HIOKI

Instruction Manual

LOGGER UTILITY

The latest edition of the instruction manual

EN

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Contents

Introduction

"Logger Utility" is a special application software for the following instrument.
  Model 8423 Memory HiLogger
  Model 8430-20 Memory HiLogger
  Model LR8400-20 Memory HiLogger
  Model LR8401-20 Memory HiLogger
  Model LR8402-20 Memory HiLogger
  Model LR8431-20 Memory HiLogger
  Model LR8432-20 Heat Flow Logger
  Model LR8410-20 Wireless Logging Station
  Model LR8450 Memory HiLogger
  Model LR8450-01 Memory HiLogger
  Model LR8101 Data Logger
  Model LR8102 Data Logger
 (From now on, these products described as logger)
 The latest version can be downloaded from our web site. (https://www.hioki.com)

The latest edition of the instruction manual

The contents of this manual are subject to change, for example as a result of product improvements or changes to specifications.
The latest edition can be downloaded from Hioki's website.
https://www.hioki.com/global/support/download

Trademarks

Excel and Windows are trademarks of the Microsoft group of companies.

Safety Symbols / Notations

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

⚠CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the Logger.
NOTE	Indicates advisory items related to performance or correct operation of the Logger.

(p. #)	Indicates the location of reference information.
(?→)	Indicates quick references for operation and remedies for troubleshooting.
*	Indicates that descriptive information is provided below.
[ ]	Menus, pages, setting items, dialogs, buttons in a dialog, and other names on the screen are indicated in brackets.
CURSOR (Bold characters)	Bold characters within the text indicate keyboard labels.
Windows	Windows Unless otherwise specified, "Windows" represents Windows 7, Windows 8, Windows 10, or Windows 11.
Dialog	Dialog box represents a Windows dialog box.
Logger	"Memory HiLogger" and "Wireless Logging Station" have bee abbreviated as "Logger" in the text.

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.

Precautions related to disc usage

⚠CAUTION

• Exercise care to keep the recording surface of the disc free of dirt and damage. If you need to label the disc, for example with text, use a marker with a soft tip.
• When not using the disc, store it in a protective case. Avoid exposing discs to direct sunlight, high temperatures, or high humidity.
• Hioki is not liable for any computer system issues that arise in connection with the use of this disc.

Overview   Chapter 1

1.1   Product Overview

"Logger Utility" has the following functions.

Real Time Data Collection

Real time data can be collected from multiple sets (up to 5) of Loggers connected to the PC, using the LAN or

USB. During the data collection, besides the status of the waveforms, numerical values and alert outputs can also be confirmed in real time.
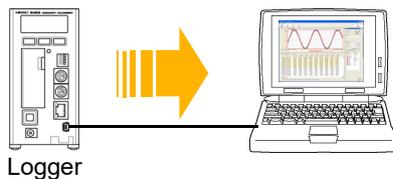
Logger

Waveform Display

Waveform files recorded with the Logger can be displayed on the screen. Waveforms can be displayed on separate sheets, with the waveforms of any channel displayed on any sheet of your choice.
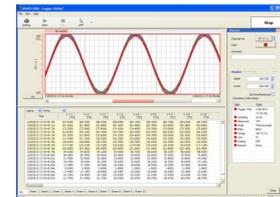
Multiple Search Functions

Data can be searched for various conditions such as time and maximum value.

Waveform Printing

Displayed waveforms can be printed with the printer connected to the PC.

Data Conversion

Measurement data obtained by the "Logger Utility" can be converted to the CSV format, and the CSV file can be opened using the table calculation software.

Numerical Calculations

A total of 14 types of numerical calculations, such as average value, and peak value can be performed for each channel.

Transmission of Setting Data

Settings for the Logger can be done and transmitted via the PC.

Waveform Calculation

The measured data of channels is calculated with four arithmetic operations to display the waveform.

1.2 Measurement Flowchart

Proceed with measurement while referring to the following measurement flowchart.

Preparing for Measurement

1. Install the software on the PC (p.6, p.8)
2. Install the Logger and connect the input cables
3. Start the software Logger Utility (p. 13)

Setting Measurement Conditions

1. Register the Logger in Logger Utility (p. 35)
2. Set the IP address and other communication settings (LAN communications only)
3. Set the measurement conditions (p.47 to p.159)
4. Send the settings to the Logger (p. 161)
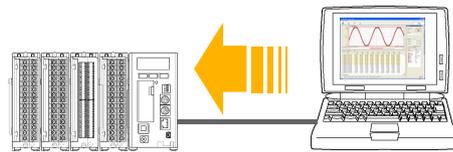
From Start to End of Measurement

Computer Based Measurement (p. 170)

Acquire and save data in real time.

Connect the Logger directly to a PC (one-to-one).

Example: 8423
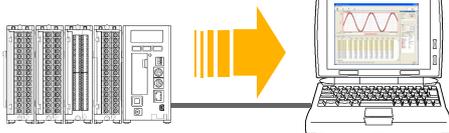
1. Start measurement with the ▶ Start button of Logger Utility.
2. Stop measurement with the ■ Stop button.

Standalone Measurement (p. 173)

Save data to a CF card
(8423, 8430-20, LR8431-20 and LR8432-20)

Save data to CF card or USB flash drive
(LR8400-20, LR8401-20, LR8402-20)

Save data to SD card or USB flash drive (LR8410-20, LR8450, LR8450-01, LR8101, and LR8102)

Example: LR8400-20

1. Disconnect the communication cable from the Logger.
2. Press the Logger **START** key* to start measuring.
3. Press the Logger **STOP** key* to stop measuring.

*: On the 8430-20, LR8431-20 and LR8432-20, the same key starts and stops measuring.

Analyzing Recorded Data

Loading and Displaying Measured Data (p. 220)

Other

Loading Measurement Data (p. 222)

Installing the Software

Chapter 2

Follow the procedure below to install the supplied software Logger Utility on the PC. Before starting the installation, check the operating environment.

Logger Utility Operating Environment

OS	Windows 7, Windows 8, Windows 10, Windows 11
CPU	1 GHz or higher 32 bit (× 86) or 64 bit (× 64) processor
Monitor Resolution	1024 × 768 dots or better, At least 65,536 colors
Memory	1 GB or more of RAM (32 bit), 2 GB or more of RAM (64 bit)
Interface	Ethernet or USB

Installation Procedure

When connecting via a LAN, it is not necessary to install the USB driver or to connect the USB cable.

1. Place the included DVD in the computer's disc drive.

1. Open the website. (https://www.hioki.com/global)

2. Install Logger Utility (p. 6)

2. Install Logger Utility (p. 8)

3. Install the USB driver (p. 10)

4. Connect the AC adapter to the Logger and turn on the power.

5. Connect the Logger and PC with the USB cable.

USB Cable

For model 8423 Memory HiLogger

2.1   Installing Logger Utility

Follow the procedure below to install Logger Utility. This explanation is for installing the software on Windows. The messages displayed may differ slightly depending on other operation system or settings you are using.

Important

If you are running software such as antivirus software, be sure to end the software before you start the installation. The installation may not be performed properly if antivirus software is running.

The software can be installed from either the included DVD or Hioki's website.

Installing the software from the included DVD

1. Start up Windows.
Exit all running applications.

2. Insert the supplied DVD in the disc drive.
If the installer opens automatically, proceed to step **4**.

3. Double-click [index.html] on the DVD.

Library
navi
USB Driver
AUTORUN.INF
index.htm

4. Click [English].

HIOKI
Logger Application Disc
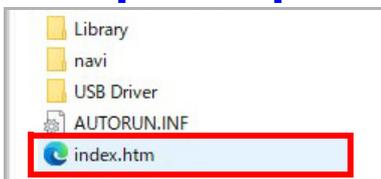
日本語 **English**

5. Click [Logger Utility].

HIOKI
Logger Application Disc

Application

Logger Utility
Wireless Logger Collector   CAN Editor   GENNECT One

6. Click [Install] to launch [SetupENG.exe].

Install Install(中) Files Manual

Logger Utility/Wireless Logger Collector
Version 1.96 Version 1.08 August, 2022

Install Install(中) Files Manual

1. Overview

Logger Utility
○ Compatible Measuring Instrument
8423, 8430, LR8400, LR8400-03, LR8401, LR8402, LR8410, LR8410-90, LR8431, LR8432, LR8512, LR8513, LR8514, LR8515, LR8520, LR8400-92, LR8400-93, LR8450, LR8450-01

1. You can control instruments as well as perform data collection.
 * Real-time data collection of the LR8450 and LR8450-01 is limited by the recording interval and the maximum number of channels that can be measured.

7. Click [Next].

HIOKI Logger Utility - InstallShield Wizard

Welcome to the InstallShield Wizard for HIOKI Logger Utility

The InstallShield(R) Wizard will install HIOKI Logger Utility on your computer. To continue, click Next.

WARNING: This program is protected by copyright law and international treaties.

Click

< Back   Next >   Cancel

The Logger Utility's license agreement will open.

8. **Read and agree with the contents in the License Agreement then click the [Next] button.**

Check

Click

9. **Click [Next].**

Installing the Logger Utility starts.
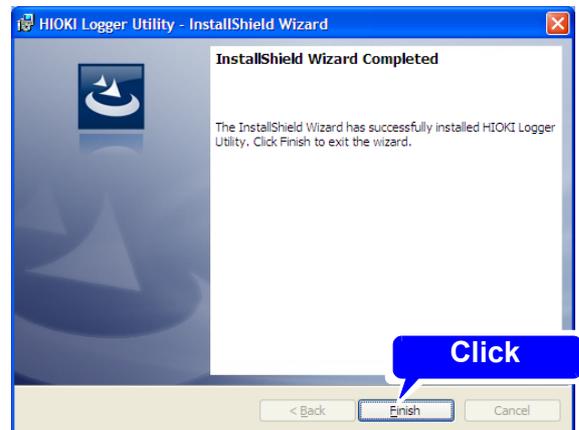
Click

10. **Click [Finish].**

Click

This completes the installation.

To change the installation destination

Click **[Change]** to select another folder. There is normally no need to change it.

How can installation be aborted?

Click **[Cancel]**.

Installing the software from Hioki's website

If your computer doesn't have a disc drive, you can install the Logger Utility from Hioki's website.

1. Start up Windows.
Exit all running applications.

2. Open the Hioki's website.
(https://www.hioki.com/global)

3. Open the [Service & Support] > [Downloads] > [Drivers, Firmware & Software] page.
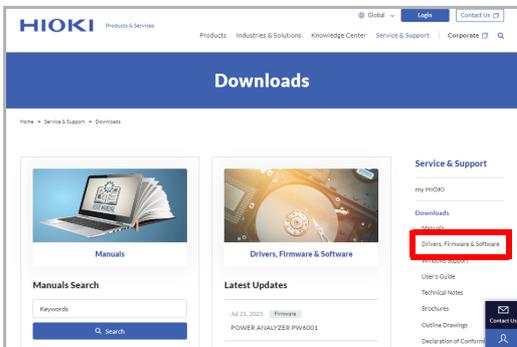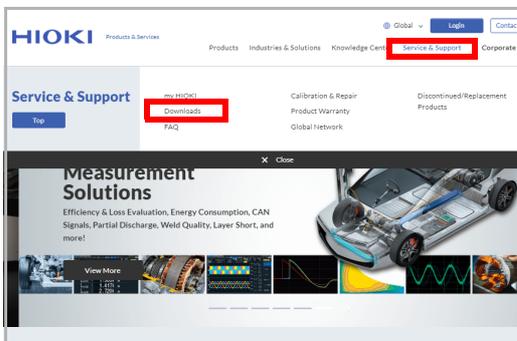
4. Search for your logger's model.
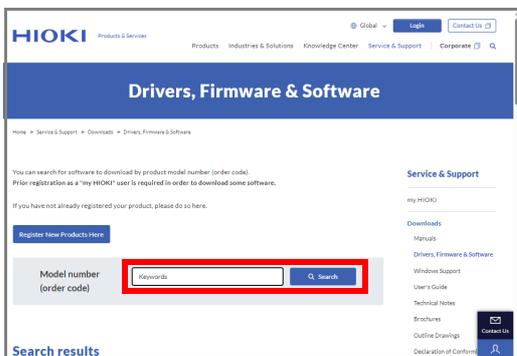
5. Click [Logger Utility/Wireless Logger Collector].
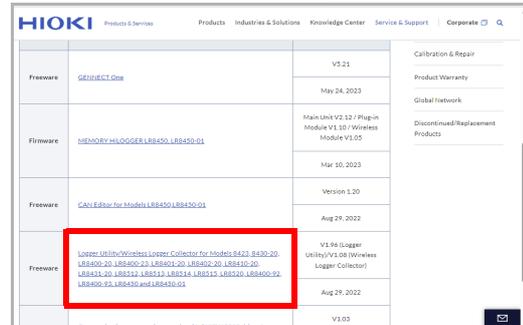
6. Click [Download].

Download the installation file (ZIP format).

7. Unzip the downloaded file (ZIP format).

8. Click and launch [Setup.exe].
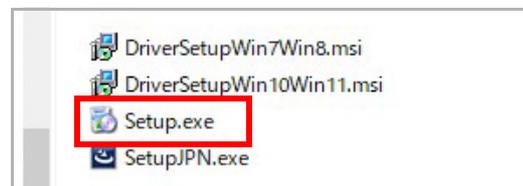
The Logger Utility's license agreement will open.

9. Click [Next].
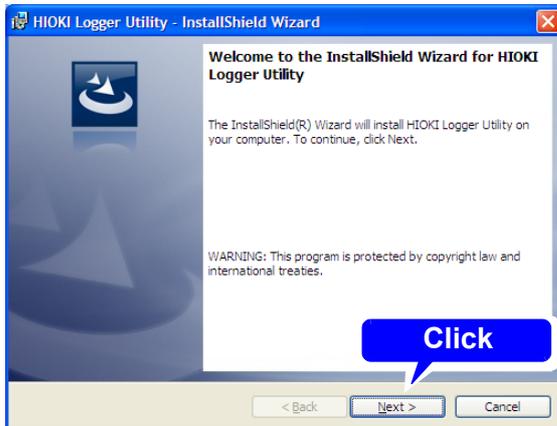
10. Read and agree with the contents in the License Agreement then click the [Next] button.

11. Click [Next].

Installing the Logger Utility starts.
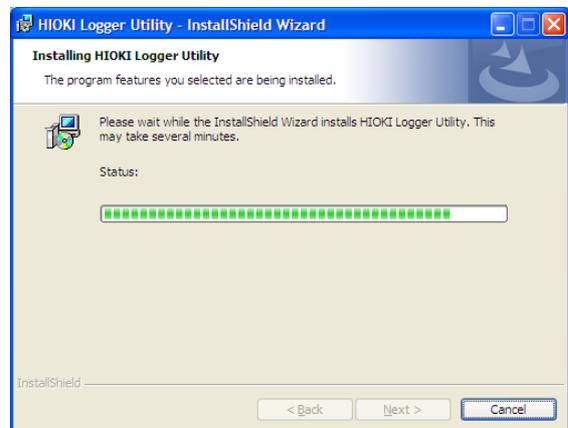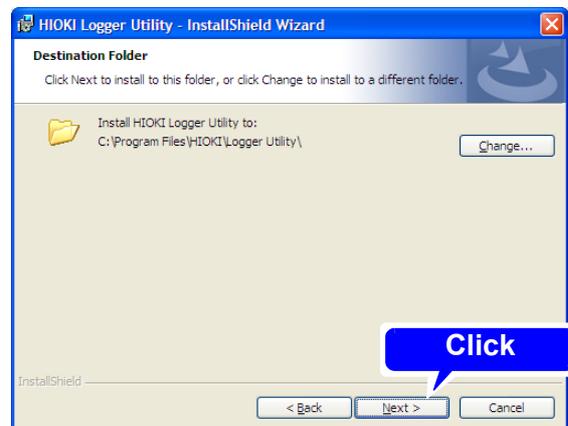
12. Click [Finish].
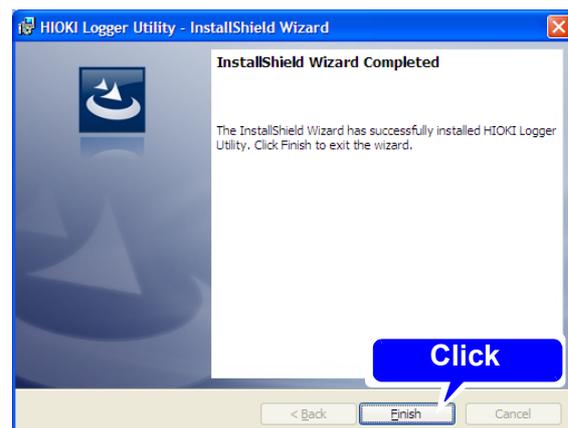
This completes the installation.

To change the installation destination

Click [Change] to select another folder. There is normally no need to change it.

How can installation be aborted?

Click [Cancel].

2.2   Installing the USB Driver

Install the USB driver as described below before connecting to the Logger via USB cable.

1. Install the driver.

If you are using the Windows 7/8:
Run **[DriverSetupWin7Win8.msi]** in the DVD.
If Logger Utility is already installed, run the DVD from the following location.
[c:\Program Files\HIOKI\LoggerUtility\Driver\DriverSetupWin7Win8.msi]

If you are using the Windows 10/11:
Run **[DriverSetupWin10Win11.msi]** in the DVD.
If [Logger Utility] is already installed, run the DVD from the following location.
[c:\Program Files\HIOKI\LoggerUtility\Driver\DriverSetupWin10Win11.msi]

NOTE   Depending on the environment, the dialog box may take some time to appear so please wait till it does so.

2. Click [Next].

3. Click [Next].

When you want to change the installation destination
Click **[Browse...]** to change the folder to install into. Normally, there is no need to change.

4. Click [Next] to start installing.

Installing.

For Windows 7/8/10/11

When a dialog box requesting your permission to continue the program appears, click **[Continue]**.
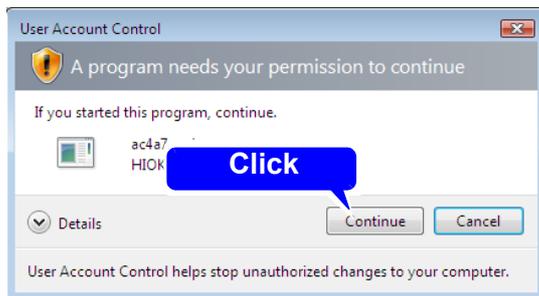
Sometimes another dialog box requesting your permission to install the software may appear. When it does, check **[Always trust software from "HIOKI E.E. CORPORATION".]** and click **[Install]** to continue.

5. **When installation is completed and the dialog box appears, click [Close] to exit.**
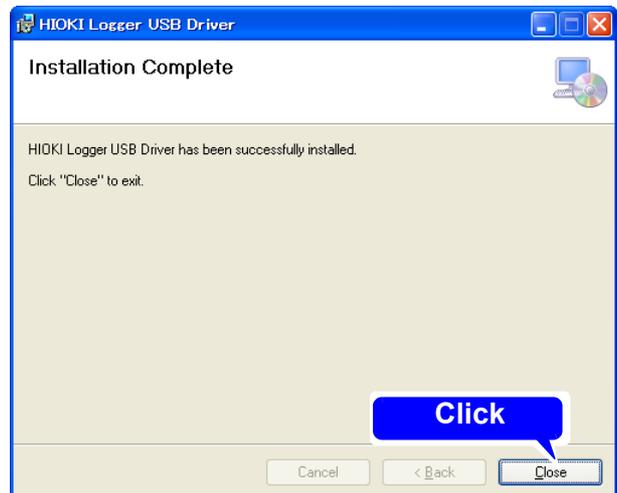
This completes the driver installation.

2.3   Connecting the Logger to a PC (USB connection)

Install the driver as described in section "2.2"(p. 10) before connecting to the Logger.
The following procedures apply to the LR8400-20, LR8401-20, and LR8402-20. The procedures for the 8423, 8430-20, LR8431-20, LR8432-20, LR8410-20, LR8450 and LR8450-01 are the same.

⚠ **CAUTION** | Do not plug in or unplug the USB cable while the instrument is operating.

For Windows 7/8/10/11

1. **Connect the AC adapter to the Logger and turn the power on.**

2. **Connect the Logger and computer with the USB cable provided.**
The Logger is automatically recognized, and preparations to use the device are complete.

HIOKI MEMORY HiLOGGER LR8400 (COM3) ✕
Device driver software installed successfully.

If you're unable to establish a USB connection with the logger in Windows 10 or Windows 11
If you find either of the following when you open Device Manager, follow steps **1** through **5** to change your Windows settings and then check whether the USB driver is properly recognized:

• An exclamation point (**[!]**) is displayed as the icon for **[HIOKI MEMORY HiLOGGER LR8450 (COMxx)]**.
• The following error is shown: **[Windows cannot load the device driver for this hardware. The driver may be corrupted or missing. (Code 39).]**

Procedure

1. **Open [Settings] in Windows.**

2. **Click [Update & Security] > [Windows Security].**

3. **Click [Device security].**

4. **Click [Core isolation details].**

5. **Set [Memory integrity] to [Off].**

2.4 Starting and Ending Logger Utility

Starting Logger Utility

For Windows 7/10/11

From the Start Menu of Windows, click **[All Programs]** - **[HIOKI]** - **[Logger Utility]** - **[Logger Utility]**.
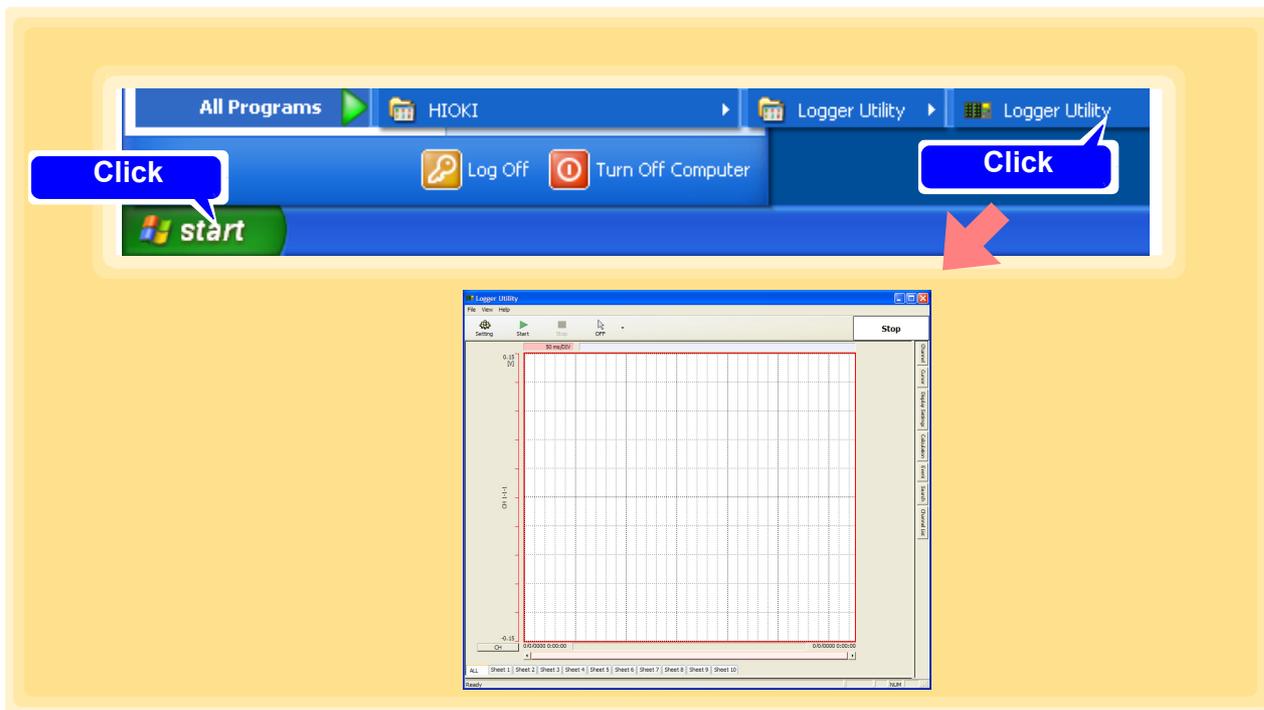
Logger Utility starts with the settings in the same state as when the software was last ended.

When you want to initialize the settings, click **[Initialize All Settings]** from the File menu.

For Windows 8

From the charm, click ［**Start**］.
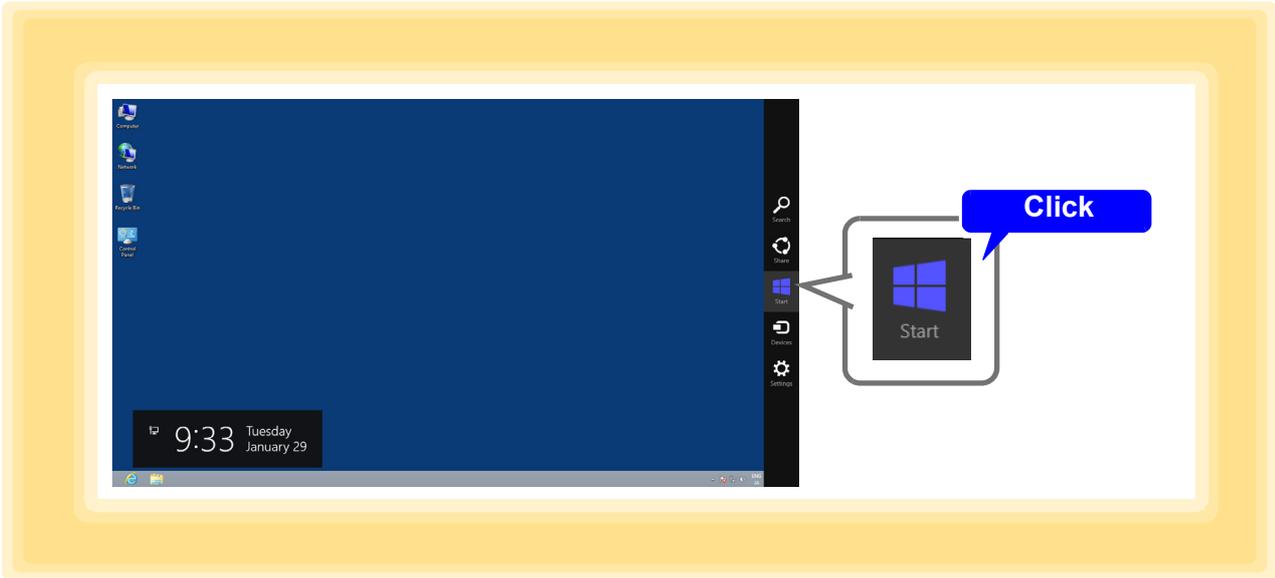
From the Start Menu, Click **[Logger Utility]**.
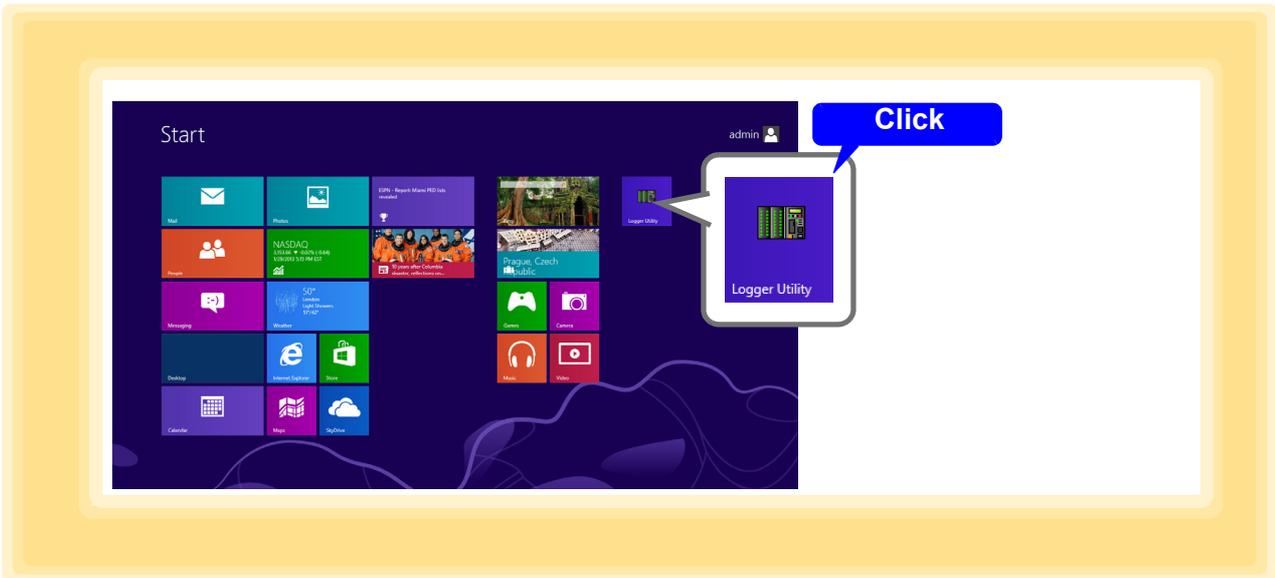
NOTE   When using Logger Utility, do not set the power setting of the PC to "Power saver." If a real-time measurement is made in the PC setting of "Power saver," the mesurement may be stopped.

Ending Logger Utility

Click **[Exit Application]** from the File menu of the main screen.

Open Waveform File...		Ctrl+O
Open Setting File...		Ctrl+Shift+O
Save Setting File...		Ctrl+Shift+S
Save File in Text Format...		
Batch conversion as text format...		
Combination of division files...		
Output Data to Excel...		
Transfer real time data to Excel...		
Open Waveform File in External Data Format...		
Save Waveform File in External Data Format...		
Print...		Ctrl+P
Recent Files		
Initialize All Settings		Ctrl+I
Exit Application		Alt+F4

Click

Alternatively, you can click the **[x]** close button at the top right of the main screen.

Click

Close button

Minimizes the window.

Maximizes the window size.

Closes the window.
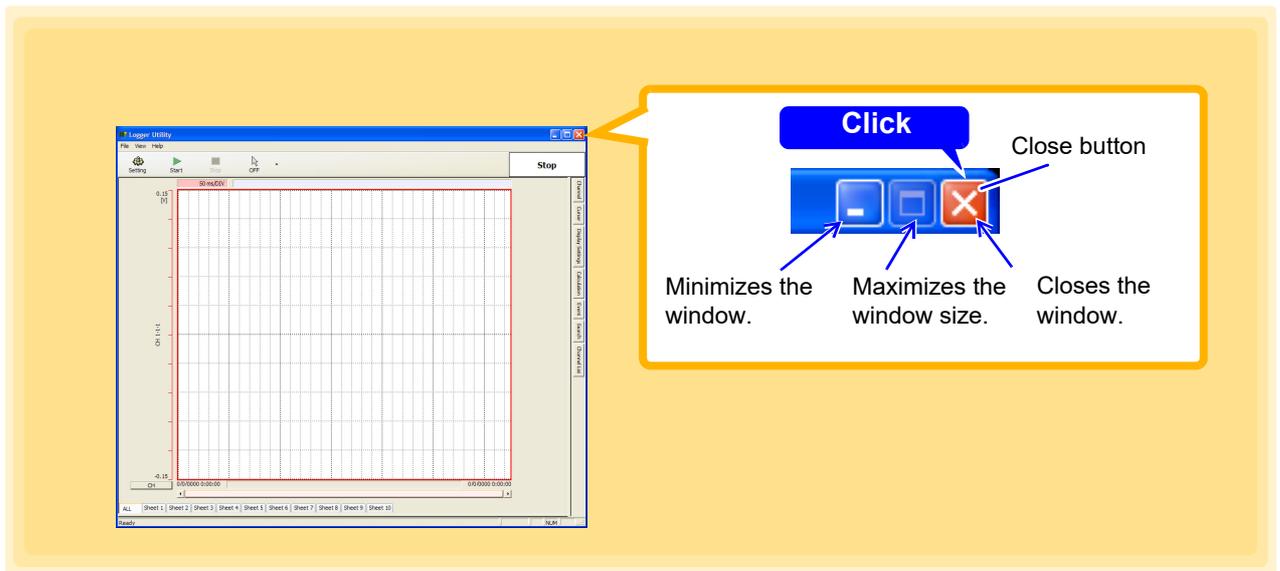
2.5   Uninstalling the Logger Utility

Use the following procedure to uninstall the program.

1. **Windows 7/10/11: From the Windows Start menu, select the [Control Panel].**
Windows 8: From the desktop, select the [Charm]-[Setting]-[Control Panel].

2. **Double click [Add or Remove Programs].**

3. **From the list of installed programs, select [HIOKI Logger Utility], and remove it.**
The installer starts automatically.

1

(2) Click

(1) Click

2

Double click

The **[Add or Remove Programs]** screen appears.

3
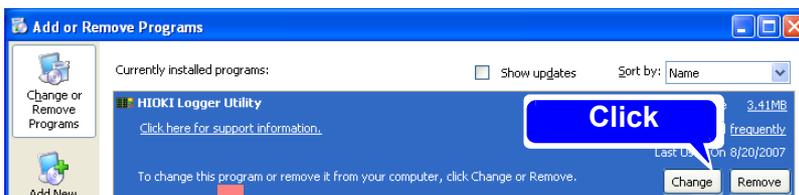
Click

A confirmation dialog appears when you click **[Remove]**.

Click
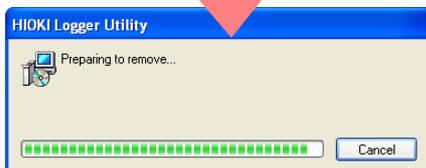
Uninstall is finished.

You are returned to the **[Add or Remove Programs]** screen. Settings files are not deleted during uninstall, so if no longer needed, delete them manually.

Software Screen   Chapter 3

This chapter describes the screen configuration, part names, and functions of the supplied software Logger Utility.

3.1   Main Screen

When you start Logger Utility, the main screen appears. This is the basic screen of Logger Utility.

Menu Bar (p. 18)

File   View   Help

Saves and loads measurement data and setting data, waveform printing, etc.

Tool Button (p. 19)

Displays the settings screen, starts and stops measurement, etc.

Measurement Condition
Displays measurement condition as "Measuring", "Stop", "Wait for TRIG", etc.

Waveform Display Area (p. 19)
Displays measurement data as waveforms.

Display Settings Windows
Click the tabs on the right side to display setting items. The windows allow for configuring the advanced settings of the waveform display area, analyzing data, etc.

List Display Area (p. 20)
Displays measurement data as numerical values.

Settings Screen
Allows for setting measurement conditions.

Status Bar
Displays the status of the main screen.

Menu Bar

The menu bar contains three menus: File, Display, and Help.

◆[File] Menu

This menu includes items for saving and loading files, waveform printing, initializing Logger Utility, etc.
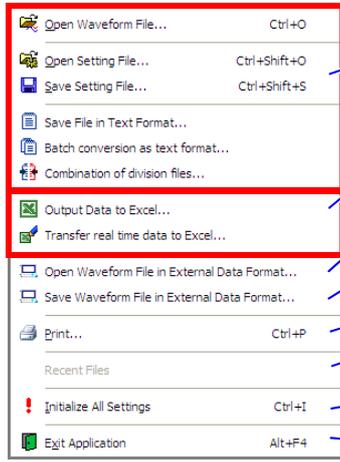
Open Waveform File...	Ctrl+O
Open Setting File...	Ctrl+Shift+O
Save Setting File...	Ctrl+Shift+S
Save File in Text Format...	
Batch conversion as text format...	
Combination of division files...	
Output Data to Excel...	
Transfer real time data to Excel...	
Open Waveform File in External Data Format...	
Save Waveform File in External Data Format...	
Print...	Ctrl+P
Recent Files	
Initialize All Settings	Ctrl+I
Exit Application	Alt+F4

Open (load) and save a file.

Transfer real-time data to Excel (p. 223).

Open a waveform file saved in an external data format (LR5000, etc.).

Save a waveform file in an external data format (LR5000, etc.).

Print waveforms.

Shows previously opened files.
Click here to reopen a file.

This item resets all settings of Logger Utility to their default state.

This item ends Logger Utility.

◆[View] Menu

This menu is for displaying/hiding the status bar.
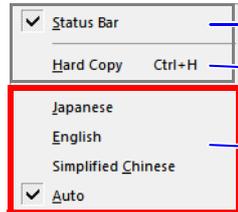
✓ Status Bar	
Hard Copy	Ctrl+H
Japanese	
English	
Simplified Chinese	
✓ Auto	

Switches the status bar on and off.

Saves a copy of the main screen to the clipboard.

Sets the display language.
If Auto is selected, the Windows display language setting is used.
The setting is applied the next time the software is started.

◆[Help] Menu

This menu is for displaying the software version of Logger Utility.

Manual...
About Logger Utility...

Opens the instruction manual (PDF) of Logger Utility.

Version Information

Logger Utility Version V 1.00

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All rights reserved.

OK

Tool Button

The tool buttons are for control such as displaying the measurement settings, or starting and stopping measurement.

Tool buttons	Explanations
Setting	Displays the settings screen.
Start	Starts measurement.
Stop	Stops measurement.
OFF	Displays the A and B cursors, and inserts event marks.
MONI Monitor	Start Monitoring
MONI Moni Stop	Stop Monitoring

Waveform Display Area

This area displays the measurement waveforms.
You can also split the screen to display two waveforms. The frame of the active screen is emphasized. See "6.3 Changing Display Settings" (p. 180).

Upper limit value

Gauge

Lower limit value

Comment 1

Comment 2

Scroll bar
This indicates the positional relation for displaying measurement waveforms. You can drag the mouse to change a displayed position.
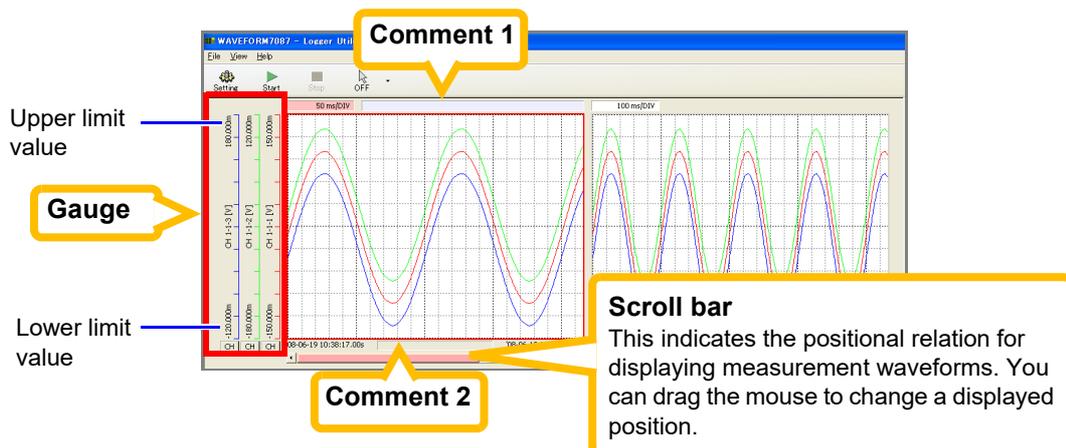
Double-clicking a comment enables it to be set.
Enter characters with the keyboard, and then press the **Enter** key.

NOTE Scrolling apply to the active screen.

List Display Area

This area displays measurement waveforms and calculation results as numerical values.

Display content
Allows for selecting Logging, Calculation, and Num Wide.

Sheet tab
If a display channel is pre-assigned to each sheet, the sheet tabs allow you to switch the display channels.

NOTE
- Scrolling and changing sheets apply to the active screen.
- When logging is selected for the display content, you can select the display type (Analog, Logic, Alarm, Wave Calculation, or All) for the next column on the right. When logging is selected and an alarm setting is enabled, the alarm status is displayed on the far left.

3.2 Settings Screens

Click the **[Setting]** button in the main screen to display the settings screen. Click the menu buttons to display various setting pages, and configure settings. See "Chapter 4 Setting Measurement Criteria" (p. 33).
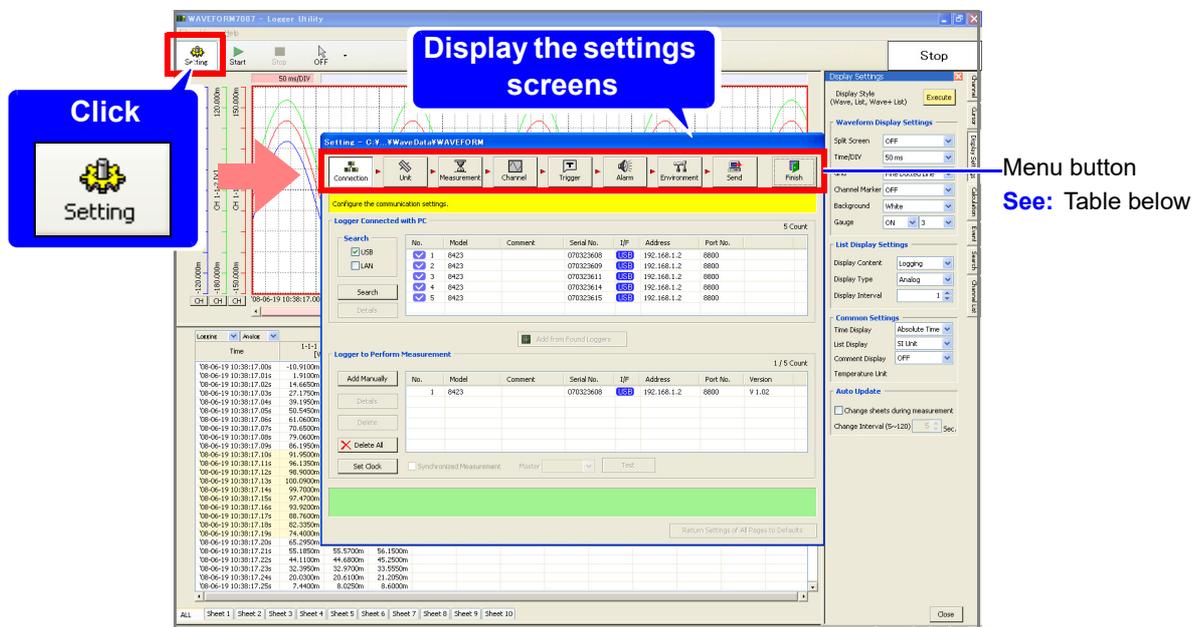
| Menu buttons	Setting pages	Explanations
Connection	**Connection** 4.1 (p. 35)	This page is for setting the Logger for measurement.
Unit	**Unit** 4.2 (p. 53)	This page is for setting the installed input units and digital filter in the Logger.
Measurement	**Measurement** 4.3 (p. 58)	This page is for setting the measurement conditions, data save method, etc.
Channel	**Channel** 4.4 (p. 74)	This page is for setting the measurement range for each channel, display conditions, etc. This page is for setting the waveform calculation also.
Trigger	**Trigger** 4.5 (p. 116)	This page is for setting trigger conditions.
Alarm	**Alarm** 4.6 (p. 134)	It allows for setting the output condition and action upon alarm generation. (This page is only enabled when the 8997 Alarm Unit is attached to the 8423.)
Environment	**Environment** 4.7 (p. 141)	This page is for setting the external control input terminals, CF card/SD card/USB memory stick save format, etc. It is for operations that work only on the Logger main unit.
Send	**Send** 4.8 (p. 161)	This page is for sending the settings to the Logger.

[Connection]

[Trigger]

[Unit]

[Alarm]

[Measurement]

[Environment]

[Channel]

If part of the settings screen is not displayed:
The DPI setting for the display may be set to an option other than its native or recommended size (100%).

Windows 7/8

1. Select **[Control panel]** - **[Appearance Personalization]** - **[Display]**.

2. On Display Dialog, select the setting to **[smaller - 100%(default)]**.
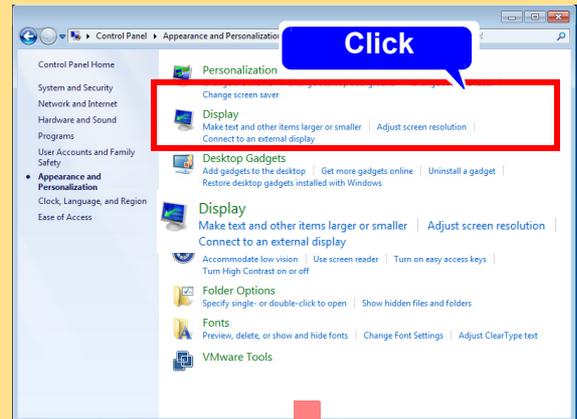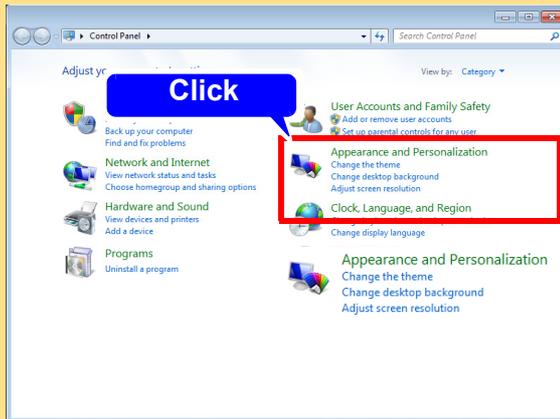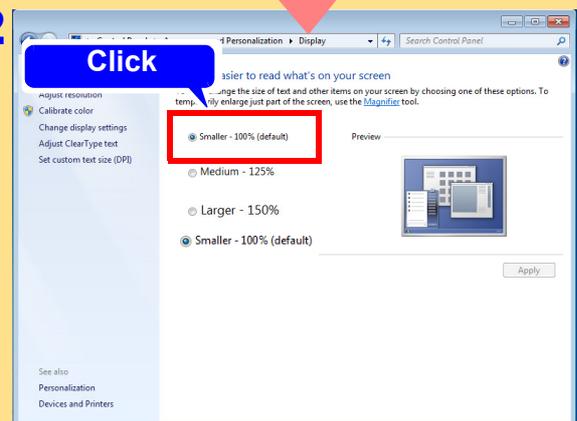
Windows 10/11

1. Click **[Settings]** - **[System]** - **[Display]**.

2. Set **[Scale and layout]** (Change the size of text, apps, and other items) to 100%.
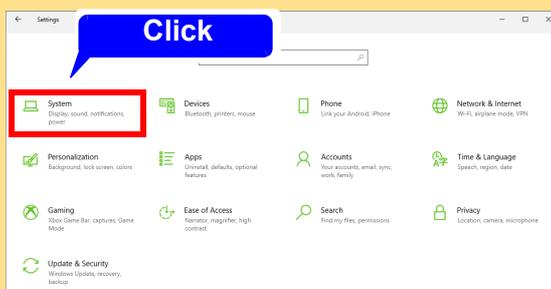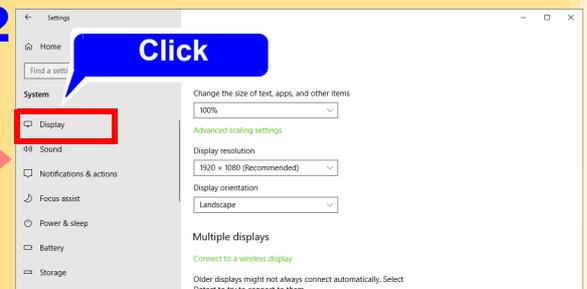
NOTE   After changing the display size, reboot the computer.

3.3 Display Settings Windows

Click tabs on the right edge of the main screen to display windows for setting the waveform display area and confirming items such as measurement conditions. See "Chapter 6 Analyzing Measurement Data" (p. 175).
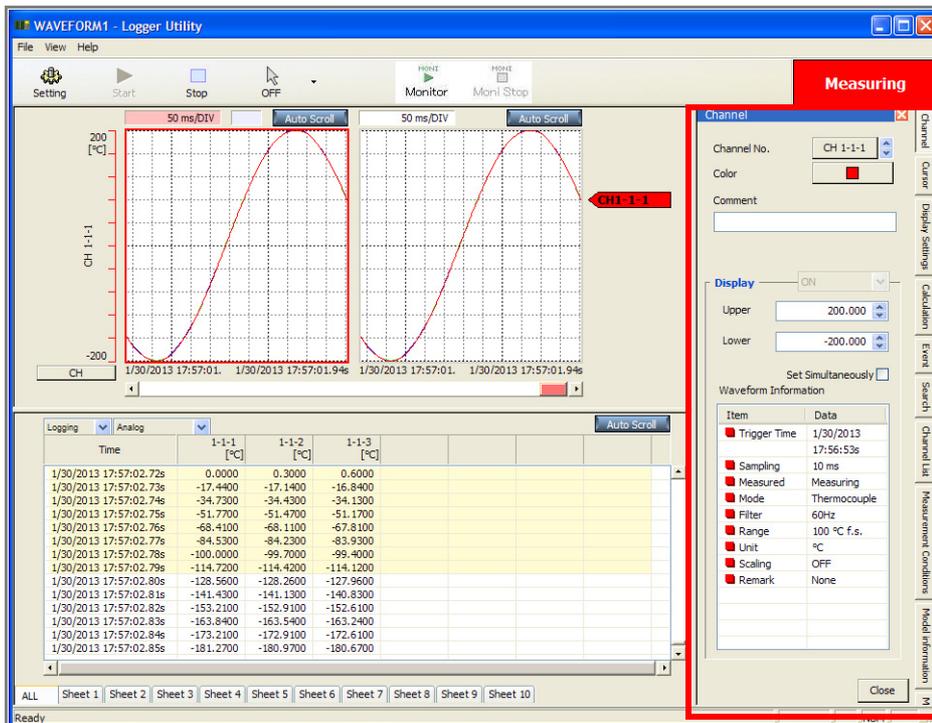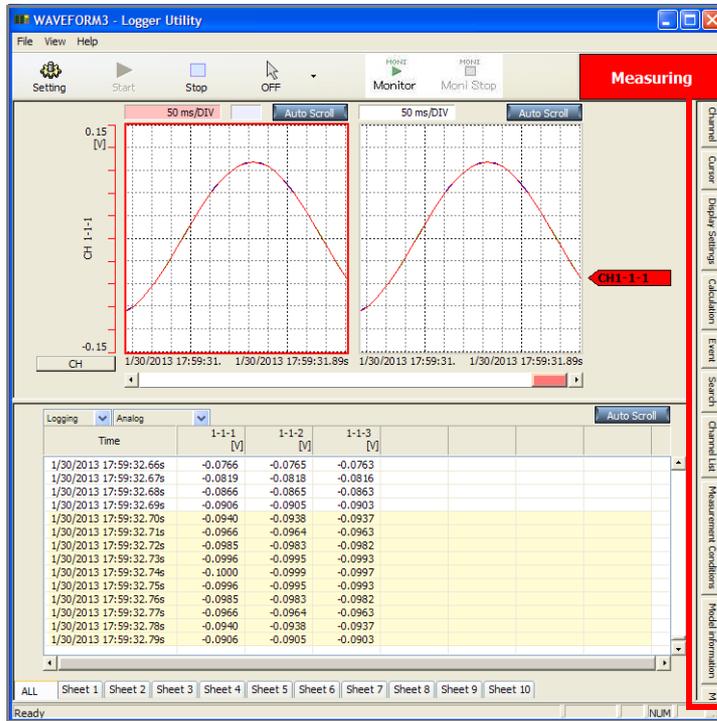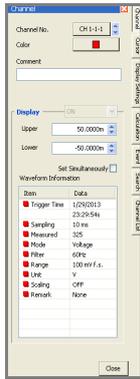
[Channel]

Set the display method for any channel. Waveform information is also displayed.
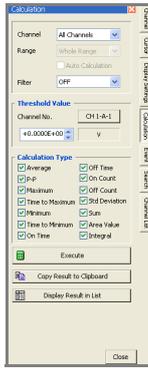
[Calculation]

Set calculation items and calculation ranges.
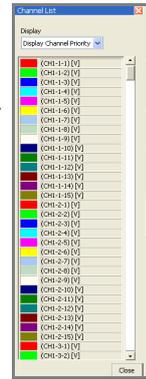
[Channel List]

Switch the channel display for the currently selected sheet.
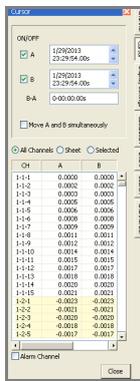
[Cursor]

Set cursors A and B.
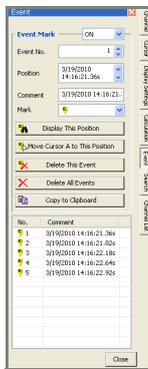
[Event]

Perform tasks such as switching and editing the event mark display.

[Measurement Conditions]

Display measurement progress. (Displayed only during measurement)

[Display Settings]

Set the display method for the waveform display area and list display area.

[Search]

Search the measurement data for parts that match the conditions.
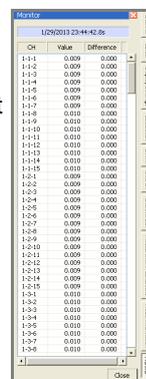
[Monitor]

Display the difference between the values of the sample immediately before and the current values. (Displayed only during measurement)

[Model Information]

Displays the measurement unit's signal strength and battery life (shown during measurement only).

3.4 Channel Indication on Screens

Channel numbers are indicated on Logger Utility screens as shown below.

NOTE   Z1 to Z60 are displayed for the waveform calculation channel.

When using Model 8423

Channel number

CH1-1-1
Logger   Unit   Channel

Input Modules
8 · · · · · · · · · · · · · · · 1   Logger 1 Primary

Channel 1
⋮
15

HUB

USB or LAN

Logger 2

Maximum of five loggers

Logger 5

9683 Connection Cable (for synchronization, option)
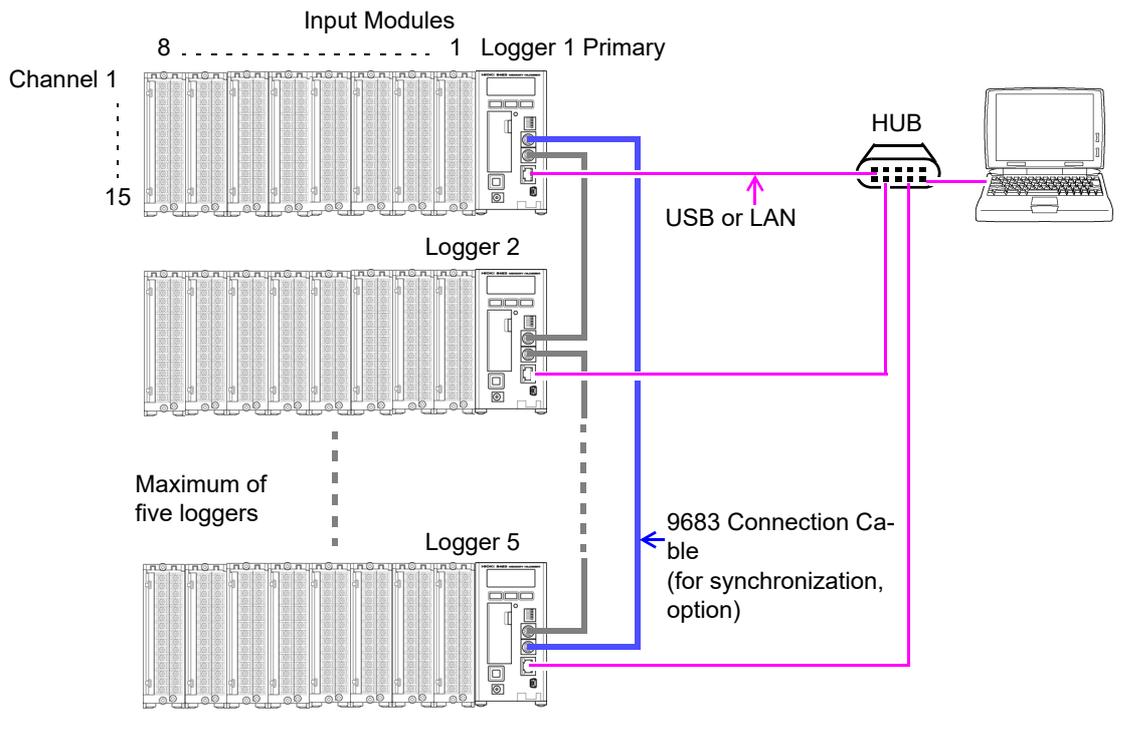
NOTE   For details on how to connect the 9683 Connection Cables (for synchronization), see 8423 Instruction Manual "3.7 Connecting Synchronization Cables".

When using Model 8430-20, LR8431-20 and LR8432-20

Channel number

CH1-A-1   CH1-P-1   CH1-ALM

Logger   Analog   Channel   Logger   Pulse   Channel   Logger   Alarm
          Input   Input   Output

LR8432-20 only

            Waveform Calculation

CH1-W-1

   Logger   Channel

Pulse Input Channel   1 - - - - 4

Analog Input Channel

     1 - - - - - 1 0

9641 Connection Cable
(for pulse input)

HUB

Logger 1

USB

Logger 2

Maximum of
five loggers
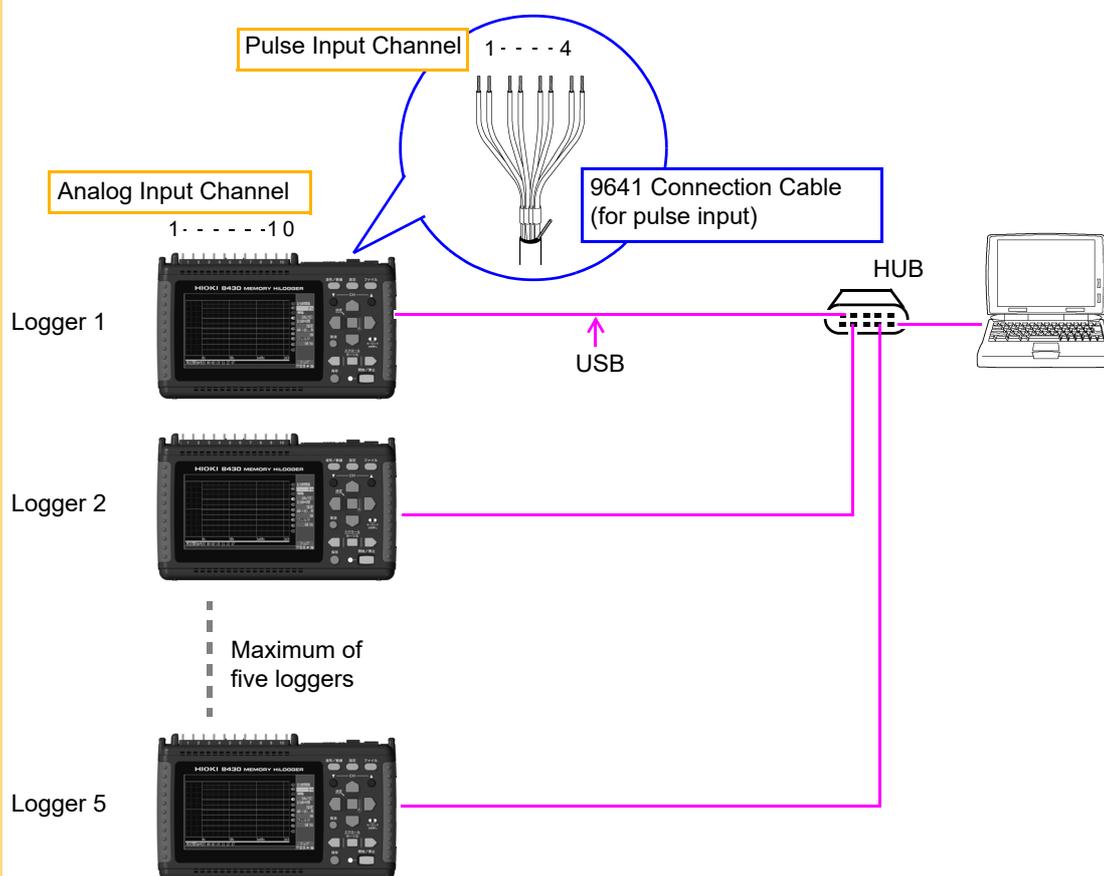
Logger 5

NOTE   For details on how to connect the 9641 Connection Cable (for pulse input), see 8430-20, LR8431-20, LR8432-20 Instruction Manual "2.3 Connecting Measurement Cables to the Logger".

When using Model LR8400-20, LR8401-20, or LR8402-20

Channel number

CH1-1-1

Logger (1 to 5)　Unit　Channel (1 to 60)

CH1-P-1

Logger (1 to 5)　Pulse Input　Channel (1 to 8)

CH1-ALM-1

Logger (1 to 5)　Alarm Output　Channel (1 to 4)

Waveform Calculation

CH1-W-1

Logger (1 to 5)　Channel (1 to 30)
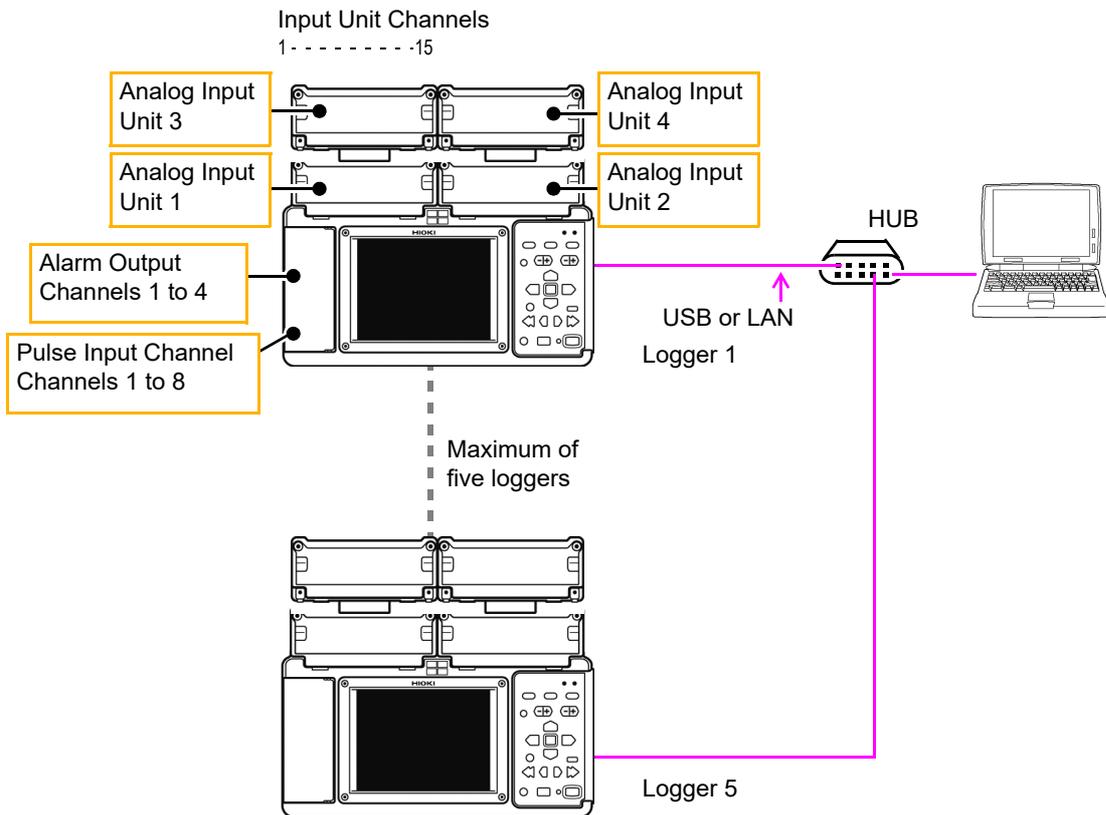
Input Unit Channels
1 - - - - - - - - - ·15

Analog Input Unit 3

Analog Input Unit 4

Analog Input Unit 1

Analog Input Unit 2

Alarm Output Channels 1 to 4

Pulse Input Channel Channels 1 to 8

HUB

USB or LAN
Logger 1

Maximum of five loggers

Logger 5

NOTE To communicate using the USB or LAN interface, select **[USB]** or **[LAN]** for the **[Communication Interface]** in the **[Communication]** settings on the System screen of the LR8400-20, LR8401-20, or LR8402-20. See "10.1 USB Settings and Connections" and "10.2 LAN Settings and Connections (Before connecting to the network)" in the instruction manual for the LR8400-20, LR8401-20, and LR8402-20.

