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RM18G／RM18N
HYBRID RECORDER
(MULTIPOINT RECORDER)

INSTRUCTION MANUAL

HXPRM18mnG0002E
(1ST EDITION)

ABOUT RECORDER MANUAL

Thank you for your buying the OHKURA RM18G/N HYBRID RECORDER (MULTIPOINT RECORDER).

Be sure to refer this instruction manual to use the recorder properly before using it.

1. The recorder manual consists of the following two booklets:

①RM18G/N HYBRID RECORDER INSTRUCTION MANUAL (this manual)
②HYBRID RECORDER ENGINEERING DATA MANUAL (standard attachment)

In case of the communication interface specifications (option), depending on the specific specification, one of the following manuals is attached.

③RS-232C Communication Interface Manual
④RS-422A Communication Interface Manual
⑤Special Specification Communication Interface Manual

This manual describes installing the recorder, wiring, and setting printing modes for a usual use; alarm setting, setting of user's data, and maintenance.

Hybrid Recorder Engineering Data Manual of the item ② describes the engineering data concerning the specifications of recorder. A recorder set up under the specifications as per an order, is normally shipped. Refer to the initial setting in case of a change of specifications such as range setting, setting ADC taking-in, etc.

The rest of Communication Interface Manuals mentioned in the items ③～⑤, describe wiring, setting, protocol, etc. for communications.

These manuals describe only the RM18G/N Hybrid Multipoint Recorder.
For information about RM18G/N Hybrid Pen Recorder ,
please refer to a specific manual for Multipoint Recorder.

2. How to Use Recorder Manual:

⚠ ; Matters to be attended to prevent an accident or a damage in handling of the equipment

[Note] ; Note for a proper use

[Reference] ; Reference for your operation

3. Revision of Recorder Manual:

The revision of the Recorder Manual will be made without any prior notice.
No part of this manual may be reproduced in any form by any means including photo-copying, without permission from the publisher.

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About Recorder Manual

The following points are to be attended especially for a proper and safe use of the recorder. Be sure to read carefully.

1. Power-on:

Befor turning on power to the recorder, check whether the ground is made properly. (For prevention of electric shock)
Before turning on power to the recorder, check whether the voltage of power meet with the specifications.

2. Ground:

In the event that the ground is not made properly, the recorder may become dangerous to handle. Make sure of proper ground, after the ground of recorder was made. Do not cut the ground wire of recorder or remove the connected wire with ground terminal.

3. Fuse:

Use the fuse assigned by our company (for prevention of fire). Do not make a short circuit at fuse holder. In case of replacement of fuse, you'd better to turn off power to the recorder, and turn off even a main power source.

4. Troubles of ground or fuse:

In case of troubles of ground or fuse, you have to turn off power to the recorder, and turn off even a main power source.

5. Wiring:

The wiring for input and output should be done after confirming a proper ground.

6. Environment:

The recorder should be installed at a safe environment. It is very dangerous to install the recorder at the place where an inflammable or explosive matter is being placed.

7. Taking out of main unit:

Before taking out of main unit from case, turn off power to the recorder. (For prevention of electric shock)

8. Handling of main unit:

Do not touch the switch, etc. of internal unit of recorder. Do not replace the main unit or the printed circuit board. In the event that you have done any of the above replacement, we do not guarantee the actuation of the equipment. Be sure to contact with our agent or our salesman in such case.

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1. UNPACKING RECORDER

Upon delivery of the recorder, check that all accessories are provided. Check also there is no external damage to the recorder. If an accessory is missing or there is an external damage, contact our salesman or the shop where you purchased the recorder.

1.1 Checking Accessories

The Accessories shown in Figure 1.1 are provided with the recorder. Check that all accessories are provided.

