HIOKI

Instruction Manual

8430-20

MEMORY HiLOGGER

HIOKI E. E. CORPORATION

May 2011 Revised edition 5 8430B981-05 11-05H

600254315

Contents

Chapter 3
Setting before Measurement 35

Introduction

Thank you for purchasing the HIOKI "Model 8430-20 Memory HiLogger." To obtain maximum performance from the instrument, please read this manual carefully, and keep it handy for future reference.

Registered trademarks

- Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.
- CompactFlash is a registered trademark of Sandisk Corporation (USA).

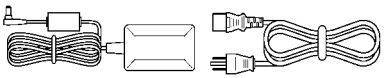
Confirming Package Contents

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 8430-20 Memory HiLogger1**

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



(p. 28)

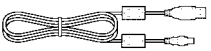
☐ **Model 9809 Protection Sheet 1**

Please stick this over the screen to protect it from any damage.

☐ **Instruction Manual**
(This document) 1

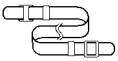
☐ **Measurement Guide 1**

☐ **USB Cable 1**



(p. A25)

☐ **Strap 1**



(p. 32)

☐ **Logger Utility (Data acquisition application program CD) 1**

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 9809 Protection Sheet
- ❑ Model 9726 PC Card (128MB)
- ❑ Model 9727 PC Card (256MB)
- ❑ Model 9728 PC Card (512MB)
- ❑ Model 9729 PC Card (1GB)
- ❑ Model 9830 PC Card (2GB)

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).
|	Indicates the ON side of the power switch.
○	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 or Windows 7.

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.

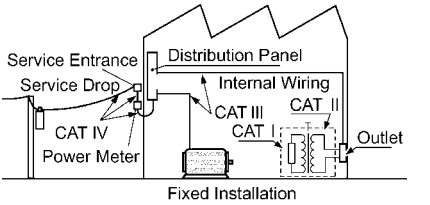
Example: For the 1 V range, f.s. = 1 V

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 (Overvoltage categories)

This instrument complies with CAT I safety requirements.
To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.



CAT I: Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar device.
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).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.
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.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.
The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.

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


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


Exposed to high levels of particulate dust


Subject to vibration

In the presence of corrosive or explosive gases


Exposed to strong electromagnetic fields
Near electromagnetic radiators


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

CAUTION The maximum operating (ambient) temperature for the 8430-20 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.

Installation Precautions

- Do not install the instrument with any side except the bottom facing down.
- Leave sufficient space around the ventilation holes and install the instrument with the holes unobstructed.

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: 2.1, "Using the Battery Pack (Option)" (p. 24)

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 only to a 3-contact (two-conductor + ground) outlet.**
- **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.**

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.

Overview Chapter 1

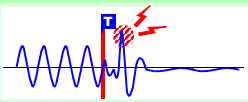
1.1 Product Overview and Features

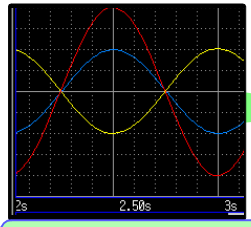
The Hioki 8430-20 Memory HiLogger is a compact, lightweight, easy-to-operate waveform recorder. It can run on batteries, and can be quickly deployed when a power anomaly occurs.
Measurement data can be monitored, subjected to calculations and analyzed on a personal computer using the supplied application program.

Observe voltage fluctuations and temperature changes
Just connect measurement leads or thermocouples to measure as needed.

Acquire pulse signals
Measure integrated pulses or revolutions from sensors and pulse output devices such as watt-hour meters.

Record anomalies
Abnormal events can be analyzed by recording with the trigger function (p. 63)
Use the alarm function to output signals when anomalies occur (p. 69).





Measurement data and setting configurations are stored, read and managed as data files
Measurement data can be stored to and read from an optional CF card (p. 85)

Waveform analysis

Gauge display (p. 78)

Zoom in/out (p. 77)

Numerical display (p. 81)

Event search (p. 82)

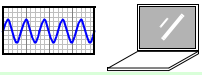
Cursor Measurements (p. 78)

Using the A/B cursors, values at cursor locations on waveforms and the time at trigger positions can be displayed.

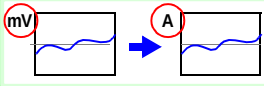
Numerical Calculations (p. 105)

Performs six calculation types, including maximum and average values.

Analysis on a PC
Monitor and analyze measurement data with the supplied application program (p. A18).



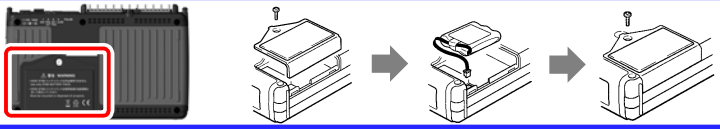
Display in converted units
Using the scaling function, input values can be displayed in units of the actual physical quantity being measured, such as current or flow volume (p. 54).



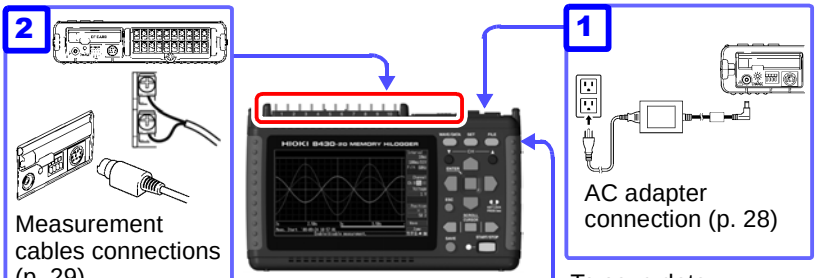
1.2 Measurement Flow

Installing, Connecting and Turning On

Install the Battery Pack (option) (p. 24)



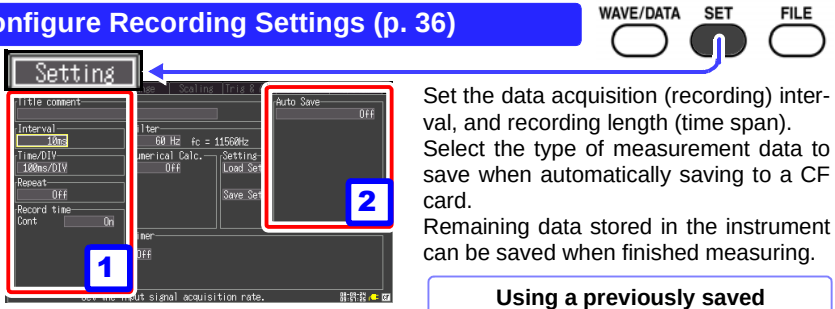
Connect to the Model 8430-20 (p. 23), and Set Up (p. 7)



Turn the Power On (p. 33)

Settings

Configure Recording Settings (p. 36)

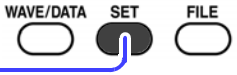


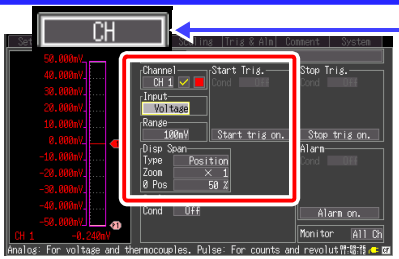
Set the data acquisition (recording) interval, and recording length (time span).
Select the type of measurement data to save when automatically saving to a CF card.
Remaining data stored in the instrument can be saved when finished measuring.

Using a previously saved setting configuration

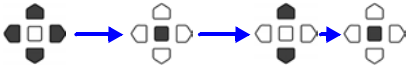
Reload a previously stored setting configuration from Model 8430-20 memory or a CF card, and measure (p. 97)

Configure Input Channels (p. 36)



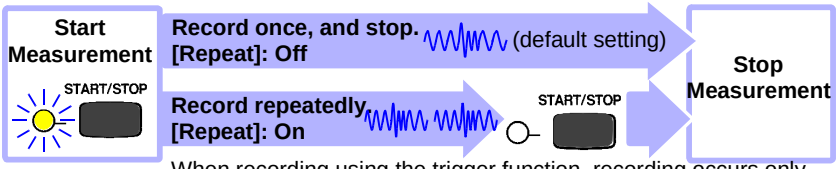


Select input channels, and set input types and measurement ranges.
Make other settings as desired.



Starting and Stopping Measurement

Press the START/STOP Key (p. 20)



When recording using the trigger function, recording occurs only when the input waveform satisfies specified trigger criteria.

Data Analysis

View Measurement Data (p. 75)

Waveforms can be zoomed and numerical values confirmed.

Save Data (p. 85)

Measurement data, waveform data, screen images and numerical calculation results can be saved.

Calculate (p. 105)

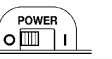
Numerical measurement data can be applied to calculations.

View on a Computer (p. A18)

Analyze recorded data using the supplied application program.

When Finished

Turn the Memory HiLogger Off (p. 33)



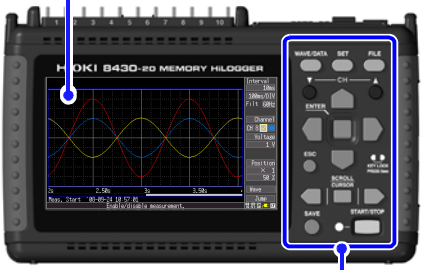
1.3 Names and Functions of Parts

Front Panel

Display Screen (p. 75)

4.3-inch TFT color LCD

Screen Configurations (p. 16)



Operating Keys

Rear Panel

Manufacturer's Serial No.

Shows the serial number.
Do not remove this label, as it is required for product support.

Battery Compartment (p. 24)

The optional Model 9780 Battery Pack is installed here.

Operating Keys

Choose a screen

■ WAVE/DATA
Selects among waveform screen displays (p. 16).

■ SET
Displays the Settings screens, and switches among the screen tabs with each press (p. 18).

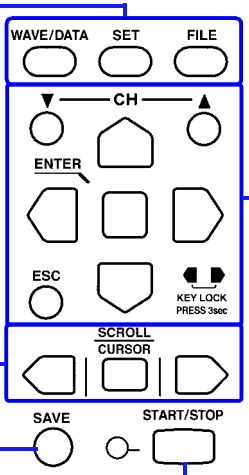
■ FILE
Displays file information (p. 17).

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. 19).

Saving operations

Press to save data manually (p. 90).



Start and stop measurement

Start and stop measurement. The LED at the left lights green while measuring (p. 20).

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 (p. 34).

Top Panel

CF Card Slot
Insert an optional CF card (p. 87)

AC Adapter Socket
Connect the supplied Model Z1005 AC Adapter (p. 28).

CHARGE LED
This LED lights when the battery is charging (p. 27).

Analog Input Terminals
Connect measurement leads for voltage measurement, and thermocouples for temperature (p. 29).

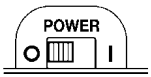
Pulse Input Connector
Connect an optional 9641 cable (p. 31).

External Control Terminals
Control signals can be received from and output to external devices (p. 119).

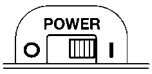
Right Side

USB Port
(USB 2.0 mini-B receptacle)
Use for communications with a computer . Open the dust cap and connect the USB cable
To transfer data from the HiLogger's CF card to the computer, first select the HiLogger's USB Drive Mode (p. 102)
You can also monitor measurement data and change instrument settings from the computer with the supplied Logger Utility program (p. A25).

POWER Switch
Turns the instrument on and off (p. 33)



○ Power Off



| Power On

1.4 Screen Configurations

Waveform/Numerical Screens

WAVE/DATA SET FILE

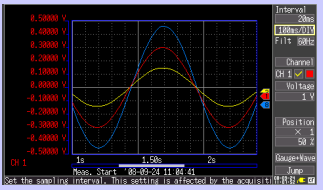
Selects between seven display types.

The screen switches each time you press the key.

Operational information is displayed along the bottom of the screen.

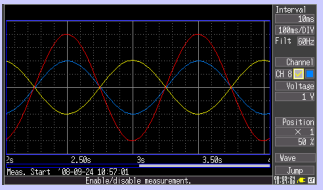
Selection is also available from the name of the current screen displayed near the bottom right

[Gauge+Wave]
↓
[Wave]
↓
[Wave+Value]
↓
[Value+Cmnt]
↓
[Value]
↓
[Wave+Calc]
↓
[Wave+Crsr]
↓



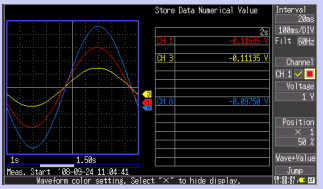
[Gauge+Wave] Screen

Measurement data is displayed as waveforms with gauges (p. 78).



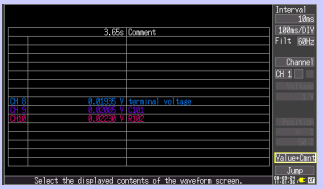
[Wave] Screen

Measurement data is displayed as waveforms (p. 75).



[Wave+Value] Screen

Measurement data is displayed as waveforms and numerical values (p. 81).

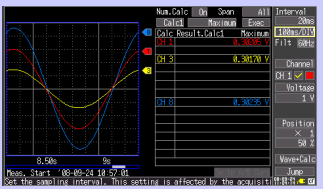


[Value+Cmnt] Screen

Measurement data is displayed as numerical values with comments (p. 81).

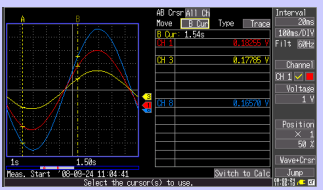
[Value] Screen

Measurement data is displayed as numerical values (p. 81).



[Wave+Calc] Screen

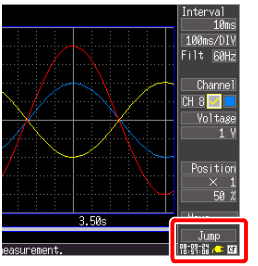
Measurement data is displayed as waveforms with calculation results (p. 81).



[Wave+Crsr] Screen

Measurement data is displayed as waveforms with cursor values (p. 78).

Waveform/Numerical Screens (About the Icons)



CF card
Displayed when a CF card is inserted.
The icon appears red when accessing the card.

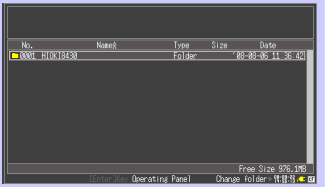
Power source indicator
Indicates the Memory HiLogger's power source.

	AC adapter operation
	Battery pack operation (Fully charged battery pack)
	Battery pack operation
	Battery pack operation (Low battery indicator)

Clock
"Setting the Date and Time" (p. 115)

File Screen

Operational information is displayed along the bottom of the screen.



File Screen

View and manage files on the CF card (p. 85).

Settings Screens

WAVE/DATA SET FILE

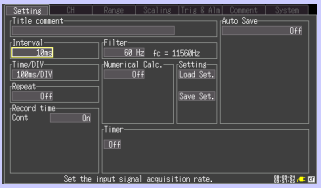
Selects between seven display types.

The screen switches each time you press the key.

Operational information is displayed along the bottom of the screen.

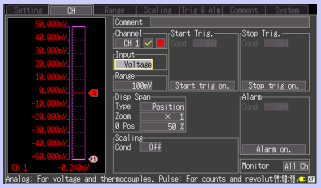
SCROLL CURSOR

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



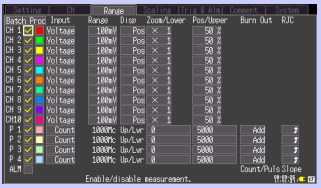
[Setting] Screen

Make settings for recording (p. 40). Set numerical calculation, auto-saving and timers.



[CH] Screen

Make input channel settings while viewing the monitor display (p. 46).

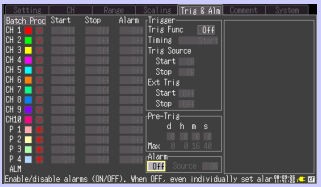


[Range] Screen

Make settings while viewing all channel settings (p. 58).

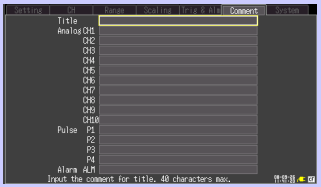
[Scaling] Screen

Make these settings to convert measured values to arbitrary units for display (p. 54).



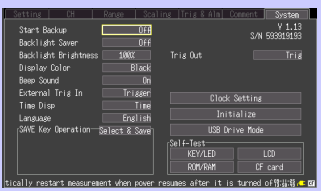
[Trig & Alm] Screen

Recording criteria (triggering) and warning sounds can be set for each channel (p. 63).



[Comment] Screen

Enter channel comments (p. 56)

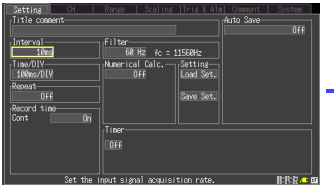


[System] Screen

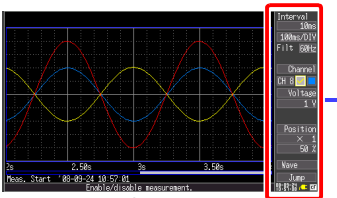
Configure the system environment (p. 111).

1.5 Basic Operation

Screen Operations

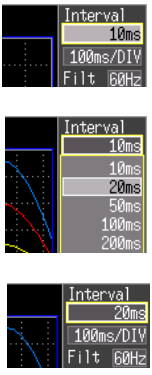


Setting Screen



Waveform Screen

Changing screen contents



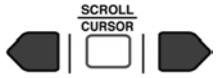
Select the item to change.

Show available setting options.

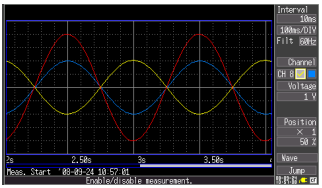
Select the desired setting.

Apply the new setting, or cancel it.

Scrolling a waveform



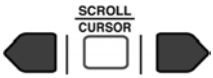
See: "Scrolling Waveforms" (p. 76)



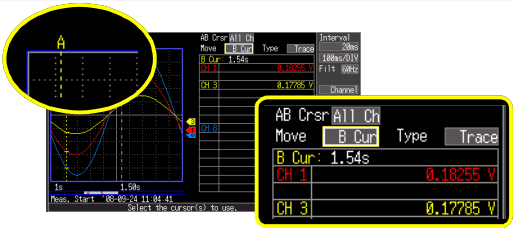
Reading values at cursors

1 

Display the A/B cursors.

2 

Move the A/B cursors.
Values at cursor positions can be read numerically.



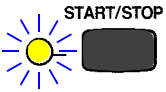
You can select the cursor display type and which cursor(s) to move (p. 78).

Starting and Stopping Recording

Acquire measurement data on the Memory HiLogger, and start recording. When recording stops depends on data recording settings (repeat recording, triggering, timers, etc.). (p. 73)

When you want measurement data to be automatically saved, before starting recording, check that auto-save is enabled (p. 44), that a CF card is correctly inserted (p. 88), and that sufficient storage capacity is available (p. A10).

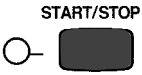
Start Measurement



Press the **START/STOP** key.
The green LED lights.
When using the trigger function, the times when measurement starts and when recording (data acquisition) starts are not the same.

A confirmation message appears when you press the **START/STOP** key to start recording. Save important data to a CF card before starting, because previous measurement data will be overwritten when recording starts.

Finish Measurement



When [Repeat] (record multiple instances of the specified recording length) or [Cont] (record continuously) is enabled:
Pressing the **START/STOP** key stops recording.

When [Repeat] and [Cont] are disabled (Off):
Recording stops after the specified recording length. Pressing the **START/STOP** key during recording displays a confirmation message. Select **[Yes]** to stop recording.

For details about repeating and continuous recording:
See: "Selecting the Recording Start/stop Method" (p. 42)
"Set the Recording Length for Repeated or One-time Recording" (p. 43)

Disabling Key Operations (Key-Lock Function)

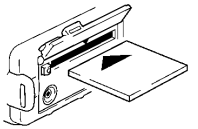
Keys can be disabled to avoid inadvertent operations.

Press and hold the right and left cursor keys for three seconds to lock the other keys, and repeat to unlock.

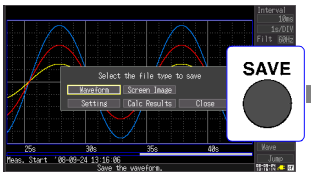
Saving Data

Measurement data, settings, screen images and numerical calculation results can be saved.
For details of the saving methods, see Chapter 6, "Saving & Loading Data" (p. 85).

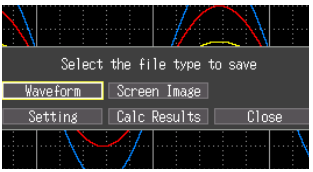
(Default settings)
Saving Method: [Select & Save] (Press the **SAVE** key to select and save data.)



Insert a CF card.



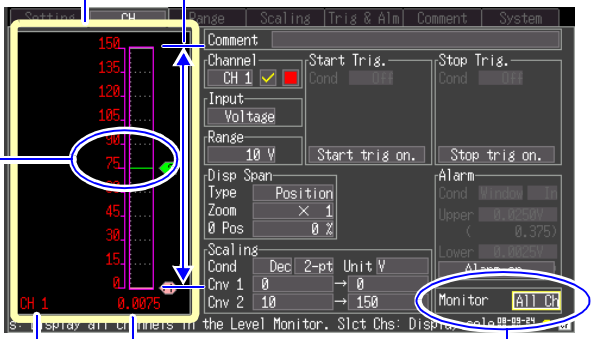
Press the **SAVE** key.
A dialog appears.



Select the items to be saved, and press the **ENTER** key. Select **[Yes]** in the confirmation dialog, and press ENTER again to save the data to the CF card.

Verifying the Input Level (Level Monitor)

You can verify the input status and display range while making settings on the Setting screen. This is not available while measuring.



Measurement Preparations Chapter 2

1 Install the 9780 Battery Pack (option) (p. 24)

Rear View

2 Connect measurement cables (p. 29)

- Voltage measurement: Connect the measurement leads.
- Temperature measurement: Connect thermocouples.
- Pulse signals: Connect the Hioki 9641 connection cable

3 Connect the AC adapter (p. 28)

4 (To save data)
Insert a CF card (option) (p. 87)

Attach the strap (p. 32)

External control signal inputs
External control signal outputs (p. 119)

5 Turn the power on (p. 33)
Execute zero adjustment (p. 34)

2.1 Using the Battery Pack (Option)

If commercial power is not available when the AC adapter is connected, the 8430-20 Memory HiLogger can operate from the Model 9780 battery pack, so when using commercial power, the battery pack serves as a backup supply during power outages.
Charge the battery pack fully before using it the first time.

⚠WARNING

Be sure to observe the following precautions. Incorrect handling may result in liquid leaks, heat generation, ignition, bursting and other hazards.

- **Do not use a battery pack other than the 9780 Battery Pack. We cannot accept responsibility for accidents or damage related to the use of any other batteries.**
- **To avoid the possibility of explosion, do not short circuit, disassemble or incinerate battery pack.**
- **When storing the instrument, make sure no objects that could short-circuit the connectors are placed near them.**
- **The battery pack contains lye, which can cause blindness if comes into contact with the eyes. Should battery liquid get into your eyes, do not rub your eyes but rinse them in plenty of water and seek the immediate attention of a physician.**

Installing and replacing the battery pack

- **To avoid electric shock, turn off the power switch and disconnect the cables before replacing the battery pack.**
- **After installing or replacing the battery pack, replace the battery compartment cover and screw.**
- **Handle and dispose of batteries in accordance with local regulations.**

⚠CAUTION **Observe the following to avoid damage to the instrument.**

- Use the battery pack in an ambient temperature range of 0 to 40°C and charge it in an ambient temperature range of 5 - 30°C to be on the safe side.
- If the battery packs fails to complete charging within the stipulated time, disconnect the AC adapter from the pack to stop charging.
- Consult your dealer or nearest service station should liquid leaks, strange odor, heat, discoloration, deformation and other abnormal conditions occur during use, charging or storage. Should these conditions occur during use or charging, turn off and disconnect the instrument immediately.
- Do not expose the instrument to water and do not use it in excessively humid locations or locations exposed to rain.
- Do not expose the instrument to strong impacts and do not throw it around.

NOTE

- The battery pack is subject to self-discharge. Be sure to charge the battery pack before initial use.
- When recharging a discharged battery pack in the Model 8430-20, allow it to charge for at least ten minutes with the Model 8430-20 turned off to maximize battery longevity.
- The battery pack is a consumable. If the battery capacity remains very low after correct recharging, the useful battery life is at an end. It can be recharged up to about 500 times.
- To prevent battery pack deterioration when the battery will not be used for 1 month or longer, remove it and store it in a dry location with an ambient temperature range of between -10 to 30°C. Be sure to discharge and charge it every two months. Long-term storage when capacity has decreased will make charging impossible and reduce performance.
- Remove the battery pack from instrument once a month and check that appearance is normal.
- As long as battery charge remains, waveform data is retained in internal memory while the Memory HiLogger is turned off, so the battery continues to gradually discharge. When the battery charge is depleted, stored waveform data is lost.

When to charge

When powering the instrument from the battery pack without the Model Z1005 AC Adapter, the low battery indicator () is displayed when the battery charge is depleted, indicating that the battery pack requires charging.
Note that if the Memory HiLogger is turned off under this situation, waveform data may fail to be backed up, and could be lost.

Approximate charging time:
About 200 minutes at 23ºC when recharged at the first appearance of the low battery indicator.

Approximate continuous battery-only operating time

(operating at 23°C)

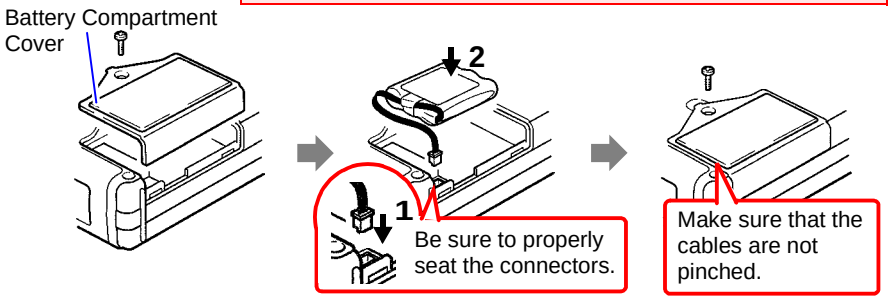
- After a full charge, with the LCD backlight always on (default setting): approximately 2.5 hours
- After a full charge, with the LCD backlight off (five minutes after last key-press): approximately 3 hours

See: "Enabling and Disabling the Backlight Saver" (p. 113)

Install the Battery Pack

Required tool:
One Phillips screwdriver (No.2)

Important
Disconnect the AC adapter when installing the battery pack.



1 Place the Memory HiLogger face down, and remove the battery compartment cover screw and cover.

2 Connect the plugs of the battery pack to the connectors and insert the battery pack with the label side up.

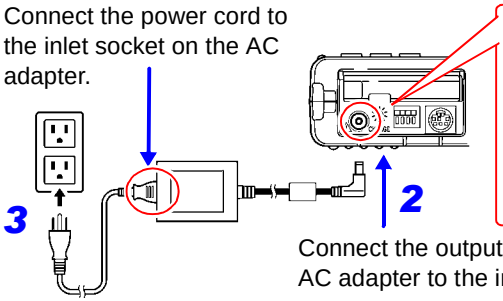
3 Replace the battery compartment cover and screw.

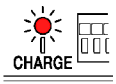
Pull the battery pack plug straight out to remove the battery pack.

Charge the Battery Pack

Regardless of whether the Memory HiLogger is on or off, the battery pack recharges whenever the Z1005 AC Adapter is plugged in to a power source. Therefore, charging is provided by merely keeping the battery installed in the Memory HiLogger.

1 Connect the power cord to the inlet socket on the AC adapter.





The CHARGE LED lights red when charging begins.
Charging is finished when the CHARGE LED turns off.

Connect the output plug of the AC adapter to the instrument.

Plug the power cord into the mains outlet.

Refer to 2.2, "Connecting the AC Adapter" (p. 28) for details about the AC adapter.

2.2 Connecting the AC Adapter

Connect the power cord and the instrument to the supplied Model Z1005 AC Adapter, then plug the power cord into an outlet. When used with the battery pack installed, the battery serves as an operating backup supply in case of power failure, and the AC adapter otherwise has priority.

Before Connecting

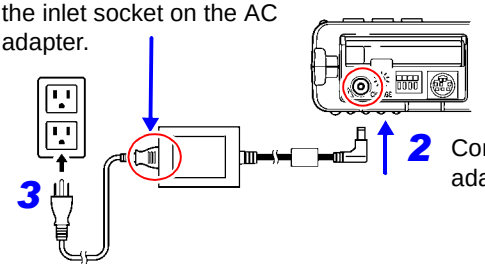
⚠WARNING

- **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 only to a 3-contact (two-conductor + ground) outlet.**

⚠CAUTION

To avoid damaging the power cord, grasp the plug, not the cord, when unplugging it from the power outlet.

1 Connect the power cord to the inlet socket on the AC adapter.



Rated supply voltage is 100 to 240 VAC, and rated supply frequency is 50 or 60 Hz.

2 Connect the output plug of the AC adapter to the instrument.

3 Plug the power cord into the mains outlet.

2.3 Connecting Measurement Cables to the Memory HiLogger

Connect the appropriate cables for the intended recording application.

- When recording voltage fluctuations or temperature changes (p. 30)
- When recording pulse signals (p. 31)

Be sure to read the "Operating Precautions" (p. 6) before connecting the cables.

Connecting to the Analog Input Terminals

DANGER

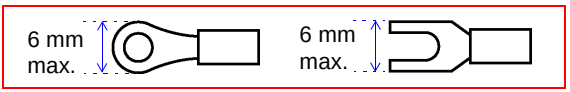
- **The maximum input voltage (and the maximum rated voltage to earth) for the analog input terminals is 30 Vrms (or 60 V DC). If the voltage is exceeded, this device will be damaged and personal injury will result. Therefore, do not perform measurement in this case.**
- **Do not leave the Memory HiLogger 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.**

WARNING

- **Do not connect a cable to the instrument while it is connected to the object to be measured. Otherwise, an electric shock accident may occur.**
- **To avoid short-circuit accidents, make certain that connections are secure.**

NOTE

- Measurements may be affected by noise or other electromagnetic ingress if input leads are longer than about three meters.
- Route measurement leads and cables as far away as possible from power and earth lines.
- Measurement values may be scattered if the leads are routed in parallel with other devices. If they must be parallel, check operation before taking measurements.
- Avoid temperature changes around the terminal block. Especially avoid directed airflow such as from an electric fan or air-conditioner vent.
- If connecting crimped terminals to the analog input terminals, use insulated terminals for M3 screws with the size shown below.

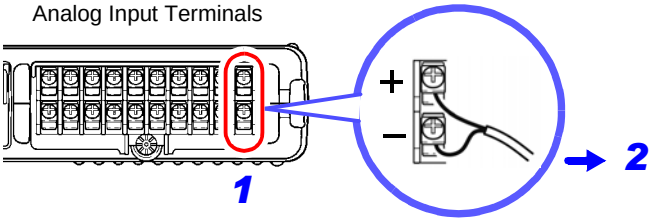


Connecting Measurement Leads or Thermocouples (for voltage or temperature, respectively)

Connect the voltage and temperature measurement (thermocouple) leads to the analog input terminals.

Tools required: Phillips screwdriver (for M3 screws)

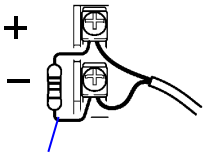
Analog Input Terminals



Connect to the measurement object.

Using the screwdriver, loosen the terminal block screws, insert the bare ends of the leads, and tighten the screws.

When applying 4 - 20 mA input current



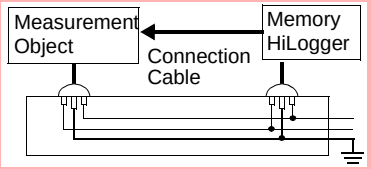
Connect a 250 Ω shunt resistor as shown.

(For details on instrumentation control equipment measurements, see p. 47 .)

