HIOKI

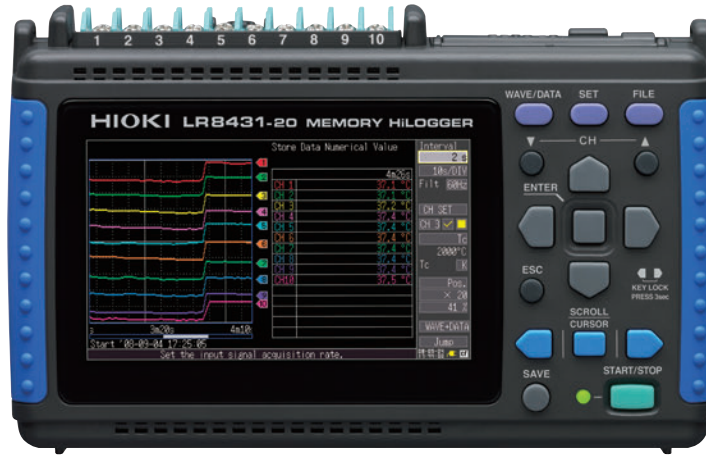
LR8431-20

Measurement Guide

MEMORY HiLOGGER

LR8432-20

HEAT FLOW LOGGER



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Procedure

Operation and Screen Types (p.14)	Describes the screen types and an overview of the operating keys.
Measurement Procedure (p.18)	Describes procedures from measurement preparation to analysis.
Monitoring Voltage Fluctuations (p.21)	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 V - 10 V DC output proportional to 0 V - 150 V AC rms input.)
Monitoring Temperature Changes (p.23)	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.26)	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.
Monitoring Heat Flow (Model LR8432-20 only) (p.28)	This section describes heat flow and temperature measurement using the Heat Flow Sensor and thermocouples. (LR8432-20 only) Here we explain how to measure heat flow and temperature every second (using the Heat Flow Sensor and thermocouples K) and how to measure changes in these variables.
Analysis (p.32)	View and calculate waveform measurement values using the A/B cursors.

Introduction

Thank you for purchasing the HIOKI “Model LR8431-20 Memory HiLogger” or “LR8432-20 Heat Flow Logger.”
This Measurement Guide consists of some basic application examples. Before using the instrument, be sure to read the Instruction Manual carefully.

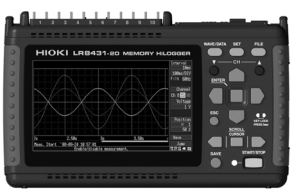
The product appearance and screen shots shown in this document are based on Model LR8431-20.
(Except for descriptions of functions installed in the LR8432-20 only)

Confirming Package Contents

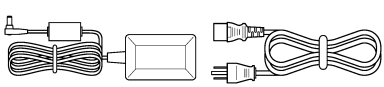
When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your authorized Hioki distributor or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

Confirm that these contents are provided.

☐ **Model LR8431-20 Memory HiLogger or Model LR8432-20 Heat Flow Logger 1**

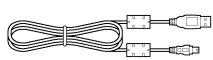


☐ **Model Z1005 AC Adapter ..... 1 with supplied power cord**



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

☐ **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 authorized Hioki distributor or reseller.

- ☐ Model 9780 Battery Pack
- ☐ Model Z1005 AC Adapter
- ☐ Model 9641 Connection Cable (for pulse inputs)
- ☐ Model 9782 Carrying Case
- ☐ Model 9812 Soft Case
- ☐ Model 9728 PC Card (512 M)
- ☐ Model 9729 PC Card (1 G)
- ☐ Model 9830 PC Card (2 G)
- ☐ Model 9809 Protection Sheet
- ☐ Z2012 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2013 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2014 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2015 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2016 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2017 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2018 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2019 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2012-01 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2013-01 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2014-01 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2015-01 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2016-01 Heat Flow Sensor (LR8432-20 only)
- ☐ Z2017-01 Heat Flow Sensor (LR8432-20 only)
- ☐ Z5008 Thermally Conductive Tape (LR8432-20 only)

⚠CAUTION Applying any excessive force to the Heat Flow Sensor can damage the sensor. When transporting the Heat Flow Sensor in a case, store the sensor in the pocket of the 9782 Carrying Case. Do not store the Heat Flow Sensor in the 9812 Soft Case.

Safety Information

This instrument is designed to conform to IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, using the instrument in a way not described in this manual may negate the provided safety features.
Before using the instrument, be certain to carefully read the following safety notes:

⚠DANGER **Mishandling during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use.**

⚠WARNING **With regard to the electricity supply, there are risks of electric shock, heat generation, fire, and arc flash due to short circuits. If persons unfamiliar with electricity measuring instrument are to use the instrument, another person familiar with such instruments must supervise operations.**

Safety Symbols

⚠	Indicates cautions and hazards. When the symbol is printed on the instrument, refer to a corresponding topic in the Instruction Manual.
⎓	Indicates DC (Direct Current).
~	Indicates AC (Alternating Current).
|	Indicates the ON side of the power switch.
○	Indicates the OFF side of the power switch.

Notation

In this document, the risk seriousness and the hazard levels are classified as follows.

⚠DANGER	Indicates an imminently hazardous situation that will result in death or serious injury to the operator.
⚠WARNING	Indicates a potentially hazardous situation that may result in death or serious injury to the operator.
⚠CAUTION	Indicates a potentially hazardous situation that may result in minor or moderate injury to the operator or damage to the instrument or malfunction.
NOTE	Indicates information related to the operation of the instrument or maintenance tasks with which the operators must be fully familiar.
IMPORTANT	Indicates information related to the operation of the instrument or maintenance tasks with which the operators must be fully familiar.

Symbols for Various Standards

CE	Indicates that the product conforms to regulations set out by the EU 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 XP, Windows Vista, Windows 7, Windows 8 or Windows 10.	
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.

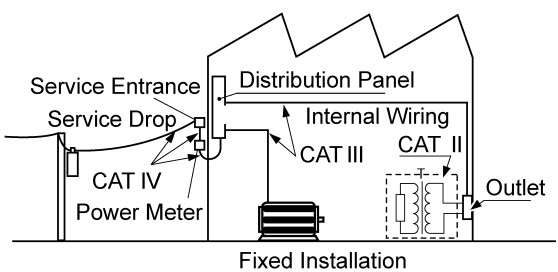
Measurement categories

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.

⚠DANGER

- **Using a measuring 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.**
- **Never use a measuring instrument that lacks category labeling in a CAT II to CAT IV measurement environment. Doing so could result in a serious accident.**

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



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 the instrument’s internal 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 shipping. If you find any damage, contact your authorized Hioki distributor or reseller.
- 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 your authorized Hioki distributor or reseller for replacements.

