RT3108N, RT3208N, RT3216N
OMNIACE
OPERATION MANUAL

NEC San-ei Instruments, Ltd.

Second Edition October 1994

CE MARKING GENERAL INFORMATION

To our customers in Europe: RE:RT3108N/RT3208N/RT3216N RECORDERS

These products are in conformity with EMC Directive 89/336/EEC.

Conformity specifications

EN55011 (B)
EN50082-1 : IEC801-2 (ESD)
IEC801-3 (RF Field)
IEC801-4 (EFT)

EN61010-1

Caution:

In order to meet above requirements, all the amplifiers or options can not be used at this moment although we are making every effort to improve our product items and following conditions at this moment should be met for the requirements.(as of January 17, 1996).

1) Do not use other input units than the ones supplied, which were shipped before December 31, 1995.

2) Input units, which meet above requirements, are:

* DC amplifier unit RT31-144 with safety connector,
* F/V converter unit RT31-146 with safety connector,
* Zero Suppression amlifier RT31- 145 with safety connect,
* Floating DC amplifier unit RT31-147 with safety connector,
* RMS converter unit RT31-149 with safety connector,
* DC amplifier with fine control RT31- 148 with safety connector.
* Event amplifier unit RT31-110,
* DC Strain amplifier unit RT31-111

Note: Charge amplifier, Thermocouple unit and same input units, but different models can not be used for CE conformity recordder at this moment (as of January 17, 1996) although we are improving the specification to meet the requirements.

3) Specified input cable(RT31-162) should be used instead of the cable 0311-5158 mentioned in this operation manual when using DC amplifier unit (RT31-144), F/V converter unit (RT31-146), floating DC amplifier unit (RT31-147), zero suppression amplifier unit (RT31-145) , DC amplifier with fine control adjustment (RT31-148). and RMS converter unit (RT31-149).

4) When using event amplifier (RT31-110), specified logic probe (RT31-163) should be used instead of RT33-120 mentioned in this manual.

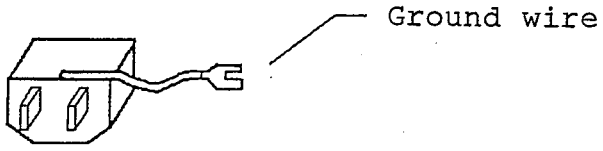
BEFORE ATTEMPTING TO OPERATE THIS INSTRUMENT, OBSERVE THE FOLLOWING NOTES:

Congratulations on your purchase of this OMNIACE RT3216N.
Prior to shipment, this instrument has been subjected to stringent quality control inspections.
In order to properly and safely operate this instrument, observe the following notes and use the instrument in accordance with the contents of this operation manual. This manual uses screen displays for RT3216N, which is almost the same operation as that of RT3108N and RT3208N except for number of channel.
Checkout of external appearance and accessories:
Check the appearance if any damage might be found.
Check the supplied accessories by referring to the accompanying packing list. Should any damage or shortage of any items be discovered upon unpacking the contents, contact our agent from whom you have purchased this instrument.

Checkout of power supply voltage:
Check if the power supply voltage is within the rated voltage labeled on the instrument.

Checkout of fuse:
To prevent any possibility of failure, use a fuse specified by this instrument.
To avoid possible cause of failure, any fuse, which is not specified by this instrument, must not be used, or the terminals of the fuse holder must not be short-circuited.
(The DC power supply will be discussed later.)

Protective grounding:
To prevent any possibility of failure, the instrument must be properly grounded without fail before turning on the power to the instrument.
The plug of the AC power cable (0311-5044 for 100 V AC) provides 3 pins, the cylindrical pin of which, located at the center, is a ground terminal. When the AC power cable is to be used with an adaptor, be sure to connect the ground wire of the adaptor and the ground terminal of the instrument to a proper external ground terminal.



The ground wire is treated with shrinkable tubing to prevent the ground wire from being inserted into the AC power outlet. Therefore, if it is to be connected to an external ground terminal, remove this tubing.

Note:

The AC power cable is not equipped with a plug when shipped from the factory to outside Japan due to varying power requirements from country to country.

Connection of input signals:

Before connecting input signals, the ground terminal of this instrument must be properly grounded.

Caution on maximum input voltage:

To avoid possible cause of failure, do not apply an input voltage, which exceeds the allowable range, to a DC amplifier unit (including a DC amplifier unit with BNC input) or a zero suppression amplifier. The input signal must be less than the allowable input voltage.

Allowable input voltage (DC or AC peak value)	Range
100 V	x1 V FS
500 V	x100 V FS

Prohibition on use of instrument under dangerous environment:

Do not use the instrument in the presence of flammable and explosive gases and/or aqueous vapor. Using the instrument under such environment is very dangerous.

Real-time waveform display:
If the frequency of an input signal becomes higher, the displayed real-time waveform may be different from the recorded waveform.

Note:

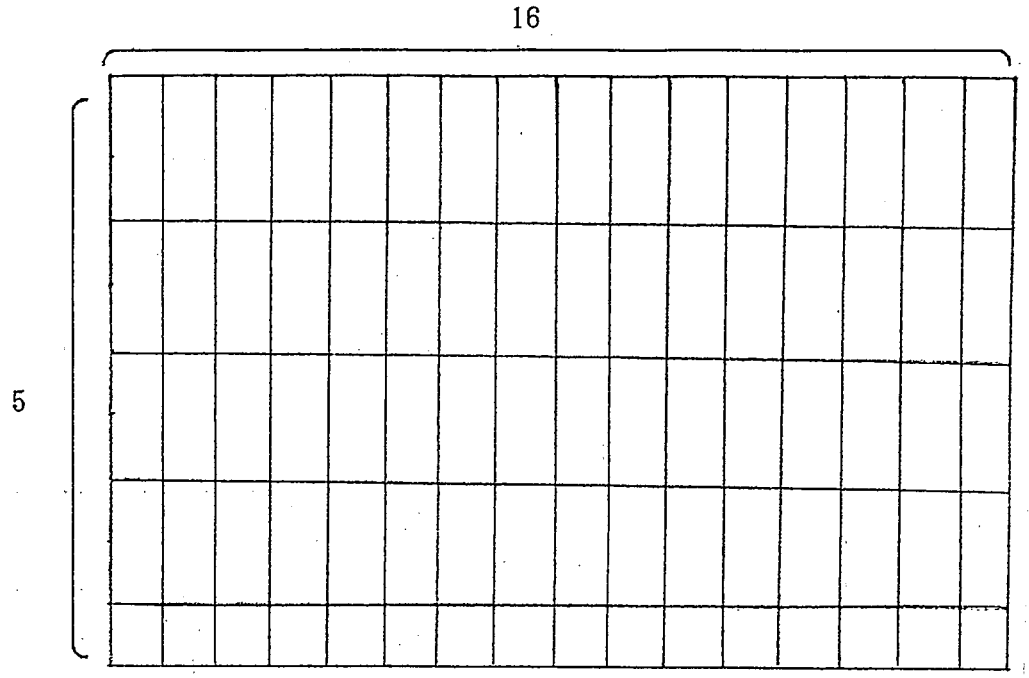
Should the instrument malfunction during use, turn OFF the power to the instrument at once and contact our agent from whom you purchased this instrument.

Prior to shipment, this instrument has been subjected to stringent quality control inspections. In case of question or complaint about this instrument or its operation manual, however, please notify us. We will intend to reflect your favorable opinions.

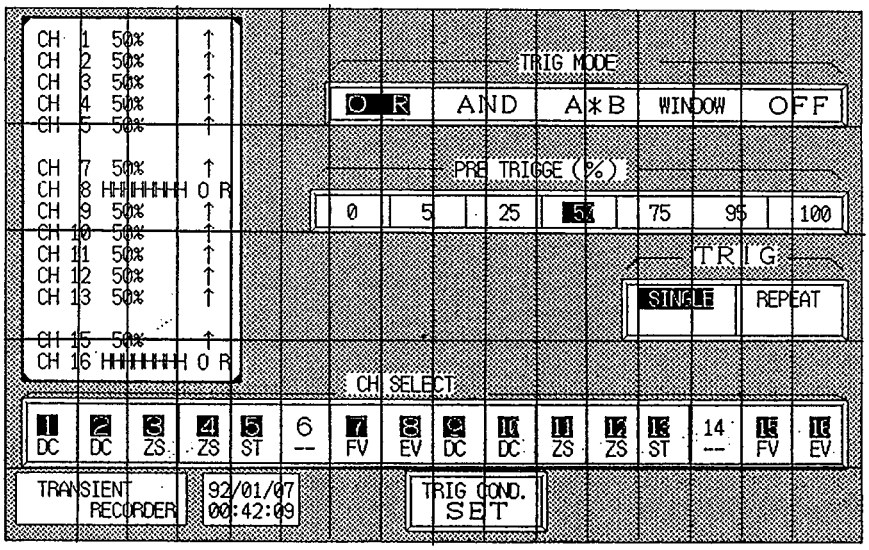
Caution on touch-pad-panel:
This instrument uses touch-pad-panel key switches.
To avoid possible cause of failure, observe the following:

° Do not press the touch-pad-panel key switches with a pointed thing.
° Do not press the touch-pad-panel key switches forcibly.
° Do not put any item on the touch-pad panel.
° Do not press two key switches or more simultaneously, otherwise the instrument may malfunction.

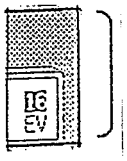
The touch-pad-panel key switches should be pressed gently with a finger.
The touch-pad panel is composed of 80 key switches, as shown in the figure on the following page:



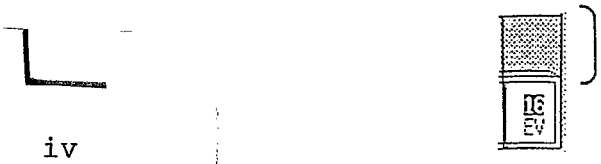
In the actual screen display, the touch-pad panel is demarcated, as shown below:



① In the figure shown above, the area of a key switch is indicated by the mark "⎫".
See the figure at right.



Therefore, even when the part (see the figure below.) is pressed, the key switch is operated. When the setup has been completed, set the KEY LOCK switch to the TOUCH PANEL position.



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SECTION 1

INTRODUCTION

1.1 Outline and Features

1.1.1 Outline

The OMNIACE RT3216N is a multi-channel thermal dot recorder employing a 9-inch large-size EL display and a touch-pad panel.
The maximum number of channels is 16 channels and the recording width is 216 mm. (128 mm for RT3108N)
By the utilization of the EL display and the operation panel with a touch pad displayed in English, the operability has been further improved. Displayed waveforms are easy to observe. In addition to the conventional recorder capability, the RT3216N waveform displaying and recording instrument is equipped with digital oscillographic capability.

This instrument provides the following functions:

° Display:
Setting-up of real-time and memory waveform monitors, basic instrument and input units.

° Recording method:
Thermal recording by thermal print-head.
Number of dots; 8 dots/mm.
Recording width; 216 mm. (RT3216N) (128 mm for RT3108N)

° Real-time recorder:
Waveform recording, data recording, X-Y recording, real-time trigger recording.

° Memory recorder:
Waveform recording, data recording, X-Y recording.

° Transient recorder:
Waveform recording.

In addition, this instrument is equipped with RS-232C and remote interfaces and memory card capability as standard, and a GP-IB interface can be installed as an option.

Up to a maximum of 16 input units can be built into the basic instrument. For the types of units with * mark, the number of units, which can be built into the instrument, is limited.

° DC amplifier unit .....(RT31-109)
° Event amplifier unit .....(RT31-110)*
° DC bridge strain amplifier unit ....(RT31-111)*
° F/V converter unit .....(RT31-112)
° DC amplifier unit with BNC input ...(RT31-126)
° Zero suppression amplifier unit ....(RT31-131)

1.1.2 Features

° Excellent operability by large-size EL display and touch-pad panel in English.
° Recording input waveforms possible while monitoring them.
° High-accuracy measurement by 12-bit A/D converter.
° High-speed sampling of up to 200 kHz.
° Wide variety of measurements by various trigger functions and recording formats.
° Memory recording available during real-time recording (transient recording).
° Standby function for power failure or instantaneous power interruption.
° Direct recording of 200 V AC power line available.
° RS-232C, remote and memory card (available up to 4M bytes) functions installed as standard.
° Base-line positioning finely adjusted (in 0.125 mm steps).
° Simultaneous triggering of 16 channels available. (for RT3216N)
° Simultaneous monitoring of 16 channels available. (for RT3216N)
° Maximum paper speed: 100 mm/sec.
Maximum time-axis resolution: 40 dots/mm.
° Thickness of waveform lines adjustable (Separately adjustable for each channel).
° RT3108N-1, RT3208-1 for DC11-28V DC power supply.

1.2 System Configuration

The OMNIACE consists of the basic-instrument section, input units and a set of optional and standard accessories, as shown below:

1.2.1 Model Number

Product name	Model number	Remarks
OMNIACE	RT3216N	Designed for AC power supply

Note: RT3216N-1 designed for DC11-28V DC power supply.

1.2.2 Basic-instrument Section and Input Units

Nomenclature			Remarks	Composition
Basic-instrument section	Housing case of basic instrument (Recorder section and input units included) Operation and display sections			1
	Power supply	90 to 132 V AC 180 to 264 V AC Automatically selected	(Note 1) Except for RT3108N	1
	RS-232C function Remote function Memory card function			1
	GP-IB unit		Option RT31-106	
Input units	DC amplifier unit		Standard RT31-109	
	Event amplifier unit		Option RT31-110	
	DC bridge strain amplifier unit		Option RT31-111	
	F/V converter unit		Option RT31-112	
	DC amplifier unit with BNC input		Option RT31-126	
	Zero suppression amplifier unit		Option RT31-131	
	Blank panel		RT31-118	

Note 1: Although, in this instrument, the power supply can be automatically selected from 100 V AC system to 200 V AC system, the power line voltage must be specified in connection with fuses, etc., when ordering.

Configuration of input units: (for RT3216N)

As shown in the tables below, the input units can be built into the slot numbers 1 to 16, which are indicated on the upper and lower places (Upper place for slot numbers 1 to 8, and lower place for slot numbers 9 to 16).

Slot numbers 1 to 8 (Upper place):

Slot numbers	1	2	3	4	5	6	7	8	Remarks
DC amplifier unit	○	○							
Event amplifier unit	□	□	□	□	□	□	□	○	
DC bridge strain amplifier unit					○				
F/V converter unit							○		
DC amplifier unit with BNC input									
Zero suppression amplifier unit			○	○					
Blank panel									

Slot numbers 9 to 16 (Lower place):

Slot numbers	9	10	11	12	13	14	15	16	Remarks
DC amplifier unit	○	○							16 units max.
Event amplifier unit	□	□	□	□	□	□	□	○	8 units max.*
DC bridge strain amplifier unit					○				8 unit max. **
F/V converter unit							○		16 units max.
DC amplifier unit with BNC input									16 units max.
Zero suppression amplifier unit			○	○					16 units max.
Blank panel									

The tables shown above show the system configuration composed of four DC amplifier units, two event amplifier units, two DC bridge strain amplifier units, two F/V converter units and four zero suppression amplifier units.

* Event amplifier unit:
  A maximum of 8 units can be built into the basic instrument. One unit can be built into the slot numbers 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12, 13 or 14, and 15 or 16. Therefore, 8 units can be built into the basic instrument in total. (One unit can be built into either slot number of each compartment.)

Two units can be built into each compartment depending on operating conditions. This means that 16 units can be built into the basic instrument in total. In this case, however, if the printing functions of two units installed in each compartment are turned ON, the waveform on the lower number channel is recorded. Therefore, be sure to turn OFF the printing function of either one. This is convenient to selectively record signals with the signals connected to the units.
Although the event amplifier unit can be installed with other types of units (DC amplifier unit, F/V converter unit, DC bridge strain amplifier unit, zero suppression amplifier unit), the waveform of the event amplifier unit is superimposed on the waveform of another type of unit during one-eighth division recording.
Care must be taken, therefore, that the signal waveform of another type of unit cannot be separated from the event waveform within the one-eighth division area.

**DC bridge strain amplifier unit:
A maximum of 8 units can be built into the basic instrument.
This unit occupies two unit spaces, and can be installed into only eight positions shown in the tables on the previous page.

1.2.3 Standard Accessories Supplied (RT3216N)

Items	Model numbers	Remarks	Qty.
AC power cable*	0311-5044	Used for 100 V AC, 2.5 m	1
Adaptor*	0250-1053	KPR-25S	1
Fuse*	0334-3022	Time-lag fuse, No.19195, 4 A	1
Recording paper holder	5633-1794	For both ends of recording paper	2
Remote connector	0245-9502	Plug, XM2A-1501	1 set
	0245-9561	Hood, XM2S-1511	
Recording paper	0511-3167	Roll paper, 219.5mm x 30m	1
Operation manual	5691-1264	Provided for basic instrument	1
Operation manual	5691-1265	Provided for GP-IB, RS-232C, remote and memory card functions	1

* When ordering the instrument used for the 200 V AC system, the items marked with * are changed to the items shown on the following page:

(The adaptor is not supplied.)

AC power cable	0311-5112	Used for 200 V AC, 3.5 m (Plug not supplied)	1
Fuse	0334-3019	Time-lag fuse, No.19195, 2 A	1

1.2.4 Consumables (for RT3208N/RT3216N).

Items	Model numbers	Remarks
Recording paper	YPS106	Roll paper, 219.5mm x 30m 5 rolls/case (0511-3172)
Recording paper	YPS108	Roll paper, 219.5mm x 30m 5 rolls/case (0511-3173) Perforation pitch: 150mm Paper supply indicating print pitch: 300mm, 99 to 00
Recording paper	YPS112	Z-fold paper, 219.5mm x 200m, Z-fold width: 300mm Paper supply indicating print (pages): 669 to 000 Note: For use of Z-fold paper, the Z-fold paper supply case (RT32-129) is required.

Note: 0511-3102 Roll paper 139.5mm, 30m for RT3108N.

1.2.5 Optional Accessories

Items	Model number	Remarks
Cable for logic IC	0311-5007	2 cables/unit
Cable for IC clip	0311-5008	4 cables/bag, 2 bags/unit
Cable for test clip	0311-5009	4 cables/bag, 2 bags/unit

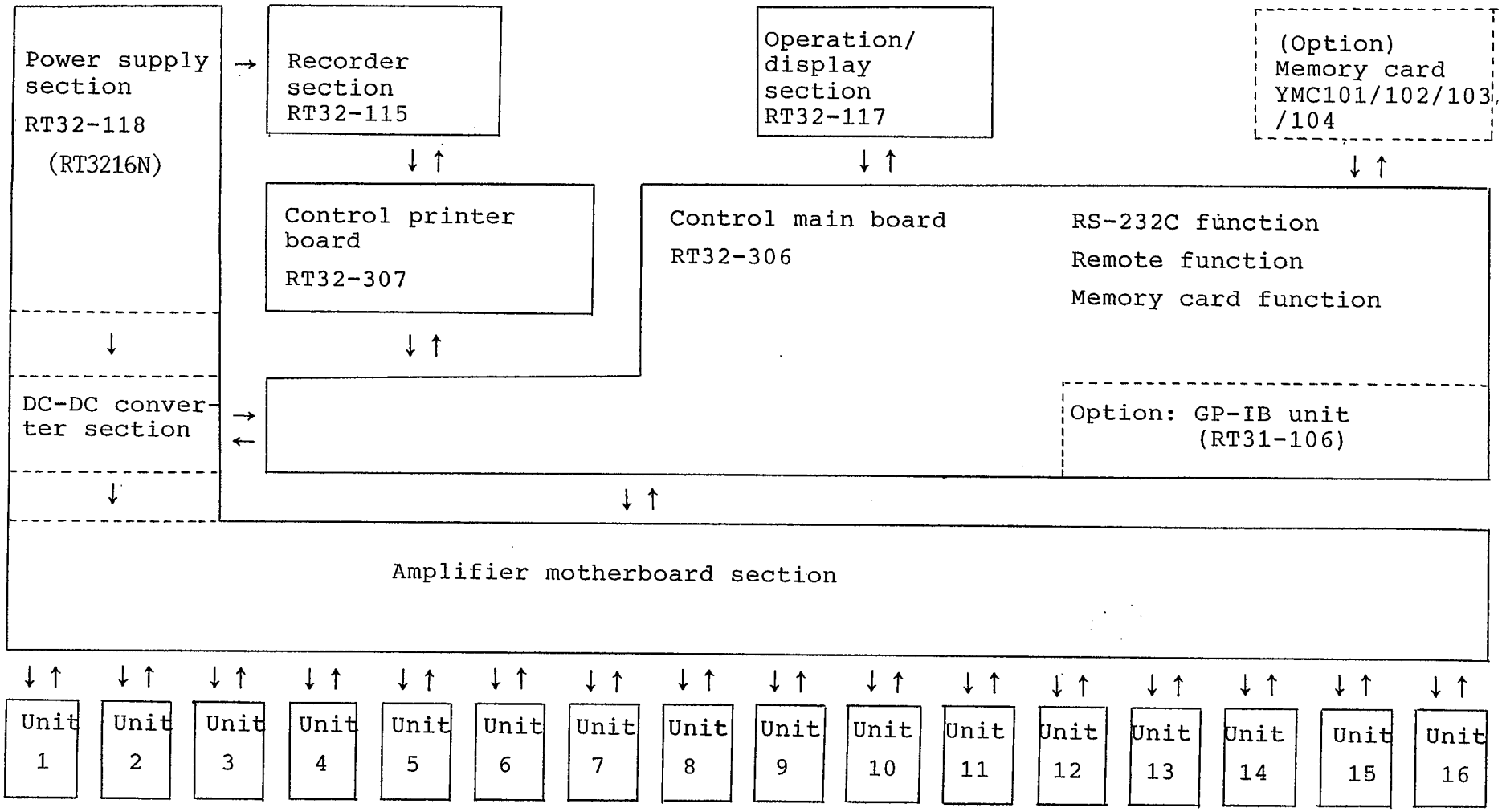
The above optional accessories are provided for the event amplifier unit (RT31-110).

1.2.6 Other Options (for RT3216N)

Items	Model numbers	Remarks
Carrying case	RT32-125	Shoulder-bag type made by vinyl leather.
Transport case	RT32-126	Aluminum trunk.
Dust cover	RT32-127	Dustproof vinyl cover.
Acrylic cover	RT32-128	Acrylic cover.
Paper take-up	RT31-127	Paper take-up for external installation.
Cover for display	RT31-125	Acrylic cover.
Touch panel sheet	RT31-122	Smoke sheet. 3 sheets/set.
IC memory card	YMC101	64K bytes, Complies with JEIDA Ver. 4.
	YMC102	512K bytes, Complies with JEIDA Ver. 4.
	YMC103	1M bytes, Complies with JEIDA Ver. 4.
	YMC104	2M bytes, Complies with JEIDA Ver. 4.
Signal input cable	0311-5107	Cable length: 2 m. Double-deck banana plug - test clip.
Z-fold paper supply case	RT32-129	

1.2.7 Options for DC Bridge Strain Amplifier Unit

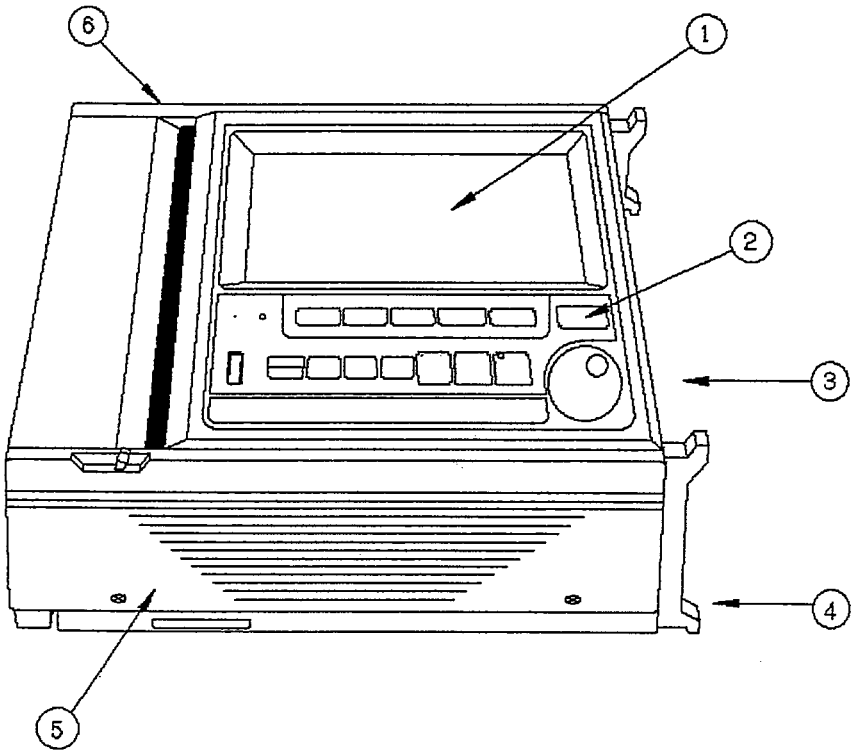
Items	Model numbers	Remarks
Bridge box with cable	5370	For 120 ohms, Cable length: 3 m.
	5373	For 350 ohms, Cable length: 3 m.
Small-sized bridge box with cable	5379	For 120 ohms, Cable length: 2 m.
	5380	For 350 ohms, Cable length: 2 m.
Interconnecting cable	47230	Cable length: 10 m.
Extension cable	47231	Cable length: 10 m.
Connector (NDIS standard)	0241-3118	PRC03-12A10-7M10.5, 7P plug.
	0241-3119	PRC03-32A10-7F10.5, 7P jack (For interconnection).



Input units:
- ° DC amplifier unit (RT31-109)
- ° Event amplifier unit (RT31-110)
- ° Zero suppression amplifier unit (RT31-131)
- ° DC bridge strain amplifier unit (RT31-111)
- ° F/V converter unit (RT31-112)
- ° DC amplifier unit with BNC input (RT31-126)
- ° Blank panel (RT31-118)

SECTION 2

DISPLAY, INPUT UNITS, OPERATING CONTROLS AND CONNECTORS, etc.



This section describes and illustrates the display, input units, operating controls and connectors, etc., as indicated in the following:

① Display (Refer to 2.1.):
This consists of an EL display and a touch-pad panel.
Setup screen displays and waveforms can be displayed on the EL display, and setup contents can be changed by the touch-pad panel.

② Operation panel (Refer to 2.2.):
A group of operating control keys and a jog dial are provided on this panel for changing screen displays or for start of recording operation.

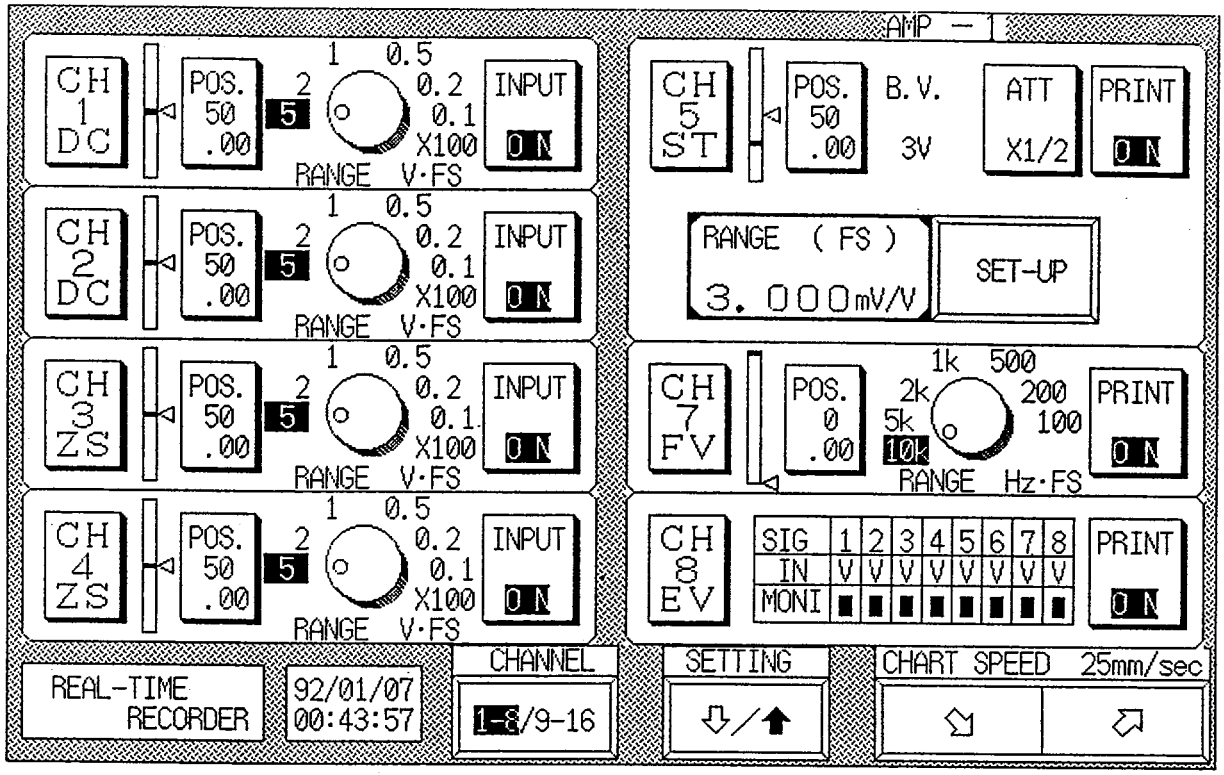
③ Input-unit compartment (Refer to 2.3.):
Input units such as DC amplifier units and event amplifier units, etc., can be built into this compartment.

④ Lower side panel (Refer to 2.4.):
A power switch, a fuse holder, an AC power socket, a ground terminal, and trigger input and output terminals are provided on this panel.

⑤ Front part (Refer to 2.5.):
A lock lever and a connector for inserting an IC memory card are provided.

⑥ Rear part (Refer to 2.6.):
Connectors for remote, RS-232C and optional GP-IB functions are provided.

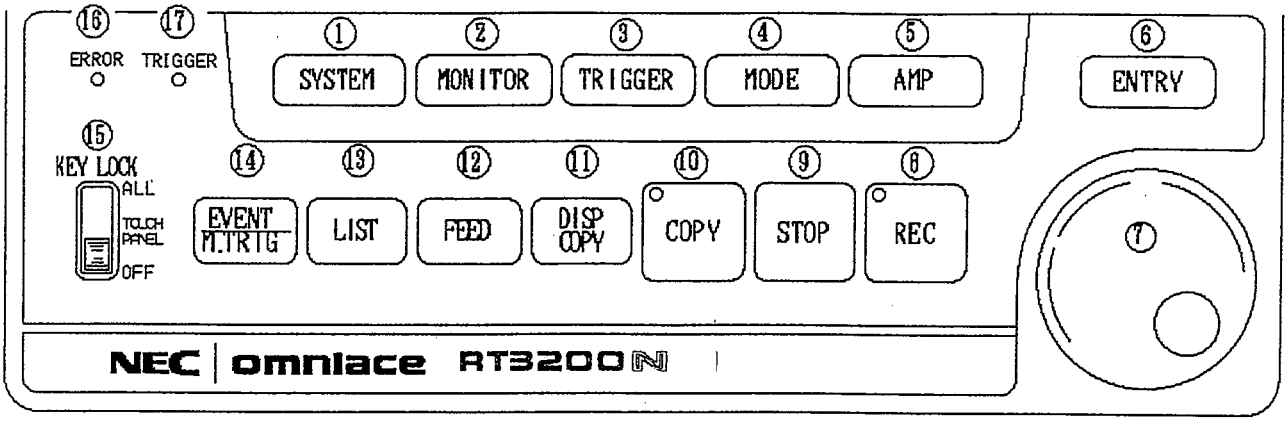
2.1 Display (for RT3216N)



(When the RT3216N contains 16 DC amplifier units, the AMP screen display illustrated above appears by turning on the power with the instrument put in the condition as shipped from the factory.)

This is an EL display provided with a touch-pad panel.
Screen displays can be selected by a group of keys located on the operation panel. (SYSTEM, MONITOR, TRIGGER, MODE and AMP keys)
In addition, the setup contents displayed on the screen can be changed by the ENTRY key and the jog dial on the operation panel, and by lightly touching touch-pad keys on the screen display.

2.2 Operation Panel



① [SYSTEM] (System key):

The selected screen display of a recorder type (real-time recorder, memory recorder or transient recorder) or the setup screen display of an additional function can be displayed.

② [MONITOR] (Waveform monitoring key):

An input signal can be monitored directly as a waveform, or memory data can be displayed as a waveform, data or an X-Y format.

③ [TRIGGER] (Trigger key):

The setup screen display of a trigger condition can be displayed.

④ [MODE] (Mode (record/memory) key):

The setup screen display of a recording condition for each recorder type can be displayed.

⑤ [AMP] (AMP key):

The setup screen display of a recording condition for each input unit can be displayed.

⑥ [ENTRY] (Entry key):

This is used to set up a screen display.

⑦ Jog dial:

This is used to set up a screen display.

⑧ [○ REC] (REC (record start) key):

This is used to start recording.

Real-time recorder:

When this key is pressed, the LED lights during recording.

Memory recorder:

When this key is pressed, the LED lights to allow memory write to be started. Then, when a trigger is generated, the LED starts blinking and goes out when memory write has been completed.

⑨ [STOP] (Stop key):

This is used to stop recording operation.

⑩ [○ COPY] (Memory copy key):

This is used to copy memory contents.

The LED lights during recording.

⑪ [DISP COPY] (Display copy key):

This is used to produce a hard copy of contents displayed on the screen. When this key is pressed, the LED, which is located on the COPY key ⑩, lights to indicate that the instrument is put into the hard-copy operation.

⑫ [FEED] (Feed (paper advancing) key):

This is used to advance recording paper without recording.

While this key is pressed, recording paper advances.

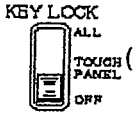
⑬ [LIST] (List print key):

This is used to print the setup contents of an input unit or the basic instrument, or memory contents (the maximum/minimum values, etc., of an input signal).

⑭ EVENT / M.TRIG (Mark print/manual trigger key):

In the case of the memory recorder or the transient recorder, a trigger is generated by pressing this key irrespective of the trigger setup contents.

In the case of the real-time recorder, an event mark (M date and time) is printed on one edge of recording paper.

⑮ 

(Key lock switch):

This switch is provided to avoid inadvertent key operation.

ALL: All keys are disabled.

TOUCH PANEL: Touch-pad-panel keys are disabled.

OFF: All keys are energized.

⑯ ERROR (Error LED):
○ (Red)

This LED lights in the following conditions:

° When the instrument is not loaded with recording paper.

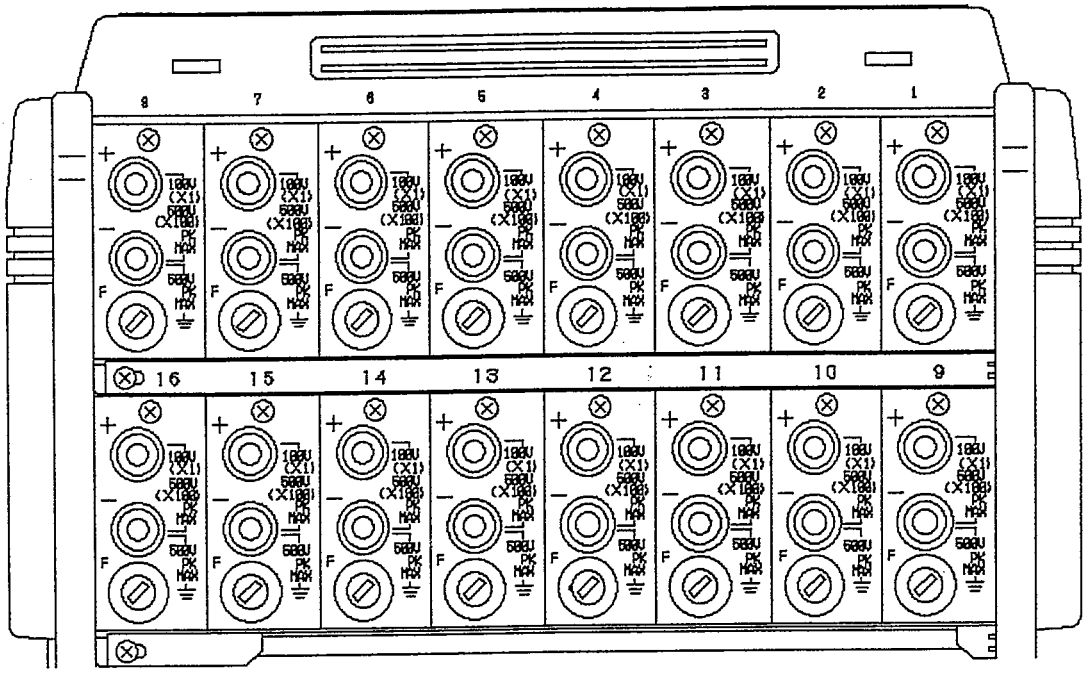
° When the pressure of the thermal print-head is released.

° Should the temperature of the thermal print-head rise abnormally.

⑰ TRIGGER (Trigger LED):
○ (Orange)

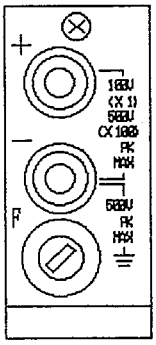
When a trigger setup condition is satisfied, the LED lights momentarily to indicate that a trigger occurs.

2.3 Input-unit Compartment



The above figure illustrates the 16-channel DC amplifier configuration of the basic instrument.

2.3.1 DC Amplifier Unit (RT31-109)



+, - (input terminals):

Dual type binding posts.

The negative (-) terminal is connected to GUARD inside the unit.

Allowable input voltage;

Range x1;

100 V (DC or AC peak value).

Range x100;

500 V (DC or AC peak value).

Common mode voltage;

500 V (DC or AC peak value).

F (fuse holder):

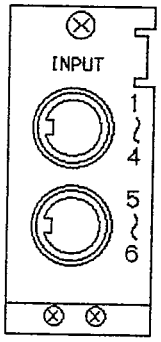
A 0.1 A fuse is installed as standard to protect the DC amplifier unit from an excessive input voltage. In addtion, a 10 mA fuse (0334-2105) is available for protection.

Note:

The fuse for protection is installed to reduce any possibility of the unit being damaged and it is not provided to completely protect the unit itself.

A signal-input cable (0311-5107: Double-deck banana plug - test clip, cable length: 2 m) is available.

2.3.2 Event Amplifier Unit (RT31-110: Option)



INPUT (input connectors):

Two round 8-pin DIN connectors.

One is for channel 1 to channel 4, and the other for channel 5 to channel 8.

These connectors can connect the following probes:

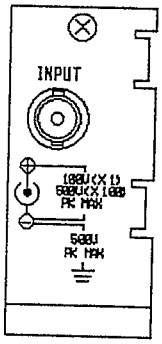
° Supplied probe for logic IC.

° Probe for floating voltage (1539).

° Probe for voltage fluctuation (1540, 1543).

The 8 channels inside the unit are COMMON.

2.3.3 DC Amplifier Unit with BNC Input (RT31-126: Option)



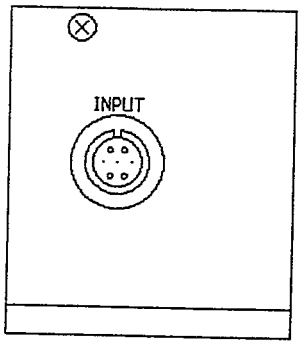
With regard to the DC amplifier unit with BNC input, the input terminals of the DC amplifier unit (RT31-109) are changed to a coaxial connector to allow connection to the output of a data recorder through a coaxial cable.

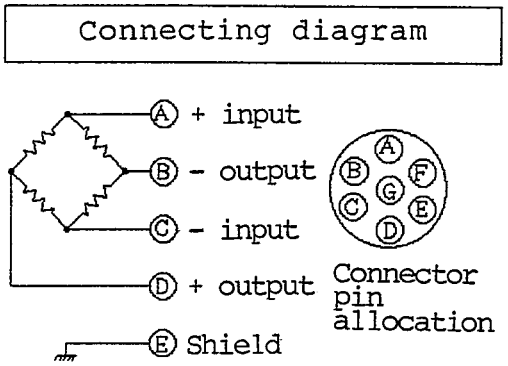
Since the negative (-) side of a signal is connected to the shell of the coaxial connector, this part should not be touched to avoid any possibility of a serious danger. A signal source to be connected should, therefore, be carefully inspected before use, or it is recommended to use the standard DC amplifier unit (RT31-109).

2.3.4 DC Bridge Strain Amplifier Unit (RT31-111: Option)

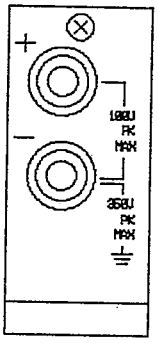
INPUT connector:

A strain-gage-based transducer can be connected to this connector.





2.3.5 F/V Converter Unit (RT31-112: Option)



+, - (input terminals):

Dual type binding posts.

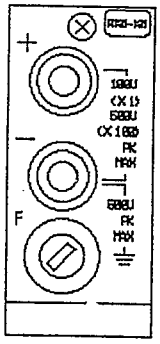
Allowable input voltage;

100 V (DC or AC peak value).

Common mode voltage;

350 V (DC or AC peak value).

2.3.6 Zero Suppression Amplifier Unit (RT31-131: Option)



+, - (input terminals):

Dual type binding posts.

Allowable input voltage;

Range of 0.1 to 1 V FS;

100 V (DC or AC peak value).

Range of 2 to 500 V FS;

500 V (DC or AC peak value).

Common mode voltage;

500 V (DC or AC peak value).

The negative (-) terminal is connected to GUARD inside the unit.

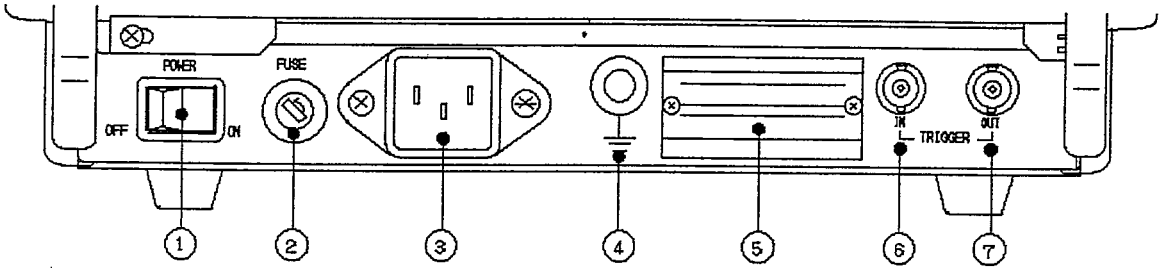
F (fuse holder):

A 0.1 A fuse is installed as standard to protect the zero suppression amplifier unit from an excessive input voltage. In addition, a 10 mA fuse (0334-2105) is available for protection.

Note:

The fuse for protection is installed to reduce any possibility of the unit being damaged and it is not provided to completely protect the unit itself.

2.4 Lower Side Panel



① POWER switch:

This switch turns ON or OFF the power to the instrument.

② FUSE holder:

Time lag fuse	Power (RT3216N)
4.0 A	100 V AC system
2.0 A	200 V AC system

Time lag fuse	Power (RT3108N)
2.0 A	100 VAC
1.0 A	200 VAC

Time lag fuse	Power (RT3208N)
3.15 A	100 VAC
1.6 A	200 VAC

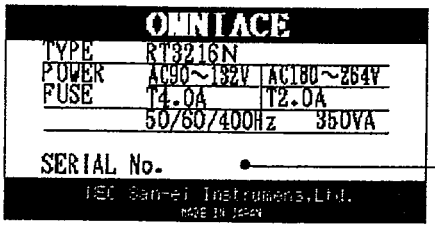
③ AC power socket:

The furnished AC power cable is connected to this socket.

④ ⏚ (Ground terminal):

This is an additional protective ground terminal for grounding the instrument.

⑤ Rating plate:



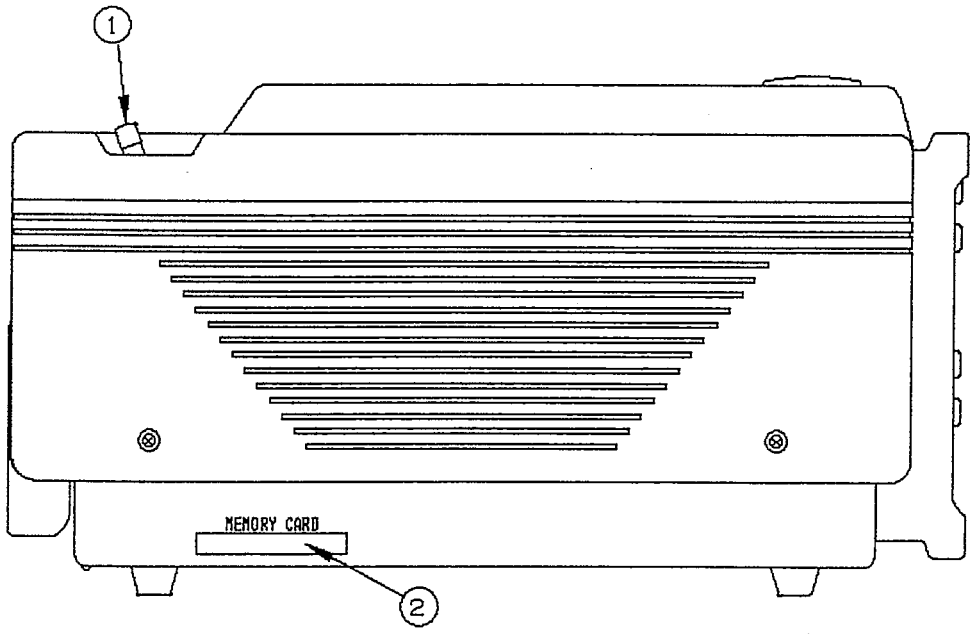
⑥ TRIGGER IN (External trigger input terminal: BNC coaxial connector):

This is used when the instrument is to be operated by an external trigger.

⑦ TRIGGER OUT (Trigger output terminal: BNC coaxial connector):

This is used when two or more instruments are to be operated in parallel by a trigger or when a triggered condition is to be monitored.

2.5 Front Part



① LOCK lever:

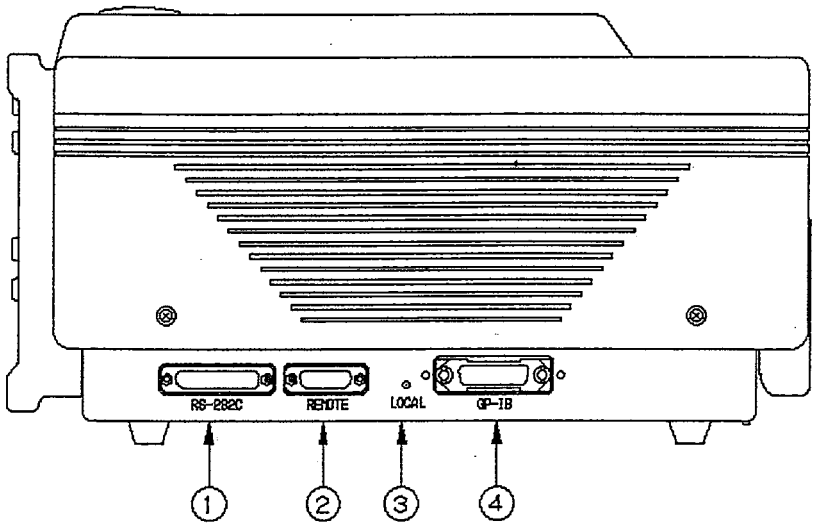
This lever is used to raise or lower the thermal print-head.
To set recording paper, place the lever to the right-side position to raise the thermal print-head. To record data, place the lever to the LOCK side.

② MEMORY CARD connector:

An IC memory card is inserted into this connector.
Following IC memory cards are available:

IC memory cards (Option)	YMC101	64K bytes
	YMC102	512K bytes
	YMC103	1M bytes
	YMC104	2M bytes

2.6 Rear Part



① RS-232C connector:

This connector is provided to connect an external instrument (host computer, etc.).

② REMOTE connector:

This connector is provided for the following purposes:

° External start ON/OFF.
° Paper advancement synchronously with an external pulse.
° External event marking.
° Paper advancement.
° Remote input/output of an error output.

③ LOCAL switch:

This is a selector switch to put the instrument into the REMOTE or LOCAL mode.

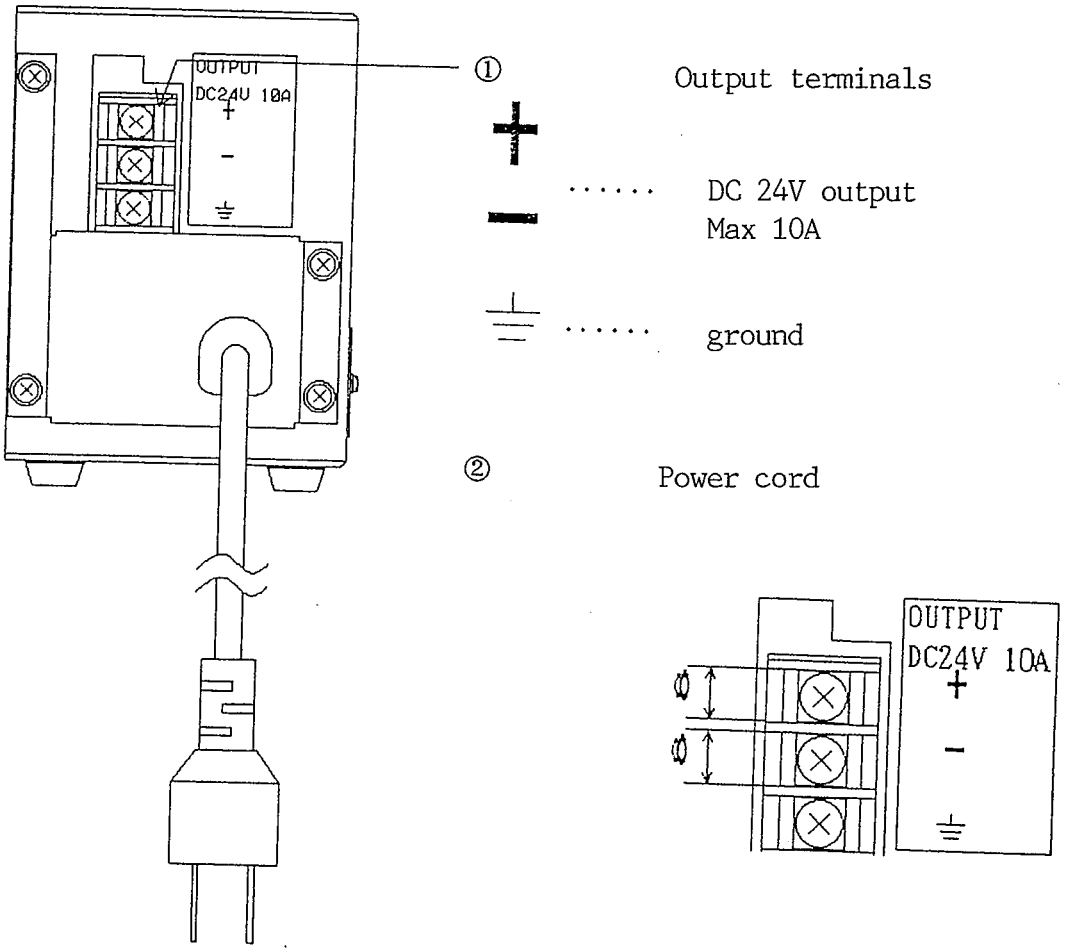
④ GP-IB connector (GP-IB unit RT31-106: Option):

This connector is provided to connect an external instrument (host computer, etc.).

2.7 AC Adaptor , (option RT31-128)

This adaptor is for RT3108N-1 , RT3208N-1 and RT3216N-1 DC power supply models to supply each recorder with DC 24V power output.

Caution: First connect output terminals of adaptor with the recorder and then AC power cord of adaptor with power source outlet.



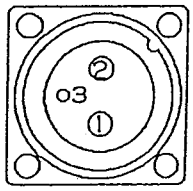
2.8 Power consumption

A maximum power consumption for DC power models RT3108N-1, RT3208N-1 and RT3216N-1 is as follows when each recorder is operated on DC11V.

Model No.	Max.consumption	Current flowing into DC power cord
RT3108N-1	approx. 120VA	approx. 11A
RT3208N-1	approx. 170VA	approx. 11A
RT3216N-1	approx. 220VA	approx. 18A

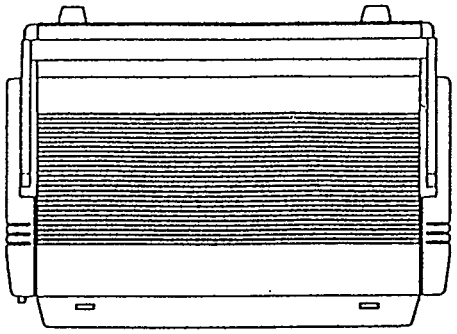
Note: DC power cable should be selected carefully considering the current flowing as described above into the DC power cable respectively.

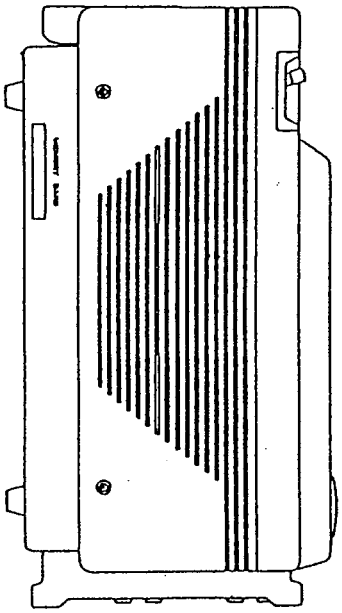
RT3216N-1, DC power version (DC11 - 28V)

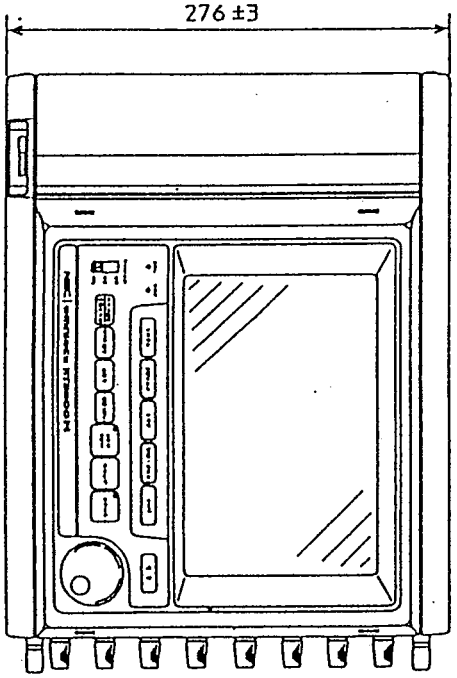


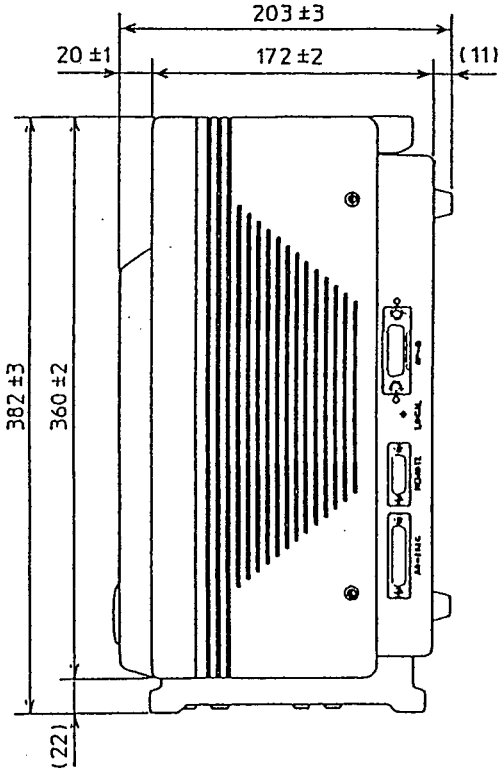
A white lead is for pin-1, positive(+),
A black lead is for pin-2, negative(-).
DC power cable 0311-5167 is supplied as standard.

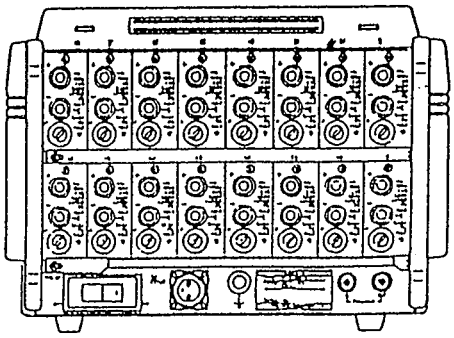
15A for RT3108N-1 and RT3208N-1, and 20A for RT3216N-1 at power protector respectively.











SECTION 3

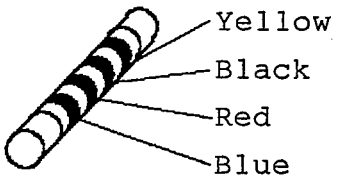
OPERATING INSTRUCTIONS

3.1 Preparation before Use and Precautions

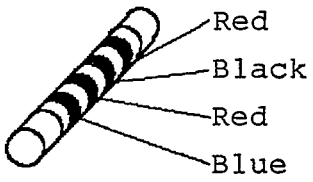
3.1.1 Checkout before Connecting AC Power

Before connecting the AC power cable, verify that the POWER switch is turned OFF.
Also verify that the power source voltage to be connected is within the range indicated on the rating plate.
Verify that a proper fuse (4.0 A fuse for 100 V AC system, 2.0 A fuse for 200 V AC system) is installed in the FUSE holder. (RT3216N)

Time lag fuse 4.0 A: for 100 V AC system.



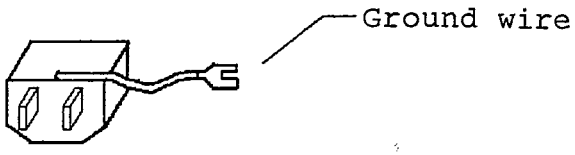
Time lag fuse 2.0 A: for 200 V AC system.



Note: 2.0A for 100VAC, 1.0A for 200VAC(RT3108N)
3.15A for 100VAC, 1.6A for 200VAC(RT3208N)

3.1.2 AC Power Cable

The plug of the AC power cable (0311-5044: 100 V AC system, cable length: 2 m) provides 3 pins, the central cylindrical pin of which is a protective ground terminal. When the adaptor (0250-1053: KPR-25S) is used with the plug, the ground wire of the adaptor or the ground terminal of the basic instrument must be connected to an external ground terminal without fail.



Caution:

The ground wire is treated with shrinkable tubing to prevent the ground wire from being inserted into the AC power outlet. Therefore, if it is to be connected to an external ground terminal, remove this tubing.

3.1.3 Operating Environment

The location of this instrument should be under environments of the ambient temperature of 0°C to +40°C and the ambient humidity of 35% to 85% RH. In addition, the instrument should be horizontally placed. To properly operate this instrument, it should not be installed in the following locations:

- An area exposed to direct rays of the sun or an area near a heater, etc.
- An area filled with moisture, steam, dust and smoke.
- An area where corrosive gases are generated or an area exposed to salt sea breeze.
- An area affected by severe vibration or shock.
- An area affected by surge voltages of lightning or a contact breaker, etc., or by interfering radio waves.
- An area where the ventilating holes of the front and rear covers of the instrument are blocked by obstacles.

If the instrument should not properly function, proceed as follows:
If the instrument should not properly function owing to the fact that it is operated in an adverse environment exceeding the limit of the specified operating condition or because it is operated under the effect of a common mode noise of more than the specified value, operate the instrument, as indicated in the following:

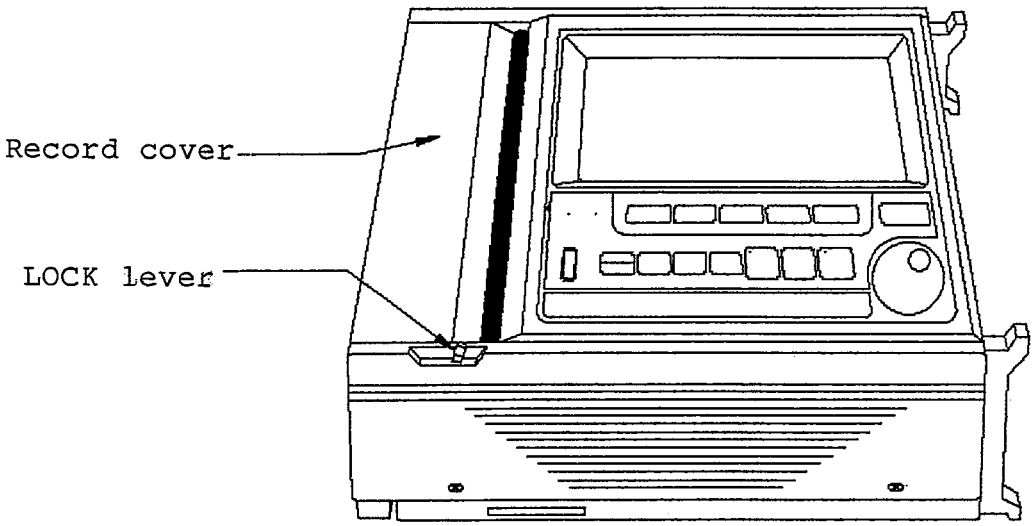
1. Turn OFF the POWER switch.
2. Set the KEY LOCK switch to ALL.

3. While pressing the STOP and REC keys, turn ON the POWER switch.
4. When a screen display appears, set the KEY LOCK switch to OFF.

3.2 Paper Loading

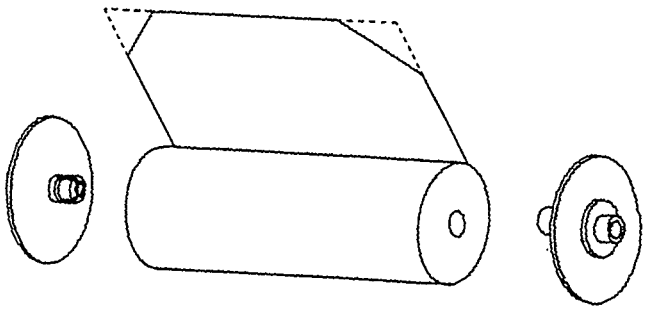
3.2.1 Roll Paper Loading

(1) The figure below shows the basic instrument.

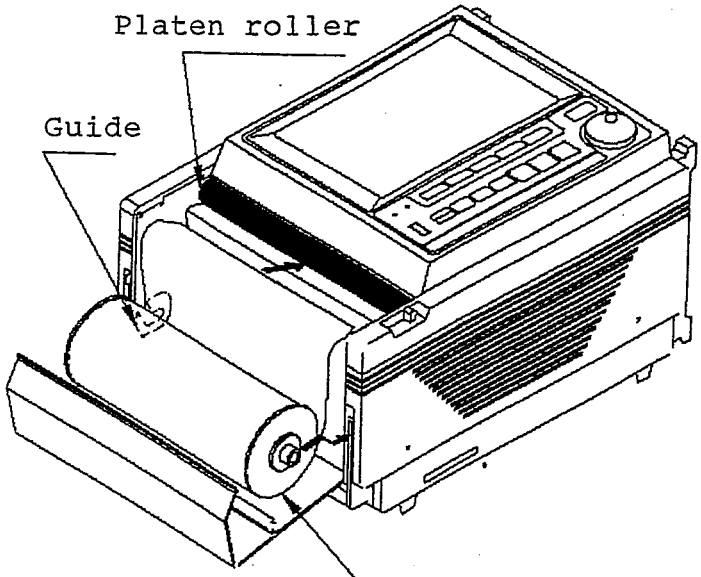


1. Open the record cover located at the left side of the instrument.
2. Set the LOCK lever to the right side to raise the thermal print-head.

(2) Insert the paper supply flanges to both ends of recording paper roll. If the paper roll to be loaded was used for some length,of paper, cut both edges of paper as illustrated in the figure below to make paper loading easier. Avoid using part of a newly loaded paper fixed with a piece of tape, as it may not be colored.

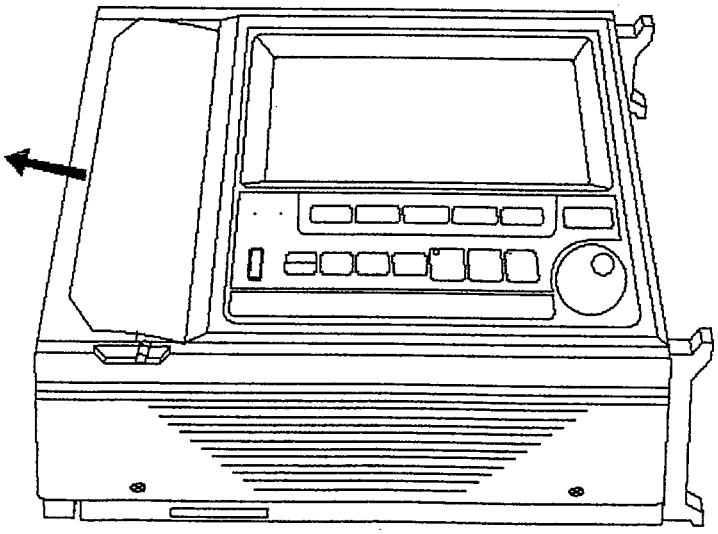


(3) Load recording paper along the guide into the paper supply compartment. At this time, the recording paper must be installed in the proper winding direction.



Load the instrument with recording paper so that this part of paper is not slackened.

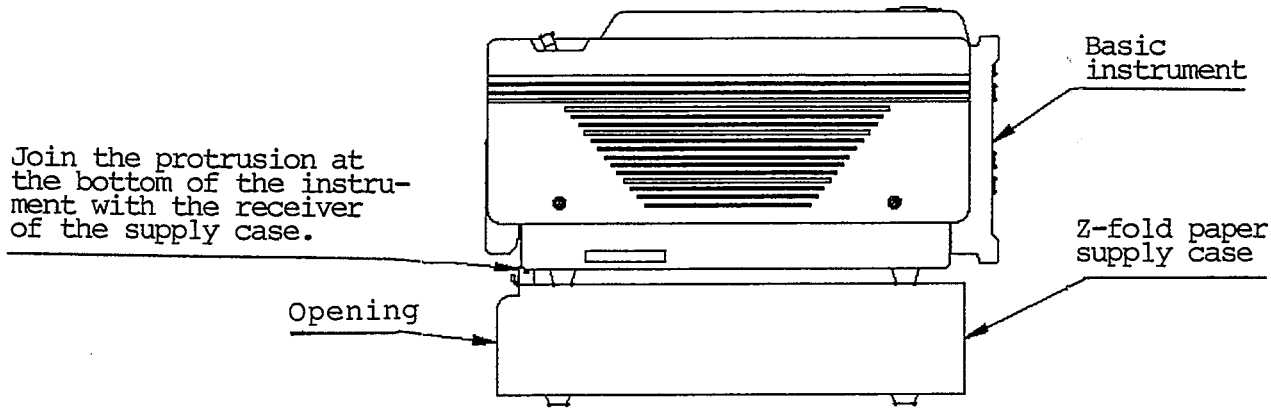
(4) Insert the tip of recording paper into the gap beneath the platen roller (black roller) and pull it out from above the platen roller for approximately 10 centimeters in the arrow direction.
In this case, the recording paper should be taut in the paper supply compartment and that the edges of recording paper should be in parallel with the surfaces of the flanges.
If the recording paper is not set properly, it may weave.



3.2.2 Z-fold Paper Loading (only for RT3208N and RT3216N)

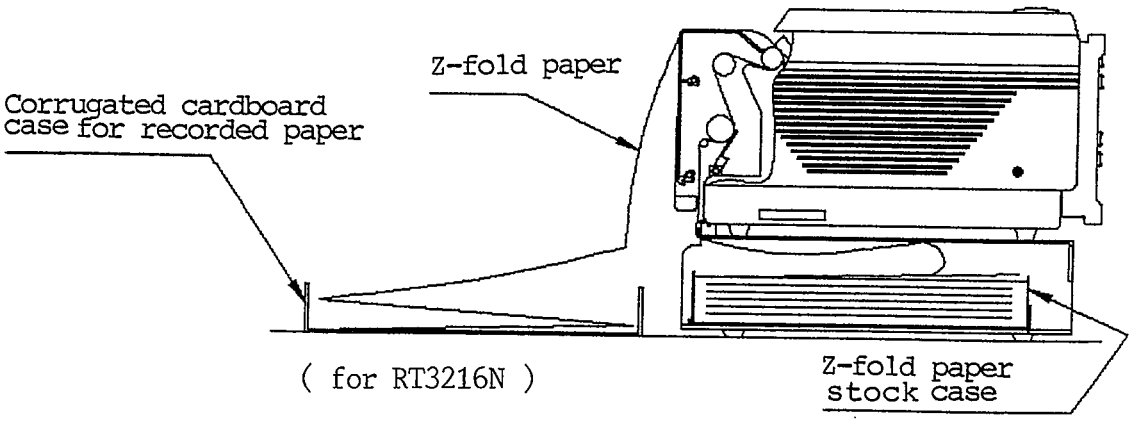
Although Z-fold paper (YPS112) can be loaded into this instrument, the Z-fold paper supply case (RT32-129: Option) is required. The fold width of Z-fold paper is 30 cm and the paper length is 200 m. Page numbers (669 ~ 000) are stamped on each page so that the amount of paper remaining in the instrument can be known.

(1) Place the basic instrument on the Z-fold paper supply case.
Place the Z-fold paper supply case on a horizontal place and then place the basic instrument on it. At this time, space must be provided for recorded Z-fold paper (at the left side of the instrument shown in the figure below). Place the basic instrument on the Z-fold paper supply case with the protrusion at the bottom of the instrument joined with the receiver of the supply case.

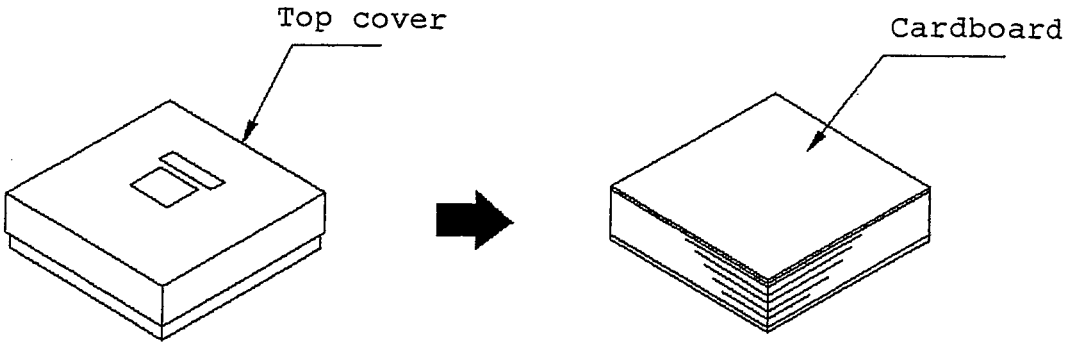


Note: Z-fold paper supply case for RT3216N can not be used for RT3208N.

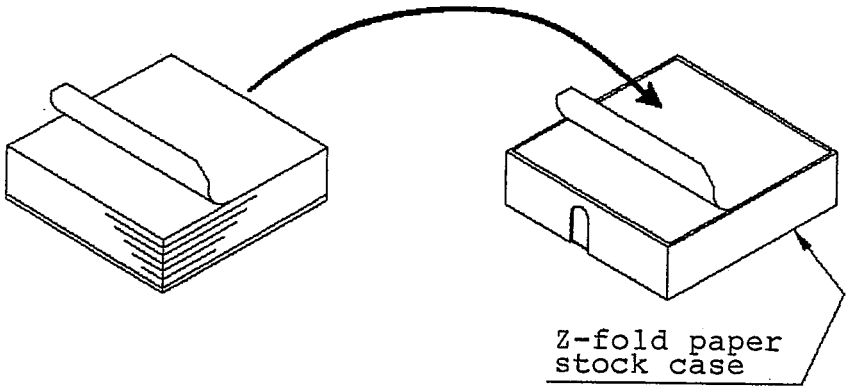
(2) Paper loading
The figure below shows the entire view of the instrument loaded with Z-fold paper.



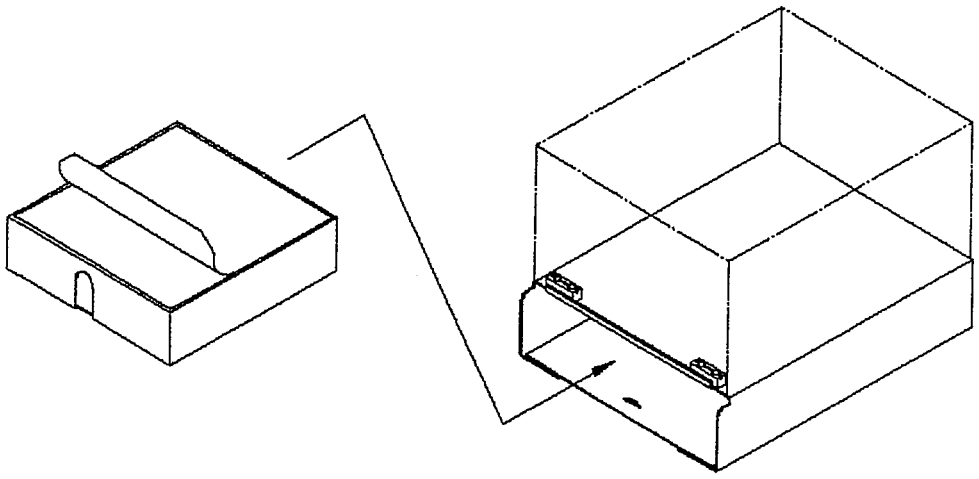
1. Open the top cover of the container for recording paper and take out the package of recording paper. Break the seal of the transparent polyvinyl chloride package.
   Use the top cover as a receiving case for recorded paper.



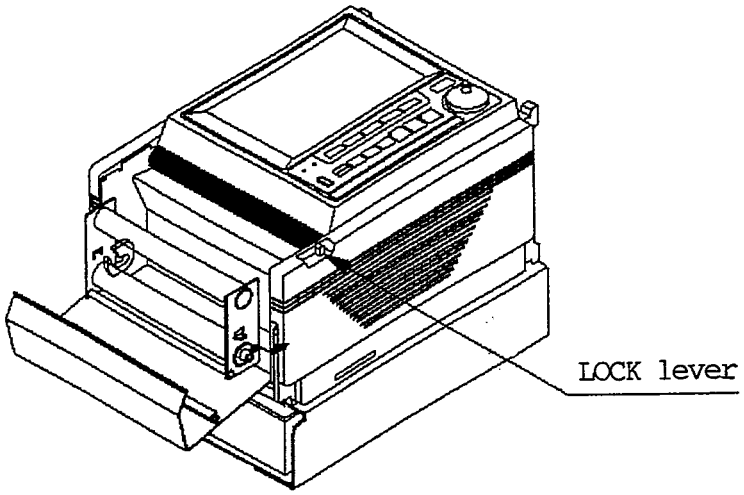
2. Remove the top cardboard and put the pack of recording paper into the stock case together with the bottom cardboard.



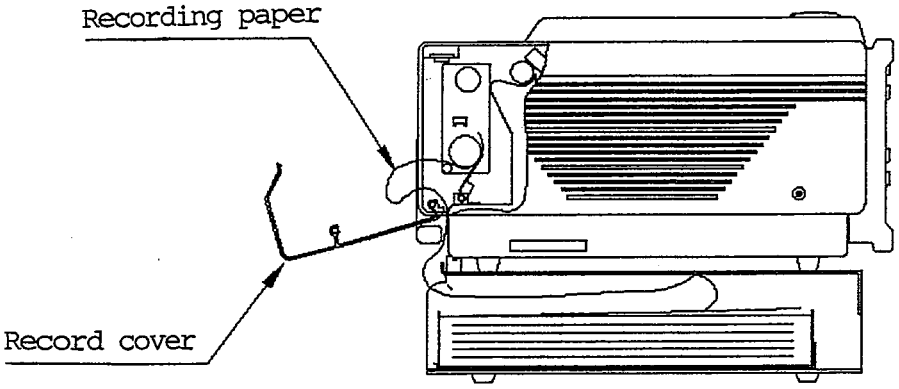
3. Put the stock case into the z-fold paper supply case with the cut top part of recording paper to the opening side of the supply case.



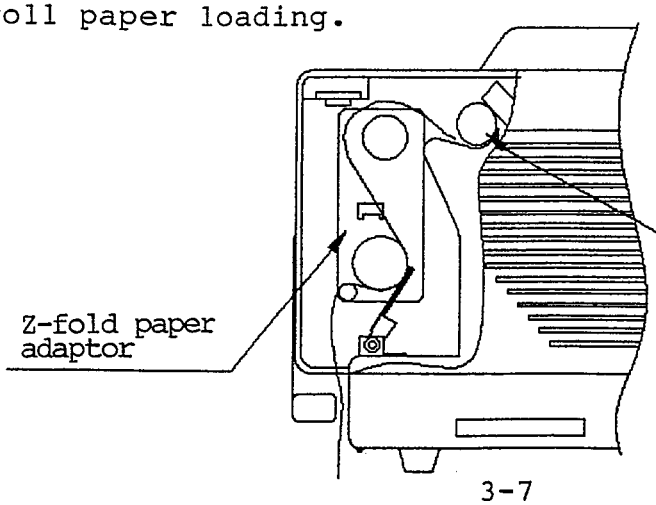
4. Set the LOCK lever of the instrument to the right-side position, open the cover for recording paper and attach the Z-fold paper adaptor.



5. Pull recording paper out of the Z-fold paper supply case and pass it from beneath the record cover into the recording section.



6. Pass recording paper on the rollers of the Z-fold paper adaptor, as shown in the figure below, and insert the top part of paper from beneath the platen roller.
After this has been done, the procedure is the same as that for roll paper loading.



Note: Adaptor for RT3216N can not be used for RT3208N.

7. Pull out recording paper by holding the top edges of paper to set it in parallel, set the LOCK lever to the left-side position and close the record cover.

8. Press the FEED key on the operation panel to verify that recording paper advances properly and does not weave.
   Use the top cover of the container for recording paper as a receiving case for recorded paper.
   If one or two pages of folded recording paper are put into this receiving case, this makes paper folding relatively easier.
   Besides, note that recorded paper emerging from the instrument may not be satisfactorily folded by natural fall owing to the effects of humidity or environments for installation.

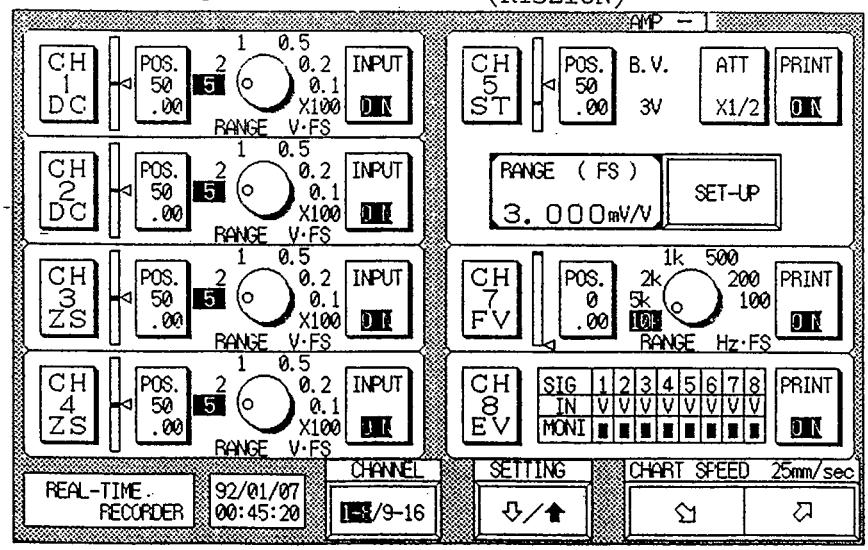
3.3 Power Application and Initial State

3.3.1 Power Application

When the installation for the instrument has been completed, connect the AC power cable and turn on the power to the instrument in the following manner:

(1) Connect the connector of the AC power cable to the AC power socket on the lower side panel.
(2) Connect the plug of the AC power cable to a proper power outlet.
(3) Turn ON the POWER switch.

