8860-50
8861-50
8860-51
8861-51

MEMORY HiCORDER

HIOKI

1

Quick Start Manual

Read This Manual First

It describes preparations for use, basic operating procedures and usage methods.

EN

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6001930 28

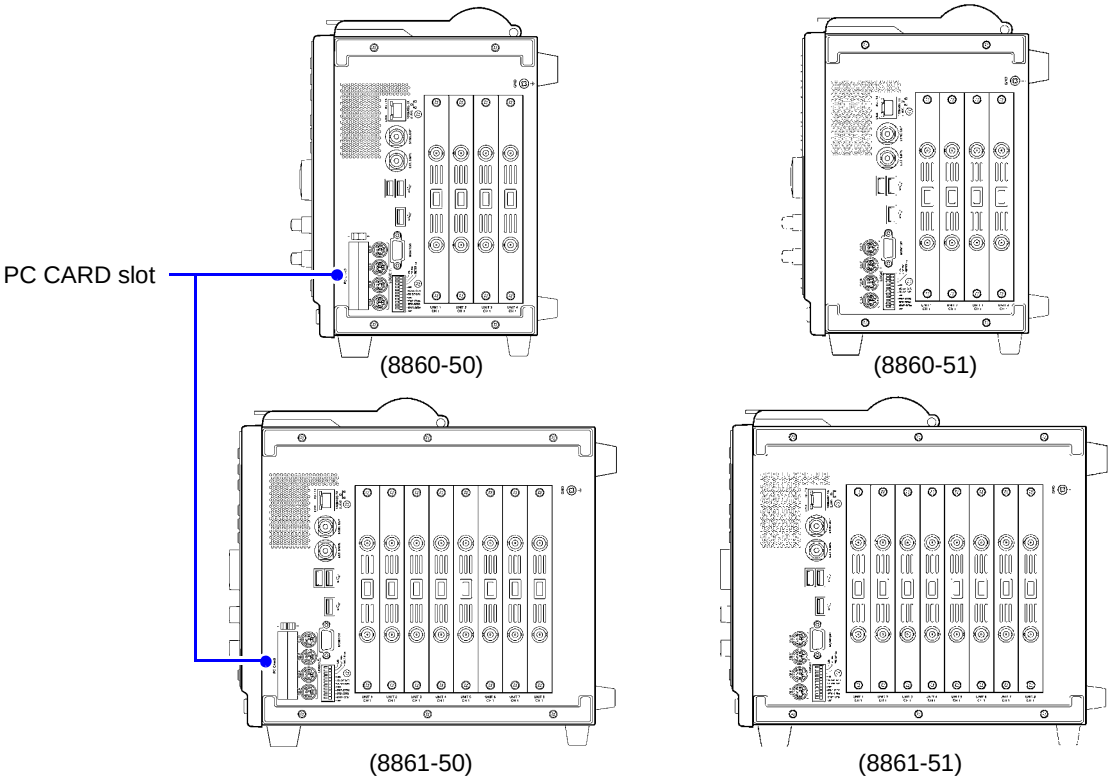
Differences between the 8860-50 and the 8860-51, and between the 8861-50 and the 8860-51

Unless otherwise noted in this manual, information provided for the 8860-50 also applies to the 8860-51, and information provided for the 8861-50 also applies to the 8861-51.
The following tables summarize the differences between the 8860-50 and the 8860-51, and between the 8861-50 and the 8860-51.

	8860-50	8860-51
PC CARD slot	Yes*	No
Hard disk	Optional	Built-in

	8861-50	8861-51
PC CARD slot	Yes*	No
Hard disk	Optional	Built-in

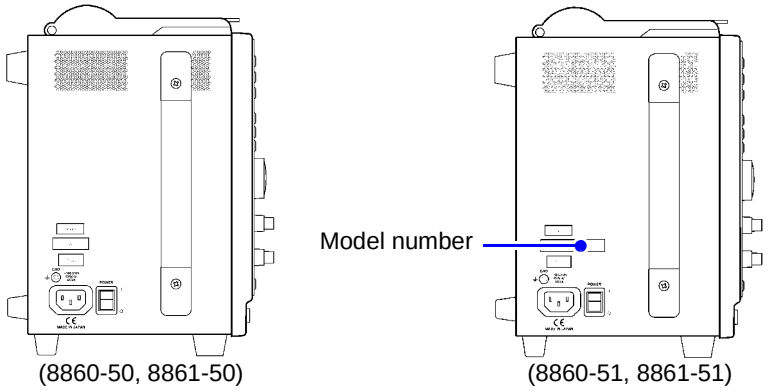
* The PC CARD slot is located on the right side of the product.



(8860-50) (8860-51)

(8861-50) (8861-51)

You can check whether a given instrument is the 8860-51 or 8861-51 by referring to the model number on the left side of the product.



(8860-50, 8861-50) (8860-51, 8861-51)

Although the 8860-51 and 8861-51 do not have a PC CARD slot, the file screen and other screens include language referring to the “PC CARD”. Change the media save destination and the file load source before using the instrument.

Contents

Introduction

Thank you for purchasing the HIOKI “Model 8860-50/8861-50/8860-51/8861-51 Memory HiCorder."
To obtain maximum performance from the instrument, please read this manual carefully, and keep it handy for future reference.

In this manual, the “instrument” means the Model 8860-50, the 8861-50, the 8860-51 or the 8861-51 Memory HiCorder.

* Unless otherwise noted in this manual, information provided for the 8860-50 also applies to the 8860-51, and information provided for the 8861-50 also applies to the 8861-51.

* The 8860-51 and 8861-51 do not have a PC CARD slot.

The following documents are provided with this instrument. Refer to them as appropriate for your application.

Document		Description
1	**Quick Start Manual** (This document)	**Read this first.** It describes preparations for use, basic operating procedures and usage methods.
2	**Input Module Guide**	**To connect input modules and measurement cables, and when making input channel settings;** this Guide describes the optional input modules, related cable connection procedures, and their settings and specifications.
3	**Instruction Manual**	**To obtain setting details;** this Manual describes details of the functions and operations of the instrument, and its specifications.
4	**Analysis and Communication Supplement**	**To analyze measurement data using the calculation functions, and to communicate with the instrument;** this supplement describes the procedures for analyzing data using numerical calculations, waveform calculations and FFT functions, and how to communicate with the instrument using a computer.

Registered trademarks

Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

If you encounter problems during operation

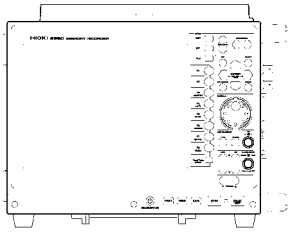
If you want to know a measurement workflow	"1.2 Measurement Workflow" (p. 12) For operation overviews: "Chapter 3 Operation Overview" in the *Instruction Manual*
For screen configurations	"2.2 Screen Types and Contents" (p. 23) "2.2 Screen Organization" in the *Instruction Manual*
For input module connections and channel setting procedures	*Input Module Guide*
When an error is displayed	"Appendix 1 Error Messages" in the *Instruction Manual*
When measurement problems occur, or for general measurement questions	"Appendix 3 Common Questions" (p. A8) "Before returning for repair" (p. 82)

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.

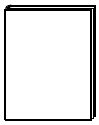
Confirm that these contents are provided.

☐ This instrument: Model 8860-50/8861-50/ 8860-51/8861-51 Memory HiCorder (8860-50: 4-module, 8861-50: 8-module)



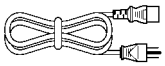
Accessories

☐ 1 Quick Start Manual
☐ 2 Input Module Guide
☐ 3 Instruction Manual
☐ 4 Analysis and Communication Supplement
.....One each

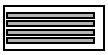


☐ Application CD
(Wave Viewer * and Communications Manual) 1
*. The latest version can be downloaded from our web site.

☐ Power Cord.....1



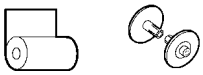
☐ Input Cable Labels.....1



☐ Ferrite clamp-on choke.....1

(If a printer module is installed)

For Model 8995 A4 Printer Unit:
☐ Model 9231 Recording Paper.....1 roll
☐ Paper Roll Holders .....1 pair



For Model 8995-01 A6 Printer Unit:
☐ Model 9234 Recording Paper.....1 roll
☐ Paper Roll Axle.....1

Other options specified when ordered

For information about options:
See "Appendix 5 Options" in the *Instruction Manual*

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 a burn hazard if touched directly.
	Indicates DC (Direct Current).
	Indicates AC (Alternating Current).
	Indicates both DC (Direct Current) and AC (Alternating Current).
	Indicates a grounding terminal.
	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.

Other Symbols

Symbols in text

	Indicates a prohibited action.
(p.)	Indicates the location of reference information.
	Indicates quick references for operation and remedies for troubleshooting.
*	Indicates that descriptive information is provided below.
[ ]	Screen labels such as menu items, page titles, setting items, dialog titles and buttons are indicated by square brackets [ ].
CURSOR (Bold characters)	Bold characters within the text indicate operating key labels.

Unless otherwise specified, “Windows” represents Windows 95, 98, Me, Widows NT4.0, Windows 2000, Windows XP, or Windows Vista.

Mouse operation terminology

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

Accuracy

We define measurement tolerances in terms of f.s. (full scale) 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. In this instrument, the maximum displayable value is the range (V/div) times the number of divisions (20)

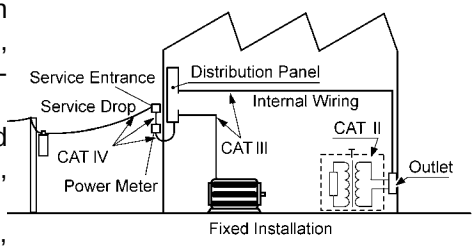
Measurement categories

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

CAT II: Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.) CAT II covers directly measuring electrical outlet receptacles.

CAT III: Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.

CAT IV: The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).



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

The applicable measurement category is determined by the input module being used. Refer to "Input and Measurement Precautions" (p. 9) or "Chapter 5 Specifications" in the *Input Module Guide* for the applicable measurement categories.

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 probes and connection cords 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 20 to 80% RH (non-condensating)
However, the operating temperature range may depend on the options used.

Operating Conditions	Operating Temperature
While changing the battery in the Model 9719-50 Memory Backup Unit	10 to 40°C
While using the Model 8995 A4 Printer Unit, 8995-01 A6 Printer Unit or 9718-50 HD Unit	5 to 40°C

Temperature and humidity range for guaranteed accuracy:
23±5°C, 20 to 80%RH

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

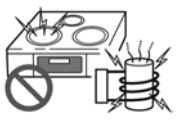
Exposed to direct sunlight
Exposed to high temperature

In the presence of corrosive or explosive gases

Exposed to liquids
Exposed to high humidity or condensation

Exposed to strong electromagnetic fields
Near electromagnetic radiators

Exposed to high levels of particulate dust



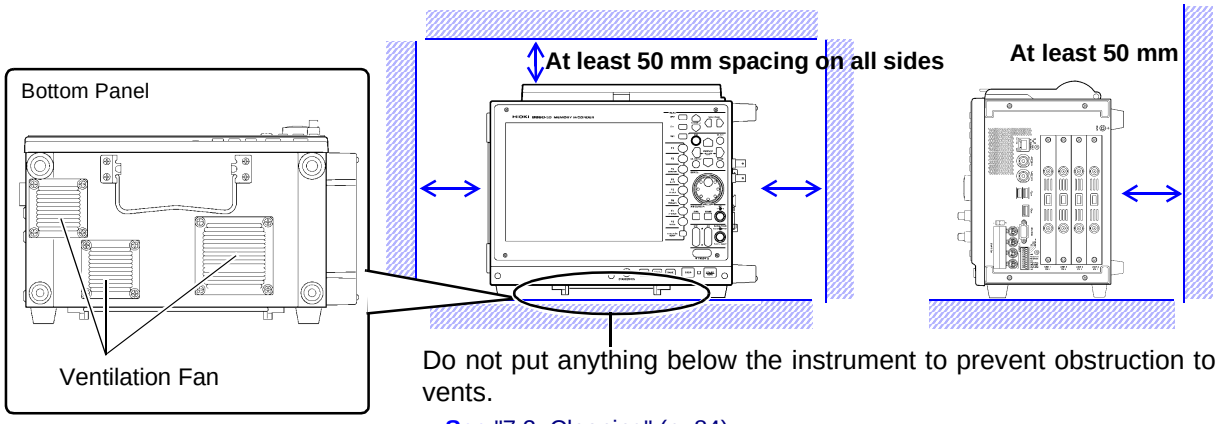
Near induction heating systems
(e.g., high-frequency induction heating systems and IH cooking utensils)

Subject to vibration

Installing

To prevent overheating, be sure to leave the specified clearances around the unit.

- The instrument should be operated only with the bottom or rear side downwards.
- Vents must not be obstructed.



Do not put anything below the instrument to prevent obstruction to the vents.

See "7.2 Cleaning" (p. 84)

NOTE When using the optional printer, provide enough space for ejected recording paper.

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.**
- **Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.**

⚠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.
- Use the handle to carry the instrument.

  See "Chapter 2 Names and Functions of Parts" (p. 19)
- When the Model 8958 16-Ch Scanner Unit is installed, do not lift up on the connector section of the unit. The connector section could be damaged.

NOTE This product 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 Probes

⚠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.

NOTE Use only the specified connection cables. Using a non-specified cable may result in incorrect measurements due to poor connection or other reasons.

Before Connecting

⚠WARNING

Before turning power on

- **Before turning the instrument on, make sure the supply voltage matches that indicated on the its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.**
- **To avoid electrical accidents and to maintain the safety specifications of this instrument, connect the power cord provided only to a 3-contact (two-conductor + ground) outlet.**

Installing and removing input modules

- **To avoid electric shock accident, before removing or replacing an input module, confirm that the instrument is turned off and that the connection cords are disconnected.**
- **The mounting screws must be firmly tightened or the input module may not perform to specifications, or may even fail.**
- **To avoid the danger of electric shock, never operate the instrument with an input module removed. To use the instrument after removing an input module, install a blank panel over the opening of the removed module.**

For additional information about input modules, their connections and measurement precautions, refer to the *Input Module Guide*.

Using an Optional Printer

⚠CAUTION

When the instrument is not to be used for a long time, or when transporting

To avoid straining some parts of the printer, and to prevent dirt adhering to the print head, set the print head to its lowered position (so that the print head rests against the print roller).

After storing the printer without use for a long time, inspect the following before use:

1. Move the head raising lever up and down.
2. Perform test printing (printer check) three or four times.

NOTE

When printing

- Avoid slow printing as much as possible in hot or humid environments. Otherwise, printer life may be severely shortened.
- Please use only the specified recording paper. Using non-specified paper may not only result in faulty printing, but printing may become impossible.
- If the recording paper is skewed on the roller, paper jams may occur. If the recording paper is skewed on the roller, paper jams may result.
- Printing is not possible when the recording paper is loaded upside-down.

Refer to "3.3 Loading Recording Paper (With a Printer Module Installed)" (p. 42) for printing precautions.

Input and Measurement Precautions

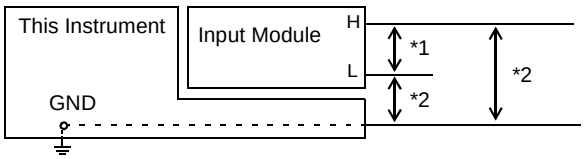
⚠DANGER

The maximum input voltage and maximum rated voltage to ground (between the grounds of the input terminals and the instrument, and between inputs of other analog modules) of each input module and external input terminals are shown below. To avoid risk of electric shock and damage to the instrument, be careful to not exceed these ratings. The maximum rated voltage to ground is the same regardless of whether an input attenuator or similar device is used.

Input Terminal (Input Module)	Maximum Input Voltage*1	Maximum Rated Voltage to Ground*2
8936 Analog Unit	400 V DC max	370 V AC/DC
8956 Analog Unit	400 V DC max	300 V AC/DC
8946 4-Ch Analog Unit	30 V rms/ 60 V DC	30 V rms / 60 V DC
8938 FFT Analog Unit	400 V DC max	370 V AC/DC
8957 High Resolution Unit	400 V DC max	300 V AC/DC
8959 DC/RMS Unit	400 V DC max	370 V AC/DC
8937 Voltage/Temp Unit	30 V rms/ 60 V DC	30 V rms / 60 V DC
8939 Strain Unit	10 V DC max	30 V rms / 60 V DC
8960 Strain Unit	10 V DC max	33 V rms / 70 V DC
8961 High Voltage Unit	1000 V DC max	1000 V AC/DC (CAT II) 600 V AC/DC (CAT III)
8940 F/V Unit	(BNC jacks and sensor receptacles) 30 V rms / 60 V DC	(BNC jack) 30 V rms / 60 V DC (Sensor receptacle terminals) Uninsulated
8947 Charge Unit*3	(BNC jack) 30 V rms / 60 V DC	(BNC jack) 30 V rms / 60 V DC
8958 16-Ch Scanner Unit	40 V DC max	33 V rms / 70 V DC
9322 Differential Probe	(CATII) 2000 V DC, 1000 V AC (CAT III) 600 V AC/DC	With grabber clips 1500 V AC/DC (CAT II) 600 V AC/DC (CAT III) With alligator clips 1000 V AC/DC (CAT II) 600 V AC/DC (CAT III)

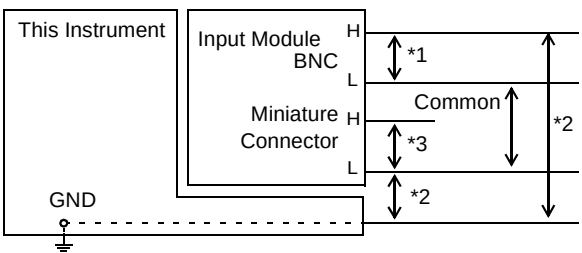
I/O Terminals	Maximum input voltage	Maximum rated voltage to ground
EXT.SMPL EXT.TRIG PRINT/EXT.IN3 STOP/EXT.IN2 START/EXT.IN1	-2 to 7 V DC	Uninsulated
TRIG OUT/CAL NG/EXT OUT2 GO/EXT OUT1	-20 to 30 V DC, 50 mA max, 200 mW max	
SYNC.OUT	Do not apply a voltage.	

(Input modules other than the Model 8947 Charge Unit)



"xxx V AC/DC" indicates an RMS value, and "xxx V DC max" indicates an instantaneous value.

(8947 Charge Unit)



*1. Maximum input voltage
*2. Maximum rated voltage to ground
*3. Maximum applied electric charge
500 pC (high-sensitivity side, 6 ranges),
50,000 pC (low-sensitivity side, 6 ranges)

⚠DANGER

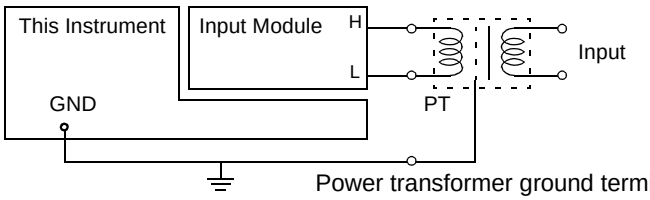
To avoid accidents in the event of a short circuit, when measuring commercial mains voltage using the Model 8936, 8938, 8956, 8957, 8959 or 8961 input modules, connection should be made only at the secondary side of a breaker. Never make connections at the primary side of a breaker, as unrestricted current flow could cause a serious accident if a short circuit occurs.

⚠CAUTION

- When measuring AC mains voltage, for example, using a power transformer, be sure to connect the ground terminal of the power transformer to ground.

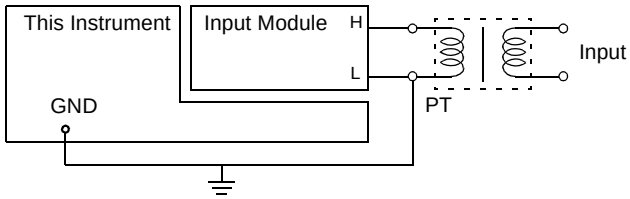
Using a power transformer (PT)

Power transformer with ground terminal



Ground (Earth terminal of power source, or equivalent)

Power transformer without ground terminal



Ground (Earth terminal of power source, or equivalent)

- Do not short circuit the SYNC.OUT jack and the ground of the instrument, or apply external voltage. Doing so can result in damage to the instrument.

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.

Shipping precautions

- To ensure safe handling, when transporting the instrument, please use the original box and packing materials, but do not use if the box is damaged or warped, or if the packing materials are in poor condition or incomplete.
- When packing the instrument, make sure to disconnect the cables from the main device.
- When transporting, avoid dropping or other excessive impact.

⚠CAUTION

To avoid damage, observe the following when shipping the instrument:

- Remove the PC cards before shipping.
- If the optional printer module is installed, remove the paper. If the paper is left in the instrument, the paper-handling components may be damaged by vibration.

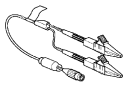
Overview Chapter 1

1.1 Product Overview and Features

In this case

- Viewing waveforms before and after an anomaly.
- Capturing the waveform of an intermittent anomaly.
- Recording multiple signal lines over an extended period.
- Acquiring measurement data for processing on a PC.

Recording various analog signals

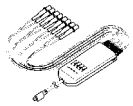


Measurements are provided in combination with optional input modules, cables and clamp probes depending on the application.

Voltage, Current, Temperature, Acceleration, Vibration, Frequency, Stress, etc.

Recording logic signals

Measures using optional logic probes.
Mixed analog and logic recording is possible.



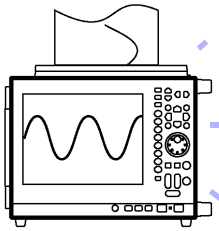
Input Module Guide

Automatic and manual printing of measurement data (p. 75)

Measurement data can be printed with the optional A4 or A6 internal printer and special recording paper. Printing is also available on an external USB printer.
"Chapter 12 Printing" in the *Instruction Manual*

Automatic and manual saving, loading and file management of measurement data (p. 65)

Data saving and loading are available with optional PC Cards. Also, using optional proprietary drives, saving and loading can be performed on hard disk. Data on storage media can be managed with this instrument.
"Chapter 11 Saving/Loading Data & Managing Files" in the *Instruction Manual*
Memory capacity can be expanded with optional memory boards. (This option must be specified when ordering.) 8860-50: 32 Megawords to 1 Gigaword, Model 8861-50: 64 Megawords to 2 Gigawords

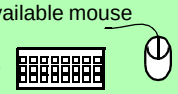


Measures with functions that support analytical applications

Memory Function
Recorder Function
Real-Time Saving Function
REC&MEM Function
FFT Function

Easy entry of text and numerical values

Screen operations and character input can be performed by connecting a commonly available mouse or keyboard.
"3.3 Common Operations" in the *Instruction Manual*



Remote control and data collection

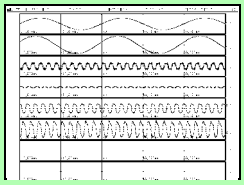
The instrument can be connected to a PC for measurement data analysis and remote control.
"Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*

External Control

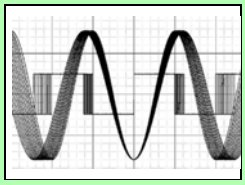
The instrument can be controlled by external signals.
"Chapter 14 External Control" in the *Instruction Manual*

Analysis

Split-Screen Display

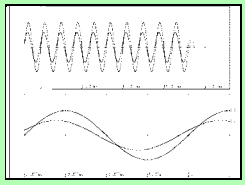


Overlay

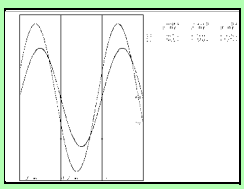


X-Y Display

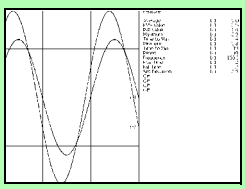
Zoom



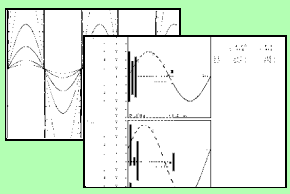
Cursor Measurements



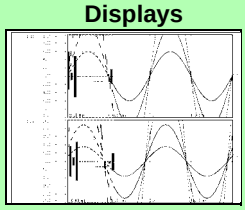
Numerical Calculations



Sheet Display



Gauge and Level Monitor Displays



Many other functions are provided in addition to these. Refer to "Appendix 2 Overview of Settings and Functions" (p. A2) and "Chapter 1 Overview" in the *Instruction Manual*.

1.2 Measurement Workflow

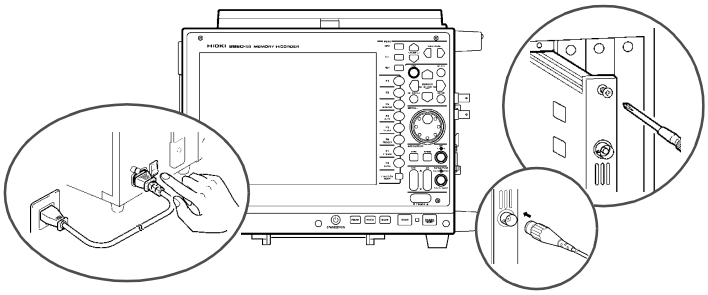
Overall workflow and summary

See "4.4 Actual Measurement and Analysis" (p. 54)

1 Install & Connect

Connect the instrument to the measurement object, and turn power on (p. 37).

- Install the instrument
- Connect
- Turn power on



2 Make Instrument Settings

Make appropriate instrument settings to acquire the measurement data (p. 49).
Automatic setting is available (p. 51).

- Setting measurement configuration
- Select the input channels

(To record specified waveforms)

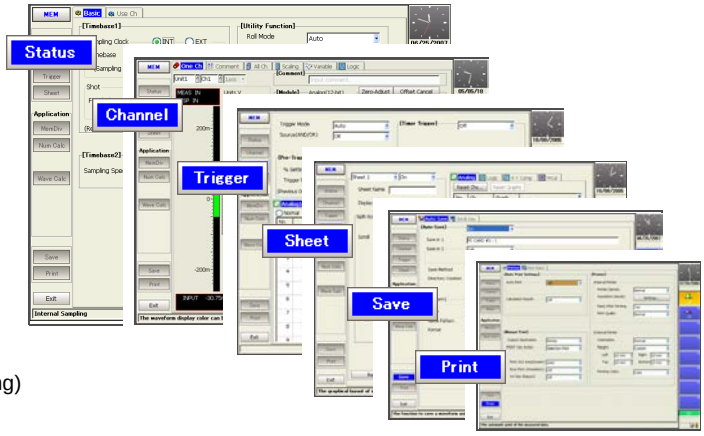
- Set trigger criteria

(To change the layout of the Waveform screen)

- Select the Screen Layout

(To automatically save and print while measuring)

- Set saving and printing conditions



3 Measure

Press the START key to start measuring.

- Start recording
- Stop recording

Measurement data recording stops automatically after the preset period, or when you press STOP.
(Setting contents determine what causes measurement to stop.)

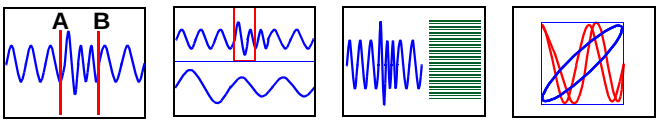
4 Analyze, Save and Print

Analyze measurement data (p. 61).
Save and print measurement data as occasion demands.

- Analysis

(As occasion demands)

- Optionally save and print



5 Finish

If you don't want to shut down completely (in order to measure again immediately), press the STANDBY/ON key to activate the standby state (p. 47).

- Turn the power off

Operation Overview: Recording Analog Waveforms

For more details, refer to "3.1 Measurement Workflow" in the *Instruction Manual*.
Also refer to "Appendix 2 Overview of Settings and Functions" (p. A2) and "Appendix 3 Common Questions" (p. A8).

Installation & Connections

Install the input modules and cables required for measurement (p. 37).

See "Instrument Installation" (p. 6) in this manual

Details of input module connections and connection cables:
See "Chapter 2 Connections" in the *Input Module Guide*

Power ON

See "3.6 Turning the Power On and Off" (p. 46) in this manual

To set the clock:
See "3.7 Setting the Clock" (p. 48)

Function Selection

Select the function according to your application.
See "Function Selection" (p. 29)

Record instantaneous waveforms

- **Memory (MEM)** (Sampling point recording)

Long-term measurements

- **Recorder (REC)** (Envelope recording)

- Memory function
  To record relatively fast signals from µs to minutes
- Recorder function
  To record relatively slow signals at low speeds from ms to hours

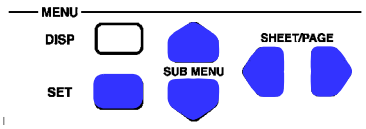
Other function

- REC&MEM function
- FFT function
- Real-Time Saving function

Measurement Configuration Settings

Make settings on the Status Settings screen.

Press the **SET** key to open the Settings screen
Press the **SUB MENU** keys to select the **Status** menu



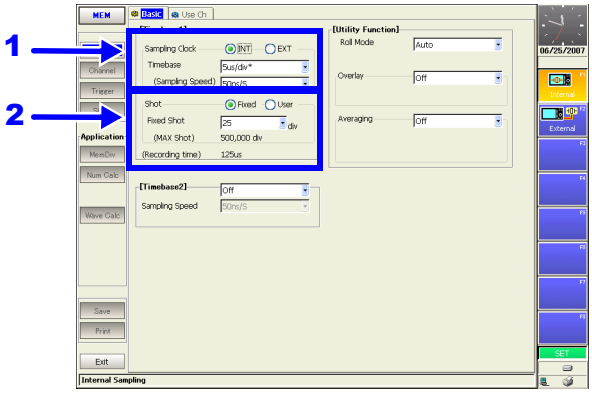
Press the **SHEET/PAGE** keys to select the **[Use Ch]** page

Verify the channel(s) to be used

Press the **SHEET/PAGE** keys to select the **[Basic]** page

1 Set the timebase (horizontal axis)

2 Set the recording length



See "4.2 Setting Measurement Configuration (Status Settings Screen)" in the *Instruction Manual*

Input Channel Settings

Press the SUB MENU keys to select the Channel menu
Press the SHEET/PAGE keys to select the [One Ch] page

3 **Select the Unit (module) and Channel**

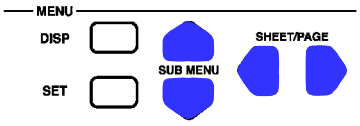
4 **Select the measurement range (vertical axis)**
Make input-module-related settings

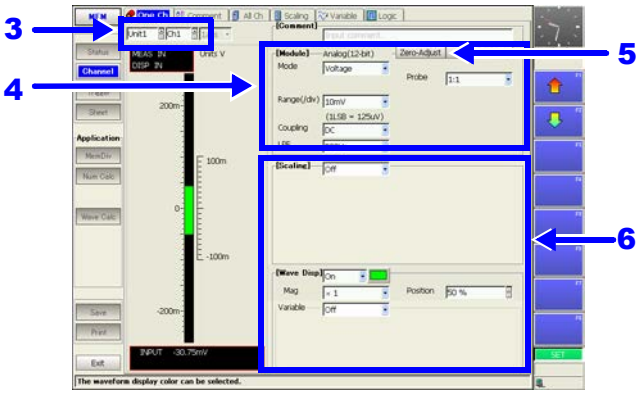
5 **Perform zero adjustment**

(after warm-up)

6 **(As occasion demands)**
Set the scaling, waveform colors and zero position

Make settings on the Channel Settings screen.





See "Chapter 3 Input Channel Settings" in the *Input Module Guide*
"Chapter 5 Input Channel Settings" and "7.1 Making Input Waveform Display Settings (Analog Waveforms)" in the *Instruction Manual*

Trigger Settings

Press the SUB MENU keys to select the Trigger menu

7 **Set the trigger mode**

Default setting:
(Memory) [Auto]
(Recorder) [Single]

8 **Set the trigger criteria (AND/OR)**

Default setting: [OR]

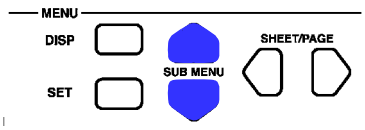
9 **(Memory) Set pre-trigger** | **(Recorder) Set trigger timing**

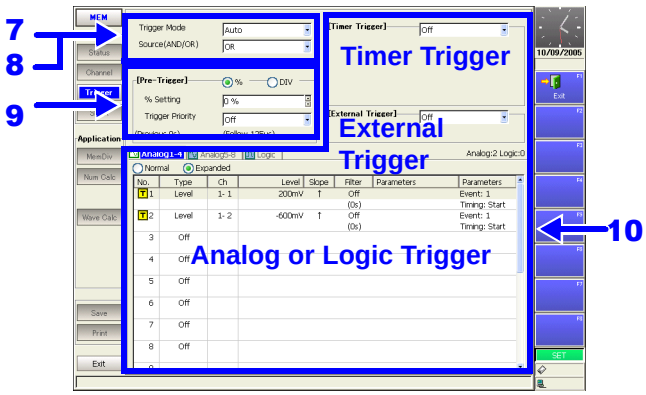
10 **Set each trigger source**

Default setting: All [Off]

(If you want to record a specific waveform, such as an anomaly)

Set on the Trigger Settings screen.





