Instruction Manual
MAINFRAME
For RA1000 Series

NEC San-ei Instruments, Ltd.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. There limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- Disposing of your used our product -

In the European Union

EU-wide legislation as implemented in each Member State requires that used electrical and electronic products carrying the mark(left) must be disposed of separately from normal household waste. This include electrical accessories, such as chargers or AC adaptors.

The mark on the electrical and electronic products only applies to the current European Union Member States.

Outside the European Union

If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority and ask for the correct method of disposal.

INTRODUCTION

We thank you for your purchase of our product Thermal-Dot Recorder OMNIACE II RA1000series Please read this manual before operating this instrument.

This manual provides the information necessary to operate the RA1000series recorder safely. Place this manual within reach of the RA1100/1200. This manual covers basic functions and operations of the RA1100/1200 and handling precautions. For operation of other functions, please refer to the separate-volume manuals listed below. If you encounter any problems in the manuals, please contact our sales representative.

<Separate-volume manuals>

Manual	Document No.	Contents
Instruction Manual RS-232C, GP-IB RA1000 Series	95691-2075-0000	This manual provides the information necessary to operate the recorder with interfaces such as GP-IB or RS-232C. It also covers descriptions on interface commands to allow control by a PC.
Instruction Manual Amplifier Units RA1000 Series	95691-2076-0000	This manual explains how to use and install amp units.

＊ RA1000 series stands for RA1100, RA1200 and RA1300 in this manual.

■ Before Using

- **When Opening Package**
  If opening the package in a warm room during the cold season, open the package after it has reached room temperature to avoid any operational failure due to condensation on the surface of the product.

- **Examining Contents in Package**
  This instrument is delivered after a thorough examination at the factory prior to shipment. However, please examine the product's condition and verify that no obvious shipping damage has occurred after opening the package. Also, examine the specifications of the input units and accessories. If there are any missing or damaged items, please contact our sales representative.

Notice

- Turn off the power when the operation is abnormal.
  If it is impossible to trace the causes of an abnormal operation, please contact our sales representative. In this case, let us know in what way the unit was operating incorrectly and what the environmental conditions are.
- The contents of this manual are subject to change without notice.
-
- Please let us know if there are any points that are unclear or missing in this manual.

■ Safety Measures - Warning and Cautions

To safely use products

The RA1100/1200 is a product conforming to the IEC standard safety class I. The recorder is manufactured with safety in mind, however, accidents may occur due to misuse by the user. To avoid such accidents, read this manual carefully before use. Observe the following warning and cautions when using the interface and remote control functions. To safely use the input units, the following statements are used in this manual to call the readers' attention.

⚠ WARNING

This indicates a condition or practice that could result in personal injury or loss of life, or may result in light injury or physical damage if this equipment is misused due to neglect of a Warning.

⚠ CAUTION

This indicates a condition or practice that could result in light injury or damage to the equipment or other property if this equipment is misused due to neglect of a Caution.

Be sure to observe the following instructions when using this recorder. The warranty does not cover damages resulting from the actions against instructions, cautions, or warnings mentioned in this manual. Besides, there are a lot of actions that are "cannot" and "do not". It is impossible to write all such descriptions in this manual. Accordingly, assume any actions to be "impossible" except the actions explicitly described as "possible".

⚠ WARNING

- **Power Supply**

  Make sure that the power supply is within the rating indicated on the rating plate attached to this recorder. If any voltage exceeding the rated voltage were supplied, there would be risk of damage to this recorder, or even a fire.

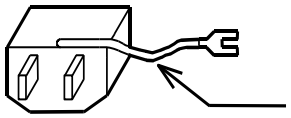
  Also, in order to prevent electric shock and hazards such as a fire, be sure to use only the AC power cable and the adapter (3-prong/2-prong converter) supplied with this recorder.

- **Protective Grounding**

  Be sure to ground this recorder before supplying power. Grounding is necessary to use this recorder safely, as well as to protect the user and peripheral equipment from injury or damage. Be sure to observe the following instructions:

1) This recorder uses a 3-conductor AC power supply cable containing a ground lead and a 3-prong AC power plug. By plugging the power supply cable into a 3-pole AC outlet with a ground pole, grounding will be done automatically.
2) If the power cable is plugged into a 2-pole AC outlet, be sure to plug it by attaching an adapter (3-prong/2-prong converter) to the plug of the power cable. In this case, secure the grounding by connecting either a grounding lead extending from the adapter or a functional grounding terminal in the power panel of this recorder with the external grounding conductor terminal.

Adapter (3-prong/2-prong converter)



Earth Cable

3) When grounding, do not connect the grounding lead to a water pipe, as water pipes are not necessarily conductive to the earth. Never connect the ground lead to a gas pipe either, as it is extremely dangerous.
4) While the power is supplied to the recorder, do not cut or remove the protective grounding line. Otherwise, safety of the recorder is not guaranteed.

⚠ WARNING

- **Connection of Input Signals**
  Be sure to ground the grounding terminal of this recorder before connecting to the measurement target. Also, when connecting this recorder to another measurement instrument, be careful not to exceed the maximum allowable common mode input voltage range. A voltage exceeding the range can cause damage to this recorder.

- **Use in Gaseous Atmosphere**
  Never use this recorder in a flammable or explosive atmosphere, or atmosphere of steam. Use in such atmosphere will result in danger to users and the recorder.

- **Disassembling the Frame**
  It is dangerous to remove the frame due to high-voltage parts inside. Do not remove the frame from the recorder other than by our service engineers.

- **Fuse at AC Power Supply Block (RA1100/RA1200)**

RA1100

100 VAC	Time-lag fuse No. 19195 1.0 A
200 VAC	Time-lag fuse No. 19195 0.5 A

RA1200

100 VAC	Time-lag fuse No. 19195 2.0 A
200 VAC	Time-lag fuse No. 19195 1.0 A

RA1300

100 VAC	Time-lag fuse No. 19195 4.0 A
200 VAC	Time-lag fuse No. 19195 2.0 A

- **Handling of Back-up Battery (Cautions when Disposing)**
  This recorder includes a lithium secondary battery (Lithium-ion secondary battery). When disposing this recorder, remove the lithium secondary battery in advance.
  Do not dispose of it in fire or disassemble. The lithium secondary battery may explode when it is heated and organic electrolyte that may exude from it is harmful to human skin. When disposing the lithium secondary battery, isolate terminals by covering with tape and dispose as a noncombustible.

⚠ CAUTION

- **Caution in Handling**

  When using this recorder, always follow the precautions below. Improper handling may lead to erroneous operations and damages.

1) Users who are not familiar with the operation of this recorder should avoid using it.
2) Storage environment

   The storage temperature of the input units is –10 to 60°C (except for chart recording paper). Avoid storing in places where the temperature could rise over the storage temperature and where there is direct sunlight exposure such as inside an automobile.
3) Use this recorder at locations that satisfy the installation requirement, the category II (CAT II) of the safety standard for electrical measurement instruments in IEC61010-1 (JIS-C-1004).
4) This recorder is a product with a pollution degree of 2.
5) Do not use this recorder at the following locations. In addition, carefully check the environment when using this recorder.
   1. Locations where the temperature and humidity rise due to direct sunlight or heaters. (The operating environment of the recorder; temperature: 0 to 40 °C, (5 to 40 °C during FD operation) humidity: 35 to 85%)
   2. Wet locations
   3. Locations where salt, oil, or corrosive gases exist
   4. Damp or dusty locations
   5. Locations subject to strong vibrations
   6. Locations with a strong electromagnetic field
   7. This recorder is provided with ventilation openings in order to prevent overheating. Ensure that the ventilation openings remain unobstructed by covers or materials. Otherwise, the internal temperature of the recorder rises, causing malfunctions.
6) Be careful of power voltage fluctuations. Do not use the recorder when these are likely to exceed the rated voltage.
7) If the power supply includes a lot of noise or high-voltage inductive noise, use noise filters to avoid operation errors.
8) Do not try to draw a floppy disk out of the drive while the drive is operating (while the LED is lit up). Otherwise, data saved on the disk may be damaged.
9) When connecting an MO or PD drive to the SCSI connector, first supply the power to the MO or PD disk before powering up the recorder. After confirming the power is being supplied, turn the power of the recorder on. If the power of the recorder is turned on first, the MO or PD drive will not be recognized.
10) This recorder uses a touch panel. When touching the panel, do not use a sharp object or push with high-pressure other than necessary. Press the panel gently with the fingertip. In addition, do not press more than one button/key at once. Be sure to press only one button/key at a time. Pressing two or more buttons/keys at once may cause misoperations.
11) Use the chart recording paper specified by NEC San-ei. Use of a chart that is not recommended may cause failure in printing or shorten the life of the thermal head. (Applied in RA1200 only)
12) If the recorder is not used for a long period of time, the internal backup battery (Lithium secondary battery) may completely discharge, causing the battery life to shorten. When the recorder is not used for a long period time, supply the recorder with power two or three times a month to charge the battery. (12 hours power-up allows battery to become fully charged.)
13) Do not insert a pointed or sharp object into the ventilation openings of this recorder.
14) To clean this recorder, first turn off the power, place it in a well-ventilated location, and wipe the recorder with soft cloth moistened with ethanol. Do not use benzene, petroleum solvents, or chemically treated cloths, as they can cause deformation or discoloration.

15) When transporting the recorder, use the package and packaging material supplied at factory shipment, or use a package and packaging material more shock-resistance than those supplied.

16) We recommend a periodical calibration to maintain the accuracy of the input units. More reliable measurements are possible by calibrating the input units once a year (extra cost option).

■ Warranty - General

We ship our products after conducting quality control, which covers from design to manufacturing. It is, however, possible that failures may occur in the products. If the product does not operate correctly, please make a check of the power supply, cable connections, or other conditions before returning this product to us. For repair or calibration, contact our sales agency. Before returning, be sure to inform us of the model (RA1000series), serial number, and problematic points. The following is our warranty.

■ Limited Warranty

1. Warranty period

One year from our shipment.

2. Warranty period

We will repair the defects of our product free of charge within the warranty period; however, this warranty does not apply in the following cases.

(1) Damage or faults caused by incorrect use.
(2) Damage or faults caused by fire, earthquake, traffic accident, or other natural disasters.
(3) Damage or faults caused by a repair or modification that is carried out by someone other than a service representative of NEC San-ei Instruments.
(4) Damage or faults caused by use or storage in environmental conditions that should be avoided.
(5) Periodical calibration.
(6) Damage or faults caused during transportation.

3. Liability

We do not assume any liabilities for equipment other than NEC San-ei Instruments.

■ Terms and Symbols in This Manual

Terms and symbols used in this manual denote as follows.

Terms and Symbols	Description
⚠ WARNING	This indicates a condition or practice that could result in personal injury or loss of life, or may result in light injury or physical damage if this equipment is misused due to neglect of a Warning.
⚠ CAUTION	This indicates a condition or practice that could result in light injury or damage to the equipment or other property if this equipment is misused due to neglect of a Caution.
NOTE	This indicates a condition or practice that could result in incorrect operation or damages in data if this equipment is misused due to neglect of Note.
TIPS	This symbol gives setting restrictions and additional descriptions.
☞	Reference page
This recorder	RA1000series
[ ]	Characters enclosed by brackets represent a key name in the operation panel.
Memory	Internal memory of RA1000series When measuring with memory recorder or transient recorder, measured data is recorded in this memory.
Disk	The following recording media can be used in this product. • FD: 3.5-inch floppy disk, 2HD (double-sided, high-density type) • MO: 3.5-inch magneto-optic disk (120,230,540,640 MB) • PD: 12-cm phase change disk (650 MB) "Disk" in this manual is interpreted as the above three recording media.
PC card	The following PC card can be used in this product. • IC memory card (SRAM card): 64 KB to 4 MB • Flash memory card: 2 MB to 100 MB "PC card" in this manual is interpreted as the above two cards.
k (lower case) K (upper case)	A unit of numerical value "k" is used to represent 1000 such as "10 kg". "K" is used to represent 1024 such as "4 K data"

■ Liquid Crystal Display

This recorder has a TFT color LCD for display. There may be cases where the light of pixels does not come on or off in the LCD. In addition,the LCD includes unevenness slightly due to temperaturechanges. Please be aware that these cases are not disorders.

CONTENTS

1. RA1000 OVERVIEW

1.1 Overview and Features

1.1.1 Overview

The RA1000 Series are data acquisition equipment having a maximum of 16 channels and large-size color display, featuring high performance satisfying diverse measurement requirements. Amplifiers such as DC, FFT, temperature, strain, and vibration/RMS amps are supported and all amps feature 2-ch configuration per unit. Since a maximum sampling speed of 1 MHz and 16-bit A/D resolution are available, more advanced measurements become possible.
Measured data can be saved in FD, PC card (ATA flash card or SRAM card), MO (optical magnetic disk), or PD (phase change disk).
The following measurement modes are available.

(1) Real-time mode, which allows signals to be printed in real-time with data backup recording.
(2) Memory mode, which allows high-speed signals to be saved in recorder memory or to perform data filing.
(3) Transient mode, which is a combination of the real-time mode and memory mode.
(4) Filing mode to record data directly into various media.

Users can switch the recording mode according to the type of measurement. Not only data acquisition but also signal data printing is available. The internal printer has a recording width of 216 mm and a density of 8 dots per millimeter, enabling signal printing on thermal chart with high fidelity. (RA1200, 1300) Moreover, usability has been enhanced by employing a touch panel. Other remarkable features include direct report output of measurement results, operation processing, and control via telephone line.

1.1.2 Features

- Selection of functions
  Expansion functions such as operation, FFT, and waveform judgment, as well as interface functions such as RS-232C, Fax modem, GP-IB, and SCSI are provided as optional functions, allowing users to select suitable functions for measurement. System move-up is easy since RS-232C, GP-IB, and SCSI are available by plug-in and expansion functions can be installed by floppy disks.
- Multi-channel support
  Newly developed amps, which have two channels per unit, enable a measurement for 16 channels with a standalone compact recorder.
- High-speed sampling
  High-speed DC amp enables 1 ms/s (1 μ s) sampling for 16 channels at the same time.
- Long-time data filing
  Long-time data acquisition (filing) such as a data recorder is available.
  Since measured data is saved in memory media in digital form, data analysis after the measurement, which was not possible in the data printed on the chart, and long-time data management are available.
- Remote and FAX transmission functions which improve efficiency of measurement
  By simply connecting the recorder to a modem, remote control via a telephone line is available. Waveform data of recorded image can be transferred to a facsimile at data recording after automatic call.
- Zone statistics, functions, and FFT operation functions (optional)
- Amp unit
  There are 10 types of amp units as follows. Users can choose eight units among them. The input of each amp unit is isolated and the units offer easy replacement due to their plug-in connection.

Unit name	Type No.
2CH high-resolution amp unit	AP11-101
2CH FFT amp unit	AP11-102
2CH high-speed amp unit	AP11-103
2CH AC strain amp unit	AP11-104
Event amp unit	AP11-105

Unit name	Type No.
2CH TC/DC amp unit	AP11-106
TC/DC amp unit	AP11-107
F/V converter unit	AP11-108
2CH vibration/RMS amp unit	AP11-109
2CH DC strain amp unit	AP11-110

Remark
The RA1100 does not have a printer unit. In addition, it does not have settings for the real-time mode.

1.2 Configuration

1.2.1 Model

This recorder instrument comprises the main recorder unit, amp units, optional units, and standard accessories.

Product name	Model	Remark
Omniace Ⅱ	RA1100	When placing order, specify the display to "English".
Omniace Ⅱ	RA1200	
Omniace Ⅱ	RA1300	

1.2.2 Recorder and Amp Unit

Name		Configuration	Remark
Main body	Recorder body (operation block, display block, amp insertion block, and control block)	1	・Remote terminal ・PC card slot ・FD drive
	Built-in printer	1	Not applicable to RA1100
	Power supply (100VAC or 200VAC)	1	Specify when placing order
	RS-232C unit	Optional	RA11-106
	GP-IB unit	Optional	RA11-105
	SCSI unit	Optional	RA11-107
	Memory expansion unit	Optional	RA11-126, specify when placing order
	AC bridge power supply unit	Optional	RA11-109, specify when placing order
	DC power supply unit	Optional	RA11-110, specify when placing order
	Built-in MO unit	Optional	RA11-108, specify when placing order

Amp unit

Unit name	Type No.	Remark
2CH high-resolution amp unit	AP11-101	
2CH FFT amp unit	AP11-102	
2CH high-speed amp unit	AP11-103	
2CH AC strain amp unit	AP11-104	
Event amp unit	AP11-105	
2CH TC/DC amp unit	AP11-106	
TC/DC amp unit	AP11-107	
F/V converter unit	AP11-108	
2CH vibration/RMS amp unit	AP11-109	
2CH DC strain amp unit	AP11-110	

Optional function

Unit name	Type No.	Remark
Arithmetic operation unit	RA11-752	
FFT unit	RA11-751	
Waveform judgment unit	RA11-753	

1.2.3 Standard Accessories (Display in Japanese and 100 VAC)

Name	Type No.	Rating	Quantity
AC power supply cable	0311-5044	100VAC, 2.5m	1
Adaptor	0250-1053	KPR-24S	1
Users manual	95691-2074-0000	For Mainframe	1
Users manual	95691-2075-0000	For RS-232C and GP-IB	1
Users manual	95691-2076-0000	For Amplifier units	1

The following accessories are included in models other than the RA1100

Chart printing paper holder	5633-1794	1 piece for each end of roll chart	2
Chart	0511-3167	Roll chart 219.5 mm × 30 m	1

1.2.4 Other Accessories and Consumables

(1) Accessories for event amp unit (AP11-105)(RT31-163)

Name	Type No.	Remark
Logic IC cable	0311-5007	2 cables per unit
IC clip cables	0311-5008	4 cables per bag, 2 bags per unit
Alligator clip cable	0311-5009	4 cables per bag, 2 bags per unit

(2) Consumables

Name	Type No.	Specifications
Recording chart paper	YPS106	Roll chart paper, 219.5 mm × 30 m, 5 volumes/box
Recording chart paper	YPS108	Roll chart paper, 219.5 mm × 30 m, 5 volumes/box With 300-mm pitch perforated lines Remaining length indication print pitch: 300 mm 99 to 01
Recording chart paper	YPS112	Z-fold paper, 219.5 mm x 200 m, fold width: 300 mm Remaining length indication print pitch (pages): 669-000 Note: Supply case (RA12-103) is required for Z-fold paper

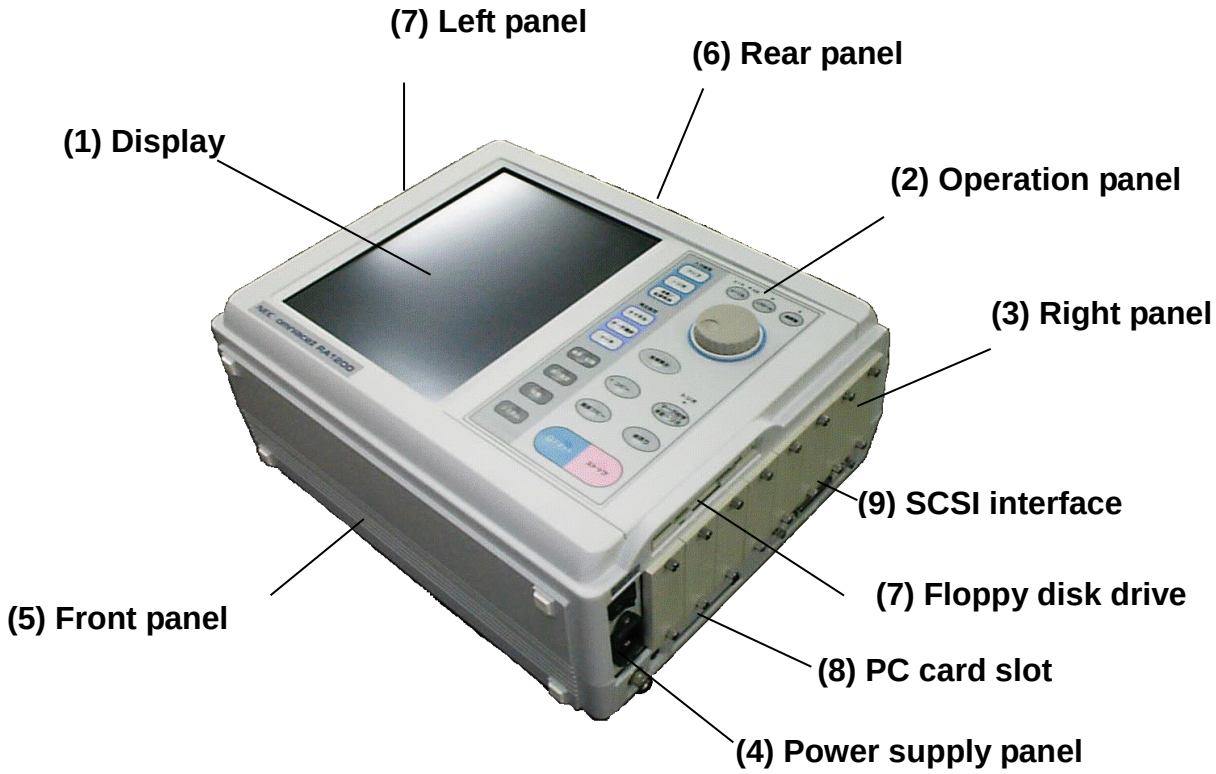
1.2.5 Other Optional Equipment

Name	Type no.	Remark
Carrying box	RA11-117	With caster
Dust cover	RA11-121	Dustproof vinyl cover
Cart (push car)	RA11-118	
Paper take-up	RT31-164	External rewinder
Display Cover	RA11-122	Dustproof acrylic cover for recorder
Carrying case	RT36-115	
SRAM card	YMC101	64 Kbytes
	YMC102	512 Kbytes
	YMC103	1 Mbyte
	YMC104	2 Mbytes
Z-fold paper supply case	RA12-103	

2. NAME AND FUNCTION OF EACH PART

2.1 Panel Description

This section names and describes the parts of the mainframe panel of this instrument.



(1) Display
The display is a TFT color LCD with a touch pad panel on which is displayed the status of the setting screen and the input signals. Touching the screen directly can make settings.
☞ Page 2-3

(2) Operation panel
The keys on this panel are used to switch display screens, or to start and stop measurement recording operations.
☞ Page 2-4

(3) Right panel
This panel includes input slots, a floppy disk drive, PC card slot, and SCSI connector.
☞ Page 2-6

(4) Power supply panel
This panel includes a power switch and an AC socket.
☞ Page 2-6

(5) Front panel

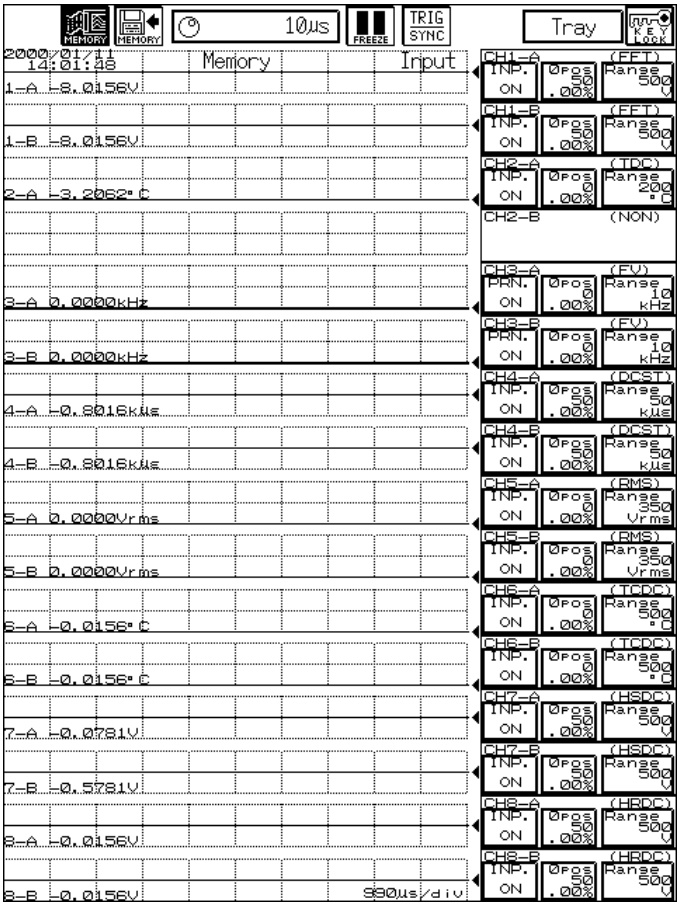
(6) Rear panel
This panel includes the remote pin and the RS-232C(option) and GP-IB(option) connectors.
☞ Page 2-9

(7) Left panel
This panel includes the recorder block in the RA1200.

2.2 Display

The display of this instrument is a TFT color LCD with a touch pad panel. Settings are made by directly touching the panel when the relevant setting screen is displayed.

When power is applied to this instrument in its shipped state, an image like the one shown below appears on the screen.
(The detail of amplifier varies by a kind of amplifier to be installed.)



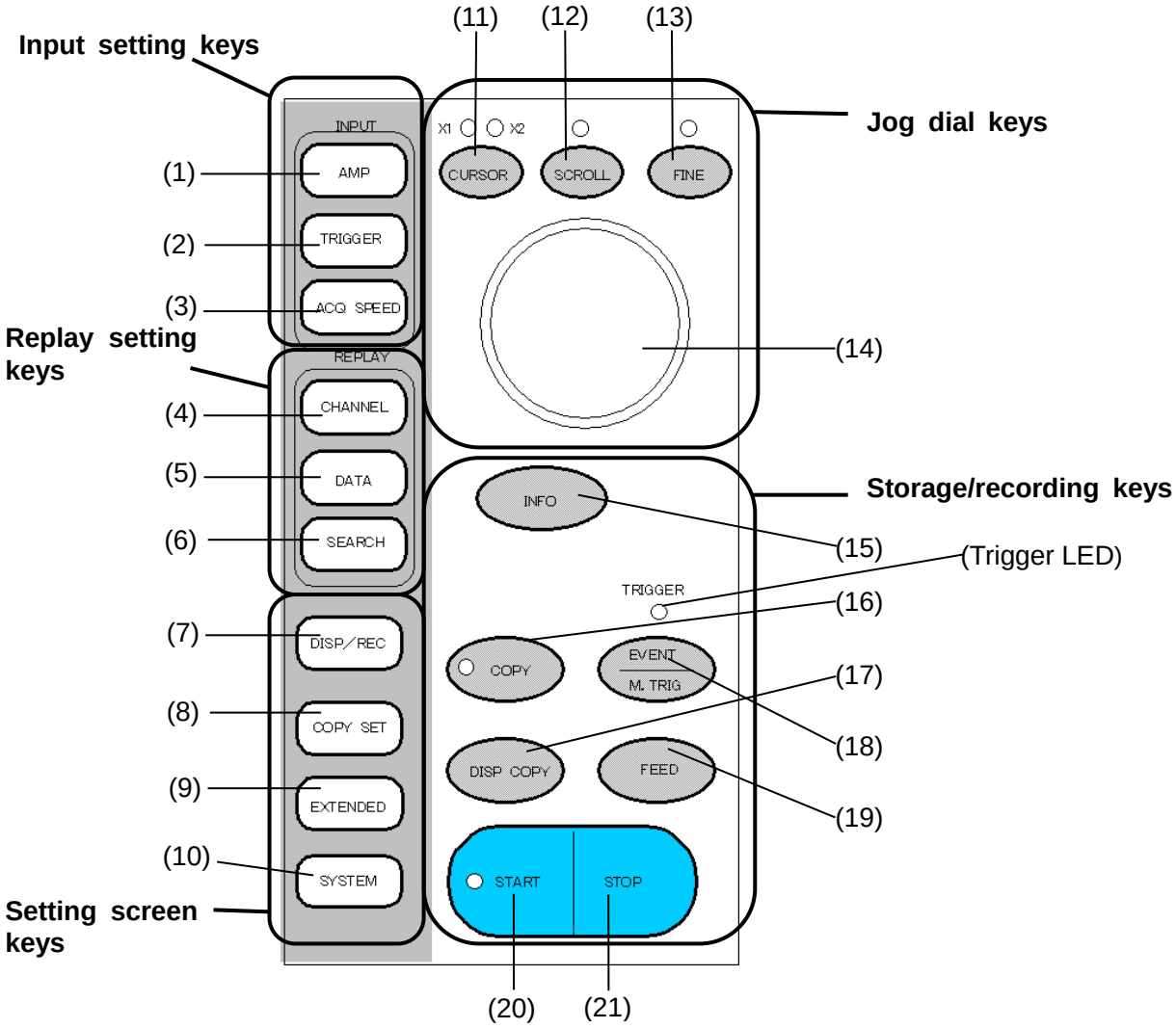
[Input Setting] Screen

The display screen is switched via key input from the operation panel, and input unit, recording condition, storage on disk and PC card, trigger and other settings are all made via the touch panel keys on the displayed screen.

NOTE On parts of the display screen, it may be observed that some dots remain perpetually bright whereas others are always dark. In addition, the liquid crystal display inherently tends to generate uneven brightness as a result of changes in temperature, etc. Note that these do not constitute operational failures.

2.3 Operation Panel

The functions of the keys on the operation panel are described below.



(This is the operation panel of the RA1200)

● **Input setting keys**

On the Input Setting screen (default :blue background) it is possible to monitor input signals as waveforms or digital values in real time, as well as change the monitor speed.

(1) AMP: Displays the Amplifier screen

Settings related to the amp unit, such as the range and input ON/OFF, are made on this screen.

(2) TRIGGER: Displays the Trigger screen

Settings related to trigger conditions, such as the trigger mode selection and trigger level setting, are made on this screen.

(3) ACQ SPEED: Sets the recording speed

Matters related to recording, such as the sampling and paper feed speed, and pretrigger setting, can be made on this screen.

● **Replay setting keys**

On the Reproduction Setting screen (default :gray background) it is possible to monitor the replay of data stored in the memory, or on a disk or PC card. The form of display can be selected from waveform, digital, or X-Y grid.

(4) CHANNEL: Displays channel data

When this key is pressed, detailed information about the channels is displayed.

(5) DATA: Selects the stored data

Data stored in memory or on a disk by an input setting can be selected.

(6) SEARCH: Allows the display of specific parts of a waveform

When this key is pressed, the user is able to specify the display of a particular section of a waveform.

● **Setting screen keys**

These keys are used for both input settings and replay settings.

(7) DISP/REC: Makes monitor display and recording paper recording settings

This key is used to make settings related to printing and X-Y recording.

(8) COPY SET: Makes settings for how data is output to recording paper, disk or fax

This key is used to make settings related to the destination of the stored data (floppy disk, printer, fax, etc.)

(9) EXTENDED: Calls the Expanded Function screen

This key is used to call the waveform determination function, interval statistics calculation function, function calculation function, and FFT function expanded function menus.

(10) SYSTEM: Displays the System screen

Auxiliary settings, which are used for setting the mode, etc., maintenance settings for the time and date of the instrument, communication settings for when GP-IB, RS-232C, and remote are used, and a number of other settings are made on this screen.

● **Jog dial keys**

(11) CURSOR X1/X2: Moves cursors X1 and X2

This key is used to move cursor X1 or cursor X2 on the Input Setting or Reproduction Setting screen. The cursor whose upper section is lit by an LED can be manipulated via the touch pad panel.

(12) SCROLL: Scrolls the waveform display

This key is used to scroll the waveform display on the Input Monitor or Reproduction Monitor screen. When this key is pressed the LED in the upper section lights up.

(13) FINE: Adjusts the speed of the cursor/scroll movement

This key can be used to finely adjust the speed the cursor moves or the waveform is scrolled on the Reproduction Monitor screen. When this key is pressed the LED in the upper section lights up.

(14) Jog dial: Changes values continuously, moves the cursor and scrolls waveforms on the monitor screens

By rotating the jog dial when making a setting, values can be changed continuously. The jog dial also enables smooth cursor movement and waveform scrolling on the monitor screens.

● **Storage/recording keys**

(15) INFO.: Displays waveform data on the monitor

When this key is pressed, data such as the mode name, channel number, signal name, and scale is displayed on the waveform monitor.

(16) COPY: Copies data

When this key is pressed, data previously stored in the instrument's internal memory, or on a disk or PC card can be reproduced and recorded on paper ("copied"). The LED of this key is lit up while copying is in progress.

(17) DISP COPY: Makes a hard copy of the displayed screen

When this key is pressed, a hard copy can be made of the screen currently being displayed.

(18) EVENT/M.TRIG: Prints marks on recordings and sets off a trigger manually

When this key is pressed, marks can be printed when recording on paper and a trigger can be set off manually.

(19) RA1200, RA1300 - FEED: Feeds through paper without printing

Depressing this key continuously causes the paper to be fed through with no printing.

RA1100 - FILE

Open a screen of "File Operation".

(20) START: Starts measurement

Pressing this key causes measurement to start. The LED of this key is lit up while measurement is in progress.

(21) STOP: Stops operation

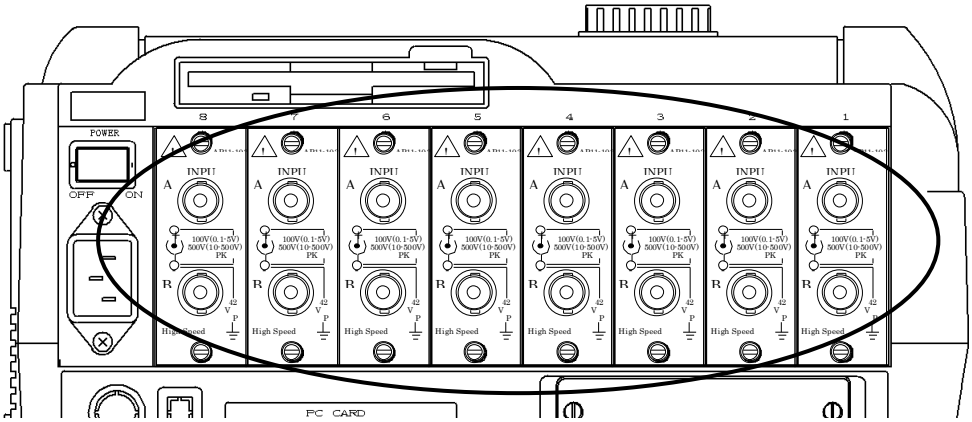
When this key is pressed, the operations of this instrument (measurement, screen hard copy, etc.) can be stopped.

(Trigger LED): Trigger generation confirmation

This LED blinks when a trigger is generated.

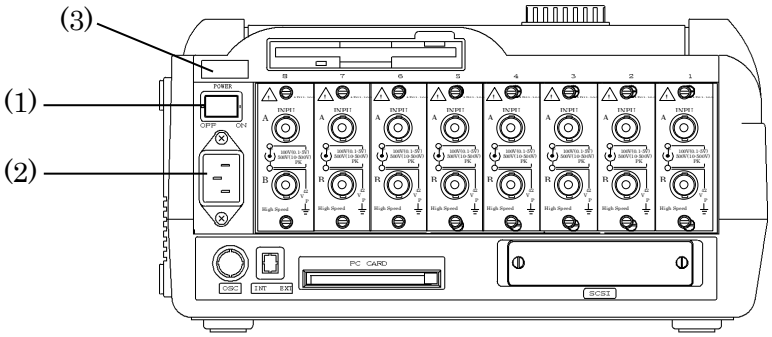
2.4 Right Panel

Up to 8 optional amp units can be inserted in this instrument's input slots.



(The figure above shows an example of the input slot section when eight 2-channel high-speed DC amps have been inserted.)

2.5 Power Supply Panel



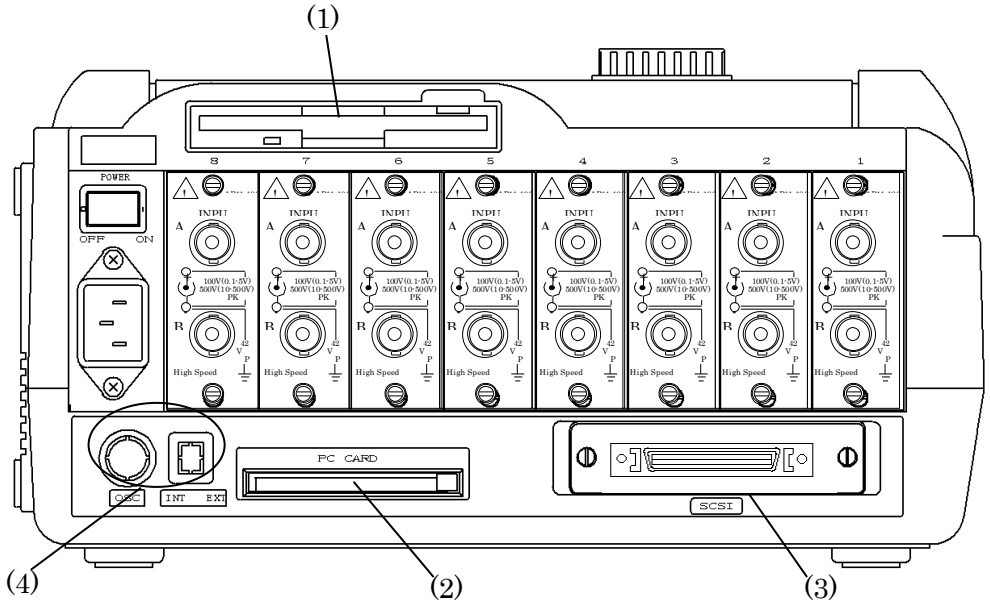
(1) POWER (power supply switch)
This switch is used to turn on and off the power supply for this instrument

(2) AC socket
The accessory AC power cable is connected at this socket.

(3) Rating plate
The input voltage range and current consumption are indicated here

90 to 132 V AC
50/60 Hz 180 VA

2.6 Floppy/PC Card/SCSI Section



(1) Floppy disk drive

This is the floppy disk drive (3.5 in.) input slot.
The LED shines a green light when the floppy disk drive is in use.

(2) PC card slot

This is the slot for inputting a flash memory or IC memory card (SRAM card).

The following cards can be used in this instrument.

- **When using commercial cards**
  Flash memory cards: 2 MB to 640 MB
  IC memory cards (SRAM cards): 64 KB to 4 MB

NOTE

Be sure to use only the flash memory cards from the recommended manufacturers.
☞ Refer to Section 14 for details.

Caution when using the ATA flash memory card.

The ATA flash memory card has characteristics that may make it malfunction if the power is switched on and off in quick succession. Consequently, if the power is switched on and then off while the ATA card is in this instrument's card slot (this includes cases of power blackout), the card may not be able to be accessed normally. ("No card" will be displayed on the File screen.). In such cases, if the card is removed and then reinserted, it will be able to be read and written normally. Note that because data may not be saved correctly if the power is cut while this card in the middle of a storage operation, it is recommended that a UPS (uninterrupted power supply) be used when filing for a long period of time.

- **Option:**

IC memory card (SRAM card)	YMC101	64 KB
	YMC102	512 KB
	YMC103	1 MB
	YMC104	2 MB

(3) SCSI connector(OPTION : RA11-107)

This connector is for connecting a MO or PD drive.

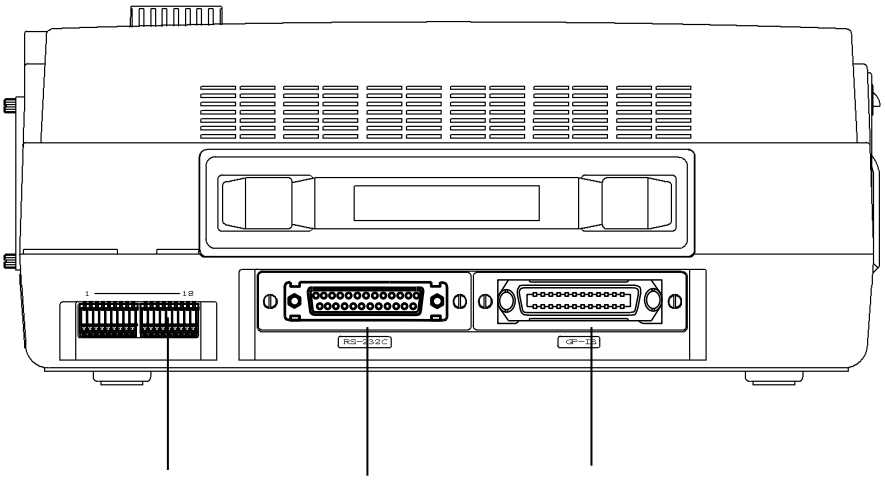
(4) AC bridge power supply switch/OSC pin

This is the INT/EXT switch and OSC pin for the AC bridge power supply unit (RA11-109 option)

NOTE

When setting EXT, be sure to input synchronous signal for AC bridge from OSC terminal. When setting INT, be sure to set other eguipments connected with OSC terminal to EXT side. If it fails to set in either case, it can not only measure but also it may cause trouble.

2.7 Rear Panel



(1) **(2)** **(3)**

(1) Remote pin

This is the remote I/O pin for the following signals.

- Start ON/OFF from outside
- External pulse synchronous paper feed
- External pulse synchronous sampling
- External event mark signal
- Paper feed (feeding of recording paper with no printing)
- Error output
- Protect signal (signal input from the uninterrupted power supply when there is a power failure)
- Waveform determination output
- Trigger input/output

* These pin numbers and configurations are described on bottom plate of the main unit.

(2) RS-232C connector (RA11-106 : OPTION)

This is for connecting an external device (host computer, modem, FAX)

(3) GP-IB connector (RA11-105 : OPTION)

This is for connecting an external device (host computer, etc.)

3 PRE-MEASUREMENT PROCEDURES

3.1 Before Switching on the Power

The arrangements for using this recorder and the cautions that must be taken are explained below.

3.1.1 Usage Environment

⚠ CAUTION Cautions regarding the installation site.

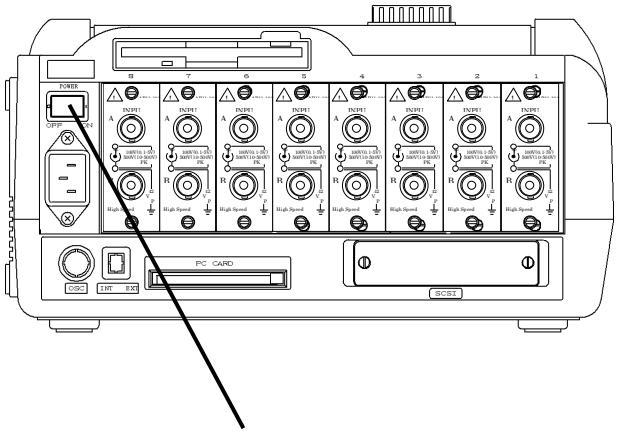
- Use this recorder on a flat surface.
- Use this recorder in a place that meets the requirements of Installation Category II (CAT II) of the Safety Standards for Electrical Measurement Instruments, JIS-C-1010-1 (IEC61010-1).
- Use this recorder in a place with an ambient temperature between 0 and 40℃ (5 to 40℃ when operating FDD) and humidity between 35% and 85% RH.
- This recorder has a pollution factor of 2.
- Use this recorder in a sufficiently safe environment, taking care to avoid use in the following places.

(1) Damp or wet places
(2) Places with salty, oily or gaseous atmospheres
(3) Humid or dusty places
(4) Places subject to strong vibration or shock
(5) Places subject to voltage surges due to an electromagnetic field
(6) To protect from an excessive internal temperature, this recorder is provided with ventilation holes. These holes must under no circumstances be obstructed by surrounding objects, as an excessive internal temperature may cause damage to the recorder.
(7) Do not place paper or other flammable materials near this recorder.

3.1.2 Before Connecting AC Power Cable

Be sure to check the following items before connecting the AC power cable to this recorder.

- **The power supply switch (POWER) of this recorder must be OFF.**
- **The AC power supply must conform to the ratings specified on the rating plate.**
- **Ensure amplifier or interface units are inserted.**



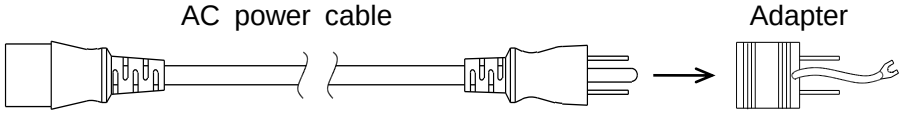
Power supply switch

CAUTION This recorder must be grounded before power is applied.

This grounding protection is for the safety of this recorder, as well as for that of the user and peripheral equipment.

If the AC power cable that comes with this recorder is connected to a 3-pin power outlet equip ped with a protective conductor pin, the recorder is automatically grounded.
When using a 2-pin power outlet, ground the recorder using the following method.

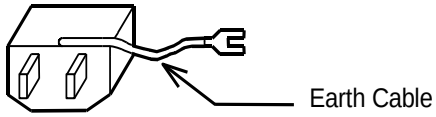
Connect the ground lead from the adapter (3-pin/2-pin converter) to the external protective conductor pin, effectively grounding the recorder.



3.1.3 AC Power Cable

The AC power cable included with this recorder (0311-5044: AC 100-V system, 2.5 m) is a 3-pin type, with a round pin in the center for protective grounding.
When this cable is plugged into a 2-pin outlet without a protective grounding terminal, a 3-pin/2-pin conversion adapter should be attached to the plug of the power cable.

0250-1053
KPR-24S



⚠ WARNING The ground lead of the 3-pin/2-pin adapter is covered with a shrinkable tubing to prevent insertion in the AC outlet. Be sure to remove this tubing when connecting the lead to an external ground terminal. Take care to avoid inserting the ground lead into the AC outlet when the tubing has been removed

3.1.4 Use of MO and PD

An MO (magneto-optical disk) or PD (phase change optical disk) can be used in this recorder by connecting an MO or PD drive to the SCSI connector on the rear panel. Ensure that the MO or PD to be used has been formatted to this recorder.

☞ Refer to Section 16 for details.

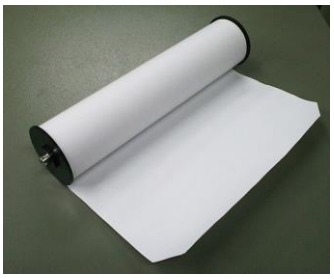
3.2 Paper Loading (RA1200,RA1300)

Load either a paper roll or z-fold paper into this recorder.

3.2.1 Paper Roll

1. Attach the paper holders to the paper roll

Attach accessory paper holders holder to both ends of the paper roll. If loading a partially used roll, trim the edges for ease of loading, as shown in the figure below.



NOTE Use only the paper roll prepared exclusively for this recorder by our company (YPS106 and YPS108). If other types are used, the recording quality cannot be guaranteed, and the normal operation of the paper feed may be affected.
Do not use the portion of the new roll that is covered with tape, as colors may not be printed normally on this area.

2. Open the cover of the recording paper section by raising the lock

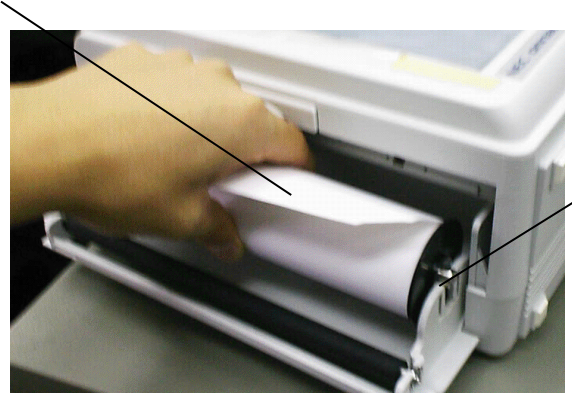
Pull the lock lever upwards.

3. Load the paper in the compartment slots following the recorder guide

Press the paper holders into the slots until a click is heard.

NOTE Be sure the paper roll is loaded so that the thermally sensitive side is face up; if this side is face down, the paper cannot be printed.

Check the winding direction carefully



Insert the paper holders into the slots.

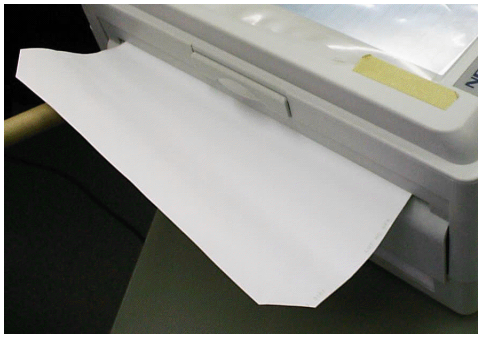
4. Pull out the paper

Insert the paper in the opening under the platen roller (black roller) of the recording section and pull it out about 10 cm.

1. Insert the paper under the platen roller
2. Pull the paper out about 10 cm

5. Close cover of recording paper section

After pulling out the paper, close the cover firmly pressing down on both sides (until a click is heard). Pull the paper out keeping it straight. It does not print normally unless both ends are pushed in correctly.



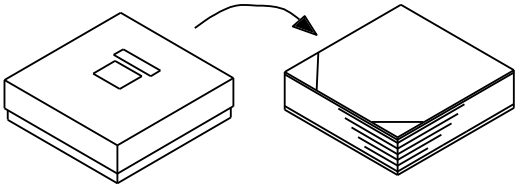
3.2.2 Loading z-fold paper

To use z-fold paper (YPS112), a z-fold paper case (RA12-103, sold separately) is required.

<Z-fold paper>

YPS112

- Folded width: 30 cm
- Length: 200 m
- To indicate how much paper is remaining, a page number (669 to 000) is printed on each page.



NOTE Use only the z-fold paper prepared exclusively for this recorder by our company. If other types are used, the recording quality cannot be guaranteed, and the normal operation of the paper feed may be affected.

<Z-fold paper case>

Z-fold paper case: RA12-103
- Z-fold paper case: About 3 kg
- A z-fold paper stock box (about 300 g) comes with the z-fold paper case
- Z-fold paper adapter: About 200 g

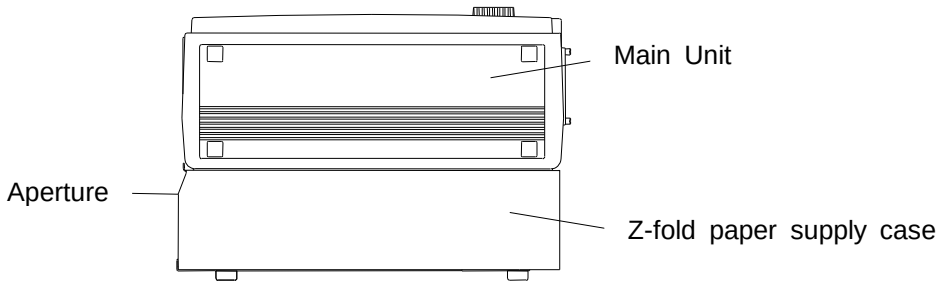
<External dimensions of z-fold paper case>

As appears in the figure in 18.15.6

The procedure for loading the z-fold paper is explained as follows.

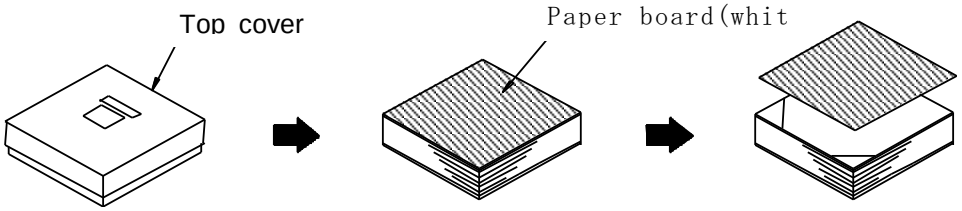
1. Place the recorder on top of the paper case

Set the paper case on a flat surface with its opening on the left. Then place this recorder on top of the case, aligning the rubber legs with the metal fittings of the case.

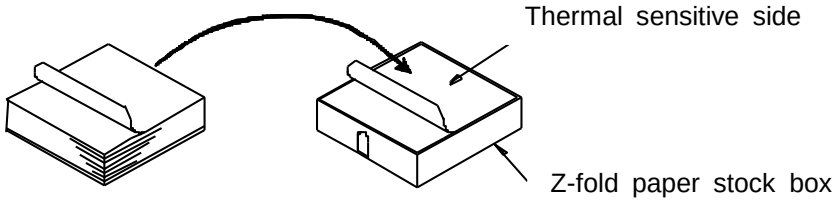


2. Put the paper in the case

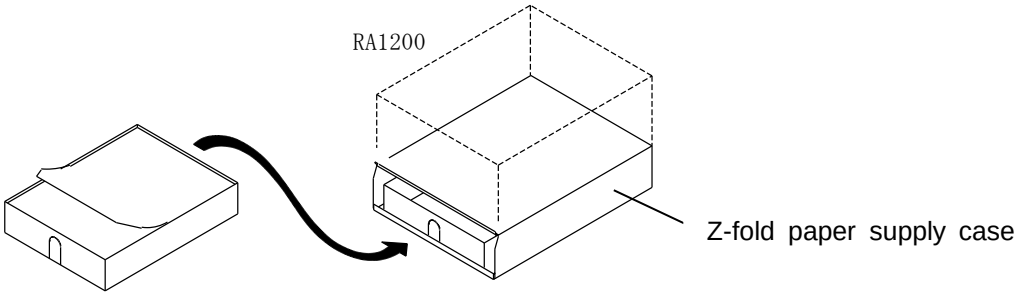
1) Remove the contents from the case, open the plastic bag and take out the piece of cardboard covering the paper. Use the top cover of the case as a receptacle for the recorded paper.



2) Place the paper in the stock box with the thermally sensitive side (the side with blue numbers printed on the edges) facing up.

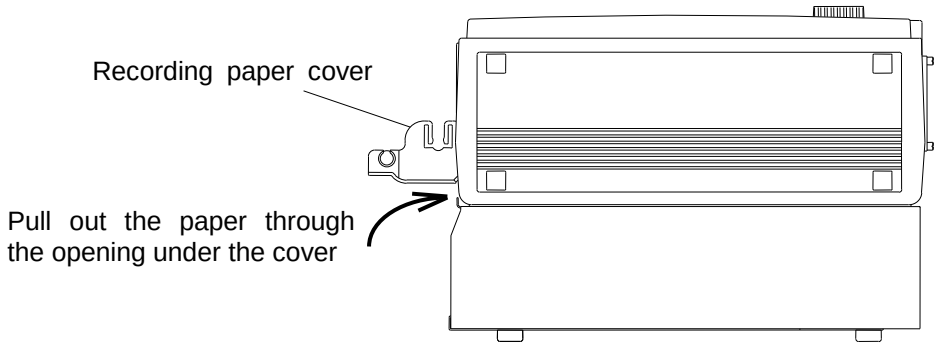


3) Position the stock box so the paper flap edge (non-folded edge) is facing toward you and insert the box into the case opening.



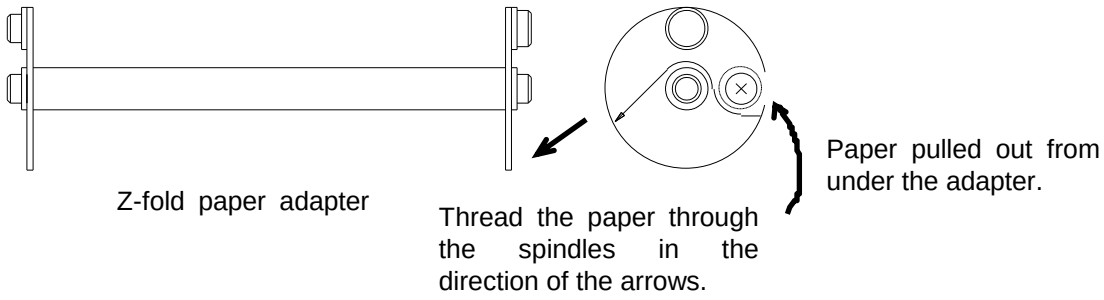
3. Open the recording section cover by raising the lever

After opening the cover, pull out the paper from the case through the opening under the cover.



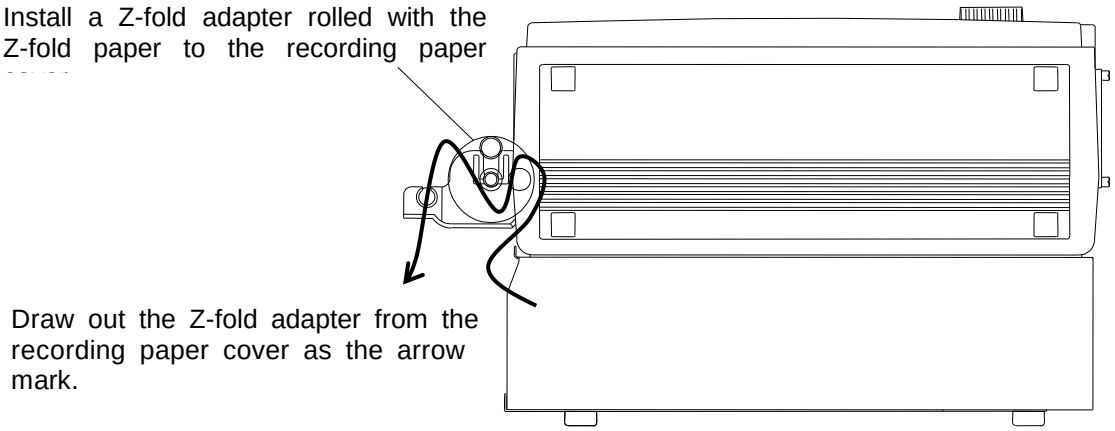
4. Thread the paper through the z-fold paper adapter

Thread the paper pulled out from under the cover through the z-fold paper adapter as shown below.



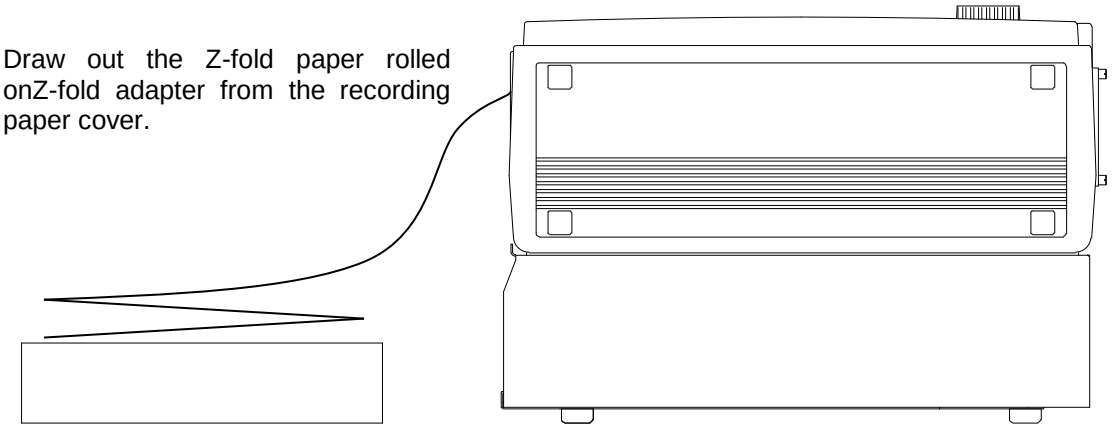
5. Insert the paper adapter in the slots of the cover

Press the paper adapter with the paper wound on it into the slots until a click is heard. Insert the paper wound on the adapter in the opening under the platen roller (black roller) of the recording section and pull it out about 10 cm.