Connecting to the Pulse Input Connector

DANGER

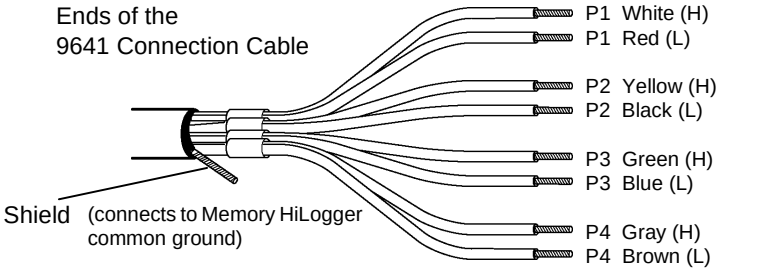
To avoid electric shock and short circuit accidents or damage to the instrument, pay attention to the following:



- **The ground terminal for the optional 9641 Connection Cable is not isolated from the Memory HiLogger's ground (chassis ground). Therefore, if the measurement object connects to AC, it should have a grounded, polarized plug, and be connected to the same power outlet as the Memory HiLogger's AC adapter.**
  If the Memory HiLogger and measurement object are connected to different mains circuits, or if an ungrounded power cord is used, the potential difference between the different grounding paths may result in current flow through a connection cable that could damage the measurement object or Memory HiLogger.
- **The input voltage range limits are -5 to +10 V. If these limits are exceeded, the instrument could be damaged and personal injury or death could occur, so do not attempt measurement.**

CAUTION

For safety, we recommend using only Hioki's connection cable (measurement lead cable).

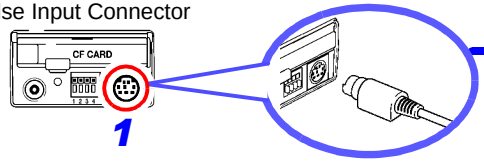


(Each channel's L line connects to Memory HiLogger common ground.)

Connecting the Optional Model 9641 Connection Cable (for Pulse Signal Input)

Connect the optional 9461 connection cable to the pulse input connector.

Pulse Input Connector



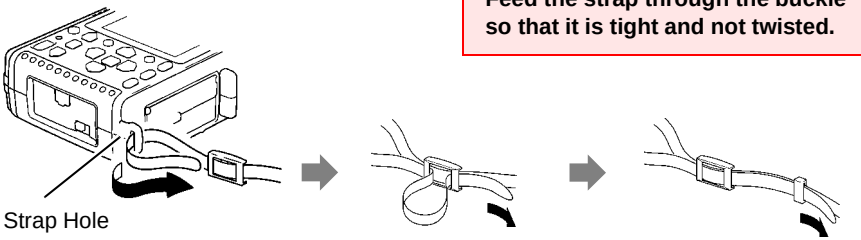
2 Connect the other end of the cable to the pulse source(s) to be measured.

2.4 Attaching the Carrying Strap

Use the strap to avoid dropping the instrument while carrying, or when you need to hang it on a hook.

⚠CAUTION Attach both ends of the Strap securely to the instrument. If insecurely attached, the instrument may fall and be damaged when carrying.

Feed the strap through the buckle so that it is tight and not twisted.



1 Push the strap through one of the strap holes on the instrument.

2 Feed the strap through the buckle.

3 Put the end of the strap under the retaining loop.

4 Repeat the same procedure with the other end of the strap and the other strap hole.

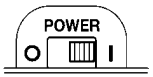
2.5 Turning the Power On and Off

⚠WARNING Using the AC Adapter

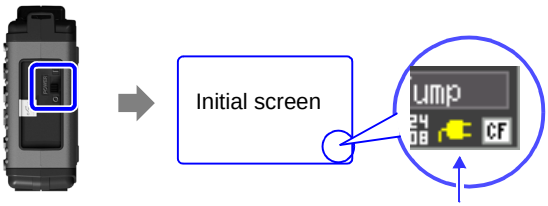
Before turning the instrument on, make sure the supply voltage matches that indicated on its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.
Rated supply voltage is 100 to 240 VAC
(Voltage fluctuations of ±10% from the rated supply voltage are taken into account.)
Rated supply frequency is 50 or 60 Hz.

Turning Power On

Verify that the instrument and peripheral devices are correctly connected.



Turn the power switch on (I).



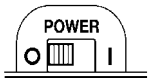
Right Side

The power supply icon appears near the bottom right corner of the screen (p. 17).

If the " " indicator is not displayed, the instrument is not being powered from the AC line. In this state, the battery charge will be depleted if measuring for a long time, and measurement may be interrupted. Verify that the AC adapter is securely connected to an AC power source and to the instrument.

Execute zero-adjust 30 minutes after turning power on (p. 34).

Turning Power Off



Turn the power switch off (○).

The installed battery pack is charged whenever the AC adapter is plugged into a power outlet, even when the Memory HiLogger is off. In addition, providing there is some remaining battery charge, waveform data and the setting configuration are memorized whenever the Memory HiLogger is turned off, so that when the Memory HiLogger is turned back on, the same operating state is displayed.

2.6 Zero Adjustment

Zero adjustment corrects for voltage offset at the input terminals, so that Memory HiLogger measurements are relative to zero volts.
Repeat zero adjustment if the ambient temperature changes suddenly.

Turn on the power and wait for 30 minutes to stabilize the internal temperature of the Memory HiLogger.

1 (simultaneously)

With the Waveform or [CH] screen displayed, press and hold these keys simultaneously for one second.

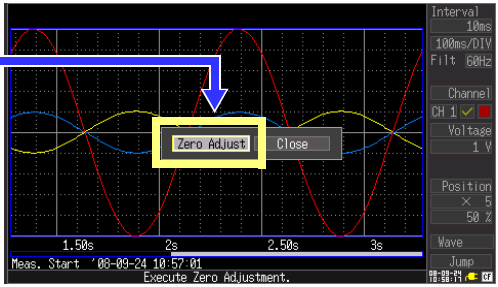
The Zero Adjust dialog appears.

2

Select **[Zero Adjust]**.

Apply

Zero adjustment is executed.



From the Setting screen

NOTE Any zero-adjust setting is cleared upon system reset (p. 116).

Setting before Measurement Chapter 3

3.1 Pre-Operation Inspection

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

1 Peripheral Device Inspection

Is the insulation of the measurement cable to be used damaged, or is bare metal exposed?

Metal Exposed → Do not use if damage is present as you could receive an electric shock. Replace the damaged items.

No Metal Exposed → To 2

2 Instrument Inspection

Is damage to the instrument evident?

Yes → If damage is evident, request repairs.

No

When turning power on

Does the HIOKI logo appear on the screen?

No → The power cord may be damaged, or the instrument may be damaged internally. Request repairs.

Yes

Is the Waveform or Setting screen displayed? (When power is turned on the first time after purchase, the Setting screen should appear.)

→ The instrument may be damaged internally. Request repairs.

Nothing appears, or the display is abnormal

Yes

Inspection complete

3.2 Operating Flow Overview

Connect

Connect measurement cables (p. 29).

Configure

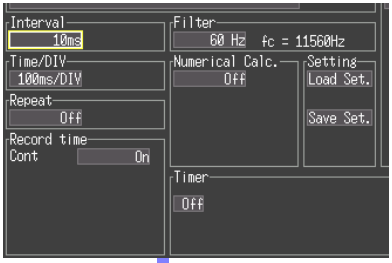
WAVE/DATA SET FILE

Display the Setting screen

Configure measurement settings

Configure data recording settings (p. 40)

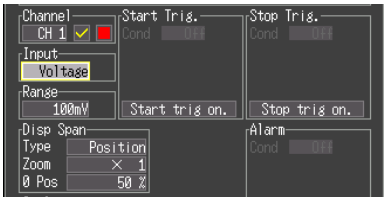
Setting



[Setting] screen

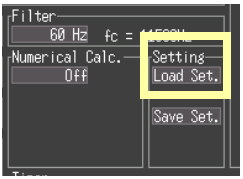
Configure input channels (p. 46)

CH



[CH] screen

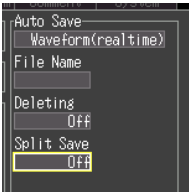
Reload stored settings (p. 97)



[Setting] screen

(as needed)

Configure data saving



[Setting] screen

Record

When configuration is finished, start recording (p. 20).

START/STOP

Analyze

Analyze recorded data on the Waveform screen (p. 75).
Calculations can be applied to measured data (p. 105).

Save

Select and save data (p. 85).

SAVE

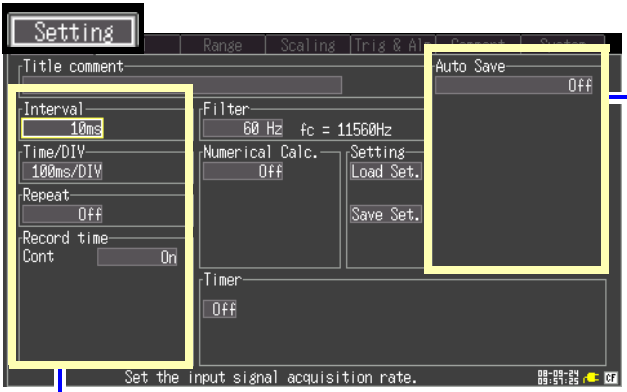
Measurement Configuration (Setting Screen)

Before measuring, configure the measurement settings on the [Setting] and [CH] screens. A brief operational description of the currently selected (highlighted) setting item appears at the bottom of the screen.

Three recording methods are available. Timed recording, which record between specified start and stop times, can be used in combination with these methods (p. 72).

Recording Method	Description
Normal Recording	Records for the specified recording length beginning when measurement starts (Cont: Off).
Continuous Recording	Records continuously beginning when measurement starts (Cont: On).
Repeat Recording	Records repeatedly for the specified recording length (time span) (Repeat: On).

Configure recording settings: [Setting] screen



∗. Must be set before measuring.

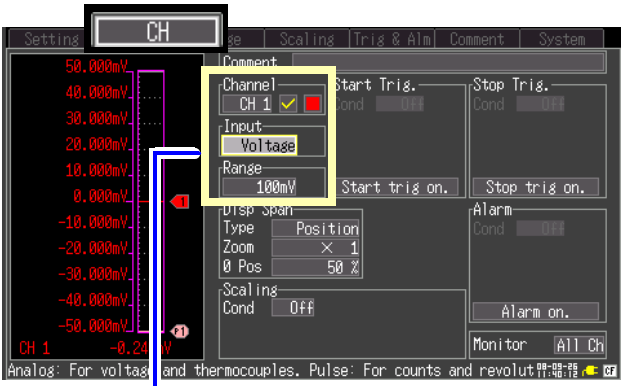
Horizontal Axis (Time Axis) Settings

- Data recording (acquisition) interval (p. 40)*
- Display time base (time per horizontal division) (p. 41)
- Recording start/stop method (p. 42)*
- Recording length (time span) for repeated or one-time recording (p. 43)*

Make other settings as needed.

- Save automatically while measuring (p. 44)∗
- Reloading Settings (p. 97)
- Saving Settings (p. 96)
- Enter a title for measurements (p. 56)
- Filter out noise (p. 43)
- Perform numerical calculations (p. 105)
- Record by timer (p. 72)∗

Configure input channel settings: [CH] screen



Input Channel Settings

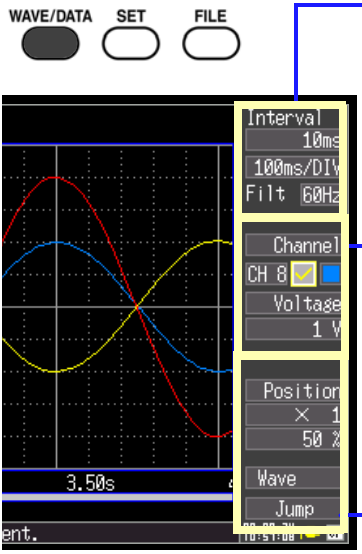
- Voltage measurement (p. 47)
- Temperature measurement (p. 48)
- Integration (pulse count) (p. 49)
- Revolution measurement (p. 50)

Make other settings as needed.

- Entering channel comments (p. 56)
- Selecting channel display colors (p. 52)
- Setting the display range
  Specifying the display position (p. 52)
  Specifying upper and lower display limits (p. 53)
- Recording specific events (triggering) (p. 64)
- Setting alarm output (alarm function) (p. 69)
- Setting Unit Conversion (Scaling) (p. 54)
- Switching the monitor display (p. 22)

Measurement Configuration (Waveform Screen)

Certain setting items are available on the Waveform screen. Setting details are the same as for those on the Setting screen.



Waveform Screen

Horizontal Axis Settings

- Specify the recording interval (data acquisition interval) (p. 40)
- Specify the display time base (time per horizontal division) (p. 41)
- Enable digital filtering (noise suppression) (p. 43)

Input Channel Settings

- Voltage measurement (p. 47)
- Temperature measurement (p. 48)
- Integration (pulse count) (p. 49)
- Revolution measurement (p. 50)
- Alarm settings (p. 69)

Waveform Display Settings

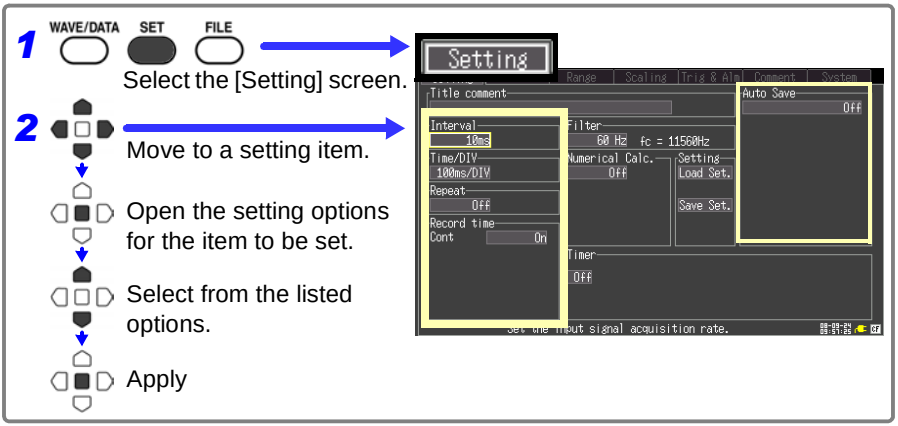
- Setting the display range
  Specifying the display position (p. 52)
  Specifying upper and lower display limits (p. 53)
- Select the alarm display type (p. 78)
- Displaying any point in time (Jump function) (p. 77)

About Channel Settings

Pressing the **CH ▲/▼** keys selects channel setting and gauge display items. However, while measurement data is displayed, such changes affect only those channels selected (by a check mark [☑]).

3.3 Setting Configuration 1 – Recording Settings

Configure the horizontal axis and recording settings on the [Setting] screen.
To save data while measuring, auto save must be enabled beforehand (p. 44).

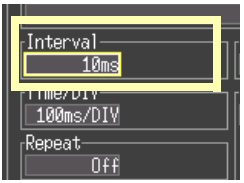


Specify the Recording Interval

Select the data acquisition interval to suit your measurement objectives. Note that shorter recording intervals restrict the maximum recording time.

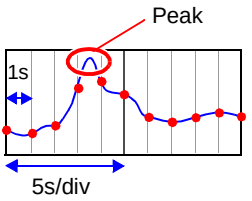
Select from the **[Interval]** setting options.

Setting options:
10ms∗, 20ms, 50ms, 100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 30s, 1min, 2min, 5min, 10min, 20min, 30min, 1h (∗ default setting)

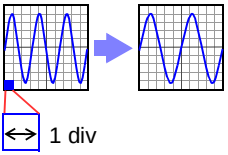


Broken wire detection is automatically disabled when the interval is set to 10, 20 or 50 ms (p. 48).

Some waveform peaks may not be displayable with certain interval settings.
For example, when the [Interval] is 1 s and the [Time/DIV] (time base) is 5 s.



Setting the Display Time Base (horizontal axis magnification, set as needed)

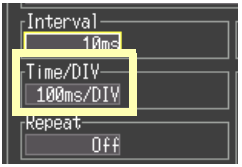


Displayed waveforms can be expanded or compressed along the horizontal axis. Shorter setting values correspond to greater magnification. This setting can be changed both during and after measurement without affecting acquired data (p. 77).

Select from the **[Time/DIV]** setting options.

Setting options:

100ms∗**, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 30s, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 5h, 10h, 12h, 1day** [/DIV] (∗ default setting)



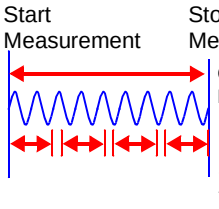
When auto save is enabled for waveforms, 100, 200 and 500 ms settings are automatically changed to 1 s when measurement starts, and the shorter values cannot be selected while measuring.

Available display time base settings depend on the selected recording interval. Horizontal axis display options are affected when the recording interval is changed after measuring, because the options for expanding (or compressing) the displayed axis depend on the recording interval used when measuring.

●: Selectable, ×: Not selectable, △: Not selectable while measuring

Horizontal axis	Recording interval																		
	[ms]						[s]						[min]						[h]
	10	20	50	100	200	500	1	2	5	10	20	30	1	2	5	10	20	30	1
100ms	●	●	●	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
200ms	●	●	●	●	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
500ms	●	●	●	●	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
1s	●	●	●	●	●	●	×	×	×	×	×	×	×	×	×	×	×	×	×
2s	●	●	●	●	●	●	●	×	×	×	×	×	×	×	×	×	×	×	×
5s	●	●	●	●	●	●	●	×	×	×	×	×	×	×	×	×	×	×	×
10s	●	●	●	●	●	●	●	●	●	×	×	×	×	×	×	×	×	×	×
20s	●	●	●	●	●	●	●	●	●	●	×	×	×	×	×	×	×	×	×
30s	●	●	●	●	●	●	●	●	●	●	×	×	×	×	×	×	×	×	×
1min	●	●	●	●	●	●	●	●	●	●	●	●	×	×	×	×	×	×	×
2min	●	●	●	●	●	●	●	●	●	●	●	●	●	×	×	×	×	×	×
5min	●	●	●	●	●	●	●	●	●	●	●	●	●	×	×	×	×	×	×
10min	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	×	×	×	×
20min	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	×	×	×
30min	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	×	×	×
1h	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	×
2h	△	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5h	△	△	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
10h	△	△	△	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
12h	△	△	△	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1day	△	△	△	△	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Selecting the Recording Start/stop Method



Specify how you want recording to start and stop. The following methods are available.

• Record continuously:
Record continuously between starting and stopping measurement.

• Specified length (time span):
Record only for a specified time span (can be set to automatically repeat) (p. 43)

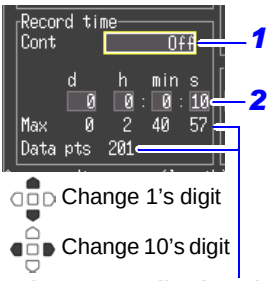
To record continuously,
Enable continuous recording (set **[Cont]** to **[On]**). (default setting)

Recording continues until you press the **START/STOP** key, or until a "stop trigger" event occurs.
When auto save is enabled for measurement data, the saving method depends on whether [Deleting] or [Split Save] (segmented save) is selected (p. 44).

To record for a specified length (time span),

1 Set **[Cont]** to **[Off]**.

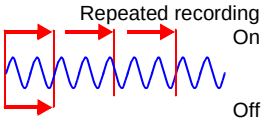
2 Specify the duration of one recording length (time span).
Setting options:
d (days) **0** to **499**, h (hours) **0** to **23**,
min (minutes) **0** to **59**, s (seconds) **0** to **59**



Recording proceeds for the specified length. Recording stops early if you press the **START/STOP** key before the recording length has elapsed, or if a "stop trigger" event occurs.

Maximum recording length and data samples
Indicates the maximum recording time to internal memory, and the maximum number of data samples. These values are limited by the specified recording length and the number of measurement channels used.
See: Appendix 6, "Maximum Recordable Time" (p. A10)

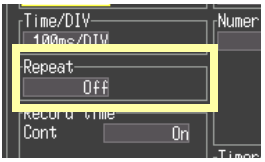
Set the Recording Length for Repeated or One-time Recording



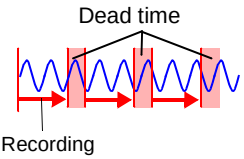
Select whether recording should be resumed after the specified recording length has elapsed or after recording is stopped by a "stop trigger" event.

Select from the **[Repeat]** setting options.
Setting options:(∗ default setting)

Off∗	Recording stop after one recording length (time span).
On	Recording restarts after the specified recording length has elapsed or after recording is stopped by a "stop trigger" event. To manually stop recording, press the **START/STOP** key.



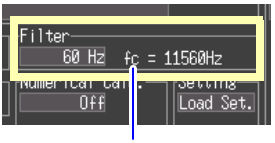
When repeating recording is enabled ([Repeat] set to [On])
After a recording length has elapsed, some "dead time" is needed for internal processing before recording can resume.
Because recording is not available during the dead time, enable continuous recording (set [Cont] to [On]) if you need to record without data loss.



Enable Digital Filtering (noise suppression) (as needed)

Electrical noise mixed with input signals can be removed by digital filtering. Noise suppression is most effective for longer recordings, where it can provide higher measurement accuracy and less scattering. Set as needed to suit your measurement environment.
See:"Cut-off frequency" (p. 131)

Select from the **[Filter]** setting options.
Setting options:**60Hz**∗**, 50Hz, Off** (∗ default setting)



fc: cut-off frequency

When disabled (set to Off), broken wire detection is also disabled (p. 48).
When the 60 Hz digital filter is selected, optimum line noise suppression occurs when the recording length is between two seconds and one hour.
Noise is suppressed with either 50 Hz or 60 Hz filter selections, although the measurement timing difference between channels may be increased, depending on the recording length. Disabling the filter (set to Off) minimizes such timing differences (to less than 1 ms between channels).

Automatic Saving

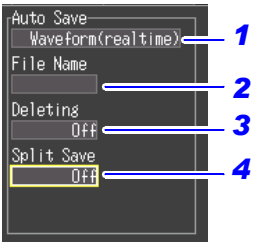
Measurement data can be automatically saved to a CF card while measuring. The available types and formats of automatically saved data are as follows.

Saved Content	Setting	File Extension	Description
Waveform data only	Waveform (realtime)	.MEM	Waveform data is saved to the CF card while recording.
	CSV (realtime)*2	.CSV	Waveform data is saved in CSV text format while recording. Saved data cannot be reloaded in the HiLogger.
Calculation results only *1	Calc(post meas.)	.CSV	After recording, calculation results are saved to the CF card. When [Repeat] is enabled ([On]), calculation results for each recording are included in the recorded data file. **Numerical calculation settings must be configured before starting recording (p. 105).**
Waveform data and calculation results *1	Waveform + Calc	.MEM, .CSV	Waveform data is saved while recording, and calculation results are saved when recording finishes. **Numerical calculation settings must be configured before starting recording (p. 105).**
	CSV + Calc*2	.CSV, .CSV	Waveform is saved in CSV text format while recording, and calculation results are saved when recording finishes. Saved data cannot be reloaded in the HiLogger.

*1. Numerical calculation settings must be made before starting recording (p. 105).
*2. The [CSV (real time)] and [CSV + Calc] settings are not available when the record interval is 10ms or 20ms. Also, when opening a CSV file in a spreadsheet program, note that the number of rows that can be loaded at one time is limited (p. A6).

1 Select which content to save from the **[Auto Save]** settings.

Setting options: **Off***, **Waveform(realtime)**, **CSV(realtime)**, **Calc(post meas.)**, **Waveform + Calc**, **CSV + Calc** (* default setting)



Horizontal axis settings are inhibited during automatic saving of waveforms (p. 41).

When [Waveform(realtime)], [CSV(realtime)], [Waveform + Calc], [CSV + Calc] is selected

2 (As needed) You can enter a file name for the waveform files.

See: 3.6, "Entering Comments" (p. 56)

If left blank, file names are created automatically.

See: Appendix 2, "File Naming" (p. A6)

3 Select the **[Deleting]** method for saving data when the CF card becomes full.

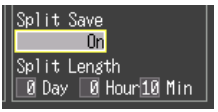
Setting options:(* default setting)

Off*	Saving stops when the CF card becomes full.
On	When space on the CF card declines to a certain level when starting or during automatic saving, the oldest file is deleted. If the file cannot be deleted, saving stops. Only waveform files can be deleted in this way. Appendix 2, "File Naming" (p. A6)

4 Select whether to create a new file for each recording length, or to create new files at specified intervals (using **[Split Save]**).

Setting options:(* default setting)

Off*	One file is created for each recording length.
On	Specify the length (time span) of saved segments. A measurement data file is created for each segment.
Ref Time	Specify a reference time and segment length (time span). A file is saved after each segment time span beginning at the reference time.



[Split Save: On]

Segment length: Days (0 to 30), Hours (0 to 23), Minutes (0 to 59)

[Split Save: Ref Time]

Ref Time (reference time): 0:0 to 23:59

Length (Segment length): 1, 2, 5, 10, 15, 20, 30 minutes, 1, 2, 3, 4, 6, 8, 12 hours, 1day

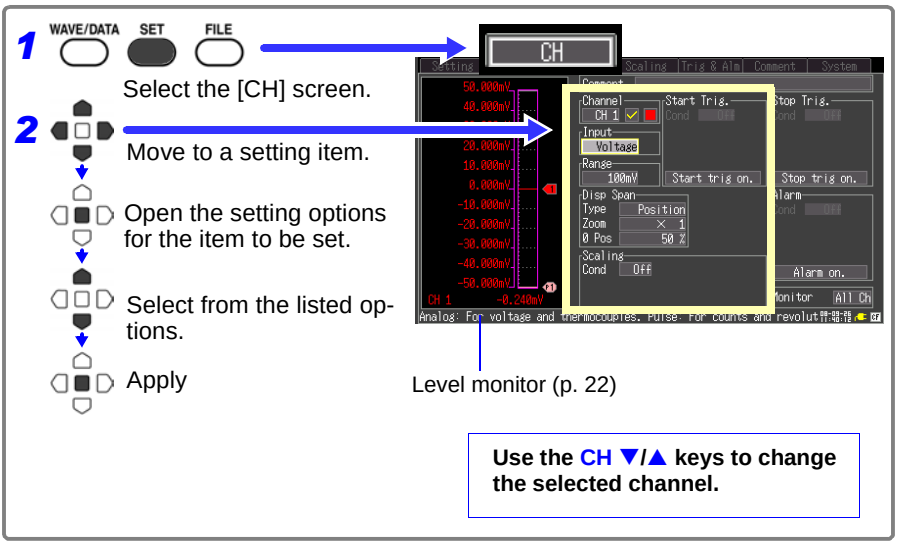
When starting measurement, the message “Sync fixed time” is displayed until the recording interval synchronizes with specified reference time.

3.4 Setting Configuration 2 – Input Channel Settings

Configure the input channel settings on the [CH] screen. You can make these settings while viewing input signal amplitude on the level monitor.
There are two general types of input signals, analog channels CH1 – CH10 and pulse channels P1 to P4. The analog channels can be used to measure voltage and temperature (with thermocouples), and the pulse channels can be used for pulse counting (integration) and revolution measurement.

Analog channels	Pulse channels
"Voltage Measurement Settings" (p. 47)	"Integration (Count) Measurement Settings" (p. 49)
"Temperature Measurement Settings" (p. 48)	"Revolution Measurement Settings" (p. 50)

Settings can be changed while viewing all channel settings on the [Range], [Scaling], [Trig & Alm], and [Comment] screens.
In this example, settings are made on the [CH] screen while viewing the level monitor.
You can specify recording criteria with the input settings to control recording, or to output alarm signals. See Chapter 4, "Specifying Criteria for Measurements (Triggering, Alarm and Timer)" (p. 63) for details.



Voltage Measurement Settings

Configure these settings for each voltage measurement channel.

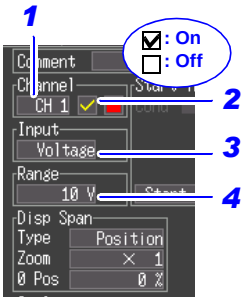
1 Select a channel (CH 1 to CH 10) for the [Channel] setting contents.

2 To enable measurement on the channel, select On to display the check mark (☑).

3 Select **[Voltage]** for the **[Input]** (input type) setting.

4 Select the appropriate measurement amplitude range for the **[Range]** setting.

Setting options:
100mV∗, 1V, 10V, 20V, 100V, 1-5V
(∗ default setting)



Instrumentation and Control Device Measurements

For instrumentation control signal measurements, select [1-5 V]. This range corresponds to the 4-20 mA output standard for instrumentation control. This setting automatically sets 1- and 5-volt lower and upper limits, respectively, in the 10 V range. Measurement accuracy is ±10 mV ±5 mV. To measure 4-20 mA current, connect a 250Ω shunt resistor between + and – analog input terminals (p. 30).

Use the scaling function to scale measurements to any arbitrary unit value for display (p. 54).

Temperature Measurement Settings

Configure these settings for each temperature measurement channel.

1 Select a channel (CH 1 to CH 10) for the [Channel] setting contents.

2 To enable measurement on the channel, select On to display the check mark (☑).

3 Select **[Tc]** for the **[Input]** (input type) setting.

4 Select the type of thermocouple to be used.

Setting options:
K∗, J, E, T, N, R, S, B (∗ default setting)

5 Enable or disable **[Burn Out]**.

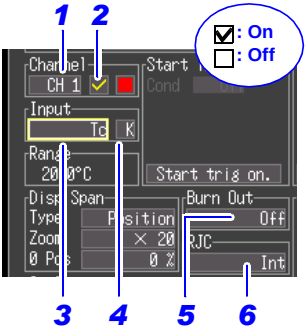
Setting options:(∗ default setting)

Off∗	Do not detect broken (disconnected) wires. Normally when the thermocouple is disconnected, the value will fluctuate, etc. and will not be stable.
On	Detect broken wires. (This setting is available only when the recording interval is at least 100 ms, and the 50 Hz or 60 Hz digital filter is enabled.) When the wires are disconnected, "OVER" will be displayed as the measurement value.

6 Select the reference junction compensation (RJC) method for the **[RJC]** setting.

Setting options:(∗ default setting)

Int∗	Use the Memory HiLogger's internal compensation. Measurement accuracy is the sum of the temperature measurement accuracy and the RJC accuracy.
Ext	Use an external RJC method instead of the Memory HiLogger's internal compensation. Memory HiLogger measurement accuracy is equivalent to the temperature measurement accuracy.



Temperature Measurement Range
(Depends on thermocouple type)

K	-200°C to 1350°C
J	-200°C to 1200°C
E	-200°C to 1000°C
N	-200°C to 1300°C
T	-200°C to 400°C
R	0°C to 1700°C
S	0°C to 1700°C
B	400°C to 1800°C

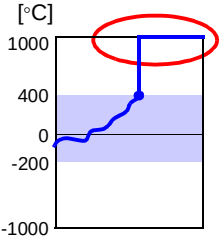
JIS C 1602-1995
With type B, the display shows 0 to 400°C, but accuracy is not guaranteed.

About Burn Out Detection

Broken (disconnected) thermocouple wires are detected using a tiny (300 nA) sensing current. The thermal equivalent of the thermoelectromotive force (thermocouple resistance (Ω) times the 300 nA sensing current) is added to the measured value. However, measurement errors can occur if the thermocouple wire is long or if the wire itself has a large resistance, in which cases broken wire detection should be disabled (set to Off).

If Thermocouple Measurement Range is Exceeded

Example: Using a type T thermocouple with range -200 to +400°C
When measurements are outside of the range of the thermocouple, the waveform saturates and clings to the top of the screen as shown at the right.
The numerical measurement values are displayed as “OVER” and the cursor measurement value, calculation values and saved data are handled as full-scale output values of the 16-bit A/D converter.
See: "8430-20 Measurement Values" (p. A11)



Integration (Count) Measurement Settings

Configure these settings for each pulse channel receiving input from a pulse output device such as a watt-hour or flow meter.
Use the scaling function to display integrated pulse counts as the corresponding physical units (such as Wh or VA) of the measurement parameter (p. 54).

1 Select a channel (P 1 to P 4) for the [Channel] setting contents.

2 To enable measurement on the channel, select On to display the check mark (☑).

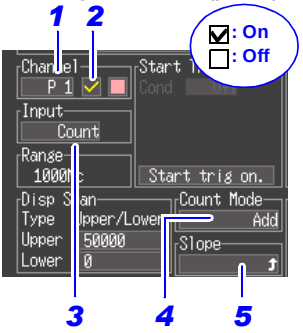
3 Select **[Count]** for the **[Input]** (input type) setting.