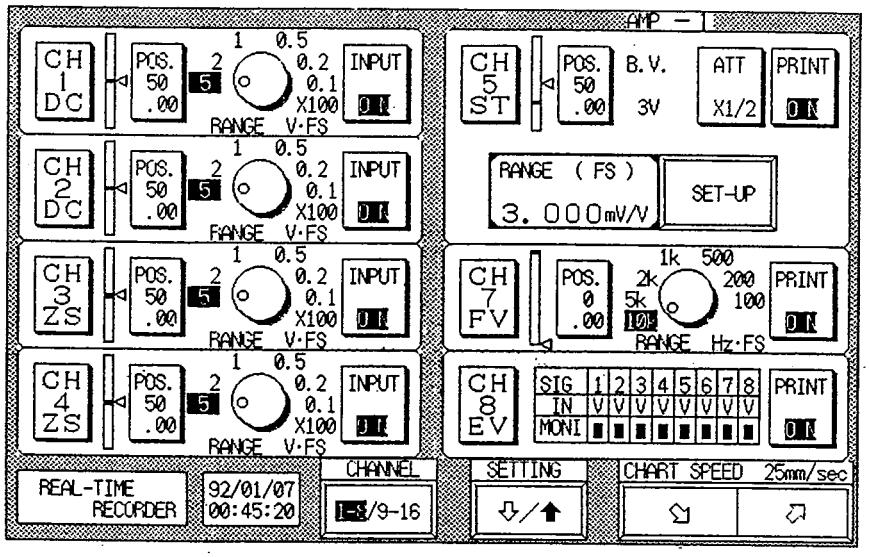
When the POWER switch has been turned ON, an AMP-1 display appears, as shown in the figure below: (RT3216N)



3.3.2 Initial State

When the power to the instrument is turned on with the instrument put in the condition as shipped from the factory, the AMP-1 display appears, indicating that the instrument is set up, as shown below:

(RT3216N)



In the case of the above AMP-1 display, the instrument contains two DC amplifier units, two zero suppression amplifier units, one DC bridge strain amplifier unit, one F/V converter unit and one event amplifier unit in slot 1 to slot 8.

Recorder type: Real-time recorder.

MODE

Recording format:

Waveform.

Paper speed:

25 mm/sec.

Shot:

Continuous.

Full scale:

Divided into 16 equal parts (1/16)

Real-time trigger:

OFF.

AMP

DC amplifier unit

Input:

ON (Input ON, record ON).

Sensitivity:

500 V FS.

Base line:

50.00.

Filter:

OFF.

Event amplifier unit

Print:

ON.

Input:

Voltage input.

DC bridge strain amplifier unit

Print:

ON.

Sensitivity:

3.000 mV/V

Base line:

50.00.

Magnification:

x1/2

Bridge excitation voltage:

3 V.

F/V converter unit

Print:

ON.

Sensitivity:

10 kHz FS

Base line:

50.00.

Zero suppression amplifier unit

Input:

ON (Input ON, record ON).

Sensitivity:

500 V FS.

Base line:

50.00.

Filter:

OFF.

When the REC key on the operation panel is pressed in the state shown above, real-time waveform recording is carried out and recording is stopped by pressing the STOP key.

3.4 Input Signal Connection

There are various types of input units available for a wide variety of measurement purposes.

Input units	Maximum number of units that can be installed in the basic instrument for RT3216N, 16-CH
DC amplifier unit	16
Zero suppression amplifier unit	16
DC amplifier unit with BNC input	16
Event amplifier unit	8
DC bridge strain amplifier unit	8
F/V converter unit	16

° The input of each unit is isolated from its output.

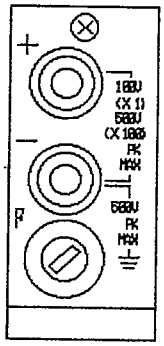
° The units, which are installed in the basic instrument, are isolated with each other, and they are also isolated from the housing case of the basic instrument.

3.4.1 Connection of DC Amplifier Unit, Zero Suppression Amplifier Unit and DC Amplifier Unit with BNC Input

(1) Connection

The input section of each unit is shown in each figure below: Fundamentally, connect the positive (+) input terminal (red-coded or coaxial central contact) to the high-impedance side (H (hot) side) of a signal source and the negative (-) input terminal (gray-coded or coaxial shell) to the low-impedance side (L (cold) side) of the signal source.

DC amplifier unit

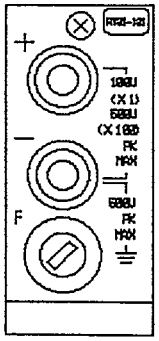


Signal source

(+) ← High-impedance side ← (+)

(-) ← Low-impedance side ← (-)

Zero suppression amplifier unit

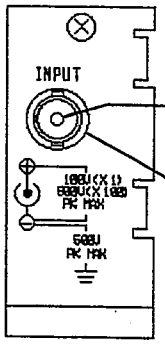


Signal source

(+) ← High-impedance side ← (+)

(-) ← Low-impedance side ← (-)

DC amplifier unit with BNC input



Signal source

Central contact ← High-impedance side ← (+)

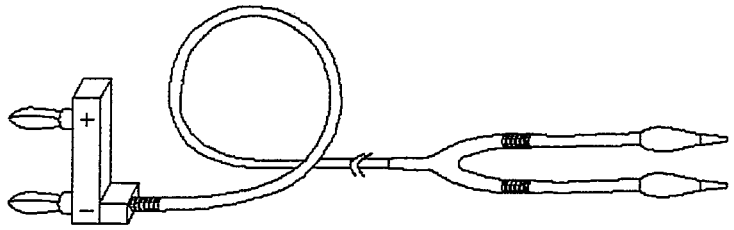
Shell ← Low-impedance side ← (-)

° To record a very small signal, note the following points:
The input cable should be as short as possible. For electrostatic noises, use a shielded cable. For electrical noises, twist the positive (+) and negative (-) leads of the input cable together.

° The signal source impedance should be less than 100 ohms.
The lower the signal source impedance, the less the noise contained in recorded data.

(2) Signal input cable

A signal input cable (0311-5107: Option) is available and can be used for the DC amplifier unit, zero suppression amplifier unit and F/V converter unit.
Connect the positive (+) and negative (-) tips of the connector of the signal input cable to the positive (+) and negative (-) terminals of each input unit to cause coincidence between the positive terminals, and between the negative terminals.



(3) Cautions on input signal

1. The common-mode voltage (CMV) must be less than 500 V DC or AC peak value.
The insulating material of the cable to be used must withstand the voltage of more than 500 V.
A pulsed common-mode noise should not be applied, either. If it is applied and should exceed the common-mode voltage, the unit may malfunction.
2. Maximum input voltage
If a voltage exceeding the maximum input voltage specified for each sensitivity range should inadvertently be applied, electrical parts inside the instrument may be damaged.
Care must be taken, therefore, not to allow the input voltage to exceed the specified value in each sensitivity range, as shown on the following page.

Sensitivity (V FS)	0.1, 0.2, 0.5, 1, 2, 5	10, 20, 50, 100, 200, 500
Allowable input voltage (V)	100 V	500 V

3. Input impedance

   The input impedance is approximately 1 MΩ.

   Care should be taken, however, that if the input voltage is more than approximately ±11 V in the range of 0.1 to 5 V/FS, the protection circuit is actuated, causing the input impedance to be approximately 10 kΩ.

4. DC amplifier unit with BNC input

   With regard to the DC amplifier unit with BNC input, the input terminals of the DC amplifier unit (RT31-109) are changed to a coaxial connector to allow connection to the output of a data recorder through a coaxial cable.

   Since the negative (-) side of a signal is connected to the shell of the coaxial connector, this part should not be touched to avoid any possibility of a serious danger.

   A signal source to be connected should, therefore, be carefully inspected before use, or it is recommended to use the standard DC amplifier unit (RT31-109).

3.4.2 Connection of Event Amplifier Unit

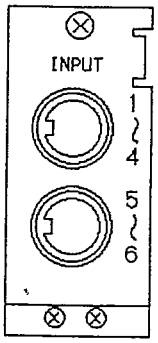
(1) Connection

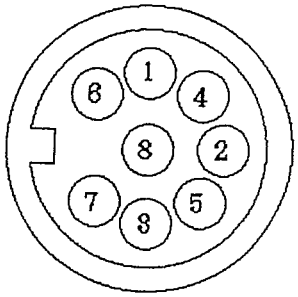
The input section of the event amplifier unit is shown in the figure below:

To operate this unit, connect the furnished probe for logic IC to the input connector (round DIN 8-pin connector).

The input of the unit is isolated from its output, and both of them are isolated from the housing case of the basic instrument.

Channel 1 to channel 8 inside the unit are COMMON.





Input connector as viewed from the plug-insertion side

Connector 1 ~ 4

Pin No.	Signal name
1	Channel 1 input
2	Channel 2 input
3	Channel 3 input
4	Channel 4 input
5	GND
6	+15 V output
7	N. G.
8	N. G.

Connector 5 ~ 8

Pin No.	Signal name
1	Channel 5 input
2	Channel 6 input
3	Channel 7 input
4	Channel 8 input
5	GND
6	+15 V output
7	N. G.
8	N. G.

(2) Input signal

Voltage input	Input voltage range	0 ~ +24 V
	Detecting level	H level: Approx. 2.5 V or more L level: Approx. 0.5 V or less
	Input current	Less than 1 μA
Contact input	Detecting level	Open: Greater than 2 kΩ Short: Less than 250 kΩ
	Load current	2 mA (max.)

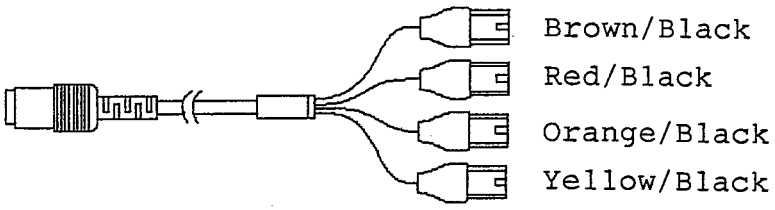
Caution: When an input voltage is applied beyond the range, an input impedance becomes approx. 50Kohm as the protection circuit effects.

(3) Probe for logic IC

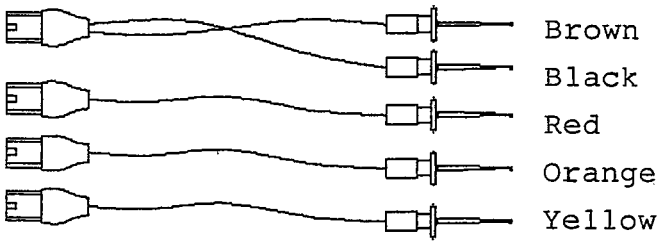
The probe for logic IC is composed of a cable for logic IC, a cable for IC clip and a cable for test clip.

When connecting the cable for IC clip or the cable for test clip to the cable for logic IC, connect the same color-coded leads to each other.

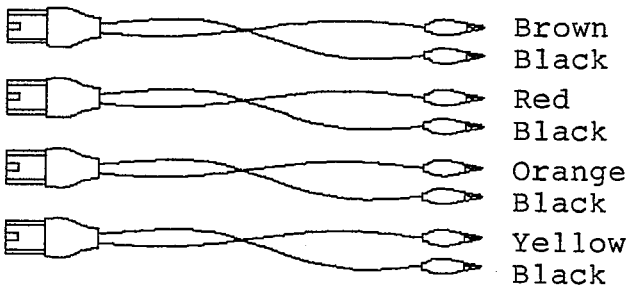
° Cable for logic IC (0511-5008)



° Cable for IC clip



° Cable for test clip



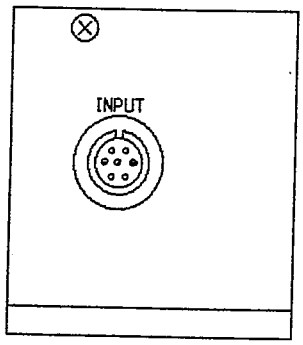
Channels		Cable for logic IC	Cable for IC clip	Cable for test clip
1	5	Brown/Black	Brown/Black	Brown/Black
2	6	Red/Black	Red	Red/Black
3	7	Orange/Black	Orange	Orange/Black
4	8	Yellow/Black	Yellow	Yellow/Black

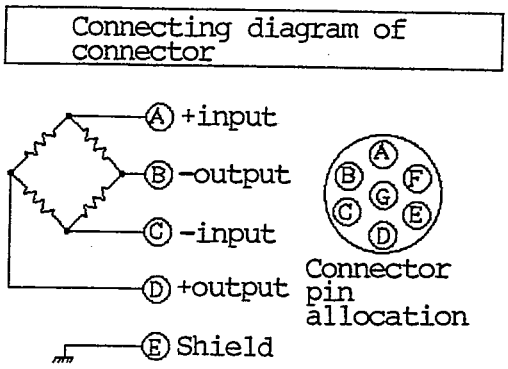
3.4.3 Connection of DC Bridge Strain Amplifier Unit

(1) Connection

The input section of the DC bridge strain amplifier unit is shown in the figure below:

Connect a strain-gage-based transducer to the input connector.





(2) Cautions on use of transducer

1. Securely fix the transducer by referring to the manufacturer's instruction manual for transducer. If the transducer is unstably fixed, the unit may malfunction or this may be the cause of occurrence of noises.
2. Although the transducer and its connector are generally proof against the effect of humidity, avoid splashes of water or rain.
3. Use the transducer whose shield (E) terminal is not connected to other terminals (A, B, C, D).
4. Avoid placing the transducer and its connecting cable in a strong electric or magnetic field.
5. If the cable from the bridge box or the transducer to the instrument is long, the bridge excitation voltage may drop by the conductor's resistance of the cable, as shown below:

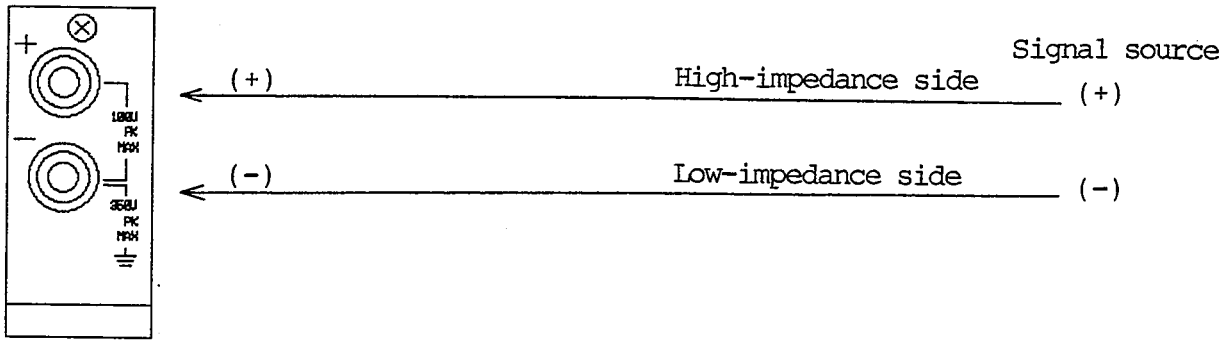
Bridge excitation voltage drop rate (%)	Cable length from instrument to bridge box (m) (Wire material: AWG20, +20°C)			
Bridge resistance (Ω)	20 m	50 m	100 m	200 m
60	-2.4	-5.8	-11.0	-19.9
120	-1.2	-3.0	-5.8	-11.0
350	-0.4	-1.1	-2.1	-4.1
500	-0.3	-0.7	-1.5	-2.9
1000	-0.1	-0.4	-0.7	-1.5

3.4.4 Connection of F/V Converter Unit

(1) Connection

The input section of the F/V converter unit is shown in the figure below:

Fundamentally, connect the high-impedance side (H (hot) side) of a signal source to the positive (+) input terminal (red), and the low-impedance side (L(cold) side) of the signal source to the negative (-) input terminal (gray).



(2) Input signal

1. Operating input range and frequency range

   Care must be taken that if the unit is operated in a range other than the range of 0.3 to 30 V p-p, an error may occur in measurement.

   The frequency range is from 1 Hz to 10 kHz.

2. Common-mode voltage (CMV)

   This unit must be used on condition that the common-mode voltage (CMV) is less than 350 V DC or AC peak.

   A pulsed common-mode noise should not be applied, either. If it is applied and should exceed the common-mode voltage, the unit may malfunction.

3. Maximum input voltage

   If an input voltage exceeding the maximum input voltage (100 V DC or AC peak) should inadvertently be applied to the unit, electrical parts inside the instrument may be damaged.

4. Input impedance

   The input impedance is always 100 kΩ.

3.5 Interchanging Input Units

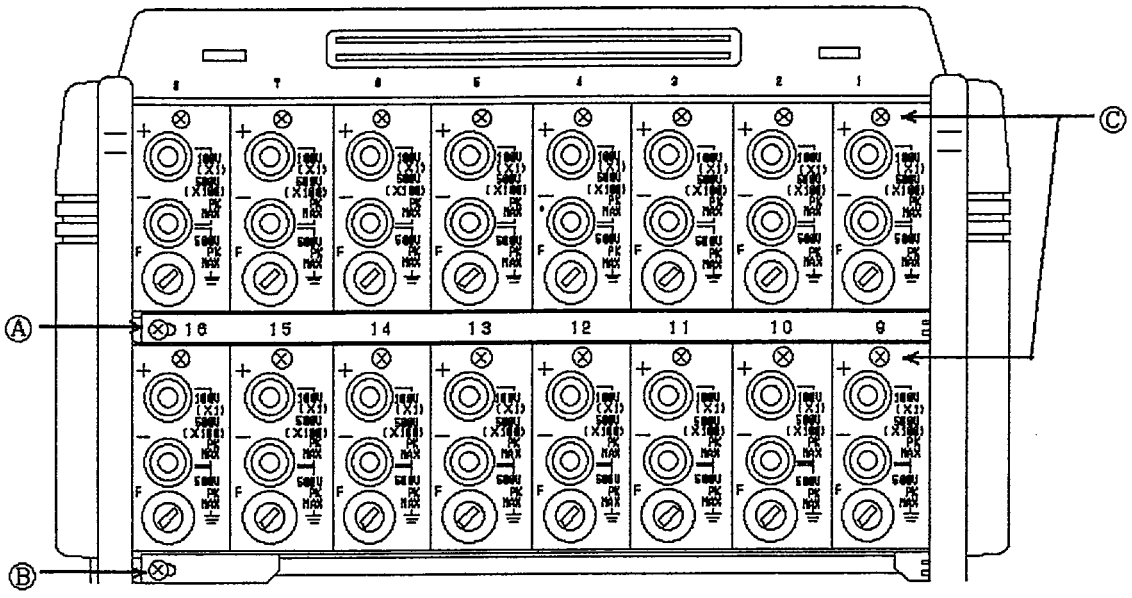
Caution:

° Remove all connected input cables from the instrument.

° Turn OFF the POWER switch of the instrument and remove the power cable from the instrument.

Never insert or remove input units into or from the basic instrument with the power to the instrument turned ON.

(RT3216N)



1. When an input unit for interchanging is to be inserted into any location of slot 1 to slot 8 on the upper stage, loosen the screw Ⓐ (M3 x 6) (loosen the screw Ⓑ in the case of slot 9 to slot 16 on the lower stage) with a Phillips screwdriver and move it a little in the left direction to remove the catch of the fixture from the rear protection foot. Then, remove the fixture.
2. Remove the screw Ⓒ (M3) of the input unit that needs to be removed for interchanging and pull out the unit straight toward you by holding the input terminal section (connector).
   Besides, an event amplifier unit can be easily pulled out by removing a neighboring input unit in advance or by connecting a cable for logic IC, which is not connected to a signal source, to the input connector for holding by hand.

3. Carefully connect an input unit, which is to be interchanged, to the connector of the amplifier motherboard along the groove guide of the printed circuit board.
4. Tighten screws in the reverse order from the procedure for removal.

Note:

The DC bridge strain amplifier unit occupies space for 2 slots and can be installed into any of the following locations:
Never install this unit in any location other than those.

1 and 2, 3 an 4, 5 and 6, and 7 and 8 of slot section (4 locations on the upper stage)
9 and 10, 11 and 12, 13 and 14, and 15 and 16 of slot section (4 locations on lower stage)

Caution:

Never operate the instrument with input units not installed.
Be sure to install a blank panel (RT31-118: Option) without fail to cover space where an input unit is not installed.

3.6 Storage and Handling of Recording Paper and Recorded Data

When heat is applied to the surface of recording paper by the thermal print-head, chemical reaction occurs and clear,black traces can be obtained on the white background.
Recorded data or white background may be faded by stationery, chemicals and environments, etc. Care must be taken, therefore, when handing recorded data and recording paper.

3.6.1 Storage of Recording Paper

When recording paper is packed in a container, proceed as follows:
° Do not store it under a high-temperature environment.
° Do not store it near a heat source.
° An ambient temperature of 40°C or less may be recommended.
If recording paper is stored for a long time under a high-temperature environment, white background may be faded. So, be careful.

When recording paper is unpacked, proceed as follows:

° Use the same care as that for packed recording paper.
° Avoid placing it under exposure to light for long hours.
° If it is exposed to light for long hours, white background may be discolored. Use utmost care, therefore, when measurement is carried out outdoors.

3.6.2 Storage of Recorded Data

° Avoid placing it under high temperature and humidity environments.
° Do not expose it to sun light or strong light for long hours.
° Recorded data and white background may be faded if exposed to high temperature, high humidity or light.
° Recorded data should be stored under the environments of less than 40°C and 80% RH.

3.6.3 Handling Care on Recorded Data

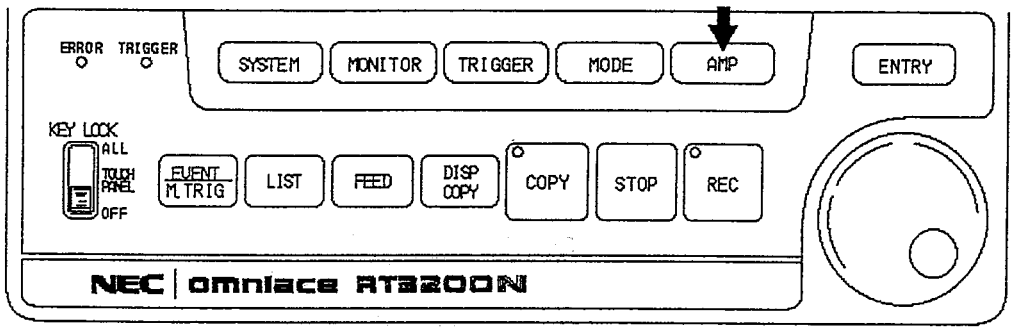
° Even if recorded data is wet or rubbed, the data will not disappear.
° Recorded data will not be discolored by such petroleum solvents as gasoline and benzine, etc.
° Recorded data is discolored by such volatile organic solvents as alcohol, ester and ketone, etc.
° If recorded data should absorb such nonvolatile organic solvents as plasticizer, etc., coloring capability is reduced, causing recorded data to be faded.
° If recorded data is in close contact with diazo sensitive paper, which is not sufficiently dried after development, recorded portions may be faded.
° If a felt-point pen containing organic solvents is used, ink will run on paper.

SECTION 4

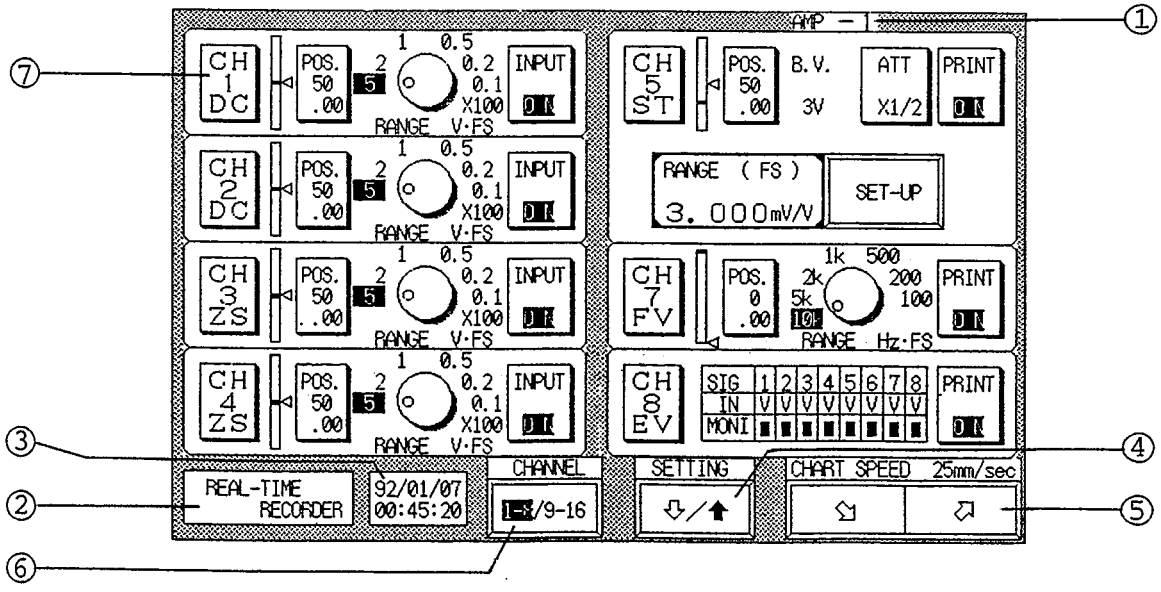
SETTING-UP OF INPUT UNITS

This section describes the setting-up procedures and methods of each unit.
Read the contents of this section in accordance with the input unit to be used.

When setting up an input unit, press the AMP key on the operation panel.



Press the AMP key and an AMP screen display (AMP-1 or AMP-2) appears.



The states of various types of input units are displayed on the AMP screen display and fundamental settings can be carried out. (For the setting-up procedures, refer to 4.1 to 4.6.) In the screen display shown above, parts of ① to ⑦ will be explained from display to setting

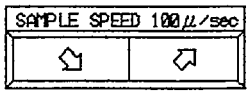
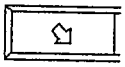
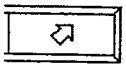
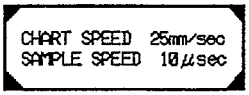
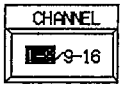
keys, as follows:

1) Display

No.	Display	Display contents
①	AMP-1	AMP-1 or AMP-2 is displayed on part ①. On the AMP-1 display, the states of input units of channel 1 to channel 8 (channel 9 to channel 16 on the AMP-2) are displayed and the fundamental settings can be carried out. Note: The figure on the previous page shows the AMP-1 screen display.
②	REAL-TIME RECORDER	On part ②, a recorder type being now used is displayed Three recorder types are available, as shown below: REAL-TIME RECORDER　MEMORY RECORDER　TRANSIENT RECORDER
③	92/01/01 00:45:20	On part ③, the present date and time are displayed.

2) Setting keys

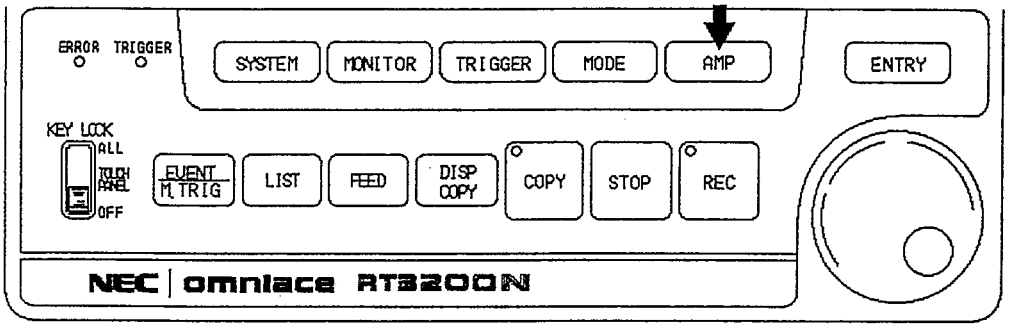
No.	Setting keys	Display contents and setting procedures
④	SETTING ⇩/⬆	When changing a base-line position or sensitivity, use this key to select its changing direction. When the key is pressed, the display is changed as SETTING ⬇/⇧ or SETTING ⇩/⬆ . For the detailed setting procedures on this key, refer to the setting procedures for each input unit, which will be explained in 4.1 to 4.5.
⑤	Note: Regarding part 5, the contents are different from recorder type to recorder type to be used.	
	In real-time recorder: CHART SPEED 25mm/sec ⇧ ⇩	Chart speed can be changed. Chart speed is reduced by pressing ⇧ . Chart speed is increased by pressing ⇩ .

		Chart speed can be changed in steps as follows: 100, 50, 25, 10, 5, 2 and 1 mm/sec. 100, 50, 25, 10, 5, 2 and 1 mm/min.
	In memory recorder: 	Sample speed can be changed. Sample speed can be reduced by pressing  . Sample speed can be increased by pressing  . Sample speed can be changed in steps as follows: 5, 10, 20, 50, 100, 200 and 500 μsec. 1, 2, 5, 10, 20, 50 and 100 msec.
	In transient recorder: 	Only chart speed and sample speed are displayed. (Note that the setting-up cannot be done.)
⑥	 (This key is only for RT3216N.)	Pressing this key selects the AMP-1 display or the AMP-2 display.  shows the AMP-1 screen display (display conditions of channel 1 to channel 8).  shows the AMP-2 screen display (display conditions of channel 9 to channel 16).
⑦		When the key of each channel number is pressed, an AMP-3 screen display* appears to allow detailed settings. On the "DC" part of the key, the type of an input unit is displayed. The following are symbols of input units to be displayed: DC: DC amplifier unit (or DC amplifier unit with BNC input) EV: Event amplifier unit ST: DC bridge strain amplifier unit FV: F/V converter unit ZS: Zero suppression amplifier unit

* On the AMP-3 screen display, detailed settings of each channel are available. In addition, the settings can be made all together. For the setting procedures, refer to the setting procedures of each input unit, which will be explained later in 4.1 to 4.6.

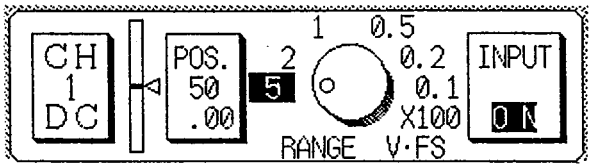
4.1 Setting-up of DC Amplifier Unit and DC Amplifier Unit with BNC Input

Press the (AMP) key on the operation panel.



The AMP screen display (AMP-1 or AMP-2) appears by pressing the (AMP) key.

On the AMP screen display, the status of the DC amplifier unit (or the DC amplifier unit with BNC input) is displayed, as shown in the figure below:

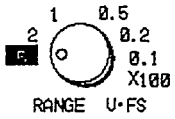
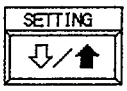
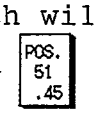
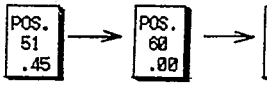


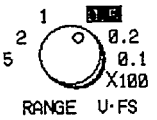
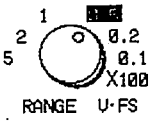
The above screen display will be explained from display to setting keys, as follows:

1) Display

Display	Display contents
	The input signal can be monitored as a waveform, and its base line is indicated by ◁. The monitored waveform is displayed in full scale and the range is linked with the base-line position.

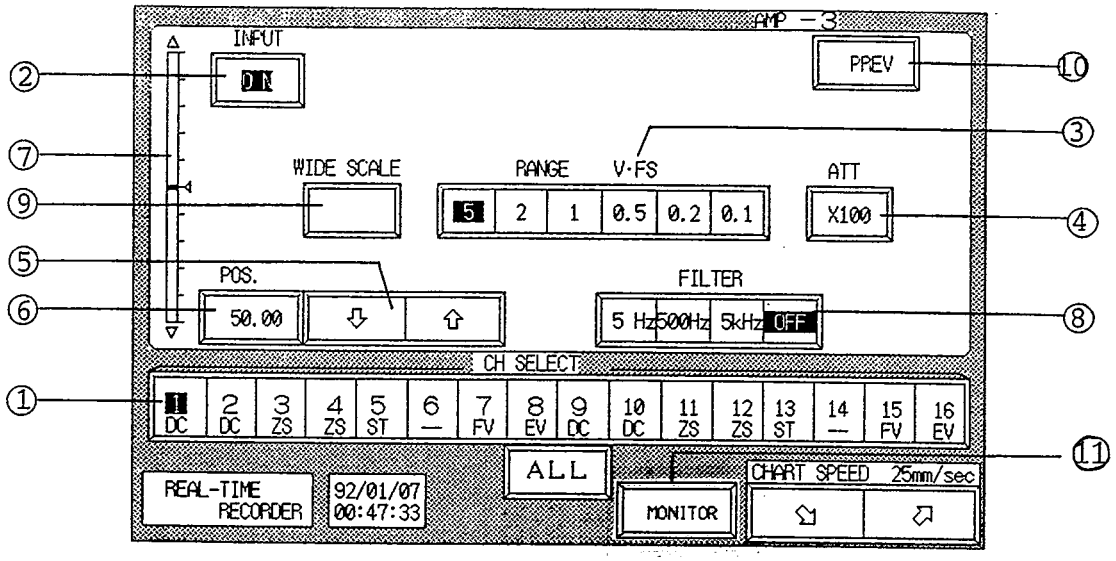
2) Setting keys

Setting keys	Display contents and setting procedures
	When this key is pressed, ON, OFF or GND can be selected. ON : The input to the amplifier is turned ON so that recording can be carried out. OFF: The input to the amplifier is turned OFF so that recording is also turned OFF. GND: The input to the amplifier is turned OFF and recording is set to the base-line position.
	Press ◯ to change the input range one range by one range. Select the changing direction by  .
	This is used to move the base-line position of an input signal. When this key is pressed, the base-line position is moved in 10 steps with the full scale divided in 100 steps. In the initial state, the base line is positioned on the middle of the set recording width with the base line in "50.00". * The base-line position represents the display or recorded position where 0 V is inputted (the input is short-circuited). Note: If a numerical value is present in a place of less than a units digit (1.45), it indicates that the base-line position is more finely adjusted than the ordinary 10-step increment or decrement. (e.g. ) On the inside of this screen display, however, the base-line position cannot be finely adjusted. (For the setting procedures on the base-line fine adjustment, refer to the setting-up on AMP-3 display, which will be discussed later.) When  is pressed, the base-line position is moved upwards or downwards by the ordinary 10-step increment or decrement as in  .

	Use SETTING ⇩/⬆ to select the changing direction.
SETTING ⇩/⬆	This key is located at the lower part on the AMP screen display. This is used to select moving directions of input ranges and base-line positions. When the key is pressed, moving directions can be selecte as follows: When  is pressed in SETTING ⇩/⬆, the sensitivity is continuously changed from 500 V FS to 0.1 V FS clockwise in the order of 0.5→0.2→0.1→... Note: The sensitivity cannot be changed from 0.1 V FS to 500 V FS. When POS. 50 .00 is pressed, the base-line position is moved in the order of 50.00→60.00→70.00→... When  is pressed in SETTING ⬇/⇧, the sensitivity is continuously changed from 0.1 V FS to 500 V FS counter-clockwise in the order of 0.5→1→2→... Note: The sensitivity cannot be changed from 500 V FS to 0.1 V FS. When POS. 50 .00 is pressed, the base-line position is moved in the order of 50.00→40.00→30.00→...

When CH 1 DC (the channel number key of a DC amplifier unit incorporated) is pressed, the AMP-3 screen display appears to allow detailed settings to be carried out. (See the following pages.)

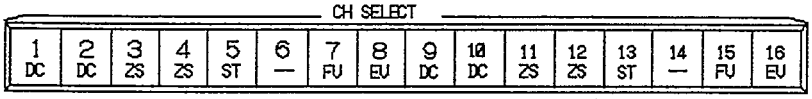
Press [CH 1 DC] to display the AMP-3 screen display, as shown below:



Detailed settings can be carried'out for each channel on this AMP-3 screen display.

① Channel selection:

Any displayed channel can be changed.



By pressing any channel key that needs to be set, the selected channel number is reversely displayed as **1**, and the setup screen display of the selected channel is displayed to allow each item to be set.

When [ALL] is pressed, the input units of the same type can be simultaneously set.

For details, refer to 4.6 Setting Input Units All Together.

② Input:

The input condition can be set to ON, OFF or GND.

ON : The input to the amplifier is turned ON and recording can be carried out.

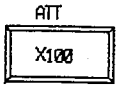
OFF: The input to the amplifier is turned OFF and recording is also turned OFF.

GND: The input to the amplifier is turned OFF and recording is set to the base-line position.

③ Range (sensitivity) (V FS):

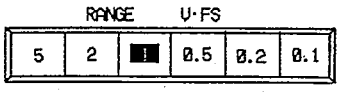
④ ATT (magnification):

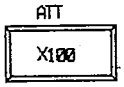
The input range can be set by range (sensitivity) and ATT (magnification).

When 

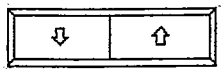
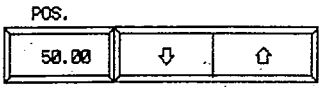
is pressed, the display can be changed as x1 or x100 to set up the magnification.

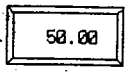
Example:

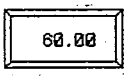
When the sensitivity and magnification are set to 

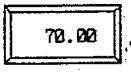


, the range becomes 100 V FS.

⑤ When  of 

is pressed, the base-line position of an input signal goes up or down in 10 steps as in 

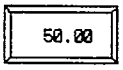
→ 

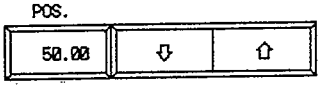
→ 

.

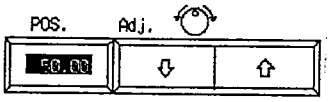
The base-line position is displayed at the right side of the monitor ⑦ with ◁.

⑥ Base-line fine adjustment:

When 

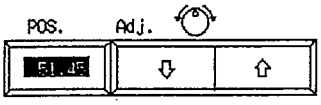
of 

is pressed, the numerical value is reversely displayed as in 

of 

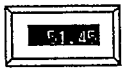
.

By turning the jog dial, a numerical value of less than a units digit is displayed, so that the base-line position can be more finely adjusted (in 0.05 steps) than the ordinary 10-step adjustment as in

of 

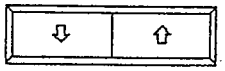
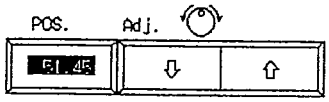
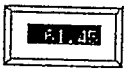
.

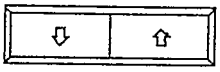
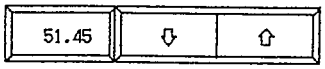
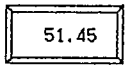
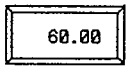
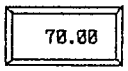
The base-line position can be moved in 0.125 mm steps during recording by the jog dial.

When 

is pressed again, the setting-up is completed and the reversely displayed number is restored.

Note:

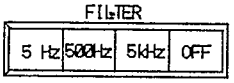
When  is pressed during fine adjustment as in  , the base-line position is moved with a finely adjusted component (1.45) maintained as in  →  .

When  is pressed during the time the fine adjustment is not being carried out as in  , the base-line position is moved in 1/10 steps of the full scale as in  →  →  .

⑦ Monitor:

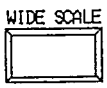
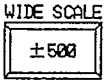
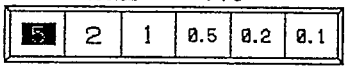
The status of an input signal, linked with the set base-line position, is displayed.

⑧ Filter:

Any low-pass filter can be selected from  .

(The selected filter is reversely displayed.)

⑨ Wide scale:

Pressing  allows   to be displayed.

In this mode, a waveform of +500 V to -500 V can be displayed and recorded.

Note:

The range of 1000 V FS is not available.

If, for instance, the base-line position is set in 0.00 (the lowest position), the range for displaying and recording a waveform is from 0 to +500 V.

⑩ PREV (previous page):

An 8-channel screen display can be selected.

For selecting channel 1 to channel 8, the screen display of channel 1 to channel 8 (AMP-1) is selected.

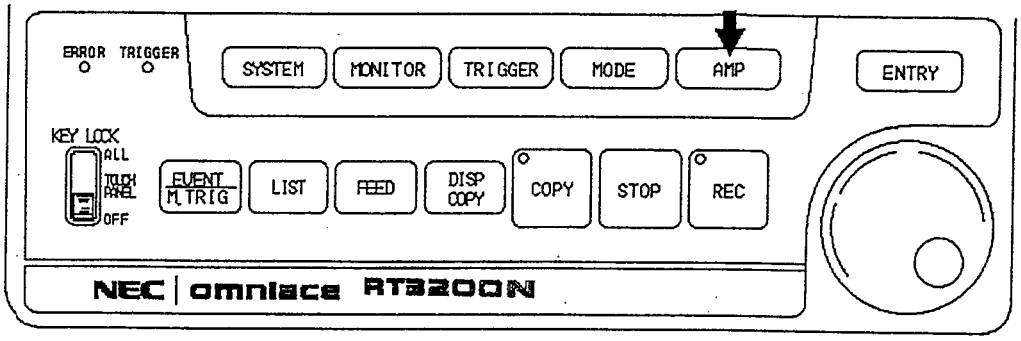
For selecting channel 9 to channel 16, the screen display of channel 9 to channel 16 (AMP-2) is selected.

⑪ Pressing "MONITOR" key changes into AMP SETUP MONITOR SCREEN DISPLAY.

Refer to 4.7 item for details.

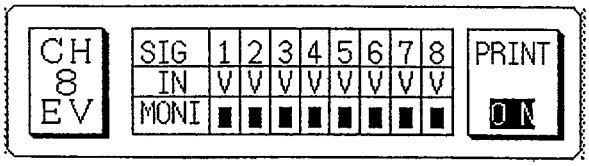
4.2 Setting-up of Event Amplifier Unit

Press the [AMP] key on the operation panel.



The AMP screen display (AMP-1 or AMP-2) appears by pressing the [AMP] key.

On the AMP screen display, the status of the event amplifier is displayed, as shown in the figure below:



The above screen display will be explained from display to setting keys, as follows:

1) Display

Display	Display contents
SIG 1 2 3 4 5 6 7 8 IN V V V V V V V V MONI	The type of input of each channel (1 ~ 8) of within the event amplifier unit and the condition of an input signal are displayed. IN (input): Shows the type of an input. V; Voltage input C; Contact input ° Contact input Decides whether the input condition is open or short, and the result is outputted. ° Voltage input Decides whether the input-signal condition is in H level or in L level, and the result is outputted. Input range: 0 to 24 V H: Greater than 2.5 V L: Lower than 0.5 V

MONI (monitored condition): Monitors the waveform of an input-signal condition.

Condition	Voltage input	Contact input
■	H	Short
▬	L	Open

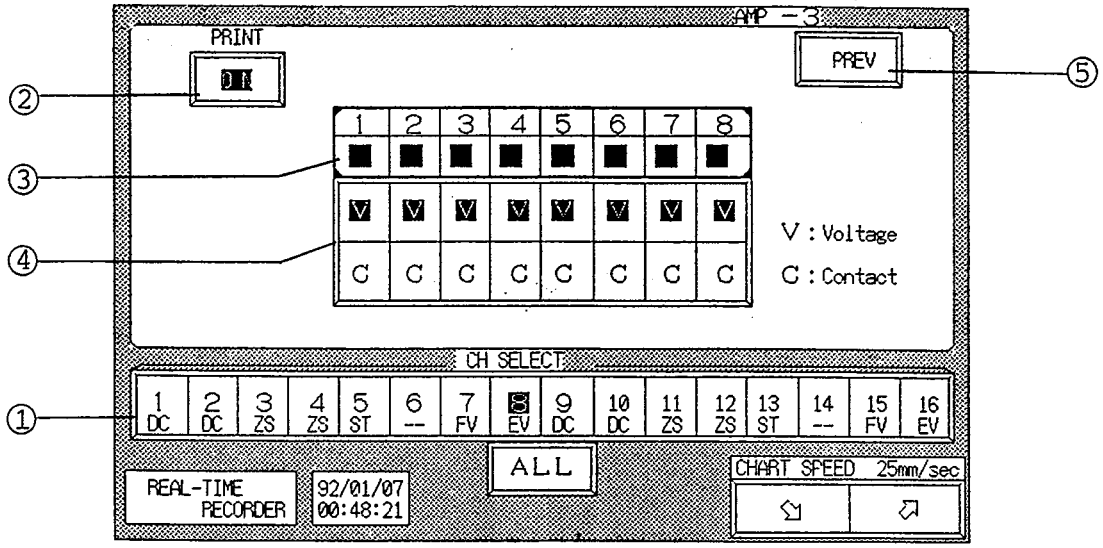
2) Setting keys

Setting keys	Display contents and setting procedures
PRINT	Press this key to set ON or OFF of printing.

When CH 8 EV (the channel number key of an event amplifier unit) is pressed, the AMP-3 screen display appears to allow detailed settings to be carried out:

(See the following pages.)

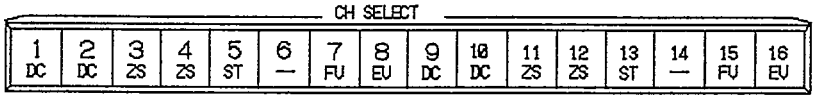
Press [CH 8 EV] to display the AMP-3 screen display, as shown in the figure below:



Detailed settings can be carried out for each channel on this AMP-3 screen display.

① Channel selection:

Any displayed channel can be changed.



By pressing any channel key that needs to be set, the selected channel number is reversely displayed as 1, and the setup screen display of the selected channel is displayed to allow each item to be set.

When [ALL] is pressed, the input units of the same type can be simultaneously set.

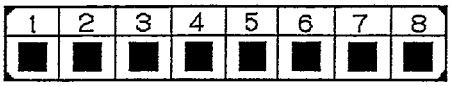
For details, refer to 4.6 Setting Input Units All Together.

② Print:

ON/OFF of printing can be set.

③ Monitor:

The conditions of input signals for all channels (1 ~ 8) of within the event amplifier unit can be monitored in waveforms.



Condition	Voltage input	Contact input
■	H	Short
▬	L	Open

④ Signal:

Input signals to the event amplifier unit can be selected.

Type of input:

V; Voltage input

C; Contact input

° V (voltage input)

Decides whether the input-signal condition is in H level or in L level, and the result is outputted.

Input range: 0 to 24 V

H level: Greater than 2.5 V

L level: Less than 0.5 V

° C (contact input)

Decides whether the input condition is open or short, and the result is outputted.

V	V	V	V	V	V	V	V
C	C	C	C	C	C	C	C

Press any part of "V" or "C" for selection. (The selected type of input is reversely displayed.)

⑤ PREV (previous page):

An 8-channel screen display can be selected.

For selecting channel 1 to channel 8, the screen display of channel 1 to channel 8 (AMP-1) is selected.

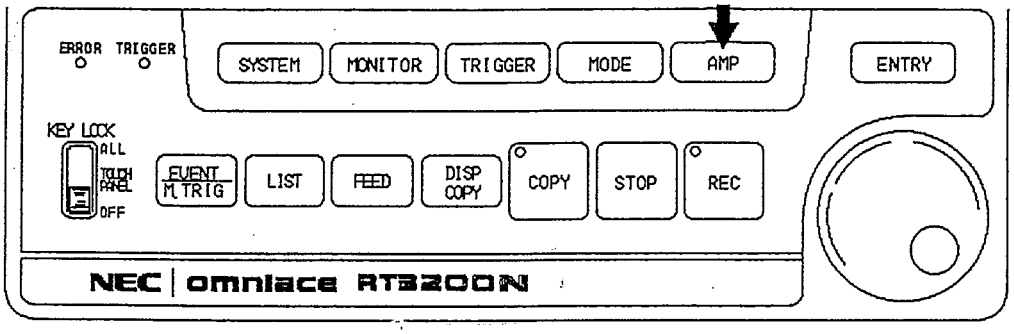
For selecting channel 9 to channel 16, the screen display of channel 9 to channel 16 (AMP-2) is selected.

Note:

In this operation manual, the capital letters CH represent channel 1 to channel 16 of input units, while the small letters ch represent the channels in the inner part of the event amplifier unit.

4.3 Setting-up of DC Bridge Strain Amplifier Unit

Press the AMP key on the operation panel.

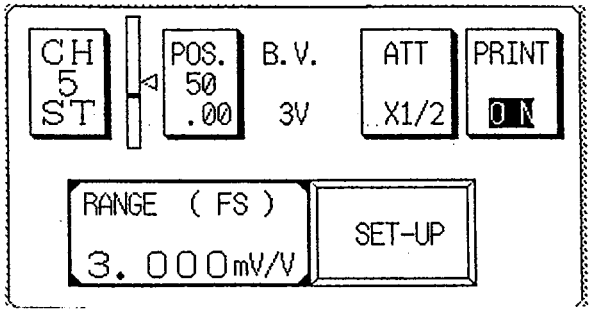


The AMP screen display (AMP-1 or AMP-2) appears by pressing the AMP key.

On the AMP screen display, the status of the DC bridge strain amplifier unit is displayed, as shown in the figure below:

Note:

The DC bridge strain amplifier unit cannot be installed into any channel other than odd channels.



The above screen display will be explained from displays to setting keys.

1) Display

Display	Display contents
	The input signal can be monitored as a waveform, and its base line is indicated by ◁.

	The monitored waveform is displayed in full scale and the range is linked with the base-line position.
B.V. 3V	The value of the DC bridge excitation voltage is displayed and it can be set to 3 V or 10 V. For the setting procedures, refer to "Setting DC bridge excitation voltage on MENU 2 screen display (SYSTEM PAGE 3/3). Note: In the initial status, the bridge excitation voltage is set in 3 V.

2) Setting keys

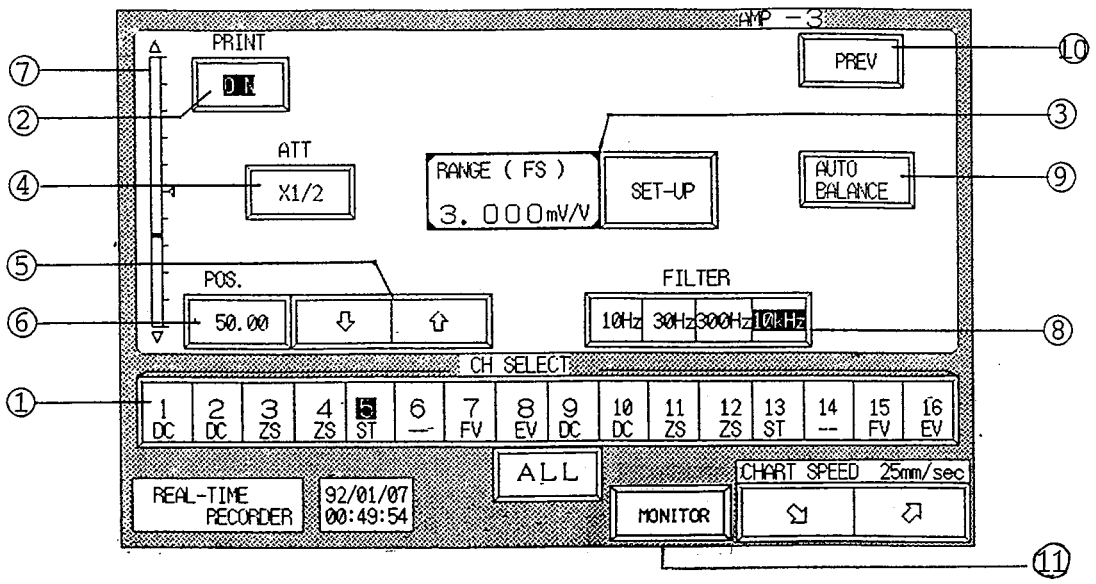
Setting keys	Display contents and setting procedures
PRINT ON	Press this key to turn printing ON or OFF.
RANGE (FS) 3.000mV/V SET-UP	When the SET-UP key is pressed, the display is changed to RANGE (FS) 3.000mV/V to allow sensitivity (FS) to be varied from 0.450 to 3.300mV/V with the jog dial. Set the sensitivity to the rated output of a strain-gage-based transducer to be used. When the key is pressed again, the display is returned to the original state and the setting is completed.
ATT X1/2	When this key is pressed, the display is changed to x1/2 and x1. The sensitivity set with x1 (FS) can be changed to x1/2. Sensitivity per full scale is shown below: The sensitivity set with ATT X1/2 and RANGE (FS) 3.000mV/V becomes 6.000 mV/V (FS).

	The sensitivity set with [ATT / X1] and [RANGE (FS) / 3.000mV/V] becomes 3.000 mV/V (FS). Note: If ATT is set to x1/2, the displayed or recorded deflection of the output of a transducer can be halved. (The full scale is doubled.) When the output deflection does not stay within the full-scale range, set ATT to x1/2.
[POS. / 50 / .00]	This is used to move the base-line position of an input signal. When this key is pressed, the base-line position is moved by 10 steps with the full scale divided in 100 steps. In the initial state, the base line is positioned on the middle of the set recording width with the base line in "50.00". * The base-line position represents the display or recorded position where 0 V is inputted (the input is short-circuited). Note: If a numerical value is present in a place of less than a units digits (1.45), it indicates that the base-line position is more finely adjusted than the ordinary 10-step increment or decrement by using the base-line position fine adjusting function. (e.g. [POS. / 51 / .45]) On the inside of this screen display, however, the base-line position cannot be finely adjusted. (For the setting procedures on the base-line fine adjustment, refer to the setting-up on AMP-3 display, which will be discussed later.) When [POS. / 51 / .45] is pressed, the base-line position is moved upwards or downwards by the ordinary 10-step increment or decrement as in [POS. / 51 / .45] → [POS. / 60 / .00] → [POS. / 70 / .00].

	Use [SETTING ⇩/⬆] to select the changing directions.
[SETTING ⇩/⬆]	(This key is located at the lower part on the AMP screen display.) This is used to select moving directions of sensitivity (input ranges) and base-line positions.
	When [POS. 50 .00] is pressed in [SETTING ⇩/⬆], the base-line position is moved in the order of 50.00 → 60.00 → 70.00 → ...
	When [POS. 50 .00] is pressed in [SETTING ⬇/⇧], the base-line position is moved in the order of 50.00 → 40.00 → 30.00 → ...

When [CH 5 ST] (the channel number key of a DC bridge strain amplifier unit) is pressed, the AMP-3 screen display appears to allow detailed settings to be carried out.
(See the following pages.)

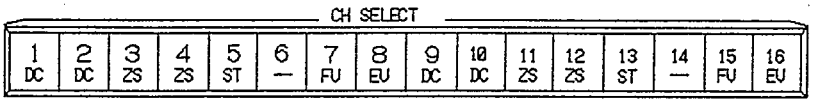
Press [CH 5 ST] to display the AMP-3 screen display, as shown below:



Detailed settings can be carried out for each channel on this AMP-3 screen display.

① Channel selection:

Any displayed channel can be changed.



By pressing any channel key that needs to be set, the selected channel number is reversely displayed as 1, and the setup screen display of the selected channel is displayed to allow each item to be set. When [ALL] is pressed, the input units of the same type can be simultaneously set.

For detailes, refer to 4.6 Setting Input Units All Together.

② Print:

ON/OFF of printing can be set.

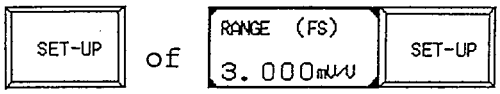
③ Sensitivity range (V FS):

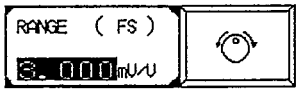
④ Attenuation (ATT):

The input range can be set in accordance with the rated output of a strain-gage-based transducer by sensitivity and attenuation.

When 

is pressed, the display can be changed to x1/2 and x1, and the sensitivity (FS) set with x1 can be changed to x1/2.

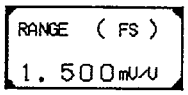
When 

is pressed, the display is changed to 

to allow the sensitivity range (FS) to be varied from 0.450 mV/V to 3.300 mV/V with the jog dial.
Sensitivity per full scale is shown below:

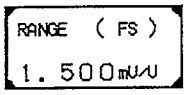
Example:

The sensitivity set with 

and 

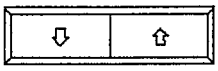
becomes 3.000 mV/V (FS).

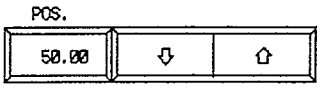
The sensitivity set with 

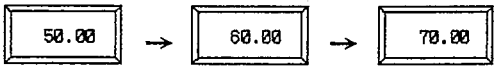
and 

becomes 1.500 mV/V (FS).

⑤ Base line:

When 

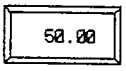
of 

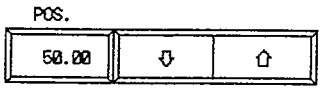
is pressed, the base-line position of an input signal goes up or down by 10 steps as in 

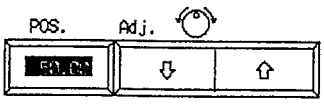
.

The base-line position is displayed at the right side of the monitor ⑦ with ◁.

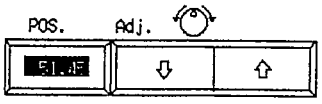
⑥ Base-line fine adjustment:

When 

of 

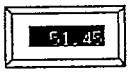
is pressed, the numerical value is reversely displayed as in 50.00 of 

.

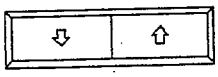
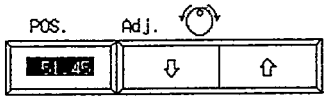
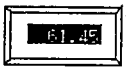
By turning the jog dial, a numerical value of less than a units digit is displayed, so that the base-line position can be more finely adjusted (in 0.05 steps) than the ordinary 10-step adjustment as in 51.45 of 

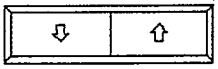
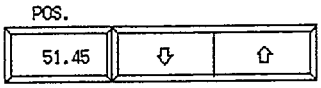
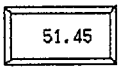
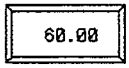
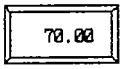
.

The base-line position can be moved in 0.125 mm steps by the jog dial during recording.

When  is pressed again, the setting-up is completed and the reversely displayed number is restored.

Note:

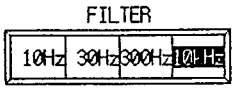
When  is pressed during fine adjustment as in  , the base-line position is moved with a finely adjusted component (1.45) maintained as in  →  .

When  is pressed during the time the fine adjustment is not being carried out as in  , the base-line position is moved in 1/10 steps of the full scale as in  →  →  .

⑦ Monitor:

The status of an input monitor, linked with the set base-line position, is displayed.

⑧ Filter:

Any low-pass filter can be selected from  .

(The selected filter is reversely displayed.)

⑨ Auto balance:

The moment the  key is pressed, a deviation of the base-line of an input signal is automatically corrected (in approximately one second) to allow the input signal to be placed on the base-line position (on the ◁ position at the right side of the monitor ⑦).

⑩ PREV (previous page):

An 8-channel screen display can be selected.

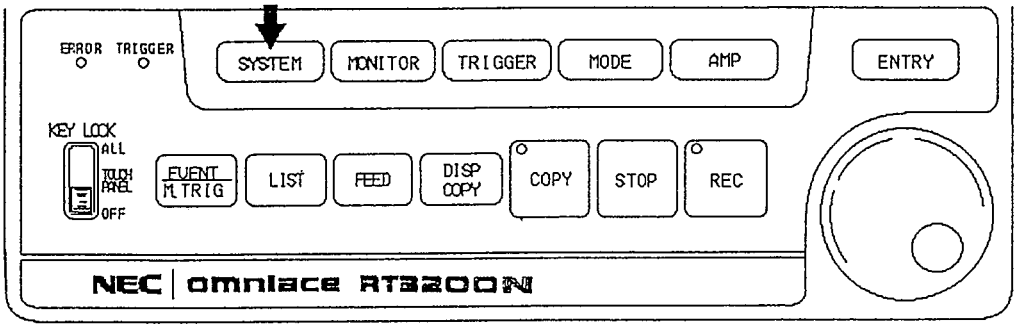
For selecting channel 1 to channel 8, the screen display of channel 1 to channel 8 (AMP-1) is selected.

For selecting channel 9 to channel 16, the screen display of channel 9 to channel 16 (AMP-2) is selected.

⑪ Refer to item 4.7 in this manual.

Setting-up of DC bridge excitation voltage on MENU 2 (SYSTEM PAGE 3/3)

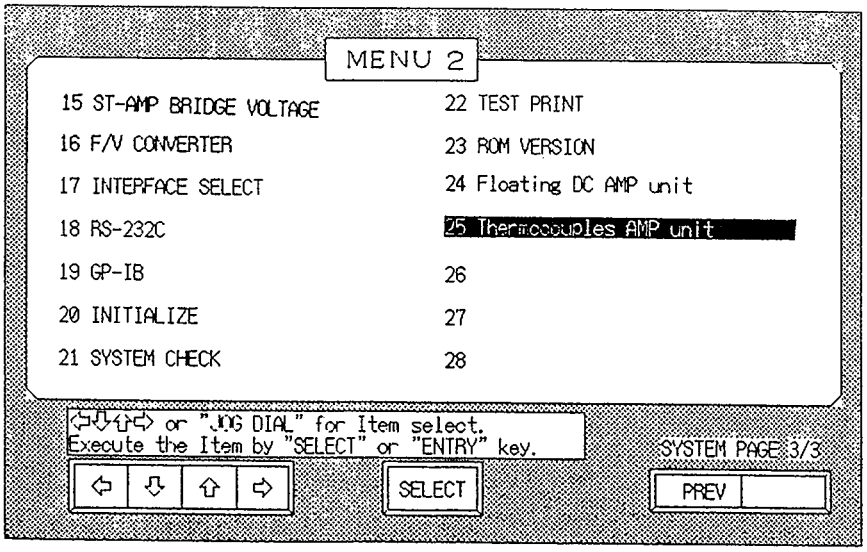
Press the SYSTEM key on the operation panel.



The MENU 2 screen display (SYSTEM PAGE 3/3), as shown in the figure below, appears by pressing the SYSTEM key.

Note:

When another system page is displayed, press the NEXT key to display MENU 2 (SYSTEM PAGE 3/3).



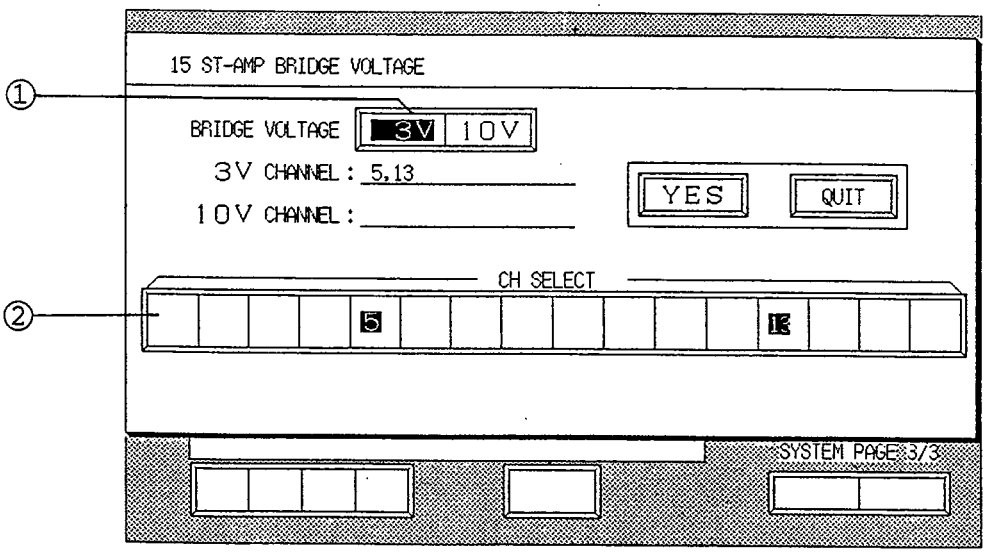
By means of ⇦ ⇩ ⇧ ⇨ inside the screen display or the jog dial, the reversed display can be moved to the item of "15 ST-AMP BRIDGE E VOLTAGE."

When the [SELECT] key inside the screen display or the [ENTRY] key on the operation panel is pressed, the screen display, as shown below, appears.

Note:

If a DC bridge strain amplifier unit or DC bridge strain amplifier units are not installed, or if no unit is displayed by restricting channels to be used (refer to System Menu 9 MEMORY DIVISIONS.), an error occurs, causing no screen display to appear with audible sound even by pressing the key.

Press the [ENTRY] key or [SELECT] key to display a screen display shown below:

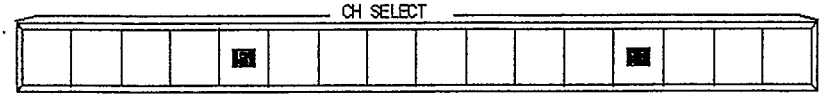


① Set the bridge excitation voltage.

Press [3V] or [10V] of [3V 10V] to select any bridge excitation voltage.

(The selected bridge excitation voltage is reversely displayed.)

② Select a channel where the bridge excitation voltage is to be set.



Press the channel number key where the bridge excitation voltage is to be set.

The reversely displayed channel as in ⑤ is set to the bridge excitation voltage selected in ①.

Note:

In channel selection, only an odd channel or odd channels,where a DC bridge strain amplifier unit or DC bridge strain amplifier units are installed, are displayed.

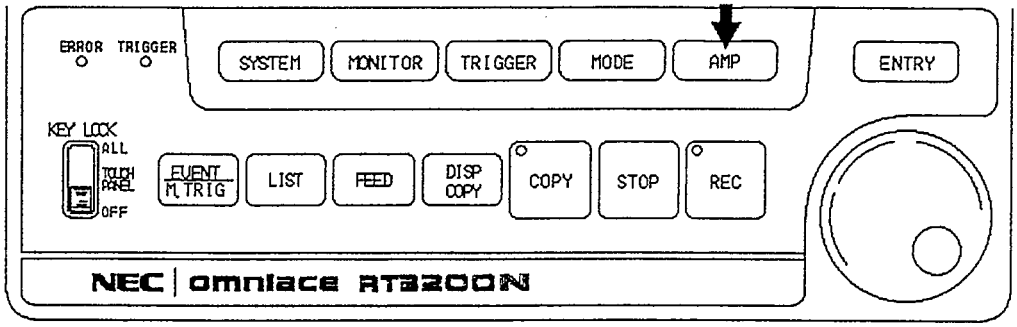
Up to a maximum of 8 DC bridge strain amplifier units can be built into the basic instrument.

The channel or channels set to 3 V are displayed in 3V CHANNEL in ①.
The channel or channels set to 10 V are displayed in 10V CHANNEL in ①.

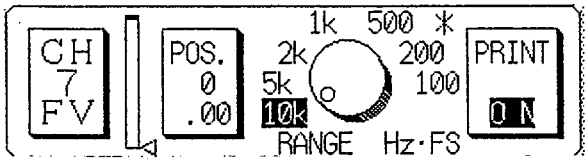
When [YES] is pressed, the bridge excitation voltage is set and the display is returned to MENU 2.
When [QUIT] is pressed, the bridge excitation voltage is not set and the display is returned to MENU 2.

4.4 Setting-up of F/V Converter Unit

Press the [AMP] key on the operation panel.



The AMP screen display (AMP-1 or AMP-2) appears by pressing the [AMP] key.
On the AMP screen display, the status of the F/V converter unit is displayed, as shown in the figure below:



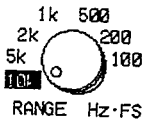
The above screen display will be explained from display to setting keys.

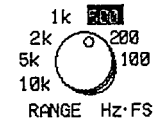
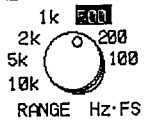
1) Display

Display	Display contents
	The input signal can be monitored as a waveform, and its base-line position is indicated by ◁. The monitored waveform is displayed in full scale and the range is linked with the base-line position.

2) Setting keys

Setting keys	Display contents and setting procedures
	Press this key to turn printing ON or OFF.

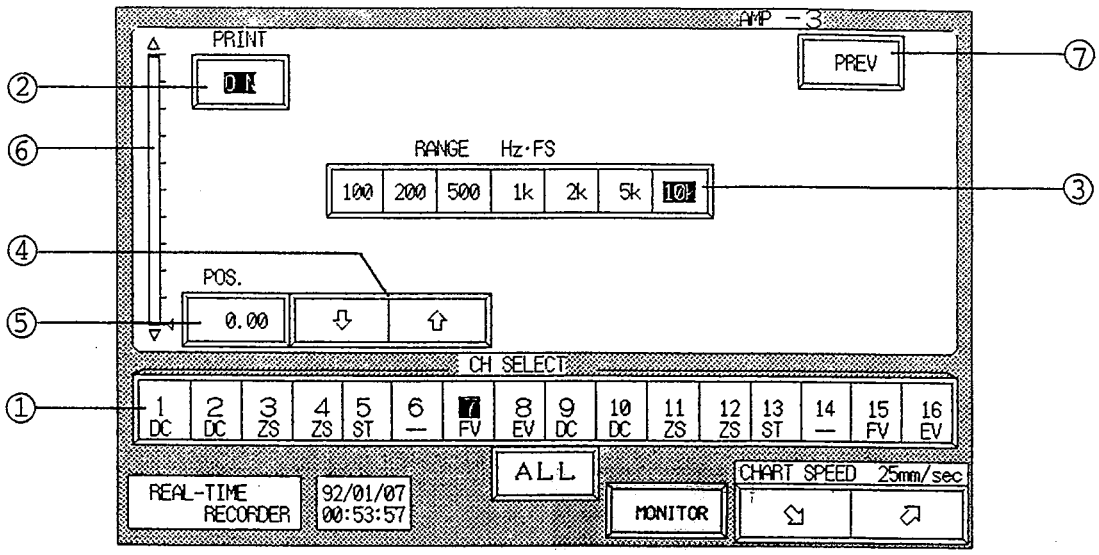
	Press ◯ to change the input range one range by one range. Select the changing direction by SETTING ⇩/⬆.
POS. 50 .00	This is used to move the base-line position of an input signal. When this key is pressed, the base-line position is moved in 10 steps with the full scale divided in 100 steps. In the initial state, the base line is positioned on the middle of the set recording width with the base line in "50.00". * The base-line position represents the display or recorded position where 0 Hz is inputted. (However, apply a signal of more than 1 Hz to the F/V converter unit.) Note: If a numerical value is present in a place of less than a units digit (1.45) as in POS. 51 .45, it indicates that the base-line position is more finely adjusted than the ordinary 10-step increment or decrement by using the base-line fine adjusting function. On the inside of this screen display, however, the base-line position cannot be finely adjusted. (For the setting procedures on the base-line fine adjustment, refer to the setting-up on AMP-3 display, which will be discussed later.) When POS. 51 .45 is pressed, the base-line position is moved upwards or downwards by the ordinary 10-step increment or decrement as in POS. 51 .45 → POS. 60 .00 → POS. 70 .00. Use SETTING ⇩/⬆ to select the changing direction.

SETTING ⇩/⬆	This key is located at the lower part on the AMP screen display. This is used to select moving directions of input ranges and base-line positions. When the key is pressed, moving directions can be selected as follows: --- When  is pressed in SETTING ⇩/⬆, the sensitivity is continuously changed from 10 kHz FS to 100 Hz FS clockwise in the order of 500→200→100→... Note: The sensitivity cannot be changed from 100 Hz FS to 10 kHz FS. When POS. 50 .00 is pressed, the base-line position is moved in the order of 50.00→60.00→70.00→... --- When  is pressed in SETTING ⬇/⇧, the sensitivity is continuously changed from 100 Hz FS to 10 kHz FS counterclockwise in the order of 500→1k→2k→... Note: The sensitivity cannot be changed from 10 kHz FS to 100 Hz FS. When POS. 50 .00 is pressed, the base-line position is moved in the order of 50.00→40.00→30.00→...

When CH 7 F/V (the channel number key of an F/V converter unit) is pressed, the AMP-3 screen display appears to allow detailed settings to be carrie out.

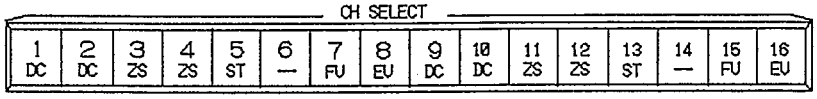
(See the following pages.)

Press [CH 7 FV] to display the AMP-3 screen display, as shown below:



Detailed settings can be carried out for each channel on this AMP-3 screen display.

① Channel selection:
Any displayed channel can be changed.



By pressing any channel key that needs to be set, the selected channel number is reversely displayed as 1, and the setup screen display of the selected channel is displayed to allow each item to be set.
When [ALL] is pressed, the input units of the same type can be simultaneously set.
For details, refer to 4.6 Setting Input Units All Together.

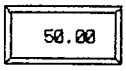
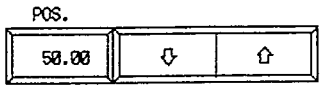
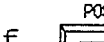
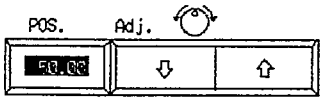
② Input:
ON/OFF of printing can be set.

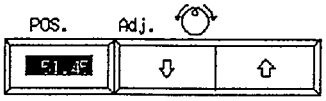
③ Range (sensitivity) (Hz FS):
The input range can be set.

④ Base line:
When [⇩ ⇧] of [POS. 50.00 ⇩ ⇧] is pressed, the base-line position of an input signal goes up or down in 10 steps as in [50.00] → [60.00] → [70.00].

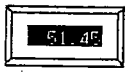
The base-line position is displayed at the right side of the monitor 6 with ◁.

⑤ Base-line fine adjustment:

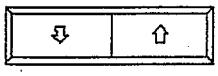
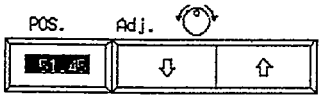
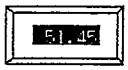
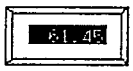
When  of  is pressed, the numerical value is reversely displayed as in  of  .

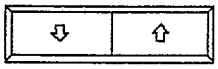
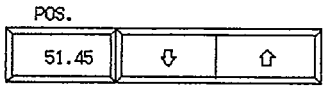
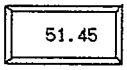
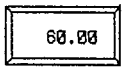
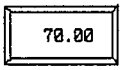
By turning the jog dial, a numerical value of less than a units digit is displayed as in of  , so that the base-line position can be more finely adjusted (in 0.05 steps) than the ordinary 10-step adjustment.

The base-line position can be moved in 0.125 mm steps by the jog dial during recording.

When  is pressed again, the setting-up is completed and the reversely displayed number is restored.

Note:

when  is pressed during fine adjustment as in  , the base-line position is moved with a finely adjusted component (1.45) maintained as in  →  .

When  is pressed during the time the fine adjustment is not being carried out as in  , the base-line position is moved in 1/10 steps of the full scale as in  →  →  .

⑥ Monitor:

The status of an input signal, linked with the set base-line position, is displayed.

⑦ PREV (previous paper):

An 8-channel screen display can be selected.

For selecting channel 1 to channel 8, the screen display of channel 1 to channel 8 (AMP-1) is selected.

For selecting channel 9 to channel 16, the screen display of channel 9 to channel 16 (AMP-2) is selected.

On setting procedures of ripple and response time:
In this unit, FILTER 1 (ON/OFF) and FILTER 2 (3, 5, 30, 50, 300 Hz) can be automatically selected to automatically reduce ripple to less than approximately 0.3% FS.
To reduce ripple, FILTER 1 selects the time constant of an integrator.
Description on ripple and time constant will be given later.
In the standard (STD) specification, the response time is as follows:

Range (sensitivity)	FILTER 1	FILTER 2	Response time
100 Hz FS	ON	3 Hz	Approx. 600 msec
200 Hz FS	ON	3 Hz	Approx. 300 msec
500 Hz FS	ON	5 Hz	Approx. 200 msec
1k Hz FS	ON	5 Hz	Approx. 200 msec
2k Hz FS	ON	5 Hz	Approx. 200 msec
5k Hz FS	ON	30 Hz	Approx. 30 msec
10k Hz FS	ON	50 Hz	Approx. 20 msec

Note:
If the response time needs to be shorter even when ripple becomes larger, set FILTER 1 and FILTER 2 by referring to the tables below:
Note that the numerical values shown in the tables are central values.
(The setting procedures will be given later.)

° Range (sensitivity) 100 Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	380 msec	0.3%	325 msec	1.0%
5 Hz	345 msec	0.5%	270 msec	1.5%
30 Hz	285 msec	1.0%	215 msec	2.5%
50 Hz	280 msec	1.0%	190 msec	2.5%
300 Hz	275 msec	1.0%	180 msec	2.5%

° Range (sensitivity) 200 Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	270 msec	0.3%	260 msec	1.5%
5 Hz	265 msec	0.5%	190 msec	2.0%
30 Hz	240 msec	1.0%	105 msec	3.0%
50 Hz	230 msec	1.0%	93 msec	3.0%
300 Hz	225 msec	1.0%	90 msec	3.0%

° Range (sensitivity) 500 Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	235 msec	0.3%	210 msec	0.5%
5 Hz	170 msec	0.5%	142 msec	0.5%
30 Hz	100 msec	0.5%	50 msec	1.5%
50 Hz	96 msec	1.0%	45 msec	2.0%
300 Hz	90 msec	1.0%	40 msec	2.5%

° Range (sensitivity) 1k Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	210 msec	0.3%	200 msec	0.5%
5 Hz	140 msec	0.5%	130 msec	0.5%
30 Hz	55 msec	1.0%	34 msec	1.0%
50 Hz	50 msec	1.0%	27 msec	1.5%
300 Hz	45 msec	1.0%	21 msec	2.5%

° Range (sensitivity) 2k Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	192 msec	0.3%	190 msec	0.5%
5 Hz	126 msec	0.5%	120 msec	0.5%
30 Hz	33 msec	0.5%	26 msec	1.0%
50 Hz	28 msec	1.0%	20 msec	1.0%
300 Hz	24 msec	1.0%	12 msec	2.5%

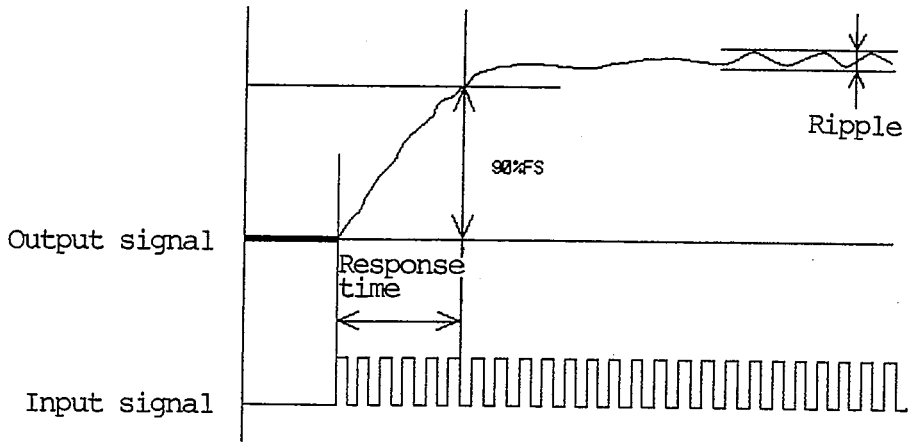
° Range (sensitivity) 5k Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	190 msec	0.3%	185 msec	0.3%
5 Hz	117 msec	0.4%	115 msec	0.3%
30 Hz	24 msec	0.4%	22 msec	0.5%
50 Hz	17 msec	0.4%	15 msec	1.0%
300 Hz	11 msec	0.8%	6 msec	1.5%

° Range (sensitivity) 10k Hz FS:

FILTER 1	ON		OFF	
FILTER 2	Response time	Ripple	Response time	Ripple
3 Hz	184 msec	0.3%	185 msec	0.3%
5 Hz	115 msec	0.3%	112 msec	0.3%
30 Hz	21 msec	0.3%	20 msec	0.4%
50 Hz	14 msec	0.3%	13 msec	0.5%
300 Hz	6 msec	0.6%	4 msec	1.0%

On ripple and response time:



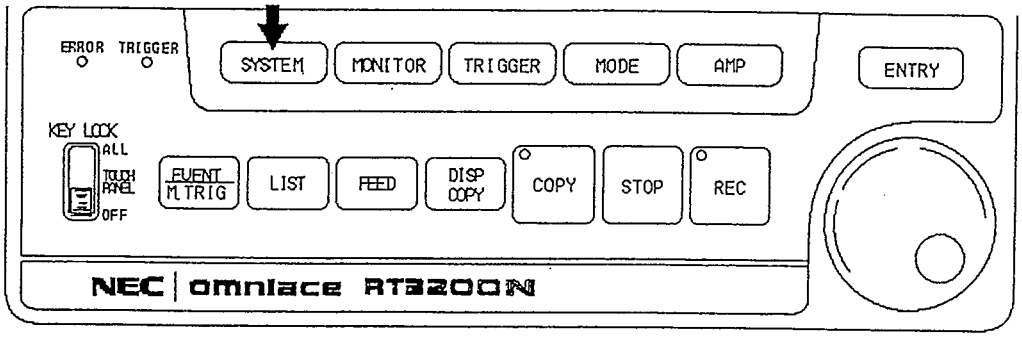
° Response time;

The time required for the output signal to reach 90 percent of its full scale in response to an input signal (a 10 kHz signal applied in the range of 10 kHz FS), with which the output deflects to its full scale.