See "Chapter 6 Trigger Settings" in the *Instruction Manual*

Display Sheet Settings

Press the SUB MENU keys to select the Sheet menu

11 **(As occasion demands)**
Select the Screen Layout
Set the number screen divisions and the split-screen layout

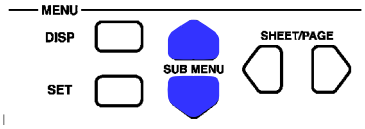
12 **Select the channels to display**

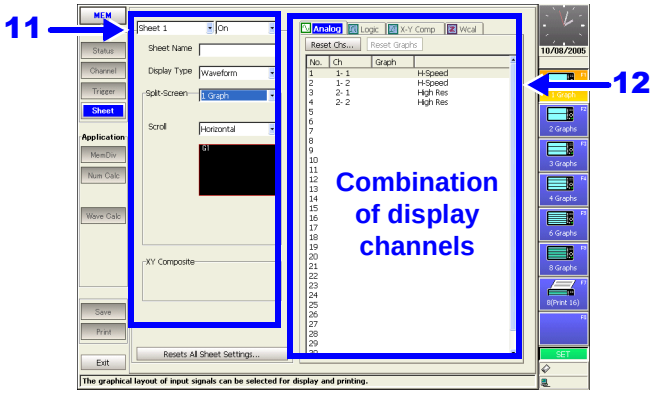
Up to 32 channels can be displayed per sheet.

When using multiple Model 8958 16-Ch Scanner Units, channels are automatically assigned to sheets.

(If you want to change the layout of the waveform screen to show any combination of channels)

Set on the Sheet Settings screen.





See "Chapter 7 Waveform Display Settings" in the *Instruction Manual*

Saving Settings

Press the SUB MENUs key to select the Save menu

13 **Select automatic or manual saving**
Specify the saving destination

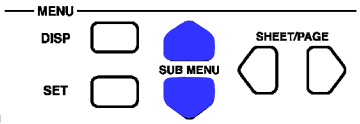
Verify that storage media has been inserted.
When saving manually, settings can be changed after measurement.

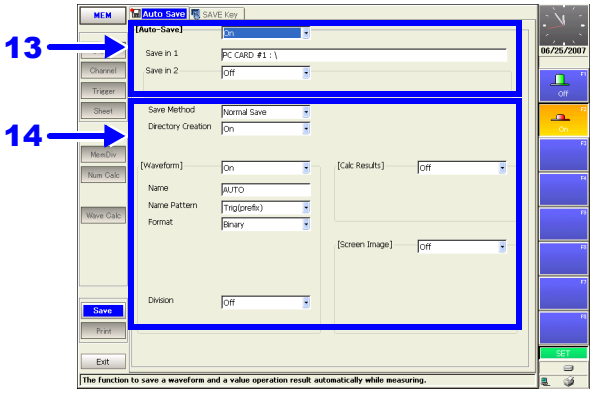
Default setting:
Auto Save [Off],
Manual Save [Selection Save]

14 **Select what to save**

(If you want to save data)

Set on the Save Settings screen.





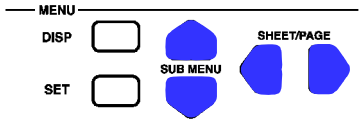
(Example: Auto Save)

See "Chapter 5 Saving & Loading Data" (p. 65) in this manual
"Chapter 11 Saving/Loading Data & Managing Files" in the *Instruction Manual*

Printing Settings

Press the SUB MENU keys to select the [Print] menu
Press the SHEET/PAGE keys to select the [Printer] page

(If you want to print data)
Set on the Print Settings screen.



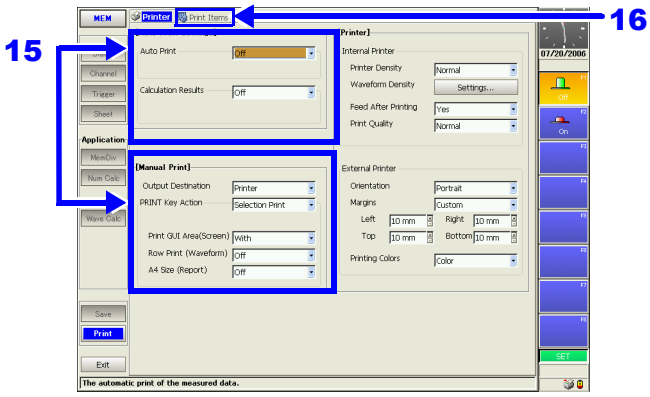
15 **Select automatic or manual printing**

Verify that the paper is loaded correctly.
When printing manually, settings can be made after measurement.

Default setting:
Auto Print [Off]
Manual Print [Selection Print]

Press the SHEET/PAGE keys to select the [Print Items] page

16 **Select what you want to print**



See "Chapter 6 Printing" (p. 75) in this manual
"Chapter 12 Printing" in the *Instruction Manual*

Start of Measurement

Data acquisition
Save & Print (when Auto enabled)

Press the START key (the green LED lights).

See "3.3.6 Starting and Stopping Measurement" in the *Instruction Manual*

End of Measurement

Press the STOP key.
Recording stops after acquiring the specified length (the green LED goes off).

Press twice to stop immediately.
If [Single] trigger is selected, recording stops automatically after acquiring the specified data length.

Data Analysis

Analysis on the waveform screen.

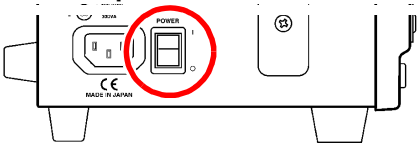
See "Chapter 8 Waveform Screen Monitoring and Analysis" in the *Instruction Manual Analysis and Communication Supplement*

Optionally save and print

Press the SAVE key to save. (Manual saving)
Press the PRINT key to print. (Manual printing)

Power OFF

Remove the cables from the measurement object, and turn the power off.



Waveform data is erased when power is turned off. However, measurement settings are retained.
To retain waveforms with power off, the optional Model 9719-50 Memory Backup Unit is required.

Operation Overview: Recording Logic Waveforms

Installation & Connections

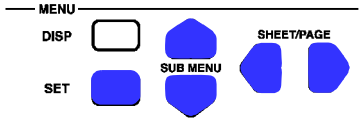
Connect the logic probes (p. 37).
Refer to the *Input Module Guide* for details about probes.

Power On

Measurement Configuration Settings

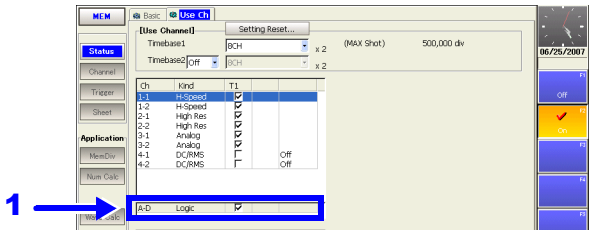
Press the SET key.
Press the SUB MENU keys to select the
Status menu
Press the SHEET/PAGE keys to select the [Use Ch] page
(With Memory function)

Make settings on the Status Settings screen.



(With Memory function)

1 Select the channels to use

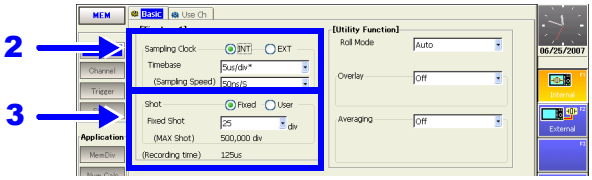


See"4.2.1 Selecting Channels to Use" in the *Instruction Manual*

Press the SHEET/PAGE keys to select the [Basic] page

2 Select the timebase

3 Set the recording length

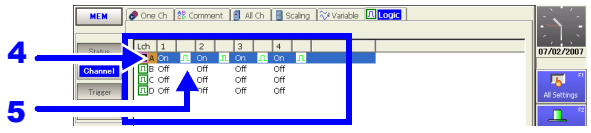


See"4.2 Setting Measurement Configuration (Status Settings Screen)" in the *Instruction Manual*

Input Channel Settings

Make settings on the [Logic] page of the Channel Settings screen.

Press the SUB MENU keys to select the
Channel menu
Press the SHEET/PAGE keys to select the [Logic] page



4 Enable (set to ON) the channels to be displayed

Default setting: [Off]

5 (As occasion demands)
Set the waveform display colors

See"Chapter 4 Logic Input Settings" in the *Input Module Guide*
"7.3.1 Setting the Waveform Display" in the *Instruction Manual*

Trigger Settings

Press the SUB MENU keys to select the Trigger menu

Press the SHEET/PAGE keys to select the [Logic] page

6 Set the trigger mode

Default setting: [Auto]

7 Set the trigger criteria (AND/ OR)

Default setting: [OR]

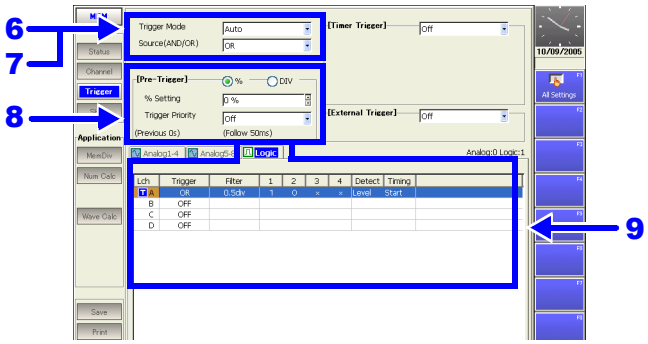
8 Set pre-trigger or trigger timing

9 Set the logic trigger

Default setting: [Off]

(If you want to record a specific waveform, such as an anomaly)

Make settings on the [Logic] page of the Trigger Settings screen.



See "Chapter 6 Trigger Settings" and "6.8 Triggering by Logic Signals (Logic Trigger)" in the *Instruction Manual*

Display Sheet Settings

Press the SUB MENU keys to select the Sheet menu

Press the SHEET/PAGE keys to select the [Logic] page

10 (As occasion demands)
Select the Screen Layout
Set the number screen divisions and the split-screen layout

11 Select whether to display or not

Default setting: [On]

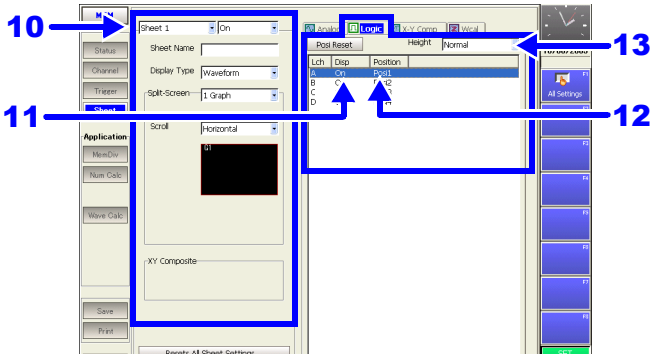
12 Set display position

13 Set display height of recording

Default setting: [Normal]

(If you want to change the display layout of the Waveform screen, to display any combination of waveforms)

Make settings on the [Logic] page of the Sheet Settings screen.



See "7.3.2 Setting the Display Position" and "7.3.3 Setting the Display Height" in the *Instruction Manual*

From here, proceed the same as for analog channels. Refer to "Saving Settings" (p. 15).

Names and Functions of Parts Chapter 2

Refer to "Chapter 2 Operating Keys and Screen Contents" in the *Instruction Manual* for details of operating keys and screens.

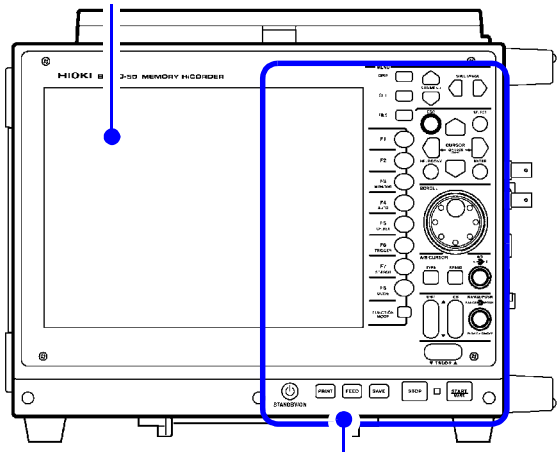
2.1 Panel Names and Functions

The number of installable input modules and the position of the handle differs on the Models 8860-50 and 8861-50

(Example: 8860-50)

Front Panel

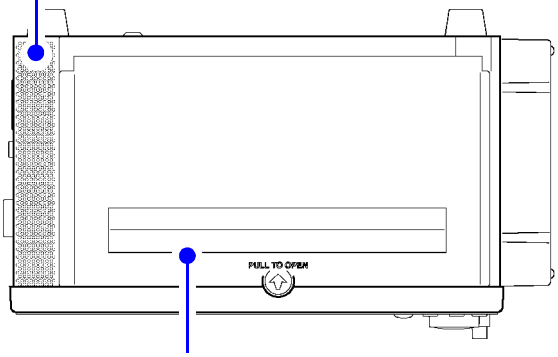
Display (LCD)
Screen Display (p. 23)



Operating Keys (p. 21)

Top Panel

Vent

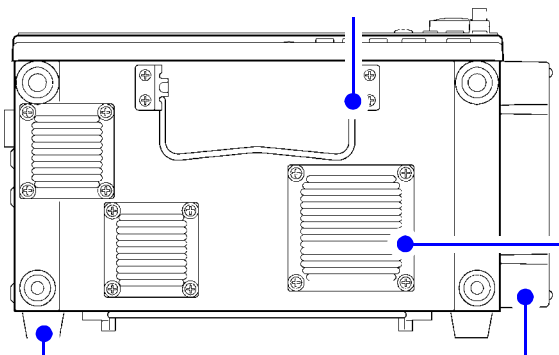


Printer

(When the optional Model 8995 A4 Printer Unit is installed)
Recording Printer Installation (p. 42)

Bottom Panel

Stand



⚠CAUTION

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

Ventilation Fan

Clean the filter periodically to avoid blockage (p. 84).

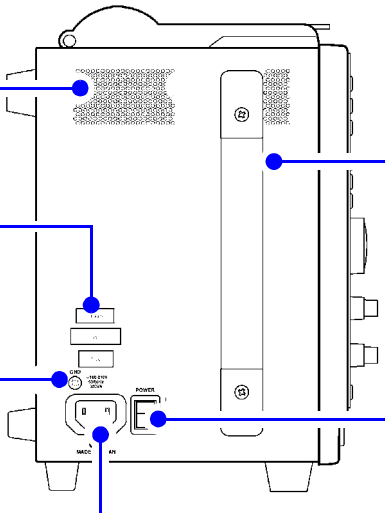
Foot

May be operated front-side-up.

Protective Cover

Protects the connector section when carrying by the handle.

Left Side



Vent

Handle
Use to carry the instrument.
(The Model 8861-50 has its handle on the side)

Serial Number
MAC Address
This is required for network management, so do not peel it off.

GND Terminal (Functional Earth)
Connect to Earth ground (p. 45).

POWER Switch
Turns the instrument on and off (p. 46).
(❙ :Power On ◯ :Power Off)

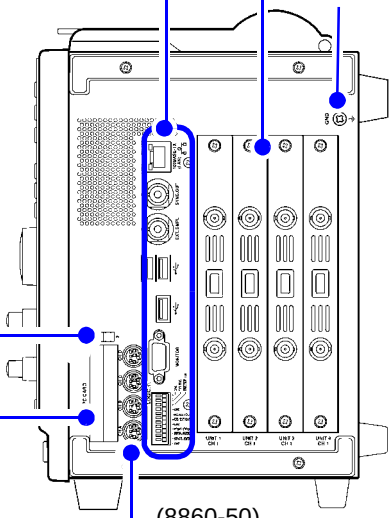
Power Inlet
Connect the supplied power cord here (p. 45).

Right Side

Various Connectors (p. 22)

GND Terminal (p. 45)

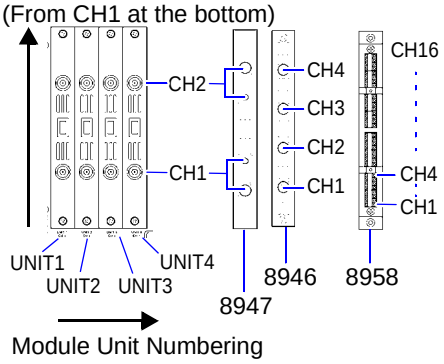
Input Module Compartment
Input modules install here.
Model 8860-50: Up to 4 modules,
Model 8861-50: Up to 8 modules



(8860-50)

Module Unit and Analog Channel Numbering

Channel Numbering
(From CH1 at the bottom)

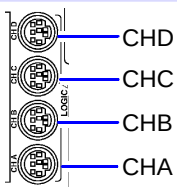


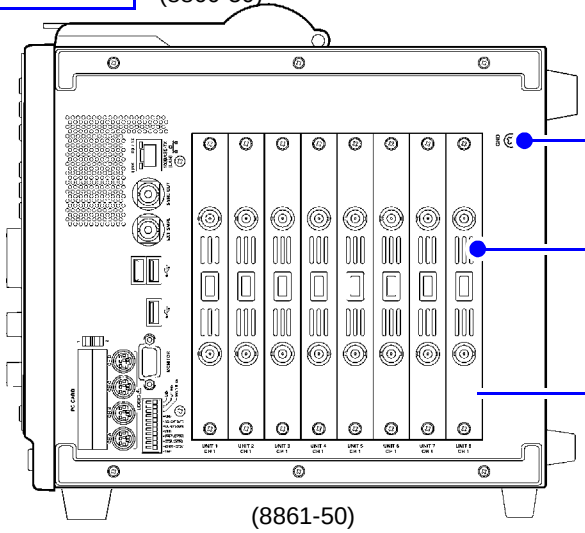
Eject Button
Ejects the PC Card.

PC CARD slots
Accepts PC Card storage media (p. 67).

LOGIC Connectors (For logic probe connection)
Input connectors for proprietary logic probes. (Channels A – D)

Logic Channels





(8861-50)

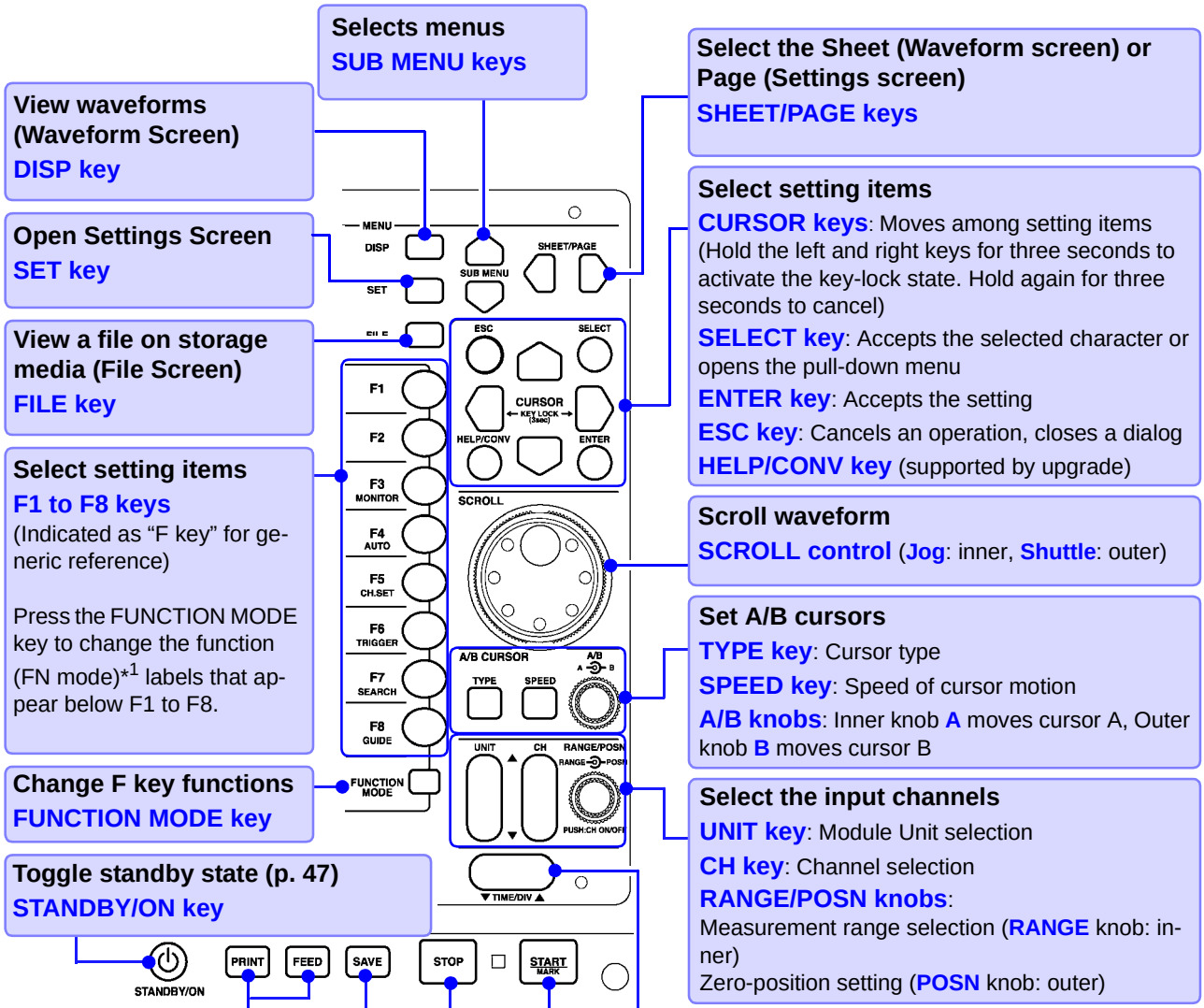
GND Terminal (p. 45)

Vent

UNIT1 - UNIT8

Operating Keys

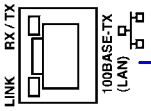
This section provides an overview of the operating keys. Refer to "Chapter 2 Operating Keys and Screen Contents" in the *Instruction Manual* for functional details of each key.



*1. FN Mode
Functions differ according to the type of display screen. Refer to "Chapter 2 Operating Keys and Screen Contents" in the *Instruction Manual*. (For the Waveform Screen)

- **F1**: Switches numerical display.
- **F2**: Switches displayed gauge.
- **F3**: Displays level monitor.
- **F4**: Executes auto setting.
- **F5**: Sets input channels.
- **F6**: Forces (Manual) triggering.
- **F7**: Searches the waveform.
- **F8**: (supported by upgrade)

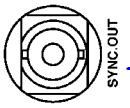
Connectors



100Base-TX (RJ45) Jack

Accepts a LAN cable connection. For connection to a network.

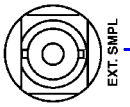
See "Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*



SYNC. OUT Jack

Use to synchronize sampling with multiple instruments. *ref*
(Sample synchronizing signal output)

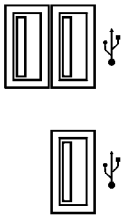
See "14.2.4 Synchronized Sampling Output (SYNC.OUT)" in the *Instruction Manual*



EXT SMPL Jack

Sampling can be synchronized by an external signal applied here. (External Sampling)
(Memory function only)

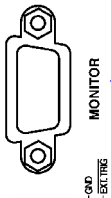
See "14.2.3 External Sampling (EXT.SMPL)" in the *Instruction Manual*



USB Port

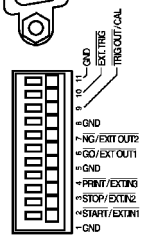
A commonly available USB mouse, keyboard or memory device can be connected here.

See **Mouse and keyboard connection:** "3.2 Before Operating" in the *Instruction Manual*



MONITOR Jack

The instrument's display can be replicated on an external PC monitor connected here.
(24-pin analog RGB)



External I/O Terminal Strip

These terminals provide and accept external input and output control signals.

See "Chapter 14 External Control" in the *Instruction Manual*

2.2 Screen Types and Contents

There are five general screen types. Refer to the *Instruction Manual* for details about each screen type.
Refer to the *Analysis and Communication Supplement* for details of the FFT function.
At power on, either the Opening screen or the Screen with the same settings that were in effect when power was last turned off appears.

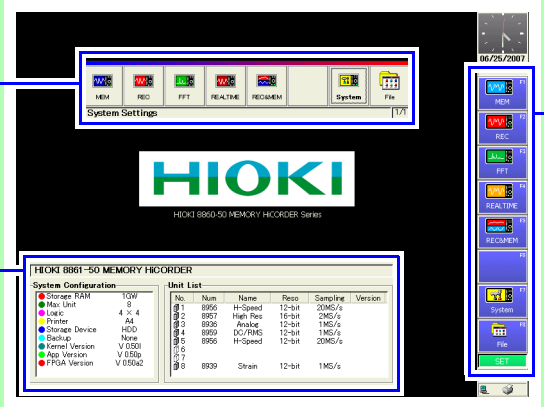
Opening Screen

For details of screen contents:"2.3 Opening Screen" in the *Instruction Manual*

This screen appears first after power on. (When you turn the power off with the Waveform screen displayed, it reappears after this screen.) The boot process takes about 40 seconds.

Function Menu
Select a function before measuring (p. 29).
(Functions can be changed from the Waveform or Settings screens)

System Configuration List
Configuration can be verified on the System screen



Setting Items
Functions can be selected with the F keys.
"Function Selection" (p. 29)
The Waveform screen appears when you select a function.

View waveforms → **DISP** key → **To Waveform Screen**

Make settings → **SET** key → **To Settings Screen (p. 24)**

Press the **F7** key, or hold down the **SET** key → **To System Screen (p. 27)**

Load existing data → **FILE** key → **To File Screen (p. 28)**

DISP Press the **DISP** key.

Waveform Screen

For details of screen contents: "2.4 Waveform Screen" in the *Instruction Manual*

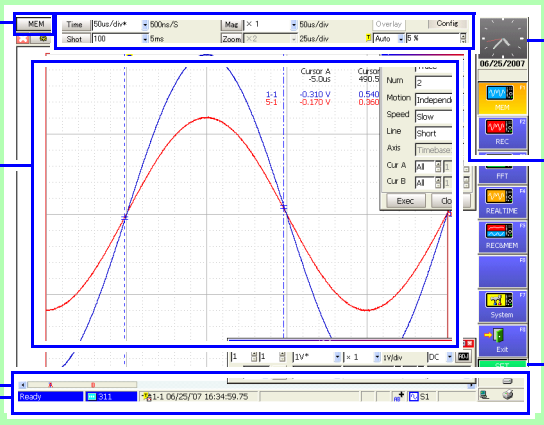
Displays waveforms acquired by the instrument. Waveforms can be displayed on separate sheets, or as the numerical values or an X-Y composite.

Function Menu
To change functions (p. 51)

Record Data (p. 30)
Press the **SHEET/PAGE** keys to change the displayed sheet.

Scroll bar (p. 30)

Status bar (p. 30)



Clock (p. 48)
Shows the current time.

Setting items (p. 31)
Press the **SUB MENU** keys to switch which setting items are displayed.
Press the F keys (**F1** to **F8**) to select a specific setting. (p. 32)

The **FUNCTION MODE** key changes the functions of the F1 to F8 keys.
[SET] → **[FN]** → **[MACRO]**

SET Press the **SET** key.

Settings Screen

For details of screen contents: "2.5 Settings Screen" in the *Instruction Manual*

Displays screens for making various operation-related settings such as for measurement, data saving, printing and calculations. Select the particular settings screen from the Settings menu. Settings menu contents are function-dependent. Some Settings screens include multiple Settings pages.

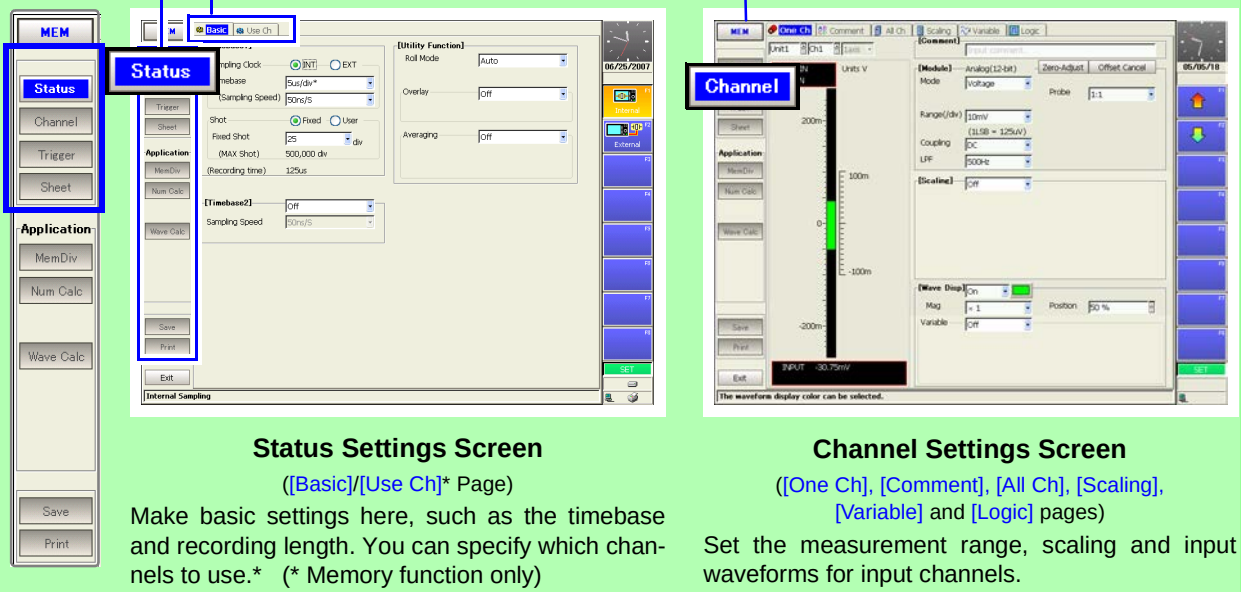
Measurement Configuration and Screen Display Settings

SUB MENU

Settings Menu
Press the **SUB MENU** keys to select a Settings screen.

Page
Press the **SHEET/PAGE** keys to select a page.

Function Menu



Status Settings Screen

([Basic]/[Use Ch]* Page)

Make basic settings here, such as the timebase and recording length. You can specify which channels to use.* (* Memory function only)

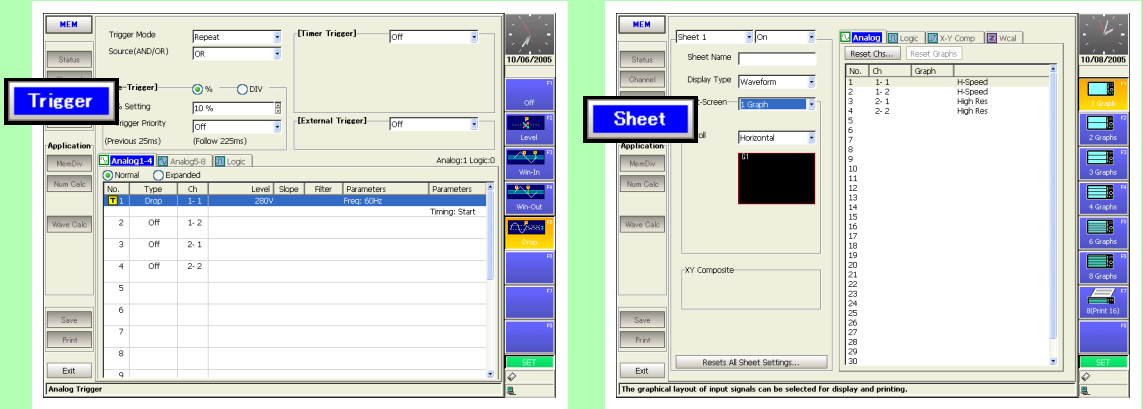
About screen contents:
"2.5.1 Status Settings Screen" in the Instruction Manual

Channel Settings Screen

([One Ch], [Comment], [All Ch], [Scaling], [Variable] and [Logic] pages)

Set the measurement range, scaling and input waveforms for input channels.

About screen contents:
"2.5.2 Channel Settings Screen" in the Instruction Manual



Trigger Settings Screen

([Analog] and [Logic] pages)

Set trigger criteria when using a trigger event for measuring.

