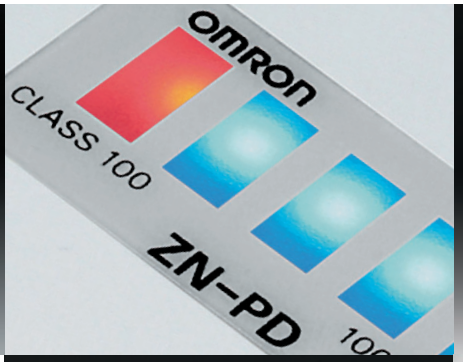
OMRON

Clean Sensing System

ZN Series

System Manual



Cat. No. Z267-E1-03

Introduction

Thank you for purchasing the ZN.
This manual provides only information, such as system components and setup procedures, that is required when using the ZN Series in a system.
For details on product functions, performance and handling methods of individual products, refer to the Instruction Sheet packaged with the respective product.
When using the ZN, be sure to observe the following:

- The ZN must be operated by personnel knowledgeable in electrical engineering.
- To ensure safe use of the product, please read the Instruction Sheet packaged with each product and this manual to deepen your understanding of the product.
- Please keep this manual and the Instruction Sheet packaged with each product in a safe place so that they can be referred to whenever necessary.

System Manual

Clean Sensing System
ZN Series

READ AND UNDERSTAND THIS DOCUMENT

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

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- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.

- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

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Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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Precautions for Safe Use

The following points are important to ensure safety, so make sure that they are strictly observed.

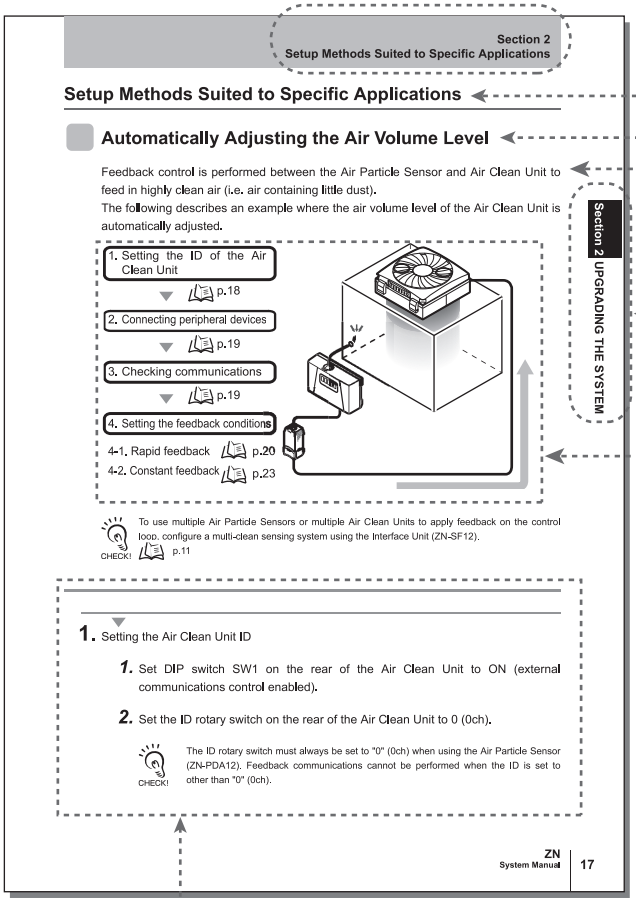
■ Power Supply and Wiring

- When connecting multiple Air Clean Units to build a system, use a commercially available LAN cable (straight type: Category 5E or higher).
- On models that can be connected to Air Clean Units, such as the Air Particle Sensor (ZN-PDA12) and Interface Unit (ZN-SF12), use the cable from the body to directly connect to the unit.
- To extend the cable mentioned above, a commercially available LAN connector female to female, straight type) and a LAN cable (straight type: Category 5E or higher) must be used.
- The cables must be 100 m or shorter in total length.

For details on other precautions for safe use and precautions for correct use, refer to the Instruction Sheet for the respective device, and make sure that they are strictly observed.

Editor's Note

Page Format



● Title of each section

● Header

Indicates the contents of the page.

● Cross-header

● Overview of the section

● Index label

Shows the chapter number and contents.

● Overview and points of the function described

Shows the operation flow and setup method.

● Operation procedure and supplementary explanation

Explains the operation procedure and the display status resulting from execution of the operation.
Helpful information regarding operation and reference pages is introduced here using symbols.

* This page does not exist.

Notational Conventions

■ Menu

In this manual, menu items displayed on the screen are enclosed with [ ].

■ Operation procedure

Operation steps are numbered to indicate their order.

■ Visual Aids

Indicates points that are important to achieve the full product performance, such as operational precautions and application procedures.

Indicates pages where related information can be found.

Indicates information helpful in operation.

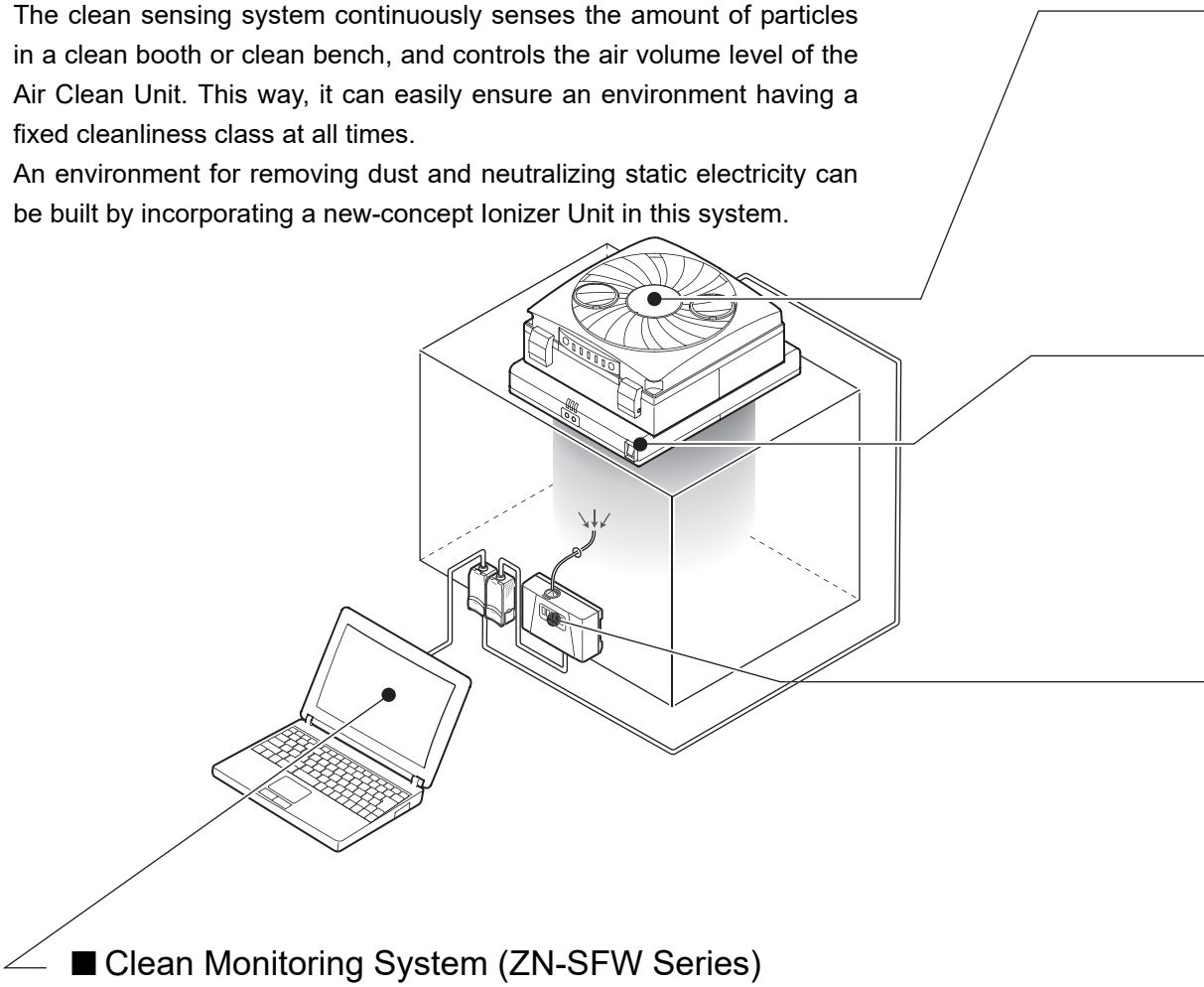
CONTENTS

Section 1
FEATURES

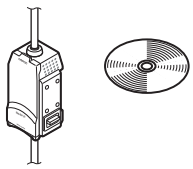
What is the "Clean Sensing System?"

System Features

The clean sensing system continuously senses the amount of particles in a clean booth or clean bench, and controls the air volume level of the Air Clean Unit. This way, it can easily ensure an environment having a fixed cleanliness class at all times.
An environment for removing dust and neutralizing static electricity can be built by incorporating a new-concept Ionizer Unit in this system.



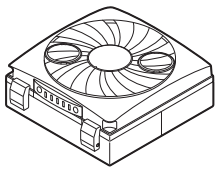
■ Clean Monitoring System (ZN-SFW Series)



Monitoring the amount of particles at multiple points in manufacturing processes is important in improving product quality. By connecting Interface Units, you can log the measured data of Air Particle Sensors at up to ten locations at once on a personal computer.
The Electrostatic Sensor (ZJ-SD) also can be connected, which means that you can also ascertain the relationship between the amount of static electricity and the amount of particles.

Thinnest in industry, large air volume

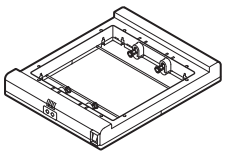
■ Air Clean Unit (ZN-A Series)



Unique twin-blower structure (ZN-A2502) achieves light weight and large air volume.
Compact but more powerful.
Incorporating a clogged main filter (HEPA) detection function.
Visibility is improved by indicators located on two corners of the body.

An industry first, one-touch dust removal and static neutralization

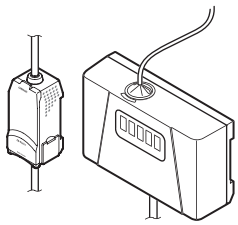
■ Ionizer Unit (ZN-J Series)



Directly mounted on Air Clean Unit
Open structure does not block the laminar airflow from the Air Clean Unit.
No more troublesome wiring required. Installation man-hours can be considerably reduced.

Smallest in industry, constant measuring

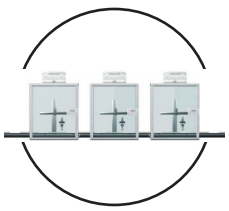
■ Air Particle Sensor (ZN-PD Series)



High-performance fan used for air suction to ensure measurement at all times.
Use of a semiconductor laser and high-sensitivity optical design in the sensor achieves measurement of minute particles of 0.3 μm, 0.5 μm and 1.0 μm in diameter.

Main Applications

Electronic component production processes



Storage or test environments

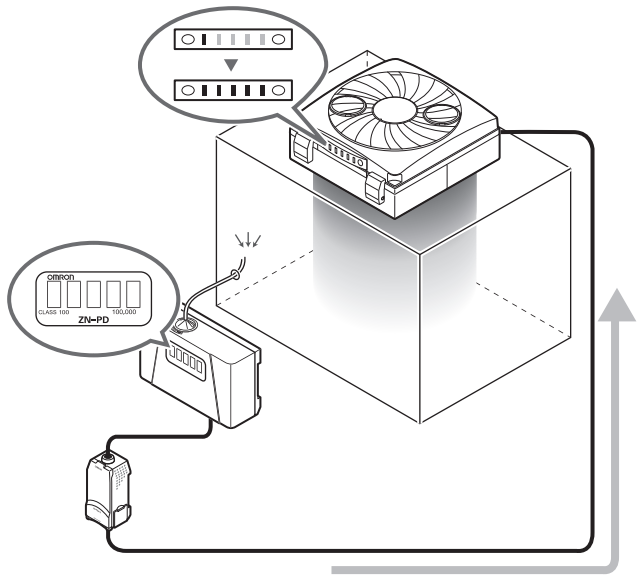
Cell manufacturing processes

Features of the Clean Sensing System

■ Feedback-based Automatic Adjustment of Air Volume

The air volume level of the Air Clean Unit can be automatically controlled based on the amount of particles measured by the Air Particle Sensor. The cleanliness class in clean booths can be maintained at the optimum air volume level in proportion to the amount of particles from rapid air feed through to fine air volume operation in the power saving mode.

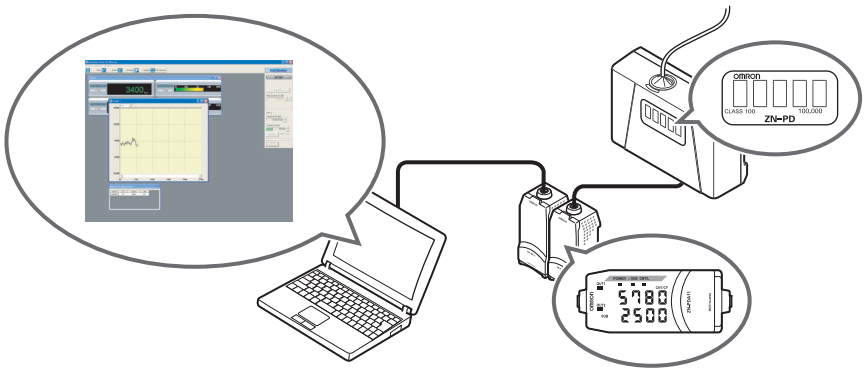
Setting Method p.18



■ Monitoring/Logging the Amount of Particles

The cleanliness class inside clean booths can be verified and ascertained by the amount of particles per unit volume. The amount of particles can be verified on the Sensor and the Amplifier Unit.
Measured values can be easily logged on a personal computer using Interface Units and the exclusive monitoring software (Realtime Clean Air Monitor). Changes in the amount of particles over time observed in this way can be made use of as data for improving product quality.

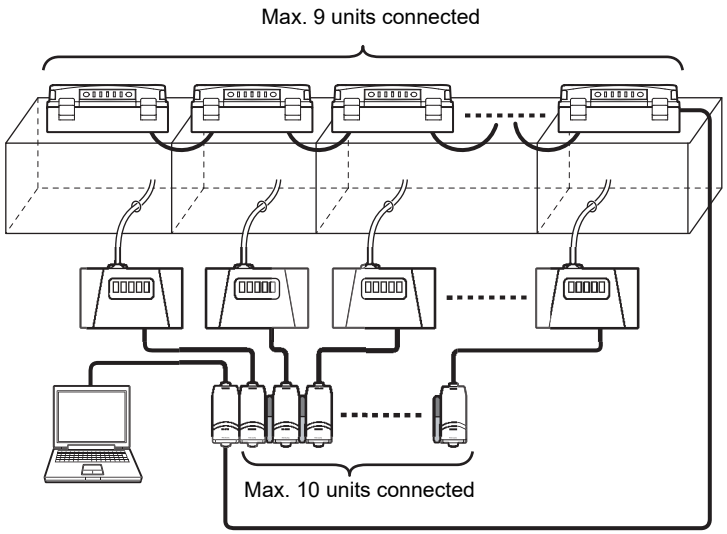
Setting Method p.25



■ Improving Product Quality by Multi-point Measurement

Since Air Clean Units and Air Particle Sensors can be connected to each other, the amount of air particles in multiple clean booths installed in processes can be comprehensively detected and controlled. Which process is worsening in cleanliness can be linked to quality control for continual management.

Setting Method p.31



■ Simultaneous Dust Removal and Static Neutralization

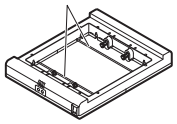
The Ionizer Unit ZN-J series, the first in industry to be added on later to an Air Clean Unit, provides you with a new clean environment capable of removing dust and neutralizing static electricity.

• Simultaneous Removal of Particles and Static Electricity

A variable DC system is used for electrostatic discharge. This system can neutralize static electricity in wide spaces.

Two ion balance sensors provide constant feedback to maintain uniform neutralizing performance.

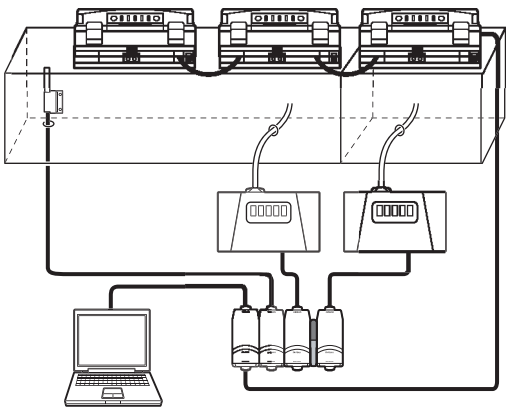
Ion Balance Sensor



• Simultaneous Monitoring of Charged Amount of Workpieces

Electrostatic Sensor ZJ-SD can be connected to the clean sensing system. The problem of adhesion of particles can be solved by accurately ascertaining the charged amount of the workpiece, and using the Ionizer Unit to appropriately neutralize static electricity.

