# RM1100

## Omnilight II

# INSTRUCTION MANUAL

A&D Company, Limited

1AV 7001750R01

# OmniLight Ⅱ

# RM1100

# Instruction Manual

A&D Company, Limited

# *Introduction*

We thank you for your purchase of our product, data acquisition instrument OMNILIGHT Ⅱ RM1100 series (hereinafter referred to as RM1100). Please read this manual before operating this instrument.

This manual provides the information necessary to operate the RM1100 series safely. Place this manual within reach of the RM1100. This manual covers basic functions and operations of the RM1100 and handling precautions. For operation of other functions, please refer to the separate-volume manuals listed below.

A PDF manual for communication command is downloadable for free from A&D's website after user registration.

If you encounter any problems in the manuals, please contact our company.

**<Separate-volume manuals>**

| Manual | Document No. | Contents |
|---|---|---|
| Instruction Manual Communication Commands RM1100 Series | 95691-2971-0000 | This manual provides descriptions on interface commands to allow this instrument control by a PC. |

## ■ 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 instrument 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 in your fax.
- 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.

## To safely use products

The RM1100 is a product conforming to the IEC standard safety class Ⅱ. The instrument 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. To safely use this instrument, the following statements are used in this instrument and 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 instrument. 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

**Read this manual carefully before use to avoid accidents**.

**Power Supply**

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

Also, in order to prevent electric shock and hazards such as a fire, be sure to use only the DC power cable and the AC adapter supplied with this instrument. Never use a damaged AC adapter and power cable.When the power is turned on, do not remove the battery and adapter.

**Connection of Input Signals**

When connecting this instrument 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 instrument.

**Use in Gaseous Atmosphere**

Never use this instrument in a flammable or explosive atmosphere, or atmosphere of steam. Use in such atmosphere will result in danger to users and the instrument.

## Disassembling the Frame

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

## Fuse at DC Power Input Block

| | |
|---|---|
| 12 VDC | Time-lag fuse 3.15A |

The fuse at the DC power input block in this instrument cannot be replaced by users. If the fuse may blow out, please contact our sales representative.

## ⚠ WARNING

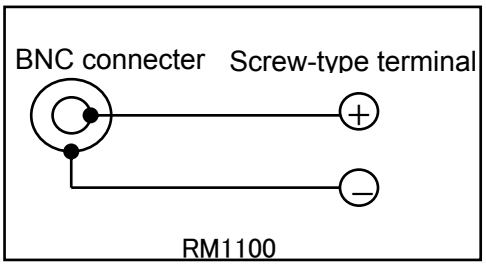
### Precaution about excess voltage

When applying input signals to this products, please make sure that range setting was properly made. Pay big attention as maximum input voltage allowed is different by ranges. This product has signal-switching relays in its input part. At the time of turning the power ON or OFF, condition of the switching relay may become unstable. If applying voltage of 42V or over under that condition, it may result in damage and/or failure of the product. If the product is broken, current may be carried to your signal-generating product and cause damage or failure. So, ALWAYS follow below instructions.

1) When power is ON, DO NOT input signal unless you make sure that startup, display and range setting of this product are properly done.
2) When turning the power OFF, disconnect input signals BEFORE shutdown. The powerbl ackout may also cause unstable condition of the switching relays. If blackout is expected, USE BATTERIES to avoid unexpected problems.

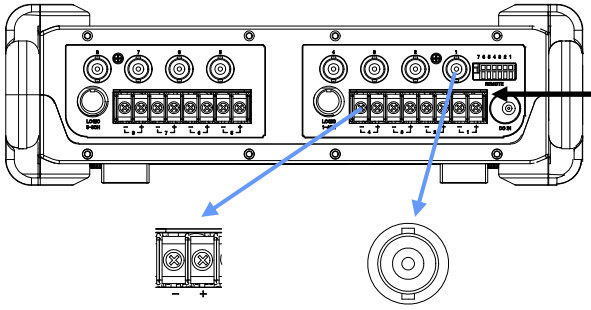
### For avoiding electric shock

1) DO NOT connect wires when high voltage is being applied. Make sure high voltage is NOT applied when connecting with screw-type terminals as shown right.




2) DO NOT remove the cover of the screw-type terminals except when you connect input wires. And, make sure that your signal-generating device is turned OFF.

3) Screw-type terminal and BNC connector of same channel are interconnected. DO NOT input signals to the screw-type terminal and BNC connector at the same time.



Screw-type terminal and BNC connector of same

Screw-type terminal BNC connector

## ⚠ WARNING

### How to Handle the Rechargeable Battery?

This instrument uses the lithium-ion battery. Be sure to carefully follow the instructions below to handle the rechargeable battery for safety.

(1) Do not disassemble or alter the rechargeable battery. The safety mechanism and the protector are built into the battery in order to prevent hazards. Damaging these features causes heat, smoke or flame from, or the burst of the battery.

(2) Do not connect (positive electrode) and (negative electrode) with metals including wire. Likewise, do not keep or carry the battery together with necklaces, hairpins or other accessories made from metal. The rechargeable battery shorts out and an excessive electric current flows, causing heat, smoke or flame from, or burst of the battery, or heating the metals such as wire, necklaces or hairpins.

(3) Do not put the rechargeable battery in fire or do not heat it. If the insulator melts, the gas blow down valve and/or the safety mechanism are damaged, or the electrolytic solution fires, such incidents cause heat, smoke or flame from, or burst of the battery.

(4) Do not use or leave the rechargeable battery around fire or under high temperature (more than 80 °C), for example, a place near a stove. In case where the resin separator is damaged with heat, the battery shorts out internally, causing heat, smoke or flame from, or burst of the battery.

(5) Do not soak the rechargeable battery in water, sea water, or other type of water. It might break the protector built into the battery and causes heat, smoke or flame from, or burst of the battery.

(6) Do not charge the battery near fire or under blazing heat. If the temperature of the battery raises high enough, the protector works in order to avoid hazardous results. In such case, the battery may lose rechargeable feature any more, or the protector may break and the battery may be charged at an extraordinary electric current and voltage, leading extraordinary chemical reactions inside the battery; which causes heat, smoke or flame from, or burst of the battery.

(7) Use the dedicated battery charger for charging the rechargeable battery. If charged with other battery chargers, the battery may be overcharged or charged at an extraordinary electric current and voltage, leading extraordinary chemical reactions inside the battery; which causes heat, smoke or flame from, or burst of the battery.

(8) Do not nail, strike with a hammer or trample on the rechargeable battery. The battery might burst or be transformed and consequently short out internally, causing heat, smoke or flame from, or burst of the battery.

## ⚠ WARNING

(9) Do not give a strong impact or throw the rechargeable battery. It causes liquid solution leakage, or heat, smoke or flame from, or burst of the battery. If the protector built into the battery breaks, the battery might be charge at an extraordinary electric current and voltage, leading extraordinary chemical reactions inside the battery, which causes heat, smoke or flame from, or burst of the battery.

(10) Do not use the battery with outer damage or the battery deformed. Those might cause heat, smoke or flame from, or burst of the battery.

(11) Do not solder directly to the rechargeable battery. The insulator may melt with heat, or the gas blow down valve and a safety mechanism may be damaged, causing heat, smoke or flame from, or burst of the battery.

(12) Do not use the rechargeable battery with positive and negative electrodes reversely. The battery would be charged reversely during charging, leading extraordinary chemical reactions inside the battery or unexpected extraordinary electric current flows during discharging, which causes heat, smoke or flame from, or burst of the battery.

(13) As for the rechargeable battery, the positive and negative electrodes are stationary. Do not connect the battery forcedly when not being able to connect with the battery charger or the equipment properly, and check the electrodes. The battery would be charged reversely when connected reversely, leading extraordinary chemical reactions inside the battery, which causes heat, smoke or flame from, or burst of the battery.

(14) Do not connect the rechargeable battery to an electrical outlet, a cigarette plug socket in a car, or other types of outlets. High voltage will be applied to the battery, and excessive electrical current will flow in it causing heat, smoke or flame from, or burst of the battery.

(15) If this rechargeable battery is used for equipment other than specified, the performance may fall, the battery life may shorten, or, for some equipment, an extraordinary electric current may flow, causing damage of the equipment and/or the battery, or heat, smoke or flame from, or burst of the battery.

(16) In case where the liquid solution leaked from the rechargeable battery gets into eyes, never to rub but rinse immediately with clean water such as tap water and get medical treatments right away. Leaving eyes without any treatments causes failures due to the liquid solution.

(17) Stop charging when the charging is not completed even if it exceeds predetermined charging time. It might cause heat, smoke or flame from, or burst of the battery.

(18) Do not put the rechargeable battery into a micro wave oven or a high-pressure container. The battery may be heated suddenly, or the hermetically sealed condition may be broken, causing heat, smoke or flame from, or burst of the battery.

(19) In case where the liquid solution or unusual odor is leaked from the rechargeable battery, keep it away from fire immediately. The leaked electrolytic solution may be ignited, causing heat, smoke or flame from, or burst of the battery.

**⚠ WARNING**

(20) When finding that the rechargeable battery generates unusual odor and/or heat, or discolored and/or deformed, or being the unusual during using, charging or keeping the battery, take it out from the equipment or the battery charger and do not use it any more. Continuing to use it without any treatments might cause heat, smoke or flame from, or burst of the battery.

## How to Hold This Equipment?

When using this equipment held with hands, hold the right and left sides firmly with both hands. Be very careful not to burn yourself when using the equipment since especially the back side serves the heat dissipation function.

## ⚠ CAUTION

**Caution in Handling**

When using this instrument, 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 instrument should avoid using it.
2) Storage environment
   The storage temperature of the instrument is –30 to 70 degrees Celsius. 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 instrument 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-1001-1).
4) This instrument is a product with a pollution degree of 2.
5) Do not use this instrument at the following locations. In addition, carefully check the environment when using this instrument.
   1. Locations where the temperature and humidity rise due to direct sunlight or heaters. (The operating environment of the instrument; temperature: -20 to 60 degrees Celsius, humidity: 35 to 80%)
   2. Locations with a strong electromagnetic field
6) This instrument except the input block is sealed. Using this instrument in places listed below, however, needs care.
   1. Wet locations
   2. Locations where salt, oil, or corrosive gases exist
   3. Damp or dusty locations
   4. Locations subject to strong vibrations
   5. Do not place flammable things such as paper near this instrument.
   6. Outdoor locations in raining or snowing

7) Avoid soaking this instrument in water as it is not waterproof.
8) Be careful of power voltage fluctuations. Do not use the instrument when these are likely to exceed the rated voltage.
9) If the power supply includes a lot of noise or high-voltage inductive noise, use noise filters to avoid operation errors.
10) This instrument 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 A&D. Use of a chart that is not recommended may cause failure in printing or shorten the life of the thermal head.

## ⚠ CAUTION

12) To clean this instrument, first turn off the power, place it in a well-ventilated location, and wipe the instrument with soft cloth moistened with ethanol. Do not use benzene, petroleum solvents, or chemically treated cloths, as they can cause deformation or discoloration.

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

14) 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).

15) How to handle batties

1. A battery is a coumable. When batteries are used and the operation time of the instrument is shortened, replace the batteries with new ones.
2. Two batteries should be replaced when battery replacing is made.
3. Follow local battery disposal rules when disposing batteries.

16) Operation temperature and storage temperature of the battery

- Operation temperature range (at charging)
  0 to 40°C (45 to 85% RH, no condensation)
- Operation temperature range (at discharging)
  -20 to 60°C (45 to 85% RH, no condensation)
- Storage temperature range (within 1 month)
  -20 to 50°C (45 to 85% RH, no condensation)
- Storage temperature range (within 3 months)
  -20 to 40°C (45 to 85% RH, no condensation)
- Storage temperature range (within 1 year)
  -20 to 20°C (45 to 85% RH, no condensation)

* The temperature range for charging is 0 to 40 degrees centigrades, but the charging level is lower when charging is made at 0 degree centigrade compared with the case where charging is made at 20 degrees centigrade.
* The lower the temperature, the shorter the discharging time.
* The storage temperature range is defined under a power recovery percentage of 50%.
* Power recovery percentage is the percentage of battery duration after storage compared with the battery duration before storage.

17) Regulation on transportation of lithium-ion batteries

The batteries used in this instrument are lithium-ion batteries. Their delivery and packing may be regulated by local rules or regulations. When shipping, contact the delivery service company how to package and ship.

## ■ 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 (RM1100series), 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 A&D.
(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 A&D.

## ■ 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 instrument | RM1100 series |
| Memory | Internal memory of RM1100series<br>When measuring with memory recorder, measured data is recorded in this memory. |
| [ ] | Characters enclosed by brackets represent a key name in the operation panel.<br>e.g. **[Realtime]** |
| k (lower case)<br>K (upper case) | A unit of numerical value<br>"k" is used to represent 1000 such as "10 kg".<br>"K" is used to represent 1024 such as "4 K data". |

## ■ Liquid Crystal Display

This instrument 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 temperature changes. Please be aware that these cases are not disorders.

## ■ 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.

# Contents

# 1. RM1100 Overview

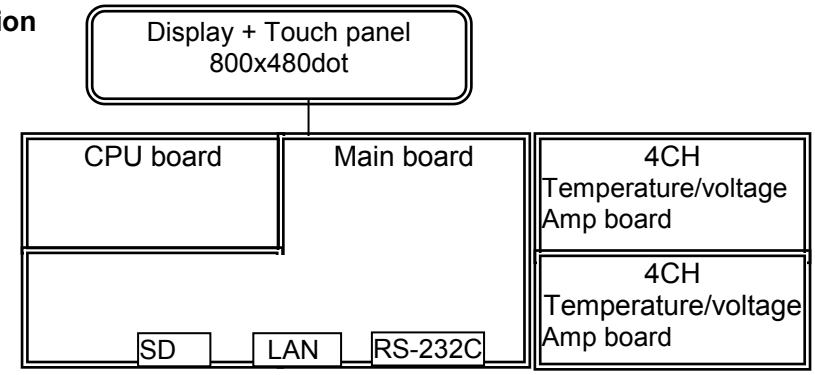
# 1.1. Basic Specifications

## *1.1.1.Overview and features*

The RM1100 is a portable data acquisition device that is designed to increase its environmental resistance to enable to be used in various measurement situations. Although the sizes are small, this instrument supports eight channels, enabling to measure signals of voltage, temperature, and others.

This instrument enables a high sampling speed of 1 μs (1 MHz) when only 1 channel is in use, and a sampling speed of 10 μs (100 kHz) when 8 channels (RM1102) are in use. A wide display and touch panel enable the dynamic waveform display and easy settings. Waveform printing through the thermal printer and long-time data acquisition into an SD card are available as optional functions.

- **Configuration**



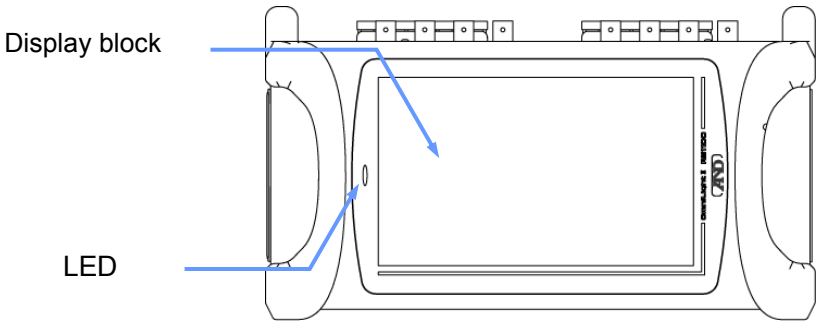

## *1.1.2. Features*

- **Temperature/voltage amplifier**
  The RM1101 incorporates four channels of and the RM1102 incorporates eight channels of temperature/voltage amplifiers. These amplifiers accept both signals of high-speed DC voltage and slow-speed temperature signals from a thermocouple. They are independently installed.
- **Long-time recording**
  An SD card (MAX 2GB) enables long-time recording of data at a high speed.
  The SD card has enough space for 62 days recording at 10ms speed with 8 input channels.
- **Waveform display on a large display**
  The 7inches LCD display is adopted for better visibility of measuring data. The 8ch (RM1102) can be dynamically displayed.
- **Various choices for measurement mode**
  Three measurement modes are provided: the Memory mode—saving high-speed signals in the memory, the Filing mode—enabling long time recording on an SD card, and the Real time mode—printing waveforms through an external printer. You can choose the appropriate mode according to your needs.
- **Standard LAN and SD card interface**
  The RM1100 is equipped with an LAN (100BASE-T) function for data communication and recorder control, and an SD card slot for recording data as a storage device.
- **Standard Interface for Ethernet and SD Card**
  RM1100 is equipped with an Ethernet port (100BASE-T) for data transfer & mainframe control and an SD card slot for saving measured data as standard.

# 2. Names and Functions of Each Block

# 2.1. Overview of Blocks

The RM1100 consists of the following blocks.




**Front View**

For details
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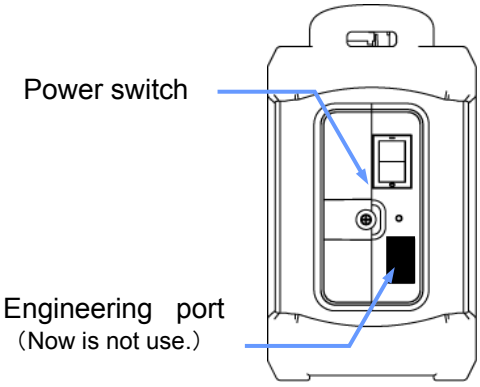
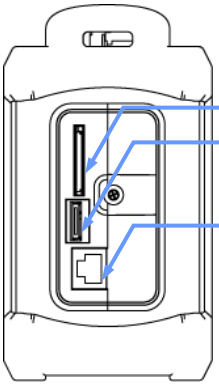



**Left side**




**Right side**

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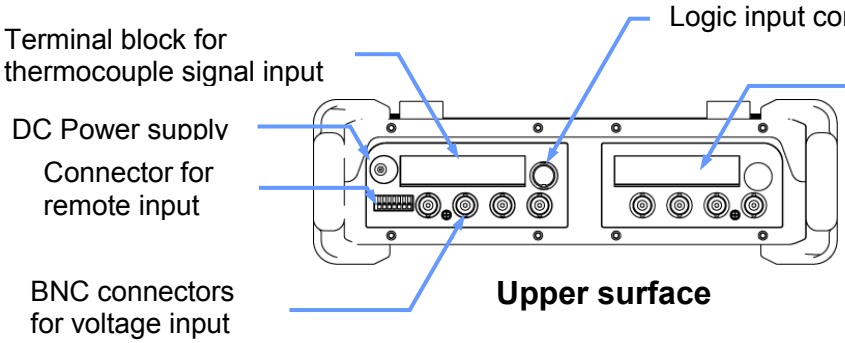


**Upper surface**

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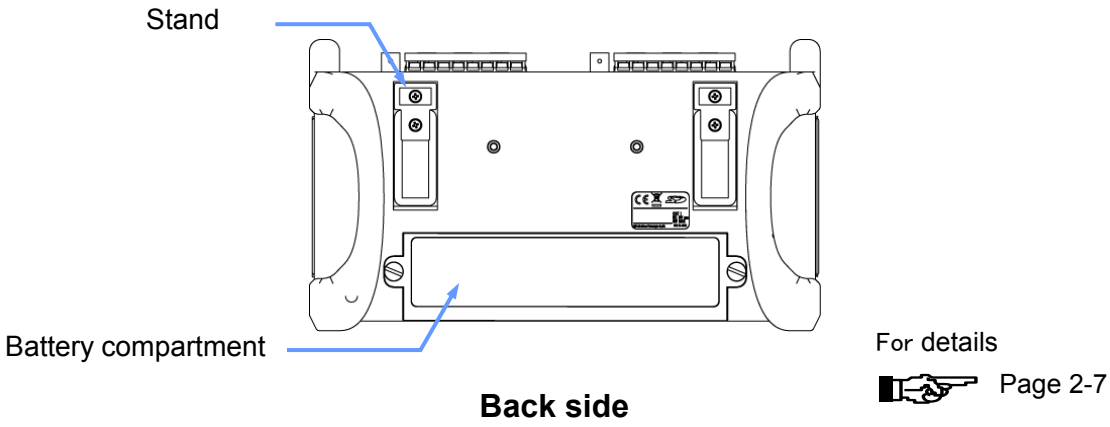


**Back side**

For details
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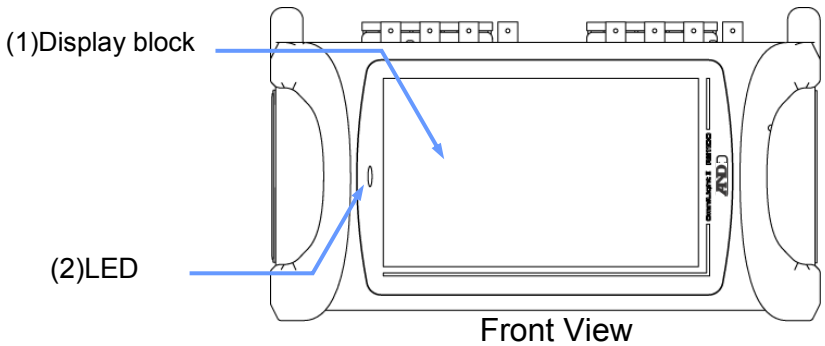
# 2.2. Front View

This section explains functions of each block on the Front View.

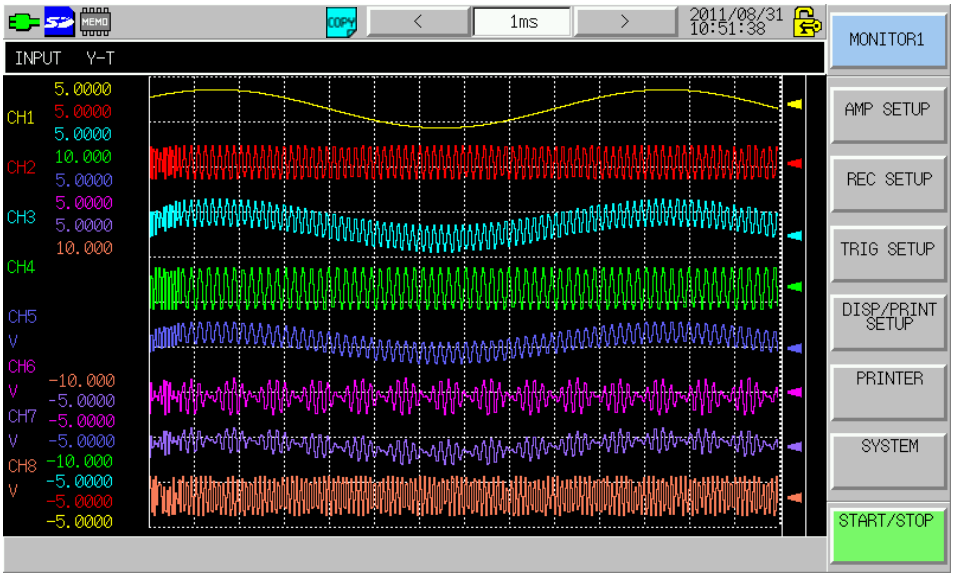



Front View

## (1) Display block

The RM1100 has a TFT color LCD with touch panel. This LCD displays screen for setup and user can make settings by touching the setting items that is displayed on the LCD.

Turn on the recorder that has the factory default settings. The following screen appears. The contents for amplifiers differ depending on the amplifiers that are installed.




The touch panel Keys on a displayed panel makes settings for input units, recording conditions, acquisition, and triggers. The conditions of the signals that are input can be observed on the display.

NOTE

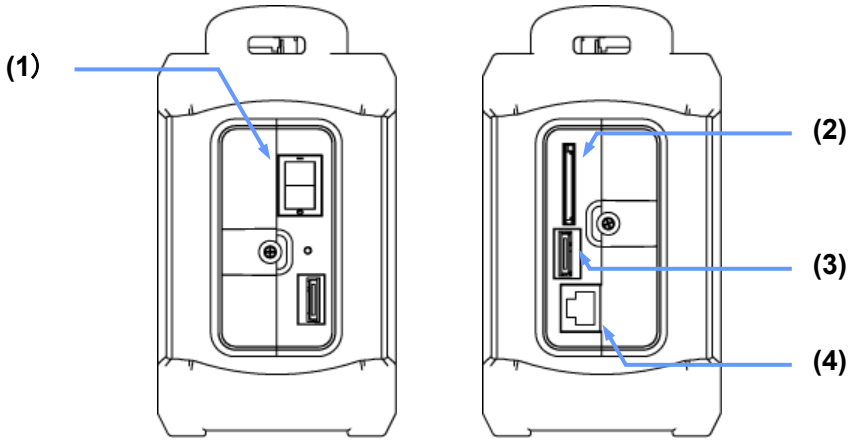
There may be few dots that always illuminate or do not illuminate on the display or slight brightness unevenness on the display. These phenomena are not defects.

## (2) LED

When power is on, the LED lights in green.
When a trigger signal is detected, the LED lights in orange.

# 2.3.Left-side Block and Right-side Block

This section explains functions of each block on the left and right sides.




### (1) Power switch

This switch turns on or off this recorder.

### (2) SD card slot

This is a connector to insert an SD card for filing recording.

### (3) RS-232C connector

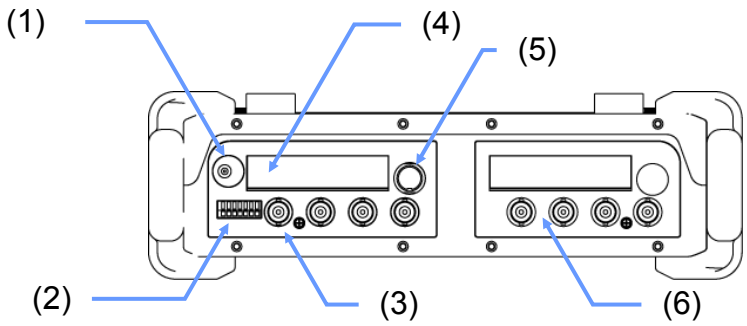
This is a connector for serial connection, and is used to communicate between a personal computer and the instrument. This connector is also used to connect to an optional external printer.

### (4) LAN connector

This is a connector for LAN connection. This connector is useful when a communication between personal computers is made.

# 2.4.Upper Surface Block

The picture below illustrates signal input block. The RM1101 accepts four channels of analog signals and four channels of logic signals; the RM1102 accepts eight channels of analog signals and eight channels of logic signals.




(Input slot area of RM1102)

## (1) DC IN (DC power supply)

The power is supplied through 12 Vdc.

## (2) Remote (Connector for remote input)

Remote unit can be inserted in this portion. Start or stop for recording/printing, trigger input, marking, or synchronous operation can be made.
Pin Nos. and the corresponding signal names are shown in the table right.

| Pin No. | Signal name |
|---|---|
| 1 | TRIG-IN |
| 2 | TRIG-OUT |
| 3 | REC-IN |
| 4 | SYNC-IN |
| 5 | MARK-IN |
| 6 | N·C |
| 7 | GND |

## (3) BNC connectors for voltage input

Voltage signals can be input through BNC connectors. If metal BNC cables are used, the potential difference between grounds is up to 42 volts. If the cables using safety BNC connector (0311-5175) are used, the potential difference between grounds is up to 300 volts. Both BNC connectors and the terminal block for thermocouple signals cannot be used at the same time.

## (4) Terminal block for thermocouple signal input

This terminal block is connected to thermocouples. Power voltage can be input to this terminal block. Both BNC connectors and the terminal block for thermocouple signals cannot be used at the same time.

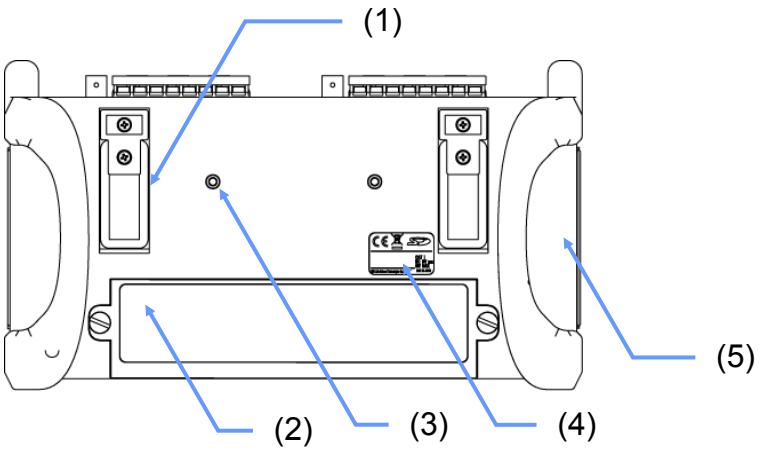
## (5) LOGIC 1- 4ch

Contact signals or voltage signals can be input.

## (6) Input connectors for RM1102

The RM1102 incorporates eight channels. The same connectors as (3), (4), and (5) are installed.

# 2.5. Back Side




## (1) Stand

Where this product is set on slope for use, use a stand to place on.

## (2) Battery cover

The battery is stored in this cover. The battery must be the product only for our company. Make sure to mount two batteries that are equal amount of charge.

## (3) External screws for fixing

They are screws to fix the instrument to external equipment. The instrument can be fixed to a display arm for office. To fix the instrument to a display arm, use dedicated screws (RM11-405).

## (4) Faceplate

Product serial number, power voltage input range and power consumption is indicated.

## (5) Protector

Use this grip when carrying.

# 3. Pre-measurement Procedures

# 3.1. Before Switching on the Power

The preparations for using this recorder and the cautions 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 Instrument, JIS-C-1010-1 (IEC61010-1).
· Use this recorder in place with **an ambient temperature between -20ºC and 40ºC 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) Places with excessive humidity due to exposure to direct sunlight or proximity to heating fixtures**
**(2) Places subject to voltage surges due to an electromagnetic field**

· This recorder is tight-sealed except input block; however, use this recorder with care when using in the following places.

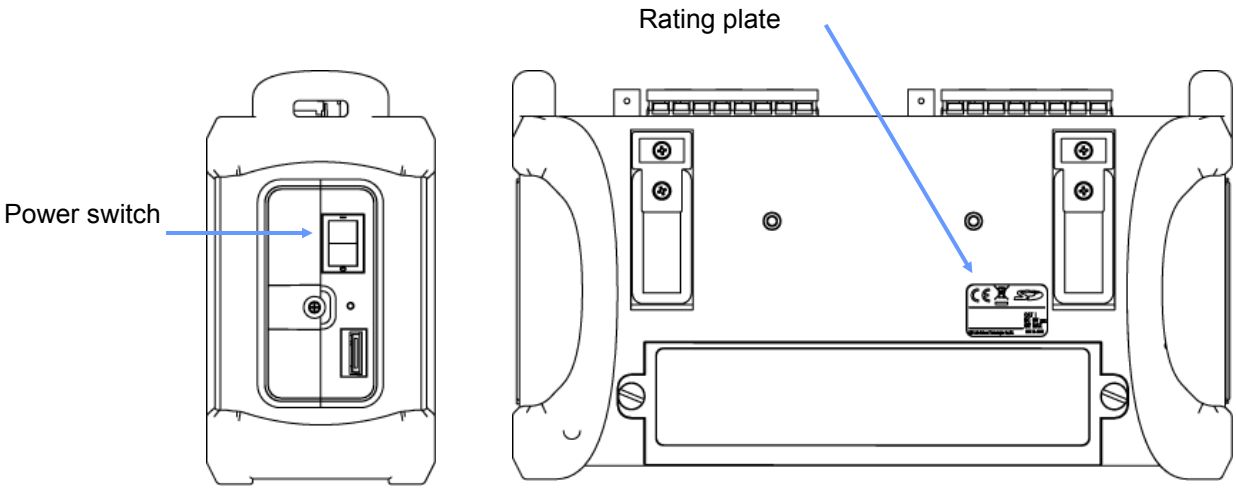
**(1) Damp or wet place**
**(2) Places with salty, oily or gaseous atmosphere**
**(3) Humid or dusty place**
**(4) Places subject to strong vibration or shock**
**(5) Do not place paper or other flammable materials near this recorder.**
**(6) Outside when raining or snowing**

## *3.1.2. Before connecting AC power cable*

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

☐ **The power supply switch (POWER) of this recorder must be OFF.**

☐ **The power supply must comfort to the rating specified on the rating plate.**



# 3.2. Turning on the Power

## ◆ When all the preparations are complete, turn on the recorder.

< Points to be checked before applying power>

- ☐ Has this recorder been set on a safe place?
- ☐ Has this recorder been set under a proper environment?
- ☐ Is the power switch currently off?

After confirming that these points 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 DC socket of this recorder

### (2) Connect the plug of the AC power cable to the power outlet

### (3) Turn on the recorder power (POWER)

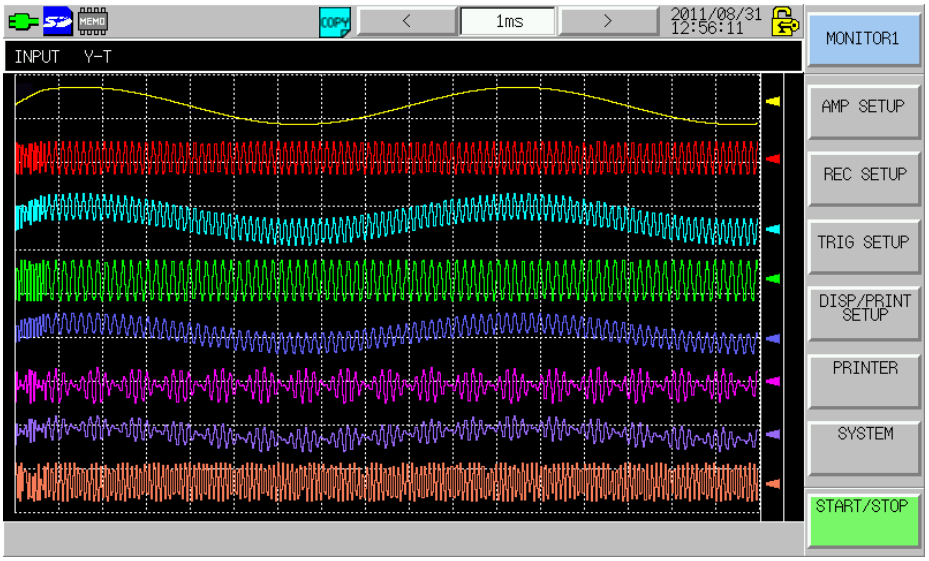
Turn on the power switch located on the left side of this recorder.

## ◆ After power application

After applying power, check the following.

### (1) Confirm that the image is properly displayed on the screen

The screen will be displayed approximately 15 seconds after power application.




### (2) The pre-measurement procedures are completed.

# *4. Operation Flow*

# Flow of Measurement, Basic Settings and Operations

# 4.1. Operation Flow

This recorder records, stores, and replays 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 amp units.**
  Note that applying a voltage greater than the maximum allowable input voltage specified by the range of each amplifier unit may cause damage to the main unit or internal components.
  ☞ Refer to Chapter 6 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 6 for details.
- **Trigger settings**
  Set the trigger for activating to be recorded.
  ☞ Refer to Chapter 10 for details.
- **Measurement mode settings**
  Select the mode appropriate for the kind of object desired from the 3 available measurement modes.
  ・To store high-speed events in memory ……**Memory mode**
  ☞ Refer to Chapter 7 for details.
  ・To store and record events over a long time in a SD card ……**Filing mode**
  ☞ Refer to Chapter 8 for details.
  ・To print the recording chart paper ……**Real time mode**
  ☞ Refer to Chapter 9 for details.

## (4) Measurement

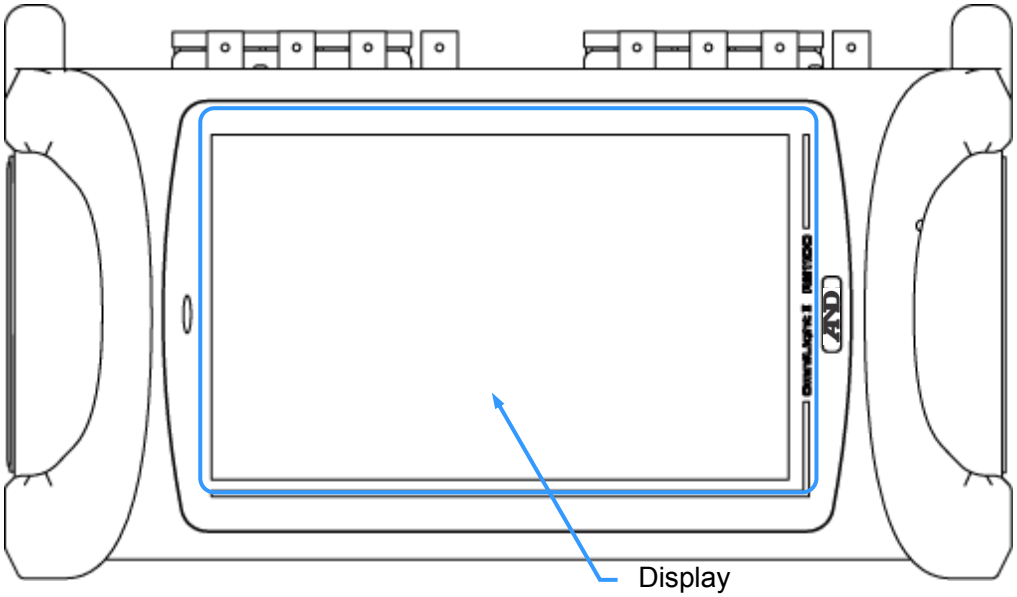
Press the [START/STOP] key to start measurement, and press the [START/STOP] key again to stop measurement.

## (5) Replay

Display stored data ……**Replay settings**
☞ Refer to Chapter 11 for details.
Copy stored data on the recording paper ……**Copying settings**
☞ Refer to Chapter 12 for details.

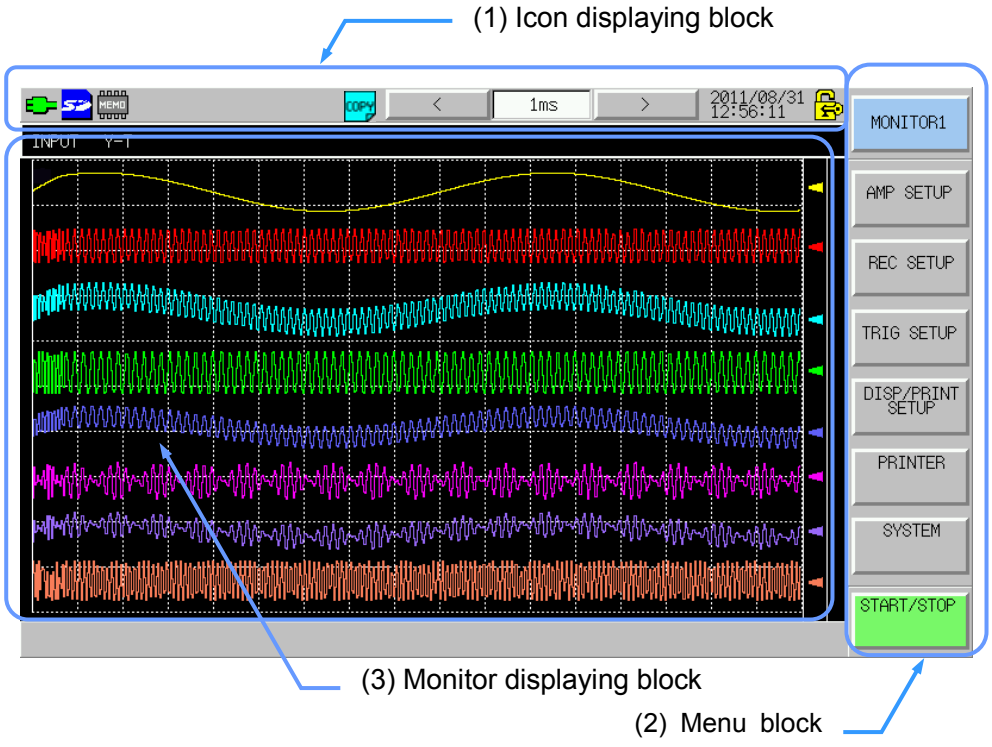
# 4.2. Making Basic Settings

This section explains various setting items and icons on the screen. As the display is of a touch panel, settings can be made by directly touching the keys and tag on the display screen.




## *4.2.1. Explanation of basic screen settings*

The setting screen is broadly divided into the icon displaying, monitor displaying, and menu blocks.



## (1) Icon displaying block

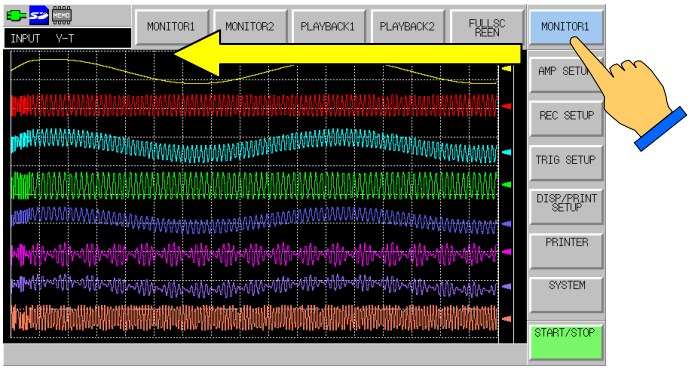
This block is always displayed on the top of the screen and used for confirming the conditions of batteries, SD cards, and various settings. The contents of icon displayed on this block change in accordance with a measurement mode and a setting item being selected.

## (2) Menu block

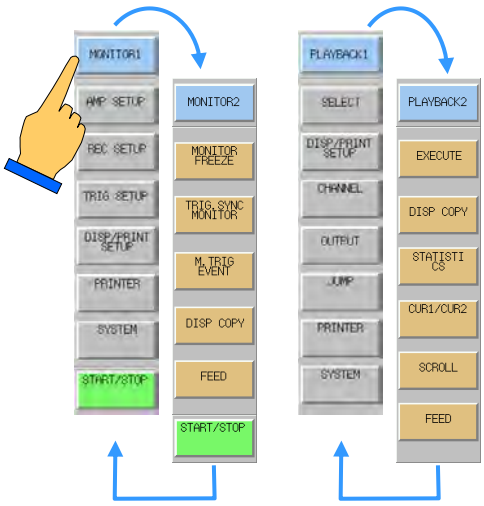
This area includes menu keys used to open setting items and execution keys. Three types of keys are identified by three colors: gray—keys opening a screen setting detailed parameters, orange—keys to move the cursor or print, and green—keys to start or stop measurement.

Refer to description of various measurement modes of [Chapter 6 Amp Unit], [Chapter 10 Trigger Settings], and [Chapters 7-9] for details about operation on a setting screen.

Holding down the key on the upper right extends a selection menu, allowing you to select the menu you need.




Menu changes by tapping the key.




Three menus are provided: for input monitor, for replay monitor, and for full screen monitor.

- For input monitor—condition setting or measurement is made while input signals are being displayed.
- For replay monitor—menus for adjustment and screens can be printed before replaying data.
- For full screen monitor—signals can be displayed with the full screen

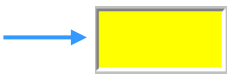
## (3) Monitor displaying block

Various settings can be configured while monitoring input signals or measured data.

## 4.2.2. Explanation of setting keys

Each setting item displays a different image depending on the input method to be used. The various input methods are explained below.

- **Selection Key**
  When the key is selected:
  The key displays a yellow color concave Key.

  When the key is not selected:
  The key displays a gray color convex Key.

  * This is a toggle switch, which alternates on and off each time it is pressed.

- **Window Key**
  “Hand” icon displayed on the key indicates that a window will open upon selection. Settings can be made in this newly opened window.

- **Check boxes**
  When a check box is pressed, a check will alternatively appear and disappear.

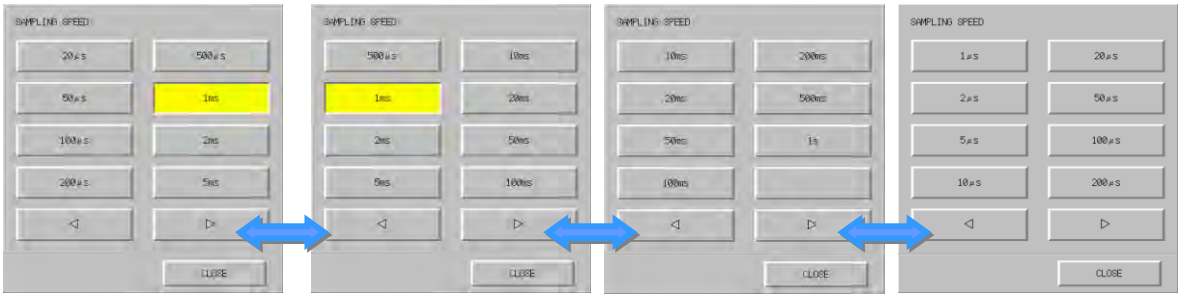
  
  

●[ △ ][ ▽ ]、[◁][▷]key

Selection keys change by pressing [ △ ][ ▽ ] Keys.


* Press [ △ ]Key to display the selection keys in reverse order.

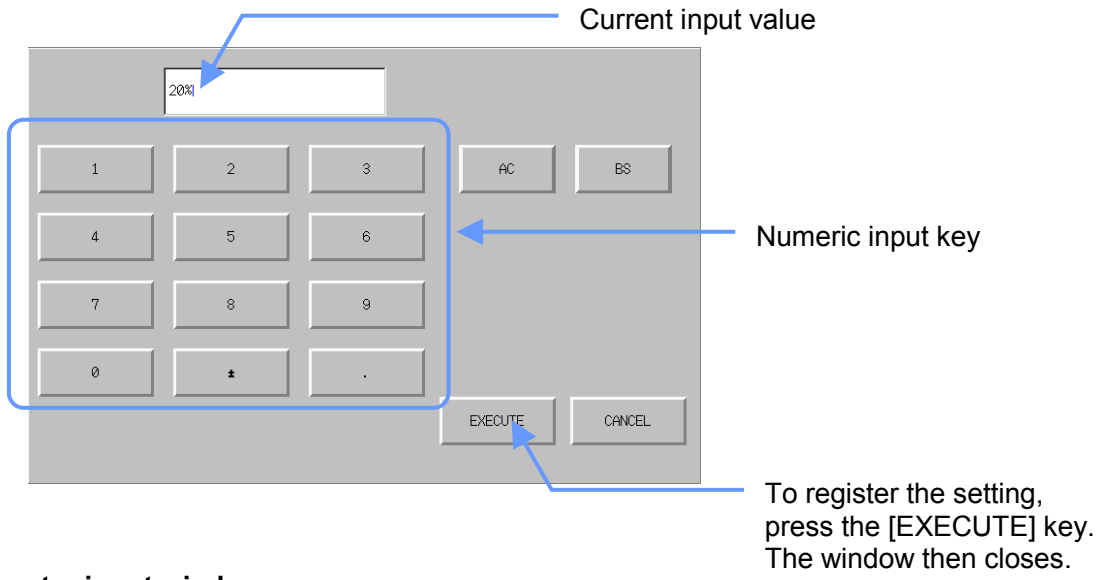
Selection keys change by pressing [ ◁ ] [ ▷ ]Keys.



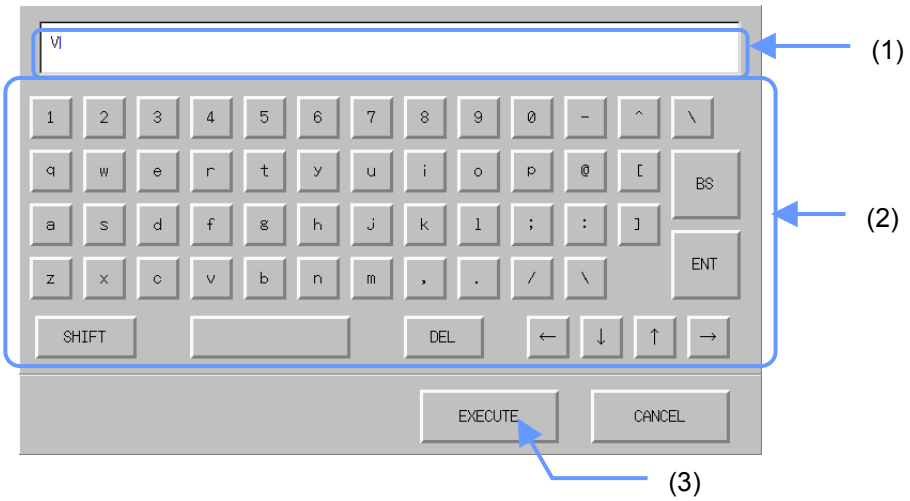
## 4.2.3.Explanation of standard setting windows

This recorder uses common setting windows to set values that are commonly used.

- **Numeral input menu**
  Use this window to enter numeral values.




- **Character input window**
  Use this window to input character strings.




(1). Input display section
This section displays input character strings and cursor position.

(2). Input operation section
This section operates input character strings from various keys.
Capital letters and symbols can be input by pressing the [SHIFT] key.
When the key is pressed, images displayed on the keyboard are changed after the key is highlighted, thereby capital letters and symbols can be input.

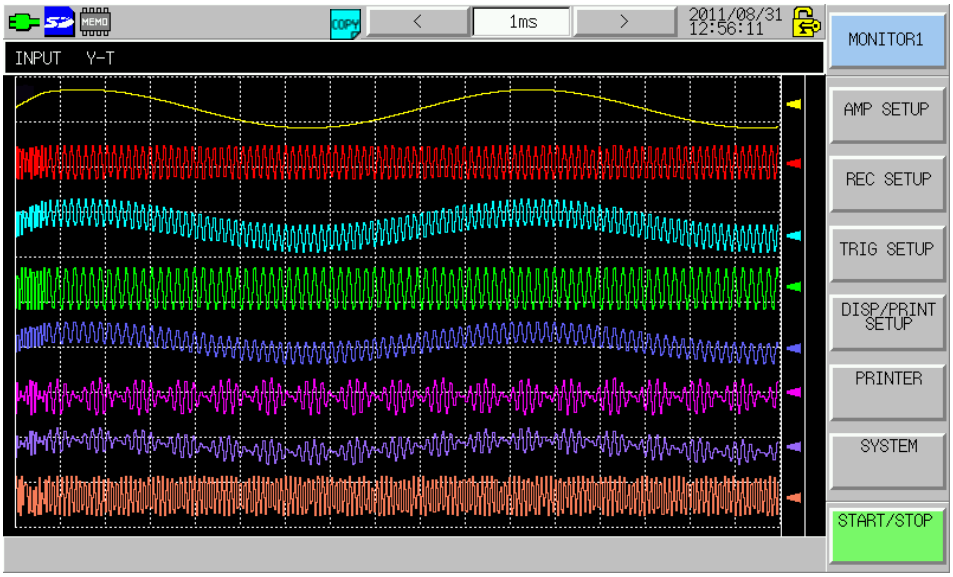
(3). [EXECUTE] key
To register character strings to input, press this key. The window will then close.

# *5. Input Signal Monitor*

## Observe Input Signals

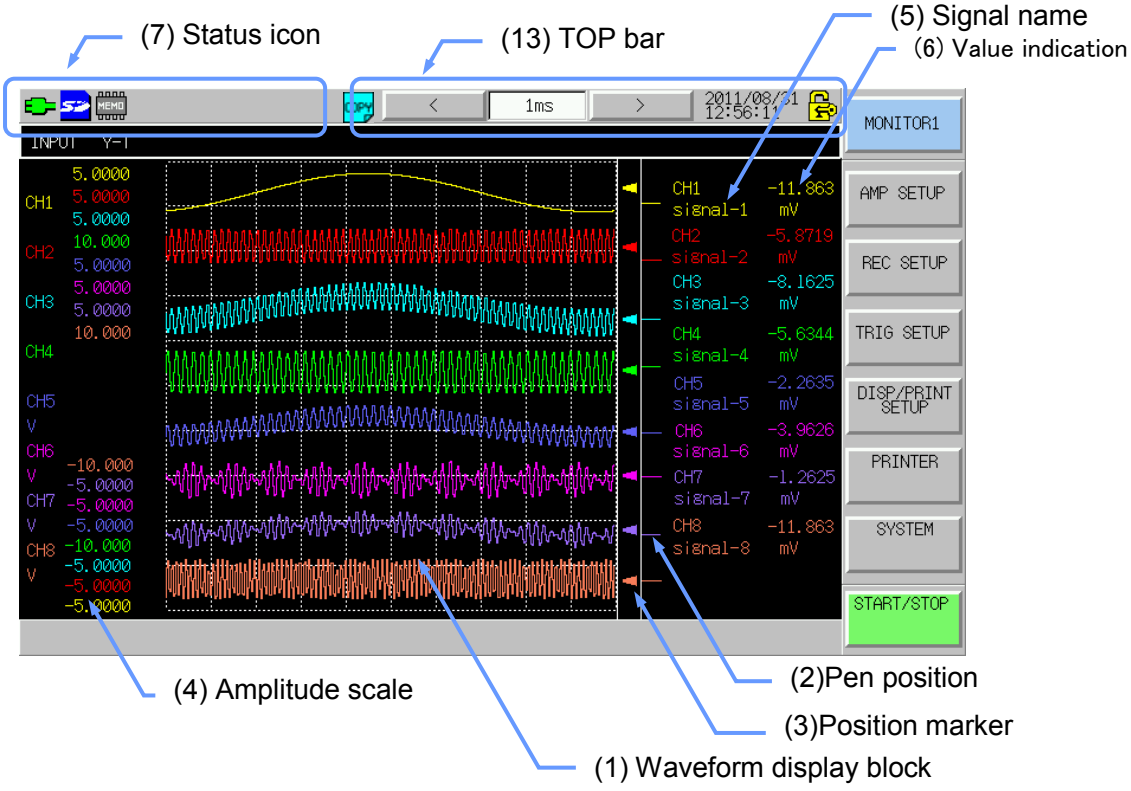
# 5.1. Observing Input Signals

To observe the signals which are input, use the “MONITOR1” or “MONITOR2” on the function menu. This screen displays the signals which are input in real time. The waveforms can be frozen as necessary.