About screen contents:
"2.5.3 Trigger Settings Screen" in the Instruction Manual

Sheet Settings Screen

([Analog], [Logic], [X-Y Comp] and [Wcal]* pages)

Set the Waveform screen layout and Sheet settings. (* Memory function only)

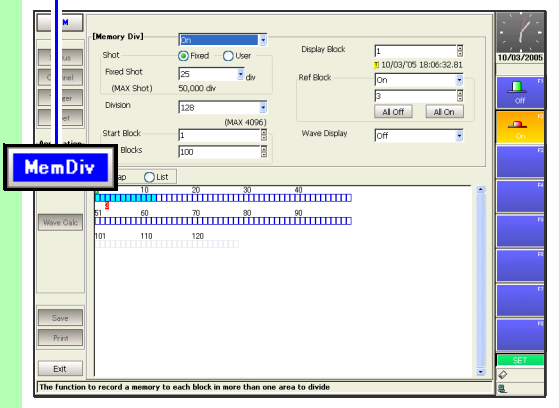
About screen contents:
"2.5.4 Sheet Settings Screen" in the Instruction Manual

Analysis Settings (Utility Functions) (Memory function only)

SUB MENU

Settings Menu

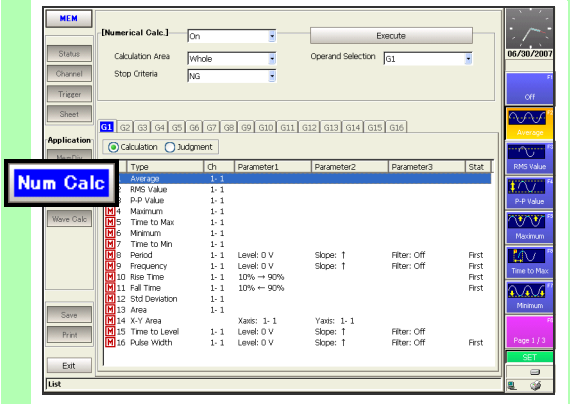
Press the **SUB MENU** keys to select a Settings screen. (function-dependent)



Memory Division (Mem Div) Settings Screen

These settings control memory partitioning.

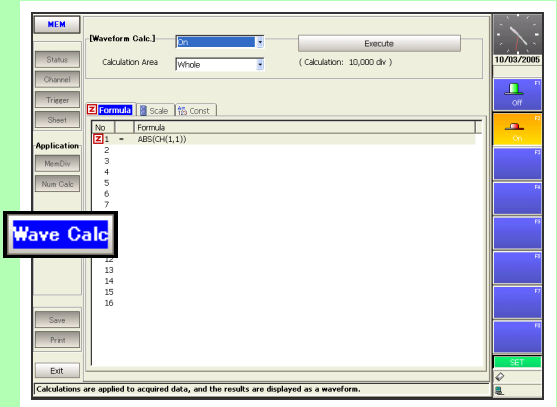
About screen contents:
"2.5.5 Memory Division Settings Screen" in the Instruction Manual



Numerical Calculation (Num Calc) Settings Screen

These are the display settings for numerical calculations.

About screen contents:
"2.5.6 Numerical Calculation (Num Calc) Settings Screen" in the Instruction Manual



Waveform Calculation (Wave Calc) Settings Screen

([Formula], [Scale] and [Const] pages)

These are the display settings for waveform calculations.

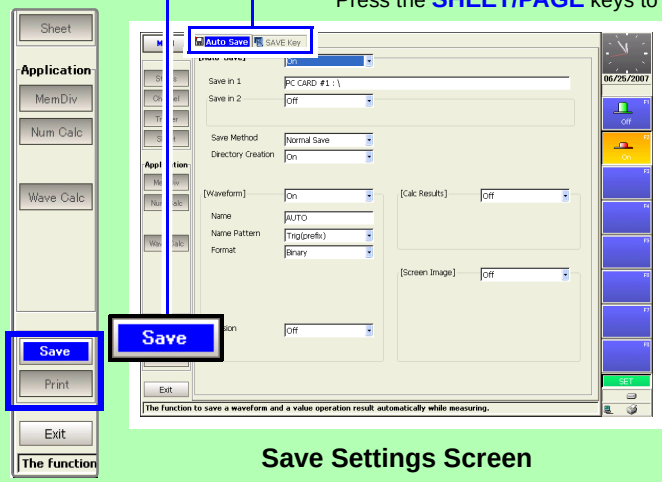
About screen contents:
"2.5.7 Waveform Calculation (Wave Calc) Settings Screen" in the *Instruction Manual*

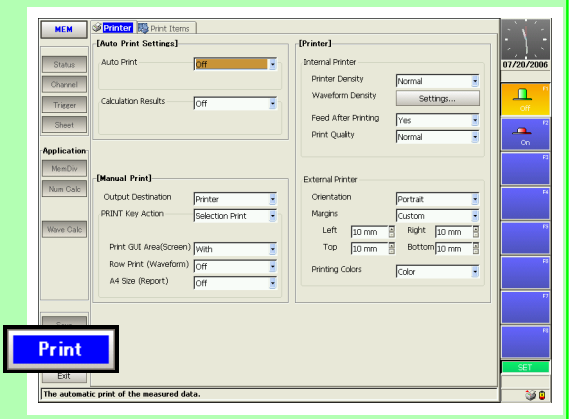
Data Saving and Printing Settings

SUB MENU

Settings Menu
Press the **SUB MENU** keys to select a Settings screen.

Page
Press the **SHEET/PAGE** keys to select a page.





Save Settings Screen

([Auto Save] and [SAVE Key] pages)

Make saving-related settings such as what to save and the saving method.

Automatic saving: [Auto Save] page
Manual saving: [SAVE Key] page

About screen contents:
"2.5.8 Save Settings Screen" in the *Instruction Manual*

Print Settings Screen

([Printer] and [Print Items] pages)

Make printing-related settings such as what to print and the printing method.

Print destination and printer settings: [Printer] page
Print item selection: [Print Items] page

About screen contents:
"2.5.9 Print Settings Screen" in the *Instruction Manual*

Press the **F7** [System] key on the Opening screen, or hold the **SET** key down.

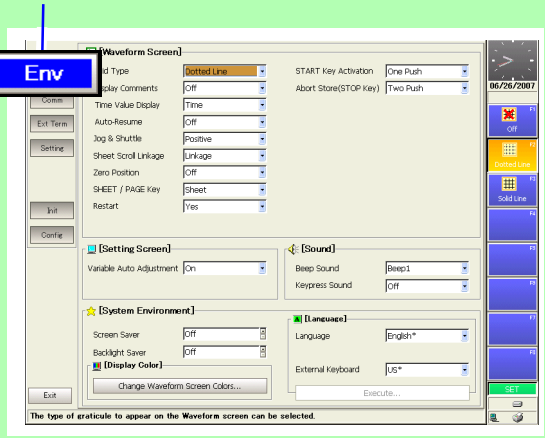
System Screen

For screen details: "2.7 System Screen" in the *Instruction Manual*

Use this screen to make system-related settings. Select from the menu to display a settings screen.

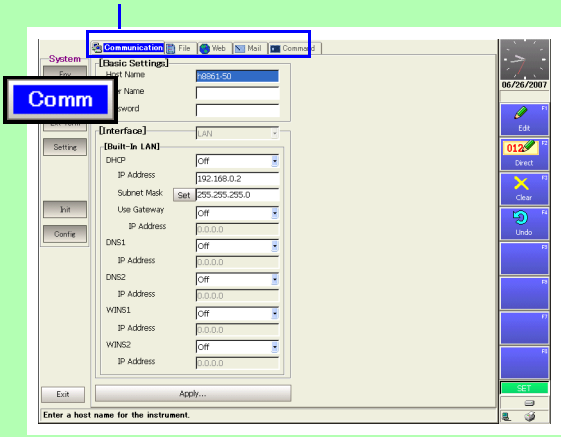
Settings Menu
Press the **SUB MENU** keys to select a Settings screen.

Page
Press the **SHEET/PAGE** keys to select a page.



Environment (Env) Settings Screen

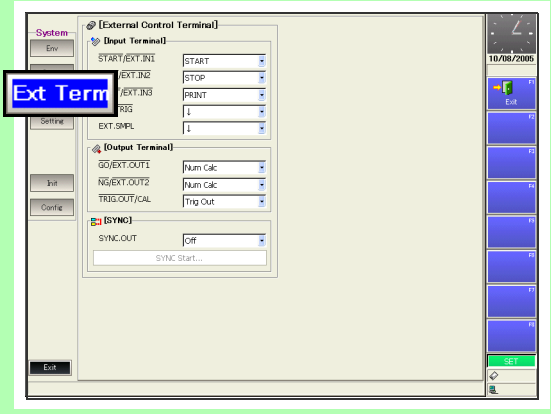
Use this screen to configure the system environment, Waveform screen layout and operating key functions.



Communication (Comm) Settings Screen

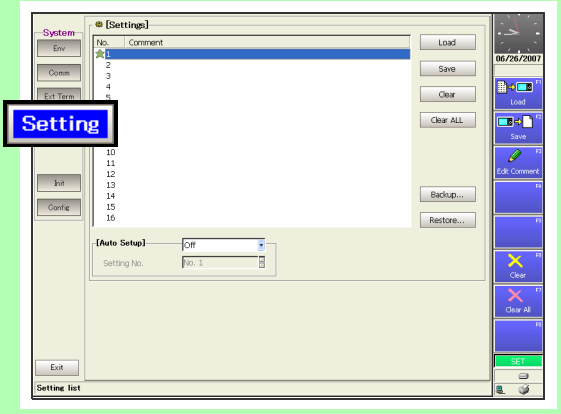
([Communication], [File], [Web], [Mail], and [Command] pages)

Use this screen to make communication-related settings.



External Terminal (Ext Term) Settings Screen

Use this screen to configure the external I/O terminals.



Setting Configuration (Setting) Screen

Use this screen to store and reload instrument settings.

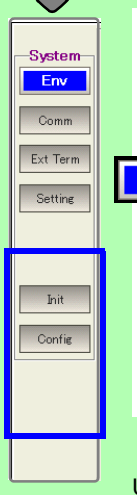
For screen details: "2.7 System Screen" in the *Instruction Manual*

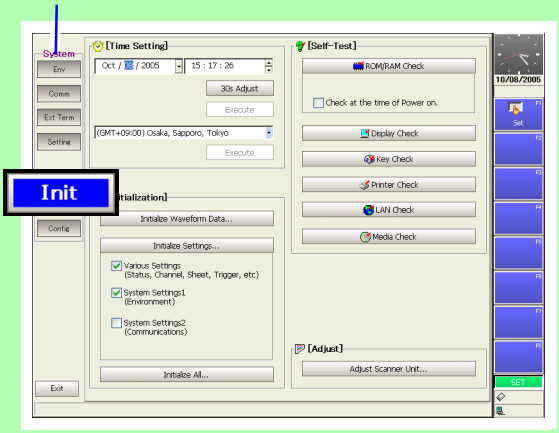
Use this screen to make system-related settings. Select from the menu to display a settings screen.

SUB MENU

Settings Menu

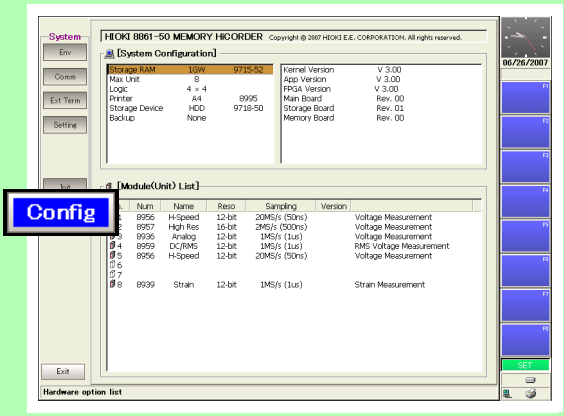
Press the **SUB MENU** keys to select a Settings screen.





Initialization (Init) Settings Screen

Use this screen to set the clock, initialize data, run self-tests and set scanner module compensation.



Configuration (Config) List Screen

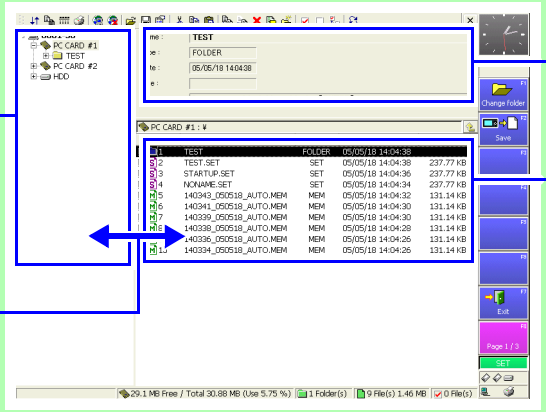
Displays the instrument's system configuration.

FILE Press the **FILE** key

File Screen

For screen details: "2.6 File Screen" in the *Instruction Manual*

Use this screen to load measurement data and manage files (copy, delete, etc.).



Operating Procedures:
"11.4 Loading Data" in the *Instruction Manual*

Function Selection

Select a function according to the desired recording data. Select from the Opening, Waveform or Settings screens. For function details, refer to "4.1 Selecting the Function" in the *Instruction Manual*.

Memory Function (MEM)
This function is most suitable for oscilloscope-type measurements, such as instantaneous waveforms and transient phenomena.
Use to record relatively fast signals with periods from µs to minutes.
(Sampling point recording)

Recorder Function (REC)
This function is suitable for use instead of a pen recorder or pen oscilloscope, or to record fluctuations and create records of slow phenomena.
Use to record relatively slow signals with periods from ms to hours.
(Envelope recording)

REC&MEM Function
For long-term monitoring; sudden or intermittent signal waveforms can be, at least partially, recorded.

Select on the Opening screen

FFT Function (FFT)
Recommended for performing frequency analysis of rotating objects, vibrations, sounds and etc.
Spectral analysis and transfer functions are available.

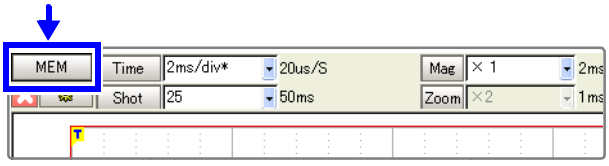
Real-Time Saving Function
Recommended for long-term recording instead of a data recorder. Measurement data is saved to the recording media in real time.

File Operations
Displays the File screen. Use this screen to load previously saved files and for other file management.

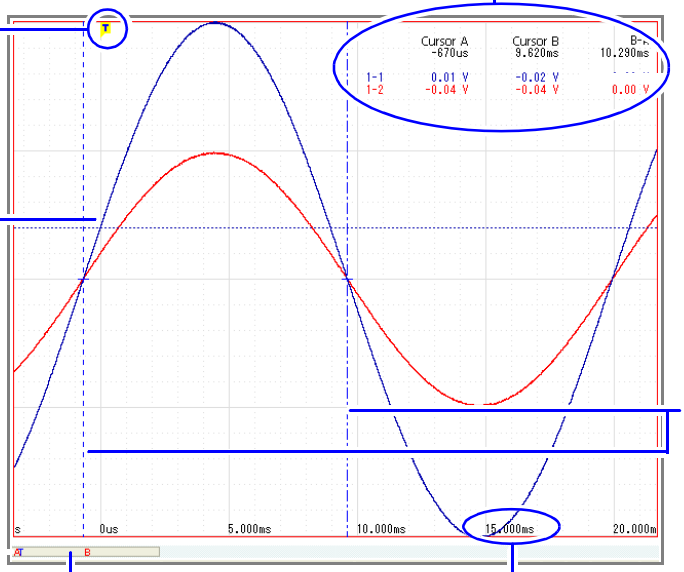
System Settings
Sets the system environment.
Clock setting procedure (p. 48)

Select on the Waveform or Settings screen

Move the cursor here, and select a function with the **F1** to **F8** keys.



Viewing Recording Data (Waveform Screen)



Trigger Mark

The trigger mark appears at the point where a trigger is applied.

Waveform

Data acquired with this instrument can be displayed as waveforms or numerical values.

To display as numerical values:
"8.13 Viewing Waveform Data as Numerical Values" in the *Instruction Manual*

A/B Cursor Values

Appear when the A/B cursors are displayed. Numerical calculation results and channel information can be displayed.

To change the information display:
Press the DISP key repeatedly to switch between waveform, information and gauge displays. (p. 63)

A/B Cursors

Move the cursors using the A/B knobs (p. 63).
A/B Cursor details:
"8.8 Cursor Values" in the *Instruction Manual*

Scroll Bar

Shows the range and position of the displayed waveform.
Viewing the Scroll bar:
"8.1 Scrolling Waveforms" in the *Instruction Manual*

Time Value Display

To change the display type:
"13.1.3 Selecting the Time Value Display" in the *Instruction Manual*

Status Bar (Waveform Screen)

This bar indicates the current states of data acquisition, internal processing, settings and display information. For details about each indicator, refer to "Appendix 1 Waveform Screen Display & Icons" (p. A1) in this manual and "2.4 Waveform Screen" in the *Instruction Manual*.

Internal Processing Status

Shows the states of data acquisition and internal processing.

Trigger Info

Shows the trigger source and the date and time of triggering.

Number of Data Acquisitions

Shows the number of times data has been acquired since the START key was pressed to start measuring.

Sub Message

Shows the estimated time to finish storing.

Setting Info

Indicates the setting states of Auto Save, Auto Print and A/B Cursors.

Display Info

Shows the sheet number of the displayed waveform.

Peripheral Device Setting Info

Icons indicate when PC Cards have been inserted, when connected to peripheral devices, and which internal devices are present.

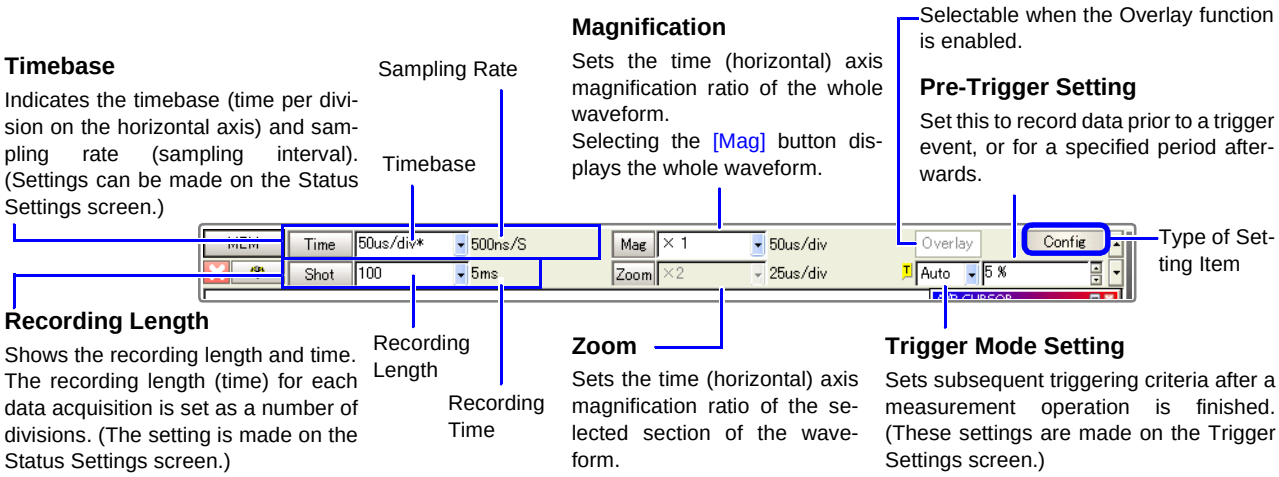
Setting Items and Contents (Waveform Screen)

Indicates current settings. These can be changed while measuring.
To change a setting, use the CURSOR keys to move the cursor to it, and press an F key to choose the new value.
Press the SUB MENU keys to switch items. (Some items are function-dependent)

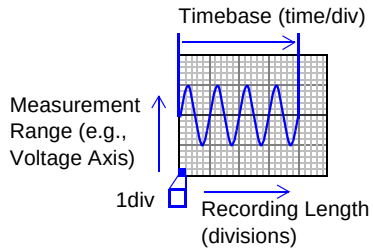
Example: Memory Function

[Config] (Meas Config & Trigger Criteria) ↔ **[Trigger]** (Analog Trigger) ↔ **[Num Calc]** (Numerical Calculation) ↔ **[Mem Div]**(Memory Division)

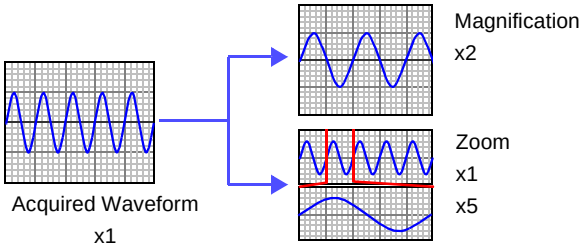
See "2.4 Waveform Screen";"Setting Items and Contents (Waveform Screen)", "4.4 Setting Measurement Configuration on the Waveform Screen", and "6.12 Making Trigger Settings on the Waveform Screen" in the *Instruction Manual*



Timebase and Recording Length



Difference Between Magnification and Zoom

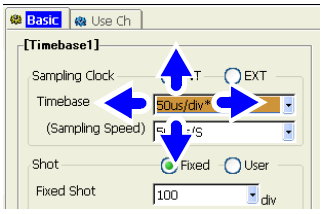


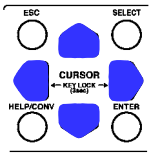
2.3 Basic Operations

2.3.1 To Change Settings

You have two ways to change settings.
This document describes how to change settings using the F keys.
In addition to the operating keys, operations can be performed using a mouse or keyboard.
Refer to "3.2.2 Using a Mouse" and "3.2.3 Using a Keyboard" in the *Instruction Manual*.

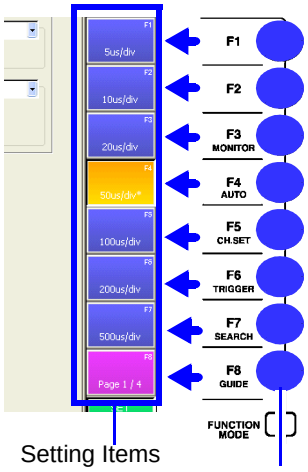
Moving to a Selection





Move the cursor to setting item.

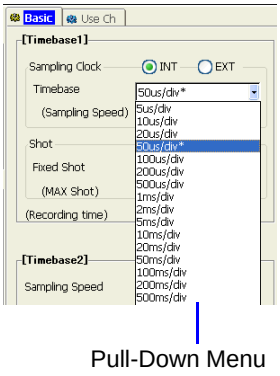
Selecting with an F key (F1 to F8)

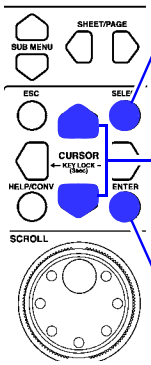


Setting items appear at the right side of the screen (GUI area).
Select using **F1** to **F8**.

When [Page] appears at **F8**:
more selections are available.
Press the **F8** key to see the additional selections.

Select from a Pull-Down Menu





SELECT key
Opens the pull-down menu.

CURSOR keys
Select a setting item.

ENTER key
Applies the setting.

Initialization and Default Settings

Each item of waveform data and setting data can be initialized.

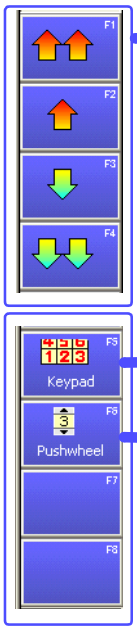
See "13.3.2 Initializing Waveform Data"
"13.3.3 Initializing System Settings (System Reset)"
"Appendix 2.1 List of Default Settings"
in the *Instruction Manual*

2.3.2 Entering Text and Numbers

See "3.3.3 Entering Text and Numbers" in the *Instruction Manual*

Entering Numbers

Move the cursor to a setting item and select an input method with the F keys.
When using a mouse, double click on a setting item to display the virtual keypad.

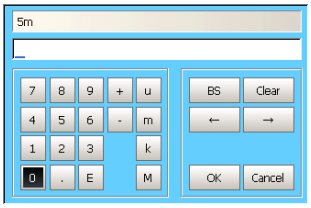


Direct entry by F keys [↑↑] [↓↓] [↑] [↓]

Enter a numerical value using the settings (↑↑, ↓↓, ↑ and ↓) assigned to the F keys.

Enter by virtual keypad [Keypad]

Enter a numerical value using the virtual keypad.



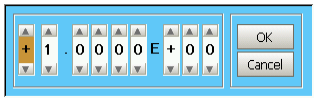
1. Select a digit ..... **CURSOR** keys
2. Accept ..... **F1** [Set] or **SELECT** key

After entering all digits,

3. Accept entry..... **F6** [OK] or **ENTER** key
   Cancel entry **F7** [Cancel] key or **ESC** key

Enter using the virtual pushwheel switches [Pushwheel]

Enter a numerical value using the virtual pushwheel switches.



1. Move to a digit ..... ◁ ▷ **CURSOR** keys
2. Set the digit value..... △ ▽ **CURSOR** keys

After entering all digits,

3. Accept entry..... **F3** [OK] or **ENTER** key
   Cancel entry ..... **F4** [Cancel] or **ESC** key

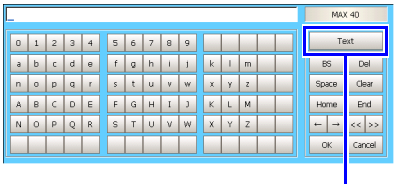
Entering Text

Move the cursor to a setting item and select an input method with the F keys. When using a mouse, double click on a setting item to display the virtual keyboard.

See "5.2 Adding Comments"; "Comment Entry Example" in the *Instruction Manual*

Enter by virtual keyboard [Edit]

Enter text using the virtual keyboard for character entry.



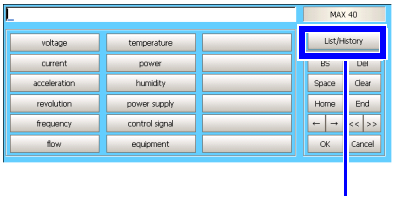
Press **F8** to switch character case.

1. Select a character ....**CURSOR** keys
2. Enter it in the entry field
   F1 [Set] or **SELECT** key

After entering all characters,

3. Accept entry .....**F6** [OK] or **ENTER** key
   Cancel entry .....**F7** [Cancel] key or **ESC** key

Enter prestored text from the virtual keyboard



[List/History]

1. Switch character case..**F8** [Character Set] key
2. Select a character....**CURSOR** keys
3. Enter it in the entry field
   F1 [Set] or **SELECT** key
4. Accept entry.....**F6** [OK] or **ENTER** key
5. Cancel entry.....**F7** [Cancel] key or **ESC** key

Enter by external keyboard [Direct]

Connect a keyboard for direct keyboard entry.

NOTE

When entering a file name (to load a file on a PC)

Windows 2000 and XP cannot handle file names containing the following characters, so they should not be used:

- ASCII: + = [ ] \ / | : * ? " < > ; ,
- Blank

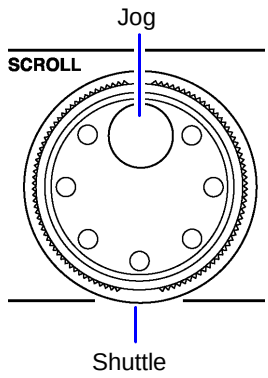
Do not use .(period) for a file name because the characters after the period are identified as the extension.

2.3.3 Viewing Recorded Data

Press the **DISP** key. The recorded waveform appears on the Waveform screen. For analysis procedures, refer to "9. Analyze Data" (p. 61), or "Chapter 8 Waveform Screen Monitoring and Analysis" in the *Instruction Manual*.

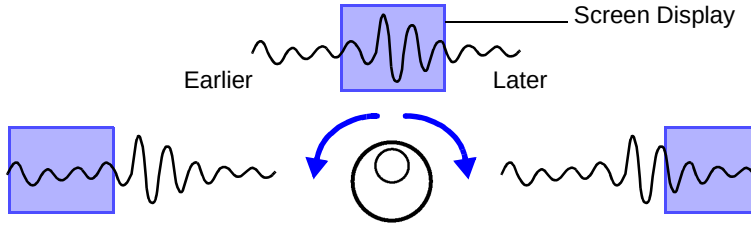
Scrolling Waveforms

See "8.1 Scrolling Waveforms" in the *Instruction Manual*



Turn the inner (Jog) or outer (Shuttle) knobs of the SCROLL control to scroll the waveform display. (only when the recorded length is at least 25 divisions)

Scroll Direction



Turn CCW
Scrolls earlier on the waveform from the current point.

Turn CW
Scrolls later on the waveform from the current point.

You can reverse the Jog and Shuttle scroll directions.

See "13.2.4 Specifying Jog & Shuttle Scroll Operations" in the *Instruction Manual*

The waveform scroll direction can be indicated vertically or continuously.

See "7.2.5 Setting Waveform Scrolling Orientation" in the *Instruction Manual*

To increase the scrolling speed:

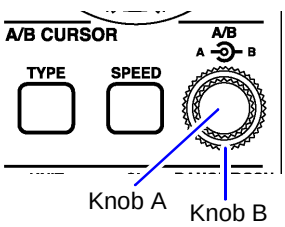
The scroll speed is controlled by the degree of rotation of the outer Shuttle knob. Turning the knob more increases the scrolling speed.

To scroll automatically (Auto-Scroll):

Turn the outer Shuttle knob in the direction desired to scroll the waveform, hold it until “Auto-Scroll” appears on the screen, and release it.
When the Shuttle knob is released, the waveform continues to scroll automatically.
To cancel, press any operating key.

Confirming Measured Values

See "8.8 Cursor Values" in the *Instruction Manual*



Press the **TYPE** key and set an A/B cursor using the Settings dialog. Turn inner knob **A** or outer knob **B** to move the A/B cursors on the screen to confirm the value at a cursor.

Measurement Preparations Chapter 3

3.1 Installation & Connection Procedures

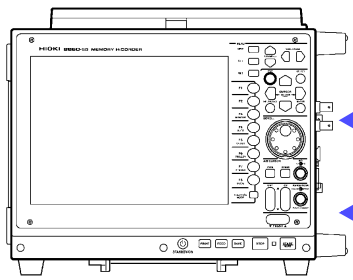
Be sure to read the "Operating Precautions" (p. 6) before installing and connecting this instrument.

1 **Install this instrument (p. 6)**

2 (When adding or changing an input module)
Install an input module
Refer to the *Input Module Guide*.

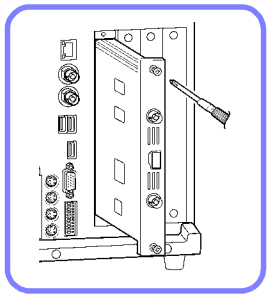
(When printing)
3 **Load recording paper (p. 42)**

Top Panel

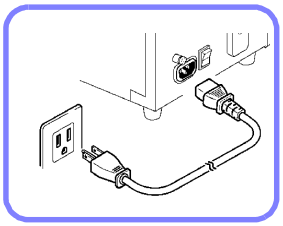


Left Side

Right Side

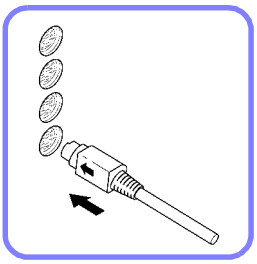


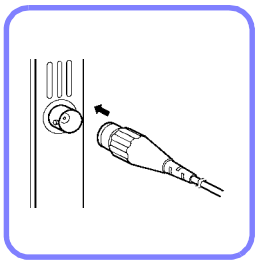
4 **Connect the power cord (p. 45)**



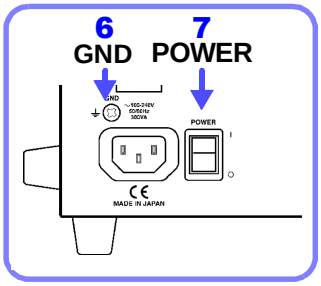
(When measuring logic signals)
5 **Connect a logic probe to the LOGIC receptacle**

(When measuring analog signals)
Connect the input cable(s) to the input module





(When measuring in an electrically noisy environment)
6 **Ground the Functional Earth of this instrument (p. 45)**



7 **Turn the power on (p. 46)**

Which probes and cables to connect depends on your measurement application (p. 38).
Refer to the *Input Module Guide* for details.

When finished measuring, disconnect the cable(s) from the measurement object(s), and turn the power off.

