HIOKI

Measurement Guide

LR8431-20

MEMORY HiLOGGER

Procedure

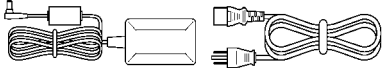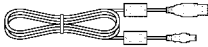|	
Operation and Screen Types (p.12)	Describes the screen types and an overview of the operating keys.
Measurement Procedure (p.16)	Describes procedures from measurement preparation to analysis.
Monitoring Voltage Fluctuations (p.19)	This section describes voltage measurement using an AC transducer* to acquire voltage fluctuation data for one week, with the data automatically saved on a CF card. * The example transducer provides 0 - 10 V DC output proportional to 0 - 150 Vrms AC input.
Monitoring Temperature Changes (p.21)	This section describes temperature measurement using a type K thermocouple to acquire temperature data once per second, for monitoring temperature changes. The post-measurement saving method is also described.
Monitoring Energy Consumption (p.24)	This section describes pulse measurement using a watt-hour meter* to acquire integrated power consumption data for one month. * The example watt-hour meter provides an output of 50,000 pulses/kWh.
Analysis (p.26)	View and calculate waveform measurement values using the A/B cursors.

Introduction

Thank you for purchasing the HIOKI "Model LR8431-20 Memory HiLogger."
This Measurement Guide consists of some basic application examples. Before using the instrument, be sure to read the Instruction Manual carefully.

Confirming Package Contents

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

Confirm that these contents are provided.

☐ **Model LR8431-20** 1
   Memory HiLogger

☐ **Measurement Guide**
   (This document) 1

☐ **Model Z1005 AC Adapter**............ 1
   with supplied power cord

☐ **USB Cable** 1

☐ **CD** 1
   • **Instruction Manual (PDF)**
   • **Logger Utility Instruction Manual (PDF)**
   • **Logger Utility (Data acquisition application program)**

   The latest version can be downloaded from our web site.

About options: Contact your dealer or Hioki representative for details.

☐ Model 9780 Battery Pack
☐ Model Z1005 AC Adapter
☐ Model 9641 Connection Cable (for pulse inputs)
☐ Model 9782 Carrying Case
☐ Model 9812 Soft Case

☐ Model 9727 PC Card (256MB)
☐ Model 9728 PC Card (512MB)
☐ Model 9729 PC Card (1GB)
☐ Model 9830 PC Card (2GB)
☐ Model 9809 Protection Sheet

Safety Information

⚠ DANGER	**This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument.** **However, using the instrument in a way not described in this manual may negate the provided safety features.** **Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.**

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

Safety Symbols

⚠	In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument.
	The ⚠ symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.
⎓	Indicates DC (Direct Current).
∿	Indicates AC (Alternating Current).
I	Indicates the ON side of the power switch.
O	Indicates the OFF side of the power switch.

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

⚠ DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
⚠ WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
⚠ CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.
NOTE	Indicates advisory items related to performance or correct operation of the instrument.

Symbols for Various Standards

CE	This symbol indicates that the product conforms to safety regulations set out by the EC Directive.
Ni-MH	This is a recycle mark established under the Resource Recycling Promotion Law (only for Japan).
	WEEE marking: This symbol indicates that the electrical and electronic appliance is put on the EU market after August 13, 2005, and producers of the Member States are required to display it on the appliance under Article 11.2 of Directive 2002/96/EC (WEEE).

Other Symbols

🚫	Indicates the prohibited action.
(p. #)	Indicates the location of reference information.
∗	Indicates that descriptive information is provided below.
[ ]	The names of setting objects and buttons on the screen are indicated by square brackets [ ].
SET (Bold characters)	Bold characters within the text indicate operating key labels.
Unless otherwise specified, "Windows" represents Windows 2000, Windows XP, Windows Vista, Windows 7 or Windows 8.	
Click: Press and quickly release the left button of the mouse. Double click: Quickly click the left button of the mouse twice.	

Accuracy

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

f.s. (maximum display value or scale length)
The maximum displayable value or scale length. This is usually the name of the currently selected range.
Example: For the 1 V range, f.s. = 1 V

rdg. (reading or displayed value)
The value currently being measured and indicated on the measuring instrument.

dgt. (resolution)
The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1" as the least-significant digit.

Measurement categories

To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories.

CAT II	Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.) CAT II covers directly measuring electrical outlet receptacles.
CAT III	Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.
CAT IV	The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).

Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Use of a measurement instrument that is not CAT-rated in CAT II to CAT IV measurement applications could result in a severe accident, and must be carefully avoided.
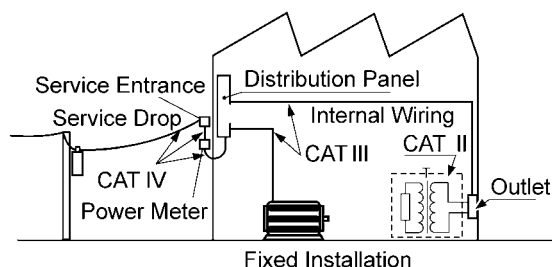
Difference between "Measurement" and "Recording"

The measurement and recording processes are distinguished as follows for the purposes of these instructions.

Measurement:	The acquisition of input values into internal HiLogger memory or to a PC via communications.
Recording:	Storing measurement data on a CF card, USB flash drive or on a PC via data communication.

Measured data (data acquired in internal memory) is erased whenever a new measurement starts. To retain data, always record (save) it.

Operating Precautions ⚠

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

Before Use

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

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

Instrument Installation

• Operating temperature and humidity: 0 to 40°C at 80% RH or less (non-condensating)

• Temperature and humidity range for guaranteed accuracy: 23±5°C, 80%RH or less

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

Exposed to direct sunlight
Exposed to high temperature

In the presence of corrosive or explosive gases

Exposed to water, oil, other chemicals, or solvents
Exposed to high humidity or condensation

Exposed to strong electromagnetic fields
Near electromagnetic radiators

Exposed to high levels of particulate dust

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

Subject to vibration

⚠**CAUTION** The maximum operating (ambient) temperature for the LR8431-20 is 40°C. Do not attempt to use in higher temperature environments.

NOTE
- Correct measurement may be impossible in the presence of strong magnetic fields, such as near transformers and high-current conductors, or in the presence of strong electromagnetic fields such as near radio transmitters.
- If liquid enters the enclosure through an air vent or other opening, it may damage the instrument's internal circuitry. Exercise caution concerning the surrounding environment when installing the instrument.

Installation Precautions

- If the instrument is used in any state other than the following, the measurement accuracy may not satisfy the device specifications.

Horizontal placement   Upright placement

- Leave sufficient space around the ventilation holes and install the instrument with the holes unobstructed.
- Avoid temperature changes around the terminal block. Especially avoid directed airflow such as from an electric fan or air conditioner vent.Thermocouple inputs are prone to measurement errors.
- When the HiLogger is moved to a location with significantly different ambient temperature, allow at least 30 minutes for thermal equalization before measuring.

