# LR5041 LR5042 LR5043



Instruction Manual

## **VOLTAGE LOGGER**



Be sure to read this manual before using the instrument.     ▶ p					
When using the instru	ment for the	☐ Troubleshooting			
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**EN** 

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#### Introduction

Thank you for purchasing the HIOKI Model LR5041, LR5042, LR5043 Voltage Logger. To obtain maximum performance from the logger, please read this manual first, and keep it handy for future reference.

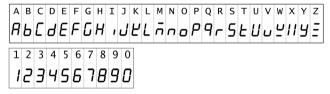
#### **Trademarks**

Microsoft and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.

#### **Notation**

$\Diamond$	Indicates a prohibited action.
(p. )	Indicates the location of reference information.
<b>?</b>	Indicates the location of reference information.
*	Indicates that descriptive information is provided below.
[ ]	Menus, commands, dialogs, buttons in a dialog, and other names on the screen and the keys are indicated in brackets.
SET (Bold charac- ters)	Bold characters within the text indicate operating button labels.
Windows	Unless otherwise specified, "Windows" represents Windows 7 or Windows 10.

The screen of this logger displays characters in the following manner.



#### Accuracy

We define measurement tolerances in terms of rdg. (reading) and dgt. (digit) values, with the following meanings:

rdg. (reading or displayed value)	The value currently being measured and indicated on the measuring instrument.
dgt. (resolution)	The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1" as the least-significant digit.

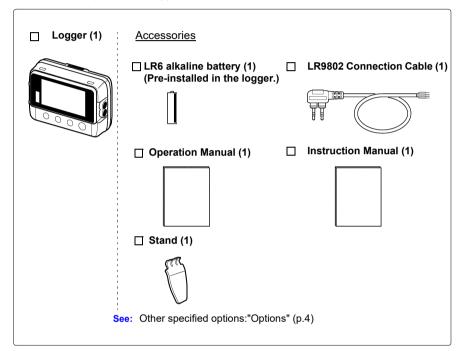
#### Mouse Operation

Click	Press and quickly release the left button of the mouse.
Right-click	Press and quickly release the right button of the mouse.
Double click	Quickly click the left button of the mouse twice.
Drag	While holding down the left button of the mouse, move the mouse and then release the left button to deposit the chosen item in the desired position.
Activate	Click on a window on the screen to activate that window.

## **Verifying Package Contents**

When you receive the logger, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Quantities in parentheses ().



#### **Options**

The options listed below are available for the instrument. To order an option, please contact your authorized Hioki distributor or reseller. Options are subject to change. Please check Hioki's website for the latest information.

□ LR5091 Communication Adapter(1) (Includes LR5000 Utility Program\* CD [PC application software] and USB Cable)



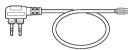
See: LR5091 specification: (p.88)

□ LR5092-20 Data Collector (Includes LR5000 Utility Program\* CD [PC application software], LR03 alkaline battery x2, Instruction manual, and USB Cable)



\* :The latest version can be downloaded from our web site.

□ LR9802 Connection Cable (Cable length: Approx. 1 m)



☐ LR9901 Wall-Mounted Holder



See: Method of mounting: (p.45)

☐ Z5004 Magnetic Strap



See: Method of mounting: (p.45)

#### **Transporting Precautions**

Use the original packing mater ials when transporting the logger, if possible. Pack the logger so that it will not sustain damage during shipping, and include a description of existing damage. We do not take any responsibility for damage incurred during shipping.

## **Safety Information**

This manual contains information and warnings essential for safe operation of the logger and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.



A DANGER This logger is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the logger. However, using the logger in a way not described in this manual may negate the provided safety features.

Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from logger defects.

#### Safety Symbols

Markings on the logger have the following meanings.



In the manual, the  $\triangle$  symbol indicates particularly important information that the user should read before using the logger.



The A symbol printed on the logger indicates that the user should refer to a corresponding topic in the manual (marked with the 🔝 symbol) before using the relevant function.



Indicates DC (Direct Current).

#### Symbols for Various Standards

Markings on the logger have the following meanings.



Indicates that the product conforms to regulations set out by the EU



This symbol indicates that the product conforms to safety requlations set out by the EC Directive.

#### **Danger Levels**

The following symbols in this manual indicate the relative importance of cautions and warnings.



Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user. Indicates that incorrect operation presents a significant hazard

Indicates that incorrect operation presents a possibility of injury to the user or damage to the logger.

that could result in serious injury or death to the user.

Indicates advisory items related to performance or correct operation of the logger.

## **Operating Precautions**

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

#### Installation Precautions

Operating temperature and humidity: -20 to70°C (-4.0 to 158.0°F), 80%RH or less

(non-condensating)

Storage temperature and humidity : -20 to70°C (-4.0 to 158.0°F), 80%RH or less

(non-condensating)

Avoid the following locations that could cause an accident or damage to the logger.



Exposed to direct sunlight Exposed to high temperature



In the presence of corrosive or explosive gases



Exposed to oil, other chemicals, or solvents Exposed to humidity or condensa-



Exposed to strong electromagnetic

Near electromagnetic radiators



Subject to vibration



Near induction heating systems (e.g., high-frequency induction heating systems and IH cooking utensils)



- The protection rating for the enclosure of this device (based on EN60529) is \*IP54.
  - · Although this logger is designed to resist the ingress of dust and water, it is not entirely water- or dust-proof, so to avoid shock or damage, do not use it in a wet or dusty environment.
  - \*IP54: This indicates the degree of protection provided by the enclosure of the device against use in hazardous locations, entry of solid foreign objects, and the ingress of water.
    - 5 : Protected against access to hazardous parts with wire measuring 1.0 mm in diameter. Dust-proof type (The penetration of dust cannot be prevented completely, but quantities of dust that may hinder the stated operation of equipment or safety cannot penetrate the enclosure.Aj
    - 4 : The equipment inside the enclosure is protected against the harmful effects of water splashed against the enclosure from any direction.

#### Avoiding Logger Damage



To avoid damage to the logger, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.

#### **CD Handling**

## **♠** CAUTION

- Always hold the disc by the edges, so as not to make fingerprints on the disc or scratch the printing. Never touch the recorded side of the disc. Do not place the disc directly on anything hard.
- · Do not wet the disc with volatile alcohol or water, as there is a possibility of the label printing disappearing.
- To write on the disc label surface, use a spirit-based felt pen. Do not use a ball-point pen or hard-tipped pen, because there is a danger of scratching the surface and corrupting the data. Do not use adhesive labels.
- · Do not expose the disc directly to the sun's rays, or keep it in conditions of high temperature or humidity, as there is a danger of warping, with consequent loss of data.
- · To remove dirt, dust, or fingerprints from the disc, wipe with a dry cloth, or use a CD cleaner. Always wipe from the inside to the outside, and do no wipe with circular movements. Never use abrasives or solvent cleaners.
- Hioki shall not be held liable for any problems with a computer system that arises from the use of this CD, or for any problem related to the purchase of a Hioki product.

#### **Preliminary Checks**

Before using the logger the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

MARNING Before using the logger, make sure that the insulation on the connection cables is undamaged and that no bare conductors are improperly exposed. Using the logger in such conditions could cause an electric shock, so contact your dealer or Hioki representative for replacements.

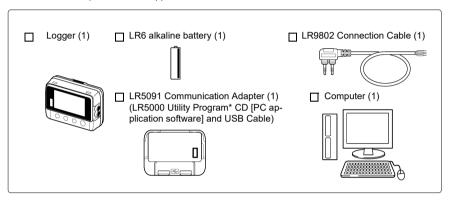
## **Measurement Preparation to Data Analysis**

The steps from measurement preparation to data analysis are illustrated with a typical measurement example.

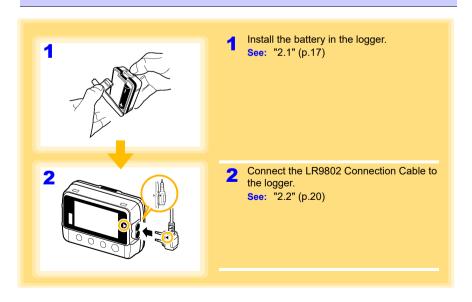
Example Case: Record a factory flow sensor output signal (1-5 V) at one-minute intervals for one month, and store the data on a computer.

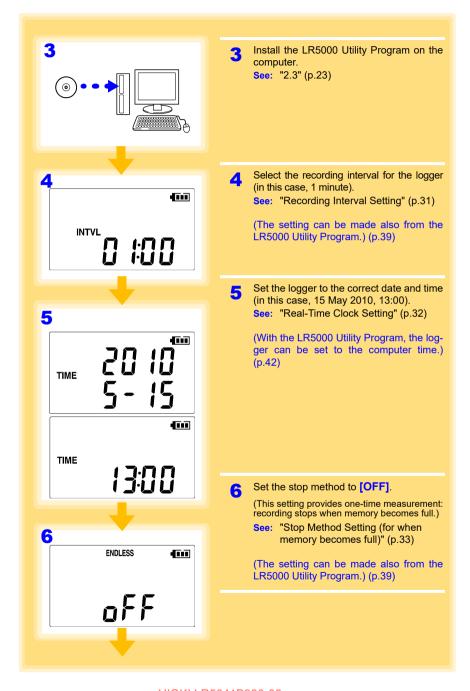
#### **Required Items:**

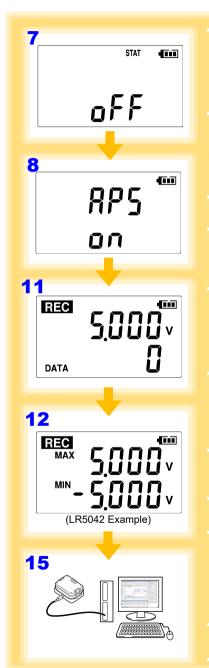
Quantities in parentheses ().



#### **Procedure:**







7 Set the recording mode to [OFF].

(This setting provides instantaneous measurement.)

See: "Recording Mode Setting" (p.34) (The setting can be made also from the LR5000 Utility Program.) (p.39)

Set the power save setting to [ON].

(The on (enabled) setting is recommended for long-term recording.)

See: "Power Save Setting" (p.34)
(The setting can be made also from the

LR5000 Utility Program.) (p.38)

Pre-measurement inspection (p.43)

10 Install the logger at the measurement site in the factory.

See: "4.2" (p.44)
(It can be wall-mounted.)

11 Hold REC/STOP on the logger for two seconds to start recording.

(Confirm that the recording data count is incrementing and that recording is actually occurring.)

See: "4.3" (p.46)

12 Switch the logger display by pressing the (+) and (-) buttons to check maximum and minimum recorded values.

(Confirm that recording is actually occurring.)

See: "4.4" (p.49)

13 After a month, hold REC/STOP on the logger again for two seconds to stop recording. See: "4.3" (p.46)

Retrieve the logger from the measurement site.

15 Import recorded data from the logger to a connected computer. For analysis, display the data in a graph.

See: "4.5" (p.49)

(The data is automatically saved when imported to the computer. By default, it is also automatically displayed in a graph.)

16 Print recorded data as needed.

See: "4.8" (p.64)

## Overview

# **Chapter 1**

#### 1.1 Product Overview and Features

This instrument is a compact portable data logger for measuring, displaying, and recording DC voltage.





Records up to 60,000 measurements

Splash-proof ingress protection (IP54)



Large display shows measured DC voltage value and recorded data count

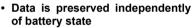
Measures DC voltage (one channel).



Browse and manage data with LR5000 Utility Program on a PC.

The LR5000 Utility Program PC application is very easy to install.

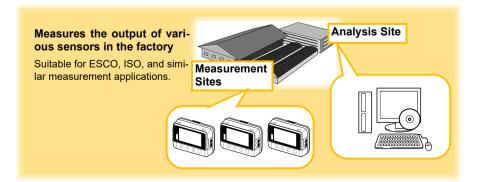
After installation, data management and browsing is easy with auto-start, data display and saving.



 Recording continues (for approx. 30 s) during battery replacement

#### Advanced functions included

- Record statistical values(p.33), (p.39)
  - Scaling (p.40), (p.67)
  - Alarm display (p.41)
- Preheat output (p.35)



## 1.2 Part Names/Functions and Display Indicators

#### **Front**

#### LCD (p.13)

IR Port (p.49) Communicates with the LR5091

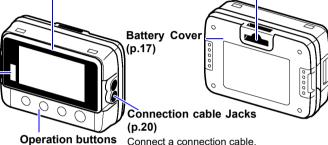
The display blanks after 30 seconds of operator inactivity (auto power save). The display reappears by pressing a button.

When the display is visible, it refreshes about once per second.

#### Back

#### Stand/Strap Attachment Hole (p.44)

Attach the logger to a wall or other surface by hanging it on a screw. (Supported screw head dimensions: up to approx. 6.8 mm in diameter and approx. 2.5 mm in thickness)



Connect a connection

#### Operation Buttons

#### **SET** button

Communication

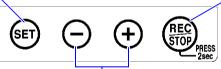
LR5092-20 Data Collector

Adapter or

#### Displays settings.

#### **REC/STOP** button

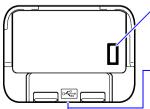
Hold for two seconds to start/stop recording. From a setting display, switches to measurement display.



#### (-) button, (+) button

Changes Measurement display contents. Changes setting values on the Settings display.

### LR5091 Communication Adapter



#### IR Port (p.49)

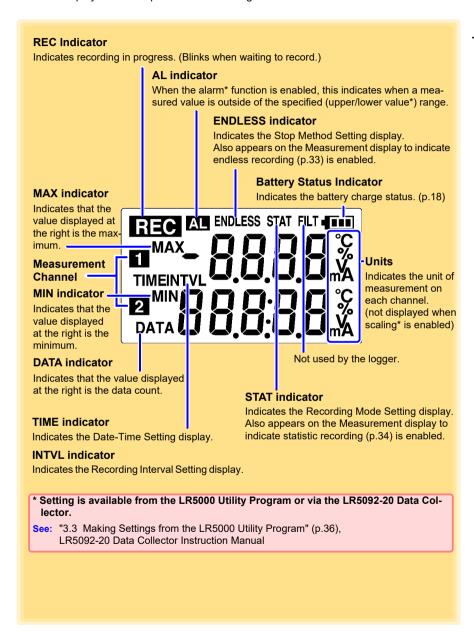
Communicates with the logger.