# 5.2. Displaying Input Waveform Monitor

The following screen appears when the “MONITOR1” function is selected.



## (1) Waveform display block

Display the signals which are input following the setting of the wave pattern record.

☞ Chapter 12 Display and Printing

## (2) Pen Position

This is zero position for all analog amps.

## (3) Position marker

Current values for analog amps are indicated with the pen position.

## (4) Amplitude scale

This is amplitude scale for analog amps. This scale may not be displayed by setting.

☞ Chapter 12 Display and Printing

## (5) Signal name

Indicate the signal name which is entered by user.

☞ Chapter 12 Display and Printing
☞ Chapter 14 System Setup

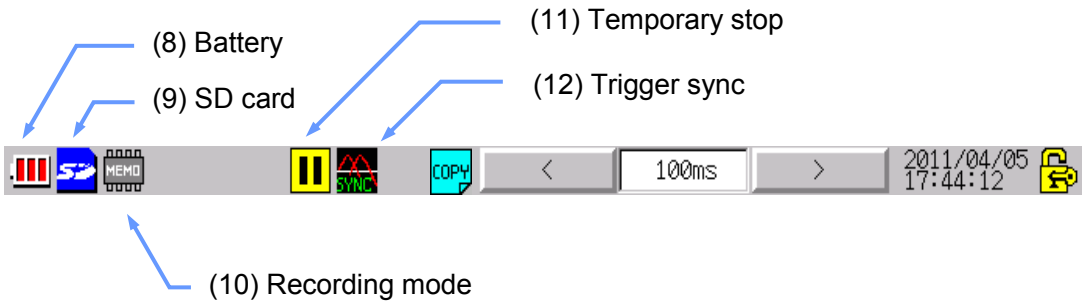
## (6) Value indication

Numerical values of current input signals are indicated. These values may not be displayed by setting.

☞ Chapter 12 Display and Printing

## (7) Status icon

Status of printing and recording is shown. The indication contents change by the measurement mode. For more information, see descriptions of measurement modes in Chapters 7 to 9.



## (8) Battery

Remaining battery level is displayed when this recorder runs on battery.
Remaining battery level is displayed as below.


Remaining battery level display is a rough indication. Batteries should be changed or charged early because the available time varies according to the usage environment temperature.

Rough indications of remaining battery level

| Indicator | 3 | 2 | 1 | 0 |
|---|---|---|---|---|
| Remaining level | 100%～50% | 50%～20% | 20%～5% | 5%～0% |


is displayed when AC adaptors is connected to this recorder regardless of batteries being used or not .

Battery discharge time depends on use environment (temperature).
Normally, at low ambient temperature, discharge time (operation time of RM1100) becomes shorter.
The operation time at -20˚C is about a half of the time at 25˚C.

When the battery indicator shows condition ‘1’ (5-20% Remaining Level), voltage may drop rapidly due to characteristics of the battery. At the condition ‘1’, use an AC adapter or exchange with fully-charged batteries.

## (9) SD card

This status indicates that a SD memory card is inserted. 

## (10) Recording mode

This status indicates the following recording mode.

: Memory mode 

: Filing mode 

: Real time mode

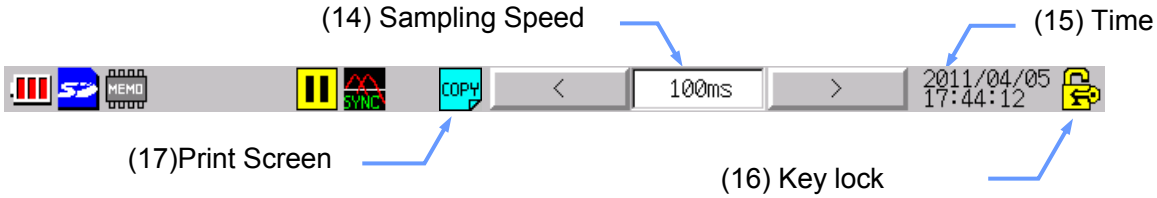
## (11) Temporary stop

This icon appears at the time of the monitor is paused.
It can be set in the operation menu.

## (12) Trigger sync

This icon appears when the monitor is in the trigger synchronous operation.
set in the operation menu.
It can be set in the operation menu.

## (13) TOP bar




## (14) Sampling speed

Setting for the sampling speed is possible. Using < or > key to set is possible. The monitoring speed changes depending on the setting value.

## (15) Time

This portion indicates the current time.

## (16) Key lock

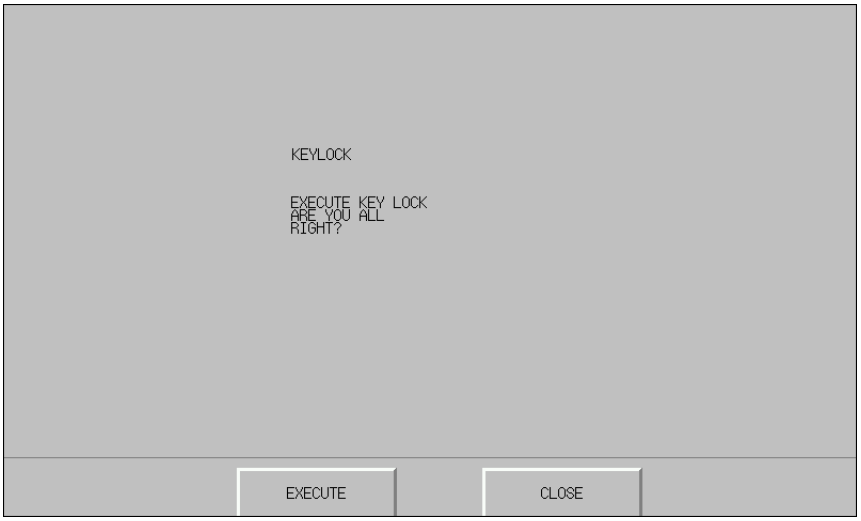
Key lock can be set as ON or OFF.

 :Key lock OFF

 :Key lock ON

Key lock can be set as ON or OFF by pushing and holding the key lock icon.

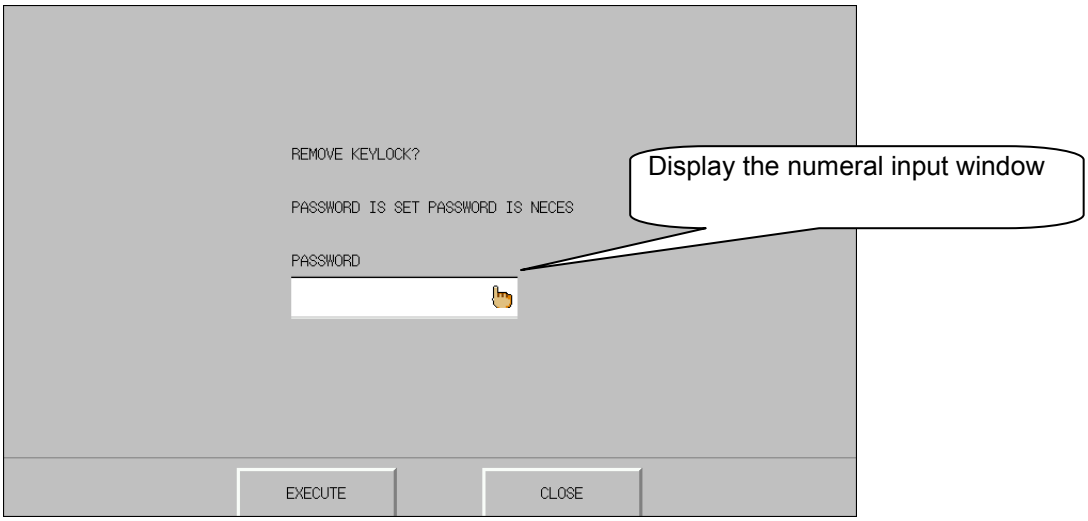
[Set the key lock]
Push and hold  Key.




Push “EXECUTE” to be Key lock .

[Unlock the key lock]
Push and hold  Key.

After inputting password and pushing “EXECUTE”, Key lock will be cancelled.




The following screen is displayed when the password is not correct.
Enter the correct password again.


## (17) Print Screen

Executes to print screen image.

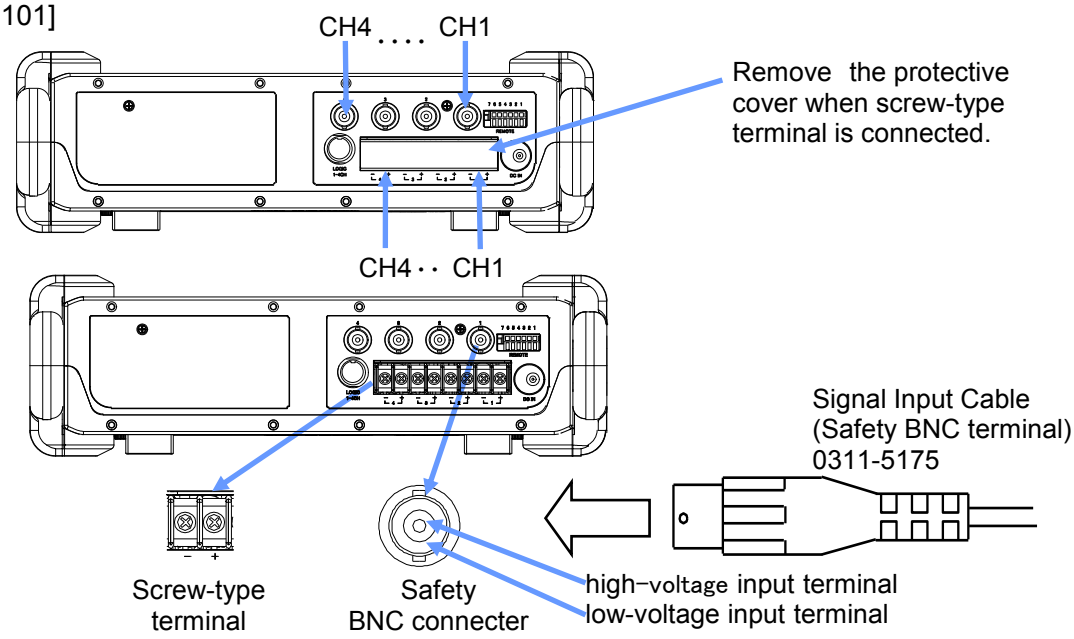

Pressing this key starts screen copy and output on paper.
For setting destination to save, refer to ☞ ’14. System Settings’

# 6. Input Amplifier

# 6.1. Signal Input Cables and Connection

How to connect signal input cables is shown below.

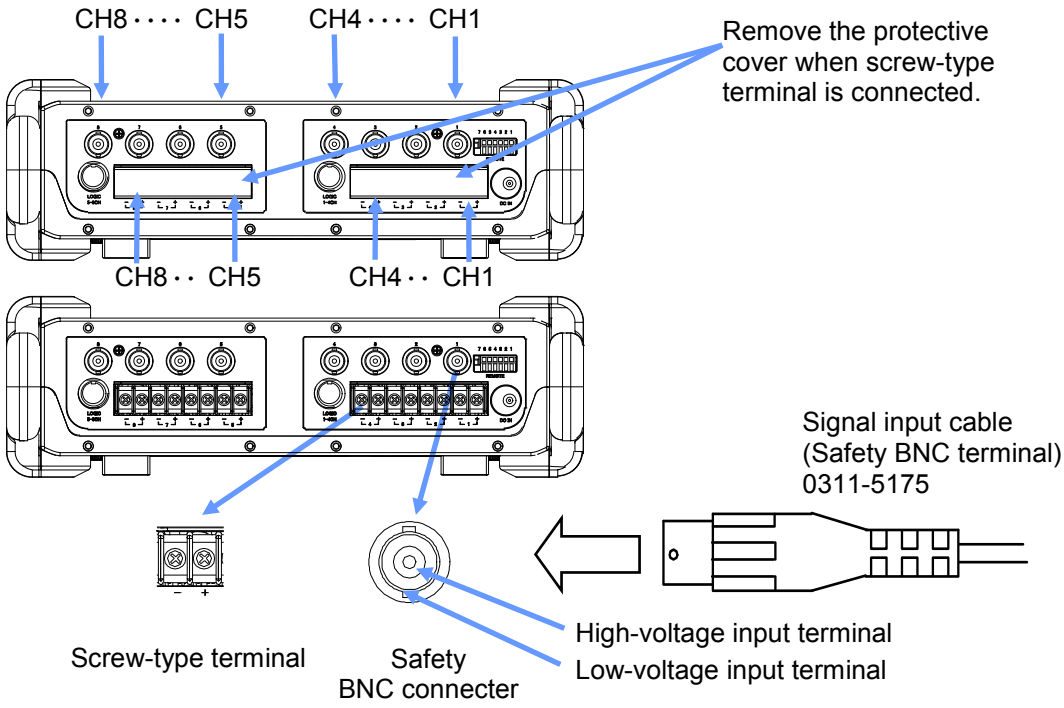
[RM1101]




Screw-type terminal and BNC connecter are connected to each other inside. Inputting either leads to measuring.
Connecting to the same channel simultaneously causes malfunction, due to the exclusive use of screw-type terminal and BNC connecter.

**⚠ CAUTION** Make sure to close the terminal block cover when using the RM1100.

[RM1102]

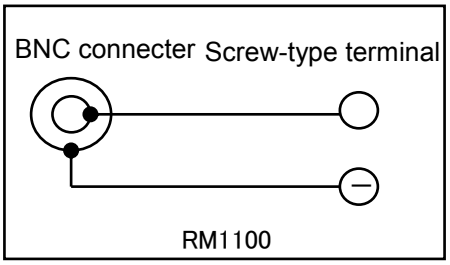



Screw-type terminal and a BNC connecter are connected to each other inside. Inputting either leads to measuring. Connecting to the same channel simultaneously causes malfunction, due to the exclusive use of screw-type terminal and BNC connecter.

**⚠ CAUTION** Make sure to close the terminal block cover when using the RM1100.

**⚠ CAUTION**

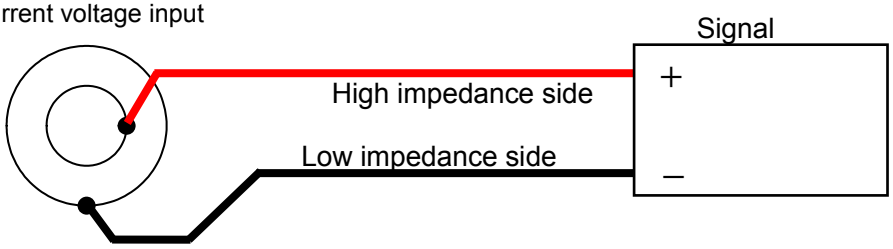
A Screw-type terminal and a BNC connecter of the same channel are connected to each other.
Never simultaneously input signals into a screw-type terminal and a BNC connecter of the same channel.
Inputting signals simultaneously may damage apparatuses to be measured.
Confirm in wiring that the power of signals are turned off to prevent electric shock. When inputting a voltage of 42 VPK or above,use a safety cable (signal input cable for a safety BNC terminal type)sold separately to prevent electric shock.



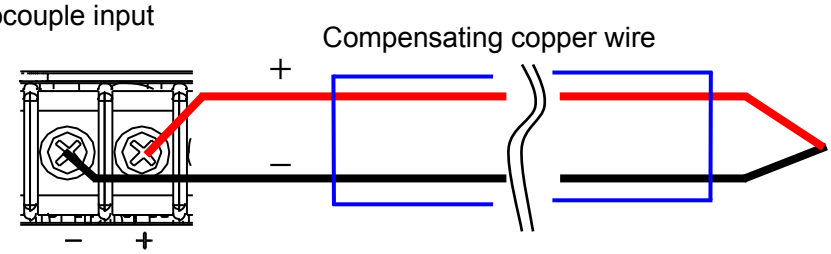

A Screw-type terminal and a BNC connector of same channel are connected each other.
Voltage applied to the BNC connector is also conducted to the screw type terminal at same potential.
For avoiding harmful electrical shock, always close the cover of the screw type terminal.

## ◆Wiring diagram

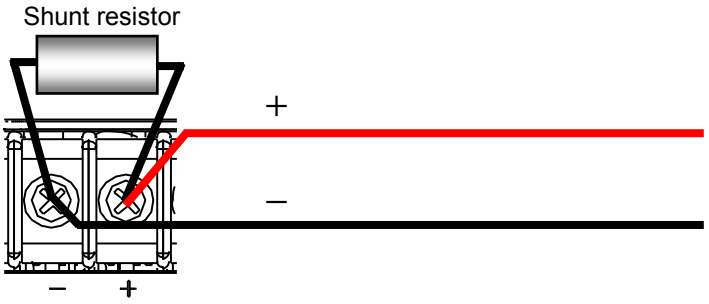
Direct-current voltage input




Thermocouple input




Direct-current input




Add a shunt resistor with 250 ohm (±0.1%) and set the range to 1 to 5 V for 4 to 20 mA.

Wire the signal input cable not to pull this unit by the cables. If pulled by the cables, the unit may be toppled by the cables.

**⚠ WARNING** Use isolated BNC cable (optional cable: signal input cable 0311-5175). The condition of external portion of a metal BNC connector is minus, and thus a user may suffer electrical shock if touching this portion. If the metal BNC cable must be used because of some reason, check the signal source and use the cable under the condition where the common mode voltage is ±42 V (DC or AC peak values) or less. Some metal BNC cable does not correctly fit to the connector. Do not use a cable that does not fit smoothly.

NOTE Pay attention to the following points when recording small signals.
- Do not use the input cable that is longer than required.
- Use a shield wire to avoid static electricity noise.

NOTE Keep the signal source resistance as low as possible (eg. 100Ω or less).The lower the signal source resistance, the better the data able to be measured.

## ◆Input Signal

**⚠ CAUTION** Allowable input Voltage
If voltage higher than allowable input voltage is applied, parts may be damaged and the instrument may fail. Do not exceed the level of input voltage.

| Range (V･FS) | 0.1 , 0.2 , 0.5 , 1 , 2 | 5 , 10 , 20 , 50 , 100 , 200 , 500 |
|---|---|---|
| Allowable input Voltage (V) | **40 V** | **500 V** |

**⚠ CAUTION** Input impedance
The input impedance is 1 MΩ or more (but the range from ±0.1 V to ±2 V with AC is apporx. 100 kΩ).

**⚠ CAUTION** Common mode voltage
Use an optional isolated BNC cable. In this case, the common mode voltage is 300 VAC or less.

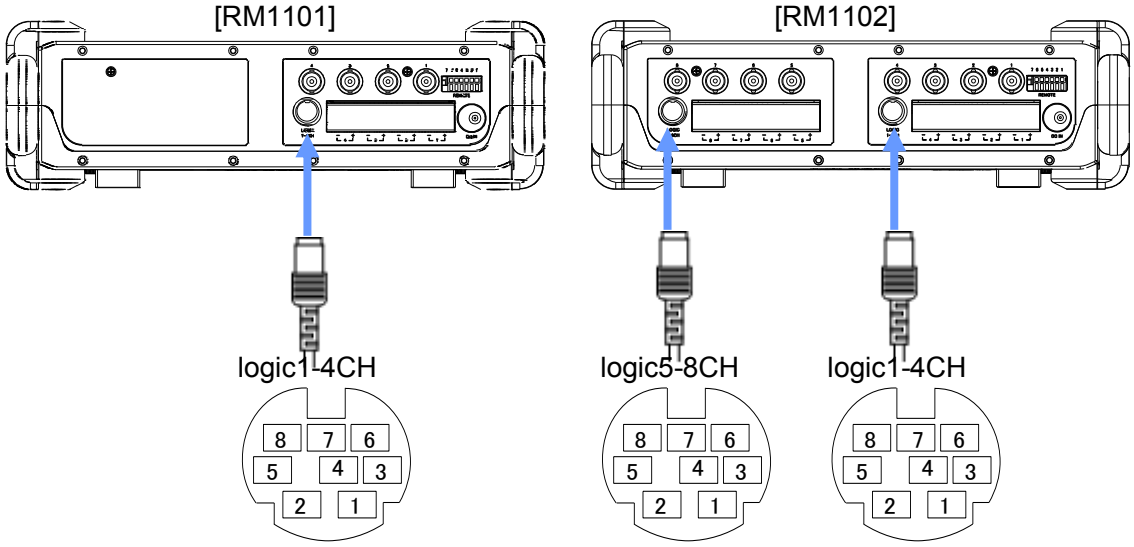
NOTE Use cable whose withstand voltage is at least 2 kV.

NOTE If common mode voltage or higher voltage is applied, the instrument could be damaged. Never apply such voltage. If pulse-type common mode voltage is applied, common mode distinction ratio may be worsened, resulting in noises in recording data.

NOTE Use the input voltage, including DC, up to ±30 V if the range from 0.1 to 2V･FS with AC is applied. If the voltage exceeding this range is inputted, you fail to measure properly.

# 6.2. Logic IC Code and Connection

The connection of logic IC codes is shown below.
Using a logic IC code(0311-5332：option） allows voltage level(0-5 V）and contact state (open and short) to be input. Connect a logic IC code（0311-5332：option）to an external input-output terminal as below. A logic IC code has four inputs and common to these four inputs in a logic amplifier.




*Side view of a plug-in

| Pin No. | Signal Name |
|---|---|
| 1 | 1ch input |
| 2 | 2ch input |
| 3 | 3ch input |
| 4 | 4ch input |
| 5 | GND |
| 6 | +5V |
| 7 | N.C |
| 8 | N.C |

| Pin No. | Signal Name |
|---|---|
| 1 | 5ch input |
| 2 | 6ch input |
| 3 | 7ch input |
| 4 | 8ch input |
| 5 | GND |
| 6 | +5V |
| 7 | N.C |
| 8 | N.C |

| Pin No. | Signal Name |
|---|---|
| 1 | 1ch input |
| 2 | 2ch input |
| 3 | 3ch input |
| 4 | 4ch input |
| 5 | GND |
| 6 | +5V |
| 7 | N.C |
| 8 | N.C |

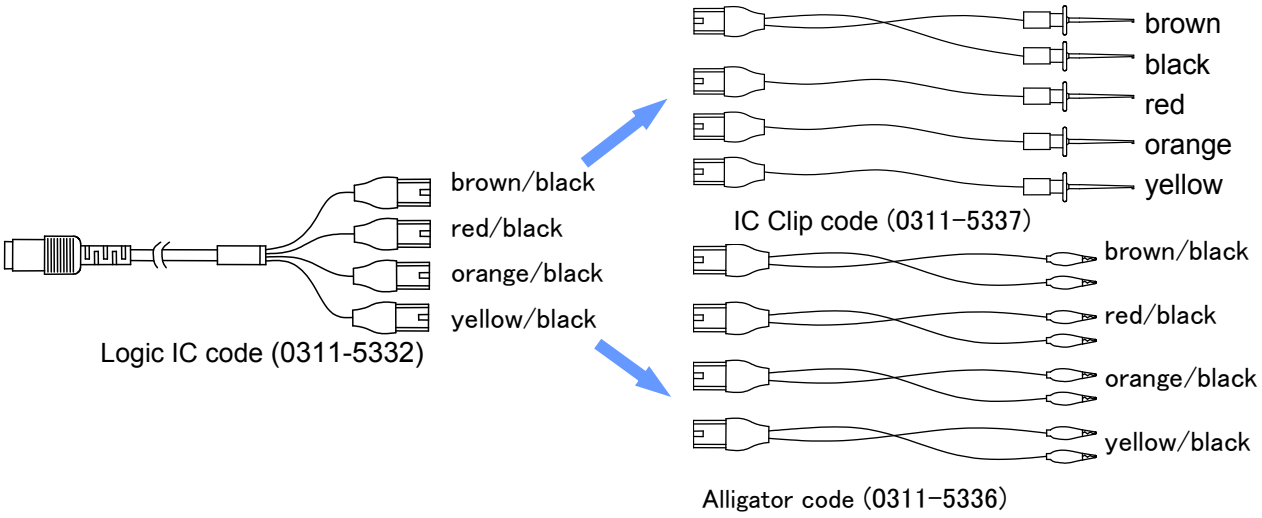
● **Input Signal**

| | | |
|---|---|---|
| Voltage input | Input voltage range | 0 -＋5 V |
| | Detection level | H level……Approx. 2.5 V or more<br>L level……Approx. 0.5 V or less |
| | Input current | 1μA or less |
| Contact input | Detection level | Short (H)…… 250 Ω or less<br>Open (L)…… 2 kΩ or more |
| | Load current | 2 mA(Max.) |

**⚠ CAUTION** Inputting voltage above the input voltage range lowers input impedance to approx. 50 kΩ.

● **Logic IC code probe**

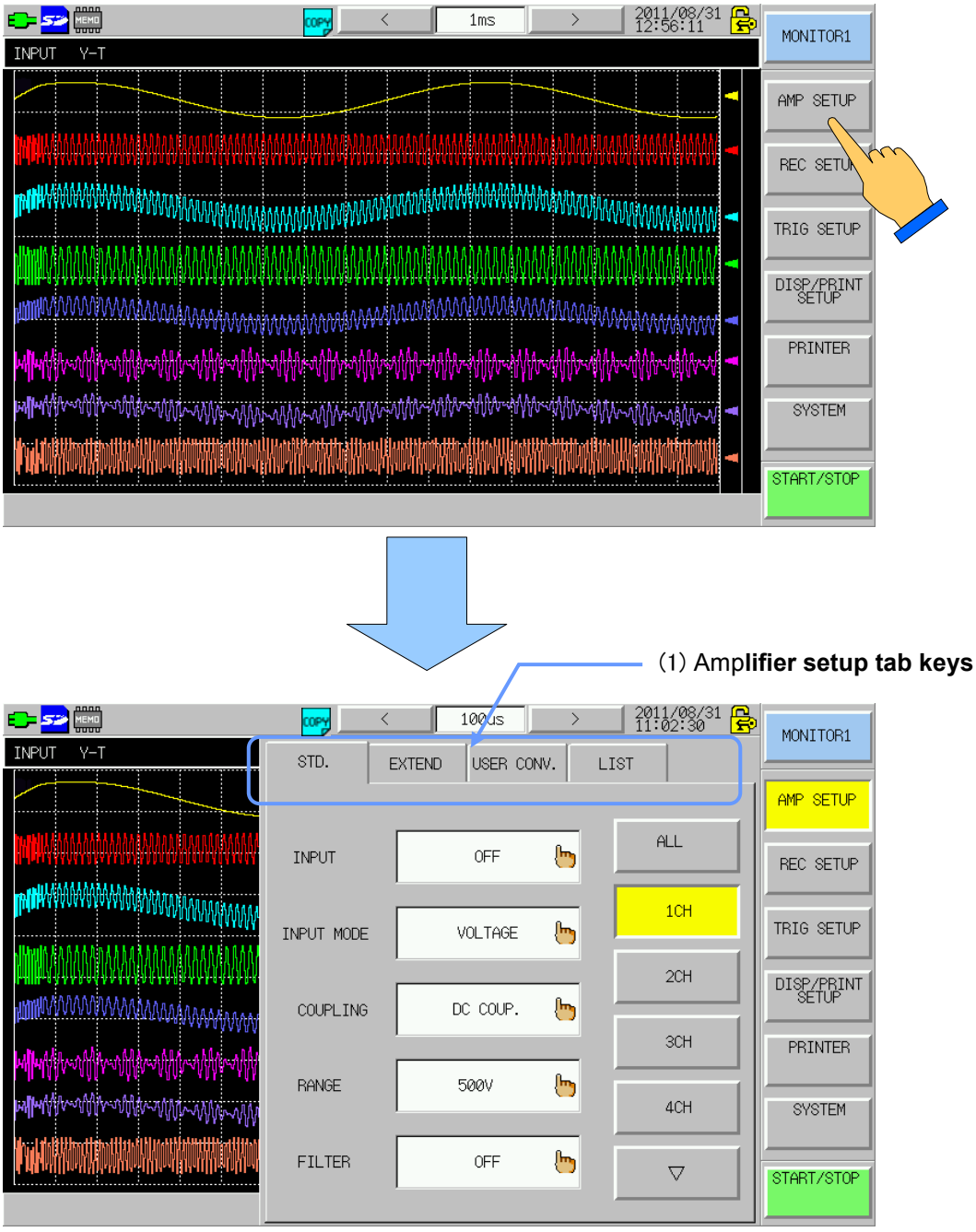
The logic IC code probe comprises logic IC code, IC Clip code, and alligator clip code. When an IC code is connected, choose the wire with the same color.




| Internal Logic Amp.ch | | Logic IC code | IC Clip code | Alligator code |
|---|---|---|---|---|
| 1 | 5 | brown/black | brown/black | brown/black |
| 2 | 6 | red/black | red | red/black |
| 3 | 7 | orange/black | orange | orange/black |
| 4 | 8 | yellow/black | yellow | yellow/black |

# 6.3. Amplifier Setup

Display the Amplifier Setup screen by pushing the Amplifier setup key. When close the screen, push the key again.

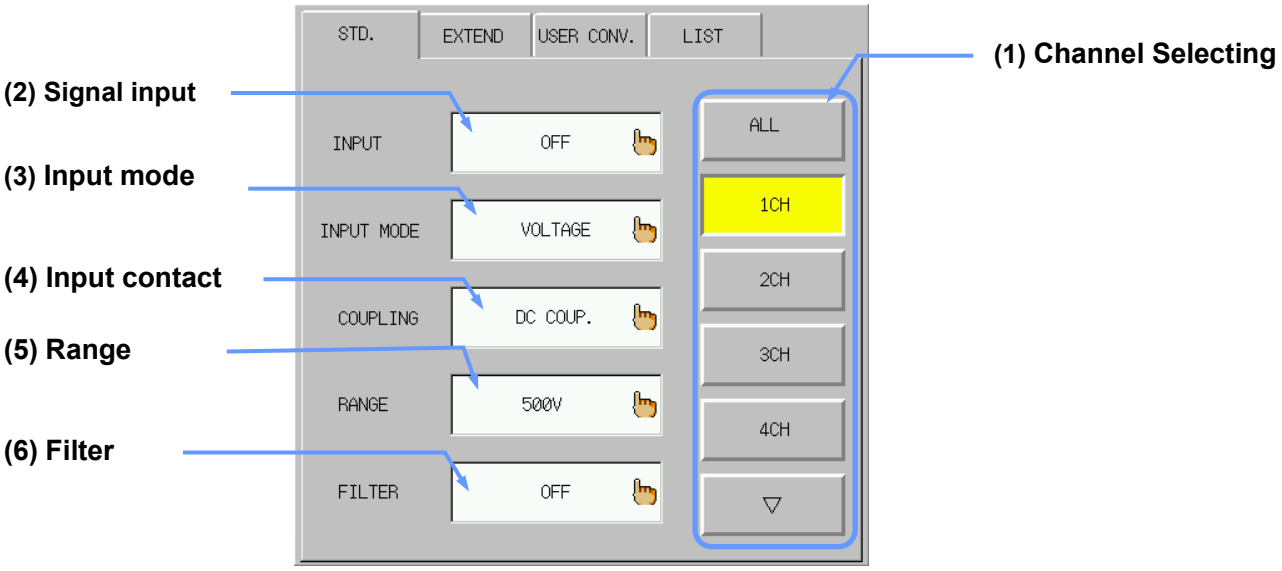



## (1) Amplifier Setup tab keys

Pressing tab keys switches between the Standard, Expansion, physical conversions, and Table of setups tab keys.

# 6.4. Standard Setup

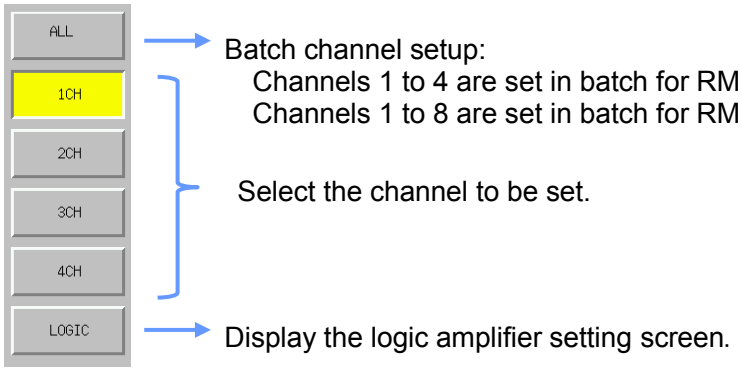
## *6.4.1.Temperature/Voltage Amplifier Setup*



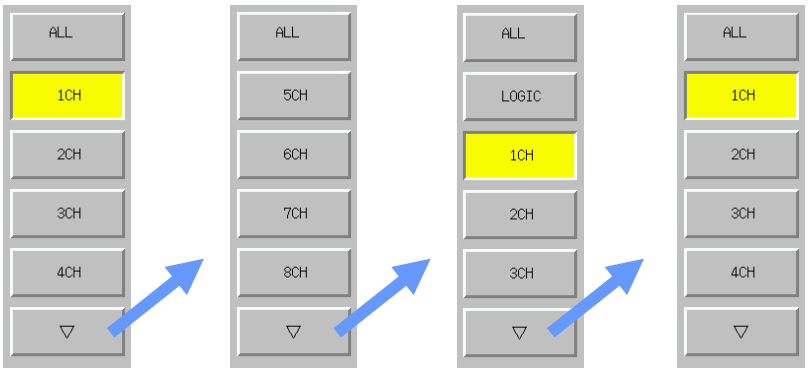

### (1) Channel Selection

Select the channel to be displayed. The selected channel is displayed in yellow.

[RM1101]

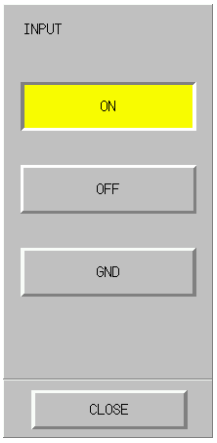



[RM1102]
Pushing the down button displays the selectable channel.



## (2) Signal input

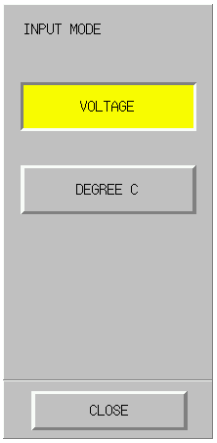
Set ON, OFF, and GND of signal input.




ON : waveform display and data recording are available.
GND : GND of signal
OFF : waveform display and data recording are available.

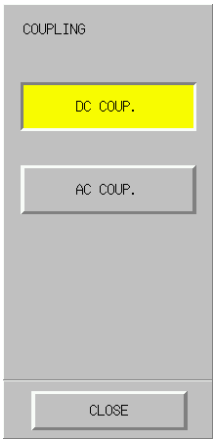
## (3) Input mode

Select Input mode to voltage or temperature (Celsius or Fahrenheit).




## (4) Input contact

Set Input contact to “AC Contact” or “DC Contact.”
Setting is available when input mode is voltage mode.

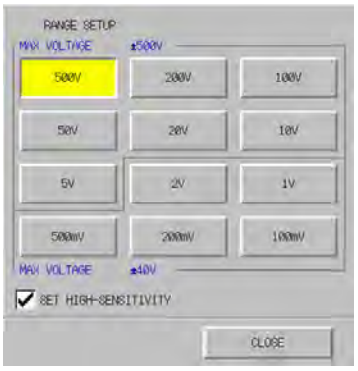



***TIPS*** AC Contact allows both DC offset and the input voltage measurement.

## (5) Range

Select the range value.

[Voltage mode]




Full-scale display


Div display

Range setting

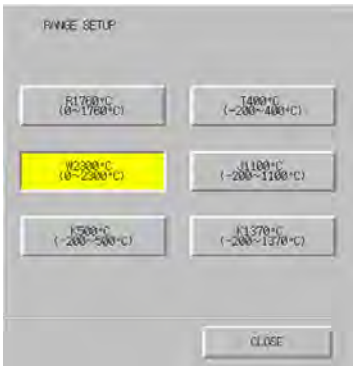
Maximum tolerance for input voltage

Use high sensitive setting.

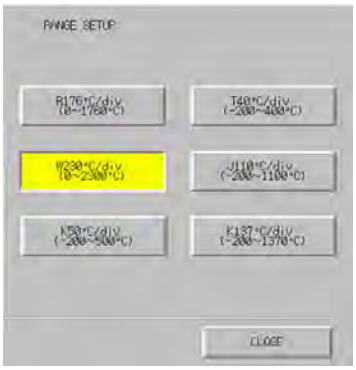
**TIPS** Refer to 14.4 *Display unit setting* for changing the Full-scale display or the Div display.

**TIPS** When the " Use high sensitive setting" check box is;
checked off: the voltage keys of 2 V, 1 V, 500 mV, 200 mV, and 100 mV cannot be set up as the maximum tolerance for input voltage;
checked ON: all the voltage keys can be set up.

[Temperature mode]




Full-scale display

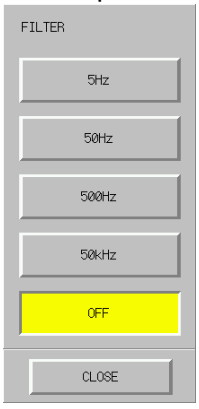



Div display

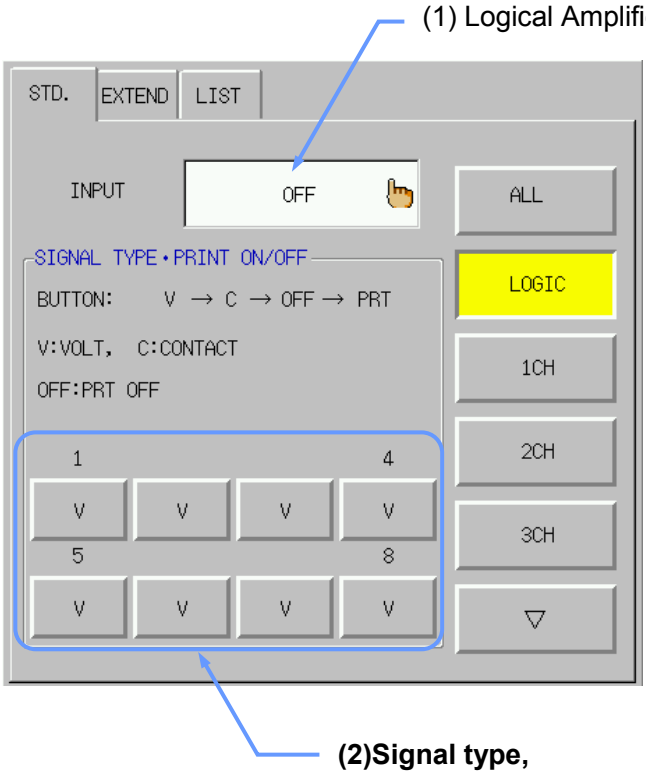
**TIPS** Refer to 14.4 *Display unit setting* for changing the Full-scale display or the Div display.

## (6) Filter

Set the Low-pass filter value. Select among 5 Hz, 50 Hz, 500 Hz, 50 kHz, and OFF.



## 6.4.2. Logical Amplifier Setup




### (1)Logical Amplifier Signal Display and Recording Setup

Set the display and recording ON/OFF for the logical amplifier signal.

**TIPS**

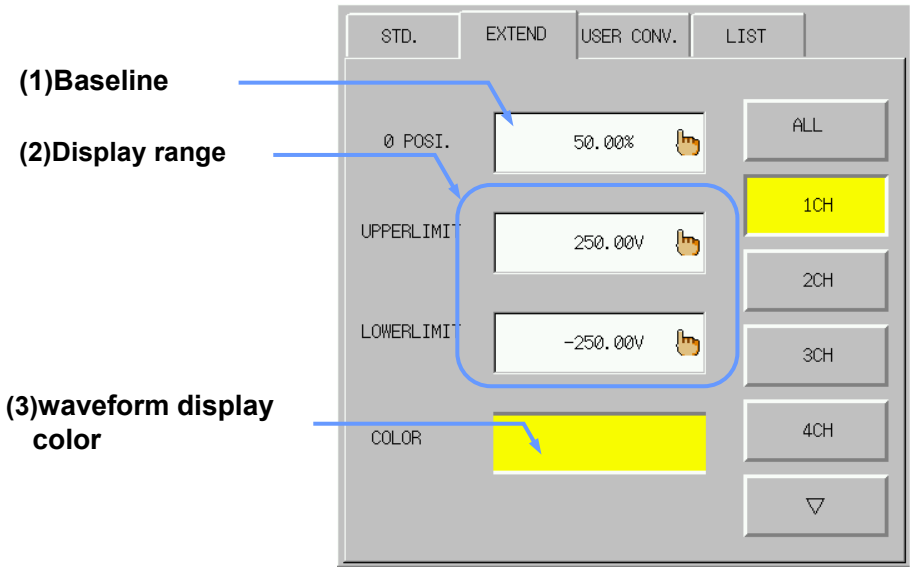
Marking (Event) information is included in Logic Amplifier Signal data. To save the marking information, set logic amplifier signal input ON.

### (2)Signal type, Print ON/OFF

Set the signal type for each logical signal and the Print ON/OFF.
The Input signal area switches from the Voltage, to the Contact point, and then to the Print OFF each time you click the Input signal area.

# 6.5. Expanded Setup

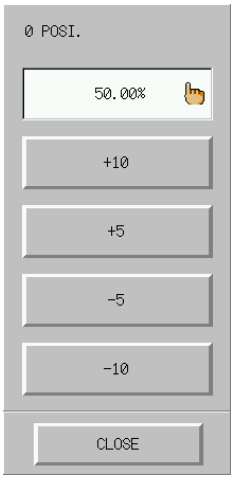
## *6.5.1. Temperature/Voltage Amplifier Setting*



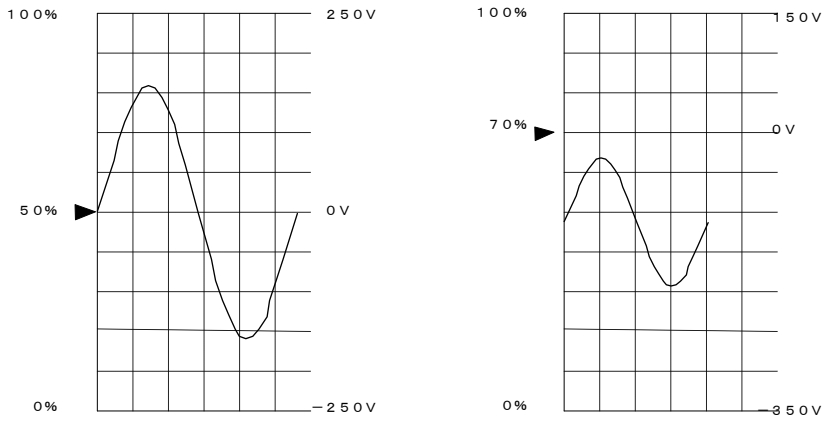

### (1) Baseline

Set the baseline position. The baseline position represents waveform display position for 0-Hz input. Suppose the full scale means 100%, the baseline can be set up by a step of 1%.

The full scale of 100% (the minimum display range of 0%, the maximum of 100%) can be set up by a step of 1%. The position can be changed with keeping the full scale width.



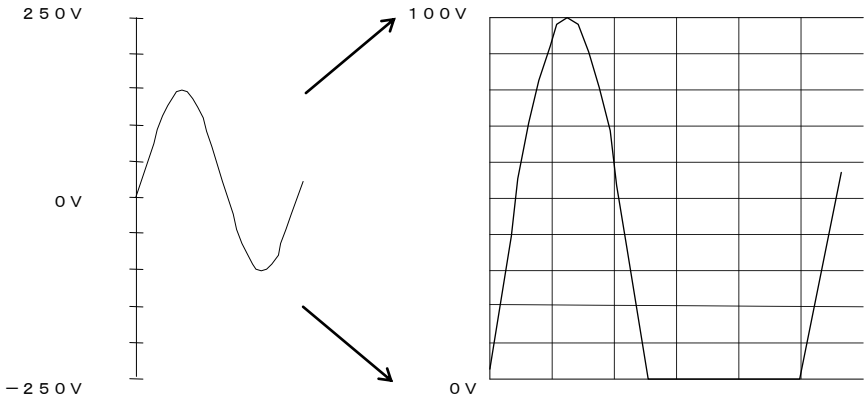

Example: In the case of the position (baseline) changed from 50% to 70%.



## (2) Display range

In the range of the present full-scale, you can set up the maximum and minimum values for your required area and make it your desired full-scale.

Example: In the range of 500 VFS, set the maximum value of 100 and the minimum value of 0 in the recording/display range.



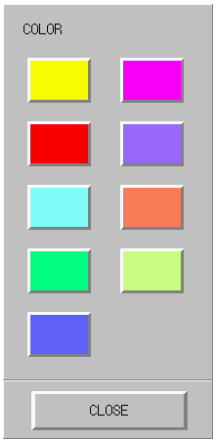

Waveform can be displayed and recorded in the range of 0 to100 V on the monitor or recording chart paper.

**TIPS**

When setting the maximum value < the minimum value, the waveform canbe displayed reversely.
Example: setting the maximum value = -2.5000 and the minimum value = +2.5000, the waveform is displayed reversely.
In this case, the scale display is also reversed (upper end is -2.5000 and the lower end is +2.5000).
To reverse the sign of the input signal instead of the waveform, set the maximum value < the minimum value for either of the input or output values.

## (3) Waveform display color

The waveform display color can be changed.

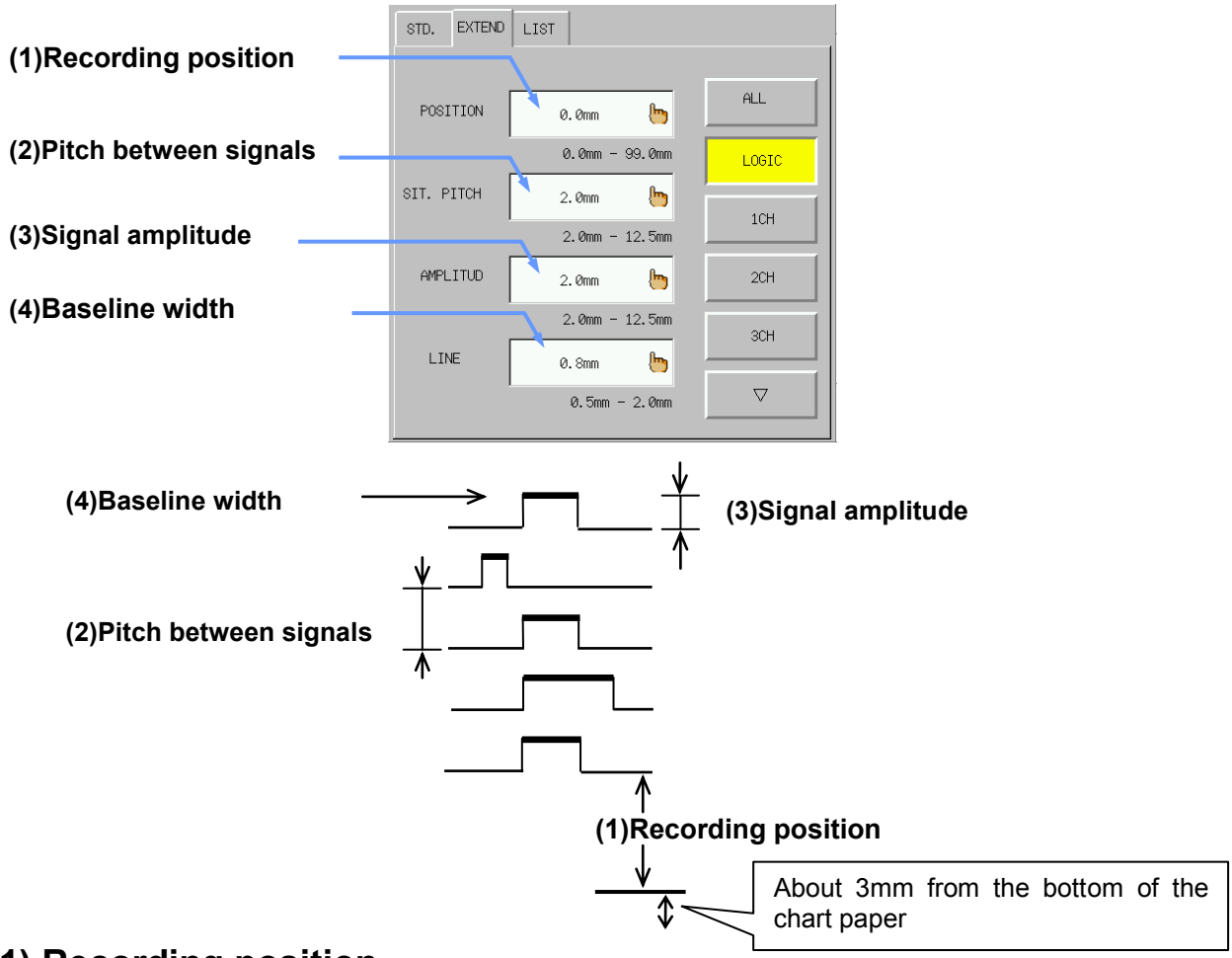



※default colors

| In the case of RM1101 | In the case of RM1102 |
|---|---|
| 1CH: yellow | 1CH: yellow |
| 2CH: red | 2CH: red |
| 3CH: light blue | 3CH: light blue |
| 4CH: green | 4CH: green |
| Logic: yellow green | 5CH: blue |
| | 6CH: pink |
| | 7CH: purple |
| | 8CH: orange |
| | Logic: yellow green |

※The colors of logic remain fixed.

## 6.5.2. Logical Amplifier Setup




### (1) Recording position

Specify signal 4 in the case of RM1101 and signal 8 in the case of RM1102 for the waveform position.
Setting range: 0.0 mm to 99.0 mm
Place the signals 1-8 to the upper position at the interval specified in the Pitch between signals.

### (2) Pitch between signals

Specify the interval of the waveform position.
Setting range: 2.0 mm to 12.5 mm
All the signals (signals 1-4 in the case of RM1101 and signals 1-8 in the case of RM1102) are specified collectively.

### (3) Signal amplitude

Specify the length of the waveform amplitude (the waveform amplitude for the time of H <=> L alternation).
Setting range: 2.0 mm to12.5 mm
All the signals (signals 1-4 in the case of RM1101 and signals 1-8 in the case of RM1102) are specified collectively.

### (4) Baseline width

Specify the waveform width at H.
Setting range: 0.5 mm to 2.0 mm
All the signals (signals 1-4 in the case of RM1101 and signals 1-8 in the case of RM1102) are specified collectively.

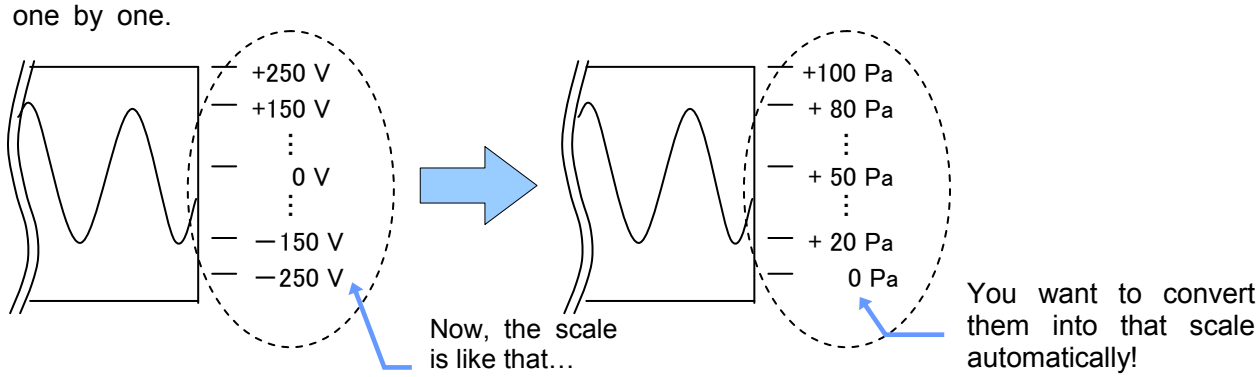
NOTE If the Recording position and the Pitch between signals are specified too large, they might exceed the effective recording width so that the logic waveform cannot be printed.

# 6.6. Physical conversion setup

The “Physical conversion” tab is common to the temperature/voltage amplifier setups, and you ca n convert the measured values to the physical amount here.

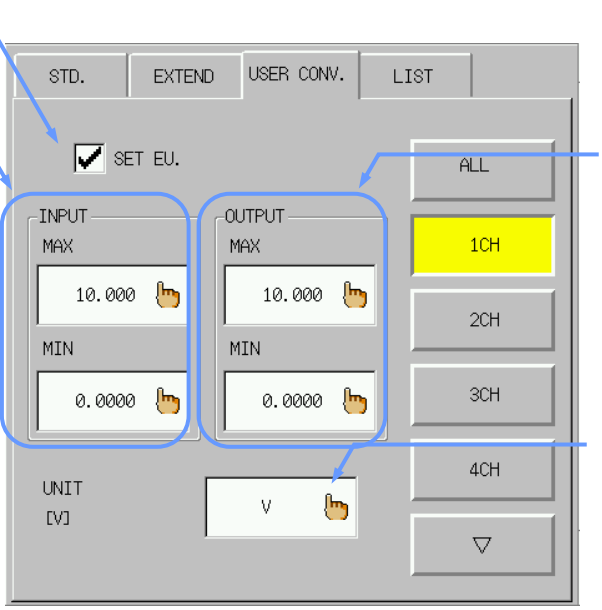
● **Physical conversion**

Since the scale is automatically converted into the desired unit, it is not necessary to convert it one by one.




**(1)Physical conversion ON/OFF**

**(2)Input rage setup**




**(3)Output rage setup**

**(4)Physical unit setup**

## (1) Physical conversion ON/OFF

Set up whether to convert scale or not. Check if you want to physical conversion. If it checked, (2), (3), and (4) will be able to set.

The "*" mark is displayed on the value display parts in order to show that physical amount conversion was applied.

