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CODE 080000-5

Digital Dust Indicator LD-5D

Operation Manual

Thank you for purchasing this product.

Be sure to read this operation manual before use.

Handle this product in accordance with the explanations described in this manual.

After reading this operation manual, keep it with the warranty in a safe place.

If you find any unclear points in this manual, please contact your Sibata distributor.

SIBATA SCIENTIFIC TECHNOLOGY LTD.

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1 Safety Precautions

The precautionary information in this operation manual is provided to ensure the safe use of the product and to prevent property damage and injury to you and other people.

All of the precautionary information is important for ensuring safety. Therefore, be sure to read and understand the information thoroughly before using the product and observe it during use.

●Users (Important)



This product should only be operated by trained and experienced operators that understand the specialized technology and dangers involved. Untrained or currently being trained operators should only operate the product under close supervision by a person that is already trained or has sufficient specialized experience.

This operation manual is written assuming the product will be operated by a person that understands the risks of operating the product.

●Graphical Symbols

The degree of danger involved in using the product without observing the indicated precautionary information is indicated by one of two labels: WARNING or CAUTION. Always observe the precautionary information indicated with these labels, which is important for ensuring safety.

Labels Indicating Degrees of Damage or Injury

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.



- The **semiconductor laser** used in this instrument is **classified as a Class 3B laser**, based on **laser safety regulations** (IEC 60825-1 and JIS C 6802). As such, it is dangerous to look directly at the laser light. In addition, to avoid skin damage, do not point the laser directly at your body. Accordingly, never disassemble or modify the detector.
- This product is a device for high concentration environments, but is not waterproof or explosionproof. Do not use near highly combustible or inflammable material, and do not suck gas into the product. It may cause explosions and fires. Do not suck briny air, corrosive gases, and chemicals into the product. It may cause malfunctions.
- Fires are strictly prohibited. Do not throw this product into fire. It may cause explosions and fires.
- This product is a dust meter for high concentration environments (Under 100 mg/m³). Do not use this product for any other uses than what is written in this operation manual. Using this product in any other way may cause malfunctions or injury to the human body.

WARNING

- Make sure the product does not come in direct contact with water. It may cause electrocution or fires.
- Do not apply strong impact to the product or drop it. It may cause malfunction of the product or accidents.
- Do not connect to the connector by wires or other metals, or any other methods than what has been indicated in this operation manual. It may cause fires or damage to the devices.
- Never disassemble or modify this product, as doing so will void the warranty with Sibata. Doing so may also result in unforeseen faults and accidents.
- If an abnormality occurs during operation of the product, stop the product immediately, and determine the cause of the abnormality. If it is determined that this product is the cause of the abnormality, turn the power off, and unplug the power cord from the outlet or take the batteries out, and contact the distributor where the product was purchased. Never operate the product if it is not functioning normally. Also, never allow anyone other than a qualified service engineer to disassemble or modify the product. Doing so could result in an accident or malfunction.
- If using an AC power supply, please use the special AC power supply suitable in your area. Do not branch the wires. This may cause electrocution or fires. If a voltage other than what has been specified is to be used, please contact the distributor where the product was purchased.
- Do not use the product if the power cord is damaged or the outlet is loose. Using damaged power cords or outlets may cause fires or electrocution.
- Do not touch the power cord or outlets with wet hands. It may cause electrocution.

CAUTION

- The liquid crystal display of this device is weak to excessive force and pressure. Please do not apply pressure or force to the liquid crystal display.
- Please be aware that in the unlikely event of a product failure, Sibata bears no responsibility to compensate for data not acquired or recorded, and is not responsible for loss of data or for other direct or indirect damages incurred from such loss. Be sure to back up data on a regular basis in case of an accident or failure.
- Rechargeable battery is installed in this product to back up for the logging data and the clock. Battery is always charged when the power is on. It is fully charged about 48 hours after complete discharge and can back up the data and clock for about 1 month. As battery remaining capacity is not shown, we recommend to charge the battery for back up the data before or after each measurement. If the product is powered for 8 hours, the data can be stored in memory for 5 days. Recommendation of replacement of rechargeable battery is once every two years.

CAUTION

- This product is a measuring device for dust. Regular maintenance may not be enough to maintain sensitivity when measuring particles that contain water such as mist. When measuring such particles, request regular maintenance including an overhaul, depending on frequency of use. Contact the distributor where you purchased the product.
- This product has taken some provisions to dustproof and waterproof, so that it may be used in high concentration environments, but can't completely guarantee these provisions. Take note of this while using the product. Please request regular maintenance for the product including an overhaul, depending on the frequency of usage.
- Install this product on a level and stable surface. If it is not placed on a level and stable surface, it may cause abnormal functions and malfunction of the product.
- Do not place or store this product in automobiles parked in the flaming sun, in direct sunlight, in front of heaters, or near fires. It may cause operational abnormalities or malfunctions.
- Do not operate this product when it is covered with cloth, bedding, or wrapped in boxes. The enclosed heat may cause fires and damage.
- Do not place heavy objects and the top of this product. It may deform the main unit of the product or cause accidents and malfunctions.
- Do not operate this product with the air sampling port off. Do not put objects such as nails in the opening when the air sampling port has been taken off. It may cause malfunctions. If an object does fall into the opening, turn the power switch off immediately, unplug the power plug and contact the distributor where you purchased the product.
- Do not bend, stretch, or twist the cord. Do not connect it to a different cord. Always unplug the power cord and output signal line from the outlet. Pulling on the power cord may cause the cord to become damaged which may cause malfunctions, electrocution and fires.
- Do not place any heavy objects on the power cord or step on it. It may cause electrocution or fires.
- Do not turn the power switch off during measurement or communication. It may cause malfunction.
- Unplug the power cord from the outlet when cleaning the product. If it is not unplugged, it may cause fires or malfunctions.
- Do not clean the product in any other methods than what has been indicated in this operation manual. If the product becomes dirty, wipe away the dirt with a soft cloth (soaked in detergent if there is significant dirt). Do not wash the main unit by putting it directly in water. It may cause electrocution, fires or malfunction.
- When storing this product, close the air sampling port, and make sure that dust does not get into the interior of the detector. If large amounts of dust get into the interior of the detector, it may not measure normally or cause malfunctions.
- When not using this product for a long time, store in as cool and dry a location as possible out of the direct sunlight.
- Minute amounts of electricity are consumed even if the power switch is turned off. If the product is not going to be used, unplug the power cord or take the batteries out. Dry cell batteries especially may discharge if the product is stored without taking them out. After using the product, be sure to remove the batteries from the battery case. Leakage of the battery as it deteriorates may cause injury to the human body or malfunctions to the product.

2 Overview

The LD-5D is a light scattering method relative concentration meter that uses a semiconductor laser light as a light source to measure dust concentrations in high concentration environments (Below 100 mg/m³).

2.1 Features

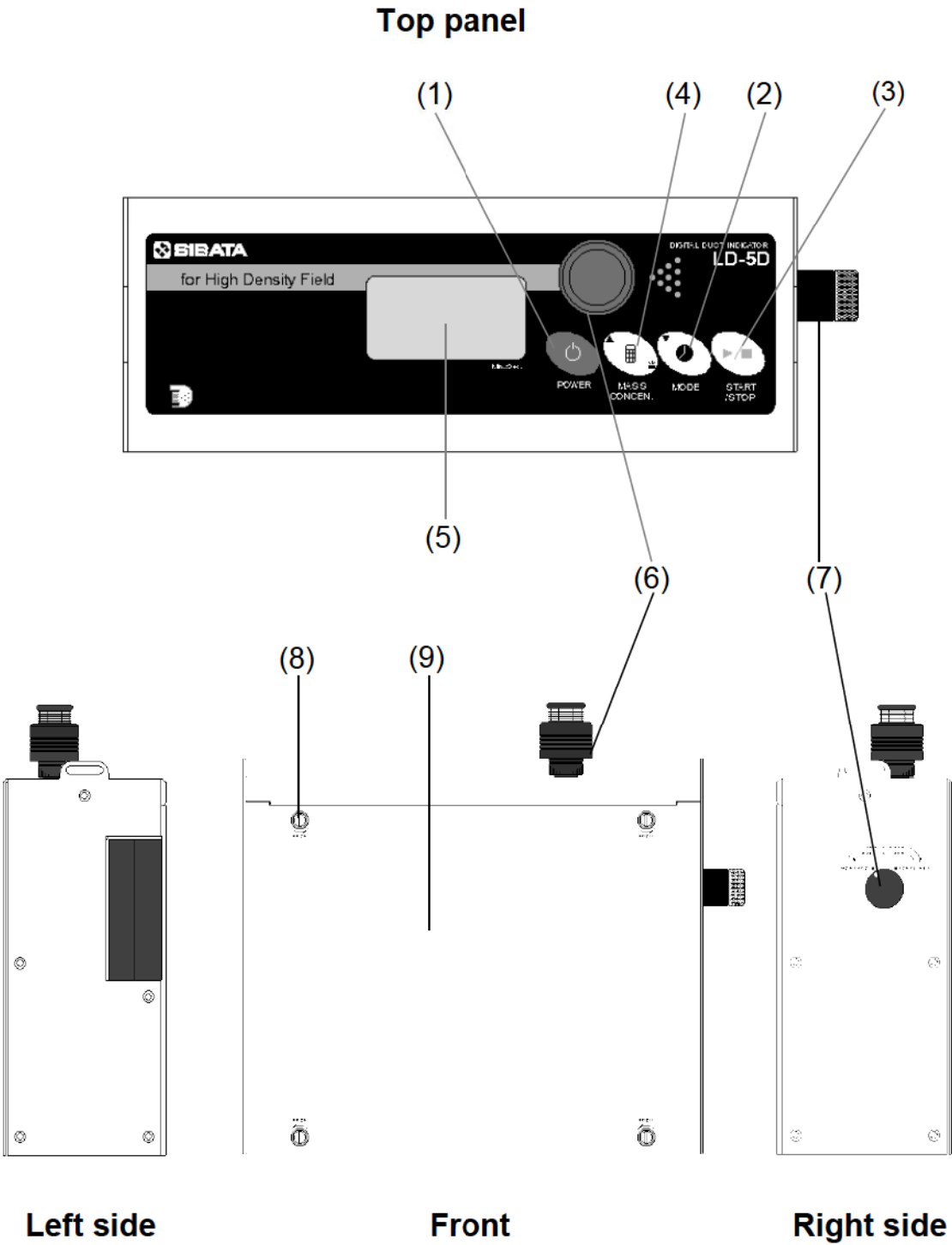
- The LD-5D can easily convert mass concentration of the measured value and display it by pre-setting a conversion factor for mass concentration.
- Equipped with a recording function (logging function) of the measured value.
 - Communication cable with software S-USB is required to retrieve data.
- The calibrated value is stored even after turning the power supply off. An automatic correction of the measured value of aerosol will be performed by using data of calibrated value.
- Provides 3 types of standard data output: USB/RS-232C interface output, voltage output (0-1V) and no-voltage pulse output (open collector).

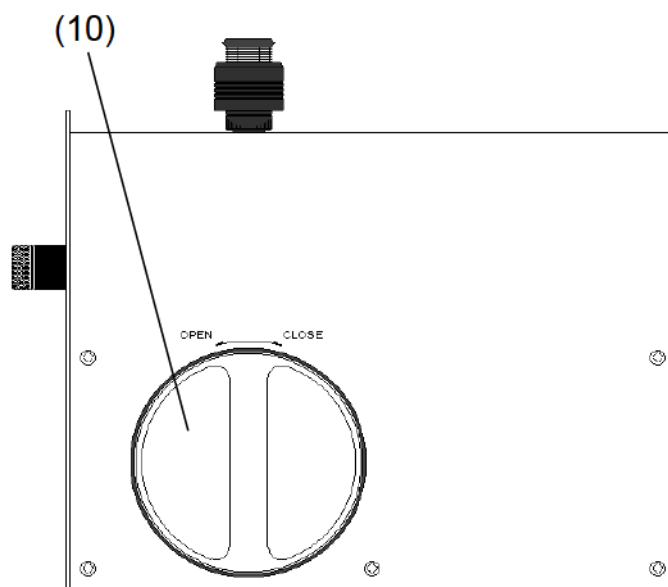
2.2 Operating Principle

- This product uses the fact that the amount of scattered light is in proportion to mass concentration when the physical natures of dust particles in the same condition are exposed to light. Therefore mass concentrations of dust particles floating in the air are measured by the strength of scattered light.
- The sheath air mechanism is designed for the sampling air to pass through the interior pipes and the clean air through the exterior pipes so that clean air surrounds the sampling air.