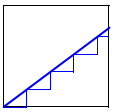
4 Select the measurement method from the **[Count Mode]** settings.
Setting options:(∗ default setting)

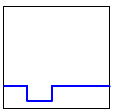
Add*	Counts the number of pulses acquired from the start of measurement.
Inst	Counts the number of pulses acquired during each recording interval. The pulse count is reset at the beginning of each recording interval.

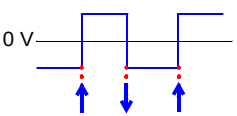
5 Select the basis of measurement from the **[Slope]** settings.
Setting options:(∗ default setting)

↑∗	Counts the number of L - H transitions.
↓	Counts the number of H - L transitions.




Totalized
[Add]


Instantaneous
[Inst]



Revolution Measurement Settings

Configure these settings for each pulse channel on which you will be counting pulses corresponding to revolutions, such as output from a rotary encoder or tachometer. The revolution measurement is obtained by counting the number of pulses input per second. Use the scaling function to display integrated pulse counts as the corresponding physical units (such as Wh or VA) of the measurement parameter (p. 54).

1 Select a channel (P 1 to P 4) for the [Channel] setting contents.

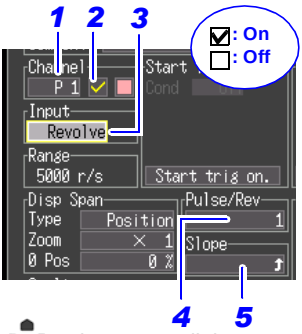
2 To enable measurement on the channel, select On to display the check mark (☑).

3 Select **[Revolve]** for the **[Input]** (input type) setting.

4 Set the **[Pulse/Rev]** setting to the number of pulses per revolution.
Setting options: **1**∗ to **1000** (∗ default setting)
The range is automatically determined by this setting.

5 Select the basis of measurement from the **[Slope]** setting.
Setting options:(∗ default setting)

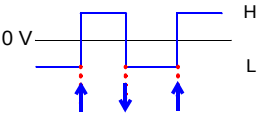
↑∗	Counts the number of revolutions based on L - H transitions.
↓	Counts the number of revolutions based on H - L transitions.



Change 1's digit

Change 10's digit

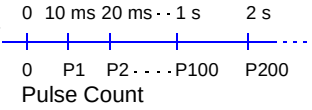
5000 r/s (n=1)



Revolution Measurement Theory

Pulse count is measured using the Memory HiLogger's internal 10 ms sampling interval.

The revolution rate (r) per second during time t_s is obtained by dividing the number of pulses from (t-1) to t_s by the number of pulses per revolution.



$$r\ [\text{rps}] = \frac{\text{Pulse count at } t_s \text{ minus pulse count at } (t\text{ -1})_s}{\text{Pulses per revolution}}$$

(rps: Revolutions per second)

Example: Pulses per revolution = 4

When the number of pulses counted in one second is P_{100} = 1000 c,
and the number of pulses counted in two seconds is P_{200} = 2000 c,
then the revolution rate (rps) at t=2s ($r_{t=2}$) can be obtained.

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

When time t_s is less than one second

The pulse count at $(t - 1)_s$ (whole seconds) cannot measured, so 100 times the pulse count between $(t\text{ -}0.01)_s$ and t_s serves and the pulse count for one second to obtain the revolution rate.
As a result, revolution measurements when t is less than one second are scattered.

$$r\ [\text{rps}] = \frac{\text{Pulse count at } t_s \text{ minus pulse count at } (t\text{ -}0.01)_s}{\text{Pulses per revolution}} \times 100$$

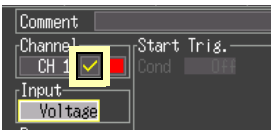
3.5 Display Settings

Configure how each channel is displayed, as needed. These settings can be changed on the Numerical/Waveform screen after measurement.

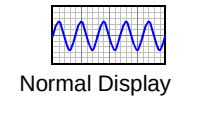
Selecting Waveform Display Color

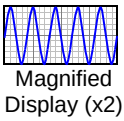
Different display colors can be selected for each input channel waveform.

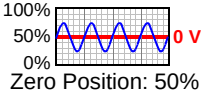
Select from the waveform display color setting options.
Setting options:**Off (x)**, 24-color

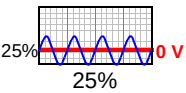


Specifying Vertical Display Range by Magnification and Zero Position (vertical axis expansion/compression)







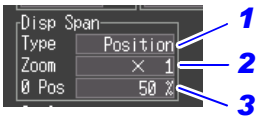


The vertical display range and zero position can be specified for each channel.
The magnification setting determines the displayed range. Waveforms are expanded or compressed vertically relative to the center of the screen.
Magnification and zero-position settings are ignored when the display range is defined by upper and lower limits.
In the 1-5V range of a voltage measurement and in integration measurement, **[Position]** cannot be specified.

1 Select **[Position]** for the **[Type]** setting options.

2 Select from the **[Zoom]** setting options.
Setting options:
x100, x50, x20, x10, x5, x2, x1∗, x1/2
(∗ default setting)

3 Set the desired zero position **[0 pos]** as a percentage of screen height.
Setting options:
50 to 150% (with x1 magnification)

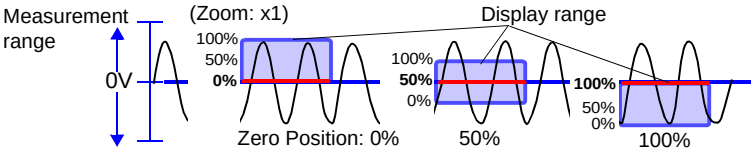


Change 1's digit

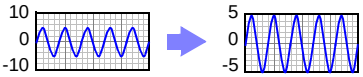
The expansion/compression range depends on the selected magnification.

Default Setting

Input type	Zoom	Zero position	Input type	Zoom	Zero position
Voltage	x1	50	Integration (Count)	–	–
Temperature (Tc)	x20	0	Revolution (Revolve)	x1	0



Specifying the Vertical Display Range by Upper and Lower Limits (expansion/compression)

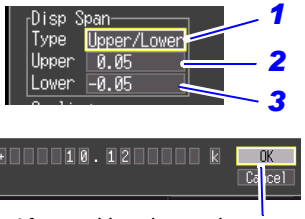


The vertical display range can be defined by upper and lower limits.
Using this method, the voltage range does not need to be selected because the optimum range is selected automatically for the display. However, upper and lower limit settings are ignored when magnification and zero position are enabled to define the display range.
As the upper and lower limits in the 1-5V range are fixed, they cannot be changed.

1 Select **[Upper/Lower]** for the **[Type]** setting item.

2 Specify the **[Upper]** value for the top of the display.

3 In the same way, specify the **[Lower]** value for the bottom of the display.
The display range and scaling settings are interlinked.



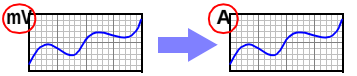
After making the settings, press **[OK]**.

The range is not automatically optimized when the upper and lower limits are set on the waveform screen.

Default Setting

Input type	Range
Voltage	-50m to 50m
Temperature (Tc)	0 to 100
Integration (Count)	0 to 5000
Revolution (Revolve)	0 to 5000

Converting Units (Scaling function)



Normal Display (Off) | Scaling Enabled

Use the scaling function to convert input voltage to the physical units of the measurement parameter for display, such to convert voltage input for display as electrical current. Converted values can be displayed in fixed- or floating-point notation.

Setting Analog Channel or Pulse Channel (Revolution) Scaling

1 For the **[Cond]**(condition) setting, select the desired numerical notation.
Setting options:(∗ default setting)

Dec	Displays converted values using fixed-point notation
Exp	Displays converted values using floating-point notation
Off*	Scaling is disabled.

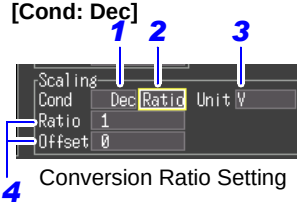
2 Move to the next item to the right, and select the scaling method.
Setting options:(∗ default setting)

Ratio*	Convert by specifying the ratio of physical units per volt of input signal (conversion ratio), offset, and the name of the units.
2-pt	Convert by specifying the input signal voltage at two points, the physical unit values at those points, and the name of the units.

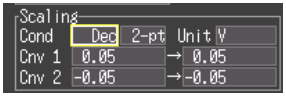
3 Enter the **[Unit]** name on the comment entry screen.
See: 3.6, "Entering Comments" (p. 56)

4 **Ratio:** Enter the conversion ratio and offset.
2-pt: Enter the values at two points before and after conversion.

[Cond: Dec]



Conversion Ratio Setting



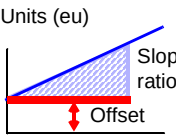
2-Point Setting

[Cond: Exp]

Conversion Ratio Setting

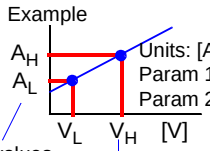
2-Point Setting

Conversion Ratio Setting Method



Converted unit values

2-Point Setting Method



Actual measurement values (input values)

V_H: High value
A_H: Converted high value
V_L: Low value
A_L: Converted low value

Combining scaling and display positioning (upper/lower limits)
To use both scaling and upper/lower display limits, set the scaling first, then upper/lower limit values. With scaling enabled, the upper and lower limit setting ranges are constrained as follows:
-9.9999E+19 ≤ Setting value ≤ -1.0000E-19, Setting value = 0,
+1.0000E-19 ≤ Setting value ≤ +9.9999E+19

Setting Pulse Channel (Integration) Scaling

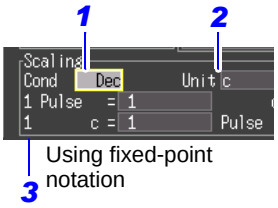
Integrated pulse values can be converted for display as physical units of the measurement parameter (such as Wh or VA).
Pulse output devices determine the amplitude per pulse in physical units, or the number of pulses per fundamental unit (for example, per kWh, liter or m^3).

1 For the **[Cond]** (condition) setting, select the desired numerical notation.
Setting options:(∗ default setting)

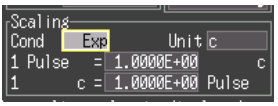
Dec	Displays converted values using fixed-point notation
Exp	Displays converted values using floating-point notation
Off*	Scaling is disabled.

2 Enter the **[Unit]** name on the comment entry screen.
See: Entering Comments (p. 56)

3 Specify the physical units per pulse or the number of pulses per fundamental unit (for example, if 1 c = 1 pulse, select [1 pulse]).
The settings for physical units per pulse and pulses per fundamental unit are interlinked.



Using fixed-point notation



Using floating-point notation

Scaling Setting Example

For integration with a 50,000 pulse/kWh watt-hour meter:
Cond: Dec
Units: kWh
1kwh=50000 pulse

For integration with a 10 liter/pulse flow meter:
Cond: Dec
Units: L
1 pulse=10L

3.6 Entering Comments

Comments of up to 40 characters can be entered as a title for the measurement data, and as a label for each input waveform.
Titles and comments are displayed on the waveform screen (Comments appear only when [Value+Cmnt] display is selected.
Titles can be entered on the [Setting] and [Comment] screens, and comments can be entered on the [CH] and [Comment] screens. This description enters a comment on the [CH] screen.

1 WAVE/DATA SET FILE

Select the **[CH]** screen.

2

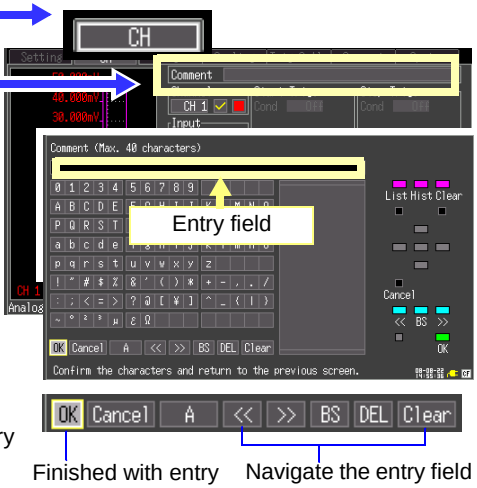
Select the field to enter the comment.

Apply
The character entry screen appears.

3

Select the characters to enter
To enter a space, select a blank character.

Apply
Characters appear in the entry field as you select them.

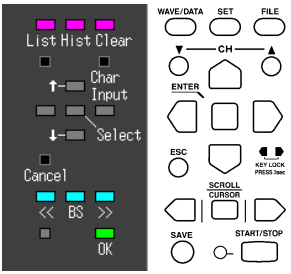


Select **[OK]**
Accepts your entry and returns to the [Comment] screen.

The following characters are converted as follows when saved to a text file.

Entered character	²	³	μ	Ω	°	ε
Converted plain text equivalent	^2	^3	^u	~o	~c	~e

Operating Panel



The operating panel depicts the functions of Memory HiLogger's operating keys.

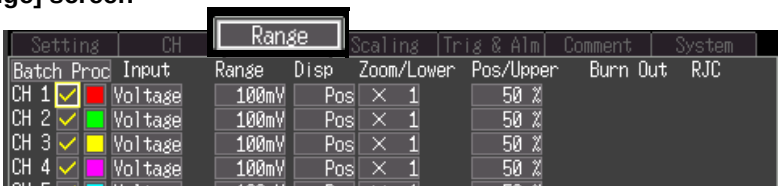
Only the keys displayed on the operating panel are enabled.

- **List** (**WAVE/DATA** key)
  Measurement related terms are registered in the list beforehand.
- **Hist** (History, **SET** key)
  You can select previously entered terms from the pick list.
- **Clear** (**FILE** key)
  Clears all entered characters.
- **Char Input** (**CH▲** key)
  Switches between the pick list and character selection frames.
- ↑/↓ (Cursor up/down key)
  Selects from the pick list frame.
- **Select** (**ENTER** key)
  Accepts the item selected in the pick list.
- **Cancel** (**ESC** key)
  Cancels entry.
- **<</ >>** (**SCROLL/CURSOR** left/right key)
  Move input position.
- **BS** (**SCROLL/CURSOR** middle key)
  Deletes one character.
- **OK** (**START/STOP** key)
  Accepts entry.

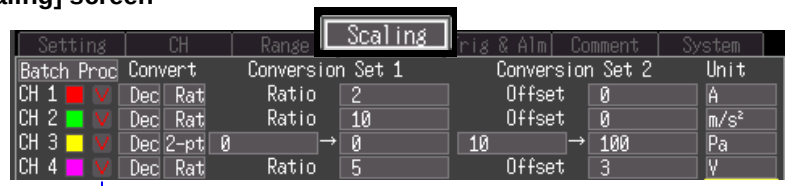
3.7 Viewing All Channel Settings in a List

All channel settings can be viewed and changed in the list. You can copy batches of settings between channels.

[Range] screen

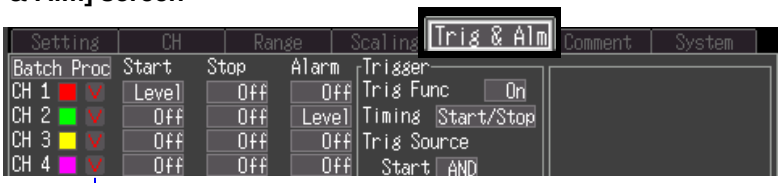


[Scaling] screen



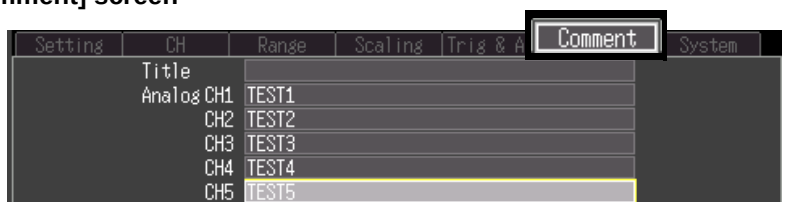
Input Types
(: Voltage, : Temperature, : Integration, : Revolution, : Alarm)

[Trig & Alm] screen



Input Types
(: Voltage, : Temperature, : Integration, : Revolution, : Alarm)

[Comment] screen



Batch Copying Channel Settings

The CH1 and P1 channel settings can be copied to other channels.

1 WAVE/DATA SET FILE

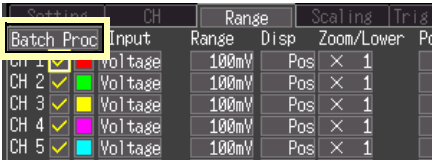
Select the screen showing the channel to copy.
[Range], [Scaling], [Trig & Alm]

2

Select **[Batch Proc]**.

Apply

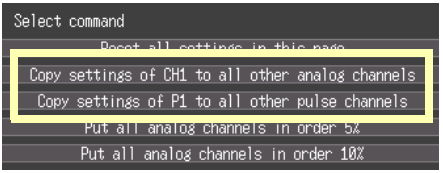
The selected items are displayed.



3 Select the desired action.

- **[Copy settings of CH1 to all other analog channels]** :
  Copy the settings from channel 1 to channels 2 through 10.
- **[Copy settings of P1 to all other pulse channels]** :
  Copy the settings from channel P1 to channels P2 through P4.

Apply



Except for the following, the settings displayed on the screen are copied.
- Waveform display color
- Input type (although this can also be copied from the [Range] screen, p. 58)

Batch Setting Waveform Display/Hide and Waveform Color Settings for All Channels

The display of all waveforms can be hidden, and all waveform display colors can be set to defaults.

This setting is only available on the [Range] screen.

1

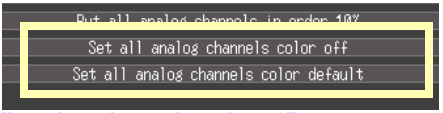
Select **[Batch Proc]**.

Apply

The selected items are displayed.

2 Select the desired action.

Apply



- **[Set all analog channels color off]**:
  Sets all channel waveforms to be hidden.
- **[Set all analog channels color default]**:
  Sets all channel waveform colors to their defaults.

Initializing Settings (to factory defaults)

All settings in the current window are reset to their factory default values.

1 WAVE/DATA SET FILE

Select which screen you want to initialize, from the [Range], [Scaling], [Trig & Alm] screens.

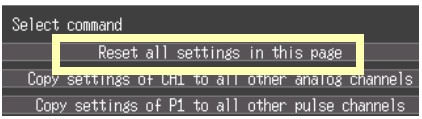
2 Select **[Batch Proc]**.

Apply

The selected items are displayed.

3 Select **[Reset all settings in this page]**.

Apply



Aligning Zero Positions on the Grid

Analog channel waveforms can be positioned evenly along the vertical grid, with CH1 at the top.
This setting applies only to channels that have their [Disp Span] - [Type] value set to [Pos]. CH1 to CH10 waveforms can be displayed together with each allotted 5% or 10% of the screen height.

This setting is only available on the [Range] screen.

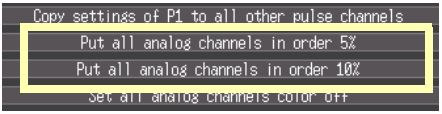
1 Select **[Batch Proc]**.

Apply

The selected items are displayed.

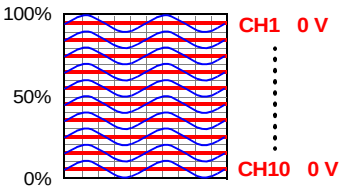
2 Select the desired action.

Apply



Alignment Example (with CH1 zero-position aligned at 95% and occupying 10% of vertical screen height)

Channel	Zero-position (%)
CH1	95
CH2	85
CH3	75
CH4	65
CH5	55
CH6	45
CH7	35
CH8	25
CH9	15
CH10	5

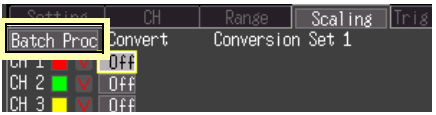


Display Celsius (°C) temperature values as Fahrenheit (°F)

All measured temperature values can be converted at once from Celsius to Fahrenheit units.
The conversion is simultaneously reflected appropriately on all scaled values.
To revert from Fahrenheit units to Celsius, disable (set to Off) the scaling function (p. 54).

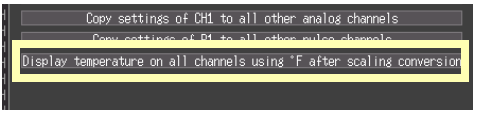
This setting is only available on the [Scaling] screen.

1 Select **[Batch Proc]**.



Apply
The selected items are displayed.

2 Select the desired action.



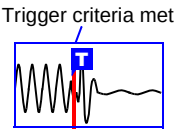
Apply

Specifying Criteria for Measurements (Triggering, Alarm and Timer) Chapter 4

You can set recording to start and stop under specific criteria (start/stop triggers), and to output alarm signals. You can also set specific times to start and stop recording, using the Timer function.

Triggering is the process of controlling the start and stop of recording by specific signals or conditions (criteria). When recording is started or stopped by a specific signal, we say the trigger is "applied" or "triggering occurs".

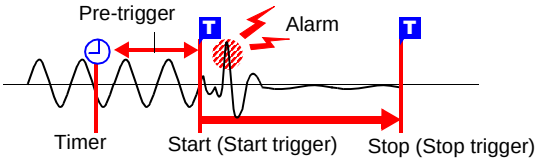
In this manual, T indicates a "trigger point", as the time at which a trigger is applied.



Criteria can be specified for the following event trigger types.

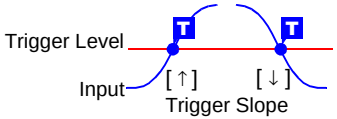
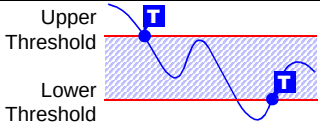
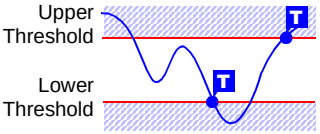
Trigger Type	Description	Setting Screen	Ref.
Start Trigger	Recording starts when the specified Start Trigger criteria are satisfied.	[CH]/ [Trig & Alm]	(p. 64)
Stop Trigger	Recording stops when the specified Stop Trigger criteria are satisfied. When [Repeat] is enabled (set to [On]), recording restarts automatically.	[CH]/ [Trig & Alm]	(p. 64)
Pre-trigger	Records data acquired during a specified period prior to each trigger event.	[Trig & Alm]	(p. 68)
Trigger Source	Various trigger criteria can be combined with logical AND/OR operations for each channel.	[Trig & Alm]	(p. 67)
External Trigger	Triggering can be applied by an external signal at the EXT.TRIG input terminal.	[Trig & Alm]	(p. 67)
Alarm	An alarm signal can be output when any specified criteria are met.	[CH]/ [Trig & Alm]	(p. 69)
Timer	Records at a specified date and time.	[Setting]	(p. 72)

Set trigger criteria for individual channels on the Channel [CH] screen, and set trigger and alarm settings for all channels on the [Trig & Alm] screen (p. 71).



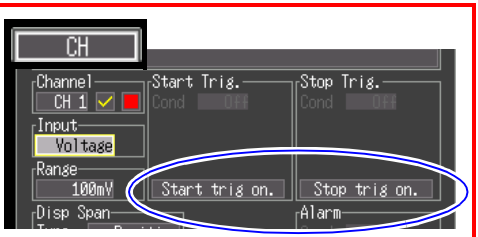
4.1 Setting Criteria to Start and Stop Recording

There are two ways to set the criteria to start and stop recording according to waveform slope.
Select whether to trigger at the rising or falling edge of the input signal.

Type of Analog Trigger	Trigger Example	Description
Level Trigger (p. 65) **[Level]**		Recording starts (or stops) when the input signal crosses the specified trigger level (voltage).
Window Trigger (p. 66) **[In]**		Recording starts (or stops) when the input signal enters a range defined by upper and lower thresholds.
[Out]		Recording starts (or stops) when the input signal exits a range defined by upper and lower thresholds.

Enable the Trigger Function

Select the trigger to use, and press the **ENTER** key. Press it again when the confirmation message appears, and you are ready to set trigger criteria (at the same time, the [Trigger] setting on the [Trig & Alm] screen turns on).

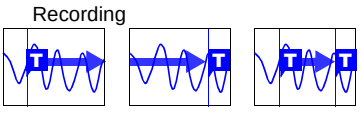


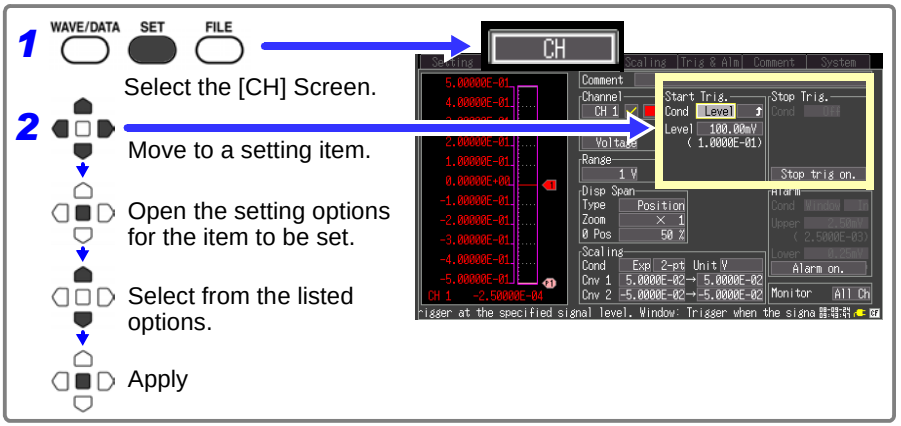
Set trigger criteria

Select the trigger criteria to be applied.

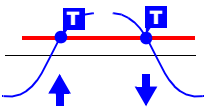
The [Timming] setting on the [Trig & Alm] screen determines the effect of triggering, as follows:

- Start recording upon trigger: [Start]
- Stop recording upon trigger: [Stop]
- Alternately start and stop upon trigger: [Start&Stop]





Setting the Input Signal Trigger Threshold (Level Trigger)



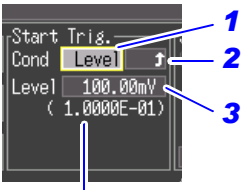
Enter the signal level threshold at which to start or stop recording, and whether triggering occurs on the upslope or downslope of the input signal.
Recording starts or stops when the signal crosses the specified threshold. The level value is an instantaneous (not rms) value.
Levels can be confirmed on the level monitor or on the Waveform screen.

1 Select **[Level]** as the [Cond] setting option for the start or stop trigger.

2 Select the input signal rising (↑) or falling (↓) edge setting option.
Setting options: (* default setting)

↑*	Recording starts (or stops) when the signal crosses the threshold on the upslope (rising edge ↑).
↓	Recording starts (or stops) when the signal crosses the threshold on the downslope (falling edge ↓).

3 Set the **[Level]** setting to the input signal level at which to start or stop recording.



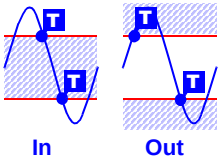
When scaling is enabled, the scaled value is also displayed.

Default setting: 0

Level Setting Ranges and Resolution

Channels	Input type	Range	Resolution	Channels	Input type	Range	Resolution
CH1 - CH10	Voltage	100mV	25 µV	P1 - P4	Count	—	1 c
		1V	250 µV		Revolve	—	1 r/s
		10V	2.5 mV				
		20V	5 mV				
		100V	25 mV				
		1-5V	2.5 mV				
	Tc	—	0.5°C				

Setting Lower and Upper Trigger Thresholds (Window Trigger)



An input signal level "window" within which recording will (or will not) occur can be defined by upper and lower threshold levels. You can select whether recording starts or stops when the input signal level enters (In) or exits (Out) of this window.
Upper and lower thresholds can be verified in the level monitor or on the Waveform screen. When scaling is enabled, the scaled threshold values are displayed.

1 Select **[Window]** as the **[Cond]** setting option for the start or stop trigger.

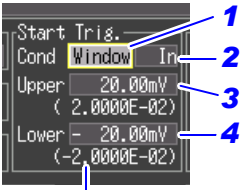
2 Select inside **[In]** or outside **[Out]**.

Setting options: (∗ default setting)

In∗	Trigger when the input signal level enters the window defined by the upper/lower thresholds.
Out	Trigger when the input signal level exits the window defined by the upper/lower thresholds.

3 Enter the upper threshold value for the **[Upper]** setting.

4 Enter the lower threshold value for the **[Lower]** setting.



When scaling is enabled, the scaled value is also displayed.

Upper/Lower Threshold Ranges and Resolution

Channels	Input	Range	Resolution	Default setting	
				Upper	Lower
CH1 - CH10	Voltage	100mV	25 µV	2 mV	-2 mV
		1V	250 µV	20 mV	-20 mV
		10V	2.5 mV	0.2 V	-0.2 V
		20V	5 mV	0.4 V	-0.4 V
		100V	25 mV	2 V	-2 V
		1-5V	2.5 mV	0.2 V	-0.2 V
	Tc	—	0.5°C	40°C	-40°C
P1 - P4	Count	—	1 c	80	0
	Revolve	—	1 r/s	80	0

Selecting Trigger Sources and Combinations

Enable the trigger function (set to On), select recording start/stop timing, and set trigger criteria. Triggering is affected only by those channels for which trigger criteria have been set.
Make these settings on the [Trig & Alm] screen.
If trigger settings have been made on the [CH] screen, skip steps 1 and 2.
The settings in steps 1 and 2 are interlinked with those on the [CH] screen.

1 Set the **[Trigger]** to **[On]**.

2 Select the **[Timming]** setting option to determine how triggering will affect recording.
Setting options: (∗ default setting)

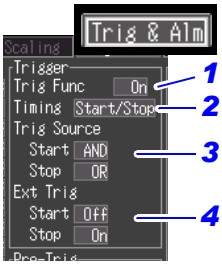
Start*	Start recording according to Start Trigger criteria.
Stop	Stop recording according to Stop Trigger criteria.
Start&Stop	Start and stop recording according to the Start and Stop Trigger criteria, respectively.

(Start and stop triggers can be set for each channel independently.)

3 Select how trigger sources are logically combined using the **[Trig Source]** - **[Start]** and **[Stop]** setting options.
Setting options:(∗ default setting)

OR*	Triggering occurs when any one of the specified trigger source criteria is met. (includes external trigger signal)
AND	Triggering occurs only when all of the specified trigger source criteria are met. (includes external trigger signal)

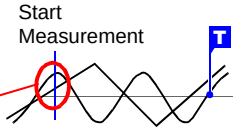
4 (When an external trigger is applied)
Set the **[Ext trig]** - **[Start]** or **[Stop]** setting to **[On]**.



To apply a trigger when the upslope (↑) of the waveform crosses zero volts:

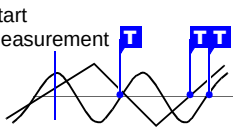
Trigger..... Level
Level..... 0 V
Slope..... ↑

When the trigger combining logic is set to [AND]
If trigger criteria are already met when you press the **START/STOP** key, no triggering occurs. Triggering occurs only after all trigger sources have ceased to meet the criteria at once, and are subsequently met again.



[AND]

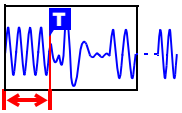
One waveform has crossed above 0V as the other crosses on the upslope



[OR]

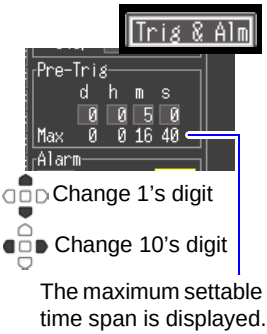
Either waveform crosses 0V on the upslope

Setting Criteria for Pre-Trigger Recording (Pre-Trig)



Select the [Start] or [Start&Stop] trigger timing setting to record waveforms both before and after trigger events.
However, pre-trigger recording is disabled when [Stop] trigger timing is selected.
Make the setting on the [Trig & Alm] screen.

For the **[Pre-Trig]** setting, specify the time (or number of days) to record before a trigger event.

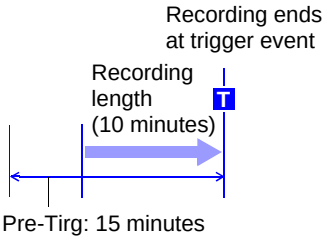


To record waveforms after a trigger event, simply specify a recording time that is longer than the pre-trigger recording time.

