RM18L
HYBRID RECORDER
(PEN RECORDER)
INSTRUCTION MANUAL

Ohkura

HXPRM18mnL0001E
FEB.2001 (4th Edition)

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION	CHG.No.
1	8/30/96	Kawa	Hoso	Oda		

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Thank you for purchasing our RM18L Hybrid Recorder.
In order to use all the functions of this instrument effectively and safely, read this manual thoroughly to understand the instrument fully, prior to using it.

No.	Instruction Manual	Description
1	RM18L Hybrid Recorder Instruction Manual (This manual)	Describes setting and wiring for regular operations of the recorder to printing operations, setting of user data such as alarm setting values, and maintenance. It also provides the setting information on input range and recording scale.
2	RS-232C Interface Instruction Manual (Option)	Describes wiring, setting, communication protocols required for communications.
3	RS-422A Interface Instruction Manual (Option)	

How to Read Instruction Manual

⚠ WARNING ; Negligence of this notification could endanger the life of an operator or result in an injury. Be sure to read.

⚠ CAUTION ; Negligence of this notification could damage this instrument. Be sure to read.

[Note] ; Notification required to use this instrument safely and properly.

[Reference] ; Tips for using this instrument.

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BE SURE TO OBSERVE THE FOLLOWING WARNINGS AND THOSE IN THE TEXT IN ORDER TO SECURE SAFETY IN HANDLING THE INSTRUMENT.

⚠ WARNINGS

General

When tampering with wiring, fuse, or inside the instrument(including removal of an main unit), be sure to disconnect this instrument from the main power source in order to prevent an electric shock.

Protective Grounding

1) In order to prevent an electric shock, be sure to provide protective grounding prior to turning on the instrument.
2) Do not cut a protective grounding conductor or disconnect protective grounding.

Power Source

1) Make sure that the supply voltage for this instrument conforms to the voltage of the supply source.
2) Attach a protective cover prior to turning on this instrument.

Fuse

1) In order to prevent a fire, use only our specified fuse.
2) Do not short-circuit a fuse holder.

Working Environment

Do not operate this instrument in the environment where it is exposed to a combustible/ explosive/corrosive gas or water/steam.

Input and Output Wiring

Provide input and output wirings after turning off the power.

⚠ CAUTIONS

Input and Output Wiring

Do not use empty terminals for other purposes such as relaying, etc.

Inside of Instrument

Do not touch the switches, etc. inside the instrument. Also, do not replace the main unit or printed circuit boards. When this is neglected, we cannot guarantee functioning of the instrument. Be sure to contact our dealer where you purchased this instrument, or our sales representative.

Transportation

When transporting this instrument or the equipment with this equipment incorporated, take proper preventive measures so that the door will not be opened, and that the main unit will and that the inner module will be not flied out. (Tightening of transportation screws, and so on)

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⚠ [CAUTIONS]

Instruction Manual

1) Ensure that this instruction manual is delivered to an end user.
2) Prior to handling this instrument, be sure to read this manual.
3) If you have any questions on this manual or find any errors or omissions in this manual, contact our sales representative.
4) After reading this manual, keep it carefully by the instrument.
5) When the manual is lost or stained, contact our sales representative.
6) When the manual is incorrectly collated or have missing pages, contact our dealer where you purchased this instrument, or our sales representative.

Installation

1) When installing this instrument, put on a protective gear such as safety shoes, helmet, etc. for your safety.
2) Do not put your foot on the installed instrument or get on it, because it is dangerous.

Maintenance

Only our servicemen or persons authorized by OHKURA are allowed to remove and disassemble the main unit and printed circuit boards.

Disposal

1) Discard the replaced batteries in a correct way.
2) Do not incinerate plastics of maintenance parts and replacement parts.
A harmful gas may be produced.

Cleaning

1) Use dry cloth to clean the surface of this instrument.
2) Do not use any organic solvent.
3) When cleaning the instrument, turn off the power.

Revisions

This instruction manual is subject to change without prior notice.

Evasion of Responsibility and Guarantee

Be sure to observe the cautions in operating, maintaining, and repairing this instrument.
We will not be responsible for or guarantee the damages resulting from negligence of them.

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1 — 1 Checking the Accessories

Upon delivery of this instrument, unpack and check its accessories and appearance.
If there are any missing accessories or damages on the appearance, contact our dealer where you purchased the instrument, or our sales representative.

Following accessories should be attached.

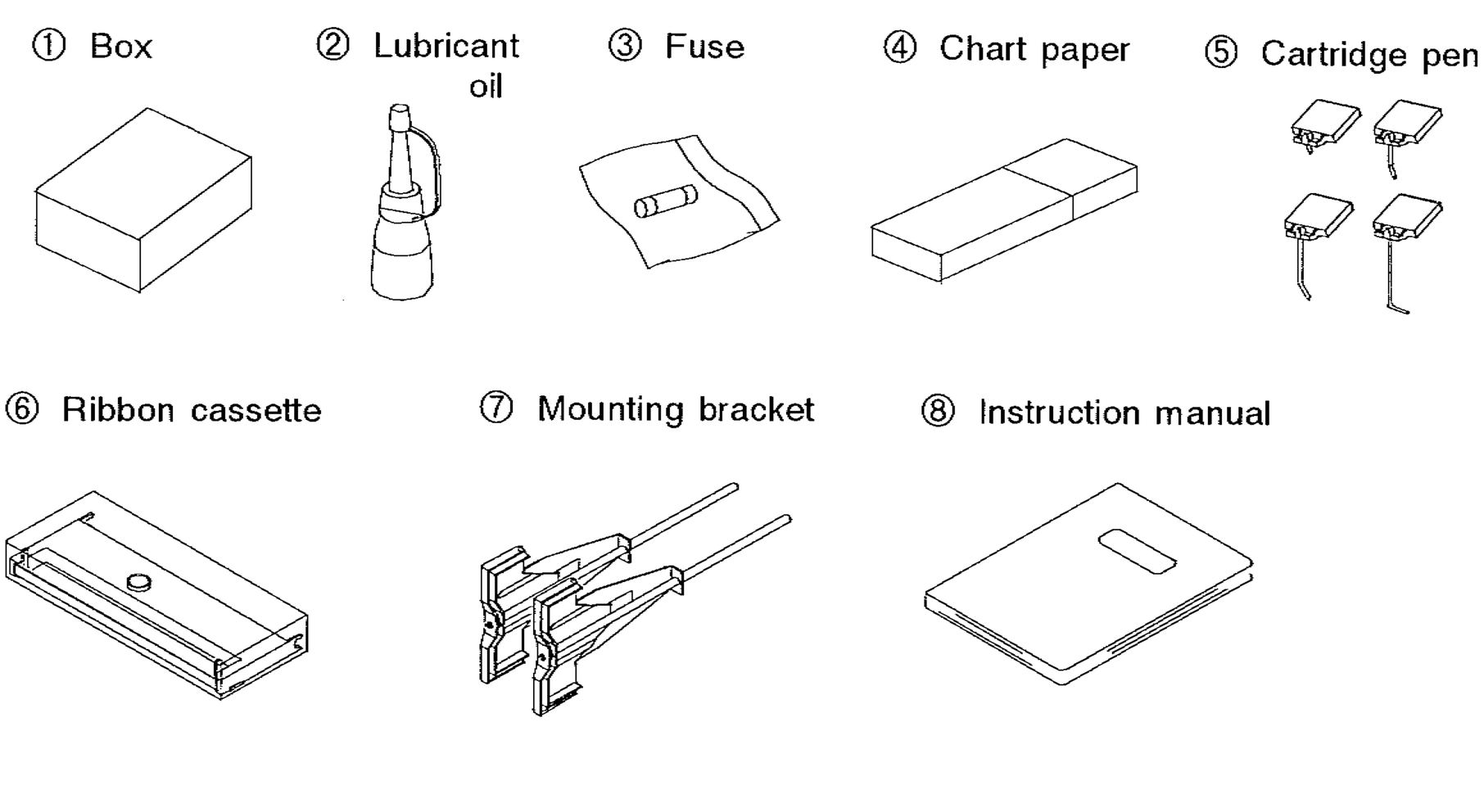

Fig. 1.1 Accessories

Table 1.1 List of Accessories

No.	Part Name	Type	No. of Pens				Remarks
			1-pen	2-pen	3-pen	4-pen	
1	Box	H2H07827	1	1	1	1	Storage box for the parts 2 through 7
2	Lubricant oil	H4A12290	1	1	1	1	
3	Fuse	WPSJ011D000001A	1	1	1	1	250V 2A (T2A)
4	Chart paper	HZCAA1025AF001	1	1	1	1	100 equal divisions
5	Cartridge pens	HPSR001L0001	1	1	1	1	For the 1-pen recorder, Red
		HPSR001L0002	—	1	1	1	For the 2-pen recorder, Blue
		HPSR001L0003	—	—	1	1	For the 3-pen recorder, Green
		HPSR001L0004	—	—	—	1	For the 4-pen recorder, Purple
6	Ribbon cassette	HPSR001H0003	1	1	1	1	
7	Mounting bracket	H4A13299	2	2	2	2	Panel mounting
8	Instruction manual	HXPRM18mnL0001E	1	1	1	1	This manual

1 – 2 Removing the Transportation Screws

Transportation screws are used to protect this instrument against shocks and vibrations during transportation. Remove them before operating it.

⚠ CAUTION

In order to protect the internal unit, install onto the panel with the transportation screws unremoved.

Removing the Transportation Screws

⚠ CAUTION

① The transportation screws are found on the right rear side of the chart holder.
② The transportation screws are required when moving this instrument alone or incorporated in the equipment. Be sure to attach them into their tapped storage holes.

① Open the door.
(It opens to the left.)

② Remove two transportation screws (M4×8) .
Then, main unit can be drawn out.

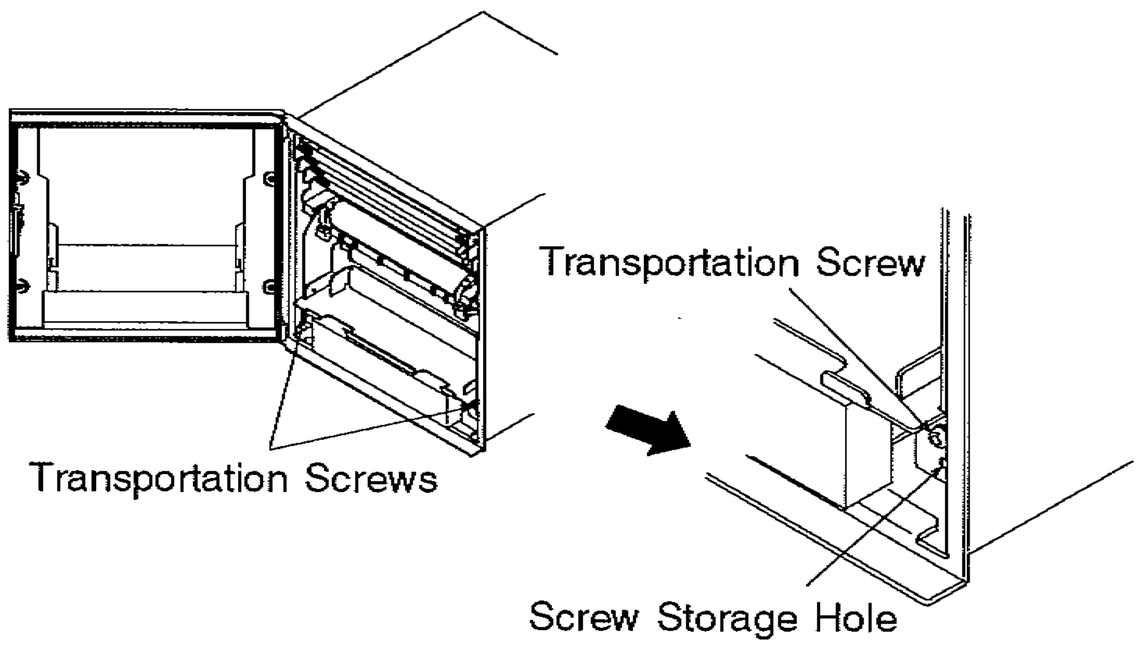

Fig. 1.2 Location of Transportation Screws

⚠ CAUTION

The transportation screws are required when transporting this instrument alone or incorporated into the equipment, or when repacking it. Be sure to attach them into the screw storage holes.

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1 – 3 Checking the Type and Specifications

A name plate, which provides a type, etc., is affixed to the right side of the main unit.
Make sure that this instrument meets your requested specifications, seeing the following tables.
Also, make sure that a scale plate and a type of input are as specified.
See Page 60 (9-3) for how to draw out the internal unit.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R	M	1	8			L		0		0	1	A	0	
				①		②	③		④		⑤			⑥

① Model

01	1-Pen type recorder
02	2-Pen type recorder
03	3-Pen type recorder
04	4-Pen type recorder

② Structure

L	Standard

③ Communications

0	None
1	RS-232C
2	RS-422A

④ DI/DO

0	None
1	8 relays
2	5 DIs
3	8 relays + 5 DIs

⑤ Door

1	N1.5(Standard)

⑥ Special Specifications

O	None
Y	Yes

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1 − 4 Temporary Storage

When storing the instrument temporarily, detach the cartridge pens and ribbon cassette from the internal unit. (See 5-2 on Page 19 and 5-3 on Page 20.)

Store the instrument in the following environment. When the instrument has been incorporated into the equipment, store it in the following environment as well.

⚠ CAUTION

Storage in a poor environment may damage the appearance, functions, and service life of the instrument.

Storage Environment

- A place with little dust.
- A place free from combustible, explosive, or corrosive gases (SO_2, H_2S, etc.) .
- A place free from vibrations or shocks.
- A place free from water or steam or high humidity (95% RH or more) .
- A place free from direct sunshine or high temperature (50°C or more) .
- A place free from an extremely low temperature (-20°C or less) .

1 − 5 Indication Card

An indication card has been affixed to the door upon delivery. When you replace it by an acryl plate, etc., comply with the following recommended dimensions.

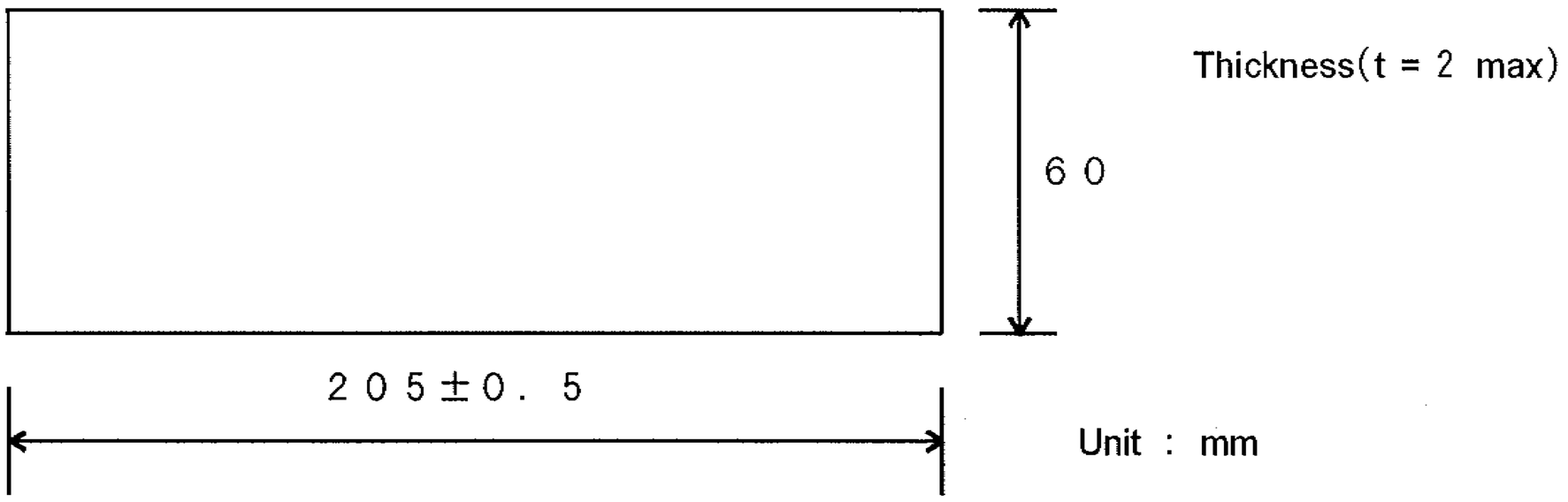

Fig. 1-3 Recommended Dimensions of Indication Card

⚠ CAUTION

When the new indication card is beyond the recommended dimensions, it may break the door or its mounting section.

The RM10L Hybrid Recorder has digital recording capabilities such as list printout, log printout, date printout, and alarm printout, in addition to conventional analog recording capabilities.
A variety of options are also available to meet diverse needs.

Features

● Non-contact design

A non-contact electromagnetic potentiometer is used to detect a position, thus realizing the longer life and reduced maintenance work of each section.

● Free power source applicable worldwide

A free power source available for 85 to 264 V AC is used.

● DC brushless motor

A DC brushless motor is used to realize a longer life and high-speed pen responsibility.

● Capable of mixing TC, mV, V, and resistive temperature detector inputs

Capable of connecting TC, mV, V, and resistive temperature detector inputs to each channel respectively. A mixture of various inputs is allowed.

● Abundant on-board options

Provided with a variety of options such as communication capability(RS-232C/RS-422A), 5 DIs, 8 relay outputs to allow high system extensibility.

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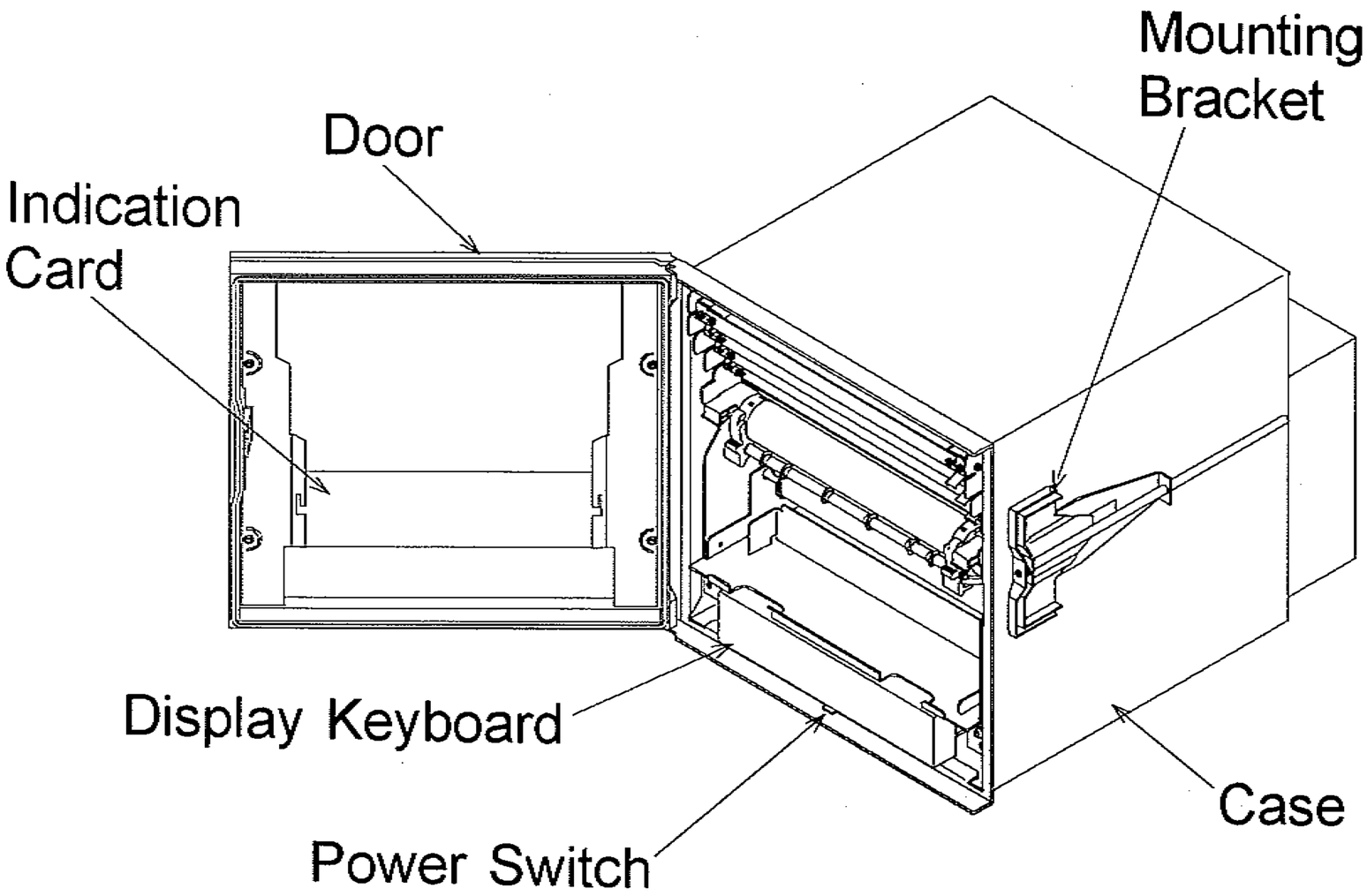

Fig. 2.1 Component Parts (1)

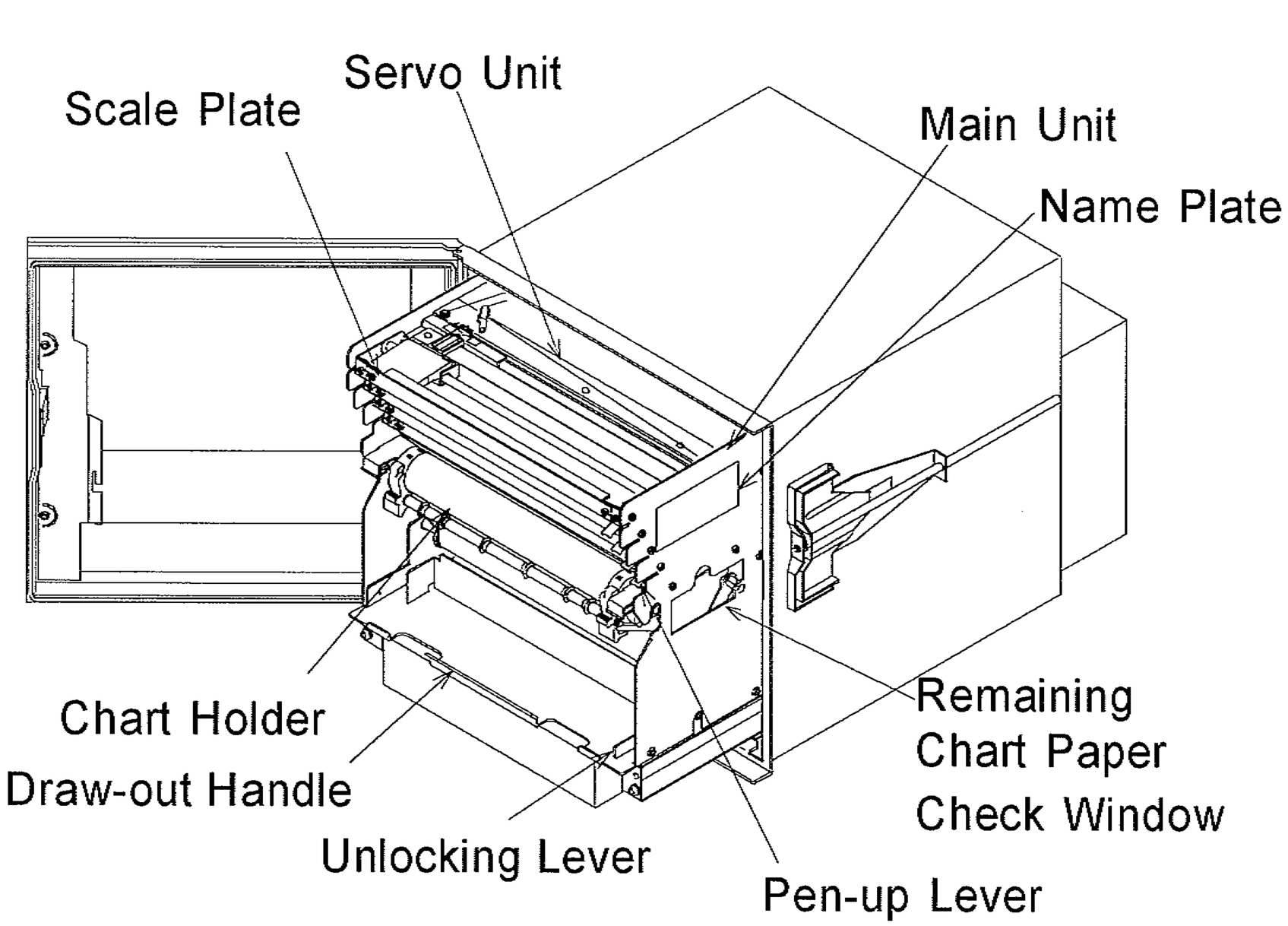

Fig. 2.2 Component Parts (2)

Display

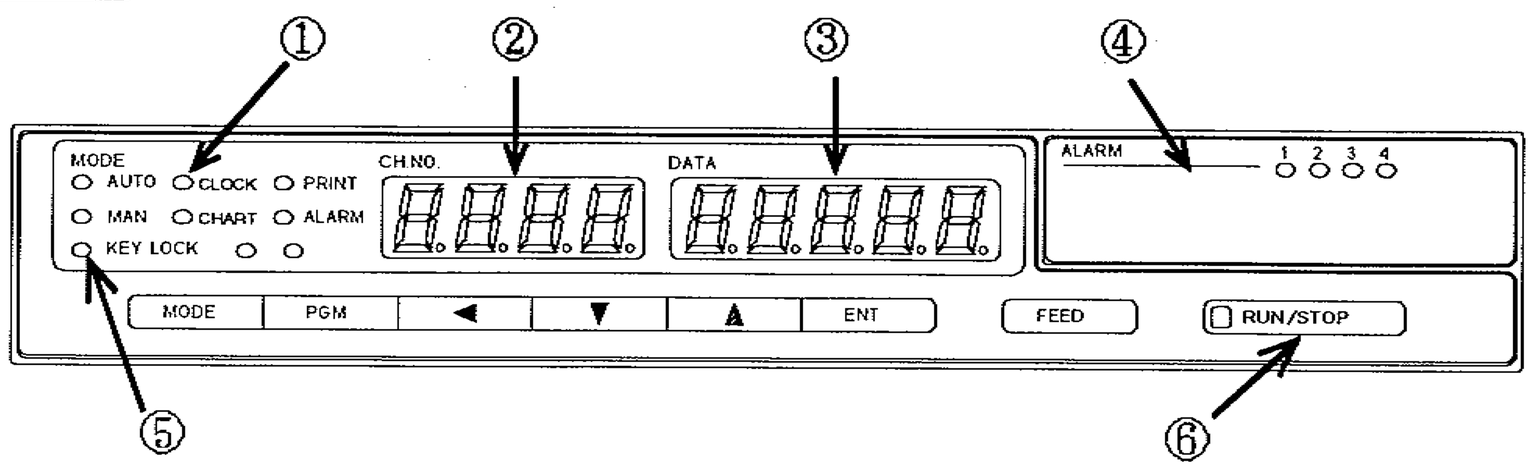

Fig. 2.3 Display

Table 2-1 Description of Display

No.	Name	Description	Remarks
①	Mode (MODE) indicator lamps	A lamp for a selected user mode is illuminated.	For the user mode, see 6-3(Pages 24 to 29).
②	Display (1)	Displays a channel number or setting item name. When an alarm occurs, an alarm value is displayed.	The display changes depending on the mode.
③	Display (2)	Displays a measured value, various set values, date, time, etc. When an error occurs, it is displayed.	For the error(self diagnosis), see 11-2 (Page 77).
④	Alarm indicator lamps [1 ○ ~ 4 ○]	A channel number corresponding to an alarm is illuminated.	For the alarms, see 7-6(Pages 36 and 37). The number of alarm indicator lamps differs depending on the number of input channels.
⑤	KEY LOCK lamp (▭KEY LOCK)	Indicates whether the keys are locked Illuminated when they are locked.	For the key lock state, see 7-2(Page 31).
⑥	RUN/STOP lamp (▭RUN/STOP)	Illuminated when recording is running, and unilluminated when it is stopping. Blinking when initializing the data.	Does not perform recording in the STOP mode. A display value changes because data sampling continues. An alarm output is also allowed.

Since the displays (1) and (2) are 7-segment LEDs, the alphabets are symbolized for display.
See the following symbolized alphabets for display.

[Reference] Symbolized Alphabets for Display

A	B	C	D	E	F	G	H	I	J	K	L	M	N
O	P	Q	R	S	T	U	V	W	X	Y	Z	γ	

Uppercase and lowercase letters are not distinguished.

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User Mode

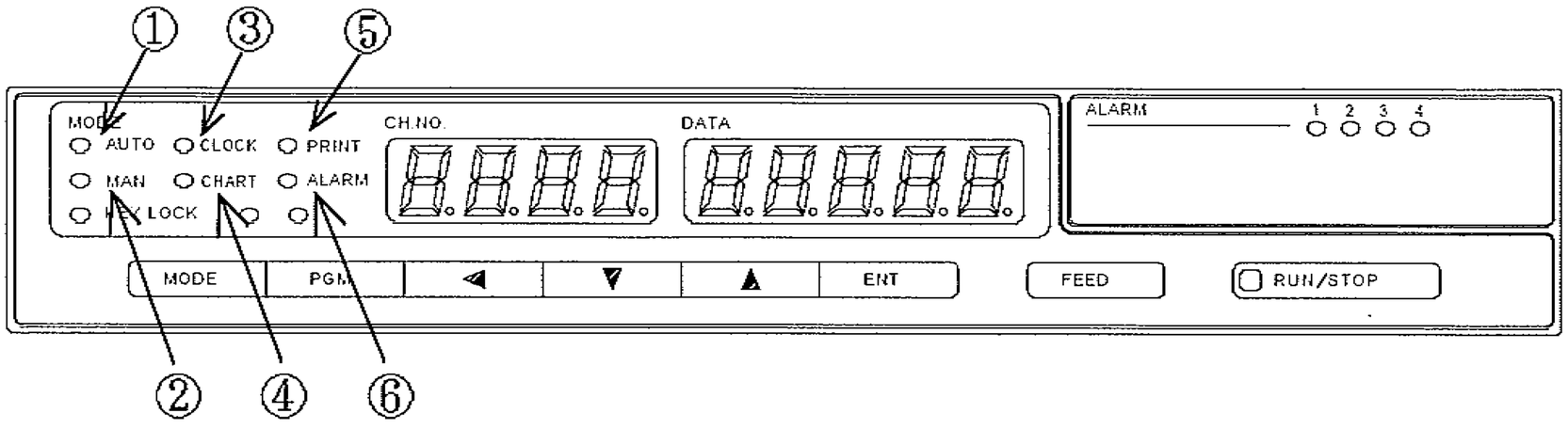


Fig. 2.4 User Mode Functions

Table 2.2 User Mode Functions

No.	Indicator Lamp	Mode	Outline of Function	Details
①	AUTO	AUTO mode	Displays the measured values for all the channels sequentially in synchronization with dot printing.	Page 25 (6-3)
②	MAN	MANUAL mode	Displays the measured value for the channel selected by the ▼ or ▲ key.	Page 25 (6-3)
③	CLOCK	CLOCK mode	Displays and alters the year, month, day, and time.	Page 25 (6-3)
④	CHART	CHART mode	Displays and sets a chart paper feed rate.	Page 26 (6-3)
⑤	PRINT	PRINT mode	Starts log printout and list printout, and sets time log.	Page 27 (6-3)
⑥	ALARM	ALARM mode	Displays the alarm setting state, sets an alarm value, and sets an alarm output.	Page 36 (7-7)

Operation Keys

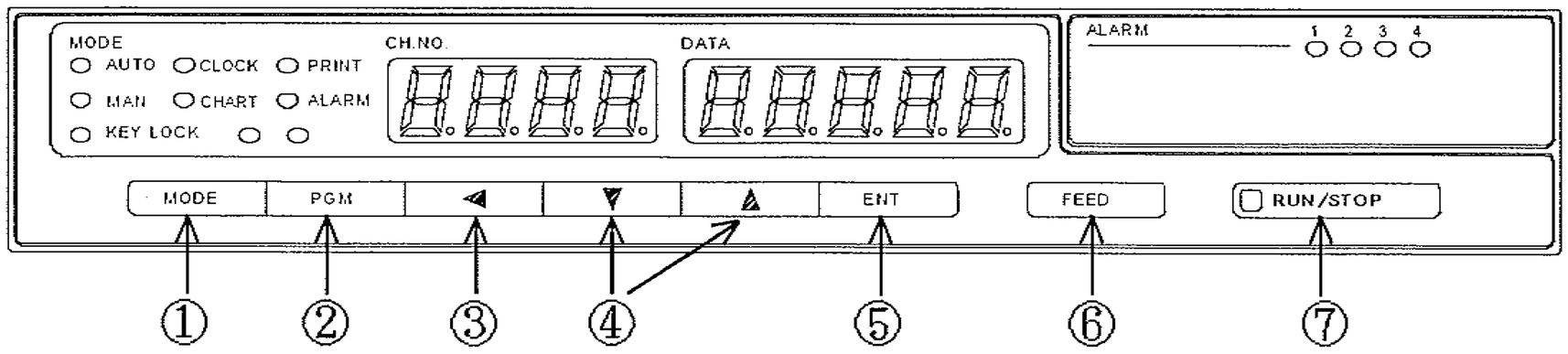


Fig. 2.5 Key Names

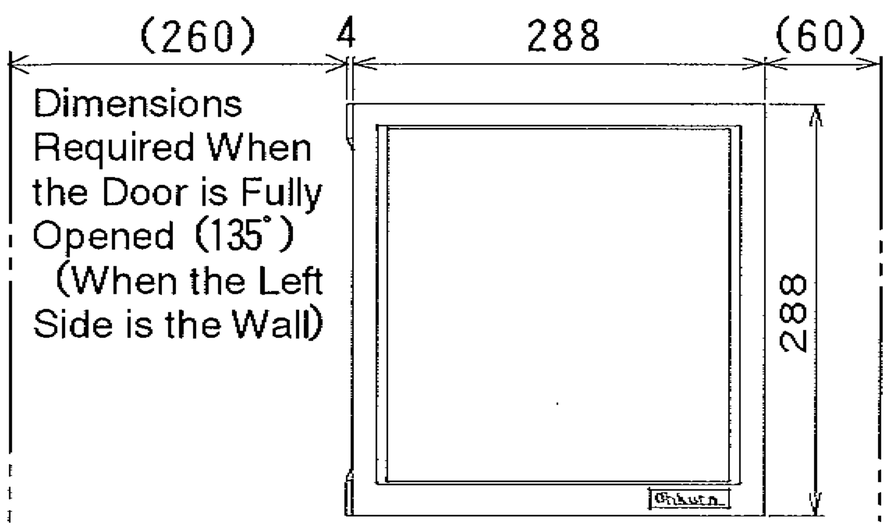
Table 2.3 Key Functions

No.	Key	Key Function
①	MODE	Selects the user mode.
②	PGM	Switches to the parameter setting enable state(input mode).
③	◀	Moves backward through the selection items when setting a parameter. Moves a changing digit to the left in the input mode.
④	▲	Counts up a numerical value or item.
	▼	Counts down a numerical value or item.
⑤	ENT	Determines a selected numerical value or item when setting a parameter. Moves a changing digit to the right in the input mode.
⑥	FEED	Feeds the chart paper quickly.
⑦	RUN/STOP	Starts/stops the function.

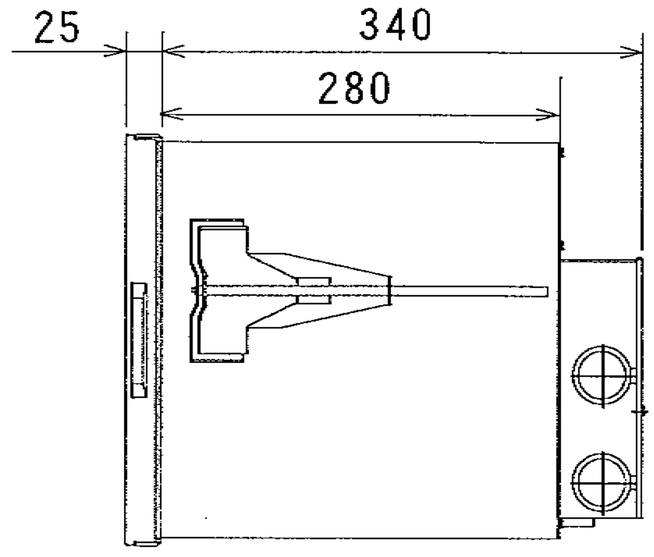
3. INSTALLATION

3 – 1 Outside Dimensions Drawing and Panel Cut Dimensions

<Front>

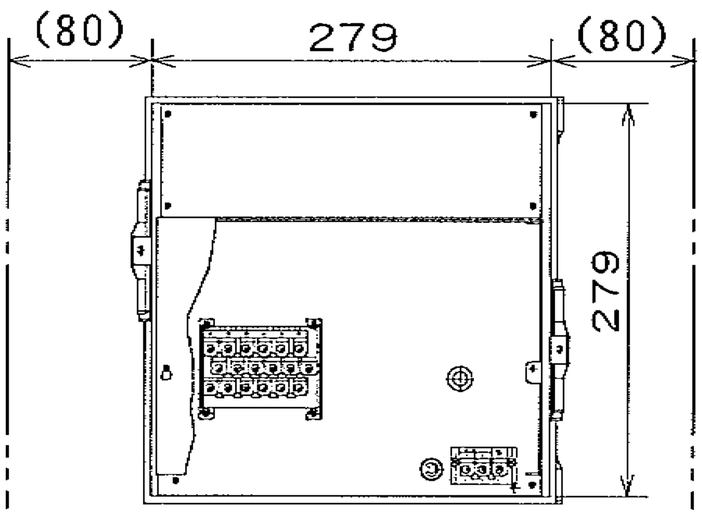


<Side>

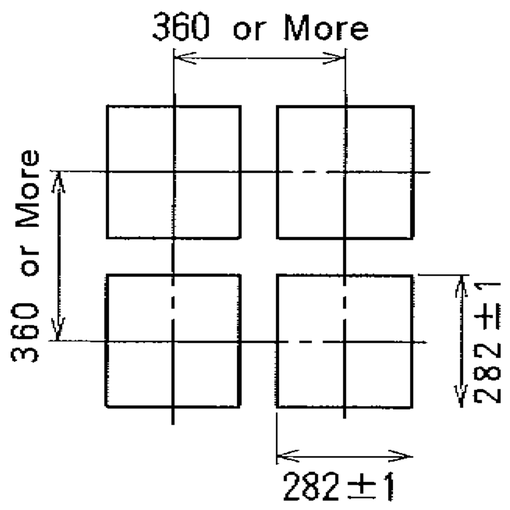


Unit : mm

<Rear>



<Panel Cutting>



⚠ CAUTION

For maintenance and safety of the instrument, it is recommended to secure the spacings larger than the parenthesized dimensions per unit.

Fig. 3.1 Outside Dimensions and Panel Cut Dimensions

⚠ WARNING

Do not install the instrument in a place exposed to a combustible, explosive, or corrosive gas (SO_2, H_2S, etc.).

⚠ CAUTION Install the instrument in the following places

Install the instrument in the following places

- A place free from where humidity often changes.
- A place of normal temperature (25 °C or so).
- A place exposed to as little mechanical vibrations as possible.
- A place with as little dust as possible.
- A place affected by the electromagnetic field as little as possible.
- A place not directly exposed to high radiant heat.
- A place where the altitude is up to 2000m.
- Humidity has an effect on the chart paper and ink. Use the instrument in a humidity range of 20 to 80%RH (60%RH is optimum).
- This instrument needs the inside installation.

Mounting to the Panel

- A steel plate not thinner than 1.2 ㎜ is recommended as a mounting panel.
- The maximum thickness of the mounting panel is 7 ㎜.

Inclination

- Install the instrument horizontally.
- The instrument should be installed so that its inclination should be 0 ° at the front and within 30 ° at the rear.

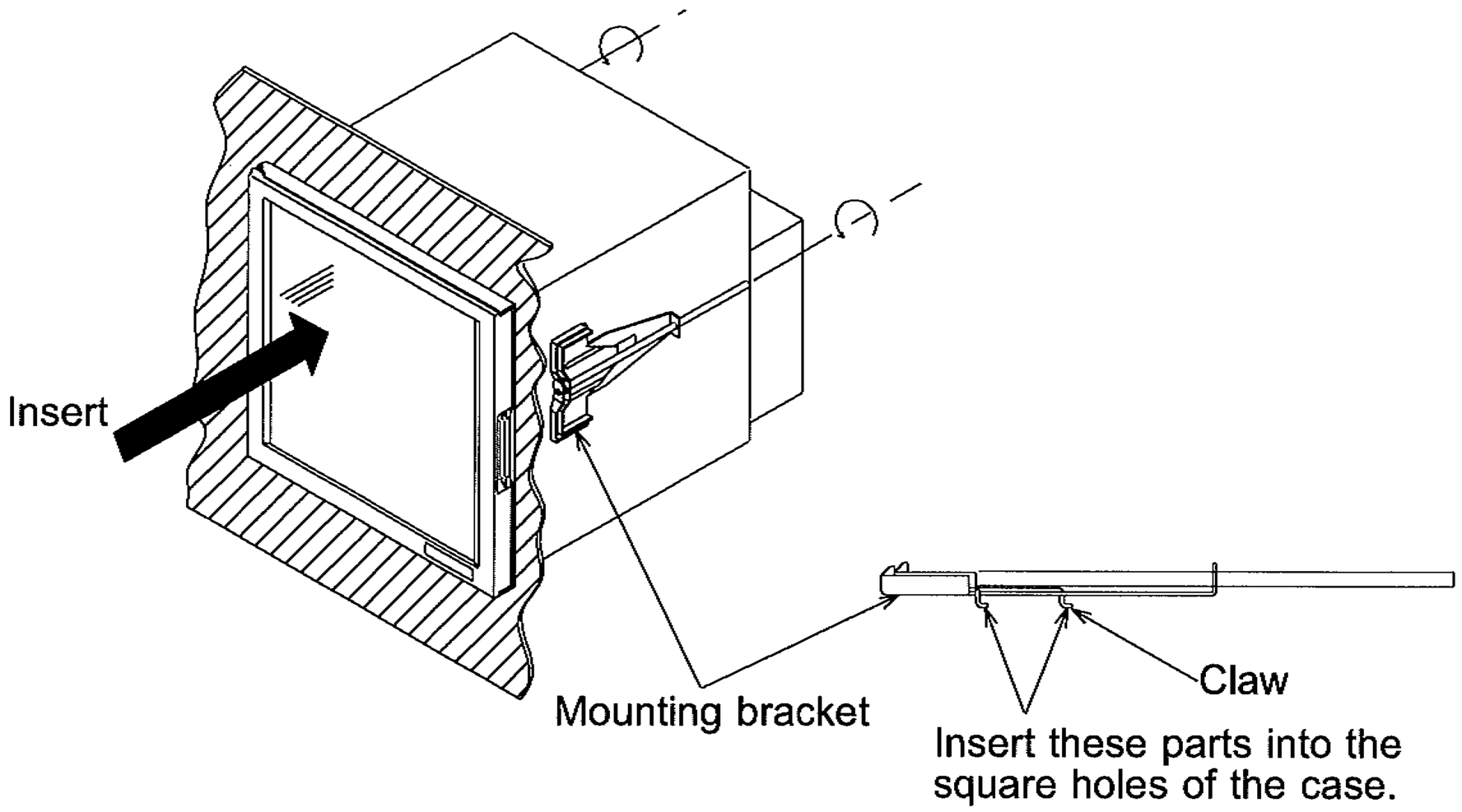


Fig. 3.2 Mounting to the Panel

⚠ CAUTION

Be sure to fix the main unit with the shipping screws for safety work and protection of the main unit. (See Fig. 1.2 on Page 2)

(1) Fix the main unit with the shipping screws.
(2) Insert the instrument through the front of the panel.
(3) Insert the claws of the mounting bracket into the square holes on the left and right sides of the case.
(4) Tighten the screws of the mounting bracket with a regular screwdriver and attach to the panel. Do not tighten by an excessive force. It would distort the case into contact with main unit and door.
Adequate tightening torque : Approx. 2N·m (20kgf·cm)
(5) After installing the instrument, put the transportation screws in the screw storage holes again.

Terminal Layout

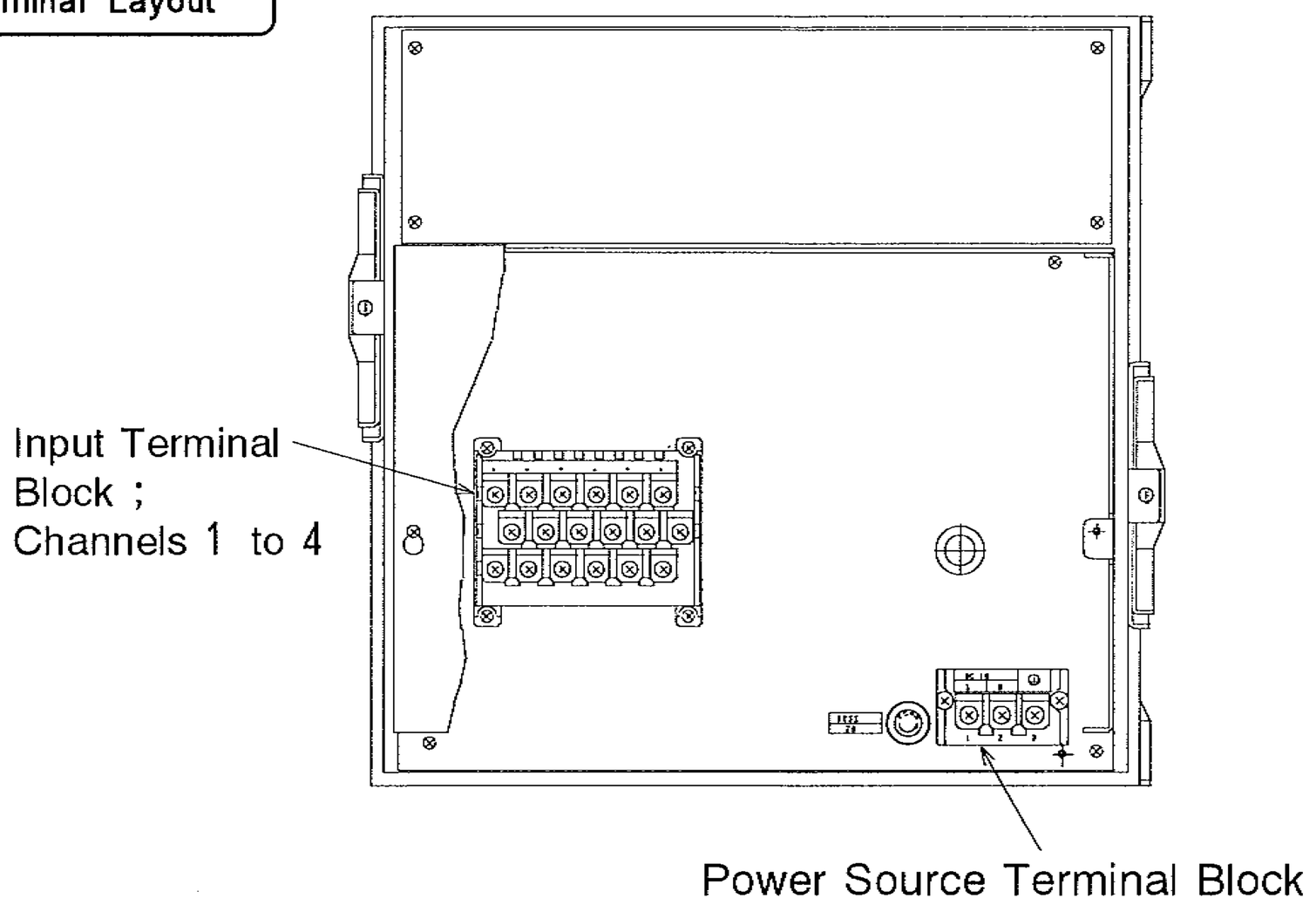


Fig. 4.1 Terminal Layout (**Rear View**)

Power Source Wiring

WARNING

① In order to prevent an electric shock, be sure to provide protective grounding prior to turning on the instrument.
② Do not cut a protective grounding conductor or disconnect protective grounding.
③ Make sure that the supply voltage for the instrument conforms to the voltage of the supply source.
④ Attach a transparent protective cover prior to turning on the POWER of the instrument.
⑤ In order to comply with the requirement of safety standard EN61010, the recorder shall have one of the following as a disconnecting device, fitted within easy reach of the operator, and labelled as the disconnecting device.
A switch or circuit breaker which complies with the requirements of IEC947-1 and IEC947-3.