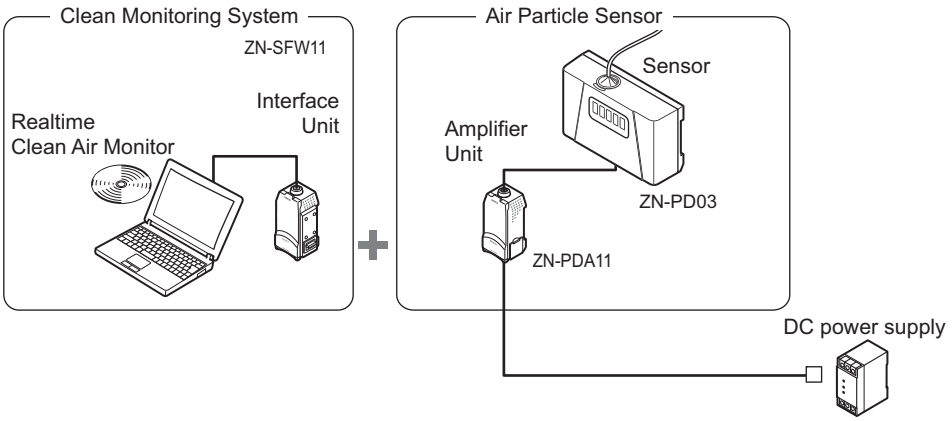
Also, since ZJ-SD data can also be captured on a personal computer via the Interface Unit, the amount of particles and charged amount can be acquired and collected simultaneously, and made use of as basic data for improving product quality.



System Configuration Examples

Direct Clean Sensing System

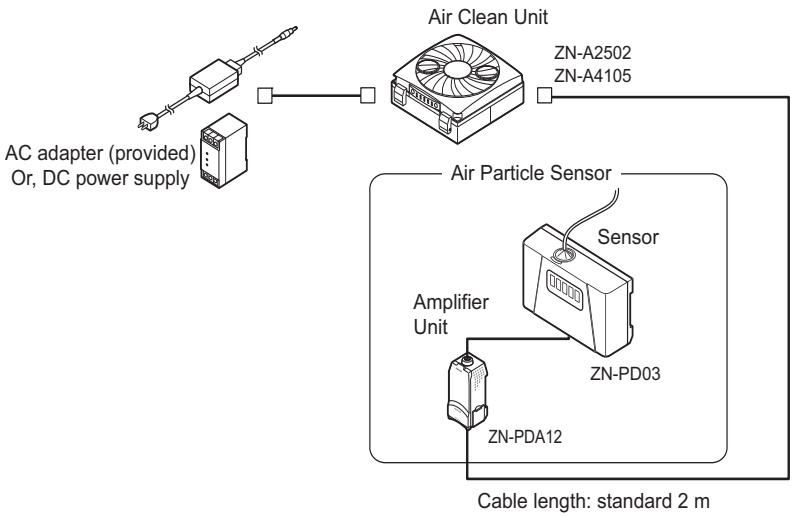
■ Data Logging



[Features]
• Monitoring/Logging the Amount of Particles

For details on settings, see p.25.

■ Feedback



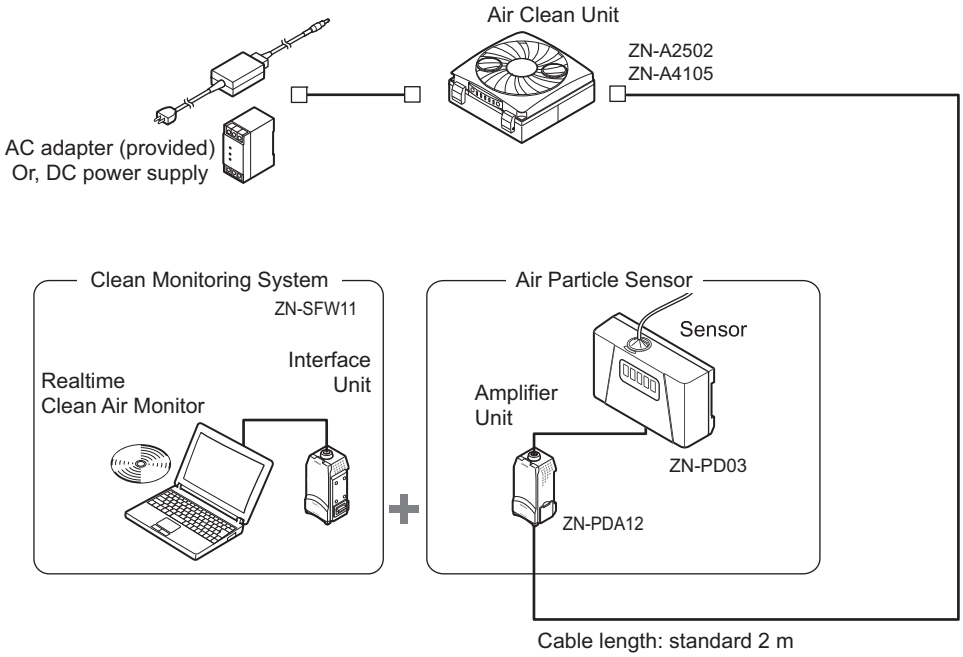
CHECK!

To extend the cable mentioned above, a commercially available LAN connector (female to female, straight type) and a LAN cable (straight type: Category 5E or higher) must be used.

[Features]
• Feedback-based Automatic Adjustment of Air Volume

For details on settings, see p.18.

■ Feedback and Data Logging



CHECK!

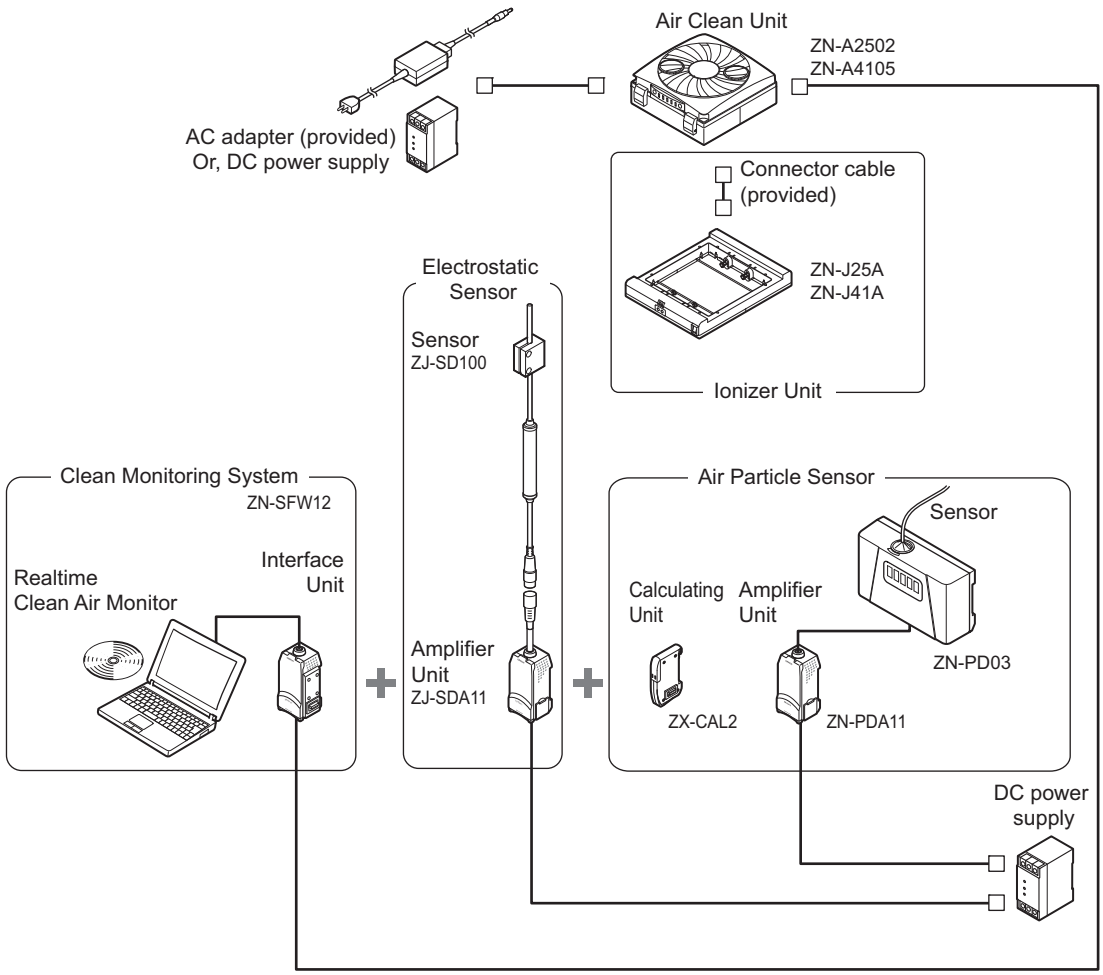
To extend the cable mentioned above, a commercially available LAN connector (female to female, straight type) and a LAN cable (straight type: Category 5E or higher) must be used.

[Features]
- Feedback-based Automatic Adjustment of Air Volume
- Monitoring/Logging the Amount of Particles

For details on settings, see p.18, p.25.

■ Dust Removal and Static Neutralization

Connection Example with Different Models (Electrostatic Sensor)



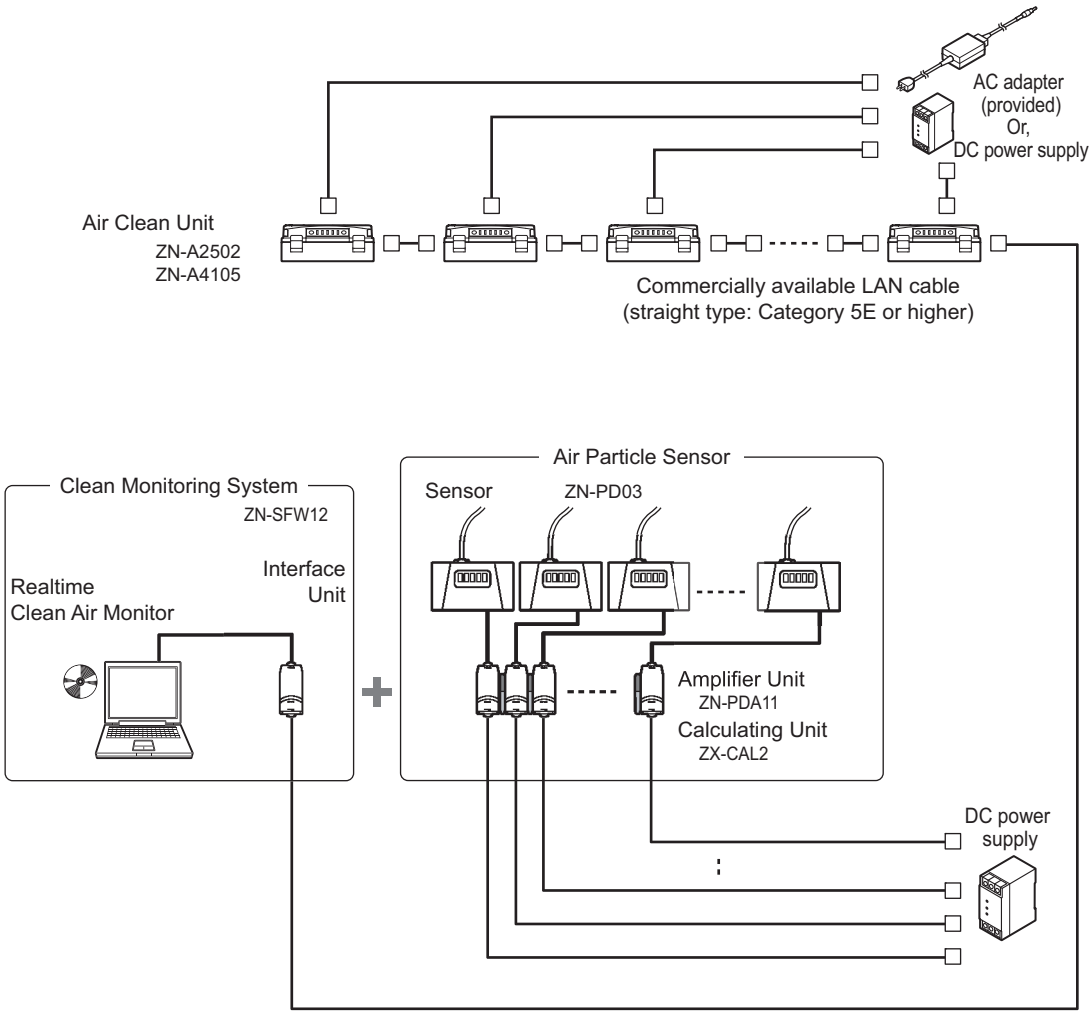
Cable length: standard 2 m

CHECK! To extend the cable mentioned above, a commercially available LAN connector (female to female, straight type) and a LAN cable (straight type: Category 5E or higher) must be used.

[Features]
- Simultaneous Monitoring of the Ion Balance
- Feedback-based Automatic Adjustment of Air Volume
- Monitoring/Logging the Amount of Particles

For details on settings, see p.18, p.25.

Multi-Clean Sensing System



Cable length: standard 2 m

CHECK!

To extend the cable mentioned above, a commercially available LAN connector (female to female, straight type) and a LAN cable (straight type: Category 5E or higher) must be used.

[Features]
- Feedback-based Automatic Adjustment of Air Volume
- Monitoring/Logging the Amount of Particles
- Detecting the Cleanliness of Multiple Processes

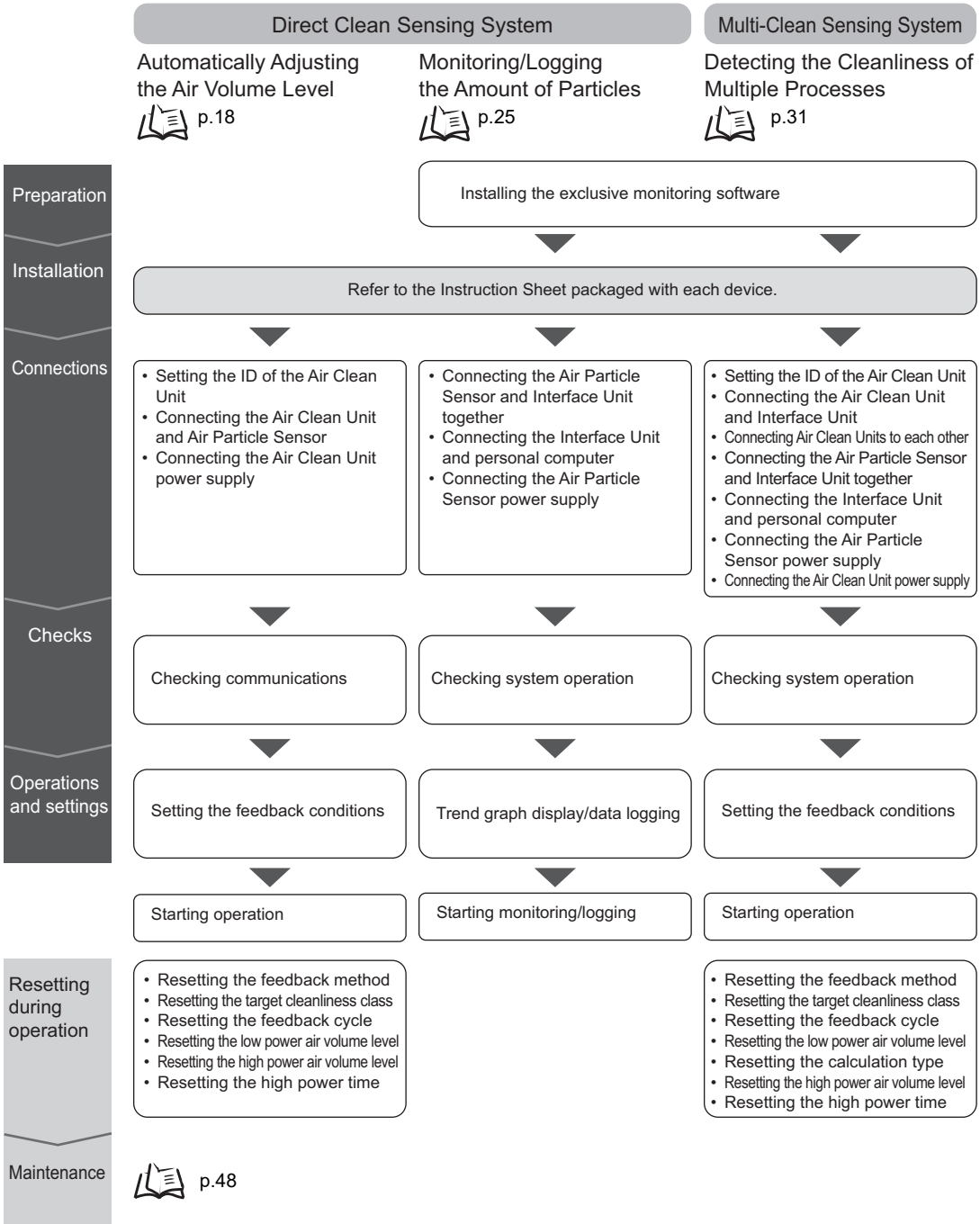
For details on settings, see p.31.

