# Model 3701 / 3702
# LR8100E / LR12000E RECORDER

IM 3701 - 01E

IM 3701 - 01E
10th Edition

# Product Registration

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## KEY FUNCTIONS

### OPERATION KEYS

| | |
|---|---|
| DISPLAY SELECT | SELECT DIGITAL DATA,BARGRAPH OR RANGE DISPLAY. |
| ■CHART START | START PAPER FEED. |
| FEED REROLL | FEED RECORDER PAPER.<br>REROLL ROLL CHART (LR4200E ONLY,OPTIONAL). |
| PEN LIFT | MOVE ALL RECORDING PEN UP AND DOWN. |
| MANUAL PRINT | PRINT MEASURED DATA. |
| LIST | PRINT CURRENT SETTING STATUS AND SCALES FOR EACH CHANNEL. |
| MANUAL MESSAGE | START PRINTING MESSAGE 0.<br>(UP TO SEVENTY CHARACTERS) |
| ■ POC | PEN OFFSET COMPENSATION ON/OFF KEY. |
| RECORD | RECORDING ON/OFF KEY. MEASUREMENT DATA IS CONTINUED ON DIGITAL OR BARGRAPH DISPLAY IN OFF STATUS. |

### FUNCTION KEYS

| | |
|---|---|
| F1 ~ F4 | FUNCTION KEYS CORRESPONDING TO SETTING PANEL.(MENU) |
| NEXT | ADVANCE TO NEXT MENU PANEL. |
| CHART SPEED | SELECT FROM STANDARD CHART SPEED.<br>[SHIFT CHART SPEED] 0 ~ S SET BY 1mm STEP. |
| ◀RANGE▶ RANGE | SELECT FROM STANDARD RANGE.<br>[SHIFT ◀RANGE▶ RANGE] 0 ~ S SET OPTIONAL RANGE AND SPAN. |
| ◀ ZERO ▶ ◀ SPAN ▶ | ADJUST ZERO POSITION .<br>RECORD OFF : ZERO POSITION ADJUST ONLY IN VOLTAGE RANGE.<br>RECORD ON : SHIFT SPAN ONLY IN VOLTAGE RANGE.<br>[SHIFT ◀ZERO SPAN▶] ADJUST SPAN. |
| RECORD AREA ADJ | SET RECORDING AREA (ZONE RECORDING). |
| AUX KEY LOCK | SET ALARM, TAG NO.,MESSAGE, CLOCK.<br>KEY LOCK IS ONLY FOR LR4100E/LR4200E. |
| MEMORY LOCAL | SETTING KEY FOR IC CARD OR FLOPPY DISK.<br>SELECT REMOTE/LOCAL GP-IB (LR4100E/LR4200E OPTIONAL). |

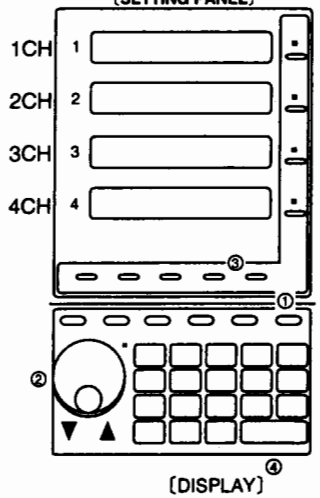
### PROGRAM KEYS

| | |
|---|---|
| A 0 ~ P SP | SET NUMERICS AND CHARACTERS. |
| SHIFT | PRESS THIS KEY ONCE TO ENTER THE CHARACTERS ON UP LEFT SIDE.<br>PRESS THIS KEY TWICE TO ENTER THE CHARACTERS ON UP RIGHT SIDE.<br>USE FOR OPTIONAL RANGE AND SPAN SETTINGS. |
| CAPS | PUT LED ON TO ENTER SMALL LETTERS.<br>PUT LED OFF TO ENTER CAPITAL LETTERS. |
| ENTRY | ENTER SETTINGS.<br>PRESS THIS KEY TWICE TO GET THE INITIAL PANEL STATUS. |
| ◯ | SETS RANGE, CHART SPEED AND ETC.<br>FINE AND COARSE ADJUSTMENT CAN BE PERFORMED DEPENDING ON KNOB ROTATION SPEED DURING SPAN SHIFT AND PEN POSITION ADJUSTMENT. |
| ▼ ▲ | MOVE CURSOR ON SETTING PANEL UP AND DOWN. |

## STANDARD OPERATION

### CHART SPEED SETTING (STANDARD MODE)

〔SETTING PANEL〕




〔KEY OPERATION〕

① PRESS CHART SPEED KEY.
SELECTS CHART SPEED SETTING MODE.

② TURN ◯ SETTING KNOB.
SET CHART SPEED VALUE.

③ SET CHART SPEED UNIT (mm/H, mm/M)
WITH F3 or F4 KEY.

④ PRESS ENTRY KEY.
ENTERS CHOSEN SETTINGS.

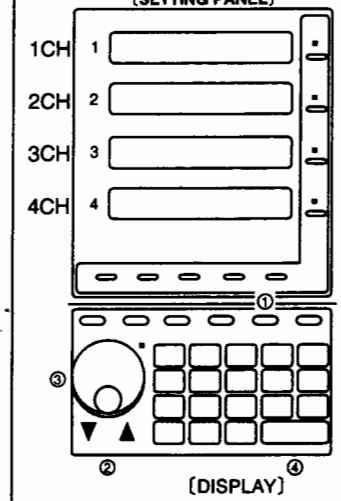
⑤ PRESS ENTRY KEY AGAIN.
RETURNS TO THE ORIGINAL STATUS.

〔DISPLAY〕

| | |
|---|---|
| 1CH | CHART SP1 : 150mm/M |
| 2CH | CHART SP2 : 10mm/M |
| 3CH | |
| 4CH | |

### RANGE SETTING(STANDARD MODE)

〔SETTING PANEL〕




〔KEY OPERATION〕

① PRESS ◀RANGE▶ RANGE KEY.
SELECTS RANGE SETTING MODE.

② PRESS ▼ ▲KEY.
CHOOSES A CHANNEL.

③ TURN ◯ SETTING KNOB.
SETS RANGE .
(ENTERS CHOSEN SETTINGS.)
REPEAT ② + ③AS REQUIRED.

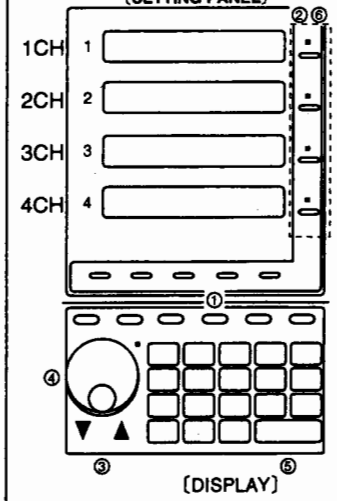
④ PRESS ENTRY KEY.
PRESS ENTRY KEY AGAIN.
RETURNS TO THE ORIGINAL STATUS.

〔DISPLAY〕

| | | |
|---|---|---|
| 1CH | 200V | 0.00 ~ 200.0 |
| 2CH | 200V | 0.00 ~ 200.0 |
| 3CH | 200V | 0.00 ~ 200.0 |
| 4CH | 200V | 0.00 ~ 200.0 |

### ZERO POSITION ADJUSTMENT (to be carried out after range setting has been completed)

〔SETTING PANEL〕




〔KEY OPERATION〕

① PRESS ◀ZERO SPAN▶ KEY.
SELECTS ZERO POSITION ADJUSTMENT MODE.

② PRESS □ KEY OF THE CHANNEL WHOSE ZERO POSITION YOU WANT TO ADJUST;THIS SETS THE CHANNEL TO "RECORD OFF" "NO PRINT-OUT ". THE PEN WILL MOVE TO THE ZERO POSITION.

③ PRESS ▼ ▲KEYS TO SELECT THE CHANNEL.

④ TURN ◯ SETTING KNOB.
ADJUSTS ZERO POSITION.
REPEAT ③ + ④ AS REQUIRED.

⑤ PRESS ENTRY KEY.
PRESS ENTRY KEY AGAIN.
RETURNS TO THE ORIGINAL STATUS.

⑥ PRESS ■ KEY AGAIN
TO SET THE CHANNEL TO "RECORD ON".
THE PEN WILL MOVE TO THE RECORDING POSITION AND START TO RECORD.

〔DISPLAY〕

| | |
|---|---|
| 1CH | 0.00V ~ 200.00V |
| 2CH | 0.00V ~ 200.00V |
| 3CH | 0.00V ~ 200.00V |
| 4CH | 0.00V ~ 200.00V |

〔KEY SWITCH OPERATION NOTE〕 NEVER USE SHARP OBJECTS SUCH AS FINGERNAILS,PENCIL TIPS,OR SCREWDRIVERS TO PRESS PANEL KEYS. DOING SO MAY DAMAGE THE KEY.

# How to use this Instruction Manual

This Instruction Manual describes the standard functions and operation procedures of Model 3701 LR8100E and Model 3702 LR12000E recorder. For operation methods of other options, see other instruction manuals listed below.

| Product name | Model | Instruction Manual No. |
|---|---|---|
| GP-IB interface | /GP-IB | IM3701-10E |
| RS-232 interface | /RS232C | IM3701-10E |
| Calculation function (only for LR8100E) | /MATH | IM3701-30E |
| Built-in alarm | /AK-08 | IM3701-40E |
| | /AK-12 | IM3701-40E |
| Remote control | /REM | IM3701-50E |

For those who wish to understand the product and application operations in details, read the manual from Section 1.

FD No. 10008 - N

# SAFETY PRECAUTIONS

This instrument is an IEC safety class I instrument (provided with terminal for protective grounding).
The following general safety precautions must be observed during all phases of operation, service and repair of this instrument. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired. Also. YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

The following symbols are used on this instrument.


To avoid injury, death of personnel or damage to the instrument, the operator must refer to an explanation in the user's manual.


ON (power)


In position of a bistable push control


OFF (power)


Out position of a bistable push control


AC power supply


DC power supply


Function Grounding Terminal (This terminal should not be used as a "Protective grounding terminal".)

**WARNING** A WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

**CAUTION** A CAUTION sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of parts of the product.

Make sure to comply with the following safety precautions. Not complying might result in injury, death of personnel or damage to the instrument.

## WARNING

- **Power Supply**
  Ensure the source voltage matches the voltage of the power supply before turning ON the power.
- **Power Cord and Plug**
  To prevent an electric shock or a fire, be sure to use the power cord supplied by YOKOGAWA. The main power plug must be plugged in an outlet with protective grounding terminal. Do not invalidate protection by using an extension cord without protective grounding.
- **Protective Grounding**
  The protective grounding terminal must be connected to ground to prevent an electric shock before turning ON the power.
- **Necessity of Protective Grounding**
  Never cut off the internal or external protective grounding wire or disconnect the wiring of the protective grounding terminal. Doing so poses a potential shock hazard.
- **Defect of Protective Grounding and Fuse**
  Do not operate the instrument when protective grounding or fuse might be defective.
- **Fuse**
  To prevent a fire, make sure to use fuses with specified standard (current, voltage, type). Before replacing the fuses, turn off the power and disconnect the power source. Do not use a different fuse or short-circuit the fuse holder.
- **Do Not Operate in an Explosive Atmosphere**
  Do not operate the instrument in the presence of flammable liquids or vapors. Operation of any electrical instrument in such an environment constitutes a safety hazard.
- **Never Touch the Interior of the Instrument**
  Inside this instrument there are areas of high voltage; therefore, never touch the interior if the power supply is connected. The cover should be removed by properly trained personnel only.
- **External Connection**
  To ground securely, connect the protective grounding before connecting to measurement or control unit.

# CONTENTS

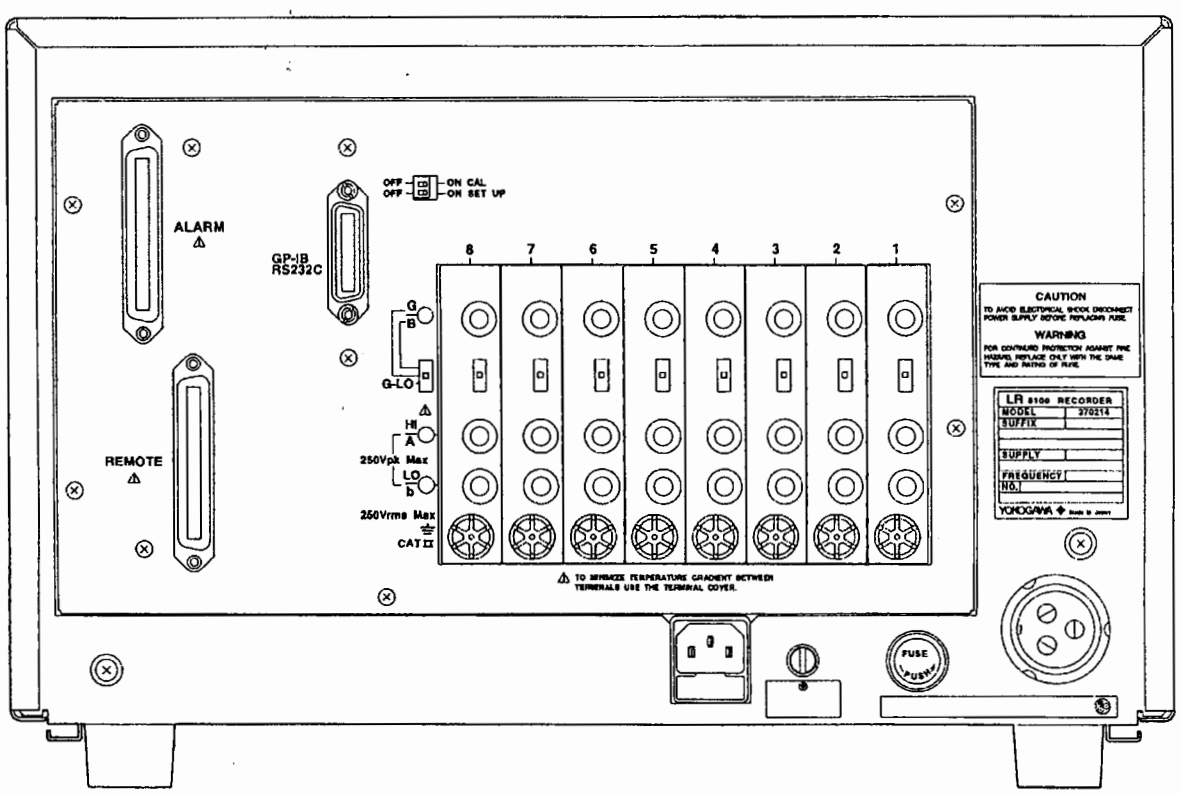
# 1. UPON RECEIVING THE PRODUCT

The LR8100E / LR12000E Recorder has been delivered after a thorough in-house inspection. However, make sure of the following when you receive it.

## 1.1 Checking the Model and Its Specifications

The LR8100E / LR12000E recorder is provided with a nameplate on its rear panel that indicates the Model, etc. as shown in Fig. 1.1. When you receive your recorder, check the information on the nameplate to make sure that it is as specified by your order. Also, when you contact us, inform us of the Model and serial number as given on the nameplate.

LR8100E




LR12000E

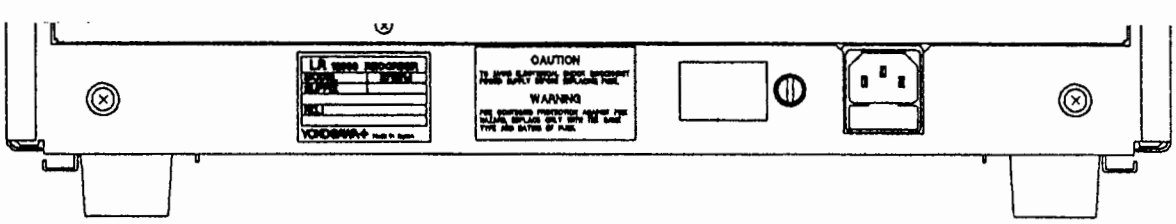



Fig 1.1

## Model and Codes

### ■ Recorder

| Model | Specification code | Specification |
|---|---|---|
| 3701 41 | ····· | 4-pen, low sensitivity(DC V, TC) |
| 3701 42 | ····· | 4-pen, medium sensitivity(DC V, TC) |
| 3701 43 | ····· | 4-pen, high sensitivity(DC V, TC) |
| 3701 44 | ····· | 4-pen, low sensitivity(DC V, TC, RTD) |
| 3701 45 | ····· | 4-pen, medium sensitivity(DC V, TC, RTD) |
| 3701 46 | ····· | 4-pen, high sensitivity(DC V, TC, RTD) |
| 3701 61 | ····· | 6-pen, low sensitivity(DC V, TC) |
| 3701 62 | ····· | 6-pen, medium sensitivity(DC V, TC) |
| 3701 63 | ····· | 6-pen, high sensitivity(DC V, TC) |
| 3701 64 | ····· | 6-pen, low sensitivity(DC V, TC, RTD) |
| 3701 65 | ····· | 6-pen, medium sensitivity(DC V, TC, RTD) |
| 3701 66 | ····· | 6-pen, high sensitivity(DC V, TC, RTD) |
| 3701 81 | ····· | 8-pen, low sensitivity(DC V, TC) |
| 3701 82 | ····· | 8-pen, medium sensitivity(DC V, TC) |
| 3701 83 | ····· | 8-pen, high sensitivity(DC V, TC) |
| 3701 84 | ····· | 8-pen, low sensitivity(DC V, TC, RTD) |
| 3701 85 | ····· | 8-pen, medium sensitivity(DC V, TC, RTD) |
| 3701 86 | ····· | 8-pen, high sensitivity(DC V, TC, RTD) |
| 3702 14 | ····· | 10-pen, low sensitivity (DC V, TC, RTD) |
| 3702 15 | ····· | 10-pen, medium sensitivity (DC V, TC, RTD) |
| 3702 16 | ····· | 10-pen, high sensitivity (DC V, TC, RTD) |
| 3702 24 | ····· | 12-pen, low sensitivity (DC V, TC, RTD) |
| 3702 25 | ····· | 12-pen, medium sensitivity (DC V, TC, RTD) |
| 3702 26 | ····· | 12-pen, high sensitivity (DC V, TC, RTD) |
| New Version | −B ····· | |
| Power supply | −0 ···· | 90V AC to 250V AC |
| Additional specification | DC Power supply (10 to 32V DC) | /DC |
| | GP-IB interface | /GP−IB |
| | RS−232C interface | /RS232C |
| | Calculation function (only for LR8100E) | /MATH |
| | Built-in alarm | /AK-08 (for LR8100E); /AK-12 (for LR12000E) |
| | Remote control | /REM |
| | °F indication | /DF |
| | 3.5 inch floppy disk drive | /FDD |

## ■ Spares

| Name | Part No. | Specification | Sales unit |
|---|---|---|---|
| Ribbon cassette | B9585SH | 1 pc./unit | 1 |
| Folded chart | B9585AH | 30 m (1 box/unit) | 10 |
| IC memory card* | 378901 | For storing set value, 8 K bytes | 1 |
| Soft cover | B9585AY | 1 pc./unit | 1 |
| Lithium battery | B9588ZB | For recorder (1 pc./unit) | 1 |
| Lithium battery | B9586JU | For 378901 (1 pc./unit) | 2 |
| Lithium battery | B9586JV | For 378904 (1 pc./unit) | 2 |
| Leadwire | B9409JA | 2-wire type, 1m (1 pc./unit) | 1 |

* Not available when the optional /FDD is equipped.

LR8100E

| Name | | Part No. | Specification | Sales unit |
|---|---|---|---|---|
| Pen cartridge | For 1st pen | B9586□A | Red (3 pcs./unit), standard | 1 |
| Pen cartridge | For 2nd pen | B9586□B | Green (3 pcs./unit), standard | 1 |
| Pen cartridge | For 3rd pen | B9586□C | Blue (3 pcs./unit), standard | 1 |
| Pen cartridge | For 4th pen | B9586□D | Brown (3 pcs./unit), standard | 1 |
| Pen cartridge | For 5th pen | B9586□E | Black (3 pcs./unit), standard | 1 |
| Pen cartridge | For 6th pen | B9586□F | Purple (3 pcs./unit), standard | 1 |
| Pen cartridge | For 7th pen | B9586□G | Orange (3 pcs./unit), standard | 1 |
| Pen cartridge | For 8th pen | B9586□H | Reddish purple (3 pcs./unit),standard | 1 |
| Pen cartridge | A set of pens 1 to 4 | B9586□R | 4 pens (1 pc./color)/unit | 1 |
| Pen cartridge | A set of pens 1 to 6 | B9586□S | 6 pens (1 pc./color)/unit | 1 |
| Pen cartridge | A set of pens 1 to 8 | B9586□T | 8 pens (1 pc./color)/unit | 1 |

Model names for the pen cartridge in the above part numbers can be used as a guide when selecting cartridges.
Standard : B9586 Y□, Normal recording with a pen speed of about 800 mm/s or less.
High speed use : B9586 Z□, High-speed recording with a pen speed of more than 800 mm/s.
Low speed use : B9586 X□, Low-speed feeding with a chart speed of about 100 mm/h or less.

LR12000E (Standard)

| Name | | Part No. | Specification | Sales unit |
|---|---|---|---|---|
| Pen cartridge | For 1st pen | B9937NA | Red (3 pcs./unit) | 1 |
| Pen cartridge | For 2nd pen | B9937NB | Green (3 pcs./unit) | 1 |
| Pen cartridge | For 3rd pen | B9937NC | Blue (3 pcs./unit) | 1 |
| Pen cartridge | For 4th pen | B9937ND | Brown (3 pcs./unit) | 1 |
| Pen cartridge | For 5th pen | B9937NE | Black (3 pcs./unit) | 1 |
| Pen cartridge | For 6th pen | B9937NF | Purple (3 pcs./unit) | 1 |
| Pen cartridge | For 7th pen | B9937NG | Orange (3 pcs./unit) | 1 |
| Pen cartridge | For 8th pen | B9937NH | Reddish purple (3 pcs./unit) | 1 |
| Pen cartridge | For 9th pen | B9937NJ | Light blue (3 pcs./unit) | 1 |
| Pen cartridge | For 10th pen | B9937NK | Yellow green (3 pcs./unit) | 1 |
| Pen cartridge | For 11th pen | B9937NL | Pink (3 pcs./unit) | 1 |
| Pen cartridge | For 12th pen | B9937NM | Yellow (3 pcs./unit) | 1 |
| Pen cartridge | A set of pens 1 to 10 | B9937PA | 10 pens (1 pc./color)/unit | 1 |
| Pen cartridge | A set of pens 1 to 12 | B9937PB | 12 pens (1 pc./color)/unit | 1 |

LR12000E (Low speed use)

| Name | | Part No. | Specification | Sales unit |
|---|---|---|---|---|
| Pen cartridge | For 1st pen | B9937NN | Red (3 pcs./unit) | 1 |
| Pen cartridge | For 2nd pen | B9937NP | Green (3 pcs./unit) | 1 |
| Pen cartridge | For 3rd pen | B9937NQ | Blue (3 pcs./unit) | 1 |
| Pen cartridge | For 4th pen | B9937NR | Brown (3 pcs./unit) | 1 |
| Pen cartridge | For 5th pen | B9937NS | Black (3 pcs./unit) | 1 |
| Pen cartridge | For 6th pen | B9937NT | Purple (3 pcs./unit) | 1 |
| Pen cartridge | For 7th pen | B9937NU | Orange (3 pcs./unit) | 1 |
| Pen cartridge | For 8th pen | B9937NV | Reddish purple (3 pcs./unit) | 1 |
| Pen cartridge | For 9th pen | B9937NW | Light blue (3 pcs./unit) | 1 |
| Pen cartridge | For 10th pen | B9937NX | Yellow green (3 pcs./unit) | 1 |
| Pen cartridge | For 11th pen | B9937NY | Pink (3 pcs./unit) | 1 |
| Pen cartridge | For 12th pen | B9937NZ | Yellow (3 pcs./unit) | 1 |
| Pen cartridge | A set of pens 1 to 10 | B9937PC | 10 pens (1 pc./color)/unit | 1 |
| Pen cartridge | A set of pens 1 to 12 | B9937PD | 12 pens (1 pc./color)/unit | 1 |

LR12000E (High speed use)

| Name | | Part No. | Specification | Sales unit |
|---|---|---|---|---|
| Pen cartridge | For 1st pen | B9937PN | Red (3 pcs./unit) | 1 |
| Pen cartridge | For 2nd pen | B9937PP | Green (3 pcs./unit) | 1 |
| Pen cartridge | For 3rd pen | B9937PQ | Blue (3 pcs./unit) | 1 |
| Pen cartridge | For 4th pen | B9937PR | Brown (3 pcs./unit) | 1 |
| Pen cartridge | For 5th pen | B9937PS | Black (3 pcs./unit) | 1 |
| Pen cartridge | For 6th pen | B9937PT | Purple (3 pcs./unit) | 1 |
| Pen cartridge | For 7th pen | B9937PU | Orange (3 pcs./unit) | 1 |
| Pen cartridge | For 8th pen | B9937PV | Reddish purple (3 pcs./unit) | 1 |
| Pen cartridge | For 9th pen | B9937PW | Light blue (3 pcs./unit) | 1 |
| Pen cartridge | For 10th pen | B9937PX | Yellow green (3 pcs./unit) | 1 |
| Pen cartridge | For 11th pen | B9937PY | Pink (3 pcs./unit) | 1 |
| Pen cartridge | For 12th pen | B9937PZ | Yellow (3 pcs./unit) | 1 |
| Pen cartridge | A set of pens 1 to 10 | B9937PE | 10 pens (1 pc./color)/unit | 1 |
| Pen cartridge | A set of pens 1 to 12 | B9937PF | 12 pens (1 pc./color)/unit | 1 |

## ■ Accessories

| Accessories | Part No. | Specification |
|---|---|---|
| Rack mounting bracket | 3789 81 | Common to JIS and ANSI |
| IC memory card | 3789 04 | For storing setting parameters and measured values, 256K bytes |
| IC memory card | 3789 05 | For storing setting parameters and measured values, 512K bytes |
| IC memory card | 3789 06 | For storing setting parameters and measured values, 1M bytes |

# 1.2 Checking the Accessories and Appearance

The recorder is provided with the accessories shown in Fig. 1.2.

Check the accessories to make sure that they are all there. Further, visually check the recorder to make sure that it has not been damaged.

Should the number of accessories be short or the recorder be damaged, contact the representative where you purchased it.

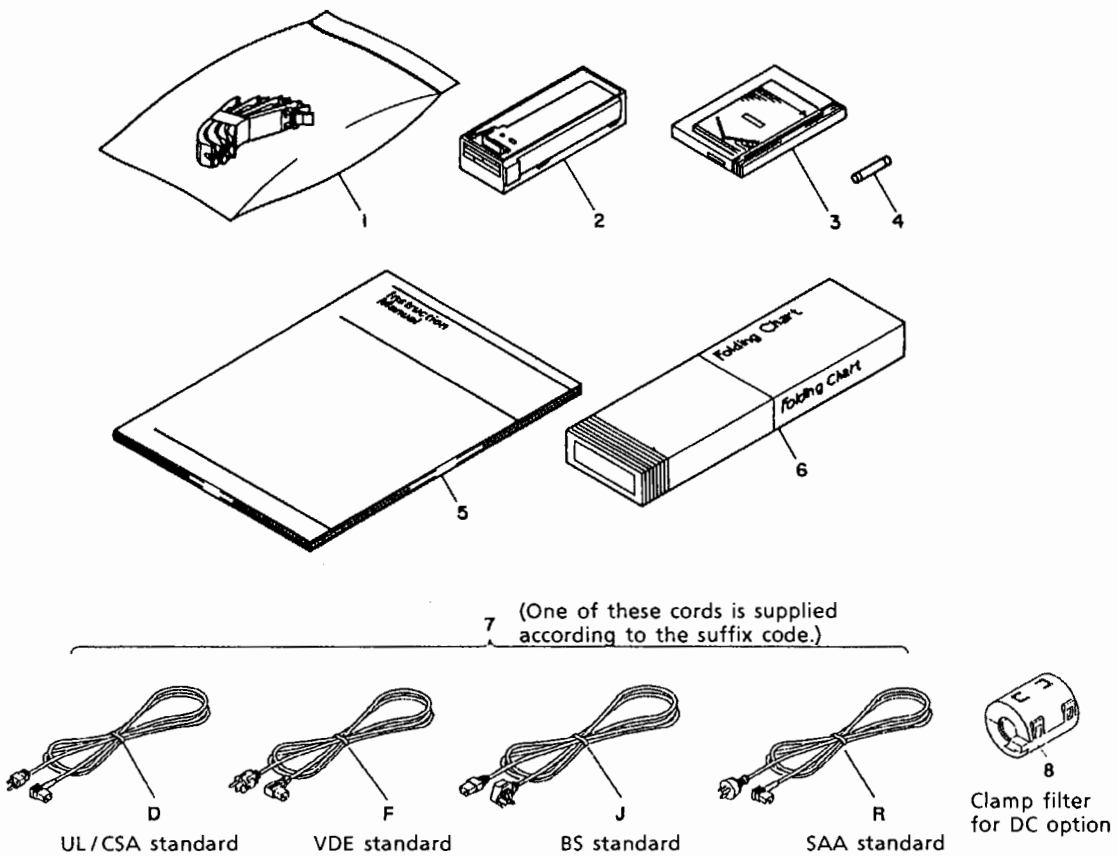



Fig. 1.2

Table 1.1

| No. | Name | Part No. | Q'ty | Remarks |
|---|---|---|---|---|
| ① | Pen cartridge | – | 1/color | Same as No. of pens |
| ② | Ribbon cassette | B9585 SH | 1 | |
| ③ | IC memory card | 378901 | 1 | |
| ④ | Fuse | A1113 EF (for LR8100E) | 1 | Installed in fuse holder |
| | | A1352 EF (for LR12000E) | 1 | Installed in fuse holder |
| ⑤ | Instruction Manual | – | 1 | |
| ⑥ | Chart | B9585 AH | 1 | About 30 m |
| ⑦ | Power supply cable | Refer to the suffix code | 1 | |
| ⑧ | Clamp filter | A1179 MN | 1 | For /DC option (LR8100E only) |

# 1.3 Prior to Using the Recorder

After unpacking the recorder, open the front door to remove shipment packing.

(1) Using a Phillips screwdriver, remove the lock screw and bracket used to hold the chart tray in place during transportaion.

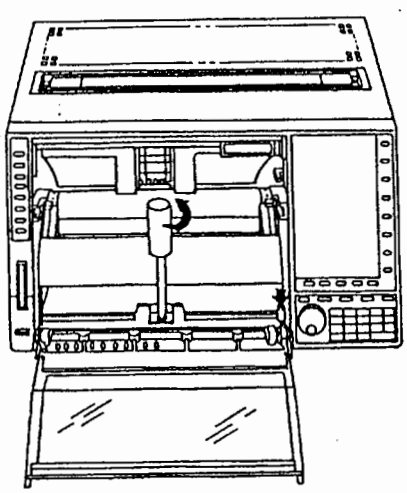
(2) Remove the plastic coated wire holding the pens in the center of the chart compartment.

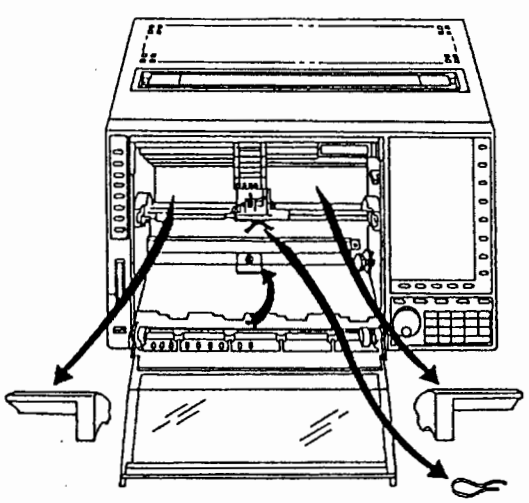
(3) Press a stop located on the lower right side of the chart compartment to allow the chart tray to swing out.

(4) Pull the tray forward and remove it from the recorder.

(5) Mount the bracket to the back of the chart tray for future use. (A tapped hole is provided to screw the bracket in place.)

(6) This completes unpacking.
The recorder is now ready for use with reference to the Instruction Manual.





# 2. OUTLINE

## 2.1 Product Outline

The LR8100E / LR12000E is a high performance, multipen recorder based on YOKOGAWA's long experience with the highly reputed HR and $\mu$R series recorders and incorporates the latest technology.

Any DC voltage, thermocouple or RTD input can be selected for each channel. In addition to analog recording, the recorder also allows measured values, dates, scales, alarm lists, and messages to be printed out or partial suppression-recorded through the use of a wire dot printer. Easy-to-read fluorescent display tubes are used and the recorder is capable of selecting measured data, bar-graph and range data displays for each channel. Thus, while the LR8100E / LR12000E offers high performance, it is easy to operate. Basic items such as range and chart speed can be easily set interactively with the display unit via function keys and setting knobs.