CAUTION Precautions for Wiring the Power Source

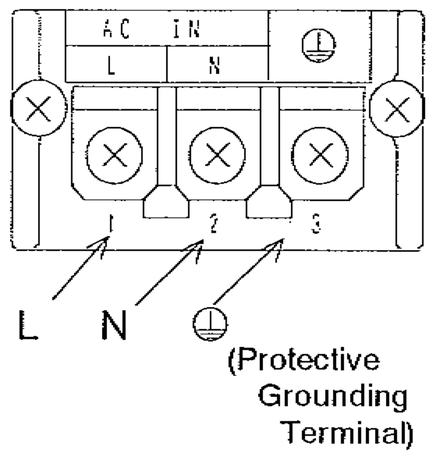
① As an electric wire for the power source, use a 600 V vinyl insulated wire (JIS C 3307) or its equivalent or above.
② Attach a press-fitting terminal with insulated sleeve (for M4) to the end of the electric wire.
③ Provide a Class-3 (grounding resistance value : 100Ω max, minimum diameter of the grounding conductor : 1.6mm) or above connection for a protective grounding terminal.
④ If the protective grounding conductor is shared by other instrument, there may be an effect caused by noise coming from the grounding conductor. It is recommended not to share it with other instrument.

Wiring Procedure

① Turn off the POWER switch of the instrument.
② Remove the transparent protective cover of the power source terminal block.
③ Connect the power source electric wire as shown in Fig. 4.2.
Connect the non-grounding side of the power source to the No.1 terminal.
④ Put back the transparent protective cover.
⑤ Make sure that protective grounding is properly provided.

Power Source Terminal Block

L : Line
N : Neutral line
⏚ : Ground line



Power Source 85 to 264VAC

Fig. 4.2 The Power Source Wiring

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1	8/30/96	Kawa	Hoso	Oda	
2	24/6/98	Kawa	Hoso	Oda	誤記⑤追加、旧版廃図
3	15/7/98	Yama	Hoso	Ogawa	電源端子台端子名変更、Z版廃図

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⚠ WARNING

Turn off the POWER prior to wiring an input line.

⚠ CAUTION Precautions for Wiring the Input Line

① Precautions for the input electric wire

- See that no noise is mixed in input wiring. For input wiring, it is recommended to use a shielding wire or twisted wire effective for noise.
- In case of thermocouple input, connect a thermocouple wire directly or use a compensation lead wire. It is recommended to use a shielded input line.
- In case of resistive temperature detector input, dispersion of 3-wire line resistance should be less than the below mentioned values. It is recommended to use a shielded input line.

  For Pt 100, JPt 100 ; 50m Ω max

  For Pt 50, Cu 10Ω ; 10m Ω max
- When it is likely to be effected by induction noise, particularly when wiring near the high-frequency power source, it is recommended to use a shielded twisted wire.
- Attach a press-fitting terminal with insulated sleeve(for M4) to the end of the electric wire.

② Precautions for wiring

- The wiring between the instrument and measurement point should be kept away from the power circuit (25V or higher circuit or DO circuit).
- Short-circuit unused input terminals. (Short-circuit between "+" and "-" in case of mV, V, or thermocouple input, and short-circuit among A, B, and b in case of resistive temperature detector input.)
- When grounding a shielding wire, etc., connect it to the protective grounding terminal of the instrument.

Wiring Procedure

① Turn off the power of the instrument.
② Remove the rear cover of the input terminal block.
③ Wire the input lines according to the wiring examples shown in Fig. 4.3, Fig. 4.4 (Page 14), and Fig. 4.5 (Page 14).
④ Put back the rear cover.

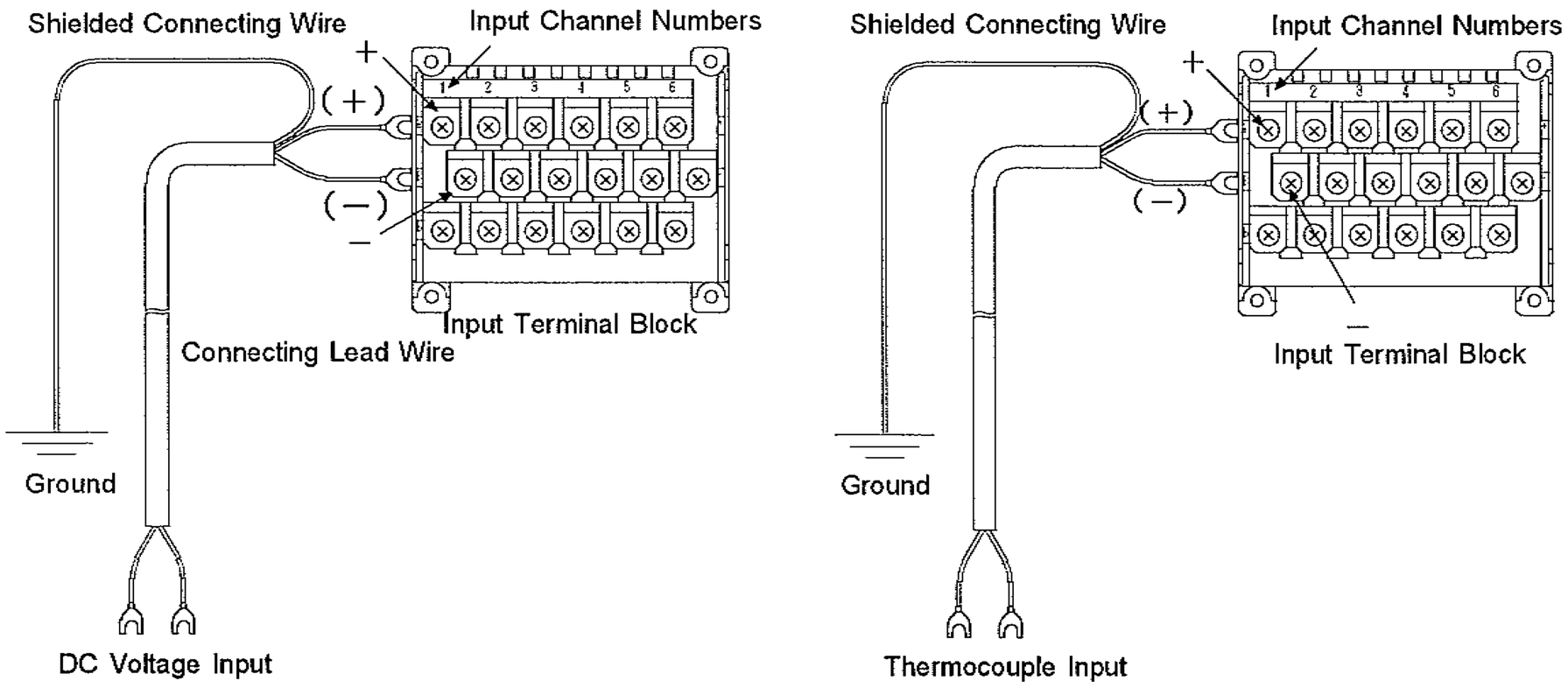

Fig. 4.3 Input Wiring (For mV, V, and Thermocouple Inputs)

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3					

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4 — 2 Input Wiring

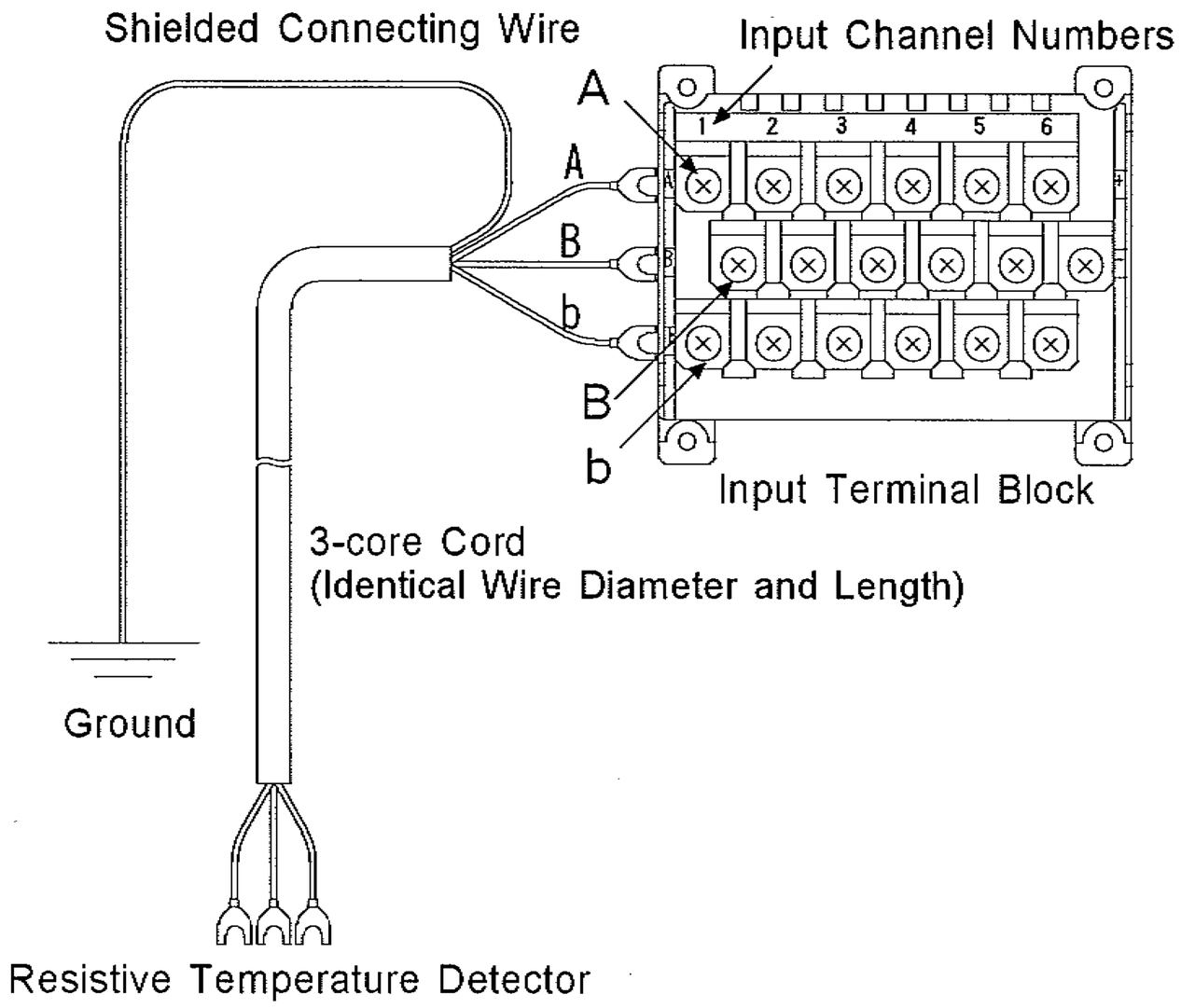

Fig. 4.4 Input Wiring (For Resistive Temperature Detector)

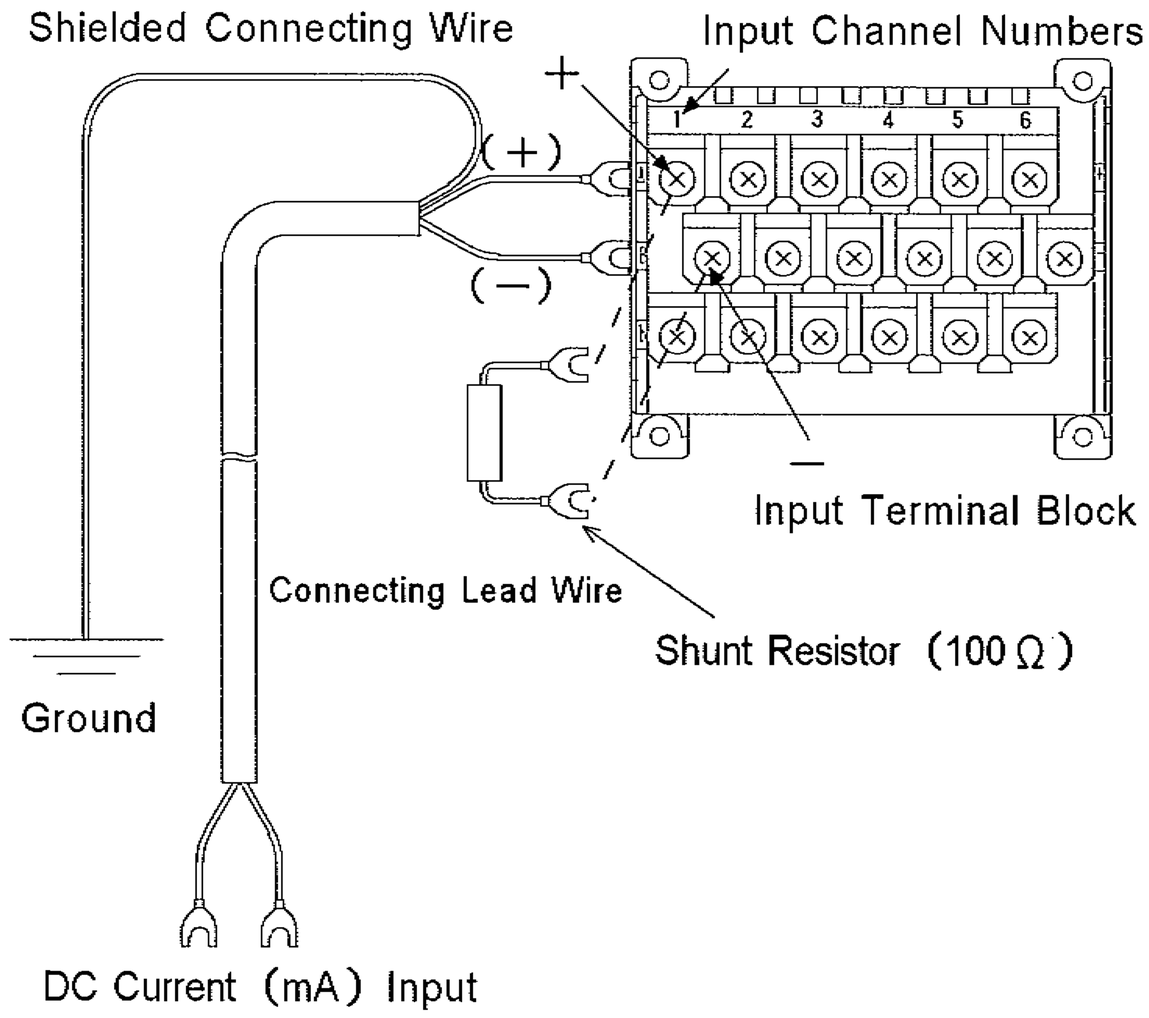

Fig. 4.5 Input Wiring (For mA Input)

[Notes]

1. Attach the shunt resistor to the input terminal block of the instrument.
2. Input accuracy is effected with the shunt resistor. Use the following recommended resistor.

Resistant value : 100 Ω Rated power : 1/8W Tolerance : ±0.1% max
Temperature coefficient : ±50ppm max

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⚠ WARNING

① Be sure to wire after turning off the POWER.
② When the power source has been connected to the Alarm output, turn off that power source.
③ When a hazardous voltage supplies to alarm terminals:
  a) Never touch terminals preventing from electric shock.
  b) Attach covers to terminals.
  c) Wires should be double shielded.
  d) Adopt round pressure terminal connectors with insulation cover for wire, preventing from lose connection.

⚠ CAUTION Precautions for Wiring the DI/Alarm Output

Precautions for Wiring the DI

① DI input has the drive power source incorporated. Do not apply a voltage to a DI input terminal from the outside.
② A DI input contact capacity should be a forward/reverse withstand voltage of 50V DC, 16mA or more, ON resistance of 20Ω max (wiring resistance included) .
③ Do not use unused terminals as relay terminals.

Precautions for Wiring the Alarm Output

① An alarm output contact capacity is as follows :
  250VAC : 3A at maximum (Resistance load)
  30VDC : 3A at maximum (Resistance load)
  125VDC : 0.5A at maximum (Resistance load) , 0.1A at maximum
  L/R=40ms at maximum (Induction load)
② Attach an anti-surge protective circuit (surge absorbers, etc.) to an output terminal, as required.
③ Attach a press-fitting terminal with insulated sleeve (for M4) to the end of an electric wire.
④ Keep alarm output wiring away from input wiring.

DI Wiring Example

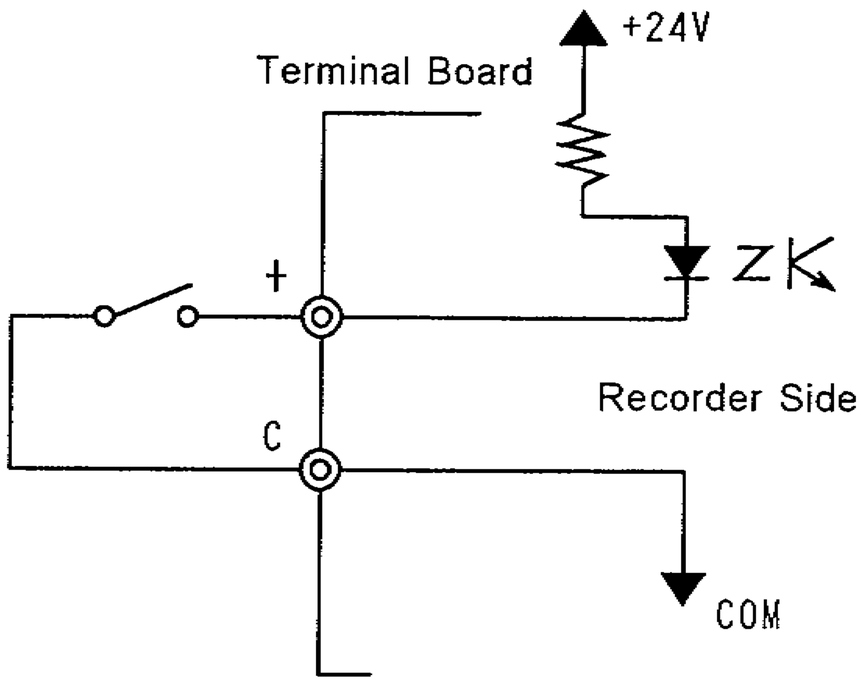

Fig. 4.6 DI Wiring Example

Alarm Output Wiring Example

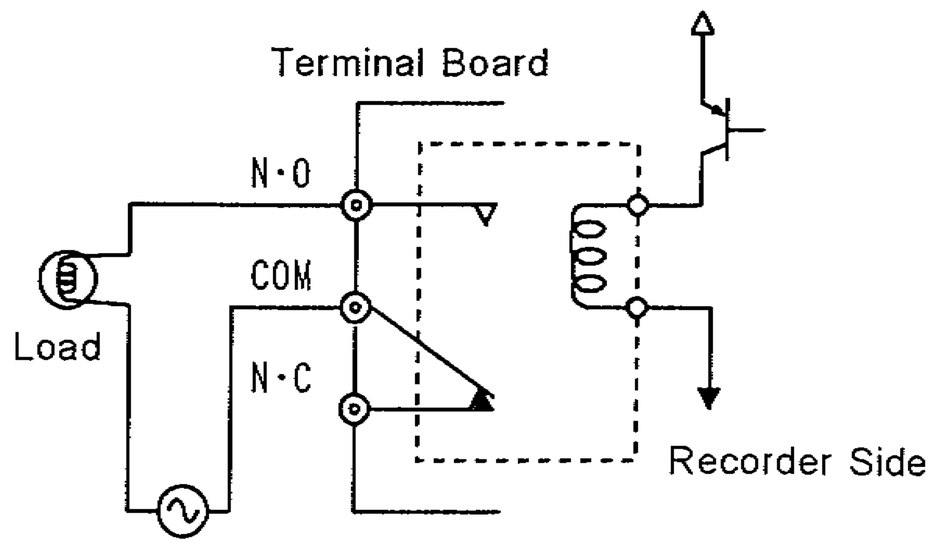

Fig. 4.7 Alarm Output Wiring Example

[Note]
The DI/Alarm output (option) consists of a combination of 5 DI inputs and 8 alarm output (relay output) contacts.

4 – 3 DI/Alarm Output Wiring (Option)

Wiring Procedure

Wire the DIs and Alarm outputs according to Fig. 4.8.

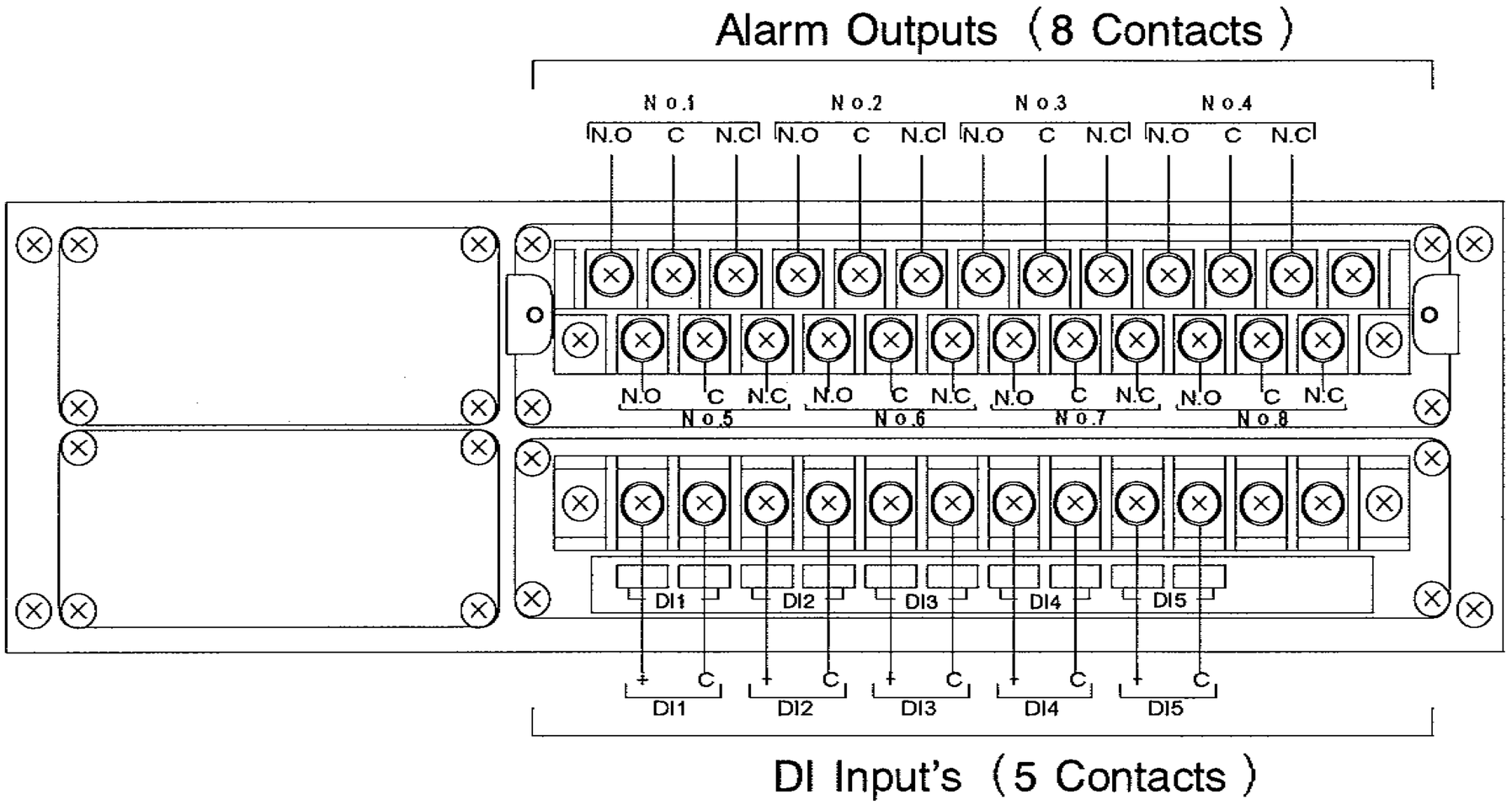

Fig. 4.8 Wiring for DI Input (5 DI Contacts) and Alarm Output (8 Alarm Output Contacts)

[Note]

The DI4 and DI5 do not function.

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⚠ CAUTION

Use our standard chart paper for proper recording.

(1) Press the POWER switch to turn off the power. Or, with the power left turned on, press RUN/STOP key to stop recording.

⚠ CAUTION

If the chart holder is lowered with the recorder being running, the printer may be damaged. When replacing the chart holder, be sure to take the step (1) first.

(2) Open the door and remove the chart holder. To remove it, hold its both ends with both hands and pull it upward.

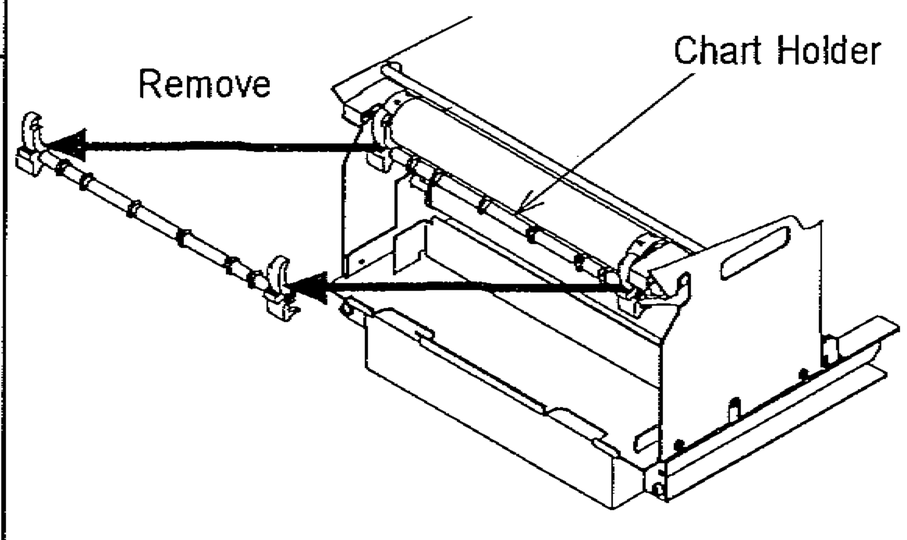


Fig. 5.1 Removing the Chart Holder

(3) Hold the levers located on the left and right sides of the chart holder and unlock to incline the holder forward.

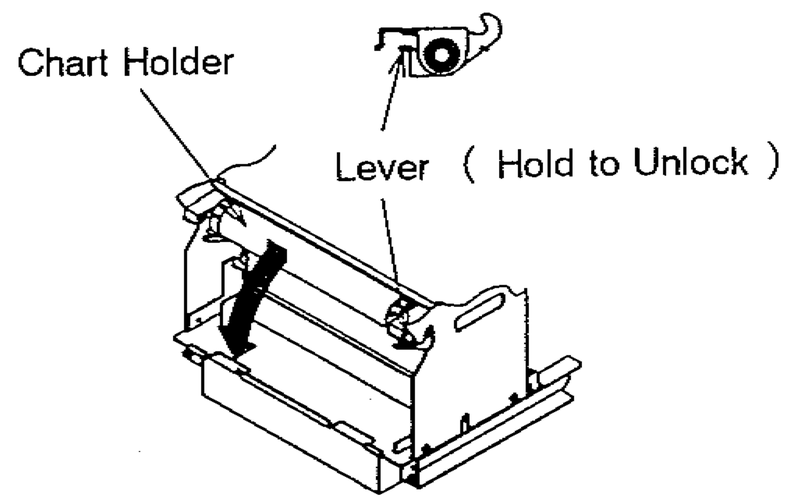


Fig. 5.2 Inclining the Holder Forward

(4) Unlock the chart cover with both index fingers to open it. When replacing the chart paper, take out used chart paper.

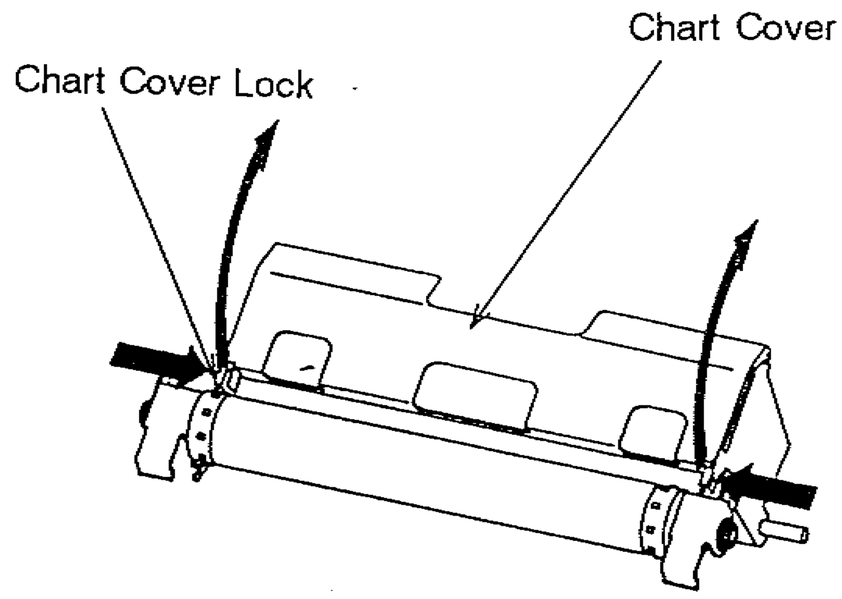
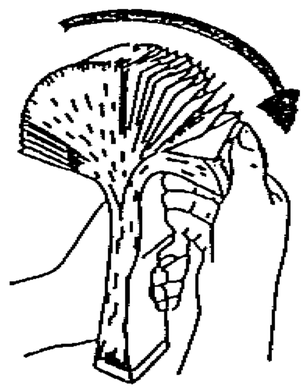


Fig. 5.3 Unlocking the Chart Cover

(5) Loosen new chart paper you want to set.



[Note]

If the chart paper is stuck at perforations, it may not be fed properly. Be sure to loosen it.

Fig. 5.4 Loosening the Chart Paper

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(6) Unfold about 3 pages of the chart paper. With square holes on the left side, set it in the paper housing so that its draw-out position will be as illustrated in the figure below.

[Note]
Make sure that the left and right holes are properly set. Set the chart paper over the shaft.
(The shaft is covered with the chart paper.)

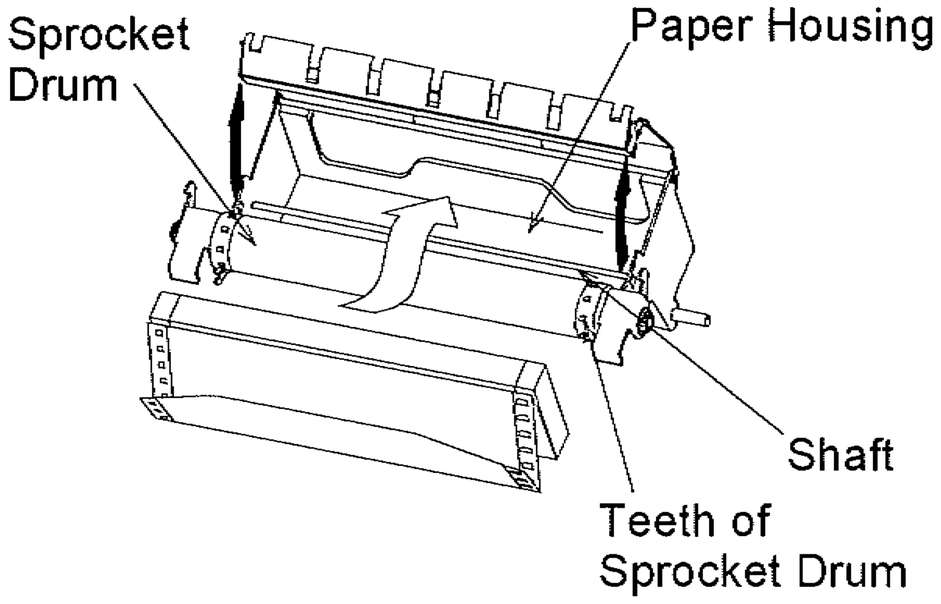

Fig. 5.5 Setting the Paper

(7) Make sure that the chart paper is bent downward and its holes are properly aligned with the teeth of the sprocket drum, and close the chart cover until it is locked.
Next, hold the levers of the chart holder with both hands and pull up the holder.
Move the levers lightly left and right, and up and down to make sure that the chart holder is attached to the main unit.

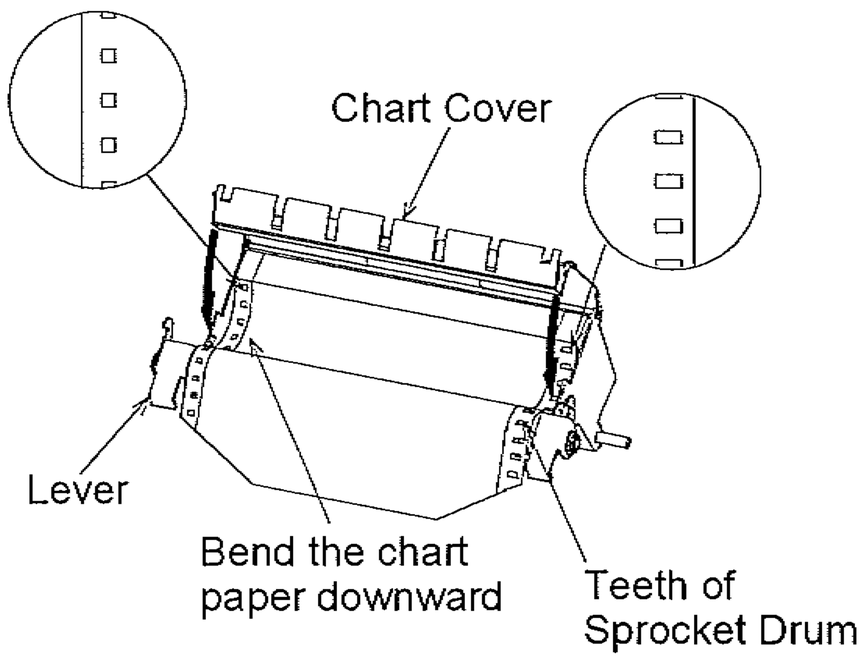

Fig. 5.6 Assembling the Chart Holder

(8) Wind the chart paper, aligning its holes with the teeth of the sprocket drum, and put back the chart holder to its original position.
When this is done, make sure that the left and right holes in the chart paper are properly engaged with the teeth of the sprocket drum.

(9) Prior to running the recorder, press FEED key on the display/keyboard with the power turned on to eliminate a play of the chart paper from between the gears of the chart holder.

[Notes]
① Be sure to feed the chart paper by about 4 to 6 pages prior to running the recorder.
② When the chart paper cannot be fed properly by pressing FEED key, check the setting condition of the chart paper.

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(1) Press the POWER switch to turn off the power. Or, with the power turned on, press the RUN/STOP key to stop recording.

(2) Hold the left and right levers of the chart holder to unlock and tilt the holder forward.

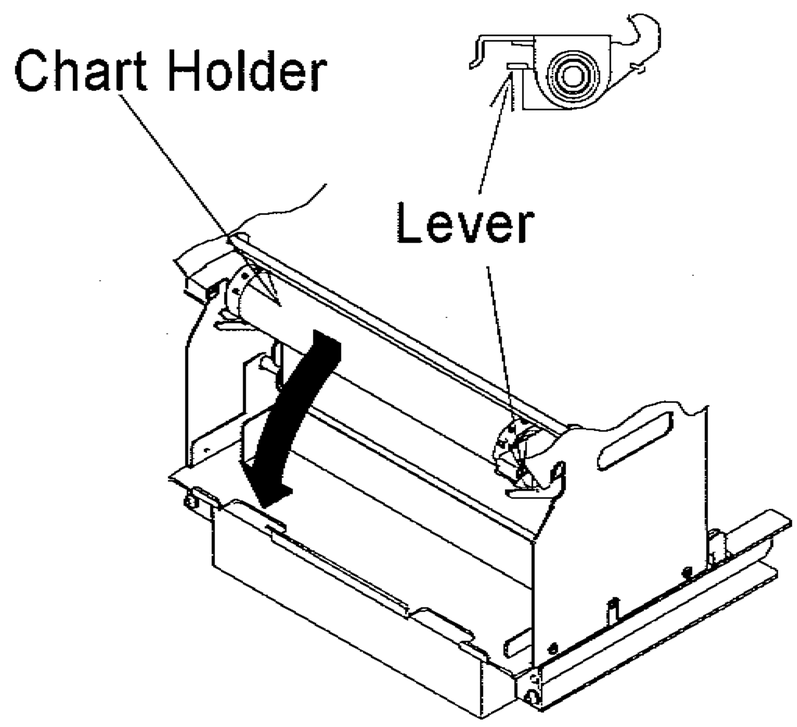

Fig. 5.7 Tilting the Holder Forward

(3) When the pen is held up, lower the pen-up lever to bring down the pen.

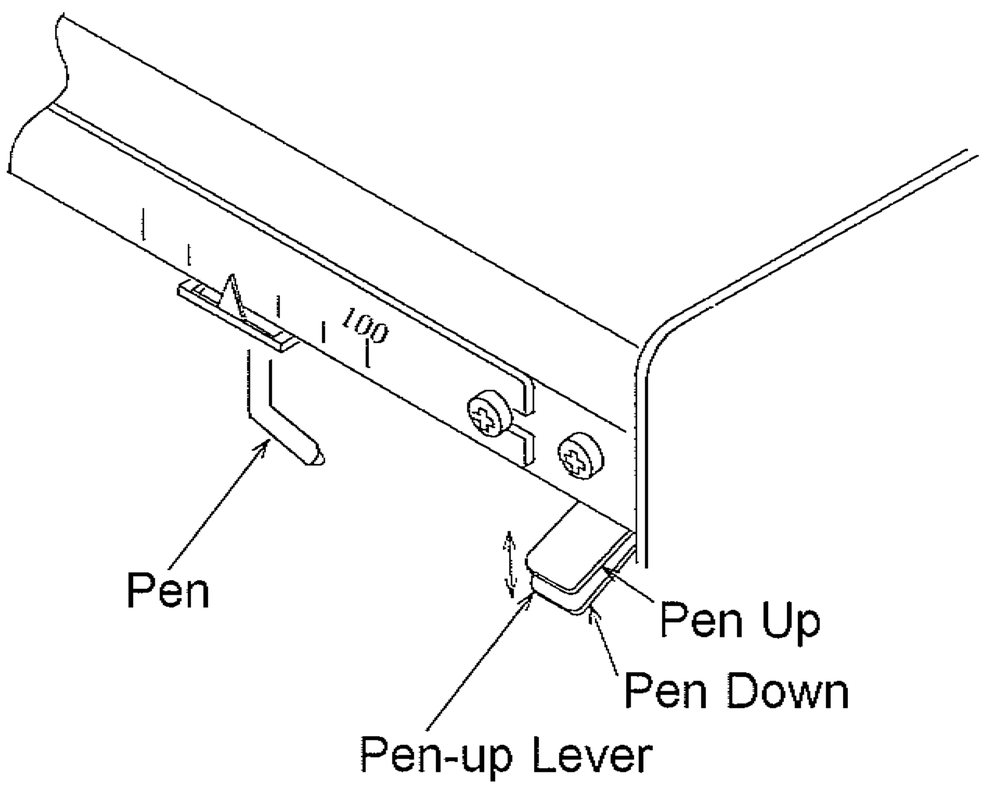

Fig. 5.8 Bringing down the Pen

(4) When the cartridge pen has been already set, pull it out to the near side as shown in Fig. 5.10.

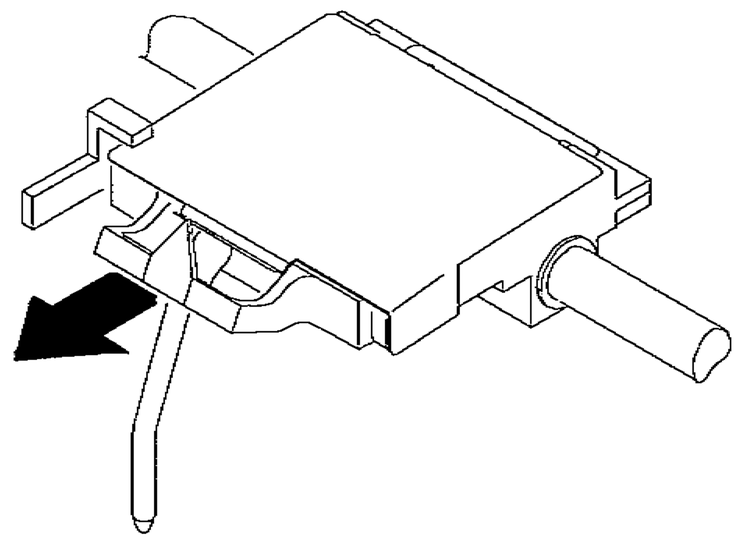

Fig. 5.9 Pulling out the Cartridge Pen

(5) Remove a pen cap from a new cartridge pen.

(6) With the chart holder tilted forward, insert the cartridge pen fully into the pen holder.

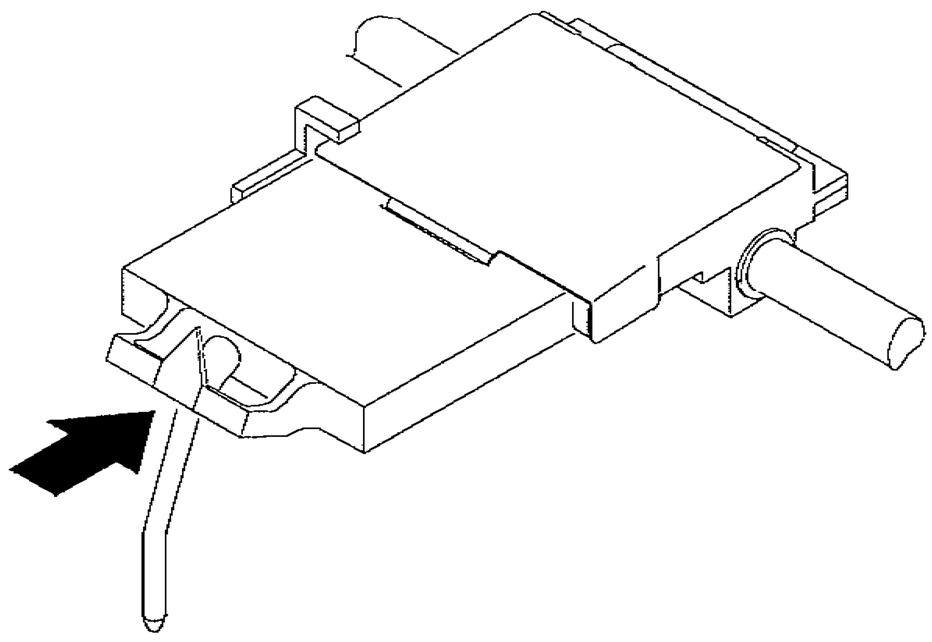

Fig. 5.10 Setting the Cartridge Pen

(7) Put back the chart holder to its original position.

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⚠ CAUTION

When replacing the ribbon cassette, tilt the chart holder forward in order to fully secure a replacement space. Therefore, replace it when there is either no chart paper or about 10 pages in the paper receiver.
It is recommended to replace the ribbon cassette together with the chart paper.

(1) Press the POWER switch to turn off the power. Or, with the power turned on, press the RUN/STOP key to stop recording.

(2) Pressing down the unlocking lever, use the draw-out handle to draw out the internal unit until it comes to a stop, as shown in the figure below.

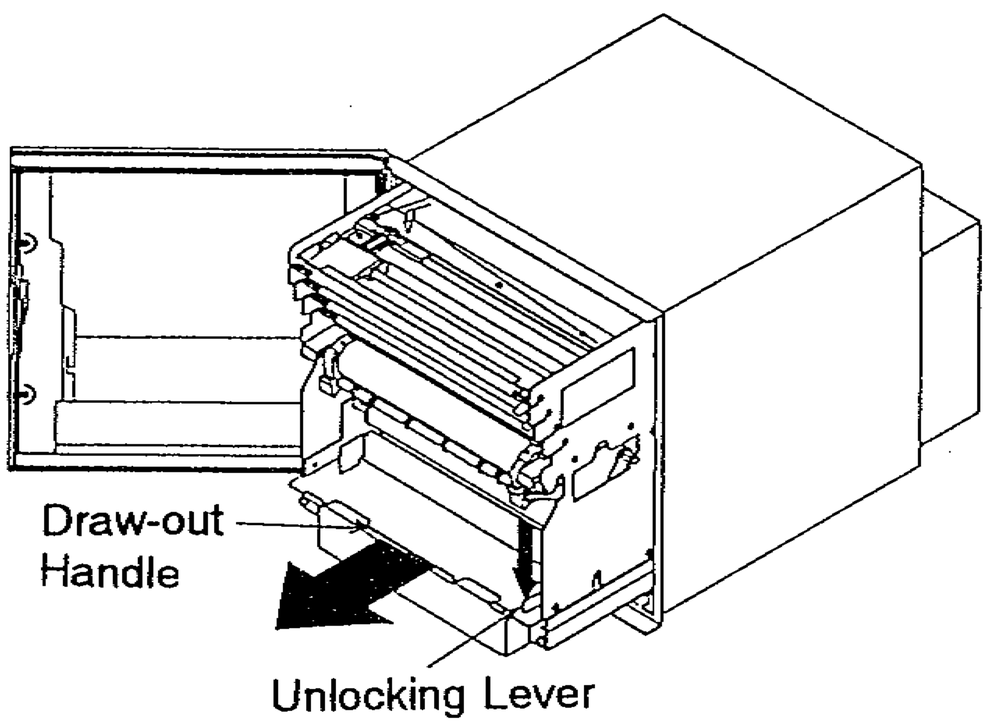

Fig. 5.11 Drawing out the Internal Unit

(3) With your finger, move the pen to the zero side (left side) .