3 Construction

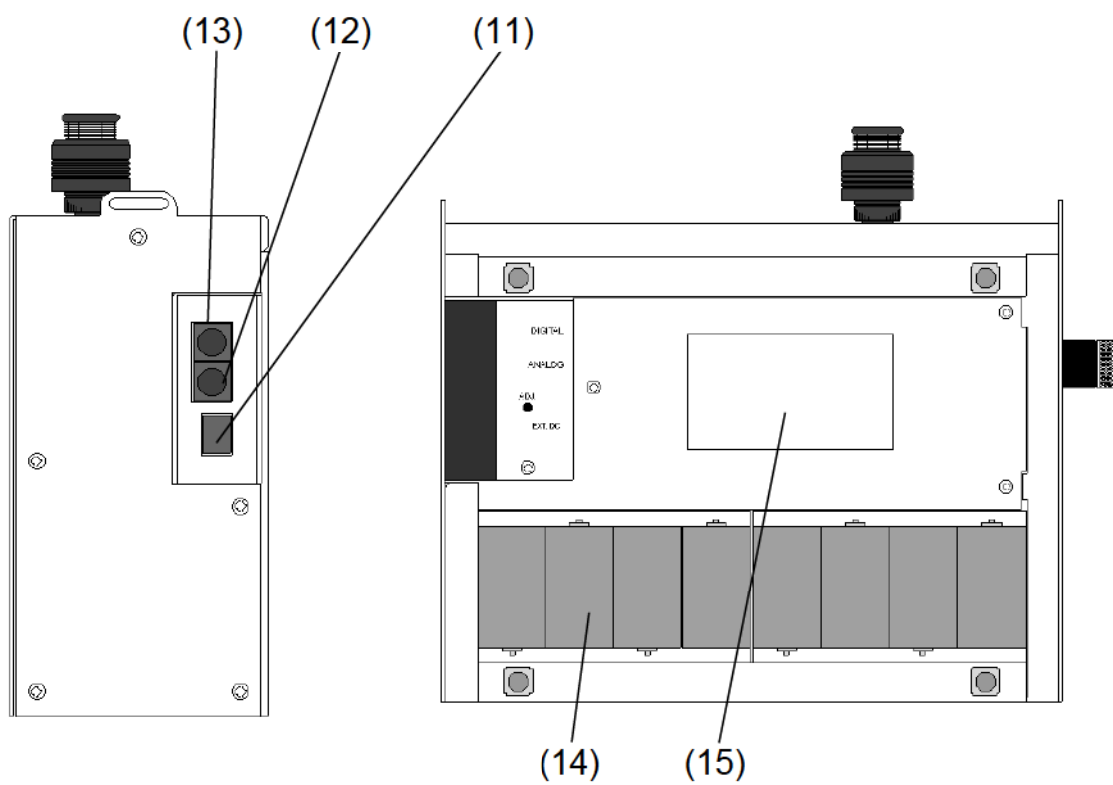
3.1 Description of Parts





Side panel

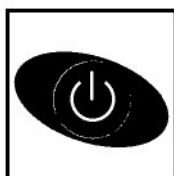
With the front panel open



Left side

Front

(1) Power switch

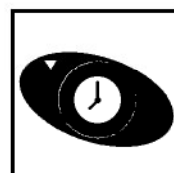


This switch is used to turn the power on and off.

When this switch is pressed once, the LD-5D will turn on, a fan will rotate and the LCD will display the initial screen.

When the switch is pressed again, the LD-5D turns off.

(2) Time setting switch (▼)

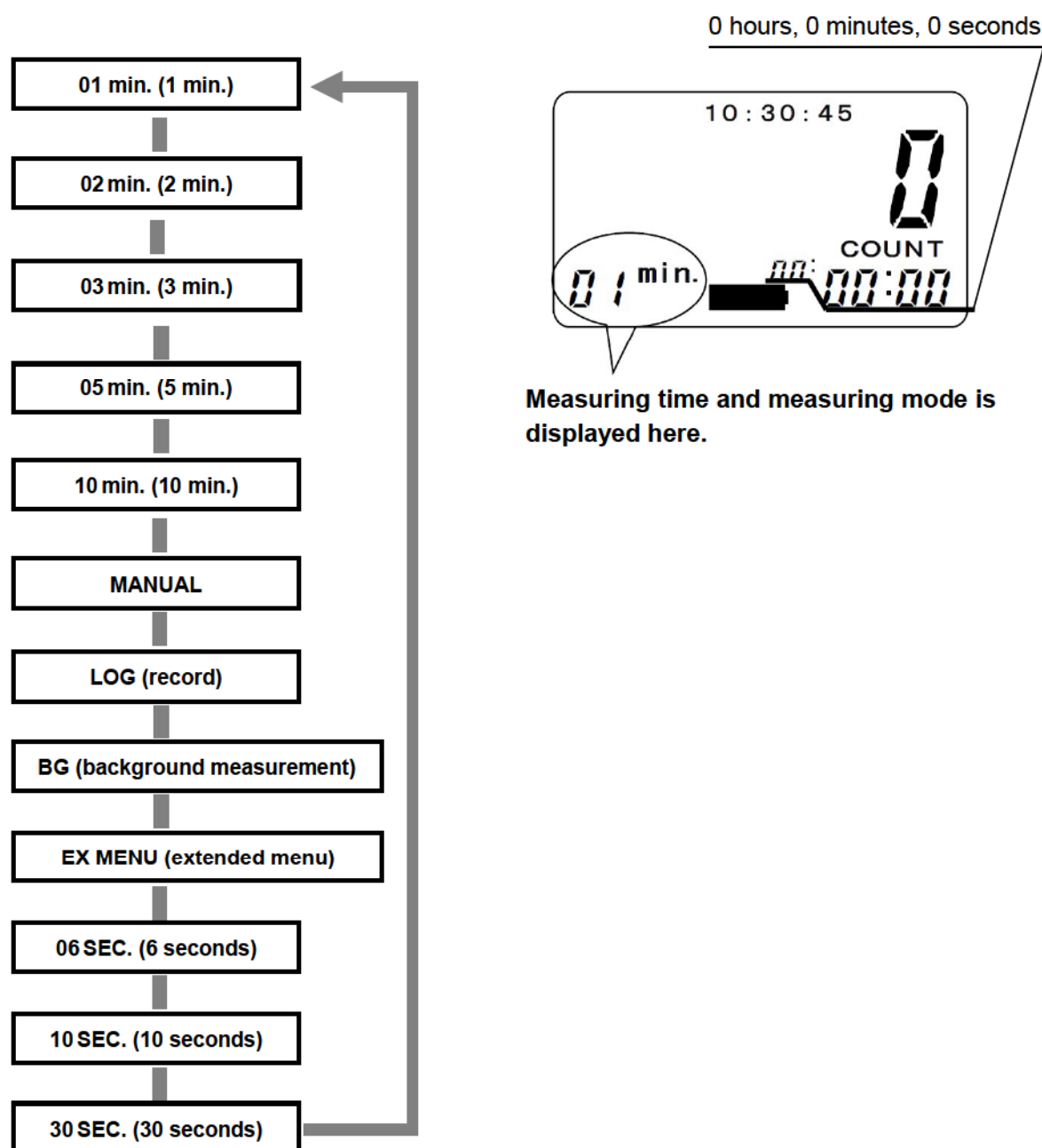


This switch is used to set measuring time and to change measuring modes.

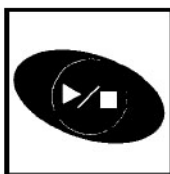
Initial value of the measuring time after turning the LD-5D on is 01min.

Thereafter, every time the switch is pressed, it will change as seen below.

Use the up and down cursor to increase or decrease the numerical value.



(3) Start/Stop switch (▶/■)



This switch is used for starting and stopping the measurement and selection of an item in the measuring mode.

When this switch is pressed once, the measurement will start.

When this switch is pressed again, the measurement will stop. In modes this switch functions as a selecting switch and the operator can select the required item by pressing this switch.

(4) Mass concentration switch (▲)



When this switch is pressed, the LD-5D converts the measured value to mass concentration value.

When this switch is pressed again, measured value is displayed.

When this switch is pressed during the measurement, a graph is displayed.

When pressed again, normal display (count display) is displayed.

If the backlight function of the liquid crystal display is set up on a timer, pressing this switch will turn the light on.

Use the up and down cursor to increase or decrease the numerical value.

(5) Graphic liquid crystal display

This is a liquid crystal display for measured value and other items as mentioned below.

- **Count value**

Will display the count value during measurement and final count value

- **Measuring time**

Remaining measuring time in the down timer mode and **elapsed time of measurement** in manual timer mode is displayed.

- **Current time**

The current time is indicated at the top of the liquid crystal display.

- **Unit**

[COUNT] when measuring and [mg/m³] when mass concentration is converted will be displayed.

- **K factor**

The K factor currently set is indicated (0.1 - 9.9).

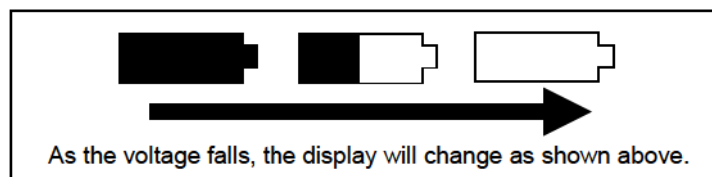
- **Set measuring time/Mode**

Measuring time in down timer mode and current time in other modes are displayed.

- **Battery voltage**

The battery voltage is indicated at the bottom of a liquid crystal display. When the battery voltage has fallen so low that it affects the function of the instrument, **the entire liquid crystal display will flash.**

When the voltage of the battery (power source) is **approximately 8V** the remaining battery display will become zero, and the entire liquid crystal display will start to flash. After this the LD-5D will function only for **approximately 30 minutes with alkaline batteries.**



As the voltage falls, the display will change as shown above.

- **Mass concentration**

Mass concentration will be displayed when the **mass concentration switch** (▲) is pressed after down timer mode measurement.

- **Graph**

The display will switch over and display the graph when the **mass concentration switch** (▲) is pressed during measurement.

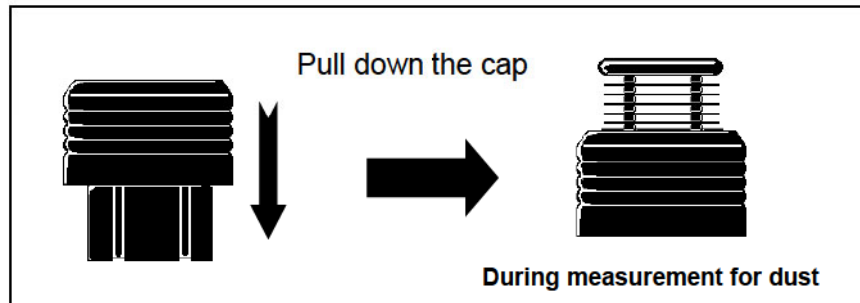
(6) Air sampling port

This is the sampling port for the air to be measured.

This air sampling port is structurally built so that air can be sampled from all directions, and shuts light disturbance out. (sunlight, illuminating lights)

Pull down the cap as shown in the figure below when measuring dust particles.

The side with the socket is where the sheath mechanism has been designed in, be careful not to apply impact to it or scratch it.



(7) Measurement / Sensitivity adjusting knob

This knob is used to set the standard light scattering plate in the detector which is used for sensitivity adjustment.

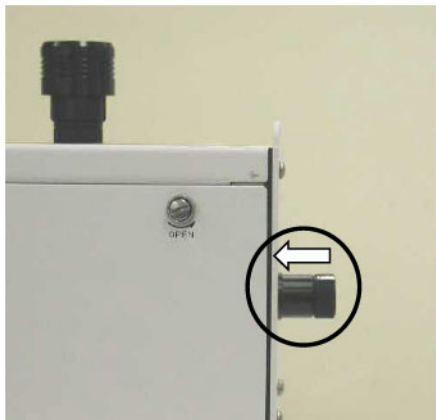
To perform sensitivity adjustment with the standard light scattering plate, turn the knob clockwise as drawn in the figure below, and push the knob into the main unit.

Reverse the procedures above to turn the knob back to its original position after completing the sensitivity adjustment.

- To protect the standard light scattering plate from dust particles, make sure that the cap of the air sampling port is up while adjusting sensitivity.



When inserting the knob, turn from [MEASURE] to [SENSE.ADJ.], before inserting the knob.



Before insertion



After insertion

(8) Battery case cover fixing screw

This is the screw that holds the battery case cover in place.

To remove the cover, turn the screw counterclockwise and start removing the bottom of the cover first.

To attach the cover, start at the **top of the cover** and insert the projection into the panel, adjust, and put the screws in. (The cover will stay in place when the “-” groove is level.)

(9) Battery case cover

This is the cover for the battery case.

(10) Capsule filter

The filter for creating purged air. To remove the filter, turn the cover counter clockwise to take it off, and remove the 4 screws inside. (→ see 8 Precautions for Maintenance, Storage, and Transport)

(11) External power connecting connector

Operation with AC is possible by connecting a special AC adapter.

(12) Analog output connector

This connector is used for retrieval of the pulse output of the DC 0-1V and open collector of the recorder. It is connected with the analog pulse cable (optional).

The 0-1V output and pulse output are outputted during measurement.

(13) Digital input output connector

This is a connector used to connect to a personal computer to process data.

