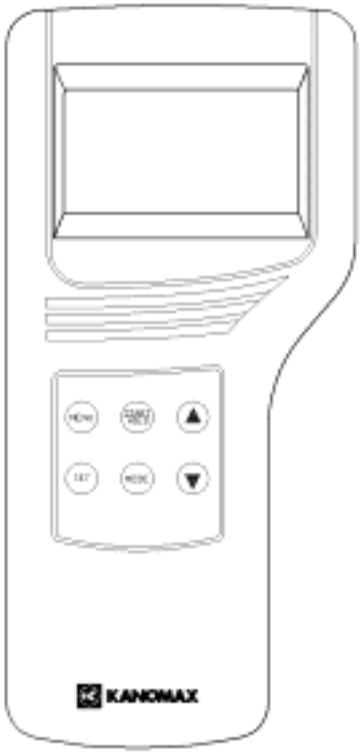
KANOMAX

CLIMOMASTER

MODEL**A531／A541／A542**
A533／A543

Operation Manual



Please use this instrument properly by reading
this user's manual and following the warning instructions.
Keep this manual in a place where it can be accessed quickly.

KANOMAX JAPAN INC.
2-1 Shimizu Suita Osaka Zip:656-0805
Phone: +81(6)6877-8261
Fax : +81(6)6877-6849

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03. 09

Thank you for purchasing Kanomax product. Please use this instrument properly by reading this operation manual and following the warning instructions.

List of Components

■ Standard

Items	MODEL	Qty	Functions
Main Body	A531-00	1	—
Probe	A531-01	One of these	Air velocity, air temperature, humidity sensor
	A541-01		Air velocity, air temperature
	A542-01		Air velocity, air temperature
	A533-01		Air velocity, air temperature, humidity sensor
	A543-01		Air velocity, air temperature
Probe Cable	A531-06	1	To connect Probe to Main Body
Carrying Case	6000-04	1	Hard case
Operation Manual	—	1	—
AA Batteries	—	6	—

■ Options

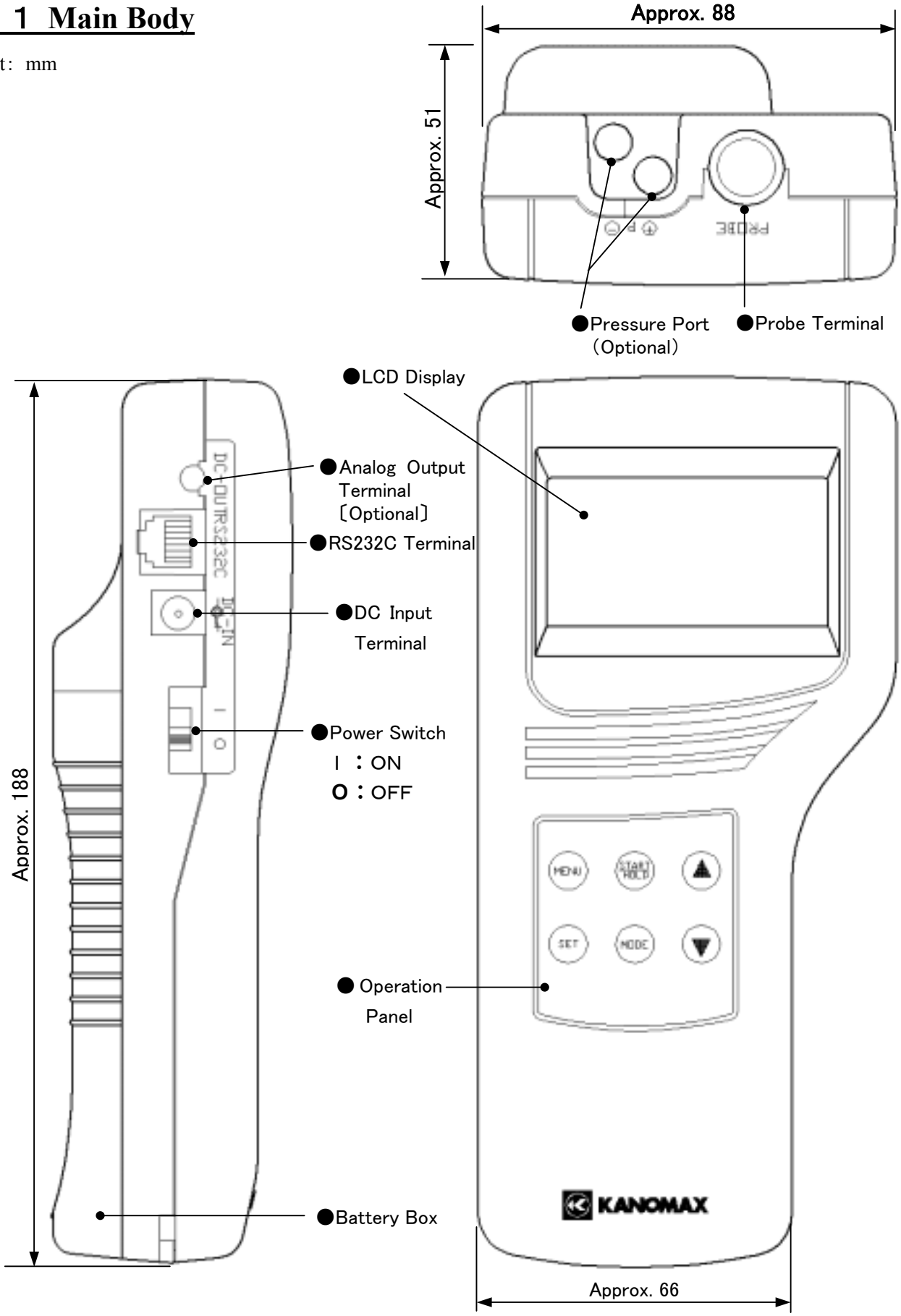
Items	MODEL	Functions
Spare Probe	A531-01	Air velocity, air temperature, humidity sensor
	A541-01	Air velocity, air temperature
	A542-01	Air velocity, air temperature
	A533-01	Air velocity, air temperature, humidity sensor
	A543-01	Air velocity, air temperature
Extension Rod (Flexible)	A531-04	For measurements of high places
Extension Rod (Straight)	A531-05	For measurements of high places
Pressure Sensor	A531-07	For measurements of static pressure
Analog Output	A531-08	Analog output terminal
AC Adaptor	6000-05	Power supply
RS232C Cable	6000-02	For the connection of Main Body and PC
Printer (Recommended)	DPU-H245	To print out all calculation result and etc.
Printer Cable	6000-03	For the connection of Main Body and Printer
Portable Anemometer Data Logging Software	S600-00	Application software

Table of Contents

1. CLIMOMASTER Anatomy

1. 1 Main Body

Unit: mm

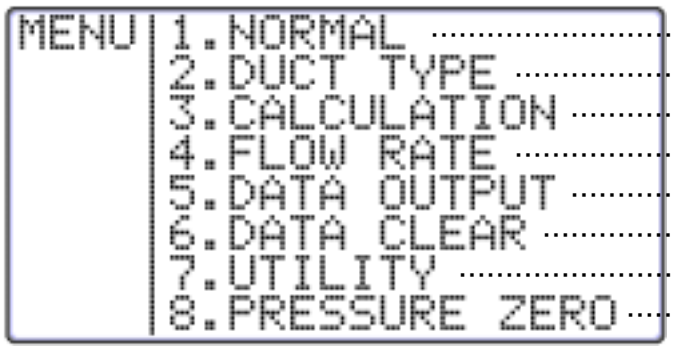


1. 2 Operation Panel (Keys and Functions)

● **MENU KEY**

Press once to access the main menu..

※ If you press this key while measuring or setting, this key will work as **CANCEL** and bring you back to the main menu.

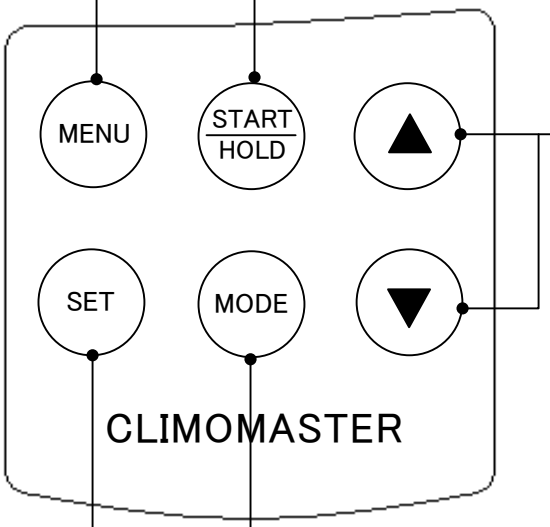


- 1.NORMAL ……Normal Mode (When you first turn on)
- 2.DUCT TYPE ……To input duct shape and size.
- 3.CALCULATION ……Calculation Mode
- 4.FLOW RATE ……To measure flow rate
- 5.DATA OUTPUT ……To download data to your PC or printer
- 6.DATA CLEAR ……To delete data
- 7.UTILITY ……To set date, time and unit
- 8.PRESSURE ZERO ……Zero adjustment （Optional）

● **START／HOLD KEY**

This key will starts and stops the calculation and/or measurement.

Also works as a **hold key.**



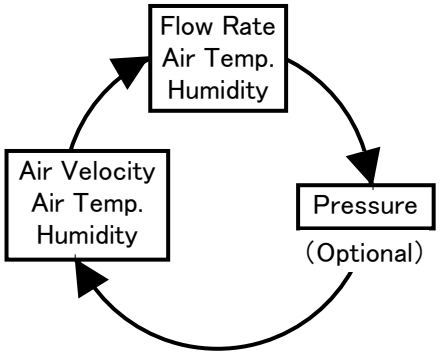
● **▲、▼ NAVIGATION KEYS**

① In the Normal Mode, this key would allow you to select the time constant from 1sec, 5sec and 10sec.

② Press this key to scroll in the desired direction.

● **MODE KEY**

You can select the mode accordingly.



※Humidity only available on MODELA531 and A533.

● **SET KEY**

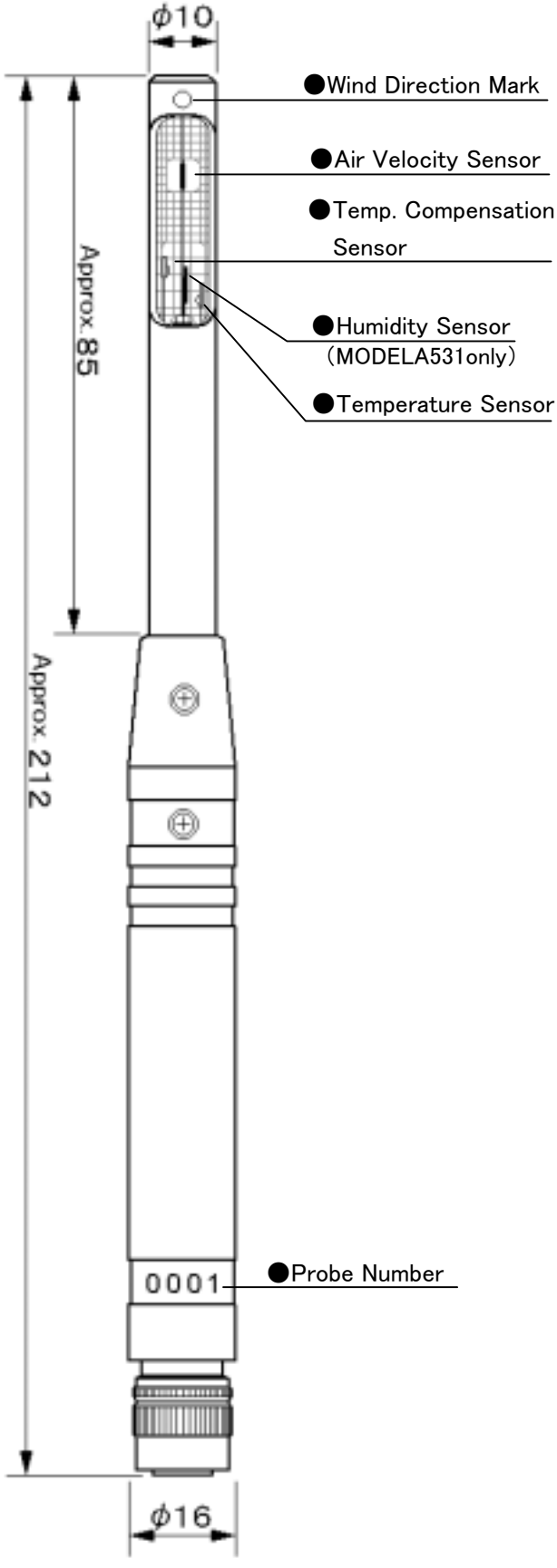
Press the key to execute the selected item.

1. 3 Probe

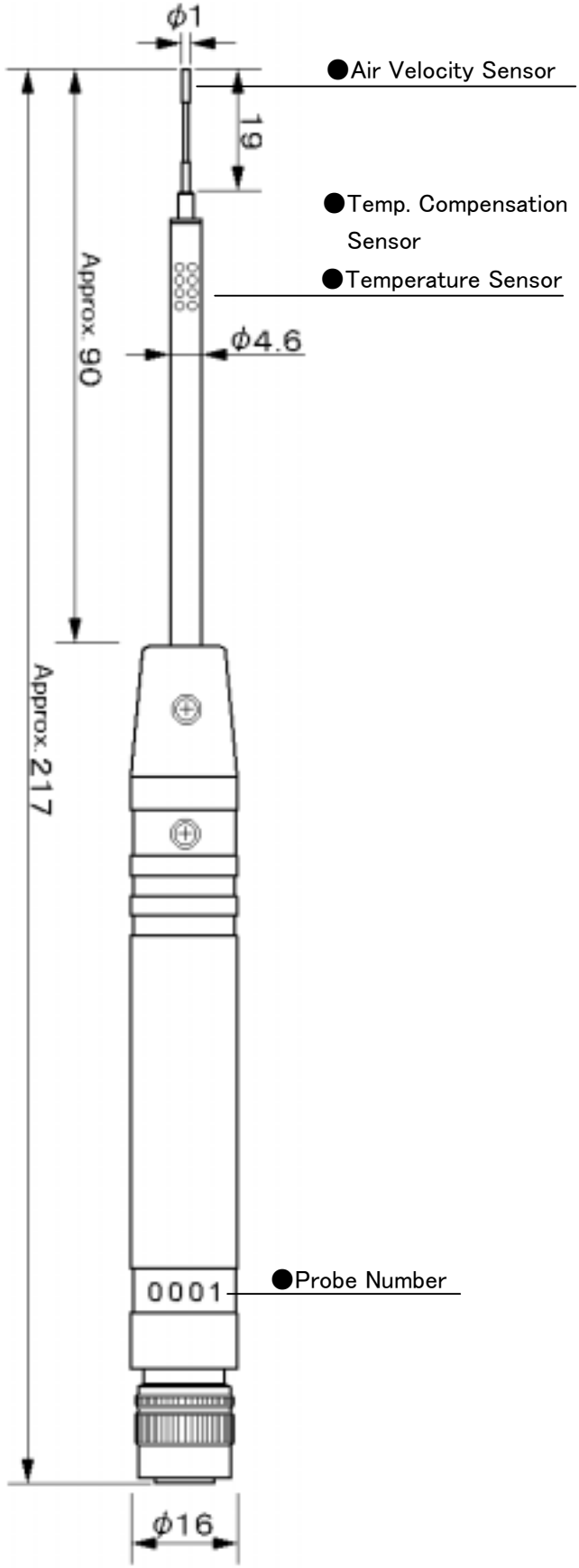
Unit: mm

There are 5 different types of probe available for the Climomaster. The model number of the Climomaster matches that of probe, which is included in the package. EPROM with calibration data is stored in the grip section of the probe, which enables you to share the main unit among these probes.