(4) Tilt the chart holder forward to the 2nd stage.

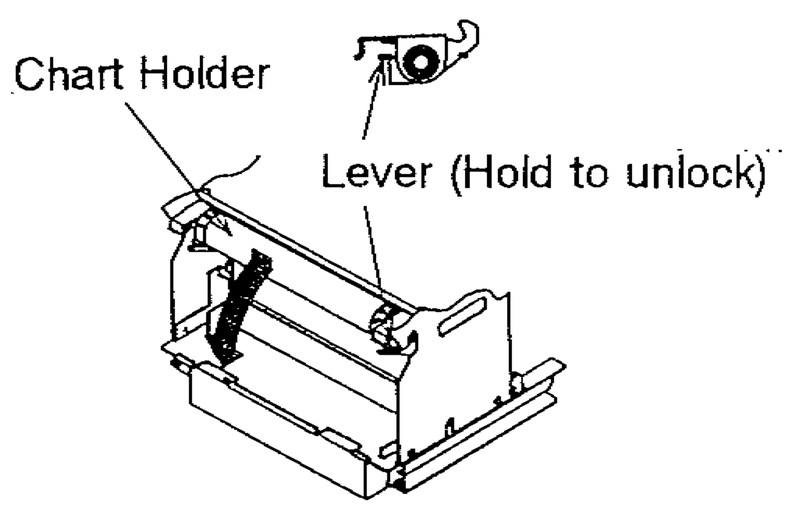

Fig. 5.12 Tilting the Chart Holder Forward

(5) When replacing the ribbon cassette, hook your finger onto the ribbon cassette through the side holes (left and right) of the frame. Pressing it down, unhook from the guide shaft.
Next, pull the ribbon cassette to this side to unhook the rear claws from the main shaft of the printer. Take out the ribbon cassette through the side hole of the frame.

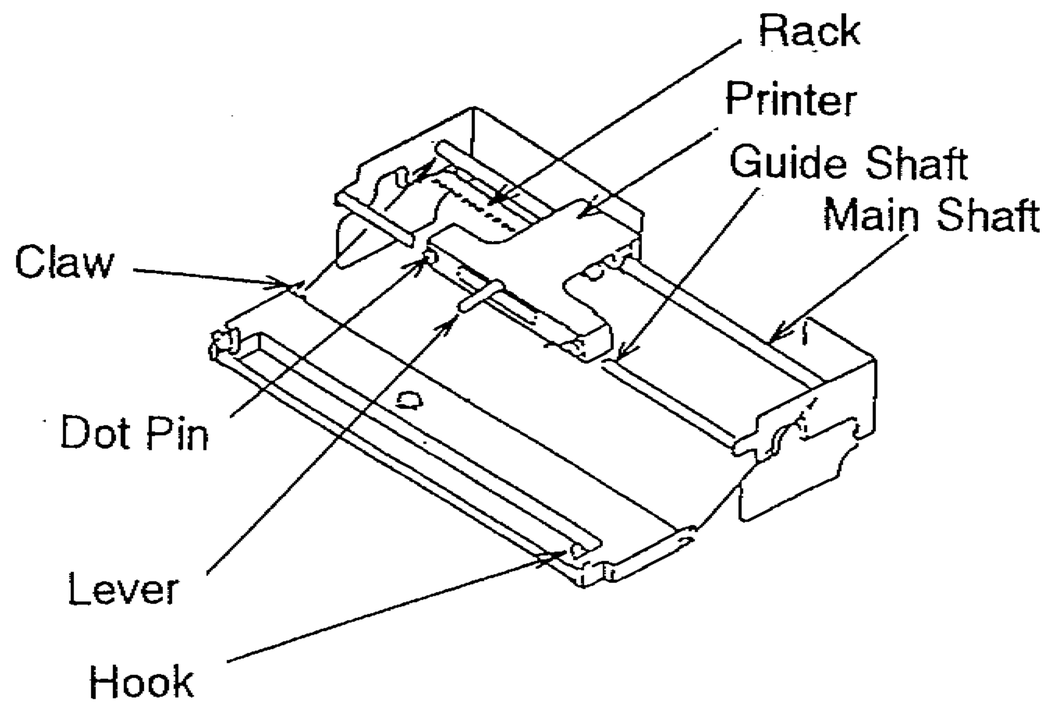

Fig. 5.13 Removing the Ribbon Cassette

(6) Turn the gear of the new ribbon cassette in the clockwise direction to unslack the ribbon.

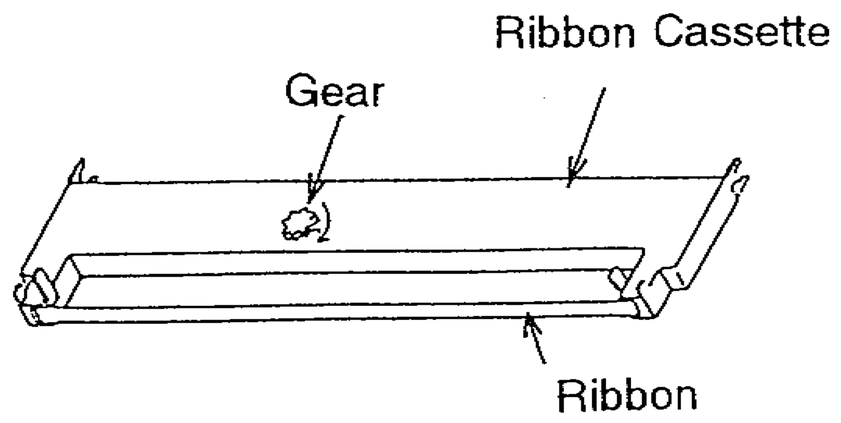

Fig. 5.14 Unslacking the Ribbon

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(7) With the gear facing upward and ribbon to the near side, insert the ribbon cassette through the side hole of the frame.

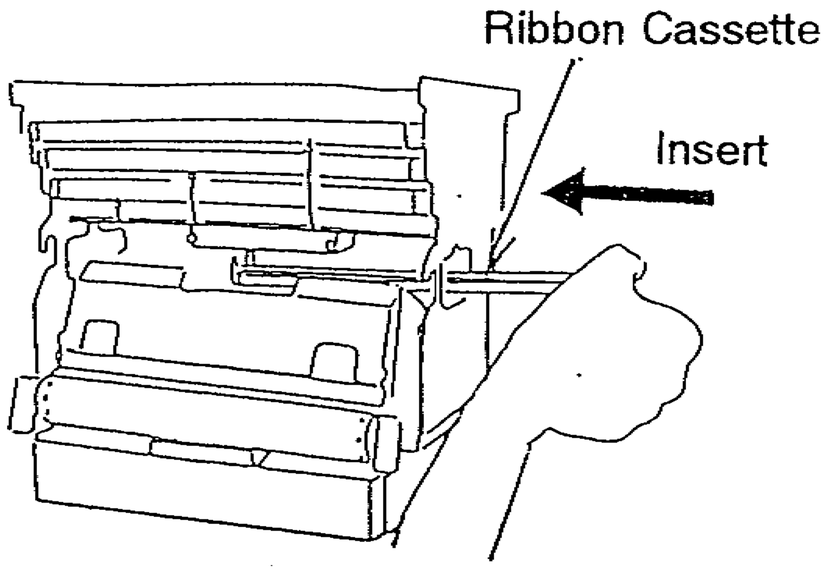

Fig. 5.15 Inserting the Ribbon Cassette

(8) Fit the rear claw of the ribbon cassette into the main shaft of the printer. Turn the ribbon cassette, centering around the main shaft, to move it upward.
Set the front hook of the ribbon cassette onto the guide shaft to fix the cassette.

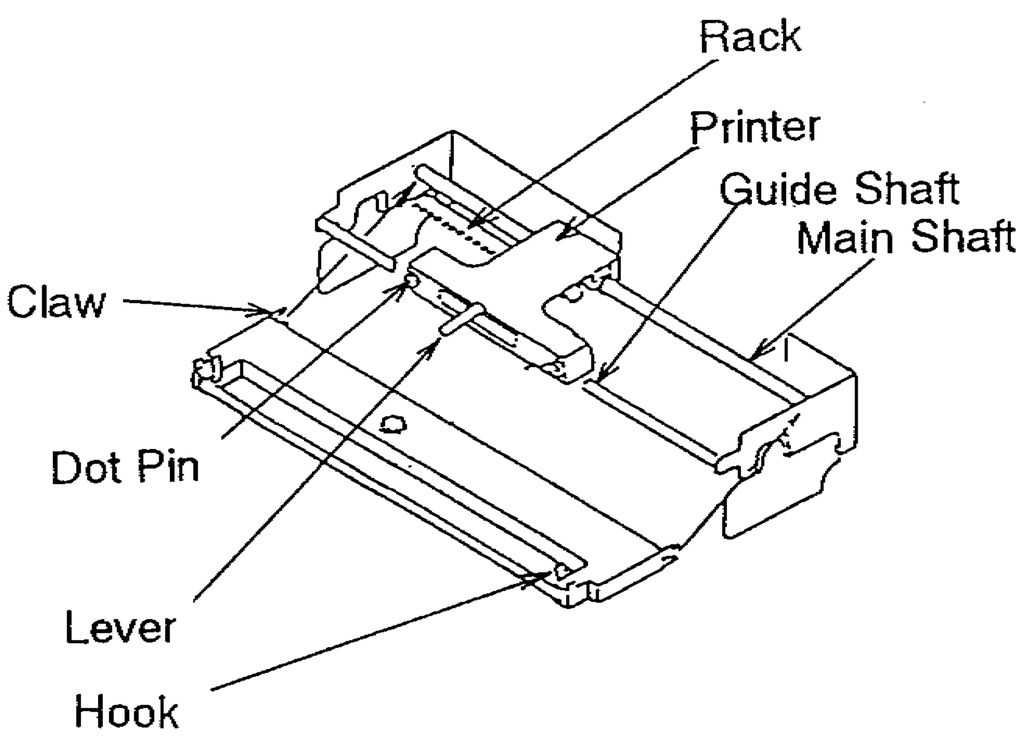

Fig. 5.16 Fixing the Ribbon Cassette

(9) Move the center lever of the printer slightly to the left and right to engage the gear to unslack the ribbon.

(10) Make sure that the ribbon is properly aligned with the dot pin of the printer.

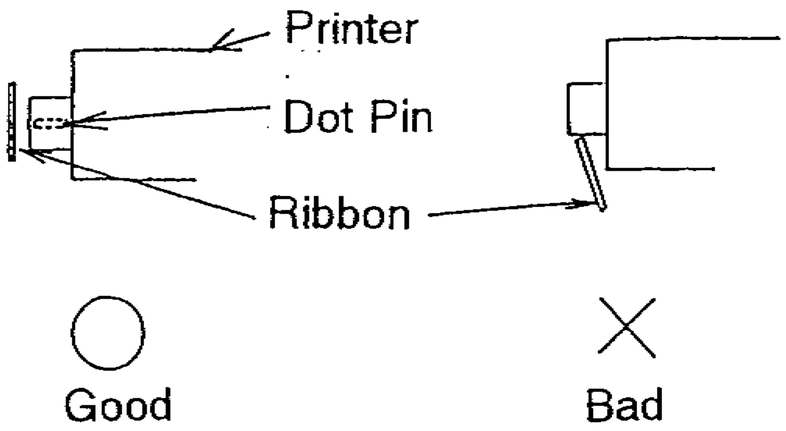

Fig. 5.17 Positioning of Ribbon and Printer's Dot Pin of Printer
(Viewed from Side of Printer)

(11) Put back the chart holder.

(12) Put back the internal unit into the case. Push it in fully.

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⚠ WARNING

Prior to turning on the power, make sure that the supply voltage meets the specifications for the instrument and the instrument is properly grounded.

⚠ CAUTION PRECAUTIONS ON THE WIRING

Prior to turning on the power, make sure that the chart paper is set in the chart holder.
If the printer is activated with no chart paper set, the sprocket drum(cylindrical part) of the chart holder may be damaged.

Open the front door and press the POWER switch located at the lower center to turn on the power.
Once the power is turned on, figures and characters are appeared in the front display.
The instrument will be ready to run(user mode) in about 5 seconds, including the initialization screen.
If the POWER switch is pressed with the power turned on, the power will be turned off.

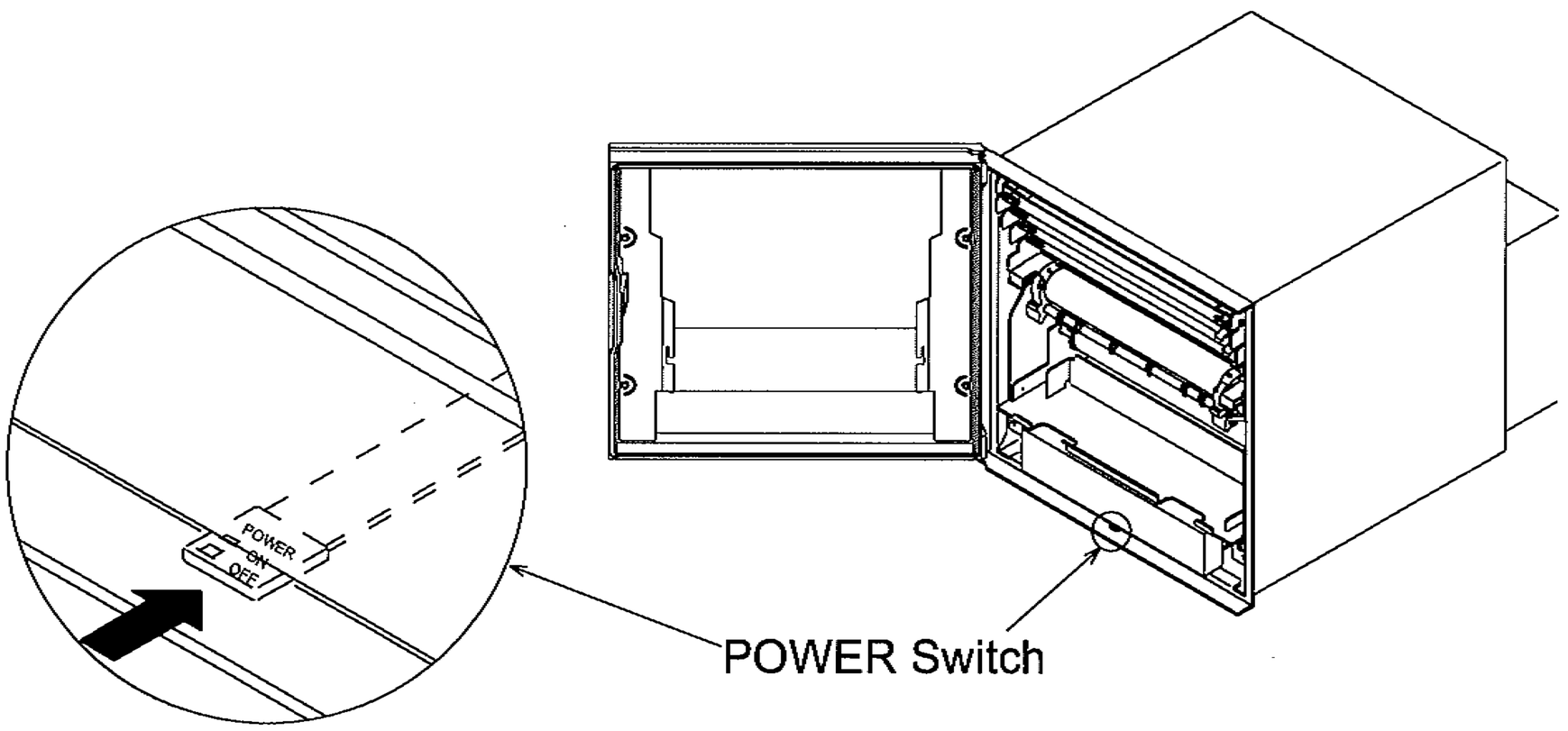


Fig. 6.1 Turning on the Power

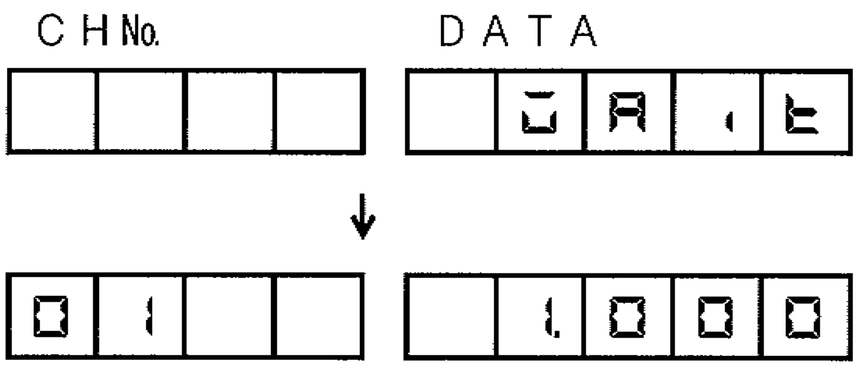


Fig. 6.2 Display Screen at Power-on

Table 6.1 Conditions after Initialization Screen

① Display mode	▭A U T O < AUTO mode >
② RUN/STOP key	RUN
③ Printout data	All the printout data and analog data prior to power-off are cleared.
④ Alarm and self-diagnosis	Alarm indications and outputs prior to power-off are not reset.
⑤ Key lock	Key lock state

[Notes]

① When the power fails, the display is initialized after power recovery, resulting in the above-mentioned initial conditions.
② The printout data are cleared in initialization. When the power is turned off during printout, printout operation does not continue after even if power is recovered.

Recording Colors

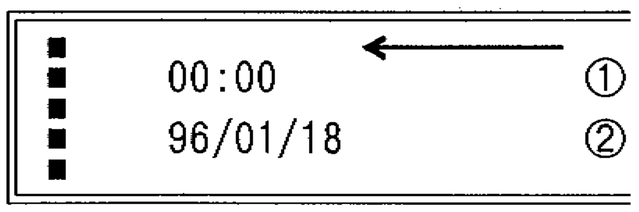
Table 6.2 lists the recording colors for each channel in analog recording.

Table 6.2 Recording Colors for Each Channel

Channel No.	Recording Color
1	Red
2	Blue
3	Green
4	Purple

Time Print and Date Print

For selection of the time and date printout function, see 8-7 on Page 50.



[Note]
Printing is synchronized with chart paper feed.

Fig. 6.3 Example of Time Print and Date Print

[REFERENCE]

Time print and date print depends on a chart paper feed rate.

Time Printing Timing

Chart Paper Feed Rate	Description
9mm/h or less	No printout
10 to 29mm/h	Printed every 6hours
30 to 100mm/h	Printed every other hour (even number hours)
101mm/h or more	Printed every hour

Date Printing Timing

Chart Paper Feed Rate	Description
4mm/h or less	No printout
5mm/h or more	Printed at specified time

Positional Relations between Time/Date Printing and Analog Recording

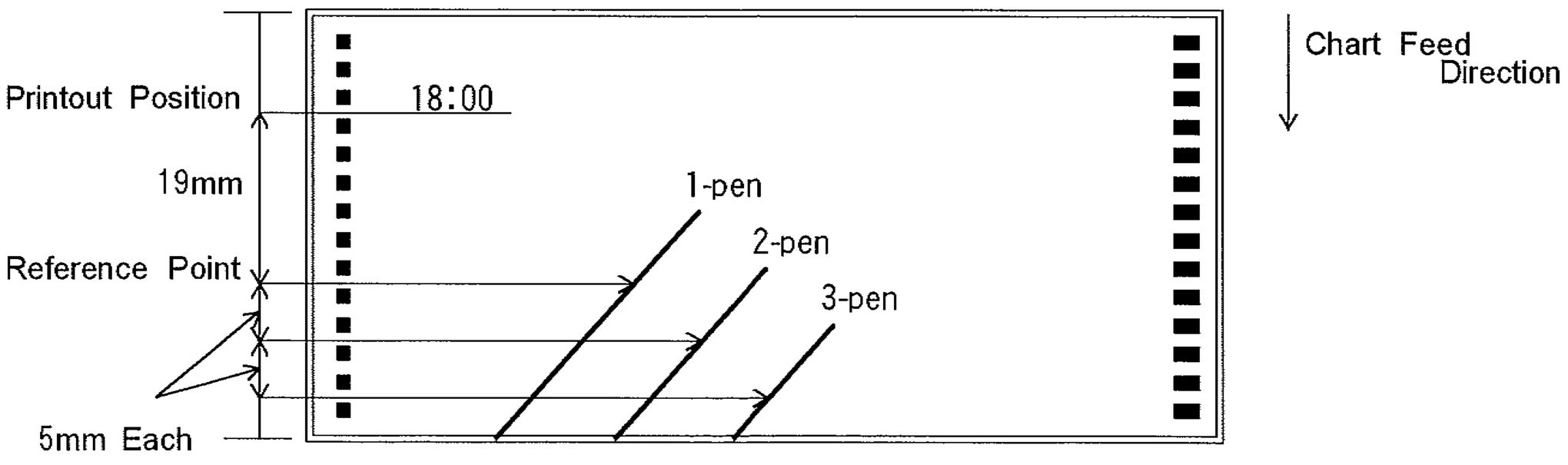


Fig. 6.4 Example of Time Printing and Analog Recording

Since each pen and printer head are attached to the positions shown in Fig. 6.4, there will be a time axis gap in analog recording for each pen.

User Mode

The user mode displays and sets the measured values, time, chart paper feed rate, and alarms required for daily maintenance. There are 6 user modes as shown in Fig. 6.5 and they are switched sequentially by pressing [MODE] key.

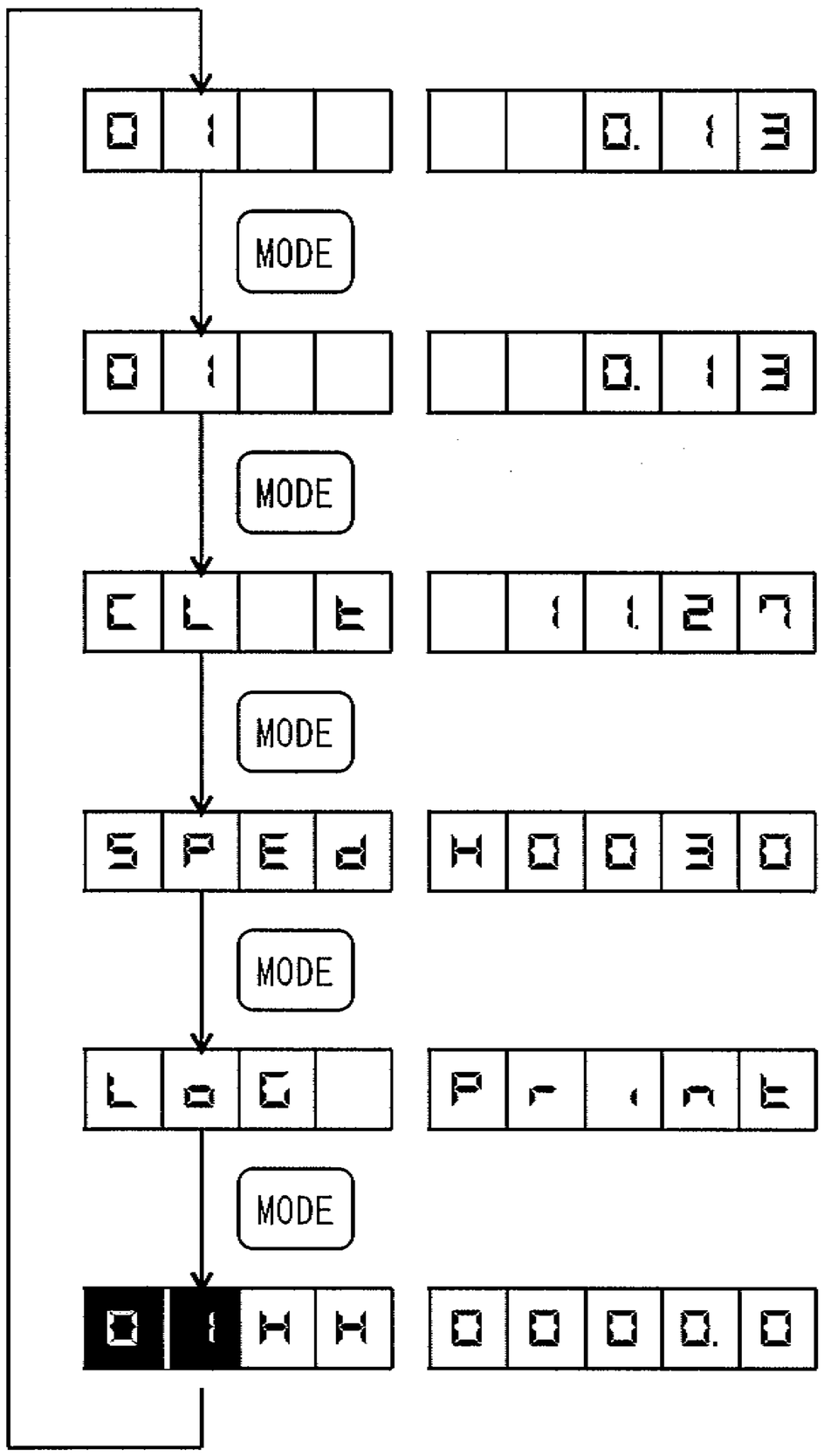


Fig. 6.5 User Mode Display

▭AUTO 〈AUTO Mode〉

The AUTO mode displays the channels, switching them sequentially at intervals of two seconds.

① Press [MODE] key to turn on "▭AUTO" mode indicator lamp.
② A measured value is automatically switched at intervals of two seconds.

[REFERENCE]

Since the data are being sampled even in the STOP mode (RUN/STOP lamp unilluminated), a measured value is switched sequentially.

▭MAN 〈MANUAL Mode〉

The MANUAL mode displays the selected fixed channel.

① Press [MODE] key to turn on the" ▭MAN" mode indicator lamp.
② Select the display channel with [▼] or [▲] key.
③ To cancel the MANUAL mode, press [MODE] key.

[REFERENCE]

Since the data are being sampled even in the STOP mode (RUN/STOP lamp unilluminated), a measured value for a selected fixed channel is displayed.

▭CLOCK 〈CLOCK Mode〉

The CLOCK mode displays the current year, month, day, and time.

① Press [MODE] key to turn on the" ▭CLOCK" mode indicator lamp.
② Use [▼] or [▲] key to display each item.

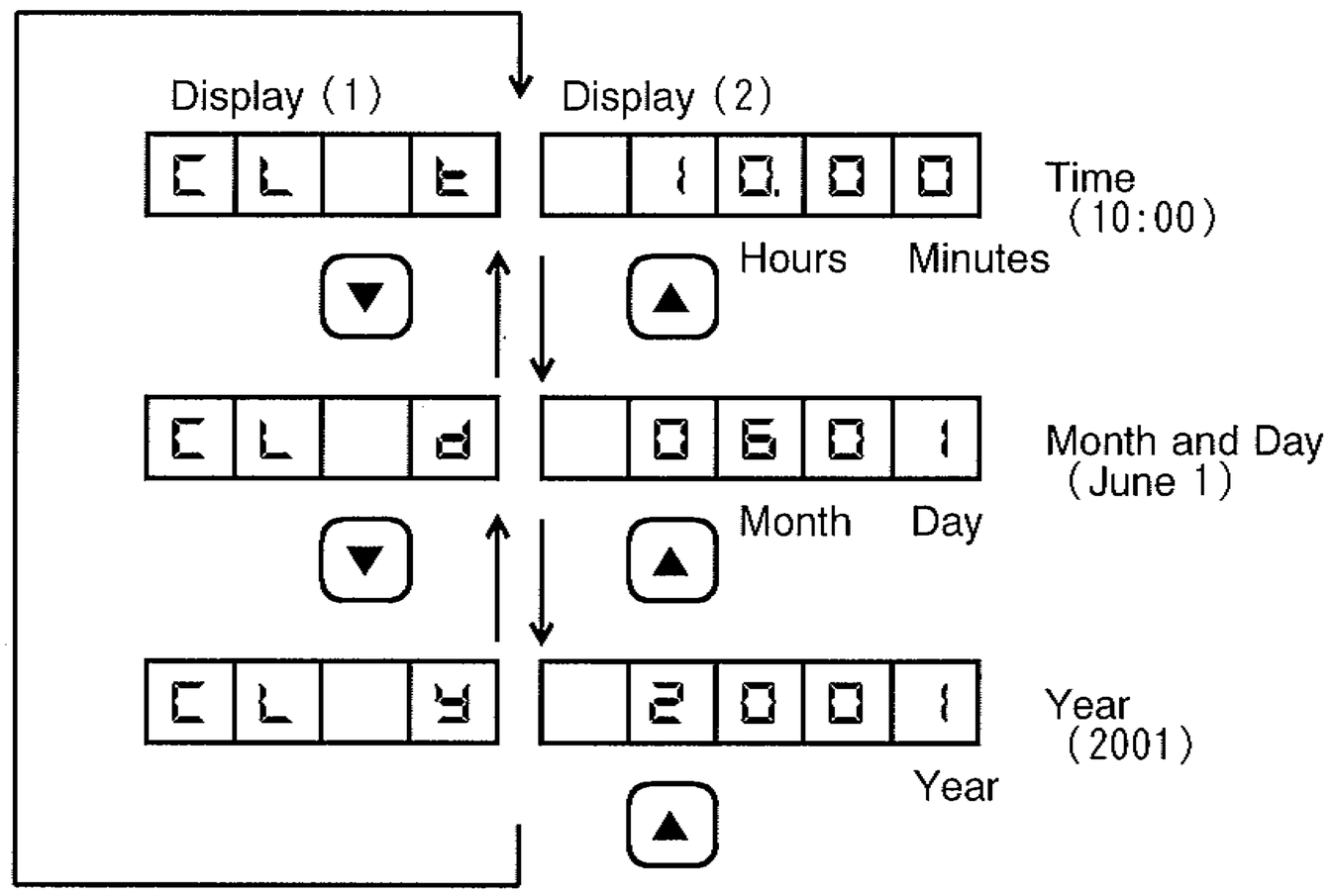


Fig. 6.6 CLOCK Mode Display Screen

▭CHART< CHART Mode >

The chart mode displays and sets the current chart speed.

Fig. 6.7 CHART Mode Display Screen

[Reference] Initial Setting
Chart speed selection
30mm/h

When chart speed selection (option) has been set, the display is as following Fig. 6.8.

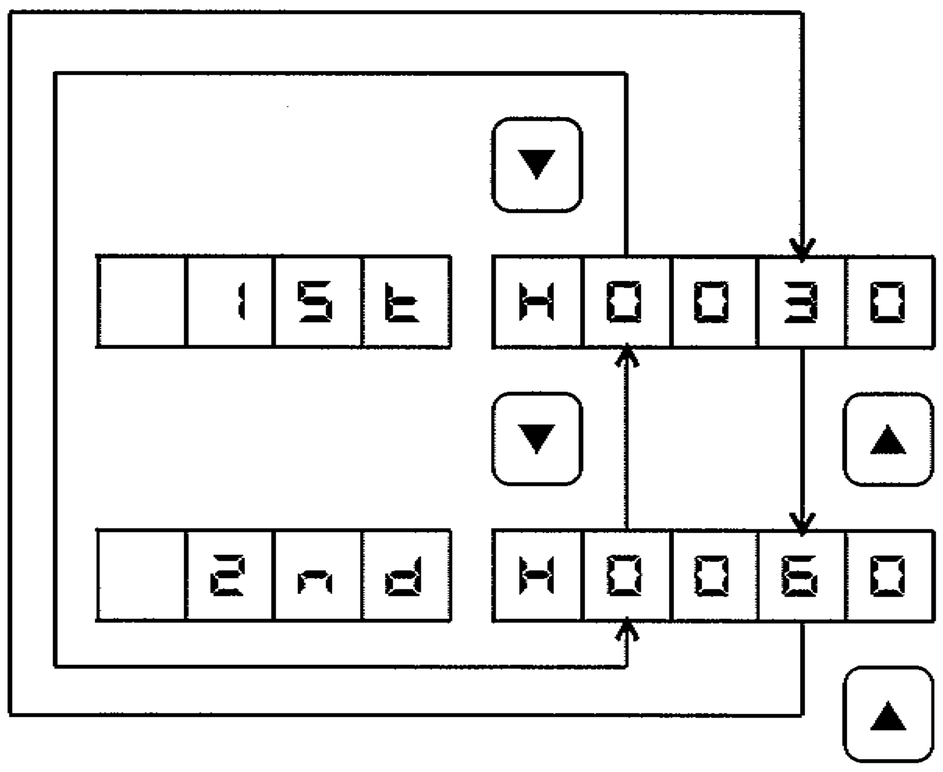


Fig. 6.8 CHART Mode Display Screen When Setting the Chart Speed

[Reference] Initial Setting
① 1st speed set value
30mm/h
② 2nd speed set value
60mm/h

▭PRINT <PRINT Mode>

The PRINT mode starts manual logging print and list print (printing of setting parameters).

① Press [MODE] key to turn on the "▭PRINT" mode indicator lamp.

② The display screen is as following Fig. 6.9.

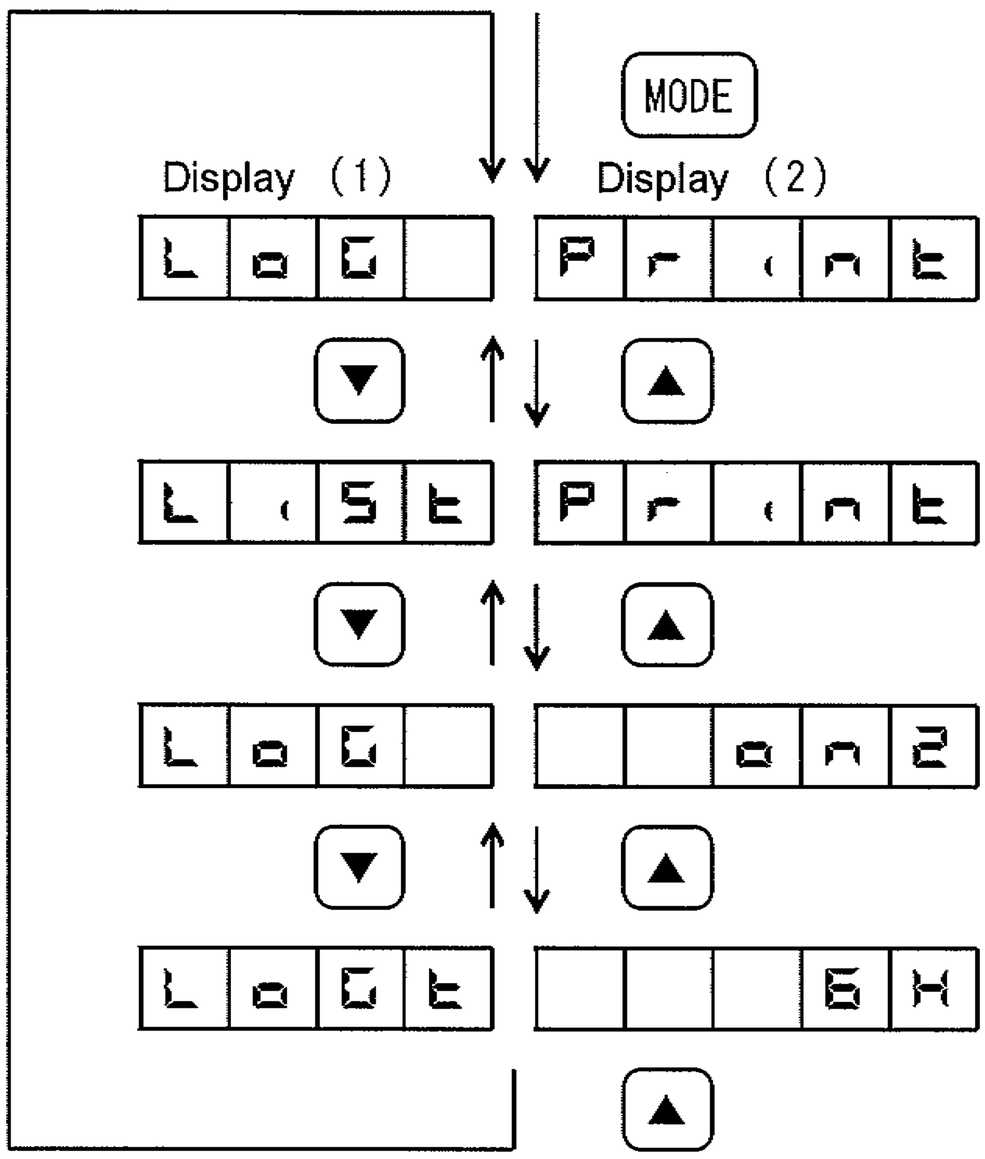


Fig. 6.9 PRINT Mode Display Screen

[Reference] Printing Priority

There is the following printout priority. When multiple printing are started simultaneously, one with higher priority is accomplished first, followed by one with lower priority upon completion of the higher-priority one.

← Higher Lower →

List Print >Alarm on Print >Alarm Recovery on Print >Logging Print >Date Print >Time Print

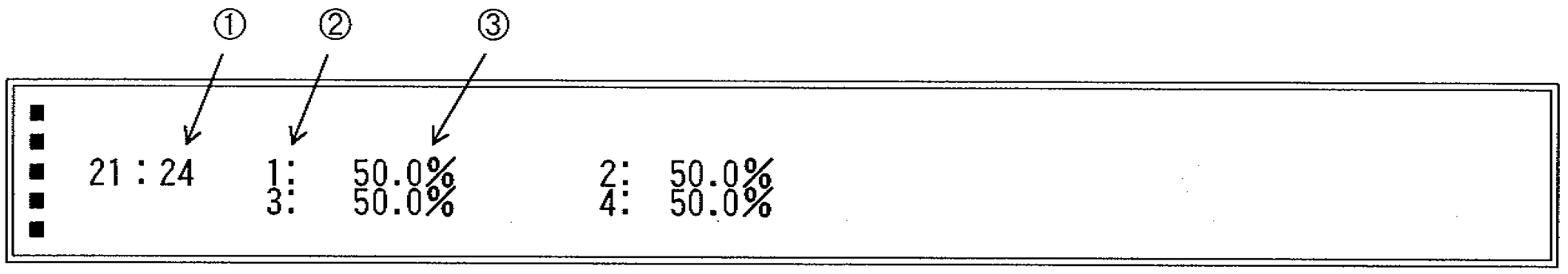
6 – 3 Basic Operation (User Mode)

Manual Logging Print

↓ ENT

Runs manual logging print.

The displays (1) and (2) blink during printing.



① Time ② Channel Number ③ Measured Value

Fig. 6.10 Manual Logging Print Example

[Notes]

① Printing is provided only when the recorder is running.
② Since list printout is asynchronous with chart paper feed, the chart paper is forcibly fed.
③ To stop log printing forcibly, press RUN/STOP key to place the recorder in the STOP mode. In this case, other waiting data are also cleared.

[Reference] Log Printing Time

Logging print time differs depending on the number of channels, printing contents, or whether an alarm is issued.

No. of Channels	Log Printing Time
1	Approx. 25 seconds
2	Approx. 40 seconds
3	Approx. 50 seconds
4	Approx. 60 seconds

Printing conditions

Measured value : 0.0°C for all channels

List Print

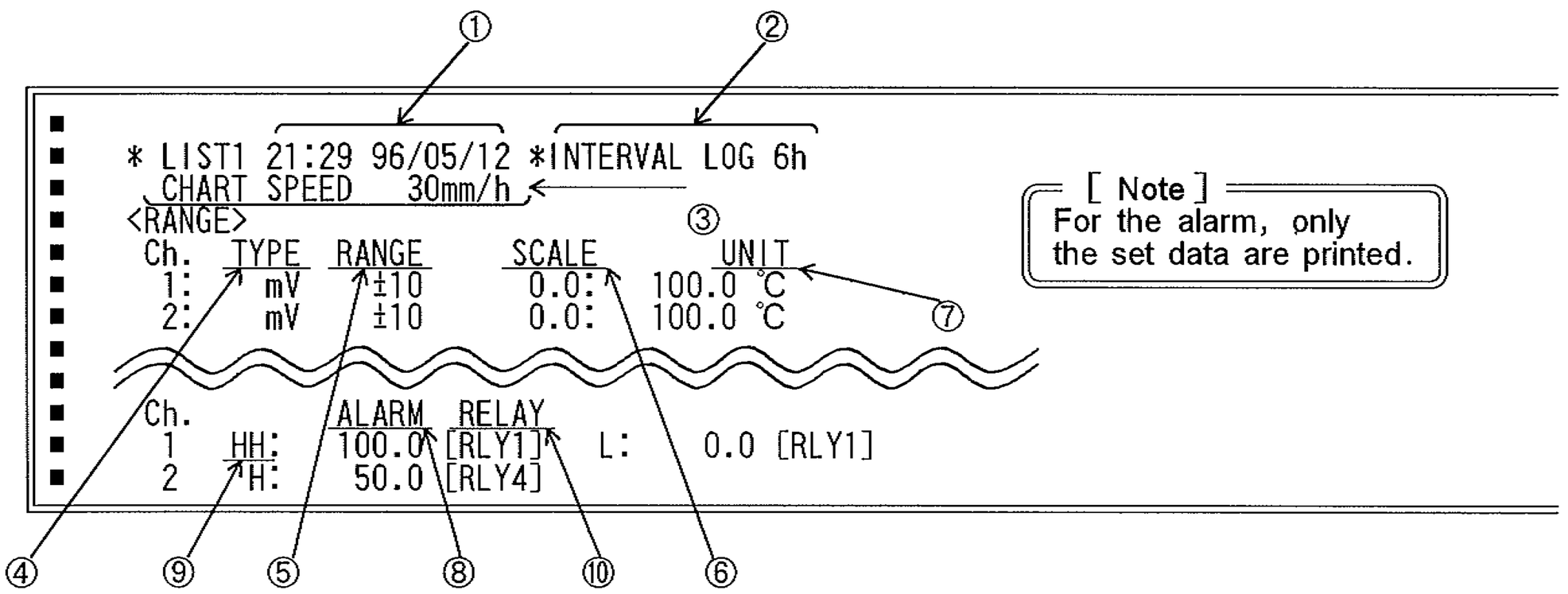
L i S t P r i n t

↓ ENT Runs list print.

The displays (1) and (2) blink during printing.

[Notes]

① Printing is provided only when the recorder is running.
② Since list printout is asynchronous with chart paper feed, the chart paper is forcibly fed.
③ To stop list printing forcibly, press RUN/STOP key to place the recorder in the STOP mode. In this case, other waiting data are also cleared.



[Note]
For the alarm, only the set data are printed.

① Date and time of printout
② Time log printout setting
③ Chart speed setting
④ TYPE : Input type
⑤ RANGE : Input range
⑥ SCALE : Scale plate zero and span point value
⑦ UNIT : Unit of the measured values
⑧ ALARM : Alarm setting
⑨ HH, H, etc. : Alarm set values
⑩ RELAY : Alarm output setting

Fig. 6.11 List Print Example

[Note]

The following input types are printed in abbreviations.

Input Type	Abbreviation
PR40－20	PR4
Au－Fe	AuF
PLⅡ	PL2
JPt100	JPT
Pt100	PT1
Pt50	PT5
Cu10Ωat0℃	CU1
Cu10Ωat25℃	CU2

[Reference] List Printing Time

List print duration subjects to change by numbers of channel, contents of printing and conditions of alarm setting.

No. of Channel	List Printing Time
1	Approx. 2min.15sec
2	Approx. 2min.45sec
3	Approx. 3min.15sec
4	Approx. 3min.45sec

Printing Conditions
Input range : 0 to 5V (All channels)
Scale : 0 to 100 (All channels)
Unit of measured values : ℃ (All channels)
Alarm set value : None (All channels)

7. SETTING

7 − 1 Setting Range

Table 7.1 lists the setting items. The initial values listed in table 7.1 have been set unless otherwise specified upon ordering.

[Notes]

① When each setting is altered, the setting parameters will not be initialized even if the instrument is turned off.

② In Table 7.1, the items marked "Option" can be set only when they are optionally specified upon ordering.

Table 7.1 User Mode Setting Parameters

Setting Item	Settable Range	Initial Setting	Remarks
CLOCK mode (▭CLOCK)			
Date and time	Year 1999 to 2098 Month 01 to 12 Day 01 to 31 Hours 00 to 23 Minutes 00 to 59	Current time	
CHART mode (▭CHART)			
Chart speed Chart speed setting 1st rate 2nd rate	 1 to 3600mm/h, 1 to 300mm/min 1 to 3600mm/h, 1 to 300mm/min	 30mm/h 60mm/h	 Option
PRINT mode (▭PRINT)			
Logging print Logging print run Logging print intervals Printout start time	 ON 1 (Asynchronous) ON 2 (Synchronous) OFF 10, 20, and 30 minutes At intervals of 1, 2, 3, 4, 6, 8, 12, and 24 hours 0 to 23	 ON 2 6hours —	 The start time can be set only when the logging print intervals are 8 hours or more.
ALARM mode (▭ALARM)			
Alarm value setting [Note] The following alarm types can be set for each channel 〈4 Alarm Types〉 HH alarm H alarm L alarm LL alarm [Note] Set for each channel	-19999 to 99999 A decimal point position and the unit of set values comply with the setup set values.	Common to all channels HH : 0.0 H : 0.0 L : 0.0 LL : 0.0	
Alarm output setting [Note] One output can be set for each alarm type of each channel	Relays 1 to 8, OFF [Note] OFF : No relay(DO) output Relays 1 to 8 : Display and relay output provided	OFF	Relay output is optional

Key Lock State

In the key lock state," ▭KEY LOCK" lamp is illuminated.

[Reference] Key Lock Conditions

① When the power is turned on and initialization is performed
② When no keys has been operated for about 3minutes after unlocking the keys

Unlocking the Keys

To unlock the keys, press both [PGM] and [ENT] keys simultaneously for about 3seconds.
" ▭KEY LOCK" lamp is turned off and the keys are unlocked.

