HIOKI

Quick Start Manual

8855

MEMORY HiCORDER

HIOKI E. E. CORPORATION

December 2008 Revised edition 9 8855A987-09 08-12H

Contents

Introduction

Thank you for purchasing the HIOKI "8855 MEMORY HiCORDER." To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

About This Manual

This manual is the Basics edition (Quick Start Manual) for the "8855 MEMORY HiCORDER." It describes the general functions and procedures needed to use the 8855. For information on advanced functions and procedures, refer to the Advanced edition (Instruction Manual) of this manual.

Inspection

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.

Accessories

Power cord 1
9231 RECORDING PAPER (when the 8994 PRINTER UNIT is installed) 1
Roll paper attachment (when the 8994 PRINTER UNIT is installed) 2
PC card protector 1
Connector cable label 1
Instruction Manual 2
Guide Book 1
Application Disk (CD-R) 1

Options

8950 ANALOG UNIT
8951 VOLTAGE/CURRENT UNIT
8952 DC/RMS UNIT
8953-10 HIGH RESOLUTION UNIT
8954 VOLTAGE/TEMP UNIT
8955 F/V UNIT
8994 PRINTER UNIT
9646 MO UNIT (with eject pin)
9663 HD UNIT
9645 MEMORY BOARD (96 M words) total 128 M words
9645-01 MEMORY BOARD (512 M words) total 512 M words
9557 RS-232C CARD
9558 GP-IB CARD
9626 PC CARD 32M
9627 PC CARD 64M
9726 PC CARD 128M
9727 PC CARD 256M
9728 PC CARD 512M
9729 PC CARD 1G
9397-01 CARRYING CASE (for the 8855)
9231 RECORDING PAPER (6 rolls)
9197 CONNECTION CORD (for high voltage, maximum input voltage 500 V)
9198 CONNECTION CORD (for low voltage, maximum input voltage 300 V)
9199 CONVERSION ADAPTOR (between BNC and banana, female)
9217 CONNECTION CORD (isolated between BNC and BNC)
9327 LOGIC PROBE (maximum input voltage 50 V)
9321-01 LOGIC PROBE (maximum input voltage 250 V)
9665 10:1PROBE
9666 100:1PROBE
9322 DIFFERENTIAL PROBE
9328 POWER CORD (for the 9322)
9325 POWER CORD (for the 8951)

220H PAPER WINDER
*9303 PT
9318 CONVERSION CABLE (for the 9270 to 9272, 9277 to 9279)
3273 CLAMP ON PROBE (DC to 50 MHz)
3273-50 CLAMP ON PROBE (DC to 50 MHz)
3274 CLAMP ON PROBE (DC to 10 MHz)
3275 CLAMP ON PROBE (DC to 2 MHz)
3276 CLAMP ON PROBE (DC to 100 MHz)
9018-10 CLAMP ON PROBE (10 to 500 A, 40 Hz to 3 kHz)
*9132-10 CLAMP ON PROBE (20 to 1000 A, 40 Hz to 1 kHz)
*9270 CLAMP ON SENSOR (20 A, 5 Hz to 50 kHz)
*9271 CLAMP ON SENSOR (200 A, 5 Hz to 50 kHz)
*9272 CLAMP ON SENSOR (20/200 A, 5 Hz to 10 kHz)
9277 UNIVERSAL CLAMP ON CT (20 A, DC to 100 kHz)
9278 UNIVERSAL CLAMP ON CT (200 A, DC to 100 kHz)
*9279 UNIVERSAL CLAMP ON CT (500 A, DC to 20 kHz)
*9555 SENSOR UNIT (used with the 9270 to 9272, and the 9277 to 9279)
9667 FLEXIBLE CLAMP ON SENSOR
(500 to 5000 A/50 to 500 A, 10 to 20 kHz)
9333 LAN COMMUNICATOR
9335 WAVE PROCESSOR
9549 FUNCTION UP DISK (power monitor function)
*: no CE marking

NOTE To connect the 9270 to 9272 or 9277 to 9279 Clamp-On Sensor to the 8951 VOLTAGE/CURRENT UNIT, use the 9318 CONVERSION CABLE. To connect these sensors to other instruments, use in combination with the 9555 SENSOR UNIT.

Safety Notes

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

⚠ 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. 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.

Safety symbols

- 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.
- In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument.

Indicates a grounding terminal.

Indicates AC (Alternating Current).

Indicates DC (Direct Current).

Indicates both DC (Direct Current) and AC (Alternating Current).

Indicates the ON side of the power switch.

Indicates the OFF side of the power switch.

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

⚠ DANGER — Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.

⚠ WARNING — Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.

⚠ CAUTION — Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.

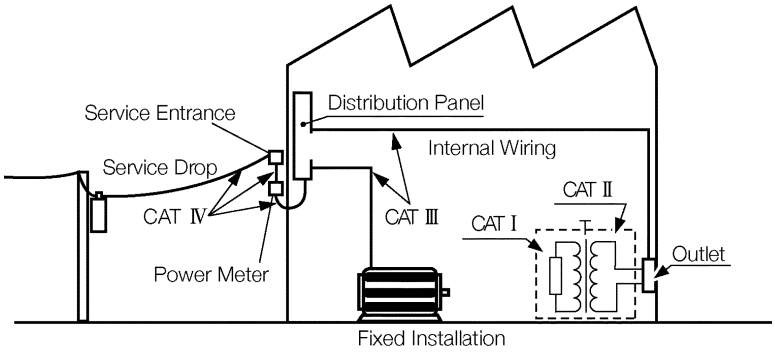
NOTE — Indicates advisory items related to performance or correct operation of the instrument.

Measurement categories (Overvoltage categories)

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

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

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.
The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



Accuracy

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

f.s.	(maximum display value or scale length) The maximum displayable value or the full length of the scale. This is usually the maximum value of the currently selected range.
rdg.	(reading or displayed value) The value currently being measured and indicated on the measuring instrument.
dgt.	(resolution) The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1".

Notes on Use

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

⚠ DANGER

Probe Connection, Measurement Voltage Input

- **Maximum input voltage ratings for the input module and the input terminals of the instrument are shown below. To avoid the risk of electric shock and damage to the instrument, take care not to exceed these ratings.**
- **The maximum rated voltage to earth of the input module (voltage between input terminals and main instrument frame ground, and between inputs of other analog input modules) is shown below. To avoid the risk of electric shock and damage to the instrument, take care that voltage between channels and between a channel and ground does not exceed these ratings.**
- **The maximum rated voltage to earth rating applies also if an input attenuator or similar is used. Ensure that voltage does not exceed these ratings.**
- **When measuring power line voltages with the 8950, 8952 or 8953-10, always connect the probe to the secondary side of the circuit breaker, so the breaker can prevent an accident if a short circuit occurs. Connection to the primary side involves the risk of electric shock and damage to the instrument.**
- **Before using the instrument, make sure that the insulation on the connection cords is undamaged and that no bare conductors are improperly exposed. Using the products in such conditions could cause an electric shock, so contact your dealer or Hioki representative for replacements. (Model 9197, 9198.)**

Input/output terminal	Maximum input voltage	Maximum rated voltage to earth
8950 (input)	400 V DC max.	370 V AC/DC
8951 (input)	30 V rms or 60 V DC	30 V rms or 60 V DC
8952 (input)	400 V DC max.	370 V AC/DC
8953-10 (input)	400 V DC max.	370 V AC/DC
8954 (input)	30 V rms or 60 V DC	370 V AC/DC
8955 (input)	30 V rms or 60 V DC	30 V rms or 60 V DC
9322	2000 V DC, 1000 V AC (CAT II) 600 V DC/AC (CAT III)	When using grabber clips 1500 V DC/AC (CAT II), 600 V DC/AC (CAT III) When using alligator clips 1000 V DC/AC (CAT II), 600 V DC/AC (CAT III)
EXT TRIG/ START • STOP/ EXT SMPL	-5 to +10 V DC	Not insulated
TRIG OUT/ GO/ NG/ EXT.OUT	-20 V to +30 V DC 500 mA max./ 200 mW max.	

⚠ DANGER

External I/O terminal connections

A common GND is used for the external I/O terminals (START, STOP, GO, NG, EXT_OUT, EXT_TRIG, EXT_OUT, and EXT_SMPL terminals) and the 8855 instrument. The terminals are not isolated. To prevent damage to the object connected to the external I/O terminals and the 8855 instrument, wire the terminals so that there is no difference in electrical potential between the GND for the external I/O terminals and the GND for the connected object.

Logic Probe Connection

- **The logic input and 8855 instrument share a common ground. Therefore, if power is supplied to the measurement object of the logic probe and to the 8855 from different sources, an electric shock or damage to the equipment may result. Even if power is supplied from the same system, if the wiring is such that a potential difference is present between the grounds, current will flow through the logic probe so that the measurement object and 8855 could be damaged. We therefore recommend the following connection method to avoid this kind of result. Refer to Section 2.5, "Logic Probe Connection" for details.**

(1) Before connecting the logic probe to the measurement object, be sure that power is supplied from the same outlet box to the measurement object and the 8855 using the supplied power cord.

(2) Before connecting the logic probe to the measurement object, connect the ground of the measurement object to the 8855 ground terminal. Also in this case, power should be supplied from the same source. Refer to Section 2.2, "Power Supply and Ground Connections" for grounding terminal details.

Differential Probe Connection

- **When using grabber clips, the 9322's maximum rated voltage to earth is 1500 V AC or DC (CAT II) / 600 V AC or DC (CAT III); when using alligator clips, it is 1000 V AC or DC (CAT II) / 600 V AC or DC (CAT III). To avoid electrical shock and possible damage to the instrument, never apply voltage greater than these limits between the input channel terminals and chassis, or across the input of two 9322s.**
- **Maximum input voltage is 1000 V AC/2000 V DC (CAT II) / 600 V AC or DC (CAT III). Attempting to measure voltage in excess of the maximum rating could destroy the instrument and result in personal injury or death.**

⚠ DANGER

10:1 and 100:1 probe connections

- **The maximum rated to-voltage does not change when using a 9665 10:1PROBE or a 9666 100:1PROBE. To avoid electrical shock or damaging the 8855 instrument, make probe connections in such a manner that the method for the probe, and make sure the to-ground voltage does not exceed the rated maximum.**
- **The maximum input voltage is 1,000 V DC for the 9665 10:1PROBE, and 5,000 V DC for the 9666 100:1PROBE. (The measurement category (overvoltage category) is the same as that of the input modules of MEMORY HiCORDERs that use the 9665 and the 9666.) Do not measure voltages that exceed the maximum input voltage, as the 8855 instrument could be damaged and an accidents resulting in injury or death could result.**

⚠ WARNING

Power Supply Connections

Before turning the instrument on, make sure the source voltage matches that indicated on the instrument's power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.

Replacing the 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.**
- **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.**

Grounding the Instrument

To avoid electrical accidents and to maintain the safety specifications of this instrument, connect the power cord only to a 3-contact (two-conductor + ground) outlet. Refer to Section 2.2, "Power Supply and Ground Connections."

Before Powering on

Check that the power supply is correct for the rating of the instrument. Be careful to avoid connecting voltage improperly, as the internal circuitry may be destroyed. (The AC fuse is integrated in the instrument.)

Usage Precautions for the Internal MO Drive (option)

To prevent damage to the instrument, do not attempt to disassemble the MO drive.

Laser radiation can be emitted when the MO drive is open. Avoid looking directly into the laser when the MO drive is open. Maximum laser output is 50 mW (at 685 nm, pulsed).

⚠ CAUTION

Installation Environment

This instrument should be installed and operated indoors only, between 5 and 40℃ and 30 to 80% RH. Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.

Storing (when the 8994 PRINTER UNIT is installed)

When the product is not to be used for an extended period, set the head up/down lever to the "head up" position. This will protect the printer head and prevent deformation of the rubber roller.

Precautions on carrying this equipment

The terminal guard of the equipment protects the inputs. Do not hold this guard when carrying the equipment. To carry this equipment, use the handle. See Section 1.2.

Shipping

- Remove the printer paper from the product. If the paper is left in the product, paper support parts may be damaged due to vibrations. (when the 8994 PRINTER UNIT is installed)
- To avoid damage to the instrument, be sure to remove the PC card, floppy disk, MO disk and SCSI cable from the instrument before shipping.
- Use the original packing materials when reshipping the instrument, if possible.

Handling the CD-R

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

Others

- In the event of problems with operation, first refer to Section 14.4, "Troubleshooting".
- Carefully read and observe all precautions in this manual.

NOTE

Using a printer

Avoid using the printer in hot, humid environments, as this can greatly reduce printer life.

Using the connection cords

Use only the specified connection cord (9197, 9198). Using a non-specified cord may result in incorrect measurements due to poor connection or other reasons.

Recording paper (when the 8994 PRINTER UNIT is installed)

- Use only recording paper specified by Hioki. Non-specified recording paper may result in poor-quality or blank printouts.
- Printing is not possible if the recording paper is loaded wrong-side up. See Section 2.9.

Chapter Summary

Chapter 1 Product Overview
Contains an overview of the instrument and its features.

Chapter 2 Installation and Preparation
Explains how to set the instrument up for measurement.

Chapter 3 Basic Key Operation
Explains how to operate the keys and the Jog/Shuttle control for carrying out basic measurement functions.

Chapter 4 Memory Function
Explains how to use the memory functions of the instrument.

Chapter 5 Recorder Function
Explains how to use the recorder functions of the instrument.

Chapter 6 Input Channel Settings
Explains how to use the input channel of the instrument.
This manual describes the most commonly used functions of the 8855.

Chapter 7 Trigger Functions
Explains how to use the trigger functions of the instrument.

Chapter 8 Waveform Display Screen Operation
Explains how to perform waveform scrolling, how to use the A/B cursors and so.

Chapter 9 SYSTEM Screen Settings
Explains how to make settings using the system setting screen.

Chapter 10 Storing and Recalling Measurement Data
Explains how to store, recall, and delete measurement data and measurement settings.

Chapter 11 External Input/ Output Terminals/ Key Lock Function
Gives specifications and usage details of the external input/output terminals, and explains how to use the key lock function.

Chapter 12 Specifications
Contains general specifications and detailed function specifications.

Chapter 13 Logic and Analog Inputs
Contains specifications and precautions for logic input section and input amplifier modules.

Chapter 14 Maintenance and Service
Describes maintenance procedures.

Chapter 1
Product Overview

1.1 Major Features

(1) Waveform collection performance

Using the 8950 ANALOG UNIT, the 8951 VOLTAGE/CURRENT UNIT, and the 8952 DC/RMS UNIT with the 8855, it is possible to record waveforms at 20 MS/s with a resolution of 12 bits.
Furthermore, using the 8953-10 HIGH RESOLUTION UNIT, it is possible to record waveforms at 1 MS/s with a resolution of 16 bits.
Using the 8954 VOLTAGE/TEMP UNIT in combination with the 8855, it is possible to record temperature.
Using the 8955 F/V UNIT in combination with the 8855, it is possible to measure items such as frequency.
Regardless of the input module, it is possible to record waveforms on up to 8 channels, simultaneously.

(2) High-resolution display

The 8855 is equipped with a 10.4-inch (800 x 600 pixels) TFT color LCD, and can display waveforms with great precision.
Because both the values and gauge can be displayed simultaneously, it is easy to confirm waveform measurements directly on-screen.

(3) Measurement functions

Memory with a maximum sampling speed of 50 ns (simultaneous recording on all channels).
If using the optional printer unit, it is possible to output real-time recordings on recording paper.

(4) Storage capacity

The 8855 has a standard storage capacity of 32 M words, expandable to 128 M or 512 Mwords with memory upgrades.

(5) Trigger function

- Digital trigger circuit
- Trigger types: level trigger, window-in trigger, window-out trigger, period trigger, glitch trigger, event trigger, logic trigger (pattern trigger)

(6) Diverse observation functions

The 8855 can calculate such values as the average, maximum, and absolute values, as well as perform arithmetic calculations.
The time and value of the cursor can be calculated for all channels.

(7) Search function

You can set criteria and search through captured waveforms.

(8) GUI display

The GUI-inspired (Graphical User Interface) design, which uses both graphical and textual representation on the function key display, makes the instrument easier to configure and operate.

(9) On-line help

On-line help guides the user through operation steps and various functions. Furthermore, you can easily display help using the setting item in the lower part of the screen.

(10) Scaling function

By setting the physical amount and the unit to be used for 1 V input, the measurement result can be converted into any desired scale.

(11) Additional recording function

When enabled, the memory is regarded as printer paper.

(12) Input modules (Option)

The analog inputs are floating, and so each input can be connected to its own independent potentials.

Select input modules suitable for measurements.

(13) Built-in thermal printer (Option)

Thermosensitive recording method using a thermal line head
The built-in printer delivers waveform printouts on the spot.
The printer can also be used to print screen shots, reduction screen shots and parameter information. Report print can be printed.

(14) External storage means (MO/HD drive option)

Measurements, settings, and images can be recorded on a MO disk or hard disk.

(15) PC card

Measurements, settings, and images can be recorded on a flash ATA card.

PPP connection is possible using a modem card.

(16) SCSI interfaces

If a MO drive is connected to the SCSI interface, the waveform data and/or setup conditions can be stored on a MO disk.

When the 8855 is connected to your PC through an SCSI, you can access the data of the internal 8855 MO disk or hard disk from the PC.

(17) Internal LAN interface (10BASE-T)

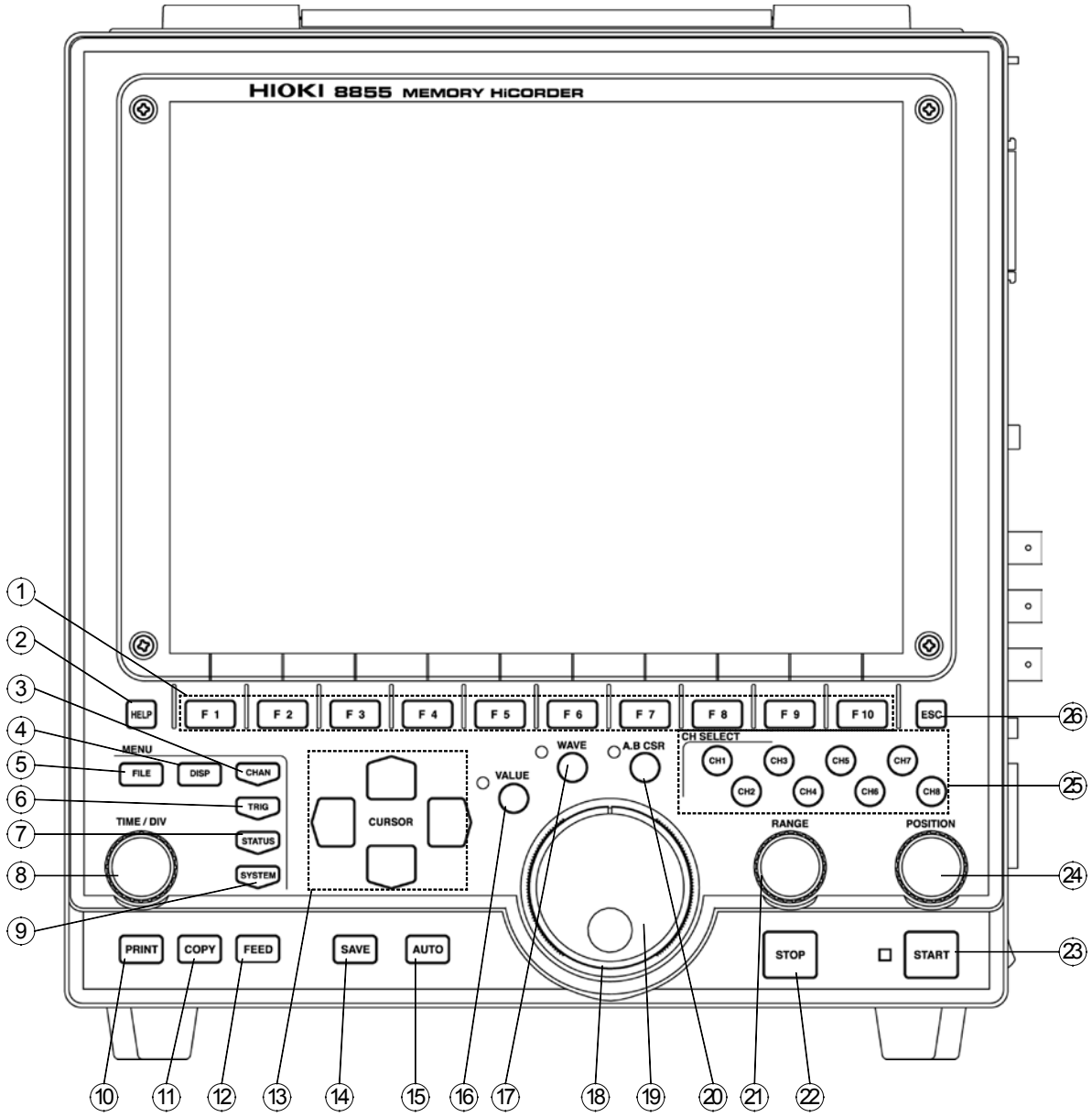
You can connect the 8855 to a local area network (LAN) using the 9333 LAN COMMUNICATOR.
When performing rapid data exchanges, such as those between the 8855 and a PC, remote operations are possible from the PC.

The 8855 supports FTP.

(18) Dual-language capability

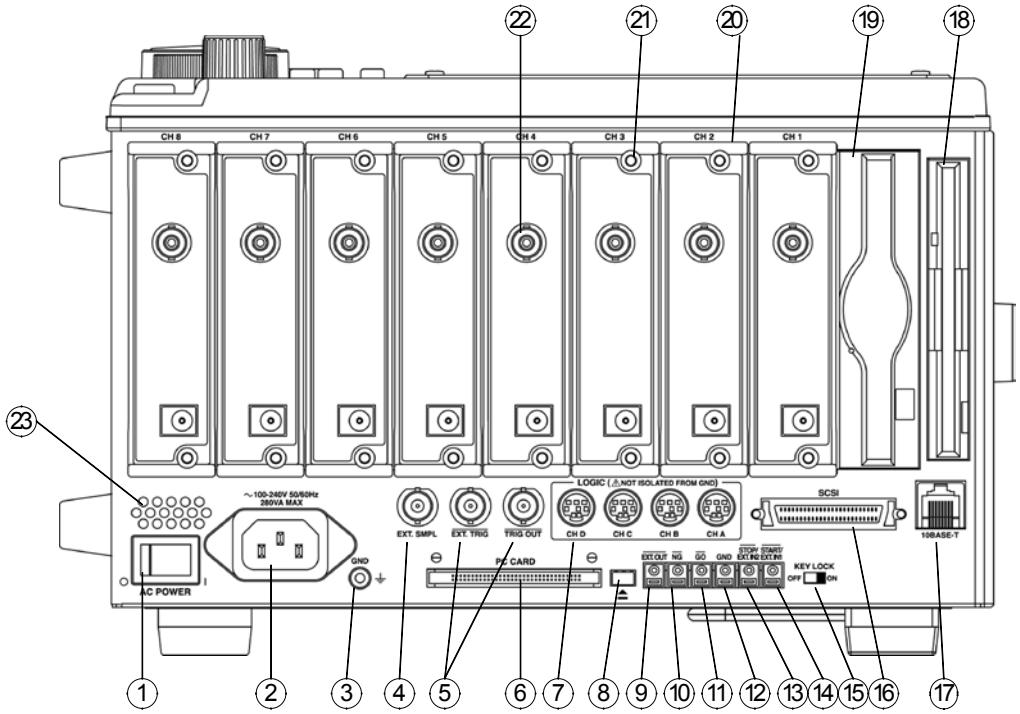
Display language is switchable between Japanese and English.

1.2 Identification of Controls and Indicators



Front Panel

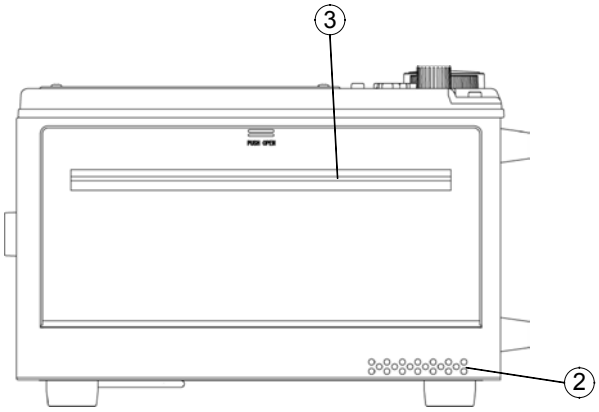
①	**F1** to **F10** key	Serve to select setting items.
②	**HELP** key	Provides on-line help.
③	**CHAN** key	Causes the display to show the Channel screen which serves for making input channel settings.
④	**DISP** key	Causes the display to show measurement and analysis results.
⑤	**FILE** key	Causes the display to show the File screen which serves for reading, storing, etc. the waveform data etc.
⑥	**TRIG** key	Causes the display to show the Trigger screen. Setting the trigger functions.
⑦	**STATUS** key	Causes the display to show the Status screen which serves for setting most measurement parameters.
⑧	**TIME/DIV** key	Serves to set the speed for inputting and storing the input signal.
⑨	**SYSTEM** key	Causes the display to show the System screen. Makes all the settings of common functions, such as the initial settings and various other settings.
⑩	**PRINT** key	Serves to print out stored waveforms.
⑪	**COPY** key	Serves to print out a hard copy of the current screen display.
⑫	**FEED** key	Causes the printer paper to advance for as long as the key is pressed.
⑬	**CURSOR** key	These keys serve to move the flashing cursor in the four directions.
⑭	**SAVE** key	Saves the data on the specified media.
⑮	**AUTO** key	Pressing this key activates automatic setting of time axis range and voltage range values of input waveform.
⑯	**VALUE** key	Uses to select the numerical values setting.
⑰	**WAVE** key	Uses to select the the waveform scrolling.
⑱	SHUTTLE	Rotary control knob that serves to change values, move the A/B cursors, and scroll the waveform.
⑲	JOG	Concentric ring that serves to change values, move the A/B cursors, and to scroll the waveform. The speed of movement is proportional to the rotation angle.
⑳	**A.B CSR** key	Uses to select the the A/B cursor moving.
㉑	**RANGE** knob	Sets the measurement range for the channel.
㉒	**STOP** key	Stops measurement and analysis. Pressing this key twice stops measurement.
㉓	**START** key	Initiates the measurement and analysis. During measurement, the LED above the key is lit.
㉔	**POSITION** knob	Sets the zero position for the channel.
㉕	Channel select keys	Selects channel.
㉖	**ESC** key	Exits the Input or Set up screen.



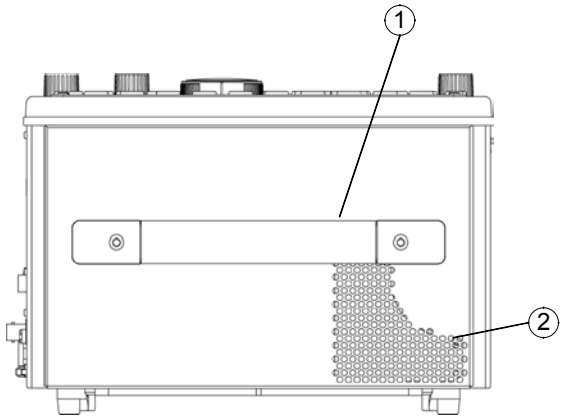
Right Side Panel

①	AC power switch	Switches on or off the AC power supply.
②	AC connector	The supplied power cord must be plugged in here.
③	Function ground terminal (GND)	Connects to the earth.
④	External sampling terminal	Allows input of an external sampling signal. (in the Memory function)
⑤	Trigger terminals	Can be used to synchronize multiple instruments, using the EXT TRIG input and TRIG OUT output.
⑥	PC card slot	Inserts the PC card.
⑦	Logic probe connectors	Input connector for the logic input section, designed for the dedicate logic probes (CH A to D).
⑧	Eject button	Removes the PC card.
⑨	External output terminal	Various output signals can be selected, such as the BUSY or error signals.
⑩	NG evaluation output terminal	When NG results from the numerical calculation evaluation and waveform evaluation, a signal is output from this terminal.
⑪	GO evaluation output terminal	When GO results from the numerical calculation evaluation and waveform evaluation, a signal is output from this terminal.
⑫	Ground terminal (GND)	Uses with ⑨ to ⑭ (except ⑫) terminals.
⑬	External stop terminals	Stop operation can be controlled.
⑭	External start terminals	Start operation can be controlled.
⑮	Key lock	Locks the operation of keys.
⑯	SCSI connector	An MO drive can be connected.
⑰	LAN connector	Can be connected to a network through a LAN.

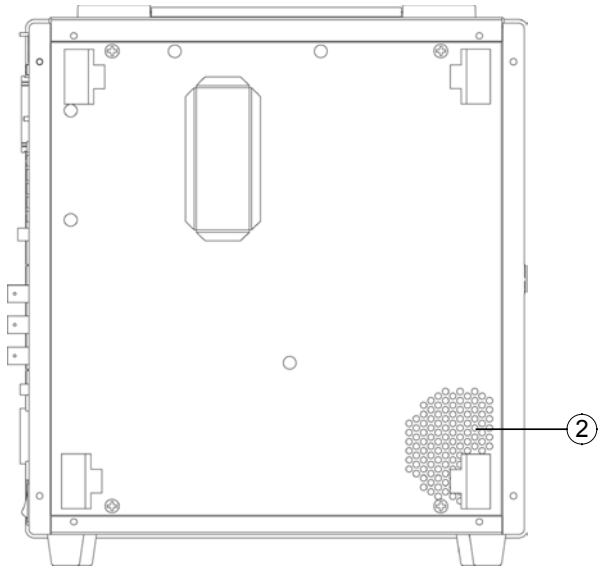
⑱	FD slot	Floppy disk is inserted.
⑲	MO slot	MO disk is inserted. (when the 9646 is installed)
⑳	Input module slots	These slots accept input modules.
㉑	Fastening screw	Secures the plug-in instrument.
㉒	Analog input connector	Unbalanced analog input. (on ANALOG UNIT)
㉓	Blowing slot	



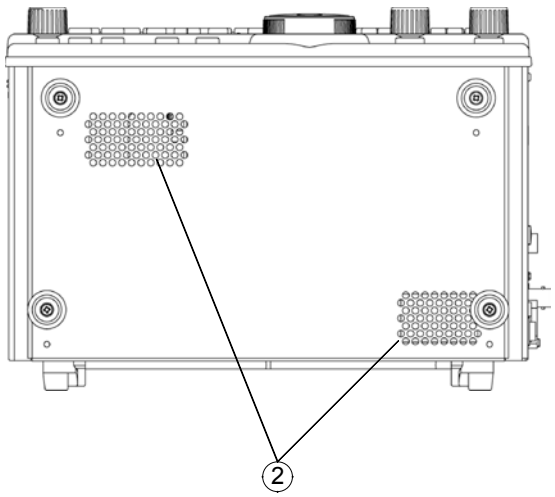
Left Side Panel



Upper Panel



Rear Panel



Bottom Panel

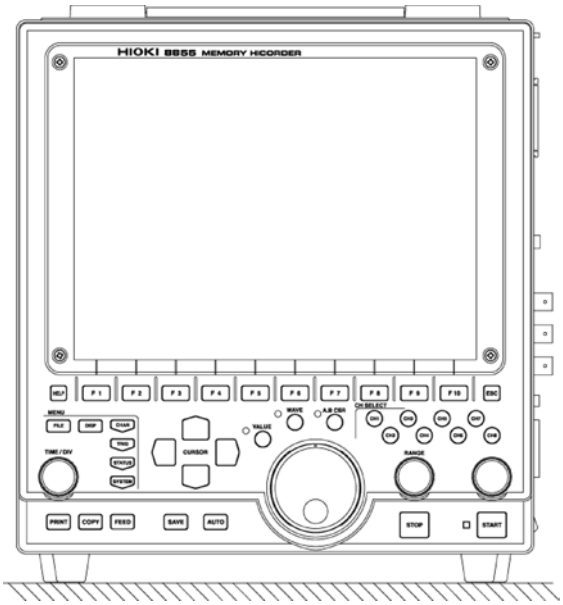
①	Handle	Serves for transporting the 8855.
②	Ventilation slots	
③	Printer	(when the 8994 PRINTER UNIT is installed)

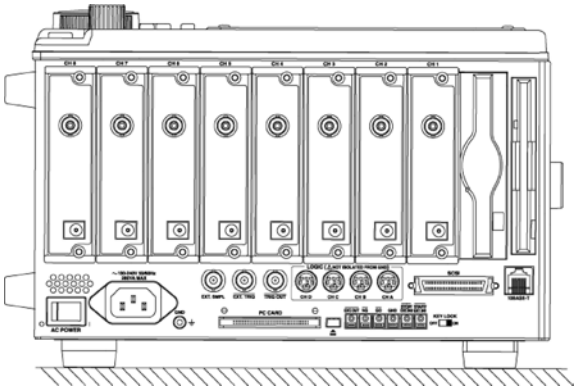
Chapter 2
Installation and Preparation

2.1 Installation of the Product

Installation orientation

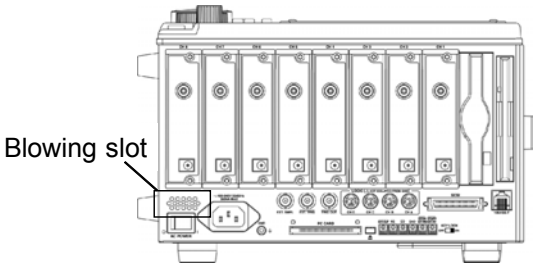
Install the instrument on a flat, level surface.



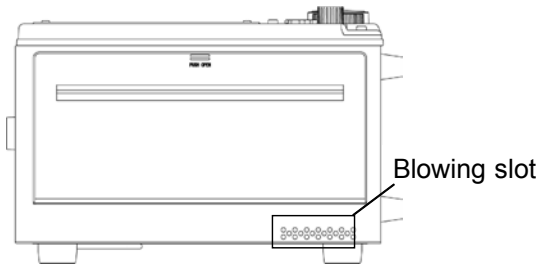


Ambient conditions

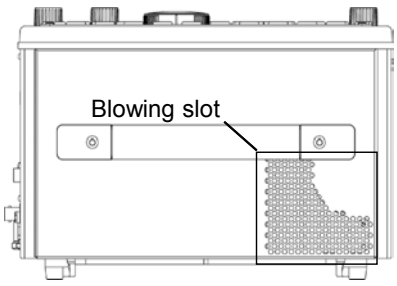
Temperature	5 to 40℃, 23±5℃ recommended for high-precision measurements.
Humidity	30 to 80% RH (no condensation); 50±10% RH (no condensation) recommended for high-precision measurements.
Ventilation	Take care not to block the ventilation openings and assure proper ventilation. When using the instrument in an upright position, take care not to block the openings on both side.



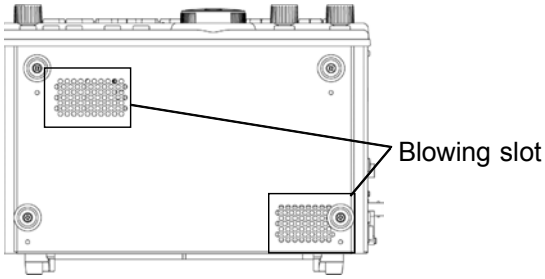
Right side



Left side



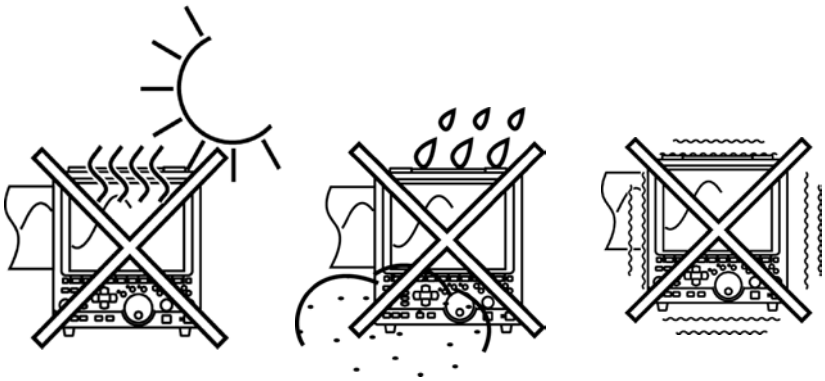
Upper side



Bottom side

Avoid the following locations:

- Subject to direct sunlight.
- Subject to high levels of dust, steam, or corrosive gases (Avoid using the equipment in an environment containing corrosive gases (e.g., H_2S, SO_2, NI_2, and CI_2) or substances that generate harmful gasses (e.g., organic silicones, cyanides, and formalins).
- Subject to vibrations.
- In the vicinity of equipment generating strong electromagnetic fields.

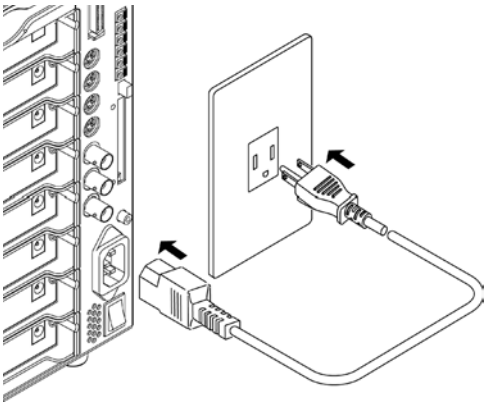


2.2 Power Supply and Ground Connections

2.2.1 Connecting the AC Power Supply

⚠ WARNING

- **Check the following points before connecting the instrument to a power supply. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.**
  - **(1) Power supply matches Rated supply voltage (100 to 240 V AC: Voltage fluctuations of ±10% from the rated supply voltage are taken into account) and rated supply frequency (50/60 Hz).**
  - **(2) The AC power switch of the 8855 is set to OFF.**
  - **(3) Use only the supplied AC power cord.**
- **When supplying power with an inverter or an uninterruptible power supply (UPS), use a device that complies with the following conditions. To avoid the risk of electric shock and damage to the instrument, do not use devices that have a voltage frequency outside the specified range, or that output square waves.**
  - **(1) Voltage: 100 V to 240 V AC**
  - **(2) Power frequency: 50/60 Hz**
  - **(3) Sine wave output (Do not use devices that have an unstable output, even if the output is sinusoidal.)**
- **The 8855 has no protective ground terminal, but is intended to be connected to a ground wire via the grounded three-core power cord supplied. In order to avoid electric shock accidents, be sure to connect the grounded three-core power cord supplied to a power supply socket one of whose terminals is properly grounded.**



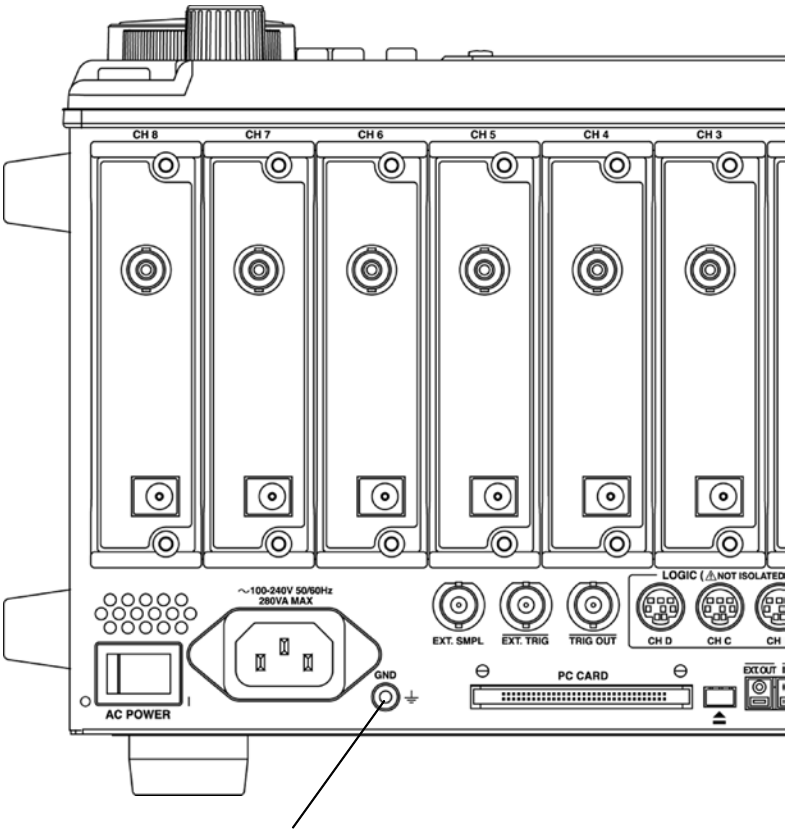
1. Verify that the AC power switch of the 8855 is set to OFF.
2. Plug the grounded three-core power cord supplied into the AC power connector on the right side of the 8855.
3. Plug the power cord into an AC outlet corresponding to the rating of the 8855.

NOTE

The fuse is incorporated in power supply. It is not user-replaceable. If a problem is found, contact your nearest dealer.

2.2.2 Functional Grounding of the 8855

When the 8855 is used in noise-prone environments, connect the functional grounding terminal to improve noise characteristics.

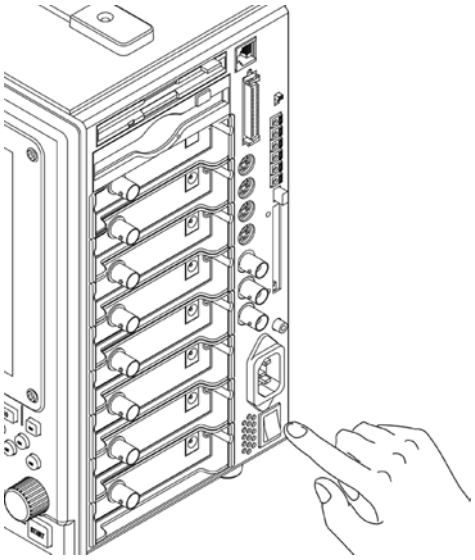


Functional grounding terminal

2.3 Power On/Off

⚠ WARNING

Check the following points before the power switch is turned on.
- **Power supply matches Rated supply voltage (100 to 240 V AC: Voltage fluctuations of ±10% from the rated supply voltage are taken into account) and rated supply frequency (50/60 Hz).**
- **The instrument is correctly installed (Section 2.1).**
- **Power cord is correctly connected (Section 2.2).**
- **The instrument is properly grounded.**



NOTE

- In order to perform accurate measurements, allow the unit to warm up for about 1 hour after the power is turned on to ensure that the internal temperature of the input module has stabilized. Then, make a zero adjustment prior to measurement. For specifications of each unit, see section 13.2.
  And for details about zero adjustment, see Section 6.4.
- When the instrument is turned off, it memorizes the currently used settings and reestablishes the same settings the next time the instrument is turned on again.

2.4 Connection of the Input Product

2.4.1 8950, 8952, 8953-10, 8955 INPUT UNITs

⚠ WARNING

- **Never connect the probe to the 8855 while the probe is already connected to the measurement object. Otherwise there is a risk of electric shock.**
- **Use only the specified input cord with this probe. An insulating BNC connector is provided to prevent electric shock. When using a metal BNC, there is risk of electric shock, due to the input L terminal having the same potential as the metal portion of the BNC connector.**

⚠ CAUTION

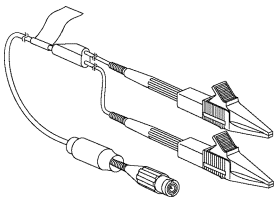
- When disconnecting the BNC connector, be sure to release the lock before pulling off the connector. Forcibly pulling the connector without releasing the lock, or pulling on the cord, can damage the connector.
- Use the power terminal with the 9322 DIFFERENTIAL PROBE only. To connect the probe, you need the 9328 POWER CORD. To avoid injuries or damage to this unit, do not connect any device other than the 9322 to the terminal.

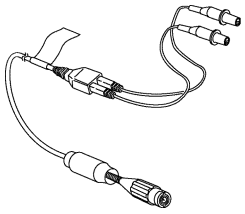
NOTE

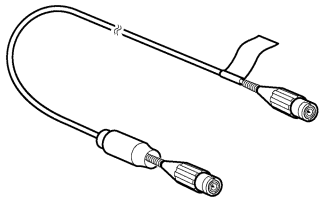
Use of an unspecified input cord may result in inaccurate measurements due to poor connection or BNC connector damage.

For safety reasons, only use the optional 9197, 9198, or 9217 CONNECTION CORD for connection to the analog input modules.

Connection Cord

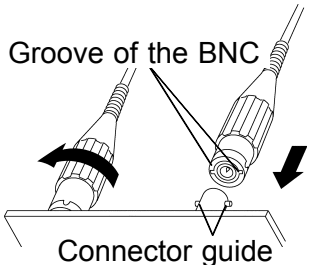






	9197	9198	9217
(Maximum input voltage :)	(500 V)	(300 V)	(300 V)
Measurement objects	Items that can be hooked to with large alligator clips	Items that can be hooked to with small alligator clips	BNC output

Connecting to the main instrument



1. Align the BNC connector with the guide groove of the module input connector, and turn clockwise while pressing in to lock the connector. (Only use the 9198 CONNECTION CORD for connection to the 8955 unit.)
2. To remove from the input module, turn the BNC connector counterclockwise to release the lock, then pull it.

2.4.2 8951 VOLTAGE/CURRENT UNIT

⚠ DANGER

Precautions when using the 3273, 3273-50, and the 3276 CLAMP ON PROBE

- **When conductors being measured carry in excess of the safe voltage level (SELV-E)* and not more than 300 V, to prevent short circuits and electric shock while the core section is open, make sure that conductors to be measured are insulated with material conforming to (1) Measurement Category (Overvoltage Category) I, (2) Double (reinforced) Insulation Requirements for Working Voltages of 300 V, and (3) Pollution Degree 2. For safeties sake, never use this sensor on bare conductors. The core and shield case are not insulated.**
- **Be careful to avoid damaging the insulation surface while taking measurements.**
- **Refer to the following standards regarding the meanings of underlined terms.**
  IEC 61010-1 (JIS C 1010-1)
  IEC 61010-2-031 (JIS C 1010-2-31)
  IEC 61010-2-032 (JIS C 1010-2-32)

Precautions when using the 3274 and the 3275 CLAMP ON PROBE

- **When conductors being measured carry in excess of the safe voltage level (SELV-E)* and not more than 600 V (CAT II) or 300 V (CAT III), to prevent short circuits and electric shock while the core section is open, make sure that the conductor insulation satisfies the (1) Basic insulation requirements for the applicable (2) Measurement Category (Overvoltage Category), (3) Working Voltage, and (4) Pollution Degree. For safeties sake, never use this sensor on bare conductors.**
- **Be careful to avoid damaging the insulation surface while taking measurements.**
- **Refer to the following standards regarding the meanings of underlined terms.**
  IEC 61010-1 (JIS C 1010-1)
  IEC 61010-2-031 (JIS C 1010-2-31)
  IEC 61010-2-032 (JIS C 1010-2-32)

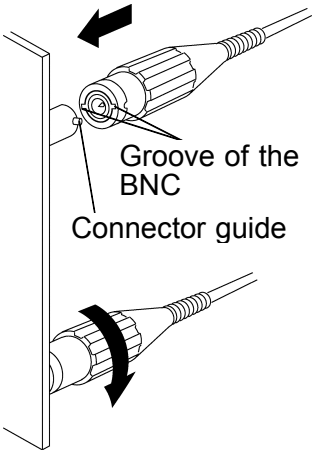
*: The voltage levels are 30 V rms and 42.4 V peak or 60 V DC.

⚠ WARNING

- **When you are using the clamp to the 8855, the 8951 GND, clamp GND, and power supply terminals of units on other channels are not insulated. Exercise care in handling these to avoid damaging this unit or suffering from injury.**
- **To avoid shock and short circuits, turn off all power before connecting probes.**

⚠ CAUTION

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 cord, can damage the connector.



Connecting the Connection cord (for voltage measurement)

1. Align the BNC connector with the guide groove of the 8855 input connector, and turn clockwise while pressing in to lock the connector.
   (For using the 8951, use the 9198 CONNECTION CORD)
2. To remove from the input module, turn the BNC connector counterclockwise to release the lock, then pull it.

Connecting the Clamp (for current measurement)

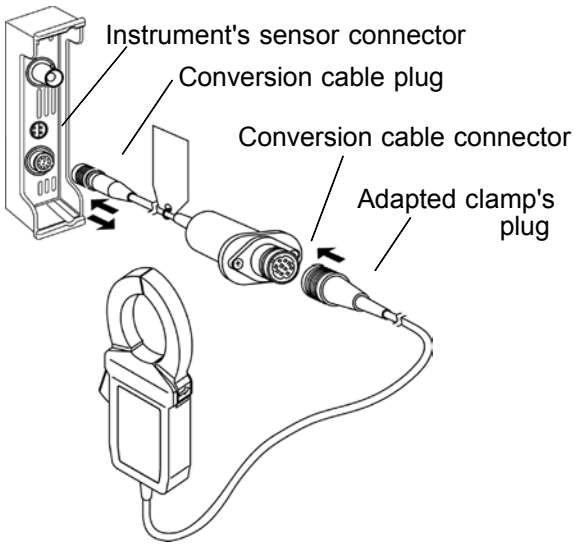
The following clamp-on sensors and clamp-on probes can be connected using the 9318 CONVERSION CABLEs.

Conversion cable	Clamp-on sensor/probe
9318	9270, 9271, 9272, 9277, 9278, 9279

Number of usable clamps

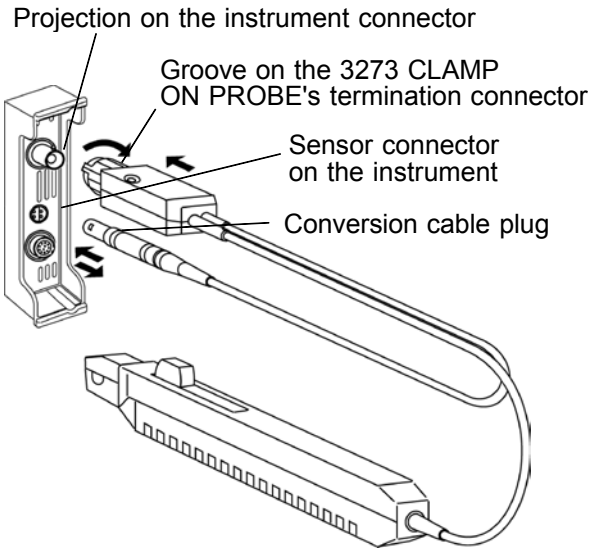
The number of clamps that can be used with the 8855 is limited according to clamp type. The clamps that can be used for the relevant clamp type is shown to the list shown below.
In the case that the relevant clamp type is used the clamp total use number is confirmed and please do not exceed the number of the list shown below.

Clamp	Number
3274 CLAMP ON PROBE	
Continuous 150 A	8
Non-continuous 300 A	4
3273-50, 3275, 3276 CLAMP ON PROBE	4
9278 UNIVERSAL CLAMP ON CT	7
9279 UNIVERSAL CLAMP ON CT	7



Connecting the 9318 CONVERSION CABLE

1. Align the groove on the conversion cable plug with the sensor connector on the 8951 and push inward until the connector locks into place.
2. Align the groove on the conversion cable connector with the adapted clamp on sensor plug and push inward until the connector locks into place.
3. To unplug the cables, slide the lock ring on each plug outward to unlock it, then pull out the plug.



Connecting the 3273, 3273-50, 3274, 3275, 3276 CLAMP ON PROBE

1. Align the groove on the 3273, 3273-50, 3274, 3275, 3276 CLAMP ON PROBE's termination connector with the pin on the BNC connector on the 8951, then slide the termination connector over the BNC connector and turn to lock it in place.
2. Align the groove on the 3273, 3273-50, 3274, 3275, 3276 cable plug with the power connector on the 8951.

2.4.3 8954 VOLTAGE/TEMP UNIT

⚠ WARNING

- **Do not connect the connection cord to the 8855 while the unit is connected to the object being measured. This may cause electric shock.**
- **A common GND is used for the voltage and temperature input on each channel. When using the voltage and temperature inputs simultaneously, do not connect them both at the same time as this may damage the object you are measuring.**
- **When using a non-insulated thermocouple to measure the temperature of points, be careful not to touch the terminals. The terminals may be electrically charged.**

⚠ CAUTION

- 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.
- Make sure that the thermocouple is installed in a location within the safe super-low voltage (30 V rms or 60 V DC). For information on selecting a thermocouple when measuring high voltage components, contact the thermocouple manufacturer.

NOTE

- The voltage and temperature inputs and this unit are isolated.

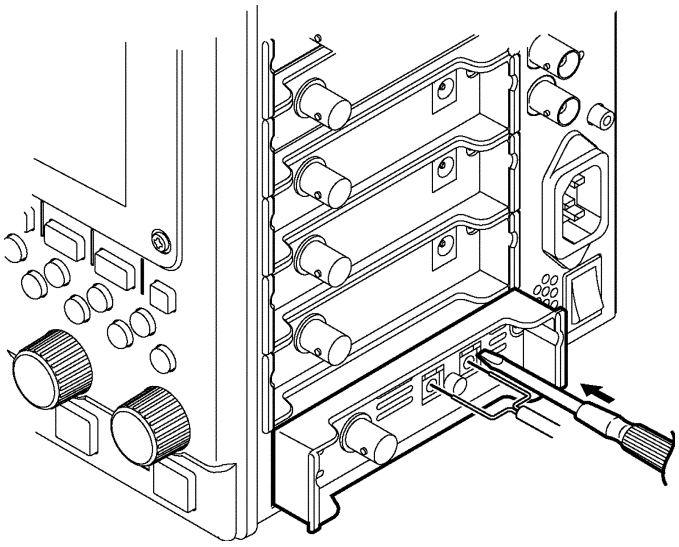
Connecting the connection cord (when measuring voltage)

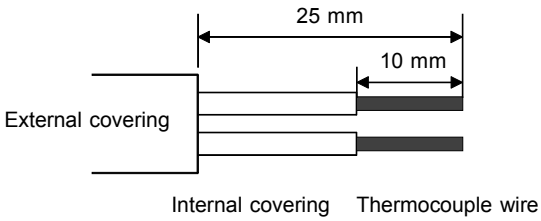
1. Align the groove on the BNC connector with the connector guide on the unit and insert the BNC connector, then turn it to the right to lock it in place. (Use the 9198 CONNECTION CORD when measuring voltage with the 8954.)
2. To remove the BNC connector, turn it to the left to release the lock, then pull it out.

Connecting the thermocouple (when measuring temperature)

1. First, remove the covering from the thermocouple.
2. Press the button with a tool, such as a screwdriver.
3. With the button pressed down, insert the thermocouple into the connection slot.
4. When you release the button, the thermocouple is fixed in place.
5. To remove the thermocouple, hold down the button and pull out the thermocouple.

How to remove the covering from the thermocouple





Recommended diameter
ϕ 0.4 mm to 1.2 mm
(AWG26 to 16)

NOTE

- To install and remove the thermocouple, use a tool such as a screwdriver.
- The push-button terminal block on the 8954 VOLTAGE/TEMP UNIT is for use with a thermocouple. Only connect the thermocouples specified (types K, J, E, T, N, R, S, B, and W).
- If you reverse the + and connections on the thermocouple, the correct value will not be displayed.

2.5 Logic Probe Connection

⚠ DANGER

The logic input and 8855 instrument share a common ground. Therefore, if power is supplied to the measurement object of the logic probe and to the 8855 from different sources, an electric shock or damage to the equipment may result.
Even if power is supplied from the same system, if the wiring is such that a potential difference is present between the grounds, current will flow through the logic probe so that the measurement object and 8855 could be damaged. We therefore recommend the following connection method to avoid this kind of result.

(1) Before connecting the logic probe to the measurement object, be sure that power is supplied from the same outlet box to the measurement object and the 8855 using the supplied power cord.

(2) Before connecting the logic probe to the measurement object, connect the ground of the measurement object to the 8855 ground terminal. Also in this case, power should be supplied from the same source. Refer to Section 2.2, "Power Supply and Ground Connections" for grounding terminal details.

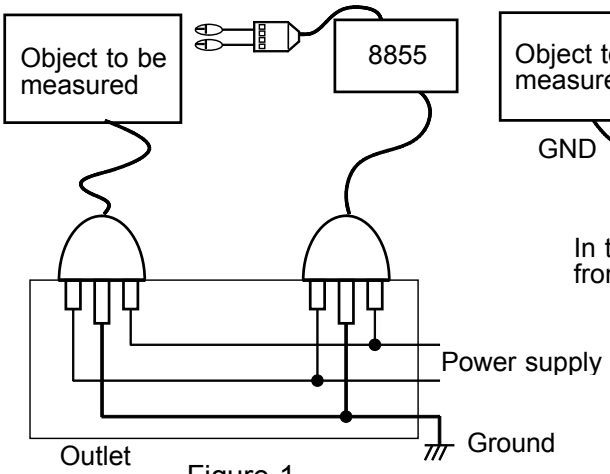


Figure 1

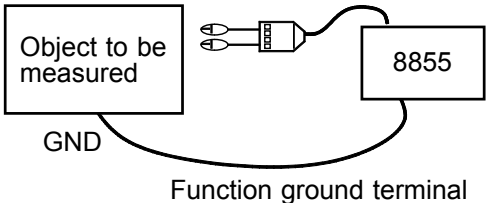
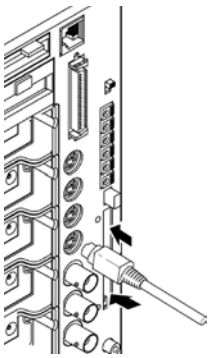


Figure 2



- The logic input is located on the rear of the instrument. Up to four probes can be connected.
- Since one logic probe can record 4 channels, the combined maximum recording capability for logic waveforms is 16 channels.
- Connect the probe by aligning the groove on the plug with the ridge on the connector.

NOTE

- If no logic probe is connected, the corresponding logic waveform is displayed on the screen at high level.
- Carefully read the instruction manual supplied with the probe.
- Do not connect logic probes other than supplied by HIOKI to the logic inputs.

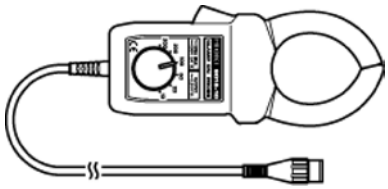
2.6 9018-10, 9132-10 CLAMP ON PROBE Connection

⚠ DANGER

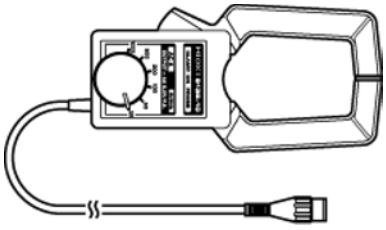
- **Clamp-on probe should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**
- **Before using the 9018-10, 9132-10 CLAMP ON PROBE, be certain that you understand the instructions and precautions in the manual**

This instrument measures input voltage, so although current can not be measured directly, current can be measured by the voltage output from the HIOKI 9810-10, 9132-10 CLAMP ON PROBEs.

Connect the BNC connector of the CLAMP ON PROBE to the analog input terminal. For details, refer to "Connecting the Connection cord (for voltage measurement)" of 2.4.2.



9018-10



9132-10

NOTE

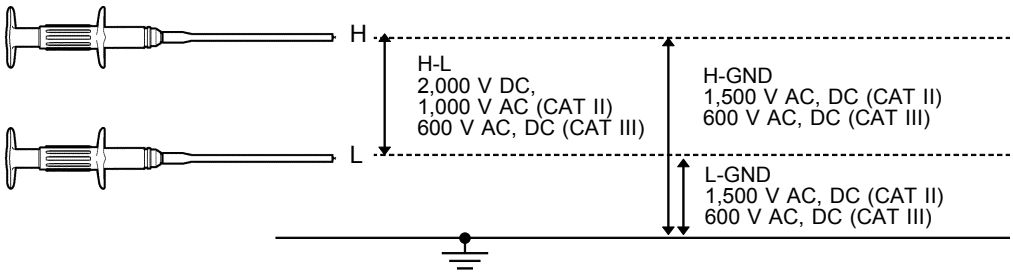
- The 8855 will indicate measurement results as voltage.
- Using the scaling function, units can be converted to "A" for display. See Instruction Manual Section 5.3.2.
- When the clamp-on probe is used for measurement, the measurement precision will be affected both by the 8855 precision and clamp-on probe precision ratings. The same is true for cases where other clamps are used.
- When using the 9199 CONVERSION ADAPTOR, the 9018, 9132 CLAMP ON PROBEs can be used.

2.7 9322 DIFFERENTIAL PROBE Connection

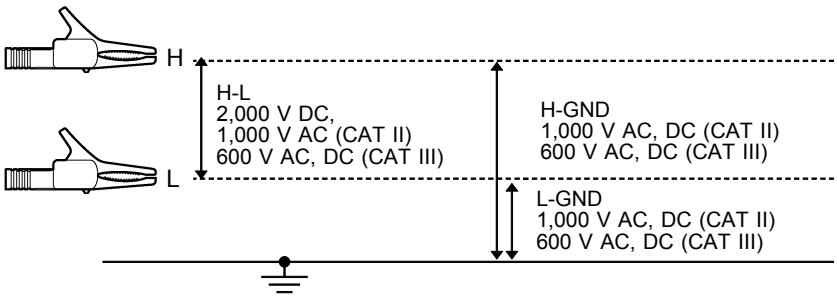
⚠ DANGER

- **When using grabber clips, the 9322's maximum rated voltage to earth is 1500 V AC or DC (CAT II) / 600 V AC or DC (CAT III); when using alligator clips, it is 1000 V AC or DC (CAT II) / 600 V AC or DC (CAT III). To avoid electrical shock and possible damage to the unit, never apply voltage greater than these limits between the input channel terminals and chassis, or across the input of two 9322s.**
- **Maximum input voltage is 1000 V AC/2000 V DC (CAT II) / 600 V AC or DC (CAT III). Attempting to measure voltage in excess of the maximum rating could destroy the instrument and result in personal injury or death.**

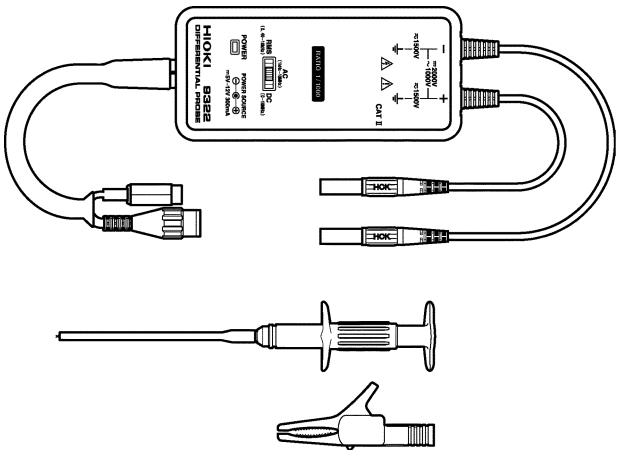
Grabber clips



Alligator clips



9322 is a differential probe that connects to input of 8855 MEMORY HiCORDER input module. For more details, refer to its instruction manual.



2.8 9665 10:1 PROBE / 9666 100:1 PROBE

⚠ DANGER

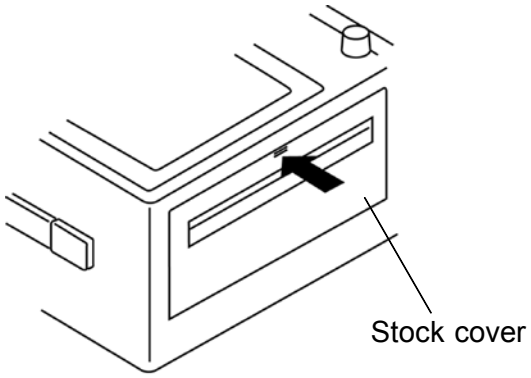
10:1 and 100:1 probe connections

- **The maximum rated to-voltage does not change when using a 9665 10:1PROBE or a 9666 100:1PROBE. To avoid electrical shock or damaging the 8855 unit, make probe connections in such a manner that the method for the probe, and make sure the to-ground voltage does not exceed the rated maximum.**
- **The maximum input voltage is 1,000 Vrms (1MHz max) for the 9665 10:1PROBE, and 5,000 Vpeaks (1MHz max) for the 9666 100:1PROBE. (The measurement category (overvoltage category) is the same as that of the input modules of MEMORY HiCORDERs that use the 9665 and the 9666.) Do not measure voltages that exceed the maximum input voltage, as the 8855 unit could be damaged and an accidents resulting in injury or death could result.**

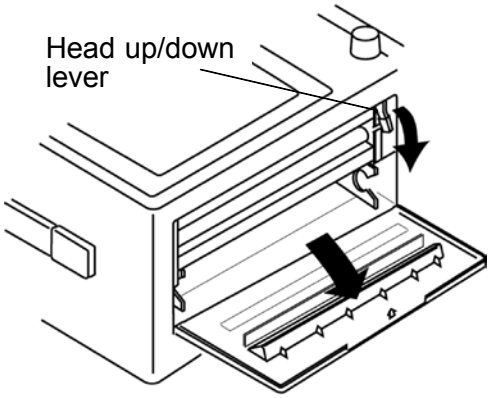
NOTE

- The 9665 10:1PROBE and the 9666 100:1PROBE cannot be used with the 8951 VOLTAGE/CURRENT UNIT, the 8954 VOLTAGE/TEMP UNIT, or the 8955 F/V UNIT.
- For details on the 9665 10:1PROBE and the 9666 100:1PROBE, refer to the instruction manuals supplied with the respective probes.

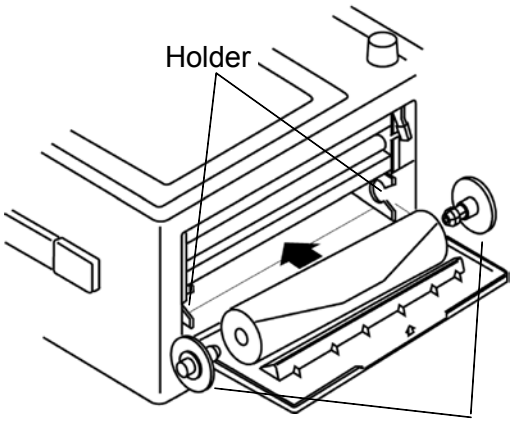
2.9 Loading Recording Paper (when the 8994 PRINTER UNIT is installed)



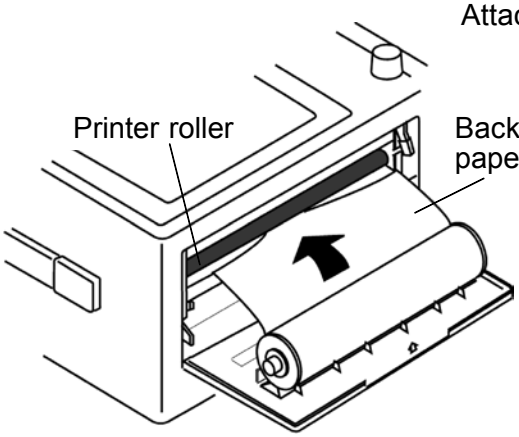
1. Press the stock cover and open it.



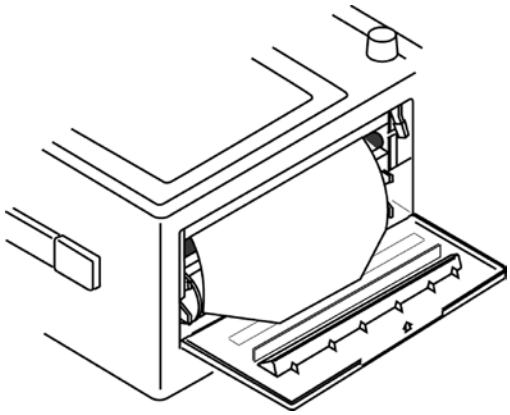
2. Put down the head up/down lever.



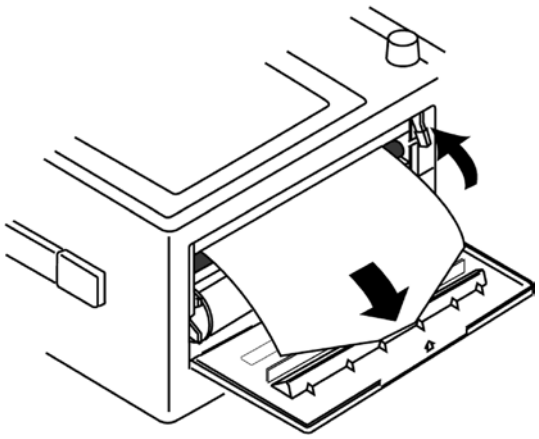
3. Insert the attachments into the ends of the roll of recording paper and set the paper into its holder.



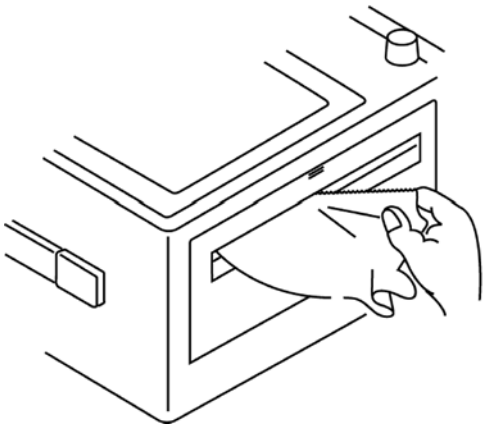
4. Insert the leading edge of the recording paper from above into the gap behind the printer roller, and pull it out to the other side.



5. Align the edges of the recording paper you pulled out of the printer with the edges of the recording paper set into the holder.
   If the edges of the recording paper are not aligned exactly, the paper will come out crooked when printing.



6. Raise the head up/down lever.
7. Pull the recording paper to the outside through the printer exit slot in the stock cover.



8. Close the stock cover, and finish by tearing off the recording paper against the edge of the printer exit slot.

⚠ CAUTION Always place the product in the head-up condition when it is to be transported or stored for an extended period of time. If the product is left idle for a long time with the head pressing on the roller, the roller may be deformed, resulting in uneven printing.

NOTE

- Make sure that the paper may jam if it is not aligned with the roller.
- Printing is not possible if the recording paper is loaded wrong-side up.

2.10 Care of Recording Paper

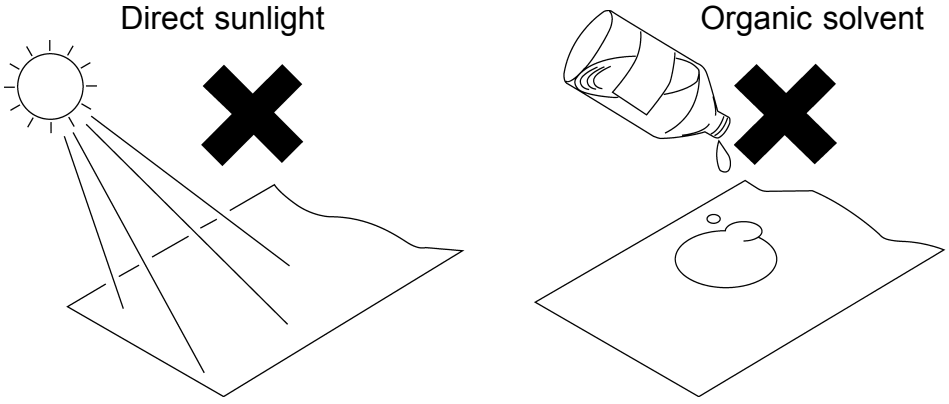
Care of recording paper

- While unopened, thermal paper will not be affected by the environment, provided that ambient temperature and humidity do not exceed normal levels. For long-term storage, temperature should be lower than 40℃. Low temperatures cause no problem.
- After opening, protect the paper from strong light, to prevent discoloration.

Storing data recordings

As the recording paper is thermally sensitive, be aware of the following points:

- To avoid discoloration, do not leave recording paper in direct sunlight.
- Store at not more than 40℃ and 90% RH.
- For permanent storage of important recorded data, photocopy the recording paper.
- Thermal paper will blacken when brought into contact with alcohol, ester, ketone, or other volatile organic substances.
- If the thermal paper absorbs an organic solvent such as alcohols or ketones it may no longer develop properly, and recorded information may fade. Soft PVC film and transparent contact adhesive tape contain such solvents, so avoid using them with recordings.
- The thermal recording paper is ruined by contact with wet Daizo copy paper.



2.11 Notes on Measurement

⚠ DANGER

- **Maximum input voltage ratings for the input module and the input terminals of the instrument are shown below. To avoid the risk of electric shock and damage to the instrument, take care not to exceed these ratings.**
- **The maximum rated voltage to earth of the input module (voltage between input terminals and main instrument frame ground, and between inputs of other analog units) is shown below. To avoid the risk of electric shock and damage to the instrument, take care that voltage between channels and between a channel and ground does not exceed these ratings.**
- **The maximum rated voltage to earth rating applies also if an input attenuator or similar is used. Ensure that voltage does not exceed these ratings.**
- **When measuring power line voltages with the 8950, 8952 or 8953-10, always connect the probe to the secondary side of the circuit breaker. Connection to the primary side involves the risk of electric shock and damage to the instrument.**
- **Before using the instrument, make sure that the insulation on the connection cords is undamaged and that no bare conductors are improperly exposed. Using the products in such conditions could cause an electric shock, so contact your dealer or Hioki representative for replacements. (Model 9197 or 9198 CONNECTION CORD.)**

Input/output terminal	Maximum input voltage	Maximum rated voltage to earth
8950 (input)	400 V DC max.	370 V AC/DC
8951 (input)	30 V rms or 60 V DC	30 V rms or 60 V DC
8952 (input)	400 V DC max.	370 V AC/DC
8953-10 (input)	400 V DC max.	370 V AC/DC
8954 (input)	30 V rms or 60 V DC	370 V AC/DC
8955 (input)	30 V rms or 60 V DC	30 V rms or 60 V DC
9322	2000 V DC, 1000 V AC (CAT II) 600 V DC/AC (CAT III)	When using grabber clips 1500 V DC/AC (CAT II), 600 V DC/AC (CAT III) When using alligator clips 1000 V DC/AC (CAT II), 600 V DC/AC (CAT III)
EXT TRIG/ START • STOP/ EXT SMPL	-5 to +10 V DC	Not insulated
TRIG OUT/ GO/ NG/ EXT.OUT	-20 V to +30 V DC 500 mA max./ 200 mW max.	