Other Connections

- If the clock is wrong after turning power on: "3.7 Setting the Clock" (p. 48)
- When using a PC Card: "5.2 Using PC Cards" (p. 67)
- When using other storage media or drives: "11.1 Storage Media" in the *Instruction Manual*
- When using a keyboard: "3.2.3 Using a Keyboard" in the *Instruction Manual*

3.2 Connecting Cables and Probes

When using an input module for measurement:
Connect the cables or sensors to the input module.

When measuring logic signals:
Connect the logic probe(s) to the LOGIC receptacle(s) on the instrument.

Refer to the *Input Module Guide* for precautions regarding connections and details of connection procedures.

Connection Preparations

WARNING

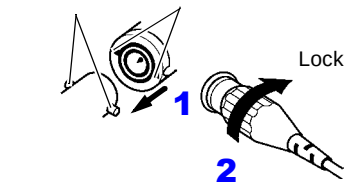
- **Do not use cables other than those specified by Hioki. The specified cables use insulated BNC connectors to avoid electric shock accidents. An uninsulated BNC plug may cause electric shock or damage to the BNC jack.**
- **Do not connect a cable to the instrument while it is connected to the object to be measured. Otherwise, an electric shock accident may occur.**

CAUTION

To prevent an electric shock accident, confirm that the white or red portion (insulation layer) inside the cable is not exposed. If a color inside the cable is exposed, do not use the cable.

Connecting to the BNC jacks on input modules

When disconnecting the BNC connector, be sure to release the lock before pulling off the connector. Forcibly pulling the connector without releasing the lock, or pulling on the cable, can damage the connector.



Connecting

Align the two slots in the BNC plug with the guide pins on the jack at the input module side, then push and twist the plug clockwise.

Disconnecting

Push the BNC plug in, twist it counterclockwise, and pull it out.

For voltage measurement

NOTE

Use only the specified connection cords. Using a non-specified cable may result in incorrect measurements due to poor connection or other reasons.

Measuring Voltage

Applicable Input Modules

- Model 8956 Analog Unit
- Model 8936 Analog Unit
- Model 8938 FFT Analog Unit
- Model 8946 4-Ch Analog Unit
- Model 8961 High Voltage Unit
- Model 8957 High Resolution Unit
- Model 8937 Voltage/Temp Unit
- Model 8940 F/V Unit
- Model 8959 DC/RMS Unit
- Model 8947 Charge Unit *1
- Model 8958 16-Ch Scanner Unit *2

(Maximum input voltage (p. 9))

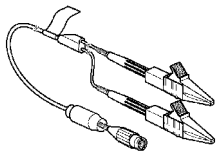
Connect to the BNC (except Model 8961) jack on an input module.

Connection Procedure:
"2.2 Connecting the Cables" in the *Input Module Guide*

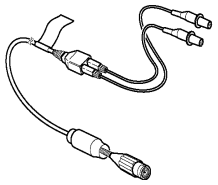
*1. The Model L9198 Connection Cord is recommended for connection.
*2. Use an input cable to make connections.
Recommended cables:
0.14 to 1.5 mm^2 single-strand, or 0.14 to 1 mm^2 multi-strand AWG 16 to 26 stripped 5 mm
*3. A power cord option or AC adapter may be required, depending on the input module used.

Use to connect: Connection Cables

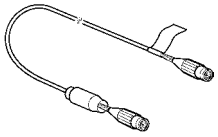
- Model L9197 Connection Cord
  Model 9197 Connection Cord
  (Maximum input voltage: 500 V)
  Large alligator clip type



- Model L9198 Connection Cord
  (Maximum input voltage: 300 V)
  Small alligator clip type

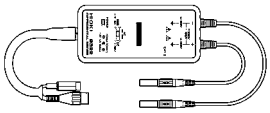


- Model L9217 Connection Cord
  (Maximum input voltage: 300 V)
  For measuring BNC output



If the voltage to be measured exceeds the maximum input rating of the input module being used:

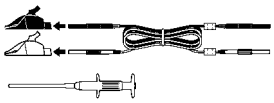
- Model 9322 Differential Probe *3
- Model 9665 10:1 Probe
- Model 9666 100:1 Probe



Example: Model 9322

for Model 8961 High Voltage Unit:

- 9242 Connection Cord
  (Connect supplied clips)



Measuring Current

Applicable Input Modules

- Model 8940 F/V Unit
- Voltage measuring input modules

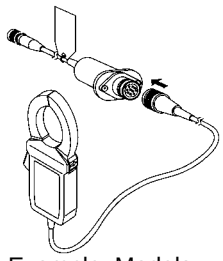
Connect to a sensor receptacle or BNC jack on an input module.

Connection Procedure:
"2.2.5 Connecting to the Model 8940 F/V Unit" and "2.3 Connecting Clamps" in the *Input Module Guide*

Depending on the clamp, a conversion cable or power supply unit may be required for connection. ("1.3 List of Input Modules, Cables, Probes and Clamp Combinations" in the *Input Module Guide*)
Scaling is also required in some cases. ("5.4 Converting Input Values (Scaling Function)" in the *Instruction Manual*)

Use to connect: Clamps

- Clamp-On Sensors:
  Models 9270, 9271, and 9272
- Universal Clamp-On CTs
  Models 9277, 9278, and 9279
- Clamp-On Probes
  Models 3273-50,
  3274, 3275, 3276,
  9018-50, and 9132-50
- Clamp-On Leak Sensor
  Model 9657-10



Example: Models 9272 and 9318

Measuring Temperature

Applicable Input Modules

- Model 8937 Voltage/Temp Unit
- Model 8958 16-Ch Scanner Unit

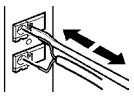
Connect to the terminal block on the input module.

Connection Procedure:
"2.2.3 Connecting to the Model 8937 Voltage/Temp Unit" and "2.2.7 Connecting to the Model 8958 16-Ch Scanner Unit" in the *Input Module Guide*

Use to connect: Thermocouple

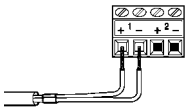
Thermocouple

For the Model 8937 Voltage/Temp Unit
(Compatible wire: AWG 16 to 26, 0.4 to 1.2 mm diameter)



Connect to terminal block

For the Model 8958 16-Ch Scanner Unit
(Compatible wire: AWG 16 to 26, 0.14 to 1.5 mm^2)



Connect to terminal block

Measuring Frequency, Count and Pulse Duty

Applicable Input Modules

Model 8940 F/V Unit

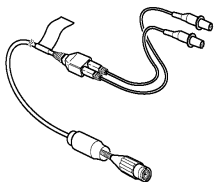
Connect to the BNC jack on an input module.

Connection Procedure:
"2.2.5 Connecting to the Model 8940 F/V Unit" in the *Input Module Guide*

Use to connect: Connection Cable

Model L9198 Connection Cord

(Maximum input voltage: 300 V)
Small alligator clip type



Using a Strain Gauge to Measure Vibration or Displacement (Strain)

Applicable Input Modules

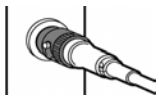
- Model 8939 Strain Unit
- Model 8960 Strain Unit

Connect to the BNC jack on an input module.

Connection Procedure:
"2.2.4 Connecting to a Strain Unit (Models 8939 and 8960)" in the *Input Module Guide*
Use the conversion cable supplied with the input module according to the sensor being used.

Use to connect: Sensor

Strain Gauge Transducer
(Not available from Hioki)



Example:
Connecting using a conversion cable

Measuring Vibration using Piezoelectric (Charge- or Preamp-type) Sensors

Applicable Input Modules

Model 8947 Charge Unit

Preamp

Connect to the BNC jack on an input module.

Charge

Connect to the miniature receptacle on the input module.

Connection Procedure:

"2.2.6 Connecting to the Model 8947 Charge Unit" in the *Input Module Guide*

Use to connect: Acceleration Sensor or Connection Cable

Preamp: Preamplified acceleration sensor*
(BNC plug, operating power 2 mA @ 15 V)

Charge: Charge-output type acceleration sensor*
(Miniature #10-32 connector)

Voltage Measurement: Model L9198 Connection Cord (recommended)

* Not available from Hioki

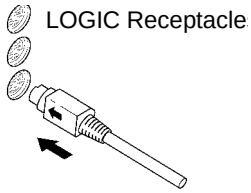
Measuring Logic Signals

Connection Procedure:

"2.6 Connecting Logic Probes" in the *Input Module Guide*

Use to connect: Logic Probe

- Model 9320-01 Logic Probe
- Model MR9321-01 Logic Probe
- Model 9327 Logic Probe



3.3 Loading Recording Paper (With a Printer Module Installed)

Printing is available using the following optional printer (specified when ordering the instrument) and recording paper.

Printer	Recording Paper (size)
Model 8995 A4 Printer Unit	Model 9231 Recording Paper (A4 size)
Model 8995-01 A6 Printer Unit	Model 9234 Recording Paper (A6 size)

About the Printer

⚠WARNING

The print head and surrounding metal parts of the Model 8995-01 A6 Printer Unit can become hot. Be careful to avoid touching these parts.

⚠CAUTION

When the instrument is not to be used for a long time, or when transporting

To avoid straining some parts of the printer, and to prevent dirt adhering to the print head, set the print head to its lowered position (so that the print head rests against the print roller).

After storing the printer without use for a long time, inspect the following before use:

1. Move the head raising lever up and down.
2. Perform test printing (printer check) three or four times.

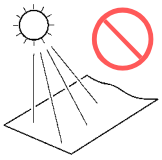
Recording Paper Usage Precautions

NOTE

- Please use only the specified recording paper. Using non-specified paper may not only result in faulty printing, but printing may become impossible.
- If the recording paper is skewed on the roller, paper jams may result.
- Printing is not possible if the front and back of the recording paper are reversed.
- Always use the paper cutter on the printer's cover to cut the printed paper. Excessive paper dust can accumulate on the roller if the paper is cut by the print head.

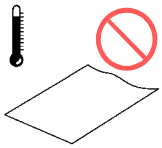
Handling and Storing Recording Paper

The recording paper is thermally and chemically sensitized. Observe the following precautions to avoid paper discoloration and fading.



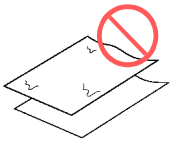
Avoid exposure to direct sunlight.

Avoid exposure to volatile organic solvents like alcohol, ethers and ketones.



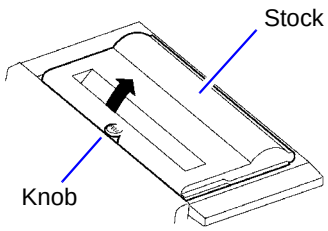
Do not store thermal paper above 40°C or 90% RH.

Avoid contact with adhesive tapes like soft vinyl chloride and cellophane tape.

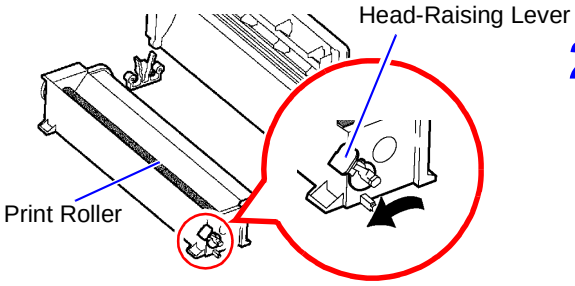


Avoid stacking with wet Diazo copy paper.

Loading Recording Paper in the Model 8995 A4 Printer Unit

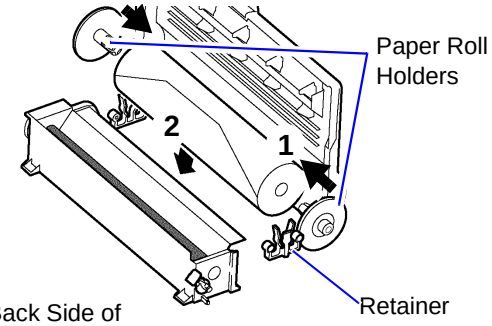


1 Pull the knob to open the stock cover.

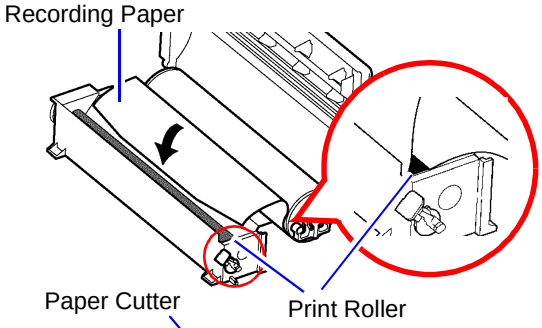


2 Pull the head-raising lever forward.

The print head is separated from the print roller. (Head-raised condition)



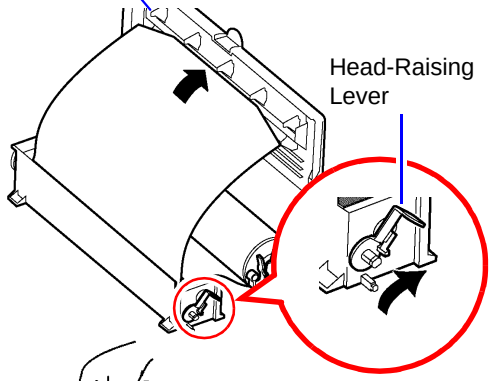
3 Put the paper roll holders in the ends of the paper roll, and place it in the retainers.



4 Insert the paper through the slot under the print roller, and pull the paper out so that the print roller turns.

5 Align the edge of the paper that you pulled out with the edge of the paper still on the roll.

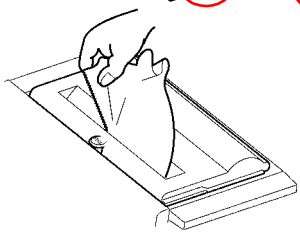
If the paper is misaligned, it will crease as it feeds.



6 Return the head-raising lever to the lowered position.

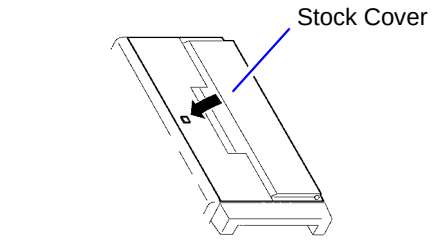
The print head should rest on the paper. (Head-lowered condition)

7 Insert the paper through the paper outlet in the stock cover, and pull a little out.

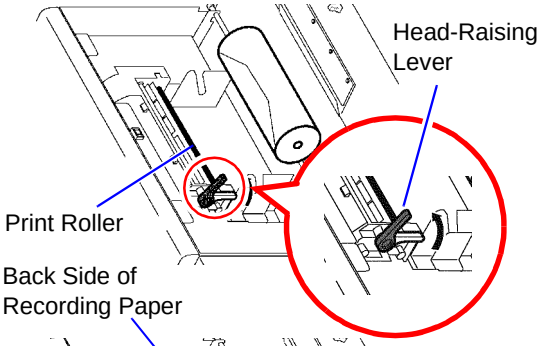


8 Close the stock cover and cut the paper using the cutter at the paper outlet to finish the procedure.

Loading Recording Paper in the Model 8995-01 A6 Printer Unit

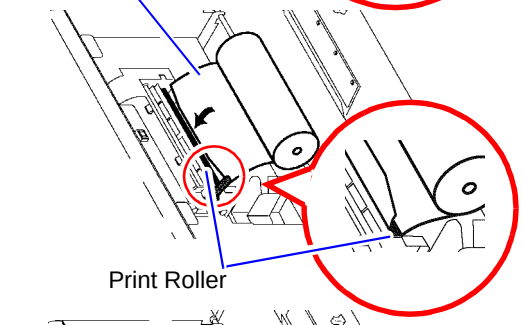


1 Push the stock cover to open the stock cover.

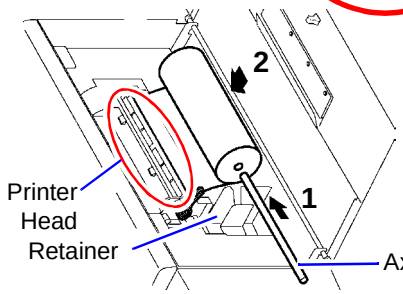


2 Raise the head-raising lever.

The print head is separated from the print roller. (Head-raised condition)



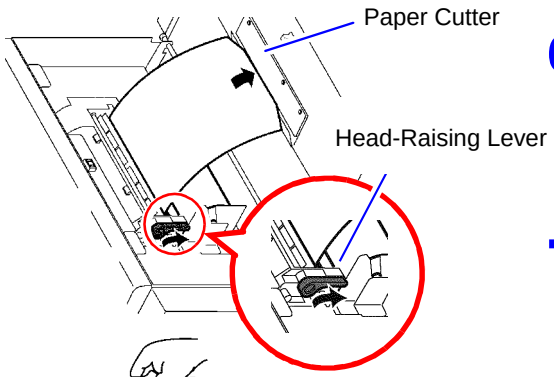
3 Insert the paper through the slot under the print roller, and pull the paper out so that the print roller turns.



4 Insert the paper roll axle through the center of the paper roll, and place it in the retainers.

5 Align the edge of the paper that you pulled out with the edge of the paper still on the roll.

If the paper is misaligned, it will crease as it feeds.



6 Return the head-raising lever to the lowered position.

The print head should rest on the paper. (Head-lowered condition)

7 Insert the paper through the paper outlet in the stock cover, and pull a little out.

8 Close the stock cover and cut the paper using the cutter at the paper outlet to finish the procedure.

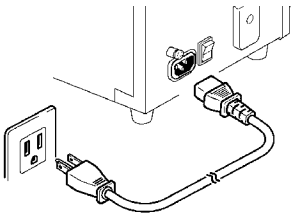
3.4 Connecting the Power Cord

⚠WARNING

- **Before turning the instrument on, make sure the supply voltage matches that indicated on the its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.**
  Rated mains supply voltage (100 to 240 V AC), rated mains supply frequency (50/60 Hz) (Voltage fluctuations of ±10% from the rated supply voltage are taken into account.)
- **To avoid electrical accidents and to maintain the safety specifications of this instrument, connect the power cord provided only to a 3-contact (two-conductor + ground) outlet.**

Connection Procedure

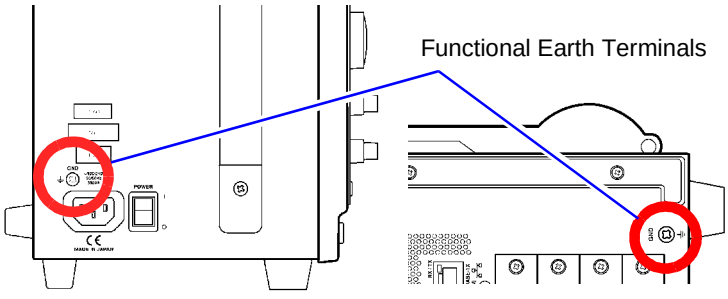
Left Side



1. Verify that the instrument's power switch is turned off.
2. Confirm that the mains supply voltage matches the instrument, and connect the power cord to the power inlet on the instrument.
3. Plug the power cord into the mains outlet.

3.5 Grounding the Instrument's Functional Earth

When measuring in an electrically noisy environment, the effects of noise can be minimized by grounding the Functional Earth terminals.



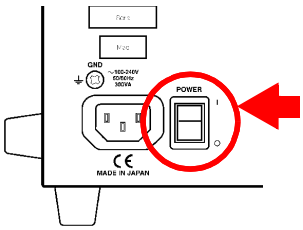
3.6 Turning the Power On and Off

Turning Power On

Before turning power on

Verify that the instrument and peripheral devices are correctly connected.
To prevent damage to the instrument, do not turn off the power after turning on until the software starts completely.

Left Side



Power On |

Turn the **POWER** switch on (|).

After Power-On

After a short time, the **STANDBY/ON** key lights red and the Opening screen appears.
The next time power is turned on, the Waveform screen for the function that was displayed when power was turned off will appear.

NOTE

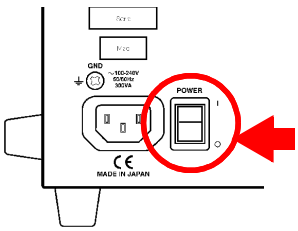
Before Starting Measurement

To obtain precise measurements, provide about 30 minutes warm-up (depending on installed input modules) after turning power on to allow the internal temperature of the input modules to stabilize.
After that, perform zero adjustment before taking measurements.

Refer to the *Input Module Guide* for input module specifications and zero adjustment.

Turning Power Off

Before Turning Power Off



Power Off ○

Recording Data

When the POWER switch or **STANDBY/ON** key of the instrument is turned off, internal recorded data is erased.

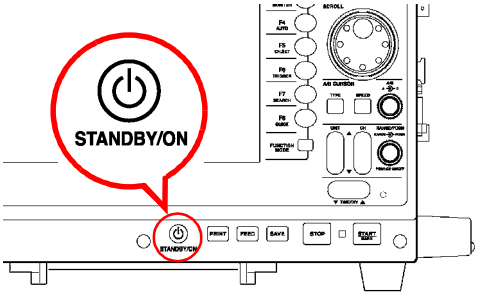
However, waveform data can be preserved when power is turned off if the optional Model 9719-50 Memory Backup Unit is installed.
If you don't want to lose recorded data, save it first to a PC Card or external storage media.
Saving Procedure: "Chapter 5 Saving & Loading Data" (p. 65)

Instrument settings are preserved when power is turned off.

Turn the **POWER** switch on (○).
When power is turned on again, the display appears with the settings that existed when power was last turned off.

When using the optional Model 9684 DC Power Unit, refer to "3.2.5 If the Model 9684 DC Power Unit is Installed" in the *Instruction Manual*.

To Avoid the Startup Delay (Entering the Standby State)



Press the **STANDBY/ON** key.

“Enter Standby Mode?” appears.

Press the **STANDBY/ON** key again. (It slowly blinks red)

The screen turns off and the instrument enters the standby state.

The fan continues to run for a while after entering standby. Also, the fans run periodically during standby to avoid internal heating.

To resume operation from standby:

Press the **STANDBY/ON** key. (It lights red)

The initial or waveform screen reappears.

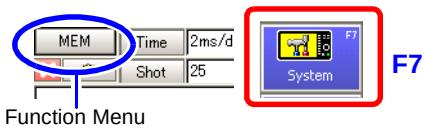
3.7 Setting the Clock

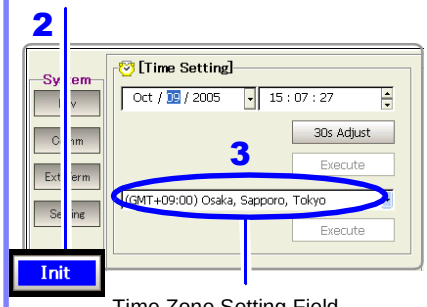
To adjust the clock, set the date and time on the Initialization screen of the System screen.

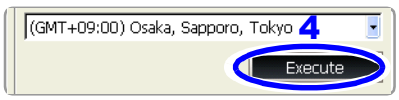
NOTE **If you need to change both the time zone and the date and time, change the time zone first.**

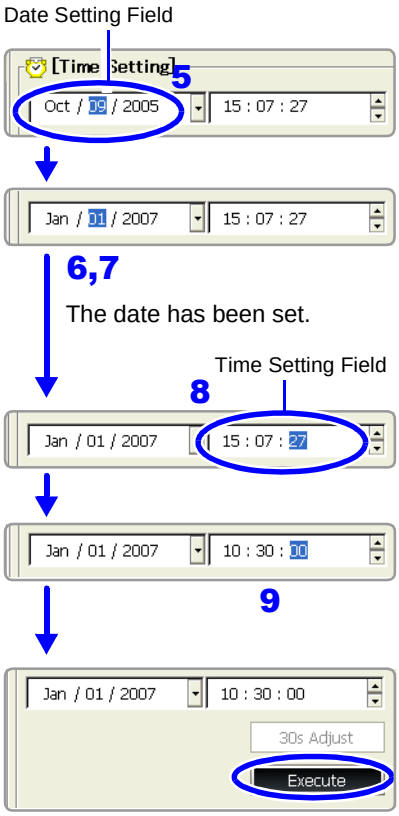
See "13.3.1 Setting the Date and Time" in the *Instruction Manual*

Setting Procedure









Open the Initialization Settings Screen

1 **When the Initialization screen appears:**
Press the **F7** [System] key.

If a screen other than the Initialization screen appears:
Use the **CURSOR** keys to move the cursor to the Function menu at the upper left, and press the **F7** [System] key.

The System screen appears.

2 Press the **SUB MENU** keys to select the [Init] menu item. The Init (Initialization) Settings screen appears.

Set the time zone

3 Use the **CURSOR** keys to move the cursor to the locale setting field as shown at the left, and select regions with the F key.

4 Use the **CURSOR** keys to move the cursor to the [Execute] key, and press the **F1** [Execute] key.

Set the date

Example: Set the date and time to January 1st 2007, 10:30:00.

5 Use the **CURSOR** keys to move the cursor to the date setting field as shown at the left, and press the **F1** [Set] key.

6 Use the ◁ ▷ **CURSOR** keys to move to the year, month and day, and change the numbers with the △ ▽ **CURSOR** keys. (Setting can be made with the **F1** to **F4** keys)

7 When finished changing the date, press **F5** [OK] or the **ENTER** key.

Set the time

8 Press the ▷ **CURSOR** key to move the cursor to the time setting field, and press the **F1** [Set] key.
Change the time setting like the date setting above.

9 When finished changing the time, press **F5** [OK] or the **ENTER** key.

Apply the new settings

10 Use the **CURSOR** keys to move the cursor to the [Execute] key, and press the **F1** [Execute] key.

Basic Operations Chapter 4

Before measuring, be sure to read the "Operating Precautions" (p. 6) and "Chapter 3 Measurement Preparations" (p. 37).

4.1 Pre-Measurement 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

When using probes and connection cables

Is the insulation of the probe or connection 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

When using a clamp

Is the clamp cracked or damaged?

- Yes → Do not use if damage is present, as you could receive an electric shock. Replace the damaged items.
- No → To 2

2 Instrument and Input Module Inspection

Is damage to the instrument or input modules 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 ↓

Do the fans rotate?
See "7.2 Cleaning" (p. 84)

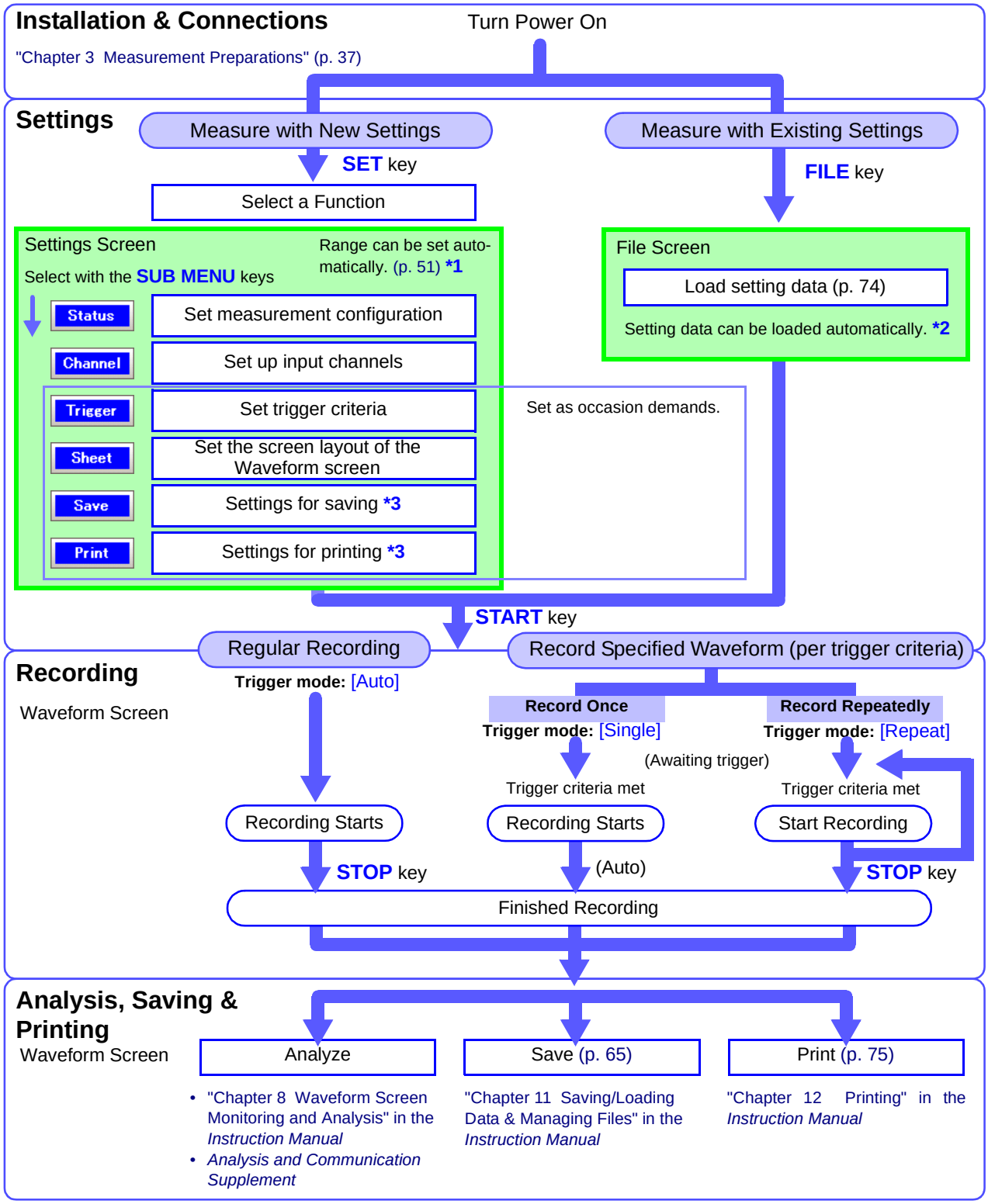
- No → Request repairs.
- Yes ↓

Does the Initial or Waveform screen appear?

- Nothing appears, or the display is abnormal → The instrument may be damaged internally. Request repairs.
- Yes ↓

Inspection complete

4.2 Operation Workflow



*1. To enable automatic setting: "3.3.5 Automatic Range Setting (Auto-Ranging Function)" in the *Instruction Manual*

*2. To load settings automatically: "11.5 Saving & Loading Auto Settings File (Auto Setup Function)" in the *Instruction Manual*

*3. When saving or printing automatically, execution timing depends on the function.
When saving or printing manually, settings can be changed after measurement.

4.3 Recording Simple Waveforms

First display the waveform for confirmation.

This description presumes that settings are at their factory default values. If the instrument has been used before, or if you suspect that settings are not at their factory default values, reinitialize the instrument before proceeding.

See "13.3.2 Initializing Waveform Data", "13.3.3 Initializing System Settings (System Reset)", "Appendix 2.1 List of Default Settings" in the *Instruction Manual*

Example: Record a 120 V AC (60 Hz) waveform.

To display waveforms, set the horizontal axis (timebase), vertical axis (measurement range) and recording length. In the measurement procedure described here, the range is set automatically.

Use Auto Setup to configure the lowest-numbered channel among those in use.

Auto Setup is recommended when the measurement range is undetermined, or when you want to verify waveform input. However, depending on the measurement mode of the input module, Auto Setup may not be available.

See "3.3.5 Automatic Range Setting (Auto-Ranging Function)" in the *Instruction Manual*

Input modules and measurement modes not supported by Auto Setup:

- The [Temp] mode of the Model 8937 Voltage/Temp Unit
- The Model 8939 Strain Unit
- [Count], [Duty] and [50/60 Hz] (mains voltage measurement) modes of the Model 8940 F/V Unit
- [Charge] and [Preamp] modes of the Model 8947 Charge Unit
- The Model 8958 16-Ch Scanner Unit
- The Model 8960 Strain Unit

Make Necessary Connections

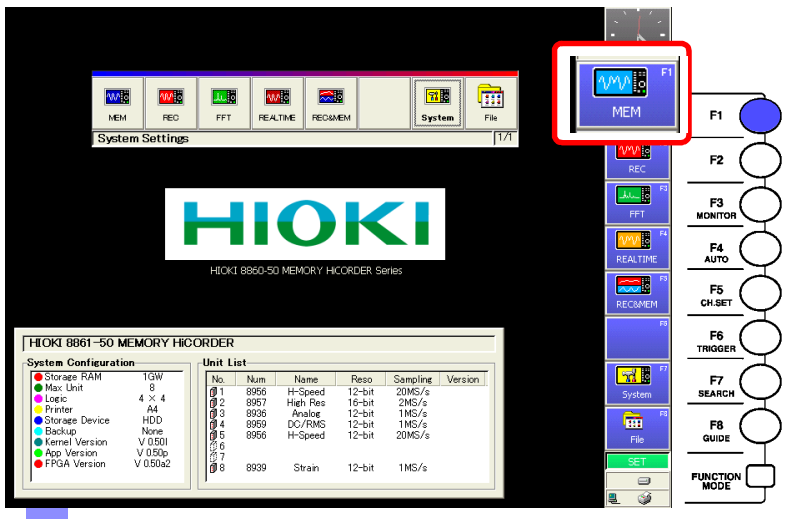
Refer to "Chapter 3 Measurement Preparations" (p. 37) and "Chapter 2 Connections" in the *Input Module Guide*.