Further, the recorder range of applications can be expanded by adding various optional functions, such as a memory function in the form of an IC memory card, calculation (only for LR8100E) and GP-IB / RS-232C communication functions, and an alarm output.

## 2.2 Features

■ **Highly Functional and Intelligent**

- Wide range of DC voltage, thermocouple and RTD inputs
  A single LR8100E / LR12000E recorder can cope with all DCV, TC and RTD inputs. Further, it has cryogenic gold-iron-chromel (KP vs Au7Fe) TC input and a cryogenic platinum and rare cobalt RTD (J263*B) input which are built into it as standard equipment.
- Versatile print-out functions
  Includes measured data, date, scale markings, alarms, messages, manual prints, lists, etc.
- A choice of 3 display functions
  Measured data, bar-graph and range data can be selected as required.
- Zone recording (recording area adjustment)
  The recording range can be arbitrarily set by adjusting the pen position.
- Partial suppression and extension
  The LR8100 / LR12000 can suppress the recording of unnecessary areas and extend the recording of important areas.
- AUTO recording span shift
  Selecting this mode automatically shifts the recording span by +50%, and continues recording when an input exceeds the measuring range (span).

■ **Simple Operation**

The LR8100E / LR12000E can be operated as simply as conventional analog recorders, even though it has multifunction capabilities. Using the function keys and setting knobs, various settings are made simply by using an interactive system with the display unit.

■ **Compact and Light Weight (about 18 kg, for LR8100E)**

The LR8100E is about 1/2 the volume and 2/3 the weight of conventional (YOKOGAWA) products.

■ **New Recording Mechanism**

The adoption of new pens allows the recorder to record for about 1500 m (about twice that of conventional units).

Further, the chart is 30 m long (twice that of conventional charts), enabling continuous operating time to be extended considerably. In addition, the provision of grooves in the platen has almost eliminated ink blots at the chart folding lines, which is a problem at low chart speeds in conventional recorders.

■ **High-speed Response 1600 mm / s**

Maximum pen speed is 1600 mm / s, significantly improving traceability at high-speed.

■ **IC Memory Card**

An IC card stores the set values and measured data. MS-DOS format is in common with other measuring instruments of YOKOGAWA.

- Set value memory (standard).
  Previously-used set values can be stored on an IC card and used again simply by inserting the IC card into the unit.
- Set value and data memory (optional)
  Can store measured data in which an alarm or external contact is triggered. Memory capacity is 256K bytes and the memory can store a maximum of 16000 data/channel (8-channel model).
  Stored data can be recorded or output for communication as required.

■ **Computer Friendly**

- GP-IB and RS-232C interfaces
  Bi-directional communication is available in which both interfaces allow data output and panel setting. Further, communication input can be analog-recorded, enabling raw measured data and communication input data to be recorded simultaneously.

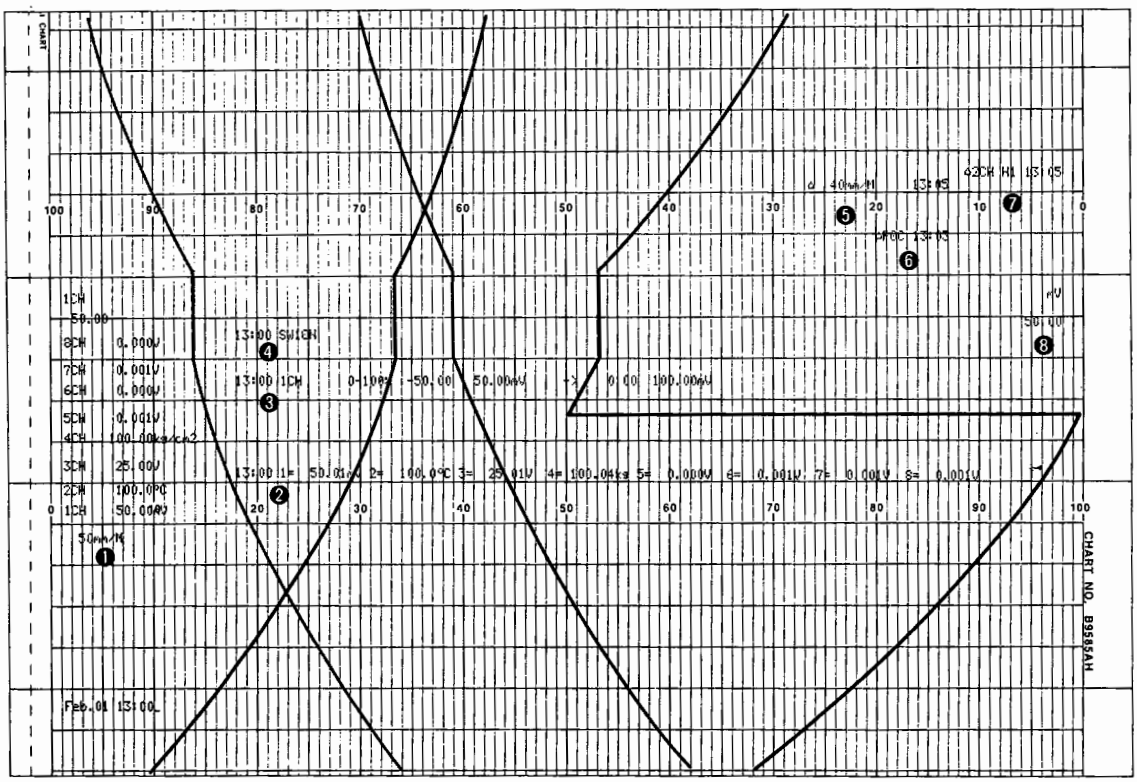
■ **AC Universal Power Requirements (90 to 250V AC) (only for LR8100E)**

■ **A wide Range of Optional Features**

- Remote control function (/REM)
  Chart start/stop, chart speed control, chart speed change, recording ON / OFF selection, message, and manual print-out are controlled remotely. Selecting recording ON / OFF allows the pens to be raised and lowered independently.
- Alarm output (/AK-08 ; /AK-12)
  Eight (LR8100E) or twelve (LR12000E) alarm outputs can be obtained and two upper or lower limit alarm levels can be set per channel.
- Power supply 10 to 32V DC (/DC, only for LR8100E)
  This DC power allows the recorder to be used in locations without AC power supply — such as in a car or for agriculture use, etc.
- Mathematical functions (/MATH, only for LR8100E)
  This function is in addition to the standard difference calculation and scaling functions and is capable of executing various calculations such as arithmetic operations, square root extraction (SQR), absolute value (ABS), common logarithms (LOG) and exponents (EXP). Calculated data can be recorded or output for communication.

# 2.3 Recording Examples

## 2.3.1 Four Analog Recording Channels Plus Various Print-outs




**(1) Fixed Time Print-out**

Executes print-out per specified time span (minimum : 1 minute).

**(2) Manual Print-out**

Pressing the MAN PRINT key prints out the time and measured data for all channels in a single line. The 10-ch LR12000E will not print the units here, whereas the 12-ch LR12000E will not print the channel number and units.

**(3) Range Change Print-out**

The range change and time contents are printed out when the range is changed in the AUTO recording span shift mode.

**(4) Message Print-out**

Can be set arbitrarily within 70 characters (with time data)

MESSAGE (0) : Pressing the MESSAGE key starts print-out.

MESSAGE (1 to 4) : If the REMOTE function (optional) is provided, print-out is executed at external contact input. (4 points maximum).

**(5) Print-out at Chart Speed Change**

Chart speed and the time prior to and following a chart speed change are printed out.

**(6) Pen-Offset Compensation ON / OFF Print-out**

The ON / OFF mark and time are printed out when pen-offset compensation is ON / OFF.

**(7) Alarm Print-out**

The channel No., alarm type, and ON / OFF time are printed out.

**(8) Scale Print out**

0% and 100% values are printed out at the same intervals as fixed time print-out.

Note) In (1), (6) above and chart start print-out, when pen-offset compensation is set to AUTO, (selection at SET UP mode. If AUTO is not selected, channel is always pen-offset compensation reference channel) the pen-offset compensation reference channel is printed out.

example △Poc 3 12:40

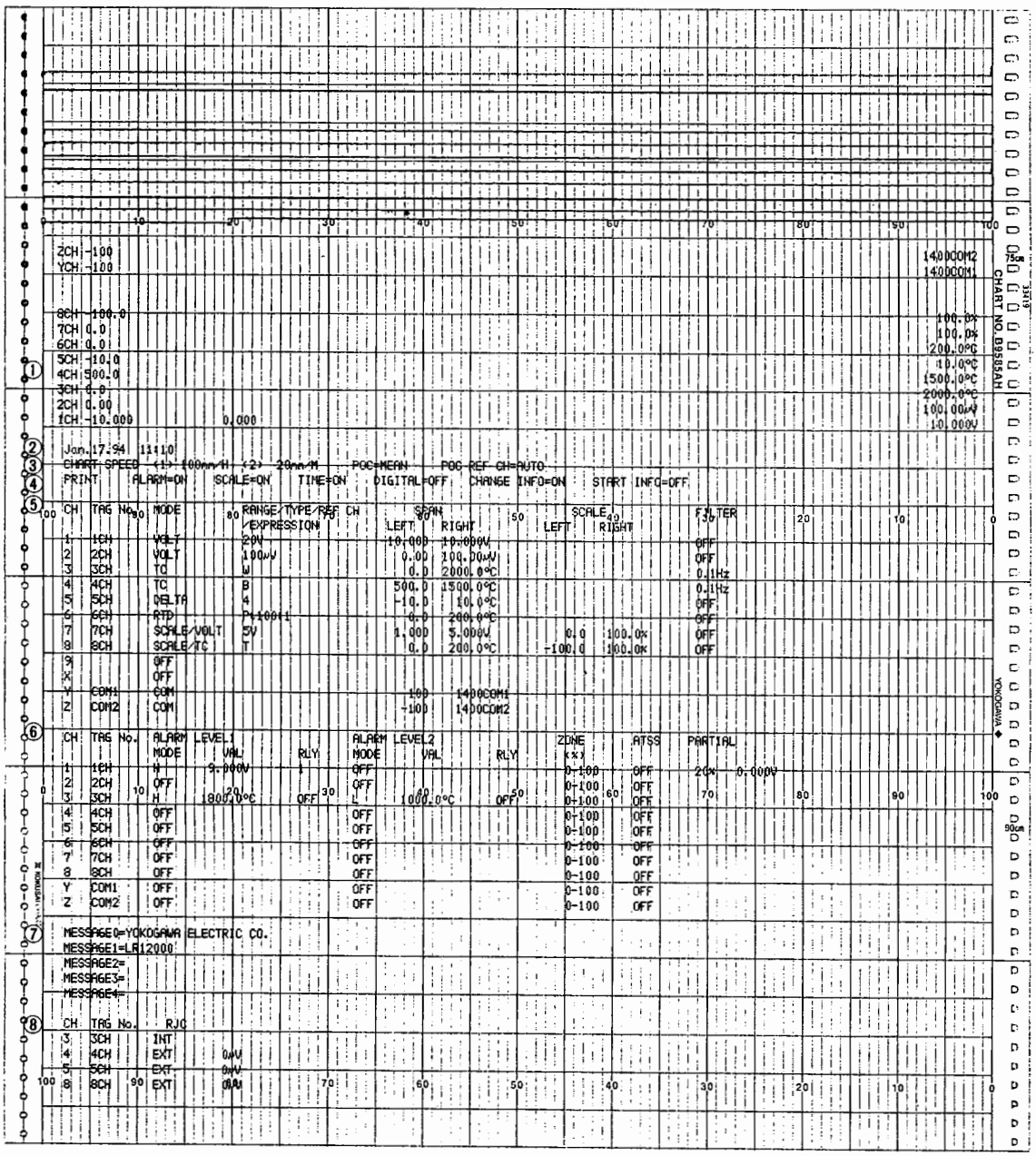
This indicates that the reference channel is 3CH and Pen-Offset Compensation is ON.

<Relationship between Fixed-time Printout and Chart Speed>

| Chart Speed | | | | Fixed Time Print-out Intervals |
|---|---|---|---|---|
| mm/min | inch/min | mm/h | inch/h | |
| 1200~300 (600~300) | 45.0~12.0 | — | — | Every minute |
| 299~ 30 | 11.9~1.2 | — | — | Every 10 minutes |
| 29~ 10 | 1.1~0.5 | 1200~120 (600~120) | 45.0~5.0 | Every hour |
| — | — | 119~60 | 4.9~2.4 | Every 2 hours |
| — | — | 59~40 | 2.3~1.6 | Every 3 hours |
| — | — | 39~20 | 1.5~0.8 | Every 6 hours |
| — | — | 19~10 | 0.7~0.5 | Every 12 hours |

(for LR12000E)

## 2.3.2 List Print-out (LR12000E example)



ZCH -100
YCH -100
14000COM2
14000COM1
8CH 100.0
7CH 0.0
6CH 0.0
5CH -10.0
4CH 500.0
3CH 0.0
2CH 0.00
1CH -10.000 0.000
100.0%
100.0%
200.0°C
10.0°C
1500.0°C
2000.0°C
100.00mV
10.000V
CHART NO.B9588AH
Jan.17:94 11:10
CHART SPEED <1> 100mm/H <2> 20mm/H POC=MEAN POC REF CH=AUTO
PRINT ALARM=ON SCALE=ON TIME=ON DIGITAL=OFF CHANGE INFO=ON START INFO=OFF

| CH | TAG No. | MODE | RANGE/TYPE/REF CH /EXPRESSION | SCAN LEFT | SCAN RIGHT | SCALE LEFT | SCALE RIGHT | FILTER |
|---|---|---|---|---|---|---|---|---|
| 1 | 1CH | VOLT | 20V | -10.000 | 10.000V | | | OFF |
| 2 | 2CH | VOLT | 100mV | 0.00 | 100.00mV | | | OFF |
| 3 | 3CH | TC | W | 0.0 | 2000.0°C | | | 0.1Hz |
| 4 | 4CH | TC | B | 500.0 | 1500.0°C | | | 0.1Hz |
| 5 | 5CH | DELTA | 4 | -10.0 | 10.0°C | | | OFF |
| 6 | 6CH | RTD | Pt100(1 | 0.0 | 200.0°C | | | OFF |
| 7 | 7CH | SCALE/VOLT | 5V | 1.000 | 5.000V | 0.0 | 100.0% | OFF |
| 8 | 8CH | SCALE/TC | T | 0.0 | 200.0°C | -100.0 | 100.0% | OFF |
| 9 | | OFF | | | | | | |
| X | | OFF | | | | | | |
| Y | COM1 | COM | | 100 | 14000COM1 | | | |
| Z | COM2 | COM | | -100 | 14000COM2 | | | |

| CH | TAG No. | ALARM LEVEL1 MODE | VAL | RLY | ALARM LEVEL2 MODE | VAL | RLY | ZONE (xx) | ATSS | PARTIAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1CH | H | 9.000V | 1 | OFF | | | 0-100 | OFF | 20% 0.000V |
| 2 | 2CH | OFF | | | OFF | | | 0-100 | OFF | |
| 3 | 3CH | H | 1800.0°C | OFF | L | 1000.0°C | OFF | 0-100 | OFF | |
| 4 | 4CH | OFF | | | OFF | | | 0-100 | OFF | |
| 5 | 5CH | OFF | | | OFF | | | 0-100 | OFF | |
| 6 | 6CH | OFF | | | OFF | | | 0-100 | OFF | |
| 7 | 7CH | OFF | | | OFF | | | 0-100 | OFF | |
| 8 | 8CH | OFF | | | OFF | | | 0-100 | OFF | |
| Y | COM1 | OFF | | | OFF | | | 0-100 | OFF | |
| Z | COM2 | OFF | | | OFF | | | 0-100 | OFF | |

MESSAGE0=YOKOGAWA ELECTRIC CO.
MESSAGE1=LR12000
MESSAGE2=
MESSAGE3=
MESSAGE4=

| CH | TAG No. | RJC |
|---|---|---|
| 3 | 3CH | INT |
| 4 | 4CH | EXT 0μV |
| 5 | 5CH | EXT 0μV |
| 8 | 8CH | EXT 0μV |

YOKOGAWA

### 2.3.3 List Print-out Description

① Scale : Recording is performed with a pen corresponding to each channel scale. However, when the list print-out is started at the Recording area adjust screen, this printout will not be done.

② Date and time

③ Contents of chart speeds (1) and (2) and phase synchronization (POC)

④ Contents of fixed time print-out

| | | |
|---|---|---|
| ALARM | : | Alarm print-out ON / OFF |
| SCALE | : | Scale print-out ON / OFF |
| TIME | : | Time print-out ON / OFF |
| DIGITAL | : | Measured data print-out ON / OFF |
| POC REF CH | : | POC reference CH (MAX / AUTO) |
| CHANGE INFO | : | Print-out ON / OFF of chart speed change |
| START INFO | : | Print-out ON / OFF of chart start |

⑤ Measuring conditions

| | | |
|---|---|---|
| CH | : | Channel No.* |
| TAG No. | : | Used instead of the channel No. (up to 7 characters) |
| MODE | : | Measuring mode |

RANGE / TYPE / REF / EXPRESSION
Range/thermocouple type/difference calculation reference
CH / calculation expression (when "/MATH" is used)

| | | |
|---|---|---|
| SPAN LEFT | : | Input span left |
| SPAN RIGHT | : | Input span right |
| SCALE RIGHT | : | Scaling right |
| FILTER | : | Input filter frequency (OFF /0.1 Hz/1 Hz) |

⑥ Alarm conditions and others

| | | |
|---|---|---|
| CH | : | Channel No.* |
| TAG No. | : | Used instead of the channel No. (up to 7 characters) |

ALARM (LEVEL 1 and 2)

| | | |
|---|---|---|
| MODE | : | H, L or OFF |
| VAL | : | Alarm set-value |
| RLY | : | Output relay No. |
| ZONE | : | Recording range (0 to 100%) |
| ATSS | : | Automatic recording span shift ON/OFF |
| PARTIAL | : | Partial suppression and extension recording limit value |

⑦ MESSAGE : Contents of messages 0 to 4 (up to 70 characters)

⑧ RJC contents : Type of external reference junction compensation (EXT / INT), and the reference junction compensation voltage (in case of EXT) for the corresponding channels.

* The LR12000E will print X, Y, Z for the channels 10 to 12 respectively.

# 3. FUNCTIONAL DESCRIPTION

## 3.1 Front Panel

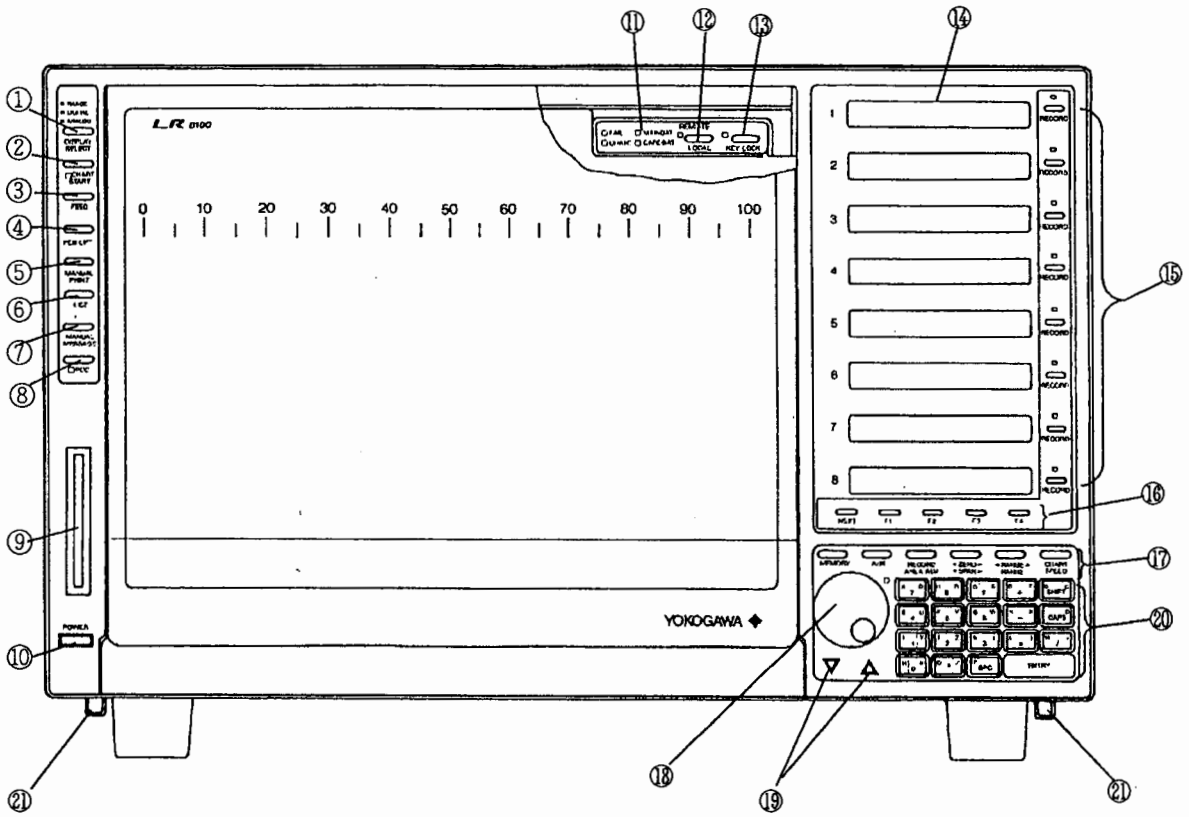
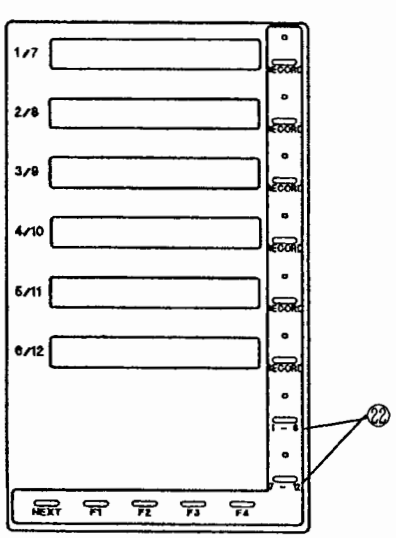



**Fig 3.1 Front Panel (LR8100E, 8 channel model)**

LR12000E



① **DISPLAY SELECT**
Used to select measured data, bar-graph and range data.
Measured data and bar-graph are renewed at about 1 second intervals.

② **CHART START**
Starts / stops the chart feed. The LED lights up when the chart is being fed.

③ **FEED**
Feeds the recording chart.

④ **PEN LIFT**
Used to raise / lower the pens simultaneously. Setting the RECORD keys to ON / OFF allows the pens to be raised / lowered individually.

⑤ **MANUAL PRINT**
Prints out measured data when this switch is pressed. Without interrupting analog recording, the measured data of all channels is printed out at high speed in about 1.5 seconds.

⑥ **LIST**
Prints out the present setting state. Further, each channel's scale is written by a corresponding pen.

⑦ **MANUAL MESSAGE**
Prints out the setting conditions of Message (0). (Up to 70 characters)
Note) The print-out of messages (1) to (4) is started by external contact input (option).

⑧ **POC (Pen Offset Compensation)**
Used to turn pen-offset compensation ON / OFF. When pen-offset compensation is set to ON, the LED lights up, and when it's set to ON / OFF, the time and the ON / OFF mark are printed out.

⑨ **IC Card Insertion Slot**
Used to insert a set value memory card (attached) or a set value and data memory card (option). IC card insertion slot is not available for the recorder equipped with the optional FDD.

⑩ **POWER Switch**
Turns the power supply ON / OFF.

⑪ **Abnormal State Indication Lamps**

| | | |
|---|---|---|
| FAIL | : | Lights up if the internal CPU fails. |
| CHART | : | Lights up when the recording chart ends. |
| MAIN BAT | : | Lights up when the main battery (built in the recorder) fails. |
| CARD BAT | : | Lights up when the IC card battery fails. |

⑫ **REMOTE/LOCAL Selection Switch**
Selects GP-IB (option) REMOTE / LOCAL. When it is set to REMOTE, the LED lights up.

⑬ **KEY LOCK**
Used to lock keys ⑯ through ⑳. When a key is locked, the LED lights up.

⑭ **Display Units**
Equipped with easy to read fluorescent display tubes which are used to display and set data. A display unit consists of 20 characters / line, and the number of display lines is the same as the number of input channels.

⑮ **RECORD**
Sets recording to ON / OFF. Measurement continues even if it is set to OFF and therefore, display and communication output (option) are available.

⑯ **Function Keys**

F1 to F4 : Function keys corresponding to setting displays (menus)

Next : A NEXT key for menus (display scroll)

⑰ **Function Keys**

| | | |
|---|---|---|
| CHART SPEED | : | Selects chart speed. |
| ◀RANGE<br>RANGE | : | Allows a measuring range to be set for each channel by using the setting knob. Pressing this key after the SHIFT key enables you to set any measuring scale, execute scaling or set the filter frequency by using the ALPHANUMERIC and ENTRY keys. |
| ◀ZERO<br>◀SPAN | : | Enables you to adjust the pen's zero position for each channel with the setting knob. Pressing this key after the SHIFT key allows you to adjust the span. |
| RECORD<br>AREA ADJ | : | Sets the recording zone arbitrarily by moving the pen position. |
| AUX | : | Sets alarms, tag numbers, messages and the clock. |
| MEMORY | : | A setting key for use with an IC card or optional FDD. |

⑱ **Setting Knob** : Sets range and chart speed. When the setting knob is used, the LED on the upper right lights up. Fine to coarse adjustment for ZERO SPAN adjustment and RECORD AREA ADJ is available by changing the rotation speed.

⑲ **Cursor Key** : Shifts the cursor on the setting display panel up and down.

⑳ **ALPHANUMERIC Key** : Sets various digital data and characters.

| | | |
|---|---|---|
| ENTRY key | : | Enters the setting contents. |
| SHIFT key | : | Pressing this key once enters the characters at the upper left of the ALPHANUMERIC key. Pressing this key twice enters the characters at the upper right of the ALPHANUMERIC key. In the range program mode and at span adjustment, select a function key after this key has been pressed. |
| CAPS key | : | When the LED at the upper right is OFF, uppercase letters are available and, when it is ON, lowercase letters are available. |

㉑ **Hooks (only for LR8100E)**

: Used to carry the recorder. They are more convenient than a normal handle when carrying it for extended period of time.

㉒ **Key for Changing the Display (only for LR12000E)**

Key to change between the displays of CH1 to 6 and CH7 to 12.

# 3.2 Rear Panel

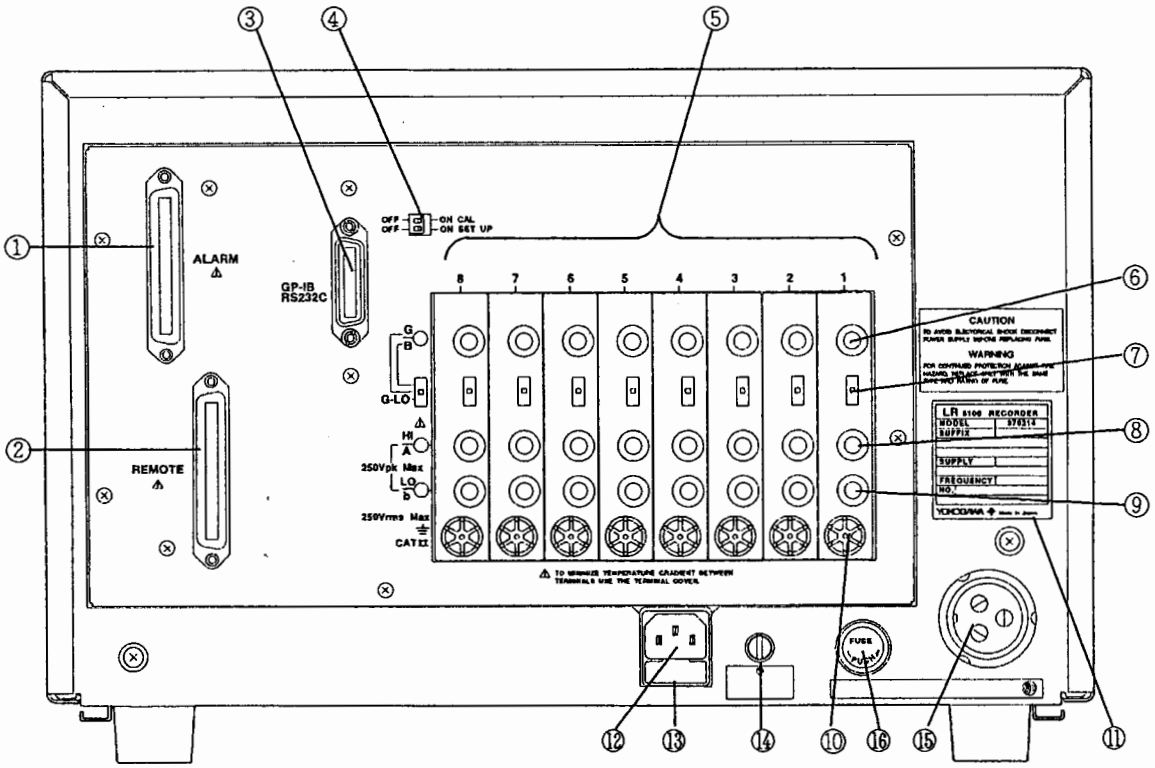



Fig. 3.2 Rear Panel (LR8100E 8-channel model)

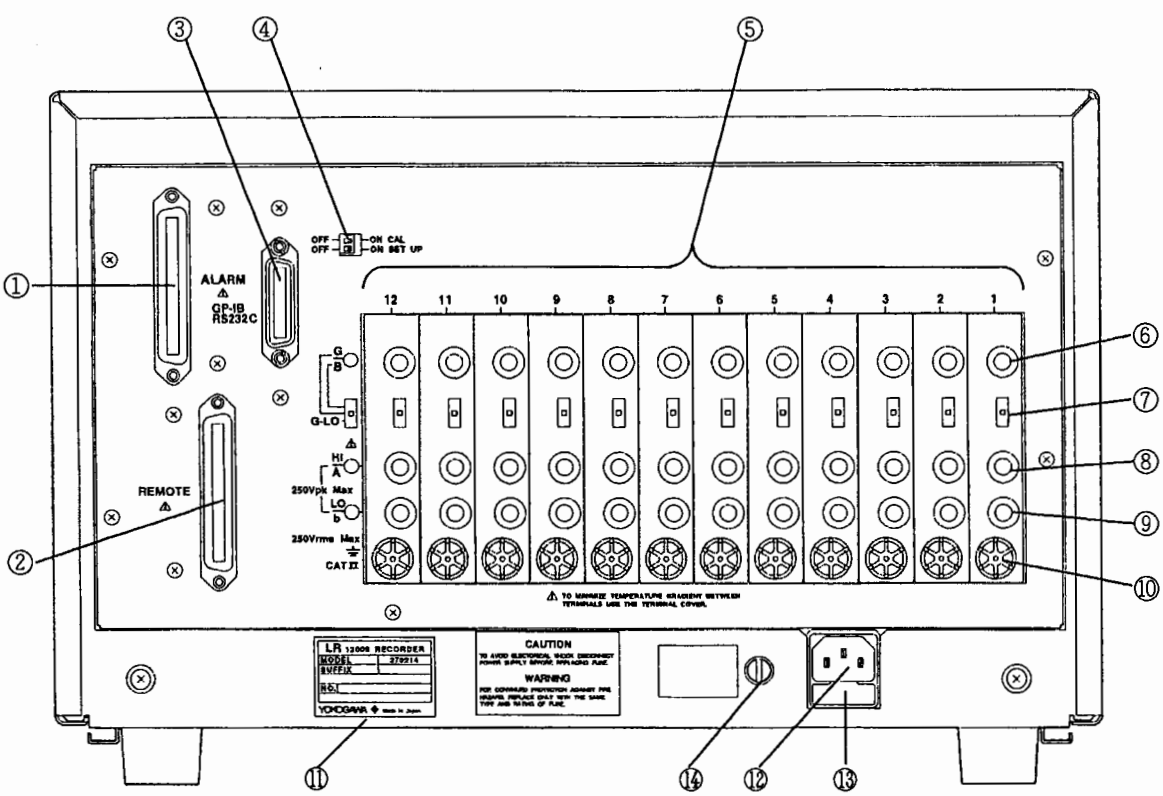



Fig. 3.3 Rear Panel (LR12000E)

① **Alarm Connector (Option)**
An alarm output (LR8100E : 8 points ; LR12000E : 12 points) connector

② **Remote Control Connector (Option)**
The chart speed can be controlled and the pens raised and lowered using external control signals.