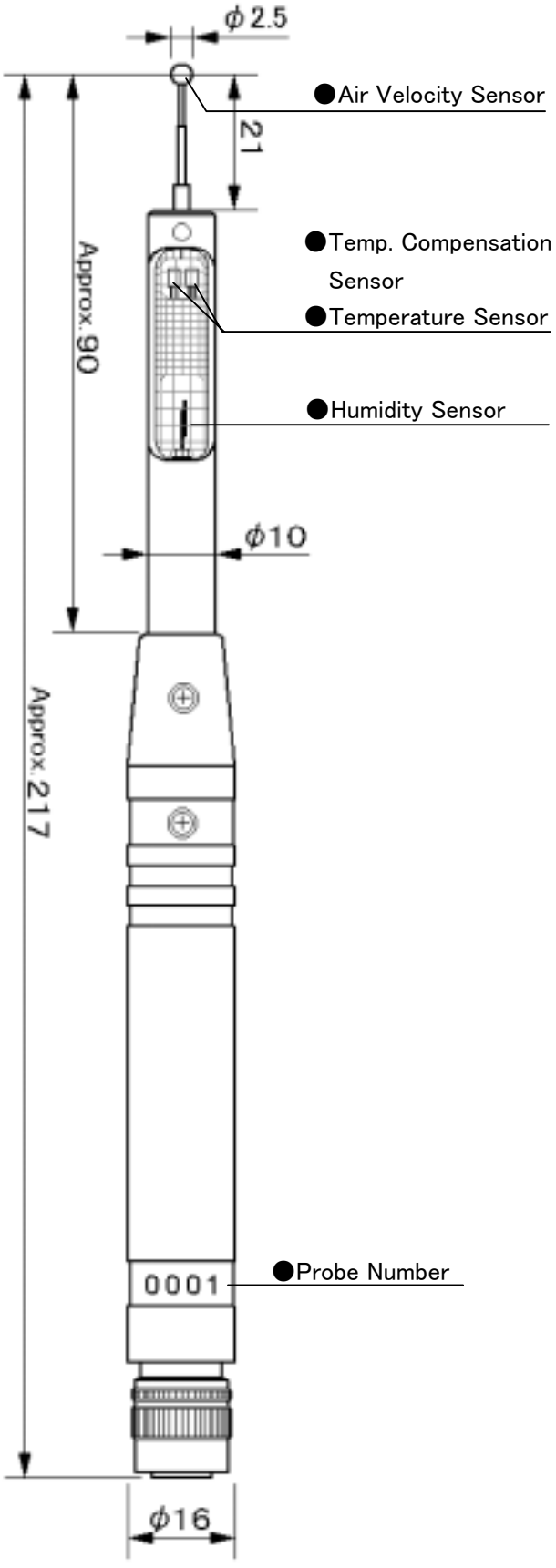
MODELA531／A541



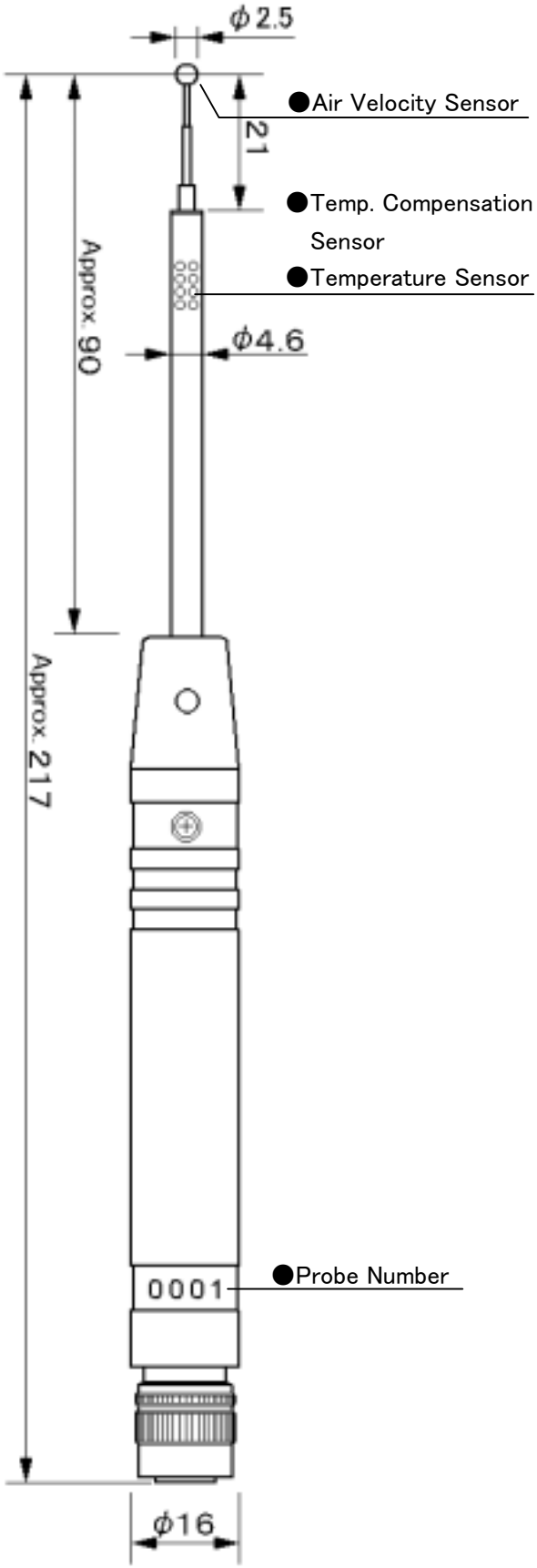
MODELA542



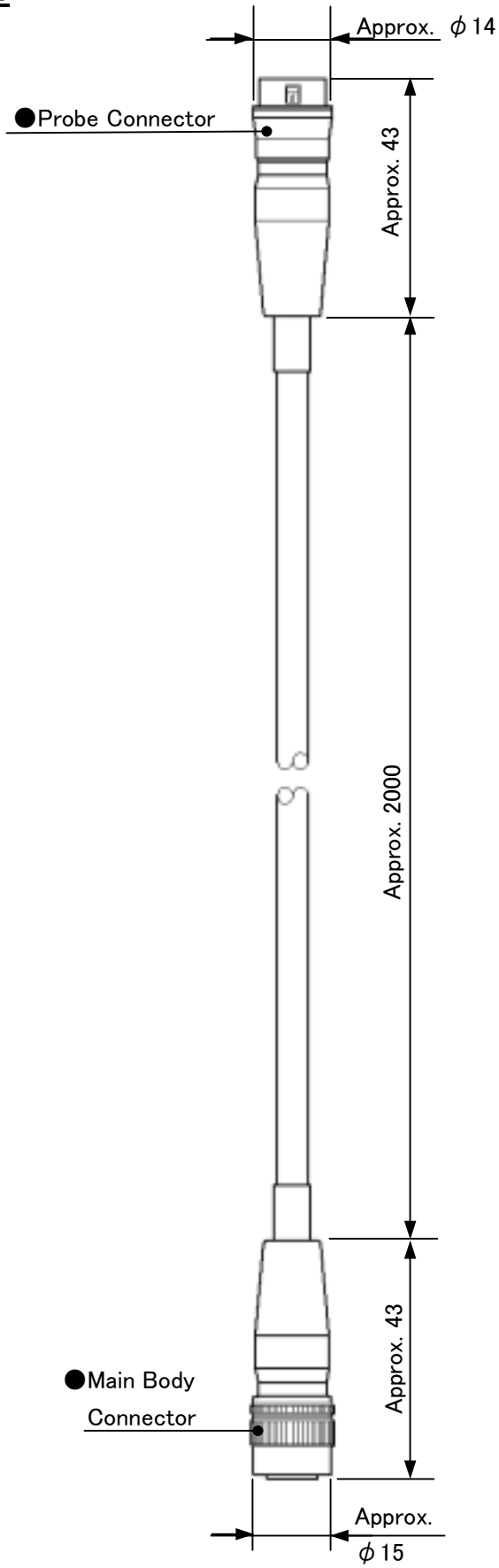
MODELA533



MODELA543

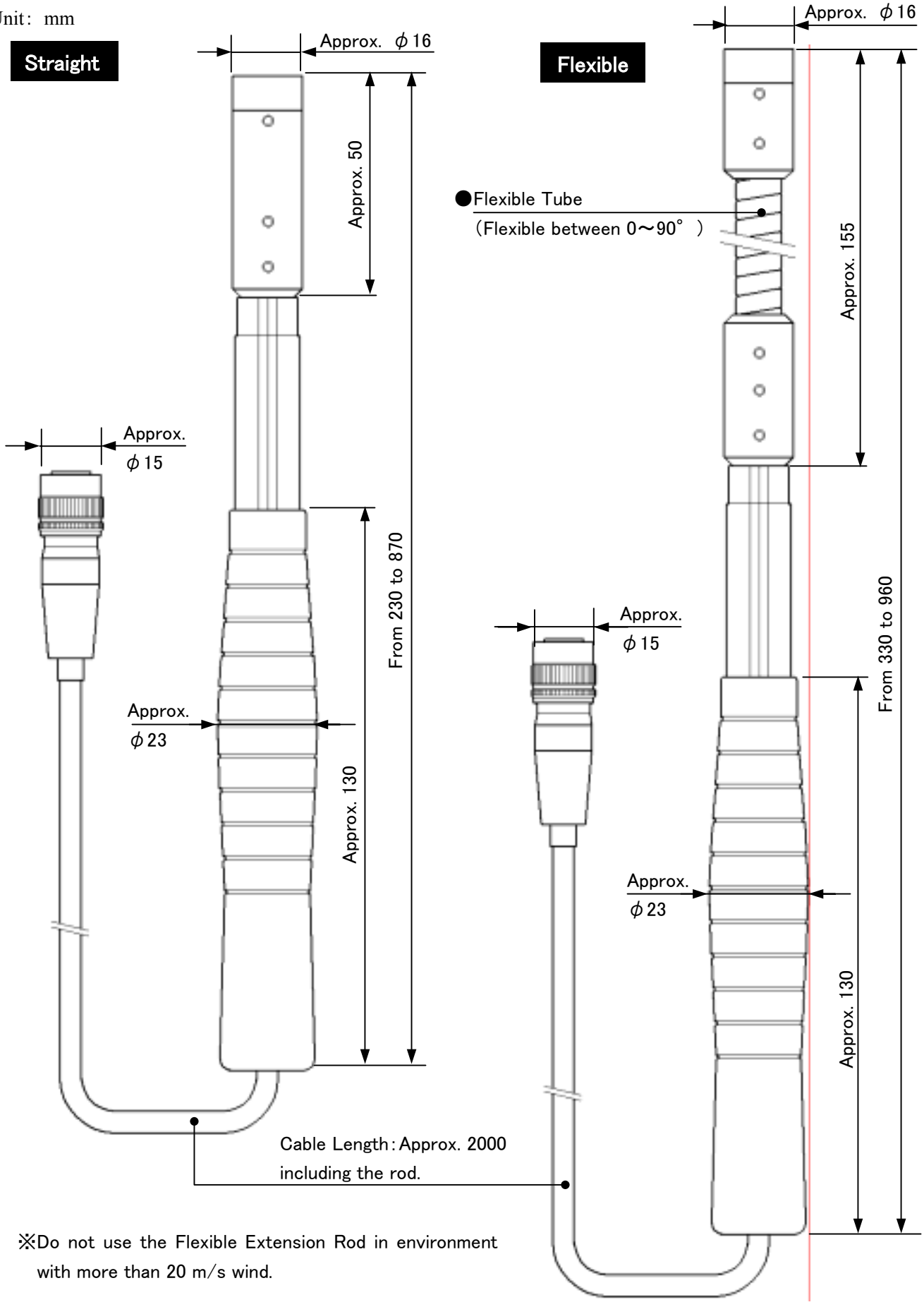


1. 4 Probe Cable



1．5 Telescopic Extension Rod（Optional）

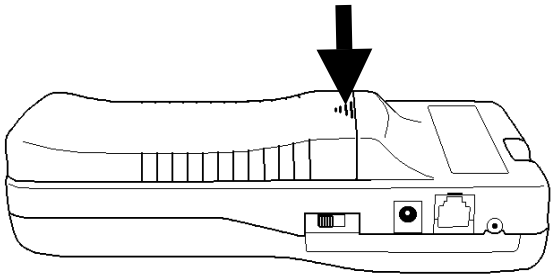
Unit：mm



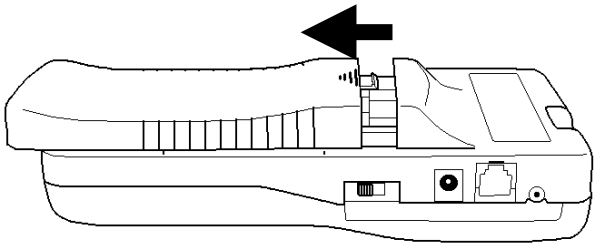
※Do not use the Flexible Extension Rod in environment with more than 20 m/s wind.

2. Getting Started

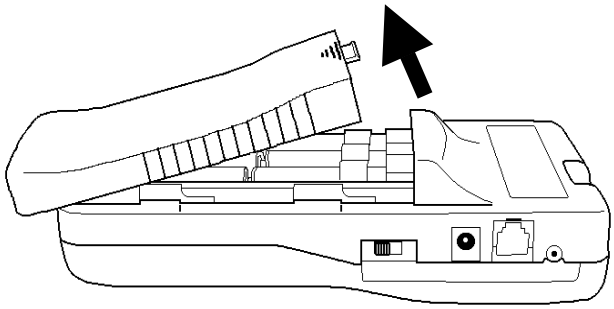
2. 1 Installing Batteries



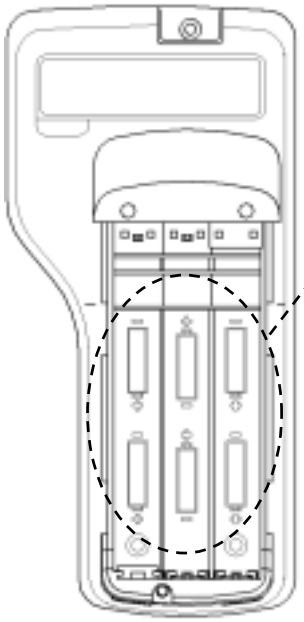
①Press down on the battery cover.



②Slide the cover until it stops.



③Lift the cover away from the body.



③ Insert the battery observing the polarity. This instrument requires 6 AA size batteries. Use only AA size Manganese (R6), alkaline (LR6) or Ni-Cd batteries for replacement.
DO NOT mix new batteries with used ones, for it may lead to leakage.
※Batteries CANNOT be recharged by optional AC adapter.

④Put the cover back on by reversing the procedure ②, ③.

2. 2 Connecting Probe

You can connect Probe directly to Main Body or via extension cable.

※ Make sure that the power is OFF when connecting or Disconnecting Probe/Probe cable.

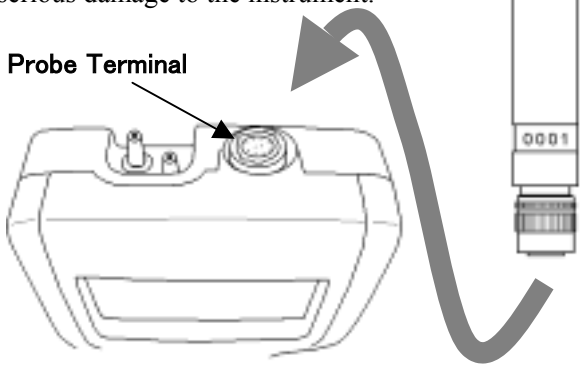
※ Do not use the extension rod at above 20m/s of wind. (It may cause damage to the rod.)

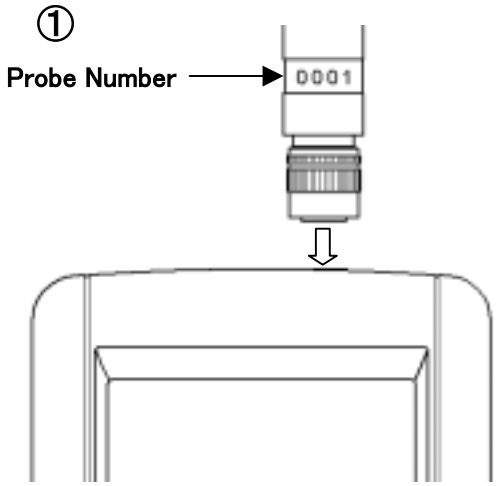
①Probe/Probe Cable connector only fits one way because the connector is not symmetrical. Attach the cable connector and rotate it until the spot where they match.

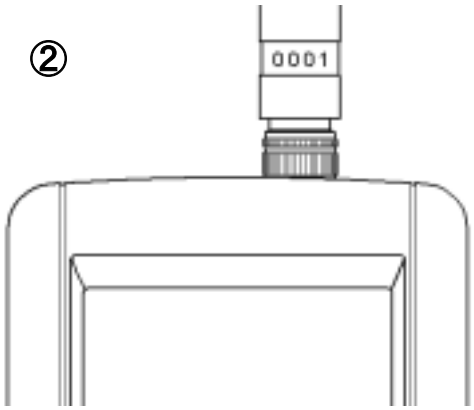
※ When you connect Probe, connect it with Probe number facing forward (see the chart ①, ②).

②Push-in the connector until you hear click.

※ DO NOT FORCE to connect Probe/Probe Cable. It may cause a serious damage to the instrument.







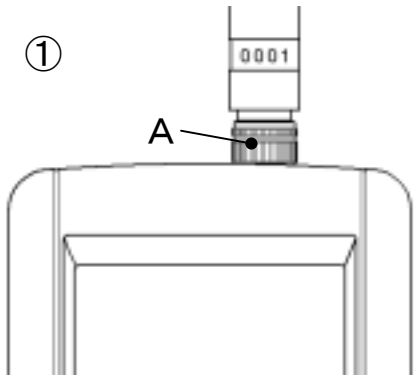
2. 3 Disconnecting Probe

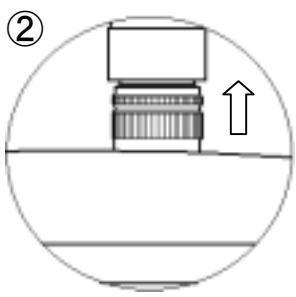
※ Make sure that the power is OFF when connecting or disconnecting.

①Pull up the lock ring of Probe/Probe Cable.(see chart ①-A)

②Pull out Probe/Probe Cable from Main Body with the lock ring up (see chart ②).

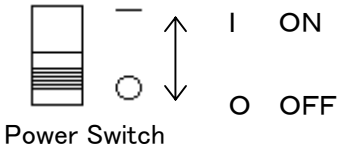
※ DO NOT rotate Probe or Probe Cable while connected. It may cause a serious damage to the instrument.





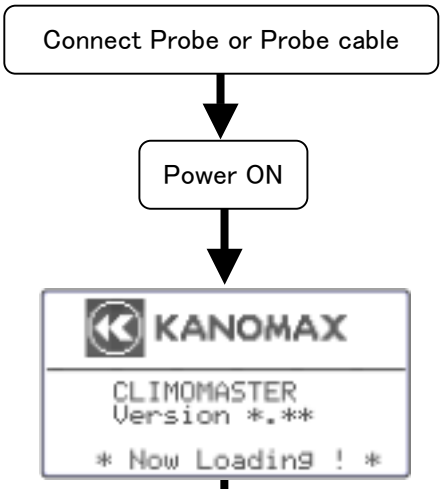
2. 4 Powering CLIMOMASTER ON／OFF

You can turn ON and OFF the CLIMOMASTER by flicking the switch on the side. When you turn on the power after connecting Probe or Probe cable, Manufacturer's logo, model name and its software version appear on the display for a few seconds.



Power Switch

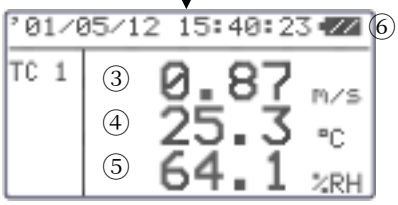
You will see the above warning when Probe is not properly connected or not connected at all. Turn off the instrument, check Probe connection and try again.



When you first turn on the CLIMOMASTER, it is in NORMAL Mode. (Units can be selected either Metric or Imperial. Please refer Page 38.)

Display icons

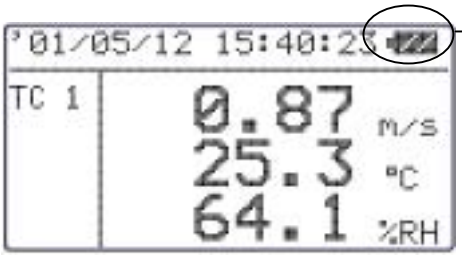
① Current date and time.
② Time Constant 1 (Refer Page 16)
③ Air velocity
④ Air temperature
⑤ Relative humidity*
⑥ Battery level indicator



NORMAL Mode

*: MODELA531/A533 only

◆ Battery Level Indicator



The battery consumption largely depends upon the air velocity, and it is difficult to predict the battery life. This "Battery Indicator" gives you the battery status and reminds you the timing for battery replacement.

The indicator changes as you see it below.


(Flashes)

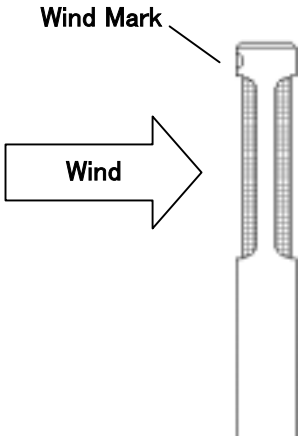
Time to replace the batteries

LOCK

When  is displayed, every function of the instrument will be locked. The measurement will stop and data will NOT be saved. To release the lock, turn off the power and replace the batteries. Even before completely run out, the low battery may cause the LCD display to freeze.

2. 5 How To Take Measurements

2. 5. 1 Measuring Air Velocity



- MODELA531/A541: Probe has its own directivity characteristics. Make sure that the wind direction mark is facing the wind (For more details on directivity characteristics, refer . p.48). If you are not sure of wind direction, slowly rotate Probe and measure at the point where you get the largest air velocity reading.
- MODELA533/A543/A542: Place the sensor perpendicular to the flow. For directivity of the needle type probe, please refer page 48.
- To make the temperature compensation more effective, make sure that the entire mesh section of Probe is evenly exposed to the airflow.
- To take a measurement in temperature changing situation, leave Probe for more than 20 seconds until the display becomes stable.

2. 5. 2 Measuring Air Temperature

- The faster the wind, the shorter the response time for temperature measurement. The normal response time is approximately 30 seconds (with the airflow of 1m/s present). Take the measurement after the reading is stabilized on the display.
- With no airflow present, the instrument's temperature reading may become higher than it actually is due to the heat generated by the air velocity sensor. It is recommended to take a measurement with at least 0.1m/s of wind present for accurate reading..

2. 5. 3 Measuring Humidity

- Use of this instrument in extremely high humidity or rapid temperature changing atmosphere may cause condensation on the surface of the sensor. When condensation occurs on the sensor surface, dry the sensor by leaving Probe in environment with 40%RH or lower for more than 24 hours.
- ——Comparing with ASSMANN Psychrometer——

  The humidity measurement function of CLIMOMASTER is strictly calibrated, traceable to Japanese National Standards carried by JEMIC (Japan Electric Meters Inspection Corporation), and it assures you highly accurate performance.

  The electronic hygrometer, used in CLIMOMASTER, is known to be more stable and has shorter response time compared to conventional ASSMANN Psychrometer. Besides, the electronic hygrometer is not dependent upon the measurement conditions, while ASSMANN Psychrometer can easily be influenced by many factors such as dust, dew and the way you wrap the gauze.