It is compatible with an USB (RS-232C). Connect with the included USB cable.

(14) Battery case

Will operate with 8 pcs of size C batteries. (→ see 4.2.1)

Minute amounts of electricity are consumed even if the power switch is turned OFF. Take the batteries out if the LD-5D is not used.

(15) Inspection report

The scattering plate value is recorded.

3.2 Description of the Modes

Press the **time setting switch** (▼) to switch between measuring time and mode.

(1) Down timer mode

Set up the measuring time and measure in this mode.

Measurement will automatically end when the measuring time that has been set up has passed.

- The **start/stop switch** (▶/■) will start measurement.
- If the **start/stop switch** (▶/■) is pressed during measurement, measurement will stop.

(2) MANUAL mode

In this mode measurement can be manually started and stopped.

- Use the **start/stop switch** (▶/■) to start and stop measurement.

(3) LOG (logging) mode

This is the mode to set up recording of measuring data.

- Use the **time setting switch** (▼) to display [LOG] and every time the **start/stop switch** (▶/■) is pressed, a selection of settings will be displayed.

(4) BG (background) mode

This mode is for performing the 6 second measurement to cancel the background.

- Use the **start/stop switch** (▶/■).

(5) EX_MENU (extended menu)

This is the mode in which multiple setups take place.

- The contents of the item to be setup and selected with the cursor will be displayed.
Press the **start/stop switch** (▶/■) once to change the contents of setup.

- **K FACTOR**

Input the K factor in this mode.

- **AUTO RUN**

Setup the ON/OFF function of MANUAL measurement when turning the power on in this mode.

- **RTCSET**

This displays the DATE SET and TIME SET menu.

Input the current year/month/day/minute/second in this mode.

- **LCD ADJUST**

This displays the LCD CONTRAST and LCD BACKLIGHT menu.

Adjust the contrast in the liquid crystal display and setup ON/OFF of the backlight in this mode.

- **RANGE**

Setup the range of analog output in this mode.

Select from automatic, x1, and x10.

- **I/F**

Setup the interface of the serial output in this mode.

Select from RS-232C and USB.

4 Preparation for Measurement

4.1 Inspection of the LD-5D

- **Filter**

Take a peek at the filter, and if it seems dirty, use a cloth to wipe clean. The filter cover is made of clear acryl, in order to observe the interior. Before taking measurement, confirm that the filter cover is completely closed. (→ For more information on maintenance, see 8 Precautions for Maintenance, Storage, and Transport)

- **Air Sampling Port**

After confirming that the air sampling port is not dirty, insert it all the way in, and close it. Make sure it is inserted straight.

- **USB, RS-232C Connection**

To connect the cable, remove the side panel and connect the connector. The screw can be opened with the jig on the shoulder belt. Screw on and off using this jig. When the groove of the screw is parallel, the side panel is closed. When the groove of the screw is perpendicular, the side panel can be removed.

When connected, close the side panel. There are sponges installed on the side panel, which the cables are held in, and prevent large dust from entering.

- Remove this side panel when inserting the batteries.

4.2 Power ON

4.2.1 When Using Dry Cell Batteries

- (1) Remove the battery case cover.
- (2) Install 8 pcs of size C dry cell batteries into the battery case.
- (3) Place the battery case into the main unit and put the battery case cover back on.
- (4) Turn the measurement/sensitivity adjusting knob (see page 11) to the [MEASURE] position.
- (5) When the **power switch** is pressed, a display will come up on the liquid crystal display.



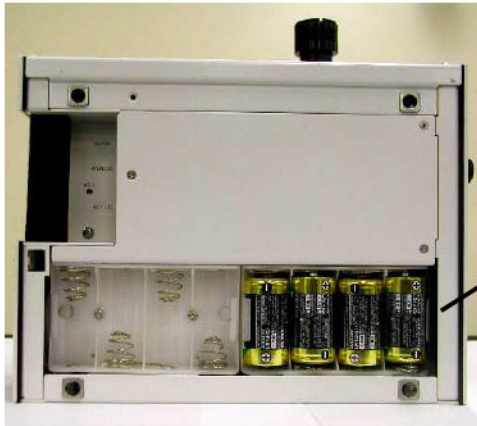
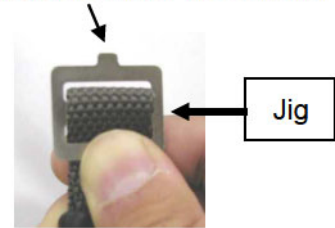
Please use the alkaline dry cell battery to operate the LD-5D.

The manganese battery and the alkaline battery are the 2 types of 1.5V size C dry cell batteries on the market. The manganese battery may be used, but compared to the alkaline battery, operation time will be shorter. The manganese dry cell battery included is for the sole purpose of confirming operation.

< How to Insert the Dry Cell Batteries >



- (1) Turn the battery case cover fixing screws (4 locations) clockwise, and remove the battery case cover.
Use the jig on the shoulder belt for the screws.



- (2) Insert size C alkaline batteries (8 pcs).



The side without the spring is the + (plus).
(Be careful of the plus, minus direction.)



- (3) Use the jig to turn the battery case cover fixing screws (4 locations) counter clockwise to close the battery case cover.

4.2.2 When Using an AC Adapter

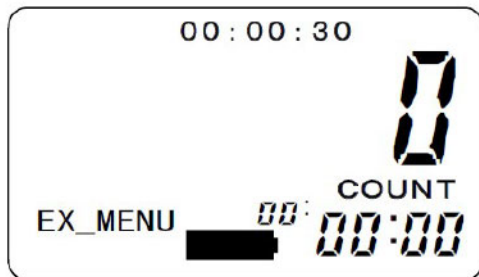
- (1) Connect the AC adapter plug into the connector for external power source on the side panel of the main unit.
 - (2) Plug the AC adapter into a commercial power outlet.
 - (3) When the **power switch** is pressed, a display will come up on the liquid crystal display.
- Please use the special AC adapter suitable in your area. Otherwise, it will damage the LD-5D.

4.3 Setting Up the Current Time

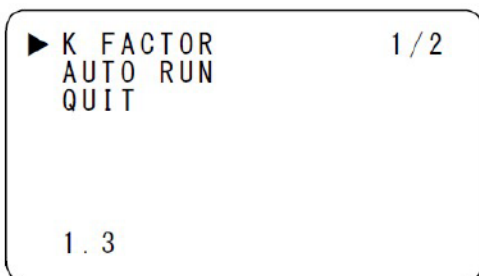
This instrument has a built in clock function. When down timer measurement (measured data is not stored.) is used, it is not necessary to set the time. However, when the logging measurement (measured data is stored.) is used, set the time. If the time is not set, an accurate time can not be recorded.

Once the current time has been set, it will be stored even after the power has been turned off and there will be no need to set the current time again.

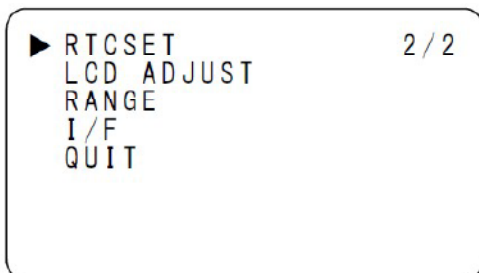
- (1) Press the **time setting switch** (▼) to change the lower left display of the liquid crystal display to time/mode setup [EX_MENU].



- (2) When [EX_MENU] is displayed, press the **start/stop switch** (▶/■) to display 1/2 of the setup menu.



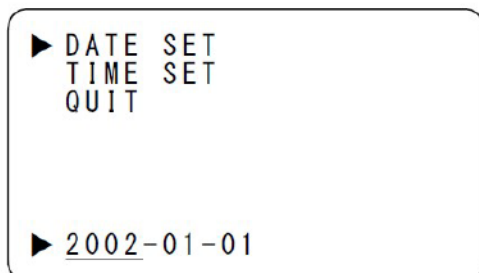
- (3) When the **time setting switch** (▼) is pressed 3 times, 2/2 of the set up menu will be displayed.



- (4) When the **start/stop switch** (▶/■) is pressed, the [RTCSET] menu will be displayed.



- (5) Press the **start/stop switch** (▶/■) to change to [DATE SET].

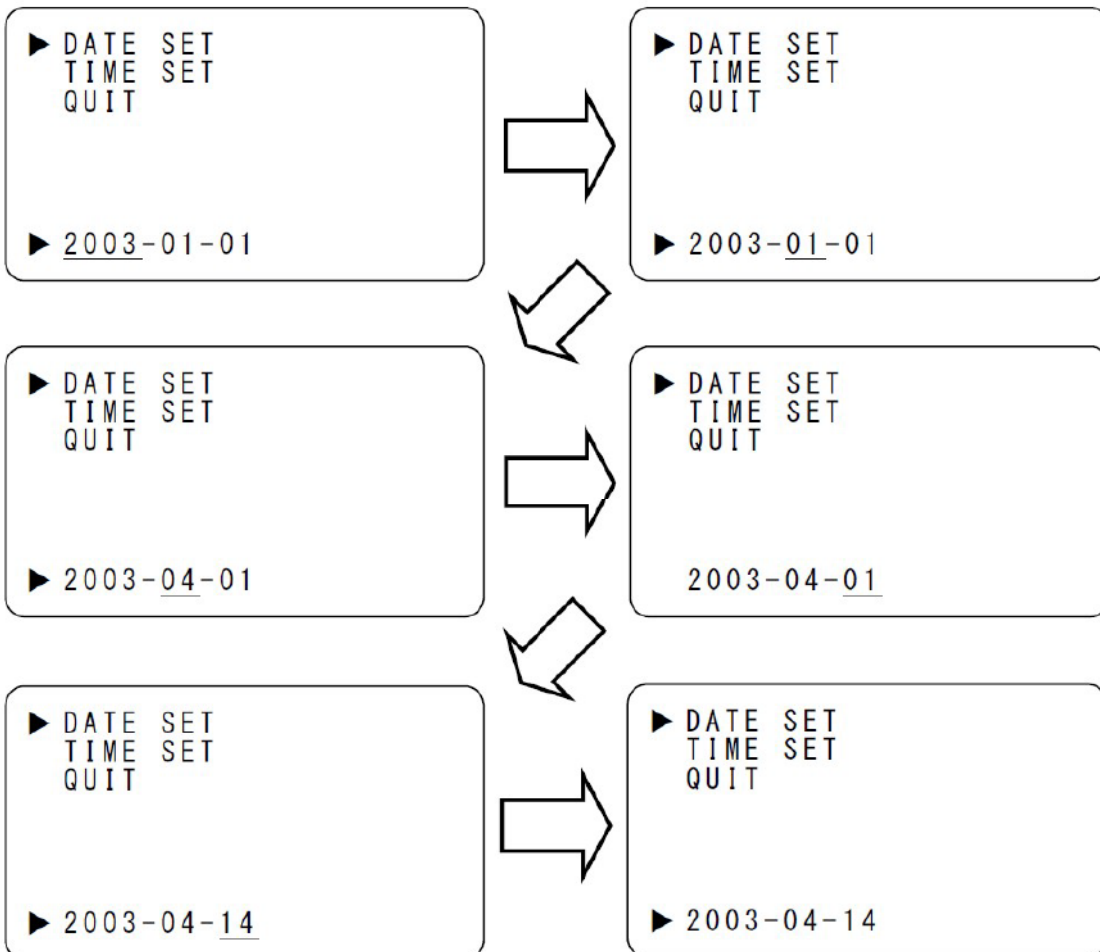


- (6) Use the **mass conversion switch** (▲) and **time setting switch** (▼) to increase or decrease the numerical value being set.

▶ DATE SET
TIME SET
QUIT

▶ 2003-01-01

- (7) Use the **start/stop switch** (▶/■) to confirm your selection (and move to the next item).