③ **GP-IB / RS-232C Connector (Option)**
GP-IB or RS-232C communication interface connector.

④ **CAL / SET UP Switch**
CAL : Calibration adjustment switch -- used only when the recorder is calibrated.
SET UP : Used to change the chart speed unit from mm to inches (by setting it to ON)

⑤ **Input Module**
Four, six, eight, ten or twelve modules are built into the recorder as specified.

⑥ **Guard Terminal or B-terminal**
Used as a guard terminal for voltage or thermocouple input and as a B-terminal for RTD input.

⑦ **Guard / B-terminal Select Switch**
Used to select the guard or B-terminal.
G : Selects the guard for voltage and thermocouple Input
B : Selects the B-terminal for RTD input
G-LO : Shorts G(Guard) and LO(minus) terminals.

⑧ **Positive Terminal**
Used as a positive terminal for voltage and thermocouple inputs and as an A-terminal for RTD input.

⑨ **Negative Terminal**
Used as a negative terminal for voltage and thermocouple inputs and as a B-terminal for RTD input.

⑩ **Reference Junction Compensating Section**
Has a built-in transistor that executes reference junction compensation when a thermocouple is used.

⑪ **Nameplate**
Check the Model and supply voltage inscribed on the nameplate.

⑫ **AC Power Supply Connector**

⑬ **Fuse Holder**

⑭ **Function Grounding Terminal**

⑮ **DC Power Supply connector (Option for LR8100E only)**
For 10 to 32V DC power supply.

⑯ **Fuse Holder for DC Power Supply (Option for LR8100E only)**

# 4. INSTALLATION

## 4.1 Installation Location

The installation site of the recorder should meet the following conditions.

(1) The recorder will be adversely affected if the unit is exposed to direct sunlight or installed near a heater. Choose a location near room temperature (23°C) with minimal temperature fluctuations. Relative humidity should be 30 to 80% with no condensation. When the relative humidity is 30% or lower, protect the recorder from static electricity buildup by using a grounded discharge mat. When moving the unit from a dry, cool environment to a warm, humid environment, allow the recorder at least one hour to acclimatize.

(2) The recorder must be installed horizontally. However, the maximum permissible inclination from front to rear is ±5°. Angles greater than this can impede proper recording.

(3) To expose the recorder to soot, steam, moisture, corrosive gases etc. will adversely affect it.

(4) To use the recorder within strong electro-magnetic fields may cause malfunction. Please avoid installing near electro-magnetic objects.

(5) To install the recorder in a location susceptible to mechanical vibrations will adversely affect the mechanical parts and the quality of recording. Please choose an installation site characterized by minimal mechanical vibrations.

(6) Install the recorder at a location in accordance with category II (CAT II) of IEC1010-1.

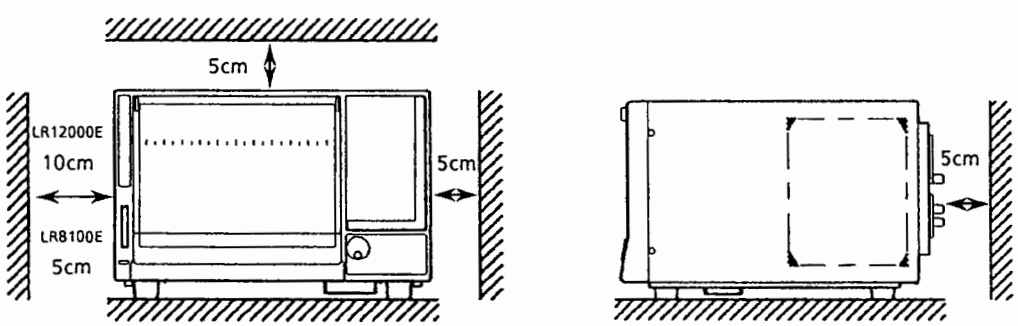
(7) Please do not install the recorder at altitudes above 2000m above sea level.

(8) This recorder is a POLLUTION DEGREE 2 instrument.

(9) Installation Site
To use the recorder within domestic establishments and within establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes may cause malfunction of other equipments. Please avoid using in domestic environment.

(10) Do not apply a force of more than 39N (approx. 4kgf) to the top of the LR12000E, since this might adversely affect the recording.

(11) The recorder has ventilation holes and an internal ventilation fan (LR12000E only). Make sure never to block these to prevent an excessive rise in internal temperature. Also make sure to conform to the minimum spaces as shown below.



# 4.2 External Dimensions and Panel Cutout

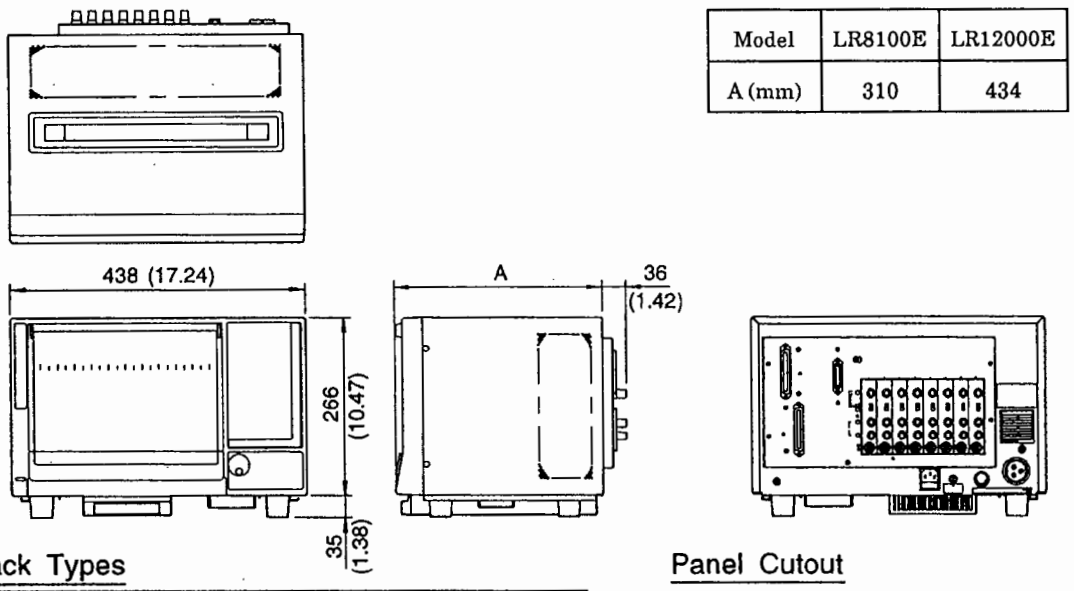
Fig. 4.1 shows the external dimensions and panel cutout.

(1) For rack mounting, use the optional rack brackets 378981. If the recorder is mounted on a JIS rack, install a sheet spacer (an accessory) at the bottom of the recorder. The spacer is not necessary for mounting on an ANSI rack.

(2) For panel mounting, use rack brackets. It is recommended that a shelf be provided as a support for the rear side of the recorder because it is quite heavy.

Unit : mm (approx. inch)

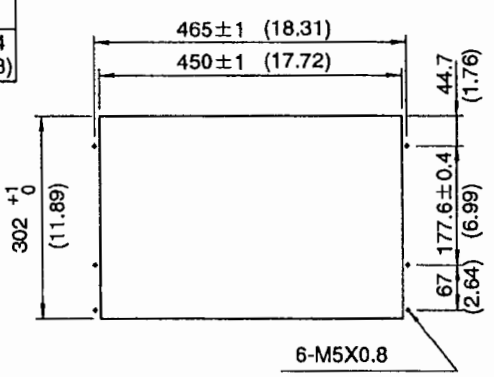
| Model | LR8100E | LR12000E |
|---|---|---|
| A (mm) | 310 | 434 |

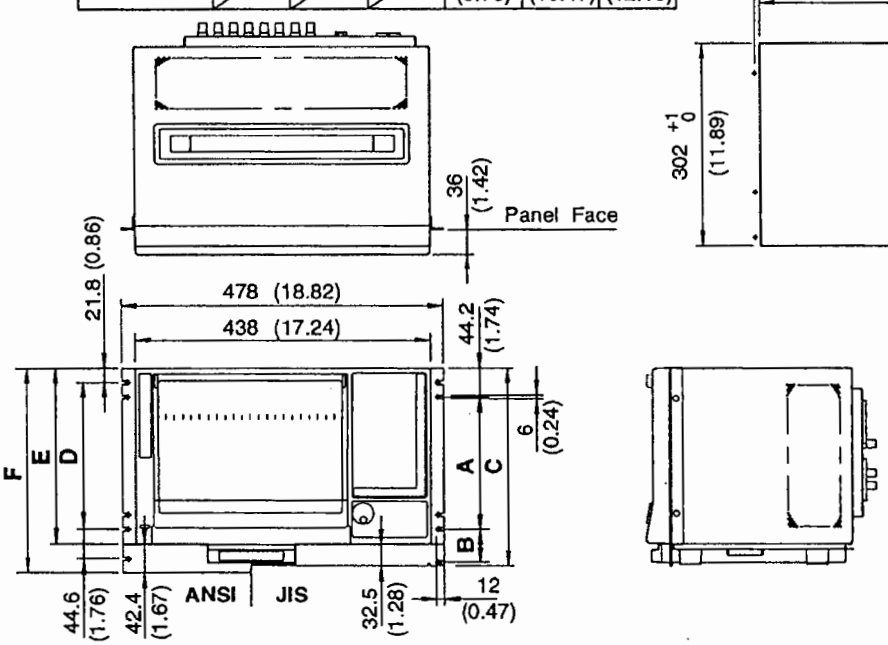



## Rack Types

| Rack Types | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| JIS | 200 (7.87) | 50 (1.97) | 299.5 (11.79) | | | |
| ANSI | | | | 222.4 (8.76) | 266 (10.47) | 309.4 (12.18) |

## Panel Cutout




If not specified, the tolerance is ±3%. However, in cases of less than 10mm, the tolerance is ±0.3mm.

**Fig. 4.1 Dimensions and Panel Cut-out**

# 5. WIRING

## 5.1 Power Supply

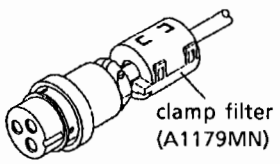
With the power switch OFF, connect the power supply cord to the power supply connector on the rear panel shown in Fig. 3.2.

For the optional DC power supply (for LR8100E only), connect the DC power supply connector:

Pin ① : Positive terminal
Pin ② : Negative terminal
Pin ③ : Ground

Connect either the AC or DC power supply. The recorder may fail to meet the EMC standard when both the AC and DC power supplies are connected.

For the optional DC power suply (for LR8100E only), apply the clamp filter (standard accessory) to the power cord as shown below. This is to eliminate the electric emmission.




**⚠ WARNING**

Always make sure to use grounded power cords. Do not use non-grounded extension cords or other measures that defeat the protection grounding.

## 5.2 Input

Connect the input terminals on the recorder rear panel as described below.

⚠ Installation category of measuring terminal is cat II.

### 5.2.1 DC Voltage and Thermocouple

The input terminal consists of three terminals; positive (H), negative (L) and guard (G).

(1) When the recorder is used in a laboratory or in a high-voltage range, connect an input line between terminals H and L with terminals L and G shorted (Fig. 5.1).

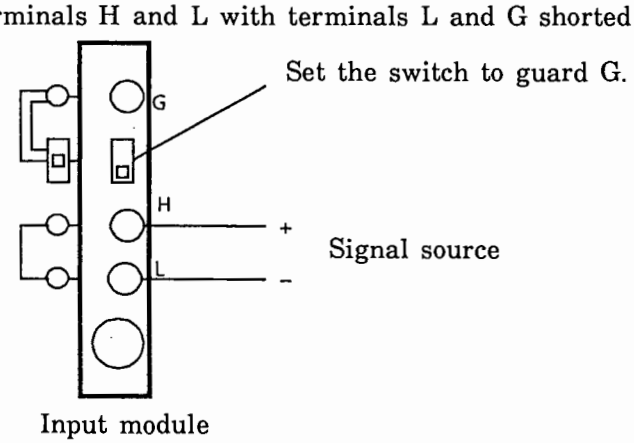



**Fig. 5.1**

(2) For high-sensitivity measurement, warm up the recorder for at least an hour.
If the recorder is likely to be affected by noise, etc. in high-sensitivity measurement, or if it is likely to be affected by common mode voltage, use the guard (G) terminal and when wiring, use shielded cables where possible. Figs. 5.2 thru 5.4 show general wiring examples.

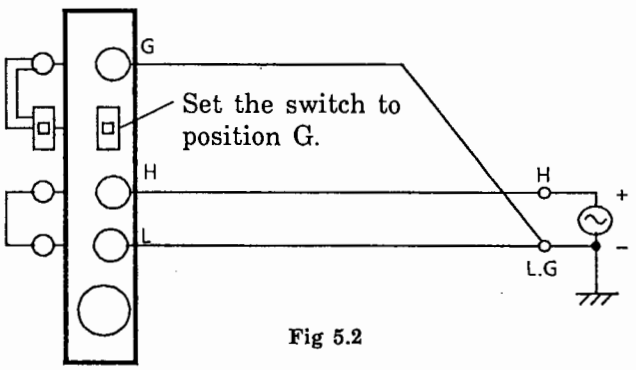



Fig 5.2

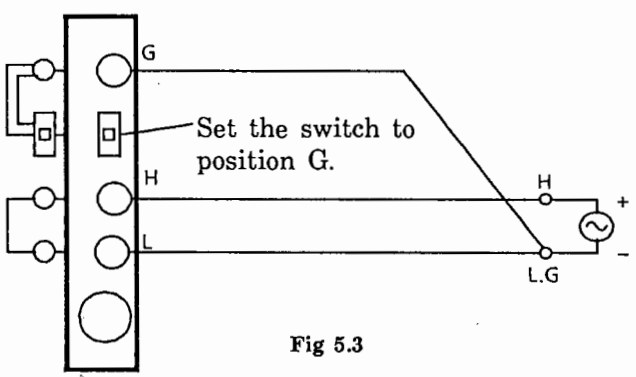



Fig 5.3

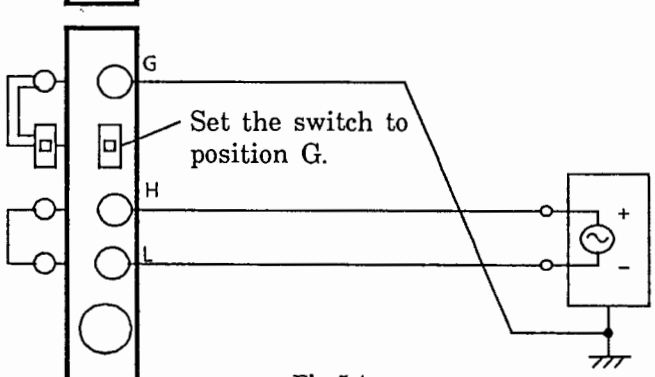



Fig 5.4

High sensitivity and temperature measurement precautions

(1) If there is a change in the temperature difference between the recorder interior and exterior, it may cause a zero drift. Take care of the following when installing the recorder.
   ① Stop air-conditioning equipment or use the recorder where there are no sudden changes in temperature. (When airconditioning equipment starts or stops, the temperature changes widely and the recorder is affected by thermoelectromotive force.
   ② Use the recorder where there is no rapid change in temperature caused by exposure to wind, direct sunlight, etc..
   ③ Always use a terminal cover to minimize the effects of wind, etc.

(2) Use of metal chips and wire other than copper for input wiring may result in a thermoelectromotive force of a few u V. Therefore, always use copper wires for high-sensitivity measurement.

(3) If thermocouples high - thermal - capacity terminals are used for connections, terminal temperature changes and reference junction compensation errors occur. Therefore, connect a thermocouple directly.

**⚠ WARNING**

1 Maximum input voltage is 250 V DC. If the voltage exceeds 250 V, the input circuit may be damaged.
2. Maximum common mode voltage is 250 V AC rms. If it exceeds this value, an error may occur or the input circuit may be damaged.
3. Never allow the maximum input to exceed 250 V DC + AC rms. If voltages which exceed this rating is applied to the input terminal, the input circuit could be damaged.

**Notes:**

1. The recorder should be grounded for any of the above cases.
2. The guard terminal function is not provided for low-sensitivity models.
3. For the high-sensitivity range use as short an input cord as possible.
4. Allowable signal source resistance is 1KΩ or less for DC voltage and thermocouple input. If it is greater, take a bias current of about 4 nA into account. In this case, 4 nA (signal source resistance) is added to the input voltage, and the voltage drop will be in error.
5. The external equipment must be comply with IEC 950 or IEC 1010.

### 5.2.2 RTD Input

Use a three-wire RTD. The cryogenic platinum and cobalt RTD (J263*B) is of the four-wire type. However, it can also be used as a three-wire type.

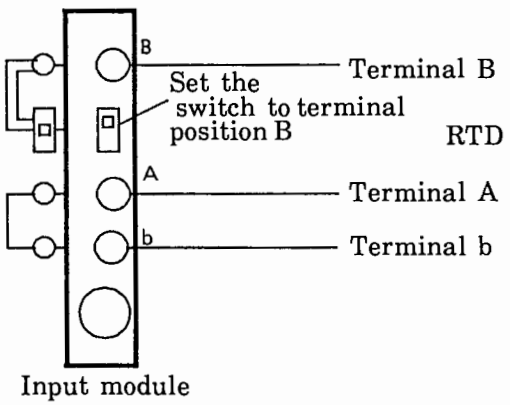



**Fig 5.5 RTD Input Wiring**

**Notes:**

1. Balance the three lead wire resistance lines for RTD input.
   Further, the following error is due to lead wire resistance.
   Pt 100, Ni 100, J263*B : 0.1°C at 10 Ω.
   Pt 50 : 0.1°C at 5 Ω.
2. Maximum common mode voltage is 250 V AC rms. If it exceeds this value, an error may occur or the input circuit may be damaged.

## 5.3 Transportation

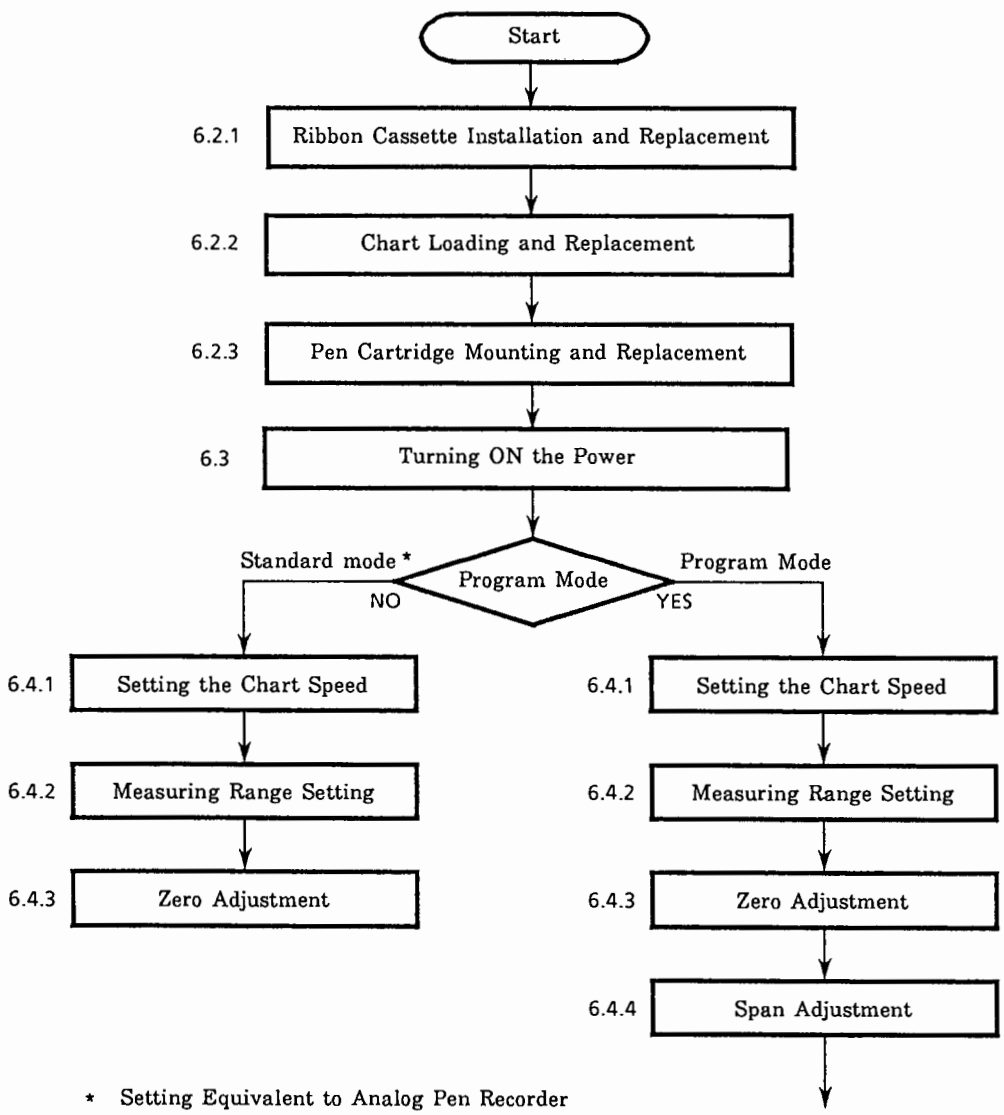
When carrying the LR12000E, please hold the underside of the recorder firmly from both sides by two persons.

# 6. OPERATION

## 6.1 Operating Procedure Flow Chart

General setting and operating procedures for the LR8100 / LR12000 are described in the following flow chart.

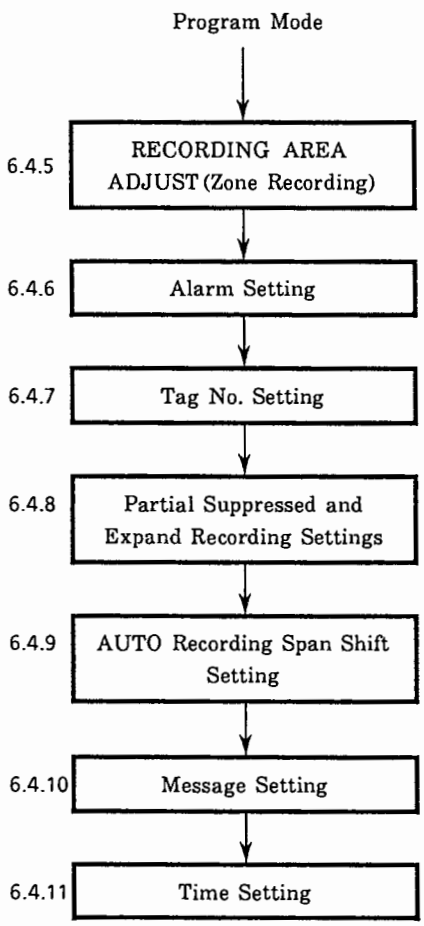
Two types of setting modes: standard and program modes, are available. When only the functions equivalent to those provided by conventional analog pen recorders are used, only the standard mode settings are required. When performing applied operations, make the settings in regular sequence in the program mode.




* Setting Equivalent to Analog Pen Recorder

**Notes :**

1. No setting is required for unnecessary items :
   only the necessary items need be set.
2. When initializing setting information, see Section 6.4.12 Set value Information.
3. When using an IC card, see Section 6.4.13 IC Card.
4. When changing initially set values such as °C / °F, see Section 6.4.14 Set up Mode.
5. When referring to the whole contents of the program, see Section 6.4.15 RAM CLEAR Setting.
6. See Section 6.4.16 Error Messages.



# 6.2 Preparation

## 6.2.1 Ribbon Cassette Installation and Replacement

> **CAUTION**
>
> Before replacing the ribbon cassette, make sure to turn off the power supply.

(1) Open the front panel and push the right-hand stoppers on the chart tray to lift the unit. (Figs. 6.1 and 6.2)
(2) Pull the tray toward you to remove it from the recorder. (Fig. 6.3)
(3) Move the printer carriage to the extreme left, and all pens on the pen carriages to the extreme right.

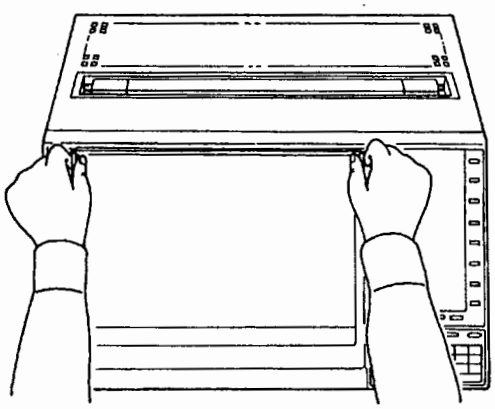


Fig 6.1

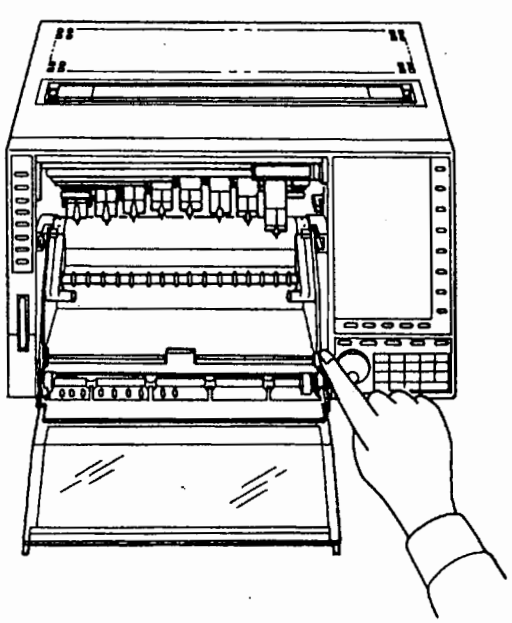


Fig 6.2

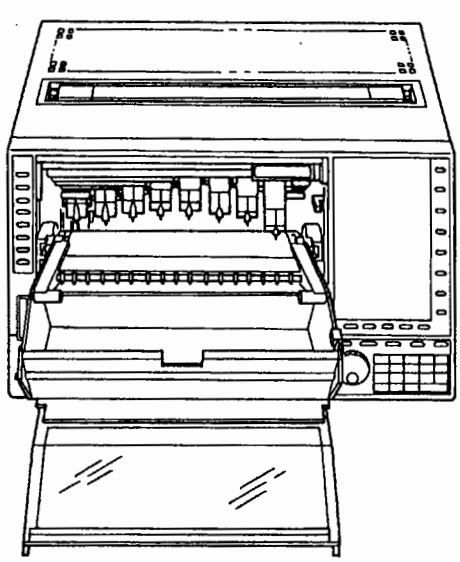


Fig 6.3

(4) Pull out the ribbon slightly from the ribbon cassette and install the ribbon onto the two guide pins. At this time, the ribbon adjustment knob must face down. (Fig. 6.4)
(5) Move the ribbon cassette approx. 20 mm to the right beyond the printer carriage with the ribbon passed through the two guide pins. (Fig. 6.5)
(6) Move that ribbon cassette back by approx. 10 mm toward the guide pins. Be sure to install the ribbon to the guide roller by dropping the slackened ribbon on the roller section so as to cover the front and rear of the printer head. (Fig. 6.6)
(7) Bring the ribbon cassette to the middle of the recorder, then change it from the right hand to the left hand to prevent the right hand from coming into contact with the pen carriage. Insert half of the cassette into the square hole on the right side plate and push the angled section at the end of the cassette. (Fig. 6.7)
(8) Push the cassette into the square hole on the right sideplate until it latches with a click. (Fig. 6.8)
(9) When the slack ribbon falls below the wire dot printer, repeat the above procedure to remove ribbon slackening.

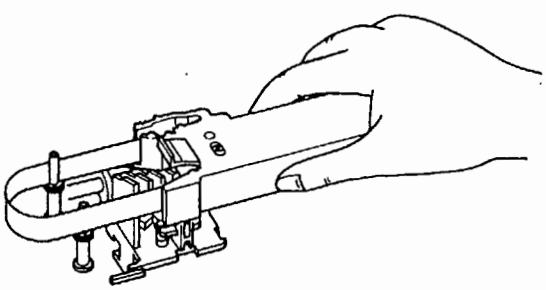


Fig 6.4

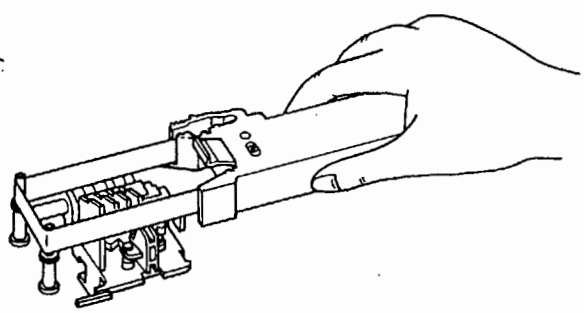


Fig 6.5

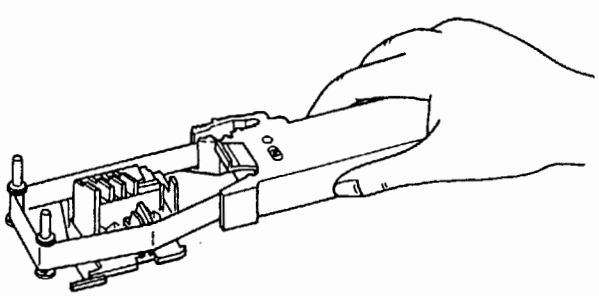


Fig 6.6

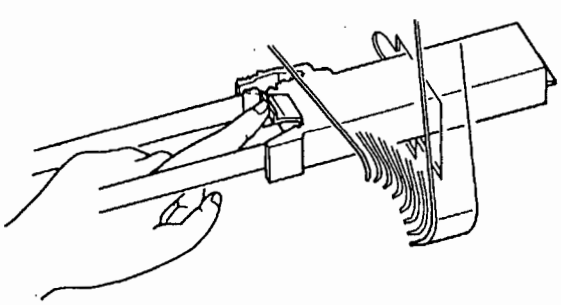


Fig 6.7

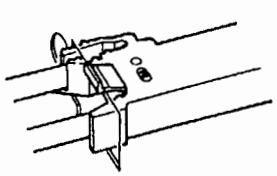


Fig 6.8

(10) When replacing the ribbon cassette, pinch the cassette latchlevers, then pull the cassette out of the hole. (Fig. 6.9) Use the same procedure when installing new cassettes.

(11) Fit the projections on the chart tray into the notches in the recorder and push the tray toward the recorder until it clicks.

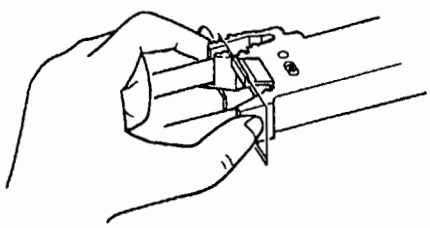


Fig 6.9

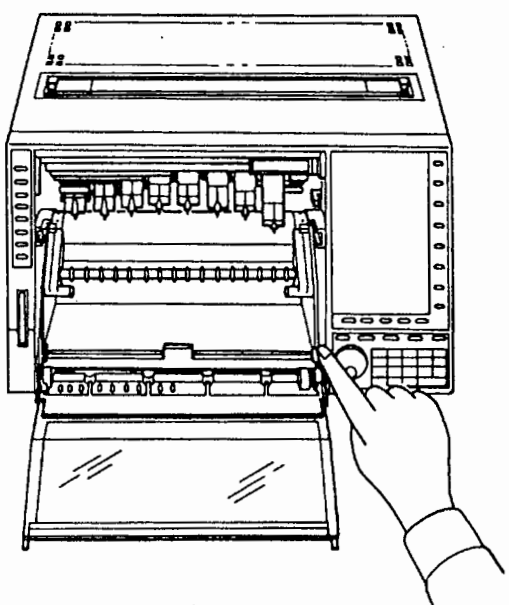


Fig 6.10

## 6.2.2 Chart Loading and Replacement

Chart replacement can be performed whether the power is turned on or not.

(1) Ruffle both ends of the chart so that the chart sheets can be fed one by one.

(2) Open the front panel and remove the chart tray from the recorder. (See Figs. 6.1 thru 6.3)

In case of the LR12000E, pen No. 1 will touch the paper, even if the pen-up function is being used. Since this will leave ink on the paper, remove pen No. 1.