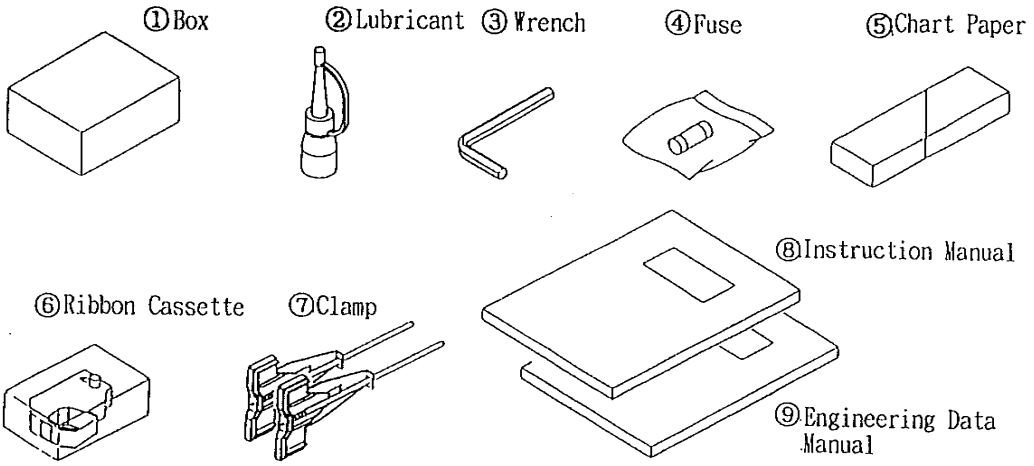


Fig. 1.1 Accessories

Chart 1.1 A List of Accessories

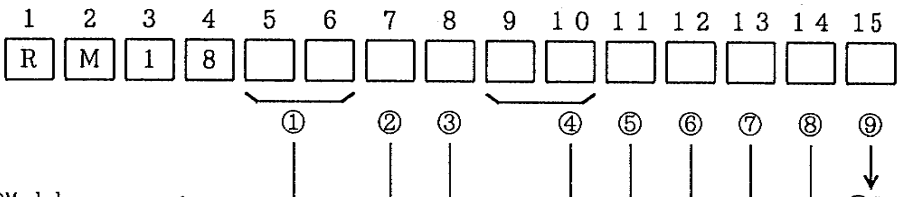
No.	Item	Part number	Quantity	Remarks
1	Box	H2H07827	1	To contain ②~⑦ items
2	Lubricant	H4A12290	1	
3	Wrench	HPSAA003A001	1	For M3 screw
4	Fuse	IPS0565A0105	1	
5	Chart paper	HZCAA1025AF001	1	100 equal divisions
6	Ribbon cassette	HPSR001H0005	1	
7	Clamp	H4A13299	2	For fixing panel
8	Instruction manual	HXPRM18mnG0002E	1	This manual
9	Engineering data manual	HXPRM18mnG0004E	1	

1.2 Checking Model and Specifications

A nameplate bearing information such as a model name is attached on the right lateral face of internal main unit. Check that the model name and code information conforms to the specifications of your order, refering to below chart.
Check also that the scale plate and input codes satisfy your requirements.

Refer to 'Section 1.3 Removing Shipping Screws and Protector' how to draw the internal main unit.

1. UNPACKING RECORDER



①Model name

01	1-pen recorder
02	2-pen recorder
03	3-pen recorder
04	4-pen recorder
06	6-multipoint recorder
12	12-multipoint recorder
24	24-multipoint recorder
30	30-multipoint recorder

②Construction

G	Standard
N	15R replacement

③Communication

0	None
1	RS−232C
2	RS−422A
9	Special

④DI／DO

00	None	13	DI(5)+8-relay
01	DO(52)	14	DI(5)(ARC)+8-relay
02	DI(24)	15	DO(52)+DI(24)+DI(5)
03	DI(5)	16	DO(52)+DI(24)+DI(5)(ARC)
04	DI(5)(ARC)	17	DO(52)+DI(24)+8-relay
05	8-relay	18	DO(52)+DI(5)+8-relay
06	DO(52)+DI(24)	19	DO(52)+DI(5)(ARC)+8-relay
07	DO(52)+DI(5)	20	DI(24)+DI(5)+8-relay
08	DO(52)+DI(5)(ARC)	21	DI(24)+DI(5)(ARC)+8-relay
09	DO(52)+8-relay	22	DO(52)+DI(24)+DI(5) +8-relay
10	DI(24)+DI(5)	23	DO(52)+DI(24)+DI(5)(ARC) +8-relay
11	DI(24)+DI(5)(ARC)		
12	DI(24)+8-relay	24	30-relay

⑤Light, Front calibration, IC memory card

0	None
1	Light
2	Front calibration
3	IC memory
4	Light + front calibration
5	Light + IC memory
6	Front calibration + IC memory
7	Light + front calibration + IC memory

⑥Door

1	N1.5(Std.)
2	7.5BG4/1.5
3	N4
4	N7
5	7.5BG6/1.5
9	Special

⑦Quake resisting spec.