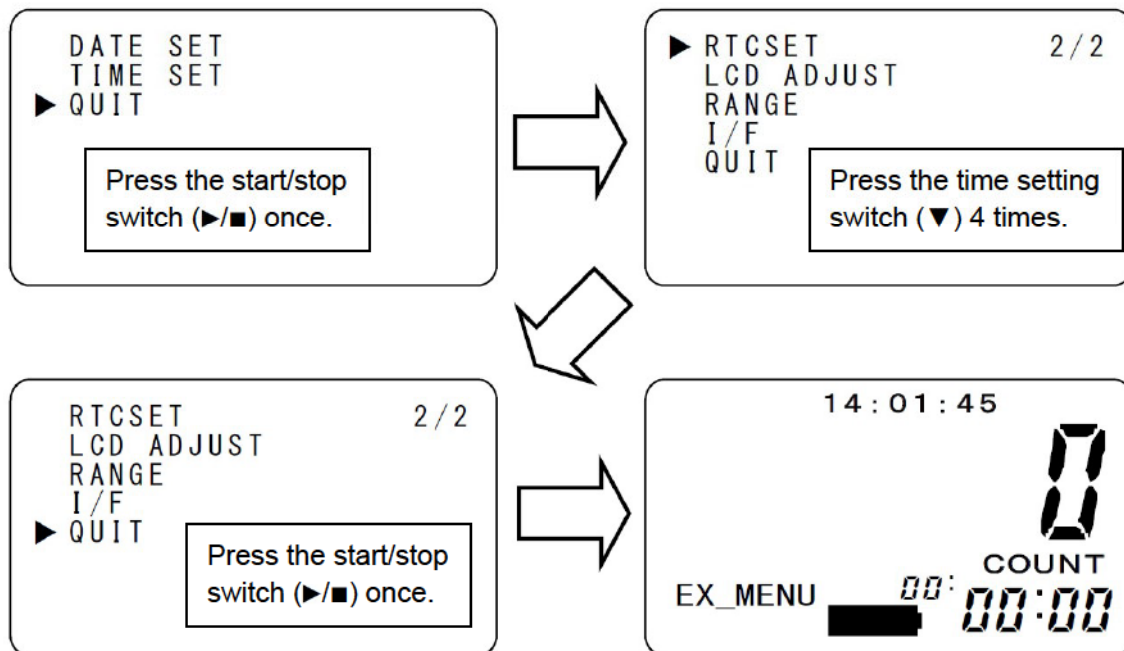


- (8) Press the **time setting switch** (▼) to change to [TIME SET] (Time setting).
Refer to [DATE SET] (date setting) as the procedures for setup are the same.

▶ DATE SET
TIME SET
QUIT

14:00:00

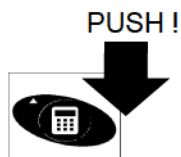
- (9) To end [RTCSET] use the time setting switch (▼) or the mass concentration switch (▲) and move the cursor (▶) in front of [QUIT] and press the start/stop switch (▶/■). Furthermore, press the time setting switch (▼) 4 times and press the start/stop switch (▶/■).



- The built in battery will back up the clock.
This battery will automatically charge itself when the power of the main unit is turned ON.
Approximately 5 days of back up is possible with 8 hours of charging.

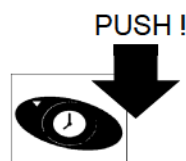
Changing the set values

The set values that are underlined may be changed with the following procedures.



Each push of the switch increases the set value by 1.

(eg.) 00 → 01 → 02



Each push of the switch decreases the set value by 1.

(eg.) 10 → 09 → 08

- If switch is pressed for more than 3 sec. fast forward function kicks in.

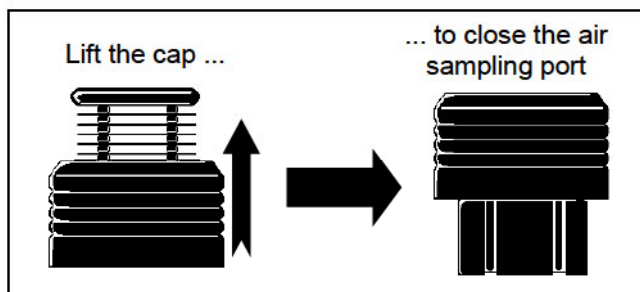
4.4 Measuring the Background (BG)

The background is measured, and will be automatically deducted from the measured value of dust particles.

Always conduct a background measurement before measuring for dust particles.

(1) Turn the measurement/sensitivity adjusting knob (see page 11) to the [MEASURE] position.

(2) Lift the cap to close the air sampling port (see figure on right).
Press the **power switch** to turn on the LD-5D power.



The BG value cannot be set properly if it is measured with the air sampling port left open.

Doing so could affect measurement results, such as causing the instrument to continue displaying a measurement value of zero. If the BG value has been measured with the air sampling port left open, close the port and measure the value again.

(3) Leave the LD-5D for 1 minute. (This procedure is necessary to fill the detector with purged air.)

(4) Press the **time setting switch** (▼) to set the time/mode setup to [BG].

(5) Press the **start/stop switch** (▶/■) to start the background (BG) measurement. It will take 6 seconds to measure BG.

The background measurement has been completed by the procedures above. The LD-5D stores the measured background value in memory and automatically deducts the background value from the measured value of dust particles. The background value stored in the memory will not be deleted by turning the LD-5D off, however, please perform a background measurement prior to every dust particle measurement.

- Background: This is a false measured value when the detector is filled with purged air. This value is a surplus for the measurement of the dust particles.

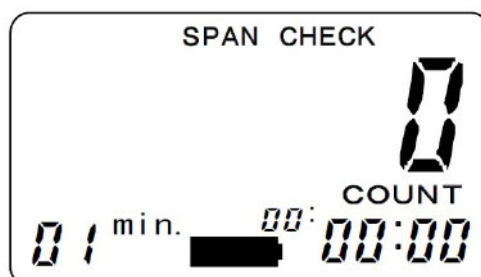
4.5 Automatic Sensitivity Adjustment (SPAN CHECK)

The automatic sensitivity adjustment is performed by measuring the value when the light scattering plate is inserted, obtaining the difference from the calibrated value and correcting it. Always perform automatic sensitivity adjustment (SPAN CHECK) before measuring for dust particles.

Always perform automatic sensitivity adjustment after the background has been measured.

- (1) Confirm that the power of the main unit is on and lift the cap to close the air sampling port.
- (2) Turn the measurement/sensitivity adjusting knob (see page 11) to the [SENSI. ADJ] position.

- (3) Confirm that [SPAN CHECK] is indicated in the upper part of the liquid crystal display and leave the LD-5D for 1 minute. (This is done to fill the detector with purged air and to stabilize the pseudo scattering light caused by the light scattering plate.)



- (4) When the start/stop switch (▶/■) is pressed, measurement of the light scattering plate begins. It will take 1 minute to measure the light scattering plate.
 - (5) When measurement is complete, turn the measurement/sensitivity adjusting knob to the [MEASURE] position.
- If the time/mode setup is either [MANUAL], [LOG], or [EX_MENU] automatic sensitivity adjustment (SPAN CHECK) is not performed.
Perform in down timer mode or [BG] mode.

The automatic sensitivity adjustment has been performed by the procedures mentioned above. The LD-5D will compare the measured value of the light scattering plate with the value of the standard light scattering plate, and automatically calculate the difference between the two and store it in memory as the corrected value.

After the completion of the automatic adjustment of sensitivity, the sensitivity is corrected with the calculated value.

5 Procedures for Measurement

5.1 Down Timer Measurement

5.1.1 Starting the Measurement



CAUTION

Do not turn the power switch off during measurement or communication.

It may cause malfunction.

Confirm that the measurement/sensitivity adjusting knob (see page 11) is [MEASURE] position. When the LD-5D is turned on, the set time displayed at the bottom left of the liquid crystal display is [01 min].

When the **start/stop switch** (▶/■) is pressed once at this time, a measurement of 1 minute is taken. The length of the measurement will depend on the time that is set and displayed.

A down timer (This is a timer indicating remaining time by deducting by 1 second from the time set.) is displayed at the bottom right of the liquid crystal display.

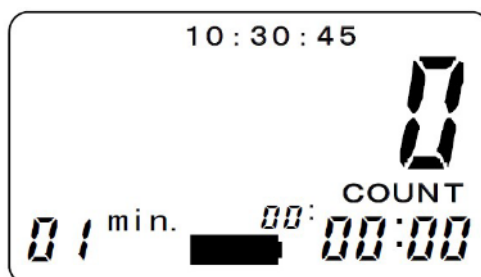
Pressing the **time setting switch** (▼) changes the time set in the display.

Pressing the **start/stop switch** (▶/■) during measurement will cancel down timer measurement.

The measured value in down timer mode can be converted into mass concentration value.

< Table for display of time set during down timer measurement >

01 min.	: measuring time 1 min.
02 min.	: measuring time 2 min.
03 min.	: measuring time 3 min.
05 min.	: measuring time 5 min.
10 min.	: measuring time 10 min.
06 sec.	: measuring time 6 sec.
10 sec.	: measuring time 10 sec.
30 sec.	: measuring time 30 sec.

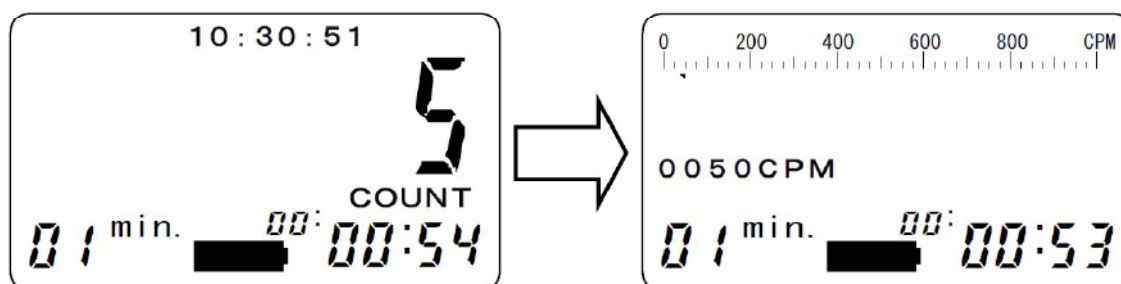


- [min.] is an abbreviation of minutes.
- [sec.] is an abbreviation of seconds.

5.1.2 Graph Display

When the **mass concentration switch** (▲) is pressed during measurement, the display will change from count to graph display.

When the **mass concentration switch** (▲) is pressed again, the display will switch back to count.

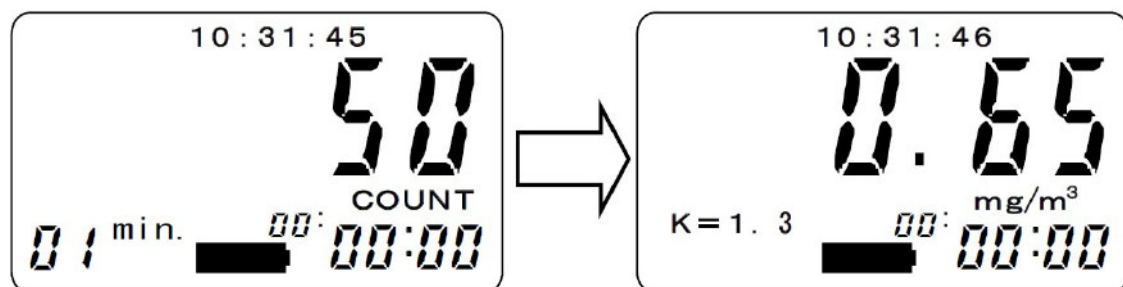


- The bar graph display starts at 32 CPM. Anything under 31 CPM will not be displayed.
- 0050 CPM is an approximate instantaneous concentration value.
- If measurement ends in graph display, it will automatically switch back to count display.

5.1.3 Mass Concentration Display

If the K factor is entered and recorded in the LD-5D, measured data can be converted into mass concentration by pressing the **mass concentration switch** (▲).

When the **mass concentration switch** (▲) is pressed again, the display will return to count.



- The only measurement data that can be converted are measurements taken in down timer mode.
- The **time setting switch** (▼) will not function in the mass concentration display. Press the **mass concentration switch** (▲) to switch to count display before using it.
- The **start/stop switch** (▶/■) will function. If there is no need to change measurement times, measurement may be started as is.

5.1.4 Converting to Mass Concentration

- (1) Conversion from relative concentration into mass concentration

Use the formula below to obtain mass concentration from relative concentration.

$$\text{Mass concentration (mg/m}^3\text{)} = R \cdot K$$

R: Relative concentration (CPM)

K: Conversion factor for mass concentration

- CPM: abbreviation for count per minute. Counted value in a minute.

- (2) Conversion factor for mass concentration (K factor)

K factor changes depending on the dust particles to be measured. Therefore, it is necessary to obtain K factor prior to the measuring or at the time of measuring.

However if the K factor has been established, it is not necessary to obtain it again.

The LD-5D has a function that makes it possible to pre-store K factor in memory and to convert it into mass concentration. Store the K factor in the memory with the procedure described later.

- (3) Obtaining K factor

- ① Place a filtration assisting collection device with a grading device (Such as a low volume air sampler) and the collection opening of the LD-5D at the same height. Put both instruments into operation to collect dust particles for a fixed time (for example 10 minutes).
- ② Use the following formula to calculate K factor by inserting the mass concentration obtained by the filtration assisting collection device and the relative concentration obtained by the LD-5D.

$$K = C/R$$

K: Conversion factor for mass concentration

C: Mass concentration collected by the filtration assisting collection device (mg/m³)

R: Relative value (CPM)

③ Example calculation

Measuring time: 10 min.