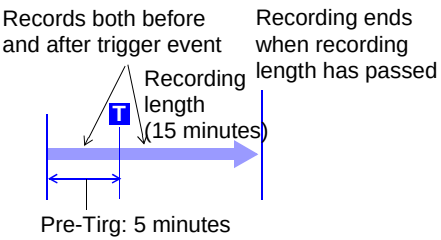
Difference between [Waiting for pre-trigger] and [Waiting for trigger]
When measurement is started, the specified pre-trigger length is recorded. This period is indicated as the [Waiting for pre-trigger].
After the specified pre-trigger length has been recorded, the period indicated as [Waiting for trigger] continues until a trigger occurs.
During the [Waiting for pre-trigger] period, trigger events are not recognized even when the trigger criteria are met.

Pre-Trigger vs. Recording Time

Recording Time shorter than Pre-Trigger Time

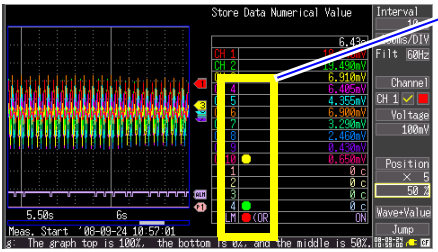


Recording Time longer than Pre-Trigger Time



4.2 Alarm Output

You can enable beep tones and an alarm output signal (for external use) for each input channel by setting its alarm criteria.
You can also view alarm output status on screens that display numerical values ([Wave+Value], [Value+Cmnt] and [Value]).

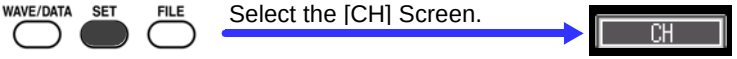


Alarm Criteria
Channel alarm status (CH1 to CH10 and P1 to P4)
- Yellow*: alarm criteria are satisfied
- Green: alarm criteria are not satisfied

*. When [Hold Alarm] is enabled (set to [On]), the indicator remains yellow because the criteria remain satisfied (until measurement is finished).

Alarm output status (ALM)
- Red: alarm signal output active
- Green: alarm signal output inactive

External alarm output requires connection to the external control terminals. See Chapter 9, "External Control" (p. 119) for details.
Select alarm input channels on the [CH] screen, and specify alarm criteria on the [Trig & Alm] screen.



Configuring Alarm Output

1 Select the [Channel] setting option to **[ALM]**.

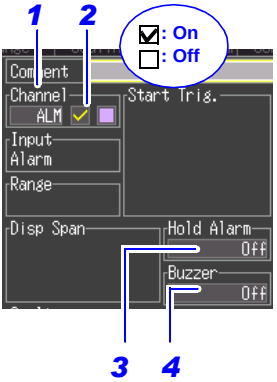
2 Set a check mark [☑] as shown to enable alarm output.

3 Set the **[Hold Alarm]** as required for your alarm output destination device.
Setting options:(∗ default setting)

Off∗	Disable the alarm output signal when alarm criteria are no longer met.
On	Hold the alarm output active state until measurement is finished.

4 Enable or disable the alarm beeper by the **[Buzzer]** setting.
Setting options:(∗ default setting)

Off∗	The Memory HiLogger will not sound an audible beep during alarm signal output.
On	The Memory HiLogger will sound an audible beep during alarm signal output.



To stop the alarm beeper while measuring, set the beeper to [Off] in the ALM channel settings on the Waveform screen.

Setting Alarm Criteria for Each Channel

1 For the **[Channel]**, select a channel for which you want to set alarm criteria.

2 Select **[Alarm on.]** to enable alarm criteria settings.

3 Select the alarm criteria type from the **[Cond]** setting options.

Setting options:(∗ default setting)

Off*	Disable alarms for this channel.
Level	Trigger an alarm when the input reaches a specified level (p. 65).
Window	Trigger an alarm when the input transitions through upper and lower limits (window). (p. 66)

Alarm criteria settings are not available unless a check mark [☑] is displayed next to the channel number.

4 Set the alarm criteria.

If you have selected **[Level]**, select alarm triggering on the upslope (↑) or downslope (↓) of the input signal, and specify the trigger level.

Setting options:

↑	Alarm output occurs when the input signal rises above the specified level threshold.
↓	Alarm output occurs when the input signal falls below the specified level threshold.

If you have selected **[Window]**, select **In** or **Out**, and specify upper and lower thresholds.

Setting options:

In	Alarm output occurs when the input signal enters the range defined by the thresholds.
Out	Alarm output occurs when the input signal exits the range defined by the thresholds.

ALM appears when no channel output is checked (☑). In this case, select [Alarm on.] to enable alarm output settings, and then set alarm criteria.

WAVE/DATA SET FILE → Select the [Trig & Alm] Screen.

Selecting Combined Alarm Output Criteria

Select how you want to combine alarm output criteria from the **[Alarm]** setting options.

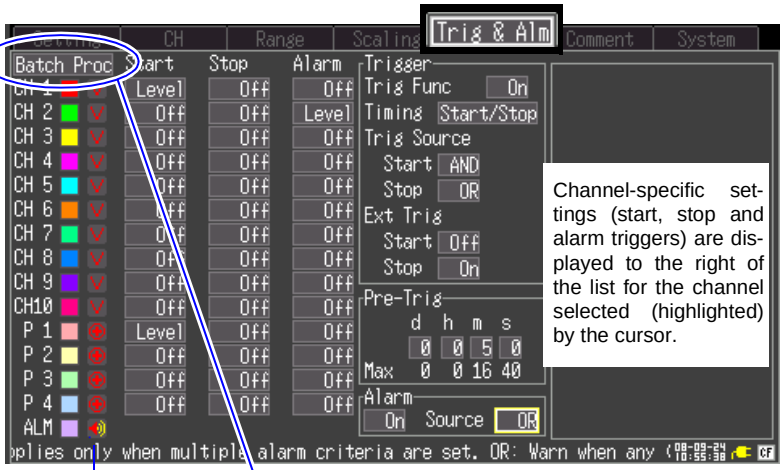
Setting options:(∗ default setting)

OR*	Alarm output occurs when the alarm criteria specified for any alarm-enabled channel are satisfied.
AND	Alarm output occurs only when the alarm criteria for every alarm-enabled channel are satisfied.

If set to [Off], change it to [On].

4.3 Confirming Trigger and Alarm Criteria Settings (List)

You can view and change trigger and alarm criteria settings for all channels. However, detailed criteria settings such as level, threshold and slope can only be changed on the [CH] screen (p. 64).



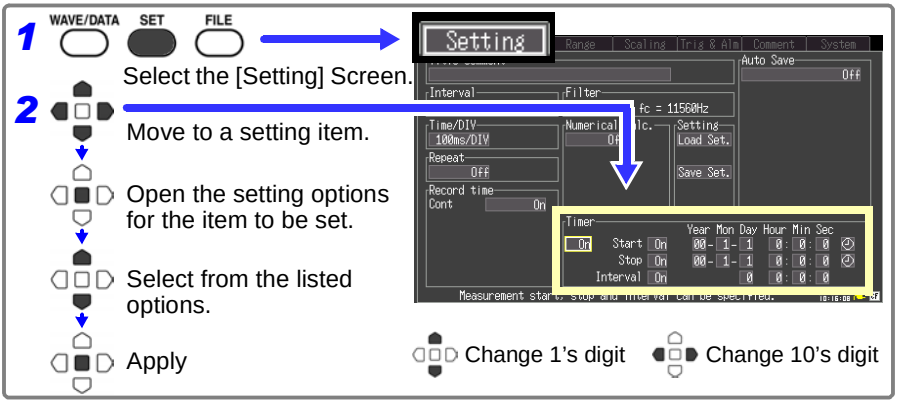
Input type
- : Voltage
- : Temperature
- : Integration
- : Revolution
- : Alarm

Select **[Batch Proc]** to initialize settings and to copy trigger and alarm settings from CH1 or P1 to the other channels.
Copyable settings include level, window thresholds and slope.

See: "Batch Copying Channel Settings" (p. 59)

4.4 Starting and Stopping Recording by Timer

Make these settings to record at a specific time. Recording can be set to repeat at specific intervals between the set start and stop times.
Before setting, confirm that the Memory HiLogger clock is set to the correct time. If not, reset the clock on the [System] screen (p. 115).



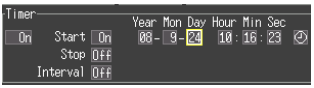
1 Set the **[Timer]** setting to **[On]**.

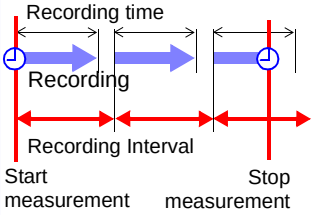
2 Enable (set to [On]) the desired timer setting items.
Setting options:

Start	Set the recording start time.
Stop	Set the recording stop time.
Interval	Set the recording repetition interval. This setting is enabled on when [Repeat] is set to [On].

3 Set the year, month, day, hour, minute and second for the start or stop time.
To enter the current time as the start or stop time, select the clock mark ( ) and press the **ENTER** key.

4 For the **[Interval]** settings, set the amount of time (days, hours, minutes and seconds) between recording repetitions.

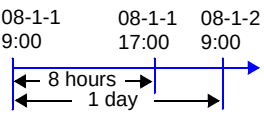




When recording times are specified, recording operation depends on the repetition and recording time settings(p. 73).

Example: To record daily from 9:00 to 17:00 for one month beginning 1/1/2008,
Repeat Recording: On, Timer: On

		(YY-M-D)	(H:M:S)
(From)	Start	**On 08-1-1**	**9: 0: 0**
(Until)	Stop	**On 08-1-31**	**17: 0: 0**
(Time from one recording to the next)	Interval	**On 1**	**0: 0: 0**
(recording length)	Cont: Off		**8: 0: 0**



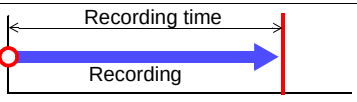
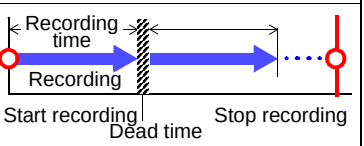
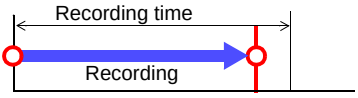
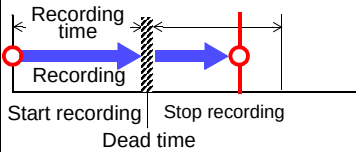
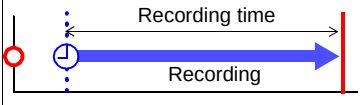
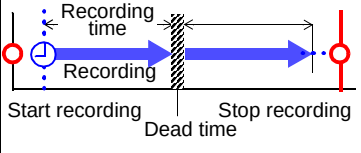
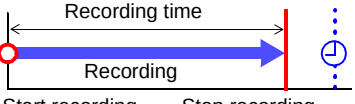
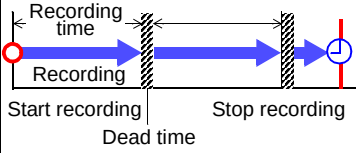
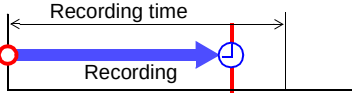
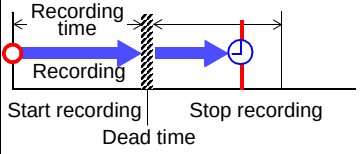
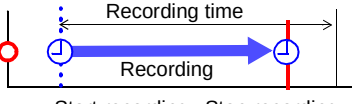
9:00 to 17:00 is 8 hours

Note: When all channels are measured and the recording interval is slower than 200ms.

4.5 About Recording Operation

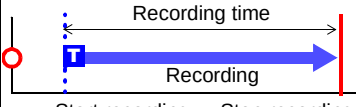
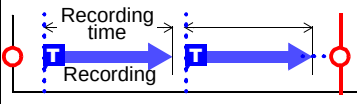
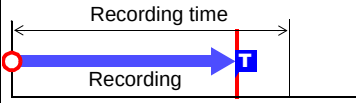
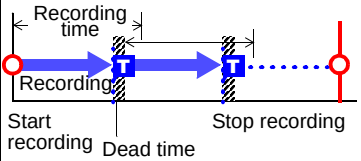
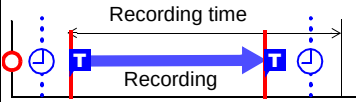
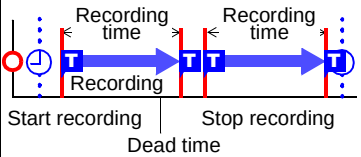
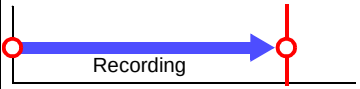
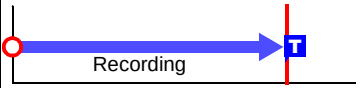
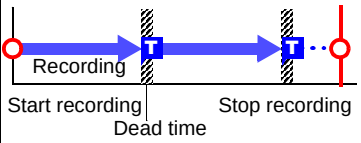
Recording operation depends on the combination of trigger, timer and repeat recording (On/Off) settings.

Press **START/STOP** Timer start/stop time Trigger criteria match

Cont.	Trig-ger	Timer	Repeat: Off	Repeat: On
Off	Off	Off		
Off	Off	Off Recording is stopped before one recording length has elapsed		
Off	Off	Start		
Off	Off	Stop The stop time setting is after the recording length has elapsed		
Off	Off	Stop The stop time setting is within the recording length		
Off	Off	Start/ Stop The stop time setting is within the recording length		(Repeat Recording: same as Off)

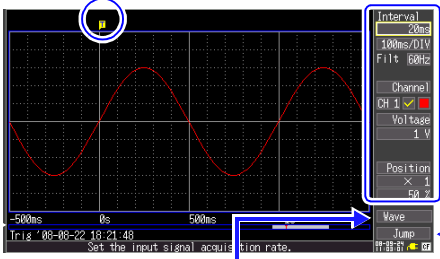
4.5 About Recording Operation

Press **START/STOP** Timer start/stop time Trigger criteria match

Cont.	Trig-ger	Timer	Repeat: Off	Repeat: On
Off	Start	Off		
Off	Stop	Off		
A stop trigger occurs before one recording length has elapsed				
Off	Start/ Stop	Start/ Stop		
A start trigger occurs after the timer start time, and a stop trigger occurs before the timer stop time				
On	Off	Off		(Repeat Recording: same as Off)
On	Stop	Off		

Waveform Analysis Chapter 5

About the Waveform and Numerical Value Screens



Trigger Mark
Indicates a trigger event

Analog and pulse waveforms
Displays acquired data as waveforms.

Time Values

Measurement Configuration
You can change these settings (p. 39)
You can switch between channel settings and event search settings.
"Event Search" (p. 82)

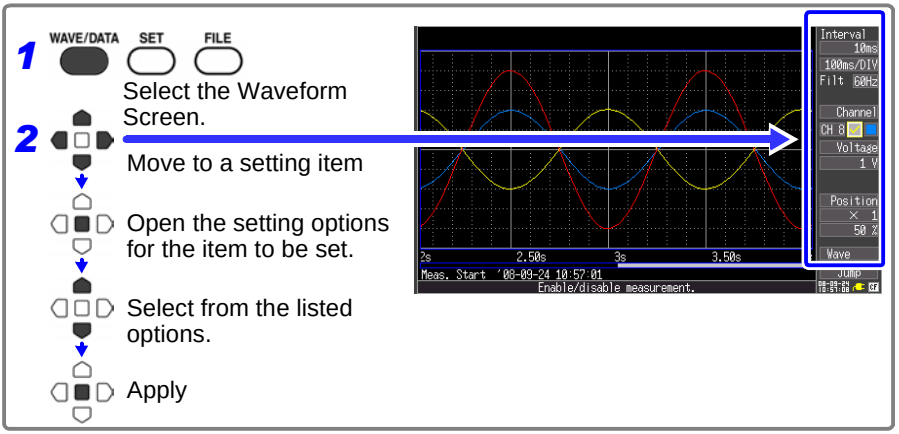
Jump Function (p. 77)

Scroll Bar
Shows the range and position of the displayed waveform.
Viewing the Scroll bar (p. 76)
Information such as measurement start time and trigger times is displayed below the scroll bar.

You can select from seven screen configurations (p. 16)

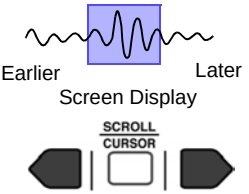
- Gauges can be displayed for each channel (p. 78)
- Numerical values at waveform cursor positions can be viewed (p. 78)
- Numerical calculation results can be displayed (p. 105)
- Measurement data can be displayed as waveforms and numerical values, as numerical values with comments, or as numerical values only (p. 81).

Settings can be changed on the Waveform/Numerical screen.



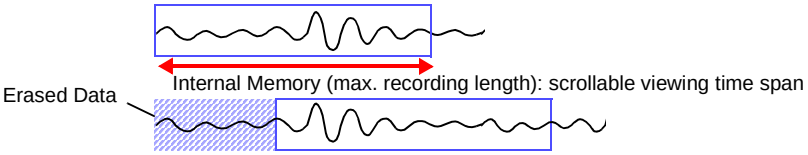
5.1 Viewing Waveforms

Scrolling Waveforms

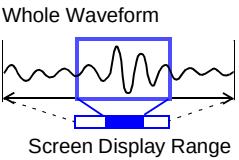


When measuring or displaying an existing waveform, use the **SCROLL/CURSOR** keys to scroll.
You can scroll to any part of a waveform while measuring. To return to the current waveform position, move the selection cursor to **[Trace]** at the lower right of the screen, and press the **ENTER** key.
To jump to the start or end of a waveform, hold the **ESC** key while scrolling.

If internal memory becomes full when measuring with [Cont] set to [On], recording continues by overwriting the oldest acquired data. Therefore, even when scrolling earlier parts of waveforms, the overwritten data is lost.

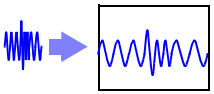


Verifying Waveform Display Position



From the scroll bar you can verify the relative position and size of the displayed portion of a waveform within the overall recorded waveform.
The width of the currently displayed time span indicator within the scroll bar depends on the time base (time per horizontal division) setting, even when the recording length is unchanged.

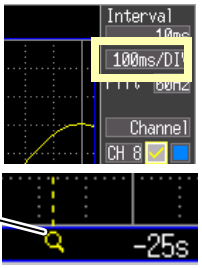
Magnifying and Compressing Horizontally



Waveforms can be magnified (expanded or compressed) along the time axis by changing the time per horizontal division.
Detailed waveform data is usually best observed with the time axis expanded, while longer-term trends are best observed with it compressed.
Horizontal magnification can be changed while measuring. However, when measuring with auto saving enabled, the 100, 200 and 500 ms settings are not selectable.

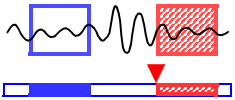
Select from the **[Time/DIV]** setting options.

Setting options:
100ms∗, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 30s, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 5h, 10h, 12h, 1day
[/div] (∗ default setting)



Indicates the center point for horizontal magnification.
When the A/B cursors are displayed, the position of cursor A becomes the reference point.

Viewing Any Waveform Location (Jump Function)



When the recording length of a waveform is long, you can specify the portion to be displayed immediately.

1 WAVE/DATA SET FILE

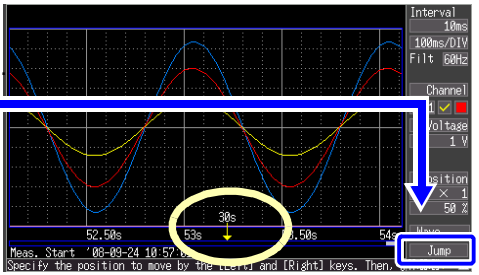
Select the Waveform Screen.

2

Select **[Jump]**.

Apply

The location of the currently displayed portion of the overall waveform is indicated by the ▼ mark on the scroll bar.



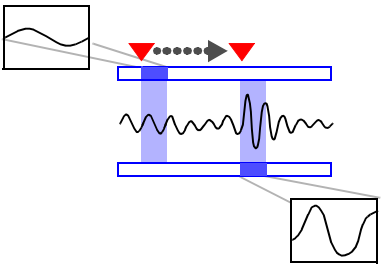
3

Move the ▼ mark to display a different portion of the waveform.

4

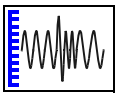
Apply

The portion of the waveform at the ▼ mark is displayed.

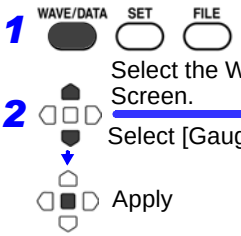


5.2 Selecting Display Options

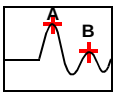
Displaying Gauges



A gauge corresponding to the measurement range of each channel can be displayed at the left side of the screen, for confirming measurement values. The color of the gauge matches the waveform display color of its input channel.
Press the **CH** ▲ or ▼ key to display the gauges for other channels. However, note that when measurement data is displayed, only those channels that are enabled (set to On ☑) for measurement can be selected.

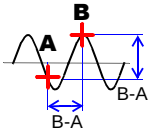
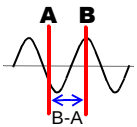
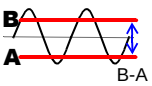


Displaying Cursor Values



Time difference and potential difference (and when scaling is enabled, scaling values) can be read as numerical values using the A/B cursors.

About Cursor Values

Cursor Type	Example	Cursor Value
Trace Cursors		Displays the time and measurement values at the A/B cursors, or the time and measurement differences between the A/B cursors. Displays the intersections (trace points) of cursors and waveforms. (the intersections of waveform traces of selected channels)
Vertical Cursors		Displays the time and frequency values at the A/B cursors, or the time and frequency differences between the A/B cursors.
Horizontal Cursors		Displays the measurement values at the A and B cursors for the selected channel(s), or the difference between A/B cursor values. A/B cursors can be enabled for any channel.

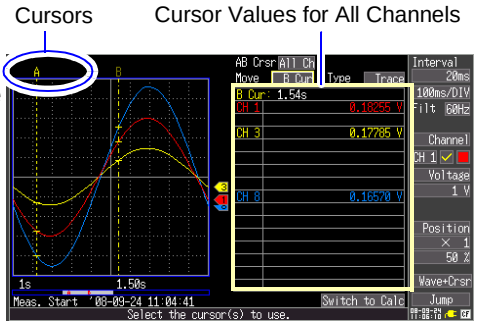
Cursor values can be displayed for all channels, or for only desired channels.

1 SCROLL CURSOR

Displays the A/B cursors and the values at the cursor positions.
To hide the cursor items again, press the **SCROLL/CURSOR** key.

2 SCROLL CURSOR

Move the cursors to display numerical values along the waveform.

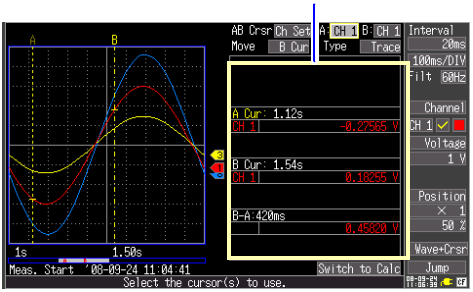


Selecting which channels have their cursor values displayed

Select from the **[AB Crsr]** setting options.

- **[All Ch]*** Displays all channels. The cursor selected for [Move] is displayed (select [AB Cur] to display B – A difference values).
- **[Ch Set]** Specify which channels to display with A and B cursors. The cursor values for the specified channels are displayed.

(* default setting)



Moving the Cursors

Select from the **[Move]** setting options.

A Cur*
B Cur
AB Cur

(* default setting)

Changing Cursor Type

Select from the **[Type]** setting options.

Trace*
Vert (Vertical)
Horz (Horizontal)

(* default setting)

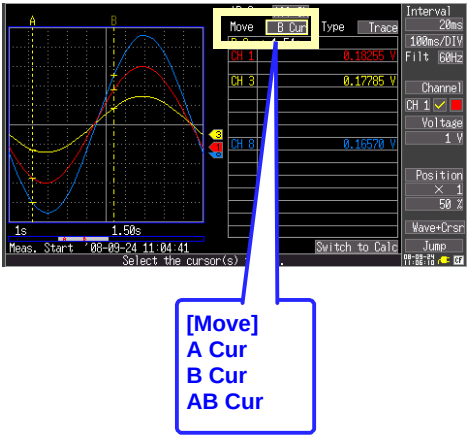
To move cursors more quickly, hold the ESC key.

Specifying a Waveform Time Span

Specify a waveform time span when saving a partial waveform or applying numerical calculations (Trace cursors or Vertical cursors).

1 SCROLL CURSOR

The A/B cursors and cursor values are displayed.



2 Select **[Move]**.

Open the setting options for the item to be set.

Select which cursor(s) to move.

Apply

3 SCROLL CURSOR

Move the A/B cursors to specify the time span.

Viewing Input Signals as Numerical Values

Numerical values can be displayed in three ways: numerical values only, waveforms and numerical values, and numerical values and comments. Displayed numerical values are those of the current input signals.

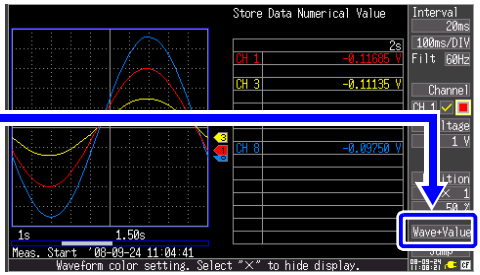
To display waveforms and numerical values

1 WAVE/DATA SET FILE

2 Select the Waveform Screen.

Select **[Wave+Value]**.

Apply



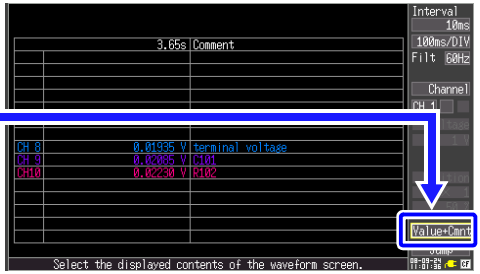
To display numerical values and comments

1 WAVE/DATA SET FILE

2 Select the Waveform Screen.

Select **[Value+Cmnt]**.

Apply



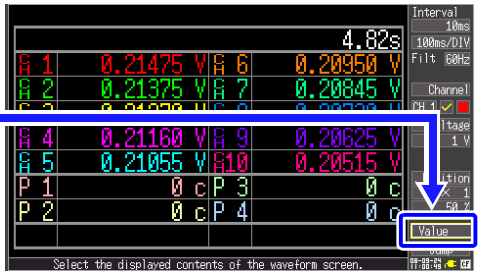
To display numerical values only

1 WAVE/DATA SET FILE

2 Select the Waveform Screen.

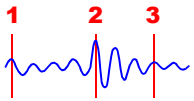
Select **[Value]**.

Apply



(Channels whose combination of measurement value and unit based on the scaling setting is longer than 13 characters are indicated by smaller display characters.)

5.3 Inserting Event Marks (Search Function)



You can insert up to 100 event marks at any point while measuring, to help find them later.
See "Searching Event Marks" (p. 84)
Event marks can be inserted while viewing waveforms or by applying external signals.

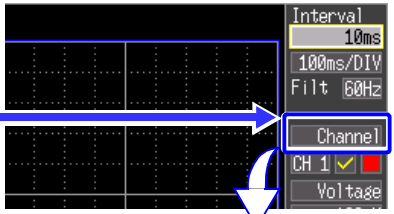
Inserting Event Marks While Viewing Waveforms

Use this procedure to insert event marks while viewing data on the Waveform/ Numerical Value screen during measurement. Event marks are numbered in the sequence they are inserted.

1 WAVE/DATA SET FILE

Select the Waveform Screen.

2 Select **[Channel].**



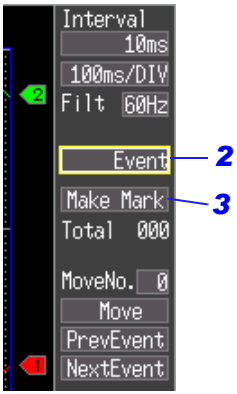
Event mark settings are displayed.

Select **[Event].**

Apply

3 Move to **[Make Mark].**

Press to insert an event mark. Event numbers appear on the waveform displayed when you select **[Make Mark]**.



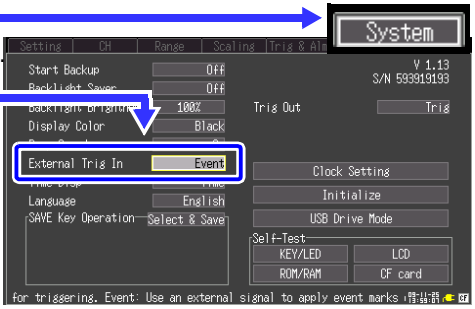
Inserting Event Marks Using External Input Signals

Event marks can be inserted by applying external input signals.

See: Input signal specifications in section 9.2, "External Trigger Input" (p. 121)

1 WAVE/DATA SET FILE

Select the [System] screen.



2

Select **[External Trig In].**

Open the setting options for the item to be set.

Select **[Event].**

Apply

3 Connect the external signal input (p. 119).
Event marks are inserted when the external trigger signal (EXT.TRIG input terminal 2) transitions on the falling edge from High level (3.0 to 5.0 V) to Low level (0 to 0.8 V).

Searching Event Marks

Any event mark can be found by searching.

1 WAVE/DATA SET FILE Select the Waveform Screen.

2 When [Channel] is displayed, switch to **[Event]**.

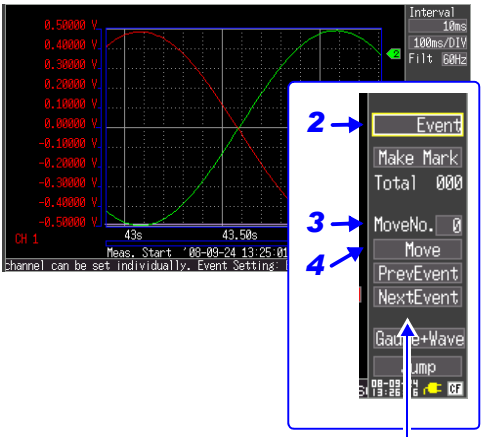
The event setting items are displayed.

Apply

3 For the **[MoveNo.]** setting, select the number of the event you want to find.

4 Select **[Move].**

The waveform with the specified event number is displayed.



You can search by incrementing and decrementing the event number.
[PrevEvent]: Search for the previous event mark.
[NextEvent]: Search for the next event mark.

Saving & Loading Data Chapter 6

Measurement data acquired by the Memory HiLogger can be saved to a CF card.

See: 6.2, "Using a CF Card" (p. 87)

Methods available for saving data consist of Auto Save, for saving data automatically while measuring; and Select & Save and Quick Save for saving data after measurement is finished. Refer to 6.3, "Saving Data" (p. 90) for details.

6.1 About Saving and Loading Data

When saving data, a folder named HIOKI8430 is created, and files are stored in the folder as follows.

O = Available, X = Not available

File Type	File Format	Folder Name	File Name *3 (Auto-numbered from 1)	Save		Load	
				Auto	Manual	Model 8430-20	PC
Settings Data	Binary	CONFIG	CONF0001.SET	×	O	O	×
Waveform Data*1	Binary	DATA\(Date)*4 (e.g. 08-07-30)	WAVE0001.MEM	O	O	O	O
	Text *5		WAVE0001.CSV	O	O	×	O
Numerical Calculation Results	Text *5	MEASURE	MEAS0001.CSV	O	O	×	O
Captured Screen Image	BMP *2	PICTURE	SCR00001.BMP	×	O	O	O

*1. Save waveform data in binary format if you intend to view it later in the HiLogger or on a computer with the supplied Logger Utility program. Waveform data and some measurement-related settings data are saved.
To save a waveform partially, specify a period by using A/B cursors before saving (p. 80).

*2. BMP Format: This is a standard Windows graphics format. These files can be handled by many graphics programs.

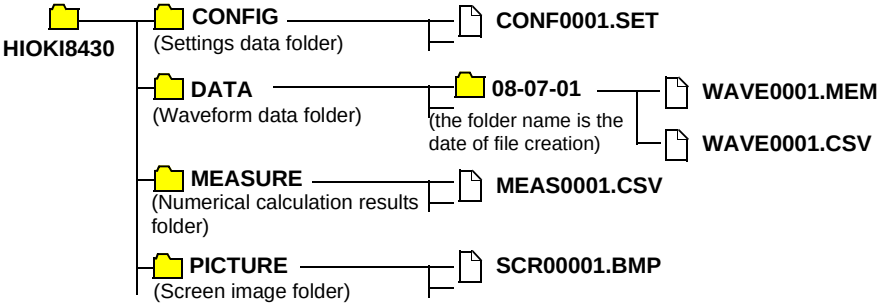
*3. Appendix 2, "File Naming" (p. A6)

*4. Date (YY-MM-DD) folders are automatically created inside the DATA folder.