Handling the Instrument

⚠WARNING
- **Do not allow the instrument to get wet, and do not take measurements with wet hands. This may cause an electric shock.**
- **Do not attempt to modify, disassemble or repair the instrument; as fire, electric shock and injury could result.**

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

NOTE
This instrument may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

Handling the Cords and Cables

⚠️**CAUTION**
- Avoid stepping on or pinching cables, which could damage the cable insulation.
- To avoid breaking the cables and probes, do not bend or pull them.
- To avoid damaging the power cord, grasp the plug, not the cord, when unplugging it from the power outlet.

Before Turning Power On

⚠️**WARNING**

Using the Battery Pack
- **For battery operation, use only the HIOKI Model 9780 Battery Pack. We do not take any responsibility for accidents or damage related to the use of any other batteries.**

See: For more information about the battery pack, see the instruction manual (on the included CD).

Using the AC Adapter
- **Use only the supplied Model Z1005 AC Adapter. AC adapter input voltage range is 100 to 240 VAC (with ±10% stability) at 50/60 Hz. To avoid electrical hazards and damage to the instrument, do not apply voltage outside of this range.**
- **Turn the instrument off before connecting the AC adapter to the instrument and to AC power.**
- **To avoid electrical accidents and to maintain the safety specifications of this instrument, connect the power cord provided only to a 3-contact (two-conductor + ground) outlet.**
- **Use only the designated power cord with this instrument. Use of other power cords may cause fire.**
- **Before turning the instrument on, make sure the supply voltage matches that indicated on its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.**

⚠️**CAUTION**
When the power is turned off, do not apply voltage or current to the connectors. Doing so may damage the instrument.

NOTE
- After use, always turn OFF the power.
- Brief power interruptions of 40 ms or less will not cause this instrument to malfunction. However, Longer interruptions may cause the Memory HiLogger to shut itself off, so consider local power conditions before installing, as appropriate.
- To ensure that recording is not interrupted by power outages, you can use the Z1005 AC Adapter and 9780 Battery Pack together.

About Inputs and Measurement

⚠ DANGER

- **The maximum input voltage (and the maximum rated voltage to earth) for the analog input terminals is 30 Vrms (or 60 V DC). If these limits are exceeded, the instrument may be damaged and personal injury or death could occur, so do not attempt measurement.**
- **Do not leave the Memory HiLogger connected to test objects in environments where a voltage surge might exceed the dielectric withstand voltage. Doing so could result in damage to the Memory HiLogger, bodily injury or fatal accident.**
- **Channels are insulated by semiconductor relays. When a voltage beyond the specification is applied between the channels, the semiconductor relay may short circuit. Please ensure that a voltage beyond specification, especially a surge such as a lightning, is never applied. When an abnormal measurement value is observed, please contact your dealer or Hioki representative for inspection.**

NOTE The waveform for an open channel may sometimes appear to be influenced by the signals of the other channels being measured. If you do not like this, please set the waveform display of the open channel to OFF or short-circuit the input terminals of the open channel by connecting the positive and negative terminal.

CD Handling

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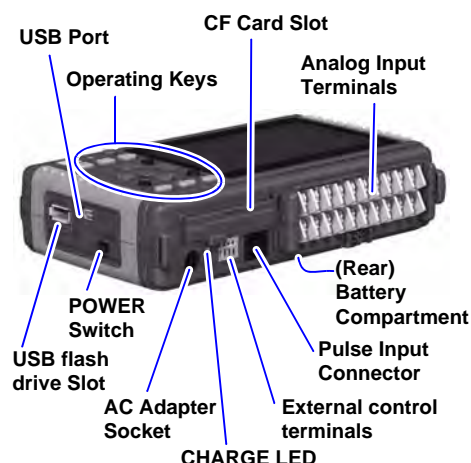
Using a CF Card/USB flash drive

⚠️ **CAUTION**
- Inserting a CF card/USB flash drive upside down, backwards or in the wrong direction may damage the CF card, USB flash drive, or HiLogger.
- Never eject a CF card /USB flash drive while measuring or when the HiLogger is or accessing the card. Data on the CF card/USB flash drive may be destroyed. (The CF icon/USB flash drive icon at the lower right is red while the card is being accessed.)
- Do not transport the HiLogger while a USB flash drive is connected. Damage could result.
- As the CF card/USB flash drive is sensitive to static electricity, damage to the CF card/USB flash drive or wrong operations by the HiLogger may occur due to static electricity. Please be careful when handling it.
- With some USB flash drives, the HiLogger may not start up if power is turned on while the USB flash drive is inserted. In such a case, turn power on first, and then insert the USB flash drive. It is recommended to try out operation with a USB flash drive before starting to use it for actual measurements.
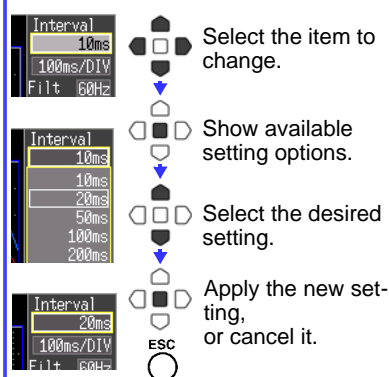
NOTE
- The Flash memory in a CF card/USB flash drive has a limited operating life. After long-term usage, data storage and retrieval become difficult. In this case, replace the CF card/USB flash drive with a new one.
- We cannot provide compensation for data loss in a CF card/USB flash drive, regardless of content or cause of the damage. Data is also cleared from memory if a long time passes after measuring. Always maintain a backup of important data stored on a CF card/USB flash drive.
- Although real-time saving to USB flash drive is supported, a CF card is recommended for data preservation. Performance cannot be guaranteed when using storage media other than a Hioki-specified CF card option.
- Use a USB flash drive whose continuous current consumption does not exceed 300 mA (peak 500 mA). (The peak value is displayed as "Max Power" under the USB flash drive self-test on the [System] screen.)
- Depending on how USB is used, the USB connector and instrument settings may vary as shown in the chart below.
- The three USB methods of use described in the chart below involve exclusive settings and cannot be used simultaneously.

USB method of use	Connector used	[System] screen USB mode setting
Use a USB flash drive.	Type A	USB Memory (Default)
Communicate with the LR8431-20 and initiate measurement using the Logger Utility software from a computer (using a USB cable).	Type B	USB Communication
Read files on a CF card that is connected to the LR8431-20 from a computer (using a USB cable).	Type B	USB Drive

Operation and Screen Types

USB Port

CF Card Slot

Operating Keys

Analog Input
Terminals

POWER
Switch

(Rear)
Battery
Compartment

USB flash
drive Slot

Pulse Input
Connector

AC Adapter
Socket

External control
terminals

CHARGE LED

Changing screen contents

Interval 10ms 100ms/DIV Filt 60Hz	Select the item to change.
Interval 10ms 10ms 20ms 50ms 100ms 200ms	Show available setting options. Select the desired setting.
Interval 20ms 100ms/DIV Filt 60Hz	Apply the new setting, or cancel it.

ESC

Operating Keys

Choose a screen

■ WAVE/DATA
Selects among waveform screen displays (p. 13).

■ SET
Displays the Settings screens, and switches among the screen tabs with each press (p. 14).