#### USB Port (p.36)

Connect a USB cable here to communicate with a computer. (Mini-B receptacle)

#### **Display Indicators**

The display indicators provide the following information.

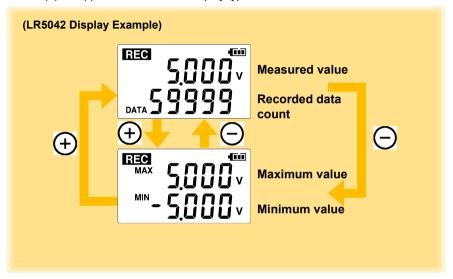


## 1.3 Display Organization

The logger has two general display types: Measurement and Settings.

#### Measuring display

The (+) and (-) buttons switch the display type.

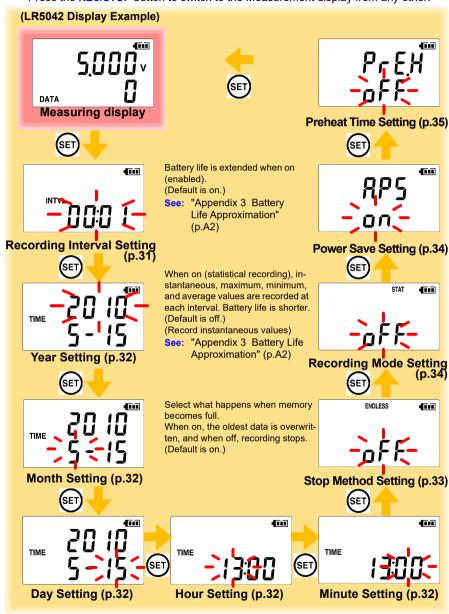


## NOTE

- For instantaneous recording, the maximum and minimum values are obtained from all the data measured at each recording interval.
- For statistical recording, the maximum and minimum values are obtained from all the data measured every second.
- The maximum and minimum values are not displayed when the recorded data count is 0.

#### **Setting display**

Select the display with the **SET** button. Press (+) and (-) to change a setting. Press the **REC/STOP** button to switch to the Measurement display from any other.



#### 1.3 Display Organization

## NOTE

- When no operation occurs for 30 seconds with the Settings display, automatically switches to Measurement display.
- When the T battery indicator appears, settings cannot be changed (although they can still be displayed).
- Settings cannot be changed while recording. However, settings can still be displayed by pressing the SET button from the Measurement display.

# Measurement Preparations

# **Chapter 2**

## 2.1 Installing (or Replacing) the Battery

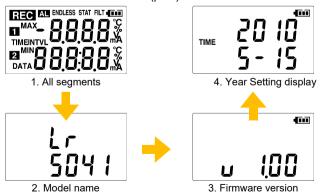


## **\_**WARNING

- After replacing the battery, replace the cover before using the logger.
- Be sure to insert them with the correct polarity. Otherwise, poor performance or damage from battery leakage could result. Replace batteries only with the specified type.
- Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.
- Handle and dispose of batteries in accordance with local regulations.

## NOTE

- Data and settings stored in the logger are retained even when the battery is depleted, and during battery replacement.
- The clock can keep good time for several minutes even when the battery is removed during a battery change.
- Once the battery indicator appears, operation can still continue for about 30 seconds when the battery is removed during recording.
- Testing monitor batteries installed in the unit may possibly be weak.
   Replace batteries before extended measurement usage.
- Use only LR03 Alkaline batteries. Using manganese batteries may not result in accurate measurements or proper communication with the LR5091 Communication Adapter and LR5092-20 Data Collector.
- After installing the batteries, the following displays appear, and the date and time need to be set. (p.32)



## NOTE

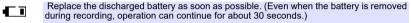
- When the  $\blacksquare \ \$  battery indicator appears, settings cannot be changed (although they can still be displayed).
- When battery voltage is too low to operate the logger, the following appears. Replace the battery to restore normal operation.

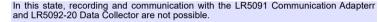


#### **Battery Status Indicator**

This indicator is displayed at the top right corner.

Battery charge remains. Fewer blocks within the indicator signify weaker battery charge
---





#### **Using a NiMH Battery**

4

The battery status indicator does not accurately show the remaining battery capacity when using a NiMH battery. Moreover, the battery life will vary greatly with the capacity, charging conditions and repeated uses. Please take note of these points when usina it.

The device's battery status display and battery life are based on the usage of a brandnew alkaline battery.

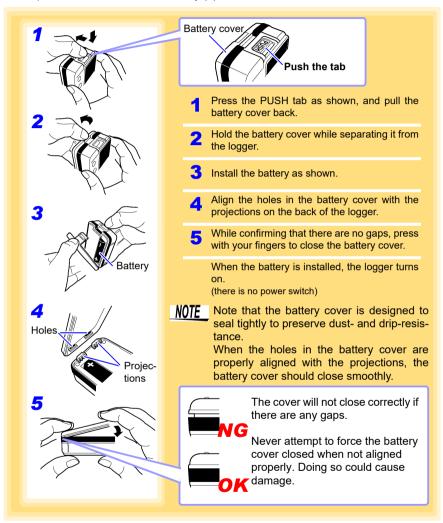
#### When the logger will not be used for long time



\*\*CAUTION To avoid corrosion and damage to this instrument from battery leakage, remove the batteries from the instrument if it is to be stored for a long time (1 week).

#### **Battery Replacement**

Required Items: LR6 alkaline battery (1)



### 2.2 Connecting a Connection Cable



Connect a connection cable to the logger's connection cable jacks.



- To avoid breaking the cable, do not bend or pull it.
- Avoid stepping on or pinching cables, which could damage the cable insulation.

#### **Connection Method**

Required Items: Hioki LR9802 Connection Cable



Align the triangles on the plug body and in front of the connection cable jacks, and insert the plug securely.

Correct values are not displayed unless the plug is inserted all the way in.



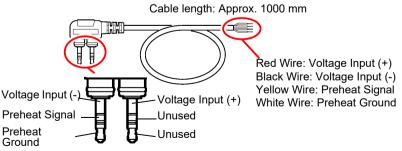
(LR5043 Example)

If values are not displayed correctly even when the plug is inserted properly, the logger or cable may be damaged. Repair may be necessary.

See: "Requesting repairs" (p.91)

#### **Connection Cable**

#### **LR9802 Connection Cable**

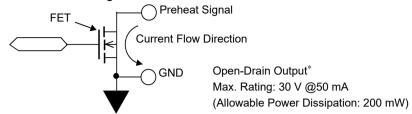


When the preheat signal is not used, insulate the preheat signal wire (yellow) and the preheat ground wire (white) with a insulating tape not to touch mistakenly each other.

NOTE

#### **About the Preheat Signal**

#### Internal Preheat Signal Circuit

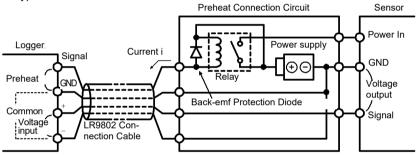


\* The FET switch between the preheat signal and ground is turned on during preheating. Connect to allow preheat signal current flow to ground.

#### **Preheat Signal Connection Circuit Example**

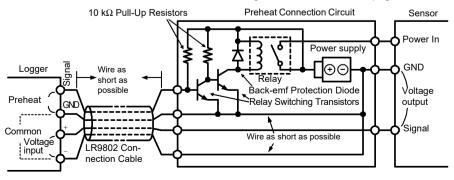
The preheat signal switches power to the sensor on and off. Connect the logger, sensor, power supply, and relay as shown below.

< Typical Circuit >



< When Sensor Output Voltage Is Low >

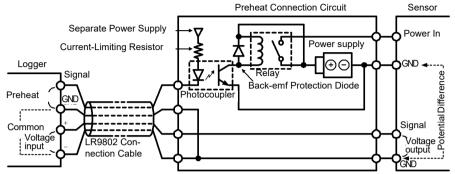
In the above circuit, if relay current (i) is large and sensor output voltage is low, measurement values may be affected by current flow in the connection cable. The amplitude of the effect is determined by cable resistance (about  $0.2\Omega$ ) and relay current (i). For example, if the relay current is 10 mA, the effect is 10 mA ×  $0.2~\Omega$ =2 mV. When the sensor output voltage is low, this 2 mV results in erroneous measurements. In such cases, the effect can be minimized using the circuit on the next page.



#### 2.2 Connecting a Connection Cable

#### < Isolating the Preheat Signal >

If the ground side of the power supply cannot be connected to measurement signal ground, isolate the preheat signal as shown in the following circuit diagram. However, in this case, a separate photocoupler power supply is required.



## NOTE

- When connecting a relay, transistors, and a photocoupler to the preheat signal line, be sure that the connected supply voltage and drive current do not exceed the maximum preheat signal ratings (30 V, 50 mA).
- When using a relay, be sure to include a back-emf protection diode to prevent damage from counter-emf when relay coil power is removed.

## 2.3 Installing the PC Application Program

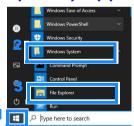
To save, browse, or print data, or to make logger settings from a computer, first install the "LR5000 Utility Program".

#### **LR5000 Utility Program Operating Requirements**

CPU	1 GHz or faster processor clock
RAM	1 GB or more (32-bit), 2 GB or more (64-bit)
os	Windows 7 or Windows 10
Library	.NET Framework 4.5.2 or later
Interface	USB
Monitor Resolution	1024×768 or higher
Hard Disk	At least 30 MB free space (Additional space is required for storing recorded data.)

#### Installation Procedure

- Start the computer.
   Administrator authority may be required for the installation.
- 2. Set the included CD to the CD-ROM drive.
- Click [Start] to display the application list.
  Click [Windows System] [File Explorer] to start Explorer.



Click [This PC], and then, double-click [CD Drive (D)] drive.



5. Double-click the [english] folder.



**6.** Double-click [setup.exe] (SET UP file).



(The extension may not be displayed.) After the installer starts, follow the instruction to proceed with the installation.



#### If the computer fails in the installation

Some computers, depending on system environments including OS and security, can fail in the installation using the CD-R.

In such a case, download the executable program from the "Drivers, Firmware, Software" page of Hioki's website, and then install it again.

The data logger series LR5000 programs consists of LR5000 Utility Program and LR5091/LR5092 Device Driver, both of which need to be installed.

If the earlier version of LR5091/LR5092 Device Driver has been installed, uninstall it before installing the latest version of program.

Ask your system administrator if installing application programs or changing system environments is prohibited for security reasons.



#### How to start the program?

The program starts automatically from the next Windows logon. (The icon appears in the task tray (notification area) (p.32).)

Click the icon and click [Show Main Screen].



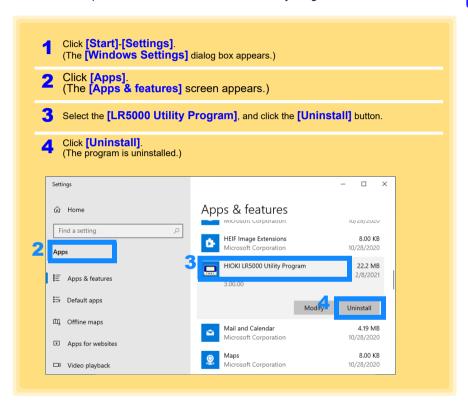
For setting and importing recorded data from loggers other than the LR5000 series, use the Communication Utility program supplied with the model 3911 or 3912 Communication Base. You can browse the recorded data by using LR5000 Utility Program also.

## NOTE

Settings and recorded data are not deleted when uninstalling or upgrading the program.

#### **Uninstall Procedure**

Follow this procedure to uninstall the LR5000 Utility Program.

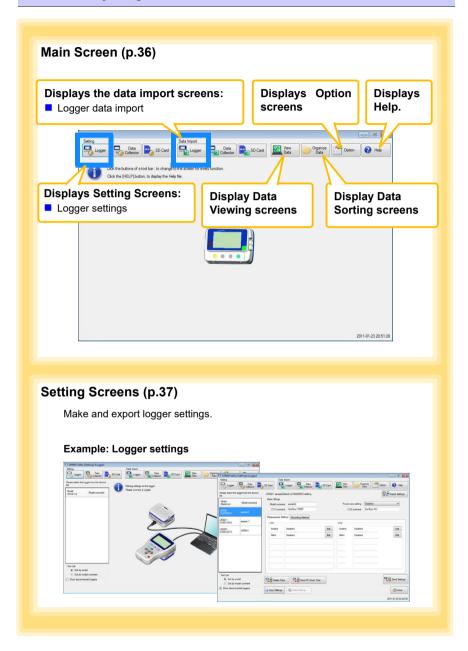


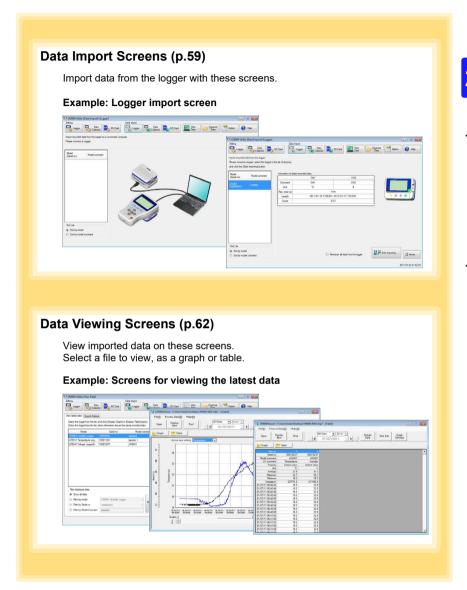
#### **Version Upgrading**

Download the latest version of the LR5000 Utility Program from our website (http://www.hioki.com).

Follow the procedure on the download page to install the latest version. (The old version is uninstalled automatically.)

#### **LR5000 Utility Program Screens**



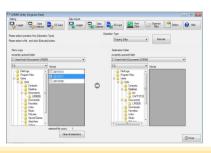


#### Data Sorting Screens (p.75)

Sort imported data on these screens.