Calculated value by the LD-5D: 1260 (count)

Mass concentration by the filtration assisting collection device: 1.5 (mg/m³)

With the measurement results above, the resulting formula is

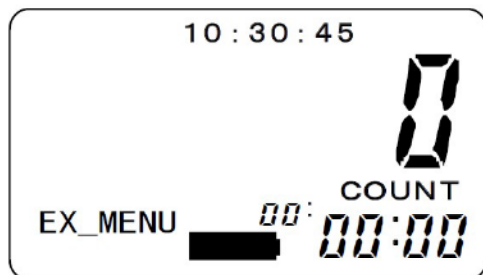
$R = 1260 \text{ count} / 10 \text{ min.} = 126 \text{ CPM}$,

With the formula above, $K = 1.5 / 126 = 0.012 \text{ (mg/m}^3\text{/CPM)}$

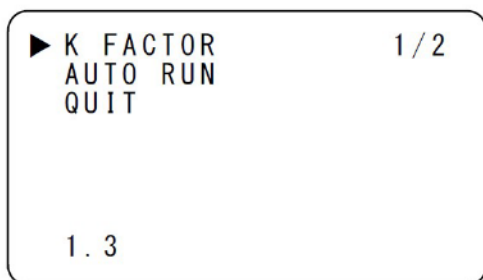
- The accuracy of the measurement in obtaining the K factor will influence all measurement results which use K factor. Thus it is necessary to select the measuring point which best represents the conditions of the surrounding particles. As for the measurement of the filtration assisting collection device, it is necessary to pay attention to the maintenance of flow volume during sampling.

(4) Setting up K factor

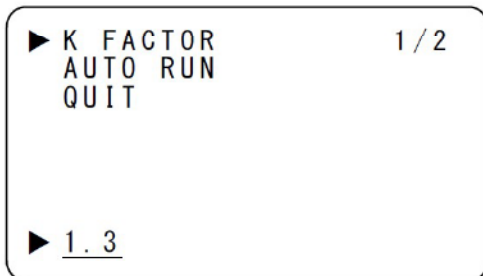
Press the **time setting switch** (▼) and change the time/mode display in the lower left of the liquid crystal display to [EX_MENU].



When the **start/stop switch** (▶/■) is pressed when [EX_MENU] appears, the setup menu 1/2 will be displayed.



When the **start/stop switch** (▶/■) is pressed, K factor will be set.



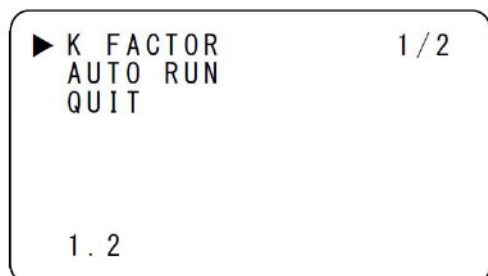
Use the time setting switch (▼) or the mass concentration switch (▲) to enter values to setup.

When the time setting switch (▼) is pressed once, the numerical value will decrease by 0.1.

When the mass concentration switch (▲) is pressed once, the numerical value will increase by 0.1.

- K factor may be inputted in the range of 0.1 to 9.9.

Press the start/stop switch (▶/■) to confirm the setup.



In the example calculation in chapter (3) Obtaining K factor, $K=0.012$ (mg/m³/CPM) was obtained, but the LD-5D has a predetermined value of 1 CPM=0.01mg/m³ to a calibrated particle so

$K=0.012/0.01=1.2$ will be entered.

Press the time setting switch (▼) 2 times and move the cursor (▶) in front of [QUIT] and press the start/stop switch (▶/■) to return to the normal screen.

5.2 Manual Measurement

5.2.1 Starting Measurement



CAUTION

Do not turn the power switch off during measurement or communication.

It may cause malfunction.

Confirm that the measurement/sensitivity adjusting knob (see page 11) is [MEASURE] position. When the power is turned on, the set time displayed at the bottom left of the liquid crystal display is [01 min].

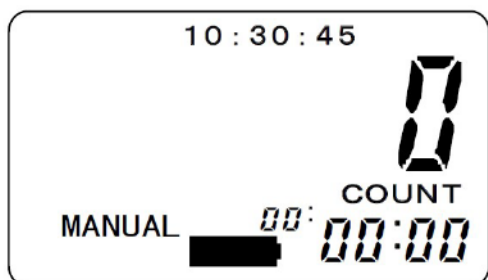
Press the time setting switch (▼) to change the time/mode setup display on the lower left of the liquid crystal display to [MANUAL].

Push the start/stop switch (▶/■) to start manual measurement.

Time passed during measurement will appear on the lower right of the liquid crystal display during measurement.

If the start/stop switch (▶/■) is pressed during manual measurement, measurement will stop.

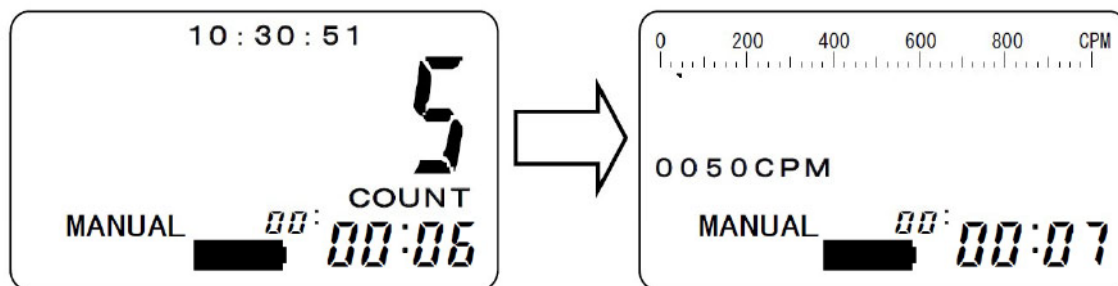
Values of manual measurement can not be converted into mass concentration.



5.2.2 Graph Display

When the **mass concentration switch** (▲) is pressed during measurement, the display will change from count to graph display.

When the **mass concentration switch** (▲) is pressed again, the display will switch back to count.



- The bar graph display starts at 32 CPM. Anything under 31 CPM will not be displayed.
- 0050 CPM is an approximate instantaneous concentration value.
- If measurement ends in graph display, it will automatically switch to count display.

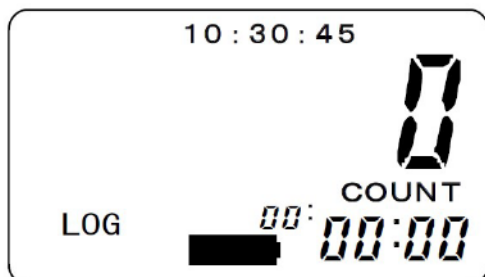
5.3 Logging Measurement

5.3.1 Conditional Setup for Logging

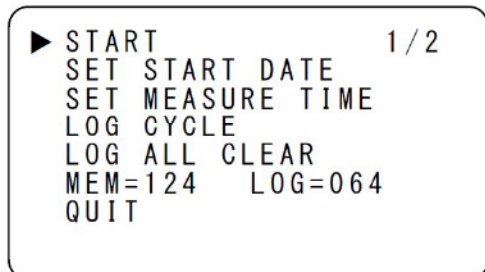
Confirm that the measurement/sensitivity adjusting knob (see page 11) is [MEASURE] position.

When the power is turned on, the set time displayed at the bottom left of the liquid crystal display is [01 min].

Push the **time setting switch** (▼) and change the time/mode setup display on the lower left of the liquid crystal display to [LOG].



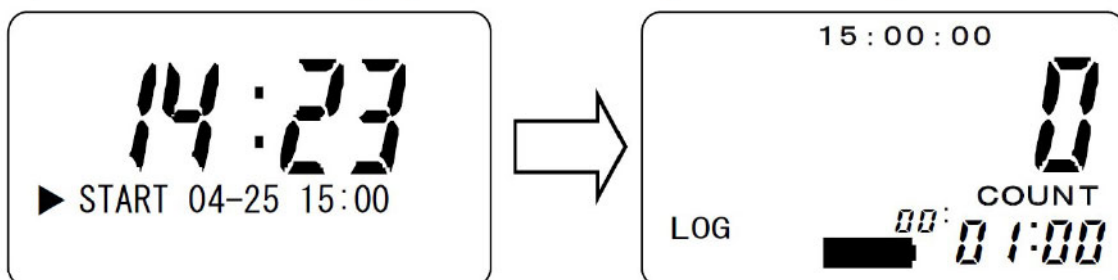
When the **start/stop switch** (▶/■) is pressed while [LOG] is displayed, set up menu 1/2 will be displayed.



Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to move the cursor (▶) and confirm the setup item with the **start/stop switch** (▶/■).

• START

Start the logging function with the timer setting. It will display the current time and month-day, hour-minute of when logging is to start and then go into start waiting mode.



To exit logging start waiting mode, it is necessary to turn the power off by pressing the **power switch**.

If month-day, hour-time of logging to be started is not set up and logging is selected, the logging function will start immediately.

It is possible to have a graph displayed during logging function, as in normal measuring.

When the **mass concentration switch** (▲) is pressed, the display will change from count to graph.

When the **mass concentration switch** (▲) is pressed again, it will switch back to count.

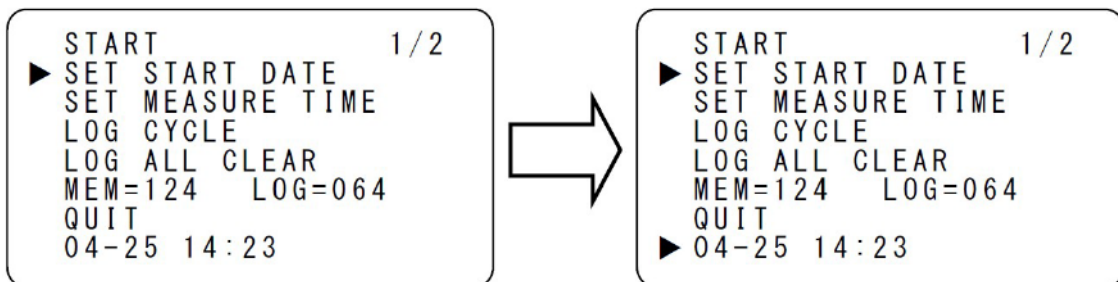
When the **start/stop switch** (▶/■) is pressed during logging function, logging will stop.

Any data that did not make the logging cycle will not be recorded.

• SET START DATE

Setup the month-day, and hour-minute of the start of measurement. The time selected in [LOG] will appear as an initial value.

To start logging immediately, do not set this up and select [START].



Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to enter values to setup.

When the **time setting switch** (▼) is pressed once the numerical value will decrease by 1.

When the **mass concentration switch** (▲) is pressed once, the numerical value will increase by 1.

Use the **start/stop switch** (▶/■) to confirm the item set (select item). When all items have been confirmed, the cursor of the (▶) numerical value setup will disappear.

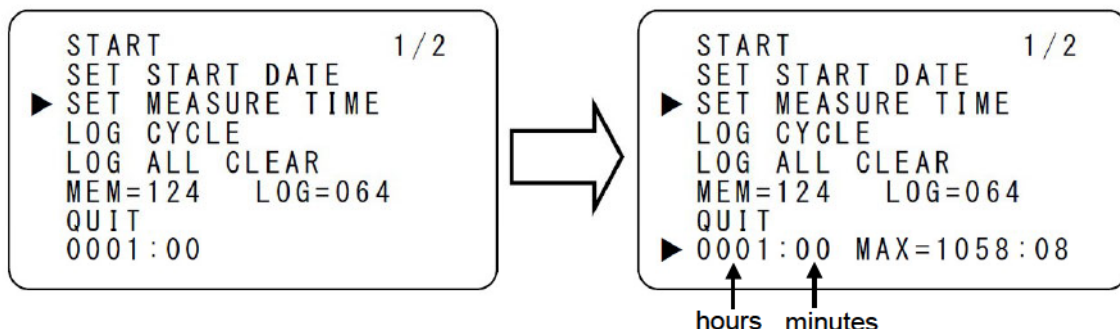
The LD-5D will automatically distinguish between earlier and later dates. However, it can not automatically fix dates that have been previously entered. For example, when 02 (February) is entered when 01-31 (January 31) had already been set, the date 31 (31st) will remain the same. Be sure to set the day also.

Seconds can not be set. Timer function starts at 00 seconds.

• SET MEASURE TIME

Set the length of logging function. Setup with hour : minute.

Remaining memory capacity and LOG CYCLE (logging cycle) will display the maximum set value (MAX=xxxx:xx).



Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to enter values to setup.

When the **time setting switch** (▼) is pressed once the numerical value will decrease by 1.

When the **mass concentration switch** (▲) is pressed once, the numerical value will increase by 1.

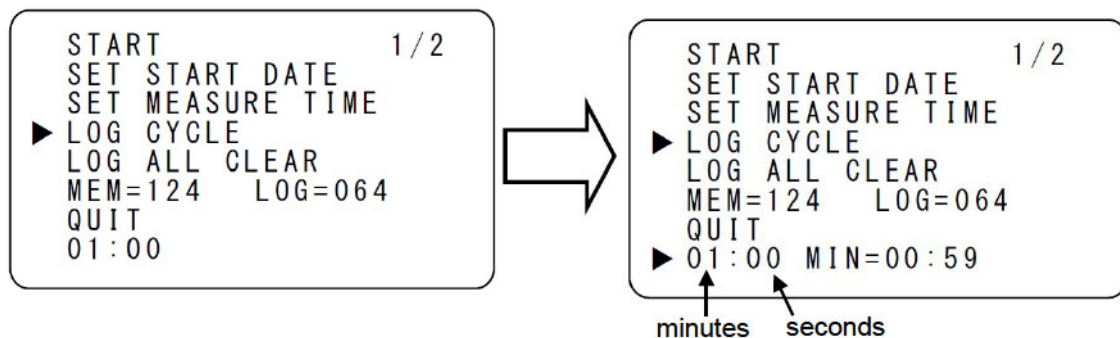
Use the **start/stop switch** (▶/■) to confirm the item set (select item). When all items have been confirmed, the cursor of the (▶) numerical value setup will disappear.