6. Close recording paper cover

Draw out the Z-fold paper straight not to sag and close the recording paper cover surely holding both edges by your both hands.



TIPS

Place the cover of the box containing the paper in front of the recording section cover to use as a paper receptacle. To ensure smooth paper output, fold one or two sheets into the receptacle before use.
Note that although z-fold paper usually folds automatically as it is output, some environmental conditions, such as a humid atmosphere or the setting location, may cause the paper not to fold normally.

3.3 Switching on the Power Supply

When all the preparations are complete, switch on the power supply.

<Items to be checked before applying power>

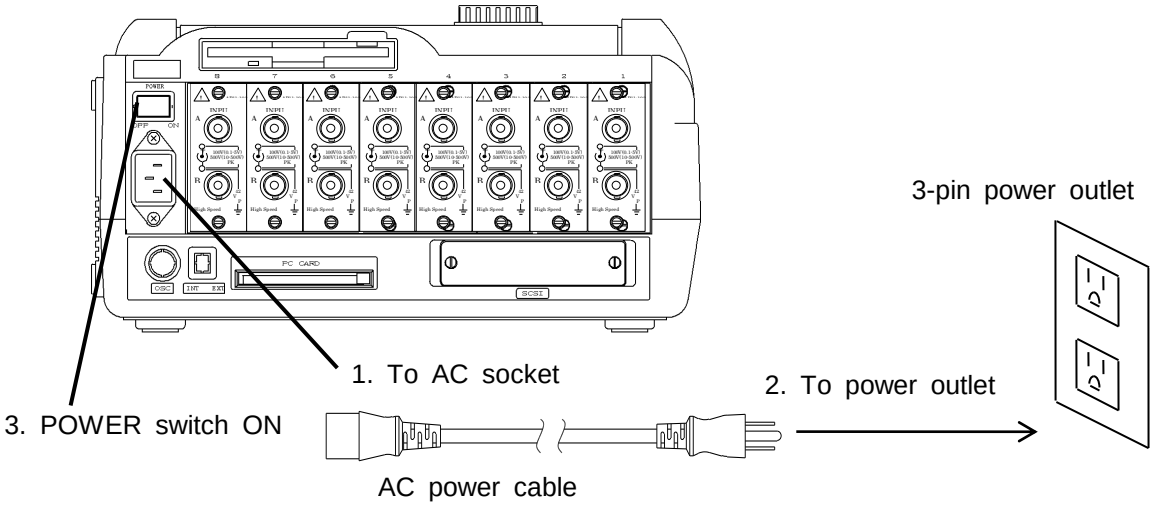
① Has this recorder been set in a safe place and in a suitable environment?
② Is the power switch currently off?
③ Is this recorder grounded?

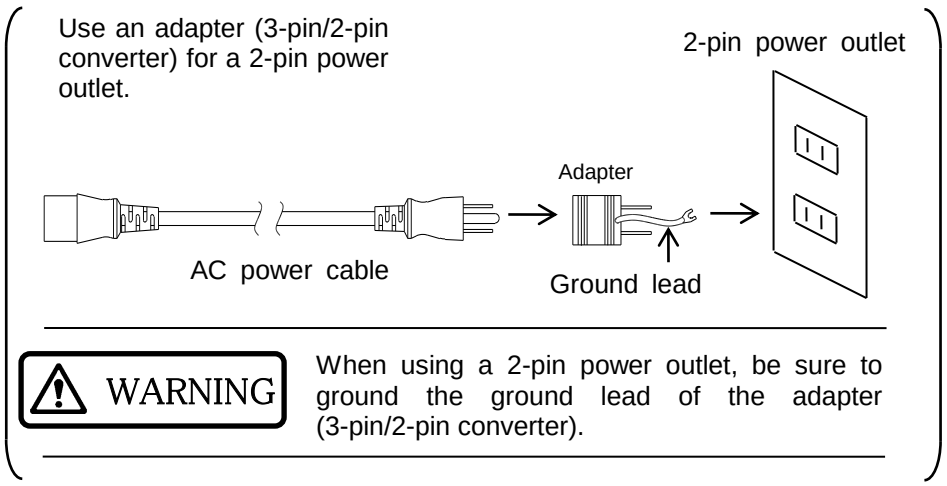
After confirming the items above are all yes, turn on the recorder following to the steps below.

1. Connect the inlet side of the AC power cable to the AC socket of this recorder
Connect the inlet side of the accessory AC power cable to the AC socket on the power supply panel of this recorder.

2. Connect the plug of the AC power cable to the power outlet
If the power outlet is of the 2-pin type, use an adapter (3-pin/2-pin converter) for the plug.

3. Turn on this recorder's POWER switch
Turn on the POWER switch located on the power supply panel of this recorder.



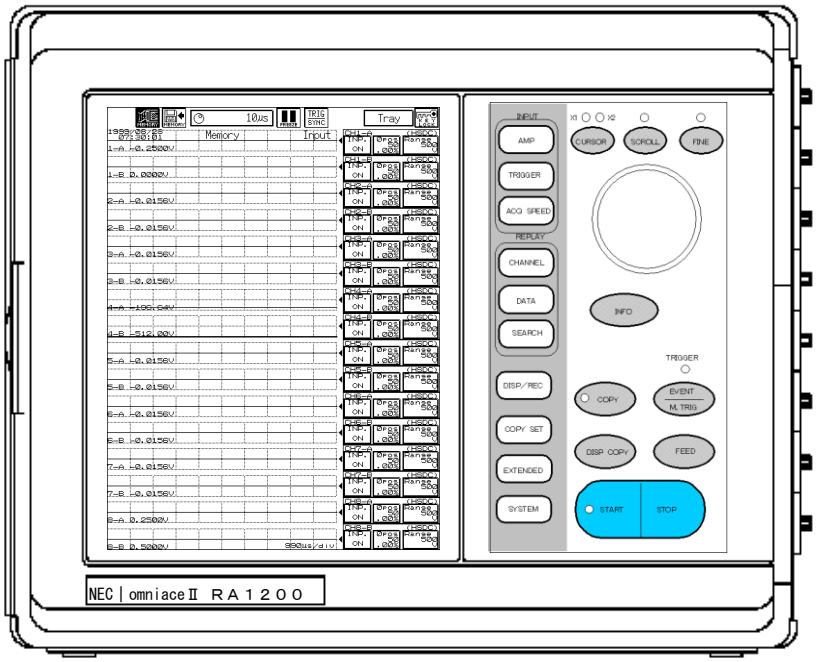


After power application

After applying power, check the following.

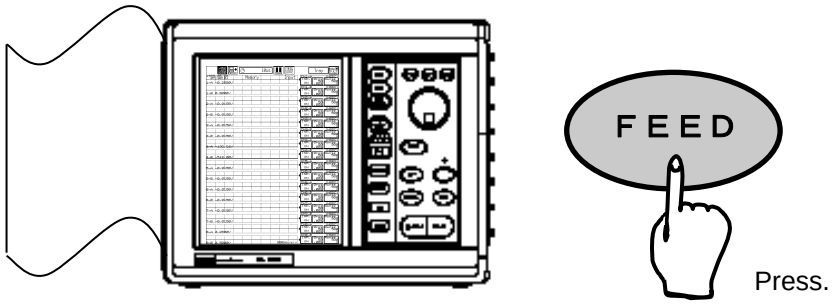
1. Confirm that the image is properly displayed on the screen

The [Input Monitor] screen will be displayed immediately after power application.



2. Confirm that the paper is feeding correctly (RA1200, RA1300)

This can be confirmed by pressing the [FEED] key on the operation panel. If no paper output occurs, check whether the cover is closed properly.



For the RA1100, confirm display of the [SYSTEM] screen by pressing the System key.

CAUTION **When using a MO or PD drive.**

When using an MO or PD drive, switch the power on and off following the procedure below.

1. Confirm that the power supply of both this recorder and the MO/PD drive is switched off.
2. Connect SCSI connector on the righ side panel and MO or PD drive.
3. Connect the power supply to the both this recorder and the MO/PD drive (use the same power supply).
4. Switch on the power of the MO/PD drive first. Switch on the power of this recorder.

Note that if power is applied to this instrument before the MO/PD drive, this instrument will be unable to recognize the drive.
When switching off the power supply, switch off the power to this instrument first, and then switch off the power to the MO/PD drive (i.e. following the opposite procedure to power application).

3.4 Connecting Signals to the Amplifier Units

Connect input signals to the amp units.

Connect signals to the amp units after switching on the power to this instrument.
Choose from the range of amp units supplied the one(s) best suited to your measurement needs.

☞ Refer to the RA1000 Instruction Manual Amplifier Units for details.

4. OPERATION FLOW

Flow of Measurement, Basic Settings and Operations

4.1 Operation Flow

Use this recorder to record, store, and reproduce input signals, following the procedures described below.

1. Before power application

Confirm that this recorder has been set in a safe place, and that all the accessories are properly attached.

☞ Refer to CHAPTER 3 for details.

2. Applying power

Inputting signals to the amplifier units.

Note that applying a voltage greater than the maximum allowable input voltage specified by the sensitivity setting of each amplifier unit may cause damage to the mainframe unit or internal components.

☞ Refer to CHAPTER 3 for details.

Confirming the status of the signals

Input signals can be monitored in real time.

☞ Refer to CHAPTER 5 for details.

3. Settings

Amplifier unit settings

Set the conditions for the data to be recorded.

☞ Refer to CHAPTER 5 for details.

Trigger settings

Set the triggers for activating the recording operation.

☞ Refer to CHAPTER 6 for details.

Mode Settings

Select the mode appropriate for the kind of measurement desired from the 4 available modes.

<Real-time mode>

To store and record low-speed events over a long time

☞ Refer to CHAPTER 10 for details.

<Memory mode>

To store and record high-speed events

☞ Refer to CHAPTER 7 for details.

<Transient mode>

To store events over a long time, but with high-speed storage available as required

☞ Refer to CHAPTER 8 for details

<Filing mode>

To store events on disk

☞ Refer to CHAPTER 9 for details.

4. Measurement

Start measurement by pressing the [START] key on the operation panel.

Stop measurement by pressing the [STOP] key on the operation panel.

5. Replay

Replaying the stored data ･･･ REPLAY SETUP

☞ Refer to CHAPTER 11.

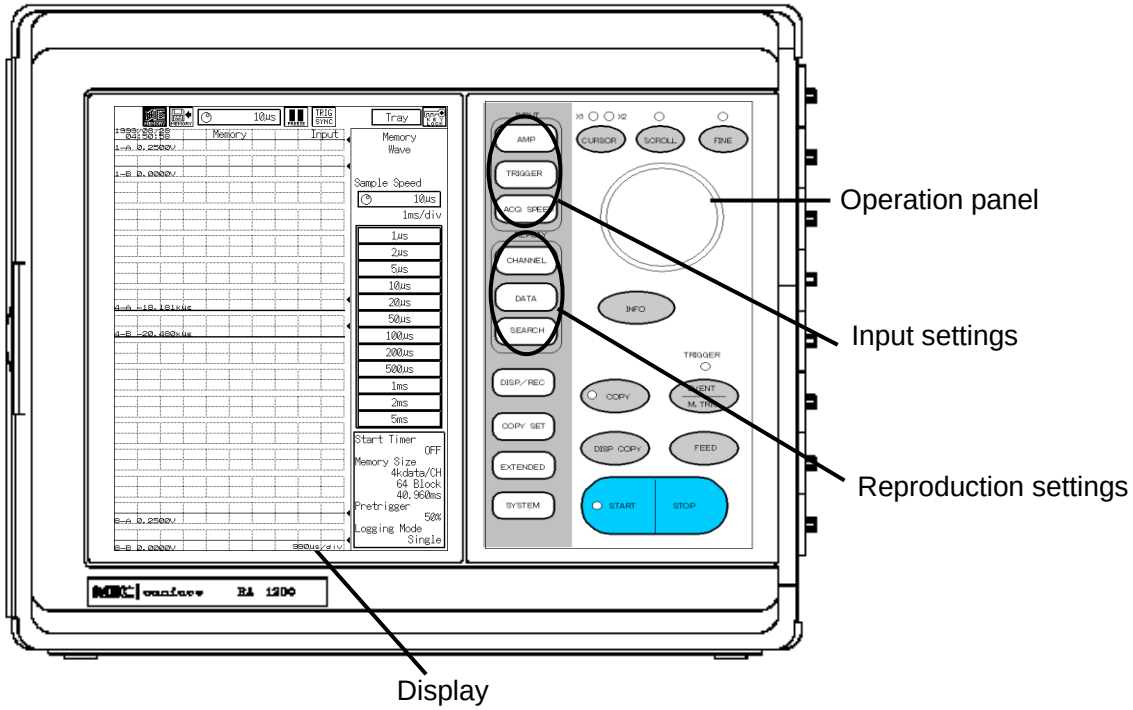
Copying the recorded data on the recording paper or save it in the file ･･･ SPECIFYING OUTPUT

☞ Refer to CHAPTER 13.

4.2. Making Basic Settings

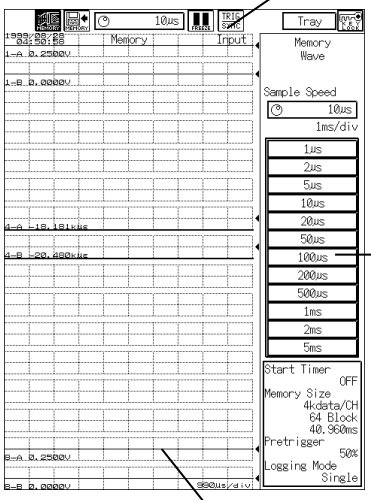
The meanings of the symbols on the screen are explained below, together with the setting procedure.

As the display is of a touch-pad type, settings can be made by directly touching the keys on the display screen.



4.2.1 Explanation of Basic Screen Settings

The setting screen is broadly divided into a control area, a waveform monitor area, and a setting area.



Control area

This is displayed on the top of the screen at all times and is used for function setting and switching the screen. The contents of the control area change in accordance with the screen currently being displayed.

Setting area

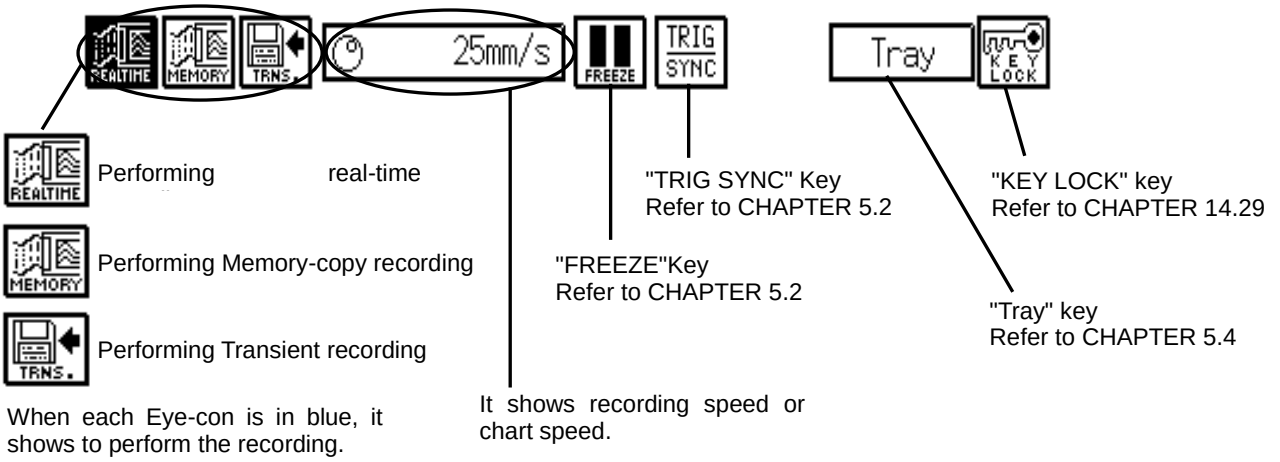
This area shows the setting windows and trays (input/reproduction monitor only). Settings are altered here.

Waveform monitor area

Because the input waveform monitor is displayed on the normal setting screen at all times, settings can be made while observing the input signals.

Control area

It is displayed at the upper part of the screen and used to change the setting function and the screen. The detail subjects to change by the screen displayed in that time.



Setting area

The setting region displays the setting window and the setting tray (Input / Play back monitor only). Change the setup here.

Waveform monitor area

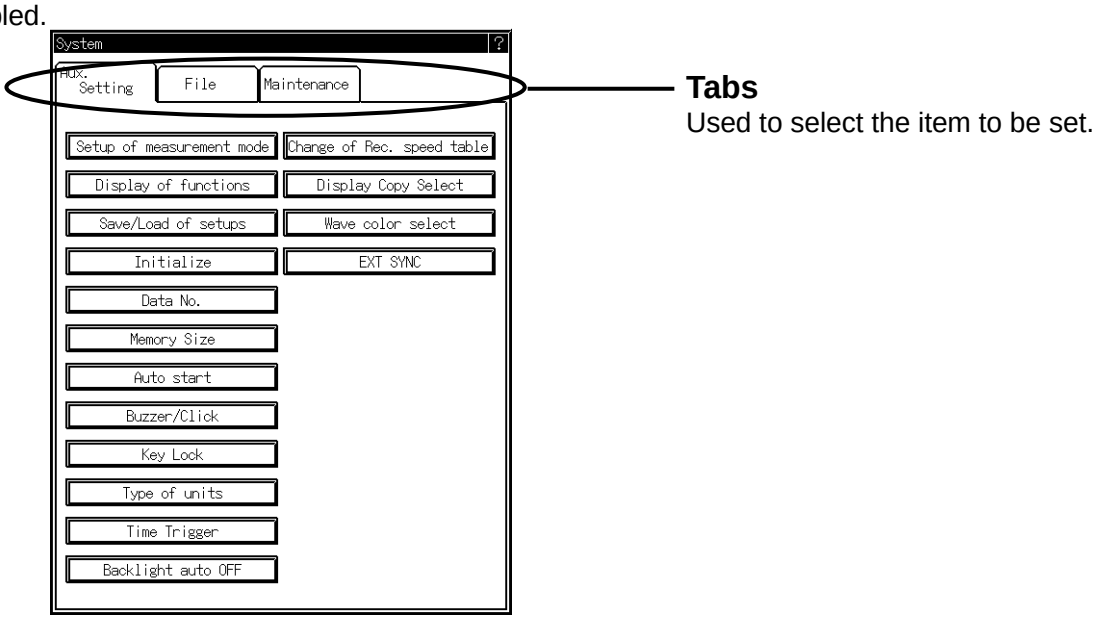
As the input waveform monitor is always displayed on the normal settig screen, it is able to perform various setting while checking the input signal.

Setting window

The Setting window displays the setting title area at the top, which becomes active when valid. When more than one window is open, the furthermost window is active and is used for setting. In some windows, a help icon is also displayed which enables the user to ascertain details about the settings.

Setting tabs

Some windows display tabs, which can be used to make settings. The uppermost tab is setting-enabled.

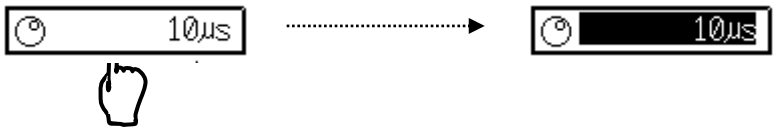


4.2.2 Explanation of setting keys

The keys display a different image depending on the setting method to be used. The various setting methods as displayed on the keys are explained below.

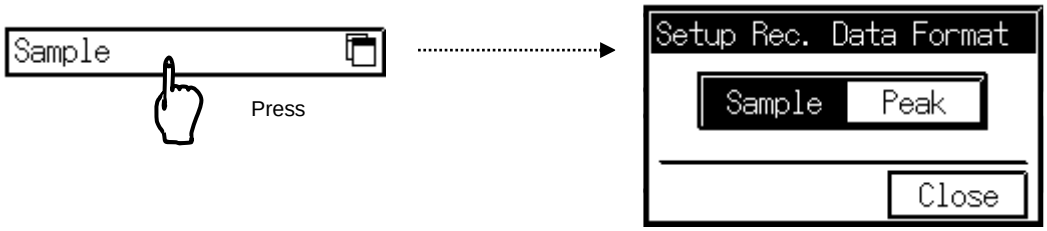
Jog key

When the jog dial image is displayed in the setting area, settings can only be made by the jog dial on the operation panel. Use the jog dial to change the setting value of the item that is highlighted (active).



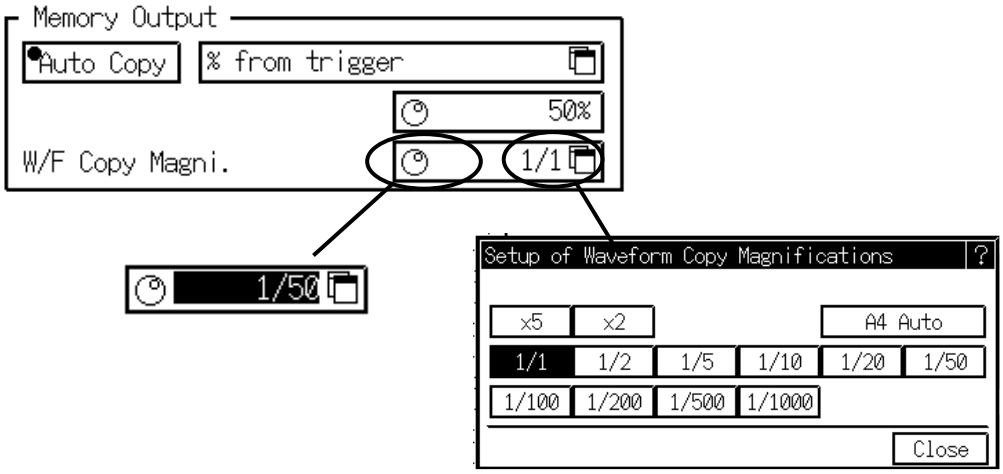
Window key

A window image displayed on the key indicates that a window will open upon selection. Settings can be made in this newly opened window.



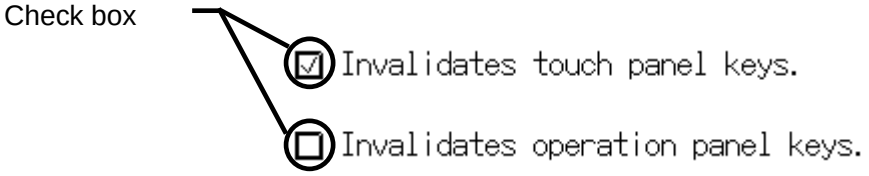
Jog key + window key

In this case, the operation is a combination of the above two items. When the left-hand side of the setting area is selected, the key operates as the jog dial (item highlighted), and when the right-hand side is selected, a setting window will open.



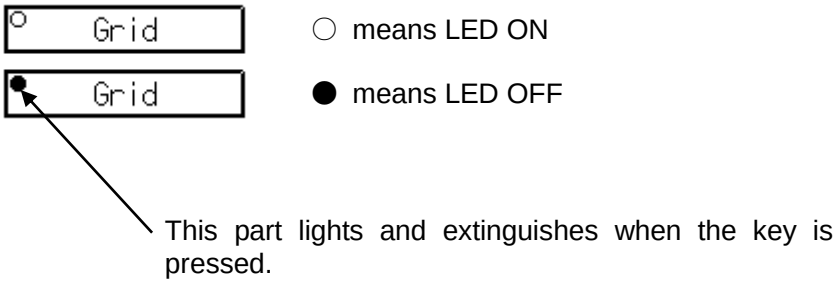
Check boxes

When a check box ☐ is pressed, a check (✓) will alternatively appear and disappear. It may not always be possible to set check boxes simultaneously when there are multiple settings.



LED key

When the LED image is displayed, a lit LED indicates ON and an unlit LED indicates OFF. ON and OFF can be switched by pressing this key.

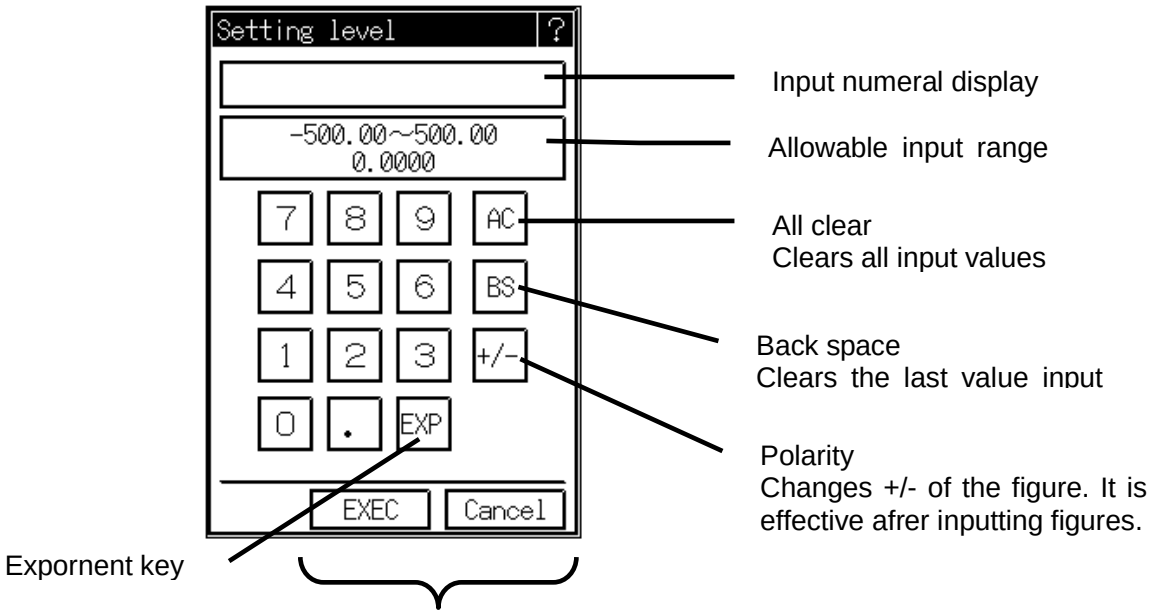


4.2.3 Explanation of standard setting windows

This recorder has a number of standard setting windows. While the basic operation of these windows is the same as for other windows, some expansions or limitations may apply, depending on the item to be set.

Numeral input window

Use this window to input numerical values.



To execute the setting, press EXEC. The window then closes.
To change the setting, press Cancel. The window then closes.

The displayed key varies according to available figures to input.

Character input window

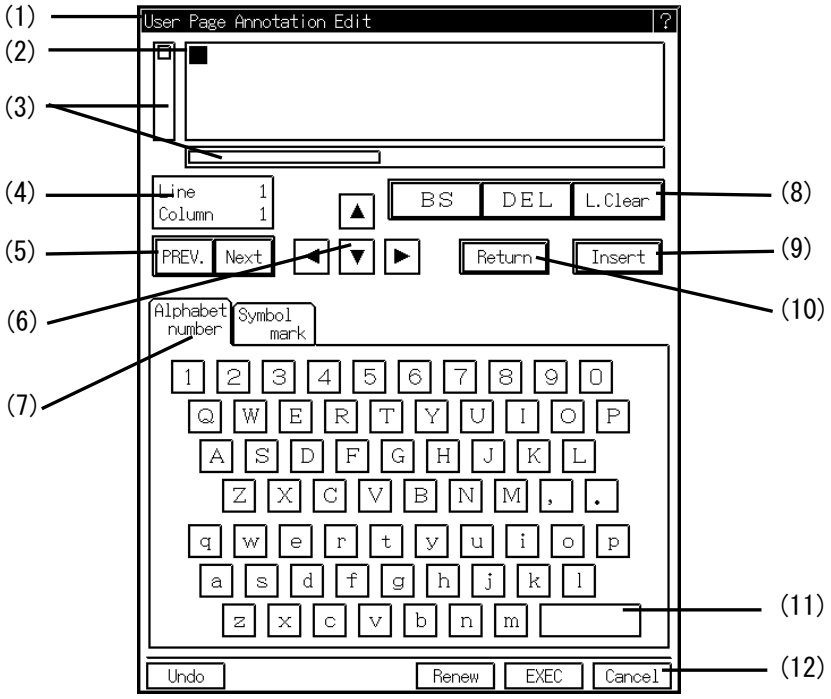
Use this window to input characters.

Standard: <Amp details - when CH annotation is input>

Expansion example: <Recording conditions - when CH annotation is input>

Expansion example: < Amp details - items moved by User Scale tab>

Limitation example: <File - when the file name is specified>



(1) Indicates what is currently being entered
(2) Displays the cursor and characters entered.
(3) Indicates the input range.
(4) Indicates the current position of the cursor.
(5) By pressing this key, the page can be changed to the preceding or subsequent one.
(6) Moves the cursor up and down. The cursor can also be moved by directly pressing 2
(7) Selects the type of characters to be entered. (The detail of display varies according to the kind of character available to input)
(8) By pressing these keys, the characters input can be erased.
 BS : Erases the character just before the cursor
 D E L : Erases the character indicated by the cursor
 L.Clear : Erases only the line indicated by the cursor
(9) When displaying "Over wrt", characters are over-written at the current curosr position.
 When displaying "Insert", characters can be inserted in the cursor position.
(10) Pressing this key will set this line indicated by the cursor and start a new line (line feed).
(11) The space key.
(12)
 Undo : By pressing this key, the previous entry for only the line indicated by the cursor can be restored.
 Update : Press this key when input is complete.
 EXEC : Press this key when input is complete. The window will then close.
 Cancel : Press this key to cancel an input. Note that any input set with the Return key will not be canceled.

5. INPUT SETTINGS

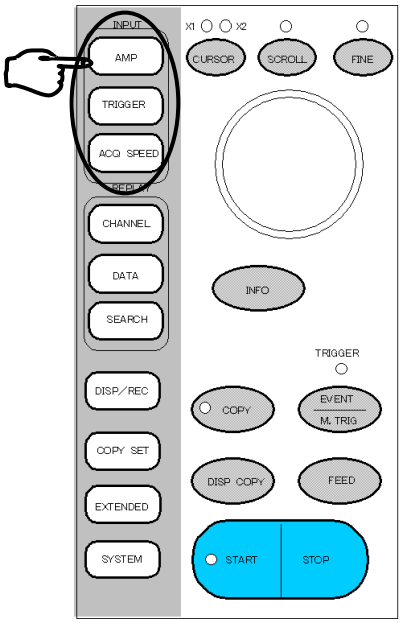
Confirming Input Signals

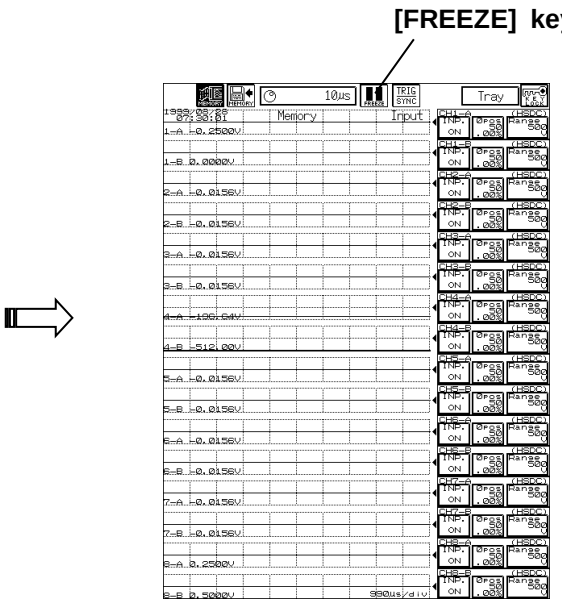
5.1 Confirming Input Signal

Use the [INPUT] screen to confirm input signals. The current status of the input signal can be displayed as a waveform in real time on this screen. Also, it is possible to freeze the displaying waveform.

Input settings are made with the [AMP], [TRIGGER], and [ACQ SPEED] keys on the operation panel.

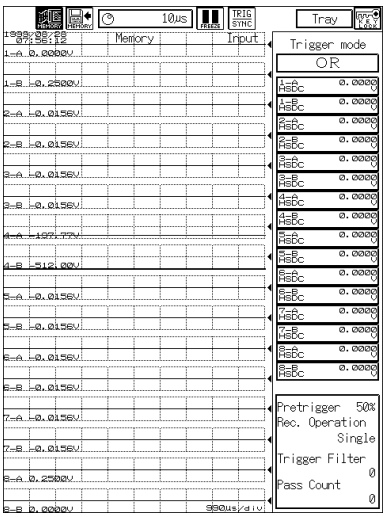
When the [AMP] key is pressed



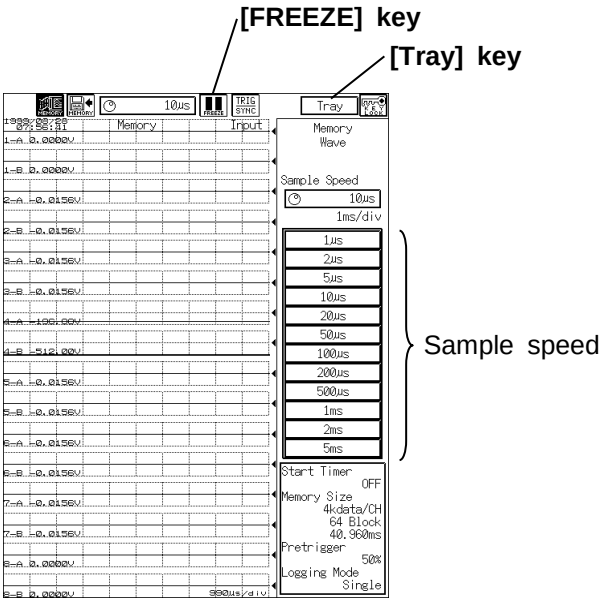


The figure above is the Input Setting screen in memory mode.

When the [TRIGGER] key is pressed.



When the [ACQ SPEED] key is pressed

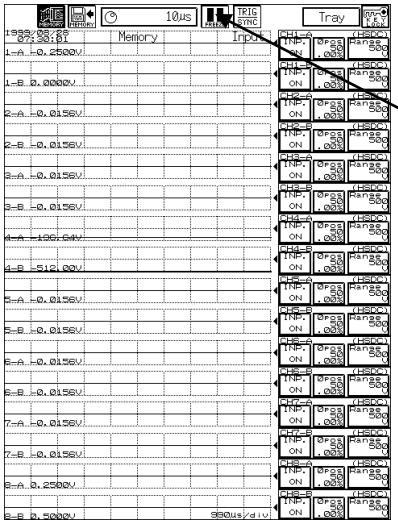


5.2 Changing the Input Monitor Display Contents

To change the setting of input monitor's display speed or channel, use the setting keys on the property bar or setting tray.

1. Temporarily stopping display

It freezes the monitor display of the input signal.
Pressing this key again in the stopped status restarts the input monitor display.

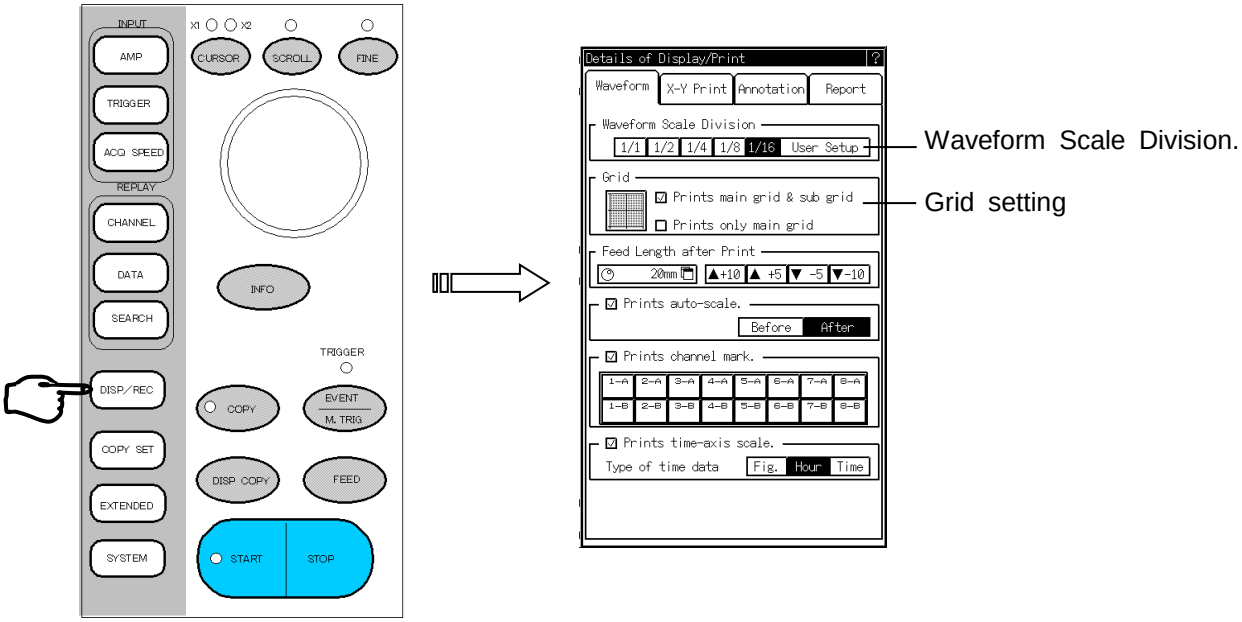


2. Synchronizing the display trigger (Memory mode)

By switching the TRIG SYNC key on, the monitor will display in synchronization with a preset trigger. This key can also be used to determine whether the internal trigger is ON or OFF. The operation of displaying waveforms is the same as that used by an oscilloscope (etc.) set to AUTO (freerun) or NORMAL (trigger synchronization).

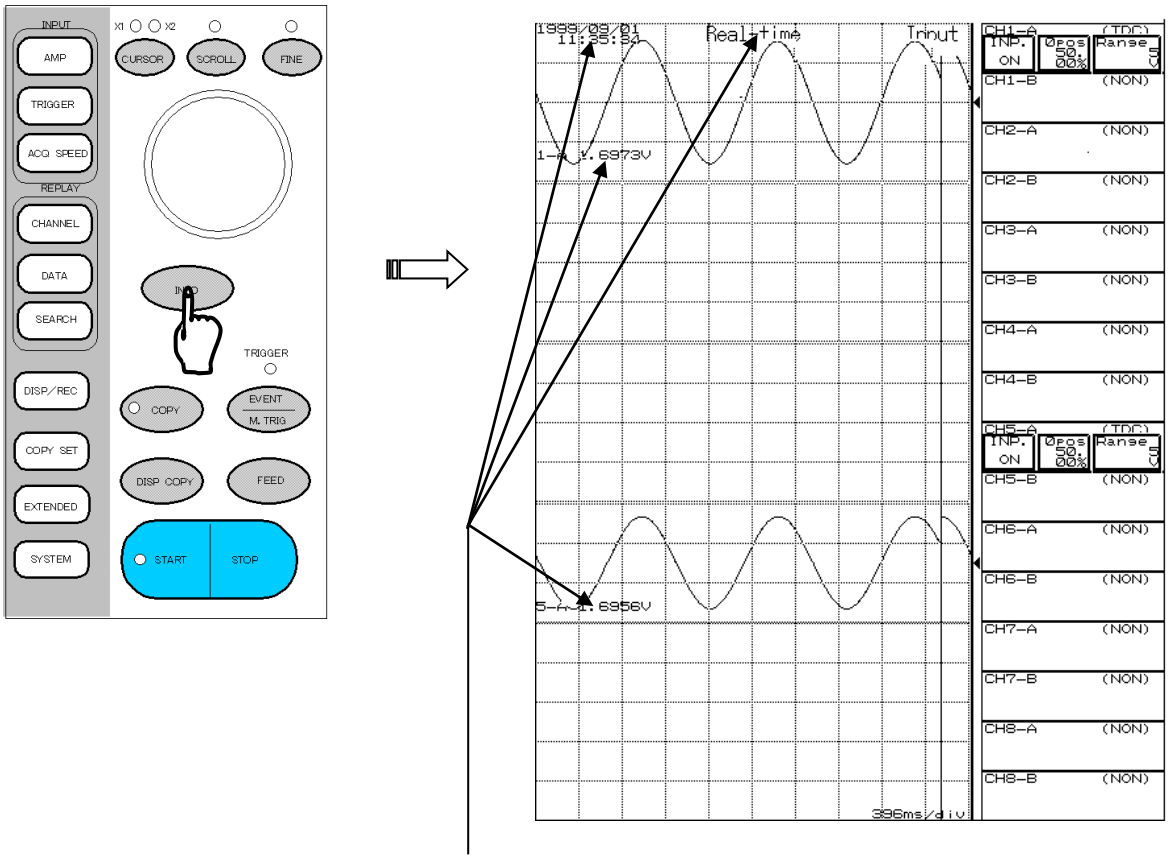
3. Changing the recording division

Press the [DISP/REC] key on the operation panel to set the recording division and grid.



4. Digital value display

Input signals are displayed as digital values by default. Press the [INFO.] key on the operation panel to erase this display, and repress this key to redisplay the value.



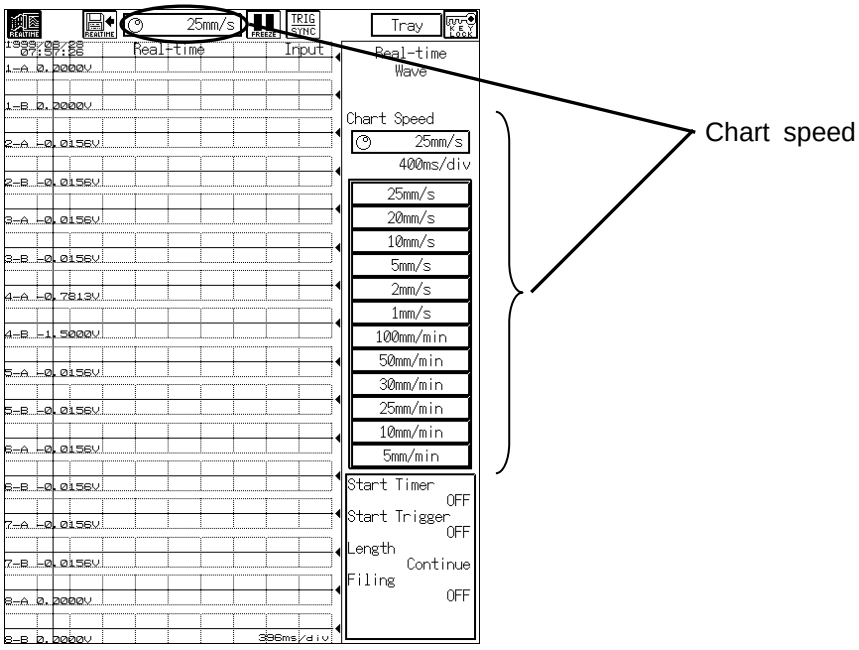
Input signals are displayed as digital values by default. Press the Data Display key on the operation panel to erase this display, and repress this key to redisplay the value.

5.3. Setting for Recording

Chart speed and sampling speed can be set at setting tray of [Input Monitor Screen]. (Setting contents differ with each mode.)

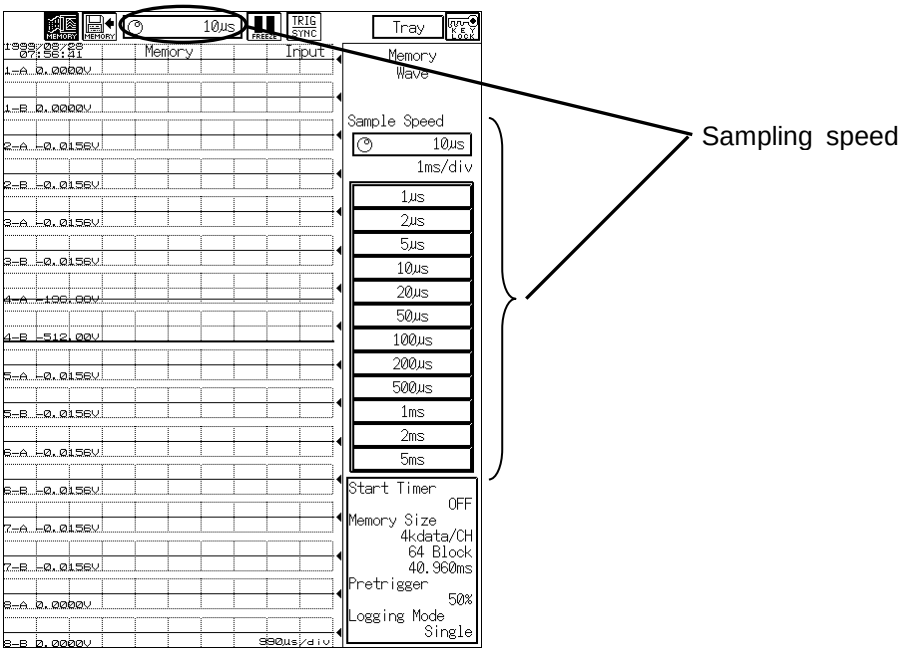
5.3.1. Setting chart speed in real-time mode

Chart speed can set in real-time mode.



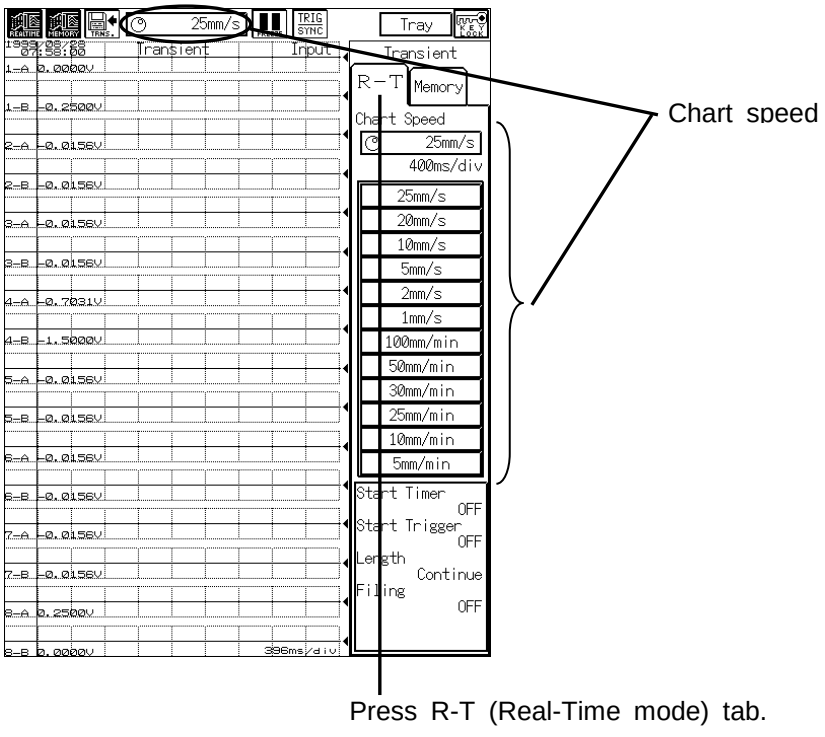
5.3.2. Setting sampling speed in memory mode

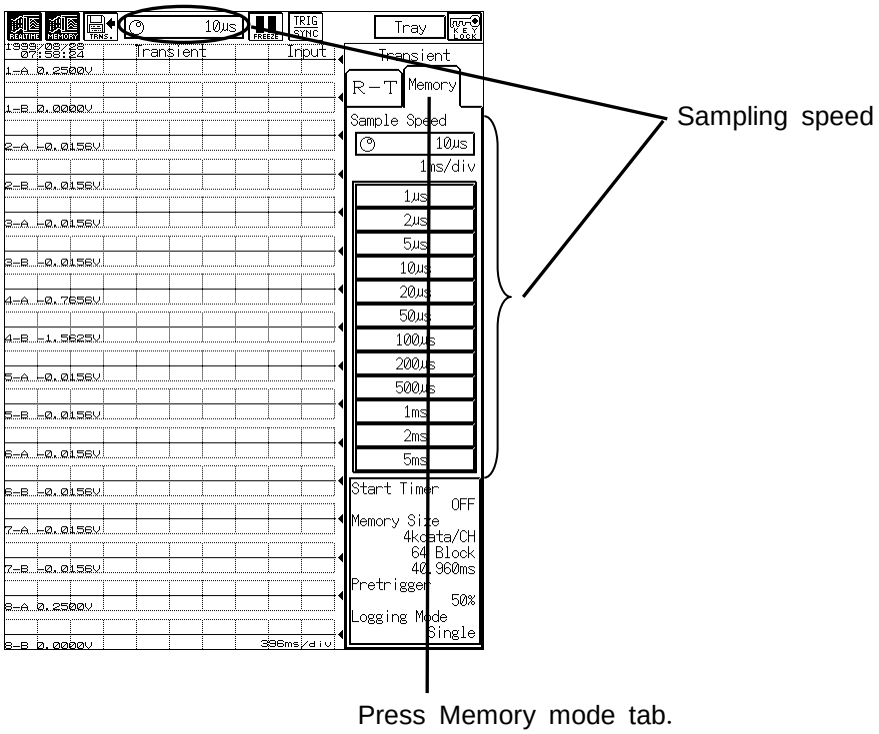
Sampling speed can set in memory mode.



5.3.3. Setting chart speed and sampling speed in transient mode

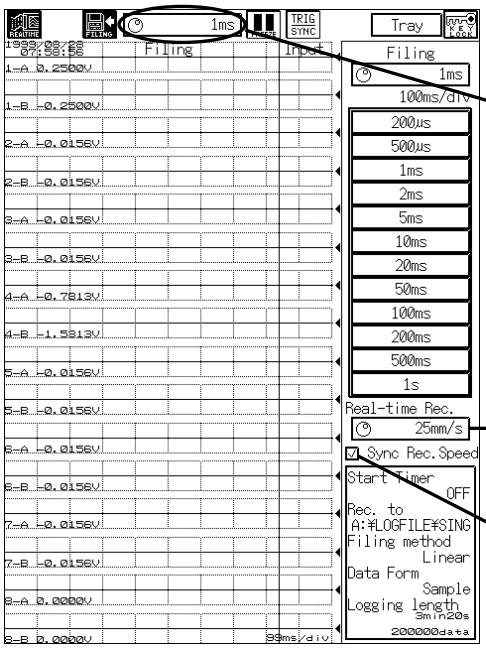
Chart speed and sampling speed can set in transient mode.





5.3.4. Setting filing record speed in filing mode

Both recording speed and chart speed can set in filing mode.



Filing record speed

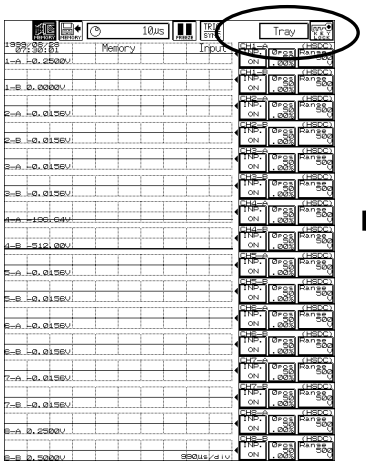
When performing Real-Time recording, set chart speed.

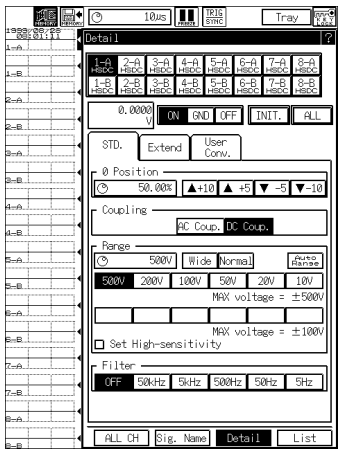
When making chart speed synchronize recording speed and outputting, put [✓] mark in check box.
(If you change the chart speed after that, it makes the setup different.)

5.4. To Expand Display Area for Waveform

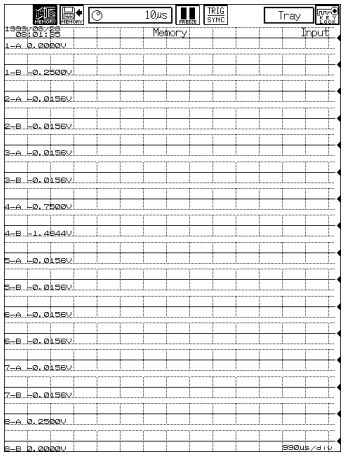
Disappearing setting tray and expanding waveform display area are possible.

Press【Tray】key





Detailed Screen



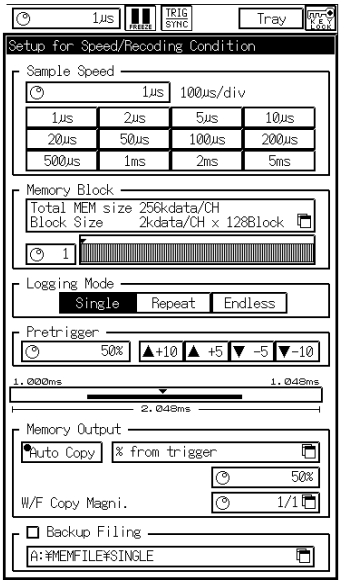
Expanded Waveform Screen

7. MEMORY MODE

Acquiring High Speed Signals

7.1 Memory Mode

In the memory mode, high speed phenomenon (maximum recording speed 1 μs) is stored in the internal memory of the main unit by a trigger and then the stored data can be saved in a disk Number of data to be stored is determined by the memory capacity.



Memory Filing

The data acquired in the memory of the recorder can be automatically saved in a disk as a file. The available filing data formats are not only the normal binary format but also the CVS format. The CSV format features comma (,) as a delimiter and text format, enabling compatibility with spreadsheet software programs. Usable media are floppy disk, PC card, MO, and PD.

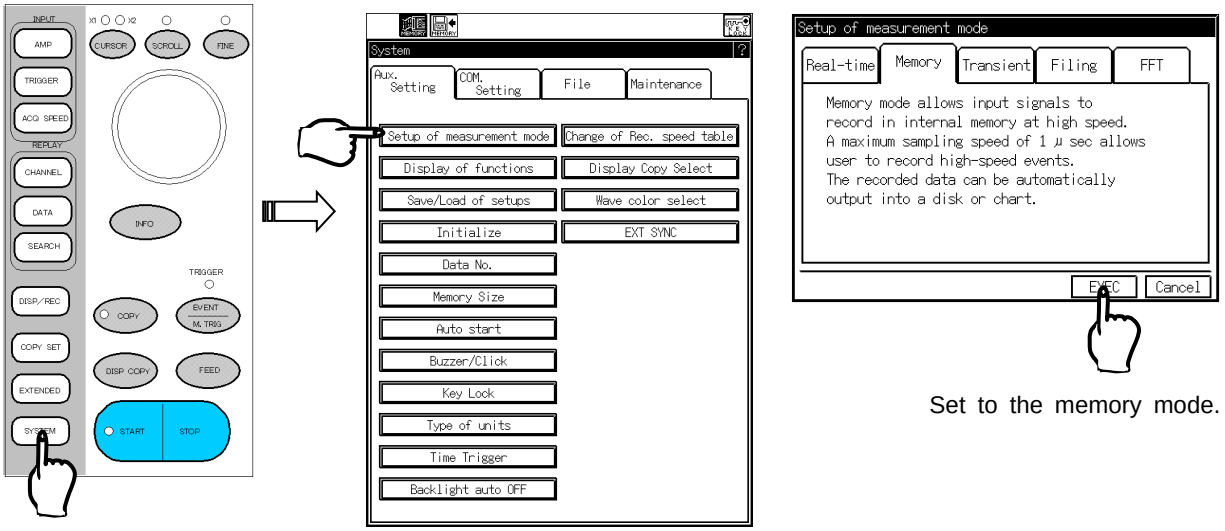
Output to Chart (RA1200, RA1300)

If the recorder is provided with the printing unit, acquired data can be output to chart recording paper. Moreover, an automatic waveform printing on the chart upon a trigger generation is available when Auto Copy has been set to ON.

7.2 Setup of Memory Mode

The [SYSTEM] screen is used to set up the memory mode.

Press the [SYSTEM] key to display the [Setup of measurement mode] screen.



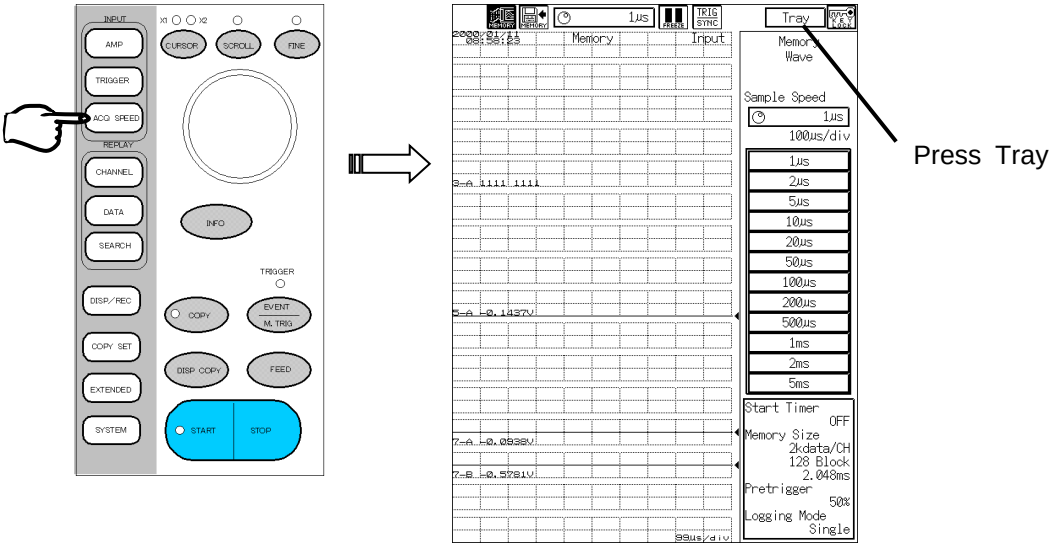
Set to the memory mode.