## (2) Input range setup

Set up the referential measuring ranges of the maximum and minimum values.

## (3) Output range setup

Set up the output ranges of the maximum and minimum values against the input ranges.

Set up the referential measuring ranges of the maximum and minimum values for the physical conversion.

## (4) Physical unit Setup

Set up the physical amount unit. Pressing the key shows the following screens.


Change the Unit selection screen by clicking up-down buttons.

a) Unit selection display
Display the present unit selection.
Clicking this key, the Key input screen will be displayed to set up any strings.

b) Unit key
Pressing the key change the setup.

**TIPS** The unit of the input value is the referential unit (unit without m and k). Even if the range is changed, the physical conversion can be used as it is.

**TIPS** At the time of inputting numerical value for the physical conversion, set up the followings in order to help the operation.

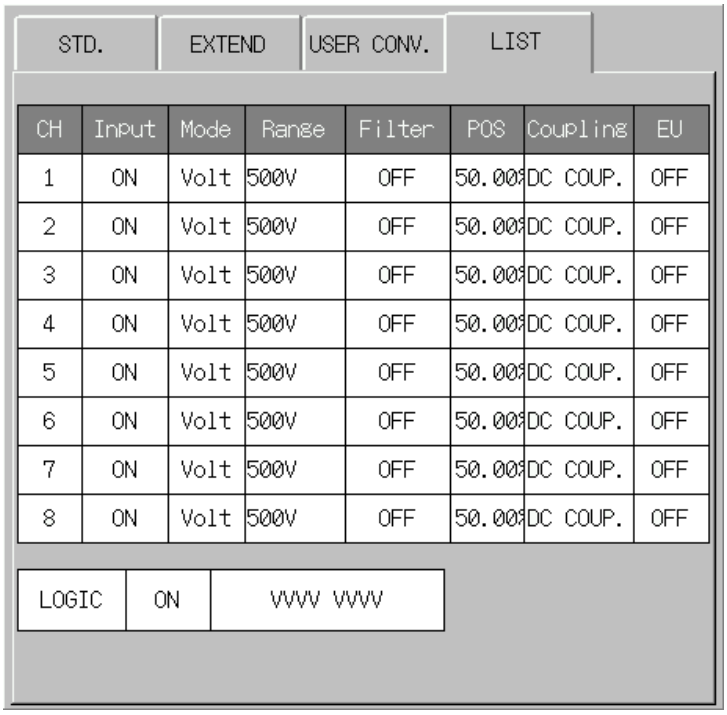
- **When changing the input values, set up the same values in the output values and the displayed recording range.**
- **When changing the output value, set up the same value in the displayed recording range.**

NOTE When setting like the followings in the input maximum and minimum values, the measured values are not displayed correctly.
(Only a fixed value is output even if the input signal changes.)

- **When the maximum and the minimum values are equal (the division by 0 is occurred during the internal calculation).**
- **When the ranges of the input maximum and minimum values exceed the effective range (the values past the maximum/minimum value).**

# 6.7.Table of Setups

Amplifier setups of all channels are shown in the table below.



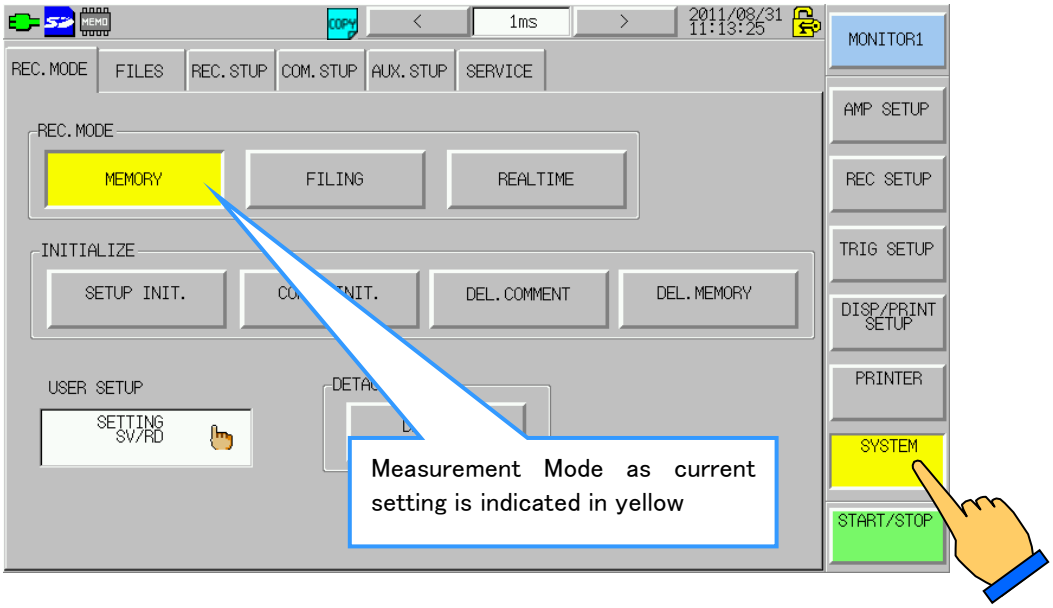
# 7. *Memory Recorder*

# Recording High-speed Signals

# 7.1.Overview of Memory Recorder Mode

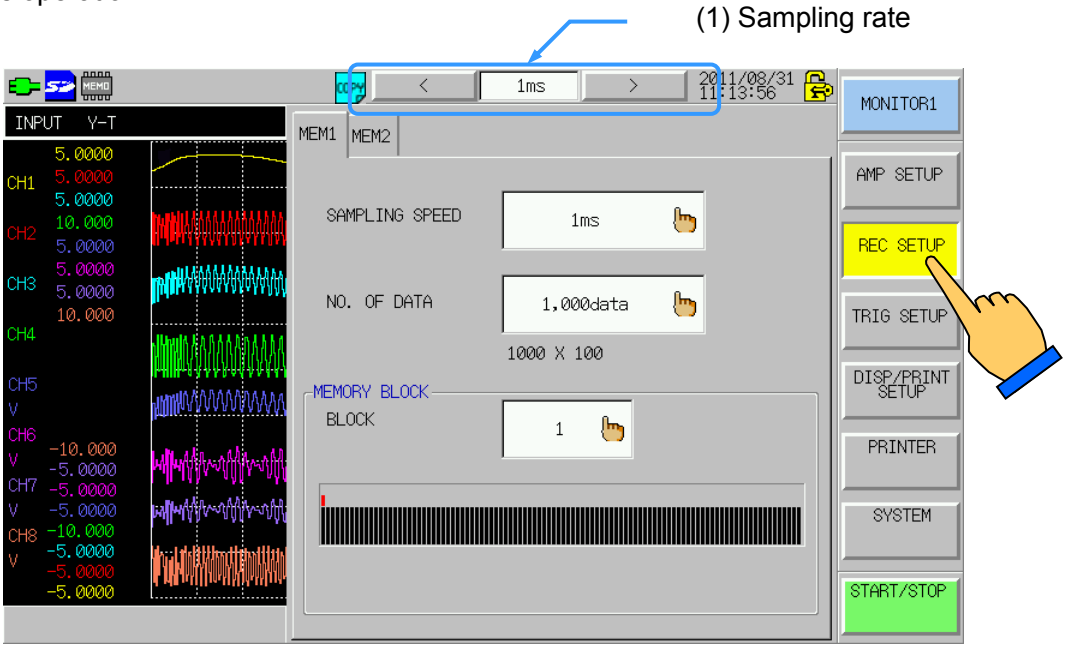
The Memory Recorder mode is useful for recording high-speed signals since this mode features a highest sampling rate of 1µs. Data recording of a certain period of time starting at a trigger is available. Automatic printing of data on chart recording paper or file saving is also available.

To set the RM1100 to the Memory mode, use the [Measurement Mode] tab on the [System setup] screen.




# 7.2.Recording Condition Setup

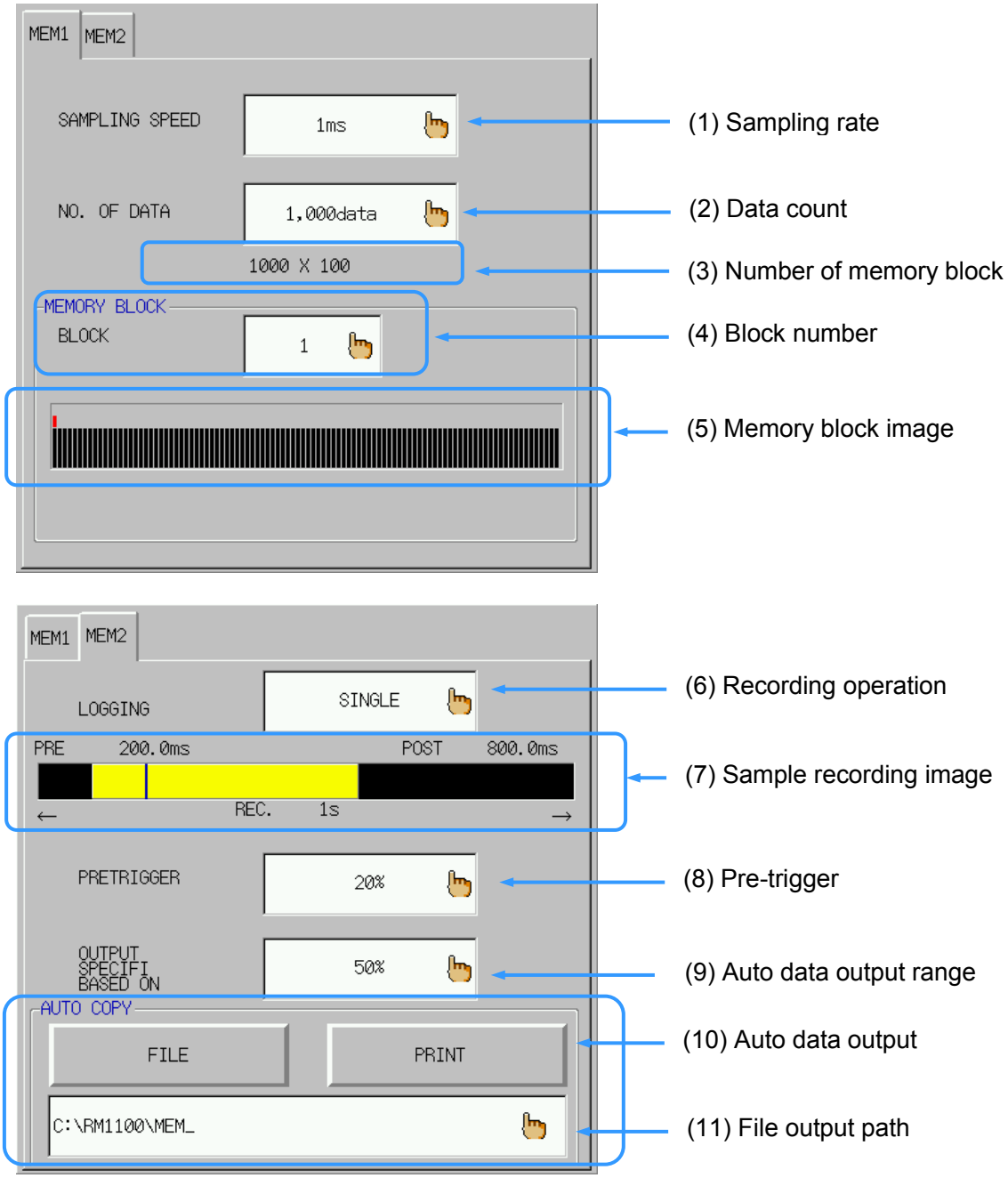
Open the following screen by pressing the [Recording Setup] key on the Operation Panel to set the recording conditions for Memory Recorder. The recording condition setup cannot be made while the recorder is in its operation.




## (1) Sampling rate

These keys are used to set sampling speed. Set with [ < ] and [ > ] keys.

## 7.2.1.Memory recording condition setup block




### (1) Sampling rate

Sampling rate for memory recording is set.
Recording speed varies depending on how many channels are used.

When using 1CH :1μs(1MS/s) ～ 1s (1S/s)
When using 2CH :2μs(500kS/s) ～ 1s (1S/s)
When using 4CH :5μs(200kS/s) ～ 1s (1S/s)
When using 8CH :10μs(100kS/s) ～ 1s (1S/s)

### (2) Data count

Data count per memory block is displayed. Pressing a key opens a setup dialog box, which allows selecting data count.

Setting data count 1,000-2,000,000 Data ( 1,2 or 5 steps )

## (3) Memory block size & recording time

Setting number of data counts decides and shows the maximum number of block allowed.

## (4) Block number

By setting the number of data, the maximum numbers of usable blocks are displayed.

## (5) Memory block image

This section displays internal memory status. The status of “Unused memory block” shows in black color and of “Recorded memory block” shows in yellow color. The number of recordable memory blocks changes depending on the data count.

## (6) Recording operation

These keys are used to specify emory recording operation.

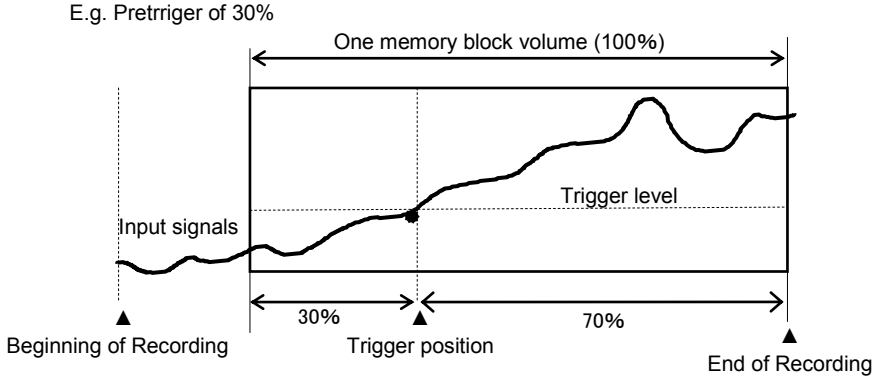
| Recording operation | Description |
|---|---|
| Once | Operation closes after recording of one block is finished. |
| Endless | Recording keeps going until stop key on the operation panel is pressed. After all memory blocks are used, it keeps overwriting from the beginning. |

## (7) Sample recording image

Trigger position on entire recording range and image from output range is displayed. Recording time, Pre-trigger, post-trigger and total recording times are displayed.

## (8) Pre-trigger

Recording size before trigger can be set in percentage. Changing this setting renews the sample recording image, which enables an user to confirm recording time allocation.
Pre-trigger: 0 to 100% (10% step)




NOTE

If a trigger is detected immediately after the start of recording, recording time may be shorter than designated.

Example1: Under pre-trigger setup of 30 ms, a trigger is detected at 10 ms after the start of recording. The pre-trigger recording data length is 10 ms, resulting in shorter data length than pre-set length.

Example2: Under post-trigger setup of 50 ms, if the Stop Key is pressed at 30 ms after the trigger detection, the post-trigger data becomes 30 ms, resulting in shorter data length than pre-set length.

## (9) Auto data output range (Trigger detection point)

Data output range for auto output is specified. The setting is made in percentage (%) in reference to the trigger detection point
Output range: 10 to 100% (10% step)

## (10) Auto data output

Designate data output to be executed after memory recording.

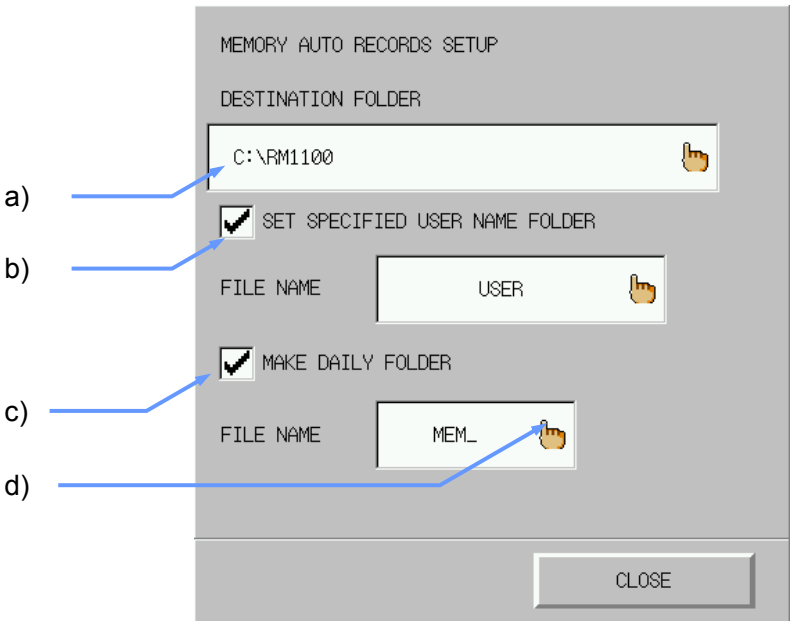
| Output format | Description |
|---|---|
| File | All data region is saved as a FSD file format. |
| Chart paper | This function prints out the waveform area, which is specified by output range. |

NOTE

The binary save performs saving of entire part of file regardless of output range settings.
Data is sent to the output path specified by the auto data output after recording one block. The following memory block recording starts after the recording operation is completed.

## (11) File output path

When selecting a file to output path, specify the folder path for saving files. Press the Key to display the next dialog.




### a) Save target path

Save target path is specified.
Folder on a SD card can be specified.

### b) ON/OFF for folder made by user

When the check box is ticked, a folder can be made by user. The data save destination will be under the folder.

### c) ON/OFF for creating folder everyday

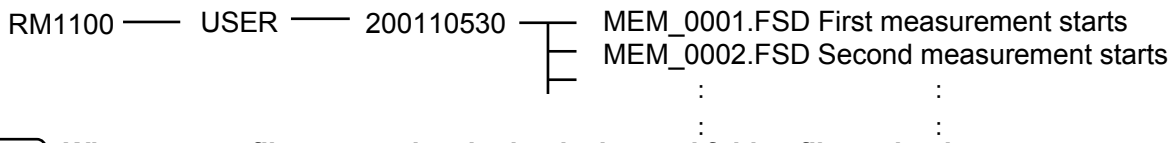
When the check box is ticked, refer the calendar, creating a folder of the measurement date (e.g. for May 31, 2011, ”20110531”), and then save the data under the folder.

### d) Arbitrary file name (Limited to the top four letters)

Top four letters for the save file is designated. The file name will have designated top four letters and four-digit serial number. The extension is “FSD”.

NOTE **Folders and Data files created by Automatic Output**

・User Name Entry Folder, and Daily Folder are ticked as default.
・Data files are created under the folders: RM1100, USER, and dates
・Every time they are recorded, four-digit serial numbers are added and updated following the specified File Name.

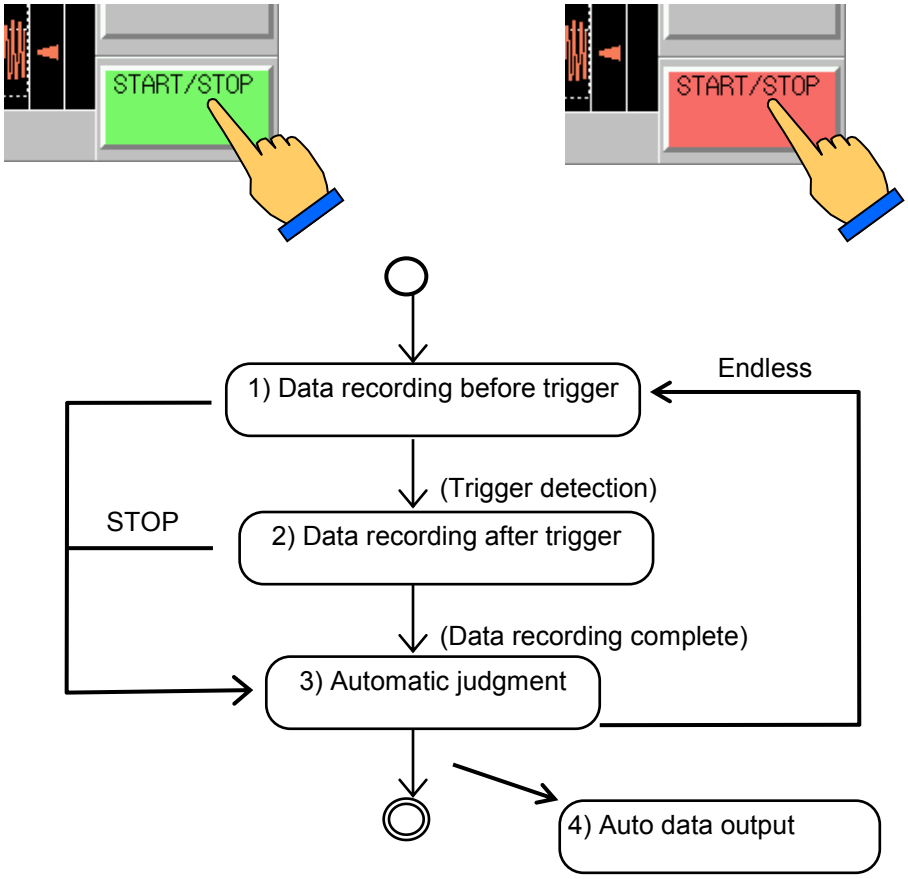



NOTE **When a same file name exists in the designated folder, file saving becomes an error.**

Please check designated folder before beginning to record data. It is recommended to create a new folder and save data there.

# 7.3.Recording Operation

Pressing the Start/Stop Key on the Operation Panel starts the Memory Recording. After the recording start, the recorder is in the wait status for trigger detection. Pressing the Start/Stop Key stops the operation forcibly. The following diagram explains the flow of operation.




*TIPS* When recording at fast sampling, Start/Stop key may not respond because measuring operation is in higher priority than key control. If such case occurs, press and hold the Start/Stop key for 2 seconds or longer.

1) Data recording before trigger
After the memory recording start, it becomes wait status of trigger. Memory block recording continues until the trigger detection is made or the Stop Key is pressed. When the trigger is detected, data recording operation starts after the trigger. When the Stop Key is pressed and operation is forcibly terminated, data recording after the trigger is not made but the operation judgment processing starts.

NOTE Other then trigger detection by an input signal, trigger detection can be made through the Manual/Marking Trigger or External Trigger signal.

2) Data recording after trigger
The amount of data specified by the pre-trigger is retained and recording for remaining amount of data is made. The recording automatically ends but forcible termination is also made through the Start/Stop Key. In this case, the data length will be shorter than the data length displayed as recording time.

3) Automatic judgment
When auto data output functions (File, chart paper) are selected to be effective, automatic data output of recording data is made. Memory block recording is repeated depending on the recording operation.

NOTE If forcible termination is made with the Star/Stop Key, memory recording finishes.
If the block for overwriting is outputting data in endless manner, recording starts after the outputting is completed

4) Auto Copy
File and chart paper output operation are executed.

NOTE When the power is turned off, memory block data is erased. Save the data in a file as necessary.

# *8. Filing Recorder*

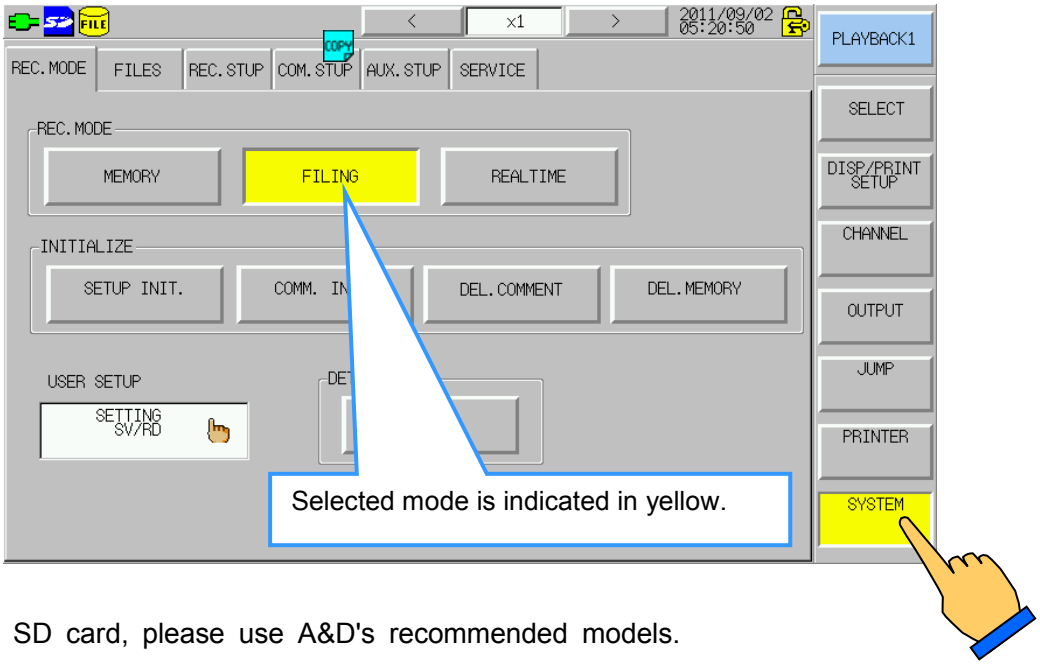
# Recording-Data in SD Card

# 8.1. Overview of Filing Mode

The Filing mode can record data in a SD card, which is suitable for a long-time measurement.
The data recorded in the SD card can be replayed on the monitor screen in the form of waveforms.

To set the recorder in the Filing mode, use the Measurement Mode tab in the System screen.

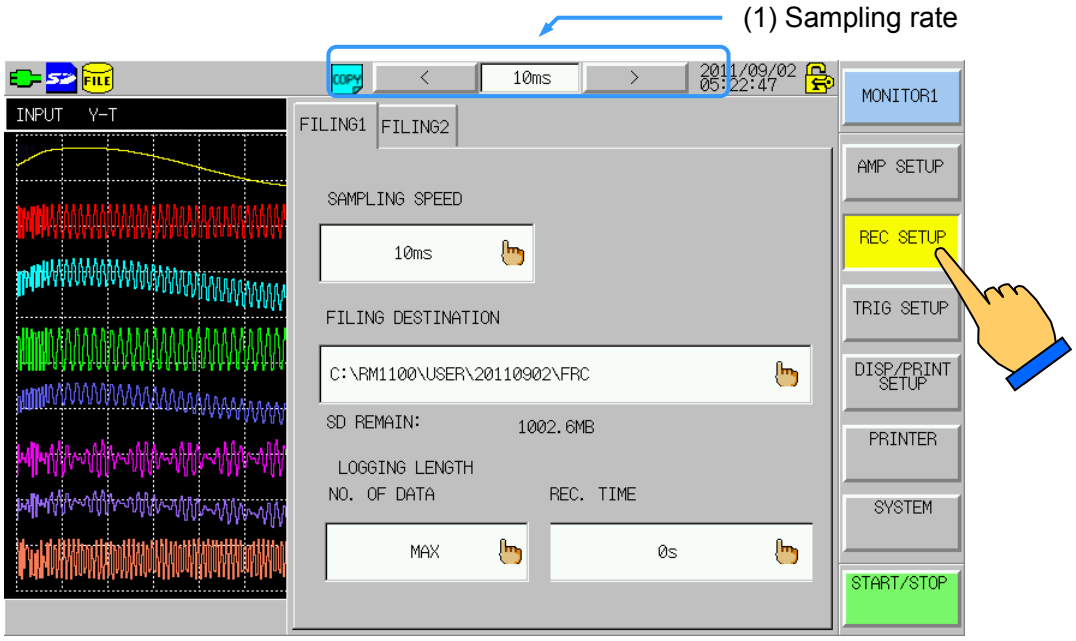
NOTE For SD card, please use A&D's recommended models.




NOTE For SD card, please use A&D's recommended models.

# 8.2. Recording Condition Setup

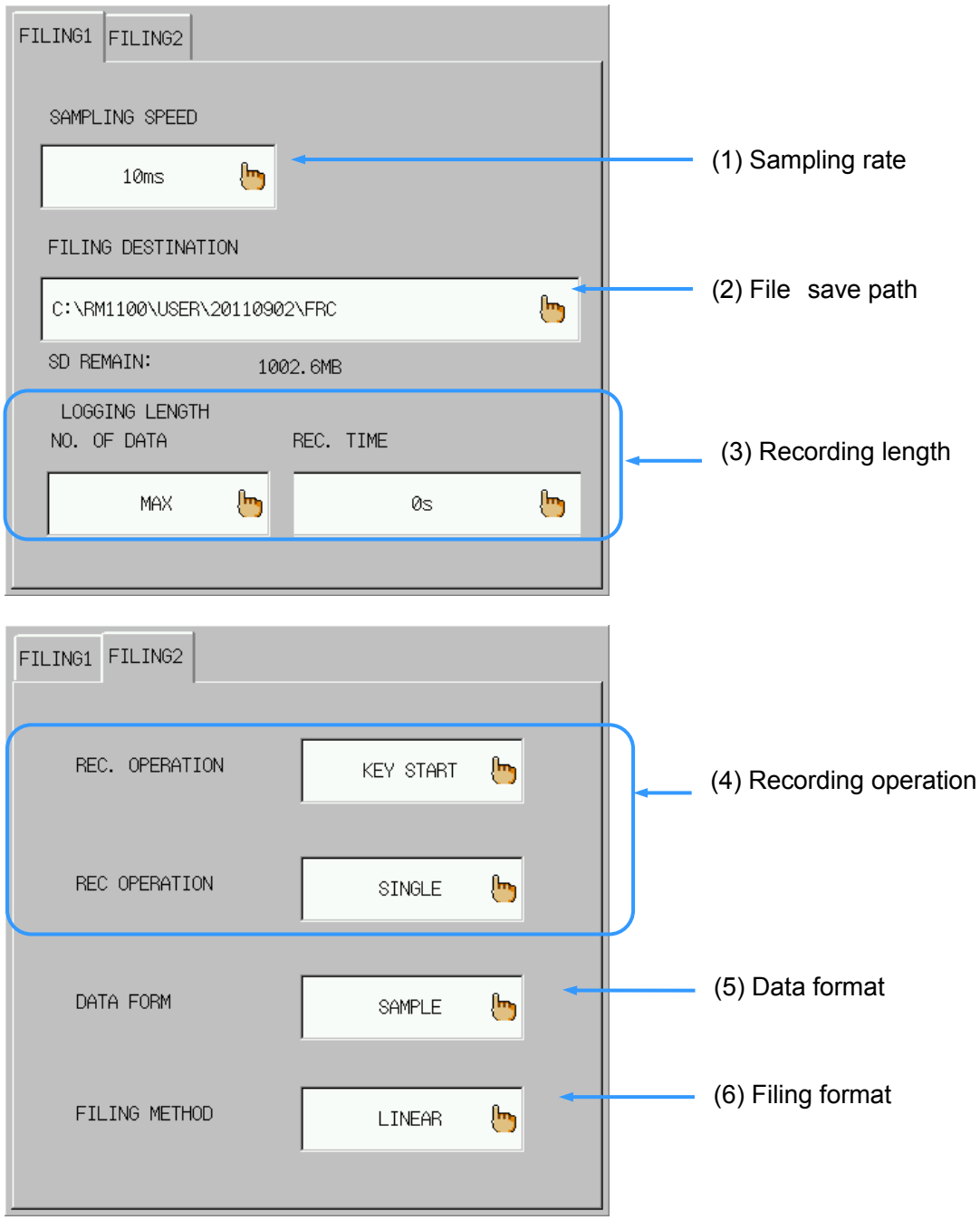
Open the following screen by pressing the [Recording Condition] key on the [Menu Bar] to set the recording conditions for Filing mode. The recording condition setup cannot be made while recording data.




## (1) Sampling rate

These keys are used to set sampling rate. Set with [ < ] or [ > ] keys.

## *8.2.1. Filing recording setup block*




### (1) Sampling rate

Recording speed in Filing mode can be set.
Executable recording speed in Filing mode can be changed depending on Data format and the number of recording channels. For more detail, refer to “8.4.2. Recording speed execution restriction”.

NOTE Recording time changes if recording speed is changed. Check before recording begins.

## (2) File save path

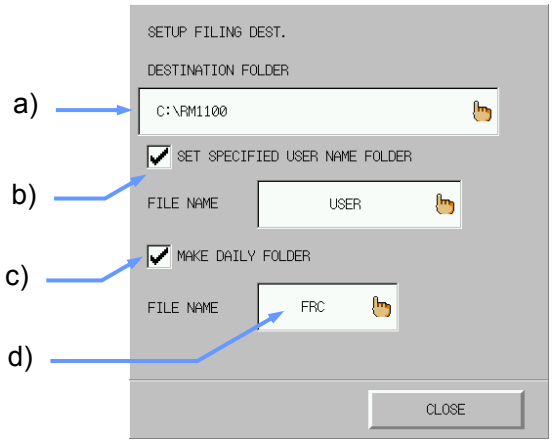
Save target path for Filing recording is indicated. Pressing the key opens below dialog box and the path can be set.

a) Save target folder
The save target folder is specified

b) User name entry folder
When this box is ticked, a folder is created and the save target will become inside of this folder.

c) Daily folder
When the check box is ticked, starting time is referenced and folder is created everyday. The data save destination will be under the folder.

d) File name
Arbitrary file name (Limited to the top three letters)
Top three letters for the save file is specified. The file name will include designated top four letters and four-digit serial number. The extension has FSD for sample and FPP for Peak.



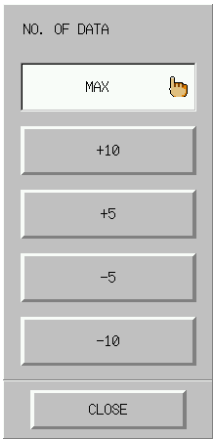

NOTE **Creating Folders and Data Files**

- User name entry folder, and Daily folder are ticked in the initial state.
- Data files are created under the folders: RM1100, USER, and dates
- Every time they are recorded, four-digit serial numbers are added and updated following the specified File name.

RM1100 — USER — 200110530 ┬ FREC0001.FSD First measurement starts
FREC0002.FSD Second measurement starts
: :
: :

## (3) Recording length

The length of recording in HD is indicated as data count and recording time. Setup can be made in the setup dialog box that is displayed when the key is pressed.




The recording time changes in conjunction with the change of the data count, and vice versa. The recording time can be determined by multiplying data number by sampling rate.

**Recording time = Data size x Sampling rate**

When the recording data size is set to zero, Maximum is displayed, and then recording is made up to the size of free space of SD Card. As a user does not need to take care of recording length, the Maximum is the best choice when recording is made with Start and Stop.

NOTE If recording data is set to 2G bytes or more (or Maximum), the data is stored at every 2G bytes. In this case, the alphabet is automatically added from “A” at the end of each file names, which indicate that these files are consecutive. Maximum capacity in loop recording is 2GB.

**TIPS**

When the setting of recording length is “MAX”, recording time is displayed at "0s". Therefore, to ensure the recording length, please make sure to use the remaining capacity of the SD card.

☞ For more details, see, 8.4. Filling recording specifications.

## **(4)** Recording operation

Filing recording operation can be made with trigger detection.

| Setup Item | Contents |
|---|---|
| Start key | When the Start key is pressed, recording begins. |
| Start Trigger | After the Start key is pressed, recording starts upon trigger activation. |
| Marking upon trigger detection | Trigger points can be memorized. The marking points can be checked on the replay monitor. |
| Once | Recording operation completes after one recording action. |
| Repeated | Filing recording repeats until the Stop key is pressed. However in the following cases, operation will be invalid because one recording automatically finishes.<br>The recording mode is Loop. |

NOTE

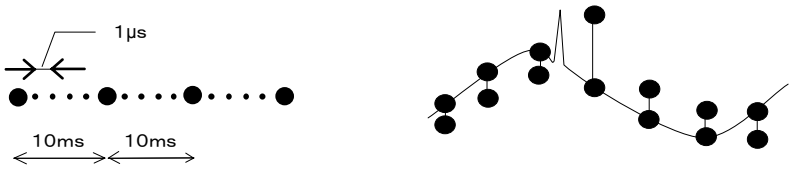
When the start trigger is set, the recording file data has no trigger mark (T) so that the recording can start after trigger is detected.

*T I P S*

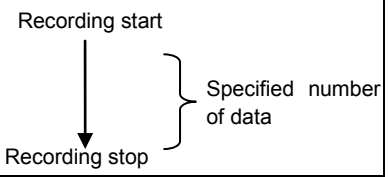
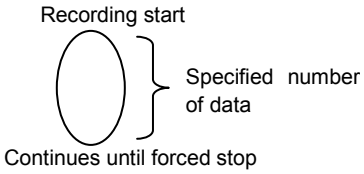
Marking (Event) information is included in Logic Amplifier Signal data.
To save the marking information, set logic amplifier signal input ON.
For setting the logic amplifier, refer to ‘6.4.2. Logical Amplifier Setup’.

## (5) Data format

When measuring data with this instrument, you can select the following systems: recording data system (sample data), which many recording instruments are performed, and recording singularity system to sample data at high speed (peak data). If data is recorded with this peak data, high-frequency noise can be recorded regardless of recording speed. The following list describes recording data systems of sample data and peak data with the level of 10 ms sampling.

| Setup item | Description |
|---|---|
| Sample | Record data with respect to every setting recording speed. This recording method is to store accurately raw data with respect to every recording speed.<br>File extensions being created are FSD.<br>One data consist of one instantaneous value. The data number per one piece of data is half comparing to Peak format.<br>  |
| Peak | Record **maximum and minimum values of data** while sampling these values of data across the setting recording speed at the highest sampling speed**.** Without damaging singularity of data (peak value), the data volume can be compressed. The recording time with the peak data system is two folds compared to sample data.<br>Files extensions being created are FPP.<br>One data consist of two values: maximum and minimum values. Regardless of recording speed, peak data is stored with the highest A/D conversion speed of amp. It is possible to observe waveform having high-frequency element for long period of time.<br>  |

## (6) Filing format

| Setup item | Contents |
|---|---|
| Linear | Operation stops when specified number of data is recorded.   |
| Loop | Overwriting for specified number of data is made. (Overwriting is made from older data.) The operation stops when the Stop key is pressed. (Maximum capacity is up to 2GB)   |

NOTE

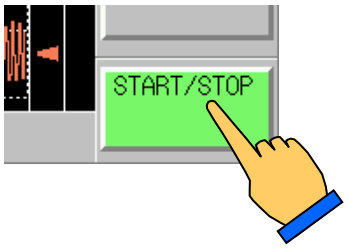
At Loop mode, sampling speed is as follows:

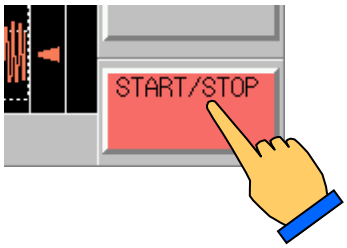
| | |
|---|---|
| When using 1 channel | 20μ sec to 1 sec |
| When using 2 channels | 50μ sec to 1 sec |
| When using 3 or 4 channels | 100μ sec to 1 sec |
| When using 5 to 9 channels | 200μ sec to 1 sec |

When an invalid value was set at Loop setup, it is automatically corrected to the maximum value allowed. When measuring at Loop mode, make sure to use a Class 10 (speed) SD card. If other class is used, it may cause losing data. Logic input is equivalent to one channel use of an analog signal.

# 8.3. Recording Operation

Pressing the Start key on the operation panel starts Filing recording. While recording is made, pressing the Stop key forcibly stops the recording.




## 8.3.1. Start of measurement

Pressing the Start key on the operation panel starts Filing recording. If the setup in which the start of recording is initiated with a trigger signal, the start of recording is made with a trigger detection.

NOTE

If the combination of sampling rate, recording length, data type, and recording channel count is not covered by recorder specifications, recording cannot be made and operation finishes with an error.
For those specifications, see 8.4 Filing Recording Specifications.

NOTE

When recording at the Filing Mode, data in the memory block #1 is deleted.
If important data is stored in the memory block #1,save it on different location before starting measurement.

## 8.3.2. To finish measurement (forced termination)

Pressing the Stop key on the Operation Panel executes forced termination. If recording length is specified, operation completes when specified number is recorded.

## 8.3.3. About errors

The followings are possible errors during Filing recording.

| Generated Error | Operation |
|---|---|
| File Error | Filing recording finishes with an error. |
| SD Card Error | Filing recording finishes with an error. |
| Duplication Error | When a same file name exists, Filing recording finishes with an error. |

## 8.3.4. Display of recording data

Display of recording data is made on replay monitor.

☞ For more details, see 11.Replay Setup

# 8.4. Filing Recording Specifications

## *8.4.1. Recording file size calculation*

This section covers how to calculate file capacity in Filing recording. The file size can be calculated using the following parameters

| Parameter | Remark |
|---|---|
| Recording length | Recording data count |
| Data type | One data is saved in two bytes.<br>Peak: 4 bytes due to two values (max. and min.)<br>Sample : 2 bytes due to instantaneous value |
| Recording channel count | Number of activated channels being set to ON (or GND). |
| Recording information | Recording information save size: 6,128 bytes<br>* Size may be increased in future as the product holds capability of future expansion. |

File size = Recording information + (Recording length x Data type x Recording channel count)

Example: Recording length = 100,000, Data format = peak, Number of recording channel: 4
Size = 6,128 + (100,000 x 4 x 4) =1,606,128 (bytes)

## *8.4.2. Recording speed execution restriction*

The following restriction may be subjected in settable range in HD recording rate depending on the data format and the number of recording channels.

| format | Recording Rate | Number of recording channel | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Sampling | 20µs | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| | 10µs | OK | OK | OK | OK | OK | OK | OK | OK | **NG** |
| | 5µs | OK | OK | OK | OK | **NG** | **NG** | **NG** | **NG** | **NG** |
| | 2µs | OK | OK | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** |
| | 1µs | OK | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** |
| Peak | 50µs | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| | 20µs | OK | OK | OK | OK | OK | OK | OK | OK | **NG** |
| | 10µs | OK | OK | OK | OK | **NG** | **NG** | **NG** | **NG** | **NG** |
| | 5µs | OK | OK | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** |
| | 2µs | OK | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** |
| | 1µs | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** | **NG** |

OK: Settable, NG: Not settable

The logic input is equivalent to one channel of recording.

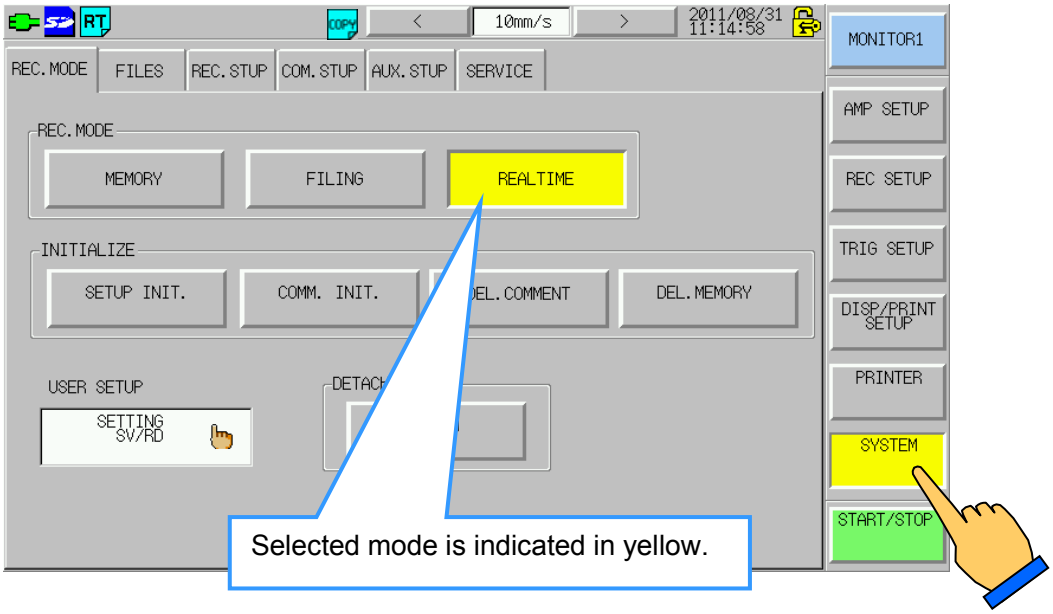
# *9. Real-time Recorder*

# Recording Low-speed Signal for Long Time

# 9.1. Real-time Mode Overview

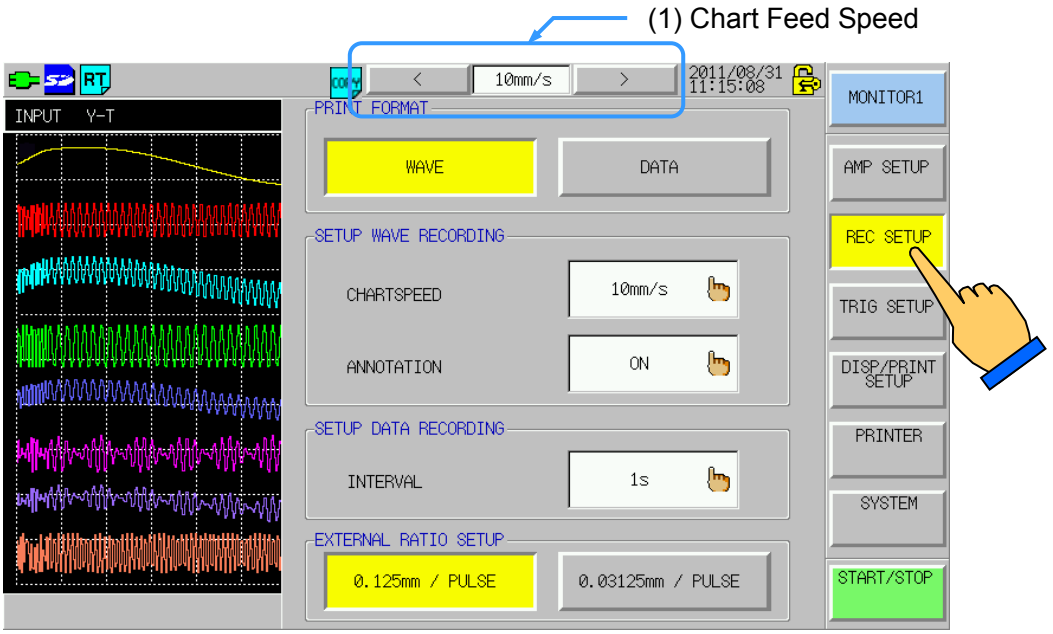
Real-time mode is a mode that is specialized to waveform printing on chart paper. Operation is possible only when printer as an option is available.

To set the main unit to the Real-time mode, use the Measurement Mode tab in the System screen.




# 9.2. Recording Condition Setup

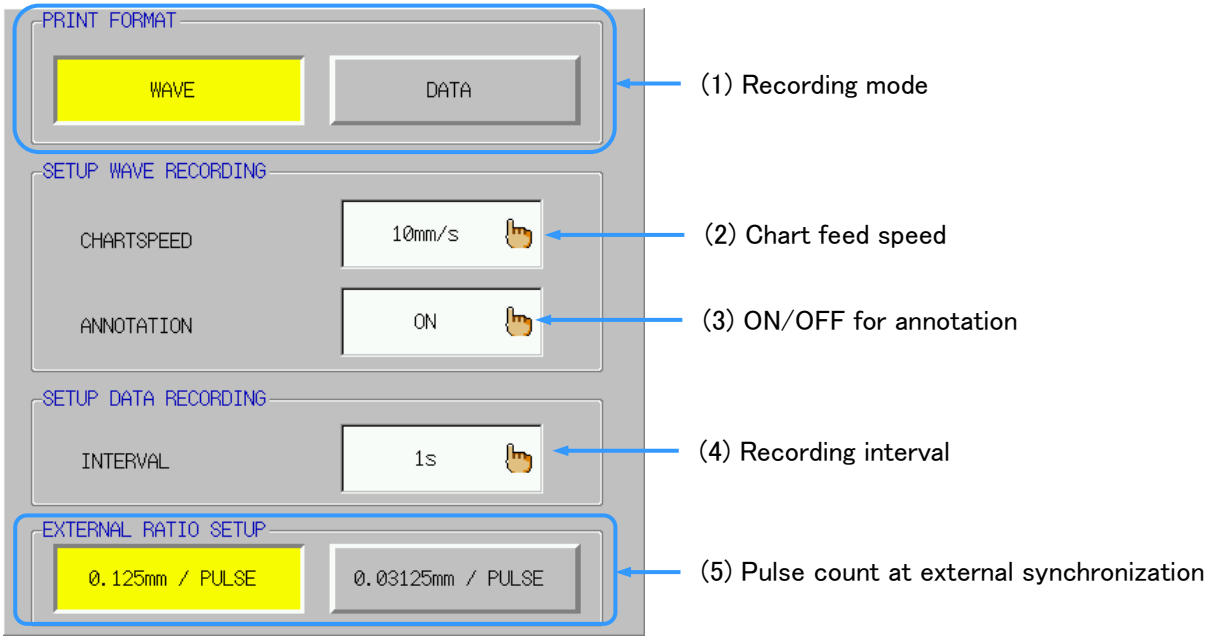
To set recording conditions in the real-time mode, press [Recording Settings] key on the menu bar to open the screen for setting details. Setting cannot be made during measuring.




## (1) Chart Feed Speed

These Keys are used to set chart paper feed speed. Setting can be made by pressing ( < ) ( > ) keys.

## 9.2.1. Real-time Recording Setup Block




### (1) Recording mode

This specifies recording mode in real-time recording.

| Recording mode | Details |
|---|---|
| Waveform | Prints waveforms on chart paper of an external printer. |
| Data printing | Prints data on chart paper of an external printer. Numerical sampled data are printed. |

### (2) Paper feed speed

You can choose printing speed. Choose from among:
10mm/s, 5mm/s, 1mm/s, 50mm/min, 20mm/min, 10mm/min, 5mm/min, 1mm/min, External sync

| | | | | | |
|---|---|---|---|---|---|
| Paper Feed | 10mm/s | 5mm/s | 1mm/s | | |
| Paper Feed | 1s/DIV | 2s/DIV | 10s/DIV | | |
| Paper Feed | 50mm/min | 20mm/min | 10mm/min | 5mm/min | 1mm/min |
| Paper Feed | 12s/DIV | 30s/DIV | 60s/DIV | 120s/DIV | 600s/DIV |

10mm/s to 1mm/min: Waveform printing is made in a speed that is set.
External synch: Waveform can be printed in synch with external pulses.

### (3) ON/OFF for annotation

This sets whether information of system annotation, channel annotation, or page annotation is printed upon waveform printing.

### (4) Recording interval

Recording interval can be chosen from among 1s, 2s, 5s, 10s, 30s, and 60s.

### (5) Pulse count at external synchronization

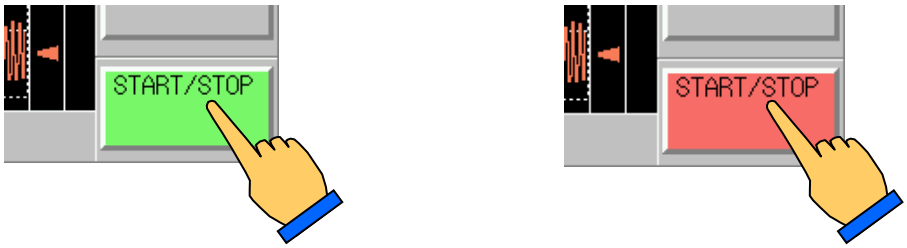
Waveform printing is made in synch with external pulses. This sets printing length per pulse.

| Printing length per pulse | Description |
|---|---|
| 0.125mm/pulse | 1 line (0.1 mm) by 8 pulses |
| 0.03125mm/pulse | 1 line (0.1 mm) by 32 pulses |

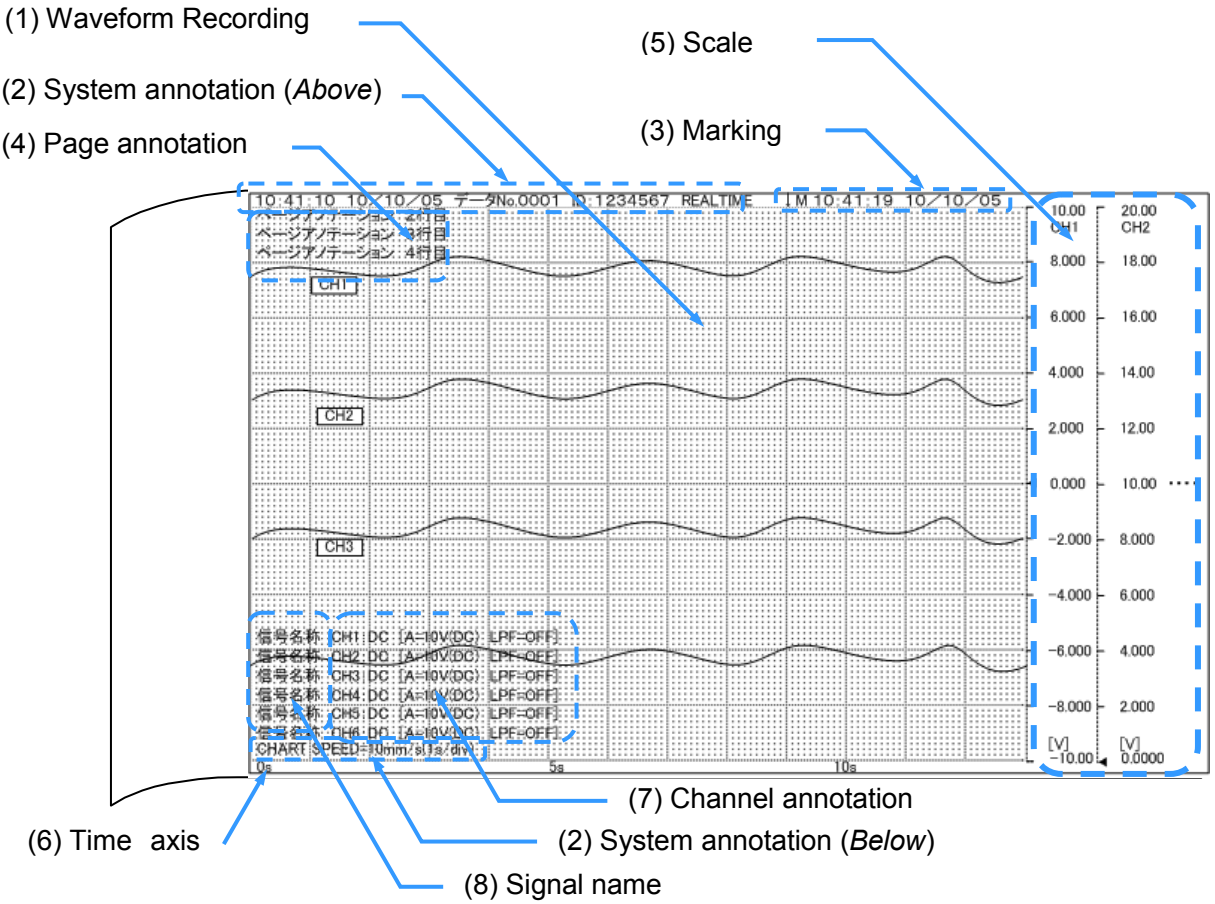
**TIPS** For external synchronization signal input, use 80Hz or less at 0.125mm/pulse. Use 320Hz or less at 0.03125mm/pulse.