Turn Power On

The Opening screen appears.

Select a Function

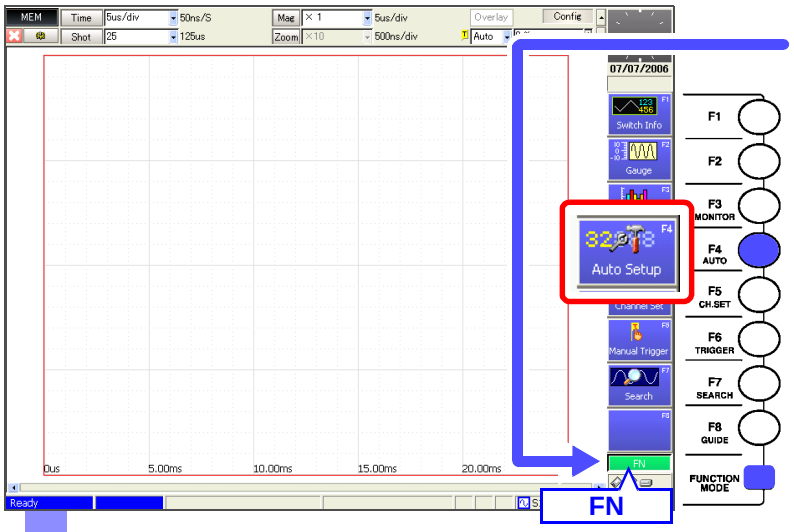
Opening Screen



Press the **F1** [MEM] key.

The Waveform screen appears.

Set Up the Instrument (Auto Setup)

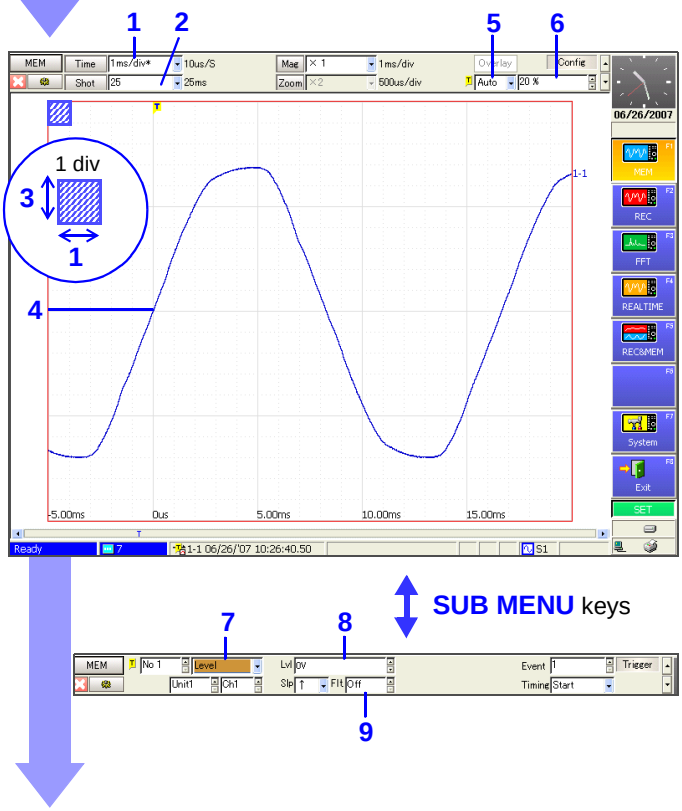


1 Press the **FUNCTION MODE** key to enable the FN mode.

2 Press the **F4** [Auto Setup] key.
A confirmation message appears.

3 Press the **F1** [OK] key.
The timebase, measurement range and zero position are automatically set, and recording starts.

Recording continues until you press the **STOP** key.



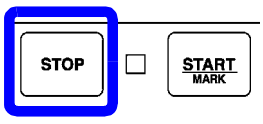
Auto Setup makes the following settings:

Settings Screen		Setting Item	Setting Value
Status	1	Timebase (Time)	1 ms/div
	2	Shot (Recording length)	(Unavailable in Auto Setup)
Channel		Mode	Voltage
	3	Range	20 V/div
	4	Position	50 %
Trigger	5	Trigger Mode	Auto
		Source (AND/OR)	OR
	6	Pre-Trigger	20%
		(Analog Trigger)	(Only lowest-numbered module and channel)
	7	Type	Level
	8	Level	Approx. 0 V
	9	Filter	Off

While viewing a waveform, settings can be changed as occasion demands.

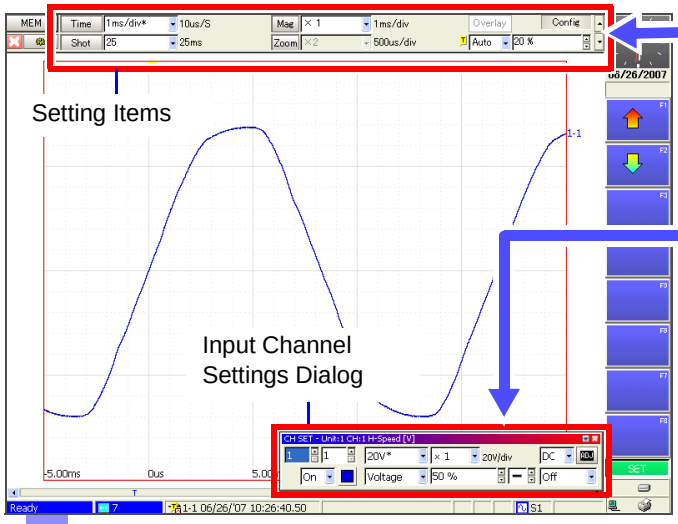
See "To Change Settings" (p. 53)

Finish Measurement



Press the **STOP** key.

To Change Settings



Changing the timebase or recording length

Use the **CURSOR** keys to move the cursor to the setting item, and press **F1** to **F8** to select the setting value. Pressing the **SUB MENU** keys changes available setting items.

Changing the selected input channel

Press the **UNIT** or **CH** key to display the [CH SET] dialog, and select the channel to be changed.

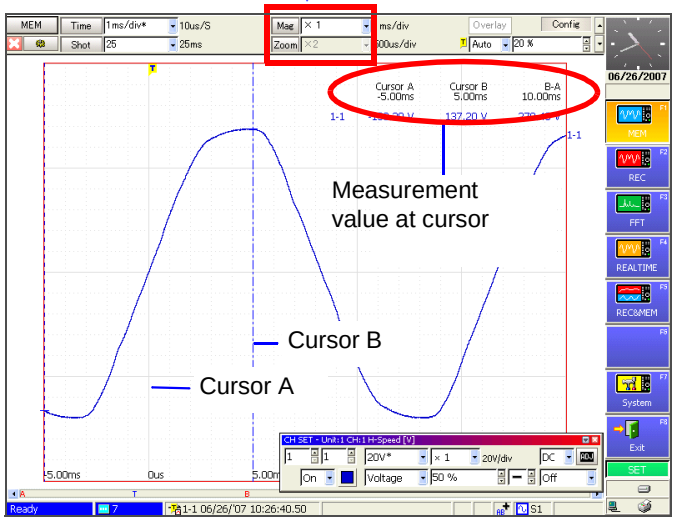
- **Changing the measurement range**
  Turn the inner **RANGE** knob.
- **Changing the waveform display position (zero position)**
  Turn the outer **POSN** knob.
- **Erasing unwanted waveforms**
  Select the unit (module) and channel of the waveform to be erased, and change [On] to [Off].

Press the **ESC** key to remove the dialog.

See "4.4 Setting Measurement Configuration on the Waveform Screen"
"5.7 Setting Input Channels from the Waveform Screen"
"6.12 Making Trigger Settings on the Waveform Screen"
in the *Instruction Manual*

After changing a setting, press the **START** key again.
However, if the change is made while measuring, the setting is reflected at the moment it is changed.

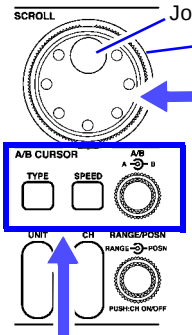
Verifying a Waveform



A waveform's horizontal axis can be expanded or compressed (p. 62)

The horizontal axis can be expanded or compressed by setting the magnification in the [Mag] (Magnification) field.
By selecting the [Zoom] button, a section of the waveform can be expanded.

See "8.9 Magnifying and Compressing Waveforms" in the *Instruction Manual*



Scrolling a waveform (p. 35)

Turn the inner Jog knob of the **SCROLL** control to scroll slowly, or the outer Shuttle knob to scroll quickly.

See "8.1 Scrolling Waveforms" in the *Instruction Manual*

Reading values at cursors (p. 63)

Press the **TYPE** key to open the [A/B Cursor] dialog.
Select the cursor type, and move the A or B cursor by turning the **A** or **B** knob, respectively.
The values at the A/B cursors appear at the top right.

See "8.8 Cursor Values" in the *Instruction Manual*

4.4 Actual Measurement and Analysis

This example uses an analog input module and connection cable to illustrate the basic measurement process of recording and analyzing an anomalous waveform. Settings and measurement procedures differ according to the specific application, as described in the *Input Module Guide*, the *Instruction Manual* and the *Analysis and Communication Supplement* .
This description presumes that settings are at their factory default values. If the instrument has been used before, or if you suspect that settings are not at their factory default values, reinitialize the instrument before proceeding.

See "13.3.2 Initializing Waveform Data", "13.3.3 Initializing System Settings (System Reset)", "Appendix 2.1 List of Default Settings" in the *Instruction Manual*

Measurement Example Overview

Record voltage sag on a 240 V, 60 Hz AC line. When the anomaly occurs, data is automatically saved to a PC Card for analysis.

1 Make Basic Settings

Make the basic settings required for measurement such as measurement configuration (recording speed [Timebase] or recording time [Shot]) and input channel selection.

2 Make settings to record the specified waveform anomaly (trigger criteria settings)

Make appropriate trigger settings to acquire the desired waveform data.
(Default settings are fine for continuously recording waveforms)

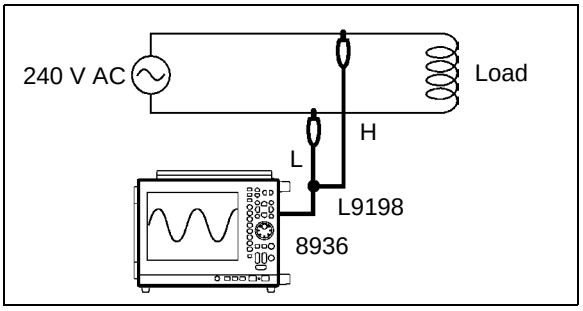
3 Make settings to save recording data to storage media

To save automatically while measuring, enable Auto Save before starting measurement. After measuring, data remaining in the instrument's internal memory can be saved manually.
(Printing works the same way)

4 Start measurement, and analyze recorded data

After measuring, you can analyze the data, and save or print it as occasion demands.

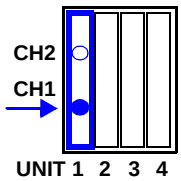
Verifying Before Measurement



Required equipment:

- This instrument
- Grounded power cord (2-conductor + ground)
- Model 8936 Analog Unit.....1
- Model L9198 Connection Cord .1
- PC Card
- Recording Paper

In this case, the Model 8936 Analog Unit is installed as Unit 1 in the Model 8860-50, so the measurement procedure describes connection of the Model L9198 Connection Cord to Ch 1.



Input Module Compartment

Setting required for this measurement:

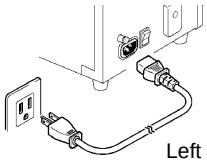
Settings Screen	Setting Item	Setting Value
	(Function)	MEM (Memory)
Status	Timebase	5 ms/div
	Shot (Recording length)	50 div
Channel	Unit, Ch	Unit 1, Ch 1*1
	Mode	Voltage
	Range	20 V/div
	Position	50 [%] (default setting)
	Mag (Magnification)	x1/2
Trigger*2	Trigger Mode	Repeat
	Pre-Trigger	10%
	Type	Drop (Voltage Sag)
	Level	280 V (RMS 197.99 V)
	Freq (Frequency)	60 Hz
Save	Auto Save	On
	Save in	(PC Card folder)

*1. Unit (module) and channel number to use
*2. Trigger settings are not needed to only observe fluctuations of the mains voltage.

1. Measurement Preparations

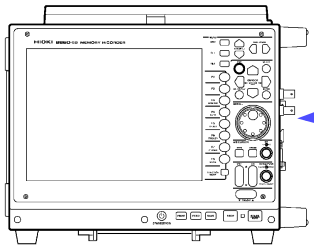
See "Chapter 3 Measurement Preparations" (p. 37), and "Chapter 2 Connections" in the *Input Module Guide*

1 Connect the power cord from this instrument to an outlet.



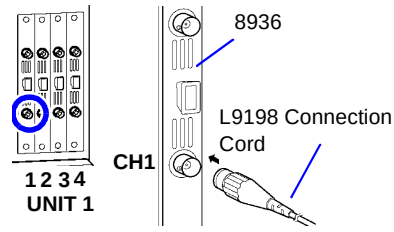
Left Side

Make sure the power switch is turned off.



This example uses channel 1 (Ch 1).

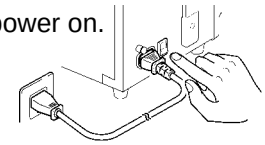
2 Connect the cable to a BNC jack on the Model 8936 Analog Unit.



Twist clockwise to lock.

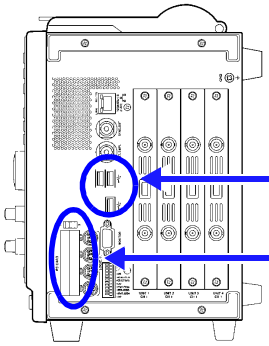
3 Connect the cable clips to the AC power line.

4 Turn the power on.



To save or print automatically, be sure to prepare the required devices before measurement.
In this case, insert a PC Card into PC CARD Slot 1.

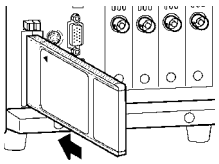
Preparations for Data Saving and Loading



No preparation is required when using the optional hard disk.
Verify that write protection on the storage media is disabled.

USB Port → Using a USB storage media drive

PC CARD Slot → Using a PC Card



Insert a PC Card into PC CARD Slot 1.

Printing Preparations

Verify that the paper is loaded correctly.

Using the internal printer: "3.3 Loading Recording Paper (With a Printer Module Installed)" (p. 42)
Using an external printer: Connect to the USB port and load paper.

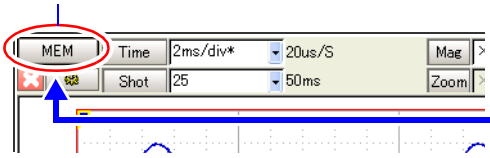
2. Select the appropriate function

See "Function Selection" (p. 29)

Opening Screen Case

Press the **F1** [MEM] (Memory Function) key.

Function Menu



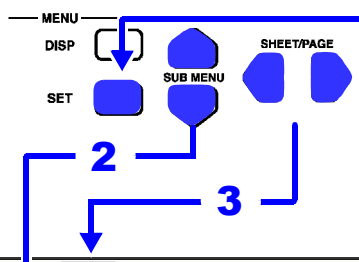
Waveform or Setting Screen Case

Using the **CURSOR** keys, move the cursor to the Function menu, and press the **F1** [MEM] key.

3. Set measurement configuration

Status

See "Chapter 4 Measurement Configuration Settings" in the *Instruction Manual*

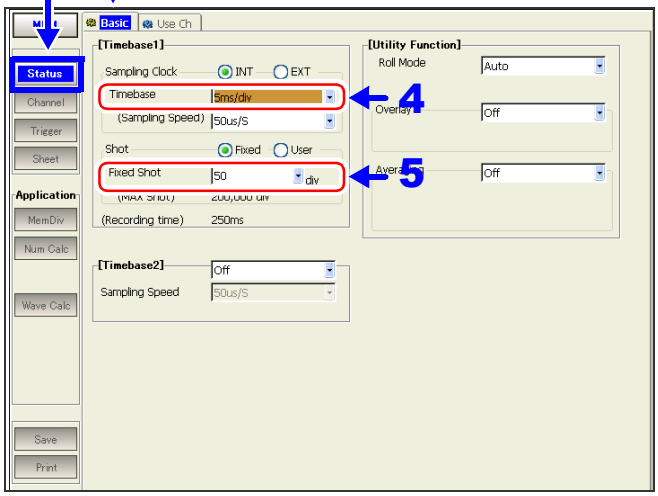


1 Press the **SET** key.

2 Press the **SUB MENU** keys to select the [Status] menu item.

3 Press the **SHEET/PAGE** keys to select the [Basic] page.

Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.



4 Set the timebase to [5 ms/div].

This is the time per division on the horizontal axis.

Sampling rate = timebase (s/div) / 100 (samples per division)

5 Set the recording length to [50 div].

Set the recording time in number of divisions.

(Recording time = timebase (s/div) × recording length (div))

Make other settings as occasion demands.

Supplement

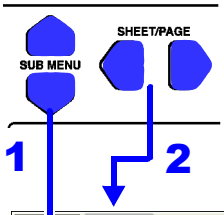
- When **F8** [Page /] appears, more selections are available. Press the **F8** key to display the additional selections.
- In the memory function case, sampling speed is 1/100th the timebase. Each division contains 100 data samples. More detailed analyses are possible when the timebase is set smaller.
- Enable auto-ranging if you cannot determine the appropriate range (p. 51).
- When using multiple channels, verify that ☑ appears with the channel to be used on the [Use Ch] page.

See: "Setting the Timebase (Horizontal Axis)" (p. A2) in this manual
"4.2.1 Selecting Channels to Use",
"4.2.2 Setting the Timebase (Horizontal Axis) and Sampling Rate",
"4.2.4 Setting the Recording Length (number of divisions)"
in the *Instruction Manual*

4. Set up the input channel

Channel

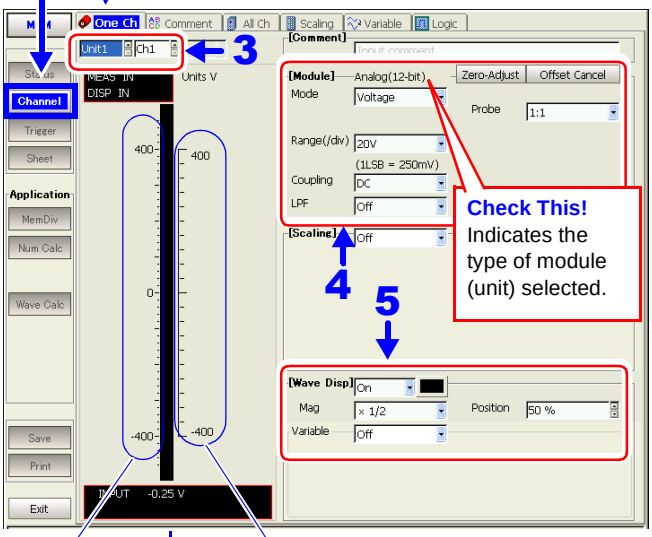
See "Chapter 5 Input Channel Settings" in the *Instruction Manual* and "Chapter 3 Input Channel Settings" in the *Input Module Guide*



1 Press the **SUB MENU** keys to select the [Channel] menu item.

2 Press the **SHEET/PAGE** keys to select the [One Ch] page.

Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.



Level Monitor

Measurement Range
Indicates the selected range.

Displayed Range
Indicates the range displayed on the screen. To change the display position or range, change the waveform display settings.

3 Select the module [Unit1] and channel number [Ch1] to be set.

4 Make appropriate input channel settings such as the measurement range.

Setting Item	Setting Value
(Verify) [Module]:Analog, Mode: Voltage	
Range(/div)	**20 V** (per division) (Each vertical division represents 20 V)
Coupling	**DC** (default setting)

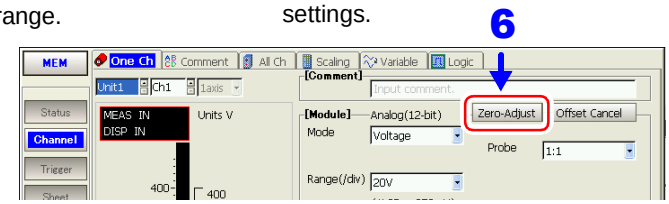
Make other settings as occasion demands.

5 Make appropriate waveform display settings.

Setting Item	Setting Value
Wave Disp	**On** (default setting)
Mag (Magnification)	**x1/2**
Position	**50%** (default setting)

Make other settings as occasion demands.

See "7.1 Making Input Waveform Display Settings (Analog Waveforms)" in the *Instruction Manual*



6 Select the [Zero-Adjust] button.

A message appears when zero-adjust is finished.

Execute zero-adjust 30 minutes after turning power on.

Proper warm-up time depends on the particular input module. Verify the specifications in the *Input Module Guide*.

Supplement

Determining the range:

Measurement range is denoted as value per division on the vertical axis.

Setting a measurement range causes the measurement area and display area of the level monitor (on the left side of the screen) to be correspondingly changed.

It is convenient to watch the indicated display area on the level monitor while setting the range.

To enter a comment for an individual channel:

A comment entered in the comment entry field appears on the waveform.

See "5.2 Adding Comments" in the *Instruction Manual*

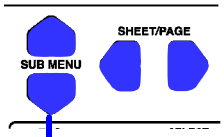
To convert the displayed units for measurements taken with a clamp or sensor, set the Scaling function.

See "5.4 Converting Input Values (Scaling Function)" on the *Instruction Manual*

5. Set Trigger Criteria

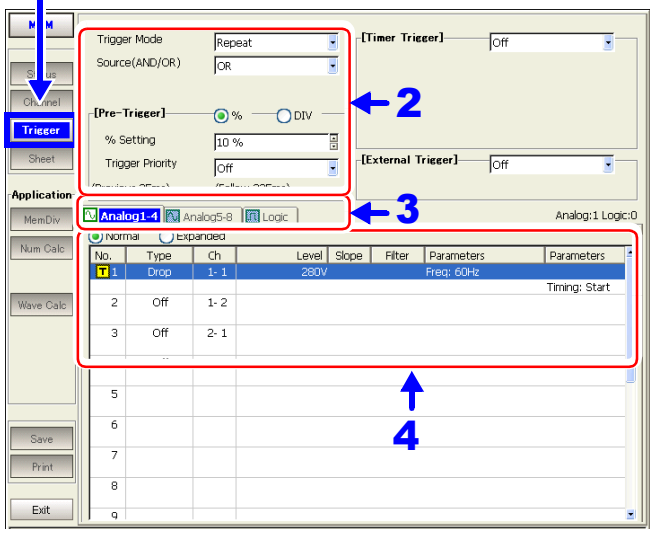
Trigger

See "Chapter 6 Trigger Settings" in the *Instruction Manual*



1 Press the **SUB MENU** keys to select the [Trigger] menu item.

Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.



2 Set the trigger.

Setting Item	Setting Value
Trigger Mode *1	**Repeat**
Pre-Trigger (% setting) *2	**10%**

See "2.3.2 Entering Text and Numbers" (p. 33)

3 Press the **SHEET/PAGE** keys to select the [Analog 1-4] page.

4 Set the analog trigger.*4

Setting Item	Setting Value
[Normal]	(default setting) (Applies one trigger to one channel)
Type	**Drop** (trigger type)
Unit	**1-1** (Unit1-Ch1)
Level *3	**280 V** (trigger level)
Parameter	Frequency: 60 Hz

Make other settings as occasion demands.

See "Chapter 6 Trigger Settings" in the *Instruction Manual*

Supplement

***1. About (trigger) modes**

- Select [Auto] if you want to view the input waveform continuously, even when no trigger is applied.
- Select [Single] if you want to record just one event and stop.
- Select [Repeat] to record continuously until you press the **STOP** key.

See "6.3 Setting the Trigger Mode" in the *Instruction Manual*

***2. About pre-triggering**

To record the waveform prior to the trigger event, set the trigger point at some percentage of the recording length.

See "6.5 Pre-Trigger Settings" in the *Instruction Manual*

***3. About (trigger) level**

The trigger level is set as an instantaneous value instead of an RMS value.

***4. About analog and logic triggering**

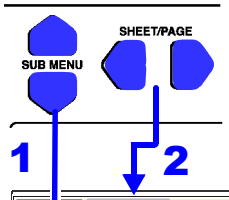
- This selection is made from the Settings dialog. Move the cursor to the [No.] field and press the **F1** [All Settings] key to display the dialog. Set each item in the dialog, and press the **ENTER** key or [Close] button when done.
- [Normal] and [Expanded] analog triggers
  Select [Normal] to apply one trigger type on one channel, and select [Expanded] to apply multiple triggers on one channel.
  (The [Normal] setting is available for level, window threshold and voltage sag trigger types.)

See "6.7 Triggering by Analog Signals" in the *Instruction Manual*

6. Enable Auto-Save

Save

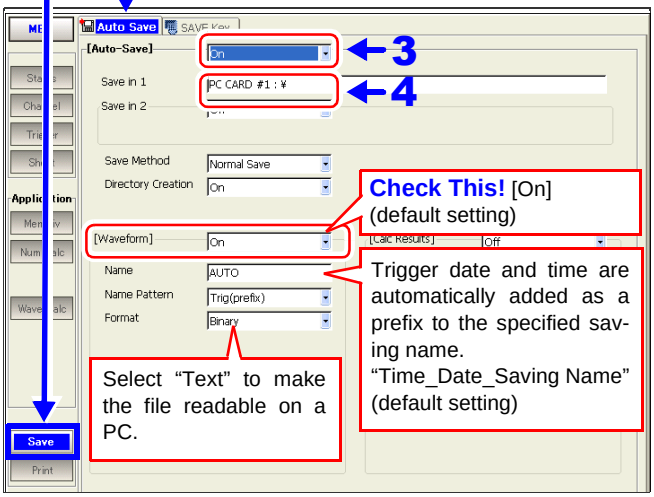
See "Chapter 11 Saving/Loading Data & Managing Files" in the *Instruction Manual*



1 Press the **SUB MENU** keys to select the [Save] menu item.

2 Press the **SHEET/PAGE** keys to select the [Auto Save] page.

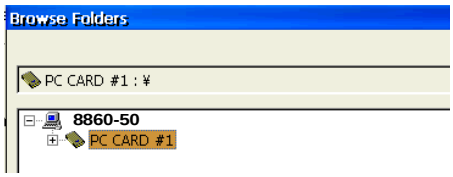
Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.



3 Set Auto Save [On].

4 Select the saving destination.

At [Save in 1], press the **F1** key to open the [Browse Folders] dialog.



CURSOR: Selects the storage media.
Select [PC Card #1] (PC Card Slot 1).

To navigate the tree, press **CURSOR**.

The waveform can now be saved with other settings in their default states. Change these settings as occasion demands.

See "11.3 Saving Data"
"11.3.4 Setting Auto Save"
"11.3.7 Automatically Saving Waveforms"
in the *Instruction Manual*

Supplement

- Using Auto Save, waveforms, numerical calculation results and screen image can be saved at the same time.
- When the [Save in 1] storage media becomes full, subsequent recording data can be stored on [Save in 2] storage media. (p. A11)
- If the [Save Method] setting is [Normal Save] (default setting) and the storage media becomes full, an error message appears. Stop measurement and change the storage media.

Verify once again before starting measurement.

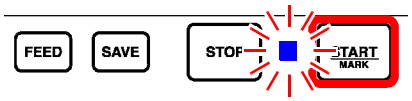
- Are connections made correctly?
- Is write-protection on the storage media disabled?
- Is storage media inserted?

What about these situations?

To record over a long period	Use high-capacity storage media. Specify a folder other than the root directory as the save destination. When more than 5,000 files have been created in one folder, a new folder is automatically created and saving continues. To continue saving even when the storage media becomes full, select [Delete Save] as the [Save Method]. When the storage media becomes full, the oldest file is deleted and saving continues. See "11.3.4 Setting Auto Save" in the *Instruction Manual*
To also print automatically	On the Print Settings screen, set Auto Print [On]. Every time a waveform is acquired, it is saved and printed. See "Chapter 12 Printing" in the *Instruction Manual*

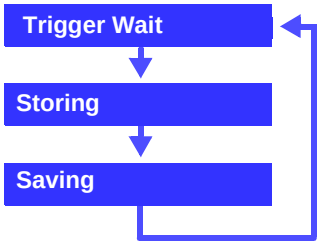
7. Start Measurement

See "3.3.6 Starting and Stopping Measurement" in the *Instruction Manual*



Press the **START** key.
The green LED lights, and the Waveform screen appears.

Status Bar Display



The instrument's measurement status is displayed on the Status bar.

Recording does not occur until the specified trigger criteria are met.

The waveform is displayed.
(If the [Roll Mode] setting is [Off] on the Status setting screen, the screen displays acquired data in quantities determined by the specified by the recording length.)

Every time data is acquired, it is saved to the PC Card and the "Trigger Wait" state is resumed.

In this measurement case, 50 divisions of data (including the pre-trigger setting of 10% of the 50-division recording length) are recorded when the voltage is 280 V (197.99 Vrms) or less, at 5 ms per division on the horizontal time axis.

Settings can be changed and the waveform can be scrolled while recording.
Recording restarts when setting are changed. ("Storage" is displayed)

8. Finish Measurement

See "3.3.6 Starting and Stopping Measurement" in the *Instruction Manual*

Press the **STOP** key.

- **Pressing Once**: Recording stops when finished acquiring data for the recording length.
- **Pressing Twice (Halt)**: Recording stops immediately.
  If you halt while awaiting a trigger, no waveform is displayed. (However, with the Memory function, the waveform does appear if the recording length is shorter than half of the maximum recording length and a trigger event has occurred before the Halt command.)

What about these situations?

You can disable the keys to prevent inadvertent operations	Hold both ◁ ▷ **CURSOR** keys simultaneously for three seconds. "Key Lock" appears under the clock display while the key-lock state is enabled. To cancel key-lock, hold the keys again for three seconds.
When "Trigger Wait" continues to be displayed and no waveform appears	If the trigger criteria are not met, no waveform is displayed (p. A11). If you need to display the waveform, execute a forced (manual) trigger. (FN Mode: **F6** key)
To view part of the waveform that is not visible while recording	Use the **SCROLL** controls to scroll the waveform. When turning the inner Jog or outer Shuttle knob, the [Scroll Trace] button appears at the left. Press the **F1** [Scroll Trace] key to return to display of the currently recording waveform. Refer to the scrolling methods: "2.3.3 Viewing Recorded Data" (p. 35)
To change settings while recording	Timebase, recording length, input channel and trigger settings can be changed from the Waveform screen. See "To Change Settings" (p. 53), "4.4 Setting Measurement Configuration on the Waveform Screen" in the *Instruction Manual*

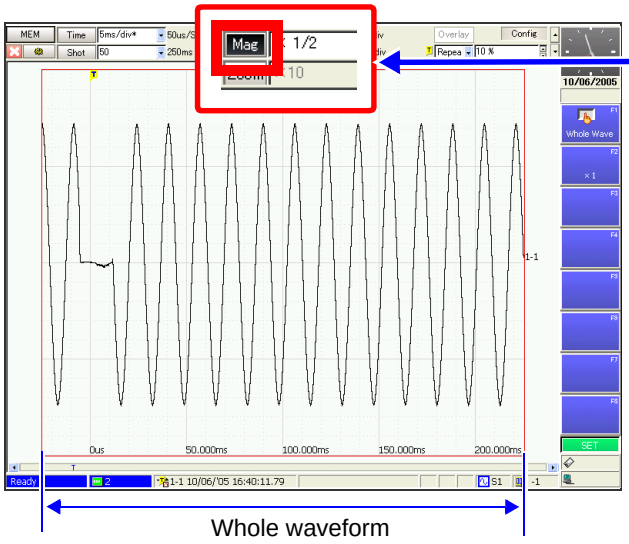
9. Analyze Data

See "Chapter 8 Waveform Screen Monitoring and Analysis" in the *Instruction Manual*

What about these situations?