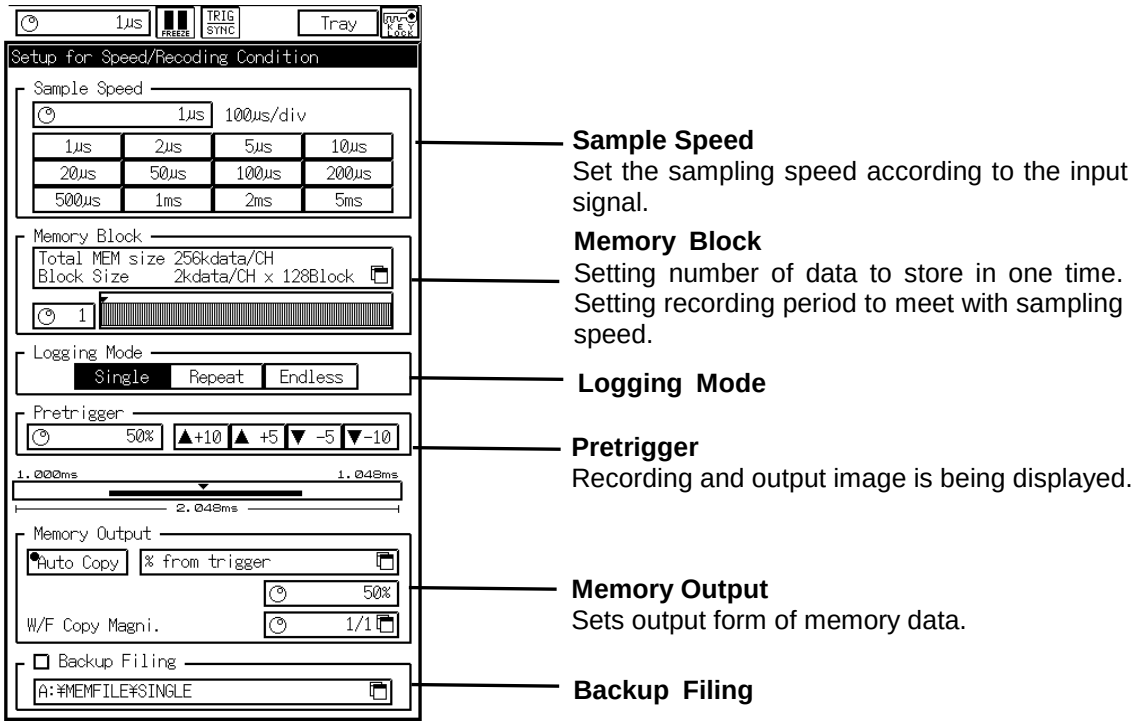
7.3 Setup of Memory Recording

This section describes the setup for acquiring input signals in the memory.

1. Setup of Memory Mode

Press the [ACQ SPEED] key in the operation panel.

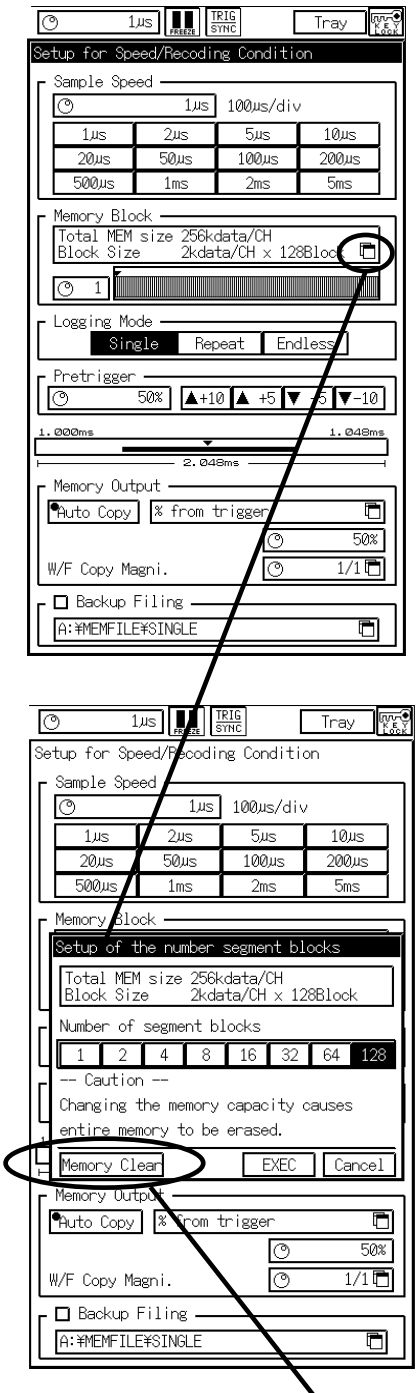




TIPS External pulse input from a remote pin is required to perform external synchronization.

NOTE When using amplifier unit other than HSDC amplifier unit (AP11-103) or EV amplifier unit (AP11-105), if setting sampling speed finer unit than 10 μ s, waveform may not be obtained correctly.
EX. Distortion is occured in waveform at 5 μ s, 11 μ s and so on.

2. Memory Block



The current memory block image is displayed. Unoccupied block is displayed in black; occupied is displayed in yellow. Use this screen to change to memory block for data recording. By touching the memory block image, you can examine the recorded data of the current setting.

Setup of the number Segment blocks

Determines recording data size. The standard memory size of 256 KData/ch in this recorder can be segmented 1 to 128 blocks, permitting use of a separate memory block.

Deletes all data in memory.

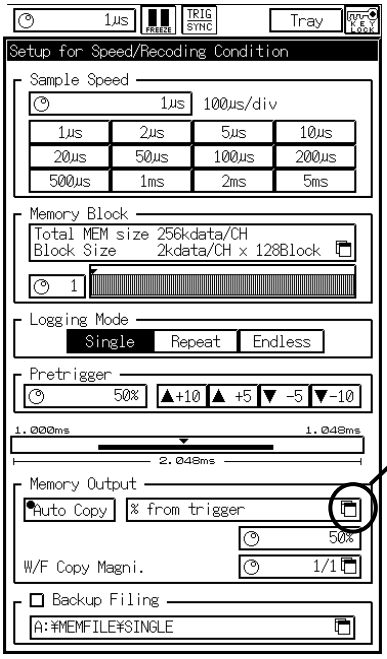
3. Logging Mode

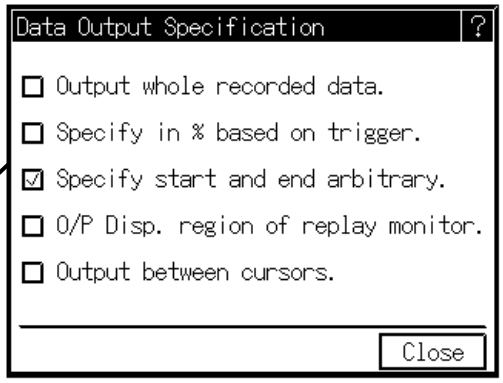
Sets recording operation upon trigger generation.

- Setup of Recording Operation and Detailed Operations

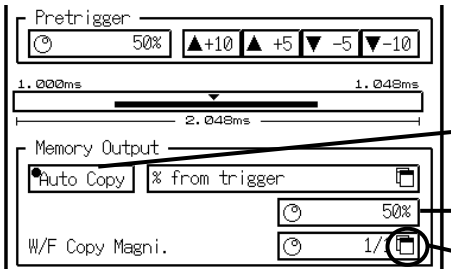
Recording operation	Detailed operation
Once	Stops recording operation after recording data in one memory block.
Repeat	It stops after recording data in the number of memory blocks.
Endless	Stops recording operation until the [STOP] key is pressed. (data in memory blocks are left.)

4. Pretrigger and Output Range Setup





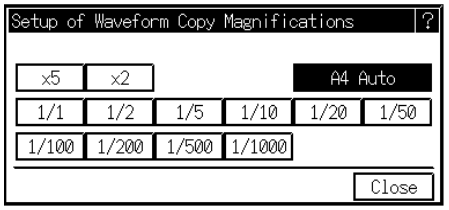
Sets memory data output form. Specify with the "✓" mark.



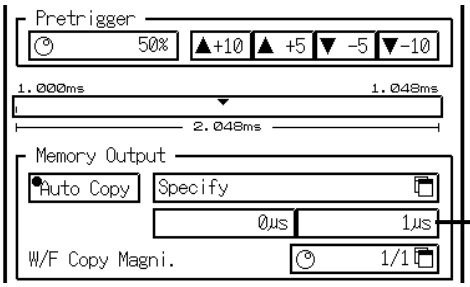
Setup by trigger

Output is ON when the light is turned on; output is OFF when the light is turned off.

Setting ratio to output memory data on the recording paper.



Sets magnifications for waveforms printed in chart. The A4 Auto denotes A4-size printing regardless of the waveform sizes.



Setup by starting/end point

Sets output range. The box on the left is the starting point and the box on the right is the end point.

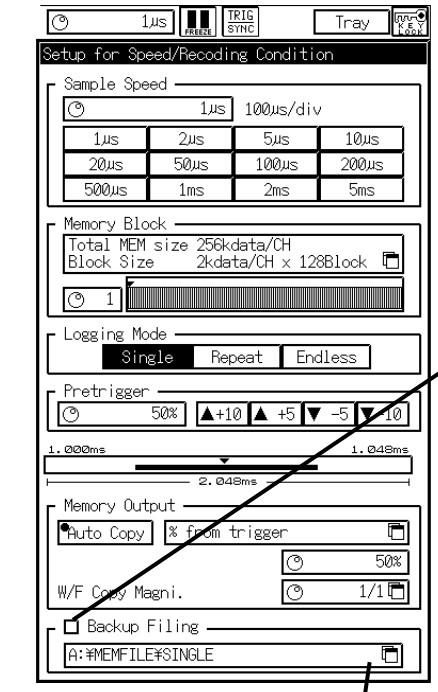
TIPS While a setup is in an active (selected) state, you can set by touching recording and output images.

☞ Refer to CHAPTER 6 PRE-TRIGGER for a description of the pre-trigger.

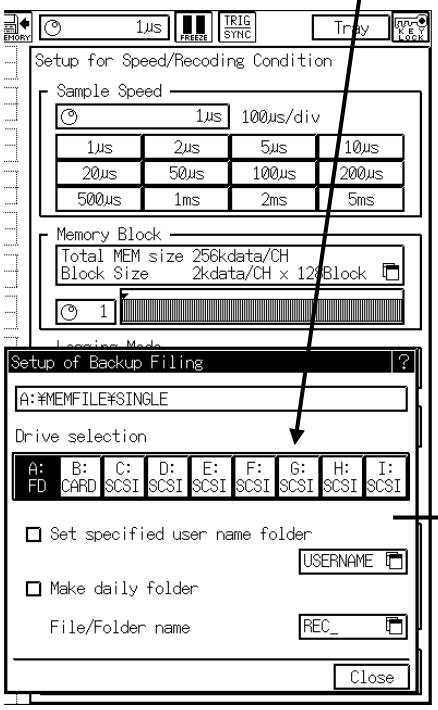
7.4 Memory Filing Setup

The memory filing allows the data recorded in the recorder memory to be automatically saved in an internal or external disk as a file.

1. Destination File Name Setup by Setting Memory Filing to ON



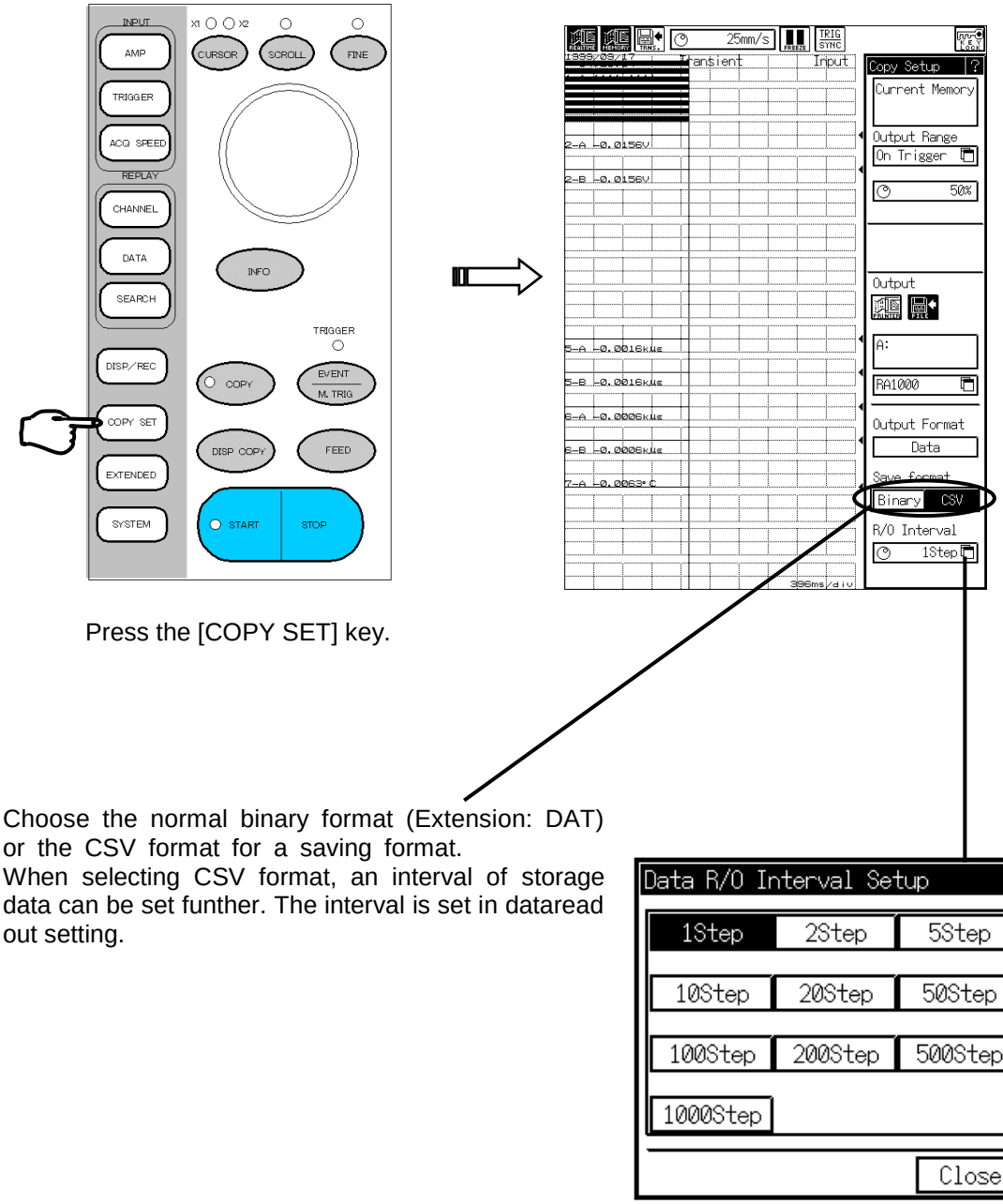
Press ☐ to display "✓".



Specifies destinations.

Sets data save drive and auto-generation folder (User name folder and day folder).
It is possible to sort data using a rule such as "by user name" or "daily".

2. Setup of Saving Format



Press the [COPY SET] key.

Choose the normal binary format (Extension: DAT) or the CSV format for a saving format.
When selecting CSV format, an interval of storage data can be set funther. The interval is set in dataread out setting.

NOTE In case of selecting CSV format, the capacity of file needs 5 to 10 times of binary format.

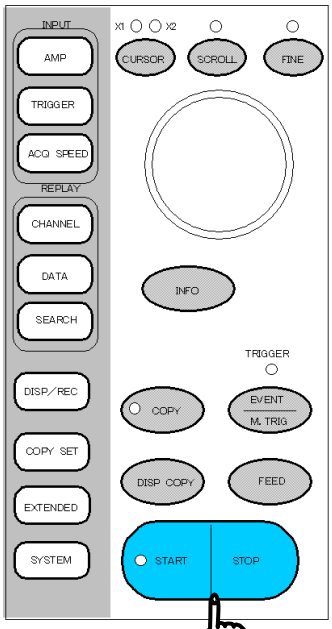
TIPS

Memory Filing Data

The memory data file format of the RA1000 Series (RA1000series) is DAT. This format is the same as that of the RT Series, however, internal data compatibilities are not maintained. If one media type (MO, PD, FD, or PC card) is used by both the RA1000 Series and RT Series, data distinction will be difficult. It is recommended to use media dedicated to one recorder model.

7.5 Start Recording

After setups, the recorder is getting ready for measurement.



Use the [START] and [STOP] keys

1. Starts Measurement

Press the [START] key to start measurement. Measurement is made when the specified conditions that are set for data acquisition are satisfied. If an error occurs, the window displays the error contents. Then, start measurement after resolving the error.

2. Stops Measurement (Forced Termination)

When the recording operation is set to Once or Repeat, measurement stops automatically after the specified memory blocks are occupied. When in Endless, the measurement continues until the [STOP] key is pressed for forced termination.

3. Replays Data

Replaying the stored data ··· REPLAY SETUP
Refer to CHAPTER 11
Copying the recorded data on the recording paper or save it in the file ··· SPECIFYING OUTPUT
Refer to CHAPTER 13.

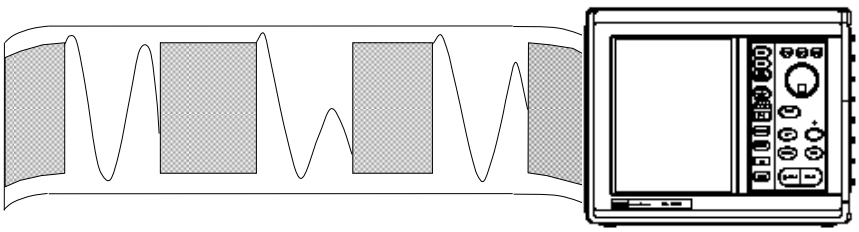
8. TRANSIENT MODE

Long-Duration Data Printing and Quick Acquisition of Necessary Data

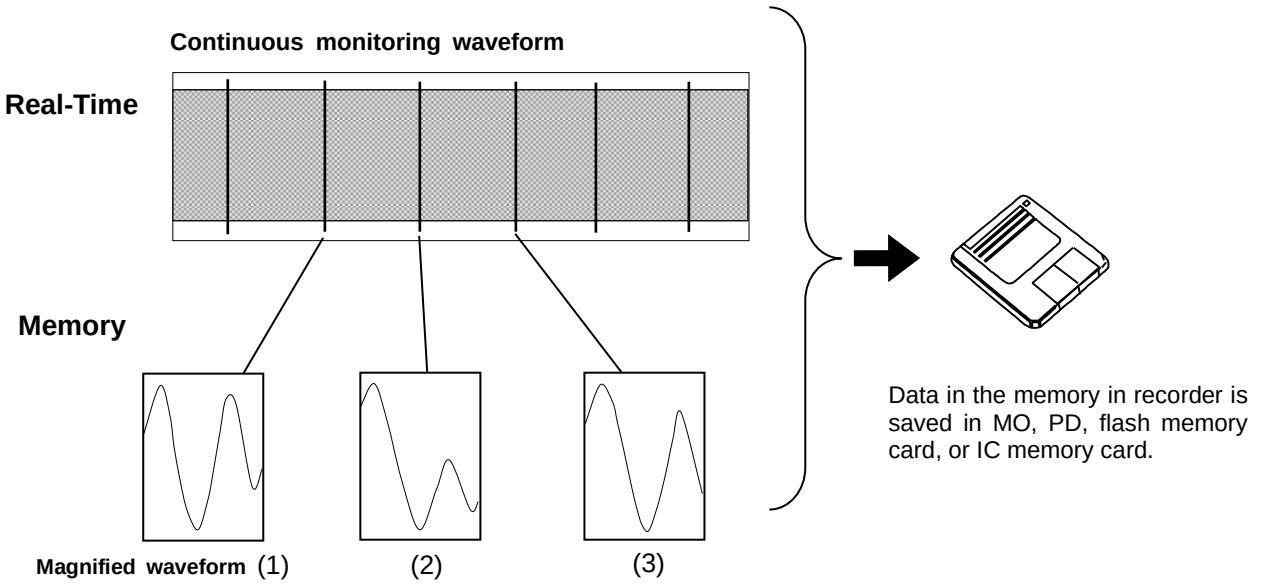
8.1 Functions of Transient Mode

In transient mode, normally slow real-time recording is performed but when a trigger occures, changing to high speed memory recording to record data. This mode permits not only continuous signal monitoring but also precise data recording at the trigger generation.

- **Transient Printing**
  Normally, the transient printing function performs slow-speed waveform printing, however, this function performs high-speed recording upon the trigger generation. Since only the necessary areas are recorded and printed, chart dissipation can be minimized.
  The output format to the recording paper is fixed to "waveform".



- **Transient Filing (PAT.P)**
  This function performs direct saving (filing) of input signals as files with the same image as the waveform that is printed on the chart. The files consist of real-time filing data with related information and memory filing data (128 files max.), enabling easier analysis as described in CHAPTER 11, REPLAY SETUP.
  PC card (standard drive) and MO/PD (connected by SCSI) can be used for filing.

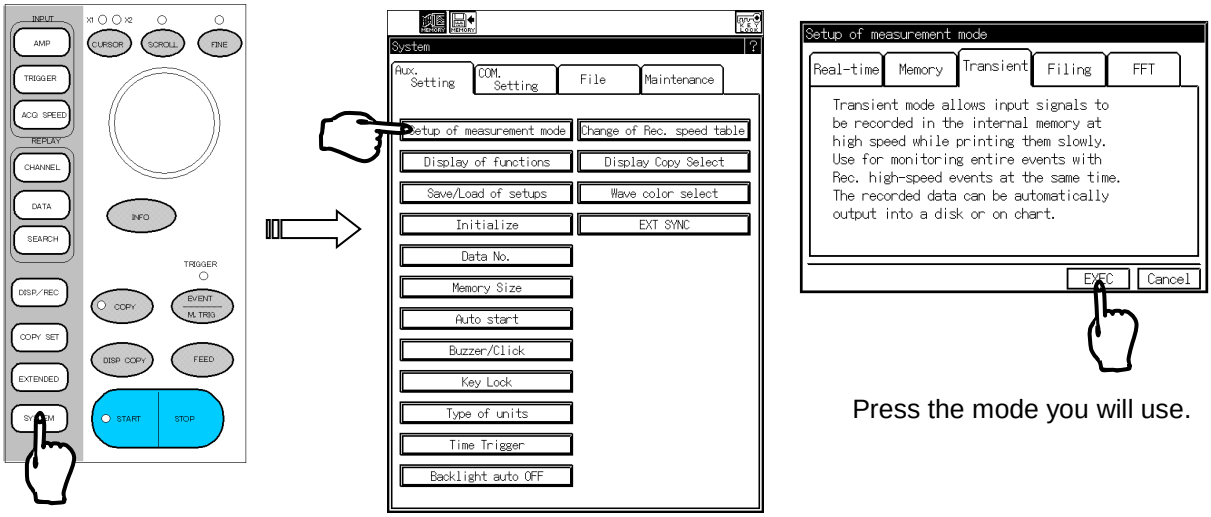


8.2 Setup of Transient Mode

The [SYSTEM] screen is used to set up the transient mode.

1. Displaying Screen for Mode

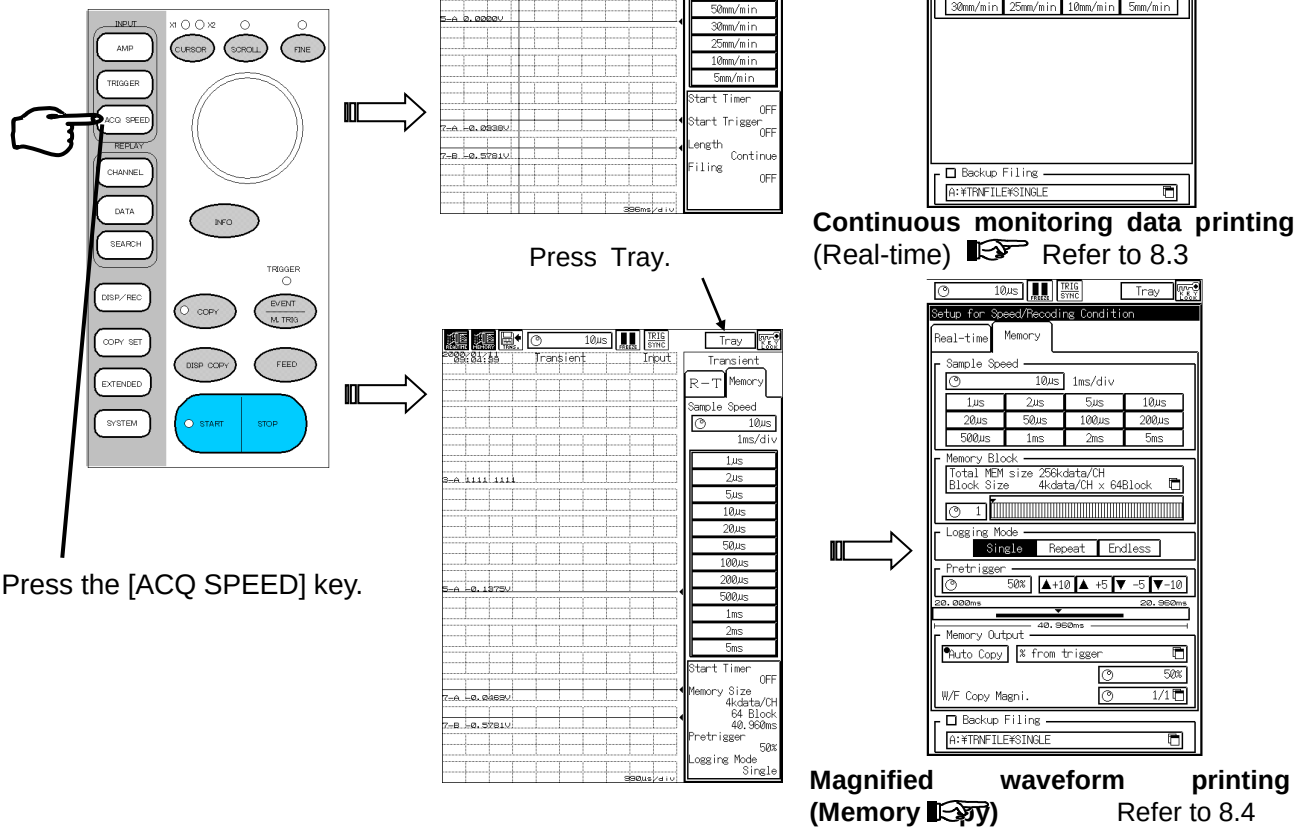
Press the [SYSTEM] key in the operation panel to open the [SYSTEM] screen.



Press the mode you will use.

2. Setup of Transient Mode

Press the [ACQ SPEED] key in the operation panel.



Press the [ACQ SPEED] key.

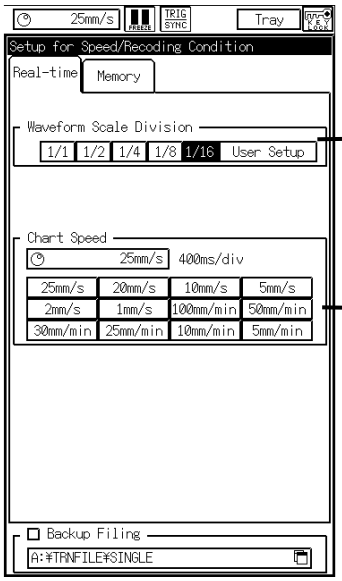
Continuous monitoring data printing (Real-time) ☞ Refer to 8.3

Magnified waveform printing (Memory ☞) Refer to 8.4

8.3 Setup of Continuous Monitoring Waveform Printing (Real-Time)

This section describes how to set the waveform printing for continuous monitoring (real-time printing). The main feature of this setup is the function of the real-time mode.

☞ Refer to CHAPTER 13. REAL-TIME MODE



Waveform Scale Division
Sets the effective printing width in waveform printing. The printing width is equal to the entire effective printing width divided by division number. The waveform images in monitor and printing are the same.

Chart Speed
Selects chart feed speed.

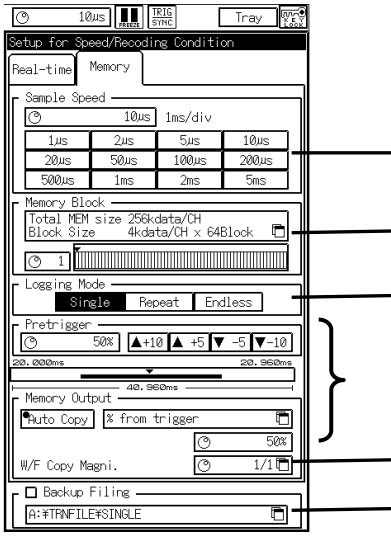
TIPS The s/div unit setup is available by changing the basic setup of measurement mode. ☞ Refer to CHAPTER 14.2.13

TIPS External pulse input is required to perform external synchronization.

8.4 Setup of Magnified Waveform Printing (Memory Copy)

This section describes how to set the magnified waveform printing (Memory copy). The main feature of this setup is the function of the memory mode.

☞ Refer to Setup of Pre-trigger and Output Range in CHAPTER 7 MEMORY MODE.



Sample Speed
Set the sampling speed according to the input signal.

Memory Block

Logging Mode

Pretrigger and Output Range

Waveform Magnification

Backup Filing

NOTE When using amplifier unit other than HSDC amplifier unit (AP11-103) or EV amplifier unit (AP11-105), if setting sampling speed finer unit, than 10 μ s, waverorm may not be obtained correctlv.

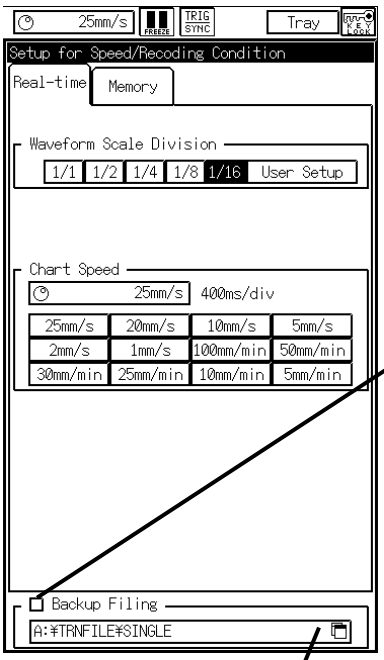
8.5 Setup of Transient Filing

The transient filing offers real-time filing of continuous monitoring waveform and memory filing of magnified waveform. Since linkages between these files are maintained, it is possible to analyze data using replay monitor. For magnified waveform (Memory filing), the specified range is subject to be filed.

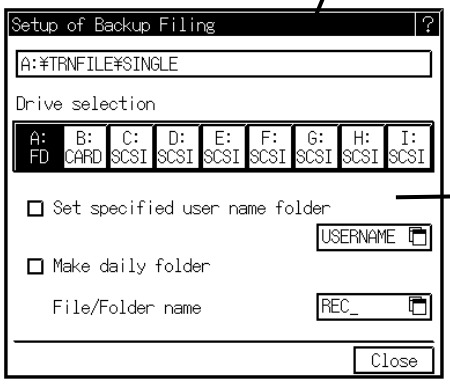
☞ Refer to Chapter 11 REPLAY SETUP.

1. Destination File Name Setup by Setting Backup Filing to ON

For setting file to record, turn ON the check box of Back up filing in either [Real-Time] or [Memory] tab.



Press ☐ to display "レ".



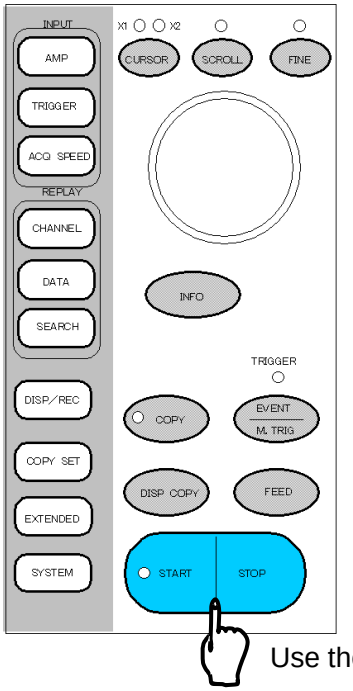
Specifies the destination.

Sets data save drive and auto-generation folder (user name folder and day folder).
It is possible to sort data using a rule such as "by user name" or "daily".

NOTE The saving format of the backup filing in the transient mode is "Binary Format" regardless of the setting at "regardless of the setting at "COPT SET".

8.6 Start Recording

After setup, the recorder is getting ready for measurement.



Use the [START] and [STOP] keys.

1. Starts Measurement

Press the [START] key to start measurement. Measurement is made when the specified conditions that are set for data acquisition are satisfied. If an error occurs, the window displays the error contents. Then, start measurement after resolving the error.
When the filing acquisition is finished, the transient recording stops, too.

2. Stops Measurement (Forced Termination)

When the filing is set, recording stops automatically after the completion of data acquisition. You can also stop the measurement by pressing the [STOP] key.

NOTE When ended by force, the data of the expanded waveform is not saved in the file automatically.

3. Replays Data

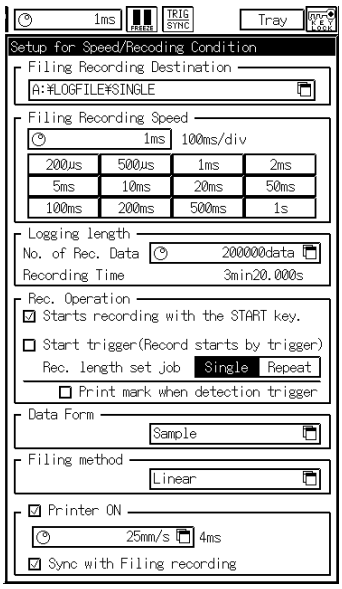
It is possible to replay (☞Refer to Chapter 11 Replay Setting) the transient data recorded by the filing recording and also save or print a part of the data (☞Refer to Chapter 13 Specifying Output). Unless the filing recording has been performed, it is possible to replay only the memory recording data.

9. FILING MODE

Saving in Media

9.1 About Filing Mode

The filing mode can save the continuous phenomenon (maximum recording speed 200μ s) automatically into a memory media like a disk and soon.



Filing

It is a mode to store data directry into the external memory media. A long term data can be stored into the file continuously without the limit of the internal memory of the main unit. The data format is a binary and peak or sample data is selectable. Floppy disk, PC card, MO or PD is available to store.

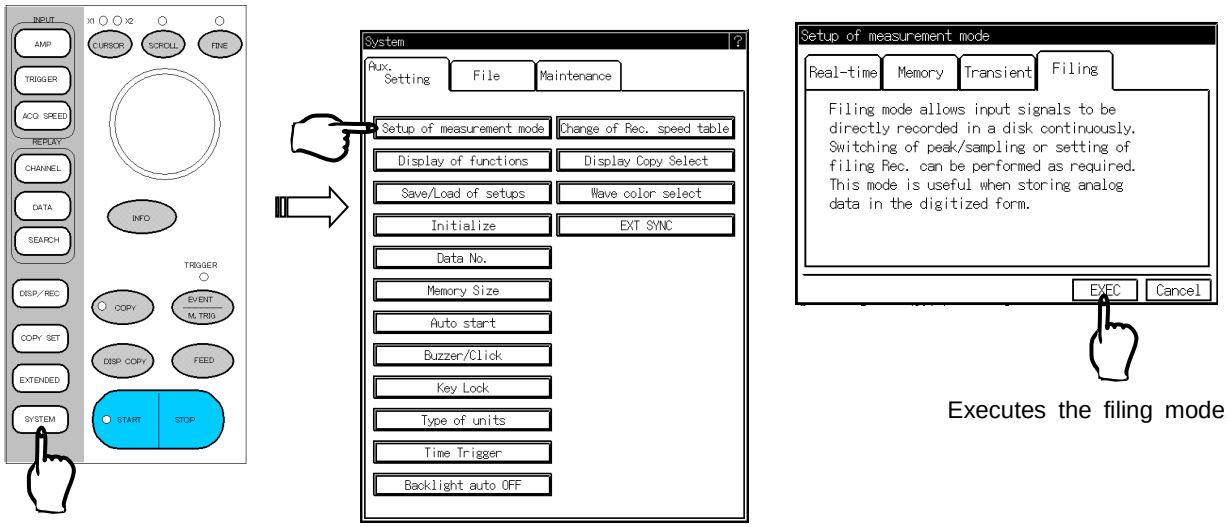
Output to Chart (RA1200, RA1300)

If the recorder is provided with the printing unit, acquired data can be output to chart recording paper. Moreover, an automatic waveform printing on the chart upon a trigger generation is available when Auto Copy has been set to ON.

9.2 How to Set Filing Mode

The [SYSTEM] screen is used to set up the filing mode.

Press the [SYSTEM] key in the operation panel to open the [Setup of measurement mode] screen.

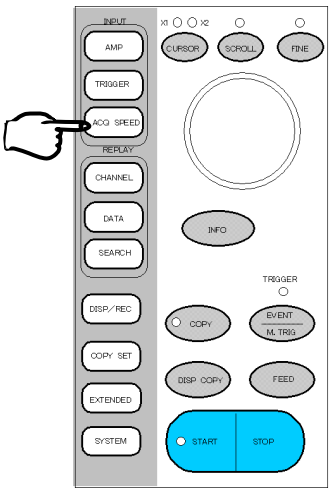


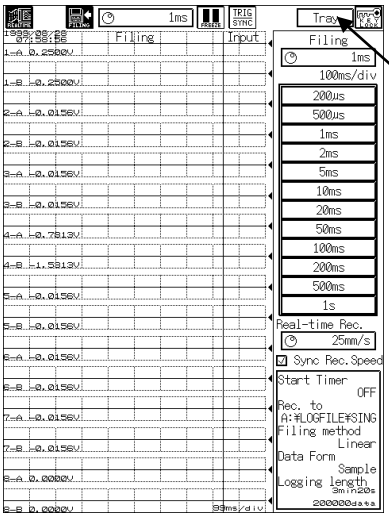
Executes the filing mode.

9.3 Setup of Filing Mode

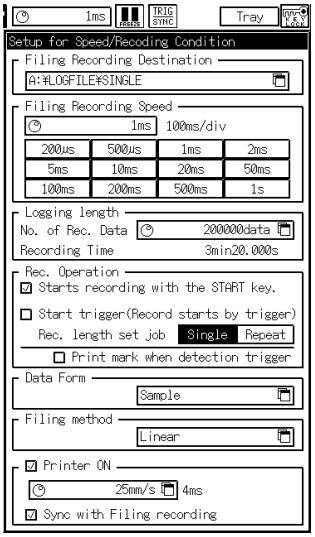
The following screen is used to set up the conditions to file input signals.

Press [ACQ SPEED] in the operation panel.



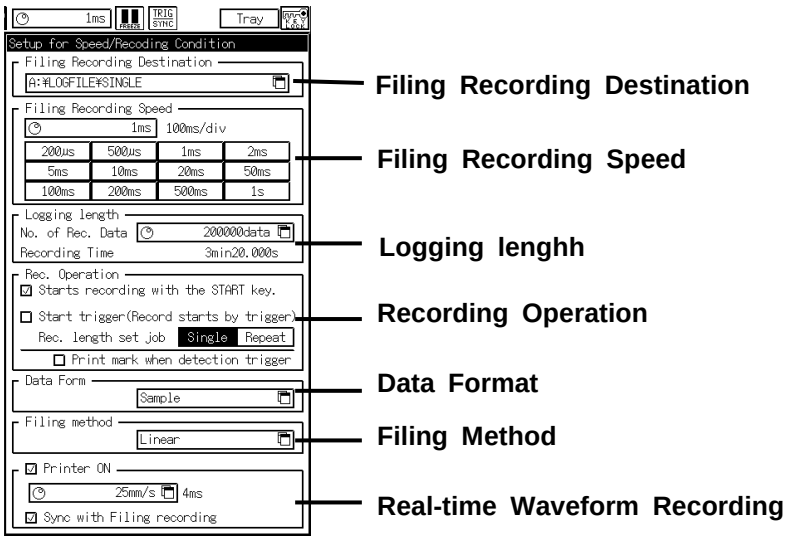


Press [Tray] to go into the detailed setup screen.



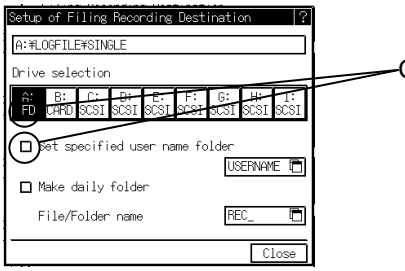
9.4 Setup of Filing

Automatic data save in an internal or external disk is available.



1. Filing Recording Destination

Set the filing recording destination to ON and open the window to specify the destination file name.



Check these boxes to set.

Specifies the destination.

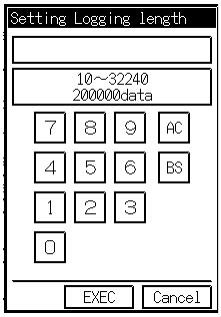
Sets data save drive and auto-generation folder (User name folder and day folder).
It is possible to sort data using a rule such as "by user name" or "daily".

2. Filing Recording Speed

Set the sampling speed according to the input signal.

3. Logging length

Set the data volume by the units of data.

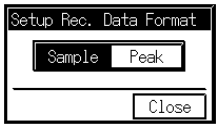


4. Setting of Recording Operation

Setting the start and the related operation of recording. Record can be started by a trigger. When specifying "Repeat" in case of start trigger, the data can be stored until the STOP key is pressed or the disk is filled up.

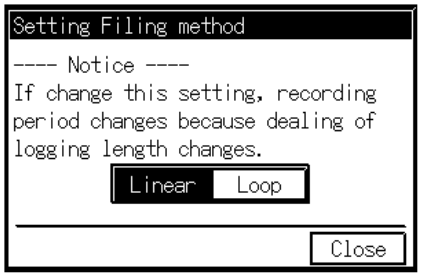
5. Setting Data Format

Either sample or peak data is selectable. When specifying [Peak], 1 data consists of two values of maximum and minimum. As peak data can be stored at maximum A/D conversion speed of the amplifier always regardless of the recording speed, waveform including high frequency component can be observed for a long term.



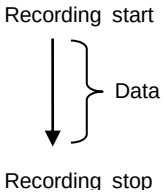
6. Filing Method

There two options, Normal and Ring.

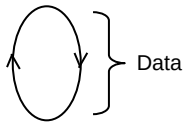


The relation between the data volume and recording method is as follows. When [Loop] is selected, the maximum length is 1 MB. (Refer to the next page for cautions regarding the Ring operation.

- **[Linear] recording**

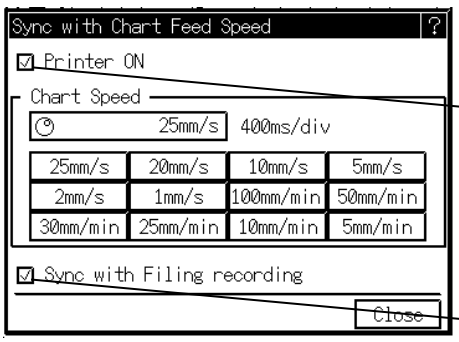


- **[Loop] recording**



Continues until forced stop

7. Real-Time Waveform Recording (RA1200, RA1300)



Check here when recording the real-time waveform on the paper simultaneously to the filing.

Check here when synchronizing the real-time waveform recording to the recording speed of the filing.

CAUTION Cautions regarding the [Loop] operation

The specifications of the ATA flash memory card, MO, and PD define that the number of rewrite times is 200 thousand to one million times. Be careful, especially when performing high-speed [Ring] operation, media may be destroyed if rewriting more than the specified numbers.

Number of rewriting

Media	Number of rewriting
ATA flash memory card	Approx. 200 thousand times
MO	Approx. one million times
PD	Approx. 500 thousand times

Rewrite Time at 500-μs Real-Time Filing (1 MB Ring)

Number of chs	Number of data per 1 MB	Time to 100 thousand writing
1	262144	Approx. 3640 hours (151 days)
2	131072	Approx. 1820 hours (75 days)
4	65536	Approx. 910 hours (38 days)
8	32768	Approx. 455 hours (19 days)
16	16384	Approx. 225 hours (9 days)

（1MB = 1,048,576 bytes）

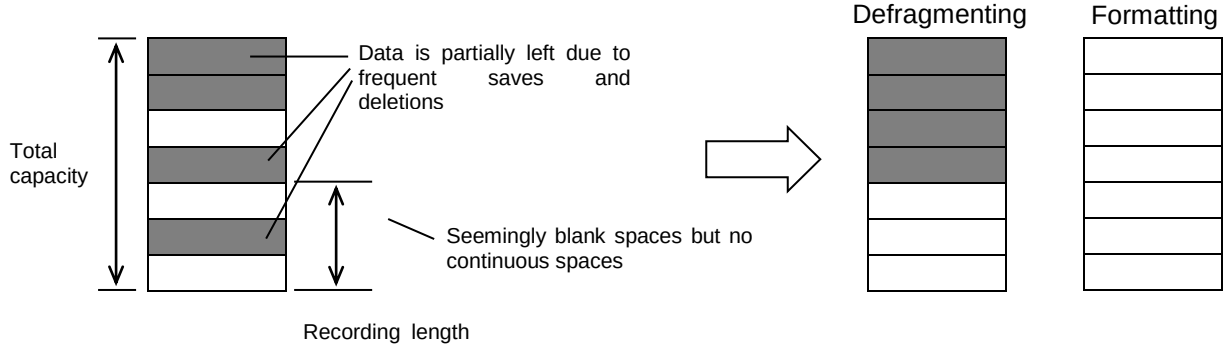
TIPS Setup of recording length (number of recording data) in real-time filing

- **Relations between data size and recording length**
  It is possible to calculate the rough recording length (number of recording data) from the remaining disk capacity and number of measurement channels in the file screen.

  [In sample filing]
  Recording length = (Remaining disk capacity - 4 kB) ÷ (Number of channels x 2)

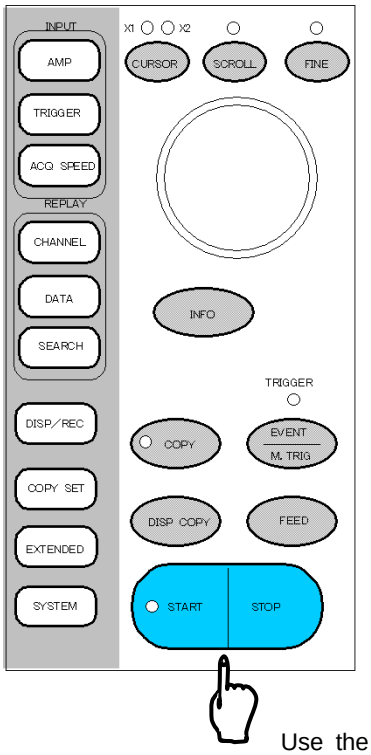
  [In peak filing]
  Recording length = (Remaining disk capacity - 4 kB) ÷ (Number of channels x 4)

The real-time filing is a method of accessing to disk at a high speed, permitting a save in the continuous blank spaces in the disk. Accordingly, there are cases where the remaining disk capacities that are displayed in the drive information and those that can be actually used for the save may differ.
Moreover, when a folder is created at the recording start, the recording may become impossible depending on the setup values due to a change in capacity. If the recording is not possible and an error occurs, restart the recording after reducing the number of recording channels and recording length.
Continuous blank space is a space that has not undergone any file deletions after disk formatting. Once files are subjected to deleting, the remaining disk capacity increases but the continuous blank space does not increase. Therefore, to use disk for save, execute formatting or defragmenting (such as defragmenter in Windows95) in advance.



9.5 Start Recording

After setups, the recorder is getting ready for measurement.



Use the [STARTt] and [STOP] keys

1. Starts Measurement

Press the [START] key to start measurement. Measurement is made when the specified conditions that are set for data acquisition are satisfied. If an error occurs, the window displays the error contents. Then, start measurement after resolving the error.

2. Stops Measurement (Forced Termination)

Except [Ring], when the recording operation is "Single" or "Repeat", the measurement stops when recording of number of data specified at the record length finishes. (In case of the recording operation is "Repeat", it stands by the next trigger.) Press [STOP] key in case to stop the measurement by force. The data is stored as the file of data recorded so far.

3. Replays Data

Replaying the stored data ··· REPLAY SETUP
☞ Refer to CHAPTER 11.
Copying the recorded data on the recording paper or save it in the file ··· SPECIFYING OUTPUT
☞ Refer to CHAPTER 13.

10. REAL-TIME MODE

Long-Time Recording of Low-Speed Events

10.1 Functions and Setups of Real-Time Mode

In real-time mode, the input signal can be recorded on the recording paper directly. It is used to record comparatively slow phenomenon. By the backup filing, the data recorded on the recording paper is saved in a disk as is. (RA1100 can not be set the real-time mode as there is no printer.)

Real-time printing
Real-time printing of input signals is available. There are three printing forms, waveform, data, and X-Y.

1. Real-time waveform printing: Prints input signals in the form of waveform
2. Real-time data printing: Prints input signals in the form of numerical data
3. Real-time X-Y printing: Prints input signals in the form of X-Y

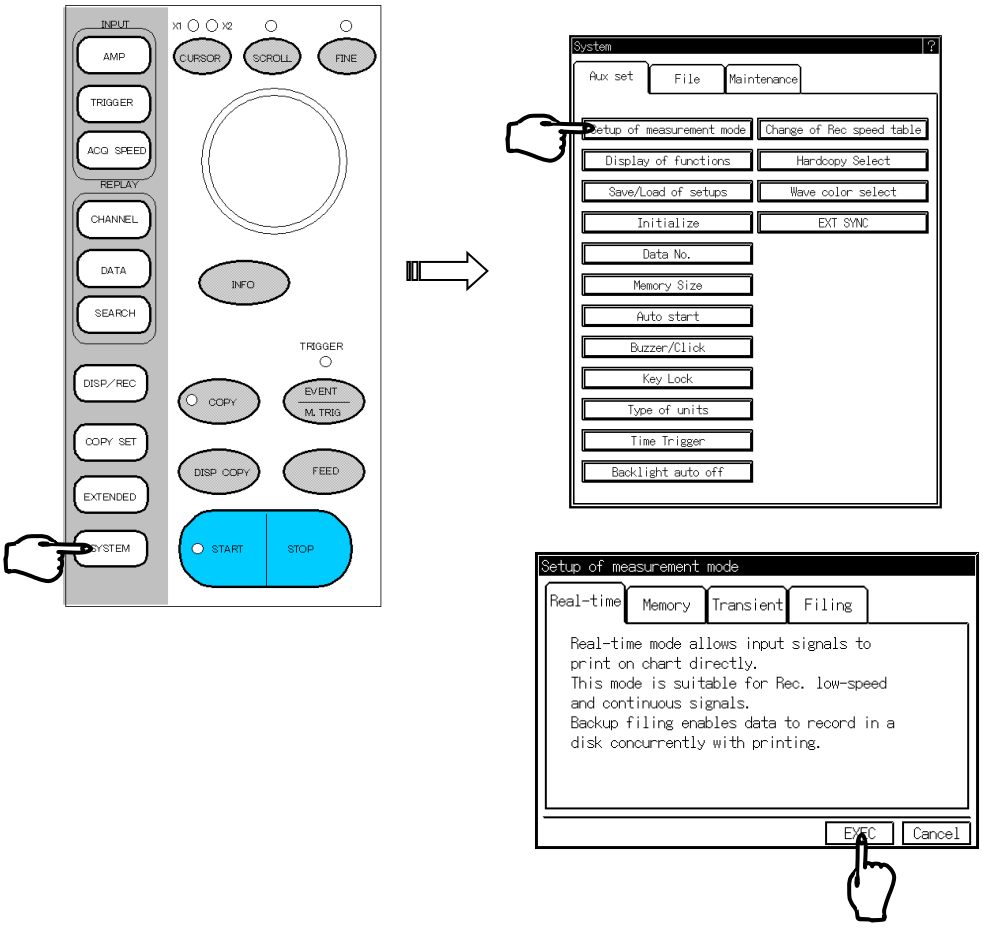
Backup filing
Raw images of waveform that have been printed on chart can be directly saved in a disk as a file. This function is referred to as filing. The filing is available for all media such as floppy disk and PC card, which are provided as standard drives, and MO/PD, which can be externally connected to the recorder.

10.2 How to Set up Real-Time Mode

The [System] screen is used to set up the real-time mode.

1. Displays Recorder Screen

Press the [SYSTEM] key to display [Aux. setting].



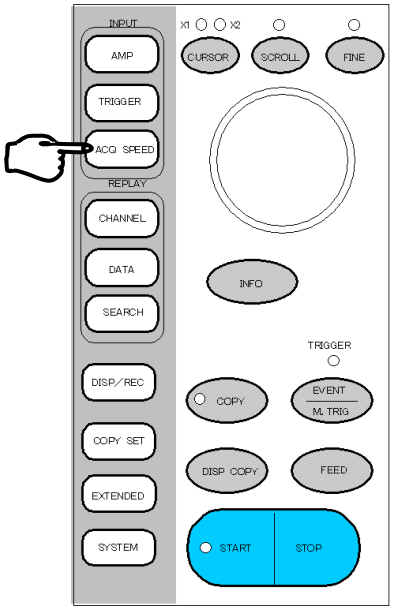
Press Measurement mode setup to change the mode.

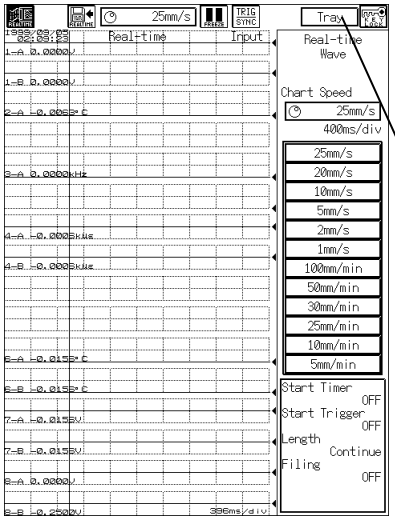
10.3 How to Setup Real-Time Printing

This section explains the setup of the real-time printing, which executes real-time printing of input signals. The real-time mode is available in the RA1200, RA1300 only, which is provided a printing block.

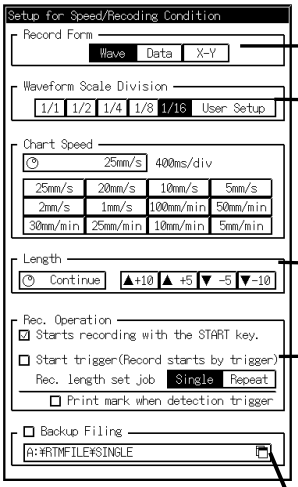
10.3.1 Setup of Real-Time Waveform Recording

Press the [ACQ SPEED] key.





Press [Tray]



Select "Wave" in Record From

Waveform Scale Division
Sets effective recording width for recording.

Chart speed
Sets chart feed speed.

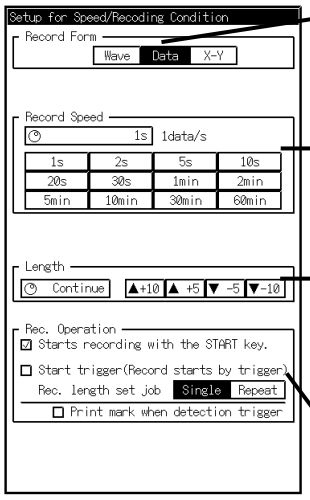
Length
Sets whether to perform continuous recording or to to stop after the specified division length of feed.

Recording operation:
Sets whether to start recording by pressing the Start key or at the trigger generation after pressing the Start key. If the start by trigger generation is selected, you can set whether to start once or repeatedly at each trigger detection. The recording length should be set to other than the continuous recording if the repeated recording by triggers is specified. A mark print is available by trigger detection during recording. Refer to "Chapter 6 Trigger Setup".

Backup filing
The input signal can be saved into the file simultaneously to the waveform recording.

10.3.2 Setup of Real-Time Digital Recording

This function records data and print in digital numerical value.



Select Data in Recording form.

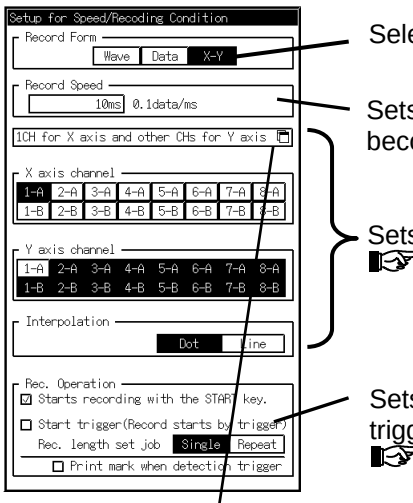
Sets recording speed.

Sets in the units of one data. Besides the standard setup, a user setup can be registered. If the continuous recording is specified, digital printing continues until the [Stop] key is pressed.

Sets the start of recording or other operations. Recording start by trigger and marking at the trigger position are available.
☞ Refer to Chapter 6 TRIGGER

10.3.3 Setup of Real-Time X-Y Recording

Data can be recorded in the form of X-Y.

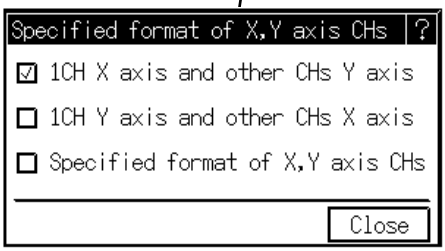


Select X-Y for the recording form.

Sets a recording speed. In the real-time X-Y, the recording speed becomes memory acquisition speed.

Sets the channels to be used.
☞ See CHAPTER 12 DISPLAY AND PRINTING

Sets the start of recording or other operations. Recording start by trigger. In the real-time X-Y recording, marks cannot be indicated.
☞ Refer to CHAPTER 6 TRIGGER SETTING

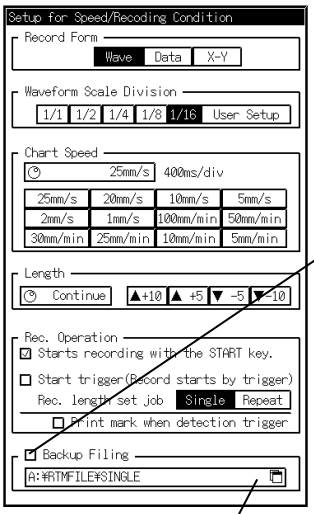


NOTE The real-time X-Y recording makes the image data write in continuously until [STOP] key is pressed, and it is printed on the recording paper by pressing the [STOP] key.

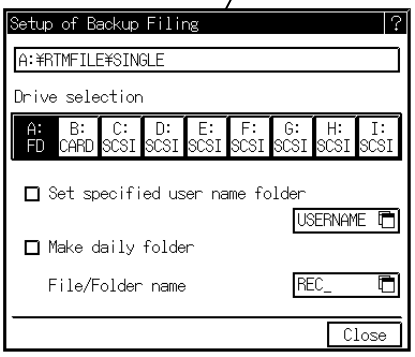
10.4 Setup of Backup Filing

Backup filing is a function to directly save the same image as the real-time waveform printing or display in an internal or external drive as a file. Data is saved as peak data such as in waveform recording.

Specifying destination file name after setting backup folder ON.



Press the "☐" mark to display the 「ν」 mark.



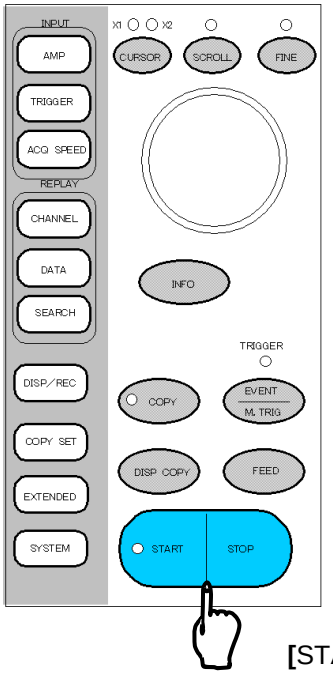
Sets the destination folder.
Sets data save folder and automatic creation folder such as user name folder or daily folder.
The destination for data sorting by the user or day can be set.