A	None
B	Yes

⑧Option

0	None
1	Yes

⑨Special

0	None
C	Electric conducivity recorder
X	Hardware
Y	Software
Z	Software +hardware

[Notes]
1. ARC；ARCNET®
2. In case of electric conductivity recorder, 24-,30-multipoint recorder and front calibration cannot be selected.

1.3 Removing Shipping Screws and Protector

The recorder is protected from shock and vibration during shipment by shipping screws and protector. Remove those shipping screws before operating the recorder.

Notes: 1. You will be able to execute the recording and printing only after removing protector of the recorder.
2. For main unit protection, do not remove the shipping screws when installing the recorder on a panel.

Removing the shipping screws

Note: 1. The shipping screws are attached on the main unit of the recorder.
2. The shipping screws are needed when the recorder is shipped as a single unit or assembled equipment. Be sure to attach the shipping screws to the screw holes for storage.

①Open the door. (the door can be opened from its right edge.)

②Draw the main unit after removing the two shipping screws (M4 X 8). The shipping screws are placed at both sides. Attach the removed shipping screws on the screw holes for storage.

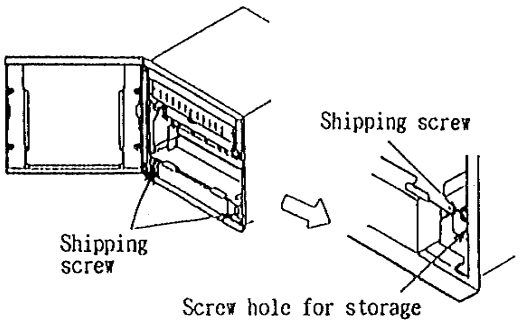


Fig. 1.2 Position of Shipping Screw

Removeing the printer protector

Notes: Be sure to store the removed printer protector, since it is needed when the recorder is shipped as a single unit or the assmbled equipment.

①Draw out the main unit by pushing down the unlocking lever at below right or the main unit until the main unit stops at the interval stopper.

②Remove the printer protector.

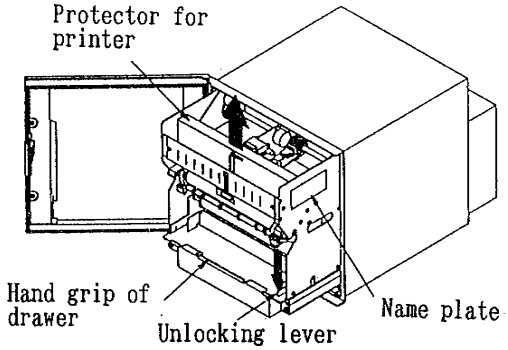


Fig. 1.3 Removing Protector for Printer

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1.4 Temporary Storage

Remove the ribbon cassette from the main unit, and store it safely. (Refer to the Section 6.2)
The recorder has to be stored under the environment described below and when the recorder is contained in equipment as well.

⚠ When the recorder is stored under an inferior environment, its external appearance, functions, and useful life can be degraded.

Suitable environment

- Only a few dust and particles exist.
- None of inflammable, explosive, corrosive, gases (such as SO_2 and H_2S) exist.
- No shock and vibration
- Free from water, moisture vapor, and high humidity (95% RH or higher)
- Free from sunshine and high temperature (50 ℃ or higher)
- Not extremely low temperature (-20 ℃ or lower)

1.5 Repacking Recorder

Note: Secure the main unit even when transporting the recorder contained in equipment.

Attaching protector for printer

①Remove ribbon cassette. (Refer to Section 6.2)
②Move the printer slowly with your fingers to center position of the main unit.
③Attach a protector for the printer.