To measure with changed settings	After changing settings on the Waveform or Settings screen, press the **START** key.
To load saved data from storage media	Press the **FILE** key to display the File screen, and select the file to load. See "11.4 Loading Data" in the *Instruction Manual*
To print recorded waveforms or settings	Make the appropriate settings on the Print Settings screen, and press the **PRINT** key. See "6.3 Manual Printing (PRINT Key)" (p. 78) in this manual, "12.4 Making Manual Print (PRINT Key Output) Settings" in the *Instruction Manual*
To save settings	Press the **SAVE** key and select [Settings] to choose the save type, and save. By saving settings, you can reload them later when you want to repeat measurement with the same settings. Saved settings can also be automatically reloaded when power is turned on. See "5.5 Data Saving" (p. 71) and "5.6 Data Loading" (p. 74) in this manual
To use recorded data on a PC	Select the waveform or display the image type, and save it. For details about data saving types, refer to "5.3 Data that can be Saved & Loaded" (p. 68) Use the LAN interface to connect to a PC. See "Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*

Viewing the Whole Waveform



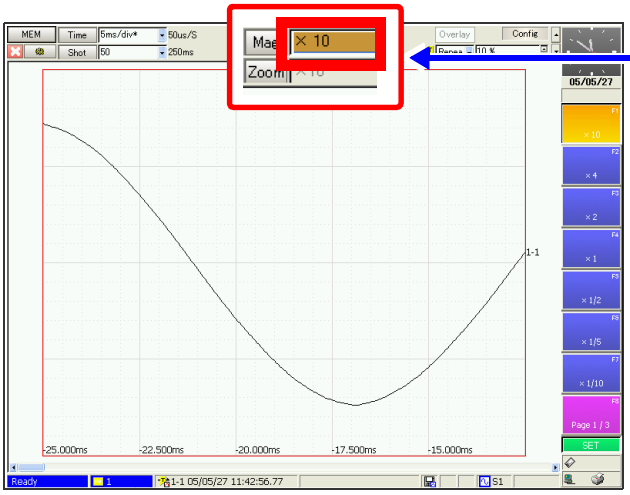
Select the [Mag] (Magnification) button

See "8.9 Magnifying and Compressing Waveforms" in the *Instruction Manual*

Using the **CURSOR** keys, move the cursor to [Mag], and press the **F1** [Whole Wave] key.

The whole waveform over the specified recording length is displayed.

Expanding Horizontally



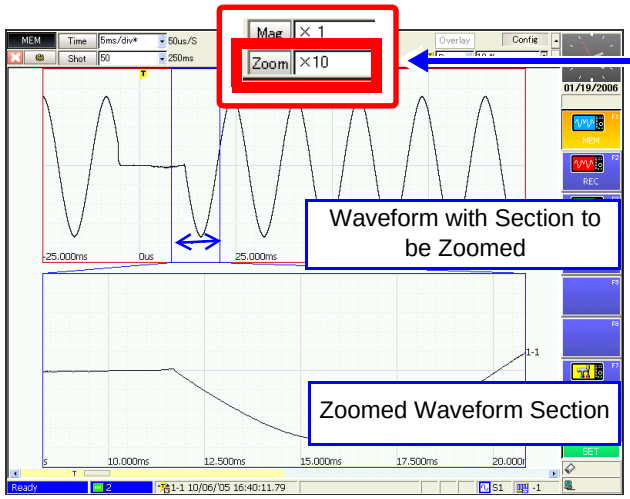
Select the horizontal axis magnification

See "8.9.1 Magnifying and Compressing Horizontally (Time Axis)" in the *Instruction Manual*

Use the **CURSOR** keys to move the cursor to the magnification setting field, and press **F1** to **F8** to select the desired magnification.

The waveform view is magnified as selected.

Zooming Part of a Waveform



Use the Zoom function

See "8.9.3 Magnifying a Section of the Horizontal Axis (Time Axis – Zoom Function)" in the *Instruction Manual*

1 Use the **CURSOR** keys to move the cursor to [Zoom], and press the **F2** [On] key.
The Zoom display is enabled.

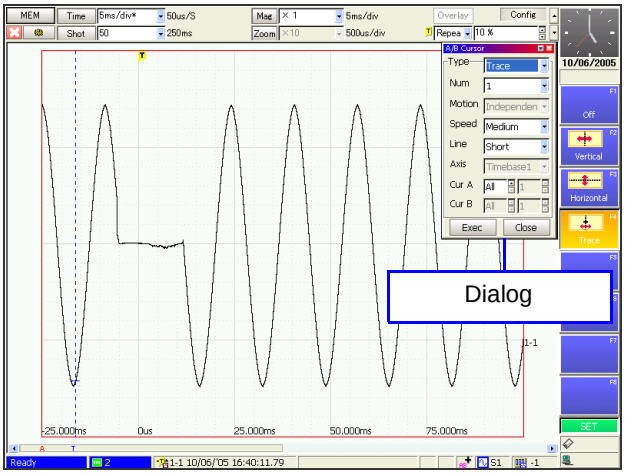
2 Move the cursor to the Zoom setting field, and select the desired magnification.

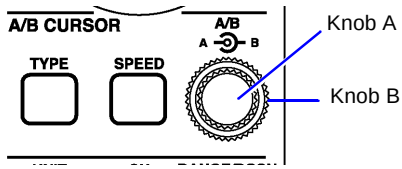
Use the **SCROLL** control to scroll the zoomed section of the waveform.
To return to the previous view, move the cursor to [Zoom], and press the **F1** [Off] key.

Viewing Measurement Values

Use the A/B cursors

See "8.8 Cursor Values" in the *Instruction Manual*



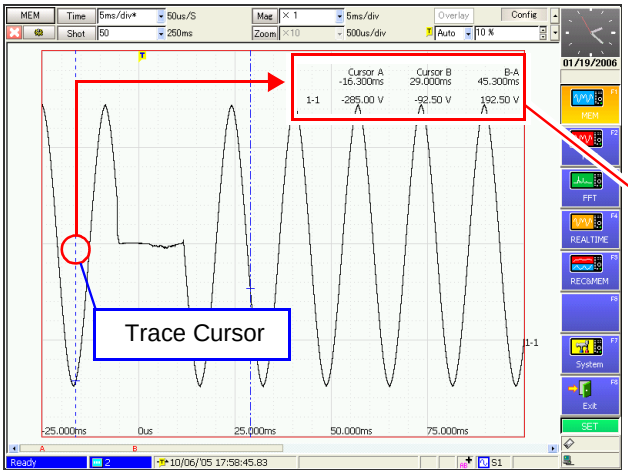


Press the **TYPE** key to select the cursor type.

The [A/B Cursor] dialog appears.

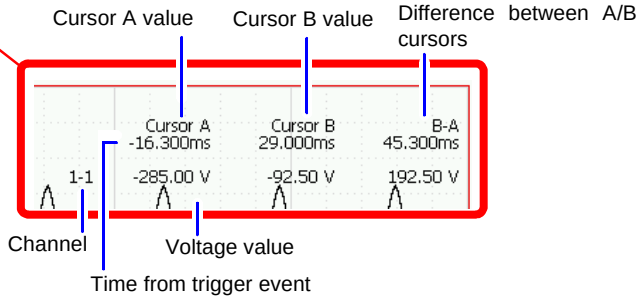
- To view the time and voltage (measurement) value: [Trace]
- To see time and period: [Vertical]
- To see the voltage value: [Horizontal]

Make other settings as occasion demands.



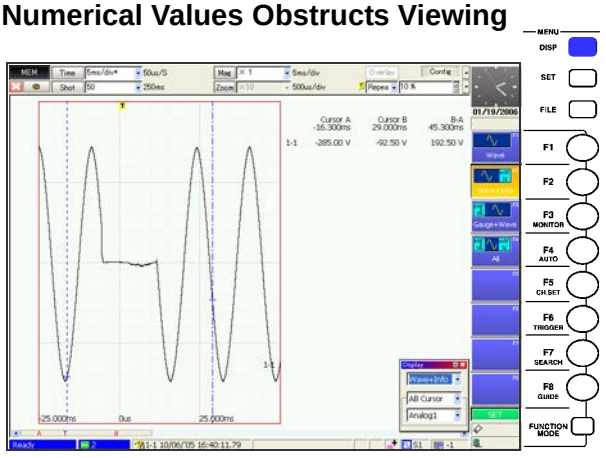
Turn inner knob A or outer knob B to move the cursor to the point to be read.

The value at the cursor is displayed.



To remove the cursors, press the **FUNCTION** key to return to the FN mode, and press the **F1** [Switch Info] key.

If Overlapping Display of Waveforms and Numerical Values Obstructs Viewing



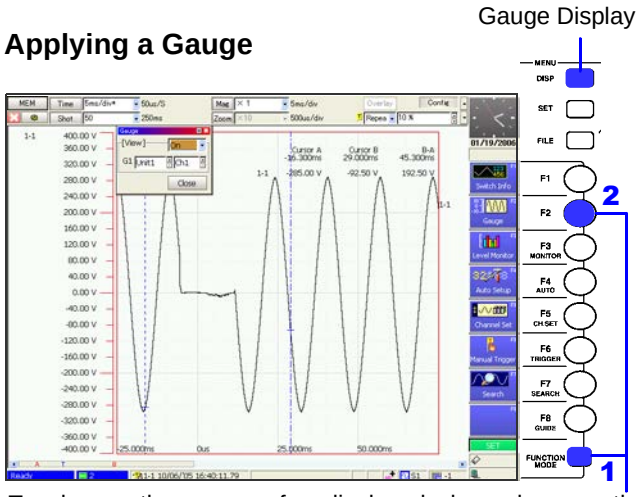
Press the **DISP** key to display method. (Waveform/ Waveform and Information Display/ Gauge and Waveform Display/ Gauge, Waveform and Information Display)

The selection can be made in the dialog.

Press the **ESC** key to close the dialog.

See "8.4 Displaying Measured Values and Information" in the *Instruction Manual*

Applying a Gauge



To change the gauge of a displayed channel, press the **FUNCTION MODE** key to enable the FN mode, and press the **F2** [Gauge] key. In the dialog, select the channel for which to display the gauge.

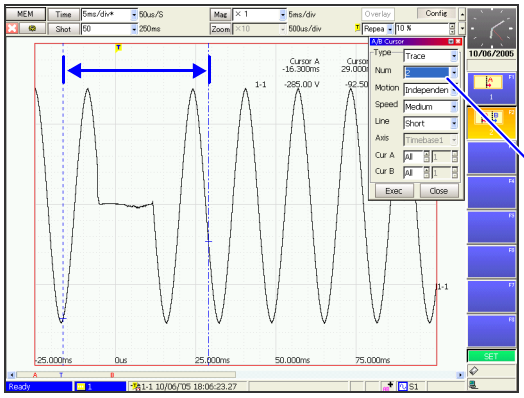
To remove the displayed gauge, press the **DISP** key to switch to Normal display.

See "8.5 Applying Gauges" in the *Instruction Manual*

10. Printing a Selected Waveform Section

See "Chapter 12 Printing" in the *Instruction Manual*

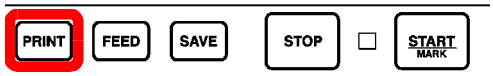
This procedure describes Selection Printing (default setting).



1 Specify the section to print using the vertical or trace cursors.

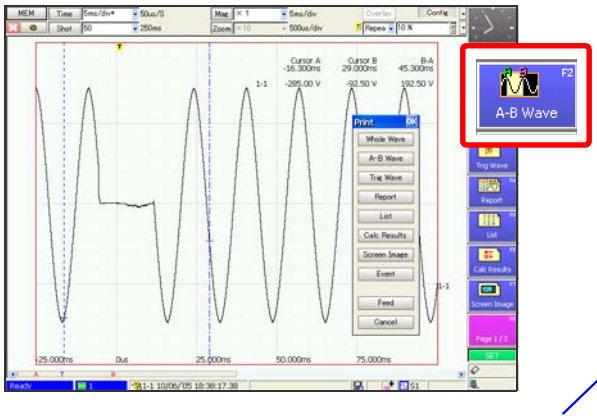
See"Viewing Measurement Values" (p. 63)

Set the number of cursors to [2].



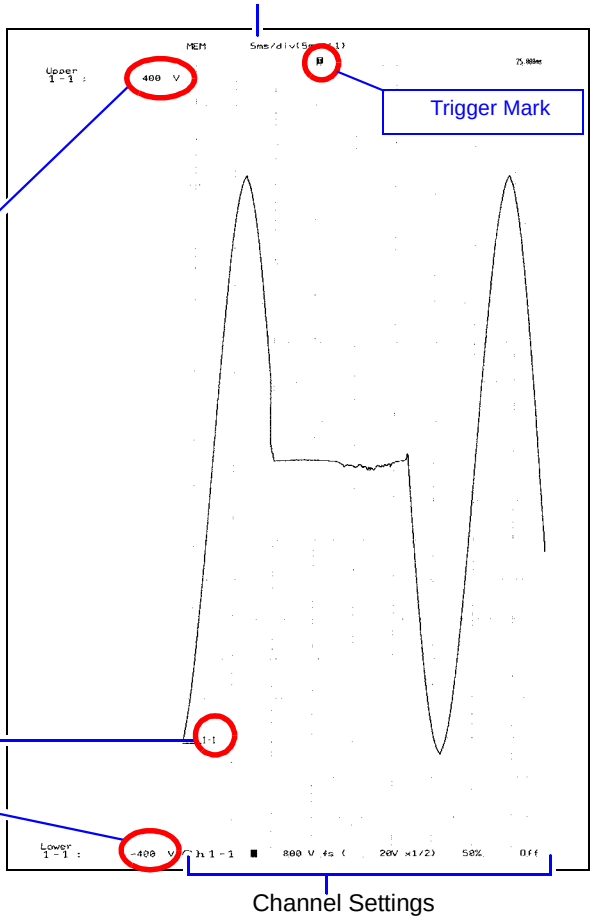
2 Press the **PRINT** key.

The [Print] dialog appears.



3 Press the **F2** [A-B Wave] key.

The specified section is printed.



Supplement

To print items other than waveforms such as a settings list, gauge and upper and lower limits, select which items you want to print on the [Print Items] page.

See "6.4 To Print a Detailed Settings List" (p. 79)

Saving & Loading Data

Chapter 5

The default at shipping and initialization of this setting is [Selection Save]. To save selections, press the **SAVE** key, make the appropriate settings and save them. You can later change your saved settings from the Save Settings screen as occasion demands.
For details, refer to "Chapter 11 Saving/Loading Data & Managing Files" in the *Instruction Manual*.

Compatible Recording Media **(p. 66)**

Data Types & Formats **(p. 68)**

Saving Procedure Overview **(p. 71)**

Compatible Data Types, and Procedures **(p. 71)**

Settings Data

Waveform Data

- Save automatically while measuring (p. 59)
- Save waveform selection after measurement (**SAVE** key)

Numerical Calculation Results

- Calculate and save automatically while measuring
- Calculate and save after measuring (**SAVE** key)

Screen Image (Display Screen)

- Save automatically while measuring
- Select and save a screen after measuring (**SAVE** key)

Load into this instrument (File Screen)

- Settings Data
- Waveform Data

File management on this instrument (File Screen)

Initialize (format) storage media

Internal storage media file and folder operations

- Copy
- Move
- Delete
- Rename
- Create folder

On-screen operations

- Sort
- Display only specified files (Filter Settings)
- Select display items from the File List (Display Settings)
- Print the File List

Handling Storage Media

See "11.1 Storage Media" in the *Instruction Manual*

This document describes saving and loading procedures using PC Cards in the internal PC Card slots.

This document describes saving procedures commonly used after measurement.

Save Procedure Details

See "11.3 Saving Data" in the *Instruction Manual*

File Size

See "Appendix 2.2 Waveform File Sizes" in the *Instruction Manual*

Loading Data

See "11.4 Loading Data" in the *Instruction Manual*

Viewing Data from this Instrument on a PC

See "Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*

Formatting Storage Media

See "11.1.5 Initializing (Formatting) Storage Media" in the *Instruction Manual*

File Management

See "11.7 Managing Files" in the *Instruction Manual*

5.1 Recording (Storage) Media

Storage Media	Remarks and Hioki Options	Storage Media Designation (when specifying the storage media type)
PC Card	(Built-in slots provided) • 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 Insert in a PC CARD slot on the right side of the instrument. (p. 67) (Two slots are provided)	PC CARD #1 (PC CARD Slot 1) *1 PC CARD #2 (PC CARD Slot 2) *1
Hard Disk	Model 9718-50 HD Unit (Capacity: 80GB) **See** "11.1.2 Using a Hard Disk" in the *Instruction Manual*	HDD
(USB drives)	Commonly available USB memory or other USB storage devices can be connected to the USB port.*3 **See** "11.1.3 Using USB Memory Devices" in the *Instruction Manual*	USB DISK #1, USB DISK #2, ... , USB DISK #5
(Networks)	Data can be transferred directly to and from PCs over a network. **See** "Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*	NETWORK #1, NETWORK #2, ... , NETWORK #10 *2

For details about saving and loading: "Chapter 11 Saving/Loading Data & Managing Files" in the *Instruction Manual*
For details about inserting storage media and connecting drives: "Preparations for Data Saving and Loading" (p. 55)

*1. Displayed when storage media is inserted.

*2. Displayed when connected to a network with sharing enabled.

*3. Not all commonly available media drives are supported.
When using a recording medium:
Do not remove the recording medium while it is being accessed (writing or reading).
Also, immediately after saving data and before removing it, verify on the File screen that the data has been saved.
No particular instrument operation is required to remove a recording medium.

⚠CAUTION

- Be sure to read the above references regarding handling of each type of recording media.
  If damage occurs to the hard disk or internal memory, we cannot restore or analyze the lost data. We therefore recommend maintaining a backup of any important data.
- Some recording media are susceptible to static electricity. Exercise care when using such products because static electricity could damage the recording medium or cause malfunction of the instrument.
- With some recording media, the instrument may not start up if power is turned on while the recording medium is inserted. In such a case, turn power on first, and then insert the recording medium. It is recommended to try out operation with a recording medium before starting to use it for actual measurements.

5.2 Using PC Cards

Important

Use only PC Cards sold by Hioki (p. 66).
Compatibility and performance are not guaranteed for PC cards made by other manufacturers. You may be unable to read from or save data to such cards.

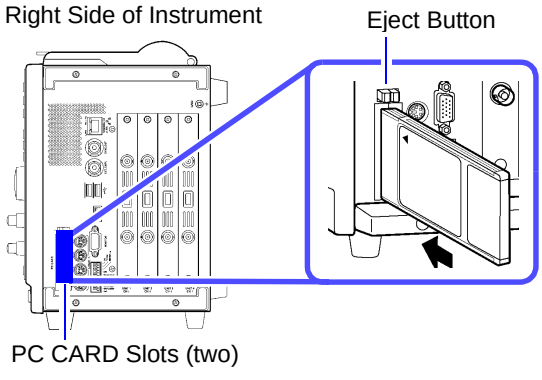
⚠CAUTION

- Format new PC Cards before use.
  To format with this instrument: "11.1.5 Initializing (Formatting) Storage Media" in the *Instruction Manual*
- Be careful to avoid inserting a PC Card backwards or upside-down. The PC Card or the instrument could be damaged.
- Never eject a PC Card while it is being accessed by the instrument. Data on the PC Card could be lost.

NOTE

- When storage media is inserted, a confirmation beep sounds, and an icon appears in the Status bar at the lower right.
  "Appendix 1 Waveform Screen Display & Icons" (p. A1)
- Be sure that storage media is inserted before selecting it for saving or loading. It cannot be displayed in the File List if it has not been inserted.
- The Flash memory in a PC Card has a limited operating life. After long-term usage, data storage and retrieval become difficult. In this case, replace the PC Card with a new one.
- We cannot provide compensation for data loss in a memory card, regardless of content or cause of the damage. Always maintain a backup of important data stored on a memory card.

PC Card Insertion & Removal



Inserting a PC Card

With the Front mark (▲) pointing toward the slot, insert the card in the direction of the arrow all the way in.

Removing a PC Card

Press the Eject button. When the button pops out, press it again to eject the PC Card.

5.3 Data that can be Saved & Loaded

The following data can be saved and loaded with this instrument. Auto Save saves the data automatically after measurement.

"O" = Possible, "–" = Not Possible

File Type	File Format	File Extension and Contents		Save		Load	PC-Readable	Reference
				Auto	Manual			
Settings Data*2 Settings made on the Settings screen, such as measurement configurations	Binary	SET	Settings data (Measurement Configuration)	—	O	O	—*5	*Instruction Manual*: "11.3.6 Saving Settings Data" "11.4.2 Loading Settings Data"*1
Waveform Data*2 All waveform data acquired by the instrument, or the waveform section demarcated by A/B cursors.	Binary	MEM	Memory Function waveform data and REC&MEM Function MEM waveform data	O	O	O	—*5,*6	*Instruction Manual*: "11.3.7 Automatically Saving Waveforms" "11.3.8 Optionally Selecting Waveforms & Saving (SAVE Key)" "11.6.2 Reading Waveform Data on a PC" "Chapter 9 Measuring with Real-Time Saving"
		REC	Recorder Function waveform data and REC&MEM Function REC waveform data	O	O	O	—*5,*6	
		RSM	Sampled waveform data from the Real-Time Saving function	O	—	O	—	
		RSR	Whole waveform data from the Real-Time Saving function	O	—	O	—	
		FFT	FFT Function Waveform Data	O	O	O	—*5	
	Text	TXT	Text Data	O	O	—	O	
Waveform Management data (Divisions)*3 Management data for dividing and saving waveform data	(Index file)	IDX	Index data for divided saving	O	O	O	—*5	*Instruction Manual*: "11.3.7 Automatically Saving Waveforms" "11.3.8 Optionally Selecting Waveforms & Saving (SAVE Key)" (when [Binary] save type is selected)
		SEQ	Index data for memory division (created automatically for batch saving)	O	O	O	—*5	*Instruction Manual*: "4.3.4 Dividing Memory" "8.12 Viewing Waveforms in Every Display Block (Memory Division)"
		RSI	Index data for the Real-Time Saving function	O	—	O	—	*Instruction Manual*: "Chapter 9 Measuring with Real-Time Saving"
		R_M	Index data for the REC&MEM function	O	O	O	—	*Instruction Manual* "Chapter 10 Long-Term Monitoring and Instantaneous Recording"
Numerical Calculation Results	Text	TXT	Text Data	O	O	—	O	*Analysis and Communication Supplement* : "1.4 Saving Numerical Calculation Results" "1.5 Reading Numerical Calculation Results on a PC"
Captured Screen Image *4	BMP	BMP	Image Data	O	O	—	O	*Instruction Manual*: "11.3.9 Automatically Saving Display Images" "11.3.10 Optionally Selecting Display Screens & Saving (SAVE Key)"
	PNG	PNG	Image Data	O	O	—	O	
Event Mark List	Text	TXT	Text Data	—	O	—	O	*Instruction Manual* "11.3.11 Saving an Event Mark List"

*1. Settings data can be loaded automatically at power-on. (Auto Setup Function)

*2. **To reload data into this instrument:**
Save it in binary format. Waveforms and some of the measurement settings are saved.
To load data into a PC: Save it in text format.
To save a waveform section, demarcate the section to save with the A/B cursors.

*3. **To load all blocks at once when memory division is enabled**:
Save using the [All Blocks] selection. A directory is created automatically, and files for the waveform data of each block and an index file (SEQ) are created. This index file is used for reloading.
To reload waveform data saved with the Divided Saving function, load the index file (IDX).
To reload waveform data in the Real-time saving function, load the index file (RSI).
To reload waveform data in the REC&MEM function, load the index file (R_M).

*4. BMP Format: This is a standard Windows graphics format. These files can be handled by many graphics programs.
PNG Format: This image file format has been internationally standardized as ISO/IEC15948.

*5. Loading is possible when using the optional Model 9725 Memory HiViewer.

*6. Loading is possible with the Waveform Viewer (Wv).

5.4 Saving Procedures and Contents

Basically, three methods are available for saving.

To save automatically while measuring

Auto Save

Automatically saves all acquired measurement data for the specified recording length. Various types of data can be saved at the same time. Select the save destination and contents before measuring (p. 59).

After installation and connection, turn power on.
Insert storage media

From the Save Settings screen, open the [Auto Save] page

Set measurement configuration, etc.

Set the Auto Save setting [On]

Specify the saving destination

Select what to save

The following can be saved simultaneously:

- Waveform Data
- Numerical Calculation Results
- Screen Image

Measure

Saving proceeds automatically

To save immediately upon pressing the SAVE key

Quick Save

This method is convenient for saving specific types of data, such as waveforms or images, or when you want to save while monitoring. Specify what you want to save before pressing the **SAVE** key.

After installation and connection, turn power on.
Insert storage media

From the Save Settings screen, open the [SAVE key] page

Set the function of the **SAVE** key to [Quick Save]

Specify the saving destination

Select what to save

Any of the following can be saved:

- Waveform Data
- Settings Data
- Numerical Calculation Results
- Screen Image
- Event list

Press the **SAVE** key*1

Save

To save selected contents

Selection Save

(Default setting)
Press the **SAVE** key to select and save the selected contents. No settings need to be made on the Save Settings screen, as settings can be made on any screen.

After installation and connection, turn power on.
Insert storage media

From the Save Settings screen, open the [SAVE key] page

Set the function of the **SAVE** key to [Selection Save]

Press the **SAVE** key.

Specify the saving destination

Select what to save

Any of the following can be saved:

- Waveform Data
- Settings Data
- Numerical Calculation Results
- Screen Image
- Event list

Select the **[Execute]** button*1

Save

Verify before saving

- Is storage media inserted?
- Is write-protection on the storage media disabled?
- Is the specified save destination correct?
- Is Auto Save set to [On] for automatic saving?

*1. To save only a section of a waveform, demarcate the section with the A/B cursors. (Saving a waveform section is not available with Auto Save)
To save a screen image, display the desired screen before saving.

5.5 Data Saving

The saving procedure for various data items using the default [Selection Save] method is described here.
Available setting contents are the same for the [Quick Save] method.
Refer to "6. Enable Auto-Save" (p. 59) for more details about Auto Save.
Refer to "11.3 Saving Data" in the *Instruction Manual* for saving procedure details.

NOTE

Before setting, verify that write-protection is disabled on the destination storage media, and insert it.

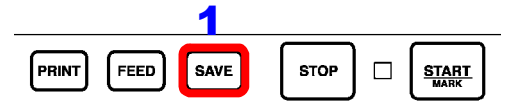
When entering a file name (to be read by a PC)

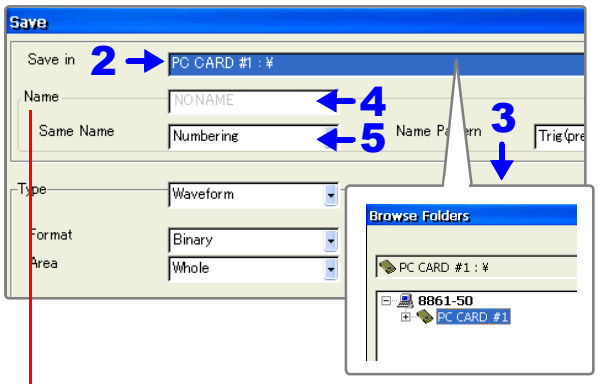
Do not use any of the following characters in a file name, as PCs running Windows 2000 or XP may not be able to handle it:

- ASCII: + = [ ] \ / | : * ? " < > ; ,
- Blank

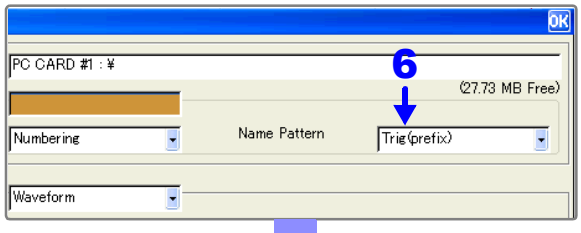
Do not use .(period) for a file name because the characters after the period are identified as the extension.

Shared Settings in Selection Save





To enter the save name:
If a keyboard is connected, you can press the **F2 [Direct]** key and enter directly from the keyboard.



Saving a Waveform (p. 72)
Saving Settings Data (p. 73)
Saving Captured Screen Images (p. 73)

1 Press the **SAVE** key.

The [Save] dialog appears.

2 Press the **F1** [Edit] key.

The [Browse Folders] dialog appears.

3 Use the ⌂▽ **CURSOR** keys to move the cursor to the storage media, and press the **F1** [OK] key.

To open a folder on the storage media, press the ▷ **CURSOR** key with the ⊞ to the left of the folder selected.

4 Press the **F1** [Edit] key to enter the file name to save. (Up to 40 characters)

See "2.3.2 Entering Text and Numbers" (p. 33)
If you have a keyboard connected, press the **F2** [Direct] key and enter from the keyboard directly.

5 If a file with the same name already exists in the destination folder, select whether to overwrite or append automatic numbering.

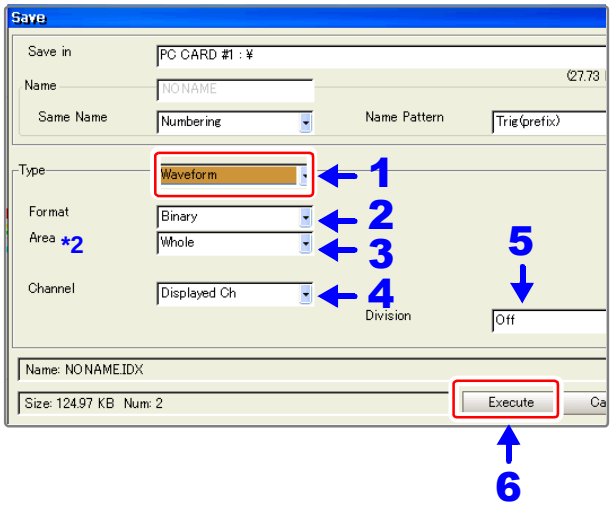
Numbering	(Default setting) If a file with the same name already exists, a number is automatically appended to the new file name to avoid duplication. (Up to four digits)
Overwrite	Duplicate existing file names are overwritten.

6 Select whether the trigger date and time should be appended before or after the specified file name.

Saving Waveforms

See "11.3.8 Optionally Selecting Waveforms & Saving (SAVE Key)" in the *Instruction Manual*

"Shared Settings in Selection Save" (p. 71)



Use the **CURSOR** keys to move the cursor to the setting item, and select the desired setting contents with the **F1** to **F8** key.

1 Press the **F2** [Waveform] key.

2 Select the data saving format.

Binary	To be able to reload data into the instrument (Default setting)
Text *1	To be able to load data into a PC

3 Select the area to be saved.

Whole	Save all measurement data. (Default setting)
A-B	Save data in the area demarcated by the A/B cursors.

4 Select the channels to save.

Displayed Ch	Saves the channels on all sheets for which waveform display is enabled [On]. (Default setting)
All Ch	Saves all stored channels.

5 (when [Binary] saving format is selected)
Select to save by divisions depending on file size.

Off	Saves as one file without divisions.
(Divisions)	If the data is larger than the specified recording length, it is divided and saved in multiple files.

See "Appendix 2.2 Waveform File Sizes" in the *Instruction Manual*

6 Press the **F1** [Execute] key.

*1. When [Text] is selected as the save type, data is saved with thinning.
Examples
2: Save every other data point. (●x●x●x...)
5: Save one of every five data points. (●xxxx●xxxx●xxxx..)
(●: saved, x: not saved)

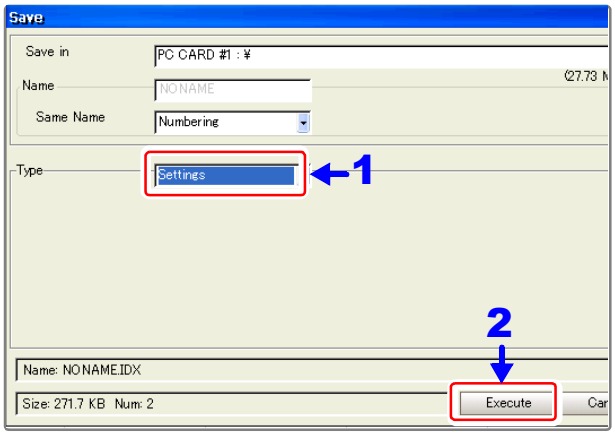
*2: [Target Blocks]
This is displayed when using the Memory Division function.
When [All Blocks] is selected, the index file (SEQ) and waveform data of all used blocks are saved as a batch.
About Memory Division:
"4.3.4 Dividing Memory" in the *Instruction Manual*

Note: Data remaining in memory is saved by manual saving with the Real-time saving function.

Saving Settings Data

See "11.3.6 Saving Settings Data" in the *Instruction Manual*

"Shared Settings in Selection Save" (p. 71)



Use the **CURSOR** keys to move the cursor to the setting item, and select the desired setting contents with the **F1** to **F8** key.

