AIR MASTER®

Operating and Service Manual

Model

4384 (A)
4385 (A)
4386 (A)
4387 (A)

ientek

Contents

Contents

Chapter 1. List of Supplied Parts

The following parts are supplied when AM 4300 Series is shipped from the factory.
Please see the list of supplied parts in the table 1-1 as below.
Please inform ientek of any difference between parts specified in the list and supplied parts.

Table 1-1 List of supplied parts

Qty	Item Description	Optional	Part/Model
1	Model 4384 Air master		4384
	Model 4384A Air master (Articulating)		4384A
	Model 4385 Air master		4385
	Model 4385A Air master (Articulating)		4385A
	Model 4386 Air master		4386
	Model 4386A Air master (Articulating)		4386A
	Model 4387 Air master		4387
	Model 4387A Air master (Articulating)		4387A
1	Carrying Case		43AMB001
4	AA Alkaline batteries		43AAM1.5V
1	AC Adapter 85~240V/50,60Hz 1A Free Voltage	○	43SRX0510SP
1	Operation and service manual		43AMO001
1	PITOT Tube, Static Pressure Tip	○	43167-6
8 ft.	Rubber Tubing		43AMT001
1	RS-232C Interface Cable		43AMIC001
1	Downloading software CD		43DSD001
1	Portable Printer	○	PORTI-S30/S40

Parts names of main body

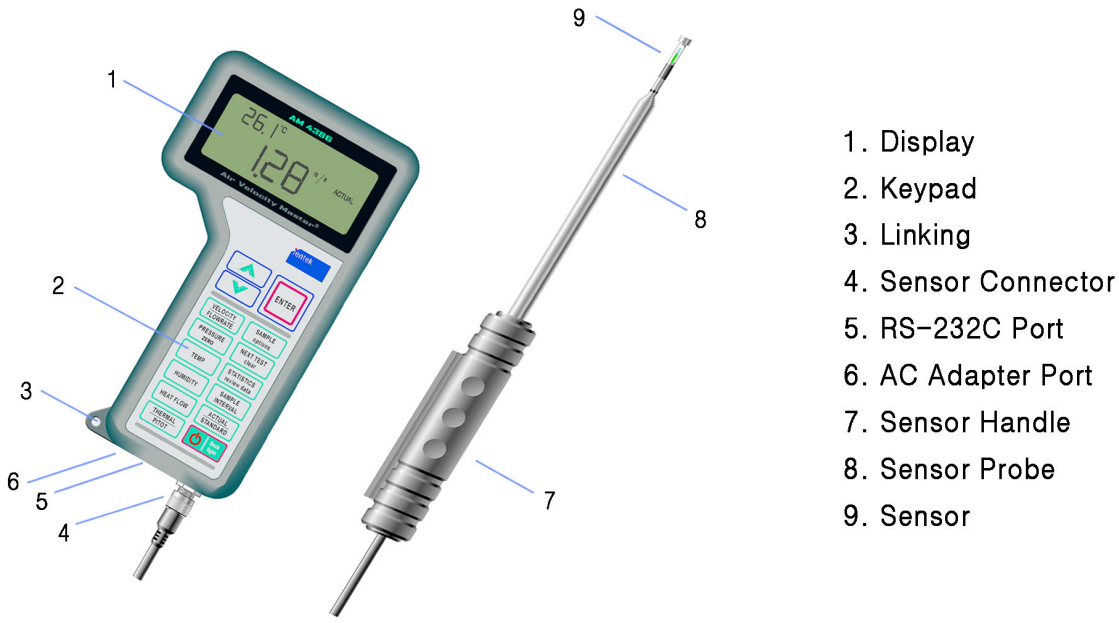


Figure 1-1 Air Master® 4300 Series

1. Display
2. Keypad
3. Linking
4. Sensor Connector
5. RS-232C port
6. AC Adapter Port
7. Sensor Handle
8. Sensor Probe
9. Sensor

Chapter 2. Setting up

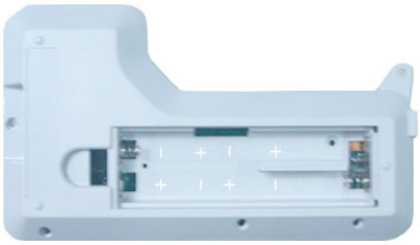
2-1 Power supply

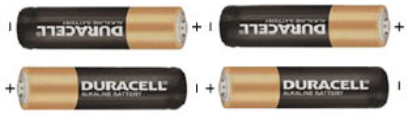
Two types of power supply: You can choose between four AA batteries and an AC adapter (Optional)

Alkaline AA Batteries

AC Adapter(Optional)

Installing the batteries





Alkaline and NICD Charge battery(Four AA)

When NICD batteries are used, the battery lifespan can be shortened.
It is recommended to avoid using CARBON-ZINE batteries, which may cause leakage of battery liquid.

Table 2-1 Battery Lifespan at 20℃

Air Velocity (ft/min)	Air Velocity (m/s)	ALKALINE (hours)
984	5	5 hour
1969	10	4 Hour

Using the optional AC Adapter

Battery power is shut down automatically.

The AC adapter cannot be used as a battery charger.

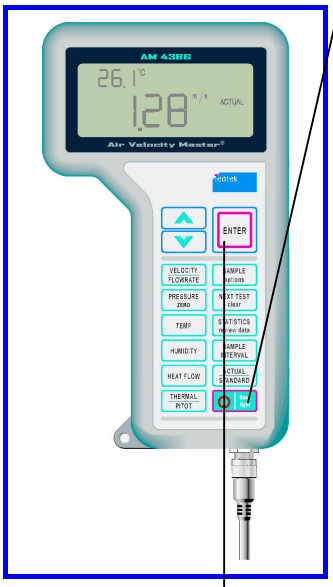
※ Ensure that the voltage and frequency on the site are compliant to the voltage and frequency specified on the label of the AC adapter.

2-2 Selecting the Units

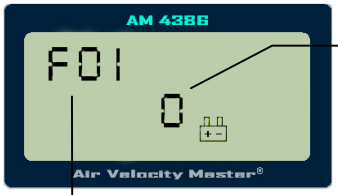
The air master can display measured values in some different measurement units.
Please see the setting menu section of this user's manual before changing the units displayed on the air master.

User Setting Menu

Starting and Operating User Setting Menu



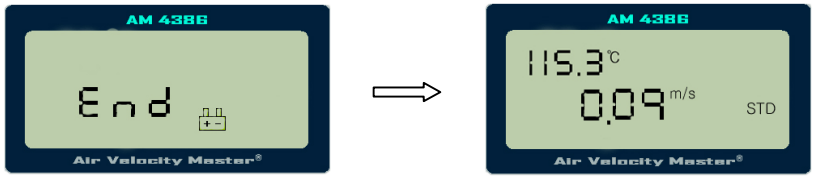
1. Please press this key, and press the ENTER key within 1 second after hearing "beep ~" buzzer sound.
2. Then, you will see the following letters appear on the display.



3. Press ∧ ∨ key to change, the setting value.

4. Press the NEXT TEST clear key and moves to the next step to change the above setting value. (F01 ~ F06)
   Ex.) F01 -> F02

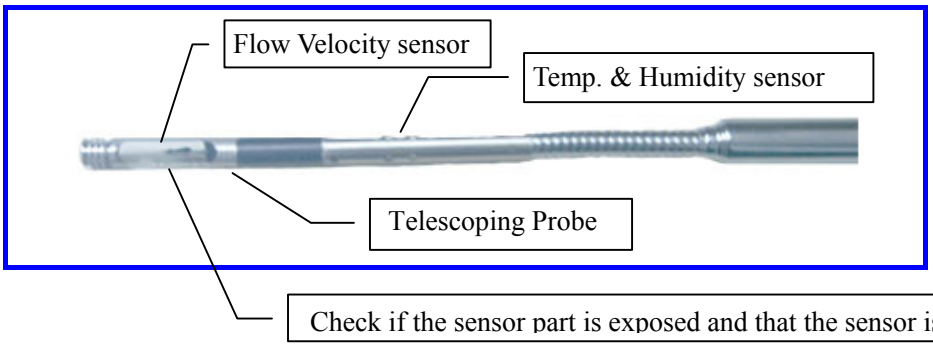
5. Press the ENTER Key to move to the measuring mode after completing the setting. Then, the End is displayed as follows and you can move to the measuring mode.