⚠ WARNING

- **In order to avoid accidents from electric shock, before removing or replacing an input module, check that the connection cords and thermocouple are disconnected, turn off the power, and remove the power cord.**
- **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.**

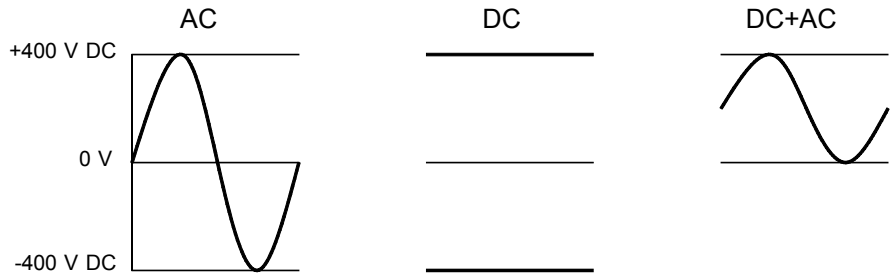
NOTE

When making measurements on an AC power line for example, using a voltage transformer, be sure to connect the voltage transformer ground terminal to ground.

Difference between "370 V AC, DC" and "400 V DC max." indication

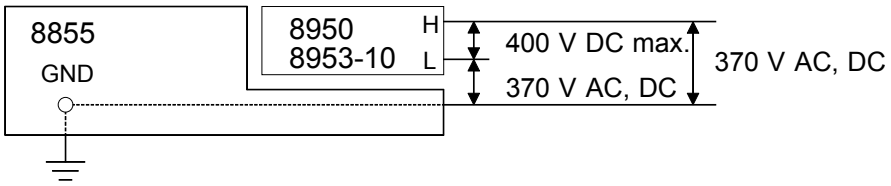
370 V AC, DC: RMS value is displayed.
400 V DC max.: Instantaneous value is displayed.

The maximum input voltage (400 V DC max.) is defined as the superposition of DC component and AC peak, as shown in the figure below.

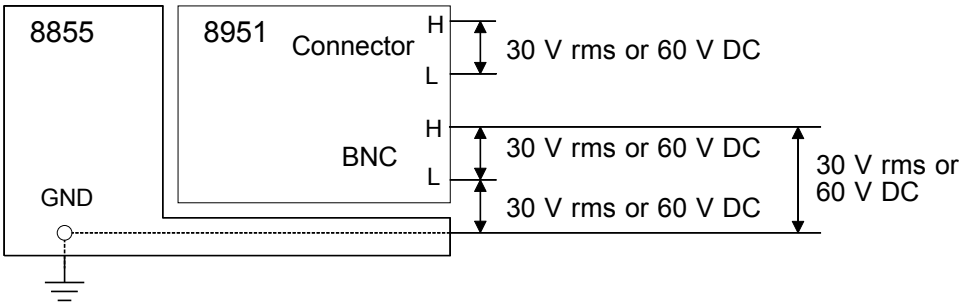


2.11.1 Maximum Input Voltage

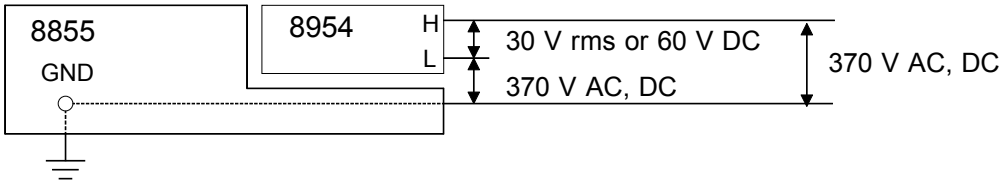
8950 ANALOG UNIT/ 8952 DC/RMS UNIT/ 8953-10 HIGH RESOLUTION UNIT



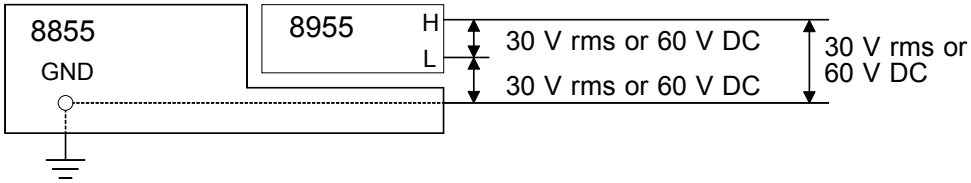
8951 VOLTAGE/CURRENT UNIT



8954 VOLTAGE/TEMP UNIT



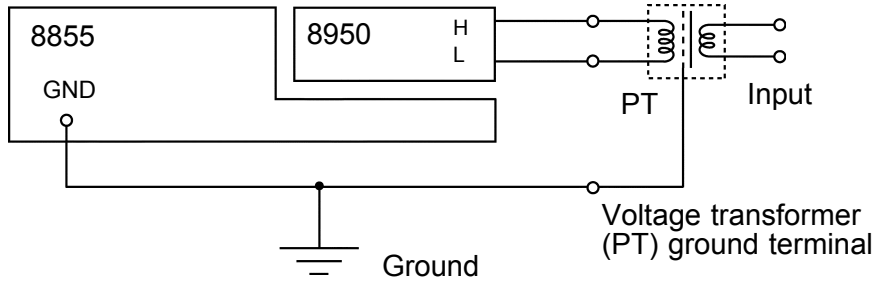
8955 F/V UNIT



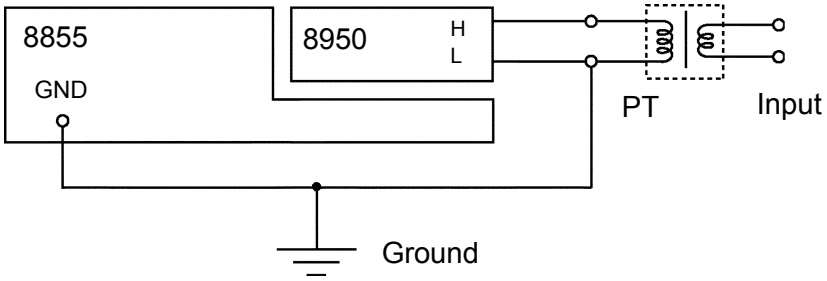
2.11.2 Using a Voltage Transformer

When making measurements on an AC power line for example, using a voltage transformer, be sure to connect the voltage transformer ground terminal to ground.

When the voltage transformer has a ground terminal



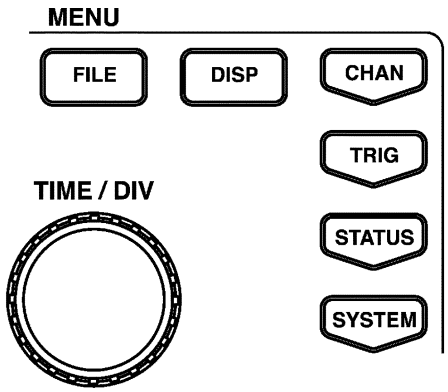
When the voltage transformer has no ground terminal



Chapter 3
Basic Key Operation

3.1 Basic Key Operation

3.1.1 Basic Display Operation (MENU)

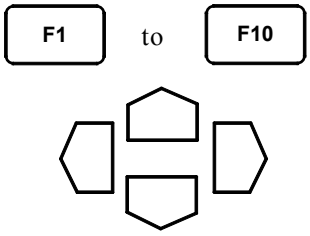


FILE key	Displays the File screen. Serves to read and store waveform data on the File screen. See Chapter 10.
DISP key	Displays the Waveform display screen. Serves to display and observe waveforms.
CHAN key	Displays the Channel screen. Serves to set measurement range, position, scaling, variable setting, comment input, etc. for input channels.
TRIG key	Displays the Trigger screen and serves to set trigger.
STATUS key	Displays the Status screen. Serves to switch pages of the Status screen. Serves to make main settings for various functions on the Status screen.
SYSTEM key	Displays the System screen. Serves to switch pages of the System screen. Serves to make common settings for all functions (clock setting, printer setting, communication setting, etc.) on the System screen.

3.1.2 Printer Key Operation

PRINT key	Serves to print out the waveform.
COPY key	Produces a hard copy of the display content.
FEED key	Forwards the paper while the key is held down.

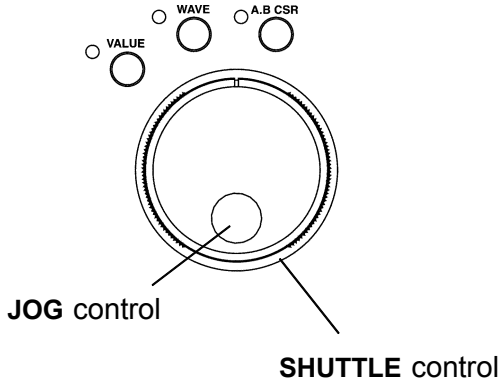
3.1.3 Setting the Items



F1 to **F10** (Function keys)	The respective items are shown in the function key display. Select and set the items.
CURSOR keys	Serve to move the flashing cursor.

3.1.4 Jog/Shuttle Controls and Select Key

Use the select key when the screen is in measurement display mode. Selected key lights LED.

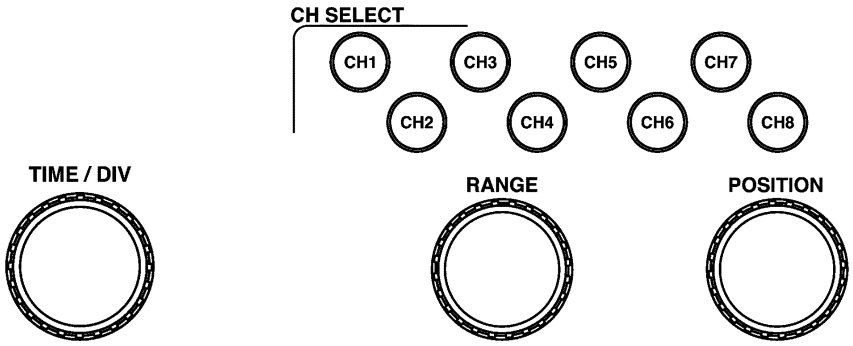


VALUE	Entering the numerical values.
WAVE	Waveform scrolling (See Section 8.1)
A.B CSR	Movement of A/B cursors (See Section 8.2)

When the LED "VALUE" is lit and the following function keys are displayed, values and items may be set with the **JOG/SHUTTLE** control.

	Increases in number.	Move the item selection cursor up in the selection window.
	Decreases in number.	Move the item selection cursor down in the selection window.
	Increases in number, large step	Increases in number, 10 or 50-units
	Increases in number, small step	Increases in number, 1-units
	Decreases in number, small step	Decreases in number, 1-units
	Decreases in number, large step	Decreases in number, 10 or 50-units

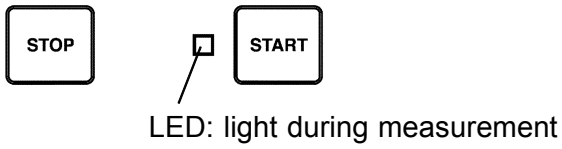
3.1.5 Basic Input Operation



Set the basic settings for analog channels. See Chapter 6.

CH1 - CH8 keys	Used to select channels and input values for connected input modules. • In the Display or Channel screen, these keys are used to select channels or set channels directly by means of the **POSITION** and **RANGE** knobs. • In the value input, these keys are used to set values.
RANGE knob	Serves to set the measurement range for the channel selected by the channel select key.
POSITION knob	Serves to set the zero position for the channel selected by the channel select key.
TIME/DIV knob	Serves to set the input signal capture speed.

3.2 Measurement Start and Stop Operation



START key	Press the **START** key to initiate measurement or set the instrument to trigger standby.
STOP key	Press the **STOP** key during measurement and trigger waiting to stop the measurement.

NOTE

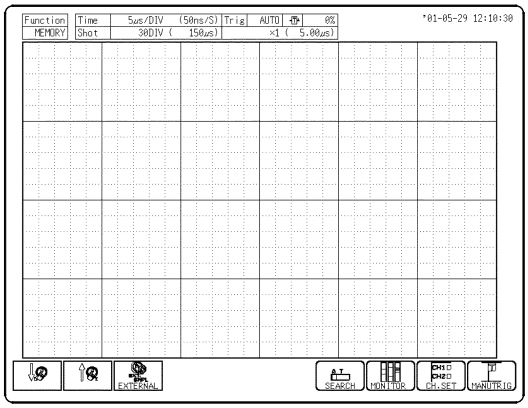
The measurement start/stop operation is separately determined by each measurement function. For details, see "Start and Stop Operation," which explains each measurement function.

3.3 Other Keys Operation

AUTO key	Automatically sets time axis range, measurement range, and zero position of the input waveforms with the memory function. See Section 4.8.
HELP key	An explanation of the Waveform display screen or the item currently selected by the cursor appears. • Press the **HELP** key to bring up a Help window containing explanatory information. • Pressing any key exits help screen.
SAVE key	Saves the data on the specified media. You can select the format for saving data. See section 10.16 for further details.
ESC key	Exits the Input or Set up screen.

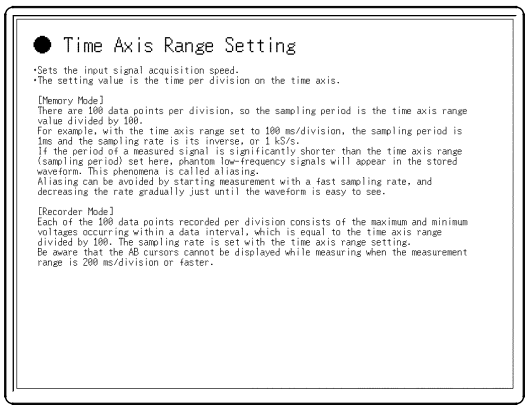
On-line Help

A brief explanation of the item currently selected by the flashing cursor is displayed by pressing the **HELP** key.
Press any key to cancel the help screen.



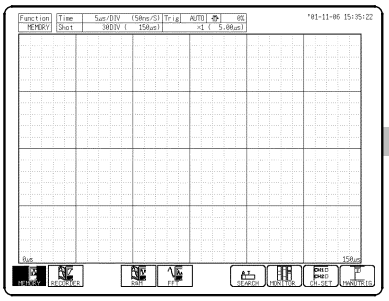
Press any key

Press the **HELP** key



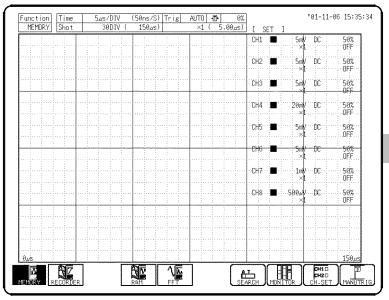
3.4 Screen Configuration

Waveform display screen



DISP

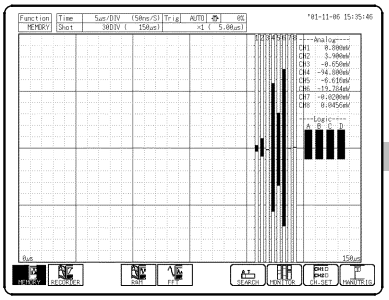
Channel setting screen



F 9

The input channel can be set. Press the **CH.SET** key to change the input channel setting screen.

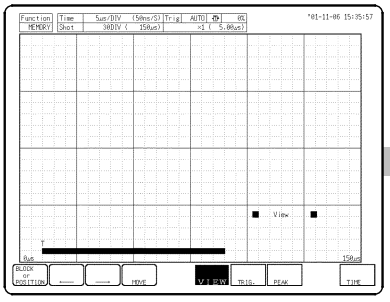
Level monitor screen



F 8

The input level can be viewed and set.

VIEW screen

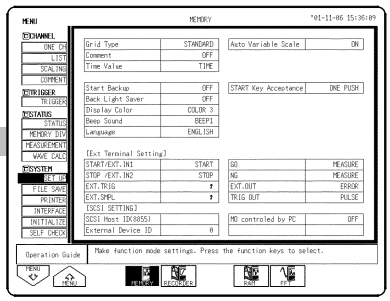


F 7

The waveform display position and block occupation status can be viewed.

SYSTEM screen

SYSTEM

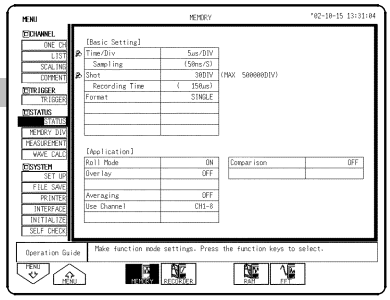


SET UP
FILE SAVE
PRINTER
INTERFACE
INITIALIZE
SELF CHECK

From the SYSTEM screen, click the <SYSTEM> key to move between the setting screens.

STATUS screen

STATUS

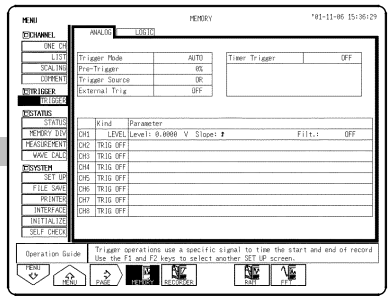


STATUS
MEMORY DIV
MEASUREMENT

From the STATUS screen, click the <STATUS> key to move between the setting screens.

TRIGGER screen

TRIG

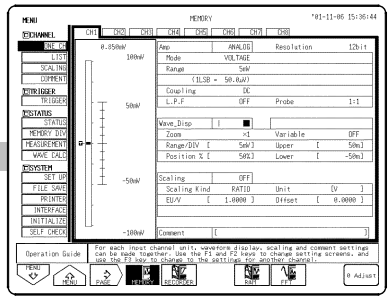


Channels 1 - 8
Channels A - D

From the TRIGGER screen, press the <F3> key (page) to move between the analog and logic setting screens.

CHANNEL screen

CHAN



ONE CH
LIST
SCALING
COMMENT

From the CHANNEL screen, press the <CHAN> key to move between the setting screens. From each channel screen, press the <F3> key (page) or a channel select key to move between individual channel setting screens.

Chapter 4
Memory Function

4.1 Overview of the Memory Function

The memory function has the following features.

(1) After being stored in the internal memory, input signal data can be displayed and printed.

(2) All input channel data are recorded on the same time axis.
Since data for all channels can be superimposed, the relative relationship between input signals can be observed visually.

(3) Time axis setting
5 µs/DIV to 5 min/DIV (24 steps)

(4) Time axis resolution 100 points/DIV

(5) Storage capacity (constant)

Number of channels	8	4	2
32 M words (DIV)	20000	50000	100000
128 M words (DIV)	100000	200000	500000
512 M words (DIV)	500000	1000000	2000000

(6) Waveform magnification/compression display and print
- Time axis direction x 10 to x 1/100000 (19 steps)
- Voltage axis direction x 100 to x 1/2 (single) 8 steps
- With the variable function, zoom function

(7) Display format
- Time axis waveform: single, dual, quad, oct screen display
- X-Y waveform: single, quad screen display (dot, line)

(8) Printing
- Auto print, Manual print, Partial print, Report print, Screen hard copy.
- Multiple printing possible.

(9) High-quality print
Smooth print function approximates analog waveform.

(10) Logging function
Numeric printout of waveform data

(11) Memory segmentation function
Helps to reduce dead time of continuous recording.

(12) Calculation function
- Waveform processing (arithmetic processing, differential processing etc.)
- Numerical calculation (frequency measurement, rms measurement etc.)

(13) Averaging
This makes it possible to eliminate noise and irregular signal components.

(14) Waveform evaluation function detects abnormal waveforms.

4.2 Operation Sequence (MEM)

Preparation

See Chapter 2

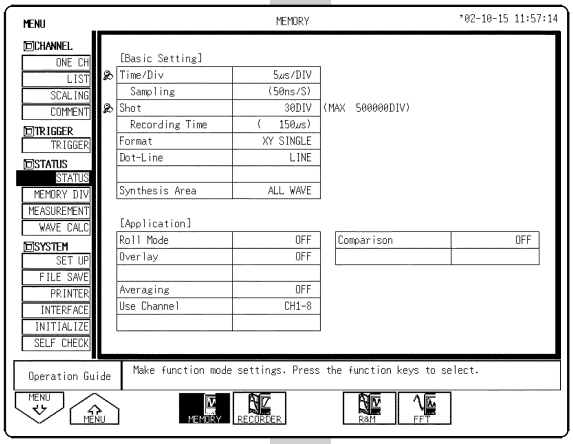
- Installation of the Instrument
- Turn on the power
- Connect the inputs

Basic Settings

Settings on the STATUS screen

See Section 4.3

Press the **STATUS** key to display the STATUS screen.

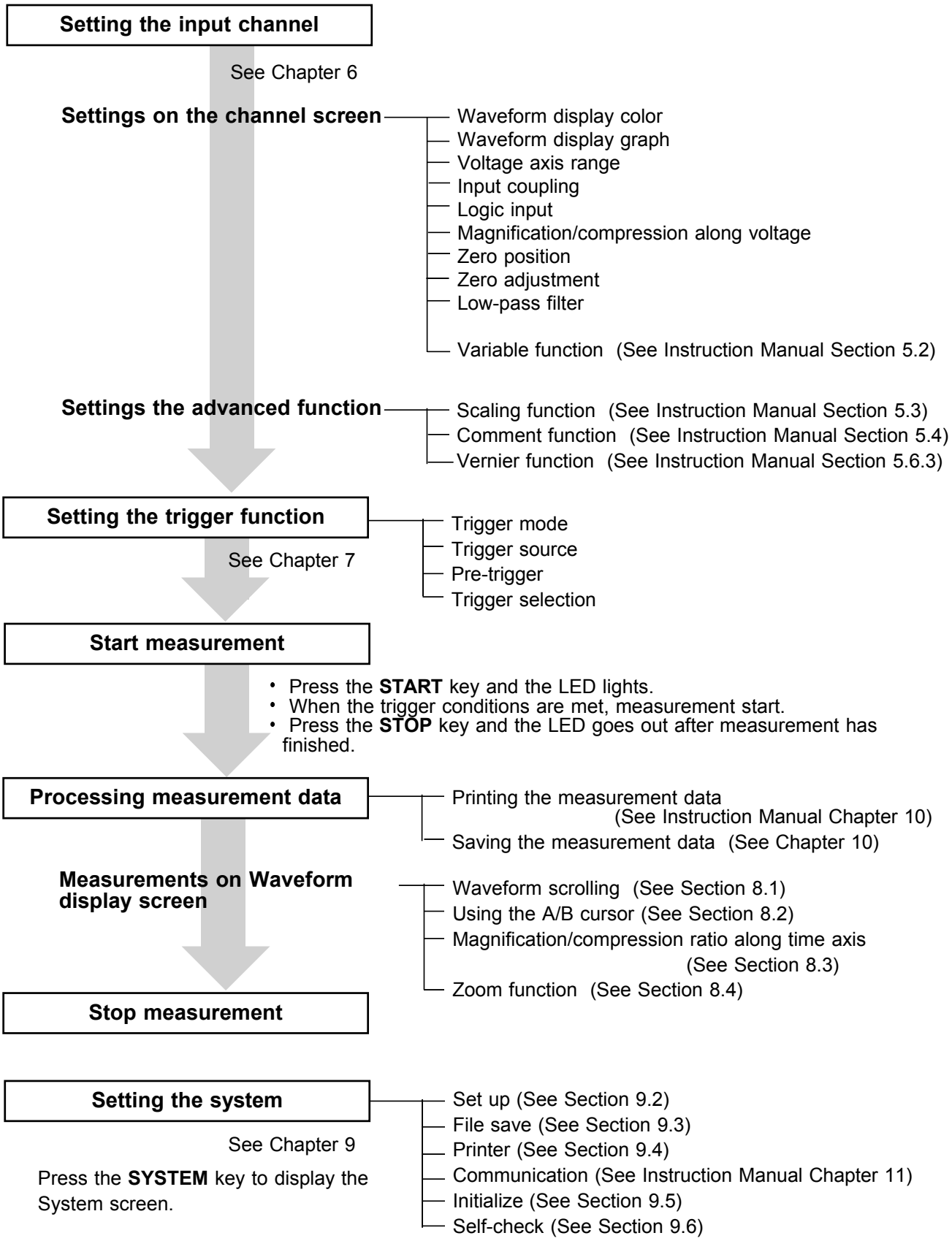


- **Function** — Select the memory function.
- **Time axis range** — Determine the speed with which the input signal waveform is captured.
- **Recording length** — Determine the length of the data sample for a single measurement.
- **Display format** — Select the format type for the Waveform display screen.
- **Interpolation** — Interpolation can be set when set the X-Y graph format.
- **Combined area settings** — Allows to set the area to be combined on the X-Y screen.
- **Roll mode** — Select whether or not to display the waveform at the same time as it is captured.
- **Overlay function** — Select whether or not to overlay.
- **Averaging count** — Set the averaging type and count.
- **Using channel** — Select whether the memory for measurement data is used by being divided up.

Advanced Settings
(Use this function, if necessary.)

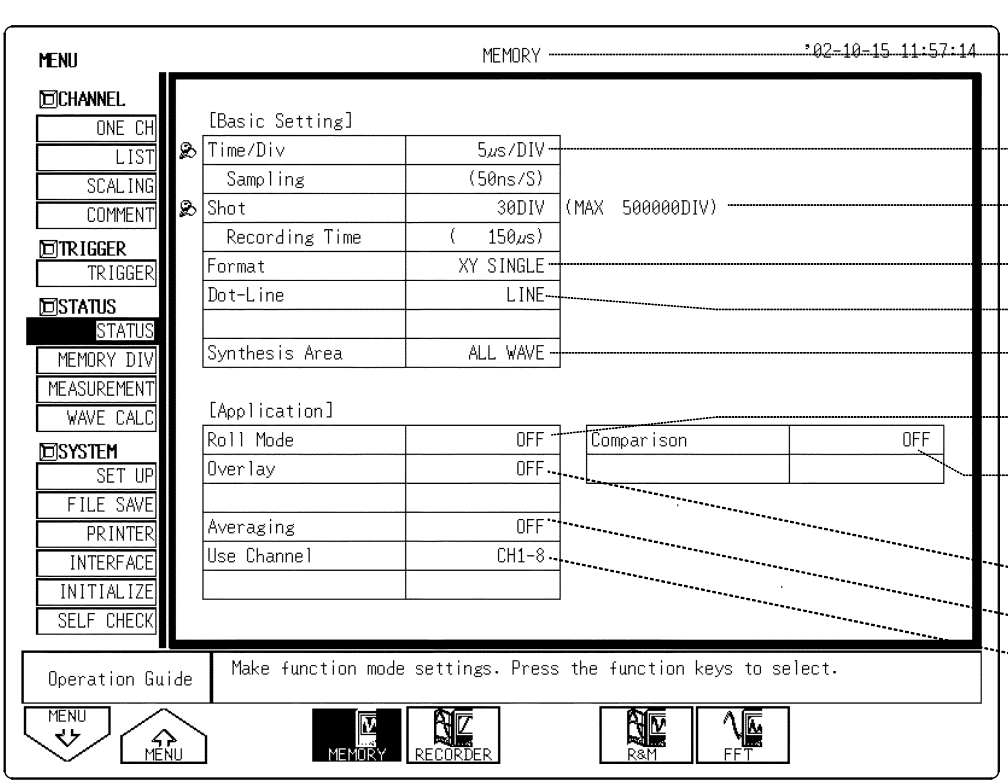
Settings on the STATUS screen

- Set the memory segmentation function
  See Instruction Manual Chapter 6
- Set the calculation function
  See Instruction Manual Chapter 7
  - Numerical calculation
  - Waveform processing calculation
- Set the waveform evaluation function
  See Instruction Manual Chapter 9


Setting the input channel
See Chapter 6
Settings on the channel screen
Waveform display color
Waveform display graph
Voltage axis range
Input coupling
Logic input
Magnification/compression along voltage
Zero position
Zero adjustment
Low-pass filter
Variable function (See Instruction Manual Section 5.2)
Settings the advanced function
Scaling function (See Instruction Manual Section 5.3)
Comment function (See Instruction Manual Section 5.4)
Vernier function (See Instruction Manual Section 5.6.3)
Setting the trigger function
Trigger mode
Trigger source
Pre-trigger
Trigger selection
See Chapter 7
Start measurement
• Press the START key and the LED lights.
• When the trigger conditions are met, measurement start.
• Press the STOP key and the LED goes out after measurement has finished.
Processing measurement data
Printing the measurement data (See Instruction Manual Chapter 10)
Saving the measurement data (See Chapter 10)
Measurements on Waveform display screen
Waveform scrolling (See Section 8.1)
Using the A/B cursor (See Section 8.2)
Magnification/compression ratio along time axis (See Section 8.3)
Zoom function (See Section 8.4)
Stop measurement
Setting the system
Set up (See Section 9.2)
File save (See Section 9.3)
Printer (See Section 9.4)
Communication (See Instruction Manual Chapter 11)
Initialize (See Section 9.5)
Self-check (See Section 9.6)
See Chapter 9
Press the SYSTEM key to display the System screen.

4.3 STATUS Settings (MEM)

Press the **STATUS** key to access the Status screen. This section explains how to set the Status screen of the memory function. See the corresponding sections for items that can be set in the Waveform display or Channel screens.
Waveform display screen: See Section 4.5
Channel screen: See Section 6.3



NOTE The settings in Section 4.3.5 are displayed only when the display format has been set to "X-Y."

4.3.1 Setting the Function Mode

The 8855 has four function modes. Select the Memory function.

Procedure

Screen: STATUS, CHANNEL, Waveform display, TRIGGER, SYSTEM

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the top position.
3. Select the **MEMORY** function key display.

Function display	Meaning
	: Memory function
	: Recorder function
	: Recorder & Memory function
	: FFT function

4.3.2 Setting the Time Axis Range

Set the speed for inputting and storing the waveform of the input signal. Time axis range setting expresses the time for 1 division. The sampling period is 1/100th of the set value for the time axis range. (100 samples/DIV) See Instruction Manual Appendix 3.

Procedure 1

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Time/DIV** item.
3. Use the **JOG** control or the function keys to make the selection. When "**EXT.**" is selected, the external sampling can be used.
For details, see Section 11.1.4.

Data points per division are set when external sampling is selected.

1. Move the flashing cursor to the **samples/DIV** item.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection. Setting range is 10 to 1000.

Procedure 2

Using the TIME/DIV key

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Use the **TIME/DIV** nob to make the selection.
The **TIME/DIV** nob can be used regardless of where the flashing cursor is located.

NOTE

- When only the 8953-10 HIGH RESOLUTION UNIT is installed, the time axis can be set higher than 50 µs/div. However, the sampling cycle cannot be set higher than 1 µs (1 MS/s).
- When using both the 8950 ANALOG UNIT and 8953-10 HIGH RESOLUTION UNIT, depending on the difference of sampling, frequency band, or frequency characteristic variations in data may occur.

4.3.3 Setting the Recording Length

The length of recording for one measurement operation (number of DIV) can be set.

FIXED SHOT Select the recording length.
USER SHOT Variable recording length can be selected by the user.

Procedure 1 Constant recording length mode

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Shot** item and select **FIXED SHOT**.
3. Use the **JOG** control or the function keys to make a setting.

Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.

Procedure 2 Variable recording length mode

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Shot** item and select **USER SHOT**.
3. Use the **JOG/SHUTTLE** control or the function keys to make a setting.

Function display	Meaning
	: Increases in number, large step (+50)
	: Increases in number, small step (+1)
	: Decreases in number, small step (-1)
	: Decreases in number, large step (-50)

NOTE

- Depending on the number of channels, the recording length is limited.
- If the recording length is changed during measurement, measurement is restarted using the newly set recording length.

The relation between number of channels and maximum recording length

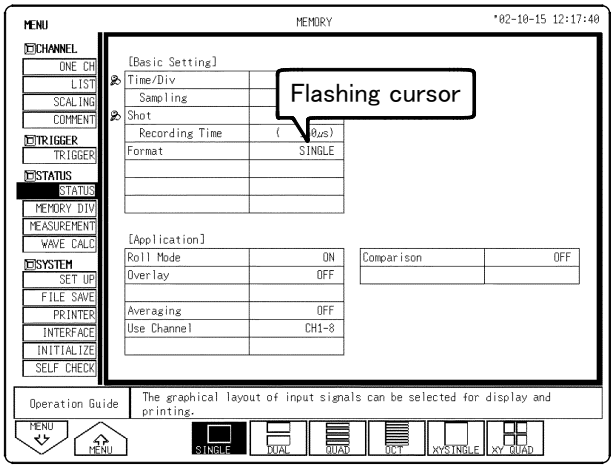
Memory capacity (words)	Maximum recording length (DIV)		
	8 channels	4 channels	2 channels
32 M	40000	80000	160000
128 M	160000	320000	640000
512 M	640000	1280000	2560000

About recording lengths and data items

A recording length of 1 DIV contains 100 data items.
The number of data items for the total set recording length is as follows:
Set recording length (number of DIV) x 100 data items + 1

4.3.4 Setting the Display Format

- The style can be set for showing input signals on the screen display and recording them on the printer.
- The styles single, dual, quad, oct, X-Y single, X-Y quad are available.

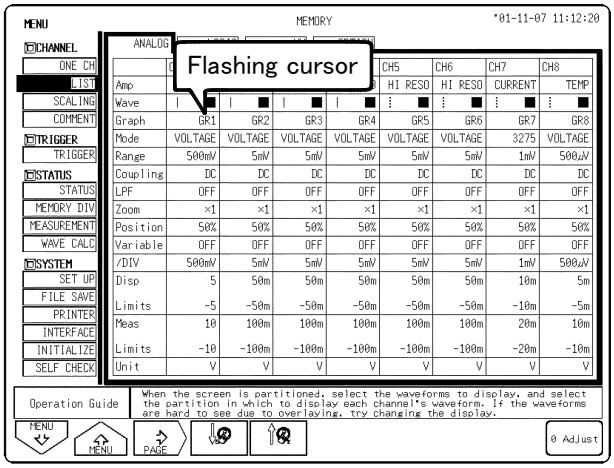


Procedure Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Format** item, as shown in the figure on the left.
3. Use the function keys to select the display format.

Function display	Meaning
SINGLE	: Display and record the waveform in one graph.
DUAL	: Display and record the waveform in two graphs.
QUAD	: Display and record the waveform in four graphs.
OCT	: Display and record the waveform in oct graphs.
XYSINGLE	: X-Y waveforms of graphs 1 to 4 are displayed in one screen.
XY QUAD	: X-Y waveforms of graphs 1 to 4 are displayed in four screen.

Set which graph type to use when display format has been set to DUAL, QUAD or OCT screen display on the Status screen.



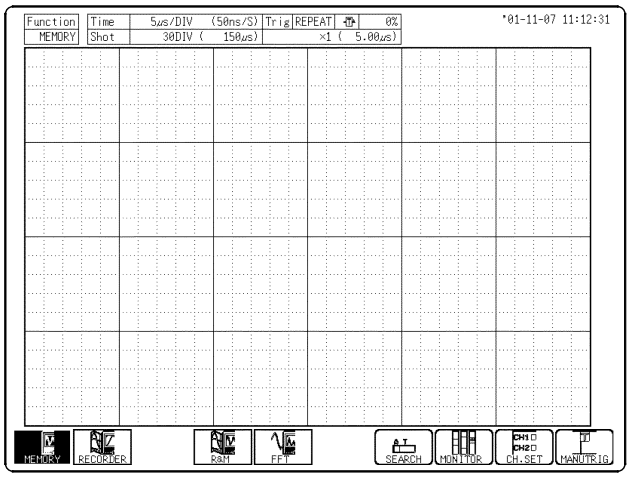
Procedure Screen: ONE CH, LIST (CHANNEL)

1. Press the **CHAN** key to display the Channel screen.
2. Move the flashing cursor to the position of the **Graph** to be set.
3. Use the function keys or **JOG** control to make the selection.

Function display	Meaning
	: Increases in number
	: Decreases in number

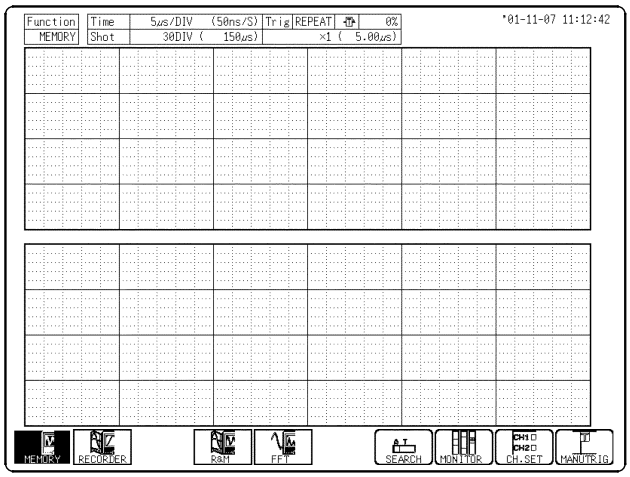
NOTE For the X-Y screen (memory and recorder) display format, see the X-Y recorder setting for each function.

Single graph



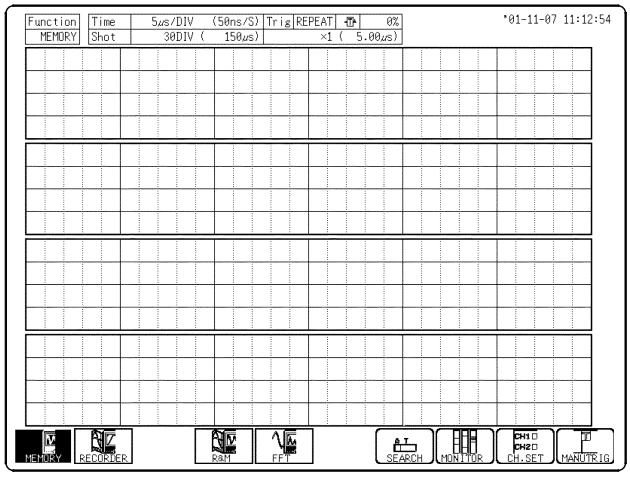
Display and record as one graph.
(At the most, 8 analog + 16 logic signals)

Dual graph



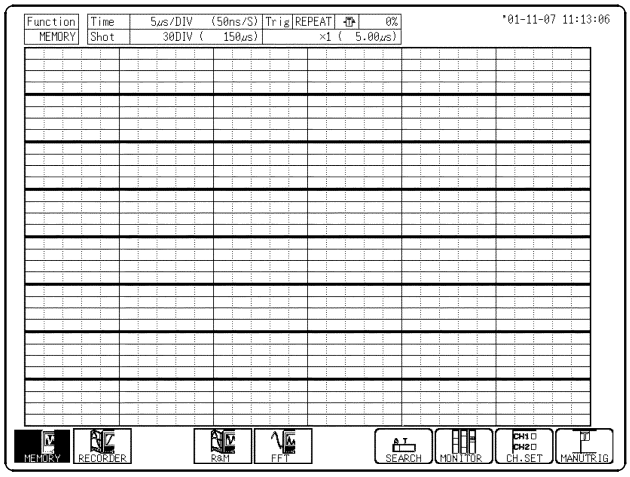
- Display and record as two graphs. (At the most, 8 analog + 16 logic signals)
- Specify which input channel to use for waveform graph display and recording.

Quad graph



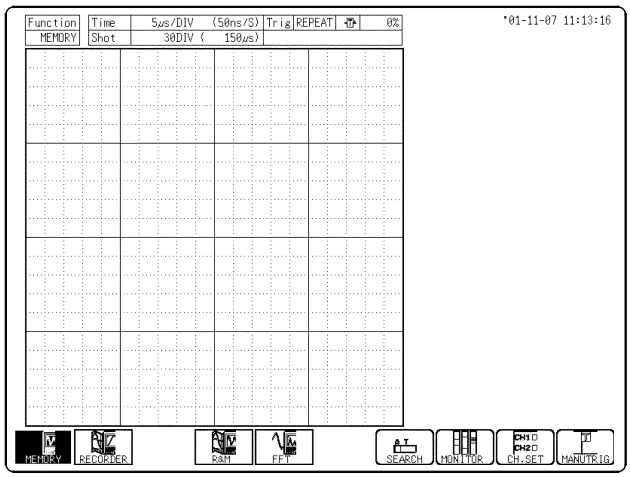
- Display and record as four graphs. (At the most, 8 analog + 8 logic signals)
- Specify which input channel to use for waveform graph display and recording.

Oct graph

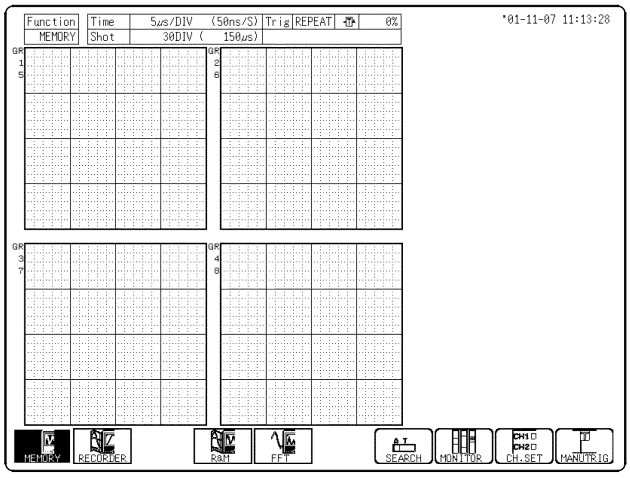


- Record as eight graphs. (At the most, 8 analog + 4 logic signals)
- Specify which input channel to use for waveform graph display and recording.

X-Y single graph



X-Y quad graph



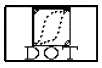
4.3.5 Setting the Interpolation (X-Y screen)

Interpolation can be set when set the X-Y graph format.
This setting determines whether the input waveform (sampling data) is to be displayed and printed as a series of dots or a line using linear interpolation.

Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Dot-Line** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Linear interpolation is not performed.
	: Linear interpolation is performed.

4.3.6 Synthesis Area (X-Y screen)

Synthesis area settings are displayed and can be modified in the STATUS Settings screen, when X-Y (dot line) is selected as the display format.
This sets the area to be plotted on the X-Y graph.

Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Synthesis Area** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Combines all waveforms.
	: Combines the waveform contained between A-B cursors.

4.3.7 Setting the Roll Mode

- This mode can be used at a time axis range setting of 10 ms/DIV or slower. By default, this is set to ON.
- In normal recording, the waveform is displayed only after all data of the recording length have been captured. At low sampling speed settings, this will cause a considerable delay between the start of measurement and the appearance of the waveform on the display.
- When roll mode is set to ON, the waveform is displayed immediately at the start of recording (the screen scrolls).
- When the time axis range of 10 ms/DIV or faster is set, normal recording is carried out even if roll mode is set to ON.

Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Roll Mode** item.
3. Use the function keys to make a setting.

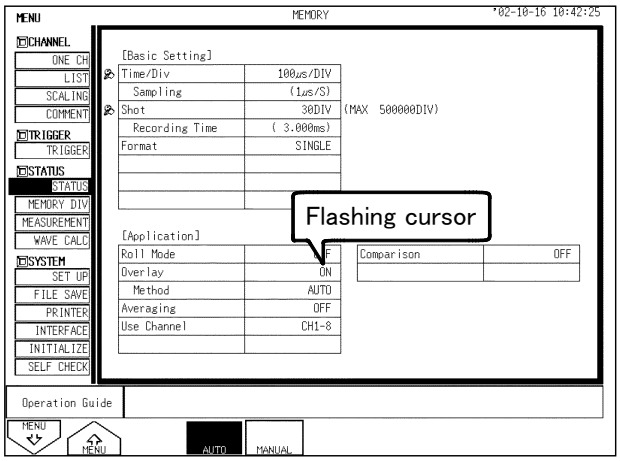
Function display	Meaning
	: Normal recording is carried out.
	: The waveform is displayed immediately at the start of recording.

NOTE

- Roll mode cannot be set together with the external sampling.
- When Roll Mode is set to ON, the settings for Overlay, Averaging, Sequential Saving, Calculating Waveform data, and Waveform evaluation are automatically turned OFF.

4.3.8 Setting the Overlay Function

- Draw a new waveform without clearing the waveform currently displayed on the screen. This function compares a waveform with the waveform recorded immediately before.



Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Overlay** item.
3. Use the function keys to make a setting.

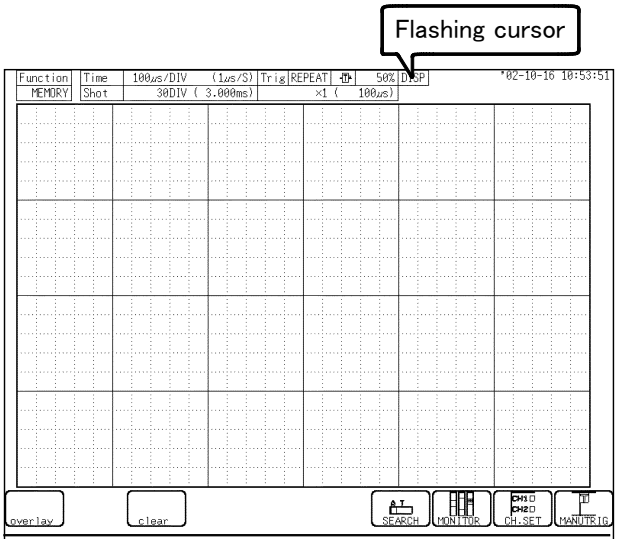
Function display	Meaning
	: Overlay is not performed.
	: Overlay is performed.

4. When the Overlay function is ON, select the overlay pattern.

Function display	Meaning
	: Standard Overlay will be conducted. When the trigger mode is set to "REPEAT" or "AUTO", waveforms will be overlaid until measurement stops.
	: Manually overlay the waveforms on the display. Regardless of the trigger mode, the waveform will remain on the display when the overlay key is pressed.

■ When Selecting "Manual" Overlay

It is possible to leave the desired waveforms on the display. The overlaid waveforms will remain until they are cleared.

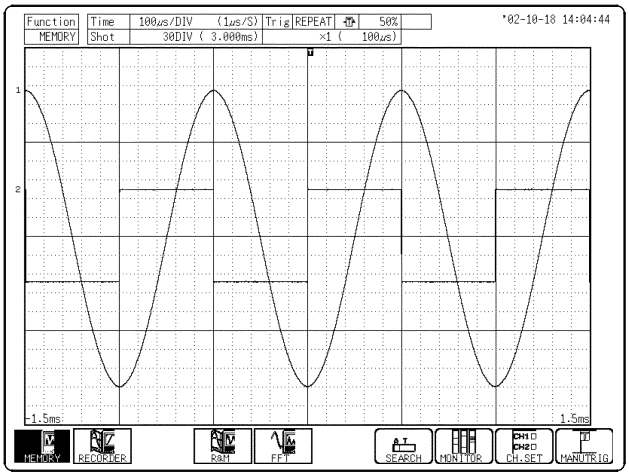


Procedure

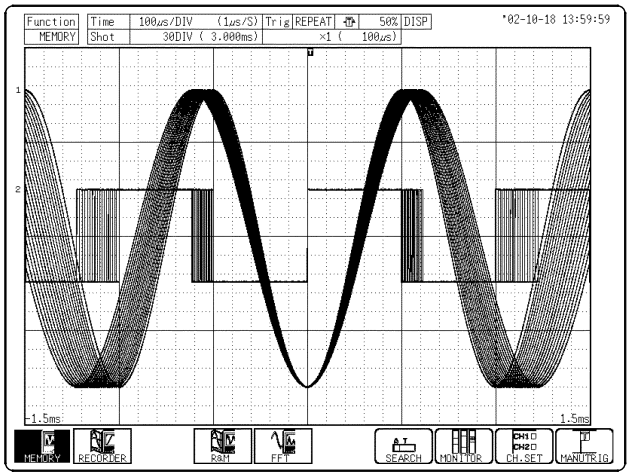
Screen: DISPLAY

1. Press the DISP key to show the display screen.
2. Move the flashing cursor to the "DISPLAY" position.
3. Use the function keys to keep the captured waveforms on the display.

Function display	Meaning
overlay	: Keep the captured waveforms on the display.
clear	: Delete only the overlaid waveforms on the display.



Normal Display



Overlaid Display

NOTE

- When the overlay function is ON and set at "AUTO", the following operations of the waveform display screen are disabled.
  (waveform scrolling, ON/OFF of the zoom function, change in time-axis magnification/compression ratio, change in zero position, and jumping to another waveform display screen using VIEW function)
- When overlay is set at "AUTO", if one of the following setting are made, the overlaid waveforms will be cleared leaving only the last captured waveform.
  (1) Changing the display format on the Status screen.
  (2) When overlay is set at "Manual" and the settings of the input channel is changed on the Channel screen.
  (changing the display graph, the time axis magnification/compression ratio, Zero position, or the Y-axis in the X-Y display)
- When overlay is set at "Manual" and the zoom function's ON/OFF setting or the display format of the status screen is changed, different format waveforms will be overlapped and displayed.
- Print and trace of the A・B cursor is conducted only for the last captured waveform.
- The overlay function cannot be set together with roll mode.

4.3.9 Setting the Averaging Function

- The averaging function allows capturing several instances of a waveform and determining the average.
- This makes it possible to eliminate noise and irregular signal components.
- The higher the number of averaging instances, the more effectively will noise be suppressed.

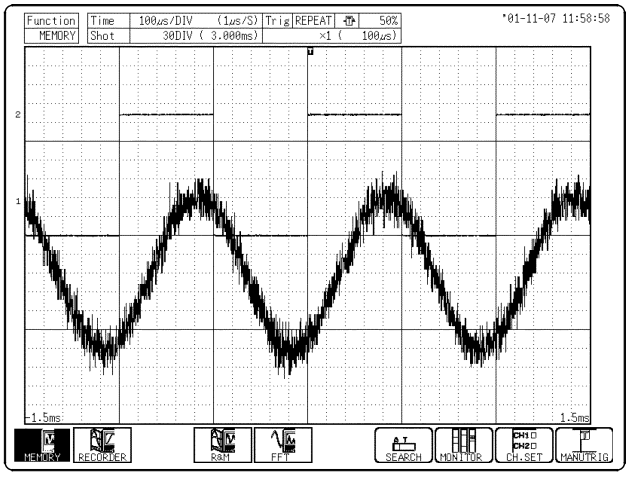
Procedure

Screen: STATUS

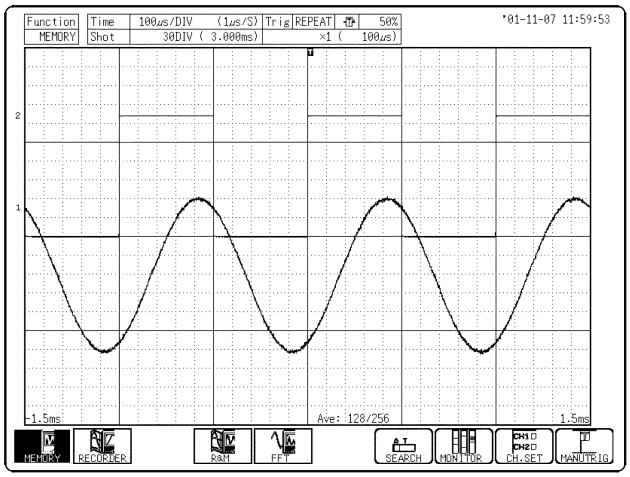
1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Averaging** item.
3. Use the function keys or **JOG/SHUTTLE** control to make a setting.

Function display	Meaning
	: Increases in number
	: Decreases in number
	: Deactivates the averaging function.

After starting the measurement, the averaging count and the current waveform data count are shown on the screen.



Before Averaging



After Averaging

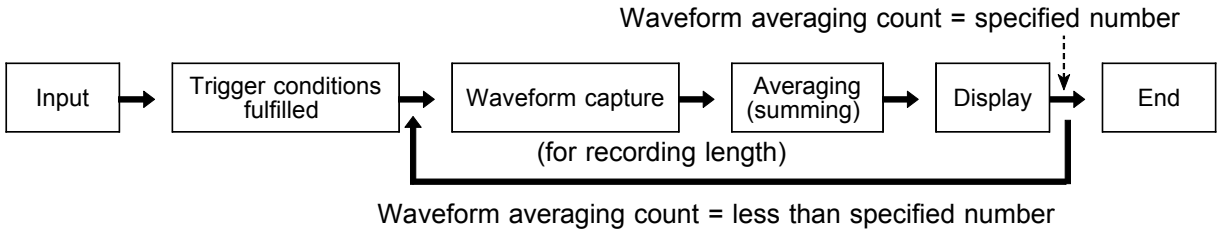
NOTE

- When the averaging function is used, logic waveform is not displayed.
- When the memory segmentation function is used, averaging is not available.
- When the averaging function is used, the maximum recording length is reduced to 25% of the normal value.

Averaging and trigger mode

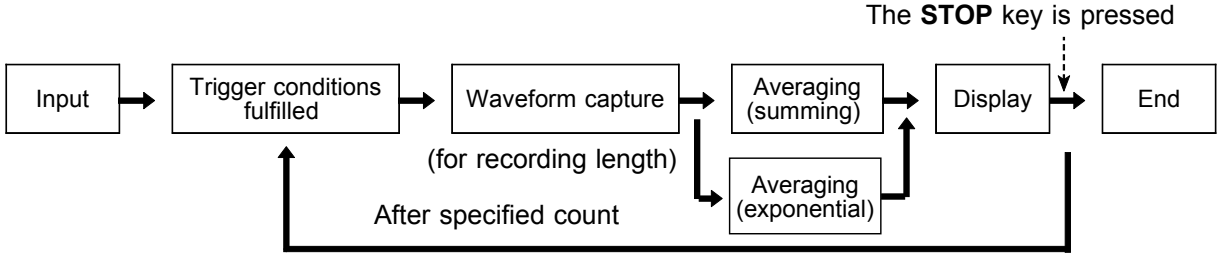
(1) Trigger mode: SINGLE

1. After the **START** key was pressed, data are captured whenever the trigger conditions are fulfilled, and summing averaging is carried out.
2. When the specified number of data has been captured, measurement stops automatically.
3. If the measurement was stopped prematurely with the **STOP** key, the averaging result up to that point is displayed.



(2) Trigger mode: REPEAT

1. After the **START** key was pressed, data are captured whenever the trigger conditions are fulfilled, and summing averaging is carried out until the specified averaging count. The averaging result is shown on the display.
2. After the specified averaging count was reached, exponential averaging is carried out whenever data are captured, and the averaging result is shown on the display.
3. If the measurement was stopped prematurely with the **STOP** key, the averaging result up to that point is displayed.



(3) Trigger mode: AUTO

When the **START** key is pressed, data are captured even if trigger conditions are not fulfilled after a certain interval. If averaging is applied to unsynchronized input signals, the result will be meaningless.

NOTE For details on summing averaging and exponential averaging, refer to Instruction Manual Section 12.3.5.

4.3.10 Using Channels

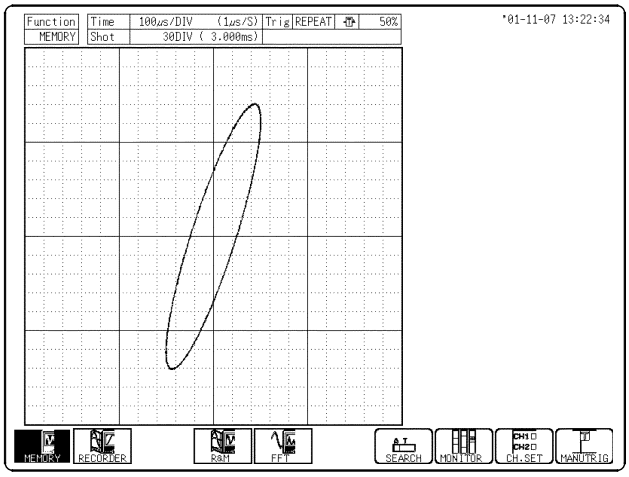
This allows you to set over how many channels you want to divide the measurement data.
The less channels you set, the longer the recording length that can be set for each channel.

Function display	Meaning
CH1-2	: Divides the memory allocated for measurement over two channels. (Channels 3 to 8, as well as logic channels C and D cannot be used.)
CH1-4	: Divides the memory allocated for measurement data over four channels. (Channels 5 to 8 cannot be used.)
CH1-8	: Divides the memory allocated for measurement data over eight channels. (Default)

4.4 Using the X-Y Waveform Plots (MEM)

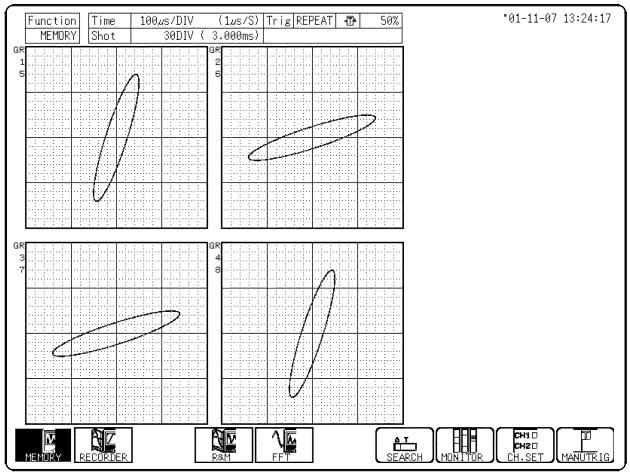
- Setting the display format to X-Y in status screen allows X-Y waveforms to be combined. Any of channels 1 to 8 can be selected for each of the X and Y axis. Up to eight X-Y plots can be made simultaneously.
- Voltage axis magnification/compression is active also when using X-Y combined plotting.
- Using the A/B cursors, it is possible to specify the data between the cursors for partial plotting.

X-Y Single



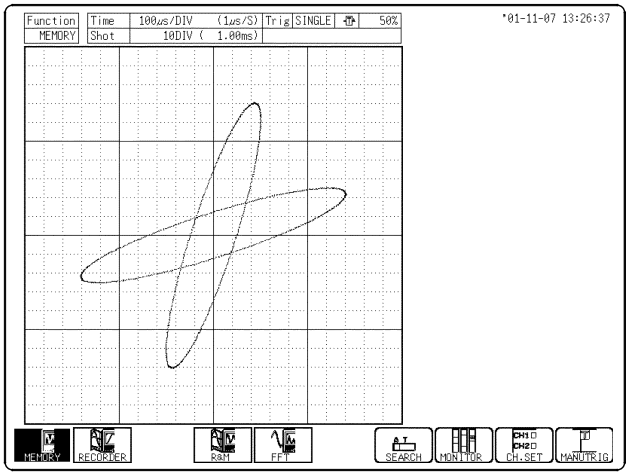
A single plot is displayed and recorded. X-Y waveforms of graphs 1 to 4 are displayed in one screen.

X-Y Quad



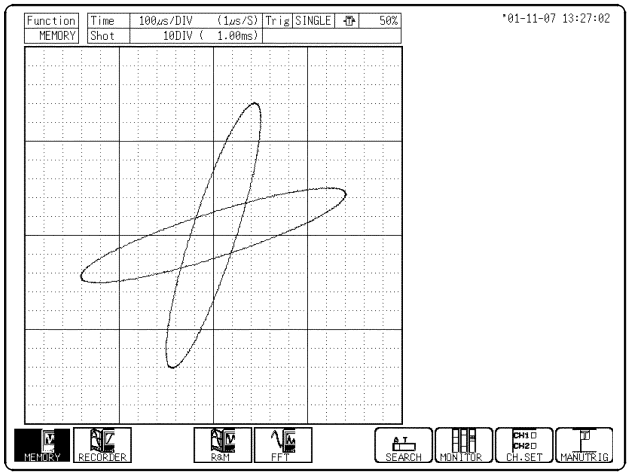
Four single plot is displayed and recorded. X-Y waveforms of graphs in the upper section.

X-Y (dot)



- The sampled data is displayed and recorded just as it comes.
- Linear interpolation is not performed.

X-Y (line)

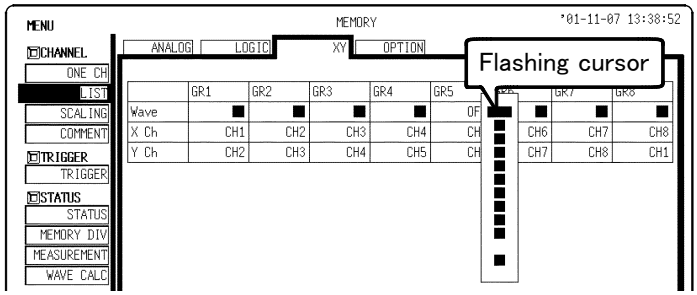


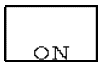
- Linear interpolation is performed.
- The display becomes easier to read, but display speed is slower compared to dot display.

Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Format** item.
3. Use the function keys to select the **X-Y single** or **X-Y quad** format.
4. Set the interpolation. (See Section 4.3.5.)
5. Set the **Synthesis Area**. (See Section 4.3.6.)
6. Press the **CHAN** key to display the List (Channel) screen.
7. Press the **F3** (**PAGE**) key to display page **XY**.
8. Move the flashing cursor to desired channel, and use the function keys to set the waveform color (including displays waveform ON/OFF).



Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.
	: Waveform is performed.
	: Waveform is not performed.

9. Specify the X-axis channel.
   Move the cursor to the channel to be used as X axis. And use the function keys or the **JOG** control to select X axis.
10. Specify the Y-axis channel.
    This is done in the same way as the X-axis setting.
11. For graph 2 to graph 8, the settings are made in an identical.

Partial X-Y plot

Using the A/B cursors, it is possible to specify a range for partial X-Y plotting.

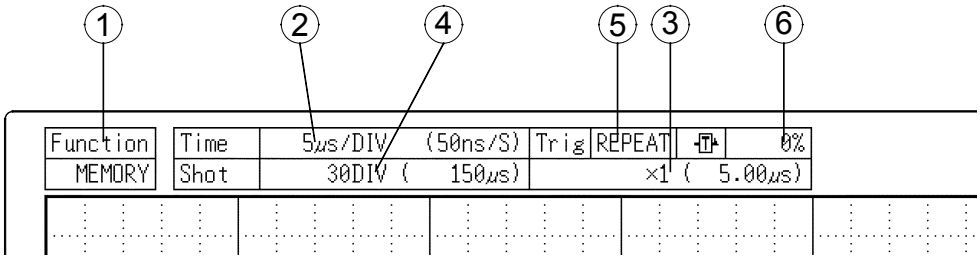
Procedure

Screen: Waveform display (excluding X-Ysingle and X-Yquad)

1. Display the captured waveform data, using a format other than **X-Ysingle** and **X-Yquad**.
2. Use the A/B cursors to specify the desired portion for plotting (see Section 8.2).
3. Press the **STATUS** key to display the Status screen.
4. Set the **Synthesis Area**. (See Section 4.3.6.)
5. Carry out combined plotting as described above.

4.5 Settings on the Waveform Display Screen (MEM)

Explains the setting items on the Waveform display screen. For details on setting, refer to Section 4.3. When want to use the **JOG/SHUTTLE** control, press the **VALUE** select key. (The selection window is not displayed.)



Setting items	Selection	Explanation
1. Function	MEM, REC	Select function.
2. Time Axis Range	5 µs/DIV to 5 min/DIV (24 steps), EXT	Set the speed for inputting and storing the waveform of the input signal. Time axis range setting expresses the time for 1 DIV.
3. Magnification/ compression along the time axis	x 10 to x 1/100000 (19 steps)	By magnifying the waveform, detailed observations can be made. By compressing the waveform, an entire change can be promptly apprehended. To use the zoom function, press the **F4** function key. You can change the magnification to a value between x 10 and x 50000.
4. Recording Length	FIXED SHOT: 30 DIV to 20000 DIV USER SHOT: 1 DIV to 40000 DIV	Using channels: 8 ch Capacity: 32 M words The length of recording for one measurement operation (the number of DIV) can be set.
5. Trigger mode	SINGLE, REPEAT, AUTO	Select trigger mode.
6. Pre-trigger	0 to 100%, -95% (19 steps)	Set the Pre-trigger.
Input channel settings	Analog input Logic input Analog trigger Comment X, Y axis (X-Y format)	Press the **F9** (**CH.SET**) key on the Waveform display screen, enables the measurement conditions for each channel to be set or changed. See Instruction Manual Section 5.6.
Level monitor function		Press the **F8** (**MONITOR**) key on the Waveform display screen. See Section 8.5.
VIEW function		Press the **F7** (**SEARCH**) key on the Waveform display screen. See Instruction Manual Section 8.1.

4.6 Setting the Print Mode

Select the format, waveform, or numerical value should be used to output measured data and computation result.

Waveform	This allows you to set the smooth print function. The smooth print function allows you to print smoother waveforms. However, the printing speed decreases accordingly.
Logging	The data spacing interval also must be set.

Procedure

Screen: PRINTER (SYSTEM)

(1) Setting the printer format

1. Press the **SYSTEM** key to display the Printer screen.
2. Move the flashing cursor to the **Print Mode** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Measurement data and the result of calculation are printed as a waveform.
	: Measurement data and the result of calculation are printed as numeric data.

(2) Setting the print interval and smooth print.

1. When the waveform format is selected in step 3 of procedure (1) above, you can activate or deactivate the smooth print function.
   When the numerical value format is selected, you need to set the print interval. (Unit: DIV)
2. Move the flashing cursor to the **interval** item or **smooth print**.
3. Use the function keys to make a setting.
   Since 1 division represents 100 samples, the print interval "0.01" refers to a printout of every sample (no print interval).
   When the print interval longer than the recording length is set, only the first dot is printed.

NOTE

When the X-Y format is selected, you cannot use the smooth print function.

4.7 Setting the Auto Print Function

When the function is enabled, printout is carried out automatically after a measurement data is captured.

Procedure

Screen: PRINTER (SYSTEM)

1. Press the **SYSTEM** key to display the Printer (System) screen.
2. Move the flashing cursor to the **Auto Print** item.
3. Use the function keys to make a setting.

Function display	Meaning
OFF	: Auto print is disabled.
PRINTER	: Prints using the internal printer.
LAN	: Automatically transfers data to a device connected through a LAN. This requires the 9333 LAN COMMUNICATOR.

NOTE

- When cursor A and B are enabled, partial printing is executed.
- When the roll mode is enabled and the time-axis range is lower than 10 ms/DIV, data is displayed and printed simultaneously.

4.8 Auto Range Function

This function automatically selects the time axis range, measurement range and zero position.
Taking the lowest numbered channel among the channels for which waveform display is on, 1 to 2.5 cycles are automatically set to be recorded as 30 divisions.
It can be used at memory function.

Procedure

Screen: Waveform display

1. Press the **DISP** key to display the Waveform display screen.
2. Press the **AUTO** key.
3. Use the function keys to make a setting.

Function display	Meaning
exec.	: Execute the Auto Range function.
calcel	: Cancel the Auto Range function.

If measurement has started using the auto-range function:

- Conditions related to the input modules (all channel)

Voltage axis range, zero position	Value set automatically
Magnification/compression ratio along the voltage axis	Single screen: x 1 Other screens: x 1/2
Low-pass filter, Input coupling	OFF, DC

- Trigger conditions (one channel only)

Trigger mode	AUTO
AND/OR for internal trigger and external trigger	OR
Pre-trigger	20%
Internal trigger	Enables only the waveform display channel with the lowest number. (If the difference between maximum and minimum is 2 divisions or less, the next channel is enabled.)
Trigger type : Level	Slope: ⊥ rising Trigger level: value set automatically Filter: OFF

- Status conditions

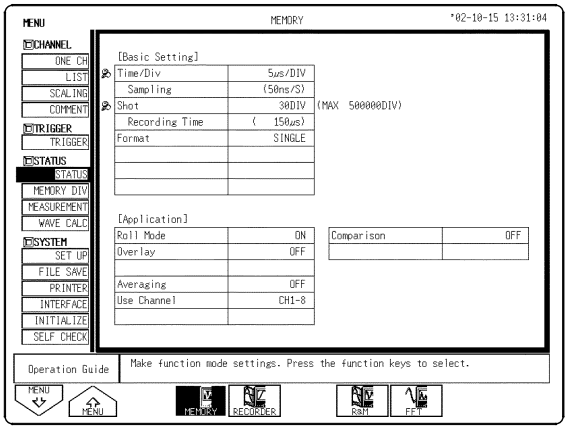
Time axis range (time/div)	Value set automatically Magnification/compression ratio: x 1
Memory segmentation	OFF

NOTE

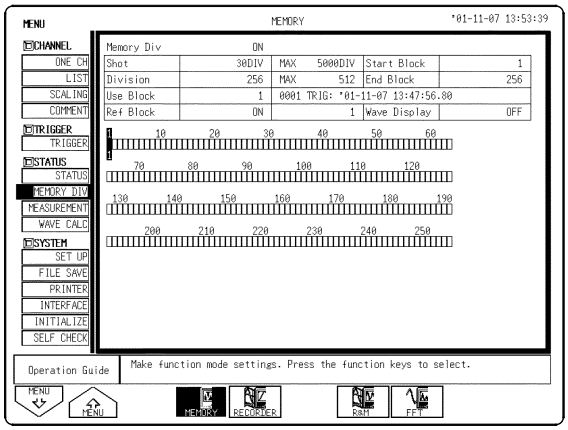
- Because the auto-range function performs automatic setting for the input signal present at the time the function is executed, input a signal before executing the function.
- If for the input signal for this channel there is only a small difference between the maximum value and the minimum value in the range of highest sensitivity (5 mV/DIV), the setting is made by taking the next higher channel.
- If the range cannot be determined, for all channels for which the waveform display is on. A warning message appears, and measurement is abandoned.
- When the auto range function is activated by pressing the **AUTO** key, a trigger output signal is generated. This should be taken into consideration when using both the trigger output and the auto range function.

4.9 Other Screen Settings

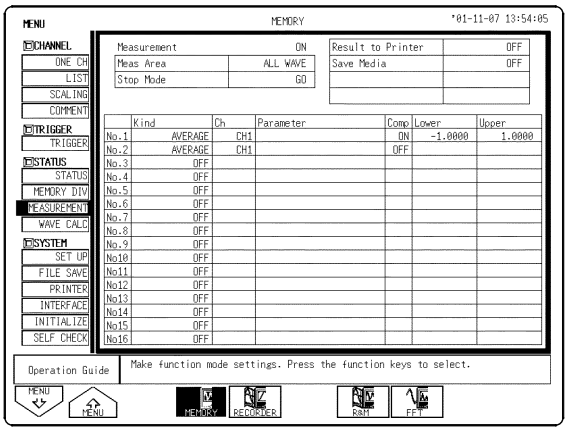
The status screen for the memory function contains four more setup screens. For detailed setup procedures, see the associated sections.
Memory segmentation screen (See Instruction manual Chapter 6.)
Numerical calculation screen (See Instruction manual Chapter 7.)
Waveform calculation screen (See Instruction manual Chapter 7.)
Waveform evaluation screen (See Instruction manual Chapter 9.)



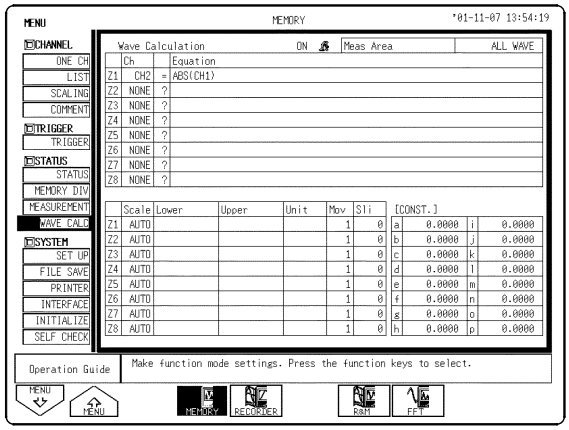
Status screen



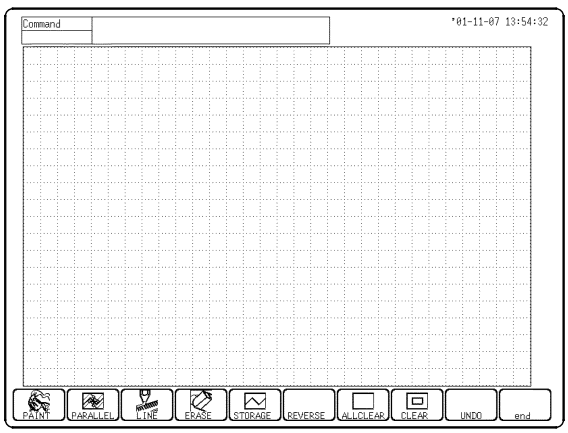
Memory segmentation screen
(MEMORY DIV)



Numerical calculation screen
(MEASUREMENT)

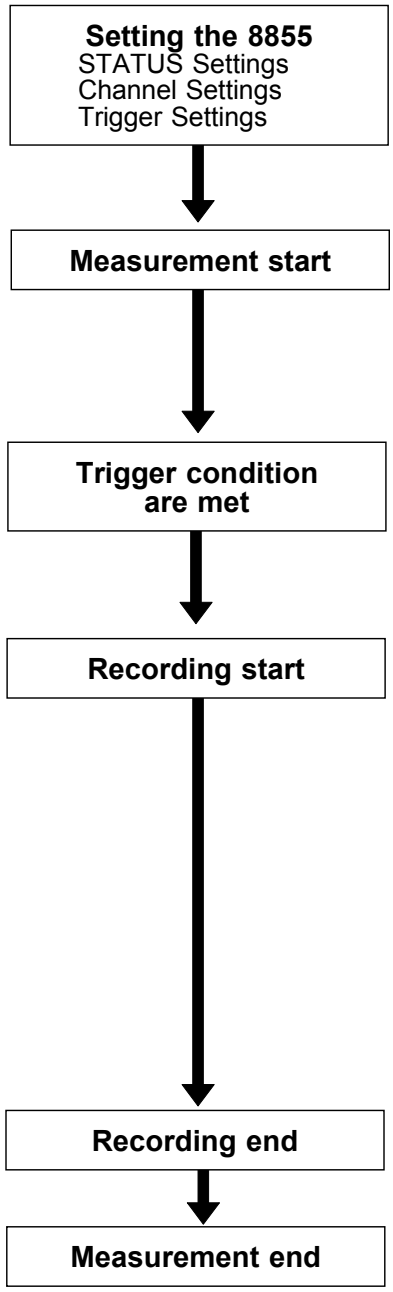


Waveform calculation screen
(MEASUREMENT)



Waveform evaluation screen

4.10 Start and Stop Operation (MEM)



See Section 4.3, "STATUS Settings (MEM)",
Chapter 6, "Input Channel Settings",
Chapter 7, "Trigger Functions",
Section 9.3.1, "Setting the Auto Save Function."