Instrument Installation

Installation environment

⚠WARNING **Installing the instrument in inappropriate locations may cause a malfunction of instrument or may give rise to an accident. Avoid the following locations:**

- **Exposed to direct sunlight or high temperature**
- **Exposed to corrosive or combustible gases**
- **Exposed to a strong electromagnetic field or electrostatic charge**
- **Near induction heating systems (such as high-frequency induction heating systems and IH cooking equipment)**
- **Susceptible to vibration**
- **Exposed to water, oil, chemicals, or solvents**
- **Exposed to high humidity or condensation**
- **Exposed to high quantities of dust particles**

⚠CAUTION

- This instrument is not drip-proof. Install the instrument with the measurement cables hanging lower than the instrument to prevent water or other fluid from entering the instrument through the measurement cables and terminal block.
- The maximum operating (ambient) temperature for the instrument 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

⚠CAUTION

Do not place the instrument on an unstable table or an inclined place. Dropping or knocking down the instrument can cause injury or damage to the instrument.

- 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 instrument 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

The cable is hardened under the 0°C or colder environment. Do not bend or pull it to avoid tearing its shield or cutting cable.

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.**

Using the AC Adapter

- **Use only the supplied Model Z1005 AC Adapter. AC adapter input voltage range is 100 V to 240 V AC at 50 Hz/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

- Do not connect the supply voltage improperly. Doing so may damage the instrument's internal circuitry.
- Avoid using an uninterruptible power supply (UPS) or DC/AC inverter with rectangular wave or pseudo-sine-wave output to power the instrument. Doing so may damage the instrument.
- When the power is turned off, do not apply voltage or current to the terminals. 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 instrument 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

- **Do not use the instrument with circuits that exceed its ratings or specifications. Doing so may cause it to become hot, resulting in bodily injury.**
- **To avoid electrical hazards and damage to the instrument, do not apply voltage exceeding the rated maximum to the input terminals.**
- **The maximum input voltage (and the maximum rated voltage to earth) for the analog input terminals is 30 V rms (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 instrument connected to test objects in environments where a voltage surge might exceed the dielectric withstand voltage. Doing so could result in damage to the instrument, 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 authorized Hioki distributor or reseller for inspection.**

IMPORTANT

Select Hioki 9641 Connection Cable for use as a cable for the pulse input connector.

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

CD precautions

- Exercise care to keep the recorded side of discs free of dirt and scratches. When writing text on a disc's label, use a pen or marker with a soft tip.
- Keep discs inside a protective case and do not expose to direct sunlight, high temperature, or high humidity.
- Hioki is not liable for any issues your computer system experiences in the course of using this disc.

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 instrument.
- Never eject a CF card /USB flash drive while measuring or when the instrument 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 instrument 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 instrument may occur due to static electricity. Please be careful when handling it.
- With some USB flash drives, the instrument 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 instrument and initiate measurement using the Logger Utility software from a computer (using a USB cable).	Type B	[USB Comm.] (USB Communication)
Read files on a CF card that is connected to the instrument from a computer (using a USB cable).	Type B	[USB Drive]

Heat Flow Sensor (Models Z2012, Z2013, Z2014, Z2015, Z2016, Z2017, Z2018, Z2019, Z2012-01, Z2013-01, Z2014-01, Z2015-01, Z2016-01, Z2017-01)

⚠CAUTION Do not subject the Heat Flow Sensor to excessive force.

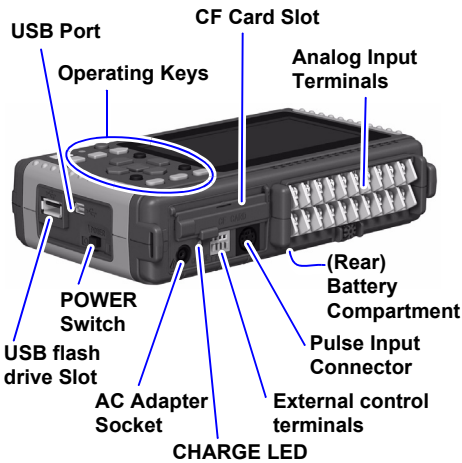
Refer to the instruction manual included with the Heat Flow Sensor for details.

Before use, check for a break between positive and negative terminals in a Heat Flow Sensor or thermocouple.

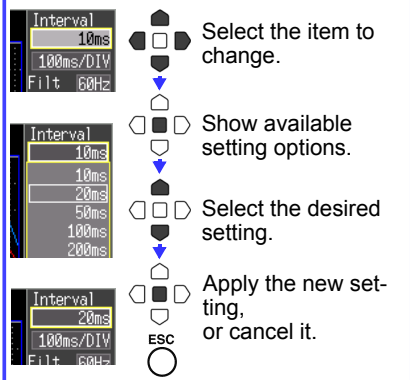
Thermally Conductive Tape Z5008

⚠CAUTION Stop using double-sided Thermally Conductive Tape immediately if it touches the human body and causes an abnormality.

Operation and Screen Types



Changing screen contents



Operating Keys

Choose a screen

■ WAVE/DATA
Selects among waveform screen displays (p. 15).

■ SET
Displays the Settings screens, and switches among the screen tabs with each press (p. 16).

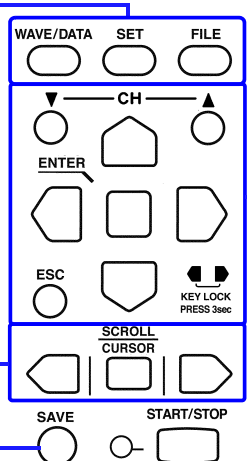
■ FILE
Displays file information (p. 17).

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. 32).

Saving operations

Press to save data manually (p. 25).



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

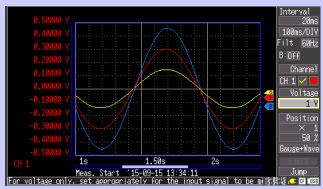
WAVE/DATA SET FILE

Selects between seven display types.

The screen switches each time you press the key.

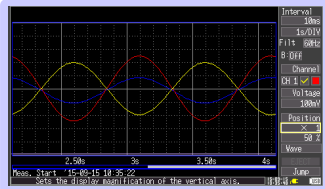
Operational information is displayed along the bottom of the screen.

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



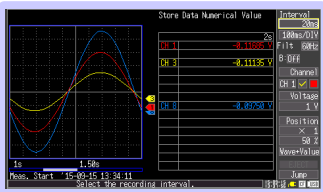
[Gauge+Wave] Screen

Measurement data is displayed as waveforms with gauges.



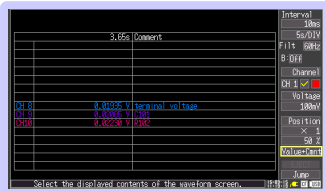
[Wave] Screen

Measurement data is displayed as waveforms.