MEMO

Section 2
UPGRADING THE SYSTEM

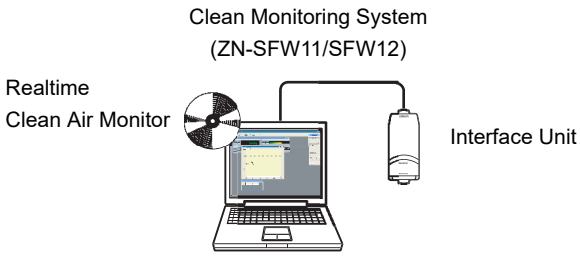
Before Upgrading the System

Flow of Operations for Upgrading the System



Installing the Exclusive Monitoring Software

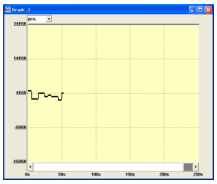
The Exclusive Monitoring Software (Realtime Clean Air Monitor) tool is provided for the ZN Series. This tool allows you to set sensing functions, acquire and collect the amount of measured particles, and display this information as a graph on a personal computer.



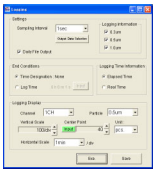
- Monitoring of measurement results

Numerical display of measured amount of particles

Graphic display of changes in measured values over time

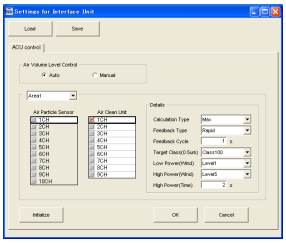


Logging of data



- Function setup support

Display and setting of Air Particle Sensor and Interface Unit settings



n How to Install/Uninstall the Software

The following describes the preparations for using Exclusive Monitoring Software.

• Installing Exclusive Monitoring Software

Before you install the software, quit all other programs that are running. Also, note that installation may take a long time if antivirus software is installed on the personal computer.

Log on as an Administrator or a user, such as a computer administrator, having rights to change system settings.

1. Turn the personal computer's power supply ON to start up Windows.
2. Insert the "Exclusive Monitoring Software" CD-ROM into the CD-ROM drive on the personal computer.
3. The program is launched automatically and the installation screen is displayed. Follow the on-screen instructions to install the software.
   If the installation is not automatically started, execute "setup.exe" in the CD-ROM.

• Uninstalling Exclusive Monitoring Software

Before you uninstall the software, quit all other programs that are running. Also, note that uninstallation may take a long time if antivirus software is installed on the personal computer.

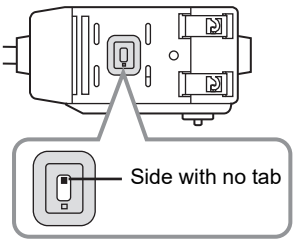
Log on as an Administrator or a user, such as a computer administrator, having rights to change system settings.

1. Turn the personal computer's power supply ON to start up Windows.
2. Select [Settings]-[Control Panel] from the [Start] menu of your personal computer.
3. Double-click [Add/Remove Programs].
4. Select [Realtime Clean Air Monitor] from the list, and click the [Change/Remove] button.
5. Click [OK].

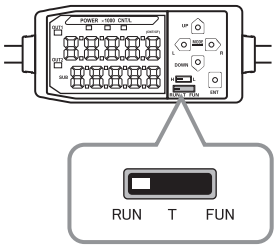
n Starting Up the Exclusive Monitoring Software

After installation is completed, start up Exclusive Monitoring Software by the following procedure.

1. Check that the current/voltage switch on the base of the Interface Unit is set to the side that has no tab (default).



2. Set the Air Particle Sensor Amplifier Unit to the RUN mode.



3. Connect the Interface Unit to the personal computer.

To connect to a personal computer (PC/AT compatible), use a 9-pin D-sub cross cable (female to female).

p.64

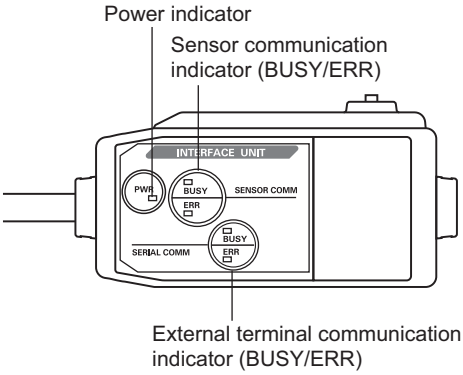
4. Connect the Interface Unit to the Amplifier Unit.

5. Turn the power supply of each device ON.

On the ZN-SF11, the ERR indicators for the sensor communications indicator and external terminal communications indicator go out.

On the ZN-SF12, the model indication when it is started up goes out, and the indication changes to the normal display (measured value display, etc.).

The Interface Unit is now ready for communications.



6. Start up the exclusive monitoring software.

Communications is automatically started.

n Exiting the Exclusive Monitoring Software

Exit Exclusive Monitoring Software by the following procedure.

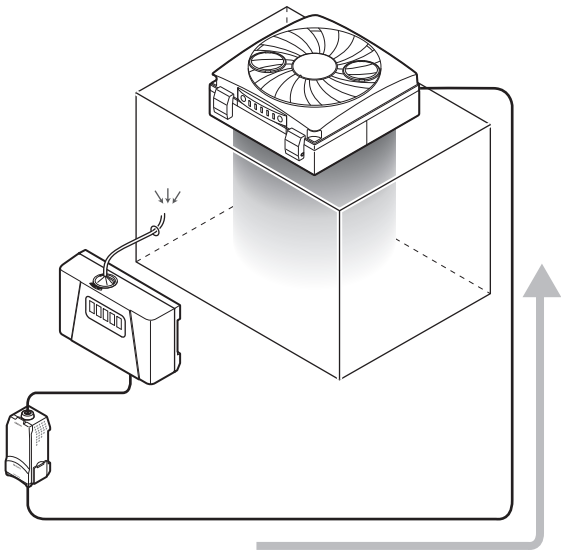
1. Select [File]-[Close] from the Exclusive Monitoring Software menu bar.

Setup Methods Suited to Specific Applications

Automatically Adjusting the Air Volume Level

Feedback control is performed between the Air Particle Sensor and Air Clean Unit to feed in highly clean air (i.e. air containing little dust).
The following describes an example where the air volume level of the Air Clean Unit is automatically adjusted.

1. Setting the ID of the Air Clean Unit
p.18
2. Connecting peripheral devices
p.19
3. Checking communications
p.19
4. Setting the feedback conditions
4-1. Rapid feedback p.20
4-2. Constant feedback p.23



CHECK! To use multiple Air Particle Sensors or multiple Air Clean Units to apply feedback on the control loop, configure a multi-clean sensing system using the Interface Unit (ZN-SF12).
p.11

1. Setting the ID of the Air Clean Unit

1. Set DIP switch SW1 on the rear of the Air Clean Unit to ON (external communications control enabled).

2. Set the ID rotary switch on the rear of the Air Clean Unit to 0 (0ch).

CHECK! The ID rotary switch must always be set to "0" (0ch) when using the Air Particle Sensor (ZN-PDA12). Feedback communications cannot be performed when the ID is set to other than "0" (0ch).

2. Connecting peripheral devices

Connect the Air Clean Unit to the Air Particle Sensor to supply power to the Air Clean Unit.

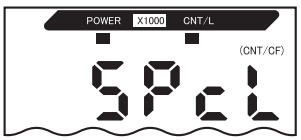
System Configuration Examples p.8

3. Checking communications

Check that communications between the units is being performed correctly by manually switching the air volume level of the Air Clean Unit on the Air Particle Sensor.

1. Set the mode switch of the Air Particle Sensor Amplifier Unit to the FUN mode.

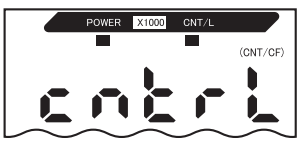
2. Display [SPCL] on the main display.



3. Display [ACU] on the sub-display.

4. Press the ENT key.

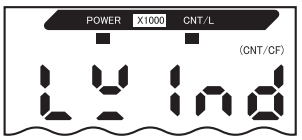
5. Display [CNTRL] on the main display.



6. Select [MNUAL].
(default value: MANUAL)

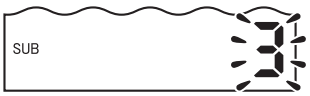
7. Press the ENT key.
This sets the selected mode.

8. Display [LWIND] on the main display.



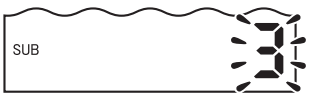
9. Set the air volume level of the Air Clean Unit.

Set the desired air volume level, and check that the air volume level is changed. (range: 1 to 5, default value: 1)



10. Press the ENT key.

Check the air volume level of the Air Clean Unit.
If the air volume changes, this indicates that communications is being performed normally.



If the air volume does not change:
Check the Air Clean Unit settings, Air Particle Sensor operation, and the wiring of connected cables.
When the Air Clean Unit settings have been changed, turn the power supply OFF and then back ON to enable the settings.

4. Setting the feedback conditions

Set the feedback conditions for the Air Clean Unit.
There are two feedback methods, and each of their setup methods is different.

Rapid feedback p.20
Constant feedback p.23

For details on feedback operation and setup parameters, see "Feedback Methods."

p.38

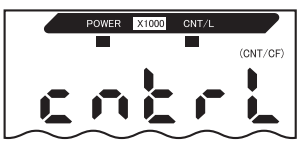
4-1. Rapid feedback

Set this method to quickly improve the environment when a drop in cleanliness is detected.

Selecting the air volume level control method

1. Display [CNTRL] on the main display.

Set the method for controlling the air volume level control of the Air Clean Unit.



2. Select [AUTO].

Set air volume level control of the Air Clean Unit to automatic.

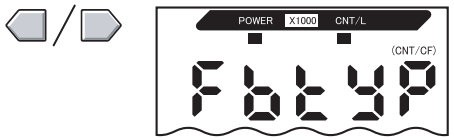
3. Press the ENT key.

This sets the selected mode.

Selecting the feedback method

4. Display [FBTYP] on the main display.

Set the feedback method.



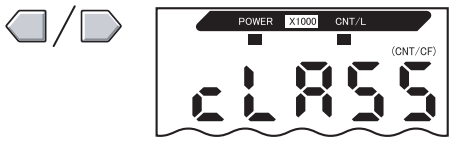
5. Display [RAPID] on the sub-display.

6. Press the ENT key.

This sets the rapid feedback method.

Setting the target cleanliness

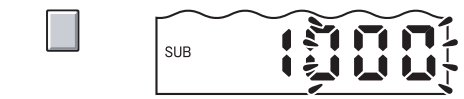
7. Display [CLASS] on the main display.



8. Select the target cleanliness class.

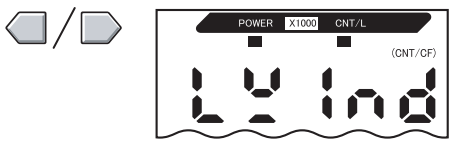
9. Press the ENT key.

This sets the specified target value.



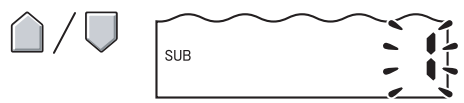
Setting the low power air volume level

10. Display [LWIND] on the main display.



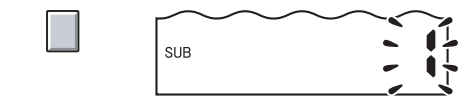
11. Set the low power air volume level of the Air Clean Unit.

Set the air volume level for when the target cleanliness is satisfied.



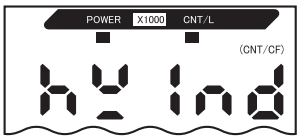
12. Press the ENT key.

This sets the specified air volume level.



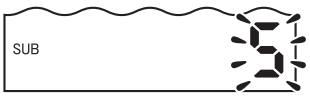
Setting the high power air volume level

13. Display [HWIND] on the main display.



14. Set the high power air volume level of the Air Clean Unit.

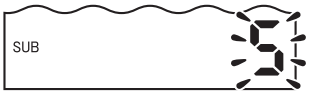
Set the air volume level within 1 to 5 (default value: 5).
Set the air volume level for when the target cleanliness is not satisfied.



For the high power air volume level, always set an air volume greater than the low power air volume level.
Feedback will not function properly if a smaller value is set.

15. Press the ENT key.

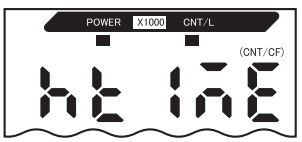
This sets the specified air volume level.



Setting the high power time

16. Display [HTIME] on the main display.

Set the high power time.



17. Set the high power time of the Air Clean Unit.

Set the time (s) within 0 to 999 (default value: 60).
Set the time that the high power air volume level is to be held for.

18. Press the ENT key.

This sets the specified time.

The time that the high power air volume level is actually held is an integer multiple of the feedback cycle (i.e. measurement cycle).
Example:
Measurement cycle: 60 s
When the high power time is set to "100 s", the actual high power time is 120 s.

19. Set the mode switch to RUN.

This starts feedback control operation.

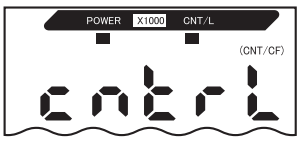
When the setting is next used, feedback is automatically started simply by turning the Air Clean Unit power supply ON.

4-2. Constant feedback

Set this method to stabilize cleanliness in the booth (area) at all times.

Selecting the air volume level control method

1. Display [CNTRL] on the main display.



2. Select [AUTO].

Set air volume level control of the Air Clean Unit to automatic.

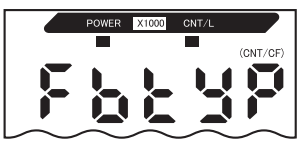
3. Press the ENT key.

This sets the selected mode.

Selecting the feedback method

4. Display [FBTYP] on the main display.

Set the feedback method.



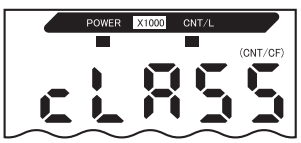
5. Display [CONST] on the sub-display.

6. Press the ENT key.

This sets the constant feedback method.

Setting the target cleanliness

7. Display [CLASS] on the main display.



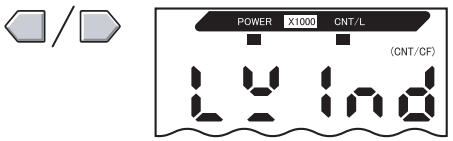
8. Select the target cleanliness class.

9. Press the ENT key.

This sets the specified target value.

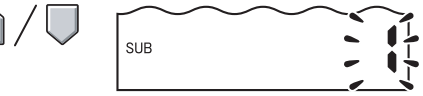
Setting the low power air volume level

10. Display [LWIND] on the main display.



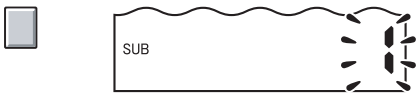
11. Set the low power air volume level of the Air Clean Unit.

Set the air volume level within 1 to 5 (default value: 1).
Set a limit value for the air volume beyond which air is not to be fed.



12. Press the ENT key.

This sets the specified air volume level.



13. Set the mode switch to RUN.

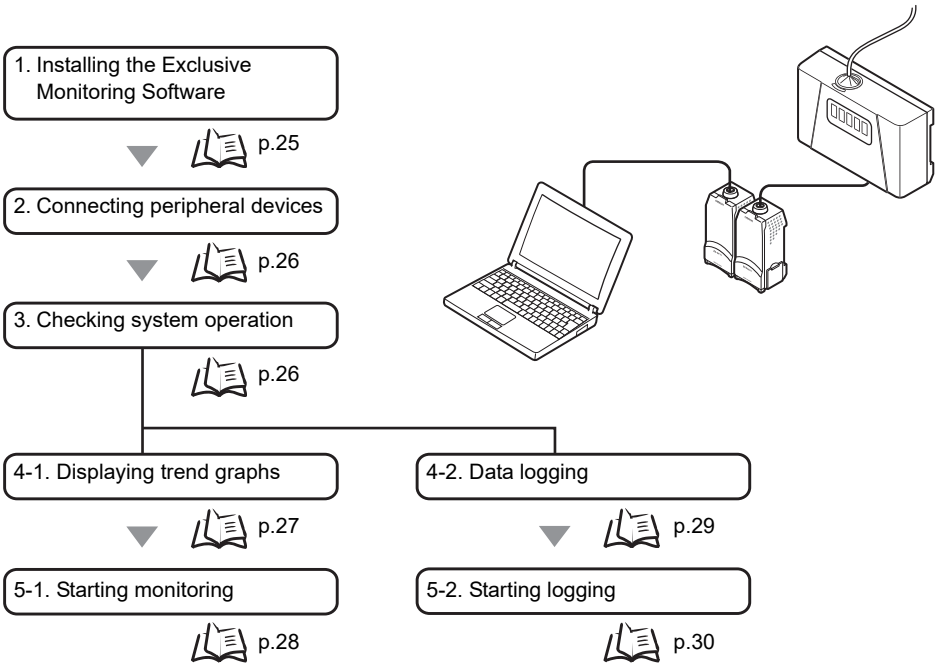
This starts feedback control operation.

CHECK!

When the setting is next used, feedback is automatically started simply by turning the Air Clean Unit power supply ON.

Monitoring/Logging the Amount of Particles

Measured particle values can be easily captured on a personal computer by using an Interface Unit (sold separately) and the Exclusive Monitoring Software.
The following describes an example where the amount of particles is displayed as a trend graph and is saved as data.



1. Installing the Exclusive Monitoring Software

Install the software (exclusive monitoring software) on the personal computer beforehand.