When using Model LR8410-20
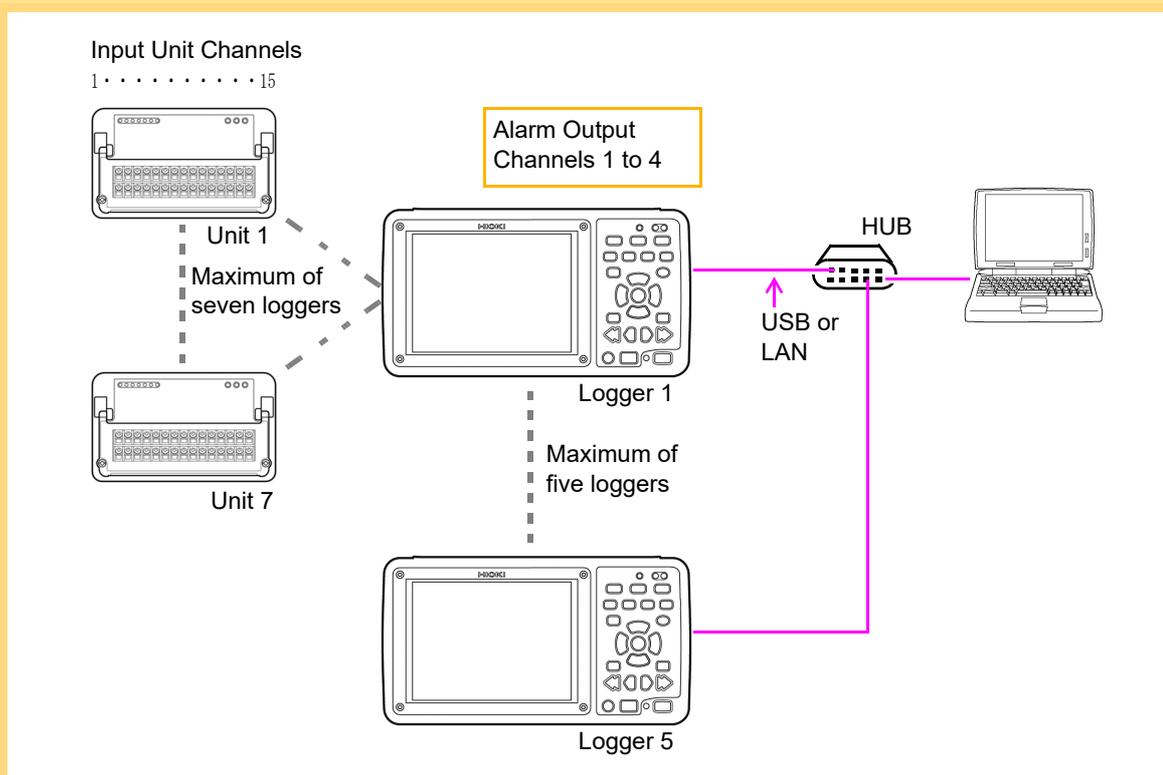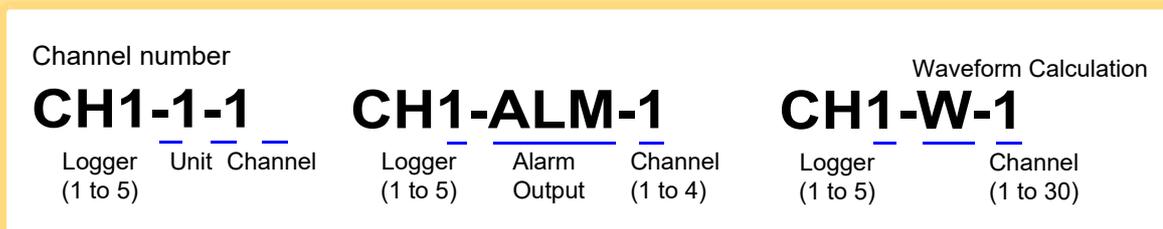
Channel number

Waveform Calculation

CH1-1-1   CH1-ALM-1   CH1-W-1

Logger	Unit	Channel
(1 to 5)		

Logger	Alarm	Channel
(1 to 5)	Output	(1 to 4)

Logger		Channel
(1 to 5)		(1 to 30)

Input Unit Channels

1 · · · · · · · · · · 15

Alarm Output
Channels 1 to 4

Unit 1

HUB

Maximum of
seven loggers

Logger 1

USB or
LAN

Unit 7

Maximum of
five loggers

Logger 5

NOTE   To communicate using the USB or LAN interface, select **[USB]** or **[LAN]** for the **[Communication Interface]** in the **[Communication]** settings on the System screen of the LR8410-20. See "10.1 USB Settings and Connections" and "10.2 LAN Settings and Connections (Before connecting to the network)" in the instruction manual for the LR8410-20.

When using Model LR8450, LR8450-01

Channel number

CH1-1-1

Logger   Unit   Channel
(1 to 5)   (1 to 30)

CH1-P-1

Logger   Pulse   Channel
(1 to 5)   Input   (1 to 8)

CH1-ALM-1

Logger   Alarm   Channel
(1 to 5)   Output   (1 to 8)

Waveform Calculation

CH1-W-1

Logger   Channel
(1 to 5)   (1 to 30)

Channel 1

Analog Input Unit 3

Analog Input Unit 4

Analog Input Unit 1

Analog Input Unit 2

HUB

Logger 1

USB or LAN

Maximum of five loggers

Unit 1

Maximum of seven loggers

Logger 5

Unit 7

NOTE   If you want to perform communications via USB or LAN, use the LR8450/LR8450-01 screen to set **[Communication]** - **[LAN]**.

      See: "9.3 Configuring and Establishing a LAN Connection" in the instruction manual for the LR8450, LR8450-01.

When using Model LR8101, LR8102

Channel number

CH1-1-1

Logger | Module | Channel
(1 to 5) | | (1 to 10)

CH1-P-1

Logger | Pulse | Channel
(1 to 5) | Input | (1)

CH1-ALM-1

Logger | Alarm | Channel
(1 to 5) | Output | (1 to 4)

CH1-W-1

Logger | Waveform | Channel
(1 to 5) | Calculation | (1 to 30)

CH1- 1 - URMS1

Logger | Module | Power Measurement Item
(1 to 5) | | (URMS1 to HST3)

Module
10 - - - - - - - - - - - - 1

Channel 1
:
15

Logger 1 Primary

HUB

LAN

Logger 2

Maximum of
five loggers

Logger 5

L6101, L6102
Optical Connection Cable*1
(for synchronization, option)
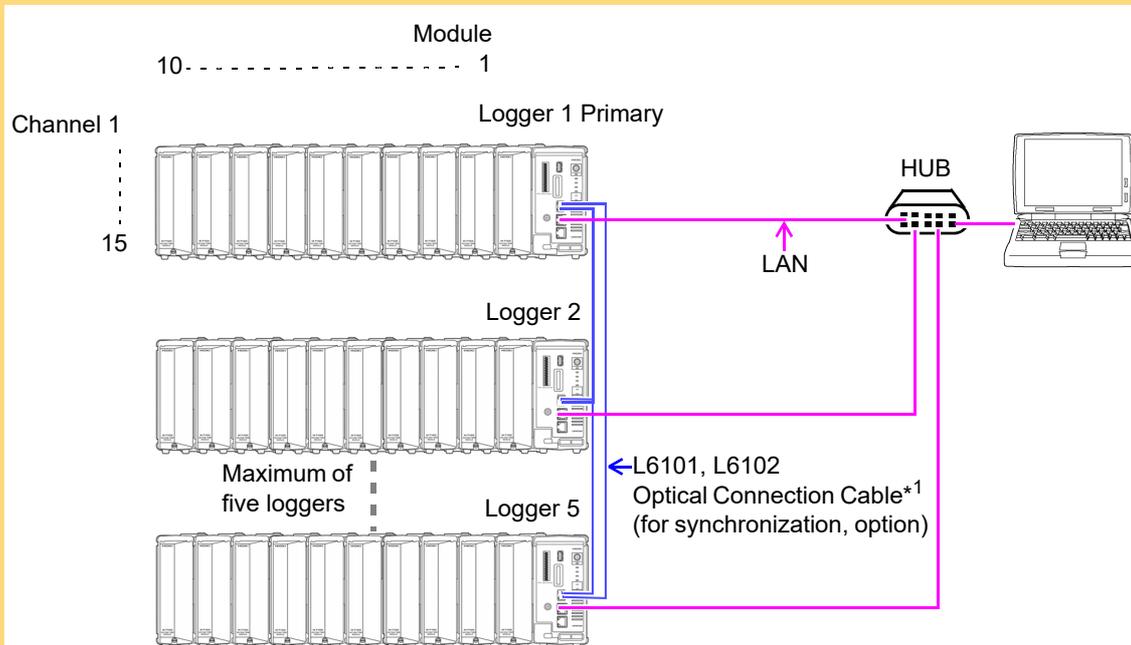
*1: LR8102 only

NOTE To communicate using the LAN interface, configure the settings in the browser.
See: See "2.8 Setting and Connecting the LAN" in the instruction manual for the LR8101, LR8102.

Setting Measurement Criteria

Chapter 4

Configure measurement settings on the Settings screen before starting to measure. Install the Logger Utility before proceeding (p. 5).

Settings Screen Display Procedure

Main screen

Click

Display the settings screens
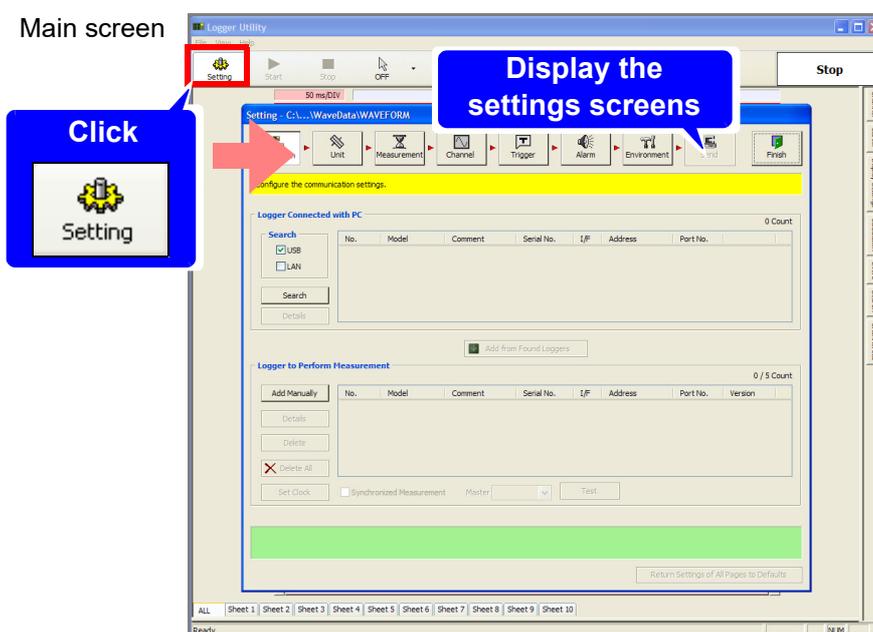
Measurement Setting Procedure

1. Register the Logger for measurement: (p. 35)

2. Confirm the unit configuration: (p. 53)

3. Configure basic settings for measurement: (p. 58)

4. Configure settings such as the measurement criteria for each channel: (p. 74)

5. Configure settings for when using the trigger function: (p. 117) <u>Trigger settings only</u>

6. Configure settings for when using the alarm function: (p. 135) <u>Model 8423 requires the 8997</u>

7. Set the environment criteria of the Logger: (p. 142)

8. Send the settings to the Logger: (p. 162)

NOTE   Some Logger Utility settings depend on the Logger model used, as shown below.

Functions	Loggers controlled by Logger Utility				
	8423 only	LR8450, LR8450-01 only	8430-20 and LR8431-20, LR8432-20 only, LR8400-20, LR8401-20, LR8402-20 only, LR8410-20 only	LR8101 LR8102 only	8423, 8430-20, LR8431-20, LR8432-20 LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102 and combined
Normal Sampling (p. 58)	O	O	O	O	O
Dual Sampling (p. 59)	O	–	–	–	O[*4]
External Sampling (p. 62)	O	–	–	O	–
External Trigger (p. 126)	O[*1]	O[*1]	O[*3]	O[*1]	–
Synchronized Measurement (p. 47)	O[*2]	O[*2]	–	O[*5]	–

O: Available   -: Unavailable

*1. Setting is available only during simultaneous measurement for measurements using 2 or more sets.

*2. Setting is available only during measurements using 2 or more sets.

*3. Setting is available only during measurements using 1 set.

*4. Only the 8423 can be set. The recording interval for the 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102 is fixed as the recording interval for the high speed group in the 8423.

*5. Setting is available only during measurements with 2 or more LR8102s.

4.1 Registering Loggers in Logger Utility

This section describes registering Loggers in Logger Utility, and configuring the connection settings for communication.

There are two methods for registering Loggers connected to the PC: "Searching and Registering" (p. 35) and "Registering Manually" (p. 39).

The search and register method can be used for a Logger connected to the PC by a USB cable or a Logger connected to the same network by a LAN cable. Searching is not possible if the network is split by, for instance, a router during LAN communication. In such a case, register Loggers manually.

4.1.1 Searching and Registering

Search for Loggers connected to the PC, and register the Loggers for measurement from the found Loggers. Up to 256 Loggers can be found, and up to 5 of them can be registered. Connect the PC and Loggers by LAN cable or USB cable beforehand.
- 8430-20, LR8431-20 and LR8432-20 can only be connected by a USB cable.
- LR8101 and LR8102 can only be connected by a LAN cable.

1. **Display the Settings screen (p. 33).**
The Connection settings page appears.

2. **Select the search object from USB and LAN, and then click the [Search] button.**
The Loggers connected to the computer appear.

Setting Items	Explanations
USB	Searches for Loggers connected to the computer by USB cable.
LAN	Searches for Loggers connected to the computer by LAN cable. Searching is not possible if the network is split by, for instance, a router. In such a case, see "4.1.2 Registering Manually" (p.39) and register Loggers manually. Use port number 8808 for the Logger search.

3. (Only when measuring via LAN (except 8430-20, LR8431-20, LR8432-20). For measuring via USB, skip to step **4**.)

Select the Logger from the list, and click the [Details] button (or double click the right button of the mouse).

Configure the network settings in the **[Advanced Information]** dialog box that appears (p. 41).

See: "LAN Connection Setting Example (except 8430-20, LR8431-20, LR8432-20)" (p. 42)

4. **Select the Logger to be registered from the list, and click the [Add from Found Loggers] button.**

(A Logger can also be added by double-clicking.)

5. **Receive configuration conditions from the registered logger (if necessary).**

Receive the logger's measurement settings to reflect the settings in Logger Utility.

See: "4.10 Process All" (p.164)

6. **Register other Loggers in the same way.**

When you want to measure with the sampling of multiple Loggers synchronized, configure the settings while referring to "4.1.3 Settings for Synchronized Measurement" (p.47).

Simultaneous measurements can only be carried out when only multiple sets of 8423, LR8450, LR8450-01, or LR8102 are used.


3

1 Select

2 Click

3 Set

4 Click

See: "Communication Setting Items" (p. 41)

<u>Enter the IP address and subnet mask.</u>

4

1 Select

2 Click

A registered Logger appears here.

NOTE

- When measuring via a LAN, measurement may not possible if you just search for a Logger and then add the Logger without changing the communication parameters. Be sure to configure the communication settings.
- To terminate Logger Search task, press the **ESC** key on the keyboard.
- The network settings in step **3** become the Logger's network settings.
- The Logger Utility distinguishes Loggers by serial number. The serial number is indicated on the sticker on the right side of model 8423, on the back of models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450 and LR8450-01, and on the front of models LR8101 and LR8102.
- The serial number consists of 9 digits. Starting from the left, the first pair of digits indicate the year of manufacture (last two digits of the year), and the next pair of digits indicate the month of manufacture.
  Do not remove this sticker as the number is important.

Serial No.

When controlling this Logger with Logger Utility, use the serial No. to differentiate it from other Loggers.
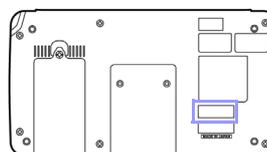
Back side of the
LR8410-20

Back side of the 8430-20,
LR8431-20, LR8432-20
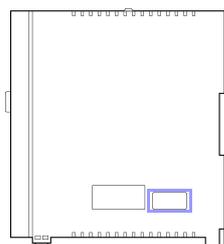
Right side of the 8423
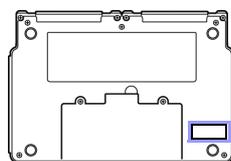
Back side of the LR8400-20,
LR8401-20, LR8402-20
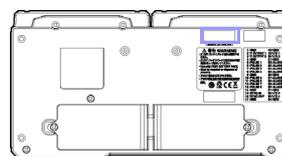
Back side of the
LR8450, LR8450-01
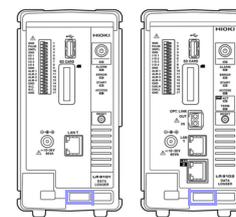
Front side of the
LR8101, LR8102

7. **Click the [Set Clock] button.**
The **[Synchronize Clock]** dialog is displayed.

8. **Click the [Set Clock] button.**
Synchronize the clock of the registered Logger with the computer.

6

Logger to Perform Measurement								1 / 5 Count
Add Manually	No.	Model	Comment	Serial No.	I/F	Address	Port No.	Version
Details	☑ 1	8423		98765432	USB	192.168.1.2	8800	V 1.00
Delete								
✕ Delete All								
Set Clock	☐ Synchronized Measurement		Master No1 ▾		Test			

Click

7

Synchronize Clock

Click

No.	Comment	Status	
1	Experiment	07-08-18 22:09:21 (+0s)	Set Clock
			Check Clock
Current Time	8/18/2007 10:09:22 PM		Close
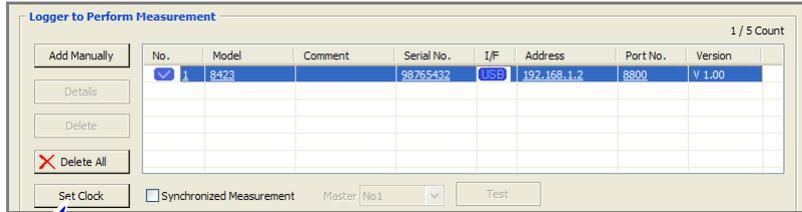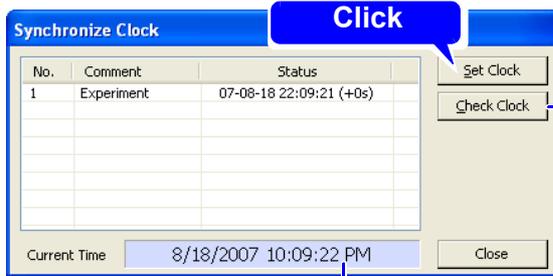
This button allows you to check the current time of the Logger.

This indicates the time of the PC.

NOTE Depending on the time setting, the clocks of the Logger Utility and the Logger may differ by ±1 second.

? How to delete a specific Logger from the registered Loggers?

You can register up to five Loggers for measurement. Delete a Logger when you want to register more than five Loggers or remove a registered Logger. Select a Logger from the list, and then click the **[Delete]** button.

If you want to delete all Loggers, click the **[Delete All]** button.

| Logger to Perform Measurement			**1 Select**					1 / 5 Count
Add Manually	No.	Model	Comment	Serial No.	I/F	Address	Port No.	Version
Details	☑ 1	8423		98765432	USB	192.168.1.2	8800	V 1.00
Delete								
✕ Delete All								
Set Clock	**2 Click**		Master No1 ▾		Test			
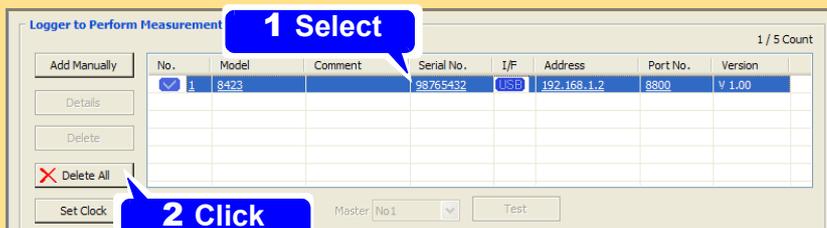
4.1.2 Registering Manually

If searching for a Logger is not possible, register it manually.
If there are already five Loggers registered, a new Logger cannot be registered. ("How to delete a specific Logger from the registered Loggers?" (p. 38)

1. **Display the Settings screen (p. 33).**
The Connection settings page appears.

2. **Click the [Add Manually] button.**
The [Add New Logger] dialog appears.

3. **Configure the settings while referring to "Communication Setting Items" (p. 41).**
First select the [Model].
Be sure to set the serial No. in the case of USB, and the IP address in the case of LAN.
It is not possible to register duplicate Loggers, such as Loggers with the same serial No.

4. **Click the [Receive] button.**
The Logger's measurement settings are received and displayed on the Logger Utility setting screen.
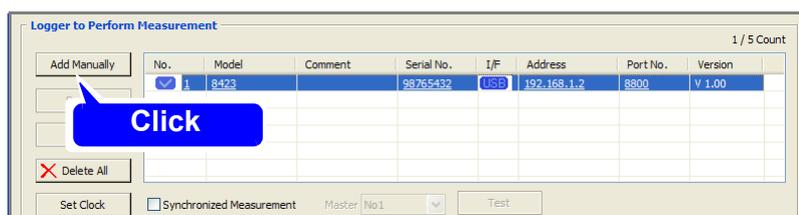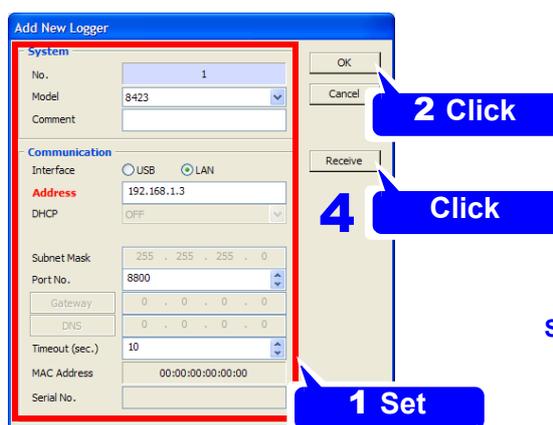
40

5. **Click the [Set Clock] button.**
The **[Synchronize Clock]** dialog is displayed.

6. **Click the [Set Clock] button.**
Synchronize the clock of the registered Logger with the computer.

5

Logger to Perform Measurement   1 / 5 Count

	No.	Model	Comment	Serial No.	I/F	Address	Port No.	Version
Add Manually	☑ 1	8423		98765432	USB	192.168.1.2	8800	V 1.00
Details								
Delete								
✕ Delete All								
Set Clock	☐ Synchronized Measurement	Master No1 ▾	Test					

Click

6

Click

Synchronize Clock

No.	Comment	Status
1	Experiment	07-08-18 22:09:21 (+0s)

Set Clock
Check Clock ——— This button allows you to check the current time of the Logger.

Current Time   8/18/2007 10:09:22 PM   Close

This indicates the time of the PC.

NOTE   Depending on the timing in which the time is set, an offset of up to ± 1 second may be generated between Logger Utility and the Logger.

Communication Setting Items

Setting Items	Explanations	Interface	
		LAN	USB
No	Indicates the number of the Logger selected in the list.	–	–
Model	Indicates the model of the Logger selected in the list.	*4	*4
Comment	This is for setting the comment of each Logger. You can set a comment up to 20 characters long.	*3	*3
Interface	Set whether communication is performed by USB or LAN.	*2	*2
IP Address	Set the IP address.	*3	–
Address	Set the address for identification on the network. Set an address that is not a duplicate of that of another device on the network. Enter an IP address. (e.g., 192.168.1.2) You can also enter a host name. If you use a host name, set DNS to ON. This cannot be used in an environment in which a DNS server is not running. You can enter up to 12 alphanumeric characters (0 to 9, a to z, A to Z, and -) to set as the host name. (e.g., LOGGER)	*1	–
DHCP (Dynamic Host Configuration Protocol)	DHCP is a function that enables an Logger to automatically obtain information such as its own IP address and configure the LAN settings accordingly. If DHCP is set to On and a DHCP server is running within the same network, it is possible to automatically obtain the IP address, subnet mask, and gateway, and configure the settings. **IP address**: An address for identifying individual devices connected to a network. Set an IP address that is not a duplicate of that of another device. If DHCP is set to On, the setting is configured automatically. If DHCP fails, the Logger sets DHCP to Off and uses the preset IP address for communication.	*3	–
Subnet Mask	A setting for separating an IP address into the address portion that indicates the network and the address portion that indicates the device. Set the same setting as that of the subnet mask of devices within the same network. If DHCP is set to On, the setting is configured automatically.	*3	–
Port No.	The Logger uses the TCP/IP protocol during communication. TCP/IP allows each communication device to establish multiple connections, so port numbers are used to differentiate between the connections. The Logger uses a pre-defined number from 8800 to 8809. There is normally no need to change a port number, but if there is a port that cannot be used because of a network security problem, change the value. The first digit of the port number is reserved.	*3	–
Gateway	**When connecting to a network**: If the PC is on a different network than the Logger, set this to On and specify the device that will be the gateway. If they are connected to the same network, generally this should be set to same gateway as the PC. **When connecting directly to the PC**: This setting is not necessary if the PC and Logger are connected to the same hub, so set it to Off. If DHCP is set to On, the setting is configured automatically.	*3	–
DNS (Domain Name System)	If DNS is set to On, specify a communication partner by name instead of IP address. (Since an IP address is a difficult-to-understand sequence of numbers, the use of a name, which is more meaningful to humans, to specify a communication partner was made possible.) If a server (DNS server) capable of obtaining a name from an IP address is running within the network, it is possible to find out an IP address by making an inquiry to the server.	*3	–
Timeout	Set the communication timeout for when controlling the Logger with the PC. If communication becomes no longer possible because some kind of trouble occurs during a connection, the PC cuts off communication with the Logger and stops measurement after the specified time elapses.	*3	*3
MAC Address	Indicates the MAC address of the Logger. The value cannot be changed.	–	–
Serial No.	Shows the serial number of the Logger. When a Logger is manually added or replaced, enter the serial No. (p. 37) from the label on the Logger. When a Logger has been registered using a search, the serial number is obtained automatically.	–	*1

*1. Input required *2. Input possible *3. Setting possible during Logger search
*4: Setting possible during manual registration –: Input not possible

NOTE   When measuring via a LAN, be sure to set the IP address and subnet mask. When connecting to a network, ask the network administrator for the settings.

## LAN Connection Setting Example (except 8430-20, LR8431-20, LR8432-20)

The 9642 LAN Cable is used to connect one PC to one model 8423, LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102.

Network Addresses	192.168.1.0/24 (Private IP addresses)
Subnet Mask	255.255.255.0
PC	(The settings are made manually)
IP Address	192.168.1.1

For a network as shown above, set the PC and the Logger's Communications settings display as shown next.

PC Settings

IP Address : 192.168.1.1
Subnet Mask : 255.255.255.0

To display the setting dialogs at the right:
1. Click **[Control Panels]-[Network and Internet Connections]-[Network Connections]**.
2. Right click **[Local Area Connection]**, and select **[Properties]**.

Local Area Connection Properties

General | Authentication | Advanced

Connect using:
Intel 21140-Based PCI Fast Ethernet / [Configure...]

This connection uses the following items:
- ☑ rks
- ☑ r Microsoft Networks
- ☑ QoS Packet Schedu...
- ☑ Internet Protocol (TCP/IP)

1 Select
2 Click

[Install...] [Uninstall] [Properties]

Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☐ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

[OK] [Cancel]

Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

3 Inputs

○ Obtain an IP address automatically
● Use the following IP address:
IP address: 192 . 168 . 1 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway: . . .

○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

[Advanced...]

[OK] [Cancel]

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Model 8423 Settings

Host Name* : LOGGER
DHCP : OFF
IP Address : 192.168.1.2
Subnet Mask : 255.255.255.0
Port Number : 880X
Gateway : OFF

```
DHCP
              OFF
```
```
IP Address
  192:168:001:002
```
```
Subnet mask    SET
  255:255:255:000
```
```
Port number
   880X         SET
```
```
Gateway
              OFF
```

LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8410-20, LR8450, LR8450-01 Settings

Host Name* : LOGGER
DHCP : Off
IP Address : 192.168.1.2
Subnet Mask : 255.255.255.0
Port Number : 880X
Gateway : Off
DNS : Off

Make settings on the Communications Settings display of the System screen.

LR8101, LR8102 Settings

Host Name[*] : LOGGER
IP Address : 192.168.1.2
Subnet Mask : 255.255.255.0
Port Number : 8800
Gateway : 0.0.0.0
DNS : 0.0.0.0

When one PC is connected to one model 8423, LR8400-20, LR8401-20,LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102 using the crossover adapter supplied with the 9642 LAN Cable, any IP address can be specified. However, we recommend using private IP addresses. Enter a host name and IP address on the Logger that will not be duplicated on the PC.

* If you set an IP address, it does not matter if a host name is not entered.

Connecting one computer to multiple models 8423, LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102 using a hub

Use straight-through cables to connect the computer and Loggers to the Ethernet hub or switch. When building a local network with no outside connections, it is recommended that private IP addresses be used for the IP addresses.
Make the same settings on the PC as shown left. Set the IP address manually.
Configure each Logger as shown below, without duplicating host names or IP addresses.

First Logger's settings (manually set)

Setting Items	Settings
Host Name	LOGGER1*
IP Address	192.168.1.2

Second Logger's settings (manually set)

Setting Items	Settings
Host Name	LOGGER2*
IP Address	192.168.1.3

Third Logger's settings (manually set)

Setting Items	Settings
Host Name	LOGGER3*
IP Address	192.168.1.4

Shared settings on first, second, and third Logger

Setting Items	Settings
DHCP	OFF
Subnet Mask	255.255.255.0
Gateway	OFF
Port Number	880X

* If you set an IP address, it does not matter if a host name is not entered.

LAN Communication Problems

Did you connect the LAN cable only after configuring Logger communications settings?

Logger LAN settings are initialized as each setting item is accepted.
Be sure to complete this LAN setting before you connect the Logger to the network.
When you edit the settings while the Logger is connected to the network, you may accidentally send illegal address information to the network. For example, you may select the same IP address as that of another Logger on the network.

Is the LAN cable connected properly?

A crossover cable connection must be used for one-to-one Logger to computer connection. The short cable of the straight-cross converter supplied with the 9642 LAN Cable is a cross cable. The connector is a straight male-female converter. The cable might not be connected to the connector properly. Remove the cable and then connect it again.

Have you set the IP address of the PC correctly?

Choose **[Run]** from the Start menu. Type **[ipconfig /all]** and click **[Enter]**. Doing so will enable you to get the IP address of the PC's network interface, subnet mask, and gateway address.

When the IP address setting is not correct
Choose **[Settings]**-**[Control Panels]** from the Start menu.
Double-click the **[Network]** icon to get the Network Properties dialog box.
Edit the IP address setting.

Can the Logger communicate with the PC?

After confirming that the IP addresses of the Logger and computer are correct, use the Windows "ping" utility to test data transfer.

Choose **[Programs]**-**[Accessories]**-**[Command Prompt]** from the Start menu.When the cursor starts blinking, type **[ping < IP address of the host you want to check >]**.
In environments where DNS is functioning properly, you can also use the hostname.

For example, if the Logger's IP address is 192.168.1.2, type

ping 192.168.1.2 and press Enter.

If the screen display is as shown below, the Logger and the PC are communicating properly. "Time" represents how long it took for the Logger and the PC to communicate.

Pinging 192.168.1.2 with 32 bytes of data:
Reply from 192.168.1.2: bytes=32 time<10ms TTL=32
Reply from 192.168.1.2: bytes=32 time<10ms TTL=32
Reply from 192.168.1.2: bytes=32 time<10ms TTL=32
Reply from 192.168.1.2: bytes=32 time=1ms TTL=32

If the screen display is as shown above, the Logger and the PC are not communicating properly. Check the cable connection again.

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Precautions on USB communication

Communications with the Logger may become unreliable if the PC is connected to any USB devices other than the Logger. If you experience instability, disconnect any other devices from the PC.
Do not unplug the USB cable of the Logger or switch off the power during measurement.
Communication from the Logger Utility will be interrupted (this applies even to Loggers which are not measuring when multiple sets of Loggers are connected).

Note) Communication may be interrupted, but the Logger will continue to carry out measurement.
If you have accidentally switched off the power to interrupt the communication, re-connect the Logger which cannot be communicated.

4.1.3 Settings for Synchronized Measurement

For model 8423

If you use special 9683 Connection Cables, it is possible to measure with the sampling of multiple model 8423s synchronized. You can set a primary instrument to be the reference for sampling (base), and measure with up to five model 8423s synchronized. With synchronized measurement, it is possible to perform measurement in which a trigger is used among multiple Loggers.

1. **Connect the 8423s to be synchronized with the 9683 Connection Cable.**

2. **Register the 8423 using a search, or manually.**
   See: "4.1.1 Searching and Registering" (p.35), "4.1.2 Registering Manually" (p.39)

3. **Add a check to [Synchronized Measurement].**
   The synchronous measurement settings are activated.

4. **Select the [Primary] Logger.**
   The selected 8423 is set as the primary sampling reference (marked as **P**).

5. **Click the [Test] button.**
   Synchronization test results are displayed.

Test Synchronization

Status | Result
Synchronization was performed properly. | **OK**

Close
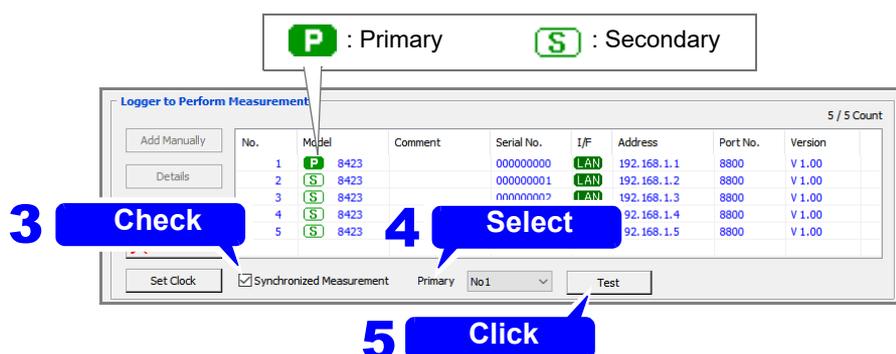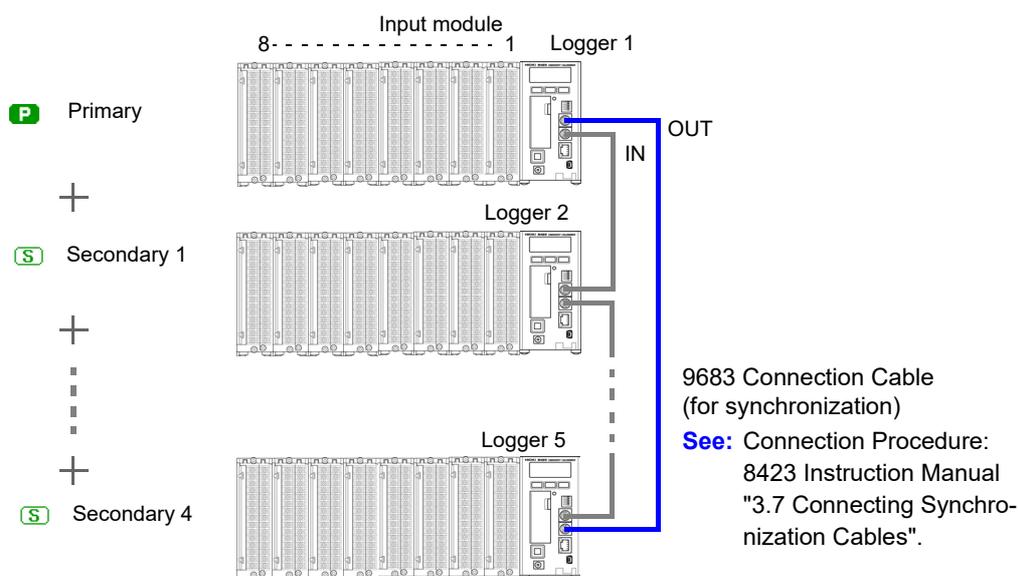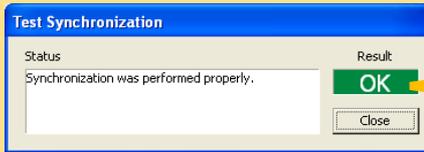
Synchronization test result

OK: The 8423s are connected properly.
NG: Check the connections of the 9683 Connection Cables according to the status.

NOTE

- Synchronous measurement settings are not available for model 8423 in combination with models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102. Synchronous measurement is only available with two to five 8423s.
- Synchronized measurement is not possible with only one Model 8423.
- Always connect the 9683 Connection Cables when synchronized measurement will be performed. Furthermore, do not connect 9683 Connection Cables if there are six or more Model 8423s. The Loggers will not work properly.
- The trigger setting is invalid when synchronized measurement is not performed.

For models LR8450 and LR8450-01

It is possible to measure with the sampling of multiple model LR8450s or LR8450-01s synchronized. You can set a primary instrument to be the reference for sampling (base), and measure with up to five model LR8450s or LR8450-01s synchronized. With synchronized measurement, it is possible to perform measurement in which a trigger is used among multiple Loggers.

1. **Connect the LR8450s or LR8450-01s to be synchronized.**

2. **Register the LR8450 or LR8450-01 using a search, or manually.**
See: "4.1.1 Searching and Registering" (p.35), "4.1.2 Registering Manually" (p.39)

3. **Add a check to [Synchronized Measurement].**
The synchronous measurement settings are activated.

4. **Select the [Primary] Logger.**
The selected LR8450 or LR8450-01 is set as the primary sampling reference (marked as **P**).

5. **Click the [Test] button.**
Synchronization test results are displayed.
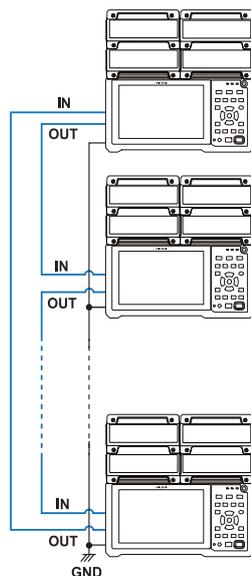
See: Connection Procedure:
LR8450 Instruction Manual
"8.3 Configuring Sync Input/
Output (SYNC) Terminals".

Synchronization test result

OK: The LR8450s or LR8450-01s are connected properly.
NG: Check the connections according to the status.

NOTE
- Synchronous measurement setting are not available for model LR8450 or LR8450-01 in combination with models 8423, 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20 or LR8410-20. Synchronous measurement is only available with two to five LR8450s and LR8450-01s.
- Synchronized measurement is not possible with only one model LR8450 or LR8450-01.
- Do not connect six or more model LR8450s or LR8450-01. The Loggers will not work properly.
- The trigger setting is invalid when synchronized measurement is not performed.
- Wireless modules are not subject to synchronized measurement. Measurement cannot be started when a wireless module is connected.

For model LR8102

It is possible to measure with the sampling of multiple model LR8102s synchronized. You can set a primary instrument to be the reference for sampling (base), and measure with up to five model LR8102s synchronized. With synchronized measurement, it is possible to perform measurement in which a trigger is used among multiple Loggers.

1. **Connect the LR8102s to be synchronized.**

2. **Register the LR8102 using a search, or manually.**
See: "4.1.1 Searching and Registering" (p.35), "4.1.2 Registering Manually" (p.39)

3. **Add a check to [Synchronized Measurement].**
The synchronous measurement settings are activated.

4. **Select the [Primary] Logger.**
The selected LR8102 is set as the primary sampling reference (marked as **P**).

5. **(As necessary) Add a check to [Power Calculation Primary].**

6. **Click the [Test] button.**
Synchronization test results are displayed.

See: Connection Procedure:
LR8101, LR8102 Instruction Manual "Wiring the optical connection cable" (LR8102 only)

Test Synchronization

Status	Result
Synchronization was performed properly.	OK

Close
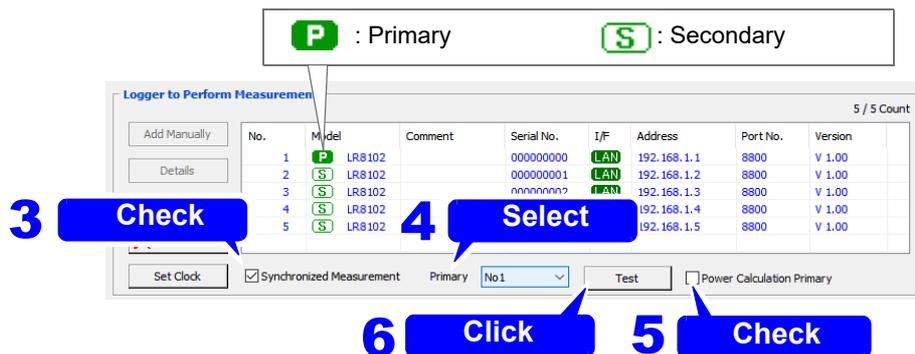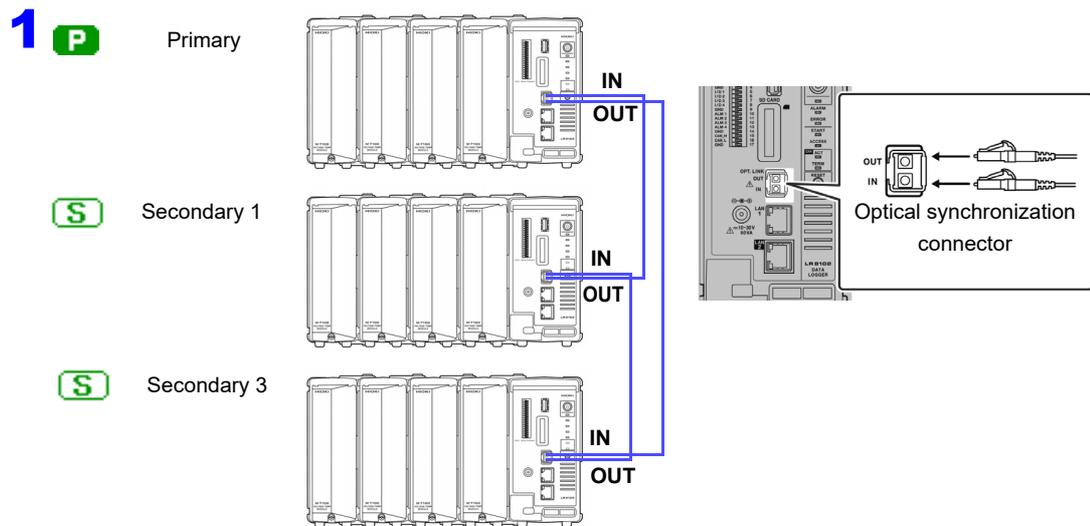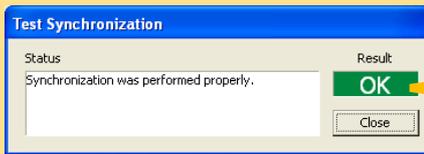
Synchronization test result

OK: The LR8102s are connected properly.

NG: Check the connections according to the status.

NOTE
- Synchronous measurement settings are not available for model LR8102 in combination with models 8423, 8430, LR8400, LR8401, LR8402, LR8431, LR8432, LR8410, LR8450, LR8450-01 or LR8101. Synchronous measurement is only available with two to five LR8102s.
- Synchronized measurement is not possible with only one model LR8102.
- Do not connect six or more model LR8102s. The Loggers will not work properly.
- The trigger setting is invalid when synchronized measurement is not performed.

4.2 Confirming the Unit Configuration (Digital Filter Setting)

If you set the digital filter, it is possible to eliminate noise superimposed on an input signal. The longer the recording interval is, the greater the effect of noise reduction.

See: For the relationship between recording intervals and filter cutoff frequencies:
8423: Instruction Manual "12.3.1 Model 8948 Voltage/Temp Unit" and "Recording Interval and Cutoff Frequency Table" of "12.3.2 Model 8949 Universal Unit".
8430-20, LR8431-20, LR8432-20: Instruction Manual "Cutoff Frequency" of "Chapter 10 Specifications".
LR8400-20, LR8401-20, LR8402-20: Instruction Manual, "Cutoff Frequency Table" in Chapter 11, "Specifications".
LR8410-20: Instruction Manual, "Cutoff Frequency Table" in Chapter 11, "Specifications."
LR8101, LR8102: Instruction Manual, "Cutoff Frequency Table" in Chapter 13, "Specifications".
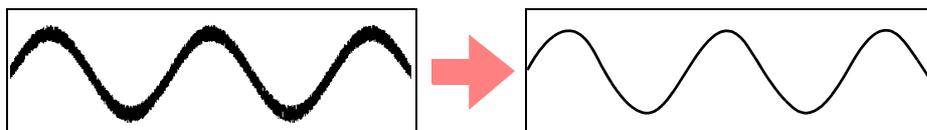
8423	Confirm the Logger's input unit configuration, and set the digital filter.
8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102	Set only the digital filter, regardless of the unit configuration. (LR8450,LR8450-01, LR8101, LR8102 is a name called Power frequency filter)

NOTE
- If the digital filter is set to 50 Hz or 60 Hz, the scanning time of each channel becomes almost as long as the time for obtaining all channel data within the recording interval. If the digital filter setting is Off, the scanning time becomes approximately 10 ms.
- The digital filter is available for analog inputs (voltage, temperature, resistance, and humidity). It is not available for logic, pulse and alarm channels.

When a Logger is Registered by Searching

When registered using a search (p. 35), the Logger's information is obtained automatically, and the input unit configuration is displayed.

1. **Display the Input module configuration page.**
Confirm that the displayed and physical configurations match (except 8430-20, LR8431-20, LR8432-20).

2. **Set the digital filter.**

Setting Items	Explanations
OFF*	The filter is not used.
50Hz	Select this to use at an operating power frequency of 50 Hz.
60Hz	Select this to use at an operating power frequency of 60 Hz.

*: Not applicable for models LR8450, LR8450-01, LR8101, LR8102.
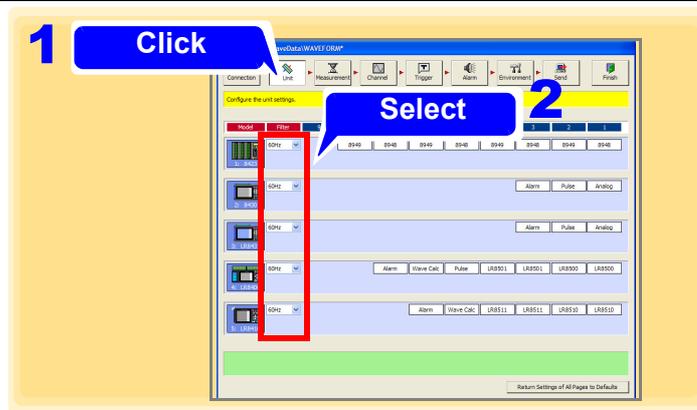
When a Logger is Registered Manually or When Changing the Unit Configuration after Searching and Registering

When a Logger is registered manually (p. 39), you can also set the unit configuration manually. Furthermore, if you have changed the unit configuration of a Logger since it was registered, change the unit configuration displayed in the screen.

1. **Display the Input module configuration page.**

2. **Click the icon of a Logger.**
The background changes from blue to red to indicate the input unit to be changed (except 8430-20, LR8431-20, LR8432-20, LR8450, LR8450-01).

3. **Select the correct input unit from the list (except 8430-20, LR8431-20, LR8432-20, LR8450, LR8450-01).**
For model 8423

Setting Items	Explanations
---	No unit
8948	8948 Voltage/Temp Unit (Voltage and Thermocouple)
8949	8949 Universal Unit (Voltage, Thermocouple, Resistance temperature detector, and Humidity)
8996	8996 Digital/Pulse Unit (Logic input and Pulse input)
8997	8997 Alarm Unit (Alarm output)

For models LR8400-20, LR8401-20, LR8402-20

Setting Items	Explanations
LR8500	LR8500 Voltage/Temp Unit (Voltage, Thermocouple, and Humidity)
LR8501	LR8501 Universal Unit (Voltage, Thermocouple, RTD, Resistance, Humidity)
Pulse	Logic input and Pulse input
Wave Calc	Waveform calculation channel
Alarm	Alarm output channel

For model LR8410-20

Setting Items	Explanations
LR8510	LR8510 Voltage/Temp Unit (Voltage, Thermocouple)
LR8511	LR8511 Universal Unit (Voltage, Thermocouple, RTD, Resistance, Humidity)
LR8512	LR8512 Wireless Pulse Logger (Pulse input and Logic input)
LR8513	LR8513 Wireless Clamp Logger (Current)
LR8514	LR8514 Wireless Humidity Logger (Temperature, and Humidity)
LR8515	LR8515 Wireless Voltage/Temp Logger (Voltage and Thermocouple)
LR8520	LR8520 Wireless Fungal Logger (Temperature, Humidity, Fungal index, and Predicted Fungal Growth)
Wave Calc	Waveform calculation channel
Alarm	Alarm output channel

For model LR8101, LR8102

Setting Items	Explanations
M7100	Voltage/Temp Module (Voltage, Thermocouple)
M7102	Voltage/Temp Module (Voltage, Thermocouple)
M7103	Power Measurement Module
Pulse	Logic input and Pulse input
Wave Calc	Waveform calculation channel
Alarm	Alarm output channel

4. **Click the icon of a Logger.**

The background changes from red to blue when the input unit change is accepted.
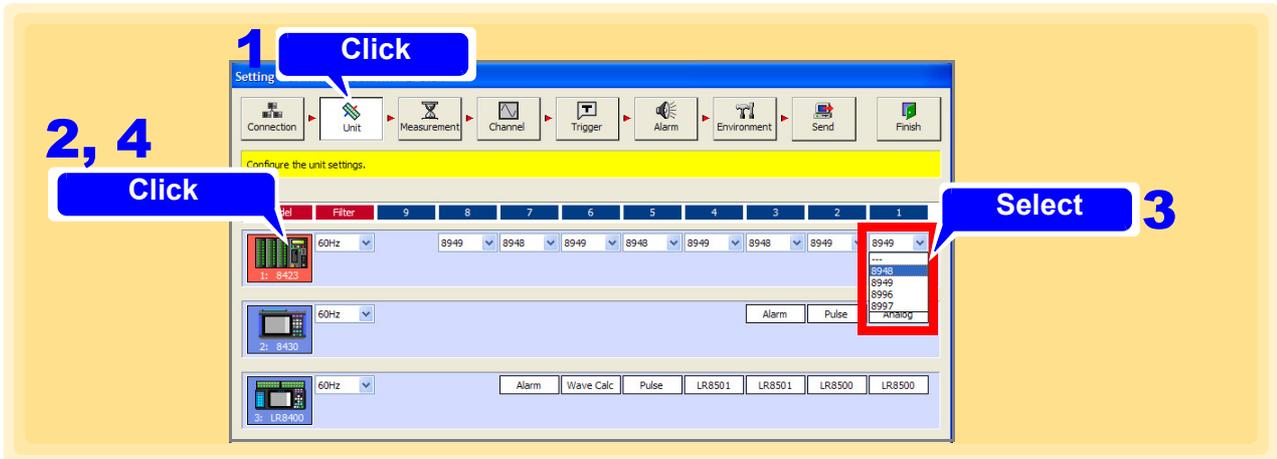
5. **Set the digital filter.**

Setting Items	Explanations
OFF*	The filter is not used.
50Hz	Select this to use at an operating power frequency of 50 Hz.
60Hz	Select this to use at an operating power frequency of 60 Hz.

*: Not applicable for model LR8450, LR8450-01, LR8101, LR8102.
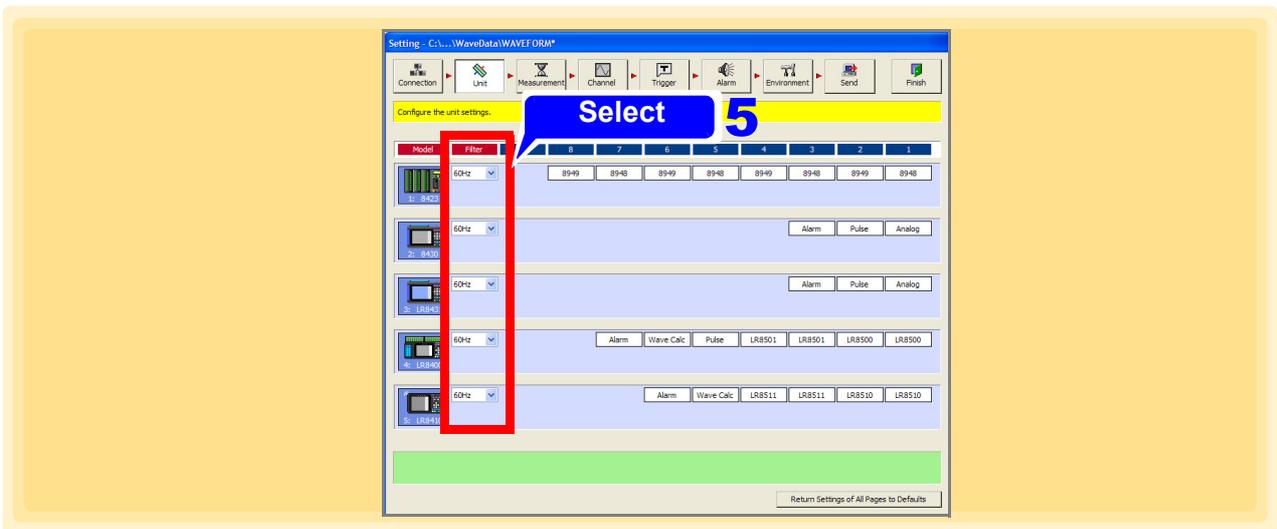
NOTE
- Register each unit in order from the right. It is not possible to leave a space between each unit when you configure the setting.
- Match the displayed input unit settings to those on the 8423, LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8101, or LR8102. Measurement is only possible when the settings match.
- When no input unit ("---") is selected, the display is as follows:
  8423, LR8101, or LR8102: Input units to the left of this one are disabled.
  LR8400-20, LR8401-20, LR8402-20, or LR8410-20: displayed starting from the right.
- Attach at least one unit other than the 8997 Alarm Unit to this model 8423. If all of the units are 8997 Alarm Units, measurement will not be performed properly.
- "Pulse", "Calc" and "Alarm" are always displayed for the LR8400-20, LR8401-20, LR8402-20, LR8450, LR8450-01, LR8101, LR8102.
- "Pulse", "Wave Calc" and "Alarm" are always displayed for the LR8410-20.

Set the data update intervals (LR8450, LR8450-01, LR8101, LR8102 only)

Setting Items	Explanations
data update intervals	AUTO, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s

Available data renewal interval settings may be limited by factors including the number of channels being used and whether burn out detection is enabled.

See the LR8450, LR8450-01, LR8101, LR8102 Instruction Manual for details.
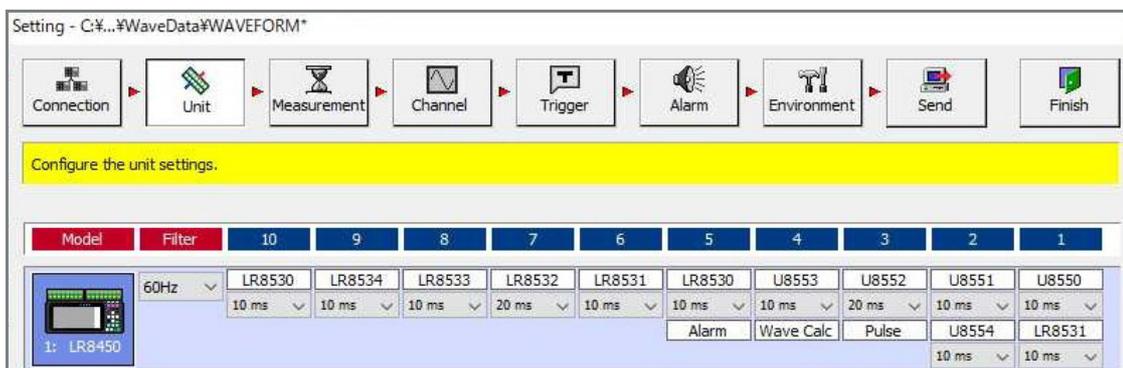
4.3 Configuring Basic Settings for Measurement

This section describes configuring basic settings for measurement such as the recording interval (sampling speed) and recording period. The screen settings differ depending on the sampling function you select.

4.3.1 Setting Function and Recording Interval

On the Measurement settings page, select the sampling function in accordance with the purpose of measurement. The method for obtaining measurement data, settings, and available functions differ depending on the sampling function. Sampling cannot be set for the 8997 Alarm Unit used with the 8423.

Normal Sampling

Sampling is performed at a timing which is synchronized to the internal clock of the Logger, and the data is recorded. The measurement data quantity is the same for all channels.

Recording interval
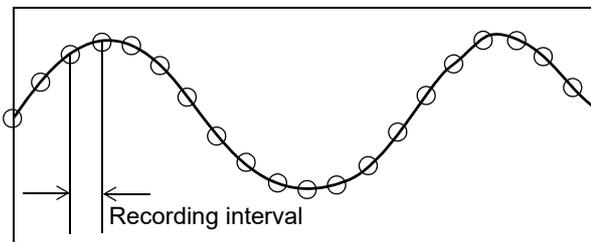
1. **Display the Measurement settings page.**

2. **Click [Normal Sampling].**

3. **Set the recording interval (high-speed).**

Setting Items	Setting Values
High speed	10, 20, 50, 100, 200, 500 ms, 1, 2, 5, 10, 20, 30 s, 1, 2, 5, 10, 20, 30 m, 1 h

LR8450, LR8450-01 can choose 1 ms, 2 ms, 5 ms.
LR8101, LR8102 can choose 5 ms.

Dual Sampling (model 8423 only)

Since it is possible to set dual sampling intervals, you can measure with the measurement interval suitable for each measurement object. This enables the effective use of internal memory and CF card space. The measurement data quantity differs depending on the specified recording interval (high-speed or low-speed). Select the recording interval for each unit.

Recording interval: 100 ms

Recording interval: 1s

Recording interval (High speed)

Recording interval (Low speed)
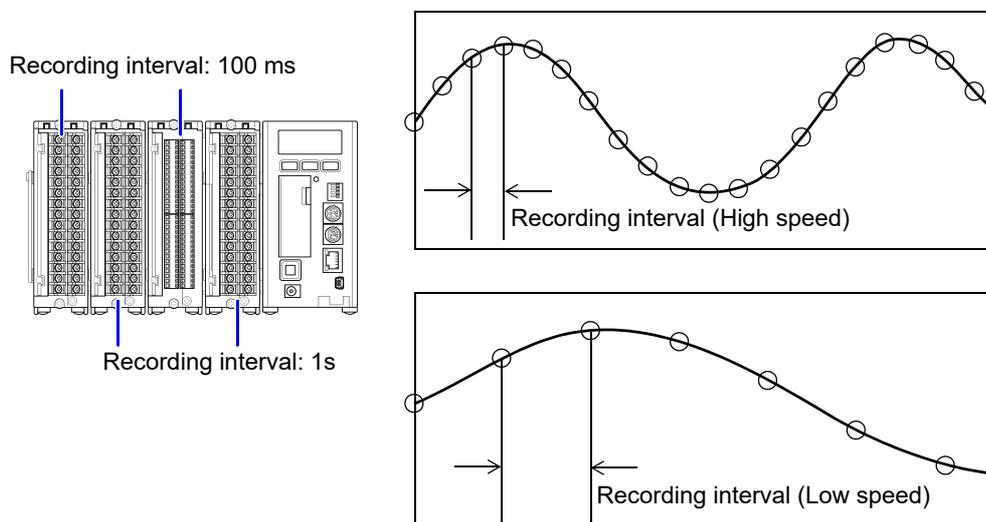
Possible Combination of High-speed Sampling and Low-speed Sampling Settings

The following table shows the combination of recording intervals that can be set when the function is dual sampling

Low-speed / High-speed	10 ms	20 ms	50 ms	100 ms	200 ms	500 ms	1s	2s	5s	10s	20s	30s	1m	2m	5m	10m	20m	30m	1h
10ms	-	-	-	O	O	O	O	O	O	O	-	-	-	-	-	-	-	-	-
20ms	-	-	-	O	O	O	O	O	O	O	O	-	-	-	-	-	-	-	-
50ms	-	-	-	O	O	O	O	O	O	O	O	O	-	-	-	-	-	-	-
100ms	-	-	-	O	O	O	O	O	O	O	O	O	O	-	-	-	-	-	-
200ms	-	-	-	-	O	-	O	O	O	O	O	O	O	O	-	-	-	-	-
500ms	-	-	-	-	-	O	O	O	O	O	O	O	O	O	O	-	-	-	-
1s	-	-	-	-	-	-	O	O	O	O	O	O	O	O	O	O	-	-	-
2s	-	-	-	-	-	-	-	O	-	O	O	O	O	O	O	O	O	O	-
5s	-	-	-	-	-	-	-	-	O	O	O	O	O	O	O	O	O	O	O
10s	-	-	-	-	-	-	-	-	-	O	O	O	O	O	O	O	O	O	O
20s	-	-	-	-	-	-	-	-	-	-	O	-	O	O	O	O	O	O	O
30s	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	O	O	O	O
1m	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	O	O	O
2m	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	O	O	O
5m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	O
10m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O
20m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O
30m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O
1h	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O

O: can be set, -: cannot be set

1. **Display the Measurement settings page.**

2. **Click [Dual Sampling].**

3. **Set the recording interval. (on each of the high-speed and low-speed)**

Setting Items	Setting Values
High-speed Low-speed	10, 20, 50, 100, 200, 500 ms, 1, 2, 5, 10, 20, 30 s, 1, 2, 5, 10, 20, 30 m, 1 h

4. **Return to the Input module configuration page.**

5. **Set the recording interval for each unit.**
Each click of the button toggles the setting **[High Speed]** and **[Low Speed]**.
(Switching is not available with models 8430-20, LR8400, LR8401, LR8402, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102.
For these models, the recording interval is fixed at the high-speed setting of the 8423.)