User set value description

F01 : Temperature units set	0	℃	1	℉						
F02 : Heat flow units set	0	BTU/hr	1	kW						
F03 : Flow velocity and flow rate units set	0 0	m/s 1/s	1 1	m/s m^3/hr	2 2	ft/min ft^3/min	3 3	m/s m^3/min		
F04 : Pressure units set	0	Pa	1	hPa	2	mmHg	3	in.H_2O	4	mmH_2O
F05 : Date, Display hour method set	0	dd:mm:yy	1	mm:dd:yy						
F06 : Baud rate	0	2400	1	4800	2	9600	3	19200 bps		
F07 : K-Factor modify	0	-	1	+	2	x				

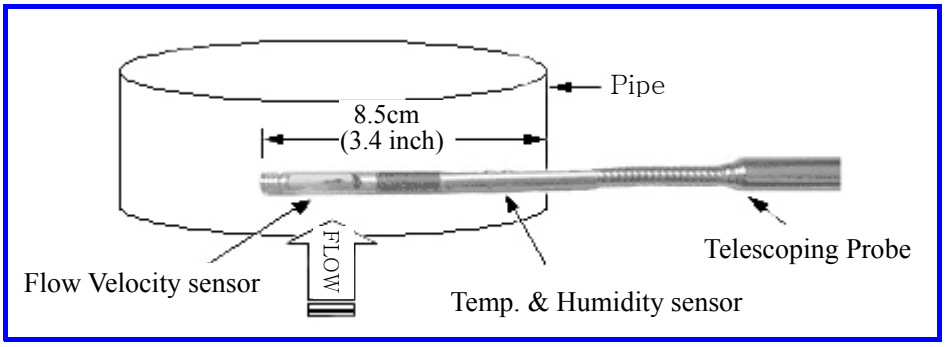
2-3 Using the telescoping Probe



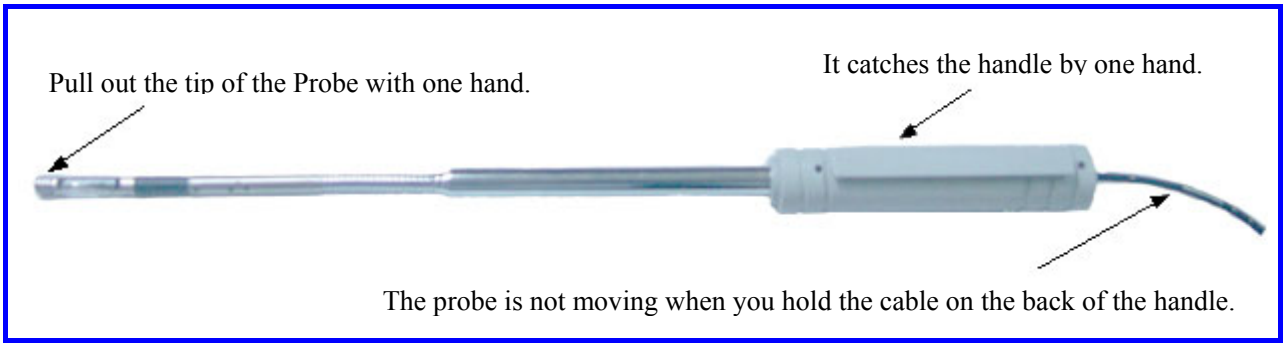
※ The humidity sensor is supplied with 4386, 4386A, 4387 and 4387A only.

Cauton：

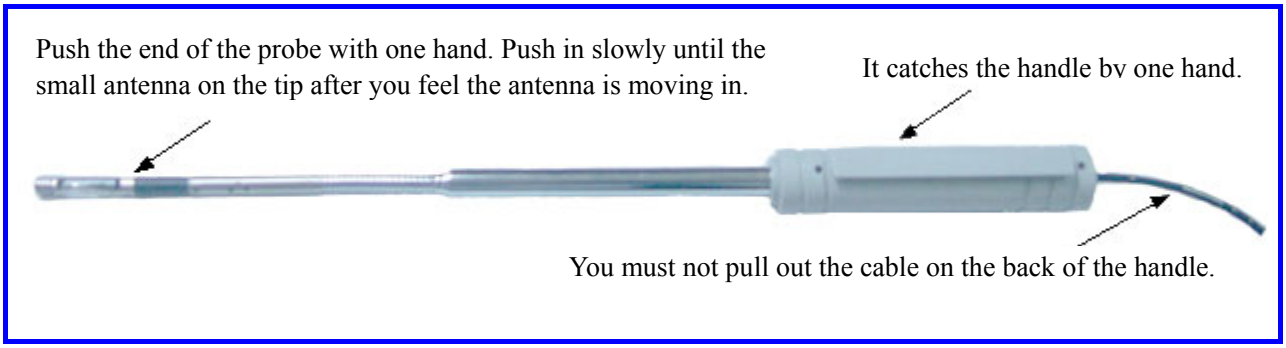
For temperature and humidity measurements



Extending the probe

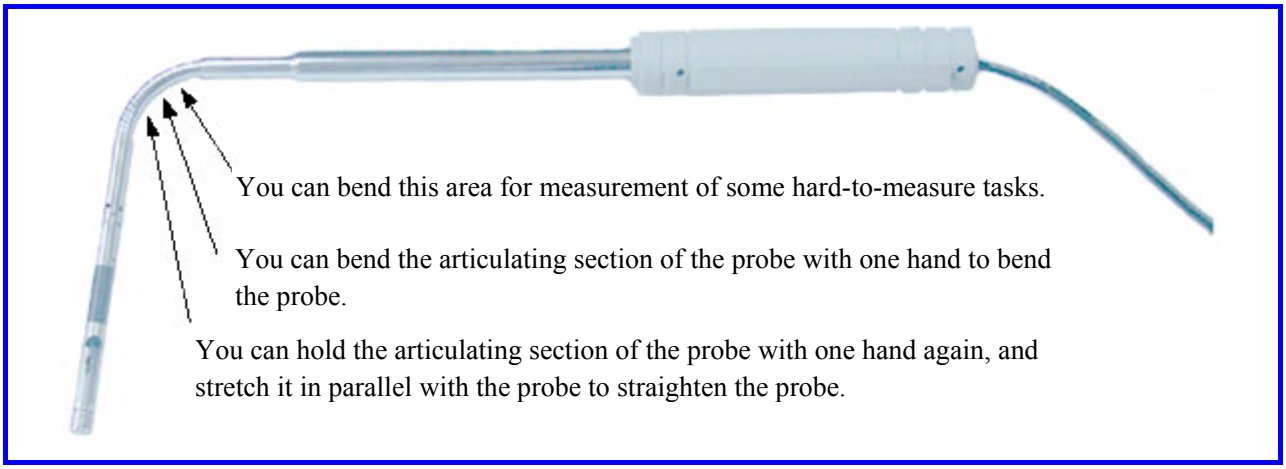


Retracting the probe



※ Be careful not to break the flow velocity sensor on the tip of the small antenna when extending or retracting the probe.

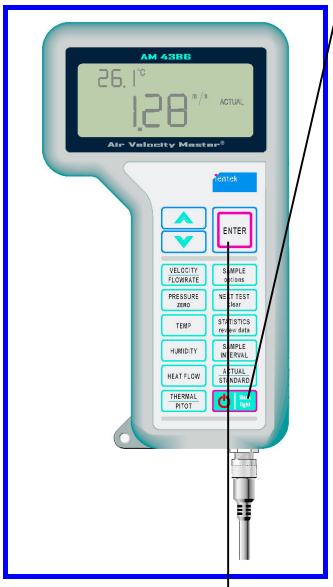
Articulating Probe (Model 4384A/ 4385A/ 4386A/ 4387A)



2-4 Time set or change

The air master is installed with a real-time clock indicating date and time.
It is important to set the date and time accurately. Otherwise, the date and time of recorded data become wrong.
This information is set to Korean standard time at ex-factory.

Setting, Changing and Operating Time

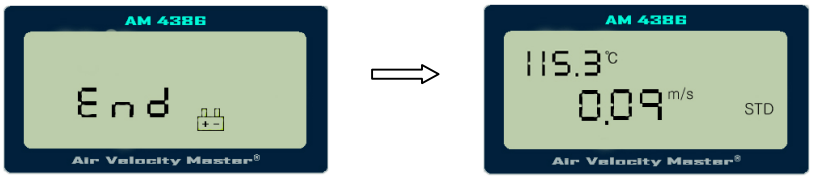


1. Please press this key, and press the TEMP key within 1 second after hearing “beep ~” buzzer sound.
2. Then, you will see the following letters appear on the display.

3. Press ∧ ∨ key when the numbers are blinked. Then the numbers are changed.
4. Press the NEXT TEST clear key, to change selected positions.
   Then the position is moved to the right.