# 9.3. Printing Start and Stop

Pressing the Start/Stop key starts printing; pressing this key again stops printing.




# 9.4. Waveform Recording Image




## (1) Waveform Recording

Input signals are printed in a form of waveform. The same waveforms as those displayed in the monitor are printed. Waveform segmentation and ON/OFF of annotation printing can be set.
For more details, see ☞ “Chapter 12. Display and Printing“, “Chapter 13. Print Setting“

## (2) System annotation (above/below)

System information related to printing is printed. Print start time is indicated on the top of the recording paper and print speed is indicated on the bottom of the recording paper.
Data No.: Automatically added number by printing is printed.
ID number: Recorder serial number is printed.

## (3) Marking

Marking is printed by pressing the Marking Key on the Operation Panel during recording. Marking time is also printed after ↓M.

Example: ↓M 12:03:00 2010/12/03

## (4) Page annotation

Following system annotation, character strings defined by user are printed over waveform printing. To set printing ON, OFF, or character strings, ☞ see Chapter 13. Print Setting

## (5) Scale

Analog waveform amplitude scale is printed. Printing OFF and scale printing format can be changed with settings. For details of scale settings, ☞ see Chapter 12. Display and Printing.

## (6) Time axis

Time axis scale is printed below the waveform printing grid. Printing ON, OFF, and format (e.g. value and time) can be set. For more details on settings, ☞ see Chapter 14. System Setup.

## (7) Channel annotation

Recording condition by signal is printed.
For printing ON/OFF for signal name and character string settings, ☞ see 13. Print Setting.

## (8) Signal name

Character strings set by user by channel are printed.
For printing ON/OFF for signal name and character string settings, ☞ see 13. Print Setting.

# 9.5. Data Recording Image

## (1) System annotation

System information related to printing is printed. Print start time is indicated on the top of the recording paper.
Data No.: Automatically added number by printing is printed.
ID number: Recorder serial number is printed

## (2) Channel annotation

Recording condition by signal is printed.

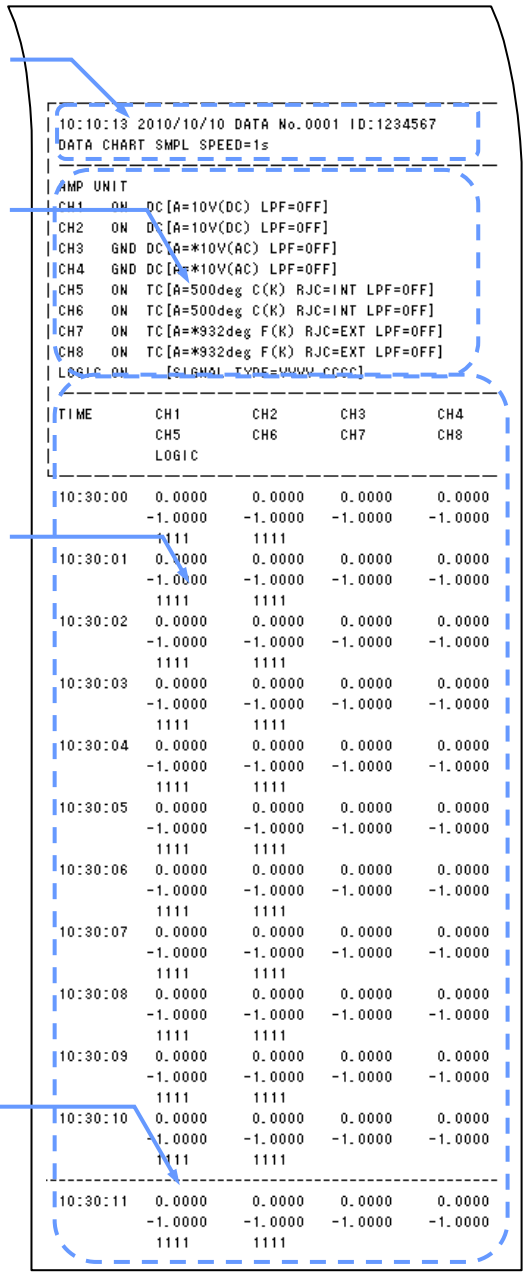
## (3) Data Printing Block

Measured value for each channel is displayed in numerical value.
Printing example is RM1102

(1) System Annotation

(2) Channel annotation

(3) Data Printing Block



```
10:10:13 2010/10/10 DATA No.0001 ID:1234567
DATA CHART SMPL SPEED=1s

AMP UNIT
CH1   ON  DC[A=10V(DC) LPF=OFF]
CH2   ON  DC[A=10V(DC) LPF=OFF]
CH3   GND DC[A=*10V(AC) LPF=OFF]
CH4   GND DC[A=*10V(AC) LPF=OFF]
CH5   ON  TC[A=500deg C(K) RJC=INT LPF=OFF]
CH6   ON  TC[A=500deg C(K) RJC=INT LPF=OFF]
CH7   ON  TC[A=*932deg F(K) RJC=EXT LPF=OFF]
CH8   ON  TC[A=*932deg F(K) RJC=EXT LPF=OFF]
LOGIC ON  [SIGNAL TYPE=YYYY CCCC]

TIME       CH1        CH2        CH3        CH4
           CH5        CH6        CH7        CH8
           LOGIC

10:30:00   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:01   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:02   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:03   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:04   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:05   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:06   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:07   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:08   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:09   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
10:30:10   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
----------------------------------------------------
10:30:11   0.0000     0.0000     0.0000     0.0000
          -1.0000    -1.0000    -1.0000    -1.0000
           1111       1111
```

The whole data are separated into several blocks (10 data as a set of data) by a single line.

# 9.6. Stop Due to Error

Printing stops in the following cases.

**(1) Chart paper-out**
In the case where chart paper run out, printing cannot be made. In this case, printing is terminated. When red marks at the both sides of the chart recording paper, prepare new chart recording paper as they signifies paper-out.

**(2) Communication cable is not connected**
Communication is disconnected and recording cannot be made. In this case, printing is terminated due to error.

**(3) Printer battery is out of charge**
In case where battery of printer runs down, communication is disrupted so recording cannot be made. In this case, printing is terminated.

**(4) Thermal head over-heating**
If the thermal head for printing is heated too much, operation stops due to error. If printing of entire screen is repeatedly made, the temperature of the thermal head at printing block rises. In this case, the recorder automatically controls the print density, thereby prohibiting temperature rise. However, if the ambient temperature is so high or heat release is not made smoothly, thermal head temperature excessively rises. In such case, printing is terminated due to error so as to prevent fire breakout.

# *10. Trigger Settings*

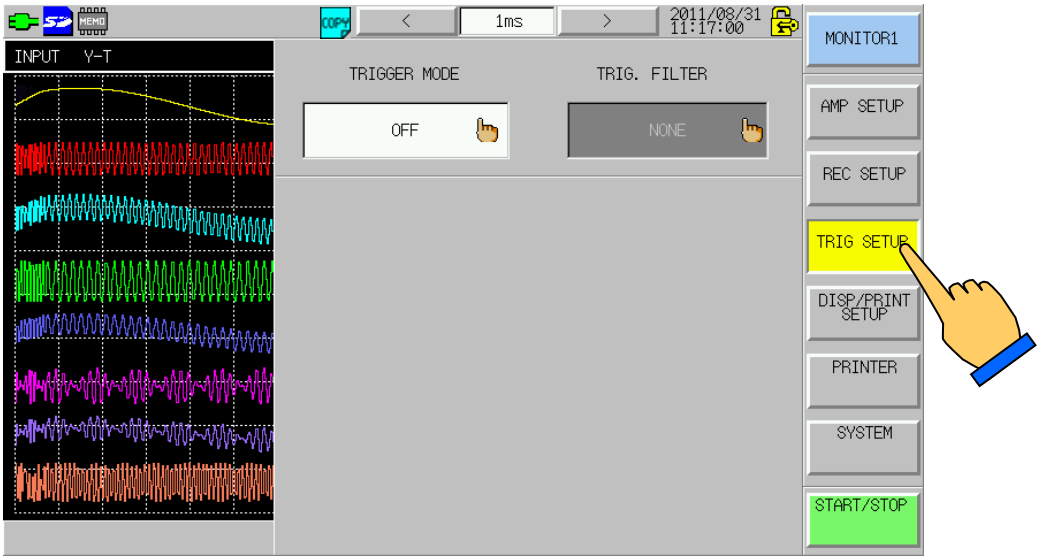
# Capturing Target Data to Be Recorded

# 10.1. Trigger Mode Description

Trigger is a timing signal to start recording. This recorder provides with four trigger modes: OR, AND, WINDOW, and OFF. Other than these modes, there are manual trigger and external triggers which are valid regardless of the input signal.

# 10.2. Method of Trigger Settings

Pressing the Trigger button on the Operation Panel opens the Trigger Settings screen.




Trigger Mode is OFF at factory default.
Trigger caused by a signal input into amp is not made.
Only the manual and external triggers are effective.

*TIPS* For setting manual or external trigger, refer to '10.6. Manual Trigger/External Trigger'.

NOTE Triggers occurred before starting to record is not valid.
If a trigger condition is met before starting to record, it is considered invalid and the RM100 will wait until the condition will be met next time.

# 10.3. Settings by Trigger Mode

## *10.3.1. Trigger mode settings*

Open the screen for Trigger Mode selection and select Trigger Mode.
As a Trigger Mode,

OR: Trigger is generated upon the satisfaction of either of the trigger conditions set as the trigger source.

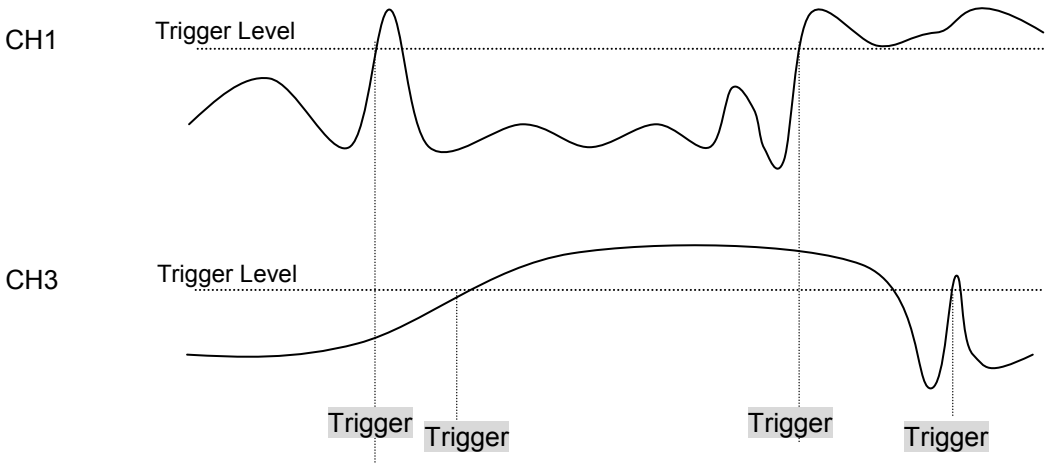
AND: Trigger is generated upon the satisfaction of the trigger condition for all channels that are set as the trigger source.

WINDOW: When the signal level enters into the pre-set range of the trigger source channel (i.e. IN) or goes out of the range of the trigger source channel (i.e. OUT), a trigger is generated.

## 10.3.2. Trigger mode—Operation at OR

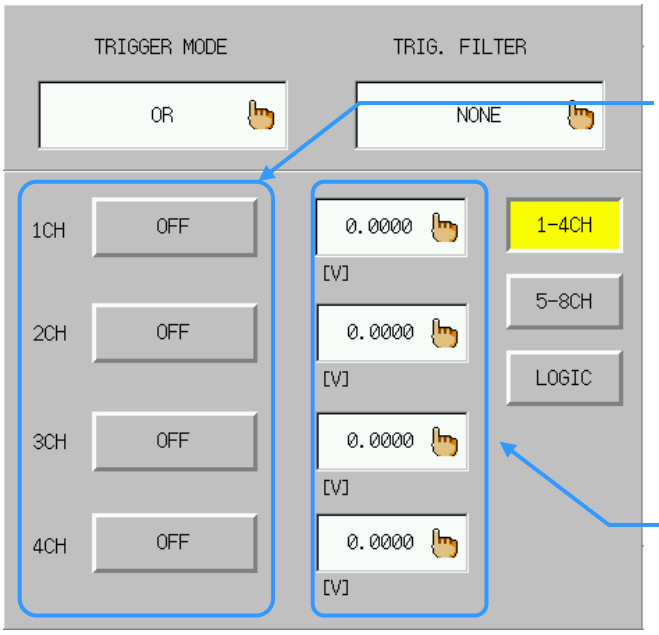
A trigger is generated either of two channels that are set for trigger source satisfies the trigger condition. The OR setting for all channels are also available.

Example: Both of slopes for CH1 and CH3 are set to “rising edge.”




## 10.3.3. Trigger mode OR

Trigger is generated upon the satisfaction of either of the trigger conditions set as the trigger source. The OR setting for all channels are available.




Set up Source Channel

Pressing this portion switches the slope.
UP: Trigger is detected at rising edge of a signal.

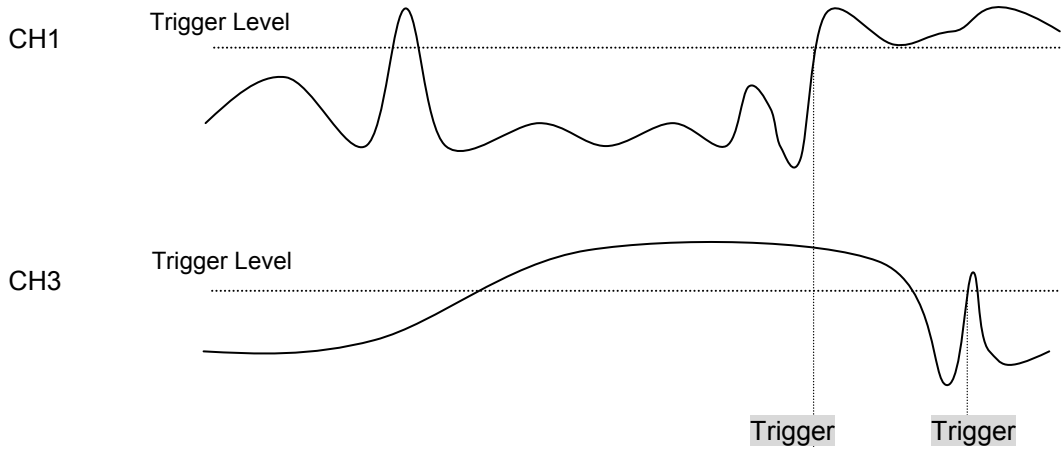
UP: Trigger is detected at rising edge of a signal.
DOWN: Trigger is detected at falling edge of a signal.
OFF: Not used as trigger channel.

Setting the trigger generation level

## 10.3.4. Trigger mode—Operation at AND

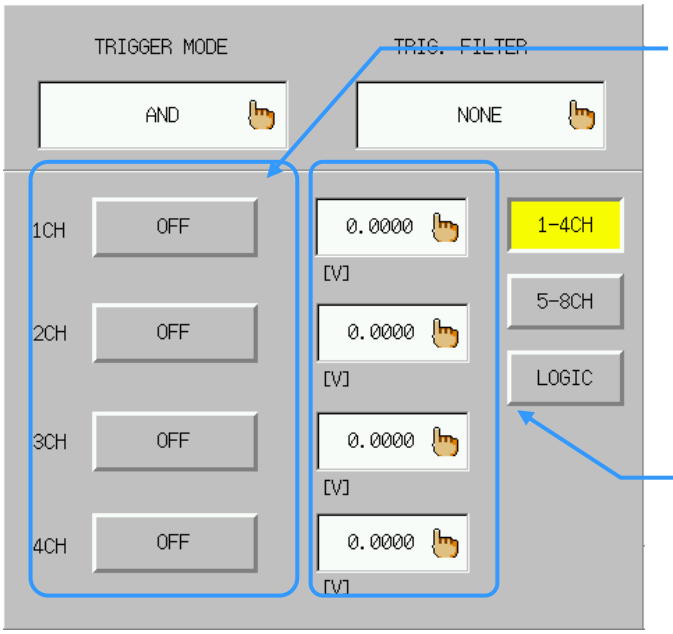
Trigger is generated all channels that are set for trigger source satisfied the trigger condition. The AND setting for all channels are also available.

Example: Both of slopes for CH1 and CH3 are set to “rising edge.”




## 10.3.5. Trigger mode AND

Trigger is generated upon the satisfaction of the trigger condition for all channels that are set as the trigger source. The AND setting for all channels are available.




Set up Source Channel

Pressing this portion switches the slope.
UP: Trigger is detected at rising level of a signal.

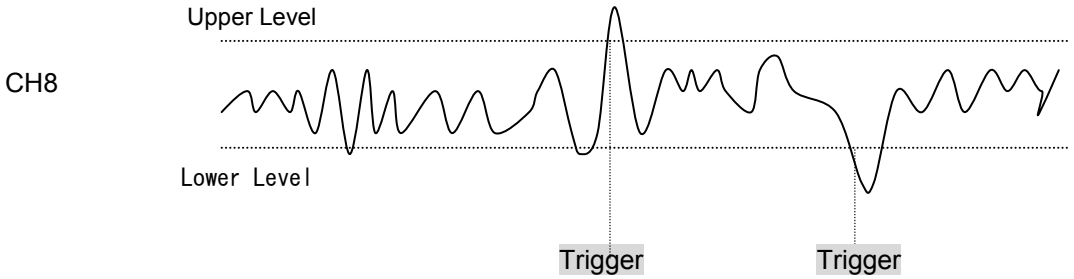
DOWN: Trigger is detected at falling level of a signal.
OFF: Not used as trigger channel.

Set up the Signal level to generate trigger.

## 10.3.6. Trigger mode—Operation at WINDOW

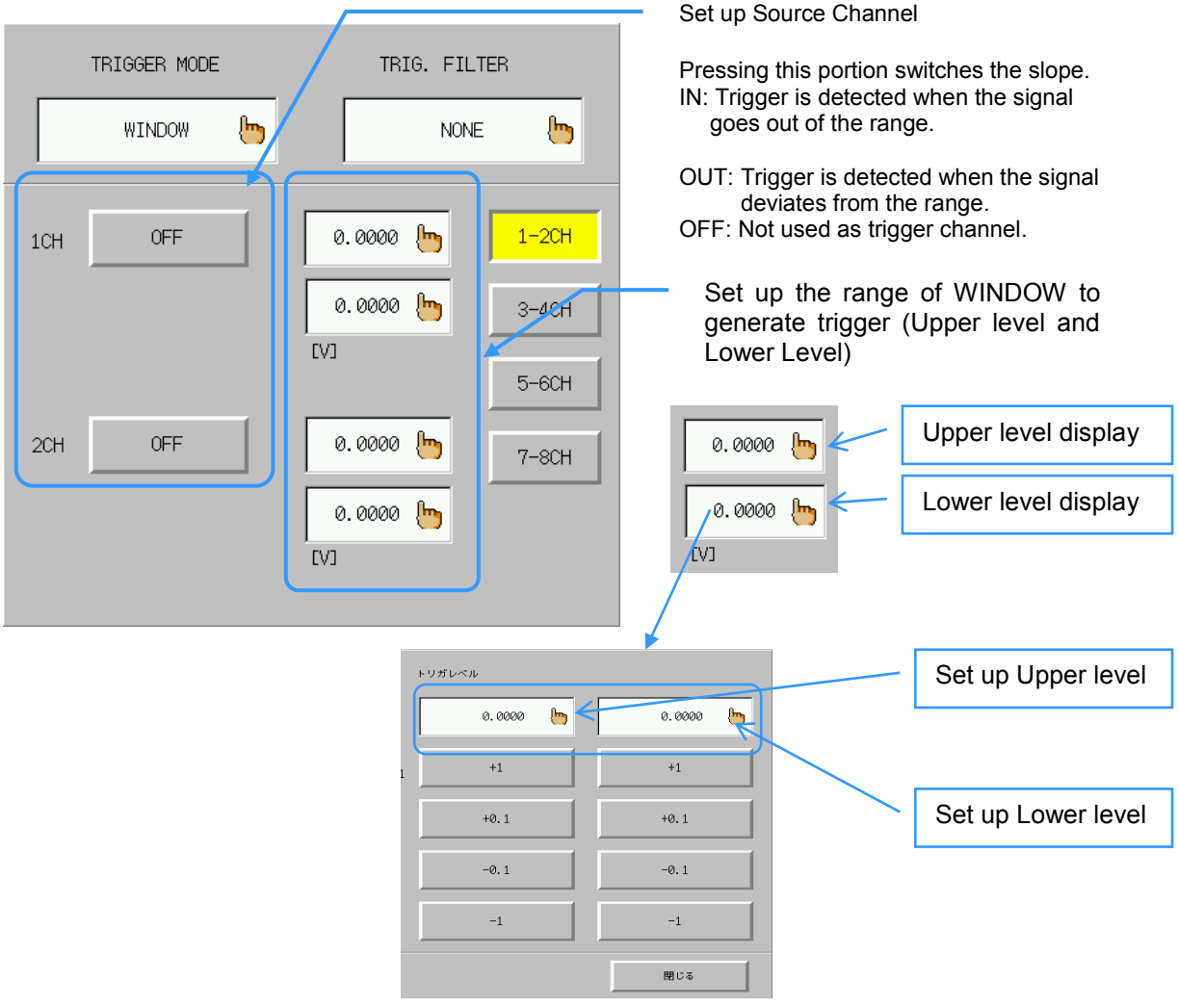
When the signal level enters into the pre-set range of the trigger source channel (i.e. IN) or goes out of the range of the trigger source channel (i.e. OUT), a trigger is generated. The trigger setup can be made for all analog channels. A trigger is generated upon satisfying of either of the trigger settings.

Example: When CH8 is set to OUT




## 10.3.7. Trigger Mode WINDOW

When the signal level enters into the pre-set range of the trigger source channel (i.e. IN) or goes out of the range of the trigger source channel (i.e. OUT), a trigger is generated. The trigger setup can be made for all analog channels. A trigger is generated upon satisfying of either of the trigger settings.




＜The screen for set up WINDOW Trigger Level＞

## *10.3.8. Trigger mode OFF*

Trigger caused by a signal input into amp is not made. Only the manual and external triggers are effective.

NOTE

When recording is made, only the trigger made after the startup is effective. If the trigger condition is satisfied before the start of recording, the status enters into the wait for next trigger condition.

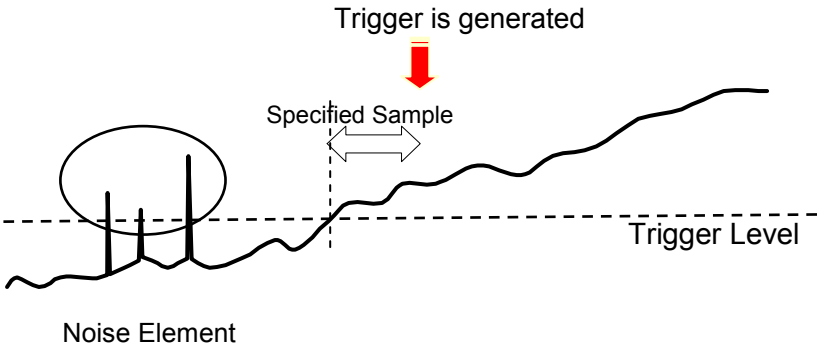
# 10.4. Trigger Filter

## *10.4.1. Trigger filter*

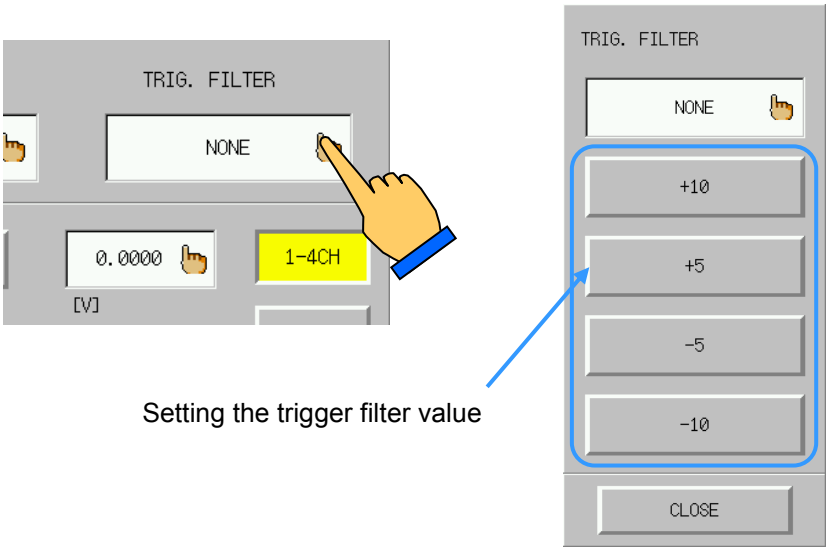
After the trigger condition that is set is satisfied, the trigger is activated after this satisfied condition continues for a specified period of time. This function is effective to eliminate noises whose pulse length is relatively short.

Trigger Filter Value＝ 1～65534 samples

Designated Time＝Sampling Rate × Trigger Filter Value

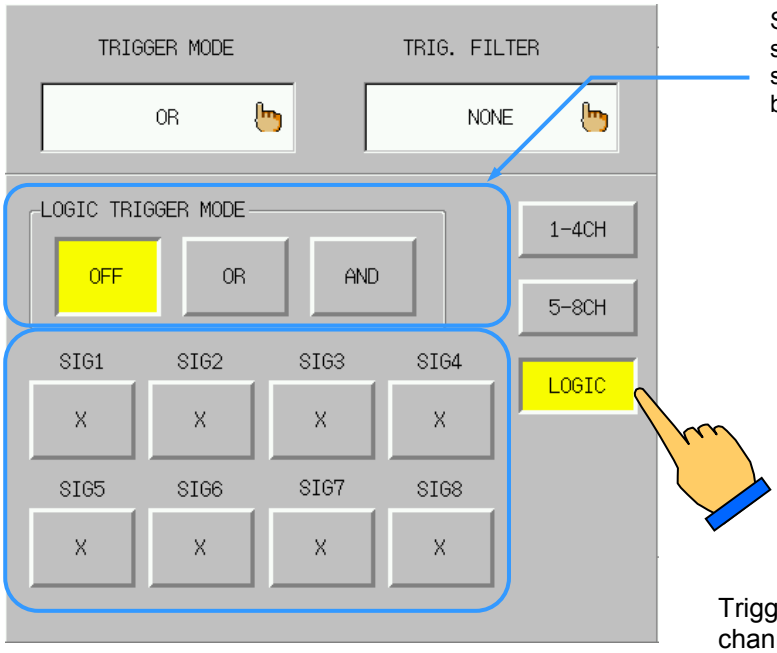



NOTE In the peak including by HD recording, make calculation based on Recording Sampling Rate = 1 μs



# 10.5. Trigger Settings for Logic Amp

Trigger settings for logic amp differs from those of other amps. The settings are made in the following screen.




Select either OR, AND, or OFF to set the trigger condition. Trigger settings are made when the check box is ticked.

Trigger conditions for channels 1 to 8 are set. H, L, NO can be set.

● Trigger condition settings

| Trigger condition | Volt(Voltage input) | Contact(Contact input) |
|---|---|---|
| H | The H condition is satisfied when the input voltage reaches +2.5V or higher. | When the contact is closed, condition is satisfied. |
| L | The L condition is satisfied when the input voltage becomes +0.5 V or lower. | When the contact is opened, condition is satisfied. |
| X | Exempting from trigger conditions | |

NOTE

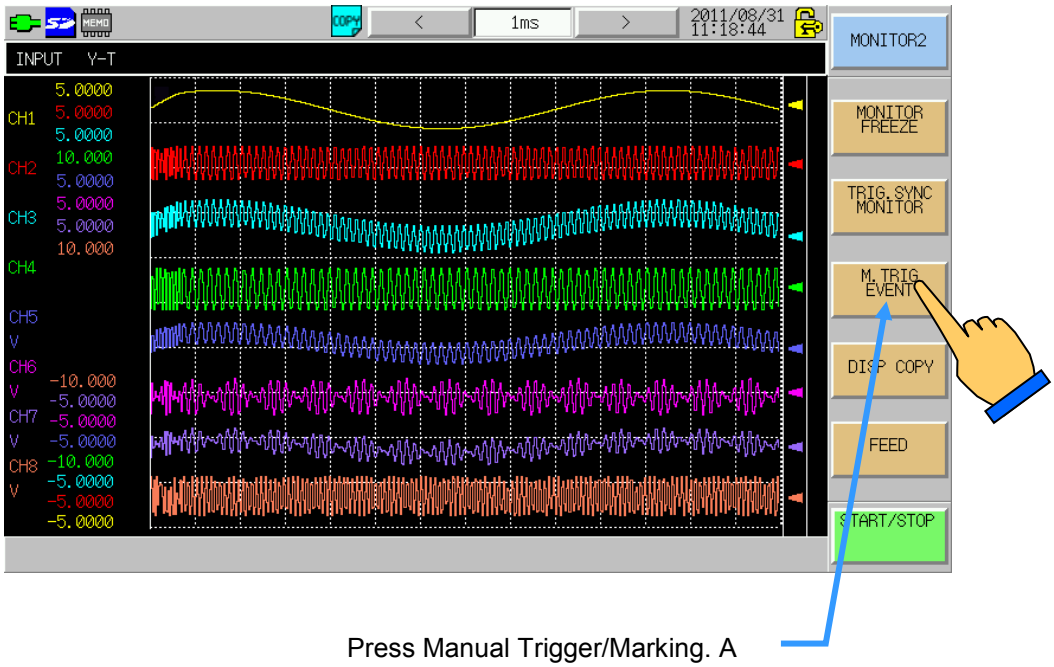
In the event amp, a trigger is activated when trigger condition is satisfied. If the trigger condition has been satisfied, a trigger will not be activated. Especially, for example, one channel has already been satisfying the trigger condition in the OR mode, the trigger will not be activated even when other channel's trigger condition is satisfied.

# 10.6. Manual Trigger/External Trigger

Regardless of trigger modes, trigger is activated manually or externally, thereby initiating the recording.

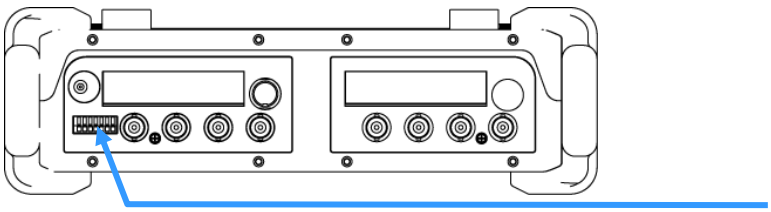
## *10.6.1. Manual trigger*

Pressing the Manual/Marking Key on the operation panel generates a trigger irrespective of other trigger settings.




## *10.6.2. External trigger (TRIG IN)*

Trigger is generated by the falling edge of a 0 to 5-V signal. To use, enter a signal into “TRIG IN” in the recorder.



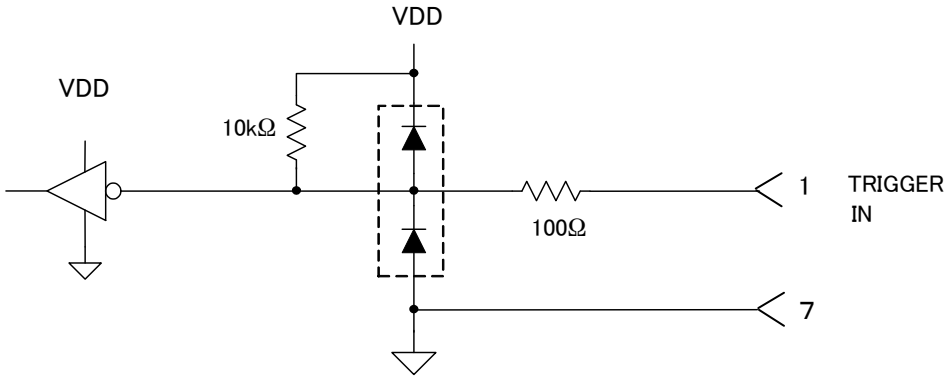
| Pin No | Signal Names |
|---|---|
| 1 | TRIG-IN |
| 2 | TRIG-OUT |
| 3 | REC-IN |
| 4 | SYNC-IN |
| 5 | MARK-IN |
| 6 | NC |
| 7 | GND |

## *10.6.3. External trigger output (TRIG OUT)*

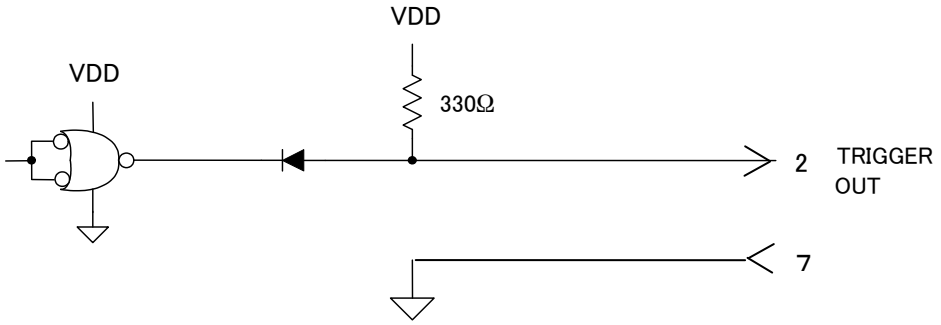
When a trigger is generated, the L level of the signal, which has TTL level and 10-ms pulse width, is output from the “TRIG OUT” terminal.
When a trigger signal is detected at 10ms pulse output,additional 10ms pulse will be output.

## *10.6.4. External Trigger Input/Output Circuit*

- External trigger input circuit
  Input signal: 0 to 5-V voltage signal (falling edge)
  Pulse width : Above 1μ s
  LOW LEVEL: Falling 0.5V
  HIGH LEVEL: Above 4.5V




- External trigger output circuit
  Output signal: TTL level active LOW
  Pulse width: Approx. 10 ms
  Fan-out: 10mA max.



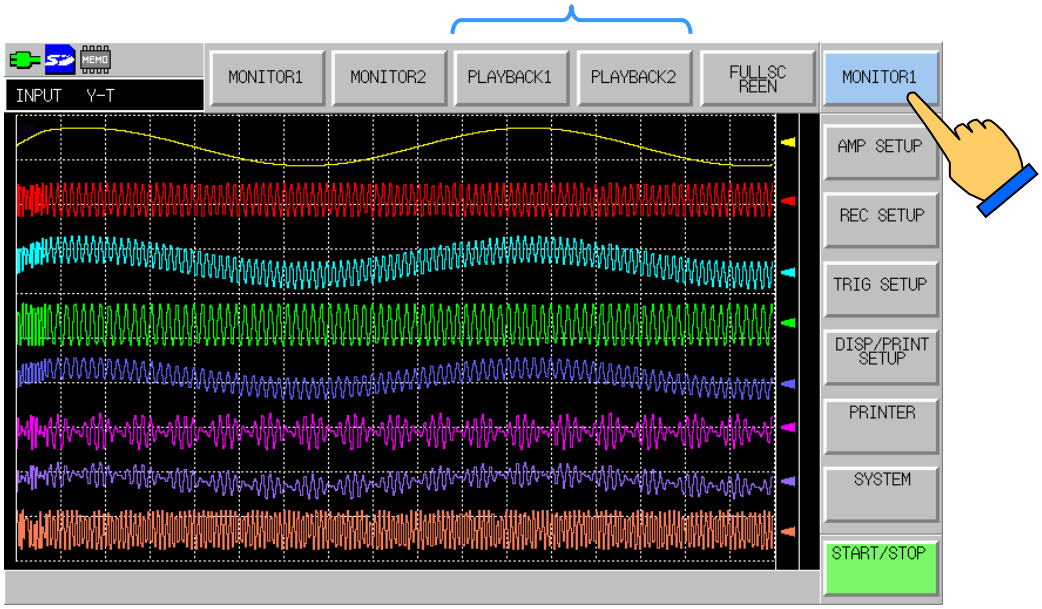
# *11. Playback*

# Displaying Recorded Data

# 11.1. Overview of Playback Monitor

To check the measured data, use the “PLAYBACK1” or the “PLAYBACK2” in the Function menu. On this screen, full waveform analysis can be seen by reading out data using the scroll or the cursor keys.

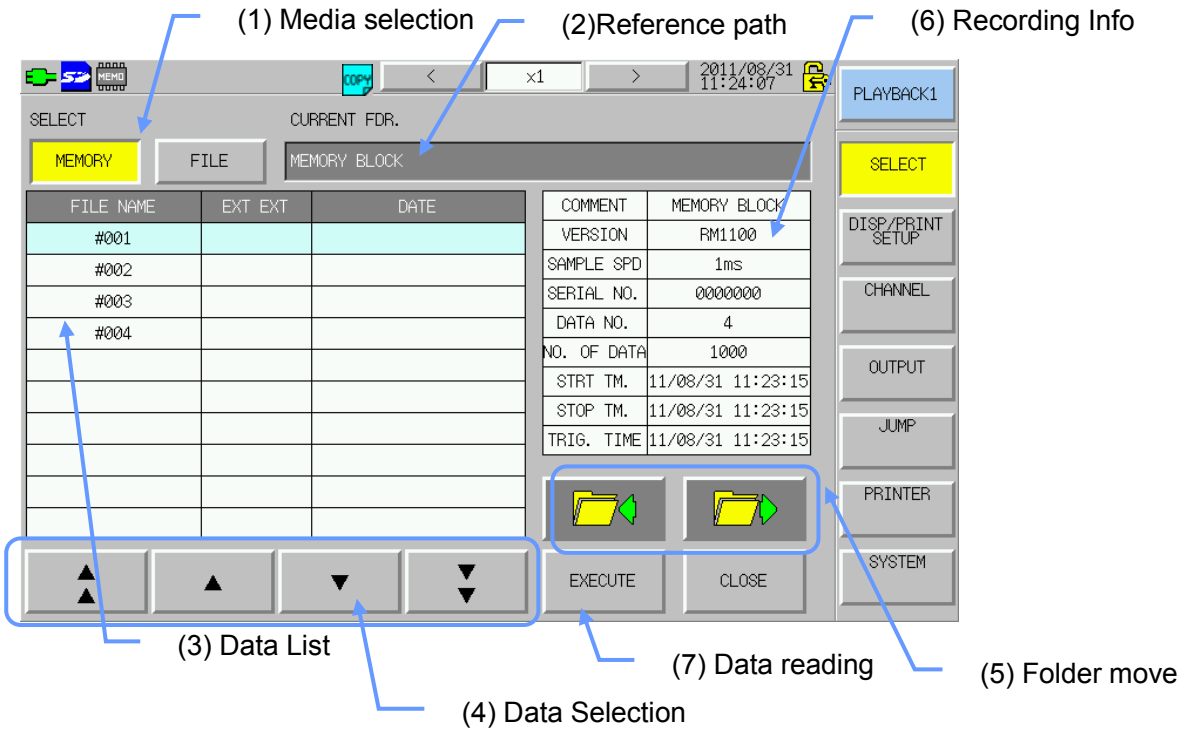
Touch and hold a Function key on the right top and see expanded menus to the left.




***TIPS*** ALWAYS select data after you pressed the MONITOR (1 or 2) key.

# 11.2. Playback Data Selection

To select the screen to be displayed on the Playback monitor, open the following screen by pressing the Data Selection Key.




## (1) Media selection

Select storage media of recorded data and press either of the built-in memory or the file (SD card) buttons.

## (2) Reference path

This indicates data reference target path.
When the built-in memory is selected, the words MEMORY BLOCK is shown here.
When the file (SD card) is selected, the name of the folder created in the SD card is shown.

## (3) Data list

Data file is listed in a specified reference path. Selection can be made through direct touching.

## (4) Data selection

This changes selected data file.

## (5) Folder move

When the file is selected for the data storage media, the reference folder can be moved.

## (6) Recording Info

This portion lists the information of recorded data that is selected in the data list. This information may be used as a reference for data selection.

NOTE

Timestamp of the file and displayed start time may be different.
This is caused by the including internal processing. This is no problem about the data files. The start time of the data is more accurate.

### (7) Data reading

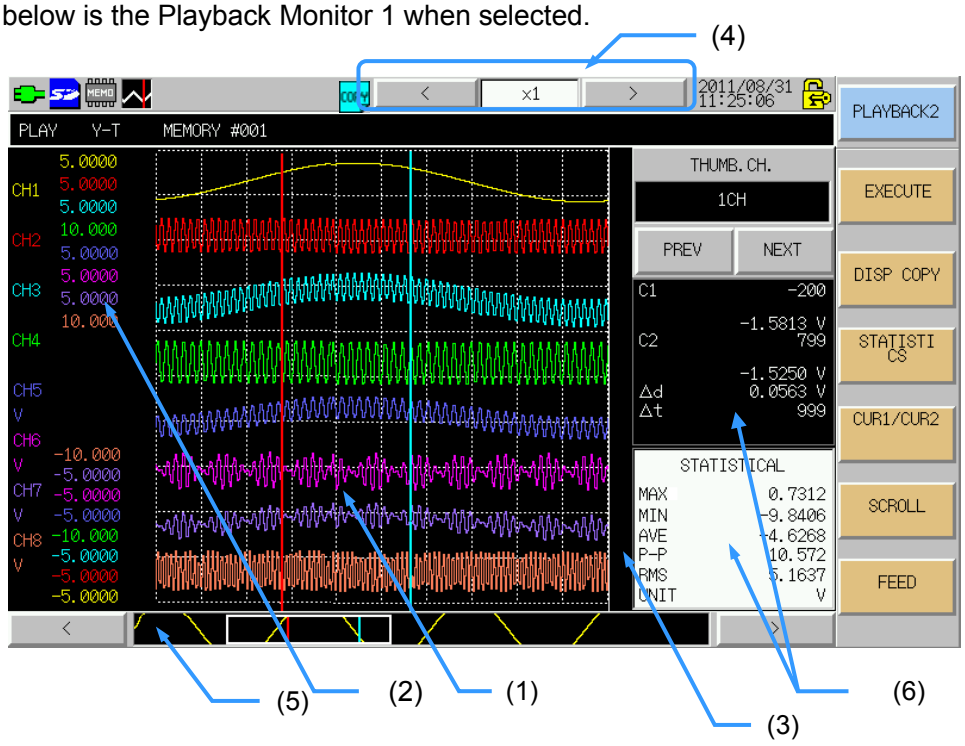
Reading out, replaying and displaying the acquired data selected from the data list.

NOTE

NEVER remove SD card from RM1100's slot while reading data.
It may result in damage on the SD card, abnormal or no display on its monitor or hang-up of the mainframe itself.

## 11.3. Playback Monitor Display

The figure below is the Playback Monitor 1 when selected.




| | | | |
|---|---|---|---|
| (1) | Waveform | Shows recorded data as waveform | |
| (2) | Scale | Displays scale for amplitude axis | 12. Display and Print |
| (3) | Position | Indicates zero position for each signal | |
| (4) | Time Axis Scaling | Enlarges or compresses time axis | 11.7 Time Axis Magnification |
| (5) | Thumbnail | Displays entire waveform of selected Region one channel<br>11.3 Waveform Display | |
| (6) | Cursor position info | Indicates cursor position info | 11.4 Value Indication |
| | Simplified calculation | Simplified calculation between cursors | 11.4 Value Indication |

*TIPS*

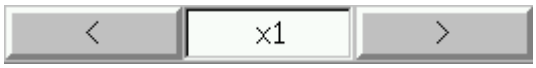
Display can be set to OFF for scale, signal name, digital indication, and cursor position info. To keep the waveform display area as large as possible, set these settings to OFF. For more details, see "13. Display and Printing".

NOTE

When data is displayed on monitor, it refers to previously-displayed data file or memory block. If you remove a SD card or clear memory block, waveform may not be displayed. In such case, reselect the data to refer.

## 11.3.1.Enlarging/compressing of recorded data time axis

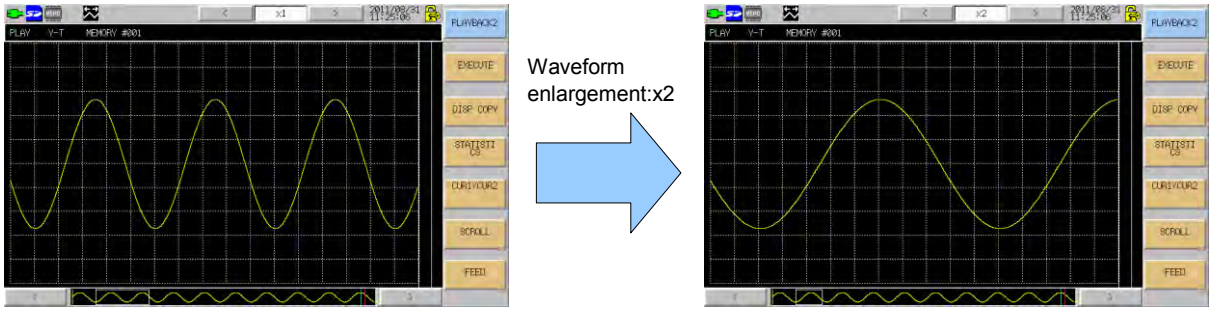
To enlarge or compress time axis, press the following Key on the upper part of the screen.
It is possible to change magnification while observing waveform without opening setup screen.




Configurable Magnification ratio:

Enlargement: x100, x50, x20, x10, x5, x2, x1

Compression: 1/2, 1/5, 1/10, 1/20, 1/50, 1/100, 1/200, 1/500, 1/1000, 1/2000, 1/5000, 1/10000



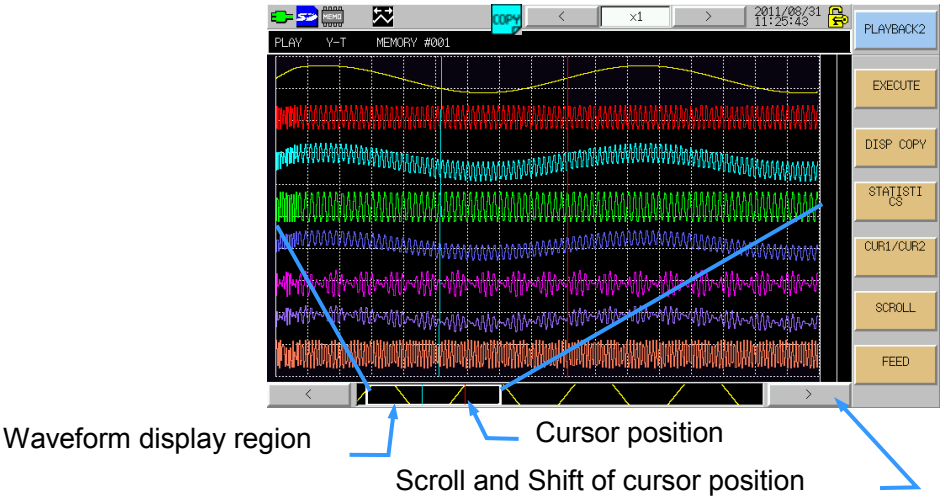

**TIPS** At playback of peak data, enlarging display is not available.

## 11.3.2.Thumbnail bar

Compressing and displaying all the acquired data of any one channel from the data currently displayed on the waveform area. Using the thumbnail bar, you can grasp the whole image of the channel. You can also recognize which segment of the data is currently displayed in the waveform area.

Function of the Thumbnail bar

1) Displaying the whole waveform data of any one channel.
2) Displaying the data in a manner that you can recognize which segment of the data is currently displayed in the waveform area.
3) Displaying the points of the cursor 1 and the cursor 2 with the red line and the blue line, respectively.
4) When the Cursor 1/Cursor 2 button is selected, move the cursors using [<] and [>] keys.
5) When the “Scroll” button is selected, scroll the waveform data displayed in the waveform area using [<] and [>] keys.
6) When the Scroll button is selected, the waveform data is automatically scrolled by double clicking the [<] or [>] key.
7) The cursors are moved or the displayed waveform is shifted by touching or dragging the waveform displayed in the thumbnail bar.



## *11.3.3.Scrolling the waveform*

To shift the waveform display region, refer to the following methods.

### (1) Operation with thumbnail

Press the Scroll key in the menu bar to scroll the displayed waveform.
Touching the thumbnail waveform portion can move the waveform displayed in the waveform area.
The waveform can be scrolled in one direction using the [<] and [>] keys in both sides of the screen.
Additionally, the waveform can be automatically scrolled by pressing and holding the [<] or [>] key.

### (2) Scrolling on the main screen

When the scroll key is pressed, users also can touch main screen (larger waveform) and scroll.

### (3) Shift through jump function

Jump to the trigger detection point or marking point is available.
For more details, see 11.5 Jump Setup.

## *11.3.4.Shift of cursor position*

To shift the cursor position, refer to the following methods.

### (1) Shift through operation panel

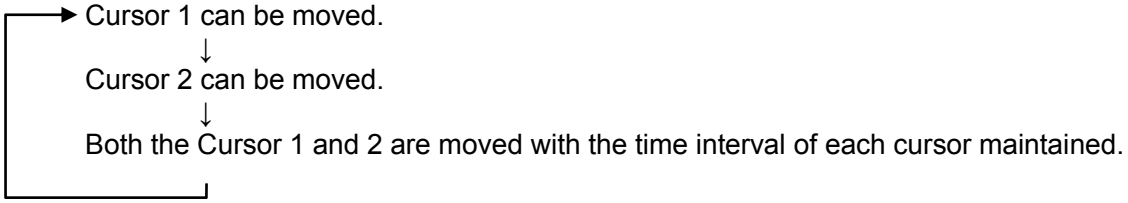
Press the Cursor 1/Cursor 2 button in the menu bar to move the cursors.
The icon at the top of the screen shows which cursor is currently operated.
Touch the thumbnail waveform portion to move the operating cursor.
The cursor can be moved in one direction using the [<] and [>] keys in both sides of the screen.

### (2) Shift through screen touch

Direct cursor shift is possible by touching the waveform display portion when the cursor shift is effective on the Operation Panel.

### (3) Switching the cursor to be moved

The cursors can be moved separately. Press the Cursor 1/Cursor 2 button in the menu bar to switch the operating cursor to be moved. The operating cursor is switched in the following order.

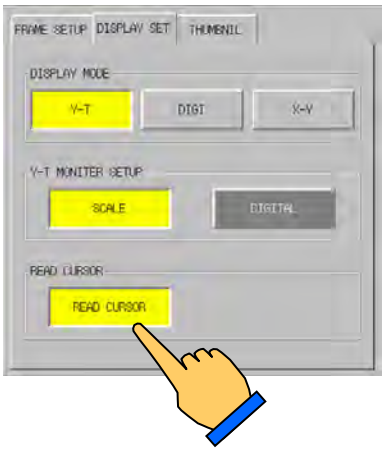


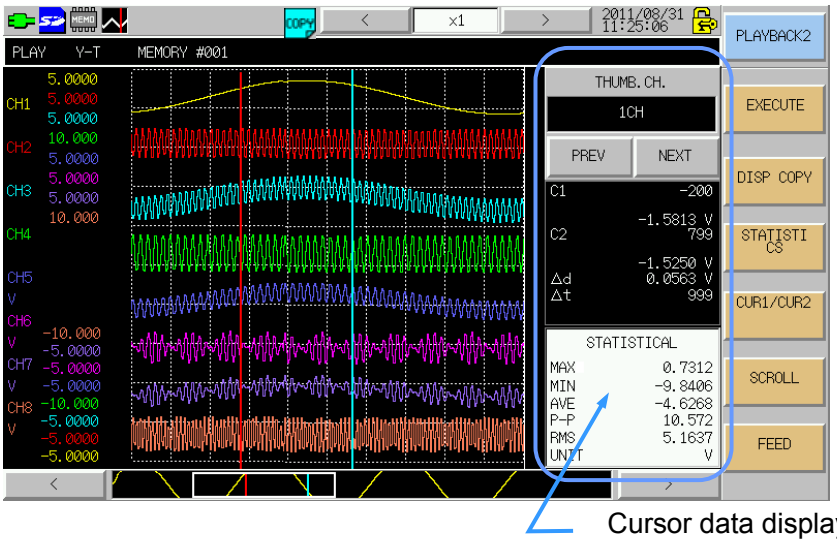

***TIPS***

To specify the channel displayed in the thumbnail bar, use the Display/Recording Setups screen.
For more details, see 12. Display and Recording.

## 11.3.5. Cursor value display

Press the Playback 1 button in the menu bar and then press the Display/Recording Setups button to switch over ON/OFF of the Cursor Value Display in the Display Setups tab in the Display/Recording Setups screen.