When using the 8423
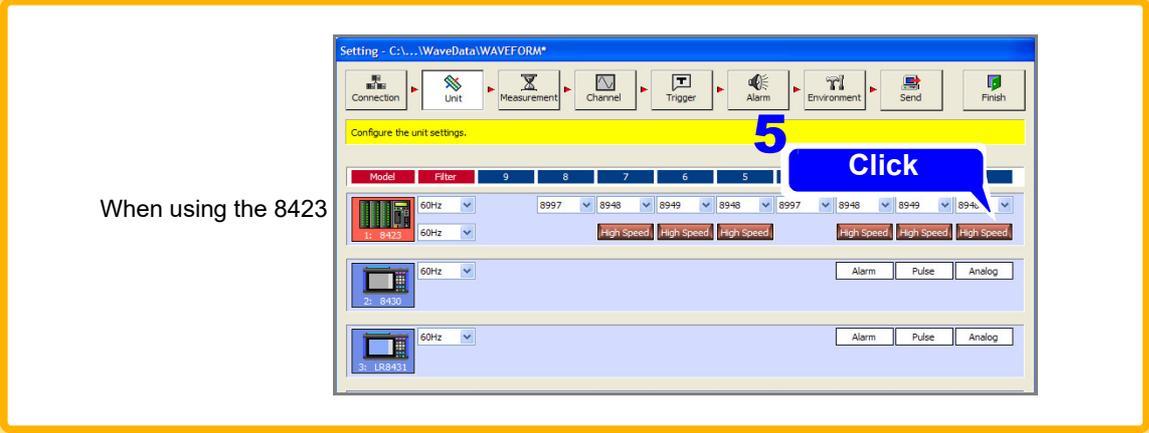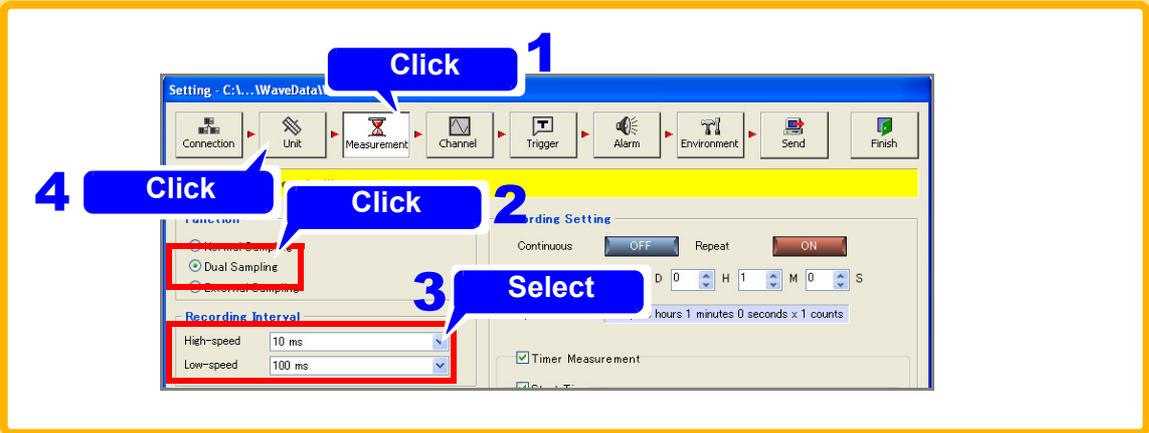
NOTE When simultaneously measuring different physical quantities, you can reduce the amount of data compared with measuring using normal sampling by selecting "High Speed" for high-speed phenomena such as voltage, and selecting "Low Speed" for capturing phenomena with gentle variations such as temperature and humidity.

6. **Set the digital filter for each of the high-speed and low-speed.**

Digital Filter Setting: 4.2 (p. 53)

Setting Items	Explanations
OFF	The filter is not used.
50Hz	Select this to use at an operating power frequency of 50 Hz.
60Hz	Select this to use at an operating power frequency of 60 Hz.

Recording interval (High-speed)

Select

Recording interval (Low-speed, when dual sampling is selected)
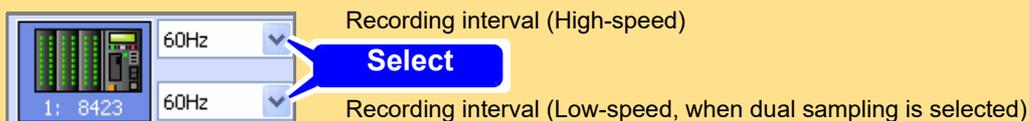
NOTE
- Dual sampling setting is only available for 8423.
- The sampling speed becomes slower on the low-speed side than the high-speed side.
- The maximum value for the sampling ratio of the high-speed side and the low-speed side is 1000 times. It is not possible to set recording intervals that exceed this ratio.
- Data of the high-speed side does not appear on the screen until scanning of the low-speed side ends. The scanning time differs depending on the recording period when the digital filter is not Off, and becomes up to approximately 20 seconds longer. When the digital filter is Off, the scanning time is 10 ms regardless of the recording interval (p. 53).
- The sampling data is the data at the scanning start time regardless of the scanning time.

External Sampling (when using model 8423)

Sampling is synchronized to the timing of the clock input from an external control input terminal on the front of the 8423, and data is recorded. The measurement data quantity is the same for all channels. A recording interval cannot be set.

External clock

Recording interval (external clock)
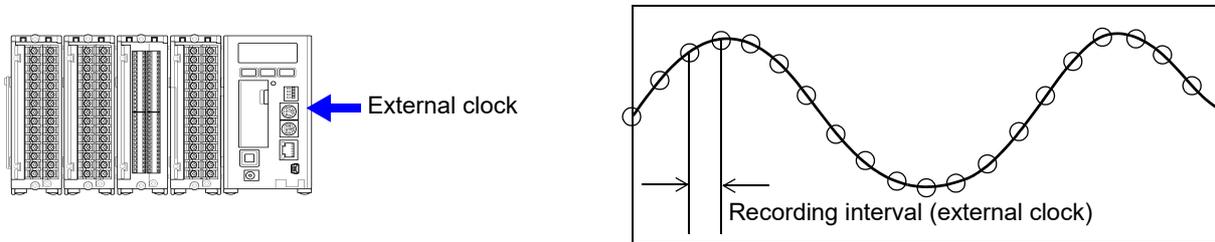
1. **Display the Measurement settings page.**

2. **Click [External Sampling].**
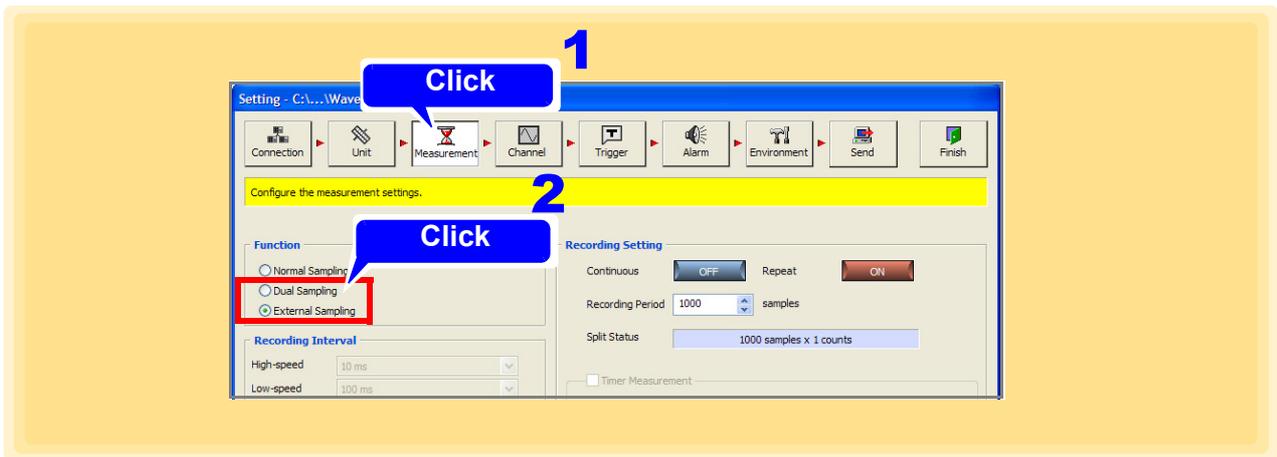
NOTE

- External sampling is not available when using only models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8410-20, LR8432-20, LR8450, LR8450-01, LR8101, or LR8102 when using the 8423 in combination with these models.
- Set the clock provided from an external device to no more than 100 Hz when using 8423. It is not possible to respond to a clock which is faster than that.
- For measurement in which a model 8423 with the 9701 or Z2000 Humidity Sensor or digital filter is used, it is not possible to record data with a recording interval for which the clock is less than 5 seconds.
- On how to connect to the external sampling terminal, see 8423 Instruction Manual "3.8 Connection Method for External Control Input Terminals".
- The following table shows the maximum response speeds when external sampling is set when using 8423.

Maximum Sampling Speed	Filter Off	50 Hz	60 Hz
No humidity measurement	10 ms/S [*]	5 s/S	5 s/S
Humidity measurement	5 s/S	5 s/S	5 s/S

* The maximum sampling speed for when performing synchronized measurement is 20 ms/S.

External Sampling (when using models LR8101, LR8102)

Sampling is synchronized to the timing of the clock input from an external control terminal on the front of the LR8101 or LR8102 and data is recorded. The measurement data quantity is the same for all channels. A recording interval cannot be set.

1. **Display the Measurement settings page.**
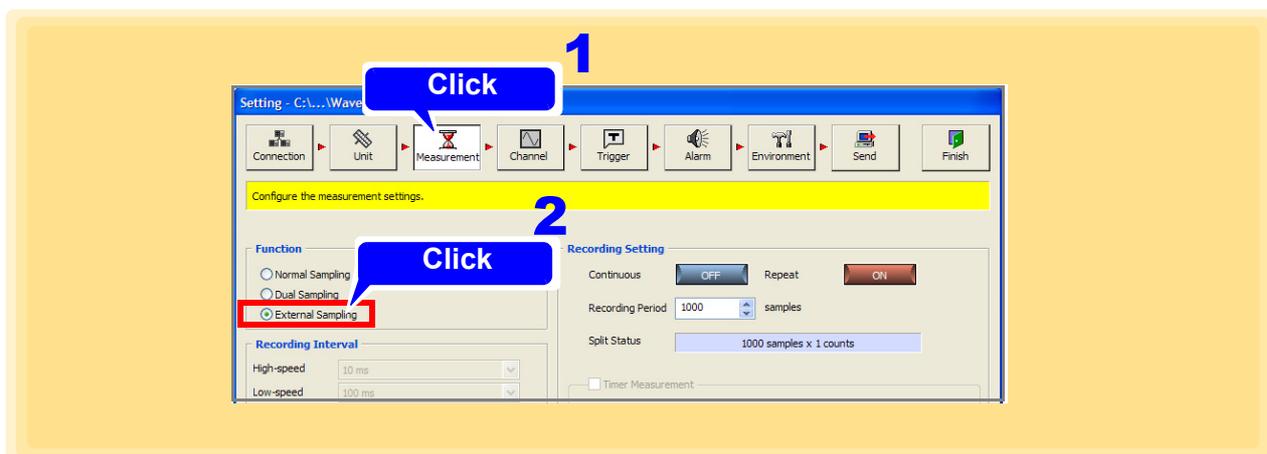
2. **Click [External Sampling].**

NOTE
- External sampling is not available when using only models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, or LR8450-01, or when using the LR8101 or LR8102 in combination with the 8423, 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, or LR8450-01.
- For how to connect to the external sampling terminal, see LR8101, LR8102 Instruction Manual "Wiring for external control."

4.3.2   File Save Settings

This section describes setting the save location and save method for measurement data.

1.   **Click the [Browse] button on the Measurement settings page.**
The **[Browse for Folder]** dialog appears.

2.   **Specify a file save location, and then click the [OK] button.**

3.   **Enter the save file name.**

4.   **Click the [Standard] button.**
The **[Folder split settings]** dialog appears.
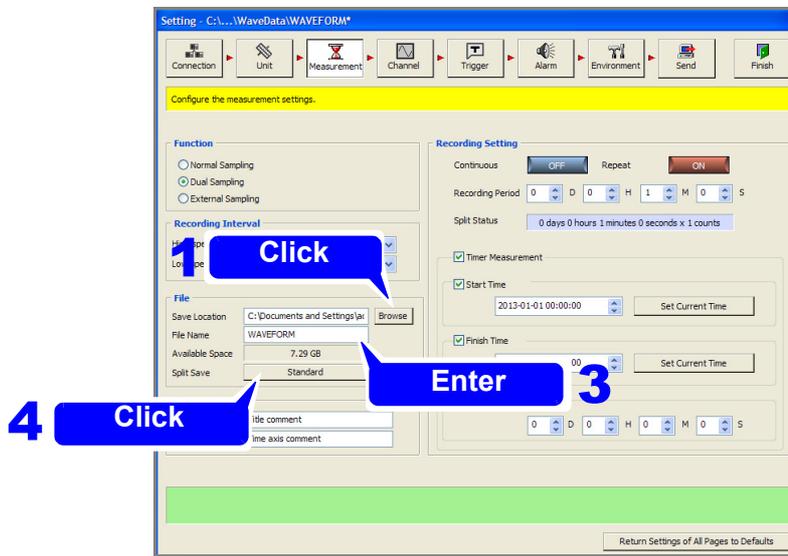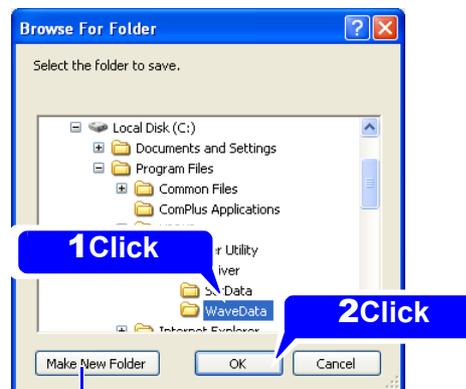
Creates a new folder within the folder currently selected in the list.

5. Select [Split Folder] setting.

This is the Logger Utility's save setting.

Setting Items	Explanations
Do Not Split Save	Destination Saves files to the save location.
Split Each Day	Creates the sub-folder "YYYYMMDD" in the save location, and saves files in that sub-folder.
Split Each Week	Creates the sub-folder "YYYYMMDD" in the save location, and saves files in that sub-folder.
Split Each Month	Creates the sub-folder "YYYYMM" in the save location, and saves files in that sub-folder.
Split Each Year	Creates the sub-folder "YYYY" in the save location, and saves files in that sub-folder.

YYYY: Year (2000 to 2999), MM: Month (01 to 12), DD: Day (01 to 31)

6. Select [Auto Save Mode] setting.

This is the save setting for both the Logger and the Logger Utility.
The auto save mode is not available when external sampling is set.

Setting Items	Explanations
Standard	Creates one file per measurement.
Split	Splits the data at regular intervals from the start of measurement, and creates separate files. Set the split length. Setting range: 0 day, 0 hour, 1 minute to 30 days, 23 hours, 59 minutes
Split at Regular Inter-vals	Allows a reference time to be set within a 24 hour period, splits data at regular intervals from that reference time, and creates separate files. Set both the split time (data split interval) and reference time (data split reference time).

When you select **[Split]**,
also set the **[Split Length]**.
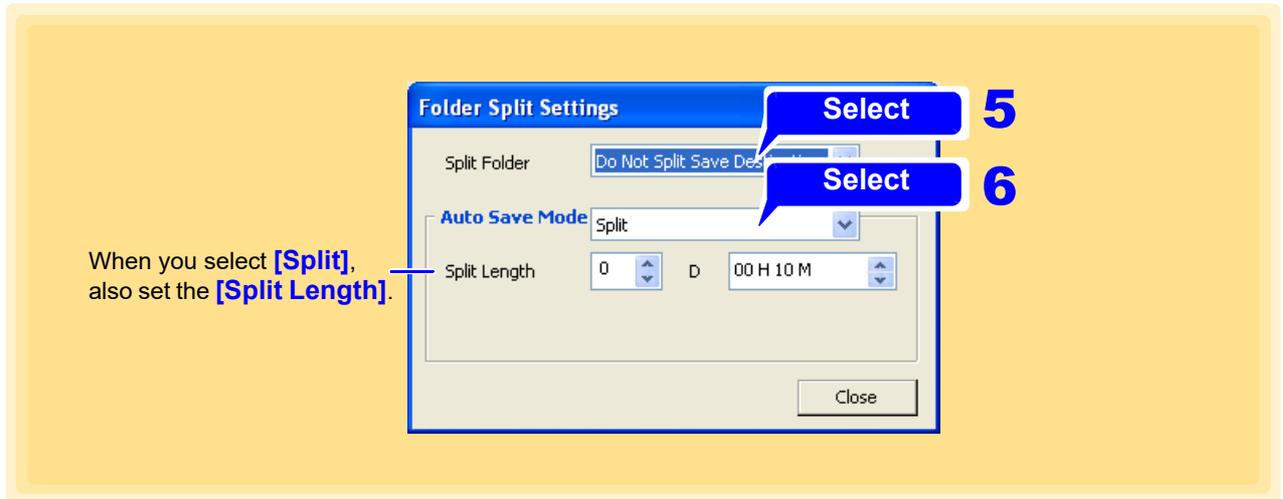
4.3.3 Comment Input

The comments that appear on the main screen can be set. Comments are effective for managing measurement data because you can enter whatever you want.
A character string is displayed in the upper part of the main screen for Comment 1, and a character string is displayed in the lower part of the main screen for Comment 2.

You can enter up to 80 characters for a comment.

Enter

Comment 1

Waveform Display Area

Comment 2
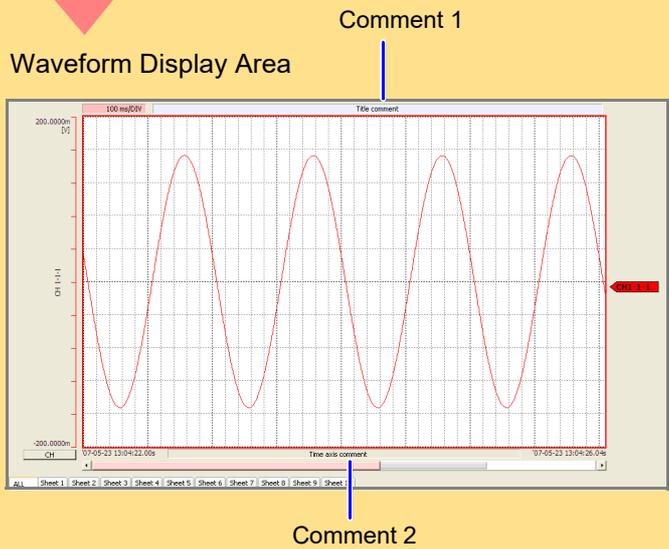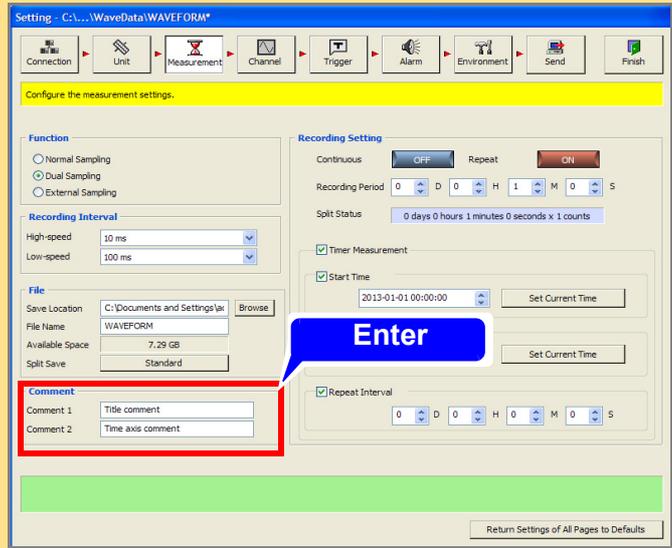
The characters entered are converted to the following symbols.

Enter	Convert	Enter	Convert
^2	2 (superscript	^3	3 (superscript)
~c	°	～ C	°
~e	ε	～ E	ε
~o	Ω	～ O	Ω
~u	μ	～ U	μ

4.3.4 Recording Settings

The following three types of recording method are available. It is also possible to measure in combination with timer measurement in order to specify a measurement start time and stop time. Make sure the current time of the PC is correct before you configure this setting.

Types of Recording	Explanations	Refer To
Normal Recording	Measures from the start of measurement for the set recording period.	"Normal Recording" (p. 67)
Continuous Recording	Measures continuously from the start of measurement.	"Continuous Recording" (p. 69)
Repeat Recording	Measures while splitting data each recording period.	"Repeat Recording" (p. 70)

Triggers are ignored during recording operation. For the relation between timer measurement and triggers, see "4.5.1 Recording Operation during Simultaneous Use of Timer Measurement and Triggers" (p.118).

Normal Recording

1. **Display the Measurement settings page.**

2. **set [Continuous] (continuous recording) and [Repeat] (repeat recording) to Off, and set the [Recording Period].**
Each click of the button toggles the setting On and Off.
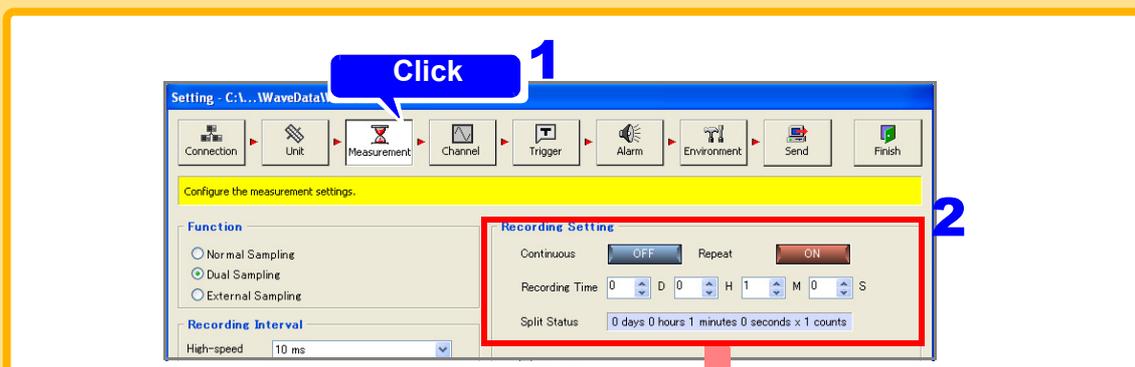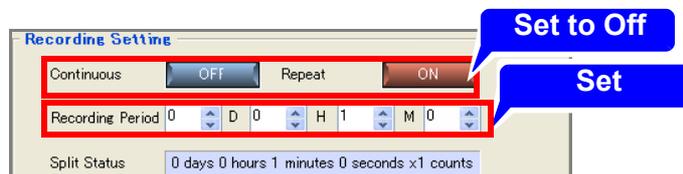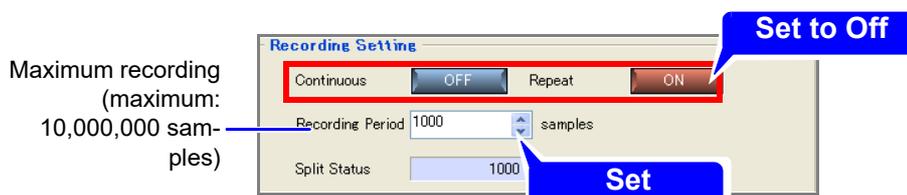
3. **Start measurement.**

Measurement continues for the set recording period.
If the **[Stop]** button is pressed before the recording period has elapsed, measurement ends.

Maximum recording period that can be stored in a single file that is generated for each record

When the recording time exceeds the maximum recording time that can be saved in one file, the file is automatically divided.

Recording Interval (High-speed)	Maximum Recording Period	Recording Interval (High-speed)	Maximum Recording Period	Recording Interval (High-speed)	Maximum Recording Period
1 ms *	2 hours	1 s	100 day	1 m	500 day
2 ms *	4 hours	2 s	200 day	2 m	500 day
5 ms *	12 hours	5 s	500 day	5 m	500 day
10 ms	1 day	10 s	500 day	10 m	500 day
20 ms	2 day	20 s	500 day	20 m	500 day
50 ms	5 day	30 s	500 day	30 m	500 day
100 ms	10 day			1 h	500 day
200 ms	20 day				
500 ms	50 day				

*: When the recording interval is set between 1 ms and 5 ms, data cannot be acquired in real time.

▷ Start button

Recording operation   Recording period
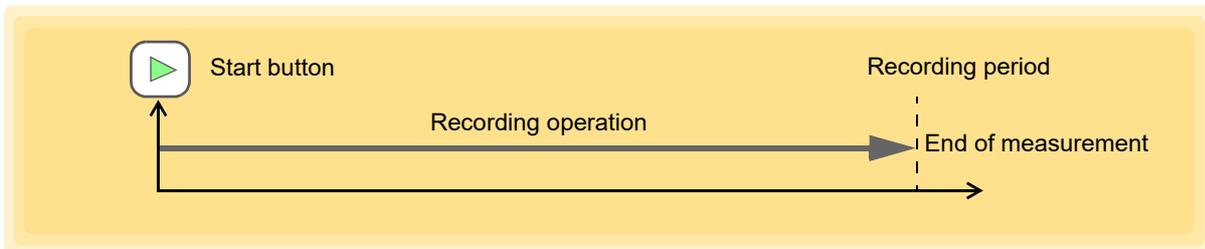
End of measurement

Continuous Recording

Measure continuously without specifying a recording period.

1. **Display the Measurement settings page.**

2. **Set [Continuous] to On.**
Each click of the button toggles the setting On and Off.
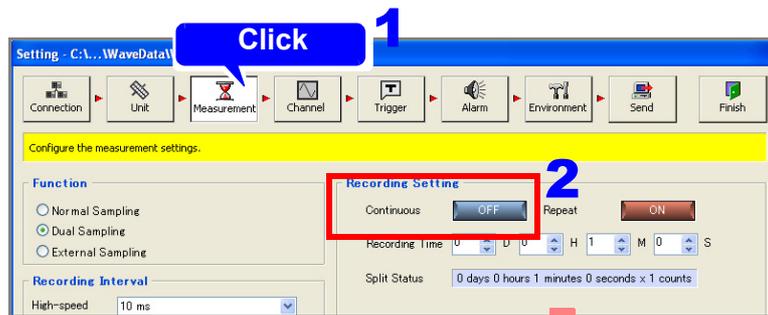
Click **1**

Setting - C:\...\WaveData

| Connection | Unit | Measurement | Channel | Trigger | Alarm | Environment | Send | Finish |

Configure the measurement settings.

2

Function
- ○ Normal Sampling
- ⊙ Dual Sampling
- ○ External Sampling

Recording Setting
Continuous OFF Repeat ON

Recording Time 0 D 0 H 1 M 0 S

Split Status 0 days 0 hours 1 minutes 0 seconds x 1 counts

Recording Interval
High-speed 10 ms

When the function is normal sampling or dual sampling (Model 8423 only)

Set to On

Recording Setting
Continuous ON Repeat ON

Recording Period 0 D 0 H 1 M 0 S

Split Status 1 days 0 hours 0 minutes 0 seconds x n counts

3. **Start measurement.**
Measurement continues until stopped.

▷ Start button

Recording operation →

Time
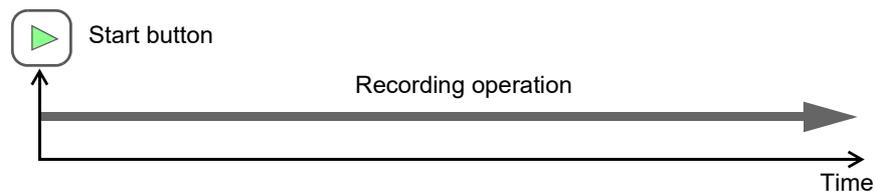
Stop trigger, when repeat recording is On

▷ Start button   T Trigger   T Trigger

Recording operation →   Recording operation →

Start measurement   Time

→| |← Deadtime for saving
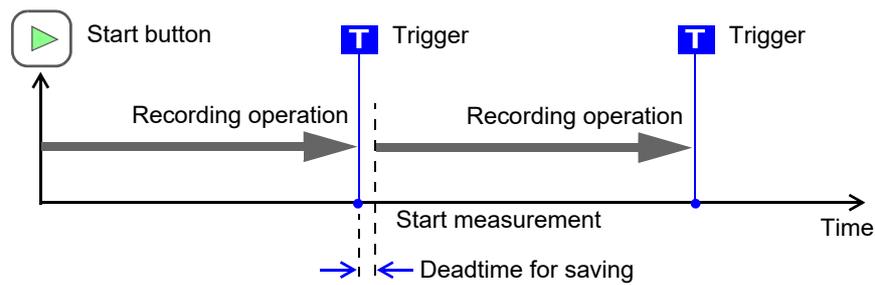
Repeat Recording

Measure while splitting data each recording period.

1. **Display the Measurement settings page.**

2. **Set [Repeat] to On, and set [Recording Period].**
Each click of the button toggles the setting ON and OFF.
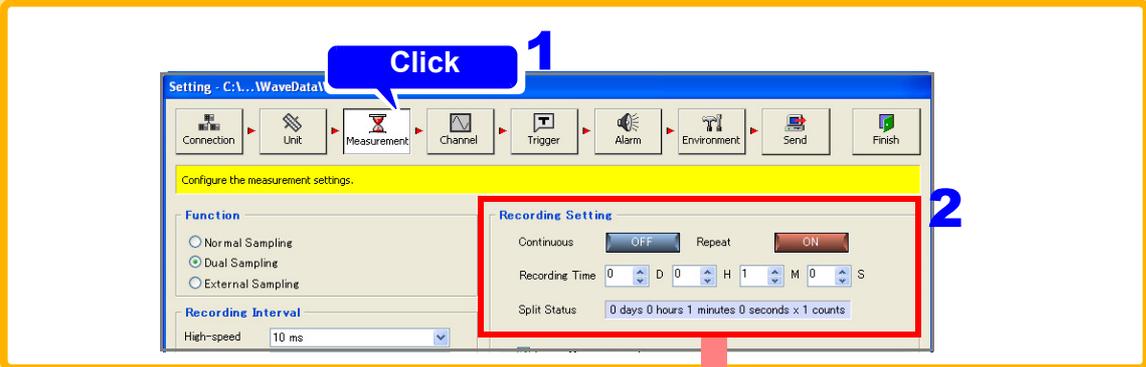
When the function is normal sampling or dual sampling (Model 8423 only)
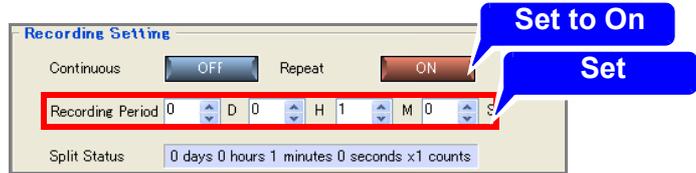
When the function is external sampling (Model 8423, LR8101, LR8102 only)

Maximum recording
(maximum:
10,000,000 sam-
ples)
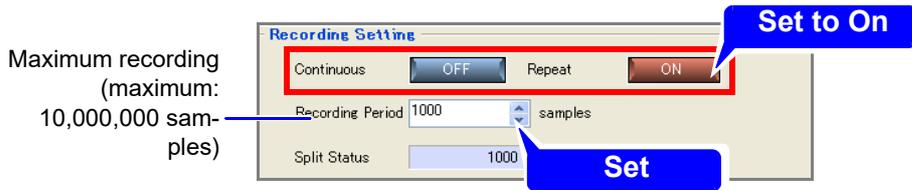
3. Start measurement.

Data is measured for successive recording periods until stopped.
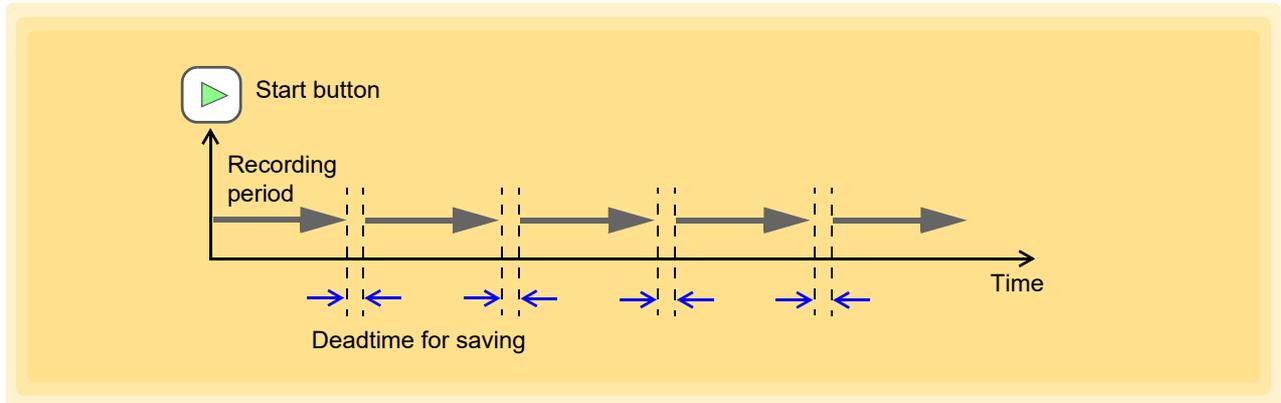
If you set a repeat measurement interval for timer measurement (p. 72), it is possible to repeat measurement while leaving a gap at a fixed interval as shown in the figure below.
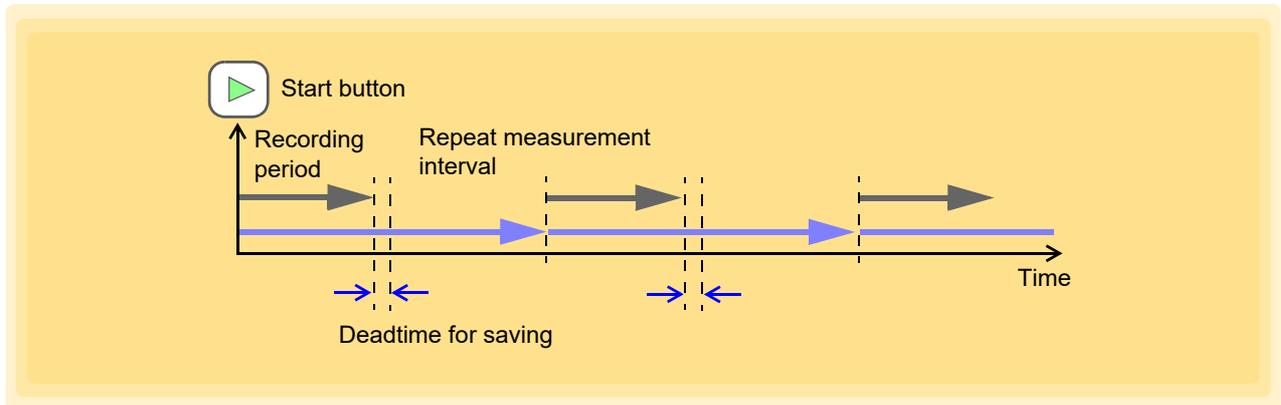
Timer Measurement

Measure continuously without specifying a recording period. The start time and stop time of measurement can be specified. If you combine timer measurement and repeat measurement, measurement such as the following is possible.

Example: Measure data from 9:00 to 17:00 every day during the period of January 1, 2007, to January 10, 2007.
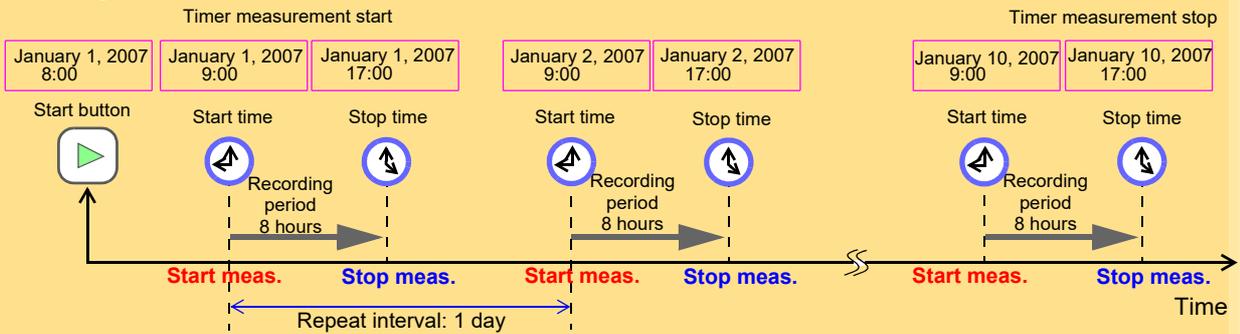
1. **Display the Measurement settings page.**

2. **Set [Continuous] to Off, [Repeat] to On, and set [Recording Period].**
Each click of the check box toggles timer measurement On and Off.

3. **Add a check to [Timer Measurement].**
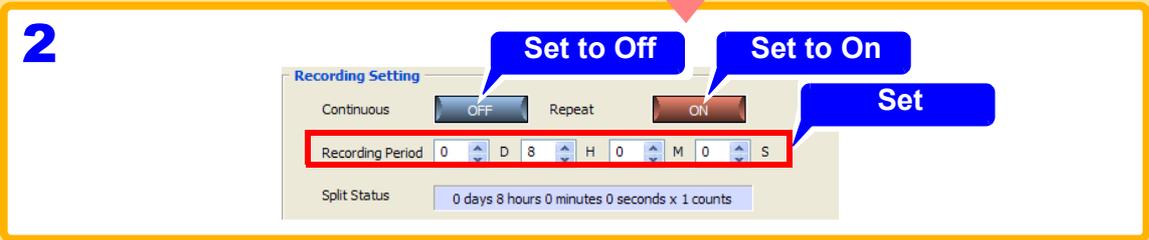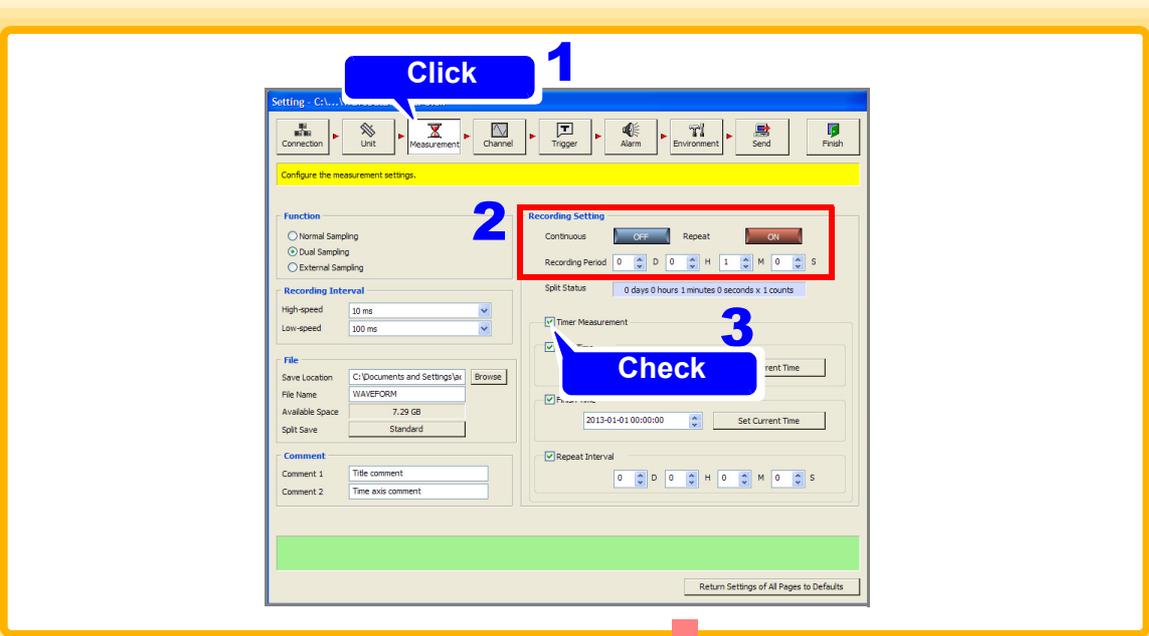
4. Select and set the measurement start and stop times, and the repeat interval.

5. Press the Start button.
Measurement starts and stops when the specified criteria are satisfied.

4 When the function is normal sampling or dual sampling (Model 8423 only)

Check

Set

Start Time
2007-01-01 09:00:00

Set Current Time

Set

Finish Time
2007-01-01 17:00:00

Set Current Time

Set

Repeat Interval

1 D 0 H 0 M 0 S

These allow you to set the current time of the PC.
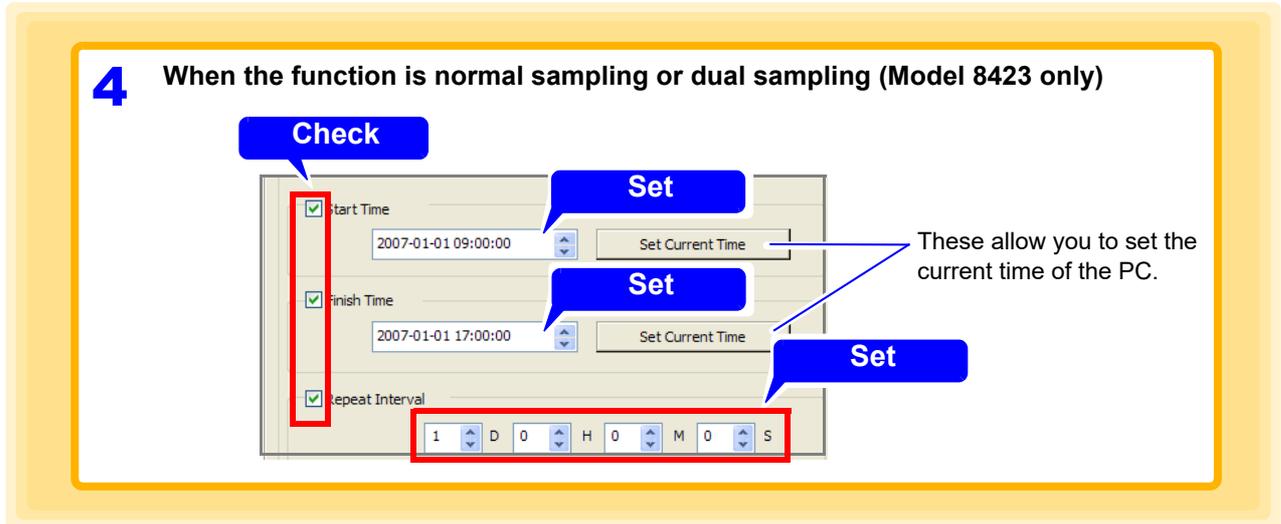
NOTE
- If timer measurement is set to Off, the measurement start time, measurement stop time, and repeat measurement interval are disabled.
- For stand-alone measurement with models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20 and LR8432-20, the maximum repeat recording interval is 99 days.

4.4 Advanced Settings for Each Channel

This section describes setting measurement criteria such as input type and range, and display settings such as display color and sheet assignment for each channel.

4.4.1 Setting Measurement Criteria

Configure settings such as the input type, range, and comment of each channel on the measurement settings page.

1. **Display the Measurement settings page of the channel settings.**

2. **Select the channel for measurement.**

3. **Enable measurement (On).**
Each click of the **[Measurement]** button toggles measurement On and Off.

4. **Set the input type.**

5. **Configure various settings in accordance with the input type.**
See: "When Voltage is Selected or Heat Flow is Selected" (p. 75),
"When Thermocouple is Selected (Temperature Measurement)" (p. 77),
"When Resistance Temperature Detector is Selected (Temperature Measurement)" (p. 79),
"When Humidity is Selected" (p. 80), "When Current is Selected (when using model LR8410-20)" (p. 81),
"When Current is Selected (when using models LR8450, LR8450-01)" (p. 84),
"Power Measurement Settings" (p. 87), "When Temperature is Selected" (p. 97),
"When Fungal Index is Selected" (p. 97),
"When Fungal Growth is Selected (Predicted Fungal Growth)" (p. 98),
"When Pulse is Selected (Integrate Pulse Measurement)" (p. 102), "When Logic is Selected" (p. 105)

Narrowing down of display channels (p. 166)

: Measurement ON

Copy the channel setting information to another channel (p. 164).

Comment input field (entering up to 40 characters is optional)

Comment input field
(entering up to 16 characters is optional, when using model LR8410-20, LR8450, LR8450-01, LR8101, or LR8102)

When Voltage is Selected or Heat Flow is Selected

Select the range.
Model 8423 can be used for measurement only with the 8948 Voltage/Temp Unit or 8949 Universal Unit connected.
(The following example is with model 8423 selected)

Range (when using models 8423, 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, or LR8450-01)

Setting Items	Measurable Ranges	Maximum Resolution
1 mV f.s. [8]	-1 to 1 mV	50 nV
2 mV f.s. [8]	-2 to 2 mV	100 nV
5 mV f.s. [8]	-5 to 5 mV	250 nV
10 mV f.s. [3,7]	-10 to 10 mV	500 nV
20 mV f.s. [3]	-20 to 20 mV	1 µV
50 mV f.s. [6]	-50 to 50 mV	10 µV
100 mV f.s.	-150 to 150 mV [1] / -100 to 100 mV [2,3]	5 µV
200 mV f.s. [3]	-200 to 200 mV	10 µV
500 mV f.s. [6]	-500 to 500 mV	100 µV
1 V f.s.	-1.5 to 1.5 V [1] / -1 to 1 V [2,3]	50 µV
2 V f.s. [3]	-2 to 2 V	100 µV
5 V f.s. [6]	-5 to 5 V	1 mV
10 V f.s.	-15 to 15 V [1] / -10 to 10 V [2,3]	500 µV
20 V f.s.	-30 to 30 V [1] / -20 to 20 V [2,3]	1 mV
50 V f.s. [6]	-50 to 50 V	10 mV
100 V f.s.	-100 to 100 V [1,3,4] / -60 to 60 V [2]	5 mV
1-5 V f.s. [5]	1 to 5 V	500 µV

*1: 8423 only
*2: 8430-20, LR8431-20, LR8432-20 only
*3: When using the LR8400-20, LR8401-20, LR8402-20 or when using the LR8410-20 with the LR8510 Wireless Voltage/Temp Unit or the LR8511 Wireless Universal Unit.
*4: 8949 Universal Unit: -60 to 60 V
*5: The 1-5 V f.s. range for voltage measurement is intended for use with measurement devices that provide an output of 1-5 V at 4-20 mA. The upper limit 5 V and the lower limit 1 V of the 10 V f.s range is set automatically. The measurement accuracy is the same as for 10 Vf.s. When inputting a 4-20 mA electric current, connect a 250 Ω resistance as a shunt resistance across the + and - analog input terminals.
*6: Only when the LR8515 Wireless Voltage/Temp Logger is connected to the LR8410-20.
*7: LR8432-20 only
*8: Only when the U8554 Strain Unit or LR8534 Wireless Strain Unit is connected to the LR8450 or LR8450-01.

4.4 Advanced Settings for Each Channel

Range (when using models LR8101 or LR8102)

Setting Items	Measurable Ranges	Maximum Resolution
10 mV f.s.	-10 to 10 mV	100 nV
20 mV f.s.	-20 to 20 mV	200 nV
100 mV f.s.	-100 to 100mV	1 µV
200 mV f.s.	-200 to 200 mV	2 µV
1 V f.s.	-1 to 1 V	10 µV
2 V f.s.	-2 to 2 V	20 µV
6 V f.s.	-6 to 6 V	60 µV
10 V f.s.	-10 to 10 V	100 µV
20 V f.s.	-20 to 20 V	200 µV
60 V f.s.	-60 to 60 V	600 µV
100 V f.s.	-100 to 100 V	1 mV
1-5 V f.s.	1 to 5 V	60 µV

When Thermocouple is Selected (Temperature Measurement)

Set the range, thermocouple type, reference junction compensation, and burn-out detection.

Model 8423 can be used for measurement only with the 8948 Voltage/Temp Unit or 8949 Universal Unit connected.

(The following example is with model 8430-20, LR8431-20, LR8432-20 selected)

Range

Setting Items	Measurable Ranges	Maximum Resolution
100°C f.s.*	-100 to 100°C	0.01°C
500°C f.s.*	-200 to 500°C	0.05°C
1000°C f.s.	-200 to 999.9°C	0.1°C
2000°C f.s.	-200 to 2000°C	0.1°C

(Model 8430-20, LR8431-20, LR8432-20: 2000°Cf.s. Fixed.)

(1000°Cf.s. range setting is available only when the LR8515 Wireless Voltage/Temp Logger is connected to the LR8410-20.)

Thermocouple (the ranges that can be selected differ depending on the type)

Items	Measurable Ranges	Items	Measurable Ranges	Items	Measurable Ranges
K	-200 to 1350°C (-200°C to 999.9°C when the LR8415 is connected to the LR8410-20)	J	-200 to 1200°C	E	-200 to 1000°C
T	-200 to 400°C	N	-200 to 1300°C	R	0 to 1700°C
S	0 to 1700°C	W (C)	0 to 2000°C (except model 8430-20, LR8431-20, LR8432-20) All except for LR8450, LR8450-01 is W. LR8450,LR8450-01 is C.	B*	400 to 1800°C (The 8423 covers 0 to 1800°C, although accuracy is not guaranteed below 400°C)

(When the LR8415 Wireless Voltage/Temp Logger is connected to the LR8410-20, only thermocouple types K and T are selectable)

RJC (Reference junction compensation format)

Setting Items	Explanations
Internal	Performs reference junction compensation on the Logger. Select Internal when connecting a thermocouple (or compensating leads) directly to the Logger. Overall measurement accuracy is the sum of the accuracies of the temperature measurement and the reference junction compensation (RJC).
External	Does not perform RJC on the Logger. Select this when using an external cold junction reference (e.g., ice water). Measurement accuracy is simply that of the temperature measurement.

* With models 8423, LR8400-20, LR8401-20, LR8402-20, LR8410-20 LR8450, LR8450-01, LR8101, LR8102 the thermocouple type B setting is not available when the 100 or 500°C f.s. range is selected.

Burn Out

Setting Items	Explanations
ON	**8423, 8430, LR8431-20, LR8432-20** Enables burn out detection. If a wire is broken, a reading that is off the scale is displayed at the top of the main screen, and +OVER appears in the list display area. A broken wire is detected by applying a very small current of approximately 400 nA (8423), approximately 300 nA (8430-20, LR8431-20, LR8432-20) to the thermocouple. If a thermocouple that is long or has a large resistance is used, measurement errors may occur. In such a case, use the thermocouple with burn out detection Off when taking measurements of high-accuracy. **LR8400-20, LR8401-20, LR8402-20, LR8410-20 LR8450, LR8450-01, LR8101, LR8102** During thermocouple measurements, a small current is applied at each recording interval to detect burned out wires. When a wire burn-out occurs, the waveform shifts to the top of the main screen, and +OVER appears for the numerical value. Detection current is timed to avoid affecting measured values.
OFF	Disables burn out detection. Normally, when a thermocouple burns out, measurements become unstable.

NOTE

8423, 8430-20, LR8431-20, LR8432-20

Only when the recording interval falls within 100 ms to 1h, and the digital filter is set at 50Hz/60Hz can the **[Burn Out]** be set to **[ON]**.

LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102

- The number of channels used determines the shortest available recording interval for which **[Burn Out]** can be enabled. See the Cut-Off Frequency Table in the Specifications in the Instruction Manual for details.
- **[Burn Out]** detection cannot be set independently for different channels or input units. When the setting for one channel is changed, it affects all channels and input units.
- For a specific recording interval, the filter cut-off frequency is higher when burn-out detection is enabled, so noise suppression is less effective.

When Resistance Temperature Detector is Selected (Temperature Measurement)

Set the range, resistance temperature device (RTD) type, and connection type.

- RTD measurements are supported by model 8423 with the 8949 Universal Unit connected.
- RTD measurements are supported by models LR8400-20, LR8401-20, LR8402-20 with the LR8501 Universal Unit connected.
- RTD measurements are supported by model LR8410-20 with the LR8501 Universal Unit connected.
- Model 8430-20, LR8431-20, LR8432-20 does not support RTD measurements.
- RTD measurements are supported by model LR8450 with the U8551 Universal Unit connected. And model LR8450-01 with the U8551 Universal Unit or LR8531 Wireless Universal Unit connected.

(The following example is with model 8423 selected)

Range

Setting Items	Measurable Ranges	Maximum Resolution
100°C f.s.	-100 to 100°C	0.01°C
500°C f.s.	-200 to 500°C	0.05°C
2000°C f.s.	-200 to 2000°C	0.1°C

Type

Setting Items	Measurable Ranges
Pt100	-200 to 800°C
JPt100	-200 to 500°C
JPt1000	-200 to 500°C

(You can choose Pt1000 only by LR8450 and LR8450-01.)

Connection Type

Setting Items	Explanations
3-wire	Connect a 3-wire measurement resistance detector.
4-wire	Connect a 4-wire measurement resistance detector.

When Humidity is Selected

The range is fixed at 100% f.s.

- Humidity measurements are supported by model 8423 with the 9701 or Z2000 Humidity Sensor connected to the 8949 Universal Unit.
- Humidity measurements are supported by models LR8400-20, LR8401-20, LR8402-20 with the Z2000 Humidity Sensor connected to the LR8500 Voltage/Temp Unit or to the LR8501 Universal Unit.
- Model 8430-20, LR8431-20, LR8432-20 does not support humidity measurements.
- Humidity measurements are supported by models LR8410-20 with the Z2010 or the Z2011 Humidity sensor connected to the LR8514 Wireless Humidity Logger or to the LR8520 Wireless Fungal Logger.
- Humidity measurements are supported by models LR8450 with the Z2000 Humidity sensor connected to the U8550 Voltage/Temp Unit or U8551 Universal Unit or U8552 Voltage/Temp Unit.
- Humidity measurements are supported by models LR8450-01 with the Z2000 Humidity sensor connected to the U8550 Voltage/Temp Unit or U8551 Universal Unit or U8552 Voltage/Temp Unit or LR8531 Wireless Universal Unit.

(The following example is with model 8423 selected)

Channel: 1-2-2	
Measurement ON	Input Type Humidity
Unit Universal	Range 100 %rh f.s.
Comment	Sensor 9701
	Return Settings of All Pages to Defaults

NOTE

8423

If humidity is selected for even one of the channels, the recording interval can only be set to a setting longer than 5 seconds because the sensor response speed is limited. If a recording interval of less than 5 seconds is selected, it is automatically changed to 5 seconds.

LR8400-20, LR8401-20, LR8402-20

Since power is continuously supplied from the +12 V output terminal, output response is free of restrictions relative to the power supply, and the recording interval can be set from 10 ms up.

LR8410-20

Since power is continuously supplied from the +12 V output terminal, output response is free of restrictions relative to the power supply, and the recording interval can be set from 100 ms up.

LR8450, LR8450-01

Since power is continuously supplied if the external output terminal is set to +12 V, output response is free of restrictions relative to the power supply, and the recording interval can be set from 10 ms up.

When Resistance is Selected

Select the range.

- Resistance measurements can be made with the LR8400-20, LR8401-20, LR8402-20 when the LR8501 Universal Unit is connected.
- Resistance measurements can be made with the LR8410-20 when the LR8511 Universal Unit is connected.
- Resistance measurements can be made with the LR8450 when the U8551 Universal Unit is connected.
- Resistance measurements can be made with the LR8450-01 when the U8551 Universal Unit or LR8531 Wireless Universal Unit is connected.

(The following example is with model LR8400-20, LR8401-20, LR8402-20 selected)

Channel: 3-3-1

Measurement	ON
Unit	Universal
Comment	
Input Type	Resistance
Range	10 Ω f.s.

Return Settings of All Pages to Defaults

Range

Setting Items	Measurable Ranges	Maximum Resolution
10 Ω f.s.	-10 Ω to 10 Ω	0.5 mΩ
20 Ω f.s.	-20 Ω to 20 Ω	1 mΩ
100 Ω f.s.	-100 Ω to 100 Ω	5 mΩ
200 Ω f.s.	-200 Ω to 200 Ω	10 mΩ

When Current is Selected (when using model LR8410-20)

Set the Current Sensor, Range, Filter, and Rec mode.
- Current measurements are supported by model LR8410-20 with the LR8513 Wireless Clamp Logger connected.

(The following example is with model LR8410-20 selected)

Channel: 1-2-1

Measurement	ON
Unit	Clamp
Comment	
Input Type	Current
Range	500 mA f.s.
Zero Suppress	ON
Current Sensor	9675
Filter	OFF
Recmode	Instant

Return Settings of All Pages to Defaults

4.4 Advanced Settings for Each Channel

Current Sensor, Range

Setting Items Current sensors	Measurable Ranges	Measurable Ranges	Maximum Resolution
9675	500 mA	AC 1.0 to 500.0 mA	0.1 mA
	5 A	AC 0.010 to 5.000 A	0.001 A
9657-10	500 mA	AC 1.0 to 500.0 mA	0.1 mA
	5 A	AC 0.010 to 5.000 A	0.001 A
9695-02	5 A	AC 0.010 to 5.000 A	0.001 A
	50 A	AC 0.10 to 50.00 A	0.01 A
CT6500	50 A	AC 0.10 to 50.00 A	0.01 A
	500 A	AC 1.0 to 500.0 A	0.1 A
9669	1000 A	AC 10 to 1000 A	1 A
CT9691-90	10 A	AC 0.10 to 10.00 A DC ± (0.10 to 10.0 A)	0.01 A
	100 A	AC 1.0 to 100.0 A DC ± (1.0 to 100.0 A)	0.1 A
CT9692-90	20 A	AC 0.10 to 20.00 A DC ± (0.10 to 20.00 A)	0.01 A
	200 A	AC 1.0 to 200.0 A DC ± (1.0 to 200.0 A)	0.1 A
CT9693-90	200 A	AC 1.0 to 200.0 A DC ± (1.0 to 200.0 A)	0.1 A
	2000 A	AC 10 to 2000 A DC ± (10 to 2000 A)	1 A
CT7631	10 A	AC 0.10 to 10.00 A DC ± (0.10 to 10.00 A)	0.01 A
	100 A	AC 1.0 to 100.0 A DC ± (1.0 to 100.0 A)	0.1 A
CT7636	20 A	AC 0.10 to 20.00 A DC ± (0.10 to 20.00 A)	0.01 A
	200 A	AC 1.0 to 200.0 A DC ± (1.0 to 200.0 A)	0.1 A
CT7642	200 A	AC 1.0 to 200.0 A DC ± (1.0 to 200.0 A)	0.1 A
	2000 A	AC 10 to 2000 A DC ± (10 to 2000 A)	1 A
CT7731	10 A	AC 0.10 to 10.00 A DC ± (0.10 to 10.00 A)	0.01 A
	100 A	AC 1.0 to 100.0 A DC ± (1.0 to 100.0 A)	0.1 A
CT7736	20 A	AC 0.10 to 20.00 A DC ± (0.10 to 20.00 A)	0.01 A
	200 A	AC 1.0 to 200.0 A DC ± (1.0 to 200.0 A)	0.1 A

Setting Items Current sensors	Measurable Ranges	Measurable Ranges	Maximum Resolution
CT7742	200 A	AC 1.0 to 200.0 A DC ± (1.0 to 200.0 A)	0.1 A
	2000 A	AC 10 to 2000 A DC ± (10 to 2000 A)	1 A
CT9667	500 A	AC 1.0 to 500.0 A	0.1 A
	5000 A	AC 10 to 5000 A	1 A
CT7044	50 A	AC 0.10 to 50.00 A	0.01A
	500 A	AC 1.0 to 500.0 A	0.1 A
	5000 A	AC 10 to 5000 A	1 A
CT7045	50 A	AC 0.10 to 50.00 A	0.01 A
	500 A	AC 1.0 to 500.0 A	0.1 A
	5000 A	AC 10 to 5000 A	1 A
CT7046	50 A	AC 0.10 to 50.00 A	0.01 A
	500 A	AC 1.0 to 500.0 A	0.1 A
	5000 A	AC 10 to 5000 A	1 A

(Models CT9667-01, CT9667-02, and CT9667-03 is configured as model CT9667)

NOTE   The firmware version number 1.40 or later is required to be installed in model LR8410 to configure the setting to the following models: CT7631, CT7636, CT7642, CT7731, CT7736, CT7742, CT9667, CT7044, CT7045, or CT7046.
For an earlier version firmware than the version number 1.40, the model LR8410 setting is configured to another sensor consisting with a range of these sensors (Furthermore, a measurement range setting is configured to 2000 A instead of 5000 A).

Filter

Setting Items	Explanations
OFF	Disables the filter. You will be able to measure current including high-frequency components.
ON	Cuts unnecessary high-frequency components when measuring 50/60 Hz currents.

Rec mode

Setting Items	Explanations
Instant	Records the instantaneous value for each recording interval.
Average	Measures at a 0.5 sec. interval and records the average value for each recording interval. (If the recording interval is 1 sec. or less, the instantaneous value will be recorded.)
Maximum	Measures at a 0.5 sec. interval and records the maximum value for each recording interval. (If the recording interval is 1 sec. or less, the instantaneous value will be recorded.)

Zero suppress

Setting Items	Explanations
OFF	Disables use of the zero suppress. Values measured with each of the ranges including those less than 10 counts are treated without change.
ON	Processes values measured with each of the ranges less than 10 counts by replacing them with zero.

NOTE
If Maximum is selected as the rec mode, the recording function in accordance with the mode is activated provided that the firmware version number of LR8410 is V1.32 or later and that of LR8513 is V1.30 or later.
If each of the firmware version numbers is earlier described above, the recording function in accordance with the rec mode of Instant will be performed with the rec mode setting of Maximum ignored.

When Current is Selected (when using models LR8450, LR8450-01)

Set the Current Sensor, Range, Filter, and Rec mode.
• Current measurements are supported by models LR8450, LR8450-01 with the U8556 Current Module or LR8536 Wireless Current Module connected.
(The following example is with model LR8450 selected)

Current Sensor, Range

Setting Items Current sensors	Measurable Ranges	Measurable Ranges	Maximum Resolution
CT7126	50 A	-60.00 A to 60.00 A	0.01 A
	5 A	-6.000 A to 6.000 A	0.001 A
CT7131	100 A	-100.00 A to 100.00 A	0.01 A
CT7116	5 A	-6.000 A to 6.000 A	0.001 A
	500 mA	-600.0 mA to 600.0 mA	0.1 mA
CT7136	500 A	-600.0 A to 600.0 A	0.1 A
	50 A	-60.00 A to 60.00 A	0.01 A
CT7044, CT7045, CT7046	5000 A	-6000 A to 6000 A	1 A
	500 A	-600.0 A to 600.0 A	0.1 A
	50 A	-60.0 A to 60.0 A	0.01 A
CT7742	2000 A	-2000.0 A to 2000.0 A	0.2 A
	200 A	-200.0 A to 200.0 A	0.1 A
CT7736	500 A	-600.0 A to 600.0 A	0.1 A
	50 A	-60.00 A to 60.00 A	0.01 A
CT7731	100 A	-100.00 A to 100.00 A	0.01 A
CT7822	20 A	-20.000 A to 20.000 A	0.002 A
	2 A	-2.000 A to 2.000 A	0.001 A
CT7812	2 A	-2.0000 A to 2.0000 A	0.0002 A
	200 mA	-200.0 mA to 200.0 mA	0.1 mA

Current sensor settings cannot be changed because they are detected automatically by the LR8450 and LR8450-01. If a connected current sensor and the displayed setting differ, click **[Detect Sensors]**.
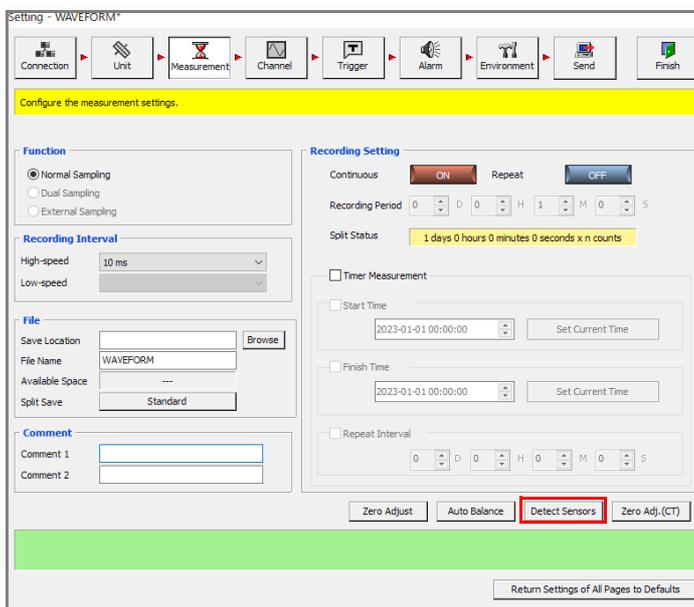
Rec mode

Setting Items	Explanations
RMS	Record RMS values.
Instant	Record instantaneous values.