[Reference] Key Lock Target Data

① Alarm set value, alarm output setting
② Chart paper feed rate
③ Year, month, day, hours, minutes
④ Logging Print setting
⑤ Setup data
⑥ Calibration

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/30/96	Kimura	Hara	Oda	

CHG.No. 2 3

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7. SETTING

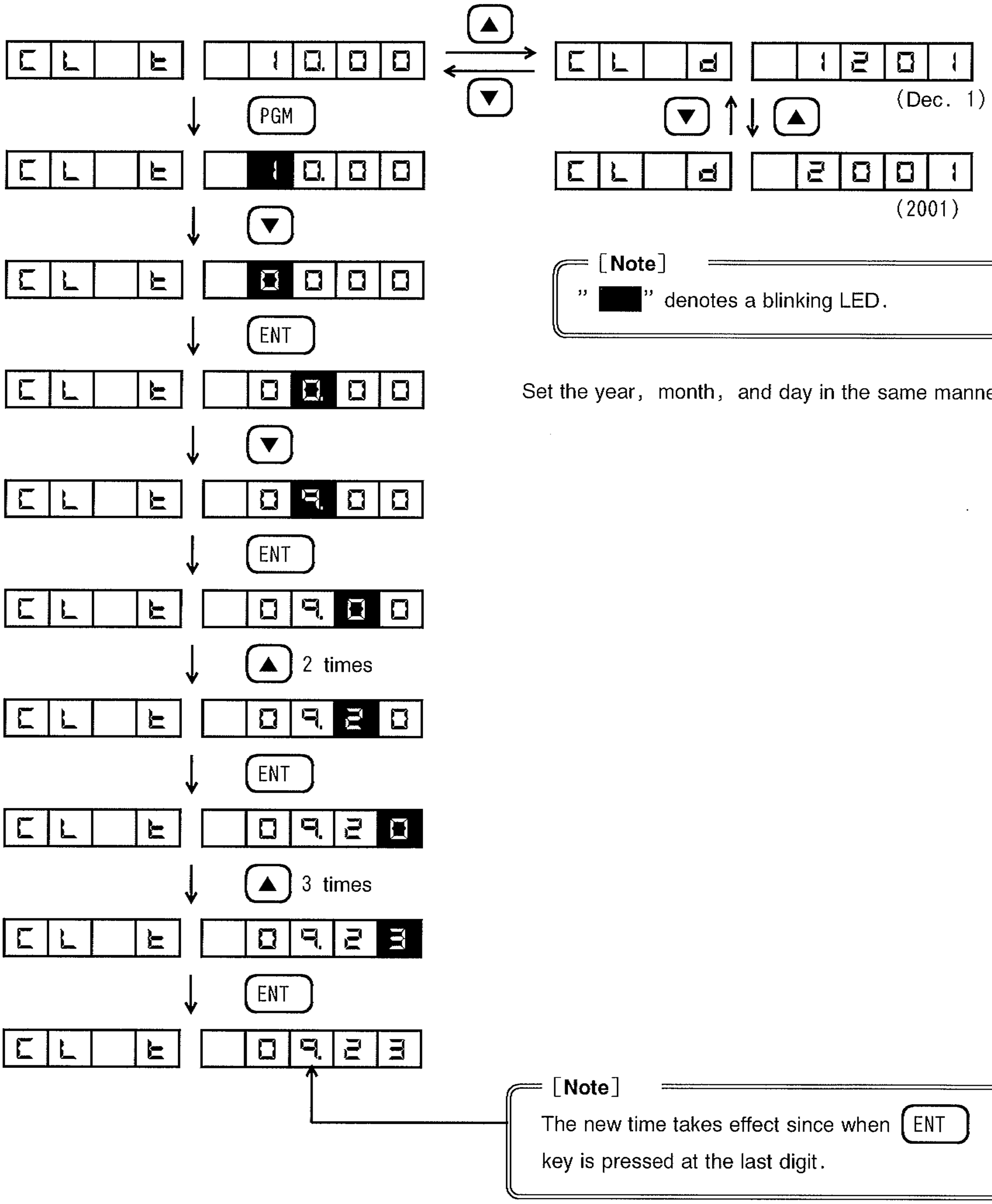
7 – 3 Time (Year, Month, Day, Hours, Minutes)

Take the following steps ① and ②, and then, see "Setting Example" to set the time.

① Press [MODE] key to turn on " ▭C L O C K " indicator lamp.

② Press both [PGM] and [ENT] keys simultaneously for about 3seconds to unlock the keys.

〈**Setting Example**〉 (Changing the time from 10:00 to 09:23)



[**Note**]

" ■ " denotes a blinking LED.

Set the year, month, and day in the same manner.

[**Note**]

The new time takes effect since when [ENT] key is pressed at the last digit.

Fig. 7.1 Time Setting Example

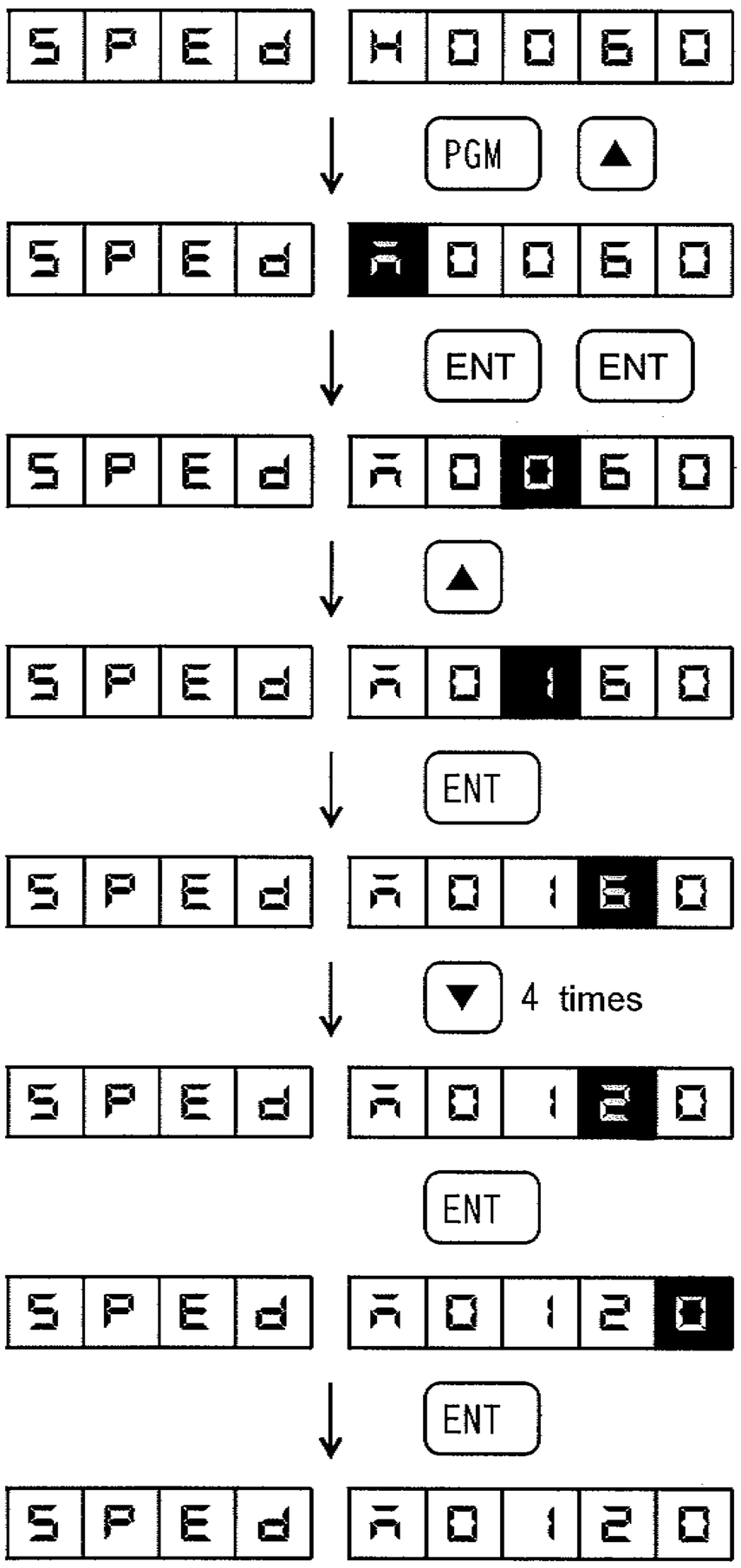
7 − 4 Chart Speed

Take the following steps ① and ②, and then, see "Setting Example" to set the chart speed.

① Press [MODE] key to turn on " ▭CHART" indicator lamp.

② Press both [PGM] and [ENT] keys simultaneously for about 3seconds to unlock the keys.

< Setting Example > Changing the chart speed from 60mm/h to 120mm/min



(End of Setting)

Fig. 7.2 Chart speed Setting Example

[Note]

" ■ " denotes a blinking LED.

[Reference] Settable Range

1 to 3600mm/h, 1 to 300mm/min

[Reference] Initial Setting

Chart speed : 30mm/h

[Note]

When chart speed selection (option) has been set, the display (1) shows  ,  .

Set the respective chart speed.

[Note]

H denotes mm/h and n denotes mm/min.

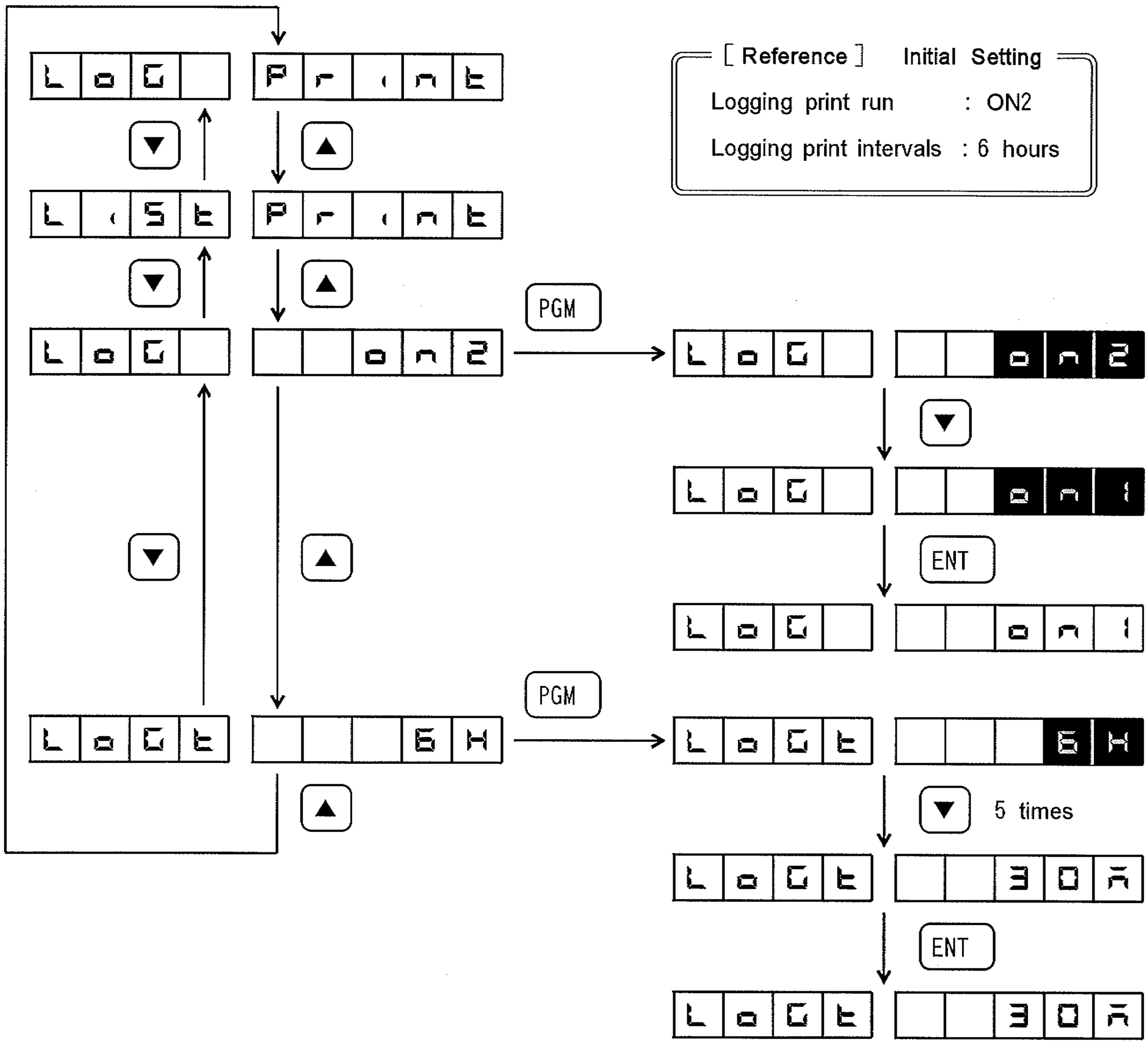
7 – 5 Logging Print

Take the following steps ① and ②, and then, see "Setting Example" to set logging print.

① Press [MODE] key to turn on "▭PRINT" indicator lamp.

② Press both [PGM] and [ENT] keys simultaneously for about 3 seconds to unlock the keys.

< Setting Example > Logging print run : ON1, Logging print intervals : 30 minutes



[Reference] Initial Setting

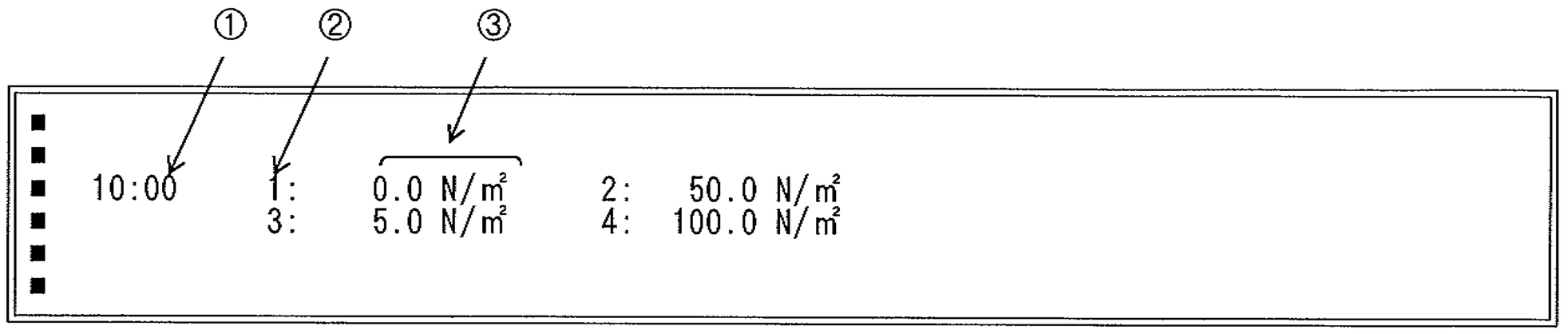
Logging print run : ON2

Logging print intervals : 6 hours

Fig. 7.3 Logging Print Setting Example

Display (2)	Screen Name	Function
on 1	Logging print run (Chart paper forced feed)	Performs logging print. Once printing is initiated, the chart paper is fed forcibly, including a line feed according to the printing format.
on2	Logging print run (Chart paper feed synchronous)	Performs logging print. Since printout is performed according to the set chart paper feed rate, analog recording is not suspended. To perform log printing properly, it is necessary to set the chart paper feed rate higher than the specified value. (See Page 35)
oFF	Logging print cancel	Does not perform time printout.

Logging Print Example



① Time ② Channel Number ③ Measured Value

Fig. 7.4 Logging Print Example

[Note] Logging print Intervals

Display (2)	Printout Intervals	Start Time Setting	Min. Chart Speed for Logging Print
10M	10 minutes 00, 10, 20, 30, 40, and 50 minutes of every hour	Disallowed	7 2 mm / h
20M	20 minutes 00, 20, and 40 minutes of every hour	Disallowed	3 6 mm / h
30M	30 minutes 00 and 30 minutes of every hour	Disallowed	2 4 mm / h
1H	1 hour Every hour	Disallowed	1 2 mm / h
2H	2 hours 00, 02, 04, ····· 22 hours	Disallowed	6 mm / h
3H	3 hours 00, 03, 06, ····· 21 hours	Disallowed	4 mm / h
4H	4 hours 00, 04, 08, ····· 20 hours	Disallowed	3 mm / h
6H	6 hours 00, 06, 12, and 18 hours	Disallowed	2 mm / h
8H00	8 hours Start time, start time + 8, and start time + 16 hours	Allowed	2 mm / h
12H00	12 hours Start time and start time + 12 hours	Allowed	1 mm / h
24H00	24 hours Daily start time	Allowed	1 mm / h

In this section, you confirm and set the alarms.

Screen Configuration

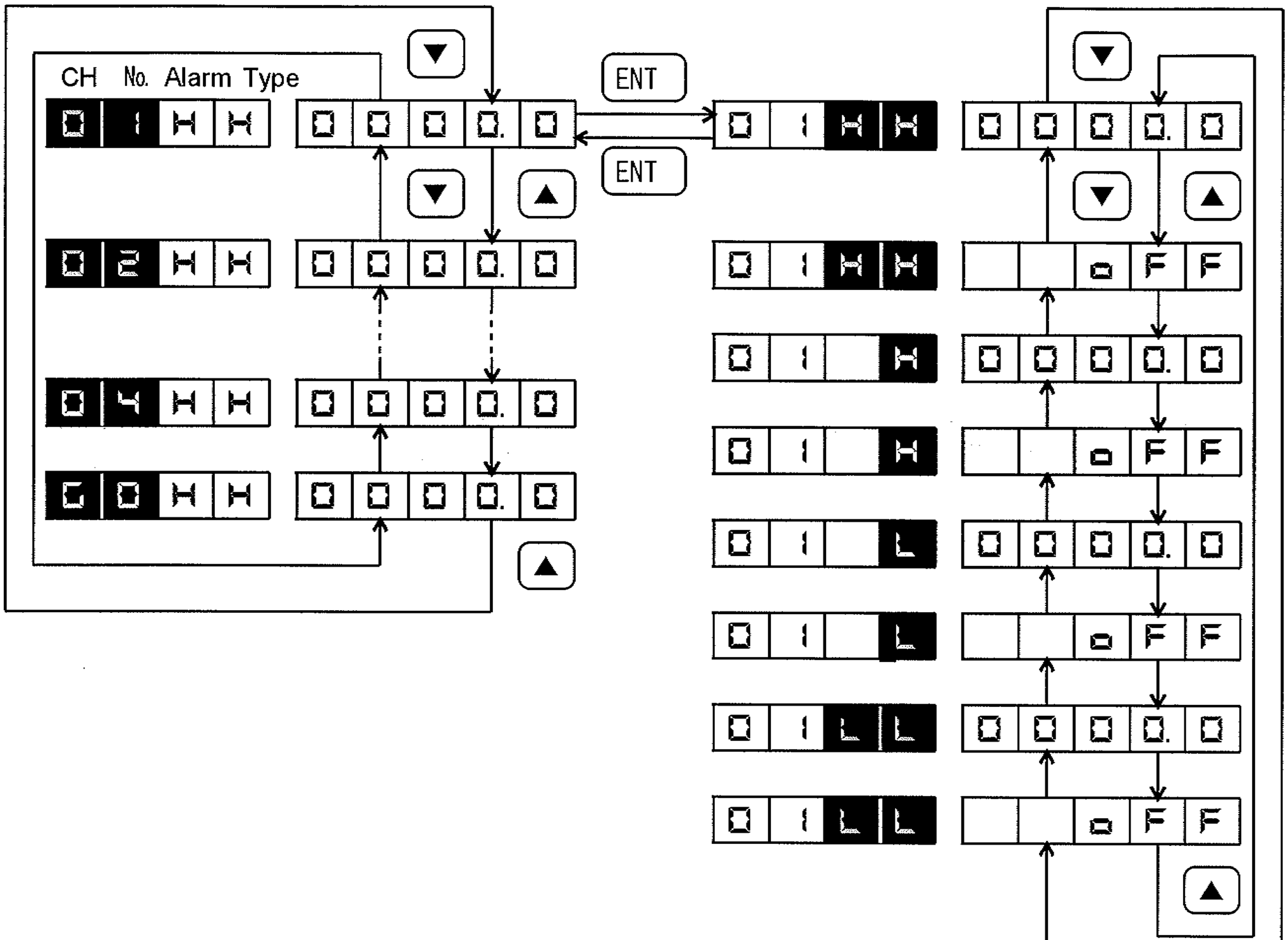


Fig. 7.5 Alarm Setting Screen

[Note]

At the time of setting, batch setting per group is allowed as well as setting per channel.
The group is G0(all channels). When confirming the set values, the one-channel data is displayed.

List of Alarm Setting Items

Table 7.2 List of Alarm Setting Items

Display(1) Ex. Channel 1	Alarm	Description	Settable Range
01 HH	HH alarm	Activated when a measured value is higher than an alarm set value.	-19999～99999 [Note] A decimal point position complies with the set value in the setup data.
H	H alarm		
LL	LL alarm	Activated when a measured value is lower than an alarm set value.	
L	L alarm		

[Reference]

① One alarm output can be set for each alarm item.
② The same alarm output number can be specified for a different alarm type or different channel.

DESCRIPTION | CHG.No. | APP'D. | CHK. | DR. | DATE | REV.
2 | 3 | Oda | Nono | Kasui | 8/20/96 | 1
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7 − 6 Alarm (⊂ALARM)

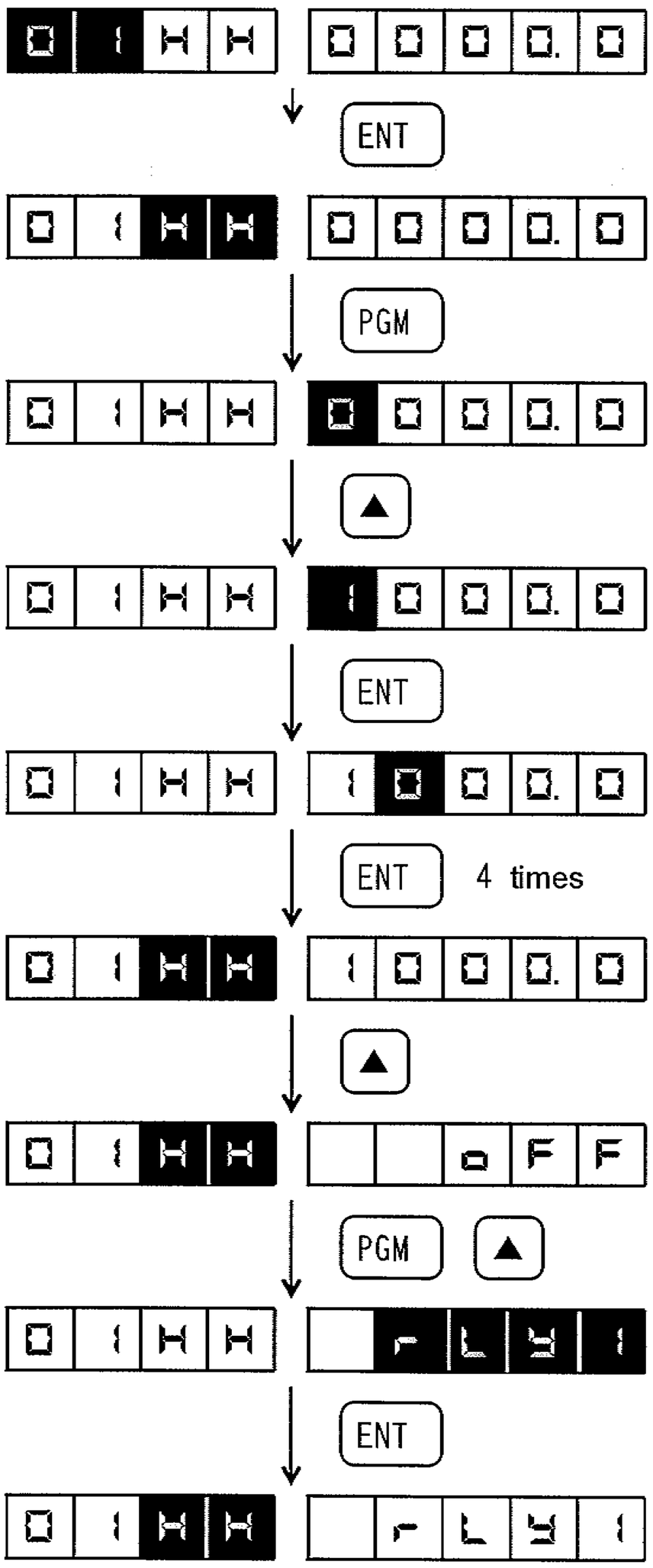
Set the alarm according to the setting example below.

< Setting Example > Setting a HH alarm value 1000.0 for the channel-1 and assigning an alarm output to the RLY1.

① Press [MODE] key to turn on "⊂ALARM" indicator lamp.

② Press both [PGM] and [ENT] keys simultaneously for about 3seconds to unlock the keys.

③ Set an alarm value and alarm output relay number.



[Note]

"■" denotes a blinking LED.

(End of setting)

Fig. 7.6 Alarm Setting Example

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION	CHG.No.
1	8/30/96	Kawa	Hoso	Oda		2 3

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8. SETUP　8 − 1 Setup Mode

This mode sets the setup data (input range, burnout operation, scaling, recording scale, digital filter, Units, printing function, alarm hysteresis, DI function, communication rate, address) and conducts an operation test on the display.

[Notes]

① Upon delivery, the setup data have been set according to the specifications given to us upon ordering.
② When the setup data is altered, the previous data cannot be restored even if the instrument is turned off.

Switching to the Setup Mode

MANUAL mode (MAN)
Press [MODE] key to illuminate " ▭MAN" indicator lamp.

① Unlock the keys. (Press [PMG] + [ENT] simultaneously for 3 seconds or more. Make sure that " ▭KEY LOCK" indicator lamp is turned off.)
② Switch to the Setup mode. (Press [▼] + [ENT] simultaneously for 3 seconds or more.)

01rG	inP 1	Setting the input range → See Page 39
↓ [MODE] " ▭CHART" lamp illuminated		
01bO	oFF	Setting the burnout operation → See Page 41
↓ [MODE] " ▭CHART" lamp illuminated		
01SC	SET	Setting the recording scale value → See Page 42
↓ [MODE] " ▭CHART" lamp illuminated		
01Ut	231	Setting the printing unit code → See Page 45
↓ [MODE] " ▭CHART" lamp illuminated		
01FL	10000	Setting the digital filter value → See Page 49
↓ [MODE] " ▭CHART" lamp illuminated		
Pr Pt	on	Setting the printing function → See Page 50
↓ [MODE] " ▭PRINT" lamp illuminated		
HYS	000.5	Setting the alarm hysteresis width → See Page 52
↓ [MODE] " ▭ALARM" lamp illuminated		
d1-1	oFF	Setting the DI function comunication rate, etc. → See Page 53
↓ [MODE]		
diSP	tESt	Display test mode → See Page 56
↓ [MODE]		
End		End of the setup mode

[Note]
" ■ " denotes a blinking LED.

[MODE] → [ENT]

Return to the AUTO mode

Fig. 8.1 Setup Mode

[Notes]

① In the setup mode," ▭AUTO" and " ▭MAN" indicator lamps are blinking.
② In the setup mode, measurement and dot printing are not performed, but the chart paper is fed.

8－2 Setting the Input Range

In this section, you set the input range. (A setting example is shown on Page 43)

① Selecting the Channel Where You Want to Set the Input Range

When selecting the channel-1, use ▲ or ▼ key to select the following:

② Selecting the Setting Item

Press PGM key. The right screen blinks. Use ▲ or ▼ key to select the input range, and press ENT key.

[Note]
" ■ " denotes a blinking LED.

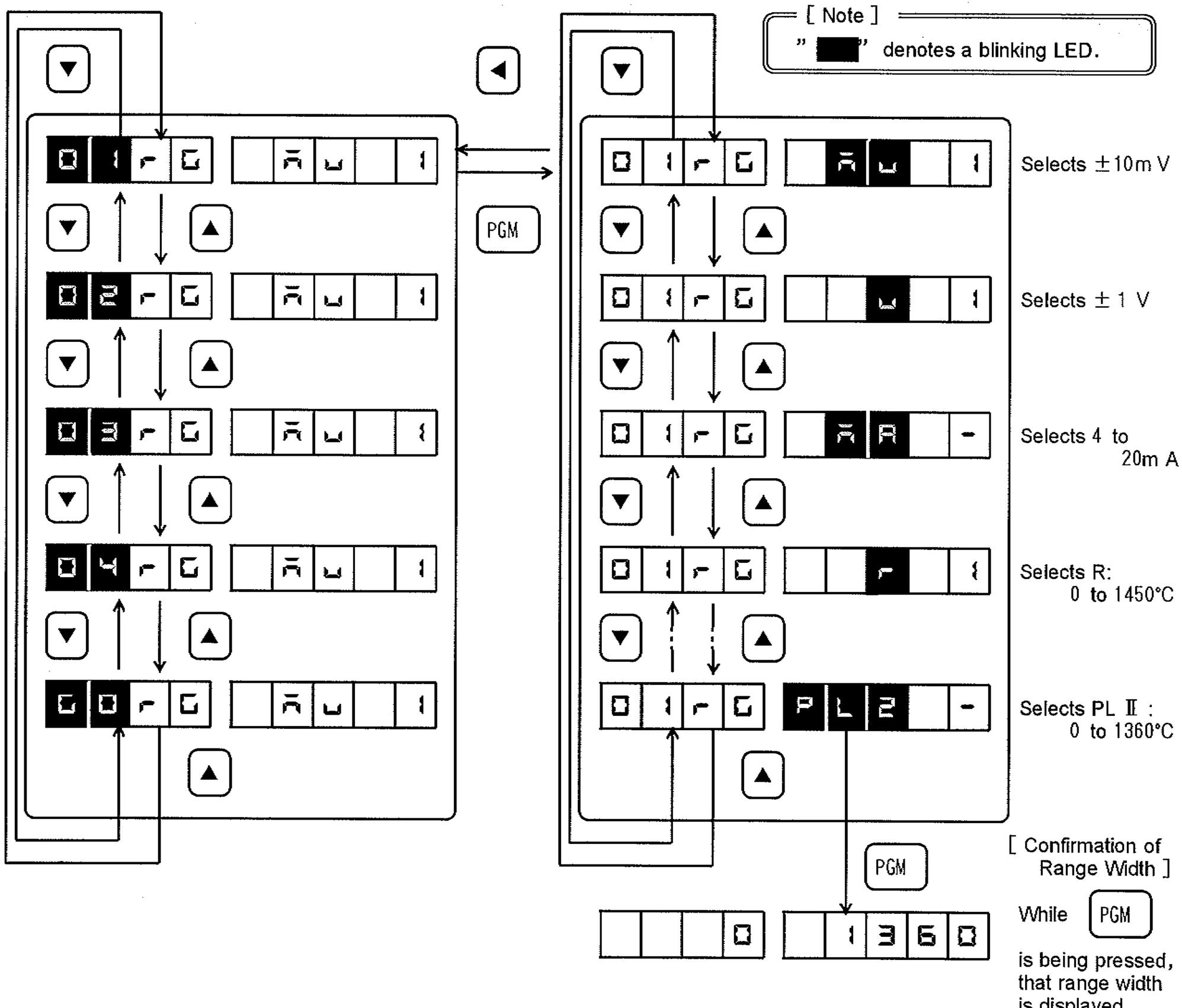

Fig. 8.2 Setting the Input Range

[Note]
You may make batch setting per group as well as setting per channel. The group is G0(all channels). When confirming the set values, the one-channel data is displayed.

[Note]
Page 40 shows the input range display symbols versus range widths.

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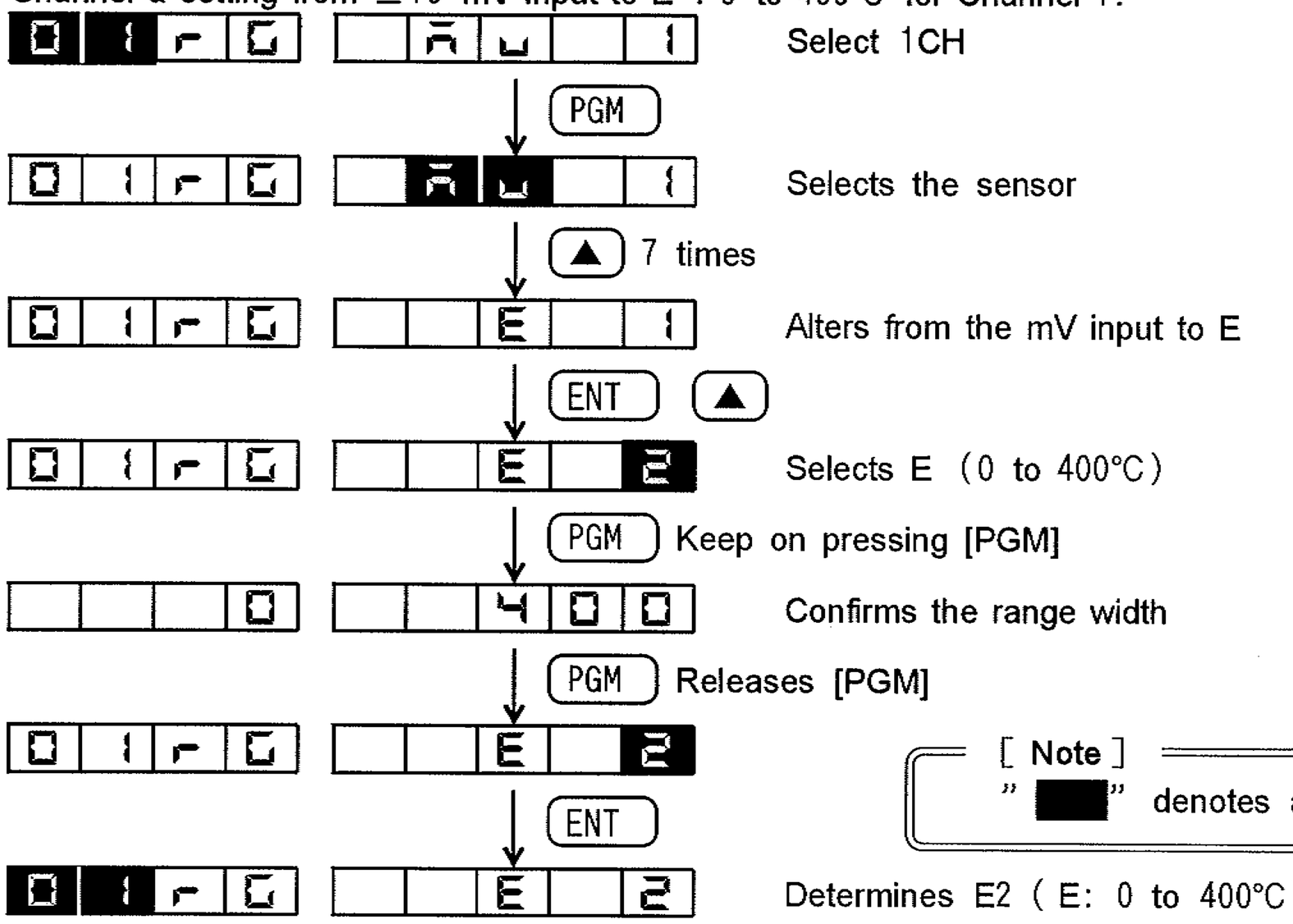
③ Setting Example

Channel a setting from ±10 mV input to E : 0 to 400°C for Channel 1.



[Note]
" ■ " denotes a blinking LED.

Fig. 8.3 Input Range Setting Example

Range Code	Display Symbol	Range Width	Range Code	Display Symbol	Range Width
001		±10mV	031		J 0～500°C
002		±50mV	032		J -200～650°C
003		±200mV	033		J -200～300°C
004		±1V	034		J -200～500°C
005		±5V	035		J -200～900°C
006		±20V	036		J -200～750°C
007		0-5V	037		T 0～150°C
008		1-5V	038		T 0 ～400°C
009		4-20mA	039		T -200～350°C
010		R 0～1450°C	040		T -200～400°C
011		R 0～1760°C	041		G 0～ 2320°C
012		S 0～1760°C	042		C 0～ 2320°C
013		B 0～1830°C	043		N 0～ 900°C
014		K 0～ 100°C	044		N 0～ 1260°C
015		K 0～ 700°C	045		PR40-20 0～1880°C
016		K 0～ 900°C	046		U -200～400°C
017		K -200～100°C	047		L -200～900°C
018		K -200～400°C	048		Au-Fe 0～300°C
019		K -200～650°C	049		JPt100at0°C -50～100°C
020		K -200～1370	050		JPt100at0°C -200～600°C
021		K 0～1000°C	051		Pt100at0°C -50～100°C
022		E 0～ 150°C	052		Pt100at0°C -200～600°C
023		E 0～ 400°C	053		Pt50at0°C -50～100°C
024		E -200～500°C	054		Pt50at0°C -100～250°C
025		E -200～600°C	055		Pt50at0°C -200～550°C
026		E -200～900°C	056		Cu10Ωat25°C -50～200°C
027		E -200～250°C	057		Cu10Ωat0 °C -50～200°C
028		E -200～400°C	058		PLⅡ 0～1360°C
029		E -200～700°C	059		
030		J 0～150°C	060		

Table 8.1 Range Codes Table

8 – 3 Setting Burnout Operation

In cases of mV input(200mV range excluded) or thermocouple input, you can set burnout analog recording operation just in case the input is disconnected.

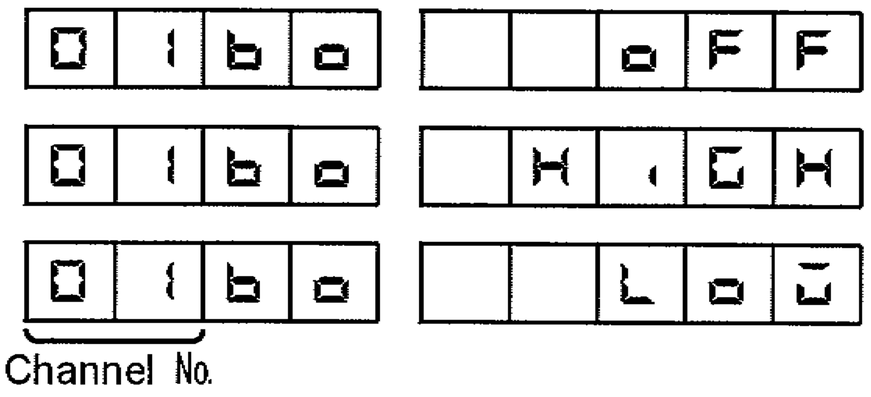
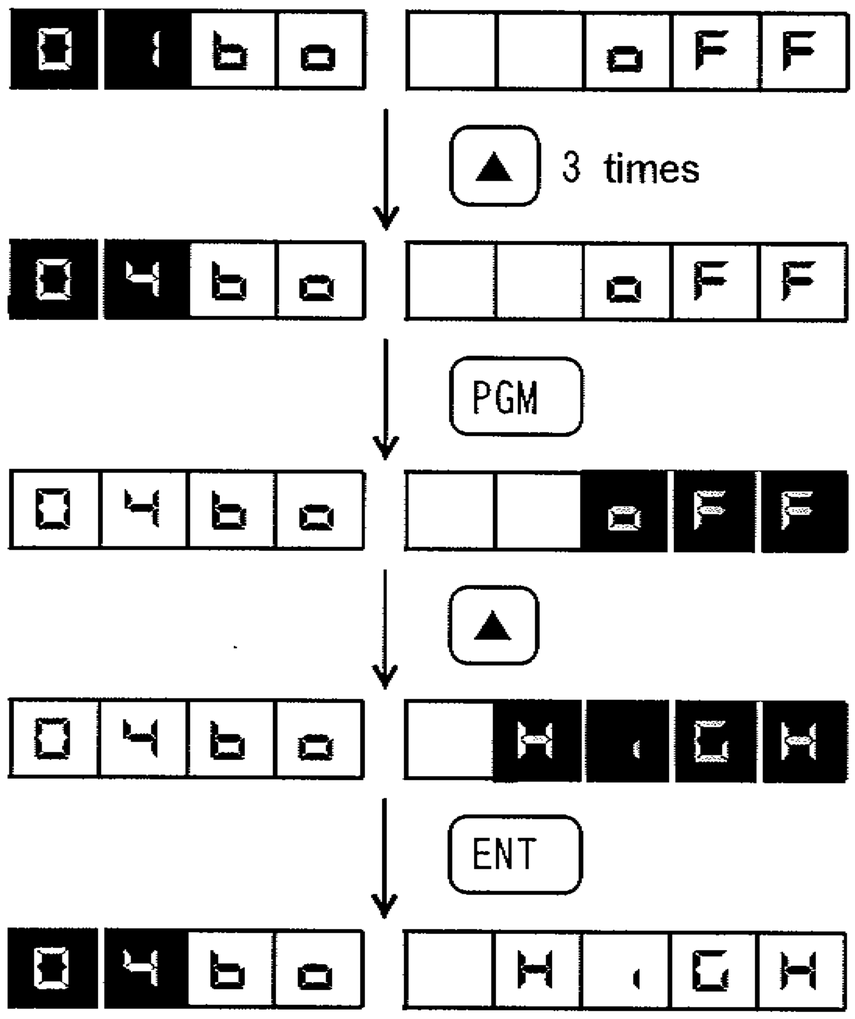


Fig. 8.4 Burnout Screen Configuration

< Setting Example >

Setting Burnout High for the channel 4



[Note]

See Page 39 for how to call this screen.

[Note]

" ■ " denotes a blinking LED.

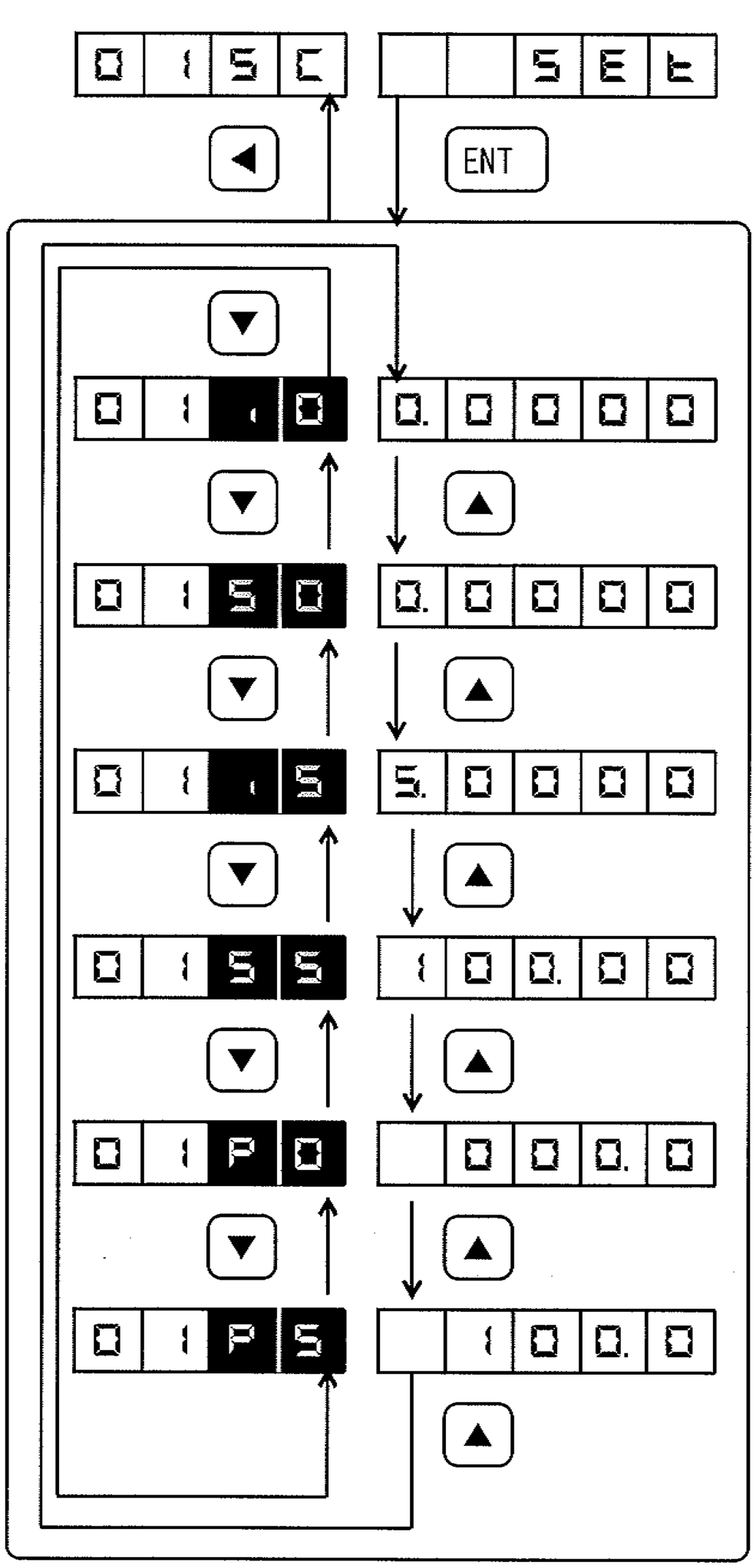
Fig. 8.5 Burnout Setting Example

8 – 4 Setting the Recording Scale Value

In this section, you set the zero and span points for the recording scale and a decimal point position for the display and printout. When scaling is required for the mV, V, or mA input, set in this mode.

Also set in this mode when making zone recording.

① Recording scale setting screen configuration (in case of mV, V, or mA input)



Recording scale value setting screen

[Note]
" ■ " denotes a blinking LED.

< Input Zero >
Sets an input range zero point.

< Scale Zero >
Sets a recording scale zero point.

< Input Span >
Sets an input range span point.

< Scale Span >
Sets a recording scale span point.
Sets a decimal point position for the display and printout.

< Position Zero >
Sets a zero point indicating position for zone recording.

< Position Span >
Sets a span point indicating position for zone recording.

[Note]
When zone recording is not made, it is unnecessary to set the position zero/span point.

Fig. 8.6 Recording Scale Value Setting Screen

[Note]
See Page 44 for thermocouple or resistive temperature detector bulb input.