Installing the Exclusive Monitoring Software p.15

2. Connecting peripheral devices

Connect the Air Clean Unit, Air Particle Sensor, Interface Unit, and the personal computer, and turn the power supply of all of these devices ON.
Before connecting these devices, turn their power supplies OFF.

System Configuration Examples p.7, p.9

3. Checking system operation

Make sure that the Air Particle Sensor and Interface Unit have started up normally.

CHECK!

- When the Air Particle Sensor has not started up normally:
  Check the Sensor connection. Also, refer to the Instruction Sheet for the Air Particle Sensor in the case of other errors.

- When the Interface Unit has not started up normally:
  Make sure that the Air Particle Sensor Amplifier Unit is in the RUN mode. Also, check the connections of the peripheral devices.

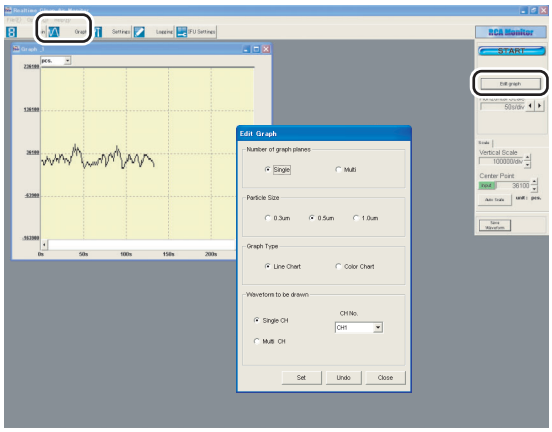
4-1. Displaying trend graphs

Display the amount of particles as a trend graph.

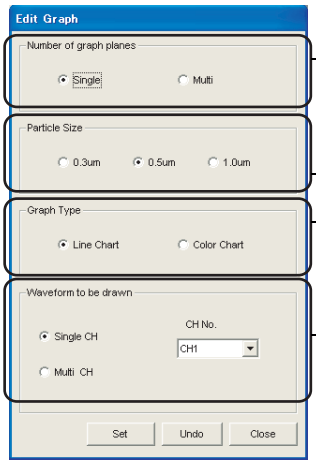
1. Start up Exclusive Monitoring Software.

Starting Up the Exclusive Monitoring Software p.17

2. Click the [Graph] button and then [Edit graph] button to display the Edit Graph screen.



3. In the Edit Graph screen, set the graph drawing conditions.



Select the number of planes to draw graphs in.
Single: All channels to be drawn as a waveform are drawn in a single graph plane.
Multi: One waveform is drawn in one graph plane.

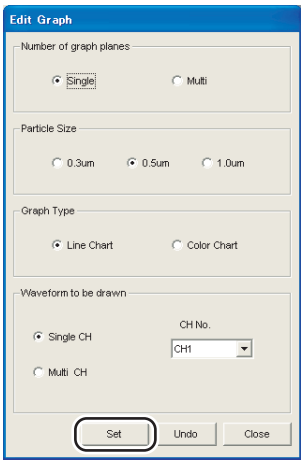
Select the particle size to be drawn as a waveform.

Select the type of the graph.
Line Chart: Displays the minimum and maximum values within a specific time period.
Color Chart: The current value is displayed color-coded.

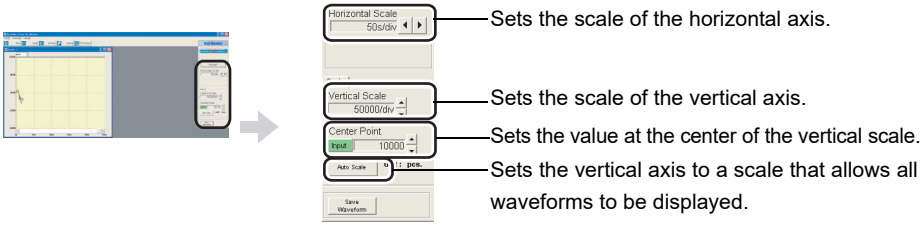
Select the channel No. to be drawn as a waveform.
Single CH: Select this item to draw only a specific channel No.
Multi CH: Select this item to draw multiple channel Nos. simultaneously.
CH No.: Select the channel No. to be drawn.

CHECK! Up to five waveforms can be drawn simultaneously.

4. Click the [Set] button.

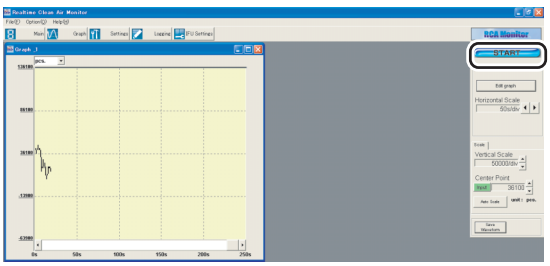


5. Align the scales of the horizontal and vertical axes.



5-1. Starting monitoring

Click the [START] button to start drawing the graph.
To stop drawing the graph, click the [STOP] button.



CHECK!

To save waveform data, click the [Save Waveform] button. (Data is saved in CSV format.)
The data for up to five planes including past data can be saved.

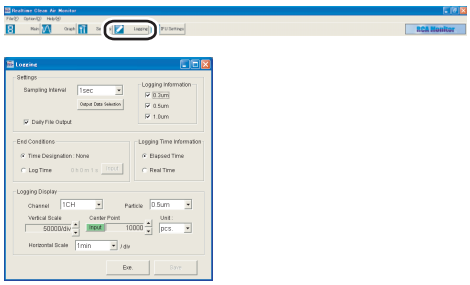
4-2. Data logging

Data logging saves the trends for the amount of particles in a clean booth as data.

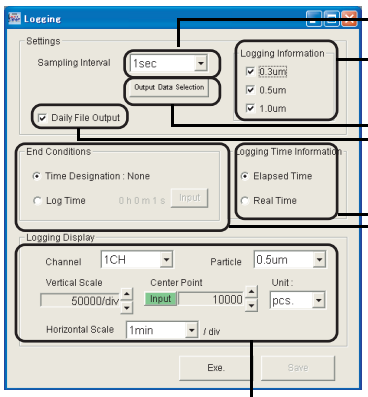
1. Start up the Exclusive Monitoring Software.

Starting Up the Exclusive Monitoring Software p.17

2. Click the [Logging] button to display the Logging screen.



3. In the Logging screen, set the logging conditions.



Select the sampling interval at which data is to be logged.

Select the particle size to be saved.
(Multiple selections are allowed.)

Click the [Output Data Selection] button to select the channel to output data from in the output channel selection screen.

When this item is selected, a logging file is automatically created and saved at each new day.

Select the time data display method that is saved at the same time as the data when performing logging.
Elapsed Time: The elapsed time is saved as the data starting from the logging start time.
Real Time: The actual time is saved as data.

Select the logging end conditions.
Time Designation: None: Logging is continued until it is ended manually.
Log Time: Set the time up to when logging ends after the [Input] button is clicked. When the time set here has elapsed, logging automatically ends. (A time up to 24 hours can be set.)

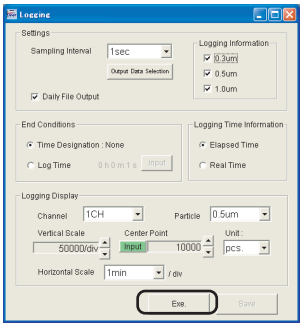
Select the channel and particle size to be drawn during logging. Also, set the horizontal and vertical scales, center of the vertical axis, and the display unit.

CHECK!

[Center Point] can be set directly by clicking the [Input] button and entering a value.
The unit selected at [Unit] is also reflected in the unit in the graph plane.

5-2. Starting logging

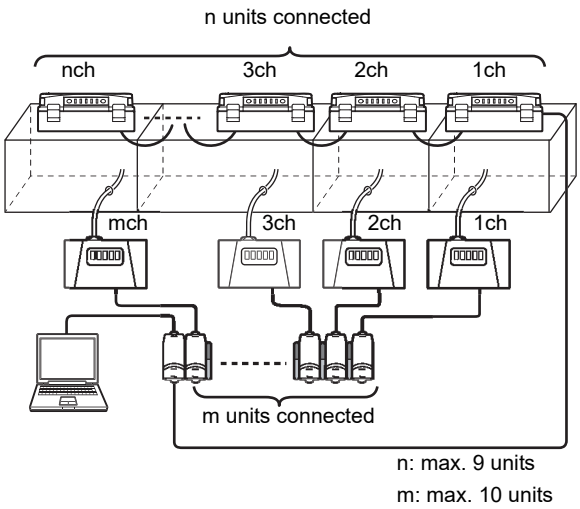
Click the [Exe.] button to start Logging.



Detecting the Cleanliness of Multiple Processes

The cleanliness of multiple processes can be verified at each individual process by multiple Air Particle Sensors and multiple Air Clean Units. The air volume level also can be controlled on individual equipment or booth (area).
The following describes an example where the cleanliness of multiple processes is controlled.

1. Installing the Exclusive Monitoring Software
p.31
2. Setting the ID of the Air Clean Unit
p.32
3. Connecting peripheral devices
p.32
4. Checking system operation
p.32
5. Setting the feedback conditions
p.32



1. Installing the Exclusive Monitoring Software

Install the software (exclusive monitoring software) on the personal computer beforehand.

Installing the Exclusive Monitoring Software p.15

2. Setting the ID of the Air Clean Unit

1. Set DIP switch SW1 on the rear of the Air Clean Unit to ON (external communications control enabled).

2. Set each of the channels (1 to n) by the ID rotary switch on the rear of the Air Clean Unit.

Be sure to set unique ID numbers to each Unit.
The Units will not function properly when the same ID is set to multiple units.
When using the ZN-SF12 to perform feedback control, do not set the ID number to "0" (0ch).
A ZN-SF12 set to 0ch cannot be controlled.

3. Connecting peripheral devices

Connect the Air Clean Unit, Air Particle Sensor, Interface Unit, and the personal computer, and turn the power supply of all of these devices ON.
Before connecting these devices, turn their power supplies OFF.

System Configuration Examples p.11

4. Checking system operation

Check operation of the Air Clean Unit, Air Particle Sensor and Interface Unit.

- When the Air Particle Sensor has not started up normally:
  Check the Sensor connection. Also, refer to the Instruction Sheet for the Air Particle Sensor in the case of other errors.
- When the Interface Unit has not started up normally:
  Make sure that the Air Particle Sensor Amplifier Unit is in the RUN mode. Also, check the connections of the peripheral devices.
- Check that the Air Clean Unit is in the standby mode.

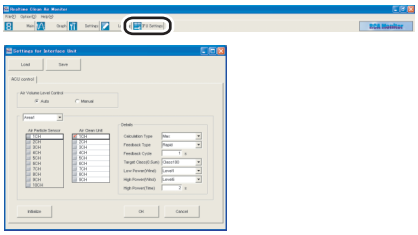
5. Setting the feedback conditions

Operate the Exclusive Monitoring Software to set multiple feedback conditions.

1. Start up Exclusive Monitoring Software.

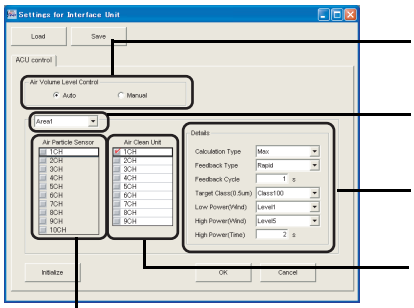
Starting Up the Exclusive Monitoring Software p.17

2. Click the [IFU Settings] button to display the Settings for Interface Unit screen.



3. In the Settings for Interface Unit screen, set the control conditions.

Set the information of the Air Clean Units and Air Particle Sensors located in the areas, and the method for controlling the air volume level of the target areas.



Air Volume Level Control:
Select the method for controlling the air volume level.

Area selection:
Select the target area to be set.

Set the details.

Feedback destination Air Clean Unit:
Select the Air Clean Unit to be controlled.

Feedback source Sensor channel:
Select the Air Particle Sensors located in the target areas.

The detailed settings are as follows:

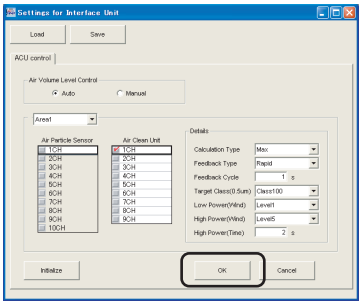
Item	Description
Calculation Type	Selects the method for calculating the measured value. Max: Select this parameter to set the maximum value of the measurement result measured by the selected Air Particle Sensor as the cleanliness of the target area. Min: Select this parameter to set the minimum value of the measurement result measured by the selected Air Particle Sensor as the cleanliness of the target area. Ave: Select this parameter to set the average value of the measurement result measured by the selected Air Particle Sensor as the cleanliness of the target area.
Feedback Type	Selects the feedback method.
Feedback Cycle	Selects the feedback cycle.
Target class(0.5µm)	Selects the cleanliness class to be controlled.
Low Power(Wind)	When "Constant" is selected at "Feedback Type", select the limit value for the air volume beyond which air is not to be fed, and when "Rapid" is selected, select the air volume level for when the cleanliness has reached the target value.
High Power(Wind)	Select the air volume level for when the cleanliness has not reached the target value. This item can be selected only when "Rapid" is selected at "Feedback Type".
High Power(Time)	Select the time that the high power air volume level is to be held for.

CHECK!

- For the high power air volume level, always set an air volume greater than the low power air volume level. Feedback will not function properly if a smaller value is set.
- The time that the high power air volume level is actually held is an integer multiple of the feedback cycle.
  Example: When Feedback Cycle is set to "60 s" and High Power(Time) is set to "100 s", the actual high power time is 120 s.
- We recommend setting the feedback cycle to the measurement cycle of the Air Particle Sensor or higher. Otherwise, feedback control will be endlessly executed based on the same measurement result, and correct feedback control will not be possible.

How Feedback Control Works p.40

4. Click the [OK] button to start feedback controlled operation.



CHECK!

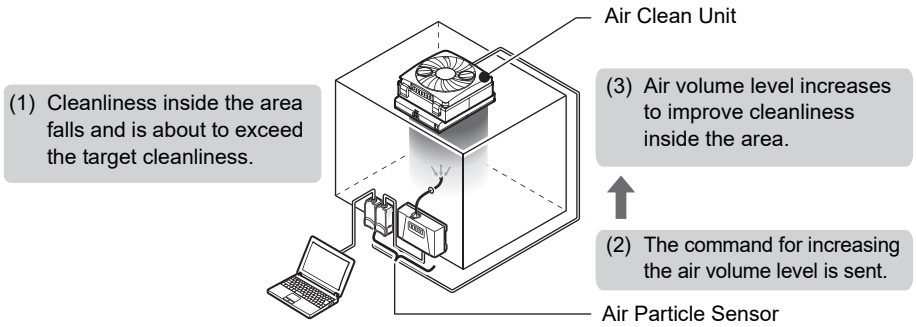
- When the setting is next used, feedback is automatically started simply by turning the Air Clean Unit and Air Particle Sensor (and Interface Unit) power supplies ON.
- Feedback sometimes is not performed smoothly (i.e. a control lag occurs during execution of feedback operation) when the power supply of the Air Clean Unit set as the control target in feedback control is not turned ON.
  To solve this, either set feedback control so that it is performed only on powered ON Air Clean Units, or turn the power supply of all currently set Air Clean Units ON.

Section 3
BASIC KNOWLEDGE OF CLEAN SENSING SYSTEMS

Feedback Control

What is "Feedback?"

"Feedback" is the control of the air volume level of the Air Clean Unit in proportion to the amount of particles to maintain the cleanliness of target spaces. The ZN series incorporates the "FO feedback" (Flexible & Optimum Feedback) function. This control program performs flexible and optimum feedback suited to the user's environment so that a clean environment can be maintained and managed.



■ System Configuration

There are two system configurations that use the feedback function, a "direct clean sensing system" and "multi-clean sensing system."

• Direct Clean Sensing System

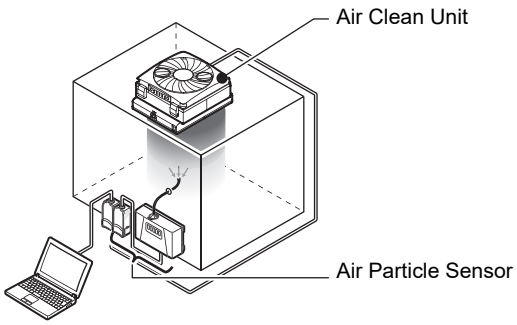
In this system, the cleanliness of one area is managed by an Air Particle Sensor and an Air Clean Unit.

Feedback processing is performed by the Air Particle Sensor.

On the direct clean sensing system, you can select between "rapid feedback" and "constant feedback" as the feedback method.

Feedback Methods p.38

Various feedback parameters (described later) can also be set.

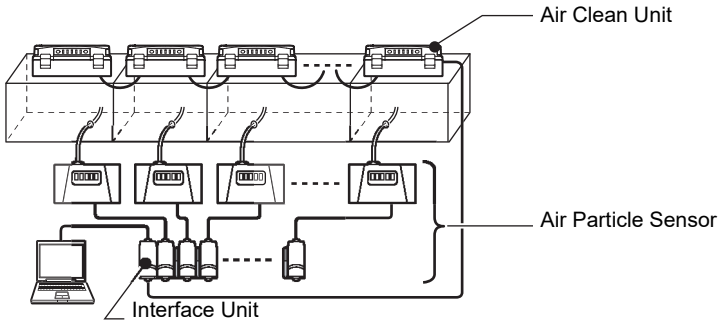


• Multi-Clean Sensing System

In this system, the cleanliness of multiple areas is managed by multiple Air Particle Sensors and multiple Air Clean Units.