Press the **START** key and LED light.
When the pre-trigger is set, the trigger will not be registered for a certain period after the start of measurement. (During this interval, "Pre-trigger standby" is shown on the display.)
When the trigger can be registered, the indication "Waiting for trigger" is shown on the display.

Data recording starts when trigger condition are met.
When trigger mode selected AUTO, instrument waits for about 1 second for trigger conditions to be met. After this interval, data recording starts, regardless of trigger state.

Displays "Storing".
When roll mode is set to ON, the waveform is displayed (scrolling) immediately at the start of recording
Using the **F7** (**SEARCH**) key to display the time (from measurement started time).
When the **STOP** key is pressed twice during measurement, the 8855 is forcibly stopped. Then the waveform data until the **STOP** key is pressed is displayed and saved. When the auto saving is set to ON, the data until a forced termination is automatically saved. (Auto printout is not executed.)
See Section 9.3.1, "Setting the Auto Save Function."

Waveform displays after data corresponding to recording length have been stored in memory.
Auto printout and auto save are executed.
Triggers thrown at this stage are ignored.

End of measurement

Each time when trigger conditions are met, data are recorded and memory contents are overwritten.

End of measurement in REPEAT and AUTO trigger modes
When the **STOP** key is pressed once during measurement, the 8855 acquires measurement data in an amount corresponding to the set recording length, and the measurement is stopped. (Waveform display, auto printout, and auto save are executed.)

When the time axis range is set to the slow range (not more than 10 ms/DIV), the waveforms measured until the **STOP** key is pressed are displayed.

When the time axis range is set to the fast range (greater than 10 ms/DIV), waveforms are not displayed. (Waveforms are displayed only if measured data having recording length equal to the previous setting exist.)

Chapter 5
Recorder Function

5.1 Overview of the Recorder Function

The recorder function has the following features.

(1) Real time display and printing of the input signal

(2) Real time continuous recording of the input signal

(3) All input channel data are recorded on the same time axis.
Since data for all channels can be superimposed, the relative relationship between input signals can be observed visually.

(4) Time axis setting
10 ms/DIV to 1 h/DIV (17 steps)

(5) Time axis resolution 100 points/DIV (printer)

(6) Sampling period
1, 10, 100 µs, 1, 10, 100 ms (Can be selected)

(7) Memory capacity
- 32 M words: 20000 DIV
- 128 M words: 80000 DIV
- 512 M words: 320000 DIV
- Arbitrarily (Set from 1 division to the maximum number of divisions at 1-division intervals)

(8) Waveform magnification/compression display and printout
- Time axis direction: x 1 to x 1/10000 (13 steps)
- Voltage axis direction: x 100 to x 1/2 (single), 8 steps
- With the variable function

(9) Display format
- Time axis waveform: single, dual, quad, oct screen display
- X-Y waveform: single, quad

(10) Scrollable display

- The most recent 20000 (128 M words: 80000, 512 M words: 320000) divisions of the data are stored in memory.
- It is possible to scroll back for easy review.

(11) Additional recording function

- The first set of measurement data is preserved, and recording of the second set of measurement data starts after the first set.

(12) Logging function

Numeric printout of waveform data.

(13) Reprint function

The most recent 20000 (128 M words: 80000, 512 M words: 320000) divisions of the data stored in memory can be printed as many times as required.

(14) Print

Real-time print, manual print, partial print, report print, screen hard copy can be printed.

(15) X-Y CONT Recorder

This function allows X-Y plot between channels in real time.

5.2 Operation Sequence (REC)

Preparation

- Installation of the Instrument
- Turn on the power
- Connect the inputs

See Chapter 2

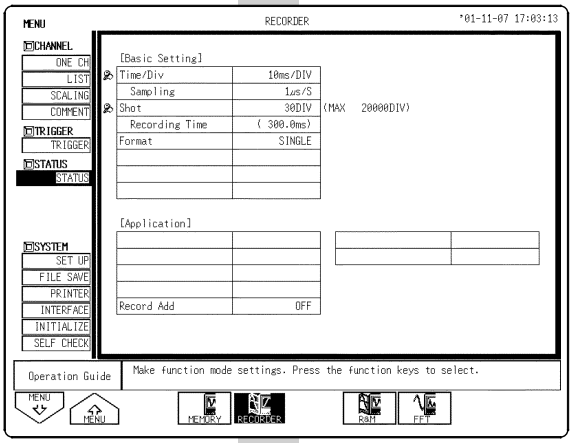
Basic Settings

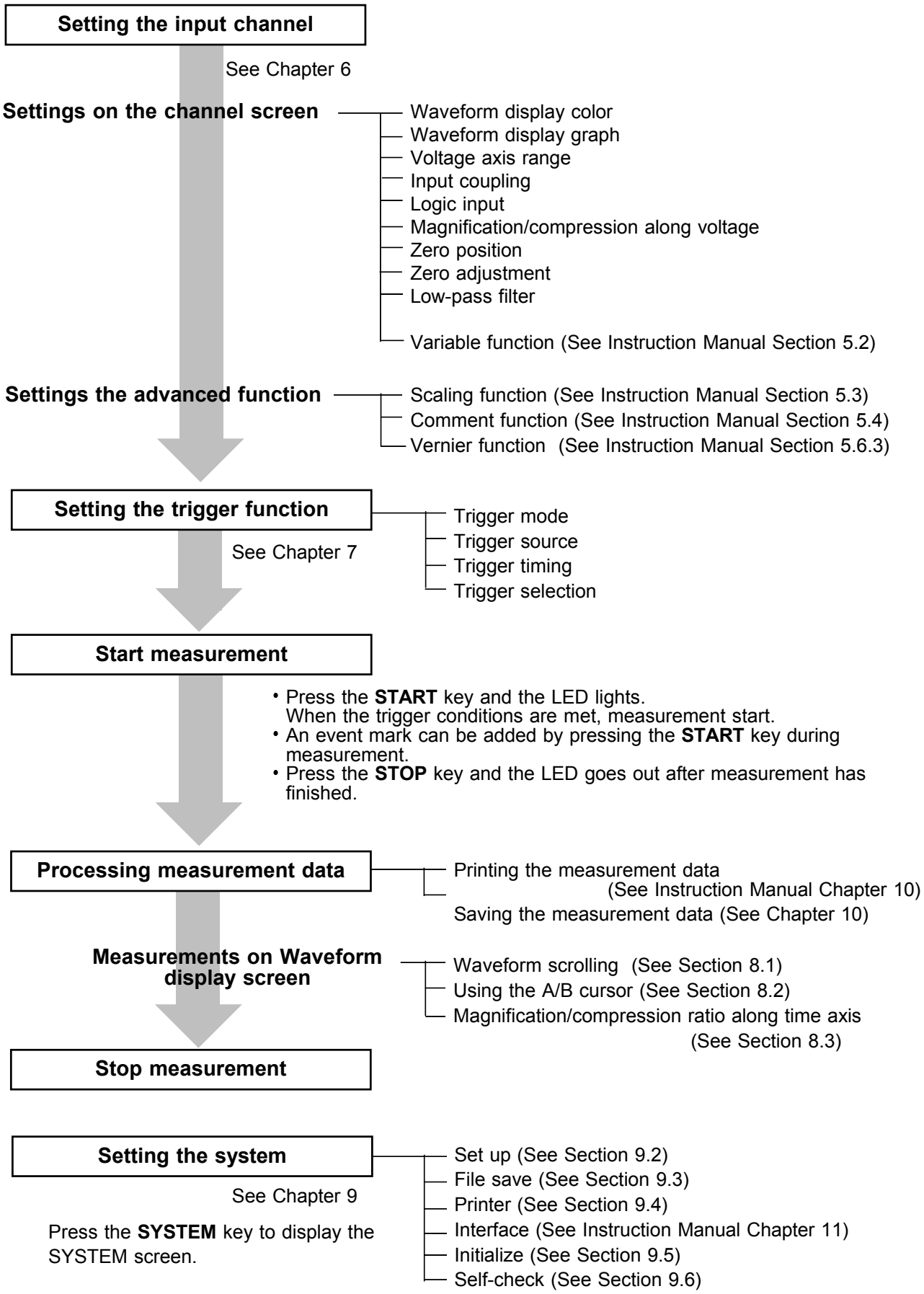
Settings on the STATUS screen

- Function — Select the recorder function.
- Time axis range / Sampling period — Determine the speed with which the input signal waveform is captured.
- Recording length — Determine the length of the data sample for a single measurement.
- Display format — Select the format type for the Waveform display screen.
- Additional recording — Set whether additional recording is required.
- Interpolation — Select dot or line in X-Y display format.
- Waveform clear — Select whether or not to clear waveform in X-Y display format.

See Section 5.3

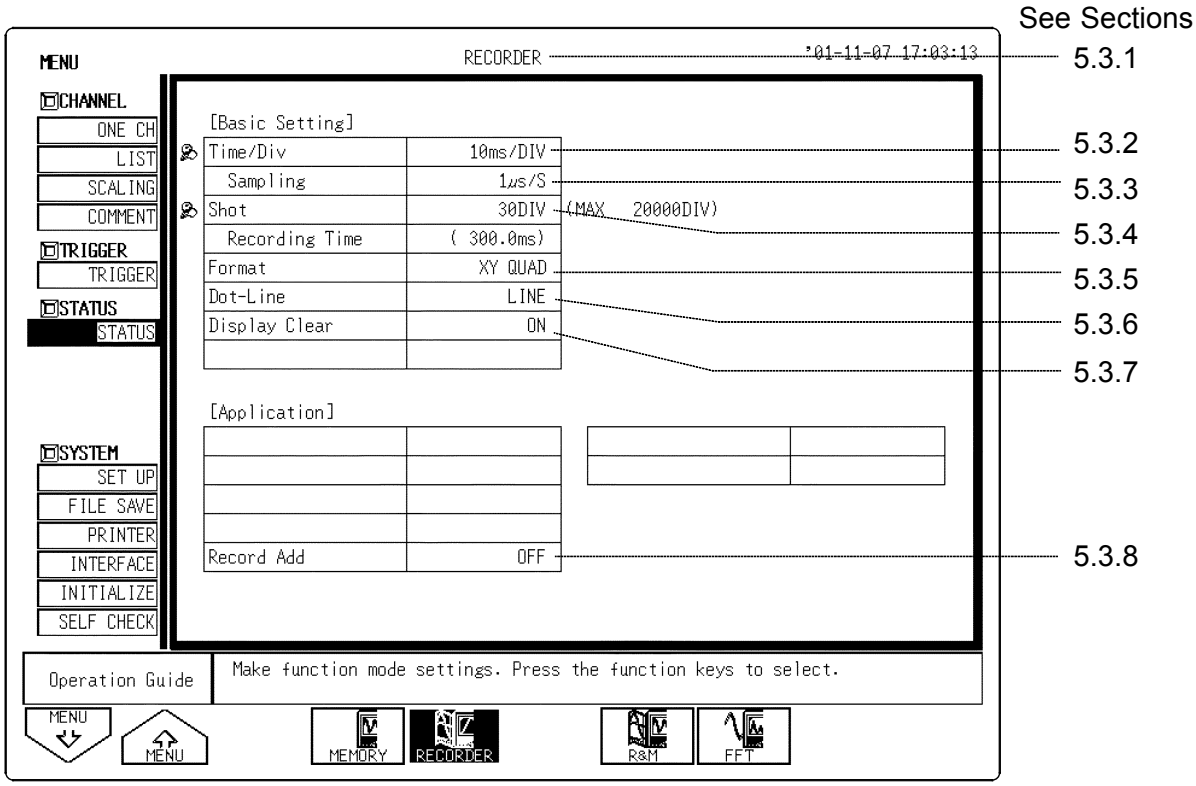
Press the **STATUS** key to display the STATUS screen.




Setting the input channel
See Chapter 6
Settings on the channel screen
Waveform display color
Waveform display graph
Voltage axis range
Input coupling
Logic input
Magnification/compression along voltage
Zero position
Zero adjustment
Low-pass filter
Variable function (See Instruction Manual Section 5.2)
Settings the advanced function
Scaling function (See Instruction Manual Section 5.3)
Comment function (See Instruction Manual Section 5.4)
Vernier function (See Instruction Manual Section 5.6.3)
Setting the trigger function
See Chapter 7
Trigger mode
Trigger source
Trigger timing
Trigger selection
Start measurement
• Press the START key and the LED lights.
When the trigger conditions are met, measurement start.
• An event mark can be added by pressing the START key during measurement.
• Press the STOP key and the LED goes out after measurement has finished.
Processing measurement data
Printing the measurement data
(See Instruction Manual Chapter 10)
Saving the measurement data (See Chapter 10)
Measurements on Waveform display screen
Waveform scrolling (See Section 8.1)
Using the A/B cursor (See Section 8.2)
Magnification/compression ratio along time axis
(See Section 8.3)
Stop measurement
Setting the system
See Chapter 9
Press the SYSTEM key to display the SYSTEM screen.
Set up (See Section 9.2)
File save (See Section 9.3)
Printer (See Section 9.4)
Interface (See Instruction Manual Chapter 11)
Initialize (See Section 9.5)
Self-check (See Section 9.6)

5.3 STATUS Settings (REC)

Press the **STATUS** key to access the Status screen. This section explains how to set the Status screen of the recorder function. See the corresponding sections for items that can be set in the Waveform display or Channel screens.
Waveform display screen: see Section 5.5
Channel screen: see Section 6.3



NOTE The settings in Section 5.3.6 and 5.3.7 are displayed only when the display format has been set to "X-Y."

5.3.1 Setting the Function Mode

The 8855 has four function modes. Select the Recorder function.

Procedure

Screen: STATUS, CHANNEL, Waveform display, TRIGGER, SYSTEM

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the top position.
3. Select the **RECORDER** function key display.

Function display	Meaning
	: Memory function
	: Recorder function
	: Recorder & Memory function
	: FFT function

5.3.2 Setting the Time Axis Range

Set the speed for inputting and storing the waveform of the input signal. Time axis range setting expresses the time for 1 division.

Procedure 1

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Time/Div** item.
3. Use the **JOG** control or the function keys to make the selection.

Using the TIME/DIV key

Procedure 2

Using the TIME/DIV key

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Use the **TIME/DIV** nob to make the selection.
   The **TIME/DIV** knob can be used regardless of where the flashing cursor is located.

NOTE

While the printer always outputs the data at the measurement magnification in recording mode, the waveform on the screen is reduced in size at the ratio shown in the table below, depending on the time-axis range.
50 ms/DIV → x 1/2, 20 ms/DIV → x 1/5, 10 ms/DIV → x 1/10

5.3.3 Setting the Sampling Period

The available range depends on the selected time axis range (input signal waveform capture rate).

Procedure

Screen: STATUS

1. Use the Menu keys to display the Status screen.
2. Move the flashing cursor to the **Sampling** item.
3. Use the **JOG** control or the function keys to make the selection.

Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.

NOTE

When a short sampling period is set and the input waveform changes slightly, a sudden disturbance such as noise will increase the difference the between the maximum and minimum values. To eliminate this phenomenon, set a long sampling period. For details, see Instruction Manual Appendix 3.4.

5.3.4 Setting the Recording Length

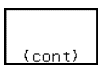
The length of recording for one measurement operation (number of DIV) can be set.

FIXED SHOT Select the recording length.
USER SHOT Variable recording length can be selected by the user.

Procedure 1 Constant recording length mode

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Shot** item and select **FIXED SHOT**.
3. Use the **JOG** control or the function keys to make a setting.

Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.
	: Setting the recording length to continuous format.

Procedure 2 Variable recording length mode

Screen: STATUS, Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Shot** item and select **USER SHOT**.
3. Use the **JOG/SHUTTLE** control or the function keys to make a setting.

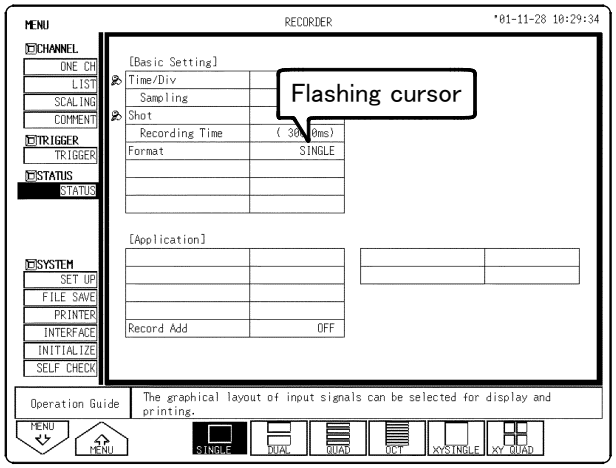
Function display	Meaning
	: Increases in number (+50)
	: Increases in number (+1)
	: Decreases in number (-1)
	: Decreases in number (-50)

NOTE

- When the recording length is set to **CONT**. in a range of 10 ms to 200 ms/DIV, the printer setting (real-time print) is automatically set to OFF.
- When the recording length is set to **CONT**., auto-saving is automatically set to OFF.
- The maximum recording length is 20000 DIV when the memory capacity is 32 M words, 80000 DIV when the memory capacity is 128 M words (when memory extended), and 320000 DIV when the memory capacity is 512 M words (when memory extended.)
- When the recording length is set to **CONT**. and a measurement exceeds the maximum recording length, the lapse of time over the maximum length is displayed as a negative value.

5.3.5 Setting the Display Format

- The style can be set for showing input signals on the screen display and recording them on the printer.
- The styles single, dual, quad, oct, X-Y single, X-Y quad are available.

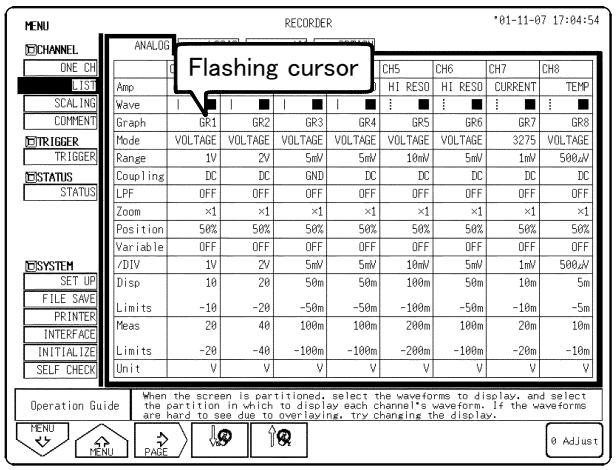


Procedure Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Format** item, as shown in the figure on the left.
3. Use the function keys to select the display format.

Function display	Meaning
SINGLE	: Display and record the waveform in one graph.
DUAL	: Display and record the waveform in two graphs.
QUAD	: Display and record the waveform in four graphs.
OCT	: Display and record the waveform in oct graphs.
XYSINGLE	: X-Y waveforms of graphs 1 to 4 are displayed in one screen.
XY QUAD	: X-Y waveforms of graphs 1 to 4 are displayed in four screen.

Set which graph type to use when display format has been set to DUAL, QUAD or OCT screen display on the Status screen.



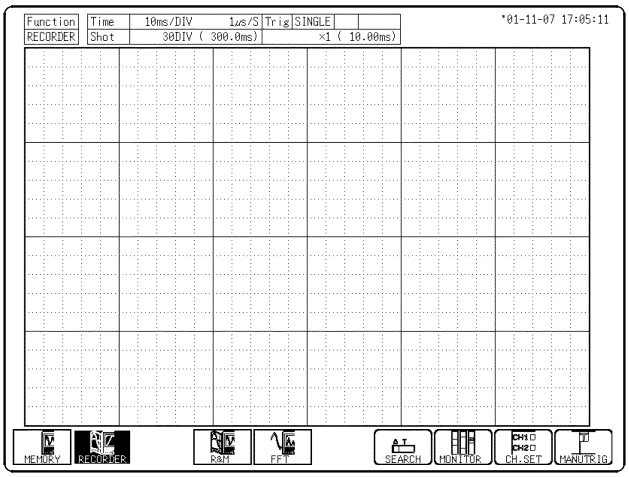
Procedure Screen: ONE CH, LIST (CHANNEL)

1. Press the **CHAN** key to display the Channel screen.
2. Move the flashing cursor to the position of the **Graph** to be set.
3. Use the function keys or **JOG** control to make the selection.

Function display	Meaning
	: Increases in number
	: Decreases in number

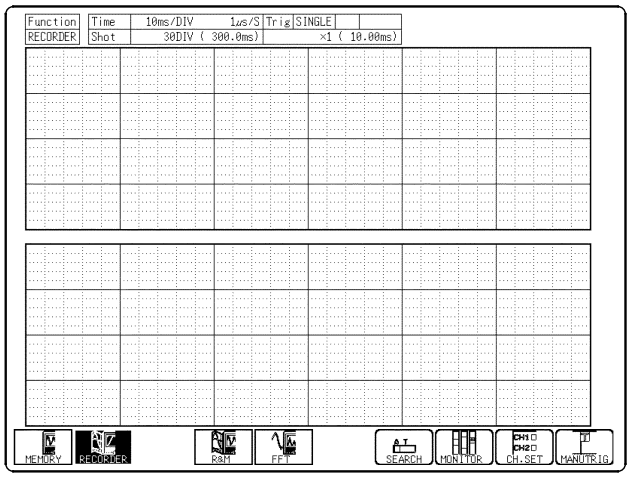
NOTE For the X-Y screen (memory and recorder) display format, see the X-Y recorder setting for each function.

Single graph



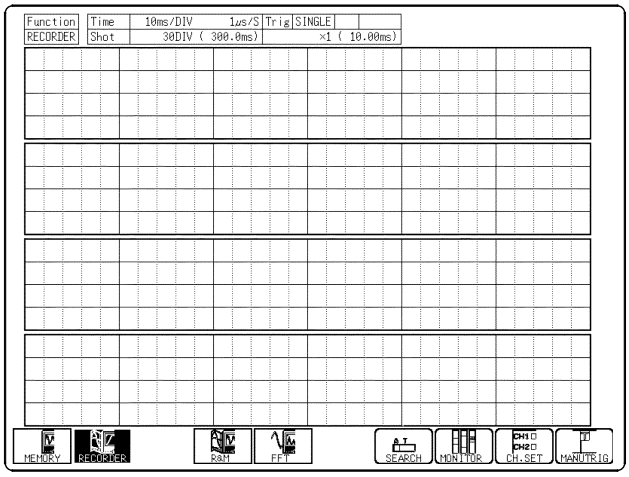
Display and record as one graph.
(At the most, 8 analog + 16 logic signals)

Dual graph



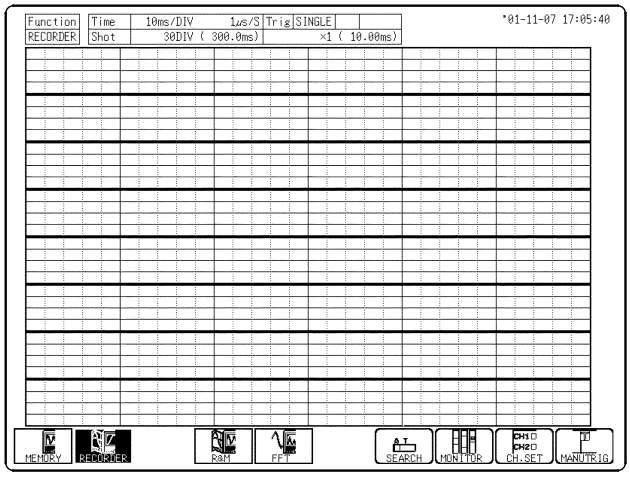
- Display and record as two graphs. (At the most, 8 analog + 16 logic signals)
- Specify which input channel to use for waveform graph display and recording.

Quad graph



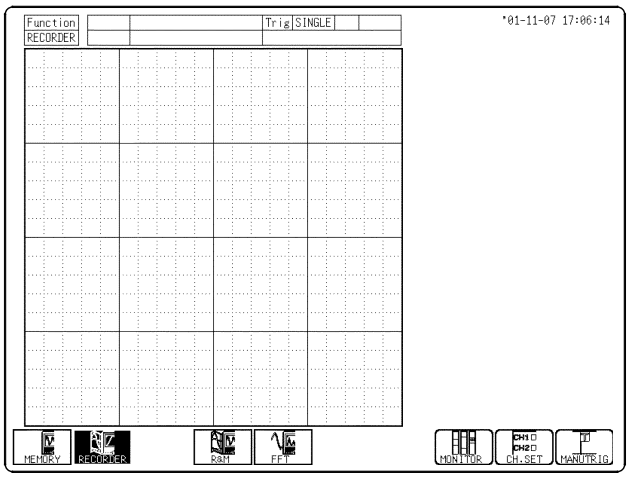
- Display and record as four graphs. (At the most, 8 analog + 8 logic signals)
- Specify which input channel to use for waveform graph display and recording.

Oct graph

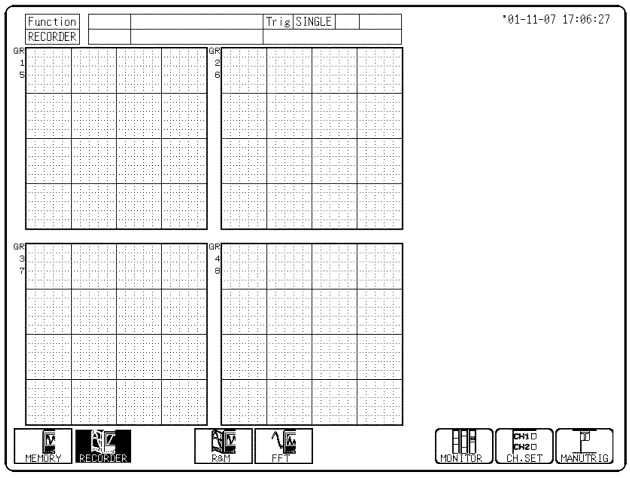


- Record as eight graphs. (At the most, 8 analog + 4 logic signals)
- Specify which input channel to use for waveform graph display and recording.

X-Y single graph



X-Y quad graph



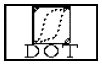
5.3.6 Setting the Interpolation (X-Y screen)

- Interpolation can be set when set the X-Y graph format.
- This setting determines whether the input waveform (sampling data) is to be displayed and printed as a series of dots or a line using linear interpolation.

Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Dot-Line** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Linear interpolation is not performed.
	: Linear interpolation is performed.

5.3.7 Setting the Display Clear Function (X-Y screen)

- It sets whether clear the waveform or not when pressing the **START** key to start measurement and the previous waveform is left.
- If the waveform is not cleared, overlay is performed.

Procedure

Screen: STATUS

1. Use the Menu keys to display the Status screen.
2. Move the flashing cursor to the **Display Clear** item.
3. Use the function keys to make a setting.

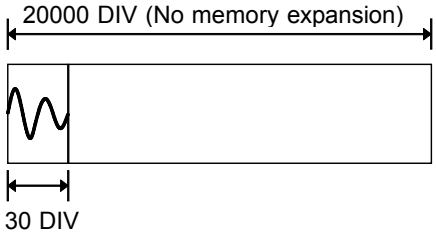
Function display	Meaning
	: Display clear is disabled.
	: Display clear is enabled.

5.3.8 Setting the Additional Recording Function

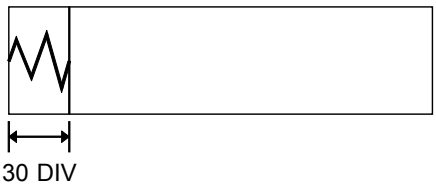
This records, regarding the memory as though it were recording paper.
The memory capacity of 32 M words can accommodate up to 20000 divisions of waveform data. With 128 M words (after optional memory expansion), waveform data of up to 80000 divisions can be saved. With 512 M words (after optional memory expansion), waveform data of up to 320000 divisions can be saved.
The waveform can be scrolled and printed out.
Switching the additional recording on and off affects the use of memory as shown below.
(When the recording length is set to 30 divisions)

Additional recording: OFF

Initial recording
Records 30 divisions of data

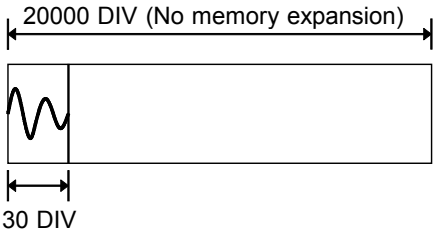


Second recording
Records a further 30 divisions of data
Initial measurements are erased, and new data is recorded from the beginning of the memory.

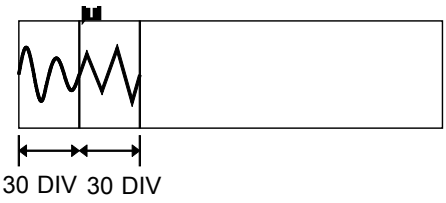


Additional recording: ON

Initial recording
Records 30 divisions of data



Second recording
New data is recorded from the end of existing data without erasing the previous measurements.



The first and second sets of waveforms can be observed by scrolling or printing the waveform.

Procedure

Screen: STATUS

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Record Add** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Additional recording is disabled.
	: Additional recording is enabled.

NOTE

- If auto-save is enabled, only newly acquired waveforms are saved. Even when A and B cursors appear on the screen, no partial save is performed, because the setting is disabled when the **START** key is pressed.
- A one-line data appears between the two measurements to delimit them. (The line of data is vertical.)
- When using the 8953-10 HIGH RESOLUTION UNIT, 8954 VOLTAGE/TEMP UNIT, or 8955 F/V UNIT, and its additional recording function is active, if logic input is activated during measurement, a logic waveform is displayed, but the data is invalid. When measurement is made with additional recording ON, the screen shows the logic waveform obtained before additional recording was turned on, but the data is invalid. If logic input is active, the analog data corresponding to that logic channel becomes 12-bit data. For details, see section 6.3.10.

5.3.9 Setting the Print Mode (only when the 8994 PRINTER UNIT is installed)

Select the format, waveform, or numerical value should be used to output measured data.

Waveform	The waveform is printed.
Logging	The data spacing interval also must be set.

Procedure

Screen: PRINTER (SYSTEM)

(1) Setting the printer format

1. Press the **SYSTEM** key to display the Printer screen.
2. Move the flashing cursor to the **Print Mode** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Measurement data and the result of calculation are printed as a waveform.
	: Measurement data and the result of calculation are printed as numeric data.

(2) Setting the print interval

1. When the numerical value is selected, set the print interval. (unit: DIV)
2. Move the flashing cursor to the **interval** item.
3. Use the function keys to make a setting.
   Since 1 division represents 100 samples, the print interval "0.01" refers to a printout of every sample (no print interval).
   When the print interval longer than the recording length is set, only the first dot is printed.

Function display	Meaning
	: Increases in number
	: Decreases in number

NOTE

- The maximum and minimum values are printed (see Instruction Manual Appendix 3.4).
- The print intervals of 0.01 to 0.5 DIV can be selected, only when there are waveform data present.
- When numerical values are output for real-time printing, the minimum print interval is 1 division.

5.3.10 Setting the Printer Function (Real Time Printing) (only when the 8994 PRINTER UNIT is installed)

The input waveform is continuously printed in real time.

Procedure

Screen: PRINTER (SYSTEM)

1. Press the **SYSTEM** key to display the Printer screen.
2. Move the flashing cursor to the **Real Time Print** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Printing is disabled.
	: Printing is enabled.

NOTE

- At a time axis range setting of 200 ms/DIV or faster, the waveform data will be printed out later. See Section 12.3, "Recorder Function."
- While the printer always outputs the data at the measurement magnification in recording mode, the waveform on the screen is reduced in size at the ratio shown in the table below, depending on the time-axis range.
  50 ms/DIV: x 1/2, 20 ms/DIV: x 1/5, 10 ms/DIV: x 1/10
- Setting a time axis range faster than 1 s/DIV may result in light printing.

5.4 Using the X-Y CONT Recorder

Set "Display Format" to the X-Y single or X-Y quad screen in the Status screen to perform X-Y waveform plotting.

(1) The same operation as a normal recorder is available to plot between channels (real-time X-Y recording).

(2) Unlike an X-Y plot produced in the memory function mode, the time axis information for each channel is not being recorded.

(3) Any of channels can be selected for each of the X and Y axis. Up to four X-Y plots can be made simultaneously.

(4) For dot display the sampling period is fixed at 300 µs, while for line display the fastest sampling period is 300 µs (unfixed).

(5) There is no limit on the length of a recording because basically the operation is the same as that of a conventional recorder.

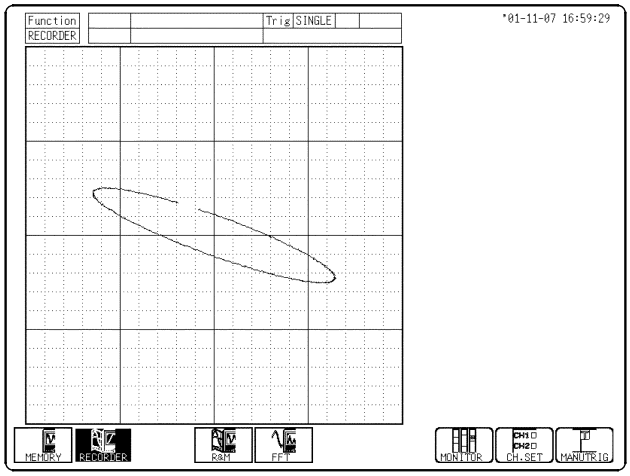
(6) When the waveform clear is OFF, overlay can be performed.

(7) Measurement data and setting data can be saved to media.

NOTE

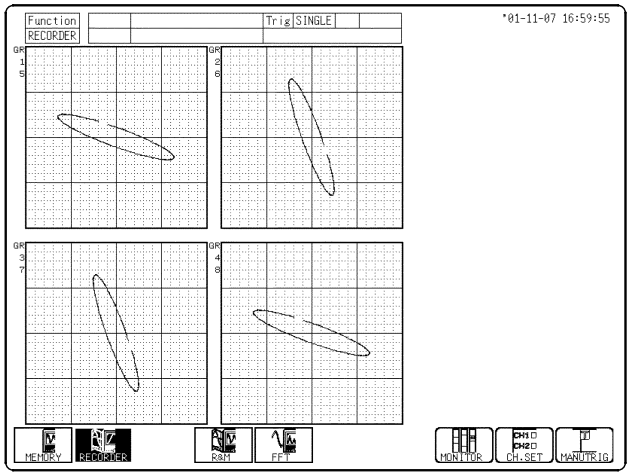
- The waveforms with a display format that has been set to screens 1 to 8 cannot be subject to X-Y plotting following measurement. In addition, the waveforms measured by setting their display formats to the X-Y screen cannot be displayed on screens 1 to 8 following measurement.
- Trace cursor can not be used on the X-Y screen.
- Even if the interpolation type changes after completion of measurement, the dots and lines do not change.
- Press the **DISP** key to switch between the X-Y single and X-Y quad display formats.

X-Y Single



A single plot is displayed and recorded. X-Y waveforms of graphs 1 to 4 are displayed in one screen.

X-Y Quad



Four single plot is displayed and recorded. X-Y waveforms of graphs 1 and 3 are displayed in the upper section, and those of graphs 2 and 4 are displayed in the lower section.

5.4.1 Setting the Status Screen

(1) Setting the format

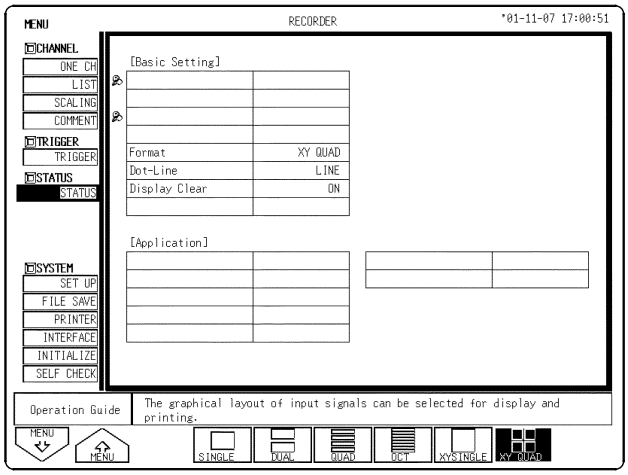
1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Format** item.
3. Use the function keys to make a setting. (See Section 5.3.5)

(2) Setting the interpolation

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Dot-Line** item.
3. Use the function keys to make a setting. (See Section 5.3.6)

(3) Setting the display clearing

1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Display Clear** item.
3. Use the function keys to make a setting. (See Section 5.3.7)

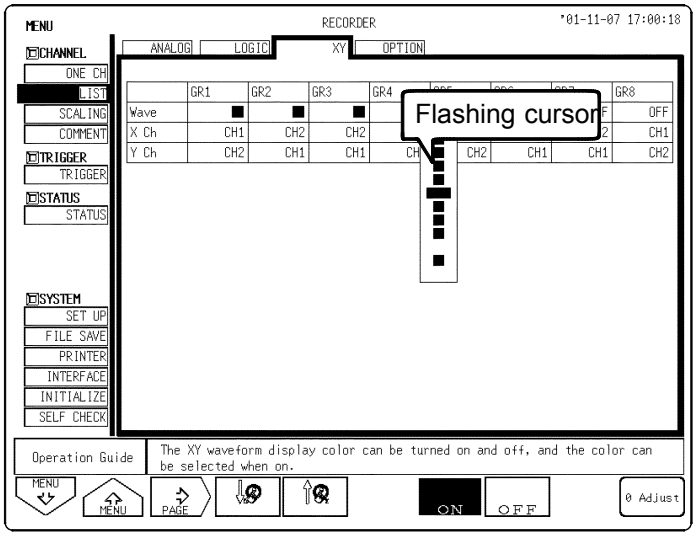


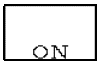
5.4.2 Setting the Channel Screen

Procedure

Screen: CHANNEL

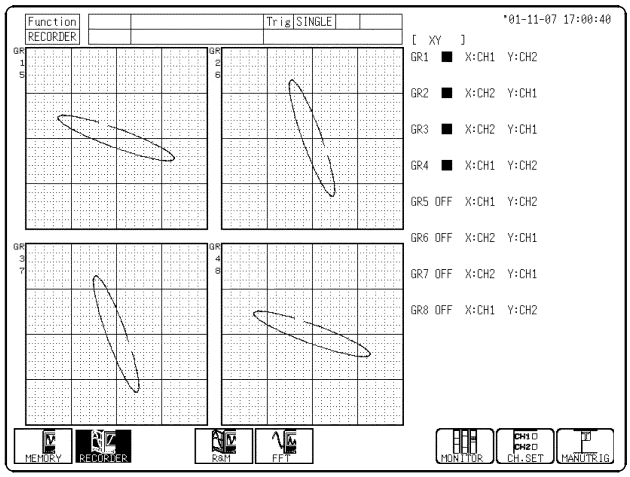
1. Press the **CHAN** key to display the List (Channel) screen.
2. Press the **F3** (**PAGE**) key to make a setting.
3. Move the flashing cursor to desired channel, and use the function keys to set the display waveform on/off and waveform color.



Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.
	: Waveform is performed.
	: Waveform is not performed.

4. Specify the X-axis channel.
   Move the cursor to the channel to be used as X axis, and use the function keys or the **JOG** control to select X axis.
5. Specify the Y-axis channel.
   This is done in the same way as the X-axis setting.
6. For graph 2 to graph 8, the settings are made in an identical.

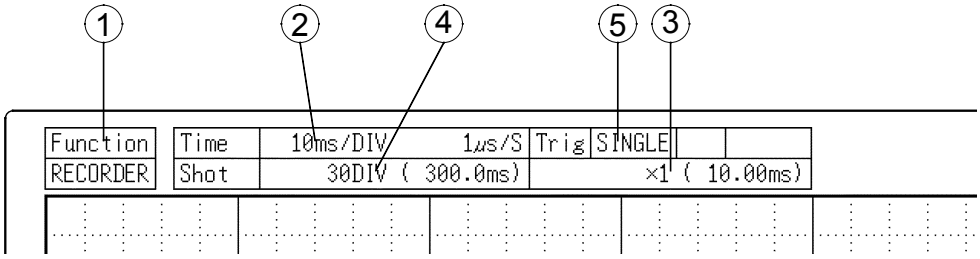
5.4.3 Setting the Waveform Display Screen



1. Press the **DISP** key to display the Waveform display screen.
2. Press the **F9** (CH.SET) key to make a setting.
   - Channel setting
   - Trigger setting
   - Comment
   - Display setting (ON/OFF), X-axis and Y-axis setting

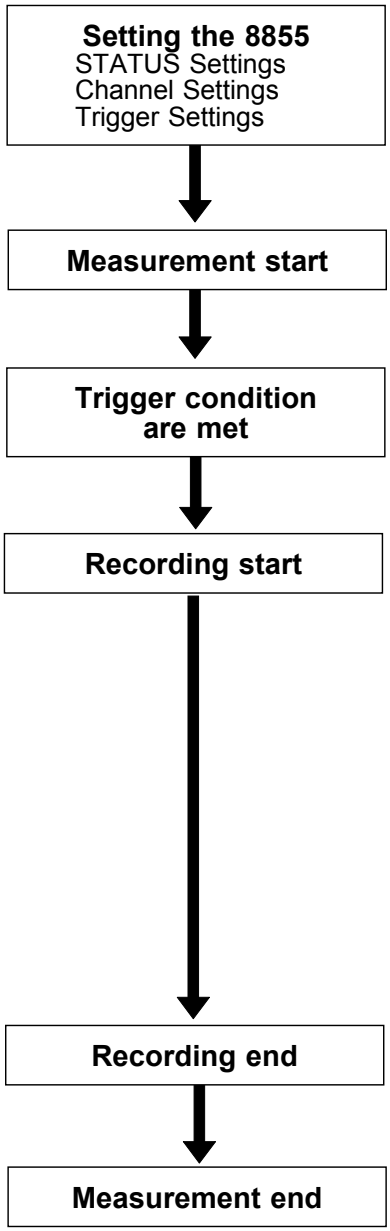
5.5 Settings on the Waveform Display Screen (REC)

Explains the setting items on the Waveform display screen.
For details on setting, refer to Section 5.3.
When want to use the **JOG/SHUTTLE** control, press the **VALUE** select key.
(The selection window is not displayed.)



Setting items	Selection	Explanation
1. Function	MEM, REC	Select function.
2. Time axis range	10 ms/DIV to 1 h/DIV 17 steps	Set the speed for inputting and storing the waveform of the input signal. Time axis range setting expresses the time for 1 DIV.
3. Compression along the time axis	x 1 to x 1/10000 (13 steps) When the time axis is 10 to 50 ms/DIV, the waveforms are compressed and displayed during measurement.	By compressing the waveform, an entire change can be promptly apprehended.
4. Recording length memory capacity: 32 M words	FIXED SHOT: 30 DIV to CONT. USER SHOT: 1 to 20000 DIV	The length of recording for one measurement operation (the number of DIV) can be set.
5. Trigger mode	SINGLE, REPEAT	Select trigger mode.
Input channel settings	• Analog input • Logic input • X, Y axis (X-Y format)	Enables the measurement conditions for each channel on the Waveform display screen to be set or changed. See Instruction Manual Section 5.6.
Level monitor function		Press the **F8** (**MONITOR**) key. See Section 8.5.
VIEW function		Press the **F7** (**SEARCH**) key. See Instruction Manual Section 8.1.

5.6 Start and Stop Operation (REC)



See Section 5.3, "STATUS Settings (REC)", Chapter 6, "Input channel settings", Chapter 7, "Trigger Function, Section 9.3.1, "Setting the Auto Save Function".

Press the **START** key and LED light.
When the trigger can be registered, the indication "Waiting for trigger" is shown on the display.

Data recording starts when trigger condition are met.
(trigger timing: start, start&stop)

Displays "Storing".
When the time axis is 10 to 50 ms/DIV, the waveforms are compressed and displayed.
If the printer is on, printing initiates simultaneously with display (only when the 8994 PRINTER UNIT is installed.) When the time axis is 10 to 200 ms/division, printing is performed as follows.
Using the **F7** (**SEARCH**) key to display the time (from measurement started time).

When automatic storage is enabled and measurement is interrupted in progress, measurement data taken prior to the interruption point is stored automatically. See Section 9.3.1, "Setting the Auto Save Function."
An event mark can be added by pressing the **START** key during measurement. After measurement is completed, you can search for the event marks. See Instruction Manual Section 8.4.

Auto saving is executed.

End of measurement

Each time when trigger conditions are met, data are recorded and memory contents are overwritten.
(Trigger timing: start / start&stop)
Data recording starts.
(Trigger timing: stop)

Trigger mode: SINGLE

REPEAT

End of measurement in REPEAT trigger modes
When **STOP** key is pressed, measurement stops

Event Marks

This selection applies only to the Recorder mode.
An event mark is entered each time the START key is pressed during measurement in the Recording mode. (Event marks can also be entered using the external start terminal.)
Event marks entered are numbered in sequence with numbers from 1 to 1000. It is not possible to enter more than 1000 event marks. Further, event marks are printed in charts when Real-Time Printing is enabled.
After measurement is completed, event marks are displayed at the top of the Waveform screen.

Chapter 6
Input Channel Settings

6.1 Overview

This section describes the various input channel settings.
This manual describes the most commonly used functions of the 8855.
For information on advanced functions, refer to the Advanced edition (Instruction Manual) of this manual.

Item \ Screen	Channel	Display	
Waveform Display Color	●	●	See Section 6.3.1
Print Density	●	●	See Section 6.3.2
Waveform display screen	●	-	See Section 6.3.3 When the display format setup on Status screen.
Measurement Mode	●	-	See Section 6.3.4
Measurement Range	●	●	See Section 6.3.5
Input Coupling	●	●	See Section 6.3.6
Magnification/Compression Ratio Along the Voltage Axis	●	●	See Section 6.3.7
Zero Position	●	●	See Section 6.3.8
Low-Pass Filter	●	●	See Section 6.3.9
Logic Display Color	●	●	See Section 6.3.10
Logic Display Position	●	●	See Section 6.3.10
Zero Adjustment	●	●	See Section 6.4
Variable Function	●	-	See Instruction Manual Section 5.2
Scaling Function	●	-	See Instruction Manual Section 5.3
Comment function	●	-	See Instruction Manual Section 5.4
Vernier	-	●	See Instruction Manual Section 5.6.3
Probe (10:1 or 100:1 differential)	●	-	See Instruction Manual Section 5.7
Response	●	-	See Instruction Manual Section 5.9 (8952 only)
AAF	●	-	See Instruction Manual Section 5.10 (8953-10 only)
RJC	●	-	See Instruction Manual Section 5.11 (8954 only)
Burn Out	●	-	See Instruction Manual Section 5.11 (8954 only)
Threshold value	●	-	See Instruction Manual Section 5.12 (8955 only)
Pull-up	●	-	See Instruction Manual Section 5.12 (8955 only)
Hold Function	●	-	See Instruction Manual Section 5.12 (8955 only)
Slope	●	-	See Instruction Manual Section 5.12 (8955 only)
Functions	●	●	

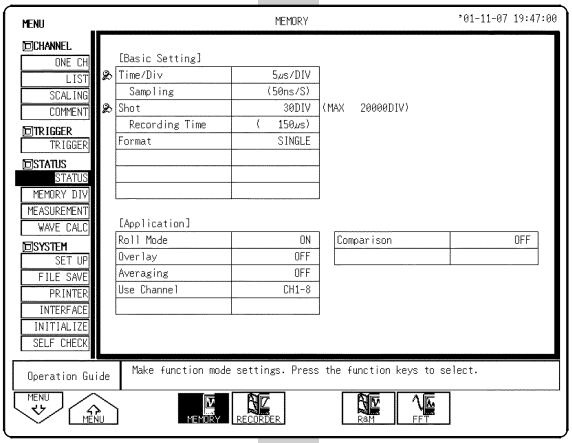
NOTE

8951 VOLTAGE/CURRENT UNIT (See Instruction Manual Section 5.8)
8952 DC/RMS UNIT (See Instruction Manual Section 5.9)
8954 VOLTAGE/TEMP UNIT (See Instruction Manual Section 5.11)
8955 F/V UNIT (See Instruction Manual Section 5.12)

6.2 Operation Procedure (Input Channel Setting)

Settings on the STATUS screen

- Function
  - Memory
  - Recorder
- Waveform display format
  - Single
  - Dual
  - Quad
  - Oct
  - X-Y single
  - X-Y dual

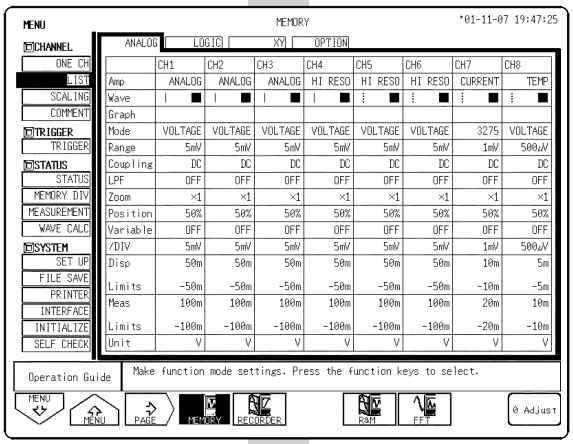


Settings on the Channel screen

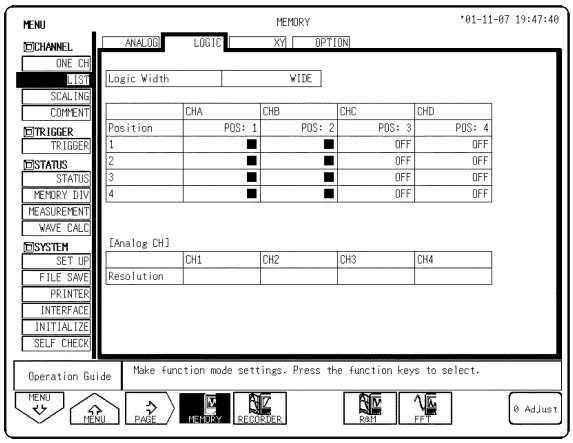
Pressing the **CHAN** key switches CHANNEL screen, LIST screen, SCALING screen, or COMMENT screen.

- Waveform display color
- Waveform display graph
- Voltage axis range
- Input coupling
- Magnification/compression along voltage
- Zero position
- Variable function
- Low-pass filter
- Logic input (CHA-CHD)

◀ Settings for analog channels



▼ Settings for logic channels



Setting on the SCALING screen

Scaling setting screen

Use this function, if necessary.
When using the scaling function, you can convert the output voltage value obtained by the sensor into a physical, measurable value. For details, see Instruction Manual section 5.3.

Setting on the COMMENT screen

Comments superimposed on the graph are of two types: title comments and analog channel comments (analog and logic). For details, see Instruction Manual Section 5.4.

Zero settings

Executing zero adjustment

After the power switch is turned on, wait approximately 30 min for the 8950, 8953-10, and make a zero adjustment of the 8950, 8953-10 prior to measurement.
See Section 6.4, "Zero adjustment."

Setting on the Waveform display screen

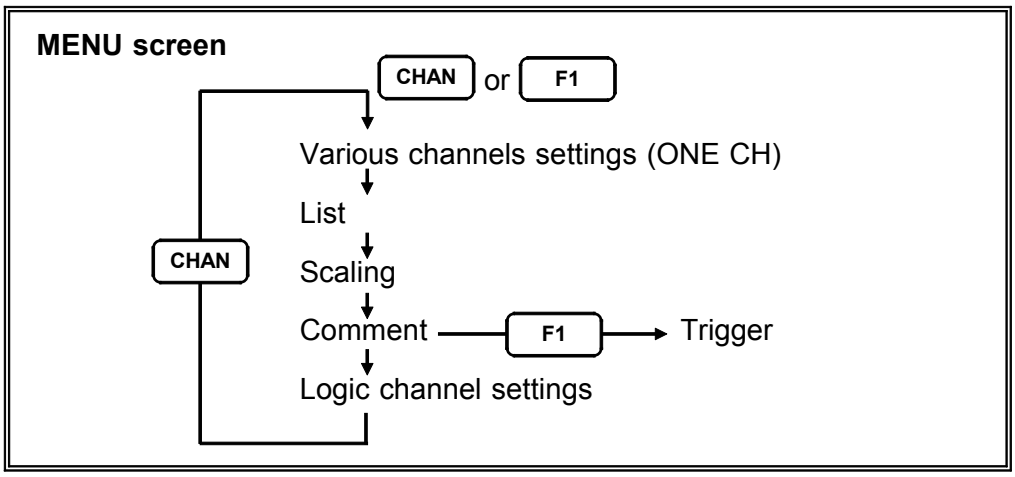
- Channels can be set directly using the (channel select) keys CH1 to CH8, the **POSITION** knob, and the **RANGE** knob.
- Vernier function can be set.
- Press the **F9** (**CH.SET**) key to set input channels in the Waveform display screen.
  See Instruction Manual Section 5.6, "Setting the Waveform Display Screen."

NOTE

Input settings differ among 8950 ANALOG UNIT. Settings for other input modules, see the sections.
8951 VOLTAGE/CURRENT UNIT (See Instruction Manual Section 5.8)
8952 DC/RMS UNIT (See Instruction Manual Section 5.9)
8954 VOLTAGE/TEMP UNIT (See Instruction Manual Section 5.11)
8955 F/V UNIT (See Instruction Manual Section 5.12)

6.3 Setting the CHANNEL Screen

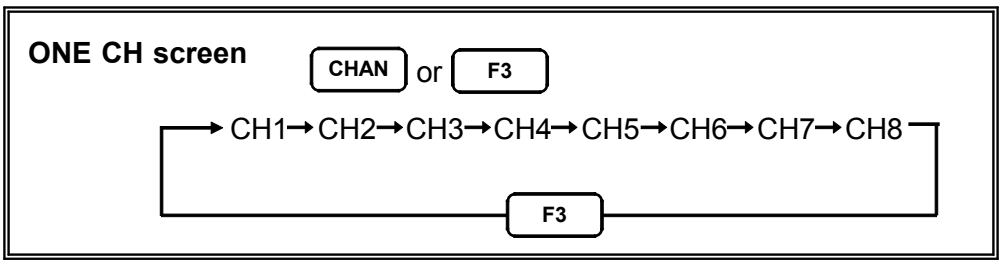
Indicates the Channel screen organization. Press the **CHAN** key to display the Channel screen.

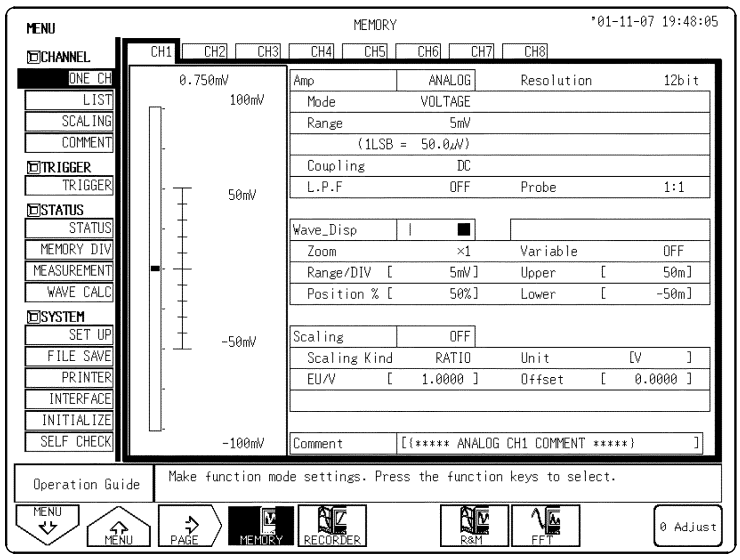


Channel settings are comprised of the following four screens: Various Channels, List, Scaling, and Comments.
A description for each of these four screens is given below.

Various Channels

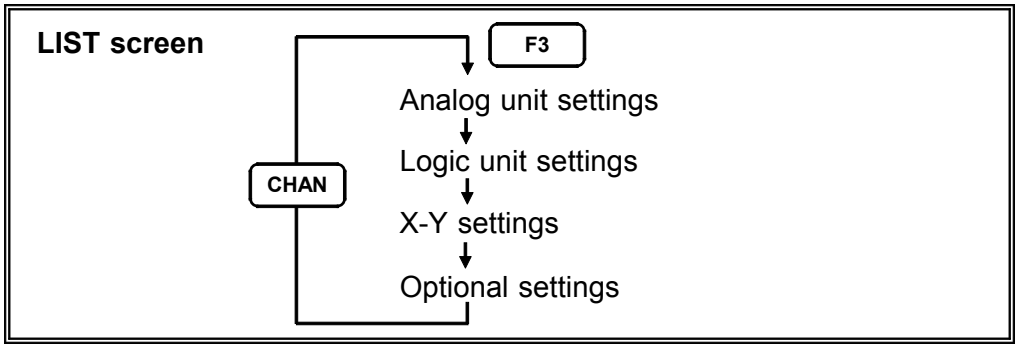
This screen allows you to make detailed settings for each channel.
Here, you can make settings for the channel displayed.

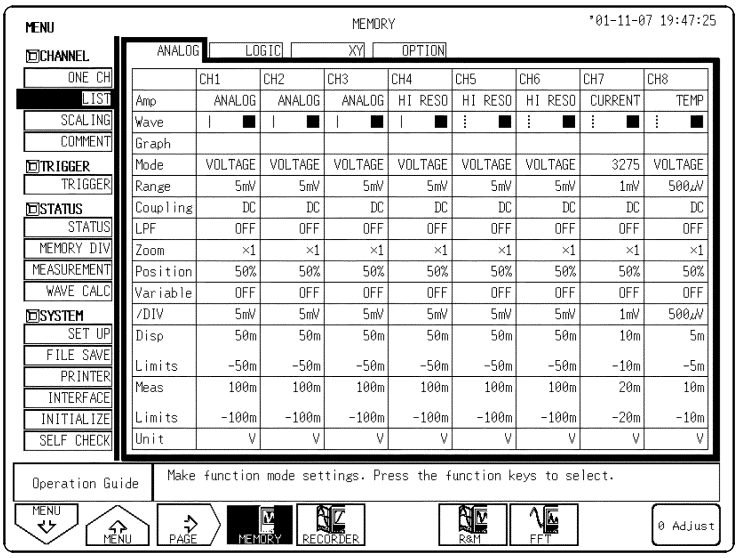




List

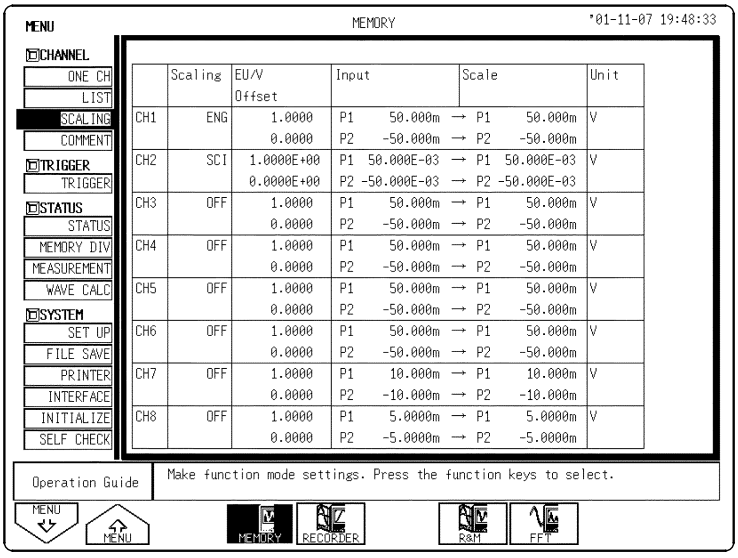
This screen allows you to display and make basic settings for all channels on a single screen.
By switching pages, you can make logic and X-Y settings.





Scaling

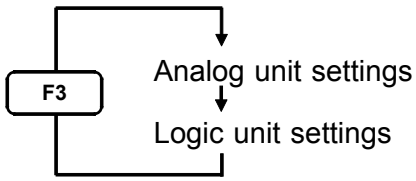
This screen allows you to make scaling settings for the various channels.
For details, see X-Y scaling settings.
For details, see Instruction Manual section 5.3.

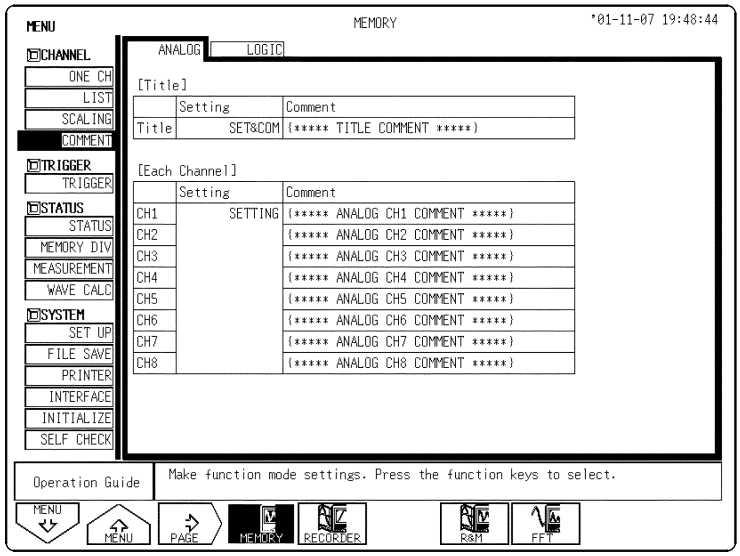


Comments

This screen allows you to enter comments about titles and the various channels.
For details, see Instruction Manual section 5.4.

COMMENT screen





6.3.1 Setting the Waveform Display Color

Set the display color for the waveform.

Procedure

Screen: ONE CH, LIST (CHANNEL), Waveform display

1. To display the channel settings screen, use the **F9** (**CH. SET**) key in Various Channels (ONE CH) on the Channel screen. You can also do this from the List or Waveform display screens.
2. Move the flashing cursor to **Color** item. (**col** on the Channel screen)
3. Use the function keys or **JOG** control to make a setting.

Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.
	: Waveform is performed.
	: Waveform is not performed.

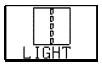
6.3.2 Setting Print Density (When the 8994 PRINTER UNIT is Installed)

Sets the type of lines used when printing.

Procedure

Screen: ONE CH, LIST (CHANNEL)

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to **Line** item.
3. Use the function keys to make a setting.

Function display	Meaning
	: Heavy
	: Slightly heavy
	: Standard density
	: Light

NOTE When real-time printing using the recorder function is ON and a time axis range faster than 1 s/DIV set, printing may be light even with print density set to DARK.

6.3.3 Setting the Waveform Display Graph Position

Sets the position at which the waveform is displayed. The waveform display position can be set when settings other than Single screen are selected in Display format setup on Status screen.

Procedure

Screen: ONE CH, LIST (CHANNEL)

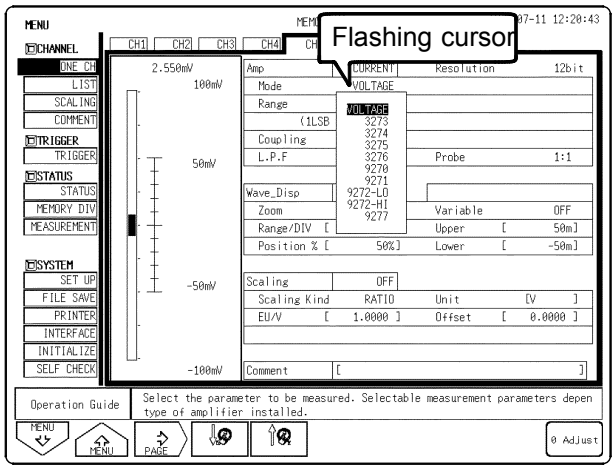
1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to **Graph** item.
3. Use the function keys or **JOG** control to make a setting.

Function display	Meaning
	: Increases in number
	: Decreases in number

NOTE For the X-Y screen (memory and recorder) display format, see the X-Y recorder setting for each function.

6.3.4 Setting the Measurement Mode

You can select a measurement mode for each module.



Procedure

Screen: ONE CH, LIST (CHANNEL)

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to **Mode** item.
3. Use the function keys or **JOG** control to make a setting.

Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.

8951 VOLTAGE/CURRENT UNIT	You can select the voltage and various clamp sensors. (See Instruction Manual Section 5.8)
8952 DC/RMS UNIT	You can select DC and RMS. (See Instruction Manual Section 5.9)
8954 VOLTAGE/TEMP UNIT	You can select the voltage and various thermocouples. (See Instruction Manual Section 5.11)
8955 F/V UNIT	You can select from the various measurement modes. (See Instruction Manual Section 5.12)

6.3.5 Setting the Voltage Axis Range

- The measurement range for each channel is set.
- The set value denotes the voltage value for 1 DIV along the measurement range (vertically).

Procedure

Screen: ONE CH, LIST (CHANNEL), Waveform display

1. To display the channel settings screen, use the **F9** (**CH. SET**) key in Various Channels (ONE CH) on the Channel screen. You can also do this from the List or Waveform display screens.
2. Move the flashing cursor to **Range** item.
3. Use the function keys, **JOG** control, or **RANGE** knob to make a setting.

Function display	Meaning
	: Increases in number
	: Decreases in number

NOTE

- The **RANGE** knob can be used regardless of where the flashing cursor is located.
- If the variable function is enabled, the size of a waveform on the screen does not change, even if the measurement range is changed.
- When the waveform is out of range, the color of the displayed waveform on the screen is changed.

6.3.6 Setting the Input Coupling

The input coupling for the input signal is set.

Procedure

Screen: ONE CH, LIST (CHANNEL), Waveform display

1. To display the channel settings screen, use the **F9** (**CH. SET**) key in Various Channels (ONE CH) on the Channel screen. You can also do this from the List or Waveform display screens.
2. Move the flashing cursor to the **Coupling** as shown in the figure below.
3. Use the function keys to make a setting.

Function display	Meaning
	: DC coupling
	: AC coupling
	: The input signal is not connected. This allows the zero position to be checked.

6.3.7 Setting the Magnification/Compression Ratio Along the Voltage Axis

Specifies the magnification/compression ratio for each channel to be used for display and recording.
Enlarges or reduces according to the zero position.

Procedure

Screen: ONE CH, LIST (CHANNEL), Waveform display

1. To display the channel settings screen, use the **F9** (**CH. SET**) key in Various Channels (ONE CH) on the Channel screen. You can also do this from the List or Waveform display screens.
2. Move the flashing cursor to the **Zoom** item.
3. Use the function keys or the **JOG** control to make a setting.

Function display	Meaning
	: Increases in number
	: Decreases in number

6.3.8 Setting the Zero Position

The position of the zero voltage is set.

Procedure

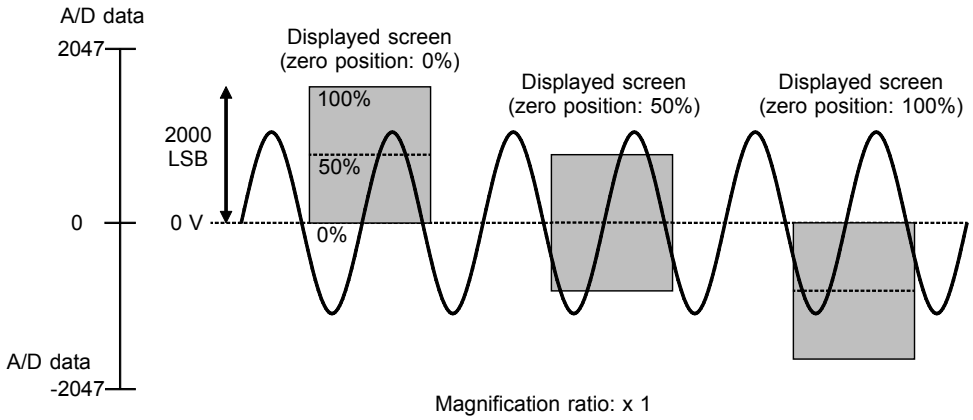
Screen: ONE CH, LIST (CHANNEL), Waveform display

1. To display the channel settings screen, use the **F9** (**CH. SET**) key in Various Channels (ONE CH) on the Channel screen. You can also do this from the List or Waveform display screens.
2. Move the flashing cursor to the **Position** item.
4. Use the function keys, the **JOG/SHUTTLE** control, or **POSITION** knob to make a setting.

Function display	Meaning
	: Changes the +10% zero position
	: Changes the +1% zero position.
	: Changes the -1% zero position.
	: Changes the -10% zero position.

NOTE

- Zero position is the reference for enlarging or reducing the voltage axis.
- Magnification/compression along the measurement range is performed using the center of the screen as reference,even if the magnification/compression ratio is changed.
- The zero positions are shown in the figure below.
- The voltage range displayed on the Waveform display screen changes according to the zero position and voltage axis magnification/compression, but the possible measurement range does not change.



Screen format	x 1/2	x 1	x 2	x 5	x 10	x 20	x 50	x 100
Full scale when using the 8950,8951,8952 (LSB)	4000	2000	1000	400	200	100	40	20
Full scale when using the 8953-10, 8954 (voltage) (LSB)	64000	32000	16000	6400	3200	1600	640	320
Full scale when using the 8954 (temperature) (LSB)	40000	20000	10000	4000	2000	1000	400	200
Full scale when using the 8955 (integration) (LSB)	80000 (40000)	40000	20000	8000	4000	2000	800	400
Full scale when using the 8955 (excluding integration) (LSB)	8000 (4000)	4000	2000	800	400	200	80	40
Zero position adjustment area	0 to 100	-100 to 150	-200 to 250	-500 to 550	-1000 to 1050	-2000 to 2050	-5000 to 5050	-10000 to 10050

*( ): effective range of the measurement data

6.3.9 Setting the Low-pass Filter

Low-pass filters internal to the modules are set. Effective for removing unneeded high-frequency components.

Procedure

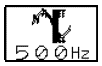
Screen: ONE CH, LIST (CHANNEL), Waveform display

1. To display the channel settings screen, use the **F9** (**CH. SET**) key in Various Channels (ONE CH) on the Channel screen. You can also do this from the List or Waveform display screens.
2. Move the flashing cursor to the **L.P.F** item.
3. Use the function keys to make a setting.

Function display — Meaning (When using the 8950 ANALOG UNIT)

: No low-pass filter is connected.

: Connect a filter with a cutoff frequency of 5 Hz



: Connect a filter with a cutoff frequency of 500 Hz

: Connect a filter with a cutoff frequency of 5 kHz

: Connect a filter with a cutoff frequency of 1 MkHz

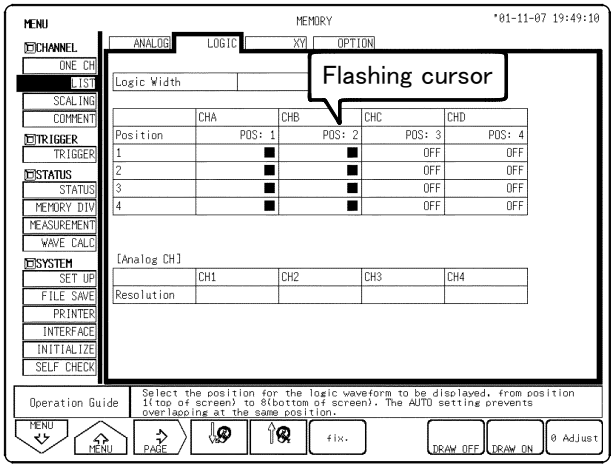
Low-pass filter for the units

Unit	Low-pass filter [Hz]
8950	OFF, 5, 500, 5 k, 1 M
8951	OFF, 5, 500, 100 k, 1 M
8952	OFF, 5, 500, 5 k, 1 M
8953-10	OFF, 5, 50, 500, 5 k, 50 k
8954	OFF, 1, 5, 50, 500
8955	OFF, 5, 500, 5 k, 100 k

NOTE The cutoff frequency of low-pass filter varies depending on the module type.

6.3.10 Setting the Logic Inputs

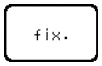
Select the display positions for CHA - CHD (1 probe).
Set the color of the logic waveform display, and turn it ON or OFF.
Set the width of the logic recording.