Filter

Setting Items	Explanations
OFF	Disables the filter. You will be able to measure current including high-frequency components.
ON	Cuts unnecessary high-frequency components.

Power Measurement Settings
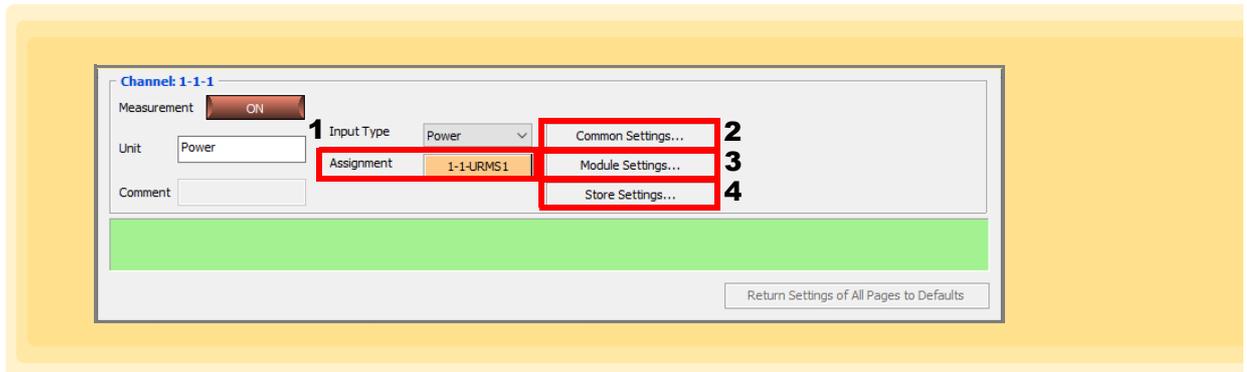
1. **Measurement Item Assignment**
Assign the desired measurement item from the power measurement items.
This application cannot measure all power measurement items in real time, so you must assign the desired 30 items to each channel.

2. **Common Settings**
Configure the power measurement settings for each instrument.

3. **Module Settings**
Configure the power measurement settings for each power measurement module (1 to 4).

4. **Store Settings**
Turn the measurement off/on and set a comment for each measurement item.

Common Settings
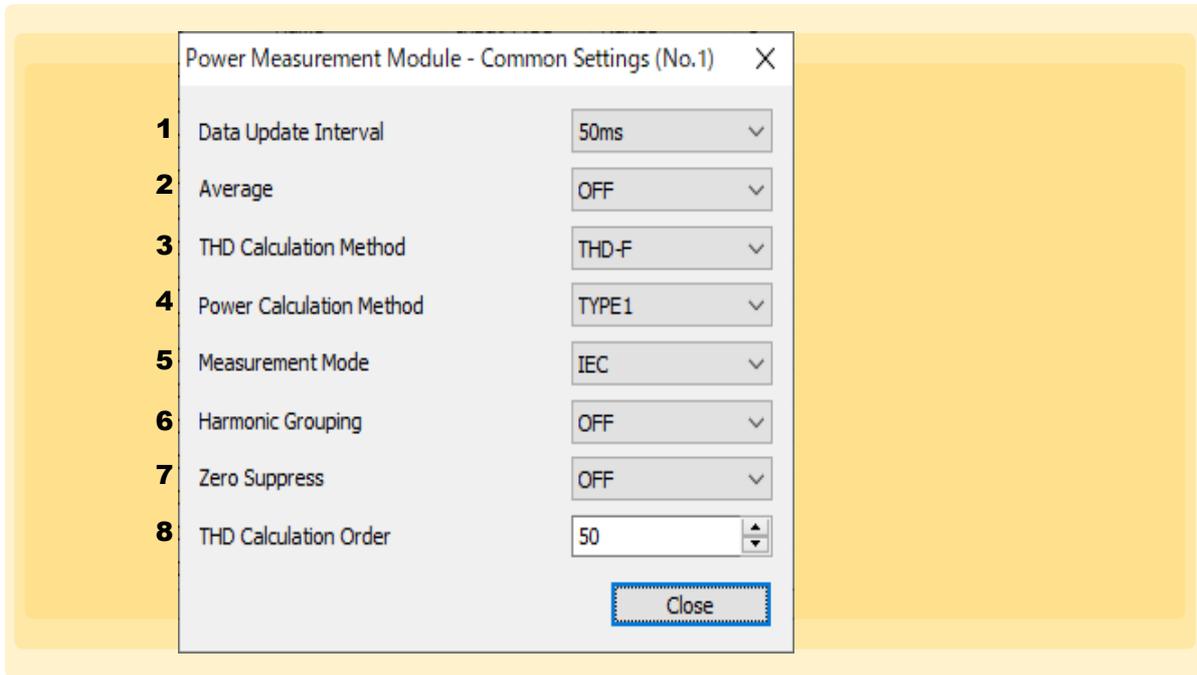
1. **Data Update Interval**

   Set the data refresh interval.

   This setting is the period for calculating the measured value from the voltage and current waveforms and updating the measured data.

   Data obtained over communications and data saved in intervals will be updated at the refresh interval set here.

   > 5 ms, 50 ms, 200 ms

   • The setting cannot be changed for each type of wiring and each channel.
   • If the measured value is unstable when 200 ms is selected, use averaging.

2. **Average**

   Set averaging.

   This function displays the measured value by averaging it. When the measured value fluctuates and there are large variations in the display, use this function to get a stable display value.

   The instrument will calculate the moving average from the newest data up to the number of items of data set here.

   > OFF, 10, 20, 40, 100

3. **THD Calculation Method**

   Select the THD (total harmonic distortion) equation.

   This setting is valid in all harmonics measurements of voltage and current for all channels.

Setting Items	Explanations
THD-F	The ratio of the total harmonics per fundamental wave. This setting is typically used in IEC standards and so on.
THD-R	The ratio of the total harmonics per total harmonics including the fundamental wave. When the waveform is greatly distorted, this setting gives a smaller value than THD-F.

4. Power Calculation Method

This function is used to select the equations for reactive power, power factor, and power phase angle according to Hioki's existing models.

There are no unified definitions for the equations for apparent power and reactive power in three-phase AC with a distorted wave, so the equations vary by measuring instrument. To increase compatibility with existing models, select the power equations from the three options according to the model.

Setting Items	Explanations
TYPE1	Compatible with TYPE1 in Hioki PW3390, 3390, and 3193 (when an option other than 3V3A is selected). Compatible with TYPE2 in Hioki 3192 and 3193 (when 3V3A is selected).
TYPE2	Compatible with TYPE2 in Hioki 3192 and 3193.
TYPE3	Adds active power sign to power factor sign.

5. Measurement Mode

Setting Items	Explanations
IEC	Select to use IEC measurement mode. For a measurement line frequency of 50 Hz or 60 Hz, the harmonics measurement conforms to IEC 61000-4-7:2002+A1:2008. Even when the data refresh interval setting is 5 ms and 50 ms, the harmonics measured value is updated at approximately 200 ms. The analysis order is up to 50th order.
Wideband	Select to use wideband measurement mode. It can be used in a wide frequency range from 0.1 Hz to 30 kHz. The analysis order depends on the frequency to measure. When the data refresh interval setting is 5 ms, the harmonics measured value is updated at 50 ms.

6. Harmonic Grouping

Select the calculation method of interharmonics for the harmonics measured value.

Setting Items	Explanations
OFF	Set only a component that is an integer multiple of the fundamental wave as a harmonic of that order.
TYPE1	Set a harmonic subgroup as harmonic of that order. This method is compatible with Hioki PW3198 harmonics.
TYPE2	Set a harmonic group as harmonic of that order.

7. Zero Suppress

When this setting is turned on, values less than 0.5% of the range are handled as zero.
To measure up to a small input for the range, turn this setting off.

Setting Items	Explanations
OFF	Zero suppression is not set.
ON	Values of 0.5% f.s. of the range are handled as zero.

8. THD Calculation Order

Set the limit on the order to use to calculate total harmonics.

> 2 to 50 (per step)

See the LR8101/LR8102 Instruction Manual for details.

Module-Specific Settings

Power Measurement Module - Module Settings (No.1-1)   ✕

Module Settings

1 Module 1

		Channel Settings	1P2W	1P2W	1P2W
2 Wiring	1P2W×3				
3 Delta Conversion	OFF	12 Synchronization Source	U1	U1	U1
4 Sharing Sync. Source	OFF	U Rectification	RMS	RMS	RMS
5 Primary Sync. Source	CH1	13 I Rectification	RMS	RMS	RMS
6 Harmonic U Channel	CH1	14 Integration Mode	RMS	RMS	RMS
7 Harmonic U Item	RMS Value	15 ZC Filter	100Hz	100Hz	100Hz
8 Harmonic I Channel	CH1	16 LPF	OFF	OFF	OFF
9 Harmonic I Item	RMS Value	17 Lower Frequency Limit	10Hz	10Hz	10Hz
10 Harmonic P Channel	CH1	18 Sensor Output Rate	100 uV/A	100 uV/A	100 uV/A
11 Harmonic P Item	Active Power	19 U Auto-Ranging	OFF	OFF	OFF
		20 U Range	1500V	1500V	1500V
		21 VT Ratio	1.00	1.00	1.00
		22 I Auto-Ranging	OFF	OFF	OFF
		23 I Range	50 A	50 A	50 A
		24 CT Ratio	1.00	1.00	1.00
		25 Current Sensor Model	CT6872	CT6872	CT6872
		Current Sensor Rate	50 A	50 A	50 A

Close

1. Module
Select the module to be configured.

2. Wiring
Select the wiring mode according to the line to measure.
When combining multiple channels (when measuring a multi-phase system), connect the same type of current sensor to each channel to be combined.
The wiring can be set between channels in the same module only.
Select the wiring mode per module.

Wiring
1-phase/2-wire (1P2W)
1-phase/3-wire (1P3W)
3-phase/3-wire (3P3W2M, 3V3A, 3P3W3M)
3-phase/4-wire (3P4W)

Wiring	CH1	CH2	CH3
1P2W×3	1P2W	1P2W	1P2W
1P3W & 1P2W	1P3W		1P2W
3P3W2M & 1P2W	3P3W2M		1P2W
3V3A	3V3A		
3P3W3M	3P3W3M		
3P4W	3P4W		

Setting Items	Explanations
1P2W **(1-phase/2-wire)**	Select this wiring also when measuring a DC line. The current sensor can be connected to either the source side or the ground side for measurements. The wiring diagrams show these two patterns.
1P3W **(1-phase/3-wire)**	-
3P3W2M **(3-phase/3-wire)**	This method uses two channels of a line with three-phase delta wiring and measures with the two-wattmeter method. Active power can be correctly measured even if the waveform is distorted by unbalance. The values of apparent/reactive power and power factor of an unbalanced line may differ from other measuring instruments. In this case, use 3V3A or 3P3W3M.
3V3A **(3-phase/3-wire)**	This method uses three channels of a line with three-phase delta wiring and measures with the two-wattmeter method. Use this method when compatibility with existing power meters, such as the Hioki 3193, must be emphasized. Active power, apparent/reactive power, and power factor can be correctly measured, even for an unbalanced line.
3P3W3M **(3-phase/3-wire)**	This method uses three channels of a line with three-phase delta wiring and measures with the three-wattmeter method. For PWM inverter measurement in which there is a large amount of leakage current with harmonic components and errors appear using 3V3A, this method can correctly measure power and is suited to measuring motor power.
3P4W **(3-phase/4-wire)**	This method uses three channels of a line with three-phase Y (star) wiring and measures with the three-wattmeter method.

3. Delta Conversion

This function measures by mutually converting delta wiring and Y (star) wiring for a three-phase measurement line. The conversion is performed according to an equation from voltage waveform data sampled at 500 kHz between different channels.

Setting Items	Explanations
OFF	Do not perform delta conversion.
ON	Perform delta conversion.

4. Sharing Sync. Source

Configure the module setting for the synchronization source sharing function.
The synchronization source can be shared between multiple M7103 modules connected to the instrument.

Setting Items	Explanations
OFF	Turn off the synchronization source sharing function.
Primary	Set the specified module to be the primary device.
Secondary	Set the specified module to be a secondary device.

5. Primary Sync. Source

Set the synchronization source channel for the synchronization source sharing function. The synchronization source of the primary device is shared with the secondary devices.

CH1, CH2, CH3

6. Harmonic U Channel
Set the voltage channel of the harmonics result to obtain.

CH1, CH2, CH3

7. Harmonic U Item
Select the voltage measurement item of the harmonics result to obtain.

Voltage RMS value, voltage content, voltage phase angle

8. Harmonic I Channel
Set the current channel of the harmonics result to obtain.

CH1, CH2, CH3

9. Harmonic I Item
Select the current measurement item of the harmonics result to obtain.

Current RMS value, current content, current phase angle

10. Harmonic P Channel
Set the power channel of the harmonics result to obtain.

CH1, CH2, CH3, SUM

11. Harmonic P Item
Select the power measurement item of the harmonics result to obtain.

Active power, power content, voltage/current phase difference

12. Synchronization Source
Set the source to determine the period (between zero crossings) on which the various calculations are based for each type of wiring.

Setting Items	Explanations
U1 to U3	Set one of these selections to measure based on a voltage signal.
I1 to I3	Set one of these selections to measure based on a current signal.
DC	Set this selection to measure based on the data refresh interval.

13. U Rectification, I Rectification
Select the rectification method of the voltage value and current value used for calculating apparent power, reactive power, and power factor.
The rectification method can be selected for voltage and current of each type of wiring.

Setting Items	Explanations
RMS	(True RMS value) Select this method normally.
MEAN	(Mean rectification RMS value equivalent) This method is typically used only when measuring line voltage with a PWM waveform on the secondary side of an inverter.

14. **Integration Mode**

Set the integration mode of each channel. The mode can be selected for each type of wiring.

Setting Items	Explanations
DC	The instantaneous current value and instantaneous voltage value of each sample are integrated by polarity. This mode can be selected only when the wiring is 1P2W. Six items, current integration (Ih+, Ih-, Ih) and active power integration (WP+, WP-, WP), are integrated at the same time.
RMS	The current RMS value and active power value at each data refresh interval are integrated. Only active power is integrated by polarity.

15. **ZC Filter**

The instrument can simultaneously measure the frequency of multiple lines. For the frequency measurement, there is a lower measurement frequency limit and zero crossing filter that can limit the frequency to measure for each type of wiring. To measure a waveform with multiple frequency components, such as a PWM waveform with a fundamental frequency and a carrier frequency, set these options according to the input frequency to measure.

100 Hz, 500 Hz, 5 kHz, 200 kHz

16. **LPF**

The instrument has a low-pass filter function to limit the frequency band. If you use this filter, you can take measurements that have high-frequency components exceeding the set frequency and unwanted external noise components removed. Normally, we recommend you take measurements with the low-pass filter turned off.

OFF, 500 Hz, 5 kHz

17. **Lower Frequency Limit**

The instrument can simultaneously measure the frequency of multiple lines. For the frequency measurement, there is a lower measurement frequency limit that can limit the frequency to measure for each type of wiring.

0.1 Hz, 1 Hz, 10 Hz

18. **Sensor Output Rate**

Select the output rate when using a BNC connector current sensor with the CT9220 conversion cable.

Setting Items	Explanations
100 µV/A	400 A / 800 A / 2 kA / 4 kA / 8 kA / 20 kA range configuration
1 mV/A	40 A / 80 A / 200 A / 400 A / 800 A / 2 kA range configuration
10 mV/A	4 A / 8 A / 20 A / 40 A / 80 A / 200 A range configuration
100 mV/A	0.4 A / 0.8 A / 2 A / 4 A / 8 A / 20 A range configuration
1 V/A	0.04 A / 0.08 A / 0.2 A / 0.4 A / 0.8 A / 2 A range configuration

19. U AUTO-Ranging

When the AUTO range is set, the range is automatically switched for the measured value.
The AUTO range function is valid only when starting a measurement using the :STARt:PWCHeck command with the LR8101 or LR8102.

NOTE   Simple measurement function is not supported.

Setting Items	Explanations
OFF	Measure voltage with the MANUAL range.
ON	Measure voltage with the AUTO range.

20. U Range

Set an appropriate voltage range for the voltage of the object under measurement. To take a measurement with good precision, select the smallest range that exceeds the input level.

6 V, 15 V, 30 V, 60 V, 150 V, 300 V, 600 V, 1500 V

21. VT Ratio

Set the ratio when using an external VT (PT).

0.01 to 9999.99

A setting that allows VT × CT to exceed 1.0E+06 cannot be set.

22. I AUTO-Ranging

When the AUTO range is set, the range is automatically switched for the measured value.
The AUTO range function is valid only when starting a measurement using the :STARt:PWCHeck command with the LR8101 or LR8102.

NOTE   Simple measurement function is not supported.

Setting Items	Explanations
OFF	Measure current with the MANUAL range.
ON	Measure current with the AUTO range.

23. I Range

Set an appropriate current range for the current of the object under measurement. To take a measurement with good precision, select the smallest range that exceeds the input level.

0.04 A / 0.08 A / 0.2 A / 0.4 A / 0.8 A / 2 A	For 2 A sensor
0.4 A / 0.8 A / 2 A / 4 A / 8 A / 20 A	For 20 A sensor
4 A / 8 A / 20 A / 40 A / 80 A / 200 A	For 200 A sensor
40 A / 80 A / 200 A / 400 A / 800 A / 2 kA	For 2000 A sensor
0.1 A / 0.2 A / 0.5 A / 1 A / 2 A / 5 A	For 5 A sensor
1 A / 2 A / 5 A / 10 A / 20 A / 50 A	For 50 A sensor
10 A / 20 A / 50 A / 100 A / 200 A / 500 A	For 500 A sensor
20 A / 40 A / 100 A / 200 A / 400 A / 1 kA	For 1000 A sensor
400 A / 800 A / 2 kA / 4 kA / 8 kA / 20 kA	When 100 μV/A
40 A / 80 A / 200 A / 400 A / 800 A / 2 kA	When 1 mV/A
4 A / 8 A / 20 A / 40 A / 80 A / 200 A	When 10 mV/A
0.4 A / 0.8 A / 2 A / 4 A / 8 A / 20 A	When 100 mV/A
0.04 A / 0.08 A / 0.2 A / 0.4 A / 0.8 A / 2 A	When 1 V/A

24. CT Ratio

Set the ratio when using an external CT.

0.01 to 9999.99

A setting that allows VT × CT to exceed 1.0E+06 cannot be set.

25. Current Sensor Model, Current Sensor Rate

These settings display information about the connected current sensor.

These settings cannot be changed because the current sensor is automatically detected by the LR8101 and LR8102. If the current settings differ from the connected current sensor, execute **[Detect Current Sensor]**.

See the LR8101/LR8102 Instruction Manual for details.

Measurement Item Settings
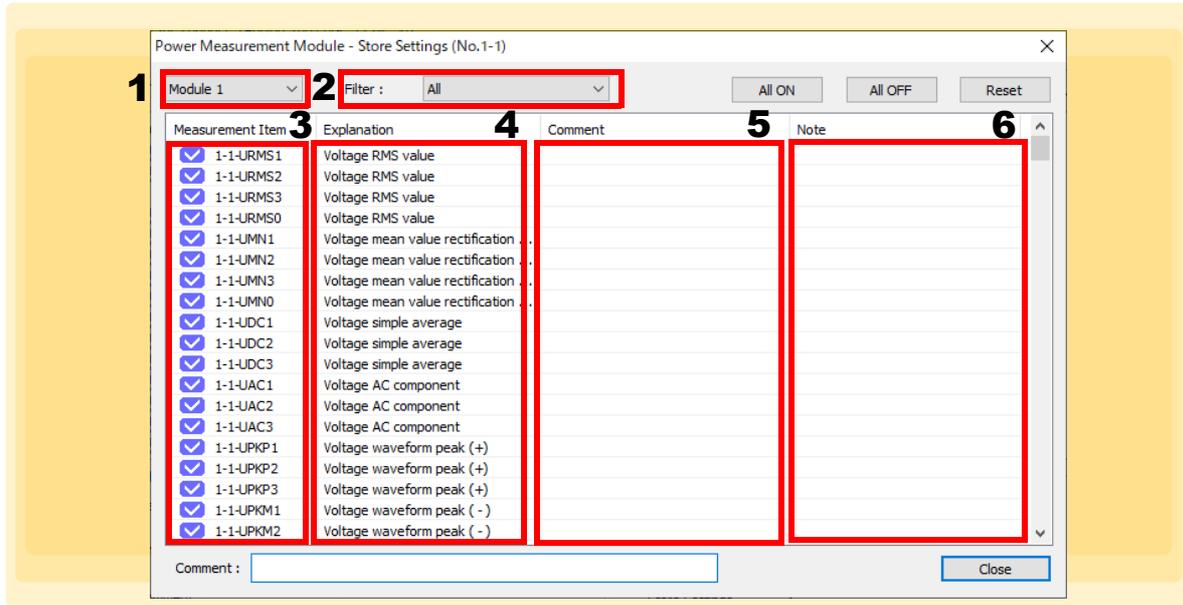
1. **Module**
   Select the module to be configured.

2. **Filter**
   You can filter the measurement items to display.

3. **Measurement Item**
   Turn the measurement on or off for each measurement item.
   Each click toggles between measurement on and off.

4. **Explanation**
   Displays an explanation for each measurement item.

5. **Comment**
   Set the desired comment for each measurement item.

6. **Note**
   Displays the status for each measurement item.

   See the LR8101/LR8102 Instruction Manual for details.

When Temperature is Selected

Select the range.
- Temperature measurements can be made with the LR8410-20 when the LR8514 Wireless Humidity Logger or LR8520 Wireless Fungal Logger is connected.

(The following example is with model LR8410-20 selected)

Range

Setting Items	Measurable Ranges	Maximum Resolution
100°C	-100°C to 100°C	0.1°C

When Fungal Index is Selected

Select the range.
- Fungal Index measurements can be made with the LR8410-20 when the LR8520 Wireless Fungal Logger is connected.

(The following example is with model LR8410-20 selected)

Range

Setting Items	Measurable Ranges	Maximum Resolution
200	0 to 200	1

(A fungal index is a non-unit.)

When Fungal Growth is Selected (Predicted Fungal Growth)

Select the range.

- Fungal Growth measurements can be made with the LR8410-20 when the LR8520 Wireless Fungal Logger is connected.

(The following example is with model LR8410-20 selected)

Range

Setting Items	Measurable Ranges	Maximum Resolution
10	0 to 4	1

(A predicted fungal growth is a non-unit.)

When Strain is Selected

Set the range.

- Strain measurement can be made with the LR8450 when U8554 Strain Unit is connected.
- Strain measurement can be made with the LR8450-50 when U8554 Strain Unit or LR8534 Wireless Strain Unit80 is connected.

(The following example is with model LR8450, LR8450-01 selected)

Range

Setting Items	Measurable Ranges	Maximum Resolution
1000 με f.s.	-1000 to 1000 με	0.05 με
2000 με f.s.	-2000 to 2000 με	0.1 με
5000 με f.s.	-5000 to 5000 με	0.25 με
10,000 με f.s.	-10,000 to 10,000 με	0.5 με
20,000 με f.s.	-20,000 to 20,000 με	1 με
50,000 με f.s.	-50,000 to 520,000 με	25 με
100,000 με f.s.	-100,000 to 100,000 με	51 με
200,000 με f.s.	-200,000 to 200,000 με	10 με

When Waveform Calculation is Selected

Set the calculation formula.

- The preset arithmetic expression is applied to measured data, and the resulting waveform is displayed on the Waveform screen.
- The calculation formula consists of arithmetic operations (+, −, ×, or ÷) between channels. Calculations can also be applied to a calculation result channel.
- Waveform calculation is supported by the LR8400-20, LR8401-20, LR8402-20, LR8410-20.

(The following example is with model LR8400-20, LR8401-20, LR8402-20 selected)

Channel 1, Channel 2

Select the channels to be included in the calculation formula. Calculation channels are specified as 1-W-1. However, only preselected channels can be specified for calculations.
(Example: when 1-W-5 is specified, 1-W-5 to 1-W-30 cannot be included in calculation formulas.)

Coeff 1, Coeff 2, Coeff 3

Set the coefficients to include in arithmetic operations.

Units

- Enter the measurement units of the calculation result.
- For the LR8432-20, the type of waveform calculation is selectable.

Arithmetic operations

Performs the arithmetic operations between the channels.

Channel 1, Channel 2

Select the channels to be included in the calculation formula. Calculation channels are specified as 1-W-1. However, only preselected channels can be specified for calculations.
(Example: when 1-W-5 is specified, 1-W-5 to 1-W-30 cannot be included in calculation formulas.)

Coeff 1, Coeff 2, Coeff 3

- Set the coefficients to include in arithmetic operations.
- For the LR8450, LR8450-01, the type of waveform calculation is selectable.

(The following example is with model LR8450, LR8450-01, LR8101, LR8102 selected)

Channel 1, Channel 2, Channel 3, Channel 4

Select the channels to be included in the calculation formula. Calculation channels are specified as 1-W-1. However, only preselected channels can be specified for calculations.
(Example: when 1-W-5 is specified, 1-W-5 to 1-W-30 cannot be included in calculation formulas.)

Coeff 1, Coeff 2, Coeff 3, Coeff 4, Coeff 5

Set the coefficients to include in arithmetic operations.

Units

Enter the measurement units of the calculation result.

Method for calculating power from the current measured with the LR8513 Wireless Clamp Logger connected to the LR8410-20 or the current measured with the U8556 Current Module, LR8536 Wireless Current Module connected to the LR8450, LR8450-01 (You can display the calculated power value on the LR8410-20, LR8450, or LR8450-01 as well by setting it to channel W before measurement.)

1. Click [Power] on the W channel menu under [Measurement].

2. Choose the desired calculation type under [Calculation formula] and enter the current measurement channel, voltage, and power factor.
The following power types are available: 1-phase/2-wire, 1-phase/3-wire, 3-phase/3-wire.

3. Click [Enter].
The corresponding channel, coefficient, operator, and unit will be set for the specified power calculation.

When Pulse is Selected (Integrate Pulse Measurement)

Set the mode, anti-chatter filter, count mode (add or instantaneous), slope, and threshold value.

- Model 8423 can be used for pulse measurement only with the 8996 Digital/Pulse Unit connected.
- A range cannot be selected. It is fixed to 1000 Mcf.s. (measurable range: 0 to 1000 M pulses) when count mode is selected, and automatically selected in accordance with the setting for the number of pulses per rotation when revolve mode is selected.
- You can choose a range of rotations of model LR8450, LR8450-01, LR8101, LR8102.
- If the scaling function is used, it is possible to convert to the physical quantity for measurement.
- Model LR8410-20 can be used for pulse measurement only with the LR8512 Wireless Pulse Logger connected.

(The following example is with model 8423 selected)

Mode

Setting Items	Explanations
Count	Integrates and measures the number of pulses output from an integrating wattmeter, flowmeter, etc.
Revolve	Measures the pulses output according to the rotation rate of a rotary encoder, rotation meter, etc. The rotation rate is obtained by counting the number of pulses input for a one-second period.

Filter (not settable for the 8430-20, LR8431-20, LR8432-20)

Setting Items	Explanations
ON	Enables use of the anti-chatter filter. Use this filter when connecting a device with a mechanical contact output.
OFF	Disables use of the anti-chatter filter.

Count Mode (only settable when [Count] is selected as the [Mode])

Setting Items	Explanations
Add	Measures the integration value from the start of measurement.
Instantaneous	Sets the instantaneous value for each recording interval. The instantaneous value is reset for each recording interval.

Pulse/rotation rate (only settable when [Revolve] is selected as the [Mode])

Setting Items	Measurable Ranges
n = 1 to 1000	0 to 5000/n r/s f.s. (n is the number of pulses per rotation)

Range (Only settable when revolve mode At LR8450, LR8450-01, LR8101, LR8102.)

Setting Items	Measurable Ranges
5000r/s f.s.	0 to 5000/n [r/s]
30000r/m f.s.	0 to 30000/n [r/m]

Slope

Setting Items	Explanations
↑	Integrates the number of times the pulse transitions from LOW to HIGH.
↓	Integrates the number of times the pulse transitions from HIGH to LOW.

Threshold (pulse detection level, not settable for the 8430-20, LR8431-20, LR8432-20)

Setting Items	Explanations
1 V	Sets the threshold value to 1 V.
4 V	Sets the threshold value to 4 V.

Count Reset (Only LR8450, LR8450-01, LR8101, LR8102 settable when [Count] is selected as the [Mode])

Setting Items	Measurable Ranges
OFF	Stop counting.
ON	Resets the count value and resets counting from 0.

Count Timing (Only LR8450, LR8450-01, LR8101, LR8102 settable when [Count] is selected as the [Mode])

Select when to start counting

Setting Items	Measurable Ranges
START	Integration starts from the start of measurement regardless of whether the trigger is met.
TRIG	Integration starts when the trigger is met.

Smoothing (Only LR8450, LR8450-01, LR8101, LR8102 settable when [Revolve] is selected as the [Mode])

Setting Items	Measurable Ranges
0 to 60	Performs the smoothing process for the set time.

Measuring Pulses (Rotation Rate)

The Logger measures the pulses output according to the rotation rate of a rotary encoder, rotation meter, etc. The rotation rate is obtained by counting the number of pulses input for a one-second period.

Use of the scaling function enables converting the measured rotation rate to the physical quantity of the measurement object to perform measurement.

Measurement Principle of the Rotation Rate

When the range is set to "Rotation Rate," the number of pulses is integrated internally every 10 ms.

$$\begin{array}{ccccccc} 0 & 10\ \text{ms} & 20\ \text{ms} & \dashrightarrow & 1\ \text{s} & \dashrightarrow & 2\ \text{s} \\ \mid & \mid & \mid & & \mid & & \mid \\ 0 & P_1 & P_2 & \dashrightarrow & P_{100} & \dashrightarrow & P_{200} \end{array} \quad \cdots$$
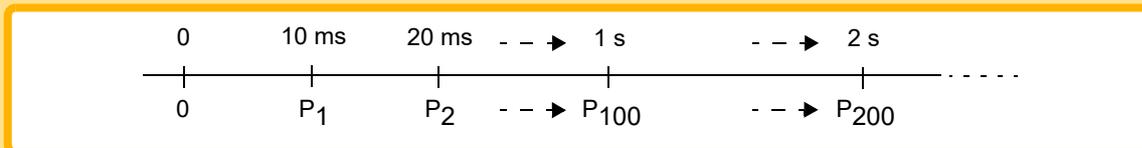
The rotation rate r at time t [s] is calculated by dividing the number of pulses from (t-1) to t [s] by the number of pulses per rotation.

$$r\ [\text{r/s}] = \frac{\text{Integrated number of pulses at t [s] - integrated number of pulses at (t-1) [s]}}{\text{Pulse / Rotation rate}}$$

Example: Pulses per rotation = 4
When 1 s, integrated number of pulses P10 = 1000 counts
When 2 s, integrated number of pulses P20 = 2000 counts
In this case, the rotation rate $r_{t=2}$ for t = 2 s is calculated as follows:

$$r_{t=2} = \frac{2000 - 1000}{4} = 250\ [\text{r/s}]$$

The integrated number of pulses of t-1 [s] is not measurable, so the value that is a hundred times the integrated number of pulses between t-0.01 [s] and t [s] is calculated as the integrated number of pulses during 1 s in order to calculate the rotation rate. For this reason, the rotation rate when t is less than 1 second may vary.

$$r\ [\text{r/s}] = \frac{(\text{Integrated number of pulses at t [s] - integrated number of pulses at (t-0.01) [s]})}{\text{Pulse / Rotation rate}} \times 100$$

When Logic is Selected

Set the anti-chatter filter and threshold.
- Model 8423 can be used for pulse measurement only with the 8996 Digital/Pulse Unit connected.
- Model LR8410-20 can be used for pulse measurement only with the LR8512 Wireless Pulse Logger connected.
- Model 8430-20, LR8431-20, LR8432-20 does not support Logic settings.

(The following example is with model 8423 selected)

Filter

Setting Items	Explanations
ON	Enables use of the anti-chatter filter. Use this filter when connecting a device with a mechanical contact output.
OFF	Disables use of the anti-chatter filter.

Threshold (threshold value of the pulse detection level)

Setting Items	Explanations
1 V	Sets the threshold value to 1 V.
4 V	Sets the threshold value to 4 V.

When LR8410 LINK is Selected

- Data measured with an instrument, such as model PW6001 or others, supporting LR8410Link connected with model LR8410 via Bluetooth can be obtained. (For more information about LR8410Link, refer to the instruction manual of Model)
- Previously configure the settings including the input type and the measurement range using the instrument supporting LR8410Link such as model PW6001 or others.
- Preforming searching or registration using the connection setting of Logger Utility allows you to carry out measurements, automatically receiving the input type, the measurement range, the scaling, the unit, and other settings of LR8410Link instrument connected via Bluetooth (these settings cannot be changed using Logger Utility).

4.4.2 Waveform Calculation Settings

The measured data is calculated with preset arithmetic expression to display the waveform. (Calculation is allowed during or after measurement) Four arithmetic operations (+, -, × and ÷) are employed between channels. Calculation is allowed for calculation channel. However, only preselected channels can be specified for calculations. (Example: when 1-Z-5 is specified, 1-Z-5 to 1-Z-60 cannot be included in calculation formulas.)

1. **Display the Waveform calculation settings page of the channel settings.**

2. **Click [ON] button to turn on [Calculate Function].**
Each click of the button switches between On and Off.

3. **Select the channel to calculate.**

4. **Click [ON] button to turn on [Calculate].**
Each click of the button switches between On and Off.

5. **Click [Edit] button.**
The **[Edit Formular]** dialog appears.

6. **Preset arithmetic expression (p. 107) and click [Enter] button.**
Up to 80 characters are allowed for arithmetic expression.
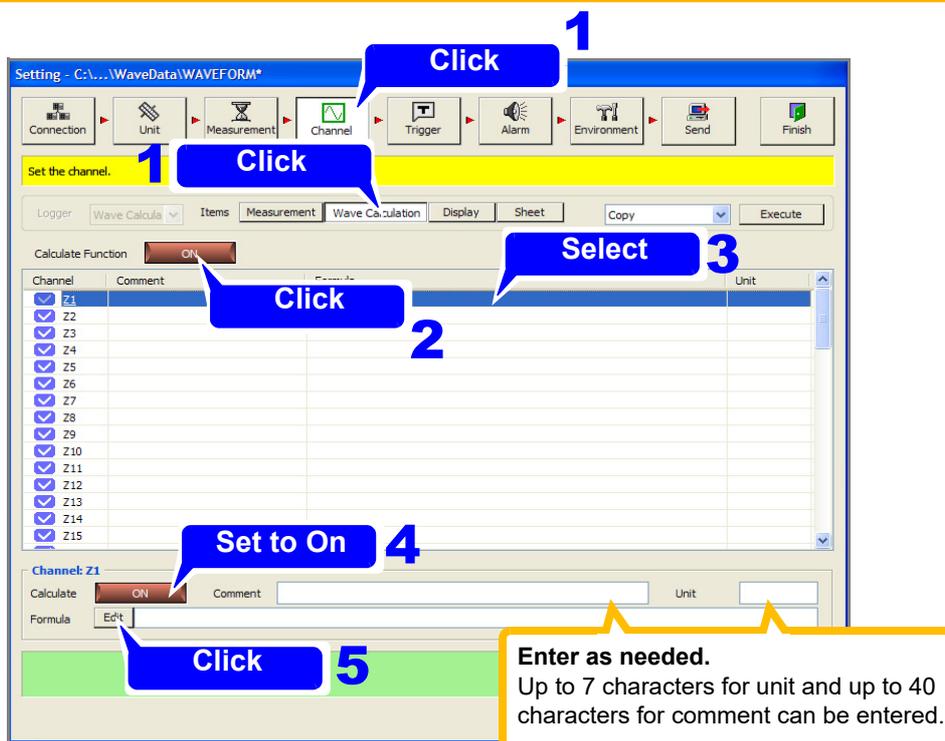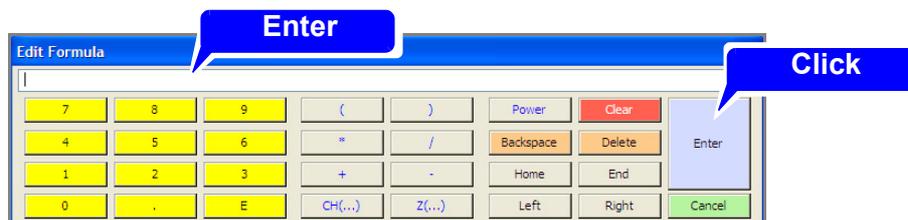
NOTE   In the following cases, an error icon **ERR** will appear at the front of the calcula-
tion expression. Measurement cannot start when the error icon is displayed so
please enter the calculation expression again.
- After entering the calculation expression, the structure of the device changes
  and the channel in the calculation expression cannot be referred to.
- The calculation expression of a high speed channel is combined with the cal-
  culation expression of a low speed channel in dual sampling.

Calculation Formula Setting Method

Key operations within the calculation formula editing dialog are as follows.

Key	Explanations
Clear	Erase the arithmetic expression totally.
Backspace	Backspace Erase the character preceding the cursor one by one.
Delete	Erase the character following the cursor one by one.
Home	Home Moves the cursor to the head of the arithmetic expression.
←	Moves the cursor left.
→	Moves the cursor right.
End	Moves the cursor to the end of the arithmetic expression.
CH (...)	Displays the dialog box. (See "Selecting measurement channel".) Select the measurement channel in the dialog box. Select device → unit → channel. The selected channel reflects on the arithmetic expression.
Z (...)	Displays the dialog box. (See "Selecting calculation channel".) Select the calculation channel in the dialog box. The selected calculation channel reflects on the calculation expression.
E	To enter constant number with exponential. (Example: 10000 → 1E4)

Method for setting power formulas

1. **Click [Power] on the [Edit Formula] menu.**

2. **Choose the desired calculation type under [Calculation formula] and enter the current measurement channel, voltage, and power factor.**
The following power types are available: 1-phase/2-wire, 1-phase/3-wire, 3-phase/3-wire.

3. **Click [Enter].**
The power formula will be entered in the **[Formula]** field.

Selecting measurement channel

Example: To select 8423 Device 1, Unit 1 and Channel 1.

1 Click **2 Click** **3 Click**

Selecting calculation channel

Example: To select Channel Z1.

1 Click

2 Click

* When a two-digit channel such as Z11 is entered, it reflects on the arithmetic expression without clicking **[OK]**.
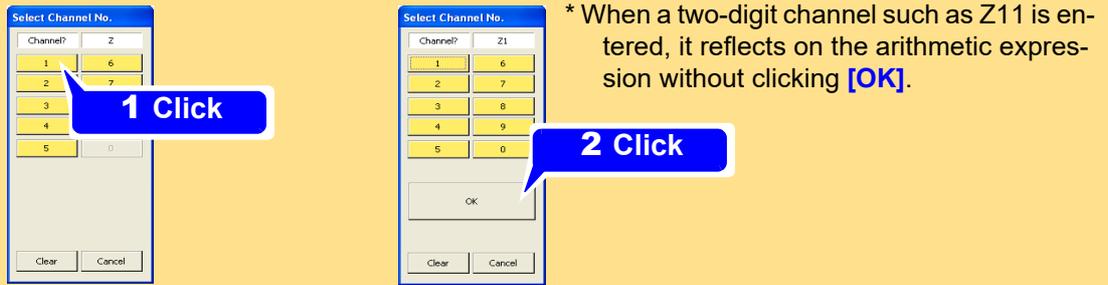
Sample arithmetic expression

Calculation	Arithmetic expression
"Measured value of Unit 3 Channel 3 in 8423 Device 1 "*3+6	3*CH(1,3,1)+6
"Measured value of Unit 1 Channel 9 in 8423 Device 2"*"Measured value of Unit 3 Channel 1 in Device 8423"	CH(2,1,9)*CH(1,3,1)
The result of arithmetic expression Z3"*5	Z(3)*5

4.4.3 Display Settings (Waveform Color, Display Digits, and Scaling)

This section describes configuring settings such as the display color, number of display digits, and scaling for each channel on the display settings page of the channel settings.

1. **Display the Display settings page of the channel settings.**

2. **Select the channel you want to set.**

3. **Set the number of display digits(number of digits to display after the decimal point) and scaling.**

Setting Items	Explanations
OFF	Scaling will not be converted.
Decimal	Scaling will be converted and the value displayed by decimals.
Exponential	Scaling will be converted and the value displayed by indexes.

4. **Select the scaling setting method and appropriate items.**

Setting Items	Explanations
Set by Ratio	Set the ratio and offset.
Set by 2 Points	Set the values of any 2 points.
Set by sense	Set the sensitivity. (Only LR8432-20)
Set by Rating	Set the rated capacity and rated output. (Only when using the U8554 Strain Unit or LR8534 Wireless Strain Unit)

5 For integration measurement with the 8996 Digital/Pulse Unit and LR8512 Wire-less Pulse Logger, and pulse input channels (integration measurement) in models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8450, LR8450-01, LR8101, and LR8102

Select

Set when **[Setting Method 1]** setting

Set when **[Setting Method 2]** setting

Setting Items	Explanations
Setting Method 1	Set scaling by the physical quantity per pulse.
Setting Method 2	Set scaling by the number of pulses per fundamental unit.

6 For revolution measurement with the 8996 Digital/Pulse Unit and LR8512 Wire-less Pulse Logger, and pulse input channels (revolution measurement) in models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8450, LR8450-01, LR8101, and LR8102

Select

Enter

Select when **[Set by Ratio]** setting

Select when **[Set by 2 Points]** setting

Setting Items	Explanations
Set by Ratio	Set the ratio and offset.
Set by 2 Points	Set the values of any 2 points.

NOTE
- The values of "Set by Ratio" and "Set by 2 Points" are linked so that the settings become the same.
- The values of "Setting Method 1" and "Setting Method 2" are linked so that the settings become the same.
- Up to 7 byte characters can be entered for the unit. Double byte characters are displayed as "*" in the display area of the 8423.
- Scaling cannot be set for the M7103 power measurement module.

About Scaling and Scaling Setting Examples

The scaling method depends on the input units and channels used.

For the 8948 Voltage/Temp Unit, 8949 Universal Unit, and analog input channels in models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102.

Use of the scaling function enables converting the output voltage obtained from, for instance, a sensor to the physical quantity of the measurement object in order to perform measurement.

The gauge graduations, scale (vertical axis upper limit value and lower limit value) values, and A-B cursor measurement values can be displayed as scaled values and units.

The following two types of scaling methods are available.

Setting by ratio

Set the physical quantity per 1 V input signal (ratio eu/V), offset value, and unit name for conversion (eu: engineering unit), and convert the measurement values obtained as voltage values to values of the set unit.

Example
Ratio: Value of A/V
Offset Value: B
Unit name: A

Convert from slope (ratio) and offset value
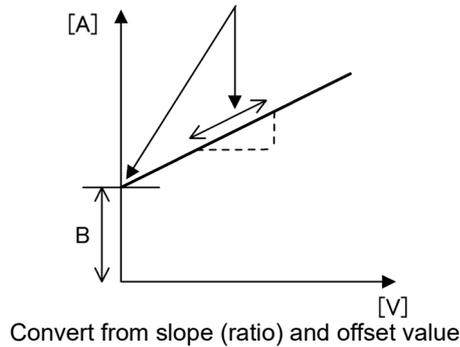
Setting by 2 points

Set the voltage values at 2 points of the input signal, the conversion value of those 2 points, and the unit name for conversion, and convert the measurement values obtained as voltage values to values of the set unit.

Example
Unit values for conversion of voltage values at 2 points
V_H: High voltage point
A_H: Conversion value for the high voltage point
V_L: Low voltage point
A_L: Conversion value for the low voltage point
Unit name: A

Value of unit for conversion
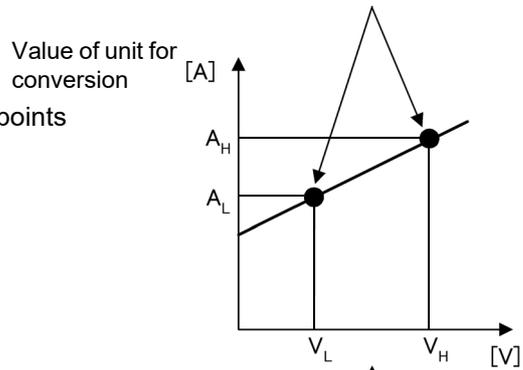
Actual measurement value

Calculate ratio from 2 points and offset value and then convert

Scaling Examples: **Use Hioki's 9322 Differential Probe to measure the effective value of the voltage of a commercial power supply**

Channel: 1-1-2				
▣ Volt./Temp.	Method	Set by Ratio	Ratio	1000	Offset	0
Display Digits 4			Input 1	+5.0000E-03	▶ Output 1	+5.0000E+0
Scaling Decimal	Unit	Vrms	Input 2	-5.0000E-03	▶ Output 2	-5.0000E+0C

Setting Items	Setting Values
Method (Scaling method)	Set by Ratio
Ratio	1000 (ratio of the 9322: 1/1000)
Unit	Vrms

For integration measurement with the 8996 Digital/Pulse Unit and LR8512 Wireless Pulse Logger, and pulse input channels (integration measurement) in models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8450, LR8450-01, LR8101, and LR8102

Use of the scaling function enables converting the integrated number of pulses to the physical quantity (Wh, VA, etc.) of the measurement object in order to perform measurement.

For pulse output devices, the physical quantity per pulse or the number of pulses per fundamental unit (e.g., 1 kWh, 1 liter, 1 m^3) is determined. You can use either of the settings in the scaling settings.

The following two types of scaling methods are available.
- **Setting method 1**: Enter the physical quantity per pulse.
- **Setting method 2:** Enter the number of pulses per fundamental unit.

Setting Example 1. **Connect a 50,000 pulse/kWh supply meter for measurement**

Channel: 1-3-8					
▣ Digital and Pulse	Method	Setting Method 2	1 Pulse	=	+2.0000E-5	kWh
Display Digits 4					
Scaling Decimal	Unit	kWh	1 kWh	=	50000	Pulse

Setting Items	Setting Values
Method (Scaling method)	Setting Method 2
Unit	kWh
1 kWh =	50000 Pulse

Setting Example 2. **Connect a 10 liter/pulse flowmeter for measurement**

Channel: 1-3-9					
▢ Digital and Pulse	Method	Setting Method 1	1 Pulse	=	10	L
Display Digits 4					
Scaling Decimal	Unit	L	1 L	=	+1.0000E-1	Pulse

Setting Items	Setting Values
Method (Scaling method)	Setting Method 1
Unit	L
1 Pulse =	10 L

For revolution measurement with the 8996 Digital/Pulse Unit and LR8512 Wireless Pulse Logger, and pulse input channels (revolution measurement) in models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8450, LR8450-01, LR8101, and LR8102

Use of the scaling function enables converting the number of pulses per second to the rotation rate per unit time in order to perform measurement.

The following two types of scaling methods are available.
- **Setting by ratio** : Set the unit time and offset value, and convert to the rotation rate per unit time.
- **Setting by 2 points** : Set the rotation rate at 2 points of the number of input pulses, the conversion value of those 2 points, and the unit name for conversion, and convert to the rotation rate per unit time.

Setting Example   **Measure using rotation rate per minute r/min (rpm)**

Setting Items	Setting Values
Method (Scaling method)	Set by Ratio
Ratio	60 (Reference: If per hour, the ratio is 3600)
Unit	r/min

When using the LR8513 Wireless Clamp Logger with the LR8410-20, and when using the U8556 Current Module or LR8536 Wireless Current Module with the LR8450, LR8450-01

You can use the scaling function to convert the measured current value to the 1-phase/2-wire power value. If the voltage is given by V and the power factor by λ, you can display the 1-phase/2-wire power value by setting the scaling conversion ratio to V*λ and the unit to W.
Power value W = Scaling conversion ratio * current value = V * λ * current value

Setting Example   **Measuring the 1-phase/2-wire power value for voltage V (for example, 100 V) and power factor λ (for example, 0.8)**

Setting Items	Setting Values
Method (Scaling method)	Set by Ratio
Ratio	80 (Reference: When the voltage V is 100 V and the power factor λ is 0.8, V* λ = 80)
Unit	W

4.4.4 Assigning Channels to Sheets

There are 11 sheets in the waveform display area of the main screen. You can select the channels you want to display and assign them to sheets. The 11 sheets include an ALL sheet for displaying all of the channels.

1. **Display the Sheet settings page of the channel settings.**

2. **Select the sheet you want to set.**
You can rename the sheet as you wish.

3. **Select a channel to display on the sheet.**

4. **Click the [Display] button to turn display ON.**

5. **Set the upper limit and lower limit.**
(Make this setting only when using the 8948 Voltage/Temp Unit, 8949 Universal Unit, 8996 Digital/Pulse Unit (pulse inputs), and analog and pulse input channels of models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102.)

Setting Items	Setting Ranges
Upper	−9.9999E+29 to 9.9999E+29
Lower	−9.9999E+29 to 9.9999E+29

NOTE To directly input the screen display upper limit and lower limit values, press the **Enter** key on the keyboard each time after each value has been inputted to set it.

6. **Set the display position.**

(Make this setting only when using the logic inputs of 8996 Digital/Pulse Unit and LR8512 Wireless Pulse Logger, and logic input channels of Logger models LR8400-20, LR8401-20, LR8402-20, LR8450, LR8450-01, LR8101, and LR8102.)

Setting Items	Setting Ranges
Position	Position 1 to 25

6

Channel: 1-3-6			
Unit	Digital and Pulse	Position	Position 6
Display	ON		

Select

Position

1 to 5

6 to 10

.
.
.
.
.

21 to 25

Waveform Display Area

4.5 Setting the Trigger Function

This section describes setting the trigger function. The trigger function can be set to start or end measurement when a set criteria is satisfied. The following signals (trigger sources) are available for applying triggers. Triggers are ignored during recording operation.

Trigger Sources	Explanations
Analog trigger (p. 128)	A trigger is applied by an input signal of an analog channel. (Level trigger, window trigger) An analog trigger cannot be set for the M7103 power measurement module.
Logic trigger (p. 134)	AND/OR is set for the input signal (1/0/x) of a logic channel in order to apply a trigger when the criteria is satisfied. Cannot be set for the 8430-20, LR8431-20, LR8432-20.
External trigger (p. 126)	A trigger is applied by an input signal of the SMPL/TRIG terminal (external control input terminal) of the 8423 main unit, or EXT.TRIG terminal (external control terminal) of the 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20 main unit or IO3 terminal (external control terminal) of the LR8450, LR8450-01, LR8101, LR8102 main unit.

NOTE
- The trigger setting will become invalid when only multiple sets of 8423 are used in measurement and no simultaneous measurement is performed.
- Trigger settings are unavailable for mixed-model measurements.

4.5.1   Recording Operation during Simultaneous Use of Timer Measurement and Triggers

The following sections show the relation with repeat recording during the imultaneous use of timer measure-
ment and triggers.

Repeat Recording Off

Normal recording operation

Start button
Recording operation
Recording period
Start meas.   Stop meas.   Time

When measurement stopped within recording period

Start button
Stop but-ton
Recording period
Recording operation
Start meas.   Stop meas.   Time

When measurement start time is set for timer measurement

Start button
Start time
Recording period
Recording operation
Start meas.   Stop meas.   Time

When measurement stop time is set after recording period for timer measurement

▶ Start button

Recording operation

Recording period

Stop time

Start meas.   **Stop meas.**   Time

When measurement stop time is set within recording period for timer measurement

▶ Start button

Recording operation

Stop time

Recording period

Start meas.   **Stop meas.**   Time

When measurement start time is set for timer measurement and stop time is set within recording period

▶ Start button

Start time

Recording operation

Stop time

Recording period

Start meas.   **Stop meas.**   Time

When start trigger is set

▶ Start button

T Start trigger

Recording period

Waiting for trigger

Recording operation

Start meas.   **Stop meas.**   Time

When stop trigger is set and stop trigger is applied before recording period

▶ Start button

T Stop trigger

Recording period

Recording operation

Start meas.   **Stop meas.**   Time

When start trigger is applied during timer measurement and stop trigger is applied before measurement stop time

Start time

▶ Start button

Waiting for trigger

Start trigger

T

Recording operation

Stop trigger

T

Stop time

Recording period

Start   **Stop**   Time

Repeat Recording On

Normal repeat recording operation
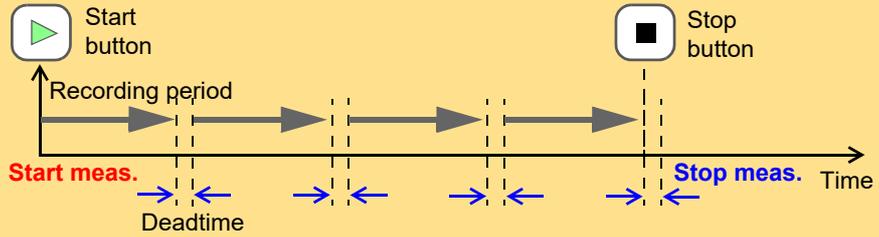
When measurement stopped within recording period
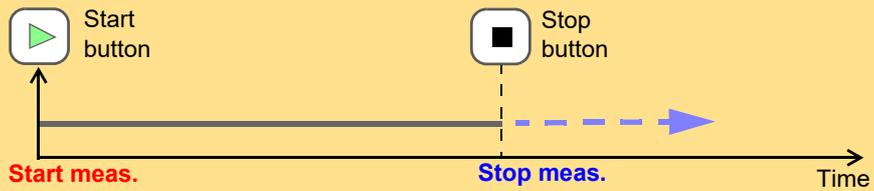
When measurement start time is set for timer measurement
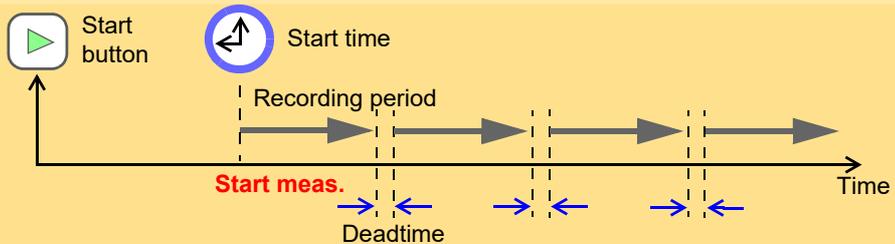
When measurement stop time is set after recording period for timer measurement

When measurement stop time is set within recording period for timer measurement

When measurement start time is set for timer measurement and stop time is set after recording period

When start trigger is set

Start button

T Start trigger   T Start trigger

Waiting for trigger   Recording period   Waiting for trigger   Recording period

Start meas.   Time

When stop trigger is set and stop trigger is applied before recording period

Start button

T Stop trigger   T   T   T

Recording period

Start meas.   **Restart meas.**   **Restart meas.**   Time

Deadtime

When start trigger is applied during timer measurement and stop trigger is applied before measurement stop time

Start button

Start time   T Start trigger   T Stop trigger   T Start trigger   T Stop trigger   Stop time

Waiting for trigger   Recording period   Waiting for trigger   Recording period

Start meas.   **Stop meas.**   Time
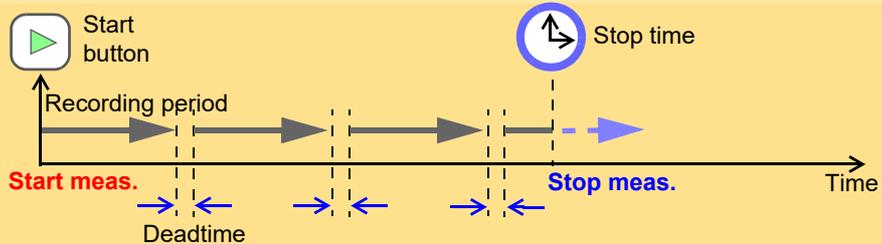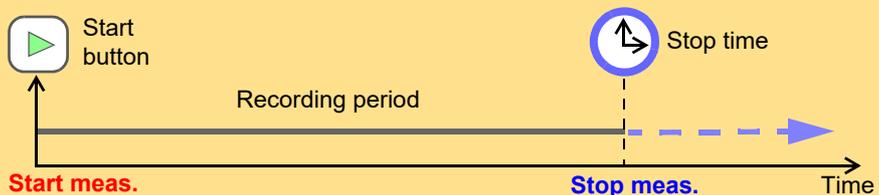
4.5.2 Pre-trigger

If the pre-trigger is set, waveforms are recorded not just after a trigger but both before and after a trigger.

The pre-trigger function is available only for stand-alone measurement.

Recording Before Triggering

Pre-Trigger Setting Amount   Recording period
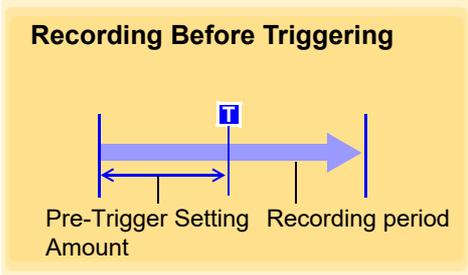
1. **Open the Trigger Settings page.**

2. **Click the trigger function button to turn it on.**
Clicking the button toggles it on and off.

3. **Set the pre-trigger time span.**
You can use the **[←→]** left and right arrow keys on the keyboard to move to an input item, and the **[↑↓]** up and down arrow keys to increase and decrease the value.

NOTE
- The setting is ignored when you use Logger Utility to perform PC based measurement.
- The pre-trigger cannot be used when the function is set to external sampling (Setting available for only model 8423, LR8101, LR8102.).
- The settable range for the pre-trigger varies depending on the recording interval that is set.
  Possible setting range: 0 to 100,000 × Record length interval
- If a pre-trigger is set, the status becomes **[Waiting for Pre-trigger]** and a trigger cannot be accepted during the period of time from the start of measurement to the time set for the pre-trigger. **[Waiting for Trigger]** is displayed until the Logger enters the trigger accept status and a trigger is applied.
- To record the waveform generated after trigger, set the recording duration longer than pre-trigger (p. 123).

Relationship between pre-trigger and recording duration

Recording duration shorter than pre-trigger

Recording ends when triggered.

Recording period (10 min)

T

Pre-trigger (15 min)

Recording duration longer than pre-trigger

Records before and after trigger.

Ends at the end of recording duration.

T

Recording period (15 min)

Pre-trigger (5 min)

4.5.3 Trigger Timing

This section describes setting the time relation between the satisfying of a trigger criteria and the waveforms recorded. You can set a trigger criteria for each of start and stop. Set the trigger timing criteria for each Logger.

1. **Open the Trigger settings page.**

2. **Click [ON] button to turn on [Trigger Function].**
Each click of the button toggles the trigger function On and Off.

3. **Select the trigger timing.**

Setting Items	Explanations
Start	Waveforms are recorded from the point in time a trigger is applied.
Stop	Recording is performed from the point in time ▶ Start button is clicked to the point in time a trigger is applied.
Start & Stop	Waveforms are recorded from the point in time a trigger is applied to the point in time the next trigger is applied.

4.5.4 Trigger Sources

Analog (exc. M7103), logic (exc. 8430-20, LR8431-20, LR8432-20), and external triggers can be combined with AND/OR logical operators. This sets the time relation between the satisfying of a criteria and the waveforms recorded. You can set AND/OR for each of start and stop. Set the trigger source criteria for each Logger.

1. **Open the Trigger settings page.**

2. **Click [ON] button to turn on [Trigger Function].**
Each click of the button toggles the trigger function On and Off.

3. **Select the trigger source.**
Each click of the button toggles the trigger source AND and OR.

Setting Items	Explanations
OR	A trigger is applied when any one of the trigger criteria is satisfied.
AND	A trigger is applied when all of the trigger criteria are satisfied.
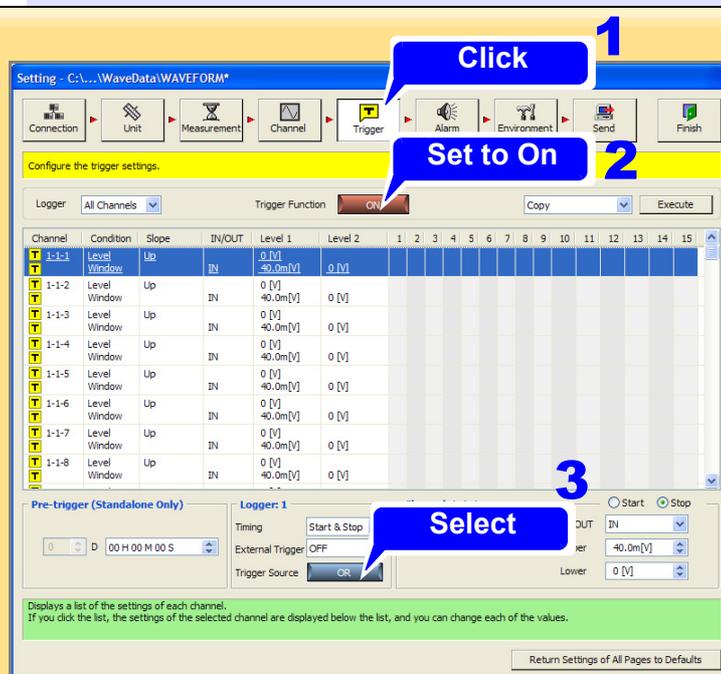
If channel 1-1-1 and channel 1-1-2 are set to a level trigger of 0.00 V (↑)

The difference between AND and OR trigger combination is shown at the right.

[AND] — One waveform has crossed above 0V as the other crosses on the upslope

[OR] — Either waveform crosses 0V on the upslope
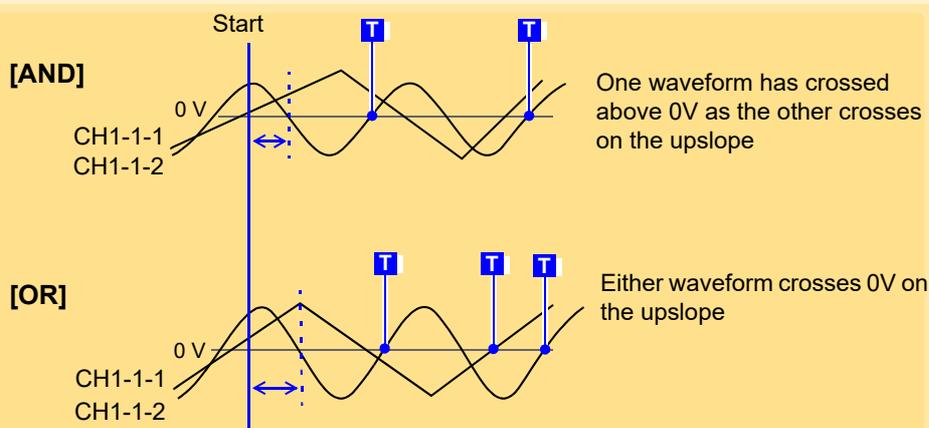
NOTE A trigger is not applied if the trigger criteria is already satisfied when measurement starts. If the criteria of one of the trigger sources is no longer satisfied and then the criteria is satisfied again, a trigger is applied.