You can copy, delete, move, combine, and extract data.

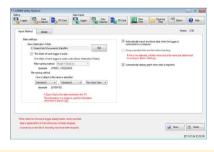
#### Example: Data Copy screen



#### **Option Screens (p.81)**

Make advanced settings on these screens. You can specify the data importing method.

#### **Example: Import Method Setting screen**



## **Settings**

# **Chapter 3**

Configure measurement settings before starting to record. Logger settings can also be made from a PC running the LR5000 Utility Program. (p.36)

## 3.1 Settings List

Following is a list of all settings.

Although all settings are available from the LR5000 Utility Program, some settings are limited when made from the logger.

Setting Item	Setting Options	Logger	Refer To	LR5000 Utility Program	Refer To
Recording Interval	Sets the recording interval.	Yes	(p.31)	Yes	(p.39)
Current Date and Time	Set the current year, month, day, hour, and minute. (The LR5000 Utility Program can set the logger's clock to match the computer's.)	Yes	(p.32)	Yes	(p.42)
Stop Method	Select the processing method when memory becomes full.	Yes	(p.33)	Yes	Included in the recording stop method
Recording Mode	Selects instantaneous or statistical value recording (measurements are taken once per second, and instantaneous, maximum, minimum, and average values are saved at each recording interval).	Yes	(p.34)	Yes	(p.39)
Power Save	Battery life is extended when on (enabled).	Yes	(p.34)	Yes	(p.38)
Preheat Time	Select the ON time for external sensor power control.	Yes	(p.35)	Yes	(p.40)
Model Comment	Enter a comment for the specified logger.	No	-	Yes	(p.38)
Channel Comment	Enter a comment for the specified measurement channel.	No	-	Yes	(p.38)
Recording Start Method	Select the recording start method. (The start time can be specified.)	No	-	Yes	(p.39)

## 3.1 Settings List

Setting Item	Setting Options	Logger	Refer To	LR5000 Utility Program	Refer To
Recording Stop Method	Select the recording stop method. (The stop time can be specified.)		-	Yes	(p.39)
Scaling	Use to scale measured values to display as adjusted values.	No	-	Yes	(p.40)
Alarm Thresholds	Set upper and lower threshold values to display the alarm indicator [AL] on the logger.	No	-	Yes	(p.41)

# 3.2 Making Settings on the Logger

To return to the Measurement display from any Settings display, press the REC/ STOP button.



- When no operation occurs for 30 seconds with Settings displayed, automatically switches to Measurement display.
- Settings cannot be changed while recording. However, settings can still be displayed by pressing the SET button from the Measurement display.

# **Recording Interval Setting**



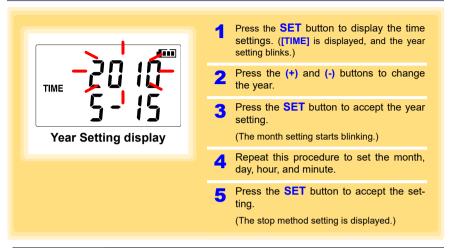
- 1 Press the **SET** button to display the interval setting. (The **[INTVL]** indicator appears, and the setting blinks.)
- Press the (+) and (-) buttons to change the recording interval.

  Example of configuration:
  1sec 00:01, 1 minute 01:00
- Press the SET button to accept the setting. (The year setting is displayed.)

Recording Interval

1(Default)/2/5/10/15/20/30 sec., 1/2 /5/10/15/20/30/60 min

# **Real-Time Clock Setting**



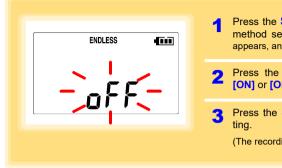
**Setting Range** 01/01/2010, 00:00 to 12/31/2039, 23:59

Note: Seconds are not settable. However, seconds are set to zero at the instant the display is switched away from the minute setting.

NOTE

After the battery has been removed for a long time, or if the clock is incorrect, reset it.

# Stop Method Setting (for when memory becomes full)



- Press the **SET** button to display the stop method setting. (The [ENDLESS] indicator appears, and the setting blinks.)
- Press the (+) and (-) buttons to select [ON] or [OFF].
- Press the **SET** button to accept the set-

(The recording mode setting is displayed.)

Setting Options	Description	
OFF	Recording stops when memory becomes full (One-Time Recording).	
ON(Default)	The oldest data is overwritten when memory is full (Endless Recording).	



When memory becomes full during one-time recording, the recorded data count appears as follows.



(the Measurement display shows channel measurement value and recorded data count)

When memory becomes full during endless recording, the recorded data count (equal to the memory capacity) remains constant.

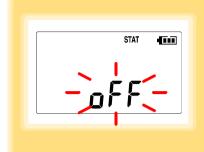


(instantaneous value recording display)



(statistical value recording display)

# **Recording Mode Setting**



- Press the SET button to display the recording mode setting. (The [STAT] indicator appears, and the setting blinks.)
- Press the (+) and (-) buttons to select [ON] or [OFF].
- **3** Press the **SET** button to accept the setting.

(The power save setting is displayed.)

Setting Options	Description	
OFF (Default)	The instantaneous value is recorded at each recording interval (instantaneous recording).	
ON	When on, measurements are taken once per second, and instantaneous, maximum, minimum, and average values are recorded at each recording interval. (statistical recording). (Up to 15,000 data values can be recorded.)	



Statistical recording cannot be selected when the recording interval is set to one second.

# **Power Save Setting**

The power save function turns off the display 30 seconds after the last button is pressed. The display reappears upon the next button press.



- 1 Press the **SET** button to display the power save setting ([APS] appears, and the setting blinks).
- Press the (+) and (-) buttons to select [ON] or [OFF].
- **3** Press the **SET** button to accept the setting.

(The measurement display appears.)

Setting Options	Description	
ON (Default)	Power save is enabled.	
OFF	Power save is disabled (the display remains visible).	

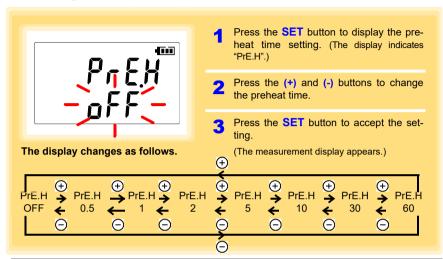


The Auto Power Save feature consumes a small amount of current

See: "Appendix 3 Battery Life Approximation" (p.A2)

# **Setting the Preheat Time**

The preheat function provides an output signal synchronized to the logger's measurement timing, to control power supplied to each sensor.



Setting Options

Description

Preheat Time

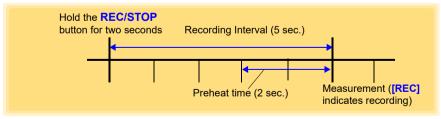
OFF(Default)/0.5/1/2/5/10/30/60 sec.



The preheat time cannot be set longer than the recording interval. It must be set shorter than the recording interval (longer preheat times are not available). Also, if the recording interval is set shorter than the preheat time setting, the preheat setting is automatically changed to [OFF].

# Preheat Signal Output Timing (when Preheat is enabled)

- 1. During measurement display: The Preheat signal is output continuously.
- When a measurement is not displayed: Measurement (recording) occurs after the specified preheat time.



# NOTE

- When power save is enabled and a button is pressed to display the measured value, some time may be required for the measured value to stabilize, according to the response time (from power-up to stable output) of the sensor.
- When the preheat time setting is not OFF, and during statistical value recording, the preheat signal is output continuously.

# 3.3 Making Settings from the LR5000 Utility Program

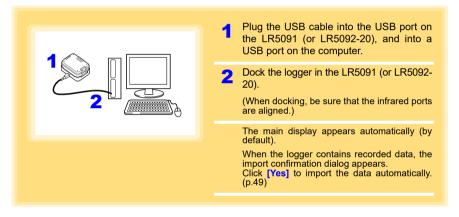
Logger settings can be made with the LR5000 Utility Program supplied with the LR5091 Communication Adapter and the LR5092-20 Data Collector.

Install the LR5000 Utility Program on the computer before connecting. (p.23)

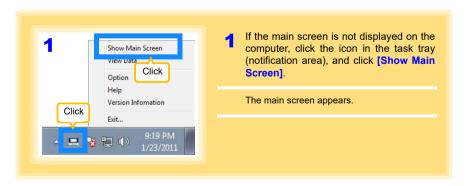
# Connecting the Logger, LR5091, and Computer

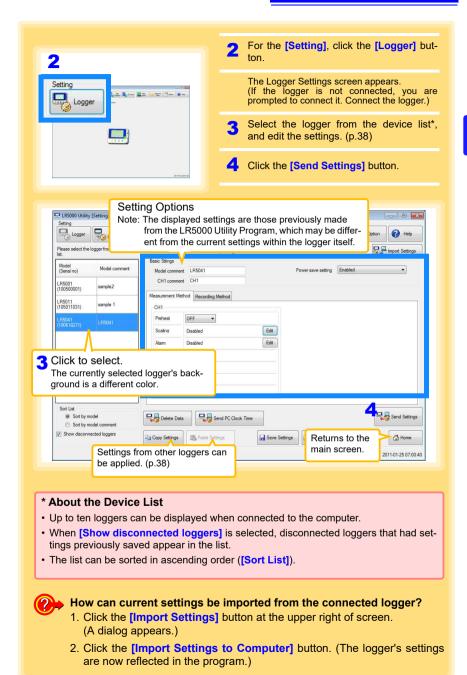
Connect to the computer using the supplied USB cable.

Required Items: Logger, LR5091 Communication Adapter, USB cable, Computer



# Logger Settings



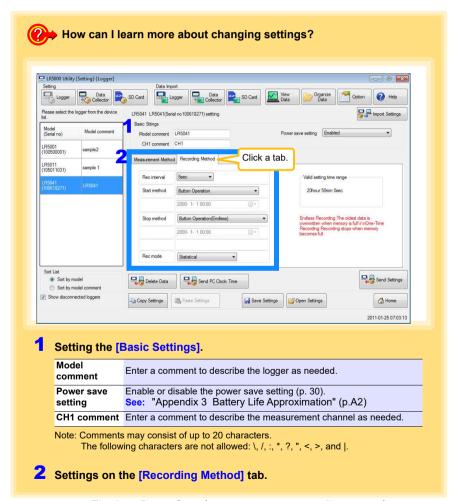


# 3.3 Making Settings from the LR5000 Utility Program



### How can the settings from one logger be copied to another?

- From the device list, select a logger with settings to be copied, and click the [Copy Settings] button.
- 2. From the device list, select a logger as the destination for the settings, and click the [Paste Settings] button. (A dialog appears.)
- 3. Click the [Paste] button in the dialog box. (The settings are copied.)



NOTE

The Auto Power Save feature consumes a small amount of current

#### Rec interval

Sets the recording interval.

1/2/5/10/15/20/30 sec., 1/2 /5/10/15/20/30/60 min

#### Start Method

Select the recording start method.

When [Scheduled Time] is selected, specify the start date and time.

Setting Options	Description	
Setting Options	Description	
<b>Button Operation</b>	Starts recording by pressing the button on the logger.	
Start After Sent	Starts recording by pressing the [Send Settings] button.	
Scheduled Time	Starts recording at the scheduled time after pressing the [Send Settings] button.	
Valid setting time	01/01/2010, 00:00 to 12/31/2039, 23:59	
range	01/01/2010, 00:00 to 12/31/2039, 23:39	
·		



When the [Scheduled Time] start method is enabled, the [REC] indicator on the logger display blinks until the specified start time.

### Stop Method

Select the recording stop method.

When [Scheduled Time (Endless)] or [Scheduled Time (One-Time)] is selected, the date and time need to be set.

Setting Options	Description	
Button Operation (endless)	Stops recording by pressing the button on the logger. The oldest data is overwritten when memory is full.	
Button Operation (one-time)	Stops recording by pressing the button on the logger. Recording also stops when memory becomes full.	
Scheduled Time (Endless)	Stops recording at the scheduled time. The oldest data is overwritten when memory is full.	
Scheduled Time (One-Time)	Stops recording at the scheduled time. Recording also stops when memory becomes full.	
Hold Data at Scheduled Time	Specify when setting [Scheduled Time (Endless)]. Select this check box to record the data at the scheduled time and stop recording.	

#### **Rec Mode**

Select the recording mode.

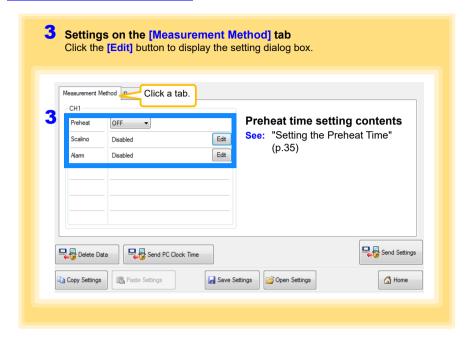
Setting Options	Description	
Instantaneous	The instantaneous value is recorded at each recording interval.	
Statistical	Measurements are taken once per second, and instantaneous, maximum, minimum, and average values are recorded at each recording interval. (Up to 15,000 data values can be recorded.)	

See: Statistical recording results in shorter battery life. "Appendix 3 Battery Life Approximation" (p.A2)



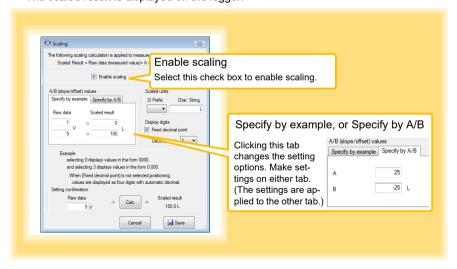
Statistical recording cannot be selected when the recording interval is set to one second.

# 3.3 Making Settings from the LR5000 Utility Program



# Scaling (set as needed) See: "What is Scaling?" (p.42)

The following scaling calculation is applied to measured values. Scaled Result = Raw data (measured value) × A + B × SI prefix (multiplier) The scaled result is displayed on the logger.