° Ripple;

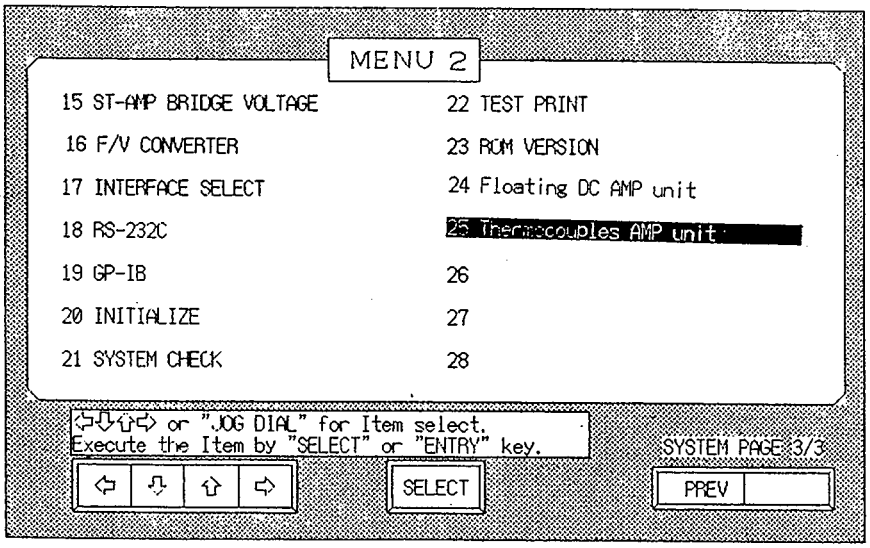
The wavelike components contained in an output signal are termed ripple, which is represented by % FS. The amplitude of ripple varies with an input frequency.

Setting-up procedures of FILTER 1 and FILTER 2:
Press the [SYSTEM] key on the operation panel.



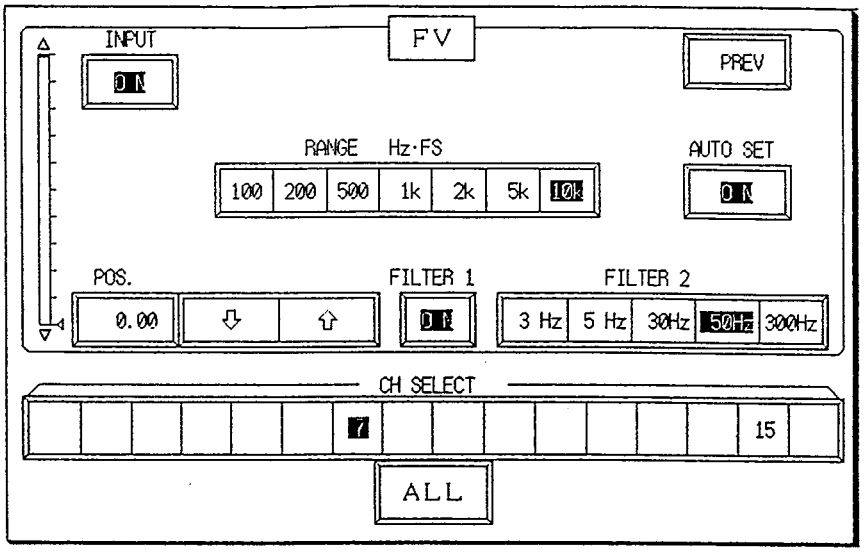
The NEMU 2 screen display (SYSTEM PAGE 3/3), as shown in the figure below, appears by pressing the [SYSTEM] key.
Note:

When another system page is displayed, press the [NEXT] key to display MENU 2 (SYSTEM PAGE 3/3).



By means of [⇦ ⇩ ⇧ ⇨] inside the screen display or the jog dial, the reversed display can be moved to the item of "16 F/V CONVERTER."

When the [SELECT] key inside the screen display or the [ENTRY] key on the operation panel is pressed, the screen display, as shown on the following page, appears.



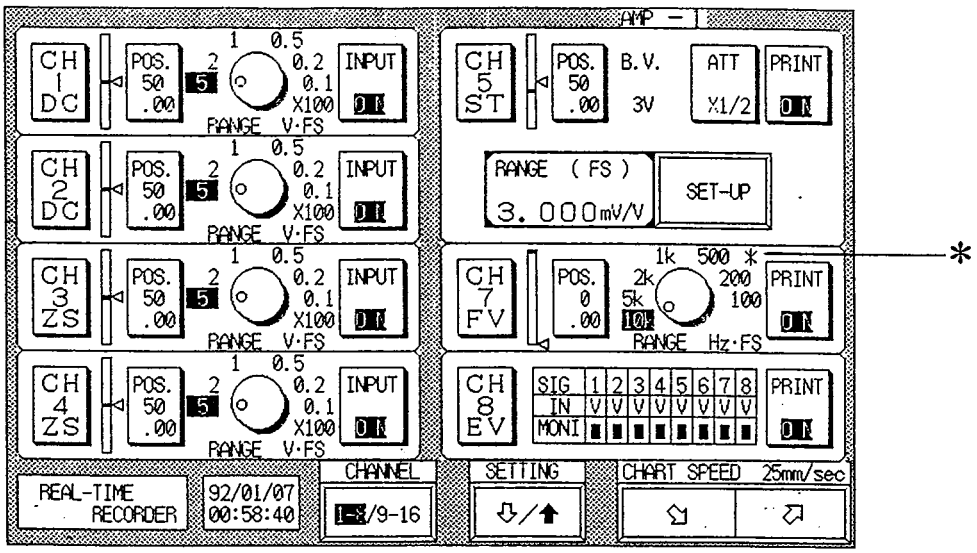
In the screen display shown above, press AUTO SET [ON] to select ON or OFF, and set the FILTER 1 and FILTER 2.

AUTO SET [ON] : The FILTER 1 is automatically turned ON, and the FILTER 2 is set to a standard value according to the change in sensitivity.

AUTO SET [OFF] : The mark * is displayed as in *RANGE Hz·FS [100 200 500 1k 2k 5k 10k], and each time the sensitivity is changed, the FILTER 1 and FILTER 2 are set to any positions according to the aforementioned tables.

Press FILTER 1 [ON] to set the FILTER 1 to ON or OFF, and press any key of FILTER 2 [3 Hz 5 Hz 30Hz 50Hz 300Hz] to set the FILTER 2.

When the filter is set to any position, the mark * is also displayed on the AMP screen display.



Changing sensitivity ranges on the AMP screen display causes the mark to disappear, and a standard value is selected.
In the case of list printing and channel annotation, "STD" is provided for a standard value.
If the filter is set to any position, the following printing is provided

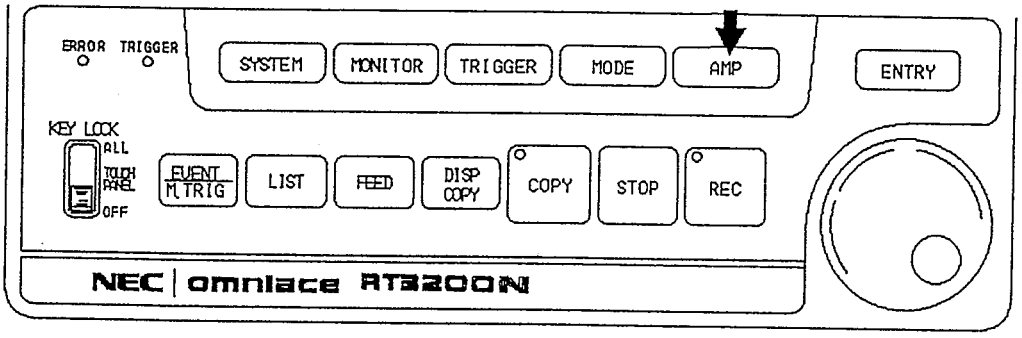
FILTER 1 set to ON: Set value of FILTER 2
FILTER 1 set to OFF: Set value of *FILTER 2

4.5 Setting-up of Zero Suppression Amplifier Unit

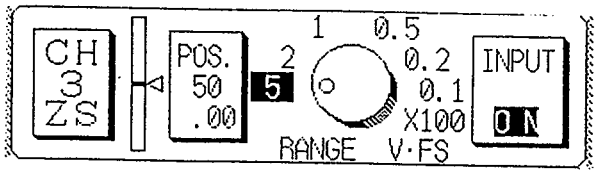
The zero suppression amplifier unit is a DC amplifier which can amplify only the AC component of an input signal by canceling the DC voltage superimposed on the input signal.
The voltage, which can be canceled, is up to a maximum of ±100 V (in the ranges of 2 to 500 V FS), and the canceling voltage is automatically generated.
In this operation manual, this canceling voltage is represented as a zero suppression voltage.
According to the measurement ranges, the zero suppression voltage ranges are set as follows:

Measurement range	0.1, 0.2, 0.5, 1 V FS	2, 5, 10, 20, 50, 100, 200, 500 V FS
Voltage range	DC ~ ±10 V	DC ~ ±100 V

Press the AMP key on the operation panel.



The AMP screen display (AMP-1 or AMP-2) appears by pressing the AMP key.
On the AMP screen display, the status of the zero suppression amplifier unit is displayed, as shown in the figure below:

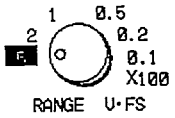


The above screen display will be explained from display to setting keys, as follows:

1) Display

Display	Display contents
	The input signal can be monitored as a waveform, and its base-line position is indicated by ◁. The monitored waveform is displayed in full scale and the range is linked with the base-line position.

2) Setting keys

Setting keys	Display contents and setting procedures
	When this key is pressed, ON, OFF or GND can be selected. ON : The input to the amplifier is turned ON so that recording can be carried out. OFF: The input to the amplifier is turned OFF so that recording is also turned OFF. GND: The input to the amplifier is turned OFF and recording is set to the base-line position.
	Press ◯ to change the input range one range by one range. Select the changing direction by SETTING ↓/↑.
	When this key is pressed, the base-line position of an input signal is moved in 10 steps with the full scale divided in 100 steps. In the initial state, the base line is positioned on the middle of the set recording width with the base line in "50.00". * The base-line position represents the display or recorded position where 0 V is inputted (the input is short-circuited). Note: If a numerical value is present in a place of less than a units digit (1.45) as in POS. 51 .45, it indicates that the base-line position is more finely adjusted than the ordinary 10-step increment or decrement by using the base-line fine adjusting function.

On the inside of this screen display, however, the base-line position cannot be finely adjusted. (For the setting procedures on the base-line fine adjustment, refer to the setting-up on AMP-3 display, which will be discussed later.)

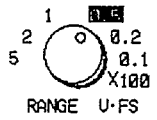
When [POS. 51 .45] is pressed, the base-line position is moved upwards or downwards by the ordinary 10-step increment or decrement as in [POS. 51 .45] → [POS. 60 .00] → [POS. 70 .00].

Use [SETTING ⇩/⬆] to select the changing direction.

[SETTING ⇩/⬆]

(This key is located at the lower part on the AMP screen display.)

This is used to select moving directions of input ranges and base-line positions.

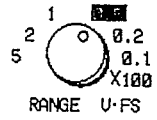
When 

is pressed in [SETTING ⇩/⬆], the sensitivity is continuously changed from 10 V FS to 5 V FS clockwise in the order of 0.5→0.2→0.1→...

Note:

The sensitivity cannot be changed from 0.1 V FS to 500 V FS.

When [POS. 50 .00] is pressed, the base-line position is moved in the order of 50.00→60.00→70.00→...

When 

is pressed in [SETTING ⬇/⇧], the sensitivity is continuously changed from 5 V FS to 10 V FS counter-clockwise in the order of 0.5→1→2→...

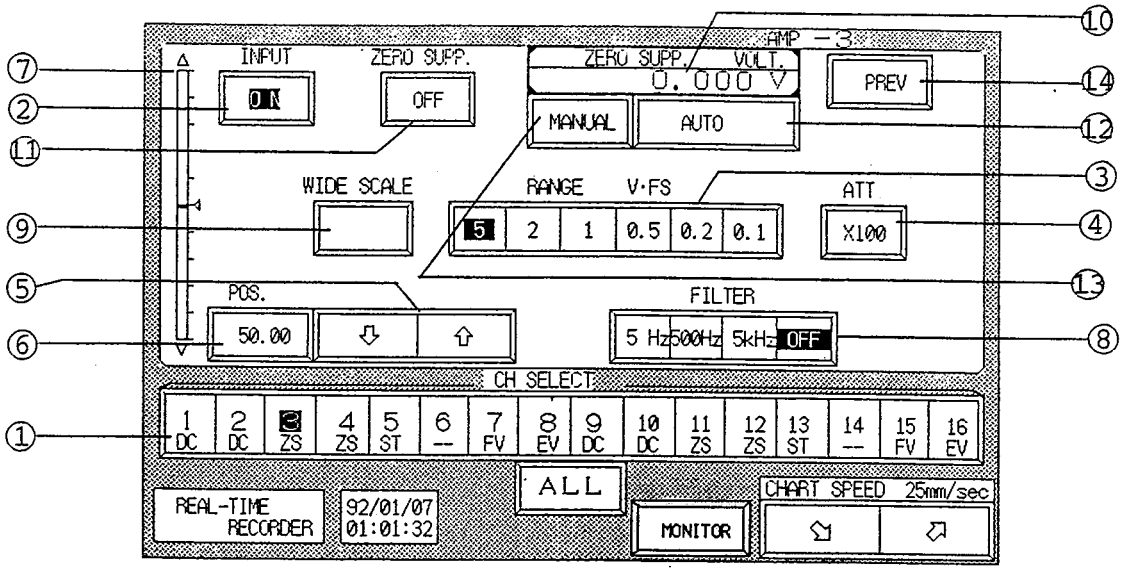
Note:

The sensitivity cannot be changed from 500 V FS to 0.1 V FS.

When [POS. 50 .00] is pressed, the base-line position is moved in the order of 50.00→40.00→30.00→...

When [CH 3 ZS] (the channel number key of a zero suppression amplifier unit) is pressed, the AMP-3 screen display appears to allow detailed settings to be carried out, as indicated in the following:

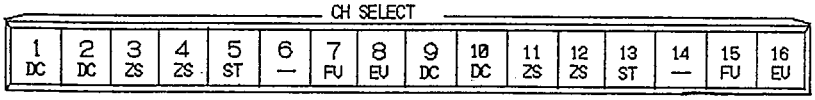
Press [CH 3 ZS] to display the AMP-3 screen display, as shown below:



Detailed settings can be carried out for each channel on this AMP-3 screen display.

① Channel selection:

Any displayed channel can be changed.



By pressing any channel key that needs to be set, the selected channel number is reversely displayed as 1, and the setup screen display of the selected channel is displayed to allow each item to be set.

When [ALL] is pressed, the input units of the same type can be simultaneously set.

For details, refer to 4.6 Setting Input Units All Together.

② Input:

The input condition can be set to ON, OFF or GND.

ON : The input to the amplifier is turned ON so that recording can be carried out.

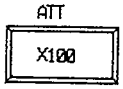
OFF: The input to the amplifier is turned OFF so that recording is also turned OFF.

GND: The input to the amplifier is turned OFF and recording is set to the base-line position.

③ Range (sensitivity) (V FS):

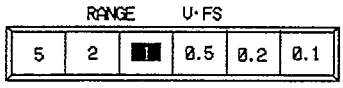
④ Attenuation (magnification):

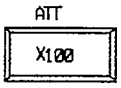
The input range can be set by RANGE and ATT.

When 

is pressed, the display can be changed as x1 or x100 to set up the magnification.

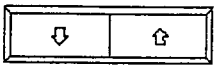
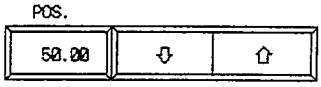
Example:

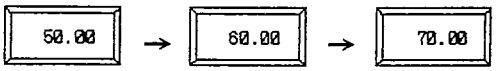
When RANGE and ATT are set to 



, the input range becomes 100 V FS.

⑤ Base line:

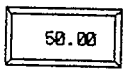
When  of 

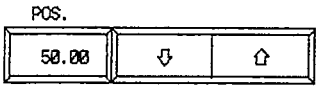
is pressed, the base-line position of an input signal goes up or down in 10 steps as in 

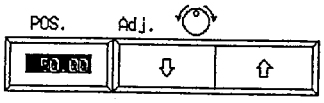
.

The base-line position is displayed at the right side of the monitor ⑦ with ◁.

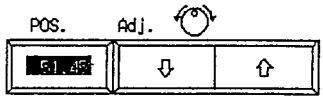
⑥ Base-line fine adjustment:

When 

of 

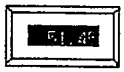
is pressed, the numerical value is reversely displayed as in 50.00 of 

.

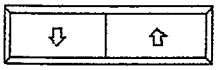
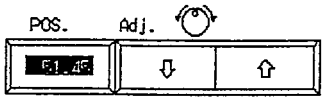
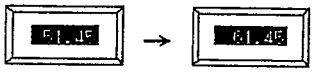
By turning the jog dial, a numerical value of less than a units digit is displayed, so that the base-line position can be more finely adjusted (in 0.05 steps) than the ordinary 10-step adjustment as in 51.45 of 

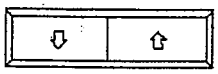
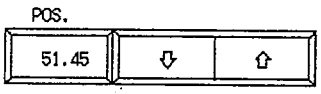
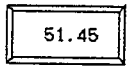
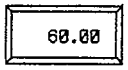
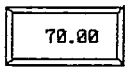
.

The base-line position can be moved in 0.125 steps by the jog dial during recording.

When  is pressed again, the setting-up is completed and the reversely displayed number is returned to the original state.

Note:

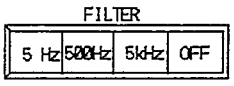
When  is pressed during fine adjustment as in  , the base-line position is moved with a finely adjusted component (1.45) maintained as in  .

When  is pressed during the time the fine adjustment is not being carried out as in  , the base-line position is moved in 1/10 steps of the full scale as in  →  →  .

⑦ Monitor:

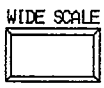
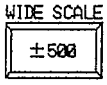
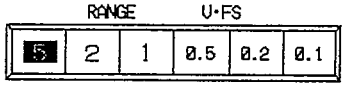
The status of an input signal, linked with the set base-line position, is displayed.

⑧ Filter:

Any low-pass filter can be selected from  .

(The selected filter is reversely displayed.)

⑨ Wide scale:

Pressing  allows   to be displayed.

In this mode, a waveform of +500 V to -500 V can be displayed and recorded.

Note:

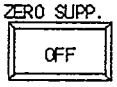
The range of 1000 V FS is not available.

If, for instance, the base-line position is set in 0.00 (the lowest position), the range for displaying and recording a waveform is from 0 to +500 V.

⑩ Zero suppression voltage:

A zero suppression voltage is displayed.

⑪ Zero suppression:

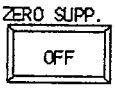
Pressing 

selects ON or OFF.

When ON is selected, a zero suppression voltage can be set.

⑫ AUTO:

A zero suppression voltage can be automatically set.

Press 

to display 

.

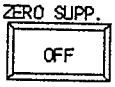
Then, press 

and the zero suppression voltage for the input signal, the moment the key is pressed, can be automatically set.

⑬ MANUAL:

A zero suppression voltage can be manually set.

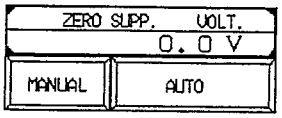
After a zero suppression voltage has been automatically set by ⑫, this can be conveniently used for the fine adjustment.

Press 

to display 

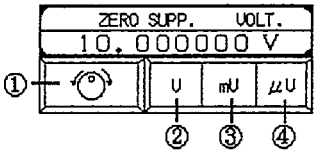
.

Then, press 

and the part of 

varies with the setup contents of sensitivity ranges, as shown below:

° When setup sensitivity ranges are from 0.1 to 1 V FS:

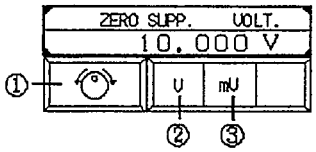


Press any key of ② to ④ in accordance with the input signal and set the zero suppression voltage with the jog dial.

A voltage of up to a maximum of ±100 V can be zero-suppressed.

Press the key ① and the display is returned to the original state and the setting is completed.

° When setup sensitivity ranges are from 2 to 500 V FS:



Press any key of ② and ③ in accordance with the input signal and set the zero suppression voltage with the jog dial.

A voltage of up to a maximum of ±100 V can be zero-suppressed.
Press the key ① and the display is returned to the original state and the setting is completed.

Note:

The function for manually setting a zero suppression voltage does not have the capability of setting zero suppression amplifier units all together by channel selection ① on the AMP-3 screen display.

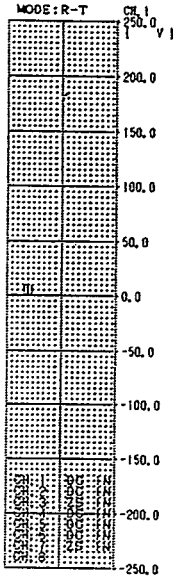
⑭ PREV (previous page):

An 8-channel screen display can be selected.
For selecting channel 1 to channel 8, the screen display of channel 1 to channel 8 (AMP-1) is selected.
For selecting channel 9 to channel 16, the screen display of channel 9 to channel 16 (AMP-2) is selected.

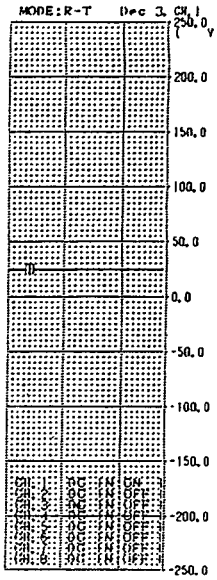
On scaling for finely adjusting function of base-line position:
When a base-line position is finely adjusted on the AMP-3 screen display, the base-line position is moved in 0.125 mm steps during recording. The displayed scaling is, however, moved only 10 steps by 10 steps with the full scale divided in 100 steps.
Care should be taken that the displayed scaling is moved according to the base-line position finely adjusted, as shown in the figures on the following page:

Sample recording:

Scaling with base-line position set in 50.00

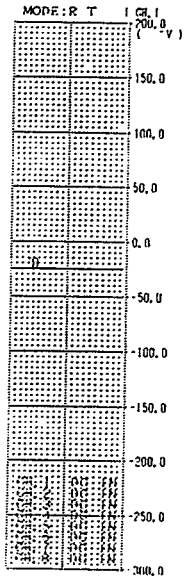


Scaling with base-line position set in 50.00 to 54.95

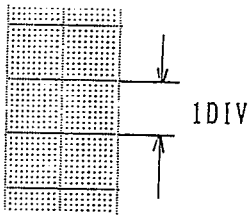


Scaling does not move.

Scaling with base-line position set in 50.00 to 64.95

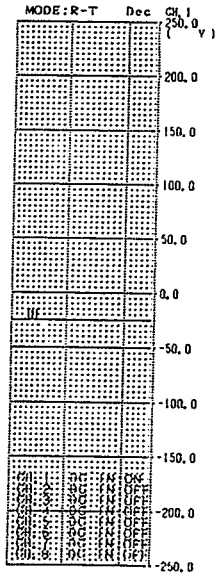


Scaling is moved in 10 steps upwards.



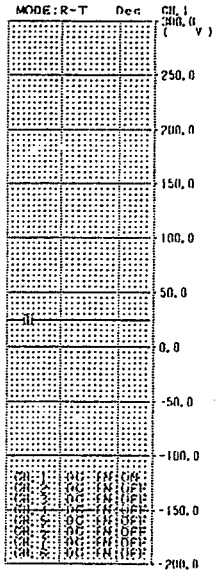
If a base-line position is moved to more than 1/2 DIV, scaling is moved.

Scaling with base-line position set in 50.00 to 45.00



Scaling does not move.

Scaling with base-line position set in 44.95 to 35.00



Scaling is moved in 10 steps downwards.

4.6 Setting Input Units All Together

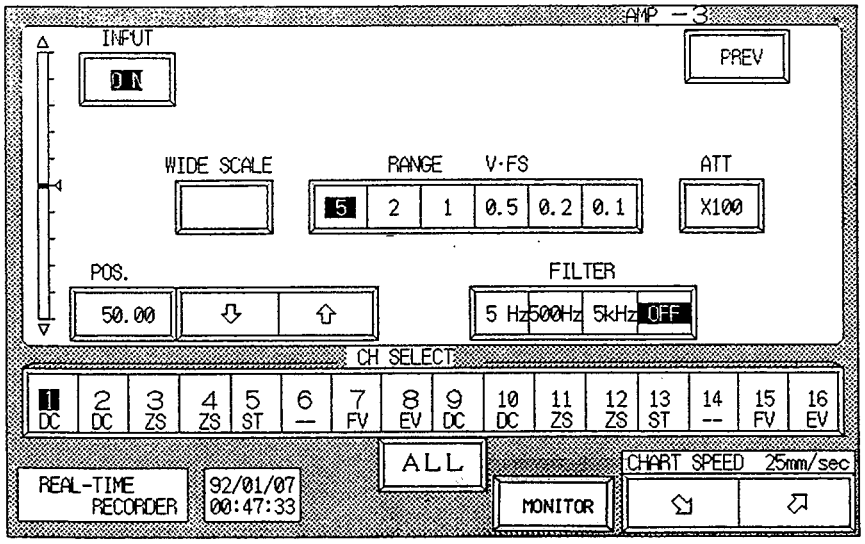
The input units of the same type can be set to the same settings all together.

Note:

The function for setting by [ALL] is energized only when two or more input units of the same type are installed in the basic instrument.

Press the [AMP] key on the operation panel to display an 8-channel screen display (AMP-1 or AMP-2).

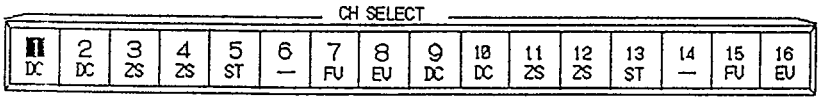
Then, press [CH 1 DC] (the channel number key) on the screen display to cause the AMP-3 screen display to appear.



Press the key of a channel to be set by channel selection to allow the setup screen display (AMP-3) of the selected channel to appear.

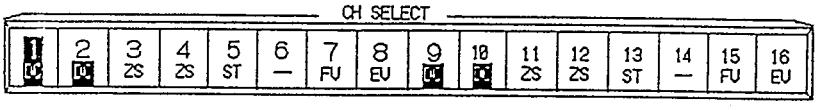
Example:

In the figure shown above, when channel 1 (the channel where a DC amplifier unit is installed) is selected, the procedures are as follows:



Press [ALL], located at the lower part of channel selection, and "ALL" is reversely displayed as in [ALL].

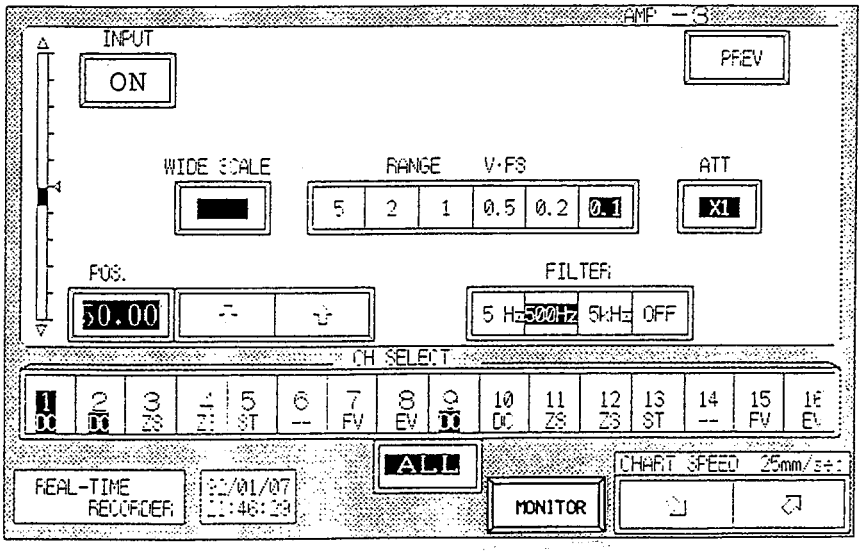
In this mode, the channels, where the input units of the same type as that built in the channel selected as in the figure above are incorporated (the channels where DC amplifier units are incorporated as in the figure above), are reversely displayed.



Note:

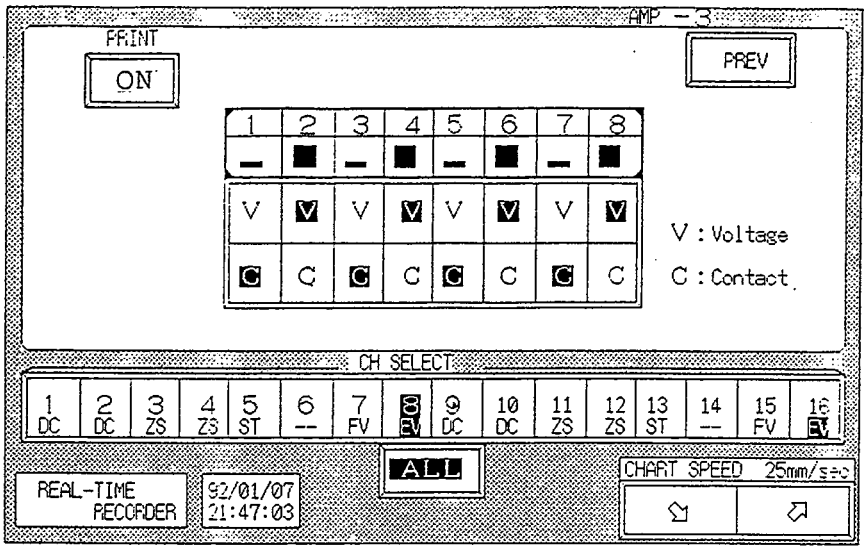
If any channel key, which is reversely displayed, is pressed, the reversely displayed channel is released, indicating that the channel is released from the mode of "setting input units all together." When the key is pressed again, it is reversely displayed, indicating that the input unit can be set all together.

The setting-up can be carried out on the AMP-3 screen display.



Press the ALL key for reverse display.
The keys, which are not reversely displayed, cannot be set all together.
In the figure shown above, channels 1, 2 and 9 are set to 0.1 V FS, base line 50.00 and filter 500 Hz.
If ALL is pressed again when the setting-up has been completed, the reversely displayed channels (channels 1, 2 and 9 in the above figure) are set to the same parameters all together and the reverse display is released.

If no key is pressed, setting input units all together cannot be carried out even when [ALL] is pressed.
Pressing [ALL] again returns the display to the original state.
In the case of event amplifier units, the AMP-3 screen display is as shown below:

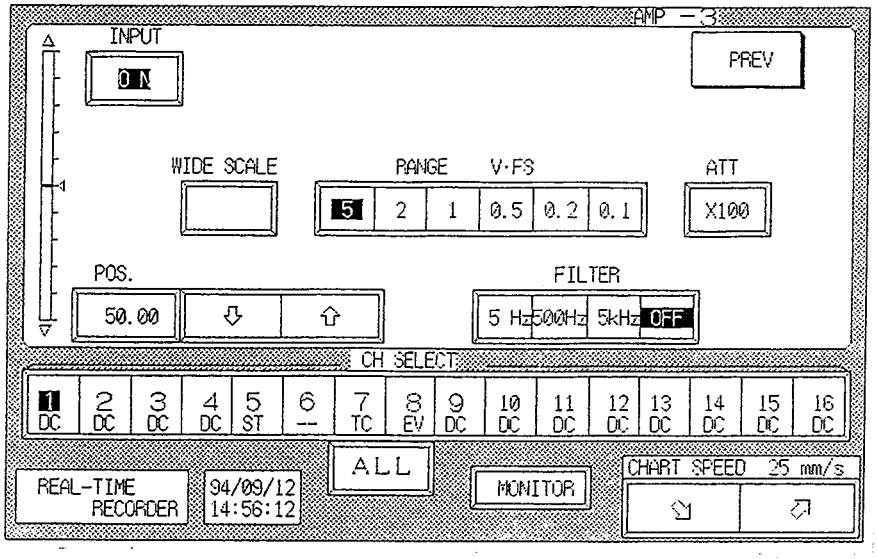


In the figure shown above, channels 8 and 16, which are reversely displayed, are set as shown below:
Channels 1, 3, 5 and 7 of the inner part of the event amplifier unit are set to the contact input, while channels 2, 4, 6 and 8 of the inner part of the event amplifier unit are set to the voltage input.

4.7 AMP Setup Monitor Screen Display

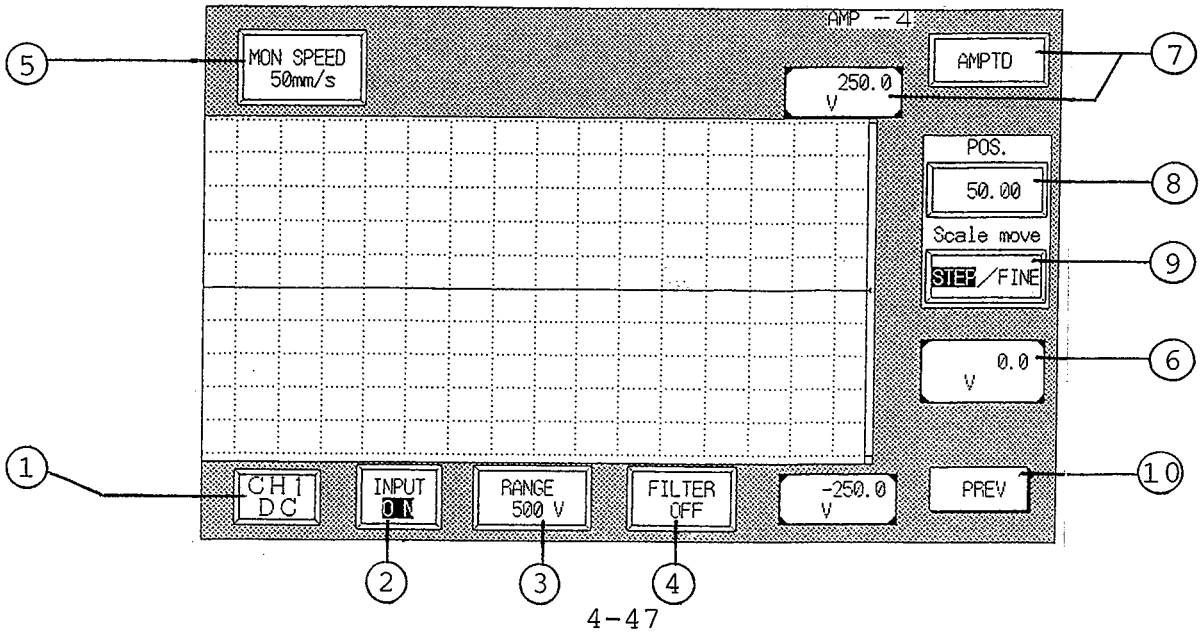
On the AMP setup monitor screen display, an input amplifier unit can be set up for each channel and, in addition, the amplitude of an input waveform can be changed without changing sensitivity while viewing the waveform monitor.
The amplitude of an input waveform can be also changed by 7 SCALE/UNIT SETTING on the MENU 2 screen display (SYSTEM PAGE 3/3).

Display the AMP-4 screen display (the AMP-3 screen display for RT3108N/3208N series) by pressing the [MONITOR] key on the AMP-3 screen display (the AMP-2 screen display for RT3108N/3208N series).



Press the [MONITOR] key to display the AMP setup monitor screen display.

In case of DC amplifier unit:



Set up each key on the AMP setup monitor screen display as follows:

① Channel selection

The channel to be displayed can be changed.

Press 

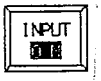
to display 

and change the channel to any channel with the jog dial.

Press 

again and the monitor screen display of the selected channel can be displayed.

② INPUT

Pressing 

displays ON, OFF or GND.

ON : The input to the amplifier is turned on, so that recording can be carried out.

OFF: The input to the amplifier is turned off and recording is also turned off.

GND: The input to the amplifier is turned off and recording is positioned on the baseline.

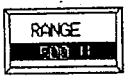
③ RANGE (sensitivity)

The input range can be changed.

Press 

to display 

and change the range to any range with the jog dial.

Pressing 

again completes the setting-up.

④ FILTER

The low-pass filter can be changed.

Press 

to display 

and select any filter value with the jog dial.

Pressing 

again completes the setting-up.

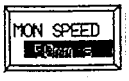
⑤ MON SPEED (monitor speed)

The monitor display speed can be changed.

Press 

to display 

and change the speed to any monitor speed with the jog dial.

Pressing 

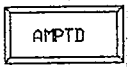
again completes the setting-up.

⑥ Digital display

The input signal can be digitally displayed.

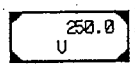
⑦ AMPTD (amplitude)

The amplitude of an input waveform can be changed to the range of from x10 to x1/2.

Press 

to display 

and change amplitude to any value with the jog dial.

On 

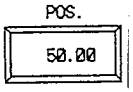
, a full-scale value is displayed.

If the amplitude is changed, a mark "#" is displayed and the full-scale value is also changed accordingly.

Pressing 

again completes the setting-up.

⑧ POS (fine adjustment of baseline position)

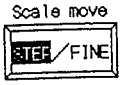
Press 

to display 

and adjust the baseline position with the jog dial.

⑨ Scale move

When recording a waveform, steps of scale display movement can be changed.

Press 

to set moving steps to STEP or FINE.

STEP: If the movement of baseline position exceeds ±0.5 DIV, the scale display is moved 10 steps by 10 steps with the full scale in 100.

FINE: If the baseline position is finely adjusted in 0.05 steps with the full scale in 100, the scale display is changed in 1/2000 steps of sensitivity.

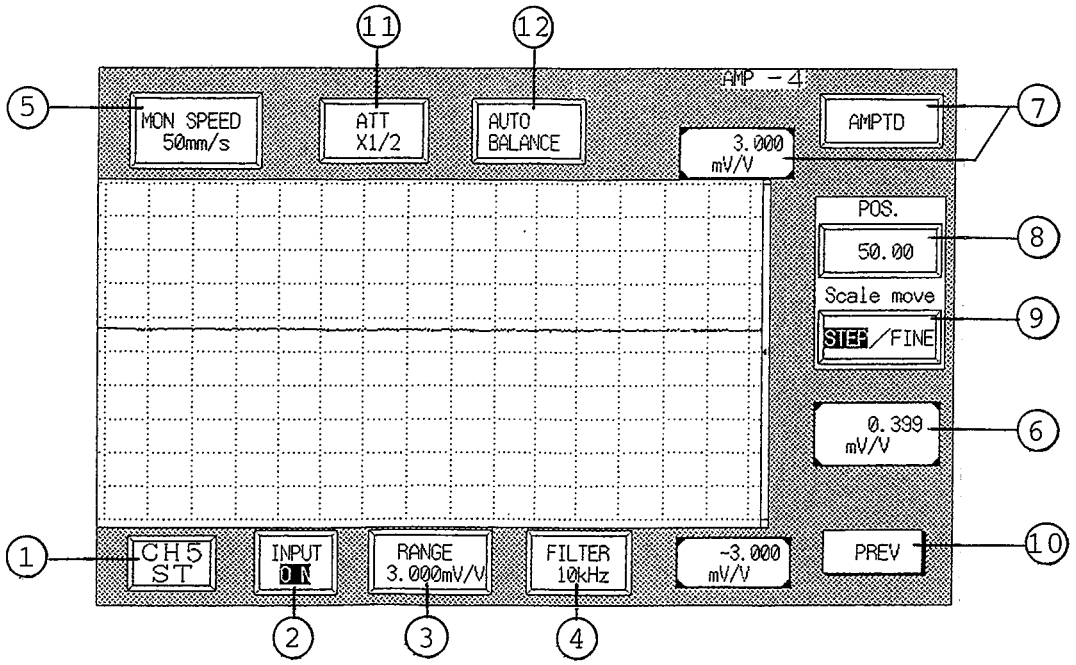
Note:

Sample recording of scale display will be shown later.

⑩ PREV (previous page)

Pressing this key selects one page previous to the current display.

In case of DC bridge strain amplifier unit:



(In the screen display shown above, the setting of keys of from ① to ⑩ is the same as that to be carried out on the screen display for DC amplifier unit.)

⑪ ATT (attenuator)

The input range, which is suited to the rated output of a strain-gage-based transducer can be set with ③ RANGE and ⑪ ATT.

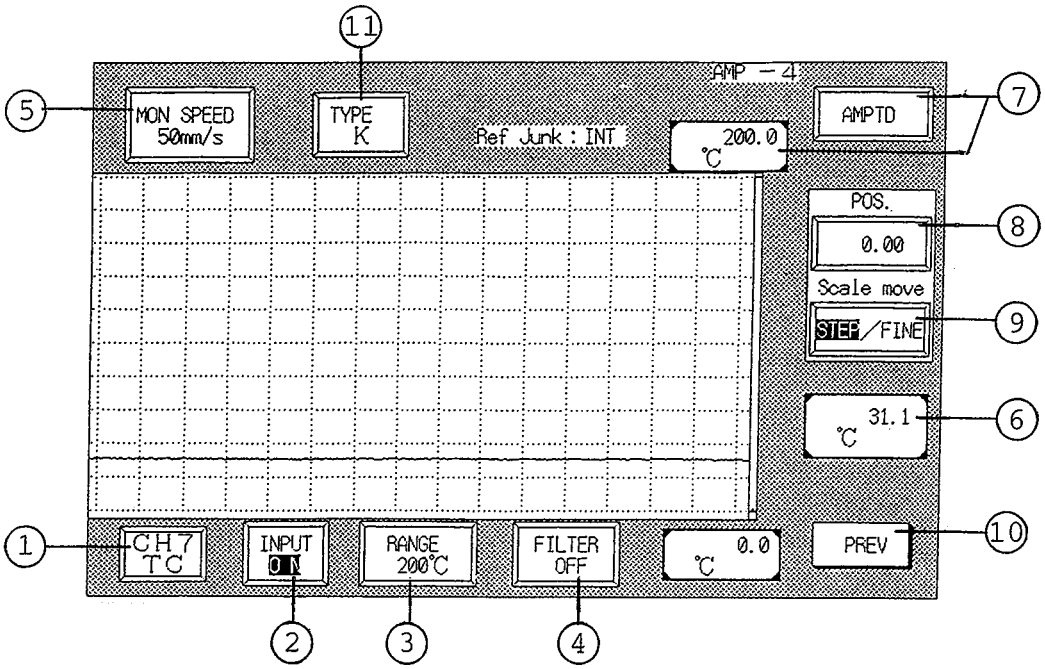
Press [ATT X1/2] and the display can be changed to x1/2 and x1.

Thus, the sensitivity (F.S.) set by x1 can be changed to x1/2.

⑫ AUTO BALANCE

The input signal can be positioned on the baseline by correcting the input-signal baseline movement automatically (in approx. 1 sec) at the moment of pressing [AUTO BALANCE].

In case of thermocouple amplifier unit:



(In the screen display shown above, the setting of keys of from (1) to (10) is the same as that to be carried out on the screen display for DC amplifier unit.)

(11) TYPE

The type of a thermocouple to be used can be selected.

When the thermocouple amplifier unit is used as a DC amplifier, select "DC".

Press [TYPE K] to display [TYPE] and change the type with the jog dial.

Notes:

° If changing amplitude is carried out on the AMP setup monitor screen display, the setup contents of MODE 1 of 7 SCALE/UNIT SETTING of the MENU 1 screen display (SYSTEM PAGE 2/3) are automatically changed. In a case where the mode is set to MODE 2 in 7 SCALE/UNIT SETTING, it is automatically changed to MODE 1.

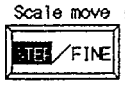
° If changing amplitude is carried out, the trigger level is affected, as it is set by percent (%) on the amplitude of a recorded waveform. After setting up amplitude, therefore, it is necessary to set up the trigger level once again.

° If the channel, where the WIDE SCALE function of a DC amplifier unit is used, is displayed on this screen display, ±500 V FS is displayed. If, however, RANGE (sensitivity) or AMPTD (amplitude) is set, the WIDE SCALE function is canceled.

* If the amplitude is changed on this screen display, a mark "#" is displayed and recorded on the digital-value display of input data, channel annotation, scale and list printing.
(If the recorded output is set to any setting other than the standard output in 7 SCALE/UNIT SETTING, a mark "*" is displayed and recorded.)

On scale display in use of fine-adjusting function of baseline position

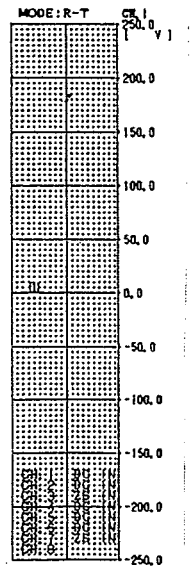
The baseline position is moved, when recording, in 0.125 mm steps in fine adjustment of the baseline position on the AMP screen display. However, the moving steps of the scale display are changed by the setting on the AMP setup monitor screen display as follows:

° Ordinary moving steps or moving steps with scale move set in 

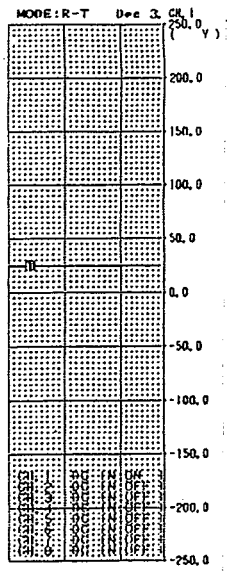
on AMP setup monitor screen display;
Because of the finely adjusted baseline position, the scale display is moved only 10 steps by 10 steps with the full scale in 100.

Sample recording:

Scale display with POS set in "50.00"

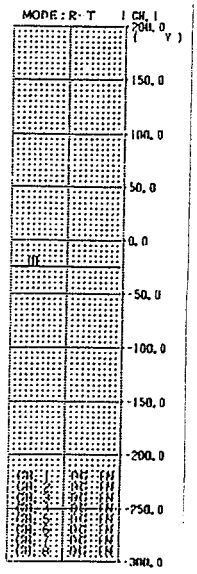


Scale display with POS set in "50.00 ~ 54.95"

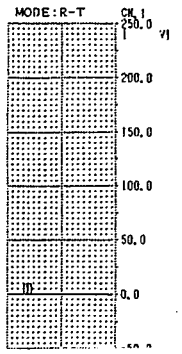


↑Scale display does not move.

Scale display with POS set in "55.00 ~ 64.95"



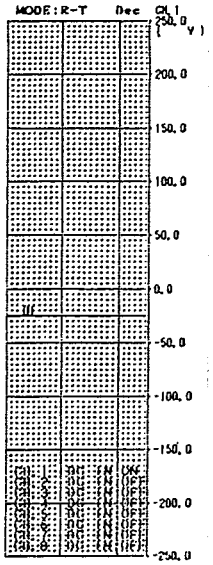
↑Scale display moves up by 10 steps.



1 DIV

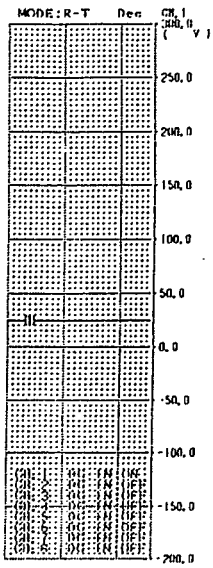
If baseline position moves by more than 1/2 DIV, scaling moves.

Scale display with POS set in "50.00 ~ 45.00"



↑Scale display does not move.

Scale display with POS set in "44.95 ~ 35.00"



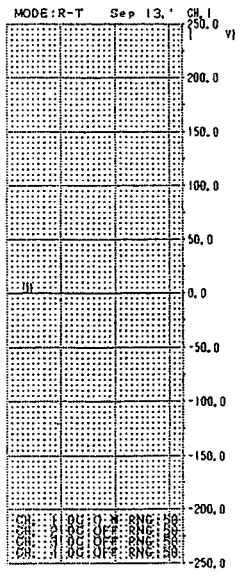
↑Scale display moves down by 10 steps.

° Moving steps with "FINE" of Scale move displayed reversely in black and white;

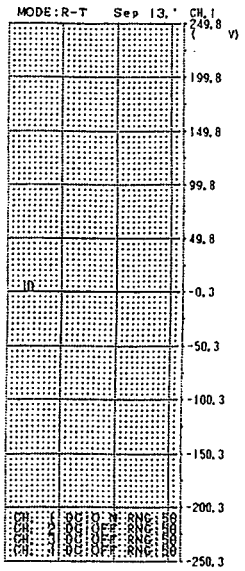
Because of the finely adjusted baseline position, the scale display is changed in 1/2000 steps of sensitivity.

Sample recording:

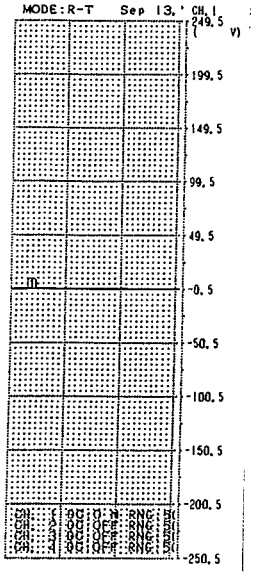
Scale display with POS set in "50.00"



Scale display with POS set in "50.05"

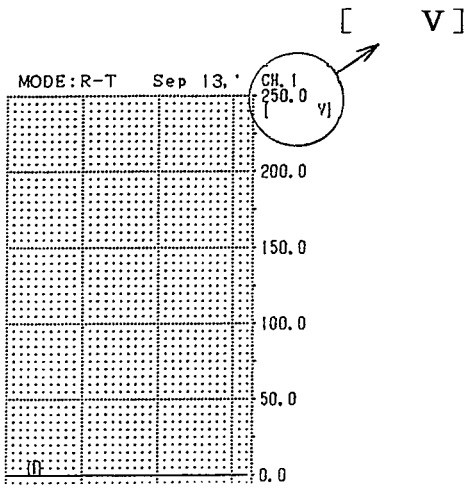


Scale display with POS set in "50.10"

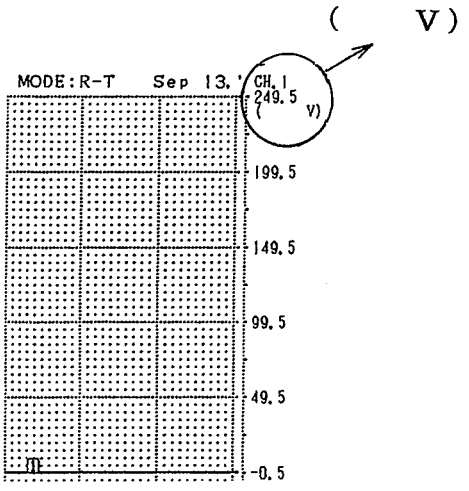


When making a comparison between the case where the baseline is positioned on a 1/10 step of the full scale and the case where the baseline position is finely adjusted, displayed part of the scale unit is changed, as shown below:

When baseline is positioned on 1/10 step of full scale (10.00, 20.00, ...);



When baseline position is finely adjusted;



Note:

For list printing and channel annotation, displayed parts of units are also changed.

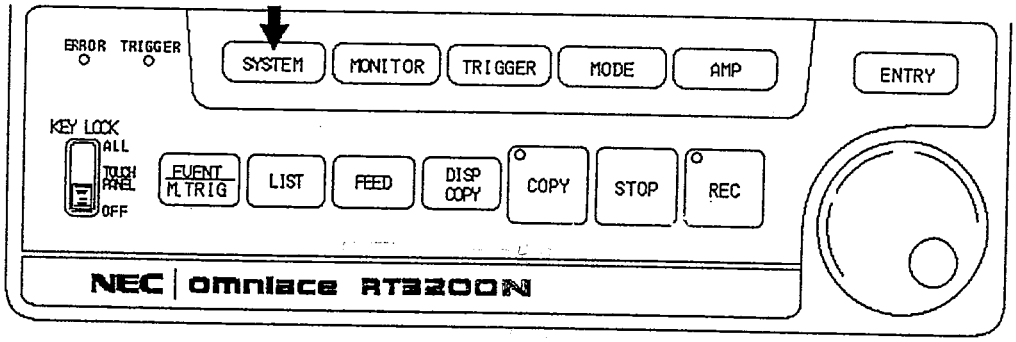
SECTION 5

HOW TO USE REAL-TIME RECORDER

The real-time recorder is a function which can directly record input signals.
There are three kinds of recording format available; waveform recording, data recording and X-Y recording.
Besides, the waveform monitor is a function which can directly monitor input signals on the display, and two kinds of display format, waveform display and digital-value display, can be selected.

5.1 Selection of Real-time Recorder

Press the SYSTEM key on the operation panel.



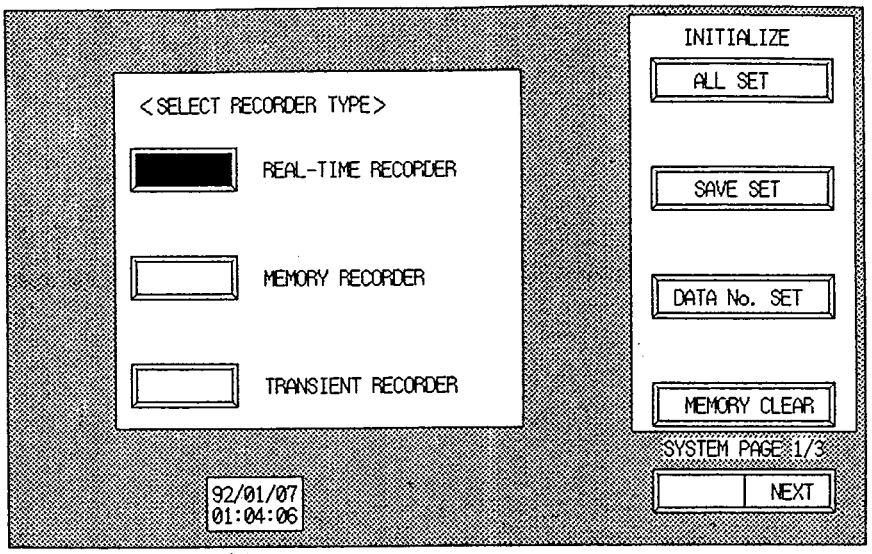
Press the SYSTEM key to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3).

Note:

When another system page is displayed, press the PREV key to display SELECT RECORDER TYPE (SYSTEM PAGE 1/3).

Select REAL-TIME RECORDER.

Press the part [ ] of [ ] REAL-TIME RECORDER .



In the figure shown above, the following settings are available:

When [ALL SET] is pressed, all setup contents of the basic instrument can be set to the initial values.
(Refer to 9.12 Initialization.)

When [SAVE SET] is pressed, the set parameters of input units and the set status of the basic instrument, which are saved in the memory of the basic instrument in 9.1 Saving and Loading Setup Contents, are left unchanged and other setup contents of the basic instrument can be initialized.

Press [YES] on the screen display for execution.

Press [QUIT] on the screen display for quitting, and the display is returned to the original state without initialization.

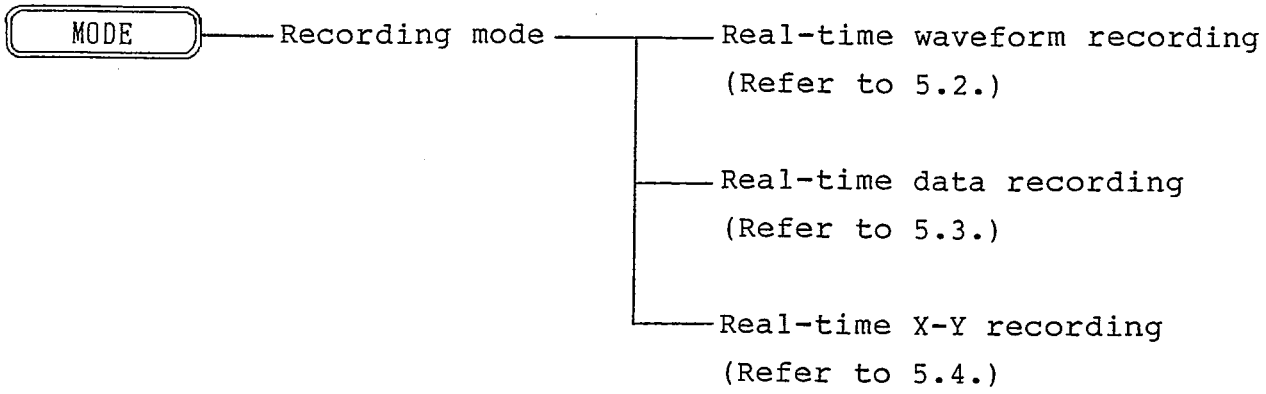
When [DATA No. SET] is pressed, the data number of the memory block is cleared to 1 or can be set to any value.
(Refer to 9.9·Setting Data No.)

When [MEMORY CLEAR] is pressed, data of the memory block can be cleared.
(Refer to 6.10 Memory Clear.)

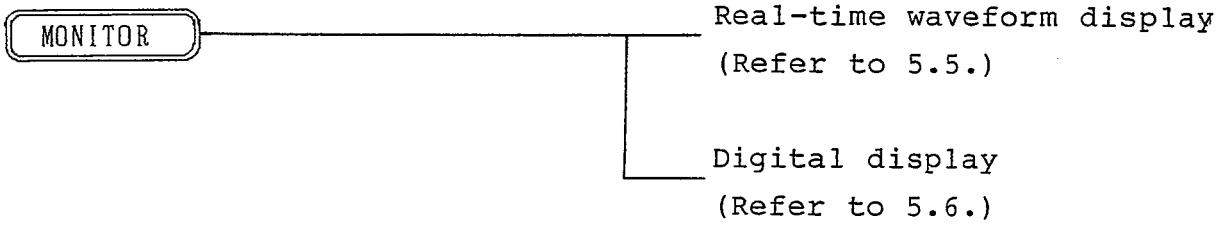
Setup contents of real-time recorder:

In the real-time recorder, the following setting-up can be conducted:

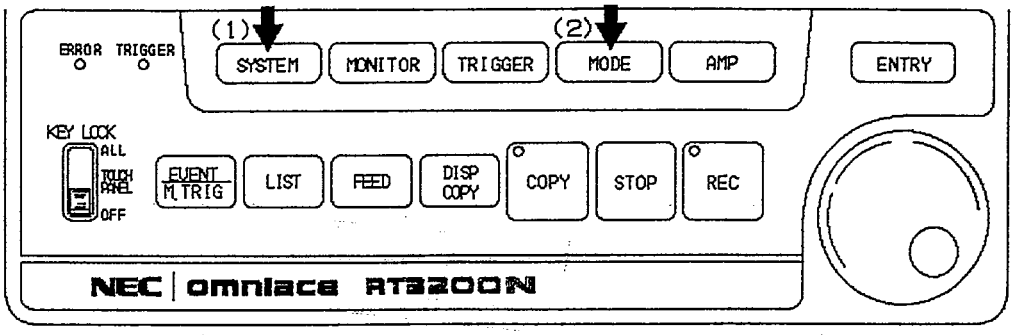
Press MODE on the operation panel for selecting recording modes.



Press the MONITOR key on the operation panel and the real-time waveform of an input signal and the digital value of input data can be displayed.



5.2 Setting-up of Real-time Waveform Recording



(1) Selection of real-time recorder:

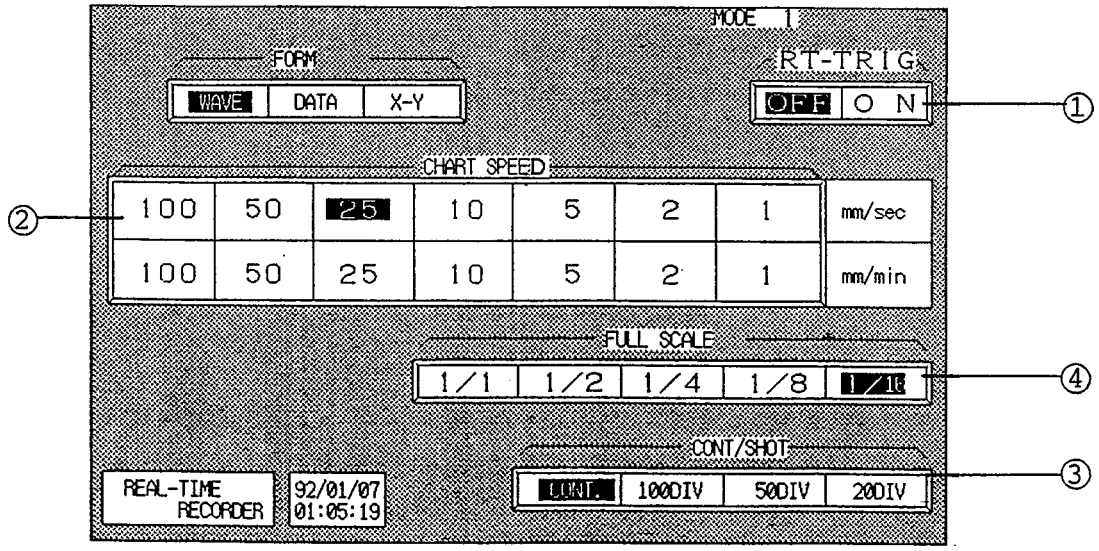
Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select REAL-TIME RECORDER. (Refer to 5.1.)

(2) Setting-up of recording format:

Press the [MODE] key on the operation panel.

Select the recording format from FORM [WAVE | DATA | X-Y] located at the upper left on the screen display.

Press [WAVE] to display the MODE 1 screen display, as shown below: (The selected recording format is reversely displayed.)



Set parameters on the MODE 1 screen display, as follows:

① RT TRIG (trigger):

Set this to 

.

Be sure to turn it [OFF] for ordinary recording.

Should it be set to [ON], recording cannot be made for as long as it is not triggered.
(For details, refer to 5.7.)

② Chart speed:
Chart paper speeds for recording waveforms can be selected.
Press any chart speed key that needs to be selected.
Note:

Even when measurement is started by pressing the [REC] key on the operation panel, the chart speed can be changed.

③ Record length control:
Automatic record length control is provided.
Press any key for selecting any record length.
CONT.: Continuous recording (10 mm/DIV).
100 DIV: Chart paper automatically stops after it has been recorded by 100 DIV (100 cm).
50 DIV: Chart paper automatically stops after it has been recorded by 50 DIV (50 cm).
20 DIV: Chart paper automatically stops after it has been recorded by 20 DIV (20 cm).

④ Full scale:
Effective record widths can be selected.
Press any key for selecting effective record widths.
1/1: 200 mm full scale
1/2: 100 mm full scale
1/4: 50 mm full scale
1/8: 25 mm full scale
1/16: 10 mm full scale

Measurement procedures:

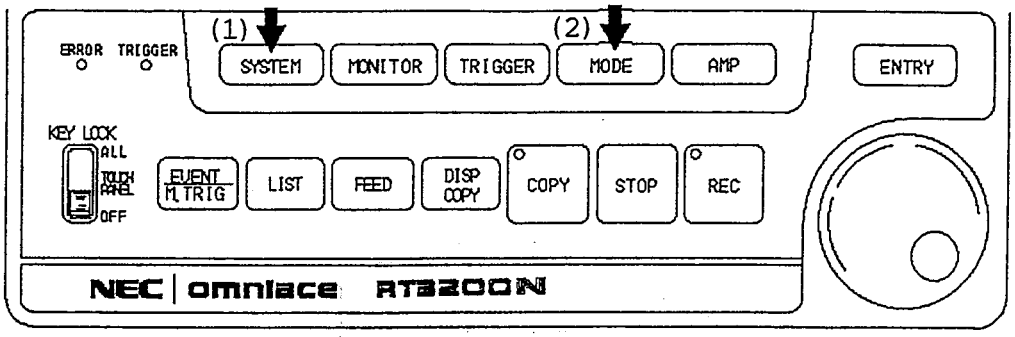
Carry out measurement after the settings on the previous page have been completed.

1. Press the [REC] key on the operation panel and the LED of the [REC] key lights and recording is started.
2. Press the [STOP] key and the LED of the [REC] key goes out and recording is stopped.

Notes:

When the record length is set to any position other than [CONT.], chart paper stops automatically by the preset record length. When [EVENT/M.TRIG] is pressed during measurement by pressing the [REC] key (or when a mark input is applied to the remote connector), the mark ↓M, and the date and time are printed at the upper margin on chart paper.

5.3 Setting-up of Real-time Data Recording



(1) Selection of real-time recorder:

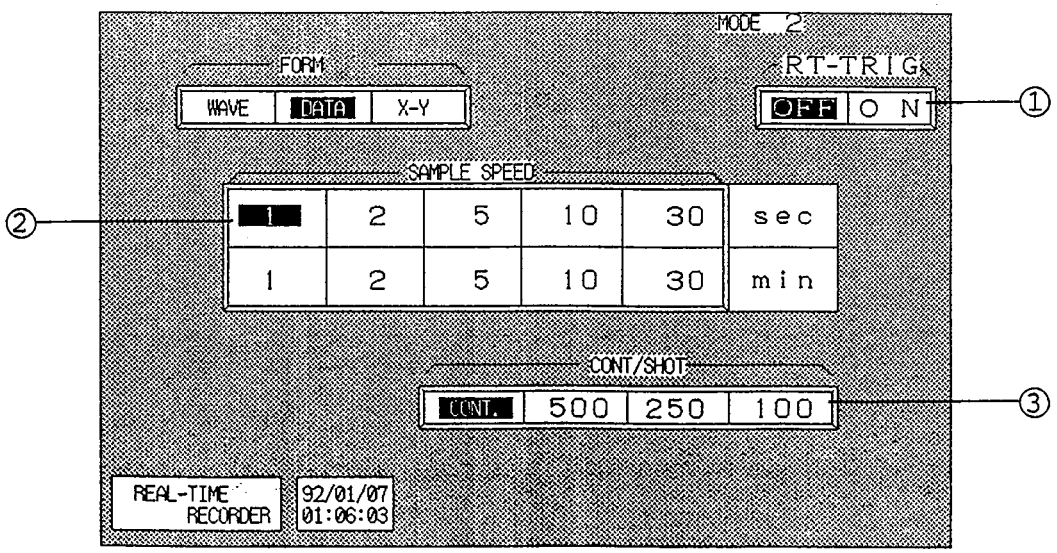
Press the SYSTEM key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select REAL-TIME RECORDER. (Refer to 5.1.)

(2) Setting-up of recording format:

Press the MODE key on the operation panel.

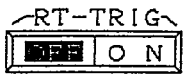
Select the recording format from FORM [WAVE | DATA | X-Y] located at the upper left on the screen display.

Press DATA to display the MODE 2 screen display, as shown in the figure below:
(The selected recording format is reversely displayed.)



Set parameters on the MODE 2 screen display, as follows:

① RT TRIG (trigger):

Set this to 

.

Be sure to set it to [OFF] for ordinary recording.

Should it be set to [ON], recording cannot be made for as long as it is not triggered.
(For details, refer to 5.7.)

② Sample speed:
Data recording intervals can be selected.
Press any sample speed key that needs to be set.
For instance, if the sample speed is set to 1 sec, data is recorded every 1 sec.
Note:

Even when measurement is started by pressing the [REC] key on the operation panel, the sample speed can be changed.

③ Record length control:
Automatic record length control is provided.
Press any key for selecting any record length.
CONT.: Continuous recording.
500 : Chart paper automatically stops after it has been recorded by 500 data items.
250 : Chart paper automatically stops after it has been recorded by 250 data items.
100 : Chart paper automatically stops after it has been recorded by 100 data items.

Measurement procedures:
Carry out measurement after above settings have been completed.

1. Press the [REC] key on the operation panel and the LED of the [REC] key lights and recording is started.

2. Press the [STOP] key and the LED of the [● REC] key goes out and recording is stopped.

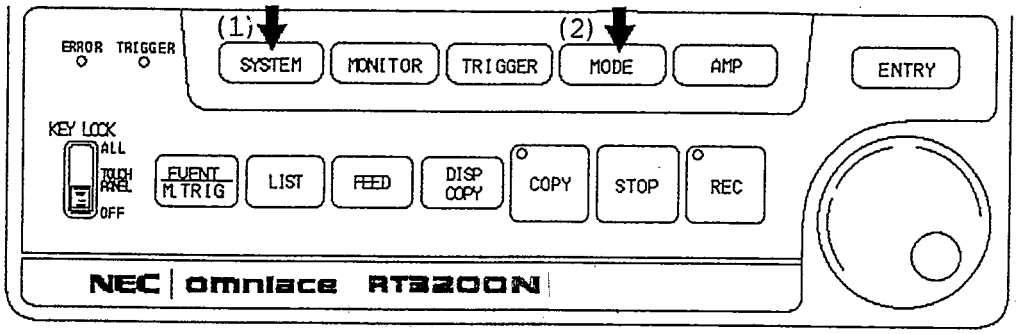
Notes:

When the record length is set to any position other than [CONT.], chart paper stops automatically by the preset record length.

When [EVENT M TRIG] is pressed during measurement by pressing the [○ REC] key (or when a mark input is applied to the remote connector), the mark M> , and the time and data are printed.

5.4 Setting-up of Real-time X-Y Recording

In real-time X-Y recording, press the [STOP] key on the operation panel for recording after X-Y data has been once plotted on the screen display.



(1) Selection of real-time recorder:

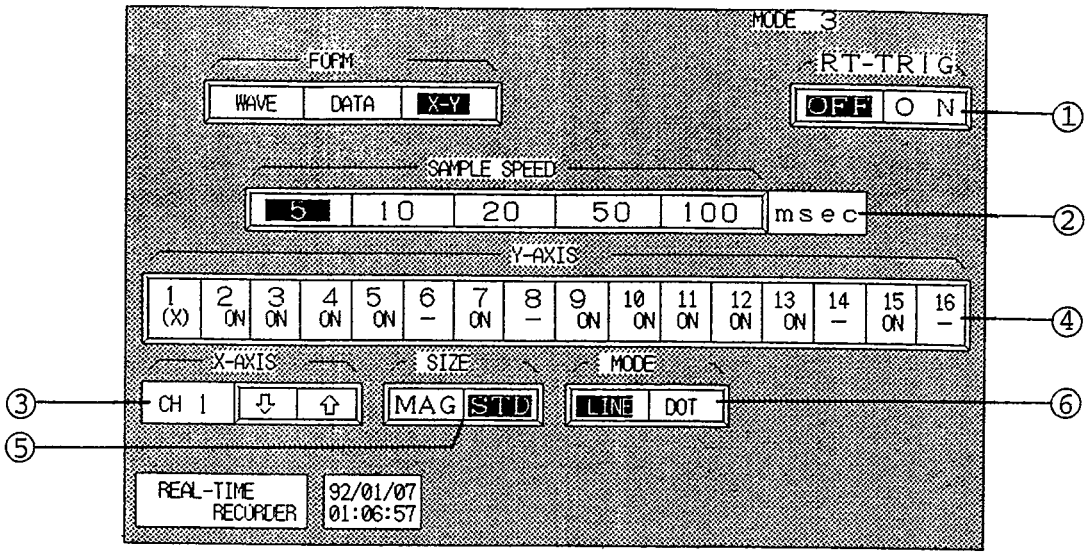
Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYTEM PAGE 1/3). Then, select REAL-TIME RECORDER. (Refer to 5.1.)

(2) Setting-up of recording format:

Press the [MODE] key on the operation panel.

Select the recording format from FORM [WAVE | DATA | X-Y] located at the upper left on the screen display.

Press [X-Y] to display the MODE 3 screen display, as shown in the figure below:
(The selected recording format is reversely displayed.)



Set parameters on the MODE 3 screen display, as follows:

① RT TRIG (trigger):

Set this to 

Be sure to set it to [OFF] for ordinary recording.

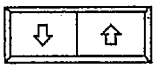
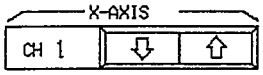
Should it be set to [ON], recording cannot be made for as long as it is not triggered.
(For details, refer to 5.7.)

② Sample speed:

Recording intervals on the screen display can be selected.
Press any sample speed key that needs to be set.
For instance, if the sample speed is set to 5 msec, data is recorded every 5 msec on the screen display.

③ X axis:

An X-axis channel can be set.

Press  of 

, and channel numbers of [CH 1] can be changed.

The displayed channel number is an X-axis channel. (For an event amplifier unit, however, this is not available.)

④ Y axis:

Recording of a Y-axis channel is set to ON or OFF.
(For an event amplifier unit, however, this is not available.)
Note:
"X" is displayed for a channel set to the X-axis channel, while "-" is displayed for a channel where an event amplifier unit is installed or for a channel where no input unit is installed.

⑤ Record size:

The record size of the memory X-Y screen display can be changed.

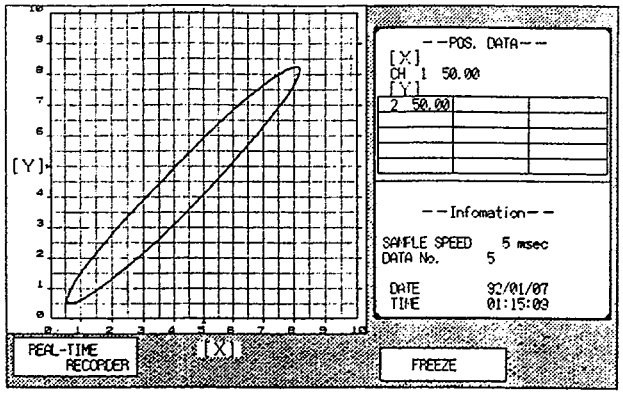
⑥ Record mode:

Linear interpolation function can be turned on or off.
LINE: Linear interpolation turned on.
DOT : Linear interpolation turned off.

Measurement procedures:
Carry out measurement after above settings have been completed.

1. Press the [○ REC] key on the operation panel and the LED of the [○ REC] key lights and the display is selected to the X-Y screen display to start recording.
(RECORD displayed at lower right on the screen display.)

2. Press the [STOP] key and the instrument is put into the FREEZE mode (FREEZE displayed at lower right on the screen display).
When the [● REC] key is pressed again, recording is restarted.
(RECORD displayed at lower right on the screen display)
When the [STOP] key is pressed again with the instrument in the FREEZE mode, the LED of the [● REC] key goes out and the LED of the [○ COPY] key lights to automatically copy the display.



On the part "--POS. DATA--" at the right margin on the screen display, the channel numbers set to the X and Y axes and the base-line position are displayed, while the following information is displayed on the part "--Information--."

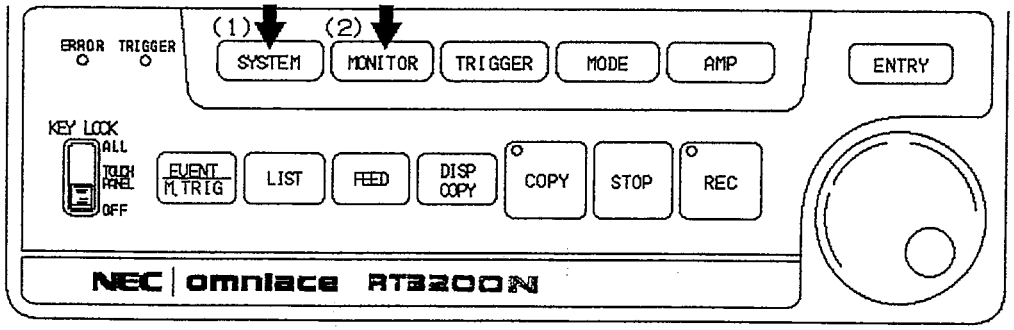
SAMPLE SPEED

DATA No.: The data number stored in each memory block.

DATE : The date when measurement is started.

TIME : The time when measurement is started.

5.5 Setting-up of Real-time Waveform Display



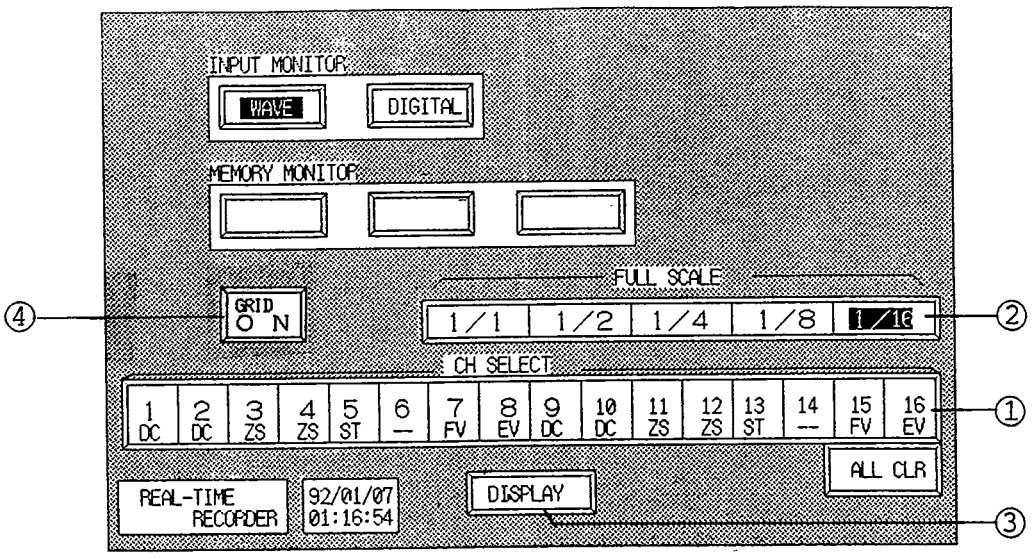
(1) Selection of real-time recorder:

Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). (Refer to 5.1.

(2) Setting-up of real-time waveform display:

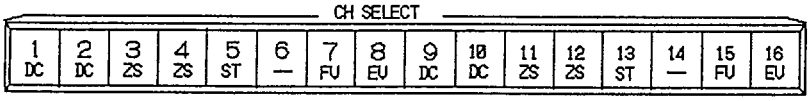
Press the [MONITOR] key on the operation panel.

Press the WAVE key of INPUT MONITOR [WAVE] [DIGITAL] located at the upper part on the screen display to display the following display.