The Interface Units acquire the data from the Air Particle Sensors that are connected together to perform feedback processing on the entire system.

Besides feedback processing on individual Air Particle Sensors, correspondence between Air Particle Sensor and Air Clean Unit channels and calculation of Air Particle Sensor data also are possible.



CHECK!

When using multiple Air Particle Sensors or multiple Air Clean Units, configure a multi-clean sensing system using the ZN-SF12.

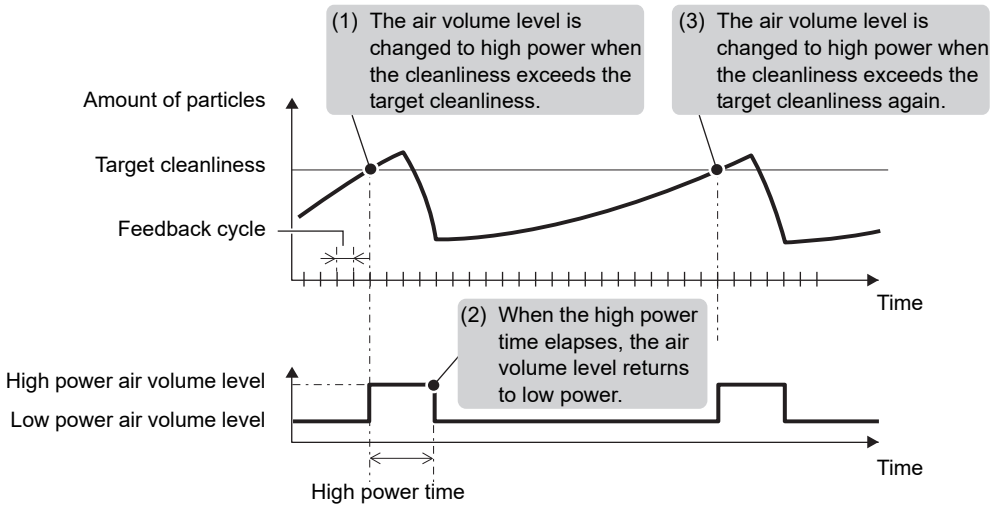
■ Feedback Methods

There are two feedback methods, "rapid feedback" and "constant feedback."

• Rapid feedback

When cleanliness has deteriorated, rapid feedback quickly increases the air volume level to recover the cleanliness.

This feedback method is effective in environments with relatively lots of change.



[Feedback Cycle]
- In a multi-clean sensing system:
  The feedback cycle can be set on the Interface Unit.
- In a direct clean sensing system:
  The feedback cycles equals the measurement time of the Air Particle Sensor.

<Feedback Operation>

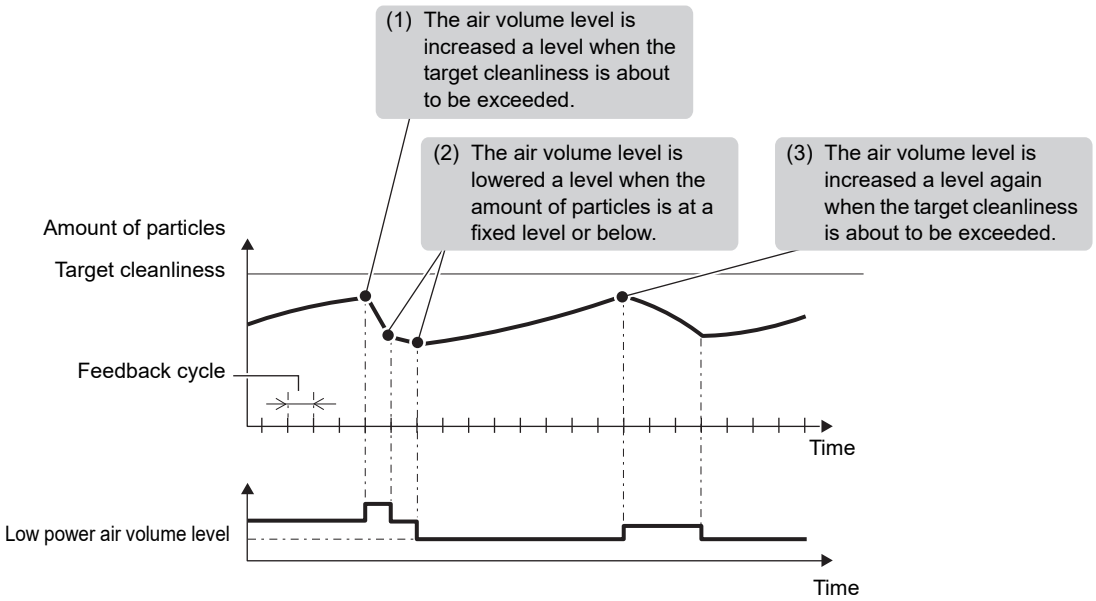
- When the high power time is set to a value other than "0":
  The high power air volume level is switched to regardless of changes in the amount of particles when the high power air volume level continues until the high power time elapses.
- When the high power time is set to "0":
  The high power air volume level continues until the amount of particles falls to a fixed level or lower, and the low power air volume level is switched to.

CHECK!

- For the high power air volume level, set an air volume greater than the lower power air volume level. Otherwise, feedback will not function properly.
- If the cleanliness is not restored after the high power time has elapsed, operation will continue at the low power air volume level (i.e. the high power air volume level will not be switched to). When this happens, either set a longer high power time or set the high power time to 0.

• Constant feedback

The air volume level is altered so that the cleanliness stabilizes at the target value. This feedback method is effective in environments with relatively little change since the cleanliness is maintained at the bare minimum air volume level.



[Feedback Cycle]
- In a multi-clean sensing system:
  The feedback cycle can be set on the Interface Unit.
- In a direct clean sensing system:
  The feedback cycle equals the "measurement time x 16" of the Air Particle Sensor.

<Feedback Operation>

The air volume level is switched in stages according to the change in the amount of particles.

CHECK!

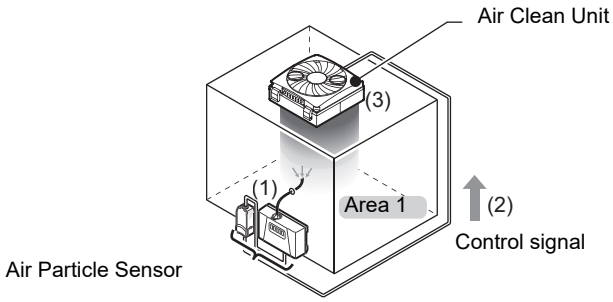
The controlled air volume level never falls below the lower power air volume level.
Set the bare minimum air volume level as the lower power air volume level.

How Feedback Control Works

The following describes the "flow of data for feedback" and "measurement processing flow" during feedback control for each system configuration.

■ Direct Clean Sensing System

• Flow of data for feedback



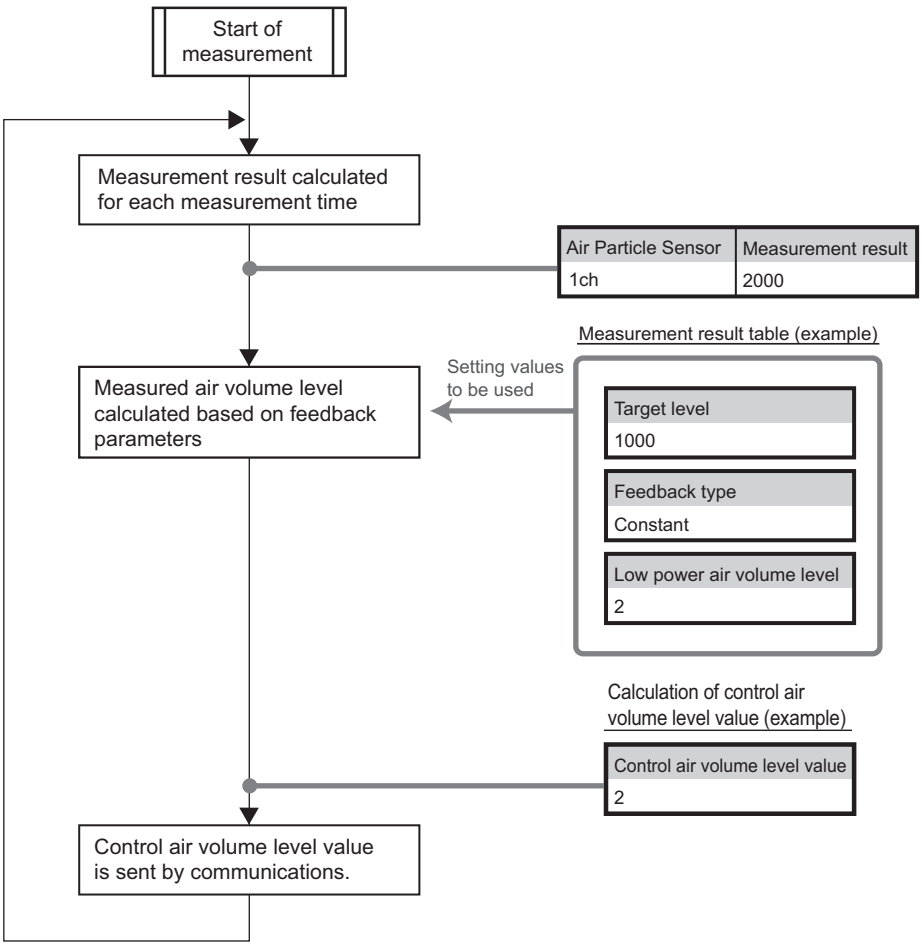
In a system configured as shown above:

(1) The amount of particles in area 1 is detected by the Sensor, and the measurement result is calculated by the Amplifier Unit.

(2) The control air volume level value of area 1 is calculated based on the measurement results, preset target values and various feedback parameters, and is sent to the Air Clean Unit.

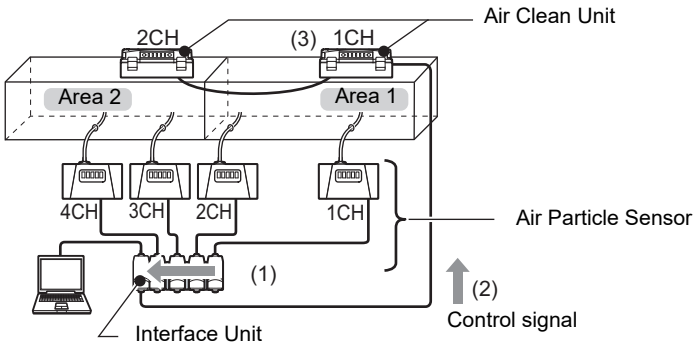
(3) The air volume level is altered according to the controlled air volume level value that arrives from the Air Particle Sensor.

• Flow of processing on the Air Particle Sensor



■ Multi-Clean Sensing System

• Flow of data for feedback



In a system configured as shown above:

(1) The amount of particles in area 1 is detected by the sensors on channels 1ch and 2ch, and the amount of particles in area 2 is detected by the sensors on channels 3ch and 4ch, the measurement result is calculated by the Amplifier Unit, and the result is transferred to the Interface Unit.

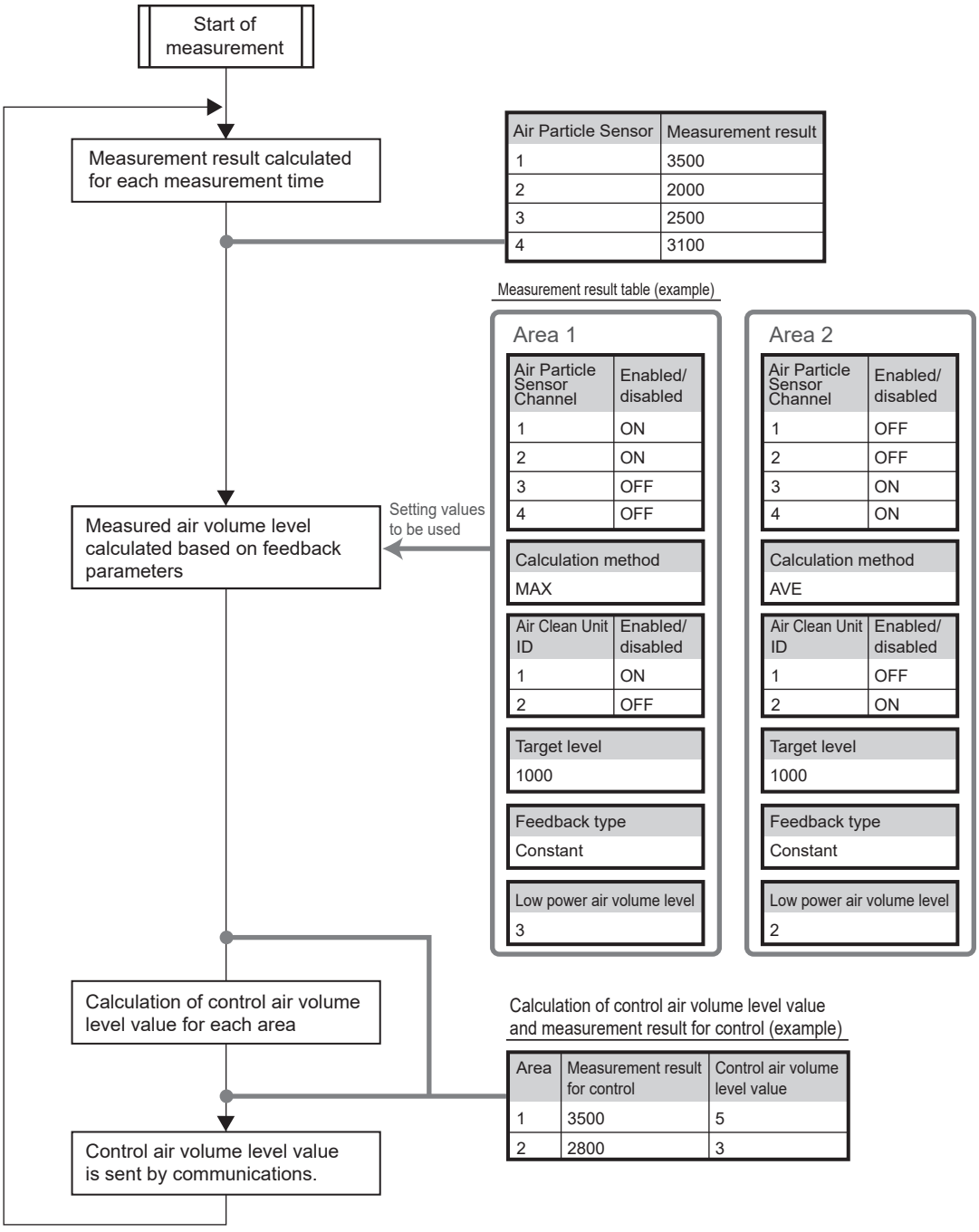
(2) The controlled air volume level value of each area is calculated based on preset target values and various feedback parameters, the measurement results sent from the Air Particle Sensors on channels 1ch to 4ch, and is sent to the Air Clean Units on channels 1ch and 2ch.

(3) The air volume level is altered according to the controlled air volume level value that arrives from the Interface Units.

• Flow of processing on Interface Unit

The following shows an example of processing flow during measurement and the data to be used when feedback processing is performed under the following conditions:

- The Air Clean Unit (ID:1) is controlled based on the larger value of the Air Particle Sensors on channels 1ch and 2ch.
- The Air Clean Unit (ID:2) is controlled based on the average value of Air Particle Sensors on channels 3ch and 4ch.



Air Particle Sensor	Measurement result
1	3500
2	2000
3	2500
4	3100

Measurement result table (example)

Area 1

Air Particle Sensor Channel	Enabled/ disabled
1	ON
2	ON
3	OFF
4	OFF

Calculation method
MAX

Air Clean Unit ID	Enabled/ disabled
1	ON
2	OFF

Target level
1000

Feedback type
Constant

Low power air volume level
3

Area 2

Air Particle Sensor Channel	Enabled/ disabled
1	OFF
2	OFF
3	ON
4	ON

Calculation method
AVE

Air Clean Unit ID	Enabled/ disabled
1	OFF
2	ON

Target level
1000

Feedback type
Constant

Low power air volume level
2

Calculation of control air volume level value and measurement result for control (example)

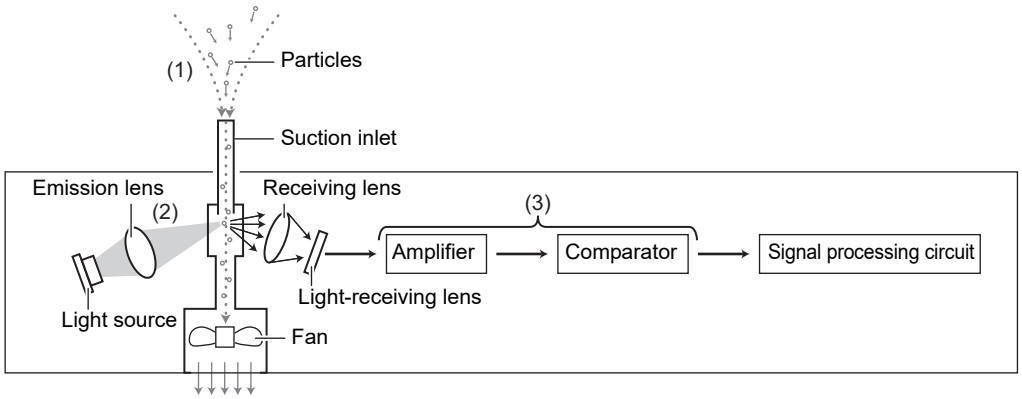
Area	Measurement result for control	Control air volume level value
1	3500	5
2	2800	3

Clean Sensing

Principle of "Particle Count"

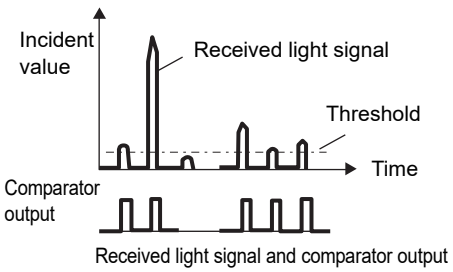
The ZN-PD series judges the cleanliness of target spaces by measuring the amount of particles (dust or dirt) floating in the air. The amount of particles is measured using the "fan method" and "scattered light method" mounted on the Air Particle Sensor (Sensor + Amplifier Unit).