5. Press the ENTER key to change the set values.
   You can move to the next step. (C01 ~ C07)
   Ex.) C01 -> C02

6. Press the ENTER Key to move to the measuring mode after completing the setting.
   Then, you can save the date and time you have set, and move to the measuring mode after the End is displayed as below.



User set value description

Display	Description
C01 05	This is the **year** setting mode. Press the Enter key to move to the day of the week setting mode.
C02 01	This is the **day** setting mode. Press the Enter key to move to the month of the week setting mode.
C03 09	This is the **month** setting mode. Press the Enter key to move to the day of the week setting mode.
C04 26	This is the **day** setting mode. Press the Enter key to move to the hour of the week setting mode.
C05 10	This is the **hour** setting mode. Press the Enter key to move to the minute of the week setting mode.
C06 10	This is the **minute** setting mode. Press the Enter key to move to the second of the week setting mode.
C07 00	This is the **second** setting mode. Press the Enter key to move to the year of the week setting mode.

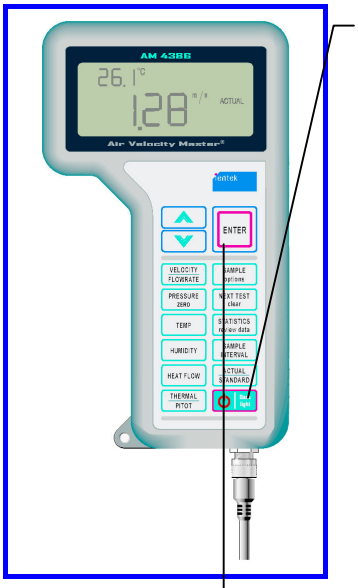
2-5 Changing the baud rate

The air master has various Baud rates (unit of communication speeds), which are used to download or print data from devices.
Increase the Baud rate to download data at faster speeds.
Please see the **user setting menu** section before changing the Baud rate.

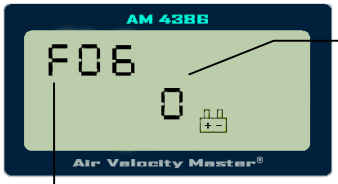
Caution：The Baud rate of the computer and that of the printer must be the same.

User Setting Menu

Starting and Operating User Setting Menu



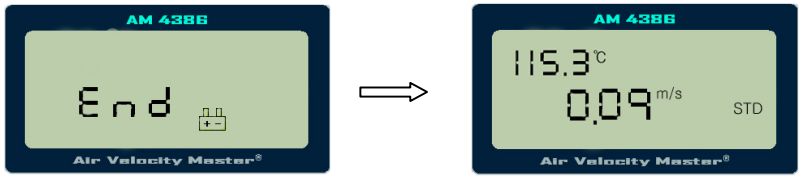
1. Please press this key, and press the ENTER key within 1 second after hearing "beep ~" buzzer sound.
2. Then, you will see the following letters appear on the display.



3. Press ∧ ∨ key to change, the setting value.

4. Press the NEXT TEST clear key and moves to the next step to change the above setting value. (F01 ~ F06)
Ex.) F05 -> F06

5. Press the ENTER Key to move to the measuring mode after completing the setting.
Then, the End is displayed as follows and you can move to the measuring mode.

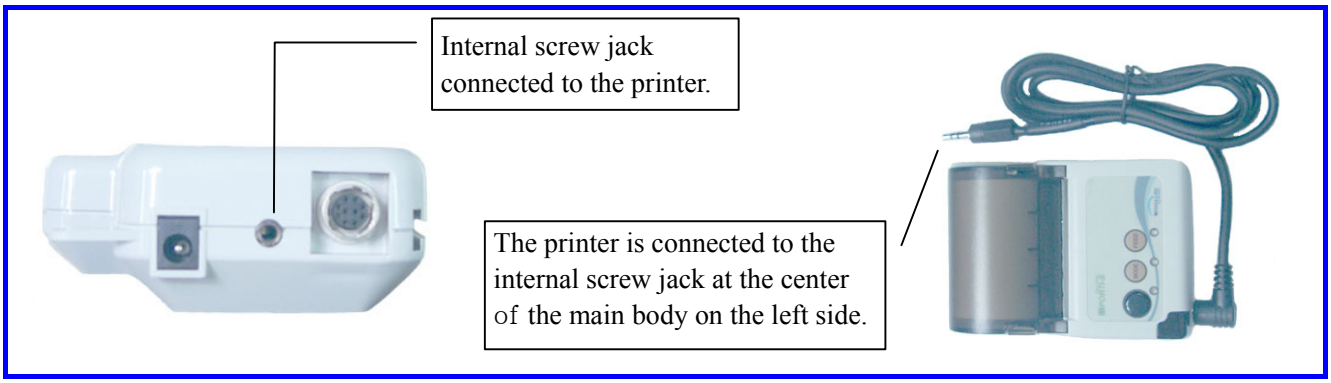


User set value description

F01 : Temperature units set	0	℃	1	°F						
F02 : Heat flow units set	0	BTU/hr	1	kW						
F03 : Flow velocity and flow rate units set	0 0	m/s 1/s	1 1	m/s m^3/hr	2 2	ft/min ft^3/min	3 3	m/s m^3/min		
F04 : Pressure units set	0	Pa	1	hPa	2	mmHg	3	in.H_2O	4	mmH_2O
F05 : Date, Display hour method set	0	dd:mm:yy	1	mm:dd:yy						
F06 : Baud rate	0	2400	1	4800	2	9600	3	19200 bps		
F07 : K-Factor modify	0	-	1	+	2	x				

2-6 Connecting a Portable Printer with PORTI-S30/S40

Connecting with and Operating a Portable Printer



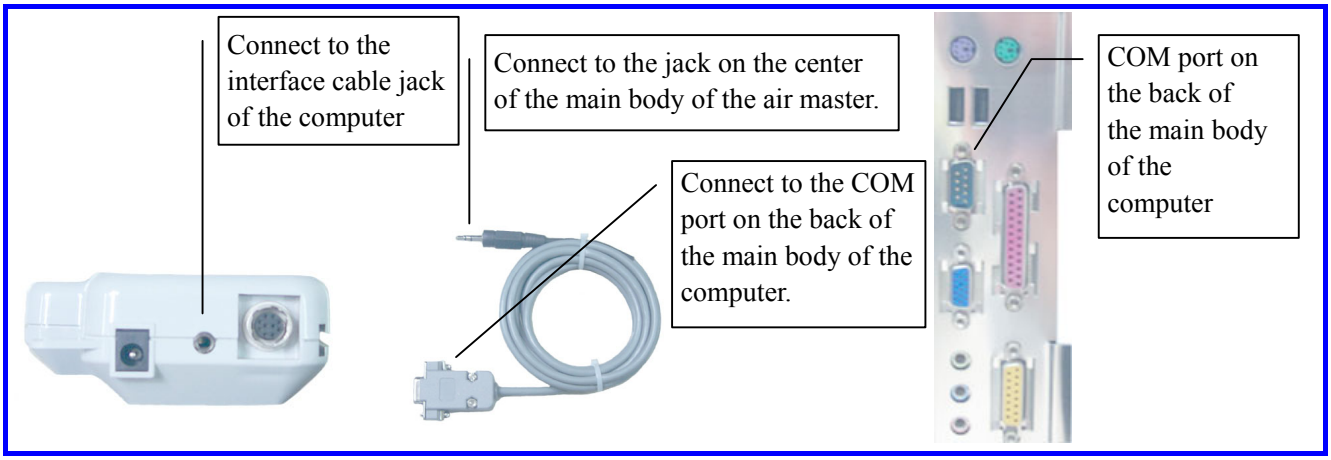
The baud rate of the portable printer must be same as that of the air master.
Please see **Changing Baud rate in 2-5** for more information on how to change the baud rate of the air master.

※ The baud rate of the portable printer is set to 9600 bps.

When you use a portable printer, you must power ON the air master before power ON the printer.
When you print symbols such as question marks (????????) or asterisks (********) on the paper, power OFF the printer after printing.
Then, reset the air master and power ON the printer again.

2-7 Connecting to a computer

Please see the following to connect the computer for downloading of saved data.