# 3.3 Making Settings from the LR5000 Utility Program

### 1. Set the following options.

Setting Options	Description	
Specify by example	Enter two known conversion points (up to ten digits each).	
Specify by A/B	Enter the scaling coefficients (A and B, up to ten digits each).	
Scaled units	<ul> <li>Select the [SI Prefix].     ([p]=1E-12, [n]=1E-9, [μ]=1E-6, [m]=1E-3, blank =1E0, [k]=1E3, [M]=1E6, [G]=1E9, [T]=1E12)</li> <li>Enter the [Char. String] to identify the scaled units.     (Up to five characters, except  /, :, *, ?, ", &lt;, &gt;, and  .)</li> </ul>	
Select [Fixed decimal point] and specify the [Decimal digits] to played to the right of the decimal point. Valid settings are 0 to 3. (Examples: selecting 0 displays values in the form 0000, and selectin plays values in the form 0.000) When [Fixed decimal point] is not selected, values are displayed as fits (0.000 to ±9999) with automatic decimal positioning.		

#### Confirm settings.

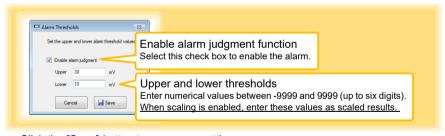
Setting confirmation  Confirm that scaling is performed properly. Enter any numerical value as raw data, and click the [Calc] button to scaled result.
--

#### Click the [Save] button.

(Scaling settings are saved, and the display returns to the Logger Settings screen.) Note: If you click the [Cancel] button without saving the settings, the display still returns to the Logger Settings screen.

# Alarm Thresholds (set as needed)

Set the upper and lower alarm threshold values. When a measurement is outside of the specified area, the [AL] (alarm) indicator is displayed on the logger.



Click the [Save] button to save your settings.

(The display returns to the Logger Settings screen.)

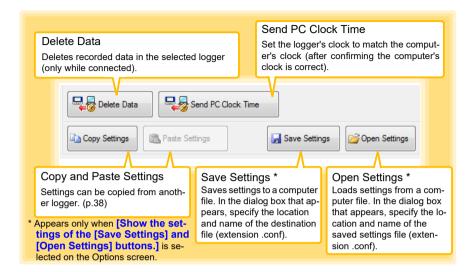
Note: If you click the [Cancel] button without saving the settings, the display still returns to the Logger Settings screen.

Note: Alarm judgment is performed at every recording interval during instantaneous recording, and once per second during statistical recording.

Note: Alarm judgment is performed using measurement values with a larger number of digits than the values (4 digits) indicated in the LR5041, LR5042, LR5043 display.

Note: The [AL] indicator appears when the measured value is out of range (OF/UF displayed), and when a sensor anomaly occurs (- - - - displayed).

# Other Settings on the Logger Settings Screen

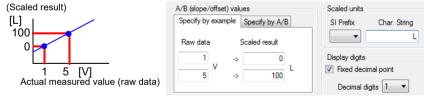


# What is Scaling?

Scaling converts actual measurement values to their corresponding values in arbitrarily determined units for display. This is convenient for converting the voltage values provided by the logger for display as the corresponding physical values the sensor is intended to measure.

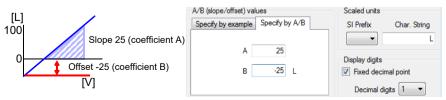
For example, if a flow sensor provides a 1 to 5 V output signal corresponding to 0 to 100 liters flow measurement, set as follows.

# To specify by conversion example



# To specify by A/B slope/offset

Slope = increase in scaled result / increase in measured value For the example case, (100 L - 0 L) / (5 V - 1 V) = 25

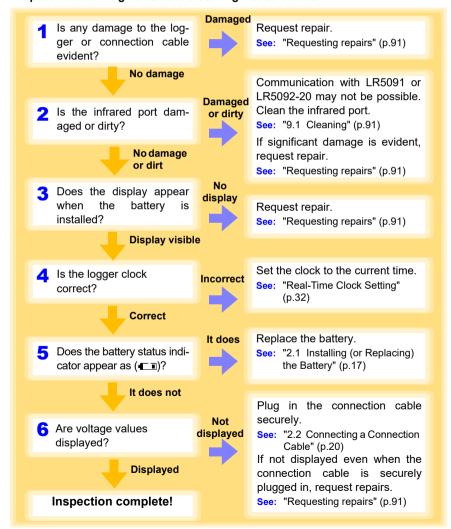


# Measurement and Analysis

# **Chapter 4**

# 4.1 Pre-Measurement Inspection

Inspect the following items before starting measurement.



#### 4.2 Installing the Logger

After inspection, install the logger at the measurement site. Be sure to read the "Installation Precautions" (p.6) before installing. Install the logger as necessary according to the following procedure.

WARNING Persons wearing electronic medical devices such as a pacemaker should not use the Z5004 strap with magnet. Such persons should avoid even proximity to the Z5004, as it may be dangerous. Medical device operation could be compromised, presenting a hazard to human life.

CAUTION Do not apply heavy downward pressure with the stand extended. The stand could be damaged.

# NOTE

- Avoid shocking the Z5004, such as by dropping. Shock can cause it to be chipped or cracked.
- Do not use the Z5004 where it may be subject to rain, dust, or condensation. Use in such conditions may cause corrosion or deterioration of the magnet.
- If the Z5004 is brought near a magnetic memory device such as a floppy disk, credit/debit card, or pre-paid card or ticket, the device may become unusable due to data corruption. It can also cause damage if brought near a precision electronic device such as a computer. TV. or electronic wristwatch

# Using the Stand

Required Items: Stand (Accessory)

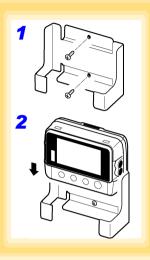


Attach the stand to the strap/stand attachment

Stand up the logger.

# Wall Mounting with the LR9901 Wall-Mounted Holder

Required Items: LR9901 (Option), 2 screws (supplied with the LR9901), screwdriver, etc. (as needed)

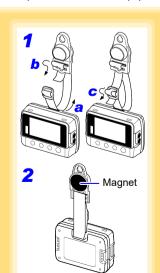


Mount the LR9901 to the wall using the two screws.

- 2 Insert the logger into the LR9901.
- The logger can also be attached to a wall or other surface by hanging the strap or attachment hole on a screw. (Supported screw head dimensions: up to approx. 6.8 mm in diameter and approx. 2.5 mm in thickness)

# **Wall Mounting with the Z5004 Magnetic Strap**

Required Items: Z5004 (Option)



- 1 Attach the Z5004 to the strap/stand attachment hole.
  - (feed the strap through a, b, and c)

2 Attach the magnet to the wall (ferrous material).

# Starting and Stopping Recording

Install the logger, connect the leads to the measurement object, and start recording.



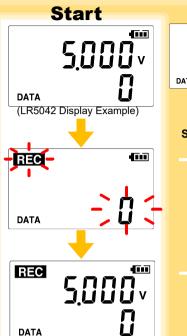
To avoid electrical shock, be careful to avoid shorting live lines with the connection cable.

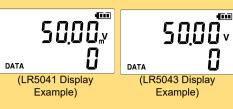
- MARNING In order to prevent electric shock and short-circuit accidents, shut off the power to the line to be measured before connecting the connection cable.
  - · Ensure that the input does not exceed the maximum rated voltage or current to avoid logger damage, short-circuiting and electric shock resulting from heat building.
  - The maximum rated voltage between input terminals and ground is 60 VDC. Attempting to measure voltages exceeding 60 V with respect to ground could damage the logger and result in personal injury.



Recording cannot start when the battery is depleted. When the battery becomes exhausted during recording, recording stops.

See: "2.1 Installing (or Replacing) the Battery" (p.17)





**Start** From the Measurement display, hold the **REC/STOP** button for two seconds.

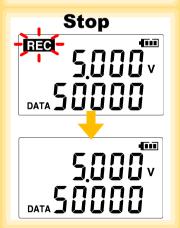
The [REC] indicator and the data count blink.

Note: Continue pressing the button until the [REC] indicator changes from a blinking to on state.

When the blinking stops and the data count is zeroed, recording starts.

Logger memory contains the data for two recording sessions. (Be aware that old data is erased when starting recording after two recording sessions.)

After one second, the measurement display reappears.



Stop Hold the REC/STOP button for two seconds while recording (while [REC] is displayed).

[REC] blinks.

Note: Continue pressing the button until the [REC] indicator changes from a blinking to off state.

Data can be imported to a computer without stopping recording.

See: "4.5 Automatically Importing (Saving)
Recorded Data to a Computer, and Graph
Display" (p.49)

[REC] disappears when recording stops.

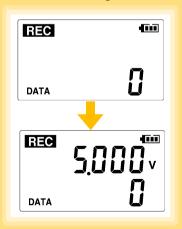
If the stop method is set to [OFF] (one-time recording), recording stops automatically when memory becomes full.(p.33)

# **Automatic Recording Start at Convenient Times**

Depending on the selected recording interval, recording start is automatically delayed until the next convenient clock time.

Recording Interval	Recording Start Time
1 sec.	00 to 59 s (1-second interval)
2 sec.	00 to 58 s (2-seconds interval)
5 sec.	00 to 55 s (5-seconds interval)
10 sec.	00 to 50 s (10-seconds interval)
15 sec.	00 to 45 s (15-seconds interval)
20 sec.	00 to 40 s (20-seconds interval)
30 sec.	00 to 30 s (30-seconds interval)
1 min	00 min, 00 s to 59 min, 00 s (1-minute interval)
2 min	00 min, 00 s to 58 min, 00 s (2-minutes interval)
5 min	00 min, 00 s to 55 min, 00 s (5-minutes interval)
10 min	00 min, 00 s to 50 min, 00 s (10-minutes interval)
15 min	00 min, 00 s to 45 min, 00 s (15-minutes interval)
20 min	00 min, 00 s to 40 min, 00 s (20-minutes interval)
30 min	00 min, 00 s to 30 min, 00 s (30-minutes interval)
60 min	00 h, 00 min, 00 s to 23 h, 00 min, 00 s (1-hour interval)

# Example: When the button is pushed to start recording at 12:01:00, and the recording interval is 10 minutes



At 12:01:00, you press the **REC/STOP** button.

The [REC] indicator in the display turns on, but recording does not start yet.

If you try starting at 12:00 but are one minute late Actual recording starts at 12:10, which is considered the next convenient time.

12:01:00 12:10:00

Recording Start Operation Actual Recording Start

At 12:10:00 Recording starts.

In the case of instantaneous value recording, the number of data soon becomes 1. In the case of statistical value recording, the number of data becomes 1 at 12:20:00.

# 4.4 Confirming Currently Measured Values and Data Recording

Confirm data recording on the Measurement display (p.14).

You can browse current measurement values (instantaneous), the count of recorded data items, and maximum and minimum values.

The (+) and (-) buttons select the type of value displayed.



How to switch from a Setting display to Measurement display?

To switch to the Measurement display from any other display, press REC/STOP.

# NOTE

- When power saving (p.34) is enabled, the display blanks after no operation occurs for 30 seconds. To browse measurement values (instantaneous) and verify each recorded data value, press any button to turn on the Measurement display.
- The currently displayed instantaneous measurement value is refreshed about once per second, regardless of the recording interval setting.

# 4.5 Automatically Importing (Saving) Recorded Data to a Computer, and Graph Display

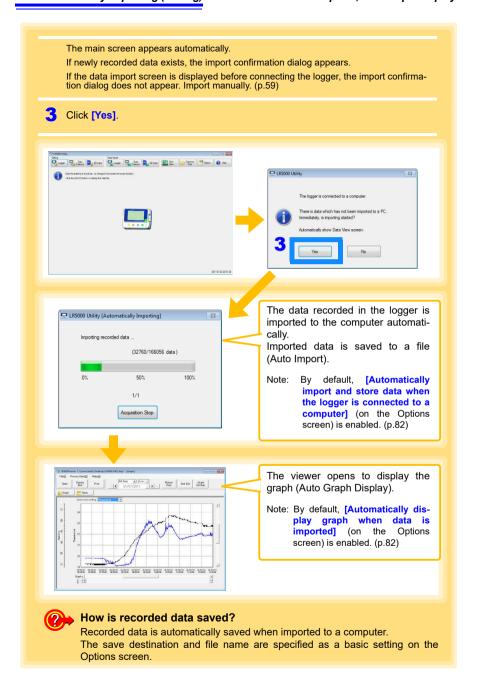
Data recorded in the logger can be imported to the computer. Install the LR5000 Utility Program on the computer beforehand. (p.23)

Required Items: Logger, LR5091 Communication Adapter (or LR5092-20 Data Collector), USB cable, and Computer



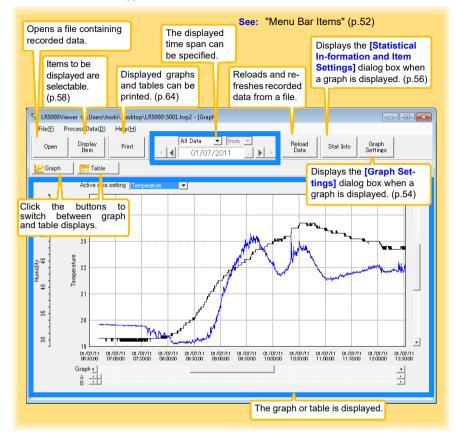
- 1 Plug the USB cable into the USB port on the LR5091 (or LR5092-20), and into a USB port on the computer.
- 2 Dock the logger in the LR5091 (or LR5092-20).

(When docking, be sure that the infrared ports are aligned.)



# Viewer Screen

The viewer screen appears as follows.