CHECK! The ZN-PD series adopts the "fan method" for sucking in air. Compared with the "pump method" used on handy-type particle sensors, for example, this method has a service life that is about 10 times longer. This enables the amount of particles to be measured stably over a long period of time.



(1) Air inside the clean booth is sucked in from the suction inlet by the fan.
(2) The sucked in air is illuminated by a laser beam.
If the air contains particles, the light is scattered.
(3) Particles are detected by scattered light entering the light receiving lens, and the amount of particles is measured.
The scattered light entering the light receiving lens is converted to electric signal by the amplifier and comparator, and is sent to the signal processing circuit.
The amount of particles is measured based on the electrical signals that are sent to this circuit.

■ Measurement of the Amount of Particles



The amount of particles is measured based on the incident value. However, this incident value increases the larger the particles become. Thresholds are set for each of the target particle diameters of 0.3 μm/0.5 μm/1.0 μm, and the particle diameter is judged according to the size of the incident value.

What is "Cleanliness?"

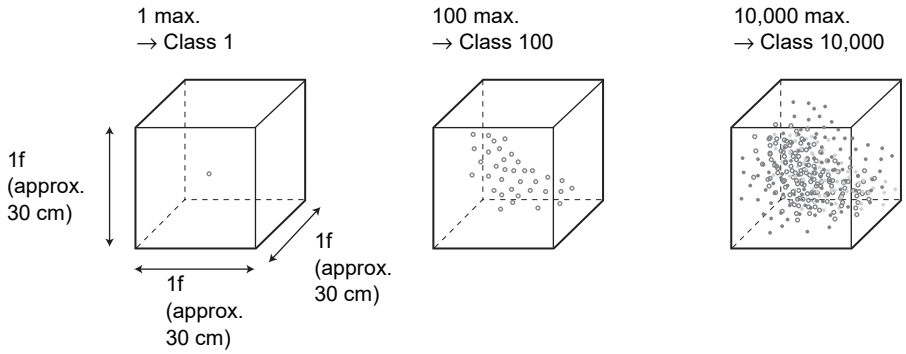
Cleanliness is expressed by the size, number and weight of polluting substances (dust, dirt, etc.) contained in a fixed area or volume. The degree of cleanliness that is indicated by the amount of dust or dirt contained in specific air is called the "cleanliness level." This is further broken down into classes called "cleanliness class."

■ Cleanliness Standards

Standards that relate to the cleanliness of clean rooms, for example, include Fed-Std-209D in the United States and JIS B 9921 in Japan. The unit volume and particle diameter of polluting substances that the criteria for these standards are based on are different. The ZN series adopts cleanliness annotation that complies with Fed-Std-209D, the most widely used standard at production sites.

■ Definition of Cleanliness According to Fed-Std-209D

Cleanliness is defined by the number of particles of 0.5 μm or more in diameter that are contained in 1 cubic foot (28.3 liters or approximately a 30 cm cube) of air, and is broken into classes defined by multiples of ten. This classification is intuitive and easy-to-understand, and has been used the longest at production sites.



	Class 1	Class 10	Class 100	Class 1,000	Class 10,000	Class 100,000
Number of particles of 0.5 μm or more/cf	1	10	100	1,000	10,000	100,000

MEMO

Section 4
APPENDICES

Maintenance

CHECK!

For details on inspection and maintenance, refer to the Instruction Sheet for the respective product.

■ Air Clean Unit

ZN-A series filters are in a double-filter structure comprising a HEPA filter and a pre-filter, and filter air that is sucked in.

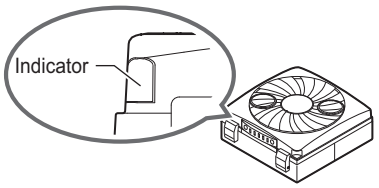
- Periodic inspection

When the filter becomes dirty, highly clean air can no longer be supplied stably for a long time. So, dust must be periodically removed from the pre-filter.

- Replacement

When the filter becomes clogged, the two indicators (green/red) on the corner of the body light simultaneously to notify that the filter must be replaced with a new one.

For details on how to replace the filter, refer to the Instruction Sheet for the Air Clean Unit.



■ Air Particle Sensor

The ZN-PDA series uses a high-performance fan on the suction module to enable continuous operation.

- Periodic inspection

Dirt and dust carried in by the fan on this system causes the filter to become dirty over extended use. When the filter becomes dirty, the amount of particles can no longer be monitored accurately. So, dust must be periodically removed from the pre-filter.

If dirt on the pre-filter is stubborn and cannot be removed, replace the pre-filter with Filter Set ZN9-PF1 (sold separately).

- Cleaning

When the system has carried in air containing lots of particulates, install Cleaning Filter ZN9-PC1 (sold separately) to maintain the inside of the Sensor in a clean state.

■ Ionizer Unit

The ZN-J series generates ions by applying a high voltage on the discharge needles to cause corona discharge.

• Periodic inspection

If the discharge needles become dirty or worn, the amount of generated ions decreases and causes the neutralizing performance to drop. So, the discharge needles must be cleaned periodically.

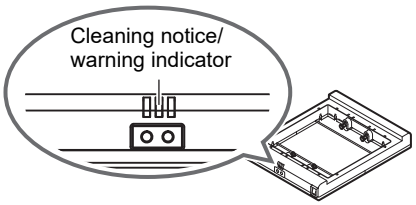
• Replacement

The cleaning notice indicator flashes orange to notify you that the discharge needles are dirty and the product's neutralizing capabilities are about to drop. The cleaning notice indicator will stop flashing and stay lit (cleaning warning) when the discharge needles become even dirtier and the product's neutralizing capabilities can no longer be sustained.

Replace the discharge needles if the cleaning warning indicator stays lit after they are cleaned.

If the cleaning warning indicator lights even after replacing the discharge needles, contact your OMRON representative.

For details on how to replace the discharge needles, refer to the Instruction Sheet for the Ionizer Unit.



Troubleshooting

Troubleshooting

This section describes countermeasures for temporary device problems. Check the malfunction in this section before sending the hardware for repair.

For details on how to connect devices, refer to the Instruction Sheet for the respective product.

Problem	Probable cause and possible countermeasure	Pages
The sensor communications LED or the external terminal communications LED ERR indicator does not light even after 5 seconds has elapsed.	The respective product is not connected correctly. • Is the mode switch on the Air Particle Sensor Amplifier Unit set to RUN? • Are the Amplifier Units connected correctly to each other, or is the Interface Unit connected correctly to the Amplifier Unit? • Has the Amplifier Unit started up properly?	-
The Air Clean Unit power supply is not ON.	• Check the power supply voltage if the DC power supply wire is used. • Is the AC adapter (provided) used?	-
The Air Particle Sensor power supply is not ON.	• Check the power supply voltage if the DC power supply is used. • Are all cables connected correctly?	-
No communications with personal computer	Turn the power supplies of the Interface Unit and Air Particle Sensor Amplifier Units OFF then back ON again. If communications still does not start, check the following points (i) to (iv), and then restart the Sensor.	-
(i) The communications ports do not match.	• Set the same communications port No. as that on the personal computer (the other communications conditions are set automatically). • Quit the application program that is using the communications port.	-
(ii) The BUSY indicator does not light up.	No signal is being sent to the Interface Unit. • Is the Sensor connected with the correct cable? (Check if it is connected with a straight cable by mistake.) • Is the sensor connected correctly? • Is the correct communications port set?	-
(iii) There is no response from the Interface Unit.	• Is the switch on the rear of the Interface Unit set to the default side? • Is the mode switch on the Air Particle Sensor's Amplifier Unit set to RUN?	p.17
(iv) An error message appears and the Sensor cannot start up.	Is the Interface Unit in use the correct one? (The dedicated Interface Unit (ZN-SF11/SF12) is required to communicate with the ZN-PDA series.)	-

Error Messages and Countermeasures

This section outlines the error messages that are displayed and the countermeasures for those messages. Check the malfunction in this section before sending the hardware for repair.

■ Air Clean Unit (ZN-A Series)

[Indicator]

Indication	Error	Countermeasure
Green, red lit simultaneously	The air outlet or air inlet is blocked.	Remove the object blocking the air outlet or air inlet.
	The filter is blocked.	Replace the filter.
Red lit	The fan is rotating irregularly.	Turn the fan power supply OFF then back ON again. If turning the power supply OFF then back ON again does not remedy the problem, contact your OMRON representative.
	The fan has reached the end of its service life.	Turn the fan power supply OFF then back ON again. If turning the power supply OFF then back ON again does not remedy the problem, a probable cause is that the fan has reached the end of its service life. Contact your OMRON representative.
	A voltage outside the rated voltage is applied to the fan.	Check the power supply voltage.
	The I/O terminal power supply and AC adapter are connected at the same time.	Check the power supply.
Green, blue flashing	The top case is open.	Close the top case, turn the power supply OFF then back ON again, and press the ON/OFF switch.

■ Ionizer Unit (ZN-J Series)

[Cleaning notice indicator/cleaning warning indicator]

Indication	Error	Countermeasure
Orange flashing	The discharge needles are dirty. Continued use in this state will cause neutralizing performance to drop.	Clean the discharge needles.
Orange lit	The discharge needles are dirty. The neutralizing performance has already dropped.	Clean the discharge needles. If this does not solve the error, the discharge needles are worn. Replace the discharge needles.

[Error output indicator]

Indication	Error	Countermeasure
Red lit	Abnormal discharge	Turn the power supply OFF then back ON again. If turning the power supply OFF then back ON again does not remedy the problem, contact your OMRON representative.

■ Air Particle Sensor (ZN-PDA Series)

[Main display]

Display	Error	Countermeasure
E-SEn (flashing)	The Sensor fan or laser is in error or has deteriorated.	Check the connection with the Sensor and Amplifier Unit, and turn the power supply OFF then back ON again. If this does not solve the problem, the Sensor is malfunctioning. Replace the Sensor.
E-hEd (flashing)	The Sensor is not connected or is in error.	
E-EEP (flashing)	The EEPROM is damaged or data is in error.	Hold down the ENT key for at least 3 seconds. If this does not solve the error, the Amplifier Unit is malfunctioning. Replace the Amplifier Unit.
E-Sht (flashing)	One or all of the judgment outputs is short-circuited.	Correct short-circuiting of short-circuited loads. (The sensor is automatically restored after the short-circuited load is canceled.)
-----	This error is indicated until the initial data is obtained after the power supply is turned ON or the FUN mode is switched to the RUN mode.	The time it takes to obtain the initial data depends on the settings for the number of samples to average and the measurement time.

[Sub-display (during communication status display)]

Display	Error	Countermeasure
Err-_	Communications timeout and other communications errors	• Check the cable connection with the Air Clean Unit. • Make sure that the channel No. of the Air Clean Unit is "0". • Switch DIP switch 1 on the Air Clean Unit to ON (external communications control enabled).

■ Interface Unit for Clean Monitoring System (ZN-SF Series)

[Main display]

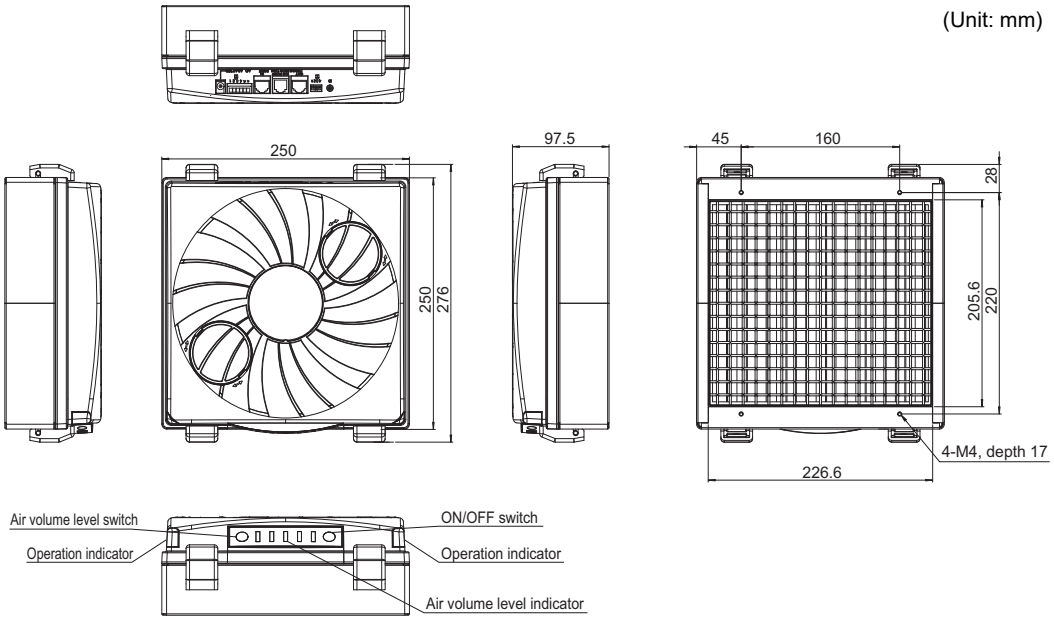
Display	Error	Countermeasure
E-AmP (flashing)	The Amplifier Unit is not connected or the adjacent Amplifier Unit cannot be recognized correctly.	• Set all mode switches on the Amplifier Unit to the RUN mode. • Make sure that the Amplifier Unit and Calculating Unit are connected correctly, and turn the power supply back ON again. If this does not solve the problem, the Amplifier Unit or Calculating Unit is malfunctioning. Replace the Amplifier Unit or Calculating Unit.
E-EEP (flashing)	The EEPROM is damaged or data is in error.	Hold down the ENT key for at least 3 seconds. If this does not solve the error, the Amplifier Unit is malfunctioning. Replace the Amplifier Unit.
Err__ (during communications status display)	Communications timeout and other communications errors on the channel indicated by __.	• Check the cable connection with the Air Clean Unit. • Check the channel No. of the Air Clean Unit and the feedback function settings.