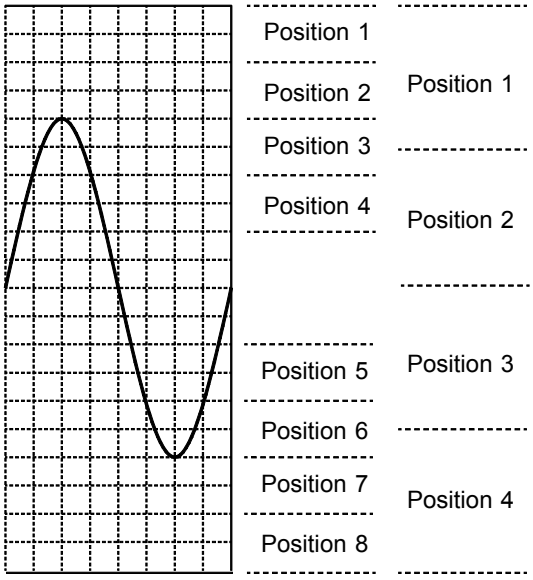
Procedure

Screen: ONE CH, LIST (CHANNEL), Waveform display

1. Use the List (Logic) screen in the Channel screen or the **F9** (**CH.SET**) key on the Waveform display screen to view the logic channel settings screen.
2. Move the flashing cursor to the channel display position that you want set, as shown in the illustration on the left.
3. Use the function keys to set the **Position**.
4. Select the **fix.** function key to change the display position.

Function display	Meaning
	: Change the display position.
	: Change the display position.
	: Set to the displayed position number.
	: All logic waveforms are displayed.
	: Logic waveforms are not displayed.

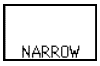
The logic waveform display positions are as follows.



5. Move the flashing cursor to the "1" to "4" item of the channel for which the display color is to be set.
6. Use the the function keys to make the selection.

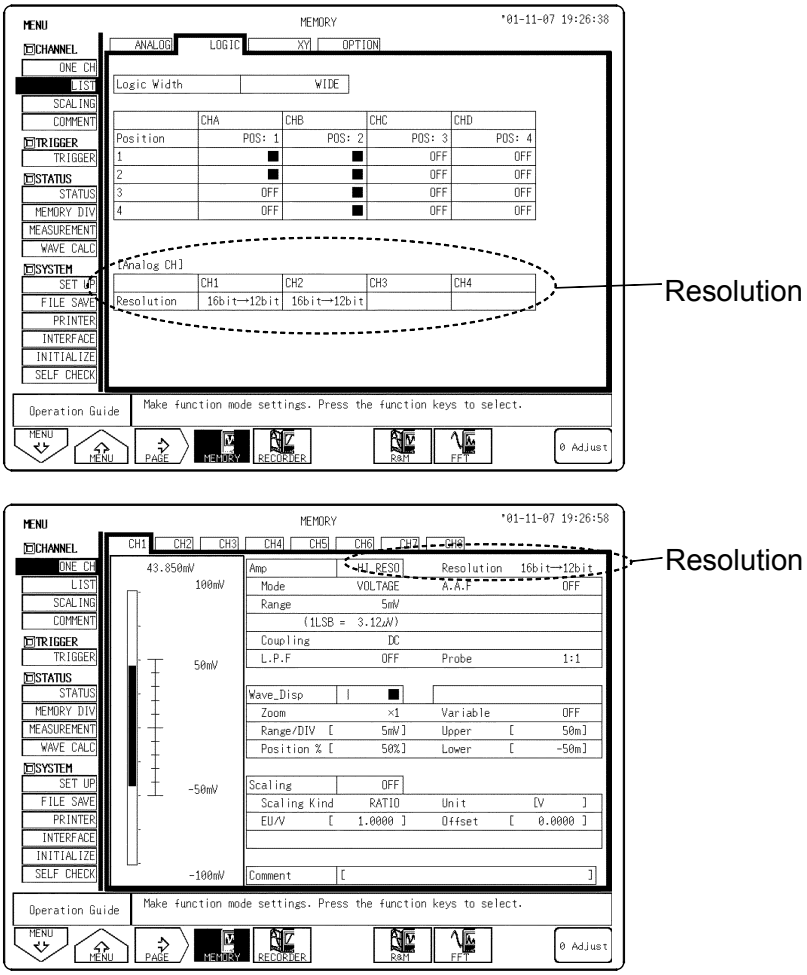
Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.
	: Waveform is performed.
	: Waveform is not performed.

7. Move the flashing cursor to the logic recording width setting.
8. Select **WIDE** or **NARROW** as the logic recording width. Depending on what was set as the recording width, the display position of the logic waveform changes as shown on the left.

Function display	Meaning
	: Makes the recording width wide.
	: Makes the recording width narrow.

NOTE

Logic and analog channels
When the 8953-10 HIGH RESOLUTION UNIT, 8954 VOLTAGE/TEMP UNIT, or 8955 F/V UNIT is installed and logic input is ON, the resolution of the 8953-10, 8954, or 8955 goes from 16 bits to 12 bits. In this situation, the screen displays clearly that the resolution changed.



The relationships between the analog and logic units are outlined below.
Analog channel 1 - logic channel A
Analog channel 2 - logic channel B
Analog channel 3 - logic channel C
Analog channel 4 - logic channel D

When the 8953-10 HIGH RESOLUTION UNIT, 8954 VOLTAGE/TEMP UNIT, or 8955 F/V UNIT is installed on CH1 to CH4. When logic input is ON, the resolution automatically changes from 16 bits to 12 bits.

6.4 Zero Adjustment

- This function calibrates the 0 V position (ground position) to the selected zero position. Use it to assure precise results.
- Allow the instrument to warm up for at least 30 minutes to ensure that the internal temperature of the input modules has stabilized.
- All ranges and channels are performed simultaneously.

Procedure

Screen: ONE CH, LIST (CHANNEL), Waveform display

1. Use the Menu keys to display the desired screen.
2. Move the flashing cursor to the **Position** item to be set.
3. Press the **F10** (**0 Adjust**) key to make zero adjustment.

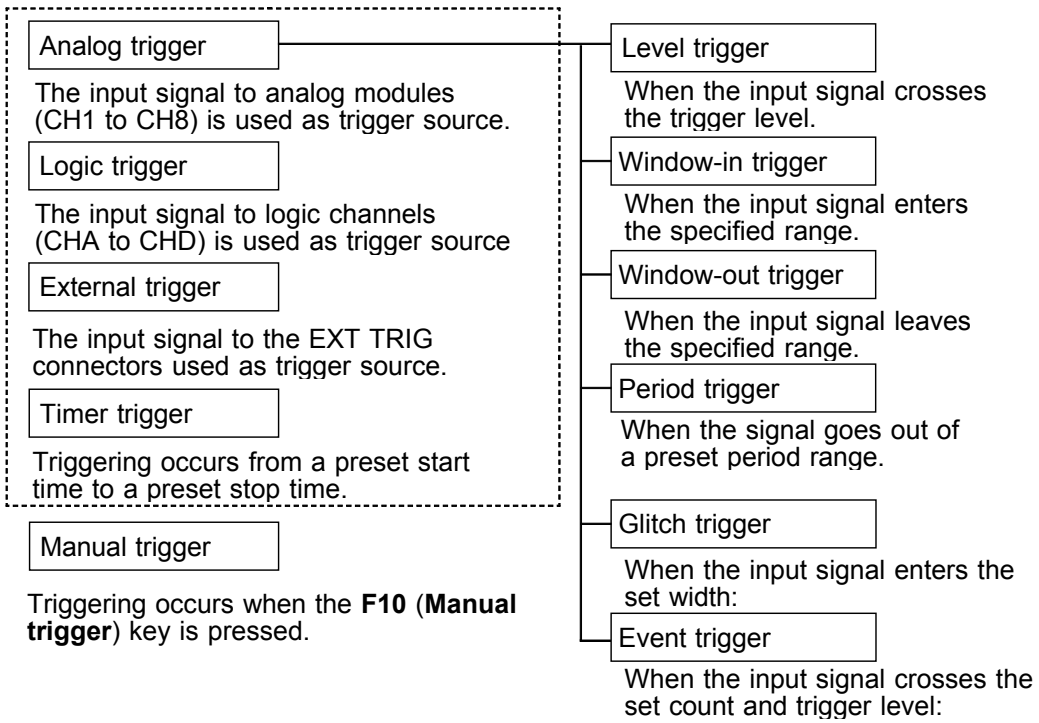
NOTE

- Zero adjustment cannot be performed during measurement.
- Repeat the zero adjustment when the input module was changed, when turn ON/OFF the power, or when the system is set to reset.
- When there is a sudden change in ambient temperature the zero position may drift. To assure continued measurement precision, perform the zero adjustment again.
- Zero adjustment cannot be performed when using the 8954 in the temperature range or when using the 8955.
- Note that zero adjustment performed while measuring harmonics may not be accurate. In such case, disconnect the input cable, then repeat zero adjustment.

Chapter 7
Trigger Functions

7.1 Overview of the Trigger Functions

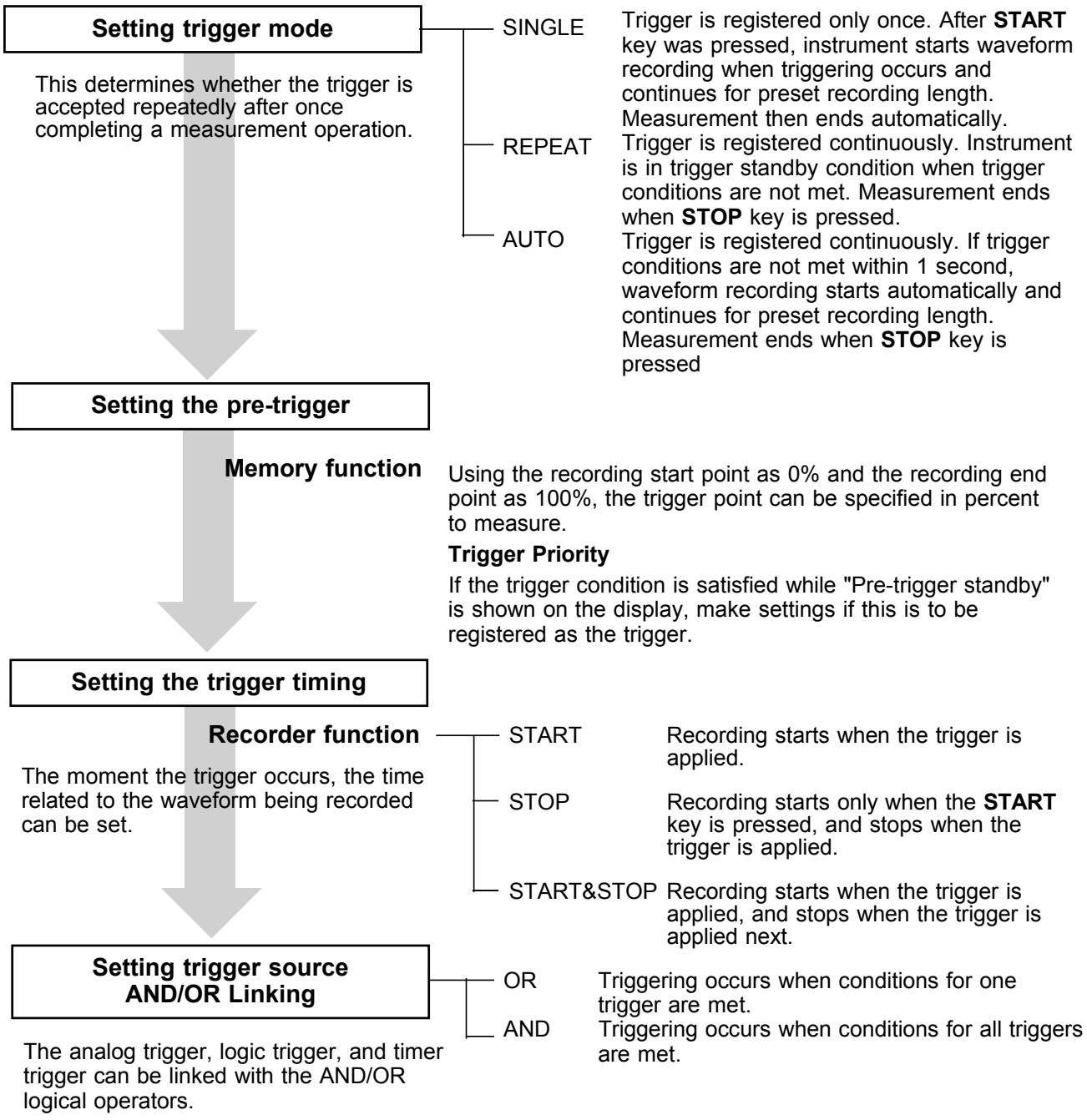
- The term "trigger" refers to a signal which is used to control the timing for recording start or stop.
- The term "triggering has occurred" refers to the state when such a signal has activated recording start or stop.
- Trigger parameters for the various functions are set using the Trigger screen or the Waveform display screen.



NOTE

- The manual trigger is always activated when the **F10** (**Manual trigger**) key is pressed, regardless of other trigger source settings.
- If the trigger settings (trigger source parameters, pre-trigger) are changed during recording, the measurement is restarted, using the new settings.

7.2 Operation Sequence (Trigger mode setting)

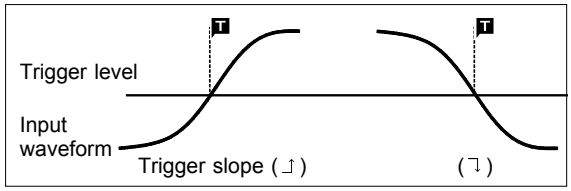


Selecting trigger type

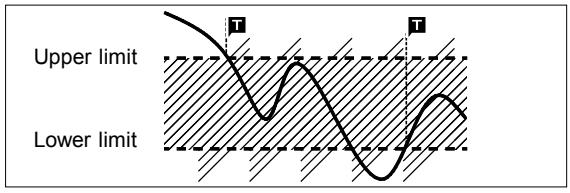
Analog trigger

- The analog signal input channels can be used as trigger source.
- The type of trigger that can be used for the various functions is limited.

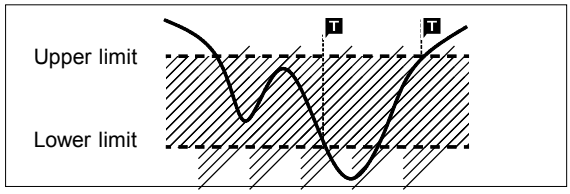
Level trigger (MEM, REC, FFT)
It is possible to set off the trigger when the input signal crosses a set triggering level (voltage).



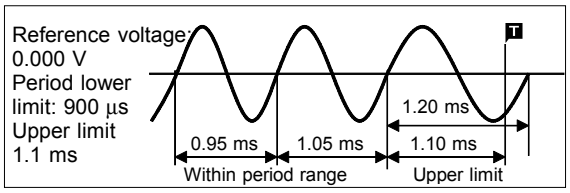
Window-in Trigger (MEM, REC, FFT)
Set upper limit level and lower limit level and activated when the input signal enters the range between these limits.



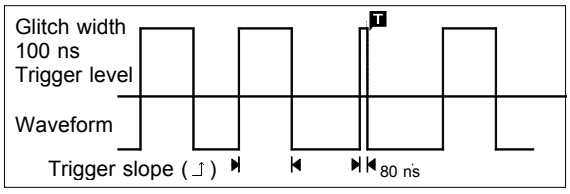
Window-out Trigger (MEM, REC, FFT)
Set upper limit level and lower limit level and activated when the input signal leaves this range.



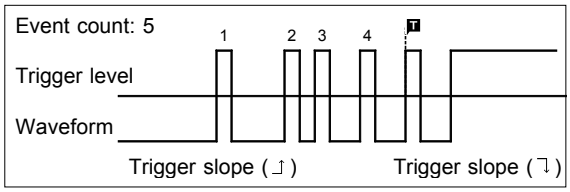
Period Trigger (MEM, REC, FFT)
This function sets both the period reference voltage and the period range, and measures the rise (fall) period of the set voltage. When the measured period deviates from the specified range, triggering occurs.



Glitch Trigger (MEM, FFT)
Set the triggering level (voltage value) and pulse width (glitch width). When the set voltage value rises (or falls) within the set pulse width, this trigger is set off.



Event Trigger (MEM, FFT)
Set the triggering level (voltage value) and event count, and count the rises above (or falls under) the set voltage value. The trigger is set off when reaching the set event count.



Logic trigger The signal of a logic channel can be used as trigger source. A trigger pattern and logical operator (AND/OR) are specified, and triggering occurs when the trigger conditions are met.

External Trigger An external signal can be used as trigger source. The external trigger is activated by either shorting the EXT TRIG terminal or applying a falling edge signal going below HIGH level (2.5 V to 5.0 V) to LOW level (0 V to 1.0 V).

Timer Trigger This function serves to activate recording at preset times. Triggering can be performed at constant intervals within a preset start time and end time.

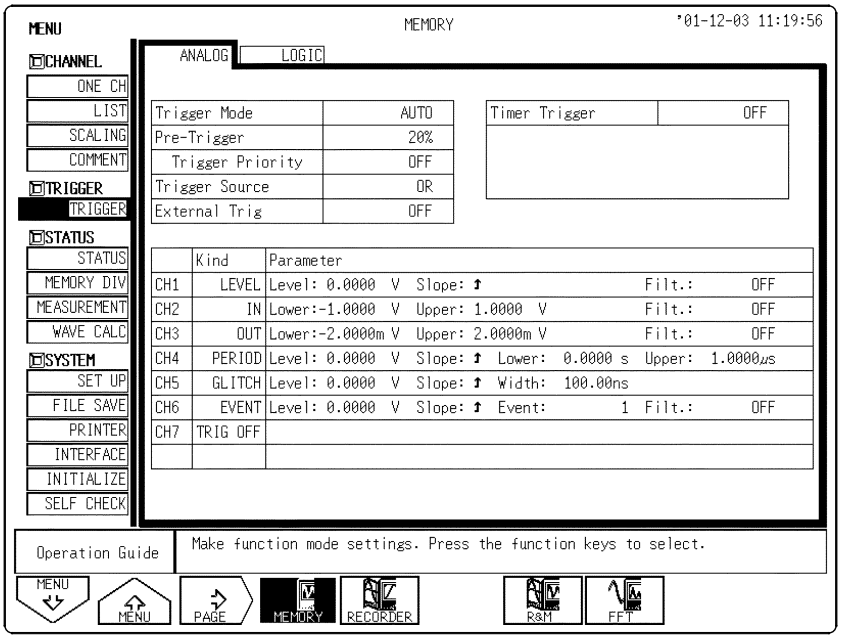
Manual trigger The manual trigger is always activated when the **F10** (**Manual trigger**) key is pressed, regardless of trigger source AND/OR linking setting.

Start measurement

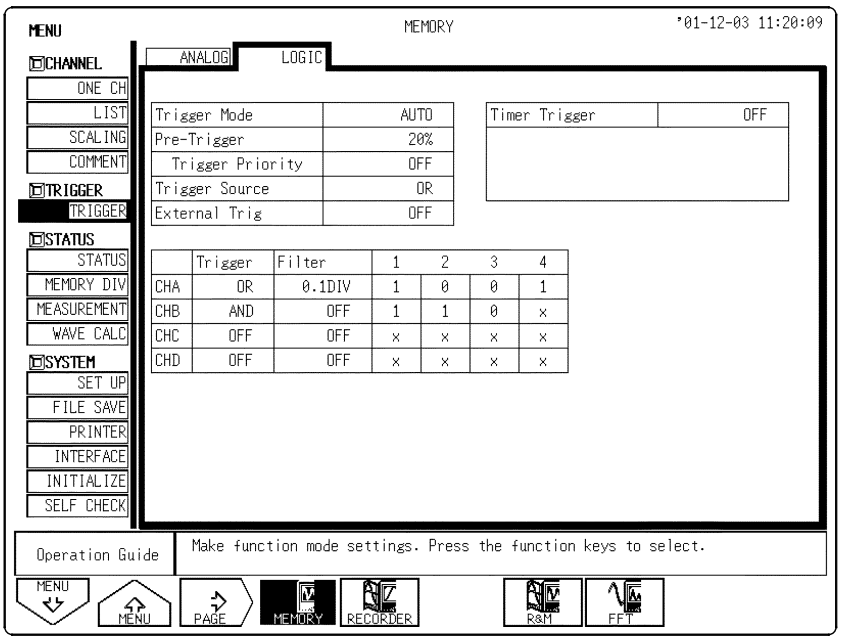
- Press the **START** key and the LED lights. When the trigger conditions are met, measurement start.
- Pressing the **STOP** key stops measurement.

7.3 TRIGGER Screen Organization

Indicates the Trigger screen organization. Press the **F3** (**PAGE**) key to display the Trigger screen.



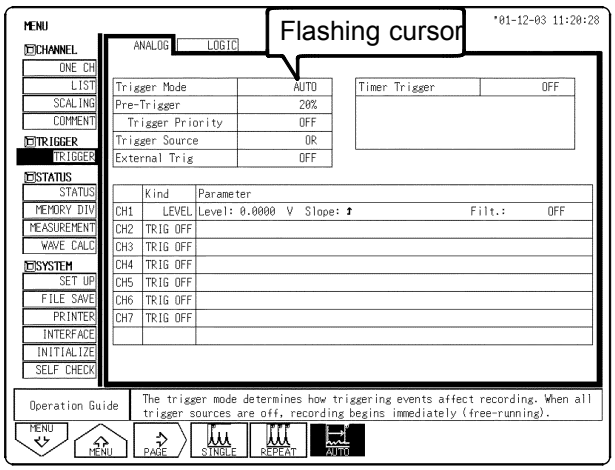
Setting items:
- Trigger mode
- Pre-trigger (for recorder function, trigger timing)
- Trigger source
- Analog channel (channels 1 to 8)
- External trigger
- Timer trigger

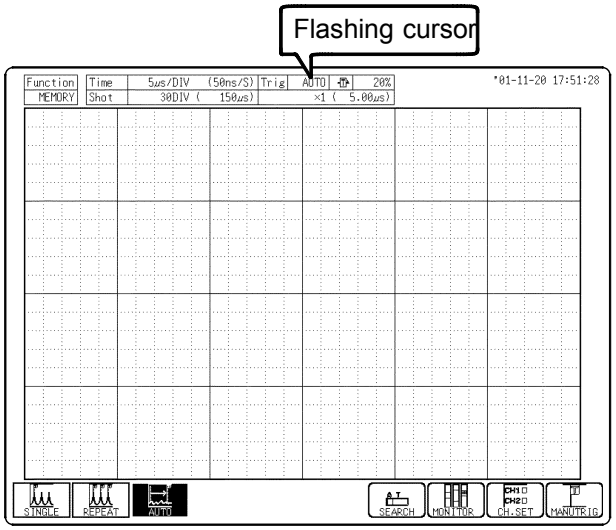


Setting items:
- Trigger mode
- Pre-trigger
- Trigger source (for recorder function, trigger timing)
- Logic channel (CHA to CHD)
- External trigger
- Timer trigger

7.4 Trigger Mode

The trigger mode determines the way triggering is used to control operation of the instrument. When all trigger sources are OFF, a recording operation begins immediately (free-run operation).





Procedure Screen: TRIGGER, Waveform display

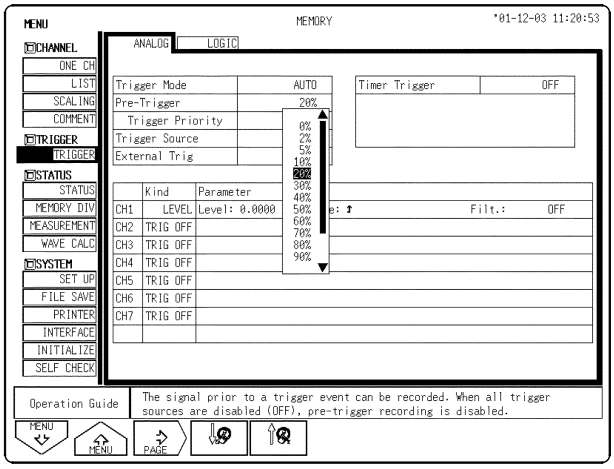
1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to the **Trigger Mode** item.
3. Use the function keys to make the selection.

Function display		Meaning
SINGLE	:	Trigger is registered only once. After **START** key was pressed, instrument starts waveform recording when triggering occurs and continues for preset recording length. Measurement then ends automatically.
REPEAT	:	Trigger is registered continuously. Instrument is in trigger standby condition when trigger conditions are not met. Measurement ends when **STOP** key is pressed.
AUTO	:	Trigger is registered continuously. If trigger conditions are not met within 1 second, waveform recording starts automatically and continues for preset recording length. Measurement ends when **STOP** key is pressed (memory function only).

7.5 Pre-trigger (MEM Function)

7.5.1 Setting the Pre-trigger

The pre-trigger function serves to record the waveform not only after but also before triggering has occurred.
The trigger mode set on available on the recorder and memory (MEM) function screen is set on available on the recorder waveform screen.
When all trigger sources are set to OFF, the pre-trigger setting is invalid.



Procedure Screen: TRIGGER, Waveform display

1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to the **Pre-Trigger** item, as shown in the figure on the left.
3. Use the **JOG** control or the function keys to make a setting.

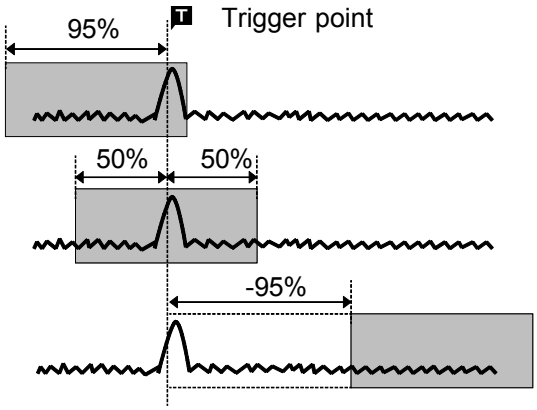
Function display	Meaning
	: Move the cursor up in the selection window.
	: Move the cursor down in the selection window.

Recording range (recording length)

[95%]:
95% of the recording in the recording length is before the trigger

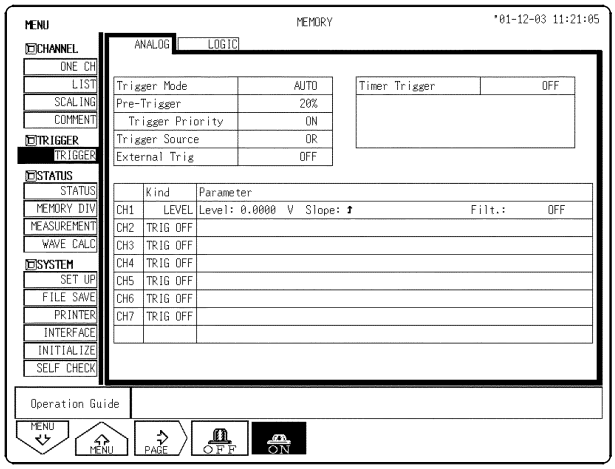
[50%]:
50% before and 50% after the trigger

[-95%]:
Recording is about one recording length after the trigger



7.5.2 Setting the Trigger Priority

When the pre-trigger is set, the trigger will not be registered for a certain period after the start of measurement.
During this interval, "Pre-trigger standby" is shown on the display.
If the trigger condition is satisfied while "Pre-trigger standby" is shown on the display, make settings if this is to be registered as the trigger.



Procedure Screen: TRIGGER

1. Press the **TRIG** key to display the Trigger screen.
2. Move the flashing cursor to the **Trigger Priority** item.
3. Use the function keys to make a setting.

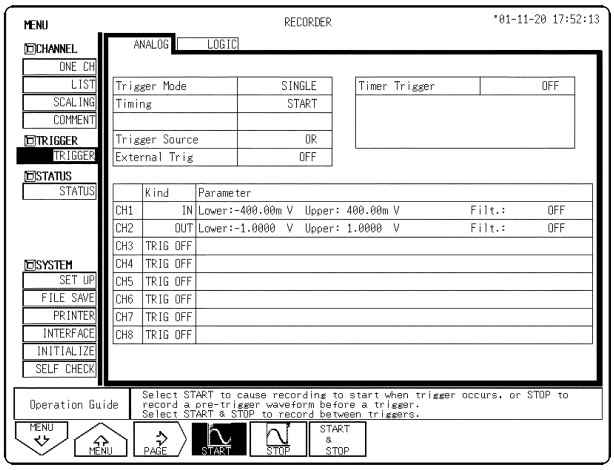
Function display	Meaning
	: The trigger is not registered during pre-trigger standby.
	: The trigger is registered during pre-trigger standby.

NOTE

- When the trigger is registered during pre-trigger standby, the actual acquired recording length of the waveform is less than the set recording length. The set recording length of the waveform changes depending on the position of the trigger when it was registered during pre-trigger standby.
- If the pre-trigger is set and trigger standby is disabled, the trigger will not be registered for a certain period after the start of measurement. (During this interval, "Pre-trigger standby " is shown on the display.)
- When the trigger can be registered, the indication "Waiting for trigger" is shown on the display.
- If the time axis range is set to "EXT." in memory function, the pre-trigger can not be set.

7.6 Trigger Timing (REC Function)

- The moment the trigger occurs, the time related to the waveform being recorded can be set.
- Not only the waveform after the trigger but also the waveform before the trigger can be recorded.



Procedure Screen: TRIGGER

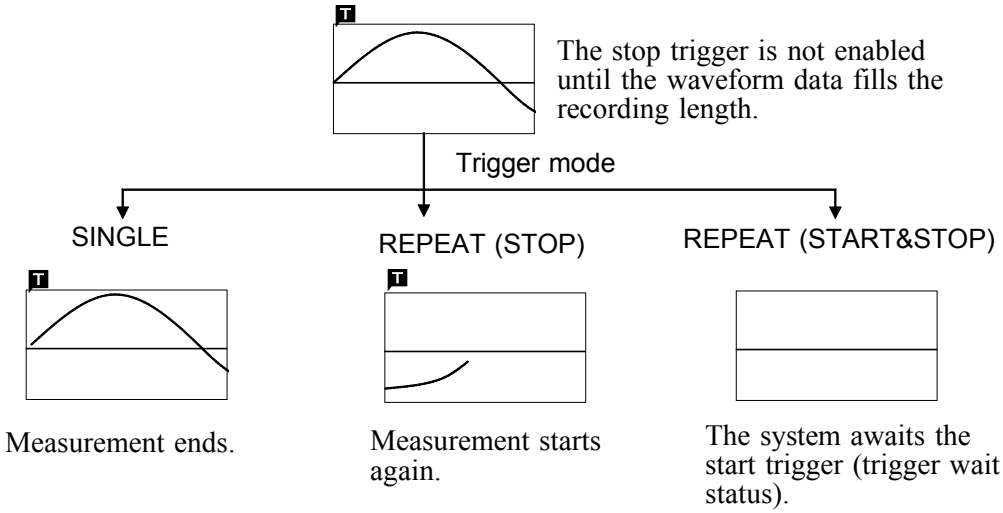
1. Press the **TRIG** key to display the Trigger screen.
2. Move the flashing cursor to the **Timing** item.
3. Use the function keys to make a setting.

Function display	Meaning
START	: Recording starts when the trigger is applied.
STOP	: Recording starts only when the **START** key is pressed, and stops when the trigger is applied.
START & STOP	: Recording starts when the trigger is applied, and stops when the trigger is applied next.

NOTE

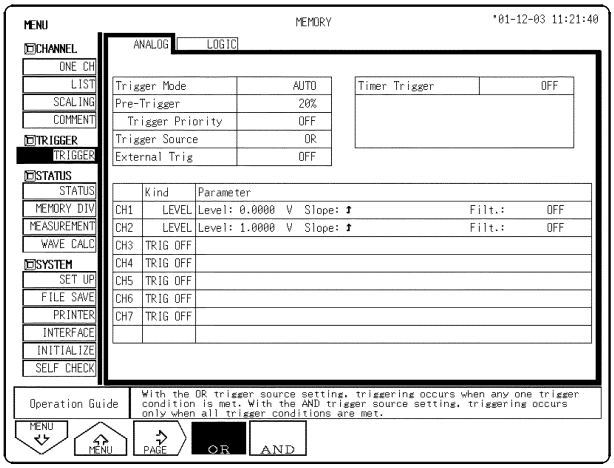
When the trigger timing is set to **Stop** or **Start & Stop**, measured waveform data equivalent to the recording length is saved if the stop triggering is not generated between the initiation of measurement and the end of the set recording length.

Trigger mode:
SINGLE: Stop measurement.
REPEAT (STOP): Start measurement again.
REPEAT (START&STOP): Wait for trigger.
Example: Trigger setting; level trigger, 0.000 V (⊥↑)



7.7 Trigger Source AND/OR Linking

The analog trigger, logic trigger, external trigger, and timer trigger can be linked with the AND/OR logical operators.
OR: Triggering occurs when conditions for one trigger are met.
AND: Triggering occurs when conditions for all triggers are met.



Procedure Screen: TRIGGER

1. Press the **TRIG** key to display the Trigger screen.
2. Move the flashing cursor to the **Trigger Source** item.
3. Use the function keys to make a setting.

Function display	Meaning
OR	: Link trigger sources with logical operator OR
AND	: Link trigger sources with logical operator AND.

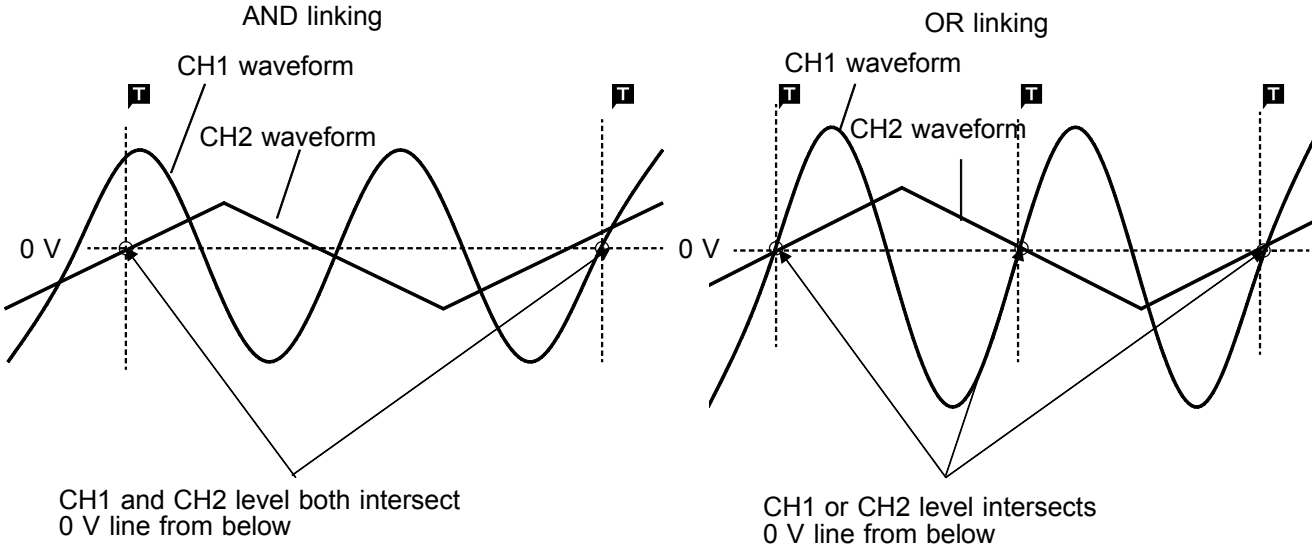
NOTE

If the trigger source is set to AND, and the trigger source setting conditions have already been met when the **START** key is pressed, triggering does not occur. When the conditions are not met once but met subsequently, triggering occurs.

Example

The figures below show the difference between the effect of AND/OR linking.

Channel	Trigger	Trigger level	Slope	Filter
CH1	Level	0.00 V	⌋⌈	OFF
CH2	Level	0.00 V	⌋⌈	OFF



7.8 Analog Trigger

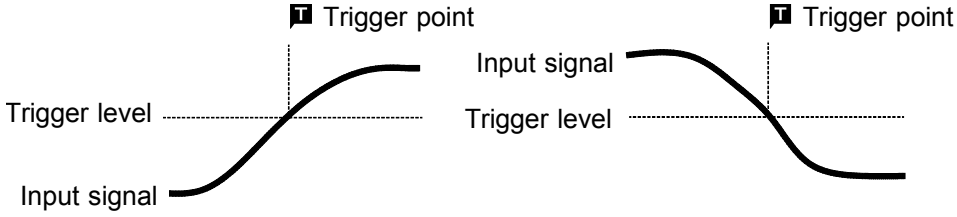
The analog signal input channels can be used as trigger source. The type of trigger that can be used for the various functions is limited.

Available trigger types for each function

Trigger \ Function	Memory	Recorder
Level	●	●
Window	●	●
Period	●	●
Glitch trigger	●	-
Event trigger	●	-

7.8.1 Level Trigger

It is possible to set off the trigger when the input signal crosses the set triggering level (voltage value). You can also select a rising, falling, or both trigger slope (⌋⌈ , ⌉⌊ , ↕).
When a trigger filter is used, triggering occurs only within the filter width. This is useful to exclude noise.

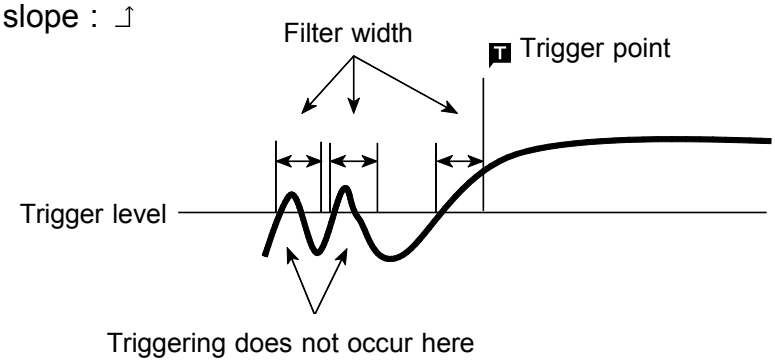


Upward trigger direction (slope : ⌋⌈) Downward trigger direction (slope : ⌋⌈)

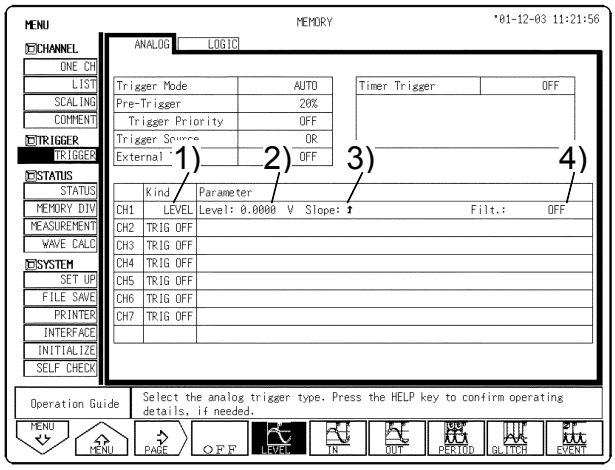
Trigger Filter

- Triggering occurs when the trigger conditions are met within the filter width. This is useful to prevent spurious triggering by noise.
- The filter width is specified by the number of divisions of the memory function, while it is fixed to 10 ms, which is enabled and disabled using the **ON/OFF** keys, for the recorder function.

Rising trigger slope : ⌋⌈



Procedure Screen: TRIGGER, Waveform display



(1) Select the level trigger

1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to position 1) shown in the figure.
3. Use the function keys to select **LEVEL**.

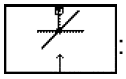
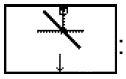
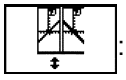
(2) Set the trigger level

1. Move the flashing cursor to position 2) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

(3) Select the trigger direction (slope).

1. Move the flashing cursor to position 3) shown in the figure.
2. Use the function keys to make the selection.

Function display	Meaning
	: Enables triggering on the rising edge.
	: Enables triggering on the falling edge.
	: The trigger is activated by the input signal crossing the trigger level when the trigger slope rises or falls (↕)

(4) Set the trigger filter

1. Move the flashing cursor to position 4) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

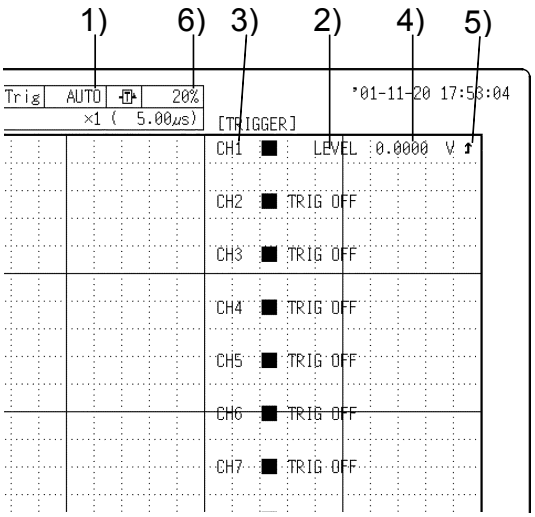
In Memory Function

OFF Trigger filter is disabled
0.1 to 10 Trigger filter is enabled. Filter width is specified using divisions

In the Recorder Function

Function display	Meaning
	: Trigger filter is disabled.
	: Trigger filter is enabled. Filter width is 10 ms.

Settings on the Waveform display screen

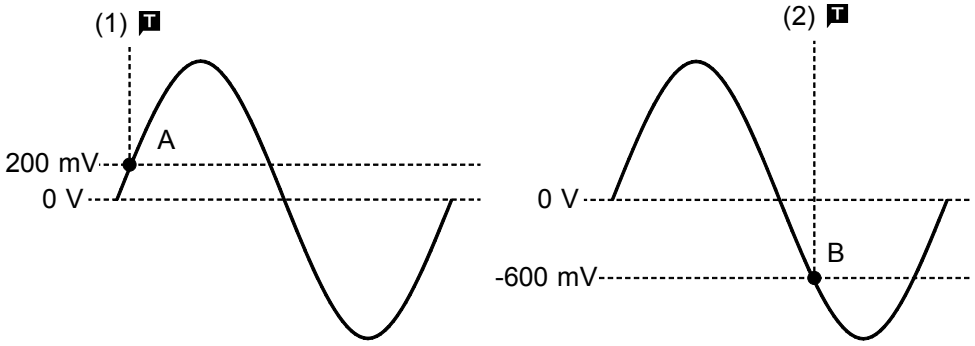


Setting items	Operation		
	Function	Jog	Shuttle
1) Trigger mode	●	-	-
2) Trigger type	●	-	-
3) Channel	-	-	-
4) Trigger level	●	●	●
5) Trigger slope	●	-	-
6) Pre-trigger	●	●	-

Restriction:
The trigger filter cannot be set.
The selected window is not displayed in the pre-trigger setting.
To set the numerical value by using the **JOG/SHUTTLE** control, press the **VALUE** key.

Example for Level Trigger

To cause triggering at point A or point B with the sine wave shown below, make the following settings.
(1) Point A trigger level: 200 mV, trigger direction (slope): rising (⤴)
(2) Point B trigger level: -600 mV, trigger direction (slope): falling (⤵)



NOTE

- When the trigger source is set to "AND," triggering occurs when the voltage is above or below the trigger level. With this setting, triggering will not occur when the trigger slope crosses the set trigger level.
- Trigger slope rising & falling (↕) is only possible for the level trigger.
- Setting a filter with the trigger slope rising & falling (↕) will delay the trigger point by one sample.

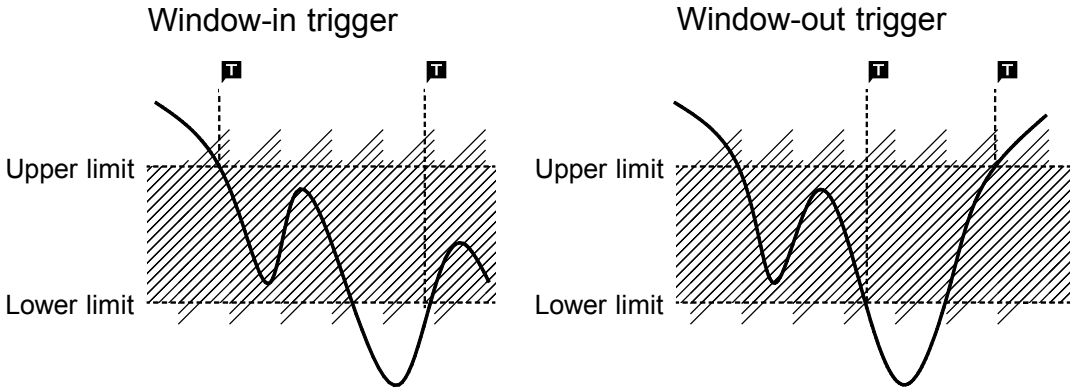
7.8.2 Window Trigger

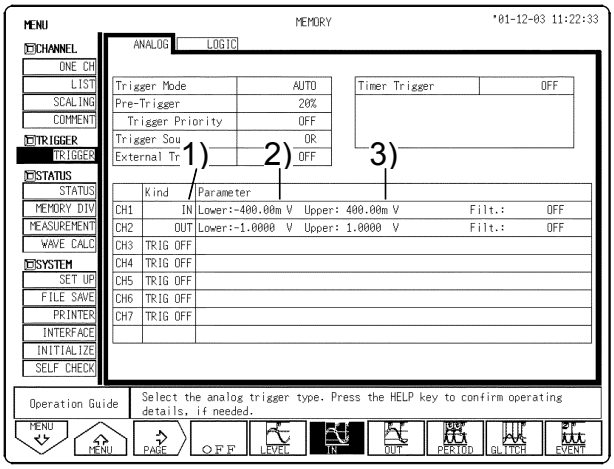
Window-In Trigger

Set upper limit level and lower limit level and activated when the input signal enters the range between these limits.

Window-Out Trigger

Set upper limit level and lower limit level and activated when the input signal leaves this range.





Procedure

Screen: TRIGGER, Waveform display

(1) Select the window-in or window-out trigger.

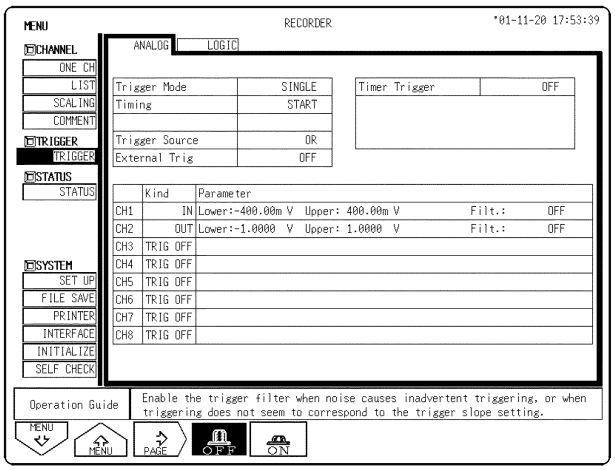
1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to position 1) shown in the figure.
3. Use the function keys to make a selection.

(2) Set the lower and upper trigger levels.

1. Move the flashing cursor to position 2) shown in the figure, and use the function keys or the **JOG/SHUTTLE** control to set the lower trigger level.
2. Move the flashing cursor to position 3) shown in the figure, set the upper trigger level.

   The upper limits must not be smaller than the lower limits, or the lower limits must not be larger than the upper limits.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step



(3) Set the trigger filter

1. Move the flashing cursor to position shown in the figure on the left.
2. Use the **JOG** control or the function keys to make the selection.

In the Memory Function

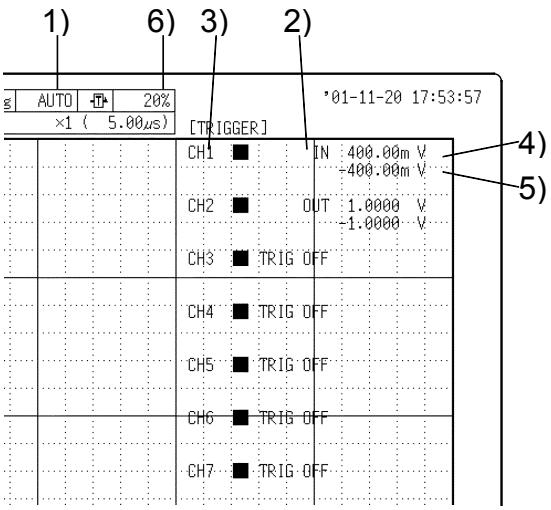
OFF Trigger filter is disabled

0.1 to 10 Trigger filter is enabled. Filter width is specified using divisions.

In the Recorder Function

Function display	Meaning
	: Trigger filter is disabled.
	: Trigger filter is enabled. Filter width is 10 ms.

Settings on the Waveform display screen



Setting items	Operation		
	Function	Jog/Shuttle	Shuttle
1) Trigger mode	●	-	-
2) Trigger type	●	-	-
3) Channel	-	-	-
4) Upper limit	●	●	●
5) Lower limit	●	●	●
6) Pre-trigger	●	●	-

Restriction:

The trigger filter cannot be set.

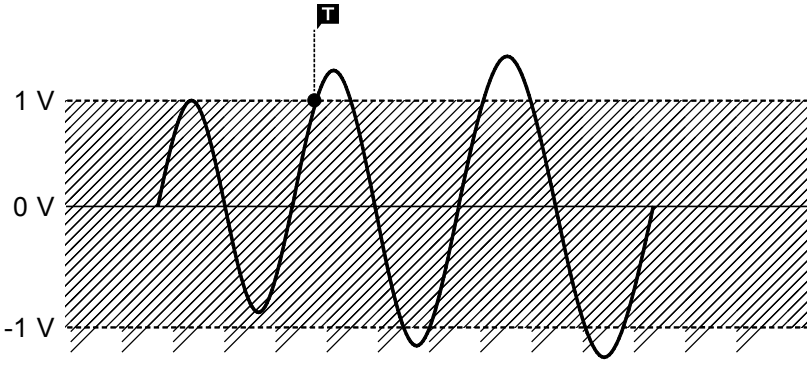
To set the numerical value by using the **JOG/SHUTTLE** control, press the **VALUE** key.

The selected window is not displayed in the pre-trigger setting.

Example for Window-out Trigger

In order to cause triggering when the signal as shown in the figure below leaves the hatched area, the following settings are made:

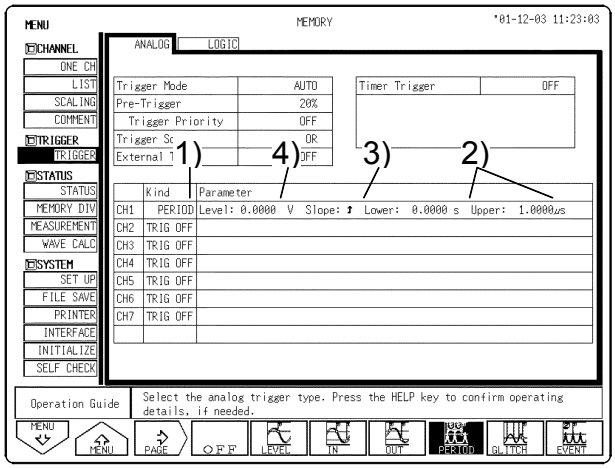
Window-out trigger Upper limit : 1 V, lower limit: -1 V



7.8.3 Period Trigger

This function sets both the period reference voltage and the period range, and measures the rise (fall) period of the reference voltage. When the measured period deviates from the specified range, triggering occurs.

Procedure Screen: TRIGGER, Waveform display



(1) Select the period trigger.

1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to position 1) shown in the figure.
3. Use the function keys to select **PERIOD**.

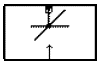
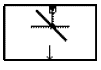
(2) Set the period range

1. Move the flashing cursor to position 2).
2. Use the **JOG/SHUTTLE** control or the function keys to make a setting.
   The setting for the period range of the period trigger changes depending on the sampling period.
   Lower limit: More than 10 times the sampling period.
   Upper limit: Less than 20000 times the sampling period.
   The upper trigger level must not be smaller than the lower trigger level, or the lower trigger level must not be larger than the upper trigger level.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

(3) Select the trigger direction (slope).

1. Move the flashing cursor to position 3) shown in the figure.
2. Use the function keys to select the trigger direction (slope).

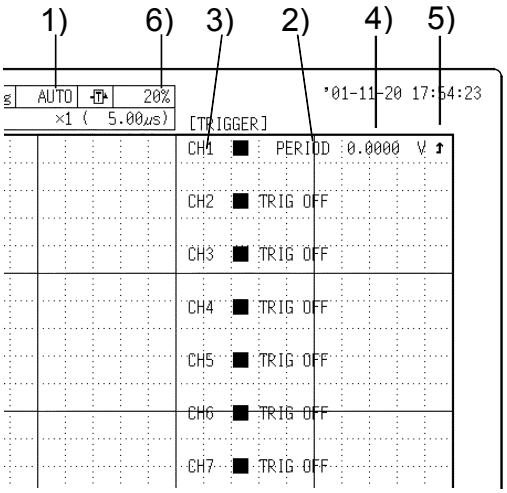
Function display	Meaning
	: Enables triggering on the rising period.
	: Enables triggering on the falling period.

(4) Set the reference voltage value

1. Move the flashing cursor to position 4) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the setting.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

Settings on the Waveform display screen



Setting items	Operation		
	Function	Jog/Shuttle	Shuttle
1. Trigger mode	●	-	-
2. Trigger type	●	-	-
3. Channel	-	-	-
4. Reference voltage	●	●	●
5. Trigger Slope	●	●	●
6. Pre-trigger	●	●	-

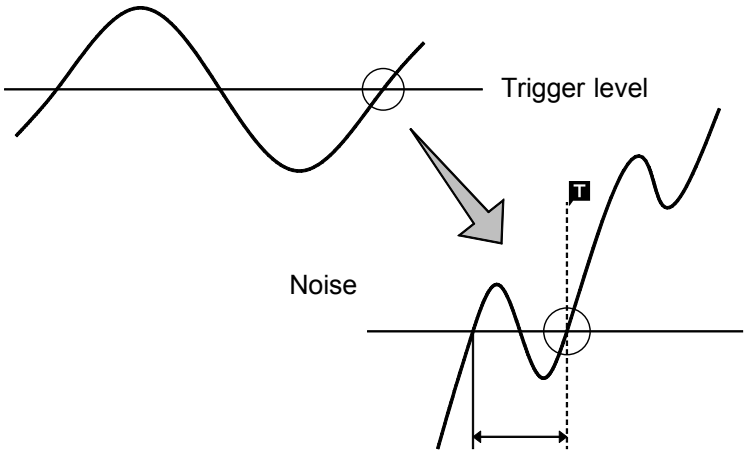
Restriction:

The upper limit and lower limit cannot be set. To set numerical value by using the **JOG/SHUTTLE** controls, press **VALUE** key.

The selected window is not displayed in the pre-trigger setting.

NOTE

- An internal trigger filter is used for the period trigger to prevent the trigger from being inadvertently activated by noise. Therefore, trigger activation above the lower limit may delay the trigger point by five samples.
- Since a trigger filter is not prepared for the period trigger, triggering may mistakenly occur due to noise (see the figure below).
  To prevent such an event, use an appropriate low-pass filter.



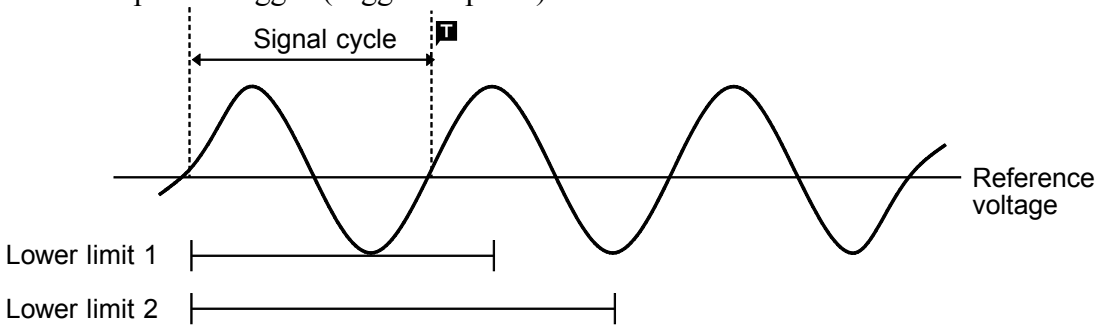
Triggering occurs, since the system judges that the period deviates from the specified range.

If the lower limit is set to "0" in period trigger settings, the lower limit is ignored, and triggering occurs when the frequency becomes greater than the upper limit that is set. Further, triggering can be set to occur when the frequency becomes greater than the upper limit that is set.

Triggering position of the period trigger

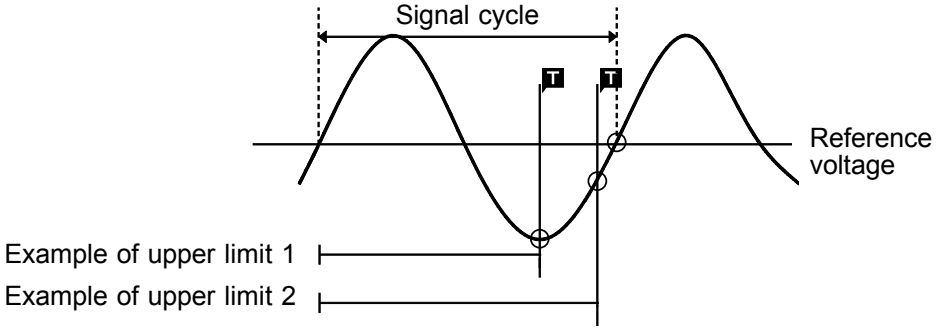
The system monitors the period of the signal that crosses the set reference voltage. When the monitored period deviates from the set range, triggering occurs. The trigger position is determined by the set period range and the measurement signal period.

Signal with a period to be measured that is smaller than the lower limit of the period trigger (trigger slope: ⊥):



When the signal crosses the reference voltage at the set trigger slope before the lower limit of the set period range appears on the screen, the intersection is always defined as the triggering position.

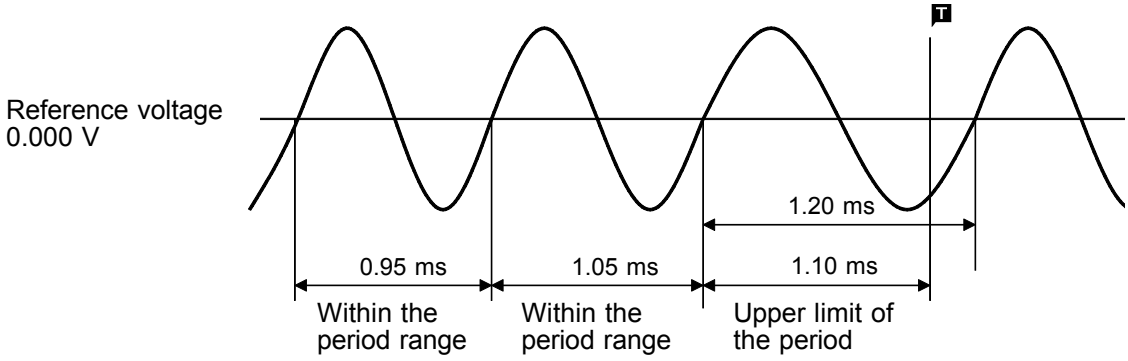
Signal with a period to be measured that is larger than the upper limit of the period trigger (trigger slope: ⊥):



When the upper limit of the set period range appears on the screen before the signal crosses the reference voltage at the set trigger slope, the upper limit is defined as the triggering position. The triggering position is determined by the position of the upper limit in the period range, as shown in the figure above.

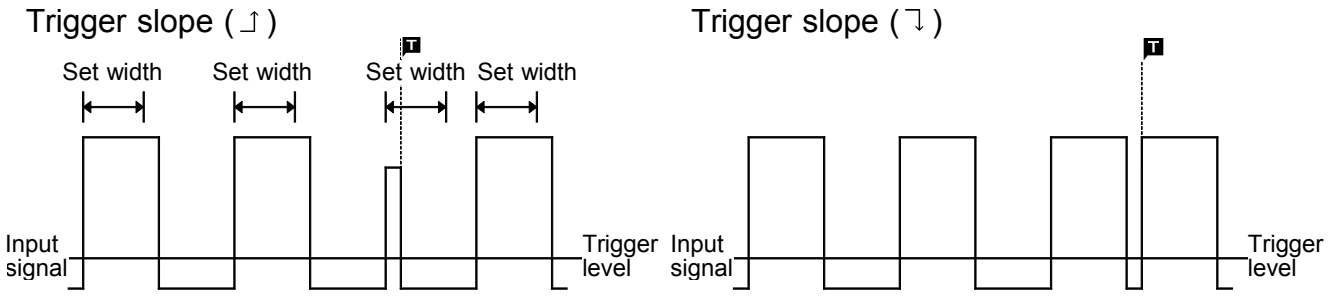
Example for Period Trigger

In order to cause triggering when the signal as shown in the figure below leaves the period range of 0.9 to 1.1 ms, the following settings are made: Lower limit of the period: 900 µs, Upper limit of the period: 1.1 ms, Reference voltage : 0.000 V

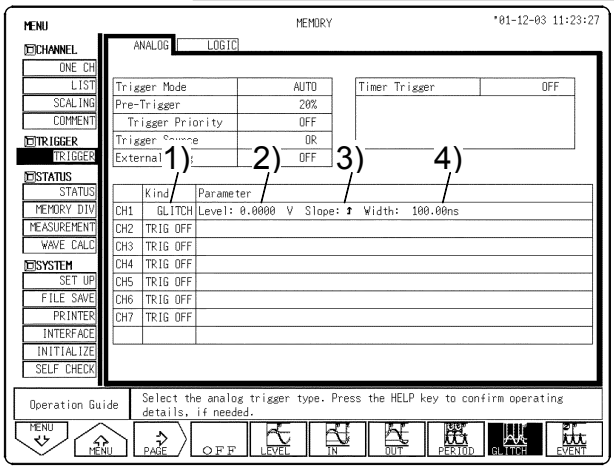


7.8.4 Glitch Trigger Settings

The trigger is set off when a pulse width shorter than the set width exists after the input signal crosses the triggering level (voltage value). You can select a rising or falling pulse width for the trigger slope (⊥, ⊤) setting.



Procedure Screen: TRIGGER, Waveform display



(1) Select the glitch trigger

1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to position 1) shown in the figure.
3. Use the function keys to select **GLITCH**.

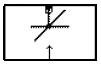
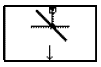
(2) Set the trigger level

1. Move the flashing cursor to position 2) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

(3) Select the trigger direction (slope).

1. Move the flashing cursor to position 3) shown in the figure.
2. Use the function keys to select the trigger direction (slope).

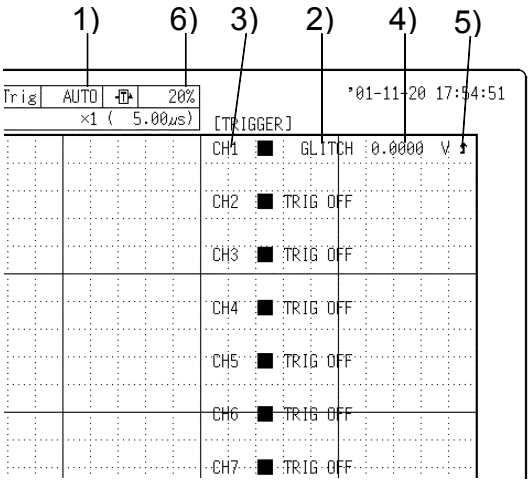
Function display	Meaning
	: Measures the glitch width from a rising waveform (⌋).
	: Measures the glitch width from a falling waveform (⌉).

(4) Select the glitch width.

1. Move the flashing cursor to position 4) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

Settings on the Waveform display screen

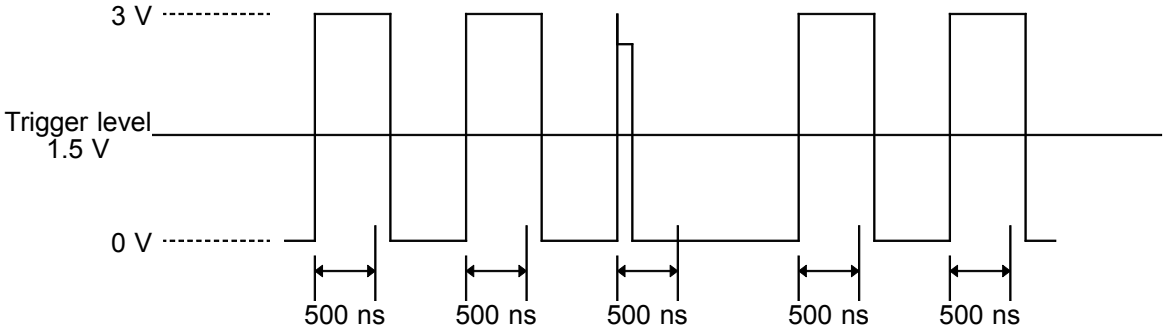


Setting items	Operation		
	Function	Jog/Shuttle	Shuttle
1) Trigger mode	●	-	-
2) Trigger type	●	-	-
3) Channel	-	-	-
4) Trigger level	●	●	●
5) Trigger slope	●	●	●
6) Pre-trigger	●	●	-

Restriction:
The trigger filter cannot be set.
To set numerical value by using the **JOG/SHUTTLE** controls, press **VALUE** key.
The selected window is not displayed in the pre-trigger setting.

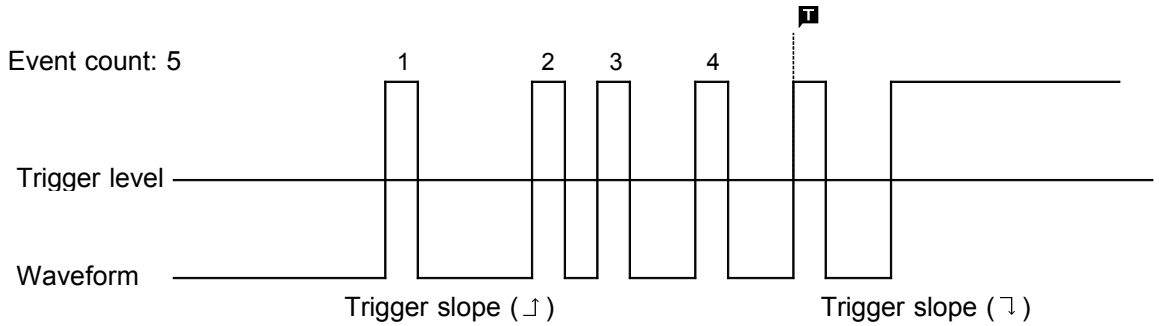
Example for Glitch Trigger

For signals like that shown in the figure, make the following settings to initiate a trigger when the pulse width (the glitch width) is within 500 ns.
Trigger level: 1.5 V, Trigger slope: ⊥, Glitch width : 500 ns

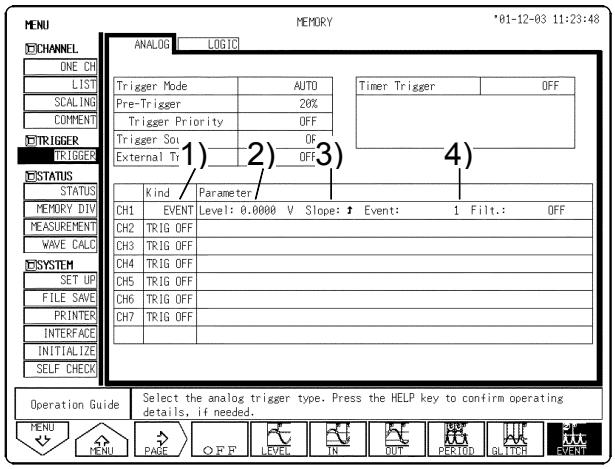


7.8.5 Event Trigger

Monitors the number of times the input signal crosses the triggering level (voltage value) and the trigger is set off when the set number of times (event count) is reached. It is possible to set a rising or falling trigger slope (⤴, ⤵) setting.



Procedure Screen: TRIGGER, Waveform display



(1) Select the event trigger

1. Display the Trigger or Waveform display screen.
2. Move the flashing cursor to position 1) shown in the figure.
3. Use the function keys to select **EVENT**.

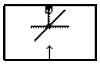
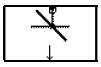
(2) Set the trigger level

1. Move the flashing cursor to position 2) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

(3) Select the trigger direction (slope).

1. Move the flashing cursor to position 3) shown in the figure.
2. Use the function keys to select the trigger direction (slope).

Function display	Meaning
	: Sets a rising waveform.
	: Sets a falling waveform.

(4) Select the event count.

1. Move the flashing cursor to position 4) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

Function display	Meaning
	: Increases in number, large step
	: Increases in number, small step
	: Decreases in number, small step
	: Decreases in number, large step

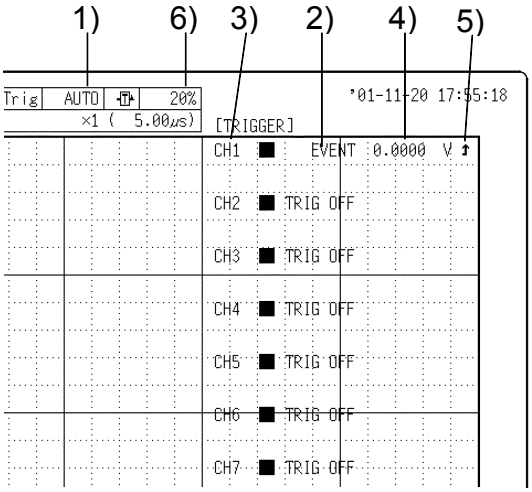
(5) Setting the trigger filter.

1. Move the flashing cursor to position 5) shown in the figure.
2. Use the function keys or **JOG** to set the event count.

In the Memory Function

OFF Trigger filter is disabled
0.1 to 10 Trigger filter is enabled. divisions. Filter width is specified using divisions

Settings on the Waveform display screen

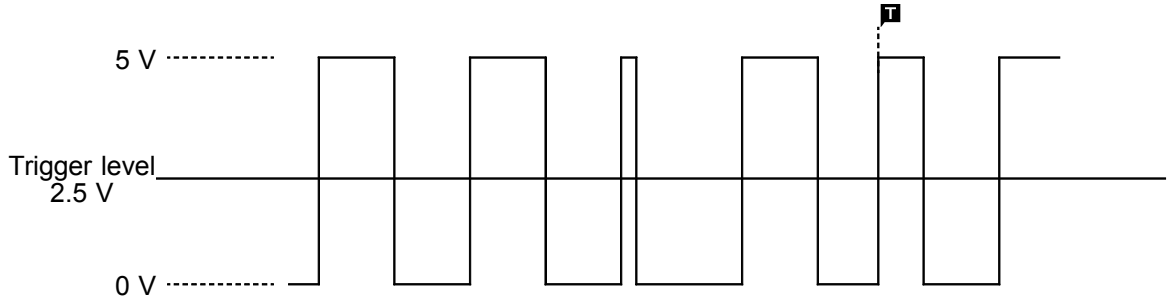


Setting items	Operation		
	Function	Jog/Shuttle	Shuttle
1) Trigger mode	●	-	-
2) Trigger type	●	-	-
3) Channel	-	-	-
4) Trigger level	●	●	●
5) Trigger slope	●	●	●
6) Pre-trigger	●	●	-

Restriction:
The trigger filter cannot be set.
To set numerical value by using the **JOG/SHUTTLE** controls, press **VALUE** key.
The selected window is not displayed in the pre-trigger setting.

Example for Event Trigger

For signals like that shown in the figure, make the following setting to initiate a trigger at the 5th pulse.
Trigger level: 2.5 V, Trigger slope: ⊥↑, Event count: 5



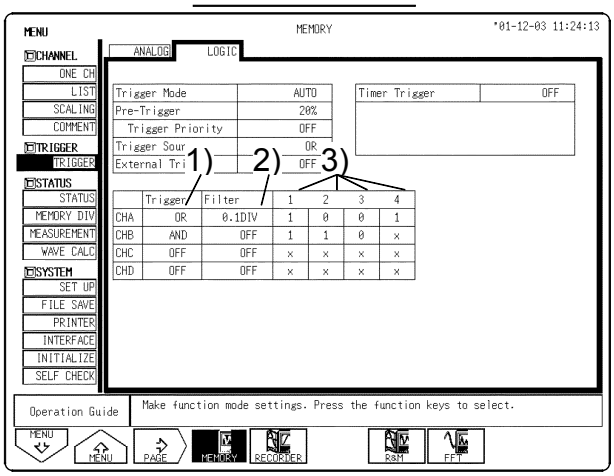
NOTE

- When using the event trigger, it is possible that it may miscount because of noise near the set triggering level. Set the trigger filter to prevent this from occurring.
- For the event trigger, internal error is prevented, which delays the trigger by one sample.

7.9 Logic Trigger

- The signal of a logic channel can be used as trigger source.
- A trigger pattern and logical operator (AND/OR) are specified, and triggering occurs when the trigger conditions are met.
- A trigger filter can be specified, so that triggering occurs only when the trigger conditions are met within the filter width.

Procedure Screen: TRIGGER



(1) Set the logic trigger AND/OR linking

1. Press the **TRIG** key, and then press the **F3** (**PAGE**) key to switch pages and display the screen shown on the left.
2. Move the flashing cursor to position 1) shown in the figure.
3. Use the function keys to select the setting.

Function display	Meaning
OFF	: Logic trigger is not used.
OR	: Triggering occurs if any one of the logic input signals conforms to the trigger pattern.
AND	: Triggering only occurs if all of the logic input signals conforms to the trigger pattern.

(2) Set the trigger filter

1. Move the flashing cursor to position 2) shown in the figure.
2. Use the **JOG/SHUTTLE** control or the function keys to make the selection.

In the Memory Function

OFF Trigger filter is disabled

0.1 to **10.0** Trigger filter is enabled. Filter width is specified using divisions

In the Recorder function

Function display	Meaning
ON	: Trigger filter is disabled.
ON	: Trigger filter is enabled. Filter width is 10 ms.