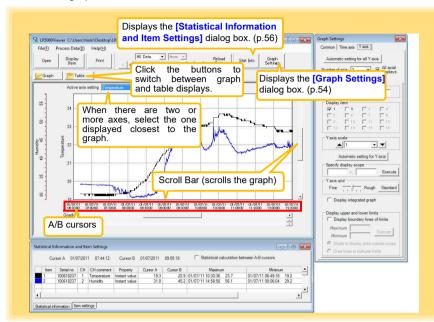
4.5 Automatically Importing (Saving) Recorded Data to a Computer, and Graph Display

# Menu Bar Items

Menu	Item	Contents
	Open	Opens a file containing recorded data.
	Recently opened recording files	Opens recently used files.
	Save recording file as	Currently displayed recording data is saved as a new file.
File	Print graph	Prints data in graphic format. (p.64)
	Paste to Microsoft Excel®	Pastes displayed data into Microsoft Excel <sup>®</sup> .
	Export CSV file	Exports displayed data as a CSV file.
	Exit	Closes the program.
Data Processing	Scaling	Applies scaling to data on one channel. (p.67)
	Power Calculation	Performs approximate electric power calculation. (p.68)
	Energy Cost	Performs approximate energy cost calculation. (p.69)
	Operating Rate	Performs approximate operating rate calculation. (p.70)
	Integration	Performs data integration. (p.71)
	Dew Point	Performs dew-point temperature calculation. (p.72)
	Two-Data-Item Arithmetic	Performs approximate two-data-item arithmetic calculation. (p.73)
	OVER Data Revision	Converts data outside of the upper and lower threshold settings to specified values, and saves as new data. (p.74)
	Help	Displays the help file.
Help	Version	Displays LR5000 Utility Program version information.

# **Main Graph Features**

The main graph features are shown below.





- 1 Drag over the area to be enlarged to enclose it in a dotted box.
- 2 Right click to open the pop-up menu, and click [Magnify selected area].



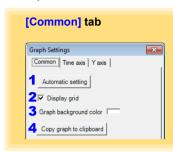
- How can graph line color and display be switched?

  Change settings on the [Item Settings] tab in the [Statistical Information
  - Change settings on the [Item Settings] tab in the [Statistical Information and Item Settings] dialog box (p.56)
- How can graph details be set?

  Detailed settings are available in the [Graph Settings] dialog box. (p.54)

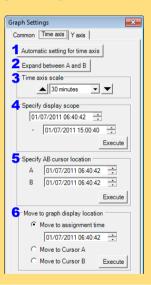
### [Graph Settings] dialog box

Graph details can be set as follows. Click each tab to access various settings.



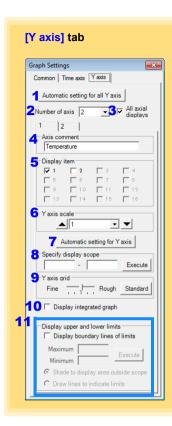
- 1 Automatically sets the time axis and Y-axis to the optimum scale.
- 2 Select to display the grid.
- 3 Changes the graph background color.
- 4 Copies the graph to the clipboard. The graph can then be pasted into Microsoft Word etc.

# [Time axis] tab



- Automatically sets the time axis to the optimum scale.
- **2** Zooms the display to show only the time span between A/B cursors.
- 3 Changes the time base scale.
- Specifies the displayed time span on the time axis. Click [Execute] to apply the settings.
- 5 Specifies cursor positions. Click [Execute] to apply the settings.
- 6 Specifies the graph start position (time). Click [Execute] to apply the settings.

### 4.5 Automatically Importing (Saving) Recorded Data to a Computer, and Graph Display

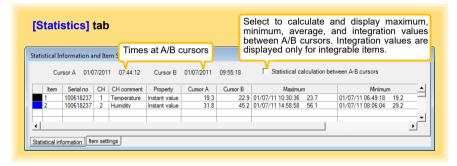


- 4 Automatically sets all Y-axes to the optimum scale.
- When the Y-axis is different for each item, set the number of axes to a value other than one. The axes can be set to the number of displayed items (up to 16).
- 3 Displays all axes.
- 4 A comment can be entered for each axis.
- 5 Select the item assigned to each axis.
- 6 Sets the Y-axis scale for each axis.
- **7** Automatically sets the currently selected Y-axis to the optimum scale.
- 8 Specifies the display span on the Y-axis. Click [Execute] to apply the settings.
- 9 Sets the Y-axis grid spacing.
- 10 Display the items selected in [Display item] on an integrated graph.
- 11 Upper and lower thresholds can be displayed as solid lines on the graph, or out-of-range areas can be filled with a solid color.

# [Statistical Information and Item Settings] dialog box

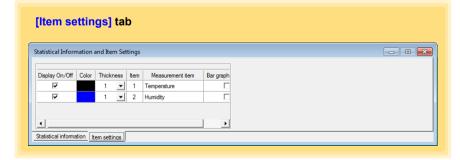
The following items appear on the [Statistical information] tab.

- · Item no.
- Serial no.
- · Channel no.
- Channel comments
- Property (Type of measurement value)
- · Measured values at A/B cursors
- · Statistical data
- Units



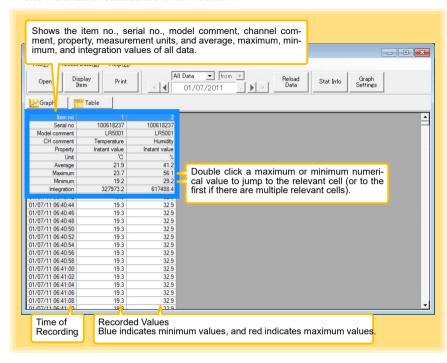
The following items appear on the [Item settings] tab.

- Display on/off
- · Graph line colors and thickness
- · Bar graph display on/off



### **Main Table Features**

The main table features are shown below.



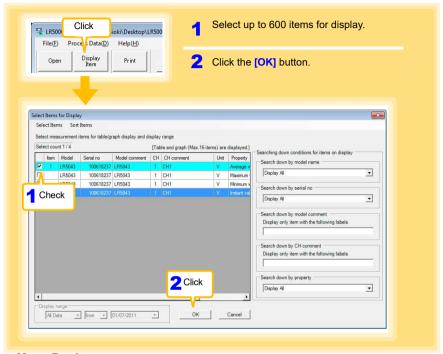
#### **Convenient Table Functions**

Use the following operations to scroll the table and copy data to the clipboard.

Item	Contents
Press Ctrl and Home keys simultaneously	Moves to the upper left corner of the table.
Press Ctrl and End keys simultaneously	Moves to the lower right corner of the table.
Home key	Scrolls to display the left edge of the table.
End key	Scrolls to the right edge of the table.
Press Ctrl and C keys simultaneously	Copies the value of the currently selected cell to the clipboard.

# **Selecting Items for Display**

Click the [Display Item] button in the viewer to display the [Select Items for Display] screen.

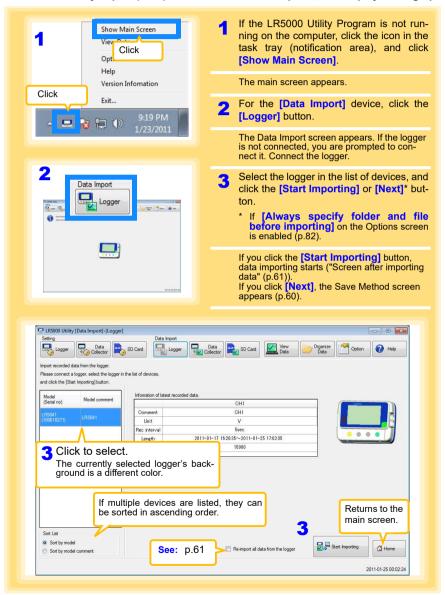


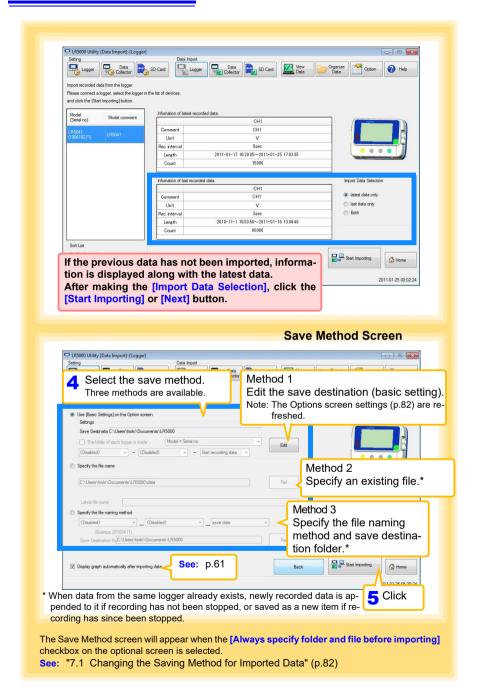
#### Menu Bar Items

Menu	Items	Contents
Select Items	Check selection range Clear checks of selection range Select all selections Clear all selections	Add and clear selection of multiple items (display in blue) selected with the mouse.  When there are 600 item in the above list, click to select or clear all items.
	Select all instant values Select all maximum values Select all minimum values Select all average values	Select all items (up to 600) of the same property.
Sort by model name Sort by serial no Sort by model comment		Sort by model name, serial no., or model comment.
Soft itellis	Move selected item up Alt+Up  Move selected item down Alt+Down	Move blue mouse-selected items up or down.
	Restore original order	Restore original order.

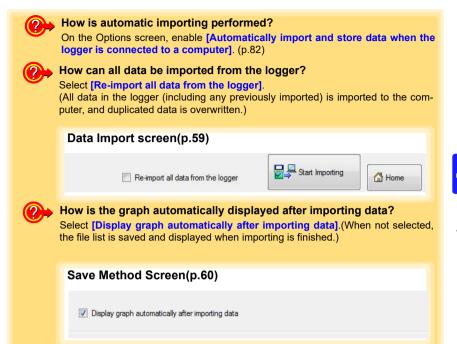
# 4.6 Manually Importing (Saving) Recorded Data to a Computer, and Graph Display

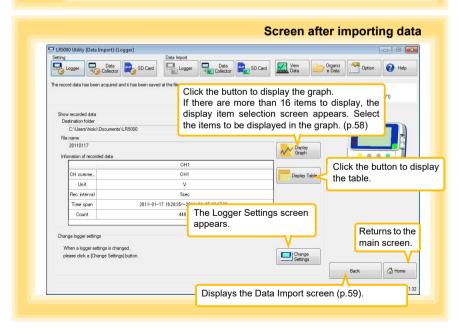
You can manually import (save) recorded data to a computer, and display it in a graph.





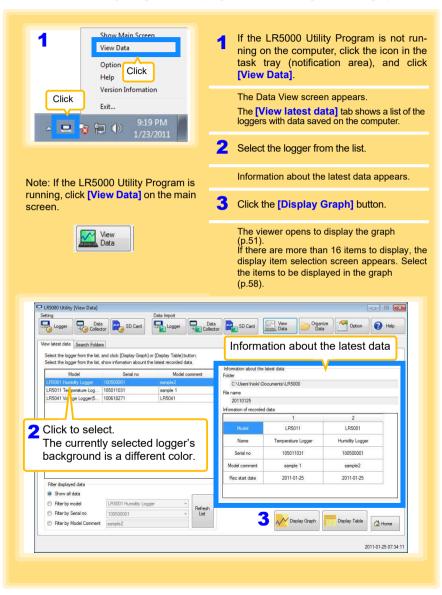
# 4.6 Manually Importing (Saving) Recorded Data to a Computer, and Graph Display



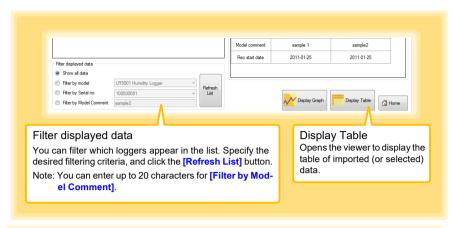


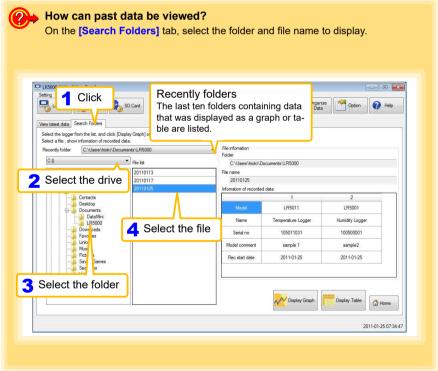
# 4.7 Displaying a Graph of Saved Recording Data

Use the LR5000 Utility Program to display saved recording data as a graph.



# **Other Data Viewing Screen Functions**



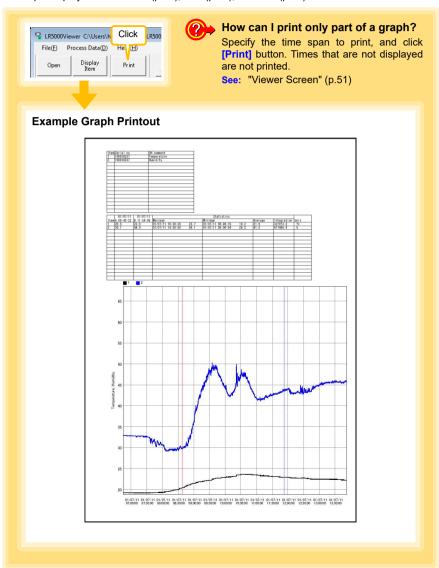


# 4.8 Printing Recorded Data

Saved recording data can be printed as a graph. Graphs displayed in the LR5000 Utility Program can be printed on A3, A4, or B4-size paper.

With the desired graph displayed, click the [Print] button.

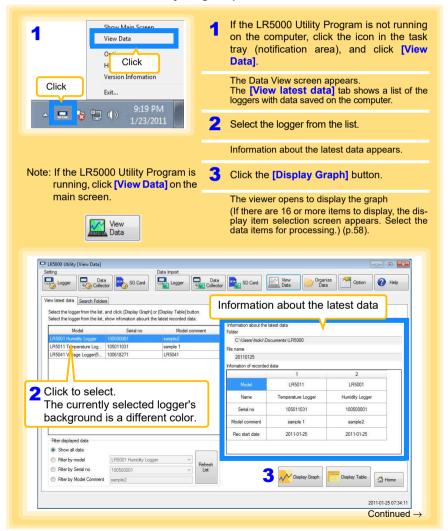
See: Graph Display Methods: "4.5" (p.49), "4.6" (p.59), and "4.7" (p.62)

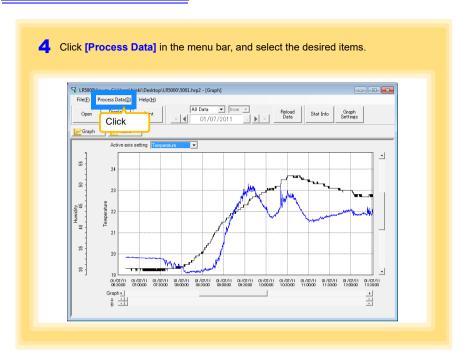


# Processing Recorded Data

# **Chapter 5**

Recorded data saved on the computer can be processed by scaling, electric power calculation, energy cost calculation, operating rate calculation, integration, dewpoint temperature calculation, two-item arithmetic calculation, and out-of-range data revision. The LR5000 Utility Program performs the calculations.