Specifications and Dimensions

Air Clean Unit

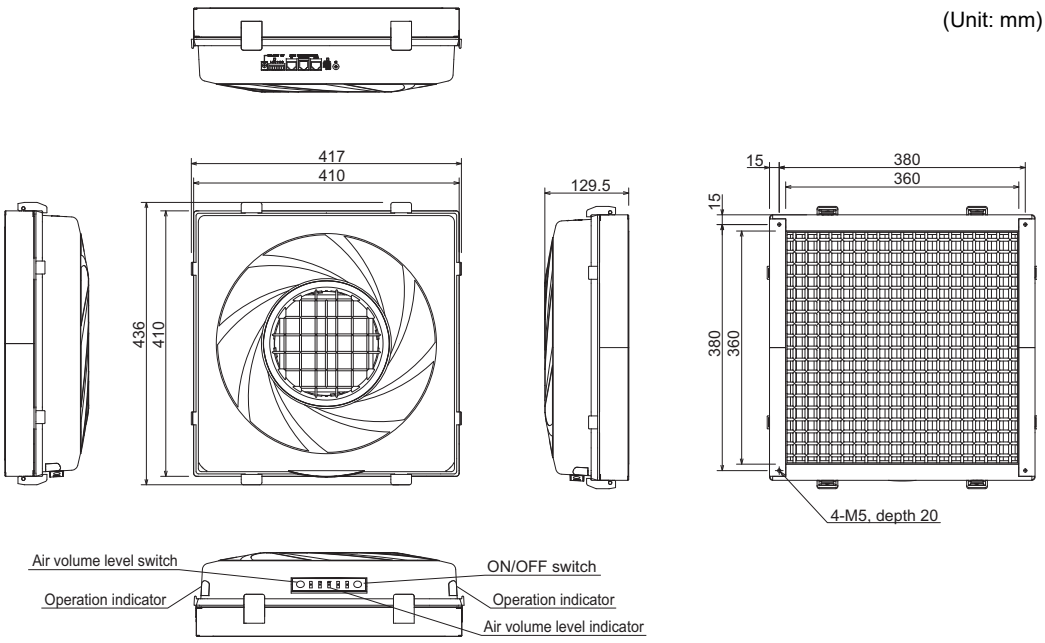
ZN-A2502/A2502D

(Unit: mm)



ZN-A4105/A4105D

(Unit: mm)



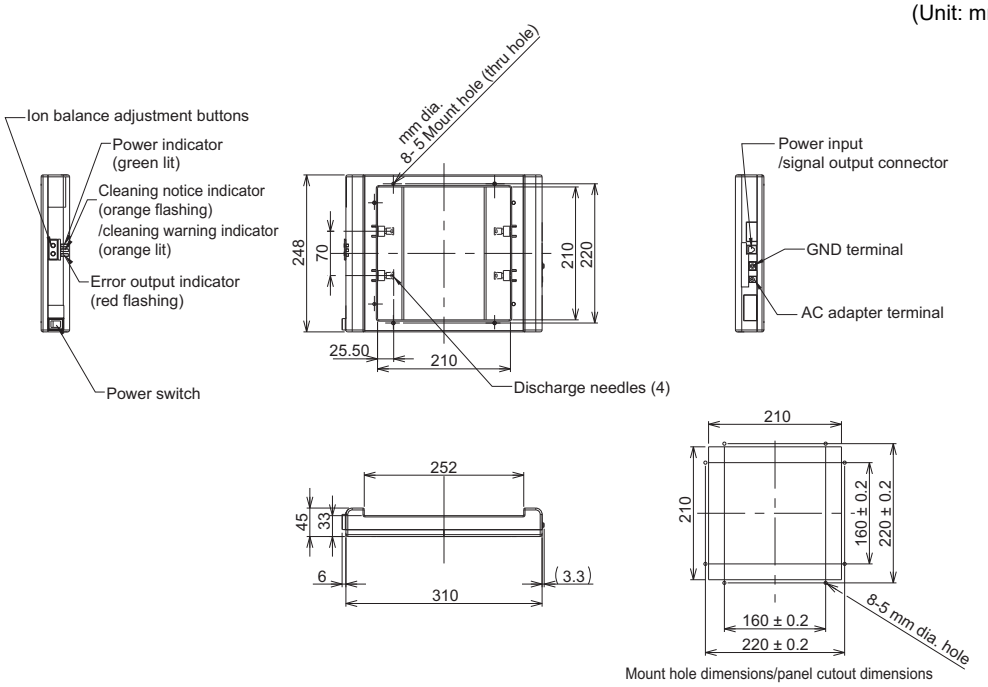
Item	ZN-A2502/A2502D	ZN-A4105/A4105D
Air outlet dimension	225 x 205 mm	360 x 360 mm
Particle outlet efficiency	More than 99.99% for 0.3 μm particles	
Air volume (m^3/min)	0.3 to 1.8 m^3/min (typical)	1.0 to 5.0 m^3/min (typical)
Sound noise level (dB)	Air volume level 3: 53 dB (typical) Air volume level 1: 41 dB (typical)	Air volume level 3: 53 dB (typical) Air volume level 1: 40 dB (typical)
Fan motor	DC brushless compact centrifugal blower: 2	DC brushless turbo fan: 1
Main filter	HEPA filter	
Main filter model	ZN9-AHP25	ZN9-AHP41
Pre-filter model	ZN9-APF25	ZN9-APF41
Power supply voltage	24 VDC ±10% Ripple (p-p) 10% max.	
Current consumption	Air volume level 5:2.1 A max. (RMS value) Air volume level 1:0.4 A max. (RMS value)	Air volume level 5:3.5 A max. (RMS value), (Peak: 5.5 A) Air volume level 1:0.32 A max. (RMS value)
Indicator	Operation: Green/Red Air volume: Blue	
Output	Alarm output 1: Alarm output 1 turns OFF when one of the following happens. (Normally, Alarm output 1 is ON.) Check the indicator to find out which one is happening. • Filter clogged • Fan error • Cleaning alarm for discharge needle (when ZN-J is used with) • Discharge error (when ZN-J is used with) Alarm output 2: Only for ZN-J used with Alarm output 2 turns OFF with the cleaning notice for the discharge needles. (Normally, Alarm output 2 is ON.)	
	30 VDC, 50 mA max. Residual voltage: 1 V max. with load current 10 mA, 2 V max. with load current 50 mA	
Functions	Air volume selectable (Level 1 to 5), automatic control by ZN-PDA, filter clogging alarm, available with ZN-J (Ionizer Unit), multi connection up to 9 units	
Ambient temperature	Operating and storage: 0 to 40°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)	
Material	Upper case: ABS, Bottom frame: Steel	
Dimensions (mm)	250 (W) x 250 (D) x 97.5 (H)	410 (W) x 410 (D) x 129.5 (H)
Weight (packed state)	Approx. 2 kg (approx. 3.3 kg)	Approx. 5.2 kg (approx. 8.6 kg)
Accessories	Instruction Sheet, Sealing parts, Mounting screws, I/O connector (XW4B-06B1-H1), AC adapter (*1) Not for ZN-A2502D, ZN-A4105D	

(*1) AC adapter:
made by Sanken Electric Co., Ltd. Model SEB100P2-24.0 (for ZN-A2502), Supply voltage 100 VAC to 240 VAC.
made by Sanken Electric Co., Ltd. Model SEC165P2-24.0 (for ZN-A4105), Supply voltage 100 VAC to 240 VAC.

Ionizer Unit

ZN-J25/J25A

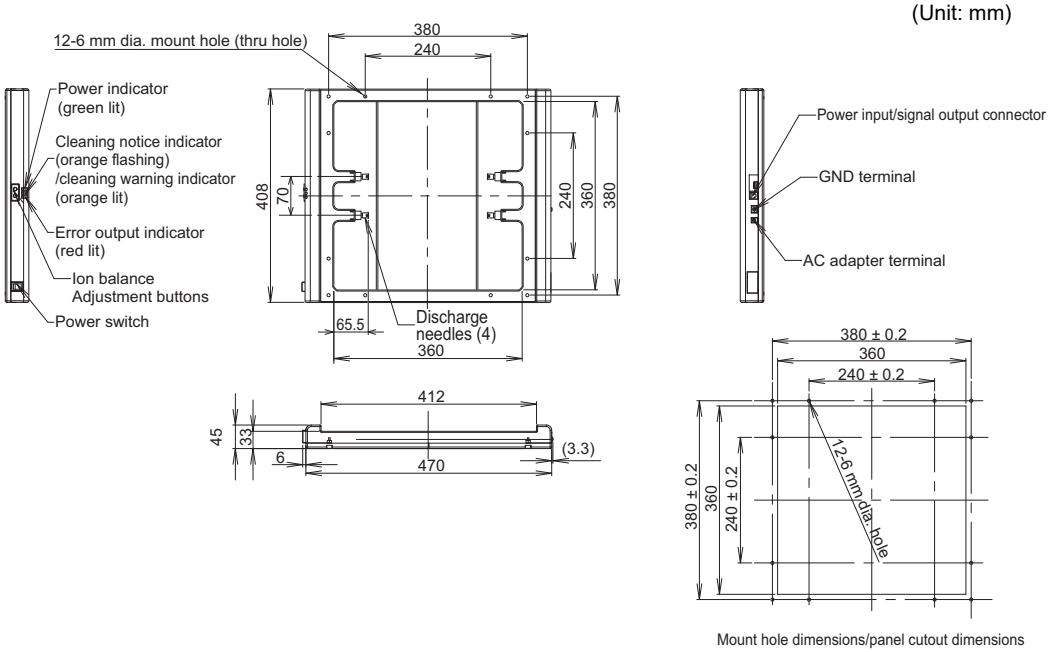
(Unit: mm)



Mount hole dimensions/panel cutout dimensions

ZN-J41/J41A

(Unit: mm)



Mount hole dimensions/panel cutout dimensions

Item	ZN-J25A	ZN-J25	ZN-J41A	ZN-J41
Available Air Clean Unit	ZN-A2502	-	ZN-A4105	-
Power supply voltage	24 VDC±10% Ripple (p-p) 10% max.			
Current consumption	300 mA max			
Output voltage	±7 kV max.			
Discharge method	Variable DC			
Neutralizing time (typical) *1	5 sec max.			
Ion balance (typical) *2	±30 V max.			
Indicator	Power (green), Cleaning notice (orange blinking), Cleaning warning (orange) Error (red)			
Output	Error output, cleaning notice/alarm output: photo MOS relay (30 VDC 300 mA max.)			
Functions	Manual ion balance adjustment, cleaning alarm, error alarm			
Ambient temperature	Operating and storage: 0 to 40°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35 to 65% (with no condensation)			
Materials	Case: ABS, Discharge needles: Tungsten			
Dimensions (mm)	248 (W) x 310 (D) x 45 (H) mm		408 (W) x 470 (D) x 45 (H) mm	
Weight (packed state)	Approx. 0.6 kg (approx. 1.4 kg)		Approx. 1.5 kg (approx. 2.7 kg)	
Accessories	Instruction sheet, Sealing parts, Mounting screws, Connector cable for Air Clean Unit, Ferrite core, English warning label	Instruction sheet, Sealing parts, Mounting screws, I/O cable (2 m), AC adapter (*3), Ferrite core, English warning label	Instruction sheet, Sealing parts, Mounting screws, Connector cable for Air Clean Unit, Ferrite core, English warning label	Instruction sheet, Sealing parts, Mounting screws, I/O cable (2 m), AC adapter (*3), Ferrite core, English warning label

(*1) Measurement conditions: Distance 300 mm, Air Clean Unit: ZN-A series with air level 5, At center of air outlet,
Neutralization: From ±1000 V down to ±100 V with Charge Plate monitor (150 x 150 mm, 20 pF)
Temperature: 18 to 28°C, Humidity: 35 to 55%
The performance might not be able to be satisfied when there is gas such as solvent gas in the measurement area.

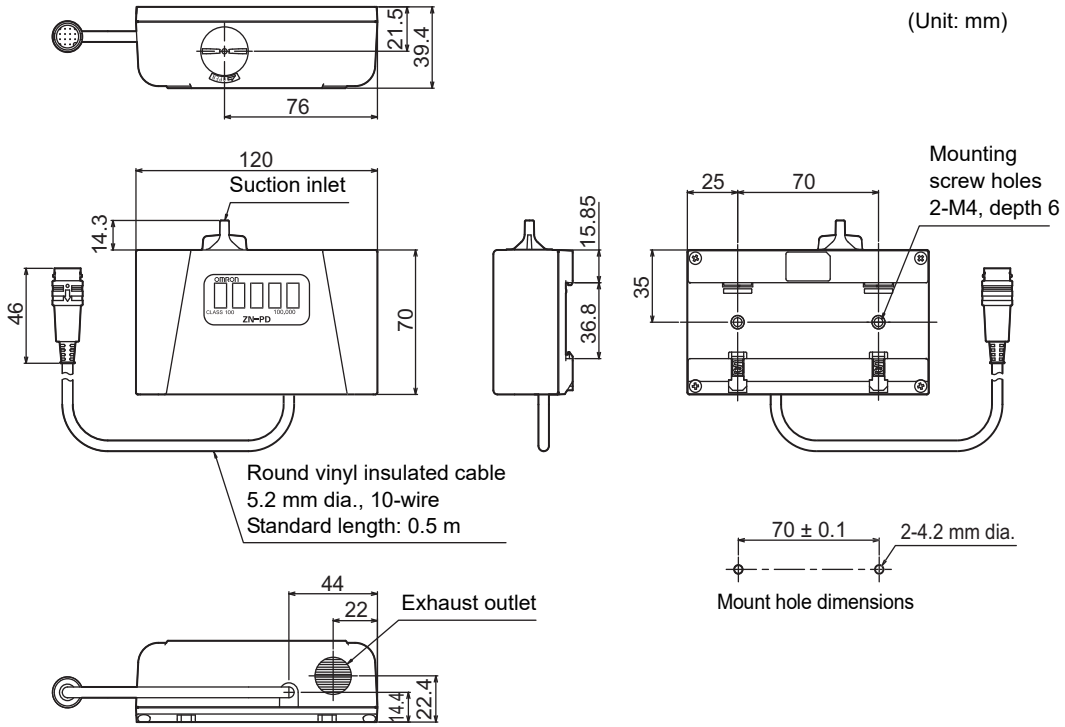
(*2) Measurement conditions: Distance 300 mm, Air Clean Unit: ZN-A series with air level 5, At center of air outlet,
Measurement time: 10 seconds at Charge Plate monitor (150 x 150 mm, 20 pF)
Temperature: 18 to 28°C, Humidity: 35 to 55%
The performance might not be able to be satisfied when there is gas such as solvent gas in the measurement area.

(*3) AC adapter: made by Sanken Electric Co., Ltd. Model SEA40N2-24.0, Supply voltage 100 VAC to 240 VAC.

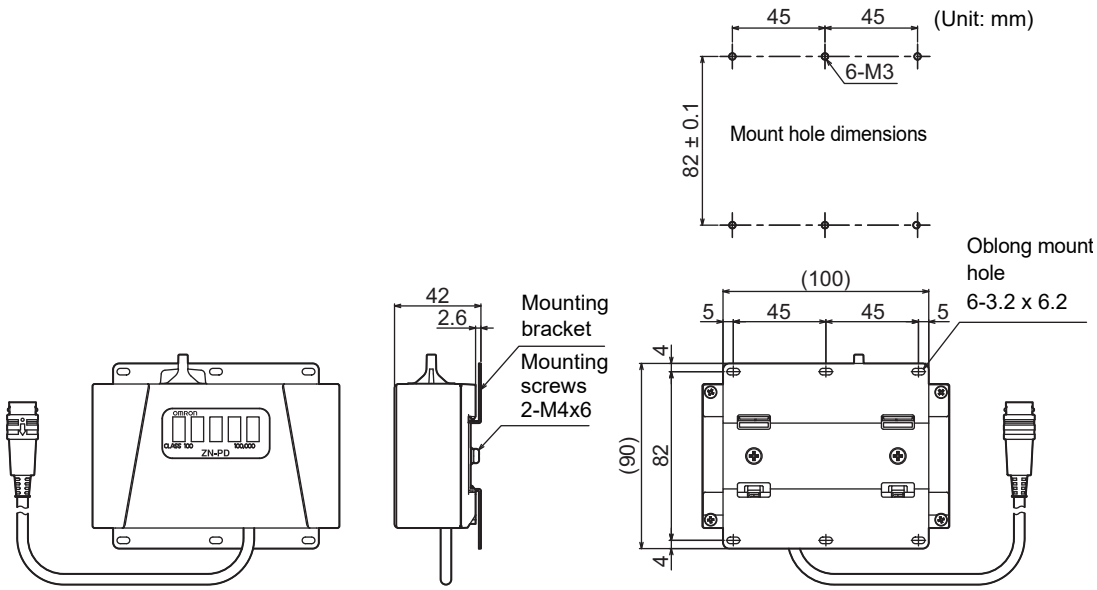
Air Particle Sensor

• Sensor

ZN-PD03



When sensor mounting bracket (ZN9-PB1, sold separately) is used

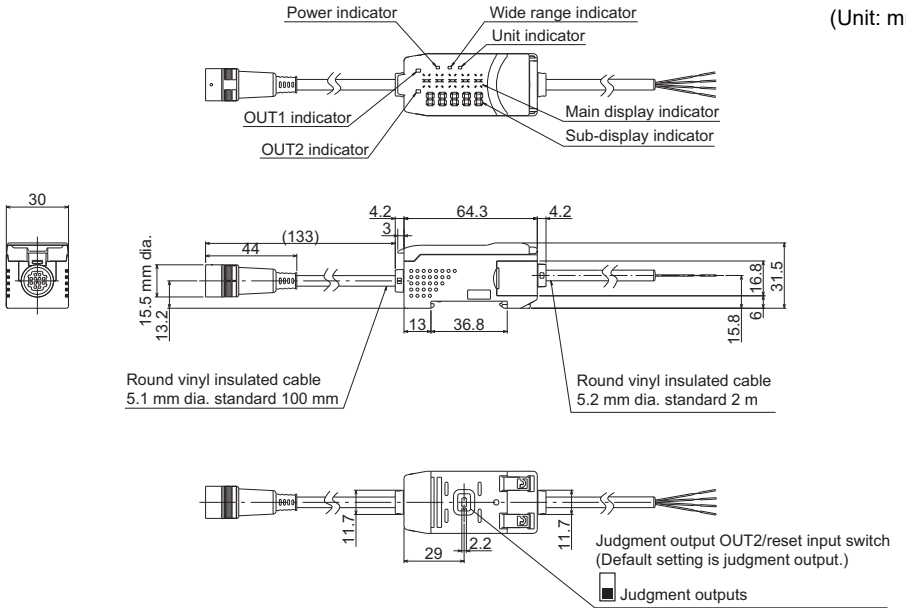


Item	ZN-PD03
Available Amplifier Unit	ZN-PDA11/ZN-PDA12
Measurement method	90° sideway light-scattering method
Light source	Semiconductor laser
Available particle size	0.3 µm/0.5 µm/1.0 µm
Available cleanliness class	Class100 to 100,000 corresponding (FED-STD-209D)
Indicator	Level indicator for Class100 to 100,000 (FED-STD-209D)
Suction tube	Inside diameter: 4 mm, Length: 1 m max.
Ambient temperature	Operating: 0 to 40°C, Storage: -15 to +50°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Vibration resistance	10 to 55 Hz, 0.7-mm double amplitude 80 min each in X, Y and Z directions
Shock resistance	150 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)
Connection method	Connector cable (standard cable length: 0.5 m)
Materials	ABS
Weight (packed state)	Approx. 300 g (approx. 450 g)
Accessories	Instruction sheet, Suction tube