(3) Set the trigger pattern

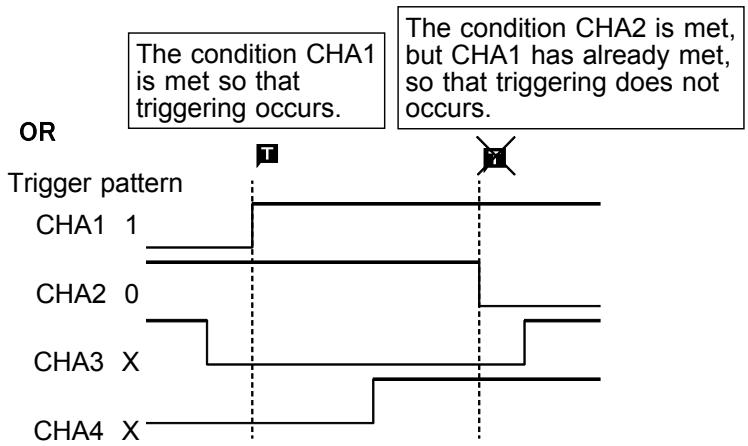
1. Move the flashing cursor to position 3).
2. Select 1 - 4 with the function key display. Make the setting with the function keys.

Function display	Meaning
X	: Signal disregarded
0	: Low level signal
1	: High level signal

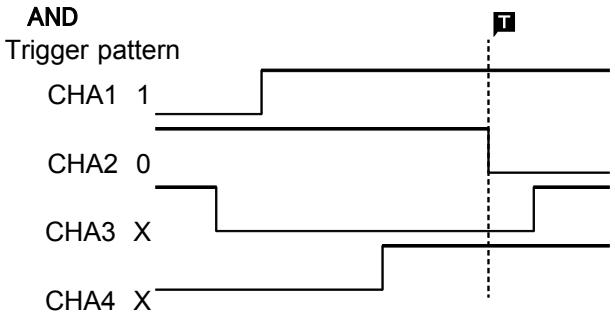
NOTE If the conditions are met already when measurement is started (AND: all trigger patterns are met, OR: one trigger pattern is met), triggering does not occur. Triggering only occurs if the conditions are removed and then met again.

Setting example of the Logic Trigger

(1) If the trigger pattern has been set to "10xx" with the operator OR, then triggering occurs as shown in the figure below.



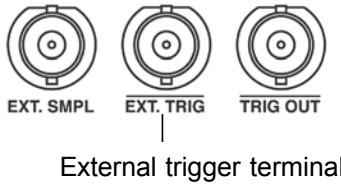
(2) If the trigger pattern has been set to "10xx" with the operator AND, then triggering occurs as shown in the figure below.

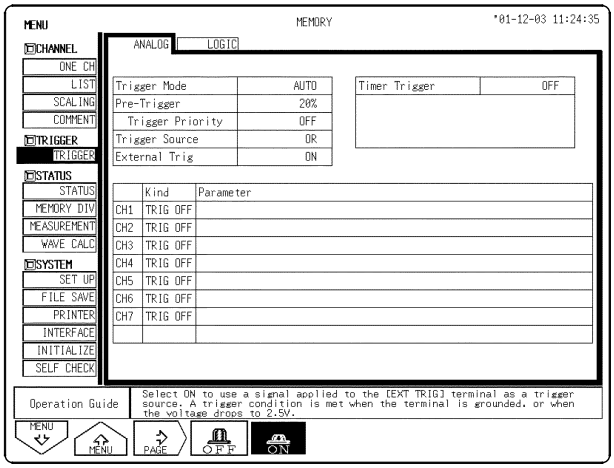


NOTE • If the conditions are met already when measurement is started (AND: all trigger patterns are met, OR: one trigger pattern is met), triggering does not occur. Triggering only occurs if the conditions are removed and then met again. Refer to the figure (1).

7.10 External Trigger Function

- An external signal can be used as trigger source.
- The external trigger is activated by either shorting the EXT TRIG terminal and GND terminal or applying a falling edge signal going below HIGH level (2.5 V to 5.0 V) to LOW level (0 V to 1.0 V).
- The external trigger facility can be used to synchronize a number of the 8855 instruments for parallel operation.
- For details for connection, refer to 11.1.2.





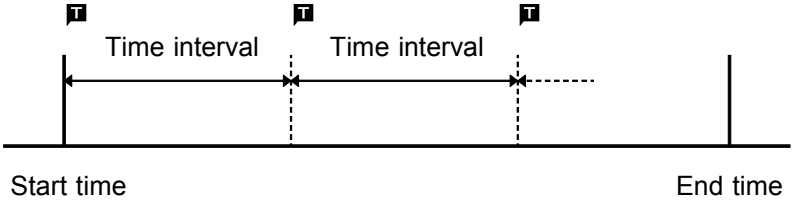
Procedure Screen: TRIGGER

1. Use the **TRIG** key to display the screen shown in the figure.
2. Move the flashing cursor to **External Trig**.
3. Use the function keys to make the selection.

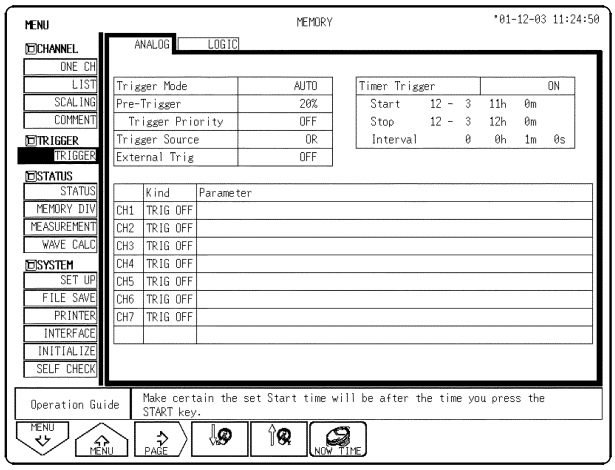
Function display	Meaning
OFF	: External trigger is not used
ON	: External trigger is used.

7.11 Timer Trigger Function

- This function serves to activate recording at preset times.
- Triggering can be performed at constant intervals within a preset start time and end time.



Procedure Screen: TRIGGER



(1) Set the timer trigger.

1. Use the **TRIG** key to display the screen shown in the figure.
2. Move the flashing cursor to **Timer Trigger**.
3. Use the function keys to select the setting.

Function display	Meaning
OFF	: Timer trigger is disabled.
ON	: Timer trigger is enabled.

(2) Set the start and end time.

1. Move the flashing cursor to the **Start** item.
2. Use the function keys or the **JOG** control to make the setting.

Function display	Meaning
	: Increases in number
	: Decreases in number
NOW TIME	: The current time is set to the start or stop time.

3. Move the flashing cursor to the **Stop** item.
4. Use the function keys or the **JOG** control to make the setting.

(3) Set the interval.

1. Move the flashing cursor to the **Interval** item.
2. Use the function keys or the **JOG** control to make the setting.

Note on use for the timer trigger

(1) Set the present time on the System screen first, then set the timer trigger.

(2) Set the start time and end time to a point after the pressing of the **START** key.

(3) When the trigger mode is set to **SINGLE**, only one trigger event is valid for the start time. The settings for time interval and end time are invalid (when timer trigger only is ON).

(4) To perform recording at regular intervals, establish the following settings.
Trigger mode: repeat. Other trigger sources: all OFF
However, triggering is disabled during the processing interval from the end of recording to the next trigger wait state (for auto saving, auto printing, waveform display processing or calculation), so depending measurement settings, recording may be disabled during this interval.

(5) When trigger sources have been linked with OR
All trigger sources are valid. Therefore triggering may occur even before the start time, and trigger standby and measurement may continue even after the stop time.

(6) When trigger sources have been linked with AND

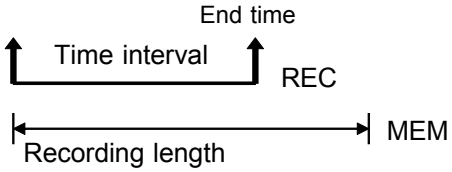
- Trigger standby is enabled at the measurement start time and at each interval, and triggering will occur when all trigger conditions other than timer trigger are met simultaneously.
- Setting the interval to 0 can be made active for the preset time interval only.
- When the recording length (recording time) is longer than the time interval:

(1) Timer trigger, which is determined from the time interval during recording, is disabled.

(2) End time

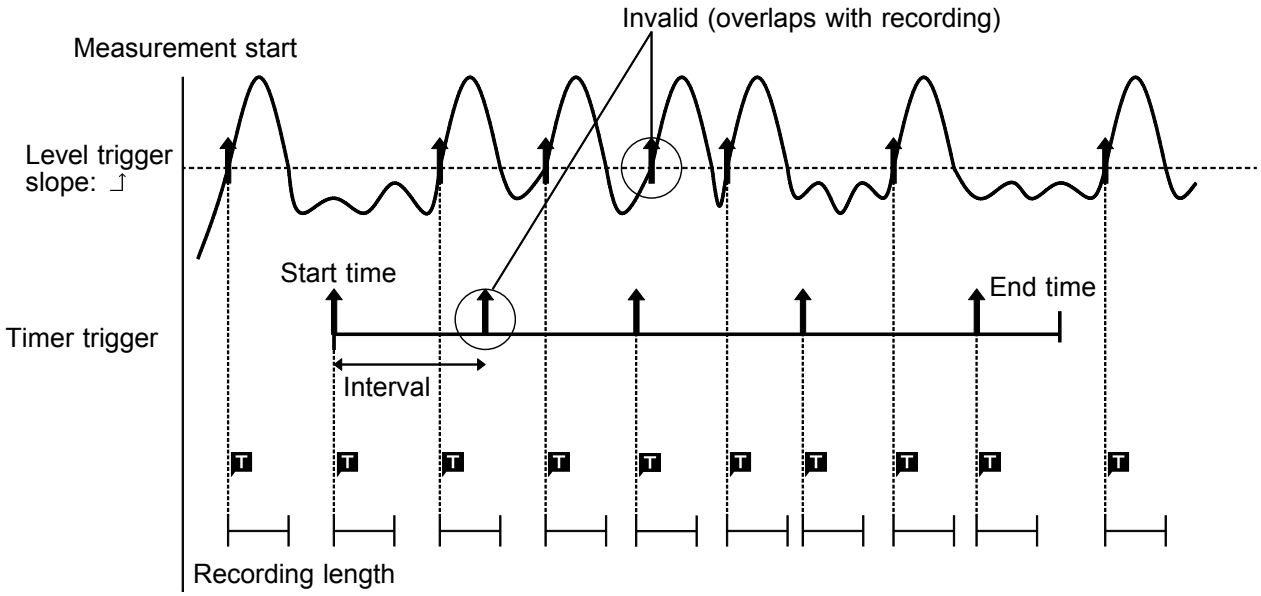
MEM: Retrieve measured data equivalent to the recording length and discontinue measurement.

REC: Stop retrieving measured data at the set stop time.



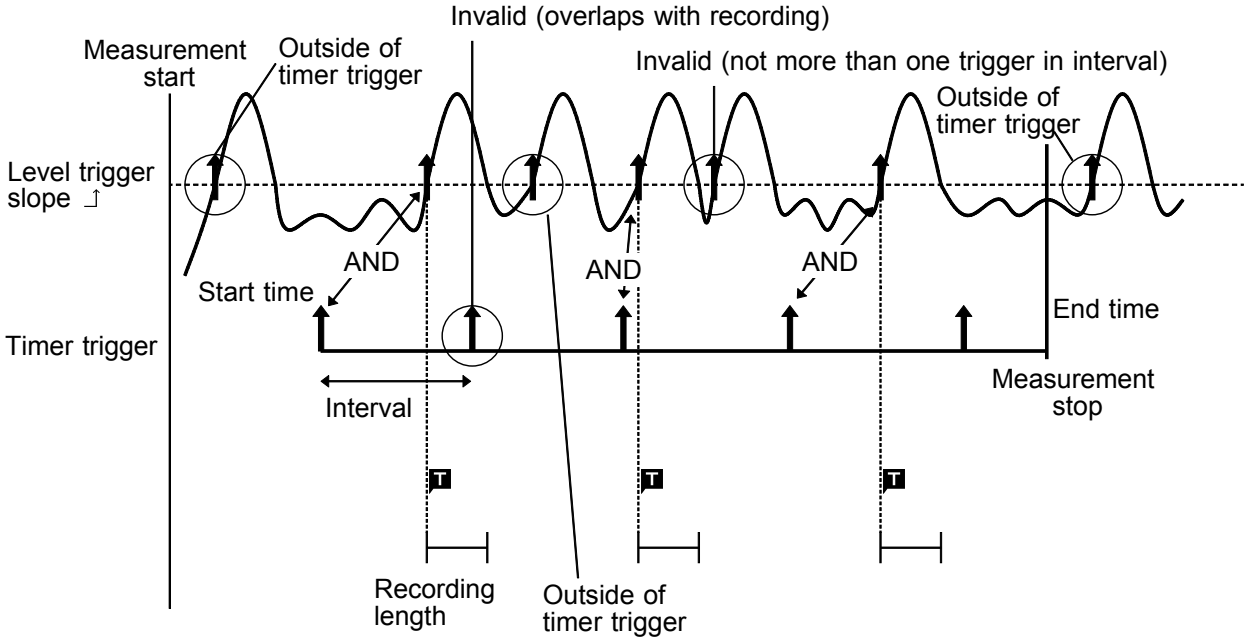
Relation between timer trigger and AND/OR linking

When trigger sources are set to OR:
All trigger sources are valid. If other trigger sources have been set, triggering can also occur before the start time or after the end time.



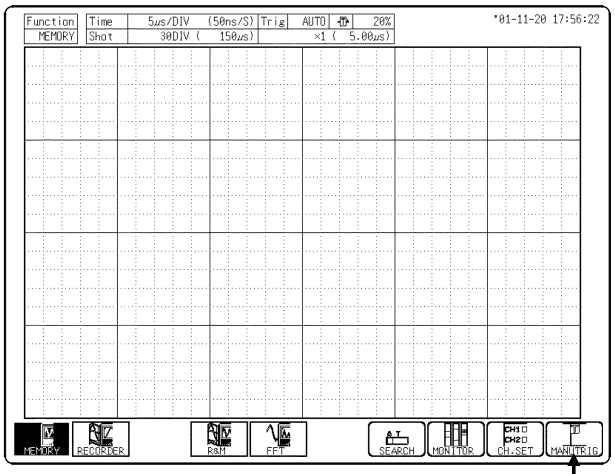
When trigger sources are set to AND:

- Measurement is carried out from the start time to the end time. Triggering occurs at the preset intervals if the conditions for the other trigger sources are also met at these points.
- If the interval has been set to 0 s, triggering occurs at any point between the start and end time, if the conditions for the other trigger sources are met.



7.12 Manual Trigger

- Triggering occurs when the Manual trigger key is pressed.
- The manual trigger is always activated when the Manual trigger key is pressed, regardless of trigger source AND/OR linking setting.

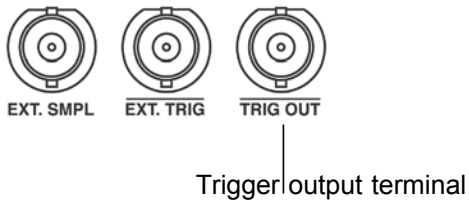


Procedure Screen: Waveform display

1. Press the **DISP** key to display the Waveform display screen.
2. When the trigger is on standby, press the **F10** (**MANU TRIG**) key to set off the trigger.

7.13 Trigger Output Terminal

- When triggering occurs, a signal is output from the TRIG OUT terminal.
- This can be used to synchronize several 8855 instruments.
- For details, see Section 11.1.3.



Trigger output period

Use the following equation to determine the trigger output period.
Equation: Trigger output period= sampling cycle x data count after triggering (minimum value)
Example:
Time axis: 100 μs/DIV (sampling cycle 1 μs)
Recording length: 30 DIV (3001 data)
Pre-trigger: 50% (After triggering: 1501 data)
Trigger output period = 1 μs x 1501 data = 1.5 ms or above

NOTE

Pressing the **AUTO** key to use the auto ranging function causes a trigger signal to be output. Care is therefore required when using the auto ranging function when the trigger output terminal is in use. (Only a memory function)

Chapter 8
Waveform Display Screen Operation

Indicates the Waveform display screen operation.

Setting the Input channel

To set a numerical value using the Jog/Shuttle control on the Waveform display screen, press the **VALUE** select key. (The selection window is not displayed.)
Pressing the **F9** (**CH.SET**) key, enables the measurement conditions for each channel on the Waveform display screen to be set or changed.
See Instruction Manual Section 5.6.

Scrolling the Waveform

To scroll the waveform on the Waveform display screen, press the **WAVE** select key.
Use the Jog/Shuttle control to scroll the waveform.

Using the A/B Cursors

- Line cursor (vertical)
- Line cursor (horizontal)
- Trace cursor
- Gauge cursor

When want to use the A/B Cursors, press the **A.B CSR** select key.

Magnification/compression ratio along the time axis

MEM: magnification and compression
REC: compression only

Zoom function

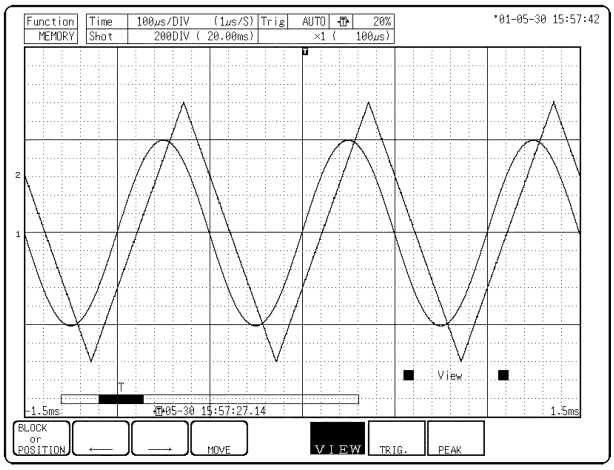
This function divides the memory function Waveform display screen into upper and lower windows, so that the regular-size waveform is displayed in the upper window and the waveform enlarged in the time axis direction is displayed in the lower window.

Input level monitor function

Press the **F8** (**MONITOR**) key key on the Waveform display screen, waveform input level can be monitored.

8.1 Scrolling the Waveform

The waveform on the display can be scrolled horizontally.

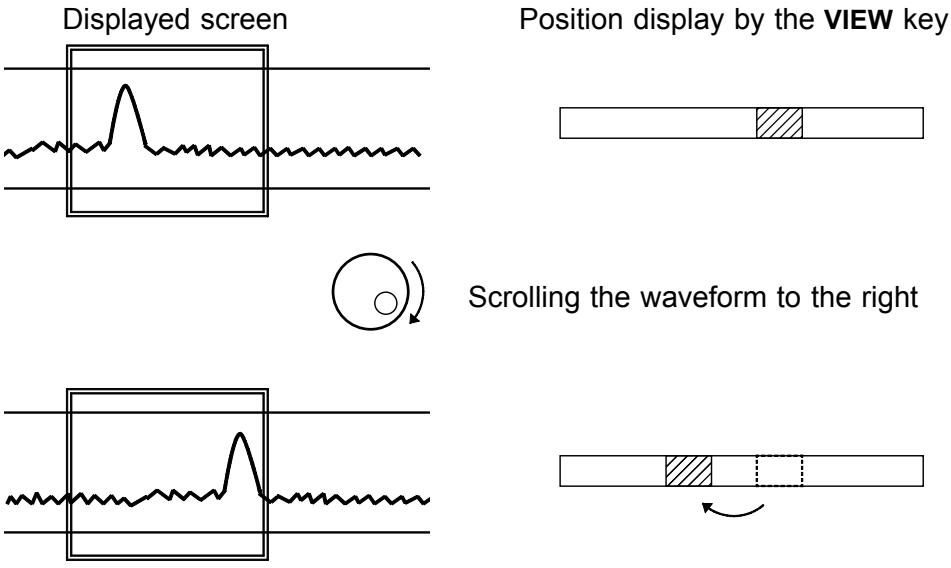


Procedure Screen: Waveform display

1. Press the **WAVE** select key.
2. Use the **JOG/SHUTTLE** control to scroll the waveform

Auto-scroll

If turning the the Shuttle control fully and holding the control for about five seconds, the indication "auto scroll" appears on the function key display and the waveform continues to scroll even if releasing the control.
Auto-scroll is canceled by pressing any key.
When the waveform is scrolled, the screen status and waveform position are as illustrated below.



8.2 Using the A/B Cursors

The A/B cursors can be used to read a time difference, frequency, or potential difference on screen. (When scaling is used, the difference is displayed in the scaling value. See Instruction Manual Section 5.3.)

Line Cursor (vertical, horizontal)

The value at cursor A and cursor B, and the value between the two cursors can be determined.

Trace Cursor

• Memory Function

The value at the point where the cursor crosses the waveform can be determined. The trace point moves on the waveform of the specified channel.

• Recorder Function

The intersection between the cursor and the waveform is displayed midway between of the maximum and minimum values.

Cursor / Value	A or B	B - A
Vertical	t Time from the trigger point (MEM) Time from recording start (REC) 1/t Frequency taking t as the period	t Time interval between the A and B cursors 1/t Frequency taking t as the period
Horizontal	v Voltage value for channel selected	v Potential difference between the A and B cursors.
Trace	t Time from trigger point (MEM) Time from recording start (REC) v Voltage value for channel selected (MEM) Maximum and minimum values for channel selected Middle value between maximum and minimum values for all channels selected. (REC)	t Time difference between the trace points v Potential difference between the trace points
Gauge	t Time from trigger point (MEM) Time from recording start (REC) v Voltage value for channel selected (MEM) Maximum and minimum values for channel selected (REC)	

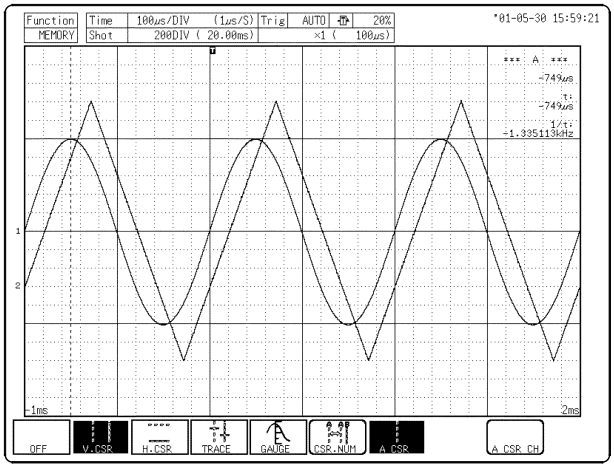
MEM: memory function, REC: recorder function

NOTE

- When external sampling is being performed, a "t" is included in the sampling number.
- While the settings are made on the Waveform display screen (displaying the input channel), the value between A and B cursors is no displayed.
- A/B cursor measurements are enabled even if the line cursor (vertical) or trace cursor are off the screen. When the cursor is set to A&B and either the A or B cursor is moved, both A and B cursors are shifted onto the screen.
- When you press the **DISP** key, the waveform display switches from 30 DIV to 20 DIV. This makes it easier to read numerical values. Press the **DISP** key again to return to the original display.
- If multiple channels are selected for display with the recorder function, the value indicated for the trace cursor is the midpoint between maximum and minimum values.

8.2.1 Using the Line Cursors (Vertical)

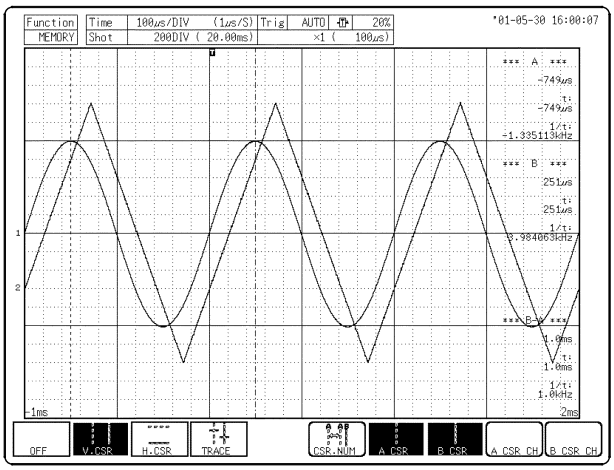
The line cursor (vertical) displays the time and period starting from the trigger position. On the recorder, the line cursor (vertical) displays the time and period starting from the initiation of recording.



Procedure Screen: Waveform display

1. Press the **A.B CSR** select key.
2. Use the function keys to select the **V.CSR**.

Function display	Meaning
OFF	: Disable A/B cursors
V.CSR	: Line cursor (vertical: t, 1/t)
H.CSR	: Line cursor (horizontal: v)
TRACE	: Trace cursor (the point where the cursor crosses the waveform)
GAUGE	: Gauge cursor (Displayed only when the cursor count is A.)
CSR.NUM	: Cursor count
A CSR	: Move the cursor A
B CSR	: Move the cursor B



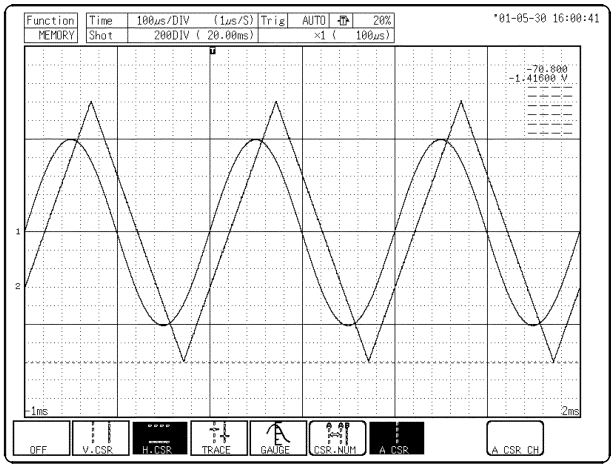
3. Use the function key display to select **CSR.NUM**. Each time you press **CSR.NUM**, the **B CSR** function keys appear or disappear.
4. Display the cursor that you want to move with the function keys, A or B. Select **A CSR**, **B CSR**, or **A-B CSR** (which moves both cursors A and B). You can also use the **A.B CSR** select key to select which cursor to move.
   In this situation, pressing the key cycles your selection as follows: A Move to B Move to AB Move to A Move.
5. Rotate the **JOG/SHUTTLE** control to move the cursor.

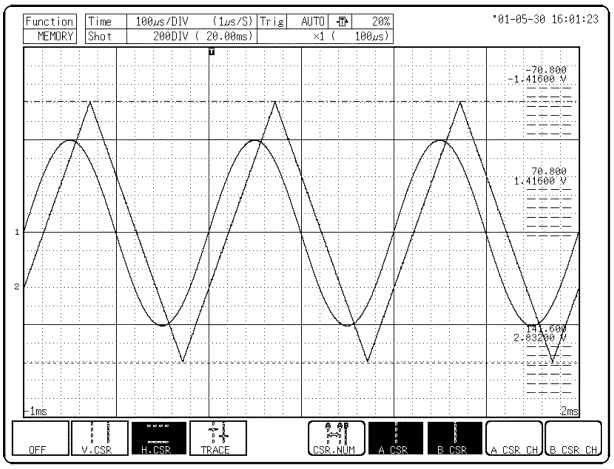
NOTE

- When the **A.B CSR** select key is used to activate the A/B cursor mode, the trace cursor can be used, also if it was set to OFF.
- A/B cursor measurements are enabled even if the line cursor (vertical) or trace cursor are off the screen. When the cursor is set to A&B and either the A or B cursor is moved, both A and B cursors are shifted onto the screen. The **F7** (**SEARCH**) key can be used to check the cursor position within the total recording length.
- When the cursor is moved to the edge of the screen, the waveform is scrolled.
- If turning the the Shuttle control fully and holding the control for about five seconds, the indication "auto scroll" appears on the function key display and the waveform continues to scroll even if releasing the control. Auto-scroll is canceled by pressing any key.
- In additional recording (REC function), the junction between data is invalid data.

8.2.2 Using the Line Cursors (Horizontal)

Used to read a voltage value of the specified channel. A/B cursor can be specified a different channel.





Procedure Screen: Waveform display

1. Press the **A.B CSR** select key.
2. Use the function keys to select the **H.CSR**.

Function display	Meaning
OFF	: Disable A/B cursors
V.CSR	: Line cursor (vertical: t, 1/t)
H.CSR	: Line cursor (horizontal: v)
TRACE	: Trace cursor (the point where the cursor crosses the waveform)
GAUGE	: Gauge cursor (Displayed only when the cursor count is A.)
CSR.NUM	: Cursor count
A CSR	: Move the cursor A
B CSR	: Move the cursor B
A CSR CH	: Specifies A cursor display channel.
B CSR CH	: Specifies B cursor display channel.

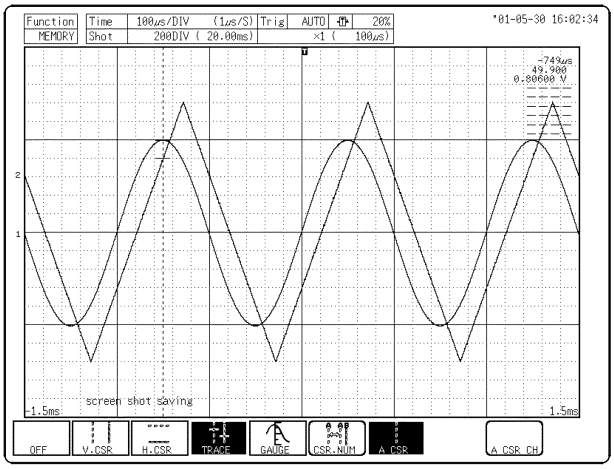
3. Use the function key display to select **CSR.NUM**. Each time you press **CSR.NUM**, the **B CSR** and **B CSR CH** function keys appear or disappear.
4. Display the cursor that you want to move with the function keys, A or B. Select **A CSR**, **B CSR**, or **A.B CSR** (which moves both cursors A and B).
   You can also use the **A.B CSR** select key to select which cursor to move. In this situation, pressing the key cycles your selection as follows: A Move to B Move to AB Move to A Move.
5. Specify the A/B cursor display channel. Specify the channel for which you want to display the read values with **A CSR CH** or **B CSR CH**.
6. Rotate the **JOG/SHUTTLE** control to move the cursor.

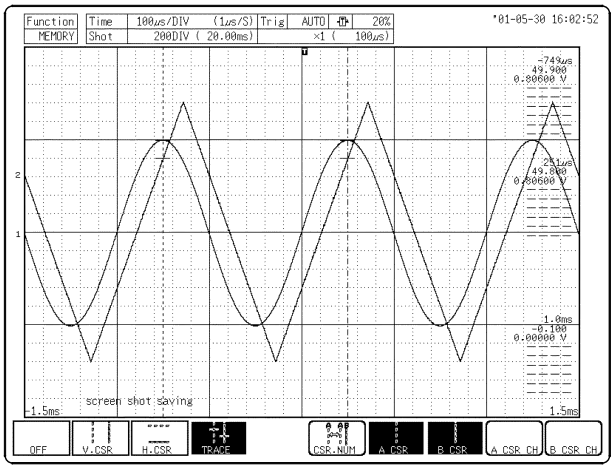
NOTE

- When the **A.B CSR** select key is used to activate the A/B cursor mode, the trace cursor (X-Y CONT: line cursor) can be used, also if it was set to OFF.
- Only channels for which a waveform is being displayed can be specified.

8.2.3 Using the Trace Cursors

Used to read the value at point where the cursor crosses the waveform of the specified channel. A/B cursor can be specified a different channel.





Procedure Screen: Waveform display

1. Press the **A.B CSR** select key.
2. Use the function keys to select the **TRACE**.

Function display	Meaning
OFF	: Disable A/B cursors
V.CSR	: Line cursor (vertical: t, 1/t)
H.CSR	: Line cursor (horizontal: v)
TRACE	: Trace cursor (the point where the cursor crosses the waveform)
GAUGE	: Gauge cursor (Displayed only when the cursor count is A.)
CSR.NUM	: Cursor count
A CSR	: Move the cursor A
B CSR	: Move the cursor B
A CSR CH	: Specifies A cursor display channel.
B CSR CH	: Specifies B cursor display channel.

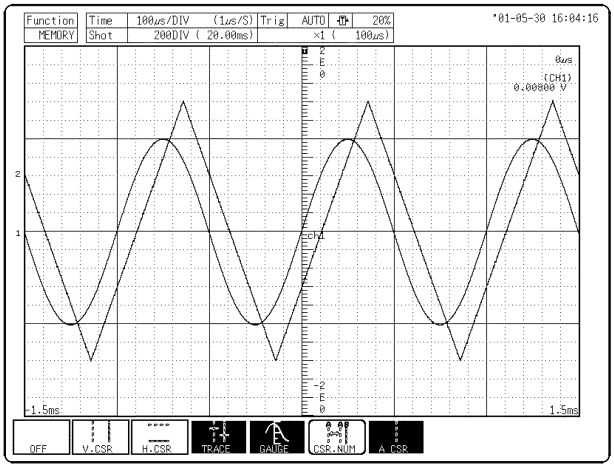
3. Use the function key display to select **CSR.NUM**. Each time you press **CSR.NUM**, the **B CSR** and **B CSR CH** function keys appear or disappear.
4. Display the cursor that you want to move with the function keys, A or B. Select **A CSR**, **B CSR**, or **A.B CSR** (which moves both cursors A and B). You can also use the **A.B CSR** select key to select which cursor to move.
   In this situation, pressing the key cycles your selection as follows: A Move to B Move to AB Move to A Move.
5. Specify the A/B cursor display channel.
   Specify the channel for which you want to display the read values with **A CSR CH** or **B CSR CH**.
6. Rotate the **JOG/SHUTTLE** control to move the A/B cursor.

NOTE

- When the **A.B CSR** select key is used to activate the A/B cursor mode, the trace cursor can be used, also if it was set to OFF.
- Trace cursor can not be used on the X-Y CONT recorder.
- A/B cursor measurements are enabled even if the line cursor (vertical) or trace cursor are off the screen. When the cursor is set to A&B and either the A or B cursor is moved, both A and B cursors are shifted onto the screen.
- The **F7** (**SEARCH**) key can be used to check the cursor position within the total recording length.
- Only channels for which a waveform is being displayed can be specified.
- By specifying a different channel for the A and B cursors, a potential difference between the waveforms in the respective channels can be determined.
- When the cursor is moved to the edge of the screen, the waveform is scrolled. (However, only when one channel is selected for each.)
- If turning the the Shuttle control fully and holding the control for about five seconds, the indication "auto scroll" appears on the function key display and the waveform continues to scroll even if releasing the control. Auto-scroll is canceled by pressing any key.

8.2.4 Operating the gauge cursor

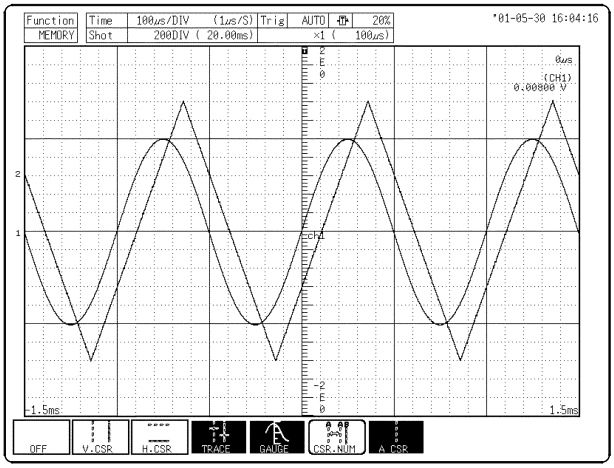
It is possible to apply and move a scale on the cursor.
It is possible to select the voltage or the time axes.
It is possible to continuously display the scale and use it as a grid scale.



Procedure Screen: Waveform display

1. Press the **A.B CSR** select key.
2. Use the function keys to select the **GAUGE**.

Function display	Meaning
OFF	: Disable A/B cursors
V.CSR	: Line cursor (vertical: t, 1/t)
H.CSR	: Line cursor (horizontal: v)
TRACE	: Trace cursor (the point where the cursor crosses the waveform)
GAUGE	: Gauge cursor (Displayed only when the cursor count is A.)
CSR.NUM	: Cursor count
A CSR	: Move the cursor A



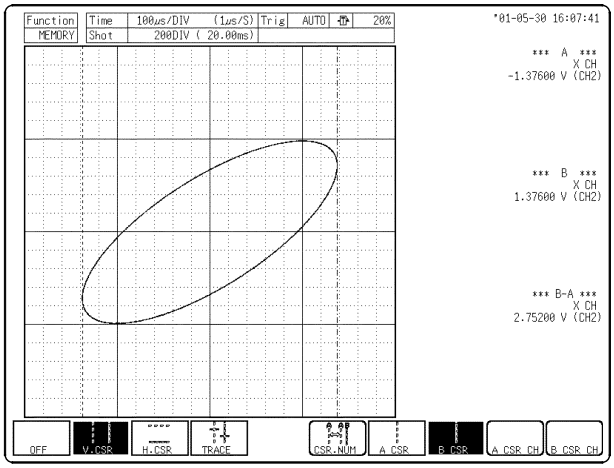
3. Select the **V CSR**, **H.CSR**, or **TRACE**. The vertical cursor is the channel gauge of the voltage axis, the horizontal cursor that of the time axis selected by the trace cursor.
4. Rotate the **JOG/SHUTTLE** control to move the A/B cursor.

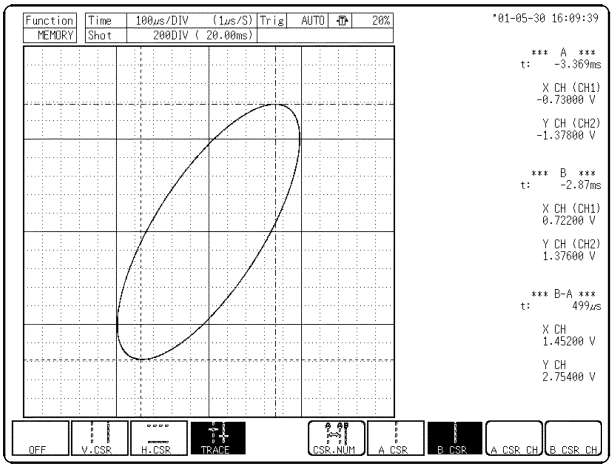
NOTE

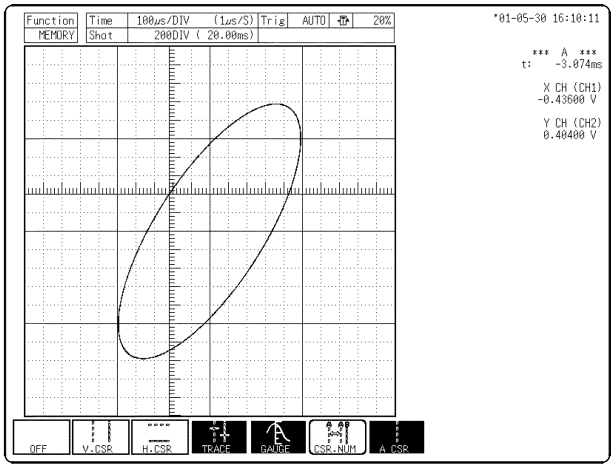
- The gauge cursor is cursor A exclusively.
- When selected with the trace cursor, the values on the gauge are those of the channels specified in sections 8.2.1 and 8.2.3.

8.2.5 Using the A/B Cursors (X-Y Screen)

The cursor can be used on the X-Y screen. Partial X-Y plotting enables operation of the A/B cursors.







Procedure Screen: Waveform display (X-Y)

1. Press the **A.B CSR** select key.
2. Use the function keys to make selection.

Function display	Meaning
OFF	: Disable A/B cursors
V.CSR	: Line cursor (vertical: t, 1/t)
H.CSR	: Line cursor (horizontal: v)
TRACE	: Trace cursor (the point where the cursor crosses the waveform)
GAUGE	: Gauge cursor (Displayed only when the cursor count is A.)
CSR.NUM	: Cursor count
A CSR	: Move the cursor A
B CSR	: Move the cursor B
A CSR CH	: Specifies A cursor display channel.
B CSR CH	: Specifies B cursor display channel.

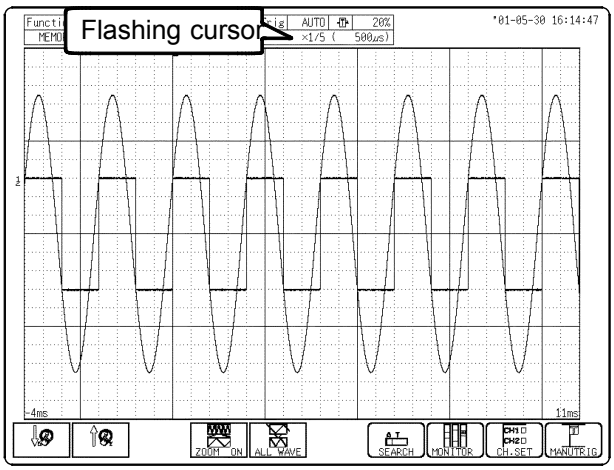
3. Use the function key display to select **CSR.NUM**. Each time you press **CSR.NUM**, the **B CSR** and **B CSR CH** function keys appear or disappear.
4. Display the cursor that you want to move with the function keys, A or B. Select **A CSR**, **B CSR**, or **A.B CSR** (which moves both cursors A and B).
   You can also use the **A.B CSR** select key to select which cursor to move.
   In this situation, pressing the key cycles your selection as follows: A Move to B Move to AB Move to A Move.
5. Specify the A/B cursor display channel. Specify the channel for which you want to display the read values with **A CSR CH** or **B CSR CH**.
6. Rotate the **JOG/SHUTTLE** control to move the A/B cursor.

NOTE

- You can use the gauge cursor in the X-Y screen. In this situation, the gauge cursor is the A cursor.
- By specifying a different graph for the A and B cursors, a potential difference between the waveforms in the respective channels can be determined.

8.3 Magnification/compression Ratio Along the Time Axis

- The magnification/compression ratio along the time axis can be set (MEM function).
- Magnification/compression of the screen uses the center as reference, regardless of the status of the A/B cursor.
- The magnification/compression factor can be changed also after measurement is completed.



Procedure Screen: Waveform display

1. Move the flashing cursor to the position shown in the figure on the left.
2. Use the function keys or the **JOG/SHUTTLE** control to select the magnification/compression ratio.

Function display	Meaning
	: Increases in number.
	: Decreases in number.

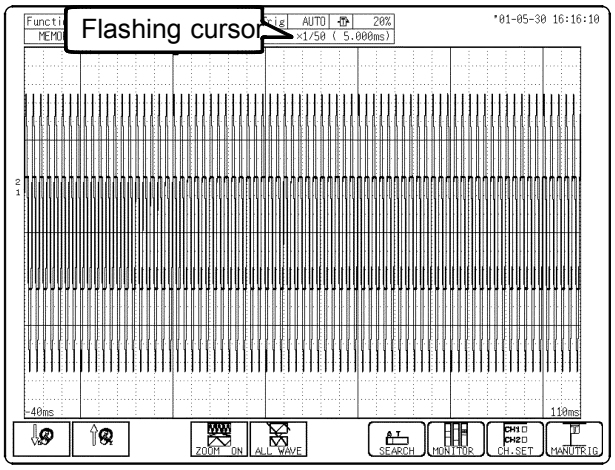
Function	Magnification/Compression ratio
MEM	x 10, x 5, x 2, x 1, x 1/2, x 1/5, x 1/10, x 1/20, x 1/50, x 1/100, x 1/200, 1/500, x 1/1000, x 1/2000, x 1/5000, x 1/10000, x 1/20000, x 1/50000, x 1/100000
REC	x 1, x 1/2, x 1/5, x 1/10, x 1/20, x 1/50, x 1/100, x 1/200, x 1/500, x 1/1000, x 1/2000, x 1/5000, x 1/10000, x 1/20000

NOTE

Set the magnification or compression ratio along the voltage axis on the Channel screen or Waveform display screen.
For details, see Section 6.3.7.

8.4 Zoom Function (MEM Function Only)

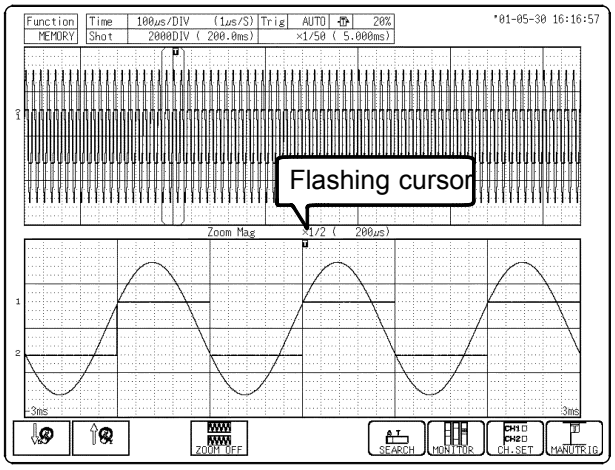
This function divides the memory function waveform display screen into upper and lower windows, so that the regular-size waveform is displayed in the upper window and the waveform enlarged in the time axis direction is displayed in the lower window.



Procedure Screen: Waveform display

1. Press the **DISP** key to display the Waveform display screen.
2. Move the flashing cursor to the position shown in the figure on the left.
3. Use the function keys to select the **ZOOM** item.
   When the zoom function is selected, the display is split into two horizontally tiled screens. The waveform before the zoom mode was activated is displayed on the upper screen. The lower screen shows the zoomed waveform.
   When the logic waveform recording width is Wide, the display positions 3 to 5 of the logic waveform are not displayed. Similarly, when the recording width is Narrow, the display positions 5 to 8 of the logic waveform are not displayed.

Function display	Meaning
ZOOM ON	: Turns the zoom function ON.



4. Move the flashing cursor to the position shown in the figure on the left.
5. Use the function keys or the **JOG/SHUTTLE** control to set the magnification ratio.
   The brackets [ ] on the upper screen indicate the waveform range displayed on the lower screen. The position of bracket can be move by using the **JOG/SHUTTLE** control with the **WAVE** select key.
   The A/B cursors are applicable to the waveform on the lower screen.

Function display	Meaning
	: Increases in number.
	: Decreases in number.

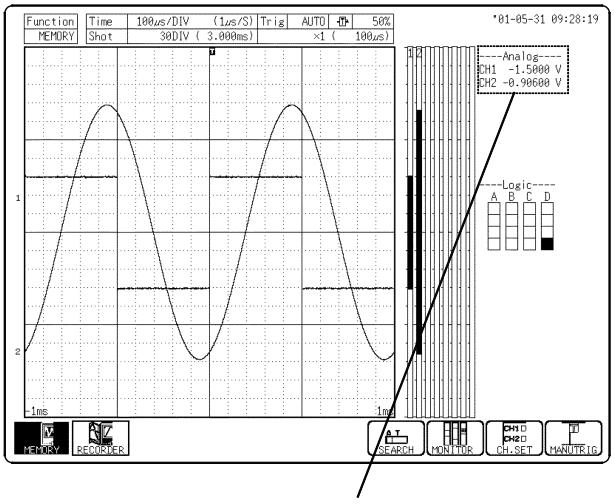
6. To exit the zoom function, press **ZOOM**.

NOTE

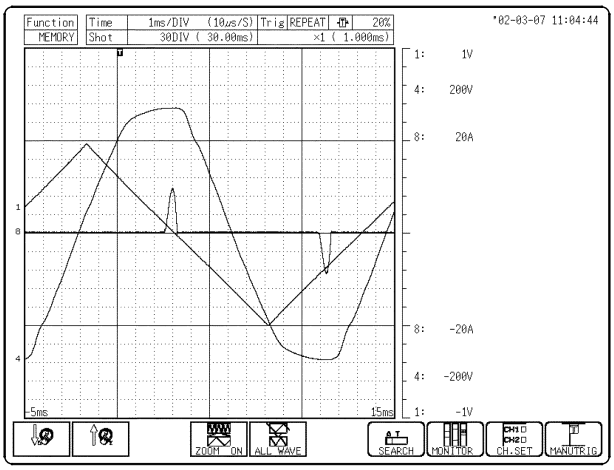
During the zoom function, pressing the **PRINT** key prints the waveform on the lower screen. (The waveform becomes that of the one screen display. If the A-B cursors are used, partial print is applied.)

8.5 Input Level Monitor Function

- The levels of all input waveforms can be monitored in real time.
- Levels are displayed separately for CH1 - CH8 and logical CHA - CHD.
- The upper and lower limits of all analog waveforms can be displayed.



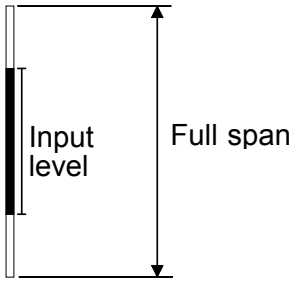
An instantaneous value for the analog channel is displayed.



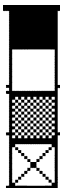
Procedure Screen: Waveform display

1. Press the **F8** (**MONITOR**) key.
2. Press the **F8** (**MONITOR**) key once more to display the upper and lower limits.
3. To exit the level monitor, press the **F8** (**MONITOR**) key once more.
   The screen displays depend on settings of display format on the Status screen in each function.
   When the X-Y screen has been set, only those channels assigned to graphs 1 to 4 are displayed.

Analog channels



Logic channels



: The input is stabilized at the HI level.
: The input varies drastically between the HI and LOW levels.
: The input is stabilized at the LOW level.
: The display is disabled.

When the input level is not displayed on the screen display range

↑ The input level exceeds the upper limit.
↓ The input level exceeds the lower limit.

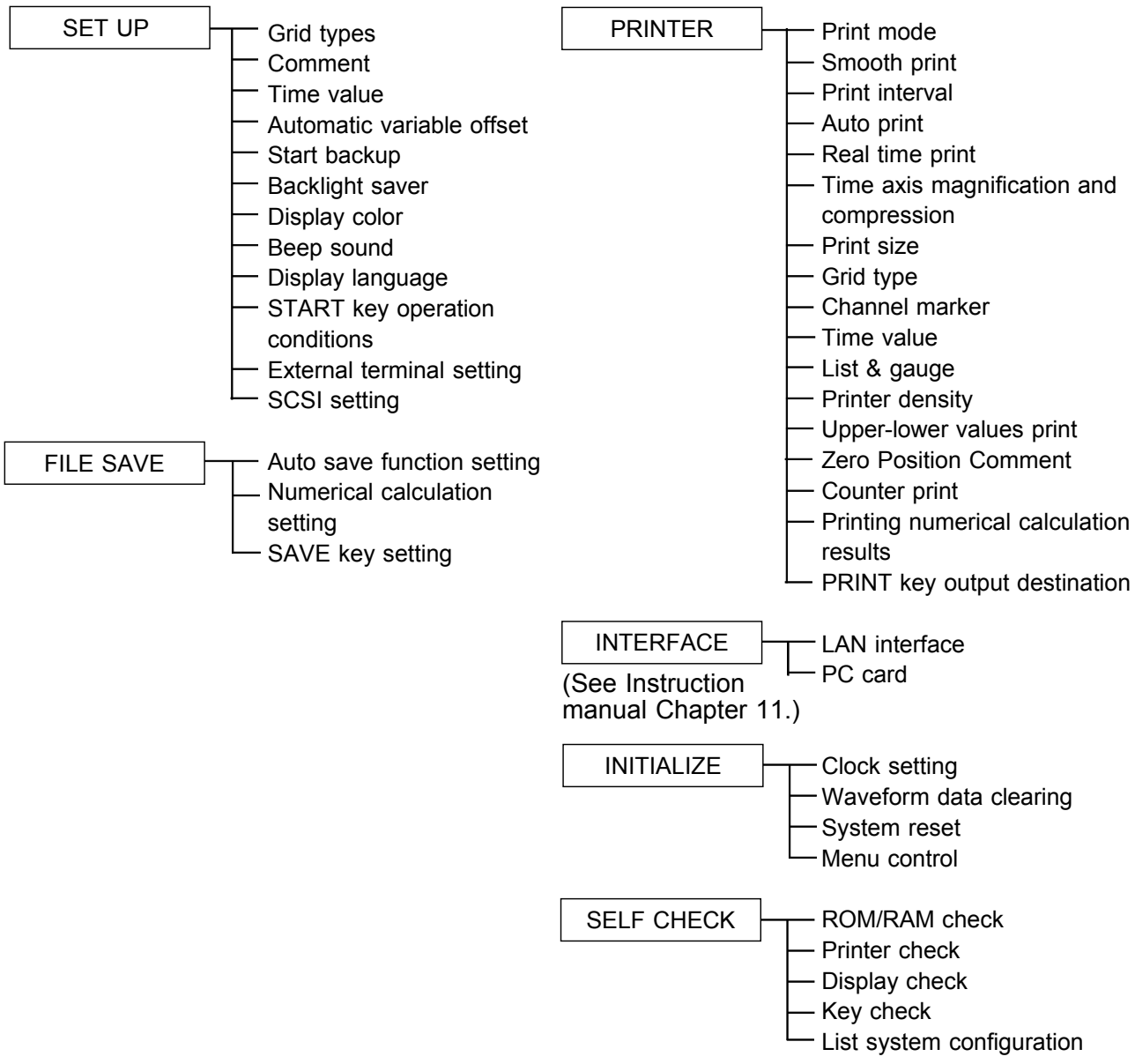
NOTE

- For the following channels, analog input level is not displayed:
  1. Channels where no input module is installed.
  2. A channel that deviates from the set active channel range (example: channel 5 or subsequent channels when the number of set active channels is four).
- The waveform display switches from 30 DIV to 20 DIV when pressing the **DISP** key. This makes it easier to read the numerical values.
- Use the **CH SELECT** key to display the upper and lower limits for the specified channel.

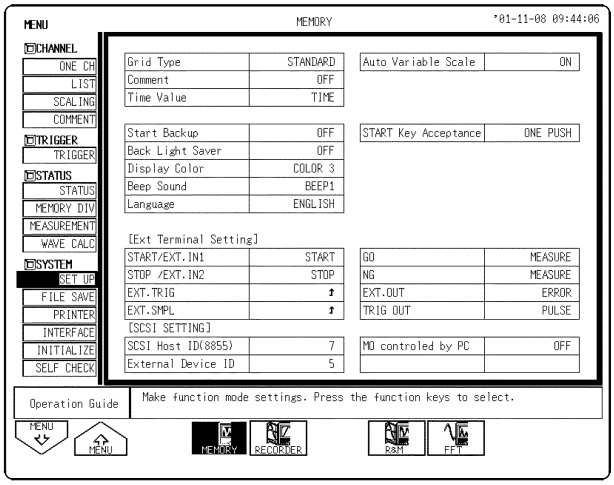
Chapter 9
SYSTEM Screen Settings

9.1 Overview

The System screen serves to set the following items which are common to all functions.



9.2 SET UP Screen (SYSTEM)



Procedure Screen: SET UP (SYSTEM)

1. Press the **SYSTEM** key to display the Set up screen.
2. Move the flashing cursor, want to set the item.
3. Use the function keys to make the selection.

"Grid Type"	See Section 9.2.1
"Comment"	See Section 9.2.2
"Time Value"	See Section 9.2.3
"Auto Variable Scale"	See Section 9.2.4
"Start Backup"	See Section 9.2.5
"Back Light Saver"	See Section 9.2.6
"Display Color"	See Section 9.2.7
"Beep Sound"	See Section 9.2.8
"Language"	See Section 9.2.9
"START Key Acceptance "	See Section 9.2.10
"Ext Terminal Setting"	See Section 9.2.11
"SCSI SETTING"	See Section 9.2.12

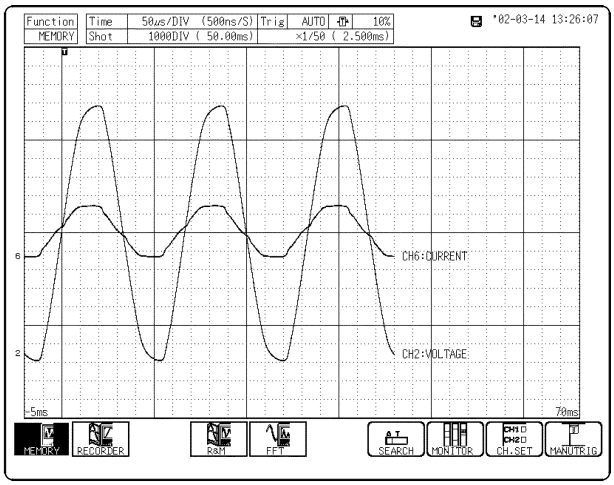
9.2.1 Grid Types

This function allows you to set the type of grid on the Waveform display screen.

Function display

9.2.2 Comment Display

This displays comments on the display.
Comments are displayed on the screen as illustrated below.
See Instruction Manual section 5.4 for detail on how to input comments.



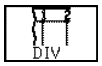
Function display — Meaning

: Comments are not displayed.

: Comments are displayed.

9.2.3 Time Value

The time from the trigger point and other information can be displayed.

Function display	Meaning
	: Displays the time from the trigger point (unit: fixed)
	: Displays the time from the trigger point (unit: base 60).
	: Displays the number of DIV/points from trigger point.
	: Displays the time when a waveform is captured.

9.2.4 Automatic Variable Scale

Linked to scaling and voltage range settings, variables and settings change automatically.

Function display	Meaning
	: Variables are not offset automatically.
	: Variables are offset automatically.

9.2.5 Start Backup

- When this function is enabled, the instrument will operate as follows: If the power supply is interrupted during recording operation (while the **START** key LED is lit), and then the power supply is restored, the 8855 goes back into the measurement operation mode, and recording is restarted immediately.
- If the trigger function is used, the instrument goes into trigger standby mode.

Function display	Meaning
	: The start key backup function is not used.
	: The start key backup function is used.

NOTE This is not effective when using a timer trigger.

9.2.6 Backlight Saver

- When this function is enabled, LCD back lighting is turned off automatically if no key is pressed for the preset interval.
- Pressing any key will turn the display on again.
- This increases the service life of the backlight.

Function display	Meaning
	: Increase time (1 to 30). The display automatically goes off after the preset interval (minutes).
	: Decrease time (1 to 30).
	: The display is shown continuously.

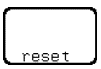
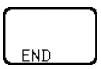
9.2.7 Display Color

- Serves to set the display color.
- The display color can be selected from among the display colors 1 to 3 and the customize screen colors which can be set as desired.

Function display	Meaning
	: Selects the display color 1.
	: Selects the display color 2.
	: Selects the display color 3.
	: Edits the screen coloring.

Customize Screen Colors

Change the R.G.B. setting values of each item on the screen. The setting values inside the window applies to the colors of the particular window. When a value is changed, the color of the area corresponding to this item changes. When system reset is executed, set colors are initialized and become the same color as that of display color 1.

Function display	Meaning
	: Increases the numerical values (hexadecimal).
	: Decreases the numerical values (hexadecimal).
	: Initializes the system.
	: Saves the settings and exits the program.

9.2.8 Beep Sound

This function indicates the operating status by a beep sound. The beep can be selected from two types. Performing a system reset sets the BEEP1 beep type.

Function display	Meaning
OFF	: Beep is not heard.
BEEP1	: The beep sounds with error messages (error or warning display) and when a waveform is evaluated as NG.
BEEP2	: The beep sounds upon start, trigger, stop and when data storage finished, as well as with error messages (error or warning display) and when a waveform is evaluated NG.

9.2.9 Display Language

Serves to set the display language.

Function display	Meaning
JAPANESE 日本語	: Displays in Japanese.
ENGLISH	: Displays in English.

9.2.10 START Key Operation Conditions

Normally, measurement starts when you press the **START** key once. However, to prevent the **START** key from being misused, you can set key operation conditions as follows.

Function display	Meaning
ONE PUSH	: Measurement starts after pressing the **START** key once.
TWO PUSH	: Measurement starts after pressing the **START** key twice.
2s PUSH	: Measurement starts after pressing the **START** key for two seconds.

NOTE When the **START** key operation condition is set to Press for 2 seconds, Continue pressing the key appears on the display. Press the **START** key for 2 seconds. When the message disappears from the display, measurement starts.

9.2.11 Setting External Terminals

START/EXT.IN1

By inputting a LOW level signal into this terminal, you can execute specific operations such as starting or stopping measurements. Resetting the system sets it to START.

Function display	Meaning
START	: Starts measuring.
STOP	: Stops measuring.
START /STOP	: Starts with a LOW level, and stop with a HIGH level.
PRINT	: Prints at the destination set as the **PRINT** key output destination.
SAVE	: Saves on the set media, according to the set conditions in the **SAVE** key settings.

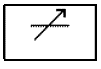
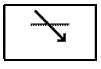
STOP/EXT.IN2

By inputting a LOW level signal into this terminal, you can execute specific operations such as starting or stopping measurements. Resetting the system will set it to STOP.

Function display	Meaning
START	: Starts measuring.
STOP	: Stops measuring.
START /STOP	: Repeatedly starts and stops measuring for each LOW level signal.
PRINT	: Prints at the destination set as the **PRINT** key output destination.
SAVE	: Saves on the set media, according to the set conditions in the **SAVE** key settings.

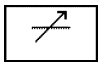
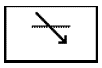
EXT.TRG

When using an external trigger, specifies whether to set off the trigger at the rising or falling edge of the input waveform.

Function display	Meaning
	: Trigger set off by a rising edge.
	: Trigger set off by a falling edge.

EXT.SMPL

Selects whether to trigger at the rising or falling edge of the input waveform when using external sampling.

Function display	Meaning
	: Samples at a rising edge.
	: Samples at a falling edge.

GO, NG

A signal is output when numerical or waveform evaluation results in GO or NG.

Function display	Meaning
MEASURE	: Output the GO or NG result of numerical evaluation.
WAVECOMP	: Output the GO or NG result of waveform evaluation.
MEASURE OR WAVECOMP	: Output the result when numerical evaluation or waveform evaluation results in GO or NG.
MEASURE AND WAVECOMP	: Output then when both numerical evaluation and waveform evaluation result in GO or NG.

EXT.OUT:

Outputs normal HIGH level signals, but it can output LOW level signals under specific conditions.

Function display	Meaning
ERROR	: Outputs LOW level signals when errors occur.
BUSY	: Outputs LOW level signals when the start command from an external source is not accepted such as when starting to save or to print.
IN START	: Outputs LOW level signals when starting.
TRIG.WAIT	: Outputs LOW level signals when waiting for a trigger to set off or when triggering.
CALIBRA -TION	: Output for probe offset (1 kHz, rectangular waveform 0 to 5 V)

9.2.12 Setting the SCSI

Set the SCSI interface. For details, refer to 10.4.

SCSI Host ID (8855 instrument)
Set the ID number of the 8855 on the SCSI bus.
The available value range is 0 to 7 (except for 4).

External Devices
Set the ID number of the MO drive, which will be connected to the 8855, on the SCSI bus. The available value range is 0 to 7.

NOTE

Do not use the same ID number for the SCSI host and external devices.

9.2.13 External Control of Internal Devices (when the 9646, 9663 is installed)

The internal MO/HD drive can be treated as a drive in the PC. Refer to "10.2 Optional Units" for details.

OFF: The MO/HD drive is not treated as a drive in the PC.
ON: The MO/HD drive is treated as a drive in the PC.

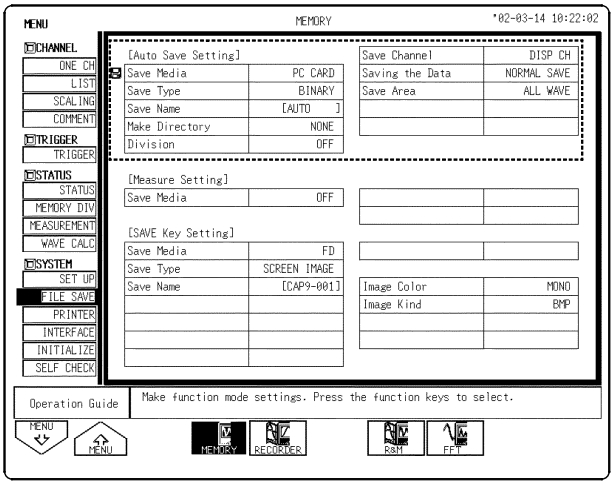
NOTE

- This can be selected only when the optional 9646 MO UNIT or 9663 HD UNIT is installed.
- When the internal MO/HD setting is enabled (ON) and the storage destination for automatic storage is set to Internal MO/HD, automatic storage setup is disabled.
- When the internal MO/HD setting is enabled (ON), the internal MO/HD media selection cannot be selected.

9.3 FILE Screen

9.3.1 Setting the Auto Save Function

Save measurement data automatically to a floppy disk, PC card, MO connected to the SCSI interface, internal MO, HDD, or LAN after capturing the recording length data. The Auto Save function stores a file in the directory currently selected on the File screen. See Section 10.13.2.



Procedure

Screen: FILE SAVE (SYSTEM)

1. Press the **SYSTEM** key to display the File save screen.
2. Move the flashing cursor to the **Auto Save Setting** item.
3. Use the function keys, select the media for auto saving.

Function display	Meaning
OFF	: Auto save is disabled.
FD	: Automatically stored on floppy disk.
PCCARD	: Automatically stored on PC card.
MO(EXT)	: Automatically stored on External MO.
MO / HDD	: Automatically stored on MO/Hard disk. (With the 9646 or 9663 installed)
LAN	: Saves the results on a device connected through a LAN. This setting requires that you have the 9333 LAN COMMUNICATOR.

4. When Media is selected, the following item appears.

Save type

Function display	Meaning
WAVE BINARY	: Data are stored as binary data.
WAVE TEXT	: Data are stored as text data.

Data stored in the text format is not readable by the 8855.

Save Name

Specify the name of the file to save here. See Section Instruction Manual 5.4.3 for details on how to input comments.
When using the Auto Save function, numbers are appended to the name set in this field. When the name of the file to save is not set before saving, AUTO is automatically assigned as the file name.

Make Directory

Automatically creates a directory after starting and saves files there.
When [Make directory] is set to [EXIST]: Once 5000 files are stored in the directory, create a new directory and save files there.

Function display	Meaning
NONE	: No directory is created.
EXIST	: A directory is created.

File segmentation

Files can be segmented when Binary is selected as the Data Type.
When a file is divided into several files and saved, the divided files will be loaded as independent waveforms. Loading the IDX file saved with those files will load all files together at once.

Save Channel

Function display	Meaning
DISP CH	: Saves only the data of the channel whose waveform display is ON.
ALL CH	: Saves data from all channels.

Saving the Data

Function display	Meaning
NORMAL SAVE	: When [Make directory] is set to [NONE], auto-save is cancelled when the storage media is full, or when the directory's file count exceeds 5000. When [Make directory] is set to [EXIST], a new directory is created each time the current directory's file count exceeds 5000, until the storage media fills up, causing auto-save to cancel.
DELETE SAVE	: When the media becomes full, old files are deleted to make room for automatic storage. When Save Format is set to binary, all files with extension "MEM", "REC", "POW", "FFT" are deleted. When Save Format is set to text, all files with extension "TXT" are deleted. Setting the Save Function to REC&MEM by selecting memory segmentation or REC&MEM invalidates the DELTE SAVE setting.

Save Area

Function display	Meaning
	: Saves all data measurements.
	: When A-B cursors are displayed, saves the data in the area between them.

Save Thin

Waveform data can be saved with thinning when Text is selected as the Data Type.
When the thinning setting is OFF, all waveform data is saved.
You can select from nine different thinning rates between 1/2 and 1/1000 in the thinning setting.

Save Function

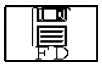
You can select the waveform data to be saved when it is measured using the recorder and memory function.
Only waveform data that has been recorded is saved when recorder is selected.
Only waveform data that has been written to the memory is saved when memory is selected.
Waveforms that are recorded or written to the memory are saved when REC&MEM is selected.

NOTE

- File names consist of 8 characters. With auto-save, since numbers are attached to the end of file names, long file names are truncated when this number is appended to the end of the file name.
- See Section 10.7 "Saving the Data (SAVE)." for file names assigned with automatic file saving.
- When both auto-print and auto-save are enabled, auto-save usually takes precedence. However, if roll mode is enabled, auto-print will execute first.
- For details on connected SCSI device, refer to Section 10.4.
- During automatic storage, if the **STOP** key is pressed twice to interrupt measurement, waveforms taken prior to the interruption are stored automatically.
- The directory and the number of files that can be stored in the directory are limited. For details, see Section 10.7.
- Only binary files can be segmented. When Floppy is selected as the Media Type, files cannot be segmented.
- Do not use the characters and symbols below in a file name. A file containing any of these characters/symbols in its file name cannot be processed under Windows 2000 or XP.
  Full-size lowercase letters: a to z
  Full-size characters: π, μ, ε
  Half-size symbols: +, =, [,]

9.3.2 Numerical Calculation Settings

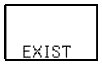
Allows you to specify to which media to save the results of the numerical calculation.
The results of the calculation are saved as text files.

Function display	Meaning
	: Calculation results are not saved.
	: Saves the results on a floppy disk.
	: Saves the results on a PC card.
	: Saves a calculation result on an external MO.
	: Saves the results on the internal MO/HD drive. (when the 9646/9663 is installed)
	: Saves the results on a device connected through a LAN. This setting requires that you have the 9333 LAN COMMUNICATOR.

Set the numerical calculation settings from Status - Measurement screen.

Specifying files to save

Allows you to select whether to create a new file to save the calculation results every time you start or to add the results to an existing file.

Function display	Meaning
	: Every time a measurement session is started, creates a new file.
	: Creates one file where to save calculation results.

Save Name

Specify the name of the file to save here. See Instruction Manual section 5.4.3 for details about how to type in text.

9.3.3 SAVE Key Settings

When you press the **SAVE** key, you need to select the data to be saved and the media where it is saved.
Saves the data in the file and directory currently set in the File screen.
See section 10.16 for further details.

NOTE

Bitmap compression is performed according to standards, but some personal computers programs do not support the compressed BMP format. If you are using software that does not support compressed BMP files, select Do not compress before you save screen data.

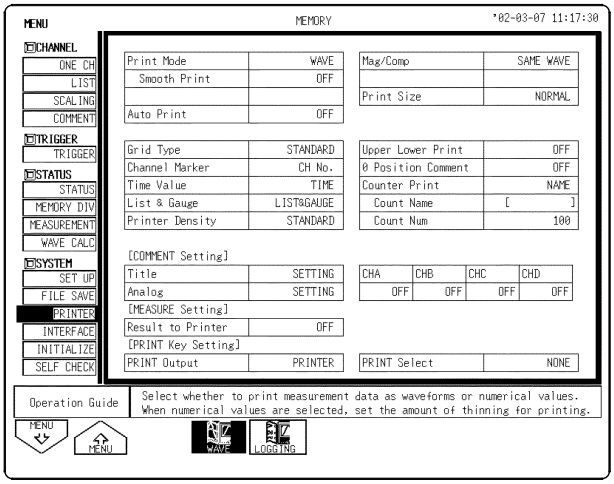
9.4 PRINTER Screen

9.4.1 Setting the Print Mode

Select the format, waveform, or numerical value should be used to output measured data and calculation results.

Waveform The smooth print function can be used, but print speed will decrease. (MEM)

Logging The data spacing interval also must be set.



Procedure

Screen: PRINTER (SYSTEM)

(1) Set the Print mode.

1. Press the **SYSTEM** key to display the Printer screen.
2. Move the flashing cursor to the **Print Mode** item.
3. Use the function keys to make a setting.

Function display	Meaning
WAVE	: Measurement data and the result of calculation are printed as a waveform.
LOGGING	: Measurement data and the result of calculation are printed as numeric data.

(2) Set the Smooth printing and print interval.

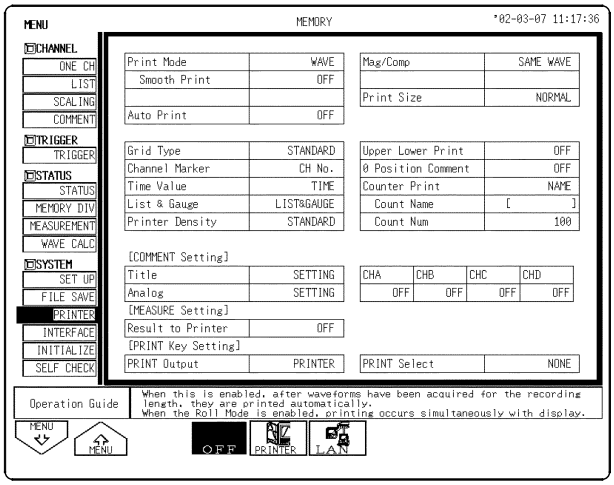
1. When "WAVE" is selected in step (1), determine whether to use the smooth printing or not. (in Memory function)
   When "LOGGING" is selected, set the print interval. (unit: DIV)
2. Move the flashing cursor to the "smooth print" or "interval" item.
3. Use the function keys to make the selection.
   Since 1 division represents 100 samples, the print interval "0.01" refers to a printout of every sample (no print interval). If the set print interval exceeds recording length, only the first point is printed.
   Both the recorder and memory print intervals can be set when using the recorder and memory function.

NOTE

- On X-Y screen, smooth printing cannot be specified.
- In recorder function, the trigger mark (T) is written as the start position mark. In an additional recording, the trigger mark is displayed in front of the most recently entered data.
- In recorder function, the maximum and minimum values are printed (see Section Instruction Manual Appendix 3.4.) The print intervals of 0.01 to 0.5 DIV can be selected, only when there are waveform data present.

9.4.2 Auto Print

Printout is carried out automatically after a waveform has been captured for the specified recording length. (in Memory function)



Procedure Screen: PRINTER (SYSTEM)

1. Press the **SYSTEM** key to display the Printer screen.
2. Move the flashing cursor to the **Auto Print** item.
3. Use the function keys to make a setting.
4. Press the **START** key to start the measurement. Printout is carried out automatically after a waveform has been captured for the specified recording length.