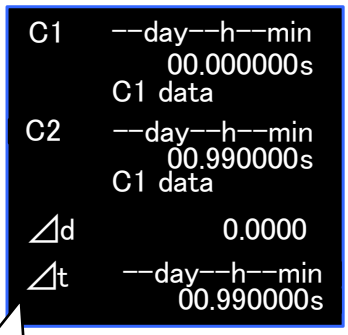



Cursor data display

### 1)Cursor Data Display

Location and data value of the Cursor 1
Location and data value of the Cursor 2
Time interval (⊿t) and data value difference (⊿d) between Cursor 1 and 2
The time axis can be changed within Time, Clock Time and Numeric.
For more details, see “14. System Setups”.




Each setting determines to show either Δ t(Time frame or clock time) or ΔS(Numeric value).

**TIPS**

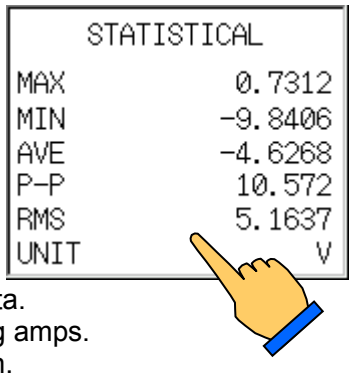
If the data is acquired in the peak format, one data consists of the maximum and minimum values.
For more details, see “12. Display and Recording”.

## 2)Simple Calculation of Data between Cursors

Displaying values including the maximum, minimum and average values of the specified area between cursors.

Calculation is made for the channel shown on the thumbnail. The following five items are output as the operation results.

| TITLE | MAX | MIN | AVE | P-P | RMS |
|---|---|---|---|---|---|
| Description | Maximum value | Minimum value | Average value | \| MAX-MIN \| | Root mean square |

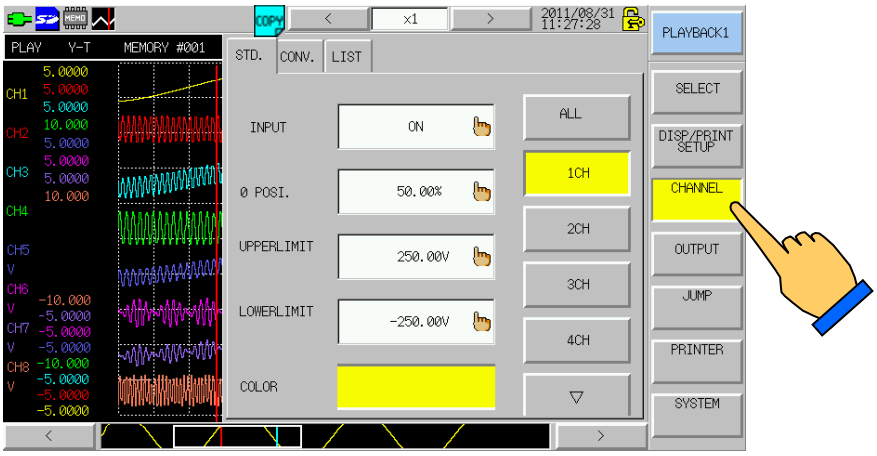



NOTE

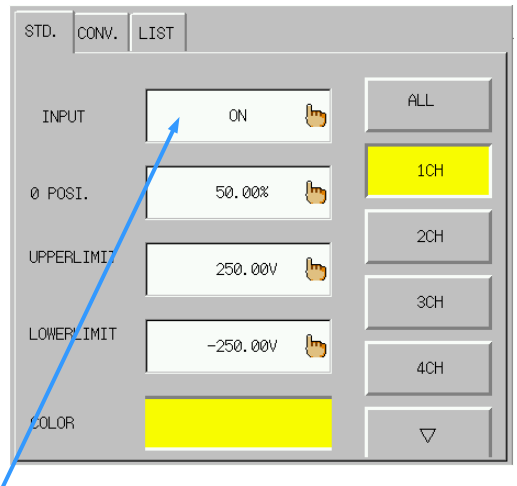
Simple calculation is available only with the Sample format data.
Simplified operation is available only on the channel for analog amps.
Simple calculation is executed when press the statistical region.

# 11.4. Channel Setup

It is possible to confirm the recording conditions for channel of the signal that are recorded as data and to change the setup for waveform display (display range, physical unit conversion). Press the Channel Setting Key in operation menu and the Setup Screen appears.



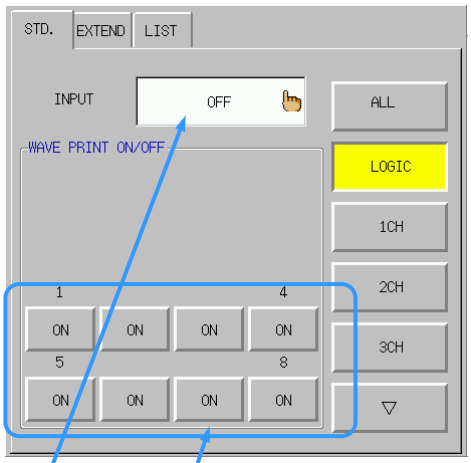

Setup screen for data measured at a temperature/voltage amps




**Signal Drawing**
Switch ON/OFF of the Signal Drawing.

Other Setup Items
- Zero position setting
- Physical conversion setting
- Display range setting

Setup screen for data measured at a digital amp




**Each Digital Signal ON/OFF Setting**
Set up each digital signal ON/OFF.

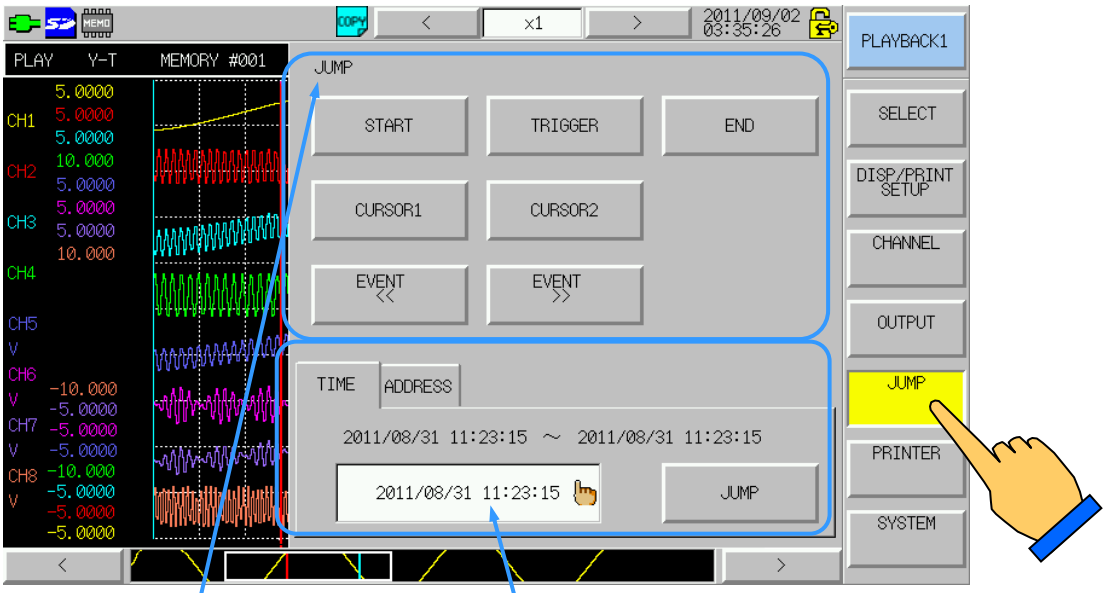
**Signal Drawing**
Switch ON/OFF of the whole digital signals.

Other Setup Screen
- Digital Waveform Adjustment

***TIPS*** Operations of Signal channel setup screen are the same as those of the Amp screen. For more details, see “6. Input Amp”.

# 11.5. Jump Setup

Jump of Y-T waveform display position can be made after the time axis position is specified. Pressing the Jump Key on the upper part of the Playback 1 screen displays the following screen.



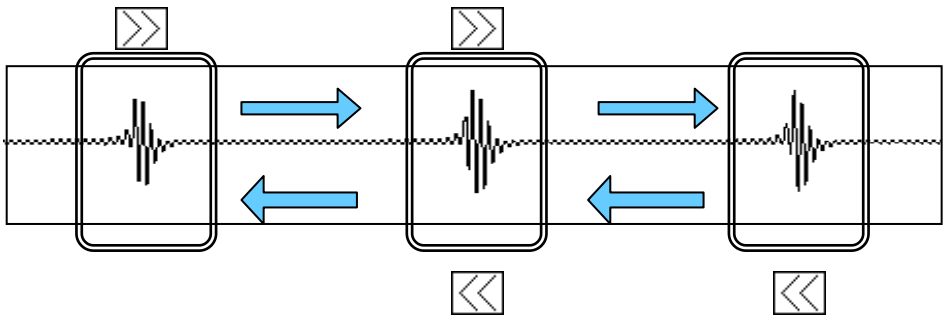

## *11.5.1. Basic jump*

Basic jump operation is made.

| | |
|---|---|
| Start point: | Jump to recording data start point |
| Trigger detection point: | Jump to the trigger detection point for recording data. If there is no trigger detection point, jump is made to the start point. |
| End point: | Jump to the end point of the recording data |
| Cursor 1: | Jump to cursor 1 position |
| Cursor 2: | Jump to cursor 2 position |
| Event <<, >>: | Search the marking information in the data recorded, and execute jump |

Event(Marking information) jump

Event jump is executed when press the EVENT << or EVENT >> button.

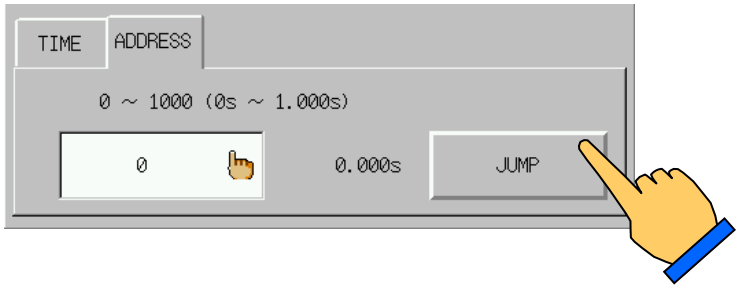


## 11.5.2. Jump to designated time

Jump is made after the waveform display position is specified by time. Specify the time using the Time tab on the Jump screen. Pressing the Jump Key executes a jump.

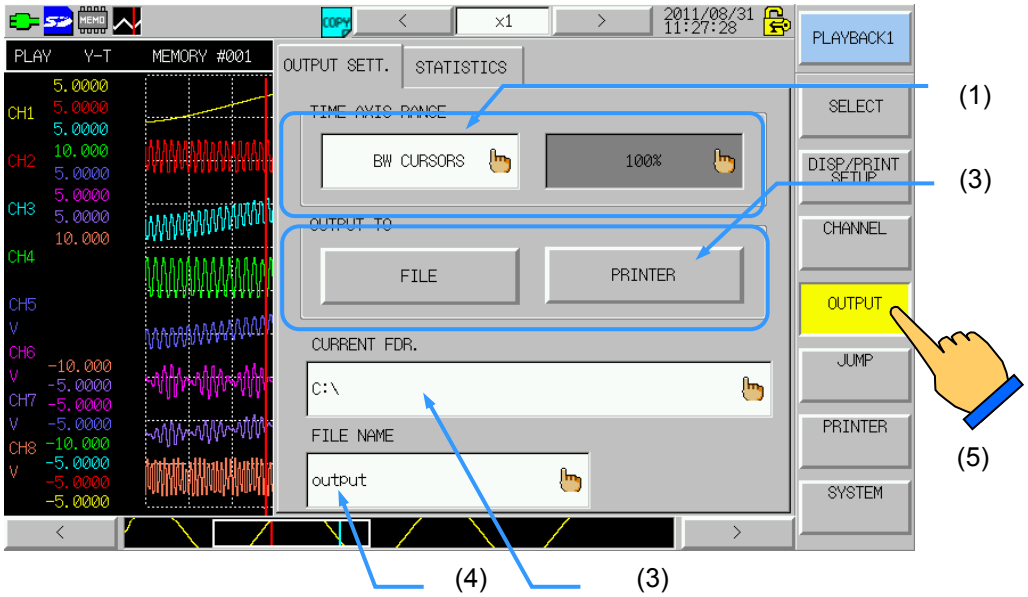
## 11.5.3. Jump to designated address

Jump can be made after waveform position is designated in address. Open the Designate Address tab on the Jump screen, and then specify the address. Press the Jump Key to execute a jump.



# 11.6. Output Setup and Execution

The displayed data can be printed out to the chart paper, or saved in an SD card. Choose range of the data to be printed and select output media (File or Printer).
To set up, firstly, press the Playback 1 button, and then press the Output Setups button to show the next screen.




## (1) Specifying output time-axis range

Select from “Between cursors” or “Trigger point basis”.
When selecting the Trigger Point Basis, you can specify the output range with 10% increments in between 10% and 100%.

**TIPS** To output all, select Specifying in percentage in reference to the trigger point and choose 100 for percentage.

## (2) Where to output

Select from File or Printer.

## (3) Output file folder

When selecting the File for the output media, specify output destination folder.

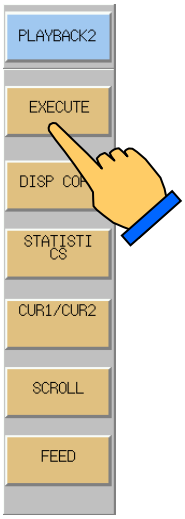
## (4) File name

Specify the output file name.

**TIPS** The output file extension is fixed as DRT.

## (5) Data output execution

Press the EXECUTE button on the Playback 2 screen to output the data.
Specify the output range using the scroll or the cursors, and then press the Output button.

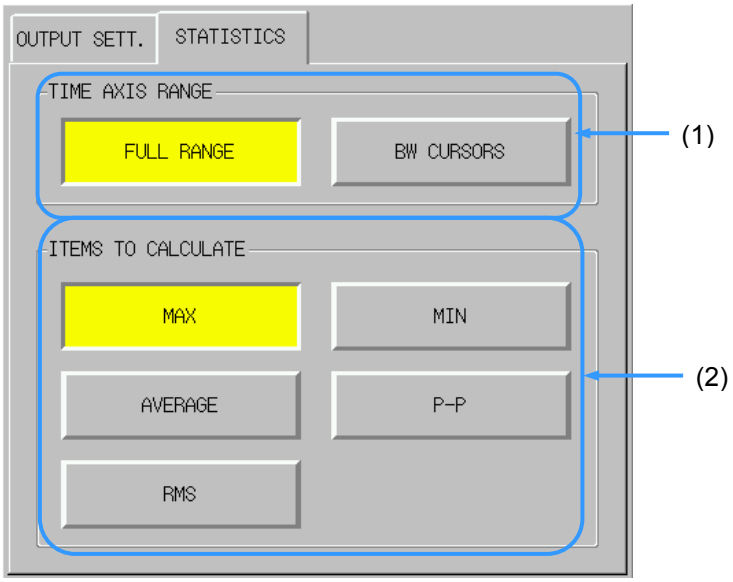



* Other operations are restricted during outputting the data.
  When selecting to output to a file, do not take out the SD card after executing the output.

* Do not remove a connection cable when sending data to printer.

# 11.7. Setup and Execution of Interval Statistical Calculation

The measured data is available for interval statistical calculation. The calculation results can be printed by external thermal printer screen or output to a file in the CSV format.
To set up, firstly, press the Playback 1 button, and then press the Output Setups button to show the next screen.




## (1) Area of statistical calculation

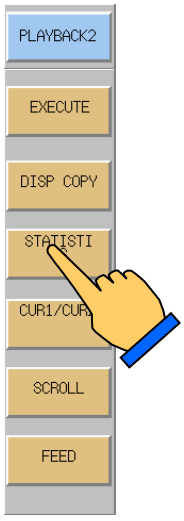
All or area specified by cursors.
FULL RANGE: All data
BW CURSORS: Area between Cursor 1 and Cursor 2

## (2) Statistical calculation details

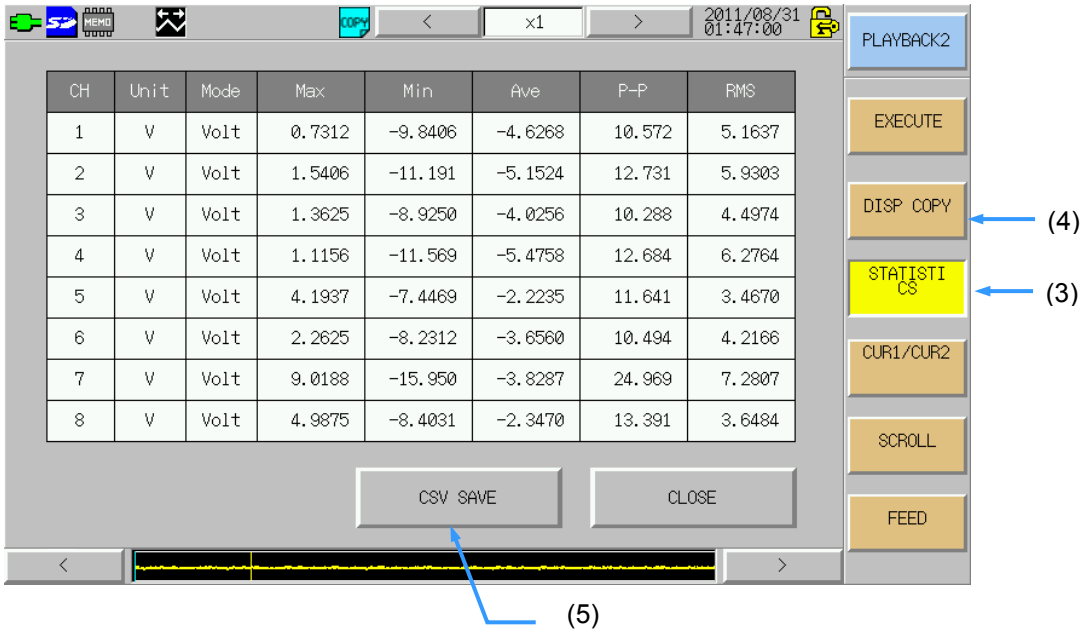
Maximum value, minimum value, average, peak, and root mean square are available.
a) MAX(Maximum value)
Outputs the maximum value among data in the specified area.
b) MIN(Minimum value)
Outputs the minimum value among data in the specified area.
c) AVERAGE
Outputs the average among data in the specified area.
d) P-P(Peak to Peak)
Calculates amplitude from the maximum value to minimum value.
e) RMS(Root mean square)
Calculates root mean square of data in the specified area.

## (3) Execution of statistical calculation

Display the Playback 2, and then press the STATISTICS key to output the results.



## Calculation Results Screen




| CH | Unit | Mode | Max | Min | Ave | P-P | RMS |
|---|---|---|---|---|---|---|---|
| 1 | V | Volt | 0.7312 | -9.8406 | -4.6268 | 10.572 | 5.1637 |
| 2 | V | Volt | 1.5406 | -11.191 | -5.1524 | 12.731 | 5.9303 |
| 3 | V | Volt | 1.3625 | -8.9250 | -4.0256 | 10.288 | 4.4974 |
| 4 | V | Volt | 1.1156 | -11.569 | -5.4758 | 12.684 | 6.2764 |
| 5 | V | Volt | 4.1937 | -7.4469 | -2.2235 | 11.641 | 3.4670 |
| 6 | V | Volt | 2.2625 | -8.2312 | -3.6560 | 10.494 | 4.2166 |
| 7 | V | Volt | 9.0188 | -15.950 | -3.8287 | 24.969 | 7.2807 |
| 8 | V | Volt | 4.9875 | -8.4031 | -2.3470 | 13.391 | 3.6484 |

## (4) Screen copy of the calculation results

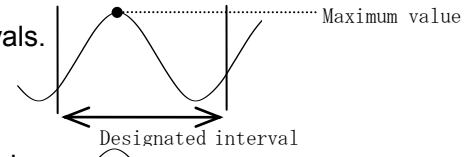
Press the Screen Copy button in the menu bar of the Playback 2 screen to print the screen image out to an external printer.

## (5) Saving the calculation results in the CSV format

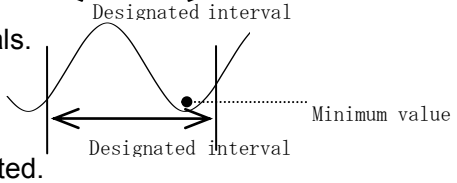
Press the Save in CSV Form button on the bottom of the screen to save the operation results in the CSV format.
A CSV file is saved in the saving destination specified in 11.6 Setup and Execution of Output.

## (6) Statistical interval arithmetic function

a) Maximum Value (MAX)
The maximum value is extracted from the data within designated intervals.




b) Minimum Value (MIN)
The minimum value is extracted from the data within designated intervals.



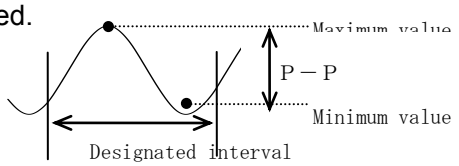

c) Average Value (AVE)
The average value of the data within the designated intervals is calculated.
Formula:

$$AVE = \sum \frac{D}{n}$$

D ··· Sample data within the range
n ··· number of data

d) P-P Value (P-P)
The range between the maximum value and minimum value is calculated.
Formula:

$$P-P = |Maximum - Minimum|$$




e) Root Mean Square (RMS)
The RMS within the designated intervals is calculated.
Formula:

$$RMS = \sqrt{\frac{\sum D^2}{n}}$$

D ··· Sample data within designated range.
n ··· number of data

# 11.8. Other Display Functions

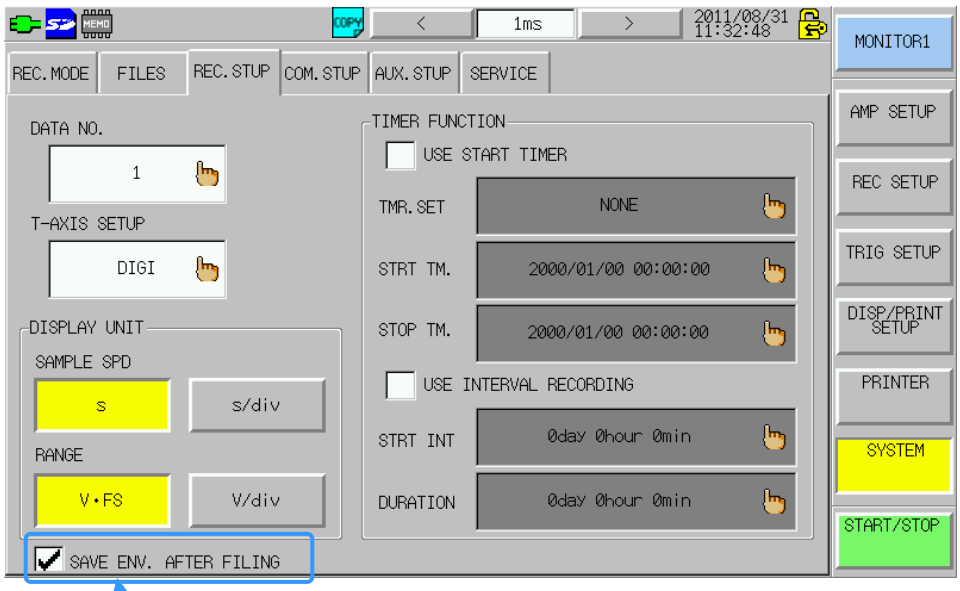
## *11.8.1. Automatic replication of the display setups for the filing data*

When retrieving the data acquired in the filing mode, the settings such as the waveform segmentation can be displayed in the same format when the data is acquired.

In the data file, the details of the Display/Recording Setups, including the number of display segmentation and the signal names, and the Settings for Printing are not saved. Therefore, when reading out the data file solely, it cannot be replayed and displayed in the same conditions when acquired and saved.
In order to return the data to the condition when it was acquired and saved, you should save the environmental file and read it out together with the data file when retrieving.

By checking the Save Environment after File Acquisition checkbox in the Data Acquisition Setups tab in the System Setups screen, you can create environmental files when acquiring and saving data files.

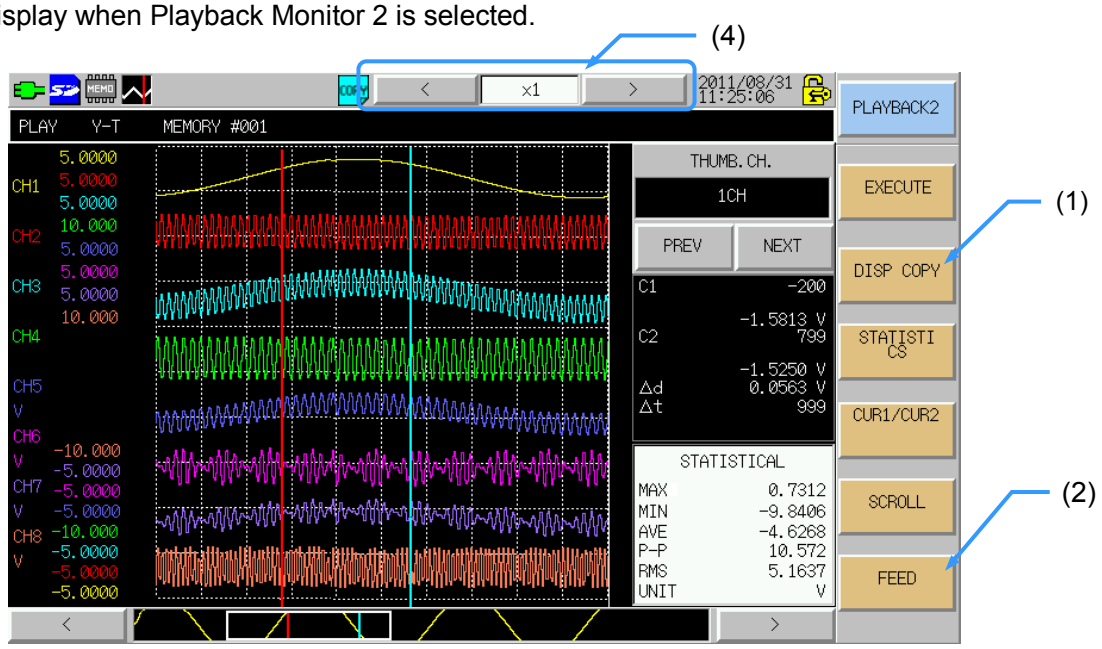
To open the System Setups screen, press the Input Monitor 1 or the Playback 1”button in the menu bar, and then press the System Setups button in each screen menu.




Environmental files are created when acquiring and saving data files.

# 11.9. Other Print Function

Below is display when Playback Monitor 2 is selected.




## (1) Screen copy

Press the DISP COPY key to print out screen image to an external printer or save the image file.
For setting destination of the screen copy, refer to ☞ '14. System Settings'.

## (2) Chart feed

Press FEED key to feed paper for preset length.
For setting the chart feed length, refer to ☞ '13. Print Settings'.
**This function is available when connected with an external printer (optional).

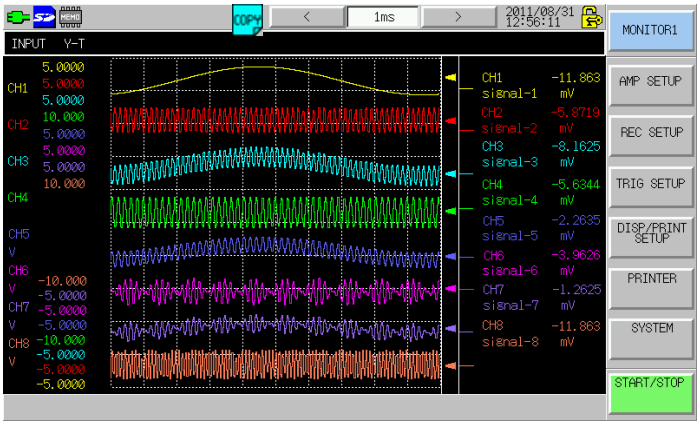
# *12. Display and Recording*

# Settings for Monitor Display and Recording format

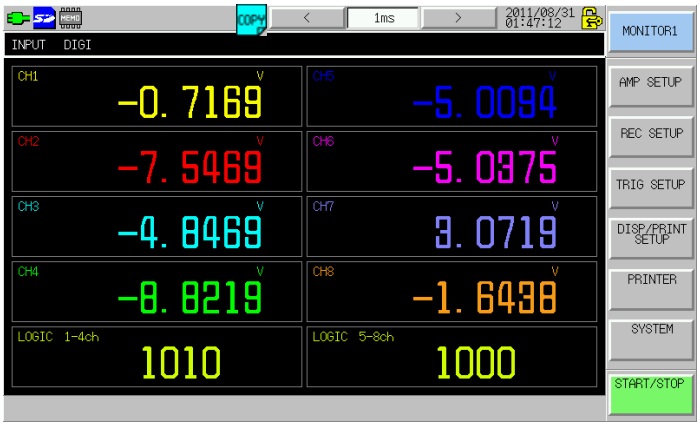
# 12.1.Settings for Display and Recording

Set display format such as waveform for monitoring and recording. There are three display monitor formats i.e., [Y-T], [Value], and [X-Y].

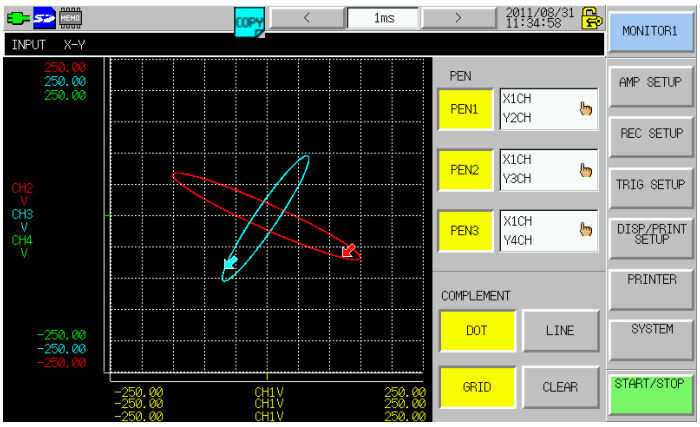
[Y—T rendering]
This is a waveform monitor in which time is set for the horizontal axis and signal amplitude is set for the vertical axis. Dynamic display of input signal waveforms is possible. The waveform display interlocked with preset value of the sampling speed can be made.




[Value indication]
Input signal values are displayed in large letters. Display update interval is 500 msec.

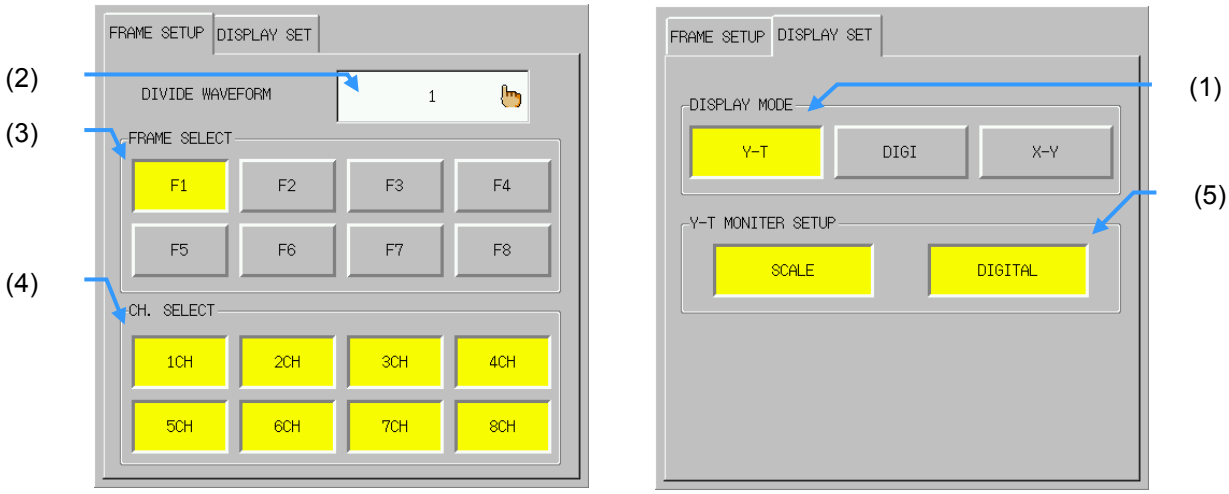



[X-Y rendering]
Correlation between signals of different channels is monitored by plotting signals from each different channel on X-axis and Y-axis. Any channel can be assigned on to X axis and Y axis respectively.



## 12.1.1. Y-T settings on input monitor

Press the [Display/Recording Settings] key on the menu bar to display the setting window. Y-T display mode is to be chosen in [Display Settings] tab. The number of frame segmentation for Y—T recording can be set from [Frame Settings] tab. The channels to be displayed on each segmented frames can be specified.

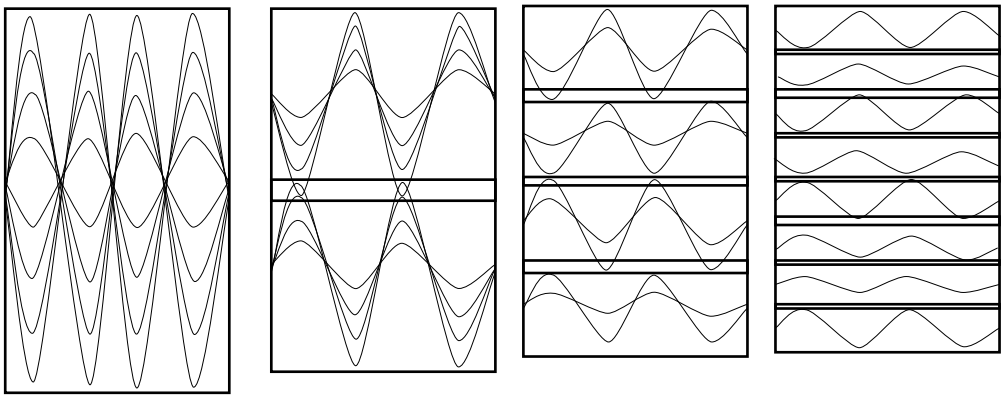



**(1) Display mode ([Display Settings] tab)**

Select the mode for displaying on the waveform monitoring region. Select the Y—T mode here, from available three modes of Y—T, Value, and X—Y.

**(2) Waveform frame segmentation ([Frame Settings] tab)**

Specify the number of segmentation for waveform recording..



Single Frame[F1] | 2 Frames[F1],[F2] | 4 Frames [F1]～[F4] | 8 Frames [F1]～[F8]

**(3) Frame selection ([Frame Settings] tab)**

The frame(s) with numbers specified by the waveform frame segmentation becomes valid. By pressing each frame number [F1], [F2], [F3], [F4]…[F8], the channel(s) assigned on each frame is displayed as assigned in the following “(4) Display CH selection.”

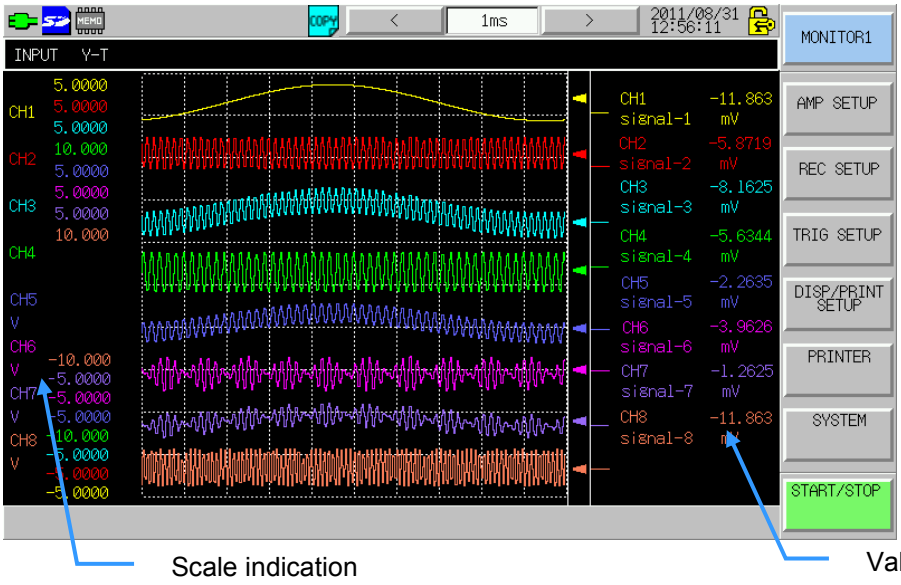
**(4) Display CH selection ([Frame Settings] tab)**

Specify the channel to be displayed on each segmented frame. Display and set the channel to be displayed on the specified frame by frame selection. Any specific channel cannot be assigned to several different frames at the same time.

**(5) Y-T monitor display settings ([Display Settings] tab)**

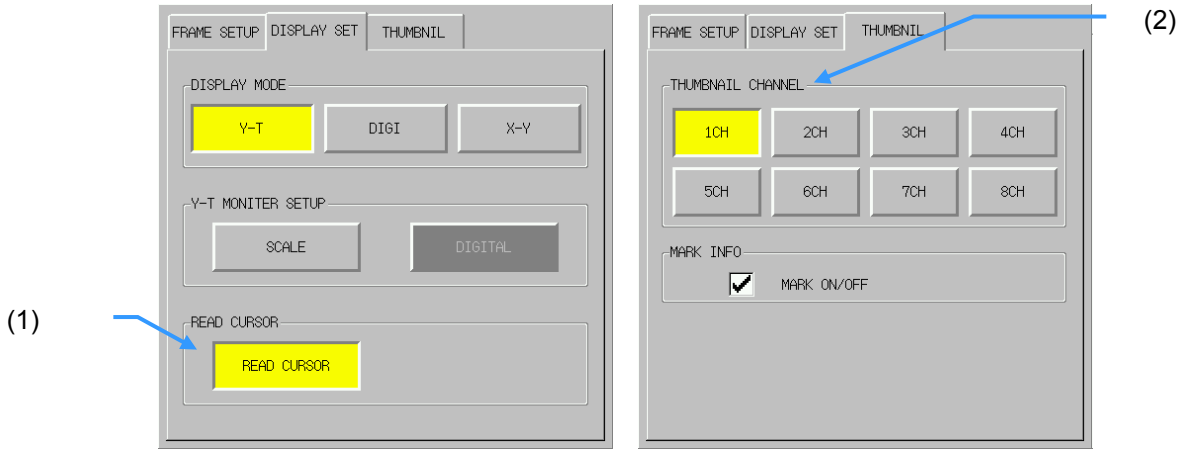
Perform the ON/OFF settings for “scale display” and “value display” when the Y—T mode is selected.

Waveform display with time on horizontal axis and signal amplitude set for vertical axis can be made in accordance with the above setting.




## *12.1.2. Y-T monitor setting in Playback mode*

The cursor value indication and thumbnail display channel setting are added to the functions available in the Input signal monitoring mode.




## (1) Cursor Value Indication

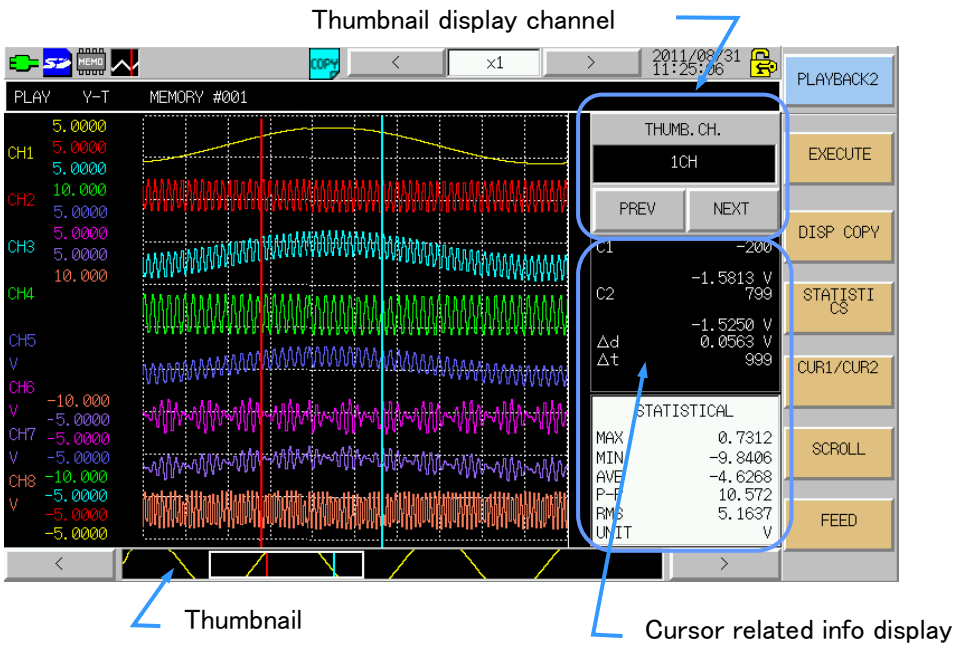
ON/OFF setting for the cursor value indication is available. Cursor position information is displayed on the playback monitor. Values for cursor 1 and cursor 2, and the simplified calculation result can be displayed.

## (2) Thumbnail Display Channel

The Channel displayed on the thumbnail can be specified.
The channel specified here is the target of simple calculation. The Channel displayed on the thumbnail can be changed on the replay monitor screen.

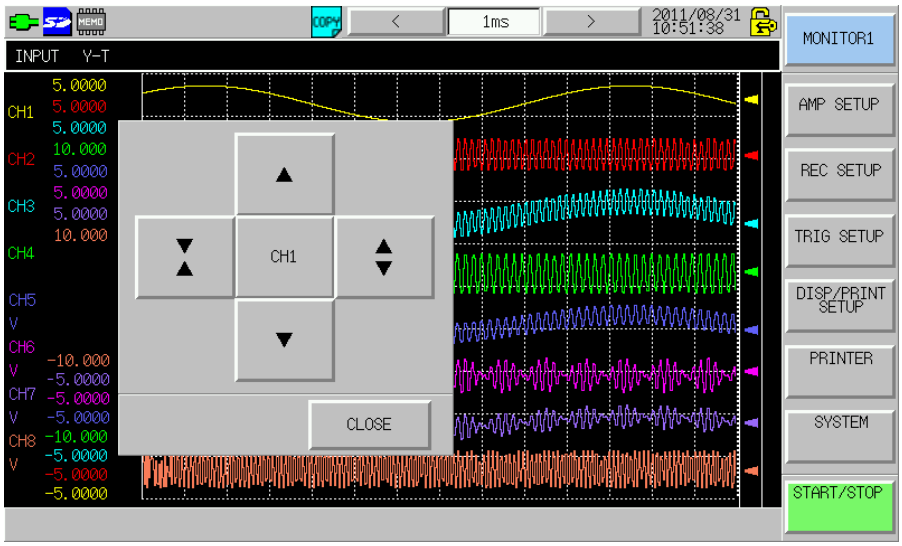
## (3) MARK INFO

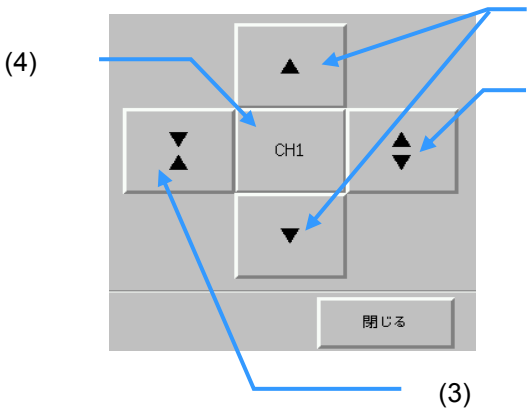
It is for displaying or not displaying mark information on screen.
When it is set as ON, saved mark information will show up on playback screen, with 'M' mark and vertical line.




## 12.1.3. Zero position and change of display range on the Y-T monitor

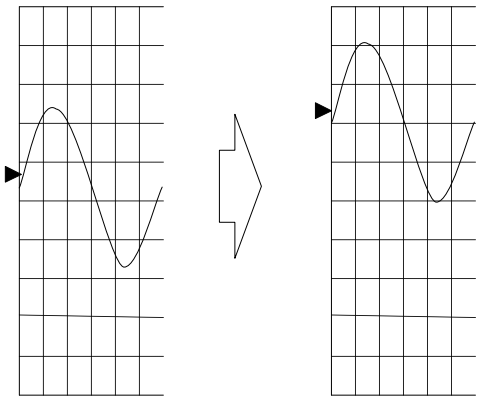
A box for setting zero position and display range appears by touching the scale display region. Display position and display range of waveforms can be changed without invoking the amplifier setting screen.



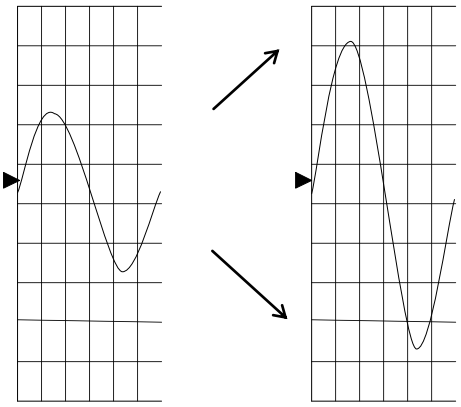




(1) Display position can be changed.
※ The settings are the same as zero position change of the amplifier settings.
(2) Expand the display range
(3) Reduce the display range.
※ The number of setting steps is changed by press and holding the key.
(4) The specified Channel can be changed by touching the Channel number in the center of the box.

(e.g.) Position change
Zero position is changed from the position of 50% to 70%.

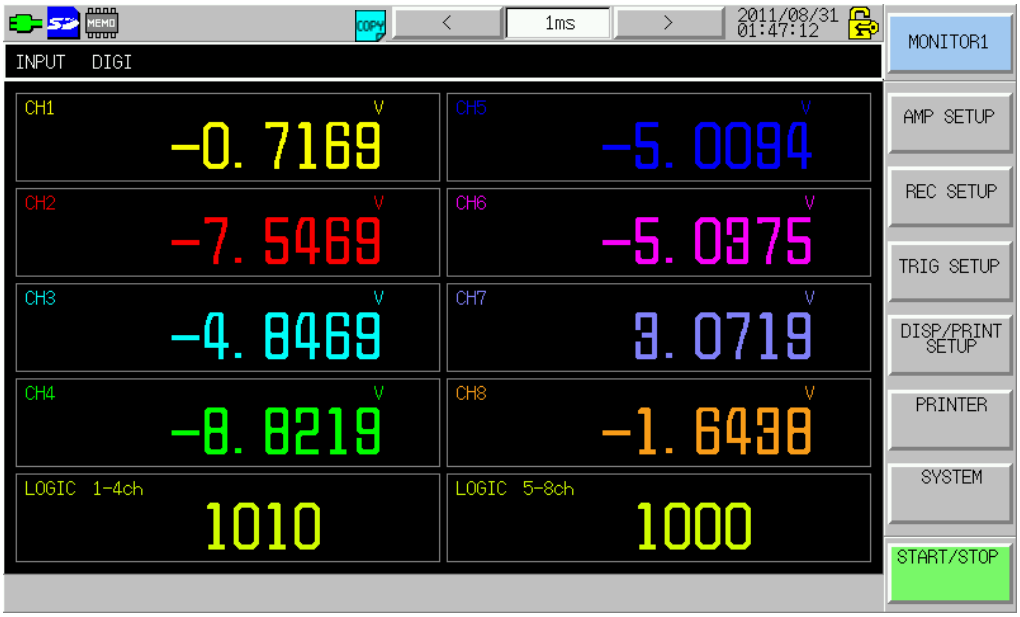


(e.g.) Display width change
Display range is reduced at the time of range 500 VFS.



## *12.1.4. Numerical value monitor*

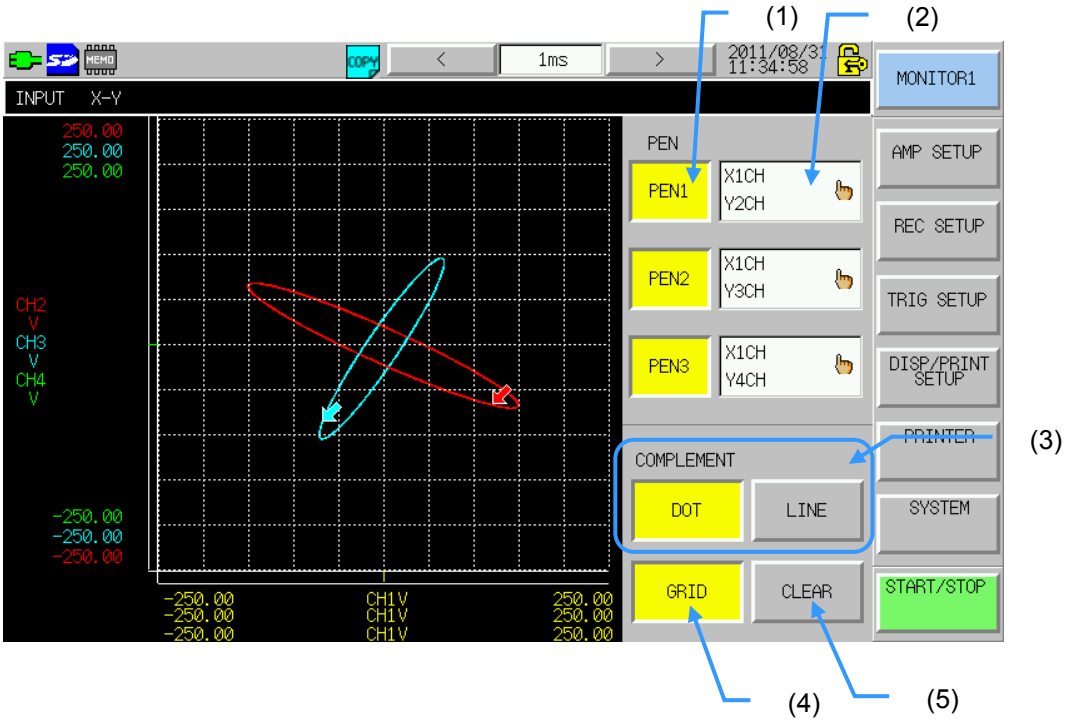
The input signal is monitored by the decimal value. Display is updated at certain interval.




**TIPS** At peak-data mode, maximum value is displayed.

## 12.1.5. X-Y monitor

This monitor displays the waveform using X-Y format. Any channel can be specified to X and Y axes. The waveform is displayed with amplitude of amplifier assigned to each axis.




(1) Pen

Maximum of 3 combinations are possible.
When any of Pen (1~3) is activated (highlighted), waveforms of the specified channels are displays; Pen-up (when not selected) does not display targeted waveforms.

(2) X-Y axis Channel

Specifies the channels to display X-Y waveforms.

(3) Data Interpolation

Selects waveform display methods
Dot: represent the waveform as a “dot”.
Line: represent the waveform as a “line”

(4) Grid:

Grid indication is set to turn ON or OFF.

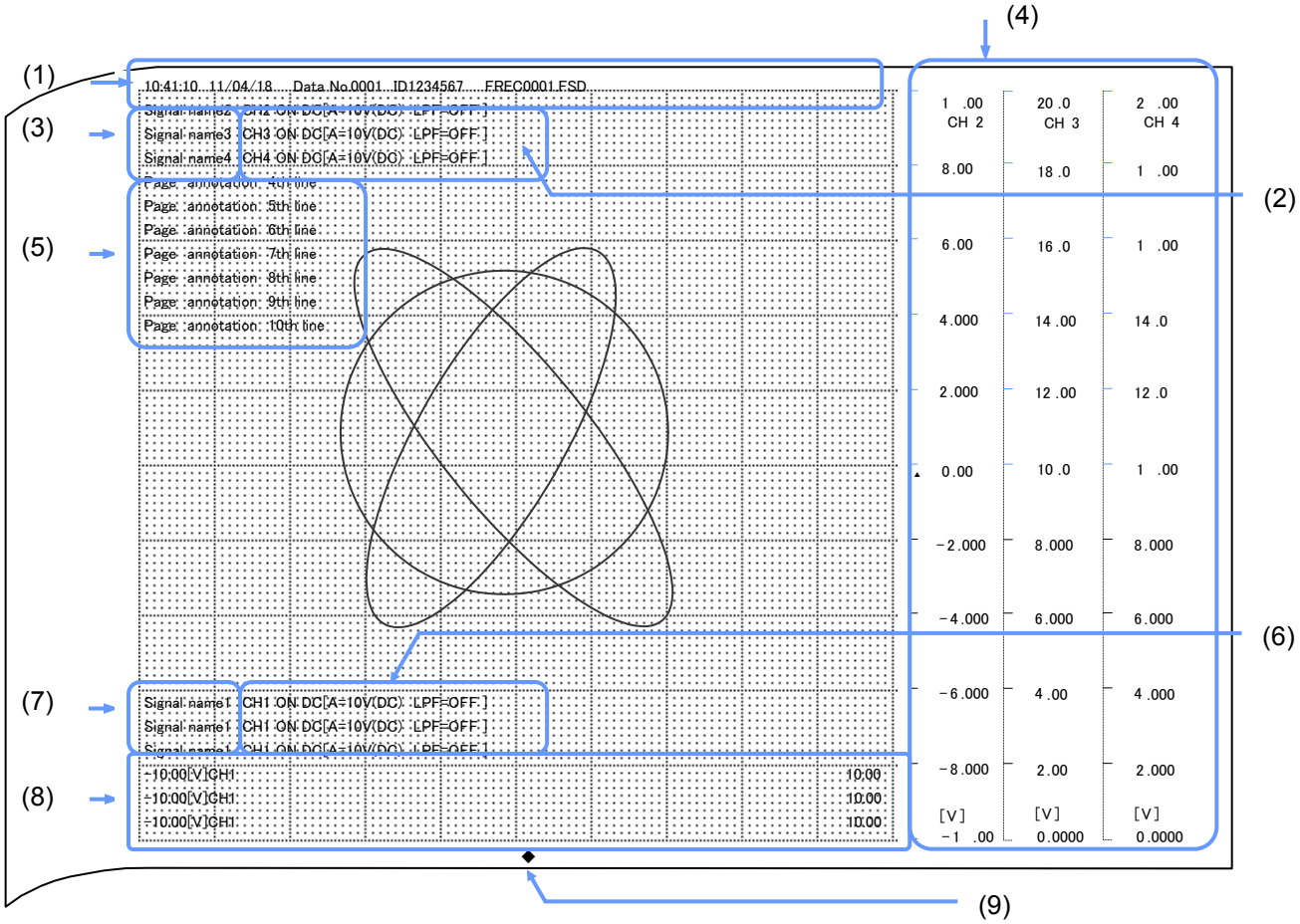
(5) Clear

Clear the waveform monitoring region (Delete the waveform display). The waveform is displayed again after clearing.