Set parameters on the above screen display, as follows:

① Channel selection:



Channels for monitoring can be selected.
The selected channels are reversely displayed. All channels can be selected.
When [ALL CLR] is pressed, the selected channels can be all cleared and channels can be selected over again.

② Full scale:
Effective display widths can be selected.

1/1 : A whole of waveform display width set as full scale.
1/2 : A half of waveform display width set as full scale.
1/4 : A quarter of waveform display width set as full scale.
1/8 : 1/8 of waveform display width set as full scale.
1/16: 1/16 of waveform display width set as full scale.

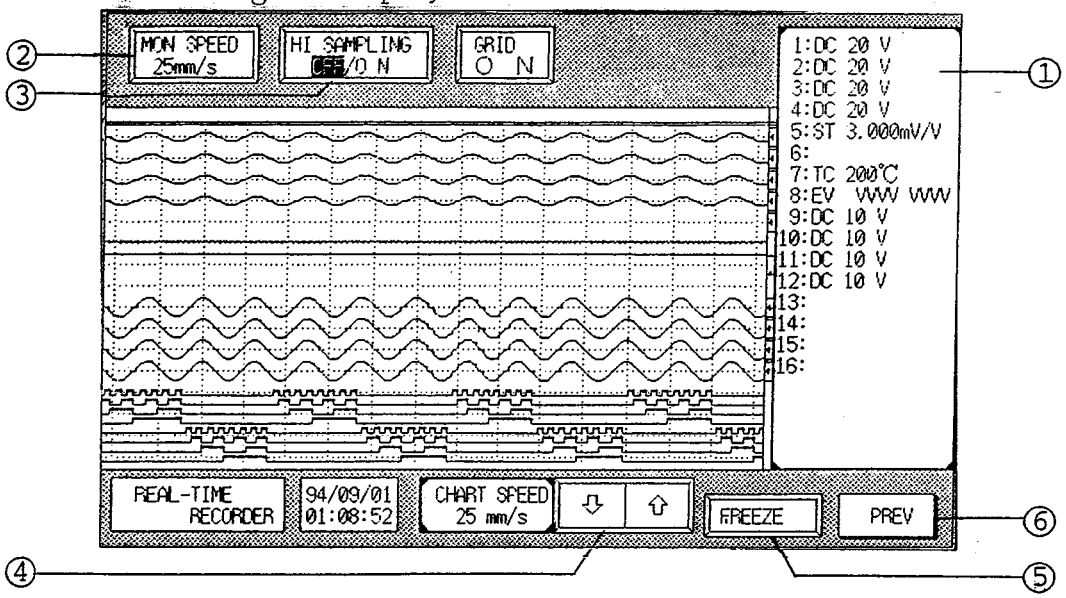
Note: 1/16 is only for RT3216N.

③ Monitor display:

Input waveforms can be monitored.

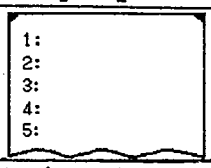
Press DISPLAY to display real-time waveforms, as shown below:

④ Grid: ON/OFF of grid display on the screen.



This section describes display ① and setting keys ② to ⑤ on the above screen display.

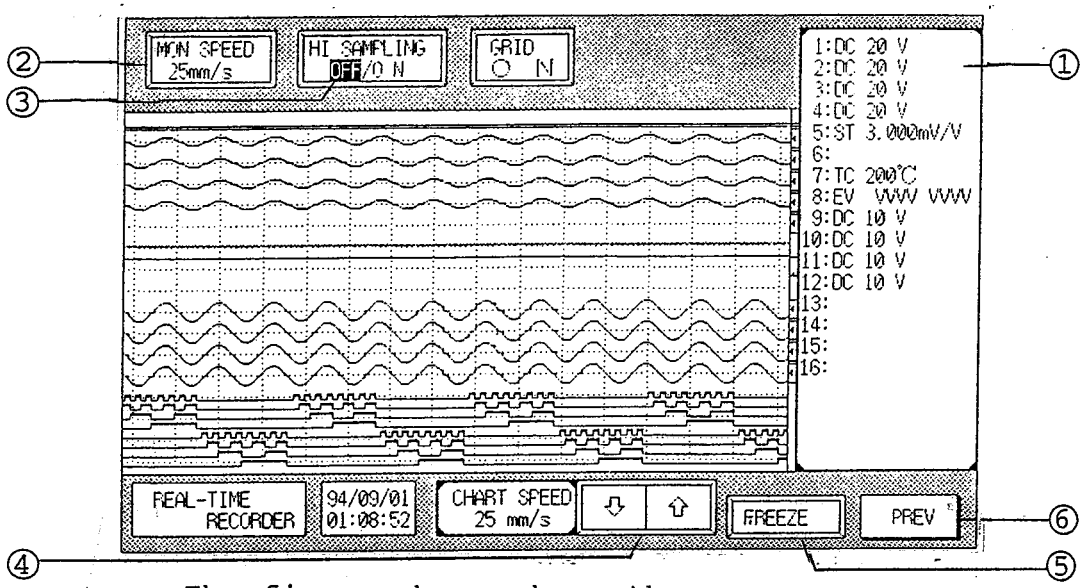
1) Display

No.	Display	Display contents
①		Input ranges of channels are displayed at the right side.

2) Setting keys

No.	Setting keys	Setting procedures
②	MONI SPEED 25mm/sec	Monitor speeds can be changed. Press this key to display MONI SPEED and the monitor speeds can be changed by the jog dial, as shown below: 1, 2, 5, 10, 25, 50 mm/sec 1, 2, 5, 10, 25, 50, 100 mm/min Note: If more than 9 channels are selected by CH SELECT, or if any event amplifier unit is selected, 50 mm/sec cannot be set.

		Press [MONI SPEED] again and the display is returned to the original state and the setting is completed * Monitor speed: A speed converted to the chart speed where waveform recording is conducted in the real-time recorder mode.



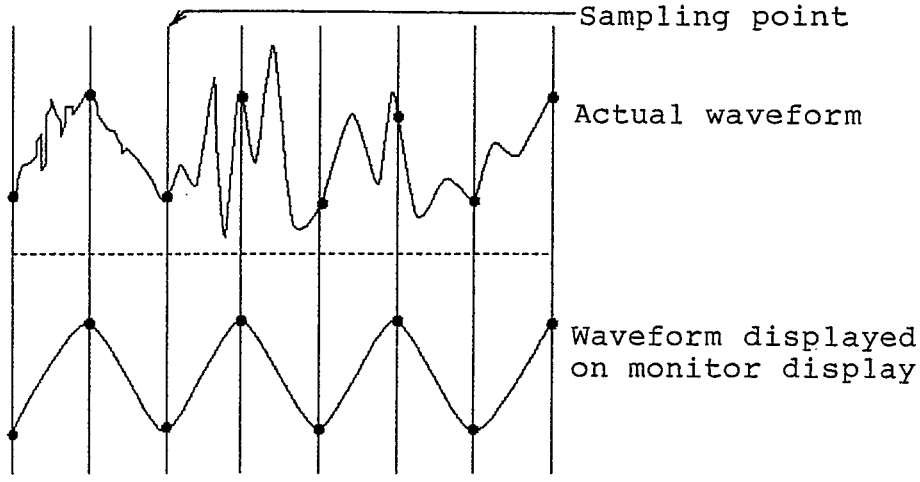
The figure above shows the same screen display as that shown on the previous page.

No.	Setting keys	Setting procedures
③	[HI SAMPLING OFF/ON]	The sample speed on the screen display can be changed. Pressing this key turns it ON or OFF. In [HI SAMPLING OFF/ON], input waveforms can be monitored at the same sample speed as that in waveform recording. In [HI SAMPLING OFF/ON], input waveforms can be monitored at a speed synchronized with waveform display. Note: When HI SAMPLING is set in ON, high speed sampling is automatically turned OFF, if any operation key is pressed. Details on the high speed sampling will be explained later.

No.	Setting keys	Setting procedures
④	CHART SPEED 25mm/sec ⇩ ⇧	Chart speeds can be changed by pressing ⇩ ⇧ as follows: 100, 50, 25, 10, 5, 2, 1 mm/sec 100, 50, 25, 10, 5, 2, 1 mm/min
⑤	FREEZE	When this key is pressed, it is reversely displayed and monitoring is stopped. Monitoring can be started by pressing this key again to release the reverse display.
⑥	PREV	When this key is pressed, the current display is returned to the previous display where channels for monitoring can be selected.

On high speed sampling:

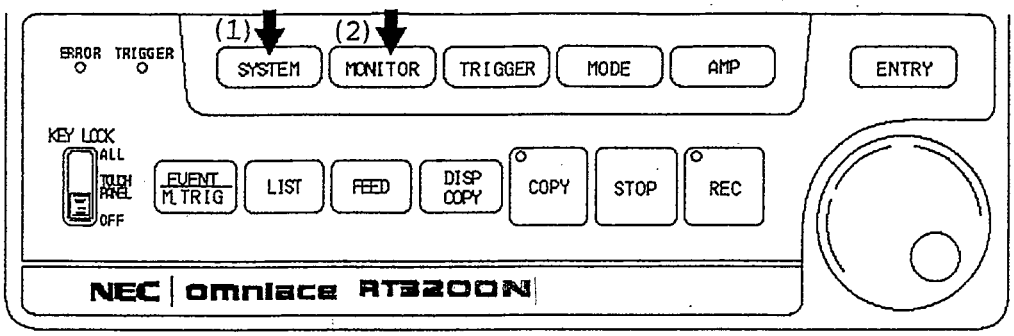
The HI SAMPLING key, when it is pressed to ON, allows the waveform of an input signal, the same waveform as a recorded waveform, to be displayed. If the frequency of an input signal is higher than 10 or 20 Hz with the HI SAMPLING key set in OFF, peak values of the signal cannot be precisely displayed. Such a signal may be displayed as a low-frequency signal different in shape from the actual waveform, if the signal frequency becomes higher.



Should this occur, set the HI SAMPLING key to ON and a waveform approximately similar to the actual waveform can be displayed.

Caution: The HI SAMPLING can not be recorded. Pressing the REC key results in OFF of HI SAMPLING automatically.

5.6 Setting-up of Digital Display



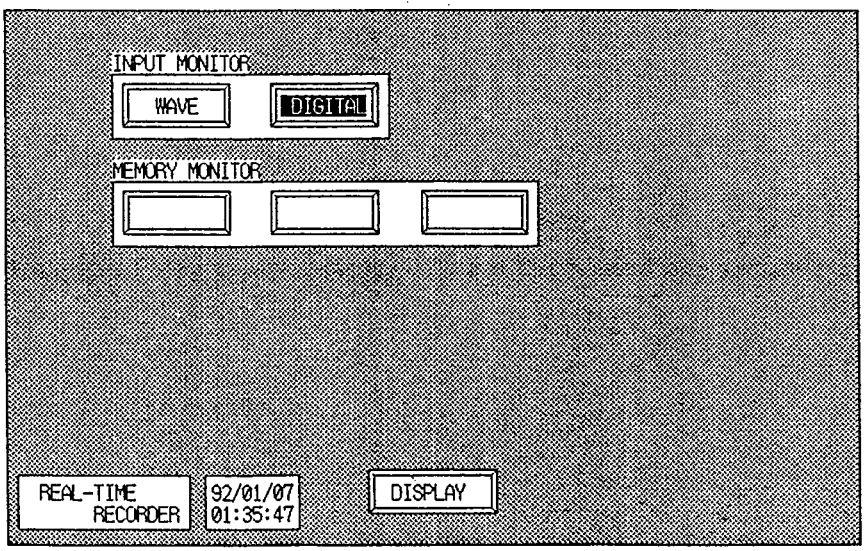
(1) Selection of real-time recorder

Press the SYSTEM key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select REAL-TIME RECORDER (Refer to 5.1.).

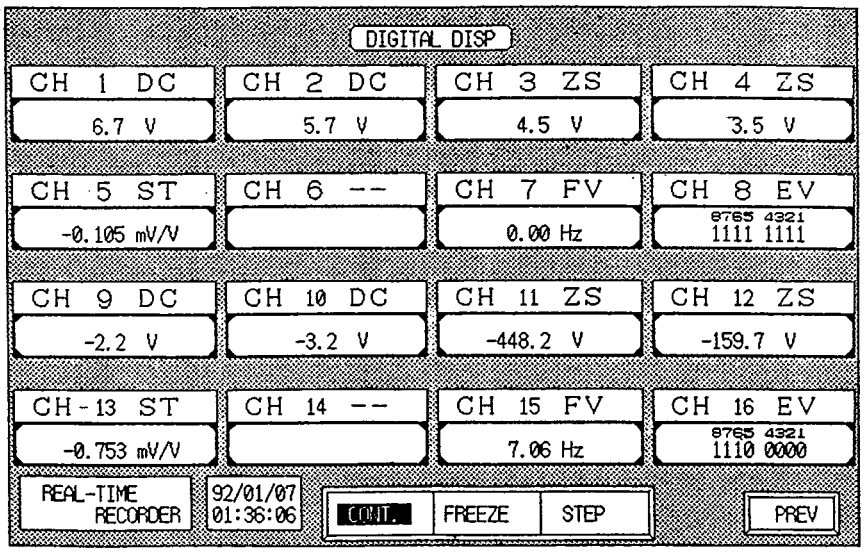
(2) Setting-up of digital display

Press the MONITOR key on the operation panel.

Press DIGITAL of INPUT MONITOR [WAVE] [DIGITAL] to cause a screen display to appear, as shown in the figure below:



Press [DISPLAY], located at the lower part on the screen display, to cause a screen display to appear, as shown in the figure below: (RT3216N)



On the screen display shown above, digital values of input data of channels 1 to 16 can be simultaneously monitored.

Following settings can be made with [CONT.] [FREEZE] [STEP].

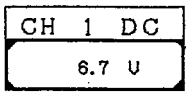
When [CONT.] is pressed during the FREEZE mode, a real-time digital display appears. Pressing [FREEZE] continues to display the latest values. Pressing the [STEP] key displays [CONT.] [FREEZE] [STEP] to put the display into the same FREEZE mode as the mode when [FREEZE] is pressed.

Each time [STEP] is pressed, values of the moment the key is pressed are displayed.

The display is returned to the previous INPUT MONITOR selecting display by pressing the [PREV] key.

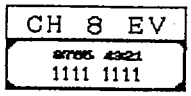
On display contents

° In case of DC amplifier unit and zero suppression amplifier unit:



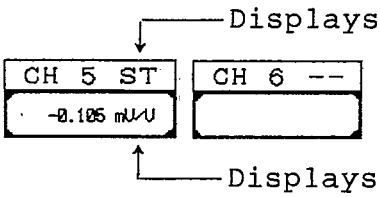
←Displays channel (CH) number and type of input unit.
←Displays input voltage digitally.

° In case of event amplifier unit:



←Displays channel (CH) number and type of input unit.
←Displays input channel (ch) numbers of event amplifier unit at upper part and input conditions with 1, 0 at lower part.

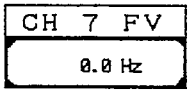
° In case of DC bridge strain amplifier unit:



Note:

Since the DC bridge strain amplifier unit occupies two unit spaces, nothing is displayed on an even channel or even channels.

° In case of F/V converter unit:

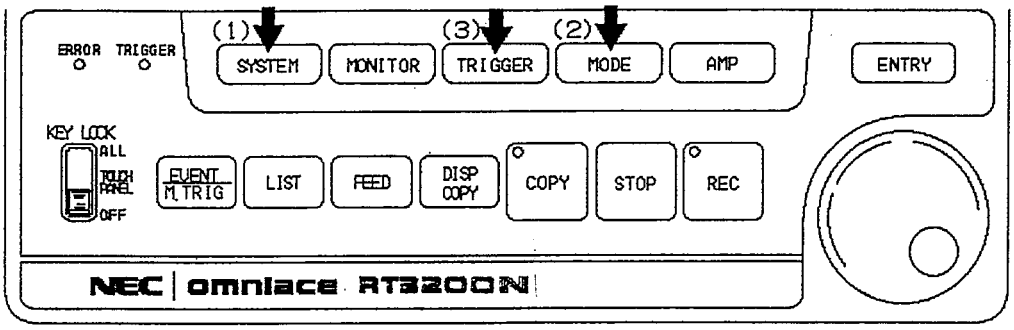


←Displays channel (CH) number and type of input unit.
←Displays input frequency digitally.

5.7 Real-time Trigger Recording

In the real-time recorder mode, real-time recording (WAVE/DATA/X-Y) can be started by a trigger.

Setting-up procedures



(1) Selection of real-time recorder

Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select REAL-TIME RECORDER (Refer to 5.1.).

(2) Selection of recording format

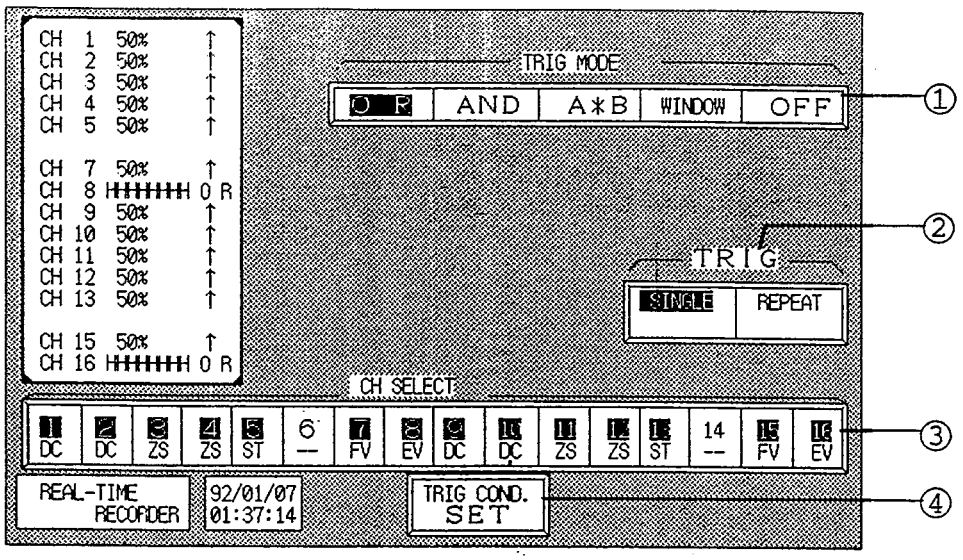
Press the [MODE] key on the operation panel.

Select the recording format from FORM [WAVE | DATA | X-Y] and set it up by referring to 5.2 to 5.4.

Press [ON] of RT-TRIG [OFF | ON] and the real-time trigger recording can be set.

(3) Setting-up of trigger

Press the TRIGGER key on the operation panel to cause the trigger screen display to appear.



Following settings can be carried out on the trigger screen display.

① Trigger mode:

Trigger modes can be set.

② Number of measurement times:

Trigger operations can be set.

SINGLE;

Triggering operation is made only once.

REPEAT;

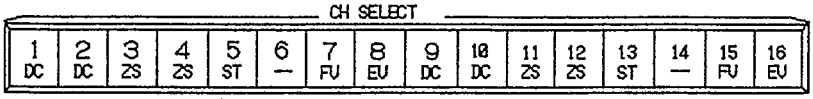
Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).

OVERWRITE;

Triggering operation is repeated.

③ Channel selection:

A channel, which is to be set to a triggering source, can be selected.



Press the channel key, which is to be set to a triggering source. The selected channel is reversely displayed, for instance, in the manner of 1.

④ Setting-up of triggering conditions:

Triggering conditions can be set.

° If the channel of a triggering source is other than an event amplifier unit, set the level and slope.

° If the channel of a triggering source is an event amplifier unit, set the trigger state.

Note:

For details on the setting-up of triggering conditions, refer to SECTION 8 TRIGGERING FUNCTIONS.

Operation for measurement

① Press the [REC] key on the operation panel and the LED of the [REC] key lights to put the instrument into a standby state for a trigger. The preset real-time recording is started upon receipt of a trigger. In the case of the X-Y recording, it is started on the X-Y screen display.

② Press the [STOP] key and the LED of the [REC] key goes out and recording is stopped (or to put the instrument into a standby state for a trigger).

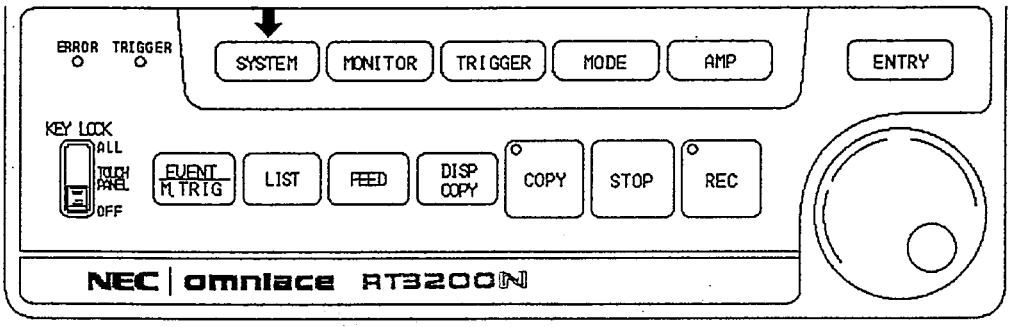
SECTION 6

HOW TO USE MEMORY RECORDER

The memory recorder is a function which can display and record an input signal after it has been once stored into the memory of the basic instrument.
Taking in an input signal into the memory can be started by means of a wide variety of triggering functions. (Refer to SECTION 8.)
In setting-up of the memory, sample speeds, memory read and memory blocks can be set in accordance with the input signal.
The data, which has been taken in, can be monitored on the waveform monitor and on the WAVE/DATA/X-Y display of memory data without recording. In addition, any required part of data can be recorded by means of a copying function by selecting a required format from three formats of WAVE, DATA and X-Y.

6.1 Selection of Memory Recorder

Press the [SYSTEM] key on the operation panel.



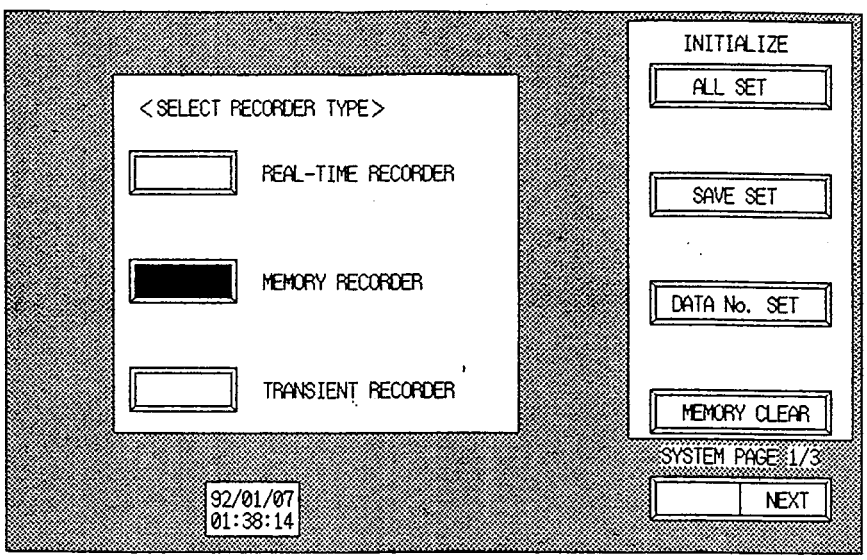
Press the [SYSTEM] key to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3).

Note:

When another system page is displayed, press the [PREV] key to display SELECT RECORDER TYPE (SYSTEM PAGE 1/3).

Select MEMORY RECORDER.

Press the part [ ] of [ ] MEMORY RECORDER .



In the figure shown above, the following settings are available:

When [ALL SET] is pressed, all setup contents of the basic instrument can be set to the initial values. (Refer to 9.12 Initialization.)

When [SAVE SET] is pressed, the set parameters of input units and the set status of the basic instrument, which are saved in the memory of the basic instrument in 9.1 Saving and Loading Setup Contents, are left unchanged and other setup contents of the basic instrument can be initialized.

Press [YES] on the screen display for execution.

Press [QUIT] on the screen display for quitting, and the display is returned to the original state without initialization.

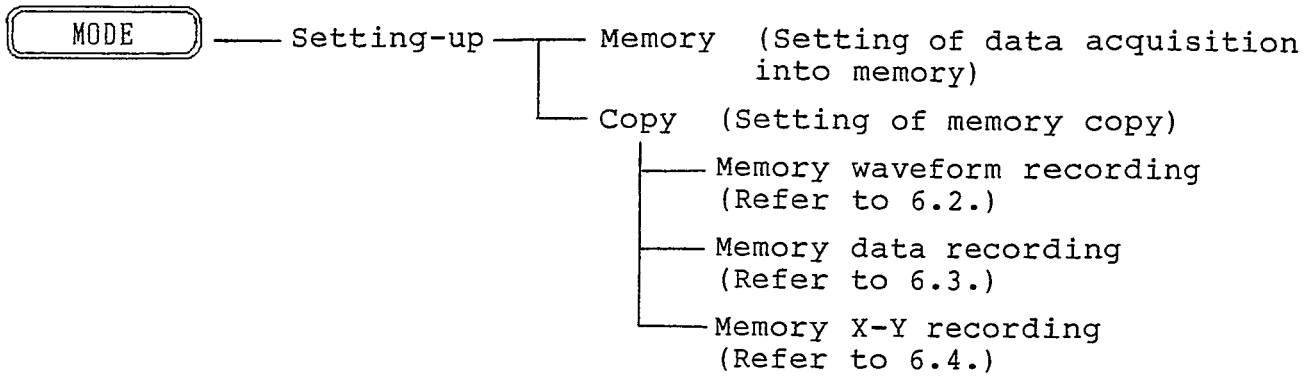
When [DATA No. SET] is pressed, the data number of the memory block is cleared to 1 or can be set to any value.
(Refer to 9.9 Setting Data No.)

When [MEMORY CLEAR] is pressed, data in the memory block can be cleared. (Refer to 6.10 Memory Clear.)

Setup contents of memory recorder:

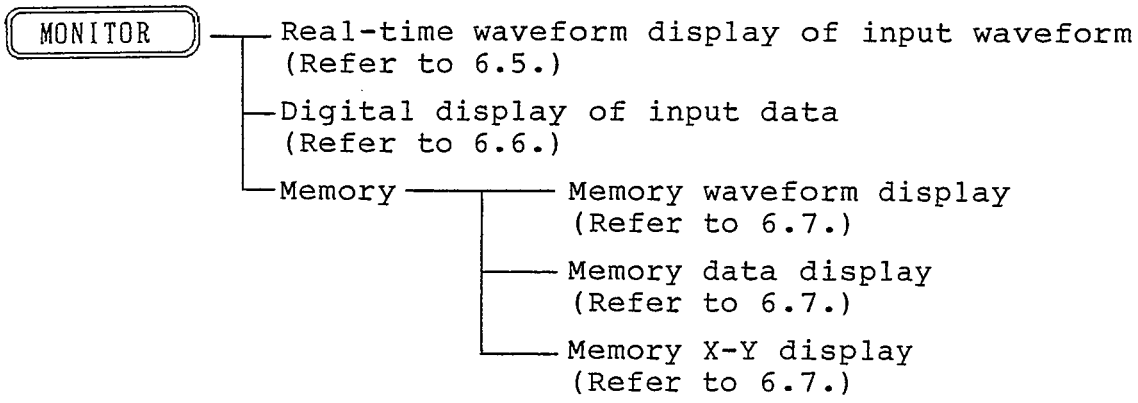
In the memory recorder, the following setting-up can be carried out.

Press the MODE key on the operation panel for selecting recording modes.



Press the MONITOR key on the operation panel and the following screen displays appear:

- Display of real-time waveform of input signal and digital value of input data.
- Display of memory waveform/data/X-Y.

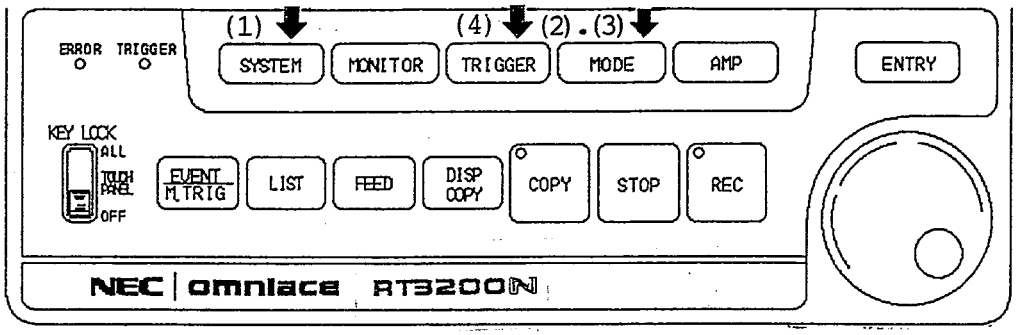


Note:

Even when paper supply is exhausted, this instrument can accept data into the memory.

Therefore, this instrument can be used, even when paper supply is nearly exhausted during recording.

6.2 Setting-up of Memory Waveform Recording



(1) Selection of memory recorder

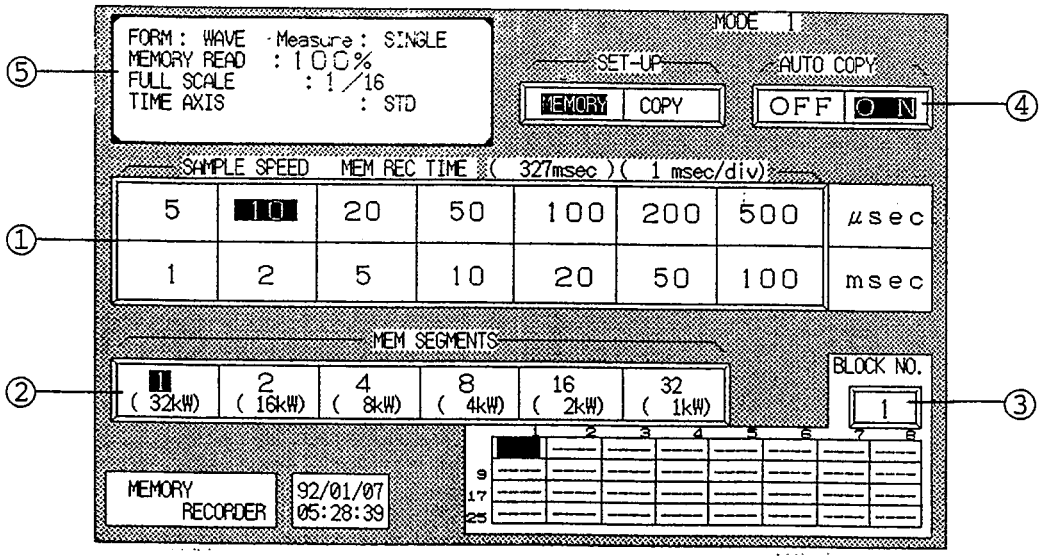
Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select MEMORY RECORDER (Refer to 6.1.).

(2) Setting-up of data acquisition into memory

Press the [MODE] key on the operation panel.

Set data acquisition into the memory by SET-UP [MEMORY | COPY], which is located at the middle on the screen display.

Press [MEMORY] to display the MODE 1 screen display shown in the figure below.



The following settings are available on the MODE 1 screen display:

① Sample speeds:

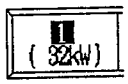
Set intervals of data taken into memory.

Note:

The memory recording time is the time required for data to be taken into memory.

When waveform recording has been conducted, the value, where 1 div of the time axis is converted to the time, is also displayed. If the sample speed is changed to another, the display is also changed.

Example:

If the sample speed is 10 μsec and that the memory segment is set in 

, the display becomes as follows:

10 μsec x 32 KW = 327 msec

10 μsec x 100 data = 1000 μsec/div

"Memory recording time (327 msec)(1000 div/sec)"

② Memory segments:

Set memory segments.

Press any MEM SEGMENTS key that needs to be set.

The memory capacity for each channel can be divided into segments for use.

Example:

In the 32 KW/channel memory capacity, if the memory is divided into 32 segments, 32 memory blocks are displayed. The memory capacity for each memory block becomes 1 KW.

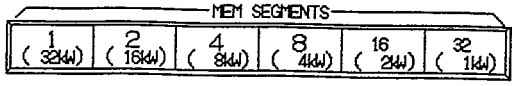
Note:

In the initial state, the memory capacity is set in 32 KW/channel.

However, the memory capacity can be increased up to a maximum of 256 KW/channel on the menu screen display.

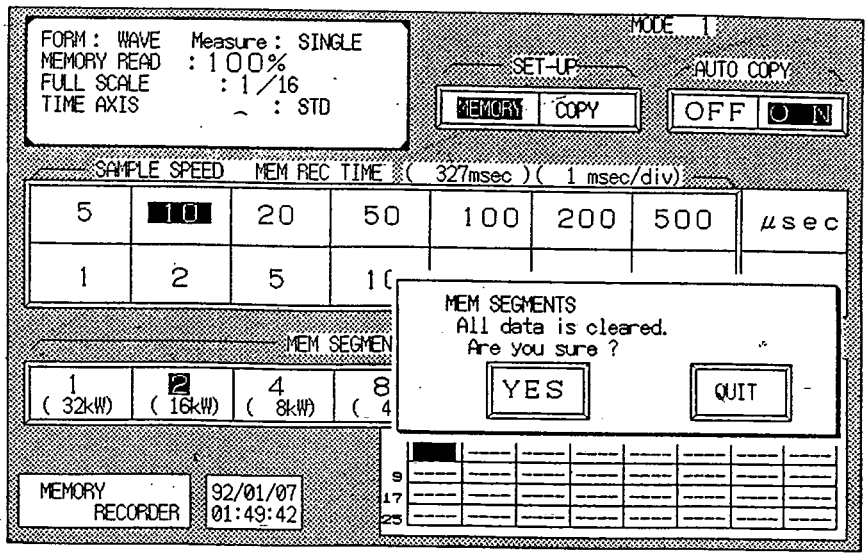
For changing memory capacity, refer to 9.8 Changing Memory Capacity (MEMORY DIVISIONS).

When memory segments are changed, the existing memory capacity is cleared.

Press any key of 

and the screen display, as shown in the figure below, appears.

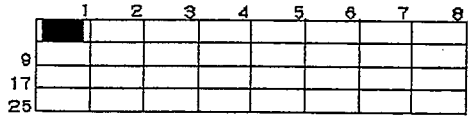
Press [YES] for changing and press [QUIT] for quitting.



③ Block selection:

Sets to which block the data is taken in, when the memory is divided into segments.

Press BLOCK [1] and it is reversely displayed as BLOCK [1], and data is taken into the memory block of the displayed number.



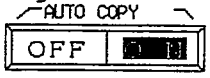
is the memory block.

Move the cursor (■) with the jog dial to the memory block, to which data is taken in.

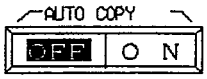
The memory block number of BLOCK [1] is changed with the movement of the cursor ■ .

Press BLOCK [1] again and the current display is returned to the original state to complete the setting.

④ Auto copy:

When the trigger condition is satisfied and writing data into memory has been completed with AUTO COPY set in 

, recording is automatically started.

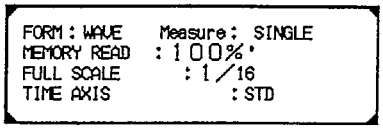
When AUTO COPY is set in 

, memory recording is not carried out for as long as the 

key on the operation panel is not pressed. (Refer to 6.9.)

⑤ Copy setup condition display:

Displays the contents of memory waveform copy set up on the MODE 2 and trigger screen displays.



Recording format

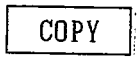
Measurement: Number of measurement times of triggering operation.

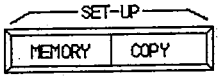
Memory read

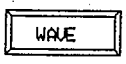
Full scale: Effective recording width.

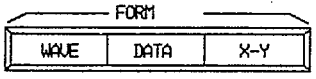
Time axis: Size of time axis of memory waveform recording.

(3) Setting-up of memory copy recording

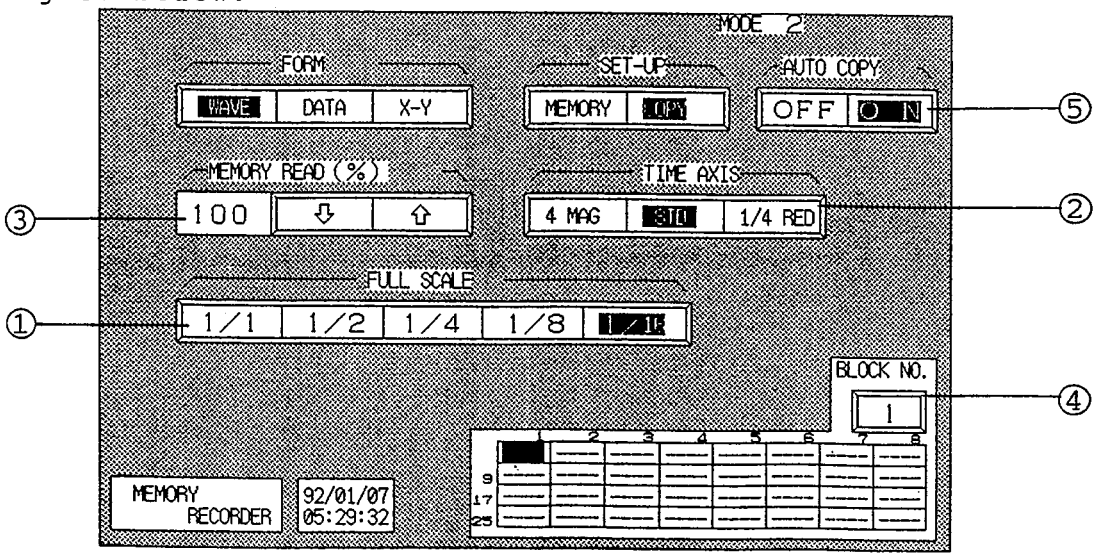
Press 

of 

and 

of 

, and the MODE 2 screen display can be displayed, as shown in the figure below:



The following settings are available on the MODE 2 screen display:

① Full scale:

Sets the effective recording widths.

1/1 : 200 mm full scale (RT3208N,RT3216N), 1/1: 100 mmFS (RT3108N)
1/2 : 100 mm full scale (RT3208N,RT3216N), 1/2: 50 mmFS (RT3108N)
1/4 : 50 mm full scale (RT3208N,RT3216N), 1/4: 25 mmFS (RT3108N)
1/8 : 25 mm full scale (RT3208N,RT3216N), 1/8: 10 mmFS (RT3108N)
1/16: 10 mm full scale (RT3216N)

② Time axis:

Sets the sizes of the time axis of memory waveform recording. Waveform recording can be conducted by magnifying or reducing the time axis. (The number of samples is 100 data/DIV.)

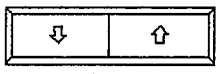
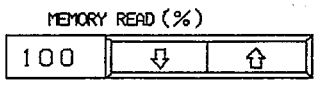
STD : Recording is made with a waveform in the standard size.
4 MAG : Recording is made with a waveform in 4 times larger than the standard size.
1/4 RED: Recording is made with a waveform in 1/4 times smaller than the standard size.

Note:

Sample recording will be given later.

③ Memory read (%):

Sets as to what percentage of memory capacity of each memory block is to be recorded.

The amount of memory read can be set from 10 to 100% in 10% steps by pressing  of 

.

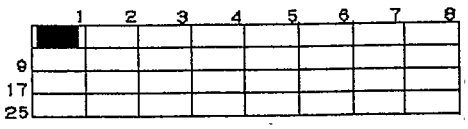
④ Block selection:

Sets the memory block for memory recording.

Press 

and it is reversely displayed as 

, and the data of the displayed memory block number is processed for memory recording.



is the memory block.

Move the cursor (■) with the jog dial to the memory block, where data is processed for memory recording.

The memory block number of BLOCK [1] is changed with the movement of the cursor ■.

Press BLOCK [1] again and the current display is returned to the original state to complete the setting.

⑤ Auto copy:

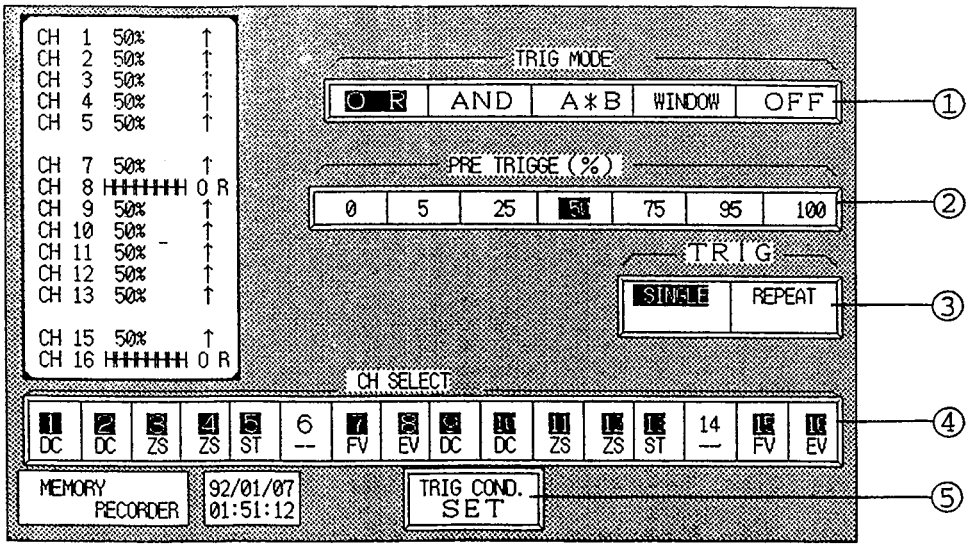
When the trigger condition is satisfied and writing data into memory has been completed with AUTO COPY set in AUTO COPY [OFF | ON], recording is automatically started.

When AUTO COPY is set in AUTO COPY [OFF | ON], memory recording is not carried out for as long as the COPY key on the operation panel is not pressed. (Refer to 6.9.)

(4) Setting-up of trigger

When the recorder type is the memory recorder, setting-up of triggering functions is required.

Press the TRIGGER key on the operation panel to cause the trigger screen display to appear.



① Trigger mode:

Sets trigger modes.

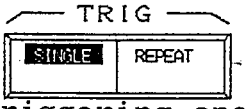
② Pretrigger:

Sets pretriggers.

Pretriggers are set in percentage of memory capacity of before triggering with reference to a triggering point where data is taken into memory.

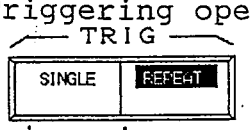
③ Number of measurement times:

Sets trigger operations.



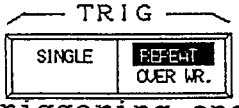
;

Triggering operation is made only once.



;

Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).

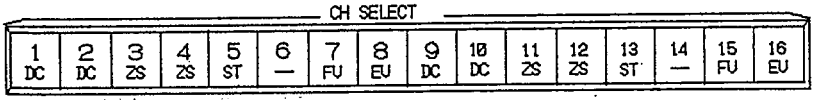


;

Triggering operation is repeated.

④ Channel selection:

A channel, which is to be set to a triggering source, can be selected.



Press the channel key, which is to be set to a triggering source. The selected channel is reversely displayed, for instance, in the manner of 1.

⑤ Setting-up of triggering condition:

Sets triggering conditions.

° If the channel of a triggering source is other than an event amplifier unit, set the level and slope.

° If the channel of a triggering source is an event amplifier unit, set the trigger state.

Note:

For details on the setting-up of triggering conditions, refer to SECTION 8 TRIGGERING FUNCTIONS.

Operation for measurement

After the above settings have been completed, measurement can be made.

1) Press the REC key on the operation panel and the LED of the REC key lights to start signal sampling and to put the instrument into a standby state for a trigger.

   The LED of the REC key blinks simultaneously with occurrence of a trigger to start data acquisition into memory.

   When data acquisition has been completed, the LED of the REC key goes out (the LED lights again, if TRIG is set in REPEAT or OVER WR.) and the LED of the COPY key lights to automatically start memory waveform recording (with AUTO COPY in ON), and measurement is completed.

2) If measurement needs to be stopped during measurement, press the STOP key.

3) Press the COPY key and measured data can be copied repeatedly.

   Following copying formats are available:

   ° Data can be copied by changing recording formats (WAVE/DATA/X-Y).
   ° Data can be copied by changing full scales (1/1, 1/2, 1/4, 1/8, 1/16).
   ° Data can be copied by changing memory read intervals or memory read amount (10% to 100%).

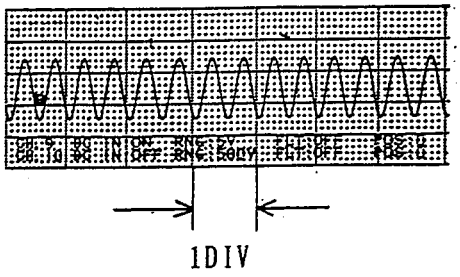
   For inputs and printout of input units which do not need to be recorded on the AMP screen display, they can be turned off for copying. (Refer to 6.8.)

On 1 DIV with time axis changed:

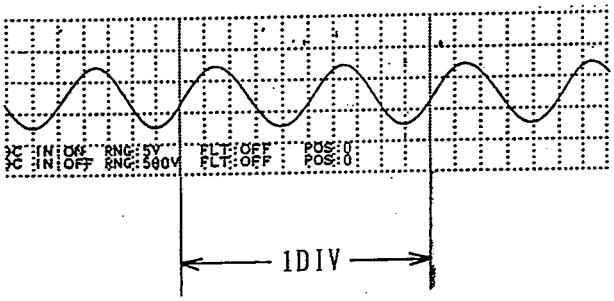
When the time axis is changed, 1 DIV becomes as shown below:

Sample recording

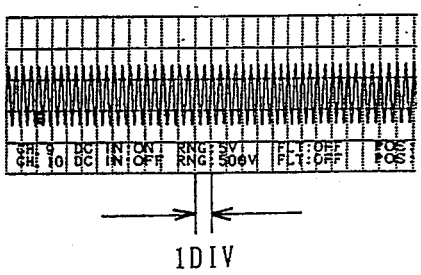
Time axis set in STD:



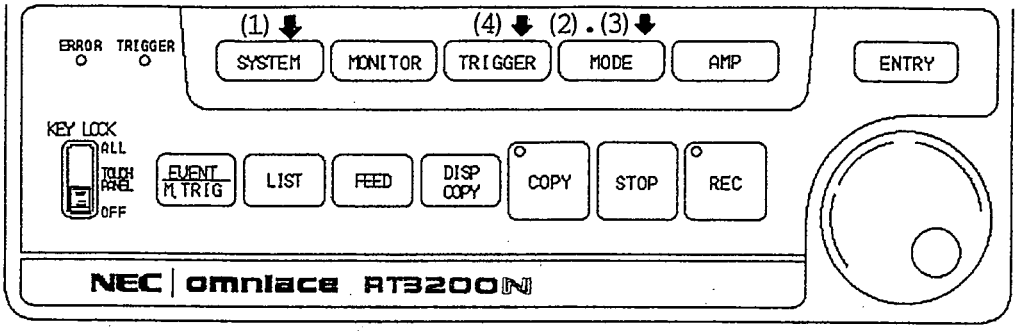
Time axis set in 4 MAG:



Time axis set in 1/4 RED:



6.3 Setting-up of Memory Data Recording



(1) Selection of memory recorder

Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select MEMORY RECORDER (Refer to 6.1.).

(2) Setting-up of data acquisition into memory

Press the [MODE] key on the operation panel.

The copy setup conditions, displayed at upper left on the screen display, are as shown below:

```
FORM:DATA    Measure: SINGLE
MEMORY READ  :100%
MEM READ INTERVAL:10 DATA
```

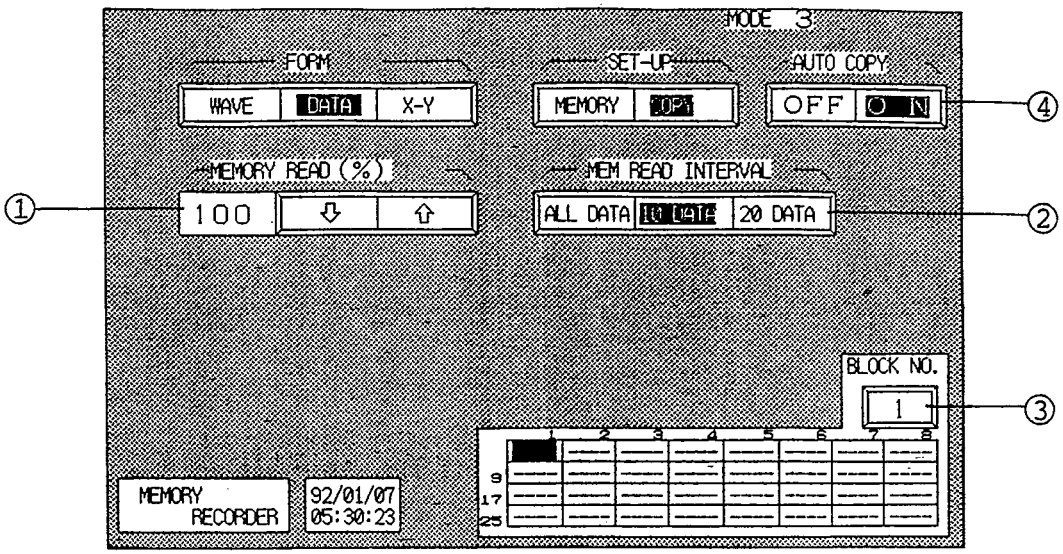
Recording format.
Measurement: Number of measurement times of triggering operation.
Memory read amount.
Memory read interval.

Set up the conditions by referring to (2) Setting-up of data acquisition into memory in 6.2.

(3) Setting-up of memory copy recording

Press [COPY] of SET-UP [MEMORY | COPY] and [DATA] of FORM [WAVE | DATA | X-Y],

and the MODE 3 screen display can be displayed, as shown on the following page.



The following settings are available on the MODE 3 screen display:

① Memory read (%):

Sets as to what percentage of memory capacity of each memory block is to be recorded.

The amount of memory read can be set from 10 to 100% in 10% steps by pressing ⇩ ⇧ of MEMORY READ (%) 100 ⇩ ⇧ .

② Memory read interval:

Sets intervals to record data stored in the memory.

ALL DATA; All data items are recorded.

10 DATA ; Recording is made at 10 data intervals.

20 DATA ; Recording is made at 20 data intervals.

③ Block selection:

Sets the memory block for memory recording.

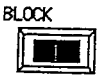
Press BLOCK 1 and it is reversely displayed as BLOCK ■ , and the data of the displayed memory block number is processed for memory recording.

1 2 3 4 5 6 7 8
9
17
25

■ is the memory block.

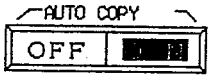
Move the cursor (■) with the jog dial to the memory block, where data is processed for memory recording.

The memory block number of BLOCK ■ is changed with the movement of the cursor ■.

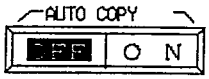
Press 

again and the current display is returned to the original state to complete the setting.

④ Auto copy:

When the trigger condition is satisfied and writing data into memory has been completed with AUTO COPY set in 

, recording is automatically started.

When AUTO COPY is set in 

, memory recording is not carried out for as long as the 

key on the operation panel is not pressed. (Refer to 6.9.)

(4) Setting-up of trigger

When the recorder type is the memory recorder, setting-up of triggering functions is required.

Press the 

key on the operation panel to set up triggering functions by referring to (4) Setting-up of trigger in 6.2.

Note:

For details on the setting-up of trigger, refer to SECTION 8.

Operation for measurement

After the above settings have been completed, measurement can be made.

1) Press the 

key on the operation panel and the LED of the 

key lights to start signal sampling and to put the instrument into a standby state for a trigger.

The LED of the 

key blinks simultaneously with occurrence of a trigger to start data acquisition into memory.

When data acquisition has been completed, the LED of the 

key goes out (the LED lights again, if TRIG is set in REPEAT or OVER WR.)

and the LED of the [COPY] key lights to automatically start memory data recording (with AUTO COPY in ON), and measurement is completed.

2) If measurement needs to be stopped during measurement, press the [STOP] key.

3) Press the [COPY] key and measured data can be copied repeatedly.

Following copying formats are available:

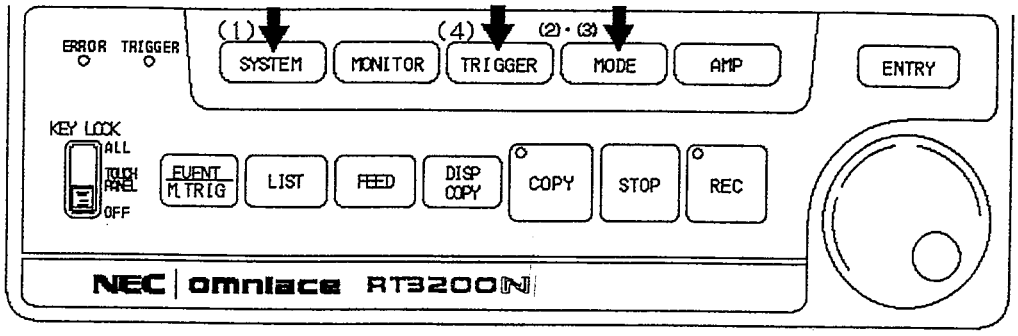
° Data can be copied by changing recording formats (WAVE/DATA/X-Y).

° Data can be copied by changing full scales (1/1, 1/2, 1/4, 1/8, 1/16).

° Data can be copied by changing memory read intervals or memory read amount (10% to 100%).

For inputs and printout of input units which do not need to be recorded on the AMP screen display, they can be turned off for copying. (Refer to 6.8.)

6.4 Setting-up of Memory X-Y Recording



(1) Selection of memory recorder

Press the SYSTEM key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select MEMORY RECORDER (Refer to 6.1.).

(2) Setting-up of data acquisition into memory

Press the MODE key on the operation panel.

The copy setup conditions, displayed at upper left on the screen display, are as shown below:

```
FORM: X-Y   Measure: SINGLE
MEM READ INTERVAL: 2 DATA
(X) : CH 1
(Y) : CH 2,3,4,5,6,7,8
```

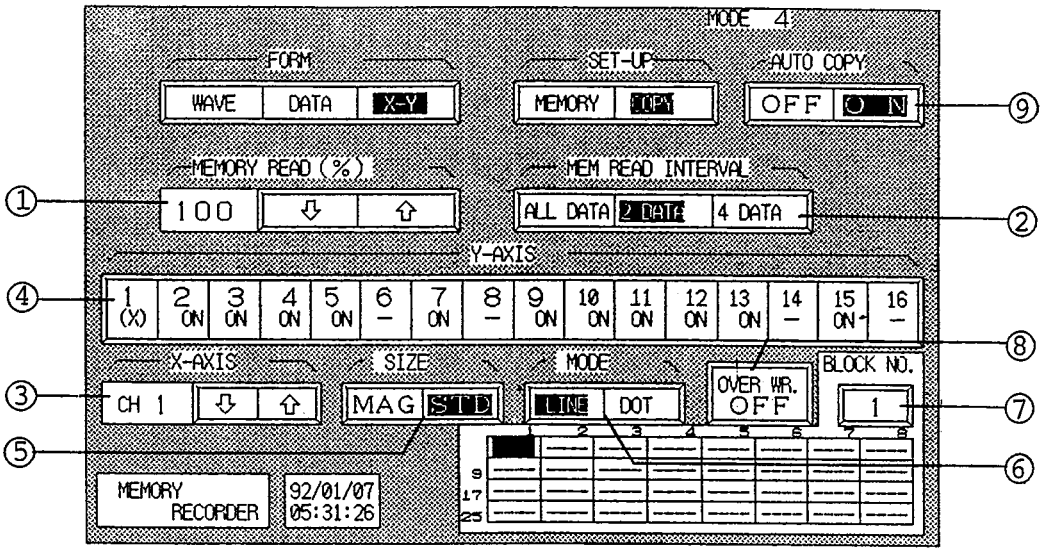
Recording format.
Measurement: Number of measurement times of triggering operation.
Memory read interval.
X axis: Channel set to X-axis.
Y axis: Channels set to Y-axis.

Set up the conditions by referring to (2) Setting-up of data acquisition into memory in 6.2.

(3) Setting-up of memory copy recording

Press [COPY] of SET-UP [MEMORY | COPY] and [X-Y] of FORM [WAVE | DATA | X-Y],

and the MODE 4 screen display can be displayed, as shown in the figure below.



The following settings are available on the MODE 4 screen display:

① Memory read (%):

Sets as to what percentage of memory capacity of each memory block is to be recorded.

The amount of memory read can be set from 10 to 100% in 10% steps by pressing [⇩ | ⇧] of MEMORY READ (%) [100 | ⇩ | ⇧].

② Memory read interval:

Sets intervals to plot data stored in the memory.

ALL DATA; All data items are recorded.

2 DATA ; Recording is made at 2 data intervals.

4 DATA ; Recording is made at 4 data intervals.

③ Sets an X-axis channel.

The channel number of [CH 1] can be changed by pressing [⇩ | ⇧] of X-AXIS [CH 1 | ⇩ | ⇧].

The displayed channel is an X-axis channel. (However, this is disabled for an event amplifier unit.)

④ Y-axis:

Sets ON/OFF of recording of Y-axis channels. (However, this is disabled for an event amplifier unit.)

"(X)" is displayed on a channel set to the X-axis, while "-" is displayed on a channel or channels where an event amplifier unit or event amplifier units are installed, or where no input unit is installed.

⑤ Recording size:

Changes recording sizes of the memory X-Y screen display.

⑥ Recording mode:

Sets as to whether linear interpolation is provided or not.

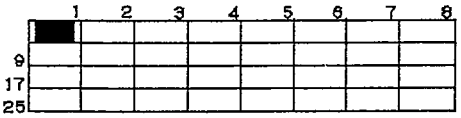
LINE; Linear interpolation provided.

DOT ; Linear interpolation not provided.

⑦ Block selection:

Sets the memory block for memory recording.

Press BLOCK [1] and it is reversely displayed as BLOCK [1], and data is taken into the memory block, the number of which is displayed.



is the memory block.

Move the cursor (■) with the jog dial to the memory block, where data is processed for memory recording.

The memory block number of BLOCK [1] is changed with the movement of the cursor ■.

Press BLOCK [1] again and the display is returned to the original state to complete the setting.

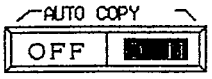
⑧ Overwriting:

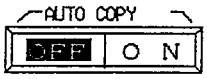
Sets overwriting of X-Y recording.

When the key is pressed, ON/OFF of overwriting can be selected.

If memory X-Y recording is to be conducted with the key set in [OVER WR. OFF], X-Y recording of the memory block, which has been set by ⑦ Block selection, is conducted.

If memory X-Y recording is to be conducted with the key set in  , data stored in all memory blocks can be recorded by means of overwriting.
(Detailed description will be given later.)

⑨ Auto copy:
When the trigger condition is satisfied and writing data into memory has been completed with AUTO COPY set in  , recording is automatically started.

When AUTO COPY is set in  , memory recording is not carried out for as long as the  key on the operation panel is not pressed. (Refer to 6.9.)

(4) Setting-up of trigger
When the recorder type is the memory recorder, setting-up of triggering functions is required.

Press the  key on the operation panel to set up triggering functions by referring to (4) Setting-up of trigger in 6.2.

Note:
For details on the setting-up of trigger, refer to SECTION 8.

Operation for measurement
After the above settings have been completed, measurement can be made.

1) Press the  key on the operation panel and the LED of the  key lights to start signal sampling and to put the instrument into a standby state for a trigger.

The LED of the [REC] key blinks simultaneously with occurrence of a trigger, an X-Y screen display appears, and plotting is started on the X-Y screen display simultaneously with data acquisition into the memory for display.
When plotting has been completed, the LED goes out. (When TRIG is set in REPEAT or OVER WR., the LED lights again.) The LED of the [COPY] key lights to automatically start X-Y recording (with AUTO COPY in ON), and measurement is completed.

2) If measurement needs to be stopped during measurement, press the [STOP] key.

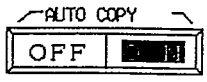
3) Press the [COPY] key and measured data can be copied repeatedly.

Following copying formats are available:

° Data can be copied by changing recording formats (WAVE/DATA/X-Y).
° Data can be copied by changing full scales (1/1, 1/2, 1/4, 1/8, 1/16).
° Data can be copied by changing memory read intervals or memory read amount (10% to 100%).

For inputs and printout of input units which do not need to be recorded on the AMP screen display, they can be turned off for copying. (Refer to 6.7)

Recorded contents with OVER WR. set in ON:

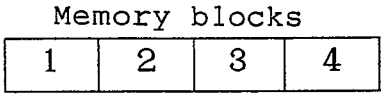
When AUTO COPY and OVER WR. are set in 

and  in setting-up of memory X-Y recording, in accordance with setup triggering contents, memory X-Y recording is carried out, as shown below:

Example:

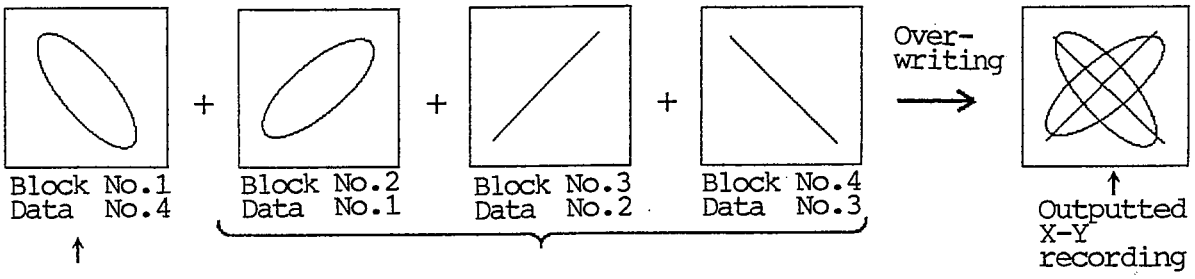
In setting-up of data acquisition into memory (refer to 6.2.), measument is carried out by dividing the memory into 4 segments and by setting the memory block, into which data is taken, to No.1.

When TRIG is set in SINGLE:

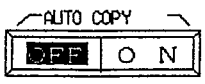


← Data taken into each memory block.
(Data of No.4 is the latest data.)

In addition to the set memory block (the memory block, into which the latest data is taken), if a memory block or memory blocks, into which data were previously taken, exist, data stored in all memory blocks, into which data are taken, are recorded by overwriting. (Refer to the figure below:)



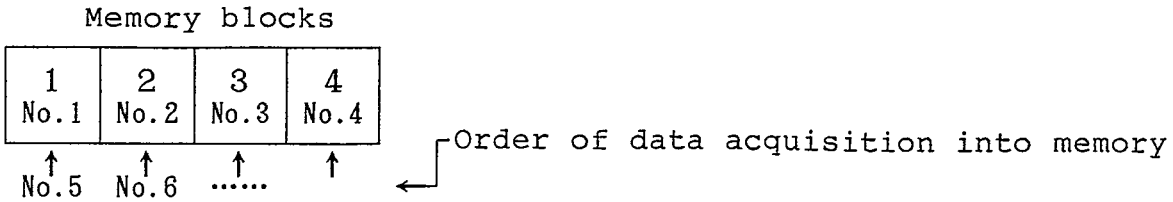
Note:

Even when AUTO COPY and OVER WR. are set in 

and  , data items stored in all memory blocks, into which data items are taken, are recorded by overwriting irrespective of triggering operation by pressing the 

key on the operation panel, as shown in the figure above.

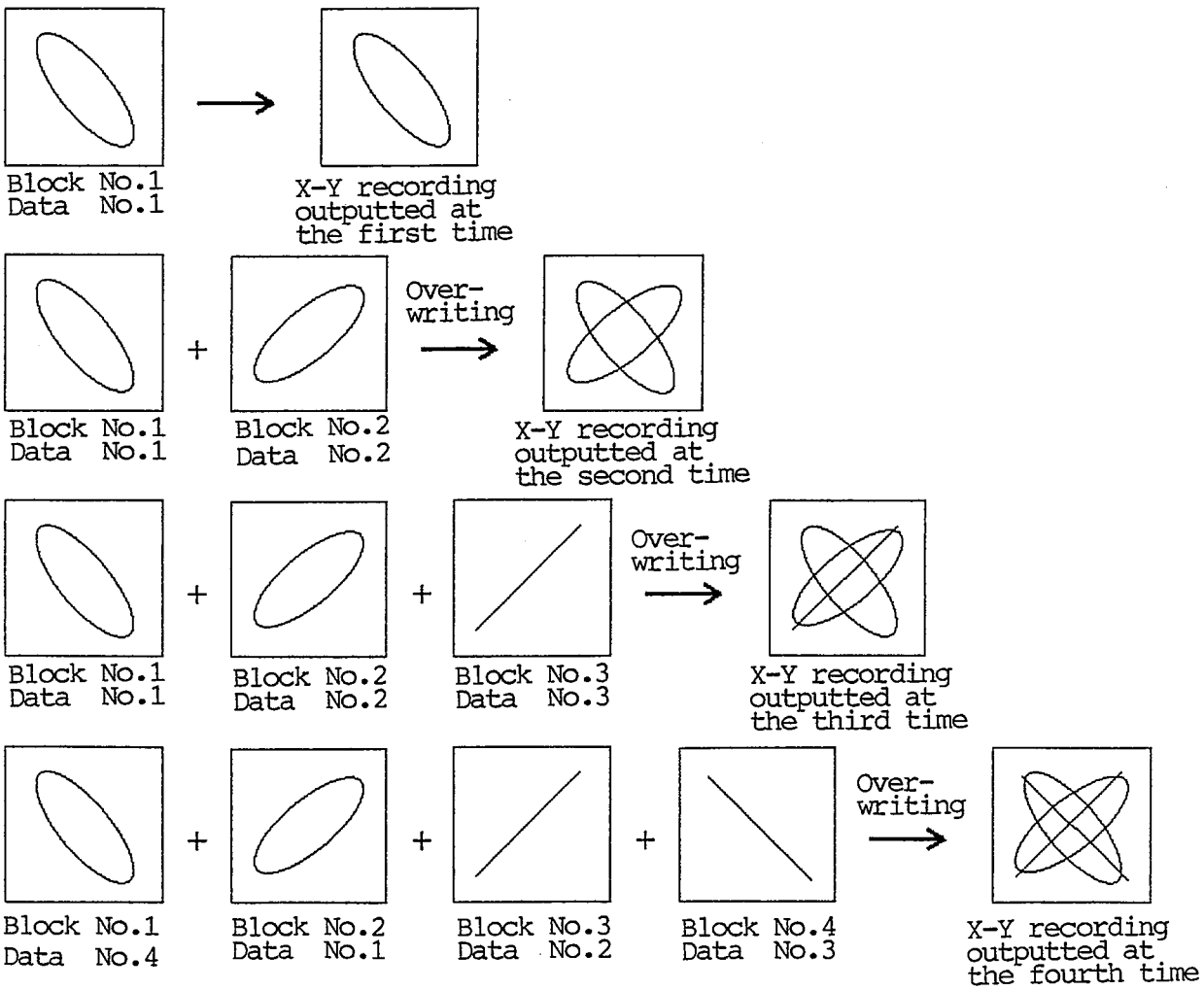
When TRIG is set in REPEAT or OVER WR.:



First, data (data No.1), stored in the set memory block, is recorded. When the data has been recorded, data (data No.2), taken into the next memory block, is written over the data which has now been recorded.

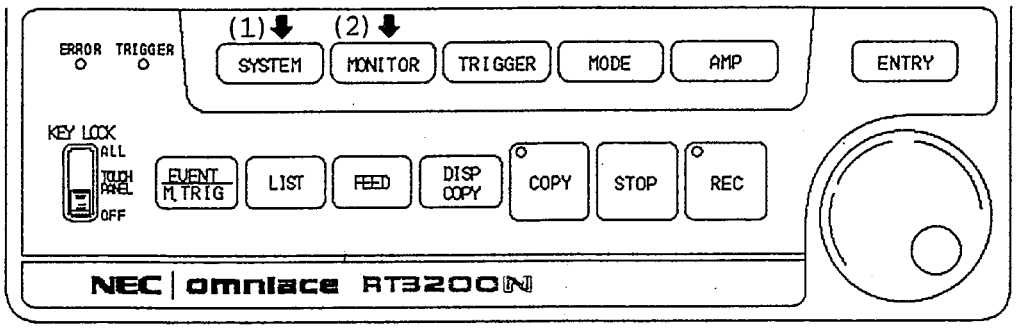
In the same manner, afterwards, data is recorded by overwriting one after another.

(Refer to the figure below:)



The operation shown on the previous page is repeated until the measurement is completed by pressing the [STOP] key on the operation panel.

6.5 Setting-up of Real-time Waveform Display

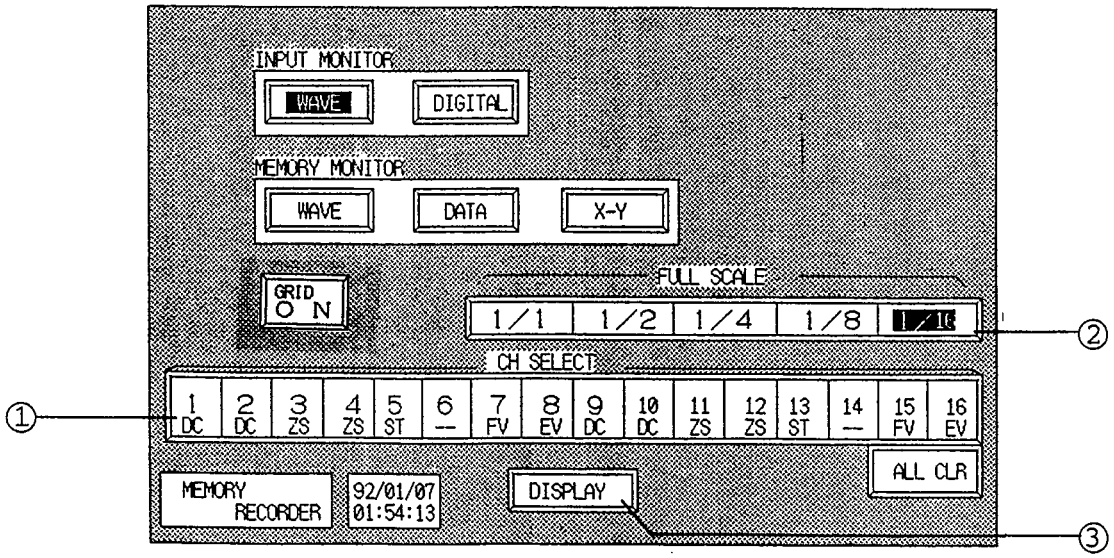


(1) Selection of memory recorder

Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select MEMORY RECORDER (Refer to 6.1.).

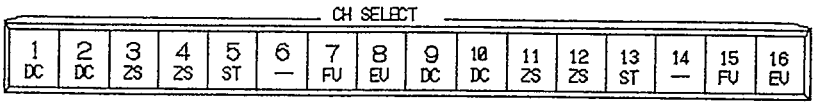
(2) Setting-up of real-time waveform display

Press the [MONITOR] key on the operation panel and then press [WAVE] of INPUT MONITOR [WAVE] [DIGITAL], located at the upper part on the screen display to cause a following screen display to appear.



The following settings are available on the screen display shown on the previous page:

① Channel selection:



A channel, which is to be monitored, can be selected. The selected channel is reversely displayed. All channels can be selected.

When [ALL CLR] is pressed, the selected channels are all cleared to do channel selection over again.

② Full scale: Sets effective display widths.

1/1 : Whole of waveform screen display displayed as full scale.

1/2 : Half of waveform screen display displayed as full scale.

1/4 : Quarter of waveform screen display displayed as full scale.

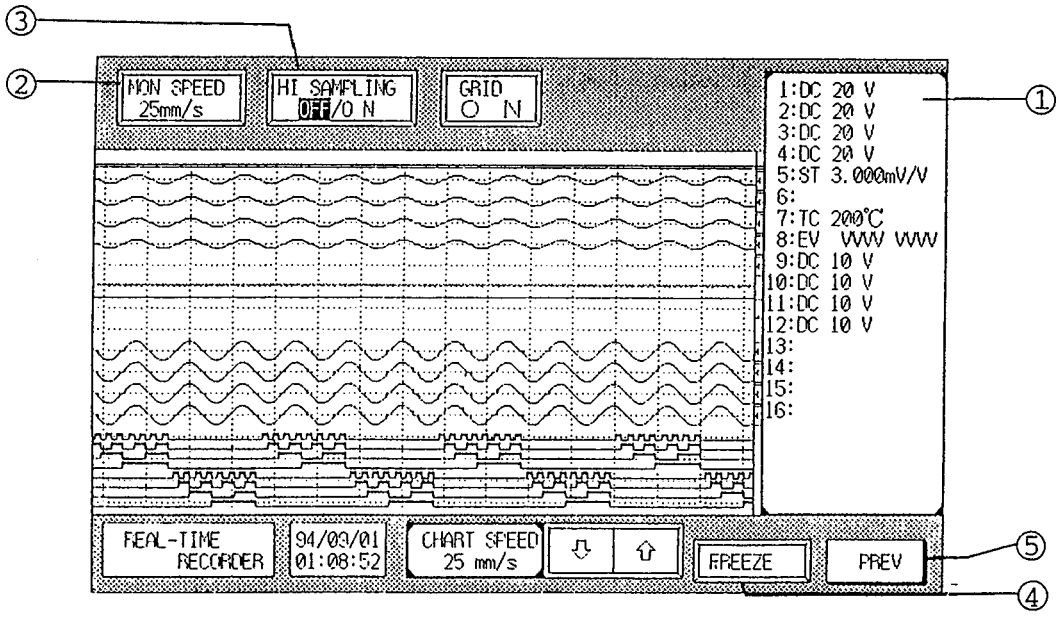
1/8 : One eighth of waveform screen display displayed as full scale.

1/16: One sixteenth of waveform screen display displayed as full scale. (RT3261N)

③ Monitoring display:

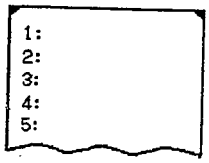
Displays input waveforms.

When [DISPLAY] is pressed, real-time waveforms are displayed as follows:

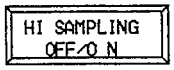


This section describes display ① and setting keys ② to ⑤ on the screen display shown on the previous page.

1) Display

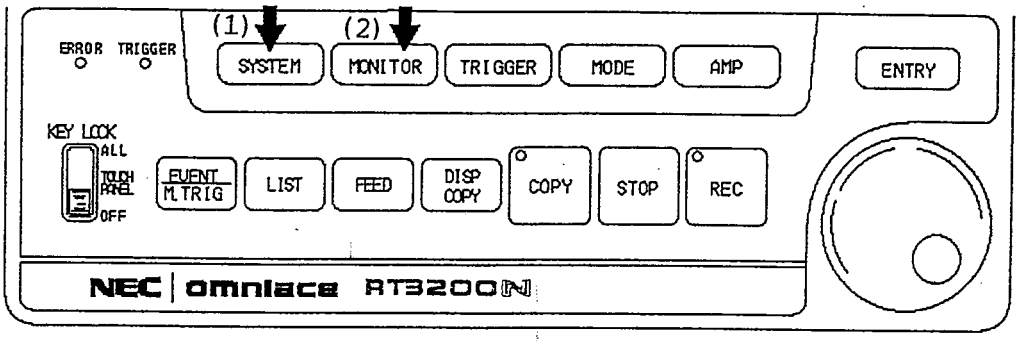
No.	Display	Display contents
①		Input ranges of channels are displayed at the right side.

2) Setting keys

No.	Setting keys	Setting procedures
②		Monitor speeds can be selected. Press this key to display  and the monitor speeds can be changed by the jog dial, as shown below: 1, 2, 5, 10, 25, 50 mm/sec 1, 2, 5, 10, 25, 50, 100 mm/min Note: If more than 9 channels are selected by CH SELECT, or if any event amplifier unit is selected, 50 mm/sec cannot be set. Press  again and the display is returned to the original state and the setting is completed. * Monitor speed: A speed converted to the chart speed where waveform recording is carried out in the real-time recorder mode.
③		The sample speed on the screen display can be changed. Pressing this key turns it ON or OFF. In  , input waveforms can be monitored at the same sample speed as that in waveform recording.

		In [HI SAMPLING OFF/ON], input waveforms can be monitored at a speed synchronized with waveform display. Note: When HI SAMPLING is set in ON, high speed sampling is automatically turned OFF, if any operation key is pressed. Details on the high speed sampling is given on page 5-17.
④	[FREEZE]	When this key is pressed, it is reversely displayed and monitoring is stopped. Monitoring can be started by pressing this key again to release the reverse display.
⑤	[PREV]	When this key is pressed, the current display is returnec to the previous display where channels for monitoring car be selected.

6.6 Setting-up of Digital Display



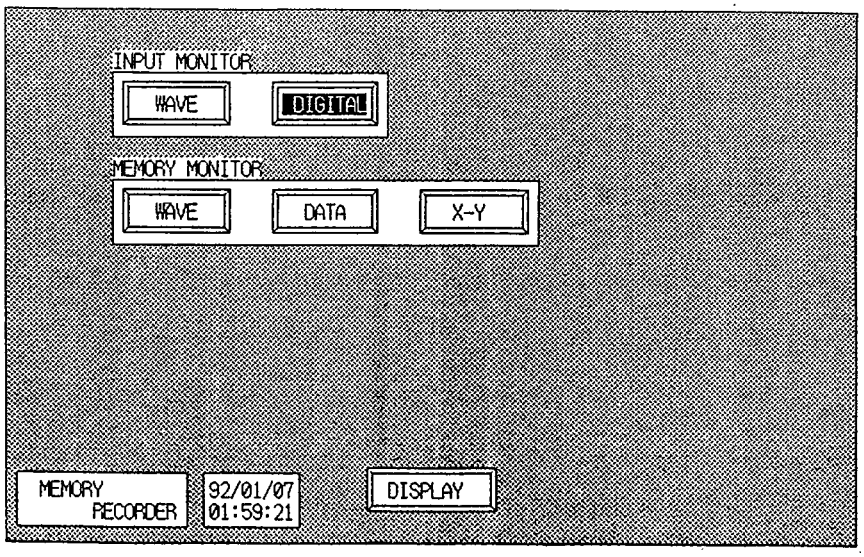
(1) Selection of memory recorder

Press the [SYSTEM] key on the operation panel to display the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3). Then, select MEMORY RECORDER (Refer to 6.1.).

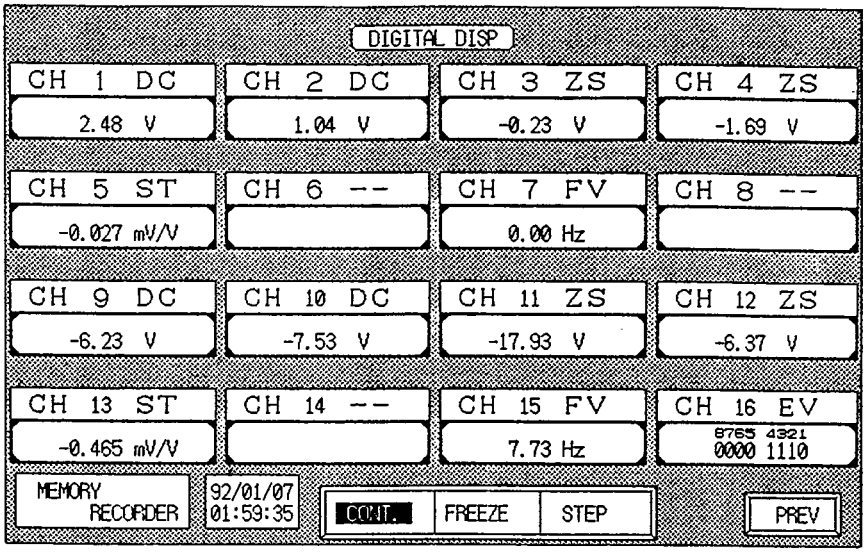
(2) Setting-up of digital display

Press the [MONITOR] key on the operation panel.

Press [DIGITAL] of INPUT MONITOR [WAVE] [DIGITAL] to cause a following screen display to appear.