[Wave+Value] Screen

Measurement data is displayed as waveforms and numerical values.

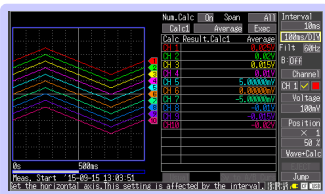


[Value+Cmnt] Screen

Measurement data is displayed as numerical values with comments.

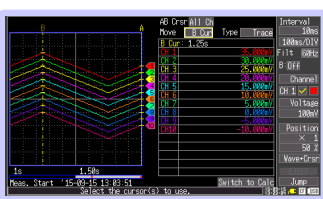
[Value] Screen

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

WAVE/DATA SET FILE

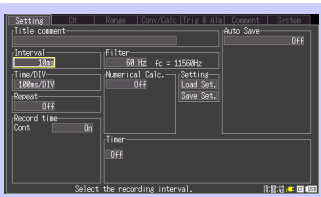
Selects between seven display types.

The screen switches each time you press the key.

Operational information is displayed along the bottom of the screen.

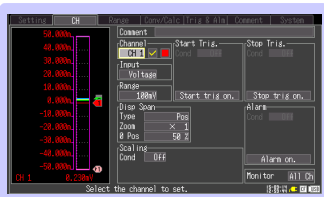
SCROLL CURSOR

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



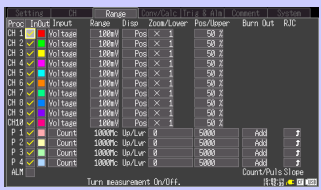
Setting Screen

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



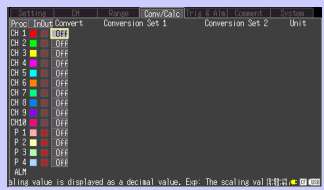
CH Screen

Make input channel settings while viewing the monitor display.



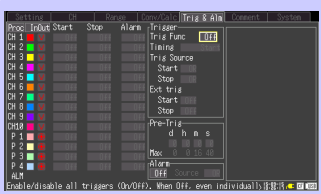
Range Screen

Make settings while viewing all channel settings.



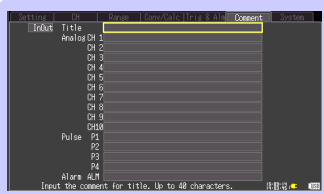
Scaling Screen

Make these settings to convert measured values to arbitrary units for display.
*Displayed to be [Conv/Calc] on Model LR8432-20.



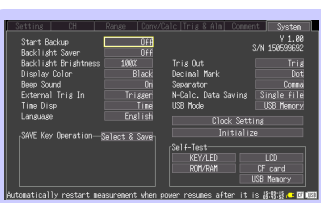
Trig & Alm Screen

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



Comment Screen

Enter channel comments.

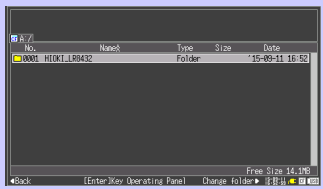


System Screen

Configure the system environment.

File Screen

Operational information is displayed along the bottom of the screen.



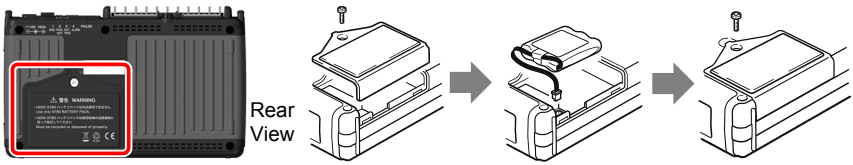
File Screen

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.

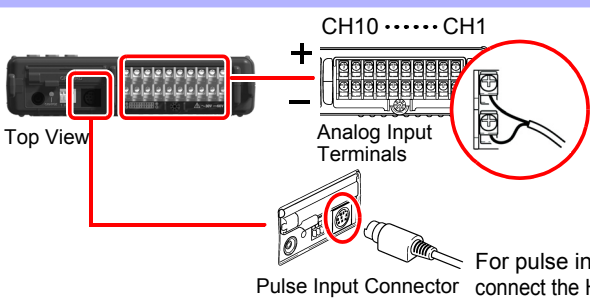
Install the battery pack (option)



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

Connect the power cord

Connect the measurement cable



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

(To measure the heat flow) * Connect the Heat Flow Sensor.

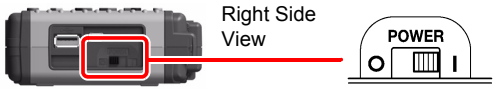
* (LR8432-20 only)

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

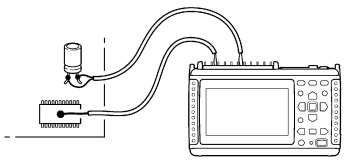
Insert a CF Card or USB flash drive (option)

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



Connect to the measurement object

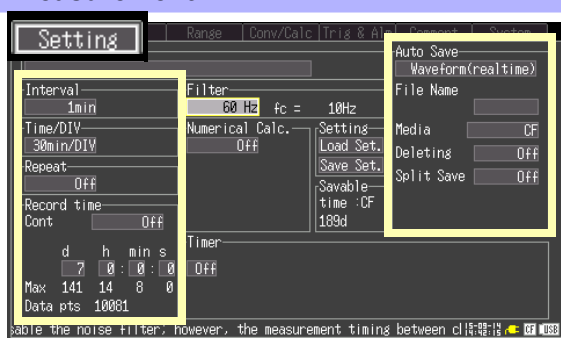


Configure settings for measurement

Configure recording settings on the Setting screen.

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

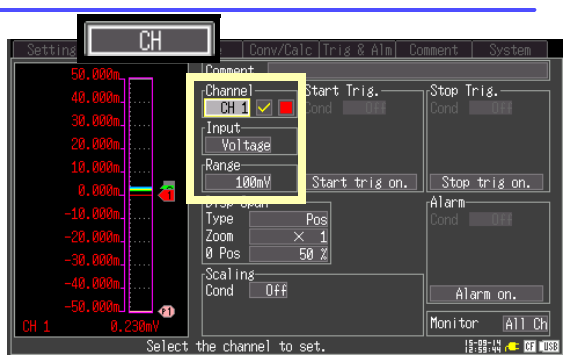
Make other settings as necessary.



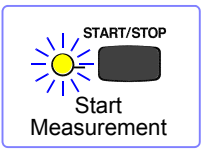
Configure input channel settings on the CH screen.

- Channel selection
- Input type
- Measurement range

Make other settings as necessary.