■ FILE
Displays file information (p. 15).

Scroll waveforms and read cursor values

Press the center key to select waveform scrolling or A/B cursor movement, then press the left and right cursor keys to scroll or move (p. 26).

Saving operations

Press to save data manually (p. 23).

WAVE/DATA   SET   FILE

▼ — CH — ▲

ENTER

ESC

KEY LOCK
PRESS 3sec

SCROLL
CURSOR

SAVE   START/STOP
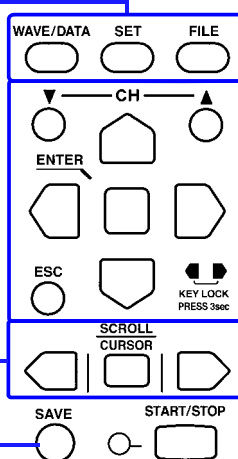
Start and stop measurement

Start and stop measurement. The LED at the left lights green while measuring.

Setup and display

■ CH▼/▲
Select channels.

■ ESC
Cancels changes to settings.

■ Cursor Keys
Moves the position of the cursor (blinking selection) on the screen.

■ ENTER
Accepts displayed settings.

■ KEY LOCK
Disables keypad operations. Press and hold the left and right cursor keys simultaneously for three seconds to lock and unlock the keys.

■ (Zero Adjust)
Performs zero adjustment. Press the up and down keys simultaneously to execute.

Waveform/Numerical Screens

WAVE/DATA   SET   FILE

Selects between seven display types.

The screen switches each time you press the key.

Operational information is displayed along the bottom of the screen.

Position
× 1

Gauge+Wave

Jump

Selection is also available from the name of the current screen displayed near the bottom right

[Gauge+Wave] Screen
Measurement data is displayed as waveforms with gauges.
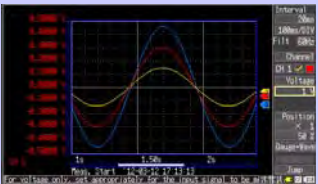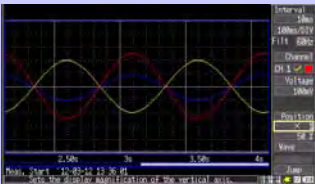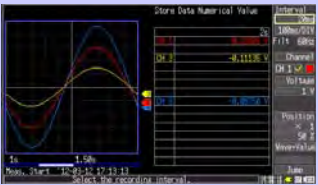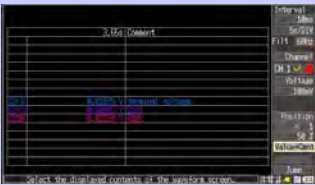
[Wave] Screen
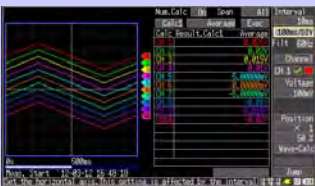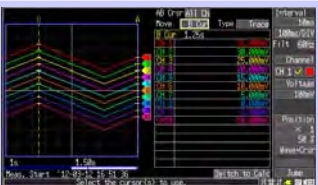Measurement data is displayed as waveforms.

[Wave+Value] Screen
Measurement data is displayed as waveforms and numerical values.

[Value+Cmnt] Screen
Measurement data is displayed as numerical values with comments.

[Value] Screen
Measurement data is displayed as numerical values.

[Wave+Calc] Screen
Measurement data is displayed as waveforms with calculation results.

[Wave+Crsr] Screen
Measurement data is displayed as waveforms with cursor values.
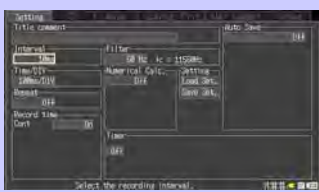
Settings Screens

Selects between seven display types.

The screen switches each time you press the key.

Operational information is displayed along the bottom of the screen.

Press the left/right cursor keys to select between the Settings screens.

Setting Screen

Make settings for recording. Set numerical calculation, auto-saving and timers.
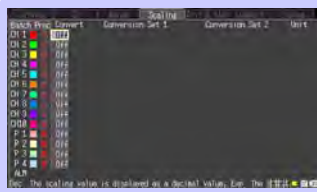

CH Screen

Make input channel settings while viewing the monitor display.
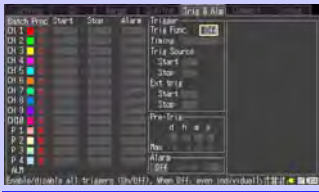

Range Screen

Make settings while viewing all channel settings.
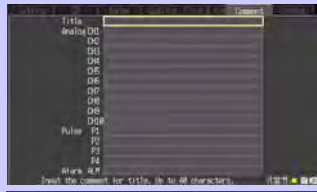
Scaling Screen

Make these settings to convert measured values to arbitrary units for display.

Trig&Alm Screen

Recording criteria (triggering) and warning sounds can be set for each channel.

Comment Screen

Enter channel comments.

System Screen

Configure the system environment.

File Screen

WAVE/DATA   SET   FILE

Operational information is displayed along the bottom of the screen.

File Screen

View and manage files on the CF Card or USB flash drive.
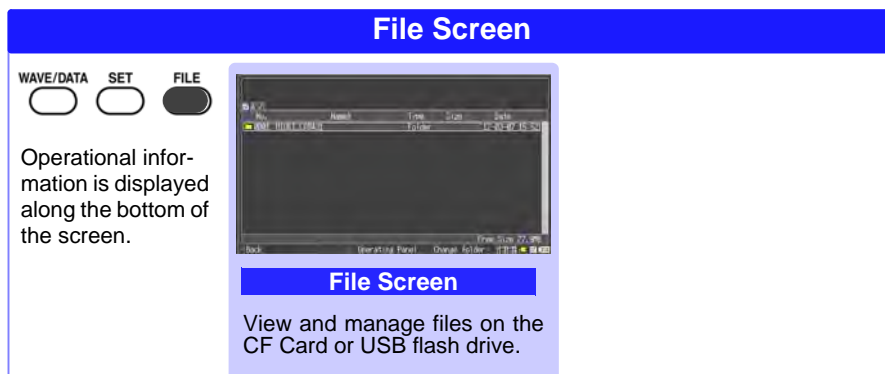
Measurement Procedure

Before measuring, be sure to read the "Usage Notes" in the Instruction Manual.
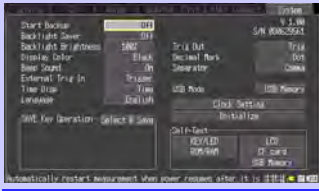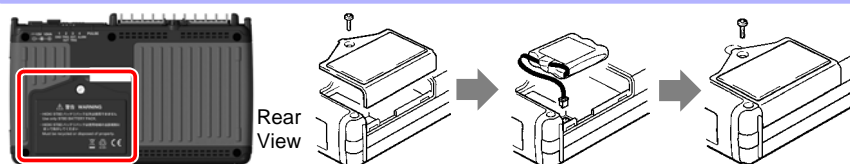
Install the battery pack (option)

Rear View

We recommend using the battery pack to provide backup during power outages, and to preserve measurement data.