Set up for values smaller than the current LOG CYCLE (logging cycle) can not be set. Setup for values over the maximum value can not be set. To run the logging function for a longer period of time, set the LOG CYCLE (logging cycle) for a large value and reset it again.

• LOG CYCLE

Sets up the logging cycle.

The minimum set value (MIN=xx:xx) will be displayed from remaining memory capacity and SET MEASURE TIME (logging function time).



Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to enter values to set up.

When the **time setting switch** (▼) is pressed once the numerical value will decrease by 1.

When the **mass concentration switch** (▲) is pressed once, the numerical value will increase by 1.

Use the **start/stop switch** (▶/■) to confirm the item set (select item). When all items have been confirmed, the cursor of the (▶) numerical value setup will disappear.

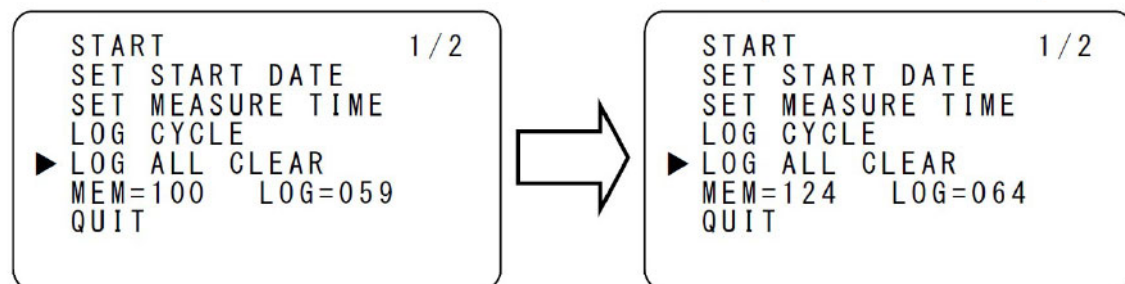
Setup for values larger than the current SET MEASURE TIME (logging function time) can not be set.

Setup for values over the minimum value can not be set. To run the LOG CYCLE (logging cycle) for a shorter period of time, set the SET MEASURE TIME (logging function time) to a small value and reset it again.

• LOG ALL CLEAR

Deletes all logging data.

Once data has been deleted, **it can not be retrieved**. Be very careful when deleting data.



Use the **start/stop switch** (►/■) to delete logging data.

When logging data is deleted, the maximum log value MEM=124 LOG=064 will be displayed.

MEM=124: Represents the remaining memory capacity of logging measurement. The maximum capacity is 124 pages.

1 page of data 512 pcs×124 pages means that 63,488 pcs of data can be stored. Even if there is time left in logging function, logging measurement will end when MEM=000.

A single logging measurement will consume at least 1 page.

LOG=064: Represents the remaining number of times logging measurement may be taken. The maximum number of times logging measurement may be taken is 64 times. When MEM=000, logging measurement can not be taken even if logging measurement has been taken less than 64 times.



Be sure to back up data on a regular basis in case of an accident or failure. It is recommended that functionality be verified in advance and that the instrument be periodically inspected.

Please be aware that in the unlikely event of a product failure, Sibata bears no responsibility to compensate for data not acquired or recorded, and is not responsible for loss of data or for other direct or indirect damages incurred from such loss.

• QUIT

Leave logging setup menu.

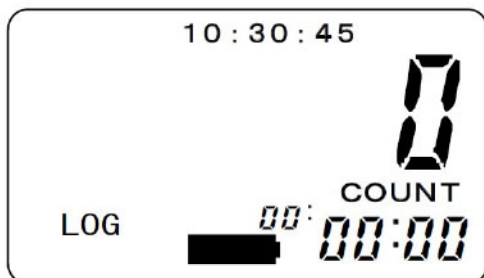
- Logging data will be kept by a built in battery.

This battery will be automatically charged when the power of the main unit is turned ON. 8 hours of charging will keep data for approximately 5 days.

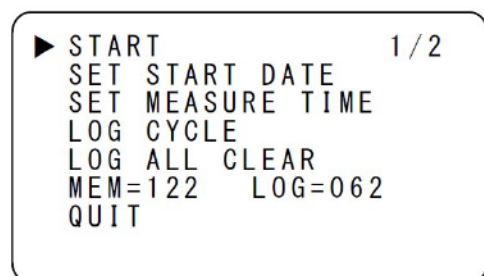
5.3.2 Displaying Logging Data

It is possible to confirm logging data on the display of the main unit.

Press the **time setting switch** (▼) and change the time/mode setup display in the lower left of the liquid crystal display to [LOG].



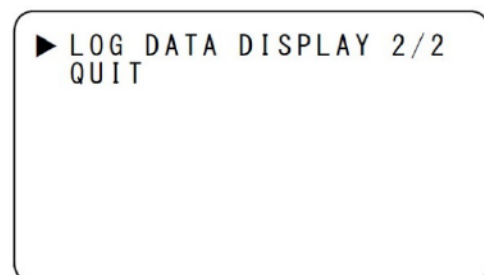
When [LOG] appears, press the **start/stop switch** (▶/■) and setup menu 1/2 will be displayed.



Press the **mass concentration switch** (▲) and setup menu 2/2 will be displayed.



Press the **mass concentration switch** (▲) once more and select LOG DATA DISPLAY.



Press the **start/stop switch** (▶/■) and the logging data will be displayed.

No is the logging number, MDHM is the starting month, day, hour, and minute, and VOL is the recorded data number.

No	M	D	H	M	VOL
▶ 00	04	25	15	00	10
01	04	25	15	30	60
QUIT					1 / 1

Use either the **time setting switch** (▼) or the **mass concentration switch** (▲) to move the cursor (▶) to the logging number desired. Press the **start/stop switch** (▶/■) and the logging data will appear.

No	H	M	S	CPM
00001	15	01	00	10
00002	15	02	00	12
00003	15	03	00	15
00004	15	04	00	13
00005	15	05	00	16
00006	15	06	00	11
▶ QUIT				1 / 2

No	H	M	S	CPM
00007	15	07	00	14
00008	15	08	00	13
00009	15	09	00	12
00010	15	10	00	11

▶ QUIT

2 / 2

No is the logging data number, HMS is the hour, minute, and second of recorded data.

If there are more than 6 pcs of data, data will be displayed in multiple pages.

Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to move through the pages.

Press the **time setting switch** (▼) to move to the next page.

Press the **mass concentration switch** (▲) to move to the previous page.

Page number/total pages will be displayed on the lower right of the screen.

When QUIT is selected and the **start/stop switch** (▶/■) is pressed, it is possible to return to the previous menu screen.

5.3.3 Retrieving Logging Data

Using the **communication cable with software S-USB (included)** enables transferring or updating LD-5D settings on the PC, and transferring log data acquired using the LD-5D to the PC, saving that data on the PC.

Log data transferred to the PC is saved in CSV file format.

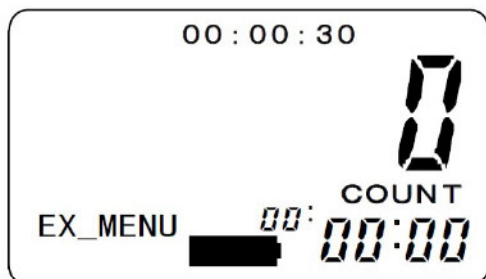


Be sure to back up data on a regular basis in case of an accident or failure. It is recommended that functionality be verified in advance and that the instrument be periodically inspected.

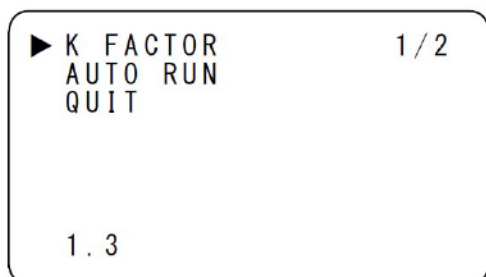
Please be aware that in the unlikely event of a product failure, Sibata bears no responsibility to compensate for data not acquired or recorded, and is not responsible for loss of data or for other direct or indirect damages incurred from such loss.

6 Procedures for Set Up

Press the **time setting switch** (▼) and change the time/mode setup display in the lower left of the liquid crystal display to [EX_MENU].

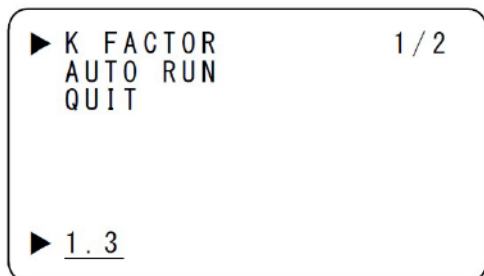


Press the **start/stop switch** (▶/■) when [EX_MENU] is displayed and setup menu 1/2 will be displayed.



6.1 K FACTOR

Move the cursor (▶) to [K FACTOR] and press the **start/stop switch** (▶/■) to set up K factor.



Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to enter values to setup.

When the **time setting switch** (▼) is pressed once, the numerical value will decrease by 0.1.

When the **mass concentration switch** (▲) is pressed once, the numerical value will increase by 0.1.

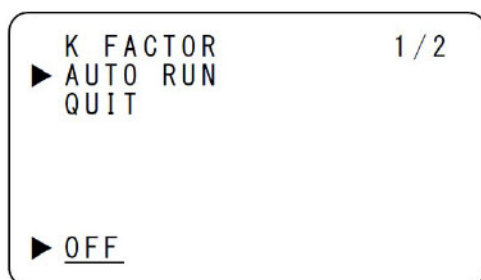
Use the **start/stop switch** (▶/■) to confirm the setup.

6.2 AUTO RAN

Move the cursor (▶) to [AUTO RUN] and press the **start/stop switch** (▶/■) to setup AUTO RUN. [AUTO RUN] is a function that automatically starts manual measurement (MANUAL) when the power of the LD-5D is turned ON.

When the **start/stop switch** (▶/■) is pressed and measurement is stopped manually, normal operation is possible after the measurement has ended.

The LD-5D does not have an external power ON/OFF function.



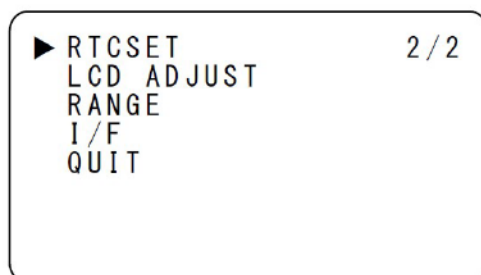
Use the time setting switch (▼) or the mass concentration switch (▲) to change the set values.

Every time the switch is pressed, a toggle function will change the set value to ON → OFF → ON....

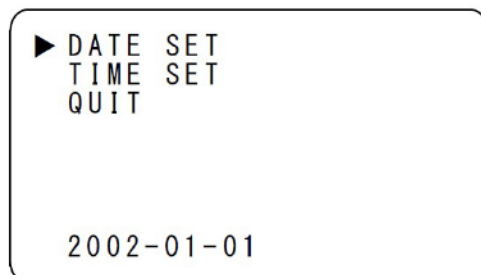
Use the start/stop switch (▶/■) to confirm the setup.

6.3 RTCSET

Move the cursor to (▶) to [RTCSET] setup menu 2/2.



Press the start/stop switch (▶/■) and the [RTCSET] menu will be displayed.



When the **start/stop switch** (▶/■) is pressed with the cursor (▶) on [DATE SET], the screen will change to [DATE SET].