4.5.5   External Triggers

A trigger signal can be applied to the SMPL/TRIG (external control input) terminal on model 8423, or to the EXT.TRIG terminal on models LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20. For the LR8450, LR8450-01, LR8101, and LR8102, triggers can be applied using the IO3 (external control terminal) input signal.
Set an external trigger for each Logger.

See: For details on the signal input criteria of the SMPL/TRIG terminal or the EXT.TRIG terminal:
      8423 Instruction Manual "5.7.1 Setting External Control Input Terminals"
      8430-20, LR8431-20, LR8432-20 Instruction Manual "9.2 External Trigger Input"
      LR8400-20, LR8401-20, LR8402-20 Instruction Manual "9.2 External Signal Output (Trigger Output)"
      LR8410 Instruction Manual "9.2 External Signal Output (Trigger Output)"
      LR8450, LR8450-01 Instruction Manual "2.6 Applying Triggers Based on External Sources"
      LR8101, LR8102 Instruction Manual "5.5 Applying External Trigger"

1.   **Open the Trigger settings page.**

2.   **Click [ON] button to turn on [Trigger Function].**
      Each click of the button toggles the trigger function On and Off.

3.   **Click the External Trigger button to enable (On), or select a slope direction (up or down arrow).**
      For model 8423, 8430-20 , LR8431-20, LR8432-20, LR8450, LR8450-01, LR8101, or LR8102

Setting Items	Explanations
OFF	The external trigger is disabled.
ON	The external trigger is enabled.

   For model LR8400-20, LR8401-20, LR8402-20, or LR8410-20

Setting Items	Explanations
OFF	The external trigger is disabled.
↑	Triggering occurs on the upslope of the external signal.
↓	Triggering occurs on the downslope of the external signal.
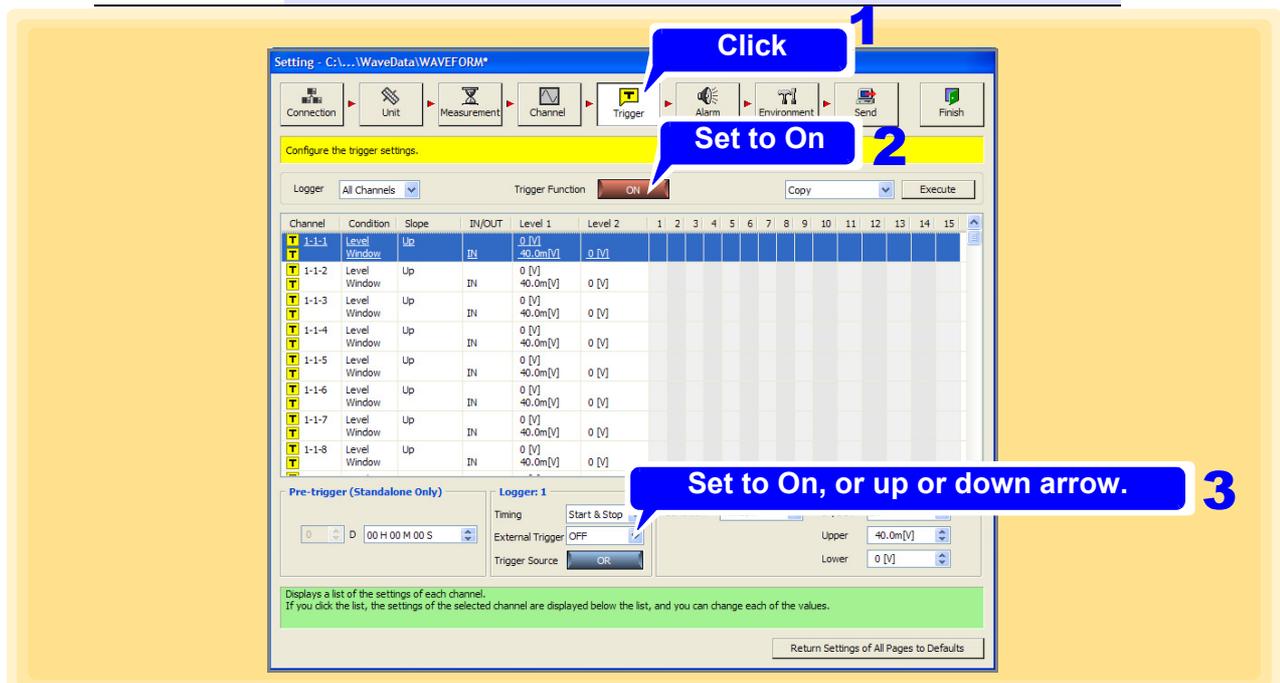
NOTE

- If the measurement function is set to **[External Sampling]**, the external trigger cannot be used.
- When external triggering of models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20 is set to **[Event]**, external triggering is disabled.
- If IO3 (external control terminal) of LR8450, LR8450-01, LR8101, and LR8102 is not set as trigger input, external trigger can not be used.

Input channels can be assigned as trigger sources. Any channel can be selected as a trigger signal.

1. **Open the Trigger settings page.**

2. **Click [ON] button to turn on [Trigger Function].**
Each click of the button toggles the trigger function On and Off.

3. **Select the channel for which to set the trigger function.**
If you want to reduce the number of display channels, use the narrow down feature to select the channels to display (p. 166).

4. **Set the trigger criteria.**
The setting values differ depending on setting of the trigger criteria. For details, see the following.

Setting Items	Explanations
Level	A trigger can be applied when the input signal crosses the set level value (threshold value) on the set slope (↑ or ↓).
Window	Set the upper limit value and lower limit value to apply a trigger when the input signal enters (IN) or exits (OUT) the corresponding range.

T : Trigger On

When the trigger timing is "Start & Stop," set each of the start trigger criteria and stop trigger criteria.

See: "When Level Trigger is Selected" (p. 129), "When Window Trigger is Selected" (p. 133)

When Level Trigger is Selected

Set the level value and slope.

Level

Set the level value for applying a trigger. The scaling setting is reflected.

Slope

Select the slope for when the input signal crosses the level value for applying a trigger.

Setting Items	Explanations
↑	A trigger is applied when the level value is crossed on the rising slope.
↓	A trigger is applied when the level value is crossed on the falling slope.

NOTE   A trigger is not applied if the trigger criteria is satisfied at start time.

Trigger Resolution
(when using models 8423, 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, or LR8450-01)

Measurement Object	Range	Trigger Resolution	Maximum Resolution
Voltage/ Heat Flow	1 mV f.s.[7]	1 μV	50 nV
	2 mV f.s.[7]	2 μV	100 nV
	5 mV f.s.[7]	5 μV	250 nV
	10 mV f.s.[3,6]	10 μV[3]	500 nV[3]
	20 mV f.s.[3]	20 μV[3]	1 μV[3]
	50 mV f.s.[5]	50 μV	10 μV
	100 mV f.s.	100 μV[1,3] 25 μV[2]	5 μV
	200 mV f.s.[3]	200 μV[3]	10 μV[3]
	500 mV f.s.[5]	500 μV	100 μV
	1 V f.s.	1 mV[1,3] 250 μV[2]	50 μV
	2 V f.s.[3]	2 mV[3]	100 μV[3]
	5 V f.s.[5]	5 mV	1 mV
	10 V f.s.	10 mV[1,3] 2.5 mV[2]	500 μV
	20 V f.s.	20 mV[1,3] 5 mV[2]	1 mV
	50 V f.s.[5]	50 mV	10 mV
	100 V f.s.	100 mV[1,3] 25 mV[2]	5 mV

Measurement Object	Range	Trigger Resolution	Maximum Resolution
Temperature	1-5 V f.s.	10 mV[*1, 3] 2.5 mV[*2]	500 µV
	100°C f.s.[*1, 3]	0.1°C[*1, 3]	0.01°C[*1, 3]
	100°C f.s.[*4]	0.1°C	0.1°C
	500°C f.s.	0.5°C	0.05°C
	1000°C f.s.[*5]	1°C	0.1°C
	2000°C f.s.	2°C[*1, 3] 0.5°C[*2]	0.1°C
Humidity	100% RH[*1, 3]	0.1% RH[*1, 3]	0.1% RH[*1, 3]
Resistance[*3]	10 Ω f.s.	10 mΩ	0.5 mΩ
	20 Ω f.s.	20 mΩ	1 mΩ
	100 Ω f.s.	100 mΩ	5 mΩ
	200 Ω f.s.	200 mΩ	10 mΩ
Pulse Integration	1000 M pulse f.s.	1 pulse	1 pulse
Pulse Rotation rate	5000 [r/s]	1/(Pulse rotation rate) [r/s]	1/(Pulse rotation rate)[r/s]

*1. 8423 only

*2. 8430-20, LR8431-20, LR8432-20 only

*3. When using the LR8400-20, LR8401-20, LR8402-20 or when using the LR8410-20 with the LR8510 Wireless Voltage/Temp Unit or the LR8511 Wireless Universal Unit.

*4. Only for models LR8410-20 with the LR8514 Wireless Humidity Logger or the LR8520 Wireless Fungal Logger connected.

*5: Only for models LR8410-20 with the LR8515 Wireless Voltage/Temp Logger connected.

*6: LR8432-20 only

*7: Only for models LR8450, LR8450-01 with the U8554 Strain Unit or LR8534 Wireless Strain Unit connected.

Measurement Object Current (Current Sensor)	Range	Trigger Resolution	Maximum Resolution
9675	500 mA	0.5 mA	0.1 mA
	5 A	0.005 A	0.001 A
9657-10	500 mA	0.5 mA	0.1 mA
	5 A	0.005 A	0.001 A
9695-02	5 A	0.005 A	0.001 A
	50 A	0.05 A	0.01 A
CT6500	50 A	0.05 A	0.01 A
	500 A	0.5 A	0.1 A
9669	1000 A	1 A	1 A
CT9691-90	10 A	0.01 A	0.01 A
	100 A	0.1 A	0.1 A
CT9692-90	20 A	0.02 A	0.01 A
	200 A	0.2 A	0.1 A
CT9693-90	200 A	0.2 A	0.1 A
	2000 A	2 A	1 A
CT7631	10 A	0.01 A	0.01 A
	100 A	0.1 A	0.1 A
CT7636	20 A	0.02 A	0.01 A
	200 A	0.2 A	0.1 A
CT7642	200 A	0.2 A	0.1 A
	2000 A	2 A	1 A
CT7731	10 A	0.01 A	0.01 A
	100 A	0.1 A	0.1 A
CT7736	20 A	0.02 A	0.01 A
	200 A	0.2 A	0.1 A
CT7742	200 A	0.2 A	0.1 A
	2000 A	2 A	1 A
CT9667	500 A	0.5 A	0.1 A
	5000 A	5 A	1 A
CT7044	50 A	0.05 A	0.01 A
	500 A	0.5 A	0.1 A
	5000 A	5 A	1 A
CT7045	50 A	0.05 A	0.01 A
	500 A	0.5 A	0.1 A
	5000 A	5 A	1 A
CT7046	50 A	0.05 A	0.01 A
	500 A	0.5 A	0.1 A
	5000 A	5 A	1 A

• Current measurements are supported by model LR8410-20 with the LR8513 Wireless Clamp logger connected.
Models CT9667-01, CT9667-02, and CT9667-03 are configured as model CT9667.

Measurement Object Current (Current Sensor)	Range	Trigger Resolution	Maximum Resolution
CT7126	50 A	0.01 A	0.01 A
	5 A	0.001 A	0.001 A
CT7131	100 A	0.01 A	0.01 A
CT7116	5 A	0.001 A	0.001 A
	500 mA	0.1 mA	0.1 mA
CT7136	500 A	0.1 A	0.1 A
	50 A	0.01 A	0.01 A
CT7044, CT7045, CT7046	5000 A	1 A	1 A
	500 A	0.1 A	0.1 A
	50 A	0.01 A	0.01 A
CT7742	2000 A	0.2 A	0.2 A
	200 A	0.1 A	0.1 A
CT7736	500 A	0.1 A	0.1 A
	50 A	0.01 A	0.01 A
CT7731	100 A	0.01 A	0.01 A
CT7822	20 A	0.002 A	0.002 A
	2 A	0.001 A	0.001 A
CT7812	2 A	0.0002 A	0.0002 A
	200 mA	0.1 mA	0.1 mA

- Current measurements are supported by model LR8450, LR84550-01 with the U8556 Current Module, LR8536 Wireless Current Module connected.

Trigger Resolution
(when using models LR8101 or LR8102)

Measurement Object	Range	Trigger Resolution	Maximum Resolution
Voltage	10 mV f.s.	10 µV	100 nV
	20 mV f.s.	20 µV	200 nV
	100 mV f.s.	100 µV	2 µV
	200 mV f.s.	200 µV	3 µV
	1 V f.s.	1 mV	10 µV
	2 V f.s.	2 mV	20 µV
	6 V f.s.	6 mV	60 µV
	10 V f.s.	10 mV	100 µV
	20 V f.s.	20 mV	200 µV
	60 V f.s.	60 mV	600 µV
	100 V f.s.	100 mV	1 mV
	1-5 V f.s.	6 mV	60 µV
Temperature	100°C f.s.	0.1°C	0.01°C
	500°C f.s.	0.5°C	0.05°C
	2000°C f.s.	2°C	0.1°C

When Window Trigger is Selected

Set IN/OUT and the upper limit value and lower limit value.

IN/OUT

Setting Items	Explanations
IN	A trigger is applied when a value enters within the range of the window (upper and lower limit values).
OUT	A trigger is applied when a value exits from the range of the window (upper and lower limit values).

Upper/Lower:

Set the level value for applying a trigger. The scaling setting is reflected. It is not possible to set an upper limit value that is smaller than the lower limit, and a lower limit value that is larger than the upper limit value.

NOTE A trigger is not applied if the trigger criteria is satisfied at start time.
Example:
Window out trigger (upper limit value: 1 V, lower limit value: -1 V)

A trigger is not applied when out of the window from the start.
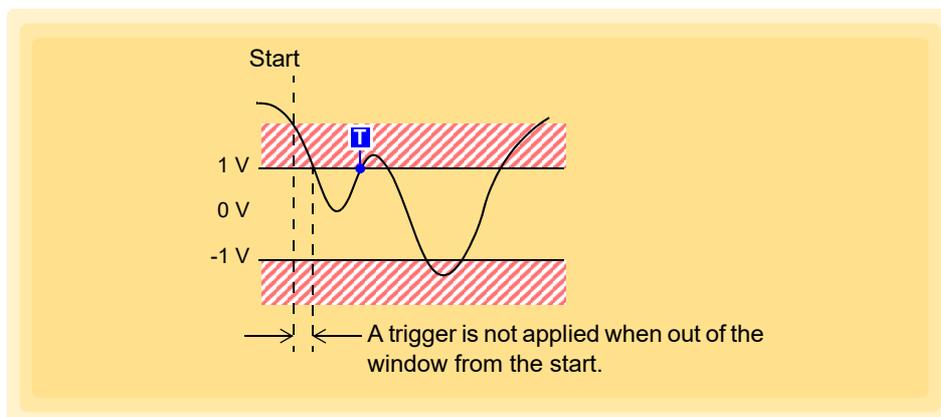
4.5.7 Logic Trigger

This section describes setting a trigger that uses a logic input signal. Set the trigger pattern (1/0/x) and the AND/OR of the trigger pattern in order to apply a trigger when a criteria is satisfied. This can be set for each channel.

These settings are available for model 8423 (with the 8996 Digital/Pulse Unit), and for models LR8400-20, LR8401-20, LR8402-20, LR8450, LR8450-01, LR8101, LR8102 when the input type is set to **[Logic]** (p. 105) and LR8410-20 (LR8512 Wireless Pulse Logger).

Logic triggering is not available with model 8430-20, LR8431-20, LR8432-20.

1. **Open the Trigger settings page.**

2. **Click [ON] button to turn on [Trigger Function].**
Each click of the button toggles the trigger function On and Off.

3. **Select the unit for which to set the trigger settings.**
If you want to reduce the number of display channels, use the narrow down feature to select the channels to display (p. 166).

4. **Select the trigger criteria.**

Setting Items	Explanations
OR	A trigger is applied when any one of the trigger criteria set with the pattern is satisfied.
AND	A trigger is applied when all of the trigger criteria set with the pattern are satisfied.

5. **Set the trigger pattern.**

Setting Items	Explanations
1	HIGH level signal
0	LOW level signal
x	Ignore signal

Clicking the **[All x]**, **[All 0]**, or **[All 1]** button allows you to convert all selected logic to the same value simultaneously.

NOTE A logic trigger is applied immediately if a trigger criteria is satisfied at start time.

5. Set the alarm setting for each channel.

(This example uses a preset voltage on CH13 (CH1-1-13) of the 8948 Voltage/Temp Unit as the alarm criteria.)

1. Select the alarm output channel.
2. Click the Source Channel button to specify the input unit and channel.
3. (This is the alarm criteria input channel.)
4. Set the alarm criteria.
   (Setting contents depend on trigger criteria settings. See "Advanced Settings".)

Setting Items	Explanations
Level	Output an alarm when the input signal satisfies the set level.
Window	Output an alarm when the input signal enters or exits the set range.
Slope (only LR8450, LR8450-01, LR8101, LR8102)	Output an alarm when the input signal over or under the set rate of change
Slope 2p (only LR8450, LR8450-01, LR8101, LR8102)	Output an alarm when the amount of change for the set width is greater than or equal to (or less than) the set level value.

" 🅰 " appears when the alarm setting is enabled.

Advanced Settings

When the [Level] criteria is selected

Level

Set the level (threshold value). Setting for scaling will be reflected.

High/Low

Setting Items	Explanations
↑	Output an alarm when the input signal satisfies the set level.
↓	Output an alarm when the input signal enters or exits the set range.

When the [Window] criteria is selected

Upper/Lower (Upper limit values, Lower limit values)

Set the upper and lower limit values of the window. Setting for scaling will be reflected. The upper limit value cannot be set lower than the lower limit value and the lower limit value cannot be set higher than the upper limit value.

IN/OUT

Setting Items	Explanations
IN	Alarm will be output whenever a value is within the range of the window (Upper/Lower limit values)
OUT	Alarm will be output whenever a value is outside the range of the window (Upper/Lower limit values)

Filter (Model LR8450, LR8450-01, LR8101, LR8102 Only)

Setting Items	Explanations
OFF, 2, 5, 10, 20, 50, 100, 200, 500, 1000	When the Alarm state continued during the established number of sample, Alarm is output.

When the [Slope] is selected (Model LR8450, LR8450-01, LR8101, LR8102 Only)

Setting Items	Explanations
Level	Set the level (threshold value). Setting for scaling will be reflected.
Time	Set the time. Level / Time = The rate of change.

When the [Slope 2P] is selected (Model LR8450, LR8450-01, LR8101, LR8102 Only)

Setting Items	Explanations
Level	Set the level (threshold value). Setting for scaling will be reflected.
Time	Set the width as an interval of time.

NOTE
- Only a channel of the same input module inserted to the 8423 can be set as the alarm source channel. (Waveform calculation channel cannot be set up for alarm.)
- If the alarm source channel is not valid, the source channel button is displayed in yellow.
- When you use the alarm function, a minimum of at least one unit other than the 8997 Alarm Unit is required.
- The alarm is output immediately if the criteria is met at the start of measurement.
- If a channel of the 8948 Voltage/Temp Unit or 8949 Universal Unit assigned to the low-speed side with dual sampling is set as the alarm source channel, alarm output may be delayed by a few samples from when the alarm criteria is satisfied.

When using Model 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102

An alarm signal (open-collector, with voltage) is output from an ALARM external control terminal[1] (ALM1 to ALM4[1,2]) when the alarm criteria match the value measured on the specified input channel. Set the alarm criteria for any input channel, and select AND/OR to combine alarm criteria.

*1: When using Model LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102

*2: ALM1 to ALM8 for Model LR8450 and LR8450-01

1. **Open the Alarm settings page.**

2. **Set alarm criteria (Model LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102 only).**

Select from alarm criteria 1 to 4[3].

Every criteria applies to each channel's alarm settings.

*3: Criteria 8 for Model LR8450 and LR8450-01

3. **Click [ON] button to turn on [Hold Alarm].**

Each click of the button toggles the trigger function On and Off. This sets whether to hold output when the alarm criteria of a certain alarm channel is satisfied, and the alarm is output.

Setting Items	Explanations
OFF	Stop alarm output when the alarm criteria is no longer satisfied.
ON	Hold alarm output until measurement ends.

4. **Click [ON] button to turn on [Buzzer].**

Each click of the button toggles the setting ON and OFF.

Enable or disable audible alarm notification on models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102.

Setting Items	Explanations
OFF	No alarm notification sounds from the Logger during alarm output.
ON	During alarm output, alarm will be emitted from the built-in speakers of the Logger.
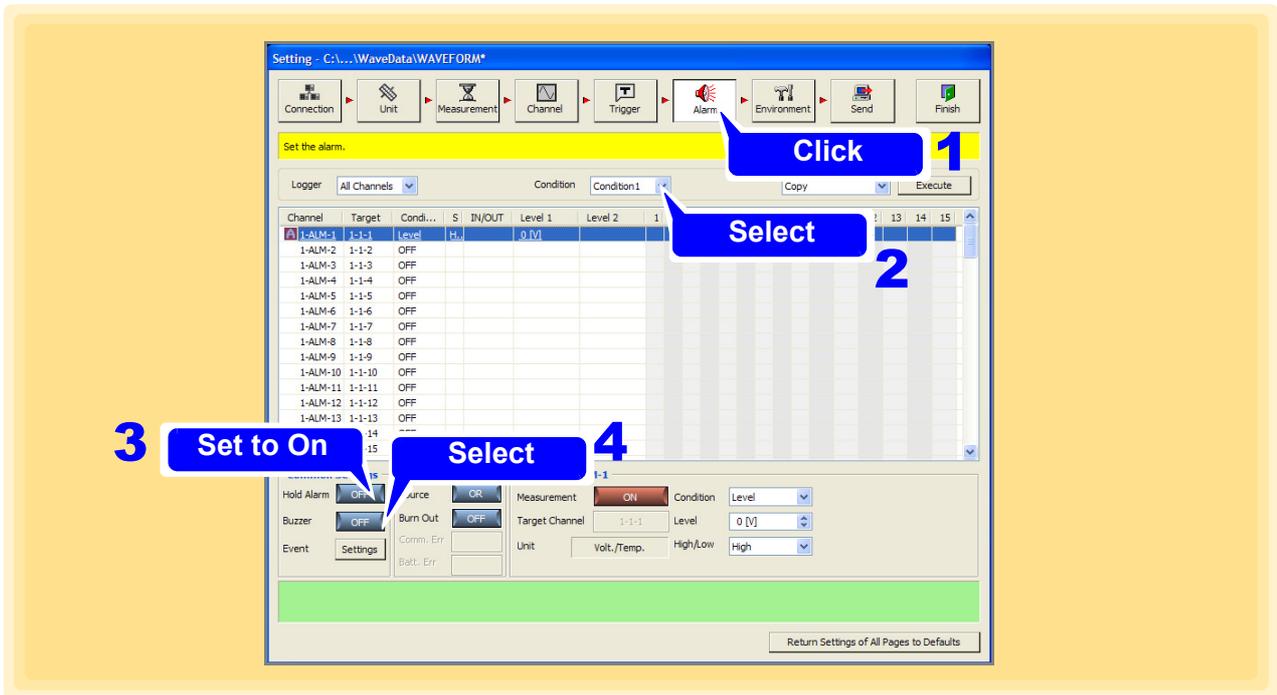
5. **Click the [Event Settings] button.**

The **[Alarm Event]** dialog appears. Set a specific action to execute when an alarm is output.

Setting Items	Explanations
Notify by Sound	Play any audio file (WAV format) when an alarm is output. Specify the location of the file.
External Program	Execute any external program when an alarm is output. Specify the location of the file.

6. **Use the narrow down feature (p. 166) to select the Loggers to set.**

7. **Click the [Source] button to select the alarm source.**

Each click of the button toggles the setting OR and AND.

Set the alarm output of the alarm criteria set for each of the output channel to either OR or AND. The alarm source can be selected on models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102 that support alarm functions.

Setting Items	Explanations
OR	Output alarm when even one of the alarm criteria is met.
AND	Output alarm when all the alarm criteria are met.

8. **Click the [Burn Out] button to enable/disable the function (Model LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102 only).**

Each click of the button toggles the setting On and Off.

Setting Items	Explanations
OFF	Thermocouple burn-out does not generate an alarm.
ON	Thermocouple burn-out generates an alarm.

9. **Click the [Comm. Err] button to select the communication error (Model LR8410-20, LR8450, LR8450-01 only).**
Each click of the button toggles the setting On and Off.

Setting Items	Explanations
OFF	Does not output a warning if an error occurs during communications with the unit.
ON	Outputs a warning if an error occurs during communications with the unit.
DELAY	Outputs a warning if 2000 samples of errors continuously occur during communications with the unit.

10. **Click the [Batt. Err] button to select the battery error (Model LR8410-20, LR8450 and LR8450-01 only).**
Each click of the button toggles the setting On and Off.

Setting Items	Explanations
OFF	Does not output a warning if the unit's remaining battery charge is low.
ON	Outputs a warning if the unit's remaining battery charge is low.

11. **Set the alarm setting for each channel.**
(This example sets the voltage level measured on CH1 as an alarm criteria.)

1. Set the input channel for setting the alarm criteria.
2. Set the criteria.
   (The setting values differ depending on setting of the trigger criteria. For details, see "Advanced Settings" (p. 137).)

Setting Items	Explanations
Level	Output an alarm when the input signal satisfies the set level.
Window	Output an alarm when the input signal enters or exits the set range.
Slope (only LR8450, LR8450-01, LR8101, LR8102)	Output an alarm when the input signal over or under the set rate of change
Slope 2p (only LR8450, LR8450-01, LR8101, LR8102)	Output an alarm when the amount of change for the set width is greater than or equal to (or less than) the set level value.

" " appears when the alarm setting is enabled.

 : Alarm ON (This is displayed when the alarm function is set correctly.)

1 Click 11

When not using the alarm function even after setting the criteria, click to **[OFF]**.

2 Set 11

Select 9,10

NOTE

- The alarm is output immediately if the criteria is met at the start of measurement.
- Logger Utility waveform calculation channels (Z1 to Z60) cannot be used as alarm inputs.
- The firmware version number 1.40 or later is required to be installed in model LR8410 to set the communication error setting to DELAY. For an earlier version firmware than the version number 1.40, the alarm function behaves as if the communication error setting is set to ON even if set to DELAY.
- An alarm cannot be set for the M7103 power measurement module.

4.7 Setting Environment Criteria

Make these settings to configure external control of the Logger, and file saving.

4.7.1 Setting External Control Input Terminals

For model 8423

This section describes setting the functions of the external control input terminals on the front of the 8423. Refer to 8423 Instruction Manual "3.8 Connection Method for External Control Input Terminals" and connect the cables to the terminals beforehand.

See: External Control Input Terminal Functions and Signal Input Criteria: 8423 Instruction Manual "5.7.1 Setting External Control Input Terminals"

External control terminals

SMPL / TRIG
START
STOP
GND
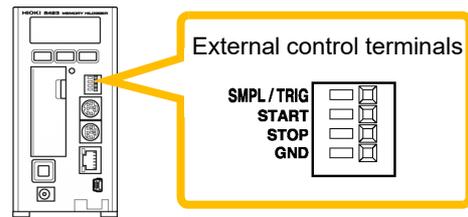
1. **Open the Environment settings page.**

2. **Click the icon of the 8423 you want to set**
The background of the icon turns red

3. **Set On or Off for the filter of the signal of each of the SMPL/TRIG inputs of the external control input terminals.**
By setting the filter to On, you can reduce erroneous operation of the Logger caused by chattering when performing control using, for example, a mechanical contact output.

4. **Set the detection edge.**
Set whether the sampling operation or trigger operation is performed with the rising or falling edge.

Setting Items	Explanations
Rise	Perform sampling or trigger with the rise of the pulse. HIGH: 2.5 to 5.0 V LOW: 0 to 1.0 V
Fall	Perform sampling or trigger with the fall of the pulse. HIGH: 2.5 to 5.0 V LOW: 0 to 1.0 V
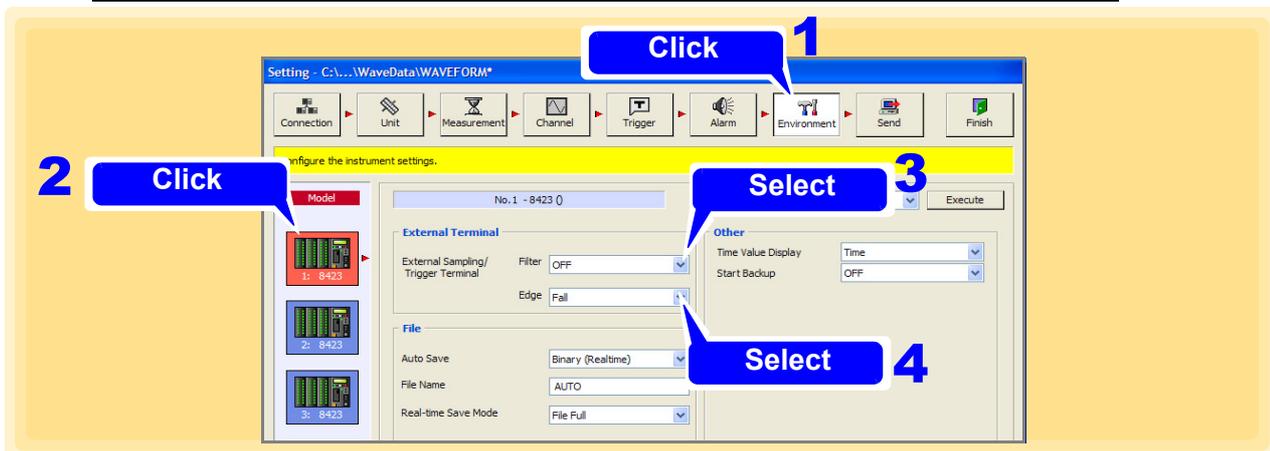
When using the 8430-20 , LR8431-20 or LR8432-20

This section describes setting the functions of the external control terminals on the top of the 8430-20, LR8431-20 or LR8432-20. Refer to 8430-20 , LR8431-20 or LR8432-20 Instruction Manual "9.1 Connecting to the External Control Terminals" and connect the cables to the terminals beforehand.

See: Functions of the external control terminal and signal input criteria: 8430-20 or LR8431-20, LR8431-20 or LR8432-20 Instruction Manual "Chapter 9 External Control"
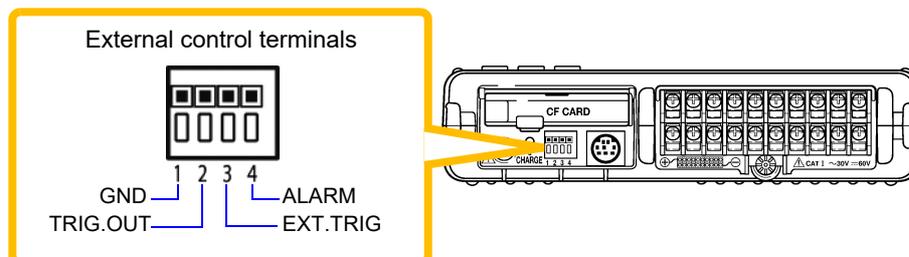
1. **Open the Environment settings page.**

2. **Click the icon of the 8430-20 , LR8431-20 or LR8432-20 you want to set**
the background of the icon turns red

3. **Select the function of the EXT.TRIG external control terminal.**

Setting Items	Explanations
Trigger	Trigger can be activated via a signal input to the EXT.TRIG terminal.
Event	Event mark can be added via a signal input to the EXT.TRIG terminal.

When using the LR8400-20, LR8401-20, or LR8402-20

Set the functions of the external control terminals at the left of the front side of models LR8400-20, LR8401-20, LR8402-20.Refer to LR8400-20, LR8401-20, LR8402-20 Instruction Manual "2.4 Making Connections" and connect the cables to the terminals beforehand.

See: External control input terminal and signal input criteria: LR8400-20, LR8401-20, LR8402-20 Instruction Manual "Chapter 9 External Control"

External control terminals
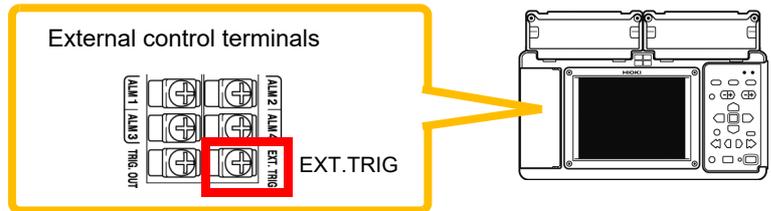
EXT.TRIG

1. **Open the Environment settings page.**

2. **Click the icon of the LR8400-20, LR8401-20, LR8402-20 you want to set.**
The background of the icon turns red.

3. **Set the EXT.TRIG terminal function of the external control terminal.**

Setting Items	Explanations
Trigger	Trigger can be activated via a signal input to the EXT.TRIG terminal.
Event	Event mark can be added via a signal input to the EXT.TRIG terminal.
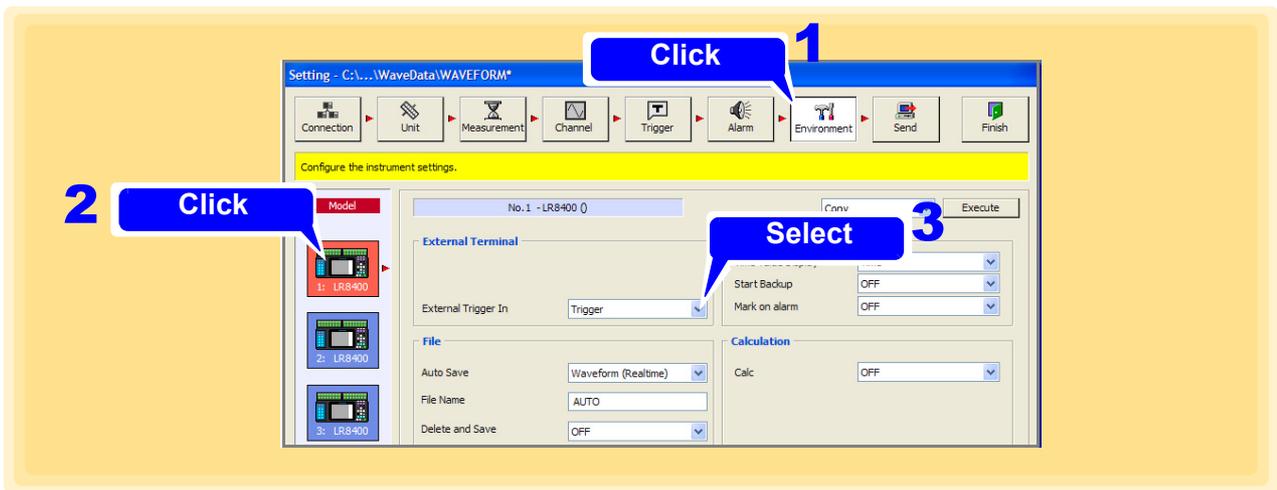
When using the LR8410-20

Set the functions of the external control terminals at the left of the front side of models LR8410-20. Refer to LR8410-20 Instruction Manual "2.4 Making Connections" and connect the cables to the terminals beforehand.

See: External control input terminal and signal input criteria: LR8410-20 Instruction Manual "Chapter 9 External Control"
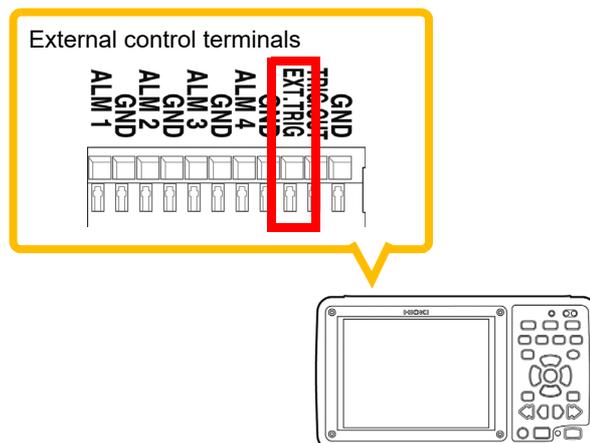
1. **Open the Environment settings page.**

2. **Click the icon of the LR8410-20 you want to set.**
The background of the icon turns red.

3. **Set the EXT.TRIG terminal function of the external control terminal.**

Setting Items	Explanations
Trigger	Trigger can be activated via a signal input to the EXT.TRIG terminal.
Event	Event mark can be added via a signal input to the EXT.TRIG terminal.

When using the LR8450, LR8450-01

Set the functions of the external control terminals at the left of the front side of models LR8450, LR8450-01. Refer to LR8450, LR8450-01 Quick Start Manual "Connecting external control signals" beforehand and connect the cables to the terminals.

1. **Open the Environment settings page.**

2. **Click the icon of the LR8450, LR8450-01 you want to set.**
The background color of the icon turns red.

3. **Select Set1, Set the InOut1 or InOut2 terminal function of the external control terminal.**

Setting Items	Explanations
OFF	Disable Input.
START	Measurement start.
STOP	Measurement stop.
START/STOP	Measurement start or stop.
Event In	Event mark can be added via a signal input.

4. **Set the InOut1 or InOut2 terminal slope.**

Setting Items	Explanations
↑	Operates on the rising edge of the external signal.
↓	Operates on the falling edge of the external signal.

5. **Select Set2, Set the InOut3 terminal function of the external control terminal.**

Setting Items	Explanations
OFF	Disable Input.
Trigger In	Set to trigger input.
Event In	Set to event input.

6. **Set the InOut4 terminal function of the external control terminal.**

Setting Items	Explanations
OFF	Disable output.
Trigger Out	Set to trigger output.
Event Out	Set to event output.

7. **Set the InOut3 or InOut4 terminal slope.**

Setting Items	Explanations
↑	Operates on the rising edge of the external signal.
↓	Operates on the falling edge of the external signal.
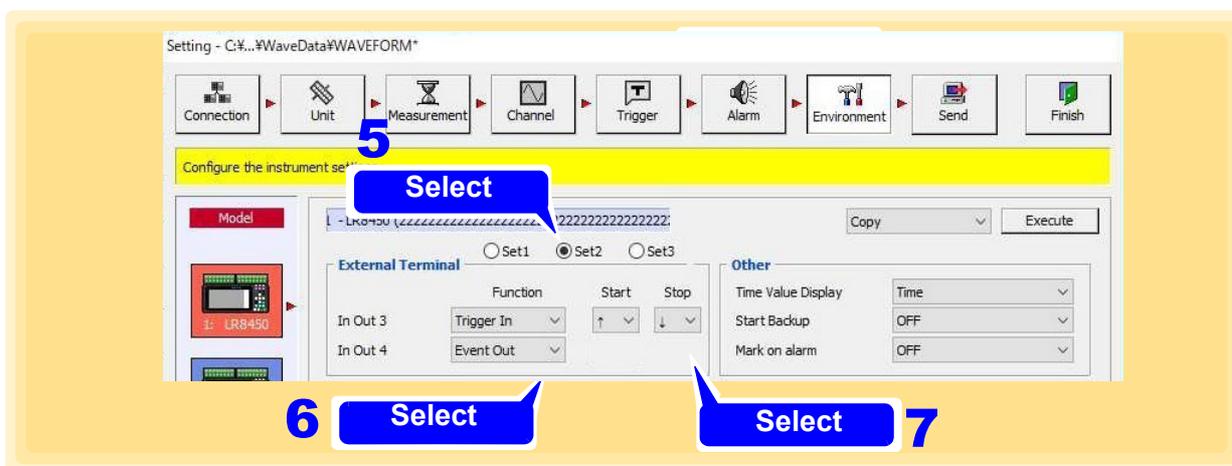
8. **Select Set3, Set the Voltage Out 1-2 level.**

Setting Items	Explanations
OFF	Do not output voltage.
5 V	Output 5 V DC.
12 V	Output 12 V DC.
24 V	Output 24 V DC.

9. **Set the Alarm Out 1-8 level.**

Setting Items	Explanations
L (Low)	Output alarm at low level. (0 V to 0.5 V)
H (High)	Output alarm at high level. (4.0 V to 5.0 V)
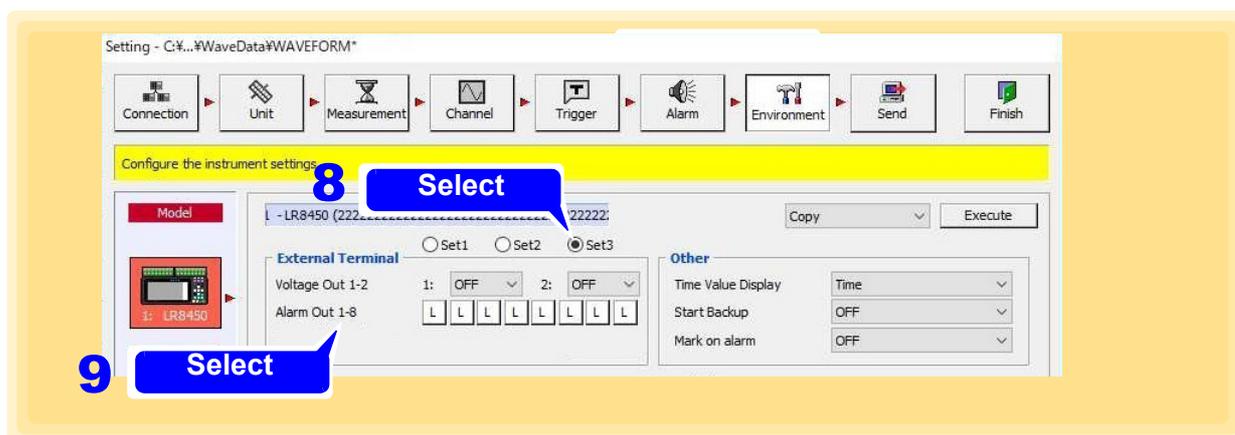
When using the LR8101, LR8102

Set the functions of the external control terminals at the left of the front side of models LR8101, LR8102. Refer to LR8101, LR8102 Instruction Manual "Wiring for external control" beforehand and connect the cables to the terminals.

1. **Open the Environment settings page.**

2. **Click the icon of the LR8101, LR8102 you want to set.**
The background color of the icon turns red.

3. **Select Set1, Set the InOut1 or InOut2 terminal function of the external control terminal.**

Setting Items	Explanations
OFF	Disable Input.
START	Measurement start.
STOP	Measurement stop.
START/STOP	Measurement start or stop.
Event In	Event mark can be added via a signal input.

4. **Set the InOut1 or InOut2 terminal slope.**

Setting Items	Explanations
↑	Operates on the rising edge of the external signal.
↓	Operates on the falling edge of the external signal.

5. **Select Set2, Set the External Input 3 terminal function of the external control terminal.**

Setting Items	Explanations
OFF	Disable Input.
Trigger In	Set to trigger input.
Event In	Set to event input.
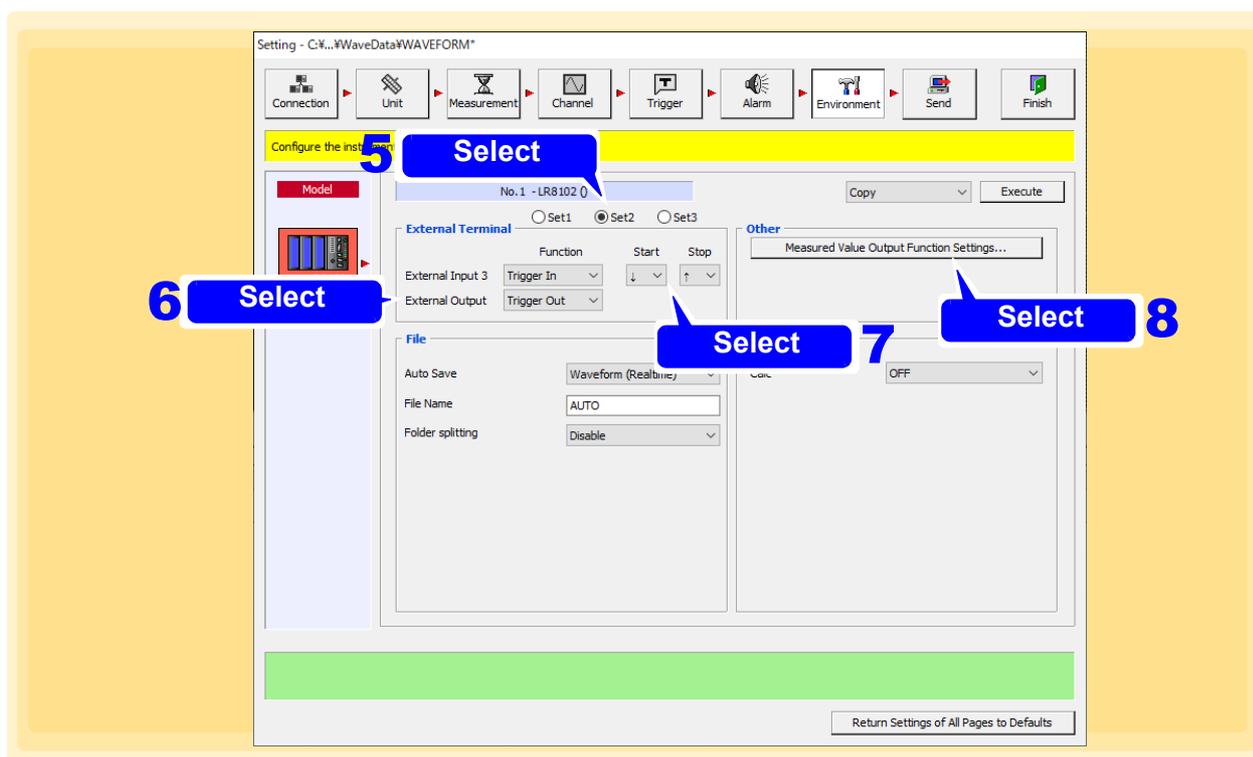
6. **Set the External Output terminal function of the external control terminal.**

Setting Items	Explanations
OFF	Disable output.
Trigger Out	Set to trigger output.
Event Out	Set to event output.

7. **Set the External Input 3 or External Output terminal slope.**

Setting Items	Explanations
↑	Operates on the rising edge of the external signal.
↓	Operates on the falling edge of the external signal.

8. **Select [Measured Value Output Function Settings].**
The **[Measured Value Output Function Settings]** dialog box appears. (Can be set for the LR8102 only.)

Measured Value Output Function Settings

The measured value can be output from the CAN terminal or LAN2.
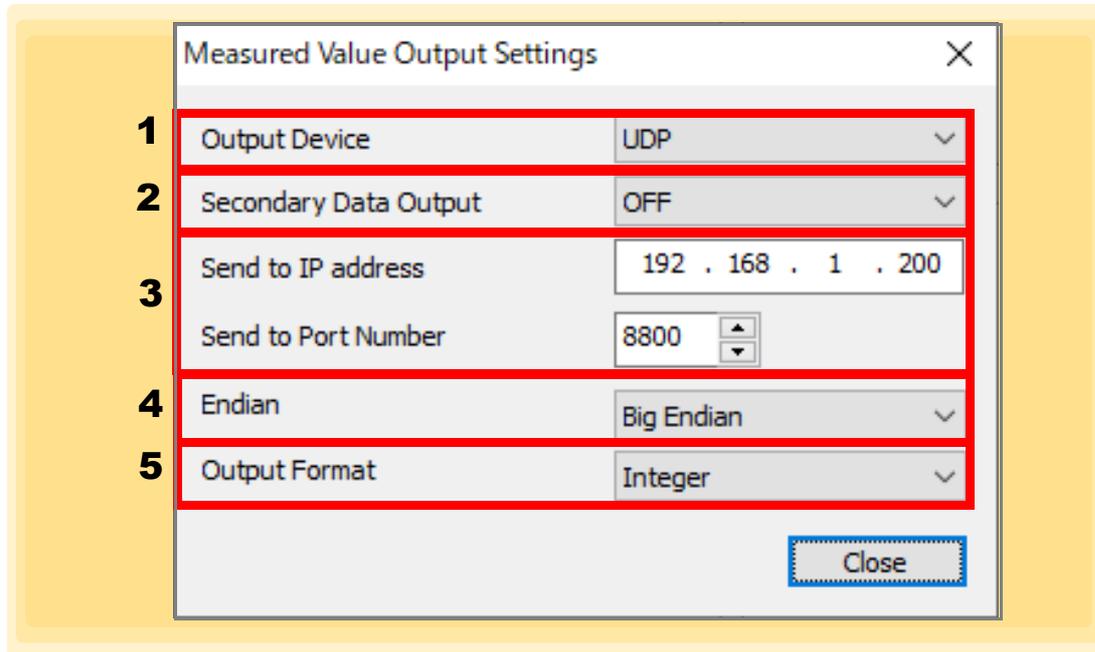
1. **Output Device**
   Set the measured value output function.

Setting Items	Explanations
OFF	Data is not output from CAN or LAN2.
UDP	Data is output from LAN2.
CAN	Data is output from the CAN terminal.

2. **Secondary Data Output**
   Set whether to output data from all secondary devices.

Setting Items	Explanations
OFF	When this instrument is the primary device, the data from all secondary devices is not output from LAN2 on this instrument.
ON	When this instrument is the primary device, the data from all secondary devices is output from LAN2 on this instrument.

3. **Send to IP address, Send to Port Number**
   Set the IP address and port number of the destination.
   (Can be set only when the output destination setting is UDP.)

4. **Endian**
   Set the order of bytes in transmission data.
   (Can be set only when the output destination setting is UDP.)

Setting Items	Explanations
Little Endian	Format in which the low-order byte is transmitted first.
Big Endian	Format in which the high-order byte is transmitted first.

5. **Output Format**

Set the output type of the transmission data.
(Can be set only when the output destination setting is UDP.)

Setting Items	Explanations
Integer	Signed 32-bit integer format
Floating-point	Single-precision floating-point number format
Text	Exponent format (ASCII code)

See the LR8101/LR8102 Instruction Manual for details.

9. **Select Set3 and set the Alarm Out 1-4 level.**

Setting Items	Explanations
L (Low)	Output alarm at low level. (0 V to 0.5 V)
H (High)	Output alarm at high level. (4.0 V to 5.0 V)
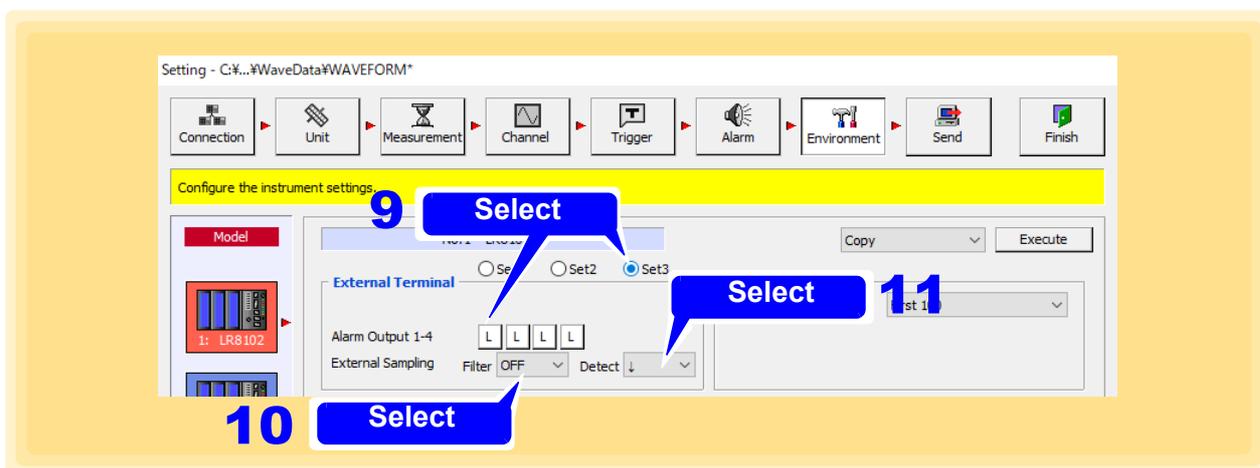
10. **Select the external sampling filter.**

Setting Items	Explanations
OFF	Disable the filter.
ON	Enable the filter.

11. **Select external sampling detection.**

Setting Items	Explanations
↑	Operates on the rising edge of the external signal.
↓	Operates on the falling edge of the external signal.

4.7.2 Save Settings

Select the method for saving measurement data to a Compact Flash (CF) card, SD card or USB flash drive inserted in the Logger.
- Saving to Compact Flash (CF) card is available only with models 8423, 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20 and LR8432-20.
- Saving to SD card is available only with model LR8410-20, LR8450, LR8450-01, LR8101, and LR8102.
- Saving to USB flash drive is available only with models LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102.

When using the 8423

1. **Open the Environment settings page.**

2. **Click the icon of the 8423 you want to change the settings.**
The background color of the selected icon turns red.

3. **Select the auto save method.**

Setting Items	Explanations
OFF	Do not save measurement data to the CF card inserted in the 8423.
Binary (Real time)	Save measurement data in binary format to the CF card inserted in the 8423, while measuring.

4. **Enter the file name.**
Use the keyboard to enter the file name to use for saving to the CF card. Enter up to 8 single-byte characters. If a file of the same name exists, a sequence number is added to the file name.

5. **Select the real-time save mode.**

Setting Items	Explanations
File Full	Ends saving when there is no longer much available space on the CF card. However, measurement continues.
Delete and Save	When the amount of available space of the CF card reaches a certain level during measurement, the oldest file in the directory currently being recorded to is deleted and the new data is saved. If a file was unable to be deleted, the same operation as for **[File Full]** is performed.
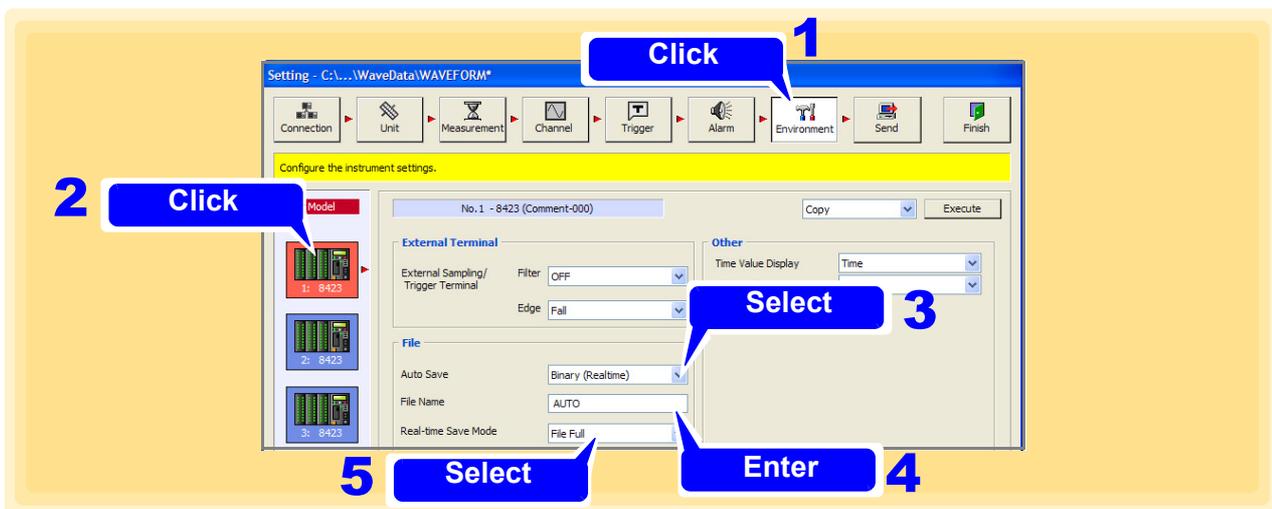
NOTE   Use the **[Auto Save Mode]** (p. 65) in the measurement setting page to perform split saving.

When using the 8430-20, LR8400-21, LR8401-21, LR8402-21, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102

1. **Open the Environment settings page.**

2. **Click the icon of the 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8450, LR8420-50, LR8450-01, LR8101, or LR8102 to be set.**
The background color of the selected icon turns red.

3. **Select the priority save destination (LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102 only).**

Setting Items	Explanations
CF	Save to the CF card (LR8400-20, LR8401-20, LR8402-20 only).
SD card	Save to the SD card (LR8410-20, LR8450, LR8450-01, LR8101, LR8102 only).
USB Memory	Save to the USB flash drive.

4. **Select the auto save method.**

Setting Items	Explanations
OFF	Do not save measurement data to the removable storage inserted in the Logger.
Waveform (Real time)	Save measurement data in binary format to the removable storage inserted in the Logger, while measuring.
CSV (Real time)	While measuring, the measured data can be saved in CSV format into the removable storage inserted in Logger. (Available from 8430-20 V1.10)
Calc (After Measurement)*	Save the calculation results after measuring to the removable storage inserted in the Logger.
Waveform And Calc*	Save measurement data in binary format while measuring and save the calculation results after measuring to the removable storage inserted in the Logger.
CSV And Calc*	While measuring, the measured data can be saved in CSV format into the removable storage inserted in Logger. The calculation results can be saved after the measurement ends. (Available from 8430-20 V1.10)
MDF	Save measurement data when measurement is performed to the removable storage inserted into the Logger using the MDF format. (LR8450, LR8450-01, LR8101, LR8102 only)
MDF and Calc*	Save measurement data when measurement is performed to the removable storage inserted into the Logger using the MDF format and save calculation results after measurement ends. (LR8450, LR8450-01, LR8101, LR8102 only)

* Split calculation results are stored each time they become available.
(Model LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102 only)

5. **Enter the file name.**
Use the keyboard to enter the file name to use for saving to the removable storage. Enter up to 8 single-byte characters. If a file of the same name exists, a sequence number is added to the file name.
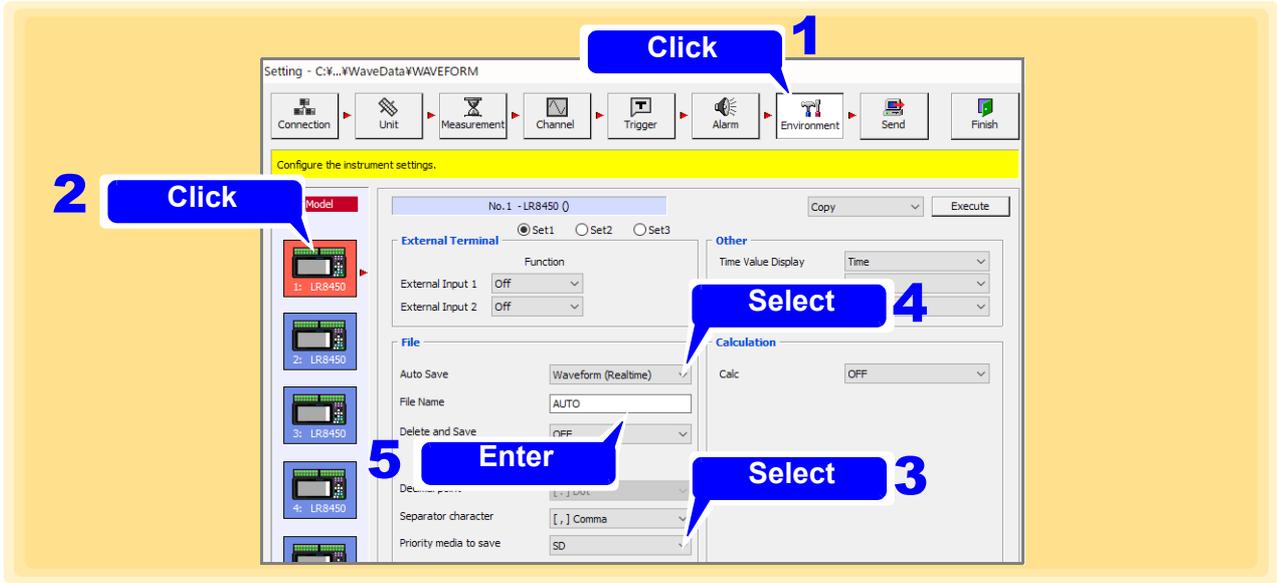
6. **Enable/disable Delete and Save.**
[Delete and Save] cannot be selected if **[Calc (After measurement)]** is set as **[Auto Save]**.

Setting Items	Explanations
OFF	Ends saving when there is no longer much available space on the removable storage. However, measurement continues.
ON	When the amount of available space of the removable storage reaches a certain level during measurement, the oldest file in the directory currently being recorded to is deleted and the new data is saved. If a file was unable to be deleted, the same operation as for **[OFF]** is performed.

7. **Select the decimal point character. (LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102 only)**
Select the decimal point character for measurement data saved in text format on the Logger.

Setting Items	Explanations	
[.] period	Use a period as the decimal point.	E.g., 123.45
[,] comma	Use a comma as the decimal point.	E.g., 123,45

The comma cannot be selected as both the decimal point character and the data separator character at the same time.
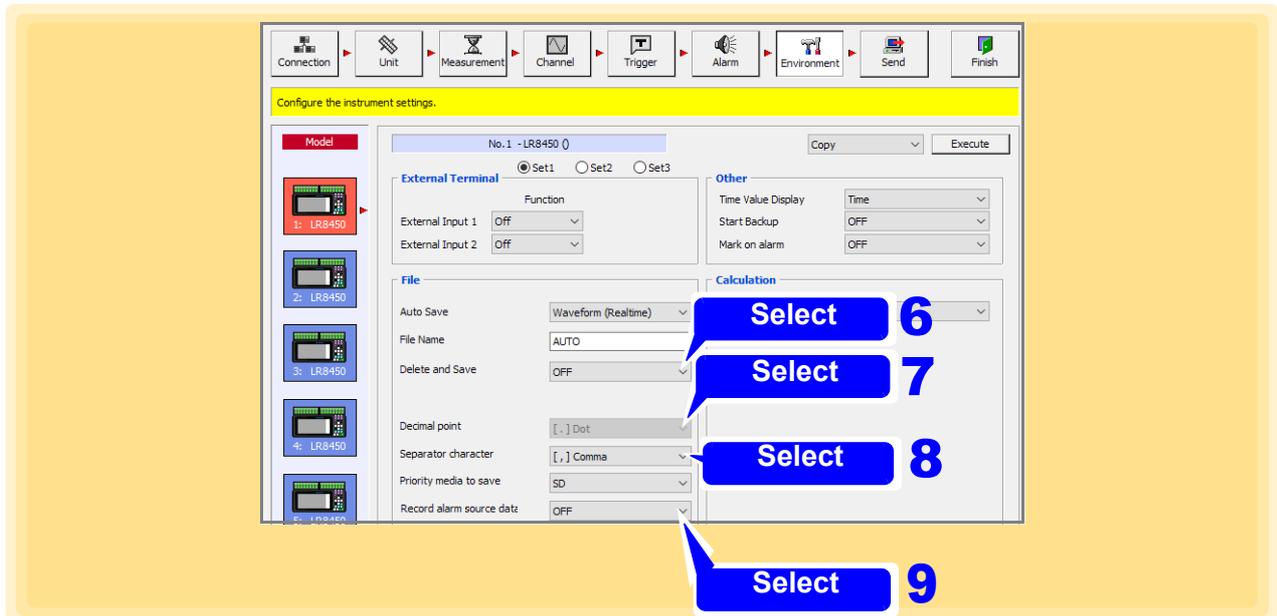
8. **Select the data separator character. (LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20 LR8410-20, LR8450, LR8450-01, LR8101, LR8102 only)**
Select the separator character for measurement data saved in text format on the Logger.