DESCRIPTION | APP'D. Oda | CHK. Hara | DR. Kawai | DATE 8/30/96 | REV. 1
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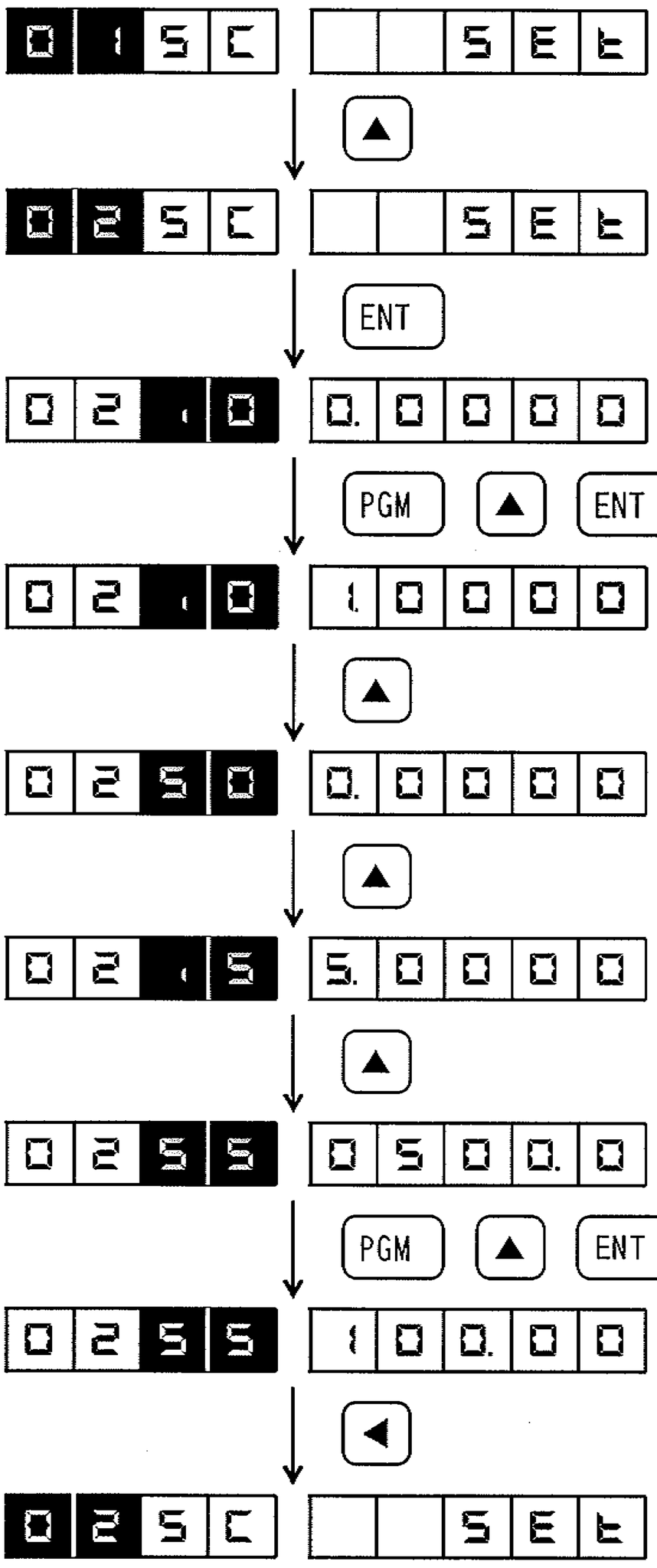
8 − 4 Setting the Recording Scale Value

< Setting Example >

Changing 0 to 5V input range, 0.0 to 500.0 display/recording range to 1 to 5V input range, 0.00 to 100.00 display/recording range, respectively, for the channel 2.



[Note]

" ■ " denotes a blinking LED.

Selects the channel 2.

Changes a zero point input value from 0 to 1.

Changes a span point scale value from 500.0 to 100.00.

Changes a span point scale value from 500.0 to 100.00.

[Note]

The decimal point position for the display and printout is determined here.

(End of setting)

Fig. 8.7 Recording Scale Value Setting Example

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/30/96	Kawa	Hase	Oda	

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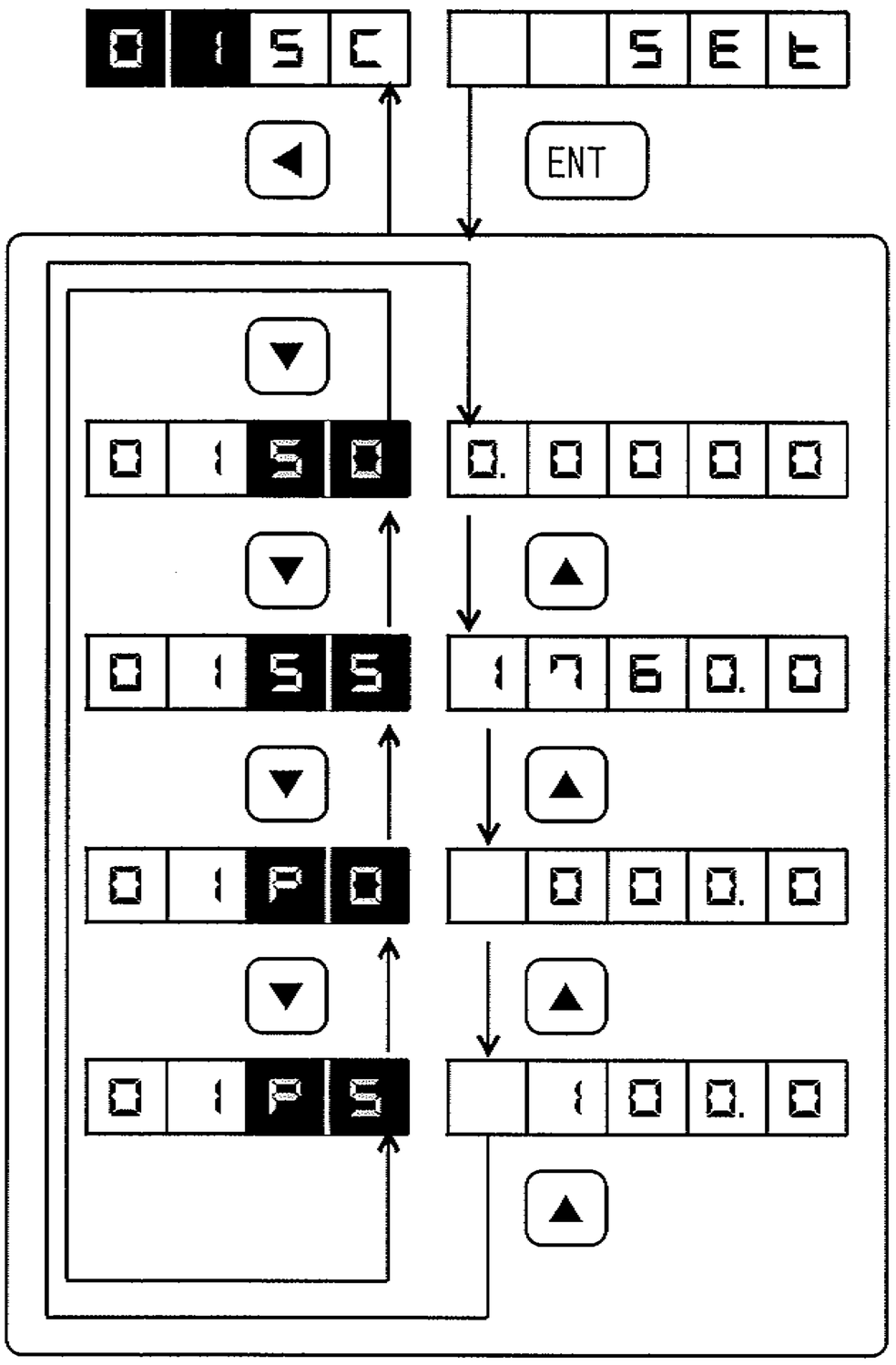
8 – 4 Setting the Recording Scale Value

② Recording scale setting screen configuration
(in case of thermocouple or resistive temperature detector input)



Recording scale value setting screen

[Note]
" ■ " denotes a blinking LED.

< Scale Zero : Zero Point Scale Value >
Sets an input range zero point.

< Scale Span : Span Point Scale Value >
Sets a recording scale span point.
Sets a decimal point position for the display and printout.

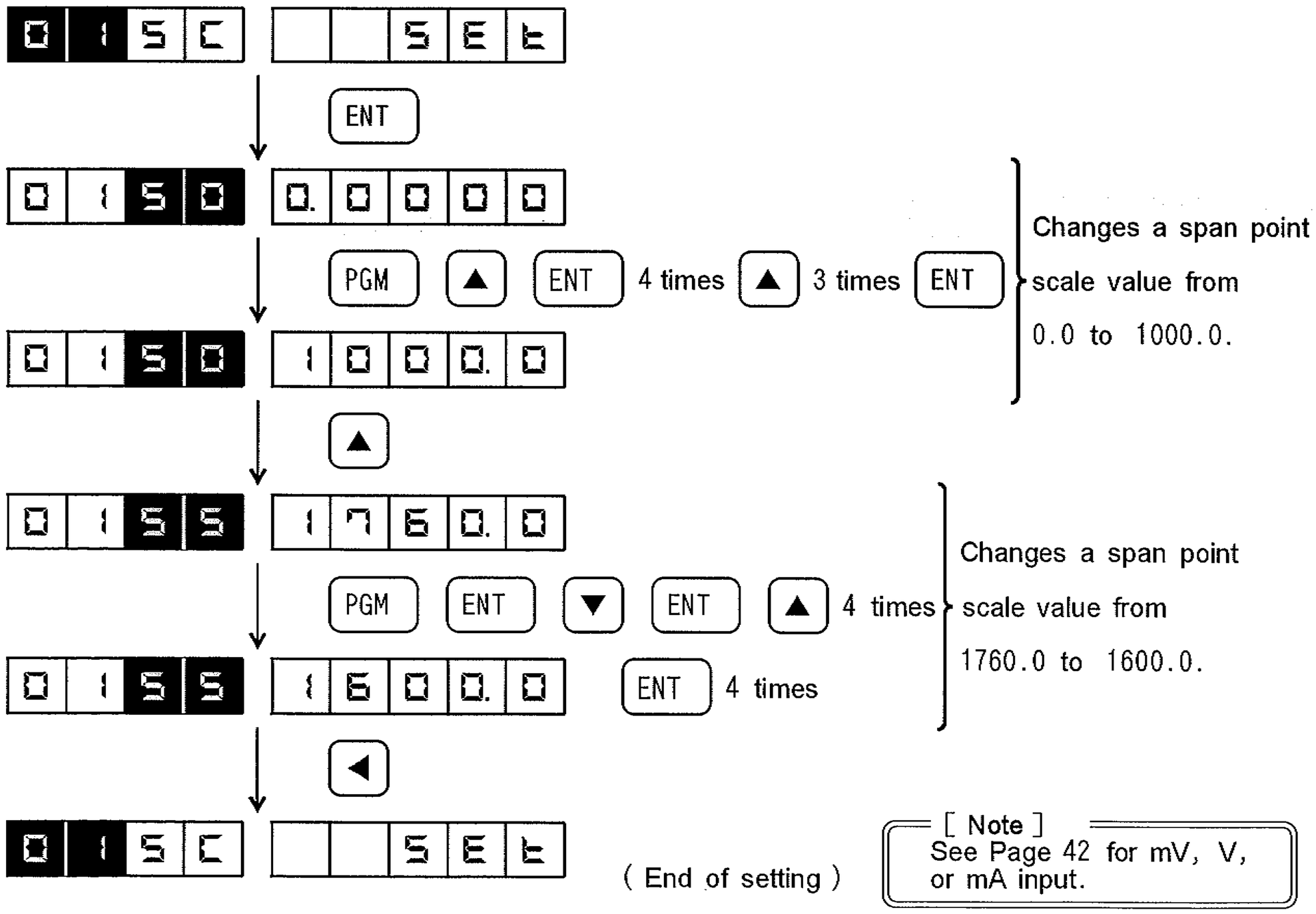
< Position Zero >
Sets a zero point indicating position for zone recording.

< Position Span >
Sets a span point indicating position for zone recording.

[Note]
When zone recording is not made, it is unnecessary to set the position zero/span point.

Fig. 8.8 Recording Scale Value Setting Screen

< Setting Example >
Changing the setting for the channel 1 from 0 to 1760°C to 1000 to 1600°C.



[Note]
See Page 42 for mV, V, or mA input.

Fig. 8.9 Recording Scale Value Setting Example

DESCRIPTION | CHG.No. | DATE | DR. | CHK. | APP'D.
2 | 3 | 8/30/96 | Kawa | Nomo | Oda
REV. 1
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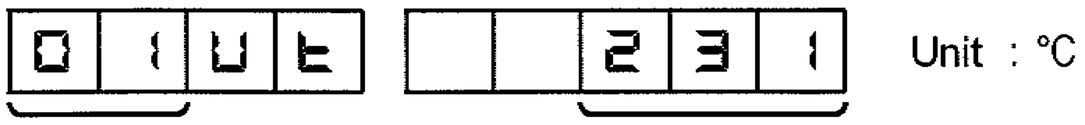
8 – 5 Setting the printing Unit Code

In this section, you set a printing unit code for measured values according to the unit codes list (Pages 46 to 48) .

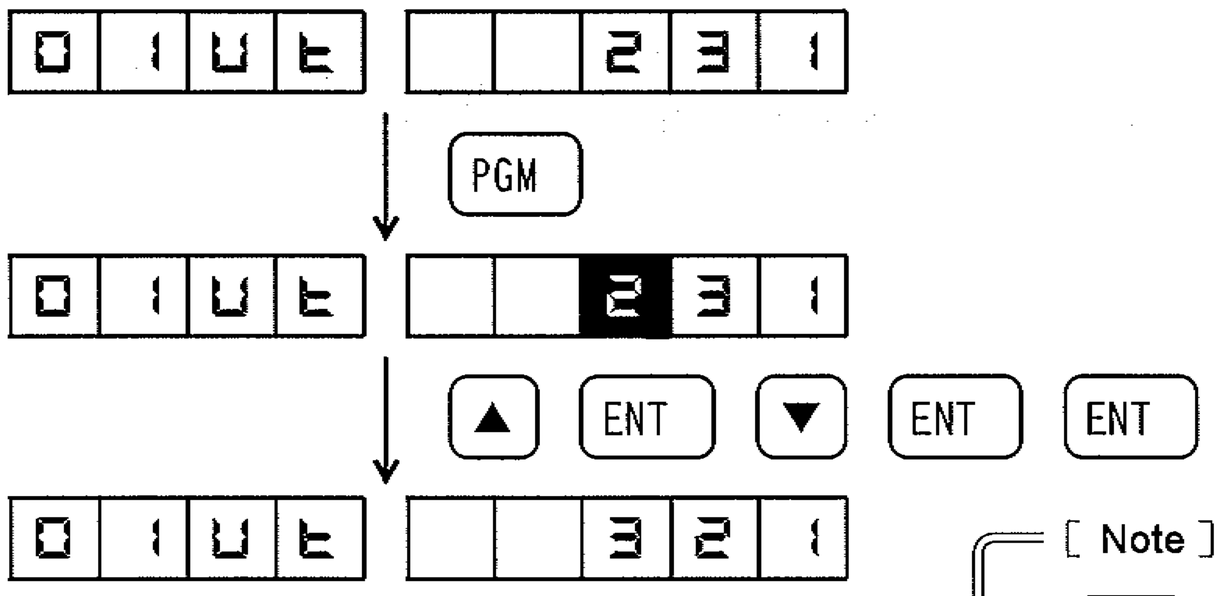


Unit : ℃

Fig. 8.10 printing Unit Code Setting Screen

< Setting Example >

Changing the unit for the channel 1 from ℃ (unit code : 231) to MW (unit code : 321) .



[Note]

" ■ " denotes a blinking LED.

Fig. 8.11 printing Unit Code Setting Example

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	9/30/96	Kuwa	Hase	Oda	

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8 – 5 Setting the printing Unit Code

	Unit Code	Symbol		Unit Code	Symbol		Unit Code	Symbol
STANDARD	00	m	ROTATING SPEED	50	s^{-1}	SPEED	100	m／s
	01	km		51	min^{-1}		101	m／min
	02	cm		52	r／min		102	m／h
	03	mm		53	-----		103	km／h
	04	μm		54	-----		104	cm／s
	05	nm		55	rps		105	cm／min
	06	Å		56	rpm		106	cm／h
	07	°		57	rph		107	mm／s
	08	'		58	-----		108	mm／min
	09	"		59	m^{-1}		109	mm／h
	10	m^2	MASS	60	kg		110	rad／s
	11	km^2		61	g		111	rad／min
	12	cm^2		62	mg		112	rad／h
	13	mm^2		63	μg		113	-----
	14	-----		64	-----		114	-----
	15	a		65	t		115	°／s
	16	ha		66	u		116	°／min
	17	-----		67	-----		117	°／h
	18	rad		68	ct		118	kn
	19	sr		69	car		119	kt
	20	m^3	DENSITY	70	kg/m^3	ACCELERATION	120	m/s^2
	21	km^3		71	t/m^3		121	-----
	22	cm^3		72	g/m^3		122	-----
	23	mm^3		73	g/cm^3		123	-----
	24	-----		74	-----		124	-----
	25	L		75	kg／L		125	rad/s^2
	26	kL		76	g／L		126	$°/s^2$
	27	mL		77	mg／L		127	-----
	28	-----		78	mol／L		128	Gal
	29	-----		79	L／moL		129	-----
TIME	30	s		80	kg/m^2	DYNAMIC	130	N
	31	ks		81	t/m^2		131	MN
	32	ms		82	g/m^2		132	kN
	33	μs		83	g/cm^2		133	mN
	34	-----		84	kg/cm^2		134	-----
	35	y		85	-----		135	kgm／s
	36	mon		86	-----		136	-----
	37	d		87	-----		137	kgf
	38	h		88	mol/m^3		138	gf
	39	min		89	m^3/mol		139	-----
FREQUENCY	40	Hz		90	kg／m	MOMENT	140	Nm
	41	GHz		91	t／m		141	MNm
	42	MHz		92	g／m		142	kNm
	43	kHz		93	g／cm		143	mNm
	44	-----		94	mg／m		144	-----
	45	cps		95	-----		145	kgm^2/s
	46	cpm		96	tex		146	kgm^2
	47	cph		97	mol		147	kgfm
	48	c		98	mol／kg		148	kgfcm
	49	c／s		99	kg／mol		149	gfcm

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	2				
	3				Oda
		8/30/96	Kawa	Nara	
	REV.	1			

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8 – 5 Setting the printing Unit Code

	Unit Code	Symbol		Unit Code	Symbol		Unit Code	Symbol
PRESSURE	150	Pa	ENERGY	200	J	FLOW	250	kg／s
	151	MPa		201	GJ		251	kg／min
	152	kPa		202	MJ		252	kg／h
	153	mPa		203	kJ		253	-----
	154	hPa		204	mJ		254	-----
	155	-----		205	-----		255	-----
	156	-----		206	ev		256	t／s
	157	-----		207	Mev		257	t／min
	158	-----		208	kev		258	t／h
	159	-----		209	-----		259	-----
	160	N／m^2		210	-----		260	m^3／s
	161	N／mm^2		211	-----		261	m^3／min
	162	-----		212	-----		262	m^3／h
	163	-----		213	-----		263	-----
	164	-----		214	-----		264	-----
	165	-----		215	-----		265	-----
	166	-----		216	-----		266	L／s
	167	-----		217	-----		267	L／min
	168	-----		218	-----		268	L／h
	169	-----		219	-----		269	-----
	170	N／m	ENGINEERING	220	W	RADIOACTIVITY	270	Bq
	171	mN／m		221	GW		271	Gy
	172	-----		222	MW		272	C／kg
	173	-----		223	kW		273	Sv
	174	-----		224	mW		274	-----
	175	-----		225	-----		275	mr／h
	176	-----		226	-----		276	Ci
	177	-----		227	-----		277	rad
	178	-----		228	-----		278	R
	179	-----		229	-----		279	rem
VISCOSITY	180	Pas	TEMPERATURE	230	K		280	cd
	181	mPas		231	°C		281	cd／m^2
	182	m^2／s		232	°F		282	Lx
	183	mm^2／s		233	mK		283	Lxs
	184	-----		234	K^{-1}		284	-----
	185	-----		235	-----		285	-----
	186	-----		236	-----		286	sb
	187	-----		237	-----		287	ph
	188	-----		238	-----		288	-----
	189	-----		239	-----		289	-----
	190	m^3／s		240	J／K		290	Lm
ACOUSTIC	191	m^2／s		241	kJ／K		291	Lm／m^2
	192	m／s		242	J／(kgK)		292	Lm／w
	193	km／s		243	kJ／(kgK)		293	Lms
	194	W／m^2		244	J／kg		294	Lmh
	195	-----		245	kJ／kg		295	-----
	196	Pas／m		246	W／(mK)		296	W／sr
	197	Pas／m^3		247	W／(m^2K)		297	W／(srm^2)
	198	Ns／m		248	J／mol		298	W／m^2
	199	-----		249	J／(molK)		299	-----

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1	8/30/96	Kitani	Hara	Ada	

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8 – 5 Setting the printing Unit Code

	Unit Code	Symbol		Unit Code	Symbol		Unit Code	Symbol
CURREUT	300	A	STATIC CAPACITY	350	F	OTHERS	400	------
	301	MA		351	mF		401	mSv/h
	302	kA		352	μF		402	Sv/h
	303	mA		353	nF		403	μSv/h
	304	μA		354	pF		404	------
	305	nA		355	------		405	mGy/h
	306	Am^2		356	F/m		406	Gy/h
	307	A/m		357	μF/m		407	μGy/h
	308	A/m^2		358	nF/m		408	------
	309	Oe		359	------		409	mBq/h
VOLTAGE	310	V	CONDUCTANCE	360	S		410	Bq/h
	311	MV		361	kS		411	μBq/h
	312	kV		362	mS		412	------
	313	mV		363	μS		413	
	314	μV		364	μS/cm		414	
	315	------		365	------		415	
	316	V/m		366	S/m		416	
	317	kV/m		367	MS/m		417	
	318	mV/m		368	kS/m		418	
	319	------		369	------		419	
ELECTRIC POWER	320	W	QUANTITY OF ELECTRICITY	370	C		420	
	321	MW		371	kC		421	
	322	kW		372	mC		422	
	323	mW		373	μC		423	
	324	μW		374	nC		424	
	325	VA		375	pC		425	
	326	kVA		376	Ah		426	
	327	Mvar		377	Cm		427	
	328	var		378	C/m^2		428	
	329	kvar		379	C/m^3		429	
ELECTRIC RESISTANCE	330	Ω	FLUX	380	Wb		430	
	331	MΩ		381	mWb		431	
	332	kΩ		382	Wbm		432	
	333	mΩ		383	Wb/m		433	
	334	μΩ		384	kWb/m		434	
	335	MΩcm		385	Mx		435	
	336	Ωm		386	T		436	
	337	kΩm		387	mT		437	
	338	mΩm		388	μT		438	
	339	μΩm		389	Gs		439	
INDUCTANCE	340	H	OTHERS	390	%		440	
	341	mH		391	‰		441	
	342	μH		392	ppm		442	
	343	nH		393	ppb		443	
	344	pH		394	dB		444	
	345	------		395	pH		445	
	346	H/m		396	phon		446	
	347	μH/m		397	Nm^3/h		447	
	348	nH/m		398	Unit		448	
	349	H^{-1}		399	------		449	

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1	92.1.16	Kawa	Hoso	oda		2 3

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8 – 6 Setting the Digital Filter Value

Apply a digital filter to a measured value to record a primary delay.
Set a filter constant (K) . (An initial value is K = 1.0000, without the digital filter)

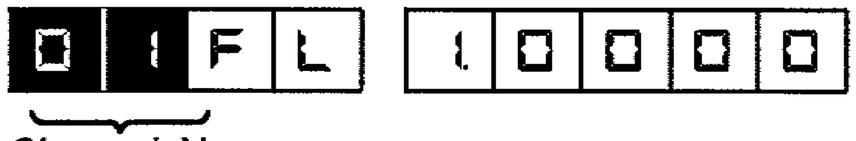


Fig. 8.12 Digital Filter Value Setting Screen

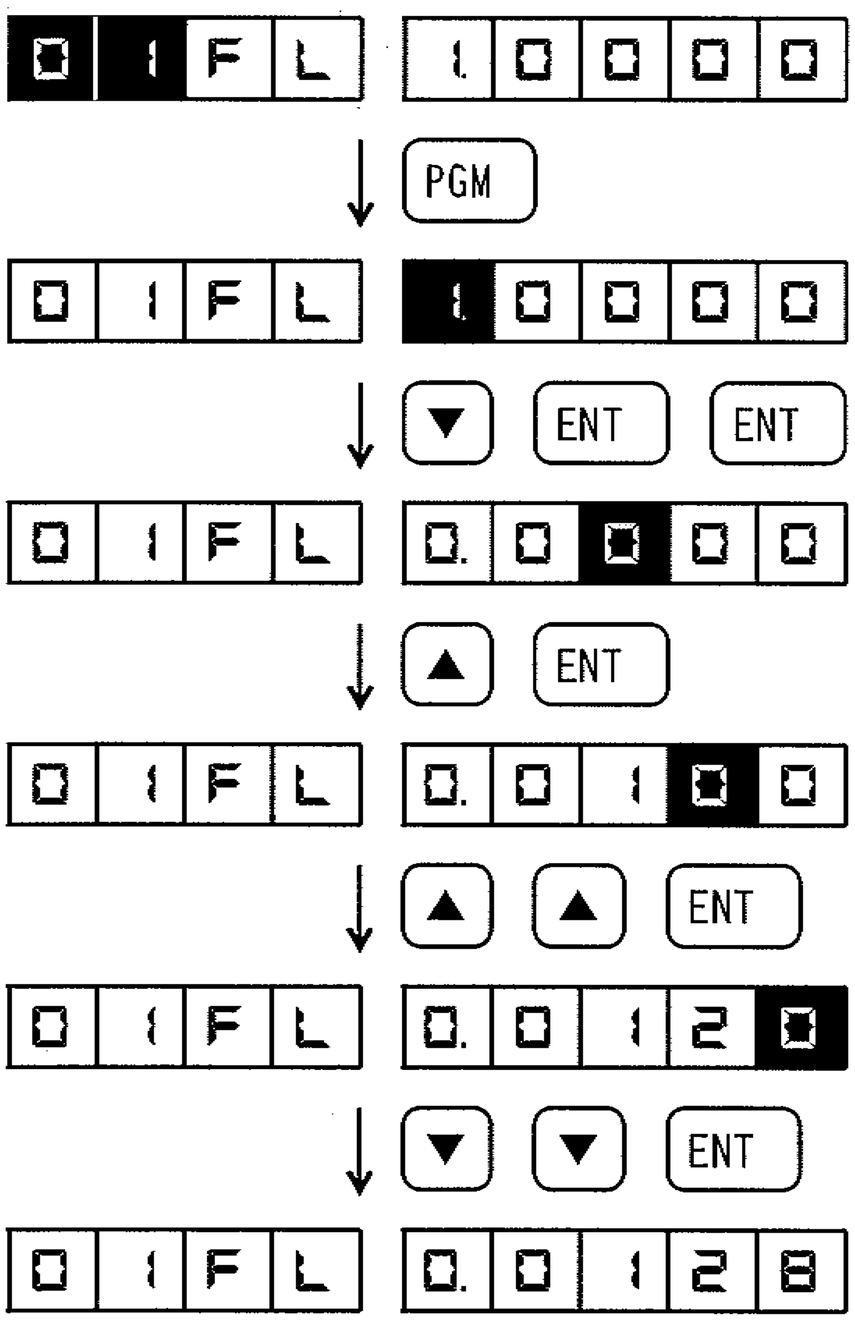
From 99.5 % response time ($T_{99.5}$) , the filter constant (K) is obtained by the following formula.

$$K = \frac{0.64}{T_{99.5}}$$

Setting Example

When the 99.5 % response time is 50 seconds;

$$K = \frac{0.64}{50} = 0.0128$$



[Note]

" ■ " denotes blinking of the display.

Fig. 8.13 Digital Filter Value Setting Example

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1	8/29/96	Kawai	Hoso	Oda	
CHG.No. 2					3

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8 – 7 Setting the Printing Function

In this section, you set whether time print, date print, alarm on print, or alarm recovery on print is to be provided/unprovided.

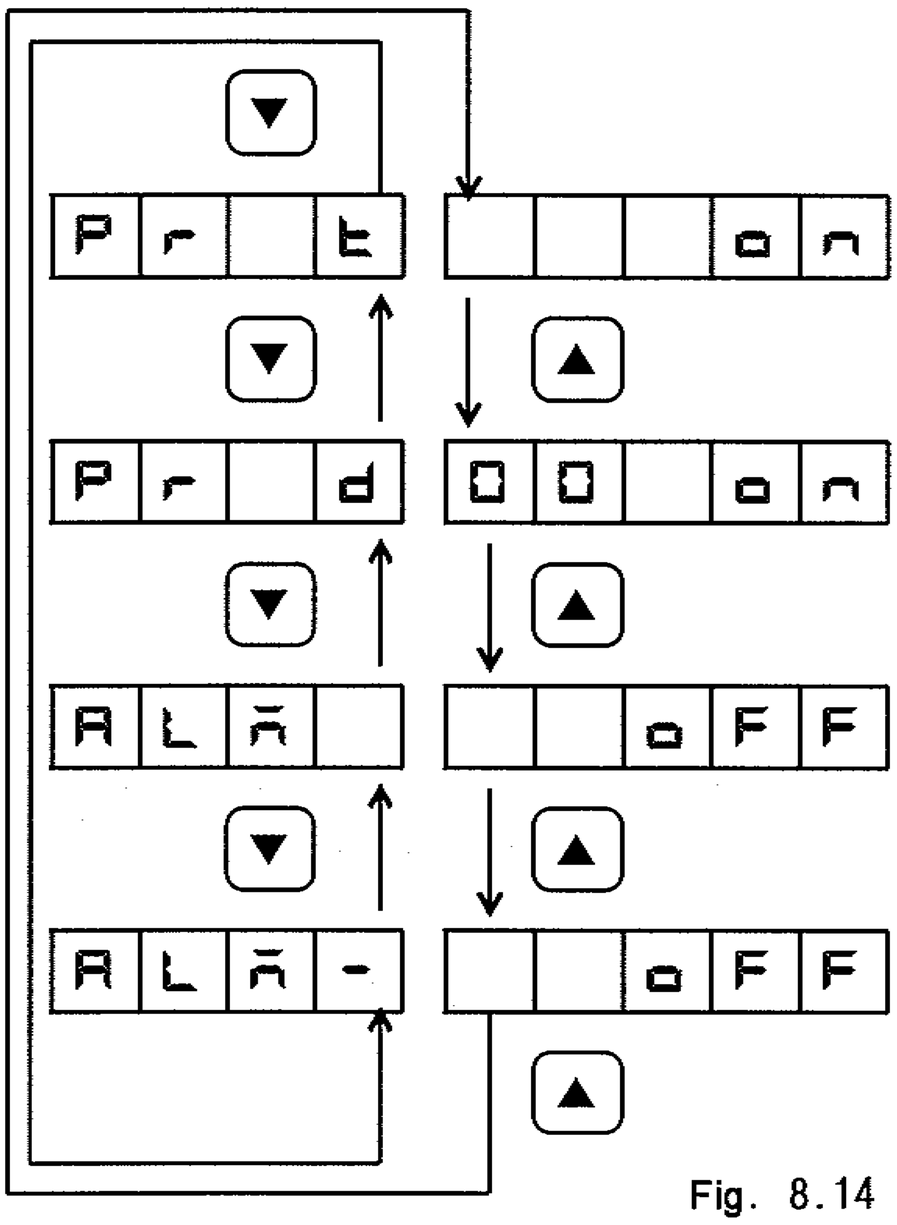
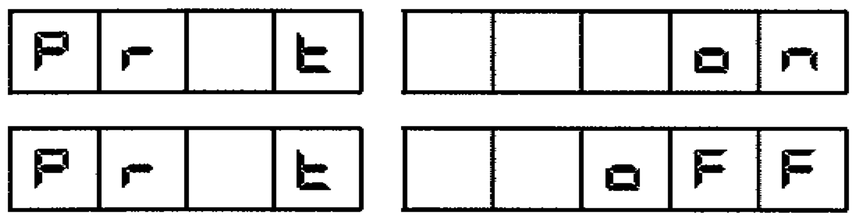


Fig. 8.14 Printing Function Setting Screen Configuration

Setting Time Print Operation

You set whether time print is to be provided or unprovided. When altering the setting, press PGM ▲ ENT keys in that order.

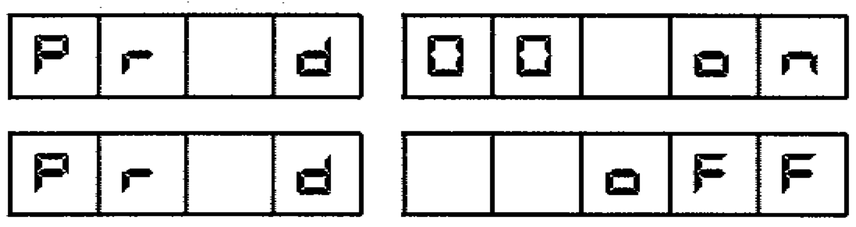


[Reference]
An initial value is " on" .

Fig. 8.15 Time Print Setting Screen

Setting Date Print Operation

You set whether date print is to be provided or unprovided.



[Reference]
An initial value is
" 00 on" .

Printed time by an hour also can be set with date printing function.

Fig. 8.16 Date Print Setting Screen

< Setting Example >

Providing date print at 5:00

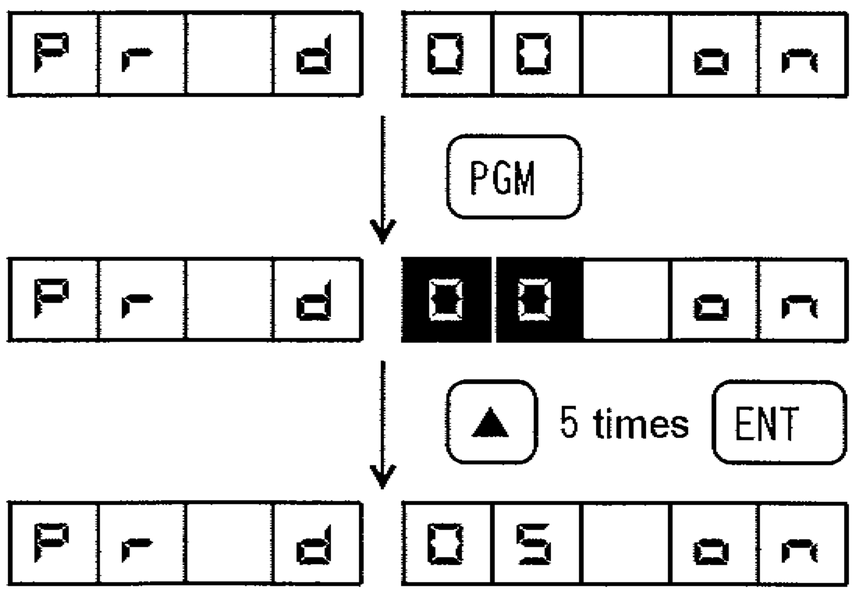
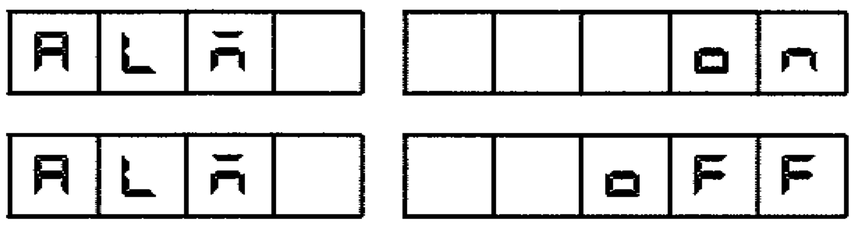


Fig. 8.17 Date Print Setting Example

[Note]
" ■ " denotes a blinking LED.

Setting Alarm on Print

You set whether alarm on print is to be provided or unprovided. When altering the setting, press PGM ▲ ENT keys in that order.



Provided

Unprovided

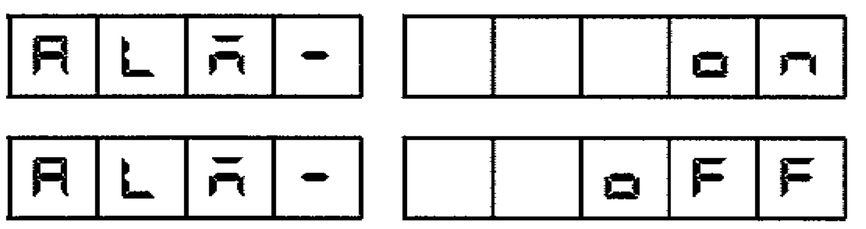
Fig. 8.18 Alarm on Print Setting Screen

[Reference]

An initial value is "oFF" unless otherwise specified.

Setting Alarm Recovery on Print

You set whether alarm recovery on print is to be provided or unprovided.
When altering the setting, press PGM ▲ ENT keys in that order.



Provided

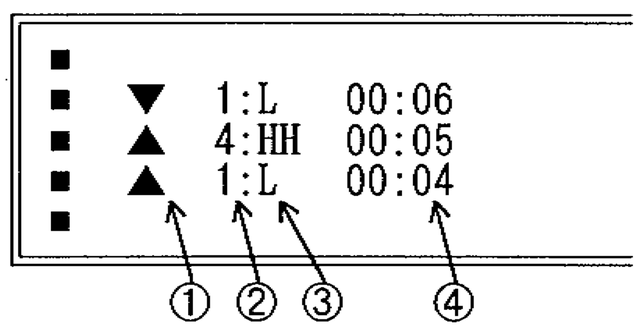
Unprovided

Fig. 8.19 Alarm Recovery on Print Setting Screen

[Reference]

An initial value is "oFF" unless otherwise specified.

< Printing Example >



① Alarm mark (▲ : Outbreak, ▼ : Reset)

② Alarm channel number

③ Type

④ Alarm(recovery) time

Fig. 8.20 Alarm on Print and Alarm Recovery on Print Example

[Note]

Printout complies with the printing priority on Page 27.

This print can wait one dot during its execution.

Note that 2-dot or more alarm/alarm recovery on print is disabled.

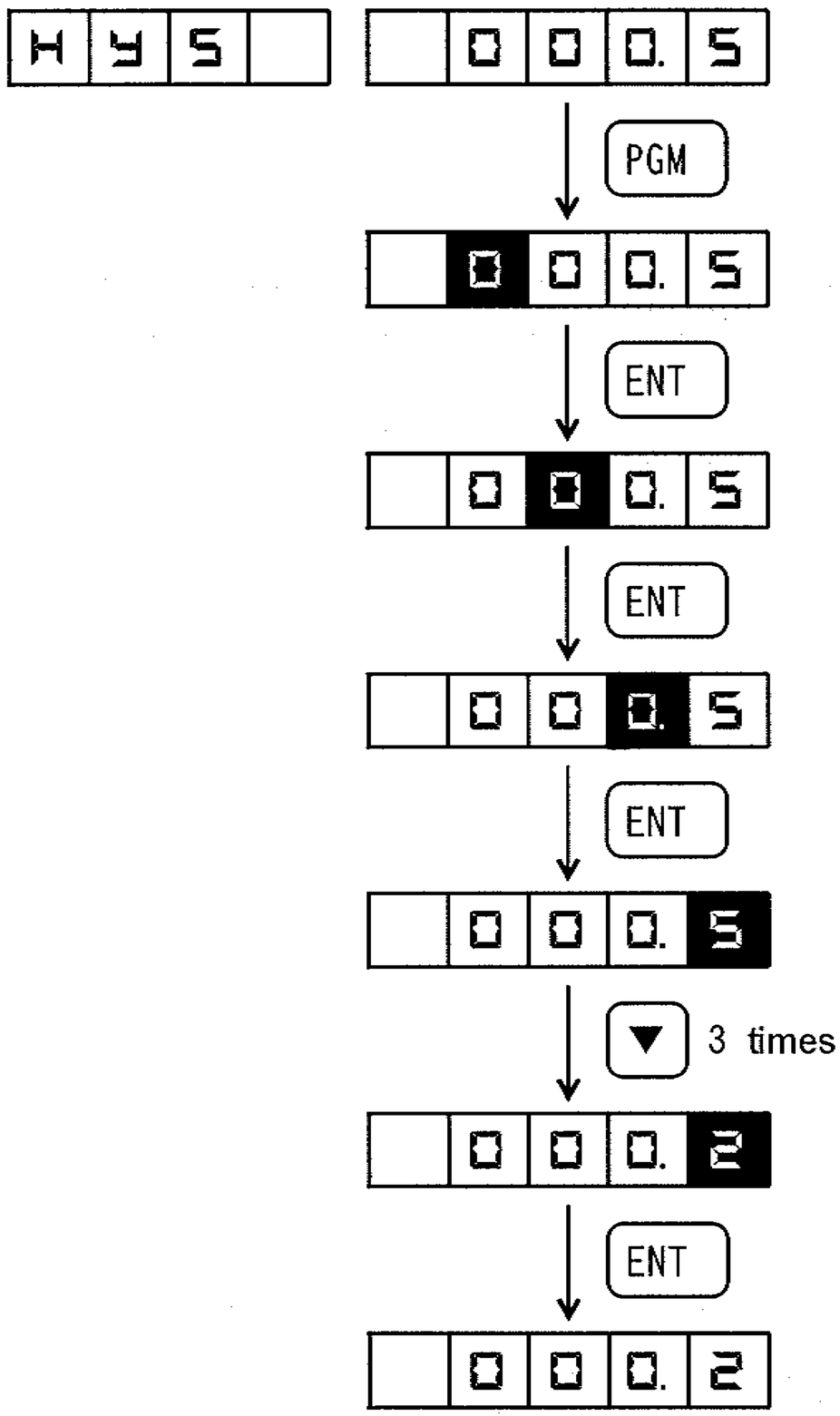
8 – 8 Setting the Alarm Hysteresis Width

In this section, you set a hysteresis width at the time of alarm recovery judgment.
This setting is common to all the channels.

HYS	000.5	Sets the alarm hysteresis width.

< Setting Example >

Changing the alarm hysteresis width from 0.5 to 0.2.



[Reference]

An initial value is " 0.5 "
unless otherwise specified.

[Note]

" ■ " denotes a blinking LED.

(End of setting)

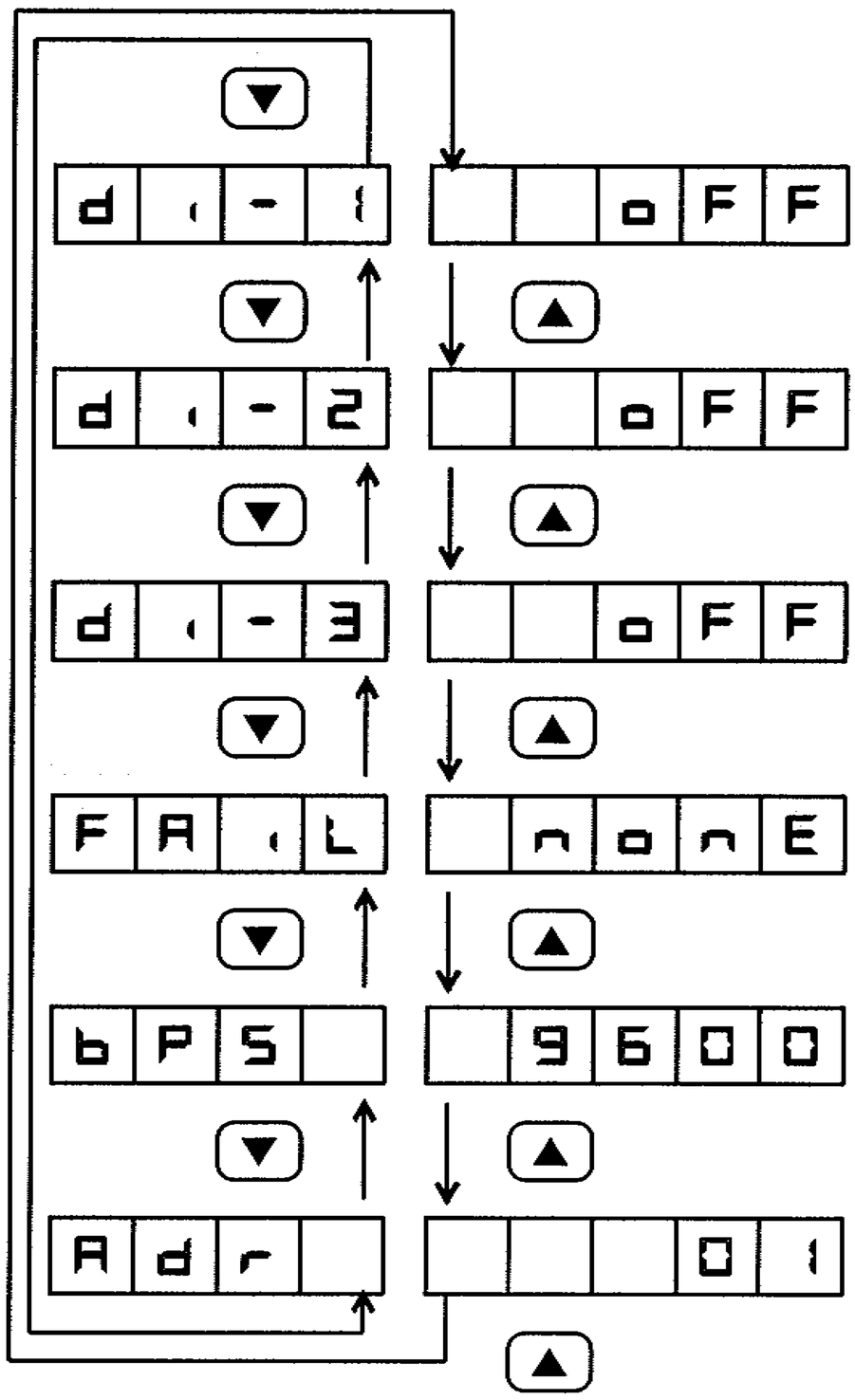
Fig. 8.21 Alarm Hysteresis Width Setting Example

[Note]

The alarm hysteresis width is provided for the full scale of the digital display value.

8-9 Setting the DI Funcution, Communication tate, Etc.

In this mode, you set the DI1-DI3 functions, fail output relay, communication rate, and communication local address.



Sets the DI (1) function → See Page 53

Sets the DI (2) function → See Page 54

Sets the DI (3) function → See Page 54

Sets the fail output relay → See Page 55

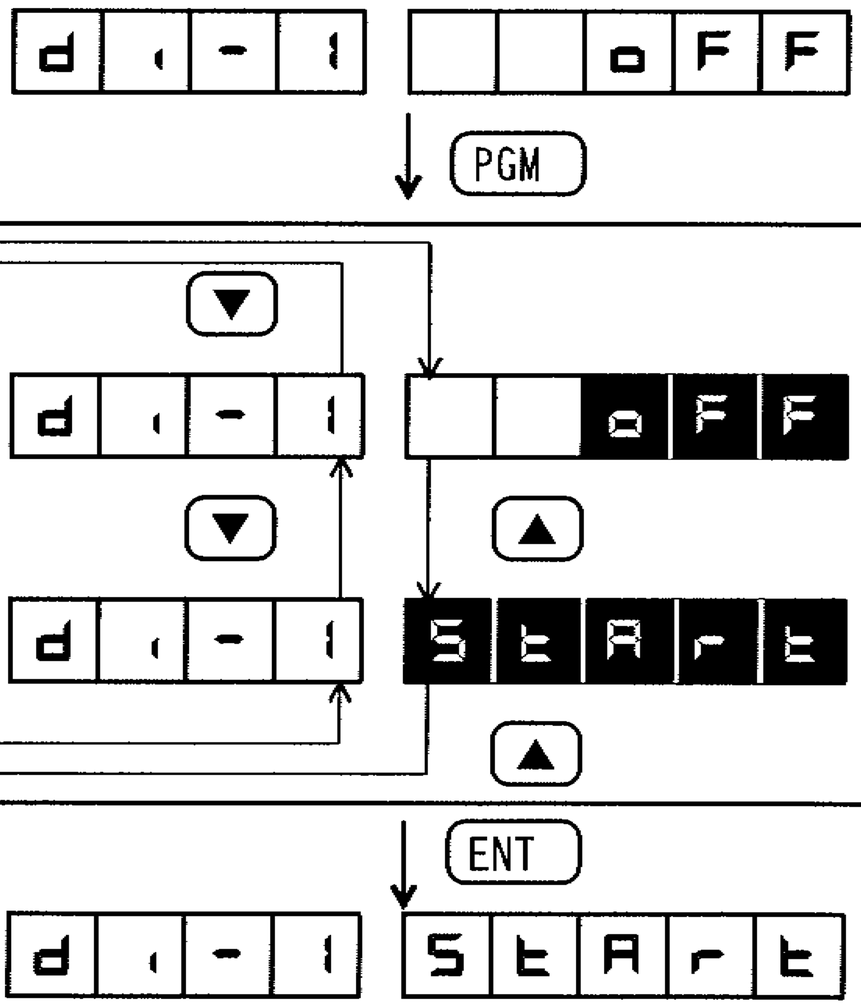
Sets the communication rate → See Page 55

Sets the communication local address → See Page 55

Fig. 8.22 DI Function, Communication Rate, Etc. Setting Screen Configuration

Setting the DI (1) function

You can select the " chart start/stop " function for the first DI (DI1) .