Press [DISPLAY], located at the lower part on the screen display, to cause a following screen display to appear.



(RT3216N)

Digital values of input data of channel 1 to channel 16 on the above screen display can be simultaneopusly monitored.
(CH1--CH8 for RT3108N and RT3208N)
The following settings can be made by [CONT.] [FREEZE] [STEP].

If [CONT.] is pressed during FREEZE, a real-time digital display appears.

If [FREEZE] is pressed, the latest values continue to be displayed.

If [STEP] is pressed, the display is changed to [CONT.] [FREEZE] [STEP] to put the instrument into the same FREEZE state as that provided by pressing [FREEZE], and each time [STEP] is pressed, the latest values are displayed.

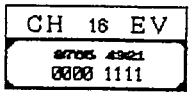
When the [PREV] key is pressed, the display is returned to the input monitoring selecting screen display.

On display contents

° In case of DC amplifier unit and zero suppression amplifier unit:

CH 1 DC ←Displays channel (CH) number and type of input unit.
2.48 V ←Displays input voltage digitally.

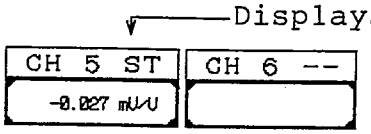
° In case of event amplifier unit:



←Displays channel (CH) number and type of input unit.

←Displays input channel (ch) number of event applifier unit at upper part and input conditions with 1, 0 at lower part.

° In case of DC bridge strain amplifier unit:



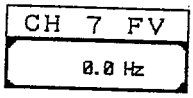
↓——Displays channel (CH) number and type of input unit.

↑——Displays output of strain-gage-based transducer.

Note:

Since the DC bridge strain amplifier unit occupies two unit spaces, nothing is displayed on an even channel or even channels.

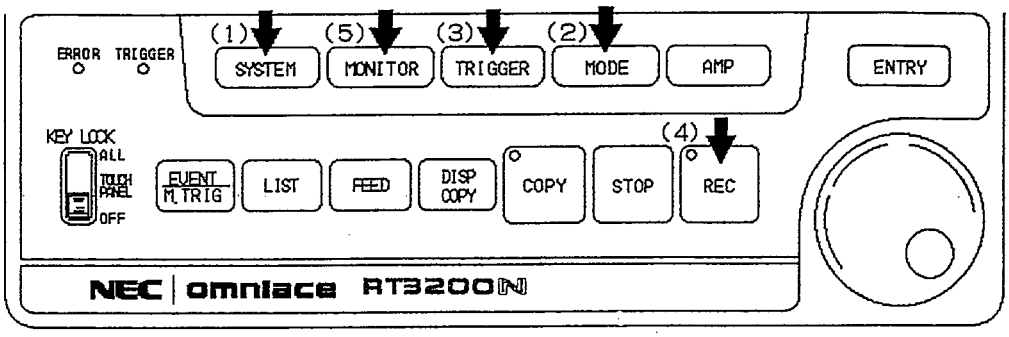
° In case of F/V converter unit:



←Displays channel (CH) number and type of input unit.

←Displays input frequency digitally.

6.7 Setting-up of Memory Display



(1) Selection of memory recorder

Press the SYSTEM key on the operation panel.

Select MEMORY RECORDER on the SYSTEM PAGE 1/3 screen display. (Refer to 6.1.)

(2) Setting-up of data acquisition into memory

Press the MODE key on the operation panel.

Set it up by referring to (2) Setting-up of data acquisition into memory in 6.2.

(3) Setting-up of trigger

When the recorder type is the memory recorder, setting-up of triggering functions is required.

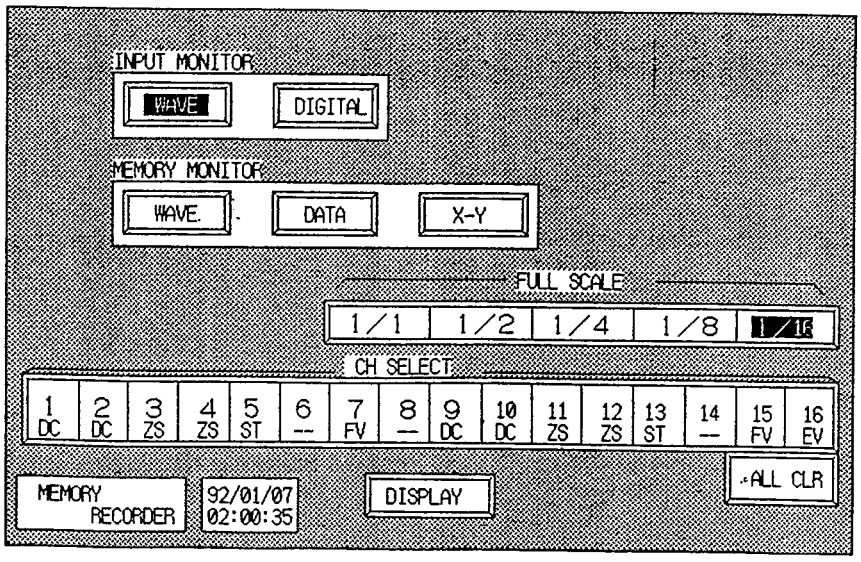
Press the TRIGGER key on the operation panel to set up the triggering functions.
(Refer to (4) Setting-up of trigger in 6.2 or SECTION 8.)

(4) Measurement

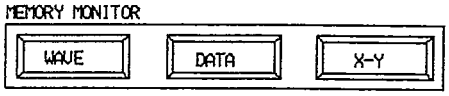
After the above settings have been completed, press the REC key on the operation panel to carry out measurement and data acquisition into memory.

(5) Setting-up of memory display

Press the MONITOR key on the operation panel to cause a following screen display to appear.



(If a screen display other than the screen display shown above appears, press PREV located at lower right on the screen display.)

Press any key of 

to select any desired screen display.

1) WAVE : Memory waveform display. (Refer to Page 6-33.)

2) DATA : Memory data display. (Refer to Page 6-39.)

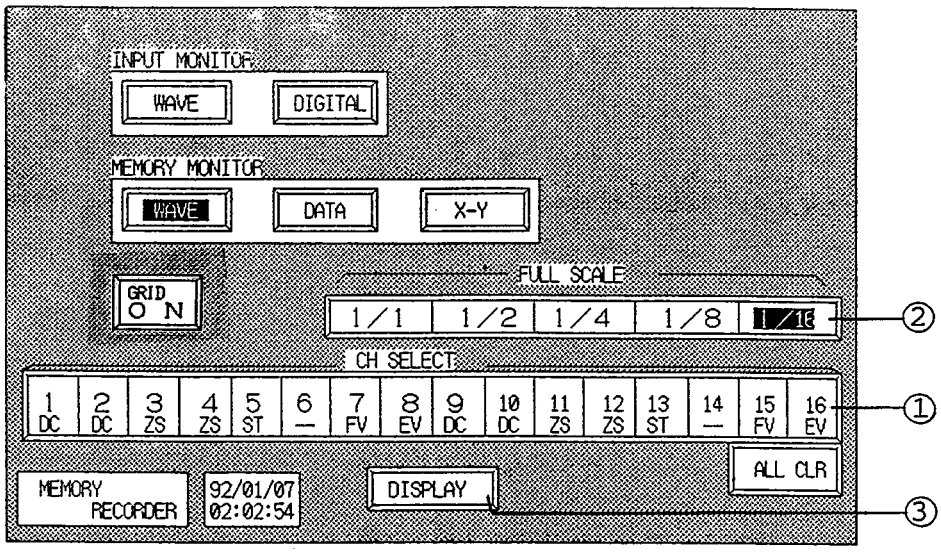
3) X-Y : Memory X-Y display. (Refer to Page 6-43.)

(1) Memory waveform display

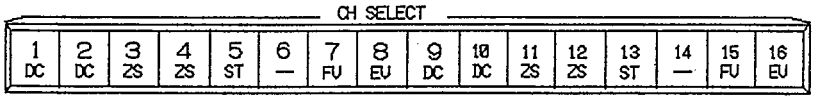
Press the MONITOR key on the operation panel.

Then, press WAVE of MEMORY MONITOR [WAVE] [DATA] [X-Y] to cause a following screen display to appear.

(When the monitoring screen display is displayed, press PREV to cause the following screen display to appear.



① Channel selection:



A channel, which is to be monitored, can be selected.
The selected channel is reversely displayed. All channels can be selected.

When ALL CLR is pressed, the selected channels are all cleared to do channel selection over again.

② Full scale:

Sets effective display widths.

Press any desired key to be set.

1/1 : Whole of waveform screen display displayed as full scale.

1/2 : Half of waveform screen display displayed as full scale.

1/4 : Quarter of waveform screen display displayed as full scale.

1/8 : One eighth of waveform screen display displayed as full scale.

1/16: One sixteenth of waveform screen display displayed as full scale (1/16 only for RT3216N)

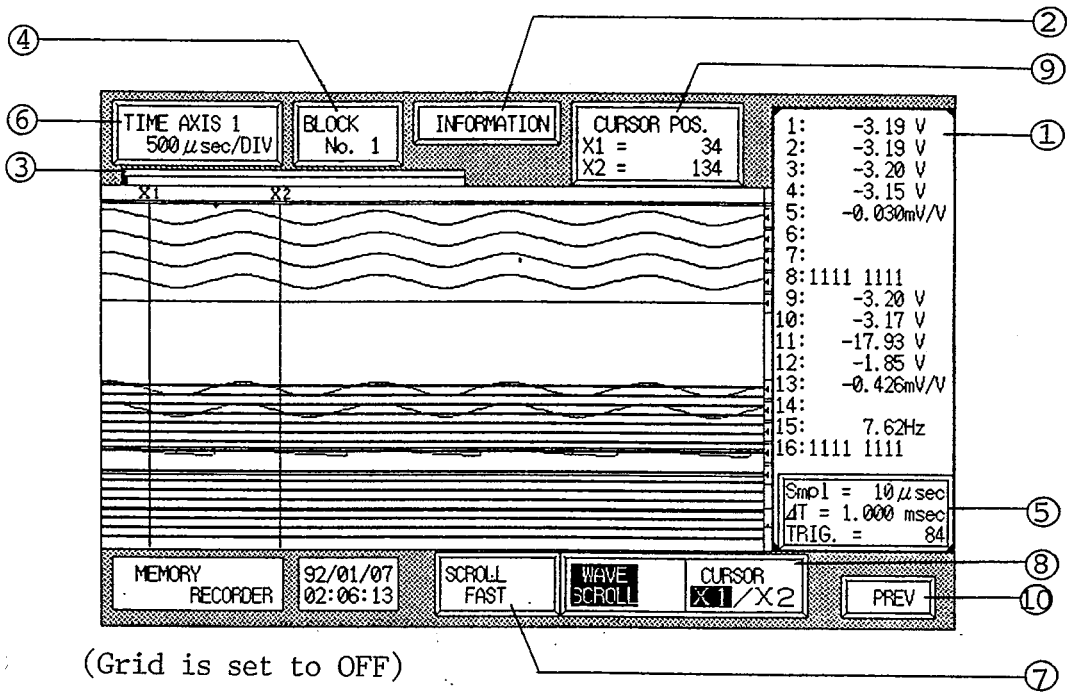
③ Monitoring display:

Displays input waveforms.

When [DISPLAY] is pressed, the memory waveform display is centered around the triggering point, as shown in the figure below:

Note:

The monitoring display cannot be made, if a channel or channels are not selected.

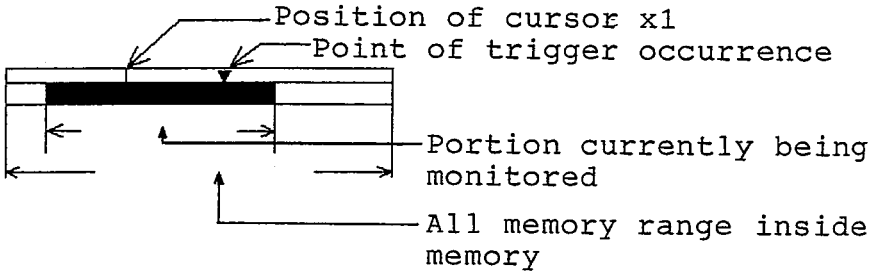


(Grid is set to OFF)

This section describes displays ① to ③ and setting keys ④ to ⑩ on the screen display shown above.

1) Display

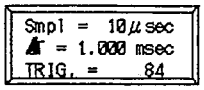
No.	Displays	Display contents
①	1: 2: 3: 4: 5:	Measured values (voltage, frequency, etc.) of intersecting points, where a reversely displayed cursor (x1 or x2) on ⑧ [CURSOR X1/X2] and each waveform meet, are displayed at the right side on the screen display.
②	[INFORMATION]	Press this key to allow it to be reversely displayed as [INFORMATION], and the following contents can be displayed:

		SAMPLE SPEED: Setup sample speed. MEM SEGMENTS: Setup number of memory segments. Value in ( ); Memory capacity per memory block. DATA No.: Data number where waveforms are currently monitored. TRIG.: Address value of data upon trigger occurrence. DATE: Date of start of measurement. TIME: Time of start of measurement. Press [MEMORY] again, and the reverse display is released and the current screen display can be returned to the monitoring display.
③	Part of ③ is displayed, as shown at right.	 Note: If measurement is stopped by pressing the STOP key before triggering, a point of trigger occurrence (▼) is not displayed.

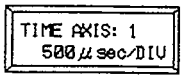
2) Setting-up

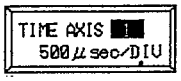
No.	Setting keys	Display contents and setting procedures
④	[BLOCK No. 1]	Press this key to allow it to be reversely displayed as [BLOCK No. 1], and the memory block, which displays a memory waveform, can be changed by the jog dial. Press [BLOCK No. 1] again, and the reverse display is

released and the memory waveform of a set memory block can be displayed.

⑤ 

This key displays the following contents:
Smpl ; Sample speed.
ΔT ; Time between cursors (x1 - x2).
TRIG.; Address of data upon trigger occurrence.
It is convenient to use this key, if measurement needs to be done over again by changing the sample speed.
The detail on the setting procedures will be given later.

⑥ 

Press this key to allow it to be reversely displayed as 

, and the time axis can be changed by the jog dial.
Press this key again after changing the time axis, and the setting-up is completed.

The table below shows the number of data per 1 DIV for the time axis:

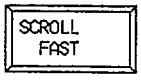
Time axis	2	1	1/2	1/4	1/8	1/16	1/32	1/64
Number of data per 1 DIV	25	50	100	200	400	800	1600	3200

If the time axis is changed, the indication of "500 μsec/DIV of 

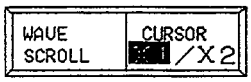
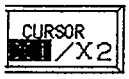
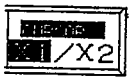
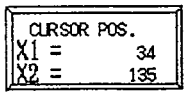
is changed.

Example: In case of 10 μsec sample speed:

Time axis	2	1	1/2	1/4	1/8	1/16	1/32	1/64
Indication	250μsec	500μsec	1msec	2msec	8msec	16msec	32msec	64msec

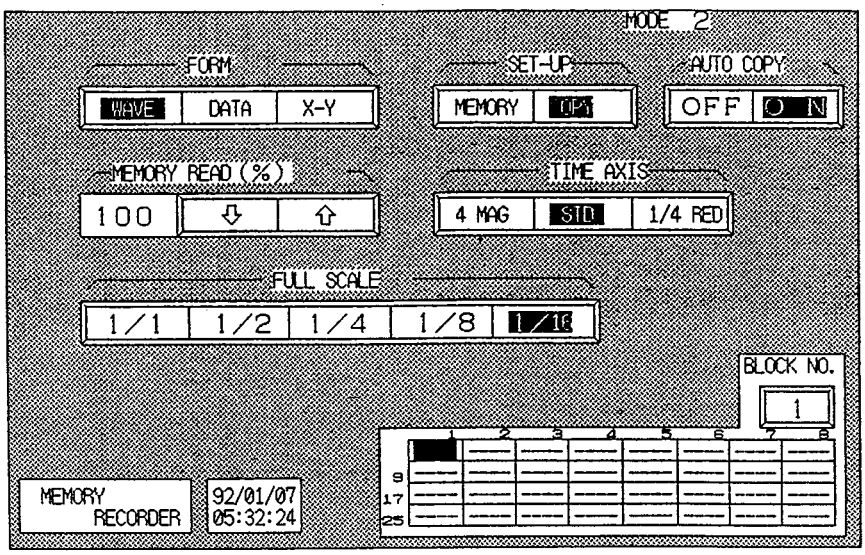
⑦ 

The scroll speed of a waveform and cursor can be changed. When this key is pressed, the scroll speed is selected in the order of slow , fast and page.

⑧		Press the  key to allow it to be reversely displayed as  , and displayed waveforms can be scrolled to the right side or the left side by the jog dial. Press the key again and the reversely displayed key is returned to the original state and the setting is released. Press  to allow it to be displayed as  and the reversely displayed portion can be selected from X1 to X2, each time this key is pressed. In X1, the cursor X1 can be moved by the jog dial in the range of all memory range inside the block. In X2, the cursor X2 can be moved by the jog dial only in the inside range of a waveform screen display.
⑨		Used to copy a specified range. (Refer to (2) of 6.8.) X1, X2: Memory address of each cursor.
⑩		When this key is pressed, the current display is returned to the previous display where channels for monitoring can be selected.

In monitoring display, it is convenient to use the [Smpl = 10μsec / = 1.000 msec / TRIG. = 84] key, if measurement needs to be done over again by changing the sample speed.

Press the [MODE] key on the operation panel. Then, press [COPY] of [SET-UP: MEMORY | COPY], located at the upper right on the screen display, to display the following mode screen display.



In the screen display shown above, set up data acquisition into memory. (Refer to 6.2.)

Select the memory block for data acquisition.

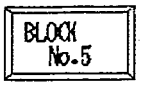
Example:

Select the memory block 5 [BLOCK 5].

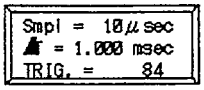
Press the [REC] key on the operation panel for measurement, and when data has been taken into memory, press the [MONITOR] key to display memory waveforms.

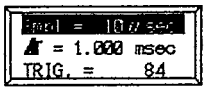
Select the memory block for monitoring display on the above mode screen display by [BLOCK No. 1].

Example:

Data in the memory block 5 

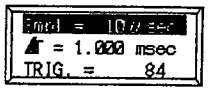
is displayed as memory waveforms.

Press the 

key to allow it to be reversely displayed as 

, and sample speeds can be changed by the jog dial, as follows:

5, 10, 20, 50, 100, 200, 500 μsec.
5, 10, 20, 50, 100, 200, 500 msec.

When the sample speed has been changed, press the 

key once again and its reverse display can be released.
(However, the sample speed to be displayed is returned to the value just before changing.)

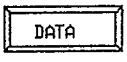
When the above settings have been completed, press the 

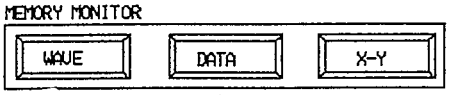
key on the operation panel to carry out measurement and data can be taken into memory at a changed sample speed.and memory waveforms can be newly displayed.

(2) Memory data display

Press the 

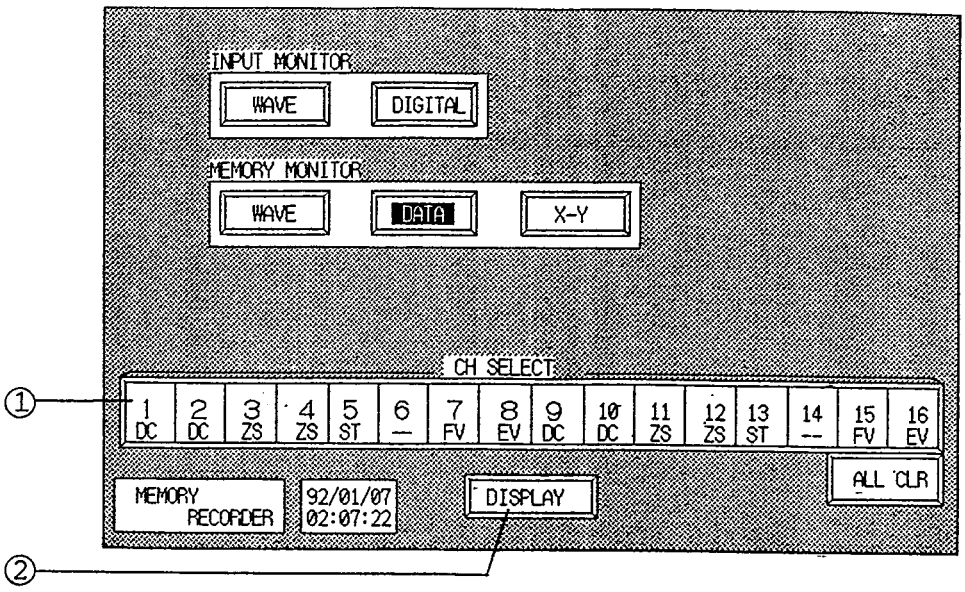
key on the operation panel.

Then, press 

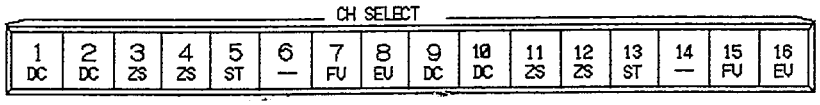
of 

on the screen display to cause a following screen display to appear.
(When a monitoring screen display is displayed, press 

, located at the lower right on the screen display, to cause a following screen display to appear.)



① Channel selection:



A channel, which is to be monitored, can be selected. The selected channel is reversely displayed. Up to a maximum of 4 channels can be selected.

When [ALL CLR] is pressed, the selected channels are all cleared to do channel selection over again.

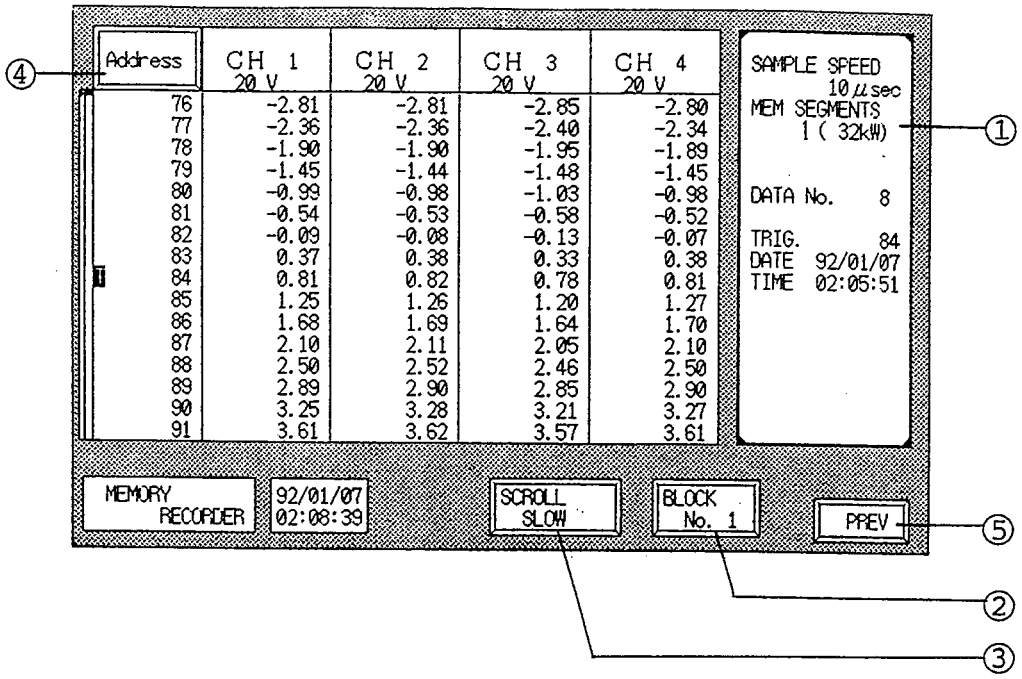
② Monitoring display:

Input waveforms can be monitored.

When [DISPLAY] is pressed, the memory data display is centered around the triggering point, as shown in the figure on the following page.

Note:

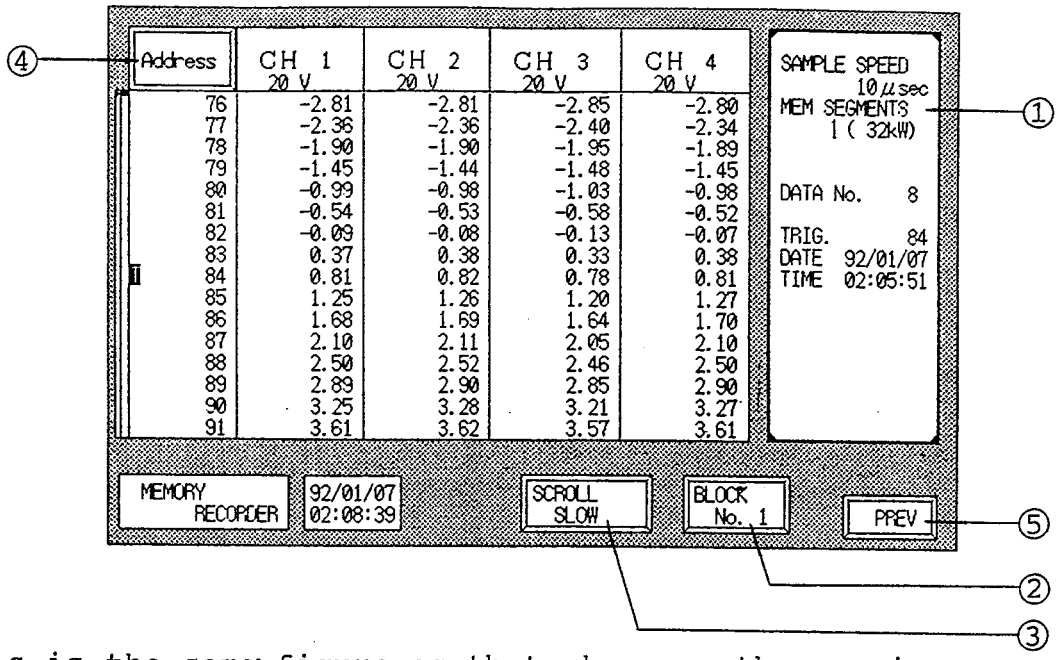
The monitoring display cannot be made, if a channel or channels are not selected.



This section describes display ① and setting keys ② to ⑤ on the screen display shown above.

1) Display

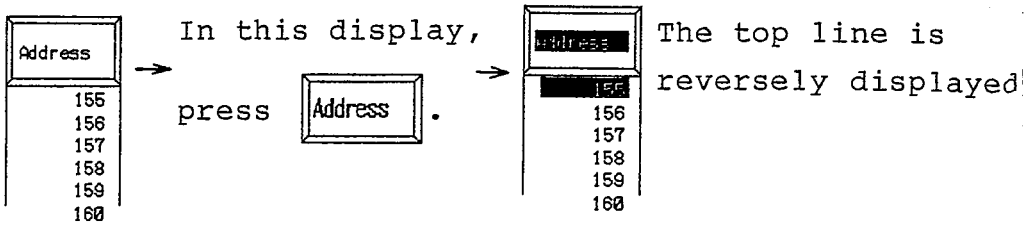
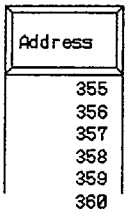
No.	Display	Display contents
①	SAMPLE SPEED 10μsec MEM SEGMENTS 1 (32kW)	Following contents are displayed at the right side on the screen display. SAMPLE SPEED: Setup sample speed. MEM SEGMENTS: Setup number of memory segments. Value in ( ); Memory capacity per memory block. DATA No.: Data number where waveforms are currently monitored TRIG.: Address value of data upon trigger occurrence. DATE: Date of start of measurement. TIME: Time of start of measurement.



(This is the same figure as that shown on the previous page.)

2) Setting-up

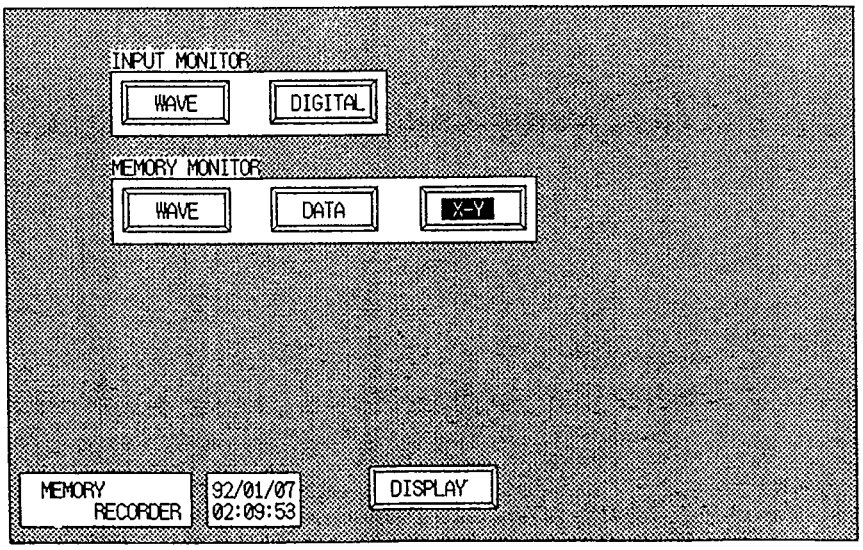
No.	Setting keys	Display contentents and setting procedures
②	BLOCK No. 1	Press this key to allow it to be reversely displayed as BLOCK No. 1 , and the memory block, which displays a memory data , can be changed by the jog dial. Press BLOCK No. 1 again, and the reverse display is released and the memory data of a set memory block can be displayed.
③	SCROLL SLOW	The number of scrolls of memory data can be changed. Pressing this key changes the indication to slow speed, page.
④	Address	The number of addresses, which scrolls memory data, can be changed in 100 steps. Press this key to allow the top line of memory addresses to be reversely displayed, and the addresses can be changed in 100 steps by the jog dial. Press this key again and data is displayed from the set number of addresses.

		Example:  Turn the jog dial and the portion of 155 can be changed as 155, 255, 355, ... Press Address in setting to 355, and the addresses can be changed as  .
⑤	PREV	When this key is pressed, the current display is returned to the previous display where channels for monitoring can be selected.

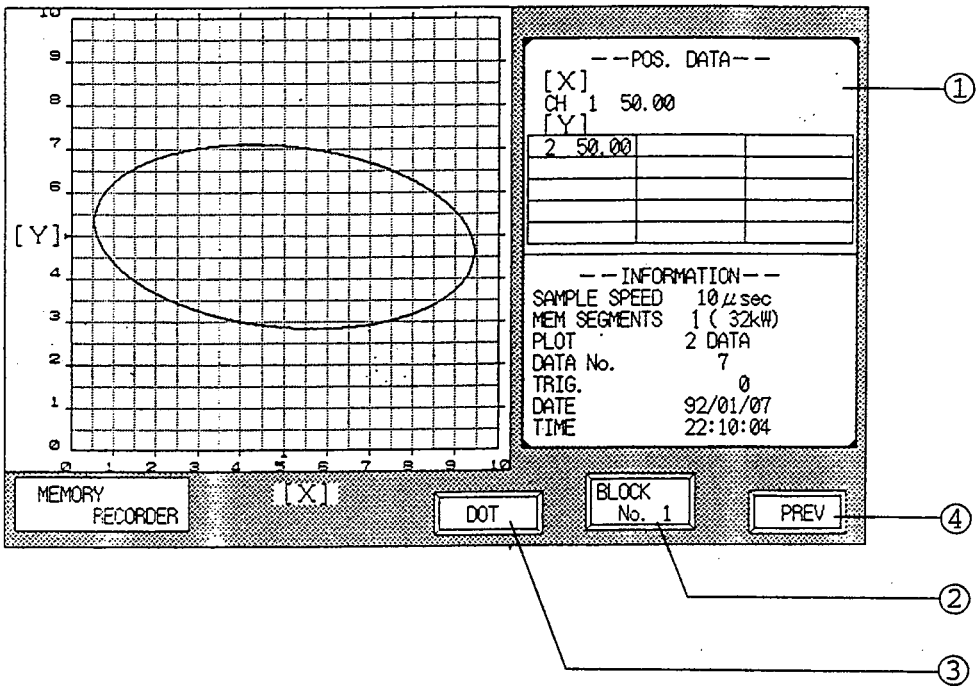
(3) Memory X-Y display

Press the MONITOR key on the operation panel.

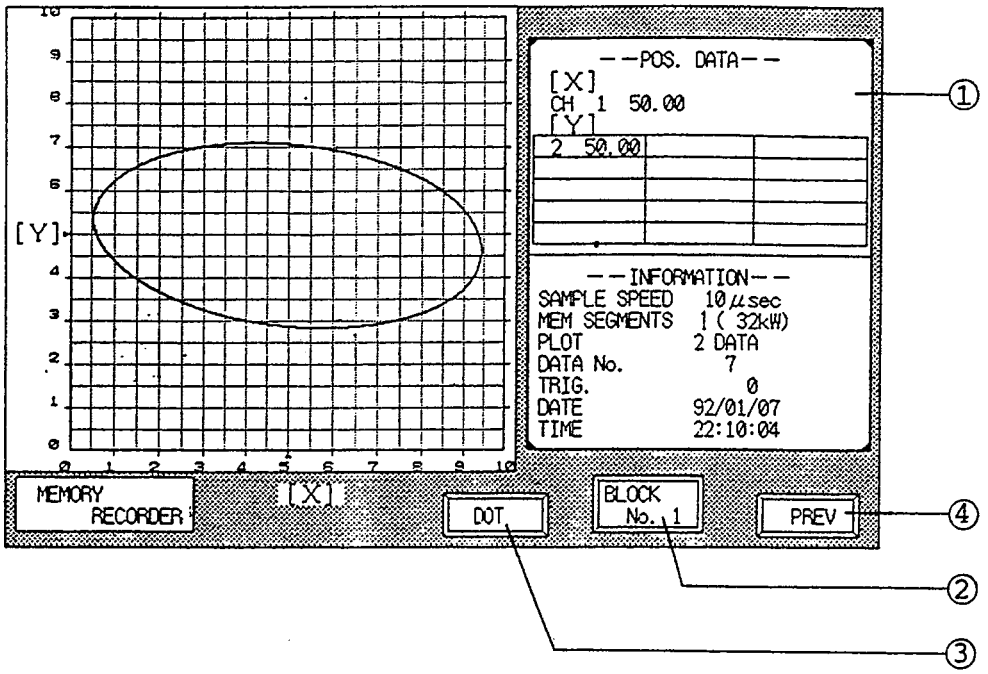
Then, press X-Y of MEMORY MONITOR [WAVE] [DATA] [X-Y] to cause a following screen display to appear. (When a monitoring screen display is displayed, press PREV, located at the lower right on the screen display, to cause a following screen display to appear.)



Press [DISPLAY] to cause a following screen display to appear.



Note: Selection of channels in X and Y axis is the same way as that of X-Y recording for memory.(Refer to item 6.4)



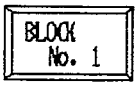
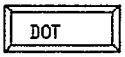
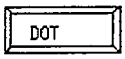
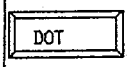
(This is the same figure as that shown on the previous page.)

This section describes display ① and setting keys ② to ④ on the screen display.

1) Display

No.	Display contents
①	Following contents are displayed at the right side on the memory X-Y screen display. -- POS. DATA -- X : A channel set to the X-axis. Y : In setting-up of the Y-axis, a channel set to ON and its base-line position. -- INFORMATION -- SAMPLE SPEED. MEM SEGMENTS: Number of memory segments and memory capacity per each memory block. PLOT: Writing amount of memory. DATA No.: Data number stored in each memory block. TRIG.: Data address upon trigger occurrence. DATE: Date of start of measurement. TIME: Time of start of measurement.

2) Setting-up

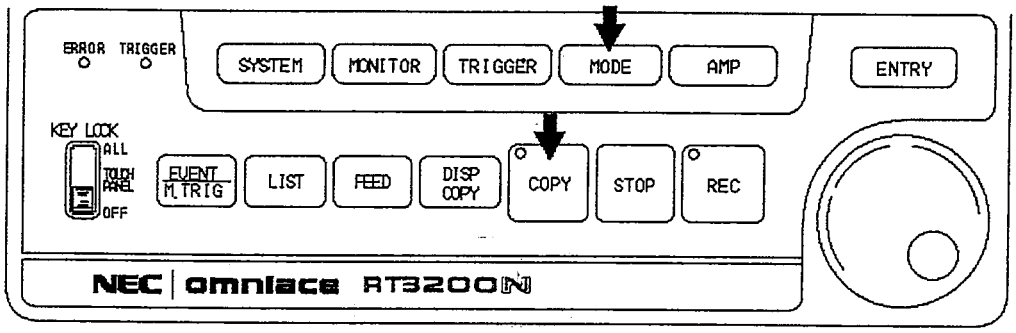
No.	Setting keys	Setting procedures
②		Press this key to allow it to be reversely displayed as  , and a memory block, which displays the memory X-Y screen display, can be selected by the jog dial. When this key is pressed again, the memory X-Y screen display of the set memory block is displayed.
③		When this key is pressed, the indication is changed as  and  to select presence or absence of linear interpolation.  : Presence of linear interpolation.  : Absence of linear interpolation.
④		When this key is pressed, the current display is returned to the previous display where channels for monitoring can be selected.

6.8 How to Use Manual Copy

After data acquisition into memory, the same data can be repeatedly recorded by the COPY key. In addition, data can be recorded in different recording formats.

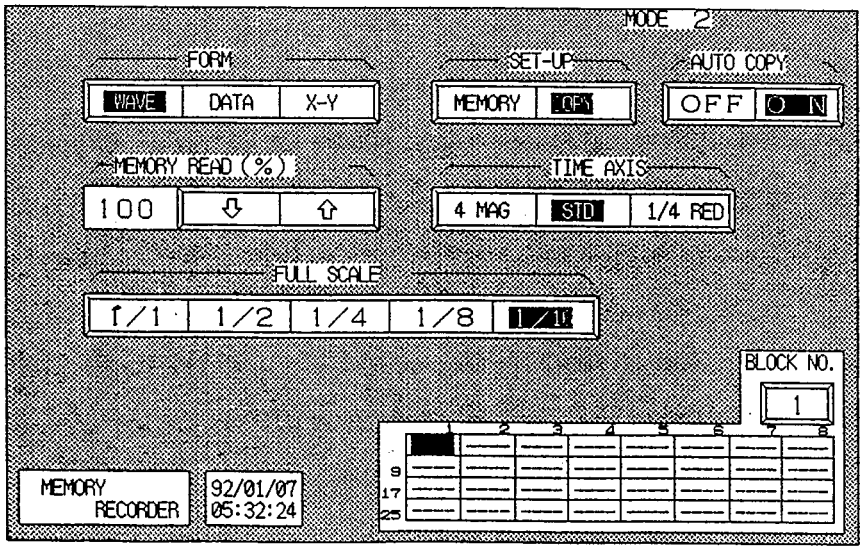
Setting procedures:
Data is taken into memory by means of the procedures described in 6.2 to 6.4.

(1) Manual copy by means of mode screen display

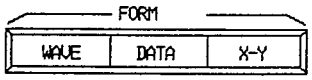


Press the MODE key on the operation panel.

Press COPY of SET-UP [MEMORY | COPY], located at the middle on the screen display, to cause a following mode screen display to appear.



On the screen display shown on the previous page, set up a recording format for manual copy.



WAVE: Waveform recording
DATA: Data recording
X-Y : X-Y recording

Set up the following items:

° Memory read interval.
° Memory read amount.
° Full scale for waveform recording.
° X-axis and Y-axis channels for X-Y recording.

Then, select a memory block for recording.
(For the setting procedures, refer to 6.2 to 6.4.)

Press the 

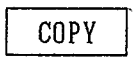
key and the manual copy can be carried out in accordance with the above set format.

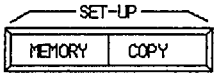
(2) Manual copy by means of waveform monitoring screen display

The portion, surrounded by the cursors x1 and x2 on the memory waveform screen display, can be repeatedly recorded in waveform, data or X-Y recording in different recording formats.

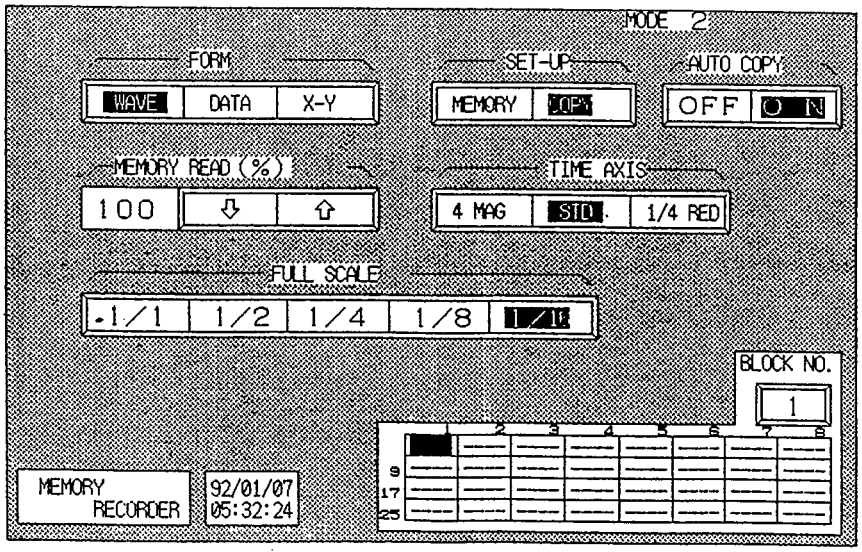
Press the 

key on the operation panel.

Then, press 

of 

to cause a following mode screen display to appear.



On the screen display shown on the previous page, set up a recording format for manual copy.

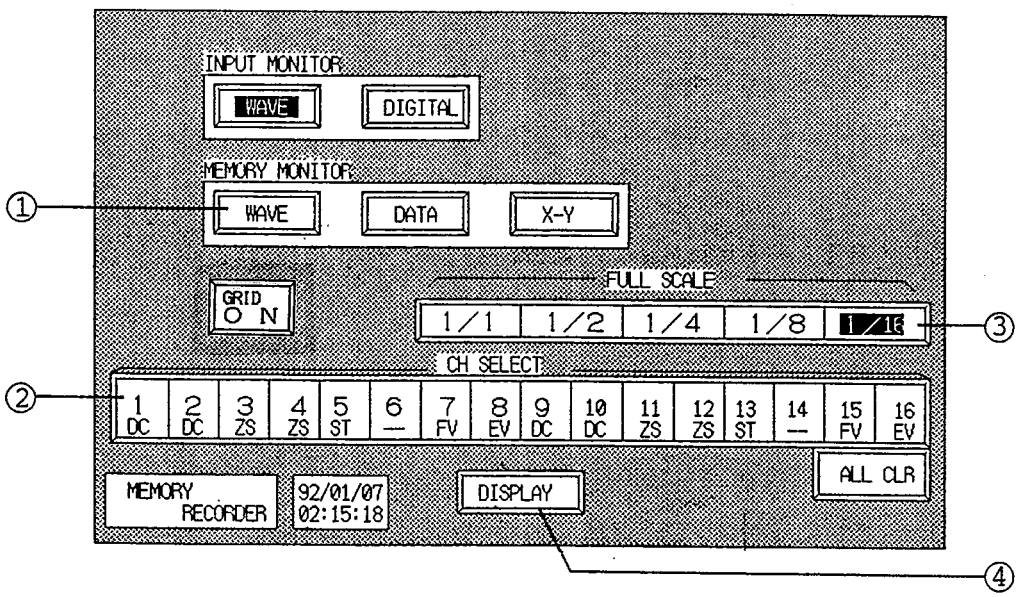
WAVE: Waveform recording
DATA: Data recording
X-Y : X-Y recording

Set up the following items:

° Memory read interval.
° Memory read amount.
° Full scale for waveform recording.
° X-axis and Y-axis channels for X-Y recording.

(For the setting procedures, refer to 6.2 to 6.4.)

Press the MONITOR key on the operation panel to cause a following screen display where channels for monitoring can be selected.



(If any screen display other than the above screen display, where channels for monitoring can be selected, may appear, press PREV, located at the lower right on the screen display, to cause the above screen display to appear.)

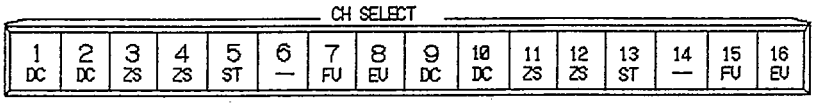
The following settings are available on the above screen display:

① Memory monitor:

Selects a memory screen display.

Press [WAVE] of MEMORY MONITOR [WAVE] [DATA] [X-Y].

② Channele selection:



A channel, which is to be monitored, can be selected.
The selected channel is reversely displayed. All channels can be selected.

When [ALL CLR] is pressed, the selected channels are all cleared to do channel selection over again.

③ Full scale:

Sets effective display widths.

1/1 : Whole of waveform screen display displayed as full scale.
1/2 : Half of waveform screen display displayed as full scale.
1/4 : Quarter of waveform screen display displayed as full scale.
1/8 : One eighth of waveform screen display displayed as full scale.
1/16: One sixteenth of waveform screen display displayed as full scale. (1/16: only for RT3216N)

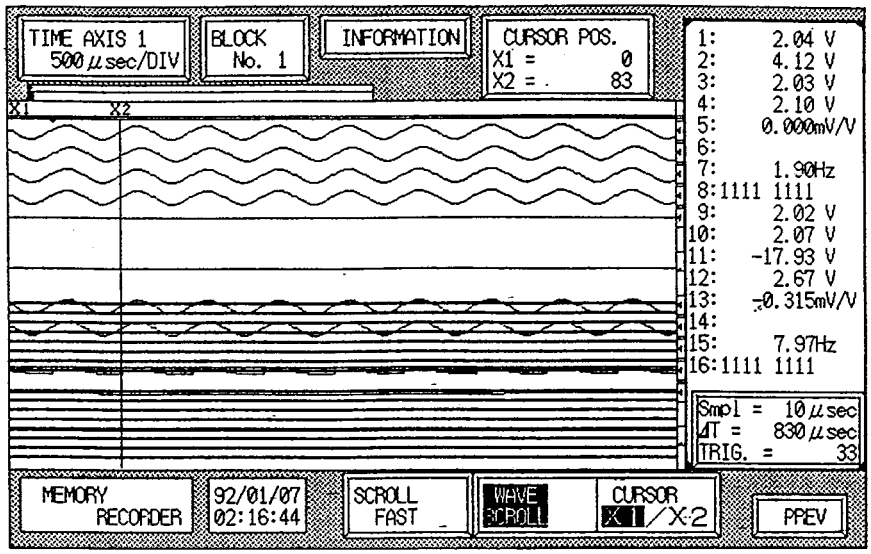
④ Monitoring display:

When [DISPLAY] is pressed, the memory waveform display is centered around the triggering point, as shown in the figure on the following page.

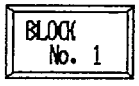
(For details on the setting keys, refer to pages from 6-33.)

Note:

The monitoring display cannot be made, if a channel or channels are not selected.



① Select a memory block for memory copy recording.

Press 

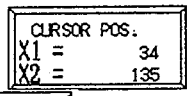
, located at the upper left on the screen display, to allow it to be reversely displayed as 

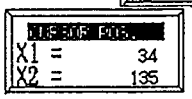
, and use the jog dial to select a memory block number for memory copy recording

Press 

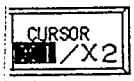
again to release the reverse display and the memory waveform of the set memory block can be displayed.

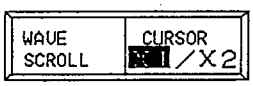
② Scroll waveforms on the memory waveform screen display and surround a portion for memory copy recording with the cursors X1 and X2.

Press 

to allow it to be reversely displayed as 

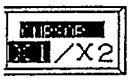
.

Press 

of 

to allow it to be displayed as 

.

Use the jog dial to move the cursor X1 (Moving range: All memory range inside block), and press 

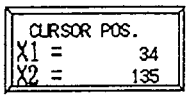
again to allow it to be displayed as 

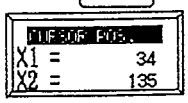
.

Then, use the jog dial to move the cursor X2 (Moving range: Only on waveform screen display).

③ After the cursors X1 and X2 have been set, press the [COPY] key and the portion surrounded by the cursors X1 and X2 can be manually copied in the format set by the mode screen display.

Note:

If the [COPY] key is pressed with 

not reversely displayed as 

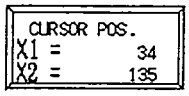
, manual copy based on the set range cannot be made.

In the following cases, manual copy based on the set range cannot be made, either:

° When the screen display has been changed.

° When the [REC] key has been pressed.

° When a hard copy has been taken.

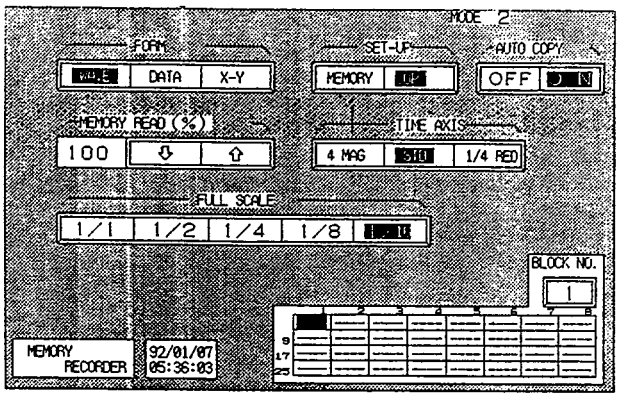
In the above cases, press 

once again and then press the [COPY] key.

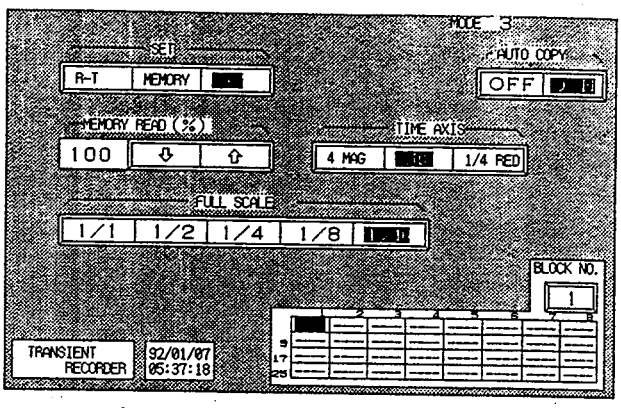
When the [LIST] key is pressed, a list based on the set range can be printed.

6.9 Auto Copy ON/OFF Function

In the memory recorder or transient recorder mode, after data has been written into the memory by a trigger, recording of the data stored in the memory can be automatically started.
This function can be turned ON or OFF.

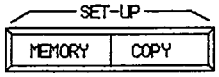


Memory recorder

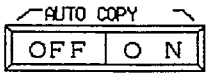


Transient recorder

(Setting-up procedures)
In case of memory recorder:

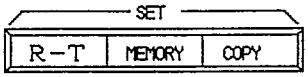
Press [COPY] of 

located at the upper left on the screen display.

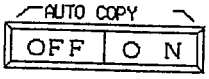
Press 

, located at the upper right on the screen display, to select ON or OFF of AUTO COPY.

In case of transient recorder:

Press [MEMORY] of 

located at the upper left on the screen display.

Press 

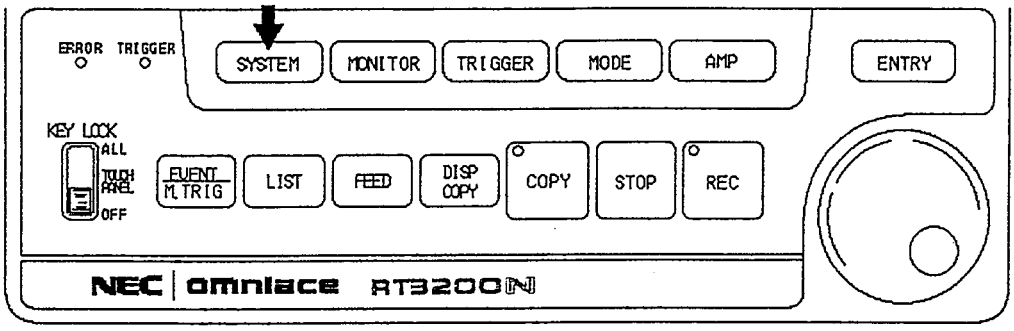
, located at the upper right on the screen display, to select ON or OFF of AUTO COPY.

Triggering operation		AUTO COPY: ON	AUTO COPY: OFF
	SINGLE	After data has been stored into the specified memory block upon receipt of a trigger, recording of the memory data is started. After that, the instrument is not put into the standby state for a trigger.	After data has been stored into the specified memory block upon receipt of a trigger, the memory operation is terminated without recording of memory data. In the transient recorder mode, recording of real-time waveforms continues while data is taken into memory.
	REPEAT	(When TRIG is set in REPEAT or OVER WR., the same operation is provided with AUTO COPY set in ON.) After data has been stored into the specified memory block upon receipt of a trigger, recording of the memory data is started. After that, the instrument is again put into the standby state for a trigger.	Data is taken into memory blocks upon receipt of a trigger, starting from the specified memory block. After data has been taken into the set number of memory segments, the memory operation is terminated. In this case, memory data is not recorded. In the transient recorder mode, recording of real-time waveforms continues, while data is taken into the set number of memory segments.
	OVERWRITE	After data has been stored into a next memory block upon receipt of a trigger, recording of the memory data is started. The above operation is repeated, while data is overwritten on the memory block where recording of memory data has been terminated, until the measurement is stopped by pressing the STOP key on the operation panel.	Data is taken into memory blocks upon receipt of a trigger, starting from the specified memory block. Data continues to be taken into memory, while data is overwritten on the memory block, until the measurement is terminated. In this case, memory data is not recorded. In the transient recorder mode, recording of real-time waveforms continues, while data continues to be taken into memory.

6.10 Memory Clear

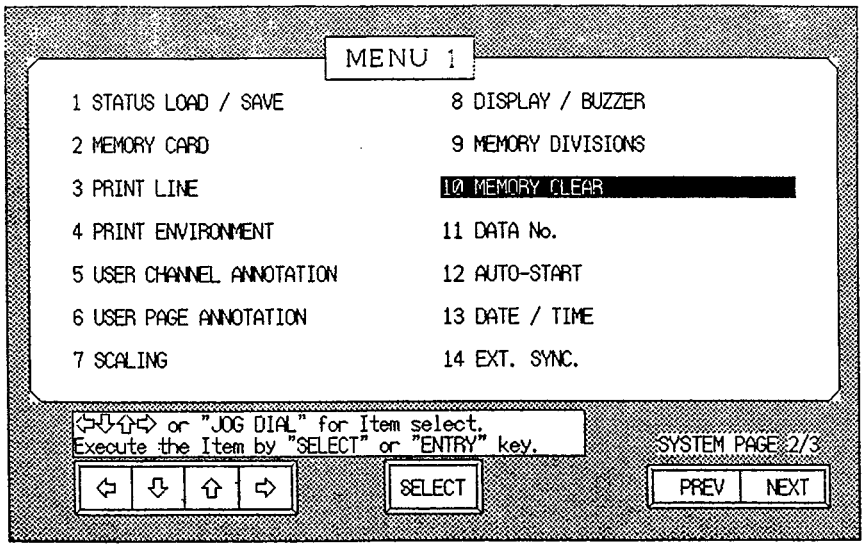
This function is provided to clear data stored in a memory block.

(Setting-up procedures)



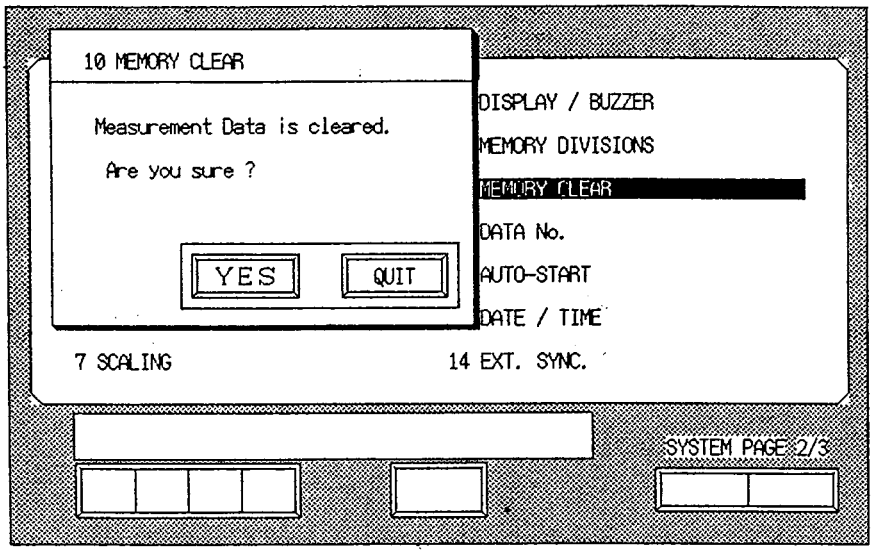
Press the [SYSTEM] key on the operation panel to cause a MENU 1 screen display (SYSTEM PAGE 2/3) to appear.

If another SYSTEM PAGE is displayed, use the [PREV] [NEXT] keys to cause the MENU 1 screen display (SYSTEM PAGE 2/3) to appear.



Use [⇦] [⇩] [⇧] [⇨] on the screen display or use the jog dial to move the reverse display to 10 MEMORY CLEAR.

Press [SELECT] on the screen display or press the [ENTRY] key on the operation panel to cause a following screen display to appear.



In the screen display shown above, press [YES] and all memory contents can be cleared.

Press [QUIT] and the above screen display is returned to the MENU 1 screen display.

Even when [MEMORY CLEAR] on the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3) is pressed, the screen display shown above appears for setting memory clear in the same way.

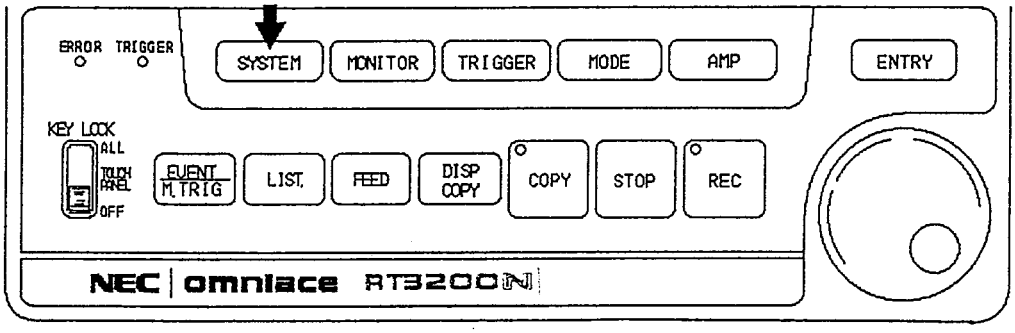
SECTION 7

HOW TO USE TRANSIENT RECORDER

The transient recorder functions as an ordinary real-time recorder, and it is switched to the function of a memory recorder upon receipt of a trigger. After data has been taken into the set number of memory segments, it is returned again to the function of a real-time recorder. When TRIG is set in REPEAT, the above operation is repeated.

7.1 Selection of Transient Recorder

Press the [SYSTEM] key on the operation panel.



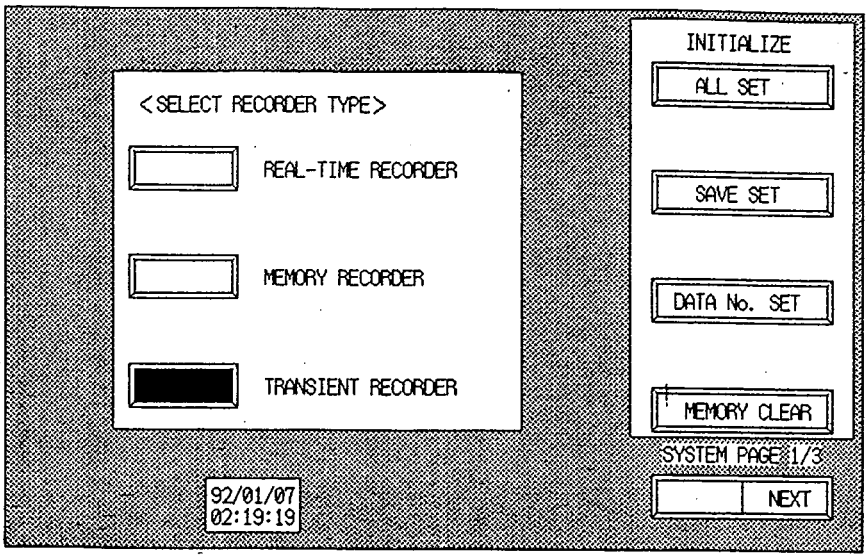
Press the [SYSTEM] key to cause the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3) to appear.

Note:

If another SYSTEM PAGE is displayed, use the [PREV] key to cause the SELECT RECORDER TYPE screen display (SYSTEM PAGE 1/3) to appear.

Select TRANSIENT RECORDER.

Press the part [ ] of [ ] TRANSIENT RECORDER .



In the figure shown above, the following settings are available:

When [ALL SET] is pressed, all setup contents of the basic instrument can be set to the initial values. (Refer to 9.12 Initialization.)

When [SAVE SET] is pressed, the set parameters of input units and the set status of the basic instrument, which are saved in the memory of the basic instrument in 9.1 Saving and Loading Setup Contents, are left unchanged and other setup contents of the basic instrument can be initialized.

Press [YES] on the screen display for execution.

Press [QUIT] on the screen display for quitting, and the display is returned to the original state without initialization.

When [DATA No. SET] is pressed, the data number of the memory block is cleared to 1 or can be set to any value.
(Refer to 9.9 Setting Data No.)

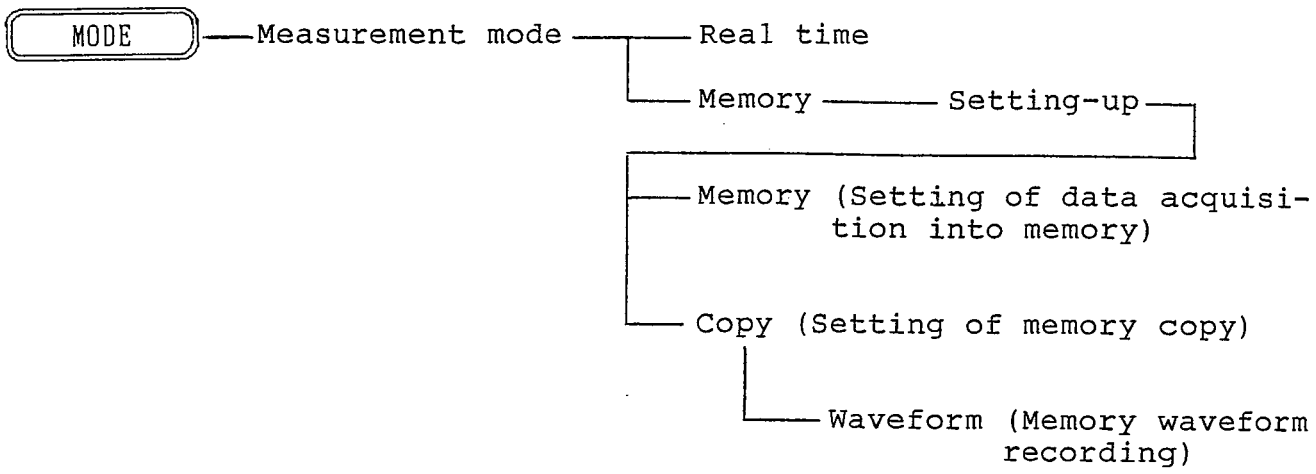
When [MEMORY CLEAR] is pressed, data in the memory block can be cleared.

(Refer to 6.10 Memory Clear.)

Setup contents of transient recorder:

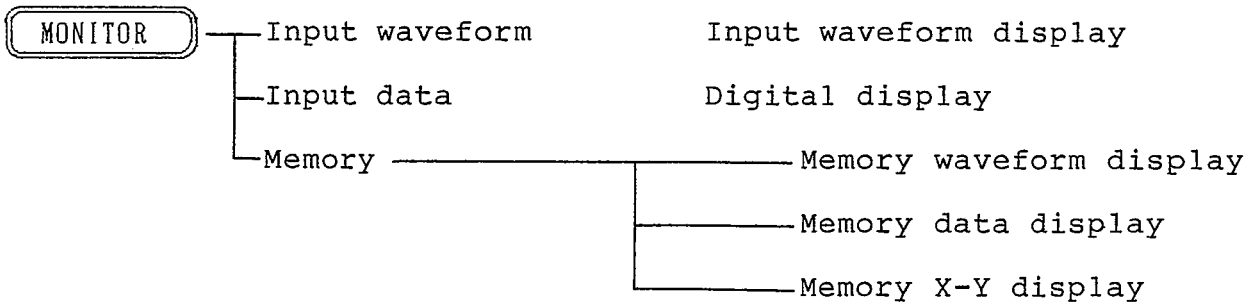
In the transient recorder, the following setting-up can be carried out:

Press the MODE key on the operation panel for selecting recording modes.



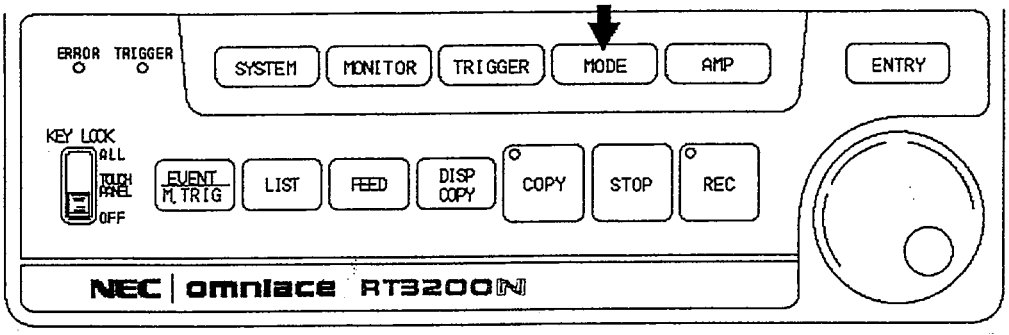
Press the MONITOR key on the operation panel and the following screen displays appear.

- Display of real-time waveform of input signal and digital value of input data.
- Display of memory waveform/data/X-Y.



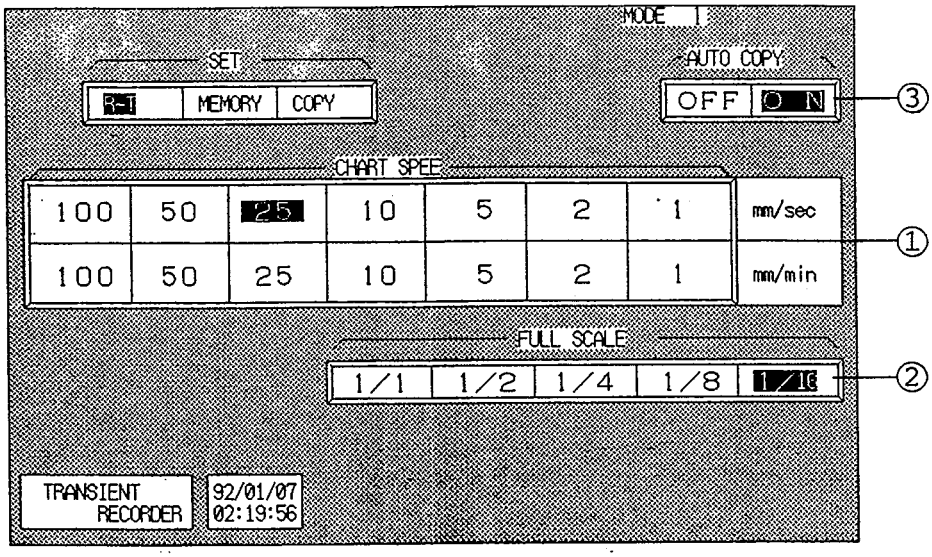
7.2 Setting-up of Transient Recording

Press the [MODE] key on the operation panel.



(1) Setting-up of real-time waveform recording

Press [R-T] of SET [R-T | MEMORY | COPY], located at the upper left on the screen display, to cause a following MODE 1 screen display to appear.



The following settings are available on the MODE 1 screen display:

① Chart speed:

Chart speeds for waveform recording can be selected.

Press any chart speed key that needs to be set.

② Full scale:

Effective record widths can be selected.

Press any key for selecting effective record widths.

1/1 ; 200 mm full scale (RT3208N,RT3216N), 1/1: 100 mmFS (RT3108N)

1/2 ; 100 mm full scale (RT3208N,RT3216N), 1/2: 50 mmFS (RT3108N)

1/4 ; 50 mm full scale (RT3208N,RT3216N), 1/4: 25 mmFS (RT3108N)

1/8 ; 20 mm full scale (RT3208N,RT3216N), 1/8: 10 mmFS (RT3108N)

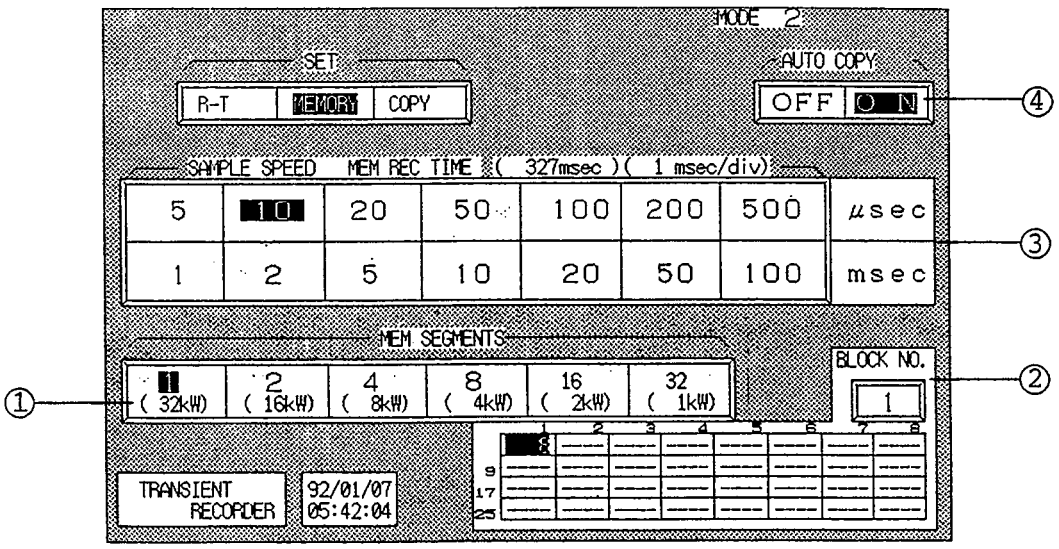
1/16; 10 mm full scale (RT3216N)

③ Auto copy:

This is set when the measurement mode of SET [R-T | MEMORY | COPY] is set in [MEMORY].

(2) Setting-up of data acquisition into memory

Press [MEMORY] of SET [R-T | MEMORY | COPY], located at the upper left on the screen display, to cause a following MODE 2 screen display to appear.



The following settings are available on the MODE 2 screen display.

① Memory segments:

Set memory segments.

Press any MEM SEGMENTS key that needs to be set.

The memory capacity for each channel can be divided into segments for use.
(Refer to 6.2.)

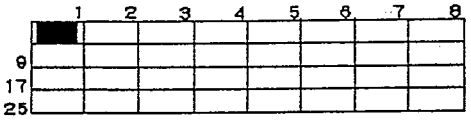
Note:

In the initial state, the memory capacity is set in 32 KW/channel.
However, the memory capacity can be increased up to a maximum of 256 KW/channel on the menu screen display (SYSTEM PAGE 2/3).
For changing memory capacity, refer to 9.8 Changing Memory Capacity (MEMORY DIVISIONS).

② Block selection:

Sets to which block the data is taken in, when the memory is divided into segments.

Press BLOCK [1] and it is reversely displayed as BLOCK [1], and data is taken into the memory block of the displayed number.

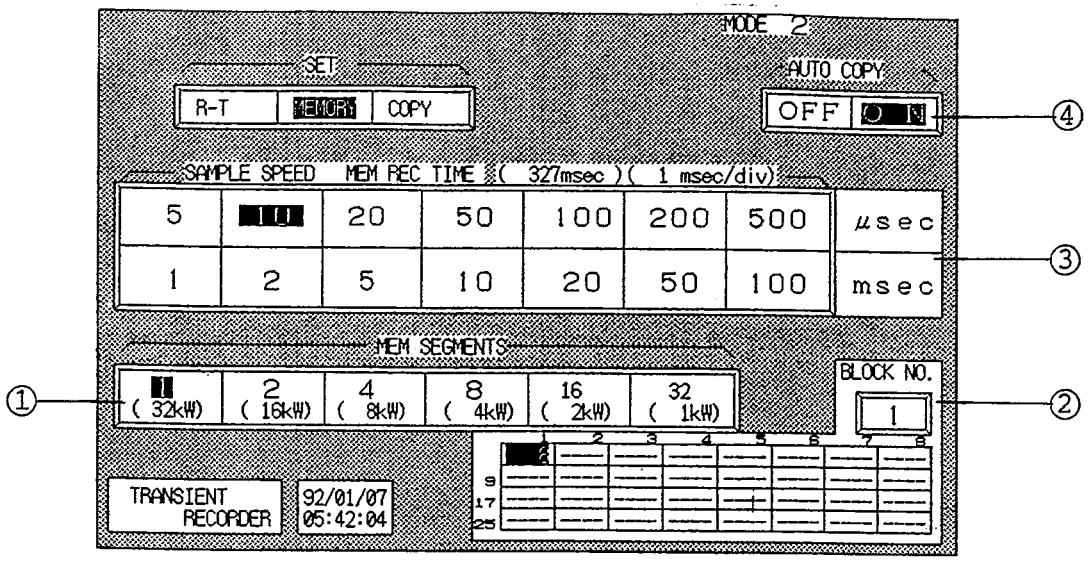


is the memory block.

Move the cursor (■) with the jog dial to the memory block, to which data is taken in.

The memory block number of BLOCK [1] is changed with the movement of the cursor ■.

Press BLOCK [1] again and the current display is returned to the original state to complete the setting.



(The figure shown above is the same screen display as that shown on page 7-5.)

③ Sample speeds:

Set intervals of data taken into memory.

Press any sample speed key that needs to be set.

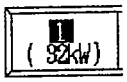
Note:

The memory recording time is the time required for data to be taken into memory.

When waveform recording has been made, the value, where 1 div of the time axis is converted to the time, is also displayed.

If the sample speed is changed to another, the display is also changed.

Example:

If the sample speed is 10 μsec and that the memory segment is set to 

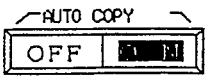
, the display becomes as follows:

10 μsec x 32 KW = 327 msec

10 μsec x 100 data = 1000 μsec/div

"Memory recording time (327 msec)(1000 div/sec)"

④ Auto copy:

When the trigger condition is satisfied and writing data into memory has been completed with AUTO COPY set in 

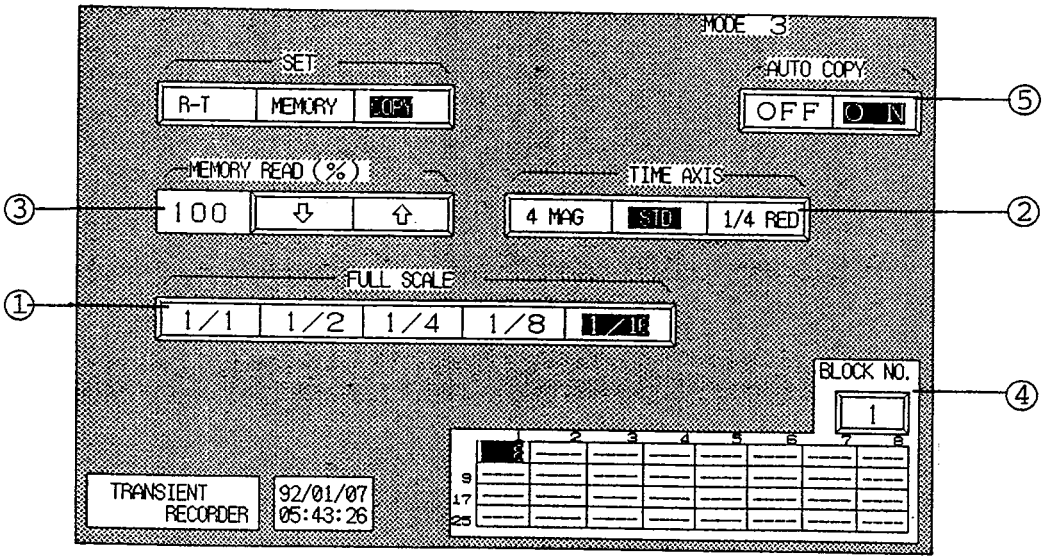
,

recording is automatically started.

When AUTO COPY is set in [AUTO COPY: OFF | ON], memory recording is not carried out for as long as the [COPY] key on the operation panel is not pressed. (Refer to 6.9.)

(3) Setting-up of memory waveform recording

Press [COPY] of [SET: R-T | MEMORY | COPY], located at the upper left on the screen display, to cause a following MODE 3 screen display to appear.



The following settings are available on the MODE 3 screen display:

① Full scale:

Effective record widths can be selected.

Press any key for selecting effective record widths.

1/1 ; 200 mm full scale (RT3208N,RT3216N), 1/1: 100 mmFS (RT3108N)
1/2 ; 100 mm full scale (RT3208N,RT3216N), 1/2: 50 mmFS (RT3108N)
1/4 ; 50 mm full scale (RT3208N,RT3216N), 1/4: 25 mmFS (RT3108N)
1/8 ; 25 mm full scale (RT3208N,RT3216N), 1/8: 10 mmFS (RT3108N)
1/16; 10 mm full scale (RT3216N)

② Time axis:

Sets the sizes of the time axis of memory waveform recording.

Waveform recording can be carried out by magnifying or reducing the time axis. (The number of samples is 100 data/DIV.)

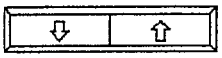
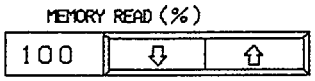
STD : Recording is made with a waveform in the standard size.

4 MAG : Recording is made with a waveform in 4 times larger than the standard size.

1/4 RED: Recording is made with a waveform in 1/4 times smaller than the standard size.

③ Memory read (%):

Sets as to what percentage of memory capacity of each memory block is to be recorded.

The amount of memory read can be set from 10 to 100% in 10% steps by pressing  of 

.

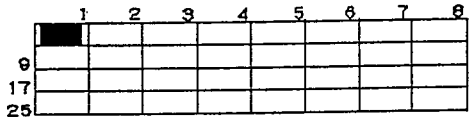
④ Block selection:

Sets the memory block for memory recording.

Press 

and it is reversely displayed as 

, and data is taken into the memory block of an indicated number.



is the memory block.

Move the cursor (■) with the jog dial to the memory block, where data is processed for memory recording.

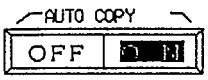
The memory block number of 

is changed with the movement of the cursor ■.

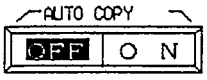
Press 

again and the current display is returned to the original state to complete the setting.

⑤ Auto copy:

When the trigger condition is satisfied and writing data into memory has been completed with AUTO COPY set in 

, recording is automatically started.