NOTE When turning ON the backup filing, the output to the recording paper is the waveform regardless of the recording format in the former section.

10.5 Recording Start

After completing setup, start recording.

10.5.1 Step of Measurement



[START] and [STOP] keys

1. Starting Measurement

Pressing the [START] key starts measurement. The actual measurement is performed after the conditions that are set for recording operation are satisfied. If an error occurs, the error contents appear in the window. In this case, start measurement after the error has disappeared.
Filling recording stops at the instant when the Real-time recording completes.

2. Completion of Measurement (Forced Termination)

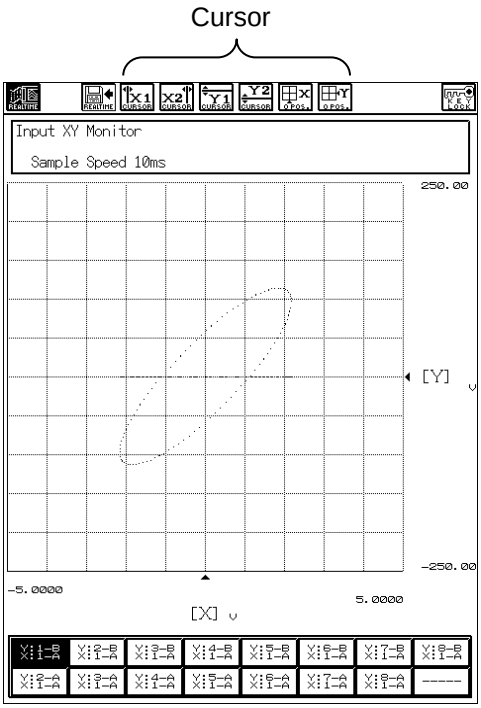
When the recording length is fixed, the recorder automatically stops after recording the specified number of data. Beside, forced termination is possible by pressing the [Stop] key.

3. Replaying Data (Only in Filing Mode)

Data replay and partial save/printing are available for the measurement of filing recording.
☞ Refer to CHAPTER 10 REPLAY SETUP

10.5.2 Operation in Real-Time X-Y Recording

In the real-time X-Y recording, firstly the real-time X-Y is displayed on the screen. After data acquisition, X-Y printing is executed.



Cursor

Cursors X1, X2, Y1, Y2 can be over wrapped on the X-Y display.

Example: If cursor X1 is pressed, a line parallel to the Y axis (cursor 1) is displayed. Cursor movement is available with JOG dial or touching X-Y display area.

11. REPLAY SETUP

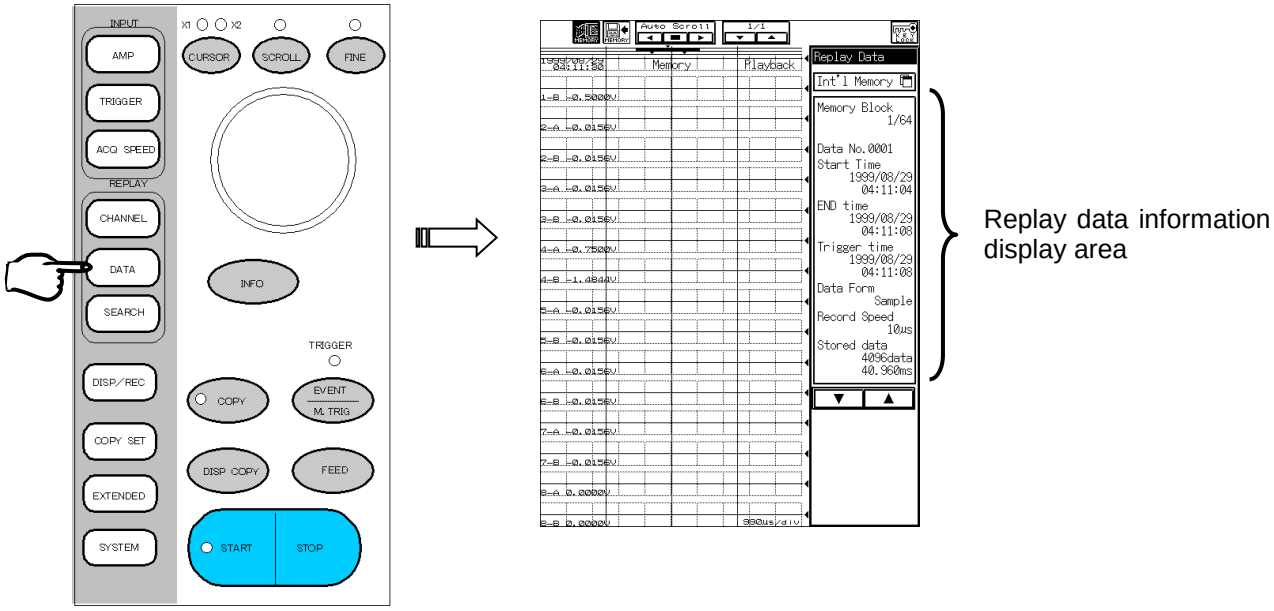
Display, Copy, and Save of Acquired Data

11.1 How to Replay Acquired Data in Memory or File

To replay the acquired data in memory or file, the [REPLAY] screen is used. In the [REPLAY] screen, you can display waveforms by choosing the data, which is acquired in the memory or file, in the list. Moreover,

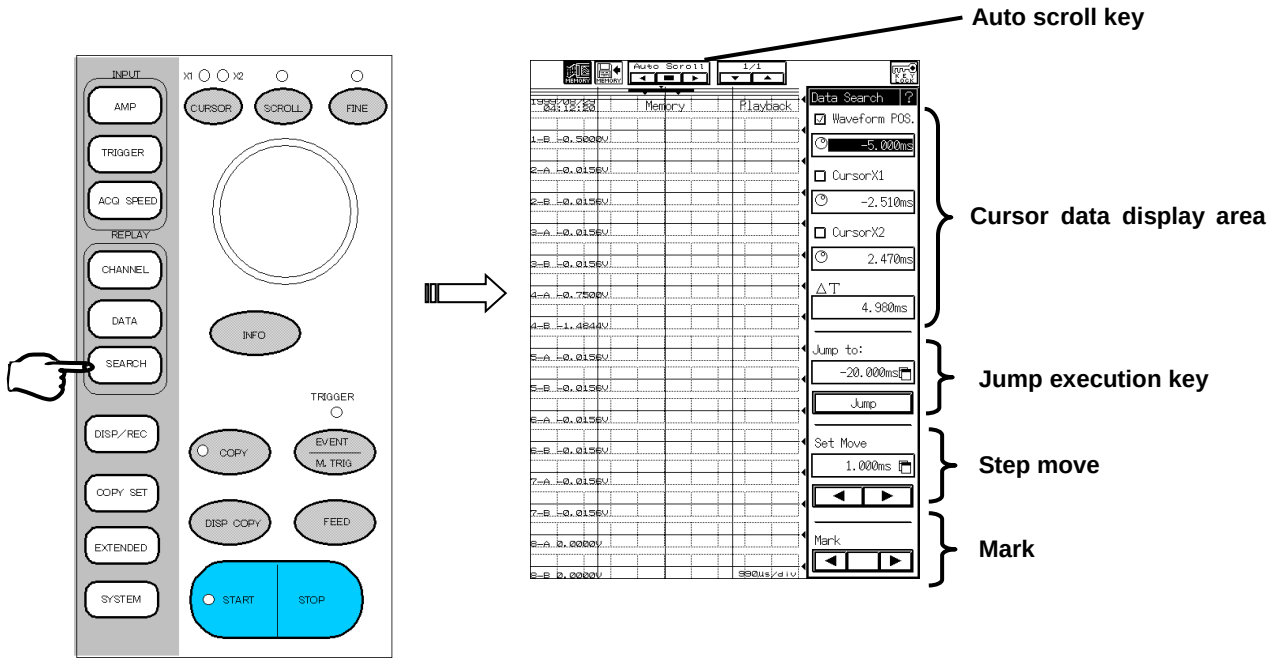
<<To display data in screen as waveform>>

Press the [DATA] key in the operation panel to display the [DATA] screen.



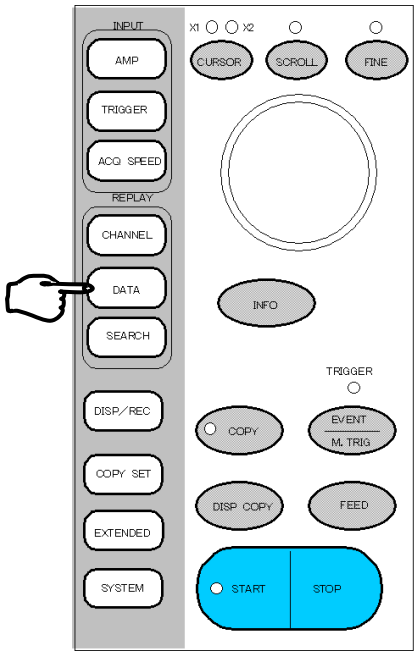
<<To search displayed data>>

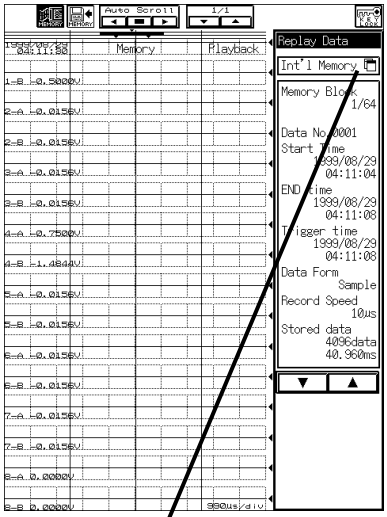
Press the [SEARCH] key in the operation panel to display the [SEARCH] screen.

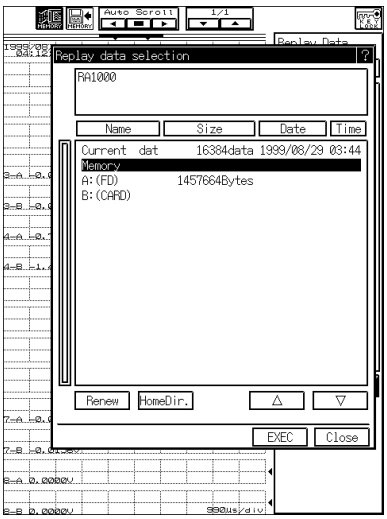


11.2 How to Select Data to be Replayed

To select data acquired in memory or file, choose [Tray] in [DATA]. Then, select the data to be replayed from the list.

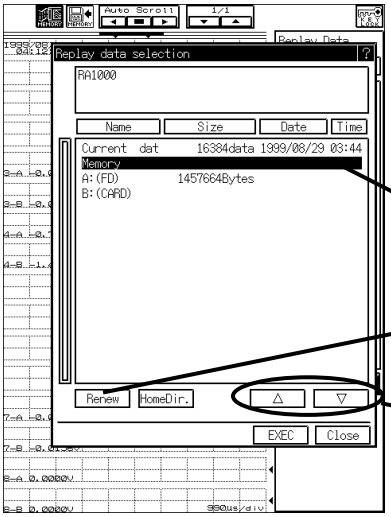






[Replay data selection]

Press this part.
(The kind of data currently selected is displayed.)



File selection

File Selection

Select the file to be displayed in the replay monitor from the file list. The file displayed in reverse display is the file currently selected. Move the reverse display by touching the screen.

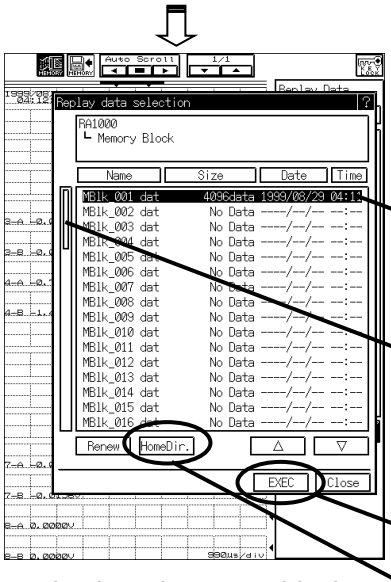
Select memory block.

Update into the newest information.

Moves upper or lower folder.

Example: Memory block selection

Select Memory from the memory file list, and then move to the file below. You can select the memory block to be displayed in the replay monitor from the memory block list. Move the reverse display by touching the screen.



Selection of memory block

The selected line is inversely displayed.

Scroll bar

Closes the data selection screen and displays the memory data block in the replay setup.

Goes back to the initial screen.

NOTE

In the file replay, the contents of file are directly read out. In this case, the memory of recorder is not used.

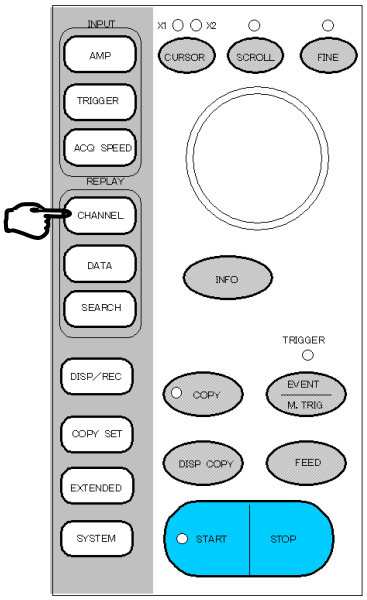
CAUTION

While media or PC card is being accessed during data replay, do not take it out of drive. Otherwise, the recorder, media, or PC card, or their data may be damaged.

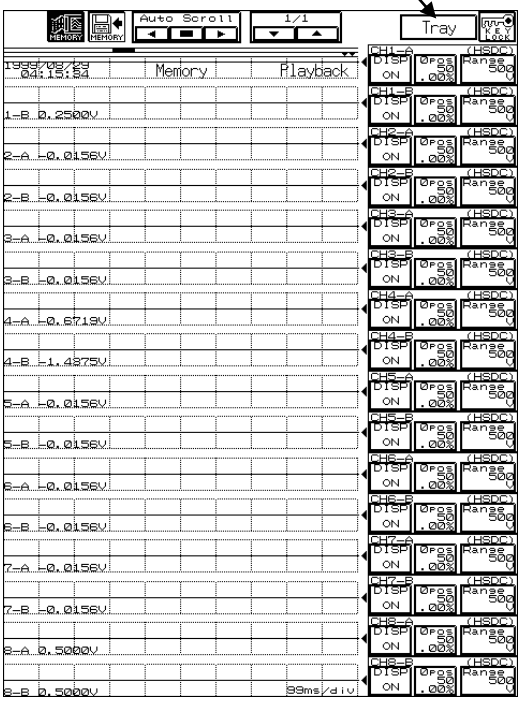
Scales or base line positions of recorded data can be changed.

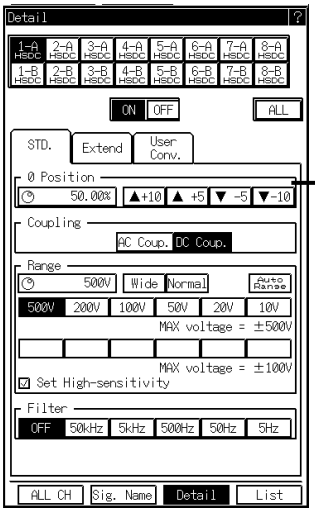
☞ Refer to RA1000 Amp Unit User's Manual for the details of scale setting.

Press the [CHANNEL] key.



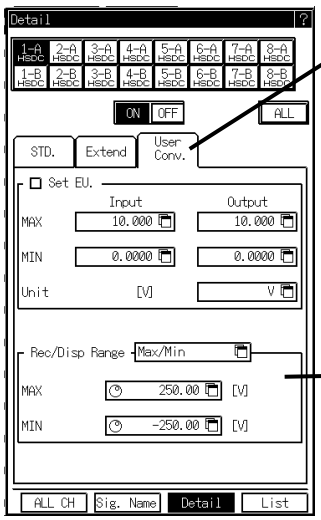
Press the [Tray] key.





Change of position (base line)
Jog dial can be used and operation in touch panel is possible.

Press [User Conv.].

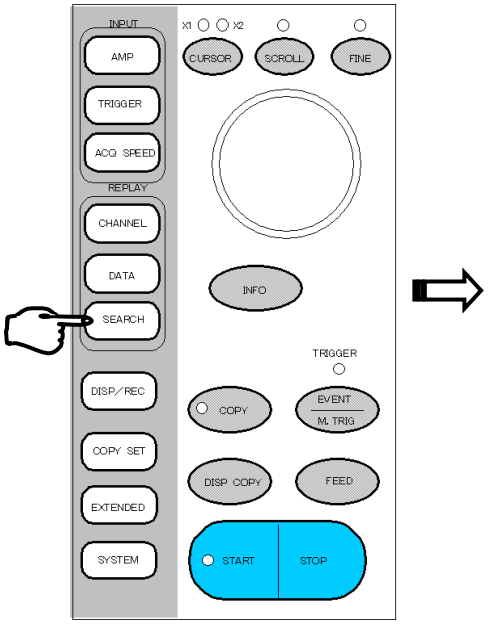


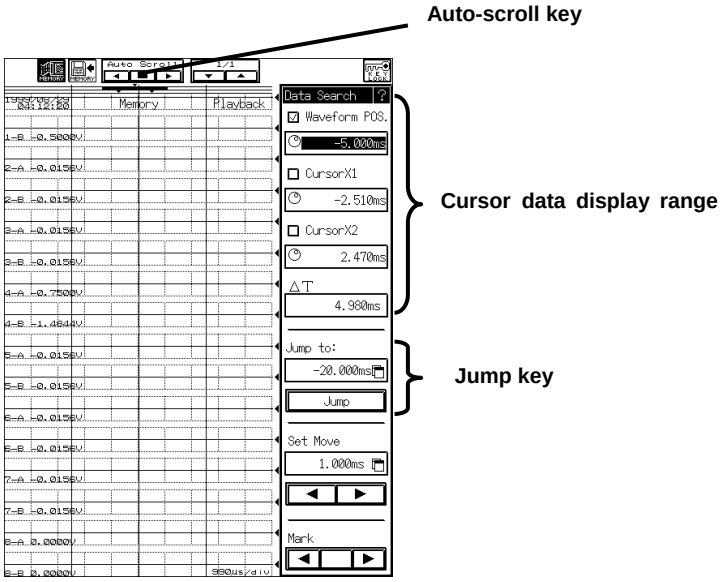
Changing of scale (display range) :
Changing the full scale of the waveform.

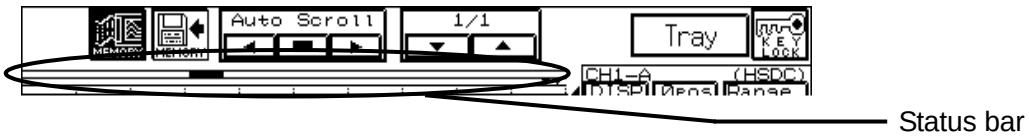
11.3 How to Display Desired Portion of Waveform

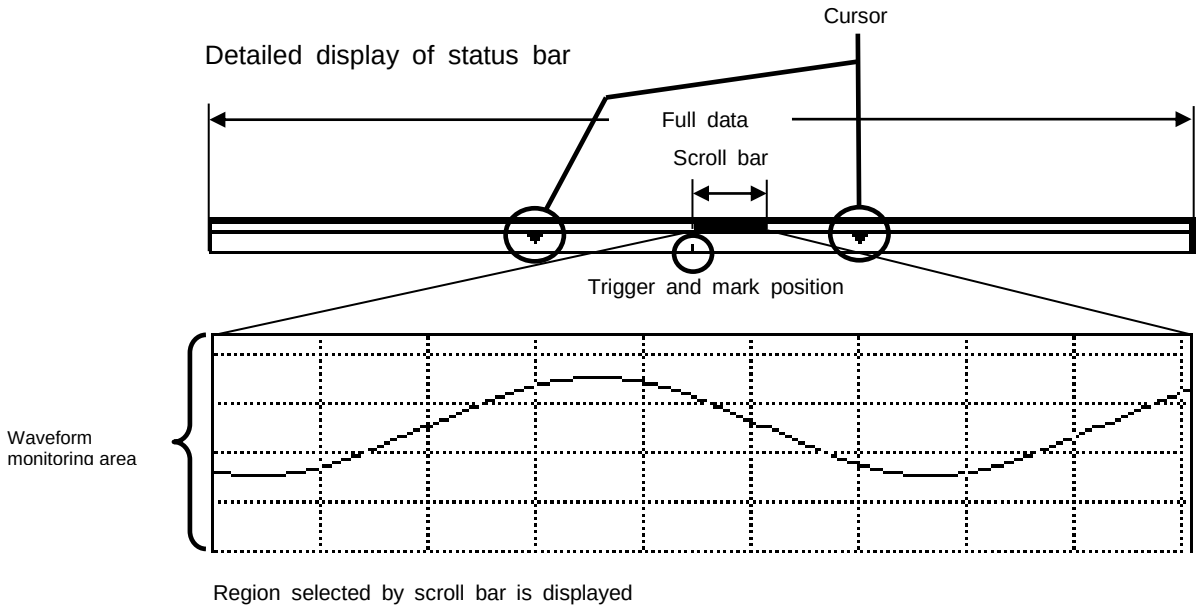
In the [REPLAY] screen, you can scroll waveforms by using the jog dial or pressing waveform monitoring area.

Press the [SEARCH] key.



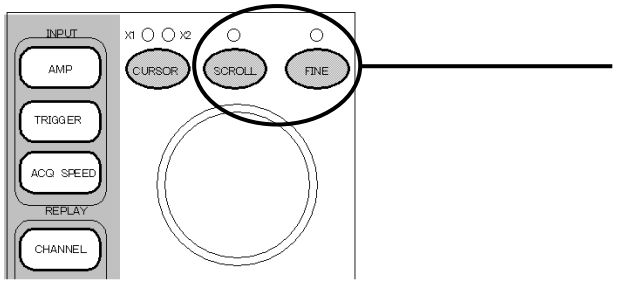






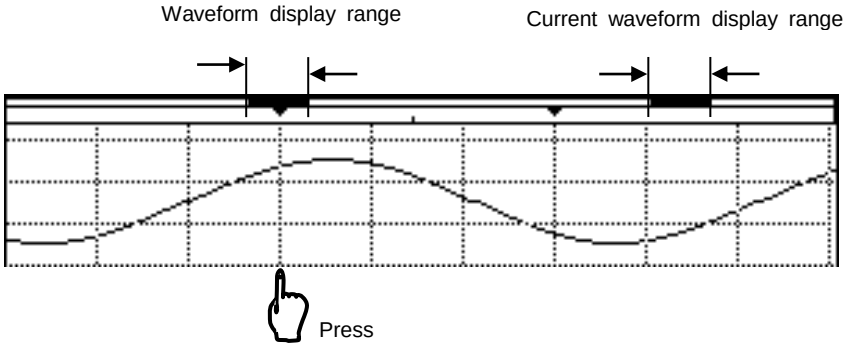
11.3.1 Scrolling with jog dial

Turn the jog dial after pressing the [SCROLL] key in the operation panel. If you keep turning the jog dial, scrolling speed is accelerated. If you keep turning the jog dial while LED lights after pressing the [FINE] key, the scrolling speed slows down. To cancel, press the [FINE] key again to put out the LED.



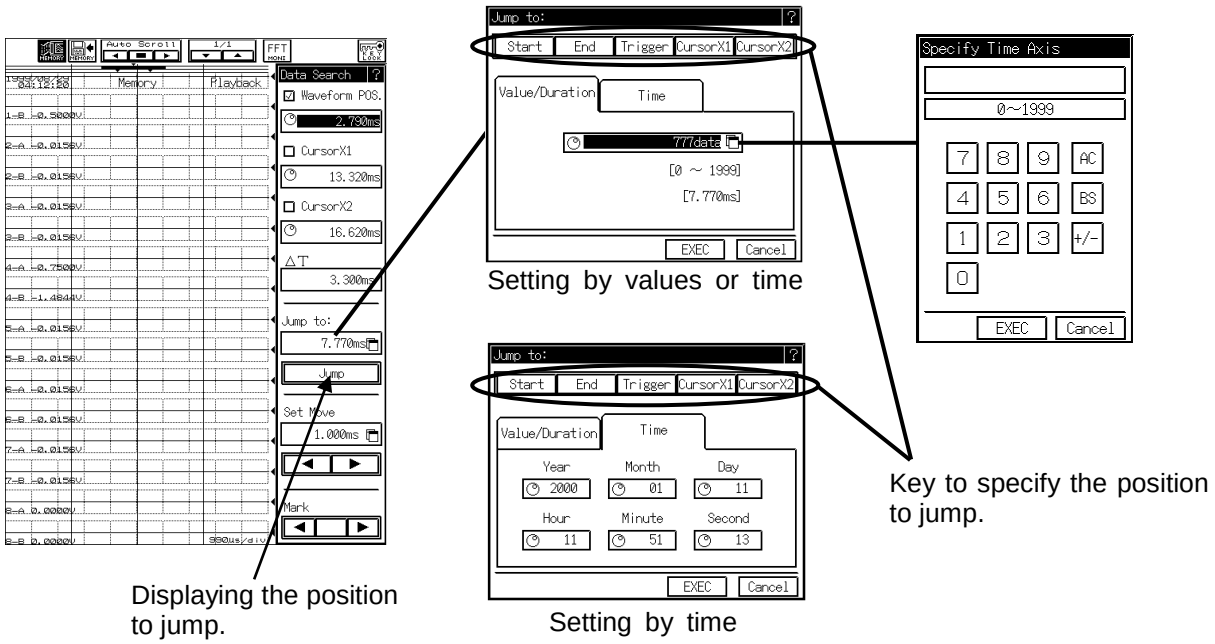
11.3.2 Scrolling in Waveform Monitoring Area

Press the [SCROLL] key in the operation panel and directly press the waveform monitoring area in the touch panel to move the area displayed.



11.3.3 Scrolling by Jump Function for Specified Position

This function allows a jump of displayed area so that the specified position can be displayed in monitoring area after specifying the positions. After specifying, press [Jump] to move area to be displayed.

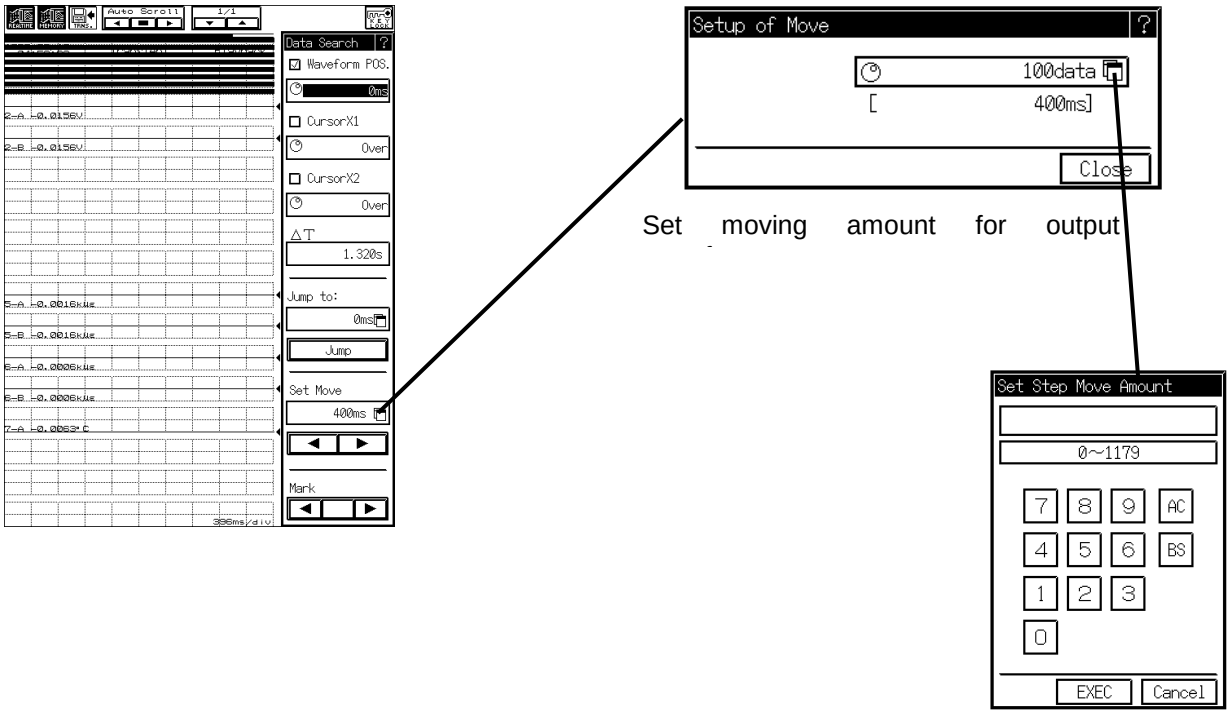


NOTE The jump pacified position screen varies depending on displayed unit formats r cursor display setup.

☞ Refer to CHAPTER 14 for displayed unit format.

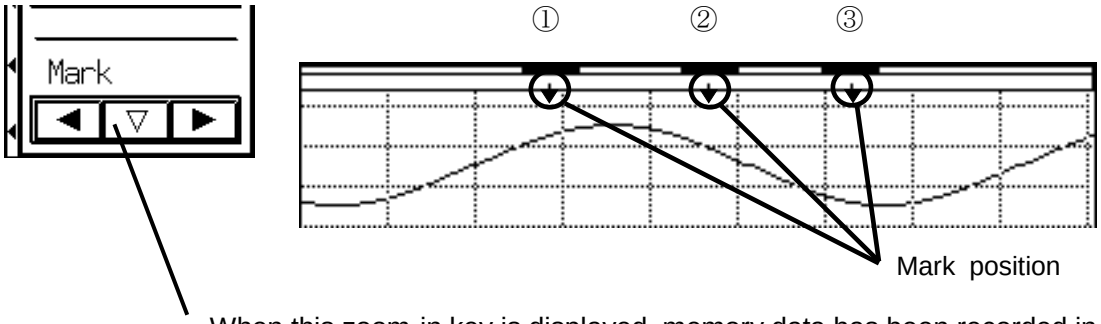
11.3.4 Scroll by step movement

Perform to mave the of set value to direction corresponding ◄ ►



11.3.5 Scrolling by Marking Jump Function

The range of display moves based on the mark position in acquisition data. If range (1) is currently displayed, pressing [▶] moves the display range to (2) and (3).



When this zoom-in key is displayed, memory data has been recorded in the mark pint (trigger) in the transient mode. Pressing this key displays waveform data recorded.

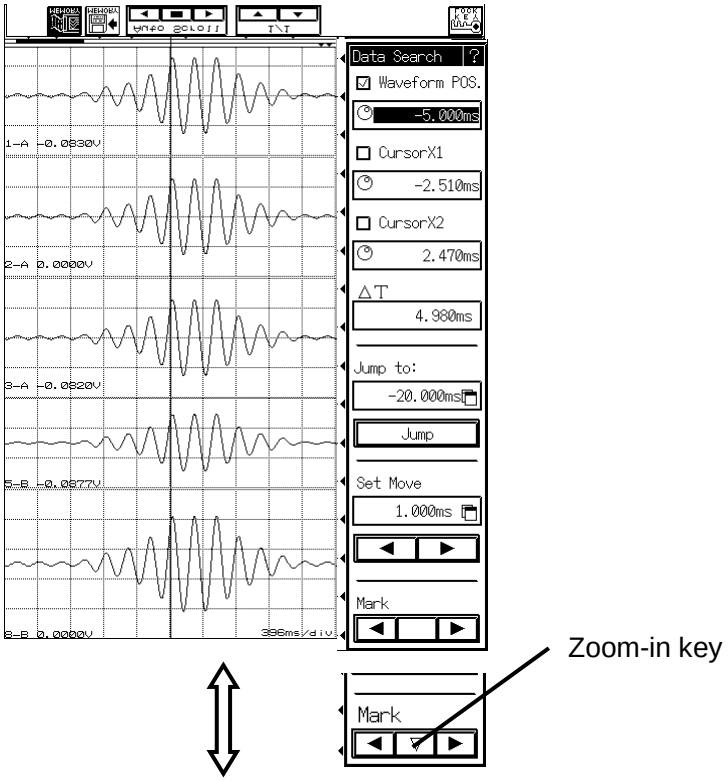
☞ Refer to 11.3.6

NOTE When performing mark jump for the stored data that has no marks, the display range moves based on cursors X1, X2, or the trigger point.

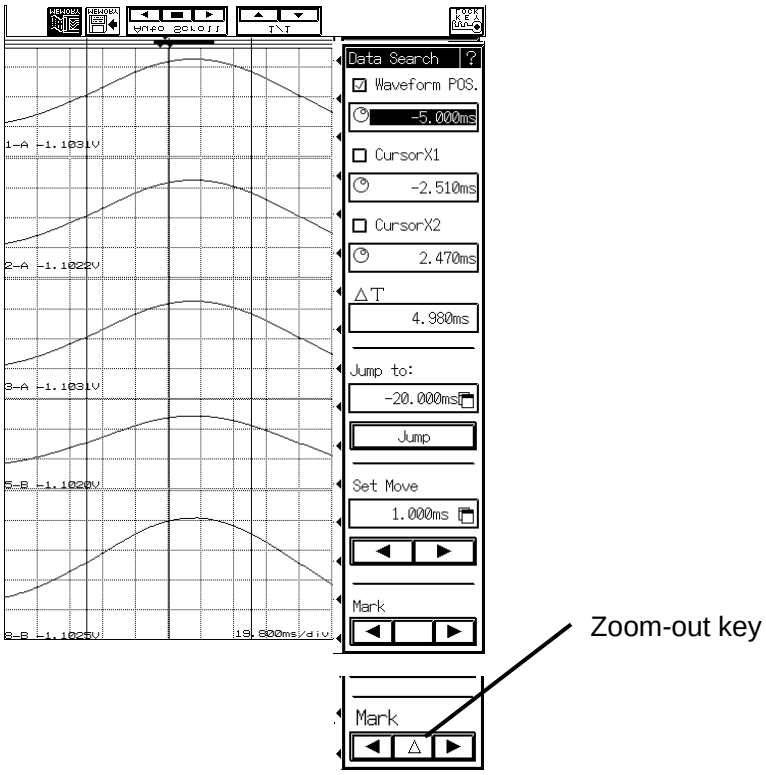
11.3.6 Zoom-in and Zoom-out for Transient Filing Data

The mark-jump function and the zoom-in/zoom-out function are used to move between the real-time filing data and the memory filing data stored by the transient filing.
The zoom-in key allows a move to memory filing data after executing the mark jump while displaying the real-time filing data stored in the transient filing. To go back to the real-time filing while the memory filing data is displayed, press the zoom-out key.

Real-time filing data

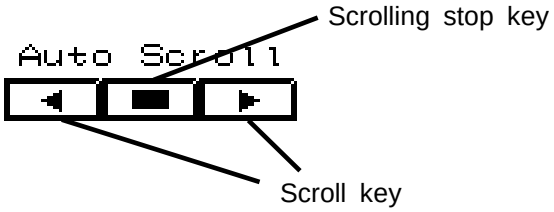


Memory filing data



11.3.7 Scrolling by Auto-Scroll Function

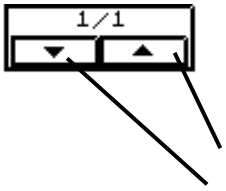
This function continuously moves displayed area. Press the ■ key to stop.



NOTE The speed of auto-scroll move is linked with the [Fine] key in the operation key.

11.3.8 Waveform Compression/Expansion

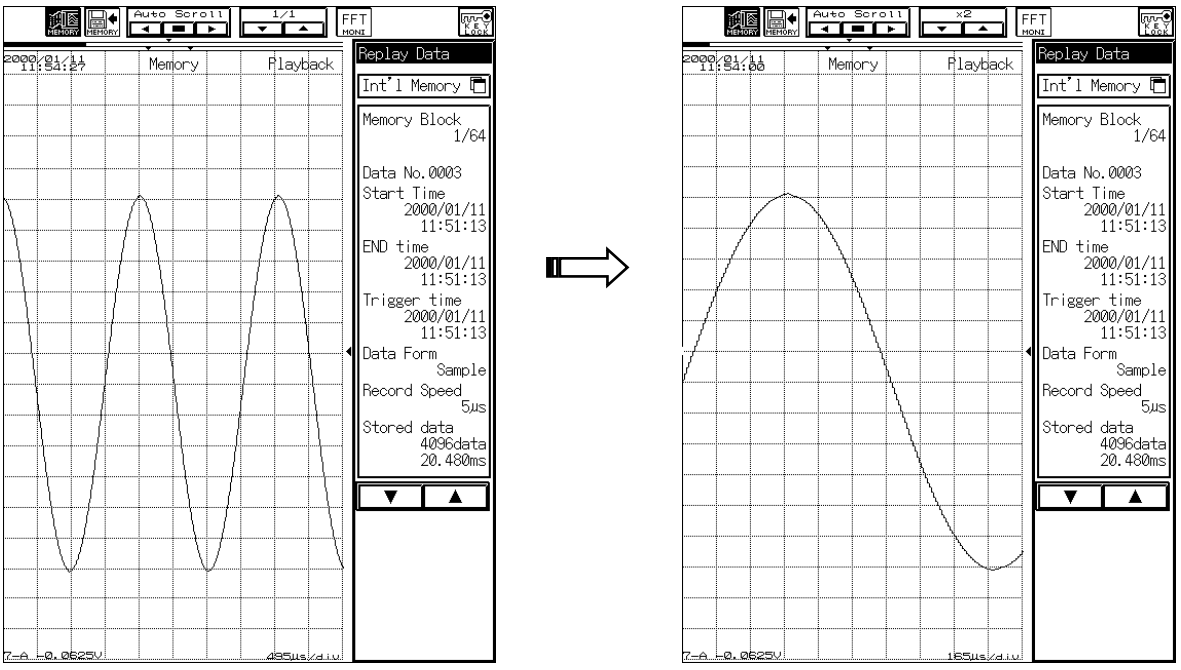
Compression and Expansion of the time axis of waveform is available.



Range: 1/1000 to x5

Compression/Expansion key

Double waveform magnification

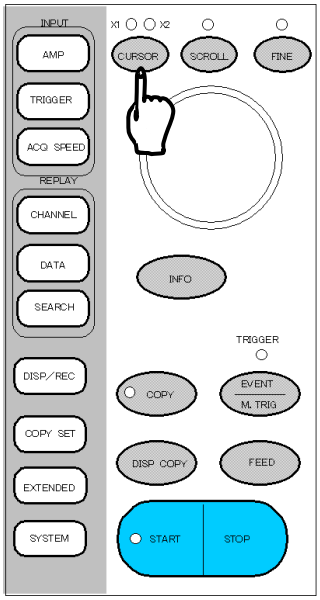


11.4 Cursor Functions

In the [REPLAY] screen, the measurement values of recorded data and the time between two points can be read using cursors X1 and X2. The measurement values and the time between two points are displayed at the cursor data display area.

11.4.1 To Switch Cursors X1 and X2

To switch active cursor, press the [Cursor X1/X2] key in the operation panel. The active cursor is displayed in inverse video in the cursor data display area.



The active-cursor LED (X1 and X2) lights up.

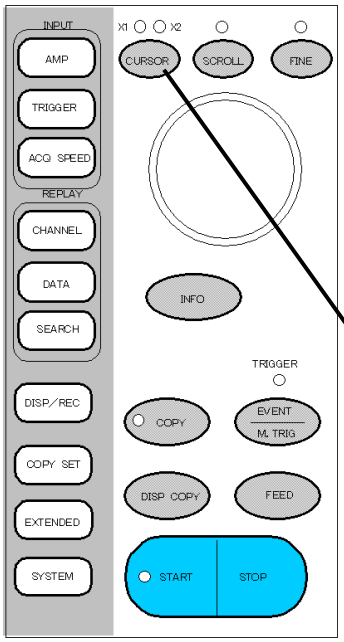
NOTE In order to switch cursors X1 and X2, press the cursor button once to light X1 up and press it again to light X2 up while LED stay out. By repeatedly pressing it, the LED of X1 lights up.

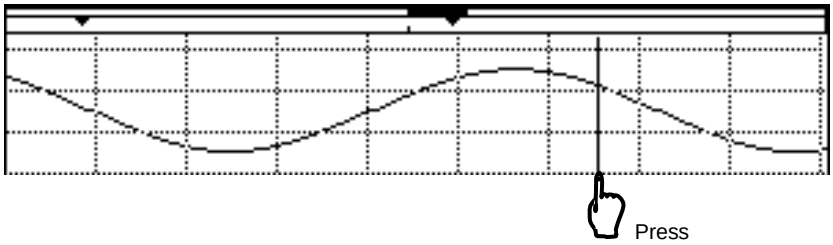
NOTE When cursors X1and X2, which are displayed in the cursor data display area, are not inversely displayed, this state means there are no active cursors.

11.4.2 How to Move Cursor at Your Desired Positions

Press the [Cursor X1/X2] key in the operation panel and turn the jog dial. Then, an active cursor, which has illuminated LED, moves.
The move acceleration is downed when the jog dial is kept turning while the LED illuminates by pressing the [FINE] key in the operation panel.
Moreover, while either cursor X1 or X2 is in active, by pressing a position in the waveform monitoring area, an active cursor moves to the pressed position.

Press the [CURSOR] key and turn the jog dial.





Press the [Cursor] key and turn the jog dial.

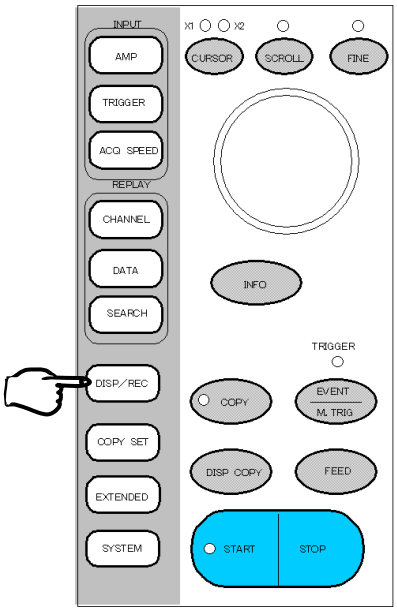
12. DISPLAY AND PRINTING

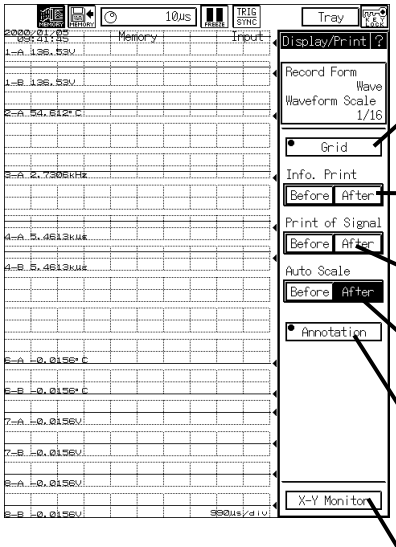
Displaying on Monitor and Printing on Chart

12.1 Setup of Display and Printing

Press the [DISP/REC] key to set up the X-Y display of waveform and printing format for waveform output.

Press the [DISP/REC] key to display the [DISP/REC] screen in the operation panel.





Sets whether grids are displayed or not during displaying waveform on the display and printing waveform on chart.

Sets the position of measurement information printing and ON/OFF. (RA1200, RA1300)

Sets the position of signal name printing and ON/OFF. (RA1200, RA1300)

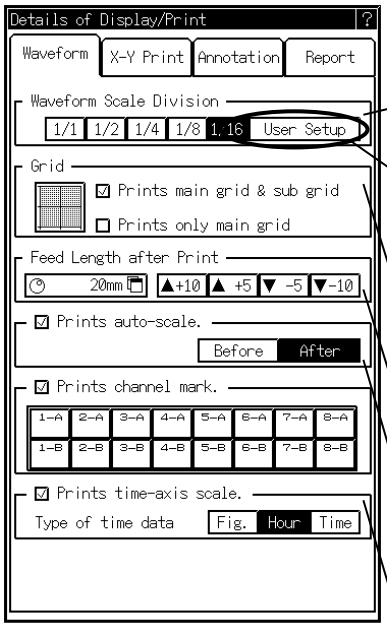
Sets the position of auto –scale printing and ON/OFF. (RA1200, RA1300)

Setting ON/OFF of printing for annotation in one lot.

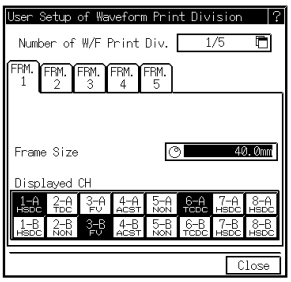
Displaying X-Y monitor screen.

12.2 Setup of Waveform Printing

Press the [Tray] key in the [display/Print] screen to open the [Detailes of Display/Print] screen.



Sets effective recording width at waveform recording. Segmentation size determines channel indication positions. The displayed image and print image will become identical. Recording width can be adjusted by user setups.



Full Scale per Frame
Setup Range
Number of waveform recording segmentations:
1/1～1/16
Scale size: 10 mm to 200 mm
Each frame can be set by 10 mm.
The size can be set up to 200

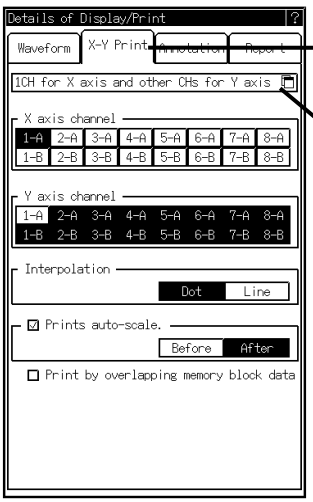
Sets the grid line of waveform.

Sets the length of blank area for printer output (RA1200, RA1300).

Prints auto-scales. Sets whether the scale is printed after recording or before recording (RA1200, RA1300).

Sets time data representation.

12.3 Setup of X-Y Recording

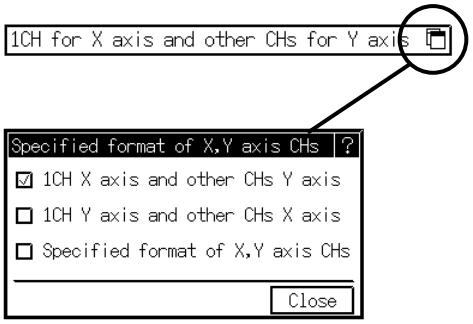


Press the X-Y Record tab

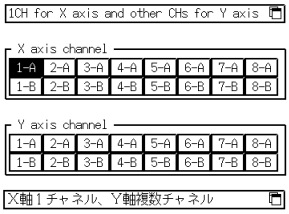
Setting X-Y recording axis.

1. Setups of X-axis and Y-axis Channels

There are three types of X-axis and Y-axis channel specifications as shown below.

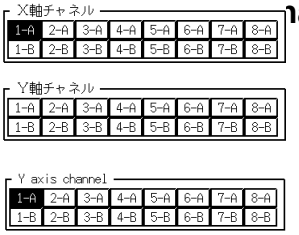


1. X: One channel, Y: More than one channel



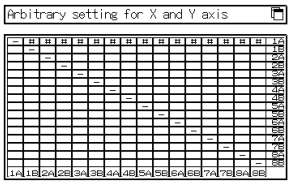
It is possible to set one channel to the X-axis channel and up to 15 channels to the Y-axis channel.

2. X: More than one channel, Y: One channel

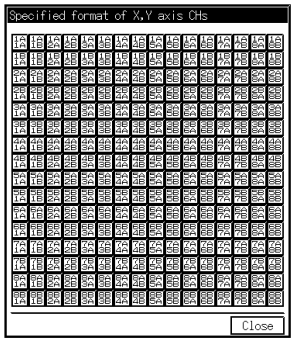


It is possible to set one channel to the Y-axis channel and up to 15 channels (excluding the channel selected in the X-axis channel) to the X-axis channel.

3. Arbitrary channel choices for X and Y axis



As shown in the illustration on the left, combinations for up to 15 channels excepting the same-channel combination can be selected. (Select channels in the touch panel. The # mark appears in the selected cell.



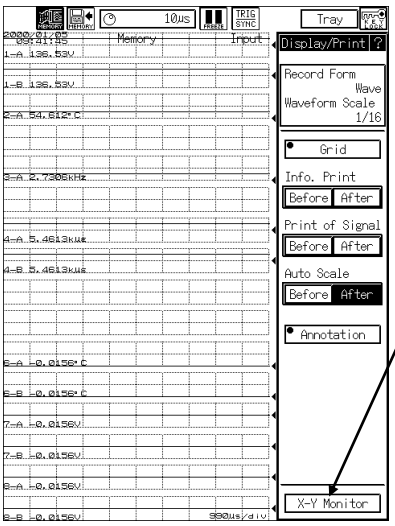
The detailed setup screen on the right appears upon touching panel.

2. Selection of Data Interpolation

Data interpolation is available for the X-Y display and can be set in this screen.

Line: With linear interpolation Dot: Without linear interpolation

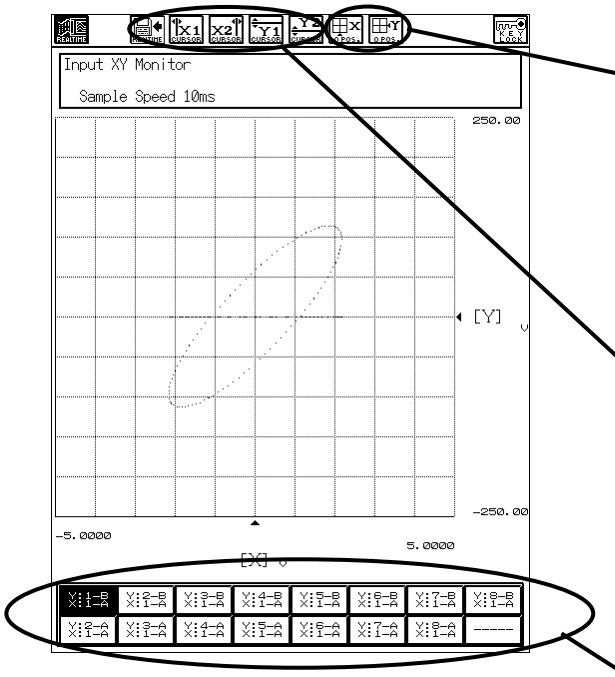
3. Displaying X-Y Screen



Return to [DISP/rec] and press [X-Y Monitor].
When displaying [Input setup], it is X-Y monitor of the input signal.
When displaying [Replay setup], it is X-Y display of the stored data.

NOTE

If X-Y axis is not set up correctly or the data available for X-Y display is not displayed at "Replay setup, the X-Y screen does not appear.



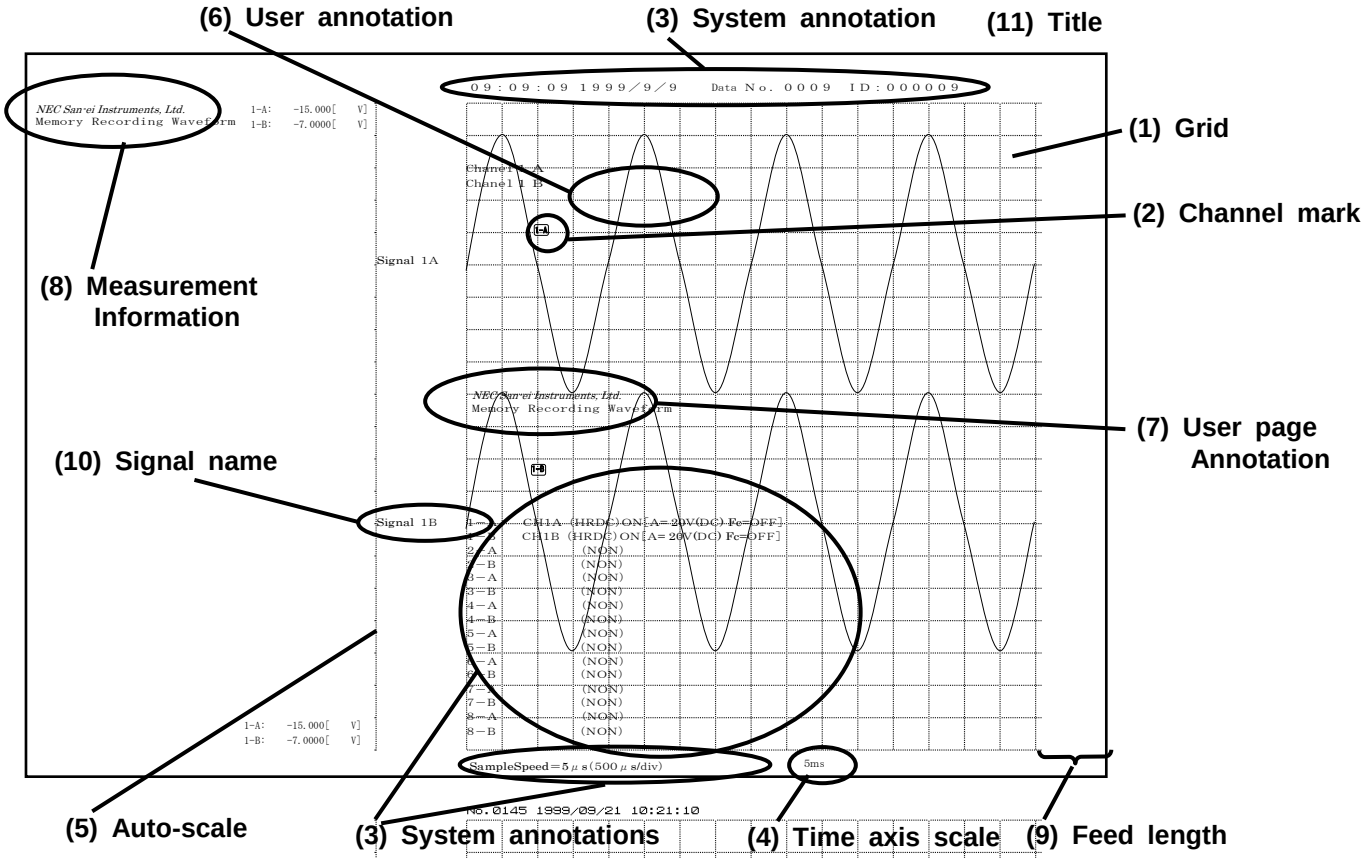
Change of Baseline
Changes baselines of the X and Y axis. Invert the key in blue and touch the X-Y monitor, then each baseline cursor is displayed.

Cursor
Displays X1, X2, Y1, Y2, and cursor. Invert the key in blue and touch the X-Y monitor, then each cursor is displayed.

Conbination of X axis and Y axis channels.
Displaying current axis setup. The screen shows the scale of the reversed display channel.

12.4 How to Read Waveform

The following waveforms appear after waveform memory recording.



(1) Grid
Grids a

(2) Chan
A chan is indicated.

(3) Syste
Measu
Upper
Lower
Below

(4) Time-
Prints t

(5) Auto
Prints measurement is avail

(6) User
An adc

(7) User
An adc

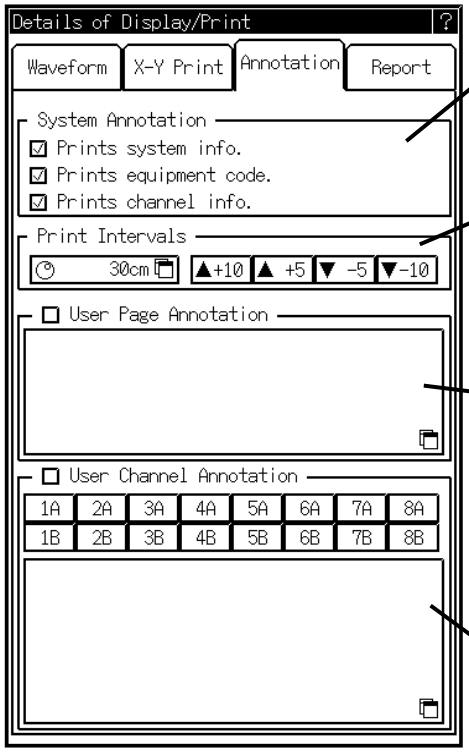
(8) Meas
Comments are printed before or after the waveform printing. Character string for printing can also be set.

(9) Feed length
Feed length after waveform printing can be set in 1 mm.

(10) Signal name
Signal names can be printed before or after waveform printing. Character strings for printing can also be set.

12.5 Annotation Setup

An addition of annotations (comments) on chart is available.



System annotation setup

Set ON/OFF of system information, instrument number, and channel information prints.

Print intervals

Sets an annotation print interval. The interval can be set from 30 cm to 1000 cm.

User page annotation

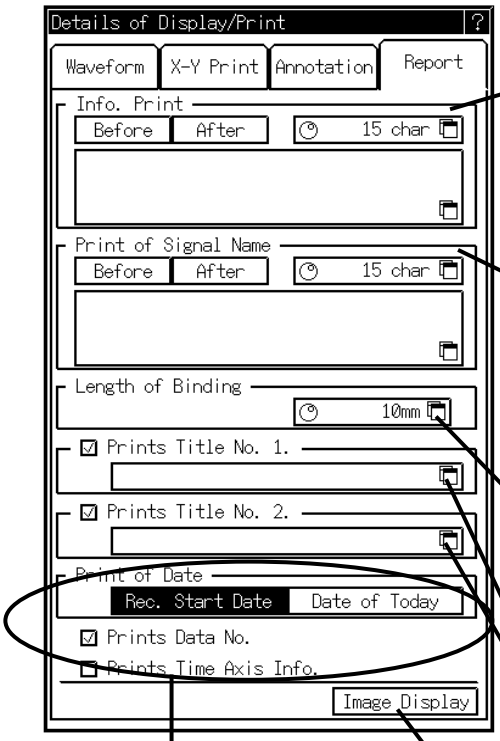
Prints comments (64 characters x 108 lines) above the measurement information.
A check box is used to set printing ON or OFF. Clicking the window key below opens character input window.

User channel annotation

Set and print any comment (31 characters x 1 line) in each channel. Select either ON or OFF for entire-channel print, and LED light up, which represents print, or LED light off, which represents no print, for each channel. Clicking the window key below opens character input window.

12.6 Report Setup

This setup is used to write characters on chart.



Measurement information printing

Comments are printed before or after the waveform printing. Character string for printing can also be set. Refer to 「**12.1 Setup of Display and Printing**」 for print ON/OFF.

Signal name print

Signal names can be printed before or after waveform printing. Character strings for printing can also be set. Refer to 「**12.1 Setup of Display and Printing**」 for print ON/OFF.

Upper margin

Upper margin can be set from 10 mm to 20

Title

Titles 1 and 2 are input in the margins.31 characters × 1 line can be set for each

Image display

The same image with that on chart is displayed on monitor.

Input the date, time axis, data No., and Titles 1 and 2 in margin.