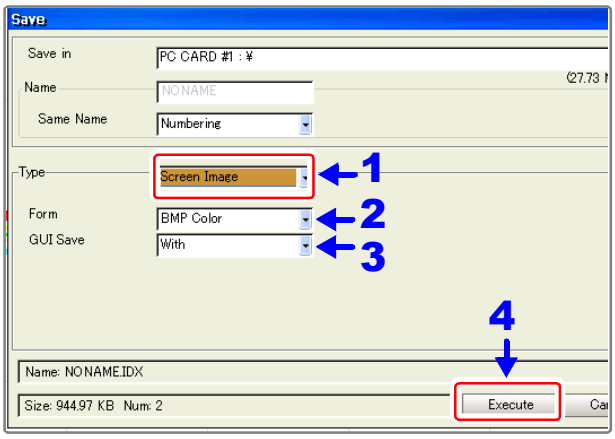
1 Press the **F1** [Settings] key.

2 Press the **F1** [Execute] key.

Saving Captured Screen Images

See "11.3.10 Optionally Selecting Display Screens & Saving (SAVE Key)" in the *Instruction Manual*

"Shared Settings in Selection Save" (p. 71)



Use the **CURSOR** keys to move the cursor to the setting item, and select the desired setting contents with the **F1** to **F8** key.

1 Press the **F3** [Screen Image] key.

2 Select the file saving format.

BMP Color	Saves a color bitmap format file. (Default setting)
Comp BMP	Saves a compressed color bitmap format file.
BMP Gray	Saves a grayscale bitmap format file.
PNG	Saves a PNG format file

3 Select whether to save the F key display (GUI area).

Without	The displayed area is not saved.
With	The displayed area is saved. (Default setting)

4 Press the **F1** [Execute] key.

5.6 Data Loading

Verify before loading

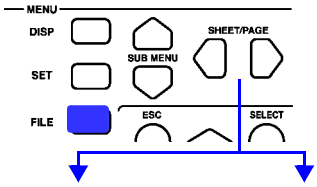
- Is storage media inserted?
- Is the loading source correct?

This instrument can load data saved in binary format.

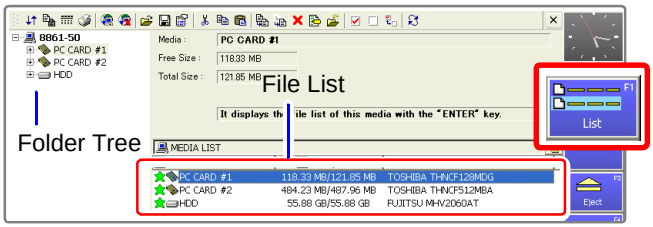
Settings Data	Waveform Data
Insert storage media	Insert storage media
↓	↓
Select the data to load (File extension: .SET)	Select the data to load (File extension: .MEM, .REC)
↓	↓
Select **F1** [Load]	Select **F1** [Load]
↓	↓
Select **F1** [Execute]	Select **F1** [Execute]
↓	↓
Load	Load

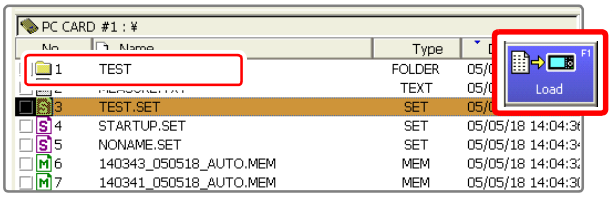
Loading Settings & Waveform Data

See "11.4.2 Loading Settings Data" and "11.4.3 Loading Waveform Data" in the *Instruction Manual*



Press the **SHEET/PAGE** keys to move the cursor.





Folder tree operations are also available.

To select a file or folder	**CURSOR** Keys
To move to or display one deeper level	**CURSOR** Key (Opens the level below the directory with the selected ⊞ symbol)
To move to or display one higher level	**CURSOR** Key (Closes levels below the directory with the ⊟ symbol)

Verify that storage media has been inserted.

1 Press the **FILE** key.

The File screen appears.

2 Use the **CURSOR** keys to select the storage media, and press **F1** [List].

The files on the selected storage media appear in the File List.

3 Use the **CURSOR** keys to select the file to load, and press the **F1** [Load] key.

If [Load] does not appear, press the **F8** key until **F8** [Page 1/3] is displayed.

File List Operations

- To open a folder: **ENTER** key
- Return to previous folder: **ESC** key

A [Confirmation] dialog appears.

4 Press the **F1** [Execute] key.

The data is loaded.

To cancel:

Press the **F2** [Cancel] key.

Chapter 6 Printing

The shipping and initial default printing method is [Selection Print]. With this setting, printing occurs after pressing the **PRINT** key and selecting what you want to print. You can change print settings as occasion demands from the Print Settings screen. Refer to "Chapter 12 Printing" in the *Instruction Manual* for details.
When using the optional printer unit, read the precautions in "3.3 Loading Recording Paper (With a Printer Module Installed)" (p. 42).

Printing Destination

- Internal Printer
- External Printer (on USB port)
  Please make sure that you read the "Appendix 2.6 Compatible External Printers" in the *Instruction Manual*.

Printing Methods (p. 76)

- Automatic Printing
  [Auto Print]: Memory Function and FFT Function
  [Real Time Print]: Recorder Function
- Manual Printing
  [Quick Print]: Prints when you press the PRINT key
  [Selection Print]: Press the PRINT key and select what to print (Default setting)

Printable Items (p. 76)

- Whole Waveform
- A-B Waveform
- Waveform before and after trigger event
- List (Settings List)
- Report
- Calculation results
- Screen image
- Event list

Depending on the print method or function, some items cannot be printed.

Description of printout types: (p. 78)
Printing examples: "12.7 Print Examples" in the *Instruction Manual*

Print Settings

- Printout Type (Waveform, Numerical Values and Screen Link)
- Print Area (Whole Waveform, A-B)
- Display value of horizontal axis (Time Value Display)

"12.6.1 Common Settings" in the *Instruction Manual*

Printer Settings

Internal Printer (Print Destination: [Printer])

- Print Density
- Paper Feed
- Print Quality

External Printer (Printing Destination: [USB])

- Paper Orientation, Margins
- Printing Colors

"12.5 Making Printer Settings" in the *Instruction Manual*

Print Setting Details (p. 79)

When printing waveforms *

- Grid Type
- Channel Markers
- List & Gauge
- Upper and Lower Limits
- Zero-Position Comments
- Counter
- Time Axis Expansion and Compression
- Gauge (when using external printer)

"12.6.2 Printing Waveforms" in the *Instruction Manual*

When printing numerical data

- Thinned numerical value data

"12.6.3 Printing Numerical Value Displays" in the *Instruction Manual*

To print comments and settings data together *

- Print Comments (Analog, Logic)
- Print Title
- Settings Data

"12.6.5 Printing Comments and Setting Data" in the *Instruction Manual*

* Some items can be set only when a particular function is enabled.

6.1 Printing Methods and Contents

Basically, three printing methods are available.

To print automatically while measuring	To print immediately upon pressing the PRINT key	To select and print specified items after measuring
Auto Print	**Quick Print**	**Selection Print**
With the Memory Function*, prints automatically after acquiring measurement data for the specified recording length. With the Recorder Function (supported only by the internal printer), prints in real time while recording. With the FFT Function, prints automatically after FFT calculation. In either case, before measuring, select the desired items to print.	Specify what you want to print before pressing the **PRINT** key. It may be convenient to print certain data optionally and to print simultaneously while analyzing.	(Default setting) After pressing the **PRINT** key, select items to print before printing. This method is convenient for printing different items each time.

* When the Roll Mode is enabled, waveforms can be printed while being displayed. (However, printing is delayed if the timebase is set faster than 500 ms/div.)

Auto Print

- Install recording paper (p. 42) After installation and connection, turn power on.
- Set measurement configuration, etc.
- Set the Auto Print setting [On]
- Select the print destination
- Select items to print
  - The following can be printed simultaneously.
    - Waveform Data
    - Numerical Calculation Results
- Measure
- Print

Verify before printing

- Is the recording paper loaded correctly?
- Is the printing destination set correctly?
- For automatic printing: Is Auto Print enabled [On]?

Quick Print

- Install recording paper (p. 42) After installation and connection, turn power on.
- Select [Quick Print] as the **PRINT** key action
- Select the print destination
- Select items to print
  - Any of the following can be printed:
    - Whole Waveform
    - A-B Waveform
    - Waveform before and after trigger event
    - Report
    - List (Settings List)
    - Calculation results
    - Screen Image
    - (Screen Link)
    - Event list
- Press the **PRINT** key
- Print

Selection Print

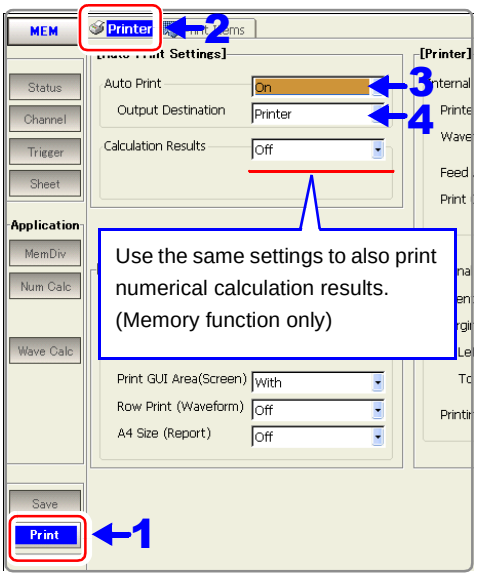
- Install recording paper (p. 42) After installation and connection, turn power on.
- Select [Selection Print] as the **PRINT** key action
- Select the print destination
- Press the **PRINT** key
- Select items to print
  - Any of the following can be printed:
    - Whole Waveform
    - A-B Waveform
    - Waveform before and after trigger event
    - Report
    - List (Settings List)
    - Calculation results
    - Screen Image
    - Event list
- Print

If both Auto Print and Auto Save are enabled, saving is performed first. However, if the Roll Mode is used with the Memory function (default setting: Auto), printing is performed first.

6.2 Printing While Recording (Auto Print)

Enable Auto Print

See"12.3 Making Auto Print Settings" in the *Instruction Manual*



1 Press the **SUB MENU** keys to select the [Print] menu.

2 Press the **SHEET/PAGE** keys to select the **[Printer]** page.
Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.

3 Press the **F2** [On] key.
Memory function and FFT function: Auto Print
Recorder function: Real-Time Printing

4 Select the printing destination. (Memory function and FFT function only)

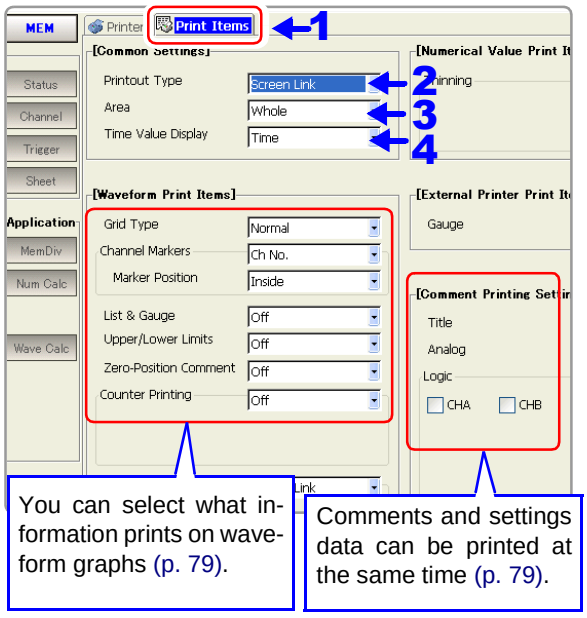
Printer	Print using the internal printer.
USB	Print using an external printer. Please make sure that you read the "Appendix 2.6 Compatible External Printers" in the *Instruction Manual*.

Make other printer settings as occasion demands.

See "12.5 Making Printer Settings" in the *Instruction Manual*

Selecting Items to Print

See "12.6 Setting the Print Content" in the *Instruction Manual*



Make other changes to waveform, numerical value, comment settings as occasion demands (p. 79).

Start Measurement: Press the START key.

Data automatically prints after acquisition by the instrument.

1 Press the **SHEET/PAGE** keys to select the [Print Items] page.
Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.

2 Select the recording format for the printer.

Waveform, Numeric, Screen Link (Default setting)

With **[Screen Link]**, the printout corresponds to actual display appearance.

3 Select the area to be printed.

Whole (Default setting) or **A-B**

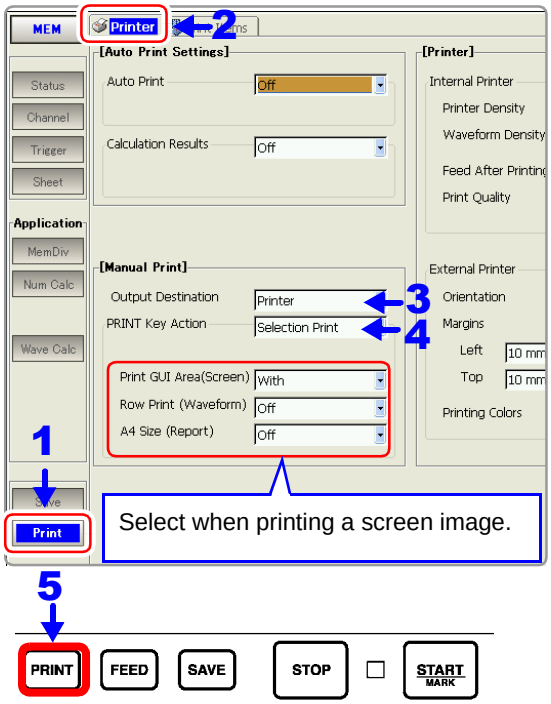
[A-B] prints the data between A/B cursors.

4 Select the horizontal axis value (timebase display).

Time	Time from trigger event (units are fixed) (Default setting)
Mod 60	Time from trigger event (units are modulo 60)
Scale	Number of divisions from trigger event
Date	Time of waveform acquisition
Samples	Number of samples from trigger event

6.3 Manual Printing (PRINT Key)

The [Selection Print] method is described here. To use the [Quick Print] method, refer to "12.4 Making Manual Print (PRINT Key Output) Settings" in the *Instruction Manual*.



1 Press the **SUB MENU** keys to select the [Print] menu.

2 Press the **SHEET/PAGE** keys to select the [Printer] page.

Now use the **CURSOR** keys to move among the setting items, and press the **F1** to **F8** keys to select the desired setting.

3 Select the printing destination.

Printer	Print using the internal printer.
USB	Print using an external printer. Please make sure that you read the "Appendix 2.6 Compatible External Printers" in the *Instruction Manual*.

4 Press the **F2** [Selection Print] key.

Change items to print as occasion demands on the [Print Items] page (p. 77).

5 Press the **PRINT** key.

6 Press the **F1** to **F8** keys to select what you want to print.

Whole Wave	Prints all waveform data acquired by the instrument.
A-B Wave *1	Prints the section of the waveform demarcated by the A/B cursors (vertical or trace cursors). When either of the A/B cursors is off the screen, the section between A-B cursors is printed. **Before selecting**: Specify the print area with the A/B knobs. Starting and ending points can be represented by either cursor.
Trig Wave *1	Prints 10 divisions of the waveform before and after the central trigger event.
Report	Prints the waveform data of the displayed area on the waveform screen, upper and lower limits and analog channel settings.
List	Prints a list of the settings on the Settings screen.
Calc Results *2	Prints numerical calculation results.
Screen Image	Prints a captured image of the displayed screen. **Before selecting**: Display the screen to be printed.
Event List	Prints an event mark information list.
Feed	Feeds the paper.
Cancel	Cancels printing

The selected items are printed.

*1. For all except the FFT function

*2. Memory function only.

Want to stop printing?

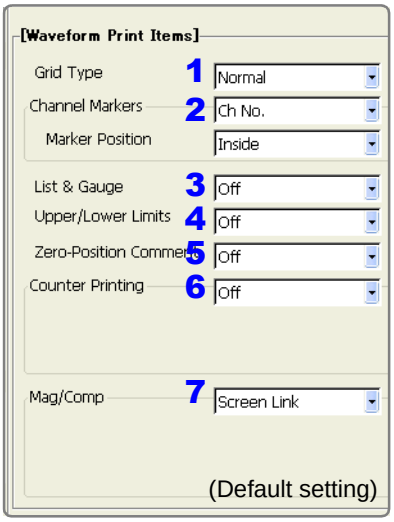
Press the **STOP** key.

To print numerical data:

On the [Print Items] page, set the [Printout Type] to [Numeric]

6.4 To Print a Detailed Settings List

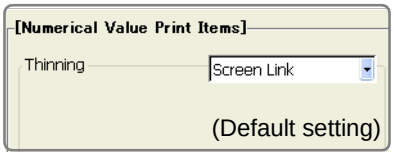
When printing waveforms [Waveform Print Items]



See "12.6.2 Printing Waveforms" in the *Instruction Manual*

	Setting Item	Selection	Description
1	Grid Type	**Off, Normal, Fine, Normal (Dark), Fine (Dark), Time Axis or T-Axis (Dark)**	Select the type and darkness of the printed grid.
2	Channel Markers	**Off, Ch No. or Comments**	Select whether to print channel numbers or comments with waveforms. (Analog channels only)
	Marker Position	**Inside or Outside**	Select the channel marker position.
3	List & Gauge	**Off, List, Gauge or List & Gauge**	Select whether to print a list or gauge.
4	Upper/ Lower Limits	**Off or On**	The upper and lower limits of each channel can be printed. When scaling is enabled, the limit values are in scaled units.
5	Zero-Position Comment	**Off or On**	Select comment printing at the zero position of each channel. (Analog channels only)
6	Counter Printing	**Off, Date or Name**	Select whether to print the number of acquired waveforms or counter name. This is convenient for distinguishing similar waveforms.
7	Mag/Comp	**Screen Link or No Screen Link**	The time axis of waveforms to be printed can be expanded or compressed. (When [No Screen Link] is selected, screen expansion and compression settings do not affect printouts) With the REC&MEM function enabled, all settings for the Record and Memory waveforms are allowed.

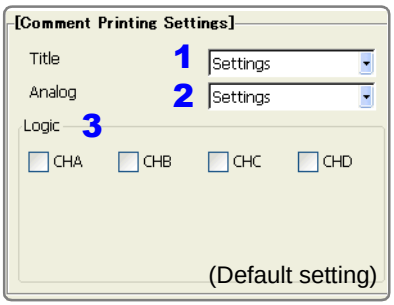
When printing numerical values [Numerical Value Print Items]



See "12.6.3 Printing Numerical Value Displays" in the *Instruction Manual*

Setting Item	Selection	Description
Thinning	**Screen Link or No Screen Link**	When data is displayed with numerical values on the Waveform screen, select whether the thinning setting is linked to the screen.

When printing comments [Comment Printing Settings]



See "12.6.5 Printing Comments and Setting Data" in the *Instruction Manual*

	Setting Item	Selection	Description
1	Title	**Off, Settings, Comments, Set& Com**	Select whether to print a title and settings data (Function, Timebase, Time Axis Magnification Ratio, Trigger Time).
2	Analog	**Off, Settings, Comments, Set& Com**	Select whether to print comments for each analog channel, or channel settings (measurement range, vertical axis expansion or compression, zero position, low-pass filter, full-scale value of range [or upper and lower limits when Variable is enabled]).
3	Logic	**On or Off**	Select whether to print comments for each logic channel.

6.4 To Print a Detailed Settings List

Maintenance and Service Chapter 7

7.1 Troubleshooting

Inspection, Repair and Calibration

Refer to "Appendix 1 Error Messages" in the *Instruction Manual* for error messages.

HDD formatting, initializing of instrument settings, upgrading to the latest software version may be carried out during repair and restoration. Please backup any important data before sending it for repair and calibration.

⚠CAUTION

If damage occurs to the hard disk, we cannot restore or analyze the lost data. We therefore recommend maintaining a backup of any important data.

NOTE

If damage is suspected, check the "Before returning for repair" (p. 82) section before contacting your dealer or Hioki representative.

Transporting

- 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.
- To avoid damage to the instrument, be sure to remove the PC cards before shipping.

Replaceable Parts

Certain parts require replacement periodically and at the end of their useful life: (Useful life depends on the operating environment and frequency of use. Operation cannot be guaranteed beyond the following periods)

Part	Life	Part	Life
Fan Motor	Approx. 4 years	Model 9718-50 HD Unit (Drive)	Approx. 20,000 hours
Printer	After using 1,000 rolls of the recording paper	LCD	Approx. 52,000 hours
		Backlight (to half brightness)	Approx. 50,000 hours
Electrolytic capacitors	Approx. 4 years (The useful life of electrolytic capacitors varies greatly according to the operating environment. In severe operating environments (40°C ambient temperature), degradation occurs in about four years, so they should be replaced periodically.)		
Lithium battery	Approx. 10 years (This instrument contains a built-in lithium battery to back up settings and the real-time clock. Have the battery replaced if the date and time are found to lag substantially or if settings are not retained when power is turned off and back on. 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.

Disposing of the Instrument

NOTE

This instrument includes a lithium battery to retain settings. Remove this battery before disposing of the instrument. Also remove the optional Model 9719-50 Memory Backup Unit, if installed.

See "Appendix 6 Disposing of the Instrument" in the *Instruction Manual*

Before returning for repair

If Power and Operating Keys Malfunction

Symptom	Check Item, or Cause	Remedy and Reference
The display does not appear when you turn the power on.	Is the power cord disconnected? Are connections made correctly?	Verify that the power cord is connected properly. "3.4 Connecting the Power Cord" (p. 45)
Keys do not work.	• Is any key being held down? • Is the key-lock state active (Key-Lock message displayed)? • Is remote control from a PC over the Web enabled?	• Verify key operation. • Deactivate the key-lock state. (Hold the ◁ ▷ **CURSOR** keys for three seconds) • Press the **SET** key to release the key-lock.

If the Display or Operations Malfunction

Symptom	Check Item, or Cause	Remedy and Reference
A waveform does not appear when you press the **START** key.	• Is the “Pre-Trig Wait” message displayed? • Is the “Trigger Wait” message displayed?	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 clamp sensor or connection cable connected correctly? • Is the measurement range set properly? • Is the low-pass filter enabled?	Verify that the clamp sensor or connection cable is connected correctly. "Chapter 2 Connections" in the *Input Module Guide* Verify the input channel settings.
While measuring with the memory function, the displayed frequency is much lower than the actual frequency.	Aliasing may be occurring.	Change the timebase to use a faster sampling rate. "Appendix 4 Supplemental Technical Information" in the *Instruction Manual*
Some channels are unusable.	Is the channel enabled for use?	"4.2.1 Selecting Channels to Use" in the *Instruction Manual*
The displayed waveform size does not change when the input range is changed.	Is the Variable function enabled?	Turn the Variable function off. "8.9.4 Setting Arbitrary Waveform Height and Position on the Vertical (Voltage) Axis (Variable Function)" in the *Instruction Manual*

Cannot Print, or Printing Malfunctions

Symptom	Check Item, or Cause	Remedy and Reference
Nothing prints on the paper.	Is the paper reversed (back to front)?	Verify that the recording paper is loaded correctly. "3.3 Loading Recording Paper (With a Printer Module Installed)" (p. 42)
Printout is too light.	• Is the specified recording paper being used? • Is the print density setting correct? • Is the print head dirty?	Try changing the print density setting. "12.5.1 Internal Printer Settings" in the *Instruction Manual* Clean the print head. "Print Head Cleaning" (p. 85)
Recording traces are too wide.	The input signal may have a ripple component.	Enable the filter in the input module settings. "3.11.3 Low-Pass Filter (LPF) Settings" in the *Input Module Guide*
Recording traces are doubled.	Is the waveform printing density set to [Light]? In this case, printed dots are spaced out in the vertical direction. Therefore, a slightly varying waveform prints sometimes as one line, and sometimes as two.	Change to waveform printing density setting to something other than [Light]. (Print Settings Screen) "12.5.1 Internal Printer Settings" in the *Instruction Manual*
Printing does not work.	• Is the printer's head-raising lever in the correct (head-lowered) position? • Is the recording paper loaded correctly? • Are the printer output settings appropriate?	Verify printer installation/connection and settings, and try printing again. "3.3 Loading Recording Paper (With a Printer Module Installed)" (p. 42), "Chapter 12 Printing" in the *Instruction Manual*

If Saving is Not Possible

Symptom	Check Item, or Cause	Remedy and Reference
If saving is not possible to PC Card storage media.	• Is write-protection on the storage media disabled? • Is the storage media inserted properly? • Is the storage media formatted? • Is the remaining capacity of the storage media too low?	"5.1 Recording (Storage) Media" (p. 66) "5.2 Using PC Cards" (p. 67)

If the cause is unknown

Try performing a system reset. All settings are returned to their factory defaults.

See "13.3.3 Initializing System Settings (System Reset)" in the *Instruction Manual*

For other problems, refer to the Appendix or the Index in the *Instruction Manual*.

7.2 Cleaning

Cleaning the Instrument and Input Modules

NOTE

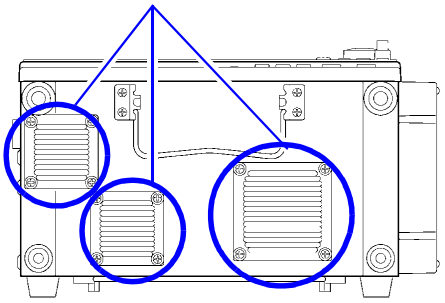
- To clean the instrument and input modules, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
- Wipe the LCD gently with a soft, dry cloth.

Cleaning the Air Filters

⚠CAUTION

Air filters are installed in the bottom panel of the instrument. Clean them periodically before severe dust buildup occurs. If a filter becomes clogged, the instrument's internal cooling is impeded, and damage may result.
Also, be sure to thoroughly dry the filters before reinstalling. Operating with a wet filter may cause damage.

Filter Covers



1 Turn the instrument off.

2 Place the instrument with the front upwards.

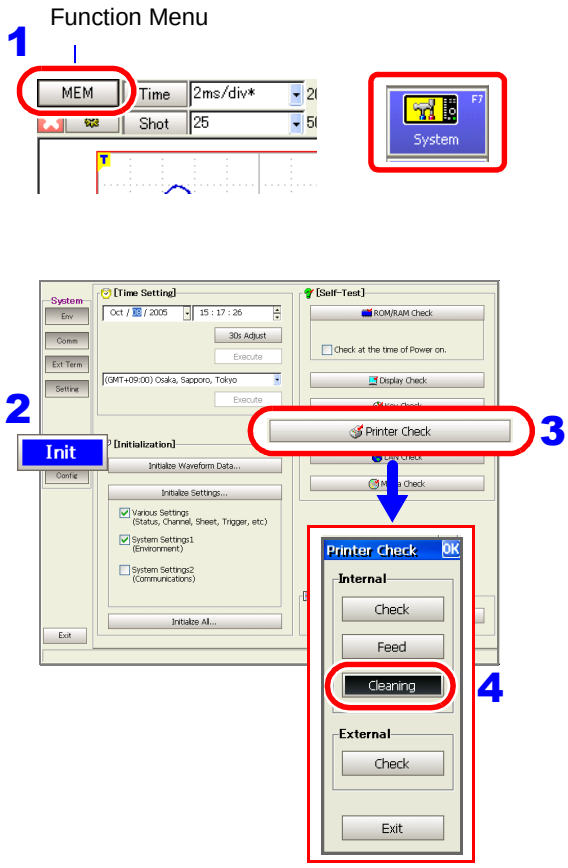
3 Use a vacuum cleaner to remove any dust or grime from the filters.

Print Head Cleaning

Normally, no maintenance is required. However, depending on usage conditions, dirt and paper dust may accumulate on the thermal head over the long term, causing light or smeared printing. In this case, clean the head by the following procedure.

Self-Check Cleaning

Before Cleaning
Recording paper is required to clean the print head. Verify that the recording paper is loaded correctly.



1 Use the **CURSOR** keys to move the cursor to the Function menu, and press the **F7** [System] key.

The System screen appears.

2 Press the **SUB MENU** keys to select the [Init] menu item.

The Init (Initialization) Settings screen appears.

3 Use the **CURSOR** keys to move the cursor to the [Printer Check] button, and press the **F1** [Execute] key.

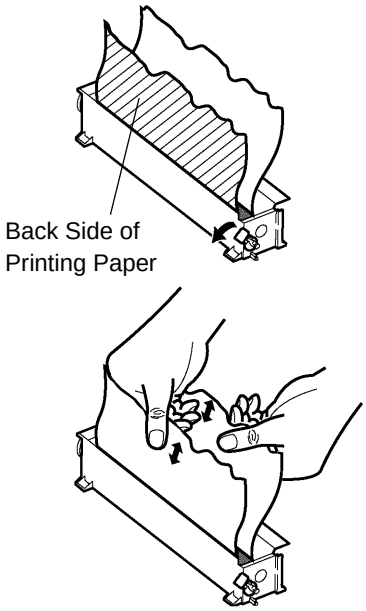
The [Printer Check] dialog appears.

4 Move the cursor to [Cleaning], and press the **F1** key.

The paper should print solid (100%) black. Check for any smearing.

If sufficient improvement is not obtained even after cleaning several times, wash the print head (p. 86).

Washing the Print Head



1 Moisten the back side of a piece of printing paper with undiluted alcohol, and insert it into the printer. If the front side is moistened, it becomes discolored.

Be careful not to apply too much undiluted alcohol.

2 Lower the head-raising lever, and wash the head by sliding the paper back and forth.

NOTE

About the Print Head

To avoid discoloring or deforming the instrument, observe the following precautions:

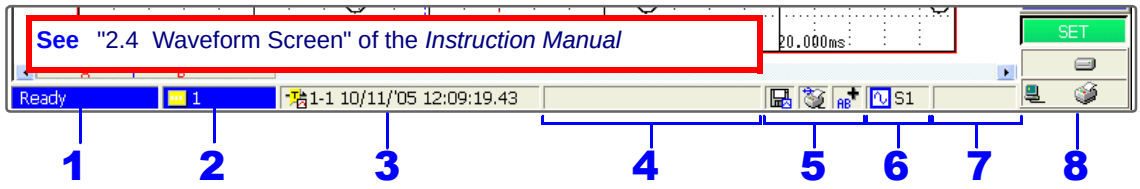
- Do not use organic solvents such as thinner or benzene
- After washing, allow the printer to dry completely before use.

About the Roller Surface

- White powder such as paper dust may accumulate on the roller surface after long-term use. A small amount should have no effect on printing, but can be removed with a commonly available camera blower brush if it causes concern.
- Always use the paper cutter on the printer's cover to cut the printed paper. Excessive paper dust can accumulate on the roller if the paper is cut by the print head.

Appendix

Appendix 1 Waveform Screen Display & Icons



1 Internal Processing State

Pre-Trig Wait	Before acquiring data Appears only when pre-trigger recording is enabled.
Trigger Wait	Trigger wait state
Timer trigger Wait	Timer trigger wait state
Scanner Wait	Scanner preparation state
Storing	Data acquisition in progress
Storing Done	Finished acquiring data
MEM End	End of Memory waveform acquisition (REC&MEM function)
Waveform	Waveform generation in progress
Calculating (n/m)	Numerical value calculation in progress
Calculating (Zn)	Waveform calculation in progress
FFT (n/m)	FFT calculation in progress
Averaging	Averaging calculation in progress
Stopped	Operation stopped
Preparing	Preparation in progress
Ready	Idle state
Printing	Printing in progress
Saving	Saving in progress
Auto-Ranging	Automatic range detection in progress
Complete	Finished automatic range detection
(File Name)	Name of loaded file

2 Storage Events

(No. of Times)	Number of data acquisitions

3 Trigger Info

1-1 10/11/'05 12:09:1 Trigger cause, date and time

4 Sub Message

Estimated time to storage completion (Appears when 10s or longer)

Count to be Averaged(n/m)

- Simple Averaging (Time axis)
- Simple Averaging (Frequency)
- Exponential Averaging (Time axis)
- Exponential Averaging (Frequency)
- Peak hold (Frequency)

5 Setting Info

- Auto Save (Waveforms)
- Auto Save (Calculations)
- Auto Save (Waveforms & Calculations)
- Auto Save (Screen images)
- Auto Save (Waveforms & Screen images)
- Auto Save (Calculations & Screen images)
- Auto Save (Waveforms & Calculations & Screen images)
- Auto Print
- Auto Print (External Printer)
- Vertical Cursor
- Horizontal Cursor
- Trace Cursor

6 Display Sheet*1

- Waveform
- FFT
- X-Y Composite
- Nyquist
- Numerical Values
- FFT+Nyquist
- Waveform + X-Y Composite
- Waveform + FFT
- Waveform + Nyquist

7 Display Information

- Block number when measuring with Memory Division enabled*2
- Displayed block number for Memory Division*2
- New: (FFT function) Use newly acquired data for calculations.
- MEM: (FFT function) Use pre-existing data for calculations.