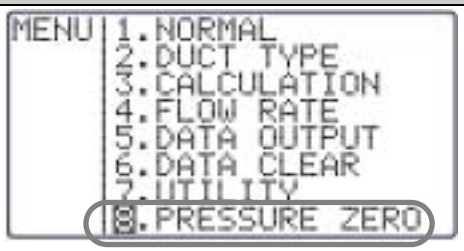
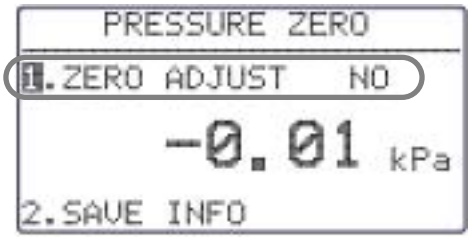
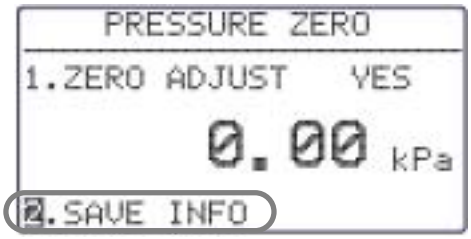
  For more information on proper handling of your ASSMANN Psychrometer, please refer to Japanese Industrial Standard (JIS-Z8806 "Method of Measuring Humidity"), or its counterpart standards that apply.

2. 5. 4 Measuring Pressure

- Do not apply more than 75kPa of pressure to the pressure sensor (optional). This may cause serious damage to the sensor.
- When you make a measurement, make sure that the temperature is somewhere in between 5 to 40℃ or 41 to 104^{O}F.
- Before you make a pressure measurement, make sure you execute the zero adjustment. When you make the adjustment, leave the both pressure ports ((+) and (-)) open.

◆ Zero adjustable range is within ±0.5kPa. If the reading is out of the range, the error massage will appear in the display.

＜Zero Adjustment Procedure＞

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select “8. PRESSURE ZERO”. Press SET.
	Use ▼▲ to select “1. ZERO ADJUST”. Press SET.
	Use ▼▲ to select “YES”. Press SET. ・Make sure that 0.00 kPa is displayed.
	Use ▼▲ to select “2. SAVE INFO”. Press SET. This will complete the zero adjustment and you are back in Main Menu. ※ If you press MENU before you save, you will go back to the Main Menu without completion of zero adjustment.

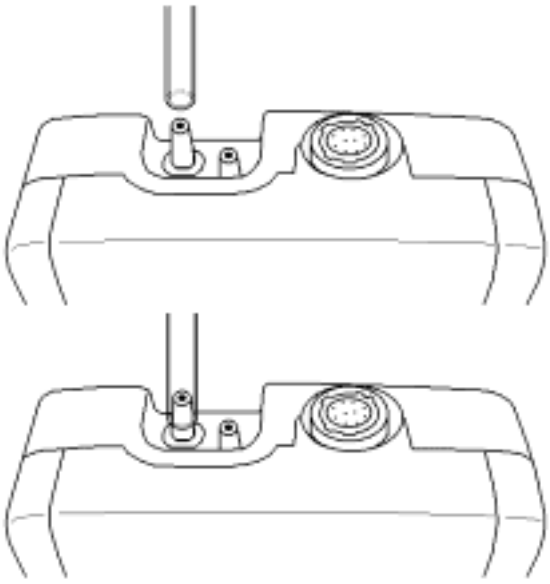
＜Connecting Pressure Tube＞

Connect the pressure tube to the (+) or (-) port as you see on the right.

Connect/insert the other end of the tube to the measuring hole of the duct. If the pressure that you are going to measure is above ambient, connect the tube to (+) Port. If it is negative, connect the tube to (-) Port.

! CAUTION !

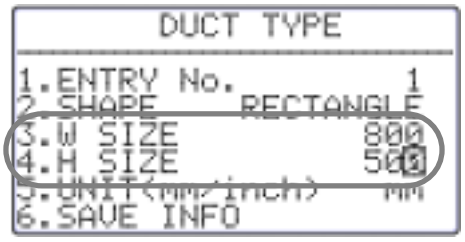
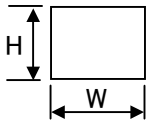
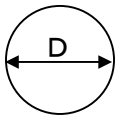
In order to make a precise measurement, the tube must be connected securely and must not be bent at any point.



3. Duct Shape/Size Input

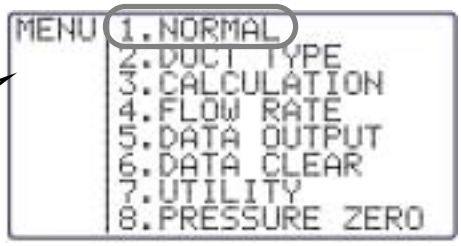
You can register in your CLIMOMASTER Model A531 up to 25 different duct types, which let you obtain the flow rate automatically. All you have to do is to select a duct before you take the measurement (for selecting a duct type, please see section 4).

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select "2. DUCT TYPE" Press SET.
	**<To Set Duct ENTRY No.>** You can choose where in memory to store the duct data. You can select the address from 1 to 25. Use ▼▲ to select "1. ENTRY No.". Press SET. Use ▼▲ to select the desired ENTRY No. Press SET.
 	**<To Set Duct SHAPE (RECTANGLE/CIRCLE)>** Use ▼▲ to select "2. SHAPE" Press SET. Use ▼▲ to select "RECTANGLE" or "CIRCLE" Press SET.

DISPLAY	PROCEDURE
	**＜To Set Duct Size＞** **Registering Rectangular Duct**  Use ▼▲ to select “3. W SIZE”. Press SET. Use ▼▲ to select the width. Press SET. Use ▼▲ to select “4. H SIZE”. Press SET. Use ▼▲ to select the height. Press SET. The maximum is 9999mm or 999.9inches per side.
	**＜To Set Duct Size＞** **Registering Circular Duct**  Use ▼▲ to select “3. Diameter” Press SET. Use ▼▲ to select the diameter of the duct. Press SET. The maximum is 9999mm or 999.9inches.
	**＜To Set Units（mm／inch）＞** Use ▼▲ to select “5. UNIT (mm/inch)” Press SET. ※ For circular duct, select “4. UNIT (mm/inch)” Use ▼▲ to select mm or inch. Press SET.
	**＜To Save the Setting＞** Use ▼▲ to select “6. SAVE INFO”. Press SET. This will complete the Duct Shape/Size Input and you are back in Main Menu. ※ If you press MENU before you save, you will go back to the Main Menu without completion of Duct Shape/Size Input.

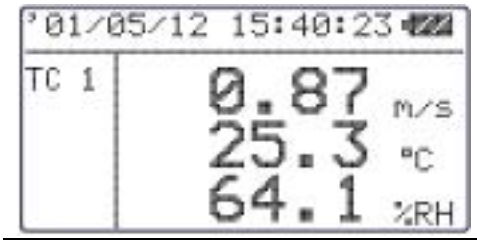
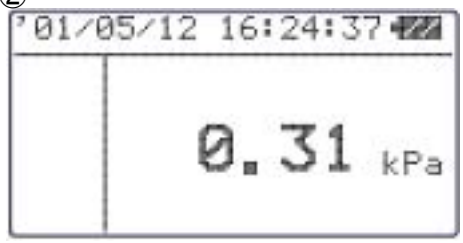
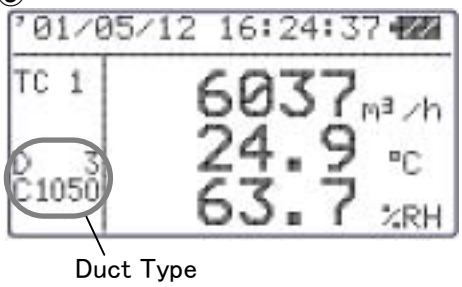
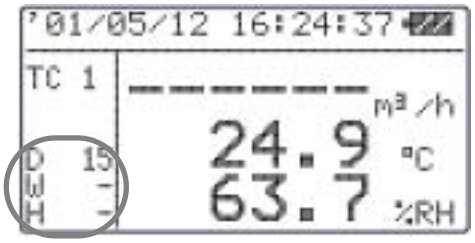
4. Normal Measurement

This is the mode that you will be in, when you first turn on the instrument. In this mode you cannot save any data. The display will be updated every 1 second.



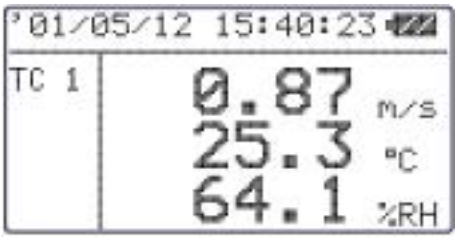
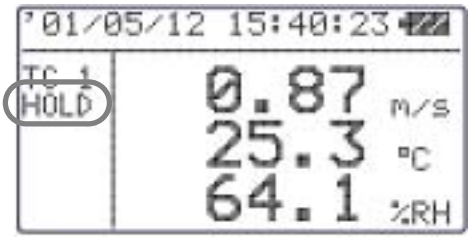
To move to NORMAL Mode from other measuring mode,
Press MENU.
Use ▼▲ to select "1. NORMAL".
Press SET.

4. 1 Selecting the Measuring Parameters

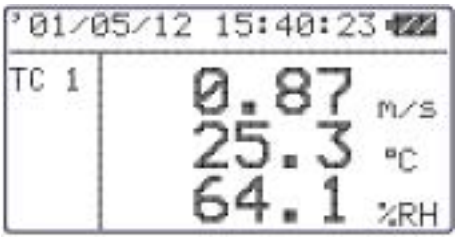
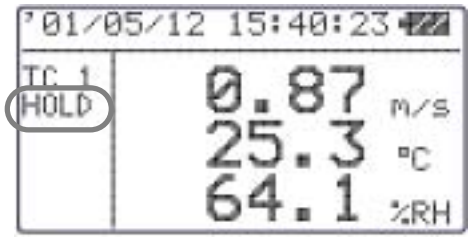
DISPLAY	PROCEDURE
① 	**<NORMAL MODE>** Press MODE, and display mode moves in order, as shown below. ②Pressure（Optional）→③Air Flow→①Air Velocity(=Normal)
② 	**＜PRESSURE MODE＞** ※This mode is available only when your instrument has optional pressure sensor built-in.
③ 	**＜FLOW RATE MODE＞** Gives you the flow rate based on your selection of a duct from pre-registered duct types (see Chapter 3). Selected duct type is shown in bottom left corner. **＜How to Select Duct Type＞** Use ▼▲ while pressing SET in Normal Mode- FLOW RATE.
	When you have not selected a duct type or your selected duct type (number) is not available, the instrument will not give you the flow rate reading.. Make sure you properly register and select the duct type. See Chapter 3. Duct Shape/Size Input for more detail.

※Humidity is available only on MODELA531 and A533.

4. 2 Display Hold

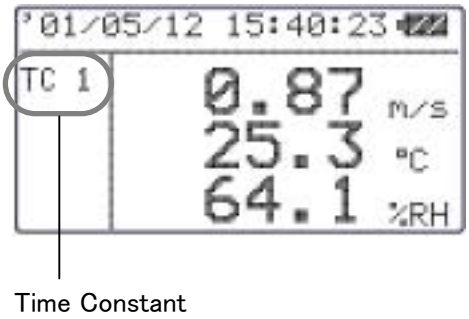
DISPLAY	PROCEDURE
	While measuring, press START HOLD.
	"HOLD" indicator appears on the display to indicate that the reading shown is held. Press START HOLD again to release.

Maximum Hold…How to Hold the Maximum Value

DISPLAY	PROCEDURE
	While measuring, press and hold START HOLD .
	"HOLD" indicator appears on the display and you can hold the maximum value of each parameter (air velocity, air temperature, humidity and pressure (optional)). When you release START HOLD, the reading shown will be frozen. Press START HOLD again to release.

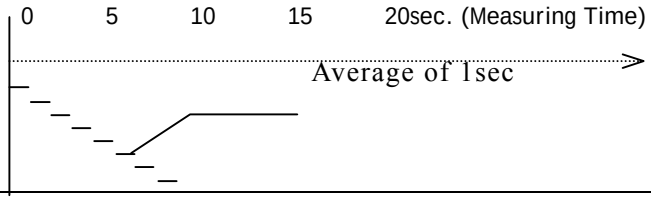
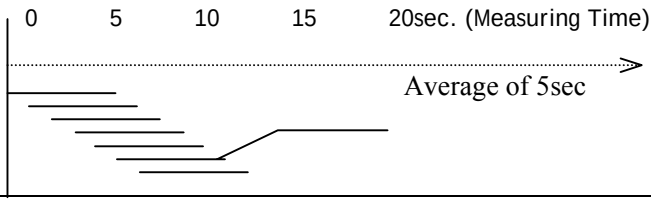
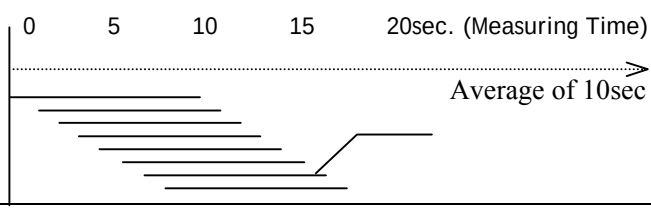
※Humidity only available on MODELA531 and A533.

4. 3 To Change Time Constant

DISPLAY	PROCEDURE
 Time Constant	In Normal Mode, you can change the Time Constant by pressing  . You can select Time Constant from 1sec, 5sec and 10sec. TC1 : Display moving average of 1sec. TC5 : Display moving average of 5sec. TC10 : Display moving average of 10sec. ※The Time Constant is only effective in Normal Mode. When you first turn on the instrument, it is effective in AIR VELOCITY and AIR FLOW of Normal Mode. If you need to make it effective in AIR TEMPERATURE, HUMIDITY and PRESSURE (Optional) in Normal Mode, refer Chapter 4.4 "To Change Time Constant Application".

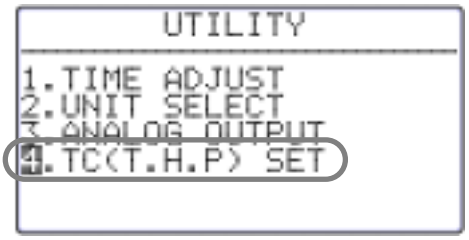
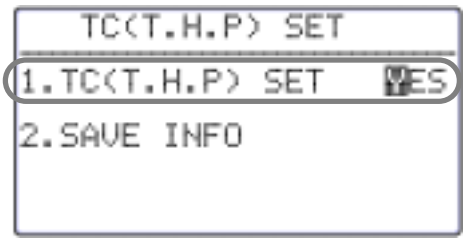
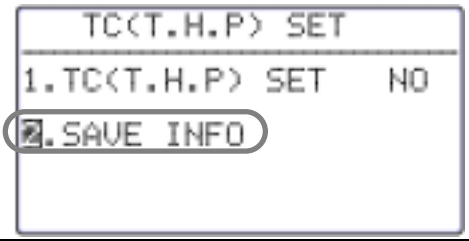
＊＊＊ What is Time Constant? ＊＊＊

Time Constant determines the time span of the moving average. When you set the Time Constant to a larger value, the indicating value will become stable. When you select the smaller(=shorter) Time Constant value, the reading will become more responsive and sensitive to the change in air velocity. This function will not be in effect in Calculation Mode and Air Flow Mode.

MODE	Way To Take In Measured Data	EXPLANATION
TC1		Take the data 10 times in a second and indicate its average as an instantaneous value at every 1 second.
TC5		Indicate the average value of 5 seconds at every 1 second. Data shifts by 1 second.
TC10		Indicate the average value of 10 seconds at every 1 second. Data shifts by 1 second.

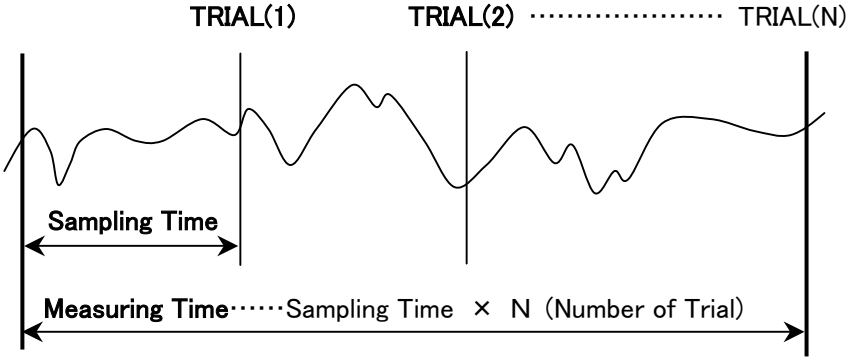
4. 4 To Change Time Constant Application

When you first turn on the instrument, the Time Constant is only effective in AIR VELOCITY and AIR FLOW of Normal Mode. If you want to make it effective in AIR TEMPERATURE, HUMIDITY and PRESSURE (Optional), the following change must be made.

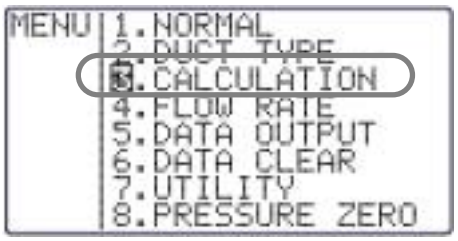
DISPLAY	PROCEDURE
	Press MENU. Use ▼ ▲ and select "7. UTILITY" Press SET.
	Use ▼ ▲ and select "4. TC(T.H) SET" or "4. TC(T.H.P) SET" Press SET.
	Use ▼ ▲ and select "1. TC(T. H. P) SET" Press SET. Use ▼ ▲ and select YES or NO Press SET. **YES:** Effective to all parameters in Normal Mode. **NO:** Only effective in AIR VELOCITY and FLOW RATE.
	**＜Save the Settings＞** Use ▼ ▲ and select "2. SAVE INFO" Press SET to save the new settings and go back to Main Menu. ※ If you press MENU before saving the settings will return you back to Main Menu.

5. Measuring Maximum, Minimum & Mean

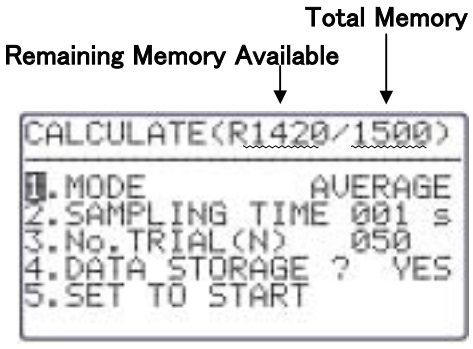
Calculation Mode will automatically calculates the maximum, minimum and mean of measured data.



- **Average (AVG)**
  AVG= Σ TRIAL(N)/N
- Maximum (MAX)
  MAX=TRIAL(i)
- Minimum (MIN)
  MIN=TRIAL(j)

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ and select "3. CALCULATION" Press SET.

CALCULATION **MODE DISPLAY ICONS**



1.CALCULATION MODE

AVERAGE : Take the average of each second within sampling time and count it as a 1 measured data.

INSTANT : Make the measurement at the last second of the sampling time and count it as a 1 measured data.

2.SAMPLING TIME (1 to 999 sec)

To set the length of sampling time of measurement.