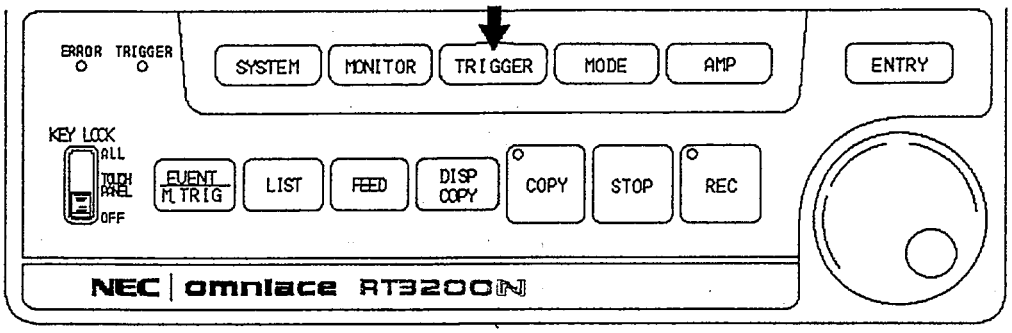
When AUTO COPY is set in 

, memory recording is not

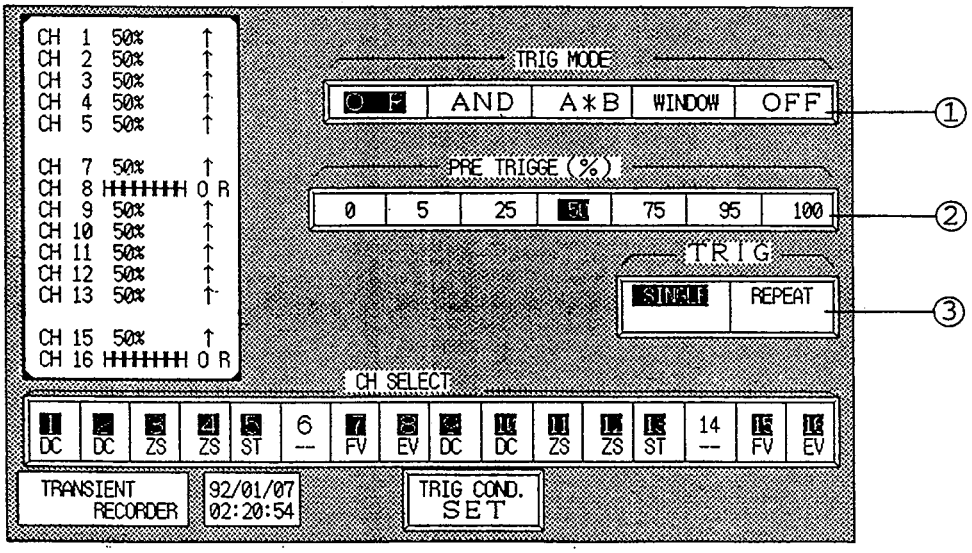
carried out for as long as the [COPY] key on the operation panel is not pressed. (Refer to 6.9.)

(4) Setting-up of trigger

When the recorder type is the transient recorder, setting-up of triggering functions is required.



Press the [TRIGGER] key on the operation panel to cause a trigger screen display to appear.



① Trigger mode:

Sets trigger modes.

② Pretrigger:

Sets pretriggers.

Pretriggers are set in percentage of memory capacity of before triggering with reference to a triggering point where data is taken into memory.

③ Number of measurement times:

Sets trigger operations.

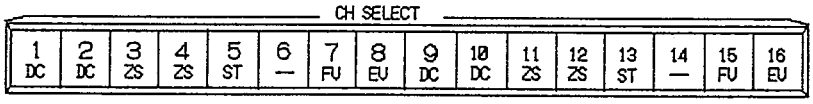
SINGLE; Triggering operation is made only once.

REPEAT; Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).

OVERWRITE; Triggering operation is repeated.

④ Channel selection:

A channel, which is to be set to a triggering source, can be selected.



Press the channel key, which is to be set to a triggering source. The selected channel is reversely displayed as **1**.

⑤ Setting-up of triggering condition:

Sets triggering conditions.

° If the channel of a triggering source is other than an event amplifier unit, set the level and slope.

° If the channel of a triggering source is an event amplifier unit, set the trigger state.

Note:

For details on the setting-up of triggering conditions, refer to SECTION 8 TRIGGERING FUNCTIONS.

Operation for measurement

After the settings, described on the previous page, have been completed, measurement can be made.

1) Press the [REC] key on the operation panel and the LED of the [REC] key lights to start real-time waveform recording.

   The LED of the [REC] key blinks simultaneously with occurrence of a trigger to start data acquisition into memory.

   When data acquisition into memory has been completed, the LED of the [REC] key goes out and the LED of the [COPY] key lights to automatically start memory waveform recording (with AUTO COPY set in ON).

   When the memory copy recording has been completed, the instrument is put again back into real-time recording.

2) If measurement needs to be stopped during measurement, press the [STOP] key.

3) Press the [COPY] key and measured data can be copied repeatedly.

   Data can be copied by changing full scales (1/1, 1/2, 1/4, 1/8, 1/16) memory read amount (10% to 100%) or time axis (4 times, standard, 1/4 times). (Refer to 7.6 How to Use Manual Copy.)

   For inputs and printout of input units which do not need to be recorded on the AMP screen display, they can be turned off for copying.

Note:

If the recorder type is changed to MEMORY RECORDER, data can be copied by changing recording formats (WAVE, DATA, X-Y). (Refer to 6.8.)

7.3 Setting-up of Real-time Waveform Display

The setting procedures are the same as those described in 5.5 Setting-up of Real-time Waveform Display (REAL-TIME RECORDER).
Refer to 5.5.

7.4 Setting-up of Digital Display

The setting procedures are the same as those described in 5.6 Setting-up of Digital Display (REAL-TIME RECORDER). Refer to 5.6.

7.5 Setting-up of Memory Display

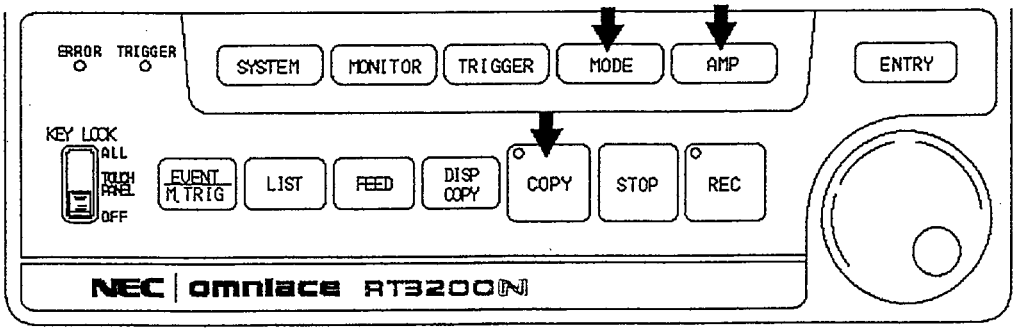
The setting procedures are the same as those described in 6.7 Setting-up of Memory Display (MEMORY RECORDER).
Refer to 6.7.

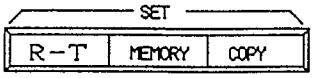
7.6 How to Use Manual Copy

Use the [STOP] key to stop measurement and recording during transient recording and data stored in the memory can be repeatedly copied by the [COPY] key.

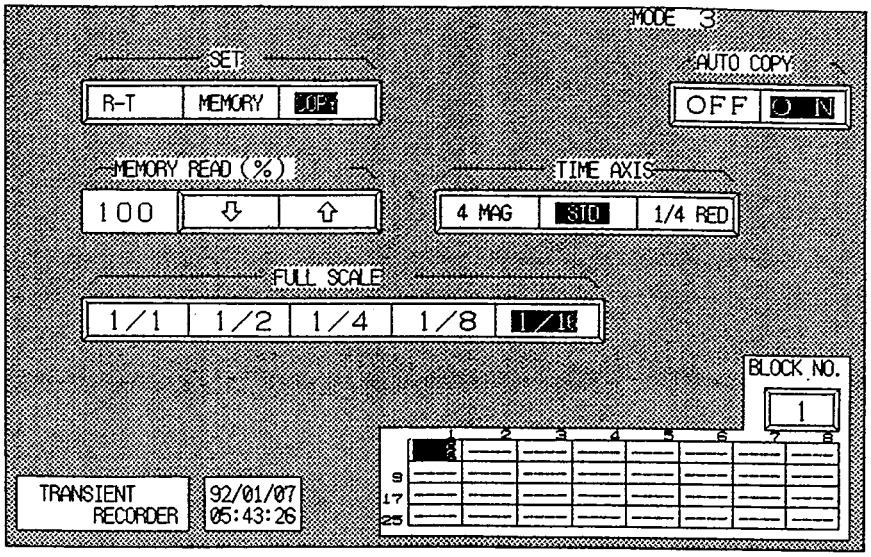
Data can be also recorded by changing recording formats.

Setting procedures



Press the [MODE] key on the operation panel. Then, press [COPY] of 

, located at the upper left on the screen display, to cause a following MODE 3 screen display to appear.



The following settings are available on the above screen display:

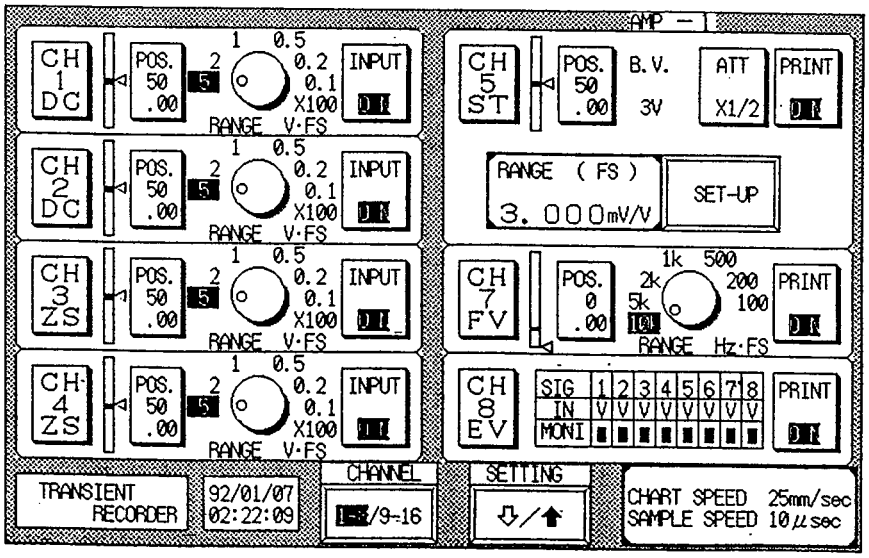
- Full scale (1/1, 1/2, 1/4, 1/8, 1/16)
- Memory read (10% to 100%)
- Time axis (4 times, standard, 1/4 times)

(For the setting procedures, refer to pages 7-8 and 7-9.)

Press the COPY key on the operation panel and data can be copied in the above set format.

Copy recording is also available by setting INPUT or PRINT of any input unit or input units, which do not need to be recorded, to OFF.

Press the AMP key on the operation panel to cause a following screen display to appear.



On the screen display shown on the previous page, press 

or 

of a channel or channels, which do not need to be copied, to set it to OFF.

Press the 

key on the operation panel and data can be copied excluding data on the channel or channels set in OFF.

Note:

If the recorder type is changed to MEMORY RECORDER, data can be copied by changing recording formats (WAVE, DATA, X-Y).
(For the setting procedures, refer to 6.8 How to Use Manual Copy.)

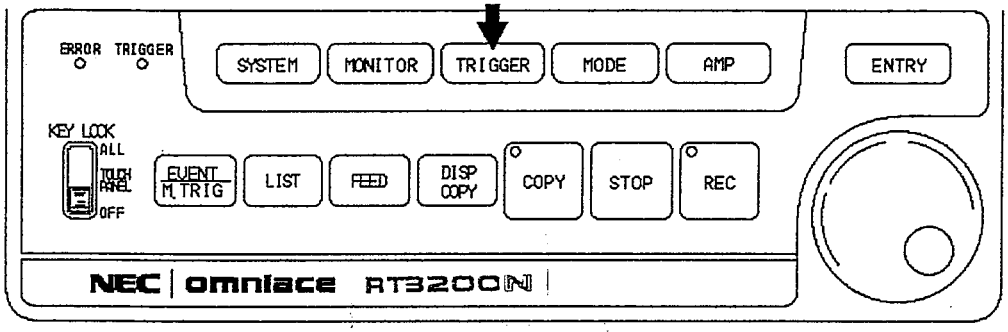
SECTION 8

TRIGGERING FUNCTIONS

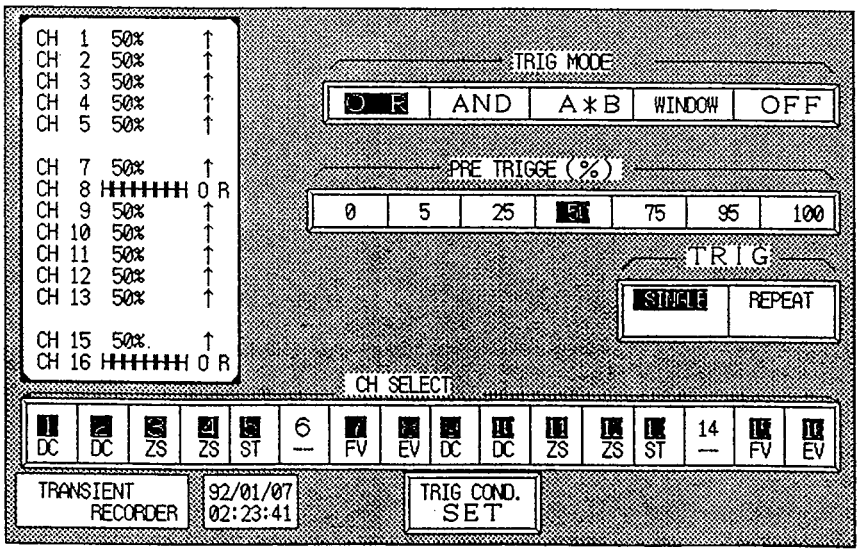
This instrument provides a wide variety of triggering functions, which can be used with triggering modes of many signals.
A trigger is a start action which causes this instrument in REAL-TIME RECORDER (with real-time trigger in ON), MEMORY RECORDER or TRANSIENT RECORDER to operate.

8.1 Operating Description on Trigger Mode

Press the TRIGGER key on the operation panel.



Press the TRIGGER key to cause a following trigger screen display to appear.



The table below shows the setting-up of sources and slopes, and operation upon trigger occurrence, when each triggering mode is set.

Trigger mode	Source	Slope	Operation upon trigger occurrence
OR	Any channel of channel 1 to channel 16	↑or↓	A trigger occurs when any condition of any channel is satisfied.
AND	Any channel of channel 1 to channel 16	↑or↓	A trigger occurs when all conditions of any channel are satisfied.
A*B	Any 2 channels of channel 1 to channel 8, or any 2 channels of channel 9 to channel 16	Source A ↑or↓ or Source B ↑or↓	A trigger occurs when source B condition is satisfied after source A condition has been satisfied.
WINDOW	Any 1 channel of channel 1 to channel 16	↑or↓	A trigger occurs when the signal deviates from the range of high and low trigger levels.
OFF	-	-	Based on manual and external triggers

Manual and external triggers are always available.

Note: In the above table, CH1 to CH8 are applied to RT3108N and RT3208N 8-channel recorder respectively.
Manual and external triggers are always effective.

On pretrigger

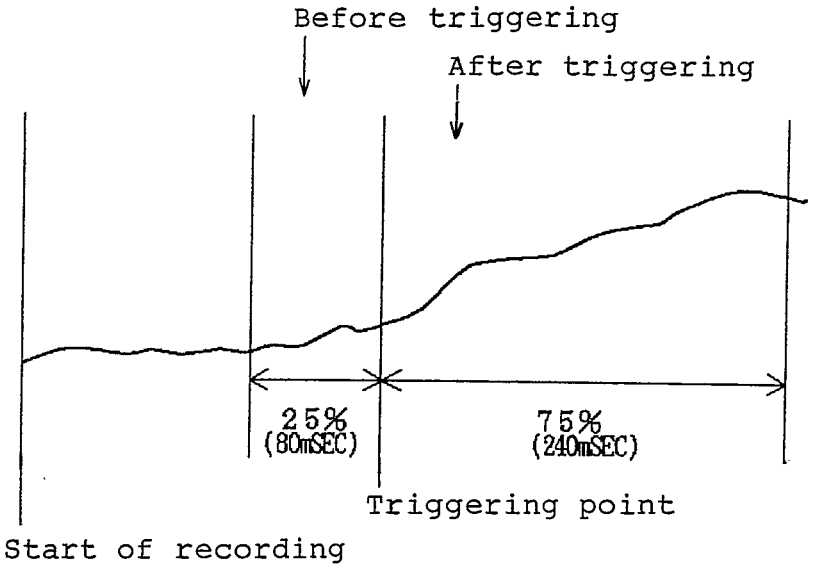
Pretriggers are set in percentage of memory capacity of before triggering with reference to a triggering point.

Example:

Memory recording is carried out at 10 μsec sampling and 32 KW/channel

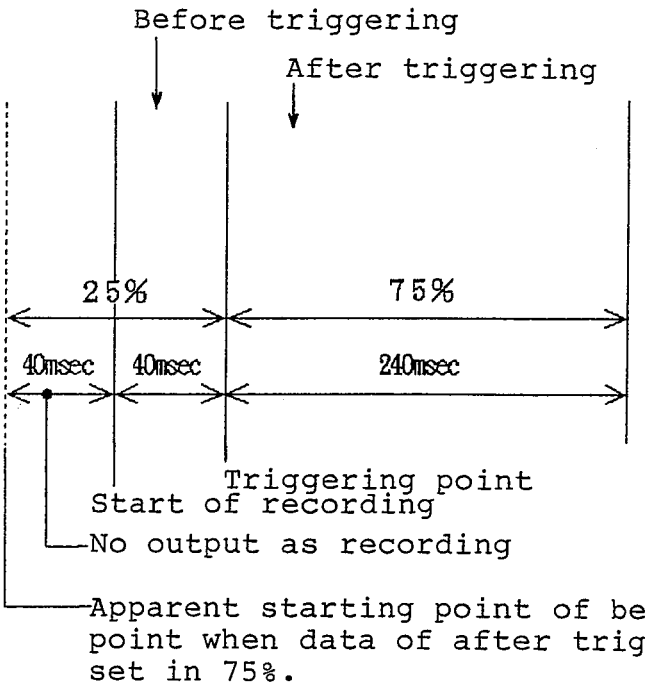
10 μsec x 32k = 320 msec

320 msec data can be taken into memory.



Data is written into the memory with PRE TRIGGER set in 25%, when recording is started. When a trigger is detected, data of 25% (80 msec) before the triggering point and data of 75% (240 msec) after the triggering point are taken into the memory and outputted as recordings.

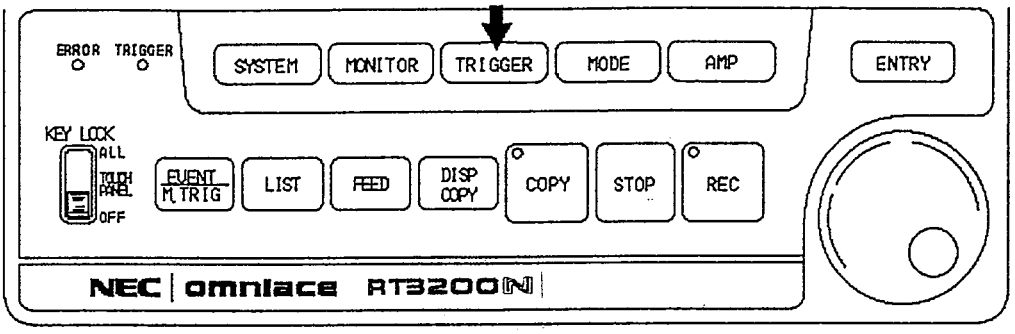
If a trigger is detected immediately after start of recording, data of 80 msec before the triggering point may not be written into the memory. For instance, the figure below shows an example where all data written into the memory is only for 40 msec before the triggering point.



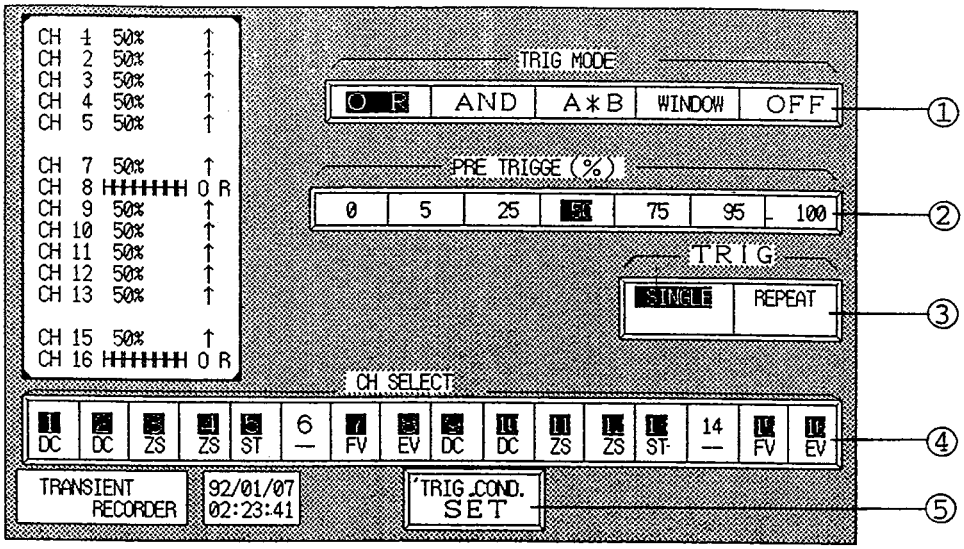
Should this occur, this instrument is capable of avoiding waste of recording paper where part of data of before start of recording is not made to be outputted as recording.
As a result, the ratio of 25% to 75% is not made with regard to outputted recordings of before and after the triggering point.

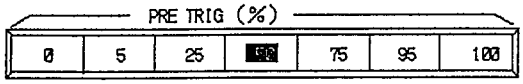
8.2 Setting-up of Trigger

Press the TRIGGER key on the operation panel.

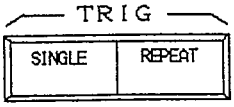


Press the TRIGGER key to cause a following trigger screen display to appear.

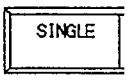
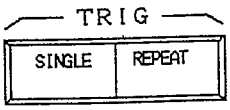
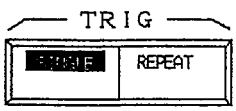


On the screen display shown above, when the recorder type is REAL-TIME RECORDER,  is not displayed.

Setting procedures of number of measurement times:

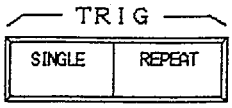


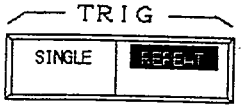
; Used to set number of times of triggering operation.

Press  of  and it is displayed as  ,

and triggering operation is made only once.

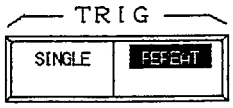
Press 

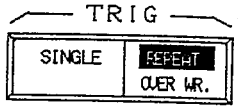
of 

and it is displayed as 

and triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).

Press 

of 

again and it is displayed as 

,

and triggering operation is repeated. If it is pressed again, it is displayed as 

.

*Difference between REPEAT and OVERWRITE

This section describes the difference between REPEAT and OVERWRITE, which is provided separately with AUTO COPY in ON and with AUTO COPY in OFF.

Example:

When the memory is divided into 4 segments on a MODE screen display; (With AUTO COPY in ON)

The same operation is provided with TRIG set in REPEAT or OVERWRITE.

Memory blocks

1	2	3	4
No.1	No.2	No.3	No.4

↑ ↑ ↑ ↑

No.5 No.6 No.7 No.8 ← Order of memory blocks into which data is taken

↑ ↑

No.9 No.10 ......

Triggering operation is repeated.

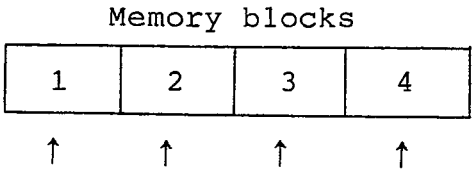
As shown in the figure above, the 5th data is taken into the memory block 1, after the 1st data has been copied.

(Until copy recording of the previous data has been completed, data is not taken into the memory, even when a trigger is received. When copy recording is completed and that a next trigger is received, data is taken into that memory block.)

The 6th data is taken into the memory block 2, after copy recording of the 2nd data has been completed.
In the same manner, after previous data taken into a memory block has been copied, the latest data is taken into that memory block one after another.
Triggering operation is repeated until measurement is terminated by pressing the STOP key on the operation panel.

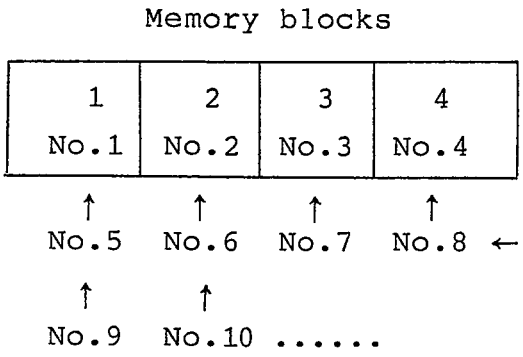
(With AUTO COPY in OFF)

° In case of REPEAT:



After triggering operation has been repeated 4 times, measurement is automatically terminated.

° In case of OVERWRITE:



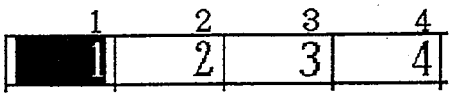
Triggering operation is repeated in the same manner as that with AUTO COPY in ON.
As shown in the figure above, the 5th data is written over the 1st data and taken into the memory block 1.
In the same manner, data is written over previous data taken into a memory block one after another. The latest data is, thus, stored into a memory block.

Triggering operation is repeated until measurement is terminated by pressing the [STOP] key on the operation panel.

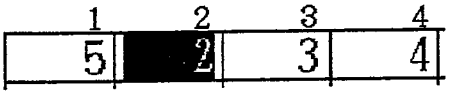
Note:

The condition of memory blocks, where data is taken into No.1 to No.4 mentioned above, is displayed on a MODE screen display, as shown below:

(The data number of block 1 is reversely displayed.)



When the [STOP] key is pressed at this time, a following display is provided and No.1 data of block 1 is cleared.



In this manner, in OVERWRITE, the latest data is taken into a reversely displayed block at the time the [STOP] key is pressed.

For the detailed description on AUTO COPY, refer to 6.9 Auto Copy ON/OFF Function.

Set up each trigger mode on the trigger screen display shown on page 8-5. The setting procedures are provided on the following pages.

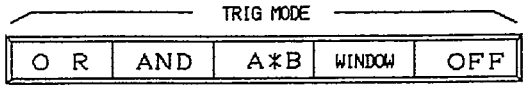
Caution:

Even when the input to each input unit is set to OFF on an AMP screen display, if it is set to a trigger source channel, there may be a possibility of triggering according to a condition.
When a trigger source channel is to be selected in setting-up of each trigger mode, a channel, which is not used as a trigger source, must be excluded from the setting-up.

8.2.1 Setting-up of OR Trigger

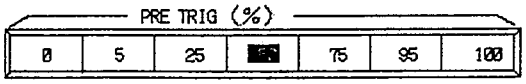
On the trigger screen display, proceed as follows:

① Setting-up of trigger mode:



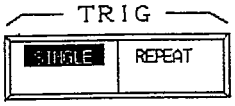
Press [O R].

② Setting-up of pretrigger:

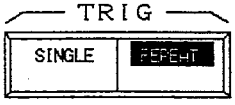


Press any pretrigger key that needs to be set.
For the description on pretriggers, refer to 8.1 Operating Description on Trigger Mode.

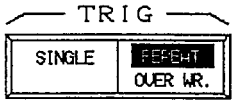
③ Setting-up of number of measurement times (TRIG):



; Triggering operation is made only once.



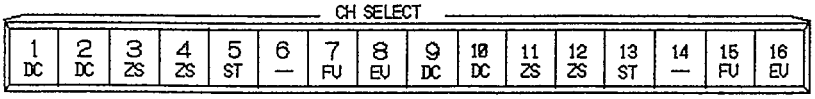
; Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).



; Triggering operation is repeated.

For the detailed setting procedures on the number of measurement times, refer to pages 8-5 and 8-6.

④ Channel selection:



A channel, which is to be set to a triggering source, can be selected. Press any channel key, which is to be set to a triggering source. The selected channel is reversely displayed as 1.

Press the key again to return the reverse display to the original state and the selected channel can be excluded from the triggering source.
Any desired channel can be selected from channels 1 to 16.(RT3216N) (All channels can be selected at the same time.)

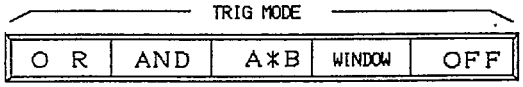
⑤ Setting-up of triggering condition:

Press [TRIG COND. SET] and the current display is changed to a TRIG. COND. SET (triggering condition setting) screen display.
If the channel of a triggering source is an event amplifier unit, the condition setting is different from that of the channels of other types of input units. For details, refer to 8.4 In Case of Event Amplifier Unit.
When other types of input units are used, refer to 8.3 In Case of DC Amplifier Unit, DC Bridge Strain Amplifier Unit, F/V Converter Unit, and Zero Suppression Amplifier Unit.

8.2.2 Setting-up of AND Trigger

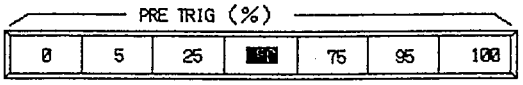
On the trigger screen display, proceed as follows:

① Setting-up of trigger mode:



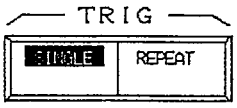
Press [AND].

② Setting-up of pretrigger:

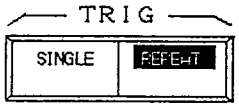


Press any pretrigger key that needs to be set.
For the description on pretriggers, refer to 8.1 Operating Description on Trigger Mode.

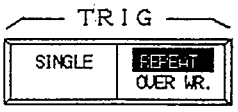
③ Setting-up of number of measurement times (TRIG):



; Triggering operation is made only once.



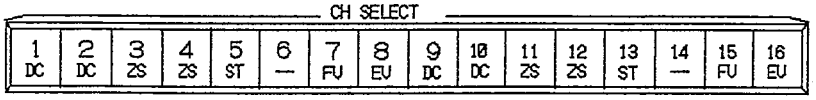
; Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).



; Triggering operation is repeated.

For the detailed setting procedures on the number of measurement times, refer to pages 8-5 and 8-6.

④ Channel selection:



A channel, which is to be set to a triggering source, can be selected. Press any channel key, which is to be set to a triggering source. The selected channel is reversely displayed as 1.
Press the key again to return the reverse display to the original state and the selected channel can be excluded from the triggering source.
Any desired channel can be selected from channels 1 to 16.
(All channels can be selected at the same time.)
Note: Any channel selection of CH1 to CH8 is available for RT3108N and RT3208N.

⑤ Setting-up of triggering condition:

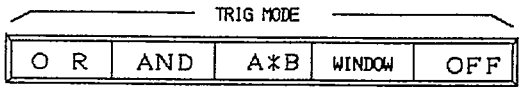
Press 

and the current display is changed to a TRIG. COND. SET (triggering condition setting) screen display.
If the channel of a triggering source is an event amplifier unit, the condition setting is different from that of the channels of other types of input units. For details, refer to 8.4 In Case of Event Amplifier Unit. When other types of input units are used, refer to 8.3 In Case of DC Amplifier Unit, DC Bridge Strain Amplifier Unit, F/V Converter Unit, and Zero Suppression Amplifier Unit.

8.2.3 Setting-up of A*B Trigger

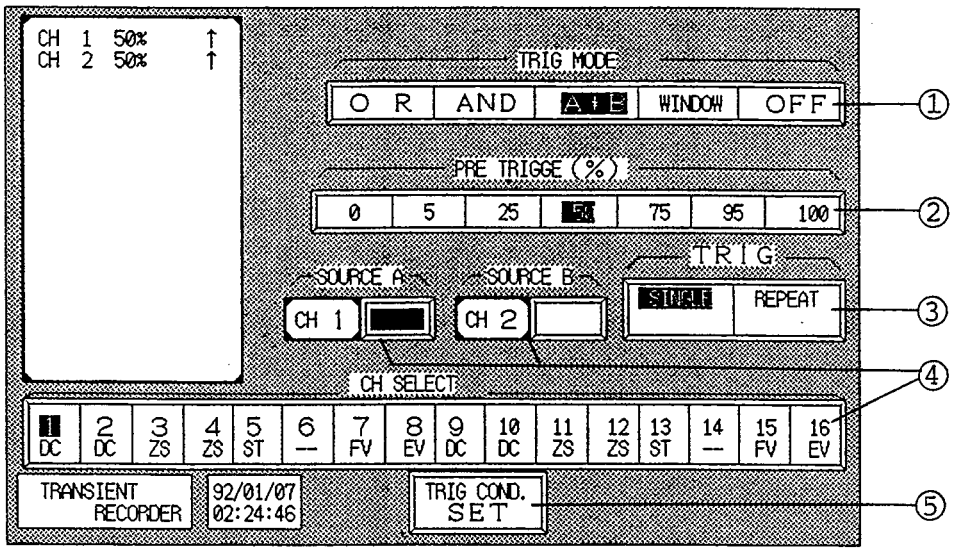
On the trigger screen display, proceed as follows:

① Setting-up of trigger mode:



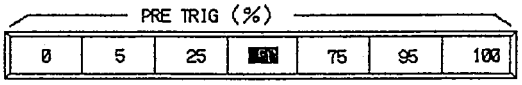
Press [A*B].

When [A*B] is pressed, a following screen display appears.



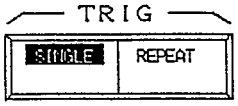
On the above screen display, proceed as follows:

② Setting-up of pretrigger:



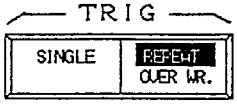
Press any pretrigger key that needs to be set.
For the description on pretriggers, refer to 8.1 Operating Description on Trigger Mode.

③ Setting-up of number of measurement times (TRIG):



; Triggering operation is made only once.

; Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).



; Triggering operation is repeated.

For the detailed setting procedures on the number of measurement times, refer to pages 8-5 and 8-6.

④ Setting-up of source A and source B:

In 

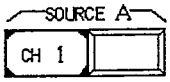
, the one indicated with ■ is made effective for setting.

Any 2 channels of from channel 1 to channel 8 or any 2 channels of from channel 9 to channel 16 can be set to source A and source B.

Note:

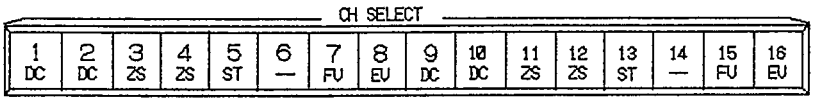
Selection of any 1 channel of from channel 1 to channel 8 or selection of any 1 channel of from channel 9 to channel 16 cannot be made.

° Setting-up of source A:

Press □ of 

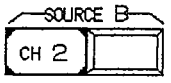
and it is displayed as ■ to allow source A to make effective for setting.

Select any 1 channel from CH SELECT and set it to source A.



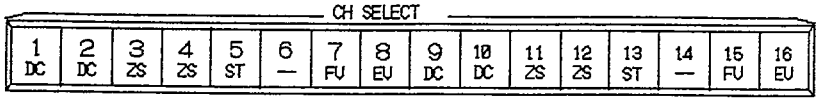
(Press any desired channel key to allow it to be reversely displayed as ■.)

° Setting-up of source B:

Press □ of 

and it is displayed as ■ to allow source B to make effective for setting.

Select any 1 channel from CH SELECT and set it to source B



(Press any desired channel key to allow it to be reversely displayed as **1**.)

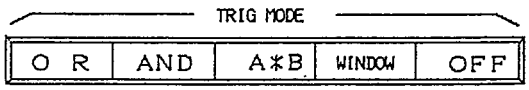
⑤ Setting-up of triggering condition:

Press [TRIG COND. SET] and the current display is changed to a TRIG. COND. SET (triggering condition setting) screen display.
If the channel of a triggering source is an event amplifier unit, the condition setting is different from that of the channels of other types of input units. For details, refer to 8.4 In Case of Event Amplifier Unit. When other types of input units are used, refer to 8.3 In Case of DC Amplifier Unit, DC Bridge Strain Amplifier Unit, F/V Converter Unit, and Zero Suppression Amplifier Unit.

8.2.4 Setting-up of WINDOW Trigger

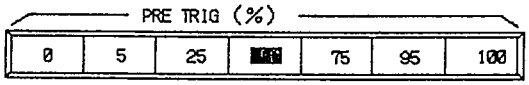
On the trigger screen display, proceed as follows:

① Setting-up of trigger mode:



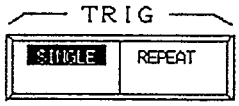
Press [WINDOW].

② Setting-up of pretrigger:

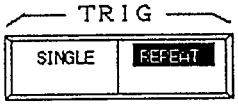


Press any pretrigger key that needs to be set.
For the description on pretriggers, refer to 8.1 Operating Description on Trigger Mode.

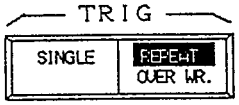
③ Setting-up of number of measurement times (TRIG):



; Triggering operation is made only once.



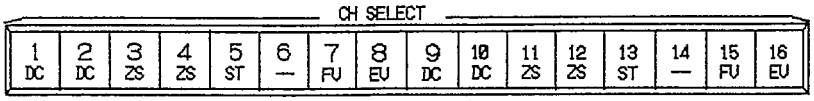
; Triggering operation is made by the number of times determined by the number of memory blocks (with AUTO COPY set in OFF).



; Triggering operation is repeated.

For the detailed setting procedures on the number of measurement times, refer to pages 8-5 and 8-6.

④ Channel selection:



A channel, which is to be set to a triggering source, can be selected. Press any channel key, which is to be set to a triggering source. The selected channel is reversely displayed as **1**.

Note:

An event amplifier unit, however, cannot be selected.

Any 1 channel of from channel 1 to channel 16 can be selected.(RT3216N)

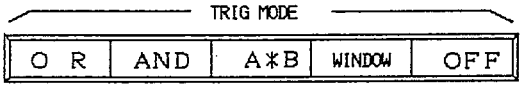
⑤ Setting-up of triggering condition:

Press [TRIG COND. SET] and the current display is changed to a TRIG. COND. SET (triggering condition setting) screen display.

Refer to 8.3 In Case of DC Amplifier Unit, DC Bridge Strain Amplifier Unit, F/V Converter Unit, and Zero Suppression Amplifier Unit.

8.2.5 Setting-up of Trigger OFF

This is used when triggering is to be made externally.
On the trigger screen display, proceed as follows:



Press [OFF].

When the trigger mode is set to OFF, triggering can be made only by an external trigger or a manual trigger (this is produced when the [EVENT M.TRIG] key on the operation panel is pressed.).

8.3 In Case of DC Amplifier Unit, DC Bridge Strain Amplifier Unit, F/V converter Unit, Zero Suppression Amplifier Unit and Thermocouple Amplifier Unit

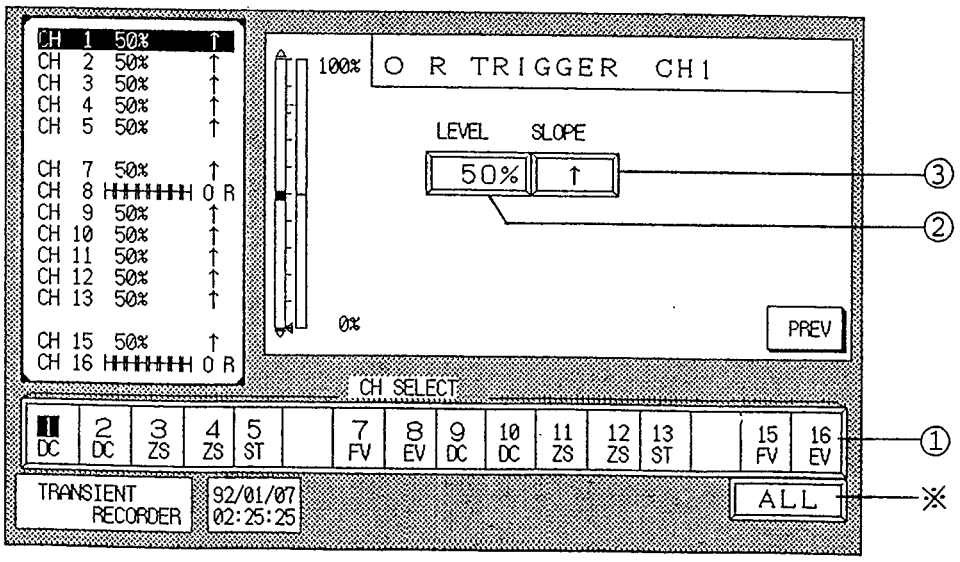
When DC amplifier, DC bridge strain amplifier, F/V converter and/or zero suppression amplifier units are selected to trigger sources, setting-up of trigger level and slope is required.
The trigger level can be set for the record full scale in 1% steps by means of SLOPE ↑ and SLOPE ↓.

8.3.1 Setting-up of Level and Slope

After a trigger mode has been set on the trigger screen display (For the setting procedures, refer to 8.2.), set up the level and slope, as indicated in the following:

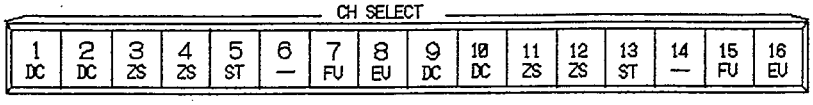
° When the trigger mode is set in OR, AND or A*B, proceed as follows:

Press TRIG COND. SET on the trigger screen display and a following trigger condition setting screen display appears.



On the above screen display, proceed as follows:

① Channel selection:
Select a channel from CH SELECT, where a triggering condition is to be set.



Note:

Only the source channel, which has been selected in 8.2 Setting-up of Trigger, is displayed.

Press the channel to be set to allow it to be reversely displayed as **1**, and the trigger setting screen display is also changed.

② Setting-up of level:

Sets the trigger level.

Press LEVEL [50%] of [50%] SLOPE [↑] to allow it to be displayed as LEVEL [50%], and it is made effective for setting.

Set up the level with the jog dial and press LEVEL [50%] again to complete the setting.

③ Setting-up of slope:

Sets the slope.

Press SLOPE [↑] of [50%] SLOPE [↑] and the indication is changed as ↑ and ↓.

When any one channel has been set, select another channel for setting.

When the above setting has been completed, a trigger occurs at the time shown below:

When the slope is in SLOPE [↑], the input signal is above the set level value and a trigger occurs when the condition of a trigger mode (OR, AND, A✻B) has been satisfied.

When the slope is in SLOPE [↓], the input signal is below the set level value and a trigger occurs when the condition of a trigger mode (OR, AND, A✻B) has been satisfied.

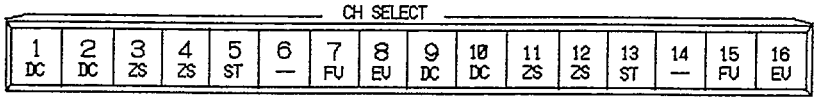
※ Setting channels all together (Effective only when the trigger mode is in OR or AND):

Press [ALL] and it is reversely displayed as [ALL], and the the setting is made effective.

Select channels to be set all together from CH SELECT.

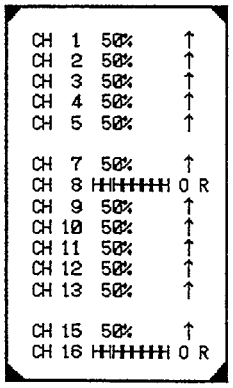
Note:

An event amplifier unit, however, cannot be selected.



Set the level and slope, and press [ALL] again to set the selected channels (which are reversely displayed) all together

: This shows the position of a trigger level.

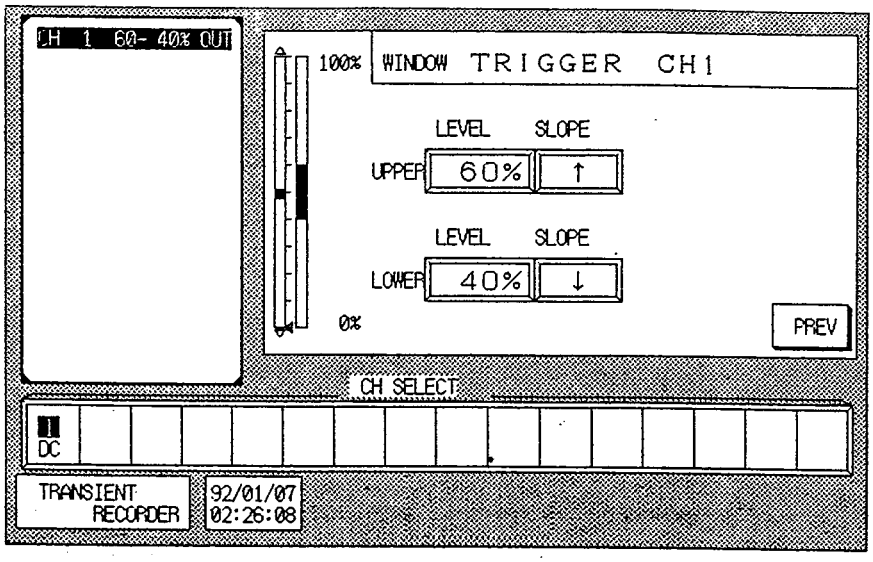


: This shows setup conditions of trigger levels and slopes.
(However, only the channels, which are set to trigger sources, are displayed.

Press [PREV] and the current display is changed to the trigger screen display.

° When the trigger mode is set in WINDOW, proceed as follows:

Press [TRIG COND. SET] on the trigger screen display and a following screen display appears.



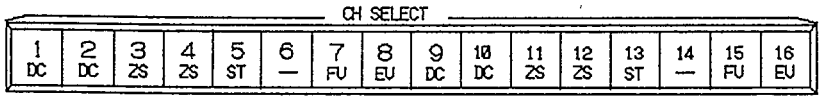
On the above screen display, proceed as follows:

① Channel selection:

Select any one channel from CH SELECT, where a triggering condition is to be set.

Note:

An event amplifier unit, however, cannot be selected.



Note:

Only the source channel, which has been selected in 8.2 Setting-up of Trigger, is displayed.

Press the channel key to be set to allow it to be reversely displayed as 1, and the trigger setting screen display is also changed.

② Setting-up of level:

Sets upper and lower trigger levels.

First, set up the upper level.

Press [LEVEL 60%] to allow it to be displayed as [LEVEL ▮▮%], and it is made effective for setting. Then, set up the level with the jog dial.

Set up the lower level in the same way.

Note:

The upper level range, which can be set, is from 4 to 100%, while the lower level range, which can be set, is from 0 to 96%.

③ Setting-up of slope:

Sets the slope.

Press [SLOPE ↑] of [LEVEL 60% SLOPE ↑] and the indication is changed as ↑ and ↓

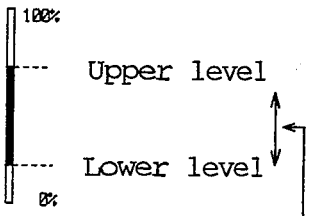
Note:

If the slope is set to the up arrow "↑" in setting-up of an upper level, the slope of a lower level is automatically set to the down arrow "↓".

On the contrary, if the slope of an upper level is set to ↓, the slope of a lower level is automatically set to ↑.

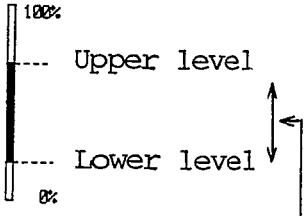
When the above settings have been completed, a trigger occurs under the following conditions:

In [SLOPE UPPER ↑] [SLOPE LOWER ↓], a trigger occurs, if the input signal deviates from this range.

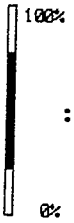


(At this time, "OUT" is displayed at the left-side part, on which trigger setting conditions are displayed, on the screen display.)

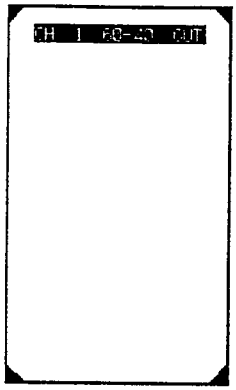
In [SLOPE UPPER ↓] [SLOPE LOWER ↑], a trigger occurs, if the input signal comes into this range.



(At this time, "IN" is displayed at the left-side part, on which trigger setting conditions are displayed, on the screen display.)



: Displays the range of a trigger level.



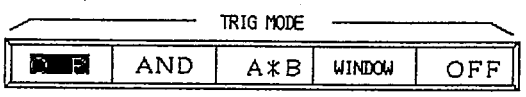
: Displays a trigger level setting condition.
(However, only one channel, which has been set to a trigger source, is displayed.)

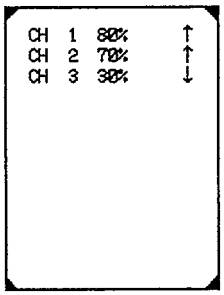
Press [PREV] and the current display is returned to the trigger screen display.

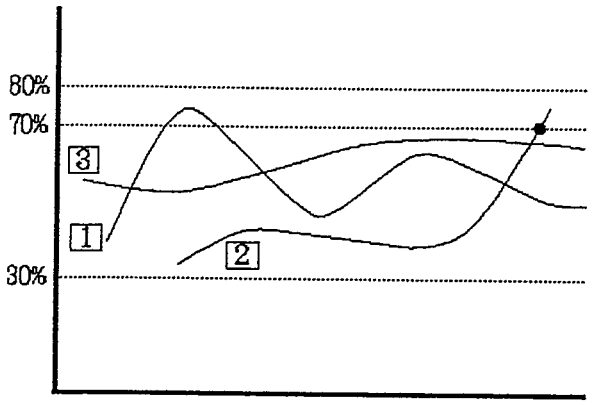
8.3.2 Setup Examples

Mark "●": Point of trigger occurrence.

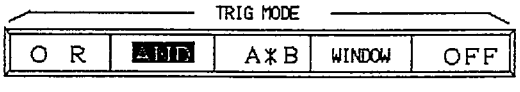
° When the trigger mode is set in OR, a trigger occurs, if any condition of any channel is satisfied.

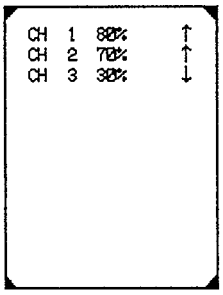


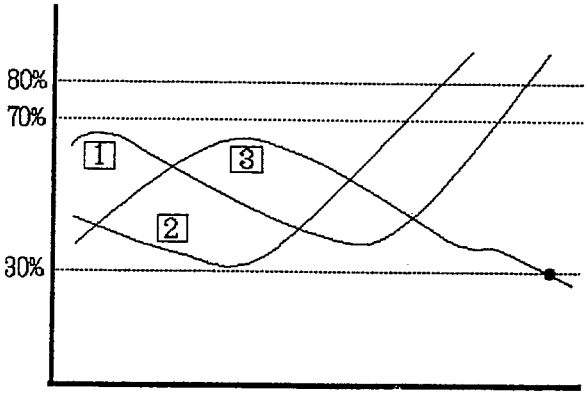




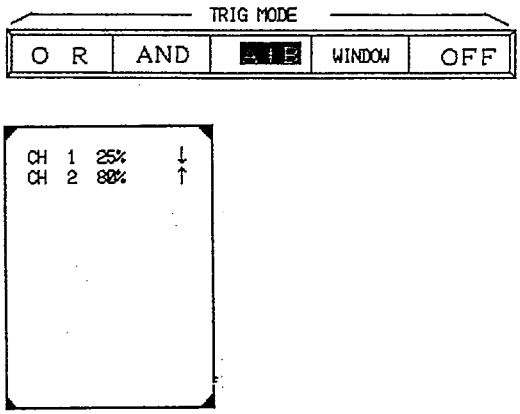
° When the trigger mode is set in AND, a trigger occurs, if all conditions of any channel are satisfied.

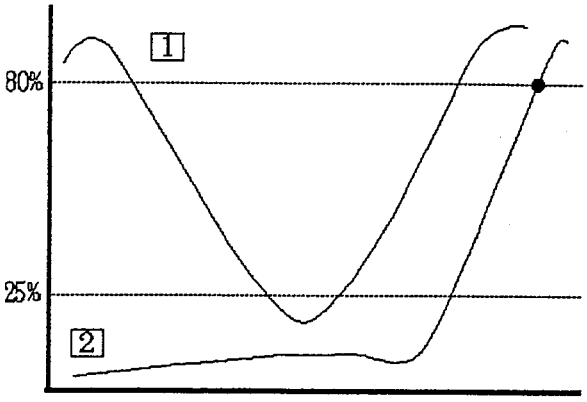




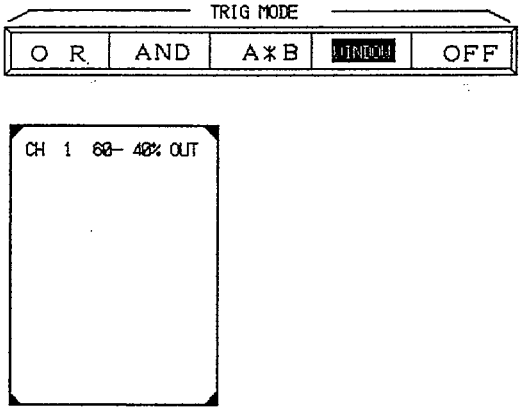


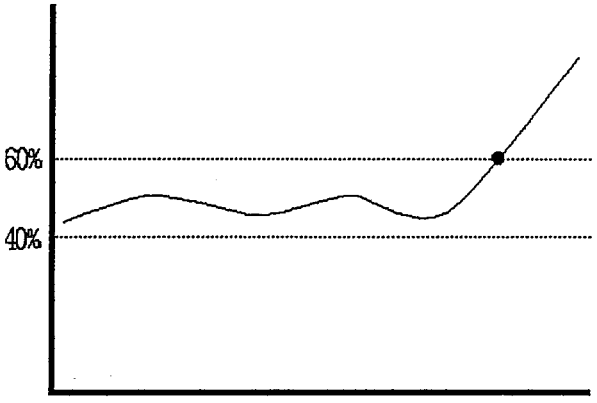
° When the trigger mode is set in A*B, a trigger occurs, when the condition of a source B channel is satisfied, after the condition of a source A channel has been satisfied.

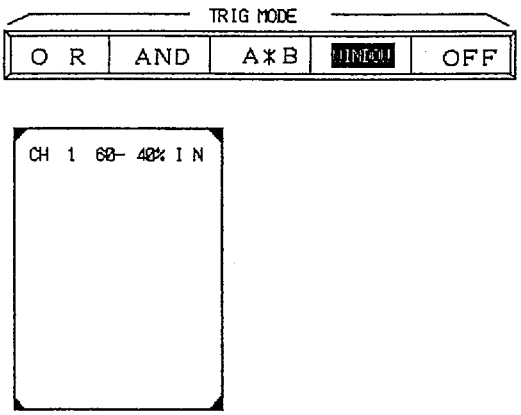


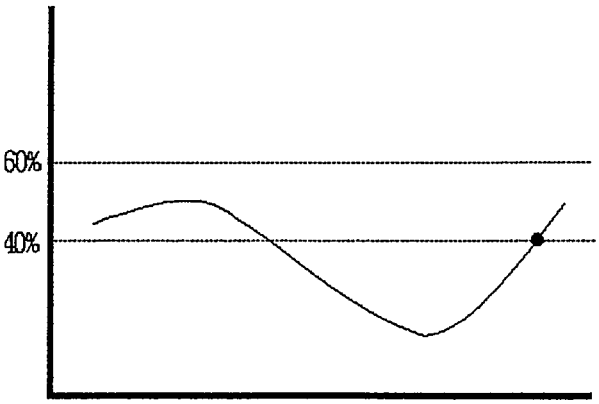


° When the trigger mode is set in WINDOW, a trigger occurs, when the signal deviates from the range of upper and lower trigger levels.









8.4 In Case of Event Amplifier Unit

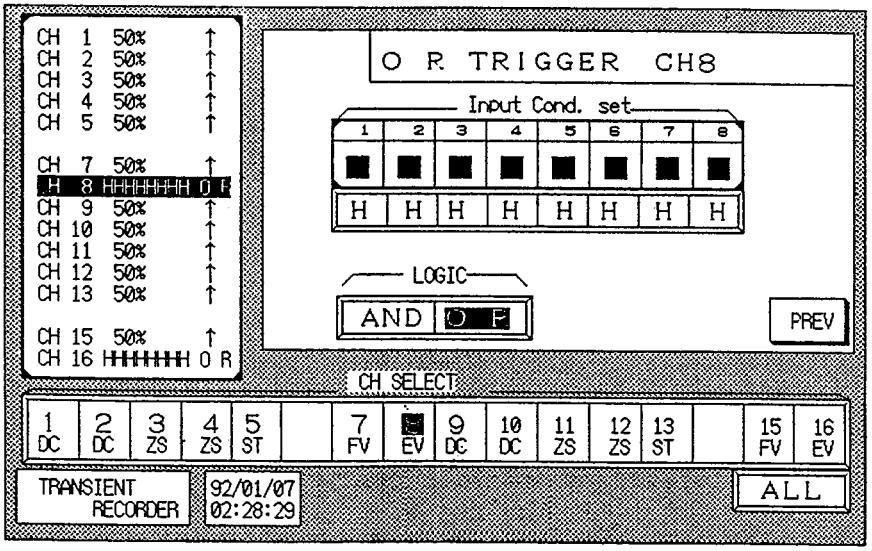
When the event amplifier unit is selected to a trigger source, only the trigger mode WINDOW is disabled.

8.4.1 Triggering Operation

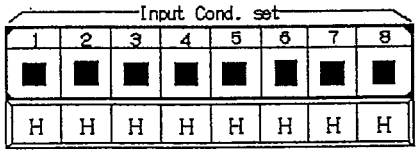
After a trigger mode has been set on the trigger screen display (refer to 8.2 for the setting procedures.), select an event amplifier unit to a trigger source.

Press 

on the trigger screen display to cause a following screen display to appear.



On the above screen display, proceed as follows:

① 

:

Set the input conditions of from channel 1 to channel 8 of the event amplifier unit to any of H, L or X (OFF).

The table below shows the trigger occurrence operation in setting-up of input conditions.

Setting of input conditions	Voltage input (DIGITAL)	Contact input (CONTACT)
Satisfaction of H condition	Greater than approx. +2.5 V	Contacts: Closed
Satisfaction of L condition	Less than approx. +0.5 V	Contacts: Opened

② A trigger occurs by OR and AND for the input conditions set to channels 1 to 8.

OR : A trigger occurs, when any input condition of from channel 1 to channel 8 is satisfied.

AND: A trigger occurs, when all input conditions of from channel 1 to channel 8 are satisfied.

Note:

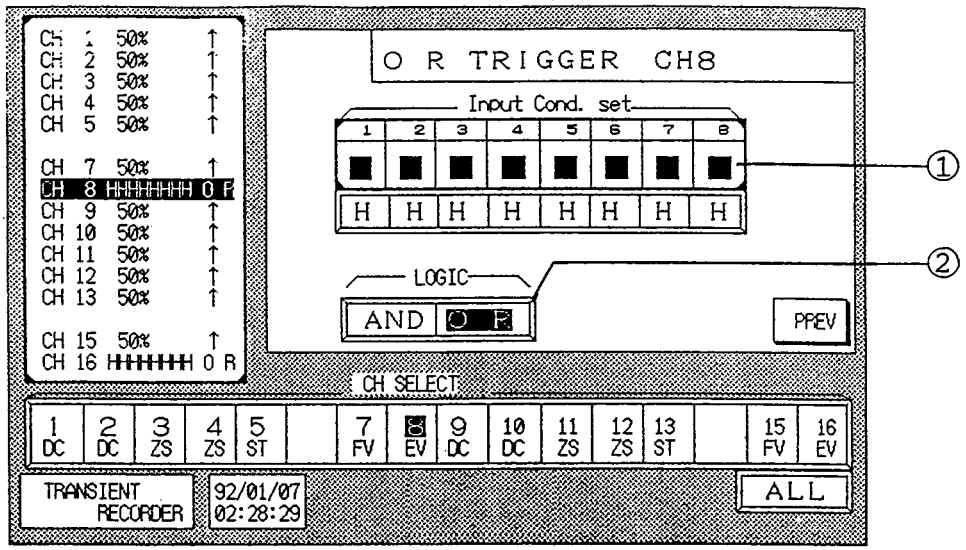
When a channel of the event amplifier unit is set to X, the channel is excluded from the OR and AND triggering conditions.

③ If the triggering condition of an event amplifier unit has been satisfied before starting sampling (before pressing the REC key on the operation panel), press the REC key and a trigger occurs at once.

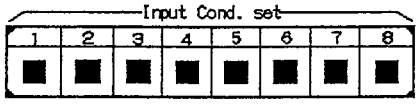
8.4.2 Setting-up of Input Condition

After a trigger mode has been set on the trigger screen display (refer to 8.2 for the setting procedures.), select an event amplifier unit as a trigger source channel.

Press TRIG COND. SET on the trigger screen display to cause a following screen display to appear.

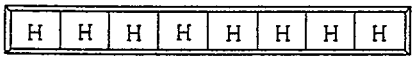


On the above screen display, proceed as follows:

① 

:

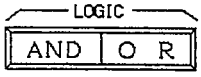
Sets the trigger states of from channel 1 and channel 8 of the event amplifier unit. This indicates the input signal conditions.

Press 

to set up the trigger states of from channel 1 to channel 8.

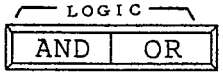
When each channel key is pressed, the indication is changed as [H] → [L] → [X] → [H] → [L] → .....

(If any channel is set to X, the channel is excluded from setup triggering conditions.)

② 

:

Sets whether Input Cond. set of channel 1 to channel 8 is set to a triggering condition by AND or a triggering condition by OR.

Press 

to select AND or OR.

(The selected logic is reversely displayed.)

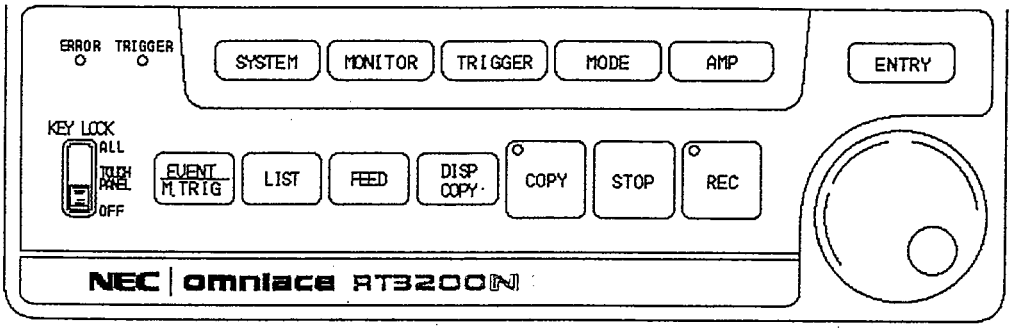
Press 

and the current display is returned to the trigger screen display.

SECTION 9

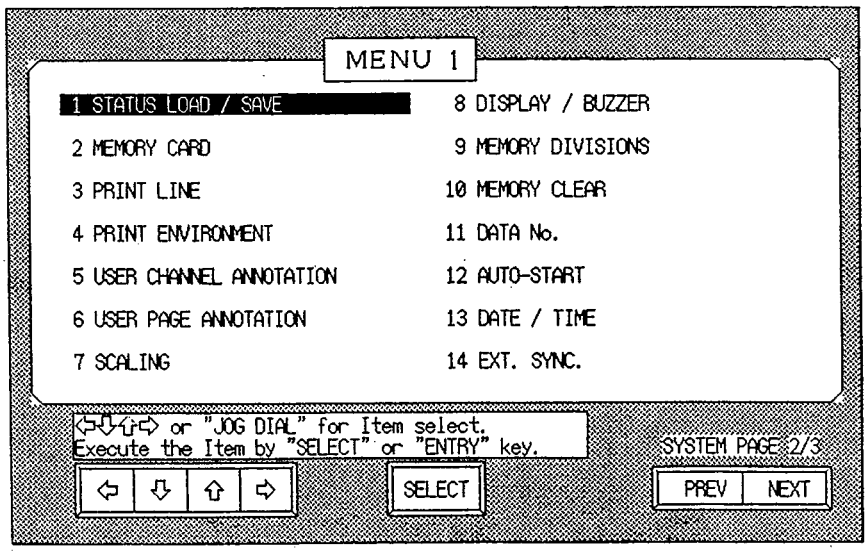
OTHER FUNCTIONS

The functions of from 9.1 to 9.15 can be set by the operations shown below:



1) Press the SYSTEM key on the operation panel to cause a SYSTEM screen display to appear.

Press PREV | NEXT to cause a MENU 1 screen display (SYSTEM PAGE 2/3) or a MENU 2 screen display (SYSTEM PAGE 3/3) to appear.



2) Move the reverse display to any item, which needs to be set, with ⇦ ⇩ ⇧ ⇨ on the screen display or with the jog dial.

3) Press [SELECT] on the screen display or press the [ENTRY] key on the operation panel to cause a setup screen display to appear.

4) The setup screen display can be returned to the SYSTEM PAGE 2/3 or SYSTEM PAGE 3/3 screen display by pressing [QUIT] or [END] on the screen display.

9.1 Saving and Loading Setup Contents

The setup contents of input units and the basic instrument can be saved into the memory of the basic instrument.
(Battery backup is provided for approximately one month with the built-in battery fully charged.)
A maximum of 4 setups can be saved.
Writing and loading can be made.
In addition, the saved contents and the setup contents of the basic instrument can be checked.

(1) Loading:
The setup contents saved in the memory of the basic instrument can be loaded.

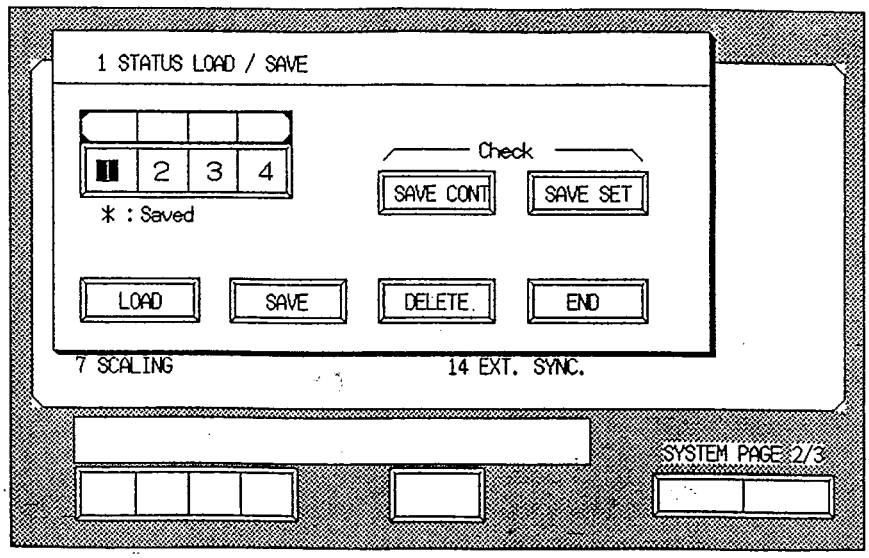
(2) Saving:
The setup conditions of the basic instrument can be saved into the memory of the basic instrument.

(3) Deleting:
The setup contents saved in the basic instrument can be deleted.

(4) Checking:
The contents and setup conditions saved in the basic instrument can be checked.

Setting procedures:
Select 1 STATUS LOAD/SAVE on the MENU 1 (SYSTEM PAGE 2/3) screen display.
(Refer to page 9-1.)

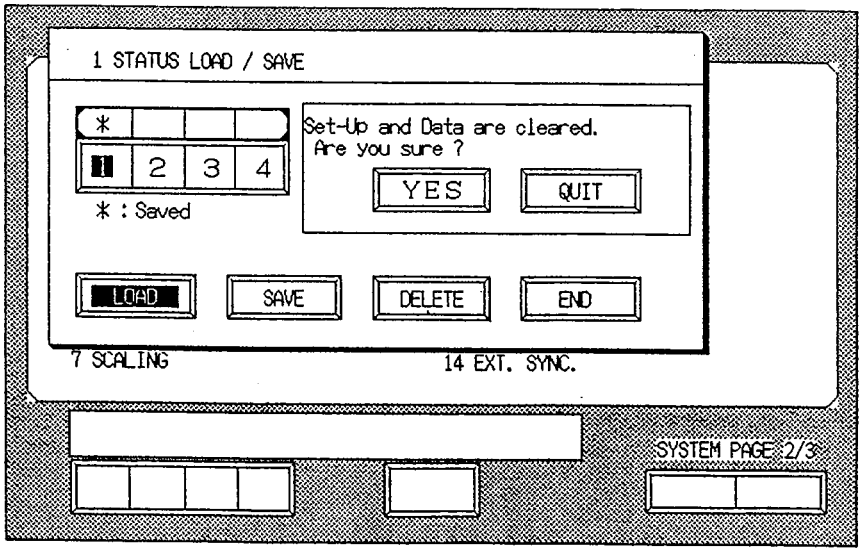
Press [SELECT] or press the [ENTRY] key on the operation panel to cause a following screen display to appear.



Press any key of [LOAD], [SAVE], [DELETE], and [SAVE CONT] [SAVE SET] in accordance with the contents to be executed.
The conditions (saved) of block 1 to block 4 can be displayed at the upper left on the screen display.
Select any block number of from 1 to 4 according to setup contents.

Press [END] and the current display is returned to the MENU 1 (SYSTEM PAGE 2/3) screen display.

(1) Loading

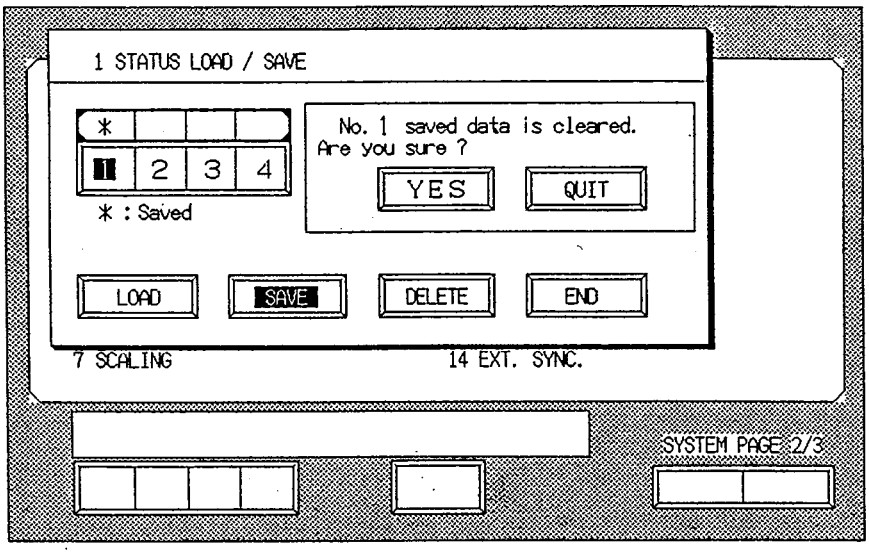


Select the number indicated with *, where data has been saved, and press [YES].

The setup conditions of the basic instrument are changed with the setup contents.

Press [QUIT] and the current display is returned to the MENU 1 (SYSTEM PAGE 2/3) screen display.

(2) Saving

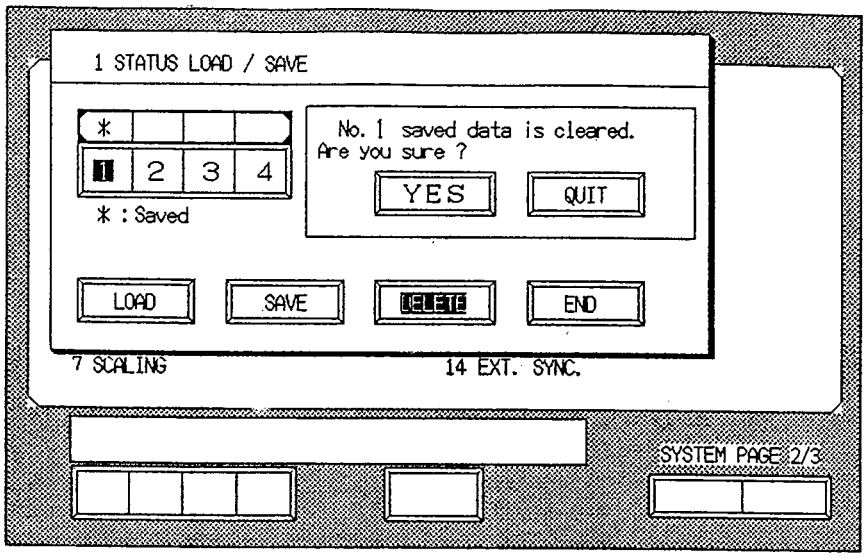


Select a block number from 1 to 4, where data is to be saved. (In the figure shown above, select a block number from 2 to 4, as data has been already saved in No.1.)

Press [YES] and the current setup conditions of the basic instrument are saved into the set number.
Data can be written over the data which has been already saved into a block.

Press [QUIT] and the current display is returned to the MENU 1 (SYSTEM PAGE 2/3) screen display.

(3) Deleting



Of the blocks indicated with *, where data has been saved, press any number key that needs to be deleted and press [YES] to delete the saved contents.

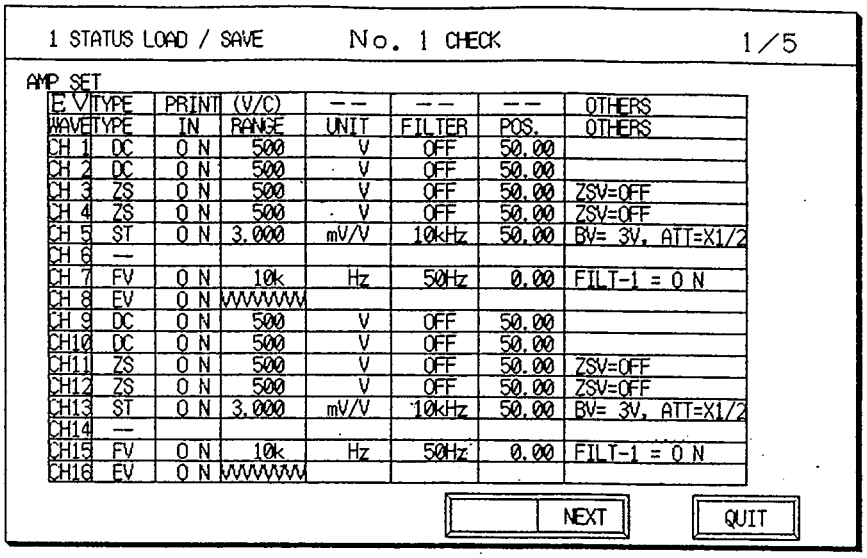
Press [QUIT] and the current display is returned to the MENU 1 (SYSTEM PAGE 2/3) screen display.

(4) Checking

The saved contents and the current setup conditions of the basic instrument can be checked.

° Checkout of saved contents:

Press [SAVE CONT]. Then, of the blocks where data has been saved, press any block number key that needs to be checked.
As shown in the figure on the following page, setup conditions can be checked as a list.



E.V/TYPE		PRINT	(V/C)	--	--	--	OTHERS
WAVE/TYPE		IN	RANGE	UNIT	FILTER	POS.	OTHERS
CH 1	DC	ON	500	V	OFF	50.00	
CH 2	DC	ON	500	V	OFF	50.00	
CH 3	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH 4	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH 5	ST	ON	3.000	mV/V	10kHz	50.00	BV= 3V, ATT=X1/2
CH 6	—						
CH 7	FV	ON	10k	Hz	50Hz	0.00	FILT-1 = ON
CH 8	EV	ON	WWWWW				
CH 9	DC	ON	500	V	OFF	50.00	
CH10	DC	ON	500	V	OFF	50.00	
CH11	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH12	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH13	ST	ON	3.000	mV/V	10kHz	50.00	BV= 3V, ATT=X1/2
CH14	—						
CH15	FV	ON	10k	Hz	50Hz	0.00	FILT-1 = ON
CH16	EV	ON	WWWWW				

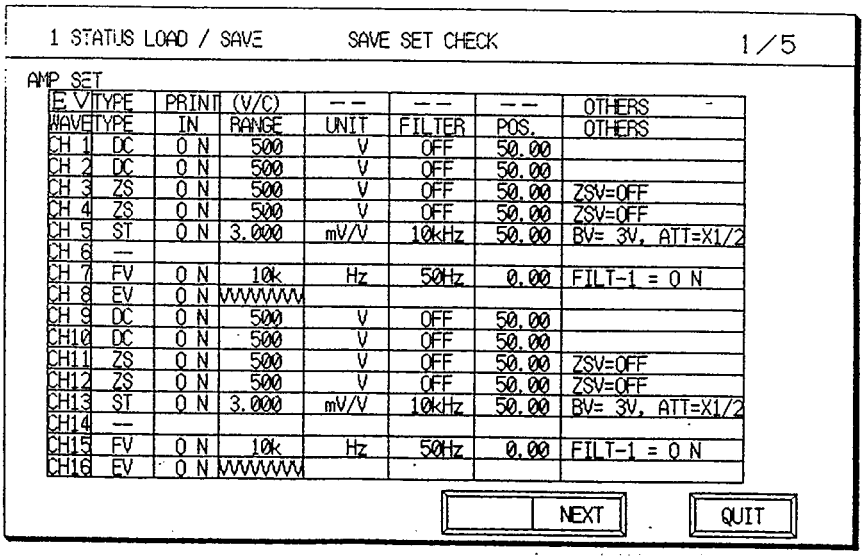
Press NEXT to cause a following screen display to appear.

There are five screen displays in all.

Press QUIT and the current display is returned to the STATUS LOAD/SAVE screen display.

° Checkout of current setup conditions of basic instrument:

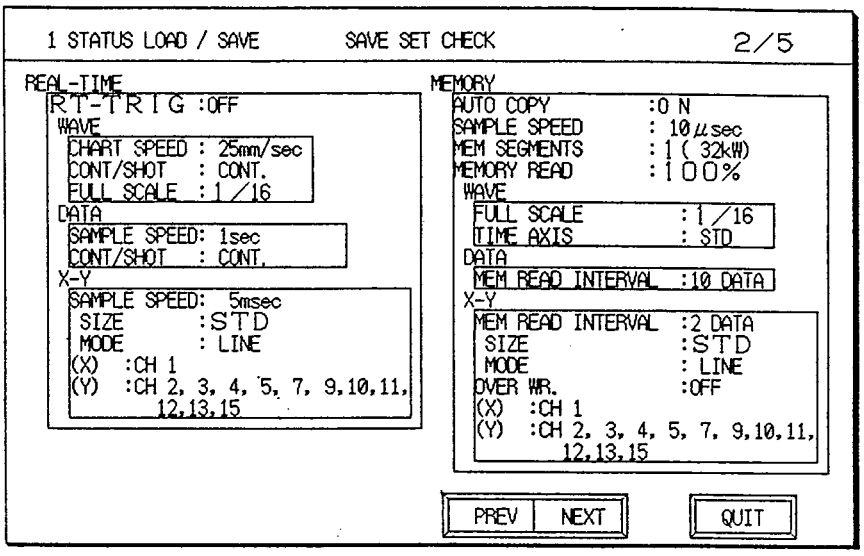
Press SAVE SET and the current setup conditions of the basic instrument can be checked as a list, as shown in the figure below.



E.V/TYPE		PRINT	(V/C)	--	--	--	OTHERS
WAVE/TYPE		IN	RANGE	UNIT	FILTER	POS.	OTHERS
CH 1	DC	ON	500	V	OFF	50.00	
CH 2	DC	ON	500	V	OFF	50.00	
CH 3	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH 4	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH 5	ST	ON	3.000	mV/V	10kHz	50.00	BV= 3V, ATT=X1/2
CH 6	—						
CH 7	FV	ON	10k	Hz	50Hz	0.00	FILT-1 = ON
CH 8	EV	ON	WWWWW				
CH 9	DC	ON	500	V	OFF	50.00	
CH10	DC	ON	500	V	OFF	50.00	
CH11	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH12	ZS	ON	500	V	OFF	50.00	ZSV=OFF
CH13	ST	ON	3.000	mV/V	10kHz	50.00	BV= 3V, ATT=X1/2
CH14	—						
CH15	FV	ON	10k	Hz	50Hz	0.00	FILT-1 = ON
CH16	EV	ON	WWWWW				

° Press [NEXT] to cause a following screen display to appear.