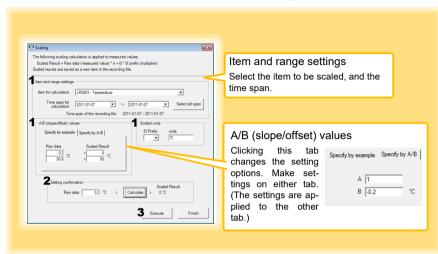


# [Process Data] Items

Items	Contents	See
Scaling	Performs scaling on the data of one channel.	(p.67)
Power Calculation	Performs approximate electric power calculation.	(p.68)
Energy Cost	Performs approximate energy cost calculation.	(p.69)
Operating Rate	Performs approximate operating rate calculation.	(p.70)
Integration	Integrates displayed data.	(p.71)
Dew Point	Performs dew-point temperature calculation.	(p.72)
Two-Data-Item Arithmetic	Performs approximate two-data-item arithmetic calculation.	(p.73)
OVER Data Revision	Converts data outside of the upper and lower threshold settings to specified values, and saves as new data items.	(p.74)

### 5.1 Scaling

The following scaling calculation is applied to measured values. Scaled Result = Raw data (measured value)  $\times$  A + B  $\times$  SI prefix (multiplier) Scaled results are saved as a new item in the recording file.



1. Select the items, time span, and the following options.

Setting Options	Description
Specify by example *	Enter two known conversion points (up to ten digits each).
Specify by A/B *	Enter the scaling coefficients (A and B, up to ten digits each).
Scaled units	<ul> <li>Select the [SI Prefix].         ([p]=1E-12, [n]=1E-9, [μ]=1E-6, [m]=1E-3, blank =1E0, [k]=1E3, [M]=1E6, [G]=1E9, [T]=1E12)</li> <li>Enter a character string to identify the scaled units.</li> <li>(Up to five characters, except  /, :, *, ?, ", &lt;, &gt;, and  .)</li> </ul>
* Set either one.	

2. Confirm settings.

Setting Confirm that scaling is performed properly.Enter any numerical value as raw data, and click the [Calculate] button to display the scaled result.

3. Click the [Execute] button.

(The scaled results are saved.)

Note: Click the [Finish] button to close the [Scaling] dialog box.

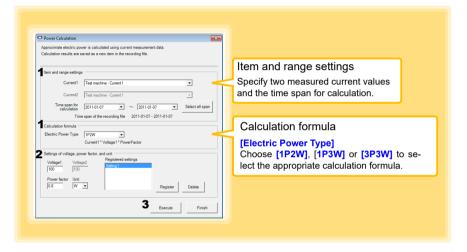
### 5.2 Calculating Electric Power

Approximate electric power is calculated using current measurement data from a clamp logger.

Calculation results are saved as a new item in the recording file.

### NOTE

- Electric power calculations are only approximate, so results do not always equal the true electric power value. Use a wattmeter if accurate power measurements are required.
- There is no way to confirm that a specified data item is really a current value. Calculation occurs regardless of data type.



- 1. Select the items, time span, and calculation formula to be used.
- 2. Specify the voltage, power factor, and units.
  - •To save the settings, click the [Register] button.
  - •To apply a registered setting, double click it ("Setting1" in the above screenshot).
  - •To delete a setting, click it then click the [Delete] button.
- 3. Click the [Execute] button.

(Calculation results are saved.)

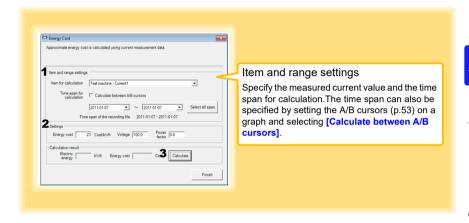
Note: Click the [Finish] button to close the [Power Calculation] dialog box.

### **Calculating Energy Cost**

Approximate energy cost is calculated using current measurement data from a clamp logger.

### NOTE

- · Energy cost calculations are only approximate, so results do not always equal the true energy cost.
- · There is no way to confirm that a specified data item is really an electric power value. Calculation occurs regardless of data type.



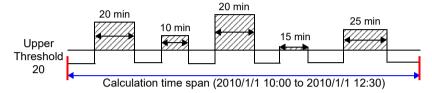
- 1. Select the item and time span.
- Specify the cost per kWh, voltage, and power factor.
- 3. Click the [Calculate] button. (Electric power consumption and energy cost values are calculated and displayed.) Note: Click the [Finish] button to close the [Energy Cost] dialog box.

### 5.4 Calculating Operating Rate

The approximate operating rate of the measured value is calculated.

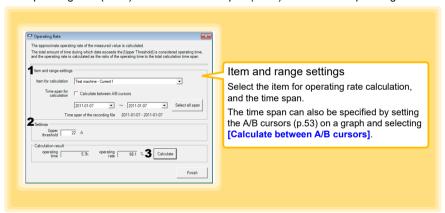
The total amount of time during which data exceeds the [Upper threshold] is considered operating time, and the operating rate is calculated as the ratio of the operating time to the total calculation time span.

Example: The time during which a device consumes 20 A or more is considered the operating time.



The sum of the times depicted by () is the operating time. (In the above diagram, operating time is 1.5 hours.)

Operating time  $(1.5 \text{ h}) \div \text{calculation time span } (2.5 \text{ h}) \times 100 = 60\% \text{ operating rate}$ 



- 1. Select the item and time span.
- 2. Set the upper threshold.
- Click the [Calculate] button.
   (Operating hours and operating rate values are calculated and displayed.)
   Note: Click the [Finish] button to close the [Operating Rate] dialog box.

### 5.5 Integration

Measurement data can be integrated over a specified time span. Integration results are saved as a new item in the recording file.



- 1. Select the item and time span.
- Click the [Execute] button. (Integration results are saved.)
   Note: Click the [Finish] button to close the [Integration] dialog box.

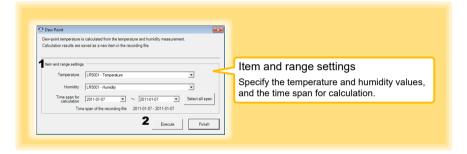
### 5.6 Calculating Dew-Point Temperature

Dew-point temperature is calculated from the temperature and humidity measurement data from the logger.

Calculation results are saved as a new item in the recording file.

### NOTE

- There is no way to confirm that a specified data item is really a temperature or humidity value. Dew-point calculation occurs regardless of data type.
- Only the specified temperature and humidity data measured during the specified recording time span is applied to calculations and saved.
- The valid range for calculation input measurement data is -100 to 100 degrees, and 0 to 100% humidity. Values outside of these ranges are replaced with the maximum or minimum value within the valid range.



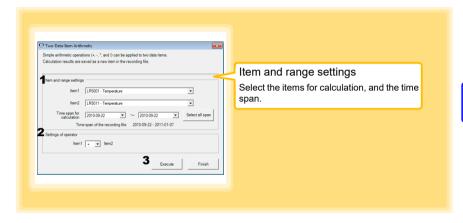
- 1. Select the items and time span.
- Click the [Execute] button. (Calculation results are saved.)

Note: Click the [Finish] button to close the [Dew Point] dialog box.

### 5.7 Two-Data-Item Arithmetic Calculations

Simple arithmetic operations (+, -, \*, and /) can be applied to two data items. Calculation results are saved as a new item in the recording file.

Only the values of data items measured during the specified recording time span are applied to calculations and saved.

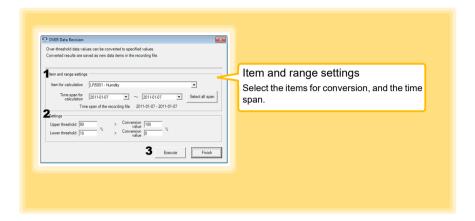


- 1. Select the items and time span.
- 2. Select the calculation operator.
- Click the [Execute] button.
   (Calculation results are saved.)
   Note: Click the [Finish] button to close the [Two-Data-Item Arithmetic] dialog box.

### 5.8 Converting Over-Threshold Data Values

Data values larger than the upper threshold and smaller than the lower threshold can be converted to specified values.

Converted results are saved as new data items in the recording file.

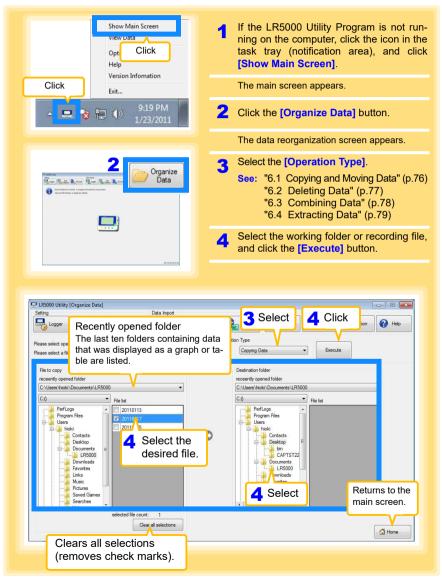


- 1. Select the items and time span.
- Set the upper and lower threshold values, and their corresponding conversion values.
- Click the [Execute] button.
   (Conversion results are saved.)
   Note: Click the [Finish] button to close the [OVER Data Revision] dialog box.

# **Organizing Data**

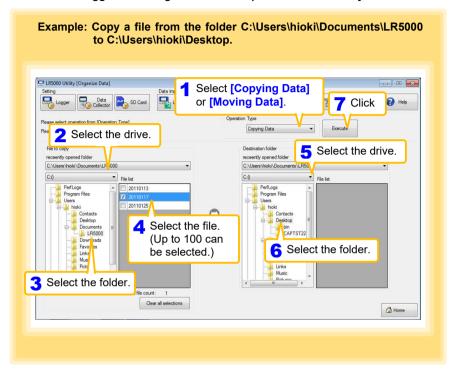
# **Chapter 6**

The LR5000 Utility Program can reorganize (copy, delete, move, combine, and extract) imported data.



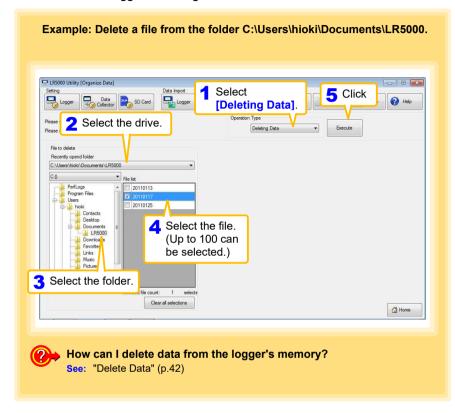
### 6.1 Copying and Moving Data

The selected logger recording files can be copied or moved to any folder.



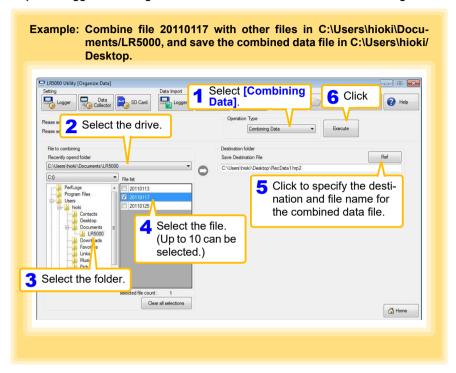
### 6.2 Deleting Data

Select and delete logger recording files as follows.



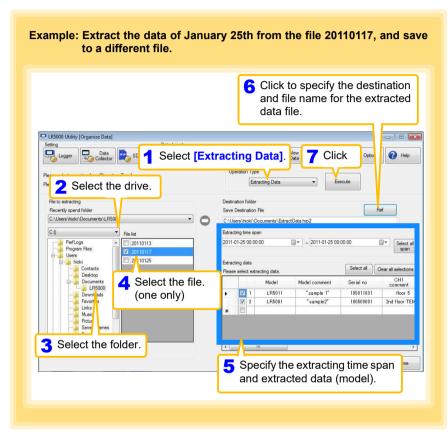
### **Combining Data**

Separate logger recording files can be combined into one set of recording data.



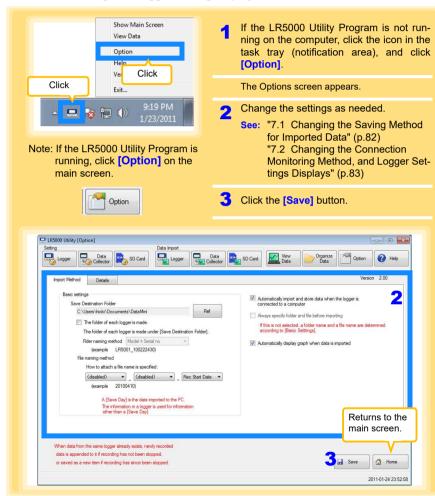
### 6.4 Extracting Data

Data in a logger recording file can be extracted to a specified time span and saved with a different file name.



# Options Settings (LR5000 Utility Program) Chapter 7

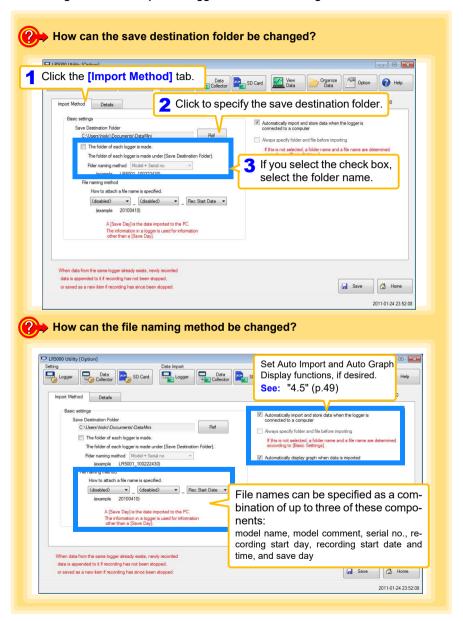
These settings determine the saving method for imported logger data, device connection monitoring, and logger setting display functions.