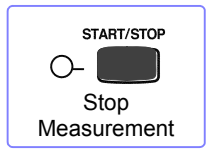


Start and finish measuring

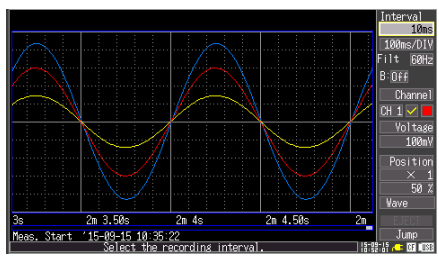


Press to start and stop recording with the selected measurement conditions.

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



Analyze



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 V to 10 V DC output proportional to 0 V to 150 V AC rms input.

1 Prepare the Following Before Measuring

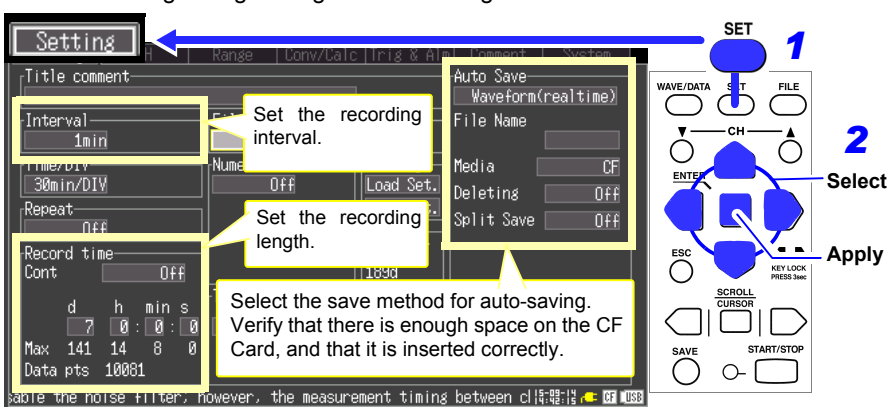
Items to prepare

- ☐ Model LR8431-20 Memory HiLogger or Model LR8432-20 Heat Flow Logger
- ☐ AC Adapter (supplied)
- ☐ Measurement (input) leads
- ☐ Transducer
- ☐ CF Card (Hioki option)

"Measurement Procedure" (p. 18)

2 Configure Measurement Settings

Make recording timing settings on the Setting screen.

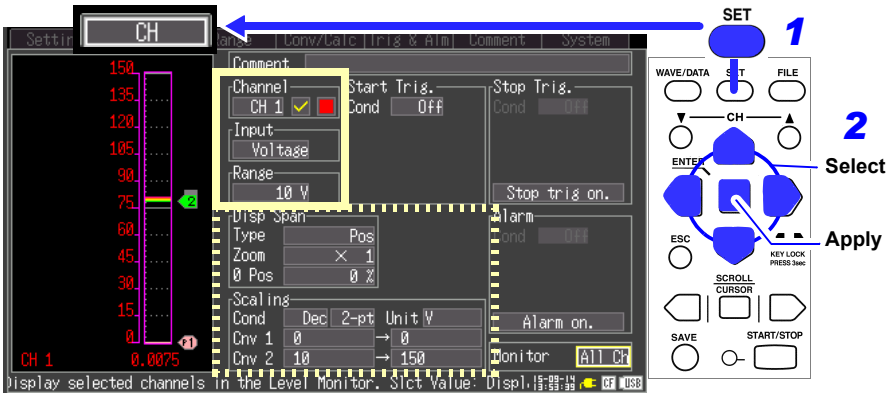


Setting Example
(Record at one-minute intervals for seven days automatically on the CF card)
Interval: 1min
Record time: Cont Off, 7 days
Auto Save: Waveform(realtime)

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

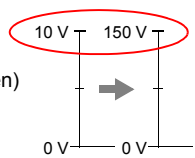
Enable [Deleting] (set to [On]) to delete old files when the CF card or USB flash drive becomes full. Otherwise, when disabled (set to [Off]), saving stops when the card becomes full. Also, when you want measurements saved in multiple files at specific intervals, set [Split Save] to [On] or to [Ref Time]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

Make input channel settings on the CH screen.



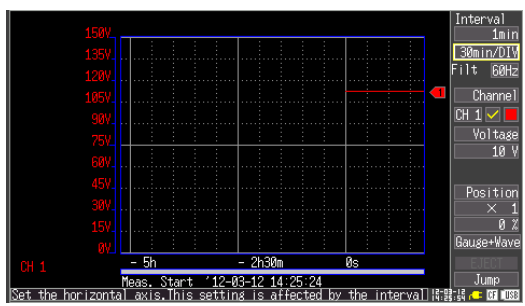
Setting Example
Channel: CH1, Input: Voltage, Range: 10V

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

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



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

Refer to “Analysis” (p. 32) 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

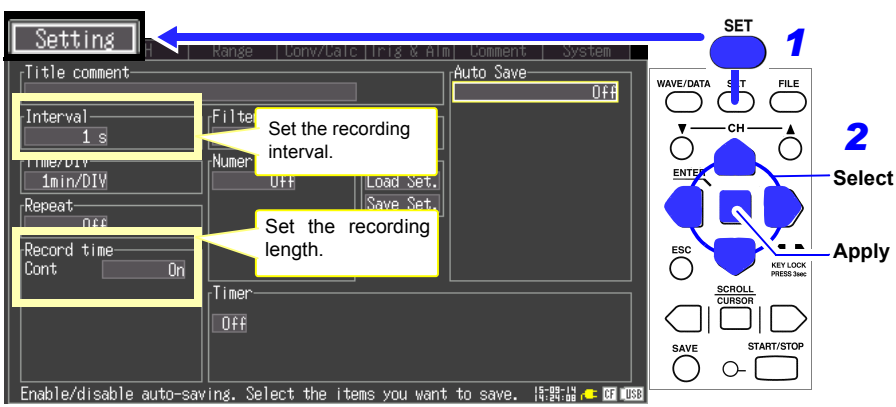
Items to prepare

- ☐ Model LR8431-20 Memory HiLogger or Model LR8432-20 Heat Flow Logger
- ☐ AC Adapter (supplied)
- ☐ Thermocouples (K)
- ☐ CF Card (Hioki option)

"Measurement Procedure" (p. 18)

2 Configure Measurement Settings

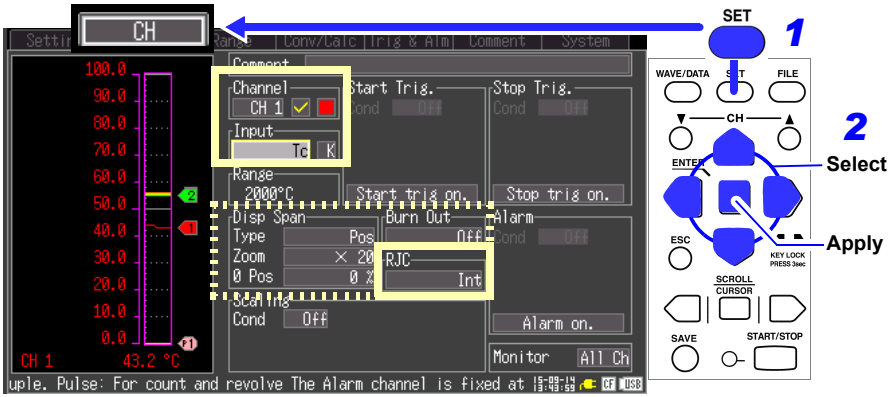
Make recording timing settings on the Setting screen.