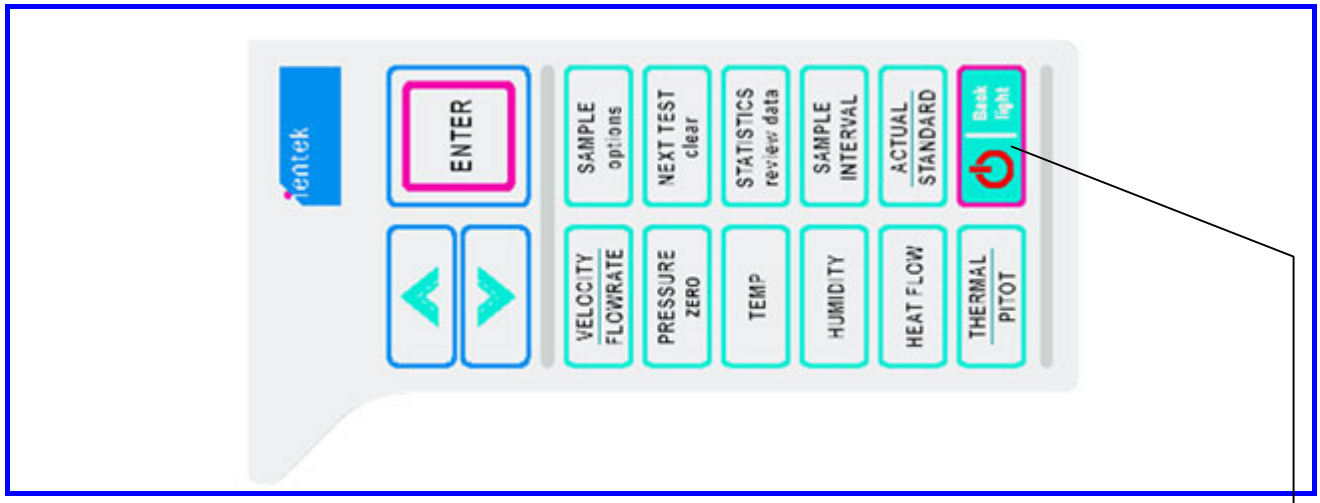


You can use the computer interface cable supplied with the air master.
Please see **Data Downloading from the Computer in Chapter 3** for more information on how to download saved data. Please see Polling Data in Chapter 3 for information on how to get data.

Caution : This symbol is used to display that the data port of the air master is not intent to be connected with public information and communication networks.
The data port must be connected only with another RS-233C port.

Chapter 3. Operating

3-1 Keypad



"Beep" sound is sent off for verification when the Back light key is pressed on the front display panel.
If the "beep" sound is not sent off, this is a status where functions of the air master are not operated properly.

※ If the "beep" sound is not sent off when pressing the Back light Backlight key of the air master, check the adapter or batteries and restart the system again.

3-2 General terms

This manual includes some general terms used for other instructions.
The followings are brief explanations on those terms.

SAMPLE Options

It includes all the measuring parameters saved at the same time. The maximum number of samples is **1,394.** (For further information, please see Controlling of Data Save & Select in the sample key explanation section in 3-13.)

TEST ID

Assemblies of samples. Test ID can have up to 1,394 samples from a single sample.
Statistics (average, minimum, maximum and count) are calculated for each **Test ID**.
The maximum number of Test IDs is **275**.
(For further information, please see the **Statistics Data (Review Data) key** section in **3-15**.)

TIME CONSTANT

Time constant is an average period of measuring values. When a measured value changes drastically, time constant is used to display the value as a stable digital value.
When the measured value swings, you can stabilize the value by increasing the time constant modestly. Display is updated every second, but the displayed measured value is an average of values measured during the time constant period. (For more information, please see the **Sample Interval key** section in **3-12**.)

Ex.) When the time constant is set to 5 seconds, the display is updated every second, but the displayed measured value is an average value of the latest 5 seconds. This is called a moving average.

LOGGING INTERVAL

Logging interval is a cycle in which the air master records measured values.
For example, when the logging interval is set to 10 minutes, the measured value is measured and recorded every 10 minutes.

3-3 Backlight Mode 

This is used to power on/off the air master of the backlight.

The display surface is lighted on when pressing the Backlight key once.
The surface is lighted off when pressing the Backlight key again.
To power off the air master, press the Backlight key for seconds.
To power on the air master, press the key for seconds.

Check the environment when it is dark by turn on the backlight of the display surface.

While power is on, the display shows all characters, and shows the status of the measuring mode after the "beep ~" sound is sent off.
Ex.) All characters are as below.
(% battery lifespan, %LOG, baud rate, time, air pressure saving, temperature saving and characters used for speed reading are displayed.)

3-4 Arrow (▲ ▼) key 

You can move up and down to find and select the desired value when setting parameters.

3-5 ENTER key 

This is a save key used to enter the selected value or condition when setting parameters.
Press this key to set the selected value.

3-6 Velocity(Wind velocity)/Flow rate(Wind flow rate) 

This is a key used to select the wind flow velocity and flow rate.
Press this key to switch to the wind velocity mode and to the flow rate mode in turn.
The flow rate mode has three options as below.
1. Flow rate (wind flow rate) in velocity (wind velocity) and range
2. Flow rate (wind flow rate) in velocity (wind velocity) and horn
3. Flow rate (wind flow rate) in pressure and K-Factor.

Circle, rectangular, horn signs and pressure units are displayed.

Use  keys to select the desired sign. Press the 

key to save the selected value.

The followings are functions used to select desired signs.

1. Selecting a circle (the cross section of a duct is circular) ○

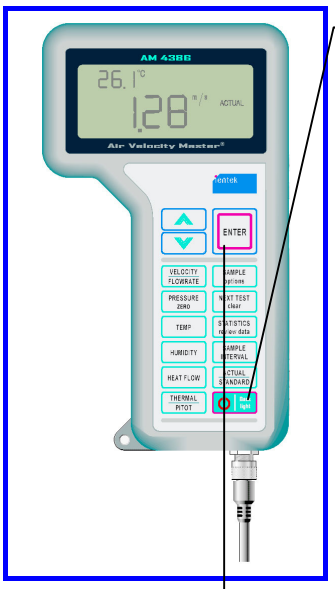
1. "beep ~" buzzer sound is sent off when this key is pressed, and the following display appears.
2. Press the VELOCITY FLOWRATE key, and the following display appears.

3. Use ∧ ∨ keys to select the circle sign, and press the ENTER key before setting the next.

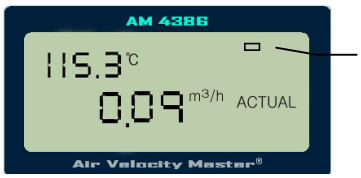
4. Use ∧ ∨ keys to enter the size.

5. Press the ENTER key after completing the setting of the size, and move to the measuring mode.

2. Selecting a rectangular (the cross section of a duct is rectangular) ▭



1. "beep ~" buzzer sound is sent off when this key is pressed, and the following display appears.
2. Press the VELOCITY FLOWRATE key, and the following display appears.



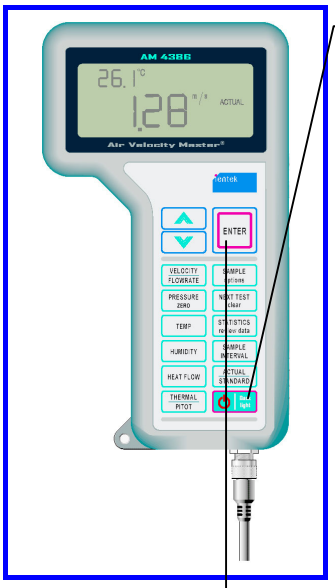
3. Use ∧ ∨ keys to select the rectangular sign, and moves to the following steps.

4. Enter the X-Size.
   Use ∧ ∨ keys to change the value.
5. Set the X-Size and press the Enter key.
   Then, the Y-Size enter mode appears.

6. Enter the Y-Size.
   Repeat the steps set for the X-Size.

7. Press the ENTER key after completing the setting of the size, and move to the measuring mode.

3. Selecting a horn symbol



1. “beep ~” buzzer sound is sent off when this key is pressed, and the following display appears.
2. Press the VELOCITY FLOWRATE key, and the following display appears.

3. Use ∧ ∨ keys to select the horn sign, and moves to the next setting.

4. Enter the Kf value (100, 300, 600 or 1200).
Use ∧ ∨ keys to select the value.

5. Press the ENTER key after completing the setting of the horn, and move to the measuring mode.

Caution：The number of the horn is a model number of the horn. For example, 100 indicates that the model number of the horn is 100.
Only horns with the following model numbers can be used for this function.
When the model number 100, 300, 600 or 1200 is selected, the air master moves to the measuring mode. If K_f is selected, K-Factors are shown in the following sequence.
Values of the last five factors used and then, new values that can be adjustable to 0.01 to 999.9.
Use ∧ ∨ keys to find the selected K_f value, and press the Enter key.