Select the [Automatically import and store data when the logger is connected to a computer] checkbox and clear the [Always specify folder and file before importing] check box to display the Data Import screen (p.60).

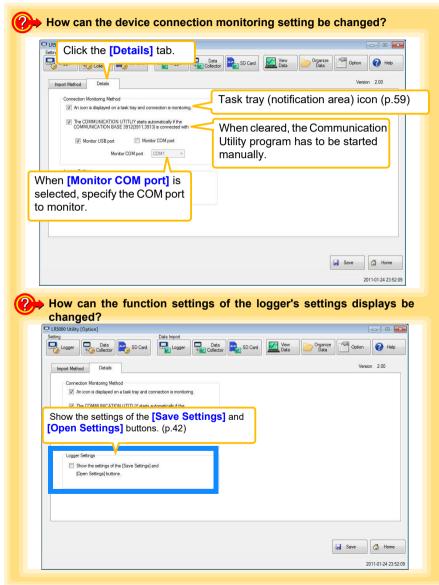
### 7.1 Changing the Saving Method for Imported Data

The saving method for imported logger data can be changed as follows.



# 7.2 Changing the Connection Monitoring Method, and Logger Settings Displays

Change the device connection monitoring settings and the functions on the logger settings displays as follows.



		_				_	
7.2	Changing the	Connection	Monitorina	Method.	and Logger	Settinas	Displavs

# **Specifications**

# **Chapter 8**

## 8.1 Measurement Specifications

Input	DC voltage (1 channel)		
Input impedance	LR5041: 4 MΩ±10% LR5042: 2.2 MΩ±10% LR5043: 2 MΩ±10%		
Measurement ranges	±50.00 mV (LR5041) ±5.000 V (LR5042) ±50.00 V (LR5043) "UF" or "OF" indicates out-of-range measurement		
Measurement accuracy	±0.5%rdg. ±5dgt.		
Accuracy guarantee for • Temperature: 23°C±5°C (73°F±9°F) temperature and humidity • Humidity: 80%RH or less (non-condensating)			
Temperature coefficient	Measurement accuracy $\times$ 0.05/°C Note: Add to measurement accuracy when outside of the range 23°C±5°C (73°F±9°F)		
Guaranteed accuracy period	1 year		
Product warranty period	3 years		
Maximum ratings	Max. rated voltage between terminals: ±60 mV (LR5041), ±6 V (LR5042), ±60 V (LR5043) Max. rated voltage to ground: 60 V DC		

## **Functional Specifications**

Display type	LCD		
Display contents	Measured value, units (mV, V), recording (REC), endless recording (ENDLESS), statistical recording (STAT), recording interval (INTVL) pre-heat time (PrE.H), date and time (TIME), alarm (AL), battery status recorded data count (DATA), maximum value (MAX), minimum value (MIN), auto power saving (APS)		
Operation button	Four ("SET", "REC/STOP", "+", "-")		
Recording interval	1/2/5/10/15/20/30 sec., 1/2/5/10/15/20/30/60 min.		
Recording modes	<ul> <li>Instantaneous recording: The instantaneous value is recorded at each recording interval</li> <li>Statistical recording: Measurements are taken once per second, and instantaneous, maximum, minimum, and average values are saved at each recording interval (cannot be selected when the recording interval is set to one second).</li> </ul>		
Recording capacity	<ul> <li>Instantaneous recording: 60,000 values</li> <li>Statistical recording: 15,000 instantaneous, maximum, minimum, and average values</li> </ul>		
Recording start method	<ul><li>Logger button operation</li><li>Instant or scheduled time (set by computer/Data Collector)</li></ul>		
Recording stop method	<ul> <li>Logger button operation (endless recording)</li> <li>Logger button operation (one-time recording)</li> <li>Scheduled time (endless recording)</li> <li>Scheduled time (one-time recording)</li> <li>Scheduled time is set by computer/Data Collector</li> </ul>		
Retained recording ses sions	Two sessions (each from recording start to stop)		
Alarm	Indicates when measured values are outside of the range defined by upper and lower thresholds set from a computer or the Data Collector		
Scaling	Scales and displays measured values according to settings made from a computer or the Data Collector (measurement units are not displayed for scaled values)		
Preheat output	OFF/0.5/1/2/5/10/30/60 sec.		
Power save setting	The measurement data display turns off about 30 seconds after the last button operation (cancel power save for continuous display)		
Real-time clock	Provided		

## Miscellaneous

Clock accuracy	±50ppm (@25°C (@77°F)) ±4.32 s/day		
Backup	Recorded data and settings (independent of battery)		
Interface	Half-duplex start/stop synchronous infrared serial communication between the logger and Communication Adapter or Data Collector		
Power supply	<ul> <li>Rated supply voltage: 1.5 V DC</li> <li>One AA-size alkaline battery (LR6)</li> <li>Recording and clock operation, and maximum and minimum values are retained for about 30 seconds during battery replacement</li> </ul>		
Maximum rated power	0.1 VA		
Battery life	<ul> <li>Approx. 2 year (instantaneous recording, with 1-minute recording interval and auto power saving, @20°C (@68°F))</li> <li>Approx. 2 month (with 1-second recording interval, @20°C (@68°F))</li> </ul>		
Dimensions	Approx. 79W×57H×28D mm (3.11"W×2.24"H×1.10"D)		
Mass	Approx. 105 g (3.7 oz.) (w/battery)		
Dust and water protection rating	IP54 (EN60529) (with connection cable connected, but not including cable tip) $\frac{1}{2}$		
Accessories	LR6 alkaline battery		
Options	<ul> <li>LR5091 Communication Adapter</li> <li>LR5092-20 Data Collector</li> <li>LR9802 Connection Cable</li> <li>LR9901 Wall-Mounted Holder</li> <li>Z5004 Magnetic Strap</li> </ul>		
Environmental conditions	<ul> <li>Operating environment: indoors, pollution degree 2, up to 2000 m ASL</li> <li>Operating temperature and humidity: -20°C to 70°C (-68°F to 158°F), 80%RH or less (non-condensating)</li> <li>Storage temperature and humidity: -20°C to 70°C (-68°F to 158°F), 80%RH or less (non-condensating)</li> </ul>		
Applicable Standards	Safety: EN61010     EMC : EN61326		

#### **LR5091 Communication Adapter Specifications** 8.4

### **Main Unit General Specifications**

Functions	Converts between the logger's infrared signals and USB signals to support communications between the logger and a computer (USB port).	
Compatible loggers	LR5001 Humidity Logger, LR5011 Temperature Logger, LR5031 Instrumentation Logger, LR5041, LR5042, LR5043 Voltage Logger, LR5051 Clamp Logger Note: Communication with models LR5031 is supported by PC Utility version 1.05 and later. LR5051 is supported by PC Utility version 1.01 and later.	
Operating temperature and humidity	Temperature: 0°C to 40°C (32°F to 104°F), Humidity: 80%RH or less (non-condensating)	
Storage temperature and humidity	Temperature: -10°C to 50°C (14°F to 122°F), Humidity: 80%RH or less (non-condensating)	
Operating environment	Indoors, pollution degree 2, up to 2000 m ASL	
Power supply	DC5 V (USB bus-powered)	
Maximum rated power	0.5 VA	
Dimensions	Approx. $83W\times61H\times19D$ mm (3.27"W×2.40"H×0.75"D) (without projections)	
Mass	Approx. 43 g (1.5 oz.) (without USB cable)	
Applicable Standards	• Safety: EN61010 • EMC : EN61326	
Product warranty period	3 years	

USB standard	USB 2.0 compliant, Full Speed support
Connector	Mini B series receptacle
Connectable device	Computer
Communication speed	115,200bps

Communication method	Half-duplex start/stop synchronous infrared serial communication
Communication speed	115,200bps

#### **Accessories**

USB cable (1 m)1	
LR5000 Utility Program (CD)1	

### **Supplied LR5000 Utility Program Specifications**

Supplied medium	CD1		
Operating environment	Personal computer meeting the following specifications  CPU: 1 GHz or faster processor clock  RAM: 1 GB or more (32-bit), 2 GB or more (64-bit)  Operating system: Windows 7 or Windows 10  Library: .NET Framework 4.5.2 or later  Interface: USB (or COM port for models 3910, 3911, or 9612)  Monitor resolution: 1024 x 768 or higher  Hard disk: At least 30 MB free space (Additional space is required for storing recorded data.)		
Model communication support	All LR5000-series loggers  Note1: Communication with models LR5031 is supported by PC Utility version 1.05 and later.  LR5051 is supported by PC Utility version 1.01 and later.  Note2: The COMMUNICATION UTILITY program supports the following models' settings and data import functions. A computer COM port and 9612 RS-232C cable are required when using the model 3910 or 3911 Communication Base.  • All "Data Logger" models 363x to 364x  • Communication Base models 3910, 3911, and 3912		
Communication connections	Communication with LR5000-series loggers:     Computer, USB cable, LR5091 Communication Adapter, and LR5000-series logger     Computer, USB cable, LR5092-20 Data Collector, and LR5000-series logger     Communication with the LR5092-20 Data Collector:     Computer, USB cable, and LR5092-20 Data Collector		
Setting functions	<ul> <li>Export/import settings by communication with the LR5000 series</li> <li>Settings exported from each LR5000 are stored on the computer (the following functions are supported by the supplied PC Utility version 2.00, or later)</li> <li>Export/import settings by communication using the LR5092-20 Data Collector</li> <li>Import and save logger settings using the LR5092-20 Data Collector via communication or SD memory card</li> <li>Settings exported to the LR5092-20 Data Collector are stored on the computer</li> </ul>		
Auto-start function	A small resident program (icon in the task tray/notification area) detects when a logger or the Data Collector is connected to the computer, and automatically starts the LR5000 Utility Program.		

## 8.4 LR5091 Communication Adapter Specifications

Display/hide Y-axis grid lines, and set grid display density Select display background color Copy graph images to the clipboard A/B cursor functions Displays statistical data (maximum, minimum, and average)  Browse recorded data in tabular format Displays statistical data (maximum, minimum, and average)  Browse recorded data in tabular format Displays up to 600 channels Displays statistical data (maximum, minimum, and average)  Export all recorded data displayed in a table in CSV format Paste to Excel® all recorded data displayed in a data table Export all recorded data between A/B cursors in CSV format Paste to Excel® all recorded data between A/B cursors  Import text files from the 3169 Clamp-On Power HiTester Note: Only electric energy data recorded at one-second or longer interval can be imported  Printing functions  Prints graphs and statistical data Supports A3, A4, and B4 paper sizes  Scaling (y=a×x+b), electric power calculation, energy cost calculation, operating rate calculation, integration, dew-point temperature calculation, arithmetic calculations, out-of-range data revision  Copy and delete data saved on the computer  (the following functions are supported by the supplied PC Utility version		
Displays up to 16 Y-axes Displays one time base axis Set line colors for each channel, and display/hide lines and bar graphs for each channel Auto setting of time base and vertical axis Display/hide Y-axis grid lines, and set grid display density Select display background color Copy graph images to the clipboard A/B cursor functions Displays statistical data (maximum, minimum, and average)  Browse recorded data in tabular format Data list display functions Displays statistical data (maximum, minimum, and average)  Export all recorded data displayed in a table in CSV format Paste to Excel® all recorded data displayed in a data table Export all recorded data between A/B cursors in CSV format Paste to Excel® all recorded data between A/B cursors Import functions  Import functions  Printing functions  Printing functions  Prints graphs and statistical data Supports A3, A4, and B4 paper sizes  Scaling (y=a×x+b), electric power calculation, energy cost calculation, operating rate calculations, out-of-range data revision  Copy and delete data saved on the computer  (the following functions are supported by the supplied PC Utility version 2.00, or later) Delete data saved to an SD memory card in the LR5092-20 Data Collector	Data import functions	<ul> <li>data</li> <li>Combines recorded data</li> <li>Incorporates new data when an LR5000-series logger holds data not previously imported</li> <li>(the following functions are supported by the supplied PC Utility version 2.00, or later)</li> <li>Communicates with the LR5092-20 Data Collector, and imports recorded data saved in the Data Collector</li> <li>Imports data saved to an SD memory card in the LR5092-20 Data Col-</li> </ul>
Data list display functions  Displays up to 600 channels Displays statistical data (maximum, minimum, and average)  Export all recorded data displayed in a table in CSV format Paste to Excel® all recorded data displayed in a data table Export all recorded data between A/B cursors in CSV format Paste to Excel® all recorded data between A/B cursors  Import functions  Import functions  Import text files from the 3169 Clamp-On Power HiTester Note: Only electric energy data recorded at one-second or longer interval can be imported  Printing functions  Prints graphs and statistical data Supports A3, A4, and B4 paper sizes  Scaling (y=a×x+b), electric power calculation, energy cost calculation, operating rate calculation, integration, dew-point temperature calculation, arithmetic calculations, out-of-range data revision  Copy and delete data saved on the computer  (the following functions are supported by the supplied PC Utility version 2.00, or later) Delete data saved to an SD memory card in the LR5092-20 Data Collector	Graph display functions	<ul> <li>Displays up to 16 Y-axes</li> <li>Displays one time base axis</li> <li>Set line colors for each channel, and display/hide lines and bar graphs for each channel</li> <li>Auto setting of time base and vertical axis</li> <li>Display/hide Y-axis grid lines, and set grid display density</li> <li>Select display background color</li> <li>Copy graph images to the clipboard</li> <li>A/B cursor functions</li> </ul>
<ul> <li>Paste to Excel<sup>®</sup> all recorded data displayed in a data table</li> <li>Export all recorded data between A/B cursors in CSV format</li> <li>Paste to Excel<sup>®</sup> all recorded data between A/B cursors</li> <li>Import text files from the 3169 Clamp-On Power HiTester</li> <li>Note: Only electric energy data recorded at one-second or longer interval can be imported</li> <li>Printing functions</li> <li>Prints graphs and statistical data</li> <li>Supports A3, A4, and B4 paper sizes</li> <li>Scaling (y=a×x+b), electric power calculation, energy cost calculation, operating rate calculation, integration, dew-point temperature calculation, arithmetic calculations, out-of-range data revision</li> <li>Copy and delete data saved on the computer</li> <li>(the following functions are supported by the supplied PC Utility version 2.00, or later)</li> <li>Delete data saved to an SD memory card in the LR5092-20 Data Collector</li> </ul>	Data list display functions	s • Displays up to 600 channels
Import functions  Note: Only electric energy data recorded at one-second or longer interval can be imported  • Prints graphs and statistical data • Supports A3, A4, and B4 paper sizes  Data processing functions  Scaling (y=a×x+b), electric power calculation, energy cost calculation, operating rate calculation, integration, dew-point temperature calculation, arithmetic calculations, out-of-range data revision  • Copy and delete data saved on the computer  (the following functions are supported by the supplied PC Utility version 2.00, or later) • Delete data saved to an SD memory card in the LR5092-20 Data Collector	Export functions	<ul> <li>Paste to Excel<sup>®</sup> all recorded data displayed in a data table</li> <li>Export all recorded data between A/B cursors in CSV format</li> </ul>
Supports A3, A4, and B4 paper sizes  Scaling (y=a×x+b), electric power calculation, energy cost calculation, operating rate calculation, integration, dew-point temperature calculation, arithmetic calculations, out-of-range data revision      Copy and delete data saved on the computer  (the following functions are supported by the supplied PC Utility version 2.00, or later)  • Delete data saved to an SD memory card in the LR5092-20 Data Collector	Import functions	Note: Only electric energy data recorded at one-second or longer interval
operating rate calculation, integration, dew-point temperature calculation, arithmetic calculations, out-of-range data revision  • Copy and delete data saved on the computer  (the following functions are supported by the supplied PC Utility version 2.00, or later)  • Delete data saved to an SD memory card in the LR5092-20 Data Collector	Printing functions	<b>5</b> .
File management functions (the following functions are supported by the supplied PC Utility version 2.00, or later)  • Delete data saved to an SD memory card in the LR5092-20 Data Collector	Data processing functions	operating rate calculation, integration, dew-point temperature calcula-
Help function Displays helpful operating instructions	File management functions	(the following functions are supported by the supplied PC Utility version 2.00, or later)  • Delete data saved to an SD memory card in the LR5092-20 Data Col-
	Help function	Displays helpful operating instructions