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.

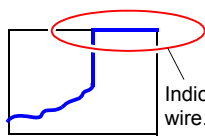
Make input channel settings on the CH screen.



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.

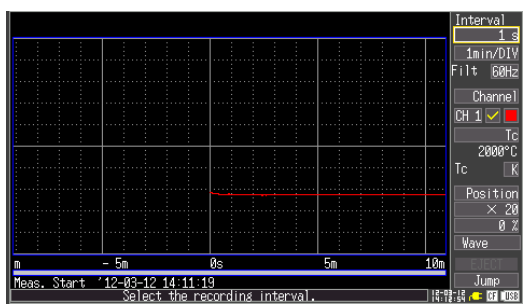


Indicates a broken wire.

3 Start and Stop Measurement

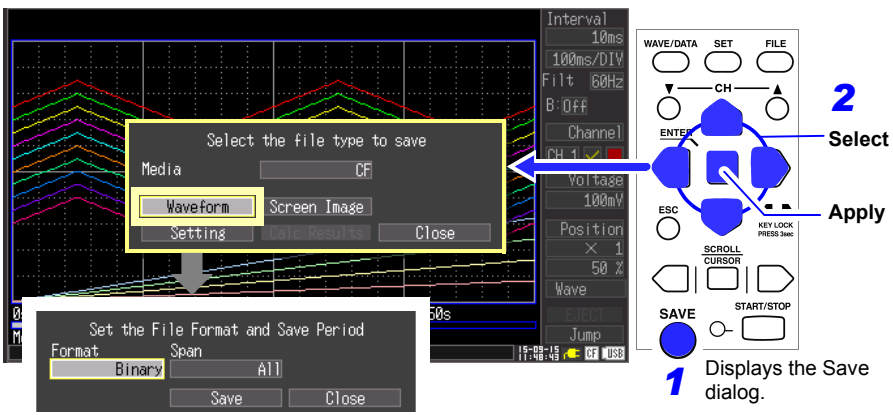
Press the **START/STOP** key.

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.



- 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. 34).
- 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. 36).

For long-term measurement, set the Auto-Save setting to [Waveform(realtime)] (p. 21). 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. 32) 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

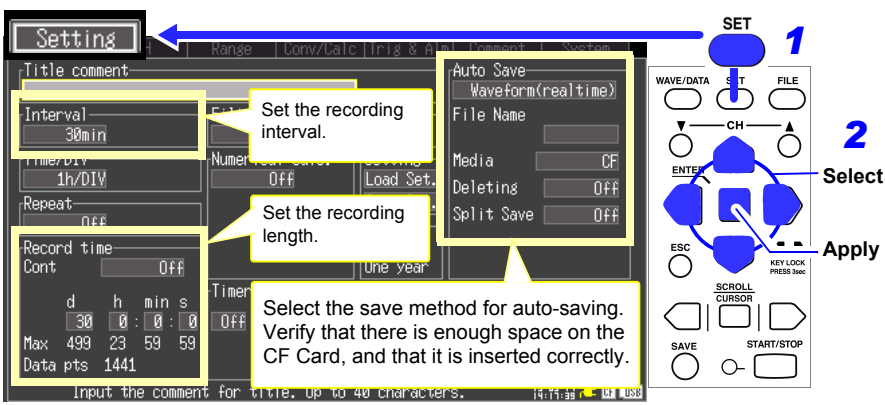
Items to prepare

- ☐ Model LR8431-20 Memory HiLogger or Model LR8432-20 Heat Flow Logger
- ☐ AC Adapter (supplied)
- ☐ Model 9641 Connection Cable (Hioki option)
- ☐ Watt-Hour Meter
- ☐ CF Card (Hioki option)

"Measurement Procedure" (p. 18)

2 Configure Measurement Settings

Make recording timing settings on the Setting screen.

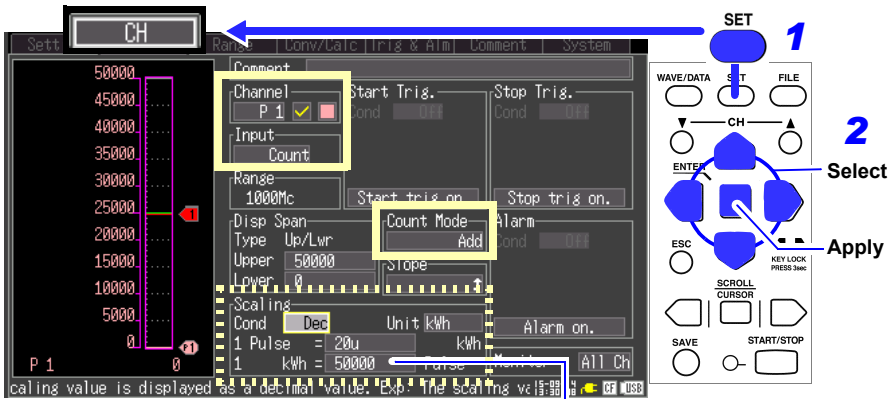


Setting Example
(Record at 30-minute intervals for 30 days, and automatically store on the CF card)
Interval: 30min
Record time: Cont Off, 30 days
Auto Save: Waveform(realtime)

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: 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)

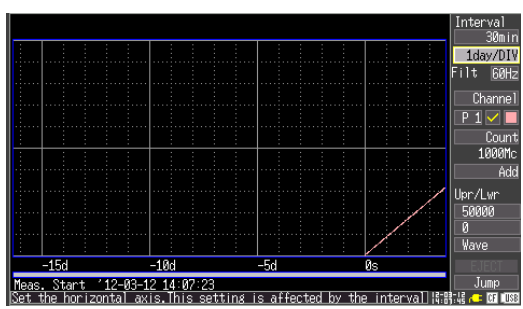
Select digit position

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. 32) for analysis methods.