Caution：This measurement can be used only for heat-ray wind gauges.
(It cannot be used in the PITOT Tube mode.)

4. Selecting a pressure units (inH_2O, mmHg, Pa, hPa or mmH_2O)　Pa
Please see the user menu section to select the unit of pressure.

Press the Pressure Zero PRESSURE ZERO key for 3 seconds, and you can adjust the pressure to zero while there is flow rate (wind velocity) from the pressure mode.
When the unit sounds off “beep” sound twice, you can check whether pressure is set to zero.

Caution：This measuring method is used for diffusers that have Taps and K values.
(Manufacturers are responsible for marking K values on diffusers.)

User set value description

F01 : Temperature units set	0	℃	1	°F						
F02 : Heat flow units set	0	BTU/hr	1	kW						
F03 : Flow velocity and flow rate units set	0 0	m/s 1/s	1 1	m/s m^3/hr	2 2	ft/min ft^3/min	3 3	m/s m^3/min		
F04 : Pressure units set	0	Pa	1	hPa	2	mmHg	3	in.H_2O	4	mmH_2O
F05 : Date, Display hour method set	0	dd:mm:yy	1	mm:dd:yy						
F06 : Baud rate	0	2400	1	4800	2	9600	3	19200 bps		
F07 : K-Factor modify	0	-	1	+	2	x				

K-Factor modify

Press [∧] [∨] keys to display the duct select mode.

Press [∧] [∨] keys until Pa is displayed. When Pa is displayed, press the [ENTER] key.

The value of K-Factor used previously is displayed. The value between 1 to 5 is the K-Factor value used previously. You cannot set the K-Factor value to 1 to 5 for new settings.

Use [∧] [∨] keys. Press [∨] key on 5 to enter the K-Factor setting mode.

When the setting is completed, press the [ENTER] key to exit to the measuring mode. The setting value is recorded on 1. Every time you change the settings, the values are saved between 1 to 5.

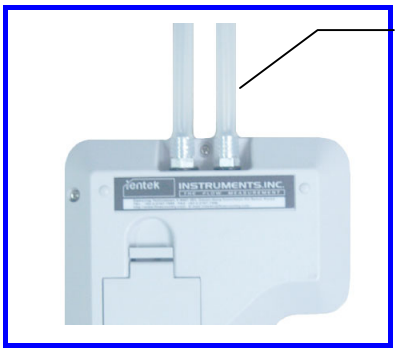
When the K-Factor value between 1 to 5 is the same as the value to be set, select it and press the [ENTER] key to exit.

Caution：You must check the form of the K-Factor in the user-setting menu before setting the K-Factor value.

3-7 Pressure(Zero) key（Model 4385/4385A/4386/4386A/4387/4387A）

[PRESSURE ZERO]

Press this key to display pressure. Press this key for more than 3 seconds to set the measured pressure value to “0.” When pressure is set to “0,” the device sounds off “beep” twice.

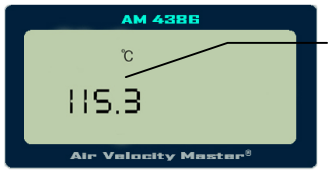


Caution：While a tube used to measure differential pressure on the end part of the bottom of the air master is not connected, or while the one end of the tube is exposed to air, set the pressure value to zero (0).

3-8 Temperature key

[TEMP]

1. Press the [TEMP] key, and the following display appears.



2. Press the Temperature key to display temperature in large-letter numbers.
In other modes, temperature or humidity is displayed in small–letter numbers on the top left.

Caution：When measuring temperature and humidity, check that the probe is at least 8.5cm (or 3.4 inch) inside airflow to be measured.

3-9 Humidity key

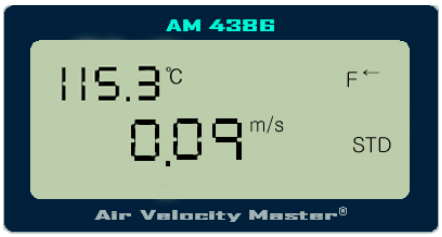
Press the 

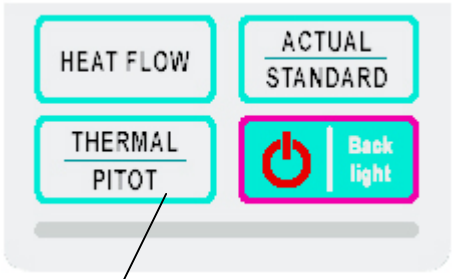
key, and relative humidity (%RH), dew point temperature (DEWPT) and wet bulb temperature (WETBULB) are displayed. Select and press the desired measurement area.
Each time you press the humidity key, you can move to the next step.

Caution：You must enter precise air pressure to get precise wet bulb temperature.
For more information on setting air pressure, please see the **Actual/Standard key** section.

Caution：When measuring temperature and humidity, the probe must be at least 8.5cm(or 3.4 inch) inside airflow to be measured. Then, temperature and humidity can be measured in airflow normally.

3-10 THERMAL/PITOT key (Model 4385/4385A/4386/4386A/4387/4387A)



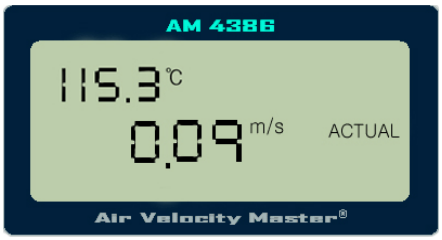


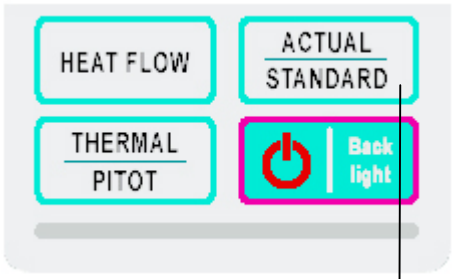
This key is used to select either the PITOT tube or the heat-ray wind velocity sensor.

Move to the desired mode between the velocity (wind velocity) and flow rate (wind flow rate).

Caution：If pressing this key while your are in other than velocity (wind velocity) or flow rate (wind flow rate) menu, you get imprecise results.

3-11 Actual /Standard key





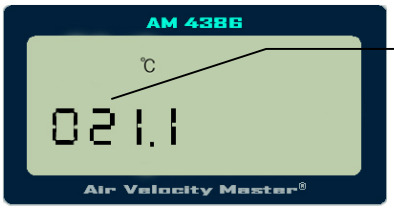
1. Press the desired key between Actual/Standard velocity (wind velocity) and flow rate (wind flow rate).
2. Press the key for seconds when seeing the environment conditions and changing the entered value.
3. Then, the presently entered air pressure and temperature appear.

4. Use 

keys to change air pressure.

Press the 

key after completing the pressure setting, and move to the next temperature setting step.



5. The temperature unit is displayed, and the presently entered temperature appears.

Use [∧] [∨] keys to change temperature.

Press the [ENTER] key after completing the temperature setting, and move to the measuring mode.

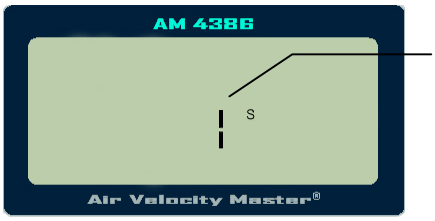
You can enter values within the range as below.
Pressure：15-40inHg(381-1016mmHg). Default setting is 29.92inHg(**760mmHg**).
Temperature：-4 to 140˚F(-20 to 60℃). Default setting is 70˚F(**21.1**℃).

Catuing：You must enter precise air pressure when measuring wet bulb temperature or heat rate.
You must enter air pressure and temperature when measuring the following values.
1) Present velocity (wind velocity) or flow rate (wind flow rate) by using a heat-ray wind gauge or a PITOT tube.

3-12 SAMPLE INTERVAL key

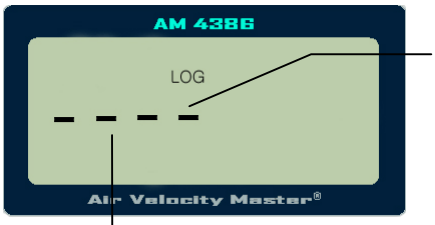
[SAMPLE INTERVAL]

Use the Sample Interval [SAMPLE INTERVAL] key to set a time constant and a logging interval.
This is used to display the time constant of the present.



1. Use [∧] [∨] keys to find the selected time constant value displayed as 1s, 2s, 5s, 10s, 15s or 20s and log signs.

Press the [ENTER] key after finding the selected value.