Connect the power cord

Top View
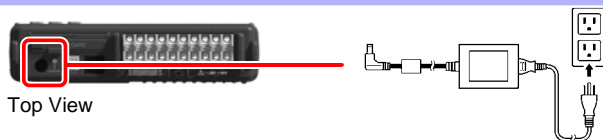
Connect the measurement cable

Top View

CH10 ...... CH1

Analog Input Terminals

For voltage or temperature measurement: connect appropriate measurement or thermocouples leads.

For pulse input signals: connect the Hioki 9641 Connection Cable .

Pulse Input Connector
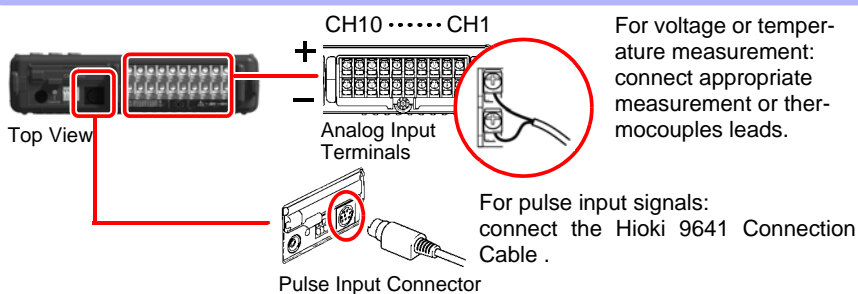
Insert a CF Card or USB flash drive (option)

Top View

Confirm that sufficient free space is available, and for auto-saving, that a CF card or USB flash drive is inserted before measuring.

Turn the power on

Right Side View

POWER

○ ▭ |
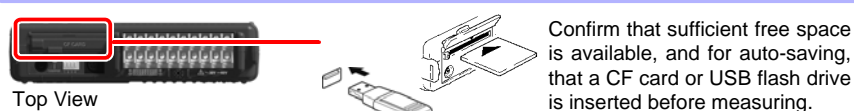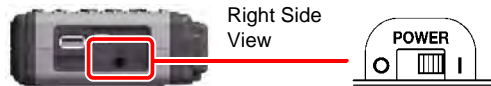
Connect to the measurement object
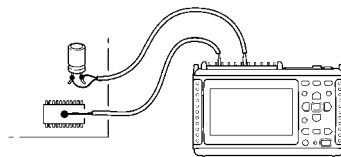
Configure settings for measurement

WAVE/DATA   SET   FILE

Configure recording settings on the Setting screen.

• Recording interval
• Recording length
• Auto-saving (if used)

Make other settings as necessary.

Setting Range Scaling Trig & Alm Comment System

Interval 1min
Time/DIV 30min/DIV
Repeat Off
Record time
Cont Off

        d   h   min s
        7   0 : 0 : 0
Max 141 14   8   0
Data pts 10081

Filter 60 Hz fc = 10Hz
Numerical Calc. Off

Timer Off

Auto Save
Waveform(realtime)
File Name
Media CF
Deleting Off
Split Save Off

Setting
Load Set.
Save Set.
Savable
time :CF
One year

In order to remove noise, select the commercial frequency that is

Configure input channel settings on the CH screen.

• Channel selection
• Input type
• Measurement range

Make other settings as necessary.

Setting **CH** Scaling Trig & Alm Comment System

Comment
Channel CH 1
Input Voltage
Range 100mV

Start Trig. Cond Off
Stop Trig. Cond Off
Start trig on. Stop trig on.

Type Pos
Zoom × 1
0 Pos 50 %
Scaling
Cond Off

Alarm Cond Off
Alarm on.
Monitor All Ch

CH 1 -0.580mV

Select the channel to set.
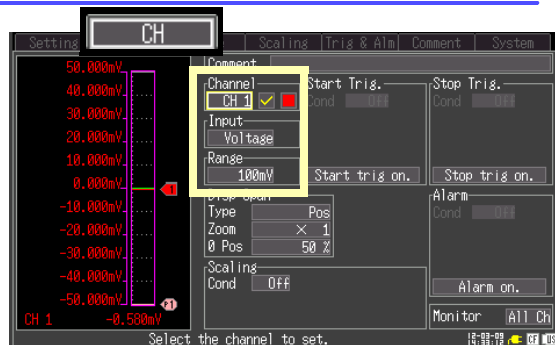
Start and finish measuring

START/STOP
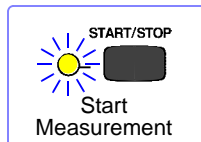
Start Measurement

Press to start and stop recording with the selected measurement conditions.

When [Repeat] is [Off] (default setting), one recording length is acquired, and recording stops automatically.
When [Repeat] is [On], recording proceeds continuously.

START/STOP

Stop Measurement

Analyze

WAVE/DATA   SET   FILE

Interval
10ms
100ms/DIV
Filt 60Hz
Channel
CH 1
Voltage
100mV

Position
× 1
50 %
Wave

Jump

3s   2m 3.50s   2m 4s   2m 4.50s   2m
Meas. Start '12-03-12 13:36:01
Select the recording interval.
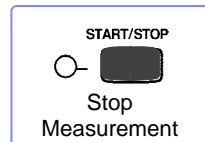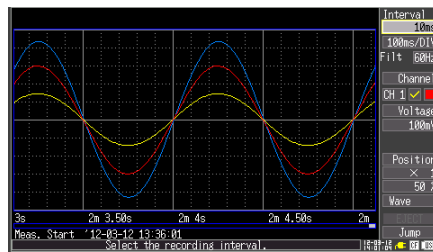
Monitoring Voltage Fluctuations

This section describes voltage measurement using an AC transducer* to acquire voltage fluctuation data for one week.
* The example transducer provides 0 - 10 V DC output proportional to 0 - 150 Vrms AC input.

1 Prepare the Following Before Measuring
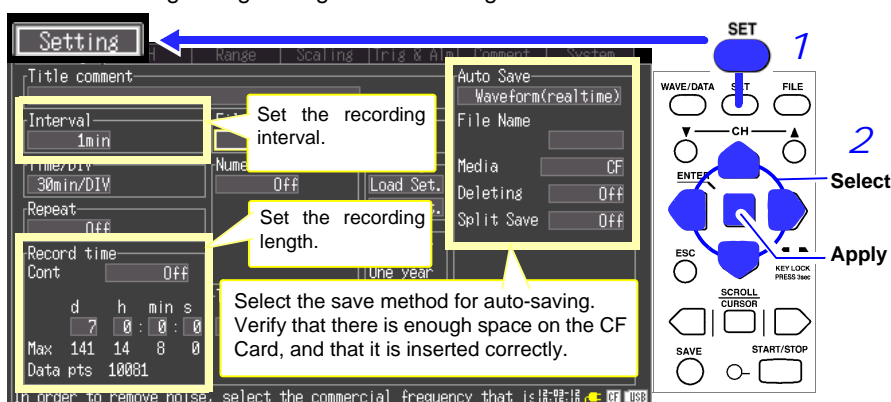
Items to prepare
- ☐ Model LR8431-20 Memory HiLogger
- ☐ AC Adapter (supplied)
- ☐ Measurement (input) leads
- ☐ Transducer
- ☐ CF Card (Hioki option)

"Measurement Procedure" (p. 16)

2 Connect to CH1   **3** Insert a CF card

1 Connect to power outlet

5

Connect to the measurement points   Turn the power on (Right side) **4**

2 Configure Measurement Settings

Make recording timing settings on the Setting screen.