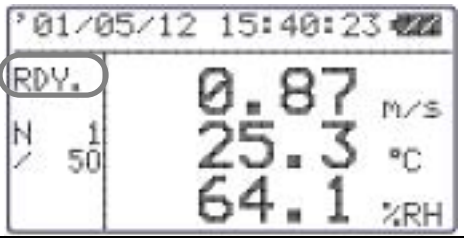
3.No. TRIAL (1 to 999 times)

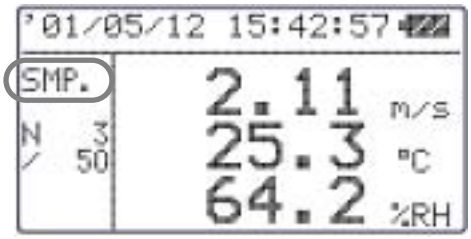
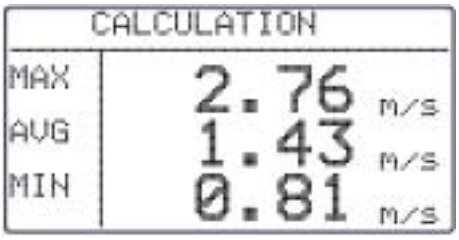
To set the number of trials (data) needed of desired sampling time.

4.DATA STORAGE (YES or NO)

5.SET TO START

Save the setting and return to standby.

DISPLAY	PROCEDURE
	**＜To Set CALCULATION MODE＞** Use ▼▲ and select "1. MODE" Press SET. Use ▼▲ and select AVERAGE or INSTANT Press SET.
	**＜To Set SAMPLING TIME＞** Use ▼▲ and select "2. SAMPLING TIME" Press SET. Use ▼▲ and select SAMPLING TIME (1 to 999sec). Press SET.
	**＜To Set No. TRIAL (N)＞** Use ▼▲ and select "3. No. TRIAL(N)" Press SET. Use ▼▲ and select No. TRIAL（1to 999 times). Press SET.
	**＜DATA STORAGE＞** Use ▼▲ and select "4. DATA STORAGE ?" Press SET. Use ▼▲ and select YES or NO. Press SET. ※You CANNOT store more than what's left in the memory. If you set the number more than the number of remaining data locations, it automatically adjusts to the amount of remaining memory locations. (Ex: if there is R0020/1500 remaining, you can only measure 20 times even if you set the No. TRIAL more than 20.)
	**＜Save the Settings＞** Use ▼▲ and select "5. SET TO START" Press SET.
	**＜READY＞** Press MODE to change the applied parameters. （Air Velocity, Air Temp., Humidity – Flow Rate, Air Temp., Humidity – Pressure） Press START/HOLD to start.

DISPLAY	PROCEDURE
	**＜While Measuring＞** Press START/HOLD to stop. ※ If you have selected “ YES ” for “ 4. DATA STORAGE ?”, the measured data will be stored. Press MENU can also stop the measurement but this would not store any data.
	**＜Result＞** After all the trials are finished, the calculated result will appear in display. Press ▼▲ to check each parameters in order of Air Velocity (or Air Flow) → Air Temp. → Humidity → Dew Point Temperature (DT), Discomfort Index. (DI) ※Only Pressure is displayed, if you measured Pressure. Press START/HOLD to return the setup mode of CALCULATION. Press MENU to return to Main Menu.

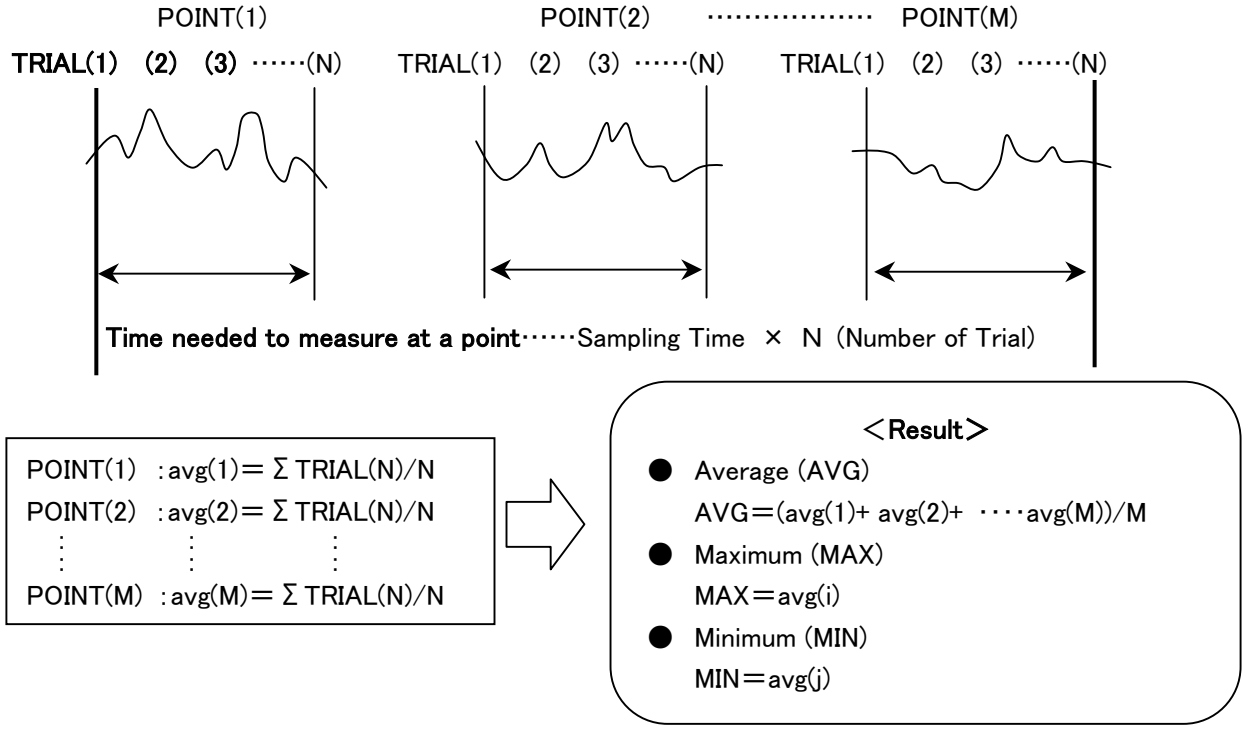
Related Functions:

- If printer is connected, press MODE to print out the result.
- To recall stored data.→P.25
- Print out→P.27
- What is Dew Point Temperature (DT) and Discomfort Index (DI)？→P.46

※Humidity only available on MODELA531 and A533.

6. Flow Rate Mode

CLIMOMASTER features the accurate Flow Rate Mode which corresponds to the industry measurement standards such as ASHRAE..



The value of each point is the average of TRIAL(1)～TRIAL(N).
The value of each point （POINT(1)～POINT(N)） will be stored in the memory.

To take an accurate measure the airflow of a duct, you need to figure out the average velocity of air inside the duct and the area of cross section of the duct.

Air Flow: Air Volume per Time Unit [m^3/min、m^3/h、ft^3/min、ft^3/h]
Air Flow (Q) = Average Air Velocity (U) × Cross Sectional Area (A)

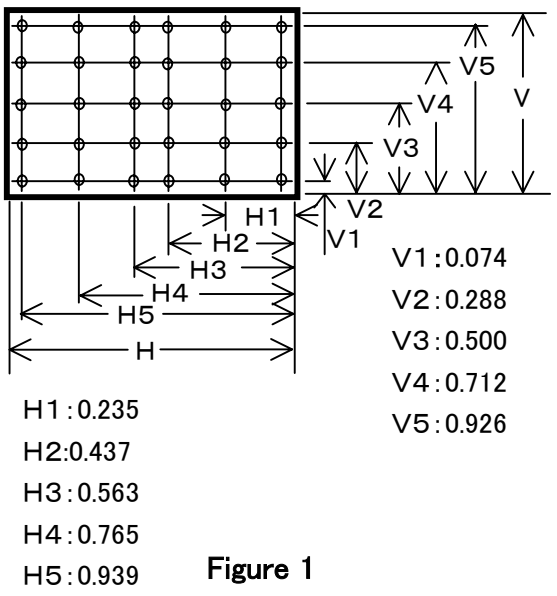


Figure 1

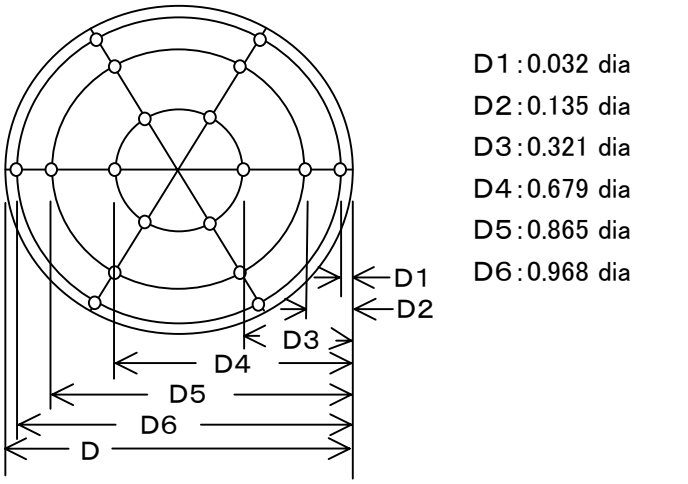


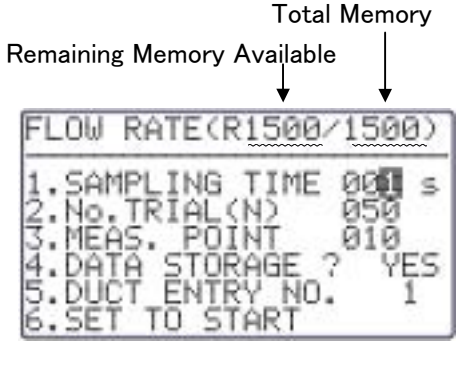
Figure 2

From ASHRAE Standards
8.6.2.3 "The Traverse"

Using the log-Tchebycheff method, the duct is divided into rectangular areas, which are further adjusted in size to account for effects of the duct wall on the airflow. (See Figure 1) A minimum of 25 points must be measured in order to get a good average. For the round duct, the duct is divided into concentric circles, each containing equal area. (See Figure 2) An equal number of readings are taken from each circular area, thus obtaining the best average. Please refer to **ASHRAE Standards 8.6.2.3 "The Traverse"** for more details.
The following shows the procedure with CLIMOMASTER.

DISPLAY	PROCEDURE
	Press MENU. Use ▼ ▲ and select "4. FLOW RATE". Press SET.
	**＜To Set SAMPLING TIME＞** Use ▼ ▲ and select "1. SAMPLING TIME" Press SET. Use ▼ ▲ and select SAMPLING TIME (1 to 999). Press SET.

FLOW RATE MODE DISPLAY ICONS



1.SAMPLING TIME (1 to 999 sec)
To set the length of sampling time of measurement.

2.No. TRIAL (N) (1 to 999 times)
To set the number of trials (data) needed of desired sampling time.

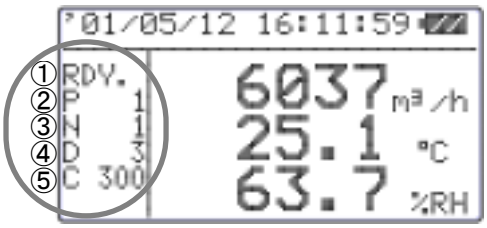
3.MEAS. POINT (1 to 999 points)
To set the number of measuring point that you are going to measure.

4.DATA STORAGE ? (YES or NO)

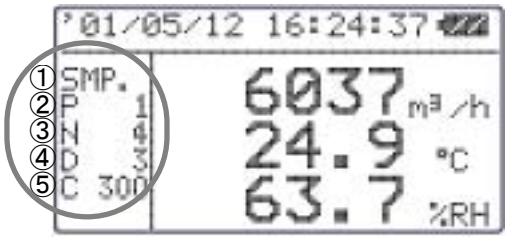
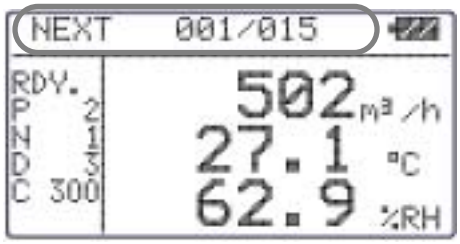
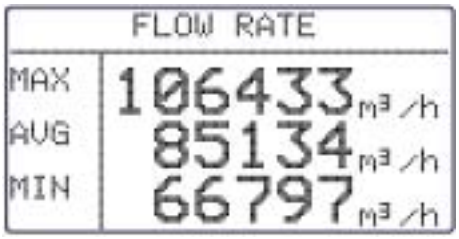
5.DUCT ENTRY NO.
Select the duct entry number of the duct that you are going to measure.

6.SET TO START
Save the setting and return to standby.

	**＜To Set No. TRIAL＞** Use ▼ ▲ and select "2. No. TRIAL (N)" Press SET. Use ▼ ▲ and select No. TRIAL (1 to 999). Press SET.

DISPLAY	PROCEDURE
	**＜To Set MEAS. POINT＞** Use ▼▲ and select “3. MEAS. POINT” Press SET. Use ▼▲ and select the number of MEAS. POINT (1 to 999). Press SET.
	**＜DATA STORAGE＞** Use ▼▲ and select “4. DATA STORAGE ?” Press SET. Use ▼▲ and select YES or NO. Press SET.
	**＜Select DUCT ENTRY NO.＞** Use ▼▲ and select “5. DUCT ENTRY NO.” Press SET. ※ If you select an open ENTRY NO., you cannot start the Flow Rate measurement.
	Here you can input the dimension of the duct. Refer Chapter 3 “Duct Shape/Size Input” (p.12) for detail.
	**＜Save the Settings＞** Use ▼▲ and select “6. SET TO START” Press SET. ※ If you press MENU before saving the settings will return you back to Main Menu.
	**＜READY＞** Press START/HOLD to start. **※＜How to Select Duct Type＞** Use ▼▲ while pressing SET.

DISPLAY ICONS
① RDY : Current Status (READY／SAMPLING)
② P001 :Current Number of Points
③ N001 :Current Number of Trial
④ D 3 :Selected Duct Entry Number
⑤ C300 :Duct Shape and Size
(In this case, the duct is circular and it's 300mm dia.)
For the rectangular duct, W ***, H *** will be displayed.

DISPLAY	PROCEDURE
	**＜While Measuring＞** Press START/HOLD to stop the measurement. If you want continue,press START/HOLD again to re-start the measurement. Press SET to complete the measurement. Then the result will appear in the display. (If Point 1 is not completed, any result will not appear in the display.) Press MENU to complete the measurement without data store.
	**＜READY After Point 1＞** After completing the measurement of Point 1, the instrument will be in STANDBY, ready to measure Point 2. NEXT 001/015 Number of Points Number of Points Already Measured
	**＜RESULT＞** After the completion of the measurement, the result will appear in the display. Press ▼ to select the parameter in order of Air Flow → Air Temperature → Humidity → Air Velocity Press START/HOLD to return the setup mode of FLOW RATE. Press MENU to return to Main Menu.

Related Functions:

- If printer is connected, press MODE to print out the result.
- To recall stored data.→P.25
- Print out→P.27

※Humidity only available on MODELA531 and A533.

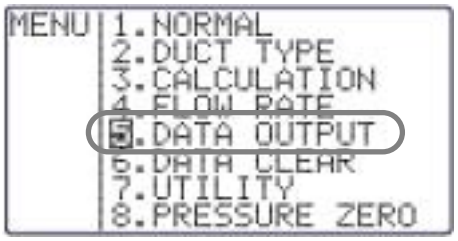
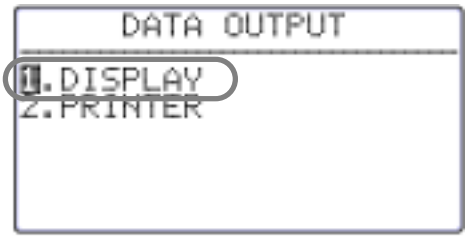
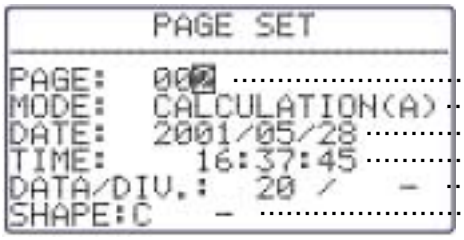
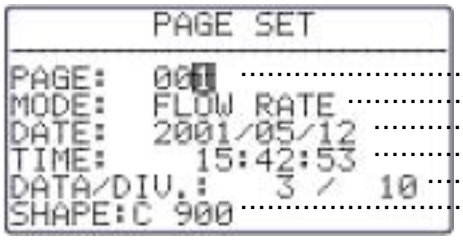
7. Data Output

7. 1 What Can Be Stored

Measuring Mode	Display		Stored Parameters	
MODEL	A531/A533	A541/A542/A543	A531/A533	A541/A542/A543
CALCULATION Mode	V, T, H	V, T	V, T, H	V, T
	W, T, H	W, T	V, W, T, H	V, W, T
	P (Optional)	P (Optional)	P	P
FLOW RATE Mode	V, T, H	V, T	V, W, T, H	V, W, T
	W, T, H	W, T	V, W, T, H	V, W, T

V: Air Velocity W: Flow Rate T: Air Temperature H: Humidity P: Pressure

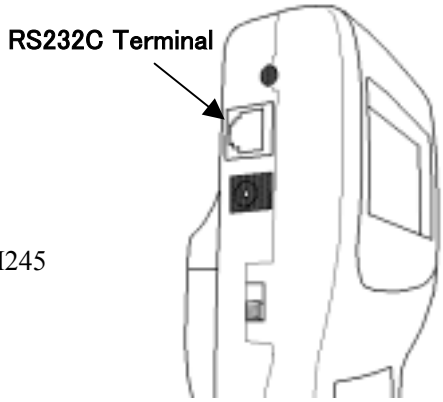
7. 2 To Recall Stored Data

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select "5. DATA OUTPUT". Press SET.
	Use ▼▲ to select " 1. DISPLAY". Press SET.
CALCULATION 	**<To Set PAGE>** Use ▼▲ to select the page that you want to recall. Press SET. Page Number Measured Mode (CALCULATION (A): AVERAGE; (I): INSTANT) Measured Date (Year / Month / Day) Measured Time (Hour : Minute : Second) Number of Trial Duct Shape/Size (Air Flow Measurement Only)
FLOW RATE 	Page Number Measured Mode Measured Date (Year / Month / Day) Measured Time (Hour: Minute: Second) Number of Trial/Number of Measuring Point Duct Shape/Size (Air Flow Measurement Only)

DISPLAY	PROCEDURE
START:001 END:050 ·····Calculation Range NUM. m/s °C %RH ·····Data Number; Air Velocity; Air Temperature; Humidity 001 0.81 25.4 64.7 002 0.95 25.4 64.7 003 0.98 25.6 64.9 004 1.05 25.7 65.1 005 1.21 25.7 65.0 006 0.99 25.9 65.2	**＜Recalled Data＞** Recalled data will be displayed. Use ▼▲ to scroll. If you measured Flow Rate in CALCULATION mode or if you measured in FLOW RATE Mode, you can select Flow Rate or Air Velocity to be displayed by pressing MODE. Only Pressure will be displayed, if you measured Pressure.
START:001 END:050 NUM. m/s °C %RH 001 0.81 25.4 64.7 002 0.95 25.4 64.7 003 0.98 25.6 64.9 004 1.05 25.7 65.1 005 1.21 25.7 65.0 006 0.99 25.9 65.2	**＜Set CALCULATION RANGE＞** You can select the range of calculation. （If you are not going to change the data range, press START/HOLD to calculate the entire data.） Press SET. Cursor will appear on “START” Use ▼▲ to select the first data Press SET. Cursor will move to “END” Use ▼▲ to select the last data. Press SET. Press START/HOLD to calculate. ※You CANNOT set more than one range.
FLOW RATE MAX 106433 m³/h AVG 85134 m³/h MIN 66797 m³/h	**In FLOW RATE Mode** Press ▼ to shift the calculation result in order of Flow Rate → Air Temperature → Humidity → Air Velocity. **In CALCULATION Mode** Press ▼ to shift the calculation result in order of Air Velocity (Flow Rate) → Air Temperature → Humidity → Dew Point Temperature, Discomfort Index. Press SET to return to PAGE SET. Press MENU to return to MAIN MENU.