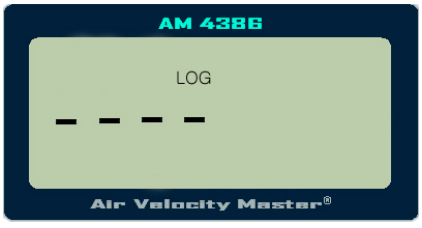
2. The selected value of the presently selected logging interval appears when ----- is selected.
3. You can select from the following values.
2s, 5s, 10s, 15s, 20s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min, 60min or Off.

Use [∧] [∨] keys to set the selected value of logging interval.

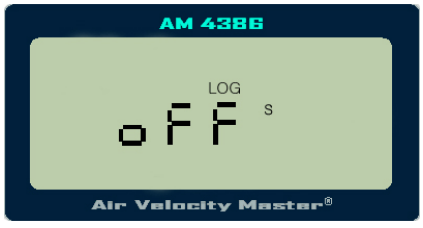
4. Then, press the [ENTER] key to move to the measuring mode.

5. If the logging interval is set shorter than the time constant, the time constant becomes as short as the logging interval.

Caution：You must set the logging interval to Off to operate the device in the discontinuous data logging (or single dot) mode.
Set the logging interval to other than Off to operate the device in the continuous data mode.



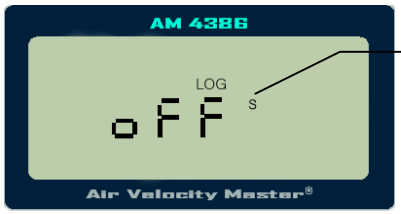
⇨



3-13 SAMPLE (Options) key

SAMPLE options

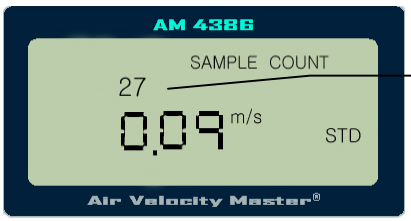
Discontinuous data logging (measuring a single dot)



1. The device must be in the discontinuous data logging mode mode initially.

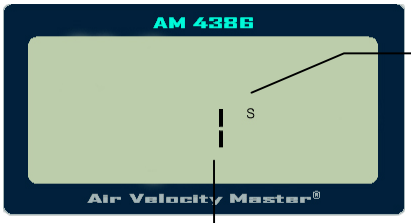
   For more information, please see the SAMPLE INTERVAL key section.

2. Press the SAMPLE options key to start the Sample.
3. Saved samples are measuring methods in the Sample options and methods displayed in large-letter numbers. (For more information, please see the Controlling Data Save & Select section.)



4. While extracting samples, the small-letter numbers read the number of samples. A count indicator appears, and the sample indicator blinks during sampling.
5. Sampling continues until the time constant period passes.
6. After that, the air master displays the number of samples and the recorded values.

Continuous data logging (values from multi measuring based on passage of time)



1. The device must be in the continuous data logging mode initially.

   (For more information, please see the SAMPLE INTERVAL key section.)
2. Press the SAMPLE options key to start the Sample.
3. Saved parameters are not only menus displayed in large-letter numbers but also those blinking in the selected menus.
4. Samples are extracted from the interval set in the **Sample Interval menu**.

   (For more information, please see the SAMPLE INTERVAL key section.)
5. LOG is shown on the display during sampling, and SAMPLE is displayed when data is saved.

   Press the SAMPLE options key again to stop the sample.
6. Display shows the following items.

   The number of saved samples and TEST ID, and see the STATISTICS review data key section to see recorded measured data saved in the device.

Controlling Data Save & Select

In this section, “On” and “Auto” are mentioned.
The followings are brief explanation on which functions are being operated.

“On” indicates that the measuring method is logged whenever the SAMPLE options key is pressed.
“Auto” indicates that the measuring method is logged automatically if the measuring method needs to be calculated in large-letter numbers when the SAMPLE options key is pressed.

For example, when the dew point is displayed in a large-letter number and you press the SAMPLE options key, the dew point, humidity and temperature are all automatically saved.
It is because the dew point has been calculated by using humidity and temperature.

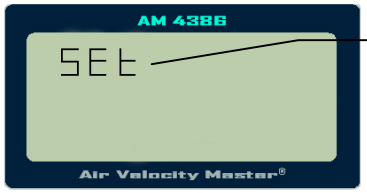
Table 3.1 shows that measured values are automatically saved when certain measuring methods are displayed.

Table 3.1 Measuring methods saved when the SAMPLE options key is pressed

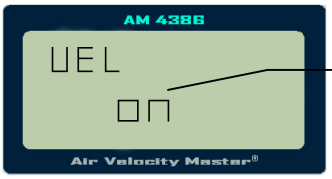
Measured method	Measuring methods automatically saved
Thermal Velocity	Velocity
PITOT Velocity	Velocity, Pressure
Temp.	Temperature
Pressure	Pressure
Humidity	Humidity
Wet Bulb	Humidity, Temperature, Wet Bulb
Dew point	Humidity, Temperature, Dew point
Heat Flow*	Heat flow, Humidity, Temperature (Flow rate (wind flow rate) is required, but saved separately.)
Flow rate from the size and shape of the duct	Velocity, flow rate and pressure when the velocity is from PITOT
Flow rate from the horn	Velocity, Flow rate
Flow rate from the pressure	Pressure, Flow rate

Data Save & Select controlling and operating methods

1. Press the next SAMPLE options key for seconds to enter and change the Data Save & Select while watching it.

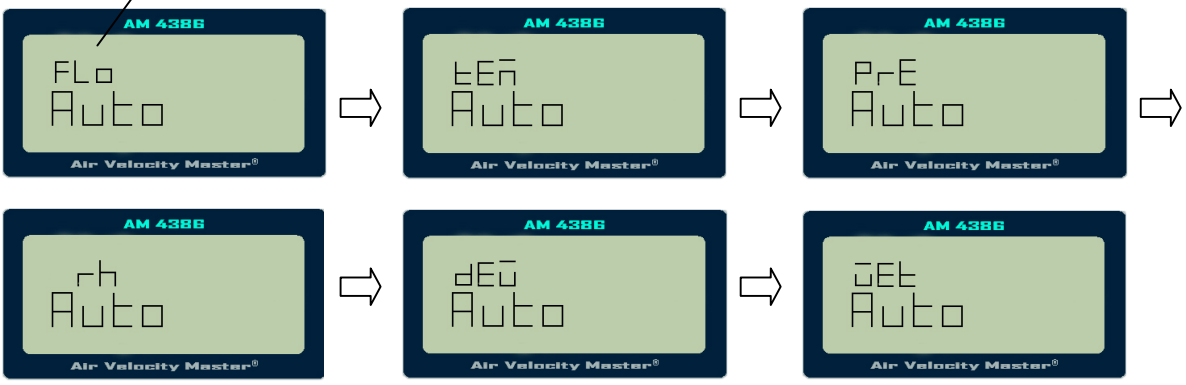


2. “SET” is turned on in small characters on the top left of the next display.
   Then, the velocity unit is turned on, and the large display shows “On” or “AUTO’ as previously set.



3. Use ∧ ∨ keys to change either “On” or “AUTO” to the operating key.
4. Press the ENTER key to move to the next measurement.

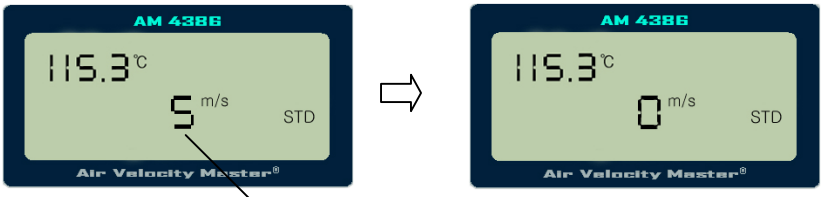
5. This pattern continues through the following measurements.
   See the procedures as follows.
   For differential pressure, temperature, relative humidity, dew point temperature, wet bulb temperature and each parameter, see the above operating methods for changes.
6. After all the measuring parameters are displayed, the device move to the measuring mode.



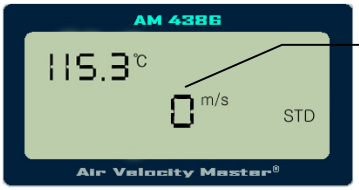
3-14 NEXT TEST (Clear) key

NEXT TEST
clear

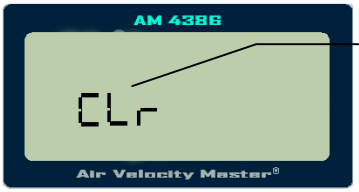
1. Press this key to move to the next Test ID.
2. You cannot move to the next Test ID when there is no saved data in the present Test ID.
3. Press the NEXT TEST clear key for seconds to remove the last sample.