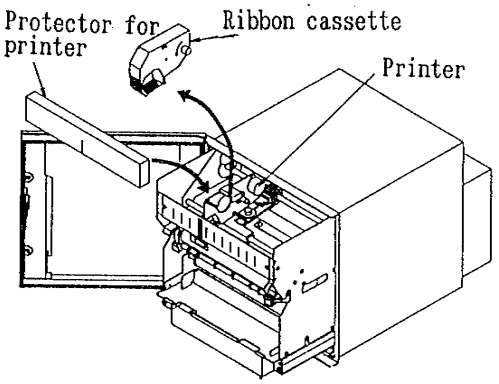

Fig. 1.4 Attaching Protector for Printer

Securing the main unit (by attaching the shipping screws)

Remove the shipping screws from screw holes for storage and attach the screws at the shipping screw holes, then, fix the main unit.

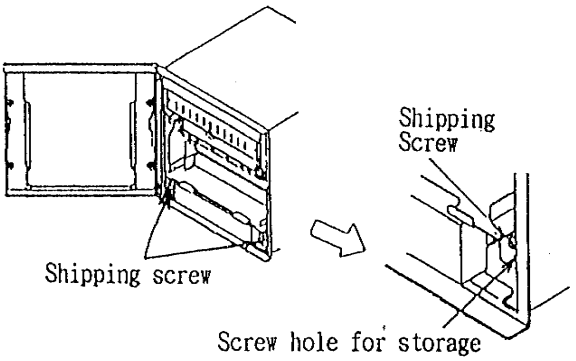

Fig. 1.5 Position of Shipping Screw

Packing

When repacking the recorder singly, use the packing box and materials for the recorder.

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2. OVERVIEW OF RECORDER

2.1 Overview

The RM18G/RM18N model hybrid recorders are the recorders that have the functions of, not only usual analog recording but also digital print functions such as list, logging, date, alarm, etc. printing. These recorders with various options can be able to conform to the diversified needs of users.

2.2 Features

- Noncontacting
  A noncontact electromagnetic potentiometer is provided for position detection, and high-pressure resisting relay is also provided for changing of input; thus the durableness of parts and easy maintenance can be assured.

- Identifying Mark Printer
  The printer has a function to identify the five different marks in addition to the six colors identifying printing and the plot identification function for 30 channels.

- 2000 V resisting specifications between the power line and the ground
  Our standard 2000 V resisting specifications are provided as normally required at the power station.

- A free power supply system applicable worldwidely
  A free power supply system corresponding to 85 ～ 264 V AC is adopted.

- Capabilities for the inputs of thermocouple, mV, V, resistive temperature detector, etc.
  The recorders have the capabilities for connection of the inputs from thermocouple, mV, V, resistive temperature detector with each channel respectively. Various different inputs can be properly handled. The precision assurance of 0.5% or lower including the enlarged scale (up to three-fold enlargement) is all right.
  Also the DE·DH wire connection, temperature gradient input, direct input of Electric conductivity can be done.

- Various options are available.
  The recorders have various communication interfaces (RS-232C, RS-422A, ARCENT®), and the options such as DI-5 points /24 points, DO-52 points,
  Relay output-8 points/30 points, etc., and a superior extendability of system.