Set the recording interval.

Set the recording length.

Select the save method for auto-saving. Verify that there is enough space on the CF Card, and that it is inserted correctly.

1 SET

2 Select

Apply

Setting Example
(Record at one-minute intervals for seven days automatically on the CF card)
Interval: 1min
Record time: Cont Off, 7 days
Auto Save: Waveform(realtime)

The default settings for the non-framed items can be left as-is. Change as needed.

Enable [Deleting] (set to [On]) to delete old files when the CF card or USB flash drive becomes full. Otherwise, when disabled (set to [Off]), saving stops when the card becomes full. Also, when you want measurements saved in multiple files at specific intervals, set [Split Save] to [On] or to [Ref Time] and set the interval as needed.

Make input channel settings on the CH screen.
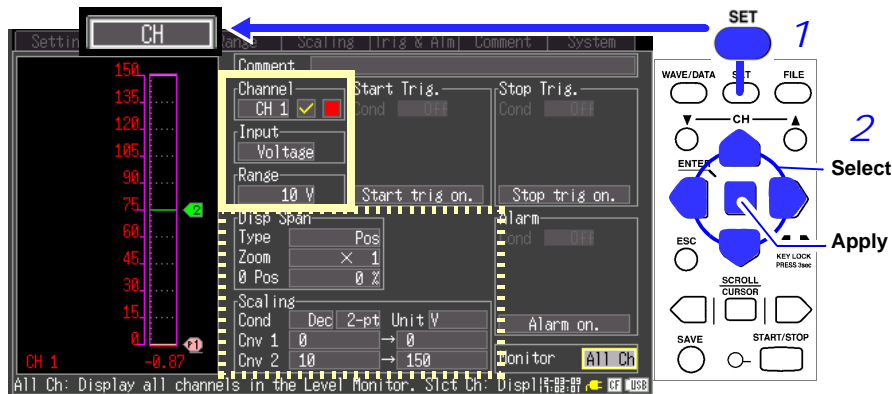
Setting Example
Channel: CH1, Input: Voltage, Range: 10V

Make other settings as necessary.
Disp Span: Position, 0 pos: 0% (displays zero volts at the bottom of the screen)
Scaling: Dec, 2-pt
Cnv 1: 0 V to 0 V , Cnv 2: 10 V to 150 V for display
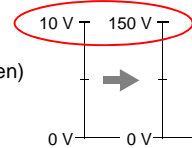
3 Start and Stop Measurement

START/STOP

Press the **START/STOP** key.
The specified data length is record-
ed on the CF card.
Recording stops seven days after
starting.

To interrupt recording, press the **START/STOP** key again.

Refer to "Analysis" (p. 26) for analysis methods.

Monitoring Temperature Changes

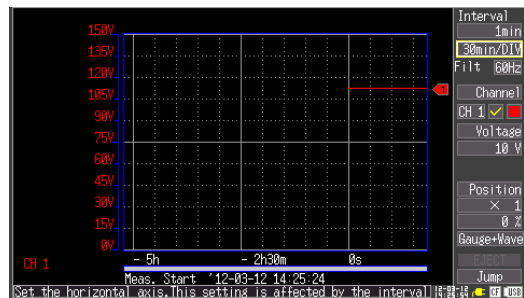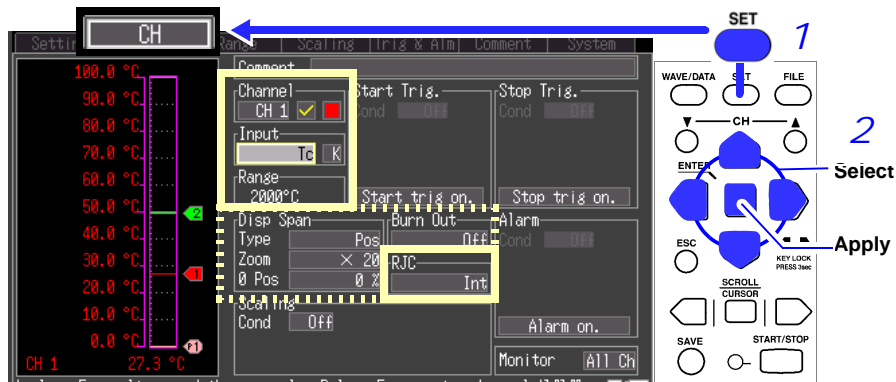This section describes temperature measurement using a type K thermocouple to acquire temperature data once per second, for monitoring temperature changes. The procedure for saving measurement data to a CF card after measuring is also described.

1 Prepare the Following Before Measuring

Items to prepare
- ☐ Model LR8431-20 Memory HiLogger
- ☐ AC Adapter (supplied)
- ☐ ThermoCouples (K)
- ☐ CF Card (Hioki option)

"Measurement Procedure" (p. 16)

Connect to CH1 *2*   *3* **Insert a CF card**

1 → **Connect to power outlet**

5 ← **Connect to the measurement points**

Turn the power on (Right side) *4*

2 Configure Measurement Settings

Make recording timing settings on the Setting screen.

Set the recording interval.

Set the recording length.

SET *1*

2

Select

Apply

Setting Example
(to record at one-second intervals from starting measurement until pressing the **START/STOP** key again)
Interval: 1s
Record time: Cont On

The default settings for the non-framed items can be left as-is. Change as needed.

Make input channel settings on the CH screen.

Setting Example
Channel: CH1, Input: Tc, K (Thermocouple)
RJC: Int

The default settings for the non-framed items can be left as-is. Change as needed.

Set the open-circuit detection and display range as necessary. Enable [Burn Out] (set to [On]) to detect a broken thermocouple. When a thermocouple is broken, its waveform appears at the top of the screen as shown at the right.
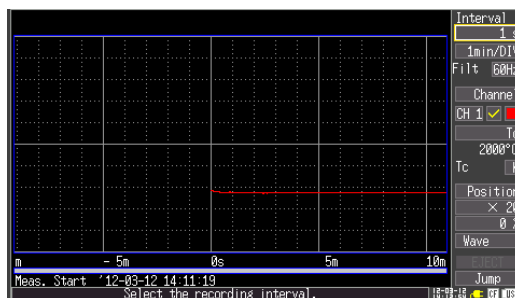
Indicates a broken wire.
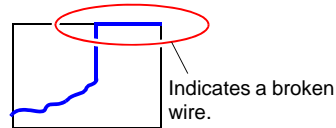
3 Start and Stop Measurement

Press the **START/STOP** key.