4. Display starts counting down 5 to 0.
   Please see the above figure for sequences.



5. Press the ENTER key when the counter indicates "0" to remove all the memory.



6. "CLR" is displayed, and all the measured data is removed.

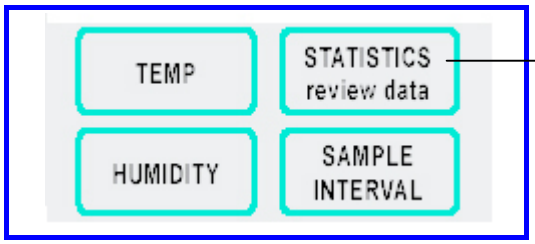
Caution：You can remove the memory except the last sample memory recorded.
You cannot go back to the previous Test ID, and remove each separate measured value.
You cannot add data to the previous Test ID.

3-15 STATISTICS (review data) key

STATISTICS review data

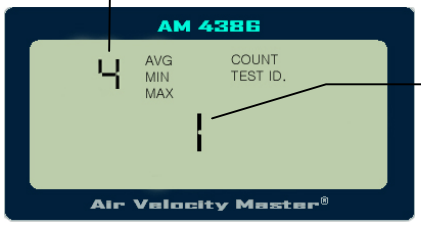
The Statistics Data key is used for two purposes.
1. To see the statistics on parameters displayed recently.
2. To examine the data on certain Test IDs.

To view statistics



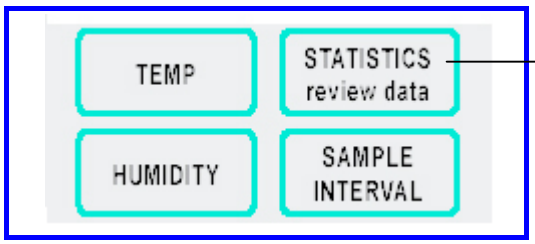
1. Press the STATISTICS review data key to see the statistics on parameters displayed recently.

2. Count is displayed in small letters.

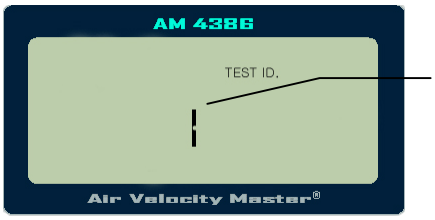


3. TEST ID is displayed in large letters.
4. Count continues to be displayed in small letters, and the large letters are changed to display the average.
5. To display the minimum after going through the maximum (before the average disappears from the display), press the STATISTICS review data key again.

To **review data**



1. Pressing the STATISTICS review data key for seconds.
The air master sounds off "beep" twice.



2. When releasing the key, large-letter numbers appear under the small-letter Test ID indication. And the Test ID sign is turned on.
3. To select the desired Test ID, use ∧ ∨ keys and press the ENTER key.

4. With the selected Test ID value, samples are shown in order of extraction from individual samples to the last one.

   To see another Test ID, press the STATISTICS review data key again.
   You can move to the Test ID in small letters without affecting the large letters.

   Use ∧ ∨ keys to select a new Test ID, and press the ENTER key.
   Keep repeating the procedures to review data.
   To review data with different measuring methods, press the measuring method while the average, maximum, minimum and count or sample is being displayed.
   When there is not data on measuring methods, "… …" appears.

   To see more data, press another measuring method. To return to the measuring mode, press the ENTER key.

3-16 HEAT FLOW key (Model 4386/4386A/4387/4387A only)

HEAT FLOW

For the air master to calculate heat flow, flow rate (wind flow rate), temperature and humidity of the front-end and the back-end of the heating (Coli) unit are required.
Data in these positions must be saved in a separate Test ID.
The first Test ID is used to calculate heat flow in the second Test ID.
Save data required to calculate heat flow.

1. Check that precise air pressure is typed in the device and whether the measured value is imprecise.
   If flow is measured from the PITOT Tube, check that correct flow temperature is typed in.
   The displayed flow rate (wind flow rate) must be standard flow, not current flow.
   Otherwise, "No rEE" message is shown on the display.
   This message indicates that there is no reference data or imprecise data used for calculation of heat flow.
   (See the ACTUAL STANDARD key section to set these parameters.)
2. Check if the device is in discontinuous (or single spot) sample mode.
   (For more information on discontinuous extraction mode, see the SAMPLE INTERVAL key and the SAMPLE options key section.)
3. Press the NEXT TEST clear key to start a new Test ID.
4. Press the VELOCITY FLOWRATE key to display flow rate (wind flow rate).
5. Press the SAMPLE options key and save the multi result value in the first (reference) position. You can get a precise measuring value by extracting more than one samples from the cross section of the duct.
6. Press the TEMP key.
7. Press the SAMPLE options key to record the measured value of temperature.
8. Press the HUMIDITY key to display relative humidity (%RH).

9. Press the SAMPLE options key to record the relative humidity(%TH).
10. Press the NEXT TEST clear key to move to the next Test ID. Move the probe to the second position. (The probe must at least 8.5cm in airflow. Then, the temperature and humidity sensor in airflow can measure values properly.)
11. Press the HEAT FLOW key to get the immediate result value of heat flow rate detection*. Press the key three times more to display invisible heat flow rate**, total heat flow rate and heat heat detection factors.
12. Press the SAMPLE options key to save the result value in the second position.

Proceed in the above sequences (**11 of 3-16**) and follow the steps as below to record result values of heat flow rate based on passage of time.

1). Switch from discontinuous to continuous data logging

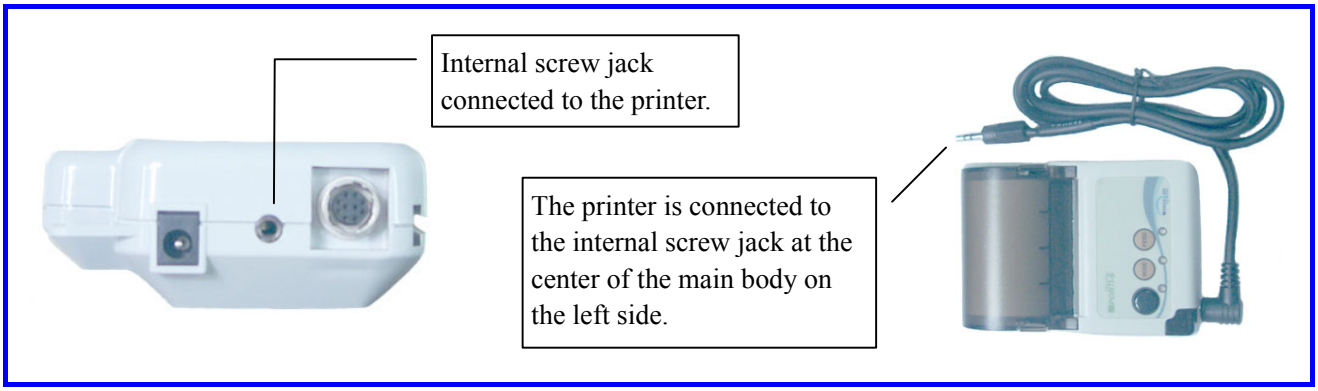
(For more information on how to switch to the continuous extraction mode, please see the SAMPLE INTERVAL and the SAMPLE options key section.)

2). Press the SAMPLE options key to start sample.
This is to automatically log required data.

3). Press the SAMPLE options key to stop sample.
This enables recording of time-sequence graph data that comes out when downloading from the computer.

SENSIBLE HEAT FLOW*
LATENT LEAT FLOW**

3-17 Printing data using the portable printer



Connect the device with a computer to print measured values.

Whenever you press the SAMPLE options key during sampling, result values are printed out automatically.

Press the STATISTICS review data key to display information on measuring data saved in the presently selected Test ID.

Press the STATISTICS review data key again to print out measured data on the presently selected measuring method.

Nothing is printed out when reviewing data.

Press the 

key for seconds to print out all data saved in the memory. All the measured data are printed out from the printer.
Display indicates “SEND” while printing out memory.

Press the 

key of the air master again to stop printing.

Caution : For printing, the baud rate of the air master must be the same as that of the printer. (DEFAULT 9600)

3-18 Downloading data of the computer

AM 4300 is a Windows-based software program used to download data saved in the memory of the air master.
Data are installed with the following features.
Test ID, measurement types, measured values, measurement units, Thermal/PITOT selection, correction factors, actual/standard parameters, flow volume and time constant.