8 Peripheral Device Info

PC Card

(Blank) No Card
- Card Present
- GP-IB Card

Internal Storage Media

- Internal Hard Drive

FD Drive

(Blank) No diskette present
- Diskette present

LAN

- Connection Status

(Blank) Disconnected

Power Supply

(Blank) AC power supply
- DC power supply

Internal Printer

(Blank) Printer not installed
- Printer Installed
- Head-raised error *3
- Out-of-Paper error *4

Battery Charge State
(When Model 9719-50 Memory Backup Unit is installed)

(Blank) Disconnected
- Rapid charging
- Rapid charging finished

Charging finishes about two hours after power on.

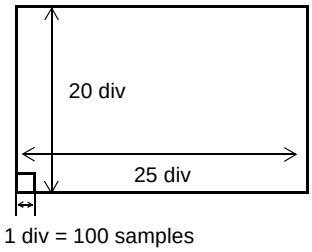
*1. Press the **SHEET/PAGE** keys to switch sheets.
*2. Press the **SHEET/PAGE** keys to switch blocks.
*3. Check the position the head-raising lever.
*4. Replace with new recording paper.

Appendix 2 Overview of Settings and Functions

Instrument Settings

About the Screen

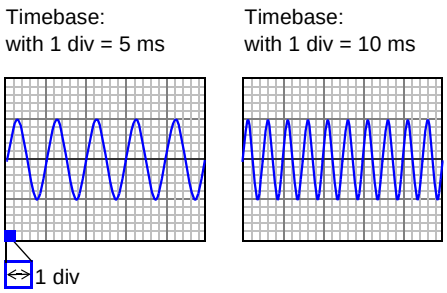
The instrument's LCD provides SVGA (800 × 600) resolution. The waveform display area consists of 625 horizontal dots and 500 vertical dots. The waveform display area is divided into 25 divisions horizontally, and 20 divisions vertically, with each division composed of 25 dots horizontally and vertically.
Each data frame (one division) represents 100 samples horizontally, and 80 to 1600 data bits vertically. (depending on the input module)
Each displayed data frame (one division) changes in accordance with expansion and compression of the time and voltage axes.



Setting the Timebase (Horizontal Axis)

See "4.2.2 Setting the Timebase (Horizontal Axis) and Sampling Rate", "8.9 Magnifying and Compressing Waveforms", and "Appendix 4.3 Measurement Frequency Limit" in the *Instruction Manual*

The input signal acquisition rate corresponds to time per division on the horizontal axis.
Determining the timebase: Calculate from the frequency and period.
f [Hz] = 1/t [s] (f: frequency, t: period)
Example: If the measurement frequency is 50 Hz: 50 [Hz] = 1/t [s]
t = 1/50 [s] = 0.02 [s] = 20 [ms]
So to display five cycles on the screen (25 divisions horizontally), 20 [ms] × 5/25 [div] = 4 ms/div
Select 5 ms/div for the timebase, which is the closest available setting to the calculated value.



To measure phenomena with relatively fast signals such as instantaneous waveforms, we suggest setting a small value (if the frequency is 50 Hz, the timebase should be set faster than 5 ms/div).

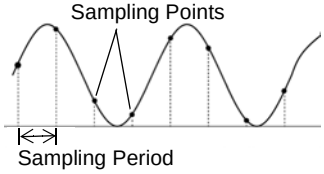
During and after measurement, waveforms can be expanded and compressed along the time axis.

- To expand and compress: Change the expansion and compression ratio. (p. 62)
- To expand a specified section (Memory function only): Use the Zoom function. (p. 62)

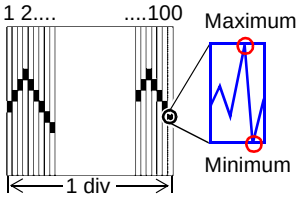
Timebase and Sampling

See "Appendix 4.1 Sampling" and "Appendix 4.4 Recorder Function Values" in the *Instruction Manual*

For the Memory Function (Sampling point recording):
The sampling period is 1/100th of the timebase. When the timebase is set to 100 µs/div, the sampling period is 1 µs. Changing the timebase setting also changes the sampling period accordingly.



For the Recorder Function (Envelope recording):
One data point is recorded every 1/100th of the timebase as two amplitude values: the maximum and minimum values measured during the specified sampling period. With the 10 ms/div timebase, one data point is recorded every 100 µs. When the sampling period is set to 1 µs, 100 samples are provided in order to record each data point. The values recorded for each data point are maximum and minimum values among these 100 samples.



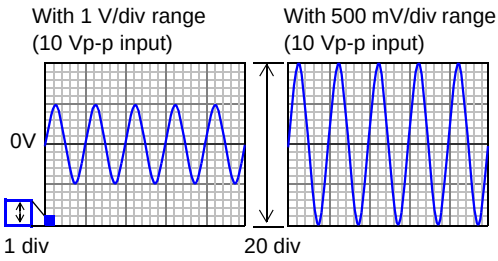
Recording Length Setting

See "4.2.4 Setting the Recording Length (number of divisions)" in the *Instruction Manual*

Set the length (number of divisions) to record each time data is acquired. Each division of the recording length consists of 100 data points. The number of data points of the whole recording length is the specified recording length (divisions) × 100, + 1.
Example. The number of data points when the specified recording length is 50 divisions: 50 div × 100 data points + 1 = 5001 data points

Measurement Range Setting

Select the amplitude range for measurement. The setting value is the number of units per division on the vertical axis.
About Resolution (vertical division)
Measurement resolution depends on the particular input module.
(with x1 voltage axis magnification)



Input Modules	Resolution (bits/div)	Screen Full Scale (bits)	Minimum Resolution
8936 to 8940, 8946, 8947, 8959	80	1600	5 V/80 = 62.5 mV *
8956	100	2000	5 V/100 = 50 mV *
8957, 8960, 8961 8958 [Voltage] Mode	1600	32000	5 V/1600 = 3.125 mV*
8958 [Temp] Mode	1000	20000	10°C/DIV = 0.01°C

* When measurement range is 5 V/div

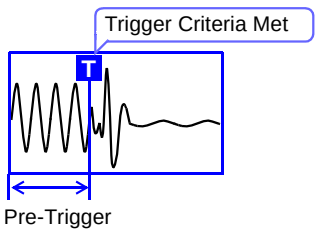
- Displayed Range (Screen Full scale) is 20div (with x1 voltage axis magnification) .
  Measurement Range (Effective data range) is 20 div (with x1 voltage axis magnification).
  However, for [Temp] mode for the Models 8937 and 8958, the measurement range differs depending on the range.
  See "3.11.1 Measurement Range Setting" - “Temperature Measurement” in the *Input Module Guide*
- The measurement range and display range can be confirmed in the level monitor of the Channel Settings Screen.
  See "4. Set up the input channel" (p. 57)
- For Input module settings:
  See "Chapter 3 Input Channel Settings" in the *Input Module Guide*
- For Input module specifications:
  See "5.2 Analog Input Section"」in the *Input Module Guide*

- **To expand and compress:** Change magnification of the vertical axis. ("8.9 Magnifying and Compressing Waveforms" of the *Instruction Manual*)
- **To shift the position on the vertical axis:** Change the zero position. ("7.1.2 Setting the Waveform Display Position (Zero Position)" of the *Instruction Manual*)
- **To display converted units:** Use the Scaling function. ("5.4 Converting Input Values (Scaling Function)" of the *Instruction Manual*)
- **To freely set the display area of the vertical axis:** Use the Variable function. ("8.9 Magnifying and Compressing Waveforms" of the *Instruction Manual*)

About Trigger and Pre-Trigger Recording

See "Chapter 6 Trigger Settings" in the *Instruction Manual*

When recording a specific signal with recording criteria (trigger criteria) set, the waveform can be recorded only when the trigger event occurs. To view phenomena prior to the trigger event, set the Pre-Trigger value to the amount of data your want to record before the event occurs.
Example: When the recording length is set to 1000 div and Pre-Trigger is set to 5%
The pre-trigger recording length (data points) is 1000 div × 5% = 50 div (5000 data points).

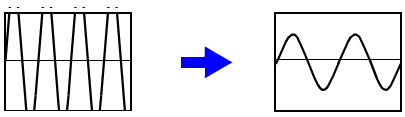


Convenience Functions

If the appropriate timebase or measurement range is unknown

Auto-Ranging Function

See "3.3.5 Automatic Range Setting (Auto-Ranging Function)" in the *Instruction Manual*

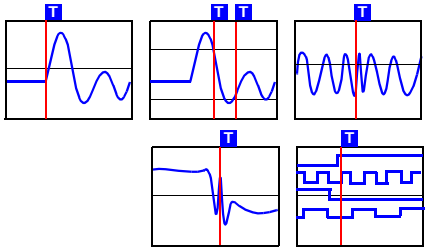


Automatically selects the timebase and range settings to display 1 to 2.5 waveform cycles.

To record and search for waveform anomalies:

Trigger Function and Waveform Search Function

See "Chapter 6 Trigger Settings", "8.14 Searching a Waveform" in the *Instruction Manual*

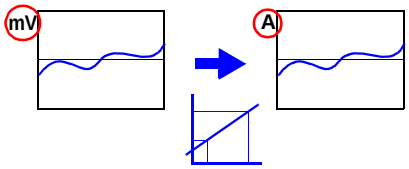


Trigger signals can be generally be obtained from the following sources: Analog trigger, logic trigger, external trigger, timer trigger and forced (manual) trigger. A trigger can be applied as a result of one or a combination of these criteria, except for the Manual trigger.
Also, after measurement, any waveform can be searched and displayed using the Search function.

To display with actual measurement units or to fix the display level of the waveform

Scaling Function

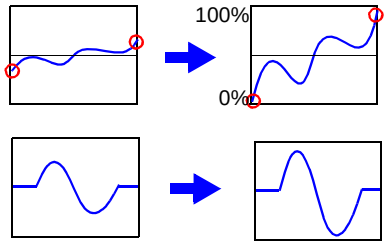
See "5.4 Converting Input Values (Scaling Function)" in the *Instruction Manual*



Input values can be converted and displayed as physical values such as speed, vibration, displacement and temperature. Two conversion methods are available: setting by conversion ratio and setting by entering equivalent values at two points.

Variable Function

See "8.9.4 Setting Arbitrary Waveform Height and Position on the Vertical (Voltage) Axis (Variable Function)" in the *Instruction Manual*



The position and size of the displayed waveform can be freely set.
By entering the upper and lower limits of the waveform, it can be set to display with full-screen amplitude.
The Scaling and Variable functions can be used in combination. The full span of output from a sensor can be displayed.

To view waveform data as numerical values/ To change the waveform display format

Numerical Values Display

See "8.13 Viewing Waveform Data as Numerical Values" of the *Instruction Manual*

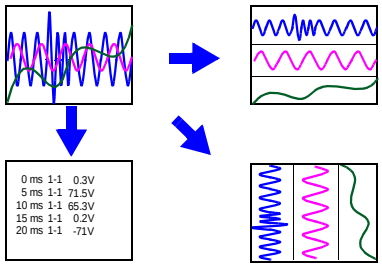
Split-Screen Display

See "7.2.4 Splitting the Display Screen (Split-Screen)" of the *Instruction Manual*

Scroll Direction

See "7.2.5 Setting Waveform Scrolling Orientation" of the *Instruction Manual*

The display format of measurement data can be freely selected.

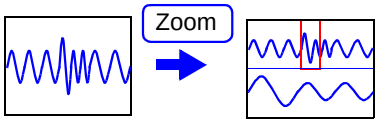


To view a waveform expanded or compressed, or to see the whole waveform

Zoom Display (Memory function only)

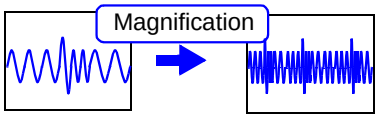
See "8.9 Magnifying and Compressing Waveforms" in the *Instruction Manual*

A normal waveform and an expanded section of it can be displayed together on the screen.



Whole Waveform Display

All waveform fluctuations can be observed.



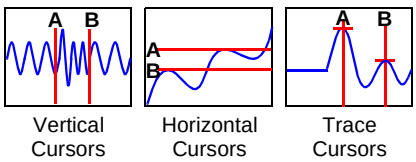
To determine the measurement value of a waveform, or to specify the waveform range

Cursor Measurements

See "8.8 Cursor Values" in the *Instruction Manual*

Use the A/B cursors to display values at the cursor positions on a waveform, and the time and number of cycles from the trigger position.

A specified data range can also be saved and printed.

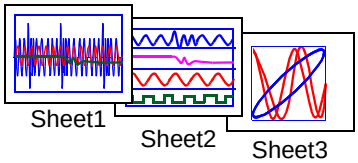


To display a combination of measurement data

Sheet Display

See "7.2.1 Assigning Display Data to Sheets" in the *Instruction Manual*

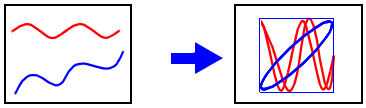
Up to 32 channels of data can be assigned per screen, and freely displayed on multiple sheets.



X-Y Composite Waveforms

See "7.4 Composite Waveforms (X-Y Waveforms)" in the *Instruction Manual*

Specify the channels for X and Y axes to form composite waveforms.

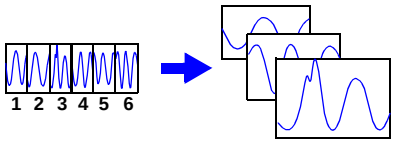


To compare with previous waveforms

Memory Division

See "4.3.4 Dividing Memory" of the *Instruction Manual*

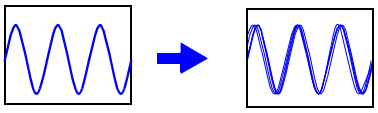
By dividing the memory space into multiple blocks, waveform data can be recorded in any block, or overlaid with any other waveforms.



Overlay

See "4.3.2 Overlaying Waveforms" of the *Instruction Manual*

Displayed waveforms are retained on-screen and overlaid with new waveforms. Use this to compare new waveforms with those recorded immediately before.

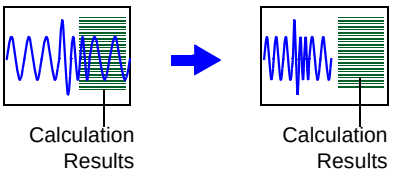


To apply calculations to measurement data

Numerical Calculations

See "Chapter 1 Numerical Calculation Functions" in the *Analysis and Communication Supplement*

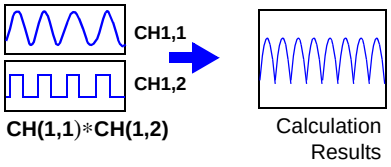
Nineteen types of numerical calculations are available, including RMS values, maximum values and averages, and up to 16 calculations can be performed at the same time. Waveforms and calculation results can be displayed separately on one screen.



Waveform Calculations

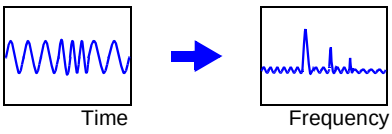
See "Chapter 2 Waveform Calculation Functions" in the *Analysis and Communication Supplement*

The waveform calculation functions allow display of the waveform calculated by a previously specified formula.



FFT Calculations

See *Analysis and Communication Supplement*

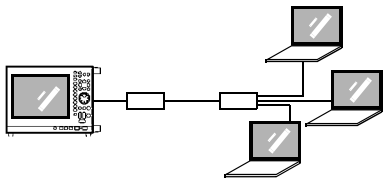


To perform remote control and data collection/ controlling the instrument through the interface

LAN (Ethernet) Communications (ftp/Web server)

See "Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*

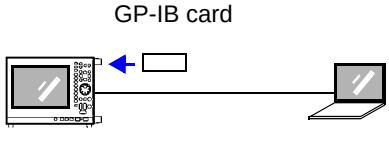
Use 100Base-TX compatible cable to connect the instrument to a network for control by a PC.



GP-IB Interface

See Communications Operating Manual on the supplied applications disc

With the GP-IB card installed, the instrument can be controlled by a computer.



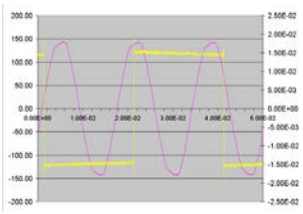
Viewing Saved Data on a Computer

Create a waveform using Excel in Windows

See "11.6.2 Reading Waveform Data on a PC" in the *Instruction Manual*

Save the measurement data in text format, and load it on the computer.

Measurement data saved in binary format can be read by the Waveform Viewer (WV) on the supplied application CD and converted to CSV format.



Waveform display and calculation using the Hioki 9725 Memory Viewer (option)

The same operations, waveform displays and calculations are available as on the instrument.

Appendix 3 Common Questions

Read this when you want to perform a certain task, or when the procedure for a particular operation is unknown.
Refer to "7.1 Troubleshooting" (p. 81) if the display or operation seems abnormal, or if damage is suspected.

To Perform This Measurement

In this case	Description	Reference
Perform simultaneous measurements with different sampling rates	Set different sampling rates on Timebase 1 and Timebase 2 from the Status screen of the Memory function, where Timebase 1 or Timebase 2 can be selected for each channel.	"4.2.3 Setting Different Sampling Rates" in the *Instruction Manual*
To send a warning when an anomaly occurs	When a trigger is applied, a signal can be output from the External I/O terminals.	"14.2.2 Trigger Output (TRIG OUT/CAL)" in the *Instruction Manual*
To use multiple recorders	Recording with multiple instruments can be performed using the external control connectors.	"14.2.1 External Trigger Input (EXT TRIG)" and "14.2.2 Trigger Output (TRIG OUT/CAL)" in the *Instruction Manual*
What happens to measurement data when power to the instrument is lost during measurement?	Measurement data acquired prior to the power interruption is lost. When [Auto-Resume] is enabled from the Environment Settings Screen of the System Screen, recording resumes automatically when power is restored. However, this action differs according to trigger settings. (Default setting: [Off])	"13.2.3 Using the Auto-Resume Function (Resume After Power Restoration)" in the *Instruction Manual*
To measure shock when dropping a test object, and to search for the vibration resonance point.	Use an acceleration sensor with the Model 8947 Charge Unit to measure vibration and shock.	
To record actual effective (true RMS) values of mains voltage	True RMS values can be recorded using the Model 8959 DC/RMS Unit. To record anomalous waveforms, enable level triggering to acquire waveforms when the RMS voltage drops. Example. Trigger: Level, Level: 90 V, Slope: ↓ (Falling)	
To monitor 120 V (50 or 60 Hz) power for a drop to 80% or lower	Using a voltage measuring input module, enable triggering upon voltage sag.	
To observe instantaneous power dropouts on 120 V (50 or 60 Hz) commercial mains, and the internal voltages of affected devices.	Measurements can be made by the combination of a voltage measuring input module and a clamp with connection cable. Changes in commercial power, changes in internal voltage of devices and changes in current flow to devices (using a clamp-on sensor) at the instant of power dropout are recorded on separate channels, and analyzed. By splitting the screen, power and device-voltage waveforms can be displayed in separate traces.	Split-Screen Display: "7.2.1 Assigning Display Data to Sheets" in the *Instruction Manual*
To observe surge noise on 240 V (60 Hz) AC mains.	AC mains and surge waveforms can be measured simultaneously. Surge noise can be detected by the slope trigger. Acquired waveforms can be analyzed by expansion and zooming.	

In this case	Description	Reference
To observe the voltage waveform on 600 V power lines	Use a voltage measuring input module and the Model 9322 Differential Probe or Model 9665 (10:1) or 9666 (100:1) attenuating probes.	"2.4 Connecting a Differential Probe", "2.5 Connecting Attenuating Probes", and "3.11.15 Probe Attenuation Selection" in the *Input Module Guide*
To perform frequency analysis	Measure using the FFT function. We recommend using an input module equipped with an anti-aliasing filter function (Models 8938, 8947, 8957 and 8960).	"Chapter 3 FFT Function" in the *Analysis and Communication Supplement*
To record data without gaps, or over a long term Measure using the Real-Time Saving function.	With the Memory and Recorder functions, data is saved after each recording length, causing measurement to be interrupted. With the Real-Time Saving function, data can be stored continuously without gaps.	"Chapter 9 Measuring with Real-Time Saving" in the *Instruction Manual*

Related Settings

In this case	Description	Reference
What is the basic setting procedure in order to view a waveform?	To display a waveform, set the following: (1) timebase (horizontal), (2) voltage axis range and zero position (vertical), and (3) trigger [Off].	
To use automatic setting for measuring when the timebase and the measurement range are unknown	Press the **FUNCTION MODE** key to select the FN mode on the Waveform screen (**DISP** key), and select **F4** (Auto Setup). The proper range is selected automatically, and recording starts. Make other settings as occasion demands.	"3.3.5 Automatic Range Setting (Auto-Ranging Function)" in the *Instruction Manual*
To set up simply when the measurement configuration is already determined	Measurement configuration settings can be saved to storage media as an auto-setup file (STARTUP.SET), so the settings can be loaded automatically at power-on. (Auto-Setup Function) Also, the settings data can be save to the instrument and it can be automatically loaded.	"11.3.6 Saving Settings Data", "11.5 Saving & Loading Auto Settings File (Auto Setup Function)" in the *Instruction Manual*
What happens to measurement configuration settings when power is turned off?	When power is turned off, measurement configuration settings are preserved within the instrument. When power is turned back on, those measurement configuration settings are recalled.	"3.6 Turning the Power On and Off" (p. 46) in this manual
What is the longest possible recording length with the fastest timebase setting?	Recording time is determined by the [Shot]. The fastest available timebase setting is [5 µs/div]. The recording length can be increased by optional internal memory expansion and by limiting which channels are used, so the maximum time cannot be definitively specified. A recording length of 10,000 divisions at 5 µs/div is equivalent to 0.05 seconds recording time.	"4.2.4 Setting the Recording Length (number of divisions)" in the *Instruction Manual*
To observe phenomena such as waveform anomalies prior to a trigger event	From the Trigger Settings screen, enable Pre-Trigger recording. (Set the position of the trigger point as a percentage of the recording length, where 0% represents the recording start point and 100% represents the recording end point)	"6.5 Pre-Trigger Settings" in the *Instruction Manual*
If “Storage Off” appears	Verify that an input module is installed for the selected channel. If installed: On the Status Settings screen, verify that the channel to be used for measurement is enabled [On]. If not installed: Select an installed module.	"4.2.1 Selecting Channels to Use" in the *Instruction Manual*

In this case	Description	Reference
How long will recording continue when the recording length is set to [Cont] with the Recorder function?	When trigger criteria are met, recording starts and continues until you press the **STOP** key. Up to 5,000 divisions of data (with Model 9715 Memory Board installed) from measurements prior to the stopping of recording is retained in internal memory. When Auto Print or Auto Save is enabled, the data acquired by the instrument is printed or saved on each such occasion.	About memory capacity and recording length: "4.2.4 Setting the Recording Length (number of divisions)"; "Setting Continuous Recording (Cont)" in the *Instruction Manual*
What is the difference between the Memory and Recorder functions?	Which function is selected determines how the timebase is set. The sampling method for each function is also different. Because the purpose of the Memory function is acquisition of instantaneous waveforms, if you set a slow timebase for long-term recording, the sampling period may be unsatisfactorily lengthened. On the other hand, the Recorder function samples and records maximum and minimum values at the specified sampling rate regardless of the timebase setting. As a result, however, only slow timebase settings are available.	"Function Selection" (p. 29) in this manual, "4.1 Selecting the Function" in the *Instruction Manual*

Modifying the Screen Display, and During Measurement

In this case	Description	Reference
To remove a Settings dialog from the display	Move the cursor to the dialog, and press the **ESC** key.	
If channel waveforms are overlapping and hard to see	Channel waveforms can be displayed separately by shifting the zero position of each waveform, or by separating the waveform traces on the Sheet Settings screen.	"7.2.4 Splitting the Display Screen (Split-Screen)", "7.2.6 Assigning Display Channels to Graphs (Analog Channels)", and "7.1.2 Setting the Waveform Display Position (Zero Position)" in the *Instruction Manual*
The grid lines (graticule) causes waveforms to be hard to see, or you want to display the grid	To remove the grid, set the [Grid Type] on the Environment Settings screen of the System screen to [Off]. The grid is displayed when [Dotted Line] or [Solid Line] is selected. (Default setting: [Dotted Line])	"13.1.1 Selecting the Grid Type" in the *Instruction Manual*
Waveform traces are too thick	Waveform traces appear thick when noise is present on the signal. Enable the low-pass filter to suppress the noise.	"3.11.3 Low-Pass Filter (LPF) Settings" in the *Input Module Guide*
Logic waveforms are not displayed	On the [Logic] page of the Sheet Settings and Channel Settings screens, set the channels to be displayed to [On]. If “Storage Off” is displayed: Set the logic channel to [On] on the [Use Ch] page of the Status Settings screen.	"4.2.1 Selecting Channels to Use" and "7.3 Displaying Logic Waveforms" in the *Instruction Manual*
A waveform is continuously acquired even when trigger criteria have been set	Is the Trigger Mode set to [Auto]? (Continuously acquires waveforms) Select [Single] to record only once when trigger criteria are satisfied, or select [Repeat] to record repeatedly.	"6.3 Setting the Trigger Mode" in the *Instruction Manual*
Cursor values and waveforms are overlapped and hard to see	Press the **DISP** key to display waveforms and numerical values separately.	"8.8 Cursor Values" in the *Instruction Manual*

In this case	Description	Reference
"Trigger Wait" is displayed even though triggering is not enabled	Is the time trigger enabled [On] or another trigger source enabled? Verify settings on the Trigger Settings screen.	
"Storing" appears, but no waveform is displayed	Is the Roll Mode function (on the Status Settings screen) of the Memory function disabled (set to [Off])? If set to [On] or [Auto], waveforms are displayed during acquisition.	"4.3.1 Displaying Waveforms During Recording (Roll Mode)" in the *Instruction Manual*
When "Trigger Wait" is displayed and no waveform appears	No waveform is displayed unless the trigger criteria are satisfied. To verify the current input waveform, change the trigger mode of the Waveform screen to [Auto], and the waveform will appear. However, when the trigger mode is [Auto], if no trigger occurs within one second after pressing the **START** key, recording starts anyway. (No trigger mark is applied)	"6.3 Setting the Trigger Mode" in the *Instruction Manual*
To hide unwanted channel waveforms	From the Waveform screen, press the **FUNCTION MODE** key to change the FN mode, and press **F5** [Channel Set]. (The Channel Settings dialog appears) Move the cursor to [Col](color) for the channel to be hidden, and select **F1** [Off].	"5.7 Setting Input Channels from the Waveform Screen" in the *Instruction Manual*

Saving and Loading

In this case	Description	Reference
If you intended to save over a long period using Auto Save, and only saved a short period	New directories are created automatically when Auto Save is [On], the [Normal Save] method is selected, and Directory Creation is [On]. (Up to 5,000 files can be saved in each directory) If these settings are [Off], saving stops after writing the maximum number of files that one directory can hold.	"11.3.4 Setting Auto Save" in the *Instruction Manual*
Auto Save seems to be enabled, but data is not saved to the storage media	• Verify that write-protection on the storage media is disabled. If write-protection is enabled, disable it. • Verify that Auto Save is [On] before starting measurement. • When stopping measurement manually, note the displayed messages, and do not interrupt auto-saving while writing to the storage media.	"11.3.4 Setting Auto Save" in the *Instruction Manual*
Only short waveforms are saved	Is the save area set to [A-B]? To save the whole waveform, select [Whole].	"11.3.5 Setting Manual Save (SAVE Key Output)" in the *Instruction Manual*
When storage media becomes full and you want to continue saving to another storage media	Specify as Media1 the storage media to which you want to save first. For [Save on Error], set [Save in 2] and specify the storage media on which to continue saving.	"11.3.4 Setting Auto Save" in the *Instruction Manual*
To save to a shared folder on a PC, or to load data	When a folder on a PC is registered for sharing over the LAN, it can be accessed from this instrument.	"11.1.4 Using a Network Shared Folder" in the *Instruction Manual* "Chapter 4 Communications Settings" in the *Analysis and Communication Supplement*

Printing

In this case	Description	Reference
To add or remove the gauge in printouts	To print the gauge, select [Gauge] or [List & Gauge] for the [List & Gauge] setting of the [Print Items] on the Print Settings screen. If set to [Off], no gauge is printed. (Default setting: [Off])	"12.6.2 Printing Waveforms" in the *Instruction Manual*
The grid appears on the screen, but doesn't print	The grid on the printout is independent of the on-screen grid. To print the grid, select the Grid Type in the [Waveform Print Items] on the Print Settings screen [Print Items]. (Default setting: [Normal])	"6.4 To Print a Detailed Settings List" (p. 79) in this manual, "12.6.2 Printing Waveforms" in the *Instruction Manual*
To print using a network printer	Printing to a network printer is not possible.	
To print in real time, or to set real-time printing, but not print	If real-time printing is set to [On] with the Recorder function, printing is performed while measuring. (only with the internal printer) However, with the Recorder function, printing is not available if the recording length is set to [Cont] (Continuous) and the timebase is set between 10 and 200 ms/div. Printing is also disabled for the 500 ms/div and 1 s/div ranges when using the DC power supply and A6 printer. In these case, print manually after measurement. Up to 5,000 divisions of data recorded prior to stopping recording is retained internally (when the Model 9715-50 Memory Board is installed).	"12.3 Making Auto Print Settings" in the *Instruction Manual*
To stop or restart during real-time printing (Recorder function only)	Press the [Print] button on the Waveform screen to stop and restart printing. When restarting printing, you can set the number of divisions prior to the current point at which to resume.	"12.3 Making Auto Print Settings" in the *Instruction Manual*
To print a screen image (Screen Print)	The procedure is determined by the [PRINT Key Action] setting on the [Printer] page of the Print Settings screen. • [Quick Print] case: Set the print type to [Screen Image], display the screen to print, and press the **PRINT** key. • [Selection Print] case: Display the screen to print, press the **PRINT** key and select [Screen Image] from the [Print] dialog.	"12.4 Making Manual Print (PRINT Key Output) Settings" in the *Instruction Manual*
To print a specified range of measurement data	The procedure is determined by the [PRINT Key Action] setting on the [Printer] page of the Print Settings screen. Before printing, specify the area to print using the A/B cursors on the Waveform screen. • [Quick Print] case: Set the print type to [A-B Wave], and press the **PRINT** key. • [Selection Print] case: Press the **PRINT** key and select [A-B Wave] from the [Print] dialog.	Specifying a Waveform Area: "8.7 Specifying a Waveform Range" in the *Instruction Manual*
To print comments	Select [Comments] or [Set & Com] for the Title or Analog setting items in [Comment Printing Settings] on the [Print Items] page of the Print Settings screen.	"12.6.5 Printing Comments and Setting Data" in the *Instruction Manual*
To print a list of settings such as the measurement configuration (List Print)	The procedure is determined by the [PRINT Key Action] setting on the [Printer] page of the Print Settings screen. • [Quick Print] case: Set the print type to [List] and press the PRINT key. • [Selection Print] case: Press the **PRINT** key and select [List] in the dialog.	"12.4 Making Manual Print (PRINT Key Output) Settings";"Manual Print [Quick Print]" in the *Instruction Manual*

In this case	Description	Reference
To print system setting contents	The Environment Settings screen of the System screen can be printed as a list. Use Screen Print to print other screens.	

Data Analysis

In this case	Description	Reference
To create graphs or analyze recorded data on a PC	Save the data in text format. However, note that data saved in text format cannot be reloaded into the instrument.	"5.3 Data that can be Saved & Loaded" (p. 68) in this manual, "11.6 Examples of Saving Data: Reading Data on a PC" in the *Instruction Manual*

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Warranty Certificate

HIOKI

Model	Serial No.	Warranty period One (1) year from date of purchase (___ / ___)

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

In the unlikely event that you experience an issue during use, please contact the distributor from which you purchased the product, which will be repaired free of charge subject to the provisions of this Warranty Certificate. This warranty is valid for a period of one (1) year from the date of purchase. If the date of purchase is unknown, the warranty is considered valid for a period of one (1) year from the product's date of manufacture. Please present this Warranty Certificate when contacting the distributor.
Accuracy is guaranteed for the duration of the separately indicated guaranteed accuracy period.

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

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

16-01 EN

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- In the interests of product development, the contents of this manual are subject to revision without prior notice.
-

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