*5. When opening a CSV file in a spreadsheet program, note that the number of rows that can be loaded at one time is limited (p. A6).

Depending on file size and CF card capacity, each folder can store over 1,000 files. However, the file screen display is limited to a maximum of 1,000 files. Also, as more files are created, more time is needed to start and stop recording. We recommend setting measurement criteria so that the number of saved files stays below 1,000 whenever possible.

Directory Structure for Saved Data



6.2 Using a CF Card

The following options are available for saving and loading measurement data with the Memory HiLogger.

Hioki options PC cards
(includes adapter)
- Model 9726 PC Card 128M
- Model 9727 PC Card 256M
- Model 9728 PC Card 512M
- Model 9729 PC Card 1G
- Model 9830 PC Card 2G

Important

Use only CF cards sold by Hioki. Compatibility and performance are not guaranteed for CF cards made by other manufacturers. You may be unable to read from or save data to such cards.

This Memory HiLogger does not require a CF (CompactFlash) adapter.
See 6.5, "Data Management" (p. 99) for details about managing data storage in the card.

⚠CAUTION

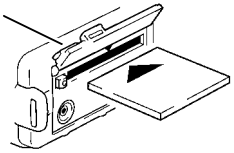
- Format new CF cards before use.
  To format with this instrument: (p. 89)
- Inserting a CF card upside down, backwards or in the wrong direction may damage the CF card or instrument.
- Never eject a CF card while measuring or when the Memory HiLogger is or accessing the card. Data on the CF card may be destroyed. (The CF icon at the lower right is red while the card is being accessed.)
- During battery-only operation, data may fail to be stored properly if battery charge is exhausted while saving. In the worst case, the CF card could be damaged, so pay appropriate attention to the discharge state of the battery pack.
- If the Eject button is in the released position, press it in first before inserting the CF card all the way in. Inserting the CF card when the Eject button is released may damage the instrument. If the CF card does not go all the way in, do not force it in. Press the Eject button once to release it, then press it again and insert the CF card all the way in.

NOTE

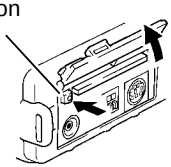
- The Flash memory in a CF card has a limited operating life. After long-term usage, data storage and retrieval become difficult. In this case, replace the CF card with a new one.
- We cannot provide compensation for data loss in a CF card, regardless of content or cause of the damage. Always maintain a backup of important data stored on a CF card.

CF Card Insertion & Removal

Cover



Eject Button



Inserting a CF card

1. Open the CF card slot cover.
2. Press the Eject button in if it is in the released position.
3. Face the CF card with the arrow mark (▲) on top, and insert it in the direction of the arrow all the way in the slot.

Removing a CF card

1. Open the CF card slot cover.
2. Press the Eject button (to release it).
3. Press the Eject button again and pull the card out.

Formatting a CF Card

CF cards are formatted from the Memory HiLogger's File screen.

1 WAVE/DATA SET FILE

Select the File Screen.

2 Open the Control Dialog box

Select **[Format]**.

Apply

The Format Confirmation dialog appears.

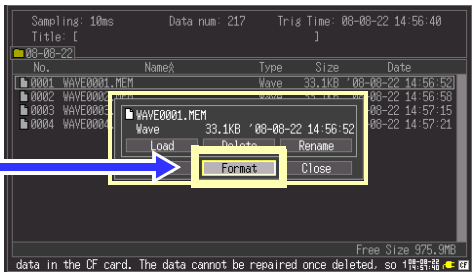
Select **[Yes]**.

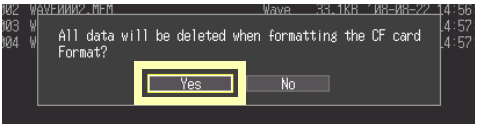
Apply

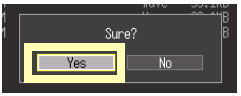
The Format Confirmation dialog appears again.

Select **[Yes]**.

Apply



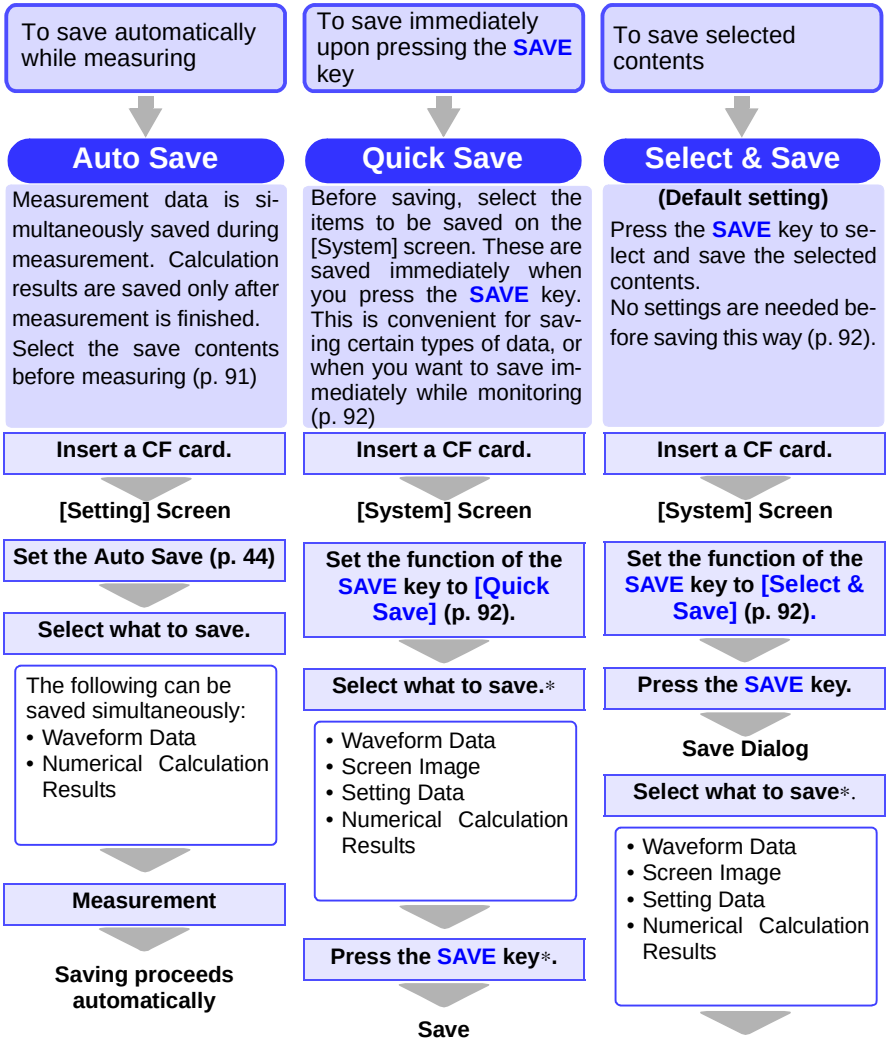




NOTE Formatting irretrievably erases all data on the CF card. Always backup important data from the CF card before formatting.

6.3 Saving Data

Basically, three methods are available for saving.



*: To save a waveform partially, specify a period by using A/B cursors. (Saving a waveform section is not available with Auto Save)
To save a screen image, display the desired screen before saving.

Automatic Saving

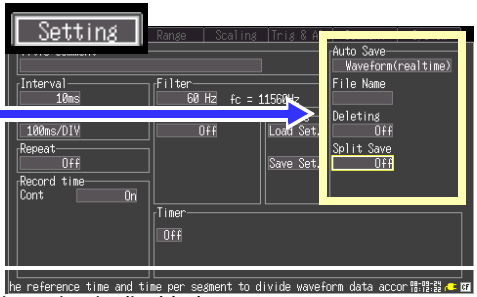
Before measuring, configure saving on the [Setting] screen. Waveforms and numerical calculation results can be saved automatically. Folders are created for saved data according to data type, and files are automatically numbered (p. 85). For waveform data, folders named with the current date (YY-MM-DD) are created automatically.
Before starting to measure, confirm that Auto Save is configured correctly, and that the CF card is properly installed.

1 WAVE/DATA SET FILE

Select the [Setting] Screen.

2

Select the desired save method from the **[Auto Save]** setting options.



Save methods:

Off	Automatic saving is disabled.
Waveform (realtime) *1	Waveform data in binary format is saved to CF card while recording.
CSV(realtime) *1,*2	Waveform data in text format is saved to CF card while recording. Saved data cannot be reloaded in the HiLogger.
Calc(post meas.)	Calculation results are saved to CF card after recording. When [Repeat] is enabled ([On]), calculation results for each recording are included in the recorded data file.
Waveform + Calc *1	Waveform data in binary format is saved while recording, and calculation results are saved when recording stops.
CSV + Calc *1,*2	Waveform data in text format is saved while recording, and calculation results are saved when recording stops.

*1. Otherwise, make advanced settings as needed (p. 44).

See: "When [Waveform(realtime)], [CSV(realtime)], [Waveform + Calc], [CSV + Calc] is selected" (p. 45)

*2.The [CSV (real time)] and [CSV + Calc] settings are not available when the record interval is 10ms or 20ms. Also, when opening a CSV file in a spreadsheet program, note that the number of rows that can be loaded at one time is limited (p. A6).

To save calculation results automatically, configure calculation settings before starting measurement (p. 105).

When saving waveforms automatically, horizontal axis display setting is restricted when starting measurement, but can be freely adjusted for analysis afterwards (although 100, 200 and 500 ms horizontal axis settings are automatically changed to 1 s when measurement starts, and cannot be reselected while measuring).

Apply

3 After making any other necessary settings, press the **START/STOP** key.

Data is automatically saved to the CF card when measurement finishes.
("Directory Structure for Saved Data" (p. 86))

Selecting the Manual Saving Method [Quick Save]/[Select & Save]

Two manual saving methods are available: [Quick Save] and [Select & Save], both of which offer the same setting options.
When saving measurement data, folders are created on the CF card for each data type, and files are automatically numbered (p. 85)

1 WAVE/DATA SET FILE

Select the [System] Screen.

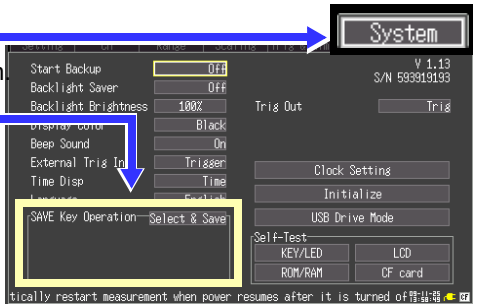
2

Move to a setting item.

Open the setting options for the item to be set.

Select from the listed options.

Apply



Selecting **[SAVE Key Operation]** setting options.

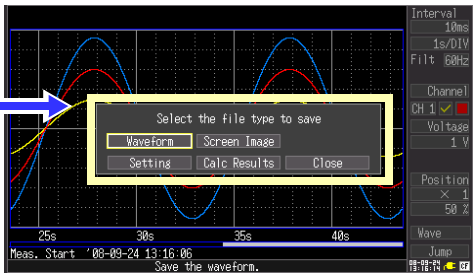
Setting options:	(* default setting)
Select & Save*	Pressing the **SAVE** key displays the setting options for saving.
Quick Save	Select the setting options for saving on the [System] screen before pressing the **SAVE** key.

[Select & Save]

SAVE

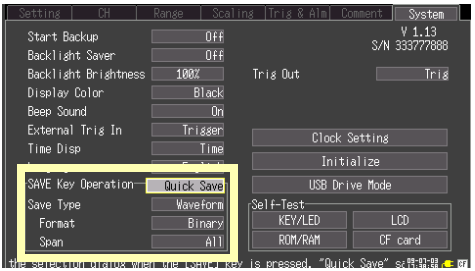
The Save dialog appears.
Select from the saving options in this dialog.

- Save Waveforms (p. 93)
- Save Screen Image (p. 94)
- Save Numerical Calculation Results (p. 95)
- Save Settings (p. 96)



[Quick Save]

Setting items are displayed.
Select your saving options.

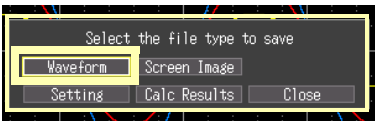


Saving Waveform Data (with the SAVE Key)

Waveform data is saved in files named WAVEnnnn.MEM in folders named with the date of recording (YY-MM-DD), created in the [HIOKI8430]-[DATA] folder (p. 85).
To save a partial waveform, specify the time span to save beforehand (p. 80).

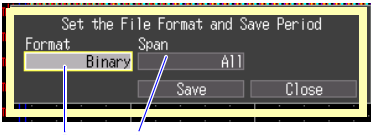
Select & Save

SAVE



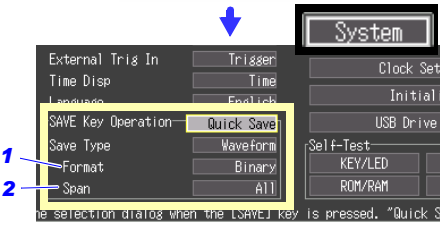
(Select from the dialog that appears when you press the **SAVE** key)

Select **[Waveform]**, and press the **ENTER** key.



Quick Save

WAVE/DATA SET FILE



(Before pressing the **SAVE** key, make settings on the System screen)

Select **[Waveform]** as the **[Save Type]**.

(∗ default setting)

1 For the **[Format]** setting, select the data saving format.

Binary Select this format to be able to reload the saved data into the instrument, or so that it can be loaded into the Logger Utility program.

Text Select this format to save the data as a text file.

2 From the **[Span]** setting options, select the portion of the data to save.

All *, A-B, Start-A, Start-B, A-End, B-End
(All = all acquired waveforms, A = Cursor A, B = Cursor B,
Start = start of acquired waveforms, End = end of acquired waveforms)

Select **[Save]** and press the **ENTER** key.

Select **[Yes]** in the confirmation dialog, and press the **ENTER** key.

SAVE

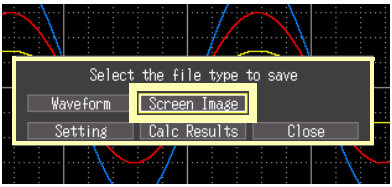
Capturing a Screen Image (With the SAVE Key)

Captured screen image files are automatically named SCR*nnnnn*.BMP in a folder named [HIOKI8430]-[PICTURE] (p. 85).

Select & Save

SAVE

Display the screen to capture, and press the **SAVE** key.



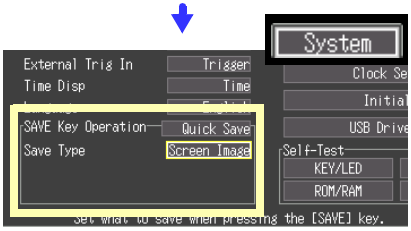
(Select from the dialog that appears when you press the **SAVE** key)

Select **[Screen Image]**, and press the **ENTER** key.

Select **[Yes]** in the confirmation dialog, and press the **ENTER** key.

Quick Save

WAVE/DATA SET FILE



(Before pressing the **SAVE** key, make settings on the System screen)

Select **[Screen Image]** as the **[Save Type]**.

Display the screen to capture

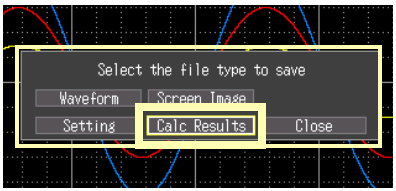
SAVE

Saving Numerical Calculation Results (With the SAVE Key)

Numerical calculation settings are necessary before saving results (p. 105).
Numerical calculation result files are automatically named MEAS*nnnn*.CSV in a folder named [HIOKI8430]-[MEASURE] (p. 85).

Select & Save

SAVE



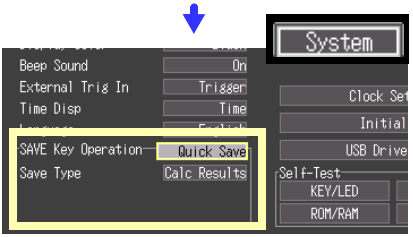
(Select from the dialog that appears when you press the **SAVE** key)

Select **[Calc Results]**, and press the **ENTER** key (p. 105).

Select **[Yes]** in the confirmation dialog, and press the **ENTER** key.

Quick Save

WAVE/DATA SET FILE



(Before pressing the **SAVE** key, make settings on the System screen)

Select **[Calc Results]** as the **[Save Type]**.

Display the numerical calculation results to be saved.

SAVE

By specifying a particular time span for numerical calculation, only the results for that time span are saved.

Saving Setting Configurations

Setting configurations can be saved as data files and later reloaded into the Memory HiLogger when you need to make more measurements with the same settings.
Up to ten setting configurations can be saved to internal memory, and more can be stored on a CF card.

1 WAVE/DATA SET FILE

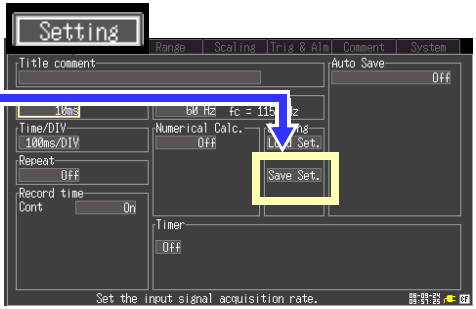
Select the [Setting] Screen.

2

Select **[Save Set.]**.

Apply

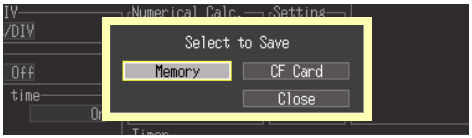
The Save dialog appears.



3

Select whether to save to the 8430-20's memory or to a CF card.

Apply



4 **(When [Memory] is selected)**

Select **[Save]** for the configuration instance (No.) to save.
Enter a comment as needed.

Apply

Comments entered on the [Comment] screen are displayed here.

(When [CF Card] is selected)

Setting configuration files are automatically named CONF*nnnn*.SET in a folder named [HIOKI8430]-[CONFIG] (p. 85)
To reload a setting configuration (p. 97)

6.4 Loading Data on the Memory HiLogger

Previously stored binary waveform data, captured screen images and saved setting configurations can be reloaded into the Memory HiLogger (p. 85)
Data stored on a CF card can also be transferred to a computer using the supplied USB cable (p. 102).

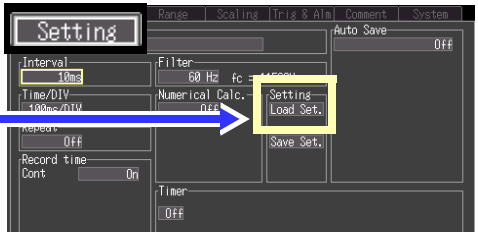
Loading a Setting Configuration

Setting configurations saved in the Memory HiLogger's memory or on a CF card can be reloaded. Also, when a setting folder named STARTUP.SET has been created in the [HIOKI8430]-[CONFIG] folder on the CF card, settings stored there can be automatically reloaded when the HiLogger is turned on.

See: "Saving Setting Configurations" (p. 96)

1 WAVE/DATA SET FILE

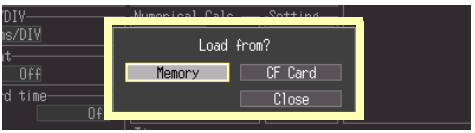
Select the [Setting] Screen.



2 Select **[Load Set.]**.

Apply

The loading dialog appears.



3 Select whether to load a setting configuration from 8430-20's memory or CF card.

Apply

4 **(If you selected [Memory])**

Select **[Load]** for the configuration you want to load.

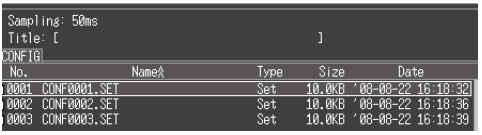
Apply

When Loading from Memory HiLogger Memory
The list of configurations stored in Memory HiLogger memory is displayed.

(If you selected [CF Card])

Select the configuration file to load. (CONF*nnnn*.SET)

Apply



When Loading from CF card
Configuration files stored in the [HIOKI8430]-[CONFIG] folder on the CF card are displayed.

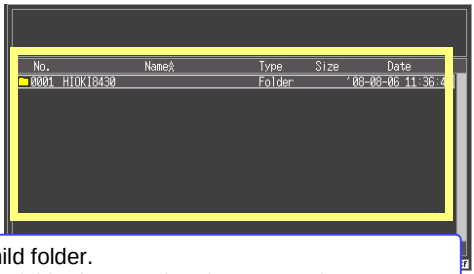
Memory HiLogger settings are reconfigured to those in the loaded configuration file.

Loading Waveform Data and Screen Images

Binary waveform data or captured screen images can be reloaded into the Memory HiLogger.

1 WAVE/DATA SET FILE

Select the File Screen.

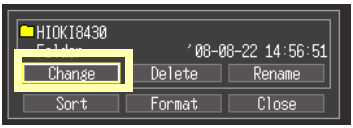


2 The contents of the CF card are displayed.

Select a file to load

Displays the child folder.
After selecting a folder by pressing the **ENTER** key, select **[Change]** in the displayed control dialog box.

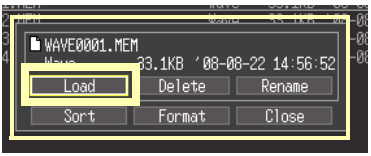
Displays the parent folder.



Apply

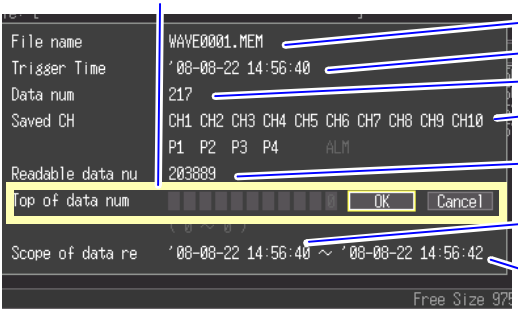
The control dialog box appears.

3 Select **[Load]**.



Apply

(When loading waveforms)
When the amount of data in a file to be loaded exceeds the internal memory capacity, you can specify a data point (number) at which to start loading. The loadable data size shows the maximum number of data points that can be loaded. This setting is not needed if the data to be loaded will fit in internal memory. Select [OK] to load the data.



- Waveform data file name
- Waveform data trigger time
- Number of data points in the file
- Channels saved in waveform data to be loaded (Analog, Pulse, and Alarm)
- Maximum number of data points that can be loaded (to internal memory)
- Settable range of offset to first data point
- Times of first and last data points to be loaded

6.5 Data Management

You can manage data stored on a CF card in the Memory HiLogger.

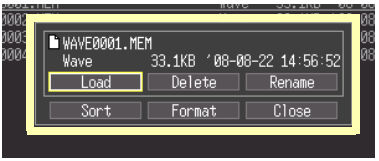
- Load a file (when the file is selected) (p. 97)
- Move displayed folders (when the folder is selected) (p. 99)
- Delete data (p. 100)
- Rename files and folders (p. 100)
- Sort files (p. 101)
- Format a CF card (p. 89)

The following operations can be performed from the control dialog box displayed by pressing the **ENTER** key from the File screen.

1 WAVE/DATA SET FILE

Select the File Screen.

2 Opens the control dialog box.

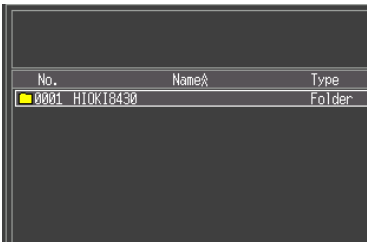


Viewing Folder Contents and the Parent Folder

1 WAVE/DATA SET FILE

Select the File Screen.

The contents of the card are displayed.



2 Select a folder to view.

View child folder (view contents of the currently highlighted folder) (press the **ENTER** key and select **[Folder]** in the displayed control dialog box)

Displays the parent folder.

Deleting Data

Folder and files on the CF card can be deleted.

1 WAVE/DATA SET FILE

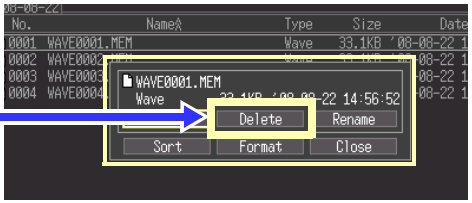
Select the File Screen.
The contents of the CF card are displayed.

2 Select a file to delete.

Apply

3 Select **[Delete]**.

Apply



A confirmation dialog appears.
Select **[Yes]** and press the **ENTER** key to delete.

Renaming Files and Folders

Folders and files on a CF card can be renamed. File names may consist of up to 26 regular characters.

1 WAVE/DATA SET FILE

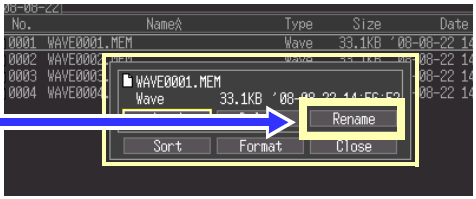
Select the File Screen.
The contents of the CF card are displayed.

2 Select the file or folder to rename.

Apply

3 Select **[Rename].**

Apply



The character entry dialog appears.

Enter the new file name (the same way as when entering a comment)(p. 56)
A confirmation dialog appears.
Select **[Yes]** and press the **ENTER** key to apply the new name.

Sorting Files

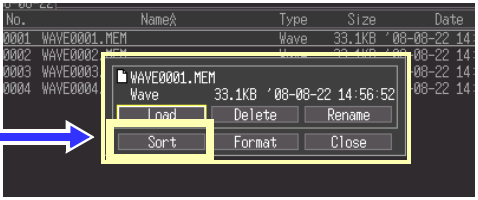
Files can be sorted in ascending or descending order according to a selected sort key.

1 WAVE/DATA SET FILE

Select the File Screen.

2 Apply

The control dialog box appears.



3 Select **[Sort]**.

Apply

4 Select the key on which to sort.

Apply

5 Select the desired sort order.
(Ascending or Descending)
Files are displayed in the new sort order

6 ESC

Finish

6.6 Transferring Data to a Computer (USB Drive Mode)

Data saved to a CF card can be transferred to a computer using the supplied USB cable. Before connecting the USB cable, select the USB Drive Mode on the HiLogger. To analyze data with the supplied Logger Utility program, refer to the program's instruction manual on the CD.

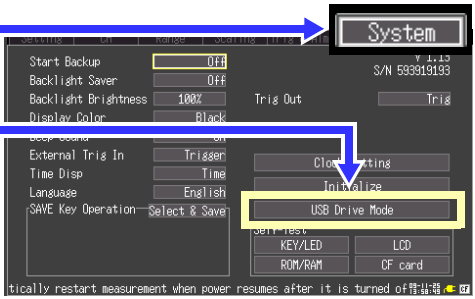
See: Appendix 9, "Using the Application Program" (p. A18)

NOTE • The USB Drive Mode cannot be used in Windows2000.

Select the USB Drive Mode

1 WAVE/DATA SET FILE

Select the [System] Screen.



2 Select **[USB Drive Mode]**.

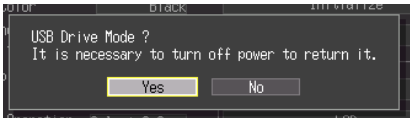
Apply

A confirmation dialog appears.

3 Select **[Yes]**.

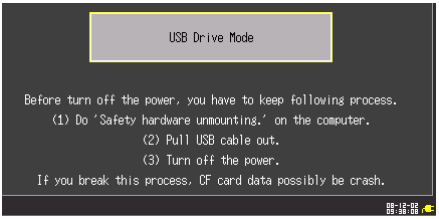
Apply

The USB Drive Mode is enabled.



No other HiLogger operations are available when the USB Drive Mode is enabled. Also, HiLogger communications with the supplied Logger Utility program are disabled.

See: "To exit USB Drive Mode" (p. 103)



4 Connect the USB cable (p. 103)

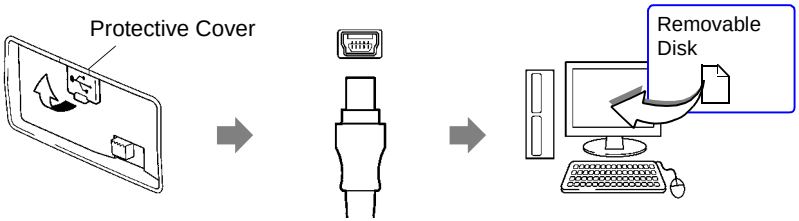
Connecting the USB Cable

Compatible OS: Windows XP, Vista, or 7

⚠CAUTION

- Do not eject the CF card or pull out the USB cable during data transfer. Doing so would prevent proper data transfer.
- The Memory HiLogger and computer should be connected to the same earth ground. If grounded separately, potential difference between the ground points can cause malfunctions or damage when connecting the USB cable.

Before connecting the USB cable to the HiLogger, select the USB Drive Mode on the [System] screen. Otherwise, the HiLogger's CF card cannot be accessed.



1 Open the protective cover over the USB connector.

2 Orient the USB cable plug properly, and insert it into the receptacle.

3 Connect the other end of the cable to a USB port on the computer.
The computer should recognize the Memory HiLogger as a removable disk when the cable is connected.

To exit USB Drive Mode

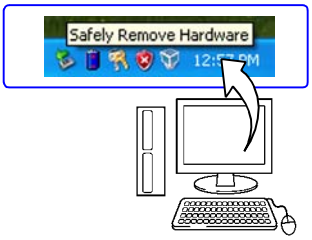
1 Click the Safely Remove Hardware ( ) icon in the Windows notification area.

2 Click the appropriate line “Safely remove USB Mass Storage Device – Drive(H:)” where H is the drive letter that Windows assigned to the HiLogger.

3 When “Safe to remove hardware” appears, click [X] or [OK].

4 Disconnect the USB cable.

5 Turn the HiLogger off and back on.



Numerical Calculations Chapter 7

7.1 Calculation Methods

Calculations can be applied to measured data. Six types of numerical calculation are available, four of which can be applied at the same time. Refer to 7.2, "Numerical Value Calculation Expressions" (p. 109) for details of the calculation methods. You can specify the measurement time span over which calculations are to be applied (p. 108).

Types of calculations

• Average value	Average value of waveform data
• Peak value	Peak-to-peak value of waveform data
• Maximum value	Maximum value of waveform data
• Minimum value	Minimum value of waveform data
• Time to maximum value	Time elapsed from the start of measurement to the maximum value
• Time to minimum value	Time elapsed from the start of measurement to the minimum value

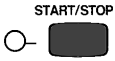
Two methods are available for applying calculations, as follows.

Auto Calculation

Configure numerical calculations before starting measurement. Calculations are performed automatically after measurement (p. 106).

(Setting Screen)
Set Numerical Calculation to [On], and select the calculation types

To save calculation results automatically
(Setting Screen)
Enable Auto Save (p. 91)



Start and finish measuring

Analyze (p. 75)

Calculating After Measuring

Configure numerical calculations after measurement (p. 107).

End of Measurement

(Setting screen or Waveform screen)
Set Numerical Calculation to [On], and select the calculation types.

(Waveform Screen)
Execute Calculations

Analyze (p. 75)

Auto Calculation

Numerical calculations are performed automatically after measurement.

1 WAVE/DATA SET FILE

Select the [Setting] Screen.

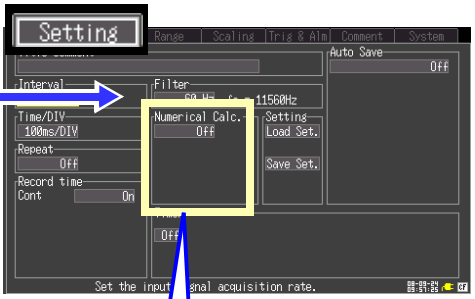
2

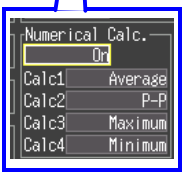
Select **[Numerical Calc.]**.

Open the setting options for the item to be set.

Select **[On]**.

Apply





3

Select any of **[Calc1]** to **[Calc4]**.

Open the setting options for the item to be set.

Select the calculation type.
Calculation types:
Average, P-P, Maximum, Minimum, Time To Max., Time To Min.,
(or **Off**, the default)

Apply

4 Enable Auto Save (if automatic saving is needed)
"Automatic Saving" (p. 91)

5 START/STOP

Start and finish measuring.