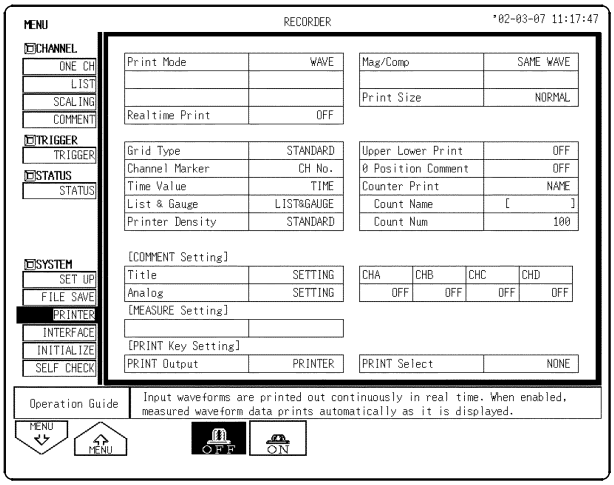
Function display	Meaning
OFF	: Does not print automatically.
PRINTER	: Prints using the internal printer.
LAN	: Automatically transfers data to a device connected through a LAN. This setting requires that you have the 9333 LAN COMMUNICATOR.

NOTE

- When cursors A and B are enabled in memory function, partial printing is executed .
- When the roll mode is enabled in memory function and the time-axis range is lower than 10 ms/division, data is displayed and printed simultaneously.
- When both auto-print and auto-save are enabled in memory function, auto-save usually takes precedence. However, if roll mode is enabled, auto-print will execute first.

9.4.3 Real Time Print

The input waveform and data are printed out continuously in real time. (in Recorder function)



Procedure

Screen: PRINTER (SYSTEM)

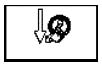
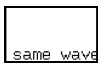
1. Press the **STATUS** key to display the Status screen.
2. Move the flashing cursor to the **Realtime Print** item.
3. Use the function keys, and select **ON**.
4. When measurement starts, waveform appears on screen and printout starts.

NOTE

- At a time axis range setting of 200 ms/DIV or faster, the waveform data will be printed out later. (See Section 12.3.)
- While the printer always outputs the data at the measurement magnification in recording mode, the waveform on the screen is reduced in size at the ratio shown below, depending on the time-axis range.
  REC: 50 ms/DIV x 1/2, 20 ms/DIV x 1/5, 10 ms/DIV x 1/10

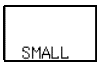
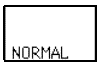
9.4.4 Time Axis Magnification and Compression

You can magnify or compress the time axis of the printed waveforms, regardless of the Waveform display screen magnification factor.
Both the recorder and memory can be set when using the recorder and memory function.

Function display	Meaning
	: Magnifies.
	: Compresses.
	: Screen magnification and compression operate in parallel.

9.4.5 Print Size

Allows you to select the print size.

Function display	Meaning
	: Prints standard size (A4).
	: Prints reduced size (A6).

NOTE This setting also applies to the BMP files of waveform images.

9.4.6 Grid Type

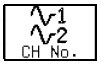
Selects the type of grid drawn on the recording paper.

Function display	Meaning
	

NOTE In printing in the X-Y screen format, the standard time axis and the standard time axis (dark) are applied.

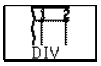
9.4.7 Channel Marker

The channel numbers or the comments are printed together with the waveform on the recording paper. (Analog channel only)

Function display	Meaning
	: Channel numbers will not be printed for the waveform on the recording paper.
	: Channel numbers will be printed for the waveform on the recording paper.
	: Comments will be printed for the waveform on the recording paper.

9.4.8 Time Value

The time from the trigger point and other information can be displayed.

Function display	Meaning
	: Displays the time from the trigger point (unit: fixed)
	: Displays the time from the trigger point (unit: base 60).
	: Displays the number of points from trigger points.
	: Displays the time when a waveform is captured.

9.4.9 List & Gauge

When a waveform is printed out (except for screen hard copies), the gauge can be printed out at the beginning, and a listing can be printed out at the end.

Function display	Meaning
OFF	: No gauges or listing
LIST	: Print listing only
GAUGE	: Print gauges only
LIST& GAUGE	: Print both gauges and listing

9.4.10 Printer Density

Serves to set the printer density. Select the setting which yields the most easy to read printout.

Function display	Meaning
LIGHT	
MIDLIGHT	
STANDARD	
MIDDARK	
DARK	

9.4.11 Upper-lower Values Print

In waveform printing, the upper and lower values of each channel are printed first. When the scaling function is being used, the scaled values are printed.

Function display	Meaning
OFF	: Upper-lower print is not used.
ON	: Upper-lower print is used.

9.4.12 Zero Position Comment

In waveform printing, comments are printed out in the zero position of each channel. This comment printing is valid only for the analog channels. Comments can be set on System (Comment) screen.

Function display	Meaning
OFF	: Zero position comment is not used.
ON	: Zero position comment is used.

9.4.13 Counter Print

In waveform printing, the counter can be printed out. This function is useful to distinguish between similar waveforms.

Function display	Meaning
	: Counter Print is not printed.
	: Counter Print is printed with date.
	: Counter Print is printed with counter name.

- A counter name of up to ten characters can be specified. For information on how to enter the counter name, see Instruction Manual Section 5.4.3.
- After the instrument is turned on, the counter is reset to 0 (zero), and the counter value is increased each time a waveform is retrieved. (The maximum counter value is 9999.)

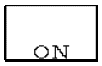
To start from an arbitrary count, move the flashing cursor to the count value and provide the setting using the function keys or the **JOG/SHUTTLE** control.

9.4.14 Making Print Settings for Comments

Allows you to make title and analog channel settings, and to set comments for printed output.
The setting conditions and comments are printed with waveforms.
For details, see Instruction Manual section 5.4.

9.4.15 Printing Numerical Calculation Results

Sets whether to print numerical calculation results or not.

Function display	Meaning
	: Does not print numerical calculation results.
	: Prints numerical calculation results.

9.4.16 COPY key setting

Select whether to print the GUI when photocopying a waveform screen image.

Function display	Meaning
	: Do not print the GUI when photocopying a waveform screen image.
	: Print the GUI when photocopying a waveform screen image. (Default)

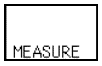
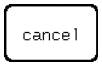
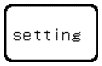
9.4.17 PRINT Key Output Destination

Allows you to select the output destination when the **PRINT** key is pressed.

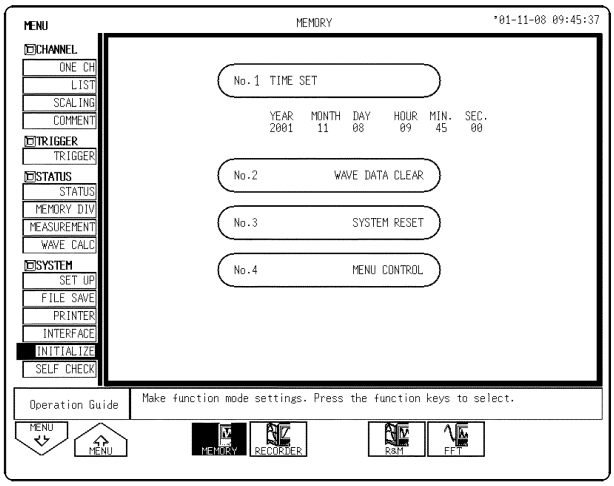
Function display	Meaning
	: Outputs to the internal printer.
	: Outputs to a device connected through a LAN.

9.4.18 Print Selection Upon Execution

You can select the area and the type of printout when you press the **PRINT** key, in the waveform screen.
This also helps to prevent printing by mistake.
When you set the print selection upon printing to Yes, you can make the following selections.

Function display	Meaning
	: Prints the entire area of the waveform data loaded in memory.
	: Prints the area between A-B cursors of the waveform loaded in memory.
	: Prints 10 DIV waveforms before and after the triggering position.
	: Prints the area displayed on the screen with the settings related to the display.
	: Prints all the settings.
	: Prints the value calculations.
	: Cancels the settings.
	: Accesses the settings screen.

9.5 INITIALIZE Screen



Procedure Screen: INITIALIZE (SYSTEM)

1. Press the **SYSTEM** key to display the Initialize screen.
2. Move the flashing cursor, want to set the item.
3. Use the function keys to make the selection.

Time Set	See Section 9.5.1
Wavw Data Clear	See Section 9.5.2
System Reset	See Section 9.5.3
Menu Control	See Section 9.5.4

9.5.1 Setting the Clock

This instrument incorporates a calendar with automatic leap year compensation and 24-hour clock. The clock is used for the following functions:

- Timer trigger function
- Trigger time list printout

Procedure

1. Move the flashing cursor to the year, month, day, hour, minute items of **TIME SET**, and use the **JOG/SHUTTLE** control or the function keys to make the settings.
2. Press the **F4** (**exec.**) key to start the clock. Seconds are reset to 00.
3. For correcting errors of less than 1 minute.
   Press **30 sec adjust** to make the setting.
   When 30 s adjustment is pressed, the seconds are handled as follows.
   00 to 29 seconds: Minutes are unchanged and seconds are reset to 00.
   30 to 59 seconds: Minutes are advanced by 1 and seconds are reset to 00.

9.5.2 Clearing the Waveform Data

Clears and initializes waveform data stored in memory.

Procedure

1. Move the flashing cursor to **WAVE DATA CLEAR**, and make the setting.
2. Press the **F4** (**exec.**) key.

9.5.3 System Reset

- Resets all settings to the factory default values.
- The same effect can be achieved by turning power to the instrument on while holding down the **STOP** key.
- While pressing the **START** + **STOP** keys, turn ON the power to initializes all the contents. Under a normal system reset, the Communication Settings and Settings RAM are not initialized.

Procedure

1. Move the flashing cursor to the **SYSTEM RESET** item, and make the setting.
2. Press the **F4** (**exec.**) key.

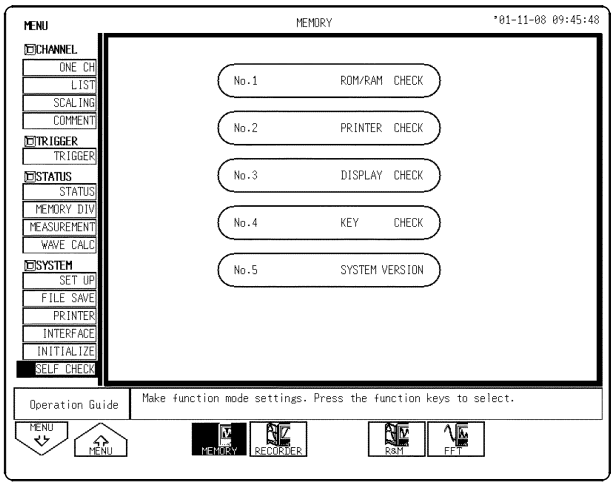
9.5.4 Menu Control

You can hide any menu on the screens. Hiding settings on menus prevents misoperation because they cannot be used.

Procedure

1. Move the flashing cursor to **(No. 4) Menu Control**.
2. Press the **F4** (**exec.**) key function key to execute.
3. Position the cursor on the menu. To hide, press the **OFF** function key. To view, press the **ON** function key.
4. Press the **F5** (**reset**) function key to return the settings to their defaults.
5. Press the **F6** (**end**) function key to exit.

9.6 Self-check



Procedure Screen: SELF CHECK (SYSTEM)

1. Press the **SYSTEM** key to display the Self Check screen.
2. Move the flashing cursor to set the item.
3. Use the function keys to make the selection.
   ROM/RAM Check See Section 9.6.1
   Printer Check See Section 9.6.2
   Display Check See Section 9.6.3
   Key Check See Section 9.6.4
   System Version See Section 9.6.5

9.6.1 ROM/RAM Check

- This test checks the internal memory (ROM and RAM) of the 8855.
- The test is non-destructive; it does not affect the contents of RAM.
- The result is displayed as follows. OK: Passed, NG: Failed

Procedure Screen: SELF CHECK (SYSTEM)

1. Move the flashing cursor to the **ROM/RAM CHECK** item.
2. Press the **F4** (**exec.**) key to check the ROM and RAM. During the test, all keys are disabled.
   Press the **STOP** key to suspend checking of items during execution.
   The device version is displayed at the upper right of the screen during ROM/RAM check.
3. When the test is completed, press any key to return to the self-test setting screen.

NOTE If memory is expanded, it will require more time to check the storage RAM.

9.6.2 Printer Check (when the 8994 PRINTER UNIT is installed)

- This test checks the printer operation.
- The printer head is cleaned.

Procedure

1. Move the flashing cursor to the **PRINTER CHECK** item.
2. Press the **F4** (**exec.**) key to check the check the printer operation.
   To cancel the test pattern printout, press the **STOP** key.
3. Press the **cleaning** function key to clean the printer head. Hold down this key for about five seconds.

9.6.3 Display Check

- This test checks the display.
- Available check patterns include solid display of black, red, green, blue, and white; a gradation check, and waveform drawing in the three primary and three complementary colors.

Procedure

1. Move the flashing cursor to the **DISPLAY CHECK** item.
2. Press the **F4** (**exec.**) key to check the display.
   Press any key to move to the next check.
3. When the test is completed, press any key to return to the Self check setting screen.

9.6.4 Key Check

This test checks the key operation.

Procedure

1. Move the flashing cursor to the **KEY CHECK** item.
2. Press the **F4** (**exec.**) key to start the test.
3. Press any key on the front panel, and the corresponding field on the display changes to reverse. Turn the **JOG/SHUTTLE** control at least one turn fully clockwise and counterclockwise and press each of the keys at least once, and the test is completed.

NOTE

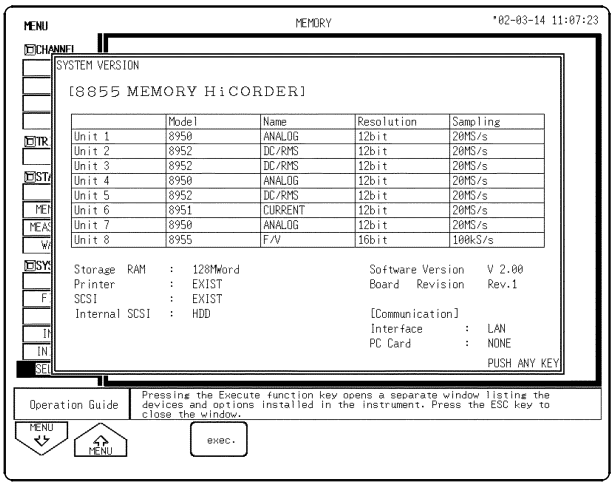
- If any key is defective, the key test cannot be completed normally.
- In this case, press the **START** key and the **STOP** key together to return to the Self check setting screen.
- The **START** key and Select key serve for testing the LED function.

9.6.5 List System Configuration

The programmed optional configurations and software versions are displayed. You can check the configuration of options and the software applications that are available on the opening screen.

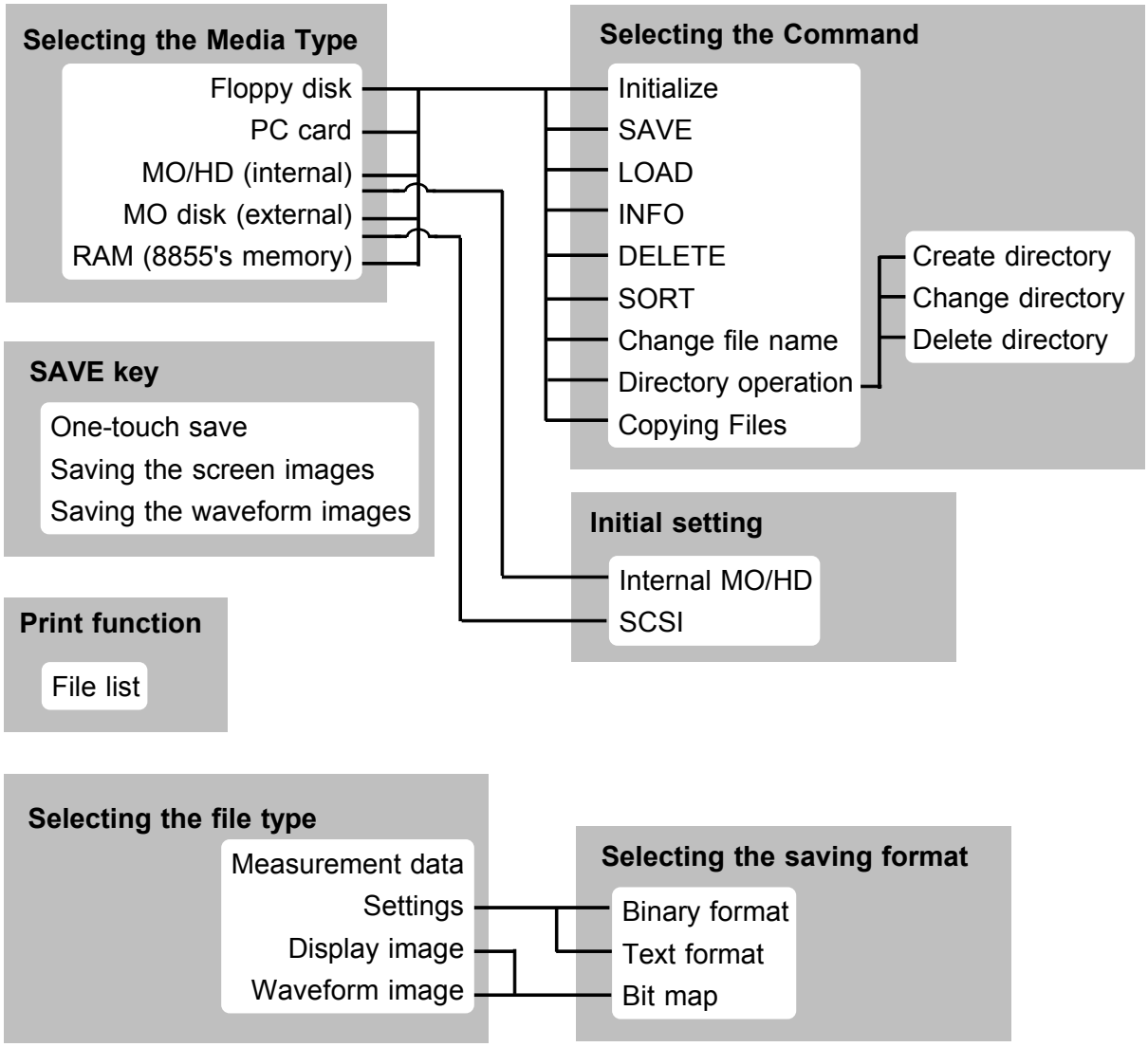
Procedure

1. Move the flashing cursor to the **SYSTEM VERSION** item, and make the setting.
2. Press the **F4** (**exec.**) key.
3. Press any key to return to the Self-Diagnosis screen.



Chapter 10
Storing and Recalling Measurement Data

You can save and load measurement data and settings.
You can use floppy disks, PC cards, and external or the internal MO/HD, or the instrument's memory as the media (recording media) to save data.



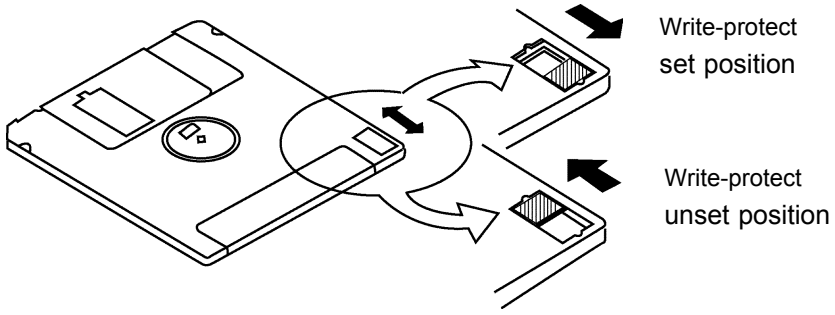
10.1 Floppy Disk

⚠ CAUTION

- If a floppy disk is inserted upside down, backwards, or in the wrong direction, the floppy disk or the instrument may suffer damage. Before shipping the instrument, always remove the floppy disk.
- 2DD floppy disks formatted in PC9801 640 KB format cannot be used.
- Do not remove the floppy disk while the floppy disk drive is operating (the LED on the floppy disk drive is on).
- The number of bytes depends on the floppy disk format.
- If the write-protect tab on the floppy disk is in the set position, the operations can not be performed.
- The floppy disk must be initialized (formatted) before using it.

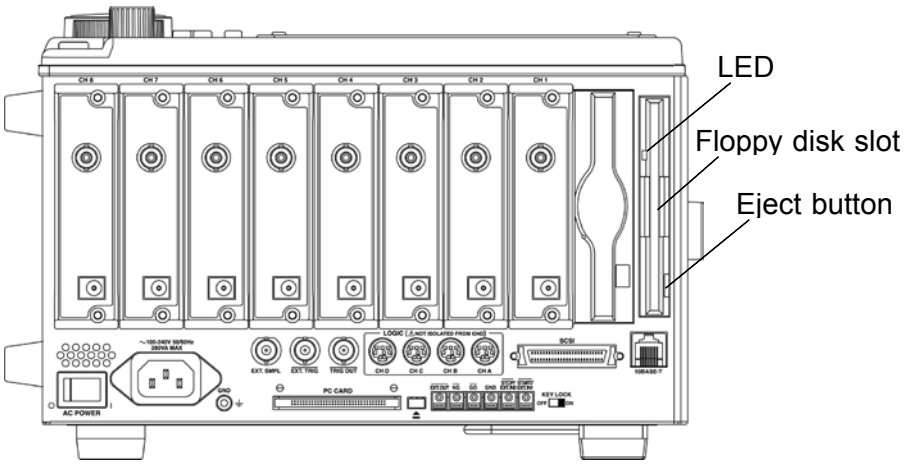
3.5 inch 2HD or 2DD floppy disks can be used.
The following floppy disk formats can be used:
720 KB (IBM PC/AT compatible), 1.2 MB (NEC PC-9801 series), 1.44 MB (IBM PC/AT compatible or NEC PC-9801 series with 3-mode drive)

Write protection



How to set a floppy disk:

Insert the floppy disk into the drive with the disk label facing toward the eject button.
To remove the floppy disk, press the eject button.



10.2 Optional Units (Option)

10.2.1 9646 MO UNIT (Option)

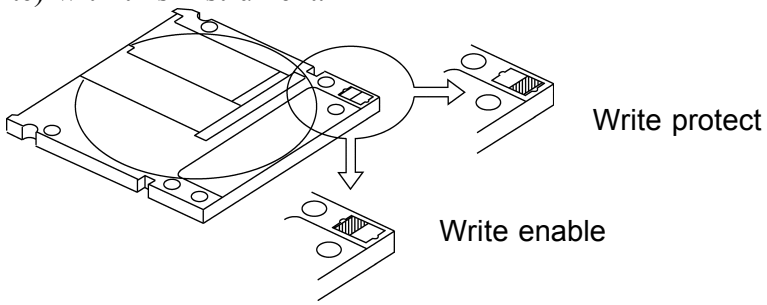
⚠ CAUTION

- If a MO disk is inserted upside down, backwards, or in the wrong direction, the MO disk or the instrument may suffer damage. Before shipping the instrument, always remove the MO disk.
- Do not remove the MO disk while the MO disk drive is operating (the LED on the MO disk drive is on).
- The number of bytes depends on the MO disk format.
- If the write-protect tab on the MO disk is in the set position, the operations can not be performed.
- The MO disk must be initialized (formatted) before using it.
- Do not use the MO drive if the 8855 is tilted.In this position, it could fail to function normally.
- When you insert the MO disk in the drive, you cannot access the MO before MO drive LED turns off. (It turns off in approximately 10 seconds.)
- Refrain from using the MO where the temperature exceeds 35ºC. (When used where the temperature exceeds 35ºC, the disk protect function is activated, which makes it impossible to save or load data.)

MO type

Use 3.5-inch MO disks (128, 230, 540, 640 MB, 1.3 GB: rewritable and overwrite) with this instrument.

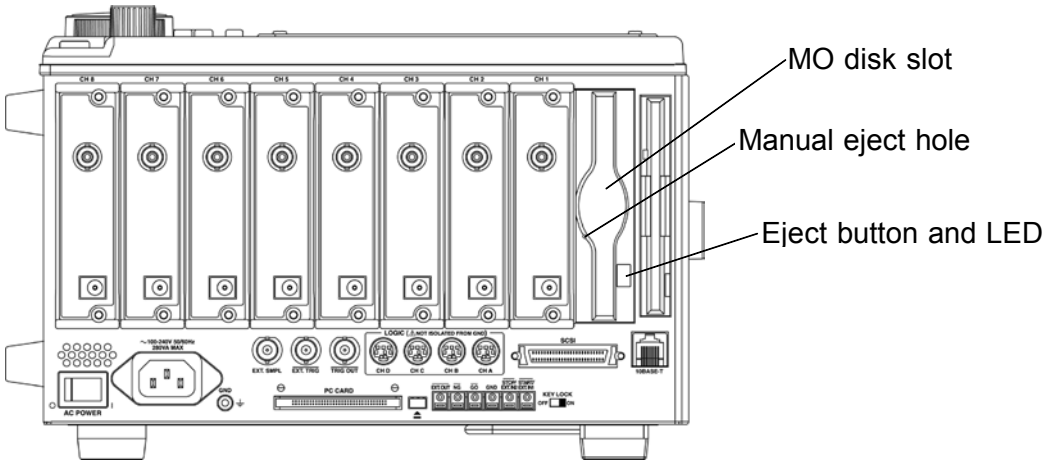
Write protection



10

Inserting/ Removing

Insert the MO disk into the drive with the disk label facing toward the eject button.
To remove the MO disk, press the eject button.



NOTE

If for any reason it should be impossible to remove the disk, use the following procedure.

- During powering on, press continuously the eject button of the MO drive to eject the disk.
- Power off the instrument and insert a pin of diameter approximately 1 mm into the manual eject hole of the MO drive, to eject the disk.

10.2.2 9663 HD UNIT

⚠ CAUTION

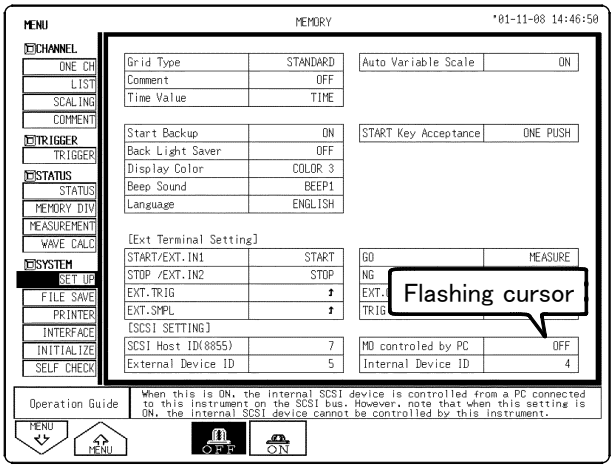
- Do not turn off the power while the hard disk is operating (reading or writing).
  Doing so may destroy the data being read or written.
  If this occurs, reinitialize the module.
- Do not subject the instrument to strong shock or vibration. Doing so may damage the HD module.
- Avoid using the HD at temperatures of 35ºC or above. Doing so may make it impossible to save or load data.

Capacity

The hard disk has a capacity of 20 GB.
The hard disk is initialized at the factory.

10.2.3 Setting the Internal MO/HD (When the 9646, 9663 is installed)

You can use the internal MO drive from the PC connected to this device (8855) through a SCSI. In this situation, it is not possible to use the internal MO/HD from the device.



Procedure Screen: SET UP (SYSTEM)

1. Turn OFF the PC and turn ON the device (8855).
2. Go to the Set up (System) screen.
3. Move the flashing cursor to **MO controlled by PC**.
4. Make a selection using the function key.

Function display	Meaning
OFF	: Turns external control OFF so that the device can use the internal MO/HD.
ON	: Turns external control ON so that the PC can use the internal MO/HD.

5. Start the PC.

Setting the SCSI Host ID (8855)

Sets an ID number on the 8855 SCSI bus.
(Setting Range: 0 to 3 and 5 to 7)
4 cannot be set because it is used for the internal MO/HD ID.
Do not set an ID number similar to that of a peripheral connected to the 8855.

Setting the External Device ID

Sets an ID number on the SCSI bus of the peripheral connected to the 8855 SCSI connector.
(Setting Range: 0 to 3 and 5 to 7)
4 cannot be set because it is used for the internal MO/HD ID.
Do not set an ID number similar to that of a peripheral connected to the 8855.

NOTE

- This can be selected only when the optional 9646 MO UNIT or 9663 HD UNIT is installed.
- The ID of the internal MO/HD is fixed at 4.
- When the internal MO/HD setting is enabled (ON), the internal MO/HD media selection cannot be selected.
- When the internal MO/HD setting is enabled (ON) and the storage destination for automatic storage is set to Internal MO/HD, automatic storage setup is disabled.

10.3 PC Card

⚠ WARNING

- **For a data storage card (Compact Flash card), use only PC Cards sold by HIOKI.**
  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. The data on the PC card may be damaged.

  HIOKI options
  PC cards (includes adapter)
  9626 PC CARD 32M
  9627 PC CARD 64M
  9726 PC CARD 128M
  9727 PC CARD 256M
  9728 PC CARD 512M
- **Our optional PC cards (Compact Flash card, RS-232C card, and GP-IB card) are compatible with the 8855 MEMORY HiCORDER.**

⚠ CAUTION

- For horizontal installation of the product, insert the PC card slowly into the slot with the card label facing up. For vertical installation, insert the PC card into the slot with the card label facing toward you.
- Inserting a pc card upside down, backwards or in the wrong direction may damage the PC card or the instrument.
- Do not remove the PC card while the PC card unit is operating. The data on the 8855 may be damaged.
- The number of bytes depends on the PC card format.
- Do not remove and re-insert the PC card during LAN communication. Doing so will disconnect the LAN transfer.

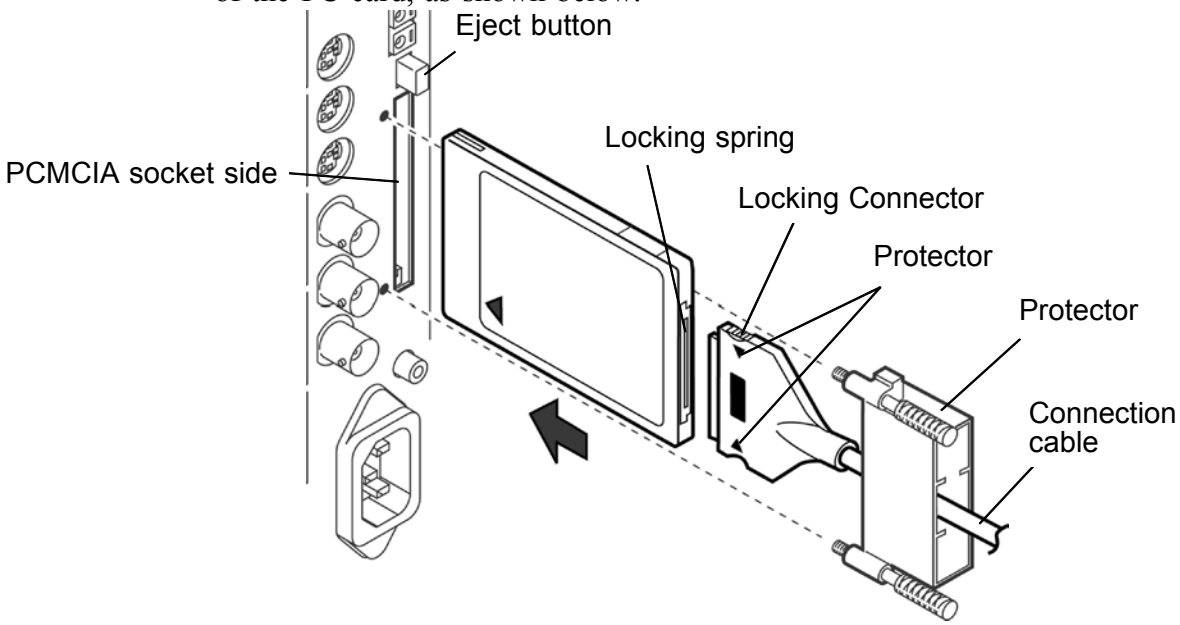
10.3.1 Using the PC Card Slot

⚠ CAUTION

- If a PC card is inserted upside down, backwards, or in the wrong direction, the PC card or the instrument may suffer damage. To avoid damage to the PC card or connector, observe the cautions listed below.
- Inserting the card with the wrong orientation or in other ways than described above.
- Inserting the card while attached to the connection cable.
- Moving the 8855 while the connection cable is connected to the card.
- Pulling the card out by the cable or exerting excessive force on the connector.
- Placing objects on the connection cable connector.

Cable and PC card connection

1. Pass the PC card protector through the connection cable, as shown below.
2. Plug the PC card end of the connection cable into the PC card. The top side of the cable connector (marked with a ▲) should match the top side of the PC card, as shown below.



3. Insert the PC card in the PC card slot on the 8855. Verify that the ▲ mark on the card points in the correct direction, and make sure that the card is properly seated in the slot. The PC card is keyed to prevent wrong insertion, but exerting excessive force may damage the card or the slot.
4. Attach the PC card protector to the 8855.

Removing the PC card

1. Remove the PC card protector.
2. To remove the PC card, press the eject button. Do not press the eject button before removing the PC card protector.

NOTE

To avoid damage to the 8855, always remove the PC card protector before pressing the eject button.

10.4 SCSI Interface

10.4.1 SCSI Interface Specifications

General specifications

See Section 12.1.6.

Electrical specifications

Input signals

Receiver	CMOS receiver with hysteresis
Input signal levels	Low level: 0 to 0.8 V DC, High level: 2.0 to 5.25 V DC
Maximum load current	±10 μA (excluding terminator)
Minimum hysteresis	0.2 V DC

Output signals

Driver	Open-drain CMOS driver
Output signal levels	Low level: 0 to 0.8 V DC, High level: 2.0 to 5.25 V DC
Driver sink current	48 mA

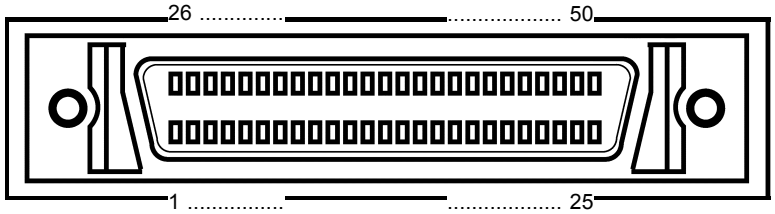
Terminator power signal

Output voltage	4 to 5.25 V DC
Maximum output current	1.2 A

Connector

Recommended connector:
Socket used: High density (pin type) (D-Sub half-pitch 50 P)
SCSI connector pin outs

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	GND	11	GND	21	GND	31	-DB5	41	-ATN
2	GND	12	GND	22	GND	32	-DB6	42	GND
3	GND	13	GND	23	GND	33	-DB7	43	-BSY
4	GND	14	GND	24	GND	34	-DBP	44	-ACK
5	GND	15	GND	25	GND	35	GND	45	-RST
6	GND	16	GND	26	-DB0	36	GND	46	-MSG
7	GND	17	GND	27	-DB1	37	GND	47	-SEL
8	GND	18	GND	28	-DB2	38	TERMPWR	48	-C/D
9	GND	19	GND	29	-DB3	39	GND	49	-REQ
10	GND	20	GND	30	-DB4	40	GND	50	-I/O



NOTE

- The SCSI cable is not supplied.
- Check the connection types on both the 8855 and the connected device. Use commercially-available SCSI cables.

10.4.2 Setting the MO Disk Drive

⚠ CAUTION

- Do not power off while the MO disk is being accepted.
- Power for the 8855, external storage device and PC should be obtained from the same outlet. Otherwise, potential difference between grounds may cause malfunctions.

■ Connection to a MO disk drive

- Select a SCSI cable with a connector corresponding to that of the disk drive.
- Check that both the 8855 and the MO disk drive are powered off.
- Connect firmly the SCSI connector on the right side panel of the 8855 and the MO disk drive.

■ Powering on

- Always power on the MO disk drive before powering on the 8855.
- Always power off the MO disk drive after powering off the 8855.

■ System configuration

- A maximum of seven SCSI interfaces can be connected, but the 8855 can only access either of one MO disk drive.
- When accessing the 8855 internal MO or an external MO drive connected to the 8855 through a PC, set External Control of Internal Devices in the system screen to ON. See section 10.2.1 for further details.If it remains OFF, control signals conflict with the SCSI bus destroying your data, and can also damage your MO drive. If the specifications of the MO drive are changed, it could become inoperable.
- Ensure that all devices on the SCSI bus have different address IDs.
- Fit a terminator on the last SCSI device on the daisy-chain.

■ MO disk drive

- Within the SCSI standard, some commands are left for manufacturer-dependent use. MO disk drive which requires such commands cannot be used with the 8855.
- Depending on the operating environment and any impedance mismatch of the interface cable, it is possible for timing discrepancies on the SCSI bus to prevent the MO disk drive from operating normally.

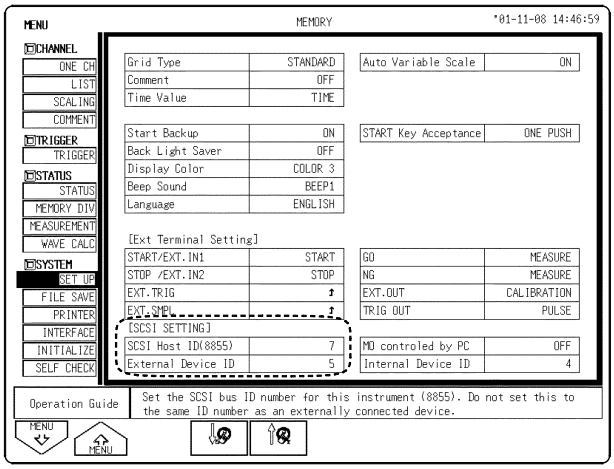
■ MO type (As of September, 2004)

Use 3.5-inch MO disks (128, 230, 540, 640 MB, 1.3 GB: rewritable and overwrite) with this instrument.

The following MO drives have been used satisfactorily by HIOKI.

640 MB	I O Data	MOF-RM640, MOF-SM640, MOX-SX640, MOX-SX640A
	Logitec	LMO-640, LMO-640S2, LMO-640F, LMO-643F, LMO-S645F, LMO-A636S, LMO-A654S, LMO-FA654S
1.3 GB	Buffalo	MOS-U1300
	I O Data	MOF-1300, MOX-SX1.3, MOX-SX1.3A
	Logitec	LMO-A1345S, LMO-A1354S, LMO-FA1354S

10.4.3 Setting the SCSI ID



Procedure Screen: SET UP (SYSTEM)

1. Press the **SYSTEM** key to display the Set up screen.
2. Move the flashing cursor to the **SCSI SETTING** item.
3. Use the function keys or **JOG** control to make the setting.

Function display	Meaning
	: Increases in number
	: Decreases in number

SCSI Host ID (8855 instrument)

Set the ID number of the 8855 on the SCSI bus.
The available value range is 0 to 3, 5 to 7.

Setting the Peripheral ID

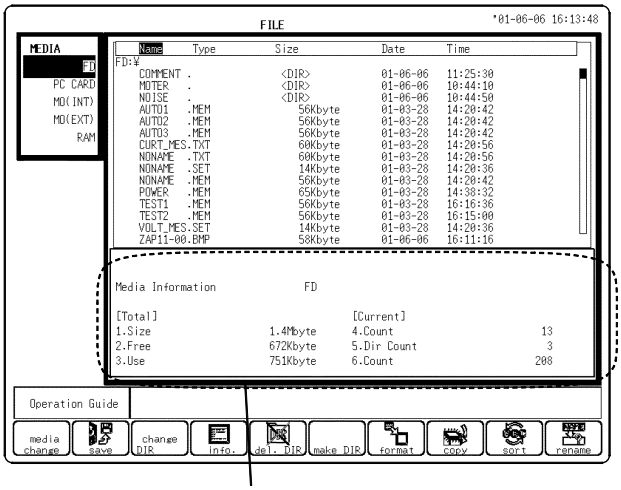
Set the ID number of the MO drive, which will be connected to the 8855, on the SCSI bus. The ID number of the internal MO drive (optional) is set to 4. Therefore, if the internal MO drive has been mounted, the ID number 4 cannot be specified. The available value range is 0 to 3, 5 to 7.

NOTE

Do not use the same ID numbers for the SCSI host and peripherals.

10.5 Selecting the Media Type

Selects the media (recording media) to use for saving and loading data. You can select from floppy disks, PC cards, the internal MO/HD drive (optional), a peripheral MO drive, or the instrument's RAM memory. Media information is displayed at the bottom of the screen.

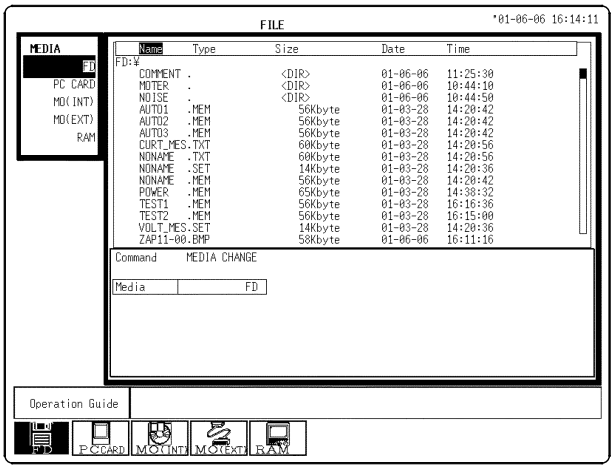


Media Information
Information pertaining to the selected media is displayed here.

Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Press the **F1** (**media change**) key.

Function display	Meaning
media change	: Changes the media.
save	: Saves data (See section 10.7)
load	: Loads data (See section 10.8)
info.	: File information (See section 10.9)
delete	: Deletes a file (See section 10.10)
make DIR	: Creates a directory (See section 10.13)
format	: Initializes (See section 10.6)
sort	: Rearranges files (See section 10.11)
rename	: Renames files (See section 10.12)



3. Make a selection using the function key.

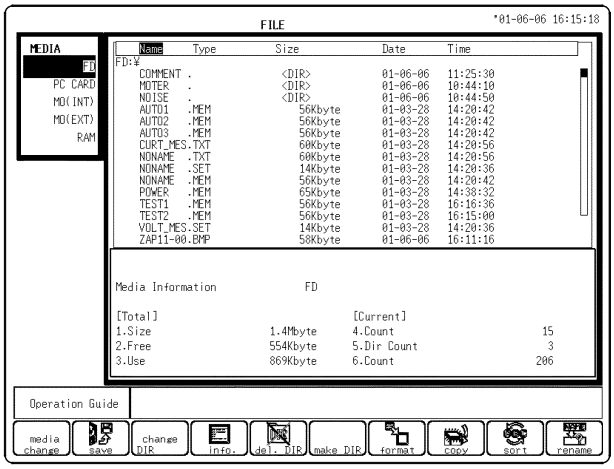
Function display	Meaning
FD	: Floppy disk media are used.
PCCARD	: PC card media are used.
MO / HDD	: MO disk or hard disk media are used.
MO(EXT)	: Select the external storage connected to the SCSI interface as the recording medium.
RAM	: Sets the 8855's memory as the recording media. The setting data saved in internal memory (RAM) is retained even after power is turned off.

NOTE

- Only settings can be saved with the internal memory (RAM).
- The internal MO/HD can selected when the optional 9646 MO UNIT/ 9663 HD UNIT is installed. However, you cannot select it when the internal MO is controlled externally. (See section 10.2)

10.6 Initializing (FORMAT)

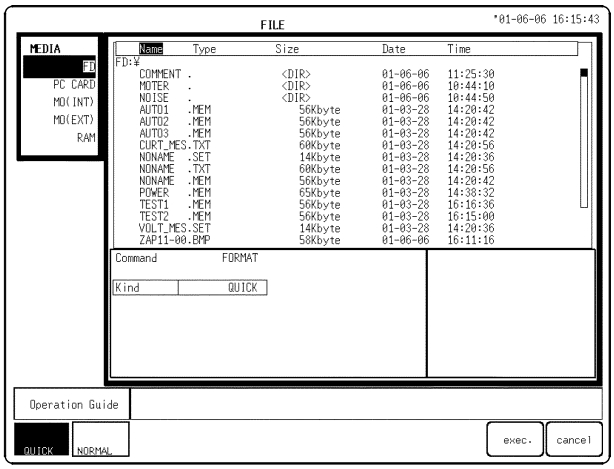
Initializes (or formats) the selected media.
Formatting deletes all information recorded on that media.



Procedure Screen: FILE SAVE (SYSTEM)

(1) Selecting the media. (See Section 10.5)

1. Press the **FILE** key to display the File screen.
2. Press the **F1** (**media change**) key.
3. Make a selection using the function key.



(2) Selecting the Command.

1. Press the **F7** (**format**) key.

Function display	Meaning
format	: Initializes

2. Use the function key to select the type of formatting.
   Normally, you should select **QUICK**. Select **NORMAL** when the media is formatted for the first time.

Function display	Meaning
QUICK	: Deletes all files on the media.
NORMAL	: Formats and enables data writing on the media. Deletes all files.

(3) Formatting

Press the **exec.** function key to start formatting.

Function display	Meaning
exec.	: Initializes (formats) the selected media.
cancel	: Cancels the formatting command.

NOTE

- Use the MS-DOS format for floppy disks and PC cards.
- When formatting in Normal mode, a floppy disk, a 2 HD disk formatted at 1.44 MB while a 2 DD disk is formatted at 720 KB.
- The MO-disk format conforms to the super floppy format.
- You cannot format a media that is write protected.

10.7 Saving the Data (SAVE)

Saves instrument settings and waveform data to the selected media.

Contents and volume that can be recorded

(1) Setting conditions (SET)

1. You can save the instrument setting conditions. When memory is split, this saves the display block setting conditions.
2. When loading settings to the instrument, the setting conditions are duplicated.
3. Recording capacity: 512 bytes x 33 = 16,896 bytes

(2) Measurement data (MEM, REC)

1. Saves the instruments measurement data.
2. When using cursor A-B , it can save data in blocks.
3. When the measurement data is loaded, the instrument can duplicate the waveform. (Binary format) Furthermore, a portion of the setting conditions is loaded when measuring data.
4. Select the binary or text format for saved files. Text is used when loading to a PC. Select Binary to load to the 8855.
5. The X-Y waveform of the recorder function cannot be saved in text format.
6. When the memory is split, a directory is created when some blocks are set to Batch Save.Each blocks waveform data and an index file SEQ to load all blocks at one time are created in that directory.
7. Logic saves one block as one channel.
8. See Instruction Manual Appendix 5 for details about the file size.
9. Specify the area of the waveform to save a portion.
   Only cursor A: From cursor A to the end of the waveform.
   Cursor A-B: The waveform between cursors A and B.

(3) Screen Images (Bitmap)

You can save the instruments screens as bitmap (.bmp) files. Save using the **SAVE** key. (See section 10.16)
The following files were saved Non-compressed. Compressed files have an indefinite size (see section 10.16).

Color Settings	File size
Color, Grayscale	481,078 byte
Monochrome, inverted monochrome	60,062 byte

Bitmaps are one of Windows[*1] standard image formats and many software support bitmaps.
See section 10.16 for details about how to set the destination of screen images.
(*1): The Windows is a registered trademark of Microsoft Corporation.

(4) Waveform Images (Bitmap)

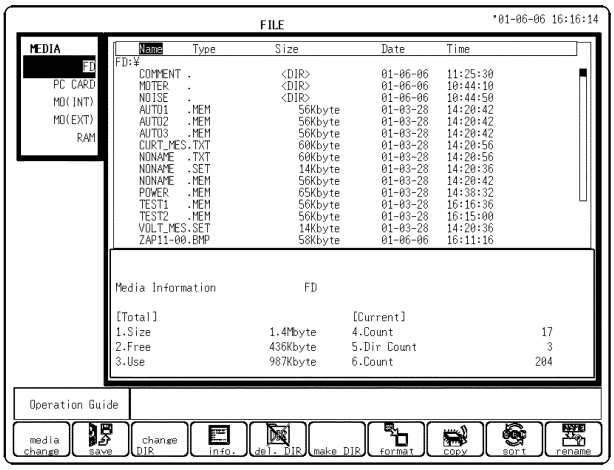
1. You can save waveforms as bitmap (.bmp) files.
   Save using the **SAVE** key. (See section 10.16)
2. Print size varies according to the print image recording length set in the system screen (see section 10.16).
3. Waveform images are the images printed by the optional 8994 PRINTER UNIT.
   The number of directories and files that can be saved is shown in Media Information (see section 10.5, item 6).

NOTE

- Data stored in the text and BMP format is not readable by the 8855.
- Do not use the characters and symbols below in a file name. A file containing any of these characters/symbols in its file name cannot be processed under Windows 2000 or XP.
  Full-size lowercase letters: a to z
  Full-size characters: π, μ, ε
  Half-size symbols: +, =, [,]

10.7.1 Setting the Data to Store

Saves settings and waveform data to a media.
Saves files in the current directory of the media shown in the File screen.
You need to format unformatted media before using them.
When using cursor A-B, it can save portions of the waveforms.
One-touch save is possible with the **SAVE** key (see section 10.16).



Procedure Screen: FILE SAVE (SYSTEM)

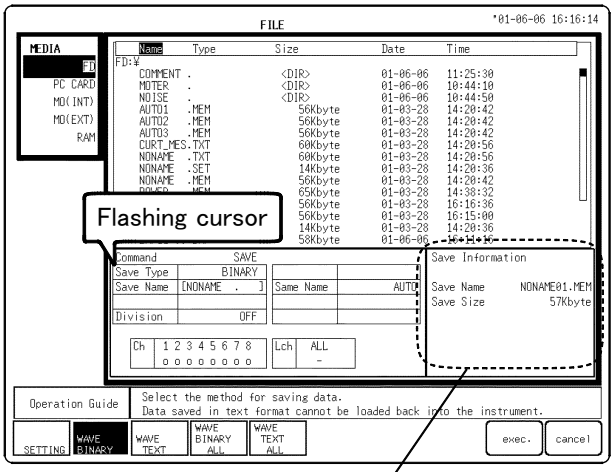
(1) Select the media. (See Section 10.5)

1. Press the **FILE** key to display the File screen.
2. Press the **F1** (**media change**) key.
3. Use the function keys to make the selection.

(2) Select the Command.

Press the **F2** (**save**) key.

Function display	Meaning
save	: Saves data



Save Information
Displays the name and size of the data to be saved.

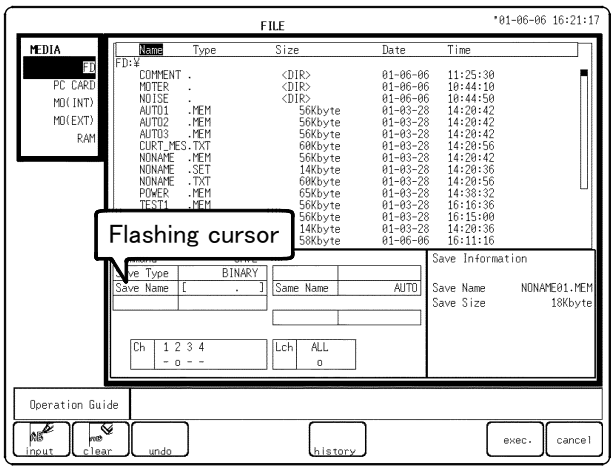
(3) Select the store format.

1. Move the flashing cursor to the **Save Type** item.
2. Use the function keys to select the format.

Function display	Meaning
SETTING	: Setting data
WAVE BINARY	: Waveform data (binary format) Waveform data of the display block while using the memory segmentation function Waveform data displayed on the screen when REC&MEM is selected.
WAVE TEXT	: Waveform data (text format) Waveform data of the display block while using the memory segmentation function Waveform data displayed on the screen when REC&MEM is selected.
WAVE BINARY ALL	: Waveform data of all blocks while using the memory segmentation function Index files and waveform data for REC&MEM.
WAVE TEXT ALL	: Waveform data of all blocks while using the memory segmentation function Index files and waveform data for REC&MEM.
JUDGE AREA	: Waveform evaluation area and setting data.
exec.	: Saves the data.
cancel	: Cancels the save command.

NOTE

- Text is used when loading to a PC. Select Binary to load to the 8855.
- The X-Y waveform of the recorder function, and the Nyquist waveform of the FFT function cannot be saved in text format.
- When the media is RAM, only settings are saved.

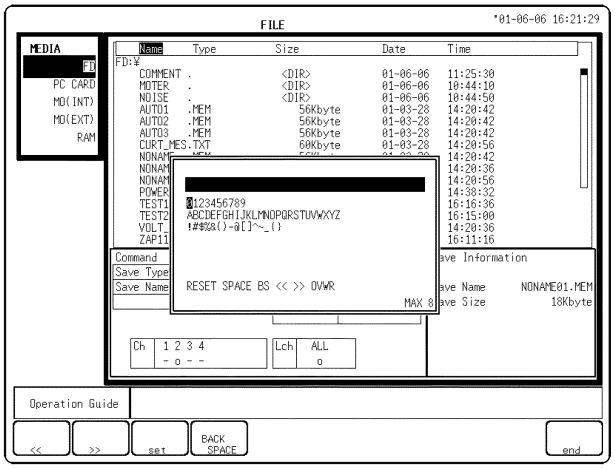


(4) Enter the file name.

Allows you to input the file name of the data to be saved. If you do not specify an 8-character file name, the file is saved as NONAME.

1. Move the flashing cursor to the **Save Name** item.
2. Use the function keys to select **input**.

Function display	Meaning
input	: Opens the window where to input the file name.
clear	: Clear the file name.
undo	: Returns to the previous file name, ignoring changes



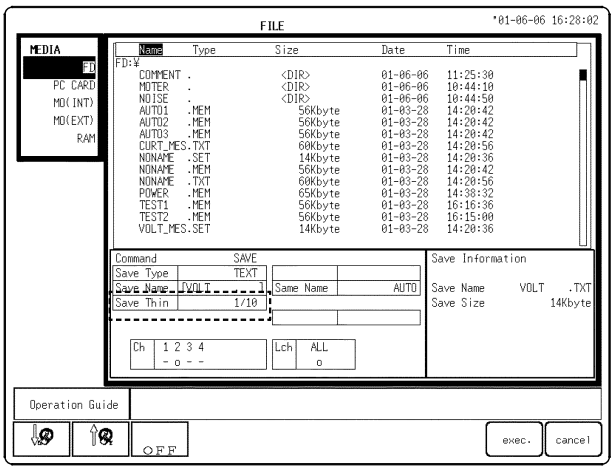
3. Use the function key to enter characters.

Function display	Meaning
<<	: Character input position moves to the left
>>	: Character input position moves to the right
set	: Inputs the selected character
BACK SPACE	: Deletes the previous character
end	: Exits and closes the character input window

4. Use the **<<** and **>>** function keys or **JOG** to specify the characters' input position.
5. Use the cursor keys to select the characters in the window and press the Set function key to input them. See Instruction Manual section 5.4.3 for a detailed explanation of the window.
6. When you are done, press the **end** function key.

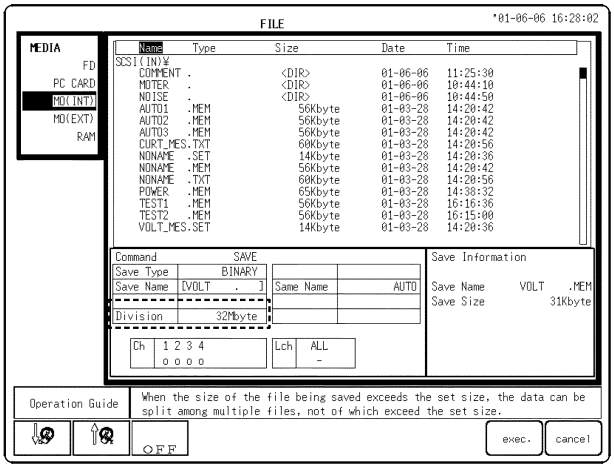
(5) Enter the file name extension.

It is possible to input an extension to the file name to be saved. An extension corresponding to the type of file saved is automatically assigned if an 3-character extension is not specified.
Normally, this can remain blank.
The input method is the same as that of (4) Inputting File Names



(6) Thinning Data (Save the text)

Allows you to set the thinning rate when the type of data to be saved is Text.
Use the ↑ and ↓ function keys to set the thinning rate.
Selections: OFF, 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, 1/1000



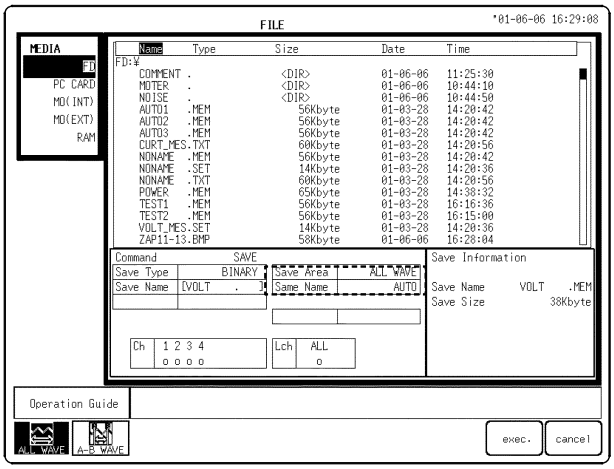
(7) File segmentation settings (for binary files only)

Segments a single file into multiple files when the file exceeds the maximum size set.
The file size can be set using the function keys.
Selections: 32 MB, 128 MB, or 512 MB

When a file is segmented and saved, a new directory is created for the segmented files, and an index file created in that directory.
All index files can be read at one time.
Individual files are handled as independent waveform files.

NOTE

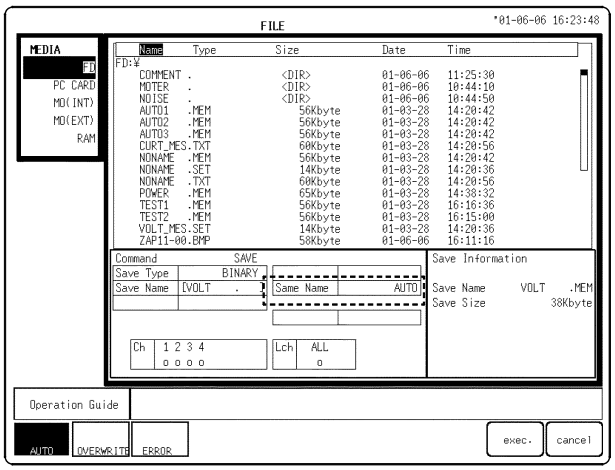
- Files cannot be segmented when Floppy is selected as the Save Media.



(8) Setting the Save Range (Partial Save)

When using A-B cursor in the Waveform display screen, set the range of the waveform to be saved. It is possible to save any range of waveform data. (Partial Save)

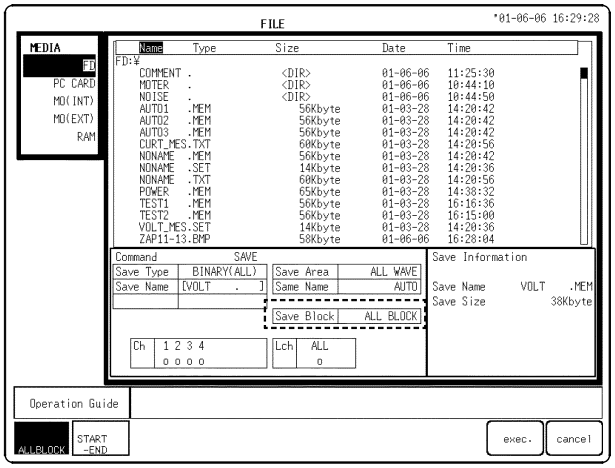
Function display	Meaning
ALL WAVE	: Saves the data from start to end
A-B WAVE	: Only saves the data between cursors A and B. When only using cursor A, saves the data from cursor A.



(9) Setting Same Name Processing

Allows you to set what kind of processing you want performed when a file name already exists in the destination directory.

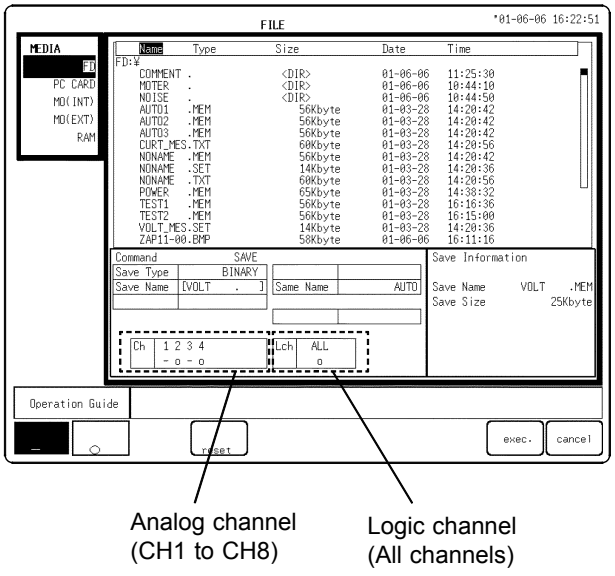
Function display	Meaning
AUTO	: Automatically adds a number after the file name when the same name is already present in the folder. (Maximum 4 digits) Appends a number that is incremented automatically to the file name. Example When the file name is TEST: TEST, TEST0001, TEST0002, etc. When the file name is TEST1: TEST1, TEST2, TEST3, etc.
OVERWRITE	: Overwrites the file with the same name, deleting its contents
ERROR	: Displays an error message to the effect that it is trying to save a file that already exists.



(10) Selecting the Block to Save (Memory Segmentation)

When saving waveforms in batch while using the memory segmentation function, allows you to select the block to be saved.

Function display	Meaning
ALLBLOCK	: Saves all blocks where waveforms exists
START -END	: Saves from the starting block to the ending block (See Instruction Manual Chapter 6 Memory Segmentation Function)



(11) Select the channel for storing data.

1. Move the flashing cursor to the **Ch** item.
2. For each channel, select if, **Yes** or **No**, they are to be saved. Make this setting for each analog channel and in batch for all the logic channels.

Function display	Meaning
_	: Does not save
○	: Saves
reset	: Returns to the previous settings, ignoring changes

(12) Saving

Press the **exec.** function key to save.

Function display	Meaning
exec.	: Saves the data.
cancel	: Cancels the save command.

Saving the Waveform Data of a Split Memory

When the memory is split, a directory is created when all blocks are set to Batch Save.Waveform data of each block (MEM) and index file (SEQ) are created in the directory.
When reading the index file (SEQ), it is possible to read in the waveform data of all blocks at one time.

Saving Waveform Data Measured With the Recorder & Memory Function

A directory is created when measured data is saved in a batch using the recorder & memory function. If waveform data saved in the memory (MEM) or waveform data of a split memory exists within the directory, waveform data for each block (MEM), recorded waveform data (REC), and an index file (R_M) are created. When reading the index file (R_M), if the waveform data is saved in the memory or part of a split memory, it is possible to read in the waveform data of all blocks and recorded waveform data at one time.

Saving of segmented files

When a file is saved as a segmented data, an index file (.IDX) is created automatically. All segmented data can be loaded at one time by reading the index file.

NOTE

- Data stored in the text format is not readable by the 8855.
- Waveforms whose recorder function display format is X-Y, and the Nyquist waveform of the FFT function cannot be saved in text format.
- You cannot save to write-protected media (to prevent overwriting).
- When the "Enter" function key is selected, the file size to be saved is displayed.
- The directory and the number of files that can be stored in the directory are limited. For details, see Section 10.5.
- Thinning cannot be selected when FFT data is saved in text format.
- Do not use the characters and symbols below in a file name. A file containing any of these characters/symbols in its file name cannot be processed under Windows 2000 or XP.
  Full-size lowercase letters: a to z
  Full-size characters: π, μ, ε
  Half-size symbols: +, =, [,]

Automatic file name assignment

If the file name is entered as a blank [.], it is assigned automatically according to the following principle.

Auto save	Waveform data, screen data	Parameter calculation result
[AUTO .EXT]	[NONAME .EXT]	[MEASURE .TXT]
[AUTO0001.EXT]	[NONAME01.EXT]	[MEASURE1 .TXT]
↓	↓	↓
[AUTO0010.EXT]	[NONAME10.EXT]	[MEASUR10 .TXT]
↓	↓	↓
[AUTO0100 .EXT]	[NONAM100.EXT]	[MEASU100 .TXT]
↓	↓	↓
[AUTO5000.EXT]	[NONA5000.EXT]	[MEAS5000 .TXT]

File name extension

If no file name extension (3 characters after period) is entered, the following extensions are automatically assigned, according to the stored data type.

MEM	Memory binary data file	●
REC	Recorder binary data file	●
XYC	X-Y CONT recorder binary data file	●
SEQ	Memory segmentation index file	●
TXT	Text data file	-
SET	Setting data file	●
BMP	Bit map (.bmp) file	-
ARE	Waveform evaluation area	●
R_M	REC & MEM index file	●
FFT	FFT binary data file	●
POW	Power function binary data file	●
IDX	Saving of segmented index file	●

●: Files can be read into the instrument. -: Reading is not possible

10.7.2 Text data store example

If the comment setting is OFF, text data is saved as shown below.

```
"COMMENT","8855 MEM DATA"          : Comment string and data type
"DATE","03-28-2001"                : Date (MMDDYY)
"TIME","10:10:00"                  : Time
"NUM_SIGS",3                       : Signal Count
"INTERVAL",1.000E-06               : Horizontal Axis Interval
"HORZ_UNITS","s"                   : Horizontal Axis Units
"VERT_UNITS","s","V","V"           : Vertical Axis Units
"SIGNAL","TIME","ACH 1","ACH 2"    : Signal name
"DATA"                             : Data start
+0.000000000E+00,-5.9375E-03,+9.3750E-04
+1.000000000E-06,-5.6875E-03,+7.5000E-04
```

When setting title comments,
title comments are added accordingly.

When setting comments for each chann
comments are added accordingly.

Example 1 When the data for analog 4 channels and logic 4 channels is stored in Memory function.

```
"COMMENT","8855 MEM DATA"
"DATE","03-28-2001"
"TIME","10:10:00"
"NUM_SIGS",9
"INTERVAL",1.000E-06
"HORZ_UNITS","s"
"VERT_UNITS","s","V","V","V","V","Bit","Bit","Bit","Bit"
"SIGNAL","TIME","ACH 1","ACH 2","ACH 3","ACH 4","LCHA1","LCHA2","LCHA3","LCHA4"
"DATA"
 +0.000000000E+00,-5.9375E-03,+9.3750E-04,+2.3500E-03,-9.3750E-04,1,1,1,1
 +1.000000000E-06,-5.6875E-03,+7.5000E-04,+2.4125E-03,-1.0312E-03,1,1,1,1
 +2.000000000E-06,-5.5000E-03,+6.2500E-04,+2.3688E-03,-1.0437E-03,1,1,1,1
 +3.000000000E-06,-5.5000E-03,+6.2500E-04,+2.4000E-03,-1.1750E-03,1,1,1,1
 +4.000000000E-06,-5.3750E-03,+4.3750E-04,+2.4000E-03,-1.1687E-03,1,1,1,1
 +5.000000000E-06,-5.6250E-03,-5.1875E-03,+1.0250E-03,-1.2187E-03,1,1,1,1
 +6.000000000E-06,+4.3750E-04,-7.6875E-03,-1.1250E-03,-9.3750E-05,1,1,1,1
 +7.000000000E-06,+2.1875E-03,-6.1875E-03,-1.6875E-03,+8.0000E-04,1,1,1,1
 +8.000000000E-06,+1.5625E-03,-6.5000E-03,-2.0687E-03,+1.1687E-03,1,1,1,1
 +9.000000000E-06,+1.3750E-03,-6.3750E-03,-2.2500E-03,+1.3125E-03,1,1,1,1
 +1.000000000E-05,+1.3750E-03,-6.2500E-03,-2.2875E-03,+1.4250E-03,1,1,1,1
```

Example 2 When the data is stored in Recorder function.

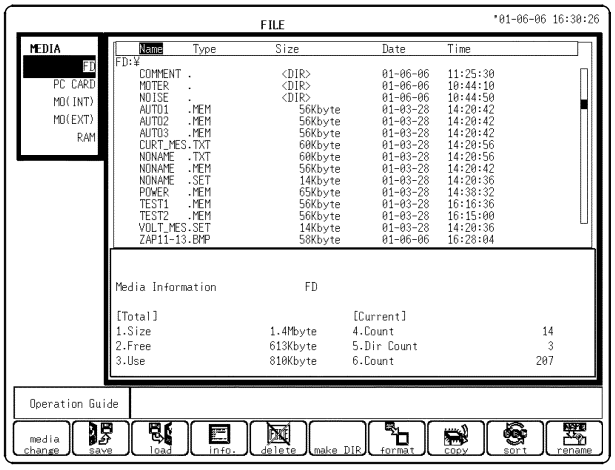
```
"COMMENT","8855 REC DATA"
"DATE","03-28-2001"
"TIME","10:10:00"
"NUM_SIGS",13
"INTERVAL",1.000E-04
"HORZ_UNITS","s"
"VERT_UNITS","s","V","V","V","V","Bit","Bit","Bit","Bit","Bit","Bit","Bit","Bit"
"SIGNAL","TIME","ACH 1(Max)","ACH 1(Min)","ACH 2(Max)","ACH 2(Min)","LCHA1(Max)",
"LCHA2(Max)","LCHA3(Max)","LCHA4(Max)","LCHA1(Min)","LCHA2(Min)","LCHA3(Min)","LCHA4(Min)
"
"DATA"
 +0.000000000E+00,+2.5000E-03,-8.5000E-03,+1.8125E-03,-8.9375E-03,1,1,1,1,0,0,0,0
 +1.000000000E-04,+2.2500E-03,-8.8125E-03,+1.8750E-03,-9.1250E-03,1,1,1,1,0,0,0,0
 +2.000000000E-04,+2.5000E-03,-8.7500E-03,+1.8125E-03,-9.2500E-03,1,1,1,1,0,0,0,0
 +3.000000000E-04,+2.4375E-03,-8.5000E-03,+2.0000E-03,-9.1250E-03,1,1,1,1,0,0,0,0
 +4.000000000E-04,+2.5625E-03,-8.6875E-03,+1.9375E-03,-9.3125E-03,1,1,1,1,0,0,0,0
 +5.000000000E-04,+2.3750E-03,-8.3750E-03,+1.9375E-03,-8.9375E-03,1,1,1,1,0,0,0,0
 +6.000000000E-04,+2.5000E-03,-8.8750E-03,+2.0625E-03,-8.8750E-03,1,1,1,1,0,0,0,0
 +7.000000000E-04,+2.3750E-03,-8.8125E-03,+1.8750E-03,-9.0625E-03,1,1,1,1,0,0,0,0
 +8.000000000E-04,+2.5000E-03,-8.6250E-03,+2.0625E-03,-9.3125E-03,1,1,1,1,0,0,0,0
 +9.000000000E-04,+2.3750E-03,-8.3750E-03,+2.0000E-03,-9.1875E-03,1,1,1,1,0,0,0,0
```

NOTE

The recorder functions sample waveforms at a rate that exceeds that indicated by the time axis on the screen. Data captured is converted to sampling data for display according to the range being displayed on screen, and the maximum and minimum values during the sampling period are stored in memory. However, if data is thinned out, the thinned data is simply saved in thinned form.

10.8 Loading the Data (LOAD)

Allows you to load settings and waveform data from the recording media to the 8855.



Procedure Screen: FILE SAVE (SYSTEM)

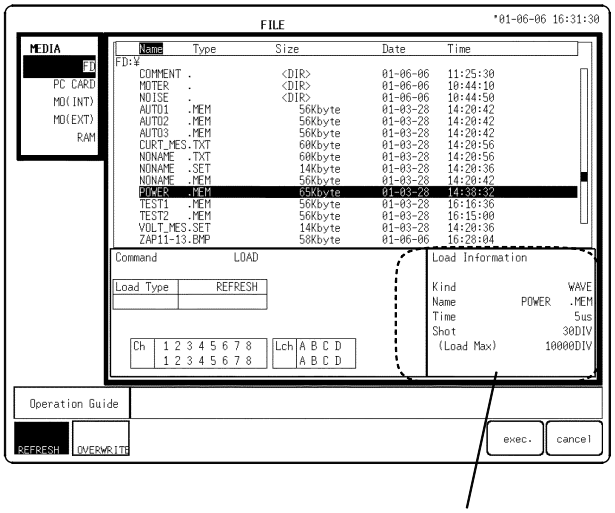
(1) Select the media to load. (See Section 10.5)

1. Press the **FILE** key to display the File screen.
2. Press the **F1** (**media change**) key.
3. Use the function keys to make selection.

(2) Select the Command.

1. Use the **JOG** control or cursor key to select the desired file.
2. Press the **F3** (**load**) key.

Function display	Meaning
load	: Loads data



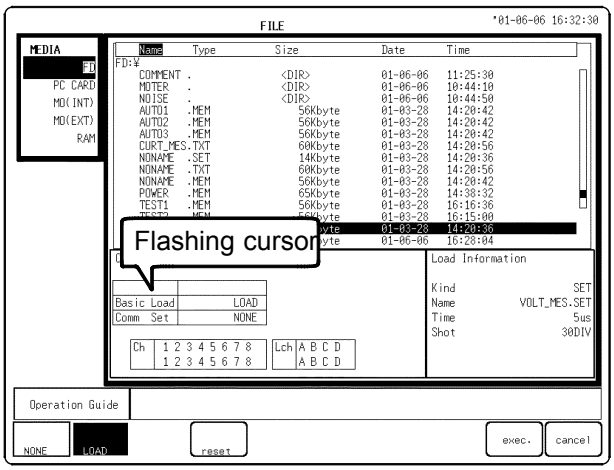
Loading information
Displays the information of the data to load.