**NOTE** “Clear” (7) is not valid in playback mode for recorded signal display.

# 12.2. X-Y Waveform Printing Image

Here is waveform image to be printed when the X-Y display mode is selected.
Refer to the Chapter 13 for the settings of each printing item (ON/OFF of the printing).




## (1)System Annotation

System information related to printing is printed. Print start time is indicated on the top of the recording paper.

Data No. : Automatically given sequence number to each printing is printed.

ID No. : Recorder ID number is printed.

## (2)Y-axis Channel Annotation

Channel information set for the Y-axis is printed.

## (3)Y-axis Channel Signal Names

Channel signal names set for the Y-axis are printed.

## (4)Y-axis Scale

Scale information set for the X-axis is printed.

## (5)Page Annotation

Character strings defined by user are printed over waveform printing. To set printing ON, OFF, or character strings, ☞ see Chapter 13. Print Settings.

## (6)X-axis Channel Annotation

Channel information set for the X-axis is printed.

## (7)X-axis Channel Signal Names

Channel signal names set for the X-axis are printed.

## (8)X-axis Scale

Scale information for the X-axis is printed.

## (9)X-axis Zero Position

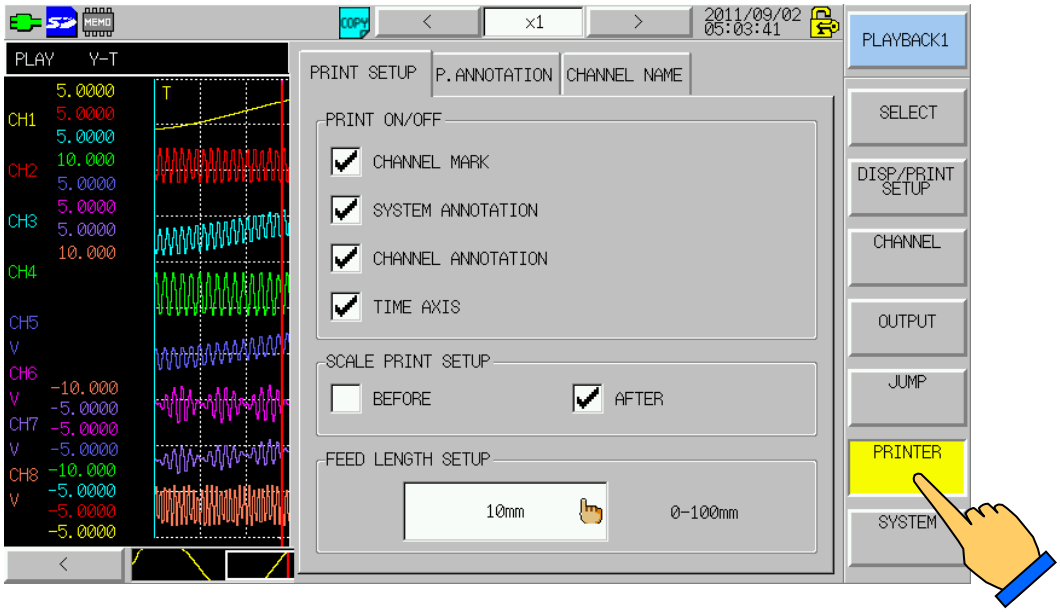
Zero position for the selected channel for the X-axis is printed.
If some of zero position of different signals overlap each other, it may become difficult to see identify overlapping ones.
If the zero position is at the grid edge, it will not be shown in the printed copy.

# *13. Print Settings*

# Printing for Chart Paper

# 13.1. Print Settings

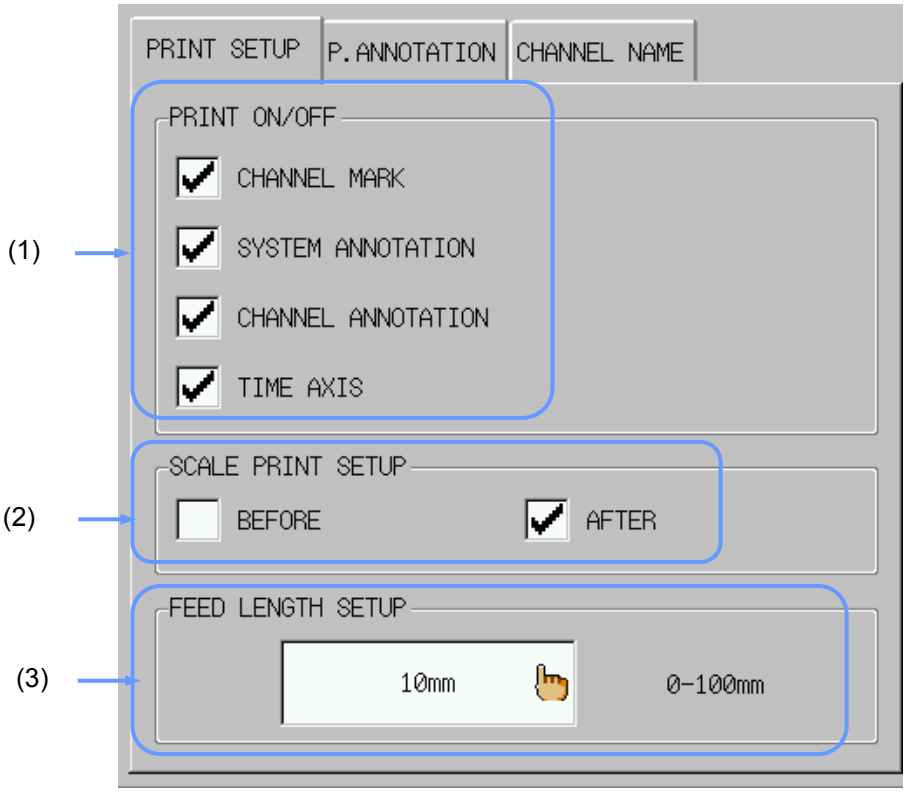
Set up formats to execute waveform records or X-Y records.




## *13.1.1. Print settings*

Setup Feed length after recording ends, Scale print before and after recording, and Print eac h item ON/OFF when recording to printer.

Display a screen by pressing [Print Settings] key of [Replay Monitor1] in Menu bar.



## (1) Printing Item ON/OFF

Whether to switch ON or OFF for the following information can be determined.

1) Channel Mark : prints CH number near waveform
2) System Annotation : prints measurement starting time, data No., etc.
3) Channel Annotation : prints setting information of each channel
4) Time-axis : prints time-axis information

## (2) Scale Print Settings

Position to print scale can be specified.

1) Before recording : print scale before recording start, and then print waveforms
2) After recording : print scale after recording stop

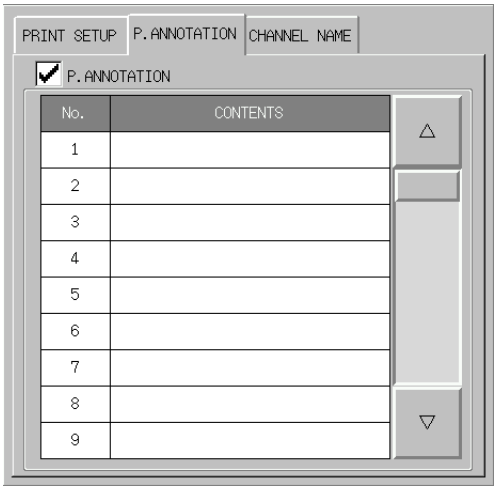
*Print of the scale can be set either ON or OFF.

## (3) Feed Length Setting

The amount of chart feed after printing can be set.
A smaller value should be set if chart paper usage must be saved under continuous printing.

### *13.1.2. Page annotation*

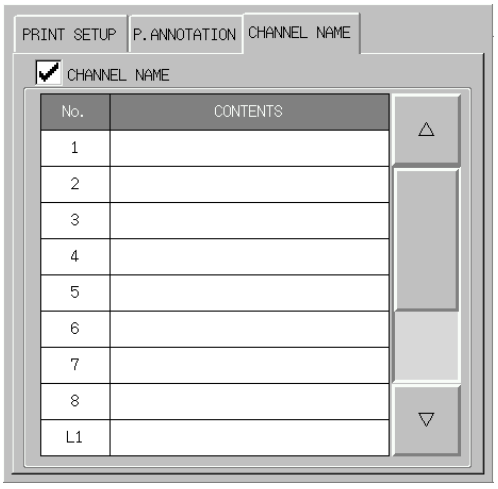
Printing of annotation can be selected ON or OFF.
A maximum of 80 characters in each row x 52 rows can be specified.
Character input screen is displayed by touching the Portion showing the contents of each row.
Refer to Chapter 12,1.4. Character Input for details




### *13.1.3. Signal name*

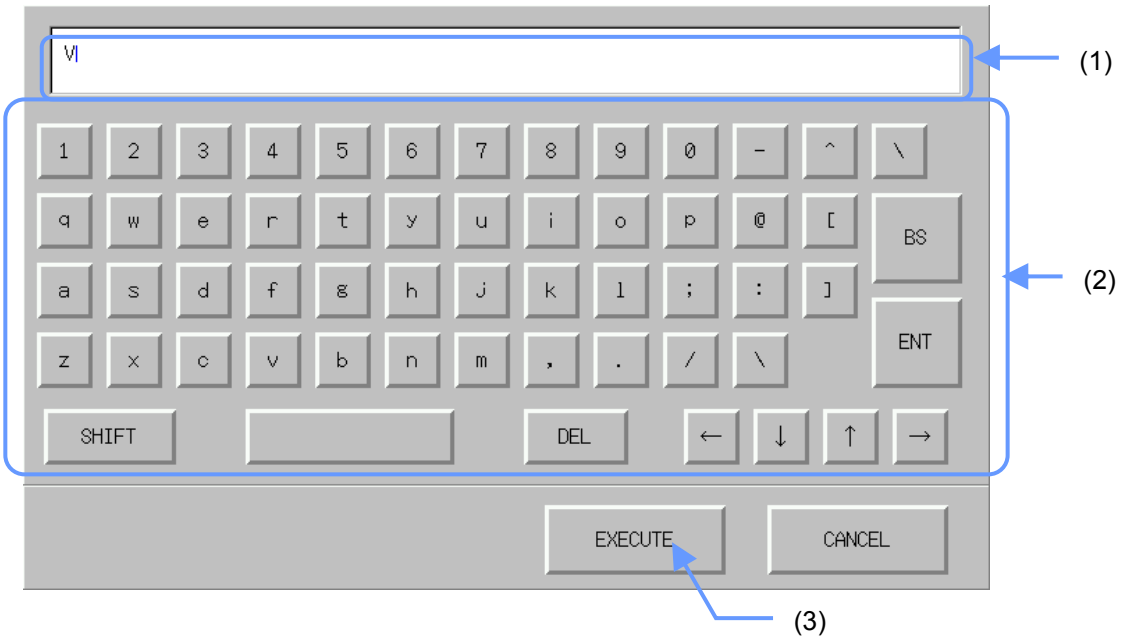
Printing of the signal name can be set ON or OFF.
Maximum 30 characters per each channel can be specified.
Character input screen is displayed by touching the Portion showing the contents of each signal name.
Signal name can be entered from channel 1 to 8 and L1 only.
Names entered as L2 to L8 are not printed on paper.

Refer to Chapter 13,1.4. Character Input for details



## *13.1.4. Character input window*

Use this window to input character strings.




### (1)Input display section.

This section displays input character strings and cursor position.

### (2)Input operation section.

This section operates input character strings from various keys.
Capital letters and symbols can be input by pressing the [SHIFT] key.
When the key is pressed, images displayed on the keyboard are changed after the key is highlighted, thereby capital letters and symbols can be input

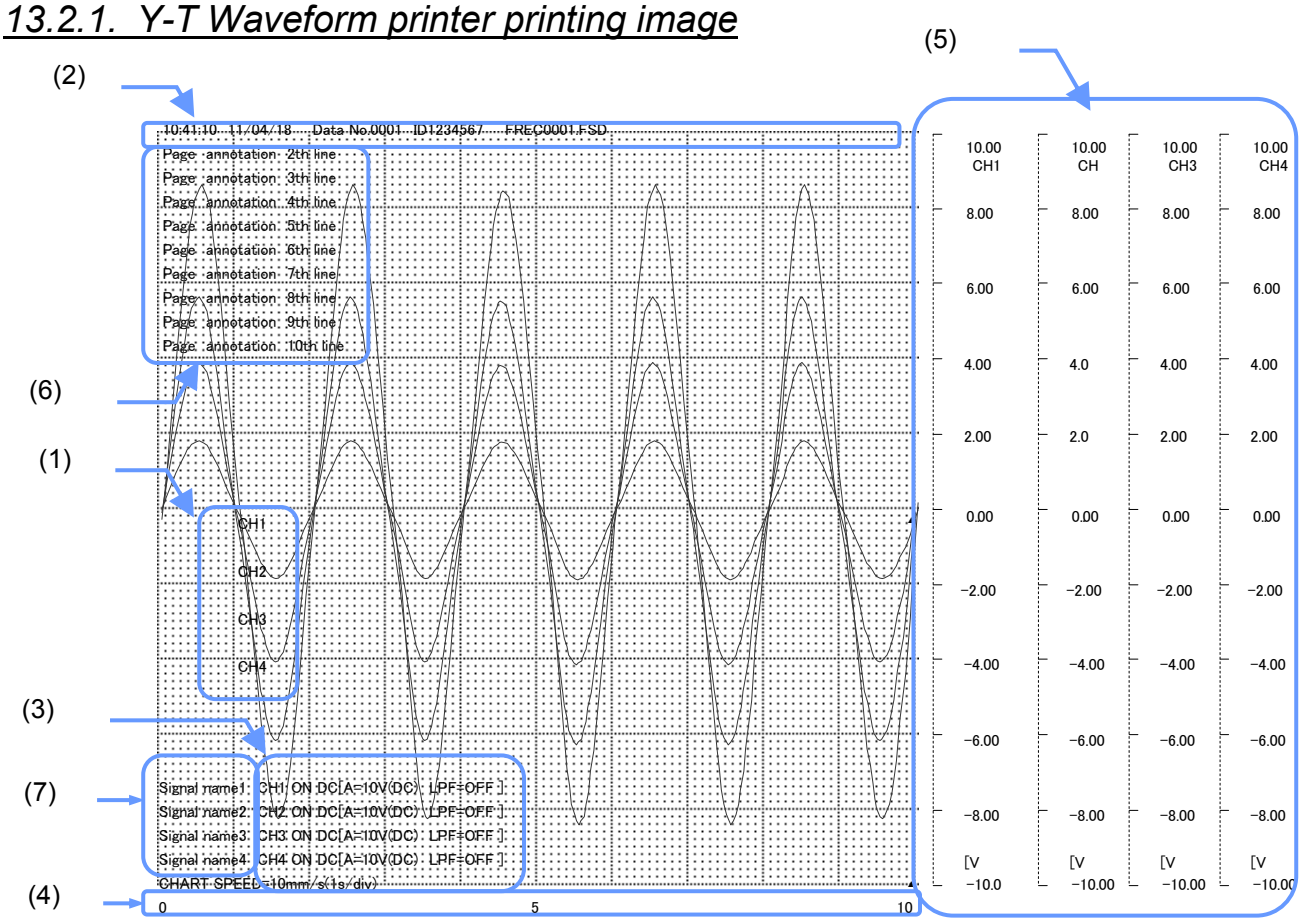
### (3)[Execute] key

To register character strings to input, press this key. The window will then close.

# 13.2. Y-T Waveform printer printing image

The following items set in [Print Settings] are shown as below.

## *13.2.1. Y-T Waveform printer printing image*




### (1) Channel Mark

Channel number is printed near the waveform signal base line.

### (2) System Annotation

System information to printing such as print start time, data No., is printed.

### (3) Channel Annotation

Channel information is printed.

### (4) Time-axis

Time-axis information is printed.

### (5) Scale

Scale information set in the Y-axis is printed.

### (6) Page Annotation

Character strings set in page annotation are printed.

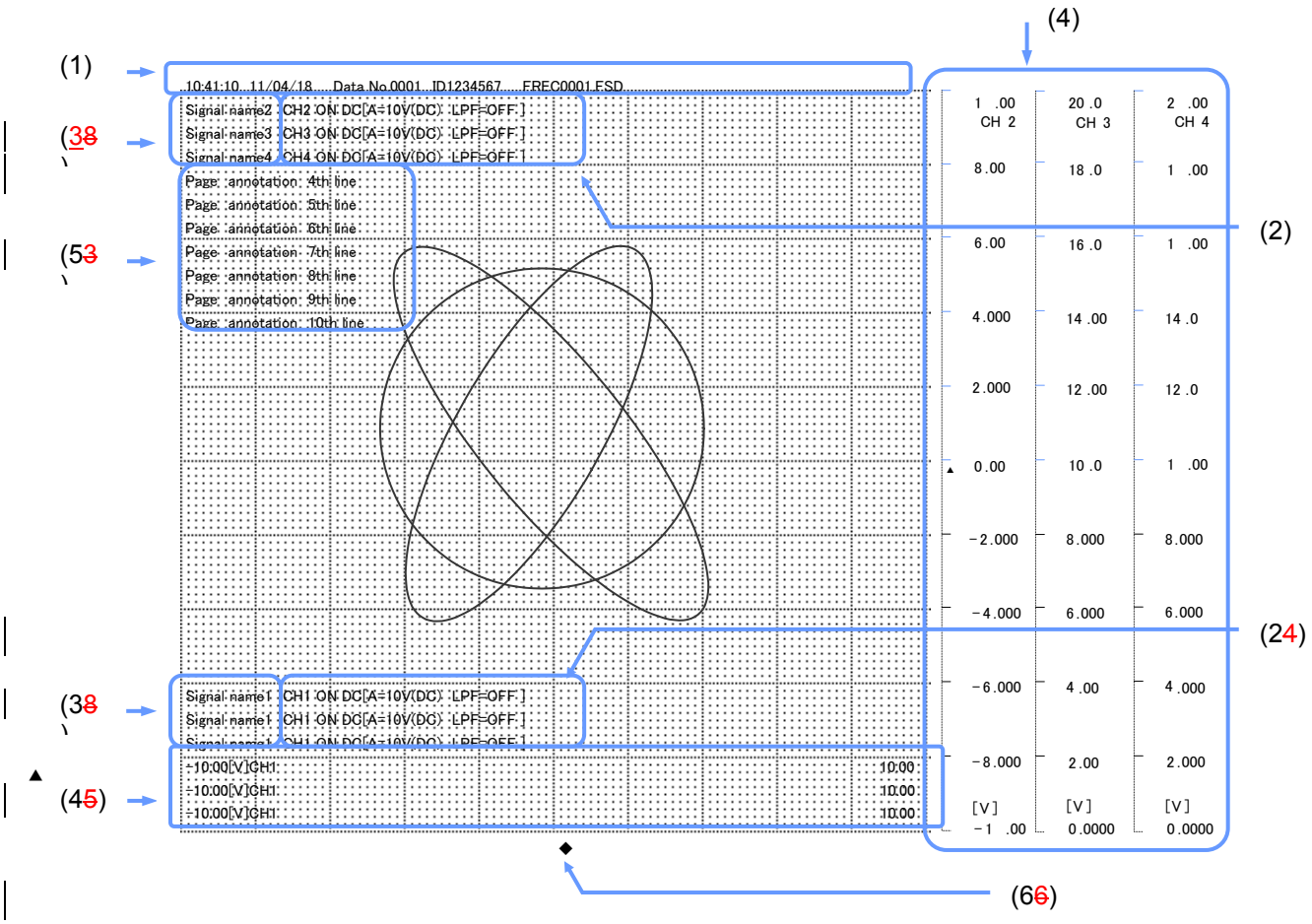
### (7) Signal Name

Character strings set in signal name are printed.

**TIPS**

Printing priority is as below orders. If printing overlaps, item in higher order is printed.
1. System Annotation; 2. Channel Annotation; 3. Page Annotation

## 13.2.2. X-Y Waveform printer printing image




### (1)System Annotation

System information to printing such as print start time, data No., is printed.

### (2)Channel Annotation

Channel information set in the X-axis and Y-axis is printed.

### (3)Channel Signal Names

Channel signal names set for the X-axis and Y-axis are printed.

### (4)Scale

Scale information set in the X-axis and Y-axis is printed.

### (5)Page Annotation

Character strings set in page annotation are printed.

### (6)Zero Position

Zero position of channel set in the X-axis.

**TIPS**

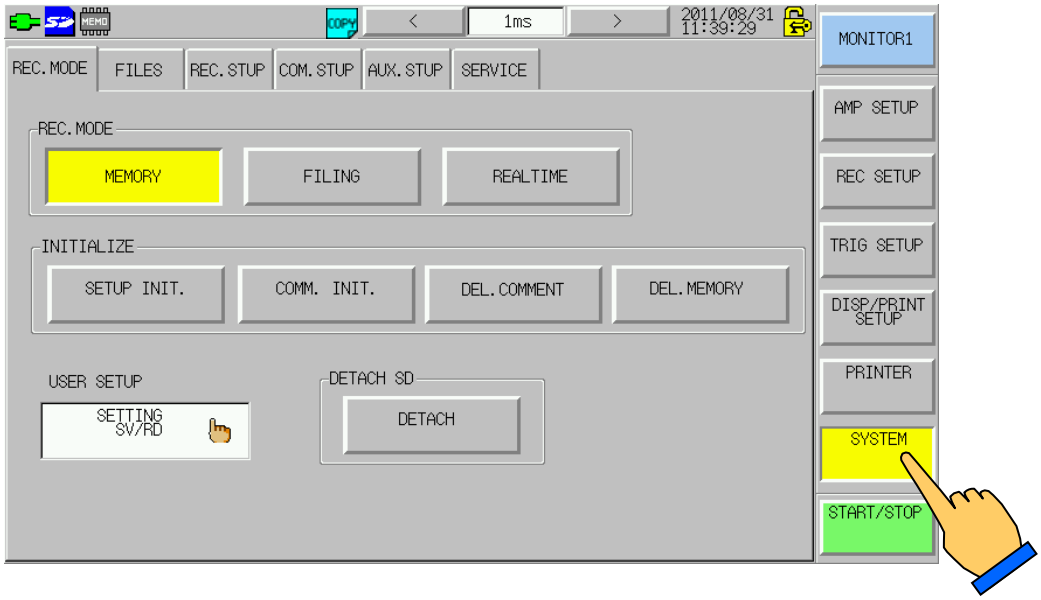
Printing priority is as below orders. If printing overlaps, item in higher order is printed.
1. System Annotation; 2. Channel Annotation; 3. Page Annotation

# *14. System Settings*

## Other Functions

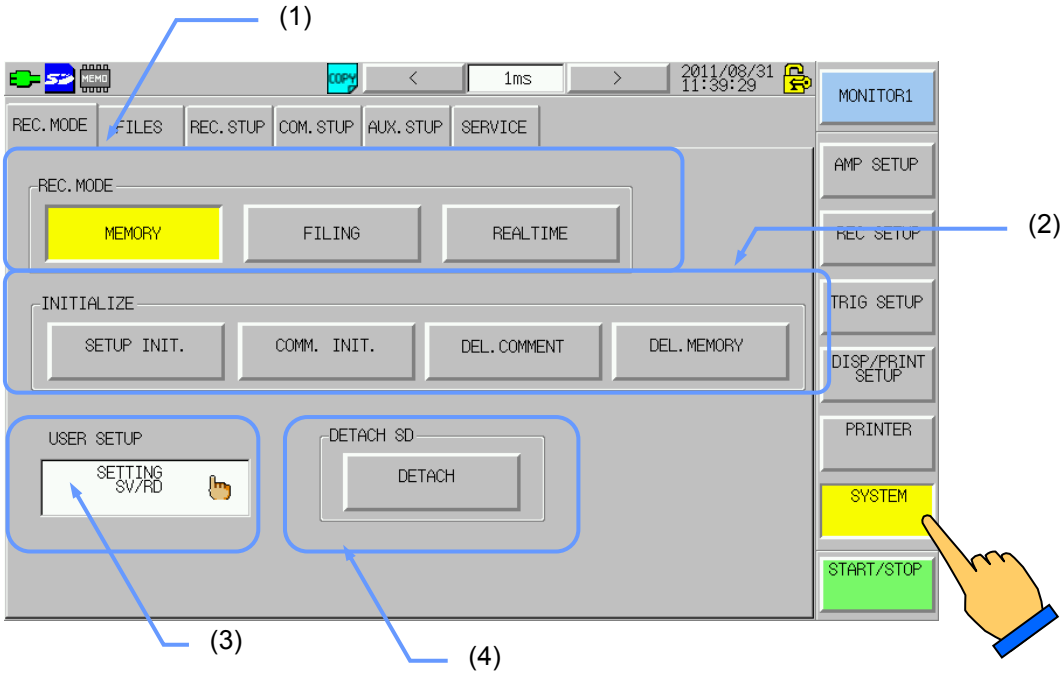
# 14.1. System Screen

Pressing the System Setting Key opens the System Setting screen. System Settings are divided in Measurement Mode, File Operations, Recording Settings, Communication Settings, Auxiliary Settings, and Maintenance, and each setting screen is displayed by pressing the tab Key.



# 14.2. Measurement Mode

In the Measurement Mode screen of the System settings, Measurement Mode settings for this recorder as well as saving, readout, and initialization of all setup information can be made. Pressing the System setting Key and the Measurement Mode tab displays the following screen.




## (1) Measurement Mode

Measurement mode of this recorder can be changed.

## (2) Initialize

The setup of this recorder can be resumed to the factory default. Also, the item to be initialized can be set.

**a) Recorder Initialize Key**

The setup status can be resumed to the factory default.

**b) Communication Initialize Key**

Only communication setup can be initialized to the factory default.

**c) Annotation Delete Key**

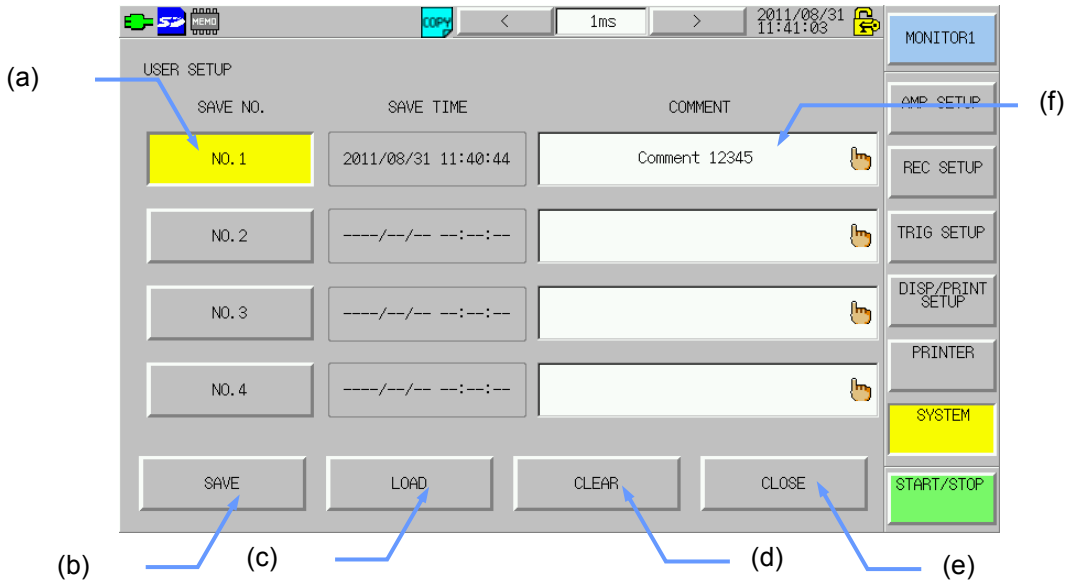
Deletes annotation character strings.

**d) Memory Delete Key**

All data in memory blocks is deleted.

## (3) Setup Value Save

The settings of the recorder can be saved in, read out, or cleared from the internal memory. Comments can be entered, which makes it easier to recognize file. Pressing save or readout Key for setup value displays following screen below.




**a) Save (No.1-4) Key**

Select the destination to save.

**b) Save Key**

Save the setup data corresponding to the selected Save No.

**c) Load Key**

Load the setup data corresponding to the selected Save No.

**d) Clear Key**

Clear the setup data corresponding to the selected Save No.

**e) Close Key**

Close this screen.

**f) Comment Key**

Information on the measurement conditions can be registered as a comment within 16 letters.

## (4) SD Card Disconnection

Disconnect the SD card connected to this recorder.
Pressing SD card disconnection Key displays the screen below.

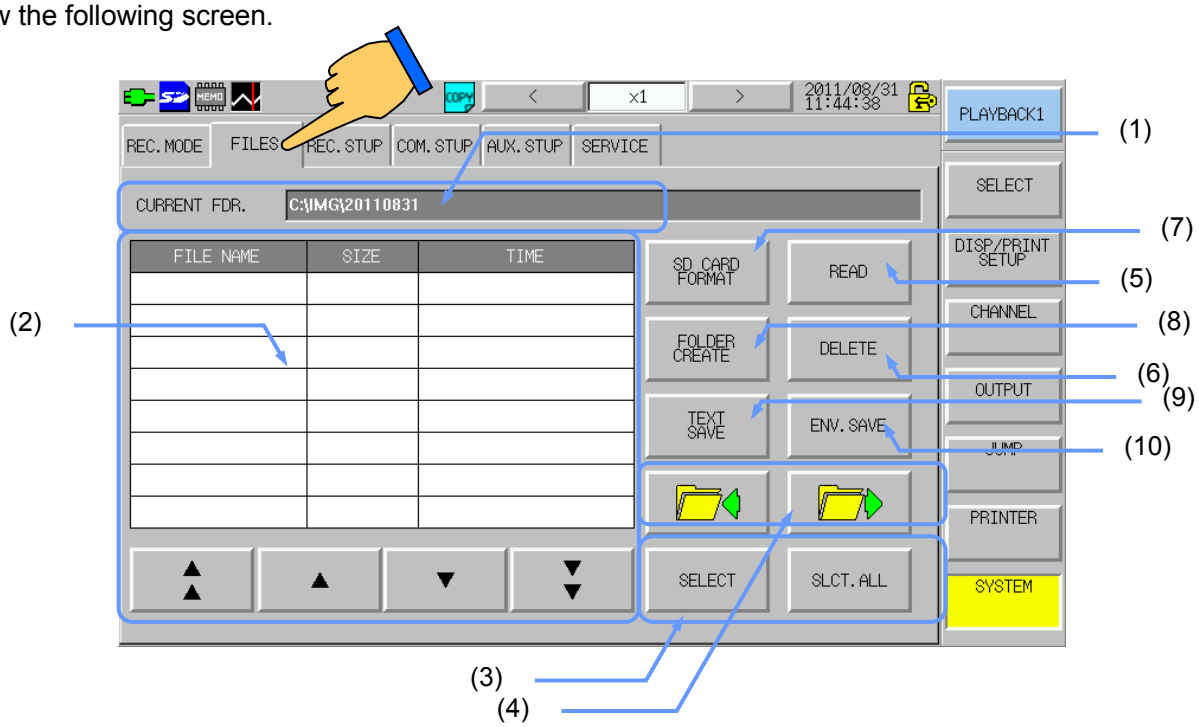

After this Key is pressed, a message “You can disconnect SD card” appears. Then, remove the SD card.


NOTE

Do not disconnect the SD card during the measurement. Disconnection during the recording may cause an error. Use only the SD card optionally prepared by our company. If other SD cards than our optional one are used, the operation cannot be guaranteed.

# 14.3. File Operations

File operations are made for the installed SD card through the File Operation screen on the System Setting screen. Press the System Setting Key on the operation panel and the File Operation tab to show the following screen.




## (1) Current Folder

Display the file path for the SD card.

## (2) List Display

The list of referenced file folder is displayed.
The file folder can be selected by directly touching the list on the screen.
The selected line will be reverse-displayed, and can be selected by directly touching the list-displaying part or operating from the up/down movement key located below the list.


When the number of files or folders exceeds the range of the list-displaying region, next list is displayed to be selected.


The line of the list moves one by one to be selected.

***TIPS*** RM1100 uses 8.3 filename (short filename). If file/folder name is 9 characters or more, it will be shortened to 8 characters.

## (3) Selection

Select Key : Confirms the list selection. Use to select multiple files.
Select All Key : Selects all files in the list. Pressing this Key again releases all selections.

## (4) Folder Movement

Move the selected folder.

move up one level.

move to the folder that is selected.

## (5) Readout

Environment and text save files are read out.

## (6) Delete

Deletes file or folder. When a folder is selected, the folder and the files in the folder are deleted. When the confirmation screen is displayed, be sure the correct files or folders are selected, and execute delete.

NOTE The deleted files and holders cannot be recovered.
Take due care before delete.

## (7) SD Card Format

Format the SD card. Once the format confirmation screen is displayed for the SD card, confirm and start formatting.

*TIPS* For formatting a 2GB SD card, select FAT16.
For formatting 4 or 8GB card, select FAT32 and Class10 (or over).

## (8) Folder Creation

A new folder can be created in the current folder. When the confirmation screen is displayed, confirm and execute.

## (9) Text Save

Text (Annotation character strings, communication setup value) information can be saved in the SD card file. It is useful to store text information in SD card and read out text information from another RM1100 recorder. The extension of file to be saved is TXT.

*TIPS* The text file has an extension of “TXT.” A text editor can read this file, accordingly.

**a) Format for Signal Name Text File**

The file format for the Signal Name Character strings in each channel is shown below. The Signal Name Character strings, consists of the prefix “TSN” and three-digit channel number, precede the character strings selected by the user after three-digit signal number

```
//Signal Name
TSN001,001,CH1 Signal Name
TSN002,001,CH2 Signal Name
TSN003,001,CH3 Signal Name
TSN004,001,CH4 Signal Name
TSN005,001,CH5 Signal Name
TSN006,001,CH6 Signal Name
TSN007,001,CH7 Signal Name
TSN008,001,CH8 Signal Name
TSN009,001,LOGIC Signal1 Name
TSN009,002, LOGIC Signal2 Name
  ～<omitted>～
TSN009,008,LOGIC Signal8 Name
```

*When saving text file in the recorder, information for all 8 channels is saved irrespective of the number of input channel of RM1101 and RM1102.
*When reading out the text file in the RM1101 recorder.
When information for channels 5 to 8 does not exist, readout information up to channel 4 can be read.

**b) Format for Page Annotation Text File**

The file format for the Page Annotation Character strings is shown below. Page annotation character strings precedes the character strings selected by the user and consists of three-digit row number and the prefix “TIP.”
Row numbers are from 001 to 052.

```
//Page Annotation
TIP001,Page Annotation
TIP002,
  ～<omitted>～
TIP050,
TIP051,
TIP052,
```

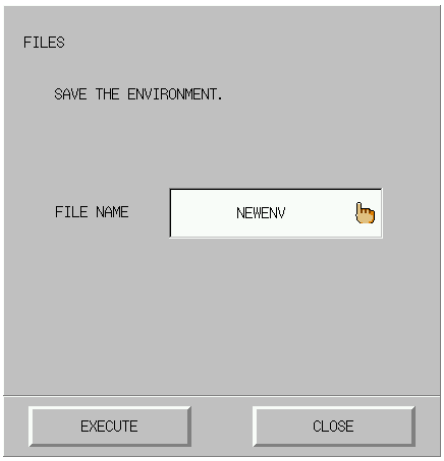
**c) Format for Communication Setup Text File**

The file format for communication setup information is shown below. Communication setup information precedes communication setup information selected by the user and consists of three-digit row number and the prefix “COM.”
Odd row numbers contain comment information about settings.
Even row numbers contain setup information. (Refer to the comment one row above.)

```
//Communication
COM001,Communication Port : NONE / LAN / RS-232C
COM002,NONE
COM003,Baudrate : 4800 / 9600 / 19200 / 38400 / 57600 / 115200
COM004,9600
COM005,Data bits : 8 / 7
COM006,8
COM007,Stop bits : 1 / 2
COM008,1
COM009,Parity : NONE / ODD / EVEN
COM010,NONE
COM011,Flow control : RTSCTS / XONXOFF
COM012,RTSCTS
COM013,Delimiter : CRLF / CR / LF
COM014,CRLF
COM015,Timeout : [0-60]s
COM016,10
COM017,Use DHCP : ON / OFF
COM018,OFF
COM019,IP address
COM020,192.168.200.1
COM021,Sub net mask
COM022,255.255.255.0
COM023,Gateway address
COM024,0.0.0.0
//END OF FILE
```

## (10) Environment Save

Setup information can be saved in a file of the SD card. It is useful to save the setup information in the SD card or read it out on another RM1100 recorder. The following screen appears when pressing the Environment Save Key.




After setting the information to be saved, press the [EXECUTE]Key to save the file. The extension of file to be saved is “ENV.”

NOTE If an environment save file is read out by another RM1100 recorder, the setup from which the hardware configuration is different is displayed to be default,. (when type of amplifier is different and other cases.)

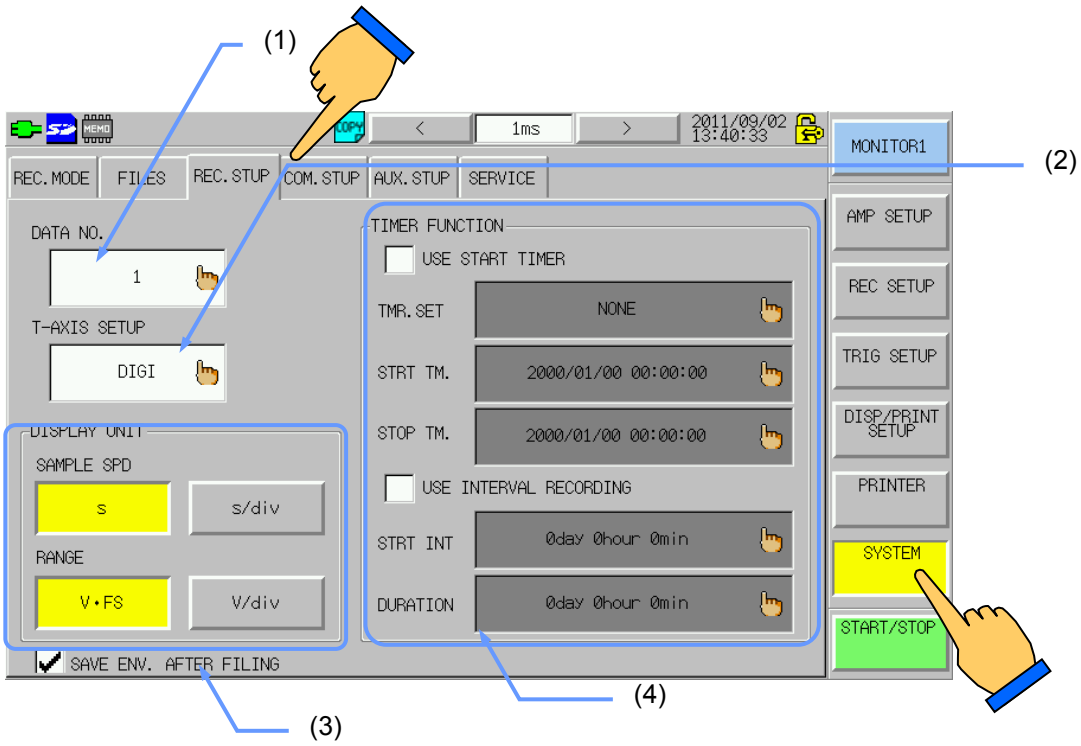
## (11) File Format List

RM1100 File Format List

| File Overview | Extension | Remarks |
|---|---|---|
| Environmental File | .ENV | Measurement condition file |
| Text File | .TXT | Text (Annotation character string, communication settings) information file |
| Universal Data File | .DRT | Data file format stored using the replay monitor |
| Peak Data File | .FPP | Data file in filing mode |
| Sample Data File | .FSD | Data file in filing mode or memory mode |
| Statistical Operation Result File | .CSV | Statistical operation result file calculated using the replay monitor |

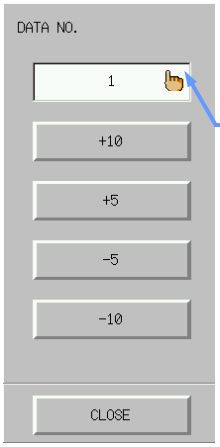
# 14.4. Recording Settings

Press the System Key, and then press the Recording Settings tab. The following screen appears.




## (1) Data No. Setting

The number assigned to the measurement data can be changed. Pressing Data No. Key displays the following screen.

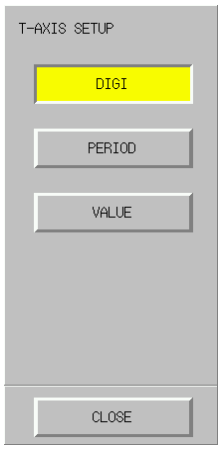



Pressing this displays the value input screen and can be set.

***TIPS*** The data number increments automatically after recording. This function is useful to identify the recording data sequence. The data number is added to the file name, and also can be printed on the upper portion of the waveform printout.

## (2) Time-axis Representation

Pressing Time-axis Representation screen changes the time-axis units used in waveform recording.




**TIPS**

・Value displays the data number. The reference of the trigger point in the memory mode is represented to be 0.
・Elapsed time displays the recording time. The reference of the trigger point in the memory mode is represented to be 0.
・Clock time displays the recording time or the trigger point are displayed year, month, day hour, minute, and second.

## (3) Display Unit settings

Change the units of time-axis and amplitude-axis.

**Change the unit system of time-axis**

Change the unit system of time-axis including waveform printing for time-axis, a cursor on the replay monitor, and the range display of auto output in memory mode.
Time-axis units such as recording speed can be selected as to whether to be represented in s, ms, and μs, or s, ms, and μs per 1div.

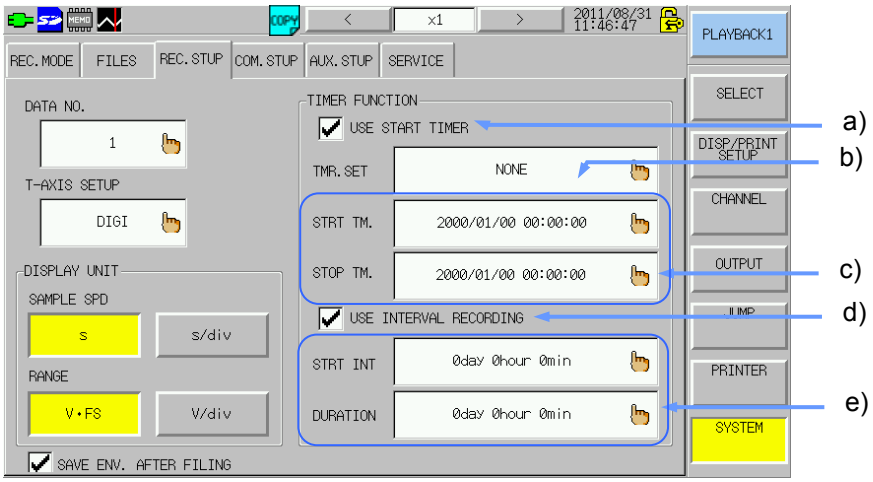
**Change the unit system of amplitude-axis**

Amplitude-axis units such as range and display range can be selected as to whether to be represented in physical quantity including voltage (V), temperature (℃) and others or voltage (V), temperature (℃) and others per 1div.

| [Range・FS] | ←→ | [Range / div] |
|---|---|---|
| 500V | | 50V/div |
| 200V | | 20V/div |
| 100V | | 10V/div |
| 50V | | 5V/div |

## (4) Timer Recording Settings

Recording start and finish is controlled by time. Using the timer function specifies the start and finish time of the recording. Also recording operation for a specified time at regular intervals can be set. When using the start timer and interval function, be sure to input the finish time.




**a) Start Timer ON/OFF**

When using the start timer function, check this box.

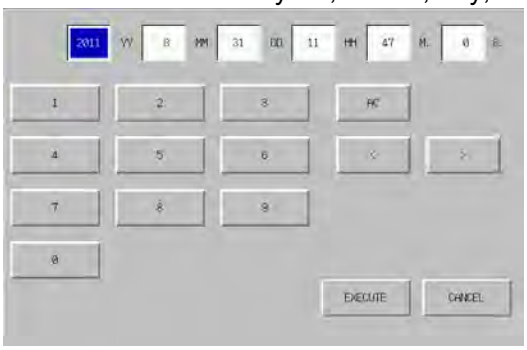
**b) Cycle Settings**

Recording start cycle is set with timer.


**c) Start and Finish Time**

Start time: sets start time for year, month, day, hour, minute, and second

Finish time: sets finish time for year, month, day, hour, minute, and second




***TIPS*** Depending on the contents of “Cycle Settings,” available setup items are changed as shown in this table.

| cycle setting | Setting items |
|---|---|
| Every month timer | Day, hour, minute, second |
| Every day timer | Hour, minute, second |
| Every minutes timer | Minute, second |
| | Year, day, hour, minute, second |

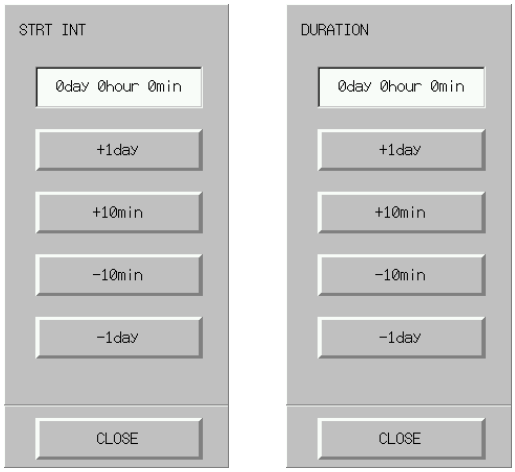
**d) Interval ON/OFF**

When using the Interval function, check this box. The use of the Interval function is set when repeated recordings are made using timer function.

**e) Interval settings**

Start Interval ： sets recording start interval

Operation time ： sets recording operation time




Example：To make 20-minute recording every hour from 0:00 a.m. on December 24, 2011 to0:00 a.m. on the next day.

1) Check the Timer Function box.
   To use timer function, be sure to check the start timer box.
2) Specify the start time （2011/12/24 0:00）
3) Specify the finish time （2011/12/25 0:00）
4) Check the Interval Function box.
   Do not check if the measurement is for only one interval.
   Add a check mark only when repeated recordings are made.
5) Specify the start interval （1h）
6) Specify the operation time （20min）

***TIPS***

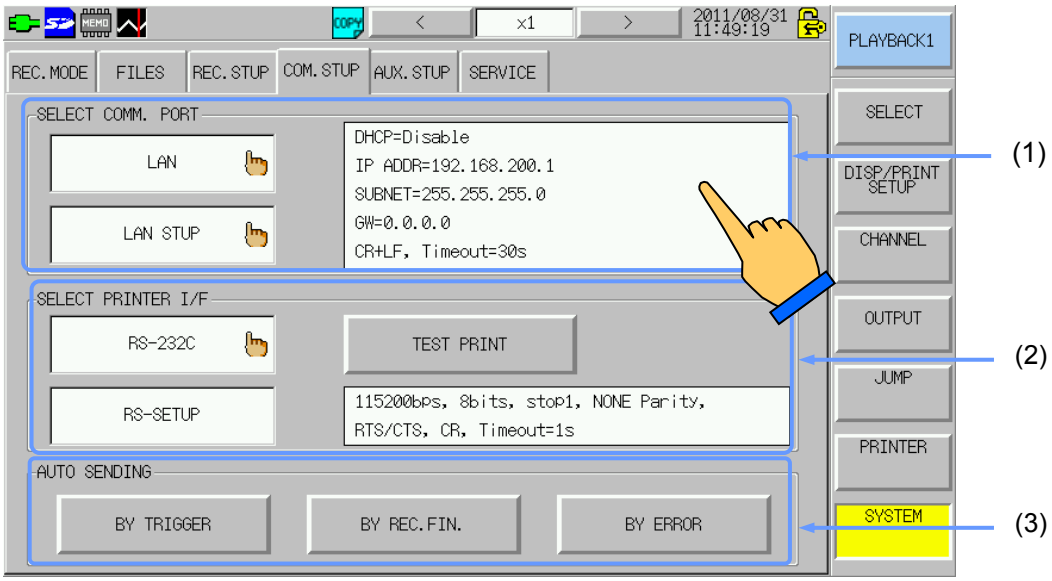
The actual recording operation time may be shortened depending on the recording length settings. When the time function is set, the timer information is displayed in the information display area.

# 14.5. Communication Settings

Press the Communication Setting tab on the System Key on the Operation Panel. The following screen appears.

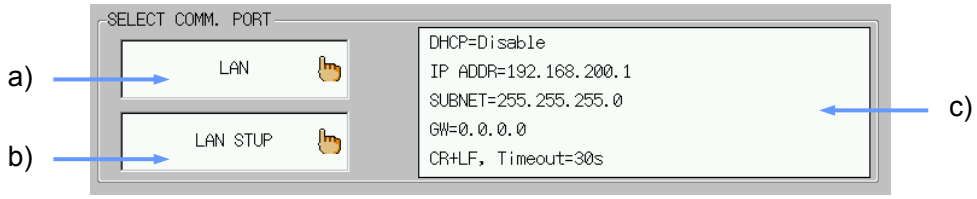
NOTE

Communication control for this recorder uses dedicated communication commands. For more details, see the volume of the instruction manual, “RM1100 Series Communication Command User’s Manual (95691-2971-0000).” Communication Command User’s Manual can be downloaded free in pdf format on our company’s home page.

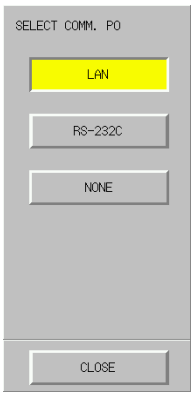



## (1) Communication Port Selection

Select the communication port for remote-control of this recorder.




### a) Communication Port Selection



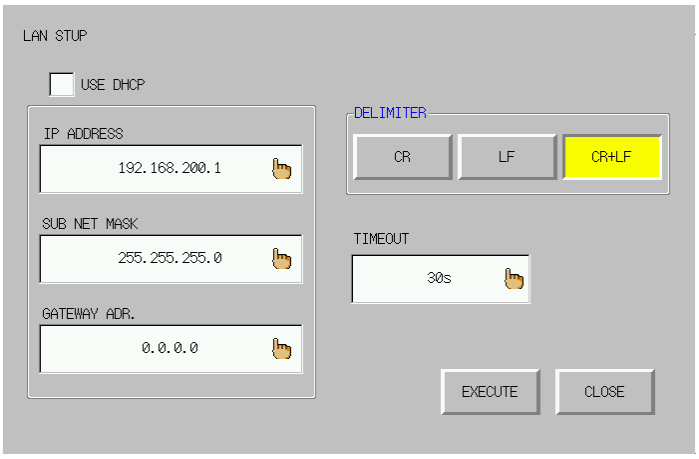

Opens communication Port Selection Screen and selects interface to connect.

*TIPS*

RS-232C Interface can be also used as interface to connect this recorder to optional recorder.
When selecting RS-232C Interface for printer, it can not be set for Remote Control.

### b) LAN Settings

Pressing the LAN Setting Key displays the LAN Setting Panel indicating the current setting contents.



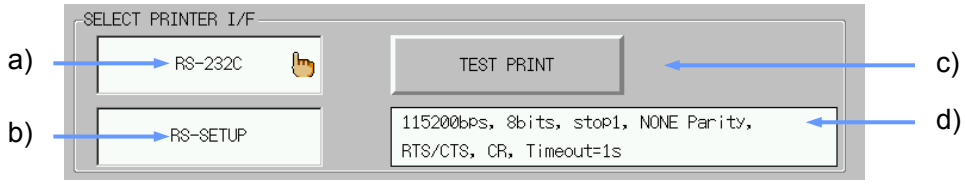

1) IP Address:
   Displays the Value Input Screen for the IP Address Setting and sets the IP address.
2) Sub Net Mask:
   Display the value input screen for the Sub net mask setting and sets the sub net mask.
3) Gateway Address:
   Displays value input screen for the Gateway Address setting and sets the gateway address.
4) Use DHCP:
   Set if the DHCP function is valid or not valid.
5) Delimiter:
   Delimiter is selected from CR+LF/CR/LF.
6) Time-out:
   Displays the value input screen for the time-out setting and sets the time-out.

NOTE Reboot of this recorder is necessary after change of LAN Settings.

### c) LAN Setting Display

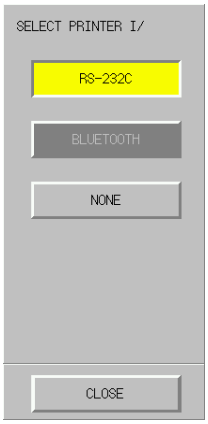
Displays contents of settings specified from Communication Port Selection.