Setting Items	Explanations	
[,] comma	Use a comma as the separator character.	E.g., 123.45,-123.45
[ ] space	Use a space as the separator character.	E.g., 123.45 -123.45
[ ] tab	Use a tab as the separator character.	E.g., 123.45 -123.45
[;] semicolon	Use a semicolon as the separator character.	E.g., 123.45;-123.45

The comma cannot be selected as both the decimal point character and the data separator character at the same time.

9. **Select whether to record the alarm source data that triggered the alarm. (LR8450, LR8450-01 only)**

Setting Items	Explanations
OFF	Do not save the alarm source channel that triggered the alarm
ON	Save the alarm source channel that triggered the alarm. Use this setting only when necessary as it will increase the size of the data saved.

10. **Choose setting (2) and select the type of folder split setting to use. (LR8450, LR8450-01, LR8101, LR8102 only)**

Setting Items	Explanations
Disable	Save data corresponding to the recording time in the same folder.
1 d	Split data into different folders by day.
1 week	Split data into different folders by week. Each week will last from Monday through Sunday.
1 month	Split data into different folders by month.
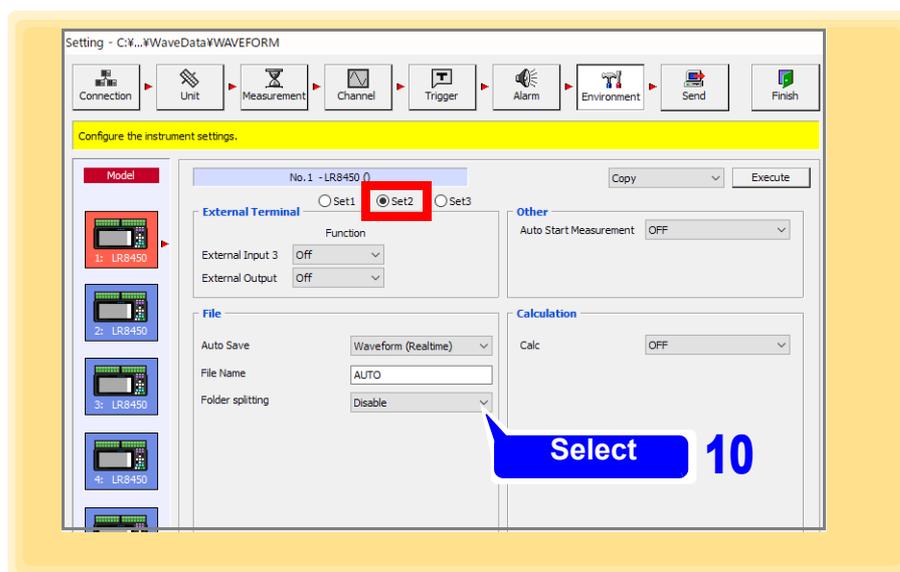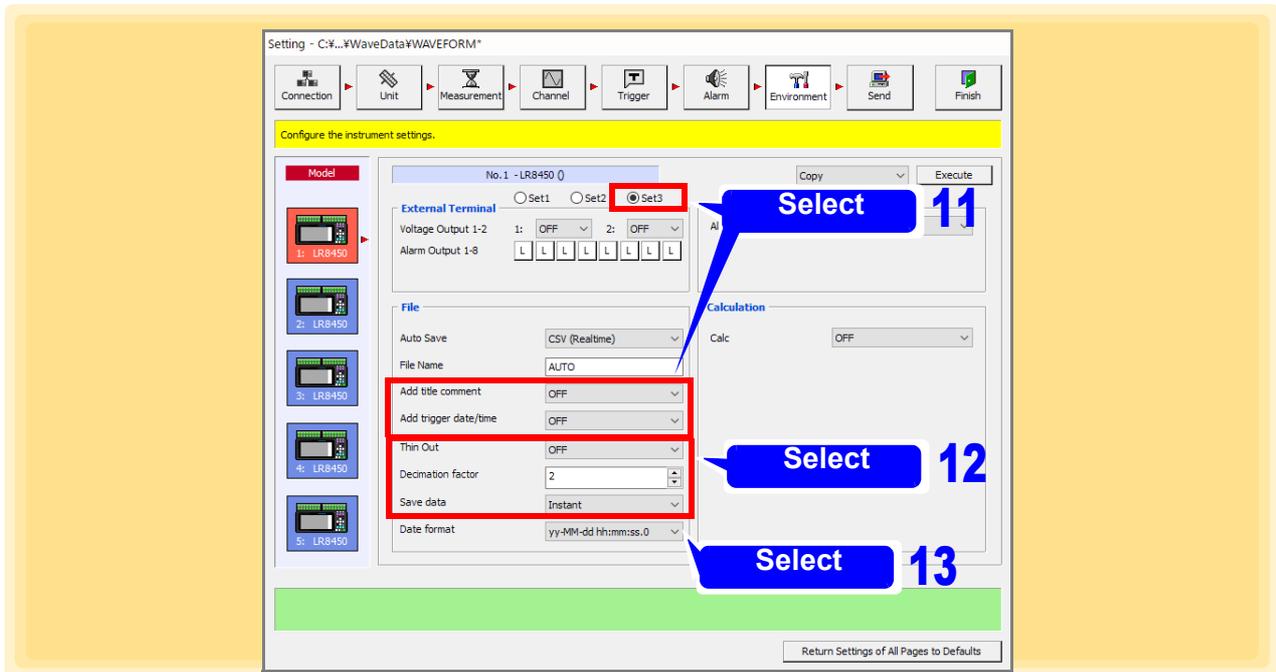
11. **Select setting 3 and select whether to add title comments and trigger dates/times. (LR8450, LR8450-01, LR8101, LR8102 only)**

Setting Items	Explanations
OFF	Do not add title comments or trigger dates/times to measurement data file-names.
ON	Add title comments or trigger dates/times to filenames.

12. **Select whether to save thinned data and specify the thinning interval (decimation factor) and the data to be saved. (LR8450, LR8450-01, LR8101, LR8102 only)**

Setting Items	Explanations
OFF	Do not save thinned data.
ON	Save the instantaneous value or statistical value for each thinning interval.

13. **Select the date and time format. (LR8450, LR8450-01, LR8101, LR8102 only)**

Setting Items	Explanations
yy-MM-dd hh:mm:ss.0	Output dates and times using the format ['(apostrophe) year-month-day hours:minutes:seconds.milliseconds]. Example: '20-12-01 23:59:59.999
yyyy-MM-dd hh:mm:ss + ms	Output dates and times using the format [year-month-day hours:minutes:seconds], and output time data of less than 1 s (unit: ms) as a separate file. Example: 2020-12-01 23:59:59,999

NOTE
- To save the calculation results automatically on the removable storage, always set the numerical calculation items. Refer to "4.7.5 Numerical Calculation" (p.160) on how to set the numerical calculation items.
- Use the **[Auto Save Mode]** (p. 65) in the measurement setting page to perform split saving.

Delete and Save Criteria

• The files in the directory in which measurement files are created are subject to deletion.

• Files with the .MEM, .MDF, .CSV, .TXT (.TXT is for model LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, LR8102 only) extension are recognized as waveform files. Therefore, even a file of a completely different type is likely to be deleted, because it is recognized as waveform file.

• Files are determined to be new or old by their time stamp (date and time of creation).

• A file is not deleted if there is no more than one waveform file for which recording has finished in the directory. If an attempt is made to delete a waveform file that is too large for the capacity of the media, the file may not be able to be deleted. As a guideline, ensure the size of one file becomes less than a 1/4 that of the available space.

• If you are using split save, the operation is the same as when auto save is performed multiple times without splitting files. Therefore, even a file that was created by splitting after measuring once is deleted when regarded as old in terms of time.

4.7.3 Time Value Display

This section describes setting the display method for the time values of measurement data handled by the Logger. For the 8423, set the display method for the time values shown when using the HTTP function to obtain internal memory data in text format.

For model 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450 or LR8450-01 set the display format for the time value horizontal axis label at the bottom of the Logger screen.

For model LR8101 or LR8102, set the time value display format for saving text.

See: About the HTTP function: 8423 Instruction Manual "Chapter 11 Communications (HTTP/FTP)"
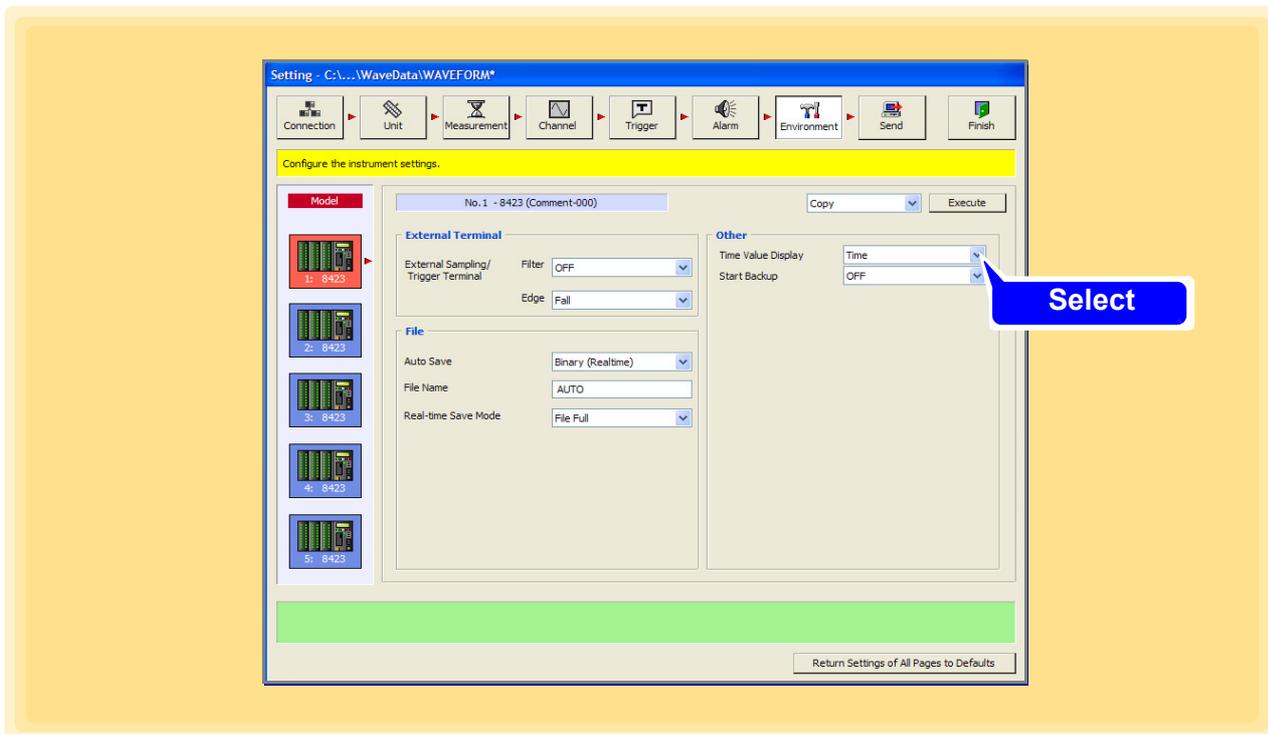
Time Value Display

Setting Items	Explanations
Time	Display the time since the start of measurement in hours, minutes, and seconds. If a trigger is set, the time since the trigger.
Date	Display the date and time the data was obtained.
Point	Display the number of data items since the start of measurement. If a trigger is set, the number of data items since the last trigger point.
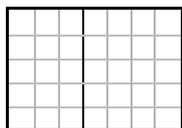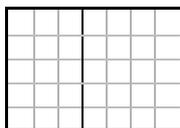
1d2h3m4s   08-07-10 12:10:30   10
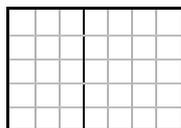
4.7.4   Auto Resume

Set the behavior of the Logger upon recovery from a power outage during recording. This setting is only enabled during standalone measurement.
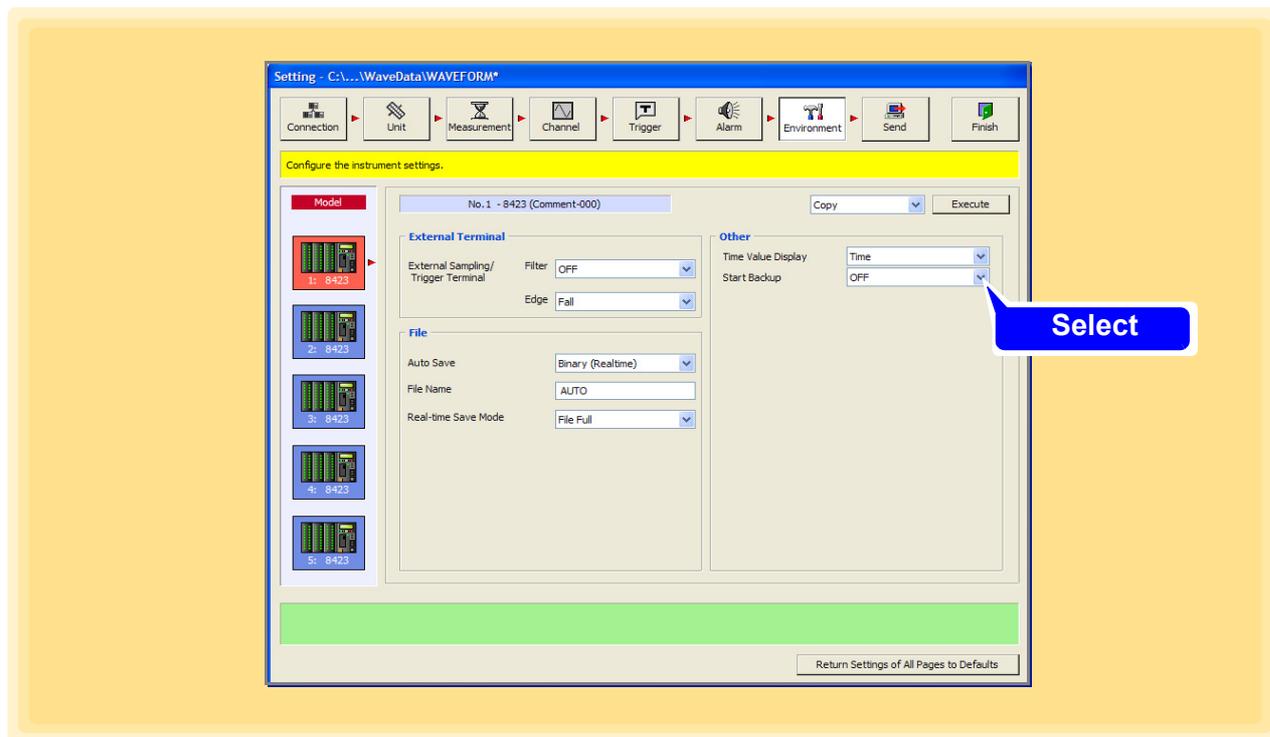
Start Backup (Auto Resume)

Setting Items	Explanations
OFF	Stop measurement when there is a power cut.
ON	When the power supply is restored, the Logger enters the restart state and starts the recording operation. (Previous measurement data is discarded from the memory of the Logger.) If a trigger is being used, the Logger enters the trigger wait state.

NOTE   Even when the auto resume function is On, if the Logger was being controlled by Logger Utility when the power outage occurred, the Logger will resume measurement but Logger Utility will not be able to resume measurement.

4.7.5 Numerical Calculation

Select numerical calculations for models 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102. Model 8430-20, LR8431-20, LR8432-20, LR8400-20, LR8401-20, LR8431-20, LR8432-20 up to six, and model LR8450, LR8450-01, LR8101, LR8102 supports up to thirteen types of numerical calculations can be applied to measurement data. Model 8430-20, LR8431-20, LR8432-20 supports up to four simultaneous calculations, and models LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8432-20 support up to six, and models LR8450, LR8450-01, LR8101, LR8102 support up to ten.

See: About numerical calculation: 8430-20, LR8431-20 Instruction Manual "7.2 Numerical Value Calculation Expressions", LR8400-20, LR8401-20, LR8402-20 Instruction Manual "7.1 Performing Calculations (Average, Maximum, and Minimum Measurement, and Others)", LR8410-20 Instruction Manual "7.1 Performing Calculations (Average, Maximum, and Minimum Measurement, and Others)", LR8450, LR8450-01 Instruction Manual "6.1 Performing Numerical Calculations ", LR8101, LR8102 Instruction Manual "9.1 Performing Numerical Calculation".

1. **Open the Environment settings page.**

2. **Click the icon of the 8430-20, LR8400-20, LR8401-20, LR8402-20, LR8431-20, LR8432-20, LR8410-20, LR8450, LR8450-01, LR8101, or LR8102 to be set.**
The background color of the selected icon turns red.

3. **Enable numerical calculations (On).**

Setting Items	Explanations
OFF	Do not perform numerical calculation.
ON	Perform numerical calculation.

4. **Select the calculations (1 to 4) to execute (1 to 6 on the LR8400-20, LR8401-20, LR8402-20, LR8410-20) (1 to 10 on the LR8450, LR8450-01, LR8101, LR8102).**

Setting Items
Average, P-P, Maximum, Minimum, Time To Maximum, Time To Minimum, Sum (Note) Integral, Operating Ratio, OnTime, OffTime, OnCount, OffCount

Note)
- Sum is only on model LR8432-20.
- Integral, Operating Ratio, OnTime, OffTime, OnCount, OffCount is only on models LR8450, LR8450-01, LR8101, LR8102.

5. **Select setting 2 and select whether to split files. (LR8450, LR8450-01, LR8101, LR8102 only)**

Setting Items	Explanations
Single file	Save all numerical calculation results in a single file.
Individual calc	In addition to a file containing all calculations, create a file for each calculation type.

6. **Select whether to split calculations by time. (LR8450, LR8450-01, LR8101, LR8102 only)**

Setting Items	Explanations
Disable	Perform numerical calculations for all data from the start of measurement until the end of measurement and then save the calculation results.
Enable	Perform numerical calculations at the specified interval from the start of measurement*1 and save calculation results for each interval.
Timed	Automatically adjust the length of the first interval based on the **[Reference time]** so that calculation values are saved at the set interval (**[Split time]**). (The first interval will be shorter than the **[Split time]**.)

*1. If using triggers, from the start trigger.
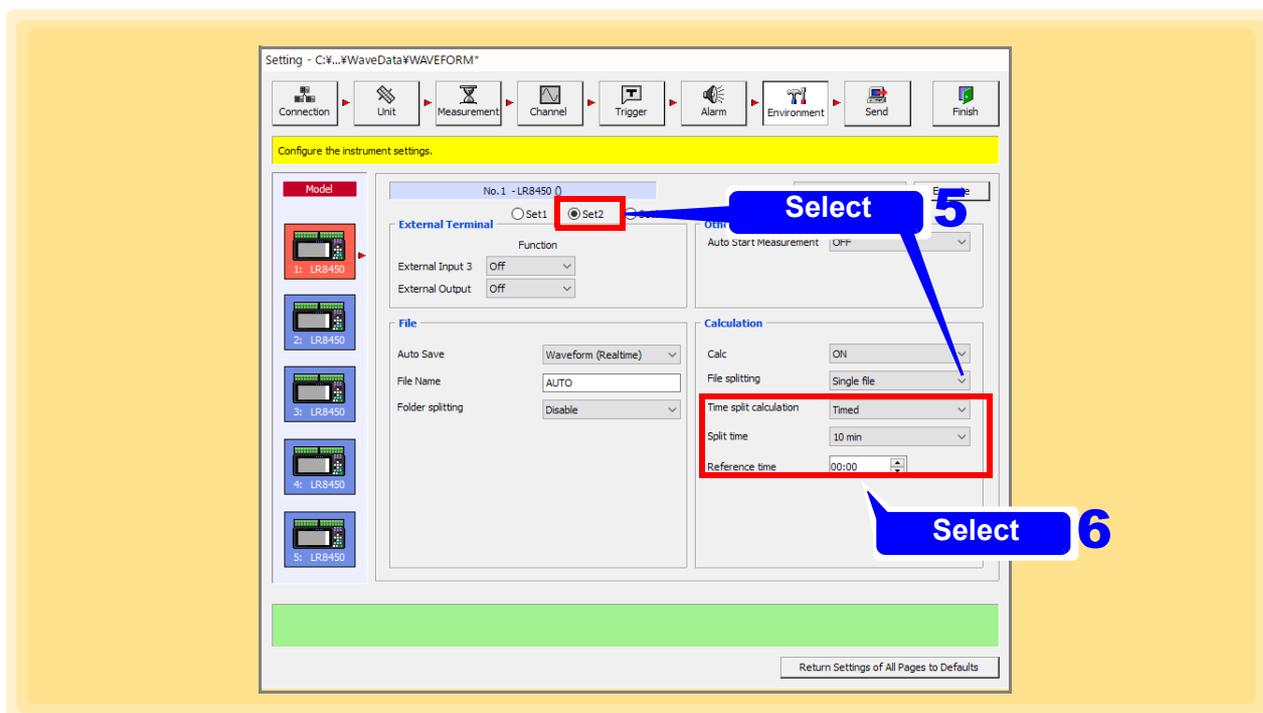
4.8 Send Settings

When you want to use just the Logger for measurement without using a PC (standalone), send the settings to the Logger beforehand.

1. **Configure the settings in "4.1 Registering Loggers in Logger Utility" to "4.7 Setting Environment Criteria".**

2. **Click the [Send] button.**
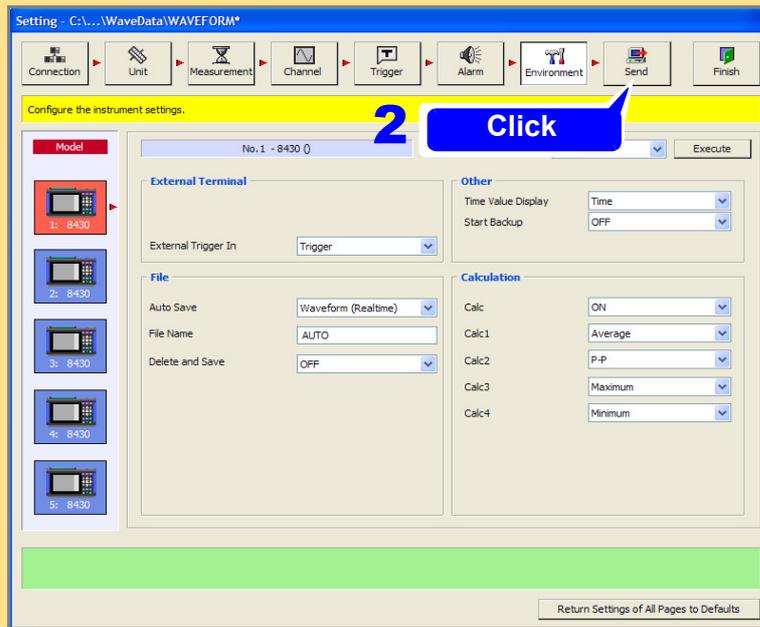
> **NOTE** • It is not possible to send the settings for a Logger that is already measuring.
> • There is no need to send the settings if you are using Logger Utility for control, because the settings are sent automatically at the start of measurement.

4.9 Receiving the settings

You can reflect the logger settings in Logger Utility.

1. **Display the Settings screen.**
The Connection settings page appears.

2. **From the list of loggers, select the logger you wish to use to perform measurement, and then click the [Details] button.**
Configure the network settings in the **[Advanced Information]** dialog box that appears

3. **Click the [Receive] button.**
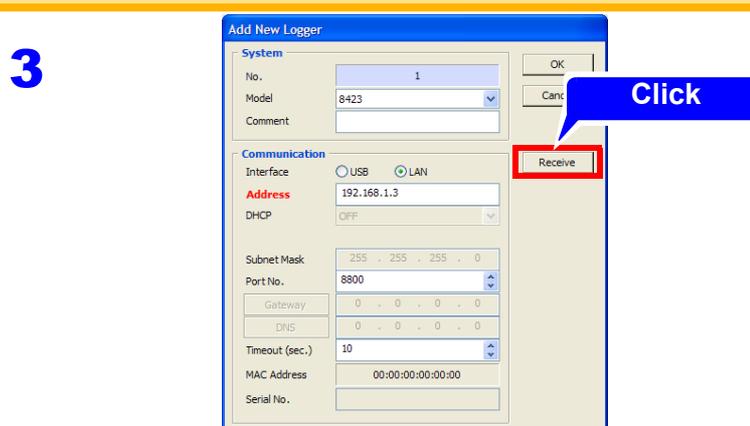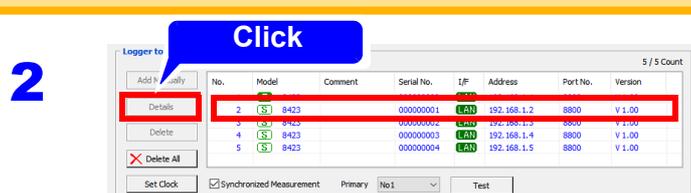
NOTE Settings cannot be received from the logger under measurement.

4.10 Process All

You can copy the setting information for any channel and paste it to other channels. This function is available on the following pages.

Setting Pages	Copy	Unit Copy	Copy to Other Sheets	Reset Waveform Position
Measurement settings page of the channel settings	Yes	Yes	No	No
Waveform calculation settings page of the channel settings	Yes	No	No	No
Display settings page of the channel settings	Yes	No	No	No
Sheet settings page of the channel settings	Yes	No	Yes	Yes
Trigger settings page	Yes	No	No	No
Alarm settings page	Yes	No	No	No
Environment settings page	Yes	No	No	No

1. **Show the Display settings page of the channel settings.**

2. **Select [Copy].**

3. **Select the copy source channel.**

4. **Click the [Execute] button.**
The **[Copy]** dialog appears.

NOTE	• Copying settings between channels of different measurement types may not be possible. • Batch copying settings on the Alarm Settings screen may cause alarms to be disabled. In that case enable measurement for the particular channels on the Measurement Settings page of the Channel Settings screen.

5. **Select the parameters to copy and copy destinations, and then click [Copy].**

Setting Items	Explanations
Select All	Select all the parameters to copy or copy destinations.
Unselect	Clear the selection for all the parameters to copy or copy destinations.
Reverse	Reverse the selection for the parameters to copy or copy destinations.
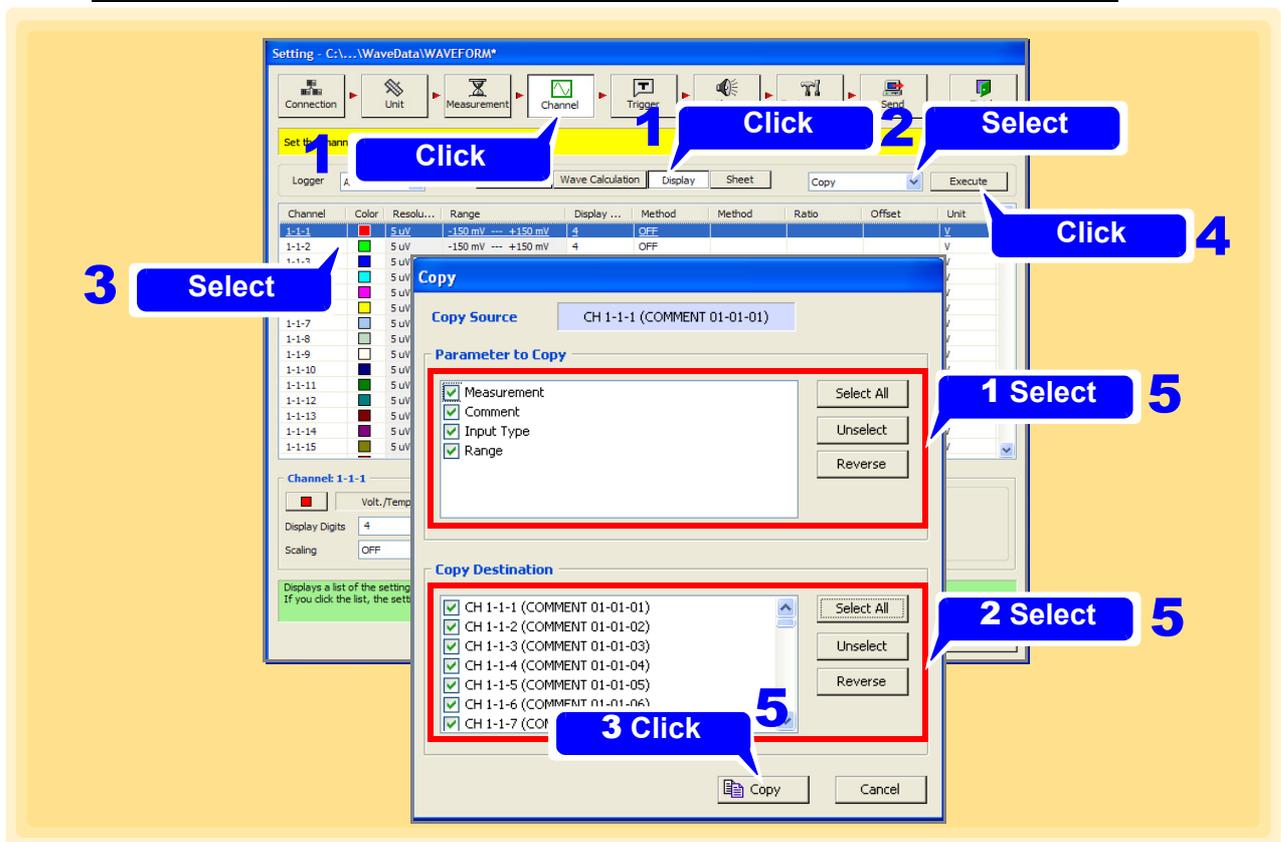
4.11 Narrowing Down of Display Channels

Normally, all channels are displayed on the pages for channel settings (measurement settings, display settings, and sheets), trigger settings, and alarm settings, but you can also use **[Logger]** to display channels by Logger.

4.12 Return Settings of All Pages to Defaults

Click the **[Return Settings of All Pages to Defaults]** button to change the settings of all pages back to the same as they were before the dialogs are displayed.
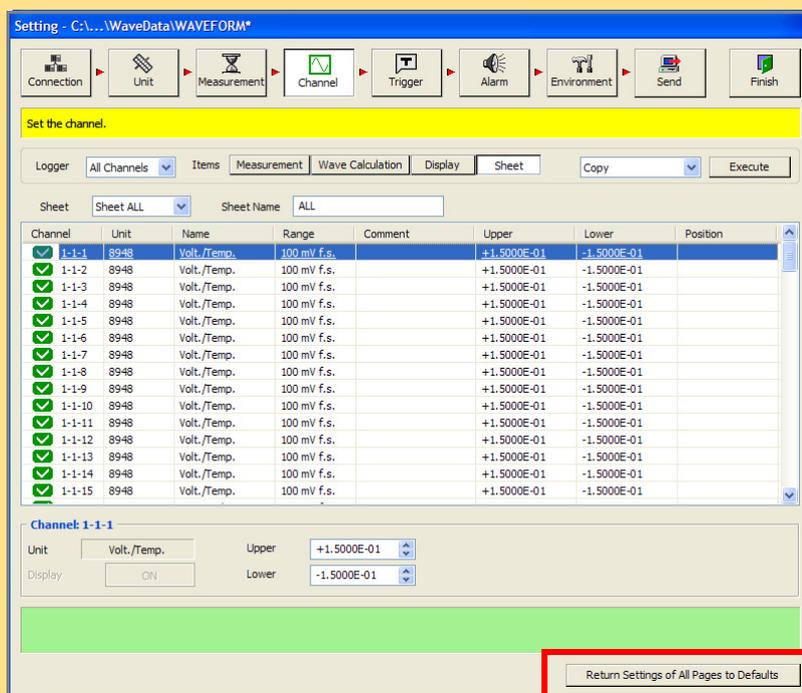
NOTE When clicking the **[Send]** button to send the settings to the Logger, the **[Return Settings of All Pages to Defaults]** button will be disabled and no settings can be restored.

4.13 Perform Zero Adjustment and Auto Balance

Perform zero adjustment (Model LR8450, LR8450-01, LR8101, LR8102 only)

Correct the deviation of the input section and set the reference potential to 0V. Perform zero adjustment when you are concerned about zero deviation when the input is short-circuited.

Perform zero adjustment (CT) (Model LR8450, LR8450-01 only)

For the current module, the current sensor's input value under no load can be adjusted to zero. Be sure to perform zero adjustment with the current sensor connected while under no load, or after removing the current sensor from the circuit under measurement.

Perform auto balance (Model LR8450, LR8450-01 only)

In the strain unit, the reference output level of the converter can be adjusted to the specified zero position.

> **NOTE**　Auto balance is executed within the range set on the main unit. Execute auto balance after sending the settings to the main unit by sending settings.
> Zero adjustment (CT) will be performed for the current sensor connected to the logger, the range, and the input mode. Perform zero adjustment (CT) after sending settings to the logger.

Starting and Stopping Measurement
Chapter 5

Two measurement methods are available.

Computer based measurement	Using PC communications, data is acquired to the PC's hard disk and observed in real time.
Standalone measurement	Without communicating with the PC, data is saved to the Logger's internal memory, CF card, SD card, or USB flash drive.

Standalone Measurement
• With model 8423, make measurement settings using the Logger Utility program, send the settings to the Logger, and start measuring.
• With models 8430-20, LR8400-21, LR8401-21,LR8402-21, LR8431-20, LR8432-20, LR8410-20, LR8450 and LR8450-01 make measurement settings on the Logger, or use the Logger Utility and send the settings to the Logger, and start measuring.
The following examples show the procedure after settings have been sent from the Logger Utility.

Start/End Measurement

Computer Based Measurement (p. 170)

Acquire and save data in real time.

Connect the Logger directly to a PC (one-to-one).

Example: 8423
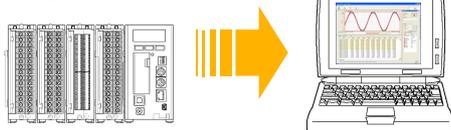
1. Start measurement with the [Start] button of Logger Utility
2. Stop measurement with the [Stop] button

Standalone Measurement (p. 173)

Save data to a CF card (8423, 8430-20, LR8431-20 and LR8432-20)

Save data to CF card or USB flash drive (LR8400-21, LR8401-21, LR8410-20, LR8450 and LR8450-01)

Save data to SD card or USB memory (LR8410-20)

Example: LR8400-21

1. Disconnect the communication cable from the Logger
2. Press the Logger START key* to start measuring.
3. Press the Logger STOP key* to stop measuring.

* On the 8430-20, LR8431-20, LR8432-20 the same key starts and stops measuring.

Analyzing Recorded Data

Loading and Displaying Measured Data (p. 220)

NOTE
In case of model 8423, the measurement conditions are also set and sent from a PC when you perform standalone measurement. When you have finished setting all of the measurement conditions, click the **[Send]** button in the settings screen.

5.1 Starting and Ending Measurement

5.1.1 Computer-Based Measurements

1. Click the ▶ Start button in the main screen of Logger Utility.

Measurement starts.
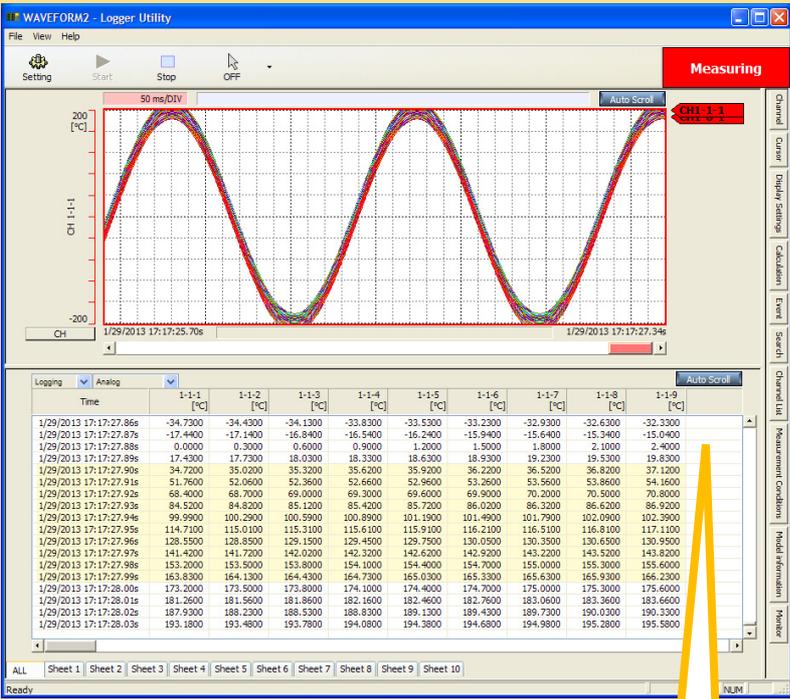
Auto Scroll : Scroll the waveform automatically

Manual Scroll : Scroll the waveform manually
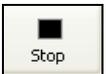
2. Click the ■ Stop button in the main screen.

Measurement stops.

When recording time and timer measurement functions are enabled, measurement stops automatically without pressing the ■ Stop button.
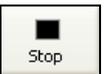
NOTE
- For PC based measurement, end all other applications. Even if the PC you are using satisfies the operating environment specifications, measurement and recording may not be able to be performed properly due to the state of the PC when, for example, other applications are open.
- When a measurement is scheduled using the LR8410-20 no other measurement can be started by pressing the **[start]** button.

Why is a waveform not displayed?
The measurement waveform may have gone out of the display range. Change the display upper limit and display lower limit settings on the **[Channel]** tab of the display settings window to match the measurement values.
See "6.1 Changing the Waveform Display Range" (p. 176).

How do I check the measurement value at any point of a waveform?
Click the tool button on the main screen to display cursors A and B. You can confirm the measurement value of a specific position of a cursor on the **[Cursor]** tab of the display settings window.
See "6.2 Checking Cursor Values" (p. 178).

How do I add graduations (scale) to the graph?
On the **[Display Setting]** tab in the display settings window, set gauge display to ON.
See "6.3 Changing Display Settings" (p. 180).

How do I split the waveform display area into two?
On the **[Display Setting]** tab in the display settings window, set split screen to ON.
See "6.3 Changing Display Settings" (p. 180).

How do I add a mark to a waveform?
Click the tool button on the main screen to display an event mark. You can then click on the waveform to add an event mark.
See "6.5 Event Mark Function" (p. 197).

Confirm the input (monitor)

You can check the input status and display range with the current settings. If you move to the setting screen and change the range etc. while monitoring, the monitor operates with the changed range.

This is useful when you want to check measured values before starting real-time saving.

(The measurement file of Logger Utility is overwritten and saved in the MONITOR.LUW file, so the measurement file does not increase even if monitoring is repeated.)

1. Click the [MONI Monitor] button on the front of the Logger Utility main screen.

Start measurement.
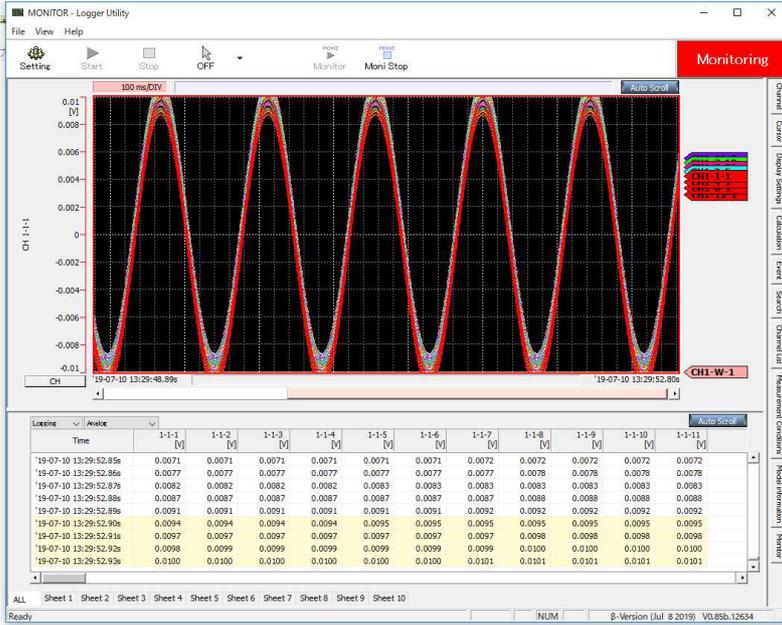
2. Click the [MONI oni Stop] button on the Logger Utility main screen.

Stop measurement.

NOTE During monitoring, the logger operates as trigger function OFF, timer measurement OFF, automatic save OFF, and continuous recording ON.

5.1.2   Standalone Measurement

When using the 8423

1. Press [START /MARK] **on the front of the 8423**
Start measurement.
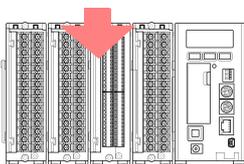
[START /MARK] : Lit green during measurement

2. Press [STOP] **twice to stop measurement.**
Stop measurement.
When recording time and timer measurement functions are enabled, measurement stops automatically without pressing [STOP].

When using the 8430-20 , LR8431-20 and LR8432-20

1. Press [START/STOP] **on the front of the 8430-20 , LR8431-20 and LR8432-20.**
Start measurement.

[START/STOP] : Lit the LED (green) at the left side of the key during measurement

2. Press [START/STOP] .
Stop measurement.
When recording time and timer measurement functions are enabled, measurement stops automatically without pressing [START/STOP] .

When using the LR8400-20, LR8401-20, and LR8402-20

1. Press [START] **on the front of the LR8400-20, LR8401-20, and LR8402-20.**
Start measurement.
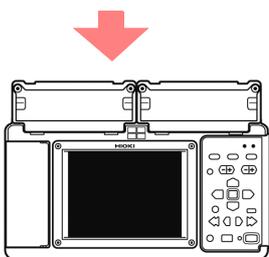
When the **[Start/Stop massage:On]** (default setting) is selected (enabled), the Start Confirmation message is displayed.
Select **[Yes]** and press **ENTER** to start measurements.

[START] : Lit the LED (green) at the left side of the key during measurement

When the **[Start/Stop massage:On]** (default setting) is selected (enabled), the Stop Confirmation message is displayed.
Select **[Yes]** and press **ENTER** to stop measurements.

2. Press [STOP].
Stop measurement.
When recording time and timer measurement functions are enabled, measurement stops automatically without pressing [STOP].

When using the LR8410-20

1. **Press** [START] **on the front of the LR8410-20.**
Start measurement.
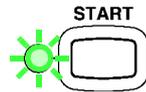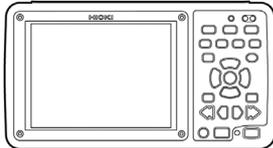
> When the **[Start/Stop massage:On]** (default setting) is selected (enabled), the Start Confirmation message is displayed.
> Select **[Yes]** and press **ENTER** to start measurements.

[START] : Lit the LED (green) at the left side of the key during measurement

> When the **[Start/Stop massage:On]** (default setting) is selected (enabled), the Stop Confirmation message is displayed.
> Select **[Yes]** and press **ENTER** to stop measurements.

2. **Press** [STOP]**.**
Stop measurement.

When recording time and a measurement is scheduled, measurement stops automatically without pressing [STOP].

When using the LR8450, LR8450-01

1. **Press** [START] **on the front of the LR8450, LR8450-01.**
Start measurement.
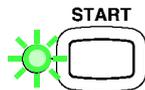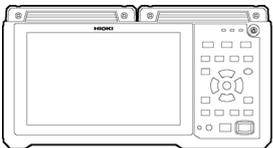
> When the **[Start/Stop massage:On]** (default setting) is selected (enabled), the Start Confirmation message is displayed.
> Select **[Yes]** and press **ENTER** to start measurements.

[START] : Lit the LED (green) at the left side of the key during measurement

> When the **[Start/Stop massage:On]** (default setting) is selected (enabled), the Stop Confirmation message is displayed.
> Select **[Yes]** and press **ENTER** to stop measurements.

2. **Press** [STOP]**.**
Stop measurement.

When recording time and a measurement is scheduled, measurement stops automatically without pressing [STOP].

How do I add a mark to a waveform?

- 8423: Press the [START/MARK] key during the measurement to add the event mark. (Max. 100 marks)

- With models 8430-20, LR8400-21, LR8401-21, LR8402-21, LR8431-20, LR8432-20, LR8410-20, LR8450 and LR8450-01 event marks (up to 100, LR8410-20, LR8450, LR8450-01: up to 1000) can be inserted by Logger key operation, or by applying a signal to an external control terminal.

See: 8430-20, LR8431-20 or LR8432-20 Instruction Manual "5.3 Inserting Event Marks (Search Function)", LR8400-20, LR8401-20, and LR8402-20 Instruction Manual "4.3 Marking Waveforms and Searching Marks (Search Function)"
LR8410-20 Instruction Manual "4.3 Marking Waveforms and Searching Marks (Search Function)"
LR8450,LR8450-01 Instruction Manual "5 Marking Functionalty"

Analyzing Measurement Data

Chapter 6

Click a tab on the right side of the main screen to display a settings display window. These windows allow for configuring the advanced settings of the waveform display area, analyzing data, etc.
To analyze data with waveform calculations, see "4.4.2 Waveform Calculation Settings" (p. 106).
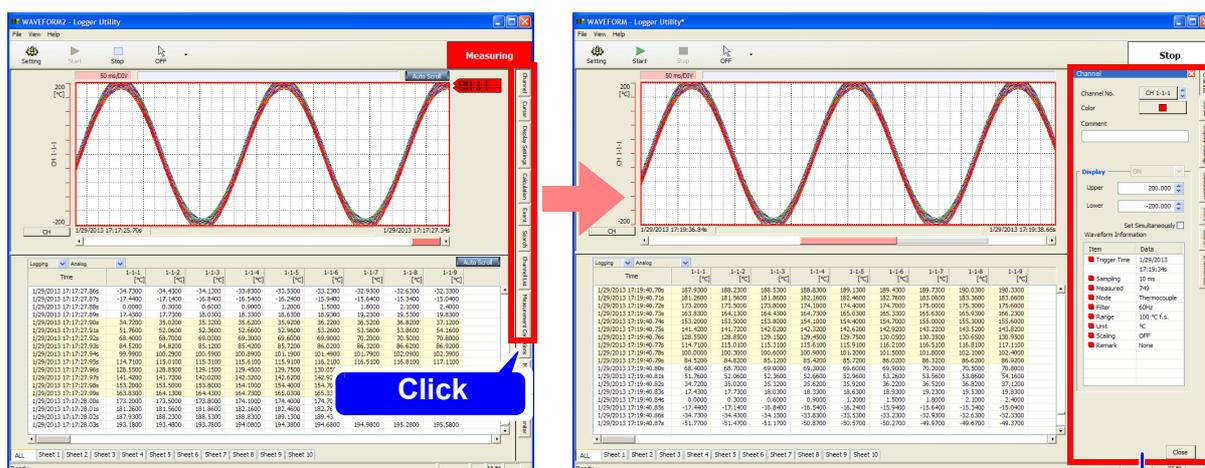
Display Settings Windows

[Channel] tab: Changing the Waveform Display Range (p. 176)

[Cursor] tab: Check the measurement values at the locations of the cursors A and B (p. 178)

[Display Setting] tab: Configure the display settings of the main screen (p. 180)

[Calculation] tab: Calculate the maximum value and minimum value of a waveform, etc.(p. 190)

[Event] tab: Event Mark Function (p. 197)

[Search] tab: Add a mark to a waveform or search for a mark (p. 200)

[Channel List] tab: Display the display color of each channel (p. 205)

[Measurement Conditions] tab: Display the measurement start time, number of data items, etc. (p. 206)

[Monitor] tab*: Display the instantaneous value of each channel (p. 207)

* Displayed only while measuring

6.1   Changing the Waveform Display Range

Measurement data cannot be confirmed in the waveform display area when it goes out of the vertical range of the display.
In this case, change the upper/lower limits of the display with the **[Channel]** tab. Waveform color and comments can also be changed.

1. **Click the [Channel] tab on the right side of the main screen.**
The display setting window opens.

2. **Click the channel number button.**
The dialog is displayed.

3. **Select the channel for which to change the settings by selecting the Logger, unit, and then channel.**
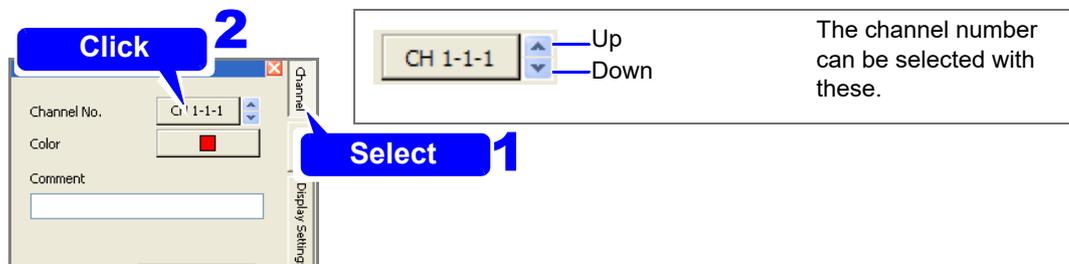
Example for model 8423

4. **Set waveform display to ON, and set the display upper limit and display lower limit.**
When the sheet is ALL, the ON/OFF setting of display is not available.

5. **If you want to change the waveform color, select the desired color from the [Color] dialog box.**
Selecting a color that makes the waveforms easy to see is recommended.

4

(Gauge display is ON in this

1 Set to On.
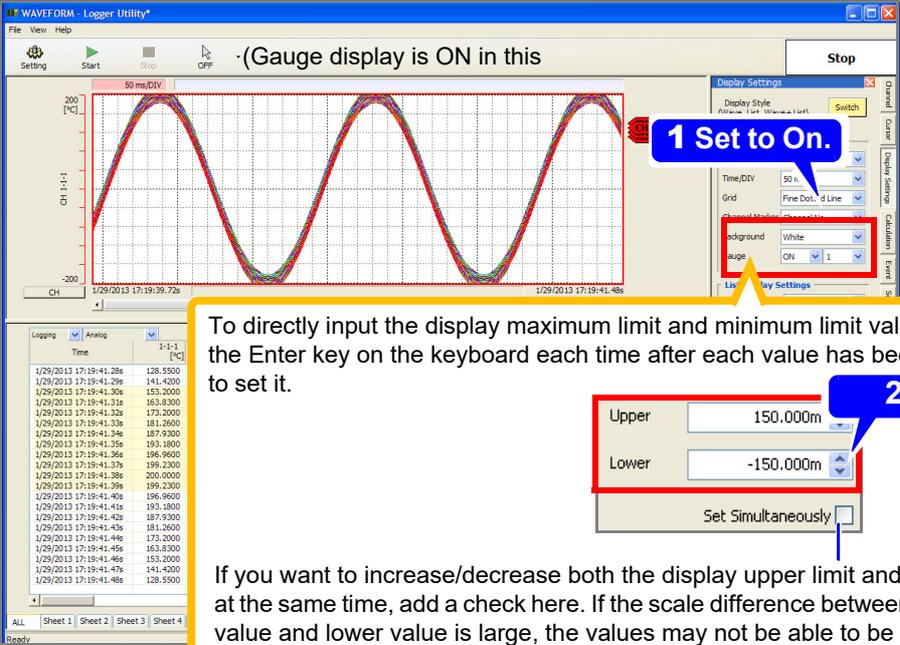
To directly input the display maximum limit and minimum limit values, press the Enter key on the keyboard each time after each value has been inputted to set it.

2 Set

| Upper | 150.000m |
| Lower | -150.000m |

Set Simultaneously

If you want to increase/decrease both the display upper limit and lower limit at the same time, add a check here. If the scale difference between the upper value and lower value is large, the values may not be able to be increased/decreased at the same time.

5

1 Click

Channel No.   Ch. 1-1
Color
Comment
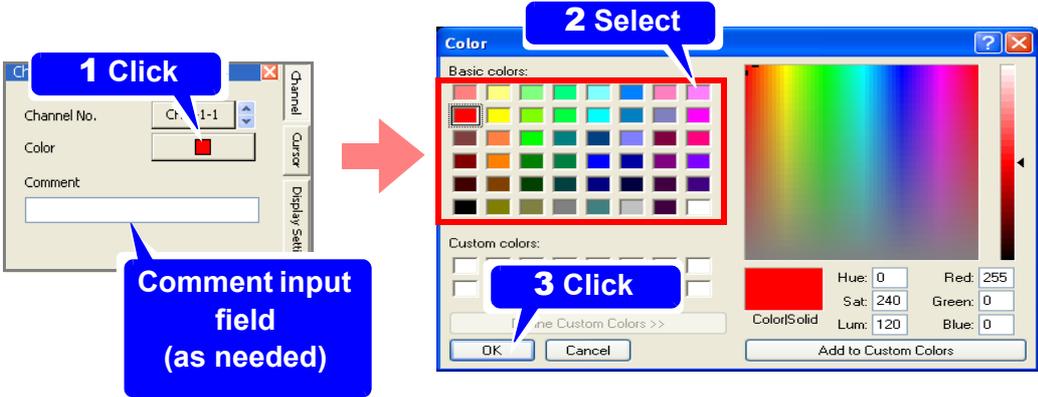
Comment input field (as needed)

2 Select

Color

Basic colors:

Custom colors:

3 Click

Color|Solid

OK   Cancel

Hue: 0   Red: 255
Sat: 240   Green: 0
Lum: 120   Blue: 0

Add to Custom Colors

6.2 Checking Cursor Values

You can use both cursors (cursors A and B) to check measurement values.

1. Click the **[Cursor]** tab on the right side of the main screen to open the settings window.

2. Add a check for the cursor to use.
The selected cursor appears in the waveform display area.

3. Select channels to check measurement values.
The values measured on the selected channels are displayed.

Selectable Items	Explanations
All Channels	Display the values of all channels.
Sheet	Display the values of channels in the sheet currently displayed.
Selected	Display the values of the selected channel.

4. Scroll * the cursor to display measurement values.
The measurement values at the specified cursor position are displayed.

∗: When the mouse operation button is [⟵ OFF], you can move the mouse to a cursor on the screen to display the ⇔ mark, and then move the selected cursor by dragging. When the mouse operation button is [Cursor A] or [Cursor B], clicking on the screen moves the cursor to the clicked position.
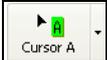
Channel	A	B
1-1-01	-5.0000u	-1.7150m
1-1-02	145.0000u	-1.5650m
1-1-03	295.0000u	-1.4150m
1-1-04	445.0000u	-1.2650m
1-1-05	595.0000u	-1.1150m
1-1-06	745.0000u	-965.0000u
1-1-07	895.0000u	-815.0000u
1-1-08	1.0450m	-665.0000u
1-1-09	1.1950m	-515.0000u
1-1-10	1.3450m	-365.0000u
1-1-11	1.4950m	-215.0000u
1-1-12	1.6450m	-65.0000u

⊙ All Channels ○ Sheet ○ Selected

CH	B-A	Unit
1-1-1	-4.3350m	V
1-1-2	-4.3350m	V
1-1-3	-4.3350m	V
1-1-4	-4.3350m	V
1-1-5	-4.3350m	V
1-1-6	-4.3350m	V
1-1-7	-4.3350m	V
1-1-8	-4.3350m	V
1-1-9	-4.3350m	V
1-1-10	-4.3350m	V
1-1-11	-4.3350m	V
1-1-12	-4.3350m	V

Channel numbers

Cursor B measurement values

Cursor A measurement values

Unit*

Difference in measurement values between cursors A and B.*

∗: When the knob of the scroll bar below the list is moved, the difference in measurement value between cursors A and B will be displayed.

Copy cursor value to clipboard

You can copy the value measured by the cursor to the clipboard and use it in Notepad etc.

1. Click "Copy cursor value to clipboard" on the [Cursor] tab.

2. Open "Notepad" etc. and "Paste".

1 Click

2 Paste

```
A,'19-07-10 13:30:21.46s
B,'19-07-10 13:30:21.56s
B-A,0-00:00:00.10s
CH,A,B,B-A,UNIT
CH1-1-1,0.0017,0.0087,0.0069,V
CH1-1-2,0.0018,0.0087,0.0069,V
CH1-1-3,0.0018,0.0087,0.0069,V
CH1-1-4,0.0018,0.0087,0.0069,V
CH1-1-5,0.0018,0.0087,0.0069,V
CH1-1-6,0.0018,0.0087,0.0069,V
CH1-1-7,0.0018,0.0087,0.0069,V
CH1-1-8,0.0018,0.0088,0.0069,V
CH1-1-9,0.0019,0.0088,0.0069,V
CH1-1-10,0.0019,0.0088,0.0069,V
CH1-1-11,0.0019,0.0088,0.0069,V
CH1-1-12,0.0019,0.0088,0.0069,V
CH1-1-13,0.0019,0.0088,0.0069,V
CH1-1-14,0.0019,0.0089,0.0069,V
CH1-1-15,0.0019,0.0089,0.0069,V
CH1-2-1,0.0015,0.0084,0.0069,V
CH1-2-2,0.0015,0.0084,0.0069,V
CH1-2-3,0.0015,0.0085,0.0069,V
CH1-2-4,0.0016,0.0085,0.0069,V
CH1-2-5,0.0016,0.0085,0.0069,V
CH1-2-6,0.0016,0.0085,0.0069,V
CH1-2-7,0.0016,0.0085,0.0069,V
CH1-2-8,0.0016,0.0085,0.0069,V
CH1-2-9,0.0016,0.0086,0.0069,V
```

6.3   Changing Display Settings

You can switch the display in the main screen and configure settings such as the display format.

6.3.1   Switching between Waveform Display and List Display

You can switch the measurement data display method of the main screen between waveform display, list display, and waveform plus list display.

1. Click the [Display Setting] tab on the right side of the main screen to open the settings window.

2. Each click of the [Switch] button switches the display of the main screen.

Selectable Items	Explanations
List Display	Displays waveform data as numerical values. It is also possible to display calculation results.
Wave Display	Displays measured waveforms.
Wave + List Display	Displays both the waveform display and list display in one screen.

6.3.2 Waveform Display Settings

This section describes setting the display format of the waveform display area.

1. Click the **[Display Setting]** tab on the right side of the main screen to open the settings window.

2. Click the **[Switch]** button to switch to waveform display or waveform plus list display.

3. Set various waveform display settings.
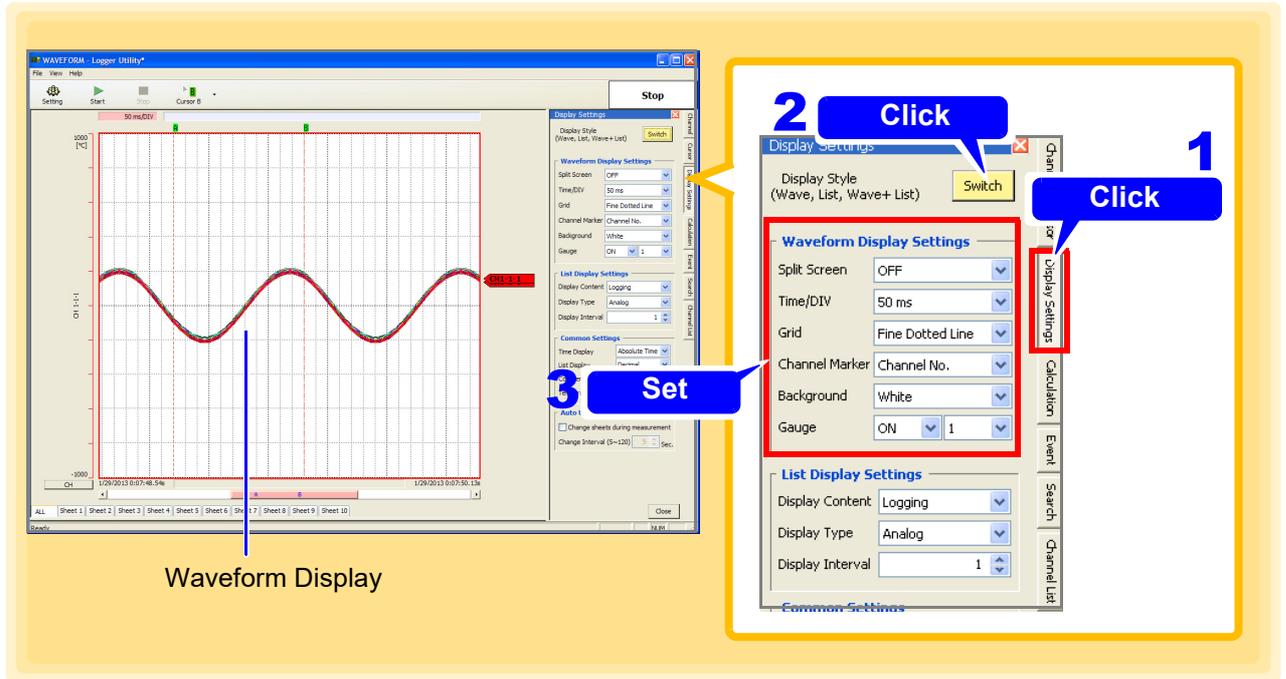
Waveform Display

Various Waveform Display Settings

Split Screen The waveform display area can be spit into two screens.

Selectable Items	Explanations
ON	Displays two waveform screens.
OFF	Displays one waveform screen.

Split Screen OFF   Split Screen ON
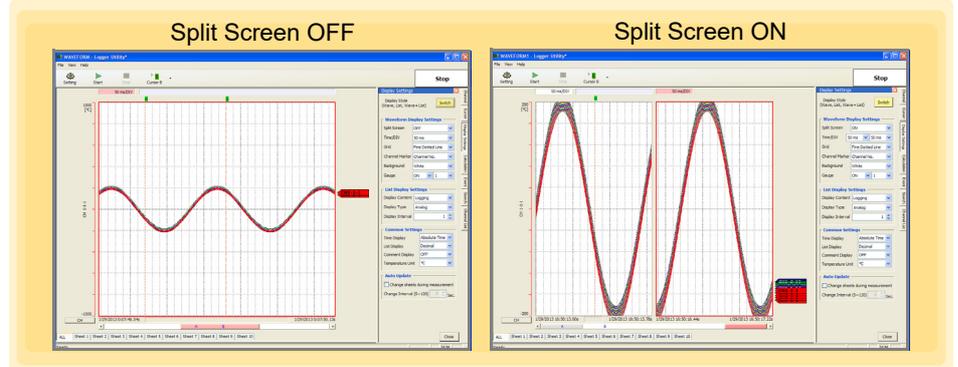
Time/1 Square   Set the time axis (time per square) of the waveform display area.

Selectable Items
50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s,   1 min, 2 min, 5 min, 10 min, 20 min, 30 min,   1 hour, 2 hour, 5 hour, 10 hour, 12 hour, 1 day, 2 day

When split screen is ON, you can set the time axis of each of the screens.

Display Grid   You can select from the following grid types for the waveform display area.