※Humidity only available on MODELA531 and A533.

7. 3 Print Out



You can connect CLIMOMASTER to a printer using an RC232C cable for data printout.

7. 3. 1 Preparation

＜Need to Have＞

- Printer (Optional)……Recommended: Seiko Instruments Model DPU-H245
- Printer Cable（Optional）

＜Check the BAUD RATE＞

You need to coordinate the baud rate and data transmission conditions on both Main Body and the printer.
The factory setting of Main Body is as follows:

Data Bit Length	8 bits
Parity	None
Stop Bit	1
Delimiter	CRLF
Baud Rate	9600 bps

※ To change the BAUD RATE, refer p.38 “Units and Baud Rate”.

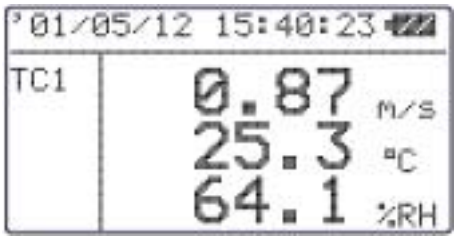
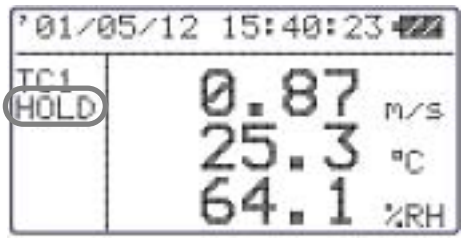
For the setting of printer, refer printer’s operation manual.

＜Connecting Printer＞

① Connect printer to Main Body using an RS-232C cable.
② Turn ON the CLIMOMASTER first, and then turn ON the printer.

Make sure that the CLIMOMASTER is displaying NORMAL Mode.

7. 3. 2 NORMAL Mode Print Out

DISPLAY	PROCEDURE
	Press START/HOLD to HOLD the display.
	Press MODE to print out. If printer is not connected properly, you will find “PERR” in lower left side of the display.

Examples of Print Out

＜NORMAL Mode＞

Print out of Air Velocity Mode

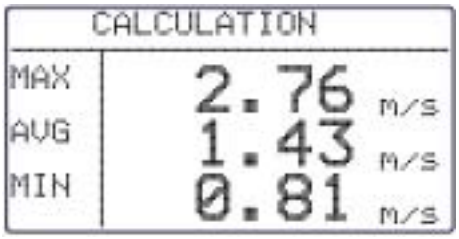
```
2001/06/19 13:42:09
Velocity     0.12 m/s  ……Air Velocity
Temperature  25.9 ° C  ……Air Temperature
Humidity     62.7 %RH  ……Humidity
```

Print out of Pressure (Optional) Mode

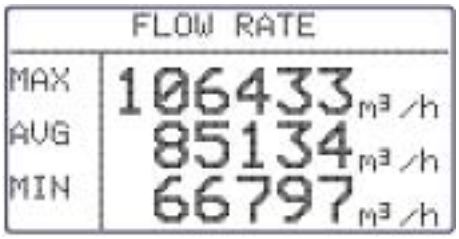
```
2001/06/19 13:42:28
Pressure     0.23 kPa  ……Pressure
```

※Humidity only available on MODELA531 and A533.

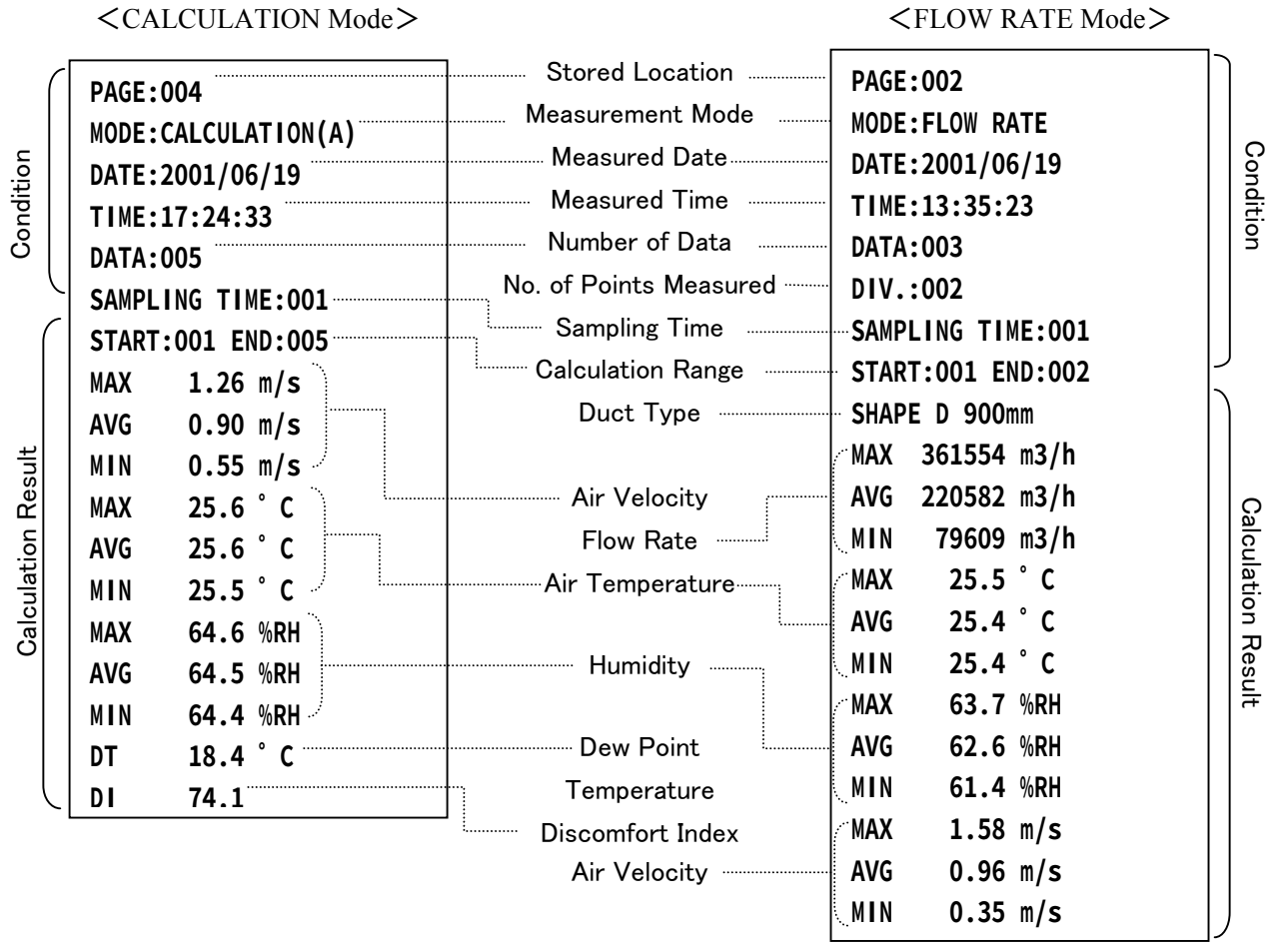
7. 3. 3 CALCULATION Mode Print Out

DISPLAY	PROCEDURE
	Press MODE after the measurement and calculation to print out the result.

7. 3. 4 FLOW RATE Mode Print Out

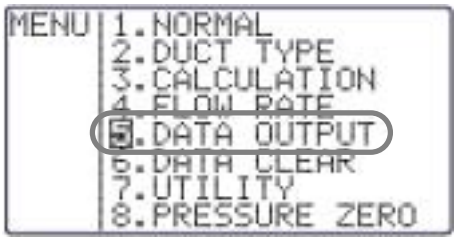
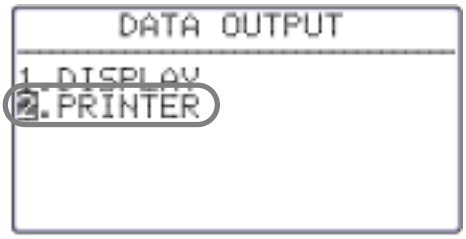
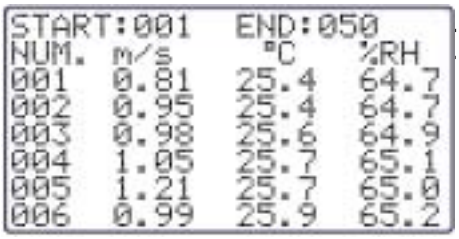
DISPLAY	PROCEDURE
	Press MODE after the measurement and calculation to print out the result.

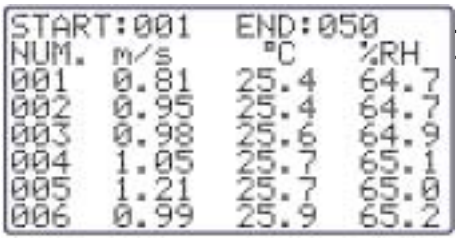
Examples of Print Out



※Humidity , Dew Point Temperature (DT) and Discomfort Index (DI) only available on MODELA531 and A533.

7. 3. 5 Stored Data Print Out

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select "5. DATA OUTPUT" Press SET.
	Use ▼▲ to select "2. PRINTER" Press SET.
	Use ▼▲ to select the page that you want to print out. Press SET. ·····Page Number ·····Measurement Mode (CALCULATION or FLOW RATE) ·····Measured Date (Year / Month / Day) ·····Measured Time (Hour : Minute : Second) ·····Number of Trial/Number of Measuring Point ·····Duct Shape/Size (Air Flow Measurement Only)
	The data you have selected will be displayed. Press ▼ to scroll. ·····Calculation Range ·····Data Number; Air Velocity; Air Temperature; Humidity If you measured Air Flow in CALCULATION mode or if you measured in FLOW RATE Mode, you can select Air Flow or Air Velocity to be displayed by pressing MODE. If you measured pressure, only pressure will be displayed.



The data you have selected will be displayed.

Press ▼ to scroll.

·····Calculation Range
·····Data Number; Air Velocity; Air Temperature; Humidity

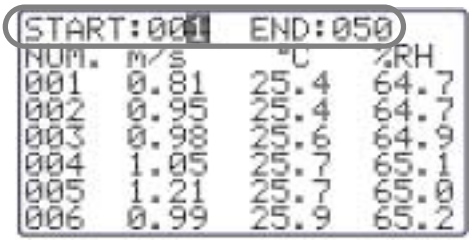
If you measured Air Flow in CALCULATION mode or if you measured in FLOW RATE Mode, you can select Air Flow or Air Velocity to be displayed by pressing MODE.

If you measured Pressure, only Pressure will be displayed.

＜Set PRINT OUT RANGE＞

You can select the range of calculation.

（If you are not going to change the data range, press START/HOLD to calculate the entire data.）



Press SET.

Cursor will appear on “START”

Use ▼▲ to select starting point.

Press SET.

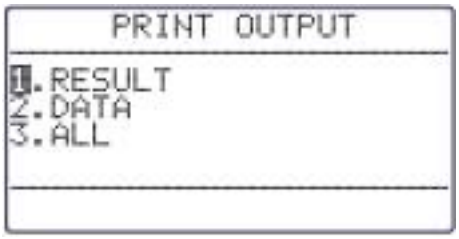
Cursor will move to “END”

Use ▼▲ to select l.

Press SET.

Press START/HOLD to calculate.

※ You CANNOT set more than one range.



Press START/HOLD to select the content of the Print Out.

Use ▼▲ to select.

Press SET to print out.

1. RESULT·····Condition and Calculation Result
2. DATA·····Condition and Stored Data
3. ALL·····Condition, Calculation Result and Stored Data

※Humidity only available on MODELA531 and A533.

Example of Print Out

＜FLOW RATE Mode＞

```
PAGE SET
PAGE:011
MODE:FLOW RATE
DATE:2001/06/21
TIME:16:23:08
DATA:003
DIV.:005
SAMPLING TIME:001
START:001 END:005
SHAPE W 200 H 300mm
MAX   32194 m3/h
AVG   16871 m3/h
MIN    5446 m3/h
MAX    25.9 ° C
AVG    25.9 ° C
MIN    25.8 ° C
MAX    72.2 %RH
AVG    71.2 %RH
MIN    69.7 %RH
MAX    1.49 m/s
AVG    0.78 m/s
MIN    0.25 m/s
NUM. m3/h   ° C     %RH
001  20596    25.8    69.7
002  19906    25.9    72.2
003   6214    25.9    71.3
004   5446    25.9    71.4
```

Condition (Always printed out)

Calculation Result (RESULT)

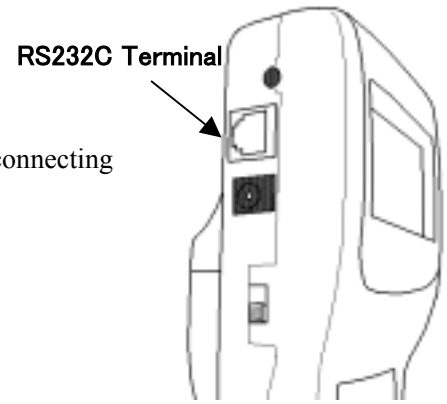
Stored Data (DATA)

＜CALCULATION Mode＞

```
PAGE SET
PAGE:001
MODE:CALCULATION(A)
DATE:2001/05/19
TIME:11:32:26
DATA:010
SAMPLING TIME:001
START:001 END:010
MAX    0.75 m/s
AVG    0.40 m/s
MIN    0.05 m/s
MAX    25.8 ° C
AVG    25.6 ° C
MIN    25.4 ° C
MAX    59.1 %RH
AVG    58.2 %RH
MIN    57.5 %RH
DT     16.8 ° C
DI     73.4
NUM.  m/s     ° C    %RH
001   0.05    25.8    57.5
002   0.06    25.8    57.6
003   0.48    25.6    57.7
004   0.48    25.6    57.8
005   0.56    25.6    58.0
006   0.48    25.6    58.3
007   0.39    25.5    58.5
008   0.75    25.5    58.7
009   0.27    25.4    58.8
```

※Humidity , Dew Point Temperature (DT) and Discomfort Index (DI) only available on MODELA531 and A533.

7. 4 Digital Output



7. 4. 1 Preparation

You can download the data stored in CLIMOMASTER to your PC, by connecting CLIMOMASTER and your PC with the RC232C cable (Optional).

＜Need To Have＞

●Personal Computer

●RS-232C Cable（Optional）

＜Check the BAUD RATE＞

You need to coordinate the data transmission conditions on both Main Body and your PC.

The factory setting of Main Body is as follows:

Data Bit Length	8 bits
Parity	None
Stop Bit	1
Delimiter	CRLF
Baud Rate	9600 bps

※ To change the BAUD RATE, refer p.38 “Units and Baud Rate”.

For setting your PC, refer to the operation manual of your PC

＜Connecting PC＞

① Turn OFF the CLIMOMASTER.

② Connect PC to Main Body using an RS-232C cable.

③ Turn ON the CLIMOMASTER.

④ Make sure that the CLIMOMASTER is displaying NORMAL Mode.

Make sure that the CLIMOMASTER is displaying NORMAL Mode.

RS232C Cable Wiring Diagram

PC (D-Sub9 pin)		Connection	CLIMOMASTER（MODELA531）			
Signal	Pin No.		Pin No.	Signal	Purpose	Direction
NC	1		1	GND	Ground	
RXD	2		2	TXD	Transmitting	Output
TXD	3		3	RXD	Receiving	Input
NC	4		4	CTS	Transmission Approval	Input
GND	5		5	RTS	Transmission Request	Output
NC	6		6	NC		
RTS	7					
CTS	8					
NC	9					

Note: Data logging software also available from Kanomax.

7. 5 To Access From Your PC

To connect CLIMOMASTER to your PC, please refer to p.32.

———Icons and its Meaning———

␣: Space
↵: Return or Press Enter
*: A Number

"0000000" will be displayed for humidity on MODELA541, A542 and A543.

Command	Function
D＊＊＊＊↵	Number of Downloading Data
N↵	Cancel
S↵	Output of Measuring Condition (of On-Time Data)
U↵	Output of Measuring Units
K↵	Output of Duct Shape/Size
P↵	Output of Page Number
T＊＊＊＊↵	Output of Stored Data
M＊＊＊＊↵	Output of Measuring Condition (of Stored Data)
B↵	Output of Measuring Condition of All Pages

7. 5. 1 Transmission of On-Time Data

DISPLAY	PROCEDURE
Example: Air Velocity Mode and typed D****↵ AD↵ ␣␣␣0.19;␣␣␣26.8;␣␣␣73.4↵ ␣␣␣0.51;␣␣␣26.8;␣␣␣73.5↵ ␣␣␣0.61;␣␣␣27.0;␣␣␣76.1↵ ␣␣␣0.24;␣␣␣27.0;␣␣␣77.5↵ ␣␣␣0.15;␣␣␣26.9;␣␣␣76.0↵ AN↵	**<Set Number of Data Needed>** **Press "D＊＊＊＊↵"** (※Must type in 4 digits) After "AD", the data will be displayed. Each data represent 1sec of measurement. If you ask for 20 data, it takes approximately 20sec to display. The maximum number that can be set is 999. If you need more, re-send the command. **<Output Content>** Air Velocity Mode: Velocity; Temperature; Humidity Flow Rate Mode: Flow Rate; Temperature; Humidity Pressure Mode: 0000000; 0000000; Pressure **<To Cancel>** **Press "N↵"** ＊"0000000" will be displayed for humidity on MODELA541, A542 and A543.
DISPLAY	**PROCEDURE**
AS↵ WTH;01;␣␣200;␣␣300;␣␣␣␣-;mm↵	**<To Download Measuring Conditions>** **Press "S↵"** After "AS", the data will be displayed. **<Output Content>** Measuring Parameter (**WTH, VTH** or **PRS**); Time Constant; Width; Height; Diameter; Units of Duct Size **WTH:** Flow Rate, Temperature, Humidity **VTH:** Air Velocity, Temperature, Humidity **PRS:** Pressure (Optional)
DISPLAY	**PROCEDURE**
AU↵ m/s;° C;%RH;kPa;m3/min↵	**<To Download Measuring Units>** **Press "U↵"** After "AU", the data will be displayed. **<Output Content>** Velocity Unit; Temperature Unit; Humidity Unit; Pressure Unit; Flow Rate Unit

7. 5. 2 Transmission of Stored Memory

DISPLAY	PROCEDURE
AK↵ 01;␣␣200;␣␣300;␣␣␣␣-;mm↵ 02;␣␣␣␣-;␣␣␣␣-;␣␣500;inch↵ 24;␣␣550;␣␣400;␣␣␣␣-;mm↵ 25;␣␣␣␣-;␣␣␣␣-; ␣250;mm↵	**<To Download Duct Setting>** **Press "K↵"** After "AK", the data will be displayed. All stored duct settings (1 thru 25) will be downloaded. **<Output Content>** Entry No. (Data Location): Width; Height; Diameter; Units of Duct Size

DISPLAY	PROCEDURE
AP↵ P0011↵	**<To Download Page Number>** After "AP", the data will be displayed. **Press "P↵"** Number of data stored pages will be downloaded.

DISPLAY	PROCEDURE
AT↵ 2001/05/19;13:32:26↵ 001;␣␣␣0.05;␣␣␣25.8;␣␣␣57.5↵ 002;␣␣␣0.06;␣␣␣25.8;␣␣␣57.6↵ 003;␣␣␣0.48;␣␣␣25.6;␣␣␣57.7↵ 004;␣␣␣0.48;␣␣␣25.6;␣␣␣57.8↵ 005;␣␣␣0.56;␣␣␣25.6;␣␣␣58.0↵	**<To Download Stored Data>** **Press "T＊＊＊＊↵"** (※Must type in 4 digits) Type in the desired page number after "T". After "AT", the data will be displayed. **<Output Content>** Air Velocity Mode: Number of Data; Velocity; Temperature; Humidity Flow Rate Mode: Number of Data; Flow Rate; Temperature; Humidity Pressure Mode: Number of Data; 0000000; 0000000; Pressure ※ The numbers will be displayed in currently selected units. NOT in units of at saving the data. ※ Calculated data will not be downloaded.