Sets the DI (1) function

No function

Enables the chart start/stop function

(End of setting)

[Note]

" ■ " denotes a blinking LED.

Fig. 8.23 DI (1) Setting Screen

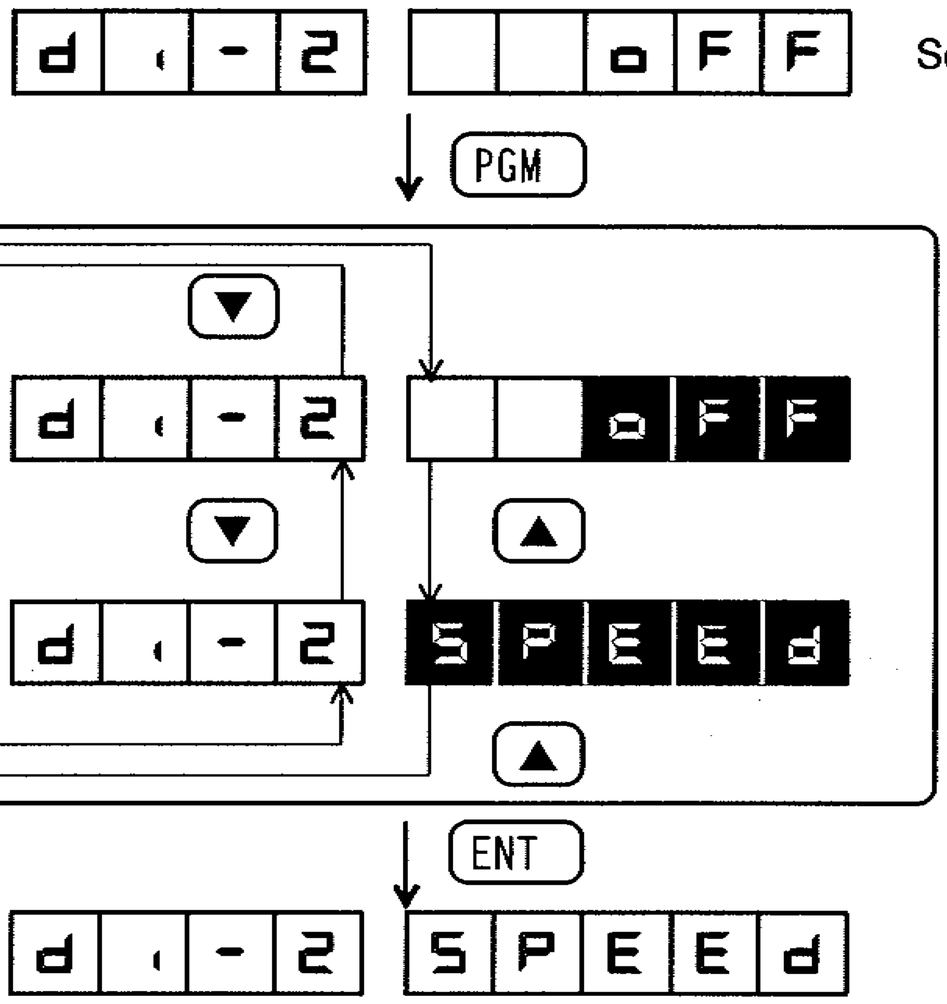
DI (1) State	Chart Paper Feed State
ON	Start state
OFF	Stop state (Indication and dot printing provided.)

[Note]

To use this function, optional " 5DI " is required.

Setting the DI (2) Function

You can select the " change chart speed function " for the second DI (DI2) .



Sets the DI (2) function

No function

Enables the chart speed selection function

(End of setting)

[Note]
" ■ " denotes a blinking LED.

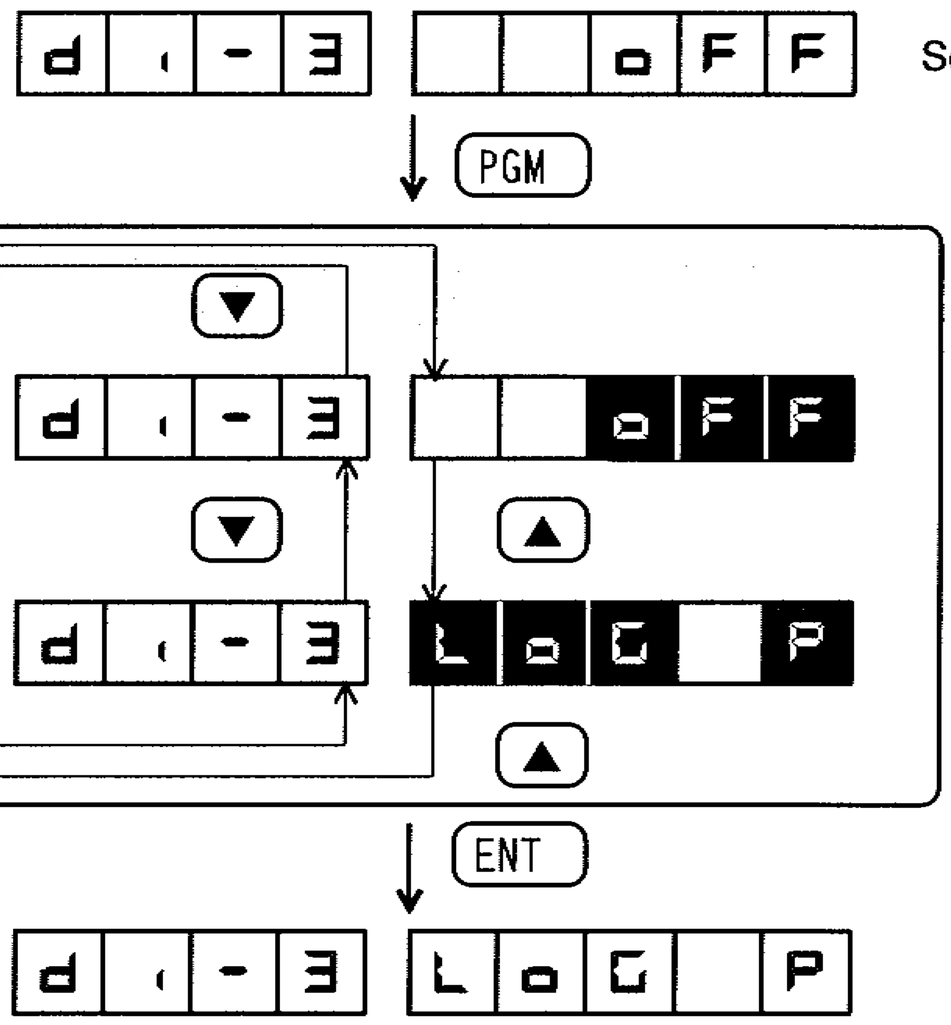
Fig. 8.24 DI (2) Setting Screen

DI (2) State	Chart Speed Selection
ON	1st speed
OFF	2nd speed

[Note]
To use this function, optional " 5DI " is required.

Setting the DI (3) Function

You can select the " external logging print start function " for the third DI (DI3) .



Sets the DI (3) function

No function

Enables the external logging print start function

(End of setting)

[Note]
" ■ " denotes a blinking LED.

[Note]
To use this function, optional " 5DI " is required.

Fig. 8.25 DI (3) Setting Screen

DI (3) State	External Logging Print Start
OFF→ON	Starts logging print (synchronous printing)

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Setting the Fail Output Relay

When an error occurs inside the recorder, a relay is driven to output its status.
The relay number to be outputted is RLY №8 which cannot be altered.
In this section, you set on/off of this function and the logic upon output.

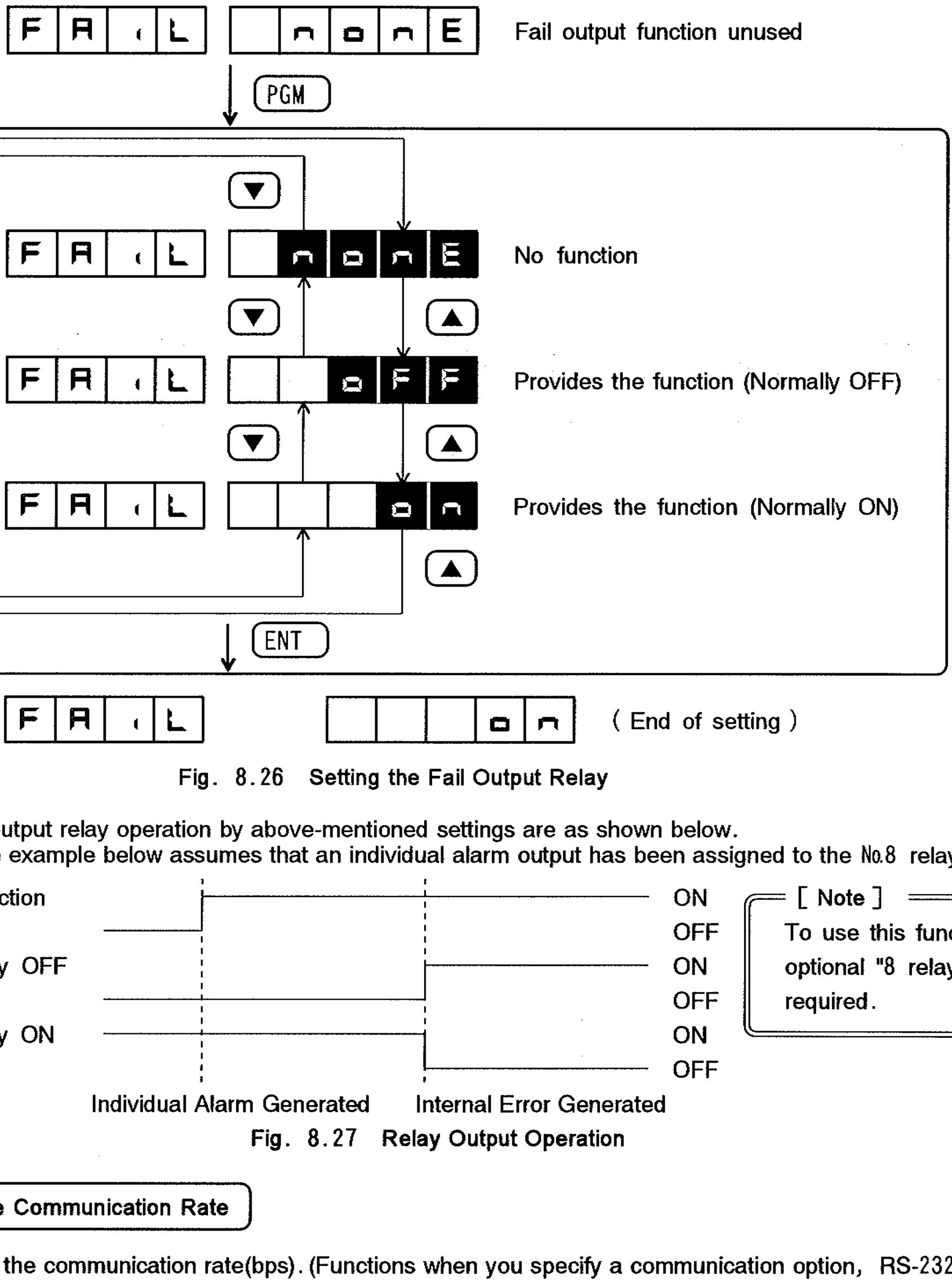
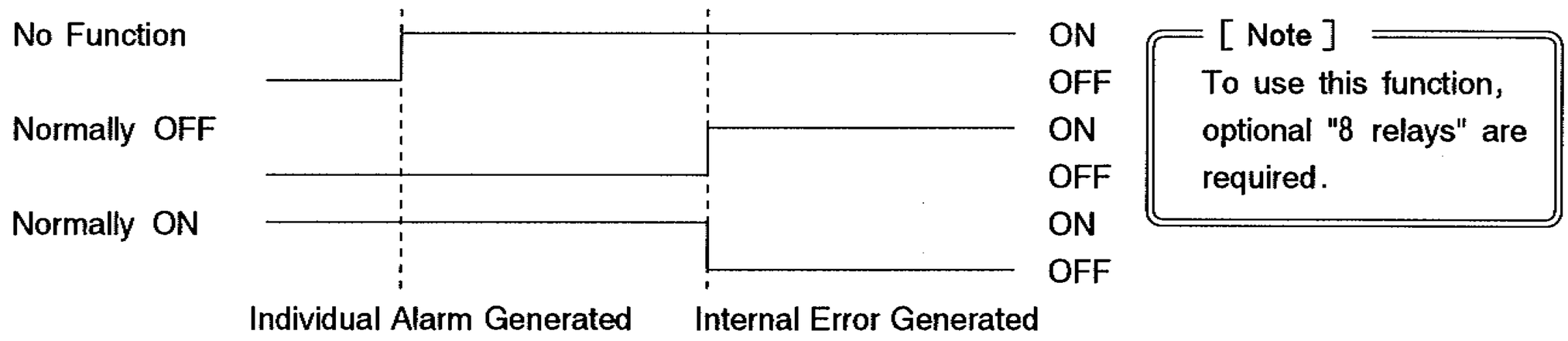


Fig. 8.26 Setting the Fail Output Relay

Fail output relay operation by above-mentioned settings are as shown below.
(The example below assumes that an individual alarm output has been assigned to the №8 relay.)

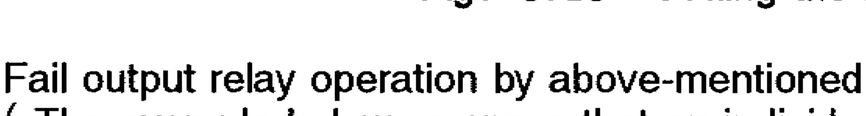


[Note]
To use this function, optional "8 relays" are required.

Fig. 8.27 Relay Output Operation

Setting the Communication Rate

You set the communication rate(bps). (Functions when you specify a communication option, RS-232C or RS-422A.)



(Select 19200, 9600, 4800, 2400, or 1200.)

Setting the Communication Local Address

You set the local address. (Functions when you specify a communication option, RS-422A.)

(Setting range : 01 to 15)

8－10 Display Unit Test Mode

In this mode, all the display LEDs are turned on by operating as follows to diagnose hardware related troubles.

Display Test Method

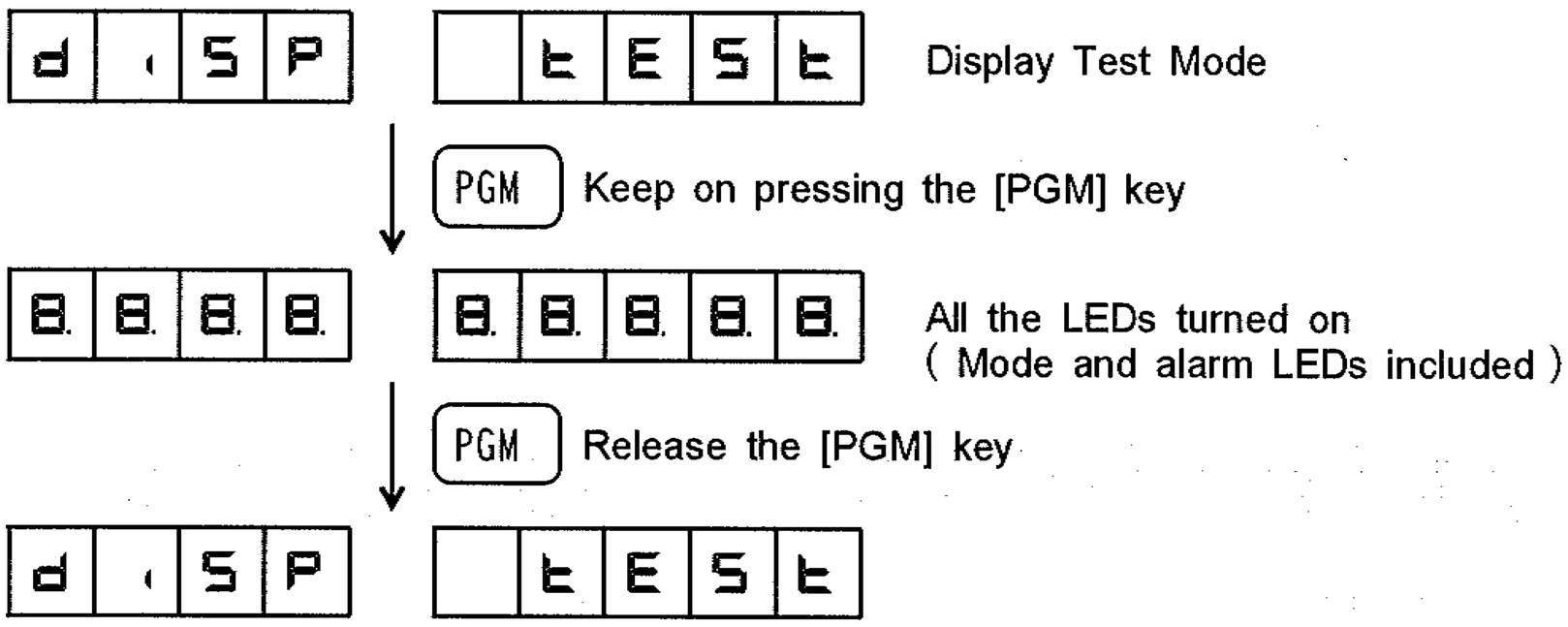


Fig. 8.28 Display Unit Test Screen

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/20/98	Kawai	Hara	Oda	

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Inspect the following items. When a defect is found, see 11-1 Troubleshooting (Pages 73 to 76) .

Inspection Items

- **Isn't the cursor fully swung ?**

- **Are recording and indication done properly ?**
  - · Is analog recording properly done ?
  - · Is there a large error between the display value and analog recording value ?
  - · Is recording by the cartridge pen not blurred or blotted ?
  - · Is printout clear ?

- **Is the chart paper fed properly ?**
  - · Is the chart paper folded properly ?
  - · Aren't the feed holes in the chart paper torn off or broken ?
  - · Is the chart paper feed rate correct ?

- **Is there any abnormal sound ?**

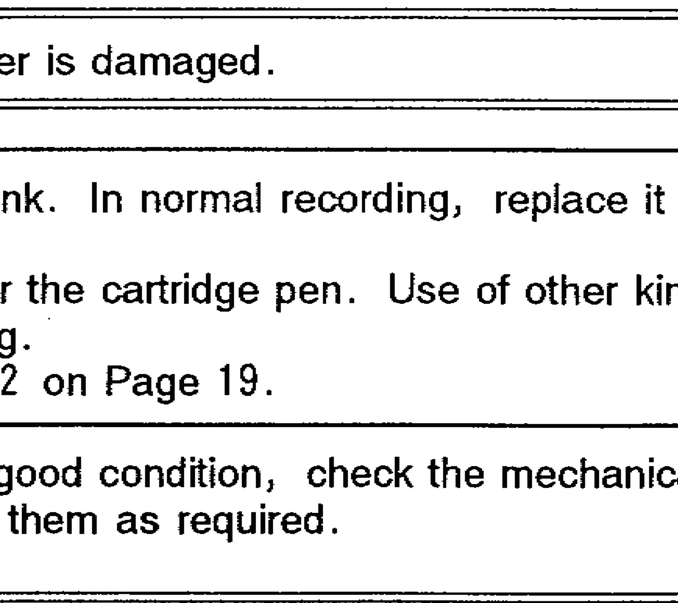
Consumable Parts

Table 9.1 List of Consumable Parts

NO.	Consumable Part	Part Number	Remarks
1	Chart paper	HZCAA1025AF001	Uniform scale divided into 100 (when provided as a standard accessory)
2	Ribbon cassette	HPSR001H0003	
3	Cartridge pen	HPSR001L0001	For the 1-pen recorder (Red)
		HPSR001L0002	For the 2-pen recorder (Blue)
		HPSR001L0003	For the 3-pen recorder (Green)
		HPSR001L0004	For the 4-pen recorder (Purple)
4	Lubricant	H4A12290	LAUNA 40 produced by NIPPON OIL (or its equivalent)
5	Timing belt	WPSU035A000002A	
6	Fuse	WPSJ011D000001A	250V 2A (T2A)

Maintenance and Servicing

Table 9.2 Maintenance and Servicing List

Maintenance/ Servicing Item	Remedy
Chart Paper	(1) When the chart paper is running out, a red mark appears on the right of the chart paper. Replace it immediately. **⚠ CAUTION** ① If dotting or printing is performed without the chart paper, ink may stick to the sprocket drum or the printer and sprocket drum may be damaged. Be sure to perform printing with the chart paper set. ② It is recommended to use our standard chart paper to ensure proper recording. **[Reference]** ① The full length of the chart paper is 23 m. ② Draw out the main unit. You can check a remaining amount of the chart paper through the remaining chart paper check window located on the right side of the main unit.
Ribbon Cassette	(1) When recording with a ribbon, a dot printing color phases out. To ensure clear recording, replace the ribbon cassette as early as possible. (2) Use the ribbon cassette within one year after its purchase. Due to evaporation of ink, a printing color phases out as time goes on. Replacement recommendation: · After recording 3 rolls of the chart paper (3 months in continuous operation at normal temperature and humidity) · About 6 months when operation is suspended after unpacking (3) For the replacement method, see 5-3 on Page 20. **⚠ CAUTION** Never use the ribbon which fiber is damaged.
Cartridge pen	(1) The cartridge contains about 3ml of ink. In normal recording, replace it monthly. (2) The ink used is specially prepared for the cartridge pen. Use of other kind of ink causes blot or blur in recording. (3) For the replacement method, see 5-2 on Page 19.
Lubrication	In order to always use the instrument in a good condition, check the mechanical moving parts for oil shortage and lubricate them as required. **⚠ CAUTION** ① Lubricate periodically at the following intervals. ② When you find any adhered substance caused by oil contamination, eliminate it and lubricate. ③ Apply only one or two drops of oil and wipe away excessive oil. <Where to Lubricate> a : Pen holder slide shaft (Semiannually) b : Core holder slide shaft (Semiannually) c : Printer shaft (Semiannually) d : Sprocket drum bearing (Annually)  Internal Unit of Recorder Fig. 9.1 Where to Lubricate

〈 Continued 〉

Maintenance / Servicing Item	Remedy
Fuse	It is recommended to replace the fuse every other year for preventive maintenance.

⚠ WARNING

When replace the fuse, turn off the power, and then, disconnect the instrument from the main power source. Be sure to use our specified fuse. (Fire prevention) Do not short-circuit the fuse holder.

[Replacement Procedure]

(1) Turn off the power and disconnect the instrument from the main power source.
(2) The fuse is found on the rear of the instrument. (See Fig. 9.2) Use a regular screwdriver to remove the fuse.
(3) Set a new fuse.

[Note]
A warning plate is affixed to the side of the case.

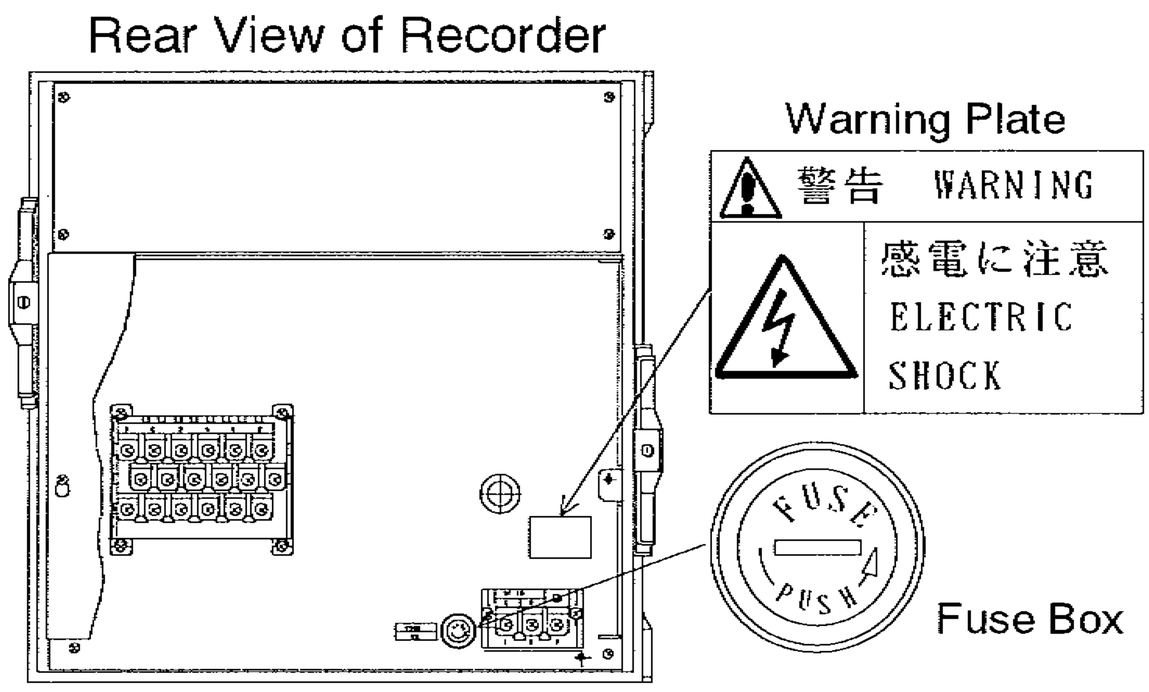


Fig. 9.2 Fuse Setting Position

Timing belt	In order to maintain recording quality, it is recommended to replace the timing belt every five years. For the replacement method, see 9-3 on Page 60.

9 – 3 Replacing the Timing Belt

The pen for this instrument is coupled with the motor by the timing belt. In order to maintain recording quality, it is recommended to replace the timing belt every five years. (It is recommended to replace the entire pen servo unit.)

(1) Removing the main unit

① Press the POWER switch to turn off the power.

② Pushing down the unlocking lever, use the draw-out handle to draw out the main unit to the position shown in the figure below.

⚠ CAUTION
Support the main unit firmly with hand and draw it out slowly.

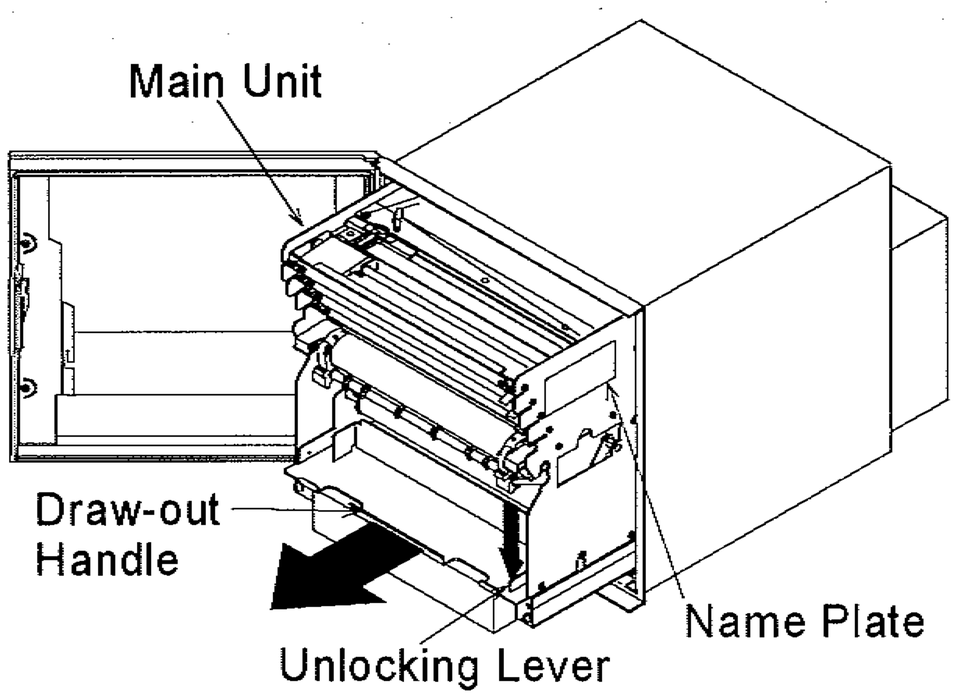


Fig. 9.3 Drawing out the Main Unit

③ Pushing down the lower right lever inside the main unit, draw it out to the near side.

⚠ CAUTION
Support the main unit firmly with hand and draw it out slowly.

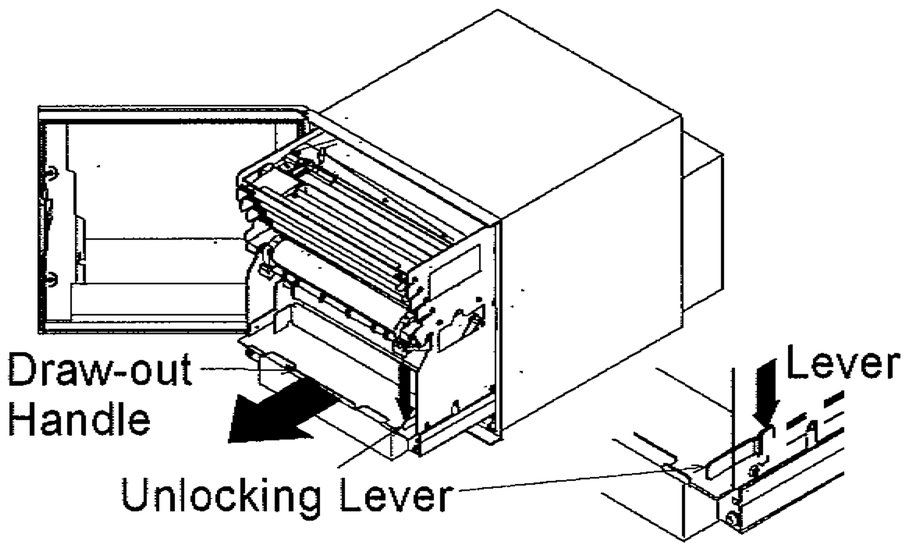


Fig. 9.4 Removing the Main Unit

④ The main unit is connected to the printed circuit board in the case by means of a flat cable. Shift down the levers at both ends of the connector for the main unit to unlock and disconnect the flat cable.

⚠ CAUTION
Disconnect/reconnect the connector on the part of the main unit. Do not disconnect/reconnect it on the part of the printed circuit board in the case because it could damage the card.

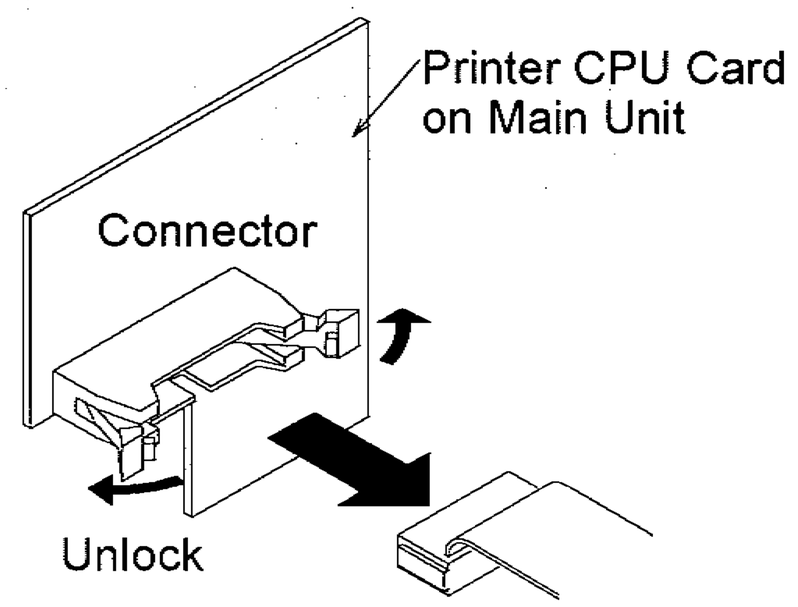


Fig. 9.5 Disconnecting the Flat Cable

REV.	DATE	DR.	CHK.	APP'D.	CHG.No.	DESCRIPTION
1	8/30/96	Kawa	Noso	Oda	2	3

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Replacing the Timing Belt

① Detach the cartridge pen.

② Disconnect the FPC cable connector connected to the rear of the servo unit. (See Fig. 9.6)

⚠ CAUTION

Draw out the FPC cable straight in a careful manner. Twisting it could cause a damage.

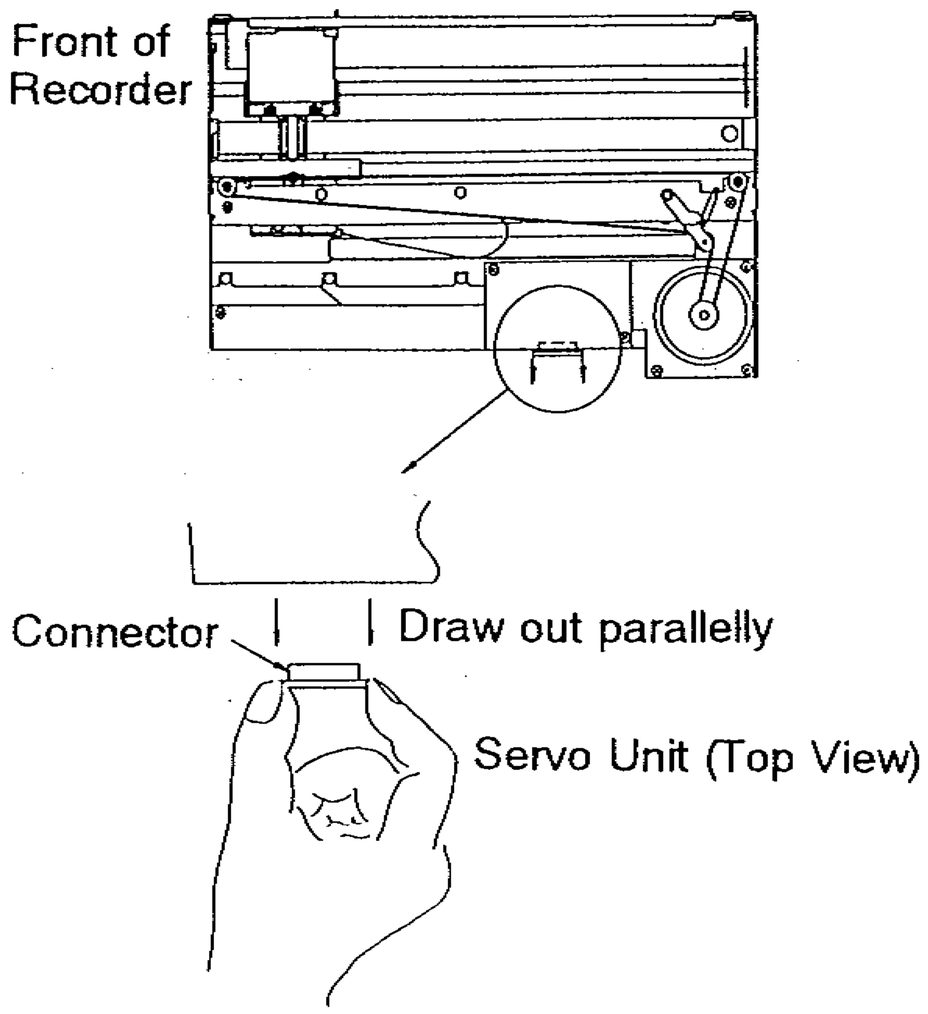

Fig. 9.6 Disconnecting the FPC Cable Connector

③ Unscrew the main unit as shown in Fig. 9.7 and draw out the servo unit forward to detach it. When this is done, loosen other screws used to fix the parts other than the servo unit to facilitate detachment of the servo unit.

⚠ CAUTION

Be careful not to damage the FPC cable.

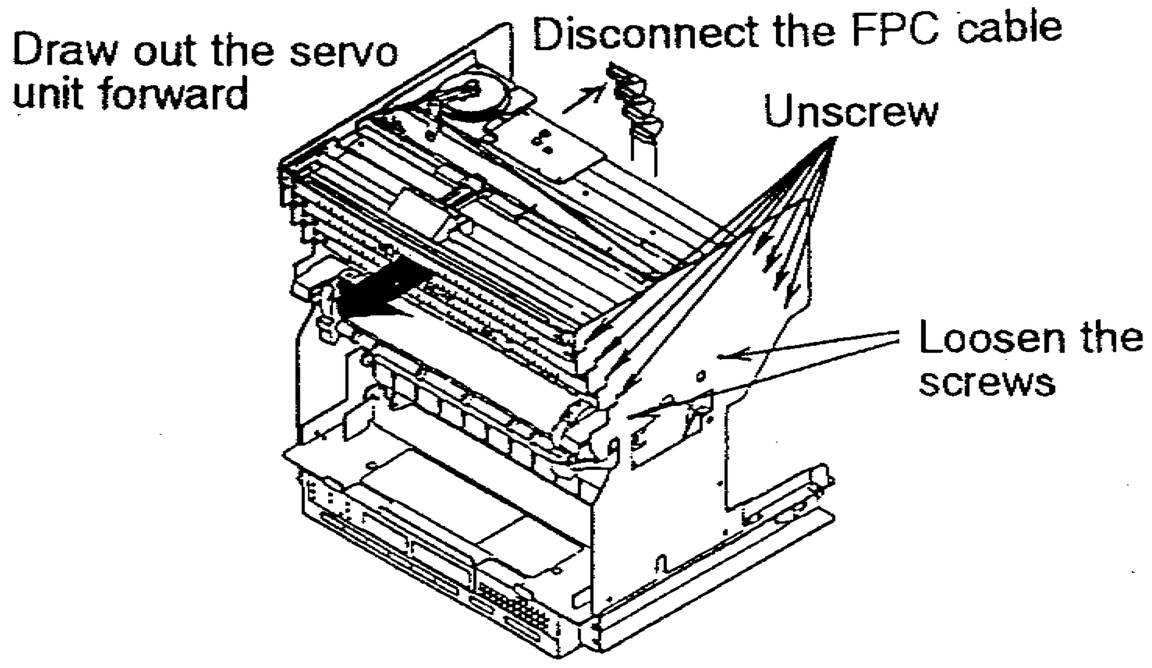

Fig. 9.7 Detaching the Servo Unit

④ Detach the timing belt from the servo unit.

⚠ CAUTION

Be careful not to damage the FPC cable for the non-contact potentiometer.

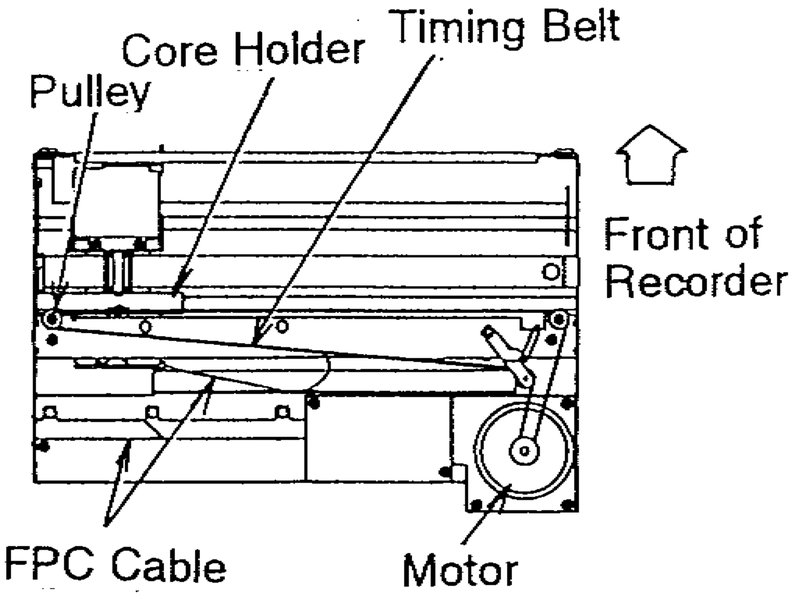

Fig. 9.8 Detaching the Timing Belt

⑤ Prepare a new timing belt. With its toothed side facing the inside, engage it with the teeth of the motor pulleys.

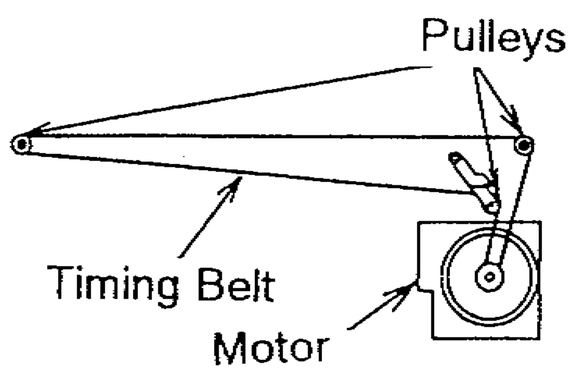

Fig. 9.9 Setting the Timing Belt onto the Pulleys

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/30/96	Kanai	Hara	oda	
2					
3					
CHG.No.					

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⑥ Fit the timing belt into the groove of the core holder. Make sure that the core holder moves smoothly to the leftand right.

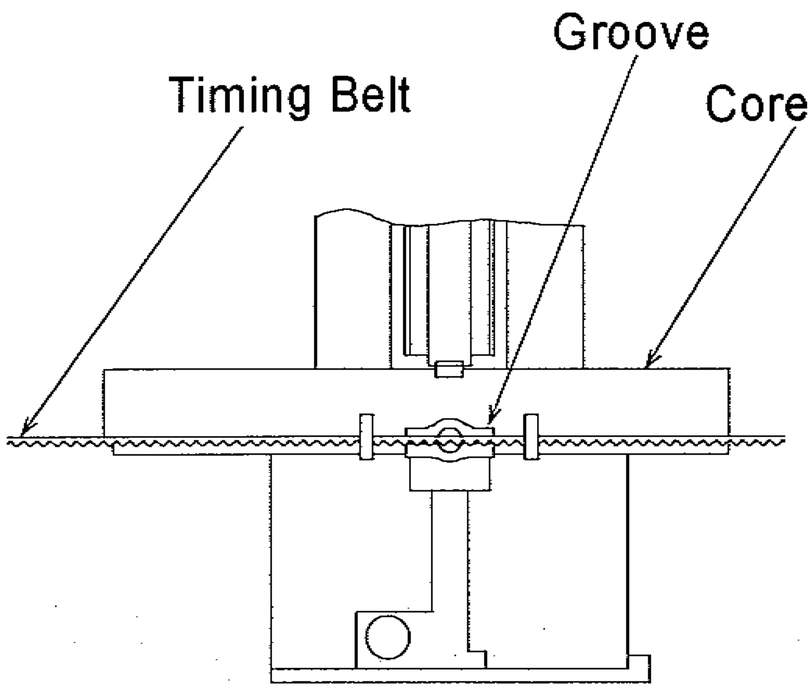


Fig. 9.10 Setting the Timing Belt onto the Core Holder

⑦ Fit the round projections of the servo unit into the grooves of the main unit frame to reattach the servo unit. Tighten the loosened screws.

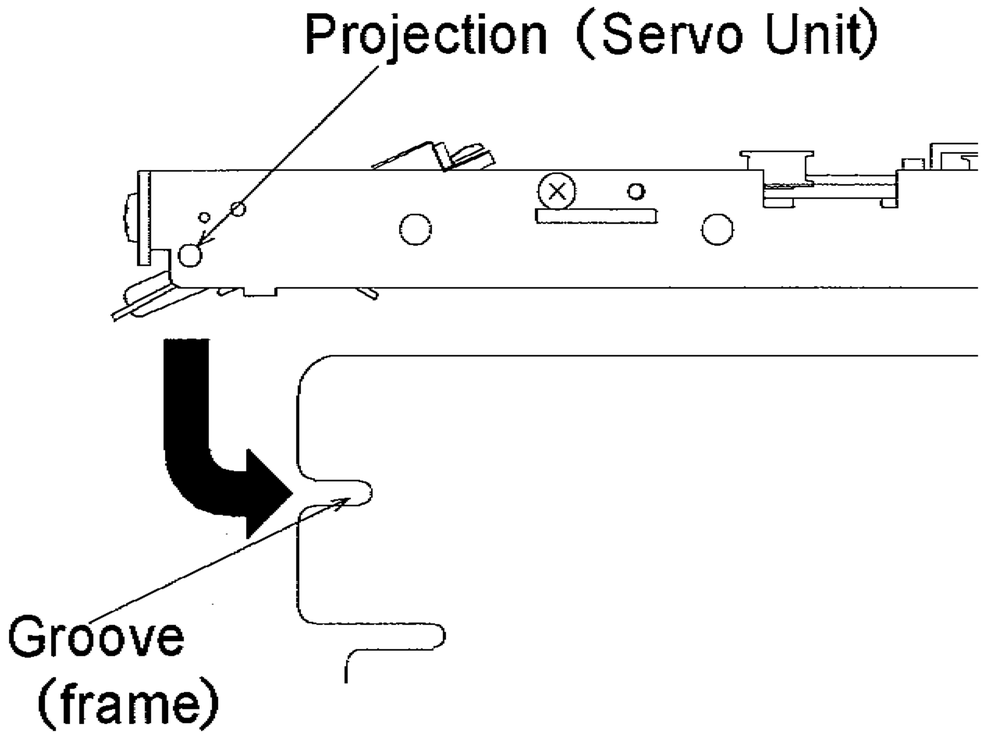


Fig. 9.11 Reattaching the Servo Unit to the Main Unit

⑧ Connect the FPC cable to the rear of the servo unit.

Setting the Main Unit

① Connect the flat cable coming from the printed circuit board in the case to the connector of the main unit.

② Push the main unit into the case as far as it goes.

10. CALIBRATION

10－1 Calibration Mode

In this section, you make cursor adjustment and input calibration.