(3) Select the type of file to load.

When the type of file is waveform data, you can select the loading format.
However, when the function and time axis range differ from the waveform of the instrument, and the waveform data was measured using external sampling, this is automatically set to **Refresh**.
If the data is loaded using **Overwrite**, it loads a multiple waveforms from multiple files, allowing layered writing.

1. Use the cursor key to move the flashing cursor to the **Load Information** position.
2. Use the function key to select the loading format.

Function display	Meaning
REFRESH	: Erases the instruments waveform data and loads new data.
OVERWRITE	: Loads data, leaving the instruments waveform data intact, except the data of the channels read.

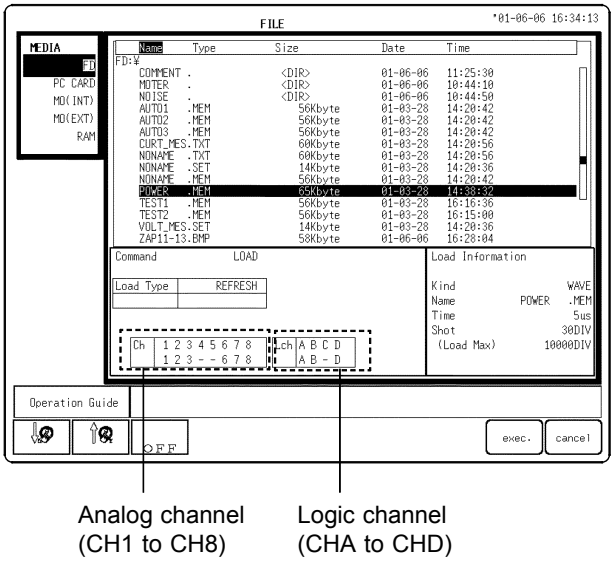


(4) Setting basic loading

When the file type is Setting Data, you can select exactly what to load.

1. Use the cursor key to move the flashing cursor to **Basic Load**.
2. Use the function key to select the loading format.

Function display	Meaning
NONE	: Does not load settings other than the channel settings. (Basic Load) : Does not load communication settings. (Comm Set)
LOAD	: Loads settings other than the channel settings. (Basic Load) : Loads communication settings. (Comm Set)
reset	: Reverts (5) Loading Destination Channel Settings to the settings prior to modification.



(5) Loading destination channel settings

You can select the channel to load the data.
It is possible to load to channels that are not installed on the instrument.

1. Use the cursor key to move the flashing cursor to **Load Ch**.
2. Use the ↑ and ↓ function keys to select the channel to load.
   OFF channels are not loaded.
   Analog and Logic can both be set.
   - indicates that it is OFF (not loaded).

(6) Loading

To load, press the **exec.** function key.

Function display	Meaning
exec.	: Loads the specified data. The loaded file will appear at the top-right corner of the display screen.
cancel	: Cancels the load command.

Loading waveform data of a split memory

When the memory is split, a directory is created when all blocks are set to Batch Save.
Waveform data of each block and index file (SEQ) are created in the directory.
To load the waveform data:

1. Move to the directory that was created. (See section 10.13.2)
2. Load the each blocks waveform file (MEM) or the index file (SEQ).
   When reading the index file (SEQ), it is possible to read in the waveform data of all blocks at one time.

Reading Waveform Data Measured With the Recorder & Memory Function

A directory is created when measured data is saved in a batch using the recorder & memory function. If waveform data saved in the memory (MEM) or waveform data of a split memory exists within the directory, waveform data for each block, recorded waveform data (REC), and an index file (R_M) are created.
To load the above data:

1. Move to the directory that was created.
2. Load the waveform data file stored in the memory (MEM), recorded waveform data file (REC), or index file (R_M).
   When reading the index file (R_M), if the waveform data is saved in the memory or part of a split memory, it is possible to read in the waveform data of all blocks and recorded waveform data at one time.

Loading segmented data

When a file is saved as segmented data, a new directory is created automatically.
In this directory, files are created with a maximum size that does not exceed the set upper limit.
To load the above data:

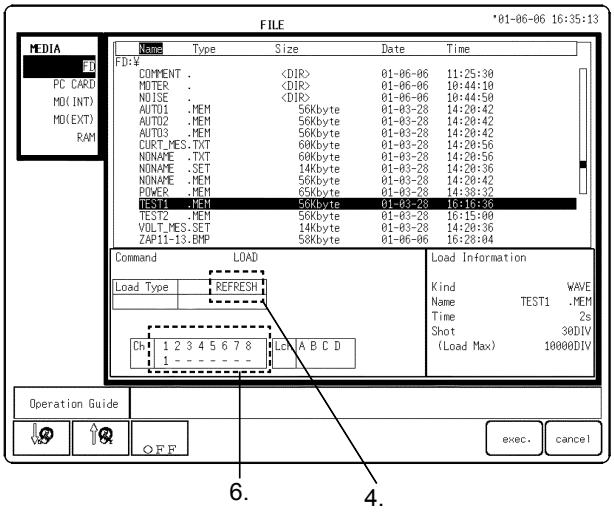
1. Move to the directory that was created.
2. Load the various files or index file (.IDX) inside the directory.
   When reading the index file (.IDX), it is possible to load all of the waveform data at one time.

NOTE

- In case of "OVERWRITE," the settings in the instrument are given preference. When the data in the instrument differs from the file functions or time-axis range, the data cannot be loaded.
- Waveform data measured using an external sampling cannot be Overwrite and Load.
- The data loading turn: CH1→8, CHA→D
- If the plural data are loaded in the same channel, the data most recently sent remains in the memory.
- Data stored in the text format is not readable by the 8855.
- Data saved by a MEMORY HiCORDER other than the 8855 cannot be loaded.
- The Recording Length that Can Be Loaded is shown in the Loading Information.Anything exceeding this limit is not loaded.
- When a file is loaded, the filename appears at the top-right corner of the display screen. This filename remains displayed until the <START> key is pressed.

To display the waveforms from a multiple files simultaneously (except for X-Y recorder, FFT function, power monitor function) :

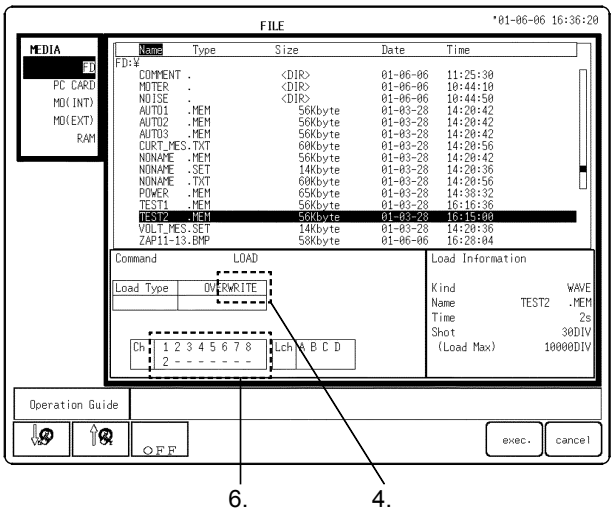
It is possible to simultaneously display the waveforms from different files on the screen.
(Only when the functions and time axis range are the same.)
This allows comparison of normal and abnormal waveforms.
For example, let's try to display the waveforms of CH1 from files TEST1 and TEST2 simultaneously on the screen.



Procedure Screen: FILE SAVE (SYSTEM)

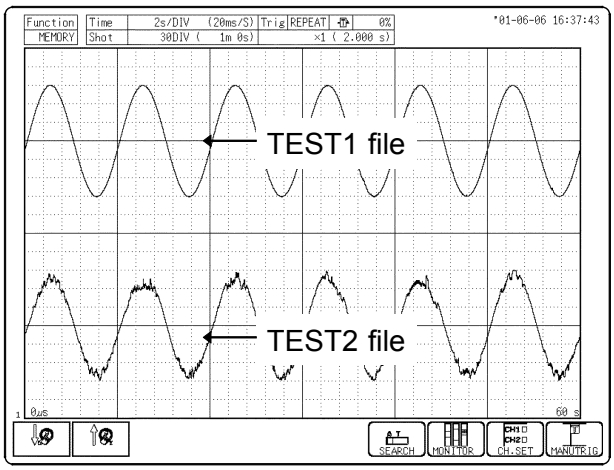
(1) First, load the waveform data from TEST1.

1. Use the cursor key or **JOG** to move the band cursor to the TEST1 file.
2. Press the **F3** (load) function key to select.
3. Use the cursor key to move the flashing cursor to **Load Type**.
4. Use the function key to select **Refresh** as the loading type.
5. Use the cursor key to move the flashing cursor to **Load Ch**.
6. Here, the waveform data of CH1 in that file is loaded to CH1 of the instrument. Use the function key to turn the channels other than CH1 OFF (so that they display).
7. Press the **F9** (exec.) function key to load the waveform data from TEST1 to CH1.



(2) Next, load the waveform data from TEST2.

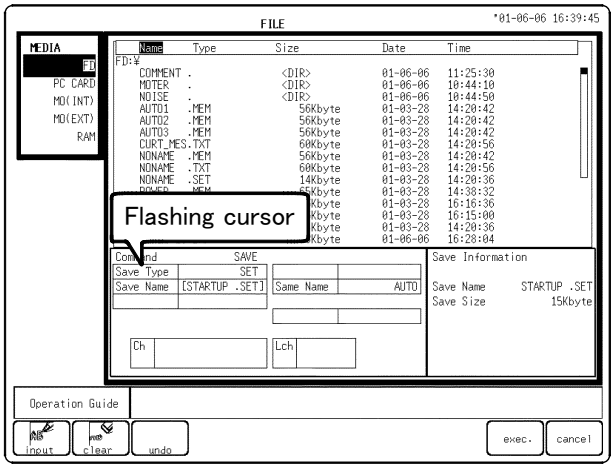
1. Press the **FILE** key to access the File screen, then use the cursor key or **JOG** to move the band cursor to the TEST2 file.
2. Use the **F3** (load) function key to select.
3. Use the cursor key to move the flashing cursor to **Load Type**.
4. Use the function key to set **Overwrite** as the loading type.
5. Use the cursor key to move the flashing cursor to **Load Ch**.
6. Here, the waveform data of CH1 in that file is loaded to CH2 of the instrument.
   Use the function key set CH1 to 2 and to turn the channels other than CH1 OFF (so that they display).
7. Press the **F9** (exec.) function key to load the waveform data from TEST2 to CH2.



(3) This displays the waveforms of TEST1 and TEST2.

Auto Setup Function

When you turn on the instrument, this function automatically loads settings from memory.
Media that can use this function are floppy disks, PC cards, and the instrument's memory (RAM).
This is enabled if the settings file STARTUP.SET exists on floppy disk, a PC card, or in the instrument's memory.



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Set the media to floppy disk, PC card, or RAM. (See section 10.5)
3. Select **Save** with the function key.
4. Use the cursor key to move the flashing cursor to **Save Type**.
5. Use the function key to select **Settings** as the save type.
6. Use the cursor key to move the flashing cursor to **Save Name**.
7. Select **Character Input** with the function key and save with the file as **STARTUP.SET**.
8. This completes the file (settings) for auto-setup. When the instrument is turned on, this file is loaded automatically.

NOTE

- The auto-setup function is enabled only for floppy disks, PC cards, or the instrument's memory.
- The file priority for auto-setup is in 1) RAM, 2) floppy disk, 3) PC cards, if more than one type of media exists.
- Place the auto-setup file in the root directory.

Note on Overwrite loading

To load the measured data file into the 8855 when it already contains previously measured data, the previous data takes precedence over the new data (in such an event, "Partly").
Therefore, to reflect all the settings for the waveform data to be loaded, select "REFRESH." When the functions of the new data differ from those of the previous data (i.e., when the data exists in the memory but you want to load the recorder data), the above operation is unnecessary.

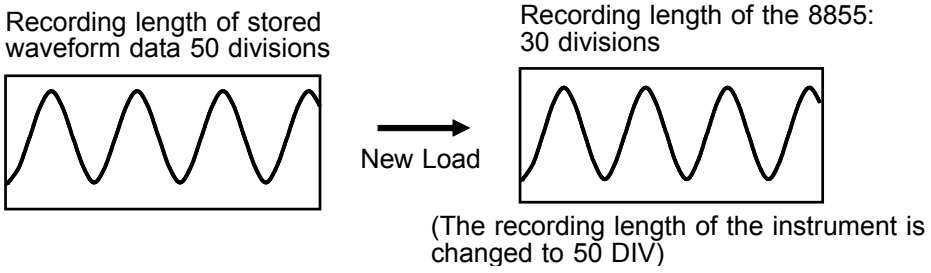
Screens	WAVE (Binary)				SET
	MEM	REC	FFT	POW	
STATUS screen*	Partly	Partly	Partly	Partly	●
MEMORY DIV screen	-		-	-	●
MEASUREMENT screen	Partly			● (power)	●
TRIGGER screen	●	●	●	●	●
CHANNEL screen	●	●	●	●	●
Variable screen	●	●	●	●	●
Scaling settings	●	●	●	●	●
Comment settings	●	●	●	●	●
SYSTEM screen	-	-	-	-	●

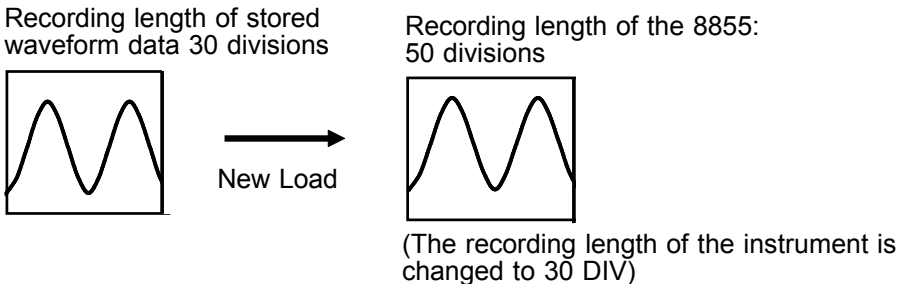
●: Set by the saving data Partly: Set by the instrument setting
-: No data
*: Channels used are not loaded when loading waveform data.

NOTE

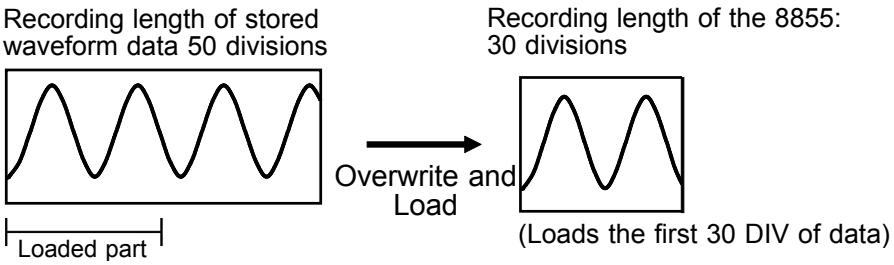
- When reading index files, you cannot select to overwrite and load.
- Trigger settings (internal triggers) for each channel are reflected, but other trigger settings (pre-trigger, external trigger, etc.) are not.
- When using Overwrite and Load, only the settings of the loaded channels are reflected.

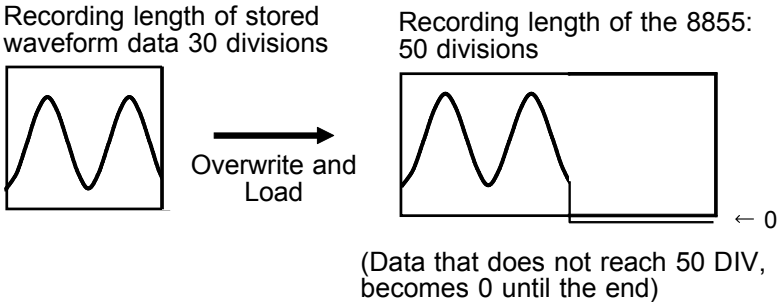
When the recording length of stored data and the recording length of the 8855 differ:
New Load: Record length of the saved data has priority.





Overwrite and Load: Record length of the instrument has priority.

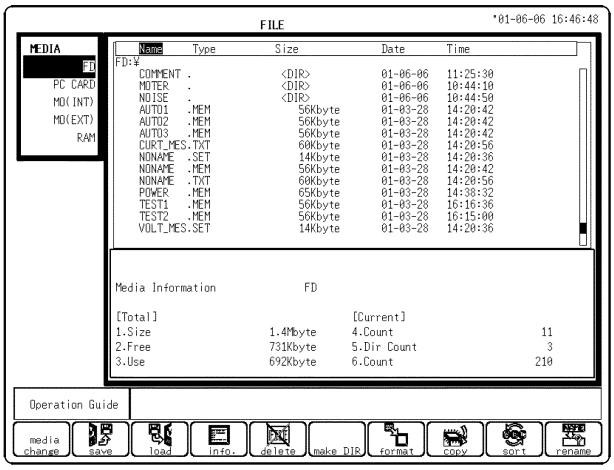




(0: Bottom edge data value when no zoom function is applied to the voltage axis.)

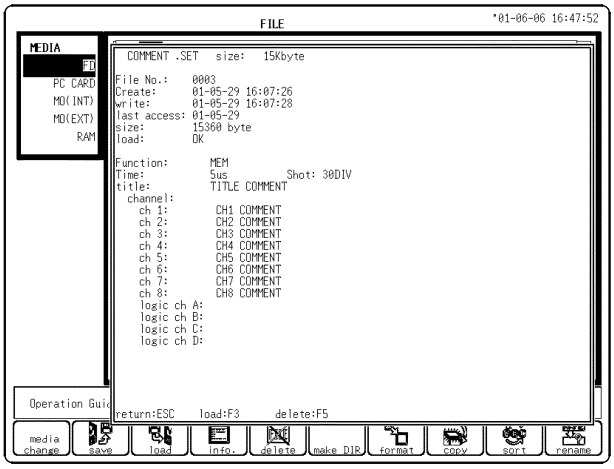
10.9 File Information (INFO)

Displays file or directory information.



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Select **MEDIA**.
3. Use the **JOG/SHUTTLE** control or the cursor keys to select the desired file name.
4. Use the **F4** (info.) function key and the selected file or directory information appears.

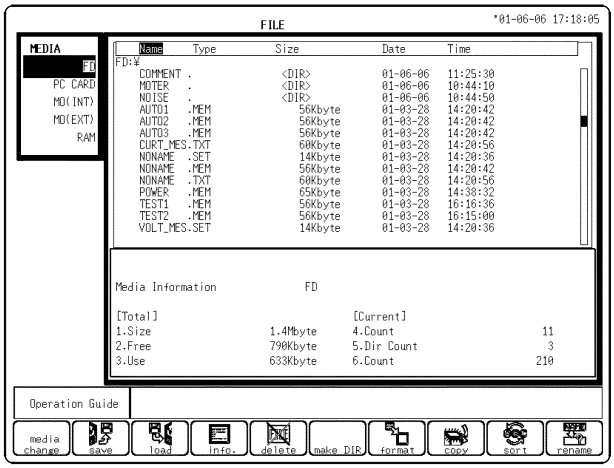


Function display	Meaning
info.	: File information

5. Press the **ESC** key to exit.

When displaying the information of files that can be loaded, you can load the file by pressing **F3** (**load**) key. Press the **F3** function key to display the load command screen.
When displaying the information of files or directories that can be deleted, you can delete them by pressing **F5** (**delete**) key. Press the **F5** function key to display the delete command screen.
When displaying the information of waveform data in text format, you can load the content of the file by pressing **F3** (**load**) key. Press the **F3** function key to display the text data. Scroll up or down with the cursor key. Press the **ESC** key to exit.

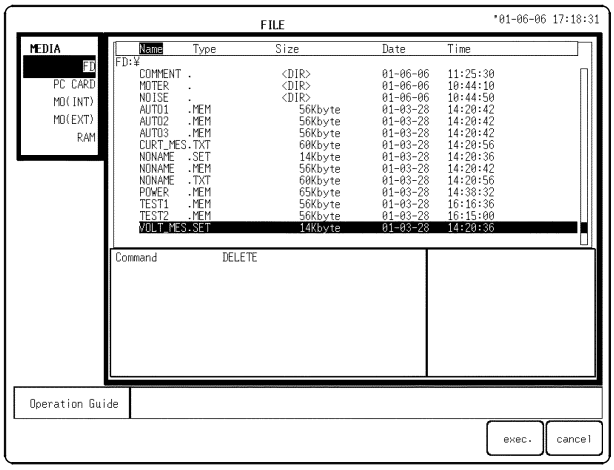
10.10 Deleting a File (DELETE)



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Select **MEDIA**.
3. Move the band cursor to the file that you want to delete.
4. Press the **F5** (**delete**) keys.

Function display	Meaning
delete	: Deletes a file



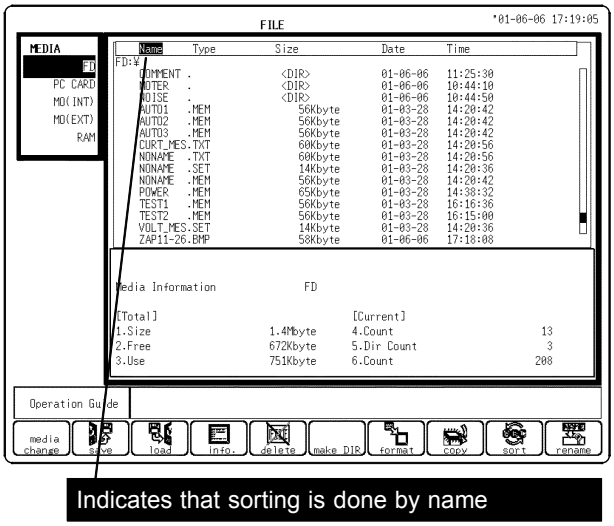
5. Use the **F9** (**exec.**) function key and select to delete.

Function display	Meaning
exec.	: Deletes files
cancel	: Cancels the delete command.

NOTE You cannot save to write-protected media (to prevent overwriting).

10.11 Sorting Files (SORT)

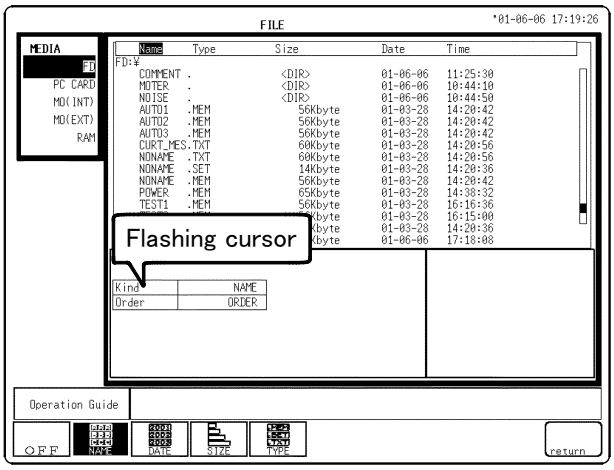
The file screen is sorted by type. The sort order can be selected from file name, date, file size and type (file extension).



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Press the **F9** (**sort**) keys to select.

Function display	Meaning
sort	: Rearranges files



3. Move the flashing cursor to **Kind**.
4. Use the function key to select the kind.

Function display	Meaning
OFF	: No sorting
NAME	: Sorts in order of file names
DATE	: Sorts in order of dates
SIZE	: Sorts in order of file sizes
TYPE	: Sorts in order of extensions

5. Move the flashing cursor to **Order**.
6. Use the function key to select order.

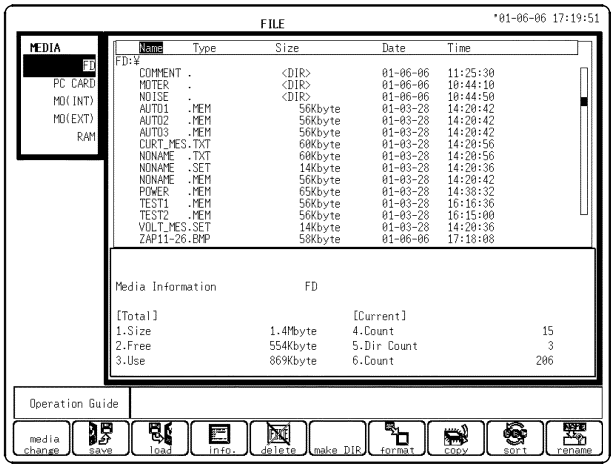
Function display	Meaning
ORDER	: Sorts descending
REVERSE	: Sorts ascending

7. To exit, press the **F10** (return) function key.

NOTE When directories and files are mixed, directories are always displayed before files.

10.12 Changing the File Name

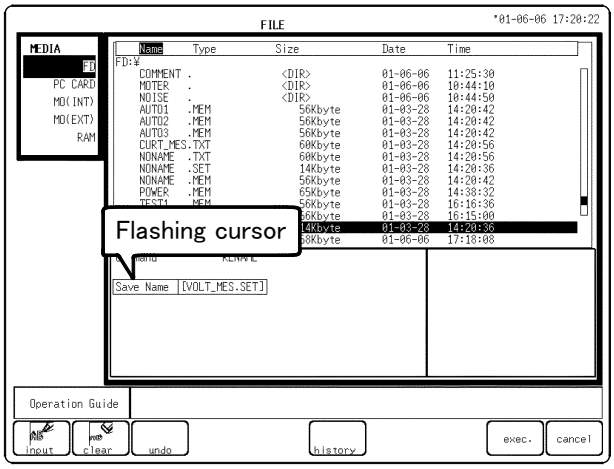
Allows you to change the name of files or directories.



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Select Media.(See section 10.5)
3. Use the **JOG**, **SHUTTLE**, or cursor keys to move the band cursor to the file or directory name that you want to change.
4. Press the **F10** (**rename**) function key.

Function display	Meaning
rename	: Renames files



5. Input a new name. See section 10.7.1, item (4) for details about inputting file names.
6. To change the name, use the **F9** (**exec.**) function key.

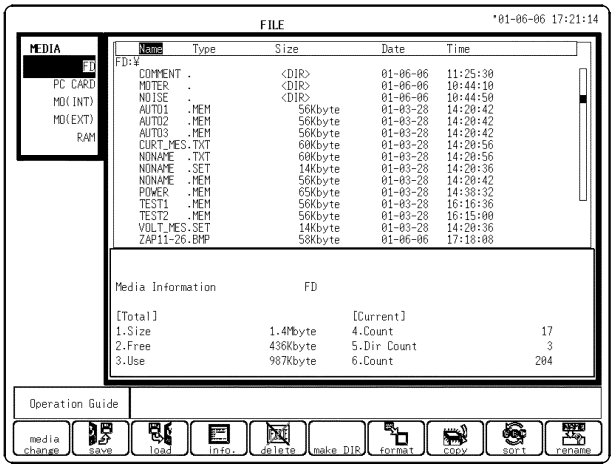
Function display	Meaning
exec.	: Changes names
cancel	: Cancels the name change

NOTE You cannot save to write-protected media (to prevent changing the file name).

10.13 Operating the Directory

10.13.1 Making a Directory (MK DIR)

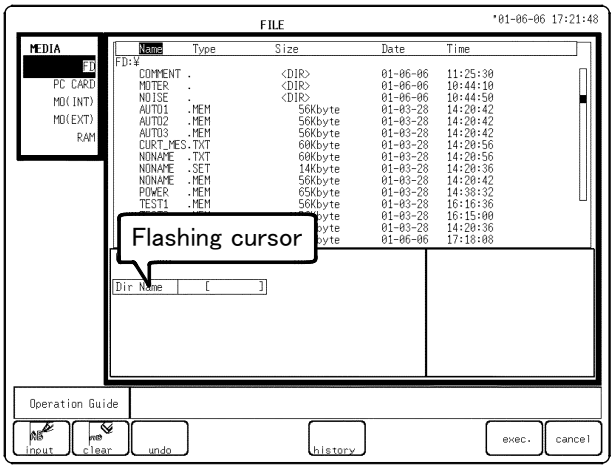
Creates a subdirectory on the selected medium.



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Select **MEDIA**. (See section 10.5)
3. Press the **F6** (**make DIR**) keys to select.

Function display	Meaning
make DIR	: Creates a directory



4. Input a new directory name. The input method is the same as the one for file names. See section 10.7.1, item (4) for details about inputting file names.

Function display	Meaning
input	: Opens the window where to input the file name.
clear	: Clear the file name.
undo	: Returns to the previous file name, ignoring changes

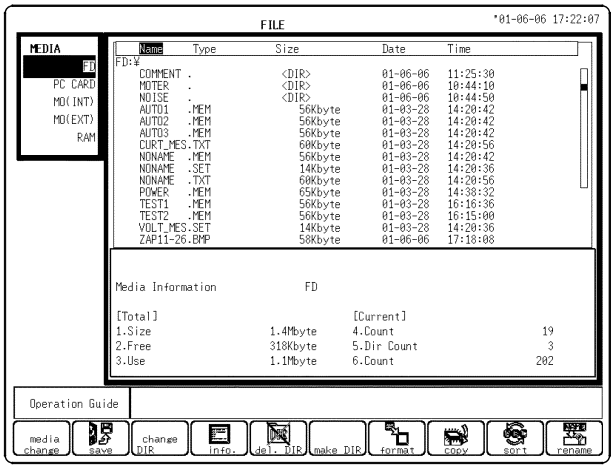
5. To create a directory, press the **F9** (**exec.**) function key.

Function display	Meaning
exec.	: Creates a directory
cancel	: Cancels the directory creation command

NOTE You cannot save to write-protected media (to prevent overwriting).

10.13.2 Changing a Directory (CH DIR)

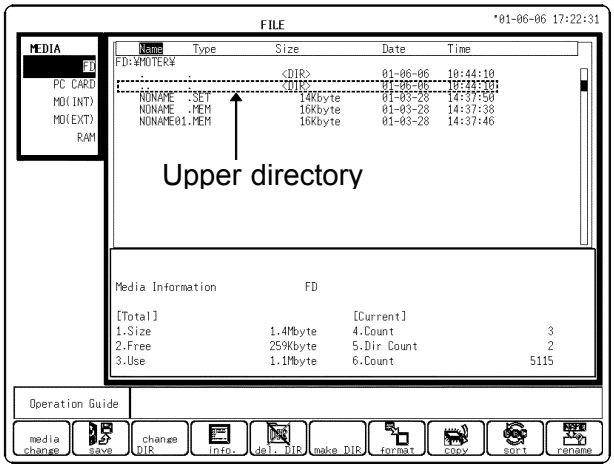
A directory is changed. The 8855 provides direct movement only one layer up or down in the directory hierarchy.



Procedure Screen: FILE SAVE (SYSTEM)

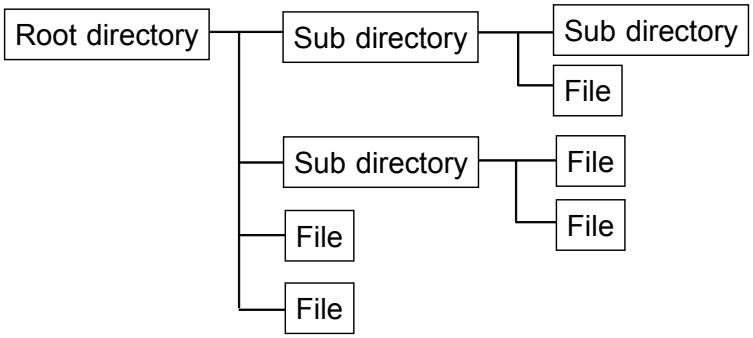
1. Press the **FILE** key to display the File screen.
2. Select **MEDIA**. (See section 10.5)
3. Use the cursor key or **JOG** to move the band cursor to the appropriate directory. Items showing <DIR> in the Size column of the file list are directories.
4. Press the **F3** (**change DIR**) function key and move to the directory specified by the band cursor.

Function display	Meaning
change DIR	: Changes a directory



When you want to move down the folder hierarchy, move the band cursor to the directory where you wish to move.
When you want to move up the folder hierarchy, move the band cursor to the .. directory.

Directory organization

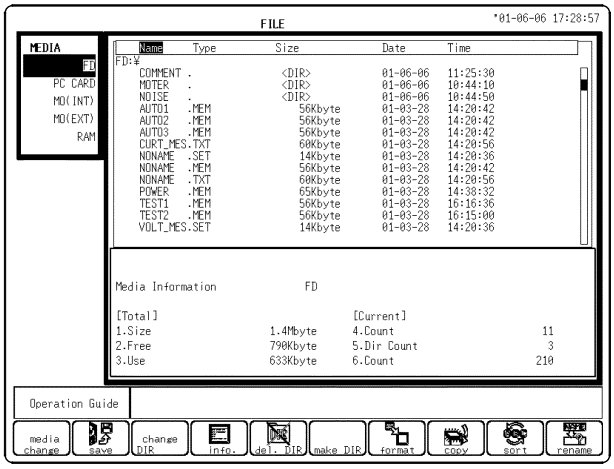


NOTE

- Stores a file in the directory currently selected on the File screen.
- The directory and the number of files that can be stored in the directory are limited.

10.13.3 Deleting a Directory (RM DIR)

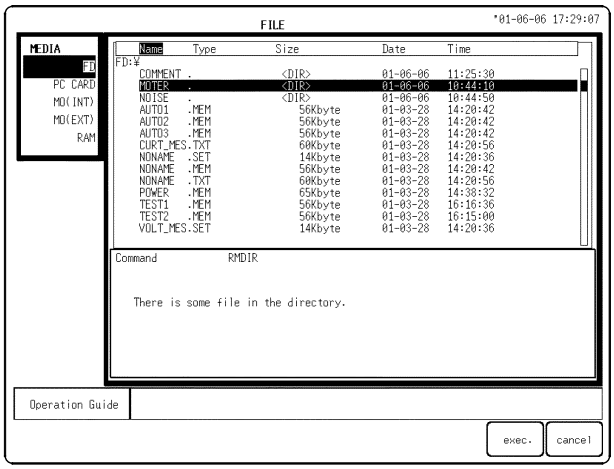
A directory is deleted. Even if there are files and directories in a directory, the directory can be deleted.



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Select **MEDIA**. (See section 10.5)
3. Using the **JOG/SHUTTLE** control, or the cursor key, select the target directory on the bar cursor from the file list.
   Items showing <DIR> in the Size column of the file list are directories.
4. Use the **F5** (**del. DIR**) function key and to delete the directory pointed to by the band cursor.

Function display	Meaning
del. DIR	: Deletes a directory



5. To create a directory, press the **F9** (**exec.**) function key.

Function display	Meaning
exec.	: Delete a directory.
cancel	: Cancel the deletion procedure.

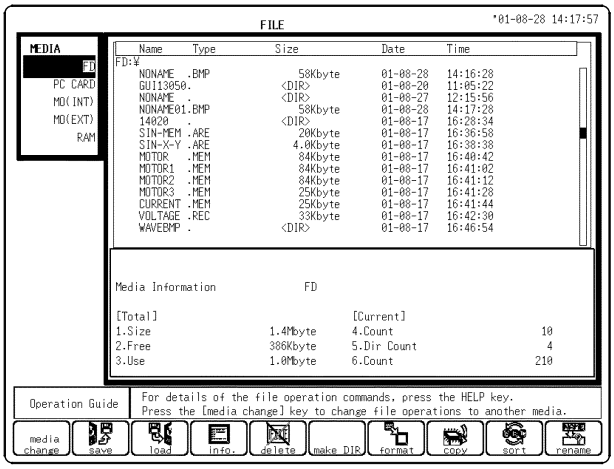
Indicates whether or not there are files in the folder.

NOTE

You cannot save to write-protected media (to prevent deleting a file).

10.14 Copying Files

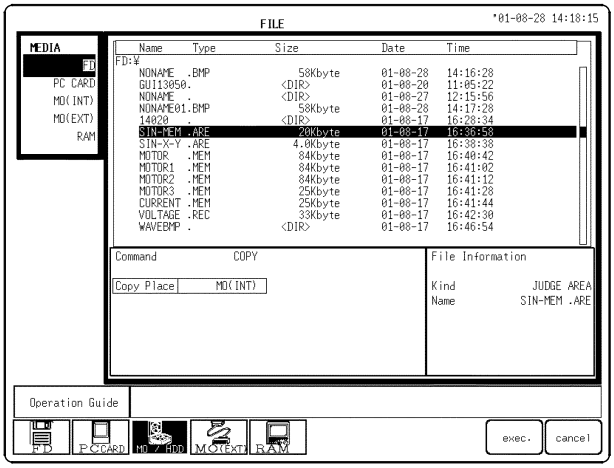
You can copy files between different types of media.
For example, you can copy files from a FD to an MO.



Procedure Screen: FILE SAVE (SYSTEM)

1. Press the **FILE** key to display the File screen.
2. Select the media that is the copy source. (See Section 10.5.)
3. Use the cursor key or **JOG** control to move the band cursor to the directory or file you want to copy.
4. Use the **F8** (**copy**) function key and to delete the directory pointed to by the band cursor.

Function display	Meaning
	: Floppy disk
	: PC card
	: Internal MO disk or hard disk
	: Sets the external MO connected to the SCSI interface.
	: Sets the 8855's memory as the recording media.

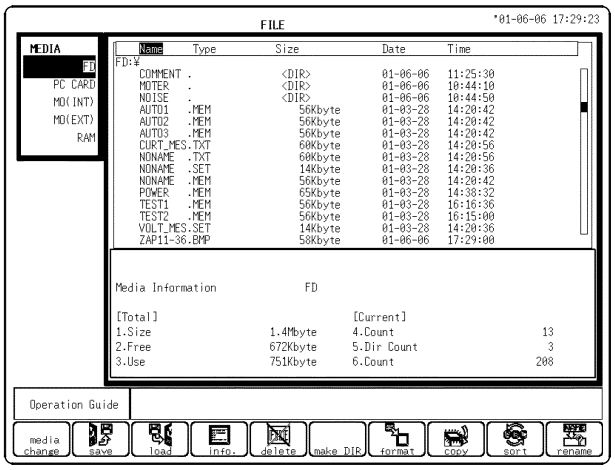


5. Select the save destination media.
6. To copy the file, use the **F9** (**exec.**) function key.

Function display	Meaning
exec.	: Copies the data.
cancel	: Cancels the copy command.

10.15 Printing the File List

Prints a list of files displayed on the file screen.



Procedure Screen: FILE

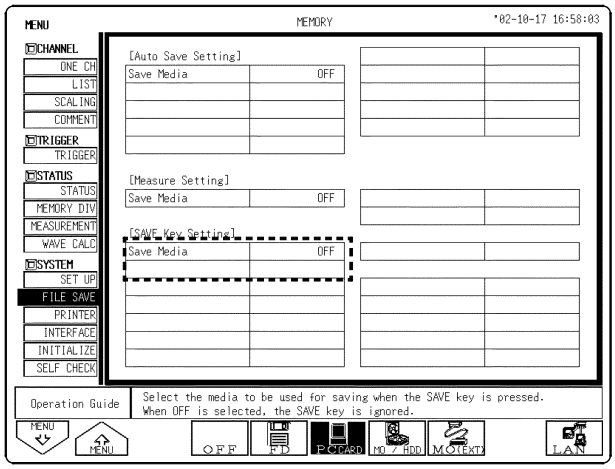
1. Press the **FILE** key to display the File screen.
2. Select **Media** to display the list of files to print. (See section 10.5) When you want to print a list of files in a sub-directory, move to the directory that you want to print. (See section 10.13.2)
3. Press the **PRINT** key to start printing. See Instruction Manual section 10.5 for an printout example.

NOTE

The data to be printed is that displayed on the file screen.
Only directory names are printed; not their contents.

10.16 SAVE Key Settings (One-touch Save)

Use the **SAVE** key to allow you to save data quickly and easily.
Press the **SAVE** key to save preset data.
Use the **SAVE** key to save screen and waveform images.
Before you use the **SAVE** key, you need to set the **SAVE** key functions.
Press the **SAVE** key to set on what media you want to save your data.



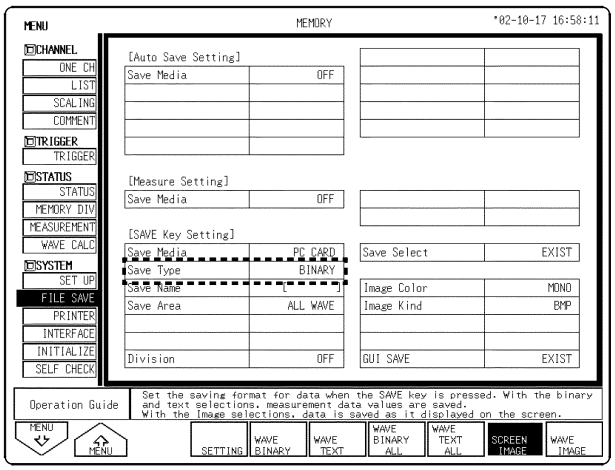
Procedure Screen: FILE SAVE (SYSTEM)

(1) Setting the Recording Media

Select the destination of the data.

1. Access the Save screen.
2. Move the flashing cursor to **Save Media** in the **SAVE key settings**.When you press the **SAVE** key when **Save Media** is inactive, the flashing cursor automatically moves there.
3. Use the function key to select what media you want to use to save your data.

Function display	Meaning
OFF	: Disables the **SAVE** key
FD	: Saves the data on a floppy disk
PCCARD	: Saves the data on a PC card
MO / HDD	: Saves the data on the internal MO/HD
MO(EXT)	: Saves the data on an external MO connected to the SCSI interface
LAN	: Saves the data on a server connected through a LAN This requires the 9333 LAN COMMUNICATOR.

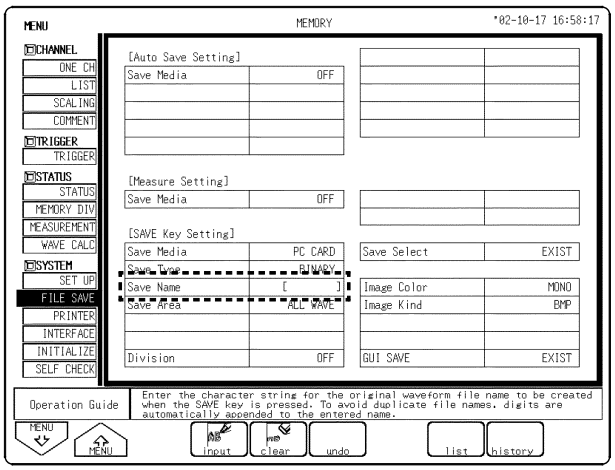


(2) Setting the File Format

Select the type of data to be saved.

1. When you select save media, **Save Type** appears.
2. Move the flashing cursor to **Save Type**.
3. Use the function key to select the type of data to be saved.

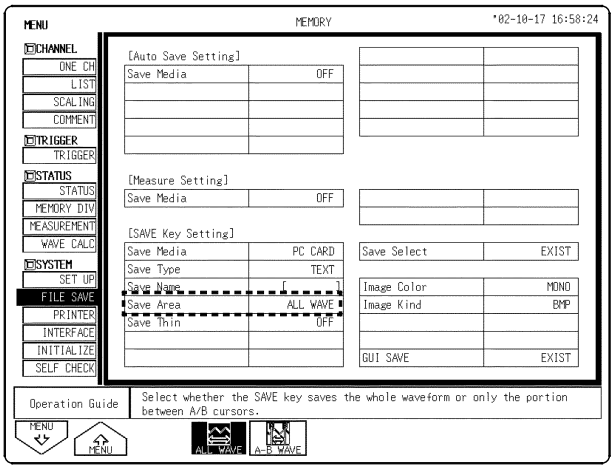
Function display	Meaning
SETTING	: Settings
WAVE BINARY	: Waveform data, binary format (Displayed block when memory segmentation is ON; displayed waveform data when REC&MEM is ON)
WAVE TEXT	: Waveform data, text format (Only displayed blocks when memory is split) Waveform data displayed on the screen when REC&MEM is selected.
WAVE BINARY ALL	: Waveform data of all blocks or REC & MEM, binary format (Enabled when the memory is segment or REC & MEM)
WAVE TEXT ALL	: Waveform data of all blocks or REC & MEM, text format (Enabled when the memory is segment or REC & MEM)
SCREEN IMAGE	: Screen Image (Bitmap Format) Saves the displayed screen image
WAVE IMAGE	: Waveform Image (Bitmap Format) Saves the waveform image routed to the printer



(3) Setting Under What Name to Save Files

Allows you to set under what name the file is saved.

1. When you select a floppy disk, PC card, or MO as the Save Media, **Save Name** appears. (When the save media is on a LAN, you cannot set under what name you want to save files.)
2. Move the flashing cursor to **Save Name**.
3. Sets under what name the files are to be saved. See section 10.7.1, item (4) for details about how to input the names. From the second save with the **SAVE** key, the 8855 automatically appends a number to the preset file name, to avoid duplication. (Maximum 4 digits)
   Also, when the last character of the file name is already a digit, the increment of file names continues from there.
   Example
   When you set the name to TEST:
   TEST, TEST0001, TEST0002, etc.
   When you set the name to TEST1:
   TEST1, TEST2, TEST3, etc.



(4) Setting the Saving Area

Selects the area of the waveform to be saved. When using A-B cursor on the Waveform display screen, you can save part of the waveform.

1. When the type of data to save is set to waveform data, **Save Area** to save appears.
2. Move the flashing cursor to **Save Area**.
3. Use the function key to select the area of the waveform to be saved.

Function display		Meaning
	:	Saves all the waveforms in the instrument's memory
	:	Only saves the waveform between cursors A and B When only using cursor A, saves the data from cursor A

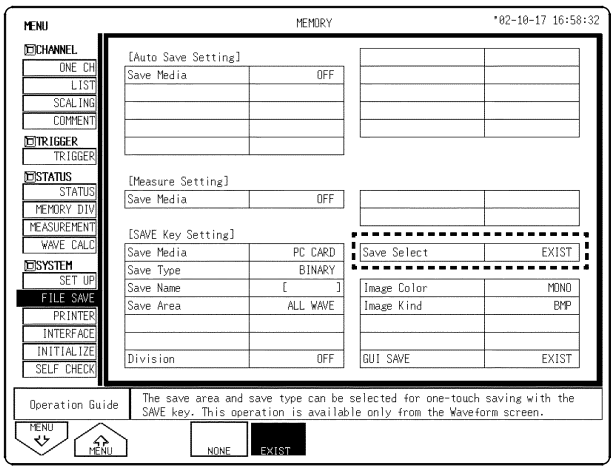
(5) Setting Thinning

Sets the thinning rate of the waveform (in text format).

1. When the type of data to save is waveform in text format, **Save Thin** appears.
2. Move the flashing cursor to **Save Thin**.
3. Use the ↑ and ↓ function keys to set the thinning rate.
   Contents of the Selection
   OFF, 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, 1/1000

(6) File segmentation

Files can be segmented and saved when Binary is selected as the Data Type.
Segmented file sizes: 32 MW, 128 MW or 512 MW

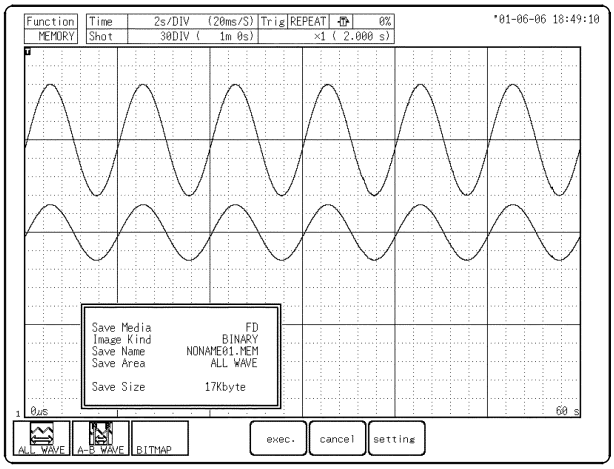


(7) Setting Save Operations Selection

Allows you to select how to perform save operations.
You can specify whether to save immediately or save after selecting operations when you press the **SAVE** key.
This operation is enabled only on the Waveform display screen.

1. When the type of data to save is set to waveform data, **Save Select** appears.
2. Move the flashing cursor to **Save Select** item.
3. Use the function key to select the how to perform save operations.

Function display	Meaning
EXIST	: Once the **SAVE** key is pressed, the save operation is not immediately performed, allowing you to select the operations below. Doing this helps prevent misuse of the SAVE key. You can also select the area of data that you want to save, as well as save screen images.
NONE	: Saves the data immediately when the SAVE key is pressed. (One-touch Save)



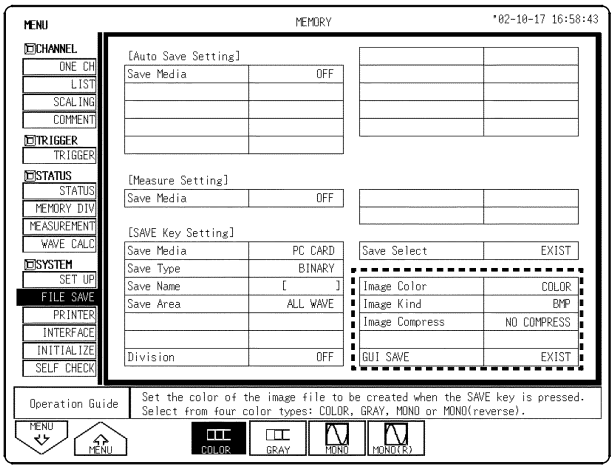
When Save Select is set to Yes.

1. Press the **SAVE** key.
2. Use the function key to select the waveform to be saved.

Function display	Meaning
ALL WAVE	: Saves all the waveform regardless of A-B cursor.
A-B WAVE	: Saves only the waveform between cursors A and B. (When using only cursor A, saves the data after it)
BITMAP	: Saves the screen image (Bitmap Format)

3. To save, press the **F5** (**exec.**) function key.

Function display	Meaning
exec.	: Saves the data
cancel	: Cancels save
setting	: Shifts to the **SAVE** key settings screen



(8) Setting the Color of Saved Images

Allows you to select the color of the image to be saved.
The image type is preset to Bitmap format and it cannot be changed.

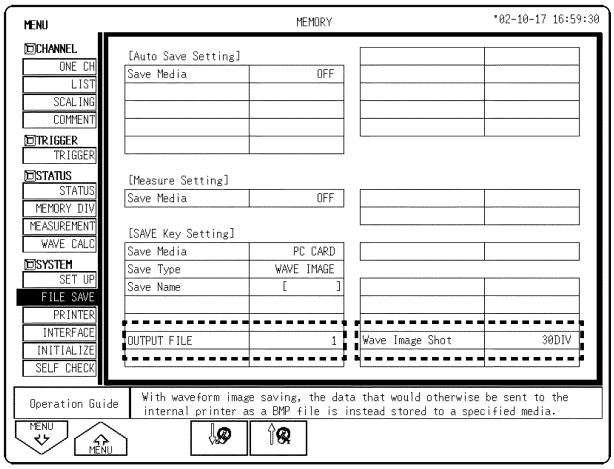
1. When you set the type of data to save is set to waveform data or screen image, **Image Color appears**.
2. Move the flashing cursor to **Image Color**.
3. Use the function key to select the color of the image to be saved.

Function display	Meaning
COLOR	: Saves the image as it is displayed
GRAY	: Saves the image in grayscale (16 shades)
MONO	: Saves a black on white image
MONO(R)	: Saves a white on black image

(9) Saving GUI

Select whether to save the GUI when saving a waveform screen image in BMP format.

Function display	Meaning
NONE	: Do not save the GUI of the screen image
EXIST	: Save the GUI of the screen image



(10) Setting the Image Compression

Allows you to select the compression of the image to be saved.
You can compress images when you save them. The quality of the image not affected by compression. There are some cases in which compressed images cannot be opened, depending on what software you use. In such cases, do not compress images.
When the saving media is on a LAN, you cannot set this.

1. When the image is saved in color or in grayscale, **Image Compress** appears.
2. Move the flashing cursor to **Image Compress**.
3. Use the function key to select the compression of the image to be saved.

Function display	Meaning
NO COMPRESS	: Does not compress
COMPRESS	: Compresses

(11) Setting the Waveform Image Recording Length

Allows you to set the length of the waveform image to be saved.
When the waveform measured is shorter than the waveform image recording length, the instrument saves the measured length only.
When using A-B cursor, saves the data between the two cursors.
When only using cursor A, saves the data from cursor A.
When the area specified by A-B cursor is shorter than the waveform image recording length, saves the specified area only. Inversely, if the area is longer, it saves the waveform image recording length only. This setting is based on the print size (see 9.4.5).

1. When you set the type of data to save to waveform image, **Wave Image Shot** appears.
2. Move the flashing cursor to **Wave Image Shot**.
3. Use the ↑ and ↓ function keys to set the recording length to be saved. Setting Area: 1 to 60 DIV.

Number of Output Files

You can save a measured waveform exceeding the waveform image recording length in multiple files.
1. Move the blinking cursor to **[Number of output files]**.
2. Use the ↑ or ↓ function key, or the jog wheel to specify the number of files.
[Setting range] 1 to 100, ALL

One-touch Save

You can perform the same operation with the **SAVE** key as when saving data from the file screen.
You can save waveforms with a single touch, while watching them on the Waveform display screen.
(When Save Operations Selection is set to No.)
Press the **SAVE** key to save the preset data.
When Save Operations Selection is set to Yes, after you press the **SAVE** key, you can select whether to save the waveform data or the screen image. Or, you can specify the area of data to be saved.

Saving Screen Images

You can save the instruments screens as bitmap (.bmp) files.
Set the **SAVE** key Data Type setting to Displayed Image.
Press the SAVE key to save screen images.

Saving Waveform Images

Allows you to save printed waveforms as bitmap (.bmp) files.
Set the **SAVE** key Data Type setting to Waveform Image.
Press the **SAVE** key to save the waveform routed to the printer as a bitmap.
Data is saved with a Time Axis to Voltage Axis ratio of 2.5:1.

NOTE

The BMP size varies depending on the print size setting of the printer.

Chapter 11
External Input/ Output Terminals/ Key Lock Function

11.1 External Input/Output Terminals

11.1.1 Connecting the Terminals

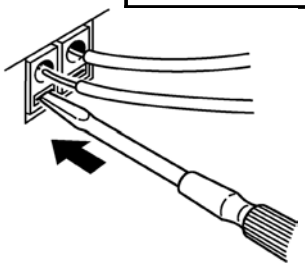
⚠ DANGER

External I/O terminal connections
A common GND is used for the external I/O terminals (START, STOP, GO, NG, EXT_OUT, EXT_TRIG, EXT_OUT, and EXT_SMPL terminals) and the 8855 instrument. The terminals are not isolated. To prevent damage to the object connected to the external I/O terminals and the 8855 instrument, wire the terminals so that there is no difference in electrical potential between the GND for the external I/O terminals and the GND for the connected object.

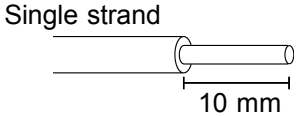
⚠ WARNING

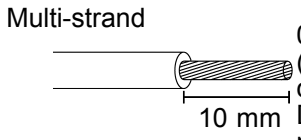
Maximum input voltage ratings for the input/output terminals of the 8855 are shown below. To avoid the risk of electric shock and damage to the instrument, take care not to exceed these ratings.

Input/output terminal	Maximum input voltage	Maximum rated voltage to earth
EXT TRIG START/STOP PRINT EXT SMPL	-5 to +10 V DC	Not insulated
TRIG OUT GO NG	-20 V to +30 V DC 500 mA max. 200 mW max.	



1. Push the tab with a flatblade screwdriver or similar.
2. While keeping the tab depressed, insert a stripped wire into the connector opening.
3. Release the tab to lock the wire.





Recommended wire
Single strand: 1.0 mm dia. (AWG #18)
Multi-strand: 0.75 mm^2

Usable limits
Single strand: 0.3 to 1.0 mm dia. (AWG #26 to #18)
Multi-strand: 0.3 to 0.75 mm^2 (AWG #22 to #20)
Strand diameter: minimum 0.18 mm

Standard insulation stripping length: 10 mm

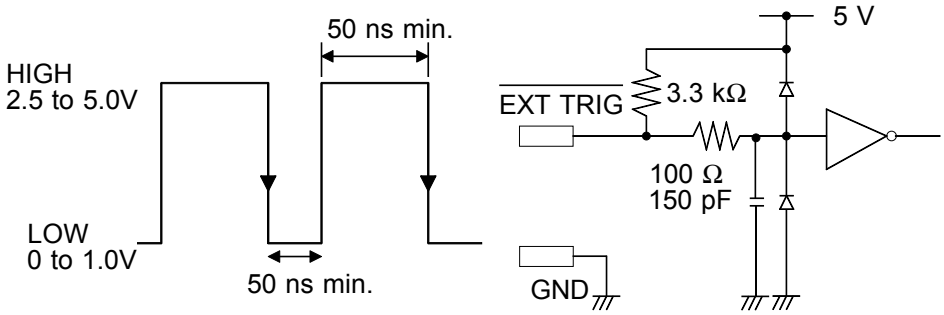
11.1.2 External Trigger Input Terminal [EXT TRIG]

- An external signal can be used as trigger source.
- Several 8855 instruments can be synchronized for parallel operation.

Signal input method

- Short the terminal to ground, or input a pulse signal (High level: 2.5 to 5.0 V, Low level: 0 to 1.0 V) or a square wave signal.
- Triggering is activated at the falling edge of 2.5 V of the input waveform or using a terminal short.
- You can select a rising or falling waveform. Default: Rise
  (Setting procedure: See "9.2.11 Setting External Terminals")

Voltage range	High level: 2.5 to 5.0 V, Low level: 0 to 1.0 V
Pulse width	High level: min. 50 ns, Low level: min. 50 ns
Maximum input voltage	-2 to 7 V



NOTE The external trigger input (EXT TRIG) cannot be used, unless the external trigger is enabled on the Trigger screen.

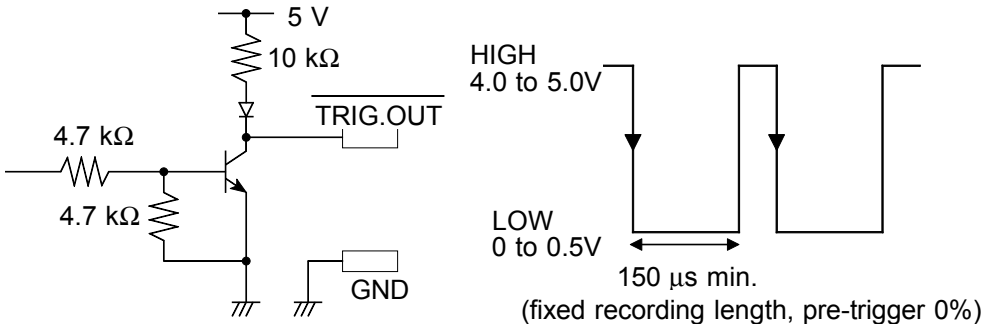
11.1.3 Trigger Output Terminal [TRIG OUT]

- When triggering occurs, a signal is output from this terminal.
- Several 8855 instruments can be synchronized for parallel operation.

Trigger output signal

Signal type	Open-collector signal, active Low
Output voltage	High level: 4.0 to 5.0 V
Range	Low level (sampling period x the number of data*) min.
Pulse width	Low level: min. 10 ms.
Maximum input voltage	-20 to +30 V, max. 500 mA, max. 200 mW

*: After triggering occurs



NOTE When the auto range function is activated by pressing the **AUTO** key, a trigger output signal is generated. This should be taken into consideration when using both the trigger output and the auto range function. (Memory function only

11.1.4 External Sampling Terminal [EXT SMPL]

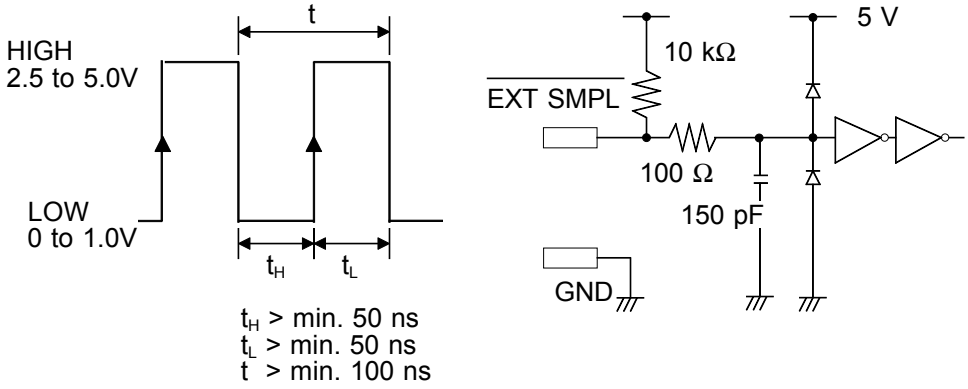
An external signal can be used to set the sampling rate.

Signal input method

- Input a pulse signal (High level: 2.5 to 5.0 V, Low level: 0 to 1.0 V) or a square wave signal to the terminal to ground.
- Triggering is activated at the falling edge of the input waveform.

Voltage range	High level: 2.5 to 5.0 V, Low level: 0 to 1.0 V
Pulse width	High/Low level: 50 ns min.
Frequency	Memory 10 MHz max.
Maximum input voltage	-2 to 7 V

- You can select a rising or falling waveform. Default: Rise
(Setting procedure: See "9.2.11 Setting External Terminals")



t_H > min. 50 ns
t_L > min. 50 ns
t > min. 100 ns

NOTE The external sampling can be used in Memory function. To use external sampling, set the time-axis range to "EXT."

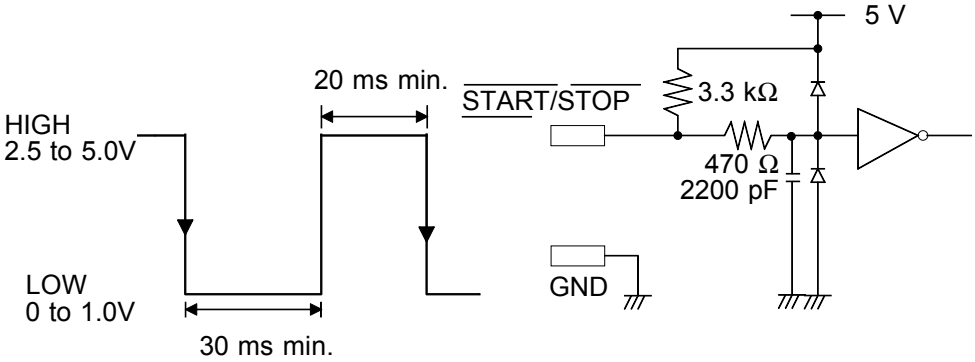
11.1.5 External Start/Stop Terminal

START terminal Measurement starts when a signal is input here.
STOP terminal Measurement and printing stop when a signal is input here.

Signal input method

- Short the terminal to ground, or input a pulse signal (High level: 2.5 to 5.0 V, Low level: 0 to 1.0 V) or a square wave signal.
- Control is activated at the falling level of the input waveform (active Low).

Voltage range	High level: 2.5 to 5.0 V,Low level: 0 to 1.0 V
Pulse width	High level: 20 ms min. , Low level: 30 ms min.
Maximum input voltage	-5 to 10 V



Keeps the signal of single events. Returns to HIGH upon next start-up.
You can select external start and stop signals. See section 9.2.11 for details.

11.1.6 GO/NG Evaluation Output Terminal

When the numerical evaluation or waveform evaluation is used, a signal is output from these connectors when the result is GO (pass) or NG (fail).

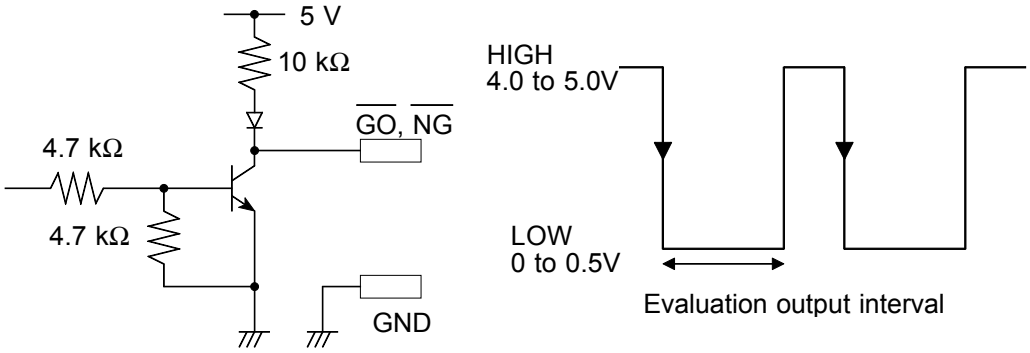
Output signal

Signal type	Open-collector signal, active Low
Output voltage range	High level: 4.0 to 5.0 V, Low level: 0 to 0.5 V
Maximum input voltage	-20 to +30 V, max. 500 mA, max. 200 mW

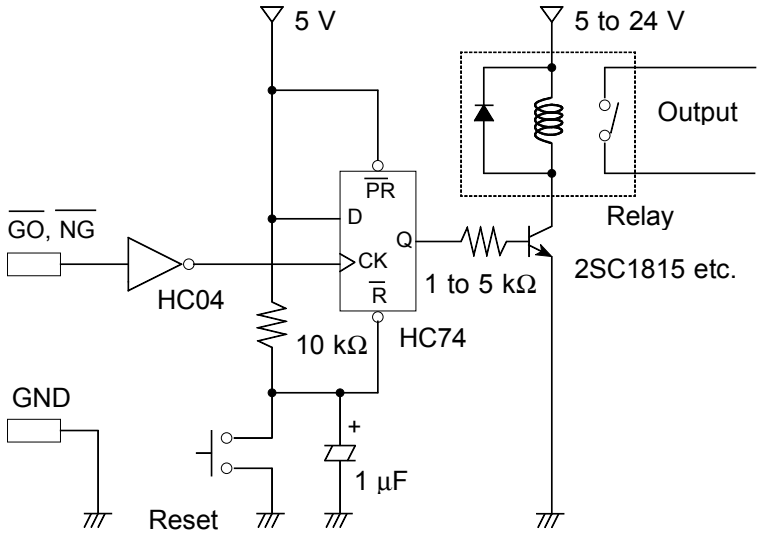
Evaluation output interval

(numerical evaluation: min. 1.8 ms, waveform evaluation: min. 4.2 ms)

Keeps the signal of continuous events until the next trigger.



The following diagram shows an example of a circuit that operates an alarm by means of a GO/NG terminal.



11.1.7 External Output Terminal

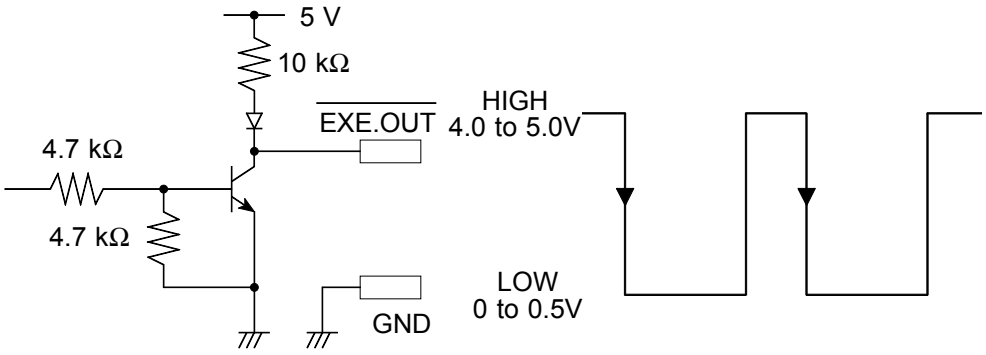
Outputs the 8855's status.

Selecting output signals

Selections	Contents	Output situation
Errors	When an error occurs	Error has occurred
BUSY	When the instrument does not start	Saving, printing, etc.
Starting	When the instrument is starting	Starting
Waiting for trigger	When the instrument is waiting for a trigger	Waiting for Trigger
Probe offset	10:1, 100:1 probe calibration output (1 kHz)	Selecting the probe offset

Output signal

Signal type	Open-collector signal, active Low
Output voltage range	High level: 4.0 to 5.0 V, Low level: 0 to 0.5 V
Maximum input voltage	-5 to +10 V



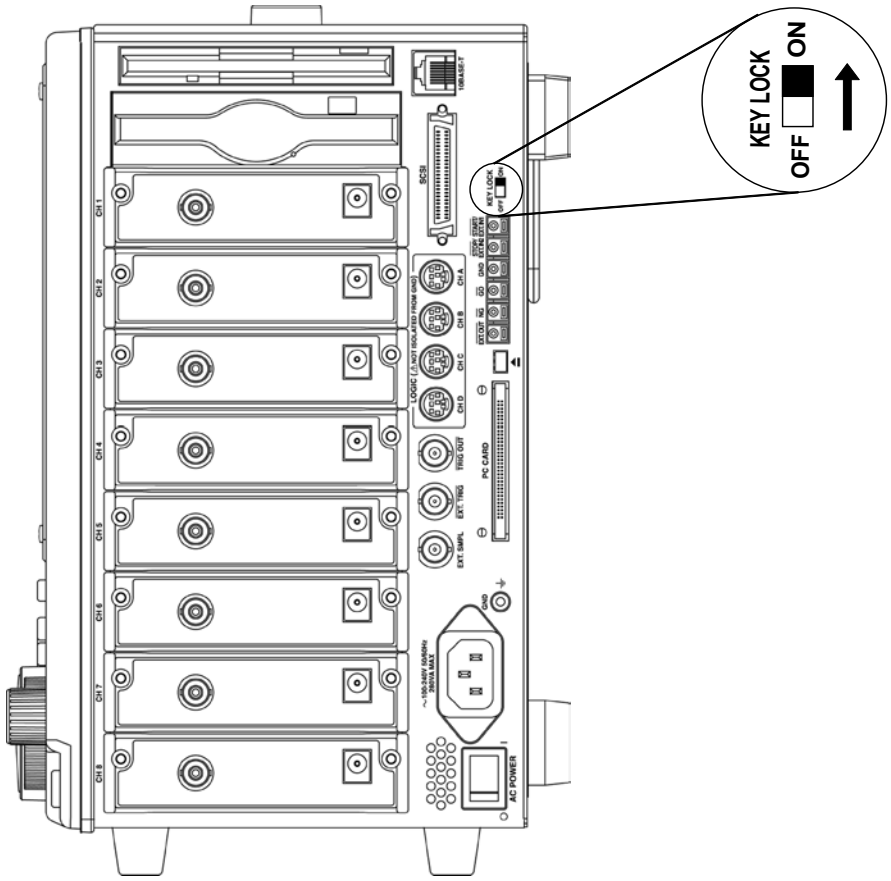
11.2 Using the Key Lock Function

This function disables all front-panel controls of the 8855.
The function serves to prevent unintended changes to settings during a measurement.

Procedure

Move the KEY LOCK sliding switch on the side of the instrument to its ON position.

- When the key lock function is active, the indication KEY LOCK is shown on the display.
- If the backlight saver function is used and the display backlight turns off, it can be turned on again by touching any key. The function assigned to the key will not be activated.



NOTE The external I/O terminal is active.

Chapter 12
Specifications

12.1 General Specifications

12.1.1 Basic Specifications

Measurement functions	Memory: High-speed data saving Recorder: Real time recording Recorder & Memory: High-speed data saving & Real time recording FFT: Frequency analysis
Number of channels (maximum)	8 analog channels + 16 logic channels (The logic channels are standard equipment for the 8855, common ground with main unit)
Memory capacity	Standard: 32 Mwords (total) 16 bit x 16 Mwords/ch (2ch) 16 bit x 8 Mwords/ch (4ch) 16 bit x 4 Mwords/ch (8ch) When the 9645 is installed: 128 M words (total) 16 bit x 64 Mwords (2ch) 16 bit x 32 Mwords (4ch) 16 bit x 16 Mwords (8ch) When the 9645-01 is installed: 512 M words (total) 16 bit x 256 Mwords (2ch) 16 bit x 128 Mwords (4ch) 16 bit x 64 Mwords (8ch)
Maximum sampling speed	20 MS/s (Simultaneously on all channels) * When using the high-resolution unit, the maximum is 1 MS/s external sampling (10 MS/s)
Time axis accuracy	±0.005% (difference between grid and actual time)
Input method	Plug-in type unit for each channel
External control terminals	External trigger input, trigger output, GO/NG output, EXT.OUT output, external start/stop, print input, external sampling
Time measurement functions	Auto calendar with automatic leap year, 24 hour clock
Backup battery and lifetime	Used for clock and to preserve waveforms and settings, approxmately 10 years (reference value at 25°C (77°F)
Dielectric strength	15 seconds at 1.39 kV AC between the main unit and the power supply 15 seconds at 3.7 kV AC between the input module and the main instrument, and between the each input modules

Insulation resistance	Between the main instrument and the power supply, between the input module and the main instrument, and between the each input modules At least 100 MΩ/500 V DC
Location for use	Max. 2000 m (6562 feet) height, indoors
Operational ranges for temperature and humidity	Temperature: 5°C to 40°C (41°F to 104°F) Relative humidity: 30% to 80% RH (with no condensation)
Temperature and humidity ranges for assured accuracy	Temperature: 23±5°C (73°F±41°F) Relative humidity: 30% to 80% RH (with no condensation)
Period of guaranteed accuracy	1 year
Temperature and humidity ranges for storage	Temperature: -10°C to 50°C (14°F to 122°F) Relative humidity: 20% to 90% RH (with no condensation)
Power supply	Rated power voltage 100 to 240 V AC (Continuous input, voltage fluctuations of ±10% from the rated supply voltage are taken into account.) Rated power frequency 50/60 Hz
Maximum rated power	180 VA max. (when printer installed: 280 VAmax.)
Dimensions and mass	Approx. 275W x 285H x 170D mm (10.83"W x 11.22"H x 6.69"D) (excluding projections) Approx. 6.3 kg (22.2 oz.) Approx. 7.1 kg (25.0 oz.) (when printer installed) Approx. 7.7 kg (27.2 oz.) (when printer and MO drive installed)
Standards Applying	Safety EN61010 Pollution Degree 2, measurement category II (anticipated transient overvoltage 4000 V) EMC EN61326 Class A EN61000-3-2 EN61000-3-3

12.1.2 Recorder (8994 PRINTER UNIT: Optional. Specify upon order)

Method of recording	Thermosensitive recording method using a thermal line head
Recording paper	Roll type thermosensitive paper, 216 mm x 30 m (8.5" x 1.18")(long)
Width of recording	Total recording width: 212 mm±1 mm (8.35"±0.04") Waveform portion: 200 mm (20 DIV) ±1 mm (7.87"(20DIV)±0.04"))
Recording speed	Approx. 25 mm (0.98")/s max.
Paper feed accuracy	±1% (25°C (77°F), 60% RH)

12.1.3 Display

Display language	Japanese/English (selectable)
Screen	10.4 inch TFT color LCD display (800 x 600 dots)

Display resolution	In the memory, recorder (1 DIV = 25 (horizontally) x 25 (vertically) dots) Waveform: 30 DIV x 20 DIV Text: 50 characters x 25 lines In the X-Y display (1 DIV = 25 (horizontally) x 25 (vertically) dots) Waveform: 20 DIV x 20 DIV Text: 50 characters x 25 lines
Backlight lifetime	Approx. 55,000 hours (25°C (77°F), reference value)

NOTE

TFT color LCDs characteristically have a few defective pixels that do not always light, or that remain lit.
We do not consider the presence of six or fewer such defects to indicate a damaged or faulty display. Please be aware of this in advance.