6 Analyze (p. 75)

The results of numerical calculations are displayed on the Waveform screen.

Manual Calculation

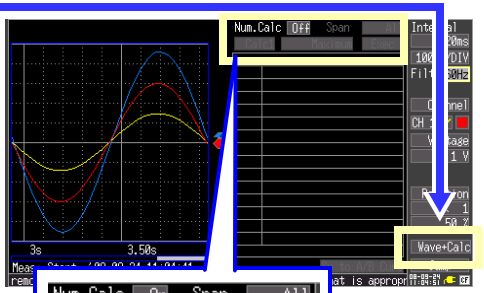
1 START/STOP

Start and finish measuring.

2 WAVE/DATA SET FILE

Select the Waveform Screen.
You can select it from the [Setting] screen.

3 Select **[Wave+Calc]** display.



4 Enable (set to [On]) numerical calculation.

5 Select **[Calc1]** to **[Calc4]** and move to the setting options.

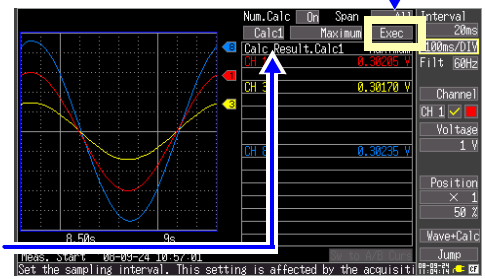
Open the setting options for the item to be set.

Select the calculation type.
Calculation types:
Average, P-P, Maximum, Minimum, Time To Max., Time To Min.,
(or **Off**, the default)

Apply

6 Select **[Exec]**.

Apply



7 Analyze (p. 75)

The results of numerical calculations are displayed.

The displayed calculation results are determined by the selected calculation number.

Apply Calculations to a Specific Time Span (Manual Calculation Only)

After measuring, calculation can be applied to a specified time span.
Make any other calculation settings before specifying the calculation time span (p. 107).

1 SCROLL CURSOR

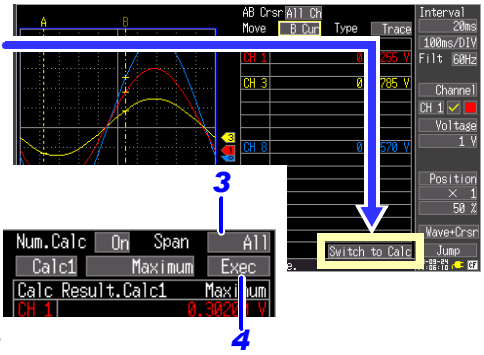
Display A/B Cursors.

SCROLL CURSOR

Position the A/B cursors to define the calculation time span.
To select which cursor to move: (p. 80)

2 Select **[Switch to Calc]**.

Apply



3 Select the **[Span]** setting option

Open the setting options for the item to be set.

Select the calculation time span
All, A-B, Start-A, Start-B, A-End, B-End

Apply

- **All**: The entire acquired waveform
- **A-B**: The time span between cursors A and B
- **Start-A**: From the start of the acquired waveform to cursor A
- **Start-B**: From the start of the acquired waveform to cursor B
- **A-End**: From cursor A to the end of the acquired waveform
- **B-End**: From cursor B to the end of the acquired waveform

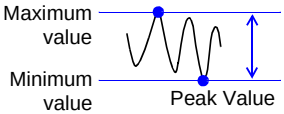
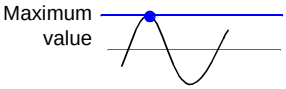
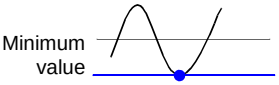
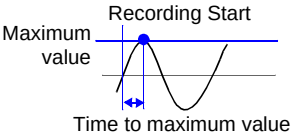
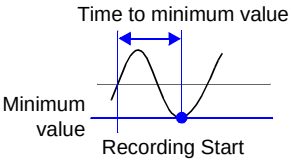
4 Select **[Exec]**.

Apply

The results of calculations are displayed.

When you select [Switch to Calc] the calculation display screen appears, and A/B cursor motion is enabled. However, changing to the [Wave+Calc] display hides the A/B cursors (so they are not movable), although the calculation range can still be changed.

7.2 Numerical Value Calculation Expressions

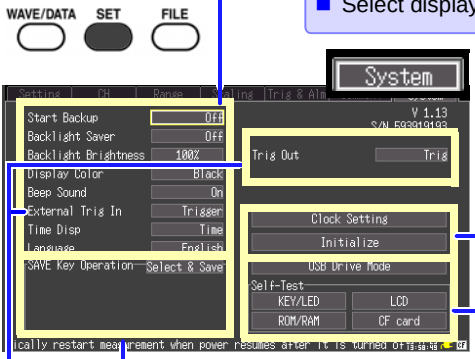
Average	$AVE = \frac{1}{n}\sum_{i=1}^{n} di$	Obtains the average value of waveform data. *AVE*: Average value *n* : Data count *di* : Data on channel number i
Peak Value (P-P)		Obtains the value of the difference (peak-to-peak value) between maximum and minimum values of waveform data.
Maximum Value		Obtains the maximum value of waveform data.
Minimum Value		Obtains the minimum value of waveform data.
Time to maximum value		Acquires the time (s) elapsed from the start of recording to maximum value. When there are two or more maxima, this value is the first to occur.
Time to minimum value		Acquires the time (s) elapsed from the start of recording to minimum value. When there are two or more minima, this value is the first to occur.

System Environment Settings Chapter 8

Settings affecting the clock, **SAVE** key operation and self testing are made from the System screen.

Screen and Key Operation Settings

- Specify operating behavior when recovering from power outages (Start Backup) (p. 112)
- Set backlight power saving (p. 113)
- Set backlight brightness (p. 112)
- Select black or white screen background (p. 113)
- Enable or disable the beeper (p. 113)
- Set the horizontal axis (time value display) (p. 114)
- Select display language (p. 114)



System-Related Settings

- Set the clock (p. 115)
- Reinitialize the Memory HiLogger (p. 116)
- Transfer data (p. 102)

Self Testing

- KEY/LED test (p. 117)
- LCD test (p. 117)
- ROM/RAM test (p. 117)
- CF card test (p. 117)

Save (Storage) Settings (SAVE key)

- Select the saving method for the **SAVE** key (p. 92)

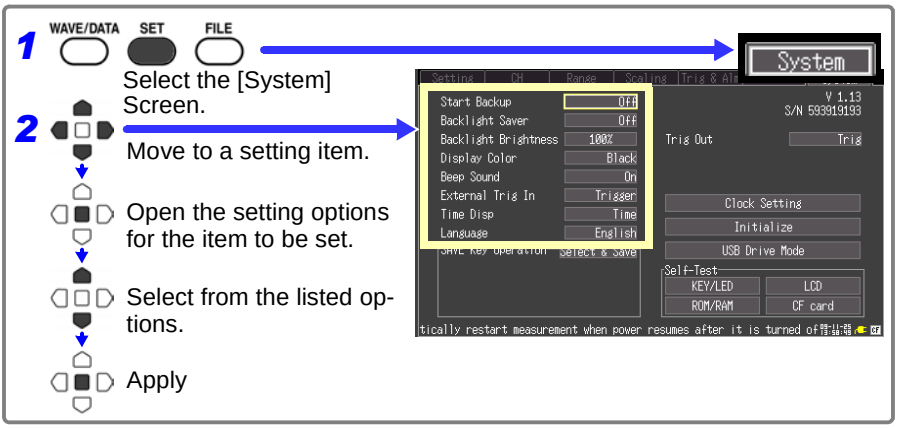
(for [Quick Save])

- Select the type of data to save (p. 93)
- Select the time span to save (p. 93)

External Control Terminals

- Select external triggering (p. 121)
- Insert event marks by external input (p. 83)
- Set the trigger output (p. 122)

8.1 Screen and Key Operation Settings



Using the Auto-Resume Function (Resume After Power Restoration)

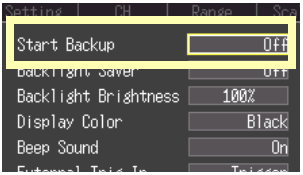
If a power outage or other power loss causes an interruption in recording (while the LED on the left side of the **START/STOP** key is lit), you can automatically resume recording when the power is restored. If you are using triggers, the triggers are restored to the [Waiting for trigger] state.

NOTE Bear in mind that data on the CF card can be lost if power is disrupted while writing to it.

Select from the **[Start Backup]** setting options.

Setting options:(* default setting)

Off*	Do not use the Auto-Resume Function.
On	Use the Auto-Resume Function.



Adjust Backlight Brightness

Backlight brightness can be selected from four levels. Lower brightness settings provide longer battery operating time.

When the **[Backlight Brightness]** setting is selected, pressing the **ENTER** key repeated cycles through the four brightness levels.

Setting options: **100%***, **70%, 40%, 25%** (four-step brightness setting) (* default setting)

Enabling and Disabling the Backlight Saver

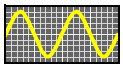
A backlight saver can be activated after a specified number of minutes during which no operation key is pressed. The backlight saver turns off the backlight of the LCD, prolonging the lifetime of the backlight by turning it off when not needed.
To deactivate the backlight saver, press any key. The operating screen appears again.
While the backlight saver is active, the Memory HiLogger's measuring state is still indicated by the LED (lights green when measuring, and blinks when not measuring).

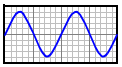
Select from the **[Backlight Saver]** setting options.
Setting options:(* default setting)

Off*	Disables the backlight saver function. The operating screen is always displayed.
1min, 2min, 3min, 4min, 5min	The backlight saver is activated if the specified time is exceeded.

Be aware that power is still consumed even when the backlight is off, so be sure to turn the Memory HiLogger power switch off when not in use.

Selecting Black or White Screen Background

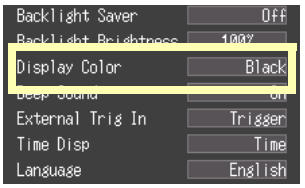

Black Background


White Background

The screen background can be set to black or white.

Select from the **[Display Color]** setting options.
Setting options:(* default setting)

Black*	Make background black
White	Make background white.

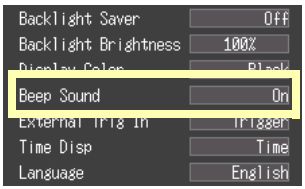


Enabling or Disabling the Beeper

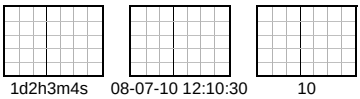
The beeper can be set to sound when an error occurs.

Select from the **[Beep Sound]** setting options.
Setting options:(* default setting)

On*	Emit a beep sound on error messages (error and warning displays).
Off	Do not emit beep sound.



Selecting the Horizontal (Time) Axis Display



Select the display method for the horizontal axis at the bottom of the screen.

Select from the **[Time Disp]** setting options.
Setting options:(∗ default setting):

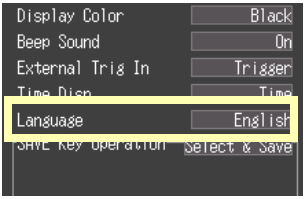
Time*	Displays the time span from the start of measurement. If triggering is enabled, the displayed time span is from the last trigger event.
Date	Displays the date and time of data acquisition.
Data Pts	Displays the number of data points from the start of measurement. If triggering is enabled, the displayed data points begin from the last trigger event.

Selecting the Display Language

Select the display language.

Select from the **[Language]** setting options.
Setting options:(∗ default setting)

English*	Display in English.
Japanese	Display in Japanese.



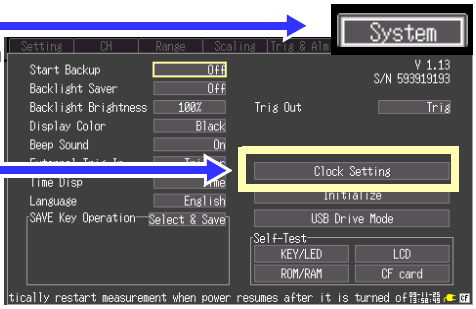
8.2 Making System Settings

Setting the Date and Time

The 8430-20 is equipped with an auto-calendar, automatic leap year detection, and a 24-hour clock.
If the clock is not set to the correct time, measurement start time (trigger time) and file date information will be incorrect. If this occurs, reset the clock.

1 WAVE/DATA SET FILE

Select the [System] Screen



2 Select **[Clock Setting]**.

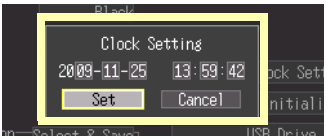
Apply
The setting dialog appears.

3 Select an item to change. (year, month, day, hour, minute or second)

Apply

Adjust the setting.

Apply



Change 1's digit

Change 10's digit

4 Select **[Set]**.

Apply

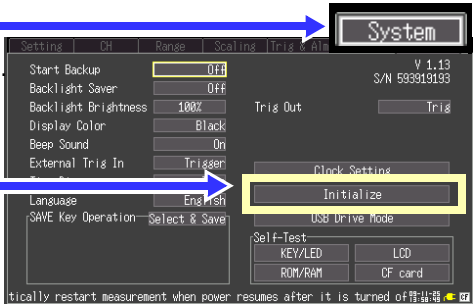
The clock is reset.

Initializing the Memory HiLogger (System Reset)

This procedure resets all settings to their factory defaults.
The system is reset by pressing and holding the **START/STOP** key while turning the Memory HiLogger POWER switch on.
For details about the factory default settings, see Appendix 5, "List of Default Settings" (p. A9).

1 WAVE/DATA SET FILE

Select the [System] Screen.



2 Select **[Initialize]**.

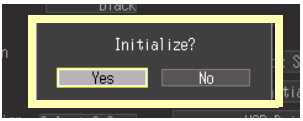
Apply

A confirmation dialog appears.

3 Select **[Yes]**.

Apply

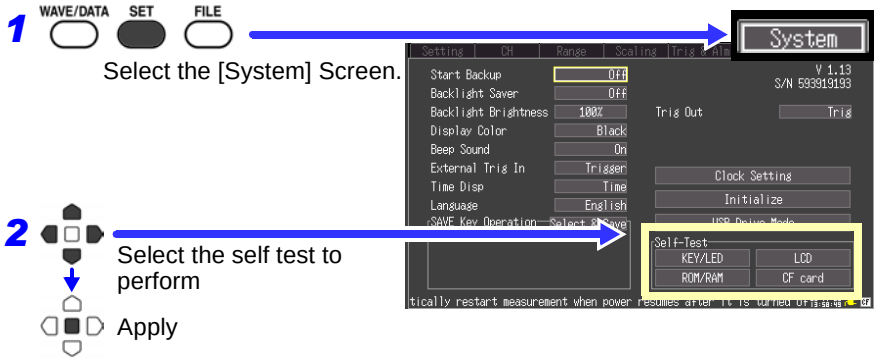
Initialization proceeds.



Setting configurations stored in Memory HiLogger memory are not affected.
To delete stored setting configurations, press and hold both the **SAVE** and **START/STOP** keys simultaneously.
When the power is switched on, the language selection screen will display for you to choose the language you wish to use.

Self-Test

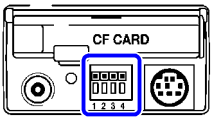
The following self tests are available. Results are displayed on the screen.
If any faults are found, have the Memory HiLogger repaired. Contact your dealer or Hioki representative.



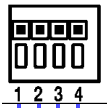
Self-Test	Details
KEY/LED	Tests the keys and LEDs for correct operation. After every key has been pressed, the KEY/LED check finishes. Pressing the **START/STOP** key also tests whether the LED lights. If you notice a malfunction, press the **SAVE** and **START/STOP** keys simultaneously to abort the test.
LCD	Tests the screen display (color test, gradation test, character test) The screen changes each time you press an operation key. If the display screen seems abnormal, request repairs.
ROM/RAM	Tests the instrument's internal memory (ROM and RAM) If "NG" appears, request repairs.
CF card	Tests whether the Memory HiLogger recognizes the inserted CF card. The CF card is formatted (p. 89)

External Control ⚠ Chapter 9

The external control terminals on the Memory HiLogger support trigger signal input and output.



Top View



GND
(common with instrument ground)

TRIG.OUT (Trigger output)
Output a signal when a trigger event occurs (p. 122).

ALARM (Output)
A signal is output whenever the alarm criteria are satisfied (p. 124).

EXT.TRIG (External trigger input)
Input external signals (p. 121).

9.1 Connecting to the External Control Terminals

DANGER **To avoid electrical hazards and damage to the instrument, do not apply voltage exceeding the rated maximum to the external control terminals.**

	I/O terminals	Maximum input voltage
Input	EXT.TRIG	-2 to 7 V DC
Output	TRIG.OUT	-20 to 30 V DC 5 mA max, 200 mW max
	ALARM	

WARNING **To prevent electric shock accidents and damage to the equipment, always observe the following precautions when making connections to external terminal blocks and external connectors.**

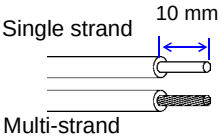
- **Before making connections, turn off the power on the instrument and the equipment to connect.**
- **Do not exceed the specified signal levels for signals supplied to external terminal blocks.**
- **Ensure that devices and systems to be connected to the external control terminals are properly isolated.**

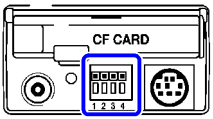
⚠CAUTION

- The external control ground terminal is not isolated from the Memory HiLogger's chassis ground. Make certain that there will be no potential difference between the external control ground terminal and the ground of any connected device. Otherwise, the Memory HiLogger or device could be damaged.
- To avoid electric shock, use the recommended wire type to connect to the external control terminals, or otherwise ensure that the wire used has adequate current-handling capacity and insulation.

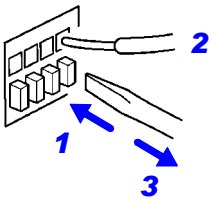
Terminal Connections

- Recommended cables:
  single strand diameter 1.0 mm (AWG18),
  multi-strand 0.75 mm^2 (AWG20)
- Usable cables:
  Single strand diameter 0.4 to 1.0 mm (AWG26 to 18),
  Multi-strand 0.3 to 0.75 mm^2 (AWG22 to 20)
  Strand diameter 0.18 mm or greater (per wire)
- Standard insulation stripping length:10 mm
- Button operation specified tool: Flat-blade screwdriver (tip width 2.6 mm)





Top View



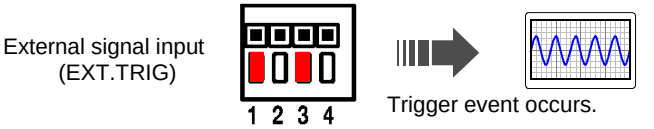
1 Push in the button on the connector with a flat-blade screwdriver or other tool.

2 With the button held in, insert the cable into the cable connection hole.

3 Release the button.
The cable is locked.

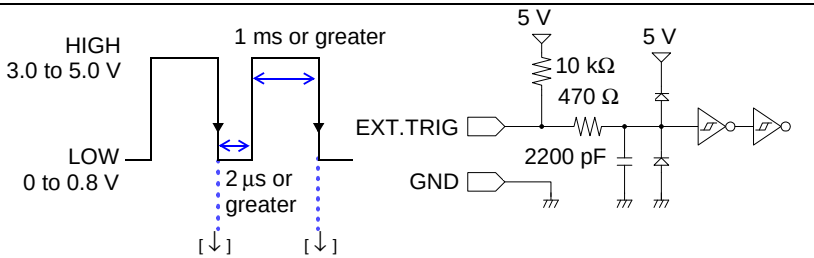
9.2 External Trigger Input

Triggering can be controlled by applying a signal from an external trigger source. This allows synchronous operation of multiple Memory HiLoggers by parallel triggering (p. 125).



Trigger Input Signals

Voltage range	HIGH level: 3.0 to 5.0 V, LOW level: 0 to 0.8 V
Pulse width	HIGH level: 1 ms or greater, LOW level: 2 µs or greater
Maximum input voltage	-2 to 7 V



Signal Input Procedure

1 Connect the external trigger signal source and signal ground to external control terminals 3 (EXT.TRIG) and 1 (GND), respectively.

For the connection method (p. 120)

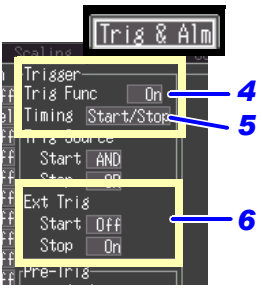
2 Press the **SET** key to open the [System] screen.

3 Set the **[External Trig In]** setting to **[Trigger]** (default setting).

4 Open the [Trig & Alm] screen, and set the **[Trig Func]** to **[On]**.

5 Specify trigger start and stop times by the **[Timing]** settings, as needed.

6 Set the **[Ext Trig] - [Start]** and **[Stop]** settings to **[On]**.



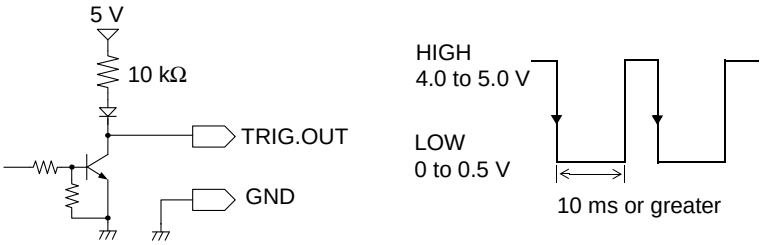
7 Either short the EXT.TRIG terminal to ground, or apply a pulse train (rectangular wave) to the EXT.TRIG terminal, with 3 to 5 V High and 0 to 0.8 V Low levels.
Triggering occurs on the falling edge of the input waveform.

9.3 External Signal Output (Trigger Output)

You can output a signal when a trigger event occurs. This allows synchronous operation of multiple Memory HiLoggers by parallel triggering (p. 125)

Trigger Output Signals

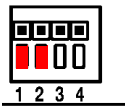
Output signal	Open collector output (with voltage output), active LOW
Output voltage range	HIGH level: 4.0 to 5.0 V, LOW level: 0 to 0.5 V
Pulse width	LOW level: 10 ms or greater
Maximum input voltage	-20 to +30 V 50 mA max 200 mW max



NOTE When triggering is not otherwise used, a trigger signal is output during measurement.

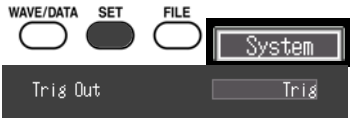
Signal Output Procedure

1 Connect the external trigger signal destination and signal ground to external control terminals 2 (TRIG.OUT) and 1 (GND), respectively.



For the connection method (p. 120)

2 Press the **SET** key to open the [System] screen.



3 Select from the [Trig Out] settings.
Setting options: (* default setting)

Trig *	Output a signal only when a trigger event occurs. The signal outputs synchronized to the setting of the trigger timing.
Start	Output a signal even at the start of a measurement that is not a trigger event.

Trigger output setting	Trigger setting	Trigger timing	Trigger output timing
Trig	Disabled	-	no output
	Enabled *1	Start	Start recording
		Stop	Stop recording
		Start/Stop	Start recording/stop recording
Start	Disabled	-	Start recording
	Enabled *1	Start	Start recording
		Stop	Start recording/stop recording
		Start/Stop	Start recording/stop recording

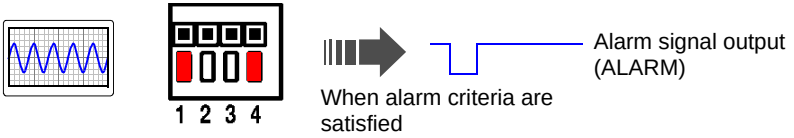
*1. Indicates that in trigger function On, the trigger is set at one of the following - analog channel, pulse channel or external trigger.

When a trigger event occurs, a pulse wave changing from the HIGH level (4.0 to 5.0 V) to the LOW level (0 to 0.5 V) is output from the TRIG.OUT terminal.

9.4 Alarm Signal Output (Alarm Output)

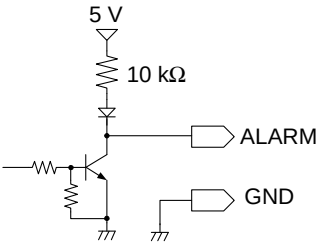
This signal is output when alarm criteria are satisfied.
Specify the desired alarm criteria.

See: 4.2, "Alarm Output" (p. 69)



About the Alarm Output Signal

Output signal	Open collector output (with voltage output), active LOW
Output voltage range	HIGH level: 4.0 to 5.0 V, LOW level: 0 to 0.5 V
Output Refresh	Every recording interval
Maximum input voltage	-20 to +30 V 5 mA max 200 mW max



Connect the ALARM (No. 4) and GND (No. 1) terminals of the external control terminal block to the signal output line and ground, respectively. When the alarm criteria are satisfied, a Low level (0 to 1V) signal is output.

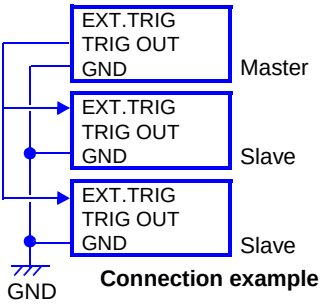
For the connection method (p. 120)

9.5 Synchronous Measurements with Multiple Instruments

Multiple instruments can be synchronized using the external control terminals.

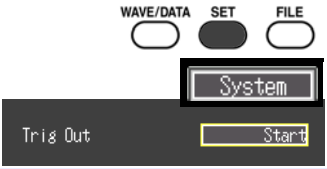
Parallel synchronization

Set one instrument to master, and set the others to slave.



Connection example

Set the master instrument.



1. Press the **SET** key to open the [System] screen.
2. Set the **[Trig Out]** setting to **[Start]**.

Set the slave instrument.

1. Press the **SET** key to open the [System] screen.
2. Set the **[External Trg In]** setting to **[Trigger]**.
3. Press the **SET** key to open the [Trig&Alm] screen.
4. Set as follows.
   Trig Func: On
   Timing: Start
   Trig Source Start: OR
   Ext Trig Start: On

Turn the start trigger setting for all the channels (analog, pulse) to Off. Failure to do so may start the measurement without synchronization.

Press the START/STOP key of the slave instrument to start the measurement (trigger waiting state). In this state, press the START/STOP key of the master instrument to start the measurement. The slave instrument will start the measurement at the same time.

Specifications Chapter 10

(1) General Specifications

Basic Specifications

No. of channels (max.)	10 analog channels + 4 pulse channels Standard product configuration. Pulse grounds share common ground with instrument.
Internal memory capacity	Total 3.5 MW (mega words)
Maximum sampling rate	10 ms/All channels
Timebase accuracy	±0.01% (Relative grid timing error)
External terminals	External Trigger Input, Trigger Output, Alarm Output and GND
Clock functions	Auto calendar, auto leap year judgment, 24-hour timer Accuracy: ±50ppm (0°C to 40°C), Nominal value: ±10ppm (25°C)
Backup battery life	Approx. five years for clock and settings (@25°C, 77°F)
Conditions of guaranteed accuracy	After 30 minutes warm-up
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80% RH or less (non-condensating)
Temperature and humidity range for guaranteed accuracy	Temperature 23±5°C (73±9°F), Humidity 80% RH or less (non-condensating)
Storage temperature and humidity	Temperature -10 to 50°C (14 to 122°F), Humidity 80% RH or less (non-condensating)
Period of guaranteed accuracy	1 year
Operating environment	Indoors, Pollution degree 2, up to 2000 m (6562-ft.) ASL
Dielectric strength	350 VAC for 15 seconds (between each input channel and chassis, and between input channels)

Basic Specifications

Power source	• Model Z1005 AC Adapter Rated supply voltage 100 to 240 VAC (Voltage fluctuations of ±10% from the rated supply voltage are taken into account) Rated supply frequency 50/60 Hz Anticipated transient overvoltage 2500 V • Model 9780 Battery Pack 3.6 V (Note) The AC Adapter has priority when connected • 12 V Battery (10 to 16 VDC, ±10% tolerance) (Note) Wiring from battery to instrument should be no more than 3m long
Maximum rated power	30 VA (When using the AC Adapter to charge the 9780 Battery Pack in the Memory HiLogger) 10 VA (When using 12 VDC to charge the 9780 Battery Pack in the Memory HiLogger)
Continuous operating time	When using Model 9780 Battery Pack, approx. 2.5 hours (@25°C)
Charging function	With the 9780 Battery Pack installed and the AC Adapter connected Charging time: Approx. 200 minutes (@25°C) Note 1. Actual charging time depends on battery condition Note 2. Charging temperature range: 5 to 30°C
Dimensions	Approx. 176W × 101H × 41D mm (sans protrusions) (6.93"W × 3.98"H × 1.61"D)
Mass	Approx. 550g (19.4 oz.) (without Model 9780 Battery Pack) Approx. 620g (21.9 oz.) (With Model 9780 Battery Pack installed)
Effect of radiated radio-frequency electromagnetic field	±5.0%f.s. at 3 V/m
Effect of conducted radio-frequency electromagnetic field	±5.0%f.s. at 3 V
Applicable Standards	Safety EN61010 EMC EN61326 Class A EN61000-3-2 EN61000-3-3

Display Section

Display character	English/ Japanese selectable
Display type	4.3-in TFT Color LCD (480 × 272 dots)
Display resolution	Waveform: Max. 20 divisions (time axis) × 10 divisions (voltage axis) (1 division = 20 dot (time axis) × 20dot (voltage axis)) Note: The number of displayed time axis divisions depends on the display configuration.

Display Section

Dot pitch	0.198mm × 0.198mm
Backlight	On, Off
Backlight life span	Approx. 10,000 hours (continuously on)
Backlight saver function	Selectable from on, or auto-off after selectable interval
Backlight brightness	Selectable from four levels (100%, 70%, 40%, 25%)

External Interfaces

USB standard	USB2.0 compliant High Speed
Connector	Series-mini B receptacle
Connecting devices	PC
Function	Supports data acquisition using a data acquisition application program Supports remote setting of measurement criteria using a data acquisition application program Transfer files between an installed CF card and connected PC

External Storage

Slot	One CompactFlash compliant slot CF Card Type I accepted
Card type	Flash ATA card
Card capacities	Model 9726 (128MB), 9727 (256MB), 9728 (512MB), 9729 (1GB), 9830 (2GB)
Data formats	FAT and FAT32 supported
Storage contents	• Setting configurations • Measurement data (binary and csv format) (data between A-B cursors can be saved) • Screen images (compressed bitmap format) • Calculation results

Measurement Input Section

Input terminals	M3 screw type terminal block (2 terminals per channel) Pulse inputs use a special connector
Measurement object	• Voltage • Thermocouple (K, J, E, T, N, R, S, B) • Pulse count integration (cumulative and instantaneous), revolution variations

Measurement Input Section

Measurement ranges and resolution

Measurement Object	Range	Measurable Range	Max. Resolution
Voltage	100mV f.s.	-100 mV to +100 mV	5 µV
	1V f.s.	-1 V to +1 V	50 µV
	10V f.s.	-10 V to +10 V	500 µV
	20V f.s.	-20 V to +20 V	1 mV
	100V f.s.	-60 V to +60 V	5 mV
	1-5V	1V to 5V	500 µV
Temperature (thermocouple)	2000°C f.s.	-200°C to 2000°C *1	0.1°C
Pulse Integration	1,000M pulse f.s.	0 to 1,000M pulse	1 pulse
Revolution Variation	5,000/n r/s f.s.	0 to 5,000/n r/s	1/n r/s
	n = pulses/revolution, from 1 to 1,000		

*1: Upper and lower limits depend on sensor input range

Temperature measurement input range

K: -200°C to 1350°C
E: -200°C to 1000°C
N: -200°C to 1300°C
S: 0°C to 1700°C
(JIS C 1602-1995)

J: -200°C to 1200°C
T: -200°C to 400°C
R: 0°C to 1700°C
B: 400°C to 1800°C

Measurement accuracy

- Voltage: ±0.1% f.s. (For the 1-5V range, f.s = 10 V)
- Thermocouple:
  K, J, E, T, N : ±2°C
  R, S : ±4.5°C (less than 400°C)
  R, S, B : ±3°C (400°C or more)
- Reference junction compensation accuracy: ±1°C
  (Add to thermocouple measurement accuracy when internal RJC is enabled.)