(3) Pull both the right and left chart holders (transparent) forward. (Fig. 6.12)

(4) Remove the chart holding roller from the unit. Because there is a spring mechanism at the left of the roller, push the roller leftward to remove it. (Fig. 6.13)

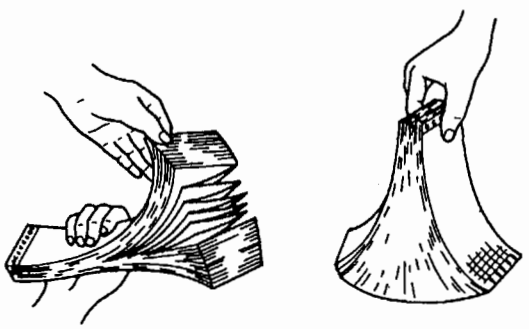
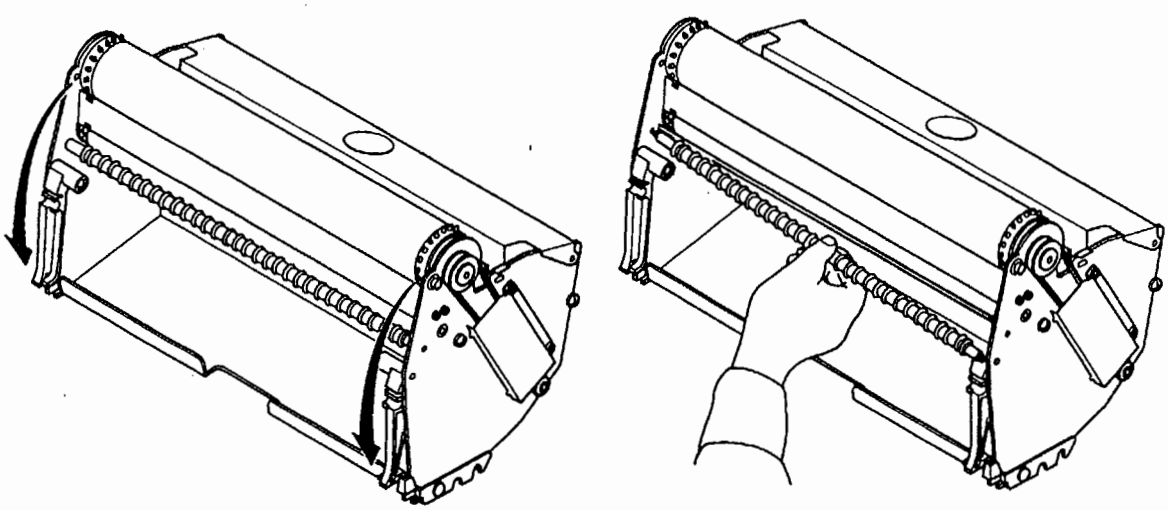


Fig 6.11



(5) Lift up both knobs of the metal chart holder at the rear section of the chart tray. (Fig. 6.14)

(6) Load the chart into the tray by pulling it to the leftside. In this case, set the chart so that the round holes in the chart are positioned at the left. (Fig. 6.15)

(7) Align the chart holes on both sides of the chart with the sprockets at both sides of the housing unit, and reinstall the chart holding roller in place with the spring-equipped end at the left. (Fig. 6.13) In this case, make sure that both the right and left chart holes are positioned correctly.

(8) Return both the right and left chart holders to their places on the housing holder. (See Fig. 6.12.)

(9) Set the projecting sections of the housing unit to the recorder support notch and push the unit to the recorder until a locking sound is heard. (See Fig. 6.10.)

(10) Turn ON the power and press the FEED pushbutton on the left front panel of the recorder to feed more than three folded portions of the chart to the chart receiving section. In this case, make sure that the chart is feeding normally. Even when the chart is fed manually, press the FEED button to make sure that the feeding operation is normal. If the chart does not feed correctly, repeat the procedure from step (2) above.

(11) When the chart is nearly finished, a vermilion band indicating "RENEW CHART" appears on the chart. When this appears, install a new chart.

(12) When the chart is finished, the CHART END indicator lights up at the top of the front panel. When this happens, replace the chart with a new one by following the procedure described in steps (1) to (10) above.

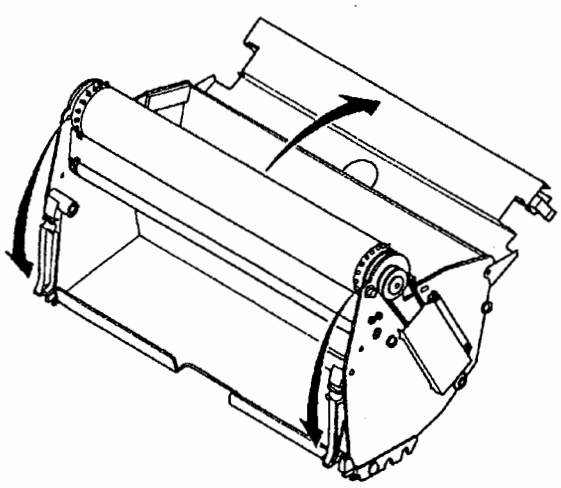


Fig 6.14

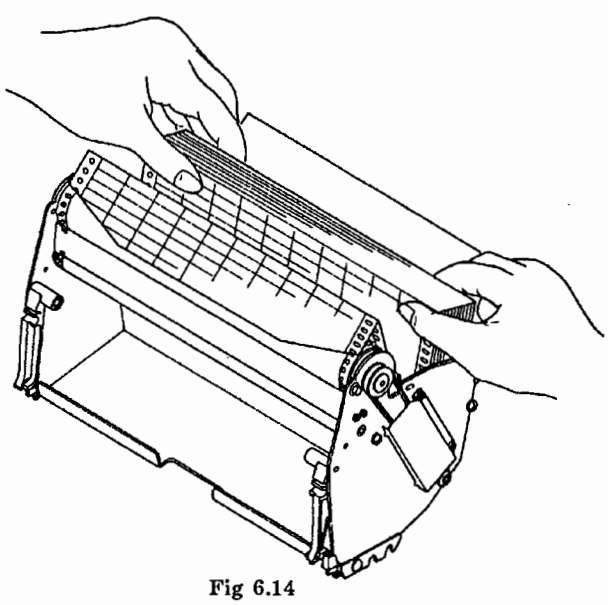


Fig 6.14

**CAUTION**

Always use recorder charts (B9585AH) provided by YOKOGAWA as use of other charts may cause problems.

## 6.2.3 Pen Cartridge Mounting and Replacement

> **CAUTION**
>
> Before replacing the pen cartridge, make sure to turn off the power supply.

(1) Open the front door.

(2) It is recommended that the pens be mounted or replaced after the chart tray has been removed.
Press the tray at the right of the chart tray and remove the unit from the recorder (See Fig. 6.2.).
The pens can also be replaced without removing the chart tray, but it is rather difficult.

(3) Remove the cap from the pen cartridge and insert it into the pen cap holder at the bottom of the inside of the front door for storage. Note that the LR12000E is not equipped with a pen cap holder.

(4) Install a pen cartridge to the holder.
Make sure that a pen corresponding to the pen number and color shown on the pen holder has been installed. Note, however, that pens with different numbers and colors can also be mounted.
When installing the cartridge, insert it into the holder so that the projection at the rear of the cartridge is positioned below the pen cartridge shaft, then press it onto the holder (Fig. 6.16).
Cartridge installation is complete when a locking sound is heard and the pen is flush with the holder.

(5) Pens can be removed from the pen holder by lifting the center portion of the cartridge upward (Fig. 6.17).

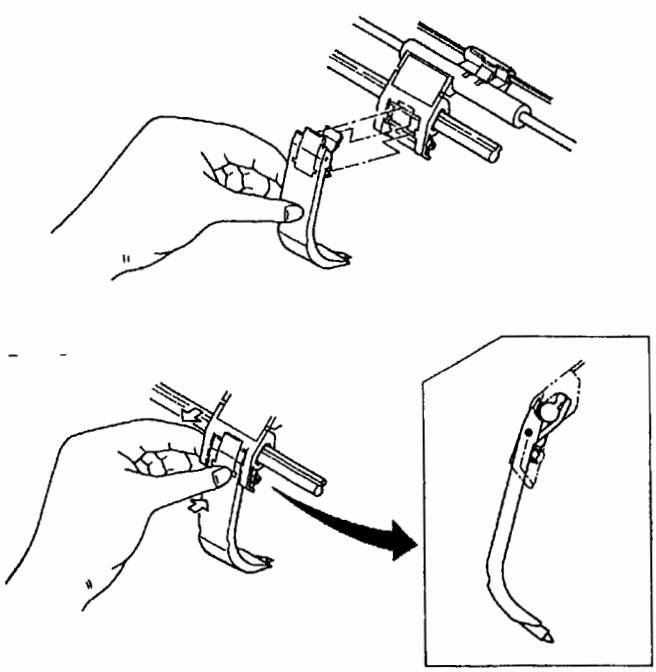


Fig 6.16

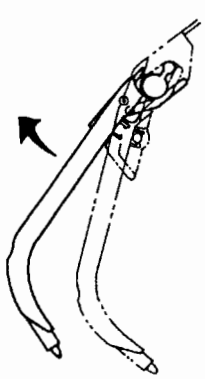


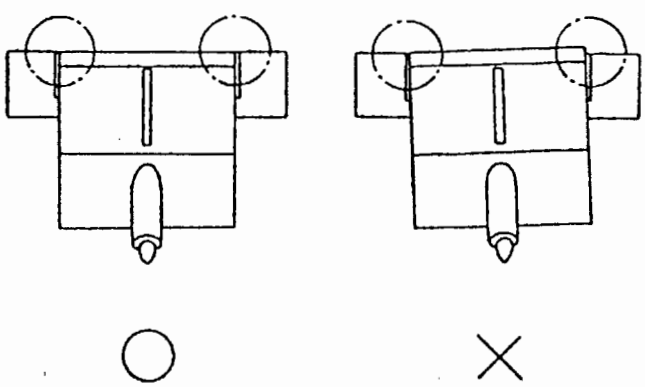
Fig 6.17

(6) There are three types of pens; standard, high-speed and low-speed.
A selection guide showing how to distinguish between them is set out below.

| | | |
|---|---|---|
| Standard | : | used for normal recording with a pen recording speed of about 800 mm / s or less.<br>Color of the bracket at the rear of the pen : Gray |
| High-speed type | : | used for recording high-speed phenomenon requiring a pen recording speed of more than 800 mm/s.<br>Color of the bracket at the rear of the pen : Blue |
| Low-speed type | : | used for low-speed feeding with a chart feed speed of about 100 mm/h or less.<br>Color of the bracket at the rear of the pen : White |

**Notes:**

1. Forcing the pen holders right and left with the power supplied may damage their function.
2. If the recorder is not used for a long time, remove the pens and always cover them with pen caps.
3. A pen cartridge has latch sections at its right and left.
   Make sure that both latches are firmly set and that the cartridge is flush with the holder.
   Note that an inclined pen cartridge will not record correctly.



## 6.2.4 Battery Replacement

> **CAUTION**
>
> Before replacing the battery, make sure to turn off the power supply and disconnect the power source.

Batteries to protect setting parameters are installed prior to delivery.

(1) If the MAIN BAT indicator on top of the front panel lights up, replace the batteries.
(2) Turn the power supply OFF and in case of the LR8100E unscrew 4 screws; 2 on top of the recorder and 2 at the rear, using a Phillips screwdriver (Fig. 6.18) ; in case of the LR12000E, unscrew 2 screws at the rear.
(3) Pull the top cover to the rear to remove it. There is lithium battery pack on the right side when viewed from the front (Fig. 6.19). The battery pack incorporates lead wires and connectors.
(4) Remove the battery from the recorder using a Phillips screwdriver and then take the leads and connector off the battery.
(5) Mount a new battery (Part No. : B9588ZB) onto the connector of the main board from which the used battery was removed.
(6) Fix the battery in place with a screw.
(7) Install the cover to complete replacement.

**Note:**

Replacing the battery erases the setting parameters. If necessary, store them in an IC card. (For storing the setting parameters, see Section 6.4.13.)

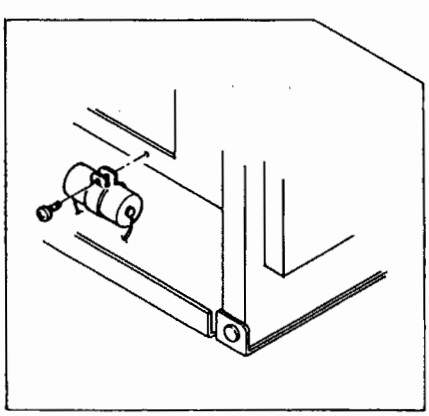


Fig 6.18

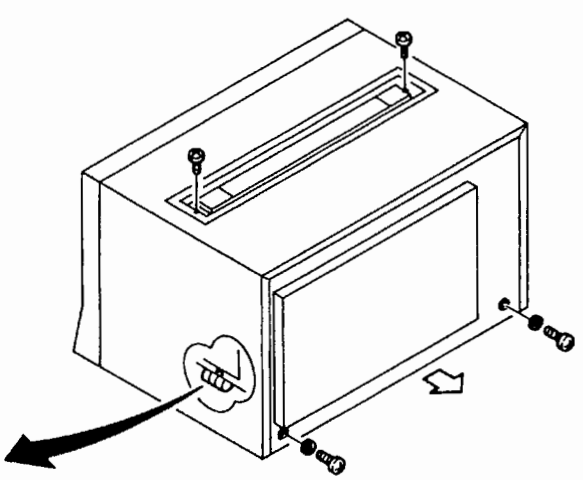


Fig 6.19

## 6.2.5 Battery Installation and Replacement (from the IC card)

The following describes the IC card set data protection battery installation and replacement procedure.

(1) Hold the IC card so that the side which shows the part number faces upward.
(2) Place your finger nail in the battery holder groove and pull it forward to take out the battery holder (Fig. 6.20).
(3) Insert a new battery (B9586JU or B9586JV : optional) into the battery holder.
(4) Insert the battery holder into the IC card.
This completes battery installation upon delivery. The following describes how to replace the battery.
(5) If the CARD BAT indicator on top of the front panel lights up, it is time to replace the IC card battery.
(6) The battery should be removed with the recorder power supply set to ON and the IC card installed in the recorder. Note that replacing the battery when the power is OFF, or after the card has been removed from the recorder, erases the set data.
(7) Place your finger nail into the battery holder groove at the near right of the IC card to pull out the battery holder.
(8) Replace the battery with a new one and return the battery holder to the IC card.
This completes IC battery replacement.

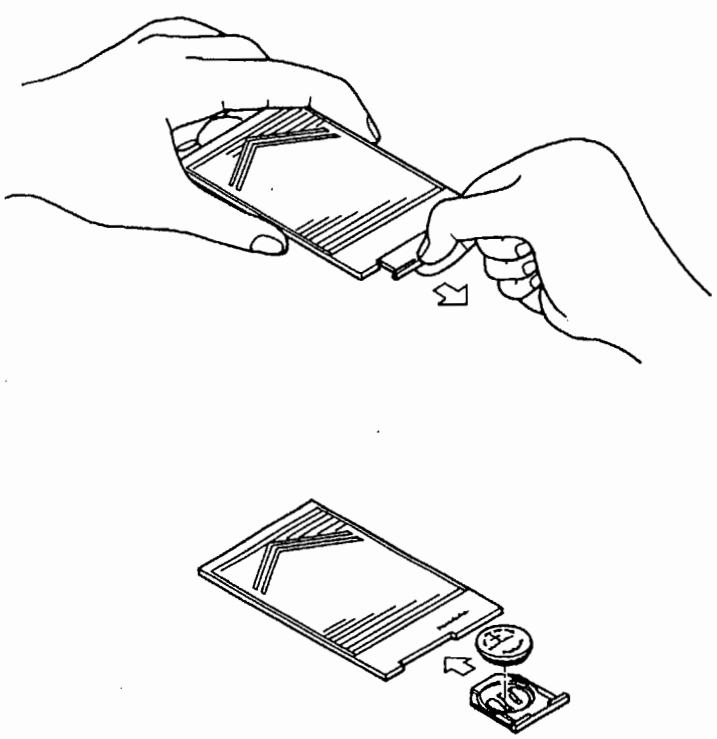


Fig 6.20

### 6.2.6 Front Door Removal

The LR8100E / LR12000E allows you to remove the front door so that the space available can be used effectively. The following describes removal and installation of the front door.

(1) Pull the front door forward. There is a front door removal slide washer at the bottom right of the front door.
(2) Place your finger nail on the slide washer projection and slide it to the left. This allows the front door to be removed.
(3) When mounting the door, insert the slide washer into the recorder hole and fasten the door.

**Note:**

If the chart tray is fully loaded with a chart when the front door is removed, the chart may jump out of the recorder. Therefore, it is recommended that the recorder be used with the front door installed whenever possible.

# 6.3 Turning the Power Supply ON

Turn ON the power on the front panel. The operation and program keys are set prior to shipment.

### (1) Operation Key

| Key | Initial Setting Status |
|---|---|
| DISPLAY SELECT | DIGITAL |
| □CHART START | OFF |
| FEED | OFF |
| PENLIFT | UP |
| MANUAL PRINT | OFF |
| LIST | OFF |
| MANUAL MESSAGE | OFF |
| □POC | OFF |
| REMOTE □ LOCAL | LOCAL (with GP-IB) |
| □ KEY LOCK | OFF |
| □ RECORD | OFF |

## (2) Program Key

| Key | Initial Setting Status | |
|---|---|---|
| CHART SPEED | 10mm / M | |
| ◀RANGE▶ RANGE | MODE | VOLT |
| | RANGE | 200V |
| | SPAN L | 0.00V |
| | SPAN R | 200.00V |
| | FILTER | OFF |
| ◀ZERO▶ ◀SPAN▶ | ZERO | 0.00~200.00V |
| | SPAN | 0.00~200.00V |
| RECORD AREA ADJ | 0~100% | |
| AUX | ALARM | OFF |
| | TAG No. | CH |
| | MESSAGE | Space |
| | RCD | can not set |
| | RAM CLEAR | NO |

# 6.4 Setting

## Precautions

① Note that there might be a difference between the setting panel described here and the actual panel, since the number of display rows differs depending on the number of input channels.

② Depress the keys with your finger, when setting data. Depressing with nails or using a sharp tool may cause damage to the instrument.

## 6.4.1 Setting the Chart Speed

Two modes, standard and program, are used in setting the chart speed.

### (1) Standard Mode

**Function** : Selects the chart speed corresponding to that of analog recorders via the function keys and setting knob.

**[Key operation]** **[Setting display]** **[Description]**

CHART SPEED

( F3 )

```
CHART SP1 : 10mm/H

        ← → mm/H mm/M
```

Press the CHART SPEED function key. If the speed is to be changed from mm/M to mm/H, press function key F3.

Setting knob

Set the chart speed with the setting knob. Chart speeds that can be selected in the standard mode are shown in Table 6.1.

ENTRY

ENTRY

```
CHART SP1 : 100mm/H

        ← → mm/H mm/M
```

Pressing the ENTRY key twice completes this setting. The display will return to the original status.

( Because setting becomes valid when the key is pressed once, press the ENTRY key to check to see if the chart is fed at the rate set. )

**Table 6.1 Standard Mode Chart Speed**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| mm / min<br>mm / h | 10 | 12 | 20 | 30 | 50 | 60 | 75 |
| | 100 | 120 | 150 | 200 | 300 | 500 | 600 |
| | 750 | 1000 | 1200 | | | | |
| inch* / min<br>inch / h | 0.5 | 1 | 1.2 | 2 | 3 | 5 | 6 |
| | 10 | 12 | 20 | 30 | 45 | | |
| | | | | | | | |

* For transferring to inch series, see Section 6.4.14 Set Up Mode.

## (2) Program Mode

**Function** : Allows the recorder to set chart speed in 1 mm units by pressing the ALPHANUMERIC key.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| CHART SPEED<br>( F3 ) | CHART SP1 : 10mm/H<br>← → mm/H mm/M | Press the CHART SPEED function key. To change the speed from mm/M to mm/H, press function key F3. |
| N 0 #<br>⌇<br>C 9 S | | Set the data (digits) you desire by pressing the ALPHANUMERIC key. |
| ENTRY<br>ENTRY | CHART SP1 : 100mm/H<br>← → mm/H mm/M | Pressing the ENTRY key twice completes this setting. The display will return to the original status. |
| | | ( Because setting becomes valid when the key is pressed once, press the ENTRY key to check to see if the chart is fed at the rate set. ) |

## 6.4.2 Measuring Range Setting

Two modes, standard and program, can be used in setting the measuring range.

### (1) Standard Mode

**Function** : Selects the measuring range corresponding to that of analog recorder through the function keys and setting knob.

**[Key operation]** **[Setting display]** **[Discription]**

RANGE

```
1CH  200V 0.00~200.00
2CH  200V 0.00~200.00
3CH  200V 0.00~200.00
4CH  200V 0.00~200.00
```

Pressing the RANGE function key allows the display unit to show the present measuring range for every channel. When the scaling function is used, the scaled values will appear.
The cursor blinks at the CH1 setting display, indicating that the CH1 measuring range can be changed.

```
1CH  5V    0.000~5.000
2CH  200V  0.00~200.00
3CH  200V  0.00~200.00
4CH  200V  0.00~200.00
```

Turning the setting knob transfers the CH1 measuring range contents shown in Table 6.2 in the order of DC voltage, thermocouple and RTD successively.
Select any range.

(Lighting up of the LED at the top right of the setting knob indicates that setting knob operation is valid. Further, the pen moves corresponding to range change.)

or

```
1CH  5V    0.000~5.000
2CH  200V  0.00~200.00
3CH  200V  0.00~200.00
4CH  200V  0.00~200.00
```

Then, press the cursor key below the setting knob to shift the cursor to the next channel. This allows you to set the measuring range for the next channel.

ENTRY
ENTRY

```
1CH  5V     0.000~5.000
2CH  T      -200.0~400.0
3CH  50mV     0.00~50.00
4CH  10V   0.000~10.000
```

After the final channel measuring range has been set, press the ENTRY key twice. This enables the display to return to the original status.

In case of the LR12000E, switch between channels 1 to 6 and 7 to 12 using the display switch key.

Table 6.2 Standard Mode Range and Span Table

| DC Voltage Range | | | | SPAN |
|---|---|---|---|---|
| High Sensitivity | | | 100 μV | 0~ 100 μV |
| | | | 200 〃 | 0~ 200 〃 |
| | | | 500 〃 | 0~ 500 〃 |
| | Medium Sensitivity | | 1 mV | 0~ 1 mV |
| | | | 2 〃 | 0~ 2 〃 |
| | | | 5 〃 | 0~ 5 〃 |
| | | Low Sensitivity | 10 〃 | 0~ 10 〃 |
| | | | 20 〃 | 0~ 20 〃 |
| | | | 50 〃 | 0~ 50 〃 |
| | | | 100 〃 | 0~ 100 〃 |
| | | | 200 〃 | 0~ 200 〃 |
| | | | 500 〃 | 0~ 500 〃 |
| | | | 1 V | 0~ 1 V |
| | | | 2 〃 | 0~ 2 〃 |
| | | | 5 〃 | 0~ 5 〃 |
| | | | 10 〃 | 0~ 10 〃 |
| | | | 20 〃 | 0~ 20 〃 |
| | | | 50 〃 | 0~ 50 〃 |
| | | | 100 〃 | 0~ 100 〃 |
| | | | 200 〃 | 0~ 200 〃 |

| Temperature Range | | SPAN | |
|---|---|---|---|
| | | °C | °F |
| TC | R | 0.0 ~ 1700.0 °C | 100 ~ 3200 °F |
| | S | 0.0 ~ 1700.0 °C | 100 ~ 3200 °F |
| | B | 0.0 ~ 1800.0 °C | 100 ~ 3300 °F |
| | K | −200.0 ~ 1300.0 °C | −300.0 ~ 2400.0 °F |
| | E | −200.0 ~ 800.0 °C | −300.0 ~ 1400.0 °F |
| | J | −200.0 ~ 1100.0 °C | −300.0 ~ 2000.0 °F |
| | T | −200.0 ~ 400.0 °C | −300.0 ~ 700.0 °F |
| | N | 0.0 ~ 1300.0 °C | 100.0 ~ 2300.0 °F |
| | W | 0.0 ~ 2300.0 °C | 100 ~ 4100 °F |
| | L (DIN) | −200.0 ~ 900.0 °C | −300.0 ~ 1600.0 °F |
| | U (DIN) | −200.0 ~ 400.0 °C | −300.0 ~ 700.0 °F |
| | Kp VS Aμ7Fe | 0.0 ~ 300.0 K | 0.0 ~ 300.0 K |
| RTD | Pt 100 : 1 | −200.0 ~ 800.0 °C | −300.0 ~ 1500.0 °F |
| | Pt 100 : 2 | −200.0 ~ 400.0 °C | −300.0 ~ 700.0 °F |
| | Pt 100 : 3 | −100.0 ~ 100.0 °C | −200.0 ~ 300.0 °F |
| | Pt 50 : 1 | −200.0 ~ 600.0 °C | −300.0 ~ 1100.0 °F |
| | Pt 50 : 2 | 0.0 ~ 600.0 °C | 0.0 ~ 1100.0 °F |
| | Pt 100 : 1 /JPt | −200.0 ~ 600.0 °C | −300.0 ~ 1100.0 °F |
| | Pt 100 : 2 /JPt | −200.0 ~ 400.0 °C | −300.0 ~ 700.0 °F |
| | Pt 100 : 3 /JPt | −100.0 ~ 100.0 °C | −200.0 ~ 300.0 °F |
| | Pt 50 : 1 /JPt | −200.0 ~ 600.0 °C | −300.0 ~ 1100.0 °F |
| | Pt 50 : 2 /JPt | 0.0 ~ 600.0 °C | 0.0 ~ 1100.0 °F |
| | Ni100 (DIN) | 0.0 ~ 100.0 °C | 0.0 ~ 300.0 °F |
| | Ni100 (SAMA) | −200.0 ~ 200.0 °C | −300.0 ~ 400.0 °F |
| | J263*B | 0.0 ~ 300.0 K | 0.0 ~ 300.0 K |

### (2) Program Mode

**Function** : Allows the recorder to set application modes other than the standard mode per channel to the program as shown in the tables below.

Seven settings are available in the standard function. For details, see the succeeding pages.

**[OFF]**

```
4CH
MODE : OFF
```

**[VOLT]**

```
4CH
MODE : VOLT
RANGE : 5V
SPAN  L : 0.000V
SPAN  R : 5.000V
FILTER : OFF
```

**[TC]**

```
4CH
MODE : TC
TYPE : S
SPAN  L :    0.0 °C
SPAN  R : 1760.0 °C
FILTER : OFF
```

**[RTD]**

```
4CH
MODE : RTD
TYPE : Pt100:1
SPAN L :   0.0 °C
SPAN R : 100.0 °C
FILTER : OFF
```

**[DELTA]**

```
4CH
MODE : DELT
REF CH : 1CH
SPAN L : 0.000mV
SPAN R : 5.000mV
FILTER : 1Hz
```

**[SCALE]**

```
4CH
MODE : SCALE/VOLT
RANGE : 200V
TYPE:
SPAN L :   0.00V
SPAN R : 200.00V
SCALE L : 1%
SCALE R : 100%
UNIT : %
FILTER : 0.1Hz
```

**[COPY]**

```
4CH
MODE : COPY CH:1CH
```

[OFF]

**Function** : Turns channels not used for measuring OFF.

**Setting item** : ① Channel Selection
② Channel OFF

**Setting example** : Setting CH4 to OFF

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| SHIFT | 1CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Press the RANGE function key after the SHIFT key to enable the setting display to appear. The display unit always shows the present CH1 setting display. |
| RANGE<br>F4 | | Press the F4 key to select CH4. Press the Next key to switch the displayed channels. |
| | 4CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | The display unit shows the present CH4 setting contents. |
| F1 | | Press the F1 key to set the channel OFF mode. |
| | 4CH<br>MODE : OFF<br><br><br><br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | The OFF mode appears. After confirming it, press the ENTRY key. This validates the setting contents. |
| ENTRY | | To complete the setting, press the ENTRY key once more. |
| ENTRY | | This enables the display to return to the original status. |

**Note** : If the range is set OFF, alarms set so far will be released automatically. Apart from alarms, auto recording span shift (and partial contraction / expansion mode) is also released automatically.
The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

[VOLT]

**Function** : Setting to measure VOLT (voltage).

**Setting item** :
① CH : Channel No.
② RANGE : Measuring range
③ SPAN L : Span (measuring range) left value
④ SPAN R : Span (measuring range) right value
⑤ FILTER : Low-pass-filter frequency

**Setting example** :
① CH : 4CH
MODE : VOLT
② RANGE : 5V
③ SPAN L : 1.000 V
④ SPAN R : 5.000 V
⑤ FILTER : 1 HZ

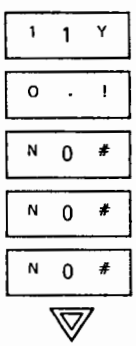
| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| SHIFT<br>RANGE<br>F4 | 1CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Press the function key "RANGE" after the SHIFT key to show enable the setting display panel. The display panel always shows the setting display panel corresponding to the present CH1.<br>Press the F4 key to select CH4.<br>Press the Next key to switch the displayed channels. |
| F2 | 4CH<br>MODE : OFF<br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | When the channel is selected, the cursor shifts automatically to MODE. Press the F2 key to set MODE to VOLT. |

**Note** : The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

[Key operation] [Setting display] [Description]

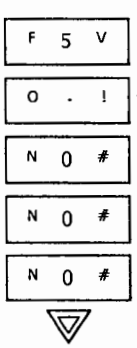
```
4CH
MODE : VOLT
RANGE : 2V
SPAN L : 0.0000V
SPAN R : 2.0000V
FILTER : OFF
```

Select the range (5 V) using the setting knob.
After range selection, press the cursor key to move to the next setting.




```
4CH
MODE : VOLT
RANGE : 5V
SPAN L : 0.000V
SPAN R : 5.000V
FILTER : OFF
  ←    →    del
```

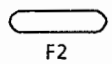
Set SPAN L using the ten key. The span setting range is as shown in Table 6.2.
The number of digits is changed by entering numerics or by pressing the F1 ( ← ) or F2 ( → ) keys. Unnecessary numerics can be deleted by pressing the F3 (del) key.
After the setting ends, press the cursor key. When no numeric change is required, press the cursor key to move to the next setting.




```
4CH
MODE : VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
FILTER : OFF
  ←    →    del
```

Set the right span (SPAN R) using the ten key. The setting procedure is the same as for the left span.
After setting is finished, press the cursor key.

[Key operation] [Setting display] [Description]




```
4CH
MODE : VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
FILTER : OFF
 0.1 1Hz OFF
```

Set the low pass filter frequency to 1Hz by pressing the F2 key.


```
4CH
MODE : VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
FILTER : 1Hz
 0.1 1Hz OFF
```

Press the Entry key.
The details set at this time are used for the measurement, and the cursor returns to the CH position. Continue program setting as required, and when it is necessary to end the setting, press the ENTRY key to return to the original display.