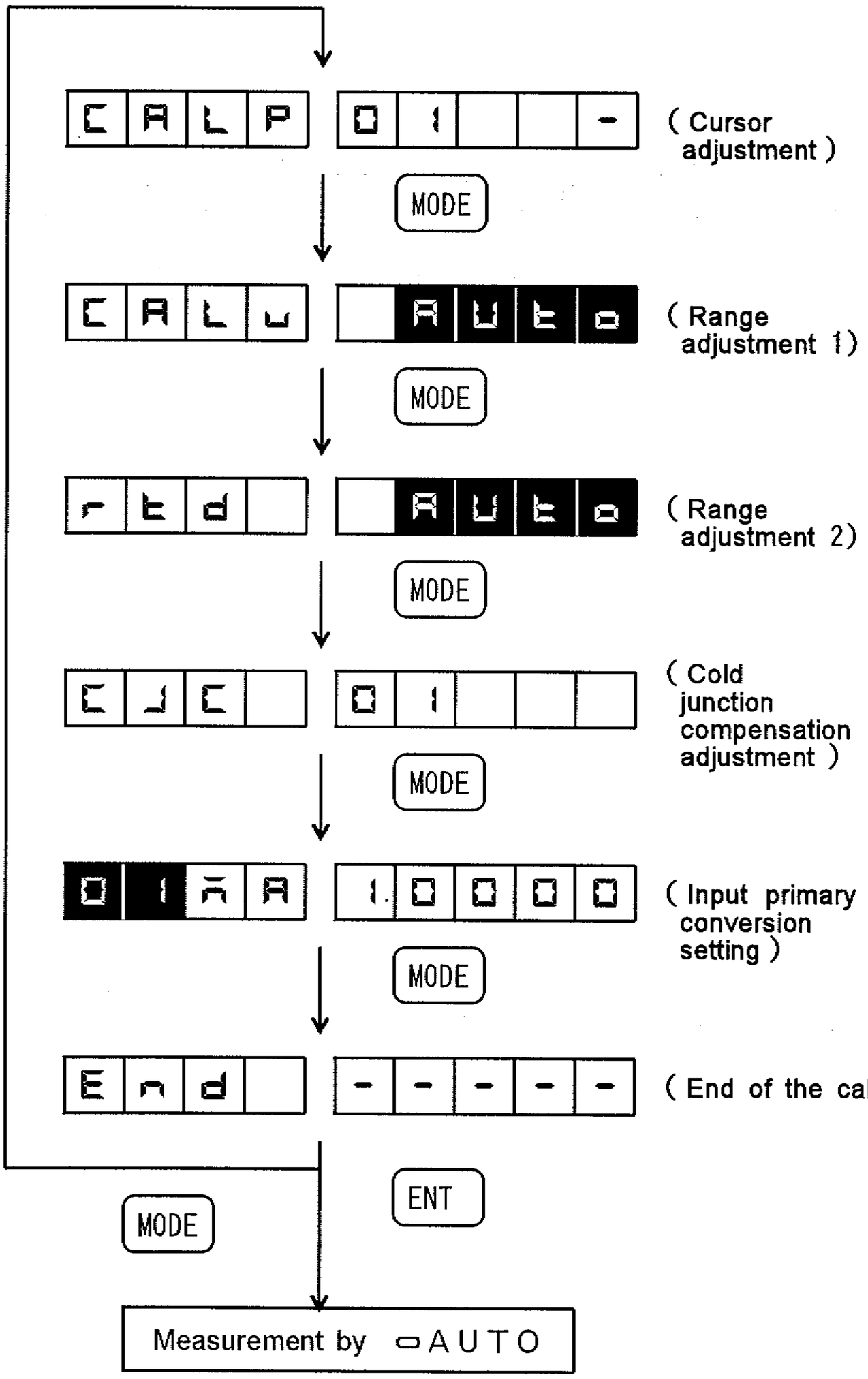
[Notes]

① Make calibration when there is a big error.

② Calibration should be carried out about 30 minutes or more after turning on the power.

③ Neither measurement nor recording is performed in the calibration mode.

Switching to the Calibration Mode



① Unlocking the keys

Press the PGM and ENT keys simultaneously for about 3 seconds. Press the MODE key to illuminate the "MAN" indicator lamp.

② Switching to the calibration mode

Press the ◀ and ENT key simultaneously for about 5 seconds.

③ The six mode indicator lamps blink and the calibration mode takes effect.

AUTO CLOCK PRINT
MAN CHART ALARM

Fig. 10.1 Switching to the Calibration Mode

You adjust the positions of the chart paper, scale plate, and cursor for each channel.

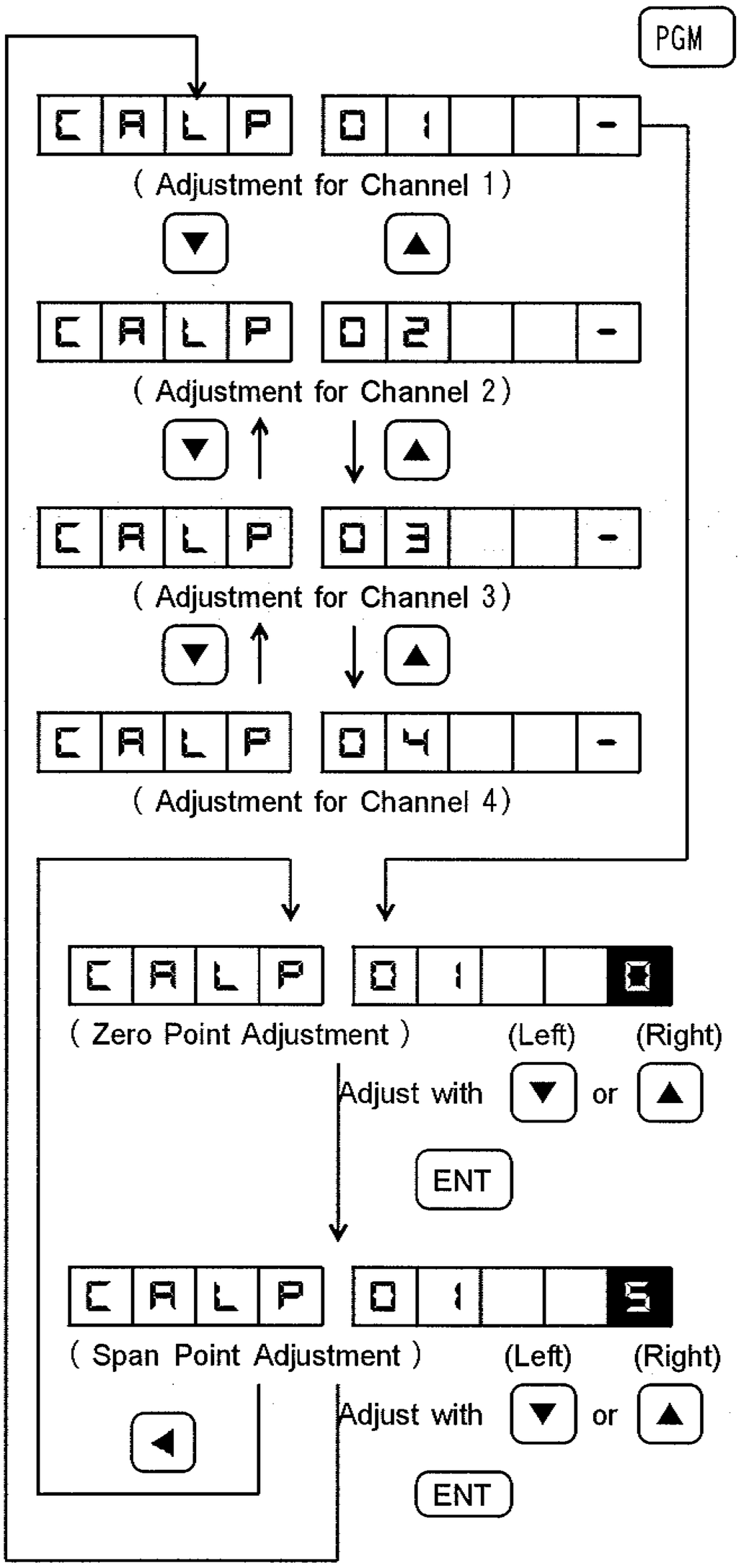


Fig. 10.2 Cursor Adjustment Example

[Notes]

① This calibration does not require a calibration signal to be input. Adjustment is allowed even if a measuring input has been applied.
② Do not make adjustment which causes the cursor to fully swing to the zero or span side. Such adjustment may cause a mechanically abnormal sound or hinder normal recording operation.

< Adjustment Method >

① Using the ▲ or ▼ key, adjust the cursor to scale plate and press the ENT key.

② Make sure that a scale plate position(zero point, span point)and chart paper position(zero point, span point)are properly adjusted.

[Notes]

① When the zero point of the scale plate is not aligned with that of the chart paper, adjust the scale plate position to align them.
② The span point recording position of the chart paper moves depending of expansion /coutraction of the chart paper. Adjust the scale plate position, based on the zero point.
③ Make this adjustment with the recorder running.

[Note]

" ■ " denotes a blinking LED.

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/30/96	Kuwata	Hara	Oda	
2	CHG.No.				
3					

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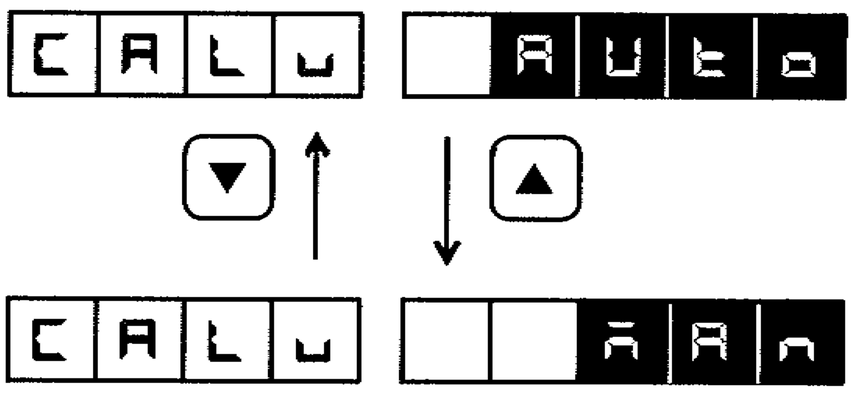
In this section, you make calibration for mV, V, mA, or thermocouple input.

Range adjustment 1 has two kinds of calibrations; auto calibration (display : Auto) and manual calibration (display : mAn).

Manual calibration allows you to calibrate only a required range.

Screen Configuration



[Note]

Calibrate all the channels.

Fig. 10.3 Range Adjustment 1 Screen Configuration

Wiring

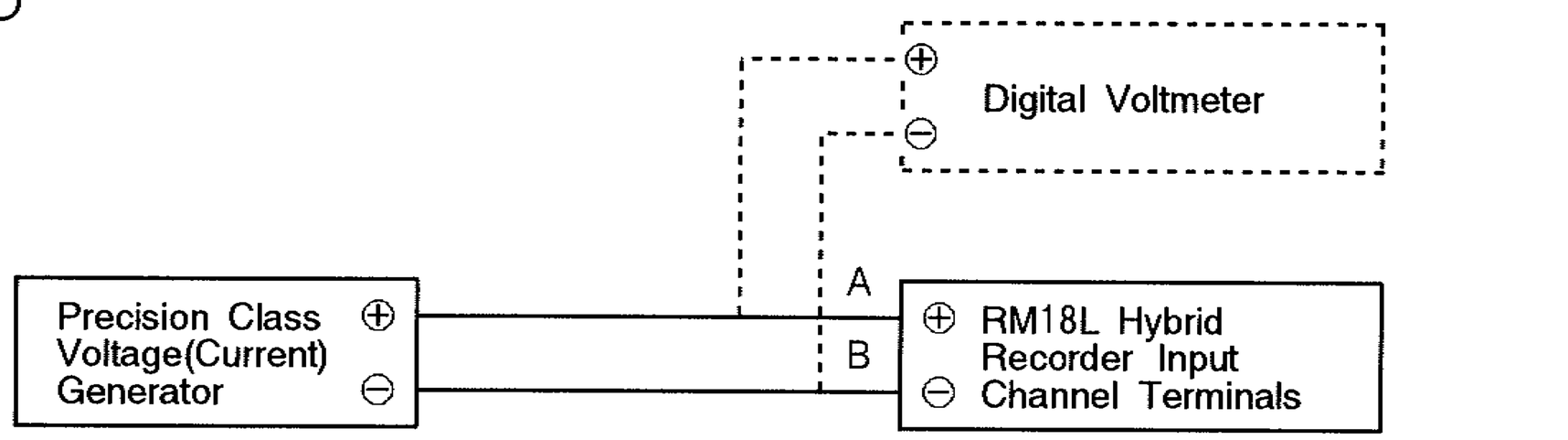


Fig. 10.4 Wiring for Range Adjustment 1

[Note]

When the mA input is used and a shunt resistor is attached to the input terminal block, detach a shunt resistor from the calibration channel and calibrate an input signal in voltage.

[Note]

Use the digital voltmeter in the following case.

① When a single unit of the voltage(current) generator cannot meet the calibration input voltage specification on Page 66, use the digital voltmeter with accuracy of ±0.02% or less.

DESCRIPTION | CHG.No. 2 3 | APP'D. | CHK. | DR. | DATE | REV. 1
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HXPRM18mnL0001E

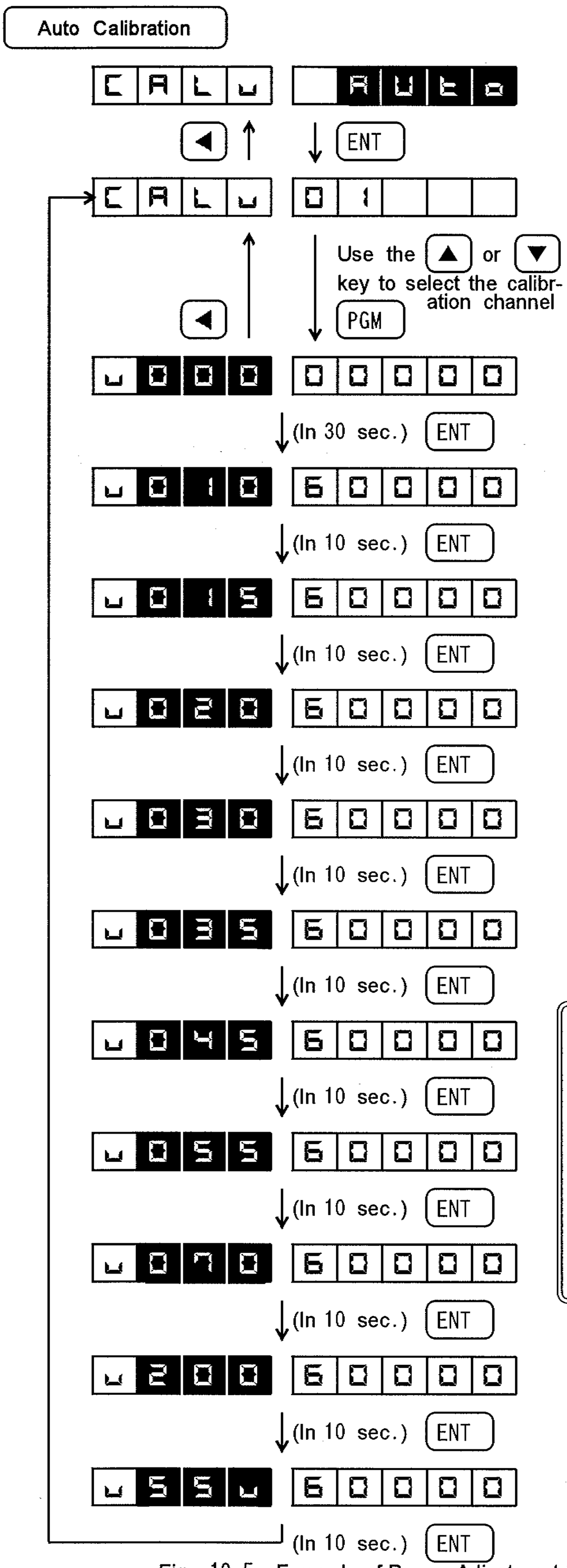

Fig. 10.5 Example of Range Adjustment 1 (Auto Calibration)

[Note]

" ■ " denotes a blinking LED.

① Select auto calibration (display : AUto)

② Select the channel to which you want to apply an input.

③ Press the PGM key to start calibration.

④ Input a voltage according to the following table.

Input Voltage Display	Input Voltage
␣000	0.000mV ±2μV
␣0 10	10.000mV ±2μV
␣0 15	15.000mV ±2μV
␣020	20.000mV ±2μV
␣030	30.000mV ±5μV
␣035	35.000mV ±5μV
␣045	45.000mV ±5μV
␣055	55.000mV ±5μV
␣070	70.000mV ±5μV
␣200	200.000mV ±10μV
␣55␣	5.500V ±1mV

⑤ A calibration time for one point is 30 seconds or more for 0 mV, and 10 seconds or more for the others; press the ENT key after the respective times.

[Note]

A value of the display (2) will be about 0 count for 0 mV input and about 60,000 counts for the other inputs. Since many ranges have been calibrated, a counter value could deviate within -2000 to +5000 counts, but this is a value with in a normal operating range.

Manual Calibration

This instrument provides calibrations corresponding to all the ranges. Like this calibration, however, it can provide calibration only designed for a specific range.

＜ Setting Example ＞ Inputting through the channel 1

Calibrate the range code No.000 (±10mV)

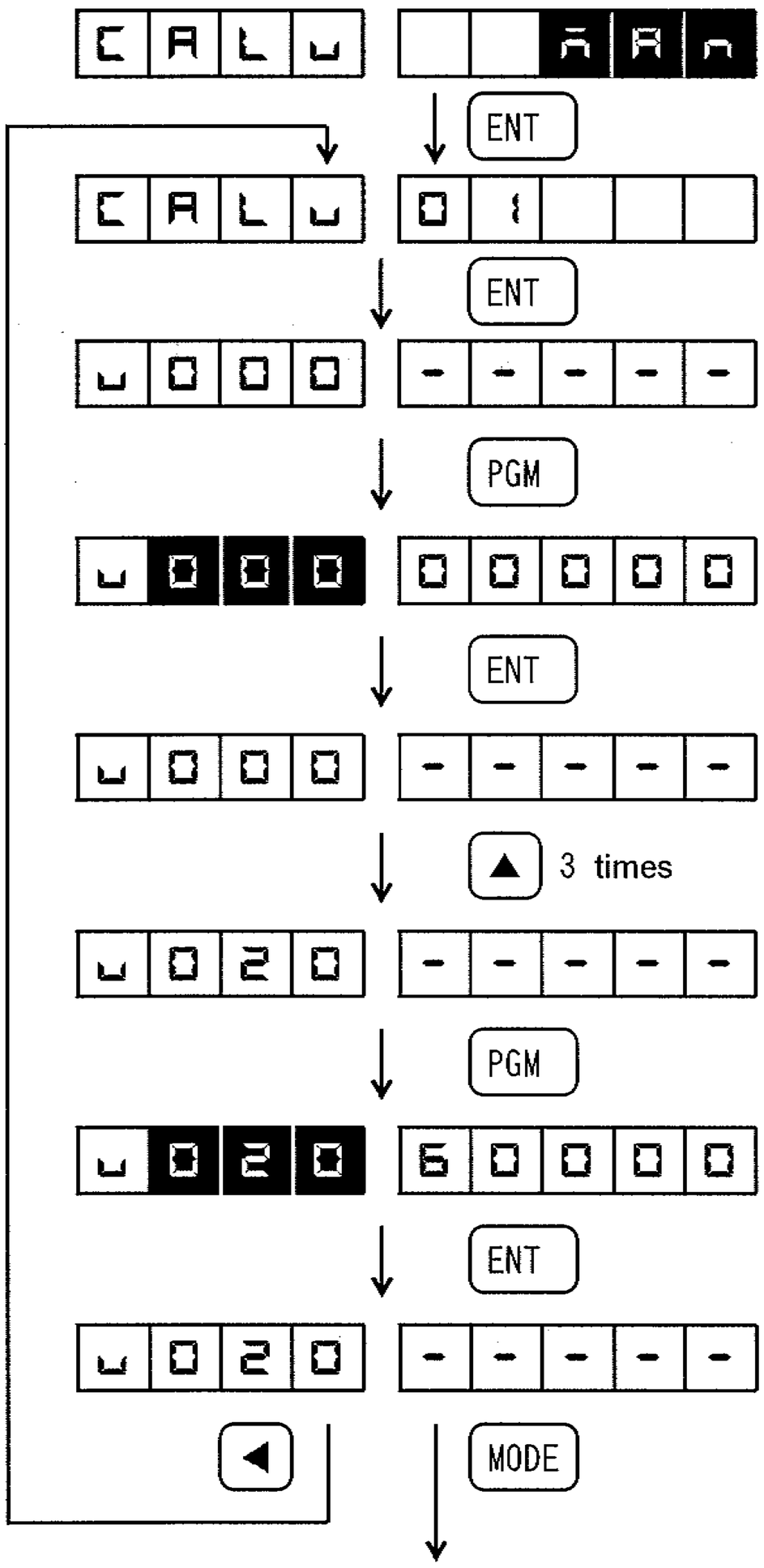

Fig. 10.6 Example of Range Adjustment 1 (Manual Calibration)

[Note]

" ■ " denotes a blinking LED.

① Select manual calibration (display : □AA)

② Select the channel to which you want to apply an input.

③ Make zero point calibration (□000).

④ Input a voltage corresponding to the range code number, according to the following table.

Input Voltage Display	Range Code No.
□000	All the range codes
□010	014,022,030,037,045
□015	017,048
□020	000,003,008,010,012,013,018,027,033,039
□030	011,015,019,023,028,031,034,038,040,046
□035	016,024,032,041,042,043
□045	021,025,036,044
□055	001,004,006,007,020,035,047,058
□070	026
□200	002,005
□55□	003,004,005,006,007,008

[Notes]

① See Page 40 for the range code numbers.

② Note that three points input may be required depending on the range.

DESCRIPTION | CHG.No. 2 3 | APP'D. oda | CHK. Hoso | DR. Kawa | DATE 8/30/96 | REV. 1
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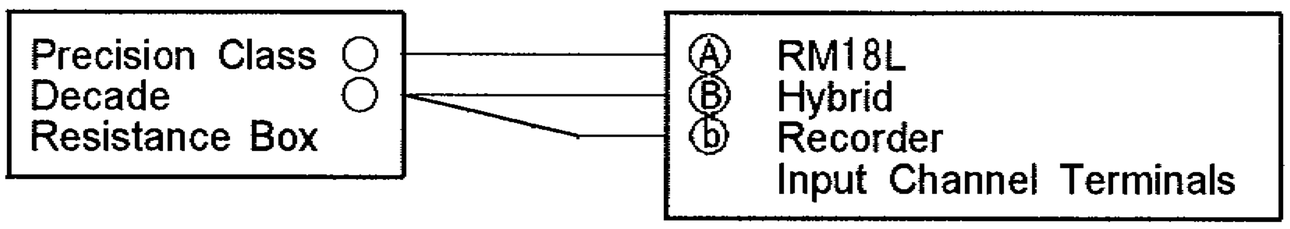
10-4 Range Adjustment 2 (rtd)

In case of resistive temperature detector input, carry out this calibration after range adjustment 1.

Range adjustment 2 has two kinds of calibrations; auto calibration (display : Auto) and manual calibration (display : mAn). Manual calibration allows you to calibrate only a required range.

Wiring

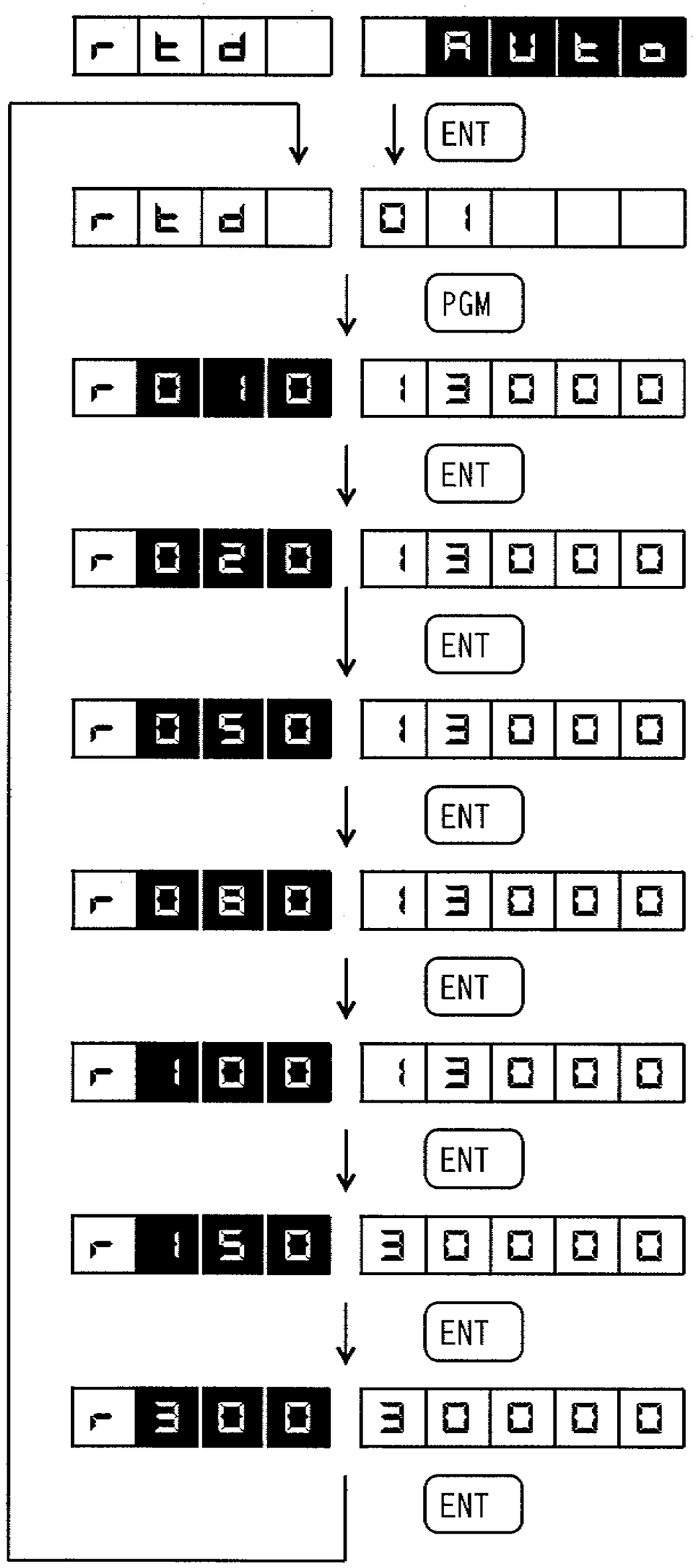


[Notes]
① Deviation of resistance value for each wire should be 6m Ω or less.
② Calibrate all the channels.

Connect to the calibration input channel

Fig. 10.7 Range Adjustment 2 Screen Configuration

Auto Calibration



① Select auto calibration. (display : Auto)

② Select the channel to which you want to apply an input.

③ Press PGM key to start calibration.

④ Input a resistance value according to the following table. After 10 seconds or more, press ENT key.

Input Resistance Display	Input Resistance Value
r010	10.000Ω ± 5mΩ
r020	20.000Ω ± 5mΩ
r050	50.000Ω ±10mΩ
r080	80.000Ω ±10mΩ
r100	100.000Ω ±15mΩ
r150	150.000Ω ±20mΩ
r300	300.000Ω ±35mΩ

[Note]
A value of the display (2) is in a range of 5000 to 50000.

[Note]
" ■ " denotes a blinking LED.

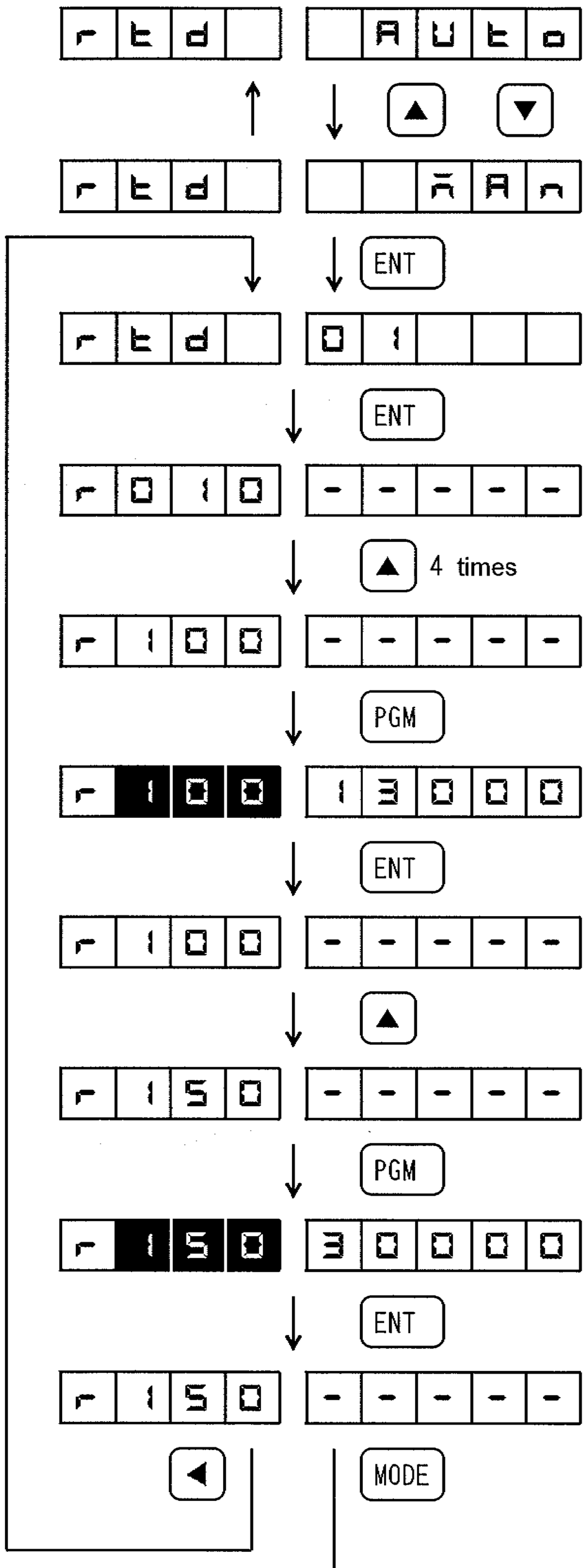
Fig. 10.8 Example of Range Adjustment 2 (Auto Calibration)

DESCRIPTION | CHG.No. 2 3 | APP'D. Oda | CHK. Hara | DR. Kata | DATE 8/30/96 | REV. 1 | PAGE 73 OF | HXPRM18mnL0001E

Like range adjustment 1, range adjustment 2 provides calibration corresponding to a specific range.

Manual Calibration

< Setting Example > Calibrating the range code №51 (Pt100) at the channel 1.



[Note]

" ■ " denotes a blinking LED.

① Select manual calibration.
(display : mAn)

② Select the channel to which you want to apply an input.

③ Press PGM key to start calibration.

④ Input a required resistance value according to the following table. After 10seconds or more, press ENT key.

Input Resistance Display	Range Code No.
r010	056,057
r020	056,057
r050	053,054
r080	053
r100	049,050,051, 052,054,055
r150	049,051,055
r300	050,052

[Note]

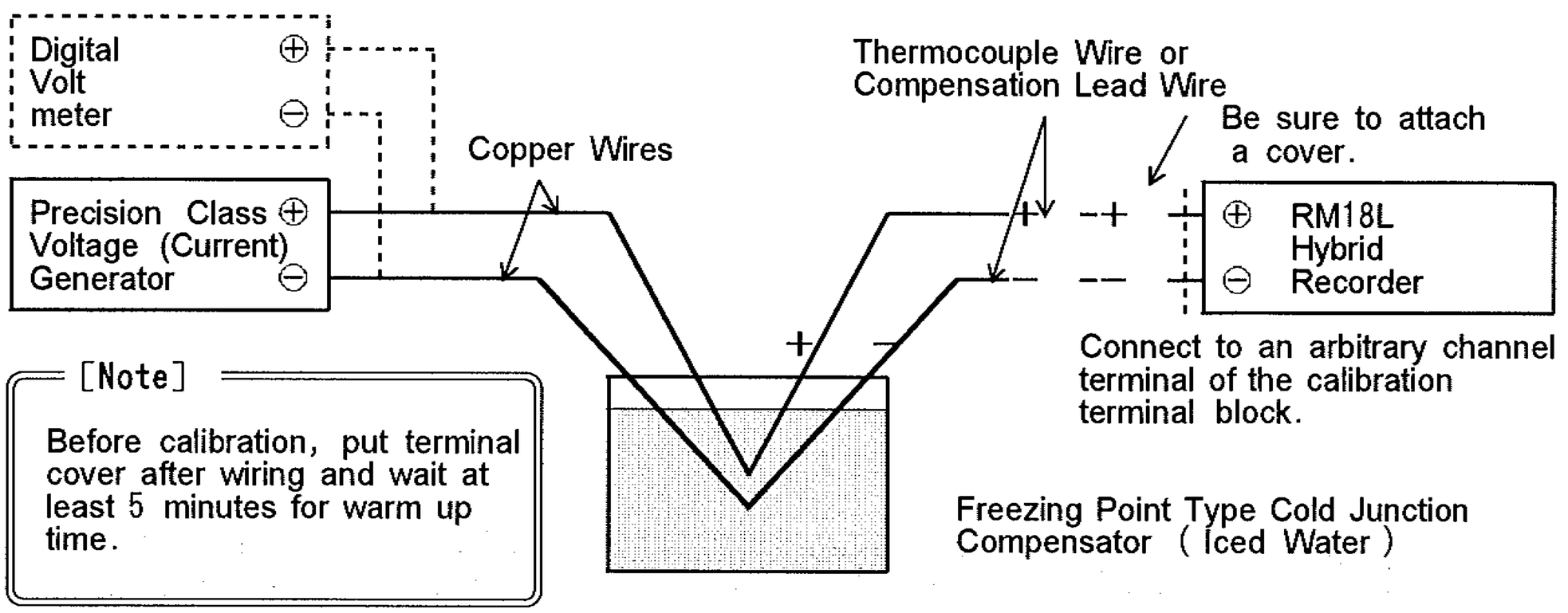
See Page 40 for the range code numbers.

Fig. 10.9 Example of Range Adjustment 2 (Manual Calibration)

DESCRIPTION | CHG.No. | DR. Kazuki | CHK. Hara | APP'D. Oda | DATE 93/9/6 | REV. 1 | PAGE 74 OF | HXPRM18mnL0001E

In case of thermocouple input, make this adjustment. Make cold junction compensation adjustment for each terminal block.

Wiring



[Note]

Before calibration, put terminal cover after wiring and wait at least 5 minutes for warm up time.

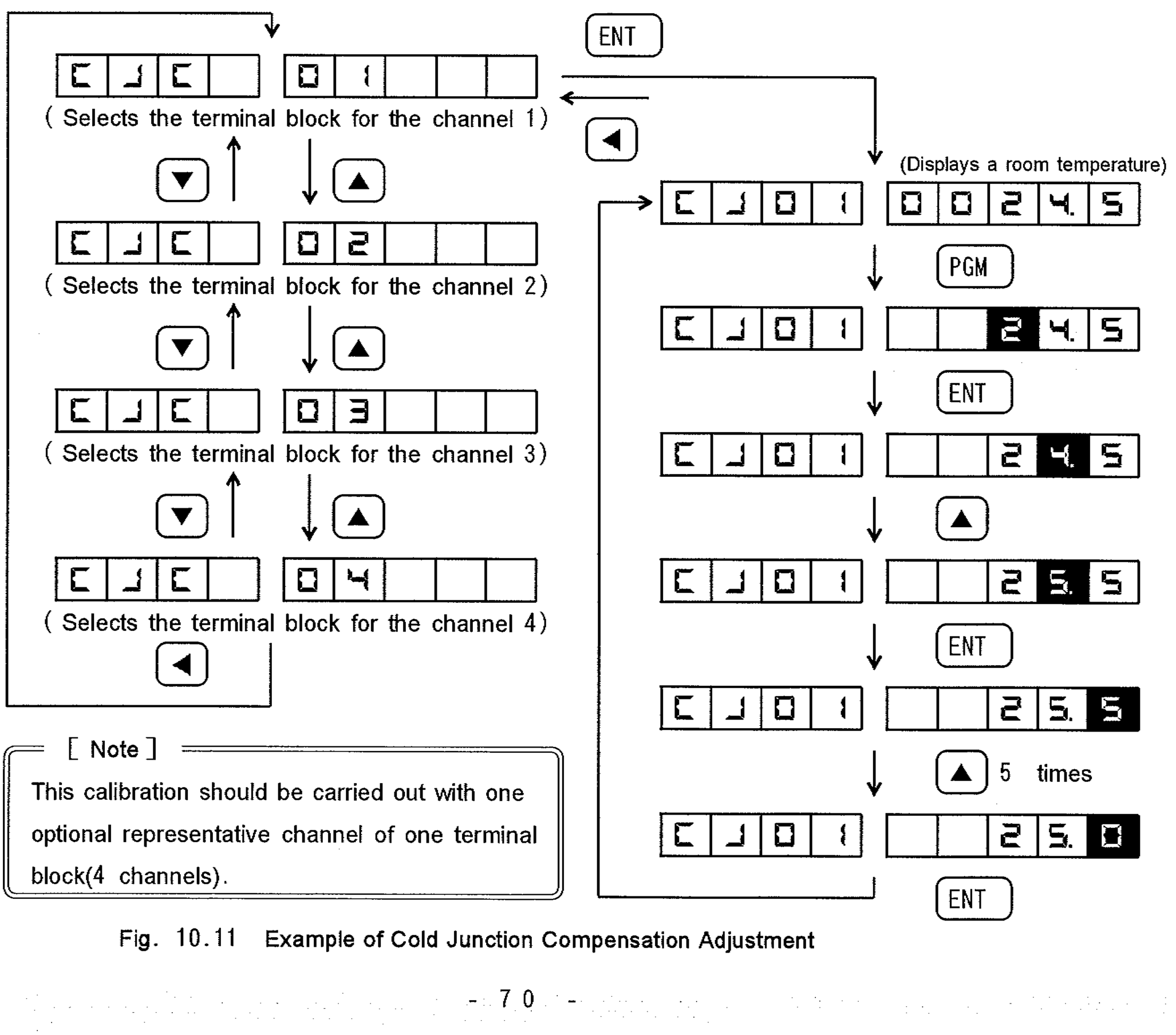
Fig. 10.10 Connections for Cold junction Compensation Adjustment

Calibration

< Setting Example >

When an input is connected to the channel 1, and a thermocouple input display value (measured value at 0°C input) is −0.5°C and a room temperature display value is 24.5°C.

① Confirm in advance a measured value (−0.5°C in this setting example) when 0.000mV ±2μV is applied to the channel 1 by the voltage generator.
② Add to the room temperature the difference (0.5°C) from a true value. [0− (−0.5) =0.5°C]
③ Calibrate other input terminal blocks in the same manner.



[Note]

This calibration should be carried out with one optional representative channel of one terminal block(4 channels).

Fig. 10.11 Example of Cold Junction Compensation Adjustment

When you want to correct an input, set the parameters shown in the following formula.

Conversion value (mV) = Input value (mV) × A + B

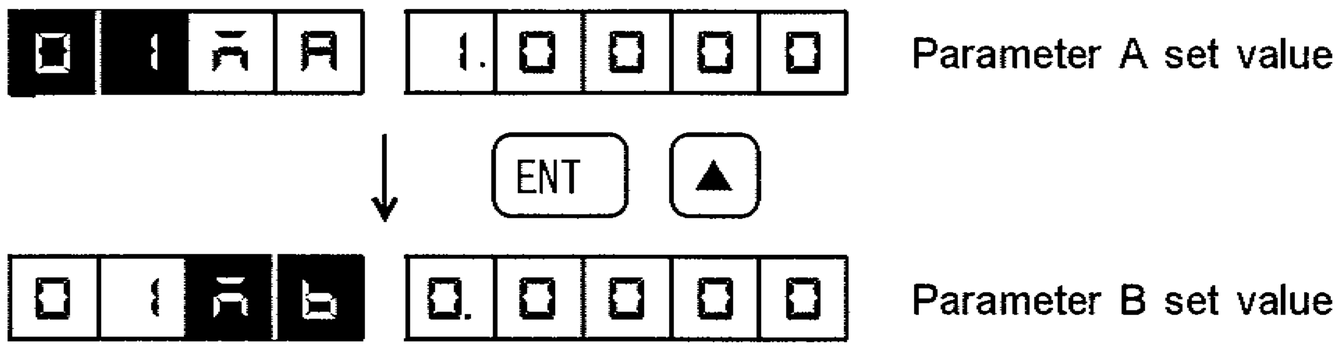


Fig. 10.12 Input Primary Conversion Setting Screen

[Note]

Assuming the input value is mV, calculate and set the parameters A and B.

Setting Example

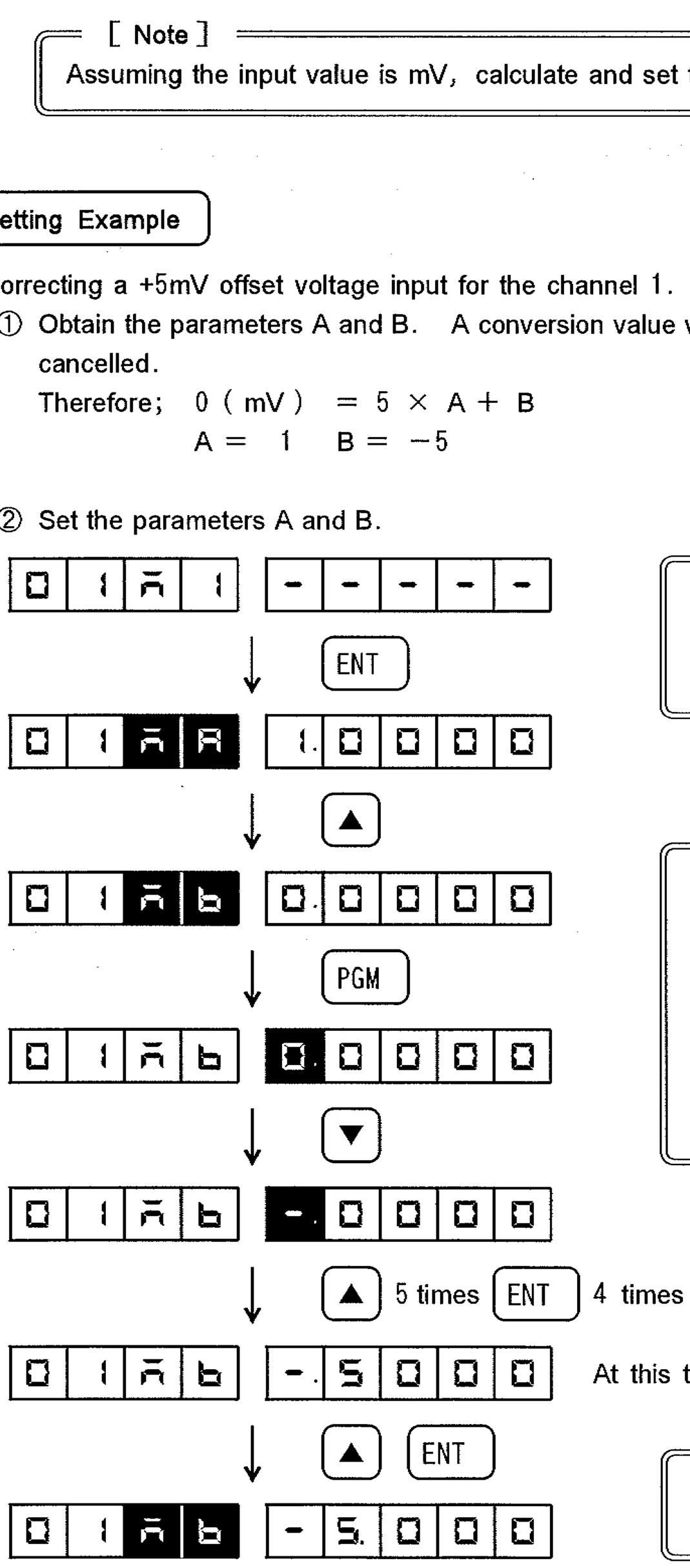
Correcting a +5mV offset voltage input for the channel 1.

① Obtain the parameters A and B. A conversion value will be 0mV because an offset voltage is cancelled.

Therefore; 0 (mV) = 5 × A + B

A = 1 B = −5

② Set the parameters A and B.



[Reference]

Initial values for A and B are A = 1.0000 and B = 0.0000.

[Notes]

1. When this function is not used, set A = 1.0000 and B = 0.0000.
2. Note that there is an offset voltage to a reference input at the time of scale test upon inspection.

[Note]

" ■ " denotes a blinking LED.

Fig. 10.13 Input Primary Conversion Setting Example

DESCRIPTION | APP'D. Oda | CHK. Nozo | DR. Kawa | DATE 8/6/96 | REV. 1 | CHG.No. 2 3
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When input wiring is blocked by the mounting panel and does not reach at the time of scale test, use this tie port.

Using the Tie Port

Rear View of Recorder

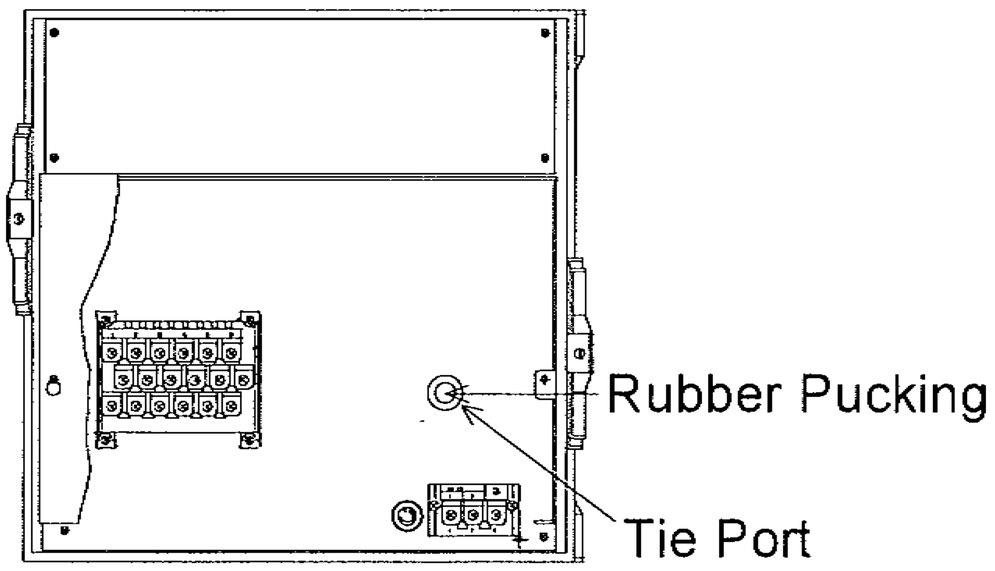


Fig. 10.14 Tie Port Position

① Turn off the power switch.

② Take out the main unit. (See Page 60)

③ Remove the rubber packing shown in Fig. 10.14.