NOTE The description of this page is effective when setting the output format (setting of Output in [COPY SET]) to "Waveform" and Copy magnifications to [A4 Auto]. However, [Info. Print] and [Print of Signal Name] are always available when the output format is "Waveform".

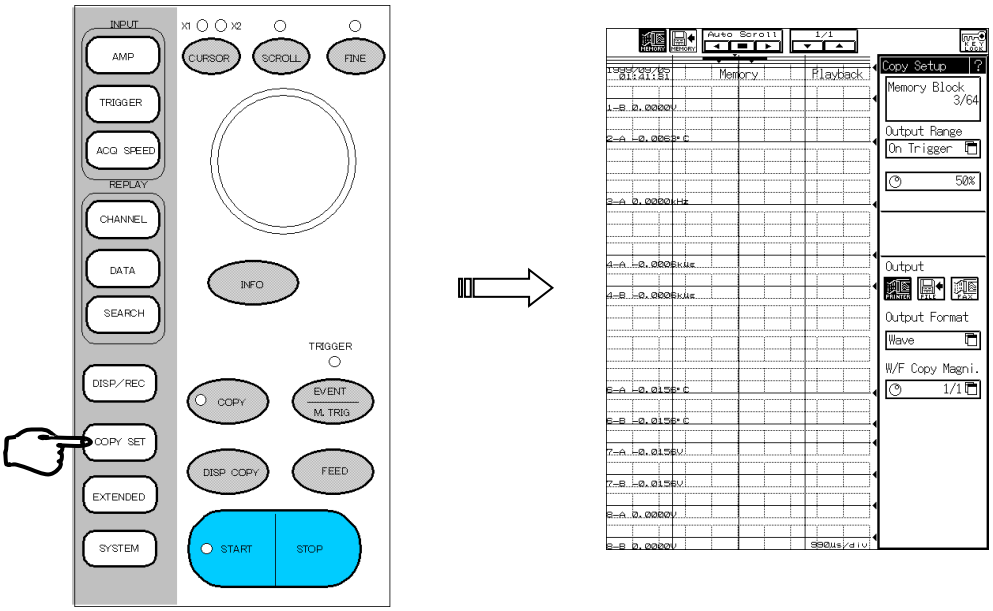
13. SPECIFYING OUTPUT

Displaying, Copying, and Saving Acquired Data

The stored data can be saved in the file, printed on the recording paper (RA1200, RA1300) and transmitted to the FAX by specifying the range.

1. Press the [DATA] on the operation panel to select the data to be output.
(Refer to CHAPTER 11)

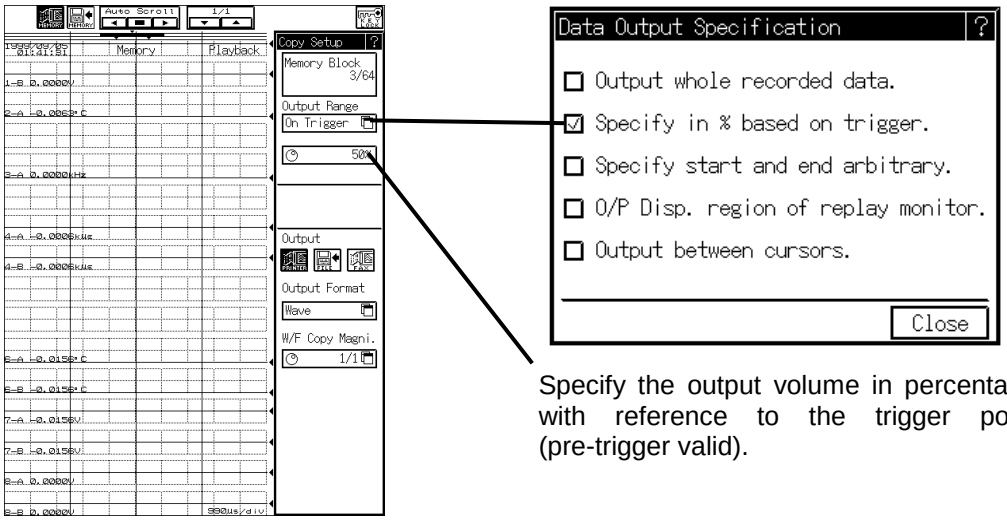
2. Press [COPY SET] to open the output specification screen.



NOTE [COPY SET] is available by pressing [COPY] key.
However when the measuring mode is [Memory], this setup is available as well as Auto Copy and Backup filing.

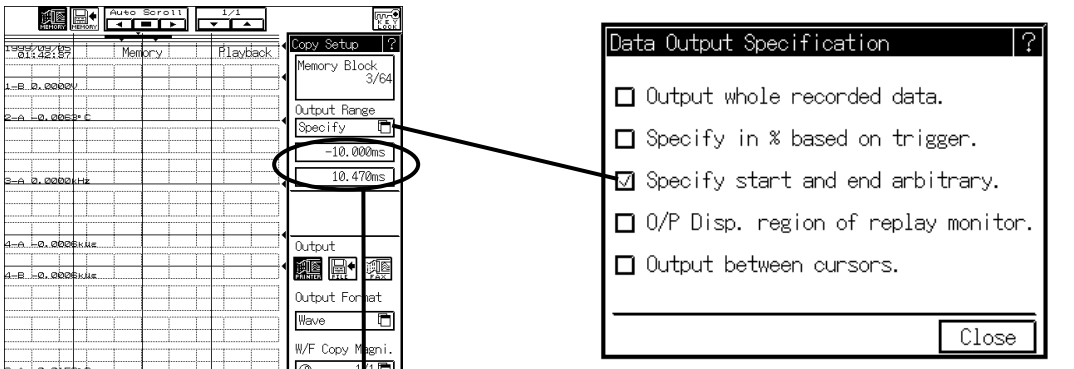
13.1 Setting Output Range

Select [On Trigger] or [Specify] for output range.



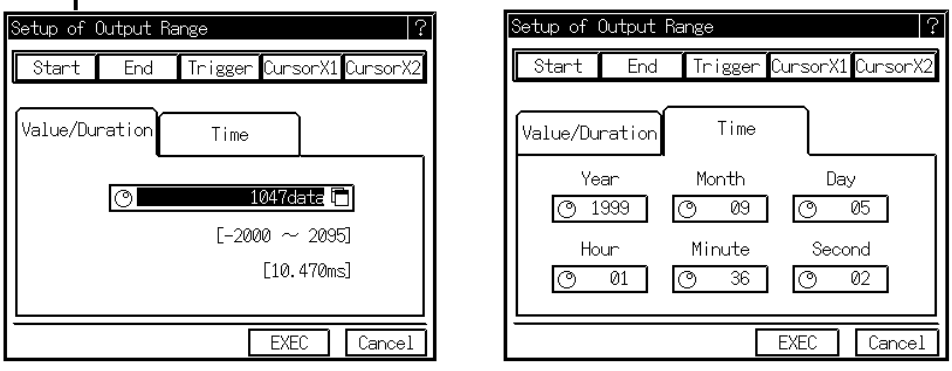
Specify the output volume in percentage with reference to the trigger point (pre-trigger valid).

When setting to [specify]



Specify the start and stop times directly. Values, time, and date/time can be used as follows.

By pressing here twice, the setting window opens.



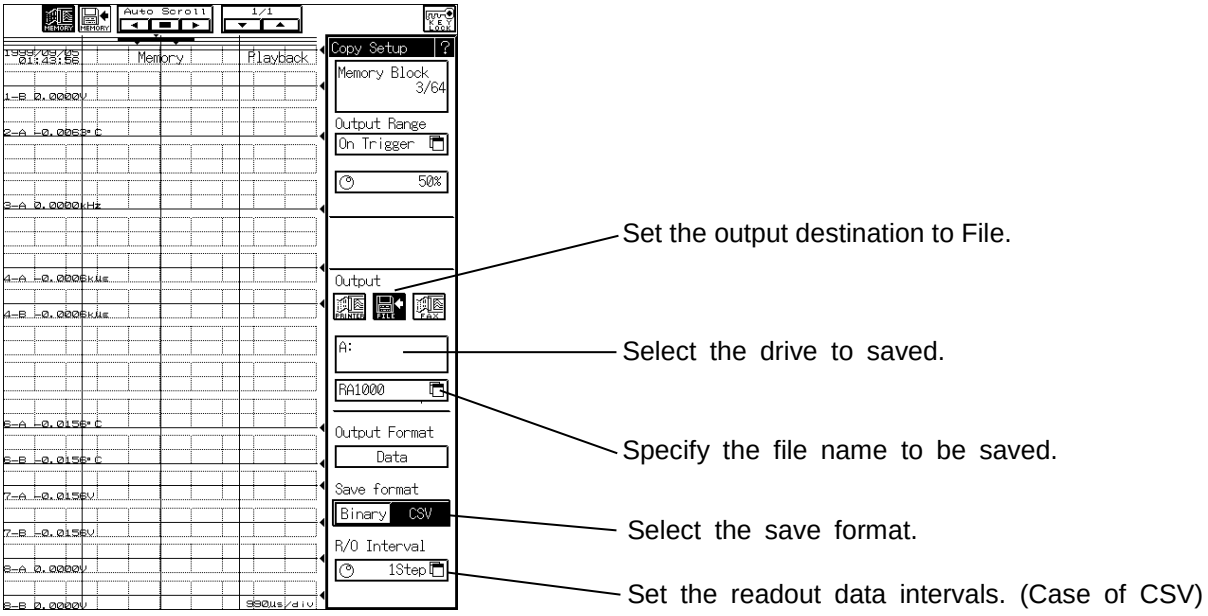
13.2 Output to File

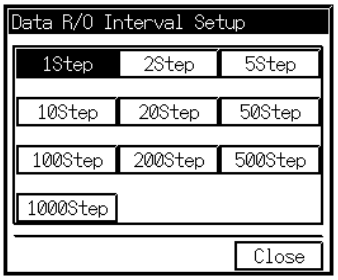
This section explains how to save the data displayed on the replay setup screen in a file.

1. Specify the range to be saved in a file

Specify the range to be saved in a file (Refer to 12.1)

2. Select the output destination and save format

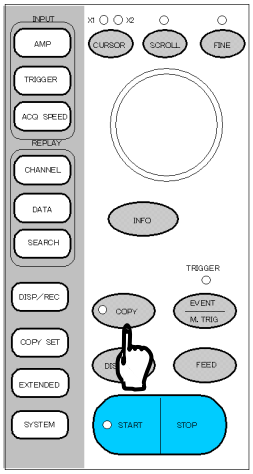




NOTE The extension of binary format becomes. DRT. This extension means the binary-format file that stores specified range of data. This file can be replayed on the replay monitor screen.

NOTE The extension of the file saved in the format of CSV is .CSV. The CSV file cannot be replayed on the replay monitor screen.

3. Saving in a file



Press the [COPY] key on the operation panel to save.

NOTE These setups are effective when outputting the file by [COPY] key. Excepting when the measuring mode is [Memory], all of the storage format of the filing, performed auto matically by pressing [START] key, is binary.

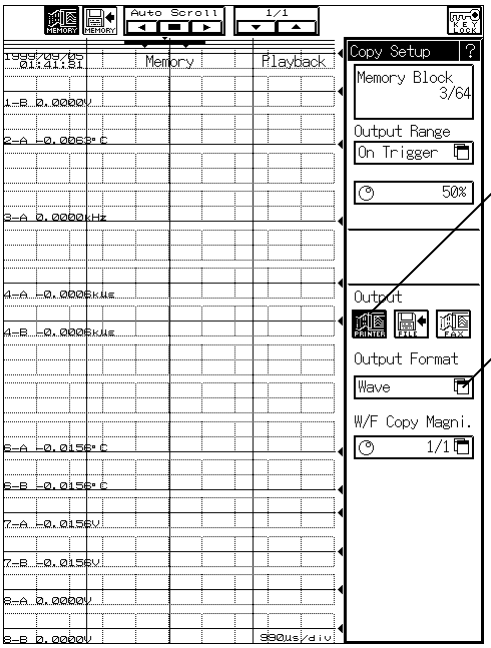
13.3 Output to Printer (RA1200, RA1300)

This section explains how to print the data displayed on the replay setup screen on chart.

1. Specify the range to be printed on chart

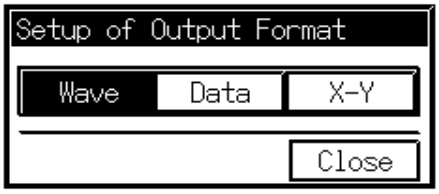
Specify the range to be saved in a file (Refer to 13.1)

2. Select the output destination and output form



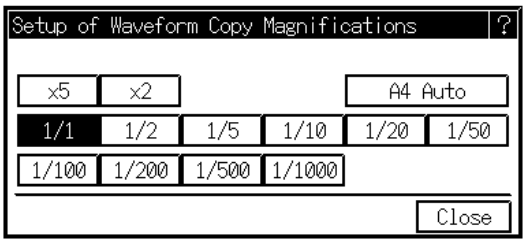
Set the output destination to PRINTER.

Set the output form.



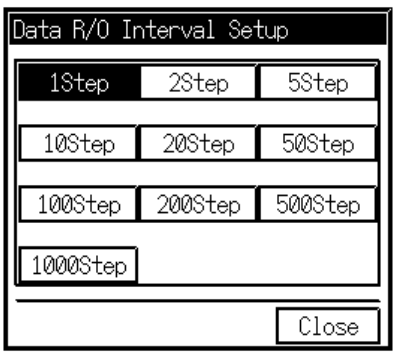
(1) Waveform

Set the magnifications of the waveform



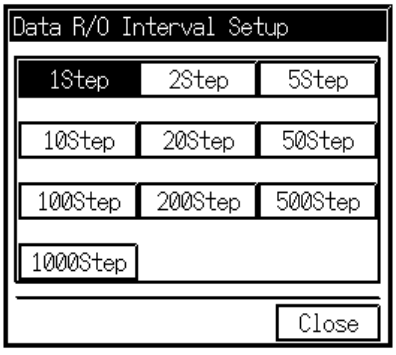
(2) Numerical data

Set the data intervals to be printed.

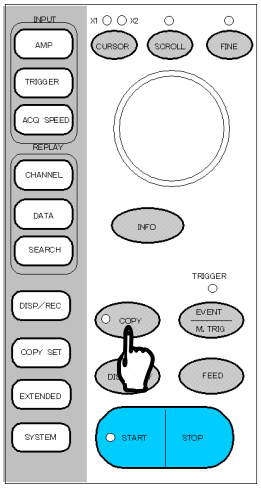


(3) X-Y

Set the data intervals to be printed.



3. Output to Chart Recording Paper



Press the [COPY] key on the operation panel to start printing.

13.4 Output to FAX

Explaining order to output data displayed on pray back setting screen to FAX.

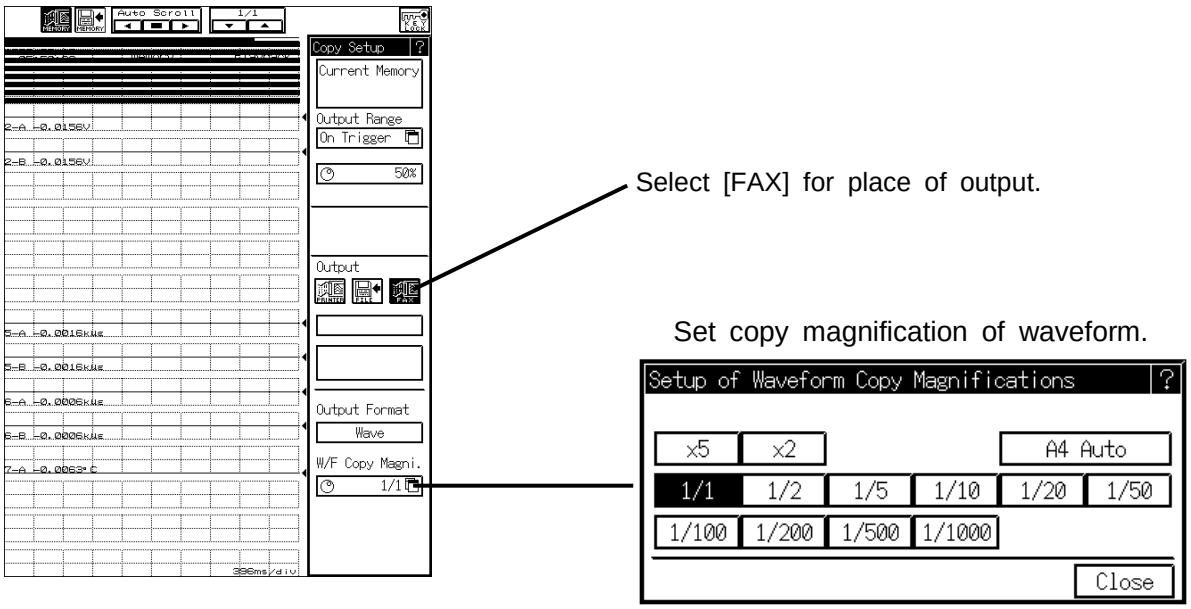
1. Setting communication interface

☞ Refer to 1.1 and 1.5 of “RA1000 RS-232C,GP-IB” instruction manual.

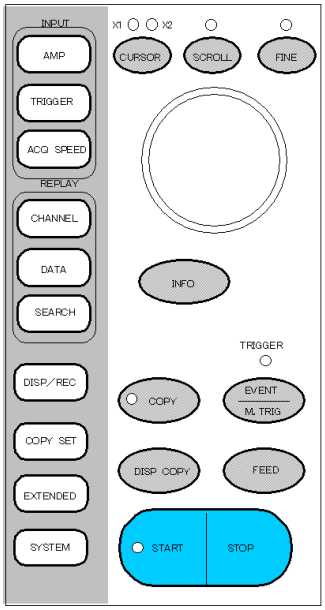
2. Setting range to output to FAX

☞ Refer to 13.1

3. Selecting place of output and output format



4. outputting to FAX



Press [COPY] key on operation panel.
By this operation, output starts.

14 SYSTEM SETUP

Other Functions

14.1 Other Functions

Aux. Setting ☞ Refer to 14.2 How to Set Auxiliary Setup

- **Setup of measurement mode**
  You can select the mode among the real-time, memory, transient, and filing modes, (FFT:Option).
- **Display of function**
  You can delete unnecessary functions and restrict them appearing in the touch panel.
- **Save/Load of setups**
  You can save and read out setup state. Moreover, saved or current setup status can be listed.
- **Initialize**
  Initialization of Setup status and internal memory is available.
- **Data No.**
  You can change the data number, which is numbered for measurement data.
- **Memory Size**
  Limiting the number of channels to be used can expansion memory capacity.
- **Auto start**
  In case of a power failure or shutdown during recording, the recorder operates immediately after the power recovery.
- **Buzzer/Click**
  You can enable or disable the buzzer or click sound.
- **Key Lock**
  You can specify the key to be locked.
- **Type of units**
  You can change the units of time and amplitude axes.
- **Time Trigger**
  Recording start at preset time is available in this function.
- **Backlight auto OFF**
  You can set either the backlighting off or activating a screen saver when no key touch for a specified wait time. After a key touch, the display recovers the previous screen.
- **Change of Rec. speed table**
  You can change a figure of speed table appeared in each measurement mode.
- **Display Copy Select**
  You can specify the output destination from chart and output drives.
- **Wave color select**
  You can set the color of waveform and back ground that is displayed in the screen.
- **EXT SYNC**
  Input setups for data recording synchronized with external pulses are available.

NOTE When using the external synchronization, change recording speed setting table and then setup the key table [EXT SYNC].

COM. Setting ☞ Refer to 14.3 How to Set Communication Setup.

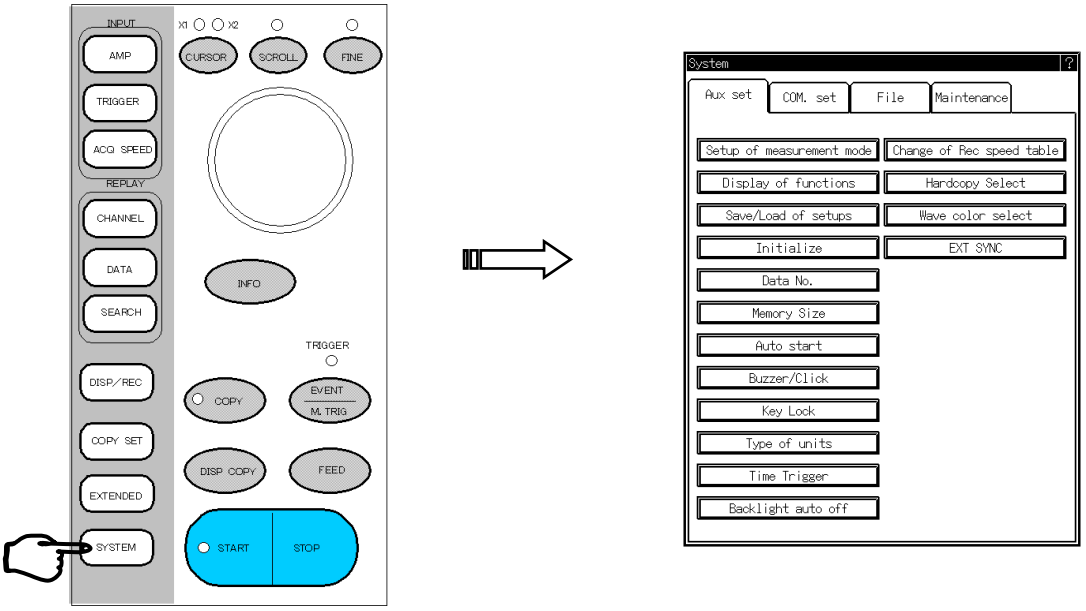
- **RS-232C**
  Direct control from the host computer is available via an RS-232C interface.
- **GP-IB**
  Direct control from the host computer is available via a GP-IB interface.
- **Modem communications**
  Remote control is available by connecting the recorder to modem through a telephone line.
- **Fax transmission**
  Waveform data and messages can be transmitted via a fax machine by connecting the recorder to fax modem.

Maintenance ☞ Refer to 14.4 How to Maintain

- **Clock setting**
  Internal timer can be adjusted.
- **Test Print**
  By performing a test print on chart, you can examine the printing quality whether there are problems such as dot dropouts and faint streaking or not.
- **Version**
  Versions can be displayed.
- **Touch panel CAL.**
  In case of mismatches between the positions of display key and key response, it is possible to calibrate the touch panel.

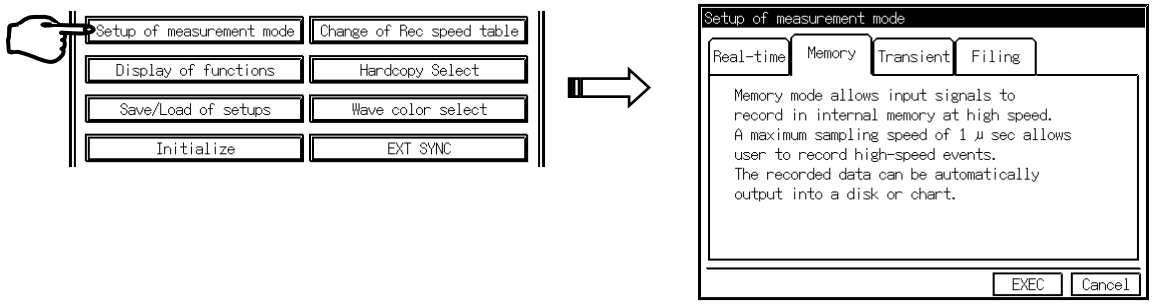
14.2 Auxiliary Setup

To make auxiliary setup, Open the [System] screen and press the【Aux. Setting】tab to display the screen below.



14.2.1 How to Setup of measurement mode

Select the mode you use.

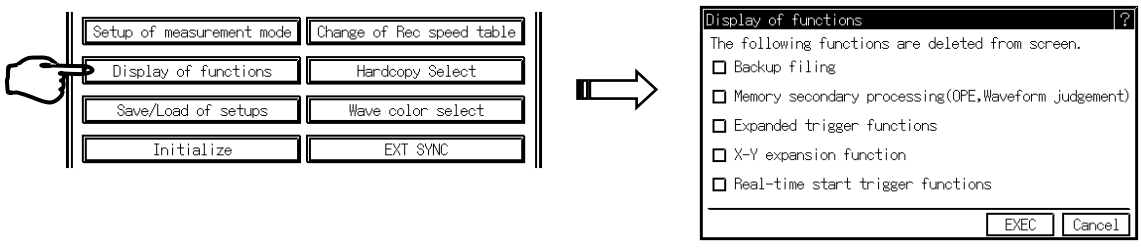


Press the tub of the mode you use and select the【EXEC】key.

14.2.2 To Set Display of functions

Placing a「レ」mark to the function to be used

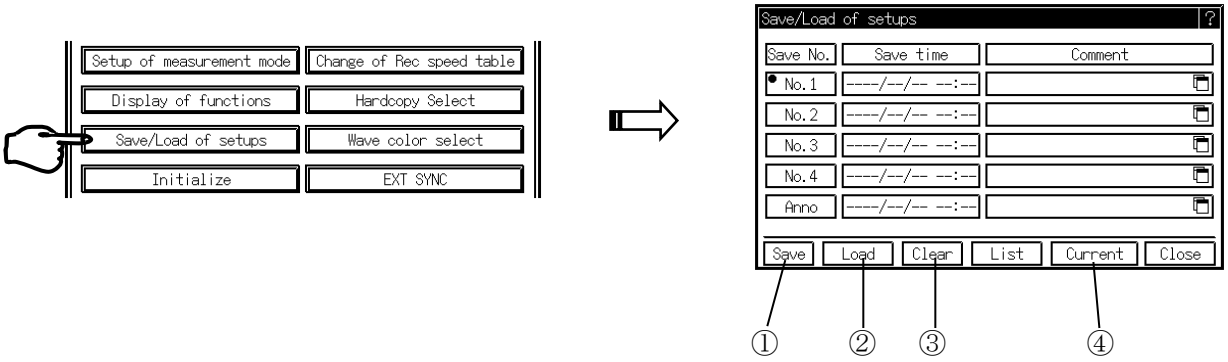
Press the【Display of functions】key in System – Aux. Setting tub to open the window below.



14.2.3 How to Save/Load of Setups

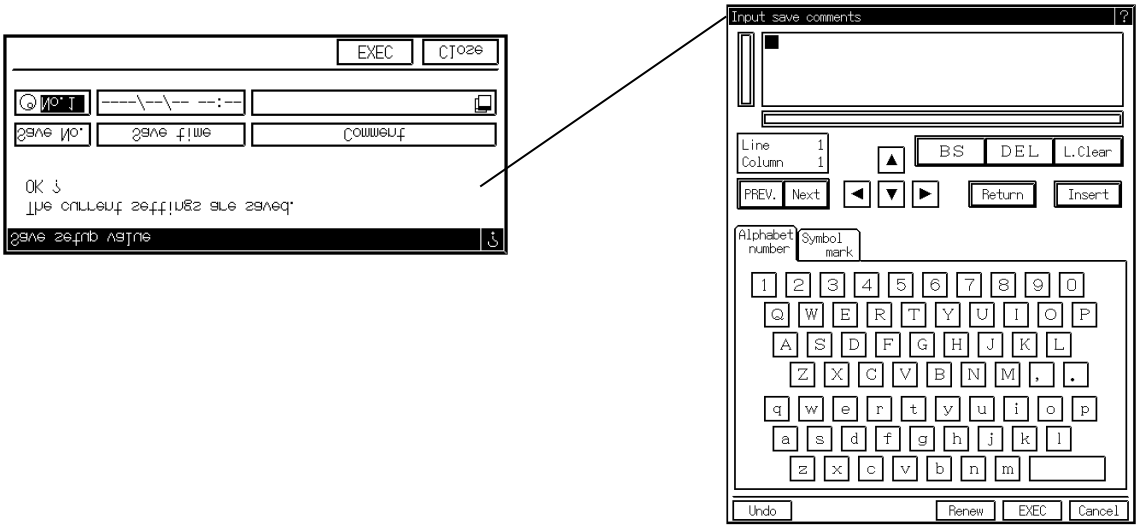
Setup status can be saved in and read out from the memory of recorder. Moreover, the saved or current setup status can be listed.

Press the【Save/Load of Setups】 key in System – Aux. Setting tab to open the window below.



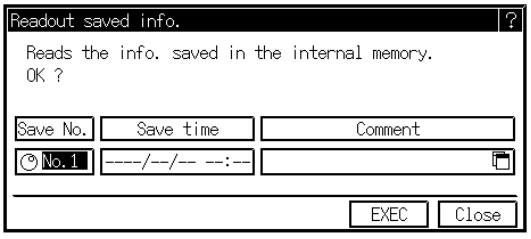
(1) Saves setup values

Saves the setup values in the specified save number.



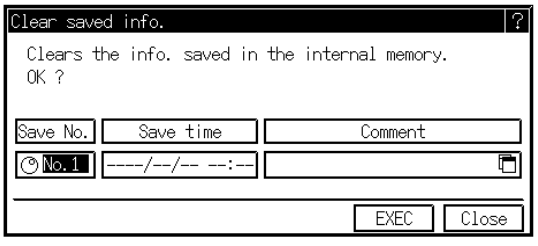
(2) Read out setup values

Reads out the setup values of the specified save number.



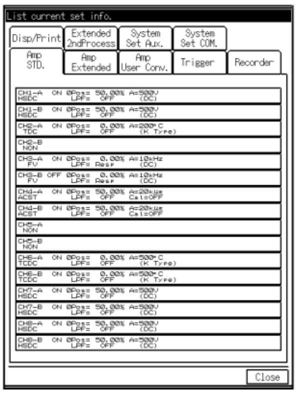
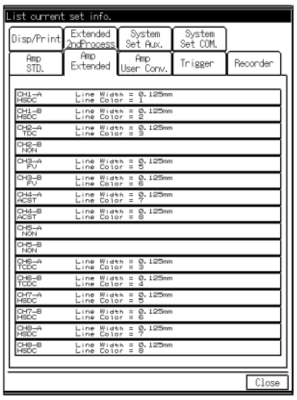
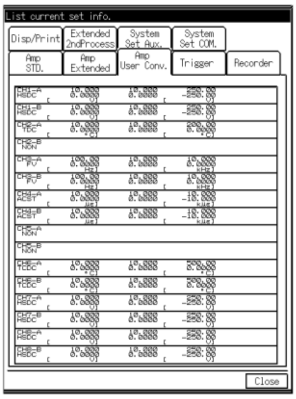
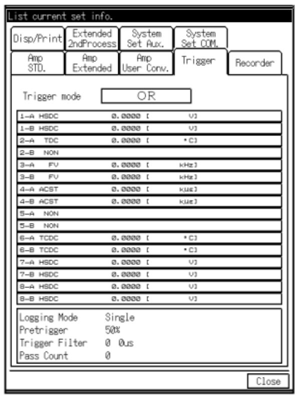
(3) Deletes the saved setup number

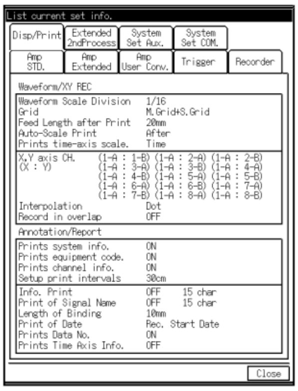
Deletes the setup values of the specified save number.

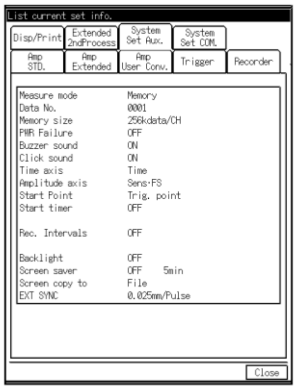


(4) Displays lists of setup value

Displays the lists of the setup values of the specified save number.

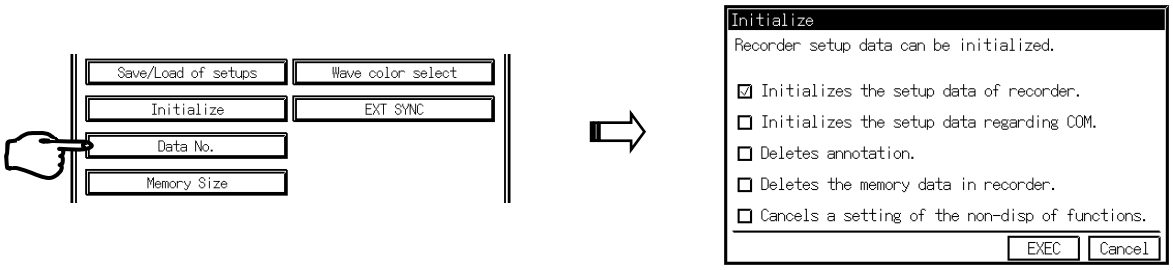





14.2.4 How to Initialize Recorder

You can initialize the setup status and internal memory.

Press the【Initialize】key in the System – Aux. setting tub screen to open the window below.



The setup data of recorder

The setup is initialized to the factory-shipment setup

The setup data regarding COM.

The setup for communication is initialized to the factory-shipment setup.

Annotation

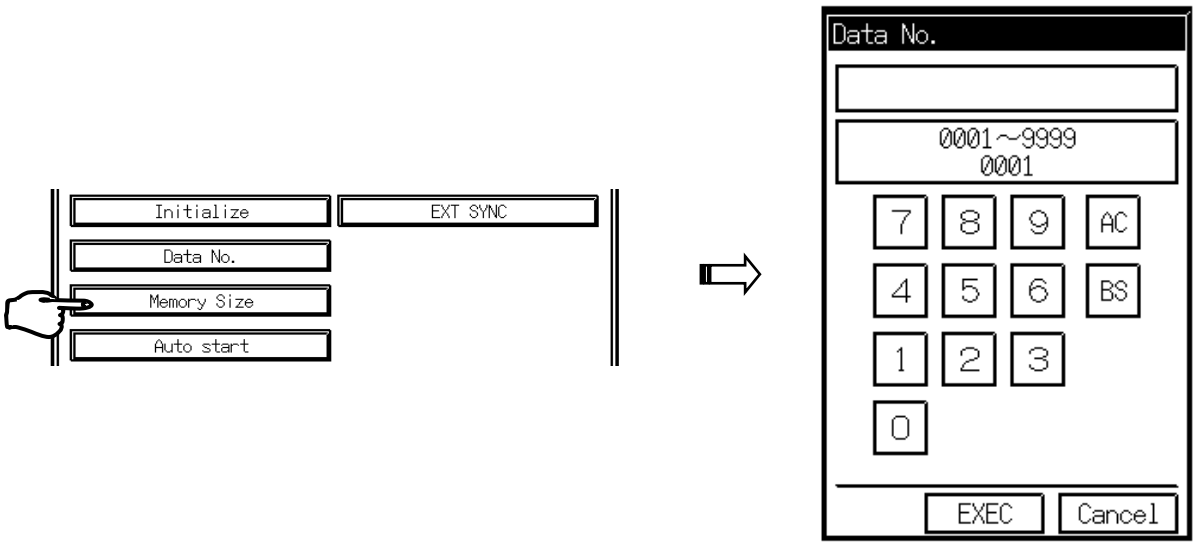
Setting of the non-disp of functions

NOTE If initializing the main unit setup data, the stored data in the memory block is also deleted.

14.2.5 How to Set Data No.

You can change data no., which is assigned to measured data.

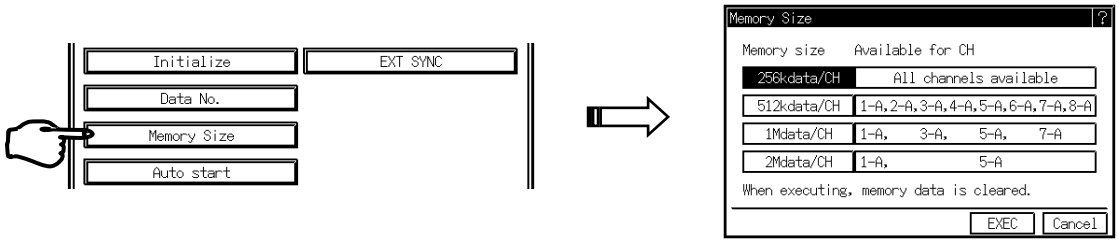
Press the【Data No.】key in System – Aux. setting tab screen to open the window below.



14.2.6 How to Expand Memory Capacity

You can change and expand the capacity of memory per channel by limiting the number of channels used for memory recording.

Press the【Memory Size】key in System – Aux. Setting setup tab screen to open the window below.

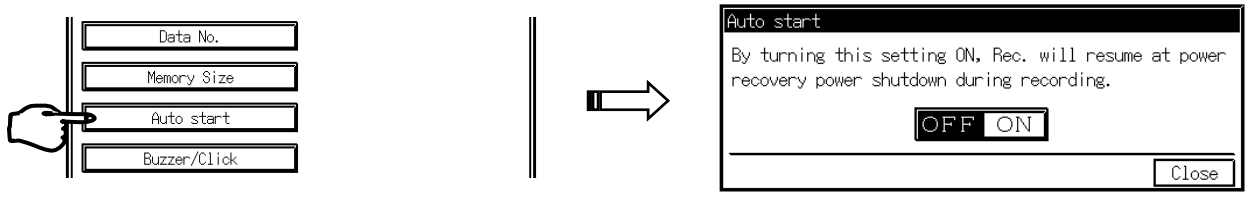


TIPS The memory capacity expansion is effective only in the transient mode. The channels excluded will not be displayed even though amp units are attached.

14.2.7 How to Automatically Restart Recording at Power Recovery in the Event of Power Failure during Recording

Automatic recording restart is possible in the event of power failure during recording.

Press the【Auto start】key in System – Aux. Setting tab screen to open the window below.



TIPS The recorder prints the data and time of power failure at the operation restart.

NOTE
- If the power fails during the memory recording, the recorded data will be lost and restart the memory recording upon the power recovery.
- If the power fails during the filing, files may be damaged. To perform the filing, we recommend using uninterruptible power supply unit.

14.2.8 To Switch on or off Buzzer and Click Sound

Buzzer and click sound can be switched on or off.

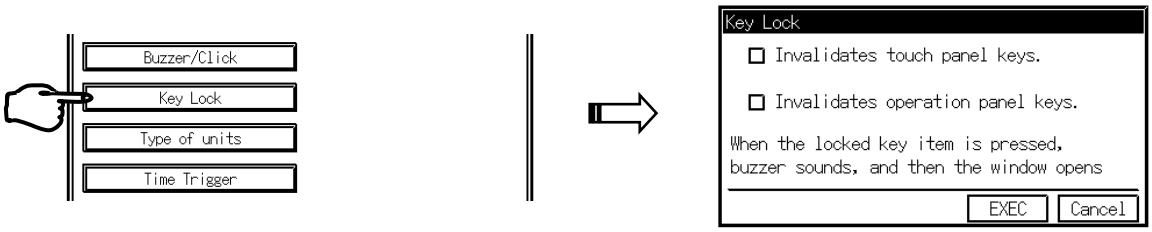
Press the【Buzzer/Click】key in System – Aux. Setting setup tab screen to open the window below.

Switches on or off on touch panel

14.2.9 Key Lock

By the function of the key lock, you can invalidate key entries for the specified menu.

Press the【Key Lock】key in System – Aux. Setting setup tab screen to open the window below.

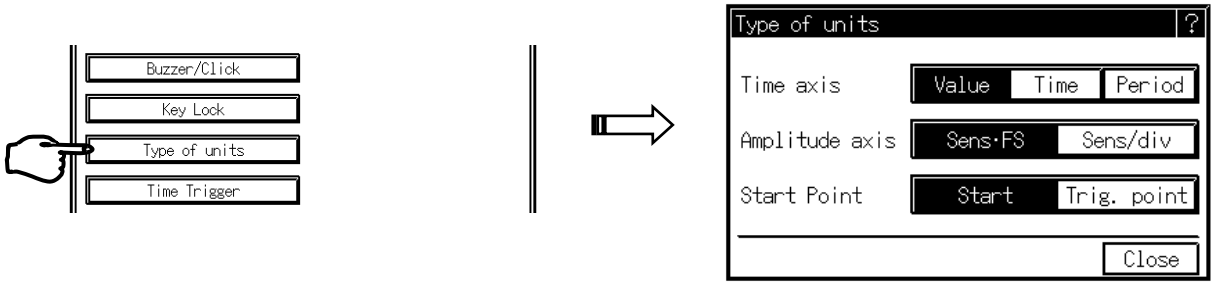


The item marked with the「レ」mark becomes effective.

14.2.10 Type of units

You can change the units of time and amplitude axes.

Press the【Type of units】key in System – Aux. Setting tab screen to open the window below.



(1) Changing units of time axis

You can change the units regarding the time axis such as changes in the time axis printing in waveform recording, cursor in waveform monitor, output range display in memory recording.

(2) Changing units of amplitude axis

You can change the units of amplitude axis. This makes the display of amplifier sensitivity change.

Example: [Sens/div] - Sensitivity per division: 50 V/div
[Sens/FS]- Sensitivity of full scale: 500 V (Full scale)
When setting Sens/div, 10div = full scall.

(3) Setting starting point in time axis

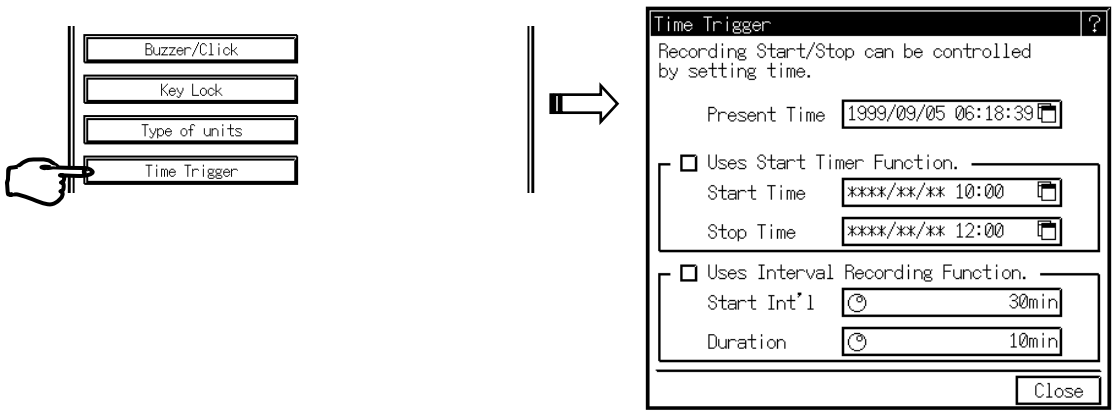
You can change the starting point (0 point) in the time axis. If the trigger point has not been set to the reference point, the starting point of recording will be the starting point. If the trigger point has been set to the reference point, the time axis is represented as the negative area for the pre-trigger part and the positive area for the post-trigger part.

TIPS If there are no trigger points under the setting in which a trigger point is set to the reference, the starting point of data in the time axis will be the starting point of recording.

14.2.11 Time Trigger

Controls of recording start and finish by internal timer are available.

Press the【Time Trigger】key in System – Aux. Setting tab screen to open the window below.

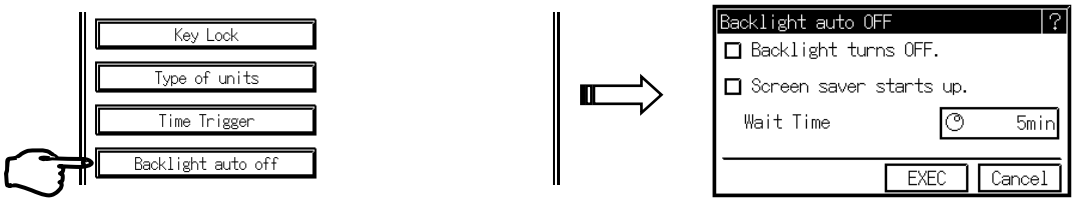


- Start timer function : Sets the time to start and stop recording automatically. When upper figures are omitted (∗is displayed), the operation is repeated at every specified time.
- Interval function : Sets the period from pressing [START] key to finishing the operation automatically and the peried to restart.
  Ex. Recording for 10 miutes at every 1 hour.
- When setting the start timer and the interval timer simultaneously, the operation is repeated at the interval from the start time and the Stop Time.

14.2.12 How to Automatically Shut off Backlight of Display

If no key entries for the specified wait time, the backlight is shut off and screen saver is activated.

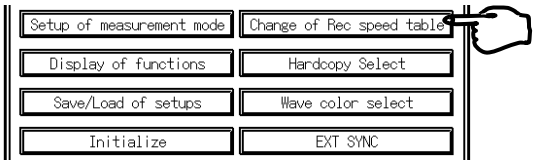
Press the【Backlight auto OFF】key in System – Aux. Setting tab screen to open the window below.



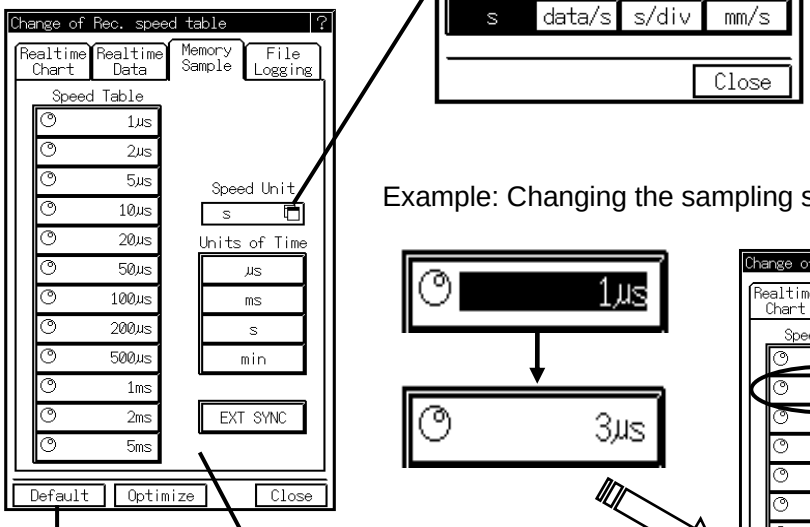
The item with the「レ」mark becomes effective.

14.2.13 Change of Recording Speed Table

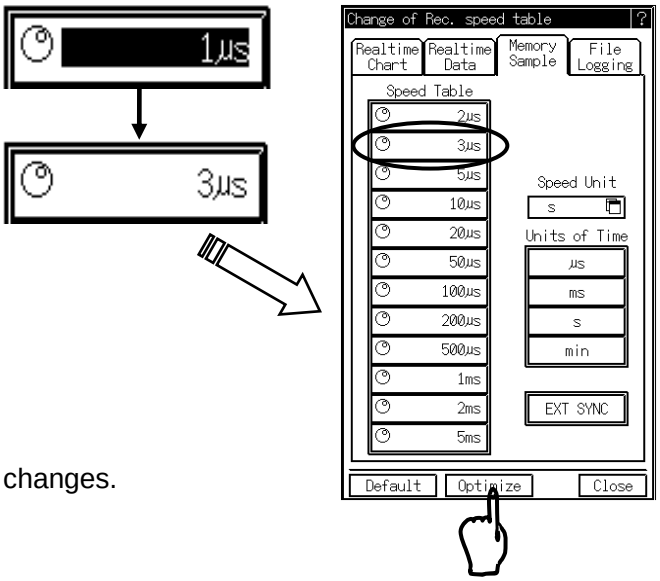
You can change the values in the speed table that appears in each measurement mode.



Setup of sampling speed



Example: Changing the sampling speed from 1 µs to 3 µs.



Sets to the initial setting.

Registers the changes.

Pressing the【Optimize】key sets the sampling speed of 3 µs in the speed table.

NOTE In case of the external synchronous recording, register [EXT SYNC] in the speed table.

There are the following settings other than the memory mode.

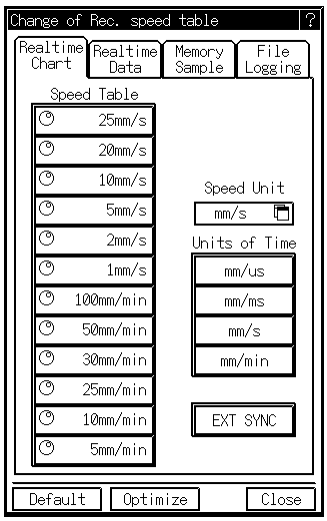
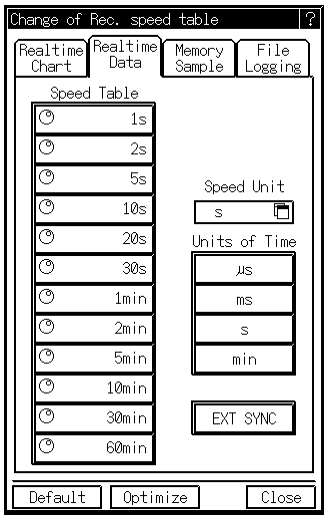
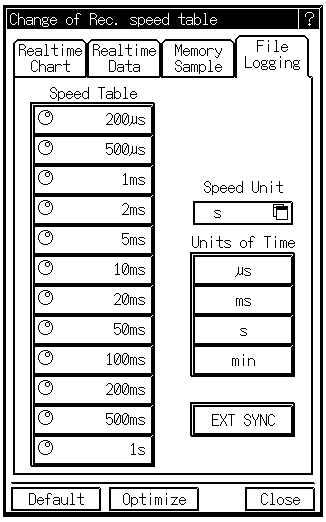


Chart feed speed setup in the real-time mode.



Data sampling speed setup in the real-time mode.

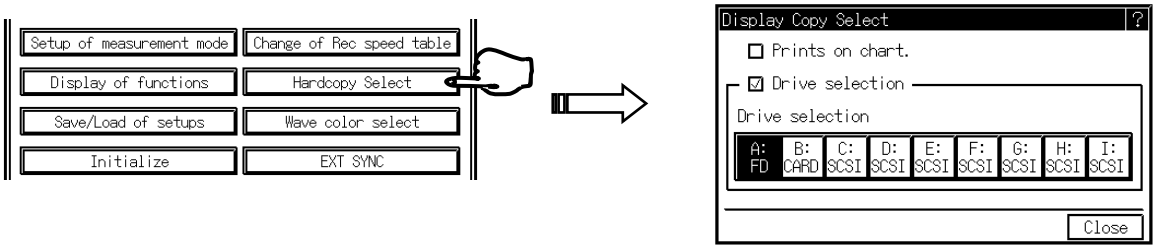


Recording speed setup in the filing mode.

14.2.14 How to Change Output Destination of Screen Copy

Setting the operation when pressing the [DISP COPY] key. RA1100 can not output to the recording paper.

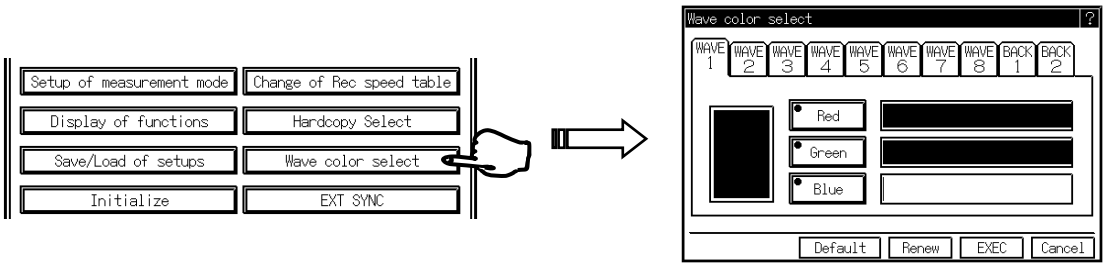
Press the【Display Copy Select】key in System – Aux. Setting tab screen to open the window below.



14.2.15 Change of Display Color

You can change the color of waveform on monitor and the color of background of LCD panel.

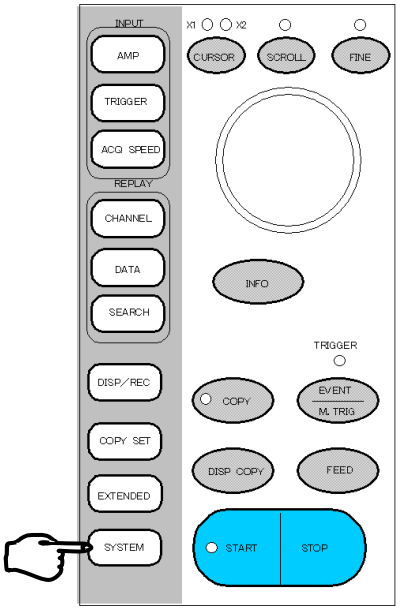
Press the【Wave color select】key in System – Aux. Setting tab screen to open the window below.

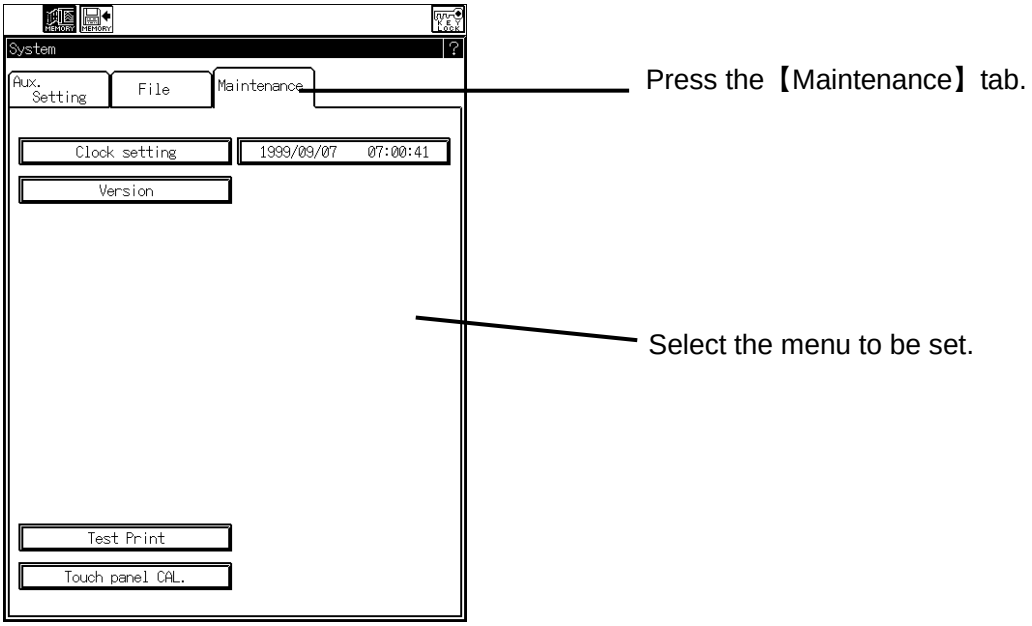


Color setup is performed by the ratio of red, green, and blue (RGB).

14.3 How to Maintain System

To perform recorder system maintenance, open the [System] screen and press the 【Maintenance】tab to open the screen below.

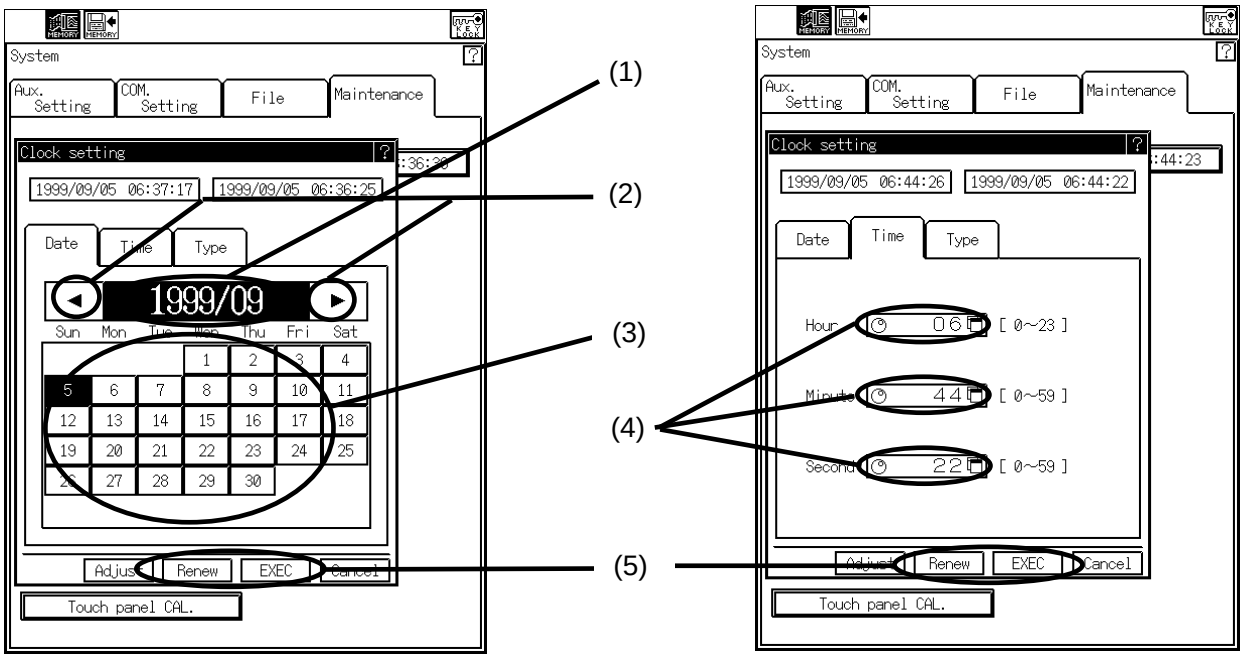




14.3.1 How to Adjust Timer

You can set the internal timer.

Press the【Clock setting】key in System - Maintenance tab screen to open the window below.



(1) Adjusts year and month

Press the 【1999/9】key to open the window for value input. Input four digits for year.

If you input a number in the first decimal place as "1999.7", month is also displayed like "1999/7".

(2) Changes month

The change of month automatically changes the calendar.

(3) Adjusts date

You can set the date.

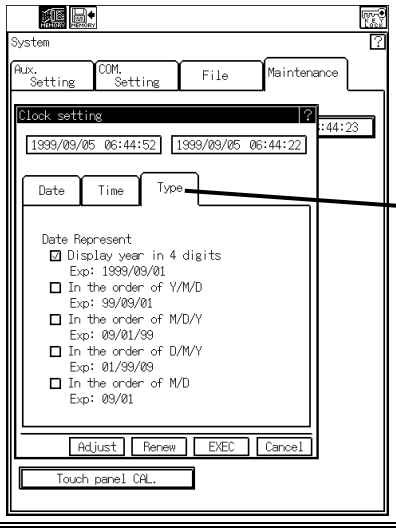
(4) Adjusts time

You can set hour, minute, and second.

(5) Sets timer in recorder

The adjusted timer data can be set in the recorder.

TIPS The current time is set to 0 second with the【Adjust】key.