Monitoring Heat Flow (Model LR8432-20 only)

This section describes simultaneous measurement of heat flow and temperature using a heat flow sensor and a type K thermocouple to obtain heat flow and temperature data once per second, for monitoring those changes. (Model LR8432-20 only) (Since they are equipped with a K-type thermocouple, another thermocouple is not required for the following models: Z2012-01, Z2013-01, Z2014-01, Z2015-01, Z2016-01, and Z2017-01 Heat Flow Sensor.)

1 Prepare the Following Before Measuring

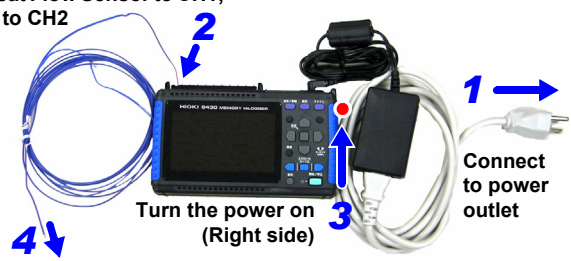
Items to prepare

- ☐ LR8432-20 Heat Flow Logger
- ☐ AC Adapter (supplied)
- ☐ Heat Flow Sensor*
- ☐ Type K thermocouple

*. Hioki option

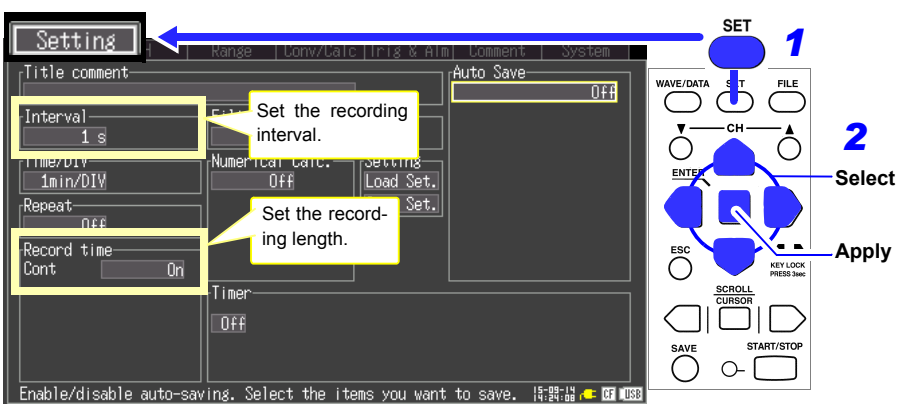
Connect to the measurement point (Refer to the instruction manual of the Heat Flow Sensor for the procedure to connect it.)

Connect the Heat Flow Sensor to CH1; thermocouple to CH2



2 Configure Measurement Settings

Make recording timing settings on the Setting screen.



Setting Example

(to record at one-second intervals from starting measurement until pressing the **START/STOP** key again)

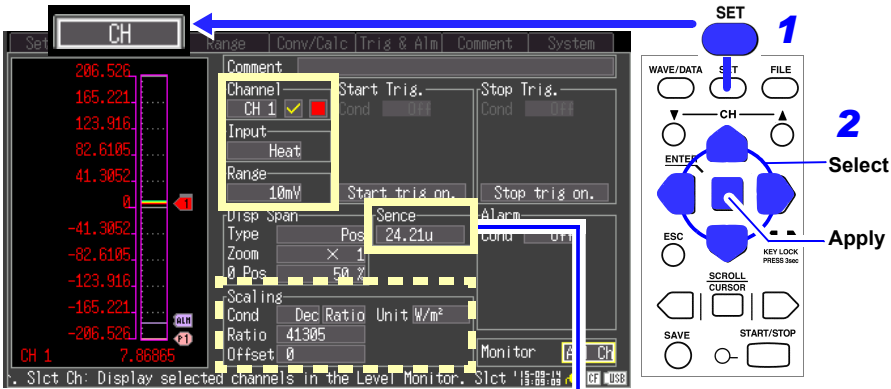
Interval: 1s

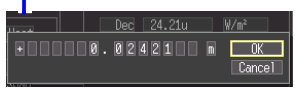
Record time: Cont On

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

Make input channel settings on the CH screen.

CH1 Setting





Setting Example

Channel: CH1, Input: Heat, Range: 10 mV

Enter the sensitivity constant of the sensor.

The test report that comes with the Heat Flow Sensor contains the sensor's sensitivity constant. When the sensitivity constant is set, the scaling of the corresponding channel is automatically changed.

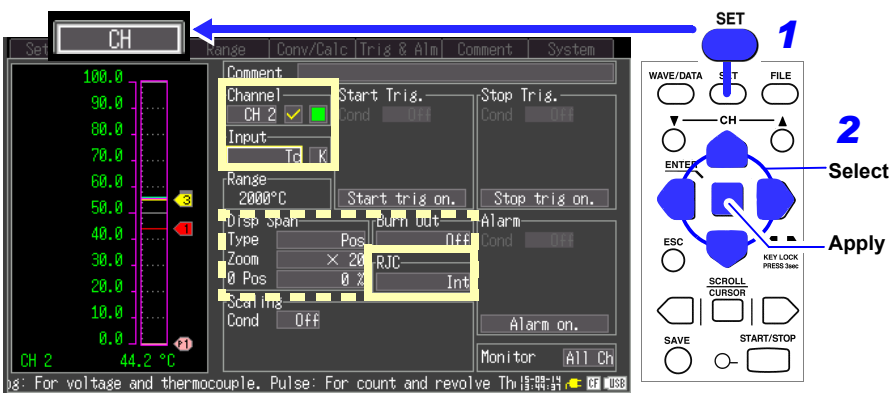
Set the display span as necessary.

(Example)

Sensitivity constant: 0.02421 mV/W·m^{-2}

(Also enter a unit prefix, if necessary.)

CH2 setting



Setting Example

Channel: CH2, Input: Tc,K (thermocouple), RJC: Int

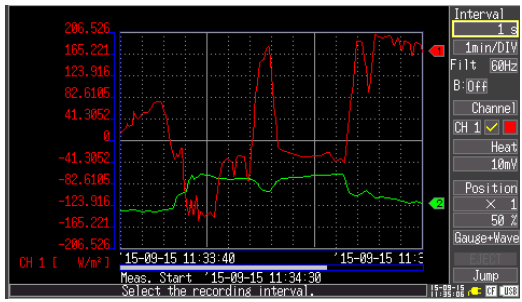
Activate the open-circuit detection and set the display range as necessary.