There are five screen displays in all.



Press [QUIT] and the current display is returned to the STATUS LOAD/SAVE screen display.

9.2 Setting-up of Print Line

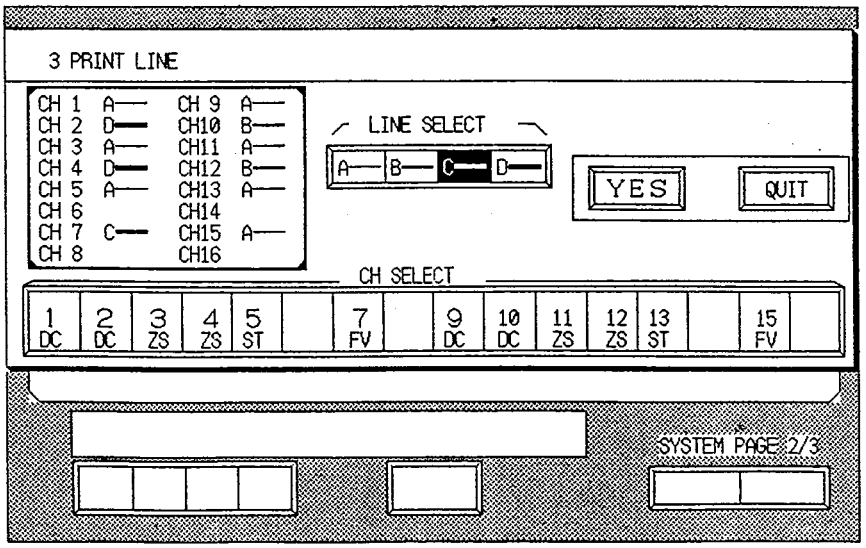
Print lines can be changed in thickness in waveform recording. Although 1-dot printing is usually provided, 2-, 3- or 4-dot printing can be selected.

Note:

The print-line thickness of an event amplifier unit cannot be changed. An event amplifier channel or event amplifier channels are not, therefore, displayed on the setup screen display.

Setting procedures:

Select 3 PRINT LINE on the MENU 1 (SYSTEM PAGE 2/3) screen display. (Refer to page 9-1.)



1) Select any of A, B, C and D of LINE SELECT.

   A: 1 dot C: 3 dots

   B: 2 dots D: 4 dots

2) Press all channel number keys, where print lines need to be changed. The changed contents are displayed at the left side as a list on the screen display.

3) When the setting has been completed, press the [YES] key and the the setup contents can be entered.

4) Press the [QUIT] key and the current display is returned to the MENU 1 screen display with the contents not set up.

(Example)

If channel 2 and channel 4 are set to D (4 dots), channel 7 is set to C (3 dots), and channel 10 and channel 12 are set to B (2 dots), respectively, as shown in the figure on the previous page:

° Press D of LINE SELECT, and then press 2 and 4 of CH SELECT.
° Press C of LINE SELECT, and then press 7 of CH SELECT.
° Press B of LINE SELECT, and then press 10 and 12 of CH SELECT.
° Press [YES].

9.3 Setting-up of Print Environment

(1) Auto scaling

This function is provided to print a scale at the end of recording in accordance with the input sensitivity and base-line position.
This function is enabed only in waveform recording.
ON : Scale printed.
OFF: Scale not printed.

(2) System annotation

This function is provided to print the following setup contents of the basic instrument with the start of recording:

Recording mode
Date
Start time for measurement
Data number
Sampling speed
Chart speed

This function is enabled only in waveform recording and the contents are printed at approximately 30 cm intervals.
ON : System annotation printed.
OFF: System annotation not printed.

(3) Channel annotation

This function is provided to print the following setup contents of input units with the start of recording.

Channel number
Type of input unit
Input ON/OFF
Sensitivity
Filter value
Base-line position
Print ON/OFF

This function is enabled only in waveform recording and the contents are printed at approximately 30 cm intervals.

ON : Channel annotation printed.

OFF: Channel annotation not printed.

(4) Channel mark

Channel numbers are printed in the vicinity of recorded waveforms. This function is enabled only in waveform recording and numbers are printed at approximately 30 cm intervals.

ON : Channel mark printed.

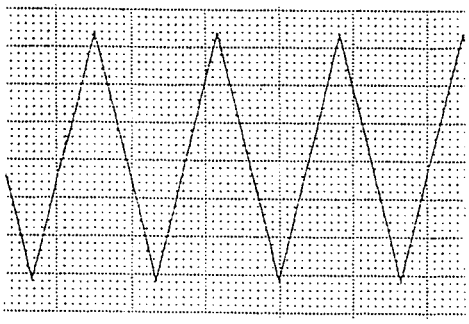
OFF: Channel mark not printed.

(5) Grid selection

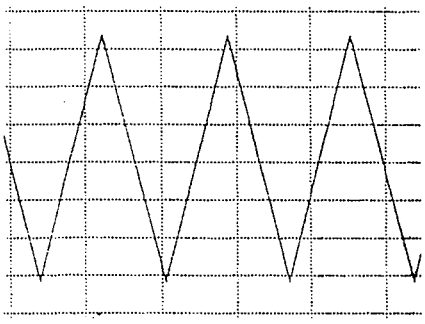
In waveform and X-Y recording, the types of grid can be selected. Grid can be selected from five types: STanDard 10, 10 mm, STanDard 5, 5mm and OFF. The figures on the following page show sample X-Y recordings with STD10, 10mm, STD5, 5mm and no grid.

(Example)

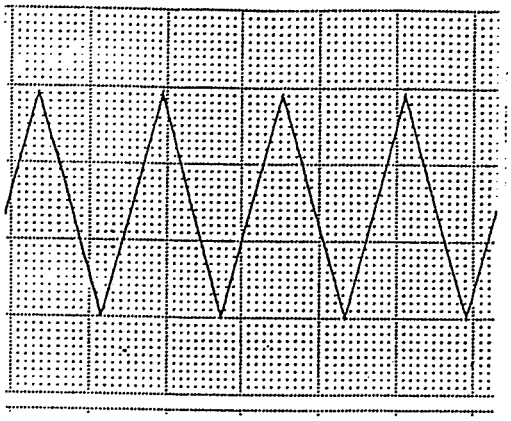
STD5:

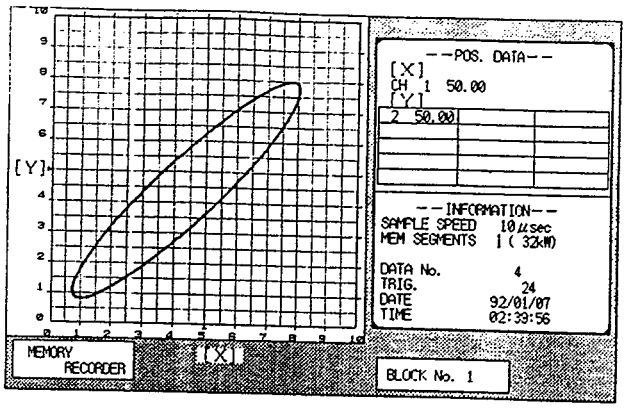


5 mm:

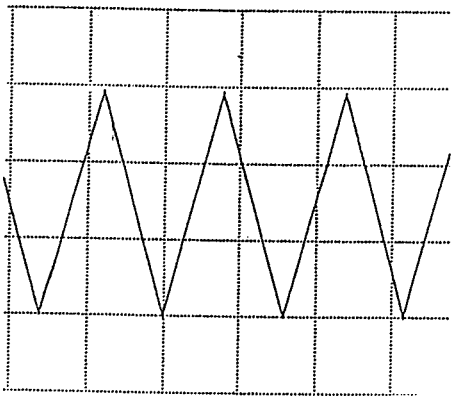


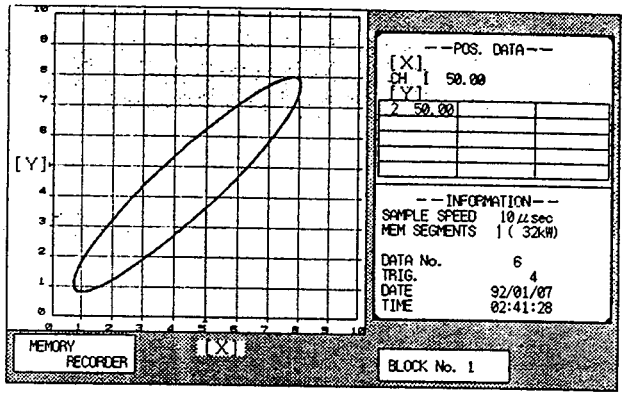
STD10:



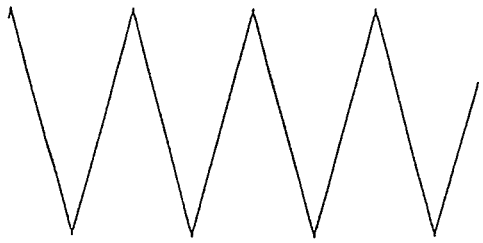


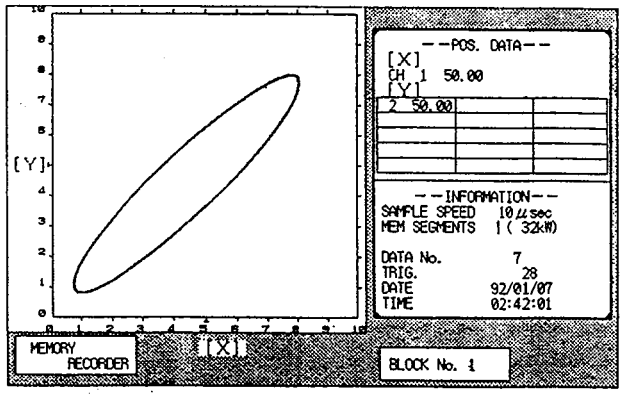
10 mm:





OFF:

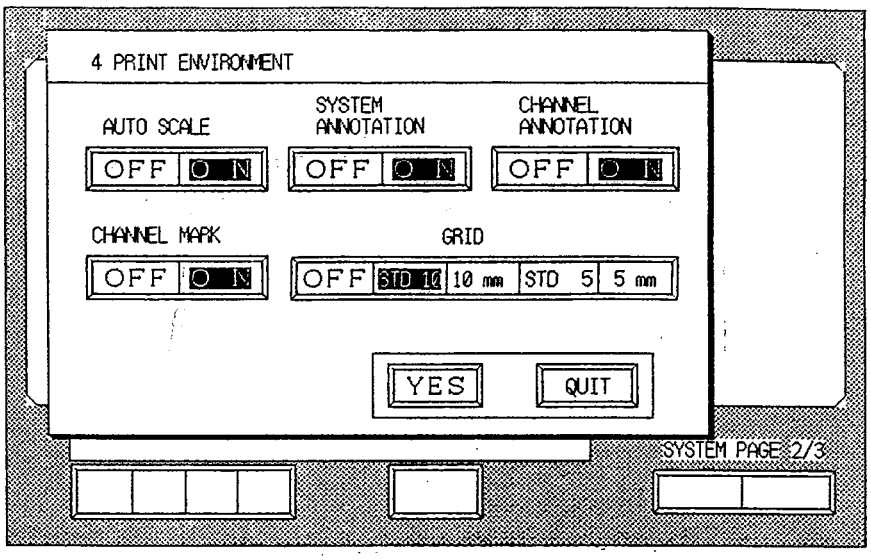




Setting procedures:

Select 4 PRINT ENVIRONMENT on the MENU 1 (SYSTEM PAGE 2/3) screen display

(Refer to page 9-1.)



On the above screen display, set ON/OFF of each item by directly touching the screen display.

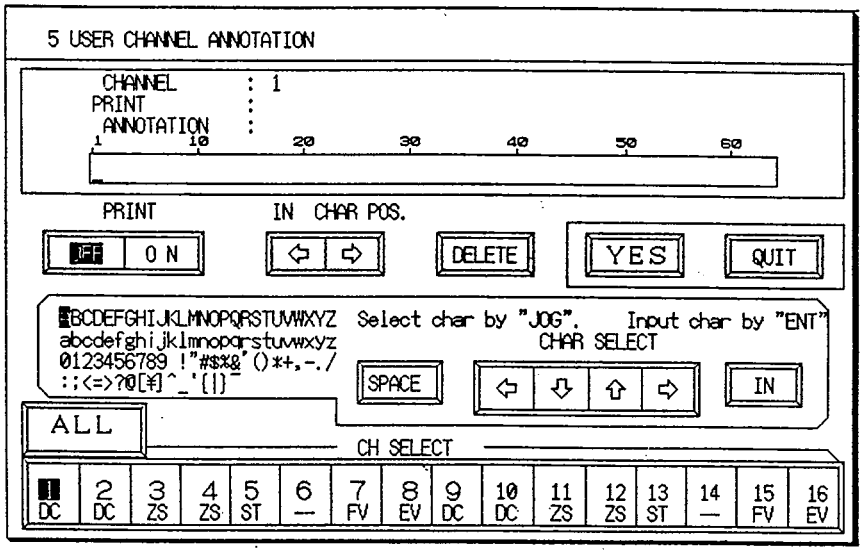
Press [YES] to set up the print environment and the current display is returned to the MENU 1 screen display.

Press [QUIT] and the current display is returned to the MENU 1 screen display without setting print environment.

9.4 User Channel Annotation

A comment of a maximum of 64 characters can be entered into each channel.
A user channel annotation is printed following a channel annotation (channel number, type of input unit, etc.) at a position approximately 10 cm away from the position of start of recording
Even when the channel annotation printing is turned OFF, the starting position for printing user channel annotations is not changed.

Setting procedures:
Select 5 USER CHANNEL ANNOTATION on the MENU 1 (SYSTEM PAGE 2/3) screen display. (Refer to page 9-1.)



° Selection of comment input channel:
Press any key number of CH SELECT, located at the lower part on the screen display, and the selected channel number is displayed at "CHANNEL: ", located at the upper part on the screen display.

Press [ALL] and all numbers of CH SELECT are reversely displayed, and the channel numbers to be set all together are displayed at "CHANNEL: " on the screen display.
Press number keys of CH SELECT to exclude the channels which are not to be set all together. (The reverse display of the excluded channels is returned to the original state.)

° Registration of characters:

Alphabetical letters, numerals and symbols can be registered by the jog dial or CHAR SELECT ⇦ ⇩ ⇧ ⇨ , and by pressing the ENTRY key on the operation panel or the IN key.

The registered item is displayed at "ANNOTATION: " on the screen display.

Items can be entered one after another by moving the cursor.

A space can be entered by pressing the SPACE key.

° Correction of registered characters:

Use IN CHAR POS. ⇦ ⇨ to move the cursor to a location where character registration needs to be corrected from the beginning.

° Printing ON/OFF:

Printing can be turned ON or OFF for each channel of entry of comments.

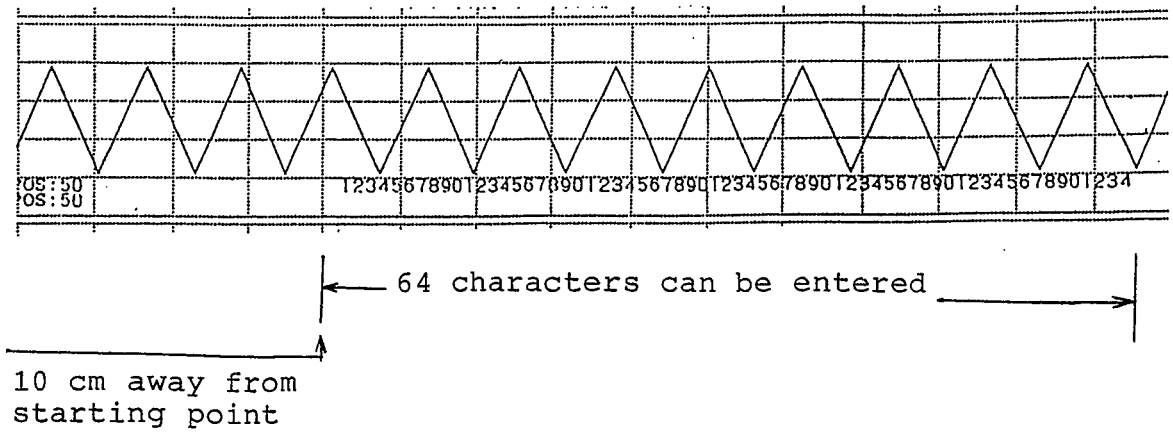
ON/OFF is displayed at "PRINT: " on the screen display.

In OFF, printing is not made.

° Termination of registration:

When the registration of all characters for the channel for entry of comments has been completed, press the YES key and the current display is returned to the MENU 1 screen display.

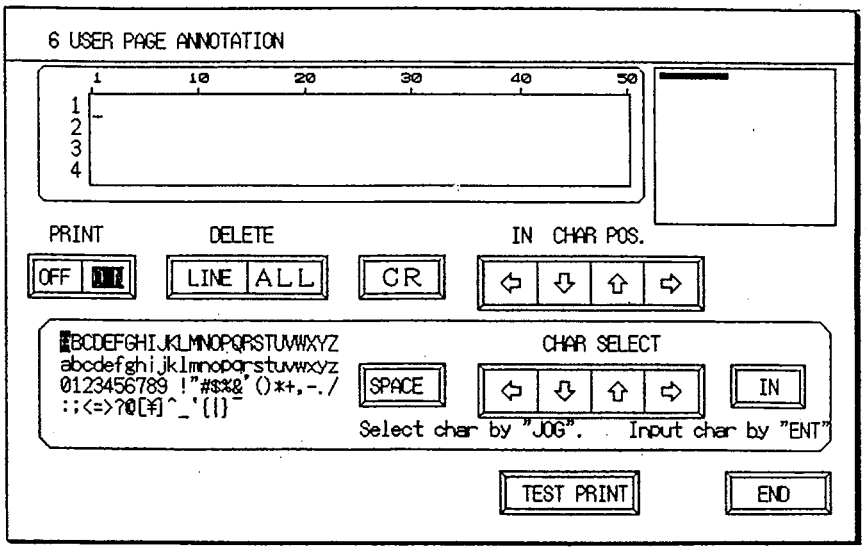
(Sample recording)



9.5 User Page Annotation

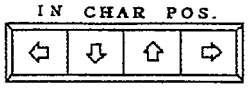
In addition to the user channel annotation, a comment of 127 characters by 108 lines can be entered. However, system, channel and user channel annotations have the precedence in printing over the user page annotation.

Setting procedures:
Select 6 USER PAGE ANNOTATION on the MENU 1 (SYSTEM PAGE 2/3) screen display.

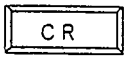


° Setting-up of input character position:
A registration character display for a space of 50 characters by 4 lines is displayed at the upper part on the screen display. The position of this display is shown by ———— of the print position display area at the right side.

The input character position can be set by moving the cursor with



.

Press 

and the cursor is moved to the starting position of a next line.

° Registration of characters:

Select characters from alpha-numerical characters and symbols, shown at the lower left on the screen display, with CHAR SELECT ⇦ ⇩ ⇧ ⇨ or the jog dial, and press the ENTRY key on the operation panel or press the IN key to register the selected characters.

Press SPACE and a space can be entered.

° Correction of registered characters:

Move the cursor with the IN CHAR POS. ⇦ ⇩ ⇧ ⇨ keys to a character that needs to be corrected and enter a new character.

Press LINE of DELETE LINE ALL and the registered characters of one line, on which the cursor is positioned, can be deleted.
If ALL is pressed, registered characters of all lines can be deleted.
The cursor is returned to the starting position of the first line.

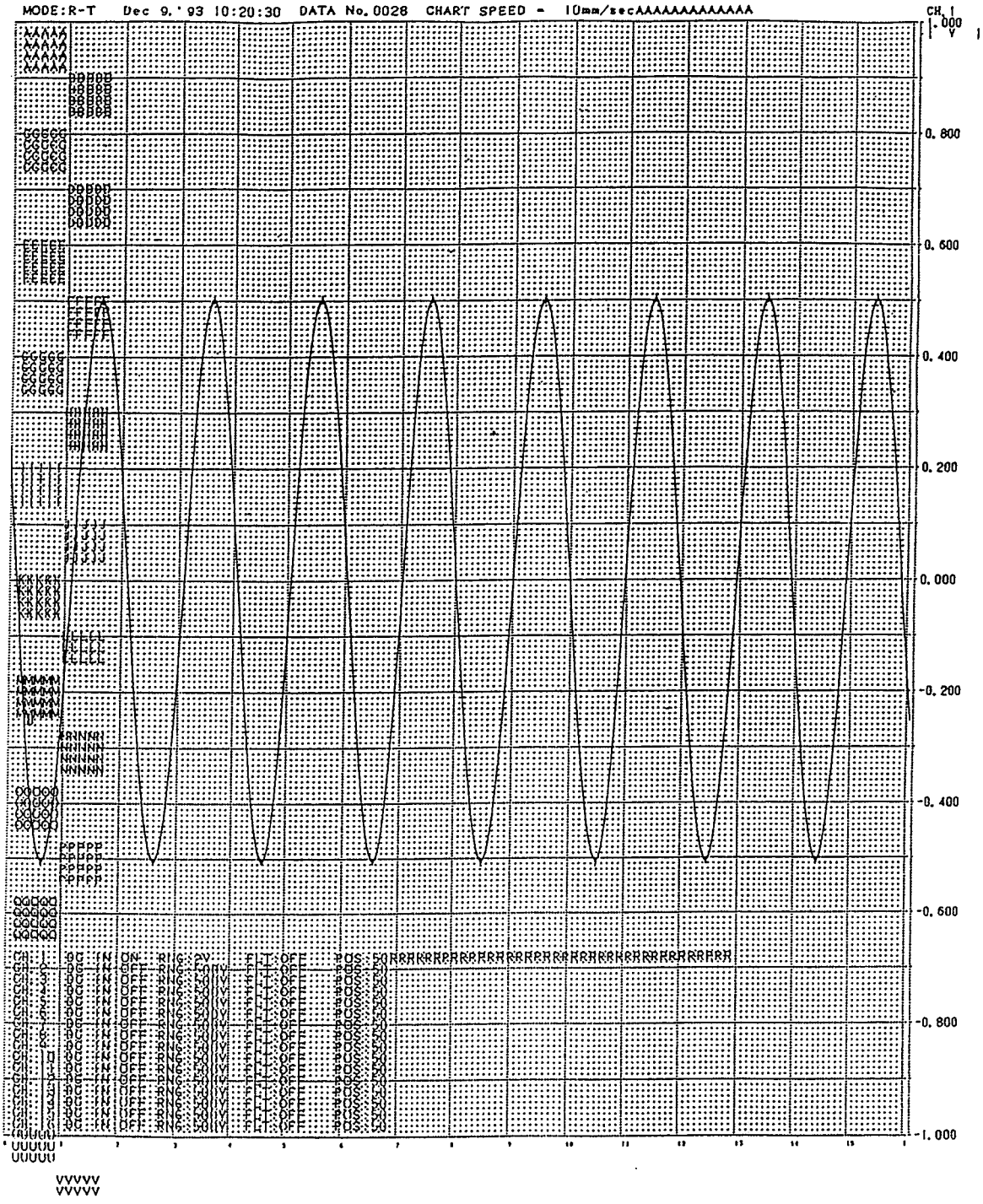
° Print ON/OFF:

Press ON of PRINT OFF ON and a user page annotation can be printed.

If OFF is pressed, printing is not made.

Press the END key and the current display is returned to the MENU 1 screen display.

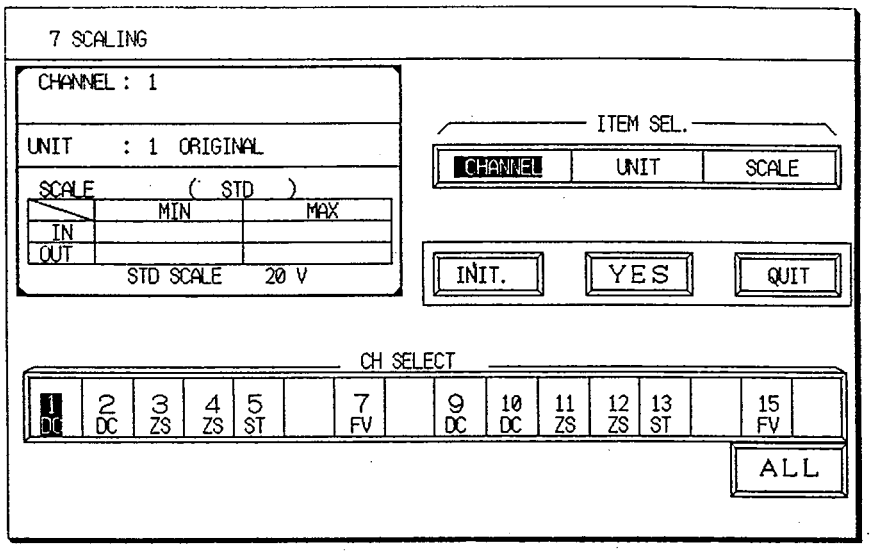
° Sample printing



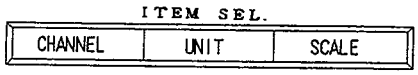
9.6 Setting-up of Scale and Unit (SCALING)

This function is used to change the full-scale value to a desired value and to change the input voltage to a physical quantity.

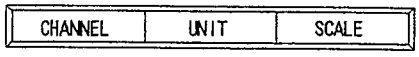
Setting procedures:
Select 7 SCALING on the MENU 1 (SYSTEM PAGE 2/3) screen display.
(Refer to page 9-1.)



In setting up scales and units, first, select a channel number that needs to be set.

Press CHANNEL of 

on the screen display and select a desired channel number from CH SELECT located at the lower part on the screen display. The selected channel number is displayed at "CHANNEL: " at the upper left on the screen display.

Then, press UNIT or SCALE of 

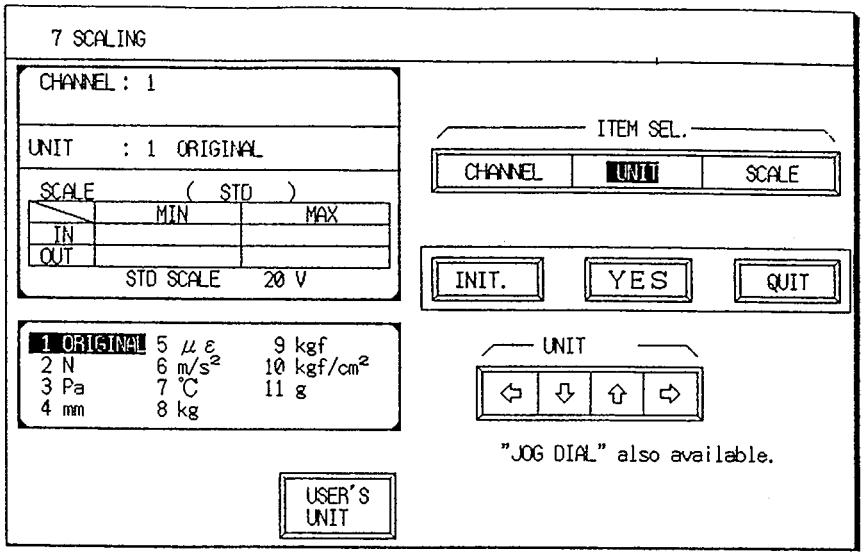
to set up each of them.

If 

is pressed, all channel numbers of CH SELECT are reversely displayed. The channels, which are not to be set all together, can be excluded by pressing the corresponding key numbers of CH SELECT. (The reverse display of the excluded channels is released.)

9.6.1 Setting-up of Unit

Press UNIT of [CHANNEL | UNIT | SCALE] .



The units (1 ORIGINAL to 11 g) built into the system are displayed.

1 ORIGINAL values are as shown below, according to the input units:

DC amplifier unit ..... mV, V

DC amplifier unit with BNC input .. mV, V

Zero suppression amplifier unit ... mV, V

DC bridge strain amplifier unit ... mV/V

F/V converter unit ..... Hz, kHz

Thermocouple amplifier unit ..... °C or °F

Select a desired unit with the jog dial or the [⇦ | ⇩ | ⇧ | ⇨] keys.

If any unit other than the units built in the system needs to be set, press [USER'S UNIT] .

Up to a maximum of 6 characters can be set for the user's unit.

Characters can be selected with the jog dial or the [⇦ | ⇩ | ⇧ | ⇨] keys, and the selected characters can be registered by pressing the [ENTRY] key on the operation panel or by pressing [IN] . A space can be entered by pressing [SPACE] .

When the unit has been registered, press [YES]. The set item can be entered and the current display is returned to the channel selecting screen display.

If [QUIT] is pressed, the current display is returned to the channel selecting screen display without setting the unit.

If [INIT.] is pressed, 1 ORIGINAL value appears.

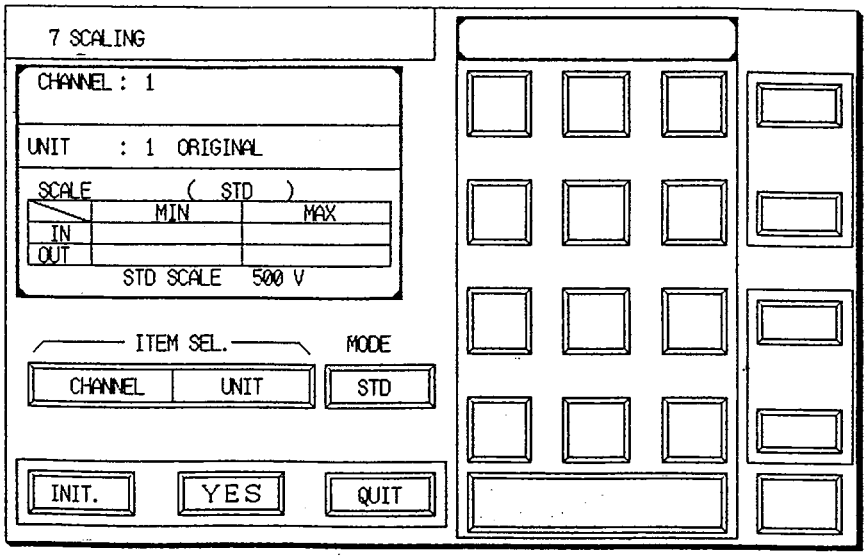
When the display has been returned to the channel selecting screen display, press [QUIT] and the channel selecting screen display is returned to the MENU 1 screen display.

Caution: Even when unit is set, unit can not be changed without changing scale.

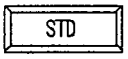
9.6.2 Setting-up of Scale

Press SCALE of 

.



Since modes can be selected as STD, MODE 1 and MODE 2 by pressing

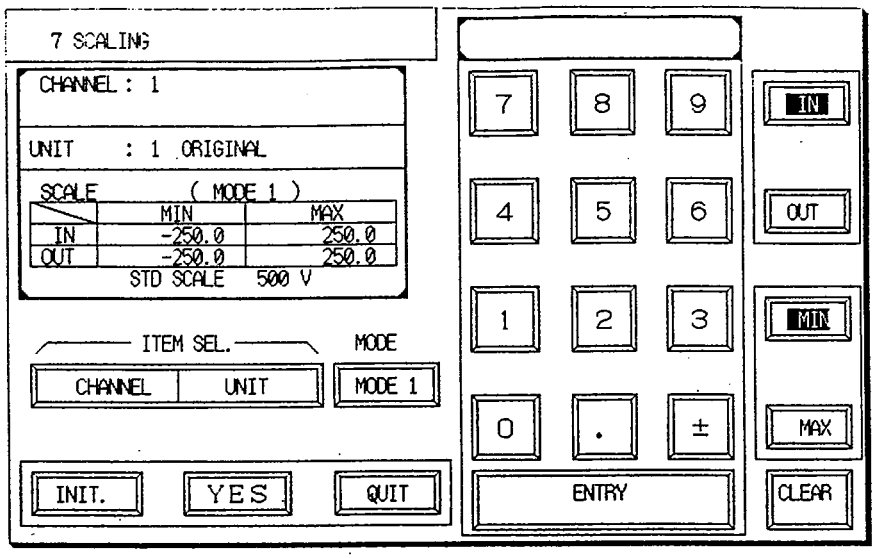


, set up the scale in each case.

(1) STD (standard):

The full-scale value is automatically determined by the set sensitivity of an input unit and the base-line position. Spaces of minimum and maximum values of input and output are blanked and a standard scale ..... is only displayed. On this screen display, changing of displayed parameters cannot be made.

(2) MODE 1



In MODE 1, the outputted minimum and maximum values for the inputted minimum and maximum values can be set to full-scale values.

The values can be entered with the ten keys (the keys numbered 0 thru 9) , and they can be registered by pressing the [ENTRY] key on the screen display.
The registered values are displayed on the minimum and maximum value spaces of input.

Since [IN] , [OUT], [MIN], and [MAX] are reversely displayed one after another, enter the values in accordance with the reverse display.
To change the numerical value that has been entered, select the respective keys and do the entry over again.
If changing of a numerical value is needed during entry, clear it with the [CLEAR] key and do the entry over again.

Press [YES] to set up the value and the current display is returned to the channel selecting screen display.

If [QUIT] is pressed, the current display is returned to the MENU 1 screen display without setting the value.

Setting limit:

At the time the [ENTRY] key on the operation panel has been pressed, setup values are checked and limited.

① If the scale value should exceed a maximum of 6 characters (a decimal point included) and should deviate from the preset limits of +32767 to -32767, it cannot be set.
If it should exceed, it is set to a limited value.

② The setting, where a minimum is greater than a maximum (reverse scale), is impossible. The setting is made to be returned to the previous state.

③ The range of a minimum and a maximum of an input, which is to be set, cannot exceed the preset sensitivity of an input unit.
If it should exceed , it is set to a limited value.

④ The setting resolution of a minimum and a maximum of an input is 1/1000. If a fraction is present, it is rounded off.

⑤ The span (the difference between a minimum and a maximum) between a minimum and a maximum of an input is more than 1/10 of the sensitivity. If setting is to be made with a span smaller than this span, the span is made to be raised to a minimum span for setting.

The tables below show the setting range, minimum span and resolution for each input unit.

DC amplifier unit, DC amplifier unit with BNC input and zero suppression amplifier unit:

Range	Setting range	Minimum span	Resolution
500V/FS	±500.0V	50V/FS	0.5V
200V/FS	±200.0V	20V/FS	0.2V
100V/FS	±100.0V	10V/FS	0.1V
50V/FS	±50.00V	5V/FS	0.05V
20V/FS	±20.00V	2V/FS	0.02V
10V/FS	±10.00V	1V/FS	0.01V
5V/FS	±5.000V	0.5V/FS	0.005V
2V/FS	±2.000V	0.2V/FS	0.002V
1V/FS	±1.000V	0.1V/FS	0.001V
0.5V/FS	±500.0mV	50mV/FS	0.5mV
0.2V/FS	±200.0mV	20mV/FS	0.2mV
0.1V/FS	±100.0mV	10mV/FS	0.1mV

F/V converter unit:

Range	Setting range	Minimum span	Resolution
10kHz/FS	10.00kHz	1kHz/FS	10Hz
5kHz/FS	5.000kHz	500Hz/FS	5Hz
2kHz/FS	2.000kHz	200Hz/FS	2Hz
1kHz/FS	1.000kHz	100Hz/FS	1Hz
500Hz/FS	500.0Hz	50Hz/FS	0.5Hz
200Hz/FS	200.0Hz	20Hz/FS	0.2Hz
100Hz/FS	100.0Hz	10Hz/FS	0.1Hz

Example:

If an input unit is set as shown below, the scaling value of an output ranges from 0 to 10 for 1 to 5 of the input range.

Sensitivity: 5 V/FS

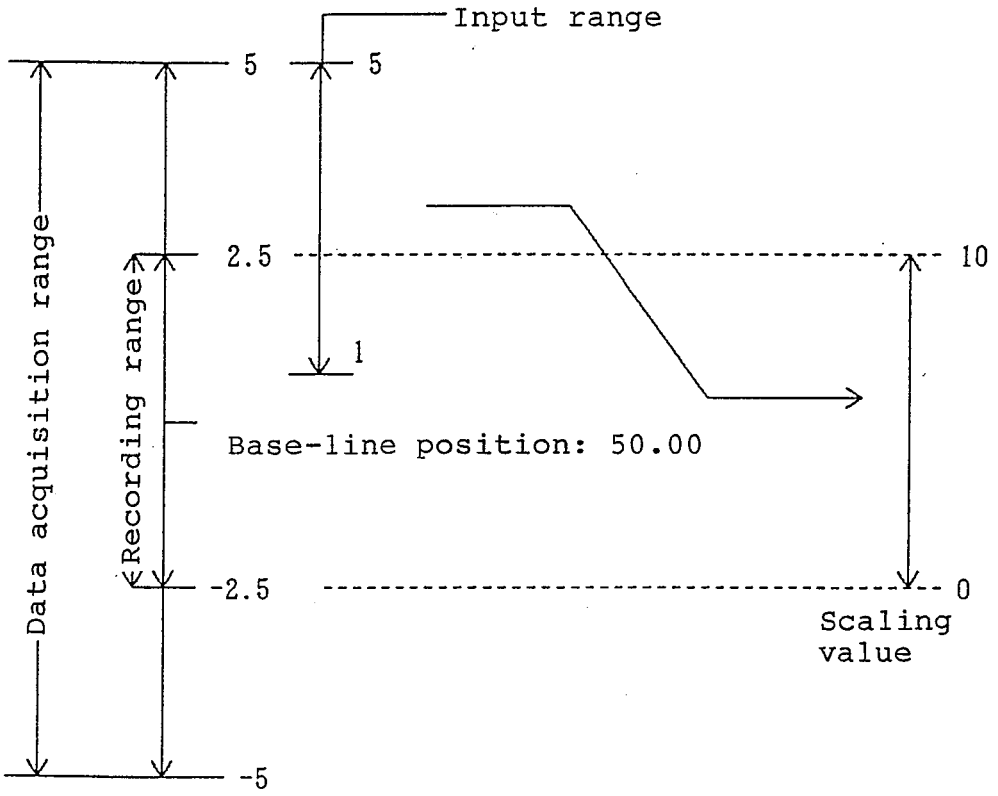
Base-line position: 50.00

Minimum value of input: 1

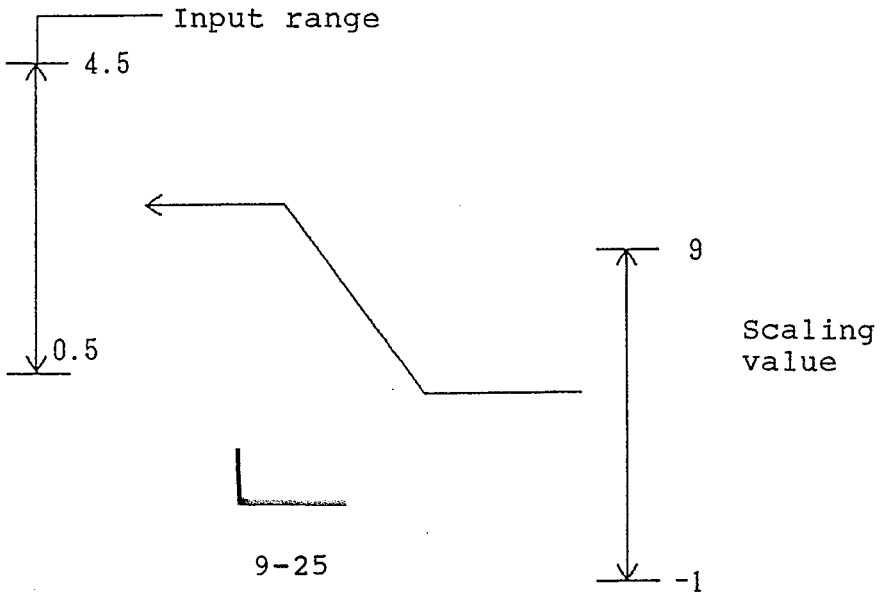
Maximum value of input: 5

Minimum value of output: 0

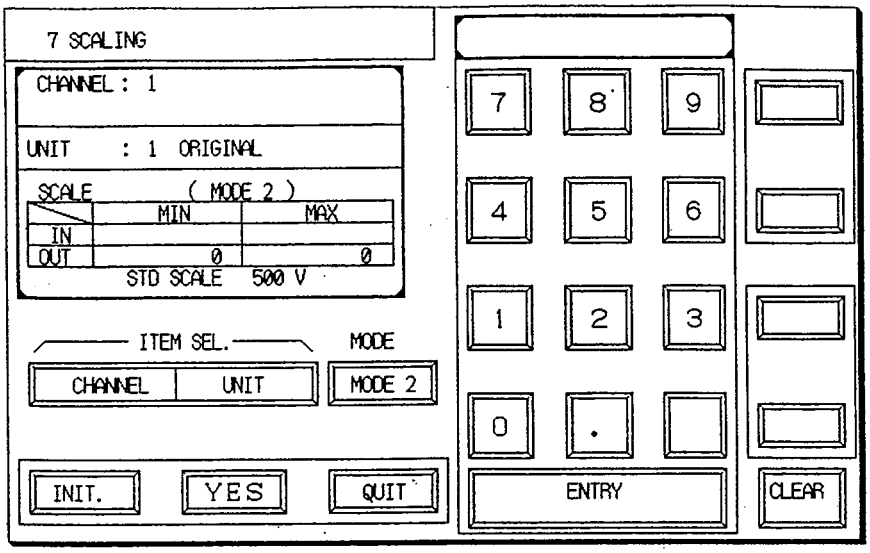
Maximum value of output: 10



If the base-line position is set to 60.00, the input range varies as shown below:



(3) MODE 2



In MODE 2, proportionally converted full-scale values for the standard scale can be set. Thus, use the ten keys for entry. The [±] key is not used.

After entry of numerical values, press [ENTRY] and the set values are displayed on the OUT spaces of SCALE.

Press [YES] to set up the values and the current display is returned to the channel selecting screen display.

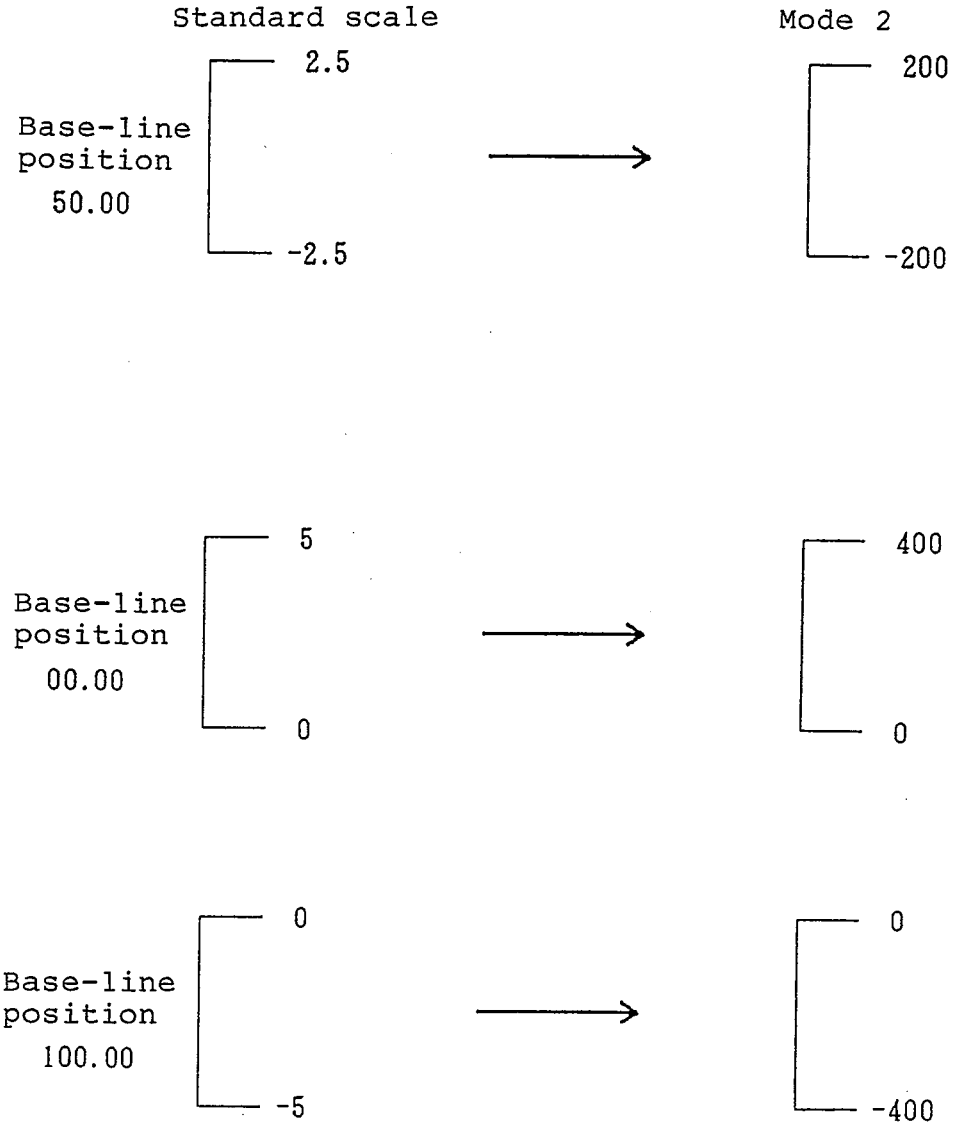
If [QUIT] is pressed, the current display is returned to the MENU 1 screen display without setting the values.

The number of characters, which can be entered, is 6 characters (including a decimal point) and the maximum numerical value, which can be entered, is 32767.

Even if a numerical value, which is greater than this, should be entered, the value to be set becomes 32767.

Example:

When the sensitivity of an input unit is set in 5 V/FS, enter 400, which is a full-scale value proportionally converted for the full-scale value 5 (standard scale). The scaling is printed as 400 V/FS.



9.7 Display/Buzzer ON/OFF

(1) Display AUTO OFF:

If no key operation is made for approximately 10 minutes, the display automatically disappears.
The display appears again, if any key is pressed.
OFF: The display always appears.
ON : The display automatically disappears.

(2) Key click:

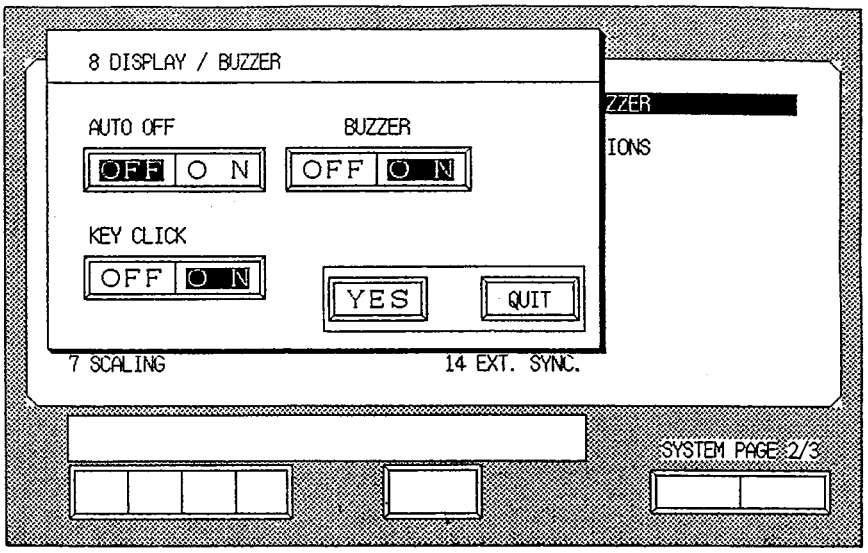
When any of the touch-pad panel keys, operation keys and jog dial is operated, a clicking sound as "pip" is produced.
If key entry is erroneously made, a warning sound as "pip, pip, pip" can be produced.
OFF: A clicking sound not produced.
ON : A clicking sound produced.

(3) Buzzer:

A continuous warning sound as "pip, pip, pip" is produced in the following cases:
When recording paper is exhausted during recording.
When the print-head pressure lever is released.
When the temperature of the print-head rises abnormally.
At this time, the ERROR LED on the operation panel lights, and the warning sound continues for as long as the error condition is not removed or the STOP key on the operation panel is not pressed.
OFF: A buzzing sound not produced. (The ERROR LED lights.)
ON : A buzzing sound produced.

Setting procedures:

Select 8 DISPLAY/BUZZER on the MENU 1 (SYSTEM PAGE 2/3) screen display.



On this screen display, set up ON/OFF of each item by pressing each key.

Press [YES] for setting-up and the current display is returned to the MENU 1 screen display.

If [QUIT] is pressed, the current display is returned to the MENU 1 screen display without setting.

9.8 Changing Memory Capacity (MEMORY DIVISIONS)

The memory capacity of this instrument is set in 32 KW/channel in the initial state.
By restricting the number of channels to be used, the memory capacity can be expanded up to a maximum of 256 KW/channel.

(1) 32 KW/CH:
All channels of from 1 to 16 can be used.

(2) 64 KW/CH:
The following channels can be used;

Channel 1	Channel 11
Channel 3	Channel 13
Channel 5	Channel 15
Channel 7	
Channel 9	

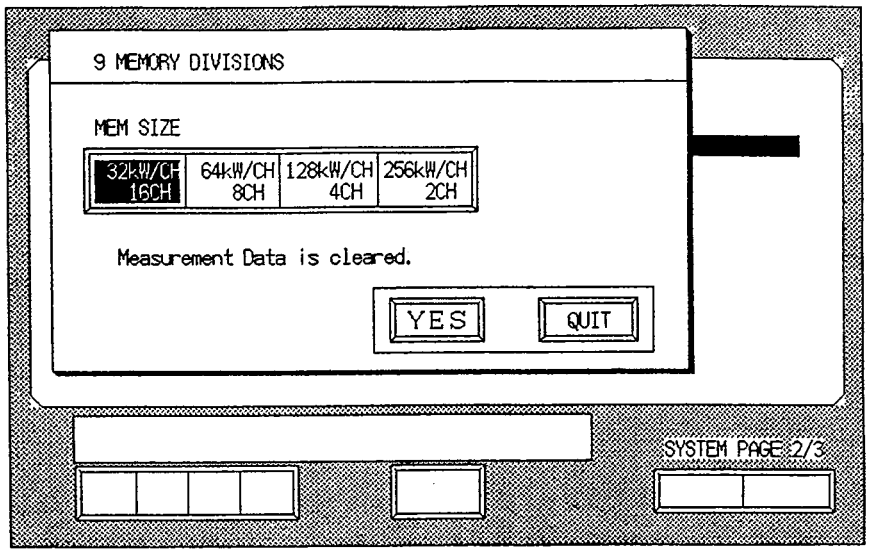
(3) 128 KW/CH:
The following channels can be used;

Channel 1	Channel 9
Channel 5	Channel 13

(4) 256 KW/CH:
Channel 1 and channel 9 can be used.

Note:
If the channels to be used are restricted, only input units, which can be used, are displayed on the AMP screen display in the memory and transient recorder modes. Also note about description on CH9 to CH16 can not be applied to RT3108N and RT3208N.

Setting procedures:
Select 9 MEMORY DIVISIONS on the MENU 1 (SYSTEM PAGE 2/3) screen display. (Refer to page 9-1.)



On this screen display, the memory capacity can be changed by pressing each key.

Press [YES] and the setting is completed and the current display is returned to the MENU 1 screen display.

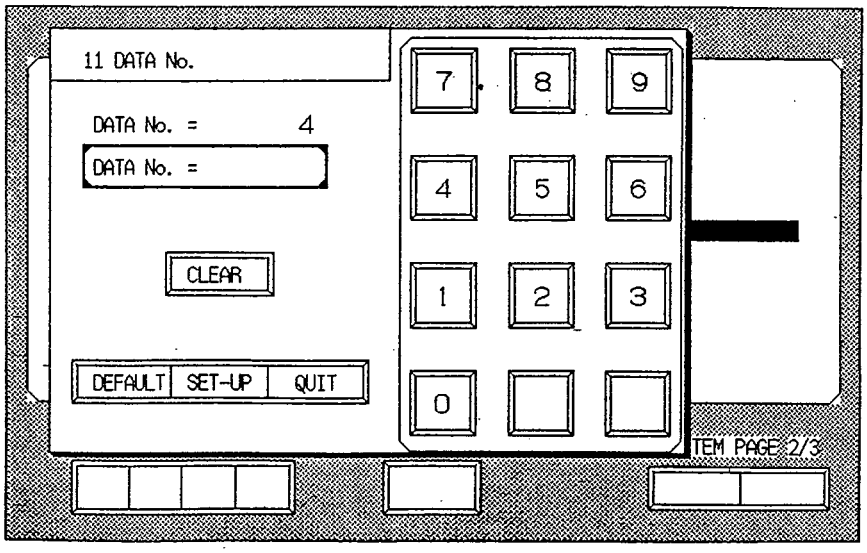
If [QUIT] is pressed, the current display is returned to the MENU 1 screen display without setting.

9.9 Setting Data No.

This function is used to set a data number to 1 as a default value or to set a data number to any value (4 digits max.).
Data numbers are automatically increased for each recording.

Setting procedures:
Select 11 DATA No. on the MENU 1 (SYSTEM PAGE 2/3) screen display. (Refer to page 9-1.)
The screen display shown below can be also displayed by pressing

[DATA No. SET] of INITIALIZE on the SYSTEM PAGE 1/3 display.



DATA No. =

[DATA No. =] : Any set data number is displayed.

Press DEFAULT of [DEFAULT | SET-UP | QUIT] and the data number is set to 1 as a default value and the current display is returned to the MENU 1 screen display.

In order to set the data number to any desired value, use the ten keys, located at the right side on the display, to enter the desired value.

If the value needs to be changed, press [CLEAR] and use the ten keys again to enter any value.

After the value has been entered, press SET-UP of [DEFAULT | SET-UP | QUIT] and the data number is set to the desired value and the current display is returned to the MENU 1 screen display.
After sebsequent measurement, data numbers are automatically incremented from the set value each time recording occurs.

If [QUIT] is pressed, the current display is returned to the MENU 1 screen display without setting the data number.

9.10 Auto Start (Standby Function)

This is an auto start function actuated when the power has been restored from power failure or disturbance during the time the power application. This means that even when power failure should occur during continuous recording, which results in suspension of recording, the REC key is automatically turned ON to continue continuous recordinc after power restoration.

This instrument provides a backup function to maintain setup conditions, and when the power is restored, the operation becomes as follows:

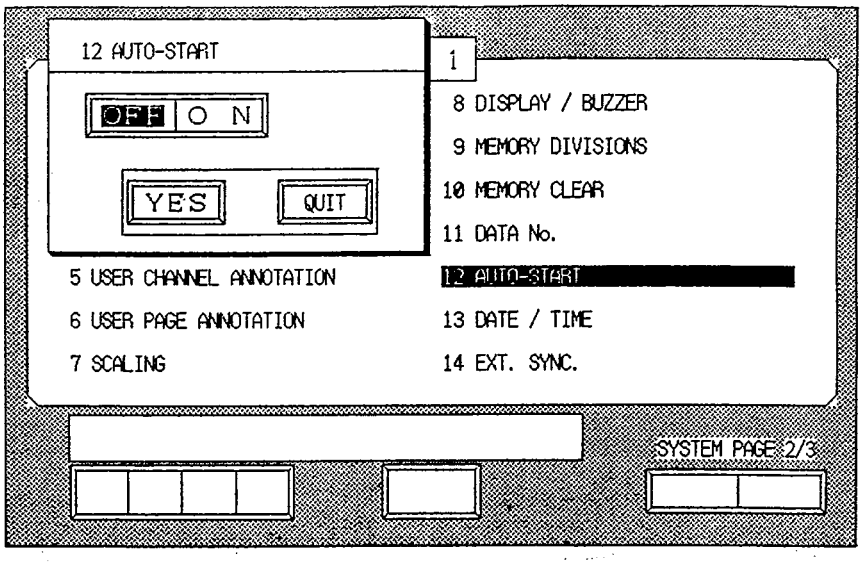
Power in OFF			Starting operation at power restoration		
				Data No.	Printing of OFF time
Stop			Stop	Hold	Absence
Real-time recorder	WAVE start ON		Restart	+1	Presence
	DATA start ON		Restart	+1	Presence
	X-Y start ON		Restart	Hold	Presence
Memory recorder	Start ON (Trigger not detected)		Memory clear Restart	+1	Presence
	Start ON (Trigger detected)		Memory clear Restart	+1	Presence
	Copy	SINGLE	Copy restarted Stop after copying	Hold	Presence
		REPEAT	Copy restarted Restarted after copying	+1	Presence
During list printing			Memory held, stop	Hold	Absence

For the transient recorder, refer to the real-time recorder and memory recorder.

When the standby operation has been executed during recording or sampling, the date, time and data number of the time the power was turned off are printed after power restoration.

Setting procedures:

Select 12 AUTO-START on the MENU 1 screen display (SYSTEM PAGE 2/3). (Refer to page 9-1.)



Directly touch the above screen display to set AUTO START to ON or OFF.

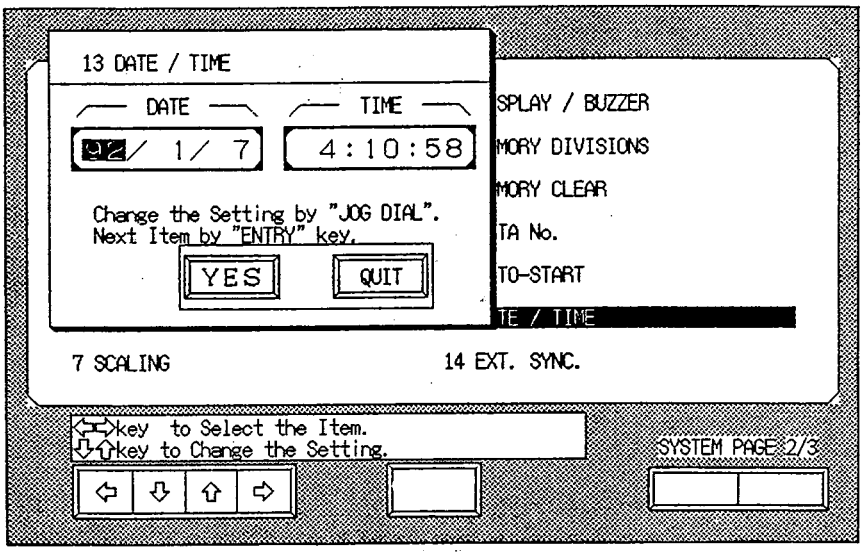
Press [YES] and the setting-up is completed and the current display is returned to the MENU 1 screen display.

Press [QUIT] and the current display is returned to the MENU 1 screen display without setting-up of AUTO START.

9.11 Setting Date and Time

This function is provided to set date and time.

Setting procedures:
Select 13 DATE/TIME on the MENU 1 screen display (SYSTEM PAGE 2/3). (Refer to page 9-1.)



Use the arrow keys ⇦ ⇨ or use the ENTRY key on the operation panel for movement to each item of the date and time to be changed.

Use the arrow keys ⇩ ⇧ or use the jog dial to change set values.

Press YES to set to the displayed date and time, and the current display is returned to the MENU 1 screen display.

Press QUIT and the current display is returned to the MENU 1 screen display without setting-up of date and time.

9.12 Initialization

This function is provided to set setup contents of this instrument to initial values.

Initial values:
Recorder type: Real-time recorder.

Input units:
- DC amplifier unit:
  - Input; ON — Magnification; x100
  - Sensitivity; 5 — Base line; 50.00
  - Filter; OFF
- Event amplifier unit:
  - Printing; ON
  - Input system; Voltage input
- DC bridge strain amplifier unit:
  - Printing; ON — Bridge excitation; 3 V
  - Sensitivity; 3.0 mV/V — Attenuation; x1/2
  - Filter; 10 kHz — Base line; 50.00
- F/V converter unit:
  - Printing; ON
  - Sensitivity; 10 kHz
  - Base line; 0
- Zero suppression amplifier unit:
  - Input; ON — Magnification; x100
  - Sensitivity; 5 — Base line; 50.00
  - Filter; OFF

Mode setting:
- Input system: Waveform — Real-time trigger; OFF
- Chart speed; 25 mm/sec — Full scale; 1/16 (RT3216N)
- Record length; Continuous — 1/8 (RT3208N/RT3108N)

Trigger setting:

Trigger mode; OFF

Number of measurement times; Single

Other settings:

Storage of setup conditions; Initialized

Setting of record line; A ———

Auto scaling; ON

System annotation; ON

Channel annotation; ON

Channel mark; ON

Grid selection; Standard

User channel annotation;
Initialized

User page annotation;
Initialized

Setting of scale and unit;
Initialized

Auto OFF of display; OFF

Buzzer; ON

Key click; ON

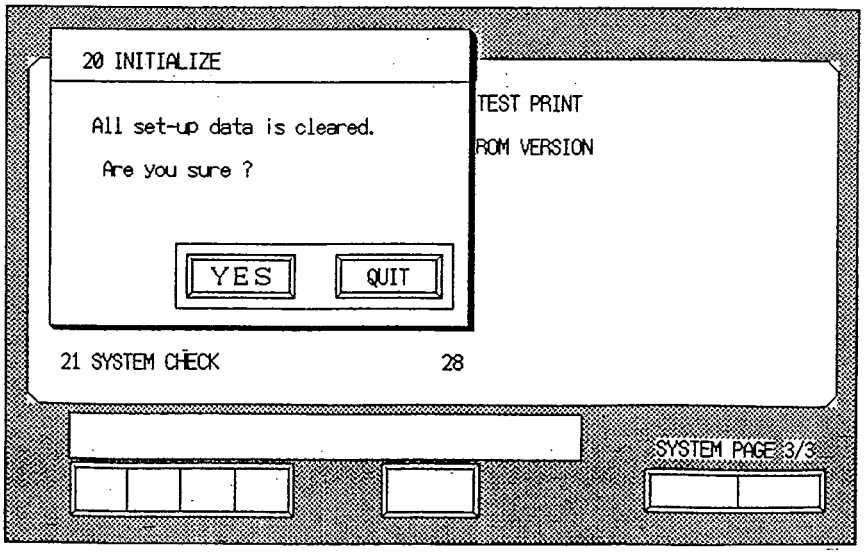
Memory segment;
32 KW/channel

Data number; 1

Auto start; OFF

Setting procedures:

Select 20 INITIALIZE on the MENU 2 screen display (SYSTEM 3/3). (Refer to page 9-1.)



Press YES and the setup contents of the basic instrument is initialized and the current display is returned to the MENU 2 screen display.

Press [QUIT] and the current display is returned to the MENU 2 screen display without initializing the setup contents of the basic instrument.

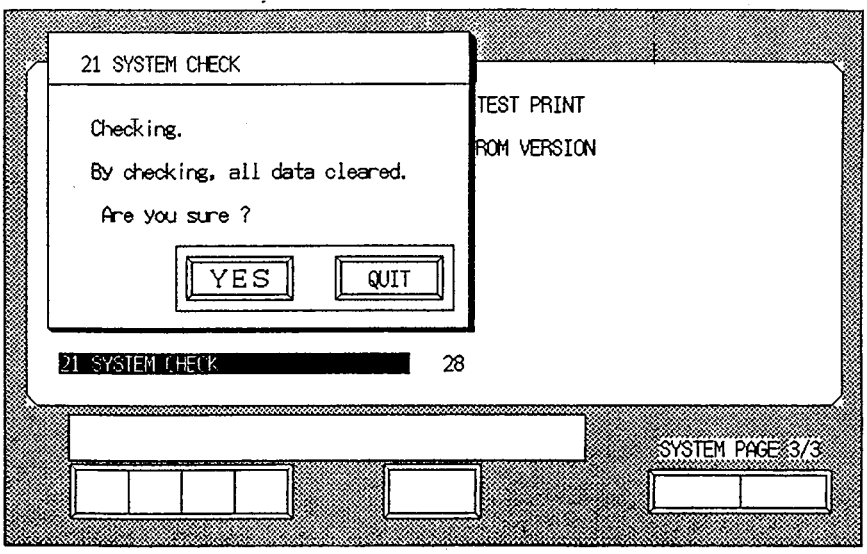
Initialization can be also made by pressing the [ALL SET] key on the SYSTEM PAGE 1/3.

9.13 System Check

This function is provided to check the internal system of the basic instrument.

Caution:
All setup conditions and measured data are cleared.

Setting procedures:
Select 21 SYSTEM CHECK on the MENU 2 screen display.
(Refer to page 9-1.)

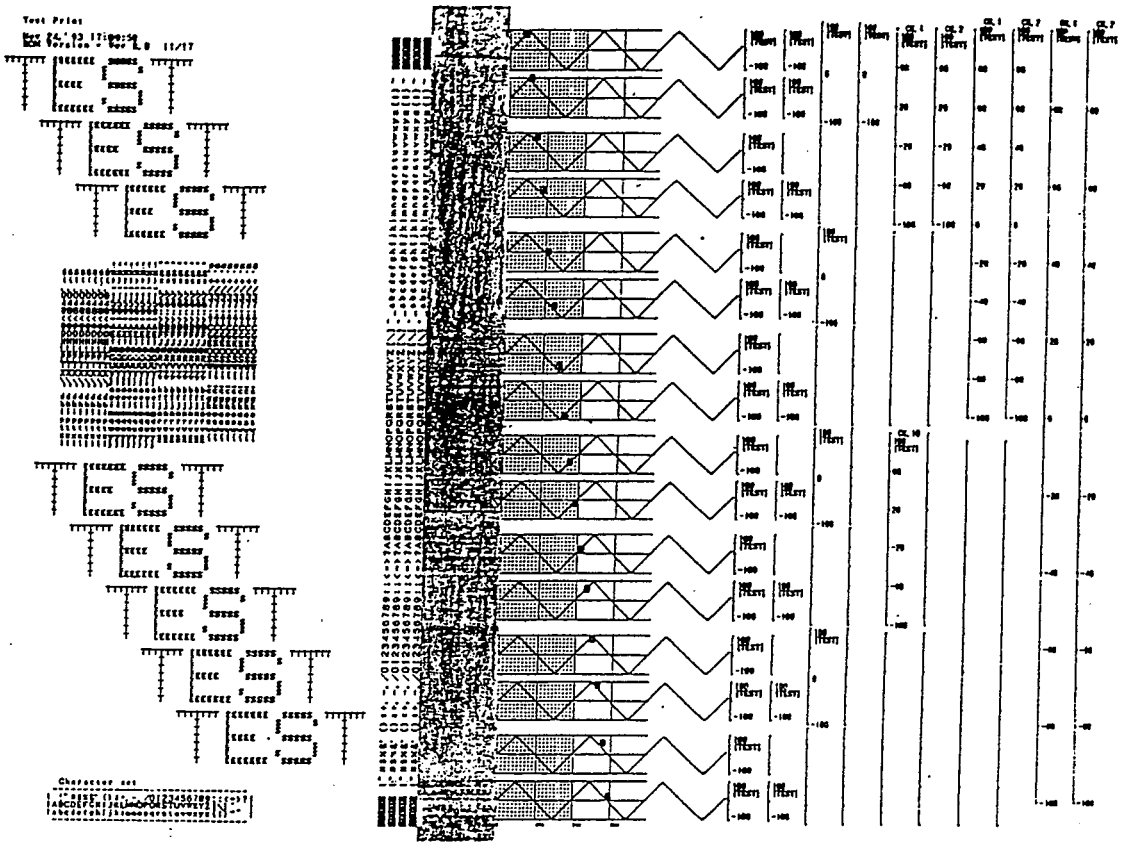


Press [YES] and SYSTEM CHECK is executed and the current display is returned to the MENU 2 screen display. Press [QUIT] and the current display is returned to the MENU 2 screen display.

9.14 Test Print

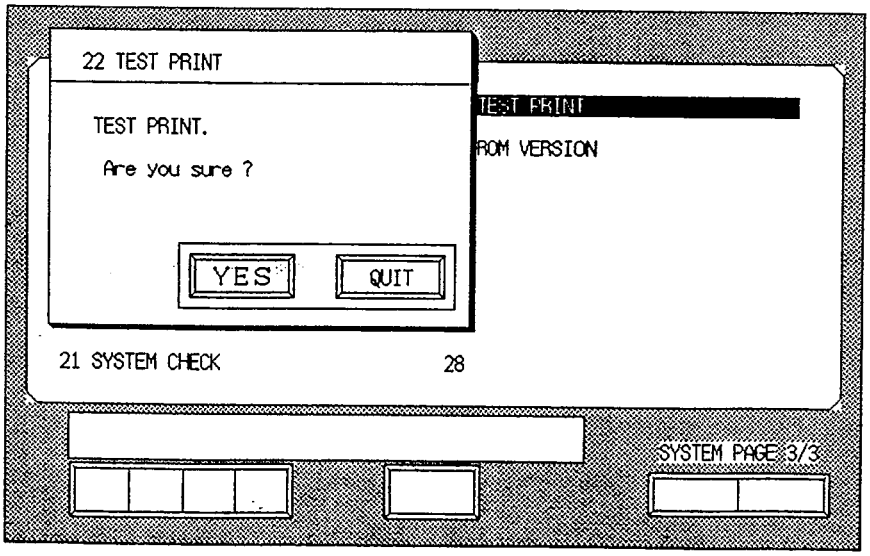
By means of the test print function, printing quality such as missing dots of the thermal print head can be checked.

Sample recording



Setting procedures:

Select 22 TEST PRINT on the MENU 2 screen display (SYSTEM PAGE 3/3). (Refer to page 9-1.)



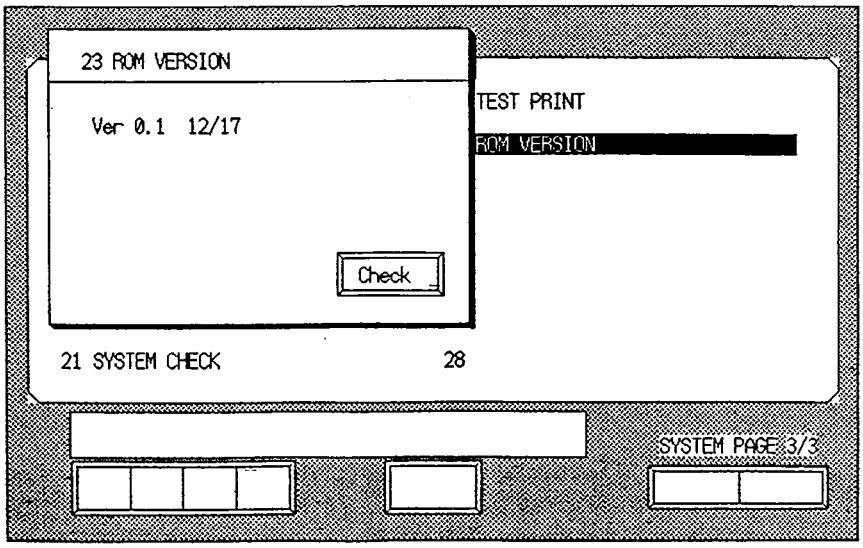
Press [YES] and the test print described on the previous page is made and the current display is returned to the MENU 2 screen display.

Press [QUIT] and the current display is returned to the MENU 2 screen display without printing.

9.15 ROM Version

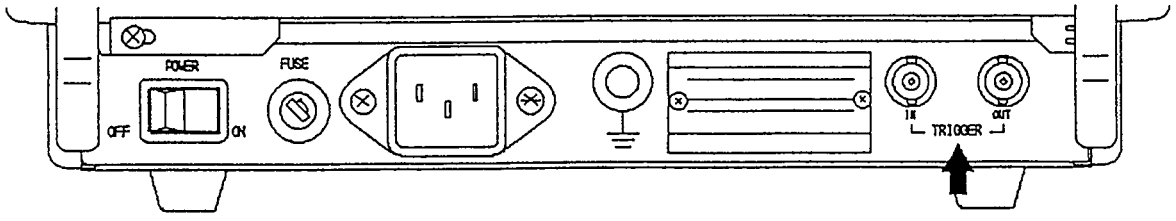
This is used to verify the ROM version of the basic instrument.

Setting procedures:
Select 23 ROM VERSION on the MENU 2 screen display (SYSTEM PAGE 3/3). (Refer to page 9-1.)



Press [Check] and the current display is returned to the MENU 2 screen display.

9.16 Trigger IN/Trigger OUT Function



Lower part of side panel of basic instrument

Trigger IN function

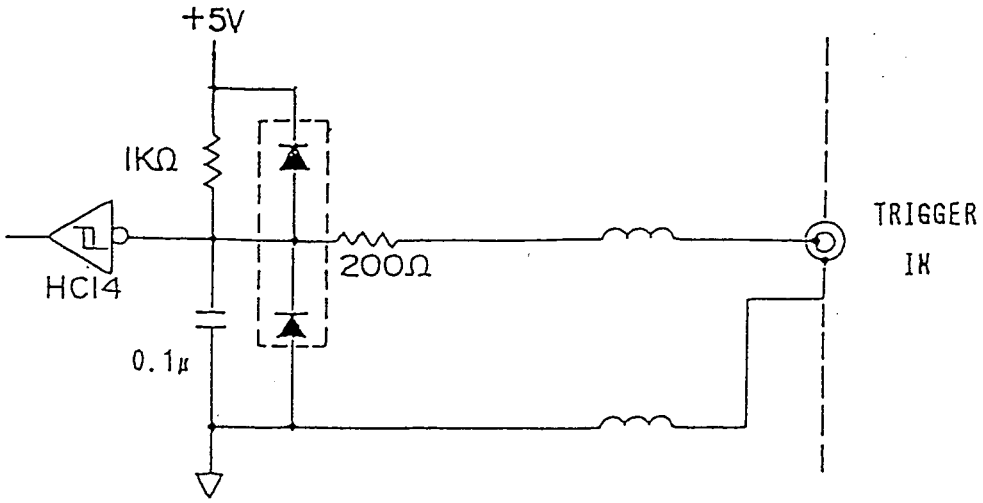
A trigger can be inputted externally from the TRIGGER IN connector located on the side of the basic instrument. An externally inputted trigger can generate a trigger irrespective of trigger settings of the basic instrument.

Input signal:

TTL level (Trailing edge).

Input connector:

Coaxial connector.



Trigger OUT function

A trigger output is generated from the TRIGGER OUT connector, located on the side of the basic instrument, upon occurrence of a trigger.

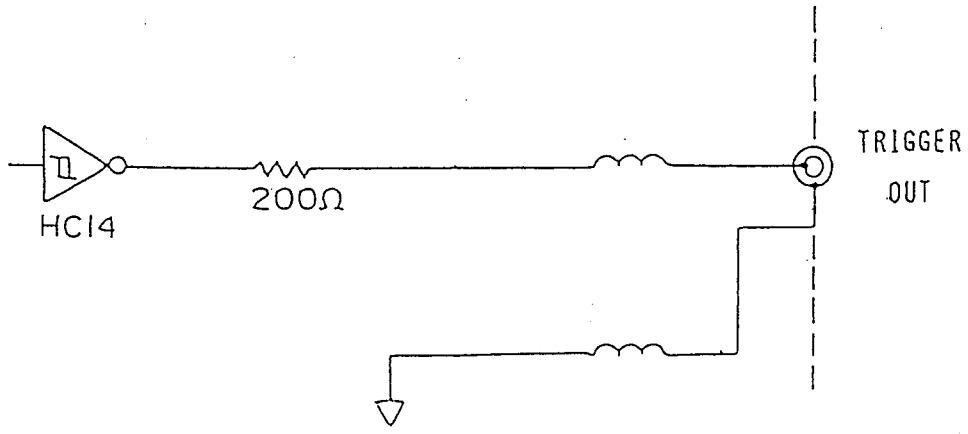
Output signal:

TTL level, active LOW.

Pulse width; Approx. 10 msec.

Output connector:

Coaxial connector.



SECTION 10

MAINTENANCE

10.1 Battery Backup

The setup values of recording conditions, date, time and measured data can be retained for approximately one month.
If the instrument is not used for longer than this period, the setup conditions, date and time must be set again.

- Power ON.
- Initializing. The instrument is set to the initial state (the state as shipped from the factory).
- Setting the built-in clock timer. (Refer to 9.11 Setting Date and Time.)

The battery can be approximately fully recharged, if the power is continuously applied for approximately 48 hours.

10.2 Cleaning of Display

To clean the display, use a piece of dry, soft cloth or a piece of gauze moistened with ethanol.
A smoked touch-pad panel sheet (RT31-122, 3 sheets/set) is available for protecting a touch-pad panel and for preventing dirt from the display.
When ordering this sheet, contact our agent from whome you have purchased this instrument.

10.3 Maintenance of Thermal Print-head

The thermal print-head may become dirty, after it has been used for long-hour recording. In this case, moisten a cotton swab with ethanol and gently clean the thermal print-head so as not to scratch it.
When recording, however, make sure that applied ethanol is completely volatilized.

10.4 Operating Life of Thermal Print-head

The thermal print-head gives more than 30 km of writing (approx. 1000 rolls of recording paper 0511-3167).
If it is used beyond this range, the recording quality may be sacrificed. In this case, contact our agent, as the thermal print-head should be replaced. (The parts replacement and service made at cost.)

10.5 Maintenance of Platen Roller

If the platen roller is contaminated with dirt, it may be damaged or the recording quality may be deteriorated.
Should this occur, gently clean the platen roller with a piece of gauze moistened with ligroin or ethanol, taking care not to scratch the surface of it.

10.6 In Case of Power Failure

If the power to the instrument was once turned off because of power failure or inadvertent removal of the power cable during recording and the power has been restored afterwards, the instrument is put into the same state as that where the [STOP] key is pressed.
Since, in this case, the setup contents, at the time the power to the instrument was turned off, are retained, start recording as it is.
When the AUTO-START function is set to ON, recording is automatically started. (For the operating instructions on the AUTO-START function, refer to 9.10 AUTO-START (standby function).)

10.7 Power Fuse Replacement

The fuse holder is provided on the lower side panel of the basic instrument (adjacent to the power switch).

° If a fuse blows, replace it only after the cause of failure has been confirmed, as internal failure of the basic instrument may be considered.

° Before attempting to replace the fuse, proceed as follows:
  Turn OFF the power switch without fail.
  Remove the power cable from the basic instrument.
  Remove the input cables from the input units.

° The fuse to be used must be a specified rated fuse.

Remove the cap from the fuse holder by turning the cap counterclockwise while pressing it lightly with a screw driver for slotted head screw.
Insert a new fuse into the fuse holder and cover it with the cap by turning the cap clockwise while pressing it lightly with the screw driver.

SECTION 11

SPECIFICATIONS

11.1 Basic Specifications

11.1.1 Basic-instrument Section

Input units:

Up to a maximum of 16 units can be built into the basic instrument. A mixed set of various types of input units can be built in the basic instrument.

DC amplifier unit	: 1 input/unit
Event amplifier unit	: 8 inputs/unit
DC bridge strain amplifier unit	: 1 input/unit
F/V converter unit	: 1 input/unit
DC amplifier unit with BNC input	: 1 input/unit
Zero suppression amplifier unit	: 1 input/unit

Display:

9-inch EL display (yellowish orange color).

Effective display area:

191.9 mm x 119.8 mm (640 dots x 400 dots).

Display density:

Dot size; 0.22 mm x 0.22 mm.
Dot pitch; 0.30 mm x 0.30 mm.

Operation:

Input units and the basic instrument can be set and operated by keys on the operation panel, touch-pad-panel keys on the EL display and the jog dial. (Panels are indicated in English)
A clicking sound is made when a key is touched. (ON/OFF function provided) The key-lock switch is provided to avoid inadvertent operating of keys.

Recording method:

Heat-sensitive recording by thermal print-head.