(6) Selects date representation style

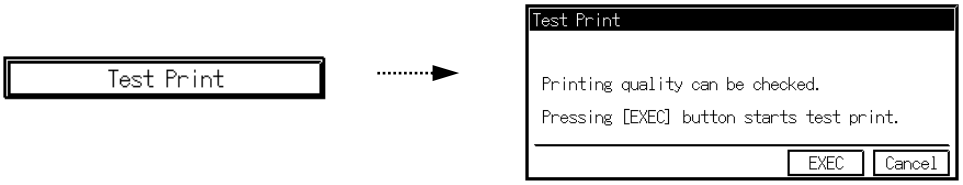
You can set the date representation style in the [Type] screen.

Press the【Type】 tab.

14.3.2 How to Check Printout Quality (RA1200, RA1300)

You can check the printout quality by examining whether there are dot dropouts in thermal head and faint streaking in printout or not by means of the test print on chart recording paper.

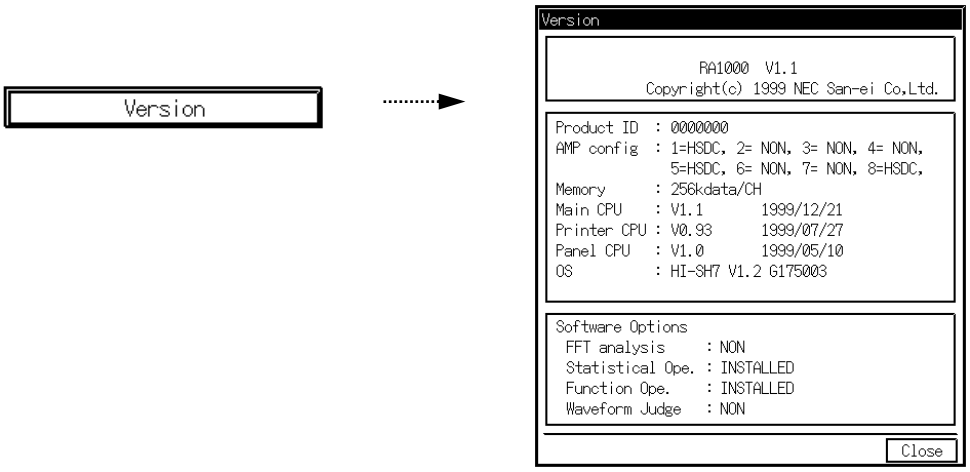
Press the【Test Print】key in System - Maintenance tab screen to open the window below.



14.3.3 How to Check Version

You can check the versions of main program or other features.

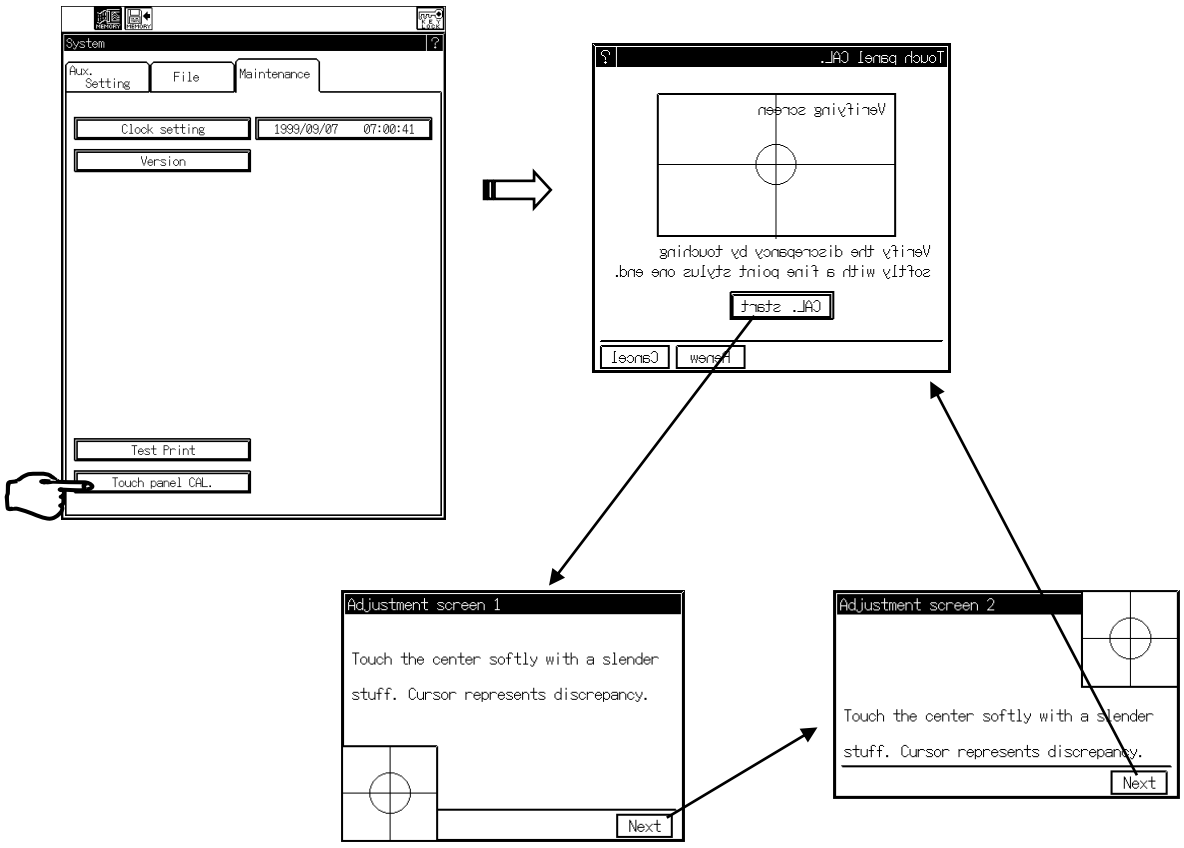
Press the【Version】key in System - Maintenance tab screen to open the window below.



14.3.4 How to Calibrate Touch Panel

If the key-displaying position and the key-responding position do not correspond, you can adjust positions by a calibration.

Press the【Touch Panel CAL】key in System - Maintenance tab screen to open the window below.



1. Confirmation of match

Touch the center of the circle softly with a thin stick to confirm a mismatch between the cross point of cursor and the center of the circle.

2. Calibration

After pressing the【CAL. Start】key to the【Adjustment Screen 1】window, touch the center of the circle. In this case, the displayed cursor indicates a current mismatch. After that, press the【Next】key. The center and the cross point need not be matched.

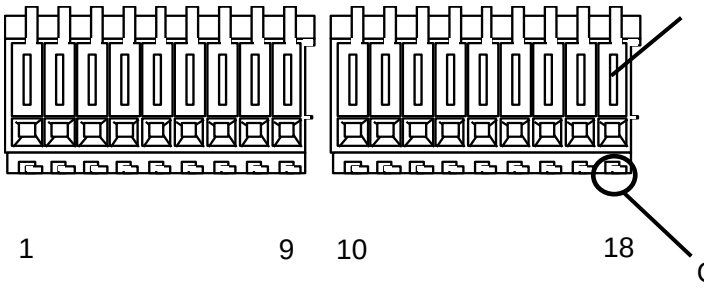
Pressing the【Next】key opens the 【Adjustment Screen 2】window. Like in the【Adjustment Screen 1】window, touch the center of the circle and press the【Next】key.

After pressing the【Next】key, the window returns to the【Touch Panel Calibration】 window. After updating the calibration information by pressing the【Renew】key, press the【Cancel】key to close the window.

14.4 Remote Functions

A remote label that indicates pin numbers and signal names is provided on the underside of recorder.

Remote pin and signal names



The terminal number is 1 to 9 and 10 to 18 (left to right). Figure is viewed from the terminal side.

Terminal No.	Signal name	Function	I/O level
1	GND		
2*	SYNC IN	Externally synchronized pulse input	0-5V
3*	SYNC OUT	Synchronization pulse output	0-5V
4	REC IN	Start ON/OFF input	0-5V
5	REC OUT	Start ON/OFF output	0-5V
6	MARK IN	Mark input	0-5V
7	MARK OU	Mark output	0-5V
8*	FEED IN	Chart feed input	0-5V
9*	FEED OUT	Chart feed output	0-5V
10	EXT IN	External sample input	0-5V
11	PROTECT IN	Protecting input	0-5V
12	ERROR OUT	Error output	Opening collector
13	WAVE GOOD	Waveform judgment result “GOOD" output	Opening collector (Optional)
14	WAVE NG	Waveform judgment result “NG" output	
15	TRIG IN	Trigger input	0-5V
16	TRIG OUT	Trigger output	0-5V
17	GND		
18	GND		

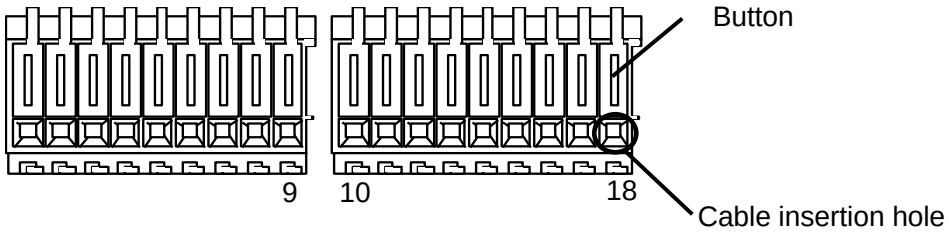
※0 - 5 V input
LOW level 0.5 V or lower
HIGH level 4.5 V or higher

※0 - 5 V output
LOW level
1.0 V or lower (IOL = 5 mA or lower)
HIGH level
4.0 V or higher (IOH = 5 mA or lower)

※Opening collector output
Collector current: 25 mA max.
Collector-emitter voltage: 50 V max.

Signals with the * mark are used in the RA1200, are not used in the RA1100.

Cable connection



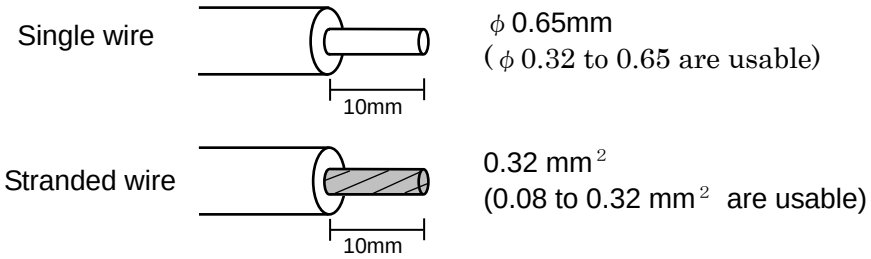
(1) Depress the button with a tool such as screwdriver.
(2) Insert a wire into the cable insertion hole while the button is depressed.
(3) After releasing the button, the wire is licked.

Suitable cable: Single wire - AWG22(φ 0.65)、Stranded wire - AWG22(0.32 mm^2)

Acceptable cable: Single wire - AWG28(φ 0.32) to AWG22(φ 0.65)
Stranded wire - AWG28(0.08 mm^2) to AWG22(0.32mm^2)

Exposed wire length: 10mm

Suitable tool for depressing button: Flat blade screwdriver (Shank diameter:φ 3, tip width: 2.6)



14.4.1 How to Perform Real-Time Acquisition and Printing in Sync with External Pulses

It is possible to perform waveform printing, input monitoring, and filing in synchronization with external pulses. The following description explains how to perform remote connector connection and recorder setup

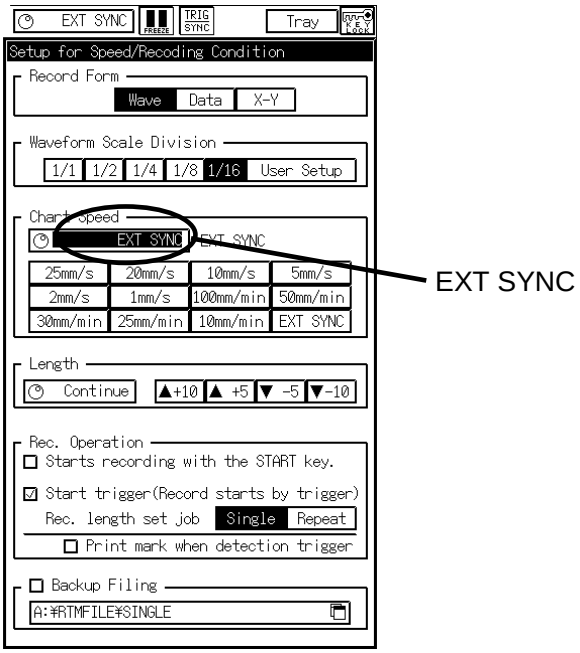
1. Connection of external input pulse signal

Synchronizing with external pulse signal, when performing waveform recording, input the external synchronous signal to No.2 pin (SYNC.IN) of remote terminal in rear panel, or when performing filing recording, input it to the No.10 pin (EXT.IN).

2. Setting recorder to external synchronization

(1) Sets the measurement mode of the recorder to [Real-Time Mode].
(2) Press the [Change of Rec. speed Table] key in System – Aux. setting tab screen and set the speed table to【EXT SYNC】.
☞ Refer to 14.2.13
(3) In the screen of speed and recording condition detailed setup, set the【Chart Speed】to【EXT SYNC】. By this,【Monitor/Recording Speed】is also set to external synchronization.
☞ Refer to 13.3.1

NOTE Unless [EXT SYNC] is registered in the speed table, the external synchronization can be set up.



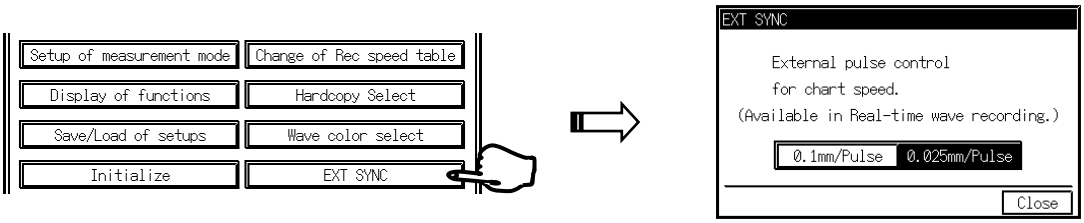
3. Start Recording

After the remote terminal connection and recording speed setting, recording by external synchronization is ready for operation. Press the [Start] key under these conditions. The recorder starts filing and waveform printing in synchronization with external pulses.

TIPS By inputting same external synchronous signal to both No.2 pin (SYNC.IN) and No.10 pin (EXT.IN) of remote terminal, waveform recording and input monitor, filing recording can be performed simultaneously.

＊ Compatibility with Previous-version products (Real-time waveform printing)

Since this recorder maintains a compatibility with previous-version products, an external pulse control setup is available. Setup is made in external synchronization printing in the [System] Aux. Setting. This setup is effective in the real-time waveform printing and input monitoring. The setup below is an example of the control of chart feed length per one external input pulse.



- **When speed is set to【0.1 mm/pulse】(Two RA1000 Series)**
  In the real-time waveform recording, a pulse prints one line (0.1 mm). In the real-time filing, a pulse saves one data.

- **When speed is set to【0.025 mm/pulse】 (Connection between RA1000 Series and SYNC OUT of previous-version)**
  In the real-time waveform recording, four pulses print one line (0.1 mm). In the real-time filing, four pulses save one data.

14.4.2 How to Perform Memory Recording by External Sampling

The following steps explain the operation of recording by external sampling.

1. Connection of external input sampling signal

Input the signal to terminal No.10 (EXT.IN) of the remote terminal in the rear panel. Use GND pin for common.

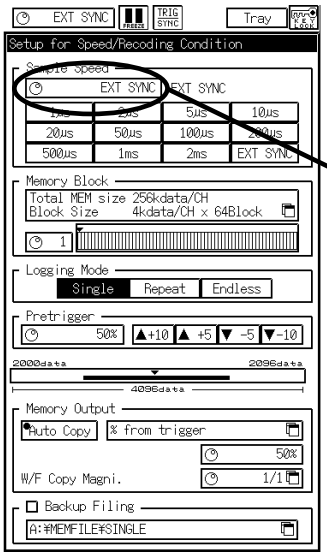
2. Setting recorder setup to external sampling

(1) Set the measurement mode of the recorder to the [Memory Mode].

(2) Press the【Change of Rec. Speed Table】key in System – Aux. Setting tab screen and set the speed table to【EXT SYNC】.

☞ Refer to 14.2.13

(3) In the screen of Setup for Speed/Recording Condition, set the【Sampling speed】to【EXT SYNC】. By this setting, 【Monitor/Recording Speed】is also set to external synchronization.



External Synchronization

NOTE

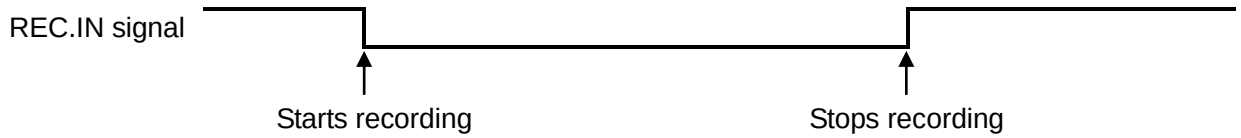
Unless [EXT SYNC] is registered in the speed table, the external synchronization can not be set up.

3. Start Recording

After the remote terminal connection and sampling speed setting, sampling by external synchronization is ready for operation. Press the [Start] key under these conditions. The recorder starts recording in the memory in synchronization with external pulses.

14.4.3 Recording Start and Stop ([Start] and [Stop] keys)

Recording starts exactly the same way as pressing the [Start] key. Pin no. 4 (REC.IN) is controlled externally. Use GND pin for common.



Recording starts and after the detection of the falling edge of the signal and continues as long as the signal is in the LOW level. The recording stops upon the detection of the rising edge of the signal.

14.4.4 Chart Feed

Chart recording paper feed is executed in the same way as pressing the [Feed] key in the panel. Pin no.8 (FEED.IN) is externally controlled. Use GND pin for common.

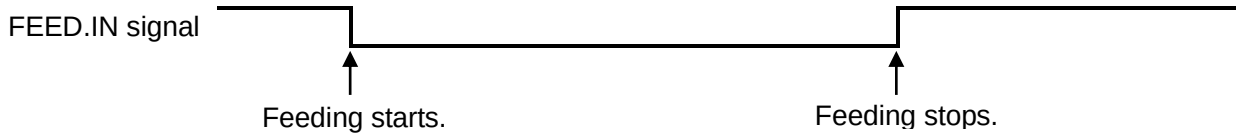
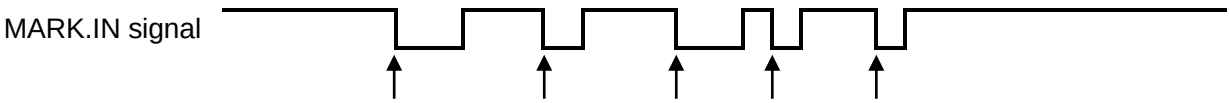


Chart feed starts and after the detection of the falling edge of the signal and continues as long as the signal is in the LOW level. The chart feed stops upon the detection of the rising edge of the signal.

14.4.5 Mark Printing

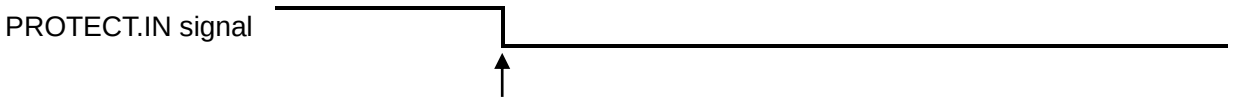
Mark is printed in the same way as pressing the [Mark Print] key in the panel. This function is effective in the real-time recording. Pin no.6 (MARK.IN) is externally controlled. Use GND pin for common.



The detection of rising edges in the real-time recording prints marks.

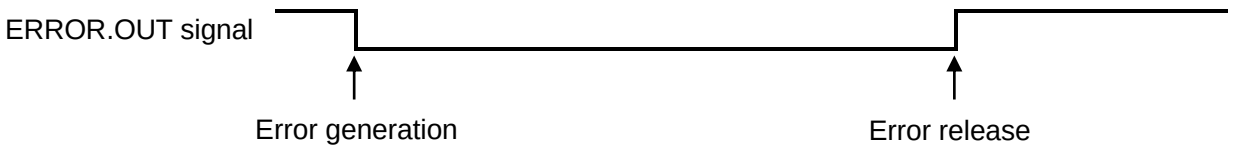
14.4.6 File Data Protection

This function is to be provided for the protection against power failure during accessing files in the state such as filing acquisition. File damages caused by the power failure are avoided by using uninterruptible power supply. No.11 pin (PROTECT.IN) of remote terminal is controlled externally. Use GND pin for common.



14.4.7 Monitoring Printing Block Error

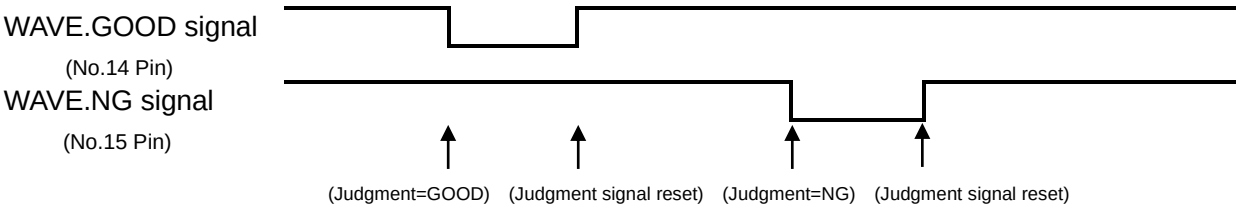
Error signal is output when an error occurs at the printing block. Typical printing block errors are paper out, abnormal thermal head temperature, etc. Signal is outputr to No.12 pin (ERROR.OUT) .



As long as an error is generated, the LOW level is generated. This signal is generated regardless of recording operation of the recorder.

14.4.8 Waveform Judgment Output (Optional: Waveform Judgment Function)

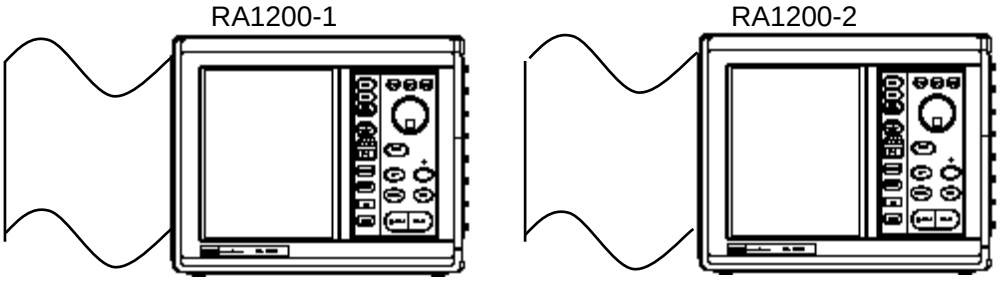
This function is effective when the recorder is used as a waveform judgment recorder. The judgment result is output via the remote connector.



The output of judgment result is reset at acquisition start. After starting recording, results are output for each judgment. In the case of repeating acquisition, the output state is maintained until the next memory block starts.

※ Parallel Operation

Simultaneous recording, feed, and mark printing by parallel connections of remote terminals to recorders are available. The example below explains how to connect terminal when recorder 1 is the master.



REC.OUT (PIN NO.5) - REC.IN (PIN NO.4)
FEED.OUT (PIN NO.9) - FEED.IN (PIN NO.8)
MARK.OUT (PIN NO.7) - MARK.IN (PIN NO.6)
SYNC.OUT (PIN NO.3) - SYNC.IN (PIN NO.2)
(Pin numbers 17 and 18 are used as common.)

By the connection as above, the panel operation of recorder 1 allows concurrent control of recorder 2.

※Refer to 6.2.4 External Trigger I/O Circuit for trigger input and output (TRIG IN, OUT)

14.5 Others

Battery Backup

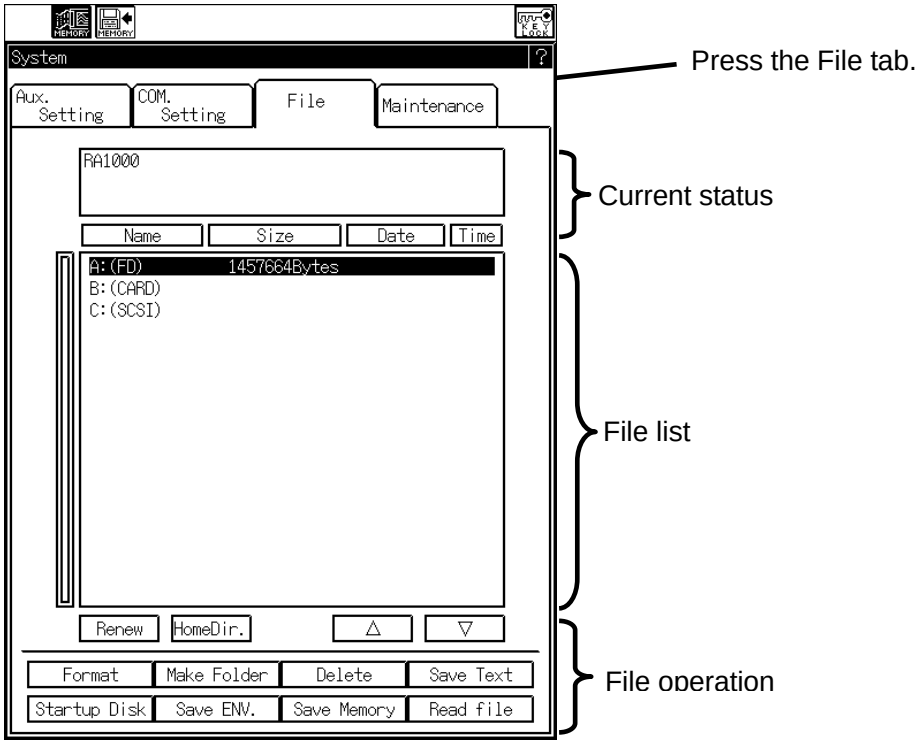
The internal battery backs up the setup information, year and date, and time of recording conditions for a month. Charging of the internal battery takes as much as 12 hours when turning on the power switch.

NOTE The stored data in the internal memory can not be backed up.

14.6 File Operation

The file format of this recorder is MS-DOS.

14.6.1 Filing Operation

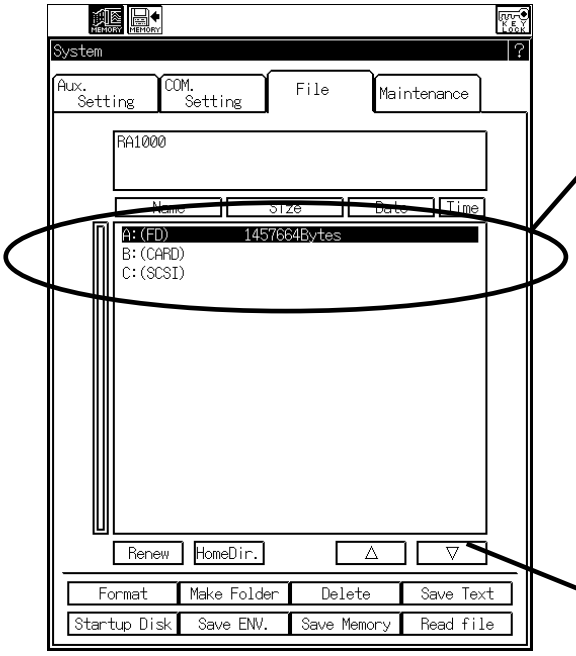


14.6.2 File List Display

The file operation screen covers internal drive and externally connected drives. In data saving, the operation covers only the drive and folder that are specified. Targetcan be moved to another destination via the list display.

1. Selecting drive

Selects among drive list.

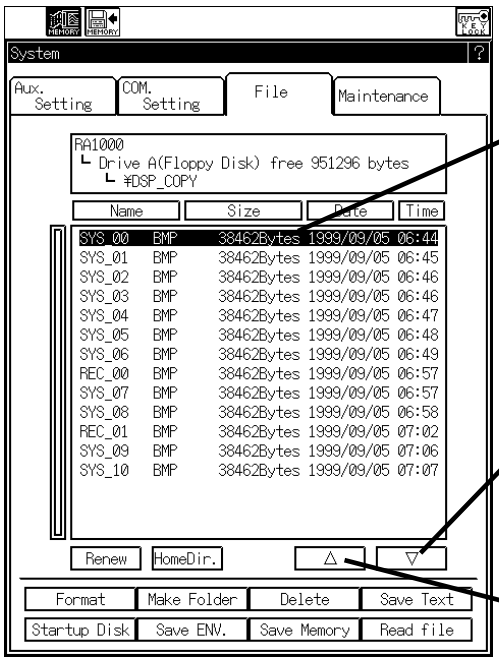


In the current status, the drive can be selected among floppy disk, PC card, or the drive connected to SCSI connector.

Folders down for one.

2. Selecting file

Select the file to be loaded out of the files listed in the table.



Touch directly to select.

Folders down for one.

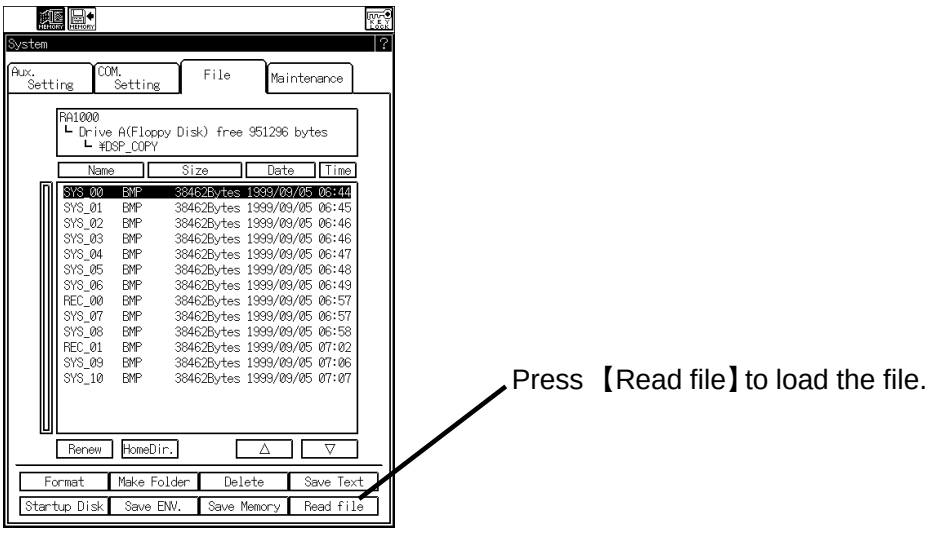
Folders up for one.

14.6.3 How to Load File

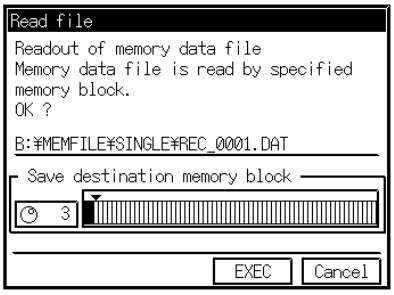
In file loading, you can load three types of files: environment, annotation, and memory data. If the environment file is loaded, the setup environment is changed to the environment file.

File selection

Select a file among the listed files.



- **When memory data (Extension: DAT)**
  The following window appears to load the memory data. Select the memory data to be loaded and execute loading. (By pressing the memory block, the memory block information appears and you can confirm the information.)



- **When other files**
  When you load files other than memory data, files are directly loaded.

RA1000 file format list

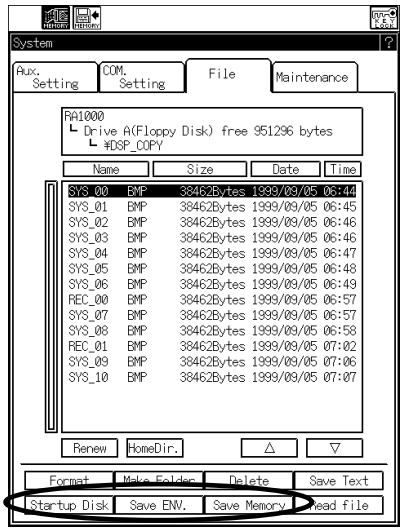
File type	Extension	Loading	Save	Remark
Environment file	.ENV	○	○	
Annotation	.TXT	○	×	Created in PC or other equipment.
Memory data file	.DAT	○	○	
General data file	.DRT	△	△	Loading and saving is available in replay setup.
Backup filing	.FPP(FSD)	△	—	Loading is available in replay setup.
Trasient filing	.IDX	△	—	Loading is available in replay setup.

○: Available
×: Not available
△: Available in replay monitor
—: Available only in filing

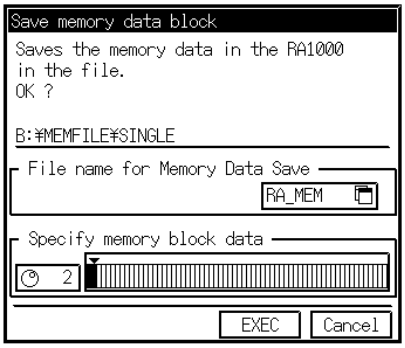
14.6.4 Saving environment and memory data

Saving of three types of files, environment file, Setup Disk, and memory data file is available. The start file is a special file that has been read at starting.

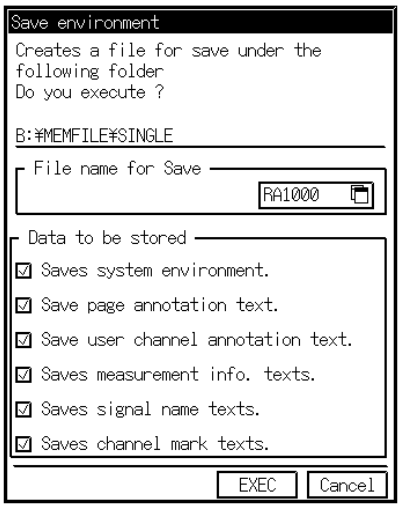
Move to the destination where the file is saved. For startup disk, the destination is always to be floppy disk.



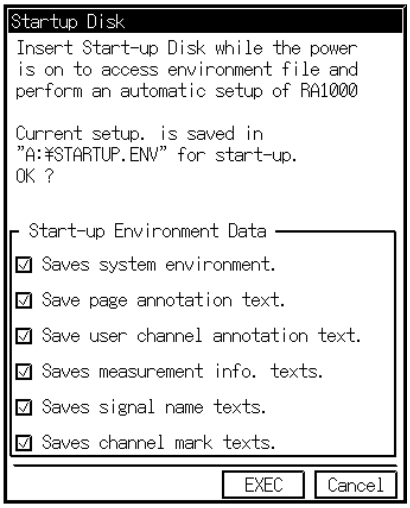
- **When 【Save Memory】**
  The following window appears when the memory save is selected. Select the memory block to be saved and executed. (Pressing the memory block displays memory block information.)



- **When【Save ENV】**



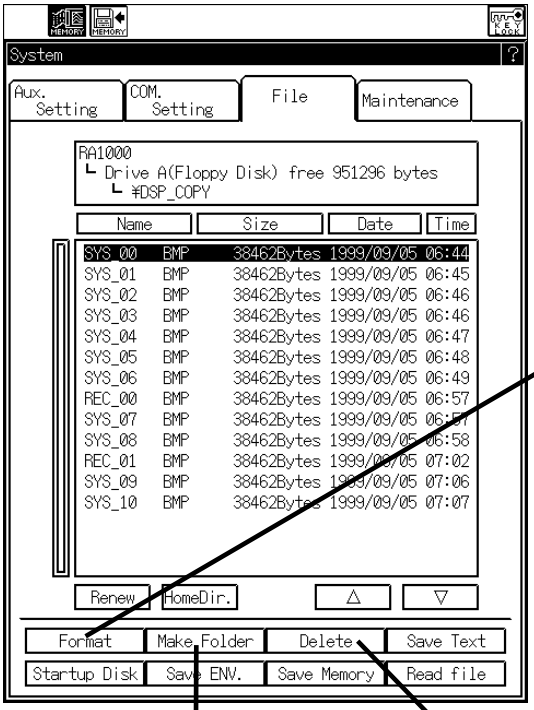
- **When【Startup Disk】**



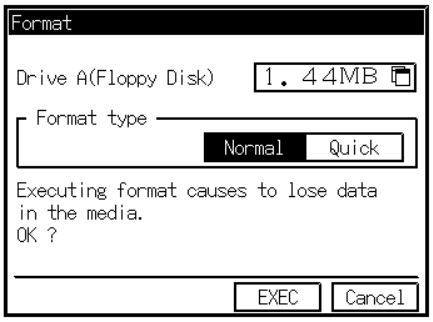
NOTE Setup disk is A : It is made with the floppy disk only.

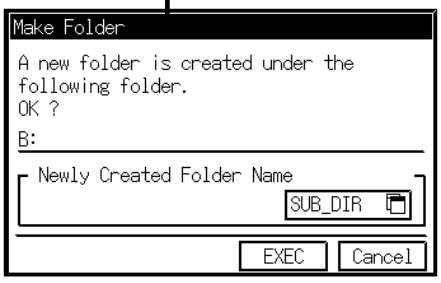
14.6.5 Other Functions

It is possible to format a disk, make and delete a folder and delete a file.

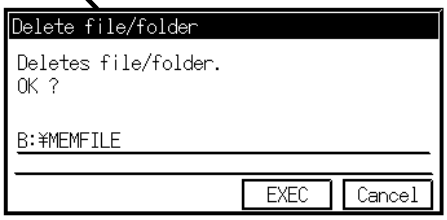


Formatting





Make Folder
Confirm it is the file table to make a new folder, and then press [EXEC] key.



Delete file/folder
File or folder selected in the file table is a target to delete.

14.6.6 Drive and Media

Drive	Standard	Capacity	Operation guarantee
Internal 3.5-inch FDD	2 HD	1.25/1.44 MB	
Internal PC card drive	SRAM	64 K to 4 MB	Only optional product
	ATA flash	2 to 640MB	Only the products made by manufacturers that are recommended by NEC San-ei.
SCSI-connection magneto-optic disk (MO)	-	128/230/640 MB	Only the drives recommended by NEC San-ei
SCSI-connection phase-change disk	-	650 MB	Only the drives recommended by NEC San-ei

Products recommended by NEC San-ei (as of June, 1998)

- **PD drive**
  PC-ODX66 (NEC)
  LF-1001JB (Panasonic)
- **MO disk**
  PC-OD302R (NEC)
  MOS341ST (Olympus)
- **ATA flash memory card**
  Hitachi ATA flash memory card
- **Modem**
  COMSTARZ MULTI560 (NEC)
  COMSTARZ MULTI336 (NEC)
  COMSTARZ MULTI288 (NEC)

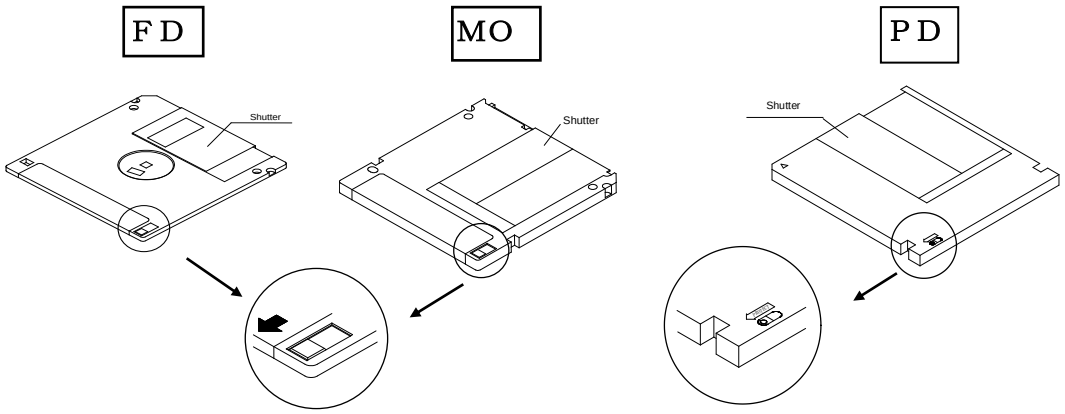
When using the products other than the list above, contact a NEC San-ei sales representative.

14.6.7 Handling Cautions

- While media or PC card is in operation, never insert or desert the media or PC card. Data will be damaged.
- Stick a label on a medium at the proper position.
- Do not open the shutter of media.
- Keep media and PC card away from magnetic field.
- Keep media and PC card away from moisture and liquid. Avoid condensation.
- Keep media and PC card away from high temperature. Avoid using and storing in dusty places.
- ATA flash memory card has special characteristics of improper operation at quick power-on and power-off. Therefore, if the recorder undergoes the condition of quick and repeating power-off and power-on such as instantaneous power interruption causes the flash card to access failure. (When displayed in recorder display, the message of "no card" appears.) In such cases, pull out the card and insert it again to permit the flash card to normal read and write. Such characteristics of the flash card may affect the auto-start function; filing into a flash card in the auto-start may not be normally operated. For this reason, do not use the flash card for the auto-start. Moreover, we recommend using an interruptible power supply (UPS) for the long-duration use in sites where the power supply is unstable.

14.6.8 Data Protection

Write protection is available for media in order to avoid an erroneous deletion. Formatting and data write/deletion of files in write-protected media are disabled; only reading is enabled. We recommend setting the write protection for media that store important data. To set write protection, move the tab to the position indicated by the arrow mark as follows. The opened state is write protection position.

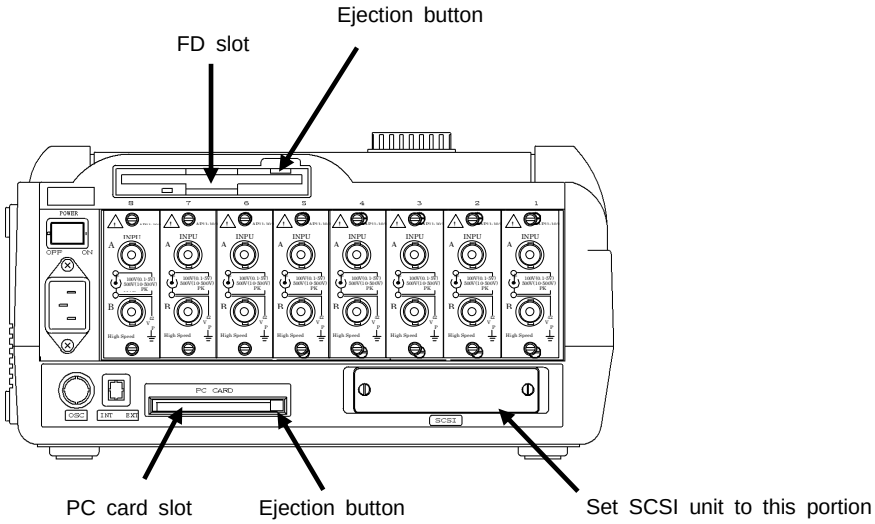


14.6.9 Media Setup

- **How to set and take out media**
  Insert a floppy disk in the FD drive at right side of the recorder. Push the disk slowly until the ejection button is pushed back. To take out the floppy disk, push the ejection button after confirming the floppy disk drive is not operating (LED does not illuminate).

- **How to set and take out card**
  Insert a PC card in the PC card connector at the front side of the recorder. Push the PC card slowly until the ejection button is pushed back. To take out the PC card, push the ejection button after confirming the PC card is not accessed.

- **How to set MO and PD**
  When using MO or PD, set the SCSI unit (RA11-107: optional) to the recorder, connect the SCSI drive to the SCSI connector, and set media.

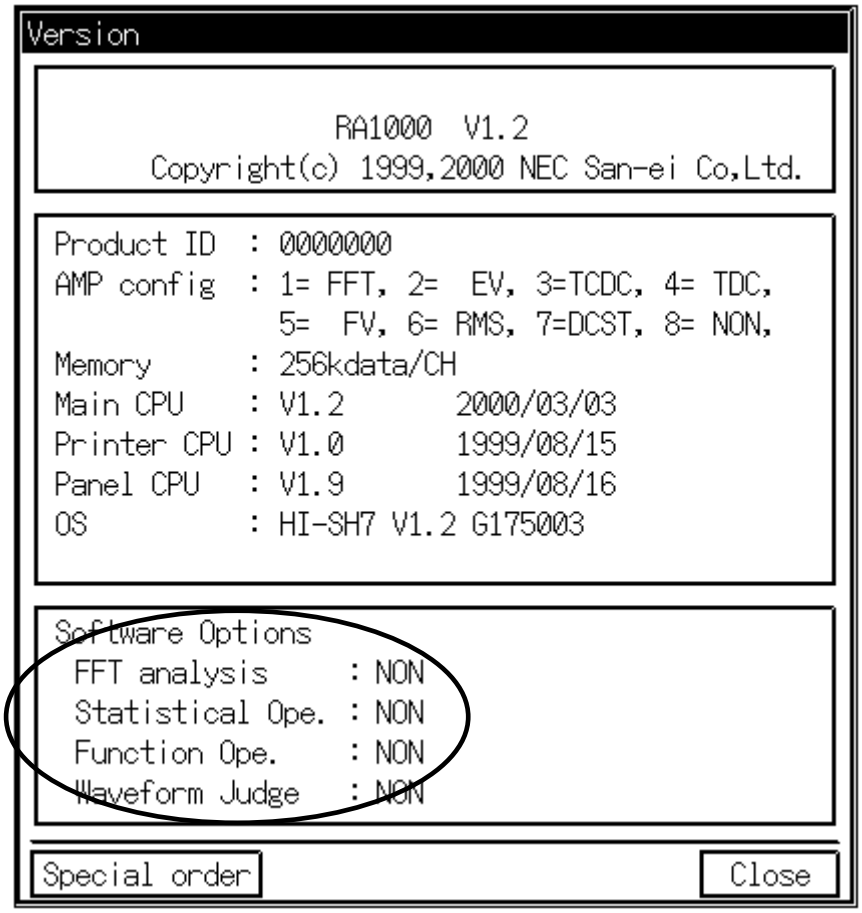


15. EXPANSION FUNCTIONS

[EXTENDED] key is available to set up following optional software functions.

- **FFT functions**
- **Operation functions**
- **Waveform functions**

Open [Maintenance] in [SYSTEM] menu to check the options.



Refer to each operation manual for the details of the optional softwares.

16. GUIDE TO OPTIONS

RA Series Amplifier Units

Unit Name	Model	Note
2-CH high-resolution DC amp	AP11-101	
2-CH FFT amp unit	AP11-102	
2-CH high-speed DC amp	AP11-103	
2-CH AC strain amp	AP11-104	
Event amp unit	AP11-105	
2-CH TC/DC amp unit	AP11-106	
TC･DC amp unit	AP11-107	
F/V converter unit	AP11-108	
2-CH vibration/RMS amp unit	AP11-109	
2-CH DC strain amp unit	AP11-110	

RA Series Hardware Options

There are a number of hardware options, some of which are dependent on whether the unit can be installed in the user's systems and some that must be specified when placing an order.

Unit Name		Format			Specification When Ordering
		RA1000	RA1200	RA1300	
1	GP-IB (Note 1)	RA11-105			—
2	RS-232C (Note 1)	RA11-106			—
3	SCSI	RA11-107			—
4	On-chip MO	RA11-108			Required
5	AC bridge power supply	RA11-109			Required
6	DC power supply	RA11-110			Required
7	AC 200 V power supply	RA11-124	RA12-108	RA13-105	Required
8	English display (Note 3)	RA11-125	RA12-106		Required
9	Extended memory	RA11-126			Required

(Note 1) Refer to the RA1000 Series Interface Manual (95691-2075-0000).
(Note 2) Refer to the RA1000 Series Amplifier Units Manual (95691-2076-0000).
(Note 3) This should be specified when ordering, but it can also be left up to the customer's discretion. Please consult with our company's sales staff.

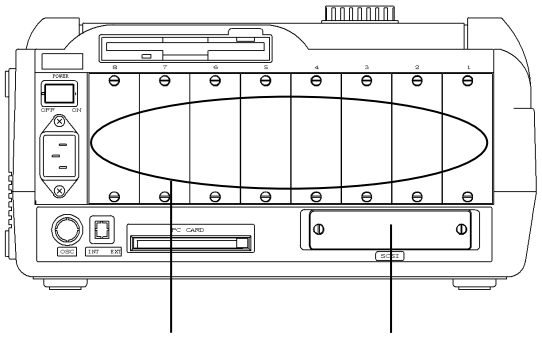
16.1 Installing the GP-IB (RA11-105)/RS-232C (RA11-106)/SCSI Unit (RA11-107)

CAUTION

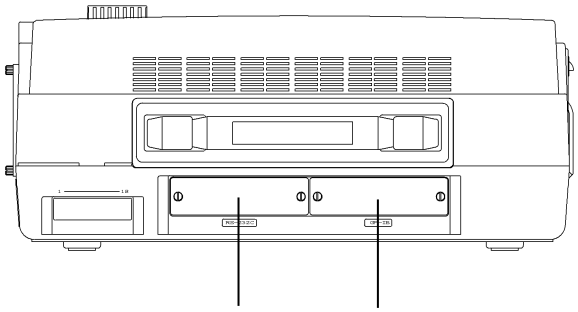
Connecting or removing cables to or from the main unit should be done with t he power switched off. The hardware unit or main unit is liable to suffer damage if the power is on when carrying out the above.

There are an input slot section of the input units and a fitting section of SCSI unit (RA11-107) in the right side panel of the main unit, and fitting sections of RS-232C unit (RA11-106) and GP-IB unit (RA11-105) in the rear panel.

(Main unit right panel)



(Main unit rear panel)



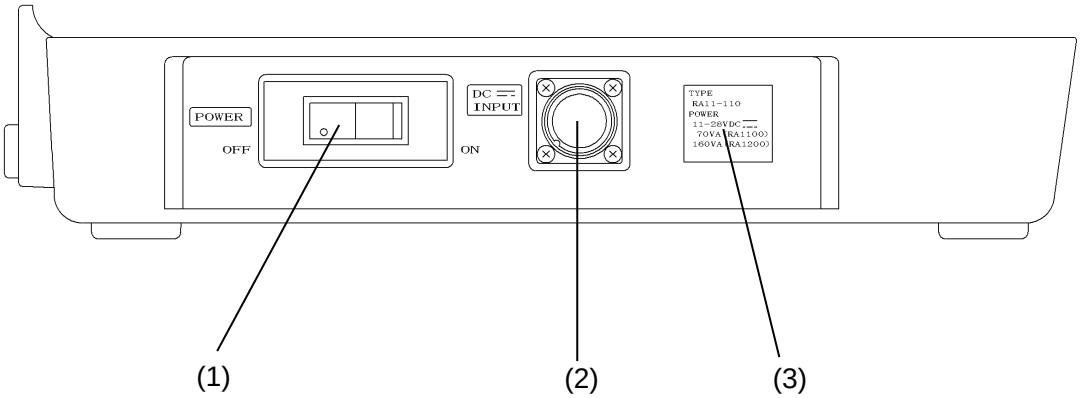
Take care not to touch inside parts when replacing units. Touching the inside parts by your hand with static electricity may cause damage. Do not touch other than panel when replacing the unit.
When installing the amplifier unit, check the up and down of the unit and insert it along with the guide of the input slot section. After the installation, be sure to fixit with screws by a screw driver of minus shape. A screw driver of minus shape (tip thickness 0.65mm or less) is necessary to fix it.
Check SYSTEM - COMMUNICATION setting tab screen if RS-232C unit or GP-IB unit is installed. Unless installing correctly, the tab is not appeared. GP-IB unit can be checked on the initial screen when turning on the power.

CAUTION

Be sure to fit blank input slots with blank panels to protect from an electric shock and to prevent a damage to the main unit from incoming other objects.

16.2 Guide to DC Power Supply Unit (RA11-110)

16.2.1 Part Names and Functions

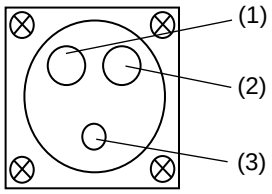


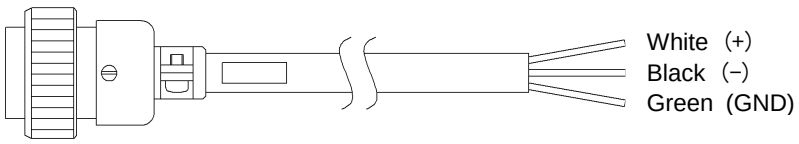
(1) POWER

This is the ON/OFF switch for the DC power supply unit. This switch is a current-pull-down type circuit protector.

(2) DC ⎓ INPUT

This is the DC power supply input connector. The DC supply cable included with the unit is connected here.





DC supply cable 0311-5180

(1) ＋
(2) －
(3) GND

(3) DC power supply rating label

This label describes the format, DC supply input voltage range, and current consumption of the unit.

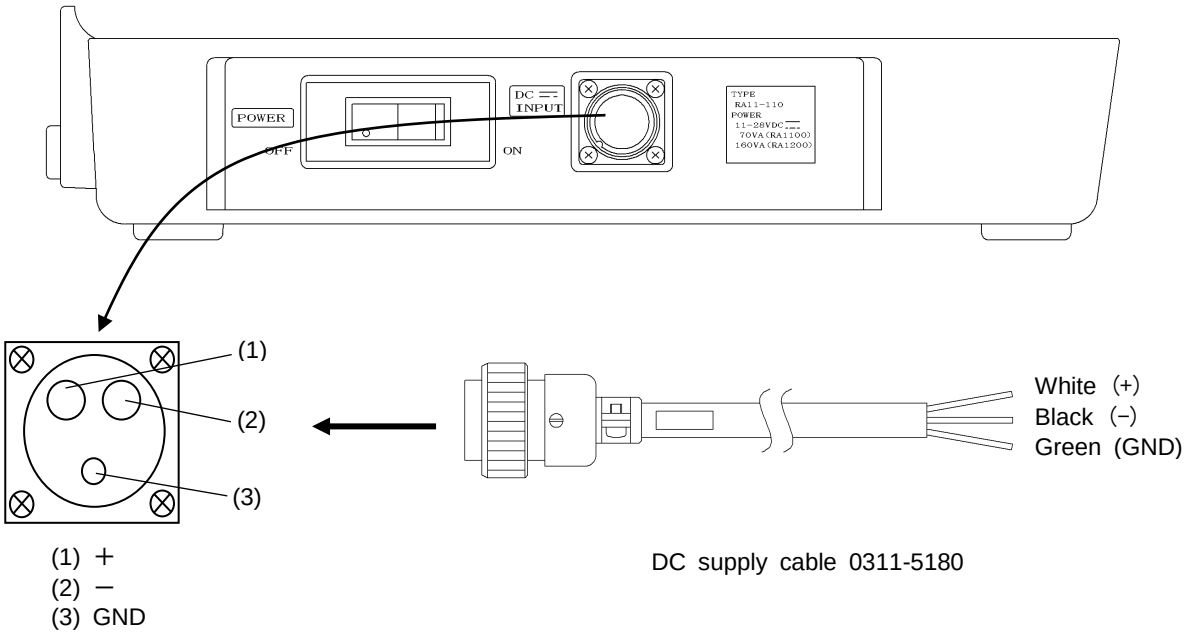
TYPE
RA11-110
POWER
11 to 28 VDC ⎓
70VA(RA1100)
160VA(RA1200)
240VA(RA1300)

16.2.2 DC Supply Cable Connection

Check the following before connecting the DC supply cable.

- That the POWER switch (circuit connector) is off.
- That the power to be supplied satisfies the DC power supply ratings printed on the rating label.

NOTE The unit may not operate if the voltage at the INPUT connector is 11 V or less. Be sure that the operating voltage used is between DC 11 V and 28 V.



1. Connect the DC supply cable plug to the DC INPUT connector.
2. Connect the DC supply cable to battery or other DC power supply.

   Cannot a white cable with +(plus) and a black cable with –(minus). Green cable is GND (chassis). Connect it to –(minus) together with the black cable or earth it to the ground.
3. Switch the power on and start operating the unit.

16.2.3 Current Consumption - Preparing a Suitable Battery

The current consumption value (reference value) for each operating status of the DC power supply unit RA11-110 is indicated in the table below.

●Main unit conditions RA1200: Amp unit, AP11-103 High-speed DC amp unit 8 units
Real-time mode
Full scale 1/1
Input signal Sine wave Full scale

For DC 12 V

Operating Status		Current (A)					
Stopped (stop)		4.8					
Paper feeding		5.2					
Operating (Start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	2	5	10	20	50
	1	5.6	5.6	5.7	5.9	6.2	6.2
	5	5.8	5.8	5.9	6.0	6.3	6.4
	10	5.8	6.0	6.1	6.3	6.5	6.6
	20	5.8	6.1	6.5	6.6	7.0	7.0
	50	5.8	6.1	6.8	7.8	8.0	8.0
	100	5.8	6.1	6.8	8.0	9.3	9.5
	1k	5.8	6.1	6.9	8.0	10.5	11.2

For DC 24 V

Operating Status		Current (A)					
Stopped (stop)		2.4					
Paper feeding		2.6					
Operating (start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	2	5	10	20	50
	1	2.8	2.8	2.9	3.0	3.1	3.1
	5	2.9	2.9	3.0	3.0	3.2	3.2
	10	2.9	3.0	3.0	3.1	3.2	3.3
	20	2.9	3.0	3.2	3.3	3.4	3.9
	50	2.9	3.0	3.4	3.8	4.5	3.9
	100	2.9	3.0	3.4	3.9	4.5	4.5
	1k	2.9	3.1	3.4	4.8	5.0	5.5

※Consumption current of RA1100 can be refered to the above value of "stop.

●Main unit conditions RA1300 : Amplifier unit, AP11-103 High-speed DC amp. unit 8 units
AC bridge voltage unit built in
Real-time mode,
Full scale 1/1,
Input signal, Sine-wave Full scale

For DC 24 V

Operating Status		Current (A)					
Stopped (stop)		4.4					
Paper feeding		4.6					
Operating (Start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	5	10	20	50	100
	1	5.4	5.7	5.8	6.0	6.8	9.4
	10	5.6	5.9	6.0	6.2	6.8	9.6
	50	6.6	6.8	7.6	7.0	8.2	11.0
	100	6.7	8.2	8.6	7.8	9.5	12.6
	200	6.8	10.2	11.5	9.8	12.4	46.2
	1k	6.8	11.2	12.8	14.2	18.0	※Reset

For DC 24 V

Operating Status		Current (A)					
Stopped (stop)		2.4					
Paper feeding		2.6					
Operating (start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	2	5	10	20	50
	1	2.7	2.8	2.9	3.1	3.3	4.7
	10	2.9	3.0	3.0	3.2	3.5	4.8
	50	3.4	3.9	3.6	3.5	4.0	5.4
	100	3.4	4.1	4.3	3.9	4.7	6.3
	200	3.4	5.5	5.6	4.9	6.1	8.2
	1k	3.4	5.7	6.4	7.6	9.4	※Reset

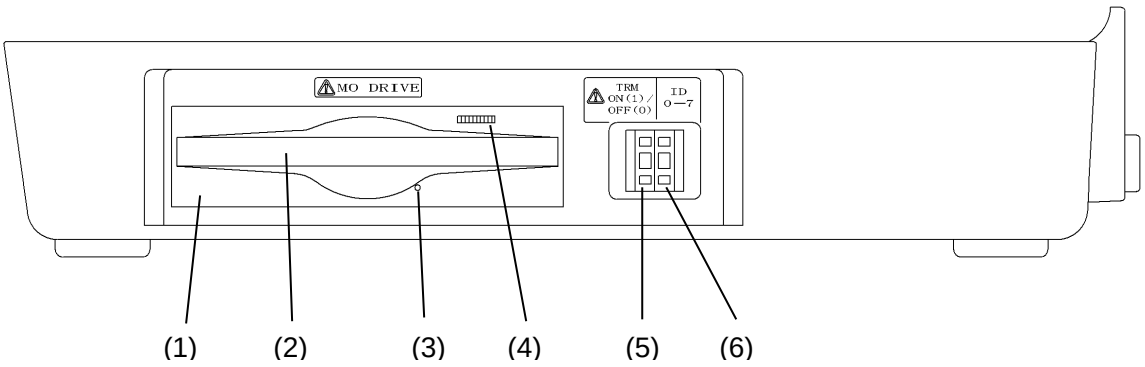
※ Reset is to stop the main unit by reset of the power.