Selectable Items
None, Dotted Line, Solid Line, Fine Dotted Line, Fine Solid Line
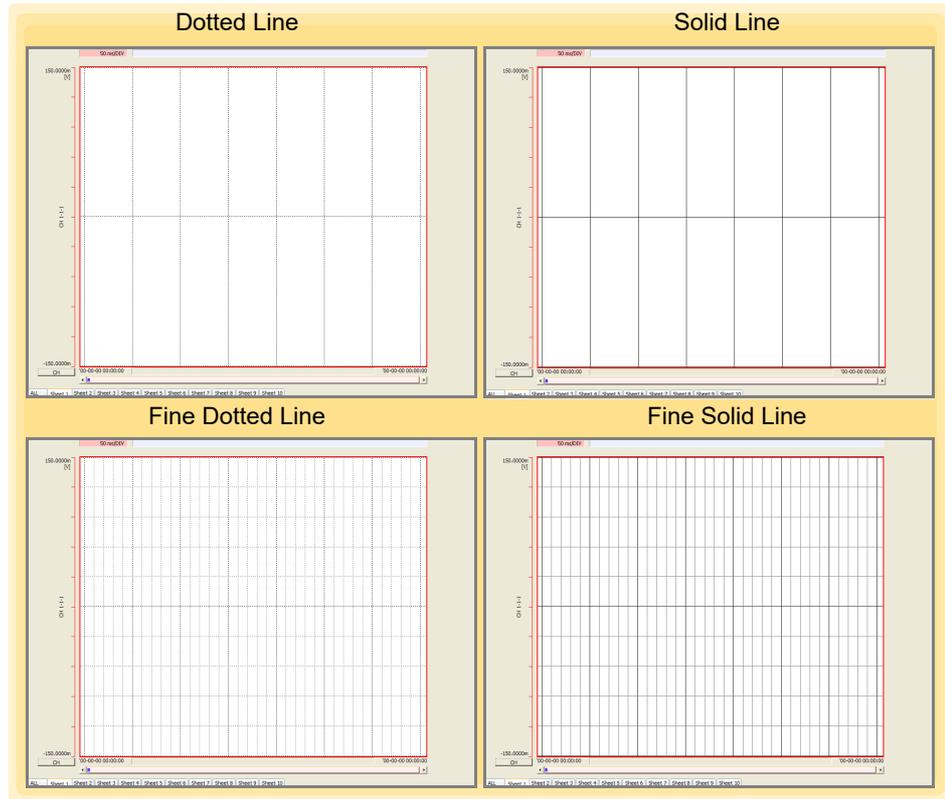
CH Marker   You can select the item to display on the right side of the waveform display area from the following items.

Selectable Items	Explanations	Display Examples
OFF	Do not display a channel mark.	Non
Channel No.	Display the channel number.	CH1-1-1
Comment	Display the comment.	COMMENT
CH & Comment	Display the channel number and comment.	1-1-1:COMMENT

If the comment is long, not all of the characters are displayed on the CH marker.

Waveform Background Color   You can select black or white for the background color of the waveform display area.

Gauge Display Quantity

You can display a gauge (graduations) on the left side of the waveform display area.

Selectable Items	Explanations
ON	Display a gauge on the left side of the waveform display area. When display of the gauge is ON, you can select a number from 1 to 8. The highest value is the display upper limit and the lowest value is the display lower limit, and the settings can be changed on the **[Channel]** tab.
OFF	Do not display a gauge.

Display Gauge ON   Display Gauge OFF

The channel for each gauge can be set by clicking the **[CH]** button displayed at the bottom of the gauge.
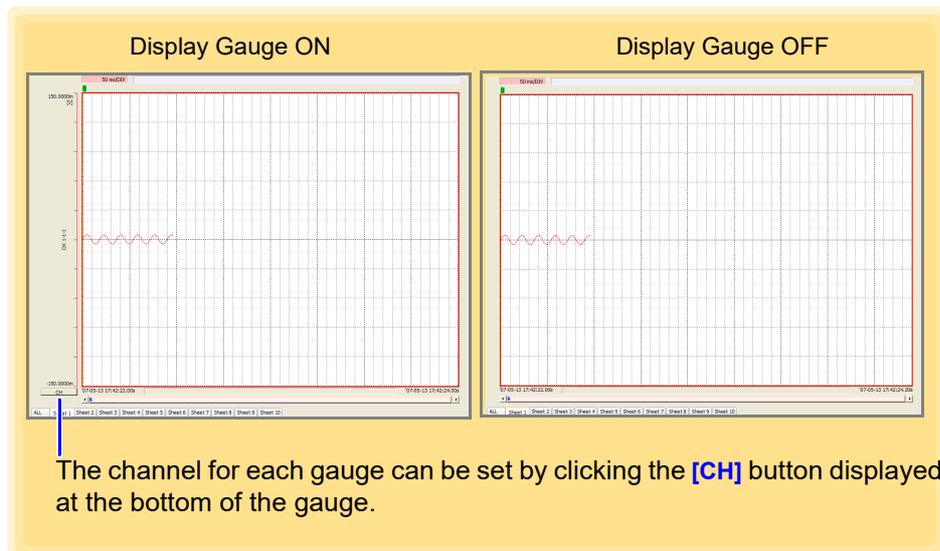
Detail display of gauge

When the vertical width of the waveform display screen is less than a certain size (325 dots), the gauge is displayed at the upper and lower limits.
When the size is over a certain size, the gauge at the position where the vertical width is equally divided is displayed.

When the size is smaller than a certain size, gauge is displayed at the upper and lower limits

When the size is over a certain size, gauge at the position where the vertical width is equally divided is displayed
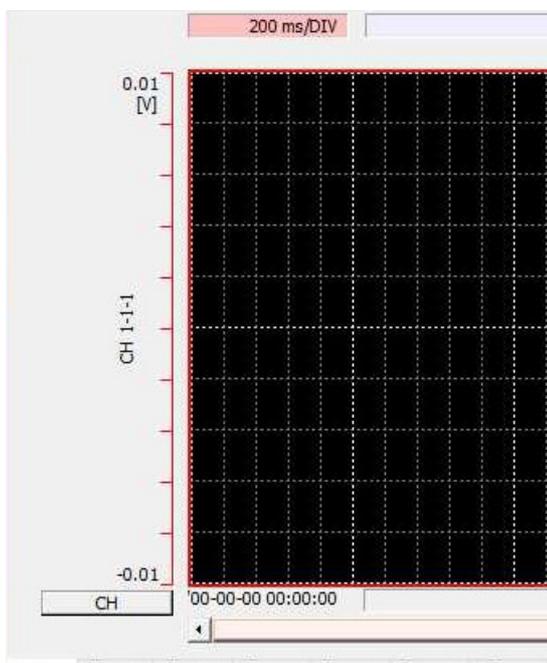
Confirming Position of Displayed Waveform Portion with Scrollbar

You can use the scrollbar to confirm what the position of the waveform portion displayed on the screen is within the whole recorded waveform. The scrollbar has two knobs, and color is used to emphasize the active knob. The positions of the cursors A and B are also indicated.

When One Screen (Split Screen OFF)

Scrollbar

Screen display range

Knob 1

Knob 2

Whole waveform
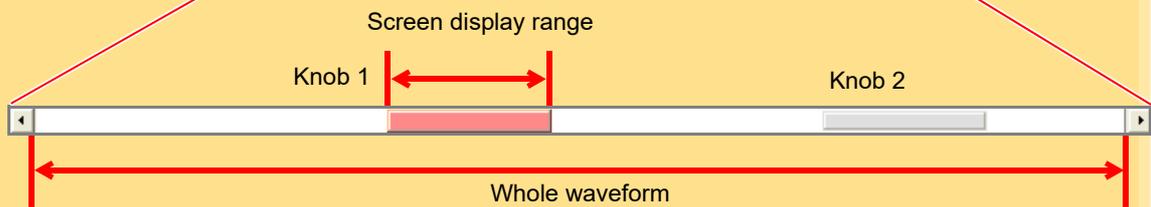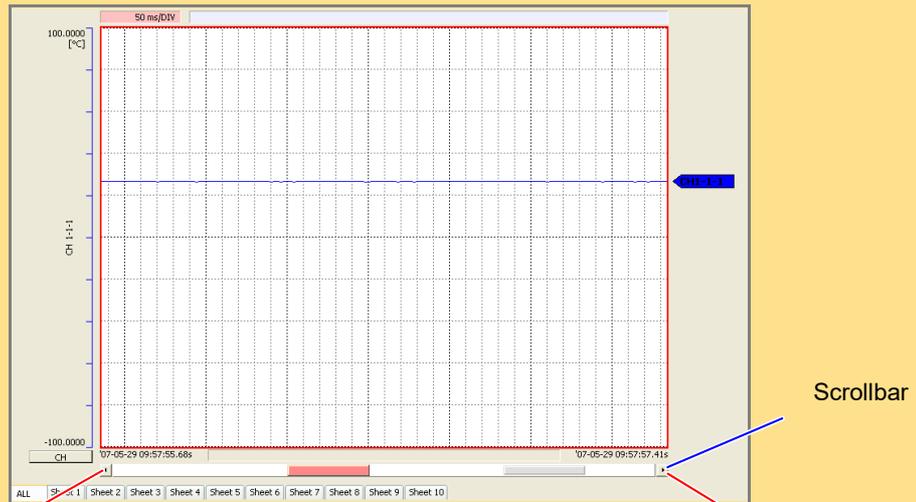
Clicking knob 2 changes the screen display range.

Screen display range

Knob 1

Knob 2

Whole waveform
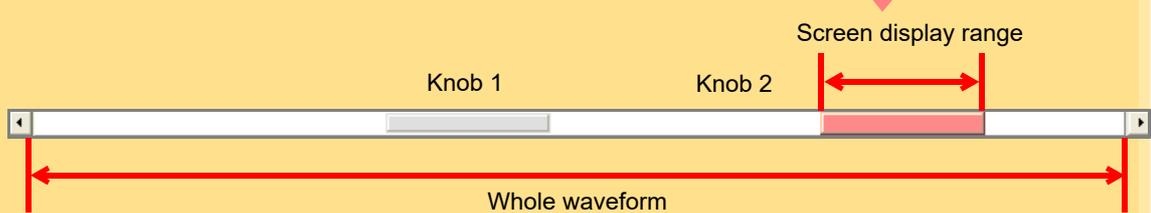
When Two Screens (Split Screen ON)

Scrollbar

Active screen display range

Inactive screen display range

Knob 1

Knob 2
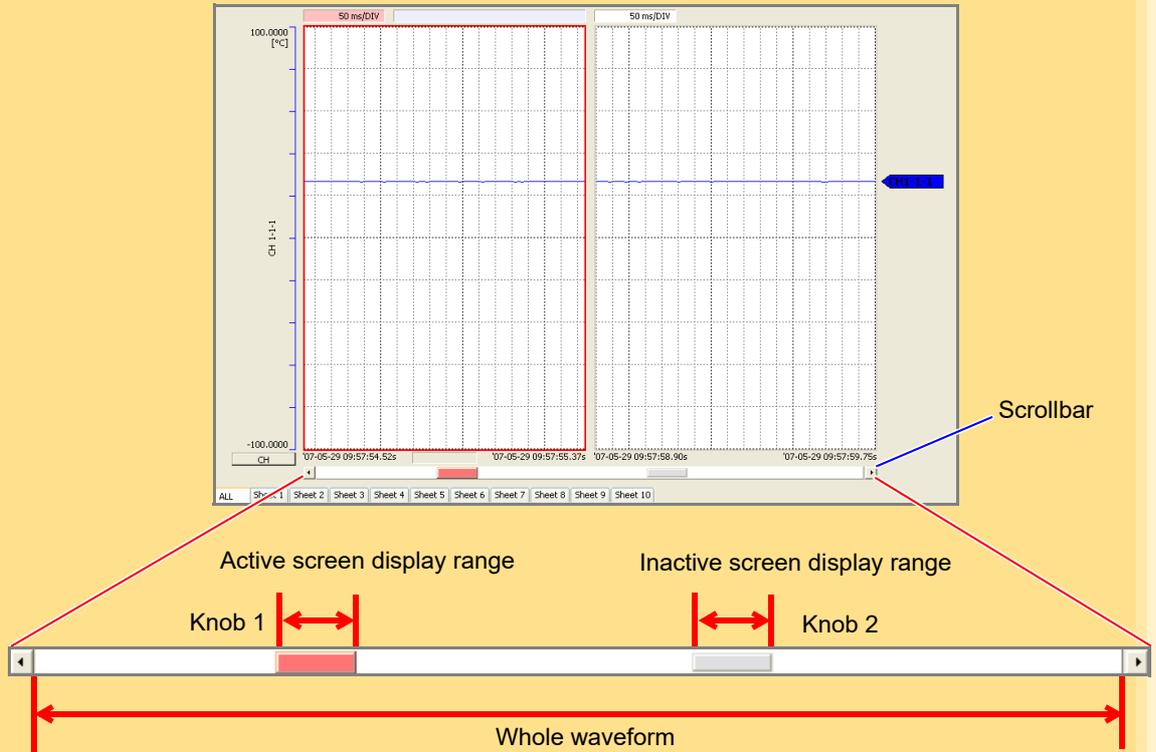
Whole waveform

Confirming Positions of Cursors with Scrollbar

Active screen display range
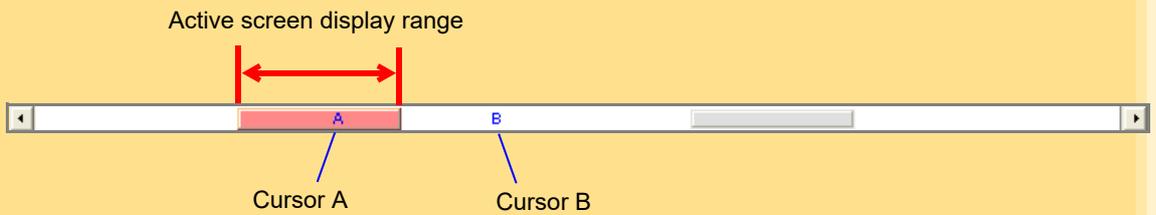
Cursor A

Cursor B

Mouse Operation

When the mouse operation button is **Wave**, dragging the cursor on the screen causes the mouse cursor to change from to , allowing you to scroll the waveform. When using a wheel mouse, you can change the waveform zoom factor by rotating the scroll wheel forward and backward.

6.3.3 List Display Settings

This section describes setting the display format of the list display area.

1. **Click the [Display Setting] tab on the right side of the main screen to open the settings window.**

2. **Click the [Execute] button to switch to list display or waveform plus list display.**

3. **Set various list display settings.**
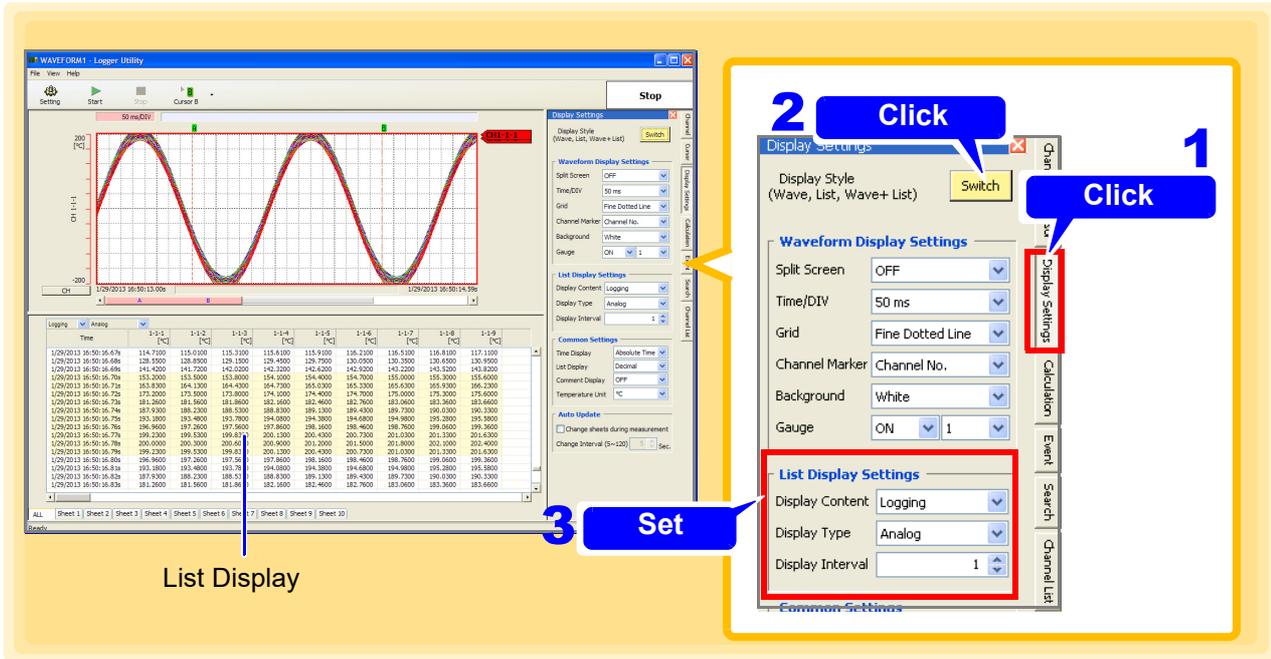
List Display

Various Numerical Value Display Settings

Display Content Set when the Logging display content setting is selected.

Selectable Items	Explanations
Logging	Display measurement values in the list display area. When logging is selected, set the display type and display interval (thinning interval) for the selected sheet.
Calculation	Display list calculation results in the list display area.
Num Wide	Display list latest measure in the list display area.
Alarm History	Display the alarm history. (LR8450 and LR8450-01 only)

Display Type Set when the Logging display content setting is selected.

Selectable Items	Explanations
Analog	Display analog data only.
Logic	Display logic data only.
Alarm	Display alarm data only.
Wave Calculation	Display waveform calculation data only.
All	Display all data.

Display Interval   (When logging is selected for the display content)
Selection range: 1 to 1000

Only when expanding numbers

Numeric expansion character size

You can select the font size when expanding numbers.

Selectable Items	Explanations
×1 to ×10	You can select the font size from 1× to 10×

Numeric enlargement display format

You can select the display format when expanding numbers

Selectable Items	Explanations
width auto	The number of horizontal channels is displayed automatically
width 5ch	The number of horizontal channels is displayed in 5ch
width 10ch	The number of horizontal channels is displayed in 10ch

6.3.4 Common Settings and Auto Update Settings

This section describes setting common settings related to display screens.

1. Click the [Display Setting] tab on the right side of the main screen to open the settings window.

2. Make Common and Auto Update settings.

Add a check here when you want to switch display sheets at a switch interval during measurement.

Set a switch interval from 5 to 120 seconds.

Common Settings

Time Display   Select the display format for time values.

Selectable Items	Explanations	Examples
Absolute Time	Display the global time (date).	1/1/2010 00:10:00.00s
Relative Time	Display the time since the start of measurement in sexagesimal.	00:10:00.00s
Second	Display the time since the start of measurement in seconds.	6.000 ks
Point	Display the number of measurement points since the start of measurement.	6000000

List Display (Numerical Display)   Select the display format for measurement values.

Selectable Items	Explanations	Examples
SI Unit	Display values with a supplementary unit added (k, m, etc.).	1.000 mV
Decimal	Display values in decimal.	0.001 V
Exponential	Display values in exponential.	1.000E-03

Set the number of digits to display after the decimal point on the channel settings page of the settings dialog box.

Comment Display

Set whether a comment is displayed.

Selectable Items	Explanations
ON	Displays the channels of the value display part using comments. The channel number is displayed for channels that do not have a comment set.
OFF	Displays the channels of the value display part using CH number.

Temperature Unit

Set whether a temperature unit is displayed.

Selectable Items	Explanations
°C	Display a temperature unit with a Centigrade unit (°C).
°F	Display a temperature unit with a Fahrenheit unit (°F) by scaling.

6.4 Numerical Value Calculations

This section describes performing calculations on the measurement data within the whole range or between the cursors A and B. (Calculations can be performed during measurement or after measurement.)

6.4.1 Calculation Settings

1. Click the **[Calculation]** tab on the right side of the main screen to open the settings window.

2. Select **[All Channels]** or **[Display Sheet]** for the calculation channels.

3. Select **[Whole Range]** or **[Between A - B]** as the calculation range.
Setting **[Between A and B]** as the calculation range allows you to select **[Auto Calculation]**.

4. Select ON or OFF for the calculation filter.
Setting ON allows you to avoid incorrect calculations caused by noise.
For calculation of ON time, OFF time, ON count, or OFF count, with the calculation filter set to ON, if 10 samples of measurement values following the first measurement value that crossed the set threshold value do not cross the threshold value again, it is determined that the first measurement value crossed the threshold value.

If the calculation range is between A and B, you can add a check here to enable calculations to be performed automatically when the cursors A and B are moved.

5. Select a channel.

6. Select the numerical calculations to perform.

Selectable Items
Average, P-P, Maximum, Time to Maximum, Minimum, Time to Minimum, On Time, Off Time, On Count, Off Count, Std Deviation, Integral, Area Value, Integration

Selectable Items	Explanations
On Count	Display the number of times measurement values crossed over the set threshold value.
Off Count	Display the number of times measurement values crossed under the set threshold value.
On Time	Obtain the total time that measurement values were larger than the set threshold value.
Off Time	Obtain the total time that measurement values were smaller than the set threshold value.

(The calculations above are not possible with pulse.)

7. Click the [Calculate] button to perform the calculation.

When On Time, Off Time, On Count, or Off Count is selected, set the threshold value here.

Example for model 8423

The list display area displays the calculation.
If a calculation is performed for the **[Whole Range]** calculation range during measurement, the calculation is performed for the range from the start of measurement to the point in time the **[Calculate]** button is pressed.
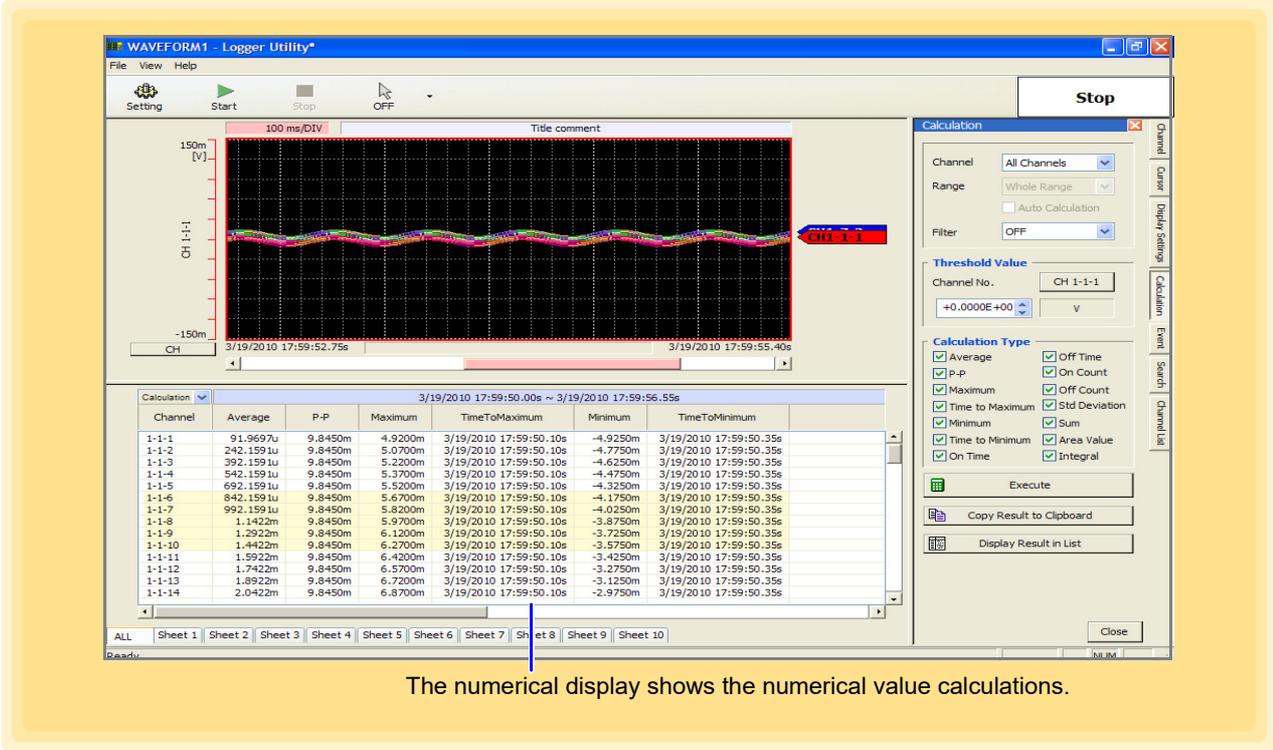
The numerical display shows the numerical value calculations.

NOTE

- When the calculation range is set to **[Between A - B]** and only one cursor is displayed, the calculation range is from the cursor display position to the end of the data.
- A calculation is not performed in real time during measurement. It is only performed when the **[Calculate]** button is clicked, or when the cursors A and B are moved while **[Auto Calculation]** is set for **[Between A - B]**.

Copying Calculation Results and Switching to the Numerical Calculation Display
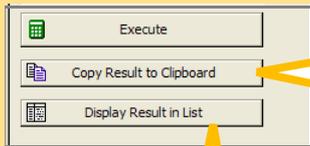
This button copies the calculation result to the clipboard. You can paste the copied data into a Notepad, Word, or other document.

If the list display area is not displayed because logging display is selected, this button switches the display to calculation display.

6.4.2 Numerical Calculation Expressions

Calculation Type	Description
Average	Obtains the average value of waveform data. $$AVE = \frac{1}{n} \sum_{i=1}^{n} di$$ AVE : Average value n : Data count di : Data on channel number i
Peak-to-Peak (P-P) Value	Obtains the value of the difference (peak-to-peak value) between maximum and minimum values of waveform data.
Maximum Value	Obtains the maximum value of waveform data.
Time to Maximum Value (Time to Max)	Calculate the time (s) from the trigger point to the maximum value. If the maximum value occurs in two or more instances, the first instance is treated as the maximum value.
Minimum Value	Obtains the minimum value of waveform data.
Time to Minimum Value (Time to Min)	Calculate the time (s) from the trigger point to the minimum value. If the minimum value occurs in two or more instances, the first instance is treated as the minimum value.
Standard Deviation (Std Deviation)	Obtains the standard deviation of the waveform data. $$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (di - AVE)^2}$$ σ : Standard Deviation AVE : Average n : Data count di : Data on channel number i
Area (Area Value)	Obtains the area value (V•s) enclosed by the zero position (point of zero potential) and the signal waveform. When calculation of the range specified by the A/B cursors is selected, the calculated area is constrained to the waveform between the cursors. $$S = \sum_{i=1}^{n} |di| \bullet h$$ S : Area n : Data count di : Data on channel number i $h = \Delta t$: Sampling period
Integration	Calculate the integration value of the signal waveforms. $$SUM = \sum_{i=1}^{n} di$$ SUM : Totalization value n : Total number of data items di : Data on channel number i
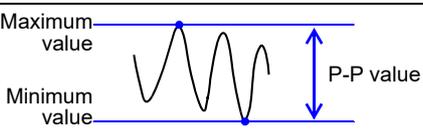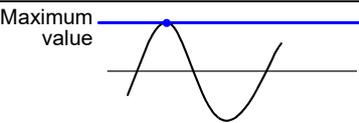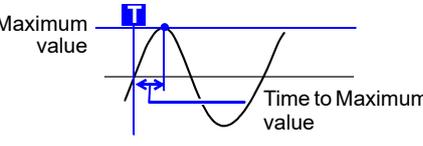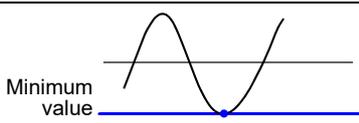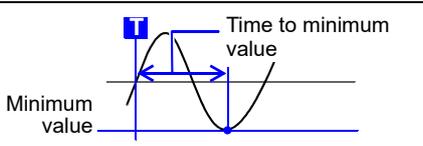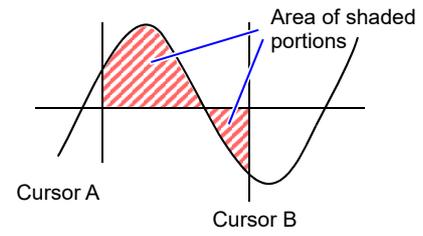
Calculation Type	Description
Integral	Calculates the integral value of the signal waveform. $$INT = \sum_{i=1}^{n} di \times \Delta t$$ INT : Integral value n : Total number of data items di : Data on channel number i Δt : Sampling period

NOTE

• When Scaling is enabled, calculations are performed after waveform data has been scaled. Also, the units of parameter values should match the scaling units.

• See "About Scaling and Scaling Setting Examples" (p. 112)

Execute Calc. and save

1. Click the **[Execute Calc And Save]** button on the Math tab.

2. Specify the location to save the file.

3. Enter a file name.

4. Select file type

5. Select math division.

6. Click the **[Save]** button.
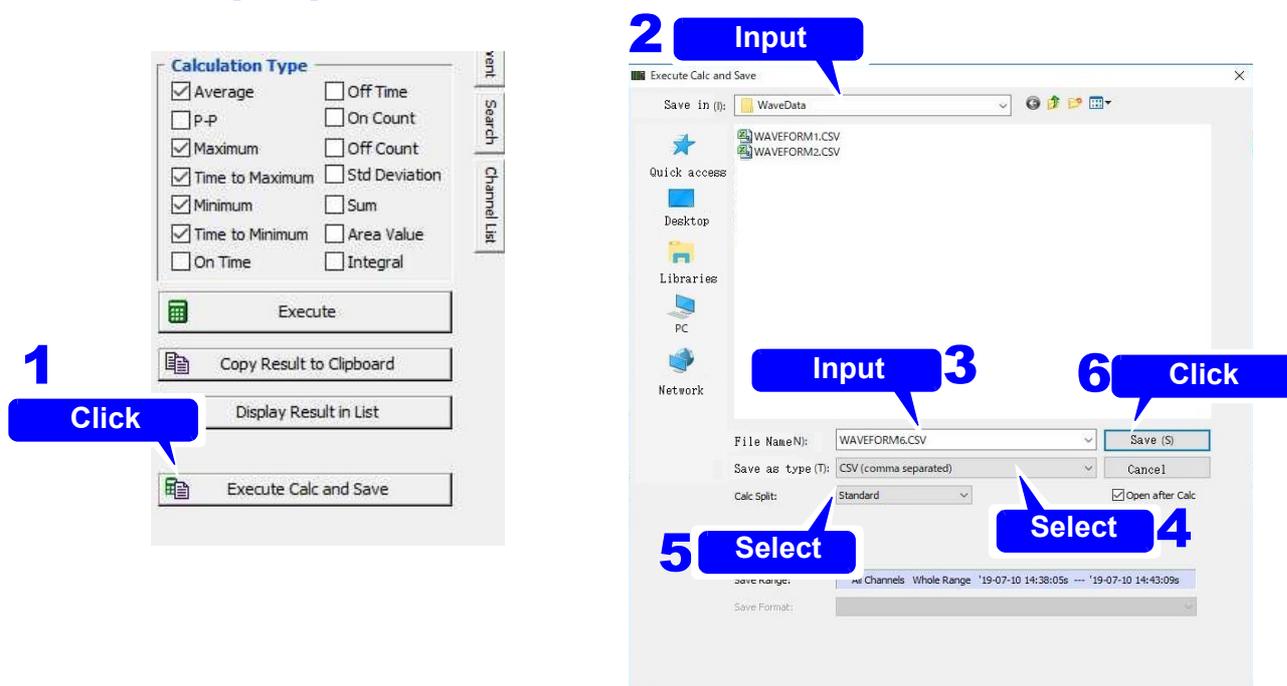
File name   Enter any file name.

Save as type   Select the save format

File Type	Extension
CSV (Comma separated)	.CSV
CSV (Semicolon separated)	.CSV
CSV (Use system settings)	.CSV
Text (Space separated)	.TXT
Text (Tab separated)	.TXT

Calc Split   Select the mode to divide the operation.

Selectable Items	Explanations
Standard	Creates one file per math operation.
Split	Divide the data at regular intervals from the beginning of the measurement data and perform numerical operation, Create a calculation result file. Setting range: 0 day, 0 hour, 1 minute to 30 days, 23 hours, 59 minutes.
Split at Regular Intervals	Allows a reference time to be set within a 24 hour period, splits data at Intervals Regular intervals from that reference time, and execute calculation and creates separate files. Set both the split time (data split interval) and reference time (data split reference time).

Save Group   Select the classification when doing Split Calculation.

Selectable Items	Explanations
Time group	Perform division operation while classifying time, and create a file.
Ch group	Perform division operation while classifying channels and create a file.

Time group example at Split at Regular interval.

Ch group example at Split at Regular interval.

NOTE   When performing numerical calculation and storing in a file, if you divide the numerical calculation, the dual sampling low-speed channel will be "-----" without performing numerical calculation.

6.5 Event Mark Function

6.5.1 Adding a Mark (Event Mark) to a Waveform

You can use the event mark function to add an event mark to any portion of a waveform.

1. **Switch the mouse operation button of the tool buttons to [Event Mark].**
If the icon is not the event mark, click the type of event mark (No. 1 to No. 20) you want to insert from the menu for **[Insert Event Mark]**.

2. **Moving the mouse cursor within the waveform display area and clicking the mouse on the location you want during measuring or after measuring will display the event mark at the top part of the waveform display area.**
An event mark is added at the top of the waveform area.

Waveform Display Area   Event Mark List

NOTE
- The maximum number of event marks that can be saved by the instrument is as follows:
  Models 8423, 8430-20, LR8431-20, LR8432-20, LR8400-20, LR8401-20, and LR8402-20: 100
  Models LR8410-20, LR8450, LR8450-01, LR8101, and LR8102: 1000

- You can also add an event mark by pressing START/MARK on the Logger during measurement. If there are already maximum number of event marks that can be saved by the Logger added, Logger Utility is not notified of an event if START/MARK is pressed.

- While measuring with models 8430-20, LR8431-20, LR8432-20, LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450 and LR8450-01, event marks can be added by key operations. While measuring with models 8430-20, LR8431-20, LR8432-20, LR8400-20, LR8401-20, LR8402-20, LR8410-20, LR8450, LR8450-01, LR8101, and LR8102, event marks can also be added by inputting a signal to an external terminal. If there are already maximum number of event marks that can be saved by the Logger added, Logger Utility is not notified of an event.

- The maximum number of event marks that can be saved with Logger Utility is 1000.

- The Logger is not notified of event marks inserted from the Logger Utility.

6.5.2   Searching for and Editing Event Marks

You can search for event marks.

1. **Click the [Event] tab on the right side of the main screen**
The settings window is opened.

2. **Set event mark to ON.**

3. **Select the event mark to search for from the event mark list.**

4. **Click the [Display This Position] button**
When the specified event mark is found, the display jumps to show the waveform at that position. If you double-click an event mark in the event mark list, the waveform at the event mark position is displayed.

Moving a Cursor to an Event Mark, and Deleting Events

This button moves cursor A to the position of the selected event mark. (This operation can also be performed by right double-clicking an event mark in the list.)

This button deletes the selected event mark.

Copies event mark information to the clipboard and Copies latest measured data to the clipboard.

This button deletes all event marks.

6.6   Searching by Specific Condition (Max, Min, and etc.)

This section describes searching for the maximum value, minimum value, variation, etc.

1. **Click the [Search] tab on the right side of the main screen**
The settings window is opened.

2. **Select the search range (p. 201).**

3. **Select the search method (p. 201) and related settings** (p. 202)**.**

4. **Click the [Execute] button.**
Jumps to position where search conditions are fulfilled and displays the waveforms. Displays search marker at the position that is searched.

2 Select

3 Select

Setting items depend on the selected search method (p. 202).

4 Click

1 Click

This button moves the cursor to the search position.
This button adds an event mark at the search position.
This button deletes the search position information.

Search marker

Search Range

Setting Items	Explanations	
Whole Range	Search the whole range of the recorded waveform.	Search range *(waveform diagram)*
Between A-B	Search the waveform portion between cursor A and cursor B of the recorded waveform. When you are just using either cursor A or cursor B, the search range is from the cursor to the end of the waveform.	Cursor A Cursor B Search range *(waveform diagram)* Cursor A or cursor B Search range *(waveform diagram)*
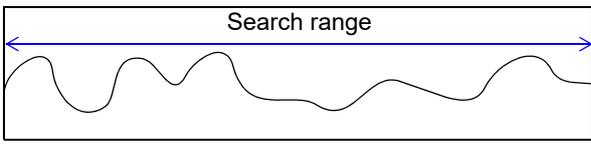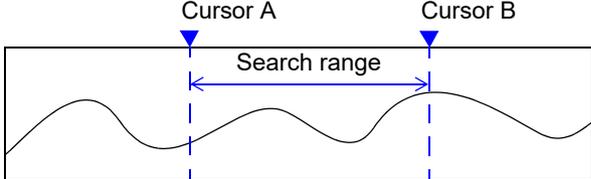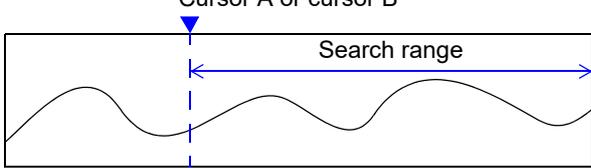
Search Method

Setting Items	Explanations	
Specify by Time	Specify a time to search.	August 19 2007 15:45:01.00s *(waveform diagram)*
Maximum Position, Minimum Position	Search for the maximum value or minimum value of any channel.	Maximum Position *(waveform diagram)* Minimum Position *(waveform diagram)*
Local Maximum Position, Local Minimum Position	Search for the maximum or minimum value near the reference point on any channel. The initial reference value is the measurement start point. The previous search position becomes the reference point once a search has been performed.	Reference value Local max. value *(waveform diagram)* Local max. value Reference value *(waveform diagram)*
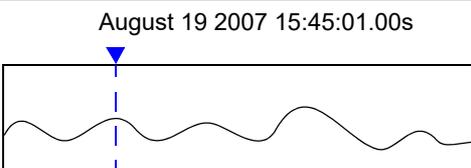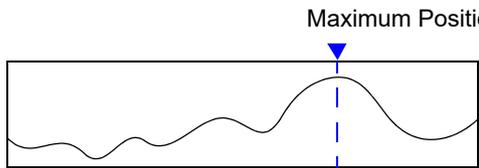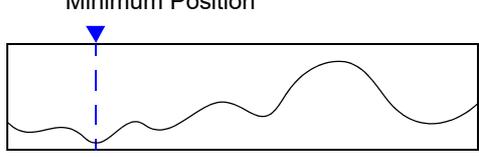
Setting Items	Explanations	
Alarm Position	Search for the position that the alarm status became ON, or the position that it became OFF. (Enable alarm operation to search using model 8423 with the 8997 Alarm Unit)	
Level	Search for a portion where any channel measurement value crosses the specified value.	
Window	Search for the portion where any channel value enters (or exits) the specified range.	
Variation	Search for a portion where the any channel value increases or decreases more than the specified variation (slope).	

Setting Items

When selecting [Specify by Time]

Set the **[Time Value]**.

When selecting [Maximum Position] or [Minimum Position]

Select [Channel]. (This example searches for the maximum value on CH1-1-1.)

1 Click

Example for model 8423

1 Click

2 Click

3 Click
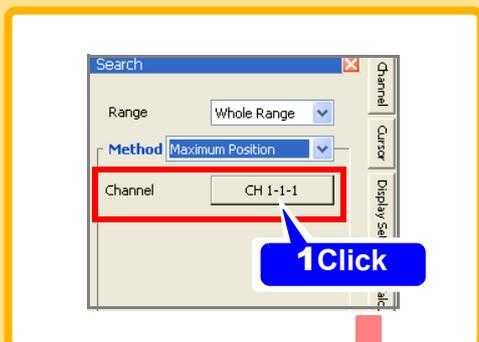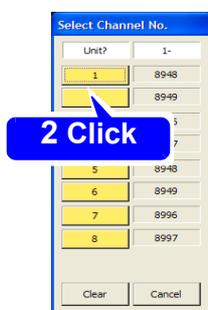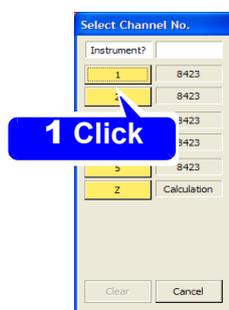
When selecting [Local Maximum Position] or [Local Minimum Position]

Select [Channel].

(Channel selection method: see above)

6.6 Searching by Specific Condition (Max, Min, and etc.)

When selecting [Alarm Position]

Select **[Alarm Channel]** and set the alarm status **[On/Off]**.

When selecting [Level]

Select **[Channel], [Level],** and **[Slope].**

When selecting [Window]

Select **[Channel]**, **[Upper],** and **[Lower]**.

When selecting [Variation]

Select **[Channel]** and **[slope].**

(Channel selection method: See "When selecting [Maximum Position] or [Minimum Position]" (p. 203)

6.7 Displaying the Channel List

The channel list shows the waveform color for each channel. You can also reduce the number of display channels. Click the **[Channel List]** tab at the right edge of the main screen to view, and make changes in the setting window.

Display

Setting Items	Explanations
Display Channel Priority	Give priority to displaying the waveforms displayed in the current display sheet.
Display Channel Only	Display only the waveforms displayed in the main current display sheet.
All Channels	Display all channels.

6.8 Confirming Measurement Conditions

Measurement conditions such as the start time, number of measurement data items, and memory usage status are displayed in real time. The **[Measurement Conditions]** tab is only displayed during measurement.
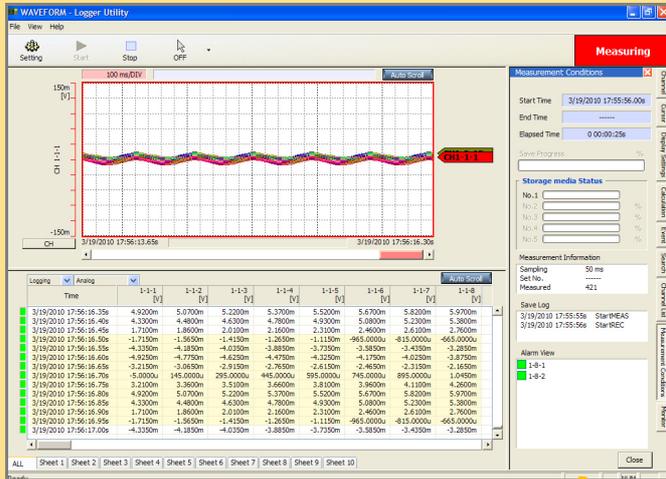
Elapsed Time

Save Progress

The progress rate for saving data is indicated by a numerical value and bar.

Calculation formula for progress rate

$$\frac{\text{Number of measurement data items}}{\text{Number of setting data items}} \times 100 \ [\%]$$

Measurement Information

This area displays the sampling, number of setting data items, and number of measurement data items.

Save Log

This area displays the save status since the start of measurement.

Alarm View

This area displays the alarm output status in real time.
This area displays the warning status since the start of measurement.
Red: Alarm activated
Green: Alarm not activated

Measurement start time

Scheduled measurement end time

This is not displayed when waiting for a trigger, when external sampling (Available only with the 8423, LR8101, LR8102), and when continuous recording.

Removable Storage Status

The CF card/USB flash drive usage status is displayed in real time for each logger. (Up to 5 loggers)

Click

6.9 Monitor Display

Instantaneous values of each channel are displayed in real time as digital values.

Click the **[Monitor]** tab on the right side of the main screen to open the display window, and confirm the instantaneous values of each channel. (The **[Monitor]** tab is only displayed during measurement.)
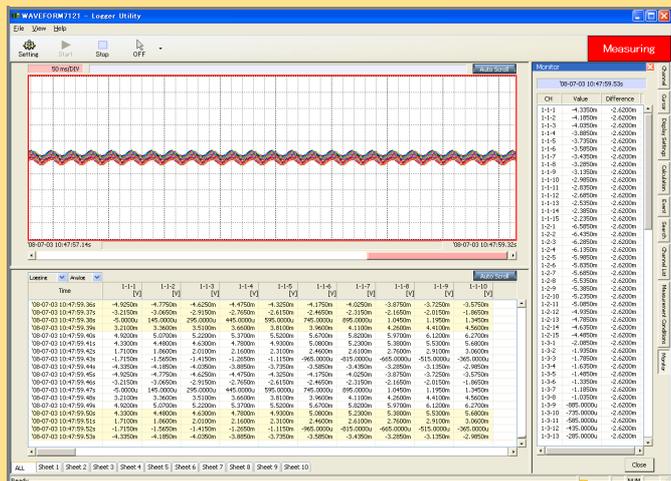
Value

This indicates the current measurement values. The values are updated as needed at the set update time. When the display is logic, "1" is displayed when in the HIGH state, and "0" when in the LOW state.

CH

This indicates the channel number.

Difference

This indicates the differences between the current measurement values and those of the sampling immediately before.

Click

If there is no data for the low-speed unit at the latest position during dual sampling (Available only with the 8423), the last measured data is displayed. In such a case, the character background is gray.

6.10 Checking Unit Information

This section describes how to display LR8410-20, LR8450-01 unit information.
Click the **[Model Information]** tab on the right side of the main screen to open the display window, and confirm the instantaneous values of each channel. (The **[Model Information]** tab is only displayed during measurement.)
For models other than the LR8410-20, LR8450-01, signal strength and remaining battery life will not be shown.

Model
Choose a Logger for which to display information (No. 1 to No. 5).
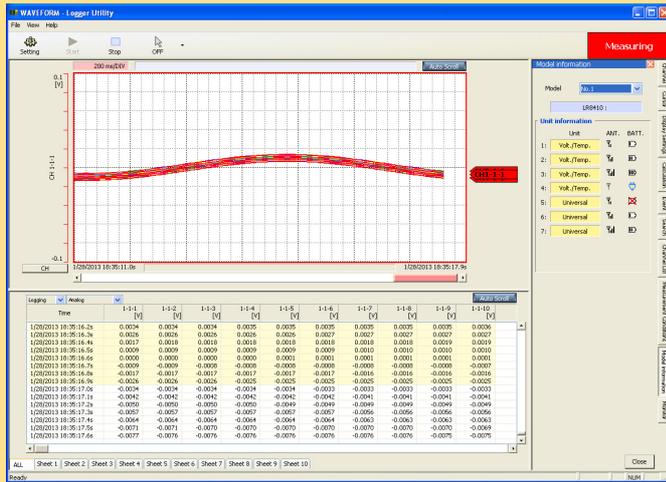
Unit
Displays comments or names associated with the units.

Signal
Displays the strength of the signal between the Logger and the unit.

Battery life
Displays the unit's remaining battery life.

Click

Saving and Reading Data

Chapter 7

You can save and read the data you measured and settings you configured with Logger Utility. The file types and extensions that can be handled are shown below.

📁 Save Directory

ABC.LUS → A setting file of Logger Utility.

AUTO.LUI → An index file for the measurement data of Logger Utility. It is created when the auto save mode is other than standard, and waveform files such as AUTO.LUW and AUTO1.LUW are read simultaneously.

AUTO.LUV → A display settings file for AUTO.LUW. It is created automatically when reading is performed. The file cannot be read by itself.

AUTO.LUW → A measurement file of Logger Utility. It is read together with AUTO.LUV.

WAVE.MEM → A measurement file from measurement with the 8423, 8430-20, LR8431-20, LR8432-20 or LR8410-20, LR8450, LR8450-01, LR8101, or LR8102. When reading is performed, the display settings file named WAVE.LUV is created.

20140531.LUX → 20140531.LUX: This file was obtained by converting an HRP2 format file measured with the LR5000 so that it could be loaded with the Logger Utility using the **[Open Waveform File in External Data Format]** command.
When the file is loaded, a display settings file with the filename 20140531.LUX will be created.

NOTE
- When a waveform file (.LUW, .MEM, .LUX) or index file (.LUI) is read, the display settings file (.LUV) is also read together. If no display settings file exists, it is created automatically. Furthermore, when the application ends, the setting conditions are written automatically to the display settings file. However, when reading data saved to, for instance, a CD-R, the display conditions cannot be saved.
- When an index file (.LUI) is read, waveforms are not displayed if the waveform file (.LUW) from the time of measurement does not exist. When copying or moving files, be sure to copy or move both the index file and waveform file together.
- A display file (.LUV) cannot be read by itself.

7.1   Saving and Reading Measurement Data

7.1.1   Saving Measurement Data as Text

This section describes saving the measurement data obtained by Logger Utility in text format.
Binary data converted to a text format is saved in that format.

1. **Click [Save File in Text Format] from the File menu.**
    The [Save File in Text Format] dialog appears.

2. **Select the target sheet for which to save measurement data.**

3. **Click check boxes to select the channels to be saved.**

4. **Enter the file name (p. 211).**

5. **Click the [Save] button.**
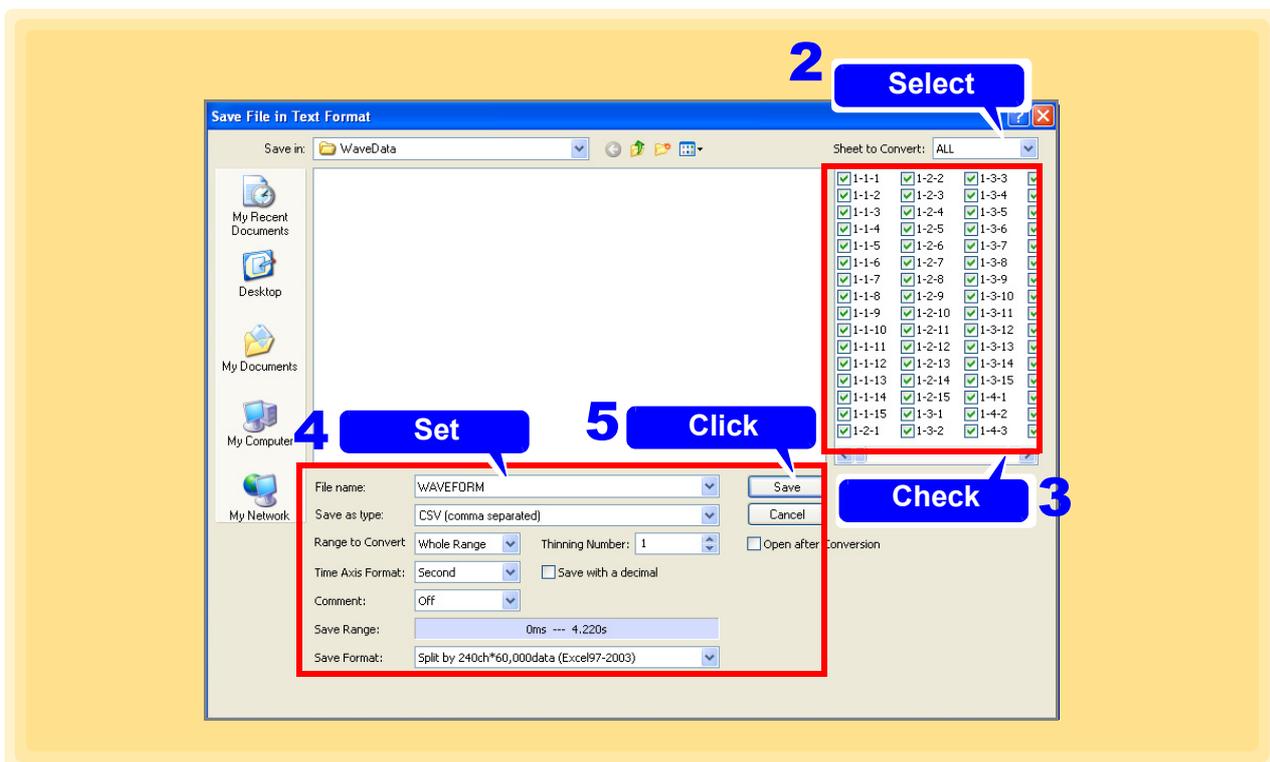
NOTE   A file saved in text format cannot be read with Logger Utility.

File Name   Enter any file name.

Save as Type (File Type)   Select the save format

File Type	Extension
CSV (Comma separated)	.CSV
CSV (Semicolon separated)	.CSV
CSV (Use system setting)	.CSV
Text (Space separated)	.TXT
Text (Tab separated)	.TXT

Range to Convert   Specify the range for saving data

Setting Items	Explanations
Whole Range	Save waveform data for the whole range.
Between A-B	Save waveform data for the section between cursor A and cursor B. If there is only one cursor, the data from the cursor position to the end is saved.

Thinning Number   Enter a value by clicking the spin buttons.
If the value for the thinning number is 1, all data is saved. In other cases, data is thinned at the specified interval and then saved.

Time Axis Format   Select from the list.

Setting Items	Explanations
Absolute Time	Save time data with the absolute time measurement started set as the reference.
Relative Time	Save time data with the time measurement started set to 0.
Second	Save time data with the time measurement started set to 0 and indicated in seconds. When **[Second]** is selected, the **[Save with a decimal]** checkbox will be displayed. Selecting this checkbox causes the unit for time values to be omitted.
Point	Save time data with the time measurement started set to 0 and as the number of data points.

Comment   Select from the list.

Setting Items	Explanations
OFF	Does not output comments.
Header	Outputs comments at the beginning of the file.
Value	Outputs comments immediately before the data section of the file.
Both	Outputs comments in both the header and the data section of the file.

Save Format   Select the desired item

Setting Items	Explanations
Split by 240ch*60,000data (Excel97-2003)	Measurement data is divided with 240 channels * 60,000samples.
Split by 600ch*1,000,000data (Excel2007 or later)	Measurement data is divided with 600 channels * 1,000,000samples.
No split	Measurement data is saved at one file.
CH-info. is arranged to a data part (split: Excel97-2003)	The channel information is appended to data header and measurement data is divided with 240 channels * 60,000samples.
CH-info. is arranged to a data part (split: Excel2007 or later)	The channel information is appended to data header and measurement data is divided with 600 channels * 1,000,000samples.
CH-info. is arranged to a data part (no split)	The channel information is appended to data header and m Measurement data is saved at one file.

Internal Format of CSV Format File and Text Format File

A CSV format file and text format file consist of a header section and a data section. The header section contains the following information regarding measurement channels. (The file in the figure is a CSV format file.)
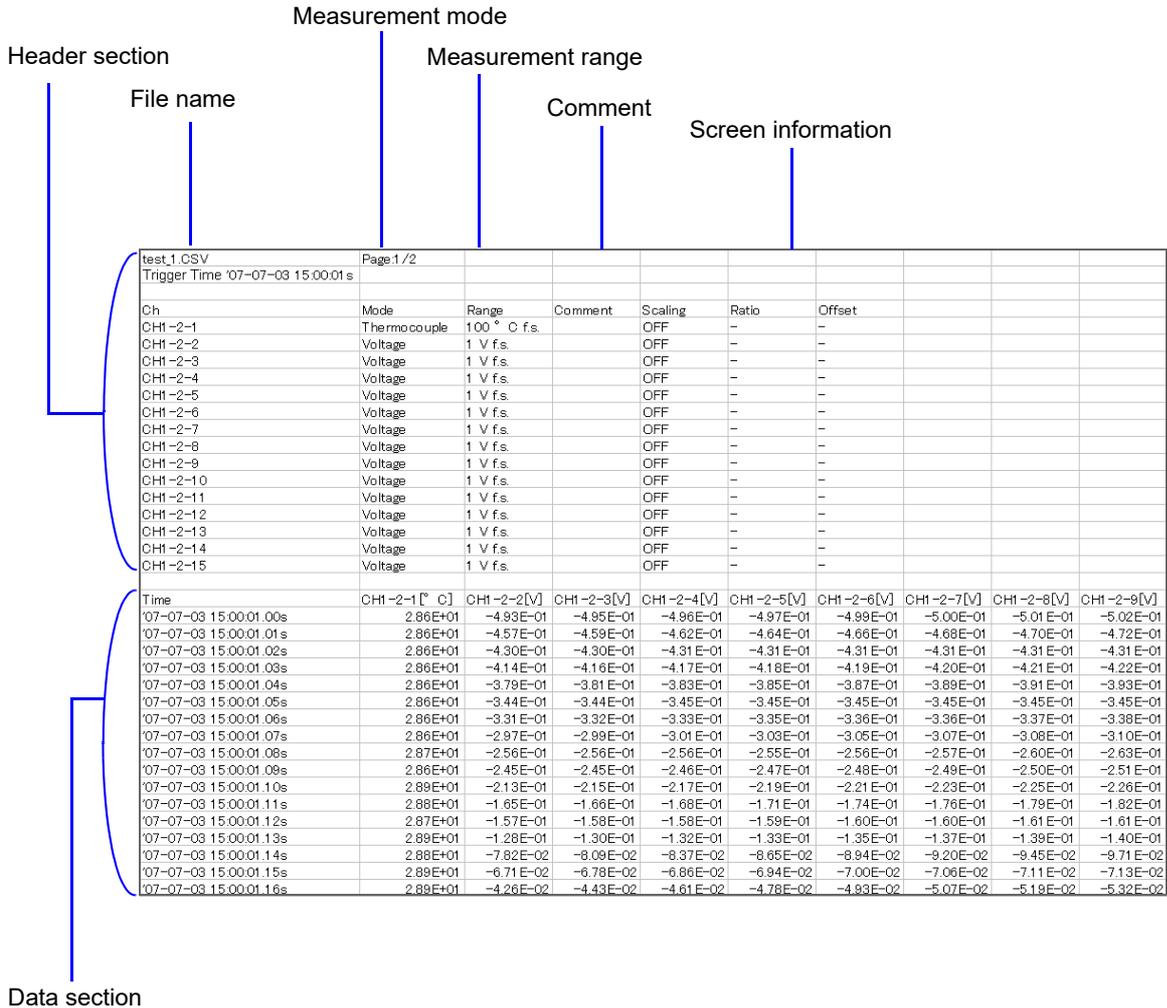
7.1.2 Batch-saving Measurement Data as Text

This section describes how to save files saved by the Logger (.MEM format) as text files.
To convert binary data (.MEM format) to the text format, simply save the file in question as a text file.

1. Click **[File]-[Batch conversion as text format]** on the menu bar.
The **[Batch conversion as text format]** dialog box will be displayed.

2. Click the **[Browse]** button and choose the file you wish to convert on the **[Open]** dialog box.
Choosing a file causes the name of the file targeted for conversion to be shown in the conversion file list.

3. Click the **[Browse]** button and choose the destination (converted) file on the **[Browse For Folder]** dialog box.
Choosing a file causes the path to the file to be shown in the **[Output folder]** field.

4. Configure **[Thin Out]** (p. 214) and other settings.

5. Select **[Combine and output on the same time axis]** as necessary.
If the checkbox is selected, the conversion results for all files being converted will be output after being merged to the same time axis.
Limit: Up to 10 files. All files being converted must use the same recording interval.

6. Click the **[Convert]** button.
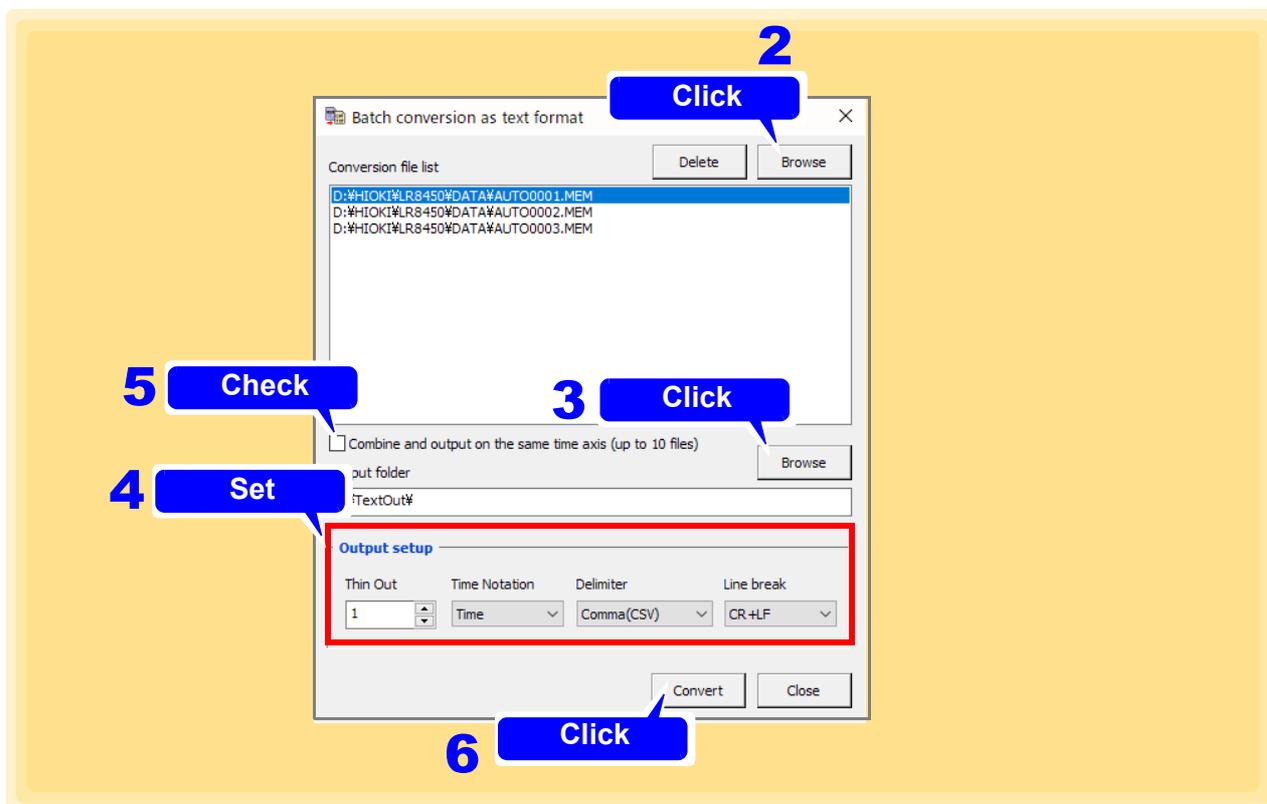
NOTE
- Files saved in the text format cannot be loaded using the Logger Utility.
- Measured data acquired using the Logger Utility cannot be converted to text format in bulk.

Thin Out Click the spin buttons to enter the desired value. When the thin-out value is 1, all data will be saved. Otherwise, data will be thinned using the specified interval before being saved.

Time notation

Setting Items	Explanations
Time	Saves time data using the time at which measurement started as 0.
Date	Saves time data using the absolute time at which measurement started as the base value.
Data Num	Saves time data as a number of data points with the time at which measurement started as 0.

Delimiter

Setting Items	Explanations
Comma (CSV)	Uses a comma character as the delimiter.
Semicolon (CSV)	Uses a semicolon character as the delimiter.
Use system setting (CSV)	Uses the delimiter set in Windows.
Space (TXT)	Uses a space character as the delimiter.
Tab (TXT)	Uses a tab character as the delimiter.

Line break

Setting Items	Explanations
CR+LF	Uses CR+LF as the line terminator.
CR	Uses CR as the line terminator.
LF	Uses LF as the line terminator.

To delete a filename from the conversion file list

To delete a file that has been registered in the file list or cancel the batch-conversion process, select the filename on the list and click the **[Delete]** button.
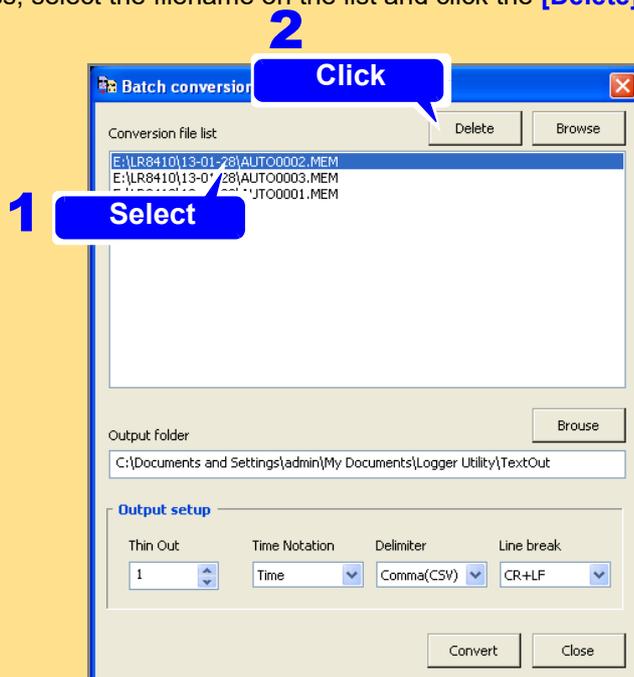
7.1.3 Combining Measurement Files

This section describes how to combine files saved by the Logger (.MEM format) into a single file.