In this case, measurement data is recorded until you press the **START/STOP** key again.
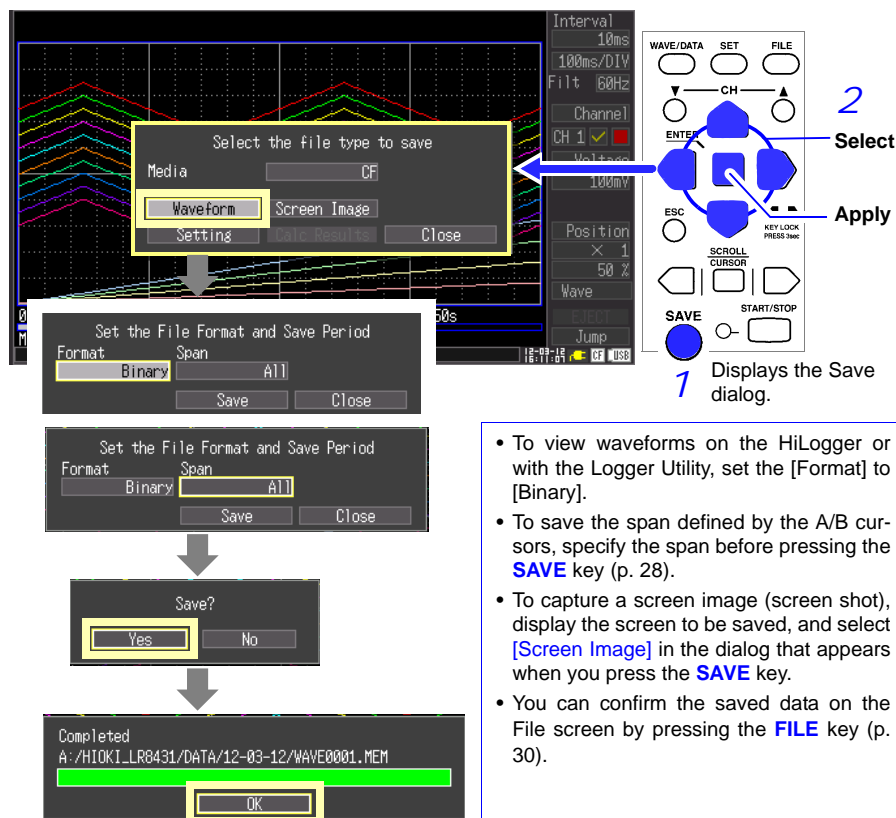
4 Saving Data After Measuring

This section describes how to save data after measuring.

Two methods are available for saving measurement data to a CF card or USB flash drive after recording: [Select & Save] and [Quick Save].

Press the **SAVE** key and select [Select & Save] to set the saving data type and make other settings. [Quick Save] causes data to be saved immediately when the **SAVE** key is pressed, according to the settings made beforehand.

In this case, we use the default [Select & Save] method to save waveform data.

2 Select

Apply

1 Displays the Save dialog.

- To view waveforms on the HiLogger or with the Logger Utility, set the [Format] to [Binary].
- To save the span defined by the A/B cursors, specify the span before pressing the **SAVE** key (p. 28).
- To capture a screen image (screen shot), display the screen to be saved, and select [Screen Image] in the dialog that appears when you press the **SAVE** key.
- You can confirm the saved data on the File screen by pressing the **FILE** key (p. 30).

For long-term measurement, set the Auto-Save setting to [Waveform(realtime)] (p. 19). When [Cont] is enabled, data recording is limited to the size of the HiLogger's internal memory.

To avoid data loss, we recommend using both the AC adapter and battery pack.

Refer to "Analysis" (p. 26) for analysis methods.

Monitoring Energy Consumption

This section describes pulse measurement using a watt-hour meter* to acquire integrated power consumption data for one month.
* The example watt-hour meter provides an output of 50,000 pulses/kWh.

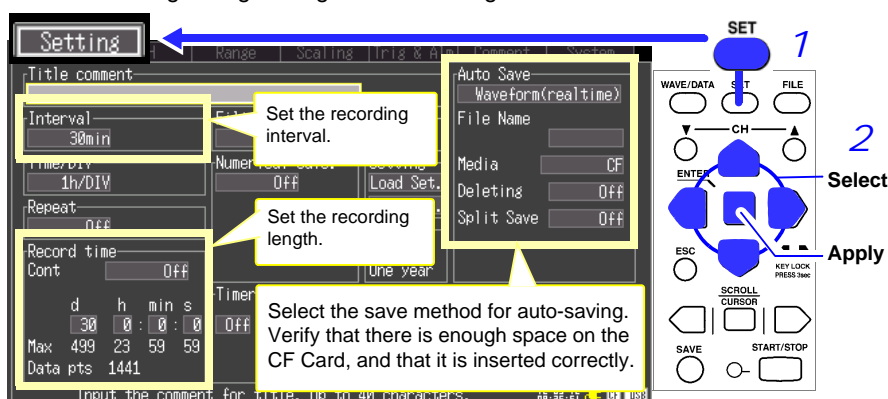## 1 Prepare the Following Before Measuring

Items to prepare
- ☐ Model LR8431-20 Memory HiLogger
- ☐ AC Adapter (supplied)
- ☐ Model 9641 Connection Cable (Hioki option)
- ☐ Watt-Hour Meter
- ☐ CF Card (Hioki option)

"Measurement Procedure" (p. 16)

2 **Connect the 9641 Connection cable**

Connect to the measurement points

3 **Insert a CF card**

1 **Connect to power outlet**

Turn the power on (Right side) **4**

5

2 Configure Measurement Settings

Make recording timing settings on the Setting screen.

Setting

Title comment

Interval
30min

Time/DIV
1h/DIV

Repeat
Off

Record time
Cont   Off

          d   h   min s
         30   0 : 0 : 0
Max   499   23   59   59
Data pts 1441

Input the comment for title. Up to 40 characters.

Set the recording interval.

Set the recording length.

Numerical Save
Off

Load Set.

One year

Timer
Off

Auto Save
Waveform(realtime)
File Name

Media   CF
Deleting   Off
Split Save   Off

Select the save method for auto-saving. Verify that there is enough space on the CF Card, and that it is inserted correctly.

SET **1**

WAVE/DATA   SET   FILE

CH

ENTER

2

Select

ESC   KEY LOCK PRESS 3sec

SCROLL CURSOR

SAVE   START/STOP

Apply

Setting Example
(Record at 30-minute intervals for 30 days, and automatically store on the CF card)
Interval: 30min
Record time: Cont Off, 30 days
AutoSave: Waveform(realtime)

The default settings for the non-framed items can be left as-is. Change as needed.

Enable [Deleting] (set to [On]) to delete old files when the CF card or USB flash drive becomes full. Otherwise, when disabled (set to [Off]), saving stops when the card becomes full. Also, when you want measurements saved in multiple files at specific intervals, set [Split Save] to [On] or to [Ref Time] and set the interval as needed.