16.3 Guide to On-Chip MO Unit (RA11-108)

CAUTION

When the MO drive is in the BUSY state (the display light is shining green), do not eject the MO disk cartridge. It is particularly important not to use manual force to eject the disk. Observe this caution strictly to ensure the performance and reliability of the disk and to avoid destroying data.

16.3.1 Part Names and Functions



(1) MO drive

The MO drive is a manual load/auto eject type that can be operated simply by inserting the MO cartridge or pressing the eject button.

(2) Disk slot

The MO cartridge is either inserted or ejected here.

(3) Manual eject hole

The MO cartridge can be manually ejected by inserting either the eject pin included with this unit or a pin with a diameter of 1 mm in this hole. When the power to the main unit is off, the cartridge cannot be ejected even if the eject switch (4) is pressed. In this case this function should be used.

NOTE

Do not eject the MO cartridge while the BUSY LED is lit, as this may cause data destruction or damage to the instrument.
Be careful not to let the cartridge drop when it is ejected.

(4) Eject button/BUSY LED (display lamp)

The eject button and BUSY LED (display lamp) are integrated as one. Press this button to eject the MO cartridge. The BUSY LED lights up green when the unit is searching, deleting data, or writing/reading.

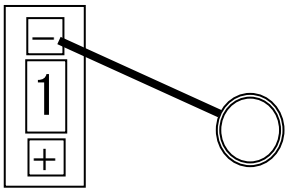
(5) SCSI terminal resistor mode setting switch (TRM) (Setting: 1/0)

Enables/disables the terminal resistor module inside the MO drive. The MO drive is disabled in all cases except for the final terminal of the SCSI bus.

Terminal Resistor Mode	Setting Switch
Terminal resistor module enabled	1
Terminal resistor module disabled	0

"1" is set at factory shipment.

NOTE Set the setting switch to [+] using a pin such as the eject pin included with the unit.

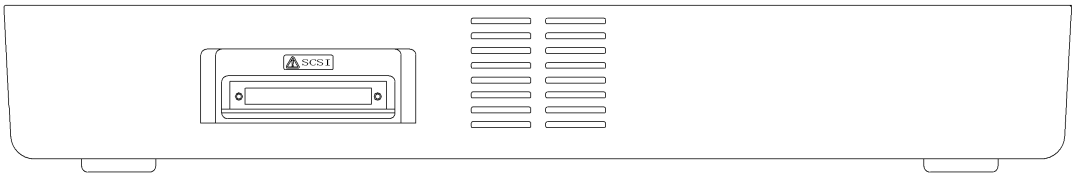


※[+] [−] : Do not press both these at the same time.

(6) SCSI ID setting switch (Setting 0 to 7)

This sets the ID of the MO drive. "1" is set at factory shipment. Depending on (7) SCSI connector, up to 7 MO drives can be connected. Be careful not to set duplicate SCSI IDs at this time.

NOTE Refer to the Note in (5) SCSI terminal resistor mode setting switch for this setting.



(7) SCSI connector (power pitch 50-pin pin type)

In addition to this MO drive, an SCSI device can be connected.

NOTE Take care when setting (5) SCSI terminal resistor mode setting switch (TRM) and (6) SCSI ID setting switch.

NOTE The data in the built-in MO unit can not be loaded to your personal computor by connecteing SCSI connector directly.

16.3.2 Inserting the MO Cartridge

Insert the MO cartridge using the following procedure.

(1) When the power to the main unit is ON

1) Check that there is no MO cartridge in the MO drive.
2) Make sure the printed side of the MO cartridge shutter is facing up.
3) Insert the open/close side of the cartridge into the MO drive slot.
4) Insert the cartridge into the slot by the operation panel until the cartridge stops, making sure to keep it straight. Once the MO cartridge has been inserted, loading will start, and a few seconds later the BUSY LED display lamp will light briefly indicating loading is complete.

NOTE

Insert the cartridge until the LED lights up.
If the cartridge is inserted by pushing on one side of the back edge more strongly than the other, the cartridge may not be inserted correctly. Be sure, therefore, to always push the center of the cartridge when inserting.
If the BUSY LED does not light even after inserting the cartridge, use the eject/BUSY LED button to remove the cartridge, then reinsert.
If you are experiencing difficulties inserting the cartridge, do not force it, as this may damage the instrument. In such a case, always remove the cartridge and reinsert, checking that the cartridge is facing the correct direction and that it is the correct side up.

(2) When the power to the main unit is OFF

1) Check that there is no MO cartridge in the MO drive.
2) Make sure the printed side of the MO cartridge shutter is facing up.
3) Insert the open/close side of the cartridge into the MO drive slot.
4) Insert the cartridge into the slot by the operation panel until the cartridge stops, making sure to keep it straight.
   The MO cartridge will remain in the MO drive as is until the power is applied to the disk unit, at which point the BUSY LED will light up.

NOTE

If the BUSY LED does not light even after the power has been switched on, eject the MO cartridge and press down on the eject button until the LED lights.
If the cartridge is inserted by pushing on one side of the back edge more strongly than the other, the cartridge may not be inserted correctly. Be sure, therefore, to always push the center of the cartridge when inserting.
If you are experiencing difficulties inserting the cartridge, do not force it, as this may damage the instrument. In such a case, always remove the cartridge and reinsert, checking that the cartridge is facing the correct direction and that it is the correct side up.

CAUTION

If the cartridge has been inserted with the shutter printing side face up and by pushing the left side of the back edge, the MO drive may not enter the READY state, even if the "Clunk" sound was heard. In this case, keep pushing the center of the back edge (use the hollow in the front panel as a guide) until the LED lights up, indicating the cartridge has been inserted correctly.

16.3.3 Removing the MO Cartridge

Eject the cartridge using the following procedure.

(1) The power to the main unit is ON

The cartridge can be removed by pressing the eject switch.

NOTE

The MO cartridge cannot be ejected when eject-disable has been set by a SCSI command.
Remove the MO cartridge after it is fully ejected.
Even if the instrument has been set in a suitable environment, that environment, or the state of the cartridge, may cause the cartridge to drop after being ejected. Take care, therefore, when ejecting the cartridge.

(2) When the power to the main unit is off

The cartridge cannot be ejected when the power is off, even if the eject button is pressed.
In this case, insert the eject pin or a similar pin with a diameter of 1 mm into the manual eject hole to manually eject the MO cartridge.

NOTE

Do not attempt to eject the cartridge while the BUSY LED is lit, as this may cause data destruction or instrument damage.
Take care to prevent the cartridge from dropping after it is ejected.

16.3.4 Formating

Refer to 14.6 File Operation.

16.3.5 Cleaning the MO drive

Dust in the air, dirt, and cigarette smoke can lower the performance of the MO drive's lens actuator. It is therefore necessary to regularly clean the lens actuator using the head cleaner indicated below.

Caution) The MO drive should be cleaned once every three months, or more, depending on the environment in which the instrument is used.

	Product Name	Model No.
Fujitsu P&S	Opto-magnetic disk cleaning cartridge	0240470

Clean the MO drive using the head cleaner following the procedure below.

1) Switch on the power to the MO drive.
2) Insert the head cleaner.
3) The head cleaner will load automatically. The brush attached to the head cleaner disk will rotate, cleaning the head lens.
4) The head cleaner will automatically eject when cleaning is complete.
5) Unless the head cleaner does not come out automatically over 30 seconds, turn off the power of the main unit and take off the head cleaner by inserting the accessory eject pin to the manual eject hole. Take care not to drop the head cleaner when ejecting.

⚠ CAUTION

Open the head cleaner shutter and check the condition of the brush. If the brush hairs are open, the lens cannot be cleaned effectively, so the brush should be changed.

16. GUIDE TO OPTIONS

RA Series Amplifier Units

Unit Name	Model	Note
2-CH high-resolution DC amp	AP11-101	
2-CH FFT amp unit	AP11-102	
2-CH high-speed DC amp	AP11-103	
2-CH AC strain amp	AP11-104	
Event amp unit	AP11-105	
2-CH TC/DC amp unit	AP11-106	
TC･DC amp unit	AP11-107	
F/V converter unit	AP11-108	
2-CH vibration/RMS amp unit	AP11-109	
2-CH DC strain amp unit	AP11-110	

RA Series Hardware Options

There are a number of hardware options, some of which are dependent on whether the unit can be installed in the user's systems and some that must be specified when placing an order.

Unit Name		Format			Specification When Ordering
		RA1000	RA1200	RA1300	
1	GP-IB (Note 1)	RA11-105			—
2	RS-232C (Note 1)	RA11-106			—
3	SCSI	RA11-107			—
4	On-chip MO	RA11-108			Required
5	AC bridge power supply	RA11-109			Required
6	DC power supply	RA11-110			Required
7	AC 200 V power supply	RA11-124	RA12-108	RA13-105	Required
8	English display (Note 3)	RA11-125	RA12-106		Required
9	Extended memory	RA11-126			Required

(Note 1) Refer to the RA1000 Series Interface Manual (95691-2075-0000).
(Note 2) Refer to the RA1000 Series Amplifier Units Manual (95691-2076-0000).
(Note 3) This should be specified when ordering, but it can also be left up to the customer's discretion. Please consult with our company's sales staff.

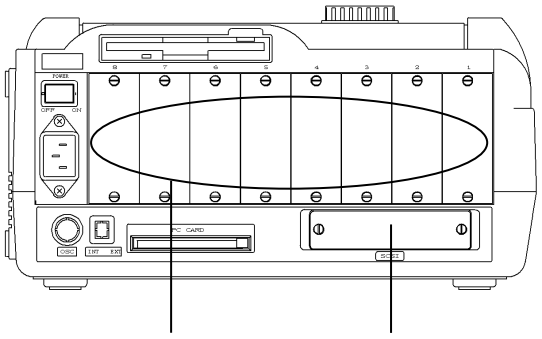
16.1 Installing the GP-IB (RA11-105)/RS-232C (RA11-106)/SCSI Unit (RA11-107)

CAUTION

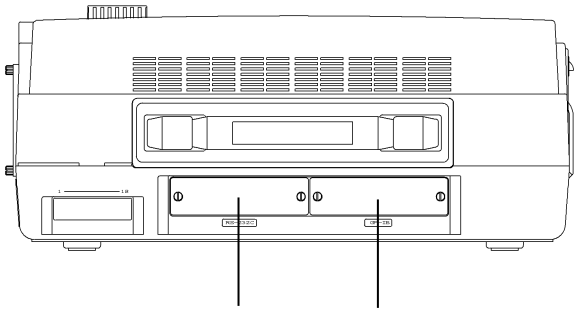
Connecting or removing cables to or from the main unit should be done with t he power switched off. The hardware unit or main unit is liable to suffer damage if the power is on when carrying out the above.

There are an input slot section of the input units and a fitting section of SCSI unit (RA11-107) in the right side panel of the main unit, and fitting sections of RS-232C unit (RA11-106) and GP-IB unit (RA11-105) in the rear panel.

(Main unit right panel)



(Main unit rear panel)



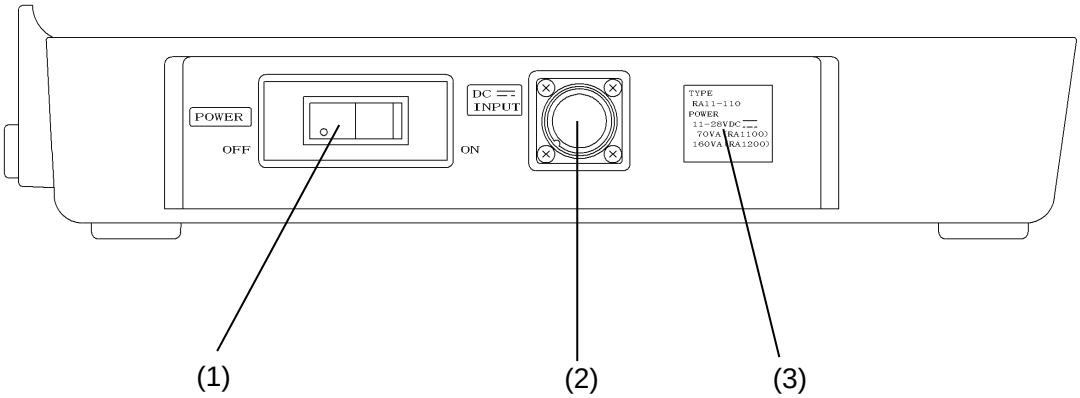
Take care not to touch inside parts when replacing units. Touching the inside parts by your hand with static electricity may cause damage. Do not touch other than panel when replacing the unit.
When installing the amplifier unit, check the up and down of the unit and insert it along with the guide of the input slot section. After the installation, be sure to fixit with screws by a screw driver of minus shape. A screw driver of minus shape (tip thickness 0.65mm or less) is necessary to fix it.
Check SYSTEM - COMMUNICATION setting tab screen if RS-232C unit or GP-IB unit is installed. Unless installing correctly, the tab is not appeared. GP-IB unit can be checked on the initial screen when turning on the power.

CAUTION

Be sure to fit blank input slots with blank panels to protect from an electric shock and to prevent a damage to the main unit from incoming other objects.

16.2 Guide to DC Power Supply Unit (RA11-110)

16.2.1 Part Names and Functions

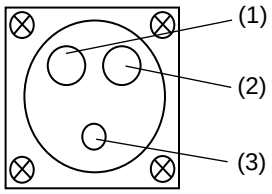


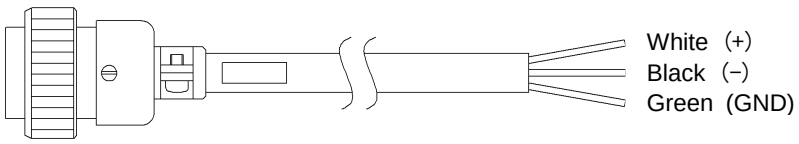
(1) POWER

This is the ON/OFF switch for the DC power supply unit. This switch is a current-pull-down type circuit protector.

(2) DC ⎓ INPUT

This is the DC power supply input connector. The DC supply cable included with the unit is connected here.





DC supply cable 0311-5180

(1) ＋
(2) －
(3) GND

(3) DC power supply rating label

This label describes the format, DC supply input voltage range, and current consumption of the unit.

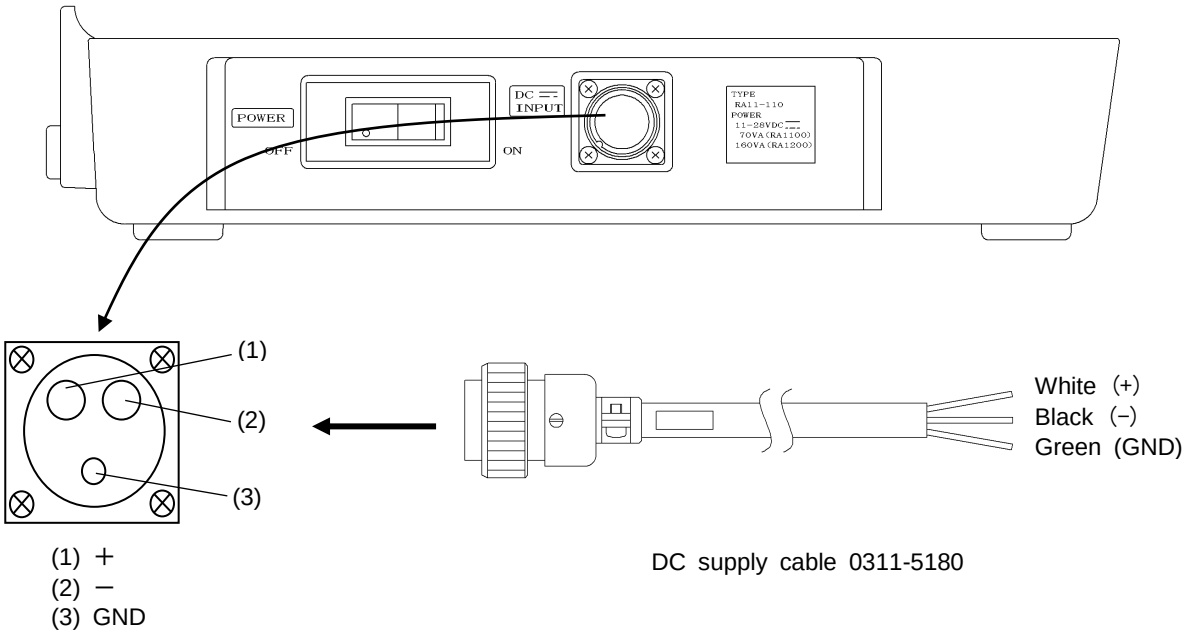
TYPE
RA11-110
POWER
11 to 28 VDC ⎓
70VA(RA1100)
160VA(RA1200)
240VA(RA1300)

16.2.2 DC Supply Cable Connection

Check the following before connecting the DC supply cable.

- That the POWER switch (circuit connector) is off.
- That the power to be supplied satisfies the DC power supply ratings printed on the rating label.

NOTE The unit may not operate if the voltage at the INPUT connector is 11 V or less. Be sure that the operating voltage used is between DC 11 V and 28 V.



1. Connect the DC supply cable plug to the DC INPUT connector.
2. Connect the DC supply cable to battery or other DC power supply.

   Cannot a white cable with +(plus) and a black cable with –(minus). Green cable is GND (chassis). Connect it to –(minus) together with the black cable or earth it to the ground.
3. Switch the power on and start operating the unit.

16.2.3 Current Consumption - Preparing a Suitable Battery

The current consumption value (reference value) for each operating status of the DC power supply unit RA11-110 is indicated in the table below.

●Main unit conditions RA1200: Amp unit, AP11-103 High-speed DC amp unit 8 units
Real-time mode
Full scale 1/1
Input signal Sine wave Full scale

For DC 12 V

Operating Status		Current (A)					
Stopped (stop)		4.8					
Paper feeding		5.2					
Operating (Start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	2	5	10	20	50
	1	5.6	5.6	5.7	5.9	6.2	6.2
	5	5.8	5.8	5.9	6.0	6.3	6.4
	10	5.8	6.0	6.1	6.3	6.5	6.6
	20	5.8	6.1	6.5	6.6	7.0	7.0
	50	5.8	6.1	6.8	7.8	8.0	8.0
	100	5.8	6.1	6.8	8.0	9.3	9.5
	1k	5.8	6.1	6.9	8.0	10.5	11.2

For DC 24 V

Operating Status		Current (A)					
Stopped (stop)		2.4					
Paper feeding		2.6					
Operating (start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	2	5	10	20	50
	1	2.8	2.8	2.9	3.0	3.1	3.1
	5	2.9	2.9	3.0	3.0	3.2	3.2
	10	2.9	3.0	3.0	3.1	3.2	3.3
	20	2.9	3.0	3.2	3.3	3.4	3.9
	50	2.9	3.0	3.4	3.8	4.5	3.9
	100	2.9	3.0	3.4	3.9	4.5	4.5
	1k	2.9	3.1	3.4	4.8	5.0	5.5

※Consumption current of RA1100 can be refered to the above value of "stop.

●Main unit conditions RA1300 : Amplifier unit, AP11-103 High-speed DC amp. unit 8 units
AC bridge voltage unit built in
Real-time mode,
Full scale 1/1,
Input signal, Sine-wave Full scale

For DC 24 V

Operating Status		Current (A)					
Stopped (stop)		4.4					
Paper feeding		4.6					
Operating (Start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	5	10	20	50	100
	1	5.4	5.7	5.8	6.0	6.8	9.4
	10	5.6	5.9	6.0	6.2	6.8	9.6
	50	6.6	6.8	7.6	7.0	8.2	11.0
	100	6.7	8.2	8.6	7.8	9.5	12.6
	200	6.8	10.2	11.5	9.8	12.4	46.2
	1k	6.8	11.2	12.8	14.2	18.0	※Reset

For DC 24 V

Operating Status		Current (A)					
Stopped (stop)		2.4					
Paper feeding		2.6					
Operating (start)	Input signal [Hz]	Paper feeding speed (mm/s)					
		1	2	5	10	20	50
	1	2.7	2.8	2.9	3.1	3.3	4.7
	10	2.9	3.0	3.0	3.2	3.5	4.8
	50	3.4	3.9	3.6	3.5	4.0	5.4
	100	3.4	4.1	4.3	3.9	4.7	6.3
	200	3.4	5.5	5.6	4.9	6.1	8.2
	1k	3.4	5.7	6.4	7.6	9.4	※Reset

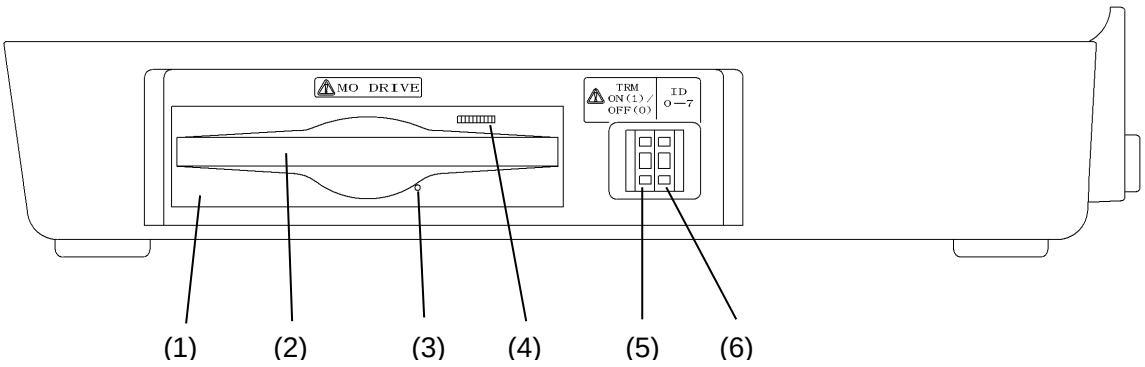
※ Reset is to stop the main unit by reset of the power.

16.3 Guide to On-Chip MO Unit (RA11-108)

CAUTION

When the MO drive is in the BUSY state (the display light is shining green), do not eject the MO disk cartridge. It is particularly important not to use manual force to eject the disk. Observe this caution strictly to ensure the performance and reliability of the disk and to avoid destroying data.

16.3.1 Part Names and Functions



(1) MO drive

The MO drive is a manual load/auto eject type that can be operated simply by inserting the MO cartridge or pressing the eject button.

(2) Disk slot

The MO cartridge is either inserted or ejected here.

(3) Manual eject hole

The MO cartridge can be manually ejected by inserting either the eject pin included with this unit or a pin with a diameter of 1 mm in this hole. When the power to the main unit is off, the cartridge cannot be ejected even if the eject switch (4) is pressed. In this case this function should be used.

NOTE

Do not eject the MO cartridge while the BUSY LED is lit, as this may cause data destruction or damage to the instrument.
Be careful not to let the cartridge drop when it is ejected.

(4) Eject button/BUSY LED (display lamp)

The eject button and BUSY LED (display lamp) are integrated as one. Press this button to eject the MO cartridge. The BUSY LED lights up green when the unit is searching, deleting data, or writing/reading.

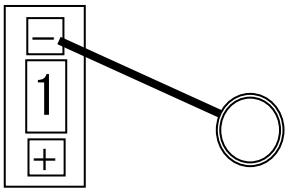
(5) SCSI terminal resistor mode setting switch (TRM) (Setting: 1/0)

Enables/disables the terminal resistor module inside the MO drive. The MO drive is disabled in all cases except for the final terminal of the SCSI bus.

Terminal Resistor Mode	Setting Switch
Terminal resistor module enabled	1
Terminal resistor module disabled	0

"1" is set at factory shipment.

NOTE Set the setting switch to [+] using a pin such as the eject pin included with the unit.

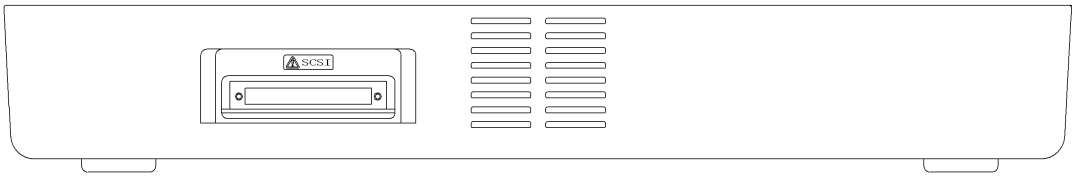


※[+] [−] : Do not press both these at the same time.

(6) SCSI ID setting switch (Setting 0 to 7)

This sets the ID of the MO drive. "1" is set at factory shipment. Depending on (7) SCSI connector, up to 7 MO drives can be connected. Be careful not to set duplicate SCSI IDs at this time.

NOTE Refer to the Note in (5) SCSI terminal resistor mode setting switch for this setting.



(7) SCSI connector (power pitch 50-pin pin type)

In addition to this MO drive, an SCSI device can be connected.

NOTE Take care when setting (5) SCSI terminal resistor mode setting switch (TRM) and (6) SCSI ID setting switch.

NOTE The data in the built-in MO unit can not be loaded to your personal computor by connecteing SCSI connector directly.

16.3.2 Inserting the MO Cartridge

Insert the MO cartridge using the following procedure.

(1) When the power to the main unit is ON

1) Check that there is no MO cartridge in the MO drive.
2) Make sure the printed side of the MO cartridge shutter is facing up.
3) Insert the open/close side of the cartridge into the MO drive slot.
4) Insert the cartridge into the slot by the operation panel until the cartridge stops, making sure to keep it straight. Once the MO cartridge has been inserted, loading will start, and a few seconds later the BUSY LED display lamp will light briefly indicating loading is complete.

NOTE

Insert the cartridge until the LED lights up.
If the cartridge is inserted by pushing on one side of the back edge more strongly than the other, the cartridge may not be inserted correctly. Be sure, therefore, to always push the center of the cartridge when inserting.
If the BUSY LED does not light even after inserting the cartridge, use the eject/BUSY LED button to remove the cartridge, then reinsert.
If you are experiencing difficulties inserting the cartridge, do not force it, as this may damage the instrument. In such a case, always remove the cartridge and reinsert, checking that the cartridge is facing the correct direction and that it is the correct side up.

(2) When the power to the main unit is OFF

1) Check that there is no MO cartridge in the MO drive.
2) Make sure the printed side of the MO cartridge shutter is facing up.
3) Insert the open/close side of the cartridge into the MO drive slot.
4) Insert the cartridge into the slot by the operation panel until the cartridge stops, making sure to keep it straight.
   The MO cartridge will remain in the MO drive as is until the power is applied to the disk unit, at which point the BUSY LED will light up.

NOTE

If the BUSY LED does not light even after the power has been switched on, eject the MO cartridge and press down on the eject button until the LED lights.
If the cartridge is inserted by pushing on one side of the back edge more strongly than the other, the cartridge may not be inserted correctly. Be sure, therefore, to always push the center of the cartridge when inserting.
If you are experiencing difficulties inserting the cartridge, do not force it, as this may damage the instrument. In such a case, always remove the cartridge and reinsert, checking that the cartridge is facing the correct direction and that it is the correct side up.

CAUTION

If the cartridge has been inserted with the shutter printing side face up and by pushing the left side of the back edge, the MO drive may not enter the READY state, even if the "Clunk" sound was heard. In this case, keep pushing the center of the back edge (use the hollow in the front panel as a guide) until the LED lights up, indicating the cartridge has been inserted correctly.

16.3.3 Removing the MO Cartridge

Eject the cartridge using the following procedure.

(1) The power to the main unit is ON

The cartridge can be removed by pressing the eject switch.

NOTE

The MO cartridge cannot be ejected when eject-disable has been set by a SCSI command.
Remove the MO cartridge after it is fully ejected.
Even if the instrument has been set in a suitable environment, that environment, or the state of the cartridge, may cause the cartridge to drop after being ejected. Take care, therefore, when ejecting the cartridge.

(2) When the power to the main unit is off

The cartridge cannot be ejected when the power is off, even if the eject button is pressed.
In this case, insert the eject pin or a similar pin with a diameter of 1 mm into the manual eject hole to manually eject the MO cartridge.

NOTE

Do not attempt to eject the cartridge while the BUSY LED is lit, as this may cause data destruction or instrument damage.
Take care to prevent the cartridge from dropping after it is ejected.

16.3.4 Formating

Refer to 14.6 File Operation.

16.3.5 Cleaning the MO drive

Dust in the air, dirt, and cigarette smoke can lower the performance of the MO drive's lens actuator. It is therefore necessary to regularly clean the lens actuator using the head cleaner indicated below.

Caution) The MO drive should be cleaned once every three months, or more, depending on the environment in which the instrument is used.

	Product Name	Model No.
Fujitsu P&S	Opto-magnetic disk cleaning cartridge	0240470

Clean the MO drive using the head cleaner following the procedure below.

1) Switch on the power to the MO drive.
2) Insert the head cleaner.
3) The head cleaner will load automatically. The brush attached to the head cleaner disk will rotate, cleaning the head lens.
4) The head cleaner will automatically eject when cleaning is complete.
5) Unless the head cleaner does not come out automatically over 30 seconds, turn off the power of the main unit and take off the head cleaner by inserting the accessory eject pin to the manual eject hole. Take care not to drop the head cleaner when ejecting.

⚠ CAUTION

Open the head cleaner shutter and check the condition of the brush. If the brush hairs are open, the lens cannot be cleaned effectively, so the brush should be changed.

17. MAINTENANCE, CLEANING, AND TROUBLESHOOTING

⚠ WARNING This is precision equipment, so do not allow anyone other than a qualified technician from our company to open the main unit case.

17.1 Handling and Storing Recording Paper and Data (RA1200, RA1300)

NOTE Care is required when handling the thermo-sensitive paper used by this instrument.

The chemical reaction caused by using a thermal head to add heat to the underside of the recording paper used for the RA1200 allows distinct black on white recording. Take care to handle the recording part of this paper so as to avoid color leakage or discoloration of the white sheet through writing materials, chemicals, or the environment (etc.).

17.1.1 Storing the Recording Paper

- Do not store the paper in a hot environment.
- Do not store the paper near heating fixtures.
- Store the paper in an environment with ambient temperature of 40°C or less, and do not store for a long period of time, as this may cause discoloration of the white sheet.
- Do not expose the paper to direct sunlight for long periods of time, especially in an unwrapped state, as this may cause discoloration of the white sheet. Take especial care, therefore, when using this instrument outside.

17.1.2 Caution for Handling and Storage of Recorded Data

- Do not store data in a hot or humid environment.
- Do not expose data to sunlight or strong light for a long period of time.
- Data may suffer from color leakage or white sheet discoloration due to heat, humidity, or light.
- Store data at 40℃ and 80％ RH or less.
- Data recorded in color will retain its color even if rubbed or exposed to water. However, the color will come off if rubbed strongly, so avoid doing so.
- The color on the recording paper will come off with volatile solvents such as alcohol and ester. It will not come off with oil-based solvents such as gin.
- If non-volatile solvents such as plastics are absorbed the color-recording capability will be reduced, causing color leakage in the recorded section.
- The recorded section may leak color if the thermo-sensitive paper is touched while not sufficiently dry.

17.2 Battery Backup

NOTE
- The setting values, date, and time of the recording are backed up for about 1 month.
- Recorded data cannot be backed up.
- If【Save/Load of setups】on the System screen is saved, these can be saved and read regardless of the battery. (Refer to Chapter 14 for details).

If not used for one month, the setting values, date, and time must be reset.

- Switch on the power
- Initialize the system
- Set the on-chip clock

Note that the battery is fully charged by applying power continually for about 12 hours.

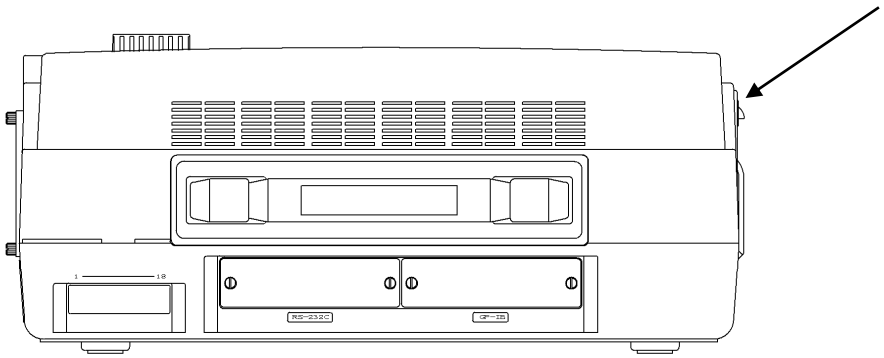
17.3 Cleaning the Display

If the display screen becomes wet, either wipe it with a soft, dry cloth, or with gauze soaked in ethanol.

17.4 Cleaning and Preserving the Thermal Head (RA1200, RA1300)

CLEANING

If recording for long periods of time, the heat dissipating part of this instrument's thermal head may become clogged with paper remains, etc. If the head is dirty, the quality of the printing and image reproduction will be reduced, so in this case the head will require cleaning.



LIFE

The life of the thermal head is about 30 km (about 1000 rolls of YPS106 recording paper). The recording quality may drop if the head is used in excess of this amount. In this case the thermal head must be replaced (additional cost), so please contact one of our sales offices or distributors.

17.5 Platen Roller Storage (RA1200, RA1300)

If the platen roller collects dust or other dirt, the thermal head may incur damage, or the quality of the printing or image reproduction may drop. When the roller shows signs of dirt, therefore, it must be cleaned carefully with gauze soaked in ethanol.

17.6 Dealing with Power Outages, etc.

If a power outage occurs, or the power cable is removed during recording, the status of the system following restoration of power will be as same status as [STOP] key on the operation panel is pressed.
In this case, because the settings at power off are backed up, recording can be started again immediately.
If the auto start function has been set to ON, recording with commence automatically.

☞ Refer to CHPTER 14 for details concerning the auto start function.

17.7 Cautions When Disposing of This Instrument

Be aware of the following when disposing of this instrument.

⚠ WARNING

This instrument employs a lithium secondary cell as the battery for back up.
Be sure to remove the lithium battery before disposing of this instrument.
The lithium battery should not be burned or broken open.
The lithium battery may explode if exposed to excessive heat. Moreover, the acid that may leak out if this battery is broken open is extremely dangerous and could cause serious injury. Tape the two potentials of the battery and dispose of it in the unburnable trash.

This instrument also employs an LCD screen.
Disposal of this LCD may be subject to local regulations.
Be sure to follow the relevant regulations when disposing of this LCD.

17.8 Troubleshooting

NOTE Please contact one of the sales offices or distributors listed in the back of this manual if this instrument requires repair.

Trouble	Cause	Action
No power Nothing displayed on the screen.	The power switch is not ON.	Switch on the power
	The power cable is not connected securely.	After switching off the power, connect the power cable securely and reapply power
	The fuse is blown.	The AC power supply input fuse inside this instrument cannot be changed by other than one of our technicians. If you think the fuse requires replacement,please contact our staff.
	The screen is in the auto off state.	The screen will be restored by touching any key.
When applying power ● The start LED is lit, but the touch panel keys do not work. ● Operation has started even though the start key was not pressed.	The system is set to auto start.	After stopping operation by pressing the Stop button, open the system menu and switch the auto start to OFF.
The touch panel keys do not work.	The start or copy LED was lit indicating the execution of a recording operation in memory or transient mode was in progress.	Press Stop to halt measurement, and then perform the operation.
Recording is disabled due to an error message. (RA1200, RA1300)	There is no recording paper.	Insert recording paper
	The thermal head is excessively hot. (the air temperature is -10°C or below)	Use this instrument in a place that has an ambient temperature of 0 to 40°C.
	The printing unit is open.	Ensure the printer unit is firmly closed.
Recording does not start even after pressing the start key. (RA 1200, RA1300)	The start trigger is ON.	Switch the start trigger OFF.
	External simultaneous recording is in progress.	Recording will not start unless a pulse signal is input to the remote pin, so press the start key after inputting a pulse.
	There is no recording paper.	Insert recording paper.
	Back-up filing is set to ON, but no disk or PC card has been set.	Set a disk or PC card in the set drive.
	The recording mode is not the real-time mode.	Switch the measurement mode to the real-time mode.

18. SPECIFICATIONS

18.1 Basic specifications

18.1.1 Recorder Specifications

Input block	Number of slots	8 (Mixed configurations of different amps is possible.)
Display unit	Display device	10.4 inch TFT color liquid crystal display
	Effective display area	211.2 mm × 158.4 mm (640 × 480 dots)
Internal memory	Standard	Storage capacity: 256K data/CH
	Increase memory unit	Storage capacity: 1M data/CH (optional)
Drive	Floppy disk drive	Built-in 3.5-inch floppy disk drive Format of MS-DOS, 2HD (1.25 MB/1.44 MB)
	PC card slot	Built-in JEIDA Ver.4.1(PCMCIA Rel.2.0) conforming TYPE Ⅱ ATA flash memory card/SRAM card can be used.
	External drive (SCSI connection)	Conformed to ANSI X3T9.2/86-109 Rev.10c (SCSI-2 standard) A maximum of Seven PDs or MOs (128/230/540/640 MB) can be connected. (Optional).
	Built-in MO unit	Compatible type of MO: 640/540/230/128 MB SCSI-ID:0 (Optional)
Remote terminal	START/STOP, MARK, FEED, PROTECT, ERROR, and SYNC, etc.	
Communication port	RS-232C	The highest velocity 38400bps (optional)
	GP-IB	IEEE488 (optional)
Printer block (RA1200,RA1300)	Printing method and printing width	Thermal printing using thermal head, Printing width: 216 mm
	Content of printing	Waveform printing, data logging, X-Y printing, and screen copy, and others
	Compatible chart	Roll paper 219.5 mm × 30 m (YPS106) Z-fold paper (219.5 mm × 200 m) can be used by the adapter.
	Waveform Printing density	Mm and voltage axis eight dots/axis ten dots in time/mm
Power supply	Rated power voltage	100-120 VAC or 200-240 VAC, specified at ordering
	Allowable fluctuation range of power voltage	90-132 VAC or 180-264 VAC
	Rated power supply voltage frequency	50/60Hz
	Range of power supply frequency change allowance	47 to 63Hz
	Withstand voltage	1.5k VAC 1 minute between ground and power supply input terminal.
	Insulation resistance	100MΩ or more at 500 VDC between ground and power supply input terminal.
	Power consumption	Approx. 180 VA max. Approx. 85 VA during standby (When eight 2-CH high-speed DC amps are built in)
Fuse	Max. rated voltage	250 V
	Max rated current	RA1100: 1A for 100 VAC type, 0.5 A 200 VAC type RA1200: 2A for 100 VAC type, 1A for 200 VAC type RA1300: 4A for 100 VAC type, 2A for 200 VAC type
	Type	Time lag
	*Users cannot replace the fuse because the fuse is installed in the recorder body. Please contact the sales agent for NEC San-ei or service center when there is a possibility that the fuse has been blown.	
Environment	Environmental for usage	Temperature: 0 - 40°C (5 to 40°C when driving FDD or built-in MO.) Humidity: 35-80%RH (without condensation) Location of use: indoor use Altitude: Not higher than 2000 m Resistance to vibration: conforming to MIL-STD-810E, Section of Basic transportation (However, the conditions that floppy disk drives and MO drive are operating are excluded.)

	Environment for storage	Temperature: -10 to 60°C Humidity: 35-85%RH (without condensation)
External dimensions and weight	External dimensions	372 ± 2 (W) × 156.5 ± 2 (H) × 305 ± 2 (D) mm (The rubber foot is included) Protrusions such as jog dial and knurled screw are not included.
	Weight	RA1100: Approx. 5.6kg (Approx. 8.1kg) RA1200,RA1300: Approx. 6.5kg (Approx. 9.0kg) The weights mentioned above are the weights of recorder without amps. Weights in parentheses are the weights of recorder with eight 2-CH AC Strain Amp, RS-232C, and GP-IB, SCSI, AC bridge power supply, and chart printing paper.
Others	Built-in clock	Accuracy: within ± 30 ppm (At room temperature)
	Backup	Built-in battery (rechargeable lithium battery) Setup information is backed up for a month (at full charge room temperature).

18.1.2 Amp Units

User can select amp units from among the following amp units according to the usage.

Amp unit	Model	Note
2-CH high-resolution DC amp	AP11-101	
2-CH FFT amp unit	AP11-102	
2-CH high-speed DC amp	AP11-103	
2-CH AC strain amp	AP11-104	
Event amp unit	AP11-105	
2-CH TC/DC amp unit	AP11-106	
TC･DC amp unit	AP11-107	
F/V converter unit	AP11-108	
2-CH vibration/RMS amp unit	AP11-109	
2-CH DC strain amp unit	AP11-110	

18.1.3 Printing Functions (RA1200, RA1300)

The following are common printing functions to all measurement modes.

Function	Waveform	Data	X-Y	Explanation
Grid pattern	√	-	√	The grid pattern automatically corresponds to the effective printing width. Selectable among main grid + sub grid, only main grid, and no grid. The grid is fixed to standard grid (10 mm, 1 mm) at the X-Y printing.
Scale print	√	-	√	Scale calculations are automatically carried out based on the sensitivity and the base line position, and the scale can be printed before or after recording.
Trigger information	√	√	-	Trigger point can be printed by an arrow mark (↓) and the date/time of trigger generation can be printed.
Data information	√	√	√	Measurement mode, date and start time of the measurement, data number, trigger condition (trigger point, date and time of the trigger), sampling speed, paper feed speed, time axes, etc. can be printed simultaneously with printing.
Page comment	√	-	√	Arbitrary input characters can be printed as well as waveform printing.
Title comment	√	√	√	Arbitrary input characters can be printed (Japanese printing). Character printing is performed prior to the waveform printing. 108 lines × 32 characters max.
A4-size report	√	-	-	The data can be printed in A4 size.

18.1.4 Amp Unit Functions

The following are printing and display functions regarding amp units.

Function	Printing	Monitor	Explanation
Physical value conversion	√	√	Full scale of waveform and display output from amp unit can be changed, and the input signal can be converted to physical values or arbitrary units.
Sensitivity representation switching function	√	√	Sensitivity representation can be set to full scale or sens/div. (example: 500 V FS→50 V/div)
Wide scale	√	√	The full scale is changed so as to the standard sensitivity setting covers the entire input range.
Channel distinction	√	-	Channel No. can be printed by the waveform in the RA1200, RA1300. Up to 4 characters can be registered.
Channel information	√	-	Setup information for each amp is available as well as measured signal printing in the RA1200, RA1300.
Channel comment	√	-	An arbitrary input character can be printed in the RA1200,RA1300. One line × 31 characters max.
Signal name print	√	-	Signal name synchronizes with the base line position in RA1200, RA1300 and is printed before the signal is printed. Concurrent use with user channel annotation is disabled.
Base line width setting	√	-	Setup of base line thickness for each channel is available in RA1200, RA1300.
Zero positions	√	-	It is possible to set the zero position in 5, 10 or 0.05% steps of full-scale.
Waveform color setting	-	√	The displaying color of waveform can be set.

18.1.5 Trigger Function

(1) Basic function

<table>
<tr><td rowspan="3">Trigger source</td><td>Internal trigger</td><td>Trigger by the triggered input signal of each amp</td></tr>
<tr><td>Manual trigger</td><td>Trigger by manual trigger in the operation panel</td></tr>
<tr><td>External trigger</td><td>Trigger by remote terminal or trigger input.</td></tr>
<tr><td>Pre-trigger</td><td colspan="2">0-100%, 1% step</td></tr>
<tr><td>Trigger filter</td><td colspan="2">1-65535 samples</td></tr>
<tr><td>Passing count</td><td colspan="2">1 to 255</td></tr>
<tr><td>Trigger operation</td><td colspan="2">Once, repeated, and endless</td></tr>
<tr><td>Trigger mode</td><td colspan="2">Four modes (OR, AND, A×B, and Window)
You can switch ON/OFF with the TRIG/SYNC key.
<table>
<tr><th>Trigger mode</th><th>Source channel</th><th>Conditions of trigger generation by input signal</th></tr>
<tr><td>OR</td><td rowspan="2">Possible to select from among all channels</td><td>When a trigger condition is satisfied in either channel</td></tr>
<tr><td>AND</td><td>When trigger conditions are satisfied in all selected channels</td></tr>
<tr><td>A×B</td><td>2 channels,
4 pairs max.</td><td>When the condition B source is satisfied after the condition A source satisfied in a combination</td></tr>
<tr><td>Window</td><td>8 channels</td><td>When signal level goes out of or comes into the range, which is defined by upper and lower trigger levels.</td></tr>
</table>
※ A manual trigger and an external trigger are generated regardless of the trigger mode.
※ The event amp unit cannot be specified for the source channel of the Window trigger.</td></tr>
<tr><td>Trigger output</td><td colspan="2">When the trigger conditions are satisfied, a 0-5 V signal (active LOW, pulse width of 1 ms) is output.</td></tr>
</table>

Time trigger function	The following settings are available regardless of the measurement mode. Start and stop by set time Setup of acquisition interval and length (time). ※ ***This function is set on the system screen.***

(2) Trigger functions of amp unit (Excluding event amp)

Trigger detection accuracy	±2%/FS
Trigger level	Physical value setting (voltage, etc.)
Trigger slope	The trigger slope differs depending on the trigger mode.

OR	Rising edge and falling edge
AND	Rising edge and falling edge
A×B	Rising edge and falling edge
Window	IN or OUT for specified range

(3) Event amp trigger functions

State setting	H, L and OFF for inputs 1 to 8.
State mode	OR and AND

State mode	Channel trigger generation condition
OR	When one of the input states becomes preset state.
AND	When all the input states become preset state

※ ***The event amp cannot be to specified for the source channel of the Window trigger.***

※ ***If trigger conditions have been satisfied, the next trigger won't be generated unless the triggered conditions must be canceled in advance.***

18.1.6 Filing Function

(1) Available drive

Drive type	Drive name	Compatible media (drive)
Built-in floppy disk drive	Fixed to A	1.25-/1.44-MB 2HD floppy disk
Built-in PC card drive	Fixed to B	ATA flash memory card SRAM card with card information (with attribute function)
Built-in MO unit	Fixed to C	128-/230-/540-/640-MB MO
External SCSI Connection drive	C-I	128-/230-/540-/640-MB MO drive and PD drive

※ ***Only recommended drives and media maintain compatibility.***

(2) Filing function

The real-time measurement data is transmitted and saved in the storage media such as internal floppy disk, internal MO drive, PC card slot, and external MO or PD drive connected the SCSI interface.

Common function	Detailed description
User-specified folder automatic creation	This function automatically cerates user-defined folders at the measurement, enabling several users to use single recorder unit.
Daily folder automatic generation	Filing data management is possible by a daily automatic folder creation.
Auto name	The file (folder) is saved by the name of arbitrary 4 characters with automatic updated four digits. ※ ***When two or more files are saved in one data acquisition, the destination becomes a folder.***

(3) File operation

Target drive	Built-in floppy disk drive, built-in PC card slot, built-in MO unit, and all drives connected to the SCSI connector in the recorder.
Format	Logical and physical formatting by the MS-DOS standard format is available.
Environment file save	Setup and annotation information can be saved. The environment file can be saved as a startup file (only in FD), which is read automatically at power-up.

Memory data save	The recorded memory data can be saved in binary.
Folder creation	A folder of arbitrary name with up to 8 characters can be created.
Deletion	File and the folder can be deleted.
File reading	Environment file (.ENV), memory data file (.DAT), and annotation text (.TXT) can be read.

18.1.7 Monitor Display and Setup Functions

You can set a variety of measurement conditions in operation panel and touch panel.

(1) Input setup screen

The screen is used for input waveform display and input setup.
Digital values of input signal can be displayed with the information display function.

Operation panel	Set item
AMP	This button sets amp conditions, physical value conversion of input signal, waveform color, base line width, signal name input, channel comment input, etc.
TRIGGER	This button sets trigger mode, trigger condition, recoding start, pre-trigger, trigger filter, and pass count.
SPEED/RECORD CONDITION	This button sets conditions regarding recording.

(2) Replay setup screen

This screen is used to select memory data or filing data in the recorder and perform physical value conversion setup and waveform replay.

Operation panel	Set item
CHANEL	This button is used to set the amp of the channel in which recorded data is replayed.
DATA SELECTION	This button is used to select data replayed.
SEARCH	This button is used to make a jump to the target part in the data to display.

18.2 Specifications for each measuring mode

18.2.1 Memory Mode

This mode records measurement data through input signal in the memory of recorder.
It is possible to replay and copy in the display.

(1) Memory acquisition

Recording speed	Recording speed is set by sampling speed (cycle). 1, 2, 5, 10, 20, 50, 100, 200, 500 μs 1, 2, 5, 10, 20, 50,100, 200, 500ms, and 1s User set 1 - 999 μs (1 μs steps), 1 - 999 ms (1 ms steps), and 1 - 999s (1s steps) External-clock-synchronized recording is also possible (remote terminal or external sampling input).
Memory capacity	256K data/channel (Up to 1M by an optional expansion memory) ***※ The memory capacity in function operation becomes 1/4.***
Block division	1, 2, 4, 8, 16, 32, 64,128 ***※ The division is from 1 to 32 in function operation.***
Recording operation	Pressing the START key in the operation panel starts recording. (The start by time trigger is also possible) Once, Repeat, or Endless can be set. Recording method / Recording operation: Once: Records only once and completes Repetition: Repeatedly records for the number of times of block division and completes. Endless: Repeatedly records until stopped. ***※ At endless, current data is overwritten.***
Range of copy	Range of specification and trigger center Copy range / Copy operation: Specification range: Range between two arbitrary points can be copied. Trigger center: Data amount from 1 to 100% of the trigger center is copied.

※ Memory capacity at channel unification and memory division.

Channel unification setting	Usable channel	Memory division setting							
		1	2	4	8	16	32	64	128
No ch unification	16 channels	256KW	128KW	64KW	32KW	16KW	8KW	4KW	2KW
2-ch unification	A-side channel	512KW	256KW	128KW	64KW	32KW	16KW	8KW	4KW
4-ch unification	1A, 3A, 5A, 7A	1MW	512KW	256KW	128KW	64KW	32KW	16KW	8KW
8-ch unification	1A, 5A	2MW	1MW	512KW	256KW	128KW	64KW	32KW	16KW

(2) Auto copy printing

In the RA1200, RA1300, automatic printing is available after data acquisition in the memory.

Range of copy	Synchronizes with the acquisition settings.
Waveform printing and copy magnifications	Magnifications: 1/1 (standard), 2, 5 times Compressions: 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, and 1/1000 times ***※ 100 data/div at standard (1/1)***
Digital printing and copy interval	1, 2, 5, 10, 20, 50,100,200,500, and 1000 steps
X-Y printing and overwrite	ON/OFF (Only when memory block is divided)

(3) Memory filing

Data is automatically filed in the memory in recorder after measurement data is recorded.

Acquisition drive	Built-in drive, built-in PC card slot, or SCSI-connected external drive
Range of copy	Synchronizes with the acquisition settings.

Data output format	Binary or CSV ***※ CSV format, which is used by software such as spreadsheets, is a text format uses comma as a delimiter.*** ***※ File extension: .DAT (binary), .CSV (CSV)***

18.2.2 Transient Mode

At normal recording, the recorder runs in the real-time mode; at trigger generation, the recorder operates in the memory mode.

(1) Transient waveform recording

In RA1200, RA1300, real-time recording and memory recording run simultaneously.

Acquisition operation	The START key in the operation panel starts recording. (The START with time trigger is also available.)
Real-time acquisition	Refer to the real-time mode. ***※ Real-time recording perform peak data acquisition regardless of settings.***
Memory acquisition	Refer to the memory mode.

(2) Transient waveform recording

In the RT1200, RA1300, the recorder initially performs the real-time waveform recording. Once the recorder detects a trigger, the recorder goes into the memory mode and records data in internal memory, and then performs auto copy.

(3) Transient filing

The backup filing and memory acquisition are performed simultaneously. After the backup filing is completed, the recorded data in the internal memory is automatically saved (memory filing). In this case, link information for the memory filing data is appended to the backup filing data, permitting to display the same image display as the printed image in the screen.

Acquisition drive	Built-in drives, built-in PC card slot or SCSI-connected external drive.
Real-time acquisition capacity	10 to max. Available capacity ***※ The empty capacity in the backup filing is available only for the area immediately after formatting.***
Range of memory copy	Synchronizes with the acquisition settings.
Data output format	Only in binary MARK.IDX Backup filing data (including link information) ¥MEMBLOCK¥BLK_????.DAT memory filing data ***※ A number from 0001 to 0128 enters in ????.***

18.2.3 Filing Mode

This mode directly saves measurement data through input signals in media.
The recording method can be set to the sampling or peak.

Acquisition operation	The START key in the operation panel starts recording. (The START with time trigger is also available.)
Acquisition drive	Built-in drives, built-in PC card slot or SCSI-connected external drive.
Acquisition speed	200, and 500 µs 1, 2, 5, 10, 20, 50, 100, 200, and 500 ms, 1s ***※ High-speed recording is not available depending on the drive and channel numbers to be used.***
Acquisition method	Sampling (Saves data in the interval of pre-set acquisition speed) Peak (Saves the max. and min. values in the pre-set acquisition time by 1 μ s sampling)
Waveform printing ON/OFF (For RA1200)	In RA1200, simultaneous data acquisition and waveform printing in chart is possible. The paper feed speed is the same as that of the real-time waveform printing.
Data output form	Only in binary ¥LOGFILE¥SINGLE¥REC_????.FSD sample filing data ¥LOGFILE¥SINGLE¥REC_????.FPP peak filing data ***※ A number from 0001 to 9999 enters in ????.***

18.2.4 Real-Time Mode

Backing up the input signal is recorded directly on the printing paper in RA1200, RA1300, and the recorded data can collect.

RA1100 cannot be set in a real-time mode

(1) Acquisition (printing) operation

Acquisition (printing) operation	The START key in the operation panel, trigger detection, and pre-set time (time trigger) starts measurement.
Mark function	The trigger generation during recording or pressing the Mark Print key records an event mark. The event mark data (128 max.) is saved with the acquisition data in the backup filing.

(2) Waveform printing

The waveform printing of the input signal is performed.

Paper feed speed	1, 2, 5, 10, 20, 25 mm/s 2, 5, 10, 20, 50, 100 mm/min (RA1200) 1, 2, 5, 10, 20, 25, 50, 100 mm/s 10, 20, 50, 100 mm/min(RA1300) User-set speed is available from 1 to 25 mm/s or from 1 to 99mm/min. The waveform printing by the external clock synchronization is also possible. (by a remote terminal or a SYNC IN input) ***※ Time/div can be displayed.***
Paper feed accuracy	±0.01% (error between time printing grid at room temperature)
Setting of length of printing	Continuous, and shot (time and div) User-set length is available from 1 to 1000 div.
Time axis	10 mm/div
Interpolation function	Available
Data acquisition	Peak detection by 1 μ s sampling
Axis dot pitch of time	10 dots/mm
Amplitude axis dot pitch	8 dots/mm

(3) Numeric printing

The input signal is printed by digital data.

Print cycle	1,2,5,10,30s 1,2,5,10,30min,1 hour User set 1-999s (1s step) and 1-60min (1min step) **The printing by the external clock synchronization is also possible. (Depend on a remote terminal and the SYNC IN input)**
Setting of number of printings	A continuous printing or it is possible to set (*O) the user (1-1000 data).

(4) X-Y printing

The X-Y printing of the input signal is done.

Set channel	The combination of X axis and Y axis channel can be displayed up to 15 maximum, arbitrary kinds.
Effective printing width	200 ×200mm
Printing density	400 ×400 dots
Interpolation function	It is (line)/none (dot)
Speed of sample	10ms

※ The event amp unit cannot be used.

(5) Backup filing function

The input signal can be collected simultaneously with the waveform printing.

Acquisition drive	External drive with which built-in drive, built-in PC card slot or SCSI is connected
Acquisition method	***Peak (The maximum and the minimum value between those are collected to media by 1 μ s sampling at acquisition intervals)***
Acquisition speed	0.1 mm/s (chart feed speed): Synchronizes with waveform printing speed Example) 1ms at 4ms and 10mm/s of 25mm/s (When the magnification is reproduced by x1, the waveform the same as the real-time waveform printing is output)
Data output form	Only the binary The ¥RTMFILE¥SINGLE¥REC_????.FPP acquisition operation: Once ¥RTMFILE¥REPEAT¥REC_????.FPP acquisition operation: Repetition ***※ A number from 0001-9999 enters in ????.***

※ Output to the recording paper is always the waveform.

18.3 Output of Acquisition Data

All of the acquisition data partially can be recorded, (*S) changes, the file format be preserved, and FAX transmit with RS-232C unit of the optional.

The output destination cannot be set in the printing part with RA1100.

At the output destination	Output form	Output method
Printing part (RA1200, RA1300)	Waveform printing	The axis can expand at time, and the printing waveform be reduced. 2 and times of five of expansion 1/1 (standard) Compression 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, 1/1000, and A4 compression ***※ 100 data of standard (one time)=/div***
	Numeric printing	Printing data interval 1, 2, 5, 10, 20, 50,100,200,500, and 1000 steps
	X-Y printing	Printing data interval 1, 2, 5, 10, 20, 50,100,200,500, and 1000 steps
File	Binary	All data within the set range is preserved.
	CSV	Preservation data interval 1, 2, 5, 10, 20, 50,100,200,500, and 1000 steps
FAX	Waveform printing	The axis can expand at time, and the printing waveform be reduced. 2 and times of five of expansion 1/1 (standard) Compression 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, 1/1000, and A4 compression ***※ 100 data of standard (one time)=/div*** ***※ Optional RS-232C unit (RA11-106) and FAX-Modem are necessary.***

18.4 Standard Functions

Function name	Detailed functions
Basic operation functions	This function performs an operation processing for the block specified in memory and allows the result data of this processing to display in the screen, print on chart, and save as a file. Copying or filing of the result is available after an automatic execution at acquisition. Zone statistic operation: max., min., P-P value, and avg.
Screen copy (Only in RA1200,RA1300)	Screen hard copy is available in the printing function.
Save of screen image	Saving in a file in the form of bitmap is available.
Chart feed (Only in RA1200,RA1300)	By depressing the Feed key, you can feed blank chart.
List display	Current setup information is listed.
Initialization	Recorder is initialized.
Auto start (standby) function	The status immediately before a power failure or interruption can be recovered in the mode other than the filing mode. The condition at recovery varies depending on the conditions at power failure. In the RA1200, RA1300, date, time, and data No. at the power failure if the wait operation has been set during recording or sampling can be printed
Save/read of data and settings	Memory acquisition data and up to four recorder setup conditions can be saved.
System check	Self-checking of recorder system is available.
Test print (Only in RA1200,RA1300)	Printing of date, time, ROM version, and test pattern are available by test printing
Data No. setup	Measurement data numbering for each measurement data is available.
Backlight auto shut-down Screen saver	If no settings and operations through operation touch panel keys or touch panel key are made for a certain period of time (1 to 60 min.), backlighting of display can be automatically turned off or screen saver can be activated.
Alarm error display function	An alarm is generated at an error generation (e.g. chart run-out, thermal head release, abnormal temperature rise of thermal head). In addition, an error window opens.
Memory capacity change function	In the memory or transient modes, a memory capacity expansion is possible by restricting the number of channels to be used.
A4 report output (Only in RA1200, RA1300)	A4-size report output is available by specifying data range in the memory.