3. NAMES OF COMPONENTS

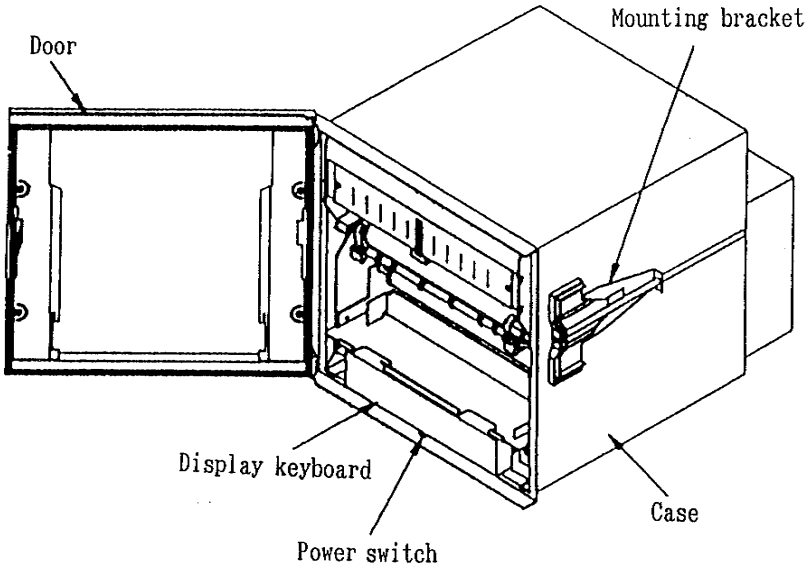

Fig. 3.1 Name of Components (1)

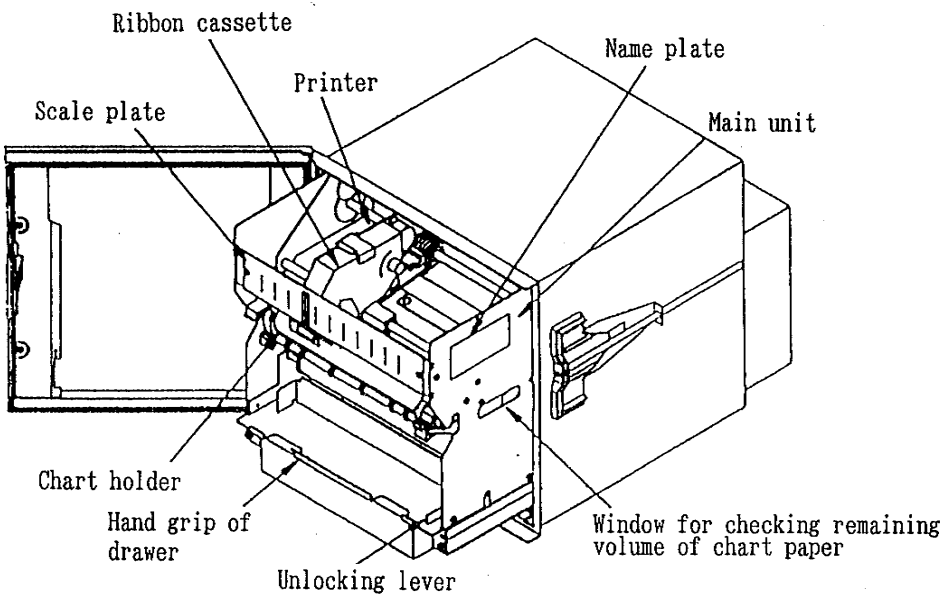

Fig. 3.2 Names of Components (2)

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4. INSTALLATION ON PANEL

4.1 Notes for Installation

(1) Selection of location

Select a location to install under the following environmental conditions.

i) Location with minimum humidity variations

ii) The temperature must be maintained around room temperature (about 25° C).

iii) Location free from inflammable, explosive, corrosive, gases (such as SO_2, H_2S, etc.)

iv) Location free from mechanical vibration

v) A dust-free environment

vi) Location free from electromagnetic interference

vii) Location not to be exposed to high-level radiant heat

Humidity adversely affects chart paper and ink. Use the recorder in a humidity range of 35% to 85% RH. (The most preferable humidity is 60% RH.)

(2) Mounting panel

i) A steel plate not thinner than 3mm is recommended as a mounting panel.

ii) A panel thicker than 15mm should not be used.

(3) Tilt

i) Install the recorder on a horizontal plane so that the recorder does not tilt rightward or leftward.

ii) Install the recorder within a tilt angle of 0° forward and 30° backward.