**Table 6.2 Span Setting Range**

| Input Range | | | | Setting Range | | |
|---|---|---|---|---|---|---|
| | | | 100 μV | -110.00~ | 110.00 | μV |
| | | | 200 〃 | -220.00~ | 220.00 | 〃 |
| | | | 500 〃 | -550.0 ~ | 550.0 | 〃 |
| | | | 1 mV | -1.1000~ | 1.1000 | mV |
| | | | 2 〃 | -2.2000~ | 2.2000 | 〃 |
| | | | 5 〃 | -5.500 ~ | 5.500 | 〃 |
| | | | 10 〃 | -11.000~ | 11.000 | 〃 |
| | | | 20 〃 | -22.000~ | 22.000 | 〃 |
| | | | 50 〃 | -55.00 ~ | 55.00 | 〃 |
| | | | 100 〃 | -110.00~ | 110.00 | 〃 |
| | | | 200 〃 | -220.00~ | 220.00 | 〃 |
| | | | 500 〃 | -550.0 ~ | 550.0 | 〃 |
| | | | 1 V | -1.1000~ | 1.1000 | V |
| | | | 2 〃 | -2.2000~ | 2.200 | 〃 |
| | | | 5 〃 | -5.500 ~ | 5.500 | 〃 |
| | | | 10 〃 | -11.000~ | 11.000 | 〃 |
| | | | 20 〃 | -22.000~ | 22.000 | 〃 |
| | | | 50 〃 | -55.00 ~ | 55.00 | 〃 |
| | | | 100 〃 | -110.00~ | 110.00 | 〃 |
| | | | 200 〃 | -220.00~ | 220.00 | 〃 |

(High Sensitivity / Medium Sensitivity / Low Sensitivity)

* Exceeding the setting range causes overrange

[TC]

**Function** : Setting to perform measurement by TC

**Setting Item** :

| | | | |
|---|---|---|---|
| ① | CH | : | Channel No. |
| ② | Type | : | Thermocouple type |
| ③ | SPAN L | : | Span (measuring range) left value |
| ④ | SPAN R | : | Span (measuring range) right value |
| ⑤ | FILTER | : | Low-pass-filter frequency |

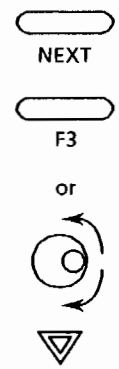
**Setting Example** :

| | | | |
|---|---|---|---|
| ① | CH | : | 4CH |
| ② | TYPE | : | T |
| ③ | SPAN L | : | 100 °C |
| ④ | SPAN R | : | 300 °C |
| ⑤ | FILTER | : | OFF |

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| SHIFT + RANGE | 1CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH | Press the function key "RANGE" after the SHIFT key to show the setting display panel. The display panel always shows the setting display panel corresponding to the present (No.1) CH. Press the Next key to switch the displayed channels. |
| F4 | ↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | |
| F3 | 4CH<br>MODE : OFF<br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | Press the F4 key to select CH4. When the channel is selected, the cursor shifts automatically to MODE. Press the F3 key to set MODE to TC. |

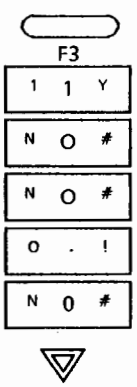
**Note** : The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

**[Key operation]** **[Setting display]** **[Description]**



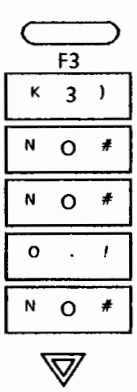

```
4CH
MODE : TC
TYPE : S
SPAN L :    0.0 ℃
SPAN R : 1760.0 ℃
FILTER : 1Hz
↓ R   S   B   K
↓ E   J   T   N
↓ W   L   U   Kpvs
```

Set thermocouples (type T) by pressing the NEXT and F3 keys or by turning the setting knob. After the setting ends, press the cursor key.




```
4CH
MODE : TC
TYPE : T
SPAN L : -200.0 ℃
SPAN R :  400.0 ℃
FILTER : 1Hz
   ←    →    del
```

Set SPAN L (100.0°C) by pressing the numeric keypad. The span setting range is as shown in Table 6.3. Press the cursor key.




```
4CH
MODE : TC
TYPE : T
SPAN L : 100.0 ℃
SPAN R : 400.0 ℃
FILTER : 1Hz
   ←    →    del
```

Set SPAN R (300.0) by pressing the numeric keypad, then press the cursor key.

[Key operation] [Setting display] [Description]

F3

```
4CH
MODE : TC
TYPE : T
SPAN L : 100.0 ℃
SPAN R : 300.0 ℃
FILTER : 1Hz
 0.1 1Hz OFF
```

Press the F3 key to turn OFF the filter. Press the ENTRY key.

ENTRY

(ENTRY)

```
4CH
MODE : TC
TYPE : T
SPAN L : 100.0 ℃
SPAN R : 300.0 ℃
FILTER : OFF
```

The details set at this time are used for the measurement and the cursor returns to the CH position.
Continue program settings as required, and when it is necessary to end the setting, press the ENTRY key.

**Table 6.3 Span Setting Range**

| Input Range | °C | °F |
|---|---|---|
| R | 0.0 ~ 1760.0 | 32 ~ 3200 |
| S | 0.0 ~ 1760.0 | 32 ~ 3200 |
| B | 0.0 ~ 1820.0 | 32 ~ 3308 |
| K | −200.0 ~ 1370.0 | −328.0 ~ 2498.0 |
| E | −200.0 ~ 800.0 | −328.0 ~ 1472.0 |
| J | −200.0 ~ 1100.0 | −328.0 ~ 2012.0 |
| T | −200.0 ~ 400.0 | −328.0 ~ 752.0 |
| N | 0.0 ~ 1300.0 | 32.0 ~ 2372.0 |
| W | 0.0 ~ 2315.0 | 32 ~ 4199 |
| L (DIN) | −200.0 ~ 900.0 | −328.0 ~ 1652.0 |
| U (DIN) | −200.0 ~ 400.0 | −328.0 ~ 752.0 |
| Kp vs Au7Fe | 0.0 ~ 300.0K | 0.0 ~ 300.0K |

[RTD]

**Function** : Setting to perform measurement by RTD

**Setting Item** :
- ① CH : Channel No.
- ② Type : RTD type
- ③ SPAN L : Span (measuring range) left value
- ④ SPAN R : Span (measuring range) right value
- ⑤ FILTER : Low-pass-filter frequency

**Setting Example** :
- ① CH : 4CH
- ② TYPE : Pt100 : 1/JPt
- ③ SPAN L : 0.0 °C
- ④ SPAN R : 50.0 °C
- ⑤ FILTER : 1Hz

**[Key operation]** | **[Setting display]** | **[Description]**

SHIFT + RANGE

```
1CH
MODE : VOLT
RANGE : 5V
SPAN L : 0.000V
SPAN R : 5.000V
FILTER : OFF
↓ 1CH 2CH 3CH 4CH
↓ 5CH 6CH 7CH 8CH
↓ 9CH XCH YCH ZCH
```

Press the function key "RANGE" after the SHIFT key to show the setting display panel, which always displays the setting display panel corresponding to the present CH1.
Press the Next key to switch the displayed channels.

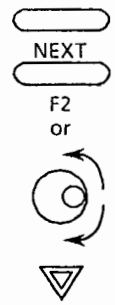
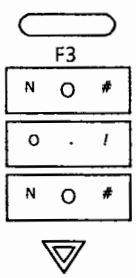
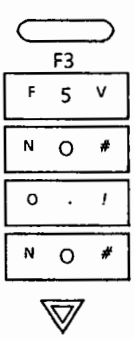
F4

```
4CH
MODE : OFF


↓ OFF   VOLT   TC  RTD
↓ DELT  SCAL COPY
```

Press the F4 key to select CH No.4.
When the channel is selected, the cursor shifts automatically to MODE. Press the F4 key to set MODE to RTD.

F4

Note : The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
|  | 4CH<br>MODE : RTD<br>TYPE : Pt100:1/JPt<br>SPAN L : -200.0 °C<br>SPAN R : 600.0 °C<br>FILTER : OFF<br>↓ Pt1 Pt2 Pt3 Pt4<br>↓ Pt5 Pt1J Pt2J Pt3J<br>↓ Pt4J Pt5J Ni1D Ni1S<br>↓ J263 | Selecting the RTD type (Pt 100Ω : 1/JPt)<br>The type can be selected by pressing the F1 to F4 keys or by turning the setting knob. Refer to table 6.4 for the relationship between RTD types, and their abbreviations.<br>After setting is finished, press the cursor key. (When the F1 to F4 keys are pressed, the cursor shifts automatically.) |
|  | 4CH<br>MODE : RTD<br>TYPE : Pt100:1/JPt<br>SPAN L : -200.0 °C<br>SPAN R : 600.0 °C<br>FILTER : OFF<br>← → del | Set SPAN L (0.0°C) by pressing the numeric keypad.<br>The span setting range is as shown in Table 6.4 Press the cursor key. |
|  | 4CH<br>MODE : RTD<br>TYPE : Pt100:1/JPt<br>SPAN L : 0.0 °C<br>SPAN R : 600.0 °C<br>FILTER : OFF<br>← → del | Set SPAN R (50.0°C) by pressing the numeric keypad, then press the cursor key. |

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| F2 | 4CH<br>MODE : RTD<br>TYPE : Pt100:1/JPt<br>SPAN L : 0.0 °C<br>SPAN R : 50.0 °C<br>FILTER : OFF<br>0.1 1Hz OFF | Press the F2 key to set the filter to 1 Hz. |
| ENTRY<br>(ENTRY) | 4CH<br>MODE : RTD<br>TYPE : Pt100:1/JPt<br>SPAN L : 0.0 °C<br>SPAN R : 50.0 °C<br>FILTER : 1Hz | Press the ENTRY key. The details set at this time are used for the measurement and the cursor returns to the CH position.<br>Change the other CH setting when required, and when it is necessary to end the setting, press the ENTRY key. |

**Table 6.4 RTD Range**

| Menu Display | Display | Measuring Range | |
|---|---|---|---|
| | | °C | °F |
| Pt1 | Pt100: 1 | – 200.0 ~ 850.0 | – 328.0 ~ 1562.0 |
| Pt2 | Pt100: 2 | – 200.0 ~ 400.0 | – 328.0 ~ 752.0 |
| Pt3 | Pt100: 3 | – 150.0 ~ 150.0 | – 238.0 ~ 302.0 |
| Pt4 | Pt50 : 1 | – 200.0 ~ 640.0 | – 328.0 ~ 1184.0 |
| Pt5 | Pt50 : 2 | – 50.0 ~ 600.0 | – 58.0 ~ 1112.0 |
| Pt1J | Pt100: 1/JPt | – 200.0 ~ 640.0 | – 328.0 ~ 1184.0 |
| Pt2J | Pt100: 2/JPt | – 200.0 ~ 400.0 | – 328.0 ~ 752.0 |
| Pt3J | Pt100: 3/JPt | – 150.0 ~ 150.0 | – 238.0 ~ 302.0 |
| Pt4J | Pt50 : 1/JPt | – 200.0 ~ 640.0 | – 328.0 ~ 1184.0 |
| Pt5J | Pt50 : 2/JPt | – 50.0 ~ 600.0 | – 58.0 ~ 1112.0 |
| Ni1D | Ni100/DIN | – 60.0 ~ 180.0 | – 76.0 ~ 356.0 |
| Ni1S | Ni100/SAMA | – 200.0 ~ 250.0 | – 328.0 ~ 482.0 |
| J263 | J263 * B | 0.0 ~ 300.0K | 0.0 ~ 300.0K |

[DELTA]

**Function** : Calculates the differential from the other channel (CH).

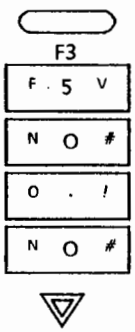
**Setting item** :
- ① CH : Which undergoes differential calculation
- ② REF CH : Reference channel
- ③ SPAN L : Span (measuring range) left value
- ④ SPAN R : Span (measuring range) right value
- ⑤ FILTER : Low-pass-filter frequency

**Restrictions** :
- ① The CH No. which undergoes differential calculation must be bigger than the reference CH No.
- ② The CH No. which undergoes differential calculation and the reference CH RANGE (voltage) or TYPE (temperature) must be the same.
- ③ If the CH No. which undergoes differential calculation, or the reference CH MODE, RANGE or TYPE is changed, the DELTA mode is released automatically.
- ④ The differential calculation cannot be set when MODE is other than VOLT, TC and RTD.

**Setting example** :
- ① CH : 4CH
- ② REF CH : 2CH
- ③ SPAN L : −50.0°C
- ④ SPAN R : 50.0°C
- ⑤ FILTER : 1Hz
- ⑥ RANGE : TYPE T

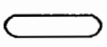
| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| SHIFT<br>RANGE<br>F4 | 1CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Press the function key "RANGE" after the SHIFT key to show the setting display panel. The display panel always shows the setting display panel corresponding to the present CH1.<br>Press the Next key to switch the displayed channels. |
| NEXT<br>F1 | 4CH<br>MODE : OFF<br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | If the channel is selected, the cursor shifts to MODE automatically.<br>Press the NEXT and F1 keys to set MODE to DELTA. |
| F2 | 4CH<br>MODE : DELTA<br>REF CH : 1CH<br>SPAN L : -200.0 °C<br>SPAN R : 400.0 °C<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH | Set the reference CH (CH2). Only the channels which can be selected by the function keys will be displayed (i.e. only channels which are smaller than the set channel). |
| H – X<br>F 5 V<br>N O #<br>O . !<br>N O #<br>▽ | 4CH<br>MODE : DELTA<br>REF CH : 2CH<br>SPAN L : -200.0 °C<br>SPAN R : 400.0 °C<br>FILTER : OFF<br>← → del | Set SPAN L (−50.0°C) by pressing the numeric keypad. The span that can be set is as shown in Table 6.5. After completing setting, press the cursor key. |

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.



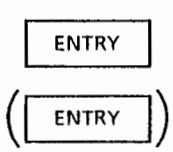

```
4CH
MODE : DELTA
REF CH : 2CH
SPAN L : -50.0 °C
SPAN R : 400.0 °C
FILTER : OFF
  ←    →    del
```

Set SPAN R (50.0 °C)
The decimal point position is corrected automatically during ENTRY by pressing the cursor key.




```
4CH
MODE : DELTA
TYPE : 2CH
SPA L :-50.0 °C
SPA R : 50.0 °C
FILTER : OFF
 0.1 1Hz OFF
```

Press the F2 key to set the filter to 1 Hz.




```
4CH
MODE : DELTA
REF CH : 2CH
SPAN L : -50.0 °C
SPAN R :  50.0 °C
FILTER : 1Hz
```

Press the ENTRY key.
The details set at this time are used for the measurement, and as a result the cursor returns to the CH1 position. When completing the setting, press the ENTRY key again.

### (1) Thermocouple

Table 6.5 DELTA Mode Setting Range

| | °C | °F |
|---|---|---|
| | Range | Range |
| R | −1760.0 ~ 1760.0 | −3200 ~ 3200 |
| S | −1760.0 ~ 1760.0 | −3200 ~ 3200 |
| B | −1820.0 ~ 1820.0 | −3295 ~ 3295 |
| K | −1370.0 ~ 1370.0 | −2498.0 ~ 2498.0 |
| E | − 800.0 ~ 800.0 | −1472.0 ~ 1472.0 |
| J | −1100.0 ~ 1100.0 | −2012.0 ~ 2012.0 |
| T | − 400.0 ~ 400.0 | − 752.0 ~ 752.0 |
| N | −1300.0 ~ 1300.0 | −2372.0 ~ 2372.0 |
| W | −2315.0 ~ 2315.0 | −4199 ~ 4199 |
| L | − 900.0 ~ 900.0 | −1562.0 ~ 1562.0 |
| U | − 400.0 ~ 400.0 | − 752.0 ~ 752.0 |
| Kp vs Au 7Fe | − 300.0 ~ 300.0k | − 300.0 ~ 300.0K |

### (2) Resistance Temperature Detector

| | °C | °F |
|---|---|---|
| | Range | Range |
| Pt100 : 1 | − 850.0 ~ 850.0 | −1562.0 ~ 1562.0 |
| Pt100 : 2 | − 400.0 ~ 400.0 | − 752.0 ~ 752.0 |
| Pt100 : 3 | − 150.0 ~ 150.0 | − 302.0 ~ 302.0 |
| Pt50 : 1 | − 640.0 ~ 640.0 | −1184.0 ~ 1184.0 |
| Pt50 : 2 | − 600.0 ~ 600.0 | −1112.0 ~ 1112.0 |
| Pt100 : 1/JPt | − 640.0 ~ 640.0 | −1184.0 ~ 1184.0 |
| Pt100 : 2/JPt | − 400.0 ~ 400.0 | − 752.0 ~ 752.0 |
| Pt100 : 3/JPt | − 150.0 ~ 150.0 | − 302.0 ~ 302.0 |
| Pt50 : 1/JPt | − 640.0 ~ 640.0 | −1184.0 ~ 1184.0 |
| Pt50 : 2/JPt | − 600.0 ~ 600.0 | −1112.0 ~ 1112.0 |
| Ni100/DIN | − 180.0 ~ 180.0 | − 356.0 ~ 356.0 |
| Ni100/SAMA | − 250.0 ~ 250.0 | − 482.0 ~ 482.0 |
| J263•B | − 300.0 ~ 300.0K | − 300.0 ~ 300.0K |

### (3) Voltage

| Range |
|---|
| + 110% of each range |
| Example : In 10mV range |
| −11.000 to 11.000 mV |

[SCALE]

**Function** : Converts voltage outputs from various converters to the respective physical amounts, along with performing temperature range scaling.

**Setting Item** :

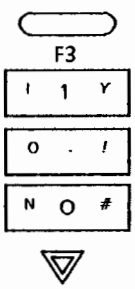
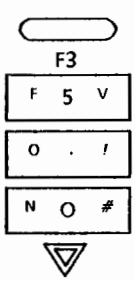
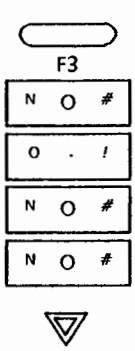
| | | | |
|---|---|---|---|
| ① | CH | : | Channel No. |
| ② | RANGE | : | Input type or TYPE |
| ③ | SPAN L | : | Span (measuring range) left value |
| ④ | SPAN R | : | Span (measuring range) right value |
| ⑤ | SCALE L | : | Scaling span left value |
| ⑥ | SCALE R | : | Scaling span right value |
| ⑦ | UNIT | : | Engineering unit (Up to 6 characters) |
| ⑧ | FILTER | : | Low pass filter frequency |

**Setting Example** :

| | | | |
|---|---|---|---|
| ① | CH | : | 4CH |
| ② | RANGE | : | 5 V |
| ③ | SPAN L | : | 1.000 V |
| ④ | SPAN R | : | 5.000 V |
| ⑤ | SCALE L | : | 0.00 |
| ⑥ | SCALE R | : | 100.00 |
| ⑦ | UNIT | : | % |
| ⑧ | FILTER | : | 1 Hz |

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| SHIFT<br>RANGE<br>F4 | 1CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Press the function key "RANGE" after the SHIFT key to show the setting display panel. The display panel always shows the setting display panel corresponding to the present CH1. Press the F4 key to select CH4.<br>Press the Next key to switch the displayed channels. |
| NEXT<br>F2 | 4CH<br>MODE : OFF<br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | When the channel is selected, the cursor shifts automatically to MODE.<br>Press the NEXT and F2 keys to set MODE to SCALE. |
| F1 | 4CH<br>MODE : SCALE/VOLT<br>RANGE : 2V<br>SPAN L : 0.0000V<br>SPAN R : 2.0000V<br>SCALE L : 1.000ABC<br>SCALER : 10.000ABC<br>UNIT : ABC<br>FILTER : OFF<br>VOLT TC RTD COM | Press the F1 key to set SCALE MODE to VOLT (voltage). VOLT, TC (thermocouple), RTD (resistance temperature detector) and optional COM (communication) are available as SCALE MODES. |
|  | 4CH<br>MODE : SCALE/VOLT<br>RANGE : 2V<br>SPAN L : 0.0000V<br>SPAN R : 2.0000V<br>SCALE L : 1.000ABC<br>SCALE R : 10.000ABC<br>UNIT : ABC<br>FILTER : OFF | Select RANGE (5 V) by turning the setting knob, and after setting is finished, press the cursor key. |

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
|  | 4CH<br>MODE : SCALE/VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>SCALE L : 1.000ABC<br>SPALE R : 10.000ABC<br>UNIT : ABC<br>FILTER : OFF<br>← → del meas | Enter SPAN L (1.000 V), then press the cursor key.<br>The decimal point position is corrected automatically during ENTRY.<br>The application of meas, which is displayed on the menu at this time, is explained at the end of [SCALE]. |
|  | 4CH<br>MODE : SCALE/VOLT<br>RANGE : 5V<br>SPAN L : 1.000V<br>SPAN R : 5.000V<br>SCALE L : 1.000ABC<br>SPALE R : 10.000ABC<br>UNIT : ABC<br>FILTER : OFF<br>← → del meas | Enter SPAN R (5.000 V) then, press the cursor key. |
|  | 4CH<br>MODE : SCALE/VOLT<br>RANGE : 5V<br>SPAN L : 1.000V<br>SPAN R : 5.000V<br>SCALE L : 1.000ABC<br>SPALE R : 10.000ABC<br>UNIT : ABC<br>FILTER : OFF<br>← → del | Set SCALE L (0.00), then press the cursor key. |

**[Key operation]** **[Setting display]** **[Description]**

F3

1 1 Y
N O #
N O #
0 . /
N O #
N O #

```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
SCALE L : 0.00ABC
SPALE R : 100.00ABC
UNIT : ABC
FILTER : OFF
   ←    →    del
```

Set SCALE R (100.00), then press the cursor key.

F3

NEXT

F3

```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
SCALE L :  0.00ABC
SCALE R : 100.00ABC
UNIT : ABC
FILTER : OFF
↓  ←    →    del
```

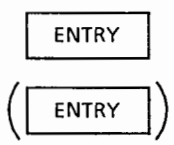
↓ Ω μ % &

Set UNIT to %. Delete the present contents by pressing the F3 key, press the NEXT and F3 keys in this order, then press the cursor key.
Set characters other than those on the menu by pressing the ALPHANUMERIC key.
Up to 6 characters can be entered, but SCALE is displayed in 5 characters. In addition, data is displayed in 2 characters from the head.

F2

```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
SCALE L : 0.00%
SPALE R : 100.00%
UNIT : %
FILTER : OFF
   0.1  1Hz  OFF
```

Press the F2 key to set the filter frequency to 1Hz.




```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 1.000V
SPAN R : 5.000V
SCALE L : 0.00%
SPALE R : 100.00%
UNIT : %
FILTER : 1Hz
```

Press the ENTRY key.
The details set at this time are used for the measurement, and the cursor returns to the CH position. Continue program setting as required, and when it is necessary to end the setting, press the ENTRY key to return to the original display.

**Notes :**

1. When the scale L decimal point position differs from that of SCALE R, match this position with the smaller number of digits after the decimal point.
2. When SPAN is set from 1 to 5 V and SCALE from 0 to 10 kg, outputs are as follows for an input of 1.2 V.

| SCALE | 0 to 10kg | 0.0 to 10.0kg | 0.00 to 10.00kg |
|---|---|---|---|
| | ↓ | ↓ | ↓ |
| Output | 0 kg | 0.5 kg | 0.5 kg |

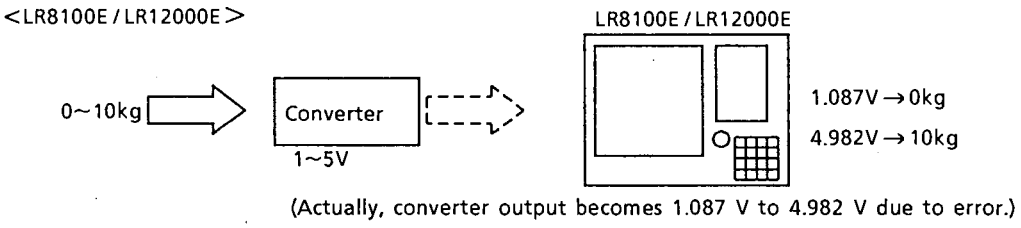
3. When the input exceeds SPAN L and SPAN R, the overflow display appears.
4. Setting range of scale value is −22000 to +22000 (except for a decimal point).

**(Meas. Function)**

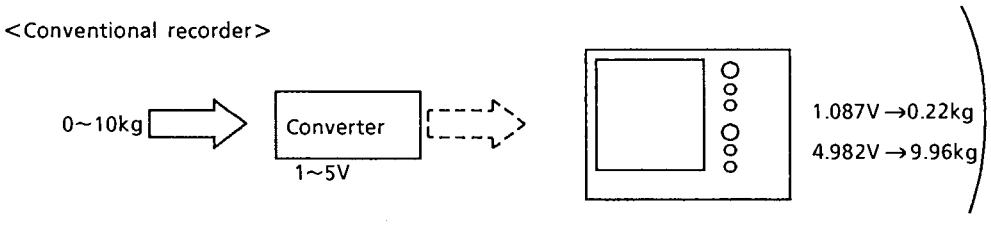
This recorder converter output voltages at ZERO and FULL can be set directly as span left and right values during VOLT range span setting.

Thus, slight converter errors are corrected automatically.

(Example) When the physical amount of 0 to 10 kg is converted by the converter and the converted result is recorded on the LR8100E / LR12000E.




(Actually, converter output becomes 1.087 V to 4.982 V due to error.)




(Converter output is 1 to 5 V, but actually it becomes 1.087 V to 4.982 V due to error.)

The LR8100E / LR12000E reads converted signals as the actual measured values which are displayed digitally and printed out.

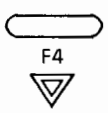
0kg→(1.087V), 10kg(→4.982V)

Thus, even if there is a slight error in converter output, the LR8100E / LR12000E maintains accurate measured values without needing to re-calibrate the converter as long as linearity is maintained between converter input and output.

**meas. Function Setting**

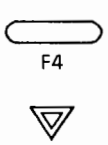
Pressing the F4 key (meas.) during span setting can substitute the actual measured-value for the SPAN value.

**[Key operation]** **[Setting display]** **[Description]**




```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 0.000V
SPAN R : 5.000V
SCALE L :
SPALE R :
UNIT :
FILTER :
  ←   →   del  meas
```

Conduct this setting with the input connected. Assume that the actual measured-value correspond to SPAN L 1.010 V and SPAN R 4.990 V.
Press the F4 key (meas) in the SPAN L item, then press the cursor key.




```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 1.010V ----------→ The measured value 1.010V is assigned.
SPAN R : 5.000V
SCALE L :
SCALE R :
UNIT :
FILTER :
  ←   →   del  meas
```

Press the F4 key in the item of SPAN R, then press the cursor key.

```
4CH
MODE : SCALE/VOLT
RANGE : 5V
SPAN L : 1.010V
SPAN R : 4.990V ----------→ The measured value 4.990 V is assigned.
SCALE L :
SCALE R :
UNIT :
FILTER :
```

The other setting is the same as the SCALE setting already described.

## [COPY]

**Function** : Setting which will copy the setting contents to any other CH without modification.

**Setting item** :
① CH : Channel No.
② Copy CH : Other channel No. to be copied.

**Setting example** :
① CH : 4CH
② Copy CH : 2CH

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| SHIFT<br>RANGE<br>F4 | 1CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : 0.000V<br>SPAN R : 5.000V<br>FILTER : OFF<br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Press the RANGE function key after the SHIFT key to enable the setting display to appear. The display unit always shows the present CH1 setting display. Press the F4 key to select CH4.<br>Press the Next key to switch the displayed channels. |
| NEXT<br>F3 | 4CH<br>MODE : OFF<br>↓ OFF VOLT TC RTD<br>↓ DELT SCAL COPY | When a channel is selected, the cursor moves to MODE automatically. Press the NEXT and F3 keys to set MODE to COPY. |

**Note** : The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| F2 | 4CH<br>MODE : COPY CH : CH<br><br><br><br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Select the CH (CH2) to be copied by pressing the F2 key. Thus, the contents of the CH2 are copied to CH4.<br>Press the Next key to switch the displayed channels. |
| ENTRY<br>(ENTRY) | 4CH<br>MODE : VOLT<br>RANGE : 5V<br>SPAN L : -5.000V<br>SPAN R : 5.000V<br>FILTER : OFF | Press the ENTRY key.<br>The details set at this time are used for the measurement, and the cursor returns to the CH position. Continue program setting if required, and when it is necessary to end the setting, press the ENTRY key to return the display to the original display. |

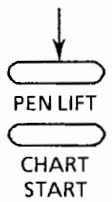
**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

## 6.4.3 ZERO Adjustment

**Function** :

Adjustment of zero position and pen position parallel movement can be made independently according to the RECORD ON/OFF switch ((15) in Section 3.1) status of each pen.
① RECORD OFF status
Pressing ◀ZERO▶ moves the pen to the zero position and as a result, any zero position can be set by turning the setting knob in the same way as with conventional analog pen recorders.
② RECORD ON status
Pressing ◀ZERO▶ enables the data to be moved (pen position) during measurement by turning the setting knob (SPAN also moves in parallel.)

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| ◀ZERO | 1CH 0.000 ~ 5.000V<br>2CH 0.00 ~ 200.00V<br>3CH 0.00 ~ 200.00V<br>4CH 0.00 ~ 200.00V | Press the ZERO function key. All the pens set to the DC voltage range move to their zero positions and the display panel simultaneously shows the measuring range of each channel. The cursor flashes at the first channel position. * Ranges other than DC voltage (VOLT) ranges are displayed as "Can not be set" |
| ENTRY<br>(ENTRY) | 1CH 0.000 ~ 5.000V<br>2CH 0.00 ~ 200.00V<br>3CH 0.00 ~ 200.00V<br>4CH 0.00 ~ 200.00V | Select the channel to be zero-adjusted by the cursor. |




Lower the pen by pressing the PEN LIFT key, then press the CHART START key to feed the chart.

Match the ZERO point to the main division on the chart by turning the setting knob while drawing a line with the pen.

ENTRY
ENTRY

When ZERO adjustment of each channel ends, press the ENTRY key twice, and the display returns to the original display panel.

**Note :** For ZERO and SPAN adjustments and VOLT measurement.
If the SPAN LEFT or RIGHT value exceeds the present input measuring range (refer to Table 6.2 and for the 5 V range : +5.5 V), the suitable internal range is selected automatically.
If the SPAN is narrow and both ends of SPAN LEFT and RIGHT enter the present lower (high-sensitivity side) reference range (for 5 V range : +5 V), the internal lower range is selected automatically.
The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

## 6.4.4 SPAN Adjustment

**Function** : Adjust SPAN (measuring range) by turning the setting knob. When the input changes suddenly during recording, SPAN can be changed immediately by using this mode without showing the range setting SPAN display panel.

**Setting Item** :
- ① CH : Channel No.
- ② L : SPAN left value adjustment
- ③ R : PAN right value adjustment
- ④ L&R : Adjustment of SPAN L and R.
- ⑤ srch : Searches the low range for the measuring range and sets a range which does not overflow so that SPAN automatically becomes +110% of range.

**Setting Example :** Search the span of CH4 then change the range to -550 to 450 mV after selecting −550 to 550 mV.

**Restrictions** :
- ① SPAN can be adjusted only when MODE is set to VOLT, TC or TRD and COM (optional).
  ("Can not be set" is displayed in modes other than the above.)
- ② Only the voltage range can be searched.

[Key operation] [Setting display] Description]

SHIFT

ZERO
SPAN

F4

```
1CH
  0.000 ~ 5.000V


↓ 1CH 2CH 3CH 4CH
```

Press the SPAN key after the SHIFT key to enable the setting display to appear.
The display unit always shows the present CH1 setting display. Press the F4 key to select CH4.
Press the Next key to switch the displayed channels.

```
↓ 5CH 6CH 7CH 8CH
↓ 9CH XCH YCH ZCH
```

F4

```
4CH
  -550.0 ~ 550.0mV


     L    R  L&R srch
```

Press the F4 key to set the optimum span.
Press the F4 key for a few seconds.
* When srch is not made, this setting is not required.

F2

```
4CH
  -550.0 ~ 550.0mV


     L    R  L&R srch
```

Press the F2 key to change SPAN RIGHT to 450 mV.

```
4CH
  -550.0 ~ 550.0mV


     L    R  L&R srch
```

Select 450.0 mV by turning the setting knob to the left.

ENTRY
ENTRY

```
4CH
  -550.0 ~ 450.0mV


     L    R  L&R srch
```

Pressing the ENTRY key twice returns the display to the original display panel.

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

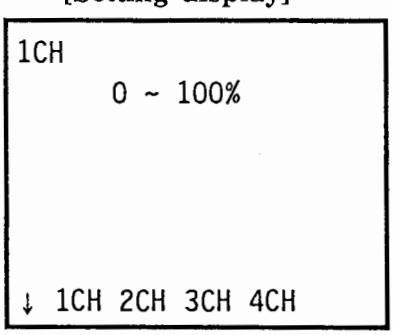
## 6.4.5 RECORDING AREA ADJUST (Zone recording)

**Function** : The recording area (zone) can be freely set by the pen position, since the pen position can be matched to a main division on the chart. Chart expansion and contraction can be corrected by setting the left side (Left) of the recording area to 0% and the right side (Right), to 100%.

**Setting Item** :
① CH : Channel No.
② L : Recording position at left
③ R : Recording position at right

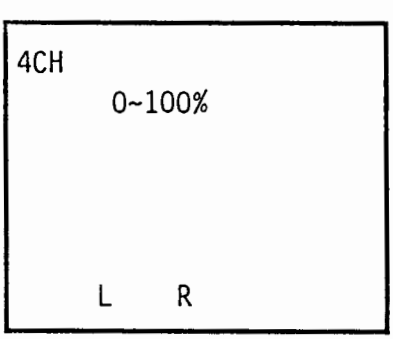
**Setting Example** :
① CH : 4
② L : 50%
③ R : 100%

**[Key operation]** **[Setting display]** **[Description]**

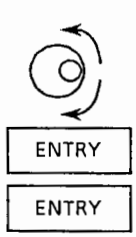



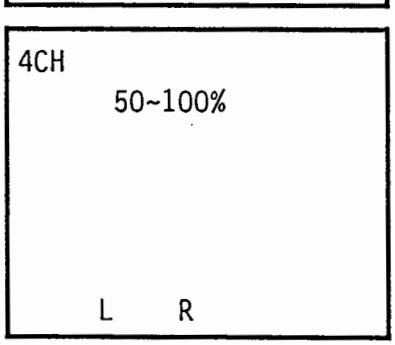

↓ 5CH 6CH 7CH 8CH
↓ 9CH XCH YCH ZCH

Press the RECORD AREA ADJ key.
Press the F4 key to select CH4.
Press the Next key to switch the displayed channels.