- Amplifier Unit

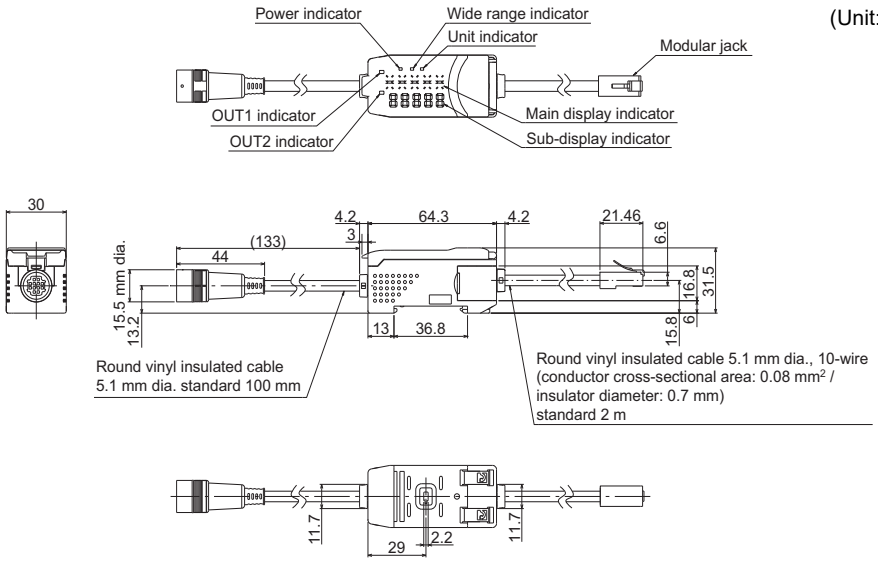
ZN-PDA11

(Unit: mm)



ZN-PDA12

(Unit: mm)

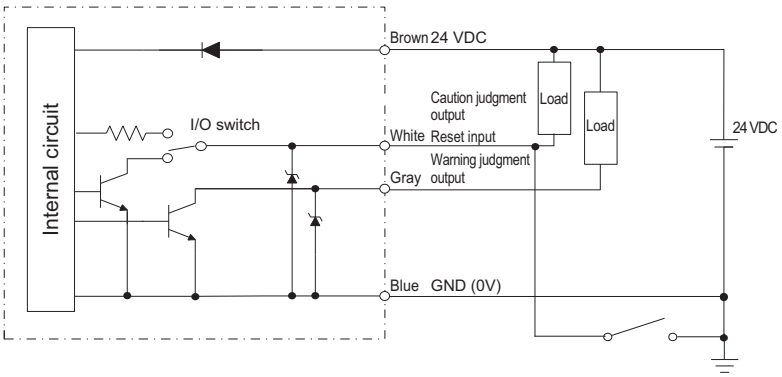


Item	ZN-PDA11	ZN-PDA12
Sampling time	1 to 599 s (selectable)	
Average count setting	1/2/4/8/16/32/64	
Indicator	Operation indicators: OUT1 (orange), OUT2 (yellow), 7-segment main display (red), 7-segment sub-display (yellow) Power (green), wide range display (green), unit selection display (green)	7-segment main display (red), 7-segment sub-display (yellow), Power (green), wide range display (green), unit selection display (green)
Judgment outputs OUT1/ OUT2(*1)	NPN open-collector outputs, 30 VDC 30mA max., Residual voltage: 1.2 V max.	-
Reset input *1	ON: Short-circuited with 0 V terminal or 1.5 V or less OFF: Open	-
Functions	Measured value display, setting value display, unit selection, scaling, peak hold, hysteresis setting, threshold level selection, wide range display, key lock, ECO mode, display reverse, display digit change, initial reset	Measured value display, communication status display, unit selection, scaling, Air Clean Unit automatic control, Air Clean Unit air level change, wide range display, key lock, ECO mode, display reverse, display digit change, initial reset
Communication with Air Clean Unit	-	Unique communication specification (RJ-45 connector and straight wiring LAN cable)
Power supply voltage	24 VDC±10% Ripple (p-p) 10% max.	24 VDC±10% Ripple (p-p) 10% max. (supplied by Air Clean Unit)
Current consumption	300 mA max.	
Ambient temperature	Operating: 0 to 40°C, Storage: -15 to +50°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)	
Insulation resistance	20 MΩ at 500 VDC	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y and Z directions	
Shock resistance	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)	
Connection method	Cable (standard cable length: 2 m)	Connector cable (standard cable length: 2 m)
Materials	Case: PBT (polybutylene terephthalate), Cover: polycarbonate	
Weight (packed state)	Approx. 180 g (approx. 350 g)	
Accessories	Instruction sheet	

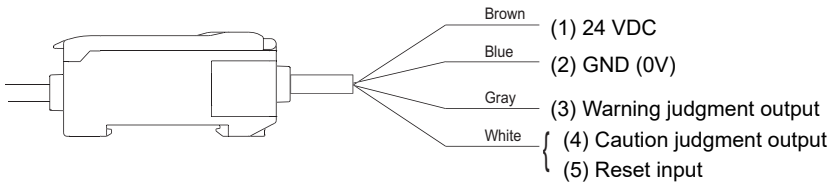
(*1) Judgment output OUT2 and reset input are switched by the DIP switch on the rear of the Amplifier Unit.

■ I/O Circuit Diagram

NPN type (ZN-PDA11)



■ External I/O



CHECK!

- Wire the cable correctly. Otherwise, the Amplifier Unit might be damaged.
- The function of the white lead can be selected by the switch on the rear of the Amplifier Unit.

(1) This is the power terminal. Connect the 24 VDC power supply to this terminal.

(2) This is the 0 V power supply terminal. On an NPN type Amplifier Unit, this terminal becomes the common terminal for inputs/outputs other than the linear output.

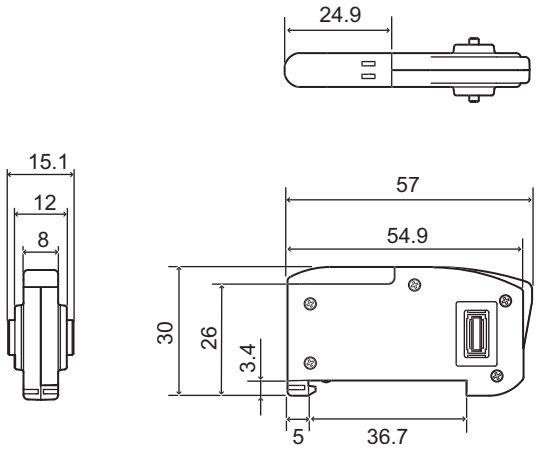
(3) This output turns ON when "measured value ≥ warning threshold".
Operation is the same as lighting of the OUT1 indicator.

(4) This output turns ON when "measured value ≥ caution threshold".
Operation is the same as lighting of the OUT2 indicator.

(5) This input is for resetting each of the outputs. When this input is ON, internal calculations are stopped, and judgment outputs are forcibly turned OFF. This input can also be used to clear the peak hold value.

- Calculating Unit
  ZX-CAL2

(Unit: mm)

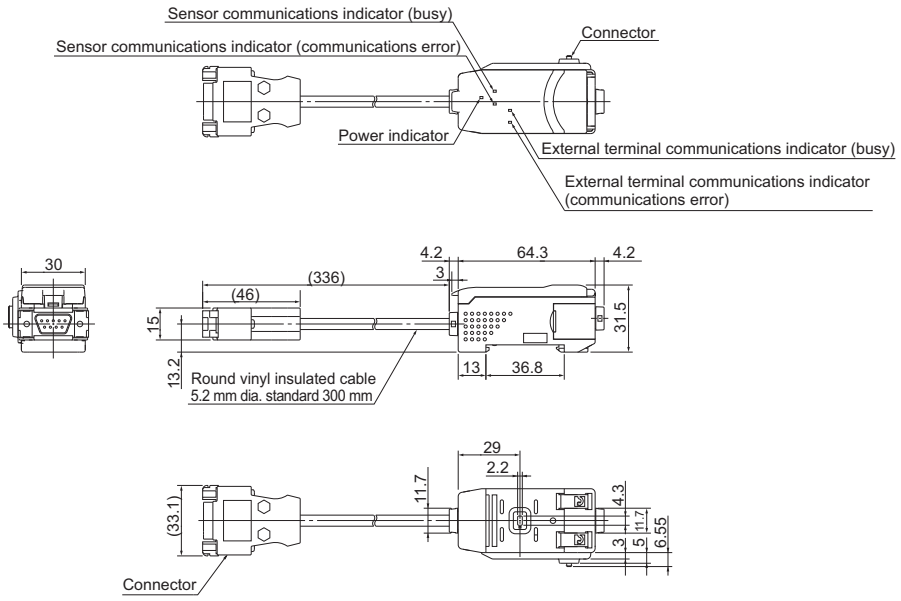


Item	ZX-CAL2
Available Amplifier Unit	ZN-PD series, ZX series, ZJ-SD series
Current consumption	12 mA or less (supplied from the Amplifier Unit)
Ambient temperature	Operating: 0 to 50°C, Storage: -15 to +60°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)
Connection method	Connector
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Insulation resistance	100 MΩ at 500 VDC
Vibration resistance	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y and Z directions
Shock resistance	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)
Materials	Display: Acrylic, Case: ABS resin
Weight (packed state)	Approx. 50 g

Interface Unit for Clean Monitoring System

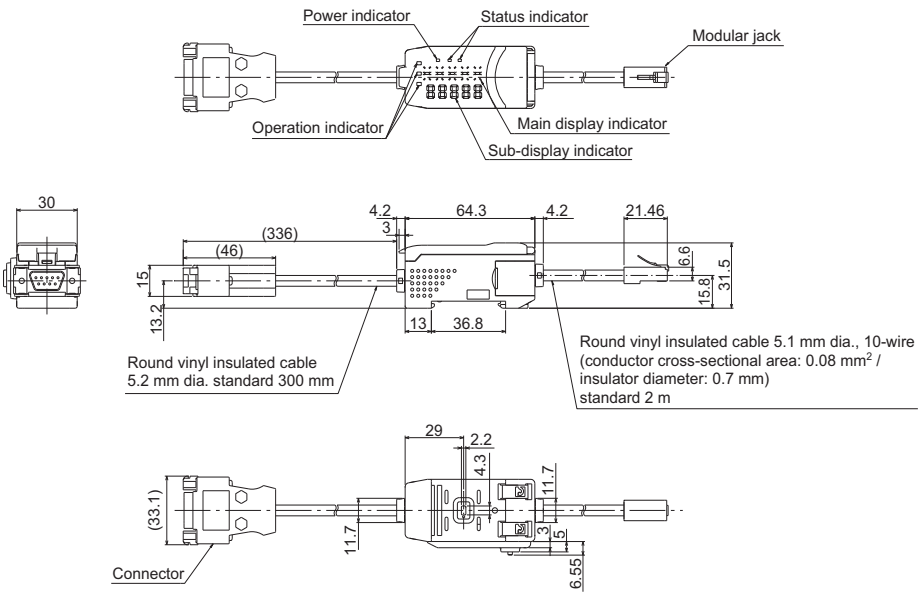
ZN-SF11

(Unit: mm)



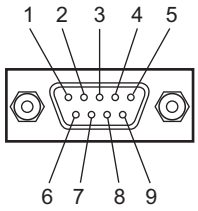
ZN-SF12

(Unit: mm)



■ Connector Pin Arrangement and Connection Example with Personal Computer

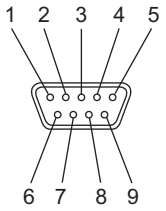
ZN-SF11/SF12 side



Pin No.	Name
1	N.C.
2	RD
3	SD
4	N.C.
5	SG
6	N.C.
7	N.C.
8	N.C.
9	N.C.

Connect the ZN-SF11/SF12 and the personal computer using a 9-pin D-sub cross cable (female-female).

Personal computer side (PC/AT compatible)



Pin No.	Name
1	CD
2	RD
3	SD
4	ER
5	SG
6	DR
7	RS
8	CS
9	CI
Connector hood	FG

* Pin Nos. may vary with the type and model of the external device to be connected. For details, refer to the instruction manual of your programmable controller or personal computer.

Clean Monitoring System

Item		ZN-SFW11	ZN-SFW12
Power supply voltage		Supplied from ZN-PDA	
Current consumption		45 mA with 24 VDC without Amplifier Unit	
Available Sensor Amplifier		ZX series, ZJ-SD series, ZN-PD series	
Available Sensor Amplifier software version		ZX-LDA__-N V1,000 or higher ZX-EDA__ V1,300 or higher ZX-TDA__ V1,100 or higher ZX-SDA__ V1,000 or higher ZX-PDA__ V1,000 or higher	
Available number of connected Sensor Amplifiers		10 max. (for ZN-PDA)	
Indicator		Power: green Sensor communications busy: green Sensor communications error: red Serial communications: green Serial communications error: red	Power (POWER: green) Serial communications (STA1: green) Not Clean (OPE1: orange) Clean (OPE2: green)
Functions		-	Air Clean Unit automatic control (multiple unit system control) Air Clean Unit air level change
Communication	Port	RS-232C (9-pin D-sub connector)	
	Protocol	CompoWay/F	
	Baud rate	38400 bps	
	Data configuration	Data bits: 8, Parity: none, Start bits: 1, Stop bits: 1, Flow control: none	
	For external device 2	-	Unique communication specification (RJ-45 connector and straight wiring LAN cable)
Ambient temperature		Operating: 0 to 40°C, Storage: -15 to +50°C (with no icing or condensation)	
Ambient humidity		Operating and storage: 35 to 85% (with no condensation)	
Insulation resistance		20 MΩ at 500 VDC	
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance		10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y and Z directions	
Shock resistance		300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)	
Connection method		-	Connector cable (standard cable length: 2 m)
Materials		Case: PBT (polybutylene terephthalate), Cover: polycarbonate	
Weight (packed state)		Approx. 100 g (approx. 480 g)	Approx. 200 g (approx. 550 g)
Accessories		CD-ROM (Realtime Clean Air Monitor), Instruction sheet, two clamps	

List of Products

■ Air Clean Unit

• Main unit

Type	Model	Remarks
250 mm Square	ZN-A2502	
250 mm Square	ZN-A2502D	Without AC adaptor
410 mm Square	ZN-A4105	
410 mm Square	ZN-A4105D	Without AC adaptor

When connecting multiple Air Clean Units to build a system, use a commercially available LAN cable (straight type: Category 5E or higher).

• Accessories

Type	Model	Remarks
Replacement filter	ZN9-AHP25	1 (for 250 mm Square filter)
	ZN9-AHP41	1 (for 410 mm Square filter)
Replacement pre-filter	ZN9-APF25	2 (for 250 mm Square filter)
	ZN9-APF41	1 (for 410 mm Square filter)

■ Ionizer Unit

• Main Unit

Type	Model	Remarks
250 mm Square	ZN-J25A	When used together with the Air Clean Unit (ZN-A2502) as a set
410 mm Square	ZN-J41A	When used together with the Air Clean Unit (ZN-A4105) as a set
250 mm Square	ZN-J25	
410 mm Square	ZN-J41	

• Accessories

Type	Model	Remarks
Replacement needles	ZN9-JH04	4 (with needle holder)
Single-ended connector cable 5 m	ZN-JC05	1 (for DC power supply, I/O cable connection)
Single-ended connector cable 10 m	ZN-JC10	1 (for DC power supply, I/O cable connection)

■ Air Particle Sensor

• Main Unit

Type	Model	Remarks
Sensor	ZN-PD03	
Amplifier Units	ZN-PDA11	Cable type 2 m
	ZN-PDA12	Connector type 2 m

• Accessories

Type	Model	Remarks
Calculating Unit	ZX-CAL2	
Double-ended connector cable 1 m	ZX-XC1A	1 (for extension between Sensor and Amplifier Unit)
Double-ended connector cable 4 m	ZX-XC4A	1 (for extension between Sensor and Amplifier Unit)
Double-ended connector cable 8 m	ZX-XC8A	1 (for extension between Sensor and Amplifier Unit)
(Sensor) Replacement filter set	ZN9-PF1	1
Cleaning filter	ZN9-PC1	1
Sensor mounting bracket	ZN9-PB1	1

■ Clean Monitoring System

Type	Model	Remarks
Interface Unit (ZN-SF11)/ Realtime Clean Air Monitor set	ZN-SFW11	Personal computer to RS-232C connection only
Interface Unit (ZN-SF12)/ Realtime Clean Air Monitor set	ZN-SFW12	Personal computer to RS-232C connection, for Air Clean Unit feedback connection

MEMO

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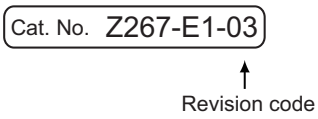
MEMO

Revision History

A manual revision code appears as a suffix to the catalog number at the bottom of the front and back covers of this manual.



Revision code	Date	Revised contents
01	June 2007	Original production
02	November 2019	P15: Windows OS description change.
03	June 2025	P15: Operating Environment delete.

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