▶ DATE SET
TIME SET
QUIT

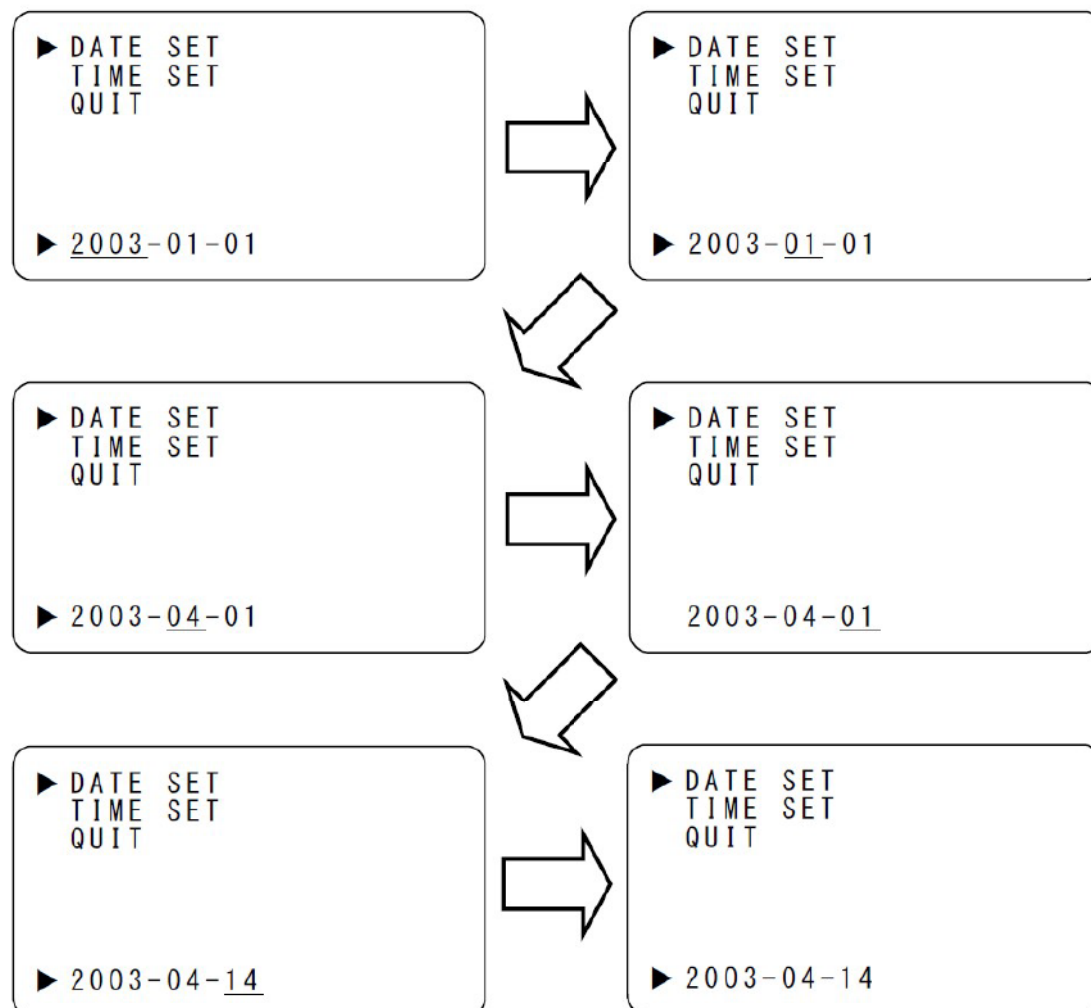
▶ 2002-01-01

Use the **mass concentration switch** (▲) and the **time setting switch** (▼) to increase or decrease setup values.

▶ DATE SET
TIME SET
QUIT

▶ 2003-01-01

Use the **start/stop switch** (▶/■) to confirm setup items (item selection).



Move the cursor (▶) to [TIME SET] and press the start/stop switch (▶/■) to change to [TIME SET].

Setup procedures are the same as [DATE SET], please refer to [DATE SET].

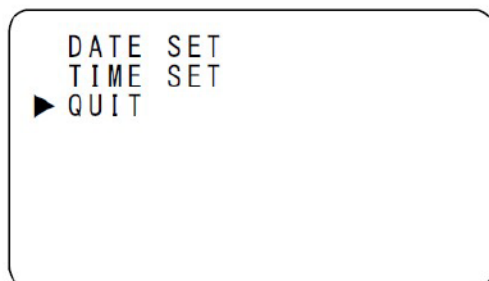


● Logging data will be kept by a built in battery.

This battery will be automatically charged when the power of the main unit is turned ON.

8 hours of charging will keep data for approximately 5 days.

To end [RTCSET] use the time setting switch (▼) or the mass concentration switch (▲) to move the cursor (▶) in front of [QUIT].

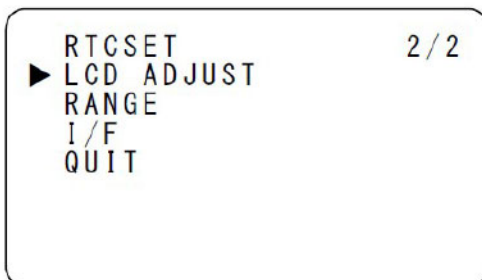


Press the start/stop switch (▶/■) to go back to setup menu 2/2.



6.4 LCD ADJUST

Move the cursor (►) to [LCD ADJUST].



When the **start/stop switch** (►/■) is pressed, the [LCD ADJUST] menu will be displayed.



6.4.1 LCD CONTRAST

If the **start/stop switch** (►/■) is pressed with the cursor (►) in front of [LCD ADJUST], the screen will change to [LCD CONTRAST] (contrast adjustment).



Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to adjust the contrast.

When the **time setting switch** (▼) is pressed the display will become lighter.

If the switch is continuously pressed, it will become the lightest it can be then become the darkest it can be and then become lighter again.

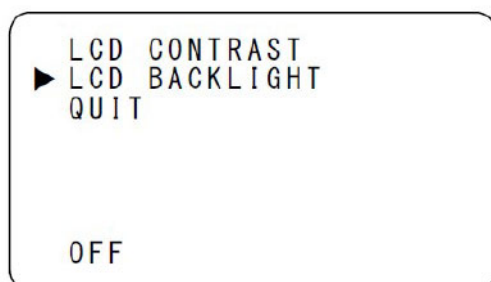
When the **mass concentration switch** (▲) is pressed the display will become darker.

If the switch is continuously pressed, it will become the darkest it can be then become the lightest it can be and then become darker again.

When the display is easier to see, use the **start/stop switch** (►/■) to confirm the setting.

6.4.2 LCD BACKLIGHT

When the start/stop switch (▶/■) is pressed with the cursor (▶) on [LCD BACKLIGHT], the screen will change to [LCD BACKLIGHT] (liquid crystal display backlight setup).



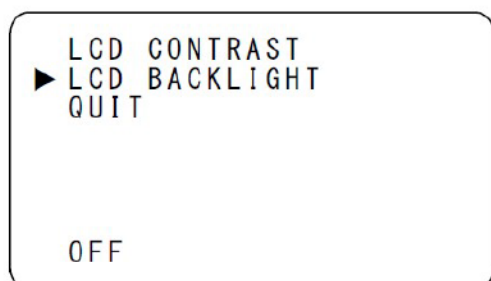
There are 3 options to choose from in setup.

OFF: The backlight will not light.

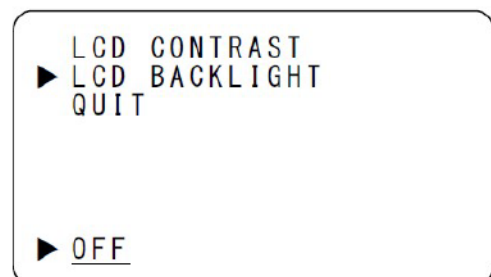
ON: The backlight will always be on.

TIMER: Turn the backlight on manually with the mass concentration switch (▲) and turn it off after a set time.

When TIMER is selected, it is possible to setup the time to turn the backlight on.



Press the start/stop switch (▶/■) and select the item to be setup.



Use the time setting switch (▼) or the mass concentration switch (▲) and change the item.



Use the **start/stop switch** (▶/■) to confirm setup.



If the timer function is setup, setup for the light is also necessary.

Select TIMER and press the **start/stop switch** (▶/■) to set the time for lighting.

Use the **time setting switch** (▼) or the **mass concentration switch** (▲) to change time setup.

When the **mass concentration switch** (▲) is pressed once, the numerical value will increase by 1.

When the **time setting switch** (▼) is pressed once the numerical value will decrease by 1.

The unit of the displayed numbers is **seconds**. 1 to 99 seconds can be setup.

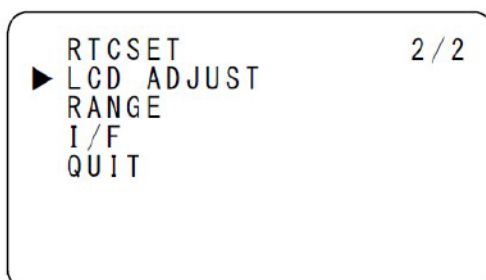
Use the **start/stop switch** (▶/■) to confirm the setup.

The lighting time will be extended until the setup time has passed while the backlight is on. No switch other than the power switch will be able to change this.

To end [LCD ADJUST] use the **time setting switch** (▼) or the **mass concentration switch** (▲) to move the cursor (▶) in front of [QUIT].



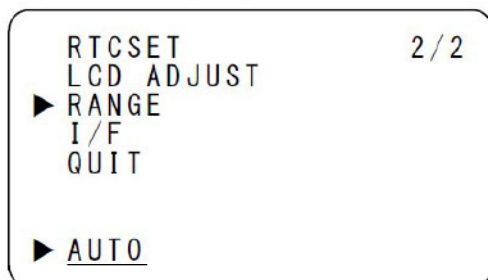
Press the **start/stop switch** (▶/■) to return to the setup menu 2/2.



6.5 RANGE

Set the range of analog output.

Move the cursor (▶) in front of [RANGE] and press the start/stop switch (▶/■) to setup the range of analog output.



There are 3 options in setup.

AUTO: Output of 0 to 1000 cpm in 0 to 1 V.

Output of 1000 to 10000 cpm in 0.1V to 1V.

The relationship between the voltage and concentration is not clear because output of range information is not available.

x10: Output of 0 to 1V in 0 to 10000 cpm.

x1: Output of 0 to 1V in 0 to 1000 cpm.

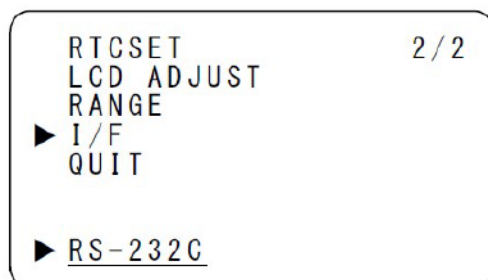
Use the time setting switch (▼) or the mass concentration switch (▲) to change the setup.

Press the start/stop switch (▶/■) to confirm setup.

6.6 I/F

Setup the interface of serial output.

Move the cursor (▶) to [I/F] and press the start/stop switch (▶/■) to setup the interface of serial output.



The 2 options in setup are RS-232C and USB.

Use the time setting switch (▼) or the mass concentration switch (▲) to change the setup.

Press the start/stop switch (▶/■) to confirm setup.

To use USB interface, the USB driver must be installed in the PC.

Refer to the "Communication Cable with Software S-USB" operation manual.

Return to the measurement display by selecting [QUIT] and pressing the start/stop switch (▶/■).

7 Analog/Pulse Output

7.1 Analog Output

This specifies the output range settings (see 6.5 Range.).

Connect the analog-pulse cable (optional) to the analog output connector.

The red wire (pin 1) is for positive voltage output and the white wire (pin 2) is for negative voltage output.

Use the analog-pulse cable by connecting it to the measuring device that will receive the voltage output.

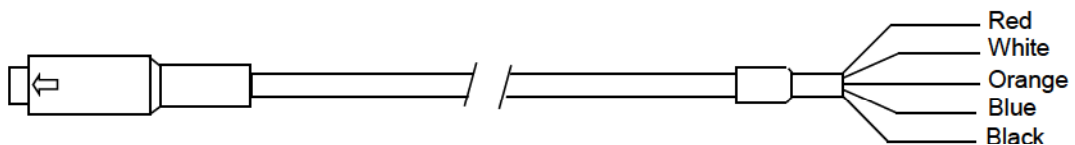
- Voltage output is measured while in operation. In halt of operation, no voltage output.

7.2 Pulse Output

Connect the analog-pulse cable (optional) to the analog output connector.

The orange wire (pin 3) is for the open collector and the blue wire (pin 4) is for the emitter. Apply 12 V or less voltage.

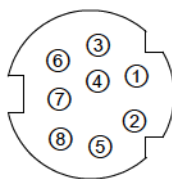
- The black wire (pin 8) is used as a spare. Normally it is not used. The black wire (pin 8) is connected equipotentially via the main unit to white (pin 2) and blue (pin 4) wires.



Shape of connector on main unit end



Pin No.



Pin No.	Wire Color	Application
①	Red	Voltage output (+)
②	White	Voltage output (-)
③	Orange	Collector
④	Blue	Emitter
⑧	Black	Spare wire, equipotential to (2) and (4)

8 Precautions for Maintenance, Storage, and Transport

Regular annual inspections are recommended for this product. If the product is used to measure high concentrations or operated continuously for long periods, perform inspections more often. Under the given conditions, Sibata will repair broken/malfunctioning products under warranty, but Sibata does not warrant any loss or damage to data recorded in memory. Please back up all required data. If the customer ignores the precautions in this manual or fails to create a backup, Sibata shall not be responsible for any damages resulting from such lost or damaged data.

●Filter

The time for changing the capsule filter is depend on the volume of sucked dust, but we recommend to change every two years in average.

The capsule filter also has a clear resin part in which accumulated dirt can be observed.