Make input channel settings on the CH screen.
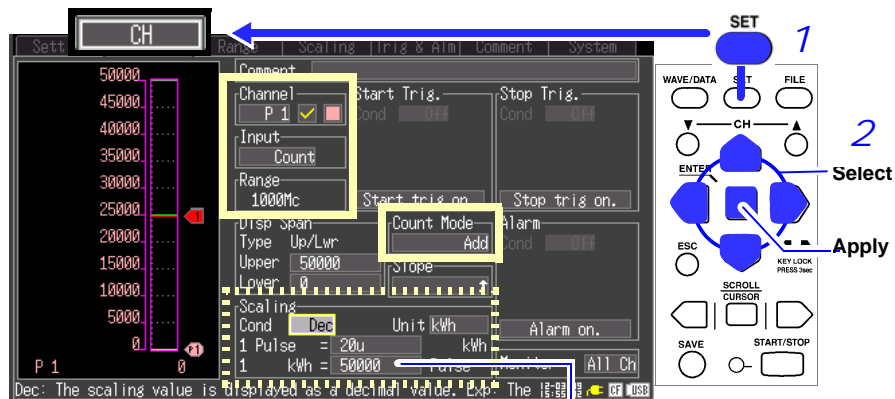
Setting Example
Channel: P1, Input: Count, Count Mode: Add

Use the scaling function to display values in kWh units.
Cond: Dec, Unit: kWh, 1 Pulse = 20u [kWh],
1 kWh=50000 Pulse
The display range changes automatically when scaling is used.

$(+/ -)$

(E/P/T/G/M/k/ (blank) /m/u/n/p/f/a)
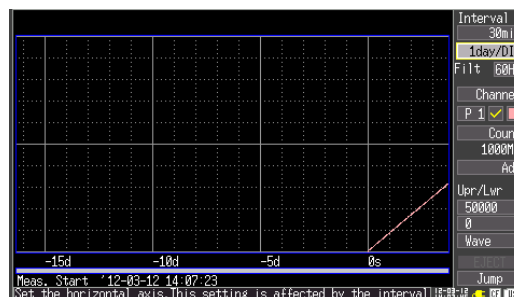
Select digit position   Select digit value

3 Start and Stop Measurement

Press the **START/STOP** key.
The specified length of data is recorded and stored on the CF card.

Recording stops thirty days after starting.

To interrupt recording, press the **START/STOP** key again.

Refer to "Analysis" (p. 26) for analysis methods.

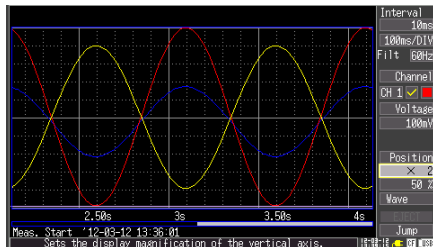# Analysis

Viewing a Measurement Waveform
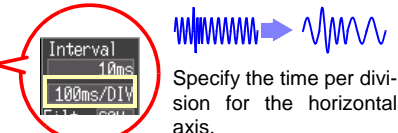
Scrolling the Waveform
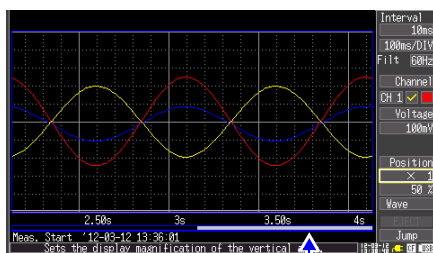
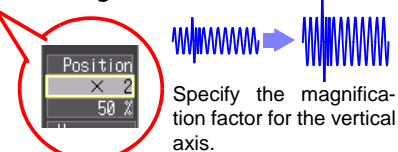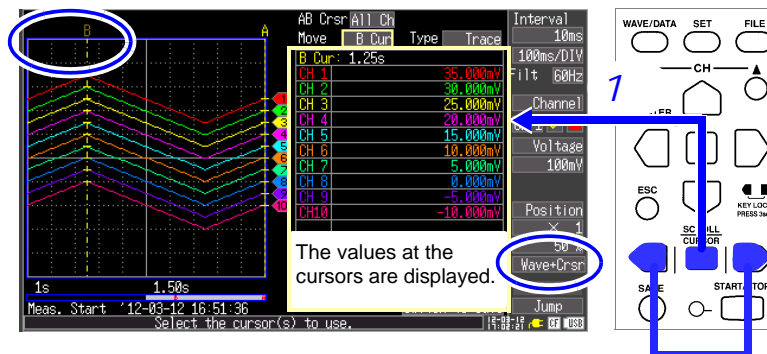The portion of a waveform that is currently displayed can be confirmed by the position of the scroll bar.

SCROLL CURSOR

Earlier   Later

Currently Displayed Portion
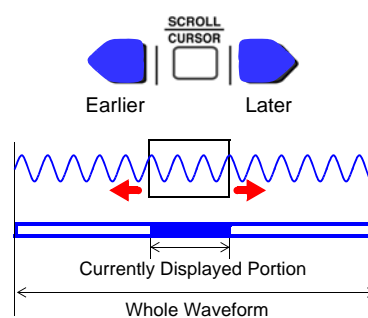
Whole Waveform

Zooming the Waveform View

Zooming (Magnifying and Reducing) the Horizontal Axis

Specify the time per division for the horizontal axis.

Zooming the Vertical Axis

Specify the magnification factor for the vertical axis.

View Measurement Values

The values at the cursors are displayed.

1

2 Press these keys to move the cursor on the displayed waveform.
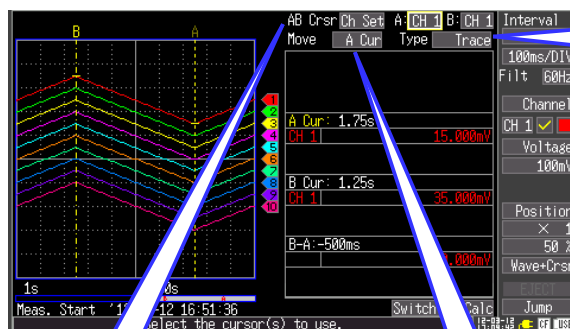
To change the cursor type, select from the [Type] setting items.

• Trace
  (time value and measurement value)
• Vert (Vertical, time value)
• Horz
  (Horizontal, measurement value)

To view only the cursor values for specified channels, Select [Ch set] from the [AB Crsr] settings, and select the channels for which to display cursor values.
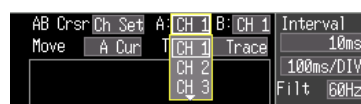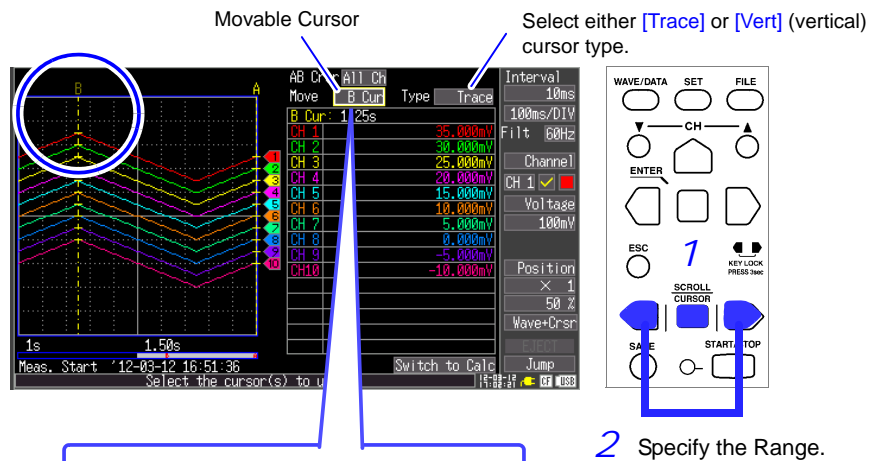
To select which cursor(s) to move, select from the [Move] setting items.