18.5 Floppy Disk Drive/PC Card Slot

18.5.1 Floppy Disk Drive

Function	Acquisition data and recorder setup conditions are saved.
Number of drives	One drive
Floppy disk which can be used	3.5-inch 2HD floppy disk (1.25MB/1.44MB)

18.5.2 PC Card Slot

Function	Measurement data (filing data) and setup conditions can be saved.
Slot	Conformed to JEIDA Ver.4.1 (PCMCIA Rel.2.0) TYPE Ⅱ x 1 slot
Usable PC card	ATA flash memory card (2M to 640 MB) SRAM card with card information (with attribute function)

18.6 Remote Terminal

18.6.1 Overview

Remote function allows start or stop of recording/printing, chart feed, mark input, or input/output of parallel synchronous operations.
Moreover, waveform printing (chart feed), filing, numerical data printing, and memory acquisition are available in synchronization with the trigger input/output or external pulse signals.
Other available functions by the external input are prevention of data file damage caused by a power failure, recorder error output, and waveform judgment output.

(1) External pulse synchronization signals - SYNC IN/SYNC OUT (Only in RA1200, RA1300)

Waveform or numerical data printing is available in synchronization with an external pulse signal input at the SYNC IN pin. This function is effective only in the real-time mode. Operation starts upon the detection of a rising edge of 0-5 V signal.

The maximum input frequencies by an external pulse are as follows.

Printing format	Paper feed pitch	Max.frequency of external pulse. (RA1200)	Max.frequency of external pulse. (RA1300)
Waveform	0.025 mm/pulse	800 pulses/s (800 Hz)	2000 pulses/s (800 Hz)
Waveform	0.1 mm/pulse	200 pulses/s (200 Hz)	500 pulses/s (200 Hz)
Numerical data	-	1 pulse/s (1 Hz)	1 pulse/s (1 Hz)

In addition, SYNC OUT outputs the IN signal of 0-5 V without any conversions in the external-pulse-synchronized waveform printing and numerical data printing.

The following signals are output in the external-pulse-synchronized waveform printing and numerical data printing.

Printing format	Paper feed pitch	SYNC OUT pulse output frequency
Waveform	0.025 mm/pulse	(Chart feed speed: Mm/s)/0.025 mm (Hz) Example) 20 mm/s → 800 Hz, 1 mm/min→ approx. 0.667 Hz
Waveform	0.1 mm/pulse	(Chart feed speed: Mm/s)/0.1 mm (Hz) Example) 20 mm/s → 200 Hz and 1 mm/min → approx. 0.167 Hz
Numerical data	-	One pulse of each print timing is output.

(2) External sampling signal - EXT IN

Data acquisition in synchronization with external pulse signal input at the EXT IN pin is available.
Operation starts upon the detection of a falling edge of 0-5 V signal.
By setting the external sampling, sampling is performed in the memory filing modes.
The maximum external pulse input frequencies by external sampling are as follows.

Measurement mode	Maximum input frequency of external input
Memory	10 kHz
Filing	100 Hz

(3) Start ON/OFF signals - REC IN/REC OUT

External control of start ON/OFF is available. Operation by external control is the same as that by pressing the Start or Stop key. The low level of 0-5 V signal activates the start condition; the high level stops the operation. Since REC OUT outputs the REC IN signal directly, the low level of 0-5 V signal is output at the start condition and the high level is output at the stop condition.

(4) External event mark signals - MARK IN/MARK OUT

An event mark printing at an edge of chart is available during waveform or data printing in the real-time recording. The event mark is printed upon the detection of the rising edge of 0-5 V signal. In the filing mode, marking data (128 max.) is saved with acquisition data.

Since the MARK OUT outputs the MARK IN signal directly, the low level of 0-5 V signal is output at the Mark Print key input.

(5) Protecting input signal - PROTECT IN

During filing recording, power output from uninterruptible power supply can protect media from data missing and damage caused by power failure. The filing recording ends upon the detection of the rising edge of 0-5 V signal.

(6) Paper feed signal- FEED IN/FEED OUT

A Low level of 0-5 V input to the FEED IN pin feeds the chart. Since FEED OUT outputs the FEED IN signal directly, the low level of 0-5 V signal is output during the chart feed operation.

(7) Error output - ERROR OUT (Only RA1200, RA1300)

An error is output at chart run-out, thermal head release, and abnormal temperature rise. It is output at file error, too. The output is an open collector output.

(8) Waveform judgment output - WAVE GOOD and WAVE NG (optional)

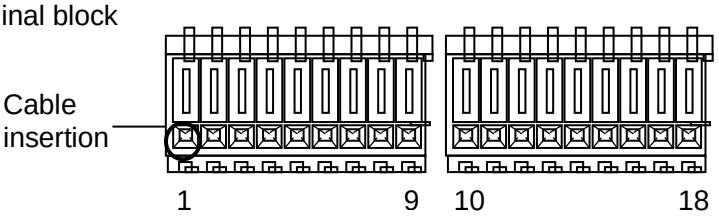
This output is available only when waveform judgment unit (RA11-753) is installed. After the signal is judged whether it is within the specified range or not, the judgment result is output. The output is an open collector output.

(9) Trigger input and output - TRIG IN and TRIG OUT

A trigger can be generated by external signal. The operation starts upon the detection of the falling edge of 0-5 V signal. The trigger generates the OUT signal in the form of a low level signal of 0-5 V for 1 ms.

18.6.2 Terminal Block/Terminal Arrangement/Circuit

Terminal block



The terminal number is 1 to 9 and 10 to 18 (left to right). Figure is viewed from the terminal side.

Terminal No.	Signal name	Function	I/O level
1	GND		
2*	SYNC IN	Externally synchronized pulse input	0-5V
3*	SYNC OUT	Synchronization pulse output	0-5V
4	REC IN	Start ON/OFF input	0-5V
5	REC OUT	Start ON/OFF output	0-5V
6	MARK IN	Mark input	0-5V
7	MARK OU	Mark output	0-5V
8*	FEED IN	Chart feed input	0-5V
9*	FEED OUT	Chart feed output	0-5V
10	EXT IN	External sample input	0-5V
11	PROTECT IN	Protecting input	0-5V
12	ERROR OUT	Error output	Opening collector
13	WAVE GOOD	Waveform judgment result “GOOD" output	Opening collector (Optional)
14	WAVE NG	Waveform judgment result “NG" output	
15	TRIG IN	Trigger input	0-5V
16	TRIG OUT	Trigger output	0-5V
17	GND		
18	GND		

※ 0 - 5 V input
LOW level 0.5 V or lower
HIGH level 4.5 V or higher

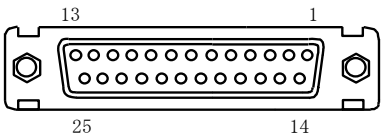
※ 0 - 5 V output
LOW level
1.0 V or lower (IOL = 5 mA or lower)
HIGH level
4.0 V or higher (IOH = 5 mA or lower)

※ Opening collector output
Collector current: 25 mA max.
Collector-emitter voltage: 50 V max.

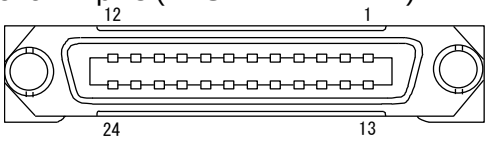
Signals with the * mark are used in the RA1200, RA1300, are not used in the RA1100.

18.7 Interface for Communications (Optional)

18.7.1 RS-232C Unit (RA11-106: Optional)

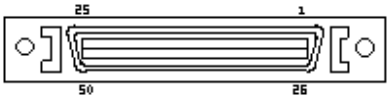
<table>
<tr><td>Functions</td><td colspan="2">• Control of the Omniace with commands is possible by connecting to the host computer.
• Control of the Omniace with commands is possible by connecting to modem.
• Automatic call for a telephone line from the Omniace is possible.
• Transmission of recorded waveform to a fax machine via a fax modem is possible.</td></tr>
<tr><td rowspan="8">Standard</td><td colspan="2">Conformed to JIS X5101 (formally C6361)</td></tr>
<tr><td>Data format</td><td>Bit cereal</td></tr>
<tr><td>Baud rate</td><td>38400,19200,9600,4800, and 2400 [bps]</td></tr>
<tr><td>Transfer method</td><td>Asynchronous method and full duplex communication method</td></tr>
<tr><td>Start bit</td><td>1 bit</td></tr>
<tr><td>Data bit</td><td>7 and 8 bits</td></tr>
<tr><td>Stop bit</td><td>1 and 2 bits</td></tr>
<tr><td>Parity bit</td><td>No parity bits, EVEN, and ODD</td></tr>
<tr><td>Electrical characteristics</td><td colspan="2">Conformed to JIS X5101
<table>
<tr><td>RD (data reception)</td><td>SD (data transmission)</td></tr>
<tr><td>true -3 to -15V</td><td>true -3 to -8V</td></tr>
<tr><td>false +3 to +15V</td><td>false +3 to +8V</td></tr>
</table>
<table>
<tr><td>CS (Transmission permission)</td><td>RS (transmission request)</td></tr>
<tr><td>ON +3 to +15V</td><td>ON +5 to +8V</td></tr>
<tr><td>OFF -3 to -15V</td><td>OFF -5 to -8V</td></tr>
</table>
<table>
<tr><td>DR, CD</td><td>ER</td></tr>
<tr><td>ON +3 to +15V</td><td>ON +5 to +8V</td></tr>
<tr><td>OFF -3 to -15V</td><td>OFF -5 to -8V</td></tr>
</table></td></tr>
<tr><td>Connector</td><td colspan="2">D sub connector 25 pins (Recorder side socket: DBLC-J25SAF-13L9)
 
</td></tr>
<tr><td>Weight</td><td colspan="2">Approx. 50 g</td></tr>
<tr><td>Pin alignment</td><td colspan="2">
<table>
<tr><td>Pin No.</td><td>Signal name</td><td>Note</td></tr>
<tr><td>1</td><td>FG (Frame GND)</td><td></td></tr>
<tr><td>2</td><td>SD (Transmitted Data)</td><td>Output</td></tr>
<tr><td>3</td><td>RD (Received Data)</td><td>Input</td></tr>
<tr><td>4</td><td>RS (Request to Send)</td><td>Output</td></tr>
<tr><td>5</td><td>CS (Clear to Send)</td><td>Input</td></tr>
<tr><td>6</td><td>DR (Data to Ready)</td><td>Input</td></tr>
</table>
<table>
<tr><td>Pin No.</td><td>Signal name</td><td>Note</td></tr>
<tr><td>7</td><td>SG (Signal GND)</td><td></td></tr>
<tr><td>8</td><td>CD (Carrier Detect)</td><td>Input</td></tr>
<tr><td>9-19</td><td>N.C (No Connect)</td><td></td></tr>
<tr><td>20</td><td>ER (Data Terminal Ready)</td><td>Output</td></tr>
<tr><td>21-25</td><td>N.C (No Connect)</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td></tr>
</table>

18.7.2 GP-IB Unit (RA11-105: Optional)

<table>
<tr><td>Functions</td><td colspan="2">The GP-IB unit is used to interface with computers, enabling control of Omiace by commands. Higher speed of data transfer than RS-232C is available.</td></tr>
<tr><td rowspan="7">Standard</td><td colspan="2">IEEE488 conforming</td></tr>
<tr><td>Data form</td><td>Eight bit parallel</td></tr>
<tr><td>Forwarding form</td><td>Three wire handshaking</td></tr>
<tr><td>Address setting</td><td>0 to 30 (31 types) settings are available</td></tr>
<tr><td>Delimiter</td><td>CR•LF, CR, LF, and EOI (four types) are available</td></tr>
<tr><td>Signal logic</td><td>Negative logic</td></tr>
<tr><td>Interface</td><td>Function list
<table>
<tr><th>Function</th><th>Content of function</th></tr>
<tr><td>SH1</td><td>All functions of source handshaking are provided.</td></tr>
<tr><td>AH1</td><td>All functions of acceptor handshaking are provided.</td></tr>
<tr><td rowspan="3">T6</td><td>Basic talker function is provided.</td></tr>
<tr><td>Serial poling function is provided.</td></tr>
<tr><td>Talker release function by the MLA specification is provided.</td></tr>
<tr><td rowspan="2">L4</td><td>Basic listener function is provided.</td></tr>
<tr><td>Listener release function by the MLA specification is provided.</td></tr>
<tr><td>SR1</td><td>The service request all functions are provided.</td></tr>
<tr><td>RL1</td><td>All functions of remote control/local are provided.</td></tr>
<tr><td>PPO</td><td>No parallel poling function</td></tr>
<tr><td>DC1</td><td>All functions of device clear are provided.</td></tr>
<tr><td>DT1</td><td>All functions of device trigger are provided.</td></tr>
<tr><td>C0</td><td>No controller function</td></tr>
</table>
Time-out specification OFF and 1-60 seconds.
If there are no respond for more than timeout time, communication finishes.
The status goes into wait status even though there is no response if timeout setting is OFF.</td></tr>
<tr><td>Electrical characteristics</td><td colspan="2">Driver V_{OL}=0.5 V or lower, V_{OH}=2.5 V or higher
Receiver V_{IL}=0.8 V or lower, V_{IH}=2.0 V or higher</td></tr>
<tr><td>Connector</td><td colspan="2">Anphenol 24 pins (ADS-B24BLFDE1B)
 
</td></tr>
<tr><td>Weight</td><td colspan="2">Approx. 60 g</td></tr>
<tr><td>Pin alignment</td><td colspan="2">
<table>
<tr><th>Pin No.</th><th>Signal name</th><th>Pin No.</th><th>Signal name</th><th>Pin No.</th><th>Signal name</th></tr>
<tr><td>1</td><td>DIO1</td><td>7</td><td>NRFD</td><td>13</td><td>DIO5</td></tr>
<tr><td>2</td><td>DIO2</td><td>8</td><td>NDAC</td><td>14</td><td>DIO6</td></tr>
<tr><td>3</td><td>DIO3</td><td>9</td><td>IFC</td><td>15</td><td>DIO7</td></tr>
<tr><td>4</td><td>DIO4</td><td>10</td><td>SRQ</td><td>16</td><td>DIO8</td></tr>
<tr><td>5</td><td>EOI</td><td>11</td><td>ATN</td><td>17</td><td>REN</td></tr>
<tr><td>6</td><td>DAV</td><td>12</td><td>SHIELD</td><td>18-24</td><td>GND</td></tr>
</table>
</td></tr>
</table>

18.8 SCSI Unit and Internal MO Unit (optional)

18.8.1 SCSI Unit (RA11-107: Optional)

Function	By connecting MO or PD drive to the SCSI connector, long-time measurement data save (filing) or setup condition save is available. Up to seven drives can be connected.
Standard	Conformed to ANSI X3T9.2/86-109 Rev.10c (SCSI-2 standard) (However, the command conforms CCS)
Electrical characteristics	Driver VOL 0.4 V or lower, VOH 3.5V or higher Receiver VIL 0.8V or lower, VIH 2.2V or higher
Terminator	220/330 Ω
Connector	Half pitch 50 pins (pin type) PCS-XE50CLFDT8 
Weight	Approx. 50 g

Pin alignment

Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
2	∗ I/O	16	BSY	40	SB5
4	REQ	20	ATN	42	SB4
6	∗ C/D	25	N.C.	44	SB3
8	SEL	26	TERMPOW	46	SB2
10	MSG	34	SBP	48	SB1
12	RST	36	SB7	50	SB0
14	ACK	38	SB6		
1, 3, 5, 7, 9, 11, 13, 15, 17 to 19, 21 to 24, 27 to 33, 35, 37, 39, 41, 43, 45, 47, 49				GND	

18.8.2 Internal MO Unit (RA11-108: Optional, Specified at Ordering)

Function	By using the internal MO drive, long-time measurement data save in MO (filing) or setup condition save is available. Up to six MO or PD drives can be connected to this MO unit
Usable disk	640 MB/540 MB/230 MB/128 MB of magneto-optic disk (MO)
SCSI ID	0-7, "0" at factory shipment
Terminal resistance mode (TRM)	Valid/invalid switching Set to "1" at factory shipment
Connector	Half pitch 50 pins (pin type)
Attachments	Ejection pin
Weight	Approx. 1.3 kg

Note 1) This unit and SCSI unit (RA11-107) cannot be installed together.
Note 2) This unit and DC power supply unit (RA11-110) cannot be installed together.

18.9 Memory Expansion Unit (RA11-126: Optional, Specified at Ordering)

Function	Memory expansion unit allows memory recording time of input signals to increase in the memory and transient modes. ***※ Data representation: 1w = One data, 1KW = 1024 data, 1MW = 1048576 data.***
Weight	Approx. 60 g

Memory capacity when memory unification or segmentation is set.

Channel unification Setup	Usable CH	Memory segmentation setup							
		1	2	4	8	16	32	64	128
No channel unification	16 CH	1MW	512KW	256KW	128KW	64KW	32KW	16KW	8KW
2-CH unification	A-side CH	2MW	1MW	512KW	256KW	128KW	64KW	32KW	16KW
4-CH unification	1-A, 3-A ,5-A, 7-A	4MW	2MW	1MW	512KW	256KW	128KW	64KW	32KW
8-CH unification	1-A, 5-A	8MW	4MW	2MW	1MW	512KW	256KW	128KW	64KW

18.10 DC power supply unit (RA11-110: Optional, Specified at Ordering)

Function	This unit permits the recorder to be used by DC power supply.
Power supply voltage	11 to 28 VDC
Withstand oltage	1.5 kVAC for 1 minute between ground and power supply input terminal
Insulation resistance	100 MΩ or more at 500 VDC between ground and power supply input terminal
Attachment	DC power supply cable (0311-5180)
Weight	Approx. 1.3 kg

Note 1) This unit and internal MO unit (RA11-108) cannot be installed together.
Note 2) When the recorder installs both AC and DC power supplies, the recorder works under AC power supply.

18.11 AC Bridge Power Supply Unit (RA11-109: Optional, Specified at Ordering)

Function	This unit is a bridge power supply for 2-CH AC strain amp unit (AP11-104)
Bridge power supply	2 Vrms, sine wave, 5 kHz
Synchronization	By using synchronization connector, synchronization with other AC bridge power supply unit of RA1000. INT/EXT switching allows master (INT)/slave (EXT) setting. LED illuminates at INT. ※It is possible to synchronize with RT3424ST. Be careful for connector connections.
Weight	Approx. 60 g

Note 1) When using 2-CH strain amp unit, this unit must be pre-installed in the recorder.

18.12 200 VAC Power Supply Unit (RA11-124,RA12-108, RA13-105:Optional, Specified at Ordering)

Function	This unit is used for 200 VAC power supply.
Power supply voltage	Voltage: 180 AC to 264 VAC
Withstand voltage	1.5 kVAC for 1 minute between ground and power supply input terminal
Insulation resistance	100 MΩ or more in 500 VDC between ground and power supply input terminal
Attachment	AC power supply cable. The following standard AC power cable and adapter are used. AC power cable: 0311-5112 x1 (3.5m for 200VAC, without adapter)

18.13 English Display Unit (RA12-106: Optional, Specified at Ordering)

Function	Operation panel, Display indications, and printing information become English.
Manual	Three English manuals are provided.

18.14 Optional Functions

18.14.1 Operation Unit (RA11-752: Optional)

Function	This unit performs operation processing for the specified block of data, displaying the result of the processing and printing the waveform or saving in a file. Automatic copying and filing at recording are available. Zone statistics operation and function operation are available.
Zone statistics operation	Besides the basic operation functions as standard functions, which include max./min. values, P-P value, and average value operation, the following statistics operations are available. Area Root-mean-square value Standard deviation Rising time and falling time
Function operation	Operation processing in combination with the following function operations is available. Four arithmetic operations / Differential Absolute value / Integral Square root / Quadratic differential Exponent / Double integral Common logarithm / Moving average Trigonometric functions (sin, cos, tan, asin, acos, atan)

18.14.2 FFT Unit (RA11-751: Optional)

Function	This unit performs the FFT operation processing for input signals or saved data, displaying the result on screen.
Analytical frequencies	10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20k, 40k, 80k, 200k, and 400k (Hz)
Recording operation	Trigger synchronization or free run
Number of sampling data	1000, 2000, 4000 (data)
Window function	OFF, hanning, hamming, exponential (constant 1.5 and 2.5), and force
Average processing	Addition: 1-1000 times Addition method: Time axis simple addition averaging Frequency axis (simple addition averaging, index weighted averaging, and peak processing)
Analytical operation processing	Linear spectrum RMS Spectrum Power Spectrum Power Spectrum density Cross power Spectrum Transfer constant Coherence function Octave analysis (1/1 and 1/3)

18.14.3 Waveform Judgment Unit (RA11-753: Optional)

Function	This unit is used to judge whether the input waveform signal is within the specified range or not. The screen displays waveform judgment area, and then displays waveform for judgment.
Number of judgment channels	8 channels max.
Creation of judgment area	Created based on the acquisition data
Judgment output	WAVE GOOD and WAVE NG are output as open collector from a remote terminal.

18.15 Attached Table and Drawing

18.15.1 Maximum Memory Acquisition Time

The relation between the memory capacity and maximum recording time in the memory and transient modes is shown as follows. The recording time differs according to the setups of channel unification and memory segmentation.

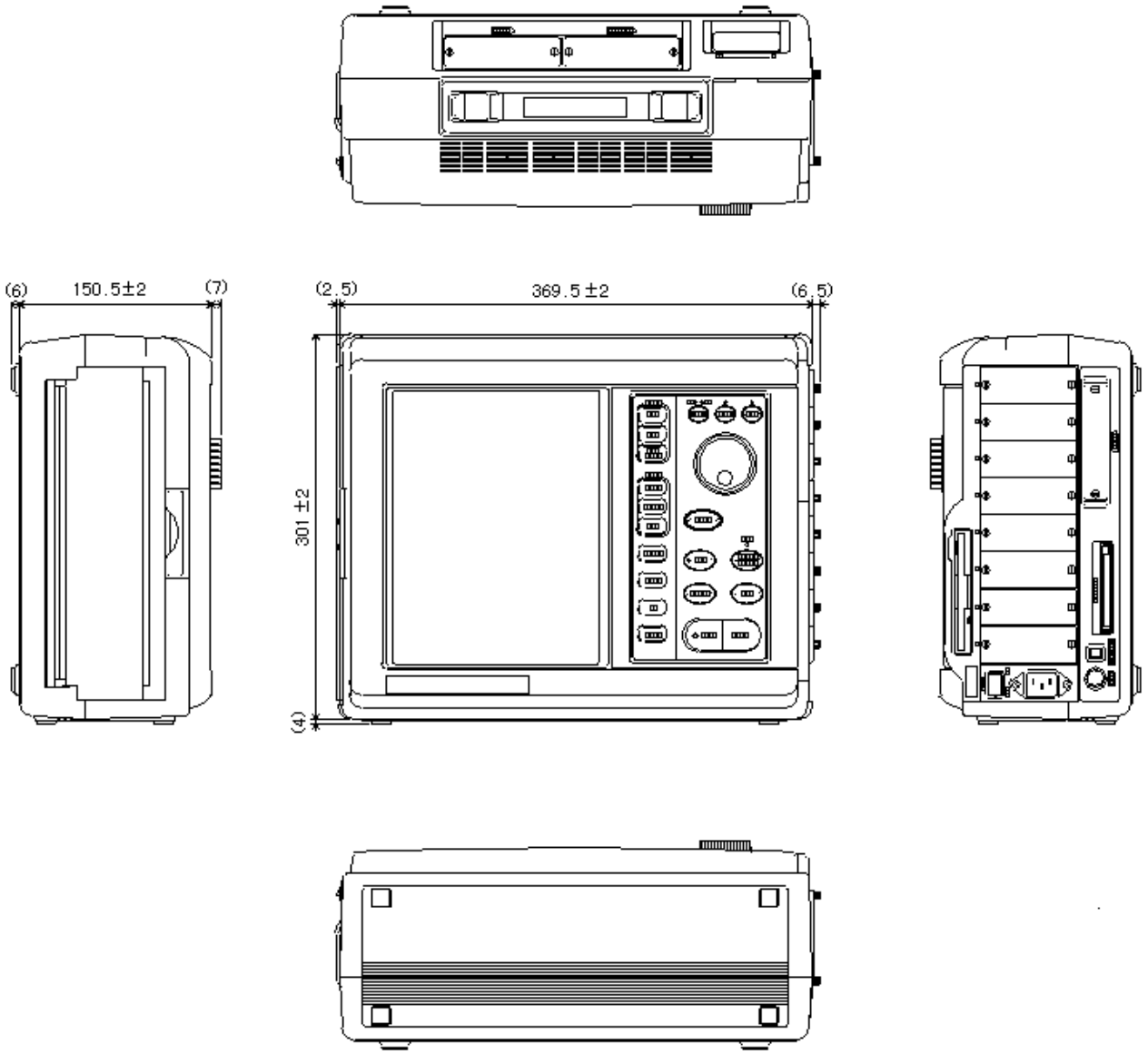
Maximum recording time 1 (at standard memory and one memory segmentation)

Channel unification setting	No channel unification	2-CH unification	4-CH unification	8-CH unification
Usable channel	16 channels	A-side channels	1-A, 3-A, 5-A, 7-A	1-A, 5-A
1 μs	262 ms	524 ms	1.04 s	2.09 s
2 μs	524 ms	1.04 s	2.09 s	4.19 s
5 μs	1.31 s	2.62 s	5.24 s	10.4 s
10 μs	2.62 s	5.24 s	10.4 s	20.9 s
20 μs	5.24 s	10.4 s	20.9 s	41.9 s
50 μs	13.1 s	26.2 s	52.4 s	1min44 s
100 μs	26.2 s	52.4 s	1min44 s	3min29 s
200 μs	52.4 s	1 min 44 s	3 min 29 s	6 min 59 s
500 μs	2 min 11 s	4 min 22 s	8 min 44 s	17 min 28 s
1 ms	4 min 22 s	8 min 44 s	17 min 28 s	34 min 57 s
2 ms	8 min 44 s	17 min 28 s	34 min 57 s	1h 9 min 54 s
5 ms	21 min 50 s	43 min 41 s	1 h 27 min 22 s	2 h 54 min 45 s
10 ms	43 min 41 s	1h27 min 22 s	2 h 54 min 45 s	5 h 49 min 31 s
20 ms	1 h 27 min 22 s	2 h 54 min 45 s	5 h 49 min 31 s	11 h 39 min 3 s
50 ms	3 h 38 min 27 s	7 h 16 min 54 s	14 h 33 min 48 s	1 day 5 h 7 min 37 s
100 ms	7 h 16 min 54 s	14 h 33 min 48 s	1 day 5h 7 min 37 s	2 days 10 h 15 min 15 s
200 ms	14 h 33 min 48 s	1 days 5 h 7 min 37 s	2 days 10 h 15 min 15 s	4 days 20 h 30 min 30 s
500 ms	1 days 12 h 24 min 32 s	3 days 0 h 49 min 4 s	6 days 1 h 38 min 8 s	12 days 3 h 16 min 16 s
1 s	3 days 0 h 49 min 4 s	6 days 1 h 38 min 8 s	12 days 3 h 16 min 16 s	24 days 6 h 32 min 32 s

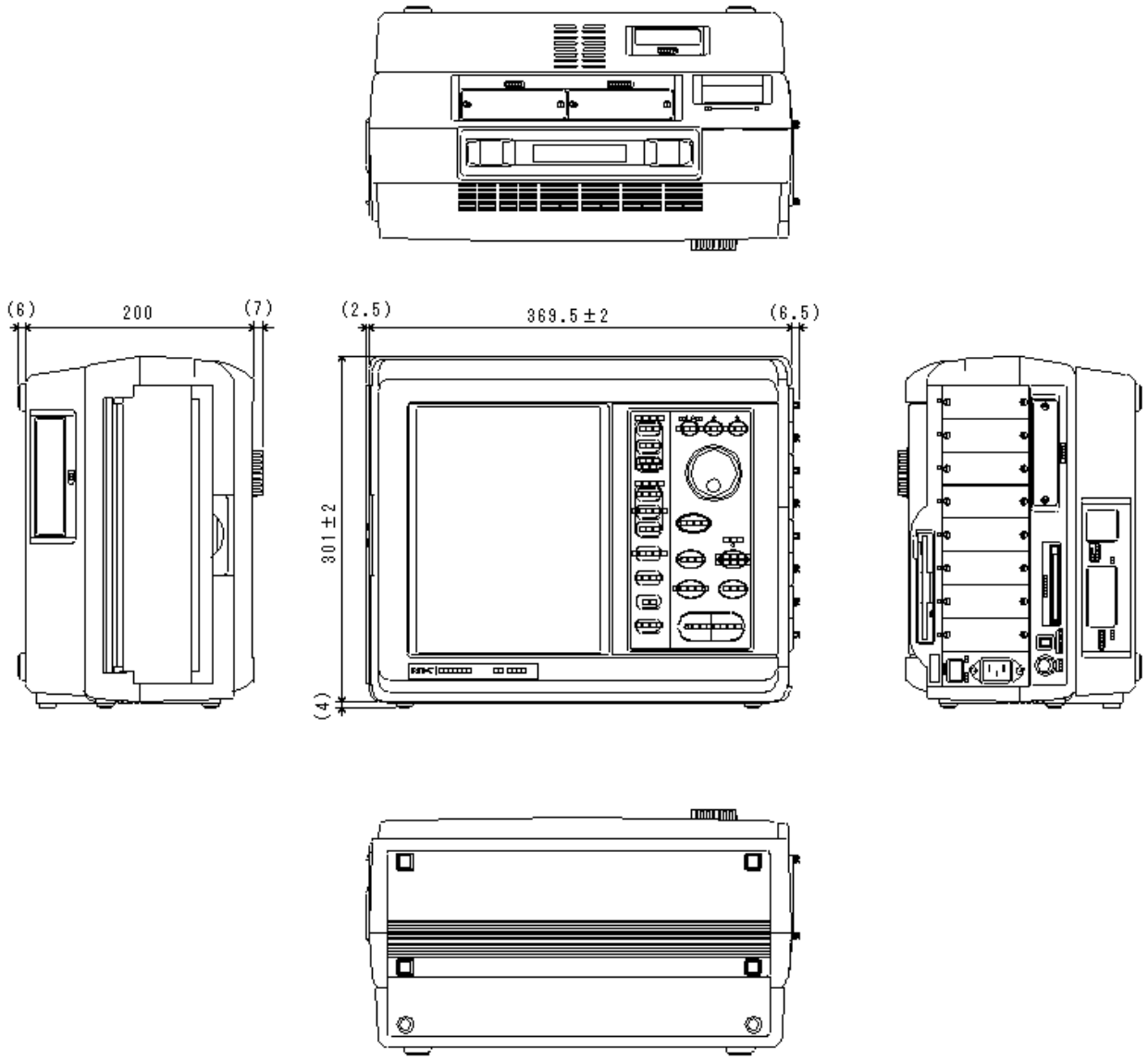
Maximum recording time 2 (at memory expansion unit installation and one memory segmentation)

Channel unification setting	No channel unification	2-CH unification	4-CH unification	8-CH unification
Usable channel	16 channels	A-side channels	1-A, 3-A, 5-A, 7-A	1-A, 5-A
1 μs	2.09 s	4.19 s	8.39 s	16.7 s
2 μs	4.19 s	8.39 s	16.7 s	33.5 s
5 μs	10.4 s	20.9 s	41.9 s	1 min 23 s
10 μs	20.9 s	41.9 s	1 min 23 s	2 min 47 s
20 μs	41.9 s	1 min 23 s	2 min 47 s	5 min 35 s
50 μs	1 min 44 s	3 min 29 s	6 min 59 s	13 min 58 s
100 μs	3 min 29 s	6 min 59 s	13 min 58 s	27 min 57 s
200 μs	6 min 59 s	13 min 58 s	27 min 57 s	55 min 55 s
500 μs	17 min 28 s	34 min 57 s	1 h 9 min 54 s	2 h 19 min 48 s
1 ms	34 min 57 s	1 h 9 min 54 s	1 h 9 min 54 s	4 h 39 min 37 s
2 ms	1 h 9 min 54 s	1 h 9 min 54 s	1 h 9 min 54 s	9 h 19 min 14 s
5 ms	2 h 54 min 45 s	5 h 49 min 31 s	11 h 39 min 3 s	23 h 18 min 6 s
10 ms	5h49 min 31 s	11 h 39 min 3 s	23 h18 min 6 s	1 days 22 h 36 min 12 s
20 ms	11 h 39 min 3 s	23 h 18min 6 s	1 days 22 h 36 min 12 s	3 days 21 h 12 min 24 s
50 ms	1 days 5 h 7 min 37 s	2 days 10 h 15 min 15 s	4 days 20 h 30 min 30 s	9 days 17 h 1 min 0 s
100 ms	2 days 10 h 15 min 15 s	4 days 20 h 30 min 30 s	9 days 17 h 1 min 0 s	19 days 10 h 2 min 1 s
200 ms	4 days 20 h 30 min 30 s	9 days 17 h 1 min 0 s	19 days 10 h 2min 1 s	38 days 20 h 4 min 3 s
500 ms	12 days 3 h 16 min 16 s	24 days 6 h 32 min 32 s	48 days 13 h 5 min 4 s	97 days 2 h 10 min 8 s
1 s	24 days 6 h 32 min 32 s	48 days 13 h 5 min 4 s	97days 2h10 min 8 s	194 days 4 h 20 min 16 s

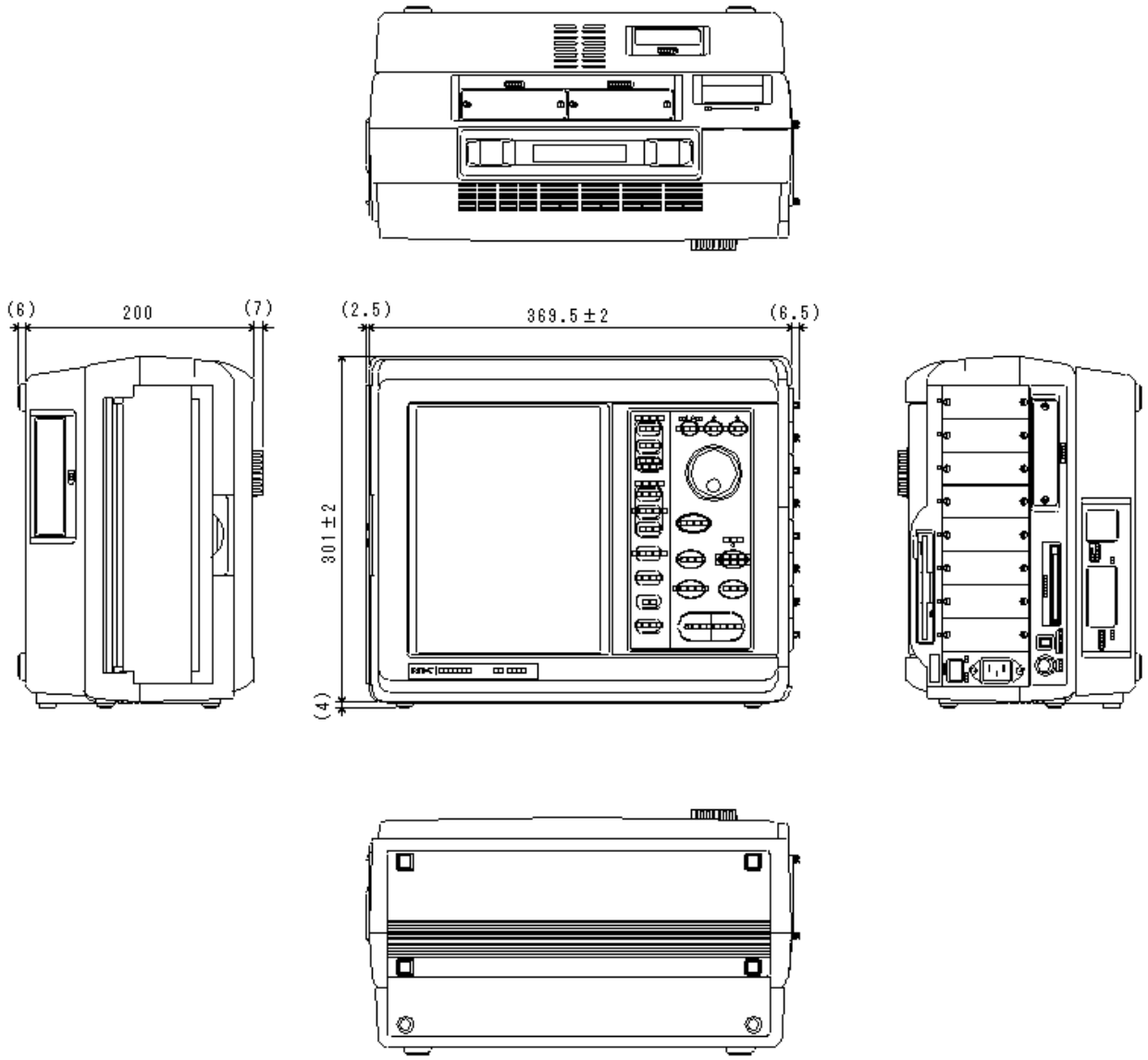
18.15.2 External Dimensions (Standard Specifications)



18.15.3 External Dimensions (with internal MO drive)

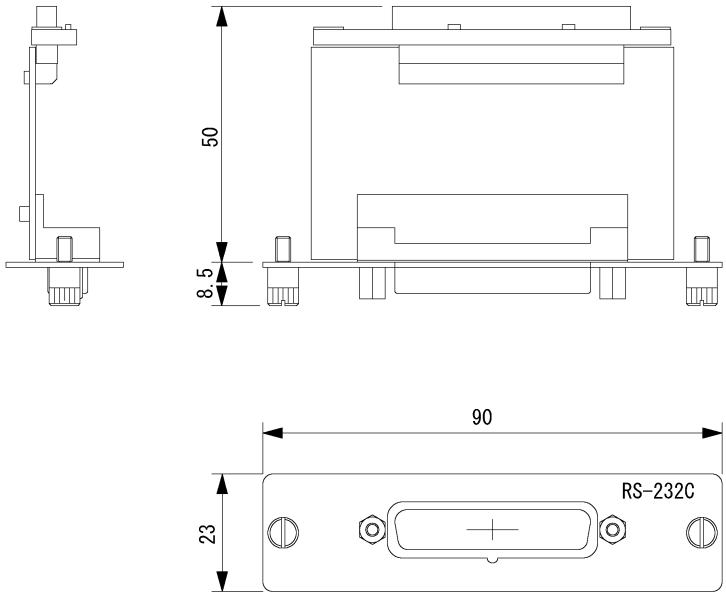


18.15.4 External Dimensions (with DC Power Supply Unit)

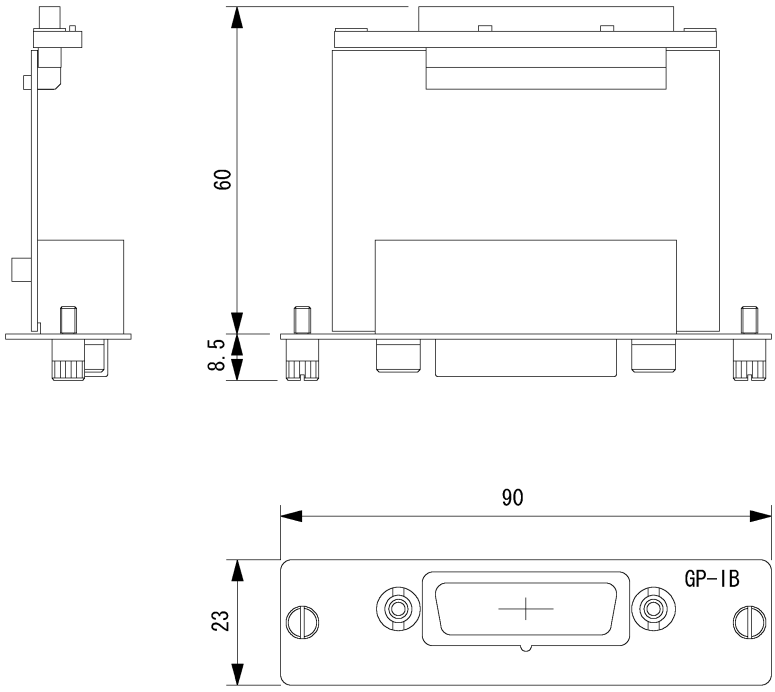


18.15.5 Optional unit External Dimensions (RS-232C unit, GP-IB unit, and SCSI unit)

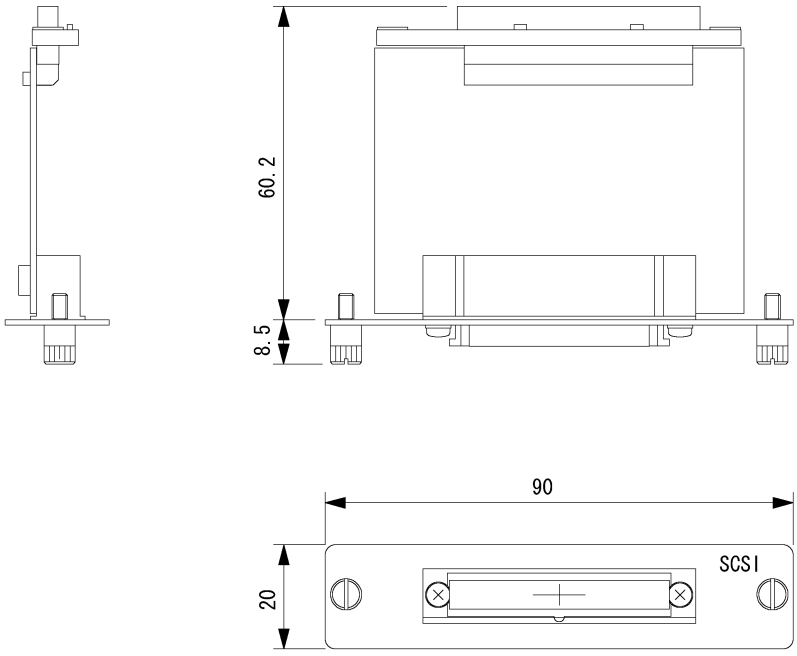
(1) RS-232C unit



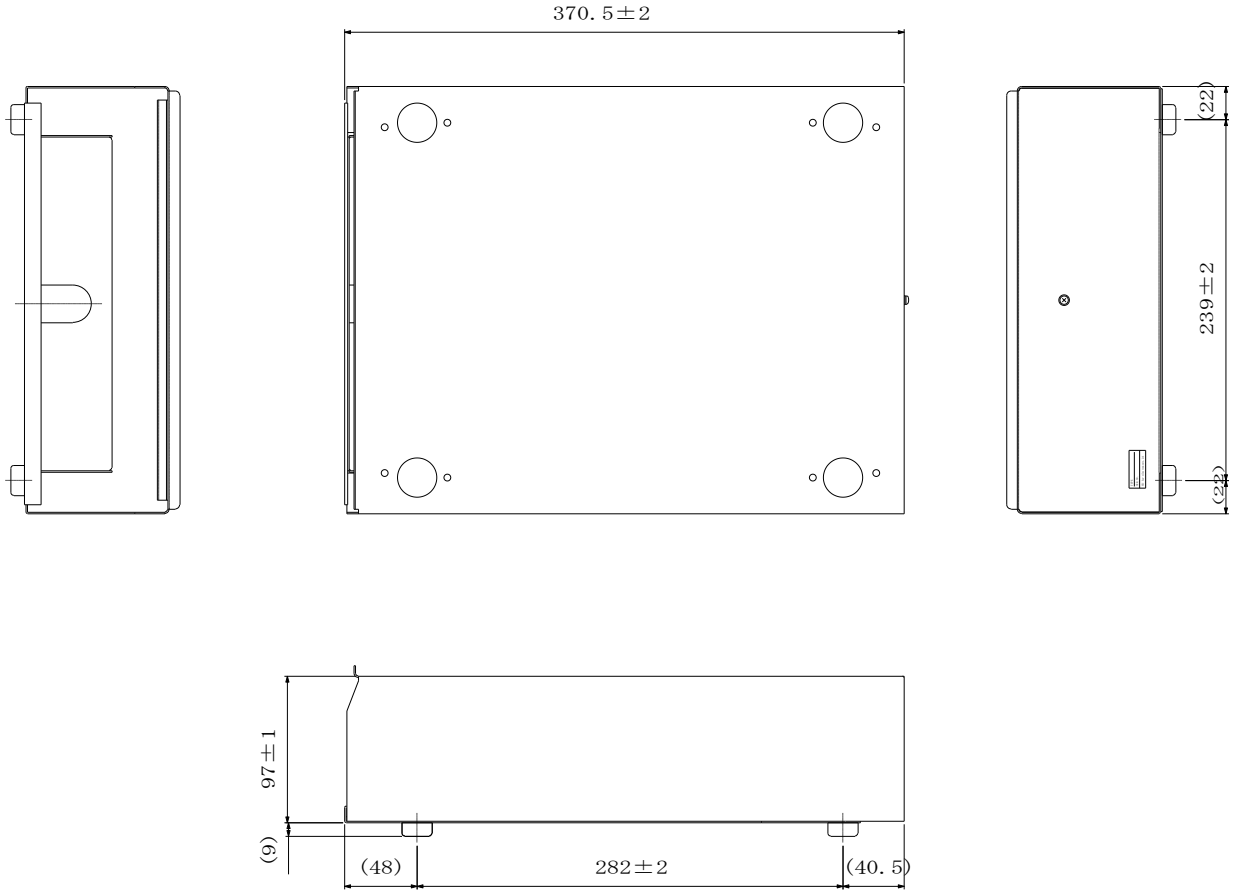
(2) GP-IB unit



(3) SCSI unit



18.15.6 External Dimensions of Z-fold Chart Recording Paper Case



18.15.7 Power Consumption (reference values)

The following values are reference values of power consumption.
For the power consumption of RA1100 and 1200,RA1300 that do not execute printing, in other words, only using memory recording, refer to the values in Stop.

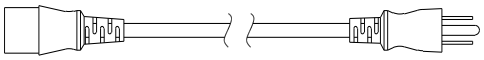
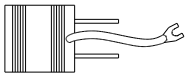
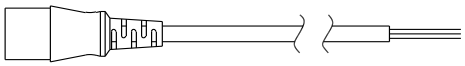
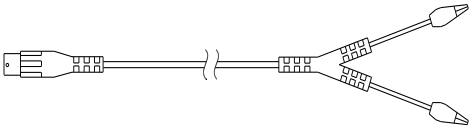
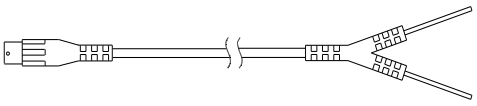
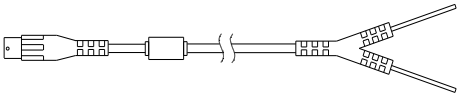
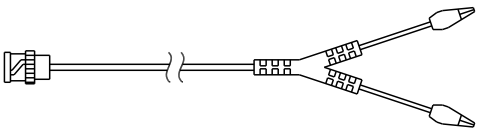
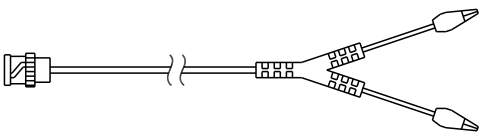
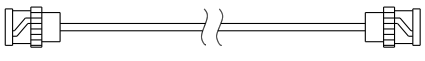
State of operation		Input signal	Power consumption
Stop		----------	Approx. 84 VA
Real-time waveform printing (RA1200)	Paper feed speed 1 mm/s	1 kHz	Approx. 96 VA
	Paper feed speed 5 mm/s	1 kHz	Approx. 96 VA
	Paper feed speed 10 mm/s	1 kHz	Approx. 132 VA
	Paper feed speed 20 mm/s	1 kHz	Approx. 156 VA
	Paper feed speed 25 mm/s	1 Hz	Approx. 108 VA
	Paper feed speed 25 mm/s	100 Hz	Approx. 162 VA
	Paper feed speed 25 mm/s	1 kHz	Approx. 172 VA

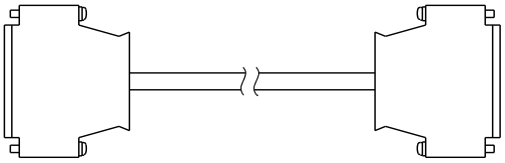
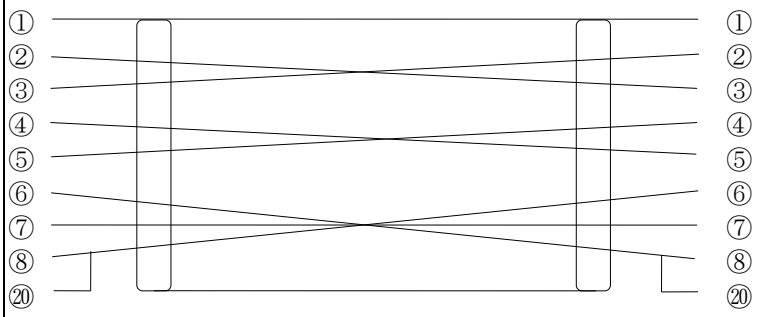
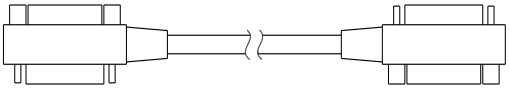
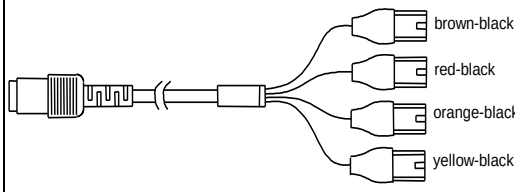
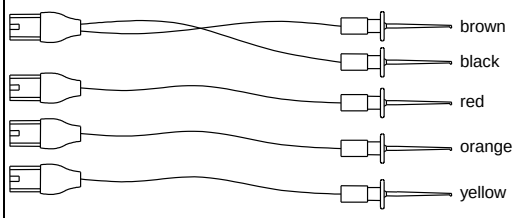
State of operation		Input signal	Power consumption
Stop		----------	Approx. 84 VA
Real-time waveform printing (RA1200)	Paper feed speed 1 mm/s	1 kHz	Approx. 100 VA
	Paper feed speed 10 mm/s	1 kHz	Approx. 160 VA
	Paper feed speed 50 mm/s	1 kHz	Approx. 270 VA
	Paper feed speed 100 mm/s	1 kHz	Approx. 140 VA
	Paper feed speed 100 mm/s	1 Hz	Approx. 190 VA
	Paper feed speed 100 mm/s	10 Hz	Approx. 340 VA

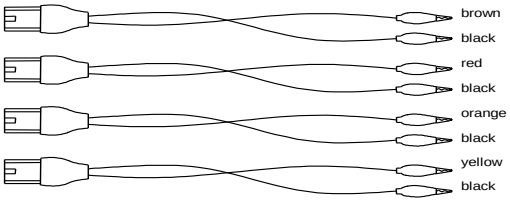
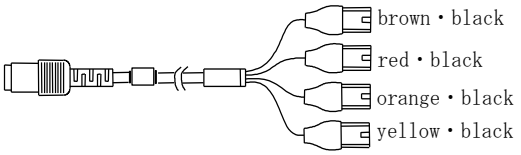
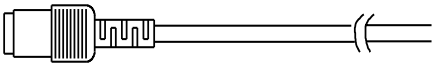
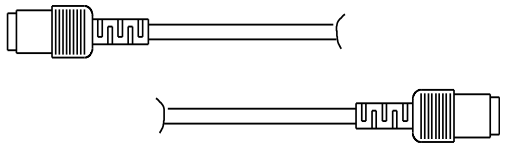
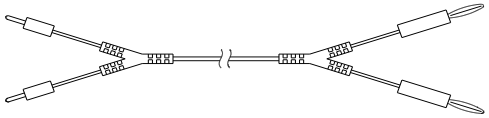
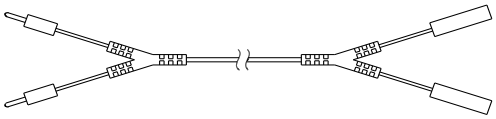
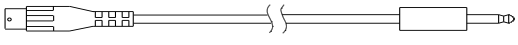
※ The RS-232C unit, GP-IB unit, SCSI unit, and AC bridge power supply unit are installed.
※ The settings are the real-time waveform printing mode, printing division of 1/1 and eight sine waveform inputs to eight channels.

19. LIST OF CABLES, PROVES AND SPARE PARTS

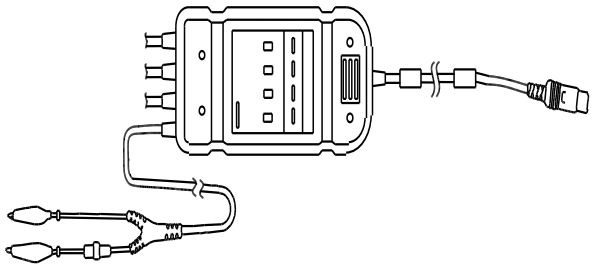
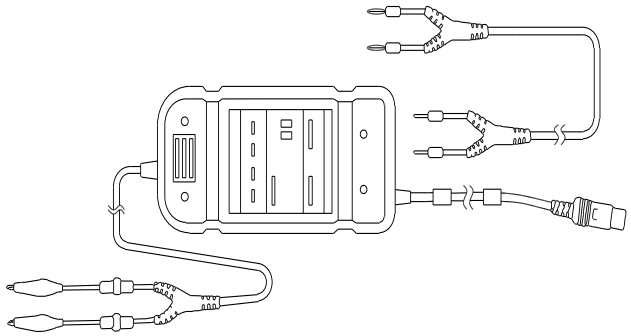
19.1 List of cables

Name (type)	Shape		Notes
AC power supply cable for 100V system (0311-5044)			2.5m in length Note: AC power supply cable with adapter Type 47326
Adapter (0250-1053)		KPR-24S	
AC power supply cable for 200V system (0311-5112)			3.5m in length
Signal input cable (0311-5175)		Safety BNC Crocodile clips Red: + Black: -	2m in length
Signal input cable (0311-5177)		Safety BNC Lead Wires Red: + Black: -	2m in length
Signal input cable (With ferrite core) (0311-5198)		Safety BNC Lead wires Red: + Black: -	2m in length
Trigger input cable (0311-2057)		BNC Crocodile clips Red: + Black: - Mold color: black	2m in length
Trigger input cable (0311-5084)		BNC Crocodile clips Red: + Black: - Mold color: red	2m in length
Output cable (47226)		BNC BNC	2m in length

Name (type)	Shape		Notes
RS-232C cable (47674)		Plug:XM2A-2501 (Hood:XM2S-2511) Plug:XM2A-2501 (Hood:XM2S-2511)	2m in length
	Connections  No connections for the other terminals		
GP-IB cable (47752) (0311-5089)		Note: 0311-5089 Reversed at one side	2m in length
Logic IC cable (0311-5007)	 	Round DIN8P plugs EI connector	1.5m in length
	Wire color: brown,black: 1ch or 5ch red,black: 2ch or 6ch orange,black: 3ch or 7ch yellow,black: 4ch or 8ch		
IC clip cable (0311-5008)	 	EI connector IC clips	15cm in length
	Wire color: brown(+): 1ch or 5ch black(GND): red(+): 2ch or 6ch orange(+): 3ch or 7ch yellow(+): 4ch or 8ch		

Name (type)	Shape		Notes
Crocodile clip cable (0311-5009)		EI connector Crocodile clip	15cm in length
	Wire color: brown(+): 1ch or 5ch black(GND) red(+): 2ch or 6ch black(GND) orange(+): 3ch or 7ch black(GND) yellow(+): 4ch or 8ch black(GND)		
Event input cable (With ferrite core) (RT31-163)		Logic IC cable (0311-5007) Round DIN8P plug EI connector	
	IC clip cable (0311-5008) Crocodile clip cable (0311-5009)		
Event amplifier input cable (0311-5001)		Round DIN8P	1.5m in length
	Wire color: brown: 1ch or 5ch red: 2ch or 6ch orange: 3ch or 7ch yellow: 4ch or 8ch shield: GND white: +15V output ∗Note: Thorough end sealing is required for the white +15V output wire, if it is not used.		
Event amplifier input cable extension (0311-5005)		Round DIN8P plug Round DIN8P socket	1.5m in length
Voltage output cable (0311-5004)		Pin chip Banana plug	1.5m in length
Voltage output cable extension (0311-5006)		Pin chip Pin chip jack	1.4m in length
Output cable for clamp meter (0311-5184)		Safety BNC Mini-plug for microphone	2m in length

19.2 List of probes and clamp meter transformers

Name (type)	Shape	Notes
Floating voltage probe (With ferrite core) (1539)		4 inputs
Voltage fluctuation probe (With ferrite core) (1540:for 100/120VAC system) (1543: for 220/240VAC system)		1 input

19.3 List of spare parts

Type	Name	Rating	Notes
YPS106	Recording paper	Roll sheet 219.5mm x 30m 5 rolls/box	0511-3172
YPS108	Recording paper	Roll sheet 219.5mm x 30m With perforation of 150mm pitch Residual quantity printed: from 99 to 00 with 300mm pitch 5 rolls/box	0511-3173
YPS112	Recording paper	Z-fold paper 219.5mm x 200m, Folding width: 300mm Residual quantity printed: from 669 to 000 for each page One(1) volume/box	0511-3182
0334-2124	Ordinary blowout fuse	MGD-0.3A	For floating voltage probe For voltage fluctuation probe
RT36-107	Touch panel sheet	3 sheets/set	
5633-1794	Recording paper holder		Two(2) holders are required to support the paper at both sides.

RA1000 Series
MAINFRAME Instruction Manual (95691-2074-0000)

First edition, Jan. 2000
Second edition, March. 2000
Third edition, Oct. 2005

NEC San-ei Instruments, Ltd.