Set the pen position to the Left (50%) value by turning the setting knob, then press the F2 key.




Match to the Right (100%) position by turning the setting knob.
Pressing the ENTRY key twice returns the display to the original display panel.

**Note** : The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

## 6.4.6 Alarm Setting

**Function** : Up to two alarm levels can be set for each channel. When an alarm is detected, it is possible to get a printout or output (by optional relays).

**Setting Item** :

| | | |
|---|---|---|
| ① CH | : | Channel No. |
| ② L1 or L2 | : | Level 1 or 2 |
| ③ MODE | : | H high limit / delta high (in case of refferential calculation channel)<br>L low limit / delta low (in case of refferential calculation channel) |
| ④ VAL | : | Alarm set-value |
| ⑤ RLY | : | Relay No. (1 to 8 for the LR8100E ; 1 to 12 for the LR12000E) can be set, but output is optional. |

**Restrictions** : Alarm setting may be turned OFF if the RANGE of the relevant channel is changed.
Therefore, carry out alarm setting after RANGE setting.

**Setting Example** :

| | | |
|---|---|---|
| ① CH | : | 4 |
| ② MODE | : | L1 |
| ③ VAL | : | 1.000 V |
| ④ RLY | : | 1 |

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | AUX<br><br><br><br>↓ ALM TAG RCD MSG | Pressing the AUX key turns the mode to the AUX mode to show the menu at the bottom of the display panel. Press the F1 key to output the alarm (ALM) setting display panel. |
| AUX<br>F1 | ↓ CLK RAM | |
| | 1CH (-5.500~5.500)<br>LI MODE : OFF<br>L2 MODE : OFF<br><br><br>↓ 1CH 2CH 3CH 4CH | Press the F4 key to select CH4. The alarm range that can be set is displayed in parentheses after the CH No. Press the Next key to switch the displayed channels. |
| F4 | ↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | |
| | 4CH (-5.500~5.500)<br>LI MODE : OFF<br>L2 MODE : OFF<br><br><br>H L OFF | Press the F1 key to change the L1 (level 1) alarm mode to H. |
| F1 | | |
| I 1 Y<br>O . !<br>N 0 #<br>N 0 #<br>N 0 # | CH (-5.500~5.500)<br>LI MODE : H<br>VAL : 0.000V<br>RLY : OFF<br>L2 NODE : OFF<br><br>← → del | Set the alarm high-limit to 1.000V using the numeric keypad. Then press the cursor key. |

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | 4CH(-5.500~5.500)<br>L1 MODE : H<br>VAL : 1.000V<br>RLY : OFF<br>L2 MODE : OFF<br><br>↓ OFF 1 2 3<br>↓ 4 5 6 7<br>↓ 8 9 X Y<br>↓ Z | Press the F2 key to select the output relay No. (1).<br>( Relay output is not available if the option / AK-08 or / AK-12 is not installed. ) |
| F2 | | |
| ENTRY<br>ENTRY | 4CH (-5.500~5.500)<br>L1 MODE : H<br>VAL : 1.000V<br>RLY : 1<br>L2 MODE : OFF | Keep Lw2 (level 2) turned OFF.<br>Pressing the ENTRY key once makes the alarm setting effective.<br>When ending the setting, press the ENTRY key again. |

**Notes :**

1. Alarm detection sampling is done every second in case of the LR8100E, and every 125 ms in case of the LR12000E.
   Therefore, it may take 1 sec. to detect the alarm after it is activated.
2. A slight variation in the measured-value may cause alarm ON / OFF repetitions. To prevent this, alarm hysteresis must be set. For details, refer to the set-up mode in Section 6.4.14.

## 6.4.7 TAG No. Setting

**Function** : A Tag No. of up to 7 characters representing the measured object can be set instead of the channel No. (1 to 8).

**Setting item** : TAG1 to 8 for the LR8100E ; TAG 1 to 9, X, Y, Z for the LR12000E
Letters and numerics up to 7 characters.

**Setting example** : Tag No. 1 is set to LR8100E.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | AUX<br><br><br><br>↓ ALM TAG RCD MSG<br>↓ CLK RAM | Pressing the AUX key sets the mode to the AUX mode and as a result, the menu is shown at the bottom of the display Press the F2 key to show the TAG setting display panel. |
| AUX<br>F2 | | |
| SHIFT<br>( * )<br>SHIFT<br>SHIFT<br>8 R<br>8 R<br>1 Y<br>O #<br>O # | TAG1 : 1CH<br>TAG2 : 2CH<br>TAG3 : 3CH<br>TAG4 : 4CH<br>TAG5 : 5CH<br>TAG6 : 6CH<br>TAG7 : 7CH<br>TAG8 : 8CH<br>↓ ← → del<br>↓ Ω μ % & | Set TAG1 to LR8100.<br>In case of the LR12000E, the settings for TAG9, TAGX, TAGY and TAGZ are added. |
| ENTRY<br>ENTRY | TAG1 : LR8100<br>TAG2 : 2CH<br>TAG3 : 3CH<br>TAG4 : 4CH<br>TAG5 : 5CH<br>TAG6 : 6CH<br>TAG7 : 7CH<br>TAG8 : 8CH<br>↓ ← → del<br>↓ Ω μ % & | When setting the Tag No. after TAG2, press the cursor key. After the setting is finished, press the ENTRY key. The setting becomes effective when the ENTRY key is pressed once.<br>Pressing the ENTRY key again returns the display to the original display panel. |

## 6.4.8 Partially Suppressed and Expanded Recording Setting

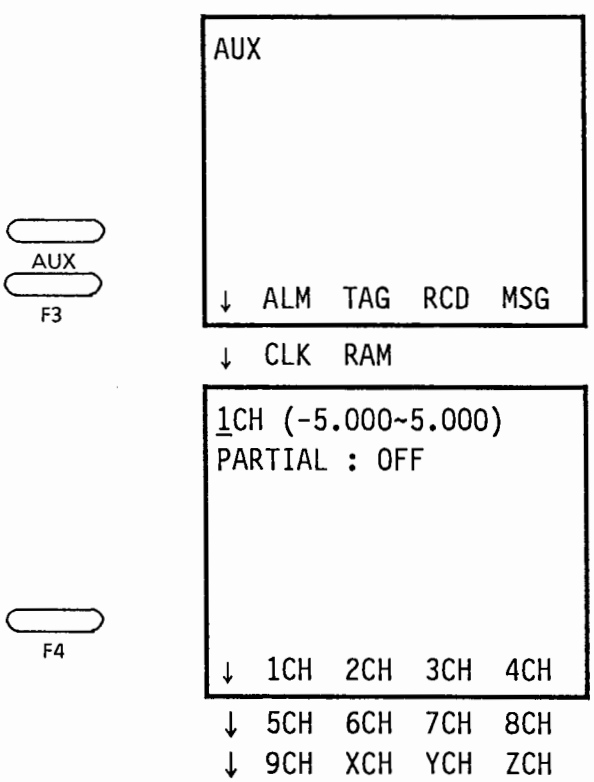
**Function** : The unnecessary recording section is suppressed and important recording section is extended.

**Setting Items** :
① CH Channel No.
② PARTIAL : Partially suppressed and extended
③ RATE : Partial suppression factor
④ BDY : Partial suppression boundary value

**Restrictions** :
① This function must be turned ON in the set-up mode. (Refer to Section 6.4.14.)
② This function is turned OFF if RANGE (MODE, RANGE, SPAN and scaling) is changed. Set this function after RANGE setting is finished.

**Setting Example** :
① CH : 4CH
② PARTIAL : ON
③ RATE : 25%
④ BDY : 1.000 V

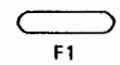
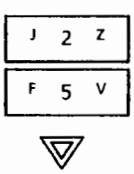
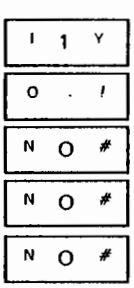
**[Key operation]** **[Setting display]** **[Description]**




Press the AUX and F3 keys. The display is changed to the PARTIAL setting display panel.

Press the F4 key to select CH4. Figures in ( ) on the right of the CH No are SPAN. BDY setting can be made within this range.
Press the Next key to switch the displayed channels.

**Note** : The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
|  | 4CH (-5.000~5.000)<br>PARTIAL : OFF<br><br><br><br>ON OFF | Press the F1 key to turn PARTIAL ON. |
|  | 4CH (-5.000~5.000)<br>PARTIAL : ON<br>RATE : 10%<br>BDY : 2.500V<br><br><br>← → del | Set RATE to 25%, then press the cursor key. |
|  | 4CH (-5.000~5.000)<br>PARTIAL : ON<br>RATE : 25%<br>BDY : 2.500V<br><br><br>← → del | Set BDY to 1.000 V. |
|  | 4CH (-5.000~5.000)<br>PARTIAL : ON<br>RATE : 25%<br>BDY : 1.000V | After setting is finished, press the ENTRY key.<br>The setting becomes effective when the ENTRY key is pressed once. Set the other channel in succession when required.<br>Pressing the ENTRY key again returns the display to the original display panel. |

## 6.4.9 AUTO Span Shift Mode Setting

**Function** : When input exceeds the measuring range, the +50% span is shifted automatically to continue recording.

**Setting Items** :
① CH : Channel No.
② AUTO SPAN SHIFT : AUTO span shift ON/OFF

**Restrictions** :
① This mode must be turned ON in the set-up mode. (Refer to Section 6.4.14.)
② This mode can be used only when RANGE is in VOLT, TC or RTD and/or COM. (NO DELTA, SCALE anD MATH can be set.)
③ If RANGE is changed to OFF, DELTA, SCALE or MATH, this mode is turned OFF automatically. Set this mode after RANGE change.
④ The span shift range is up to VOLT range +10% (For the 1V range : 1.1 V, and for ranges other than VOLT : within their measuring ranges.)

**Setting Example** :
① CH : 4
② AUTO SPAN SHIFT : ON

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | AUX<br><br><br><br>↓ ALM TAG RCD MSG<br>↓ CLK RAM | Press the AUX and F3 keys. The display changes to the AUTO SPAN SHIFT setting display panel. |
| AUX<br>F3 | | |
| | 1CH (-5.000~5.000)<br>AUTO SPAN SHIFT:OFF<br><br><br><br>↓ 1CH 2CH 3CH 4CH<br>↓ 5CH 6CH 7CH 8CH<br>↓ 9CH XCH YCH ZCH | Press the F4 key to select CH4. Press the Next key to switch the displayed channels. |
| F4 | | |
| | 4CH (-5.000~5.000)<br>AUTO SPAN SHIFT: OFF<br><br><br><br>ON OFF | Press the F1 key to turn AUTO SPAN SHIFT ON. |
| F1 | | |
| | 4CH (-5.000~5.000)<br>AUTO SPAN SHIFT: ON | After setting is finished, press the ENTRY key. The setting becomes effective when the ENTRY key is pressed once. Set the other channels in succession when required. Pressing the ENTRY key again returns the display to the original display panel. |
| ENTRY<br>ENTRY | | |

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

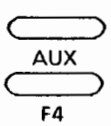
## 6.4.10 Message Setting

**Function** : Print-out is made when a message of up to 70 characters is set, and the MANUAL MESSAGE key at the front is pressed (MESSAGE 0), or optional external contact input (MESSAGE 1 to 4) is accepted.

**Setting Items** : Letters or numerics of up to 70 characters.

**Restrictions** : MESSAGE 1 to 4 can be set, but no print-out is made when no optional remote function (/REM) is provided. Print-out by the communication function is available.

**Setting Example** : Set MESSAGE 0 to SW1 ON.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
|  | AUX<br><br><br><br>↓ ALM TAG RCD MSG<br>↓ CLK RAM | Pressing the AUX key sets the mode to the AUX mode to show the menu at the bottom of the display panel. Press the F4 key to show the MESSAGE (MSG) setting display panel. |

**[Key operation]** **[Setting display]** **[Description]**

SHIFT
SHIFT
C 9 S
SHIFT
SHIFT
G 6 W
I 1 Y
SHIFT
O . /
SHIFT
N O *

```
MESSAGE 0 :

MESSAGE 1 :



↓   ←   →   del
↓   Ω   μ   %   &
```

Set MESSAGE to SW1 ON. For lower case letters, make the setting after the CAPS key is pressed.

ENTRYT
ENTRYT

```
MESSAGE 0 : SW1ON

MESSAGE 1 :
```

When setting the Tag No. after MESSAGE1, press the cursor key.
After the setting is finished, press the ENTRY key. The setting becomes effective when the ENTRY key is pressed once.
Pressing the ENTRY key again returns the display to the original display panel.

## 6.4.11 Time Setting

**Function** : Set year, month, day, hour, min., and sec.

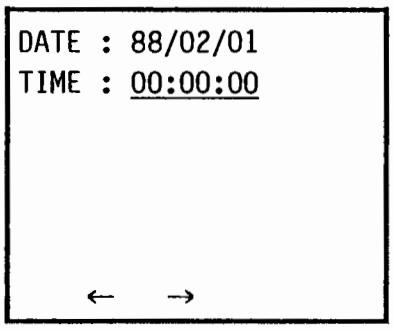
**Setting items** : ① DATE : Year / month / day
② TIME : Hour / min. / sec.

**Setting example** : ① DATE : Feb. 1, 1988
② TIME : 12-hour, 34-min. and 56-sec.

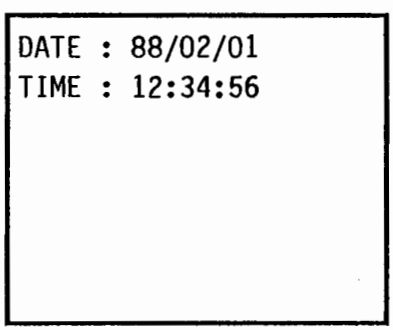
| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| AUX<br>NEXT<br>F1 | AUX<br>↓ ALM TAG RCD MSG<br>↓ CLK RAM | Pressing the AUX key sets the mode to the AUX mode.<br>Press the NEXT and F1 keys to show the time (CLK) setting display panel. |
| B 8 R<br>B 8 R<br>N O #<br>J 2 Z<br>H O #<br>I 1 Y | DATE : 88/01/01<br>TIME : 00:00:00<br>← → | Set the data to Feb. 1, '88.<br>When only certain numerics are changed, shift the digit by pressing the F1 or F2 key to set the new numerics, then press the cursor key. |

**[Key operation]** **[Setting display]** **[Description]**

I 1 Y
J 2 Z
K 3 C
E 4 V
F 5 V
G 6 W




Set the time to 12 hours, 34 min. and 56 sec.
When only certain numerics are changed, shift the digit by pressing the F1 or F2 key to set the new numerics.
Time is changed every 24 hours.




After setting is finished, press the ENTRY key twice.

ENTRY
ENTRY

## 6.4.12 Set-value Initialization (RAM CLEAR)

**Function** : Setting information currently set (excluding CLOCK) is all initialized.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| AUX<br>NEXT<br>F2 | AUX<br><br><br><br>↓ ALM TAG RCD MAG<br>↓ CLK RAM | Pressing the AUX key sets the mode to the AUX mode. Press the NEXT and F2 keys to show the RAM CLEAR setting display panel. |
| F1<br>ENTRY | RAM CLEAR : YES<br><br><br><br>YES NO | When returning to the initial setting, press the F1 key. To suspend the procedure at this stage, press the F2 key. The setting becomes effective when the ENTRY key is pressed once, the display then returns to the original display. |

## 6.4.13 IC Memory Card Setting

There are four types of IC memory cards as follows :
Standard Card (Part No. 378901). . . . . Memory Capacity 8 KB
Optional Card (Part No. 378904). . . . . Memory Capacity 256 KB
Optional Card (Part No. 378905). . . . . Memory Capacity 512 KB
Optional Card (Part No. 378906). . . . . Memory Capacity 1 MB

1. 8KB IC memory card

**Function** : The contents of settings such as range, etc. corresponding to up to 3 files can be stored in an IC memory card and used as required.

**Setting Items :**
① SET : Set condition SAVE (write) and LOAD (read) and File name registration (up to 6 characters).
② INIT : IC memory card initialization and VOLUME name registration during initialization (up to 8 characters).

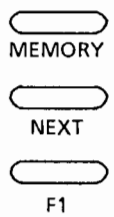
**Operation :**
① Load the lithium cells attached to the IC memory card by referring to Section 6.2.5.
② Face the up and down display mark of the IC memory card to downward, then insert the IC memory card into the slot on the right front side of the mainframe. If the mark is upsidedown, the card cannot be inserted into the slot.
③ IC memory card initialization. When the IC memory card is used for the first time after delivery, it must be initialized. The user's name and experimental details of up to 6 characters can be set for each IC memory card as VOLUME name during initialization. If an IC memory card already holding the set-value is initialized, the contents of the memory may be deleted.

<Setting Information Memory>

## Setting example

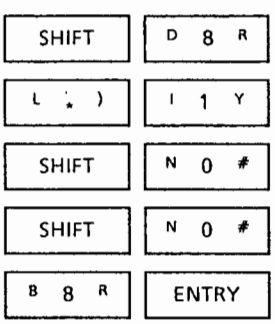
(1) Initialize the IC memory card, then register the VOLUME name(LR8100).
(2) Register FILE1 as LR1 to perform SAVE and LOAD.

**[Key operation]** **[Setting display]** **[Description]**




```
MEMORY


↓ SET WRIT READ ABRT
↓ INIT
```

Press the MEMORY function key to show the setting display panel.
Press the NEXT and F1 keys (INIT) to show the initialize display panel.

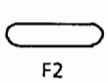



```
VOLUME :


← → del
```

Register the VOLUME name as LR8100. (VOLUME name can be omitted)
Press the ENTRY key to end initialization.
The display shows the MEMORY menu.

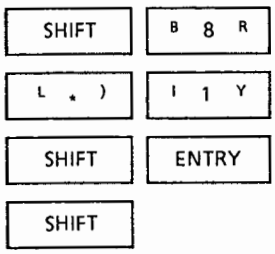

```
MEMORY


↓ SET WRIT READ ABRT
↓ INIT
```

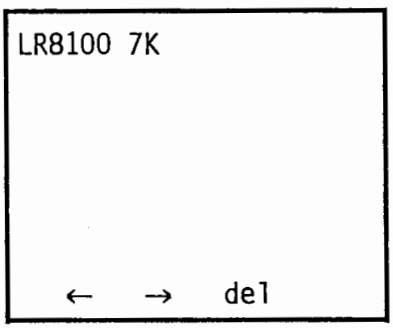
This is the operation for saving currently set setting information. First, press the F1 key (SET) to show the setting information memory menu.



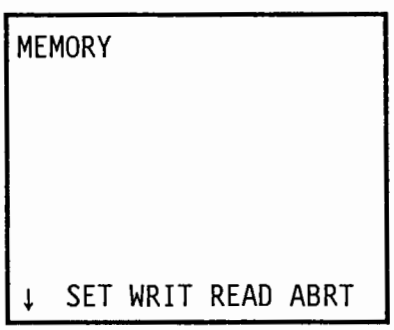

```
SET VALUE


LOAD SAVE DEL
```

Press the F2 key (SAVE) to show the SAVE setting display panel.
When deleting setting information which is no longer necessary, press the F3 key (DEL).



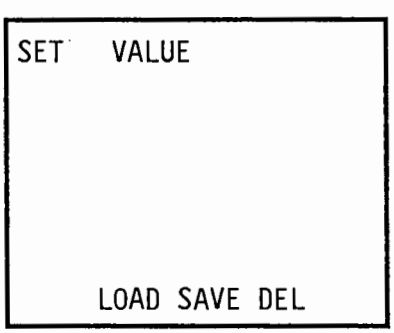



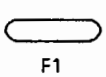

Enter the FILE name (LR1), then press the ENTRY key to end SAVE.
In addition, residual memory (unit : KB) is displayed between the VOLUME and FILE names.
When the FILE name has already been entered, select the file name with the cursor key.



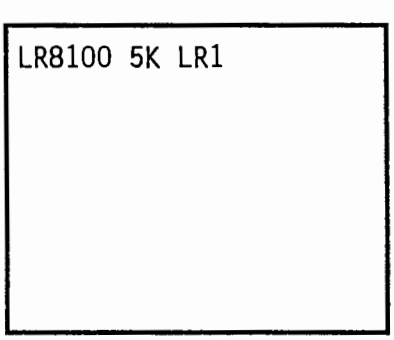


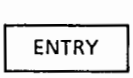
This is the operation for loading the setting information which has been saved in LR1.
First, press the F1 key (SET).




Press the F1 key (LOAD) to show the LOAD setting display panel.

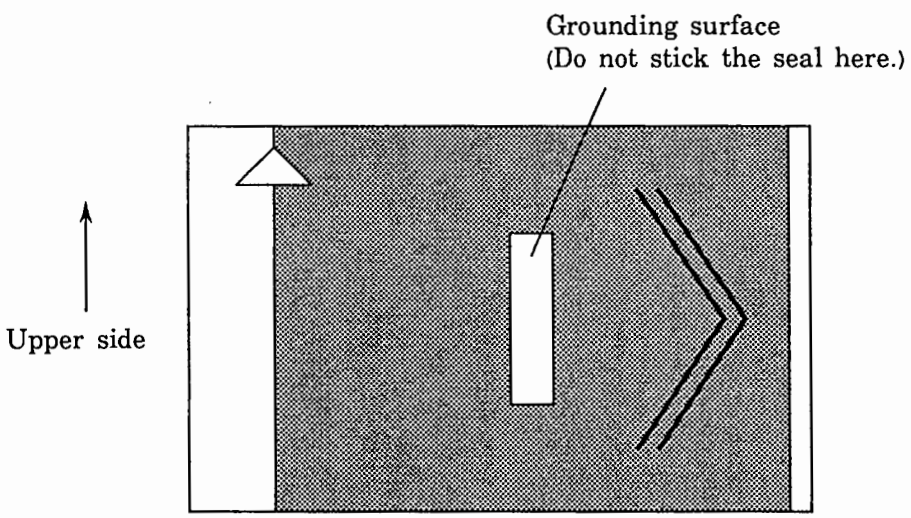



Select the FILE name to be loaded by the cursor key.
Since there is only FILE1 (LR1) here, FILE1 can be loaded simply by pressing the ENTRY key.

## Notes:

- The standard IC memory card (8K bytes) cannot store measured values (which is possible with optional 3789 04, 05 or 06). Therefore, the MEMORY menu on the setting display panel shows WRIT (F2), READ (F3) and ABRT (F4) which cannot be used without any of the optional IC memory cards.
- The IC memory card has a seal attached to it for VOLUME and FILE entry. However, never stick the seal to the grounding surface at the rear center of the IC memory card as the effectiveness of the static electricity measures is lost and the stored content may be detected.




- IC memory cards being used for the first time must be initialized, otherwise, they will not be effective.

## 2. 256KB (378904), 512KB (378905) and 1MB (378906) IC Memory Card

**Function** : An IC memory card is used to store measured and panel setting data.
The measured data storing function is manually or trigger executed by alarms CHART END or external contact signals.
Interface input data and computed data ( /MATH Model) can also be stored.
Stored panel setting data can be easily retrieved from the memory card for repeated use in the recorder.
Stored data can also be read and transmitted at any time.

**Setting Items**

SET : Loads and saves panel setting data.
WRIT : Sets writing (sampling) conditions and writes measured data.
READ : Sets readout conditions and prints out measured data (sampled data)
ABRT : Interrups WRITE or READ operations.
INIT : Initializes the memory card.

**Operation** Items (1) to (4) are the same as those of the previous section

# <Measured Data Memory>

1. Preliminary

(1) Each card has a 256K, 512K or 1M byte memory capacity, which is used to store measured and panel setting data.
A total number of 47 files can be stored in the memory.
Two files are always required : one for measured data, the other for setting data.

(2) The card dedicates 4K byte to file management.
Therefore, 252K, 508K or 1020K bytes is available for data storage.
2K bytes / file is used for panel setting data. The required measured data capacity calculation is given below.

(3) Every measured data file produced, produces a corresponding setting data file.

- The measured data file size is calculated as follows.
  ([Sampled data length] × 2) × [Sampling channel number] + $\underline{512}$
  ↓
  File header information data length

  Sampled data length : Sampling length designated data length
  Sampling channel number : Channel number with RANGE ON.

  - 1000 bit 8 channel data
    $(2 \times 1000 \times 8 + 512) / 1024 = 16.125$
    uses about 16K bytes.

  - 16000 bit 8 channel data
    $(2 \times 16000 \times 8 + 512) / 1024 = 250.5$
    uses about 250K bytes. Here 1K byte = 1024 bytes

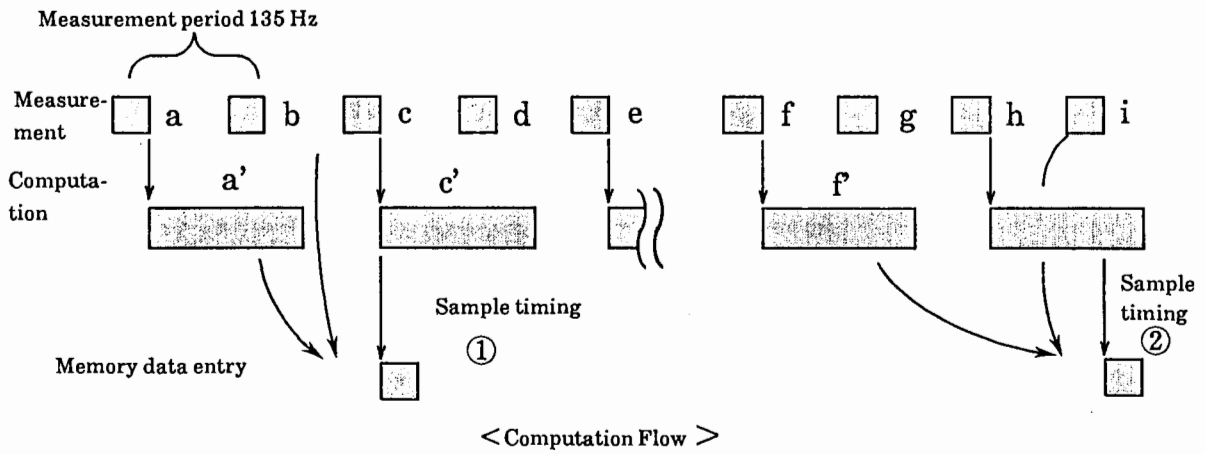
- A panel setting data file simultaneously produced with a measured data file always requires 1K byte of memory (equivalent to one channel). This file is for LR8100E / LR12000E internal use only and is not used for LOAD / SAVE on the information SET display.

(4) The 256K bytes IC memory card has a maximum of 47 files.
Example :

Number of panel setting data files ; 3
Number of measured data files ; 4
} The number of files $3 + 4 \times \underline{2} = 11$
↑
One measured data file produces one panel setting data file.

## Memory Card Data

(1) MATH data which is computed with computational expressions comes after the measurement data stored in the memory card (see the figure below).




Refer to the figure above as an aid to the following explanation:

In sample timing (1), the measured data (c) and computated value a' are entered in the memory data entry area. a' is a computation result from the measured data a. In sample timing (2), the measured data "i" and computed value f' are entered in the memory data entry area. The computation results are taken from previously measured data.

Note: Panel display and recording data are output simultaneously. Measured data sent via communications is displayed simultaneously with the panel display or recording d ata.

(2) Reading stored data.

Data in a computation channel, which is already stored in the memory card, can be computed and read. This permits modification of the computation expressions and data to be re-calculated.

When computational constants are modified and used for the computation of new data, press the F1 key to turn OFF the data entry set and start computation.

Note: When communications input values (C1 to C8) are used in the computation channel in the memory card, send these values via communications for data reading. Data in measurement mode (COM) is stored in memory, so this data can be read easily.

When communications input data (C1 to C8) must be displayed, proceed as follows:

(Example)

Set channel 1 to COM and apply a communications input value to channel 1 with CV1. Set channel 2 to "MATH". Set computational expressions using data in channel 1 (do not use C1 in this case).

When data is read an input channel is set with computational expressions after which data can be computed.

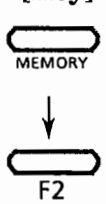
<Measured Data Memory>
Writing Data (WRITE)

**Function** : Writes measured data onto the IC memory card while simultaneously producing measuring ranges and coefficients (/MATH option).

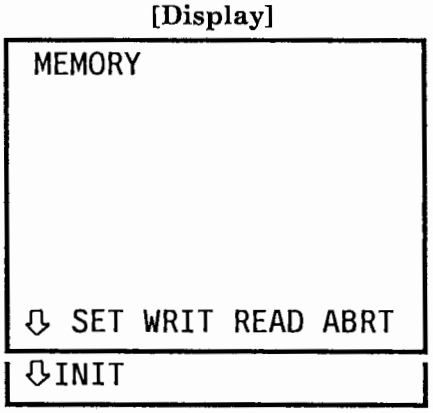
**Setting Items** :
① FILE : Setting measuring conditions
FILE Name ; max. 8 characters
MEM LEN ; Data length setting
1000 / 2000 / 4000 / 8000 / 16000 / 32000 data / CH
TRIG MODE ; Trigger mode on or off
SAMPL ; Sampling rate setting
0.01 / 0.02 / 0.05 / 0.1 / 0.2 / 0.5 / 1 / 3 / 5 / 9 / 135 Hz
PRE TRIG ; Used when TRIG MODE on.
0 to 100%, 10% increments
② DEL : Deletes unnecessary files.

**Setting Example** :
① FILE Name : LR 1
② MEM LEN : 2000 (2K)
③ TRIG MODE : ON
④ SAMPL : 9 Hz
⑤ PRE TRG : 10 %
⑥ TRIGGER : Alarm Only ON.

**[Key]**

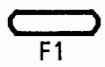


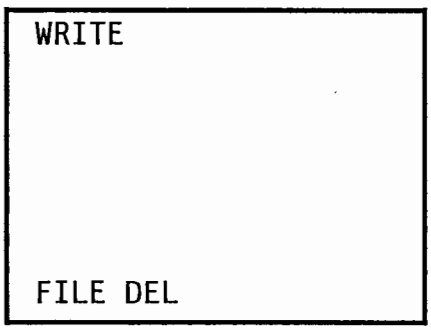

**[Display]**



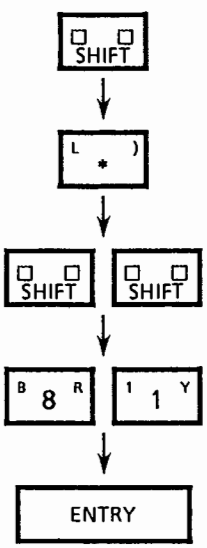

**[Description]**

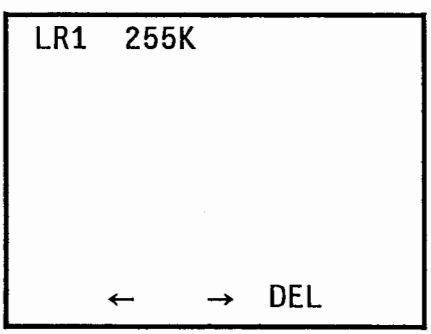
Press the MEMORY key to call up the display, and then press F2 key to display the WRITE screen.




Press F1 (FILE) key to register the file name.



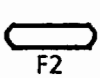



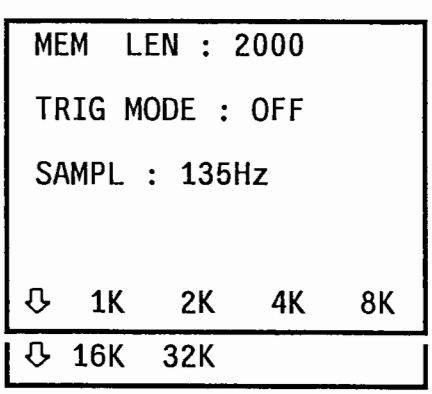

Enter LR1.

Total number of 47 files are shared by SET and WRITE.

The same name can be used with both SET and WRITE because they are independent of each other.

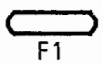
Press ENTRY key.




Press F2 key to enter 2000 (2K) into MEM LEN.

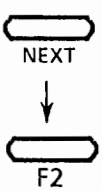
All channels excepting those with RANGE OFF can sample respective data.




```
MEM LEN : 2000
TRIG MODE : OFF
SAMPL : 135Hz


   ON  OFF
```

Press F1 key to turn ON the TRIG MODE.

In TRIG mode, if any of trigger conditions — ALARM, CHART and RMT — is true (satisfied), data entry is started. In the free mode, data entry is started manually.




```
MEM LEN:2000
TRIG MODE:ON
SAMPL:135Hz
PRE TRIG:10%
TRIG ALARM:ON
TRIG CHART:OFF
TRIG RMT  :OFF
⇩ 0.01 0.02 0.05 0.1
```

```
⇩  0.2  0.5    1   3
⇩    5    9  135
```

Set the sampling rate (SAMPL) to 9 Hz.