• A Cur
• B Cur
• AB Cur
  (Move both cursors at the same time)

Specifying a Range

Movable Cursor

Select either [Trace] or [Vert] (vertical) cursor type.

1
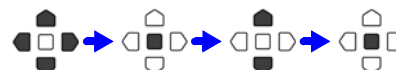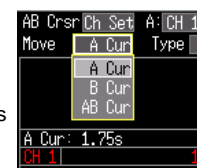
2 Specify the Range.

To select which cursor(s) to move
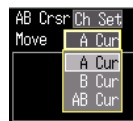
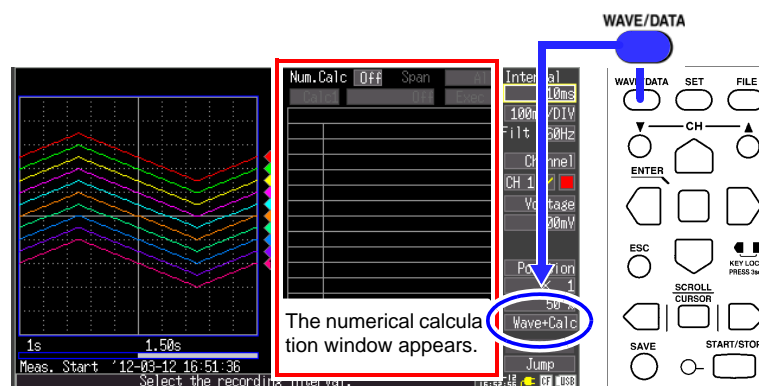Select whether to move Cursor A, Cursor B, or both together.

Calculate Measurement Data

Up to four types of calculations can be applied at the same time.
Calculation types: Average, peak value, maximum, minimum, time to maximum and time to minimum

1 Press the **WAVE/DATA** key several times to display **[Wave+Calc]**.

The numerical calculation window appears.

2 Enable **[Num.Calc]** (set to On), and set up to four calculation types (1 to 4).

Select

Apply
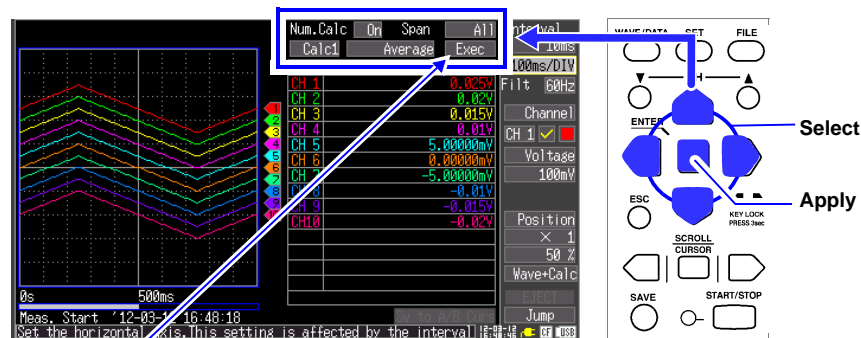
3 Select **[Exec]** and press the **ENTER** key to display calculation results.

View CF Card/USB flash drive Contents
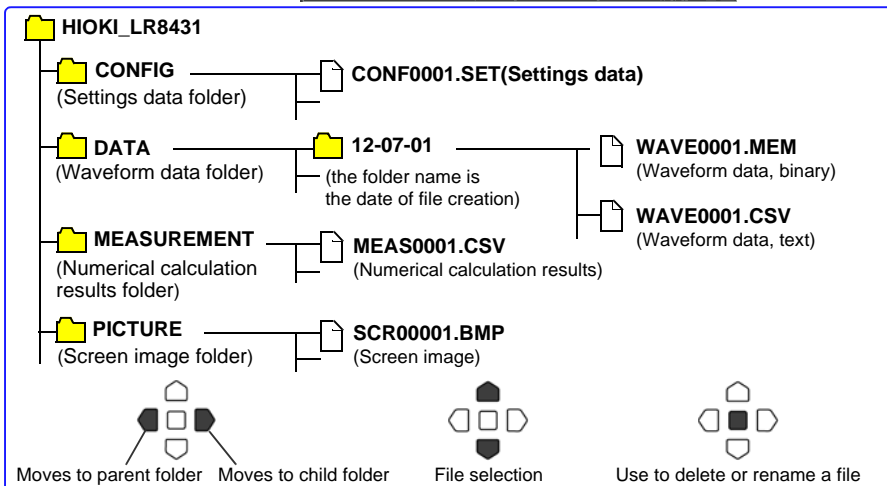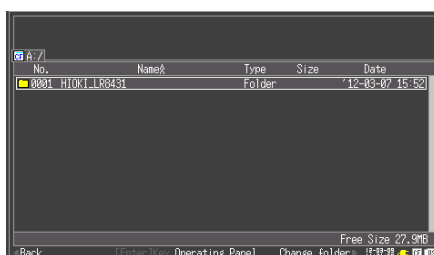
Data saved by the LR8431-20 can be confirmed on the File screen. It is stored on the CF Card or USB flash drive as follows. The numbers in the file names are automatically generated sequentially.

WAVE/DATA   SET   FILE

No.	NameA	Type	Size	Date
0001 HIOKI_LR8431		Folder		'12-03-07 15:52

Free Size 27.9MB
Back   [Enter]Key Operating Panel   Change folder

HIOKI_LR8431

CONFIG
(Settings data folder) ——— **CONF0001.SET(Settings data)**

DATA
(Waveform data folder) ——— **12-07-01**
(the folder name is the date of file creation) ——— **WAVE0001.MEM**
(Waveform data, binary)

WAVE0001.CSV
(Waveform data, text)

MEASUREMENT
(Numerical calculation results folder) ——— **MEAS0001.CSV**
(Numerical calculation results)

PICTURE
(Screen image folder) ——— **SCR00001.BMP**
(Screen image)

Moves to parent folder   Moves to child folder   File selection   Use to delete or rename a file

Analyzing HiLogger Data on a Computer

Recorded data can be analyzed and HiLogger settings can be changed using a computer running the supplied application program. Not only waveforms, but also numerical values and alarm output states can be monitored in real time. Measurement data from up to five LR8431-20 HiLoggers can be collected by one computer using USB connections. To use the Logger Utility, connect a USB cable after setting the [USB Mode] setting on the [System] screen to [USB Communication].

To access the HiLogger's CF card from a computer, connect a USB cable after setting the [USB Mode] on the [System] screen to [USB Drive].