Temperature characteristic

Add (Measurement accuracy × 0.1) /°C to measurement accuracy

Reference junction compensation

Internal/External selectable (for thermocouple measurements)

Digital filter

Off, 50 Hz, 60 Hz (cut-off frequency set automatically according to recording interval)

Cut-off frequency

[Hz]

Recording interval	Digital filter			Recording interval	Digital filter		
	60Hz	50Hz	Off		60Hz	50Hz	Off
10ms	11.56k	11.56k	11.56k	1s	108.2	108.2	11.56k
20ms	5.78k	5.78k		2s	60	54.03	
50ms	2.216k	2.216k		5s	60	50	
100ms	1.096k	1.096k		10s	60	50	
200ms	542.5	542.5		20s or more	10	10	
500ms	216.6	216.6					

Input resistance	1 MΩ±5% (broken wire detection disabled, for voltage and thermocouple measurements) At least 800 kΩ (with broken wire detection enabled for thermocouple measurements)
Normal mode rejection ratio	50dB minimum (with 50 Hz input with 5 s recording interval, and 50 Hz digital filter enabled) (with 60 Hz input with 2 s recording interval, and 60 Hz digital filter enabled)
Common mode rejection ratio	with 100 Ω maximum signal source impedance 100dB minimum (with 50 or 60 Hz input and digital filter disabled) 140dB minimum (with 50 Hz input with 5 s recording interval, and 50 Hz digital filter enabled) (with 60 Hz input with 2 s recording interval, and 60 Hz digital filter enabled)
Broken wire detection	(Temperature input) selectable On or Off, approx. 300 nA detection current
Maximum input voltage	30 Vrms or 60 VDC (analog input channel)
Maximum rated voltage to earth	30 Vrms or 60 VDC (between each input channel and chassis, and between input channels) Measurement category I (anticipated transient overvoltage 330 V)
Pulse input	Non-voltage “a” contact (normally open) open collector or voltage input
Maximum input voltage	-5 to 10 VDC
Maximum channel-to-channel voltage	Non-isolated (channels use the Memory HiLogger common ground)
Maximum rated voltage to earth	Non-isolated (channels use the Memory HiLogger common ground)
Detecting level	High: 2.5 V min., Low: 0.9 V max.
Pulse input period	At least 200 µs (both H and L levels at least 100 µs)
Slope	Either rising or falling edge pulse detection can be set for each channel
Function	Integrated count, revolution variation

(2) Measurement Functions

Basic Specifications

Recording interval	10, 20, 50, 100, 200 or 500 ms; or 1, 2, 5, 10, 20 or 30 s; or 1, 2, 5, 10, 20 or 30 min; or 1 h
Recording length (time span)	Any, with continuous recording selectable
Recording repetition function	Repeatedly measures using the specified recording length
Timer function	Records between specified start and stop times
Specifiable waveform colors	24 colors
Hybrid display configurations	• Simultaneous waveform and gauge display • Waveform display • Simultaneous waveform and numerical value display • Simultaneous numerical value and comment display • Numerical value display • Numerical calculation display (simultaneous calculation results and waveforms) • Cursor value display (simultaneous A/B cursor values and waveforms)
Waveform compression and magnification	• Time axis (horizontal axis) 100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 30s, 1min, 2min, 5min, 10min, 20min, 30min, 1h, 2h, 5h, 10h, 12h, 1day/division • Voltage axis (vertical axis) ×100, ×50, ×20, ×10, ×5, ×2, ×1, ×1/2 (switchable to upper and lower limit settings)
Waveform scrolling	Horizontal scrolling
Waveform storage	The last 3.5 M data points (recording time for one analog channel) are stored in internal memory. Data retained in memory can be observed by backward scrolling.

Trigger Section

Trigger method	Digital comparison
Trigger timing	Start, stop, start&stop
Trigger source	Analog input (CH1 to 10), Integrated pulse input (P1 to 4)
External trigger	Triggering occurs when the external trigger and ground terminals are shorted, or on falling edges from High (3 to 5 V) to Low (0 to 0.8 V) levels. Maximum input voltage: -2 to 7 VDC Minimum response pulse width: 1 ms H, 2 µs L
Trigger criteria	AND or OR of each trigger source, Trigger criteria can be set for each channel.

Trigger Section

Trigger types (analog and pulse)	• Level Trigger Triggering occurs when the signal rises (or falls) through a specified value. • Window Trigger Triggering occurs when the input signal level enters or exits the amplitude window defined by upper/lower thresholds.
Trigger level resolution	Analog channel: 0.025%f.s. (f.s. = 10 divisions) Pulse channel: 1c (Pulse count integration), 1/n r/s (revolution) n = pulses/revolution
Pre-trigger	Time span setting (any span). Settable with real-time saving.
Trigger output	Open-collector output (with 5 V output, Active Low) Pulse Width: at least 10 ms You can choose to enable output at trigger activation only or at both trigger activation and measurement start.
Trigger input and output terminals	Push-button terminals

Alarm Output

Output settings	OR, AND Output occurs when the logical sum (OR) or product (AND) of alarm trigger sources is true.
Alarm Types	The following criteria can be specified for each channel. • Level : An alarm is output by input rising above or falling below a preset level • Window : An alarm is output by input crossing into or out of a window defined by preset upper and lower trigger levels
Latch setting	Alarm output can be set to be held (latched), or not.
Beeper	On/Off
Alarm output characteristic	Open-collector output (with 5 V pull-up, active low)
Output refresh	At every recording interval

Miscellaneous

Numerical calculations	Four calculations are available at the same time
Calculations	Average value, peak value, maximum value, Time to maximum value, minimum value, Time to minimum value
Calculation time span	Can be specified by A/B cursors, or whole waveform
Cursor measurement functions	Time difference between A/B cursors, potential difference, potential at each cursor, time

Miscellaneous

Scaling functions	Available for each channel independently
Comment entry	Provided
Event mark insertion	Event markers can be inserted by screen button or by signal input at the trigger input terminal (exclusive function)
Screen image capture function	Provided (compressed bitmap format)
Retain start condition function	Provided
Auto save function	Waveform data (real-time), numerical calculation results (after measurement), Power to the instrument must not be interrupted while data is being saved.
Real-time saving	Saves real-time waveform data to CF card in binary or csv format Each recording length can be save in a separate file Overwriting save is available Up to 3.5 M data points in binary format can be loaded from a specified point (using one analog channel) Power to the instrument must not be interrupted while data is being saved.
Auto setup function	Automatically loads settings from CF card at power on
Monitor function	Indicates momentary values without storing data into memory
Waveform backup time function	Memory is retained (backed up) while the Memory HiLogger is turned off when a charged 9780 Battery Pack is present or with the Z1005 AC Adapter connected.
Waveform backup time	100 hours with a 9780 Battery Pack after full charge
Saving of settings	Up to 10 setting profiles can be saved in the instrument's memory.

(3) Miscellaneous

Accessories	• Instruction Manual (This document).....1 • Measurement Guide.....1 • Logger Utility (Data acquisition application program) CD1 • USB cable .....1 • Z1005 AC Adapter (with supplied power cord).....1 • Strap.....1 • Model 9809 Protection Sheet.....1
Options	• Model 9780 Battery Pack • Model Z1005 AC Adapter • Model 9782 Carrying Case • Model 9812 Soft Case • Model 9641Connection Cable (for pulse input) • Model 9726 PC Card (128MB) • Model 9727 PC Card (256MB) • Model 9728 PC Card (512MB) • Model 9729 PC Card (1GB) • Model 9830 PC Card (2GB) • Model 9809 Protection Sheet

Maintenance and Service Chapter 11

11.1 Troubleshooting

Inspection and Repair

⚠CAUTION Do not attempt to modify, disassemble or repair the instrument; as fire, electric shock and injury could result.

NOTE If damage is suspected, check the "Before Returning for Repair" (p. 136) section before contacting your dealer or Hioki representative.

Transporting

- Use the original packing materials when transporting the instrument, if possible.
- Pack the instrument so that it will not sustain damage during shipping, and include a description of existing damage. We cannot accept responsibility for damage incurred during shipping.

Replaceable Parts and Operating Lifetimes

Useful life depends on the operating environment and frequency of use. Operation cannot be guaranteed beyond the following periods For replacement parts, contact your dealer or Hioki representative.

Part	Life
LCD (to half brightness)	Approx. 10,000 hours
Model 9780 Battery pack	60% of initial battery capacity can be expected to remain after 500 complete charge/discharge cycles.
Battery pack connectors	Disconnection/connection times: 30 (the number of times that provides stable connection)
Electrolytic Capacitors	Approx. 10 years
Lithium Battery	Approx. 5 years The instrument contains a built-in backup lithium battery. If the date and time deviate substantially when the instrument is switched on, it is the time to replace that battery. Contact your dealer or Hioki representative.

The fuse is housed in the power unit of the instrument. If the power does not turn on, the fuse may be blown. If this occurs, a replacement or repair cannot be performed by customers. Please contact your dealer or Hioki representative.

Before Returning for Repair

If abnormal operation occurs, check the following items.

Symptom	Check Items	
The display does not appear when you turn the power on.	• Is the power cord disconnected? • Are connections made correctly? • Is the battery pack installed correctly?	Verify that the power cord is connected properly (p. 28). Verify that the battery pack is correctly installed (p. 24).
Keys do not work.	• Is any key being held down? • Is the key-lock state active? (A message appears when a key is pressed while key-lock is active.)	Verify key operation. Cancel key-lock: (Hold the ◁ ▷ cursor keys for three seconds)
Power does not turn on.	• A power protection component may be damaged.	Customers should not attempt to perform parts replacement and repair. Contact your dealer or Hioki representative for service.
A waveform does not appear when you press the START/STOP key.	• Is the "Waiting for pre-trigger" message displayed? • Is the "Waiting for trigger" message displayed? • Is the waveform display color selection box selected (☒)?	When pre-triggering is enabled, triggering is ignored until the pre-trigger portion of the waveform has been acquired. Recording starts when a trigger occurs.
No changes occur in the displayed waveform.	• Is the measurement cable connected correctly? • Is the measurement range set properly?	Verify that the clamp sensor or connection cable is connected correctly (p. 29).
Data cannot be saved to the CF card.	• Is the storage media inserted properly? • Is the storage media formatted? • Is the remaining capacity of the storage media too low?	"Using a CF Card" (p. 87)
If the cause is unknown	• Try performing a system reset (p. 116). • All settings are returned to their factory defaults. Appendix 5, "List of Default Settings" (p. A9)	

11.2 Cleaning

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

11.3 Disposing of the Instrument

The instrument contains a lithium battery for memory backup.
When disposing of this instrument, remove the lithium battery and dispose of battery and instrument in accordance with local regulations.

Removing the Lithium Battery

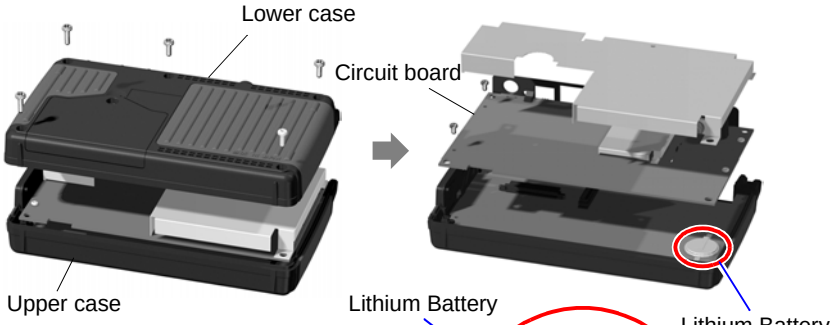
WARNING **To avoid electrocution, turn off the power switch and disconnect the power cord and cables before removing the lithium battery.**

Required tools:
- One Phillips screwdriver (No.1)
- One wire cutter (to remove the lithium battery)

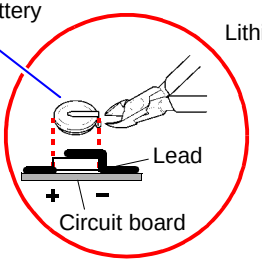
1 Verify that the power is off, and remove the measurement cables and power cord.

2 Turn the Memory HiLogger over and remove the five screws affixing the lower case.

3 Remove the lower case. Then remove the two screws affixing the circuit board, and remove it.



4 Pull the lithium battery up from the circuit board, and cut the two leads with a wire cutter.



CALIFORNIA, USA ONLY
This product contains a CR Coin Lithium Battery which contains Perchlorate Material - special handling may apply.
See www.dtsc.ca.gov/hazardouswaste/perchlorate

Appendix

Appendix 1 Error Messages and Remedial Actions

Error messages consist of either "Error" or "Warning" displays.
A screen message appears whenever an error occurs. In either case, take the remedial action indicated.

Error Messages

To clear an error message, press the **ENTER** or **ESC** key.

Message		Remedial Action
001	Failed to back up the waveform. (AC power off or not enough battery capacity.)	(with no battery pack) Bear in mind that no power backup is provided when operating with only the AC adapter. (with battery pack) If the AC adapter is not providing power, no backup is available when the battery charge get low. Recharge the battery pack.
004	Battery low. Cannot access to the waveform backup and CF card.	Low battery charge: recharge or replace with a fresh battery pack.
005	FPGA error.	Incompatible FPGA firmware version. Try updating the firmware, and if the error persists, submit the Memory HiLogger for repair.

Warning Messages

Appears just once when an error occurs. Disappears within a few seconds. Also disappears when any key is pressed.

Message		Remedial Action
101	Invalid key.	The pressed key is disabled due to measuring or other operation. Press the key again after the current operation finishes.
102	Cannot start measurement.	The **START/STOP** key is disabled when the current screen is displayed. Switch to the Waveform screen before starting measurement.
103	Cannot change while measuring.	Press the **START/STOP** key to stop measuring before changing the setting.

Message		Remedial Action
201	Exceeding the setting range.	The entered numerical value is out of the valid range. Enter a valid value.
204	Measurement range was changed.	When [Type] - [Range] is selected, the measurement range is automatically changed to match the upper and lower limits.
230	Recording time has been changed due to memory limit.	Increasing the number of measurement channels has decreased Internal memory waveform data capacity.
231	The pre-trigger time setting has been changed.	Increasing the recording interval or length requires reducing pre-trigger recording time.
232	Recording and pre-trigger times have been shortened due to memory limit.	Increasing the recording interval requires reducing recording length and pre-trigger recording time.
233	Trigger or alarm settings for this channel have been changed.	The setting ranges for count integration and revolutions have been changed.
234	The burn out setting has been disabled.	Broken wire detection is disabled (turned Off) when the recording interval is set to 10, 20 or 50 ms, or when the digital filter is disabled.
235	Burn out cannot be enabled with current settings.	Broken wire detection is disabled (turned Off) when the recording interval is set to 10, 20 or 50 ms, or when the digital filter is disabled.
236	File partition period was changed.	The segment time span has been changed in response to changing the recording interval.
237	File partition time was changed.	The segment time span has been changed in response to changing the recording interval.
238	When the record interval is 10ms or 20ms, the CSV automatic saving cannot be set.	To select [CSV (real time)] or [CSV + Calc] for auto saving, the recording interval must first be set to at least 50 ms.
239	Because the CSV automatic saving is set, the record interval cannot be set to 10ms or 20ms.	To select 10 ms or 20 ms recording interval, first select a non-CSV auto saving method.
240	The timer stop time has been passed.	Set the timer stop time to a future time.
301	No waveform data	No waveform data is preset, so data saving and calculations cannot be performed. Press the **START/STOP** key to start acquiring measurement data.
302	Confirm the A-B cursor position.	The A/B cursor positions are invalid (out of waveform range). Check the cursor positions.
303	No numeric calculation data	Execute numerical calculation (p. 105).
304	Invalid event marker.	Try moving to an event mark that is not in memory.

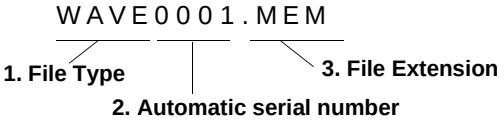
Message		Remedial Action
401	File processing error	An unexpected fault occurred while processing a file on the CF card. Turn the Memory HiLogger off and back on.
402	Cannot load this file.	The format of the file is incompatible with the Memory HiLogger, or the file is corrupt. Refer to 6.1, "About Saving and Loading Data" (p. 85) for loadable file formats.
403	Insert a CF card.	CF card not found. Insert a CF card.
404	Directory full	No more files can be created because the directory is full. Check or perform the following: 1. System reset (p. 116) 2. Verify that the CF card is specified by Hioki (p. 87) 3. Reformat the CF card (p. 89) If the message persists after performing the above, either the CF card or Memory HiLogger may be damaged. Contact your dealer or Hioki representative.
405	Not enough capacity	The CF card as insufficient space to save the file. Delete files to increase free space, or replace the CF card.
430	Some data was not saved.	The CF card is not inserted, or does not have enough free space. Insert a CF card and manually save needed data.
431	Please insert CF card.	Insert a CF card.
432	Please change CF card.	Cannot access the CF card. Replace with a new CF card.
434	CF card is full or cannot delete oldest wave file.	This may appear while measuring using waveform auto save. A file could not be saved: Not enough space on the CF card.
435	CF card will be full soon.	Not enough space on the CF card. Replace with a new CF card.
436	Saving intterruptted (low battery).	Battery charge is too low to save. Recharge, or connect the AC adapter.
437	Saving wave data. Please wait for a moment.	Some key operations are disabled because of the increased load during real-time saving. Minimize key operations as much as possible during real-time saving.
438	This folder is protected. Please rename for deleting.	This message is displayed to prevent accidental deletion of data folders. To delete a folder, first rename it.

Message		Remedial Action
501	File system error (I/O error)	An I/O error occurred while accessing the CF card. Reformat the CF card. If the error persists, try a different CF card. If this error occurs while using a good CF card, the Memory HiLogger may be damaged, in which case contact your dealer or Hioki representative.
502	File system error (Incorrect file handle)	Turn the Memory HiLogger off and back on. If the fault persists, perform system reset (p. 116).
503	File system error (system configuration)	
504	File system error (not enough memory)	
505	File system error (incomplete information)	The CF card could not be recognized. Reformat the CF card on a computer. If the error persists, try a different CF card. If this error occurs while using a good CF card, the Memory HiLogger may be damaged, in which case contact your dealer or Hioki representative.
506	File system error (incorrect device)	Turn the Memory HiLogger off and back on. If the fault persists, perform system reset (p. 116).
507	File system error (file protected)	The requested write process (including deletion) could not be performed because the file attribute is read-only. Use a computer to cancel the read-only setting.
508	File system error (failed to recognize the format)	The CF card could not be recognized. Reformat the CF card on a computer. If the error persists, try a different CF card. If this error occurs while using a good CF card, the Memory HiLogger may be damaged, in which case contact your dealer or Hioki representative.
509	File system error (limit of the number of files)	The number of files to be processed exceeds the limit, so processing cannot be performed. Delete files to increase free space, or try another CF card.
510	File system error (same name file)	An attempt was made to create a file with the same name as an existing file. Change the name of the file to be created (p. 100).
511	File system error (system busy)	Processing could not be performed because files are in use by another executing process. Wait for the current process to finish. If there is no other executing process, turn the Memory HiLogger off and back on.
512	File system error (too long path name)	The specified path name is too long. Re-enter the name of a CF card folder from the computer.

Message		Remedial Action
513	File system error (no file)	Turn the Memory HiLogger off and back on. If the fault persists, perform system reset (p. 116).
514	File system error (mode error)	
515	File system error (invalid file handle)	
516	File system error (file offset error)	
517	File system error (not enough capacity)	Insufficient free space is available on the CF card for the process to execute. Delete files to increase free space, or try another CF card.
518	File system error (invalid file name)	The file name contains an invalid character. Rename the file (p. 100).
519	File system error (directory error)	Turn the Memory HiLogger off and back on. If the fault persists, perform system reset (p. 116).
520	File system error (invalid file type)	
521	File system error (file rename error)	
522	File system error (internal parameter error)	
523	File system error (block size error)	
524	File system error (semaphore error)	
525	File system error (not supported action)	

Appendix 2 File Naming

File names are constructed as follows (must be exactly eight characters, not including extension).



File Type	Folder Name	1. File Type	2. Automatic serial number	3. File Extension
Settings Data	CONFIG	CONF	0001,... 99999999	.SET
Waveform Data	DATA (Folders named by date are automatically created) *2	Manual Save: WAVE Auto Save: (specified name) or AUTO	0001, ...99999999 *1	.MEM (Binary) .CSV (Text) *3
Numerical Calculation Results	MEASURE	Manual Save: MEAS Auto Save: (specified name) or AUTO	0001, ...99999999	.CSV *3
Captured Screen Image	PICTURE	SCR	00001...99999999	.BMP

*1 When auto saving waveform data and calculation results, automatically generated serial numbers (up to eight digits) are appended to the specified file name. If no file name is specified, AUTO is automatically entered.
(XXXX0001.MEM, XXX00001.MEM, XX000001.MEM, X0000001.MEM)
When auto numbering exceeds 9999, the file name characters are overwritten (right to left) until all eight digits are used for serial numbers.
(Example: WAVE9999.MEM, WAV10000.MEM, ..)

*2 When [Deleting] is enabled with auto save, the oldest waveform file is deleted when the CF card is full. When all waveform files within a date folder have been deleted, the folder name (date) is automatically updated.
(Example:) Before updating: 08-07-17
After updating: 08_07_17_080719_101113 *(old date_new date _new day and time)*
Hyphens (-) are changed to underbars (_) and the date when the folder name was last changed is appended.
(The example shows a new date and time of July 19th 2008, 10:11:13.)

*3 Before loading data into a spreadsheet program such as Excel, note that the number of rows that can be loaded at one time is limited (to 60,000 rows in Excel 97 – 2003, and to one million rows in Excel 2007).
Larger CSV files can be split by the following methods:
- Use a CSV file-splitting program (downloadable for free from Hioki's website).
- Before saving, select the [Split Save] saving method in the HiLogger.

Note: The number of rows recorded per minute with 10 ms recording interval is:
100 (data points per second) x 60 (seconds) = 6,000 rows

Appendix 3 Text File (CSV) Internal Format

Text files consist of header and data portions.
The header includes the following information related to measurement data.
(1) File name and version, (2) Title comment, (3) Start trigger time,
(4) Channel setting row content, (5) Channel setting rows, (6) Data row content, (7) Data rows

```
"File name","WAVE0001.CSV","V 1.14"     •••••••(1)
"Title comment",""      •••••••(2)
"Trigger Time","11-04-18 09:14:03"     •••••••(3)
"Ch","Mode","Range","Comment","Scaling","Ratio","Offset"     •••••••(4)
"CH-1","Voltage","100mV","","Off","-","-"
"CH-2","Voltage","1V","","Off","-","-"
"CH-3","Voltage","10V","","Off","-","-"
"CH-4","Voltage","20V","","Off","-","-"
"CH-5","Voltage","100V","","Off","-","-"
"CH-6","Voltage","1-5V","","Off","-","-"
"CH-7","Tc","2000 C","","Off","-","-"
"CH-8","Tc","2000 C","","Off","-","-"                                    (5)
"CH-9","Tc","2000 C","","Off","-","-"
"CH-10","Tc","2000 C","","Off","-","-"
"P-1","Count","10000000000c","","Off","-","-"
"P-2","Count","10000000000c","","Off","-","-"
"P-3","Revolve","5000r/s","","Off","-","-"
"P-4","Revolve","5000r/s","","Off","-","-"
"ALM","Alarm","","",
"Time","CH-1[V]","CH-2[V]","CH-3[V]","CH-4[V]","CH-5[V]","CH-6[V]","CH-7[C]","CH-8[C]","CH-
9[C]","CH-10[C]","P-1[c]","P-2[c]","P-3[r/s]","P-4[r/s]","ALM-CH1","ALM-CH2","ALM-CH3","ALM-
CH4","ALM-CH5","ALM-CH6","ALM-CH7","ALM-CH8","ALM-CH9","ALM-CH10","ALM-
PLS1","ALM-PLS2","ALM-PLS3","ALM-PLS4","ALM-OUT","Event",     •••••••(6)
 0.000000000E+00,-1.30000E-04,-5.05000E-03,-5.50000E-02,-1.10000E-01,-5.45000E-01,-
5.50000E-02, 3.59000E+01, 3.33000E+01, 3.17000E+01, 3.60000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 1.000000000E+00,-2.15000E-04,-5.25000E-03,-5.55000E-02,-1.10000E-01,-5.45000E-01,-
5.50000E-02, 2.62000E+01, 2.36000E+01, 2.28000E+01, 2.97000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 2.000000000E+00, 1.06000E-03,-4.60000E-03,-5.50000E-02,-1.10000E-01,-5.45000E-01,-
5.35000E-02, 1.73000E+01, 3.06000E+01, 2.99000E+01, 3.25000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,
 3.000000000E+00,-2.30000E-04,-3.55000E-03,-5.50000E-02,-1.09000E-01,-5.45000E-01,-
5.45000E-02, 5.06000E+01, 4.49000E+01, 4.11000E+01, 5.32000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 4.000000000E+00,-8.50000E-05,-5.05000E-03,-5.55000E-02,-1.10000E-01,-5.45000E-01,-
5.50000E-02, 3.49000E+01, 3.28000E+01, 3.17000E+01, 3.56000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 5.000000000E+00,-6.35000E-04,-5.45000E-03,-5.65000E-02,-1.10000E-01,-5.45000E-01,-
5.55000E-02, 2.04000E+01, 1.89000E+01, 2.49000E+01, 2.66000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 6.000000000E+00,-1.10500E-03,-5.25000E-03,-5.55000E-02,-1.10000E-01,-5.45000E-01,-
5.55000E-02, 2.29000E+01, 2.27000E+01, 2.46000E+01, 2.19000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 7.000000000E+00, 5.85000E-04,-5.10000E-03,-5.55000E-02,-1.10000E-01,-5.45000E-01,-
5.60000E-02, 2.73000E+01, 2.53000E+01, 2.45000E+01, 2.31000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,
 8.000000000E+00, 1.08000E-03,-4.45000E-03,-5.50000E-02,-1.09000E-01,-5.45000E-01,-
5.50000E-02, 5.21000E+01, 4.28000E+01, 3.89000E+01, 6.01000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,
 9.000000000E+00,-2.45000E-03,-5.85000E-03,-5.60000E-02,-1.10000E-01,-5.50000E-01,-
5.60000E-02, 2.33000E+01, 2.37000E+01, 2.48000E+01, 2.64000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 1.000000000E+01, 1.05000E-04,-6.35000E-03,-5.65000E-02,-1.11000E-01,-5.50000E-01,-
5.65000E-02, 1.06000E+01, 1.39000E+01, 1.58000E+01, 1.28000E+01, 0.000000000E+00,
0.000000000E+00, 0.000000000E+00, 0.000000000E+00,1,0,0,0,0,0,0,0,0,0,0,0,0,1,0,
```

(7)

Appendix 4 Binary File Size Calculation

(Byte units)

File size = Header size + Data size

Header size = Text header size + Binary header size

Text header size = 512 × (4 + no. of analog channels × 2 + no. of pulse channels × 2 + no. of alarm channels × 28)

Binary header size = 512 × (5 + no. of analog channels + no. of pulse channels + no. of alarm channels)

Data size = no. of analog channels × 2 + no. of pulse channels × 4 + no. of alarm channels × 2

Appendix 5 List of Default Settings

When shipped from the factory or initialized to factory defaults, the settings are as follows.

Screen	Setting Item	Default Setting
Setting	Interval	10ms
	Filter	Off
	Time/DIV	100ms/div
	Cont	On
	Repeat	Off
	Numerical Calc.	Off
	Calc1	Off
	Calc2	Off
	Calc3	Off
	Calc4	Off
	Timer	Off
	Auto Save	Off
CH	On/Off	CH1 to 10 and P1 to 4 all On
	Input	CH1 to 10: Voltage, P1 to 4: Count
	Range	100mV
	Thermo couple	K
	Burn Out	Off
	RJC	Int
	Count Mode	Add
	Pulse/Rev	1
	Slope	↑
	Disp Span	Position
	Zoom	Voltage and Revolve: x1, Tc: x20
	0 pos	Voltage: 50%, Tc and Revolve: 0%
	Upper	Voltage: 0.05, Temperature: 100, Count and Revolve: 5000
	Lower	Voltage: -0.05, Tc, Count and Revolve: 0
	Scaling	Off
	Start Trig.	Off
	Stop Trig.	Off
	Alarm	Off

Screen	Setting Item	Default Setting
Trig& Alm	Trig Func	Off
	Timing	Start
	Trig Source	
	Start	OR
	Stop	OR
	Ext Trig	
	Start	Off
	Stop	Off
	Pre-Trig	0d 0h 0m 0s
	Alarm	Off
	Source	OR
System	Start Backup	Off
	Backlight Saver	Off
	Backlight Brightness	100%
	Display Color	Black
	Beep Sound	On
	External Trig In	Trigger
	Time Disp	Time
	Language	English
	SAVE Key Operation	Select & Save

Appendix 6 Maximum Recordable Time

When saving waveform files in the form of binary data to either the instrument's internal memory or the CF card, maximum recording times are as follows.
The indicated times apply when recording all channels. Maximum recording time is inversely proportional to the number of recording channels.
Because the header portion of waveform files is not included in these calculations, actual times should be expected to be about 90% of the listed values.
Day values beyond 365 are not shown in the table.
When saving data in text format (CSV), the maximum recording time is reduced to 1/10 of the value indicated in the table or less.

(d: days/ h: hours/ min: minutes/ s: seconds)

Interval	Recording capacity					
	8430-20 internal memory (7MB)	9726 (128MB)	9727 (256MB)	9728 (512MB)	9729 (1GB)	9830 (2GB)
10ms	32min	9h 48min	19h 37min	1d 15h 14min	3d 6h 29min	6d 12h 58min
20ms	1h 4min	19h 37min	1d 15h 14min	3d 6h 29min	6d 12h 58min	13d 1h 57min
50ms	2h 40min	1h 3min	4d 2h 6min	8d 4h 13min	16d 8h 26min	32d 16h 53min
100ms	5h 21min	4d 2h 6min	8d 4h 13min	16d 8h 26min	32d 16h 53min	65d 9h 47min
200ms	10h 43min	8d 4h 13min	16d 8h 26min	32d 16h 53min	65d 9h 47min	130d 19h 35min
500ms	1d 2h 49min	20d 10h 33min	40d 21h 7min	81d 18h 14min	163d 12h 29min	327d 59min
1s	2d 5h 39min	40d 21h 7min	81d 18h 14min	163d 12h 29min	327d 59min	–
2s	4d 11h 18min	81d 18h 14min	163d 12h 29min	327d 59min	–	–
5s	11d 4h 16min	204d 9h 37min	–	–	–	–
10s	22d 8h 33min	–	–	–	–	–
20s	44d 17h 6min	–	–	–	–	–
30s	67d 1h 39min	–	–	–	–	–
1min	134d 3h 18min	–	–	–	–	–
2min	268d 6h 36min	–	–	–	–	–
5min or more	–	–	–	–	–	–

$$\text{Maximum Recordable Time} = \frac{\text{Recording capacity}^{*1} \times \text{Recording interval (s)}}{\text{No. of recording channels}^{*2} \times 2}$$

*1. Recording capacity: 7 x 1024 x 1024 (for internal memory)
*2. No. of recording channels = (no. of analog channels) + (no. of pulse channels x 2) + (alarm channel)

Appendix 7 Reference

8430-20 Measurement Values

Model 8430-20	16 bits				
	0	1	8000	FFFE	FFFF
100 mV	-OVER	-163.835 mV	0.000 mV	163.830 mV	OVER
1 V	-OVER	-1.63835 V	0.00000 V	1.63830 V	OVER
10 V	-OVER	-16.3835 V	0.0000 V	16.3830 V	OVER
20 V	-OVER	-32.7670 V	0.0000 V	32.7660 V	OVER
100 V	-OVER	-163.835 V	0.0000 V	163.830 V	OVER
Thermocouple	-OVER	-3276.7°C	0.0°C	3276.6°C	OVER

Model 8430-20	32 bits			
	0	1	3FFFFFFE	3FFFFFFF
Integration	0 c	1 c	1073741822 c	OVER
Revolution	0 r/s	1 r/s	1073741822 r/s	OVER

Appendix 8 Concerning Noise Countermeasures

Mechanism of Noise Introduction into Thermocouple Temperature Measurements

What are the sources of noise?