# **Maintenance and Service**

# **Chapter 9**

### Requesting repairs

- Use the original packing materials when transporting the instrument, if possible.
- Pack the instrument so that it will not sustain damage during shipping, and include a description of existing damage. We do not take any responsibility for damage incurred during shipping.
- Please contact your dealer or Hioki representative for information on where to submit products for repair.

#### When the logger will not be used for long time



CAUTION To avoid corrosion and damage to this instrument from battery leakage, remove the batteries from the instrument if it is to be stored for a long time (1 week).

### Cleaning

To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

NOTE

Wipe the LCD gently with a soft, dry cloth.

#### 9.2 Disposing of the Logger

Obey local regulations for disposal of electronic equipment.

## **Troubleshooting**

If damage is suspected, check the "Before requesting repairs" section before contacting your dealer or Hioki representative.

### Before requesting repairs

Problem Symptom	Probable Causes	Remedies and References
The LR5000 Utility Program cannot be installed.	The computer operating environment may be incompatible. The installation procedure may be incorrect.	Check the operating environment requirements, and try installing in (another) compatible computer.  See: "LR5000 Utility Program Operating Requirements" (p.23)
		Refer to the installation procedure, and try again. Pay particular attention to the following: Be sure to log in with an Administrator account. Before installing, be sure to close any applications running on the computer. If the installation screen does not appear, execute X:\English\Setup.exe.
No measured value is dis-	The connection cable plug	See: "Installation Procedure" (p.23)  Verify the correct plug orientation, and insert
played.	The connection cable plug is not inserted all the way	it as far as possible.
DATA (LR5043 Example)	NOTE  The maximum and minimum values are not displayed when the recorded data count is 0.	If the values are not displayed despite these measures, the connection cable and logger need to be inspected and repaired. Please contact your dealer or Hioki representative.  See: "Requesting repairs" (p.91)
The display is blank.	Power save is enabled.	Press any button or send a communication signal to turn on the display.
		See: "Part Names/Functions and Display Indicators" (p.12)
The battery is depleted too quickly.	<ul> <li>The battery supplied with the logger is still being used.</li> <li>A zinc-manganese bat- tery is being used.</li> </ul>	Install a new AA-size (LR6) alkaline battery.  See: "2.1 Installing (or Replacing) the Battery" (p.17)
Logger settings cannot be changed.	Dead battery.	When the T battery indicator appears, settings cannot be changed (but only displayed). Replace the battery.  See: "2.1 Installing (or Replacing) the Bat-
		tery" (p.17)

### Before requesting repairs

Problem Symptom	Probable Causes	Remedies and References
How can the logger's memory be erased?	-	Logger memory can be erased using the LR5000 Utility Program.  See: "Other Settings on the Logger Settings Screen" (p.42)  Note that data recorded prior to the last recording is automatically erased whenever recording starts.  (The logger retains the data from both current
		and most recent prior recording operation.)  See: "4.3 Starting and Stopping Recording" (p.46)
How can recorded values be reorganized?	-	Enable scaling.  See: "5.1 Scaling" (p.67)  Scaling settings can be made before recording.  See: "Scaling (set as needed)" (p.40)
Recorded data has disappeared.	Recording was restarted after stopping.	Note that if recording is accidentally restarted after stopping, data recorded prior to the last recording is automatically erased. (The logger retains the data from both current and most recent prior recording operations.)
The [REC] indicator disappears even though recording has not been stopped.	The one-time recording stop method is selected.	With one-time recording, recording stops automatically when memory becomes full. Change the stop method to endless recording.  See: Making Settings on the Logger: "Stop Method Setting (for when memory becomes full)" (p.33)  See: Making Settings from the LR5000 Utility Program: "Stop Method" (p.39)
		(With endless recording, the oldest data is overwritten when memory is full, so be sure to save data to a computer periodically during long-term recording. Data can be saved to a computer without stopping recording.)  See: "4.5 Automatically Importing (Saving) Recorded Data to a Computer, and Graph Display" (p.49)
The logger cannot communicate with the new LR5091 (LR5092).	The installation of the device driver to the LR5091 (LR5092) failed.	For Window XP, the driver may be required to be installed to each LR5091 (LR5092). Open Windows Device Manager and re-install the driver.
The [Failed to read data partially.] message appears.	The instrument can display up to 84000 data sets per measurement parameter.	The LR5000 viewer places a limit on the number of data sets displayed on graphs and tables. Change the duration to be displayed. Change from [All Data] to [1day].

#### **Error Displays** 9.4

The display appears as follows when an error occurs on the logger.

### **Logger Error Displays**

Error Displays	Meaning	Remedies and References
Err. 1	Calibration data error: A fault occurred with the internal calibration data.	Inspection and repair is required. Please contact your dealer or Hioki representative.
Erric	Microcomputer error: A fault occurred in microcomputer ROM/RAM.	See: "Requesting repairs" (p.91)
Err.3	Data recording error: A fault occurred in recording data or accessing settings.	
6866	Battery voltage is too low for normal logger operation.	Replace the battery.  See: "2.1 Installing (or Replacing) the Battery" (p.17)
o.F. or U.F.	A measured value is out of range.	Out-of-range values cannot be displayed.  [OF] or [UF] is displayed when this data is imported by the LR5000 Utility Program.

### **LR5000 Utility Program Error Displays**

Error Displays	Meaning	Remedies and References
OF	A measured value is out of range.	Out-of-range values cannot be dis-
UF	A measured value is out or range.	played.

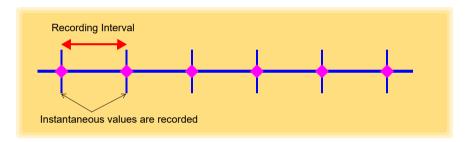
# **Appendix**

## **Appendix 1 About Recording Modes**

The recording method depends on the selected recording mode. The recording modes are as follows.

#### Instantaneous Recording

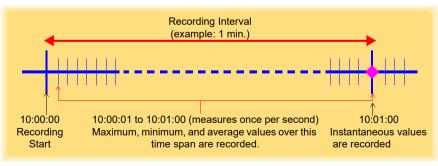
Measurements are recorded in internal memory at each recording interval.



### **Statistical Recording**

Measurements are taken once per second, and instantaneous, maximum, minimum, and average values are saved to internal memory at each recording interval.

Data at the recording start time is not recorded (in the following case, data at 10:00:00 is not recorded).



NOTE

Statistical recording cannot be selected when the recording interval is set to one second.

# Appendix 2 Recording Intervals and Maximum Recording Times

The maximum recording time is calculated according to the recording capacity.

<u>NOTE</u>

The maximum recording time is limited by the remaining battery capacity.

#### Instantaneous Recording

Up to 60,000 values can be recorded.

Recording Interval	Maximum Recording Time	Recording Interval	Maximum Recording Time
1 sec.	16 h, 40 min	1 min	41 d, 16 h
2 sec.	1 d, 9 h, 20 min	2 min	83 d, 8 h
5 sec.	3 d, 11 h, 20 min	5 min	208 d, 8 h
10 sec.	6 d, 22 h, 40 min	10 min	416 d, 16 h
15 sec.	10 d, 10 h	15 min	625 d
20 sec.	13 d, 21 h, 20 min	20 min	833 d, 8 h
30 sec.	20 d, 20 h	30 min	1250 d
		60 min	2500 d

### **Statistical Recording**

Up to 15,000 values can be recorded.

Recording Interval	Maximum Recording Time	Recording Interval	Maximum Recording Time
1 sec. (Cannot be set)	-	1 min	10 d, 10 h
2 sec.	8 h, 20 min	2 min	20 d, 20 h
5 sec.	20 h, 50 min	5 min	52 d, 2 h
10 sec.	1 d, 17 h, 40 min	10 min	104 d, 4 h
15 sec.	2 d, 14 h, 30 min	15 min	156 d, 6 h
20 sec.	3 d, 11 h, 20 min	20 min	208 d, 8 h
30 sec.	5 d, 5 h	30 min	312 d, 12 h
		60 min	625 d

## Appendix 3 Battery Life Approximation

Battery life depends on the recording interval.

The following table shows battery life when power saving (p.34) is enabled. Battery life is approximately two months when power saving is disabled or when the statistical recording mode is enabled.

Recording Interval	Battery Life	Recording Interval	Battery Life
1 sec.	Approx. 60 days	30 sec.	Approx. 1.5 year
10 sec.	Approx. 1 year	1 min or more	Approx. 2 year

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### **Warranty Certificate**



Model	Serial number	Warranty period Three (3) years from date of purchase ( /
Customer name:		

#### Important

- · Please retain this warranty certificate. Duplicates cannot be reissued.
- Complete the certificate with the model number, serial number, and date of purchase, along with your name and address. The personal information you provide on this form will only be used to provide repair service and information about Hioki products and services.

This document certifies that the product has been inspected and verified to conform to Hioki's standards.

Please contact the place of purchase in the event of a malfunction and provide this document, in which case Hioki will repair or replace the product subject to the warranty terms described below.

#### Warranty terms

- The product is guaranteed to operate properly during the warranty period (three [3] years from the date of purchase).
   If the date of purchase is unknown, the warranty period is defined as three (3) years from the date (month and year) of manufacture (as indicated by the first four digits of the serial number in YYMM format).
- 2. If the product came with an AC adapter, the adapter is warrantied for one (1) year from the date of purchase.
- The accuracy of measured values and other data generated by the product is guaranteed as described in the product specifications.
- 4. In the event that the product or AC adapter malfunctions during its respective warranty period due to a defect of workmanship or materials, Hioki will repair or replace the product or AC adapter free of charge.
- 5. The following malfunctions and issues are not covered by the warranty and as such are not subject to free repair or replacement:
  - -1. Malfunctions or damage of consumables, parts with a defined service life, etc.
  - -2. Malfunctions or damage of connectors, cables, etc.
  - -3. Malfunctions or damage caused by shipment, dropping, relocation, etc., after purchase of the product
  - -4. Malfunctions or damage caused by inappropriate handling that violates information found in the instruction manual or on precautionary labeling on the product itself
  - -5. Malfunctions or damage caused by a failure to perform maintenance or inspections as required by law or recommended in the instruction manual
  - -6. Malfunctions or damage caused by fire, storms or flooding, earthquakes, lightning, power anomalies (involving voltage, frequency, etc.), war or unrest, contamination with radiation, or other acts of God
  - -7. Damage that is limited to the product's appearance (cosmetic blemishes, deformation of enclosure shape, fading of color, etc.)
  - -8. Other malfunctions or damage for which Hioki is not responsible
- 6. The warranty will be considered invalidated in the following circumstances, in which case Hioki will be unable to perform service such as repair or calibration:
  - -1. If the product has been repaired or modified by a company, entity, or individual other than Hioki
  - -2. If the product has been embedded in another piece of equipment for use in a special application (aerospace, nuclear power, medical use, vehicle control, etc.) without Hioki's having received prior notice
- 7. If you experience a loss caused by use of the product and Hioki determines that it is responsible for the underlying issue, Hioki will provide compensation in an amount not to exceed the purchase price, with the following exceptions:
  - -1. Secondary damage arising from damage to a measured device or component that was caused by use of the product
  - -2. Damage arising from measurement results provided by the product
  - -3. Damage to a device other than the product that was sustained when connecting the device to the product (including via network connections)
- 8. Hioki reserves the right to decline to perform repair, calibration, or other service for products for which a certain amount of time has passed since their manufacture, products whose parts have been discontinued, and products that cannot be repaired due to unforeseen circumstances.

**HIOKI E.E. CORPORATION** 

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18-07 EN-3





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