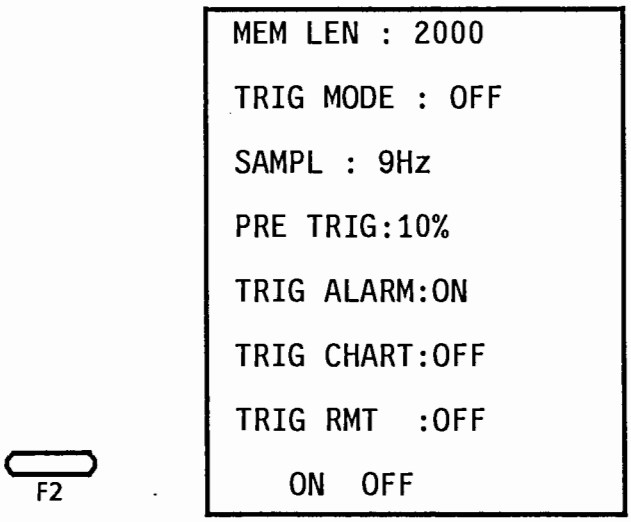
The sampling rate can be selected from 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 3, 5, 9 and 135 Hz.


```
MEM LEN : 2000
TRIG MODE : ON
SAMPL : 9Hz
PRE TRIG : 10%
TRIG ALARM:ON
TRIG CHART:OFF
TRIG RMT  :OFF
⇩   0   10   20   30
```

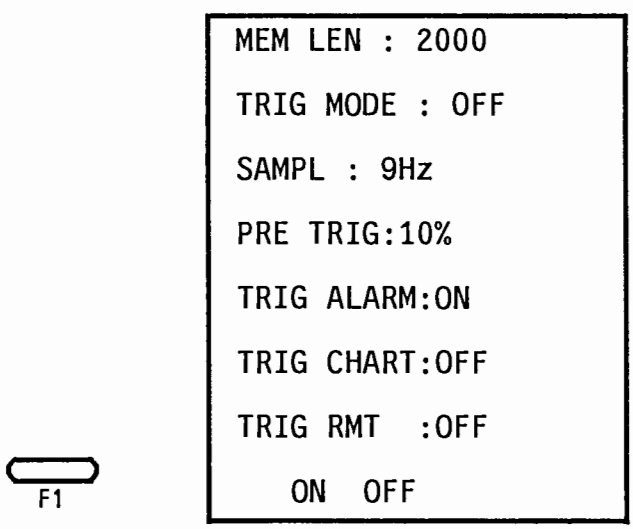
```
⇩  40   50   60   70
⇩  80   90  100
```

Set the PRE TRIG to 10% which allows MEM LEN to memorize an extra 10% of the data before the trigger acts.

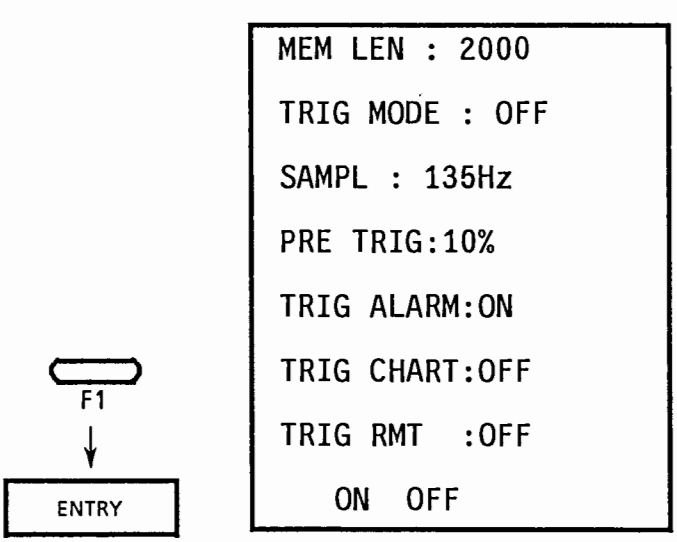
In the free mode (when the TRIG MODE is OFF), start writing press the ENTRY key.




Set TRIG ALARM. In TRIG ALARM ON status, alarms are entered in memory.




Set TRIG CHART. In TRIG CHART ON status, data is entered in the memory card when the recorder is out of paper.




Set TRIG RMT. In TRIG RMT ON status, when /REM option is added, data is entered in the memory card with a remote contact input. When the ENTRY key is pressed, the recorder is in the trigger wait status. Data entry is started in the free mode (in "TRIG MODE OFF") when the ENTRY key is pressed.

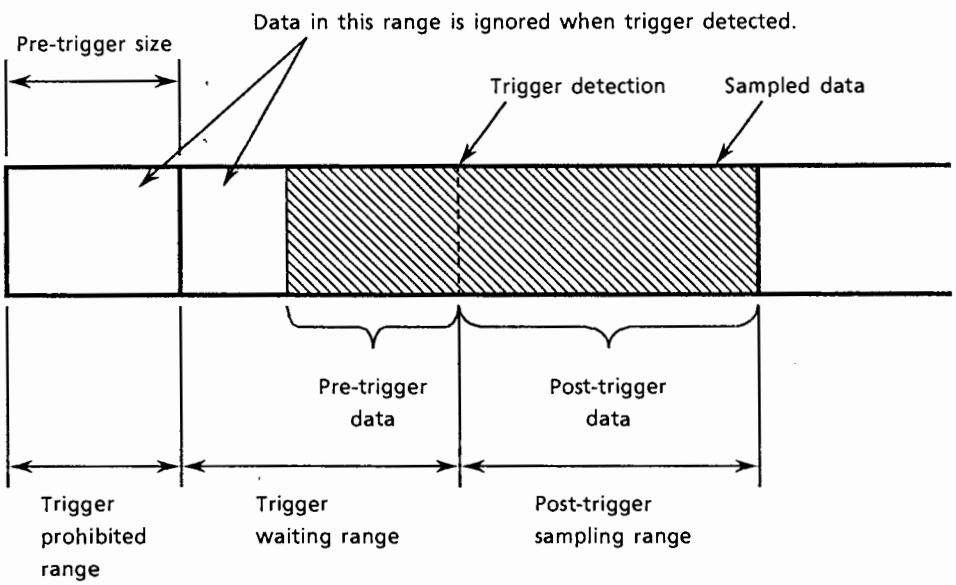
# [Trigger Conditions]

## ① Pre-trigger

For data sampling in the trigger mode use the pre-trigger.

The pre-trigger is detected only for trigger set point values over 0%.

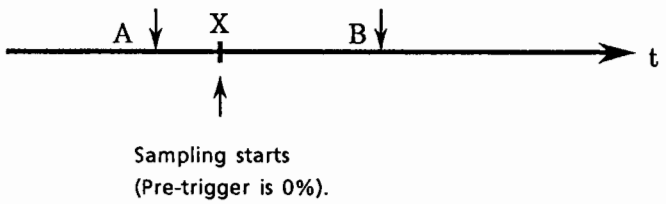
Any data prior to the pre-trigger data is ignored. Sampling continues for data following the trigger sampling period.



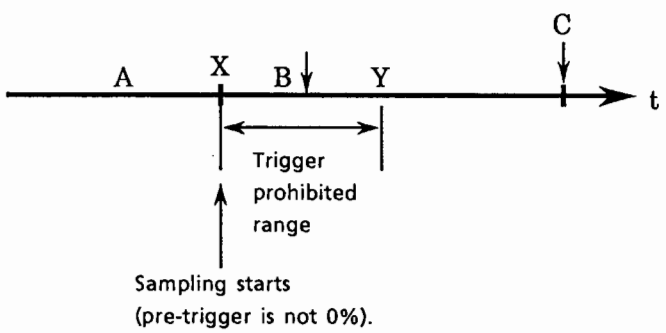
## ② Internal Alarm Trigger

A trigger can be produced in an alarm state.

At the beginning of the trigger waiting range, the alarm having already occurred produces a trigger during the sampling period.

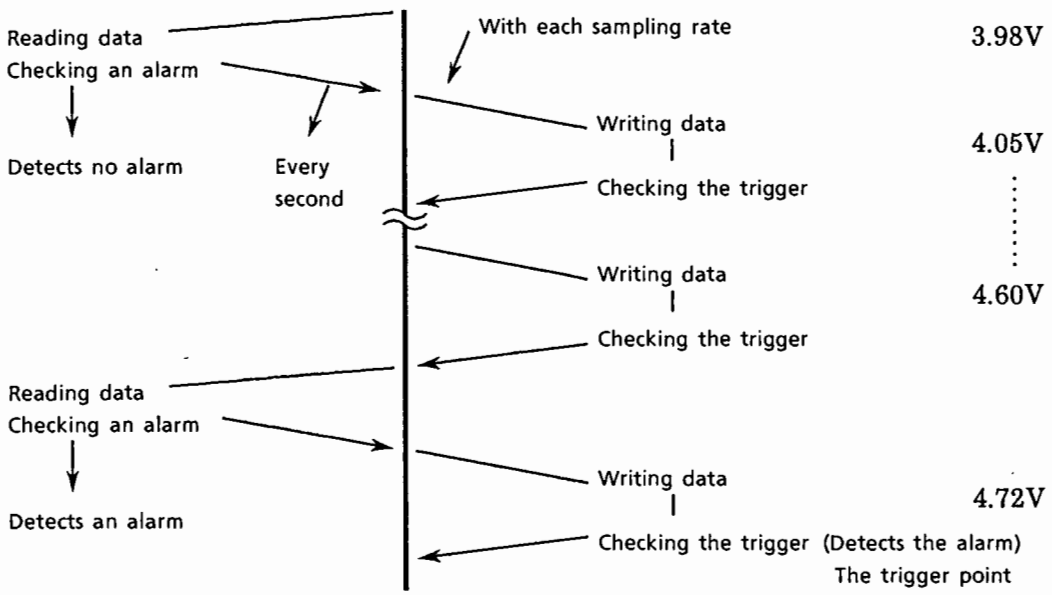



- The trigger is detected at point X when the alarm occurs at point A and sampling starts from point X.
- The trigger is detected at point B when sampling starts from point X and the alarm occurs at point B.




- If the alarm occurs at point A or B the trigger is detected at Y.
- If the alarm occurs at C the trigger is detected at C.

## ③ Alarm Trigger Detection




Assume that a high alarm is set at 4V.

On the initial search, an alarm is not detected as the sampled data is 3.98V. When the sampled data reaches 4V, the alarm is detected 1 second later at 4.60V. The trigger is then detected from the sampled data.

Therefore, data exceeds the alarm level prior to reaching the trigger point.

Especially, when sampling is executed in 135Hz in trigger mode, several tenth points alarm data may exist prior to the beginning of the trigger.

# [WRITE Completion Conditions]

Data sampling terminates upon any one of the following conditions:

(1) Sampling completion of data assigned to the data length.

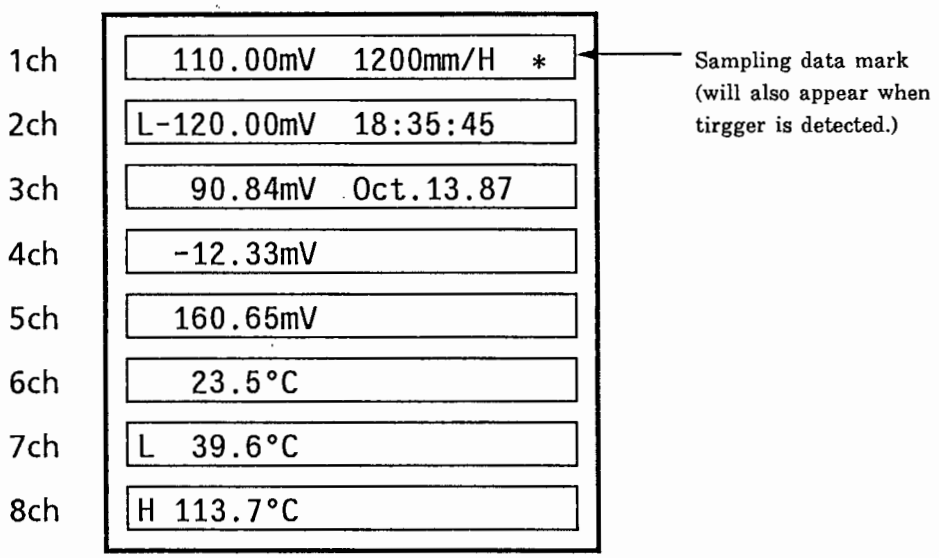
(2) Measuring condition variation detection. e.g. measuring range change.

(3) Using the F4 ABRT key.

In the case (3) above, if trigger has not been detected, the data file cannot remain in the IC memory card.

# [WRITE Indication]

During data sampling, an ( * ) appears in the sampling channel as shown in the figure below. The figure below shows the LR8100E. For the LR12000E, the display is divided into one for CH1 to 6 and one for CH7 to 12. Switching between displays can be done by pressing the function key located below the RECORD-key.




**CAUTION**

Do not remove the IC memory card from the recorder whilst writing, as data sampling will be interrupted and data already entered will remain on the IC memory card.
Sometimes sampling continues for a few seconds after removal of the card (the time period is determined by the sampling rate).

(1) Data remaining on the card cannot be used as the file ends incorrectly. Note therefore that when reusing this stored file the incomplete file is ignored. However, the file remains stored in the card.

(2) The incomplete file can be deleted along with other files by using the DEL function in the MEMORY WRITE menu.

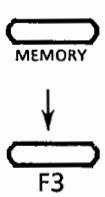
## Reading Data (READ)

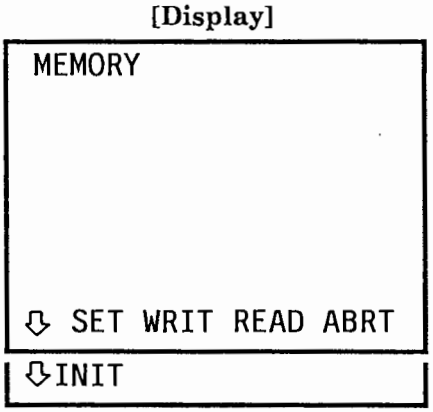
**Function** : Performs IC memory card measured data printouts or produces interface outputs (optional).

**Setting Items** :
① FILE : Sets necessary data output conditions.
FILE Name ; File name to be output.
SAMPL ; 0.01 / 0.02 / 0.05 / 0.1 / 0.2 / 0.5 / 1 / 3 / 5 / 9 / 135 Hz
START ; Set the output start point
LOAD ; Decides whether measured data and panel setting data effective while in DATA.
② INFO : Indicates the DATA panel setting data.

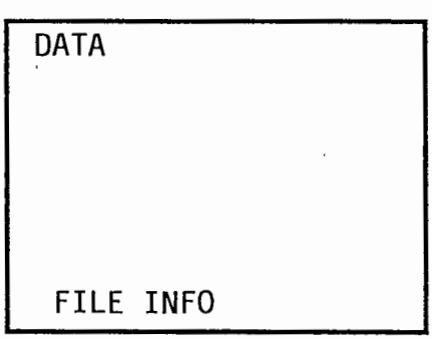
**Setting Example** :
① FILE Name : LR1
② SAMPL : 9 Hz
③ START : 1
④ LOAD : OFF

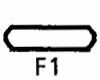
**[Key]** | **[Display]** | **[Description]**



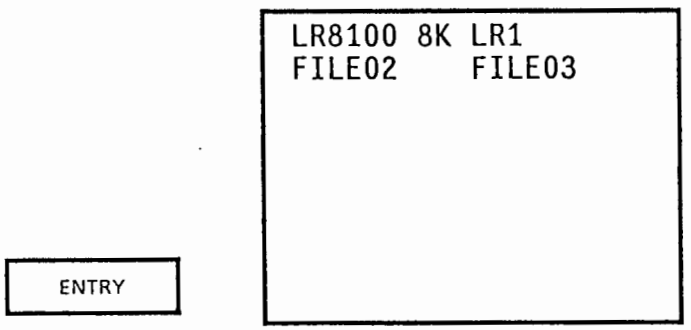




Press the MEMORY key, then the F3 key to display the READ panel.



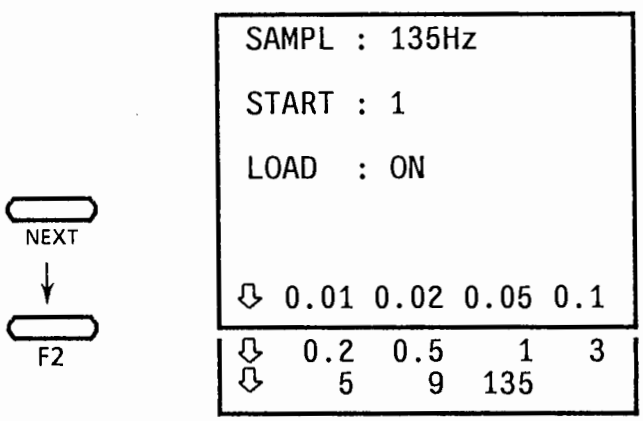




Press F1 key to call up the FILE setting display.
To display the INFO panel, press F2 key.

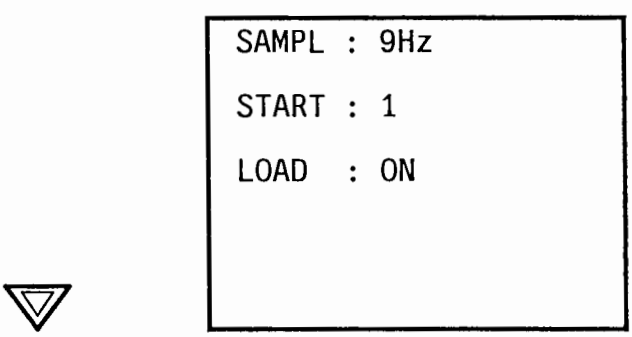



Select the file to be retrieved using the cursor.

In this example, only press the ENTRY key because the file name is LR1.

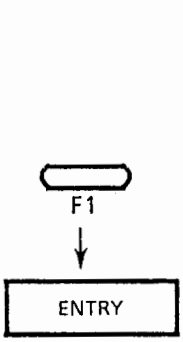



To select SAMPLE 9 Hz, press ENTRY then F2 key.




Set the output start point. In this example, output begins from data 1. Therefore, no change to the display is necessary. Continue to the next screen using the cursor key.

An error message appears if the set data length exceeds DATA LEN in the INFO display.




Press F1 to load the printout conditions (data for RANGE or /MATH).

Press ENTRY to execute READ.

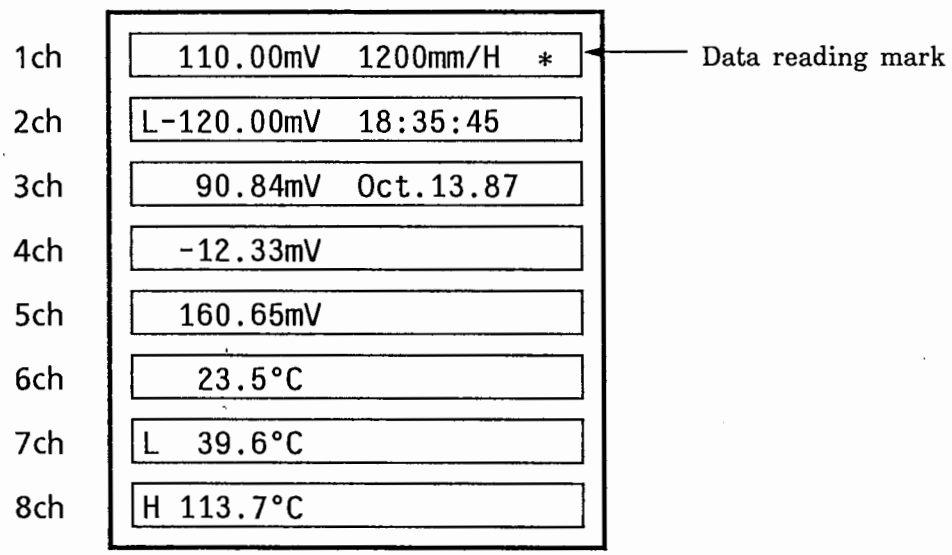
## CAUTION

(1) If ROAD is ON when setting the necessary items, the recorder reads the setting (RANGE, SPAN) and measured data. Setting data entering the recorder overrides the current setting data.

(2) When LOAD is OFF, the measuring range or chart speed can be READ through the panel setting condition display.
If the measuring range differs from the sampling set range, the indicated and printed characters differ from those at sampling even though the recorded waveform is similar to the original one.
The non-selected channel sampling data (OFF) is not reproduced. The OFF channel shows current input data.

# [READ Indication]

During reading, an ( * ) appears in the reading channel as shown in the figure below. The figure below shows the LR8100E. For the LR12000E, the display is divided into one for CH1 to 6 and one for CH7 to 12. Switching between displays can be done by pressing the function key located below the RECORD-key.




# [READ Completion Operations]

(1) Reading is terminated automatically after the recorder READs all assigned data. The memory channel changes to RECORD OFF. To restart the recording mode revert back to RECORD ON.

(2) The same procedure applies to ABRT (F4 key) executed during the READ mode.

## WRITE Information (INFO)

**Function** : Displays writing information.

**Indicating Items :**

① Apr.01.88 00: 59
② CH:123456--
③ DATA LEN: 8000
④ SAMPL: 9Hz
⑤ TRIG MODE: ON
⑥ TRIG POINT: 401

① Displays the sampling start time when TRIG is OFF.
Displays the TRIG ON time.

② Displays the data writing channel number. Channels with RANGE MODE OFF are shown as (-). The above example shows the LR8100 in which the 7th and 8th are in this mode. In case of the LR12000, the channels 1 to 9, X, Y and Z will be displayed.

③ Displays the data length actually sampled.

④ Displays the sampling rate set value.

⑤ Indicates whether the TRIG MODE is ON or OFF.
The following TRIG is not indicated if the current TRIG is OFF.

⑥ Displays the trigger starting point.

**Operation** : Press F2 when the READ setting condition panel is displayed.

READ

FILE INFO

# <IC Memory Card Specifications>

**Function:** Panel setting and measured data storage

**Medium:** IC memory card

**Memory Capacity:** 256K, 512K or 1M bytes

**Sampling Mode:**

Free Mode; Manual start

Trigger Mode; Starts with trigger conditions

**Sampling Rate:** 135 / 9 / 5 / 3 / 1 / 0.5 / 0.2 / 0.1 / 0.05 / 0.02 / 0.01 Hz
possible to switch common setting to each channel

**Data Length:** 1000 / 2000 / 4000 / 8000 / 16000 / 32000 data / channel, common setting for each channel, 2 bytes/data.

**Sampling:** Each selected channel data stored simultaneously (excepting RANGE OFF channel).

**Trigger Condition:**

Alarm Detection; Starts with any alarm ON (Detecting interval is 1 second for the LR8100E, 125 ms for the LR12000E)

External Contact Signal; Storing begins with an external contact (ON) signal, available for optional model with /REM function.

Chart End Detection ; Starts with chart end.

**Pre-trigger:** Can be set from 0 to 100%, 10% increments.

**Memory Data:** Panel setting data
Measured data
Interface input data (for Model with /GP-IB or /RS232C)

**Output:**

Printout; data output rate
135 / 9 / 5 / 3 / 1 / 0.5 / 0.2 / 0.1 / 0.05 / 0.02 / 0.01 Hz
possible to switch

Interface Output (for Model with /GP-IB or /RS232C);
ASCII to BINARY output

**Battery Backup:**

- Removing an IC memory card which has no functioning backup battery from the slot results in the loss of all data on the card.
- Battery service life depends on the memory capacity of the IC memory card.

| Model | Memory Card Capacity | Parts Number of the Battery | Battery Life (approx.) |
|---|---|---|---|
| 3789 04 | 256Kbytes | B9586JV | 2 years |
| 3789 05 | 512Kbytes | B9586JV | 2 years |
| 3789 06 | 1Mbytes | B9586JV | 1 years |

- Removing the battery from an IC memory card not in the slot will render the card unformatted. Consequently, the card will have to be reformatted before use.

### 6.4.14 SET UP Mode

**Function** : Performs initial settings such as °C / °F selection and chart speed mm or inch selection.

**Setting items :** The outline of functions executed in the SET UP mode is shown in the following.

| Menu | Setting Item | Function | | | | | Details |
|---|---|---|---|---|---|---|---|
| | | NEXT | F1 | F2 | F3 | F4 | |
| UNIT | TEMP UNIT | | °C | °F | | | Sets temperature setting units |
| | CHART SPD UNIT | | mm | inch | | | Sets speed setting units |
| PRN | CHANGE INFO | | ON | OFF | | | Chart speed change print out |
| | TIME INFO | | T/M | TIME | OFF | | Time print out |
| | ALARM INFO | | ON | OFF | | | Alarm print out |
| | SCALE INFO | | ON | OFF | | | Scale print out |
| | MESSAGE TIME | | ON | OFF | | | Time print out during message print out |
| | TAG/CH | | CH | TAG | | | TAG or CH selection during print out |
| | START INFO | | ON | OFF | | | Printing chart start |
| RCD | *POC TRACE | | P-P | MEAN | | | Pen-offset compensation selection |
| | POC REF CH | | MAX | AUTO | | | Selection on the reference channel for pen-offset compensation recording |
| | 1CH FORM<br>↓<br>12CH FORM | | OFF | PART | ATSS | | Recording format |
| RMT** (option) | REMOT CTRL | | ON | OFF | | | Presence or absence of remote control |
| | CHART SPD 2 | | ON | OFF | | | Presence or absence of CHART SPD 2 by remote control |
| | CHART CLOCK | | INT | EXT | | | Internal external disconnection of chart feed clock |
| COM** (option) | GPIB - ADDRESS | ○<br>○<br>○<br>○ | 0<br>4<br>8<br>12 | 1<br>5<br>9<br>13 | 2<br>6<br>10<br>14 | 3<br>7<br>11<br>15 | GP - IB address |
| | RS BAUD RATES | ○<br>○ | 75<br>1200 | 150<br>2400 | 300<br>4800 | 600<br>9600 | RS232C, Baud rate |
| | RS STOP BITS | | 1 | 1.5 | 2 | | RS232C, Stop bit |
| | RS PARITY | | EVEN | ODD | NINE | | RS232C, Parity error check |
| | RS DATA BITS | | 7 | 8 | | | RS232C, Data bit length |
| | RS HANDSHAKE | ○<br>○ | OFF:<br>C:R | X:E | X:R | C:E | RS232C, Handshake |
| RJC | 1CH RJC<br>↓<br>12CH RJC | | INT | EXT | | | RJC INTERNAL/EXTERNAL |
| OTHR | ALARM HYS | | ← | → | del | | Alarm hysteresis |
| | MATH ERR | | | | | | Data handling during calculation error |
| RAM | RAM CLEAR | | YES | NO | | | Setting information initialization |

* Not available for one-pen model.
** For the setting of RMT and COM, refer to the optional instruction manual.

**Operation** : SET-UP mode setting Turn ON the SET UP switch ((4) in Section 3.2) with the recorder power turned OFF, then turn ON the recorder power while pressing the ENTRY key to enter the SET UP mode.

**Default Values**

| Menu | Setting Item | Default Value |
|---|---|---|
| UNIT | TEMP UNIT | ℃ |
| | CHART SPD UNIT | mm |
| PRN | CHANGE INFO | ON |
| | TIME INFO | T/M |
| | ALARM INFO | ON |
| | SCALE INFO | ON |
| | MESSAGE TIME | ON |
| | TAG/CH | CH |
| | START INFO | ON |
| RCD | POC TRACE | P-P |
| | POC REF | MAX |
| | □CH FORM | OFF |
| RMT | REMOTE CTRL | OFF |
| COM | GP-IB | 1 |
| | RS BAUD RATES | 1200 |
| | RS STOP BITS | 2 |
| | RS PARITY | EVEN |
| | RS DATA BITS | 8 |
| | RS HANDSHAKE | OFF:OFF |
| RJC | □CH RJC | INT |
| OTHER | ALARM HYS | 0% |
| | MATH ERR | UP |

**(1) UNIT Setting**

**Function** : Sets temperature and chart speed units.

**Setting Items:**

① TEMP UNIT : °C or °F

② CHART SPD UNIT : mm or inch

**Setting example:**

① TEMP UNIT : °F

② CHART SPD UNIT : inch

**Note** : If the TEMP UNIT is changed, RANGE MODE is initialized.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | SET UP<br><br><br><br>↓ UNIT PRN RCD RMT<br>↓ COM RJC OTHR RAM | Press the F1 key to enter the UNIT setting mode. |
| F1 | | |
| | TEMP UNIT : °C<br>CHART SPD UNIT : mm<br><br><br>°C °F | Press the F2 (°F) key to select the temperature unit. (Prior to shipment) |
| F2 | | |
| | TEMP UNIT : °F<br>CHART SPD UNIT : mm<br><br><br>mm inch | Press the F2 (inch) key to determine the chart speed (mm) |
| F2 | | |
| | TEMP UNIT : °F<br>CHART SPD UNIT : inch | After completing the setting, press the ENTRY key. If the ENTRY key is pressed once, the display returns to the SET UP menu and, if it pressed twice, the start-up state is returned. |
| ENTRY<br>(ENTRY) | | |

**(2) PRN Setting**

**Function** : Performs various digital print-out related settings.

**Setting Items :**

| | | |
|---|---|---|
| ① CHANGE INFO | : | Print-out ON/OFF during chart speed change and POC selection, and auto span shift (for LR12000E only) |
| ② TIME INFO | : | Fixed time print-out related setting.<br>T/M : Prints out time and measured value<br>TIME : Only fixed time print out.<br>OFF : No print out is made. |
| ③ ALARM INFO | : | Alarm print-out ON / OFF |
| ④ SCALE INFO | : | Scale print-out ON / OFF during fixed time print out and list print out. |
| ⑤ MESSAGE TIME | : | Time print out ON / OFF during MESSAGE print out. |
| ⑥ TAG / CH | : | TAG and CH selection of fixed time, alarm and scale print out. |
| ⑦ START INFO | : | Printout ON / OFF of the start chart. |

**Setting Example**

| | | |
|---|---|---|
| ① CHANGE INFO | : | OFF |
| ② TIME INFO | : | TIME |
| ③ ALARM INFO | : | OFF |
| ④ SCALE INFO | : | OFF |
| ⑤ MESSAGE TIME | : | OFF |
| ⑥ TAG / CH | : | TAG |
| ⑦ START INFO | : | OFF |

* For print-out, refer to Section 2.3.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | SEP UP<br><br><br><br>↓ UNIT PRN RCD RMT<br>↓ COM RJC OTHR RAM | Press the F2 key to enter the PRN setting mode. |
| F2 | | |
| | CHANGE INFO : ON<br>TIME INFO : T/M<br>ALARM INFO : ON<br>SCALE INFO : ON<br>MESSAGE TIME : ON<br>TAG/CH : CH<br>ON OFF | Select CHANGE INFO by pressing the F2 (OFF) key. (Set ON prior to shipment.)<br>In case of the LR12000E, START INFO will be displayed underneath the TAG/CH setting. |
| F2 | | |
| | CHANGE INFO : OFF<br>TIME INFO : T/M<br>ALARM INFO : ON<br>SCALE INFO : ON<br>MESSAGE TIME : ON<br>TAG/CH : CH<br>T/M TIME OFF | Set TIME INFO to TIME by pressing the F2 key. (Set to T/M prior to shipment.) |
| F2 | | |
| | TIME INFO : TIME<br>ALARM INFO : ON<br>SCALE INFO : ON<br>MESSAGE TIME : ON<br>TAG/CH : CH<br><br>ON OFF | Select ALARM INFO by pressing the F2 (OFF) key. (Set ON prior to shipment.) |
| F2 | | |

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | ALARM INFO : OFF<br>SCALE INFO : ON<br><br><br><br>ON OFF | Select SCALE INFO by pressing the F2 (OFF) key. (Set ON prior to shipment.) |
| F2 | | |
| | SCALE INFO : OFF<br>MESSAGE TIME : ON<br><br><br><br>ON OFF | Select MESSAGE TIME by pressing the F2 (OFF) key. (Set ON prior to shipment.) |
| F2 | | |
| | MESSAGE TIME : OFF<br>TAG/CH : CH<br><br><br><br>CH TAG | Select TAG/CH by pressing the F2 (TAG) key. (Set ON prior to shipment.) |
| F2 | | |
| | TAG/CH : TAG<br>START INFO : ON<br><br><br><br>ON OFF | START INFO can be set. Select it by pressing the F2 (OFF) key. (The default value is ON.) |
| F2 | | |
| | CHANGE INFO : OFF<br>TIME INFO : TIME<br>ALARM INFO : OFF<br>SCAL INFO : OFF<br>MESSAGE TIME : OFF<br>TAG/CH : TAG<br>START INFO : OFF | After setting is finished press the ENTRY key. If the ENTRY key is pressed once, the display returns to the SET UP menu and, if it is pressed twice, to the start-up state. |
| ENTRY | | |
| ENTRY | | |

(3) RCD Setting

**Function** : Sets pen off set compensation method and recording format.

**Setting Items** :

① POC TRACE : Setting during pen offset compensation recording (not available for the one pen model)

- P-P : Records maximum and minimum values
- MEAN : Records the mean value. Mean value is that of the maximum and minimum values sampled while the chart is fed by 1 step (0.05 mm).