Within a factory, power is provided by large current flows at 50/60Hz. The main loads are primarily L loads, such as motors and solenoids; in addition, large current pulses are produced by capacitor input-type switching power supplies for device such as inverters and high-frequency induction furnaces. Basic wave component leak current, harmonic wave current, and other types of noise become mixed into the flow from each ground point to ground lines.

What are the paths of noise propagation?

- Common mode voltage introduced between the ground points of the device being tested and the instrument leaks to the input signal lines
- AC magnetic fields produced by current in power lines couple into loops in the input signal lines
- Coupling due to electrostatic capacitance between input signal lines and power supply lines

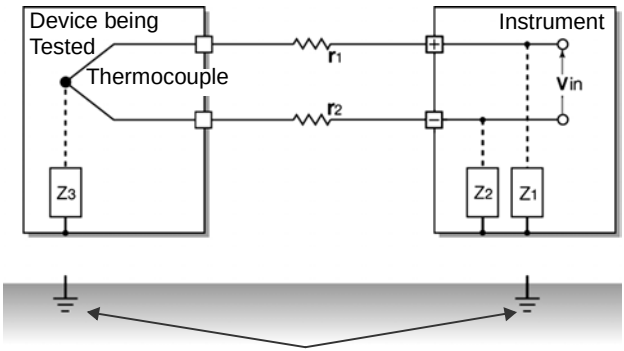
What is common mode noise?

Noise that is generated between ground and the "+" and "-" input terminals of the instrument.

What is normal mode noise?

Inter-line noise that is generated between the "+" and "-" input terminals of the instrument.

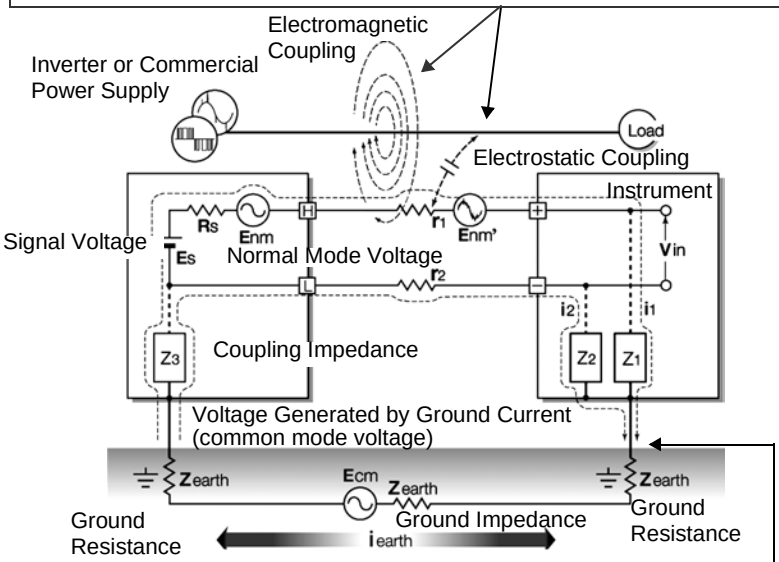
Example of Connections Where Noise Can Affect Measurements



When using a thermocouple to measure temperature, noise can affect measurements unless both the device being tested and the instrument are grounded.
Although there is no problem if the instrument is running on battery power, the instrument must be connected to ground if an AC adapter is being used.

Equivalent Circuit of Noise Introduction Path

Measurements are directly affected by normal mode voltages from electromagnetically induced noise resulting from electromagnetic coupling into looped instrument input lines by AC magnetic fields produced by inverters and commercial power lines, as well as the capacitive coupling that results from interline capacitance.



Common mode noise results from the interposition of ground impedance between the ground point of the device being tested and the ground point of the instrument, and from capacitor coupling between the ground wire and noise source.
Common mode noise is converted to normal mode voltage (Enm) that is added to the "+" and "-" input terminals of the instrument as a result of the noise current (i1) and (i2) that flows to the coupling impedance (Z1) and (Z2) between the "+" and "-" input terminals of the instrument and ground. Because common mode noise is generated between the input pins, it has a direct effect on the measurements.

The Importance of Device Grounding

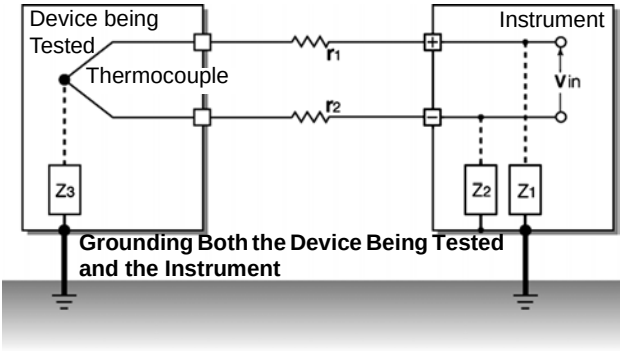
Ground the instruments (Model 8430-20) securely

The 8430-20 is designed so that the chassis is grounded when the three-prong power cord from the adapter is plugged directly into a grounded, three-prong receptacle.

If a three-prong-to-two-prong adapter must be used on the AC adapter power cord and therefore the instrument is not grounded, the instrument can still be grounded by connecting a grounded wire to the GND terminal (a pushbutton terminal) located on the side of the 8430-20.

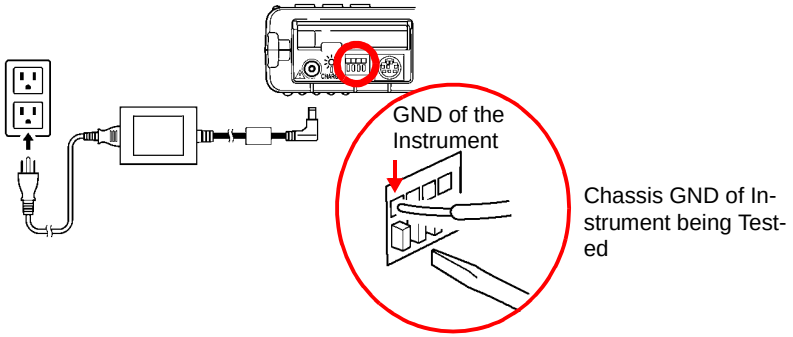
Securely ground the chassis of the device being tested.

Securely connect the chassis of the device being tested to a good ground.



Connecting the chassis GND on the signal side to the instrument chassis

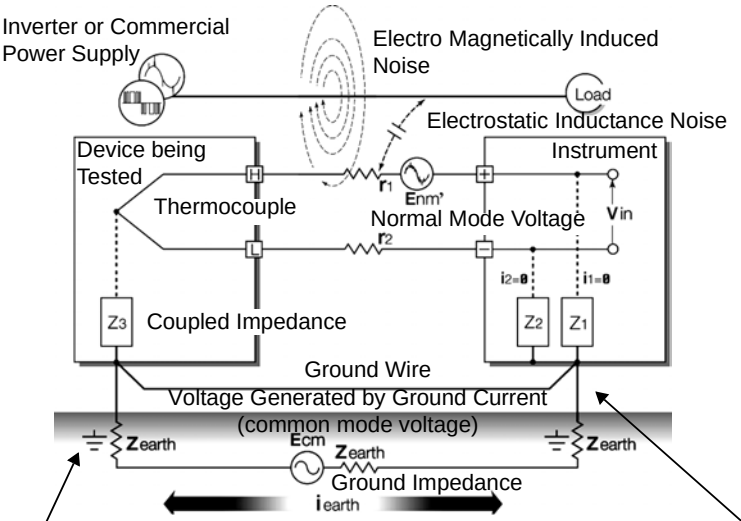
When connecting the chassis ground of the 8430-20 to the chassis ground of the device being tested and then to ground, use a wire that is as short and as thick as possible to bring both pieces of device to equal potential.



Running the instrument (Model 8430-20) on battery power

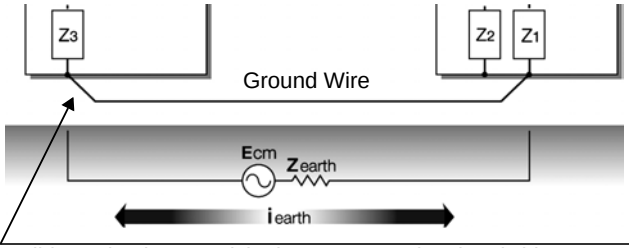
When the instrument is being powered by batteries and the AC adapter is not connected, the ground current loop is eliminated, making it possible to reduce the effects of common mode noise.
For measurements of short duration, powering the 8430-20 with batteries is an effective method for eliminating noise.

Common Mode Noise Countermeasures



Connect the chassis GND on the signal side to a good ground with a sufficiently low ground resistance. If there is still a large amount of noise, it may be possible to reduce the effects of common mode voltage by connecting a bypass ground wire to the GND terminal on the instrument.

Noise current (i1) and (i2) can be suppressed by suppressing the common mode voltage with a low-resistance ground wire or a bypass between ground poles. This suppresses the generation of normal mode voltages and reduces the effect on measurements.



If it is not possible to simply ground the instrument or the signal side, connect a ground wire between the chassis GND of the instrument and the signal side to equalize ground potentials. A basic requirement for obtaining stable measurements is to ground the device.

Blocking Noise from External Sources

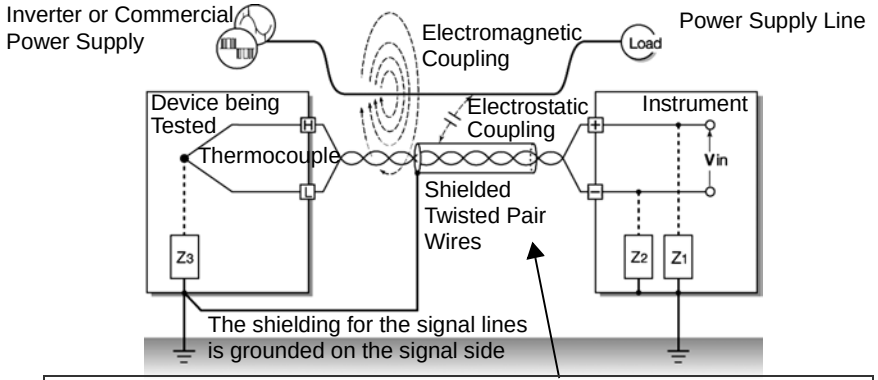
Keep signal lines away from noise sources

Keep input signal lines (of the thermocouple) away from wiring that is a noise source (such as power lines, etc.), and make any permanent installation with as much separation as possible; for example, by running wires through a separate duct.

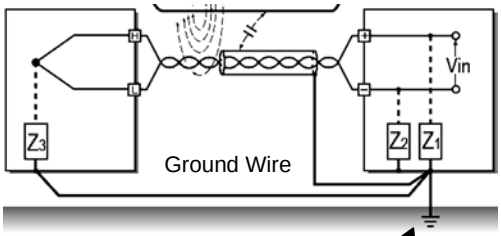
Use shielded twisted pair wiring

It is effective to use shielded twisted pairs for the input signal lines (of the thermocouple). Twisted pairs are effective for preventing electromagnetic induction, and shielded wires are effective for preventing electrostatic induction.
The shielded wires should basically be grounded on the signal source side. If it is not possible to connect the signal source to ground, connect it to the chassis GND on the 8430-20. Note that doing so has no effect if the 8430-20 is not itself connected to ground through the three-prong power cord, etc.
Shielded twisted pair wires for the thermocouple can be obtained from thermocouple manufacturers.

Normal Mode Noise Countermeasures



Keep the signal lines (of the thermocouple) away from wiring that is a noise source (such as power lines, etc.). It is also possible to shield the signal lines from electrostatic coupling and to block noise by grounding the shield.



If the signal side is not grounded or if it is grounded inadequately, connect the instrument to ground. Also ground the shielding for the signal wires on the instrument side securely.

Insulation from noise sources (temperature measurement by thermocouple)

The analog input channels are insulated from the chassis and each other. Therefore, the instrument allows you to attach the thermocouple directly to a conductor with a potential to measure it, provided that the voltage to ground does not exceed the maximum rating. If noise is likely affect measurement, wrap heat-resistant tape around the thermocouple for insulation, or use an ungrounded thermocouple and electrically insulate the input line.

Setting the Digital Filter

To remove noise from input signals, the digital filter can be set for the analog channels.

The longer the recording interval is, the larger the noise reduction effect becomes; this ensures highly accurate measurement with little scatter.

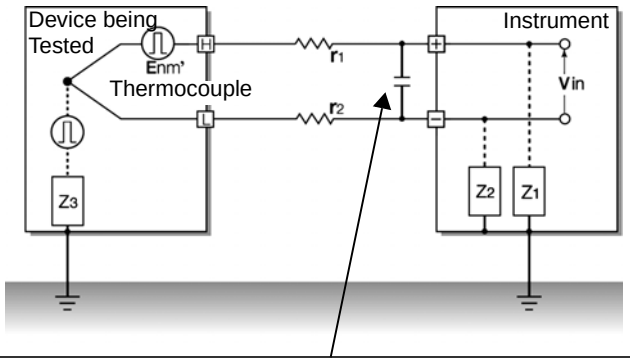
See: For recording interval and cutoff frequency (p. 130)

For example, assuming that the digital filter is set to 60Hz, noise reduction in the supply frequency is maximized at a recording interval from 2 sec. to 1 hr.

Inserting a Capacitor in the Signal Line

When noise affects the signal source directly or when measuring high-frequency pulses, it is effective to insert a capacitor between the "+" and "-" input terminals so that the noise does not enter the 8430-20. When inserting a capacitor, use one with a rated voltage that is equal to or exceeds the input voltage.

When a capacitor is inserted between the "+" and "-" input terminals, there are no restrictions on the recording interval because the filter is applied before the channel scan operation.



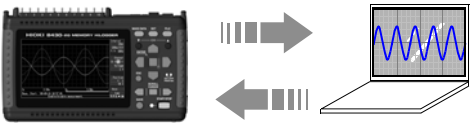
The capacitance of the capacitor should range from several µF to several thousand µF. Insert the capacitor between the "+" and "-" input terminals.

Appendix 9 Using the Application Program

The following features are available when using the supplied computer application program.

Display on the computer screen waveform files that were saved to CF card on the Memory HiLogger.
Convert binary data to CSV format for importing to spreadsheet programs on the computer.

Search event marks and measurement data using various criteria such as maxima and fluctuation values.



Acquire batch measurement data in real time from up to five HiLoggers on one computer using USB connections. Monitor waveforms, numerical values and alarm output status in real time while measuring.

Configure Memory HiLogger settings on the computer, and transfer to the Memory HiLogger.

The Logger Utility application program needs to be installed on the computer before use. A USB driver also needs to be installed on the computer to enable communications with the Memory HiLogger.
The application program can be installed from the supplied CD, or you can download the latest version from the Hioki web site.
Use the following procedure to install the software on the computer. Verify operating environment compatibility before installing.
For details such as application program operating instructions, read the instruction manual (PDF file) provided on the CD.

Operating Environment

- OS:
  Windows 2000 (with SP4 or later)
  Windows XP (with SP2 or later)
  Windows Vista
  Windows 7
- CPU: Pentium III (500 MHz) or better
- Monitor Resolution: 1024 x 768 dots or better
- Internet Explorer: 6.0 or better
- Memory: At least 512 MB
- Interface: USB

1. **Set the CD into the drive of the computer.**
2. **Install Logger Utility (p. A19).**
3. **Install the USB driver (p. A22).**
4. **Connect the AC adapter to the instrument and turn on the power.**
5. **Connect the instrument and computer with the USB cable (p. A25).**

Installing Logger Utility

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

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

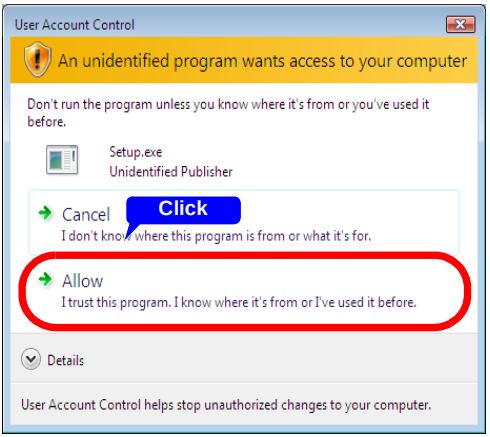
1 Start up Windows.

Exit all running applications.

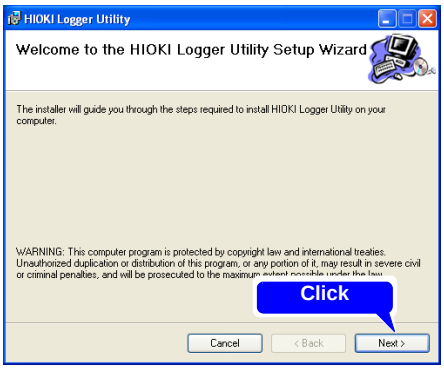
2 Insert the included CD into the computer's CD-ROM drive, the installer run automatically.

If the installer do not start, execute "setup.exe" from the CD-ROM drive.

If the installer do not start, execute "setup.exe" from the CD-ROM drive.
In Vista, Although the dialog which ask for installation permission of application, click [Allow].



3 In the installer, click [Next] and confirm the installation destination.

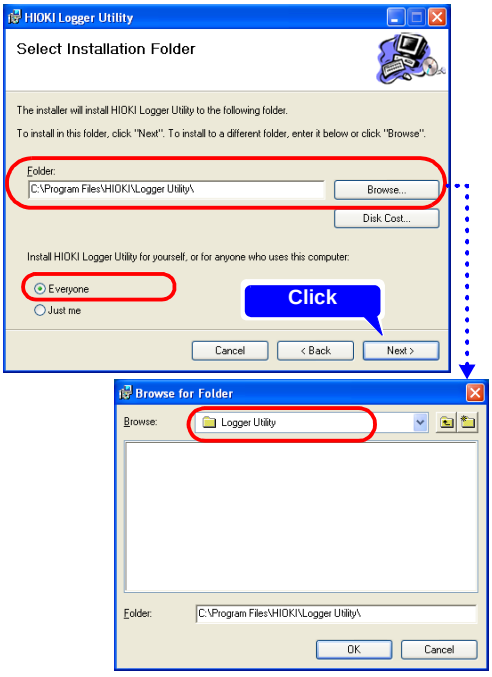


The end user license agreement is displayed.
Read the EULA, then select [Agree], and click [Next].

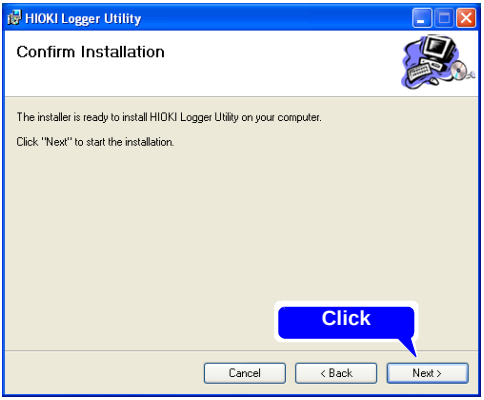
The installation destination folder can be changed on this screen.

If you are not changing the installation destination, click [Next].

To change the installation destination, click [Browse] to select another folder.

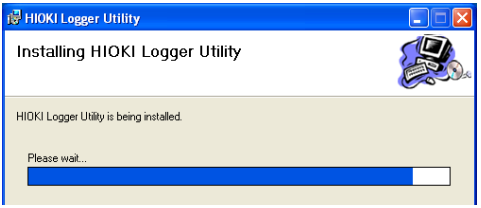


4 Click [Next] to start installing.

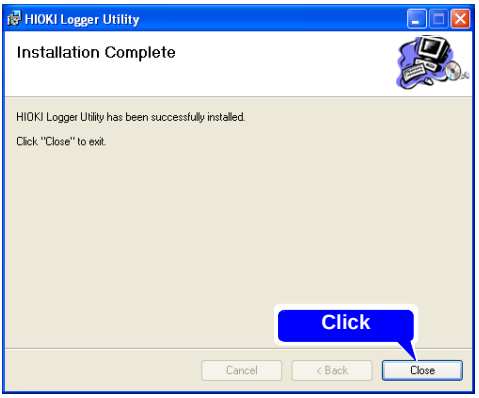


Installation starts.

Progress is displayed during installation.



To interrupt installation in progress, click [Cancel].



Installation finished

Installing the USB Driver

Install the USB driver before you use the instrument with a USB connection.

NOTE If you install the USB driver in Windows2000, the USB Drive Mode of the device will be disabled.

1 (Insert the CD found in the package into the CD-ROM drive.)
Install the driver.

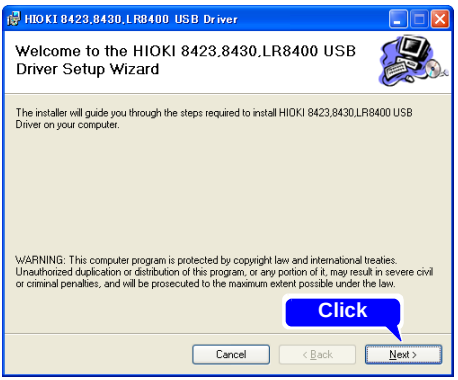
- Run [SetupDriver32.msi] in the CD-R.
  If [Logger Utility] is already installed, run the CD from the following location.
  [c:\Program Files\HIOKI\LoggerUtility\Driver\SetupDriver32.msi]

If you are using the WindowsVista/7 64bit version:

- Run [SetupDriver64.msi] in the CD-R.
  If [Logger Utility] is already installed, run the CD from the following location.
  [c:\Program Files(x86)\HIOKI\LoggerUtility\Driver\SetupDriver64.msi]

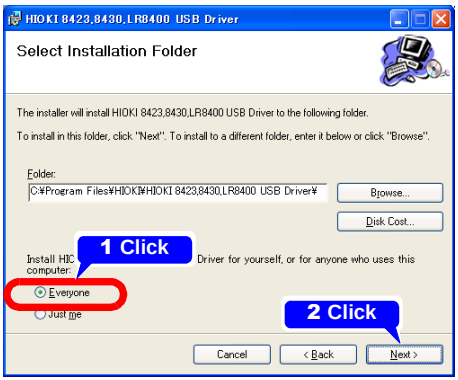
Depending on the environment, the dialog box may take some time to appear so please wait till it does so.

2 Click [Next].

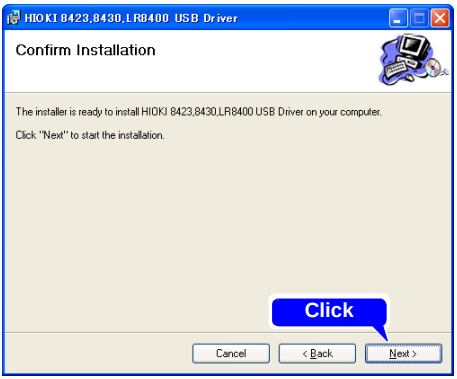


3 Check [Everyone] and click [Next].

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



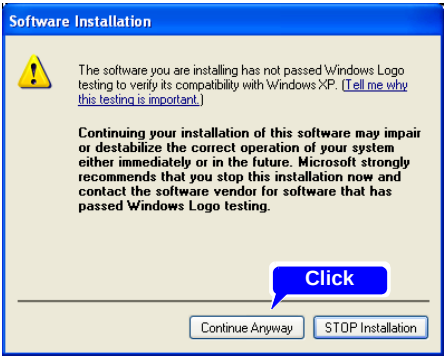
4 Click [Next].



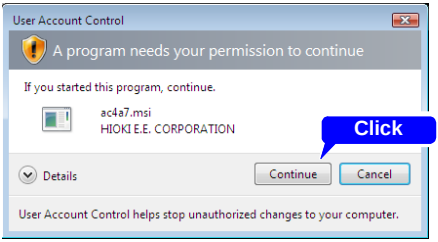
Start installing.

Installing.

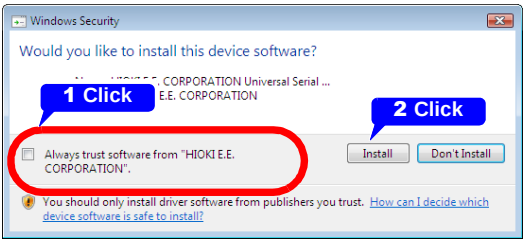
For WindowsXP
During the installation, a message saying that the software has not passed Windows Logo testing will appear a few times, click [Continue Anyway] to continue installing.



For WindowsVista/7
When a dialog box requesting your permission to continue the program appears, click [Continue].

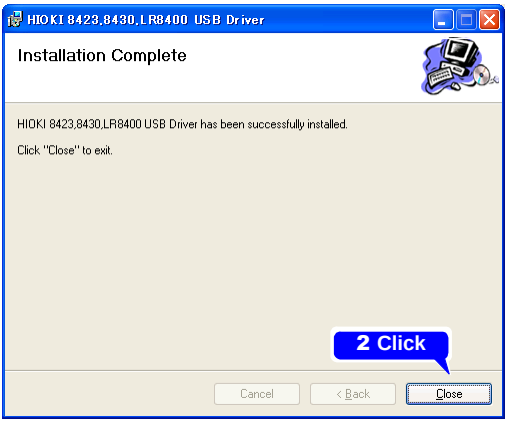


Sometimes another dialog box requesting your permission to install the software may appear. When it does, check “Always trust software from “HIOKI E.E. CORPORATION”and click [Install] to continue.



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

This completes the driver installation.

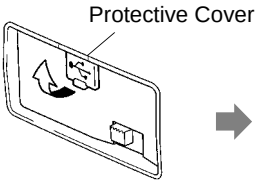


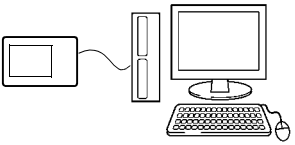
Connecting the Memory HiLogger to the Computer with a USB Cable

Install the USB driver before you use the instrument with a USB connection. (p. A22)

⚠CAUTION

- Do not pull out the USB cable during data transfer. Doing so would prevent proper data transfer.
- The Memory HiLogger and computer should be connected to the same earth ground. If grounded separately, potential difference between the ground points can cause malfunctions or damage when connecting the USB cable.





1 Open the protective cover over the USB connector.

2 Orient the USB cable plug properly, and insert it into the receptacle.

3 Connect the AC adapter to the instrument and turn on the power.

4 Connect the other end of the cable to a USB port on the computer.

Connecting with the HiLogger the first time

For Windows2000/Vista/7
The HiLogger will be recognized automatically and the device will be ready to use.

For WindowsXP
A “Found New Hardware Wizard” dialog box will appear and the new hardware detection wizard will begin (next page).

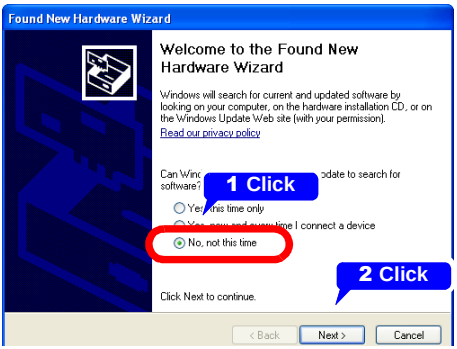
The HiLogger is already recognized

Start the Logger Utility (p. A28)

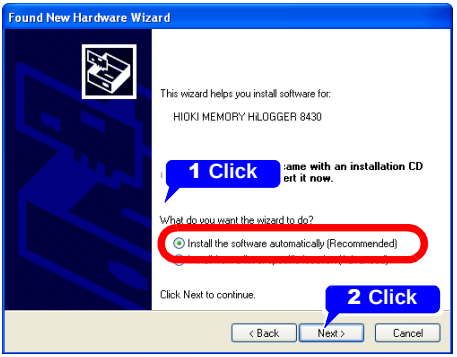
WindowsXP

1 Connect the instrument and computer with the USB cable.
After the "Found New Hardware" window appears, the [Found New Hardware Wizard] dialog box will appear.

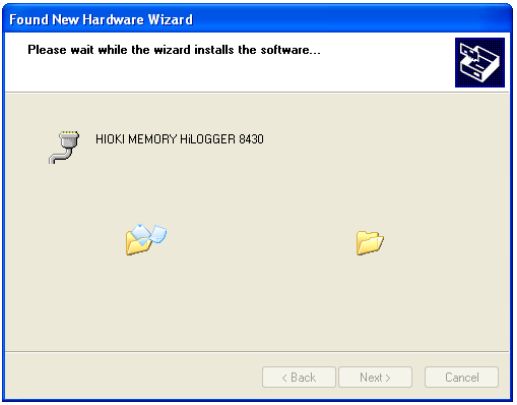
2 Check “No, not this time” and click [Next].



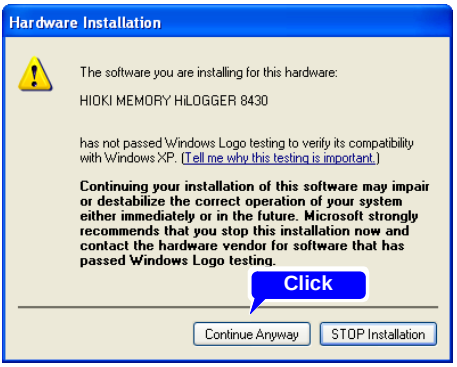
3 Check “Install the software automatically (Recommended)” and click [Next].



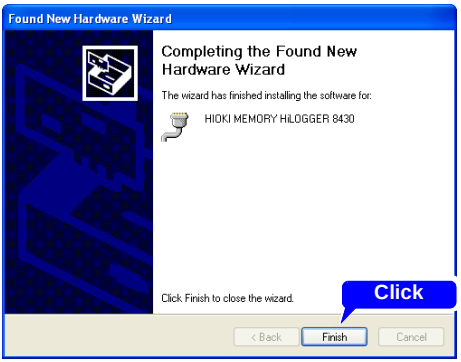
Please wait while the driver is being installed.



4 A message saying that the software has not passed Windows Logo testing will appear a few times, click [Continue Anyway] to continue installing.



5 When installation is complete, the next dialog will appear. Click [Finish].

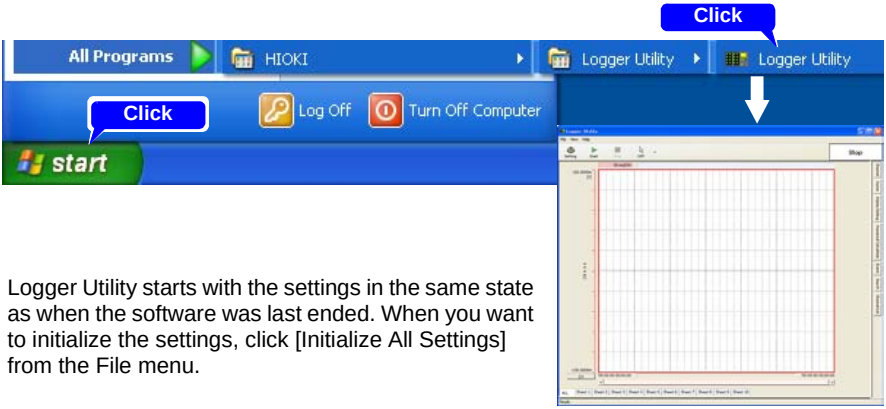


This completes the driver installation.

Starting and Ending Logger Utility

Starting Logger Utility

From the Start Menu of Windows, click [All Programs] - [HIOKI] - [Logger Utility] - [Logger Utility].



Logger Utility starts with the settings in the same state as when the software was last ended. When you want to initialize the settings, click [Initialize All Settings] from the File menu.

Ending Logger Utility

Click [Exit Application] from the File menu of the main screen. Alternatively, you can click the [x] close button at the top right of the main screen.

Uninstalling the Logger Utility

Use the following procedure to uninstall the program.

1 From the Windows Start menu, select the [Control Panel], and double click [Add or Remove Programs].

The [Add or Remove Programs] screen appears.

2 From the list of installed programs, select [Logger Utility], and remove it.
You are returned to the [Add or Remove Programs] screen.
Settings files are not deleted during uninstall, so if no longer needed, delete them manually.

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HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	MEMORY HiLOGGER
Model Number:	8430-20
Accessory:	Z1005 AC ADAPTER
Options:	9780 BATTERY PACK

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 Class A equipment Basic Immunity test requirement EN61000-3-2:2006+A1:2009+A2:2009 EN61000-3-3:2008

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC.

HIOKI E.E. CORPORATION

27 April 2011

Atsushi Mizuno

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Director of Quality Assurance

8430B999-03

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