If the capsule filter is especially dirty, dry the filter and sweep off the dust. You can re-use it.

If the filter material has been damaged, deformed, or has a hole in it, always exchange it with a new filter.

When the filter becomes clogged, the suction flow rate will go down and influence the measured data.

Consumable Capsule filter LAS-1 (Item Code 080000-55)



CAUTION

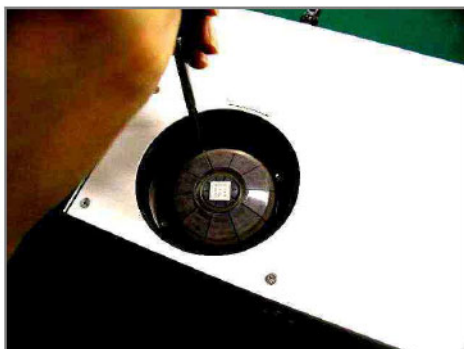
Do not wash the filter with water.

< How to Exchange >

(When exchanging the filter, be careful not to breath the dust in. We recommend wearing a dust mask.)



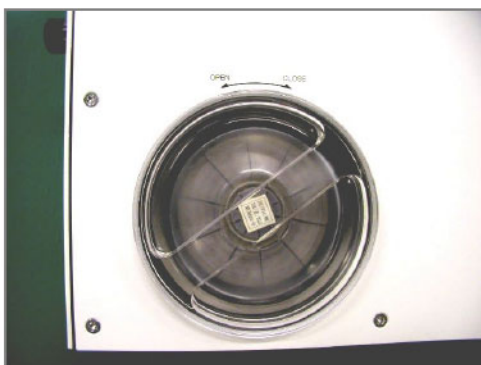
(1) Remove the cover by turning it counter clockwise.



(2) Remove the screws holding the filter inplace in 4 places. (M3x8 4 pcs of screws)



(3) Wipe the interior clean with a dust cloth.
(Clean the rubber packing also.)

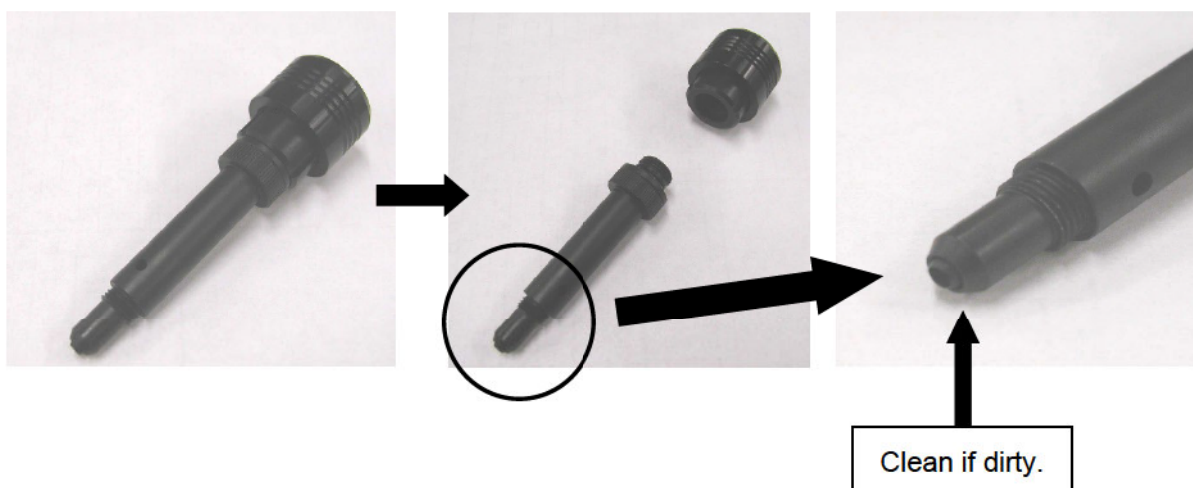


(4) Install a new filter and finally screw the 4 screws back in place to close the cover.

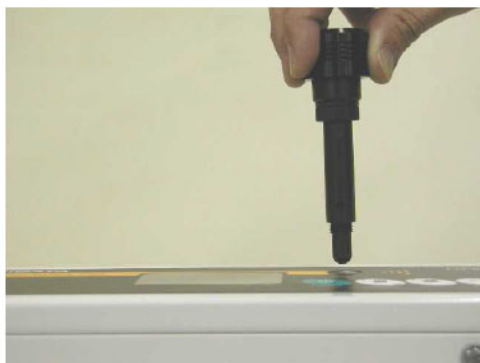
●Air Sampling Port

When high concentration measurement is performed or when measurement is taken for long periods of time, you may notice the pipe interior of the sheath air mechanism becoming dirty due to sampling air.

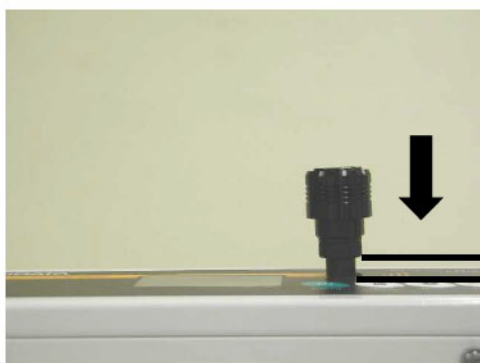
When measurement is completed for the day, remove the sheath air mechanism part and clean it with running water or an air gun. If it is especially dirty, use a neutral detergent with water (do not rub the part with a sponge) or have it ultrasonic cleaned. Make sure to dry it well before use.



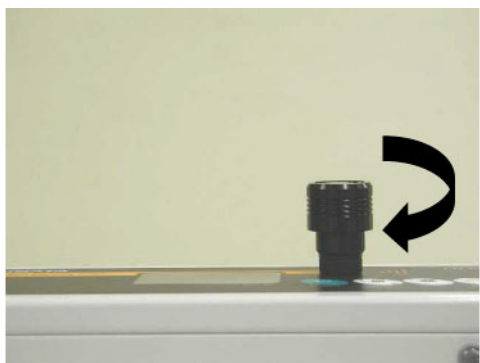
< How to Insert the Air Sampling Port >



(1) Insert the air sampling port perpendicular to the hole in the main unit. (It may be tight, but do not force the inlet in.)



(2) When the air sampling port is inserted to the height shown in the picture to the left, it will stop.



(3) When it will go no further, turn it clockwise to tightly close it.

●Storage After Use

- Close the air sampling port by lifting the cap and make sure that dust does not get into the inside of the detector.
- Even power is off, weak current is running and power is consumed. If the product is stored with battery, it will discharge the battery. To store the product after use, remove the battery to prevent leakage.
- Store in cool and dry location without the direct sunlight.

●Transporting the Product

To transport the product, set the measurement/sensitivity adjusting knob to the [SENSI. ADJ.] position to prevent damage to the plate from impacts during transport.

9 Troubleshooting

Promptly stop using the product if a problem occurs during use. If the problem was caused by a product failure, please request repairs and do not operate the product. In some cases, problems can result from causes other than product failures. Before requesting service, verify the following.

Condition	Cause	Remedy
There is no display when the power is turned ON.	The AC adapter is not connected properly.	Confirm the connection of the power adapter. (see 4.2.2)
	There is not enough capacity in the battery.	Replace the batteries. (see 4.2.1)
The measurement value is abnormal (low) or there is no count.	The air sampling port is blocked.	Measure dust with the air sampling port cap in the lowered position. (see page 11)
	The BG measurement value or sensitivity adjustment value is abnormal.	Perform a SPAN CHECK after the BG measurement. (see 4.4 and 4.5)
	The light source laser is dead. (Time period will differ according to operating conditions.)	The laser needs to be exchanged or recalibrated. Please request repairs.
	The diaphragm pump has worn out. (Time frame will differ according to usage.)	It is necessary to exchange the diaphragm and valve. Please request repairs.
The measurement value is abnormal (high).	The sensitivity adjustment value is an abnormal value.	Perform a SPAN CHECK after the BG measurement. (see 4.4 and 4.5)
The measurement value does not change.	The light scattering plate is still in place.	Use the measurement/sensitivity adjustment knob to take the light scattering plate out. (see page 11)
Logging is not possible.	The remaining memory capacity or log count is zero.	Retrieve and save logging data and perform LOG ALL CLEAR. (see 5.3.3 and page 28)
The logging data is gone.	The rechargeable backup battery for memory of the logging data has been depleted.	Turn the power of the main unit ON and the battery will automatically charge itself. It will be fully charged in approx. 48 hours. If this does not solve the problem, the rechargeable battery needs to be replaced (repaired). Replacement about once every two years is recommended.
The clock (calendar) is off.	The rechargeable backup battery for the clock has been depleted.	Turn the power of the main unit ON and the battery will automatically charge itself. It will be fully charged in approx. 48 hours. If this does not solve the problem, the rechargeable battery needs to be replaced (repaired). Replacement about once every two years is recommended.
Data can't be store in PC.	Wrong communication cable setting or port setting.	By EX_MENU I/F menu, select USB or RS-232. Check port setting. (see 6.6)

10 Specifications

Item Code	080000-5		
Model	LD-5D		
Measurement Principle	Light scattering method		
Light Source	Laser diode		
Measuring Accuracy	±10 % of calibrated particles		
Measuring Sensitivity	1CPM=0.01mg/m ³		
Measuring Range	0.01 to 100.00mg/m ³		
Display	Graphic liquid crystal display		
Displayed Contents	1. Measuring time (Down timer) 2. Measured value (00000 to 99999) 5 digits displayed 3. Measuring mode 4. Remaining battery power 5. K factor 6. Graph (by pressing the switch during measuring)		
Measuring Mode	1. Measuring time (Down timer mode) Set measuring time with built in down timer and perform measurement. (Initial time set for measuring when turning the instrument on is 1 min. in down timer mode.) 6 sec., 10 sec., 30 sec., 1 min., 2 min., 3 min., 5 min., and 10 min., are available. 2. Manual Manually operate the start and stop of measuring. 3. LOG (Logging) Set date to start measurement and measurement length. Measured data will be stored in memory of the LD-5D while measurement is taking place. 4. Span check The value of the scattering plate may be measured and the adjusted value recorded by inserting the scattering plate for sensitivity calibration. 5. BG (Background) Close the air sampling port fill the detector with purged air and take a measurement. Background value is measured and recorded.		
Data Recording Points	Max.63488 points (Hours data will be kept: 8 hours during operation (after charging approx. 5 days) Recording cycle 17.6 hours in 1 second Recording cycle approx. 44 days in 1 minute		
Out put	USB/RS-232C	Outputs data recorded in main unit.	
	Analog output *1	0 to 1 V DC Output impedance of 100 Ω 3 ranges selectable	(1) 0 to 1000 cpm: 0 to 1 V 1000 to 10000 cpm: 0.1 to 1 V (2) 0 to 1000 cpm: 0 to 1 V (3) 0 to 10000 cpm: 0 to 1 V Pin 1: DC (+) Pin 2: DC (-)
	Pulse output	Open collector Maximum voltage capacity: 12 V	Pin 3: Collector Pin 4: Emitter
Operating Time Using a Battery	Alkaline battery : approximately 24 hours		
Power Supply	(1) DC12V from 8 size C dry cell batteries (2) Special AC Adapter		
Operating Environment	0 to 40 °C, 5 to 90 %RH (Provided there is no condensation)		
Dimensions	240 (W) x 90 (D) x194 (H) mm (Projections not included)		
Weight	Approximately 2.88 kg (including batteries)		
Accessories	Shoulder belt, Size C manganese dry cell battery (for operation check), Communication cable with software S-USB		

Option *1 Analog-pulse cable (080000-052)

Consumable Capsule Filter LAS-1 (080000-55)

11 Warranty

If a Sibata product fails within one year from date of purchase, it will be repaired free of charge.

To request repairs, contact the distributor where you purchased the product.

Be sure to provide the item code, product name, model number, serial number, a description of the problem, and other relevant information.

The warranty excludes consumable parts included with the product, products without the purchase date or distributor information recorded, and products for which warranty information was revised.

A repair service fee is charged in the following cases.

- (1) Faults or damage due to improper usage
- (2) Faults or damage resulting from repairs or modifications implemented by parties other than Sibata
- (3) Faults caused by abuse or inadequate maintenance
- (4) Faults or damage resulting from fires, earthquakes, or other natural disasters.
- (5) Faults or damage occurring after purchase due to relocation, movement, falling, or vibration
- (6) Faults or damage resulting from the use of consumable items not specified by Sibata

Disclaimers

Under no circumstances shall Sibata be responsible for providing compensation for data that was not successfully acquired or recorded due to a malfunction or for incidental damages (such as loss of profits or interruption of business operations). Under the given conditions Sibata will repair broken/malfunctioning products under warranty, but Sibata does not warrant any loss or damage to data recorded in memory. Always back up necessary data before requesting repairs or other service work from Sibata. If the customer ignores the precautions in this manual or fails to create a backup, Sibata shall not be responsible for any damages resulting from lost or damaged data.



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