## (2) Printer I/F Selection



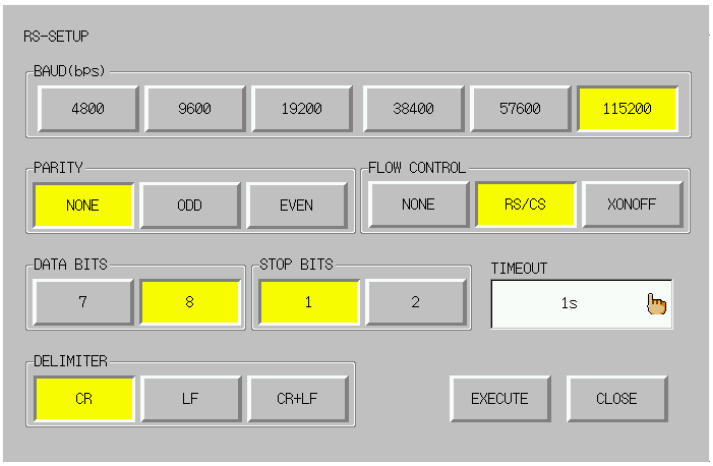

**a) Printer I/F Selection**

Select Interface that connects to optional thermal printer.




**b) RS-232CSettings**

Pressing RS-232C setting Key displays RS-232C setting panel and indicates current setting contents.




1) Communication Speed:
   Communication speed is selected from 4800/9600/19200/38400/57600/115200.
2) Parity:
   Select parity from no parity/odd number/even number.
3) Flow Control:
   Selects flow control from no flow control/RTS/CTS/Xon/Xoff even number.
4) Data Length:
   Select data length from 7bit/8bit.
5) Stop Bit:
   Select stop bit from 1bit/2bit.

6) Delimiter:
   Select delimiter from CR+LF/CR/LF.
7) Time-out:
   Value input screen for the time-out setting is displayed and sets time-out.

T I P S

RS-232C set value is fixed as below since it is for communicating with an external printer only.
Users cannot change those values.

Communication speed 115200bps, data length 8bits, stop bit 1, no parity, flow control RTS/CTS.

**c) Test Printing:**
Send a test-print to confirm the connection with the printer.

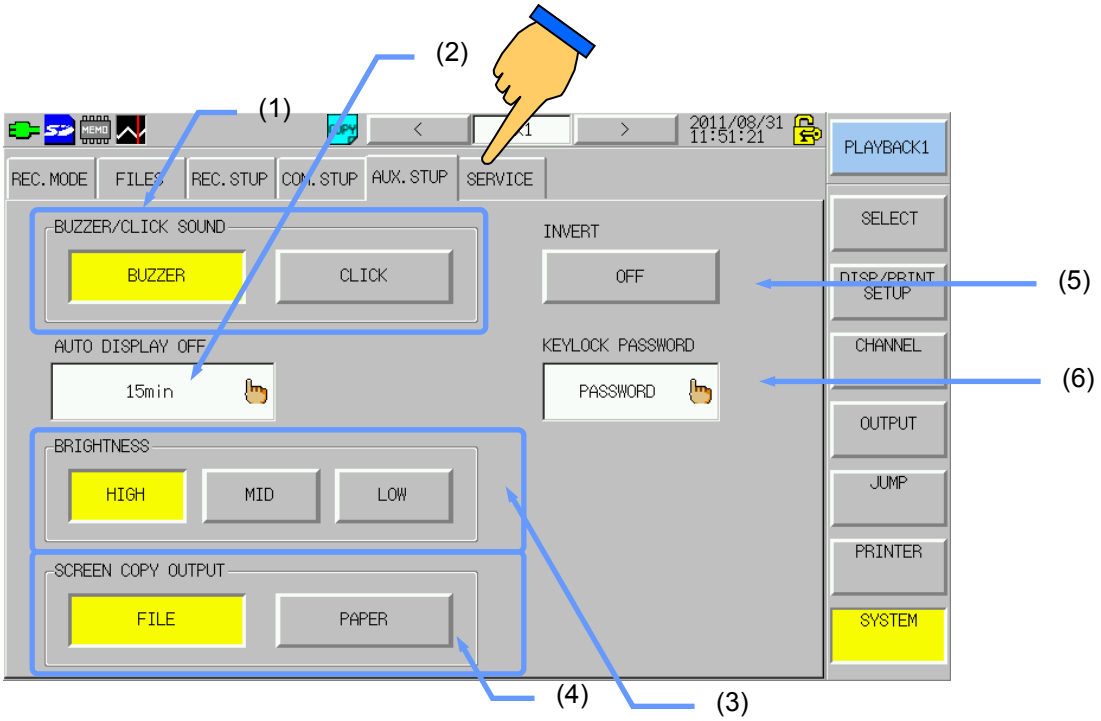
**d) RS-232CSetting Display:**
Display setup contents of RS-232C.

## (3) Auto sending

This function outputs '!' to selected communication interface (LAN for above example) when 'BY TRIGGER', 'BY REC.FIN.' or 'BY ERROR' key is pressed and preset conditions occurred.

# 14.6. Auxiliary Settings

Press the System Setting Key, and then press the Auxiliary Setting tab. The following screen appears.




## (1) Buzzer/Click Sound

Buzzer and click sound can be set ON or OFF with the Buzzer and Click keys. Error buzzer and touch key click sound can be switched off.

## (2) Auto Display Light-Off

This function can set the back auto display light-off to ON or OFF and set the waiting time with the Auto Display Light-off Key. It turns off the back light when there is no key entry for the specified waiting time. The back-light turns back on when there is a key entry.

## (3) Display Brightness

Select brightness for the display from high, medium, or low.

## (4) Screen Copy Output Destination

Output destination for screen copy can be set.

・Selecting file Key exports the contents of the screen in a color bitmap file.

・Selecting chart paper Key prints out the contents of the screen in a black and white image.

**TIPS**

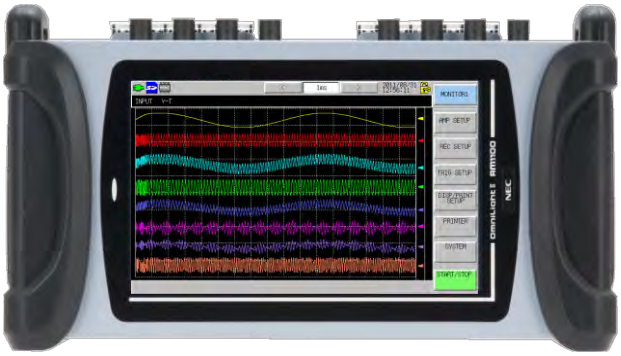
The file name to be saved is created by four-digit serial number.
Example: If save is made on Dec 3, 2010, the file is created in the folder below.
C:¥IMG¥20101203¥IMG_0000.bmp
The number of 00000 following "_" will be serial numbers. The following screen copy file will be IMG_0001.bmp.

**TIPS**

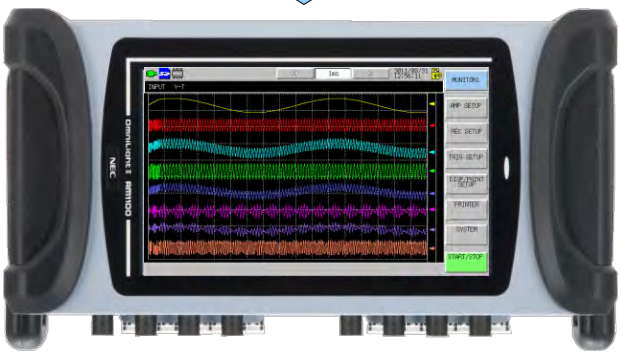
Setting screen or calculation screen is not printed by touching the DISP COPY button on screen menu.
Please do so by touching a copy icon " COPY "on the TOP bar.

## (5) Monitor Invert

Sets Invert ON/OFF of Monitor Display.



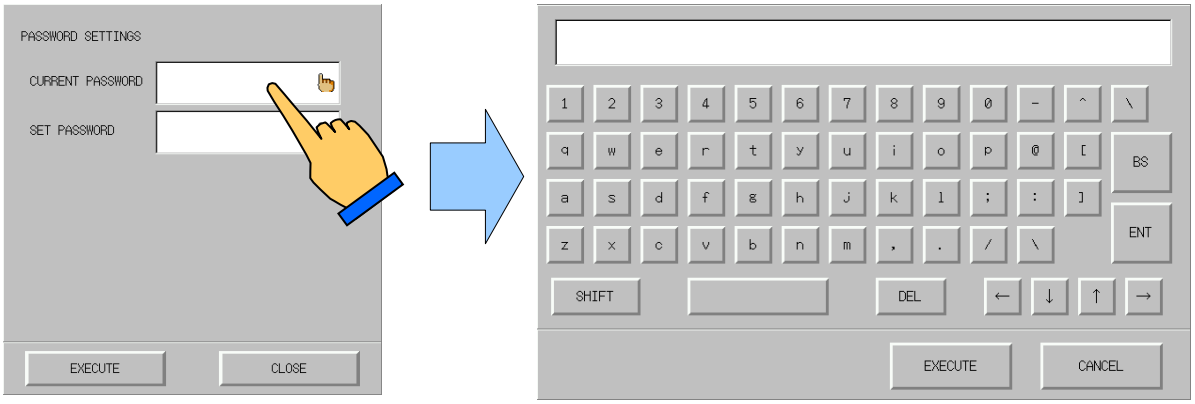
Monitor Invert OFF Settings



Monitor Invert ON Settings

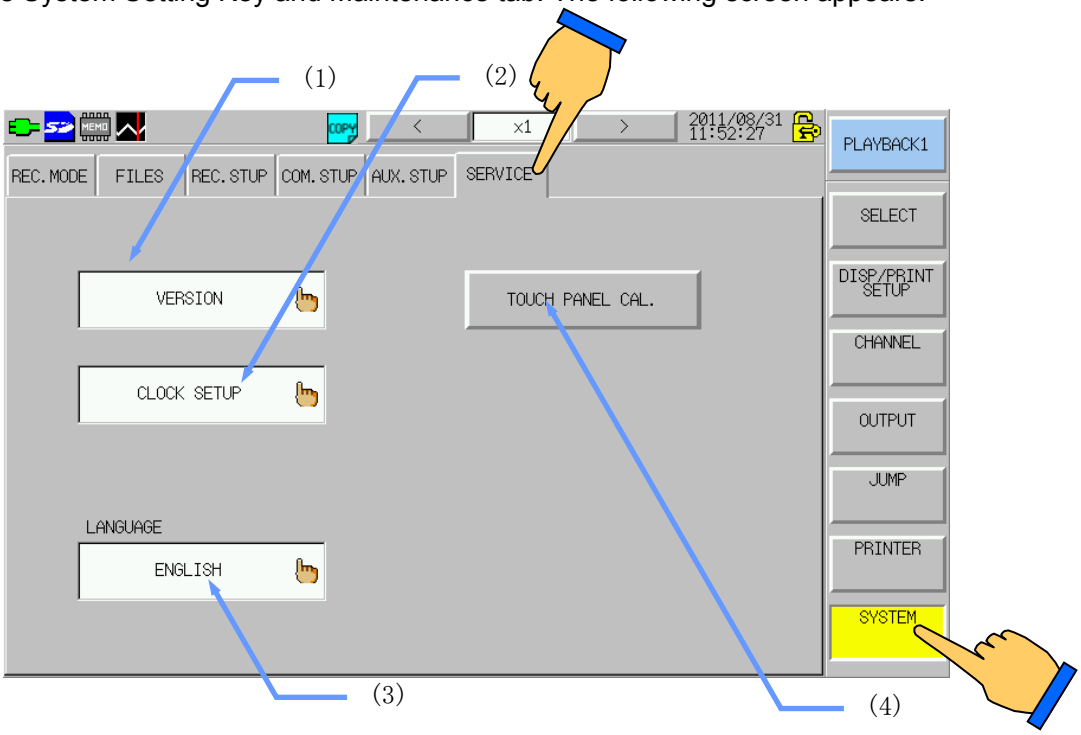
## (6) Key Lock Password Settings

Password settings for releasing the key lock can be made.
Pressing the Password Setting Key displays character strings and sets the password.
Password can be set up to a maximum of 15 characters.



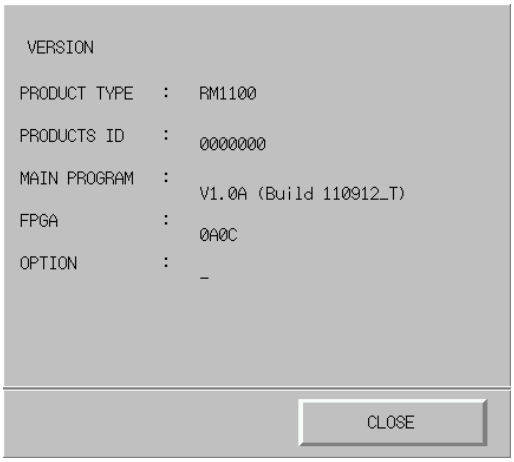
# 14.7. Maintenance

Press the System Setting Key and Maintenance tab. The following screen appears.



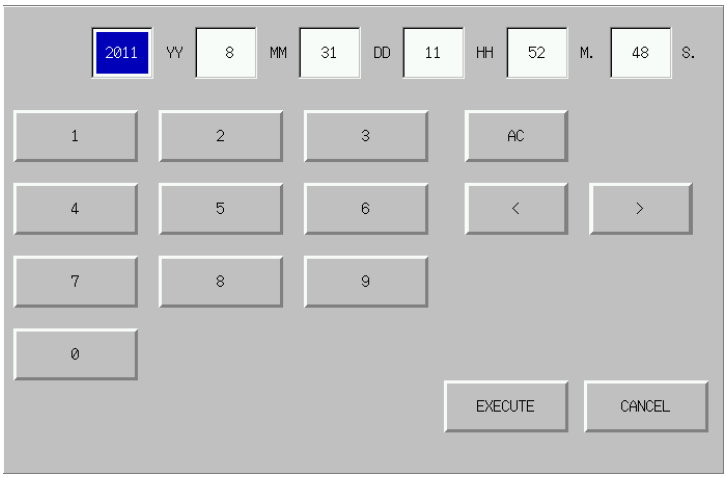

## (1) Version Indication

Press the Version Indication Key. The following screen appears.



## (2) Time Calibration

The internal clock is set. Pressing the Clock Calibration Key displays the following screen. Select windows for year, month, day, hour, minute, and second. Enter values and press OK Key to set the time calibration.




## (3) Display Language Selection

Language displayed on the screen can be selected from Japanese, English, German, Korean, traditional Chinese, simplified Chinese, French, Portuguese, Spanish, and Italian.

Press the Display Language Selection Key. The following screen appears. Select a language to be displayed. Pressing the execute Key sets display language.


NOTE

Chinese (simplified and traditional), French are not supported.
It becomes out of a movement security object. Please be careful.

## (4) Touch Panel Calibration

Pressing the Touch Panel Calibration Key displays the following screen and starts on the touch panel calibration. On the Touch Panel Calibration screen, pressing two Xs in order starts the calibration.

**TIPS** After opening the Calibration screen, if there is no input for 10 seconds, a time-out occurs and the screen goes back to the system screen.


Pressing the EXEC Key executes calibration. Pressing the Cancel Key cancels calibration. When canceling, the value returns to the settings before the calibration.

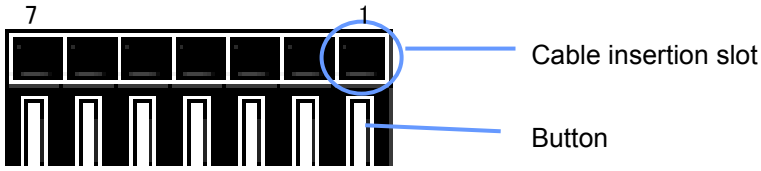
**TIPS** If touch panel detection position is out of adjustable area, save RM1100FI.txt file on a root folder of a SD card. Then, insert the card into an RM1100 and turn the power on. When the RM1100 recognizes the file at startup, it will be set to factory-default condition and the touch-panel calibration value also becomes default.

# 14.8. Remote Function

**Terminal numbers and signal numbers are indicated on the label attached to the back surface of this recorder. Refer to them when connecting the lines.**

NOTE Since the remote input operates by detecting the rising/falling edges of signals, control the remote input from a voltage signal or an open collector (if the cable is short). Use of a relay contact or a mechanical switch may make chattering noise to cause improper operation.

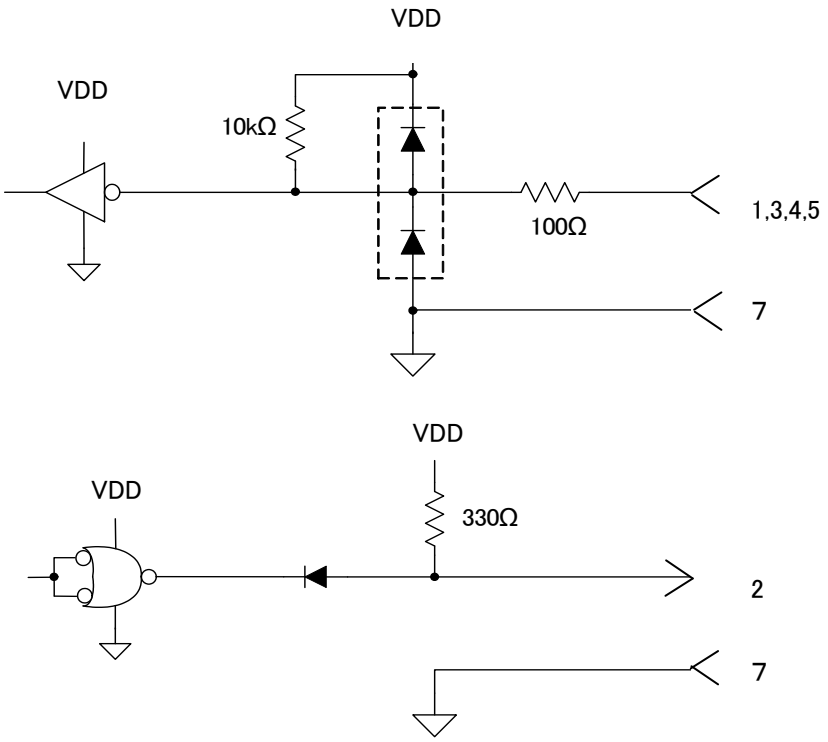
◆ Remote Terminals, Signal Names, and Function



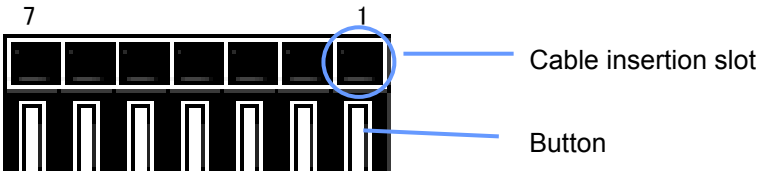

View from cable insertion side (1 to 7 from the right)

| Terminal № | Signal Name | Function | I/O Level |
|---|---|---|---|
| 1 | TRIG-IN | Trigger Input | 0-5V Voltage Falling edge Pulse width Above 1μ s |
| 2 | TRIG-OUT | Trigger Output | TTL level active LOW Pulse width 10ms |
| 3 | REC -N | Turn-ON/OFF Input | 0-5V Voltage Falling edge Pulse width Above 200μ s |
| 4 | SYNC-IN | External Synchronization use Input | 0-5V Voltage Falling edge Pulse width Above 3.125ms |
| 5 | MARK-IN | Mark Input | 0-5V Voltage Falling edge Pulse width Above 200μ s |
| 6 | | | |
| 7 | GND | | |

**※0-5V Voltage Input**
LOW LEVEL:
0.5V and lower
HIGH LEVEL:
4.5V and higher



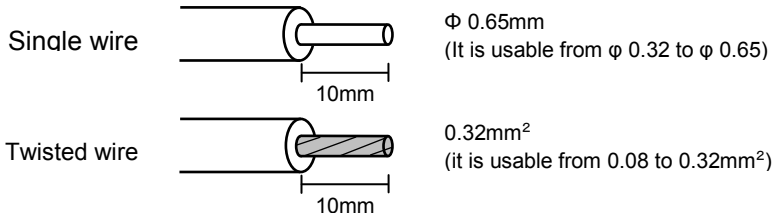
◆ Terminal Connection




View from cable insertion side (1 to 7 from the right)

(1) Press down the button using tools such as a flathead screwdriver.
(2) Insert an electric wire into the cable insertion part of the terminal while the button is being pressed down.
(3) When the screwdriver is taken off from the button, the electric wire is locked to the terminal.

Applicable wire: Solid wire AWG22(φ0.65)、Stranded wire AWG22(0.32mm$^2$)
Usable wire: Solid wire AWG28(φ0.32) to AWG22(φ0.65)
Stranded wire AWG28(0.08mm$^2$) to AWG22 (0.32mm$^2$)
Standard removed sheathing length: 10mm
Applicable tool for button pressing : Flathead screwdriver (shaft diameterφ3, blade width 2.6)




## *14.8.1. Synchronize with the external pulse to perform real-time recording*

Waveform recording can be performed by synchronizing with the external pulse. Methods for connecting and setting the remote terminals are described below.

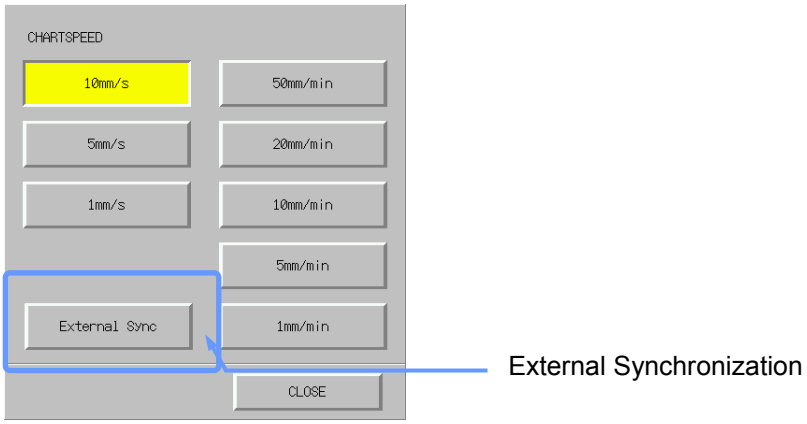
### 1. Connect the External Pulse Signal

Input the external synchronizing signal to the No.4 pin (SYNC_IN) of the remote terminal located on the back surface of the device to synchronize with the external pulse signal for performing waveform recording. Use GND pin as common.

### 2. Set the Main Body to External Synchronization

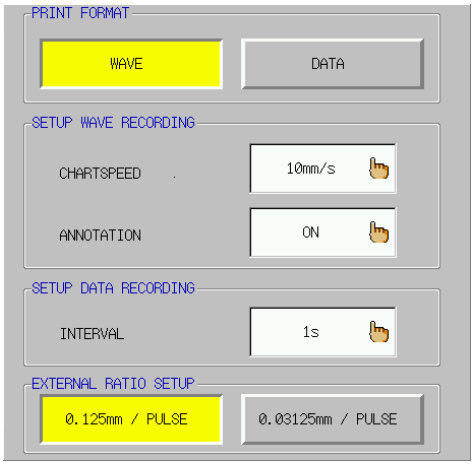
(1) Sets the measurement mode of the main body to “real-time mode.”

(2) Sets [Feeding Speed] of [Recording Settings] to “External Synchronization.” Accordingly, [Input Monitor Speed] is set to the external synchronization as well.



## 3. Specify the Pulse during the External Synchronized Recordings

Controls the amount of paper feed per one pulse of the external input pulse.




Waveform recording can be performed while synchronizing with the external pulse. Sets the recording width per one pulse.

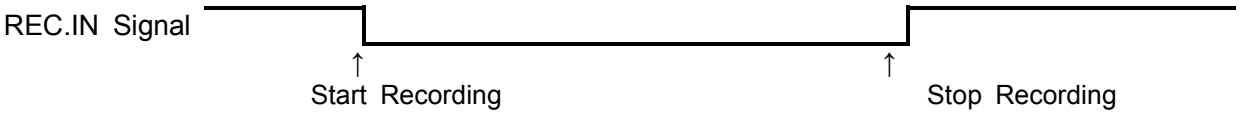
| Recording Width per 1 Pulse | Specifics |
|---|---|
| 0.125mm／Pulse | Records one line (0.1mm) for every eight pulses. |
| 0.03125mm／Pulse | Records one line (0.1mm) for every 32 pulses. |

## 4. Start Recording

External synchronized recording is ready after signal connecting to the remote terminals and setting the recording speed. Push the [Start/Stop] key in this state to synchronize with the external pulse for starting waveform recording.

### *14.8.2. Start/Stop of the recordings (“Start/Stop” Key)*

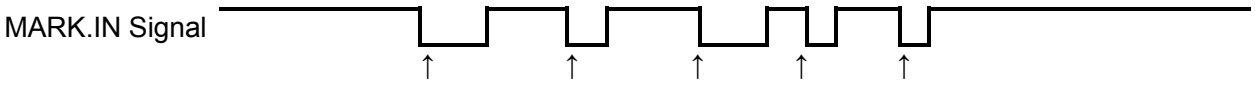
The recording will start when the [Start/Stop] key is pushed, the same way as the [Start/Stop] key on the screen is pushed. Control the No.3 pin (REC_IN) of the remote terminals externally. Use GND pin as common.




Recording starts after the falling edge is detected and is performed while the signal level is low. When the rising edge is detected, the recording stops.

## *14.8.3. Mark printing*

Mark printing is performed when the [Manual Trigger/Mark Printing] key is pushed, the same way as the [Manual Trigger/Mark Printing] key on the screen is pushed. Controls the No.5 pin (MARK_IN) of the remote terminals externally. Use GND pin as common.




Mark Printing is performed when the falling edge of the signal is detected during the real-time recording.

*T I P S*

Marking (Event) information is included in Logic Amplifier Signal data.
To save the marking information, set logic amplifier signal input ON.
For setting the logic amplifier, refer to ‘6.4.2. Logical Amplifier Setup’.

# *15. Optional Items*

# 15.1.Battery (T2UR18650F-5928) and Charge

## 15.1.1. Overview

The recorder can be used in the environments without power source by using the dedicated battery (T2UR18650F-5928). The dedicated battery charger (NC-LSC05-100V) is needed to charge the battery. Read the precautions below carefully to charge the battery properly.

## 15.1.2. Battery Charging Procedure

(1) POWER lamp lights up when the AC cable is connected to the input terminal of the battery charger and the outlet.

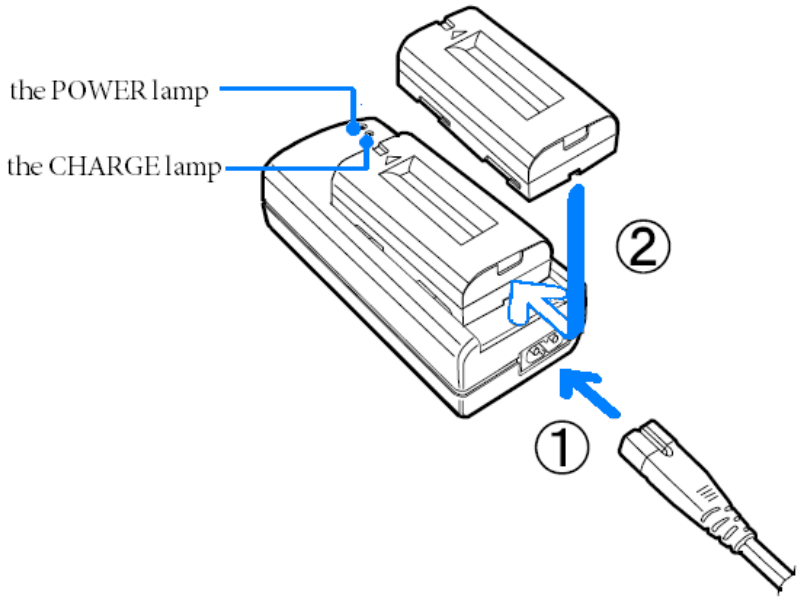
(2) Insert the battery pack into the battery charger until the click sound is heard.

CHARGE lamp on the battery charger lights up.

(3) Battery is being charged while the CHARGE lamp is lighting. Battery charge is done when the CHARGE lamp goes off. The average charging time is about four hours. (Charging time varies depending on the environmental and other conditions.)

**⚠ CAUTION** The operating environment of the recorder (charging); temperature: 0 to 40°C, humidity: 45 to 85%RH.

The operating environment of the recorder (discharging); temperature: -20 to 60°C, humidity: 45 to 85%RH.



# 15.2. Inserting Batteries (T2UR18650F-5928)

## *15.2.1. Inserting Batteries*

(1) Confirm that the power switch of the recorder is off.

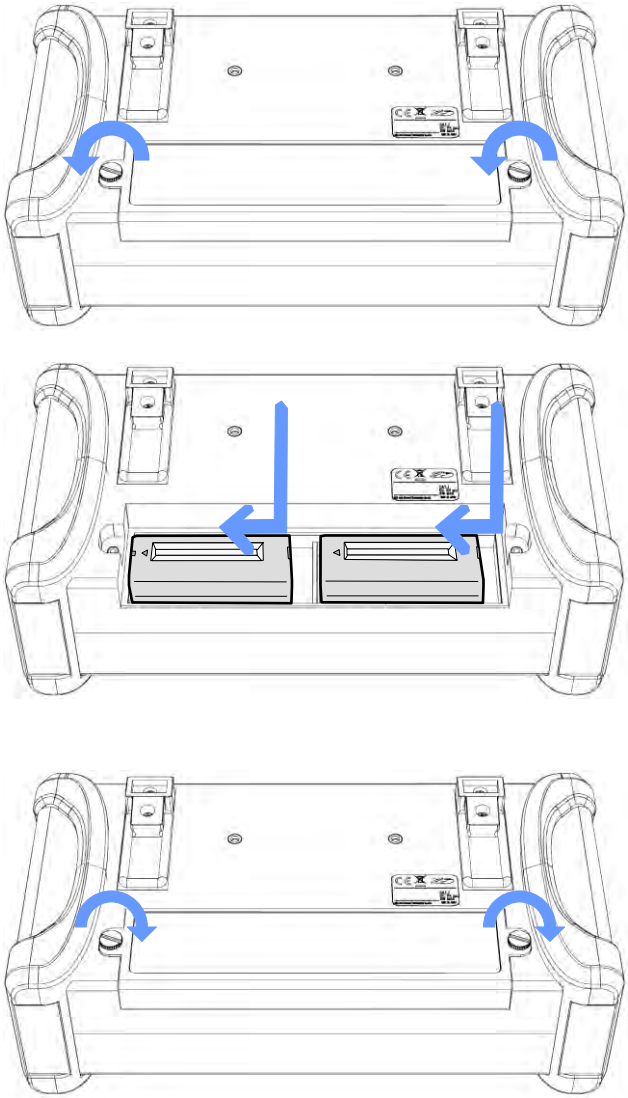
(2) Remove the battery cover on the backside of the recorder. Turn the two screws on the cover counterclockwise to remove it.

(3) Insert batteries into the battery box.

(4) Insert batteries into the right side of the battery box and then slide them to the left.

(5) Insert two batteries in order to operate the recorder.

(6) Put the backside battery cover back.



# 15.3. Thermal Printer (RM11-440)

## 15.3.1. Overview

When the measurement mode is Real time, connecting thermal printer to the recorder enables real-time waveform recording.

Read the accompanying printer instruction manual carefully before loading paper.

**⚠ CAUTION**

The operating environment of the recorder; temperature: 0 to 50ºC, humidity: 30 to 80%RH.

**⚠ CAUTION**

Use only the chart recording paper prepared exclusively for this recorder (available from us as YPS-118). 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 printing doesn't work normally on such plastic surface.

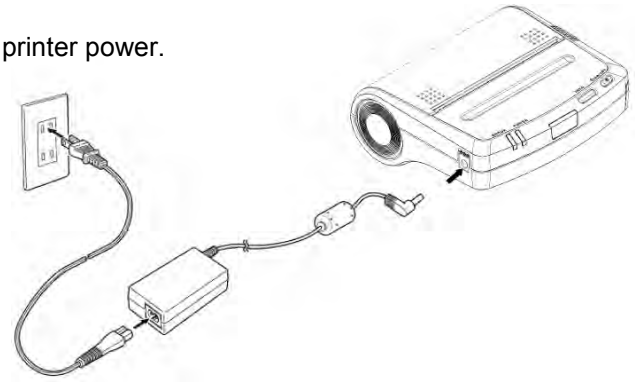
**⚠ CAUTION**

Do not change the settings of the thermal printer as all the settings are made in the factory before shipping. If any one of the settings to be changed, proper operation of the printer cannot be guaranteed.

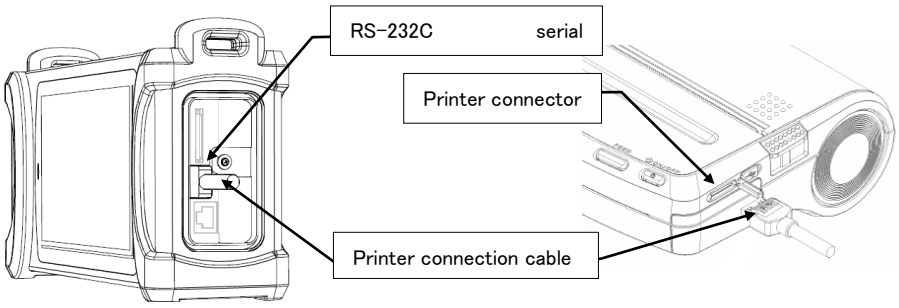
## 15.3.2.Connecting the Thermal Printer to RM1100

Use printer connection cable (0311-5335) to connect the printer connector (RS-232C) located in the right side of the recorder and the serial communication connector of the printer.

(1) Connect the printer power.



(2) Open the cover on the right side of RM1100, and the printer is connected by the printer connection cable (0311-5355) between the RS-232C serial connector and the printer connector.




## 15.3.3. Confirming the Operation

Confirm the operation of waveform recording by executing test-printing from the recorder.

☞ Refer to Chapter 14 System Setup

# 15.4. Mounting Hardware for the Display Arm (RM11-405)

## 15.4.1. Overview

Mounting hardware for the display arm is used for fixing the recorder to OA peripherals such as display arms and camera mounts.

The recorder can be flexibly laid out with display arms or camera mounts when the installation space is small or to ensure the visibility of the display from various directions.

Using the flip vertical function on the display makes cable bundling easy by fixing the recorder upside down to release the cables from the down side of the recorder.

Read the installation procedure below carefully before fixing the mounting hardware for the display arm (RM11-405).

## 15.4.2. installation Procedure

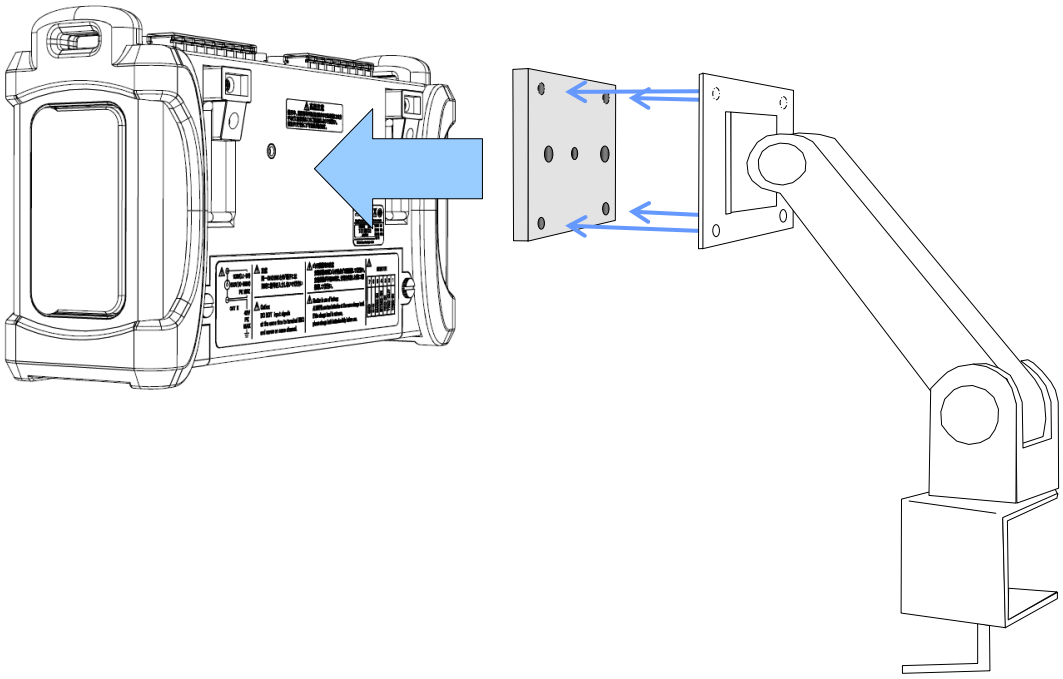
(1) There are two holes for fixing screws on the back side of the recorder.

(2) Fix the mounting hardware for display arms on the recorder with the accessory screws (two holes).

(3) Mounting hardware for display arms has four VESA mount arm-standardized screw holes and one screw hole for camera mounting.

(4) Use the screw holes at the four corners of the hardware when attaching to display arms.

(5) Use the screw hole in the center of the hardware when attaching to camera mounts.



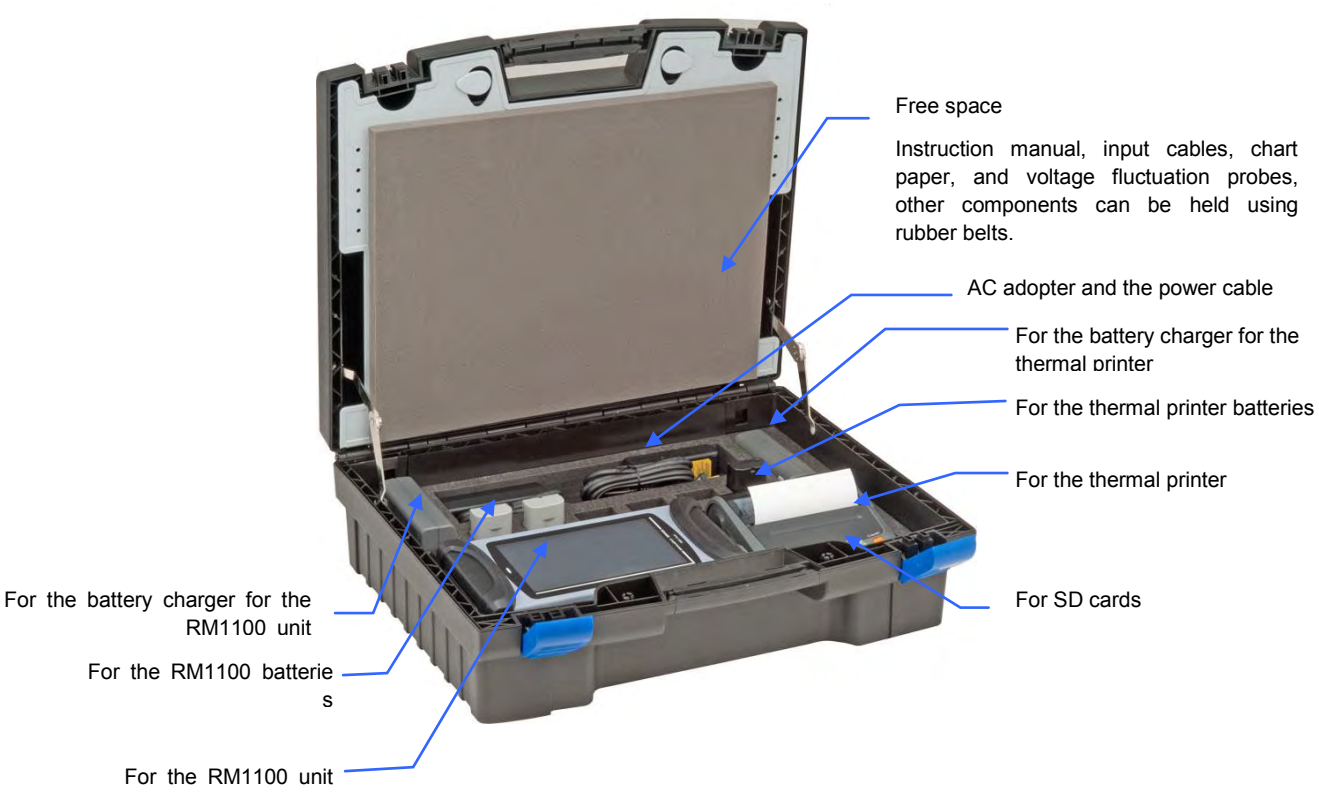
Signal input block can face downward, and up-side-down rendering on the display can be made.

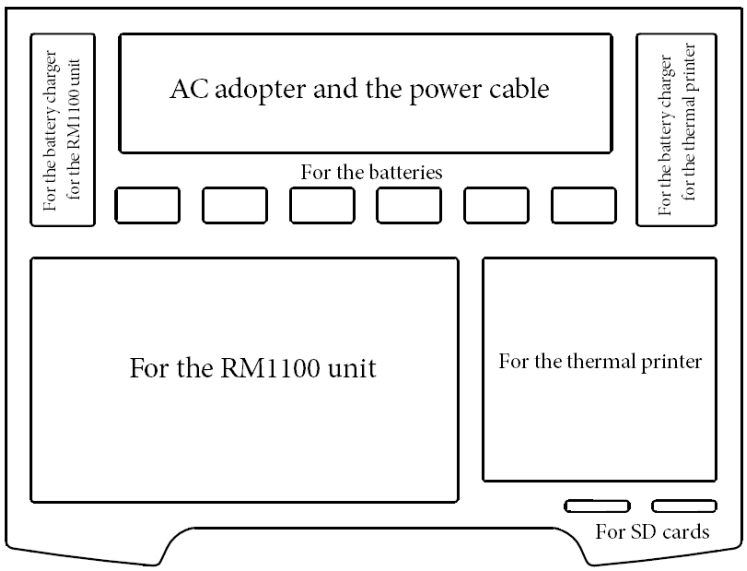
* Display arm and camera mounting kit are not provided by A&D. Purchase them at a local camera shop or office equipment shop.

# 15.5. Carrying Case (RM11-403)

## 15.5.1. Overview

The carrying case is used to store the recorder, optional thermal printer, batteries, and battery charger and others, and also to keep and carry them.




Layout for storage

# 15.6. Splash proof Cover for the Input Panel (RM11-402)

## 15.6.1. Overview

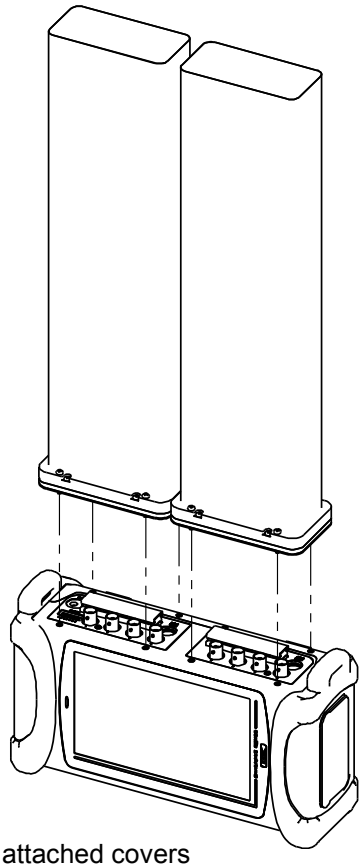
This recorder is dustproof and Splash-proof construction on five sides (front side, right and left sides, backside, and underside) of the unit except upper surface, where the input connector is located.
Use the optional waterproof cover for the input part to use the recorder under harsh environments.

Waterproof Cover for the Input Panel (RM11-402)

View when installed

## 15.6.2. How to Attach the Cover

(1) Pass the input cables through the hood of the drip-proof cover.
(2) Connect the input cables to the input connectors.
(3) Mount the drip-proof cover on the top cover panel.
(4) Fasten the hood using fixing metal pieces and screws.
(5) Purse the opening for cables to prevent moisture from entering.



Images of the attached covers

# 16. Maintenance and Cleaning

# 16.1. Maintenance and Cleaning

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

# 16.2. Battery Backup

NOTE

・The setting values, date, and time of the recording are backed up for about 5 years (at an ambient temperature of 25 degrees centigrade)
・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).

# 16.3. Cleaning the Display

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

# 16.4. Dealing with Power Outages, etc.

If a power outage occurs, or the power cable is removed during recording, Even after the power recovery, data being recorded and acquired were not guaranteed. Setup information cannot be guarante ed either.

# 16.5. 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.

# 16.6. Handling and Storing Recording Paper and Data

NOTE Care is required when handling the thermo-sensitive paper used by the optional thermal printer.

The chemical reaction caused by using a thermal head to add heat to the underside of the recording paper used for the optional thermal printer 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.).

## *16.6.1.* 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.

## *16.6.2.* 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°C 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. Specifications

# 17.1. Configuration

## 17.1.1. Model

This product is configured with the recorder unit, optional units, and a set of standard accessories.

| Description | Model | Comment |
|---|---|---|
| Omni Light Ⅱ | RM1101 | 4-channel model |
| Omni Light Ⅱ | RM1102 | 8-channel model |

## 17.1.2.Main unit (with Amp Unit)

| Description | | | Configuration | Comment |
|---|---|---|---|---|
| Main Unit | Display Unit, Signal Input Unit, and Control Unit | | 1 | RS-232C x 1<br>LAN port x 1<br>SD card x 1 |
| | Power Supply Unit(100V AC to 240V AC) | | | |
| | Amp Unit | Thermal/Voltage Amp | 4CH or 8CH | |
| | | Logic Amp | 4CH or 8CH | |

## 17.1.3. Standard options

| Description | Model | Rating | Quantity |
|---|---|---|---|
| AC Adapter | | | 1 |
| Unifizer LE for DAQ (PC Software) | NS41-101 | CD-ROM | 1 |
| User's Manual | | For Main Unit, and Unifizer LE for DAQ (PC Software NS41-101) | 1 |

## 17.1.4. Options

| Description | Model | Rating |
|---|---|---|
| Input Unit Weatherproof Cover | RM11-402 | |
| Carrying Case | RM11-403 | |
| Display Arm Attachment Lug | RM11-405 | |
| SD Memory Card | RM11-452 | 2GB, For Industrial (For Setting + data) |
| | RM11-453 | 4GB, For Industrial (For Setting + data) |
| | RM11-454 | 8GB, For Industrial (For Setting + data) |
| Cable for Logic IC | 0311-5332 | Logic IC Cord (1) *For Input Voltage 5V |
| | 0311-5337 | Cord for IC Clip (4/Set) |
| | 0311-5336 | Cord for Alligator Clip (4/Set) |
| Probe for Floating Voltage | 1539S | Convert fluctuations of voltage (4 input) to logic signal (H or L) and output |
| Probe for Voltage Fluctuations | 1540S | Outputting fluctuation voltage (±10% or ±20%) of 100 VAC or 120 VAC in the form of pulses |
| | 1543S | Outputting fluctuation voltage (±10% or ±20%) of 220 VAC or 240 VAC in the form of pulses |

## *17.1.5. Thermal printer*

| Description | Model | Rating |
|---|---|---|
| Thermal Printer | RM11-440 | For countries with 100 VAC: 100 VAC Cable |
| | | Options:<br>Power Cable/AC Adapter 1, Printer Connection Cable (0311-5335) 1, Recording Paper 1, User's Manual 1 |

| Description | Model | Rating |
|---|---|---|
| Battery for Printer | BP-L0720-A1-E | Lithium-ion, DC7.4V, 2,000mAh |
| Battery Charger for Printer | PWC-L07A1-W1-E | 100-240 VAC (50/60Hz) |
| Printer Connection Cable | 0311-5335 | |
| Recording Paper | YPS118 | A roll of paper 11.2mm x 25 m, 10 rolls per box |

# 17.2. Basic Specifications

## *17.2.1. Recorder unit specifications*

| | | |
|---|---|---|
| Input part | Analog + Logic Input | 4 channels of temperature or voltage, and 4 channels of logic signals; 8 channels of temperature or voltage and 4 channels of logic signals |
| Display part | Display Equipment | 7-inch wide TFT color LCD (800 x 480:WVGA) |
| | Available Display Area | 132.48 mm × 99.36 mm (800 × 480 dots) |
| Channels | 4CH or 8CH | Specified upon ordering |
| A/D Converter | Maximum 1μs 14bit | Conversion of all channels at the same time |
| Internal memory | 2,000,000 data/CH | Acquisition data capacity |
| Interface | RS-232C | Mobile printer I/F |
| | Ethernet | 10/100base-T |
| | Remote | Terminal bloc: TRIG IN/OUT, REC-IN、SYNC-IN、MARK-IN |
| Power Supply | Rating Line Voltage | AC Power ：100 to 240 VAC (When using AC Adapter)<br>DC Power ：DV8.5～24V (when using DC power cable)<br>Battery ：When using two batteries (T2UR18650F-5928) |
| | Line Voltage Fluctuations Tolerance | 100 to 240 VAC |
| | Rating Power Supply Frequency | 50/60 Hz |
| | Power Supply Frequency Tolerance | 47 to 63 Hz |
| | Withstanding Voltage | Power Supply Input Terminal – between groundings<br>1.5k VAC one minute |
| | Insulation Resistance | Power Supply Input Terminal – between groundings<br>500 VDC more than 100M Ohms |
| | Power Consumption | RM1101 approx. 9W, RM1102 approx. 11W |
| Battery Life | | Battery life:<br>Approx.4 hours when 4 channels are installed<br>Approx.3 hours when 8 channels are installed<br>(In normal temperature) |
| Environment | Usage Environment | Temperature: -20 to 60℃<br>Humidity: 35-80%RH (without condensation )<br>Location of use: indoor use<br>Altitude Not higher than 2000m<br>Resistance to vibration: MIL-STD-810E-514, 4-1 to 3 compliant, Class: normal transportation |
| | Save Environment | Temperature: -30 to 70℃<br>Humidity: 35 to 85%RH (without condensation) |
| | Dust-proof/drip-proof | IP41(JIS C 0920/IEC60529)<br>*Option: Drip-proof cover at the input portion (when RM11-402 is used) |
| | Resistance to vibration | Resistance to vibration MIL-STD-810G compliant<br>(Class: Normal transportation)<br>Auto parts Vibration experiment JIS D 1601 Grade 1/Class A |
| Appearance/ Weight | Dimensions | 267 (W) × 152 (H) × 84 (D) mm (excluding protrusion) |
| | Weight | RM1101:Approx.1.4kg (AC adapter, excluding battery)<br>RM1102:Approx.1.6kg (AC adapter, excluding battery) |
| Others | Built-in Clock | Accuracy: within ±30 ppm (at ambient temperatures) |
| | Backup | Built-in battery (Lithium primary battery)<br>A clock and setting information are backed up for approx. 3 to 5 years. |
| | Start-up time | Waveforms are shown in 15 seconds after turning on. |
| | Indication with Multiple Languages | 7languages<br>Japanese, English, German, Korean, Portuguese, Spanish, and Italian |

## *17.2.2. Amp input specifications*

17.2.2.1. Temperature/ Voltage Part

| Channels | | 4CH or 8CH |
|---|---|---|
| Input Terminal Shape | Voltage | Insulated BNC connector or M3 screw-in terminal block<br>(Cables cannot be input into both BNC connectors and screw-in terminal block) |
| | Temperature | M3 screw-in terminal block |
| Input Type | | Insulated unbalanced input |
| Input Coupler | | AC,DC Coupling |
| Input Impedance | | More than 1M Ohms<br>(When the AC-coupling is selected, Input Impedance is approx 100k Ohms at Ranges from ±0.1V to ±2V.) |
| Measurement Ranges | Voltage | [Voltage ranges]<br>±0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100,200, and 500 V full-scale |
| | Temperature | [Thermocouple ranges]<br>Type R Thermocouple: R1760 (0 to 1760℃)<br>Type T Thermocouple: T400 (-200 to 400℃)<br>Type J Thermocouple: J1100 (-200 to 1100℃)<br>Type K Thermocouple: K500 (-200 to 500℃)<br>Type K Thermocouple: K1370 (-200 to 1370℃)<br>Type W Thermocouple: W2300 (0 to 2300℃) |
| Maximum Input Voltage | | ±500 V (DC or AC peak value)<br>(±30 V for the range of ±0.1 to 2V) |
| Allowable Input Voltage | | Range of ± 5 V to ± 500 V: ±500 V or lower (DC or AC peak value)<br>Range of ±0.1 V to ± 2 V: ±40 V or lower (DC or AC peak value) |
| In-phase Allowable Input Voltage | | ±42V for unit only (DC or AC peak value)<br>When isolation-type BNC cable (optional) is used: 300 VAC |
| Applicable Thermocouple | | R,T,J,K, and W |
| Reference Junction | | Switchable between internal or external |
| Reference Junction Compensation | | Within ±2℃ (upon temperature equilibration at terminal) |
| Accuracy | | Temperature amp: within ±0.5% full-scale<br>Voltage amp: within ±0.3% full-scale, Linearity: within ±0.1% full-scale |
| Frequency Characteristics | | At DC amp:<br>Connection to DC: DC to 400 kHz (+0.5, within -3dB)<br>Connection to AC: 0.3 to 400 kHz (+0.5, within -3dB)<br>At Temperature amp: DC to 50 kHz |
| Low-pass Filter | | 2-pole Bessel,-12dB/oct<br>Voltage Amp：5 Hz, 50 Hz, 500 Hz, 50 kHz 及び OFF<br>Temperature Amp：5Hz,50Hz,500Hz,50kHz |
| Common Mode Rejection Ratio | | 80dB or higher (Short in input, at 60 Hz) |
| Offset Accuracy | | At DC amp.: within ±0.3% full-scale |
| Temperature Stability | | For ranges of R1760, T400, and K500:<br>Accuracy: within ±0.04%/full-scale/°C<br>For range of voltage: ±100mV full-scale<br>Zero point: within ±0.03% full-scale /°C<br>Accuracy: within ±0.01% full-scale/°C |
| Voltage Resistance | | - Input Terminals – between cases<br>- Between Input Terminals<br>1.5k VAC: 1 minute (50/60Hz) |
| A/D Converter | | 14-bit, 1μs |

*If specific temperature is not mentioned, excepting for temperature stability, 23°C ± 5°C is applicable.