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

3 Start and Stop Measurement

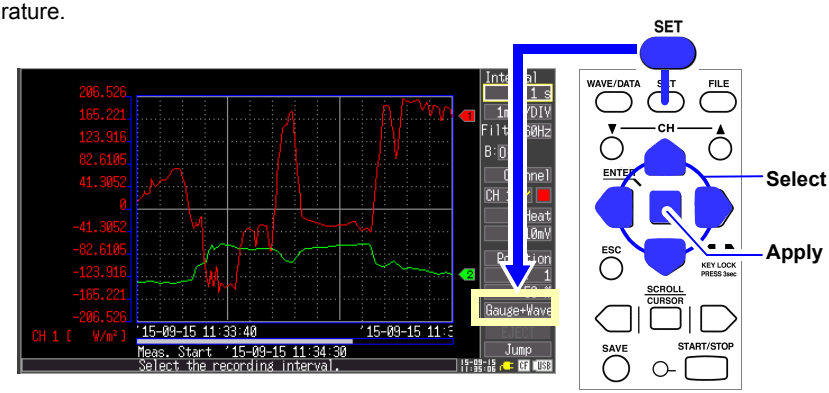
Press the **START/STOP** key.

In this case, measurement data are recorded until you press the **START/STOP** key again.

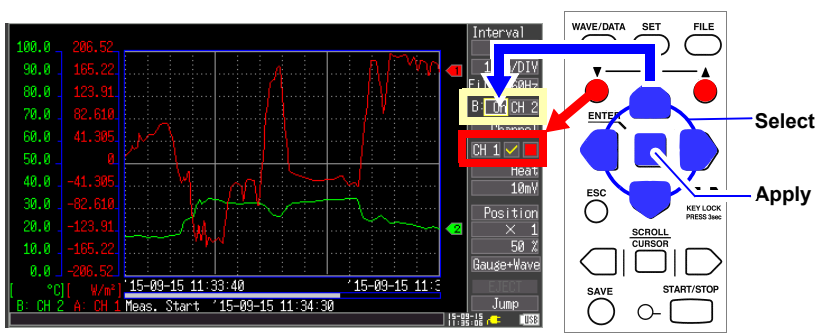


Observe the Waveform, Displaying Two Gauges (As necessary)

Observe the waveform, displaying two gauges on the [Gauge+Wave] screen of the waveform screen. It is effective to assess the correlation between the heat flow and the temperature.



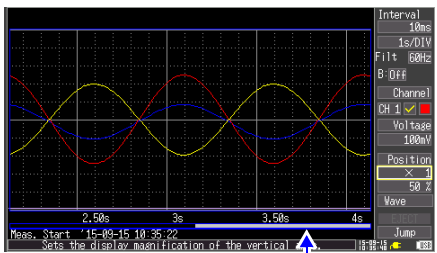
1. Press the **WAVE/DATA** key to display [Gauge+Wave].
2. Set [B: ON]. (This enables the display channel selection and the gauge B is displayed on the left of the screen.)
   The gauge A can be switched by pressing the CH ▲ key or the CH ▼ key. (Refer to “Analysis” (p. 32) for other analysis methods.)



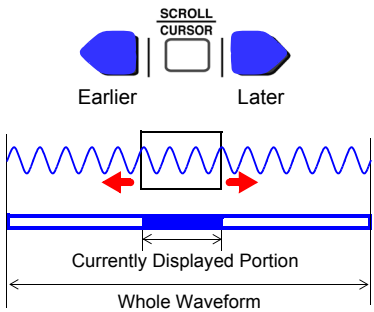
Analysis

Viewing a Measurement Waveform

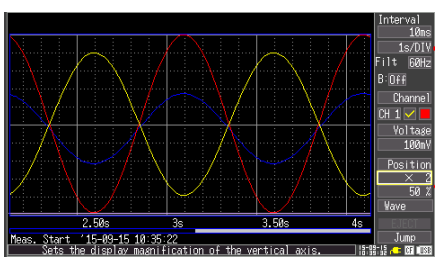
Scrolling the Waveform



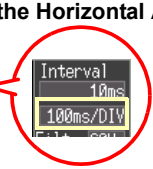
The portion of a waveform that is currently displayed can be confirmed by the position of the scroll bar.

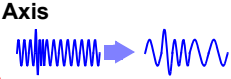


Zooming the Waveform View



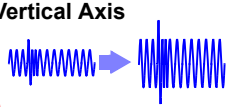
Zooming (Magnifying and Reducing) the Horizontal Axis





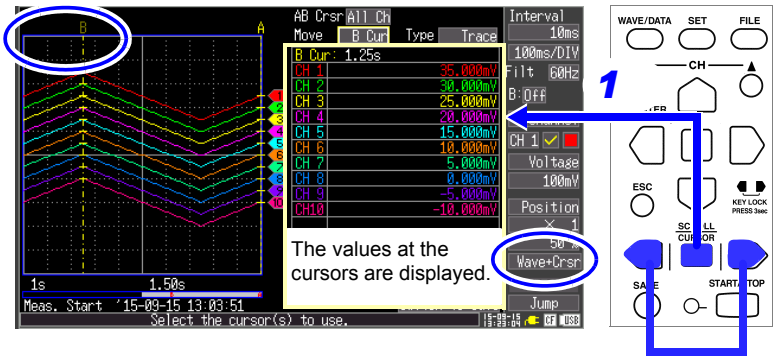
Specify the time per division for the horizontal axis.

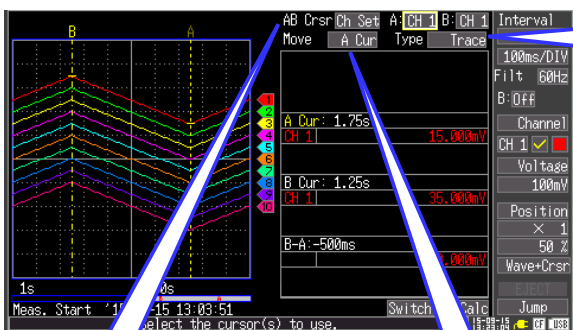
Zooming the Vertical Axis



Specify the magnification factor for the vertical axis.

View Measurement Values

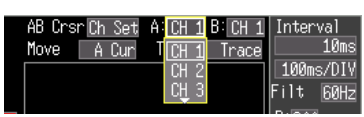




To change the cursor type, select from the [Type] setting items.

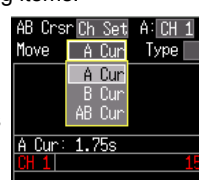
- Trace
  (time value and measurement value)
- Vert (Vertical, time value)
- Horz
  (Horizontal, measurement value)

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.