DISPLAY	PROCEDURE
AM↵ WTH;000;001;003;AVG;␣␣200;␣␣300;␣␣␣␣-;mm↵ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨	**<To Download Measuring Condition of Stored Data>** **Press "M＊＊＊＊↵"** (※Must type in 4 digits) Type in the desired page number after "M".

<Output Content>

① Measuring Parameter
- **WTH**: Flow Rate; Temperature; Humidity
- **VTH**: Velocity; Temperature; Humidity
- **PRS**: Pressure (Optional)

② Measuring Mode
- **000**: Calculation Mode
- **001**: Flow Rate Mode

③ Sampling Time

④ Number of Data

⑤ Calculation Mode
- **AVG**: Average
- **INS**: Instantaneous

In the case of Fow Rate Mode, the point is indicated.

⑥ Width

⑦ Height

⑧ Diameter

⑨ Units of Duct Size

DISPLAY	
AM↵ WTH;000;001;AVG;003;␣␣200;␣␣300;␣␣␣␣-;mm↵ VTH;001;010;INS;015;␣␣150;␣␣500;␣␣␣␣-;mm↵ PRS;000;001;AVG;003;␣␣200;␣␣300;␣␣␣␣-;mm↵	**<To Download Measuring Condition of All Pages>** **Press "B↵"** After "AM", the data will be displayed. **<Output Content>** ※Same as above

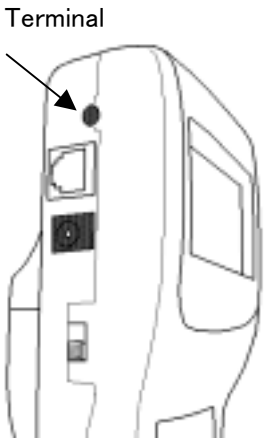
DISPLAY	PROCEDURE
ED↵	**<Error Message>** Re-type the command.

7．6 Analog Output（Optional）

①Data Update……0.1second (Except Humidity: 1second)

②Load Impedance……Above 5KΩ

③Output Current……DC 0～1V



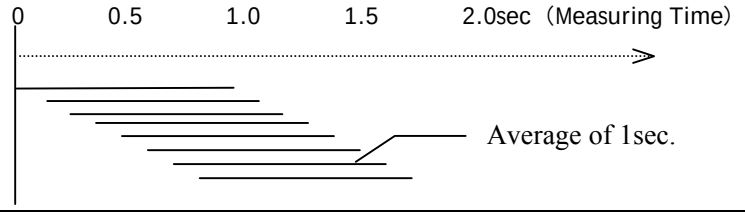
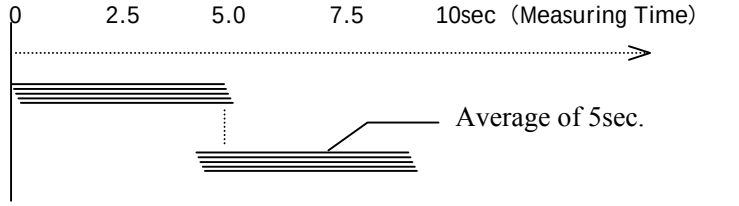
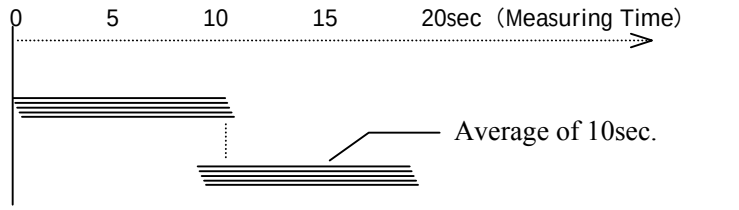
For the analog output, you must select one setting from the table below.

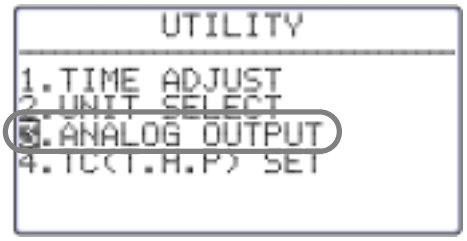
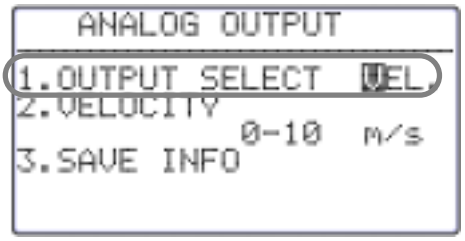
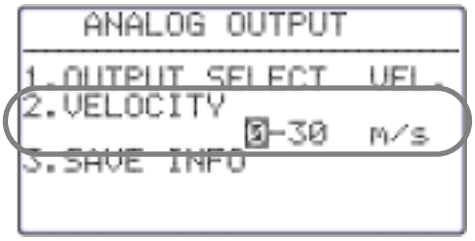
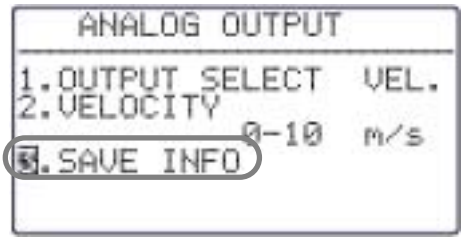
(There is no analog output for Flow Rate)

Parameter	Output Range	Conversion Formula
Velocity (U)	0 ～ 5 m/s	U= 5×V m/s
	0 ～ 10 m/s	U=10×V m/s
	0 ～ 30 m/s	U=30×V m/s
	0 ～ 1000 FPM	U=1000×V FPM
	0 ～ 2000 FPM	U=2000×V FPM
	0 ～ 6000 FPM	U=6000×V FPM
Humidity (H)	0 ～ 50 %RH	H= 50×V %RH
	0 ～ 100 %RH	H=100×V %RH
Temperature (T)	-10 ～ 40 ℃	T= 50×V−10 ℃
	0 ～ 50 ℃	T= 50×V ℃
	0 ～ 100 ℃	T=100×V ℃
	14 ～ 104 °F	T= 90×V+14 °F
	32 ～ 122 °F	T= 90×V+32 °F
	32 ～ 212 °F	T=180×V+32 °F
Pressure (P)	-2 ～ +2 kPa	P= 4×V-2 kPa
	-5 ～ +5 kPa	P= 10×V-5 kPa

Of the output range, the low end will be set at 0V and the high end will be set at 1V. The voltage is linear.

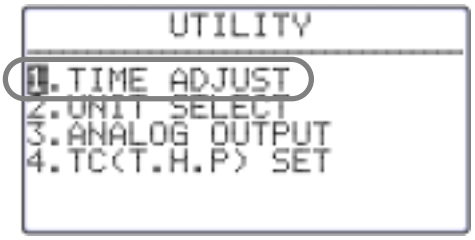
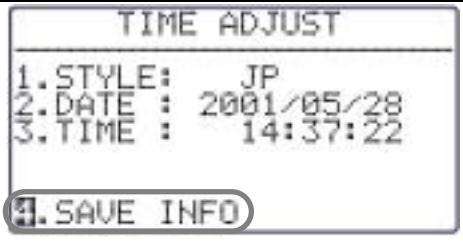
The Time Constant will be in effect. To change the setting of Time Constant, refer Chapter 4.3 "To Change Time Constant" p.16.

Mode	Way To Take In Measured Data (Analog Output)	Explanation
TC1		Take the data 10 times in a second and indicate its average as an instantaneous value at every 1 sec.
TC5		Output the average value of 5sec. at every 0.1sec. Data shifts by 0.1sec.
TC10		Output the average value of 10sec. at every 0.1sec. Data shifts by 0.1sec.

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select "7. UTILITY". Press SET.
	Use ▼▲ to select "3. ANALOG OUTPUT". Press SET.
	**<To Select Data>** Use ▼▲ to select "1. OUTPUT SELECT". Press SET. Use ▼▲ to select "VEL." (Velocity), "PRS." (Pressure/Optional), "HUM."(Humidity), "TMP."(Temperature). Press SET.
	**<To Set Output Range>** Use ▼▲ to select "2." (selected parameter). Press SET. Use ▼▲ to select the range. Press SET.
	**<To Save the Setting>** Use ▼▲ to select "3. SAVE INFO". Press SET. ※If you press MENU before you save, you will return to Main Menu and the setting will not be saved.

8. Other Settings

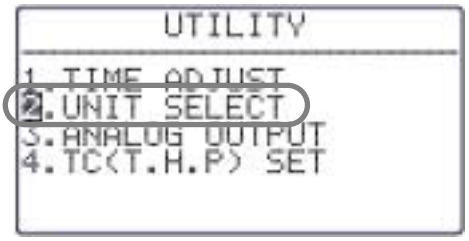
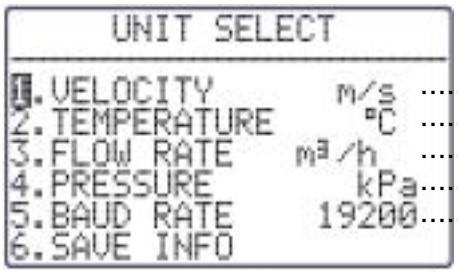
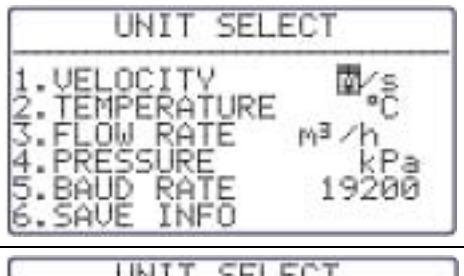
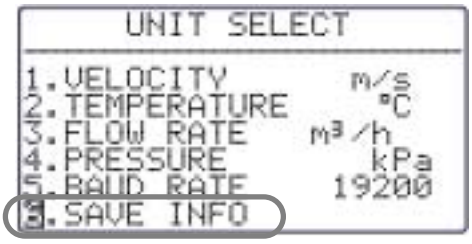
8. 1 Date

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select “7. UTILITY”. Press SET.
	Use ▼▲ to select “1. TIME ADJUST”. Press SET.
	Use ▼▲ to select "1.STYLE" or "2.DATE". Press SET. 1.STYLE: Select JP,US or EU Japanese style(JP) YYYY/MM/DD US style(US) MM/DD/YYYY EU style(EU) DD/MM/YYYY 2.DATE: Date 3.TIME: hour/minute/sec
	Use SET to select the desired item. Use ▼▲ to change the setting. Press SET to move the cursor back to “1” or “2”.
	**＜To Save the Setting＞** Use ▼▲ to select “3. SAVE INFO”. Press SET. ※If you press MENU before you save, you will return to Main Menu and the setting will not be saved.

※ Date of the output to the display or printer is depend on this setting.. But the style of the output to digital port (RS-232C) is fixed as Japanese style.

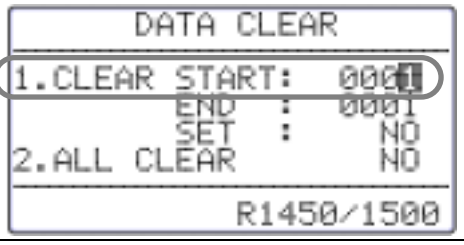
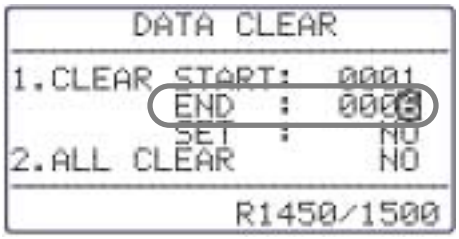
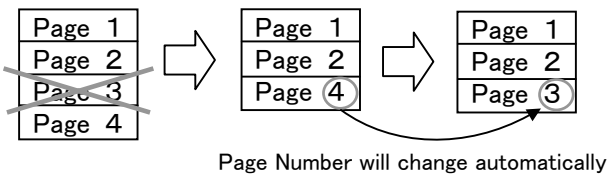
8. 2 Units and Baud Rate

＜Units Conversion Table＞
Velocity 1m/s＝196 FPM
Temperature T(°F)＝1.8×T(℃)＋32
Flow Rate 1m³/h＝35.32ft³/h

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select “7. UTILITY”. Press SET.
	Use ▼▲ to select “2. UNIT SELECT”. Press SET.
	Use ▼▲ to select the desired item（1 thru 5）. Press SET. ……m/s or FPM ……℃ or °F ……m³/h, m³/min, ft³/min or ft³/h ……kPa or Pa（Optional） ……4800, 9600, 19200 or 38400
	Use ▼▲ to change the setting. Press SET.
	**<To Save the Setting>** Use ▼▲ to select “6. SAVE INFO”. Press SET. ※ If you press MENU before you save, you will return to Main Menu and the setting will not be saved.

8. 3 To Delete Data

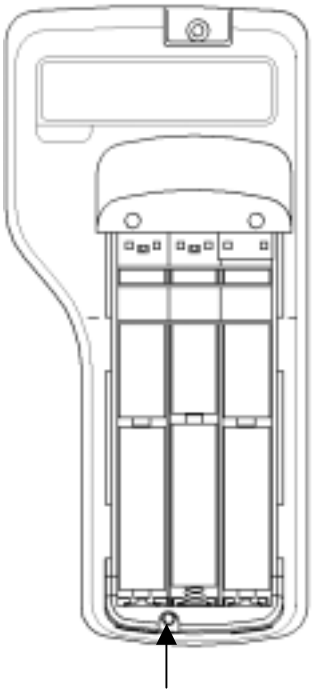
8. 3. 1 To Delete a Page of Data

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select "6. DATA CLEAR". Press SET.
	Use ▼▲ to select "1. CLEAR". Press SET. ……Starting Page Number ……Ending Page Number ……Partial Delete (YES or NO) ……All Delete (YES or NO) ……Remaining Memory / Total Memory
	Use ▼▲ to select the starting page. Press SET.
	Use ▼▲ to select the ending page. Press SET.
	Use ▼▲ to select "YES" for partial delete. Press SET.
	Selected page will be deleted and the remaining data will shift up. (See diagram below) 

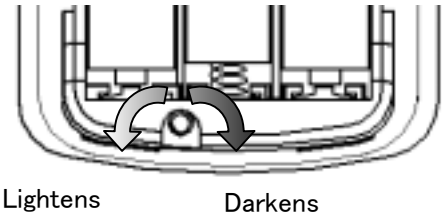
8. 3. 2 To Delete All Data

DISPLAY	PROCEDURE
	Press MENU. Use ▼▲ to select "6. DATA CLEAR". Press SET.
	Use ▼▲ to select "2. ALL CLEAR". Press SET. ……All Delete (YES or NO) ……Remaining Memory / Total Memory
	Use ▼▲ to select "YES" to delete. Press SET.
	All the data will be deleted and the Remaining Memory will be 1500.

8. 4 Contrast Adjustment



In case you find the LCD display of CLIMOMASTER too dark or too light, there is an adjusting volume at the back, bottom of Main Body, inside the battery cover.
You can adjust by using a precision driver (-)（0.9～1.5mm）.
Turn it clockwise to darken and vice versa.



9. Cleaning

- **How to Clean Probe**

Dust or particles attached on the velocity sensor would alter the amount of heat diffusion, which leads to less precise reading. Also, deformation or clogging up of the protective mesh around the sensor of CLIMOMASTER would also affect the accuracy of the instrument.
Users are encouraged to clean up Probe regularly for maintaining accurate measurement.

Procedure

Clean the sensor by soaking it to water in ultrasonic cleaner for 10 to 20 seconds. Do not soak it for too long, since there is an increased risk of damaging the coating.
Please use water only for cleaning.

! CAUTION !

!)When cleaning, make sure that the power is OFF.
!)Make sure that the sensor is dry before turning it ON.
!)DO NOT let the humidity sensor contact water(MODELA531/A533). When wet, let it air dry by placing it in environment with less than 40%RH for more than 24 hours.
!)NEVER USE alcohol or any other organic fluid.
Alcohol causes a permanent damage to the humidity sensor.
Once the sensor is damaged, the sensor needs to be replaced even if it seems functioning..

10. Specification

Product		CLIMOMASTER Air Velocity Meter				
Model		A531	A541	A542	A533	A543
Measuring Object		Clean air flow				
Air Velocity	Measuring Range	0.10～30.0 m/s			0.05～5.00m/s	
	Resolution	0.00～9.99m/s:0.01m/s 10.0～30.0m/s:0.1m/s			0.01m/s	
	Accuracy	±(2% of Reading +0.1) m/s				
	Response Time (at 1m/s, 90% response time)	Approx. 1sec.		Approx. 4sec.	Approx. 7sec.	
Air Temperature	Measuring Range	0.0～60.0C				
	Resolution	0.1C				
	Accuracy	±0.5C				
	Response Time	Approx. 30sec. (at 1m/s, 90% response time)				
Humidity*1	Measuring Range	2.0～98.0%RH	-		2.0～98.0%RH	-
	Resolution	0.1%RH	-		0.1%RH	-
	Accuracy	2～80%RH: ±2.0%RH 80～98%RH: ±3.0%RH	-		2～80%RH: ±2.0%RH 80～98%RH: ±3.0%RH	-
	Response Time	Approx.15sec.	-		Approx. 15 sec.	-
Pressure*2	Measuring Range	-5.00～+5.00 kPa				
	Resolution	0.01kPa				
	Accuracy	±(3% of Reading + 0.01) kPa				
	Response Time	Approx. 1sec.				
Temperature Compensation		±(5% of Reading + 0.1)m/s (in the temperature range 5 to 60.0C)				
Functions		Max., Min., Average, Hold, Max Hold, Time Constant (1, 5, 10 seconds), Battery Level Indicator (5 Levels), Unit selection (Air Velocity: m/s, FPM Flow Rate: m^3/min, m^3/h, ft^3/min, ft^3/h Temperature: ℃ ,°F Humidity*1: %RH, Static Pressure*2: kPa, Pa) Store up to 25 Duct Sizes (Square/Round), Max.Data Storage: 1500				
Output		Digital Output: RS-232C (Baud Rate 4800, 9600, 19200 and 38400 bps) for Output to Printer/PC Analog Output*2: DC 0～1V (select one from Air Velocity, Temperature, Humidity and Pressure)				
Power		6 × AA Batteries , AC Adaptor*2: AC 100～240V (50/60Hz)				
Battery Life		Approximately 10 hours continuous (at air velocity 5m/s, 20C, with alkaline batteries)				
Operating Environment		Main Body: 5～40C(41-104F) Probe: 0～60C (32-140 F)				
Storage Environment		5～40C (41-104 F)				
Weight		Approximately 400g (batteries included)				
Accessories		Carrying Case, Operation Manual, 6×AA Batteries, Probe Cable (2m)				
Options		Spare probe, Analog output, Pressure sensor, Extension rod, Printer, RS-232C cable, Software (for Windows), AC adaptor				

*1: Humidity only available on MODELA531 and A533.