12.1.4 Expanded memory (9645, 9645-01 MEMORY BOARD: Optional. Specify upon order)

Expansion method	Install a memory board to the storage PCB
Capacity	9645 MEMORY BOARD: 96 MW (Total of 128 MW when added to the standard 32 MW) 9645-01 MEMORY BOARD: 512 MW

12.1.5 External Data Storage

Floppy Disk

Device	3.5-inch floppy disk drive
Capacity	1.44 MB (2HD) (IBM PC/AT compatible or NEC PC-9801 series with 3-mode drive) 1.2 MB (2HD) (NEC PC-9801 series) 720 KB (2DD) (IBM PC/AT compatible)
Data format	MS-DOS format (MS-DOS is the registered trademark of Microsoft Corporation.)
Data stored	Settings, screen data (bmp), measurement data (binary or text), measurement data can be saved between cursors A and B, waveform evaluation area, screen image (BMP), spacing data (text), waveform parameter evaluation result

PC Card

Expansion slot	PC card standard Accepts TYPE I, II PC cards
Card types	Flash ATA card
Data format	MS-DOS format (MS-DOS is the registered trademark of Microsoft Corporation.)
Data stored	Settings, screen data (bmp), measurement data (binary or text), measurement data can be saved between cursors A and B, waveform evaluation area, screen image (BMP), spacing data (text), waveform parameter evaluation result

MO Disk (9646 MO UNIT: Option)

Device	3.5-inch MO disk drive
Capacity	1.3 GB (128 MB, 230 MB, 540 MB, 640 MB, 1.3 GB)
Data format	Accordance with ISO standard, overwrite object supported
Data stored	Settings, measurement data (binary or text), measurement data can be saved between cursors A and B, waveform evaluation area, screen image (BMP), spacing data (text), waveform parameter evaluation result

Hard Disk (9663 HD UNIT: Option)

Device	2.5-inch hard disk drive
Capacity	20 GB
Data format	Accordance with ISO standard
Data stored	Settings, measurement data (binary or text), measurement data can be saved between cursors A and B, waveform evaluation area, screen image (BMP), spacing data (text), waveform parameter evaluation result

12.1.6 Interface

SCSI Interface

MO disk drive	Connect to MO disk drive with SCSI cable
Data stored	Settings, screen data (bmp), measurement data (binary or text), measurement data can be saved between cursors A and B, waveform evaluation area, screen image (BMP), spacing data (text), waveform parameter evaluation result
SCSI	ANSI X3.131-1986 (SCSI level 2) JIS X6051 (SCSI level 2)
Driver/receiver	Single - ended
Data transfer method	Asynchronous
Terminator	Provided (not removable)
Terminator power	Provided
Initiator operation	Provided
Connector	• Connect to MO disk drive with SCSI cable • Connector type: High density (pin-type) (D-Sub half-pitch 50 P)

LAN Interface

LAN	IEEE802.3 Ethernet 10BASE-T

12.1.7 Others

Accessories	9231 RECORDING PAPER (When ordering the 8994 only)	1
	Roll paper attachment (When ordering the 8994 only)	2
	Power cord	1
	PC card protector	1
	Connector cable label	1
	Instruction Manual	2
	Application Disk (CD-R)	1
	Guide book	1
Option (specify upon order)	8994 PRINTER UNIT	
	9645 MEMORY BOARD (96 Mwords)	
	9645-01 MEMORY BOARD (512 Mwords)	
	9646 MO UNIT	
	9663 HD UNIT	
Option	8950 ANALOG UNIT	
	8951 VOLTAGE/CURRENT UNIT	
	8952 DC/RMS UNIT	
	8953 HIGH RESOLUTION UNIT	
	8954 VOLTAGE/TEMP UNIT	
	8955 F/V UNIT	
	9557 RS-232C CARD	
	9558 GP-IB CARD	
	9626 PC CARD 32M	
	9627 PC CARD 64M	
	9726 PC CARD 128M	
	9727 PC CARD 256M	
	9728 PC CARD 512M	
	9729 PC CARD 1G	
	9397-01 CARRYING CASE (for the 8855)	
	9231 RECORDING PAPER (6 rolls)	
	9197 CONNECTION CORD (for high voltage, maximum input voltage 500 V)	
	9198 CONNECTION CORD (for low voltage, maximum input voltage 300 V)	
	9199 CONVERSION ADAPTOR (between BNC and banana, female)	
	9217 CONNECTION CORD (isolated between BNC and BNC)	
	9327 LOGIC PROBE (maximum input voltage 50 V)	
	9321-01 LOGIC PROBE (maximum input voltage 250 V)	
	9665 10:1PROBE	
	9666 100:1PROBE	
	9322 DIFFERENTIAL PROBE	
	9328 POWER CORD (for the 9322)	
	9325 POWER CORD (for the 8951)	
	220H PAPER WINDER	
	9303 PT*	
	9318 CONVERSION CABLE (for the 9270-72, 9277-79)	
	3273 CLAMP ON PROBE (DC to 50 MHz)	
	3273-50 CLAMP ON PROBE (DC to 50 MHz)	
	3274 CLAMP ON PROBE (DC to 10 MHz)	
	3275 CLAMP ON PROBE (DC to 2 MHz)	
	3276 CLAMP ON PROBE (DC to 100 MHz)	
	9018 CLAMP ON PROBE (10 to 500 A, 40 Hz to 3 kHz)	
	9132 CLAMP ON PROBE (20 to 1000 A, 40 Hz to 1 kHz)*	
	9270 CLAMP ON SENSOR (20 A, 5 Hz to 50 kHz)*	
	9271 CLAMP ON SENSOR (200 A, 5 Hz to 50 kHz)*	
	9272 CLAMP ON SENSOR (20/200 A, 5 Hz to 10 kHz)*	
	9277 UNIVERSAL CLAMP ON CT (20 A, DC to 100 kHz)	
	9278 UNIVERSAL CLAMP ON CT (200 A, DC to 100 kHz)	
	9279 UNIVERSAL CLAMP ON CT (500 A, DC to 20 kHz)*	
	9555 SENSOR UNIT (used with the 9270 to 9272, and the 9277 to 9279)*	
	9667 FLEXIBLE CLAMP ON SENSOR (500 to 5000 A/50 to 500 A, 10 to 20 kHz)	
	*: no CE marking	

Software	9333 LAN COMMUNICATOR 9335 WAVE PROCESSOR 9549 FUNCTION UP DISK (power monitor function)

12.2 Memory Function

Time axis	5, 10, 20, 50, 100, 200, 500 µs/DIV 1, 2, 5, 10, 20, 50, 100, 200, 500 ms/DIV 1, 2, 5, 10, 30 s/DIV 1, 2, 5 min/DIV EXT. (100 samples/DIV, arbitrarily)
Time axis resolution	100 points/DIV
Sampling period	1/100 of the time axis
Recording length	Standard 30, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000[*1], 50000[*2], 100000[*3] DIV Expansion (128 M words) 30 to 100000[*1], 200000[*2], 500000[*3] DIV Expansion (512 M words) 30 to 100000, 200000, 500000[*1], 1000000[*2], 2000000[*3] DIV Arbitrarily (Set from 1 division to the maximum number of divisions at 1-division intervals.)
Screen/print format	The styles single, dual, quad, oct, X-Y single / quad are available.
Interpolation	Line (excluding X-Y format), Dot/line (X-Y format)
Recording line display	12-color (LCD), Printout: 4-type
Overlay function	Provided
Waveform magnification/ compression	Time axis x 10, x 5, x 2, x 1, x 1/2, x 1/5, x 1/10, x 1/20, x 1/50, x 1/100, x 1/200, x 1/500, x 1/1000, x 1/2000, x 1/5000, x 1/10000, x 1/20000, x 1/50000, x 1/100000 Voltage axis x 100, x 50, x 20, x 10, x 5, x 2, x 1, x 1/2
Waveform scrolling	Available in the left/right directions
Auto-print	Automatically prints the memorized waveform
Manual print	Available
Partial print	Prints between the A and the B cursors
Print smoothing function	When set, a smoothed waveform is printed, with twice the density in the time axis direction.
A4print	Available
Logging function	Records measured data as digital values
Variable function	Provided
Zoom function	Provided

([*1]): When 8 channels are in use
([*2]): When 4 channels are in use
([*3]): When 2 channels are in use

12.3 Recorder Function

Time axis	10[*1], 20[*1], 50[*1], 100[*1], 200[*1], 500 ms/DIV 1, 2, 5, 10, 30 s/DIV 1, 2, 5, 10, 30 min/DIV 1 h/DIV
Time axis resolution	100 points/DIV (with the printer)
Sampling period	1, 10, 100 µs, 1, 10, 100 ms (Can be selected, from 1/100 of the time axis setting)
Recording length	Standard 30, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000 DIV, CONT[*2] Expansion (128 M words) 30, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 50000 DIV, CONT[*2] Expansion (512 M words) 30, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 50000, 100000, 200000 DIV, CONT[*2] Arbitrarily (Set from 1 division to the maximum number of divisions at 1-division intervals.) X-Y format can be set CONT only
Screen/print format	The styles single, dual, quad, oct, X-Y single / quad are available.
Interpolation	Line (excluding X-Y format), Dot/line (X-Y format)
Recording line display	12-color (LCD), Printout: 4-type
X-Y Spatial resolution	25 dots/DIV (with the display) 80 dots/DIV (horizontally), 80 dots/DIV (vertically) (with the printer)
X-Y Sampling period	Dot display: 300 µs fixed, Line display: 300 µs to 25 ms (not fixed)
Waveform magnification/ compression	Time axis x 1, x 1/2, x 1/5, x 1/10, x 1/20, x 1/50, x 1/100, x 1/200, x 1/500, x 1/1000, x 1/2000, x 1/5000, x 1/10000 Voltage axis x 100, x 50, x 20, x 10, x 5, x 2, x 1, x 1/2
Waveform storage	Last 20000 divisions of data saved in memory *3 Can be checked by reverse scrolling and reprinted
Print function	ON/OFF and reprinted
Additional recording function	ON/OFF[*4]
A4 print	Available
Variable function	Provided

([*1]): Virtual record function
Although real-time recording to the recording paper is not possible in the high-speed range (10 to 200 ms/DIV), the waveforms are stored to the memory and can therefore be monitored on the screen. The last 20000 divisions of each waveform[(*3)] are retained in memory before the measurement is complete. If the recording length is not set to "continuous," the printer can also be operated, enabling the waveforms to be printed out later.
([*2]): With time axis 10 to 200 ms/DIV, "continuous" is not possible with printer ON.
([*3]): Expanded to 128 Mwords: 50000 DIV, expanded to 512 Mwords: 200000 DIV
([*4]): Additional recording function (recording data without paper)
Upon starting, processes the data recorded previously as shown below.
OFF: Deletes previous data and records from the beginning
ON: Continues to record data without deleting previous data
When the amount of recorded data exceeds 20,000 DIV (*3), it overwrites the old data.

12.4 Recorder & Memory Function

Time axis	Recorder 10, 20, 50, 100, 200 ms/DIV (display only) 500 ms/DIV 1, 2, 5, 10, 30 s/DIV 1, 2, 5, 10, 30 min/DIV 1 h/DIV Memory Recorder 10, 20, 50, 100, 200, 500 µs/DIV 1, 2, 5, 10, 20, 50, 100, 200, 500 ms/DIV 1, 2, 5, 10, 30 s/DIV 1, 2, 5 min/DIV
Time axis resolution	100 points/DIV
Sampling period	1/100 of the time axis.....Memory waveform
Recording length	Standard (32 M): 30 to 10000 DIV, CONT (REC) 30 to 20000 DIV, CONT (MEM) Expansion (128 M): 30 to 20000 DIV, CONT (REC) 30 to 50000 DIV, CONT (MEM) Expansion (512 M): 30 to 100000 DIV, CONT (REC) 30 to 200000 DIV, CONT (MEM) Desired setting (in addition to the above settings, 1-division steps up to the highest division are possible)
Screen/print format	The styles single, dual, quad, oct
Recording line display	12-color (LCD), Printout: 4-type
Display	Switchable between recorder and memory waveforms
Printer output	During measurement operation, recorder waveform only. After data capture, printout of recorder waveform as on display or memory recorder waveform.
Waveform storage (REC)	Last 10000 divisions of data saved in memory (*1) Can be checked by reverse scrolling and reprinted
Additional recording function	ON/OFF*2
Trigger source	CH1 to CH8, CHA to CHD and external trigger (MEM)
A4 print	Available
Zoom function	Provided(in memory recorder function)
Variable function	Provided

(*1): Expanded to 128 M words: 20000 DIV, expanded to 512 M words: 100000 DIV
(*2): Additional recording function (recording data without paper)
When enabled, the memory is regarded as printer paper. Recording starts at the end of previous data, without erasing them. When the 10000 DIV*1 has been reached, old data will be overwritten. When OFF, previous data will be erased. Set to ON if erasing is not desired.

12.5 FFT Function

FFT channel mode	1 ch FFT 2 ch FFT
FFT range setting	133 mHz to 8 MHz, EXT.
Dynamic range	72 dB (logical value), 96 dB ((logical value, 8953-10)
Number of sampling points	1000, 2000, 5000, 10000 points
Frequency resolution	1/400, 1/800, 1/2000, 1/4000
Antialiasing filter	Automatic cutoff frequency selection linked to frequency range
Analysis channel setting	2 channels selectable from all analog channels
FFT analysis mode setting	Storage waveform, Linear spectrum, RMS spectrum, Power spectrum, Cross-power spectrum, Auto-correlation function, Histogram, Transfer function, Cross-correlation function, Unit-impulse response, Coherence function, Octave analysis
Display format setting	Single, dual screen display, Nyquist display
Windows	Rectangular, Hanning, Exponential
Display scale	Linear scale, Log scale, Phase
Print function	As per the memory recorder function, excluding partial print functior
Averaging function	Simple average of time and frequency axis, exponential average, peak hold (frequency axis) (2, 4, 8 to 4096 samples)

12.6 Trigger Unit

Trigger Method	Digital comparison
Trigger modes	Memory, FFT: Single, repeat, auto Recorder: Single, repeat Recorder & Memory: Single, repeat, timer
Trigger source	Analog CH1 to CH8, logic CHA to CHD • External trigger (With an external trigger, the triggering occurs on a rising edge of 2.5 V and falling) • Manual trigger • Timer trigger • Sources can be set on or off. When all sources are off, the unit is in the free-run state. Trigger conditions can be set for each channel individually.
Trigger conditions	Logical AND or OR of any trigger sources
Trigger types (analog)	(1) Level trigger • Digital setting of voltage values for full scale • Triggering occurs at rising edge (falling edge) of set value. (2) Window-in, window-out trigger • Upper and lower trigger levels can be set. • Triggering occurs when the waveform enters or leaves the defined area. (3) Period trigger • Sets both the period reference voltage and the period range, and measures the rise (fall) period of the set voltage. When the measured period deviates from the specified range, triggering occurs. (4) Glitch Trigger • Sets the voltage value and pulse width (glitch width) • Triggered when the set voltage value rises above (or falls below) the set pulse width. (5) Event Trigger • Sets the voltage value and the event count • Triggered when the rising or falling edge of the set voltage exceeds the set number of events.
Trigger type (logic)	Pattern trigger specified by 1, 0, and x (x means that either 1 or 0 is fine.)
Trigger filter	Memory: OFF, 0.1, 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 5.0, 10.0 DIV Recorder: ON, OFF (10 ms fixed)
Trigger level resolution	0.1%f.s. (f.s. = 20 DIV)
Pre-trigger	Memory: 0, 2, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 100, -95 %
Trigger timing	Start, Stop, Start and Stop (REC)
Trigger output	Open collector output (with 5 V output voltage, active low) Minimum Pulse Width (sampling cycle x data count after triggering)
Level meter function	When waiting for trigger, the level of the analog input signal is displayed on the Waveform display screen.

12.7 Auxiliary Functions

Computation functions (MEM)	1. Numerical calculations (MEM) Average value, RMS value, peak-to-peak value, maximum value, time to maximum value, minimum value, time to minimum value, period, frequency, rise time, fall time, standard deviation, area value, X-Y area value, specified revel time, pulse width, duty ratio, pulse count, arithmetic processing (parameter calculation result can be saved on floppy disk, MO disk, and so on.) 2. Waveform calculations (MEM) Arithmetic operations, absolute value, exponents, common logarithms, square roots, moving average, 1st and 2nd derivatives, 1st and 2nd integrals, parallel displacement on time axis, trigonometric functions, reverse trigonometric functions 16 arbitrary operational equations: Calculations are possible up to a recording length that corresponds to one fourth of the memory capacity. 3. Averaging function (MEM) Additive average, exponential average (2, 4, 8 to 1024 samples) Simple average, exponential average , peakhold (2, 4, 8 to 4096 samples) (FFT)
Memory segmentation	Memory can be segmented among channels. Number of segments: Maximum 1024 Batch saving of all blocks can be selected. Input signal capture is carried out continuously using the trigger, storing waveform data successively in each block. Displaying waveform ON or OFF can be selected. Recording the waveform data in an arbitrary block. Displaying two arbitrary blocks in duplicate.
Waveform evaluation	1. Waveform area evaluation (MEM, FFT): Waveform evaluation based on evaluation area for Y-T waveform, X-Y waveform, or FFT result Evaluation modes: Out: fail if any part of waveform is outside evaluation area All out: fail if whole of waveform is outside evaluation area Stop modes: GO (pass) stop, NG (fail) stop, GO & NG stop Printer output or waveform save at stop Decision time: Approx. 750 ms max Decision period: Approx. 900 ms (MEM) With input 1 Vp-p sin wave, 1 kHz, to 1 channel, used channel ch1 to 8, 100 µs/DIV x 1, 30 DIV (depend on time-axis compression, recording length) Approx. 420 ms (FFT) 1000 points, linear spectrum, window function - rectangular (depend on frequency-axis, FFT analysis type, FFT points) Graphics editor (Provided, used for defining an arbitrary evaluation area for waveform evaluations): Line, paint, storage, erase, parallel, reverse, clear, all clr, undo, save, end 2. Numerical calculation evaluation (MEM) Decision based on setting minimum and maximum values for numerical calculation results. 3. Decision output (MEM,FFT) GO and NG outputs on right side panel: open collector outputs (with 5 V output, active low, numerical evaluation: min. 1.8 ms, waveform evaluation: min. 4.2 ms)

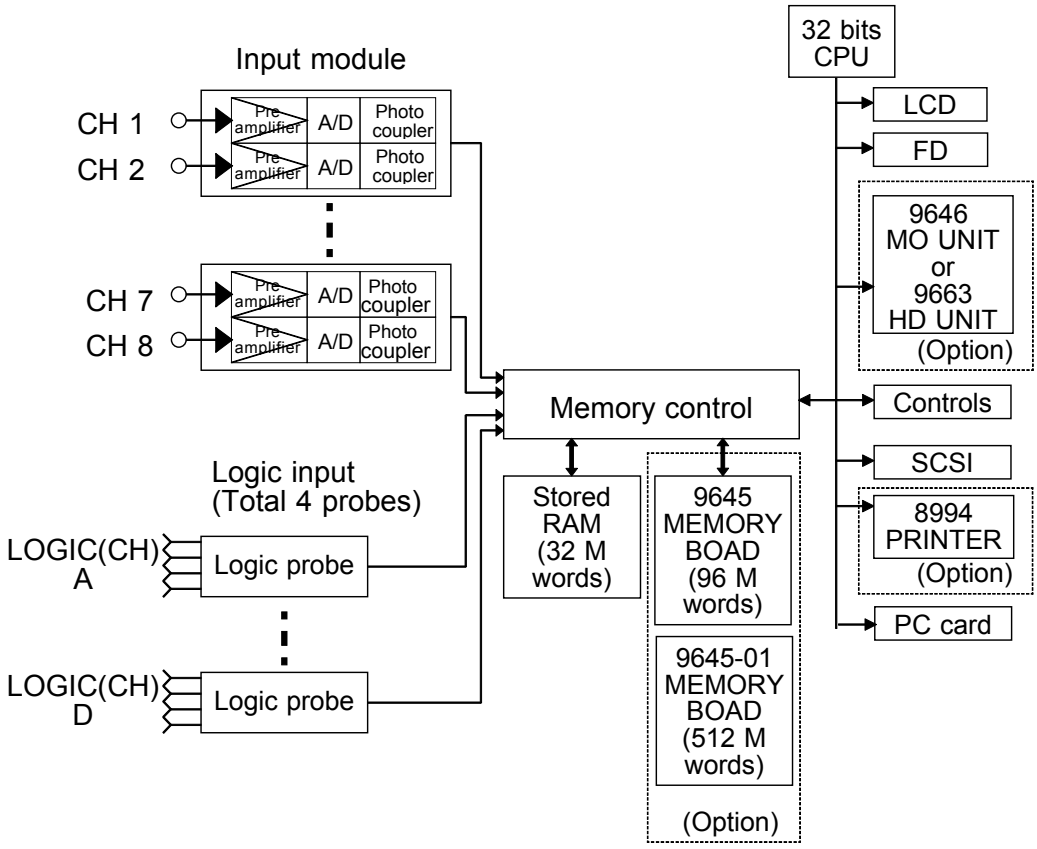
12.8 Others

Comment printing	Function, channel, Input range, zero position, trigger time, DIV and other information can be printed.
Cursor measurement function	Time difference, voltage difference or number of cycles between cursors A and B, frequency, voltage at each cursor, time from trigger
Scaling function	Specifiable for each channel
Comment input function	Provided
Display copy function	Provided
List/gauge functions	ON, OFF
Starting status backup function	Provided
Auto setup function	When the power is turned on, settings stored on a floppy disk can be automatically loaded.
Auto save function	Provided
Remote control	Start, stop terminals (threshold value: 2.5 V approx. , active low, or terminal short)
Auto-range function	Provided, selects optimum time axis and measurement range for input waveform
VIEW function	Relative positions of displayed data within recording length is shown When memory segmentation is used, usage condition of each block is shown.
On-line help	An explanation of the Waveform display screen or the item currently selected by the cursor appears.
Key lock function	Locks all keys except the KEY LOCK key
LCD back lighting	ON, OFF (with the auto OFF function) (auto OFF time can be selected 1 to 30 min)
List print function	Settings output after waveform data print. Output by pressing the PRINT key other than on Waveform display screen.
Logic display	On/off for each bits, The comments can be input
Vernier function	Input voltage can be minutely adjusted to the desired value.
Direct channel setting	Settable using the TIME/DIV key The range position of direct input module can be set by using the knob.
Level monitor function	Provided

12.9 System Operation

System operation is explained according to the block diagram.

- All system operations are controlled by a 32-bit RISC CPU.
- The input module incorporates high-speed and high-resolution 16-bit A/D converters which are connected to the main instrument via a photocoupler integrated in each input module. Each channel has its own power supply, to assure electrical isolation from the main instrument.
- Measurement data stored in memory are processed by the CPU, displayed on the LCD screen, and output to the printer. Output to floppy disk or MO disk is also provided.



12.10 Maximum Recording Length for Time Axis Settings

Memory Function: Standard (32 M)

Time axis range /DIV	Sampling period	Max. recording length		
		8 channels 20000 DIV	4 channels 50000 DIV	2 channels 100000 DIV
5 µs	50 ns	100 ms	250 ms	500 ms
10 µs	100 ns	200 ms	500 ms	1 s
20 µs	200 ns	400 ms	1 s	2 s
50 µs	500 ns	1 s	2.5 s	5 s
100 µs	1 µs	2 s	5 s	10 s
200 µs	2 µs	4 s	10 s	20 s
500 µs	5 µs	10 s	25 s	50 s
1 ms	10 µs	20 s	50 s	1 min 40 s
2 ms	20 µs	40 s	1 min 40 s	3 min 20 s
5 ms	50 µs	1 min 40 s	4 min 10 s	8 min 20 s
10 ms	100 µs	3 min 20 s	8 min 20 s	16 min 40 s
20 ms	200 µs	6 min 40 s	16 min 40 s	33 min 20 s
50 ms	500 µs	16 min 40 s	41 min 40 s	1 h 23 min 20 s
100 ms	1 ms	33 min 20 s	1 h 23 min 20 s	2 h 46 min 40 s
200 ms	2 ms	1 h 06 min 40 s	2 h 46 min 40 s	5 h 33 min 20 s
500 ms	5 ms	2 h 46 min 40 s	6 h 56 min 40 s	13 h 53 min 20 s
1 s	10 ms	5 h 33 min 20 s	13 h 53 min 20 s	1 D 3 h 46 min 40 s
2 s	20 ms	11 h 06 min 40 s	1 D 3 h 46 min 40 s	2 D 7 h 33 min 20 s
5 s	50 ms	1 D 03 h 46 min 40 s	2 D 21 h 26 min 40 s	5 D 18 h 53 min 20 s
10 s	100 ms	2 D 07 h 33 min 20 s	5 D 18 h 53 min 20 s	11 D 13 h 46 min 40 s
30 s	300 ms	6 D 22 h 40 min 00 s	17 D 8 h 40 min 00 s	34 D 17 h 20 min 00 s
1 min	600 ms	13 D 21 h 20 min 00 s	34 D 17 h 20 min 00 s	69 D 10 h 40 min 00 s
2 min	1.2 s	27 D 18 h 40 min 00 s	69 D 10 h 40 min 00 s	138 D 21 h 20 min 00 s
5 min	3.0 s	69 D 10 h 40 min 00 s	173 D 14 h 40 min 00 s	347 D 5 h 20 min 00 s

s: seconds, min: minutes, h: hours, d: days
(fixed recording length)

Memory Function: Expansion (128 M)

Time axis range /DIV	Sampling period	Max. recording length		
		8 channels 100000 DIV	4 channels 200000 DIV	2 channels 500000 DIV
5 µs	50 ns	500 ms	1 s	2.5 s
10 µs	100 ns	1 s	2 s	5 s
20 µs	200 ns	2 s	4 s	10 s
50 µs	500 ns	5 s	10 s	25 s
100 µs	1 µs	10 s	20 s	50 s
200 µs	2 µs	20 s	40 s	1 min 40 s
500 µs	5 µs	50 s	1 min 40 s	4 min 10 s
1 ms	10 µs	1 min 40 s	3 min 20 s	8 min 20 s
2 ms	20 µs	3 min 20 s	6 min 40 s	16 min 40 s
5 ms	50 µs	8 min 20 s	16 min 40 s	41 min 40 s
10 ms	100 µs	16 min 40 s	33 min 20 s	1 h 23 min 20 s
20 ms	200 µs	33 min 20 s	1 h 6 min 40 s	2 h 46 min 40 s
50 ms	500 µs	1 h 23 min 20 s	2 h 46 min 40 s	6 h 56 min 40 s
100 ms	1 ms	2 h 46 min 40 s	5 h 33 min 20 s	13 h 53 min 20 s
200 ms	2 ms	5 h 33 min 20 s	11 h 6 min 40 s	1 D 3 h 46 min 40 s
500 ms	5 ms	13 h 53 min 20 s	1 D 3 h 46 min 40 s	2 D 21 h 26 min 40 s
1 s	10 ms	1 D 3 h 46 min 40 s	2 D 7 h 33 min 20 s	5 D 18 h 53 min 20 s
2 s	20 ms	2 D 7 h 33 min 20 s	4 D 15 h 6 min 40 s	11 D 13 h 46 min 40 s
5 s	50 ms	5 D 18 h 53 min 20 s	11 D 13 h 46 min 40 s	28 D 22 h 25 min 40 s
10 s	100 ms	11 D 13 h 46 min 40 s	23 D 3 h 33 min 20 s	57 D 20 h 53 min 20 s
30 s	300 ms	34 D 17 h 20 min 00 s	69 D 10 h 40 min 00 s	173 D 14 h 40 min 00 s
1 min	600 ms	69 D 10 h 40 min 00 s	138 D 21 h 20 min 00 s	347 D 5 h 20 min 00 s
2 min	1.2 s	138 D 21 h 20 min 00 s	277 D 18 h 40 min 00 s	694 D 10 h 40 min 00 s
5 min	3.0 s	347 D 5 h 20 min 00 s	694 D 10 h 40 min 00 s	1736 D 2 h 40 min 00 s

s: seconds, min: minutes, h: hours, d: days
(fixed recording length)

Memory Function: Expansion (512 M)

Time axis range/DIV	Sampling period	Max. recording length		
		8 channels 500000 DIV	4 channels 1000000 DIV	2 channels 2000000 DIV
5 µs	50 ns	2.5 s	5 s	10 s
10 µs	100 ns	5 s	10 s	20 s
20 µs	200 ns	10 s	25 s	40 s
50 µs	500 ns	25 s	50 s	1 min 40 s
100 µs	1 µs	50 s	1 min 40 s	3 min 20 s
200 µs	2 µs	1 min 40 s	3 min 20 s	6 min 40 s
500 µs	5 µs	4 min 10 s	8 min 20 s	16 min 40 s
1 ms	10 µs	8 min 20 s	16 min 40 s	33 min 20 s
2 ms	20 µs	16 min 40 s	33 min 20 s	1 h 6 min 40 s
5 ms	50 µs	41 min 40 s	1 h 23 min 20 s	2 h 46 min 40 s
10 ms	100 µs	1 h 23 min 20 s	2 h 46 min 40 s	5 h 33 min 20 s
20 ms	200 µs	2 h 46 min 40 s	5 h 33 min 20 s	11 h 6 min 40 s
50 ms	500 µs	6 h 56 min 40 s	13 h 53 min 20 s	1 D 3 h 46 min 40 s
100 ms	1 ms	13 h 53 min 20 s	1 D 3 h 46 min 40 s	2 D 7 h 33 min 20 s
200 ms	2 ms	1 D 3 h 46 min 40 s	2 D 7 h 33 min 20 s	4 D 15 h 6 min 40 s
500 ms	5 ms	2 D 21 h 26 min 40 s	5 D 18 h 53 min 20 s	11 D 13 h 46 min 40 s
1 s	10 ms	5 D 18 h 53 min 20 s	11 D 13 h 46 min 40 s	23 D 3 h 33 min 20 s
2 s	20 ms	11 D 13 h 46 min 40 s	23 D 3 h 33 min 20 s	46 D 7 h 6 min 40 s
5 s	50 ms	28 D 22 h 26 min 40 s	37 D 20 h 53 min 20 s	115 D 17 h 46 min 40 s
10 s	100 ms	57 D 20 h 53 min 20 s	115 D 17 h 46 min 40 s	231 D 11 h 33 min 20 s
30 s	300 ms	173 D 14 h 40 min 00 s	347 D 5 h 20 min 00 s	694 D 10 h 40 min 00 s
1 min	600 ms	347 D 5 h 20 min 00 s	694 D 10 h 40 min 00 s	1388 D 21 h 20 min 00 s
2 min	1.2 s	694 D 10 h 40 min 00 s	1388 D 21 h 20 min 00 s	2777 D 18 h 40 min 00 s
5 min	3.0 s	1736 D 2 h 40 min 00 s	3472 D 5 h 20 min 00 s	6944 D 10 h 40 min 00 s

s: seconds, min: minutes, h: hours, d: days
(fixed recording length)

Recorder Function

Approximate recording time on one roll (30 m) of recording paper
(Time axis resolution: 100 points / DIV)

Time axis range	Recording paper transport speed	Recording time
10 ms/DIV	20 mm/s(*1)	(30 s)
20 ms/DIV	20 mm/s(*1)	(1 min)
50	20 (*1)	(25 min)
100	20 (*1)	(5 min)
200	20 (*1)	(10 min)
500	20	25 min
1 s/DIV	10	50 min
2	5	1 hour 40 min
5	2	4 hour 10 min
10	1	8 hour 20 min
30	20 mm/min	1 DAY 1 hour
1 min/DIV	10	2 DAY 2 hour
2	5	4 DAY 4 hour
5	2	10 DAY 10 hour
10	1	20 DAY 20 hour
30	20 mm/h	62 DAY 12 hour
1 h/DIV	10	125 DAY

s: seconds, min: minutes, h: hours, d: days

(*1)Virtual record

12.11 Memory Capacity and Recording Length

Memory Function (fixed recording length)

Card capacity	Number of divisions per channel (channel)		
	2	4	8
32 M words	100000	50000	20000
128 M words (Expansion)	500000	200000	100000
512 M words (Expansion)	2000000	1000000	500000

Recorder Function (fixed recording length)

Card capacity	Number of divisions
32 M words	20000
128 M words (Expansion)	50000
512 M words (Expansion)	200000

Memory Function (specified recording length)

Card capacity	Number of divisions per channel (channel)		
	2	4	8
32 M words	160000	80000	40000
128 M words (Expansion)	640000	320000	160000
512 M words (Expansion)	2560000	1280000	640000

Recorder Function (specified recording length)

Card capacity	Number of divisions
32 M words	20000
128 M words (Expansion)	80000
512 M words (Expansion)	320000

12.12 Waveform Backup

It is possible for the 8855 to backup waveforms.
The time it takes to perform backups differs according to the amount memory. (See table below.)

Memory Capacity and Backup Time
(Minimum 1 hour after Turning on the power)

Memory	Backup Time (Reference at 25°C)
32 Mwords standard	Minimum of 1 hour
Expanded 128 Mwords	Minimum of 20 minutes
Expanded 512 Mwords	Minimum of 4 minutes

NOTE

- When changing modules, waveforms are not backed up.
- After turning the instrument ON until the Waveform display screen appears (initialization), if the power is cut, waveforms cannot be backed up.
- If the instrument is turned OFF while compressing waveforms or calculation data, the waveforms cannot be backed up.
- Chronological changes or extreme environmental changes, such as in temperature, can shorten the backup time.

Chapter 13
Logic and Analog Inputs

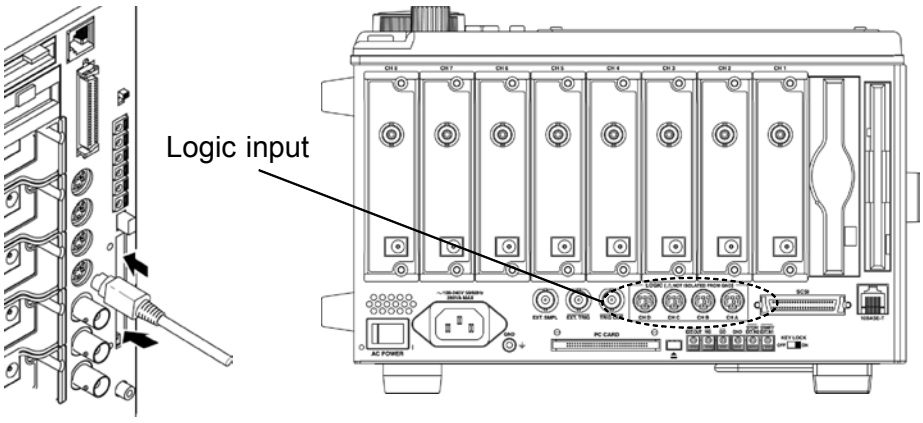
13.1 Logic Inputs

⚠ WARNING

- **The instrument has separate inputs for four probes, but the ground lines of these inputs are not isolated from each other and from the frame ground of the instrument (common ground). If voltage having a different ground level is input, a short circuit will occur, depending on the probe type.**
- **Do not connect logic probes other than supplied by HIOKI to the logic inputs.**

Logic Probe Connection

- The logic input is located on the right side of the instrument. Up to four probes can be connected.
- Since one logic probe can record 4 channels, the combined maximum recording capability for logic waveforms is 16 channels.
- Connect the probe by aligning the groove on the plug with the ridge on the connector.



NOTE

- If no logic probe is connected, the corresponding logic waveform is displayed on the screen at high level.
- Carefully read the instruction manual supplied with the probe.

9327 LOGIC PROBE

- When measuring digital signals
  Set the input selector to DIGITAL when measuring digital signals. In this case, use IC clip lead. Connect the alligator clip to the circuit ground. Use the threshold value selector to select the threshold value.
- When measuring contact signals
  Set the input selector to CONTACT when measuring contact signals. In this case, use alligator clip lead. When these lines are shorted, H level is applied to the contact input.

Range	Digital input (Threshold value)	Contact input (Detecting resistance value)
1.4 V	1.4 V±0.3 V	More than 1.5 kΩ opened (Output L) Less than 500 Ω shorted (Output H)
2.5 V	2.5 V±0.4 V	More than 3.5 kΩ opened (Output L) Less than 1.5 kΩ shorted (Output H)
4.0 V	4.0 V±0.5 V	More than 25 kΩ opened (Output L) Less than 8 kΩ shorted (Output H)

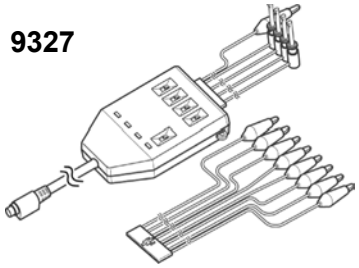
9321-01 LOGIC PROBE

- Set the input selector in accordance with the measured voltage.
  LOW range: Turning AC 100 V and DC 24 V, etc. ON/OFF
  HIGH range: Turning AC 200 V, etc. ON/OFF
- Since the inputs are bipolar, polarity should be disregarded.
- Because the inputs are insulated, each channel is connectable to independent potential points.

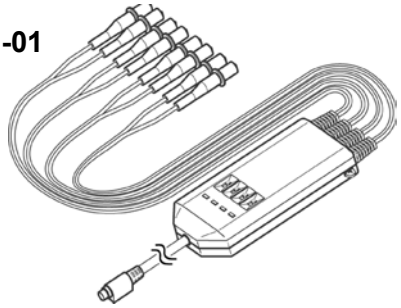
The number of channels	4 (insulated)	
Input voltage range	LOW	HIGH
Input resistance	30 kΩ min.	100 kΩ min.
Sensitivity (Output: L)	0 to 10 V AC ±(0 to 15) V DC	0 to 30 V AC ±(0 to 43) V DC
Sensitivity (Output: H)	60 to 150 V AC ±(20 to 150) V DC	170 to 250 V AC ±(70 to 250) V DC
Response time (⌋⌈) (⌈⌋)	Less than 1 ms Less than 3 ms with 100 V DC	Less than 1 ms Less than 3 ms with 200 V DC
Maximum input voltage	150 V rms	250 V rms
Maximum rated voltage to earth	250 V rms	
Dielectric strength	2.3 kV AC /1 min (between unit and channels)	
Insulation resistance	More than 100 MΩ / 500 V DC (between unit and channels)	

This instrument detects absolute values so that negative DC voltages can be applied. The above values for AC voltages are those obtained with sine wave signals of 50/60 Hz.

9327



9321-01



NOTE

The 9320-01 can be also used.
It is possible to use the 9306, 9307, 9320, and 9321 with the 9323 CONVERSION CABLE.

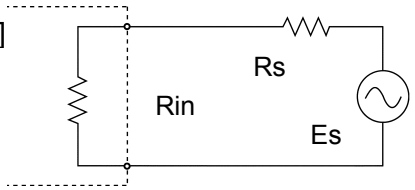
13.2 Analog Inputs

Measurement Errors Caused by Signal Source Internal Resistance

- If the signal source impedance is higher than the input impedance of the module, a measurement error will occur.
- The input impedance of the 8950 ANALOG UNIT is 1 MΩ. If the signal source impedance is 1 kΩ, an error of about 0.1% will occur.

$$\text{Measurement error} = Es\left(1-\frac{Rin}{Rs+Rin}\right)\ [V]$$

Es : Signal voltage
Rs : Signal source resistance
Rin : Input resistance



13.2.1 8950 ANALOG UNIT

Accuracy at 23°C±5°C, 30% to 80% RH after zero adjustment after 30-minute warming-up timE
Period of guaranteed accuracy: 1 year.

Measurement ranges	5, 10, 20, 50, 100, 200, 500 mV/DIV, 1, 2, 5, 10, 20 V/DIV
DC amplitude accuracy	±0.4%f.s. (filter 5 Hz ON, averaging)
Zero position accuracy	±0.1%f.s. (filter 5 Hz ON, averaging, after zero adjustment)
Temperature characteristic	Gain: ±0.03%f.s./°C, Zero position: ±0.05%f.s./°C (after zero adjustment)
Frequency characteristic	DC to 10 MHz ±3 dB (DC coupling) 7 Hz to 10 MHz ±3 dB (AC coupling, low cutoff frequency: 7 Hz±50%)
Noise	1.5 mVp-p (typ), 2 mVp-p (max.) (sensitivity range, with input shorted)
Common mode rejection ratio	80 dB min. (at 50/60 Hz and with signal source resistance 100 Ω max.)
Low-pass filter	OFF, 5±50%, 500±50%, 5 k±50%, 1 M±50% (Hz) -3 dB
Input type	Unbalanced (input isolated from output)
Input coupling	DC, GND, AC
Input resistance	1 MΩ±1%
Input capacitance	40 pF±10pF (at 100 kHz)
A/D resolution	12 bits
Maximum sampling speed	20 MS/s
Input terminals	Insulated BNC terminal
Power terminal	9322 dedicated differential probe (uses the 9328 POWER CORD), +12 V± 8% (grounds with the power terminals the other modules present)
Maximum input voltage	400 V DC max.
Insulation resistance, dielectric strength	One minute at 3.7 kV AC between the input module and the main instrument, and between the each input modules At least 100 MΩ/500 V DC
Maximum rated voltage to earth	370 V AC/DC max. (between each input channel and main instrument, and between input channels)
Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8950 is installed
Location for use	Same as the MEMORY HiCORDER in which the 8950 is installed

Temperature and humidity ranges for storage	Temperature: -10°C to 50°C (50°F to 122°F) Relative humidity: 80% RH max. (with no condensation)
Effect of radiated radio-frequency electromagnetic field	±15% f.s. at 3 V/m (max.)
Effect of conducted radio-frequency electromagnetic field	±2% f.s. at 3 V/m (max.)
Dimensions / Mass	Approx. 104.7W x 28H x 164.5D mm (4.12"W x 1.10"H x 6.48"D) (excluding projections), Approx. 150 g (5.3 oz.)
Standard Applying	Safety EN61010 Pollution Degree 2, measurement category II (anticipated transient overvoltage 4000 V) EMC EN 61326 Class A

13.2.2 8951 VOLTAGE/CURRENT UNIT

Accuracy at 23°C±5°C, 30% to 80% RH after zero adjustment after 60-minute warming-up time

Period of guaranteed accuracy: 1 year.

Common specifications

A/D resolution	12 bits
Measurement functions	Voltage measurement, current measurement
Maximum sampling speed	20 MS/s
Low-pass filter	Voltage, 3273, 3273-50, 3274, 3275, 3276 : OFF, 5, 500, 100 k, 1 MHz ±50% (Hz) -3 dB 9270, 9271, 9272 : OFF, 500 Hz ±50% -3 dB 9277, 9278 : OFF, 5, 500, 100 k ±50% (Hz) -3 dB 9279 : OFF, 5, 500 Hz ±50% -3 dB
Input coupling	Voltage, 3273, 3273-50, 3274, 3275, 3276, 9277, 9278, 9279 : DC, GND, AC 9270, 9271, 9272 : GND, AC
Maximum input voltage	30 V rms or 60 V DC
Input/ connection terminal	
Input resistance	1 MΩ±1% Input capacitance: 50 pF±10 pF (at 100 kHz) Input type: unbalanced input
BNC Terminal	Voltage and current measurements (when using 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], and 3276[*1]) Maximum rated to-ground voltage: 30 V rms or 60 V DC (When using the 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], and 3276[*1] common ground of +12 V with each of the installed modules)
Sensor connectors	HR10A-10R-S (Hirose) (For the 9270s) Power* ±12 V±8 %
Power connector	GND (Common ground of +12 V with each of the installed modules) (For the 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], and 3276[*1]) Power* ±12 V±8 % GND (Common ground of +12 V with each of the installed modules) Note: When using the 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], and 3276[*1] the BNC terminal and power connector are dual use.
Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8951 is installed

Location for use	Same as the MEMORY HiCORDER in which the 8951 is installed
Temperature and humidity ranges for storage	Temperature: -10°C to 50°C (14°F 122°F) Relative humidity: 80% RH maximum (with no condensation)
Dimensions / Mass	Approx. 104.7W x 28H x 164.5D mm (4.12"W x 1.10"H x 6.48"D) (excluding projections), Approx. 190 g (6.7 oz.)
Option	9318 CONVERSION CABLE (for connecting the clamp on sensor)
Sensors	Clamp on sensors: 9270, 9271, 9272, 9277, 9278, 9279 Clamp on probes: 3273[*1], 3273-50[*1], 3274[*1], 3275[*1], 3276[*1]
Standard Applying	Safety EN 61010 Pollution Degree 2, measurement category I (anticipated transient overvoltage 330 V) EMC EN 61326 Class A
Effect of radiated radio-frequency electromagnetic field	±15% f.s.

Voltage and Current measurement

Voltage range	1 m, 2 m, 5 m, 10 m, 20 m, 50 m, 100 m, 200 m, 500 m, 1, 2, 5 V/DIV
Current range	Using the 9270, 9272(20A), 9277, 3273, 3273-50, 3276 10 m, 20 m, 50 m, 100 m, 200 m, 500 m, 1, 2, 5 A/DIV Using the 9271, 9272(200A), 9278, 3274 100 m, 200 m, 500 m, 1, 2, 5, 10, 20, 50 A/DIV Using the 9279, 3275 200m[*2], 500m, 1[*2], 2[*2], 5, 10[*2], 20[*2], 50, 100[*2]A/DIV
Frequency characteristic[*3] (common)	DC to 4 MHz ±3 dB (DC coupling) (Adds sensor attributes when using a sensor.) 7 Hz to 4 MHz ±3 dB (AC coupling) (Adds sensor attributes when using a sensor.)
DC amplitude accuracy[*3] (common)	±0.5%f.s. (Filter 5 Hz ON, averaging)
Zero position accuracy[*3] (common)	±0.15%f.s. (Filter 5 Hz ON, averaging, after zero adjustment)
Temperature characteristic[*3] (common)	Gain: ±0.025%f.s./°C Zero position: ±0.045%f.s./°C (Low sensitivity range higher than f.s. = 100 mV) ±0.05%f.s./°C (Low sensitivity range higher than f.s. = 50 mV)
Common mode rejection ratio	80 dB minimum (at 50/60 Hz and with signal source resistance 100 Ω maximum)
Noise	Voltage measurement: 500 µVp-p max., 300 µVp-p typ (at 1 mV/DIV range) Current measurement: 5 mAp-p max. (10 mAp-p max.) +7.1 mAp-pmax. (3273) (when using the 3273, at 10 mA/DIV range)

(*1): Has safety restrictions for use.
(*2): Vertical axis resolution: 80 LSB/DIV
(*3): Add sensors, probe accuracy, and characteristics used when measuring current.
(*4): When using the 9279:
DC amplitude accuracy 0.625%f.s.
Zero position accuracy 0.20%f.s.

13.2.3 8952 DC/RMS UNIT

Accuracy at 23°C±5°C, 30% to 80% RH after auto-balancing,
after 30-minutes warming-up time. Period of guaranteed accuracy: 1 year

Measurement range	5, 10, 20, 50, 100, 200, 500 mV/DIV, 1, 2, 5, 10, 20 V/DIV
DC amplitude accuracy	±0.4%f.s. (filter 5 Hz ON, averaging)
RMS amplitude accuracy	±2%f.s. (DC, 15 Hz to 50 kHz) ±8%f.s. (50 kHz to 500 kHz) (sine wave input, response: SLOW)
Response time	SLOW: 5 s (rising up, 0-90%) MID: 800 ms (rising up, 0-90%) FAST: 100 ms (rising up, 0-90%)
Crest-factor	2
Zero position accuracy	±0.1%f.s. (filter 5 Hz ON, averaging, after zero adjustment)
Temperature characteristic	Gain: ±0.03%f.s./°C, Zero position: ±0.05%f.s./°C (after zero adjustment)
Frequency characteristic	DC to 10 MHz ±3 dB (DC coupling) 7 Hz to 10 MHz ±3 dB (AC coupling, low cutoff frequency 7 Hz±50%)
Noise	1.5 mVp-p(typ.), 2 mVp-p(max.) maximum sensitivity range, with input shorted
Common mode rejection ratio	80 dB min. (at 50/60 Hz and with signal source resistance 100 Ω max.)
Low-pass filter	OFF, 5±50%, 500±50%, 5 k±50%, 1 M±50%(Hz) -3 dB
Input type	Unbalanced (input isolated from output)
Input coupling	DC, GND, AC
Input resistance	1 MΩ±1%
Input capacitance	40 pF±10 pF (at 100 kHz)
A/D resolution	12 bits
Maximum sampling speed	20 MS/s
Input terminals	BNC terminal
Power terminal	9322 dedicated differential probe (uses the 9328 POWER CORD), +12 V± 8% (grounds with the power terminals the other modules present)
Maximum input voltage	400 V DC max.
Insulation resistance, dielectric strength	One minute at 3.7 kV AC between the input module and the main instrument, and between the each input modules At least 100 MΩ/500 V DC
Maximum rated voltage to earth	370 V AC/DC (between each input channel and main instrument, and between input channels)
Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8952 is installed
Location for use	Same as the MEMORY HiCORDER in which the 8952 is installed
Temperature and humidity ranges for storage	Temperature: -10°C to 50°C (50°F to 122°F) Relative humidity: 80% RH max. (with no condensation)
Effect of radiated radio-frequency electromagnetic field	±15% f.s. at 3 V/m (max.)
Effect of conducted radio-frequency electromagnetic field	±2% f.s. at 3 V/m (max.)
Dimensions / Mass	Approx. 104.7W x 28H x 164.5D mm (4.12"W x 1.10"H x 6.48"D) (excluding projections), Approx. 150 g (5.3 oz.)
Standard Applying	Safety EN61010 Pollution Degree 2, measurement category II (anticipated transient overvoltage 4000 V) EMC EN 61326 Class A

13.2.4 8953-10 HIGH RESOLUTION UNIT

Accuracy at 23°C±5°C, 30% to 80% RH after auto-balancing,
after 30-minutes warming-up time. Period of guaranteed accuracy: 1 year

Measurement range	5, 10, 20, 50, 100, 200, 500 mV/DIV, 1, 2, 5, 10, 20 V/DIV
DC amplitude accuracy	±0.2%f.s. (filter 5 Hz ON, averaging)
Zero position accuracy	±0.1%f.s. (filter 5 Hz ON, averaging, after zero adjustment)
Temperature characteristic	Gain: ±0.025%f.s./°C, Zero position: ±0.02%f.s./°C (after zero adjustment)
Frequency characteristic	DC to 100 kHz ±3 dB (DC coupling) 7 Hz to 100 kHz ±3 dB (AC coupling, low cutoff frequency 7 Hz±50%)
Noise	500 µVp-p(typ.), 1 mVp-p(max.) maximum sensitivity range, with input shorted
Common mode rejection ratio	80 dB min. (at 50/60 Hz and with signal source resistance 100 Ω max.)
Low-pass filter	OFF, 5±50%, 50±50%, 500±50%, 5 k, 50 k±50%(Hz) -3 dB
Anti-aliasing filter	Cutoff frequency (fc) : 20, 40, 80, 200, 400, 800, 2 k, 4 k, 8 k, 20 k, 40 k (Hz) These frequencies are automatically set when the anti-aliasing filter is set to ON. Attenuation characteristic: -66 dB, min. (at 1.5 fc)
Input type	Unbalanced (input isolated from output)
Input coupling	DC, GND, AC
Input resistance	1 MΩ±1%
Input capacitance	40 pF±10pF (at 100 kHz)
A/D resolution	16 bits
Maximum sampling speed	1 MS/s
Input terminals	BNC terminal
Power terminal	9322 dedicated differential probe (uses the 9328 POWER CORD), +12 V± 8% (grounds with the power terminals the other modules present)
Maximum input voltage	400 V DC max.
Insulation resistance, dielectric strength	One minute at 3.7 kV AC between the input module and the main instrument, and between the each input modules At least 100 MΩ/500 V DC
Maximum rated voltage to earth	370 V AC/DC (between each input channel and main instrument, and between input channels)
Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8953-10 is installed
Location for use	Same as the MEMORY HiCORDER in which the 8953-10 is installed
Temperature and humidity ranges for storage	Temperature: -10°C to 50°C (50°F to 122°F) Relative humidity: 80% RH max. (with no condensation)
Effect of radiated radio-frequency electromagnetic field	±15% f.s. at 3 V/m (max.)
Effect of conducted radio-frequency electromagnetic field	±2% f.s. at 3 V/m (max.)
Dimensions / Mass	Approx. 104.7W x 28H x 164.5D mm (4.12"W x 1.10"H x 6.48"D) (excluding projections), Approx. 150 g (5.3 oz.)
Standard Applying	Safety EN61010 Pollution Degree 2, measurement category II (anticipated transient overvoltage 4000 V) EMC EN 61326 Class A

13.2.5 8954 VOLTAGE/TEMP UNIT

Accuracy at 23℃±5℃, 30% to 80% RH after auto-balancing (voltage range), after 30-minutes warming-up time. Period of guaranteed accuracy: 1 year

When Inputting Voltage

Measurement range	500 µV/DIV, 1, 2, 5, 10, 20, 50, 100, 200, 500 mV/DIV, 1, 2 V/DIV
Zero position settings range	Recording width of 100 to 150% f.s. (with a Y-axis x 1 display)
DC amplitude accuracy	±0.2%f.s. (filter 5 Hz ON, averaging)
Zero position accuracy	±0.2%f.s. (filter 5 Hz ON, averaging, after zero adjustment)
Temperature characteristic	Gain: ±0.02%f.s./℃, Zero position: ±0.02%f.s./℃
Frequency characteristic	DC to 20 kHz $^{+1}_{-3}$ dB
Noise	75µVp-p (typ.), 120 µVp-p (max.)
Input terminals	BNC terminal
Input resistance	1 MΩ±1%
Input capacitance	60 pF±20pF (at 10 kHz)
Input coupling	DC, GND, AC
Low-pass filter	1, 5, 50, 500±50% (Hz) (-3dB)

During Thermocouple Input

Measurement range	10, 100℃/DIV
Measurement input range	K : -200 to 1350℃ N : -200 to 1300℃ W: 0 to 2000℃ T : -200 to 400℃ B : 300 to 1800℃ J : -200 to 1100℃ S : 0 to 1700℃ E : -200 to 800℃ R : 0 to 1700℃
Zero position setting range	-100% to +100% f.s. (Vertical axis: 1 time)
Temperature measurement accuracy {K,E,J,T,N}	±0.1%f.s.±1.0℃, ±0.1%f.s.±2.0℃ (-200 to 0℃)
Temperature measurement accuracy {R,S,W}	±0.1%f.s.±3.0℃
Temperature measurement accuracy {B}	±0.1%f.s.±4.0℃ (Effective measurement range: 400 to 1800℃)
Reference junction compensation	Internal/ external switchable
Reference junction compensation accuracy	±0.1%f.s.±1.5℃ (With reference junction compensation and balanced input terminal temperature)
Temperature characteristic	±0.02%f.s./℃ (Sensor: K,E,J,T,N) ±0.1%f.s./℃ (Sensor: R,S,B,W)
Frequency characteristic	DC to 1 kHz $^{+1}_{-3}$ dB Data update rate: External reference junction compensation 90µs ±60% Internal reference junction compensation 240µs ±30%
Input terminals	2 terminals
Input resistance	4.8 MΩ min.
Low-pass filter	1, 5, 50, 500±50% (Hz) (-3 dB)

Common Specification

Common mode rejection ratio	80 dB min. (at 50/60 Hz and with signal source resistance 100 Ω max.)
Input type	Unbalanced (input isolated from output)
A/D resolution	16 bits
Maximum sampling speed	100 kS/s (However, the update rate differs when inputting temperature.)
Maximum input voltage	30 V rms or 60 V DC (Voltage input and thermocouple input)
Maximum rated voltage to earth	370 V AC, DC max. (Voltage input and thermocouple input)
Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8954 is installed
Location for use	Same as the MEMORY HiCORDER in which the 8954 is installed
Temperature and humidity ranges for storage	Temperature: -10℃ to 50℃ (50℉ to 122℉) Relative humidity: 80% RH max. (with no condensation)
Dimensions / Mass	Approx. 104.7W x 28H x 163D mm (4.12"W x 1.10"H x 6.42"D) (excluding projections), Approx. 160 g (5.6 oz.)
Effect of radiated radio-frequency electromagnetic field	±15% f.s. at 3 V/m (max.)
Standard Applying	Safety EN61010 Pollution Degree 2, measurement category II (anticipated transient overvoltage 4000 V) EMC EN 61326 Class A

13.2.6 8955 F/V UNIT

Accuracy at 23℃±5℃, 30% to 80% RH after auto-balancing (voltage range), after 30-minutes warming-up time. Period of guaranteed accuracy: 1 year

Measurement Function

	Based on voltage input, measures frequency, rotation speed, commercial power frequency, integral values, pulse duty ratio, and pulse width.

Input Terminal

Connection terminal	BNC terminal
Input resistance	1 MΩ±1%
Input capacity	35 pF±15 pF
Maximum input voltage	30 Vrms or 60 V DC
Maximum voltage to earth	30 Vrms or 60 V DC
Input type	Unbalanced input (Isolated from the instrument.)

Power supply terminal

Especially for fuse with the 9322 differential probe	12 V±8% (Shares the ground of power terminals of other mounted modules.)

Measurement Specification

1. Frequency mode

Measurement range	0.1, 0.5, 1, 5, 10, 50, 100, 500, 1 k, 5 kHz/DIV (f.s.=20DIV)
Accuracy	±0.7%f.s. (100 kHzf.s. range) ±0.1%f.s. (excluding 100 kHzf.s. range)
Frequency characteristic	DC to 100 kHz

2. Rotation mode

Measurement range	10, 50, 100, 500 r/min /DIV (f.s.=20DIV)
Accuracy	±0.1%f.s.
Frequency characteristic	Zero to 10 kr/min

3. Commercial power frequency mode

Measurement range	50 Hz (40 to 60 Hz), 60 Hz (50 to 70 Hz)
Accuracy	±0.032 Hz

4. Integration mode

Measurement range	2 k, 10 k, 20 k, 100 k, 200 k, 1 Mcounts/DIV (f.s.=20DIV)
Frequency characteristic	DC to 90 kHz

5. Duty ratio mode

Measurement range	5%/DIV (f.s.=20DIV)
Accuracy	±1%
Frequency characteristic	10 to 100 kHz

6. Pulse width mode

Measurement range	500 µ, 1 m, 5 m, 10 m, 50 m, 100 ms/DIV (f.s.=20DIV)
Accuracy	±0.1%f.s.
Frequency characteristic	2.5 µ to 2 s

Measurement Resolution

	2000 LSB/DIV (f.s.=20 DIV) (integration mode) 200 LSB/DIV (f.s.=20 DIV) (excluding integration mode)

Response Time

	Less than 10 µs + sampling interval of instrument in which the module is installed. (For the following measuring modes: frequency (300 Hz or higher), integration, and pulse width.) Less than 50 µs + sampling interval of instrument in which the module is installed. (For the following measurement modes: frequency (300 Hz or less), rotation speed, commercial power frequency, and duty ratio.)

Other Functions

Threshold value	-10 to +10 V variable (0.2 V steps)
Slope	Rising/falling (Frequency, rotation, commercial power frequency mode, and integration mode)
Level	HIGH/LOW (Duty ratio, pulse width mode)
Hold	ON/OFF (Frequency, rotation, and commercial power frequency mode) When the hold function is turned off and the following measurement values are not verified within the specified time (2 times the measurement sampling period), the current measurement values are halved.
Low-pass filter	OFF, 5, 500, 5 k, 100 k±50%(Hz) -3 dB
Pull up	ON/OFF Pull up resistance: 10 kΩ

Dimensions / Mass

	Approx. 107.4W x 28H x 164.5D mm (4.23"W x 1.10"H x 6.48"D) Approx. 140 g (4.9 oz)

Operational ranges for temperature and humidity	Same as the MEMORY HiCORDER in which the 8955 is installed	
Location for use	Same as the MEMORY HiCORDER in which the 8955 is installed	
Temperature and humidity ranges for storage	Temperature: -10 to 50°C (14°F 122°F) Relative humidity: 80% RH max. (with no condensation)	
Effect of radiated radio-frequency electromagnetic field	±5% f.s. at 3 V/m (max.)	
Standard Applying	Safety	EN61010 Pollution Degree 2, measurement category I (anticipated transient overvoltage 330V)
	EMC	EN 61326 Class A

Chapter 14
Maintenance and Service

14.1 Maintenance and Inspection

To ensure the safe operation of this unit, perform maintenance regularly.

- If the unit has been subject to moisture, or if oil and dust have accumulated in the unit interior, the danger of electrical shock or fires resulting from the deterioration of insulation increases greatly. If the unit is ever subject to excessive moisture, oil, or dust, cease use immediately, and return the unit to us for maintenance.
- Periodic calibration is necessary to verify and maintain accuracy. If calibration becomes necessary, contact your dealer or Hioki representative.
- This instrument uses a lithium battery to back up it's memory. As the battery power is consumed, it's ability to store measurement conditions diminishes. In the event that measurement conditions can no longer be stored, please contact the manufacturer for repair service.
- Spare and replacement parts for this instrument are guaranteed to be available only until 7 years after manufacture of this model is terminated.
- If damage is suspected, check the "Troubleshooting" section before contacting your dealer or Hioki representative. When sending the instrument for repair, pack the instrument carefully so that it will not be damaged during shipment, and include a detailed written description of the problem. Hioki cannot be responsible for damage that occurs during shipment.

Cleaning the Unit

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

Printer Head Cleaning (when the 8994 PRINTER UNIT is installed)

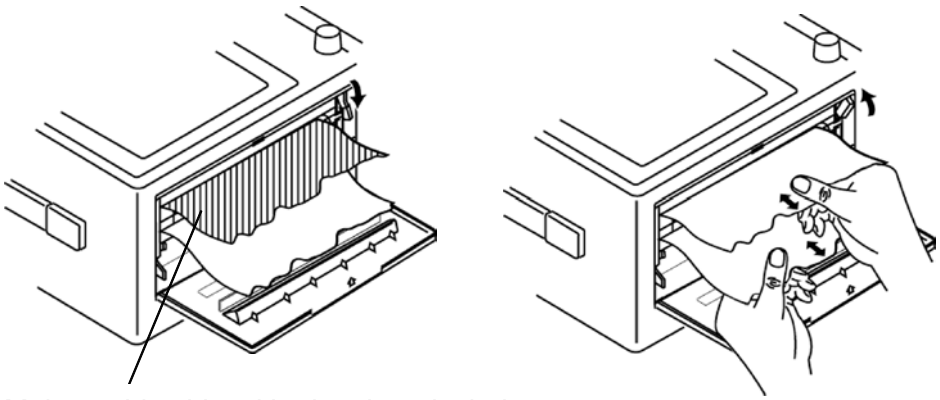
In normal use, the printer does not require periodic maintenance. However, depending on usage conditions, the thermal head may become contaminated by dust or paper scraps. If the print seems light or if there are dropped sections, clean the head as described below.

Procedure 1

1. Press the **SYSTEM** key to display the Self check screen.
2. Move the flashing cursor to the PRINTER CHECK item.
3. Press the cleaning function key for about 5 seconds. During this interval, the printer prints 100% black section.
4. If this method does not alleviate the problem, perform the steps of cleaning method 2 as described below.

Procedure 2

1. Moisten printer paper on the rear with alcohol and set the paper in the printer. (If the front side of the paper is moistened, discoloring will occur.)
2. Lower the head up/down lever and move the printer paper back and forth to clean the head.



Moisten this side with cleaning alcohol

NOTE

- Do not use organic solvents such as thinner or benzene, which could discolor or deform the product.
- After extended use, paper residue (visible as a white powder-like substance) may accumulate on the roller. While a small amount of residue has no adverse effect, the roller can be cleaned using a air-blow brush (such as sold as a camera accessory).
- Always use the paper cutter integrated in the printer cover to cut printer paper. If the paper is cut near the thermal head, a large amount of paper residue may accumulate on the roller.

14.2 Replacing the Input Modules

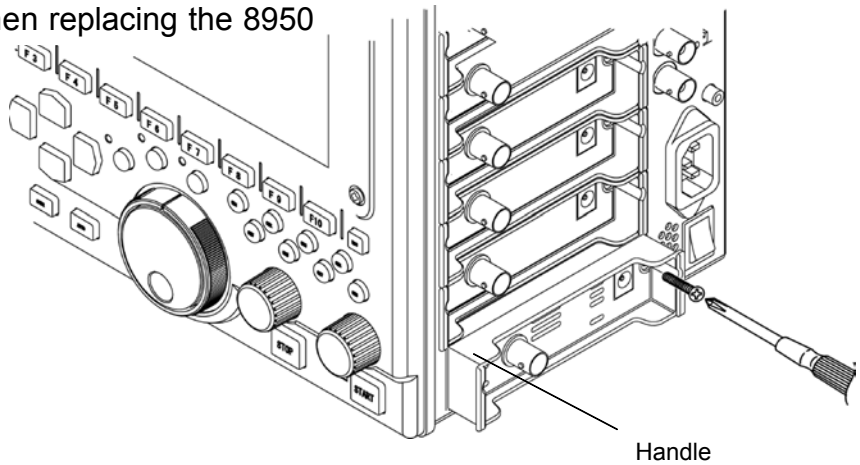
⚠ WARNING

- **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.**

- The following procedure describes how to remove the input module.
- Install the modules by reversing the procedure for removal.

1. Remove the connector cables from all input modules.
2. Power off the 8855 main instrument, and disconnect the power cord.
3. Remove the two fixing screws with a Phillips screwdriver, as shown in the figure below.
4. To remove the input module, grasp handle connector.

When replacing the 8950



NOTE

Do not measure with a blank panel removed. Otherwise, the instrument internal temperature becomes unstable and consequently the specifications are not met.

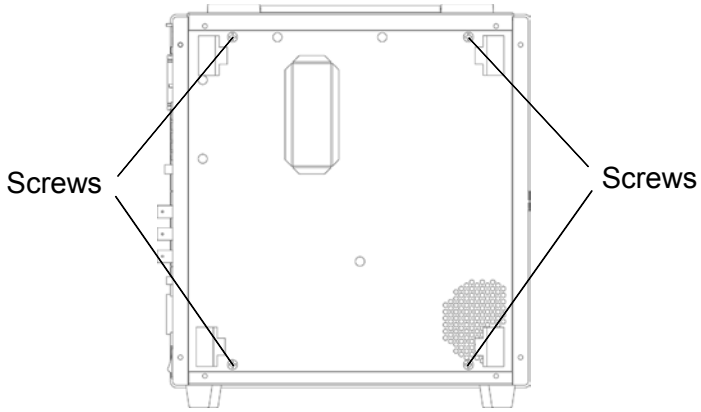
14.3 Removing the Battery Before Discarding the Unit

⚠ WARNING

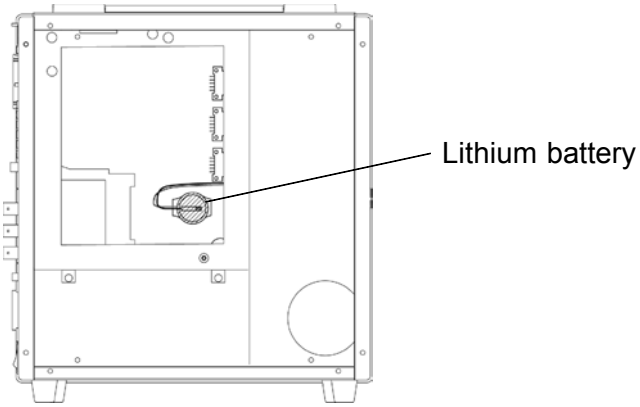
- **To avoid the risk of electric shock, be sure that all cables, the power cord and thermocouples are disconnected before removing the battery.**
- **Dispose of the battery as prescribed in your community.**

- The 8855 incorporates a lithium battery for memory backup.
- Before final disposal of the 8855, remove the battery as described below.

1. Verify that the power is switched OFF.
2. Disconnect all connector cables, the power cord and thermocouples.
3. Remove 4 bolts as illustrated below, and then remove the cover.



4. Remove the rear panel. The battery is located in the position on the PCB shown in the figure.



5. Remove the battery cords (red and black) from the board. (Pulling the cords unplugs them from the board.) Otherwise, cut the cords with wire-snippers.
6. Remove the battery (the battery is attached to the board with double-sided adhesive tape and band).

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

14.4 Troubleshooting

If the instrument does not seem to operate normally, check the following points before requesting service.

Problem	Check
LED does not light when the instrument is turned on.	Is power cord connected properly?
There is absolutely no variation in the recorded waveform.	Is the "Pre-trigger standby" message displayed? (When pre-triggering is activated, triggering does not occur until the current waveform is fully captured.) Has the "Waiting for trigger" message appeared? Check the trigger settings.
There is absolutely no variation in the recorded waveform.	Is the measurement range setting appropriate? Has a low pass filter been set?
The printed recording is non-existent.	Is the recording paper back to front?
The printed recording is very faint.	Are you using the correct (thermal) recording paper?
During memory operation, the apparent frequency of the recording is much lower than the expected frequency.	This is likely to be an aliasing error. Make the time axis range setting faster. For details, see Instruction Manual Appendix 3.
Recording lines are dense or blurred.	Input signal contains ripple components. Make suitable filter settings at input module.
Recording lines are duplicated.	When "Dotted line*" is selected as the printed line type in the waveform display color settings, the top and bottom of the line become separated by a 1-dot gap. With waveforms that have little variation, this can cause waveform printing to appear variously as one line or as two lines. To correct this, select "Solid line" as the printed line type.
The keys are dead and do not respond.	Has the instrument been put into the key lock condition (message "KEY LOCK" appeared? Press the KEY LOCK key to clear the key lock condition. Is the instrument being remotely controlled ("GP-IB REMOTE" is displayed, if the GP-IB interface is being used)?
Some channels cannot be used.	Is the number of channels to be used restricted?
The size of a waveform does not change, even if the input range is changed.	Has the variable function been enabled? Disable the variable function.

NOTE

If none of the above conditions apply, and the cause of the problem is not understood, try performing a SYSTEM RESET. All the settings will revert to the factory settings. For details, see Section 9.5.3.

Index

- A -

- B -

- C -

- D -

- E -

- F -

- G -

- H -

- I -

- J -

- K -

- L -

- M -

- O -

- P -

- R -

- S -

- T -

- U -

- V -

- W -

- X -

- Z -

- Others -

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	MEMORY HiCORDER
Model Number:	8855
Options:	8950 ANALOG UNIT 8951 VOLTAGE/CURRENT UNIT 8952 DC/RMS UNIT 8953-10 HIGH RESOLUTION UNIT 8954 VOLTAGE/TEMP UNIT 8955 F/V UNIT 8994 PRINTER UNIT 9197 CONNECTION CORD 9198 CONNECTION CORD 9217 CONNECTION CORD 9320-01 LOGIC PROBE 9321-01 LOGIC PROBE 9327 LOGIC PROBE 9328 POWER CORD 9557 RS-232C CARD 9558 GP-IB CARD 9645 MEMORY BOARD 9645-01 MEMORY BOARD 9646 MO UNIT 9663 HD UNIT 9665 10:1 PROBE 9666 100:1 PROBE

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001 EN61010-031:2002
EMC:	EN61326-1:2006 Class A equipment Basic Immunity test requirement EN61000-3-2:2006 EN61000-3-3:1995+A1:2001+A2:2005

Supplementary Information:

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

HIOKI E.E. CORPORATION

22 December 2008

Atsushi Mizuno

Director of Quality Assurance

8855A999-07

HIOKI

HIOKI E. E. CORPORATION

HEAD OFFICE
81 Koizumi, Ueda, Nagano 386-1192, Japan
TEL +81-268-28-0562 FAX +81-268-28-0568
E-mail: os-com@hioki.co.jp URL http://www.hioki.com/
(International Sales and Marketing Department)

HIOKI USA CORPORATION
6 Corporate Drive, Cranbury, NJ 08512, USA
TEL +1-609-409-9109 FAX +1-609-409-9108

Edited and published by Hioki E.E. Corporation
Technical Support Section

Printed on recycled paper Printed in Japan