Data is show with date and time, and statistics data for each Test ID is provided.
Files with downloadable data are categorized, and Tab* sets limits to enter the spreadsheet for more data analysis.

Connect the computer interface cable with the air master and the computer serial port to download data from the air master. You can use any serial port from COM1 to COM4.

※ (For more information, please see **2-7 Connecting with the Computer in Chapter 2.**)

3-19 Data Acquisition (Polling)

The air master is designed for the user to poll while using the computer.
To enable this function, the interface cable of the user’s computer and of the air master must be connected.
The baud rates of the computer and air master must be the same.
After checking the connection, start the PC program and the basic settings.
Then, collect data after creating files.
Collected data are saved in files, and you can save data in desired file formats.
Then, you can check data by opening the saved documents.

Caution：This symbol is used to display that the data port of the air master is not intent to be connected with public information and communication networks.
The data port must be connected only with another RS-233C port.

Chapter 4. Maintenance

The air master does not require separate maintenance.

4-1 Recalibration

To maintain higher accuracy of measuring, you are required to get recalibration every year.
So, you are required to send the air master to ientek.
For reasonable price, the device can be reset promptly and recover to almost new operating status.
Maintaining strict calibration records is particularly important for objects of calibration.
Please contact an ientek agency or our company to be provided with service.

ientek Co., Ltd.

Factor 2 (P)153-803
Daeryung Technotown 5th #407, 493, Gasan-dong Gumcheon-Gu, Seoul, Korea
TEL :+82-2-2107-7999 FAX : +82-2-2107-7990
http://www.flowmeter.co.kr
E-mail : master@flowcountry.com

4-2 Cases

For cleaning the main body case or storage case of the air master, use soft cloth, isopropyl alcohol or mild detergent.
Do not moisten the main body of the air master.
If the air master of the case of the AC adapter is damaged, you must replace them immediately to prevent flow of aberrant voltage.

4-3 Storage

Remove batteries from the main body when not using the air master for more than one month.
Then, you can prevent the risk of damage caused by leakage of battery liquid.

Chapter 5. Trouble check and Repair

Table 5-1 explains symptoms of problems that can occur to the air master, possible cause and solutions.

Table 5-1 Troubleshooting and Repair of Air Master

Symptom	Possible Causes	Corrective Action
Nothing is shown on the display.	Power is not turned on.	Power is turned on.
	Batteries are low or consumed up.	You can replace batteries or connect the AC adaptor.
	The battery contact area is filthy.	Clean the battery contact area.
" + − " is blinked on the display.	Battery power is low.	Replace batteries.
	Wrong AC adapter is used.	Replace with a right AC adopter.
	Power or voltage or the AC is low.	Change the AC adapter voltage, or use batteries instead.
	The battery contact area is filthy.	Clean the battery contact area.
"OVER" is shown on the display.	Velocity, pressure or temperature is higher than required values.	Use within the required range.
	The Sensible Heat Factor is higher than the <-1.5 to +1.5> range.	Enter heat data again.
Measured velocity values swings largely.	Flow is changing.	Measure again in the position where the flow of the probe is not shaking, or increase the time factor.
"Full" is shown on the display.	Data logging RAM is not working.	Send the product to ientek for repair.
"nOrEF" is shown on the display.	There is no enough data to calculate heat rate.	See the heat rate section to find which data is required (Chapter 3).

Warning : Pull out the probe immediately when the temperature exceeds 80℃.
Excessive heat cause damage on the sensor.
The range of operating temperature is seen in Appendix A.
The pressure sensor is not damaged until 10 PSI (69 kPa or 520mmHg)
The sensor may be damaged when the pressure exceeds the range.

APPENDIXES

APPENDIX A

Specifications

The manufacture may change specifications for some reasons.

Velocity of Thermal sensor (all models) :

Measuring range : 0.1 ~ 100 m/s

The measuring range which is calibration : 0.1 ~ 50 m/s

Accuracy [1 & 2] : ±2% of reading or ±0.05 m/s

Response time : < 2 S (depending on velocity and dT)

Velocity of Pitot Tube (Model 4385, 4386, 4387) :

Range [3] : 1.27 to 78.7 m/s (250 to 15,500 ft/min)

Accuracy [4] : ±1.5% at 10.16 m/s (2,000 ft/min)

Resolution : 0.01 m/s (1 ft/min)

Volumetric Flow Meter (all models) :

Range : Actual range is a function of maximum velocity, pressure, duct size, and K factor

Temperature range (all models) :

Operating range : -30 ~ 100℃ (-22 to 212˚F)

Operating (Electronics) : +5 ~ 45℃ (41 to 113˚F)

Storage : -20 ~ +60℃ (-4 to 140˚F)

Relative Humidity (all models) :

Operating range : 0 ~ 100% RH

Accuracy [7] : ±2% RH

Resolution : 0.1% RH

Wet Bulb Temperature

Operating range : -15 to +50℃ (40 to 140˚F)

Resolution : 0.1℃ (0.1˚F)

Dew Point Temperature

Operating range : +5 to +60℃ (5 to 122˚F)

Resolution : 0.1℃ (0.1˚F)

Heat flow (Model 4386, 4387)

Operating range : Function of Flow Rate, Temperature, Humidity and Barometric Pressure

Measurements Available : Sensible Heat Flow, Latent Heat Flow, Total Heat Flow and Sensible Factor

Units Measured : BTU/h, KW

Static/Differential Pressure (Models 4385(A) and 4386(A) 4387(A))

- Precisely located, burr-free static pressure holes.
- Hemispherical tip design, best for accuracy if imperfectly aligned and nearly impossible to damage.
- Long lasting 304 stainless steel construction.
- ASME design meets AMCA and ASHRAE specifications.
- 5/16” models rated to 1500˚F
- Extended static connection helps guide tip within recommended 15 ° of air flow direction.

Range [5] : -9.3 to +28.0 mmHg, or -1245 to +3735 Pa (-5 to +15 in. H_2O)

Accuracy [6] : ±1% of reading, ±1 Pa or ±0.01 mmHg (±0.005 in. H_2O)

±0.03%/ °C (±0.02%/ °F)

Resolution : 1 Pa, 0.01 mmHg (0.001 in. H_2O)

Duct Size (all models) :

Range : 1 to 635 cm in increments of 0.1 cm (1 to 250 inch in increments of 0.1 inch)

Logging Intervals (all models) :

Intervals : 2sec, 5sec, 10sec, 15sec, 20sec, 30sec, 1min, 2min, 5min, 10min, 15min, 20min, 30min, 60min

Time Constant (all models) :

Intervals : 1sec, 2sec, 5sec, 10sec, 15sec, 20sec

External Mater Dimensions (all models) :

Size Measurements : 10.6cm x 18.5cm x 3.8cm (4.2 inch x 7.2 inch x 1.5 inch)

Meter Probe Dimensions (all models) :

Probe Length : 108.5cm (42.7 inch)

Probe Diameter of Tip : 7.19mm (0.283 inch)

Probe Diameter of Base : 11mm (0.433 inch)

Probe Handle Dimensions :

Articulating Section Length : 12.18cm (4.79 inch)

Diameter of Handle : 24.35mm (0.96 inch)

Mater Weight (all models) :

Weight (with batteries) : 0.57kg (1.25 lbs)

Power Requirements (all models) :

Four AA-size batteries (included) or AC adapter(optional) 5 VDC, 1 A, 5 watts (input voltage and frequency)

NOTE

1. Temperature compensated over an air temperature range of 5 to 65℃ (40 to 150°F)
2. The accuracy statement of ±3.0% of reading or ±0.015 m/s (±3 ft/min), whichever is greater, begins at 30 ft/min through 9,999 ft/min.
3. Pressure velocity measurements are not recommended below 1,000 ft/min and are best suited to velocities over 2,000 ft/min. Range can vary depending on barometric pressure.
4. Accuracy is a function of converting pressure to velocity. Conversion accuracy improves when actual pressure values increase.
5. Overpressure range = 520 mmHg, 69 kPa (275 in H_2O)
6. Accuracy with instrument case at 25℃ (77°F), add uncertainty of 0.03%/℃ (0.02 %/°F) for change in instrument temperature.
7. Accuracy with instrument case at 25℃ (77°F), add uncertainty of 0.03%/℃ (0.05℃/°F) for change in instrument temperature.
8. Accuracy with probe at 25℃ (77°F). Add uncertainty of 0.2%RH/℃ (0.1%RH/°F) for change in probe temperature. Includes 1% hysteresis.

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