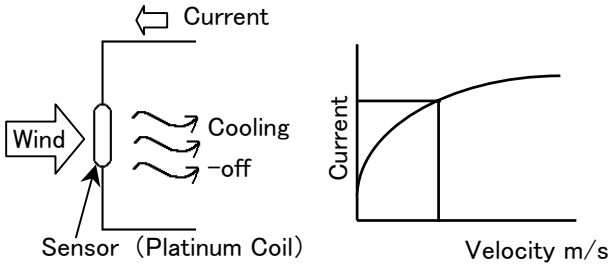
*2: Optional

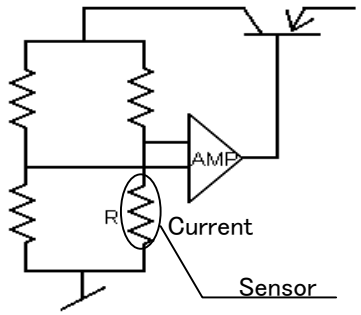
11. Principle of Measurement

11. 1 Principle of CLIMOMASTER®

➢ **Principle of Hot-Wire Anemometer**

The principle of the thermal Probe is based on a heated element from which heat is extracted by the colder impact flow. The temperature is kept constant via a regulating switch. The controlling current is directly proportional to the velocity. When thermal velocity Probes are used in turbulent flows, the measured result is influenced by the flows impacting the heated body from all directions.

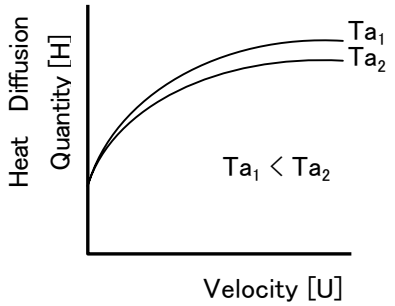




In turbulent flows, a thermal velocity sensor indicates higher measured values than a vane Probe. This can be observed during measurements in ducts. Depending on the design of the duct, turbulent flows can occur even at low velocities. The amount of heat that is extracted by the colder impact flow from the sensor can be expressed by:

$$H = (a + b\sqrt{U})(T - Ta) \quad \cdots\cdots King's\ fomula$$

Where H: Heat diffusion quantity T: Temperature of the sensor Ta: Air temperature U: Air velocity a, b: Constant



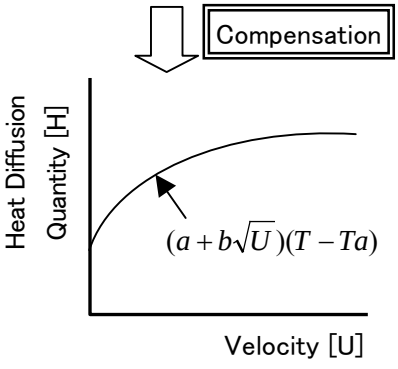
Also, heat diffusion quantity can be expressed by the formula:

$$H = RI^2$$

Where R is resistance and I is current

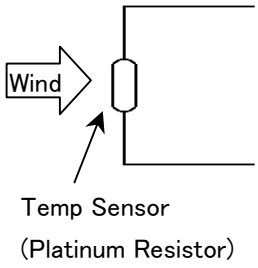
(R is kept constant regardless of air velocity since the temperature in constant).

Therefore, $RI^2 \propto a + b\sqrt{U}$



➢ **The Temperature Compensation**

The air velocity sonsor is heated to and elevated temperature relative to the surrounding air by means of control electronics. The temperature compensation sensors senses the ambient, or surrounding air temperature and forces the velocity sensor to stay at a constant overheat above the ambient. The circuit foeces the voltage to be equal by means of an operational amplifier. Air flowing past the sensor tends to cool the sensor, thus driving down its resistance. The amplifier responds by immediately delivering more power to the circuit to maintain voltage equilibrium. Delivered power is converted into electrical signal to display.



➢ **Measurement of Wind-Temperature**

The coefficient of resistance of the temperature sensor has a direct proportional relationship with the temperature. We can measure the wind temperature by adjusting the sensor's temperature to the wind-temperature, and measuring its coefficient of resistance.

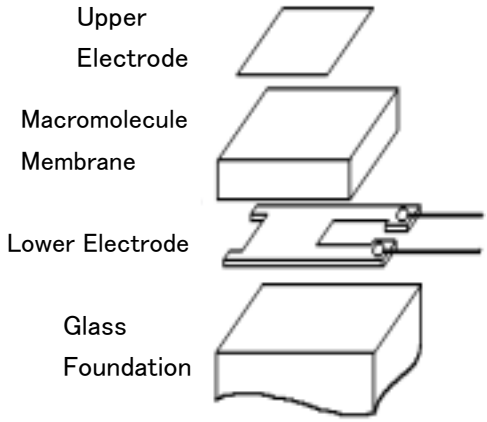
➢ **Measurement of Humidity (Hygrometer)**

The sensor is a pair of condenser and its electro-capacity is depended upon the amount of water contained in its hydrophilic macromolecule (humidity sensitive) membrane.

The components of the sensors are glass foundation; lower electrode; macromolecule membrane and upper electrode.

The upper electrode will capture the change in permittivity caused by condensation or evaporation of water vapors to the macromolecule membrane. (Electrostatic Capacity Type)

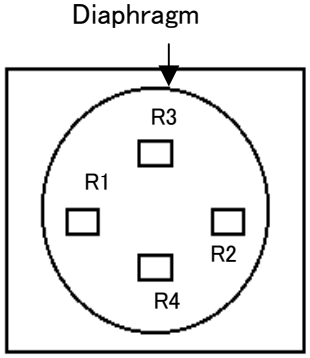
There is another type of hygrometer that uses a resistor instead of a condenser. It is usually said that the Electrostatic Capacity is good for low humidity measurement and the resistor is good for high humidity measurement.



➢ **Theory of detecting static pressure**.

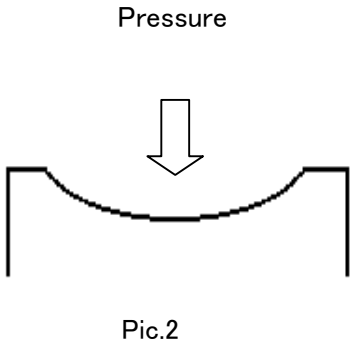
To measure static pressure, we use a diffusion-type semiconductor pressure sensor. The diffusion-type semiconductor pressure sensor is incorporated under the principle that the resonant frequency of a piezo-crystal decreases linearly with the pressure applied. On a thin diaphragm of silicon, there are four diffusion resistors (sensor chips) placed in a fixed distant apart. (Pic.1)

When the pressure is applied from above, the diaphragm will deflect downward. When it is deflected, the sensors near center (R3 and R4) will have compressing stress and the sensors near perimeter (R1 and R2) will have tensile stress instead. (Pic.2) The diffusion coefficient of diffusion resistor change according to these two stresses.

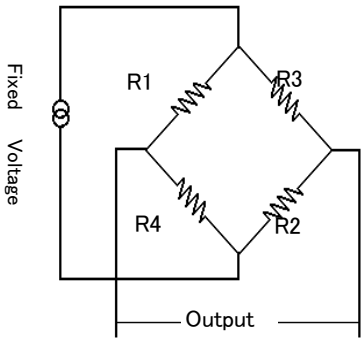


R1～R4：Diffusion Resistant

Pic.1 Pressure Sensor



Pic.2



Pic.3 Detecting Circuit

If we create a bridge among these diffusion resistors (Pic.3), it will be possible to detect voltage that is proportional to the amount of pressure applied. These sensors can be affected by the temperature, and therefore, temperature compensation circuit must be added.

11. 2 What is Discomfort Index (DI) and Dew Point Temperature (DT)?

＊＊What is DI and DT?＊＊

● Discomfort Index (DI)

Discomfort Index is indexes to show how discomfort it is in the summer time. CLIMOMASTER use the formula, shown below, which is used by the Meteorological Agency.

$$DI = 0.81T + 0.01H(0.99T - 14.3) + 46.3$$

Where

T:Temperature (℃) *H:Relative Humidity* (%*RH*)

DI Scale

	Comfortable	Little Uncomfortable	Uncomfortable	Very Uncomfortable	Cannot Endure
68	70	75	80	86	

● Dew Point Temperature (DT)

There are many formulas to calculate Dew Point Temperature are suggested, but for A531, we have adopted the most general "Antnione" formula, which is to calculate saturated vapor pressure.

$$E = \exp[18.6686 - 4030.183/(235 + T)] \times 133.322$$

$$e = \frac{H \times E}{100}$$

Where

H : *RelativeHumidity* (%*RH*) T : *Temperature* (℃)

E : *SaturatedVaporPressure* (*Pa*) e : *VaporPressure* (*Pa*)

$$DT = 4030.183/[23.5614 - \ln(e)] - 235$$

12. About Compensation

his instrument has been calibrated at normal temperature and pressure. Therefore, if you are going to measure velocity at a different temperature and pressure, the indicating value will be affected.

12. 1 Influence of Measuring Temperature

This instrument has been calibrated at normal temperature. Because of theoretical fundamentals of hot-wire anemometer, it can easily be effected by the ambient temperature. To prevent such influence, temperature compensation is needed. The temperature compensation sensor senses the ambient, or surrounding air temperature and forces the velocity sensor to stay at a constant overheat above the ambient. By adopting temperature compensation sensors, you can measure air velocity accurately within the range of 5～60℃ (41～140°F)

12. 2 Influence of Pressure at Measuring Point

This instrument has been calibrated at 1013hPa. Change in pressure does affect the amount of heat diffusion. Therefore, the pressure compensation, using the following equation, is needed.

$$Um = \frac{1013}{Pm} \times Uc$$

Where: Um: Actual Velocity[m/s] Uc: Indicating Value Pm: Pressure at the Measuring Point[hPa]

12. 3 Measuring Gas Components

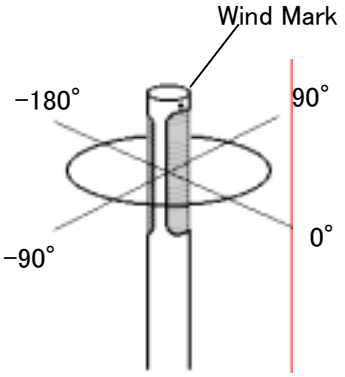
This instrument has been calibrated using air. The CLIMOMASTER indicates air velocity based on the heat capacity, i.e. the heat diffusion quantity to deprive a device of in fluid. If the fluid, which is dealt with for the measurement, is different from the fluid when the instrument is calibrated, the diffusion quantity changes and the indicating air velocity, too, will be affected.

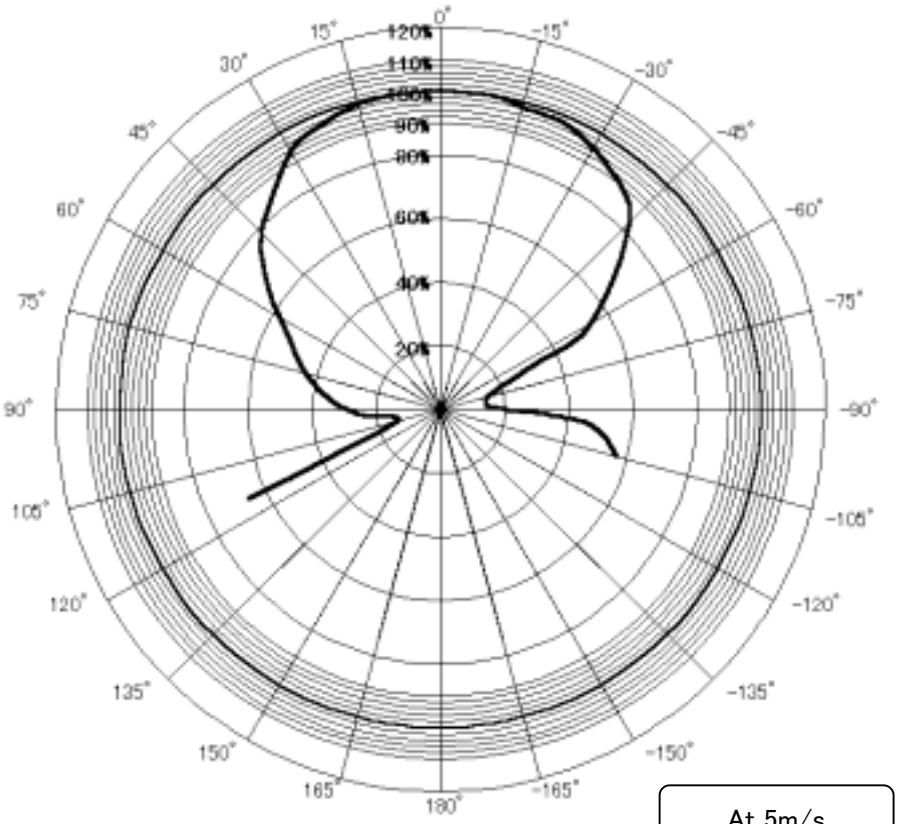
In order to compensate, you first need to find the heat diffusion quantity of air to the indicating value in mixture measurement. By substituting this heat diffusion quantity to the value in the heat diffusion-velocity relation formula, you can find the actual velocity value of the mixture.