Full recording width:

216 mm for RT3216N and RT3208N
128 mm for RT3108N

Recording density:

Voltage axis (Y axis); 8 dots/mm.

Time axis (X axis) ; 40 dots/mm (10 mm/sec or less).
20 dots/mm (25 mm/sec).
10 dots/mm (50 mm/sec).
8 dots/mm (100 mm/sec).

Effective recording width:

16-division recording, 8-division recording, 4-division recording, 2-division recording and full-width recording selectable.

Mode	Full scale	Recording
16-division recording	10 mm	Separate recording of 1 to 16 channels (RT3216N)
8-division recording	25 mm	Overlapping recording of 1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10, 11 and 12, 13 and 14, and 15 and 16 channels (RT3216N/3208N)
4-division recording	50 mm	Overlapping recording of 1 to 4, 5 to 8, 9 to 12, and 13 to 16 channels (RT3216N/RT3208N)
2-division recording	100 mm	Overlapping recording of 1 to 8, and 9 to 16 channels (RT3216N/RT3208)
Full-width recording	200 mm	Overlapping recording of 1 to 16 channels (RT3216N/RT3208N)

Note: For RT3108N

8-division:FS 10mm separate recording of 1 to 8 channels
4-division;FS 25mm 1 to 2, 3 to 4, 5 to 6, 7 to 8 channels overlapping
2-division:FS 50mm 1 to 4, 5 to 8 channels overlapping
1-division:FS 50mm 1 to 8 channels overlapping

Grid patterns:

Automatically provided according to selected mode of effctive recording width.

STD10, 10mm, STD5, 5mm, no grid.

Time-axis scale:

Real-time waveform recording		10 mm/DIV
Memory waveform recording	Standard	10 mm/DIV
	Reduction	2.5 mm/DIV
	Magnification	40 mm/DIV

Channel trace identification:

Channels can be identified by channel numbers printed near the corresponding recorded waveforms.

ON/OFF function provided.

System annotation:

Following information is printed simultaneously with recorded waveforms:

- ° Recording mode
- ° Date
- ° Time for start of measurement
- ° Data number
- ° Trigger condition
  (Trigger point, date and time)
- ° Sample speed
- ° Chart paper speed
- ° Time axis

ON/OFF function provided.

Channel annotation:

Setup contents of input units can be printed simultaneously with recorded waveforms.

ON/OFF function provided.

Battery backup:

Backup contents;

Setup information of basic instrument, recording conditions and memory data.

Backup period;

Approx. 1 month (with battery fully charged and at a normal temperature).

Recharging time;
Approx. 48 hours.

Clock timer function:
Date and time are displayed and printed by built-in clock timer.
Accuracy; ±100 ppm (at a normal temperature).

Recording paper:
Roll paper, 219.5 mm x 30 m (Type 0511-3167).

Operating environments:
Temperature; 0 to 40°C.
Humidity ; 35 to 85% RH.

Storage environments:
(Recording paper not included)
Temperature; -10 to 70°C.
Humidity ; 35 to 85% RH.

Power source: (for RT3216N, RT3208N)
Voltage; 90 to 132 V AC/180 to 264 V AC automatically selected.
Frequency; 50/60/400 Hz.
Note:
Although the instrument can be operated on 100 V AC system/200 V AC system, ordering must be made with information on the power source voltage, as the fuse for 100 V AC system is different from that for 200 V AC system.
For RT3108N, power voltage to be specified.

High potential test between power input terminals and housing case:
1500 V AC, one minute.

Insulation resistance:
Greater than 100 MΩ between power input terminals and housing case by using a 1000 V DC Megger.
Greater than 100 MΩ between input terminals and housing case by using a 1000 V DC Megger.

Power consumption: (RT3216N)

Approx. 230 VA (50 mm/sec, 200 Hz sine waves, full-scale recording).

Approx. 85 VA (Standby state).

Note: 130 VA for RT3108N, 230 VA for RT3208N.

External dimensions: (RT3108N, RT3208N)

360 ±3 mm (W) x 192 ±3 mm (H) x 276 ±3 mm (D).

Protruded portions excluded.

Note: 360 mm(W) x 192 mm(H) x 276 mm(D) for RT3216N.

Weight:

Approx. 11 kg. (RT3216N), Approx. 7.6 kg.(RT3208N), Approx. 7 kg.(RT3108N)

11.1.2 Trigger Section

Trigger detecting accuracy:

±2%.

Trigger source: (RT3216N)

INT trigger (Various trigger modes available);

Any channel selected from channels 1 to 16. (1 to 8 chs. for RT3108N and RT3208N.)

EXT trigger;

Trigger signal; TTL level (trailing edge). Input connector; Coaxial.

Manual trigger; Manual trigger key (on operation panel).

Trigger setting-up: (DC amplifier unit, DC bridge strain amplifier unit, F/V converter unit, zero suppression amplifier unit)

Trigger slope;

Leading edge.

Trailing edge.

Trigger setting-up: (Event amplifier unit)

Trigger slope;

Disabled.

State setting-up;

H, L or OFF can be set for each input. In OFF, triggering is turned off.

Trigger setting-up;

AND or OR of state setting-up conditions of inputs 1 to 8.

Trigger output:

A TTL level signal is outputted when trigger condition is satisfied.

Output signal; TTL level, active LOW.

Pulse width; Approx. 10 msec.

Output connector; Coaxial.

Trigger delay:

Pretrigger	Before trigger point	After trigger point
0%	0%	100%
5%	5%	95%
25%	25%	75%
50%	50%	50%
75%	75%	25%
95%	95%	5%
100%	100%	0%

Trigger mark:

An arrow mark (↓) together with the date and time of trigger occurrence are printed on a trigger point.

Trigger operation:

SINGLE/REPEAT selectable.

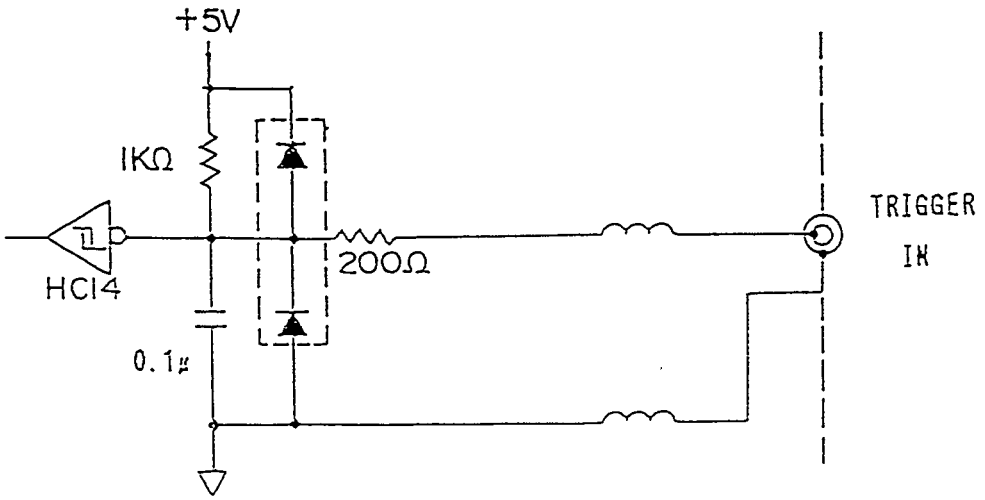
SINGLE; Trigger operation is made once.

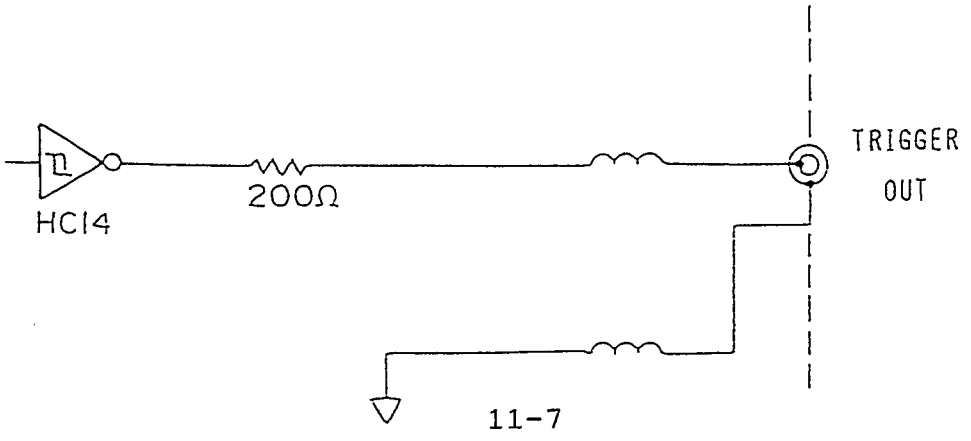
REPEAT; After completion of trigger operation, this waits for a next trigger again.

Trigger modes: (RT3216N)

Trigger modes shown below and OFF are available:

Trigger mode	Source channel	Slope	Trigger level	Description
OR	Any channel of channel 1 to channel 16	↑OR↓	0% to 100% in 1% steps	A trigger occurs when any condition of any channel is satisfied.
AND	Any channel of channel 1 to channel 16	↑OR↓	0% to 100% in 1% steps	A trigger occurs when all conditions of any channel are satisfied.
A*B	Any 2 channels of channel 1 to channel 8, or any 2 channels of channel 9 to channel 16	TRIG A ↑OR↓ or TRIG B ↑OR↓	TRIG A, B 0% to 100% in 1% steps	A trigger occurs when TRIG B condition is satisfied after TRIG A condition has been satisfied.
WINDOW	Any 1 channel of channel 1 to channel 16	↑OR↓	2 levels of high and low 0% to 100%	A trigger occurs when the signal deviates from or enters into the range of high and low trigger levels.





11.1.3 DC Amplifier Unit (RT31-109)/DC Amplifier Unit with BNC Input (RT31-126: Option)

Number of channels:
1 input/unit.

Input system:
Single-ended input, guarded floating between input and output.

Measurement sensitivity and accuracy:
0.1, 0.2, 0.5, 1, 2, 5 V /FS x1, x100 (12 steps).
Accuracy; Within ±0.5% FS. (However, within ±1% FS in 500 V/FS)
Direct recording of 200 V AC available (setting on AMP-2 display)

Input impedance:
Approx. 1 MΩ.

Allowable input voltage:
ATT x100 range; 500 V (DC or AC peak value).
ATT x1 range ; 100 V (DC or AC peak value).

Frequency response:
DC to 100 kHz (within +0.5, -3 dB).

Linearity:
Within ±0.2% FS.

Common mode voltage (CMV):
500 V (DC or AC peak value).
(RT31-126: 30Vrms or 60VDC)

Common mode rejection ratio (CMRR):
Greater than 80 dB.

Low pass filter:
OFF (100 kHz, within -3 dB), fc = 5 Hz, 500 Hz, 5 kHz.

Drift:

Within ±0.5% FS/day/10°C.

A/D conversion:

Resolution; 12 bits.

Conversion time; 5 μsec max.

Conversion method; Successive approximation.

Input connector:

RT31-109 ; Double-deck binding posts (+, -).

RT31-126 (Option). Coaxial connector.

Base-line position:

Base-line position can be set anywhere on within full scale in 1/10 steps. Fine adjustment also available in 0.125 mm steps.

Channel annotation:

Channel number, type of input unit, sensitivity, filter value, base-line position (digital value) and input ON/OFF/GND.

11.1.4 Event Amplifier Unit (RT31-110: Option)

Number of channels:

8 inputs/unit.

Input system:

Common within unit, case free.

Input signal:

Voltage and contact inputs can be set for each channel of the inner part of an event amplifier unit.

Voltage input	Input voltage range	0 to +24 V
	Detecting level	H level: Greater than approx. 2.5 V L level: Lower than approx. 0.5 V
	Input current	Less than 1 μA
Contact input	Detecting level	Open : Greater than 2 kΩ Short: Less than 250 Ω
	Load current	2 mA (max.)

Response time:

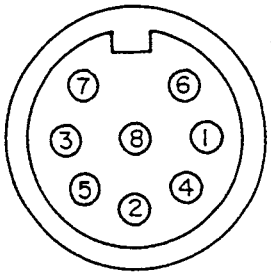
5 μsec.

Input connector:

Round DIN connector, 8 pins, 2 pieces.

Event-amplifier-unit side; XT2B-0800.

Complies with DIN45326.



Input connector as viewed from plug-insertion side

Pin No.	Signal name
1	Channel 1 input
2	Channel 2 input
3	Channel 3 input
4	Channel 4 input
5	GND
6	+15 V output
7	Not assigned
8	Not assigned

Connector for channels 1 to 4

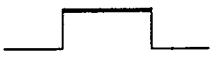
Pin No.	Signal name
1	Channel 5 input
2	Channel 6 input
3	Channel 7 input
4	Channel 8 input
5	GND
6	+15 V output
7	Not assigned
8	Not assigned

Connector for channels 5 to 8

Waveform recording:

Waveform recorded at 2 mm deflection for H and L logic levels.

H/L definition;

H level
L level 

Data recording:

Data recorded with "1" and "0" for H and L logic levels.

X-Y recording:

Disabled.

Channel annotation:

Channel number, type of input unit and ON/OFF of printing.

Probe for logic IC:

Accessory for event amplifier unit.

Application;

Connected to event amplifier unit to measure digital or relay-contact signals to be sent from electronic circuits or sequence circuits.

Configuration;

Cable for logic IC (0311-5007).... 1.5 m, 1 pc.
Cable for IC clip (0311-5008)..... 15 cm, 4 pcs./bag
Cable for test clip (0311-5009)... 15 cm, 4 pcs./bag.
Two sets of above configuration are supplied.

Connection:

Color code of wires	Corresponding input channels	
Brown	Channel 1	Channel 5
Red	Channel 2	Channel 6
Orange	Channel 3	Channel 7
Yellow	Channel 4	Channel 8
Black	GND	GND

11.1.5 DC Bridge Strain Amplifier Unit (RT31-111: Option)

Number of channels:
1 input/unit.

Applicable transducer:
Strain-gage-based transducer.
Bridge resistance; 120Ω to 1 kΩ.
Rated output ; 0.45 to 3.3 mV/V.

Gage factor:
2.00.

Bridge excitation voltage:
3 V and 10 V. (Bridge resistance; 350Ω to 1 kΩ)
Accuracy; Within ±0.3% FS.
Stability; Within ±0.01%/°C.

Balancing system:
Electronic auto-balance.
Auto-balancing time; Within 0.5 sec.
Residual voltage; Within ±0.5% FS (in 1.000 mV/V).

Balance adjustment range:
Resistance; Within ±1% (±5000 μm/m).

Sensitivity:
0.450 to 3.300 mV/V (in 0.001 mV/V steps).
Accuracy; Within ±0.5% FS.
Stability; Within ±0.01%/°C.

Attenuation:
1 and 1/2.
Accuracy; Within ±0.2% FS.
Stability; Within ±0.01%/°C.

Linearity:
Within ±0.2% FS.

Frequency response:
DC to 10 kHz (Within +0.5, -3 dB).

Low pass filter:
fc = 10 Hz, 30 Hz, 300 Hz and 10 kHz.
3-pole Bessel type.

Common mode voltage (CMV):
300 V (DC or AC peak value).

Common mode rejection ratio (CMRR):
Within 10 dB (50/60 Hz).

Drift:
Within ±0.5% FS/°C (in 1.000 mV/V).

Base-line position:
Base-line position can be set anywhere on within full scale in 1/10 steps. Fine adjustment also available in 0.125 mm steps.

Channel annotation:
Channel number, type of input unit, sensitivity, attenuation, filter value, base-line position (digital value) and ON/OFF of printing.

11.1.6 F/V Converter Unit (RT31-112: Option)

Number of channels:
1 input/unit.

Input system:
Single-ended input, floating between input and output.

Input frequency range:
1 Hz to 10 kHz.

Input voltage range:
0.3 to 30 V p-p (Approximately 0 V portion of an input waveform is set as a trigger level.)

Input pulse width:
Within 20 μsec.

Sensitivity:
100, 200, 500, 1k, 2k, 5k, 10k Hz/FS (7 steps).
Accuracy; Within ±0.5% FS.
Stability; Within ±0.02% FS/°C.

Linearity:
Within ±0.3% FS.

Input impedance:
Approx. 100 kΩ.

Maximum allowable input voltage:
100 V (DC or AC peak value).

Common mode voltage (CMV):
350 V (DC or AC peak value).

Drift:
Within ±0.3% FS/day/10°C.

Input connector:
Double-deck binding posts (+, -).

Response time and ripple:
In standard, ripple is automatically set to within approximately 0.3% FS.
Response time can be shortened by any selected setting.

Range Hz/FS	Standard setting		Selected setting	
	Response time	Ripple	Response time	Ripple
100	Approx. 600 msec	Approx. 0.3%FS	Approx. 200 msec	Approx. 5.0%FS
200	Approx. 300 msec	Approx. 0.3%FS	Approx. 100 msec	Approx. 4.0%FS
500	Approx. 200 msec	Approx. 0.3%FS	Approx. 50 msec	Approx. 3.0%FS
1k	Approx. 200 msec	Approx. 0.3%FS	Approx. 30 msec	Approx. 3.0%FS
2k	Approx. 200 msec	Approx. 0.3%FS	Approx. 20 msec	Approx. 3.0%FS
3k	Approx. 30 msec	Approx. 0.3%FS	Approx. 20 msec	Approx. 2.0%FS
10k	Approx. 20 msec	Approx. 0.3%FS	Approx. 10 msec	Approx. 2.0%FS

Response time: The rise time required to reach 90 percent of the full scale.

Base-line position:

Base-line position can be set anywhere on within full scale in 1/10 steps. Fine adjustment also available in 0.125 mm steps.

Channel annotation:

Channel number, type of input unit, sensitivity, base-line position (digital value) and ON/OFF of printing.

11.1.7 Zero Suppression Amplifier Unit (RT31-131: Option)

Number of channels:

1 input/unit.

Input system:

Single-ended input, guarded floating between input and output.

Measurement sensitivity and accuracy:

0.1, 0.2, 0.5, 1, 2, 5 V/FS x1, x100 (12 steps).

Accuracy; Within ±0.5% FS.

Direct recording of 200 V AC available.

Input impedance:

Approx. 1 MΩ.

Allowable input voltage:

0.1, 0.2, 0.5, 1 V/FS ; 100 V (DC or AC peak value).

2, 5, 10, 20, 50, 100, 200, 500 V/FS; 500 V (DC or AC peak value).

Frequency response:

DC to 50 kHz (within +0.5, -3 dB).

Linearity:

Within ±0.2% FS.

Common mode voltage (CMV):

500 V (DC or AC peak value).

Common mode rejection ratio (CMRR):

Greater than 80 dB.

Low pass filter:

2-pole Bessel type.

Cutoff frequency; 5 Hz, 500 Hz and 5 kHz.

Drift:

Within ± 1% FS/10°C (when zero suppression voltage is 0 V).

Suppression voltage:

Suppression range; ±10 V in 0.1, 0.2, 0.5, 1 V/FS.
±100 V in 2, 5, 10, 20, 50, 100, 200, 500 V/FS.

Accuracy; Within ±0.5% FS.

Stability; Within ±50 PPM FS/°C

Resolution; Approx. 50 μV in 0.1, 0.2, 0.5, 1 V/FS.
Approx. 1 mV in 2 and 5 V/FS.
Approx. 5 mV in 10, 20, 50, 100, 200, 500 V/FS.

A/D conversion:

Resolution; 12 bits

Conversion time; 5 μsec max.

Conversion method; Successive approximation.

Input connector:

Double-deck binding posts (+, -).

Base-line position:

Base-line position can be set anywhere on within full scale in 1/10 steps. Fine adjustment also available in 0.125 mm steps.

Channel annotation:

Channel number, type of input unit, sensitivity, fileter value, base-line position (digital value), input ON/OFF/GND and suppression voltage.

11.2 Display Function Specifications

11.2.1 Selection of Screen Displays

Each basic screen display can be directly displayed by the SYSTEM, MONITOR, TRIGGER, MODE and AMP keys on the operation panel.

11.2.2 SYSTEM

Setting-up of recorder type:

REAL-TIME RECORDER
MEMORY RECORDER
TRANSIENT RECORDER

Setting-up of various functions of basic instrument:
(Refer to 11.4 Other Functions.)

1. STATUS LOAD/SAVE
2. MEMORY CARD
3. Setting-up of PRINT LINE
4. Setting-up of PRINT ENVIRONMENT
5. USER CHANNEL ANNOTATION
6. USER PAGE ANNOTATION
7. SCALING

8. DISPLAY/BUZZER ON/OFF
9. MEMORY DIVISIONS
10. MEMORY CLEAR
11. DATA No.
12. AUTO-START (standby function)
13. DATE/TIME
14. EXT. SYNC.
15. ST-AMP BRIDGE VOLTAGE
16. F/V CONVERTER
17. INTERFACE SELECT
18. RS-232C
19. GP-IB
20. INITIALIZE
21. SYSTEM CHECK
22. TEST PRINT
23. ROM VERSION
24. Floating DC AMP unit
25. Thermocouples AMP unit

11.2.3 MONITOR

Displaying and setting of real-time input-signal waveforms.
Displaying and setting of waveforms, data and X-Y monitoring of memory data.
Recording input waveforms while monitoring them.
Simultaneous monitoring of waveforms of 16 channels.

11.2.4 TRIGGER

Displaying and setting of trigger conditions:
Trigger mode; OR, AND, A*B, WINDOW and OFF.
Measurement; (SINGLE and REPEAT).
Pretrigger; 0, 5, 25, 50, 75, 95 and 100%.

11.2.5 MODE

Displaying and setting of various conditions with regard to recorder types:

- Recording format (WAVE, DATA, X-Y)
- Chart speed: 100, 50, 25, 10, 5, 2, 1 mm/sec
  100, 50, 25, 10, 5, 2, 1 mm/min
- Sample speed: 5, 10, 20, 50, 100, 200, 500 μsec
  1, 2, 5, 10, 20, 50, 100 msec
- Full scale (1/1, 1/2, 1/4, 1/8, 1/16)
- Real-time trigger (ON/OFF)
- MEMORY READ INTERVAL during data recording (ALL DATA, 2 DATA, 4 DATA)
- MEMORY READ INTERVAL during X-Y recording (ALL DATA, 2 DATA, 4 DATA)
- Setting (MEMORY, COPY)
- AUTO COPY (ON, OFF)
- Memory block
- MEMORY SEGMENTS (32,16, 8, 4, 2, 1 KW)
- Time axis(4 MAG, STD, 1/4 RED)
- Amount of copy (MEMORY READ) (10 to 100%)

11.2.6 AMP

Displaying and setting of input-unit parameters, and displaying of channels 1 to 8 or channels 9 to 16 selectively:

AMP-1 and AMP-2:(RT3216N)

Sensitivity, attenuation, base-line position and ON/OFF of input/printing can be set, and chart speed and sample speed can be changed. (AMP-1 for RT3108N, RT3208N)

AMP-3 and AMP-4:(RT3216N)

Setting units all together and setting filter values are available. (AMP-2 and AMP-3 for RT3108N, RT3208N)

(DC amplifier unit)

- Base line (fine adjustment available)
- Sensitivity (V/FS)
- Attenuation (magnification) (x1, x100)
- Filter (5, 500, 5k Hz, OFF)
- Input (ON/OFF/GND)

(Event amplifier unit)

- Printing (ON/OFF)
- Input (V: voltage, C: contact)

(DC bridge strain amplifier unit)

Base line (fine adjustment available)
Sensitivity (FS) 0.450 to 3.300 mV/V
Attenuation (x1/2, x1)
Printing (ON/OFF)

(F/V converter unit)

Base line (fine adjustment available)
Sensitivity 10k, 5k, 2k, 1k, 500, 200, 100 Hz FS
Printing (ON/OFF)

(Zero suppression amplifier unit)

Base line (fine adjustment available)
Sensitivity (V/FS)
Attenuation (magnification) (x1, x100)
Filter (5, 500, 5k Hz, OFF)
Input (ON/OFF/GND)
Zero suppression range (±10 V, ±100 V)

11.3 Specifications by Recording Functions

11.3.1 Real-time Recorder

(1) Waveform recording

Function:

Waveform recording of input signal.

Chart speed:

100, 50, 25, 10, 5, 2, 1 mm/sec.
100, 50, 25, 10, 5, 2, 1 mm/min.
Chart speed can be changed during recording.

Sampling: Main: Printing interval; 0.025 mm (10 mm/sec or less).
0.05 mm (25 mm/sec or less).
0.1 mm (50 mm/sec or less).
0.125 mm (100 mm/sec or less).

Sub: 5 μsec.

Frequency response:

DC to 20 kHz.

(Number of sampling points; 10 points/interval)

Record length control:

Continuous or shot (20, 50, 100 DIV).

20 DIV: 200 mm.

50 DIV: 500 mm

100 DIV:1000 mm.

Time axis:

10 mm/DIV.

Interpolation function:

Provided.

(2) Data recording

Function:

Digital value recording of input signal.

Sampling:

1, 2, 5, 10, 30 sec.

1, 2, 5, 10, 30 min.

Record length control:

Continuous or shot (100, 250, 500 data items).

(3) X-Y recording

Function:

X-Y recording where display memory is used as X-Y memory.

X-Y recording where data of any specified one channel is used as X axis and data of another channel is used as Y axis.

Recording continues until the STOP key is pressed. (Pause function provided)

An event amplifier unit or event amplifier units are disabled.

X-axis channel:

Any one channel selected from channels 1 to 16 of input units.

Note: Channels 1 to 8 for RT3108N and RT3208N.

Effective record range:

160mm x 160mm or 80mm x 80 mm selectable

(RT3108N is only for 80mm x 80mm)

Record density:

320 dots (X axis) x 320 dots (Y axis).

Sampling:

5, 10, 20, 50, 100 msec.

(5 msec, however, for 8 channels).

Waveform interpolation function:

LINE or DOT selectable LINE: provided

DOT : not provided

(4) Trigger recording

Function:

This function is not actuated until a trigger is detected. When a trigger is detected, preset real-time waveform recording or real-time data recording is started. Recording continues by the length preset by the record length control.

Recording is made only once when the trigger operation is set in SINGLE, and when the trigger operation is set in REPEAT, the recorder is put into a standby state for a next trigger again.

Real-time setting:

Same as for real-time waveform recording and real-time data recording.

Trigger setting:

Same as for memory recording.

11.3.2 Memory Recorder

(1) Waveform recording

Function:

Reading-in of input signal into memory, and waveform recording.

Memory capacity:

32K words/channel (standard).

512K words in total. (1 word = 12 bits).

Note: Total 256 KW for RT3108N and RT3208N, total 512 KW for RT3216N.

Memory division (segments into which a memory is separated):

Selection	Full memory	2 segments	4 segments	8 segments
Channels 1 and 9	256 KW	128 KW	64 KW	32 KW
Channels 1, 5, 9 and 13	128 KW	64 KW	32 KW	16 KW
Odd channels	64 KW	32 KW	16 KW	8 KW
Channels 1 to 16	32 KW	16 KW	8 KW	4 KW

Selection	16 segments	32 segments
Channels 1 and 9	16 KW	8 KW
Channels 1, 5, 9 and 13	8 KW	4 KW
Odd channels	4 KW	2 KW
Channels 1 to 16	2 KW	1 KW

Note: Ch9 to Ch16 can not be applied to RT3108N and RT3208N.

Memory read:

In memory segments, any memory block can be specified.

This can be set from 10 to 100% in 10% increments inside the block.

Time-axis magnification and reduction:

Standard; 100 data items/DIV, Magnification; 4 times,

Reduction; 1/4 times.

Sampling:

RT3216N.

Sampling	Time axis	Maximun recording time			
		1,9CH	1,5,9,13CH	Odd channels	1~16 CH
		256 KW/unit	128 KW/unit	64 KW/unit	32 KW/unit
5 μs	500 μs/DIV	1.31s	655ms	327ms	163ms
10	1 ms/DIV	2.62	1.31s	655	327
20	2	5.24	2.62	1.31s	655
50	5	13.1	6.55	3.27	1.63s
100	10	26.2	13.1	6.55	3.27
200	20	52.4	26.2	13.1	6.55
500	50	2min11 s	1min5 s	32.7	16.3
1 ms	0.1 s/DIV	4 22 s	2 11	1min5 s	32.7
2	0.2	8 44 s	4 22	2 11	1min5 s
5	0.5	21 50	10 55	5 27	2 43
10	1	43 41	21 50	10 55	5 27
20	2	1h 27min22 s	43 41	21 50	10 55
50	5	3 38 27	1h 49min13 s	54 36	27 18
100	10	7 16 54	3 38 27	1h49min13 S	54 36

Note: CH9 to CH16 can not be applied to RT3108N and RT3208N.

Interpolation function:

Available.

Measurement operation:

SINGLE/REPEAT selectable.

SINGLE; Measurement is carried out only once.

REPEAT; Repetitive measurement.

(When effective memory capacity becomes full with AUTO COPY in OFF, SHOT or CONTINUOUS recording can be selected.

(2) Data recording

Function:

Reading-in of input signal into memory, and digital-value recording.

Memory capacity:

Same as for memory waveform recording.

Sampling:

Same as for memory waveform recording.

Record length control:

Same as for memory waveform recording.

Memory division:

Same as for memory waveform recording.

Memory read:

Same as for memory waveform recording.

Measurement operation:

Same as for memory waveform recording.

Memory read interval:

Standard; 10 data items.

Magnification; All data items.

Reduction; 20 data items.

(3) X-Y recording

Function:

Reading-in of input signal into memory, and X-Y recording where data of any selected one channel is set as X axis and data of another channel is set as Y axis.

An event amplifier unit or event amplifier units are disabled.

Memory capacity:

Same as for memory waveform recording.

Sampling:

Same as for memory waveform recording.

X-axis channel:
Any one channel selected from channels 1 to 16 of input units.

Effective record range:
160 mm x 160 mm or 80 mm x 80 mm selectable.

Record density:
320 dots (X axis) x 320 dots (Y axis).

Memory division:
Same as for memory waveform recording.

Memory read:
Same as for memory waveform recording.

Measurement operation:
Same as for memory waveform recording.

Memory read interval:
Standard; 2 data items.
Magnification; All data items.
Reduction; 4 data items.

Waveform interpolation function:
Not provided.

11.3.3 Transient Recorder

Function:
The transient recorder operates usually in the real-time waveform recording mode and writes waveforms into the memory upon detection of a trigger.

SINGLE; After recording memory waveforms, real-time waveform recording is restarted.

REPEAT; After recording memory waveforms, the recorder restarts real-time waveform recording and waits for a trigger again.

Real-time setting:

Same as for real-time waveform recording.

Trigger setting:

Same as for memory waveform recording.

11.4 Other Functions

11.4.1 Mark Printing (EVENT M. TRIG key)

An event mark can be recorded in the real-time recorder mode.

11.4.2 List Printing (LIST key)

The following information can be printed:
Date, time, data number, recording mode, input-unit condition, chart speed, trigger condition, sampling start time, trigger occurrence time, sampling stop time, and maximum value/minimum value/address of memory data of each channel.

11.4.3 Paper Advancement (FEED key)

Chart paper advances without recording during the time the FEED key is pressed.

11.4.4 Display Copy (DISP COPY key)

A display can be recorded into hard copy.

11.4.5 Initialization (SYSTEM screen display: INITIALIZE)

The basic instrument can be initialized.

11.4.6 Setting Data No. (SYSTEM screen display: Data No.)

A number can be provided for each measured data.
Data numbers are in auto-increments.
Any data number can be assigned to data.

11.4.7 Setting Print Line (SYSTEM screen display: PRINT LINE)

The thickness of print lines can be selected from 1, 2, 3 and 4 dots for each channel. (Standard: 1 dot)

11.4.8 Auto Scaling (SYSTEM screen display: PRINT ENVIRONMENT)

Scaling can be conducted automatically in accordance with sensitivities and base-line positions, and printing is provided when recording is terminated. (ON/OFF available)

11.4.9 User Channel Annotation (SYSTEM screen display: USER CHANNEL ANNOTATION)

Comments of one line by 64 characters can be entered for each channel without using an interface.

11.4.10 User Page Annotation (SYSTEM screen display: USER PAGE ANNOTATION)

Comments of 108 lines by 127 characters can be entered without using an interface.

11.4.11 Setting Scale/Unit (SYSTEM screen display: SCALING)

Scale value and unit printing can be selected for setting-up.

11.4.12 EL Display Auto OFF Function (SYSTEM screen display: DISPLAY/BUZZER ON/OFF)

The EL display can be automatically turned off.
When the EL display is set, it is automatically turned off if any key is not pressed for approximately 10 minutes.
The EL display is turned on again, if any operation-panel or touch-pad panel key is pressed.

11.4.13 Alarm Function (SYSTEM screen display: DISPLAY/BUZZER ON/OFF)

Audible alarm is given by a buzzer, if an error (chart paper exhausted, pressure of thermal print-head released, abnormal temperature rise in thermal print-head) should occur.
The audible alarm is turned off by pressing the STOP key or if the error is removed. ON/OFF function provided.

11.4.14 Setting Memory Capacity (SYSTEM screen display: MEMORY DIVISIONS)

In the memory or transient recorder mode, the memory capacity can be increased or decreased by limiting the number of channels to be used.

11.4.15 Auto Start (SYSTEM screen display: AUTO-START)

This function is energized when the power is restored from power failure or power interruption (the operation, when the power is restored, differs according to the condition of turning off the power).
When the AUTO-START operation is executed during recording or sampling, the date, time and data number, where the power is turned off, are printed.

11.4.16 Saving and Loading Setup Contents (SYSTEM screen display: STATUS LOAD/SAVE)

The setup conditions of the basic instrument and input units can be saved or loaded and simplified operation is available. Four kinds of setup conditions can be registered.

11.4.17 System Check (SYSTEM screen display: SYSTEM CHECK)

The system of the basic instrument can be checked.

11.4.18 Test Print (SYSTEM screen display: TEST PRINT)

The following items can be printed:
Date, time, ROM version, test pattern, etc.

11.4.19 Auto Copy ON/OFF Function (MODE screen display: AUTO COPY)

This can be set for the memory and transient recorder modes.
ON: When the trigger condition is satisfied, the instrument is automatically put into copying operation.
OFF: The instrument is not put into copying operation for so long as the COPY key is not pressed.

11.4.20 Error Display Function (Operation panel: ERROR LED)

The ERROR LED lights, if an error (chart paper exhausted, pressure of thermal print-head released, abnormal temperature rise in thermal print-head) should occur.

11.5 External Interface

11.5.1 RS-232C Functional Specifications

Standard:
Designed to be in compliance with JIS X5101 (former C6361).

Data format:
Bit serial.

Transfer rate:
19200,9600,4800,2400,1200 bps

Transfer system:

Start-stop synchronous system, full duplex system.

Start bit:

1 (bit).

Data bit:

7, 8 (bits).

Stop bit:

1, 2 (bits).

Parity bit:

No parity bit, EVEN, ODD.

Electrical characteristics:

Designed to be in compliance with JISX5101.

RD (RECEIVED DATA)
- true; -3 to -15 V
- false; +3 to +15 V

CS (CLEAR TO SEND)
- ON; +3 to +15 V
- OFF; -3 to -15 V

SD (TRANSMITTED DATA)
- true; -5 to -8 V
- false; +5 to +8 V

RS (REQUEST TO SEND)
- ON; +5 to +8 V
- OFF; -5 to -8 V

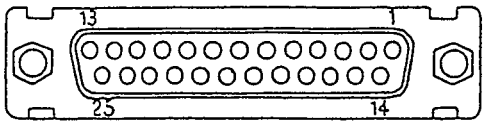
ER (DATA TERMINAL READY)
- ON; +5 to +8 V

Connector:

D sub-connector, 25 pins.

Basic-instrument side;

Socket DBLC-J25SAF-13L9F.



Viewed from plug-insertion side

Pin No.		Signal name	Signal direction viewed from basic instrument
1	FG	FRAME GND	
2	SD	TRANSMITTED DATA	OUT
3	RD	RECEIVED DATA	IN
4	RS	REQUEST TO SEND	OUT
5	CS	CLEAR TO SEND	IN
6		N. C.	
7	SG	SIGNAL GND	
8 ~ 19		N. C.	
20	ER	DATA TERMINAL READY	OUT
21 ~ 25		N. C.	

11.5.2 GP-IB Unit Specifications (Option)

Model number:

RT31-106.

Standard:

Designed to be in compliance with IEEE488.

Transfer system:

Data; 8-bit parallel, 3-wire handshake.

Signal logic:

Negative logic; true; LOW level.
false; HIGH level.

Electrical characteristics:

Driver; V_{OL} = Less than 0.5 V.
V_{OH} = Greater than 2.5 V.
Receiver; V_{IL} = Less than 0.8 V.
V_{IH} = Greater than 2.0 V.

Address setting:

0 to 30 (31 kinds) available for setting.

Delimiter:

CR.LF, CR, LF and EOI (4 kinds) available for setting.

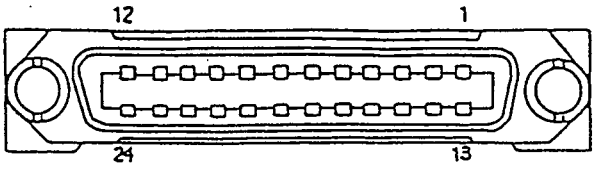
Interface function:

Function code	Functional contents
SH1	Complete source handshake capability
AH1	Complete acceptor handshake capability
T6	Basic talker capability
	Serial poll capability
	Talker reset capability specified by MLA
L4	Basic listener capability
	Listener reset capability specified by MTA
SR1	Complete service request capability
RL1	Complete remote control/local capability
PP0	No parallel poll capability
DC1	Complete device clear capability
DT1	Complete device trigger capability
C0	No controller capability

Connector:

Amphenol, 24 pins.

Basic-instrument side; RC10(F)-24R-LNA.



Viewed from plug-insertion side

Pin No.	Signal name
1	DI01
2	DI02
3	DI03
4	DI04
5	EOI
6	DAV
7	NRFD
8	NDAC
9	IFC

Pin No.	Signal name
10	SRQ
11	ATN
12	SHIELD
13	DI05
14	DI06
15	DI07
16	DI08
17	REN
18 ~ 24	GND

11.5.3 Remote Function Specifications

By using this function, chart paper can be advanced synchronously with external pulses or more than two instruments can be operated in parallel without using the RS-232C or GP-IB interface.

Note:

This function is actuated only in the real-time recorder mode.

Record ON/OFF:

Input; TTL level (Pulse width; Greater than 10 msec).
LOW level; REC (record).
HIGH level; STOP.
This can be used in parallel with RS-232C or GP-IB commands.

Output; TTL level.
LOW level outputted at real-time REC ON.

Recording on paper which is advanced synchronously with external pulses:

Paper advancement synchronously with external pulses (Waveform recording).

Input; TTL level.
Paper advancement pitch; 0.025 mm/pulse.
2000 pulses/sec max.

Output; TTL level.
Pulse width; Approx. 0.1 msec.

Data recording synchronously with external pulses (Data recording).

Input; TTL level.
Data recorded once with one pulse.
1 pulse/sec max.

Output; TTL level.
Pulse width; Approx. 0.1 msec.

External event mark printing:

Input; Trailing edge of TTL level.

Output; TTL level. Pulse width; Approx. 10 msec.
Event mark record output.

Paper feed (advancement):

Input; Trailing edge of TTL level. (LOW level)

Output; TTL level.

LOW output during paper advancement.

Error output:

Open collector output.

Collector current; Less than 25 mA.

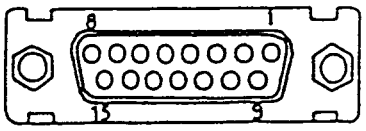
Voltage between collector and emitter; Less than 50 V.

Connector:

D sub-connector, 15 pins.

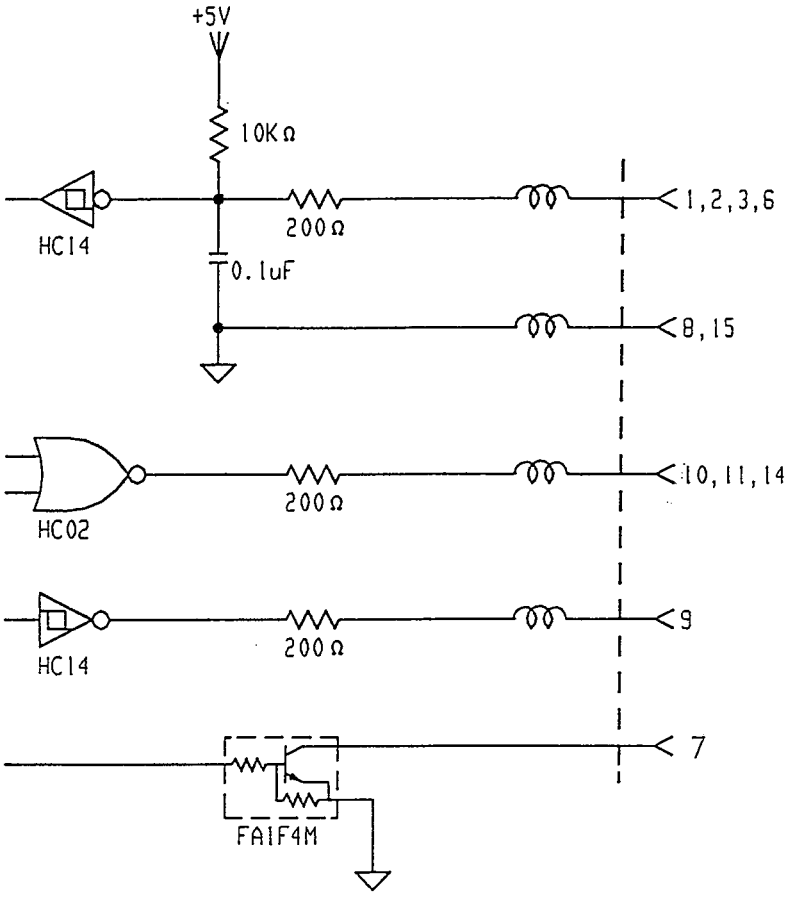
Basic-instrument side; Socket DALC-J15SAF-13L9F.

Plug (XM2A-1501) and hood (XM2S-1511) are supplied.



Viewed from plug-insertion side

Pin No.	Signal name	Function
1	$\overline{\text{SYNC IN}}$	Paper feed (advancement) pulse input
2	$\overline{\text{REC IN}}$	Record ON/OFF input
3	$\overline{\text{MARK IN}}$	Event mark input
6	$\overline{\text{FEED IN}}$	Paper feed input
7	$\overline{\text{ERR OUT}}$	Error output
8	GND	
9	$\overline{\text{SYNC OUT}}$	Paper feed pulse output
10	$\overline{\text{REC OUT}}$	Record ON/OFF output
11	$\overline{\text{MARK OUT}}$	Event mark output
14	$\overline{\text{FEED OUT}}$	Paper feed output
4,5,12,13	N. C.	
15	GND	



11.6 Memory Card Function

The IC memory card allows the setup conditions of the basic instrument and measured data to be saved or loaded.
The following IC memory cards are optionally available:
YMC101, YMC102, YMC103 and YMC104.

Function:
- Format.
- Saving setup conditions (File name; Within 8 characters).
- Saving measured data (File name; Within 8 characters).
- Comment input (Comment input of 31 characters max. for each file).
- Loading file.
- Deleting file.
- Displaying list of files.
- Automatically identifying type and capacity of IC memory card.
- Battery check of IC memory card.
- Write protection check of IC memory card.

Memory capacity available for use:

Card capacity	4 MB	2 MB	1 MB	512 KB	256 KB	128 KB	64 KB
Memory capacity available for use (bytes)	4182016	2088960	1040384	518144	257024	125952	60416

Number of insertion/removal times:

More than 5000 times.

IC memory card available for use (option):

S-RAM card designed to be in compliance with JEIDA Ver. 4.

Format used on MS-DOS conforming to NEC PC-9801.

Memory capacity; 64K bytes to 2M bytes.

YMC101; 64K bytes (Option).

YMC102; 512K bytes (Option).

YMC103; 1M bytes (Option).

YMC104; 2M bytes (Option).

Note:

The 64K bytes type is used only for saving setup conditions and comment input. Measured data cannot be saved.

11.7 Options

11.7.1 Probes

(1) Probe for logic IC (supplied with event amplifier unit)

Application:

Measurement of digital or relay-contact signals sent from electronic or sequence circuits.

Input unit to be combined:

Event amplifier unit (RT21-109).

Composition:

2 sets supplied for 1 unit.
(One set provides 4 input channels.)
Cable for logic IC (0311-5007), 1.5 m ; 1 pc.
Cable for IC clip (0311-5008), 15 cm ; 1 set
Cable for test clip (0311-5009), 15 cm; 1 set

(2) Floating voltage probe (Type 1539)

Application:

Checkout of relay coil voltage or status of ON/OFF operation timing of voltage supplied from control board.

Input unit to be combined:

Event amplifier unit (RT31-110).

Composition:

Probe ; 1 pc.
Input cable for event (0311-5001), 1.5 m ; 1 pc.
Cable for voltage measurement (0311-5002), 1.75 m; 4 pcs.
(The cable for voltage measurement is supplied with a protective fuse.)

Specifications

Number of inputs:

4 channels (floating for each channel).

Input range and input impedance:

L	H
50 to 150 V AC	100 to 250 V AC
20 to 150 V DC	80 to 250 V DC
Approx. 50 kΩ	Approx. 100 kΩ

Response time:
Rise (↑); Within 5 msec.
Fall (↓); Within 10 msec.

Indicator:
A detecting LED, provided for each channel, lights.

Maximum floating voltage:
250 V DC, AC p-p.

High potential test between channels:
1500 V AC, one minute.

Accessories supplied as standard
Operation manual : 1 copy
Probe case (Type 5633-1523): 1 pc.
Fuse (MGD-0.3A) : 1 pc.

(3) Probes for voltage fluctuation measurement (Type 1540 and Type 1543)
Application:
Detecting of instantaneous fluctuation in AC power line and recording of the voltage waveform at the output terminals for recording.

Input unit to be combined:
Event amplifier unit (RT31-110); Recording of trigger output.
DC amplifier unit (RT31-109) ; Recording of output voltage.

Composition:
Probe ; 1 pc.
Input cable for event (0311-5001), 1.5 m; 1 pc.

Input cable for voltage fluctuation measurement (0311-5003), 1.5 m ; 1 pc.
Cable for voltage output (0311-5004), 1.75 m; 1 pc.
(The input cable for voltage fluctuation measurement is supplied with a protective fuse.)

Specifications

Items	Type 1540	Type 1543
Number of inputs	1 channel	
Input impedance	Approx. 10 kΩ	Approx. 30 kΩ
Input range	100/120 V AC	220/240 V AC
Input frequency	50/60 Hz	
Detecting level of voltage fluctuation	Approx. ±10% or ±20% of input range selectable	
Trigger output	Channel 1: Detected when it is higher than +10% or +20% level. Channel 2: Detected when it is lower than -10% or -20%.	
Detecting method	Full-wave rectification, peak value detection	
Response time	Approx. one cycle of input frequency	
Indicator	UPPER TRIG LED (Red): Lights once when it is higher than detecting level. LOWER TRIG LED (Red): Lights once when it is lower than detecting level. INPUT LED (2 colors): Lights red when it is higher than detecting level. Lights green when it is within detecting level. Does not light when it is lower than detecting level.	
Maximum allowable input voltage	160 V rms	300 V rms
Maximum floating voltage	160 V rms	300 V rms
Voltage output	Outputted with ATT in 1/100	

Accessories supplied as standard

Operation manual : 1 copy
Probe case (Type 5633-1523): 1 pc.
Fuse (MGD-0.3A) : 1 pc.

11.7.2 Clamp Meters

(1) AC/DC Digital Clamp Meter (Type 5415)

This allows AC/DC current/voltage and resistance to be measured. In addition to these functions, analog OUTPUT terminals (only for current ranges), which output an input waveform as it is, and a checkout function for diodes are provided.

Specifications

Measurement range:

DC current; 200/2000 A.
DC voltage; 20/200/1000 V.
AC current; 20/2000 A.
AC voltage; 200/750 V.
Resistance; 200/1500 Ω.
Terminal open voltage; Approx. 3 V.
Measuring current ; 1 mA constant.
Diode ; 0 to 1500 mA.
Terminal open voltage; Approx. 3 V.
Measuring current ; 1 mA constant.

Analog output (only for current ranges):

DC range; 0 to 200 mV DC.
Up to a maximum of 500 mV can be outputted even when the output exceeds the display range.
AC range; 0 to 200 mV AC.
Up to a maximum of 350 mV can be outputted even when the output exceeds the display range.

Operation metnod:

Double integral method.

Response time:

Approx. 1 sec.

Sample rate:

Approx. 3 times/sec.

Conductor diameter to be measured:

Approx. 55 mm max.

Operating temperature and humidity ranges:

-10°C to 50°C.

Less than 85% RH.

Temperature and humidity ranges for maintaining accuracy:

23°C ±10°C.

Less than 85% RH.

Power source:

Battery 6F22 (former JIS S-006P) x 1 pc.

Power consumption:

Approx. 13 mA.

Battery life:

Approx. 16 hours for continuous use.

High potential test:

2500 V AC, one minute, between electrical circuit and enclosure, metallic part of core.

Insulation resistance:

Greater than 10 MΩ between electrical circuit and enclosure, metallic part of core using 1000 V Megger.

Dimensions:

70 (W) x 245 (H) x 41.7 (D) mm.

Weight:

Approx. 500 g (including battery).

Accessories supplied as standard

Measuring cable (MODEL-7053) : 1 set
Battery (6F22) : 1 pc.
Carrying case : 1 pc.
Operation manual : 1 copy
Screw driver for zero adjustment (MODEL-8026): 1 pc.
Output cable for clamp meter (0311-5113) : 1 pc.

(2) AC Power Clamp Meters (Type 5416 and Type 5417)
These clamp meters are designed for measurement of AC voltage/current and AC power.
Analog output terminals are provided.
There are two types available; Type 5416 for low power and Type 5417 for high power.

Specifications
Measurement range:

	Type 5416	Type 5417
AC voltage	200/600 V rms	
AC current	2/20 A rms	20/200 A rms
AC power	2/20 kW	20/200 kW

Accuracy:
AC voltage/current;
47 to 63 Hz ; ±1% rdg ±0.5% FS.
40 to 47, 63 to 400 Hz; ±2% rdg ±1.0% FS.
AC power;
Power factor 1 ; Same as for AC voltage/current.
Power factor 0.5; ±2% rdg ±0.5% FS (at 50/60 Hz).

Effective input range:
10% to 100% of rating.

Analog output:

Output; ±100 mV/2000 digits.

Accuracy; ±1% FS. (Added to above accuracy, load impedance; 1 MΩ)

Output impedance; Approx. 5 kΩ.

Operation system:

Feedback type, time-division multiplier system.

Response time:

Approx. 1.5 sec (Approx. 2.5 sec for power range).

Sample rate:

Approx. 2.5 times/sec.

Frequency response:

40 to 400 Hz.

Conductor diameter to be measured:

40 mm max.

Operating temperature and humidity ranges:

5 to 40°C.

20 to 80% RH.

Temperature and humidity ranges for maintaining accuracy:

23°C ±5°C.

45 to 75% RH.

Power source:

Battery R6P (former JIS-SUM-3) x 4 pcs.

Battery life:

Approx. 15 hours for continuous use.

High potential test:

2200 V AC, one minute.

Dimensions:

65 (W) x 302 (H) x 40 (D) mm.

Weight:

Approx. 730 g.

Accessories supplied as standard

Voltage measuring cable(Red/black, double-deck)	: 1 set
Voltage measuring cable(Blue, single-deck)	: 1 pc.
Analog output cable	: 1 set
Battery (R6P)	: 4 pcs.
Carrying cases (for basic instrument and probes)	: 1 set
Operation manual	: 1 copy

11.7.3 Transformers

(1) Wideband transformer for voltage input (Type PT-200W)

Specifications

Number of input channels:

4 channels.

Input voltage:

220, 110, 110/√3 V AC.

Frequency response:

Amplitude deviation; Within ±1% (40 Hz to 1 kHz).
Within -3dB (1 kHz to 4 kHz).

Phase deviation; Within ±1° (40 Hz to 1 kHz)
Within ±3° (1 kHz to 4 kHz).

High potential test:

2000 V AC, one minute.

Overload capacity:

3 time the rated voltage for one second .

Output voltage:
1 V rms.

Transformation ratio error:
Within ±1.0%.

Load impedance:
Greater than 100 k .

Shunt resistance:
Approx. 100 .

Dimensions:
250 (W) x 120 (D) x 150 (H) mm.

Weight:
Approx. 2 kg.

(2) Wideband transformer for current input (Type CT-10W)
Specifications
Number of input channels:
4 channels.

Input current:
10, 5, 2.5 A AC.

Frequency response:
Amplitude deviation; Within ±1% (40 Hz to 1 kHz).
Within -3dB (1 kHz to 4 kHz).
Phase deviation; Within ±1° (40 Hz to 1 kHz).
Within ±3° (1 kHz to 4 kHz).

High potential test:
2000 V AC, one minute.

Overload capacity:

10 times the rated current for one second .

Output voltage:

1 V rms.

Transformation ratio error:

Within ±1.0%.

Load impedance:

Greater than 100 kΩ.

Shunt resistance:

Approx. 100 Ω.

Dimensions:

250 (W) x 120 (D) x 150 (H) mm.

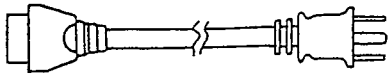
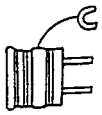
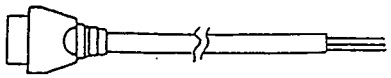
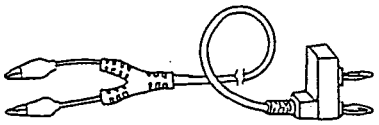
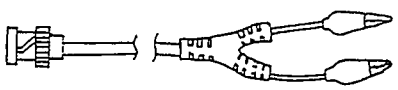
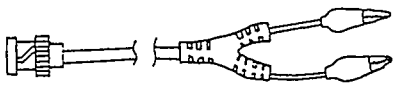
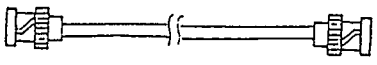
Weight:

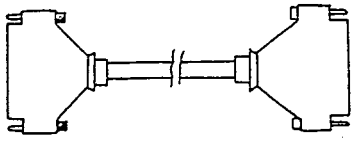
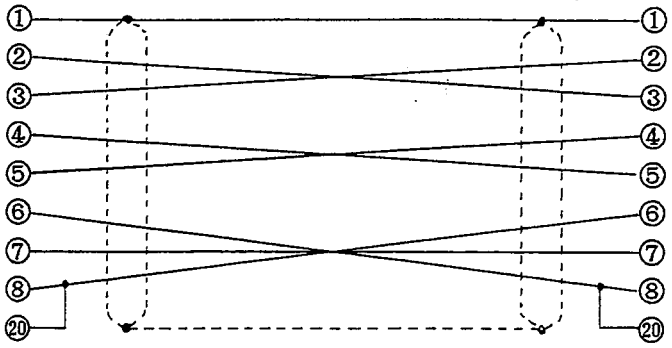
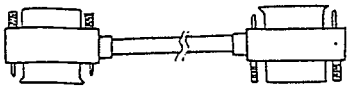
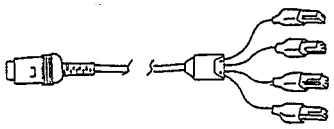
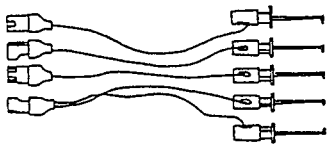
Approx. 2 kg.

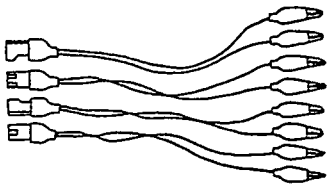
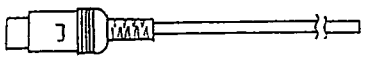
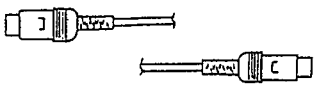
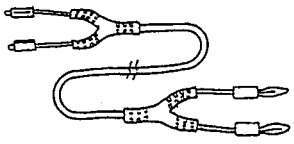
SECTION 12

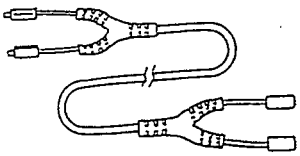
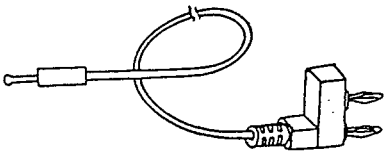
CABLES, PROBES AND SPARE PARTS

12.1 Cables

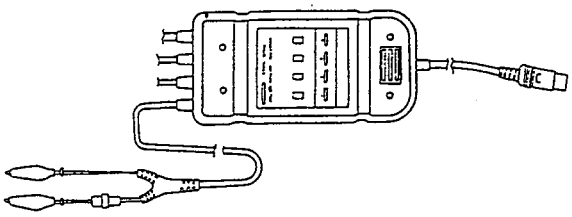
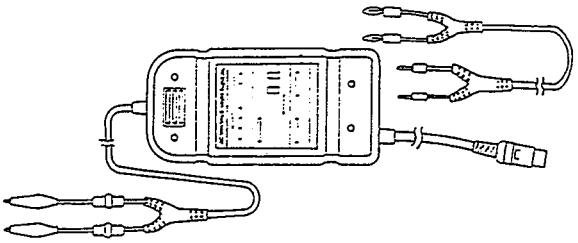
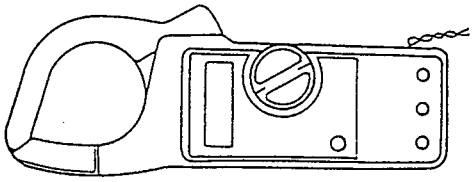
Name (Type)	Shape		Remark
AC power cable for 100 V AC system (0311-5044)			Length: 2.5m Note: Type of AC power cable with adaptor; 47326
Adaptor (0250-1053)		KPR-25S	
AC power cable for 200 V AC system (0311-5112)			Length: 3.5m
Cable for signal input (0311-5107)		Double-deck banana plug ←→ Test clips Red: + Black: -	Length: 2m
Cable for trigger input (0311-2057)		BNC ←→ Test clips Red: + Black: - Mold color: Black	Length: 2m
Cable for trigger input (0311-5022)		BNC ←→ Test clips Red: + Black: - Mold color: Red	Length: 2m
Output cable (47226)		BNC←→BNC	Length: 2m

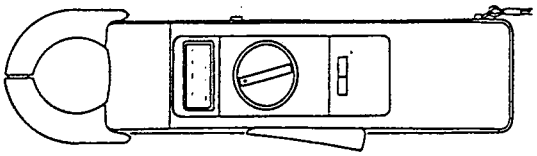
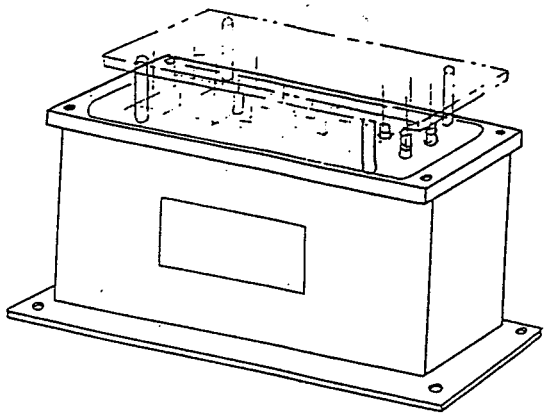
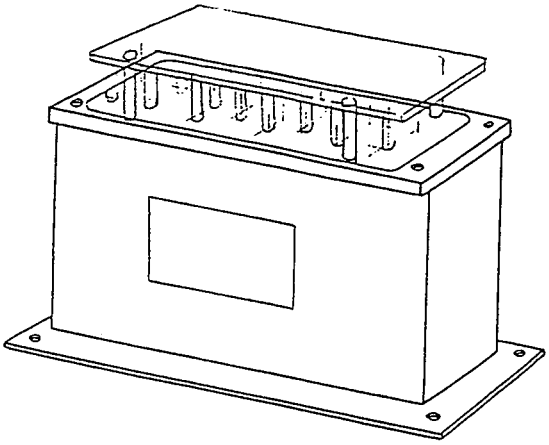
<table>
<tr><th>Name (Type)</th><th>Shape</th><th>Remark</th></tr>
<tr><td>RS-232C cable
(47674)</td><td> 
Plug: XM2A-2501
(Hood: XM2S-2511)
←→
Plug: XM2A-2501
(Hood: XM2S-2511)
Connection
 
Other pins not assigned</td><td>Length: 2m</td></tr>
<tr><td>GP-IB cable
(47752)
(0311-5089)</td><td> 
Note:
0311-5089
One end reversed</td><td>Length: 2m</td></tr>
<tr><td>Cable for
logic IC
(0311-5007)</td><td> 
Round DIN 8-pin
plug
←→ EI connector
Color code of wires:
Brown, black; channel 1 or channel 5
Red, black ;channel 2 or channel 6
Orange, black;channel 3 or channel 7
Yellow, black;channel 4 or channel 8</td><td>Length: 1.5m</td></tr>
<tr><td>Cable for IC
clip
(0311-5008)</td><td> 
EI connector
←→ IC clip
Color code of wires:
Brown (+)
Black (GND) ; channel 1 or channel 5
Red (+) ; channel 2 or channel 6
Orange (+) ; channel 3 or channel 7
Yellow (+) ; channel 4 or channel 8</td><td>Length: 15cm</td></tr>
</table>

<table>
<tr><th>Name (Type)</th><th colspan="2">Shape</th><th>Remark</th></tr>
<tr><td rowspan="2">Cable for test clip (0311-5009)</td><td>  </td><td>EI connector ←→ Test clip</td><td rowspan="2">Length: 15cm</td></tr>
<tr><td colspan="2">Color code of wires:
Brown(+) / Black(GND) ; channel 1
Red(+) / Black(GND) ; channel 2
Orange(+) / Black(GND) ; channel 3
Yellow(+) / Black(GND) ; channel 4
or channel 5 / channel 6 / channel 7 / channel 8</td></tr>
<tr><td rowspan="2">Input cable for event
(0311-5001)</td><td>  </td><td>Round DIN 8-pin</td><td rowspan="2">Length: 1.5m</td></tr>
<tr><td colspan="2">Color code of wires:
Brown ; channel 1
Red ; channel 2
Orange; channel 3
Yellow; channel 4
or channel 5 / channel 6 / channel 7 / channel 8
Shield; GND (0 V)
White ; +15 V output
Note:
If the white-coded +15V output wire is not used, be sure to do the terminal processing.</td></tr>
<tr><td>Extension input cable for event (0311-5005)</td><td>  </td><td>Round DIN 8-pin plug ←→ Round DIN 8-pin socket</td><td>Length: 1.5m</td></tr>
<tr><td>Cable for voltage output (0311-5004)</td><td>  </td><td>Pin tip ←→ Banana plug</td><td>Length: 1.5m</td></tr>
</table>

Name (Type)	Shape		Remark
Extension cable for voltage output (0311-5006)		Pin tip ←→ Pin tip,jack	Length: 1.4m
Output cable for clamp meter (0311-5113)		Double-deck banana plug ←→ Mini-plug for micro-phone	Length: 2m For 5415

12.2 Probes, Clamp Meters and Transformers

Name (Type)	Shape	Remark
Probe for floating voltage measurement (1539)		4 inputs
Probe for voltage fluctuation measurement (1540: for 100/ 120 V AC) (1543: for 220/ 240 V AC)		1 input
AC/DC digital clamp meter (5415)		

Name (Type)	Shape	Remark
AC power clamp meter (5416, 5417)		Type 5416: Low power Type 5417: High power
Wideband transformer for voltage input (PT-200W)		4 inputs
Wideband transformer for current input (CT-10W)		4 inputs

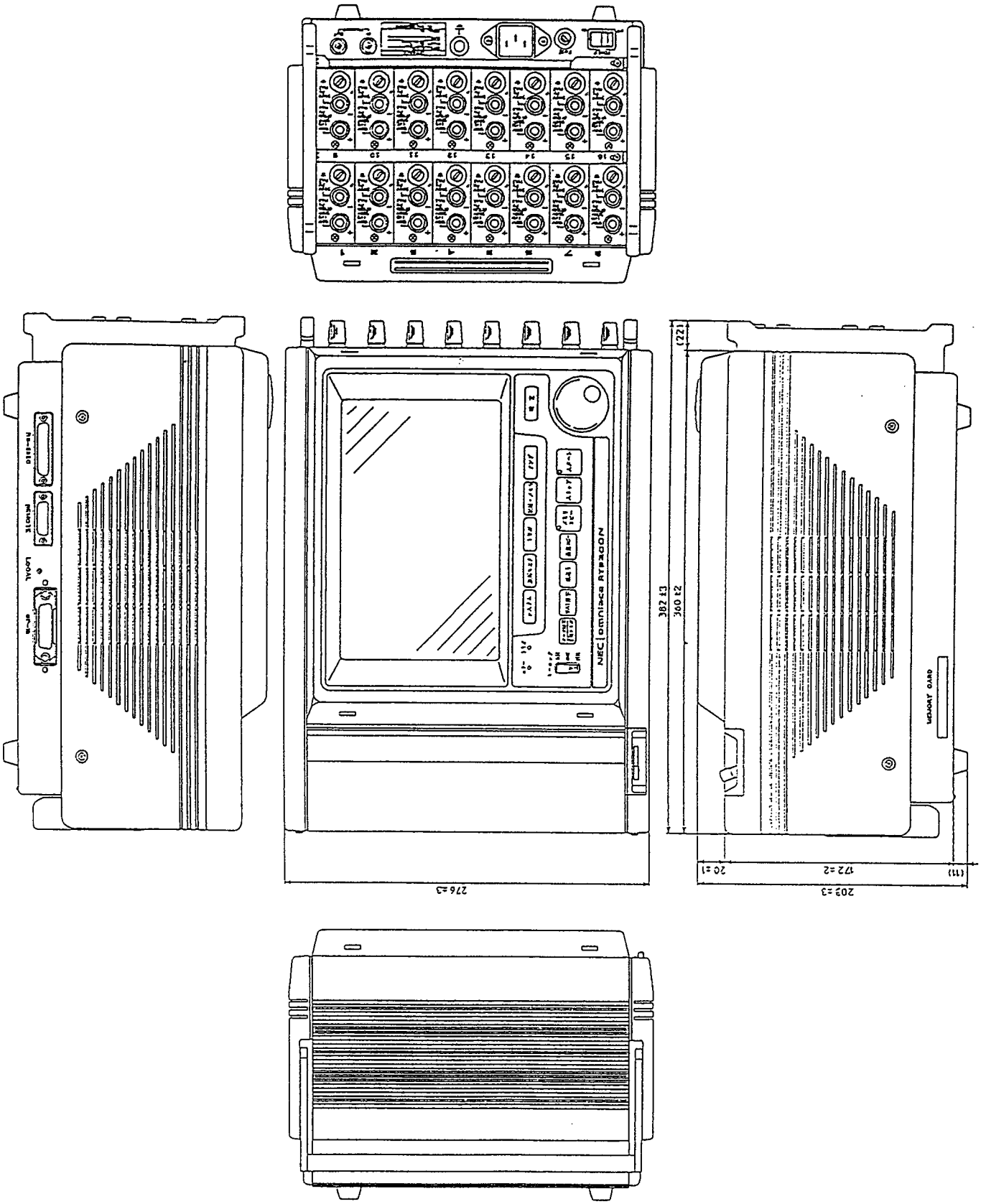
12.3 Spare Parts

Type	Spares and consumables	Rating	Remark
YPS106	Recording paper	Roll paper 219.5mm x 30m 5 rolls/box	0511-3172
YPS108	Recording paper	Roll paper 219.5mm x 30m Perforated in 150mm pitches Printed paper supply indication: 99 to 00 in 300mm pitches 5 rolls/box	0511-3173
YPS112	Recording paper	Z-fold paper 219.5mm x 200m Z-fold width: 300mm Printed paper supply indication: 669 to 000 on each page 1 pack/box	0511-3182
0334-3022	Time-lag fuse	No. 19195, 4A	Used for 100 V AC system
0334-3019	Time-lag fuse	No. 19195, 2A	Used for 200 V AC system
0334-1101	Normal acting fuse	F-7142, 0.1A	Used for DC amplifier and F/V converter units
0334-2105	Vacuum fuse	FVD-10mA	Used for DC amplifier unit and protection of units
0334-2124	Normal acting fuse	MGD-0.3A	Used for probes for floating voltage measurement and voltage fluctuation measurement
0245-9502	Remote connector plug	XM2A-1501	
0245-9561	Remote connector hood	XM2S-1511	
RT31-122	Touch panel sheet	3 sheets/set	
5633-1794	Flange		2 pieces needed for both sides of roll paper

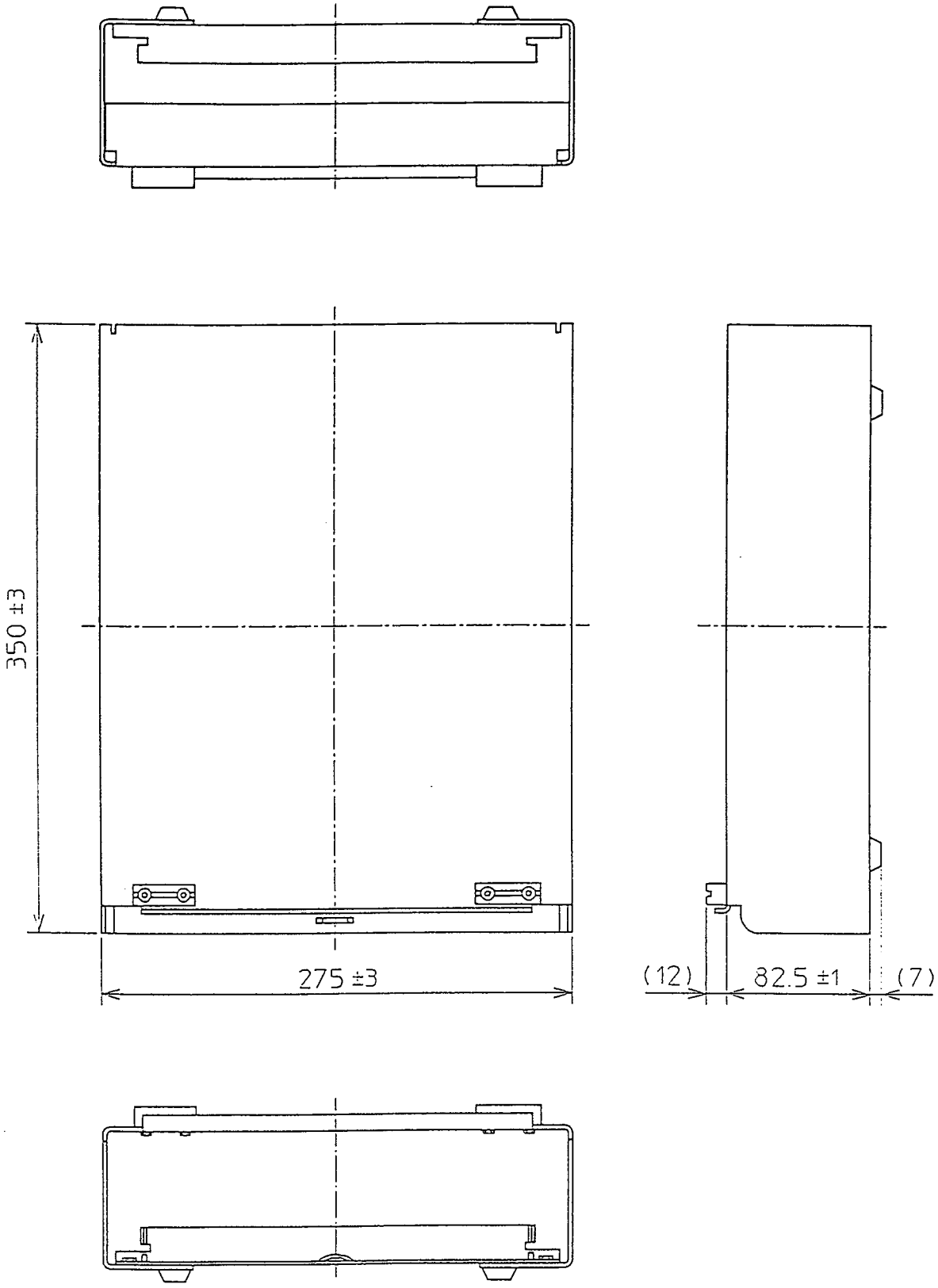
SECTION 13

DIMENSIONAL DRAWING

13.1 Dimensional Drawing of Basic Instrument (RT3216N)



13.2 Dimensional Drawing of Z-fold Paper Supply Case



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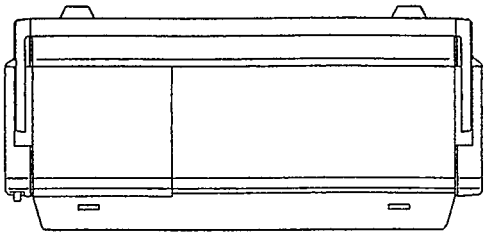

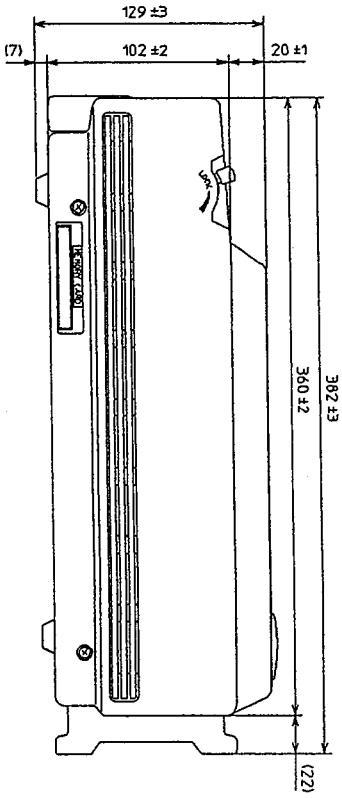

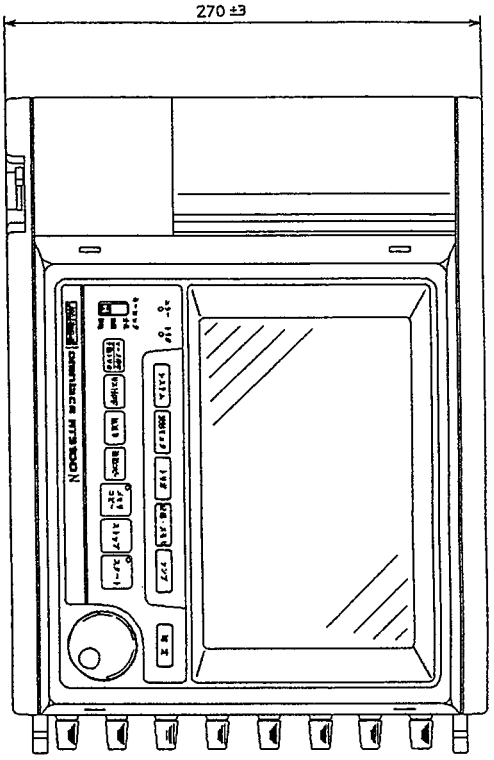

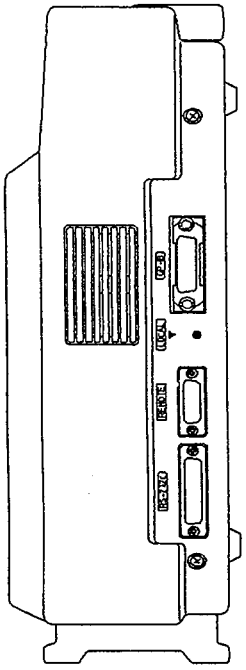

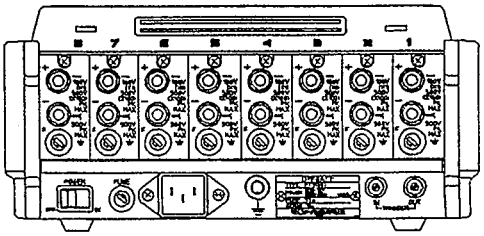

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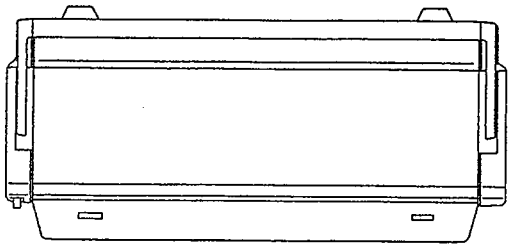

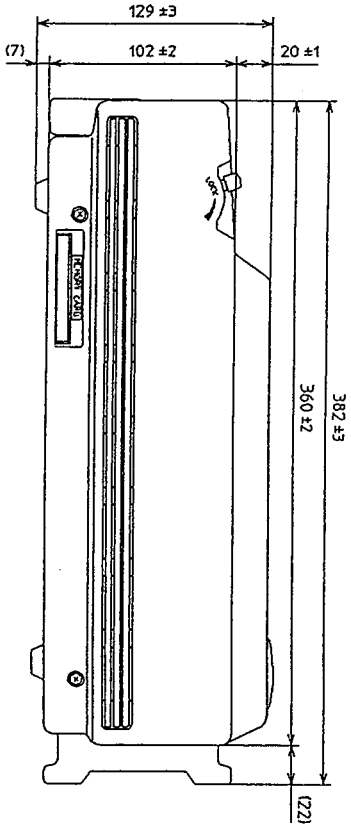

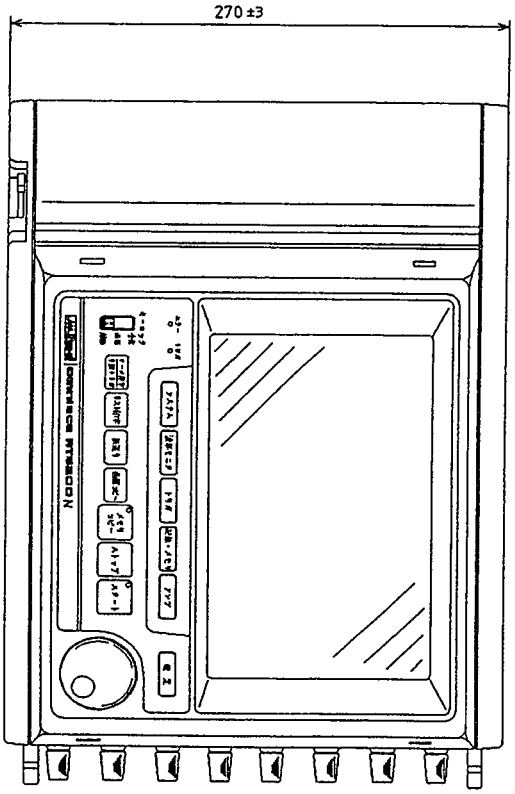

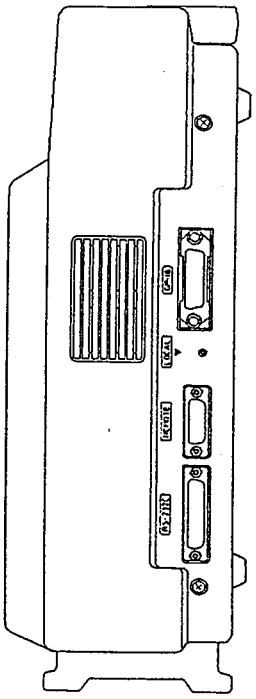

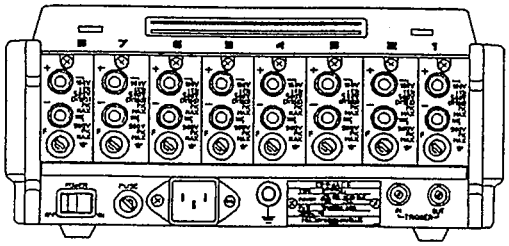

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