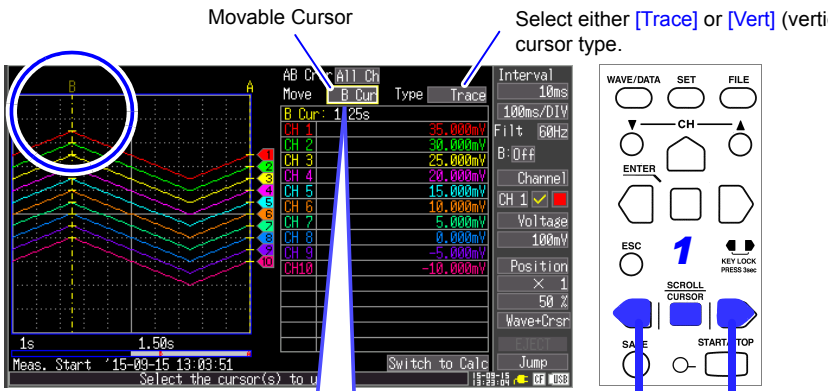


To select which cursor(s) to move, select from the [Move] setting items.

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

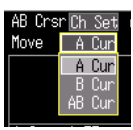


Specifying a Range

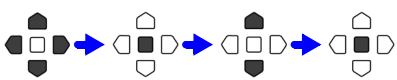


2 Specify the Range.

To select which cursor(s) to move



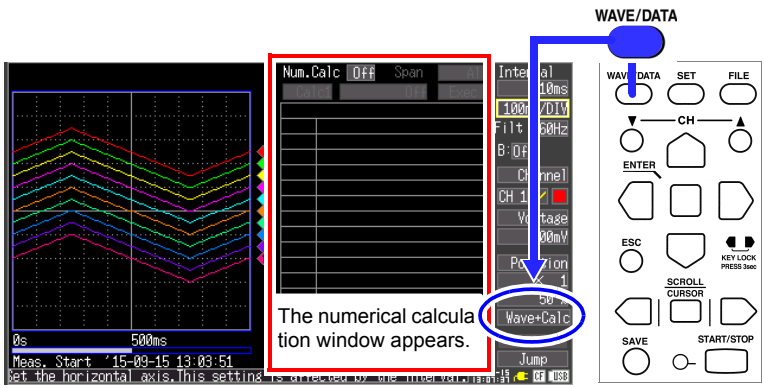
Select whether to move Cursor A, Cursor B, or both together.



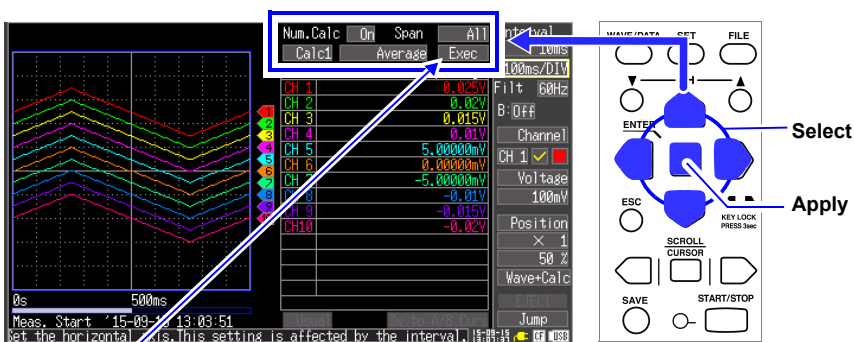
Calculate Measurement Data

Up to four types of calculations can be applied at the same time.
Calculation types: Average, peak value, maximum, minimum, time to maximum, time to minimum, and sum (LR8432-20 only)

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



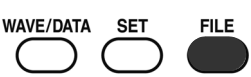
2 Enable **[Num.Calc]** (set to On), and set up to four calculation types (1 to 4).

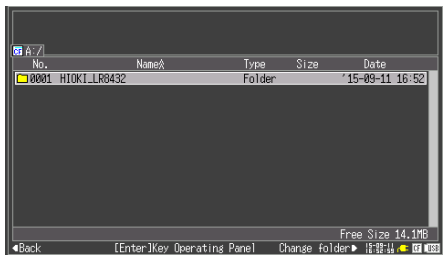


3 Select **[Exec]** and press the **ENTER** key to display calculation results.

View CF Card/USB Flash Drive Contents

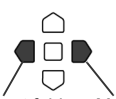
Data saved by the instrument can be confirmed on the File screen. It is stored on the CF Card or USB flash drive as follows. The numbers in the file names are automatically generated sequentially.





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

(For the LR8432-20 file example, refer to the LR8432-20 instruction manual.)

Analyzing HiLogger Data on a Computer

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].

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 instruments 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].

Warranty Certificate

HIOKI

Model	Serial No.	Warranty period Three (3) years from date of purchase (___ / ___)

This product passed a rigorous inspection process at Hioki before being shipped.

In the unlikely event that you experience an issue during use, please contact the distributor from which you purchased the product, which will be repaired free of charge subject to the provisions of this Warranty Certificate. This warranty is valid for a period of three (3) years from the date of purchase. If the date of purchase is unknown, the warranty is considered valid for a period of three (3) years from the product's date of manufacture. Please present this Warranty Certificate when contacting the distributor. Accuracy is guaranteed for the duration of the separately indicated guaranteed accuracy period.

1. Malfunctions occurring during the warranty period under conditions of normal use in conformity with the Instruction Manual, product labeling (including stamped markings), and other precautionary information will be repaired free of charge, up to the original purchase price. Hioki reserves the right to decline to offer repair, calibration, and other services for reasons that include, but are not limited to, passage of time since the product's manufacture, discontinuation of production of parts, or unforeseen circumstances.
2. Malfunctions that are determined by Hioki to have occurred under one or more of the following conditions are considered to be outside the scope of warranty coverage, even if the event in question occurs during the warranty period:
   a. Damage to objects under measurement or other secondary or tertiary damage caused by use of the product or its measurement results
   b. Malfunctions caused by improper handling or use of the product in a manner that does not conform with the provisions of the Instruction Manual
   c. Malfunctions or damage caused by repair, adjustment, or modification of the product by a company, organization, or individual not approved by Hioki
   d. Consumption of product parts, including as described in the Instruction Manual
   e. Malfunctions or damage caused by transport, dropping, or other handling of the product after purchase
   f. Changes in the product's appearance (scratches on its enclosure, etc.)
   g. Malfunctions or damage caused by fire, wind or flood damage, earthquakes, lightning, power supply anomalies (including voltage, frequency, etc.), war or civil disturbances, radioactive contamination, or other acts of God
   h. Damage caused by connecting the product to a network
   i. Failure to present this Warranty Certificate
   j. Failure to notify Hioki in advance if used in special embedded applications (space equipment, aviation equipment, nuclear power equipment, life-critical medical equipment or vehicle control equipment, etc.)
   k. Other malfunctions for which Hioki is not deemed to be responsible

*Requests
- Hioki is not able to reissue this Warranty Certificate, so please store it carefully.
- Please fill in the model, serial number, and date of purchase on this form.

16-01 EN

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