13. Probe Directivity (Air Velocity)

13. 1 MODEL A531/A541

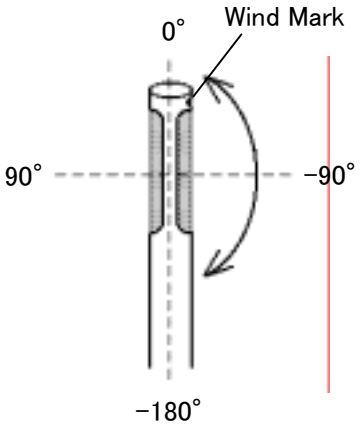
Horizontal

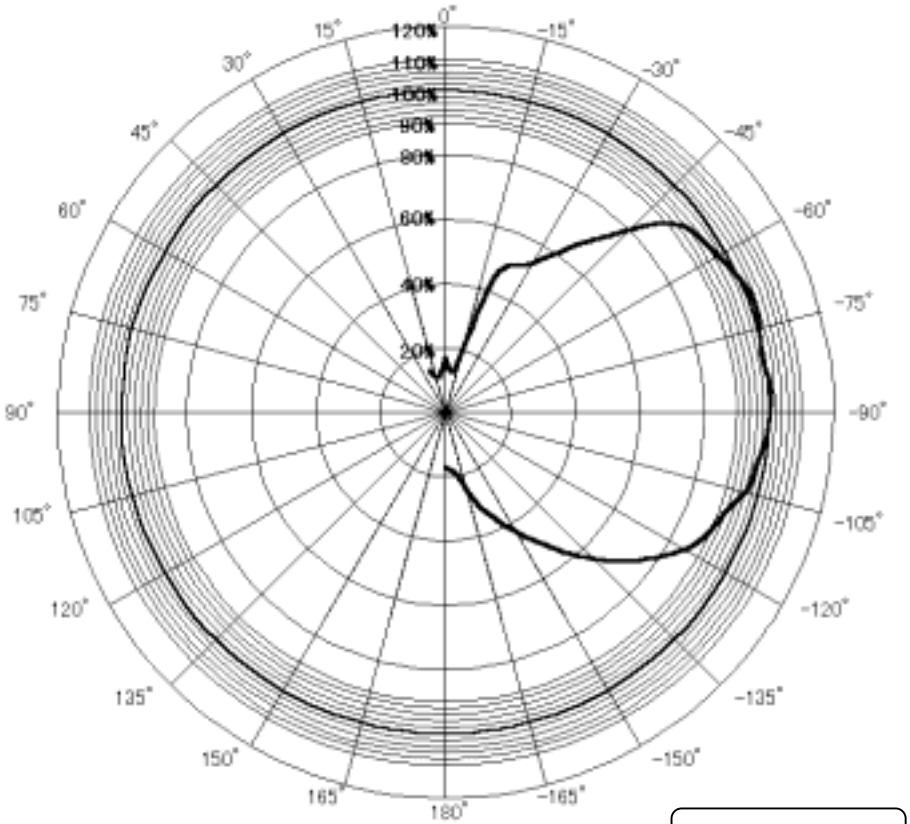




At 5m/s

Vertical

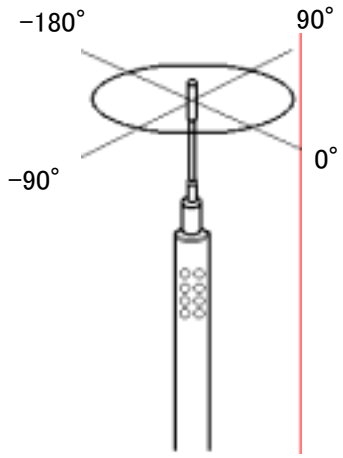


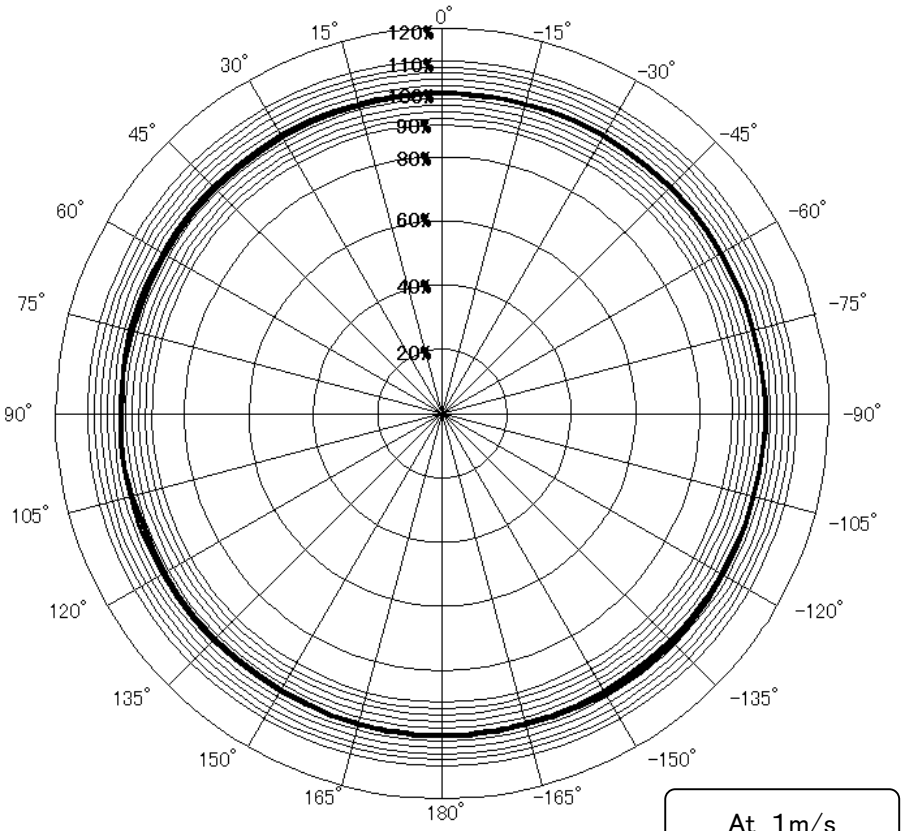


At 5m/s

13. 2 MODEL A542

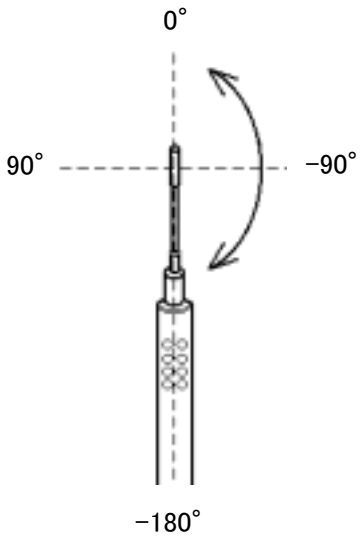
Horizontal

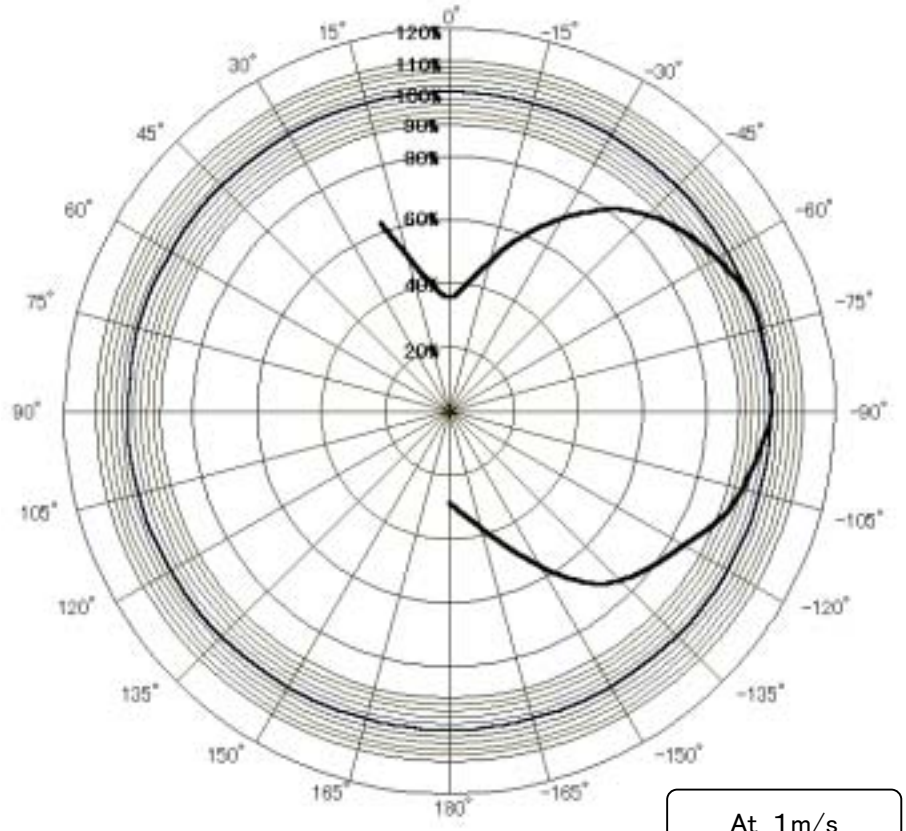




At 1m/s

Vertical

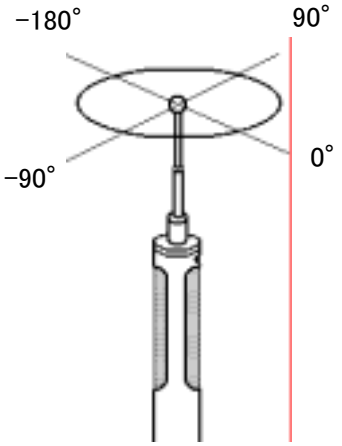


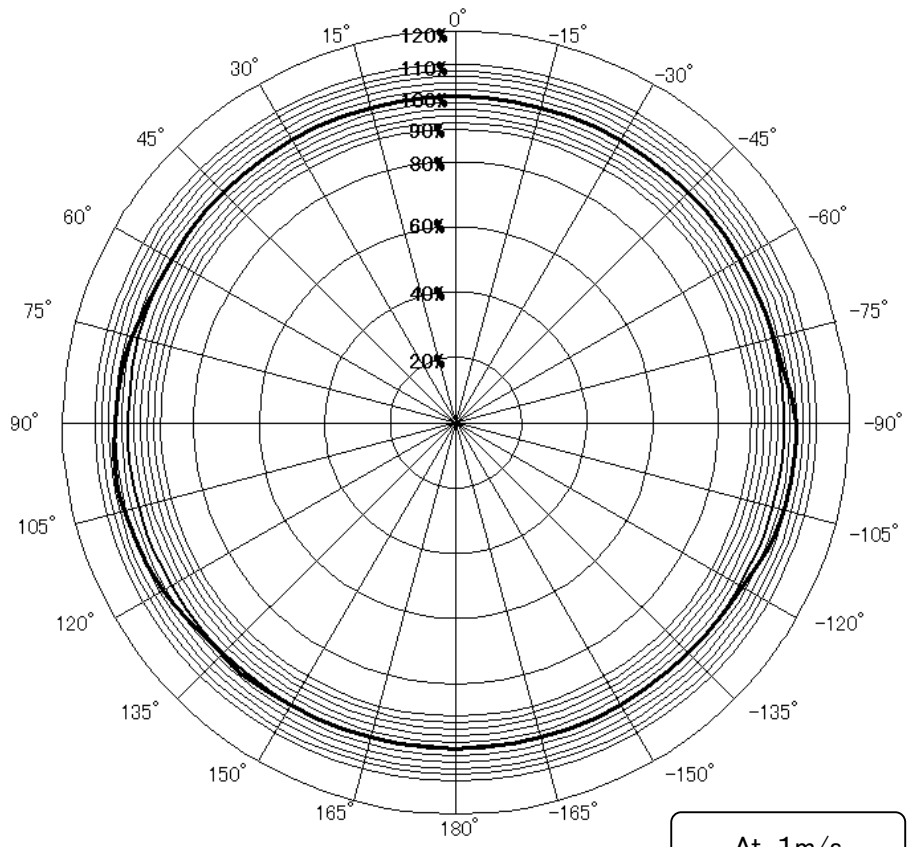


At 1m/s

13. 3 MODELA533

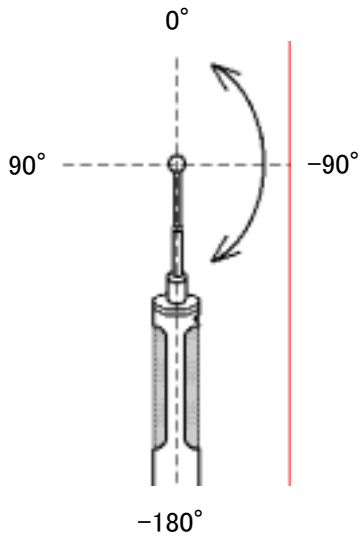
Horizontal

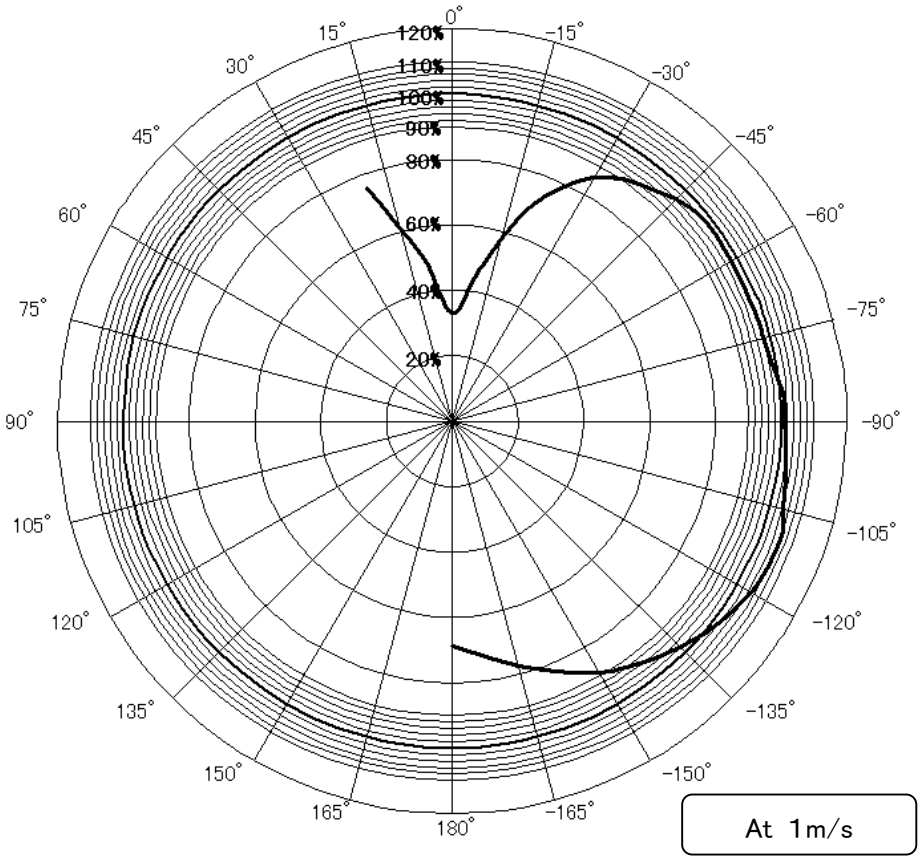




At 1m/s

Vertical

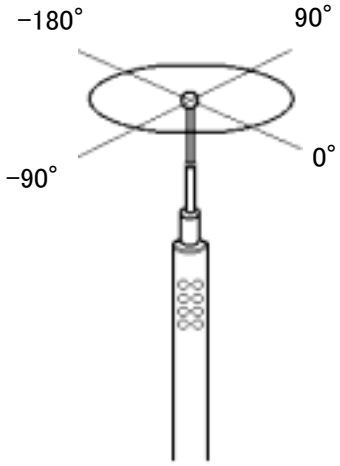


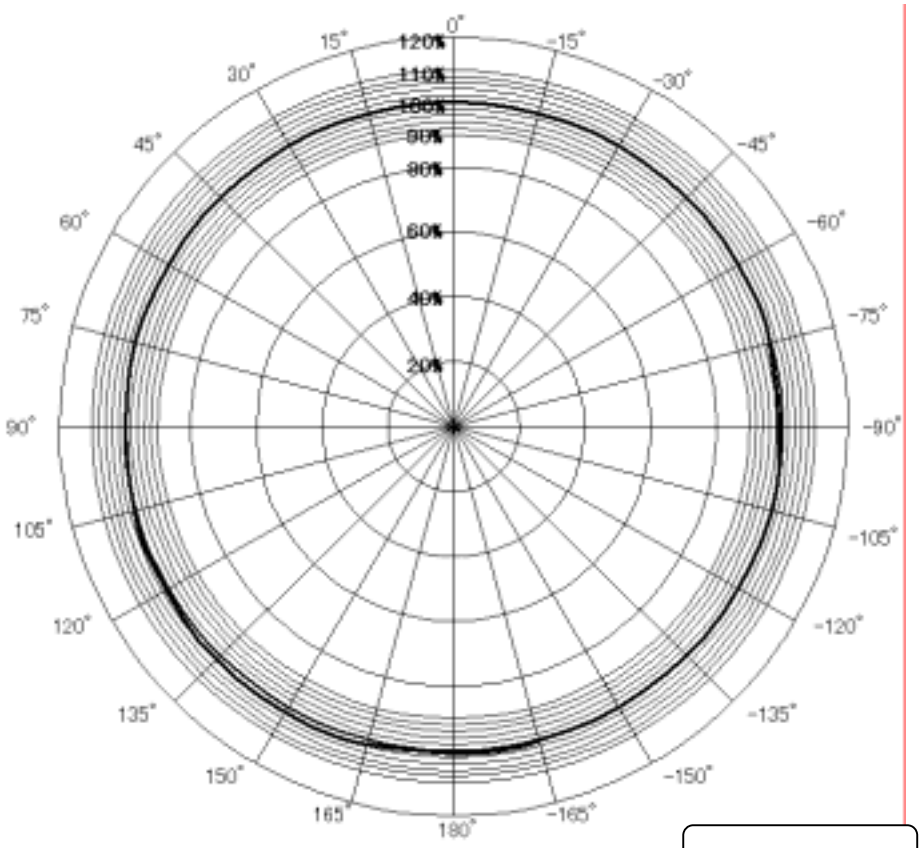


At 1m/s

13. 4 MODELA543

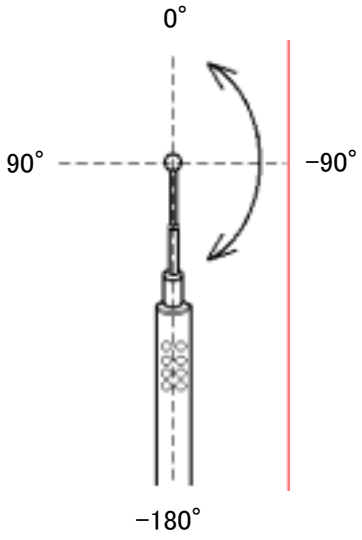
Horizontal

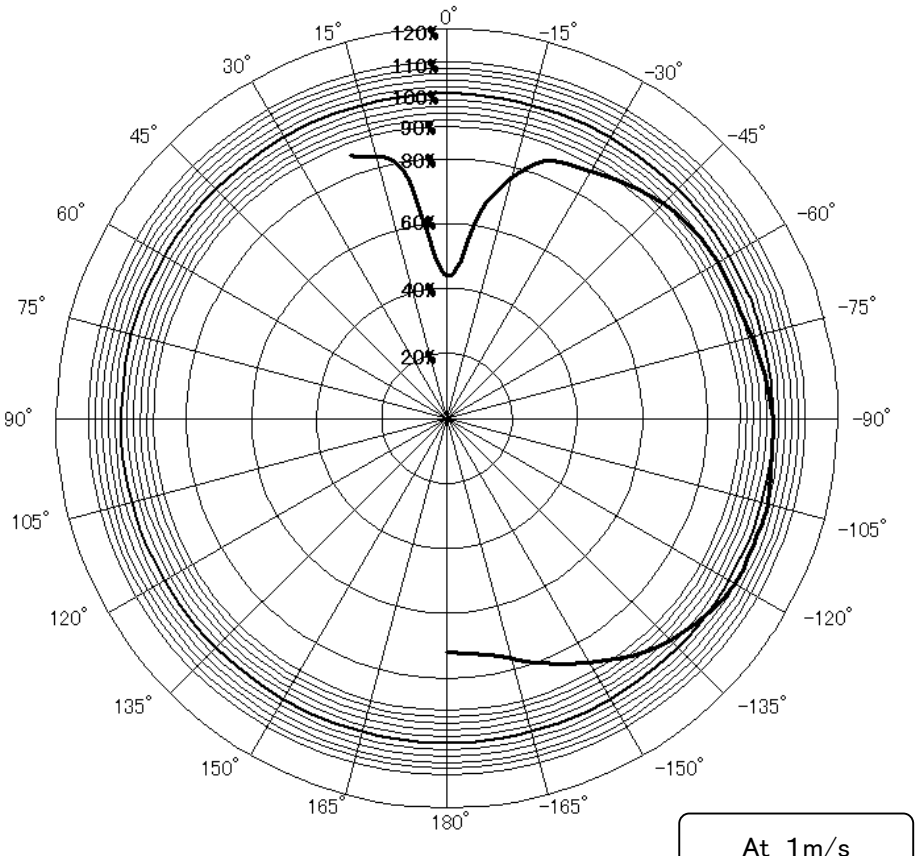




At 1m/s

Vertical





At 1m/s

14. Troubleshooting

Problem	Possible Cause(s) / Solution(s)	Refer To (Page No.)
CLIMOMASTER will not turn ON	The battery is defective. →Turn OFF the power and replace the batteries.	7
Nothing appears on the display	Contrast is not set properly. →Adjust the contrast volume switch.	41
"  " flashes.	The batteries are low. →Turn OFF the power and replace the batteries.	7, 9
"NO PROBE" is displayed.	Probe is not connected. →Turn OFF the power and connect Probe.	8
"**.*" is displayed for measured value.	CLIMOMASTER will show "**.*" for the over-the-range measurement. It must be used within the range to take the measurement.	43
" - - - - " is displayed for measured value.	Probe/Probe Cable is not connected property. →Check the connection.	8
	Probe/Probe Cable may be damaged. →Contact your local Kanomax Office or service center.	
CLIMOMASTER is not displaying the right speed.	Probe is not facing the wind. →Make sure the Wind Mark is facing the wind.	10
Higher temperature is displayed.	Theoretically, CLIMOMASTER cannot measure temperature in no-wind environment. →Measure the temperature in environment with more than 0.1m/s of wind.	10
"----" is displayed for Flow Rate.	Dust shape/size is not stored. →Type in the duct shape/size.	12
Cannot printout.	Printer is not connected properly. →Check the connection. Re-connect if necessary.	27
	The Baud Rate is not set properly. →Check both, CLIMOMASTER and printer, settings.	27
Cannot printout the display.	Display is not frozen. →①Press START HOLD to hold the display. ②Press MODE to print out.	27
Cannot cancel the print out.	You cannot cancel the print out.	27
Cannot load the data.	PC is not connected properly. →Check the connection. Re-connect if necessary.	32
	The Baud Rate is not set properly. →Check both, CLIMOMASTER and PC, settings.	32
No analog output.	Wrong polarity. →Check the polarity.	35
	Measurement is in "Hold". →Press START HOLD to release.	15

15. Warranty and After Service

Kanomax Limited Warranty

The limited warranty set below is given by KANOMAX JAPAN, Inc. (hereafter referred to as "KJI") with respect to the KANOMAX brand anemometer, its attachment parts including Probe and other accessories (hereafter referred to as "PRODUCT") that you have purchased. PRODUCT you have purchased shall be the only one that the limited warranty stated herein applies to.

Your PRODUCT, when delivered to you in new condition in its original container, is warranted against defects in materials or workmanship as follows: for a period of one (1) year from the date of original purchase, defective parts or a defective PRODUCT returned to KJI, as applicable, and proven to be defective upon inspection, will be exchanged for a new or comparable rebuilt parts, or a refurbished PRODUCT as determined by KJI. Warranty for such replacements shall not extend the original warranty period of the defective PRODUCT.

This limited warranty covers all defects encountered in normal use of the PRODUCT, and does not apply to the following cases:

(1) Use of parts or supplies other than the PRODUCT sold by KJI, which cause damage to the PRODUCT or cause abnormally frequent service calls or service problems.
(2) If any PRODUCT has its serial number or date altered or removed.
(3) Loss of damage to the PRODUCT due to abuse, mishandling, improper packaging by the owner, alteration, accident, electrical current fluctuations, failure to follow operating, maintenance or environmental instructions prescribed in the PRODUCT's instruction manual provided by KJI, or service performed by other than KJI.

NO IMPLIED WARRANTY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, APPLIES TO THE PRODUCT AFTER THE APPLICABLE PERIOD OF THE EXPRESS LIMITED WARRANTY STATED ABOVE, AND NO OTHER EXPRESS WARRANTY OR GUARANTY, EXCEPT AS MENTIONED ABOVE, GIVEN BY ANY PERSON OR ENTITY WITH RESPECT TO THE PRODUCT SHALL BIND KJI. KJI SHALL NOT BE LIABLE FOR LOSS OF STORAGE CHARGES, LOSS OR CORRUPTION OF DATA, OR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY THE USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT, REGARDLESS OF THE LEGAL THEORY ON WHICH THE CLAIM IS BASED, AND EVEN IF KJI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL RECOVERY OF ANY KIND AGAINST KJI BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE PRODUCT SOLD BY KJI AND CAUSING THE ALLEGED DAMAGE. WITHOUT LIMITING THE FOREGOING, THE OWNER ASSUMES ALL RISK AND LIABILITY FOR LOSS, DAMAGE OF, OR INJURY TO THE OWNER AND THE OWNER'S PROPERTY AND TO OTHERS AND THEIR PROPERTY ARISING OUT OF USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT NOT CAUSED DIRECTLY BY THE NEGLIGENCE OF KJI. THIS LIMITED WARRANTY SHALL NOT EXTEND TO ANYONE OTHER THAN THE ORIGINAL PURCHASER OF THE PRODUCT, OR THE PERSON FOR WHOM IT WAS PURCHASED AS A GIFT, AND STATES THE PURCHASER'S EXCLUSIVE REMEDY.

After Service

Whenever the PRODUCT is malfunctioning, please check with “Troubleshooting” to find possible cause first.

Repair parts are retained for a minimum period of five (5) years after production cessation of the PRODUCT. This storage period of repair parts is considered as the period during which KJI can provide repair service.

For more information, please contact your local distributor, or call us at KJI’s service desk from 9:00 a.m. to 5:00 p.m. JST on weekdays excluding holidays. When you make a call, please have the following information of your PRODUCT at hand:

(1) PRODUCT name;
(2) Model number;
(3) Serial number;
(4) Probe number;
(5) Description of Symptom, and;
(6) Date of purchase