17.2.2.2. Logic block

<table>
<tr><td>Channels</td><td></td><td>4ch or 8ch<br>(Channel units are installed in the input amp block)</td></tr>
<tr><td>Input Connector</td><td></td><td>Circular DIN mini connector 8P (1 piece)</td></tr>
<tr><td>Input Type</td><td></td><td>Logic input (isolation: between channel and chassis (isolation: between each channel and case, condition between a unit and unit is common.)</td></tr>
<tr><td rowspan="3">Input Signal</td><td></td><td>Voltage or contact input is set to each channel</td></tr>
<tr><td>Voltage Input</td><td>Input voltage range: 0 to +5 V<br>Detection level: H level (H)… more than approx. 2.5 V<br>L level (L)… less than approx.0.5 V<br>Input current: less than 1 µA</td></tr>
<tr><td>Contact Input</td><td>Detection level: short (H)… less than 250 Ohms<br>open (L)… more than 2 k Ohms<br>Load current: 2 mA (MAX)</td></tr>
<tr><td>Response Time</td><td></td><td>Within 1µs (+5 volts or higher is needed for the input of the H level)</td></tr>
<tr><td>Data Recording</td><td></td><td>Logic levels H and L are translated to 1 or 0, respectively.</td></tr>
<tr><td>X-Y recording</td><td></td><td>Invalid</td></tr>
<tr><td>Insulated Resistance</td><td></td><td>Input terminal – between groundings more than 100M Ohms</td></tr>
<tr><td>Voltage Resistance</td><td></td><td>Input terminal – between groundings 500 VAC 1 minute</td></tr>
<tr><td>Connector Pin</td><td></td><td>4-CH Type: 1 to 4 chs.<br>8-CHType: 1 to 4 chs., 5 to 8 chs.
<table>
<tr><th>Pin No</th><th>Signal name</th></tr>
<tr><td>1</td><td>1ch or 5ch input</td></tr>
<tr><td>2</td><td>2ch or 6ch input</td></tr>
<tr><td>3</td><td>3ch or 7ch input</td></tr>
<tr><td>4</td><td>4ch or 8ch input</td></tr>
<tr><td>5</td><td>GND</td></tr>
<tr><td>6</td><td>N.C</td></tr>
<tr><td>7</td><td>N.C</td></tr>
<tr><td>8</td><td>N.C</td></tr>
</table></td></tr>
</table>

## *17.2.3. Interface*

17.2.3.1.LAN

| | |
|---|---|
| Specifications | Communication speed: 100/10BASE-T<br>Communication Protocol: TCP/IP |

17.2.3.2.SD Card

| | |
|---|---|
| Specifications | Supporting SD or SDHC<br>** Operations cannot be guaranteed for the card other than one provided by A&D. |

17.2.3.3.RS-232C

| | |
|---|---|
| Synchronism 方式 | asynchronous communication (asynchronous) |
| Communication system | Half Duplex method |
| Data Length | 8 bit |
| Parity | No Parity bit, EVEN, ODD |
| Stop bit | 1 bit |
| Transfer speed | 115200 bps |
| Flow control | RTS/CTS |

17.2.3.4.Remote

| Input |
|---|
| 0 – 5 V Voltage Input |
| LOW level less than 0.5V |
| HIGH level over 4.5V |

| Input Signal | Functions |
|---|---|
| TRIGGER-IN | A trigger is generated when a falling edge is detected. |
| SYNC-IN | Waveform recording can be made in sync with the external signal. |
| REC-IN | The Low level let the status enter in the start. The High level stops the status. |
| MARK-IN | Marking is added when a falling edge is detected. |

| Output |
|---|
| TTL level active LOW |
| Pulse width approx.10ms |
| Fan-out 10mA(MAX) |

| Output Signal | Functions |
|---|---|
| TRIGGER-OUT | This signal is output when a trigger signal is output. |

## *17.2.4. Trigger function*

(1) Basic Functions

<table>
<tr><td rowspan="3">Trigger Source</td><td>Internal Trigger</td><td>Trigger by input signals by each amp</td></tr>
<tr><td>Manual Trigger</td><td>Trigger by manual trigger key on the operation panel</td></tr>
<tr><td>External Trigger</td><td>Trigger by trigger inputs</td></tr>
<tr><td>Pre-Trigger</td><td colspan="2">From 0 to 100% 10% step</td></tr>
<tr><td>Trigger Filter</td><td colspan="2">From 1 to 65534 samples</td></tr>
<tr><td>Trigger Operation</td><td colspan="2">Once, Repeat</td></tr>
<tr><td>Trigger Mode</td><td colspan="2">Four types: OR, AND, Window, and OFF<br>ON/OFF switching available with TRIG/SYNC key
<table>
<tr><th>Trigger Mode</th><th>Source Channel</th><th>Generating conditions of triggers from input signals</th></tr>
<tr><td>OR</td><td rowspan="2">Any Channel can be selected from all channels</td><td>When a condition is met in any channel.</td></tr>
<tr><td>AND</td><td>When all conditions are met in all selected channels.</td></tr>
<tr><td>Window</td><td>Any Channel can be selected from all channels</td><td>When a signal level changes out of range or into range of maximum / minimum trigger levels.</td></tr>
<tr><td>OFF</td><td>—</td><td>Any Trigger is not used.</td></tr>
</table>
* Manual triggers and External triggers may be generated regardless of a trigger mode.<br>*Logic cannot be specified as a source channel of Windows trigger.</td></tr>
<tr><td>Trigger Output</td><td colspan="2">When a trigger condition is met, TTL level voltage signals<br>(Active Low, Pulse width approx.10ms) is output.</td></tr>
<tr><td>Manual Trigger</td><td colspan="2">A trigger is generated without using any input signal.</td></tr>
</table>

(2) Trigger Function of Analog Input (excluding Logic amp)

<table>
<tr><td>Trigger Detection Accuracy</td><td>±2%/full-scale</td></tr>
<tr><td>Trigger Level</td><td>This level is specified by a physical value.</td></tr>
<tr><td>Trigger slope</td><td>Different depends on a trigger mode.
<table>
<tr><td>OR</td><td>Rising、Falling</td></tr>
<tr><td>AND</td><td>Rising、Falling</td></tr>
<tr><td>Window</td><td>IN/OUT to the specified range</td></tr>
</table></td></tr>
</table>

(3) Trigger Function of Logic Input

<table>
<tr><td>State setting</td><td>H, L, OFF in every input from 1 to 8.</td></tr>
<tr><td>State Mode</td><td>OR、AND
<table>
<tr><th>State Mode</th><th>Achieving conditions of channel triggers</th></tr>
<tr><td>OR</td><td>When any input state equals to a specified trigger state.</td></tr>
<tr><td>AND</td><td>When All input states equal to a specified trigger state.</td></tr>
</table>
* This mode cannot be specified in the source channel of a Windows trigger.<br>* After a condition of channel trigger is achieved, the next trigger is generated until the condition is not achieved again.</td></tr>
</table>

## *17.2.5. File function*

(1) File Function

| Common Function Name | Function Details |
|---|---|
| Automatically creating a folder specified by a user | The folder specified by user is automatically created at the time of recording to manage user's data. |
| Automatically creating folder specified per day | The folder per day can be created to manage filing data. |
| Auto Name | A File or a Folder can be saved with the name of any four characters plus automatically updated four-digit number updated.<br>**** If multiple files are saved at one recording, a folder is created.*** |

(2) File Operation

| | |
|---|---|
| operating devices | SD card, corresponding to SDHC |
| Format | Format of SD card is available<br>FAT32 |
| Saving Environment File | Setting and annotation information can be saved as a file. |
| Saving Text File | Text information of signal names and user's annotation can be saved. |
| Saving Data | Acquired data can be saved in binary format. |
| Creating Folder | Any name of folder can be created. |
| Deleting | Files and folders can be deleted. |
| Importing File | A environmental file (.ENV), Recording data file (FSD, FPP, DRT) and an annotation text (.TXT) can be imported. |

## *17.2.6. Recording function—optional specifications*

The followings are common functions of printing on recording papers regardless of a recording mode.
(*x:Function provided, -: Function not provided)

| Function | waveform | X-Y | Explanation |
|---|---|---|---|
| Scale Printing | x | x | Scales are automatically adjusted based on sensitivity and base line positions, and then printing is available before or at the end of recording. |
| Trigger Information | x | — | After printing a trigger point as the arrow mark (↓), the occurrence date and time of trigger can be printed together. |
| Data Information | x | x | Records can be printed with information such as recording mode, measuring date and starting time, data No. , trigger conditions (trigger points and trigger date and time), sampling speed, paper feeding speed, and time axis. |
| Page annotation | x | x | An annotation is printed on records. Maximum 80 characters x 52 rows |
| Signal Name | x | x | An annotation is printed on records. Maximum 30 characters |

## 17.2.7. Monitor displaying and setting function

| Status Icon | Contents on monitor |
|---|---|
| Battery | Indication of remained power level of battery |
| SD card | SD card insertion condition |
| Remote | Condition of Remote |
| Key Lock | Condition of Key Lock |
| Date/Time | Indication of current date and time |

| Operation Menu | Configuration |
|---|---|
| FREEZE | Monitor Displaying can be paused. |
| TRIG SYNC | Monitor Displaying synchronized a trigger detection is available. |
| Switching Monitor | Monitor Displaying under each of specified condition is available. |
| Value Indication | Numerical values of currently input signals are indicated. |
| Menu | Select setting menu and open various setting interface. |
| Key Lock | Cancel the Key Lock setting. |

| Setting Menu | Configuration |
|---|---|
| Input/Replay | Switches between Input Setup Screen or Replay Screen |
| Amp | Configures amp settings and physical quantity conversion of an input signal |
| Trigger | Configures the trigger related settings |
| Acquisition | Configures the settings about recording such as sampling speed |
| View/Record | Configures the settings such as scale views, signal names, grids, and waveform segmentations. |
| Printer Setting | Sets items for printer output |

| Execution Menu | Contents |
|---|---|
| START/STOP | Starts or stops recording |
| M.TRIG/MARK | Executes manual trigger |
| DISP COPY | Executes screen copying |
| FEED | Executes chart paper feed(when printer as an option) |

(3) Playback Screen
Use this screen to select the main unit's memory and the filing data, configure display playback waveforms, and so on.

| Data Information | Contents to be displayed |
|---|---|
| Data Information | Displays information on replayed data |

| Status Icon | Contents to be displayed |
|---|---|
| Battery | Remained power level of battery |
| SD card | Displays SD card insertion status |
| Remote | Remote status |
| Key Lock | Key Lock status |
| Date/Time | Displays current date and time |

| Operation Menu | Configuration |
|---|---|
| Validate cursor 1 or cursor 2 | Validates cursor 1 or cursor 2 |
| Scroll | Validates waveform scrolling |
| Digital Display | Executes monitor switching: Digital value indication—Cursor information indication—Full screen monitor |
| Menu | Selects Menu to open screen for setup |
| Key Lock | Executes the release of Key Lock setup |

| Setting Menu | Configuration |
|---|---|
| Input/Replay | Switches between Input Setup Screen/Replay Screen |
| Thumbnail indication | Performs thumbnail indication for recorded data |
| Signal Setting | Configure the display range setting of a channel of which data is played back. |
| Jump | Configure an arbitrary position to move the range of monitor displaying. |
| Time Axis | Configure narrowing/extending of waveform time axis. |

| Execution Menu | Contents |
|---|---|
| START/STOP | Starts or stops recording |
| DISP COPY | Executes screen copying |
| Statistical calculation | Executes statistical calculation for a block, and displays the results |
| FEED | Executes chart paper feed(when printer as an option) |

## *17.2.8. X−Y waveform*

| Setting Channel | Specifies an arbitrary channel: For X-axis—3 channels, For Y-axis: 3 channels |
|---|---|
| Printing density | 800 × 800 dots for chart paper printing (optional) |
| Interpolation function | Provided (line) or not provided (dot) |
| Updating speed for rendering | 100 ms |
| Pen up or down | On or off for trajectory |

**** Logic signals cannot be used.***

# 17.3. Specifications by each measurement mode

## *17.3.1. Memory mode*

(1)Memory Acquisition

<table>
<tr><td>Recording speed</td><td>Configure by the sampling speed (period).<br>[When using 1CH]<br>1,2,5,10,20,50,100,200,500µs,1,2,5,10,20,50,100,200,500ms, and 1s<br>[When using 2CH]<br>2,5,10,20,50,100,200,500µs,1,2,5,10,20,50,100,200,500ms, and 1s<br>[When using 3CH, 4CH]<br>5,10,20,50,100,200,500µs,1,2,5,10,20,50,100,200,500ms, and 1s<br>[When using 5CH to 8CH]<br>10,20,50,100,200,500µs,1,2,5,10,20,50,100,200,500ms, and 1s<br>[When using 9CH]<br>20,50,100,200,500µs,1,2,5,10,20,50,100,200,500ms, and 1s</td></tr>
<tr><td>Time Axis</td><td>0.01%</td></tr>
<tr><td>Memory Space</td><td>2,000,000data/CH</td></tr>
<tr><td>Block division</td><td>1, 2, 4, 10, 20, 40, 100 blocks can be set depending on the block to be used.</td></tr>
<tr><td>Acquisition Operation</td><td>Push the start key on the operation panel to start. (Starting with time trigger is also available)<br>Once, and Endless settings are available.
<table>
<tr><td>Acquisition Method</td><td>Acquisition Operation</td></tr>
<tr><td>Once</td><td>Measurement is made once and is finished.</td></tr>
<tr><td>Endless</td><td>A measurement is repeated the same times as the number of block.<br>If all blocks were used for recording, old data is overwritten from the starting block to record new data.<br>Recording stops when the recording stop operation is made.</td></tr>
</table>
* For endless, the existing data is overwritten.</td></tr>
<tr><td>Output Range</td><td>
<table>
<tr><td>BW CURSORS</td><td>Bitween cursors to output to a file.</td></tr>
<tr><td>TRIG.POINT</td><td>Center Trigger to output to a file with 10% to 100% of data.</td></tr>
</table>
</td></tr>
</table>

(2) Auto Output

| | |
|---|---|
| Output Range | Center Trigger to copy to a file or a recording paper (optional) with 10% to 100% of data. |
| Where to output | A file or a recording paper (optional) |
| Data Format for File Output | ***File extension .FSD (binary)***<br>File format conforms to RA2000 series. |

## 17.3.2. Filing mode

| | |
|---|---|
| Acquisition Operation | Push Acquisition Start to start (Starting with built-in timer is also available) |
| Acquisition Drive | SD card |
| Recording speed | 1,2,5,10, 20, 50, 100, 200, 500µs, 1, 2, 5, 10, 20, 50, 100, 200, 500ms,1s<br>*The recording speed needs conditions<br><br>Linear data filing<br>Sample data filing:<br>At 1 channel: 1 µs, at 2 channel: 2 µs or longer, at 3 or 4 channel: 5 µs or longer, at 5 to 8 channel: 10 µs or longer, at 9 channel: 20 µs or longer,<br>Peak data filling:<br>At 1 channel: 2 µs, at 2 channel: 5 µs or longer, at 3 or 4 channel: 10 µs or longer, at 5 to 8 channel: 20 µs or longer, at 9 channel: 50 µs or longer,<br><br>Loop data filing<br>Sample data filing:<br>At 1 channel: 20 µs, at 2 channel: 50 µs or longer, at 3 or 4 channel: 100 µs or longer, at 5 to 8 channel: 200 µs or longer, at 9 channel: 500 µs or longer,<br>Peak data filling:<br>At 1 channel: 50 µs, at 2 channel: 100 µs or longer, at 3 or 4 channel: 200 µs or longer, at 5 to 8 channel: 500 µs or longer, at 9 channel: 1 ms or longer, |
| File size | A maximum of 2 GB per a file |
| Acquisition Method | Sample (Acquiring data in every recording speed to media)<br>Peak (Acquiring maximum and minimum values in every recording interval during 1µs sampling to media) |
| Data Output Format | Only binary<br>FREC????.FSD Sample filing data<br>FREC????.FPP Peak filing data<br>***???? corresponds to a number from 0001 to 9999. 4-character name can be changed.***<br>File format conforms to RA2000 series. |

## 17.3.3. Real time mode (Optional: when using printer)

| | |
|---|---|
| Recording Paper Width | 112mm<br>Effective chart width = (maximum)104 mm |
| Paper Feeding Speed | 1, 5, 10 mm/s<br>1, 5, 10, 20, 50mm/min<br>1s／DIV、2s／DIV、10s／DIV、12s／DIV、30s／DIV、60s／DIV、<br>120s／DIV、600s／DIV |
| Time Axis | 10 mm/div |
| Data recording | Peak detection with 1µs sampling |
| Printing resolution | Time axis, Amplitude axis: 8 dots/mm |

# 17.4.Data Output Function

Record a part of or all recording data. In addition, the data can be saved in a different format.

| Where to output | Output Format | Output Method |
|---|---|---|
| File | Binary | All specified range of data is saved. |
| Data Output Format | | Only binary (Sample/peak data uses an extension below.)<br>****.DRT<br>***Any characters can be entered in ***** (up to 16 characters).***<br>File format conforms to RA2000 series. |
| Recording Part | Waveform Recording | Narrowing and Extending the time axis of a wave form is available.<br>Extending 1/1(standard), 2, 5, 10, 20, 50 100 times<br>Narrowing 1/2, 1/5, 1/10, 1/20, 1/50, 1/100 ,1/200, 1/500, 1/1000, 1/2000, 1/5000, and 1/10000 倍<br>***Standard (x1) = 100 data/div.*** |
| | X–Y Recording | Fixed |

# 17.5. Standard Function

| Function Name | Function Details |
|---|---|
| Saving Screen Image | Saving to a file in bitmap format is available.<br>Hard copy of the screen can be printed when the optional printer is used. |
| Initialization | A main unit can be reset to the default setting. |
| Saving and loading data and setting information | Saving memory recording data and maximum four setting conditions of a main unit can be saved to media. |
| Data No. setting | Any measuring data number can be assigned to each measuring data. |
| Backlight Auto Off | If no settings and operations are made for a fixed time (from 1 to 60 minutes) with the operation panel key or the touch panel key, the backlight is automatically turned off. |
| Data communication setting | LAN (Network), RS-232C can be set. |
| Buzzer clicking | Sound output can be made. |
| Key Lock | Keys on the touch panel are invalidated. |
| Statistical Calculation Function | Calculation results of maximum value, minimum value, average, peak value, and root mean square can be output. |
| Touch Panel Calibration | Calibration of touch panel detection location can be calibrated. |
| Timer Function | Recording using the start timer or interval function is available. |
| Monitor Invert | Upper bottom of monitor indication can be changed. |
| Display Brightness | Brightness of display can be selected. |

# 17.6. Remote Control Function

| Function Name | Function Details |
|---|---|
| Remote/Local | Controlling the RM1100 from the external PC can be made when the LAN connection is made.<br>During the remote connection, operation of the instrument is invalid. |

# 17.7. Unifizer LE for DAQ

[Product Overview]
Unifizer LE for DAQ is measurement support software, which can perform various settings and data acquisitions on the recorders connected to the network by remote control, and can display the acquired data on the screen or convert the data into CSV format files.

[Functions, Performances]

■ Viable OS This software runs on the OS below.
- ・Windows XP Professional (SP2 or later)
- ・Windows Vista Ultimate (32bit edition)
- ・Windows 7 (32bit edition)

■ Available Languages The language below can be displayed.
- ・Japanese
- ・English

■ Operational Models This software can operate the models below.
- ・OmnilightⅡ RM1100
- ・OmniaceⅢ RA2300 (Main program version：V2.1 build 490 or later)
- ・OmniaceⅢ RA2800 (Main program version：V1.0d build 10513 or later)

■ Communication Interface
- ・LAN (Ethernet)

■ The number of operational units
- ・Only one unit can be operated at a time.

■Installation
The program is distributed in CD format, and can be installed by Setup.exe.

**Online Processing Function**
**Unit Control Function**

［RM1100 Series Input Condition］
Amplifier block mounted on the RM1100 series can be set.
Setting Items are listed below.

◆ Temperature/Voltage Amplifier

Input ON/OFF: ON, OFF, GND
R1760C, T400C, J1100C, K1370C, K500C, W2300C
<Voltage measurement mode>
500V, 200V, 100V, 50V, 20V, 10V, 5V, 2V, 1V, 500mV,
200mV, 100mV, 50mV, 20mV, 10mV
Filter: OFF, 5Hz, 50Hz, 500Hz, 50kHz
Position: [-100.00～200.00 ] %
Input coupler: AC, DC
Measurement mode: Thermocouple, Voltage measurement
Reference junction: Temperature compensation: EXT, INT

◆ Logic Amplifier

Input ON/OFF: ON, OFF
Signal type: Voltage and Contact
Signal ON/OFF: ON/Off settings in every eight inputs
Recording position: 0.0～92.0[mm]
Signal pitch: 2.0～12.5 [mm]
Amplitude: 2.0～12.5 [mm]
Base line width: 0.5～2.0 [mm]

［Scaling Conditions］

The scaling conditions below can be set for each channel of the analogue input system on the temperature/voltage amplifier.
The conditions can also be set on multiple channels simultaneously.
・Physical unit conversion ON/OFF
・Maximum input value (any float data)
・Minimum input value (any float data)
・Maximum output value (any float data)
・Minimum output value (any float data)
・Recording full scale upper limit (any float data)
・Recording full scale lower limit (any float data)
・Units: These options below are available as a default table.
Standard, N, Pa, mm, με, m/s^2, °C, Ω, kg, kgf, kgf/cm^2, g
Any one-byte characters (maximum nine characters) can be set.

［Operation Modes］

・Real-time Mode
・Memory Mode
・Filing Mode

［Recording Conditions］

Various conditions on the recordings can be set on each operation mode shown below.

◆ Real-time Mode

<Paper feeding speed settings>
Timing: Internal and external sync
Internal: Speed value: 1,2,5 Step
Units : [mm/s]、[mm/min]
External sync : RM1100: 0.125mm/pulse、0.03125mm/pulse

◆ Memory Mode

<Sampling speed settings>
Timing: Internal and external sync
Speed value: 1,2,5 Step
Units: [μs]、[ms]、[s]
*Allowable minimum and maximum speeds are compliant with the unit specifications.

<Block no. settings>
A block number for the next recording can be specified according to the serial number of the block divided by the block size.
Setting range: [1 to 100]

<Pre-trigger size settings>
Pre-trigger size can be set by the rate against the whole size.
Setting range: [0 to 100]

<Acquisition operation settings>
The operation methods below can be selected and set.
Once, Endless

◆ Filing Mode

<File saving path>
Specifying the drive for file saving: select from the implemented drives.
Use of user folder: ON/OFF
Use of folder by day: ON/OFF
User folder name: any character string A allowed to be used as a folder name
Character limit is compliant with the specification in NTFS.
File name: Maximum four characters, one-byte alphabet and numbers

<Sampling speed settings>
Same as the “Memory recorder: sampling speed settings” settings

<Acquisition length settings>
Acquisition length in SD card can be set by the number of data, or acquisition time.
Acquisition Length=The number of data x Sampling speed

<Data format settings>
The data formats below can be selected and set.
Sample, Peak

<Filing format settings>
The filing formats below can be selected and set.
Linear, Loop

[Triggering conditions]
Conditions of triggers below can be set.

◆ Mode Selection
OFF, OR, AND, WINDOW

◆ OR/AND conditions setup
ON/OFF of detection
<Analogue amplifier>
Level: The range value can be set arbitrarily within the input range.
Slope: UP and DOWN

<Event amplifier/logic amplifier>
Detection logic: AND, OR
Detection pattern: X, H, L (excluded from the triggering condition)

◆ WINDOW condition setup
ON/OFF of detection
The trigger level maximum: The range value can be set arbitrarily within the input range.
The trigger level minimum: The range value can be set arbitrarily within the input range.
Triggering direction: IN, OUT

[Various information printing setups]
Items of various information on printing and screen of the instrument can be set.

◆ ON/OFF setup of various information printing
- System annotation
- Channel annotation
- Page annotation
- Signal name

◆ Input setup of various information printing
Characters including various annotations for information printing can be input.
Items below can be set.
Signal name: Up to 30 characters of S-JIS codes and half size codes can be input.
User annotation: Information of 108 lines can be input. The maximum number of characters per line is 64 characters.
Page annotation: Information of 52 lines can be input. The maximum number of characters per line is 80 characters.
Measuring information: Information of 108 lines can be input. The maximum number of characters per line is 31 characters.

◆ Clearing setup of various information printing
The setups of signal name, user annotation, and measuring information capable of setting character string inputting can be cleared.

[The other conditions]
- Setup of a watch embedded in the instrument
- Setup of the data number (a serial number used in the instrument)

[Execution control]
The control equipment has no display condition setup as this function has signal display setup on PCs.
Recording: Recording can be started and stopped.
Signals can be monitored during recording.
Trigger: Triggers can be operated manually by operating Keys.
Memory clearing: The data in the embedded memory can be cleared.
Blocks can be designated and designating can be carried out collectively.
Memory saving: Recorded data in the memory can be saved in files.
The block number and the output range can be designated.
***Set the path in advance, because recorded data is saved to SD drive in equipment.***
Annotation printing: Annotations can be printed by operating Keys

Real-time function
[PC real-time recording]
The data of RM1100 series and RA2000 series can be saved in PC memory area as data files in Real-time. Sampling speed: 1 ms or longer (1 ms increments), 1 s to 100 s (1s increments)
***Setting the PC real-time recording also will change the value of sampling rate in equipment.***

[PC real-time monitor]
Signals can be monitored at any time during recording.

◆ Data display
The data can be displayed according to the monitoring condition.

◆ Scale setup
The Y-axis scale can switch between the Range, Designated value, and Auto.
When the Auto selected, the auto-scale display can be conducted within the displayed data range.
The Y-T time axis scale can switch between the Lapse time, Date and time, and Time displays.

[PC real-time trigger]
Pre-trigger, starting trigger, and finishing trigger can be designated in PC real-time recording.

◆ Starting trigger
Source: The designated 1 channel of any connected apparatus can be set.
Level: Each level of up and down edges can be set.

◆ Finishing trigger
Source: The designated 1 channel of any connected apparatus can be set.
Level: Each level of up and down edges can be set.

◆ Trigger behavior
One recording span is equal to the number of pretrigger designated data + the recording span.
When recording stopped in trigger waiting state, the recorded data cannot be saved.
Finishing conditions of recording are recording completion of designated recording span or satisfying the finishing condition besides clicking the stop Key.
You cannot monitor input signals in trigger waiting state. Monitoring can be carried out after trigger detection.

◆ Pretriggering
Pretriggering can be designated using the number of data. Five thousand data, which is the addressable maximum value, can be designated (The maximum memory capacity is 48MB/unit).
The parameter in each buffer value can be changed by describing the following in “unifizer.ini” file. Pay attention to changing the parameter with consideration for the PC specifications.

●The pretrigger setup maximum value and pretrigger size
format>> [TRIGGER]

MAX_PRITRIGGER_MBYTE = 48 (Default: 48)
MAX_PRITRIGGER_COUNT = 5000 (Default: 5000)

Monitoring display

The conditions below necessary for real-time monitoring display can be set.
The control equipment has no display condition setup as this function has signal display setup on PCs.
Sheet type: Y-T, X-Y, digital、analysis (for FFT display)
Bar graph (vertical or horizontal displays)
Channel setup: Any channel and position in each screen can be set.
The number of channels capable of displaying per screen is not limited.
Display mode: Y-T, X-Y, and analysis can be displayed by switching between display divided according to channels and overwritten display.
Only Y-T, also, can switch between the div and table of digital values displays

MS-EXCEL transfer

Recorded data can be transferred to MS-Excel sheet during PC real-time recording.
The fastest sampling speed is 500 ms in using this function.
MS-Excel needs installing previously in PCs.

■ Off-line processing function

Data reading/saving

The types of files below saved with this software can be read.
SMF recording data files
DRT Manual copy data
FSD Sample Filing Data
FPP Peak Filing Data

Display function

The selected recording data has display function below and up to four recording data file can be displayed.
The number of data files displayed simultaneously is not limited. (The resource capacity implemented in the PC is equal to the limit.)
［Condition display］
The recording conditions and input setup of now displaying data can be displayed.
The displayed information, however, can be only referred to and not be changed.

◆ Recording condition information

- Apparatus information
- Recording start time
- The number of recording channels
- The number of data
- Sampling information
- Trigger address

◆ Input channel information

- The types of inputting
- Range
- Filter
- Amplifier unique information

［Thumbnail display］

All waveform overviews can be checked since the start of recording.

［Data display function］
The display function of recorded data is similar to the monitor display function.
Refer to “on-line processing function: 3) monitor display function.”

［Scale setup］
The Y-axis scale can switch between the Range, Auto, and Designated value.
When the Auto selected, the autoscale display can be conducted within the displayed data range.

［Cursor function］
Two cursors can be displayed on the waveform screen with the cursor setup turned on (You can choose between a straight line or crossing).
The time axis information of cursor position, physical quantity value, and delta between cursors are output on the screen.

［Zoom function］
The waveform can be zoomed in any rectangular area by operating a mouse on the waveform in thumbnail window or Y-T sheet and zoomed in another window.

［Automatic allocation function of display channels］
When a plurality of channels displayed in Y-T and digital displays, the display from the first to subsequent channels can be set with one click.

［Drawing function of any information］
The drawing function of any information outputs various types of information on the screen displaying data.
Operating Keys output the types of information below in the form of drawing on the screen.
Saving, also, memorize a plurality of information.

◆ Cursor lead value (C:Y value)
The signal value shown by cursor C1 and C2 can be displayed in the window with the cursor turned on.
The display channel can be chosen with the channel display box of the tool bar.
The maximum value of the cursor C1 and C2 is displayed with the peak data.

◆ Trigger point
The trigger mark is output when the trigger point exists.

◆ The maximum value
The signal maximum value between the cursor C1 and C2, and an arrow can be displayed in the window with the cursor turned on.
The maximum value is displayed with the peak data.
The display cannot be conducted in X－Y display

◆ The minimum value
The signal minimum value between the cursor C1 and C2, and an arrow can be displayed in the window with the cursor turned on.
The minimum value is used with the peak data.
The display cannot be conducted in X－Y display.

◆ Y-axis variable quantities (Y variable quantities)
The signal variable quantities between the cursor C1 and C2 of the designated channels, and an arrow can be displayed in the window with the cursor turned on.
The minimum value is employed with the peak data.
The display cannot be conducted in X－Y display.

◆ X-axis time lag (T variable quantities)
The time between the cursor C1 and C2 of the designated channels, and an arrow can be displayed in the window with the cursor turned on.
The display channel can be chosen with the channel display box of the tool bar.
The display cannot be conducted in X－Y display.

◆ P-P

The Peak to Peak between the cursor C1 and C2 of the designated channels, and an arrow can be displayed in the window with the cursor turned on.
The display channel can be chosen with the channel display box of the tool bar.
The display cannot be conducted in X－Y display.

◆ Arrow

The straight line displayed between the cursor C1 and C2 of the designated channels can be set to be displayed in the form of an arrow in the window with the cursor turned on.
The display cannot be conducted in X－Y display.

Memo function

You can write comments or draw lines in the screen freely (multiple comments/lines are permissible).
An acquired data file can be overwritten, re-read out or edited.

- Comments: you can use any font, style, size and color; such attributes are all changeable.
- Lines: you can assign arrow-heads, or can define length, direction, thickness, pattern and color; such attributes are all changeable.

CSV conversion function

The data displayed can be converted and/or stored in a CSV format file.
You can allocate or choose;
- Conversion axis: choose the time axis or the frequency axis
- Conversion range: points, time unit (μs, ms, sec), time, frequency axis (for FFT data)
- Conversion channel
- Delimiter: choose comma (,) or TAB
- Refining: simple, MAX, MIN, average or peak value
- Appending header information
- Appending time information (choose the data head basis or the trigger point basis; the time unit is automatically set from the acquired sampling units.)
- Storing file name

Printing function

The screen data displayed (waveform, conditional information) can be printed by the connected printer.

Saving and reading out functions for conditional information

The information held by this software can be saved in a file.
The saved file can be re-read out.

■ Operational and analytical processing functions

1) Operational function

◆ Operation between channels

(The following four kinds of operational expressions can be used.)

Operational expressions
①((A * an) + (B * ach) + C)
②((A * an) - (B * ach) + C)
③((A * an) * (B * ach) + C)
④((A * an) / (B * ach) + C)
an: channel acquisition data
ach: arbitrary channel acquisition data
Any numeric value can be set in the factors A, B and C (in the case of divisional operation (②), 0 cannot be set in the factor B).

◆ Exponential operation

Operational expression
(A * (an^B) + C)
an: channel acquisition data
Any numeric value can be set in the factors A, B and C.
When an<0 AND B isnot integer, or an=0 AND B<=0,
then -∞ ("-1.#IND" will be displayed).

◆ Absolute value operation

Operational expression
|an|
an: channel acquisition data

◆ Common logarithms operation

Operational expression
(A * log10(an) + C)
an: channel acquisition data
Any numeric value can be set in the factors A and C.
When an<0, then -∞ ("-1.#IND" will be displayed).

◆ Index operation

Operational expression
(A * exp(an) + C)
When exp(an) converge on -∞, then -∞ ("-1.#IND" will be displayed).
an: channel acquisition data
Any numeric values can be set in the factors A and C.

◆ 1/√2 operation

Operational expression
(A * an / √2 + C)
an: channel acquisition data
Any numeric value can be set in the factors A and C.

◆ Trigonometric functions operation

(the following six kinds of operational expressions can be used)

Operational expressions ①(A * sin(an) + C)
②(A * cos(an) + C)
③(A * tan(an) + C)
④(A * asin(an) + C)
⑤(A * acos(an) + C)
⑥(A * atan(an) + C)
an: channel acquisition data
Any numeric value can be set in the factors A and C.
In the case of asin operation (④),
when an<(-pi/2)rad OR an>(pi/2)rad,
then -∞ ("-1.#IND" will be displayed).
In the case of acos operation (⑤),
when an<-1 OR an>1, then -∞ ("-1.#IND" will be displayed).
In the case of atan operation (⑥),
when an<(-π/2)rad OR an>(π/2)rad,
then -∞ ("-1.#IND" will be displayed).

◆ Single differentiation operation

Sample data a0, a1, ..... an-1, and an
Operation result s Y'0 = 0
Y'1 = (a1 - a0)
Y'2 = (a2 - a1)
・
・
Y'n-1 = (an-1 - an-2)
Y'n = (an - an-1)

◆ Double differentiation operation

Sample data a0, a1, ..... an-1, and an
Operation results Y'0 = 0
Y''1 = Y'1 - Y'0 = (a1 - a0)
Y''2 = Y'2 - Y'1 = (a2 - a1) - (a1 - a0)
・
・
Y''n-1 = Y'n-1 - Y'n-2 = (an-1 - an-2) - (an-2 - an-3)
Y''n = Y'n - Y'n-1 = an - an-1) - (an-1 - an-2)

◆ Single integral operation

(* Possible only at the time of replay.)

Sample data a0, a1, ..... an-1, and an
Operation results Z0 = a0
Z1 = (a0 + a1)
Z2 = (a0 + a1 + a2)
・
・
Zn-1 = (a0 + a1 + a2 ..... an-2 + an-1)
Zn = (a0 + a1 + a2 ..... an-2 + an-1 + an)

◆ Double integral operation

(* Possible only at the time of replay.)

Sample data a0, a1, ..... an-1, and an

Single integral operation results Z0, Z1, and ..... Zn-1 and Zn

Operation results DZ0 = Z0 = a0

DZ1 = Z0 + Z1 = a0 + (a0 + a1)

DZ2 = Z0 + Z1 + Z2 = a0 + (a0 + a1) + (a0 + a1 + a2)

•

•

DZn-1 = Z0 +Z1 +Z2 ..... Zn-2 +Zn-1
= a0 + (a0 + a1) + (a0 + a1 + a2) .....
+ (a0 + ..... + an-1)

DZn = Z0 +Z1 +Z2 ..... Zn-2 +Zn-1 +Zn
= a0 + (a0 + a1) + (a0 + a1 + a2) .....
+ (a0 + ..... + an-1 + an)

When calculating, the time factor $\Delta t$ is always set "1."

To reflect the value of a sampling rate to an operation;

- In the case of differentiation, add the operations of *1/$\Delta t$ and *1/$\Delta t$2 to the value computed above;
- In the case of integration, add the operations of *$\Delta t$ and *$\Delta t$2 to the value computed above. The value of $\Delta t$ is computed per time axis.

◆ Moving average operation

(* Possible only at the time of replay.)

The moving average can be set from 1 to 1,000 times.

(example) Sample data a1, a2, ..... an-1, and an

Operation results A1, A2, ..... An-1, and An

Moving average times 4 times

A1 = a1

A2 = (a1 + a2) / 2

A3 = (a1 + a2 + a3) / 3

A4 = (a1 + a2 + a3 + A4) / 4

A5 = (a2 + a3 + a4 + A5) / 4

•

•

An = (an–3 + an–2 + an–1 + an) / 4

an: channel acquisition data

However, in the case of using a recorder and at the time of acquiring peak sample data, set the Max data in an.

◆ Root-mean-square value operation

(* Possible only at the time of replay.)

Sample data a1, a2, ..... an-1 and an

Operational processing RMSx (a1 - am, N)

* Perform a root-mean-square value operation with the operation range N (the sampling numbers) being from a1 to am.

Operation results A1, A2, ..... An-1, and An

A1 = RMSx (a1 - am, N)

A2 = RMSx (a2 - am+1, N)

・

・

An-2 = RMSx (an-2 - an, 3)

An-1 = RMSx (an-1 - an, 2)

An = RMSx (an, 1)

◆ Refer to acquisition data 1

Referring to all the acquisition data for the allocated channels.

Sample data a1, a2, ..... an-1, and an

◆ Refer to acquisition data 2 (where starting point (P3) is specified)

Referring to the acquisition data for the specified channel from the specified starting point (sampling point).

Sample data a(P3), a(P3+1), ..... an-1, and an

◆ Free input operation Arithmetic expressions arbitrarily combined with below functions can be calculated.

| Function Format | Operation Content | Argument Variable Scope |
|---|---|---|
| sin (value) | Sine operation | ― ― ― |
| cos (value) | Cosine operation | ― ― ― |
| tan(value) | Tangent operation | ― ― ― |
| asin (value) | Inverse Sine operation | $-\pi/2 \leq$ value $\leq \pi/2$ |
| acos (value) | Inverse Cosine operation | $-1 \leq$ value $\leq 1$ |
| atan (value) | Inverse Tangent operation | $-\pi/2 \leq$ value $\leq \pi/2$ |
| abs (value) | Absolute value operation | ― ― ― |
| exp (value) | Exponential operation | ― ― ― |
| ln (value) | Natural logarithmic operation | value > 0 |
| log10 (value) | Common logarithmic operation | value > 0 |
| sqrt (value) | Square root operation | value > 0 |
| cbrt (value) | Cube root operation | value > 0 |
| rms (value) | $1/\sqrt{2}$ operation | ― ― ― |
| func (Number) | Calculation for target channel for calculation | Number = function number (f No) |
| pow (value, multiplier) | Power operation | ― ― ― |
| dif (Device No., Channel No.) | Single differentiation operation | ― ― ― |
| ddif (Device No., Channel No.) | Double differentiation operation | ― ― ― |
| int (Device No., Channel No.) | Single integral operation | ― ― ― |
| dint (Device No., Channel No.) | Double integral operation | ― ― ― |
| difx (Number) | Single differentiation based on operation results | ― ― ― |
| ddifx (Number) | Double differentiation based on operation results | ― ― ― |
| intx (Number) | Single integral based on operation results | ― ― ― |
| dintx (Number) | Double integral based on operation results | ― ― ― |
| val (Device No., Channel No..) | Refer to acquisition data 1 | ― ― ― |
| val2 (Device No., Channel No.. , position) | Refer to acquisition data 2 | ― ― ― |
| MovAve (Device No., Channel No.., average number) | Moving average operation | 1 ≤ average number ≤ 1000 |
| RMSx(Device No., Channel No..sampling number) | RMS value operation | ― ― ― |

The below operators can be designated.
Addition, subtraction, multiplication and division・・・・・ + , - , * , /
Nesting ・・・・・ ( )
Power ・・・・・ ^
Number(constant)・・・・・ 0 to 9

◆ Registry and readout of free operations

Arbitrarily created free operations can be registered and readout. (They can be selected from the operation list same as the other operations.)

2) FFT analysis function

・FFT analysis type : linear spectrum, power spectrum, RMS spectrum, power spectrum density
・Window function: rectangular, hanning, hamming
・Average frequency: 1～16384 overlap[ 0%, 25%, 50%, 75% ]
(Average processing is off-line only.)
・Frame size: 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536
(When monitoring and including real time are fixed as 1024.)

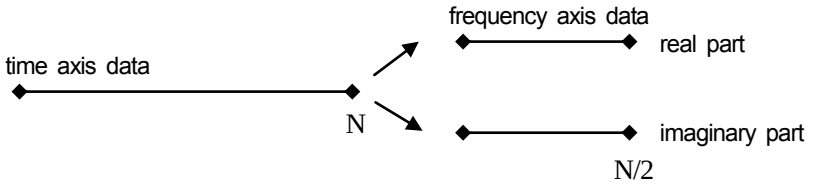
[FFT operational algorithm]

◆FFT conversion

The below notation is used for FFT convert calculation:

・N: FFT data length
・T(n): A/D data n = 0 to (N – 1)
・Adfull: A/D full scale value
・AMPxx: Amplifier input range
・kxx: Physical equivalent ( k Engineer Unit = 1 Volt )
・df: Frequency resolution

When FFT operation to time axis data [ T (0) ～ T (N-1) ] is calculated, the result will be frequency axis data and real part and imaginary part will exist.




real part Rxx (p) p = 0 ～ N / 2 – 1
imaginary part Ixx (p) p = 0 ～ N / 2 – 1

◆ Power Spectrum

・The power spectrum calculated from FFT converted frequency data is defined as auto power.
Input: frequency data (A/D data converted FFT)
Output: frequency data (positive value only)
Data score: N / 2.56
Auto power APxx (p) calculation

$$APxx(p) = Rxx^2(p) + Ixx^2(p)$$

Voltage equivalent = $APxx(p) \times (AMPxx / ADfull)^2$

Physical equivalent = $APxx(p) \times (kxx \times AMPxx / ADfull)^2$

When $A \cdot \sin(2\pi ft)$ signal is input, the power value will be $A^2$ at peak and $A^2/2$ at RMS value.

◆ Linear Spectrum

Input: auto power
Output: frequency data (positive value only)
Data score: N / 2.56

Linear spectrum takes auto power square root. $\sqrt{APxx(p)}$

Voltage equivalent = $\sqrt{APxx(p)} \times AMPxx / ADfull$

Physical equivalent = $\sqrt{APxx(p)} \times kxx \times AMPxx / ADfull$

When $A \cdot \sin(2\pi ft)$ signal is input, the linear spectrum value will be $A$.

◆ RMS Spectrum

Input: auto power
Output: frequency data (positive value only)
Data score: N / 2.56

RMS spectrum takes linear spectrum RMS value $\sqrt{APxx(p)}/\sqrt{2}$ .

Input: auto power

When $A\cdot\sin(2\pi ft)$ signal is input linear spectrum value will be $A/\sqrt{2}$ .

◆ Power Spectrum Density

Input: auto power
Output: frequency data (positive value only)
Data score: N / 2.56

Power spectrum density is divided by frequency resolution. $APxx(p)/df$

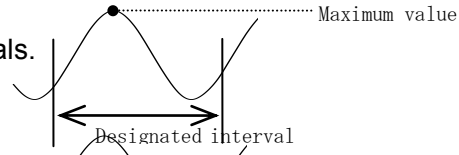
(Power per 1Hz)

3) Statistical interval arithmetic function

Statistical interval arithmetic between cursors can be calculated.

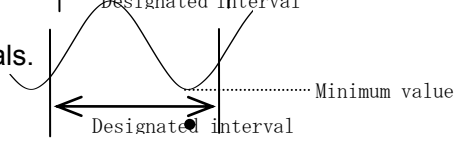
◆ Maximum Value(MAX)

The maximum value is extracted from the data within designated intervals.




◆ Minimum Value(MIN)

The minimum value is extracted from the data within designated intervals.

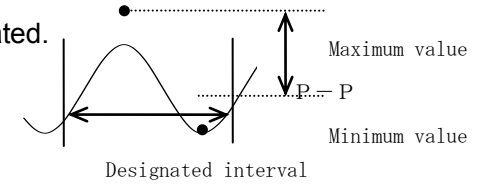



◆ P-P Value(P-P)

The range between the maximum value and minimum value is calculated.

Formula:

$$P-P=\left|Maximum-Minimum\right|$$




◆ Average Value(AVE)

The average value of the data within the designated intervals is calculated.

Formula:

$$AVE=\sum\frac{D}{n}$$

D ··· Sample data within the range
n ··· number of data

◆ Area(AREA)

The area from the base line position to the target measurement waveforms within designated intervals is calculated.

Either ± all areas, + area or – area can be selected at settings.

± all areas

All areas included + side and – side within the designated intervals is calculated. (example: the above A+B areas)

Formula:

$$\mathrm{AREA}=\sum\{\mathrm{ABS(D)}\}$$

D ··· Sample data within designated range.

+ area

+ side area within the designated intervals is calculated.(example: the above A area)

Formula:

$$\mathrm{AREA}=\sum(+D)$$

D ··· Sample data within designated range.

- area

- side area within the designated intervals is calculated.(example: the above B area)

Formula:

$$\mathrm{AREA}=\sum(-\mathrm{D})$$

D ··· Sample data within designated range.

◆ Root Mean Square(RMS)

The RMS within the designated intervals is calculated.

Formula:

n ··· number of data

$$RMS = \sqrt{\frac{\sum D^2}{n}}$$

D ··· Sample data within designated range.

◆ Standard Deviation(SD)

Standard deviation within the designated intervals is calculated.

Parameter of SD can be selected as (n) or (n-1) at settings.

N ····· SD within the data of designated intervals is calculated as 1/n.

D ··· Sample data within designated range.

Formula:

$$SD = \sqrt{\frac{1}{n}\left\{\sum D^2 - \frac{\left(\sum D\right)^2}{n}\right\}}$$

n ··· number of data

N-1 ··· SD within the data of designated intervals is calculated as 1/(n-1)

D ··· Sample data within designated range.

Formula:

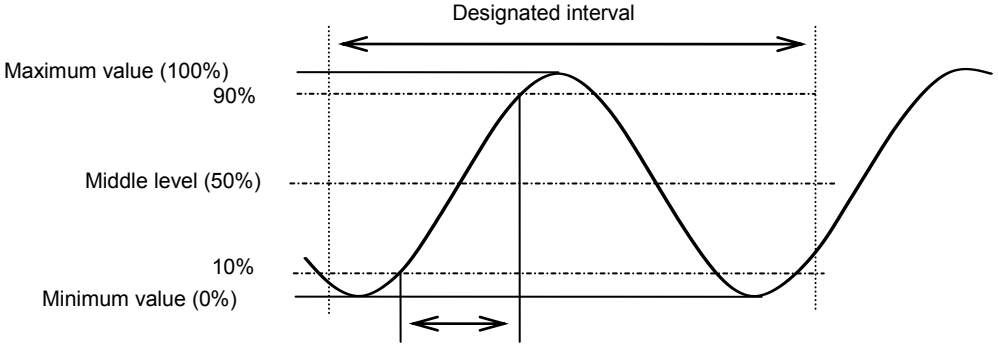
$$SD = \sqrt{\frac{1}{n\text{-}1}\left\{\sum D^2 - \frac{\left(\sum D\right)^2}{n-1}\right\}}$$

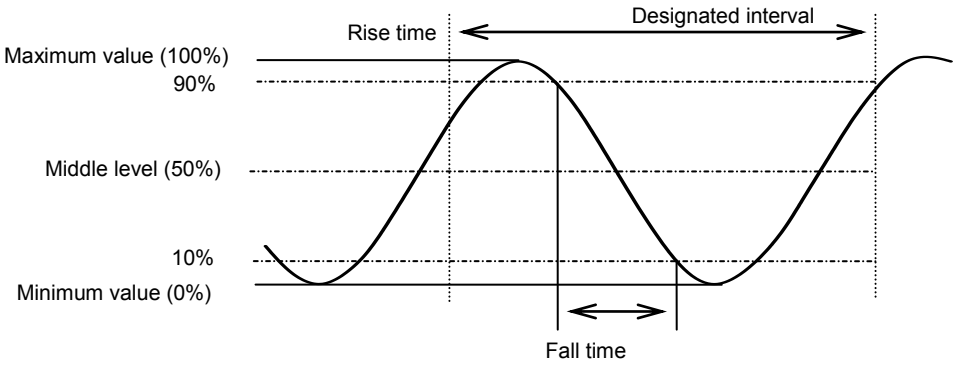
n ··· number of data

◆ Rise time or fall time

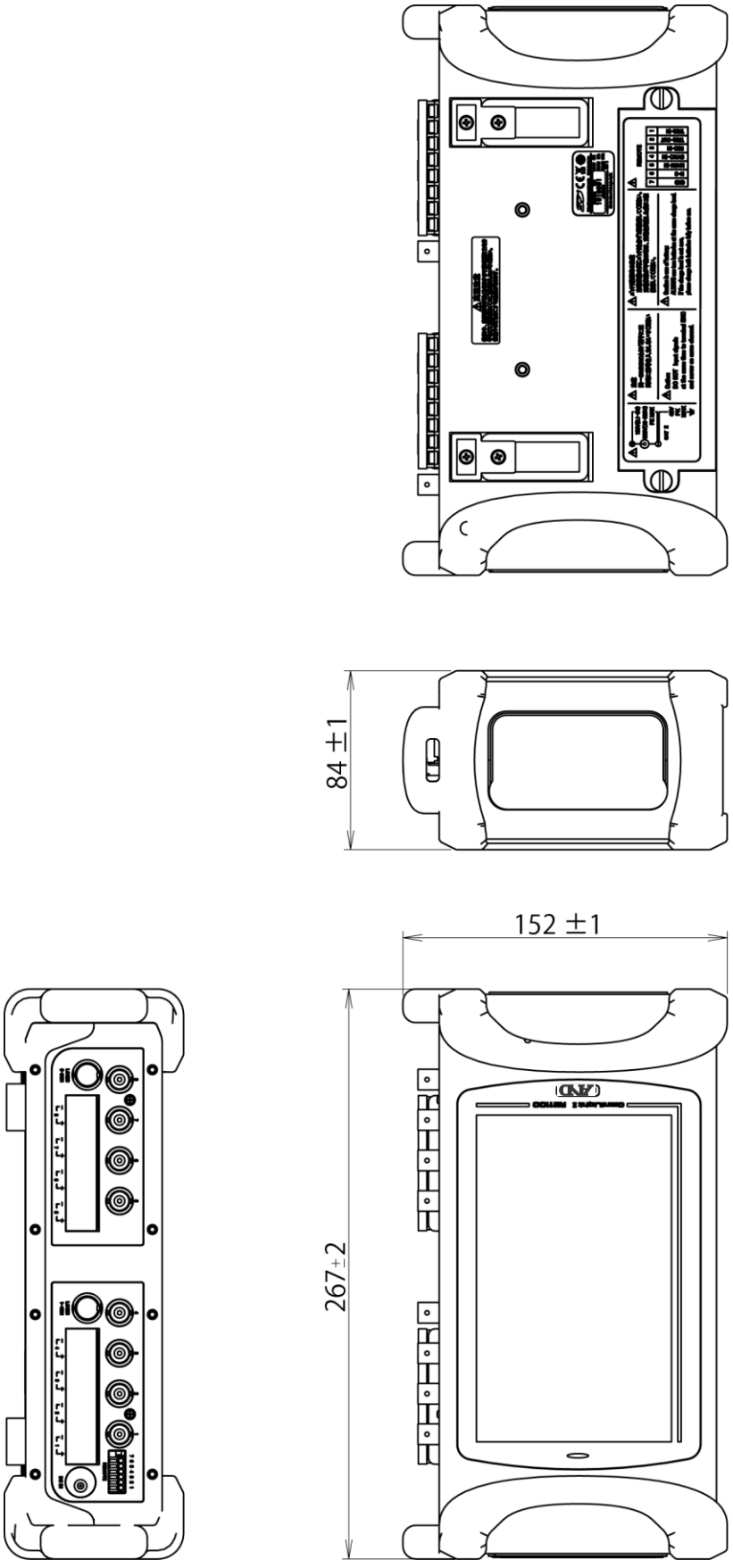
Calculate the maximum and minimum value within the designated intervals, target the first wave passing through the middle level and calculate the rise time or fall time between 10% and 90% of the wave.

The calculation result is indicated as number of sample data. Time conversion is calculated as (calculation result)x(sample speed).



# 17.8. External View




*For RM1102

# To Ensure Prolonged Use

A&D Company,Limited.

Thank you for purchasing an A&D Company,Limited. product.

To ensure prolonged use of the product that you have purchased, we offer the following lineup of maintenance services.

**1. Warranty Period**

The warranty period for this product is one year from the date of purchase (or two years depending on the option). In case of a failure, the product will be repaired free of charge (only if the failure is ascribable to the responsibility of A&D).

**2. Disclaimers**

We take no responsibility for any damages caused by the following reasons;

(1) Consequential damages and production compensation caused by any accidents of our product;
(2) Damages of our product generated by other companies' equipments and their construction;
(3) When operation, proper maintenance, and regular inspection are not done;
(4) Troubles which are apparently not attributable to our company or those that cannot be decided clearly whether our company is responsible for those troubles;
(5) Exhaustion of consumptions and repair parts;
(6) Troubles attributed to third party's conflicts;
(7) Troubles caused by a force majeure such as natural disasters

**Address inquiries to:**

**OmniLight Ⅱ　RM1100**
**Instruction Manual (7001750-R01)**

1st: September 2011
2nd: February 2012
3rd: Octber 2012
4th: May 2015
5th July 2015

A&D Company, Limited