* Recording is set to MEAN recording automatically at chart speeds exceeding 180 mm/H.

② POC REF CH : Reference CH selection and setting in pen offset compensation recording mode.

- MAX : Pen offsct compensation recording is performed in the maximum number CH (e.g. CH4 for 4-pen recorder) regarded as reference CH.
- AUTO : In the POC ON or chart start mode, pen offset compensation is performed in the maximum number CH among the measuring $CH_S$ (CH of which range is not set to OFF ) regarded as reference CH. During recording, even if the greater number than the reference CH number is set to the measuring CH, the CH cannot perform pen offset compensation recording. If the pen offset compensation recording is required, turn OFF the POC once or perform CHART STOP then retry POC recording, and the CH performs pen offset recording as a new refference CH.

③ 1 to CH12 FORM : Recording format

- OFF : Normal mode
- PART : Performs partially suppressed and extended recording
- ATSS : Performs AUTO Span Shift.

**Restrictions** : PART and ATSS cannot be used in the same channel. However, one of them must be selected.

**Setting Example :**

POC TRACE : MEAN
POC REF CH : AUTO
1 to CH12 FORM :
1CH : ATSS
2CH : PART

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | SET UP<br><br><br><br>+ UNIT PRN RCD RMT<br>+ COM RJC OTHR RAM | Press the F3 key to enter the RCD setting mode. |
| F3 | | |
| | POC TRACE : P-P<br>1CH FORM : OFF<br>↓<br>ZCH FORM<br><br>P-P MEAN | Select POC TRACE by pressing the F2 (MEAN) key. (Set to P-P prior to shipment.) |
| F2 | | |
| | POC TRACE : P-P<br>POC REF CH : AUTO<br>1CH FORM : OFF<br>↓<br>ZCH FORM : OFF<br><br>MAX AUTO | Select POC REF CH by pressing the F2 (AUTO) key (Set to Max prior to shipment.) |
| F2 | | |
| | POC TRACE : MEAN<br>POC REF CH : AUTO<br>1CH FORM : OFF<br>2CH FORM : OFF<br>↓<br>ZCH<br>OFF PART ATSS | CH1 select from (Set OFF prior to shipment.) |
| F3 | | |

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | POC TRACE : MEAN<br>POC REFCH : AUTO<br>1CH FORM : ATSS<br>2CH FORM : OFF<br>↓<br>ZCH<br><br>OFF PART ATSS | CH2 and the succeeding channels in the same way as for CH1. (Prior to shipment it is set to OFF.) |
| F2 | | |
| | POC TRACE : MEAN<br>POC REFCH : AUTO<br>1CH FORM : ATSS<br>2CH FORM : PART<br>↓<br>ZCH<br><br>OFF PART ATSS | AFter setting is finished press the ENTRY key.<br>If the ENTRY key is pressed once, the display returns to the SET UP menu and, if it is pressed twice, to the start-up state. |
| ENTRY | | |
| ENTRY | | |

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

## <Pen Offset Compensation Recording>

(1) The POC reference pen function is useful in the following cases.
When the POC recording is performed by only two pens of CH1 and 2 on a 4-pen model, the POC recording was performed in CH4 regardless of the reference, because the CH4 was the reference CH.
Consequently, the trace of the CH2 lags behind the actual real-time waveform by the chart feeding time for the gap between pens of CH4 and CH2.
For the LR, with the measuring mode of each channel 3 and 4 set to OFF,
① When the CHART START is turned ON in the POC ON state
② When the POC is turned ON in the CHART STRT ON state.
the POC recording can be performed automatically in CH2.

Note)
When the POC reference CH is selectable
① The POC reference CH is indicated on the POC modified printing when the POC is turned ON. Note that channels 10, 11 and 12 will be printed as X, Y and Z respectively.
△POC3 13 : 54
The POC starts in CH3 regarded as reference CH.
② The POC reference CH is indicated on the chart start printing at the CHART START time in POC ON status.
△1000mm/M POC 2 16 : 38
POC recording starts in CH2 regarded as a reference CH
③ The POC reference CH is also indicated in the fixed time printing
60mm/M POC3

(2) When the CHART STOP is pressed during POC recording, the chart feeding continues until the pen 1 terminates recording the pen offset corresponding data and stops.
① When the chart speed is 200mm/M or more, the chart is fed while keeping that speed.
② When the chart speed is less than 200mm/M, the remaining pen offset data can be recorded at the chart speed increased up to 200mm/M. Hence, even the recording is performed at extreme low speed, the pen offset data can be swept at several seconds and the chart can be stopped.
③ When the chart is fed by external clock, the speed is changed to 200mm/M internally to output the pen offset data.
④ The pens in number 2 or greater move to stand-by positions in the order from the pen which wrote pen offset data.
When all the pens write pen offset data, the pens return to measuring data position.

### (4) RJC Setting

**Function** : Sets whether or not thermocouple range RJC (reference junction compensation) is made internally or externally.

**Setting Items** :

① CH : Channel No.

② INT/EXT : Internal (INT)/external (EXT) selection of reference junction compensation

③ Reference junction compensation voltage when EXT is selected.
Set the value in the range of −20000 to 20000 μV.

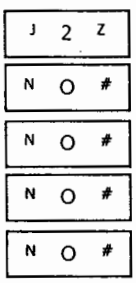
**Setting Example**

① CH : 1

② INT/EXT : EXT

③ Compensation voltage : 20000μV

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | SET UP<br><br><br><br>↓ UNIT PRN RCD RMT<br>↓ COM RJC OTHR | Press the NEXT and F2 key to enter the RJC setting mode. |
| NEXT<br>F2 | | |
| | 1CH RJC : INT<br>2CH RJC : INT<br>↓<br>ZCH RJC : INT<br><br>INT EXT | Select RJC by pressing the F2 (EXT) key. (Set to INT prior to shipment.) |
| F2 | | |




```
1CH RJC : EXT ____ µV
2CH RJC : INT
 ⌇
ZCH RJC : INT


  ←    →    del
```

When set to EXT, the RJC value can be entered to the right of EXT.
Set the value in the −20000 to 20000 µV range.
When using a Dewar flask (0°C), input 0µV.

```
1CH RJC : EXT 20000µV
2CH RJC : INT
⌇
ZCH RJC : INT


  INT EXT
```

ENTRY
ENTRY

Similarly, the same setting is made up to CH12.
After setting is finished, press the ENTRY key. If the ENTRY key is pressed once, the display returns to the SET UP menu and, if it is pressed twice, to the start-up state.

**Note :** The channels 10, 11 and 12 are displayed as X, Y and Z respectively.

### (5) OTHER Setting

**Function** : Set alarm hysteresis and processing during calculation error.

**Setting items** :

① ALARM HYS : Alarm hysteresis setting range 0 to 100%

② MATH ERR : Data processing during calculation error occurrence

UP : Processed as (+) overflow

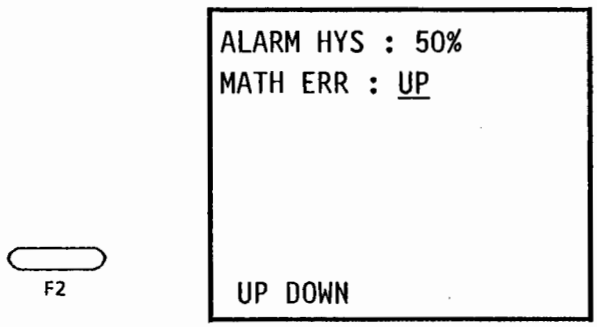
DOWN : Processed as (−) overflow

**Setting example** :

① ALARM HYS : 50%

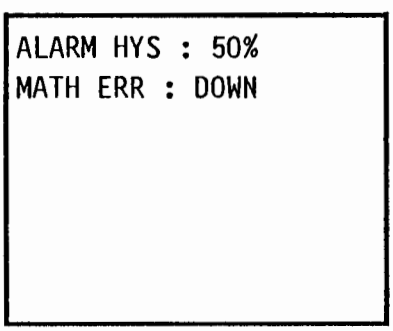
② MATH ERR : DOWN

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| | SET UP<br><br><br><br>↓ UNIT PRN RCD RMT<br>↓ COM RJC OTHR RAM | Press the NEXT and F3 key to enter the OTHER setting mode. |
| NEXT<br>F3 | | |
| | ALARM HYS : 0%<br>MATH ERR : UP<br><br><br>← → del | Set alarm hysteresis within the 0 to 100% range.<br>Set hysteresis in % with respect to span width. |
| F 5 V<br>N O # | | |




Set MATH ERR to F2 (DOWN).
(Set to UP prior to shipment.)

F2




After setting is finished press the ENTRY key.
If the ENTRY key is pressed once, the display returns to the SET UP menu and, if it is pressed twice, to the start-up state.

ENTRY

ENTRY

### (6) RAM CLEAR Setting

**Function :** Returns the SET UP, range, etc. settings currently set to their initial values.

**Note :** The temperature setting, unit setting and time setting are not cleared.

| [Key operation] | [Setting display] | [Description] |
|---|---|---|
| NEXT, F4 | SET UP<br>↓ UNIT PRN RCD RMT<br>↓ COM RJC OTHR RAM | Press the NEXT and F4 key to enter the RAM CLEAR setting mode. |
| F1, ENTRY, ENTRY | RAM CLEAR : NO<br>↓ YES NO | Press the F1 key when returning to the initial setting. (Set to ON prior to shipment.) To suspend the procedure at this stage, press the F2 key. If the ENTRY key is pressed once, the display returns to the SET UP menu and, if it is pressed twice, to the start-up state. |

## 6.4.15 Program Table

Table 6.6 shows the functions which can change the default settings.

**Table 6.6**

| | | NEXT | F1 | F2 | F3 | F4 |
|---|---|---|---|---|---|---|
| Function Selection | CH | *↓ | 1CH | 2CH | 3CH | 4CH |
| | | *↓ | * 5CH | * 6CH | * 7CH | * 8CH |
| | | *↓ | * 9CH | * XCH | * YCH | * ZCH |
| | MODE | ↓ | OFF | VOLT | TC | * RTD |
| | | ↓ | DELT | SCAL | COPY | * COM |
| | | ↓ | * MATH | | | |
| | FILTER | | 0.1Hz | 1Hz | OFF | |
| | TC TYPE | ↓ | R | S | B | K |
| | | ↓ | E | J | T | N |
| | | ↓ | W | L | U | KpvsAu7Fe |
| | RTD TYPE | ↓ | Pt1(Pt100 : 1) | Pt2(Pt100 : 2) | Pt3(Pt100 : 3) | Pt4(Pt50 : 1) |
| | | ↓ | Pt5(Pt50 : 2) | Pt1J(Pt100 : 1 / JPt) | Pt2J(Pt100 : 2 / JPt) | Pt3J(Pt100 : 3 / JPt) |
| | | ↓ | Pt4J(Pt50 : 1 / JPt) | Pt5J(50 : 2 / JPt) | Ni1D(Ni100 : 1 / DIN) | Ni1S(Ni100 : 1 / SANA) |
| | | ↓ | J263*B | | | |
| | Sub mode | | VOLT | TC | * RTD | * COM |
| | MOVE SPAN | | L | R | L & R | Srch |
| | RECORD AREA ADJUST | | L | R | | |
| | AUX | ↓ | ALM | TAG | RCD | MSG |
| | | ↓ | CLK | RAM | | |
| | ALM | | H | L | OFF | |
| | ALM(RLY) | ↓ | OFF | 1 | 2 | 3 |
| | | ↓ | 4 | 5 | 6 | 7 |
| | | ↓ | 8 | * 9 | * X | * Y |
| | | *↓ | * Z | | | |
| | Recording format | | ON | OFF | | |
| | SPAN SCALE, etc | | ← | → | del | |
| | SCALE mode span | | ← | → | del | meas |
| | Unit, etc. | ↓ | ← | → | del | |
| | | ↓ | Ω | μ | % | & |
| | Chart speed | | ← | → | mm / H | mm / M |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Setting knob Selection | Chart speed mm / min mm / h | 10 | 12 | 20 | 30 | 50 | 60 | 75 |
| | | 100 | 120 | 150 | 200 | 300 | 500 | 600 |
| | | 750** | 1000** | 1200** | | | | |
| | Chart speed inch / min inch / h | 0.5 | 1 | 1.2 | 2 | 3 | 5 | 6 |
| | | 10 | 12 | 20 | 30** | 45** | | |
| | Range high-sensitivity | 100μV | 200μV | 500μV | 1mV | 2mV | 5mV | 10mV |
| | | 20mV | 50mV | 100mV | 200mV | 500mV | 1V | 2V |
| | | 5V | 10V | 20V | 50V | 100V | 200V | |
| | Range medium-sensitivity | 1mV | 2mV | 5mV | 10mV | 20mV | 50mV | 100mV |
| | | 200mV | 500mV | 1V | 2V | 5V | 10V | 20V |
| | | 50V | 100V | 200V | | | | |
| | Range low-sensitivity | 10mV | 20mV | 50mV | 100mV | 200mV | 500mV | 1V |
| | | 2V | 5V | 10V | 20V | 50V | 100V | 200V |

* Depending on Model name (No. of pens) and options these functions may not be provided.

** Not available for the LR12000E.

## 6.4.16 Error Messages

Incorrect operation panel key operation causes an error message to be displayed.

The details of incorrect settings can be read from the numerics next to the error display. Therefore, re-set in this case.

| Error No. | Details |
|---|---|
| 1 | Grammar incorrect |
| 2 | The entered value exceeds the specified range or is a value which cannot be set. |
| 3 | CH No. unsettable. |
| 4 | The entered constant exceeds the specified range or is a value which cannot be set. |
| 5 | Character unsettable. |
| 7 | The entered mode type is not appropriate. |
| 9 | An unsettable range is selected. |
| 10 | The equation setting is inappropriate. |
| 12 | The set value is out of the settable range or is incorrect. |
| 13 | The set value is out of the settable range or is incorrect. |
| | |
| 26 | The RJC value is out of 20000 in the SET UP mode and at RJC EXT. |
| 27 | The ALARM HYS set-value exceeds 0 to 100% in the SET UP mode and at RJC OTHER. |
| 31 | Memory card related error. When this error is output, the following may be considered as a cause.<br>1. No memory card is inserted.<br>2. The memory card is not inserted correctly.<br>3. There is no data to be loaded during loading.<br>4. DATA DELETE while the memory card is used.<br>5. There is a mistake in the file name <all-space><br>6. There is a mistake in the volume label <all-space><br>7. Not initialized<br>8. Insufficient memory<br>9. The 8K byte card is used for data recording and regeneration. |
| 61 | Alarm setting VAL (alarm value) exceeds the settable range. |
| 62 | The partial suppression and extension, and BDY partial suppression prints are set out of their settable ranges. |
| 64 | Incorrect data and time settings. |
| 66 | Chart speed is set out of the following settable ranges.<br>mm unit 10~1200 (LR8100); 10~600 (LR12000)<br>inch unit 0.5~45 (LR8100); 0.5~20.0 (LR12000) |

# 7. MAINTENANCE

## 7.1 Fuse Replacement

**WARNING**

Before replacing the fuse, make sure to turn off the power supply and disconnect the power source. Use only specified fuses which should only be obtained from your sales representative. The usage of the other fuses might cause fire.

It is recommended that the fuse be replaced every 2 years as part of preventive maintenance.

<For AC power supply>

(1) The fuse holder is at the bottom of the power connector on the rear panel. (Fig. 7.1)
(2) Insert a screwdriver into the top of the fuse holder then pull it forward to pull out the fuse holder.
The fuse holder can house 2 fuses; the fuse in service and a spare fuse. (Fig. 7.1)
(3) Replace the fuse in service with a new or spare fuse.
Fuse in service: 250 V / 3.15 A time lag type, Part No. A1113EF (for the LR8100E)
250 V / 4 A time lag type, Part No. A1352EF (for the LR12000E)
(4) Return the fuse holder to its original position to complete fuse replacement.

<For DC power supply> (LR8100E only)

(1) The power supply fuse is located to the left of the DC power supply connector on the rear panel.
(2) To remove the fuse holder, push it in and turn it to the left.
(3) Replace the fuse switch: 250 V / 20 A time-lag fuse,
part number B9586UV.
(4) Put in the new fuse to complete replacement.

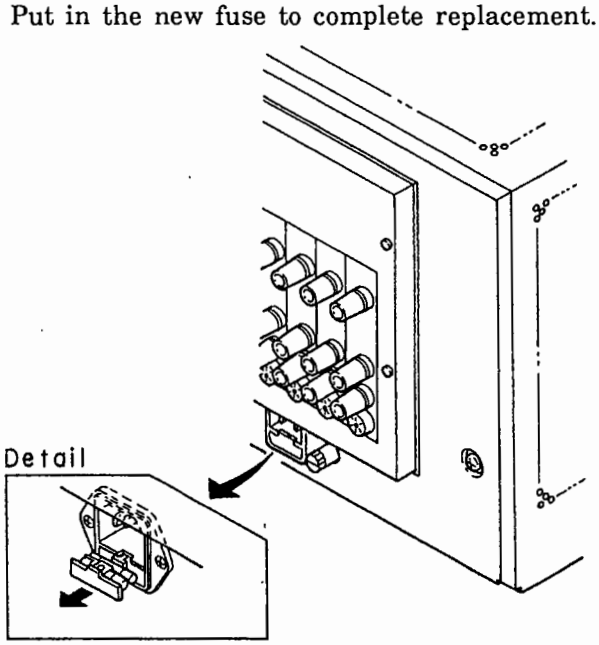



Figure 7.1

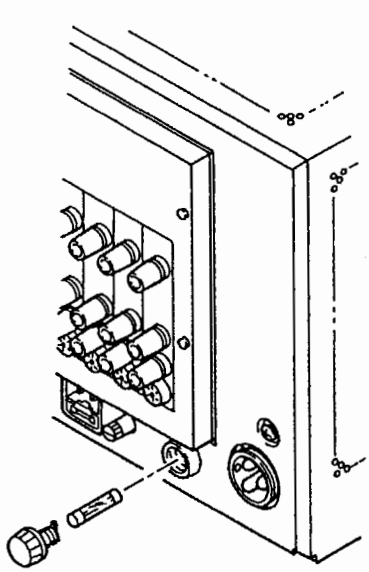


Figure 7.2

# 7.2 Cleaning

Do not use volatile chemicals when cleaning the case, operating the panel or other portions of the recorder. Do not allow rubber or vinyl to remain in contact with the recorder for extended periods of time. Always use a dry, soft cloth for cleaning.

# 8. SPECIFICATIONS

## MEASUREMENTS

**Drive System:**
Automatic null-balancing digital servo mechanism with brushless DC servomotor.

**Type of Input:**
Floating, guarded and shielded (No guard on 10 mV F.S. model).

**Input Types & Measuring Ranges:**

| | |
|---|---|
| DC V ..... | 10 mV to 200 V F.S., 1 mV to 200 V F.S., or 0.1 mV to 200 V F.S. |
| TC (ANSI, DIN, JIS) | Type R, S, B, K, E, J, T, N, W, L (DIN), U (DIN) |
| TC (NBS) ..... | KP vs Au7Fe (4 to 280K) |
| RTD ..... | Pt 100 (1 mA), JPt 100 (1 mA), Pt 50 (1 mA), Ni 100 (1 mA), J263 * B |

Pt 100 : JIS C 1604-1989, JIS C 1606-1989, : DIN IEC 751, IEC 751, Jpt 100 : JIS C 1604-1989, JIS C 1606-1989, Pt 50 : JIS C 1604-1981, JIS C 1606-1986, Ni 100 : DIN, SAMA

**Accuracy:**

| | |
|---|---|
| DC V .. | ±(0.05% of rdg + 0.03% of range + 1.0 μV). However, in case of less than 1 mV range setting, a filter of 0.1 Hz is applied. For ranges over 1 mV, a filter setting is not necessary. |
| TC ..... | ±(0.05% of rdg + 0.5°C) for K, E, J, T, L, U and KP vs Au7Fe, ±(0.05% of rdg + 1°C) for R, S and B, ±(0.1% of rdg + 0.5°C) for N, ±(0.1% of rdg + 1°C) for W. |
| RTD ... | ±(0.05% of rdg + 0.2°C) for Pt 100 Ω and Ni 100 Ω, ±(0.05% of rdg + 0.3°C) for Pt 50 Ω and J263 * B. (at 23±2°C, 55±10% R.H.). |

**Calibration Cycle:**
Recommended calibration period (under environmental conditions of 23±5°C)
for ranges less than 1 mV ; every 6 months
for ranges more than 1 mV; every 12 months

**Reference Junction Compensating Accuracy (TC):**
±0.5°C for K, E, J, T, N, W, L, U and KP vs Au7Fe, ±1°C for R, S and B (measuring range of down to −100°C).

**Bias Current:** 4 nA

**Filter:** 0.1, 1 Hz or OFF (selectable).

**Zero Set:** Adjustable.

**Measuring Cycle:** 135 Hz.

**Pen Offset Compensation (Standard):**
Average, max. / min. recording selectable (with compensation ON / OFF switch), resolution on time axis ... 0.05mm, automatic sweep function for pen offset data, and selectable POC reference pen.

**Input Impedance:**
Approx. 1 MΩ (DC V & TC).

**Allowable Source Resistance:**
Less than 1 kΩ (DC V & TC).

**Temperature Coefficient:**
±0.05% of F.S. / °C

**Maximum Allowable Input Voltage:**
250 V DC + AC rms.
(between input terminal and case, between all channels)

**Common Mode Rejection:**
More than 150 dB at AC.

**Normal Mode Rejection:**
More than 50 dB at 50 or 60 Hz.

## RECORDING & PRINTING

**Writing & Printing System:**
Ink writing using disposable felt-tip pen cartridges (analog data), and wire-dot printer using ribbon cassette (digital data).

**Effective Recording Span:**
250 mm (analog data).

**Pen Offset between Channels:**
Approx. 4 mm on the time axis.

**Number of Channels:** 4, 6, 8, 10 or 12

**Recording Colors:**

| 1st | 2nd | 3rd | 4th | 5th | 6th |
|---|---|---|---|---|---|
| Red | Green | Blue | Brown | Black | Purple |
| 7th | 8th | 9th | 10th | 11th | 12th |
| Orange | Violet | Light blue | Yellow green | Pink | Yellow |

**Recording Accuracy:**
Measurement accuracy + ±0.2% of effective recording span (including non-linearity, deadband and error between ranges).

**Maximum Pen Speed:**
Approx. 1,600 mm / s.

**Maximum Acceleration:** Approx. 8 G.

**Printing Rate:** Approx. 1.5 s / line.

**Chart:** Z-fold chart (270 mm × 30 m).

**Chart Speeds:**
LR8100E: 10 to 1200 mm / min & mm / h (1 mm steps), and 0.5 to 45.0 inch / min & inch / h (0.1 inch steps).
LR12000E: 10 to 600 mm / min & mm / h (1 mm steps), and 0.5 to 20.0 inch / min & inch / h (0.1 inch steps).

**Change of Chart Speed:**
Changes chart speed with remote control signals (optional).

**RECORD ON / OFF Selectors:**
Independently provided for each channel on the front panel (ON ... measurement / recording, OFF ... measurement).

**Pen Lift:**
All pens are simultaneously lifted and lowered.

**Chart Drive:** Pulse motor drive.

**Chart Speed Accuracy:**
±0.1% (for recordings longer than 1 m).

**Digital Data Printout:**
Time, chart speed, channel number (tag number), measured data and engineering unit are printed out at the following intervals:

| Chart speed | | Printing intervals |
|---|---|---|
| mm / min | mm / h | |
| 1200 (600) to 300 | – | 1 min |
| 299 to 30 | – | 10 min |
| 29 to 10 | 1200 (600) to 120 | 1 h |
| – | 199 to 60 | 2 h |
| – | 59 to 40 | 3 h |
| – | 39 to 20 | 6 h |
| – | 19 to 10 | 12 h |

(LR12000E)

**Tag Number Printout:**
Tag number can be printed out instead of channel number (up to 7 alphanumerics).

**Alarm Printout:**
Channel number, alarm type, and the time of alarm ON / OFF are printed.

**Scale Markings Printout:**
0% and 100% scale values can be printed out.

**Program List Printout:**
Contents of entire setting memory can be listed on the chart.

**Manual Printout:**
Time and measured data for all channels can be printed out in a single line by a push of MANUAL PRINT key.

**Message Printout:**
Message of up to 70 characters can be printed at a push of MANUAL MESSAGE key (Message 0), or by external contact signal (Message 1 to 4; optional up to 4 channels).

**Change of Chart Speed Printout:**
Chart speed and time can be printed out at the change of chart speed.

**Pen Offset Compensation ON / OFF Printout:**
ON, OFF mark and time can be printed out.

**Change of Range Printout:**
Changed contents and time can be printed at the change of range (on Auto recording span shift mode).

**Partially Expanded-Scale Recording:**
Any portion within full scale can be expanded or reduced for each channel.

**Auto Recording Span Shift Mode:**
Automatically shifts to ±50% of span, and recording continues when the input exceeds the measuring span.

**External Input Span:**
Small error of external converter can be corrected by setting the span with actual input voltage (zero ... span left, full ... span right).

## DISPLAY

**Type of Display:**
Vacuum fluorescent display (5×7 dot matrix, blue), 20 characters for each channel.

**Display Modes:**
3 display modes can be selected at a push of DISPLAY SELECT key; Digital data display ... Measured data (7 digits), data and time, or chart speed; Bar graph display (2.5% resolution); Range data display.

## ALARMS

**Number of Alarm Set Levels:**
Up to 2 levels / channel.

**Alarm Types:**
High (H), low (L), delta high (dH), and delta low (dL).

**Alarm Outputs (Optional):**
LR8100E: Up to 8 points
LR12000E: Up to 12 points (internal, contact rating ... 24 V AC 1A)

## COMPUTING FUNCTIONS

**Standard Functions:**
Scaling (ranges ... −22000 to +22000), and delta T.

**Optional Mathematical Functions (LR8100 only):**
+, −, ×, ÷, Square root, absolute value, logarithm, exponential function (up to 8 channels).

## GENERAL SPECIFICATIONS

**Standard Memory Card:**
For storing setting data (memory capacity of 8K bytes), standard accessory ... lithium battery, 1pc. (battery life of about 5 years).

**Battery-Backup Memory:**
Maintains all setting for about 10 years (at room temperature) when power is removed.

**FAIL Alarm:**
FAIL LED lights up when the instrument is in fail condition (FAIL output; optional).

**Chart END Alarm:**
CHART LED lights up before out-of-chart condition, and recording stops (alarm output, optional).

**Mounting:**
Desk-top or flush panel mounting (may be inclined up to 30°backward from vertical).

**Operating Temperature Range:**
0 to 40°C (32 to 104°F)

**Humidity Range:**
30 to 80% relative humidity.

**Insulation Resistance:**
More than 100 ΩM at 500 V DC between power line and case, and between input terminals and case.

**Dielectric Strength:**
1,500 V AC for one minute between power line and case and between input terminal and case.

**Power Supply:**
Rated Supply Voltage
LR8100E: 100 to 240 V AC (freely selected)
LR12000E: 100 to 120 V AC, 200 to 240 V AC; automatically adjusted
Rated Supply Frequency
50 / 60 Hz
Permissible Supply Voltage
LR8100E: 90 to 250 V AC 48 to 63 Hz
LR12000E: 90 to 120 V AC, 180 to 250 V AC 48 to 63 Hz

**Power Consumption:**
LR8100E:
max 4 pen : 240 VA; 6 pen : 290 VA; 8 pen : 340 VA
balanced 4 pen : 120 VA; 6 pen : 135 VA; 8 pen : 150 VA

LR12000E:
max 10 pen : 380 VA; 12 pen : 450 VA
balanced 10 pen : 170 VA; 12 pen : 190 VA

**Dimensions:**
LR8100E: approx. 438 (W) × 310 (D) × 301 (H)
LR12000E: approx. 438 (W) × 434 (D) × 301 (H)

**Weight (Approx.):**
LR8100E: 4 ch : 16.5 kg; 6 ch : 18 kg; 8 ch : 18.5 kg
LR12000E: 10 ch : 19.5 kg; 12 ch : 20.5 kg

## OPTIONAL FEATURES

■ GPIB INTERFACE (/GP-IB)

**Functional, Electrical and Mechanical Specifications:**
Meets the IEEE Standard 488-1978.

**Talker Functions:**
Input of measured data (ASCII), output of measured data (ASCII and binary), input / output of setting data (ASCII), output memory data (ASCII and binary).

**Listener Functions:**
Controls except for power ON / OFF, key lock ON / OFF and chart drive.

■ RS-232C INTERFACE (/RS232C)

**Functional, Electrical and Mechanical Specifications:**
Meets the EIA RS-232C.

**Controller Interface Functions:**
Input of measured data (ASCII), output of measured data (ASCII and binary), input / output of setting data (ASCII), output of memory data (ASCII and binary)

**Data Transfer Rates:**
75, 150, 300, 600, 1200, 2400, 4800, 9600 bps

■ REMOTE CONTROLS (/REM)

> **CAUTION**
> The maximum input voltage to the external input terminal must not exceed the −24 V to 24 V range. If voltages which exceed these values are applied, the circuit might be damaged.

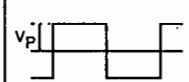
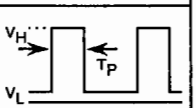
**Remote Control Signals:**
External contact, open collector or TTL-level signal.

**Chart Drive Control:**
Chart drive start / stop.

**Change of Chart Speed:**
Selectable chart speed 1 or 2.

**Manual Printout:**
Printout data & time and measured data.

**Chart Speed:**

| Remote control signal waveforms | Sine, triangular, rectangular waves | Pulse train |
|---|---|---|
| Signal level |  4v<Vp<24V |  +4V<$V_H$<+24V −24V<$V_L$<+0.5V $T_P$>300μs |
| Max. signal source impedance | 600 Ω | 50 Ω |
| Chart speed | 0.15 f cm / min (f ... Hz or pps) | |
| Max. frequency | LR8100: 800 Hz<br>LR12000: 400 Hz | LR8100: 800 pps<br>LR12000: 400 pps |

**Message Printout:**
Printout time and message (up to 70 characters, 4 strokes).

**Pen Lift:**
All recording pens lowered and lifted.

**RECORD ON / OFF Selection:**
OFF (measurement) and ON (measurement / recording).

**External Trigger:**
Start ... write to memory card (optional).

■ ALARMS (LR8100E : /AK-08; LR12000E : /AK-12)

> **CAUTION**
> The maximum input voltage to the external input terminal must not exceed the −24 V to 24 V range. If voltages which exceed these values are applied, the circuit might be damaged.

**Number of Outputs:**
LR8100E : 8 points; LR12000E : 12 points

**Contact Rating:** 24 V DC and AC 1A.

**Outputs:**
Alarm, FAIL alarm and chart END alarm outputs.

■ DC power source (/DC, LR8100E only)

**Normal Operating Voltage:**
Rated supply voltage: 12 to 24 V DC
Permissive supply voltage: 10 to 32 V DC

**Power Consumption:**
70 VA (average value), 200 VA (maximum).

**Accessories:**
Connector (1 pc.), fuse (1 pc.)

## OPTIONAL ACCESSORY

■ IC MEMORY CARD (378904, 378905, 378906)

**Data Format:** MS-DOS.

**Sampling Rate:**
Free mode (manual start)
Sample rate: 135 / 9 / 5 / 3 / 1 / 0.5 / 0.2 / 0.1 / 0.05 / 0.02 / 0.01 Hz
Trigger mode (starts by trigger)
: 135 / 9 / 5 / 3 / 1 / 0.5 / 0.2 / 0.1 / 0.05 / 0.02 / 0.01 Hz

**Memory Capacity:**
378904 : 256K bytes
378905 : 512K bytes
378906 : 1M bytes

**Data Length:**
1000, 2000, 4000, 8000, 16000, 32000 data / channel (common setting to each channel, 1 bytes / data)

**Trigger Condition:**
Alarm detection, CHART END or external contact input (optional).

**Pre-Trigger:** 0 to 100% (10% steps).

**Memory Data:**
Measured data, interface input data and computed data.

**Output:** Interface and recording output.

**EMC Conformity Standard (Except for /MATH model)**
EMI EN55011: Group1 Class A
EMS EN50082-2
Radio frequency electromagnetic field
DEVIATION
1.0 V MAX 5 V to 200 V Range
10 mV MAX 100 μV to 2 V Range
Radio frequency common mode
DEVIATION
0.1 V MAX 5 V to 200 V Range
1.0 mV MAX 100 μV to 2 V Range