Side View of Recorder

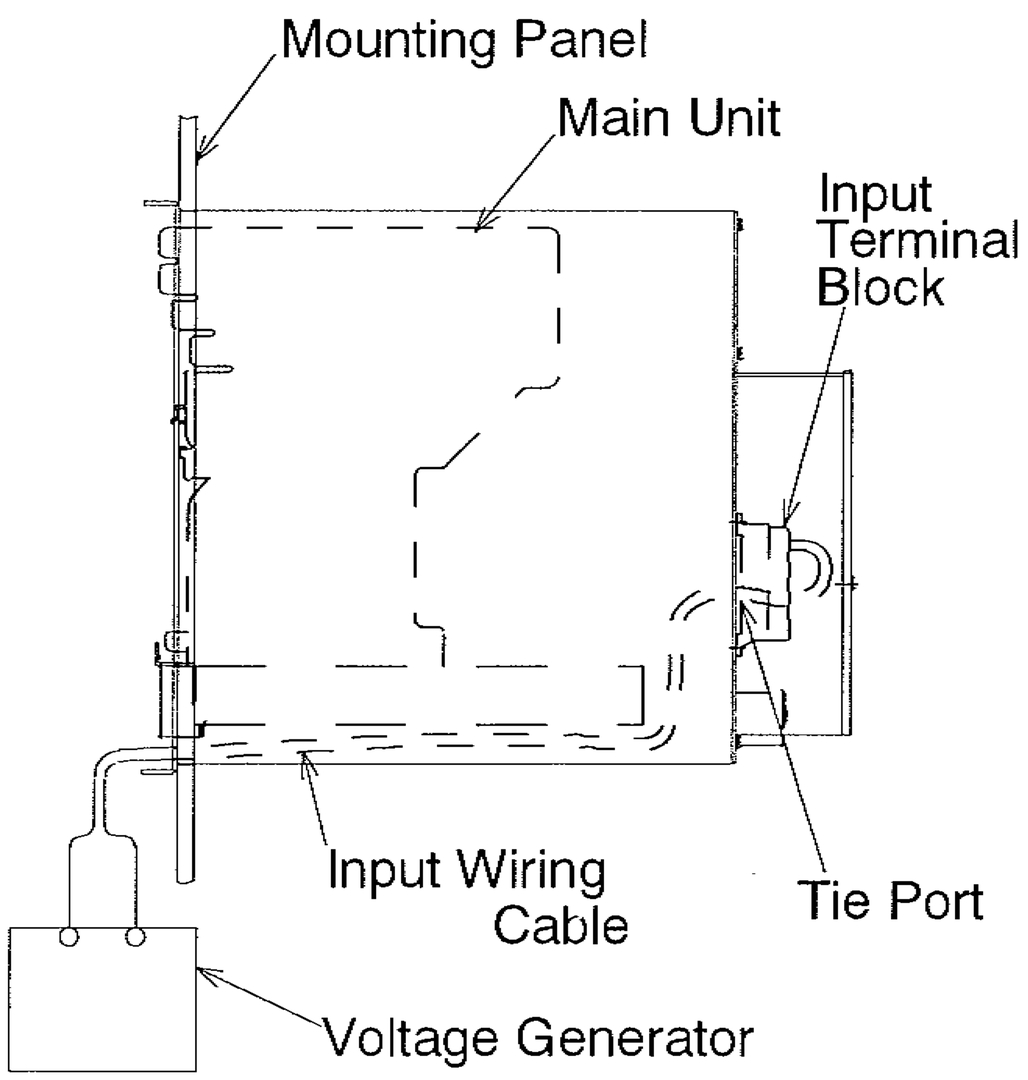


Fig. 10.15 Drawing out the Input Wiring Cable

④ Use an input wiring cable which is 2m or longer. Wire it to the terminal of the input channel you want to adjust.

⑤ With the input wiring cable pull downward through the tie port, connect the flat cable to the main unit, and put the main unit back into the case.

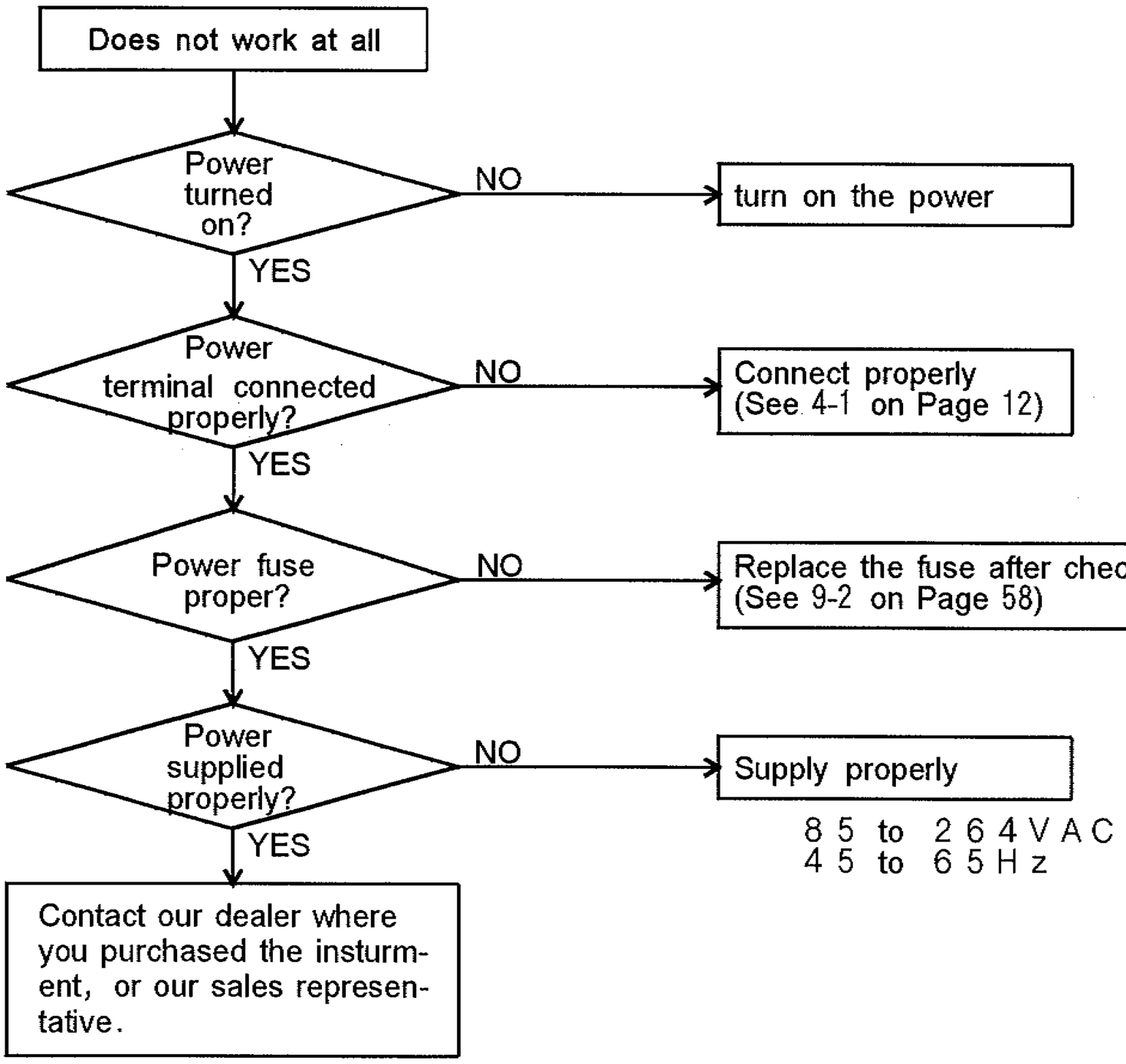
⑥ Connect the voltage generator, etc. to make necessary adjustment/confirmation.

⑦ After completion, disconnect the wiring in the reverse procedure and plug the tie port with a rubber packing.

Troubles

Trouble		Remedy
Does not work at all		→ Flow chart 1 (Page 73)
Big error		→ Flow chart 2 (Page 74)
Recording error	Cursor fully swung	→ Flow chart 3 (Page 74)
	No recording at all	→ Flow chart 4 (Page 75)
	Faint printing	→ Flow chart 5 (Page 75)
Chart paper feed error	No feed at all	→ Flow chart 6 (Page 76)
	Improper feed	→ Flow chart 7 (Page 76)
	Inaccurate feed rate	→ Contact our dealer where you purchased the instrument, or our sales representative.

Flow Chart 1



DESCRIPTION | DATE | DR. | CHK. | APP'D. | CHG.No.
1 | 8/3c/96 | Kawai | Hara | Oda | 2 | 3
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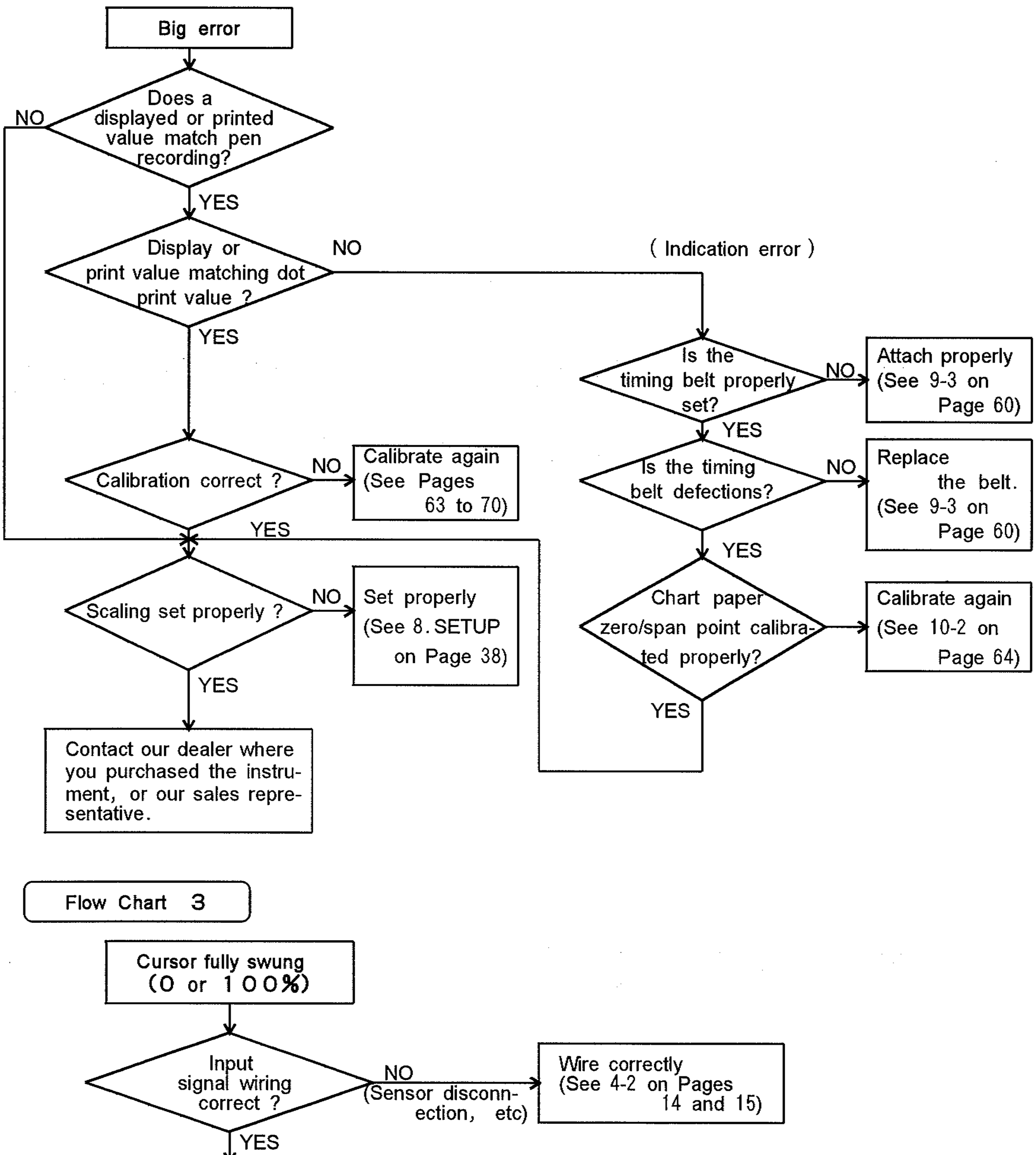
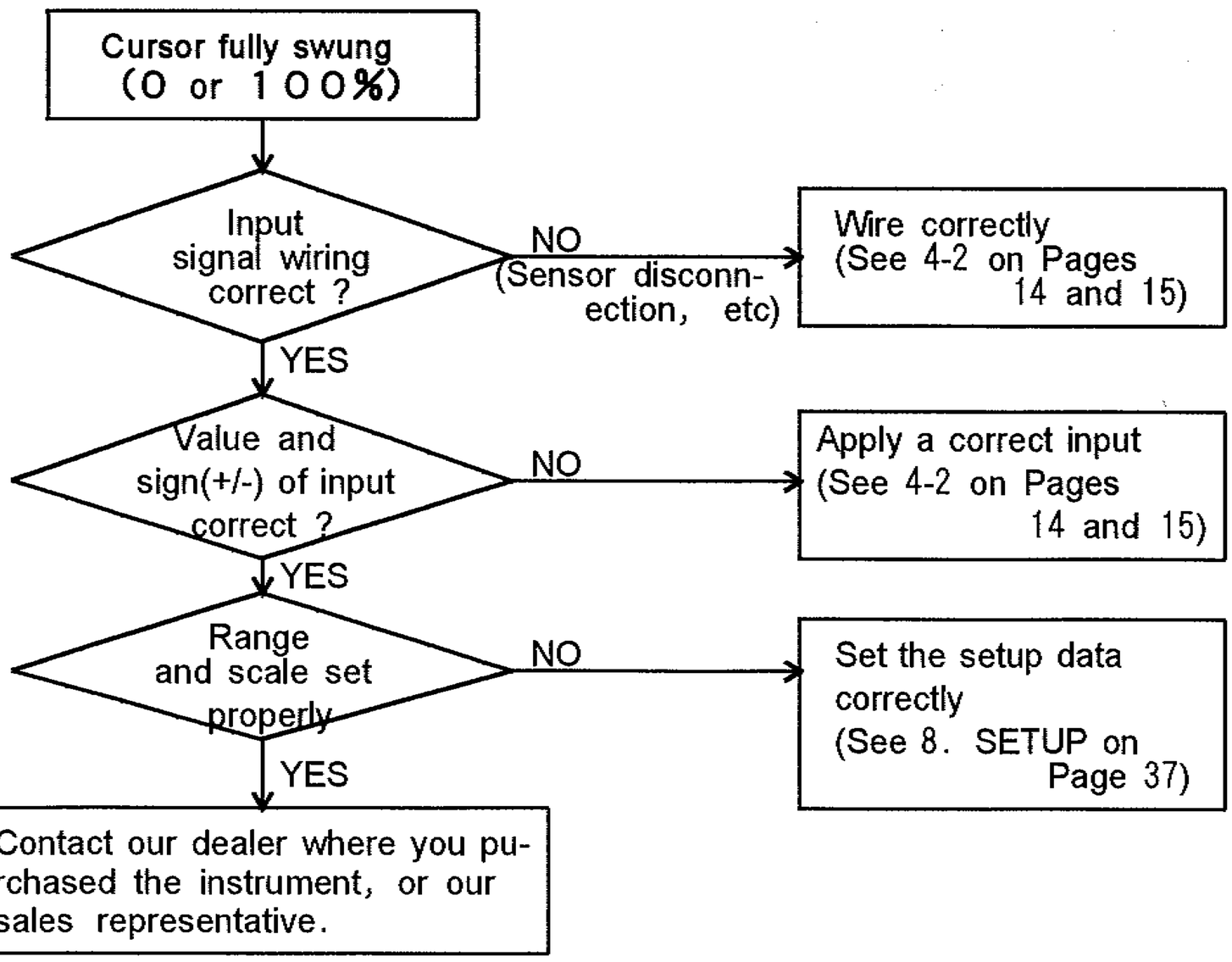
Flow Chart 2



Flow Chart 3



DESCRIPTION	CHG.No.	DATE	DR.	CHK.	APP'D.	REV.
	2 3	8/30/96	Kaiz	Hara	Oda	1

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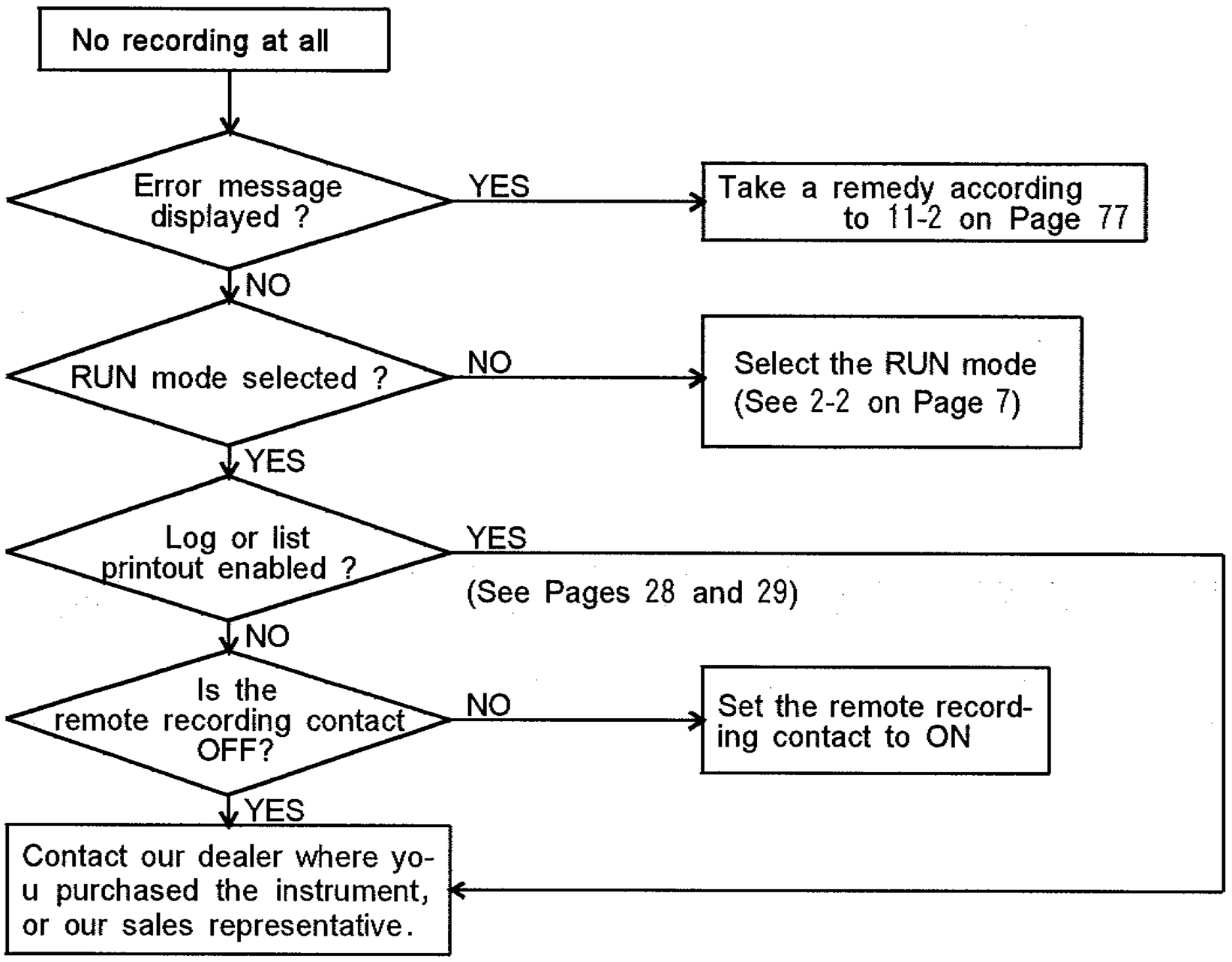
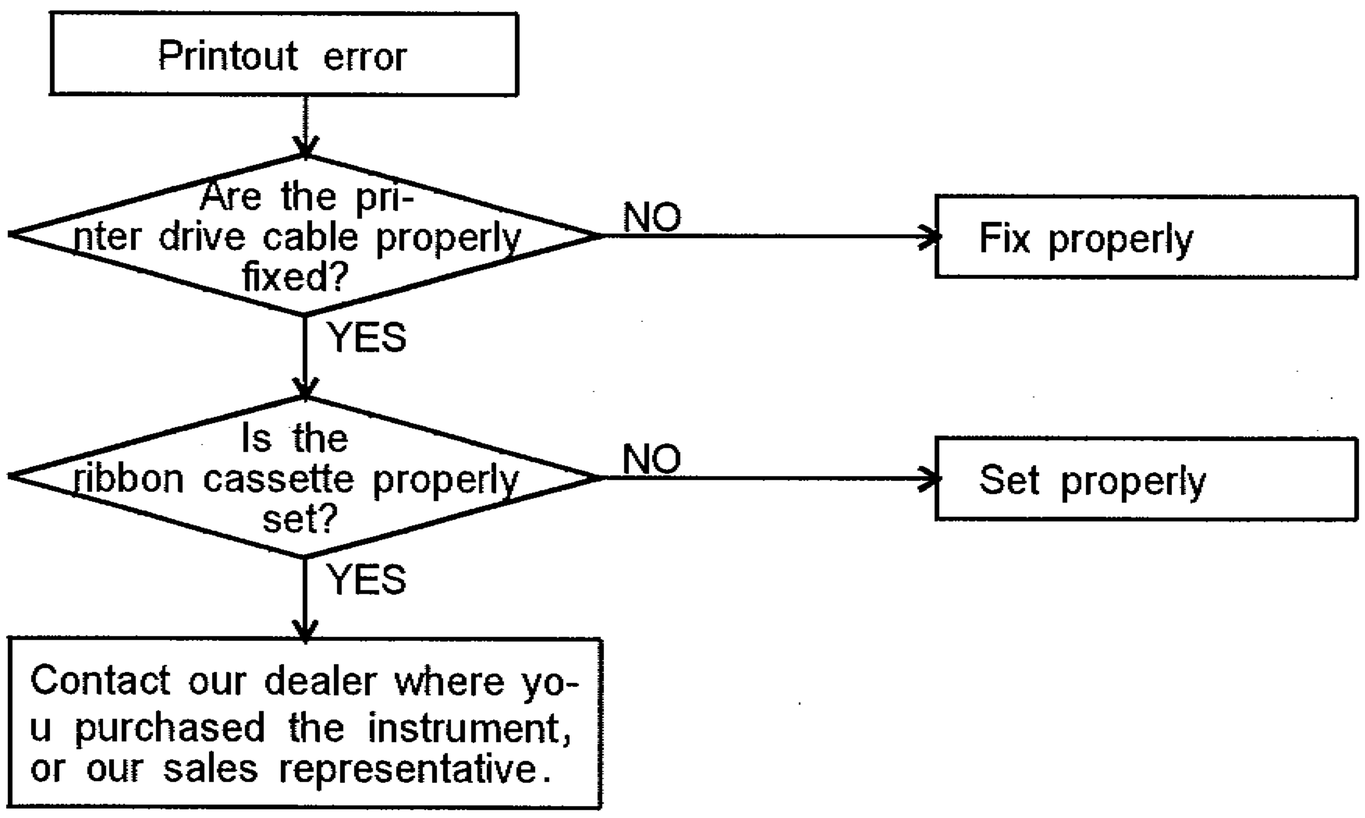
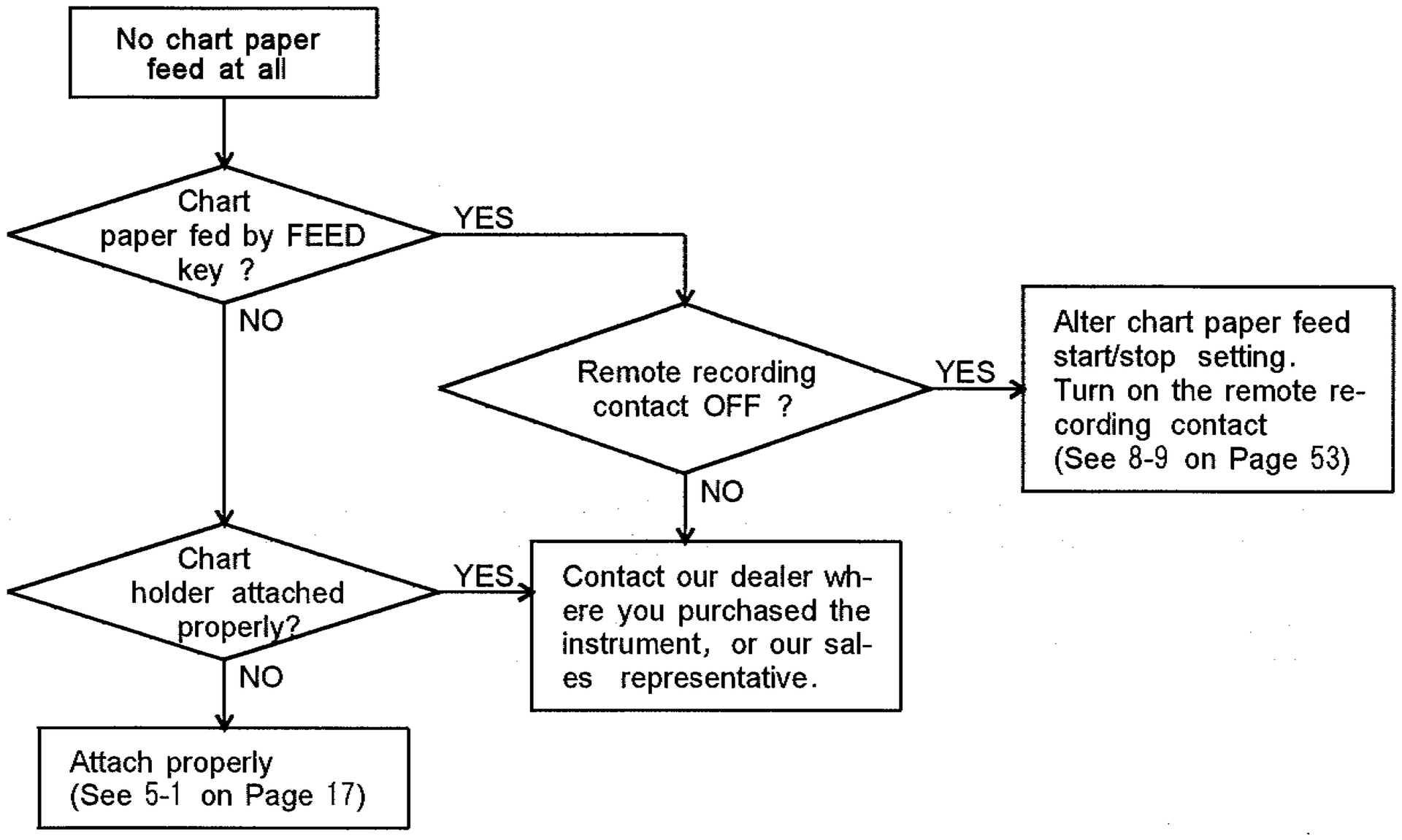
Flow Chart 4



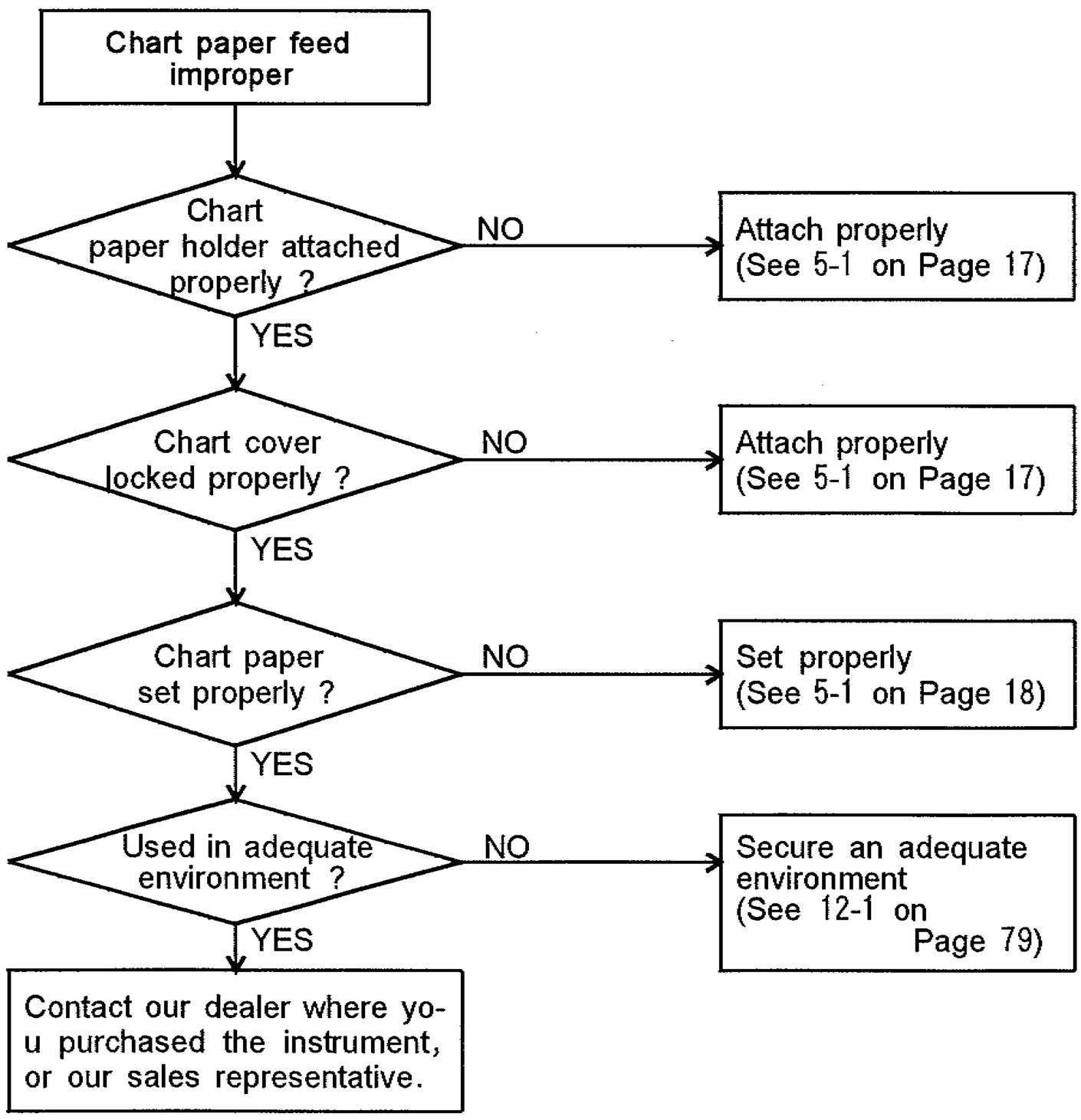
Flow Chart 5



Flow Chart 6



Flow Chart 7



REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/20/96	Kasuda	Hara	Oda	

This instrument always makes a self diagnosis on the items listed in Table 11.1 below. When an error is found in the self diagnostic results, a relevant error number is displayed.

Self Diagnostic Items

Table 11.1 List of Self Diagnostic Items

ERROR No.	Diagnosis	Remedy
2	Printer zero position error. The printer's zero point position cannot be detected.	Set the ribbon cassette properly. (See 5-3 on Page 20)
5	Communication disconnected between the main CPU card and printer CPU card	Contact our dealer where you purchased the instrument, or our sales representative.
6	Printer CPU card command error	
7	1-pen ADC card error	
8	2-pen ADC card error	
9	3-pen ADC card error	
10	4-pen ADC card error	
11	1-pen ADC card calibration value error	
12	2-pen ADC card calibration value error	
13	3-pen ADC card calibration value error	
14	4-pen ADC card calibration value error	
15	1-pen ADC card unvolatile memory error	
16	2-pen ADC card unvolatile memory error	
17	3-pen ADC card unvolatile memory error	
18	4-pen ADC card unvolatile memory error	
19	Input terminal block calibration value data error	
24	Input terminal block unvolatile memory error	
29	1-pen indication calibration value data error	
30	2-pen indication calibration value data error	
31	3-pen indication calibration value data error	
32	4-pen indication calibration value data error	
33	1-pen indication calibration value unvolatile memory error	
34	2-pen indication calibration value unvolatile memory error	
35	3-pen indication calibration value unvolatile memory error	
36	4-pen indication calibration value unvolatile memory error	
38	Unvolatile memory write error	
39	Unvolatile memory data error	
41	Clock memory error	
42	Watchdog timer error	
43	Software error	

Error Display

- When the display is in the AUTO mode, (⇨AUTO) an error message is displayed.
- When multiple errors are encountered, their error numbers are automatically displayed sequentially.

[Note]

While an error is being displayed, an alarm is not indicated.

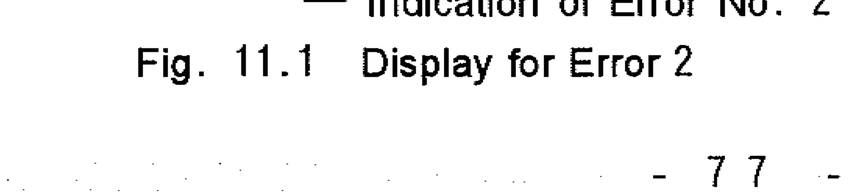


Fig. 11.1 Display for Error 2

DESCRIPTION | CHG.No. | 2 | 3
APP'D. | Oda
CHK. | Hara
DR. | Kaneko
DATE | 8/30/96
REV. | 1
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Error Output (FAIL)

When an error occurs, it is output as follows.

① In case of standard specification
When an error occurs, an error output(FAIL) is activated.

② In case of POWER-OFF specification (Option)
When an error occurs, an error output(FAIL) is deactivated.

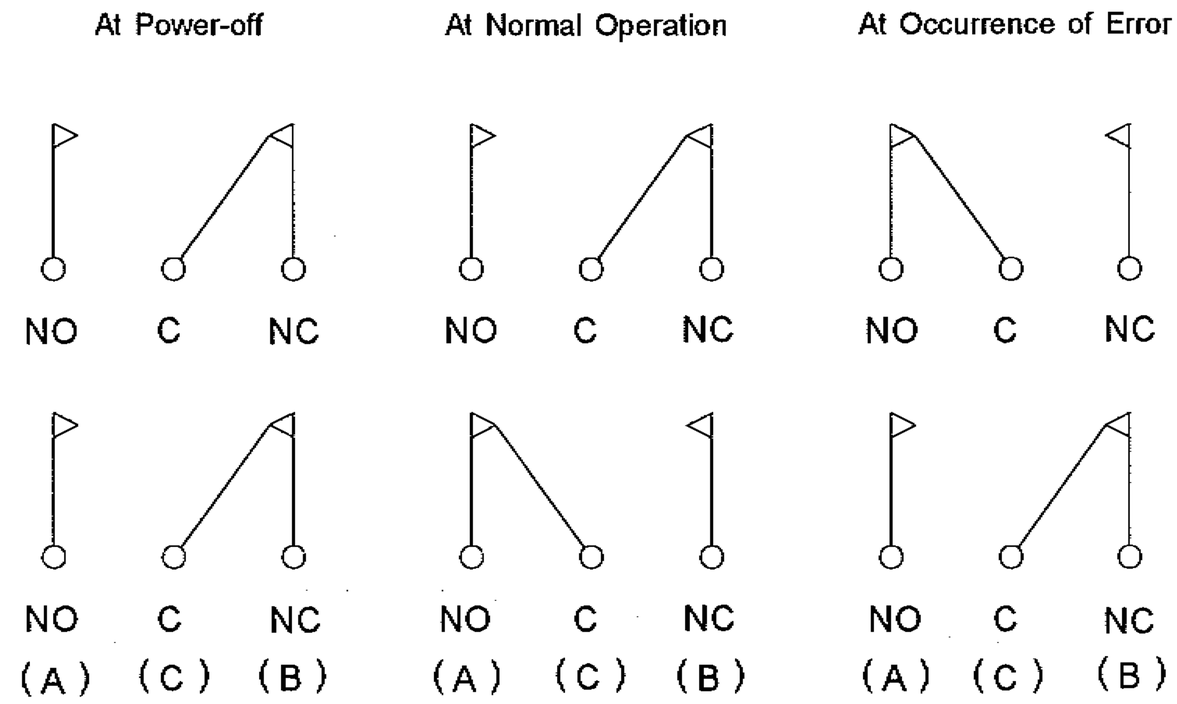

Fig. 11.2 Error Output Operation

[Notes]
① An error output is made only to the relay No.8. individual alarm output is ignored.
② To use this function, optional 8 relays are required.

12. SPECIFICATIONS

12－1 Common Specifications

● Type of Input

DC voltage : 4mVDC min, 20 VDC max
Thermocouple : K, T, J, E, B, S, R, G, C, N,
PR40-20, PL II, Au-Fe, U, L
Resistive temperature detector :
Pt100, JPt100, Pt50
Cu 10Ω at 0°C
Cu 10Ω at 25°C
DC current : 4 to 20mA DC

● Performance/Characteristics

Recording accuracy : ±0.5%max
Dead band : Within 0.2%
Input impedance :
10M Ω min in mV, TC input
(without open input protection),
200K Ω min in mV, TC input
(with open input protection),
1M Ω min in voltage input,
100Ω (shunt resistance : external) in mA input.
Allowable signal source resistance :
10K Ω max in mV, TC input
(without open input protection),
200Ω max in mV, TC input
(with open input protection),
1K Ω max in Voltage input,
10Ω max(per line) in Resistive temperature detector input.
Normal mode reduction ratio :
60dB min(50/60±0.5Hz)
Common mode reduction ratio :
140dB min(50/60±0.5Hz)
Isolation resistance : 0.5kV DC 20M Ω min between the each terminal and grounding terminal
Dielectric strength : 1.5kV AC for 1 minute between the power terminal and grounding terminal
0.5kV AC 1 minute between the input terminal and grounding terminal
Vibration resistance : 10 to 60Hz, 1m/s^2 max
Shock resistance : 2m/s^2 max
Clock preciwgsion : ±50 ppm (Monthly error: ±130 seconds)
Chart feed accuracy : ±0.1% max

● Structure

Case structure : Dust-proof
Mounting : Panel-mount
Allowable backward inclination : 30°
Material : Case --- Steel plate
Door frame --- Aluminum die casting
Color : Case --- Metallic silver
Door frame --- Black

● Power Input

Rated supply voltage range : 100 to 240 V AC
Working supply voltage range : 85 to 264 V AC
Electric wave frequency : 45 to 65 Hz
Instantaneous power failure : Operates up to 50 ms
Power consumption :

	100VAC (*)	240VAC (*)	Max. power consumption
4-pen recorder	About 25 VA	About 35 VA	About 65 VA

(*) No option at balancing time

● Normal Operating Conditions

Ambient temperature : 0 to 40 °C (UL Listing)
0 to 50 °C (Others)
Ambient humidity : 35 to 80 % RH (UL Listing)
35 to 85 % RH (Othres)

● Alarm (Relay output is optional)

Alarm types : 4 types/channel (H, HH, L, LL)
Drives : 1 relay drive/alarm set value
Alarm output : 250 V AC, 3 A max. (resistance load)
125 V DC, 0.5 A max. (resistance load)
30 V DC, 3 A max. (resistance load)
125 V DC, 0.1 A max. (induction load)
L/R = 40 ms max.
Hysteresis width : 0.5±0.2 %
Setting accuracy : ±0.5 %

● Electromagnetic compatibility (EMC)

Emissions	EN55011
Immunity	EN50082-2
Electrical safety	IEC1010 Installation category II; Pollution degree 2 UL3101-1

12. SPECIFICATIONS

12－2 Specifications of Pen Recorder

① Measurement range

Range Code	Measurement Range	Type	Unit	Max. resolution	digital Display Accuracy	Analog Indication Accuracy
000	-10.0 - +10.0	mV		10μV	±(0.2%	±0.5%
001	-50.0 - +50.0	mV		10μV	+1digit)	
002	-200.0 - +200.0	mV		100μV	Note 1	
003	-1.0 - +1.0	V		1mV		
004	-5.0 - +5.0	V		1mV		
005	-20.0 - +20.0	V		10mV		
006	0.0 - +5.0	V		1mV		
007	+1.0 - +5.0	V		1mV		
008	4.0 - 20.0	mA		0.01mA		
009						
010	0.0 - 1450.0	R	℃	0.1℃		
011	0.0 - 1760.0	R	℃	0.1℃		
012	0.0 - 1760.0	S	℃	0.1℃		
013	0.0 - 1830.0	B	℃	0.1℃	Note 2	
014	0.0 - 100.0	K	℃	0.1℃		
015	0.0 - 700.0	K	℃	0.1℃		
016	0.0 - 900.0	K	℃	0.1℃		
017	-200.0 - 100.0	K	℃	0.1℃		
018	-200.0 - 400.0	K	℃	0.1℃		
019	-200.0 - 650.0	K	℃	0.1℃		
020	-200.0 - 1370.0	K	℃	0.1℃		
021	0.0 - 1000.0	K	℃	0.1℃		
022	0.0 - 150.0	E	℃	0.1℃		
023	0.0 - 400.0	E	℃	0.1℃		
024	-200.0 - 500.0	E	℃	0.1℃		
025	-200.0 - 600.0	E	℃	0.1℃		
026	-200.0 - 900.0	E	℃	0.1℃		
027	-200.0 - 250.0	E	℃	0.1℃		
028	-200.0 - 400.0	E	℃	0.1℃		
029	-200.0 - 700.0	E	℃	0.1℃		
030	0.0 - 150.0	J	℃	0.1℃		
031	0.0 - 500.0	J	℃	0.1℃		
032	-200.0 - 650.0	J	℃	0.1℃		
033	-200.0 - 300.0	J	℃	0.1℃		
034	-200.0 - 500.0	J	℃	0.1℃		
035	-200.0 - 900.0	J	℃	0.1℃		
036	-200.0 - 750.0	J	℃	0.1℃		
037	0.0 - 150.0	T	℃	0.1℃		
038	0.0 - 400.0	T	℃	0.1℃		
039	-200.0 - 350.0	T	℃	0.1℃		
040	-200.0 - 400.0	T	℃	0.1℃		
041	0.0 - 2320.0	G	℃	0.1℃		
042	0.0 - 2320.0	C	℃	0.1℃		
043	0.0 - 900.0	N	℃	0.1℃		
044	0.0 - 1260.0	N	℃	0.1℃		
045	0.0 - 1880.0	PR4020	℃	0.1℃	Note 3	
046	-200.0 - 400.0	U	℃	0.1℃	Note 4	
047	-200.0 - 900.0	L	℃	0.1℃	Note 4	
048	0.0 - 300.0	Au-Fe	K	0.1K	Note 5	
049	-50.0 - 100.0	JPt100	℃	0.1℃		
050	-200.0 - 600.0	JPt100	℃	0.1℃		
051	-50.0 - 100.0	Pt100	℃	0.1℃		
052	-200.0 - 600.0	Pt100	℃	0.1℃		
053	-50.0 - 100.0	JPt50	℃	0.1℃		
054	-100.0 - 250.0	JPt50	℃	0.1℃		
055	-200.0 - 550.0	JPt50	℃	0.1℃		
056	-50.0 - 200.0	Cu 10Ω at 25℃	℃	0.1℃	Note 6	
057	-50.0 - 200.0	Cu 10Ω at 0℃	℃	0.1℃	Note 6	
058	0.0 - 1360.0	PLII	℃	0.1℃		
059						
060						

Terminal Block Reference Contact Compensation Acuracy
R, S, B, PR 40-20 : ± 1 ℃
K, E, J, T, G, C, N : ± 0 . 5 ℃

Note 1 . ± (0.3 % + 1digit)for up to 3-fold expansion ranges, and ± (0.3 % + 1digit)for up to 4-fold expansion ranges in cases of the voltage ranges with range code 000 to 007.
Note 2 . Accuracy is not compensated within a range of 0 to less than 400 ℃ .
Note 3 . ± 2 % for 0 to 300 ℃ , and ± 1 % for 300 to 800 ℃ .
Note 4 . ± (0.3 % + 1digit) for 0 to 200 ℃ .
Note 5 . ± (0.5 % + 1digit)
Note 6 . ± (0.8 % + 1digit)

Analog indication accuracy in Note 2 through Note 6 shall be digital display accuracy ± 0.3 % .

② Pen type recorder specifications

Block	Item	Specifications
Input Unit	Measuring point	1 , 2 , 3 , 4
	Input Sampling	1 2 0 m s
Record / Printer	Recording method	Disposable felt pen
	Printing method	Wire dot (1-color ink ribbon)
	Recording width	1 8 0 mm
	90% step response	1 . 0 s max
	Chart Sampling	———
	Chart paper	Length : 2 3 m, Width : 2 1 0 mm Folding width : 6 0 mm
	Chart speed	1～3 6 0 0 mm／h 1～3 0 0 mm／m i n
	Recording color	1 -pen : Red 2 -pen : Blue 3 -pen : Green 4 -pen : Purple
	Data print color	Purple
Outer dimension (W×H×D) (Standard)		2 8 8 × 2 8 8 × 3 4 0 mm
Weight		1 -pen : 1 4 . 0 k g max 2 -pen : 1 5 . 0 k g max 3 -pen : 1 6 . 5 k g max 4 -pen : 1 8 . 0 k g max

③ Standard functions

Item	Description
Analog indication	Indicates a measured value with the scale plate and cursor.
Analog recording	Provides analog recording by continuous pen-writing.
Engineering unit indication	Engineering unit is indicated on the scale plate. .
Digital display	Indicates channel no.,process variable, data, chart speed,alarm setpoint on the indicator 1 & 2.
Logging print	Prints each channels's procees variable,engineering unit on the chart paper in selective printing mode of synchronous logging & reco rding mode or end mode for analog recording.
Date print	Prints year and date at a programmed time.
Time print	Prints time at a programed interval.
List print	Prints type of input,range,engineering unit alarm setpoint,date,time,chart speed,scaling and logging print status on the chart paper.
Programming	Chart speed, alarm setpoint, logging print interval, date and time can be programed.
Memory backup	·Protects the clock function, using builtin lithium batteries. The battery life is 10 years(total power-off period of the instrument: 5years) ·Data is stored in the non-volatile memory.
Key lock	Locks the keys automatically if they are not operated for 3 minutes in the user mode.
Alarm	Capable of setting 4 types of alarms per channel.
Chart speed	Capable of setting the chart speed.
Time indicator	Indicates year,month,day,hour,minute,Adjust for leap year automatically.
Self diagnostic	Indicates "ERROR",and outputs when faulty.

REV.	DATE	DR.	CHK.	APP'D.	DESCRIPTION
1	8/30/96	Kawa	Hase	Oda	
2	CHG.No.				
3					

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④ Standard setting functions

Function	Description
Open input protection (Burnout)	Swings the cursor fully toward 100 % or 0 % when an input is disconnected. Either up or down can be specified for each channel. (DC voltage of ± 50mV max, thermocouple input)
Zone recording (Track recording)	Capable of specifying a recording area for each channel ro record by tracks.
Alarm on print	Prints out an alarm occurrence time and channel, alarm setting number, and alarm type when it occurs.
Alarm recovery on print	Prints out an alarm reset time and reset channel, alarm setting number, and alarm type when it is reset.
Alarm hysteresis width	Sets an alarm hysteresis width optionally. (standard: 0.5 % FS)

● Remote Functions by DI

Function	Description
Chart start/stop	Charts when set to ON and stops when set to OFF
Change chart speed	1st when the contact is turned to ON and 2nd when turned to OFF
External logging print	Prints out when the contact is turned to ON

● Alarm Board : 8 relays

● Optional Communication Unit

Function	Description
Communication	RS－232C
Unit	RS－422A