1. **Click [File]-[Combination of division files] on the menu bar.**
The **[Combine files]** dialog box will be displayed.

2. **Click the [Add] button and choose the files you wish to combine on the [Open] dialog box.**
Choosing a file causes its name to be shown on the file list.

3. **Click the [Up] and [Down] buttons as necessary to change the order of the files being combined.**
If there is a discontinuity in the measurement data contained in the files, the check buttons in the file list will disappear.

4. **Click the [Combine] button.**

5. **Specify the output (combined) filename on the [Open] dialog box and click the [Combine] button.**

Combine files						
					2 Click	Add
No.	File Name	Model	Data count	Trigger Time		Delete
☑ 1	AUTO0001.MEM	LR8410	600	1/28/2013 9:09:14		
☑ 2	AUTO0002.MEM	LR8410	600	1/28/2013 9:09:14	✕	Delete all
☑ 3	AUTO0003.MEM	LR8410	158	1/28/2013 9:0	**3** Click	
						Up
						Down
					4 Click	
						Combine
					0%	Close
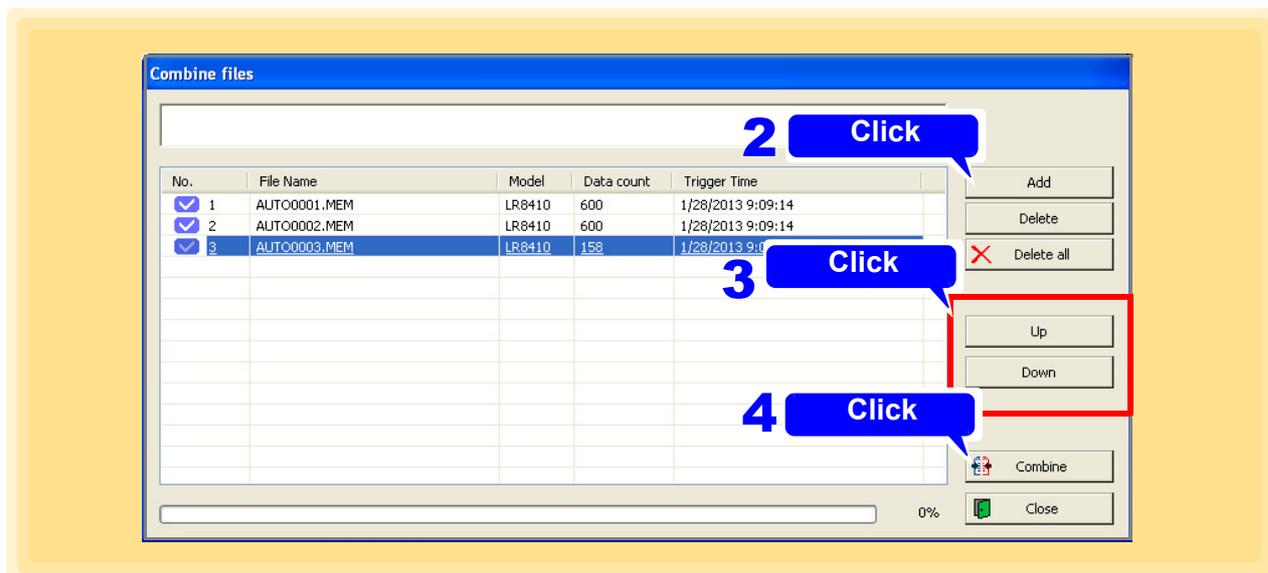
NOTE   If the files' measurement times or measurement conditions differ, or if files generated by different Loggers are mixed, the software may be unable to perform the processing to combine the files properly.

To delete a file from the combine file list

To delete a file that has been registered in the combination list or cancel the combination process, select the filename on the list and click the **[Delete]** button. To delete all files from the list, click **[Delete all]**.
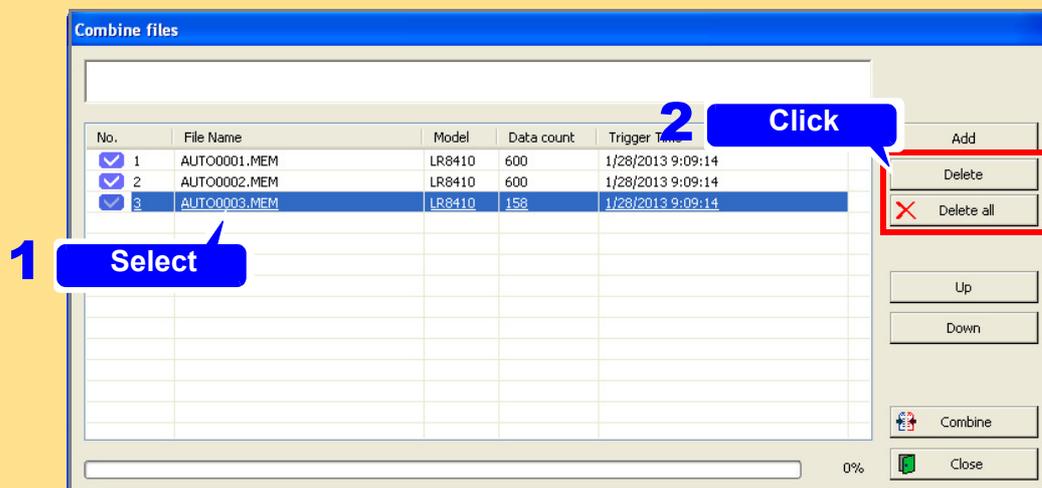
7.1.4 Converting Measurement Data to an Excel File

This section describes outputting the measurement data obtained by Logger Utility to Excel.

1. Click **[Output Data to Excel]** from the File menu.
The **[Output Data to Excel]** dialog appears.

2. Select the target sheet for which convert measurement data.

3. Click check boxes to select the channels to be converted.

4. Set the **[Range to Convert]** and Others (p. 218)

5. Click **[OK]** and then a conversion is started.
If you need to save the data, save the data on Excel.

Example of saving as an Excel file:

Range to Convert	**Specify the range for converting data**

Setting Items	Explanations
Whole Range	Convert waveform data for whole range.
Between A-B	Convert waveform data for the section between cursor A and cursor B. If there is only on cursor, the data from the cursor position to the end is converted.

NOTE Excel might cause an out of memory error when there are a lot of cells. In this case, please narrow the range to convert by A-B cursor.

Thinning Number	**Enter a value by clicking the spin button.**

If the value for the thinning number is 1, all data is converted. In other cases, data is thinned at the specified interval and then converted.

Time Axis Format	**Select the desired item from the list**

Setting Items	Explanations
Absolute Time	Convert time data with the absolute time measurement started set as the reference.
Relative Time	Convert time data with the time measurement started set to 0.
Second	Convert time data with the time measurement started set to 0 and indicated in seconds.
Point	Convert time data with the time measurement started set to 0 and as the number of data points.

Comment	**Select from the list.**

Setting Items	Explanations
OFF	Does not output comments.
Value	Outputs comments immediately before the data section of the file.

Channel Info.	**Select from the list.**

Setting Items	Explanations
OFF	Does not output channel information such as range before measurement data
ON	Outputs channel information such as range before measured data

Save Format　　**Select from the list according to Excel version.**
(due to row limitations and other version dependencies)

Setting Items	Explanations
Split by 240ch✻60,000 data (Excel97-2003)	Measurement data is divided with 240 channels ✻ 60,000samples.
Split by 600ch✻1,000,000 data (Excel2007 or later)	Measurement data is divided with 600 channels ✻ 1,000,000samples.

Specify transfer destination template file

If you want to use Excel template created in advance, please check and select a template file.
You can work efficiently by using templates that create graphs of measurement data and templates that calculate measurement data.
When transferring data to Excel, the first row is the trigger time, the second row is the channel number, and the third row is the data. If you set the channel information to ON, the data position changes depending on the number of channels. To fix the data position, turn off the channel information setting.

Example of an Excel template for creating a graph
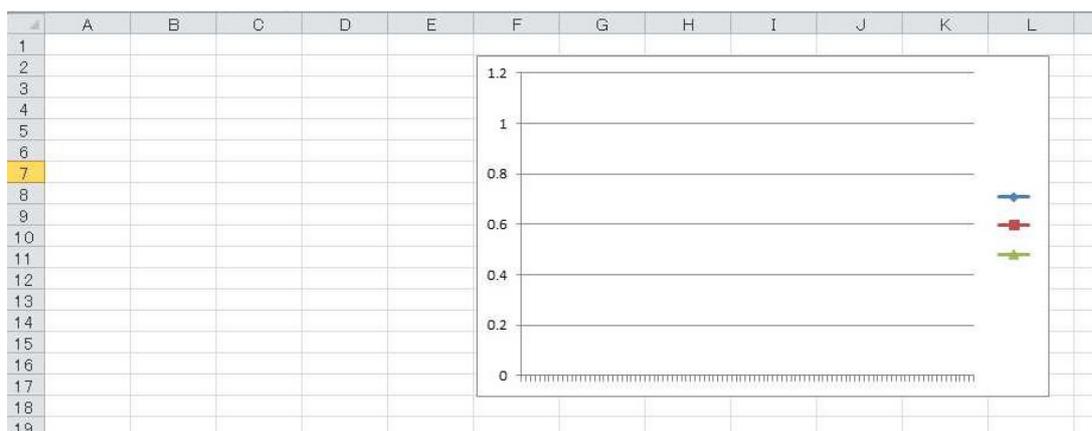
Example of outputting data by specifying Excel template

NOTE　　When measuring, data can be output to Excel.

7.1.5   Reading Measurement Data

This section describes reading the waveform files (Extension: .LUW) and index files (Extension: .LUI), measured in Logger Utility, data of waveforms measured with the Logger (Extension: .MEM), and files created by converting an HRP2 file measured with the LR5000 (Extension: .LUX).

1. **Click [Open Waveform File] from the File menu.**
The **[Open Waveform File]** dialog box appears.

2. **Select the file to read.**

3. **Click the [Open] button.**
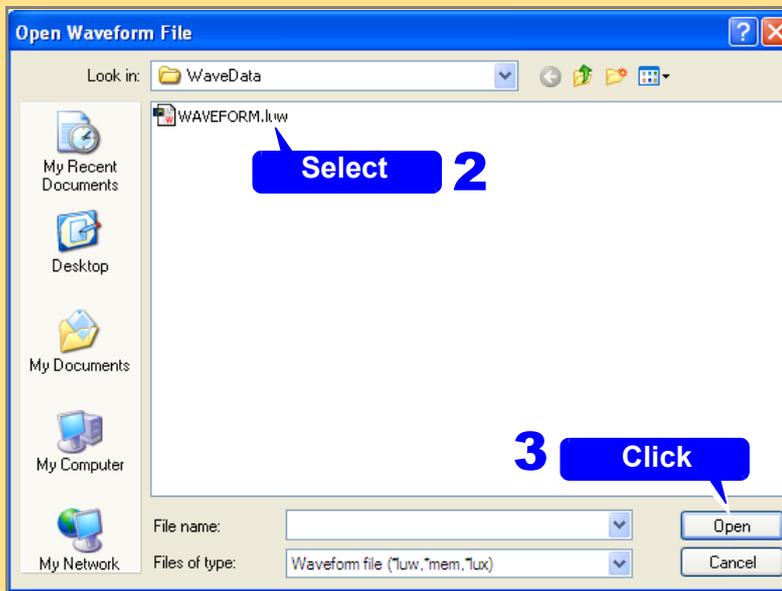
NOTE   When saving measurement data to the Logger's removable storage (CF card, SD card or USB flash drive), while simultaneously measuring with the Logger Utility, the following phenomena may occur due to differences between the Logger's clock and the PC's clock.

- The times for the initial data in the files of Logger Utility and the Logger will be different, even though they are for the same measurements.
- When files are split at regular intervals in auto save mode, the files will not be split at the exact times.
- When synchronized measurement (Available during measurements only with the 8423, LR8450, LR8450-01, or LR8102) is performed and data is saved by splitting files at regular intervals in auto save mode, the split position in each of the Loggers will differ.
- If you convert the hrp2 format file measured by the LR5000 to be able to load into the Logger Utility by performing the operation according to "Open Waveform File in External Data Format" (p. 226), you can create an LUX format file and load that file.

7.2 Saving and Reading Setting Data

You can save the settings configured with Logger Utility and the display settings. It is also possible to read set data. (Extension: .LUS)

> **NOTE**   Measurement waveforms are not included in setting data.

7.2.1 Saving Setting Data

1. **Click [Save Setting File] from the File menu.**
The **[Save Setting File]** dialog box appears.

2. **Specify the location to save the file.**

3. **Enter a file name.**

4. **Click the [Save] button.**
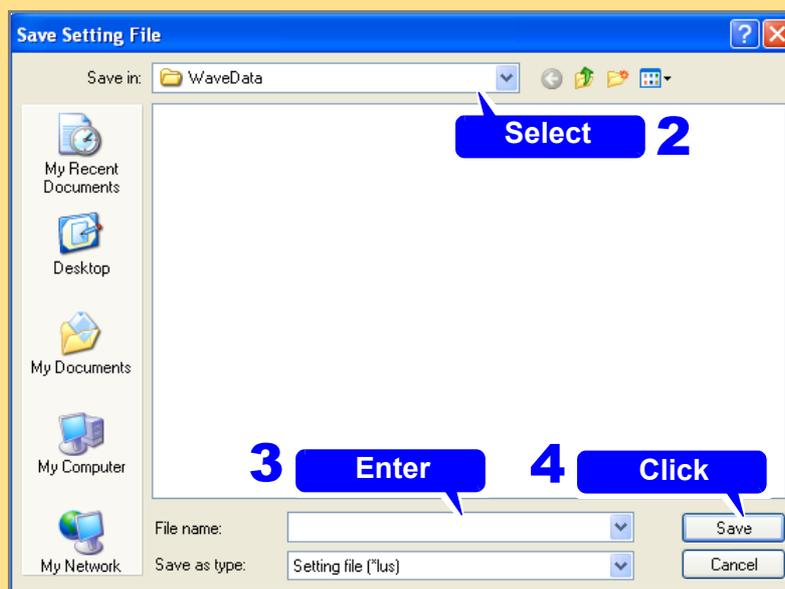
7.2.2 Reading Setting Data

1. Click **[Open Setting File]** from the File menu.
The **[Open Setting File]** dialog appears.

2. Select the file to read.

3. Click the **[Open]** button.
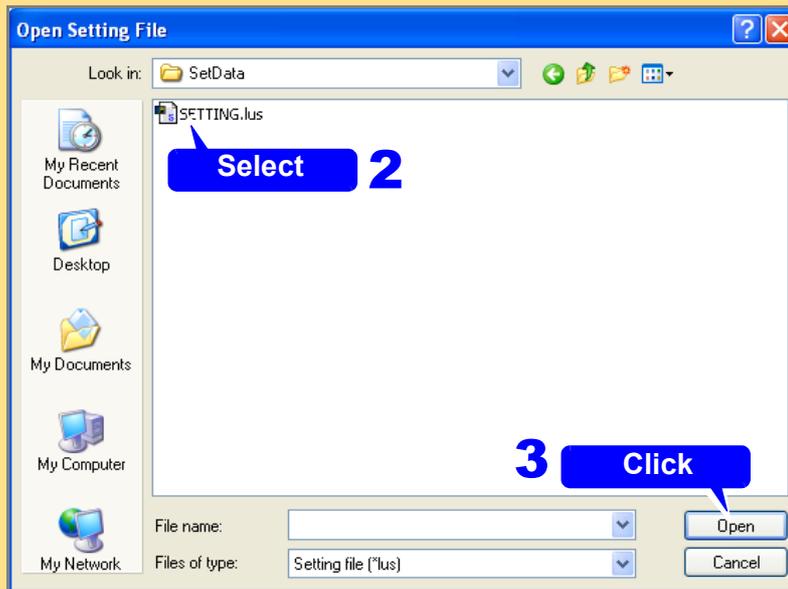
7.3 Automatically Transferring Measurement Data to Excel

While measuring with the Logger Utility, data can be automatically transferred to Excel in real time.

7.3.1 Real-Time Transfer Settings

1. In the menu bar, select **[File]-[Transfer real time data to Excel...]**.
The **[Real time data transfer to Excel]** dialog appears.

2. Select **[Transfer real time data to Excel]**.

3. Select which channels' data to transfer to Excel.

4. Enter the first cell for data transfer to Excel.
Data is transferred to Excel starting with the cell entered here. Enter a valid Excel cell number, from **[A1]** to **[IV65000]**.

5. Enter the maximum number of data values to be transferred to Excel.
Enter a value from 1 to 65,000.

6. Select the time axis label type from the list.

Setting Items	Explanations
Absolute Time	Display absolute time from the start of measurement.
Relative Time	Display relative time from zero at the start of measurement.
Second	Display relative time in seconds from zero at the start of measurement.
Point	Display relative time as the number of data points from zero at the start of measurement.

7. To repeat data transfer from the line specified in step **4** after the amount of data specified in step **5** has been transferred to Excel
Select **[Overwrite from the start cell when the data are transferred up to the last cell]**.

8. Click **[OK]**.

NOTE	• Real-time data transfer is not possible when more than 120 channels are selected. Select no more than 120 channels.
	• During real-time data transfer, Logger Utility waveform calculations (Z1 to Z60) cannot be changed.
	• Attempting to use Excel during real-time data transfer may interfere with the transfer and result in loss of measurement data. Avoid using Excel during data transfer.
	• If a sheet having the same name as the file specified for saving Logger Utility measurements is already open in Excel, data is transferred into that sheet. If such a sheet is not already open, one is created with the specified save file name (but without appended serial number).
	• If multiple sheets are open with the same file name, data will be transferred into any sheet.
	• The destination cell contents are cleared when transfer starts, and the cell format and display width are adjusted.
	• When "Overwrite from the start cell..." is selected, and a data transfer is delayed for more than one cycle, data acquired during the delay may be lost.
	• Data transfer typically refreshes about once per second, but may be slower if the Logger Utility and Excel processes are heavily loaded.
	• When attempting to transfer data for many channels and lines, Excel may exhaust available memory. In that case, reduce the amount of data to be transferred.

7.3.2 Real-Time Transfer Example

Specify transfer destination template file

If you want to use Excel template created in advance, please check and select a template file.

You can work efficiently by using templates that create graphs of measurement data and templates that calculate measurement data.

When transferring data to Excel, the first row is the trigger time, the second row is the channel number, and the third row is the data. If you set the channel information to ON, the data position changes depending on the number of channels. To fix the data position, turn off the channel information setting.

Example of an Excel template for creating a graph

Example of outputting data by specifying Excel template

7.4 Using Files in an External Data Format

Once you have converted an HRP2 format file measured with the LR5000 to a LUX format file that can be loaded with the Logger Utility, you can open it with the Logger Utility. You can also convert data measured with the Logger Utility to an HRP2 format data file that can be loaded with the LR5000 Viewer and save it as such.

7.4.1 Open Waveform File in External Data Format

Once you have converted an HRP2 format file measured with the LR5000 to a LUX format file that can be loaded with the Logger Utility, you can open it with the Logger Utility. To load HRP2 format data, you will need the HRP2 file, INI file, and BIN file. If any of these files is missing, you will not be able to open the data.

1. Click [File]-[Open Waveform File in External Data Format] on the menu bar.

2. Specify the location of the HRP2 format file measured with the LR5000.

3. Choose [LR5000 Format (*hrp2)] as the file type.

4. Enter the filename of the HRP2 format data file measured with the LR5000.

5. Click the [Open] button.
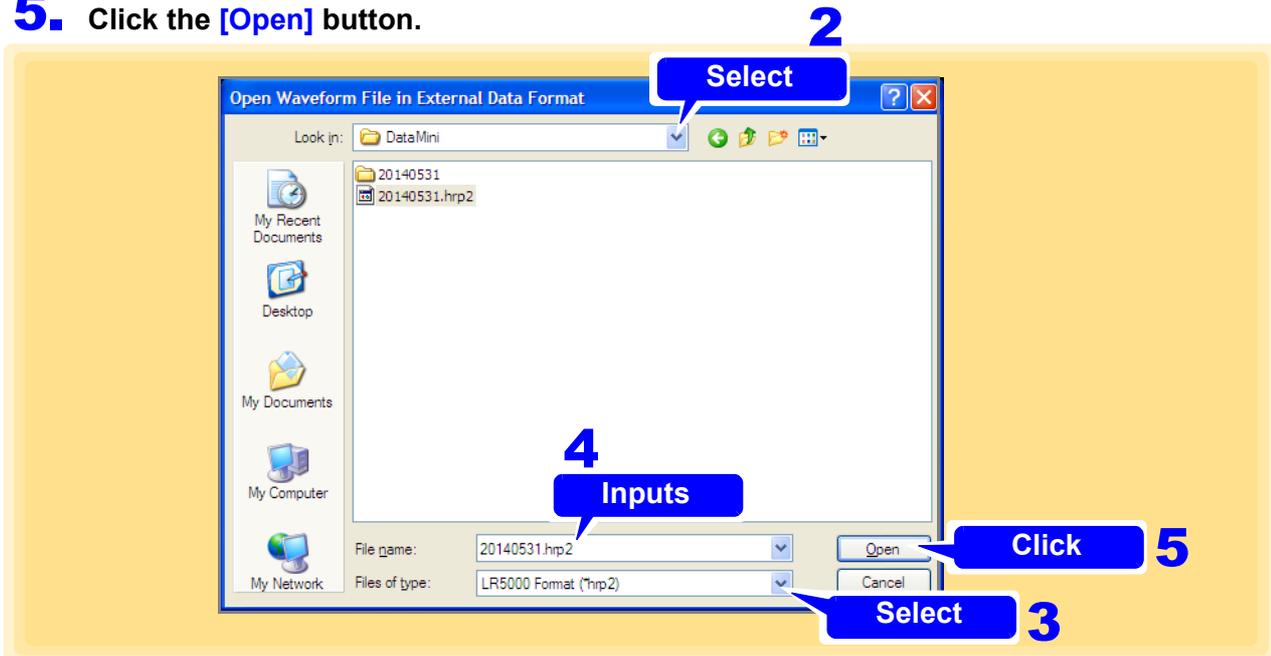
The "Convert from External Data Format to lux Data Format, and Open lux Data" dialog box will be displayed.

6. Specify the location in which to save the LUX format file that can be loaded with the Logger Utility.

7. Choose [After Conversion Format (*lux)] as the file type.

8. Enter the filename of the LUX format file.

9. Click the [Save] button.
The HRP2 format file measured with the LR5000 will be converted to a LUX format file that can be loaded with the Logger Utility, and the data in the post-conversion LUX format file will be displayed in the Logger Utility.
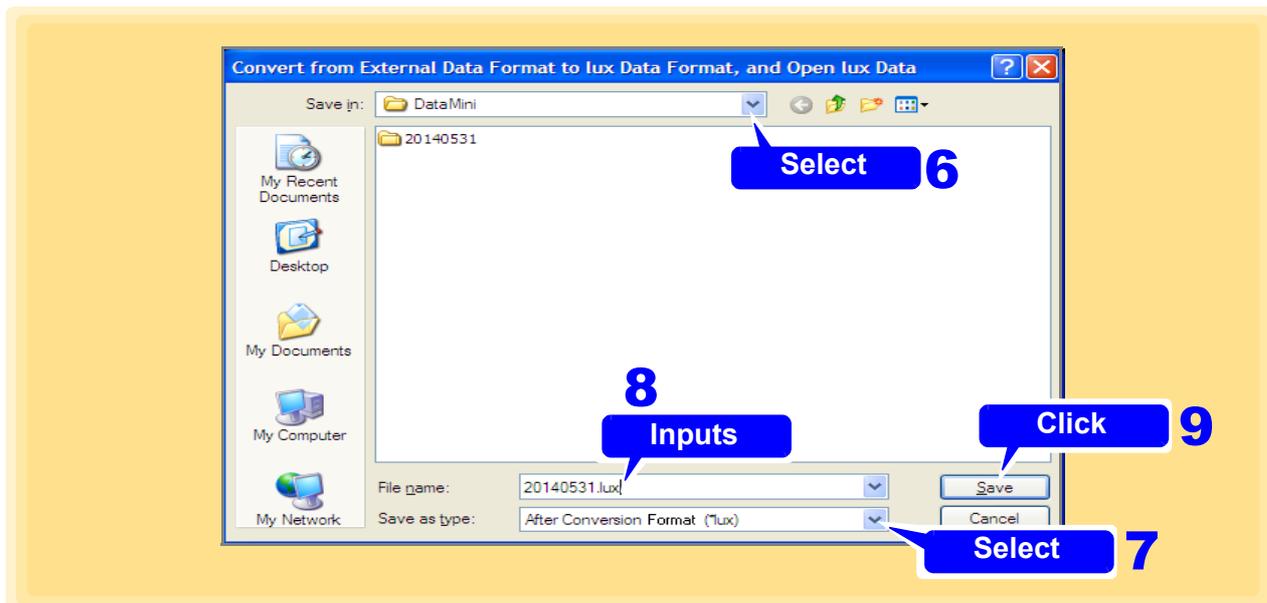
The LUX file shown below was created by converting an HRP2 format file measured with the LR5000 to a LUX format data file that can be loaded with the Logger Utility. Opening a LUX format file with the Logger Utility will cause an LUV (display settings) file to be created. The post-conversion upper and lower limit values will be set to the same values as the maximum and minimum values for all converted channels.
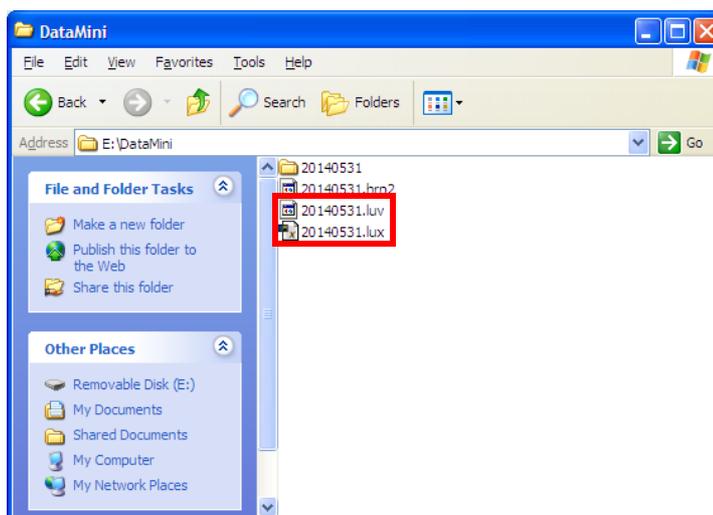
If there is data from multiple loggers in the HRP2 format file, a series of separate, sequentially numbered files will be created as follows, assuming the post-conversion filename for the first logger is "20140531.lux": 20140531_001.lux for the second logger, 20140531_002.lux for the third logger, etc. Since only the first LUX format data file will be opened after conversion, you must use the "Open Waveform File" dialog box to open other files by choosing [Waveform File (*luw, *mem, *lux)] as the file type and specifying the desired file.

NOTE

- If the recording interval in the HRP2 format file is 15 sec. or 15 min., a message will be displayed and you will not be able to open the file as those intervals are not supported by the Logger Utility.
- If the number of measurement items (channels) for each logger in the HRP2 format file is greater than 270, a message will be displayed, and you will not be able to open the file in the Logger Utility.
- If you open post-conversion LUX format data with the Logger Utility, **[DATA]** will be shown in the type, unit, and name fields. Additionally, operations such as starting measurement will not be available since the measurement target model will not have been registered.

7.4.2 Save Waveform File in External Data Format

You can convert data measured with the Logger Utility to an HRP2 format data file that can be loaded with the LR5000 Viewer and save it as such. After conversion, HRP2, INI, BIN, and other files will be created.

1. **Click [Save Waveform File in External Data Format] from the File menu.**
The **[Save Waveform File in External Data Format]** dialog appears.

2. **Select the target sheet for which to save measurement data.**

3. **Click check boxes to select the channels to be saved.**

4. **Enter the file name (p. 211).**

5. **Click the [Save] button.**
You can convert data measured with the Logger Utility to an HRP2 format data file that can be loaded with the LR5000 Viewer and save it as such.
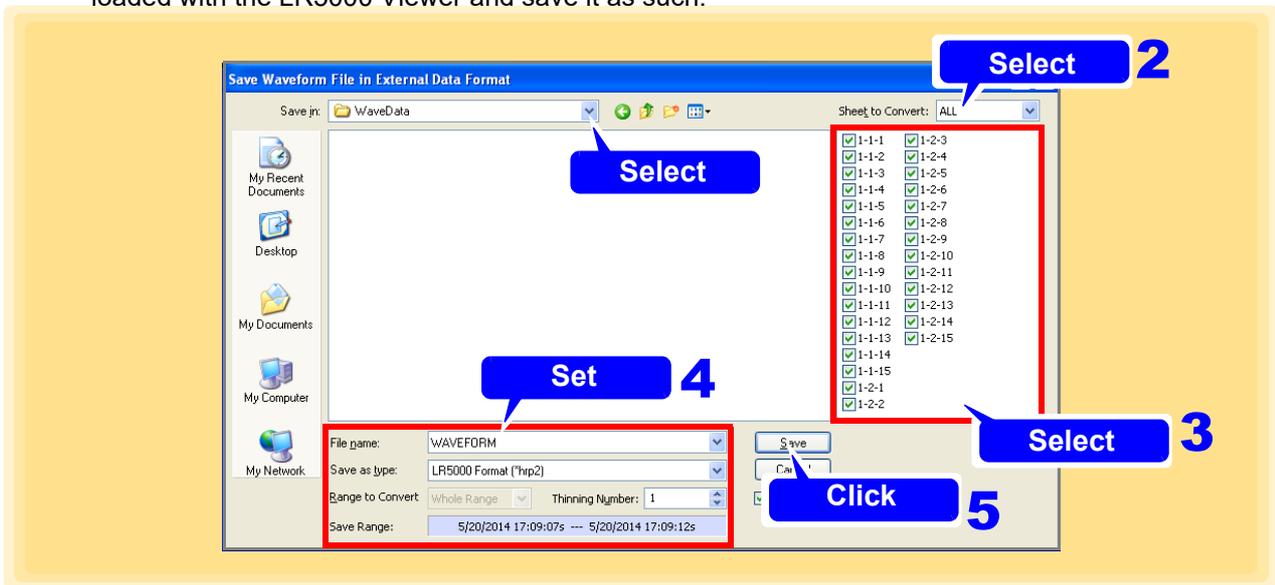
File Name	Enter any file name.

Save as type (File Type)   Select the External save format

File Type	Extension
LR5000 Format	hrp2
LR5000 and Smart Site	hrp

Range to Convert   Specify the range for saving data

Setting Items	Explanations
Whole Range	Save waveform data for the whole range.
Between A-B	Save waveform data for the section between cursor A and cursor B. If there is only one cursor, the data from the cursor position to the end is saved.

Thinning Number	Enter a value by clicking the spin buttons. If the value for the thinning number is 1, all data is saved. In other cases, data is thinned at the specified interval and then saved.
Open after Conversion	If this checkbox is selected, the file converted to the HRP2 format will automatically be opened if the LR5000 Viewer application is installed on the computer.

The HRP2 file shown below was created by converting data measured with the Logger Utility to an HRP2 format data file that can be loaded with the LR5000 Viewer.
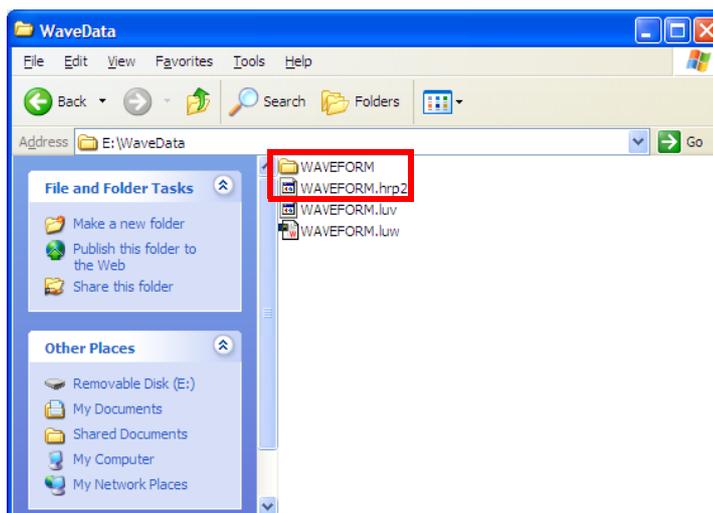
NOTE

- If the recording interval of data measured with the Logger Utility is less than 1 sec., a confirmation message will be displayed, and the file will be saved after thinning the data to a 1 sec. interval that can be opened with the LR5000 Viewer.
- If the data's start position is not 000 msec., a confirmation message will be displayed, and the file will be saved so that the data starts at the 000 msec. position so that it can be loaded with the LR5000 Viewer.
- If the file type has been set to **[LR5000 and Smart Site Compatible Format HRP]** and the number of data channels being saved exceeds 300, a message will be displayed, and you will not be able to save the file. Choose 300 or fewer channels to save. However, if the file type has been set to **[LR5000 Format HRP2]**, there is no limit on the number of channels.

7.5 Notes in Windows 7/ 8/ 10/ 11

- The setting file and waveform file that Logger Utility made are preserved in a special folder in each user by user account control function (UAC) is added by Windows 7/ 8/ 10/ 11. Therefore, another user cannot be shared with the file and waveform file.
- If waveform files have been saved in C:\Program Files\HIOKI\Logger Utility\WaveData, waveform files will not be displayed even if the folder is opened in Explorer. But waveform files are not displayed even if this folder is opened by Explorer. It is displayed by clicking the **[Compatibility Files]** displayed on a tool bar.

Windows 7
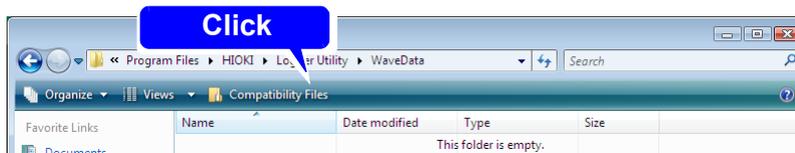
Windows 8/ 10/ 11

1. **Launch Explorer.**

2. **Enter "%LOCALAPPDATA%\VirtualStore\Program Files\HIOKI\Logger Utility\Wave-Data" in Explorer's address bar and press the ENTER key.**
The actual save destination folder will be opened.
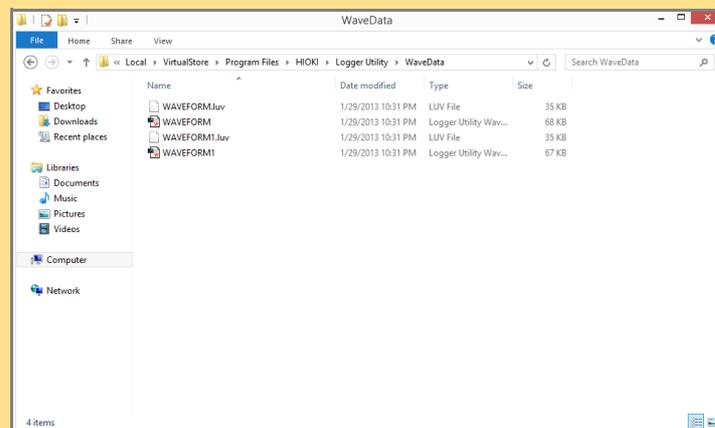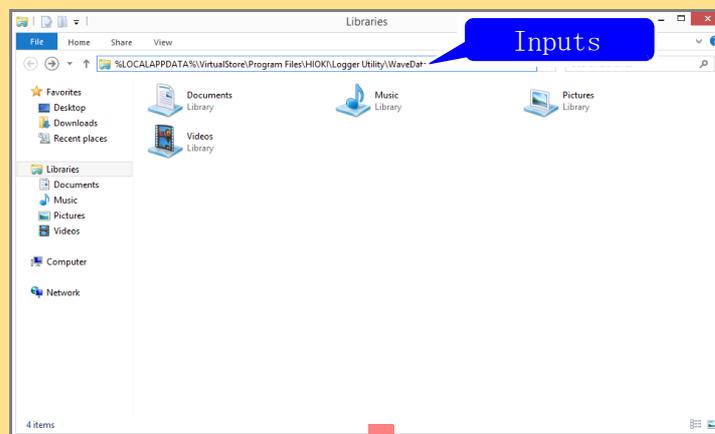
Printing

Measurement data acquired by the Logger Utility (LUW file extension) and its index file (LUI extension), as well as measurement data saved in the Logger (MEM extension), can be printed.

From the menu bar, click **[File]-[Print]**, and make settings in the **[Print Active Sheet]** dialog before printing,

Print Active Sheet

Print Area
Print type: Continuous page (print using the same time axis as the screen)
Print selection: Print displayed span / Include cursors
Span to print: '08-07-18 13:03:48 --- '08-07-18 13:19:27

Sets the print type and print selection (p. 232).

option
- [ ] Ch Marker: [ ] Print with comment(Ch without comments will not be printed)
- [ ] Gauge: ( ) First page only (•) All pages
- [ ] Ch Info (All channels may not print, in which case use separate Setting List)
- [x] Print black background as white (white waveforms print black)
- [ ] Print upper/ lower limit values to the left of waveforms

Selects the various print option items (p. 233).

Annex
- [ ] Ch Setting List   [ ] Event List   [ ] Cursor Value List

Selects the list content to be printed on the Appendix which is different from the waveform print page (p. 235).

Page
(•) All pages   from: 1
( ) Page Select   to: 1
(Number of pages: 2)

Margin(mm)
Left 20   Right 10
Top 15   Bottom 15

Sets the page to be printed and the margins (p. 236).

Printer
Printer: A4
Paper: ¥¥LAB1¥DocuCentre Color f250

Set Printer

Preview   Print   Cancel

NOTE Only the waveforms on the currently displayed sheet will be printed. To print waveforms of other sheets, display the waveforms of the sheets beforehand.

8.1 Setting the Printing Range

To set the print format and printing range of the displayed waveforms.

1. Click **[File]**-**[Print]** on the menu bar.
The **[Print Active Sheet]** dialog appears.

2. Set **[Print type]** and **[Print selection]**.

Printing range will be displayed in accordance with the selected print format and print interval.

When the print interval is checked as **[Print the span between cursors]**, print intervals are widened and the A/B cursors are printed.

Print type

Setting Items	Explanations
Print no waveforms	Waveform will not be printed.
Continuous Page (Print using the same time axis as the screen)	Print the waveform continuously across several pages.
Print the selection on one page	Compress the waveform in the selected print interval onto 1 page for printing.
Displayed screen	Print the waveform screen on display.
Print report	Print the report. When printing the report, waveform screen, and setting lists for the various channels will be printed.
Specified interval: 1 hour/page [hourly, on the hour]	Print the printing range of one page on an hourly basis. Each interval period starts **[hourly, on the hour]**. At the same time, the maximum, minimum and average values of the various channels in the printing range are also printed.
Specified interval: 1 day/page [00:00-24:00]	Print the printing range of one page on a daily basis. One interval period is **[00:00-24:00]**. At the same time, the maximum, minimum and average values of the various channels in the printing range are also printed.
Specified interval: 1 week/page [Sun.-Sat.]	Print the printing range of one page on a weekly basis. One interval period is **[Sun.-Sat.]**. At the same time, the maximum, minimum and average values of the various channels in the printing range are also printed.
Specified interval: 1 month/page [1st-31st day]	Print the printing range of one page on a monthly basis. One interval period is **[1st-31st day]**. At the same time, the maximum, minimum and average values of the various channels in the printing range are also printed.

Print selection

Not applicable when **[Print type]** is selected as **[Displayed Screen]**.

Setting Items	Explanations
Print whole span	Print waveforms of all ranges.
Print displayed span	Print waveform in the range shown.
Print the span between cursors	Print waveforms between cursors A and B (available when the A/B cursors are displayed in the waveform display screen).

NOTE   When the **[Print selection]** is selected as **[Print the span between cursors]** and only one cursor is displayed, the interval between the position of the displayed cursor and the end of the waveform will be printed.

8.2 Settings for Waveform Print Options

To select the various waveform print options. To select, click the check box to insert a check mark.

1. From the menu bar, click [File]-[Print] and make settings in the [Print Active Sheet] dialog before printing

2. Select the items to print, and the print background color.

Check

ption

☑ Ch Marker: ☐ Print with comment(Ch without comments will not be printed) — Can only be selected when **[Ch Marker]** is checked.

☑ Gauge: ⦿ First page only ◯ All pages

☑ Ch Info (All channels may not print, in which case use separate Setting List) — Can only be selected when **[Gauge]** is checked.

☑ Print black background as white (white waveforms print black)

☑ Print upper/ lower limit values to the left of waveforms

Ch Marker   Prints CH number near the waveform as a CH marker.
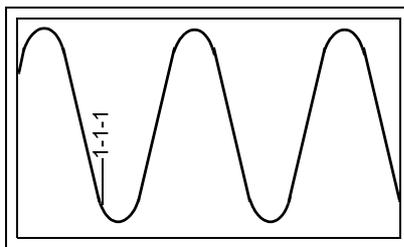
Print with comment   Prints comment near the waveform as a Ch marker.
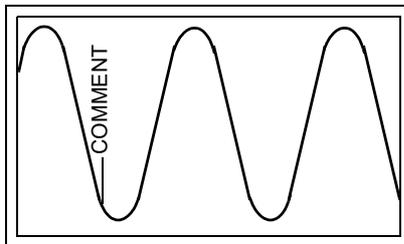
Gauge   Prints the gauge (graduations) in the left side of the waveform print area. The number of gauges that will be printed is the same as the number of gauges displayed in the waveform display portion.

Setting Items	Explanations
First page only	Print gauge in the first page only.
All pages	Print gauge in all pages.

Ch info   Prints the information of various channels in the waveform print area. (Not applicable when **[Print type]** is set as **[Print report]** or **[Specified interval]**)

- When **[Print upper/lower limit values to the left of waveforms]** is checked:
  Channel number, waveform display color, unit type, input type, range, display/DIV, filter setting, and comment will be printed.
- When **[Print upper/lower limit values to the left of waveforms]** is not checked:
  Channel number, waveform display color, range, upper/lower limit values, filter setting, and comment will be printed.

Channel Information
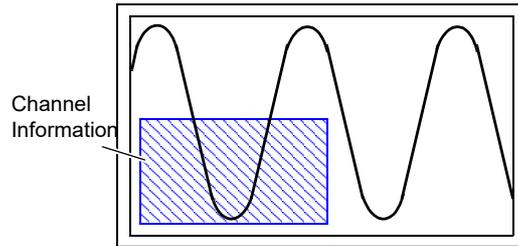
Print black background as white   Whitens the background for printing when the background of the waveform display portion is black. Waveforms that are white will be printed in black.

Print upper/lower limit values to the left of waveforms   Prints the upper limit value at the top left side and the lower limit value at the bottom left side of the waveform print area.

Upper Limit Value

Lower Limit Value
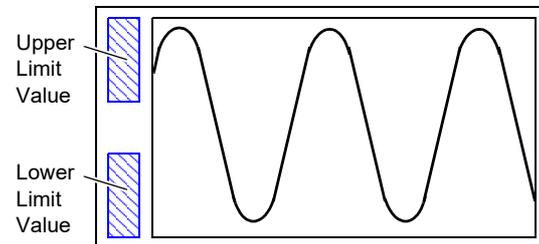
NOTE
- When **[Print with comment]** is checked, the Ch marker for channels without any comment input will not be printed.
  Be sure to click on the **[Channel]** tab found on the right side of the screen and input comments within the setting window beforehand (p. 176).
- When gauge is not displayed in the waveform display portion, gauge will not be displayed even if **[Gauge]** is checked. Make sure that gauge is displayed beforehand (p. 183).
- When number of channel is many, the printer may not be able to print channel information for all channels, and upper and lower limit values if there are too many channels.

8.3 Settings for the Appendix

To select the list content to be printed on the Appendix.

1. **From the menu bar, click [File]-[Print] and make settings in the [Print Active Sheet] dialog before printing.**

2. **Select the item(s) to print on the Annex page.**

Check

☑ Ch Setting List   ☑ Event List   ☑ Cursor Value List
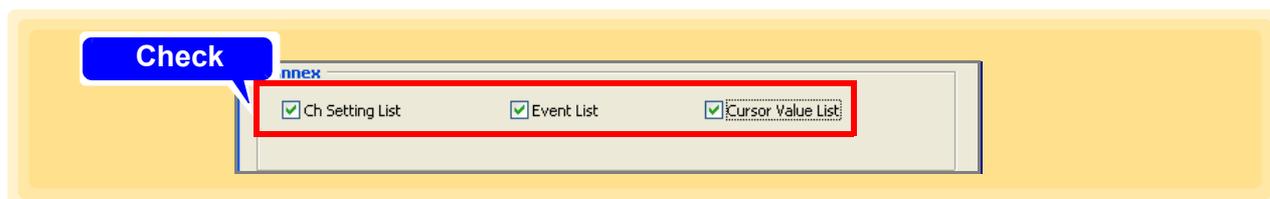
Ch Setting List   Prints the list of Unit type, Channel number, Waveform display color, Range, Input type, Display/DIV, Filter settings, and Comments.

Event List   Prints the list of Event Numbers, Event Positions, and Comments.

Cursor Value List   Prints the list of Cursor A Measurement Values and Cursor B Measurement Values, Difference in measurement value between cursors A and B, Maximum value, minimum value, and average value between cursors A and B.

NOTE
- When the cursors A/B are not displayed in the waveform display portion, the Cursor Value List will not be printed. Make sure to display cursors A/B beforehand (p. 178).
- Only the cursor measurement value will be printed when there is only one cursor in the waveform display portion.

<div style="background-color: #d5d5f5;">

8.4 Printer Settings/Printing

</div>

Set the page(s) to be printed and the margin(s).

1. From the menu bar, click **[File]-[Print]** and make settings in the **[Print Active Sheet]** dialog before printing

2. Set the page to be printed, and the upper, lower, left and right margins.

3. (as needed)
Select the printer and paper size.

4. Click the **[Print]** button to start printing.
Printing starts.
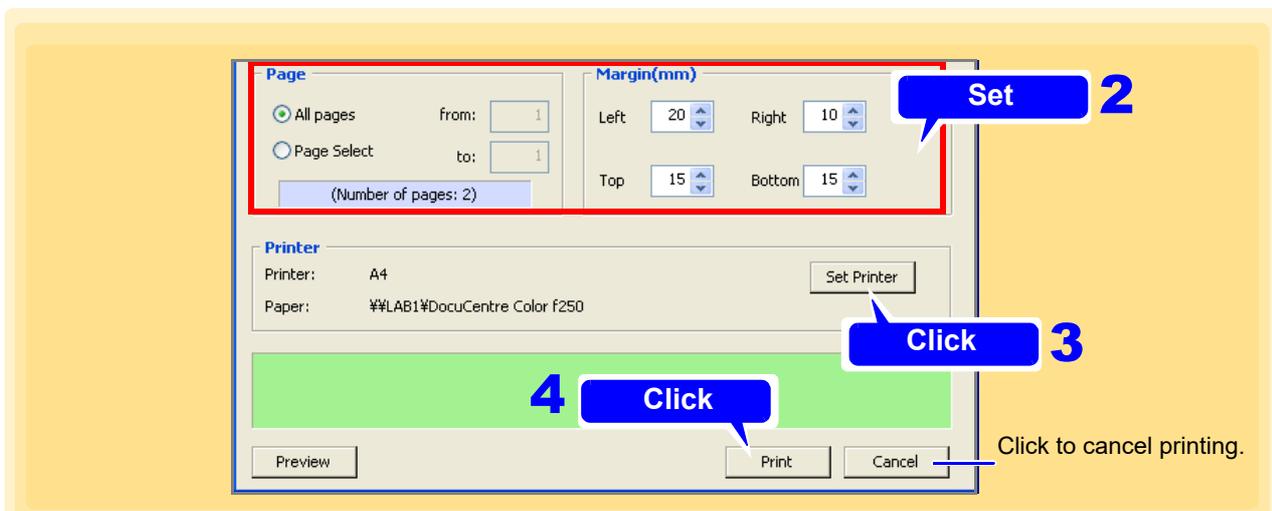
NOTE   Paper size and margin setting may lead to the Logger printing inaccurately.

8.5 Copy to Clipboard

To copy print images to the clipboard. Copied print images can be pasted on Word documents, etc.

1. From the menu bar, click **[File]-[Print]** and make settings in the **[Print Active Sheet]** dialog before printing

2. Click the **[Preview]** button to display the **[Print Preview]** dialog.

3. Click the **[To clipboard]** button to copy the print image displayed in the **[Print Preview]** dialog to the clipboard.

Click **2**

Preview | Print | Cancel

Show the page currently on display.

Select the display zoom range.

Start printing.

Click **3**

Print Preview

Prev Page | 1/2 | Next Page | Zoom: Window Height | Print | To clipboard | Cancel

Select the page on display.

Close the dialog.

Trigger:'09-07-17 11:18:22,006 (10 ns) <WAVEFORM0136.lwv>

8.6 Print Example

Print Example 1: Print Continuous Pages (during selection of waveform printing option)

Upper limit values

Cursor

Comment (p. 66)

Event Mark

COMMENT1

CH Maker

Gauge

Lower limit values

Channel information

Channel	Color	Unit	Input Type	Range	Display/DIV	Unit	Filter	Comment
1-1-1		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	aa
1-1-2		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	bb
1-1-3		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	cc
1-1-4		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	dd
1-1-5		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ee
1-1-6		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ff
1-1-7		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	gg
1-1-8		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	hh
1-1-9		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ii
1-1-10		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	jj
1-1-11		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	kk
1-1-12		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ll
1-1-13		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	mm
1-1-14		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	nn
1-1-15		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	oo

All the waveforms

Trigger: '08-07-17 11:18:22.00 (10 ms) :WAVEFORM7136.luw>

Sampling Speed

Comment (p. 66)

Show the positions of the printing ranges of all the waveforms.

Print Example 2: Print Report

Channel	Color	Range	Unit	Filter	Lower		Upper	Comment
1-1-1		100 mV f.s.	[V]	OFF	-240.000m	~	60.000m	aa
1-1-2		100 mV f.s.	[V]	OFF	-230.000m	~	70.000m	bb
1-1-3		100 mV f.s.	[V]	OFF	-220.000m	~	80.000m	cc
1-1-4		100 mV f.s.	[V]	OFF	-210.000m	~	90.000m	dd
1-1-5		100 mV f.s.	[V]	OFF	-200.000m	~	100.000m	ee
1-1-6		100 mV f.s.	[V]	OFF	-190.000m	~	110.000m	ff
1-1-7		100 mV f.s.	[V]	OFF	-180.000m	~	120.000m	gg
1-1-8		100 mV f.s.	[V]	OFF	-170.000m	~	130.000m	hh
1-1-9		100 mV f.s.	[V]	OFF	-160.000m	~	140.000m	ii
1-1-10		100 mV f.s.	[V]	OFF	-150.000m	~	150.000m	jj
1-1-11		100 mV f.s.	[V]	OFF	-140.000m	~	160.000m	kk
1-1-12		100 mV f.s.	[V]	OFF	-130.000m	~	170.000m	ll
1-1-13		100 mV f.s.	[V]	OFF	-120.000m	~	180.000m	mm
1-1-14		100 mV f.s.	[V]	OFF	-110.000m	~	190.000m	nn
1-1-15		100 mV f.s.	[V]	OFF	-100.000m	~	200.000m	oo

Trigger: '08-07-17 11:18:22.00s (10 ms) <WAVEFORM7136.luw>   1/1

Print Example 3: Cursors A-B

Trigger: '08-07-17 11:18:22.00s (10 ms) <WAVEFORM7136.luw>   1/1

Print Example 4: Specified interval: 1 hour/page

When [option] gauge, upper and lower limit values are selected

Example: Print waveforms measured from 13:03:48

Page One (Print period: 13:00 to 14:00)
Page Two (Print period: 14:00 to 15:00)
- •
- •
- •

Print Example 5: Ch Setting List, Event List, Cursor Value List

Channel	Color	Unit	Input Type	Range	Display/DIV	Unit	Filter	Comment
1-1-1		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	aa
1-1-2		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	bb
1-1-3		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	cc
1-1-4		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	dd
1-1-5		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ee
1-1-6		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ff
1-1-7		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	gg
1-1-8		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	hh
1-1-9		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ii
1-1-10		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	jj
1-1-11		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	kk
1-1-12		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	ll
1-1-13		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	mm
1-1-14		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	nn
1-1-15		8949	Voltage	100 mV f.s.	30.000m	[V]	OFF	oo

Ch Setting List

Event	Position	Comment
1	'08-07-17 11:18:22.05s	pp
2	'08-07-17 11:18:22.25s	qq
3	'08-07-17 11:18:22.40s	rr
4	'08-07-17 11:18:22.60s	ss
5	'08-07-17 11:18:22.80s	tt
6	'08-07-17 11:18:23.00s	uu
7	'08-07-17 11:18:23.20s	vv
8	'08-07-17 11:18:23.50s	ww

Event List

Cursor A: '08-07-17 11:18:22.12s   Cursor B: '08-07-17 11:18:23.32s   B-A: 0-00:00:01.20s

Channel	Unit	Cursor A	Cursor B	B-A	Minimum	Maximum	Average
1-1-1	[V]	39.640m	-52.000m	-91.640m	-52.005m	49.665m	-3.239m
1-1-2	[V]	39.845m	-52.000m	-91.845m	-52.005m	49.665m	-3.201m
1-1-3	[V]	39.970m	-52.000m	-91.970m	-52.010m	49.670m	-3.166m
1-1-4	[V]	40.155m	-52.000m	-92.155m	-52.010m	49.665m	-3.132m
1-1-5	[V]	40.355m	-52.010m	-92.365m	-52.010m	49.665m	-3.095m
1-1-6	[V]	40.540m	-52.000m	-92.540m	-52.005m	49.670m	-3.055m
1-1-7	[V]	40.750m	-52.000m	-92.750m	-52.010m	49.665m	-3.019m
1-1-8	[V]	40.840m	-52.000m	-92.840m	-52.005m	49.665m	-2.981m
1-1-9	[V]	41.035m	-52.000m	-93.035m	-52.010m	49.670m	-2.945m
1-1-10	[V]	41.230m	-51.965m	-93.195m	-51.965m	49.615m	-2.900m
1-1-11	[V]	41.430m	-51.905m	-93.335m	-51.920m	49.565m	-2.867m
1-1-12	[V]	41.550m	-51.915m	-93.465m	-51.920m	49.565m	-2.832m
1-1-13	[V]	41.735m	-51.910m	-93.645m	-51.915m	49.565m	-2.788m
1-1-14	[V]	41.910m	-51.905m	-93.815m	-51.925m	49.570m	-2.749m
1-1-15	[V]	42.040m	-51.905m	-93.945m	-51.910m	49.575m	-2.707m

Cursor Value List

8.6 Print Example

Specifications   Chapter 9

9.1   General Specifications

Overview	Controls the measurement of the logger connected to the PC and receives, displays, and saves waveform data in real time. (Total number of recorded samples: Up to 10 M data. If this data is exceeded, the measurement file is divided and the measurement is continued.)
Supplied Media	One DVD

Operating Environment	A PC that satisfies the following conditions
	CPU: 1 GHz or higher 32 bit (× 86) or 64 bit (× 64) processor
	Memory : 1 GB or more of RAM (32 bit), 2 GB or more of RAM (64 bit)
	Interface : Ethernet or USB
	OS : Windows7 (32 bit/64 bit)
	                 Windows8 (32 bit/64 bit)
	                 Windows10 (32 bit/64 bit)
	                 Windows 11 (64 bit)
	Monitor resolution: 1024 x 768 dots or better, At least 65,536 colors
	Hard disk : 3.0 GB or more of free space

Compatible measurement Instruments for Real-Time Measurement	Hioki 8423 Memory HiLogger, 8430-20 Memory HiLogger,
	LR8431-20 Memory HiLogger, LR8432-20 Heat Flow Logger,
	LR8400-20, LR8401-20, and LR8402-20 Memory HiLogger,
	LR8410-20 Wireless Logging Station, LR8450 Memory HiLogger,
	LR8450-01 Memory HiLogger, LR8101, LR8102 Data Logger
	* The LR8450 and LR8450-01, only when the recording interval is set to 10 ms or longer and a maximum of 600 measured analog channels, can perform the real-time measurement.
	  The U8555 CAN Unit and LR8535 Wireless CAN Unit are not supported.
	* The LR8101 and LR8102, only when the recording interval is set to 5 ms or longer and a maximum of 600 measured analog channels, can perform the real-time measurement.
	  The M7103 power measurement module can measure only the desired 30 items.

Compatible measurement Instruments for Waveform Display	Hioki 8423 Memory HiLogger, 8430-20 Memory HiLogger, LR8431-20 Memory HiLogger, LR8432-20 Heat Flow Logger, LR8400-20, LR8401-20, and LR8402-20 Memory HiLogger, LR8410-20 Wireless Logging Station, LR8450 Memory HiLogger, LR8450-01 Memory HiLogger, LR8512 Wireless Pulse Logger, LR8513 Wireless Clamp Logger, LR8514 Wireless Humidity Logger, LR8515 Wireless Voltage/Temp Logger, LR8520 Wireless Fungal Logger, LR8101, LR8102 Data Logger * The U8555 CAN Unit and LR8535 Wireless CAN Unit are not supported. * The M7103 power measurement module is not supported.

9.2   Function Specifications

Real-time Data Collection

Number of controllable instruments	5
Data Collection System	1 system
Display Format	Waveform (split time-axis display is possible) , Numerical values (logging) and Alarms can be displayed simultaneously. Numerical values can be displayed in a larger scale.
Numerical Value Monitor Display	Display in a separate window is possible.
Scroll	Waveforms can be scrolled during measurement

Data Collection

Settings	Data collection settings of the measurement instruments can be configured and received via the interface. Monitor functioncan be checked before measurement.
Save	Capable of saving the settings (LUS format) and measurement data (LUW format) of multiple real-time measurement instruments in one file.
Data Save Format	Real-time data collection file (LUW format). Real-time and non-real-time data transfer to Excel (Excel templates can be specified).
Event Mark	Recording during measurement is possible

Waveform Display

Supported Files	Waveform data files (LUW format, MEM format)
Display Format	Simultaneous display of waveforms (split time-axis display is possible), numerical values (logging) and alarms
Maximum Number of Channels	2035 channels (measured) + 60 channels (waveform calculation)
Waveform Display Sheets	The waveform of each channel can be displayed on any of the ten sheets
Scroll	Possible
Event Mark Recording	Possible
Cursors	Cursors A and B can be used to display voltage values at the cursor positions.
Hard Copy	A hard copy of the main screen is possible

Data Conversion

Applicable Data	Waveform data files (LUW format, MEM format)
Conversion Section	All data, specified section
Conversion Format	CSV format (comma delimited, semicolon delimited, space delimited, tab delimited), transfer to Excel sheet (Excel template can be specified), LR5000 format (hrp2,hrp)
Data Thinning	Simple thinning with any thinning number

Waveform Calculation

Calculation Items	Four arithmetic operations (+, -, *, /)
Number of calculation channel	60 channels

Calculations

Applicable Data	Waveform data files (LUW format, MEM format) Data during real-time measurement, waveform calculation data
Calculation Items	Average value, peak value, maximum value, time to maximum value, minimum value, time to minimum value, On time, Off time, On count, Off count, standard deviation, integration, area value, and integral
Save calculation	Perform numerical calculation and save to file

Search

Applicable Data	Waveform data files (LUW format, MEM format)
Search Mode	Event mark, date and time, maximum position, minimum position, local maximum position, local minimum position, alarm position, level, window, and variation

Print

Applicable Printer	Printer applicable to the using OS
Applicable Data	Waveform data files (LUW format, MEM format)
Print Format	Waveform image, Report print, List print (Channel settings, Event, Cursor value)
Print Area	All area, Specified area by A-B cursor
Print Preview	Available

Appendix

Appendix 1 Error Messages and Warning Messages

If an error message or warning message appears, solve the problem as described in the corresponding solution below.

Error Messages

No.	Messages	Solution
1	An error occurred during measurement.	Check the status of the connection with the logger and the status of the PC. With 8430, LR8400, LR8401, LR8402, LR8431, LR8432, and LR8410, measurement does not start in the File screen, so please move to another screen before starting measurement. With LR8450 and LR8450-01, the measurement does not start while in the USB drive mode or during the process of saving files, etc., so please start measurement after the process is completed.
2	An error occurred while accessing the file.	Check whether the media of the storage location or the file is damaged.
3	The specification for the save file location is incorrect.	Set the save location for files correctly on the measurement settings page of the settings screen.
4	The file could not be saved.	Check whether the media exists and the status of the media.
6	The file could not be read.	Check whether the file is damaged, and whether it is of a format supported by the Logger.
7	The media is access protected.	Check whether write-protection is set for the media.
8	There is insufficient remaining space on the media.	Delete any unnecessary files or use new media.
10	A protocol error occurred. Check the versions of the logger and the application software.	A communication protocol error has occurred. Check the power and connection status of the logger.
11	A timeout occurred.	A timeout error occurred during communication with the logger. Check the power and connection status of the logger.
23	Could not communicate with the logger.	Check whether the PC is connected to the logger properly. Check the list of loggers that support real-time measurement. See "9.1 General Specification" for compatible measurement Instruments for Real-Time Measurement (p. 243).
26	The specified address destination is not the 8423.	A device other than the 8423 is connected at the specified address destination. Be sure to connect the 8423.
28	The address or serial number is incorrect.	Check whether the address and serial number of the logger are correct. The connection cable may also be disconnected.

No.	Messages	Solution
29	The specified logger is measuring.	The operation cannot be continued because the specified logger is measuring. You can proceed with the operation if you stop measurement.
32	The synchronization cable is disconnected.	A 9683 Connection Cable (for synchronization) is disconnected or connected improperly. Check the connections.
33	Six or more loggers are connected to the synchronization chain.	Disconnect any unnecessary loggers from the synchronization chain.
34	There is an unregistered logger in the synchronization chain.	There is an unknown logger in the synchronization chain. Register the logger on the connection settings page in the settings dialog box.
35	The registered logger could not be found in the synchronization chain.	A logger registered on the connection settings page of the settings dialog box could not be found in the synchronization chain. Check the connection status or cancel the registration.
36	There is a logger with an incorrect unit configuration.	A logger with a unit configuration different from that of the registered loggers is connected. Match the unit configuration to the registered data, or cancel the registration and then reconfigure the settings.
37	There is a logger without a measurement channel.	Check the channel configuration of the connected loggers.
38	The measurement stop time has elapsed.	Set a measurement stop time that is later than the current time.
39	The recording period setting is incorrect.	The recording period is set to 0. Set the recording period to other than 0 or set continuous recording to ON.
40	The timer measurement setting is incorrect.	The same value is set for the start time and stop time. Change the value of one of them.
43	An error is in a waveform calculation.	There is a mistake in waveform calculation, so please check it.

Warning Messages

No.	Messages	Solution
100	The application cannot be ended during measurement.	Stop measurement if you want to end the application.
103	The AB cursors cannot move to this position.	If cursors A and B are set to be moved at the same time, a cursor cannot be moved to a position which will result in the other cursor being outside the measurement data range. In such a case, cancel the setting for moving the cursors at the same time.
104	The maximum number of event marks is not set.	The maximum number of event marks is 1000. Delete unnecessary event marks.
105	The selected channel cannot be used.	The selected channel cannot be used for the corresponding function. Select another channel. (Example: An alarm channel cannot be specified as a gauge channel.)
500	Data that matched the search conditions could not be found.	Change the search conditions.

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