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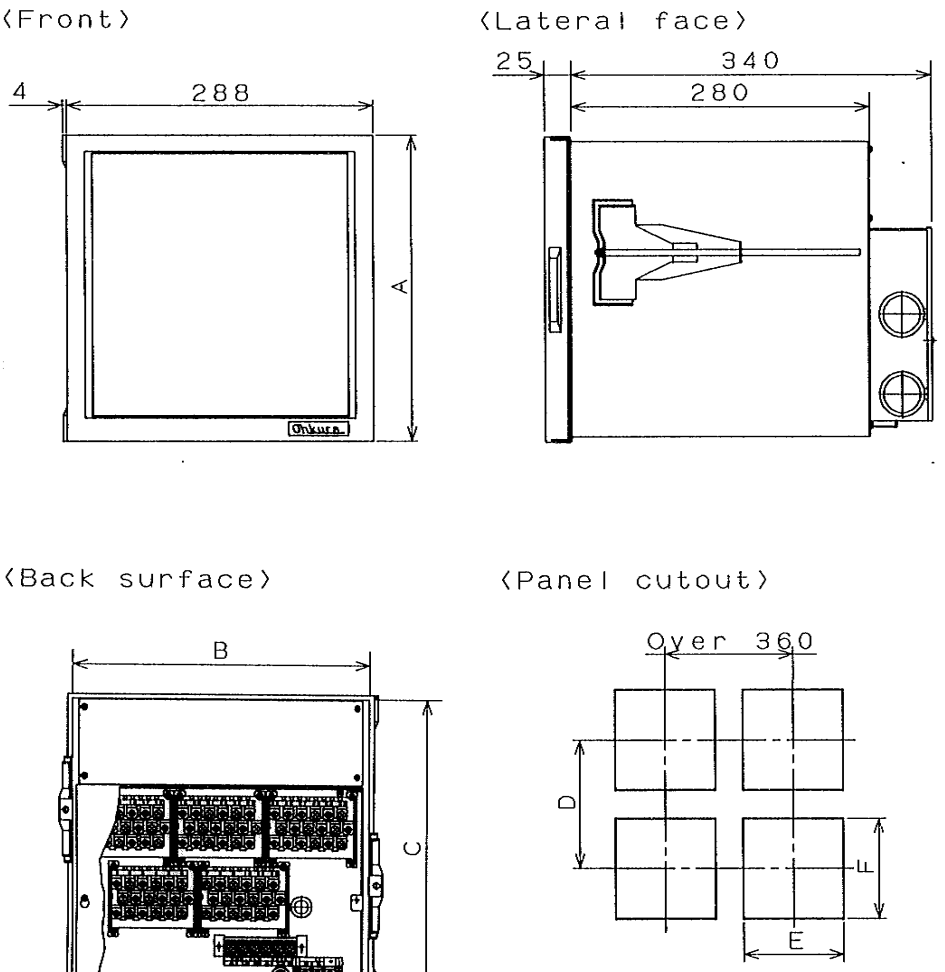
4.2 Outside Dimensions and Panel Cutout Dimensions



	G MODEL(mm)	N MODEL(mm)
A	288	322
B	279	272
C	279	310.2
D	Over 360	Over 400
E	282±1	274±1
F	282±1	314±1

Fig. 4.1 Outside Dimensions and Panel Cutout Dimensions

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4.3 Installing Recorder on Panel

⚠ For safety and main unit protection, be sure to secure the main unit with the shipping screws.(See Fig. 4.2)

(1) Secure the main unit with the shipping screws.
(2) Insert the recorder into the front of panel.
(3) Insert the claws of mounting bracket into square holes at the both lateral faces of the case to fix the bracket.
(4) Screw the carriage bolt of mounting bracket with a driver to install the recorder onto the panel. (Tighten the bolt until the recorder is jointed tightly.)
(5) After mounting the recorder, attach the shipping screws again to the holes for storage.

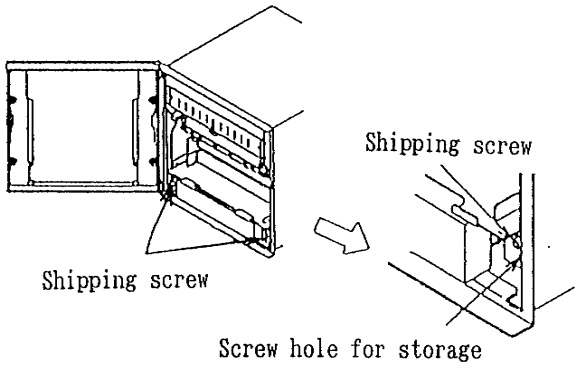

Fig. 4.2 Attaching shipping screws

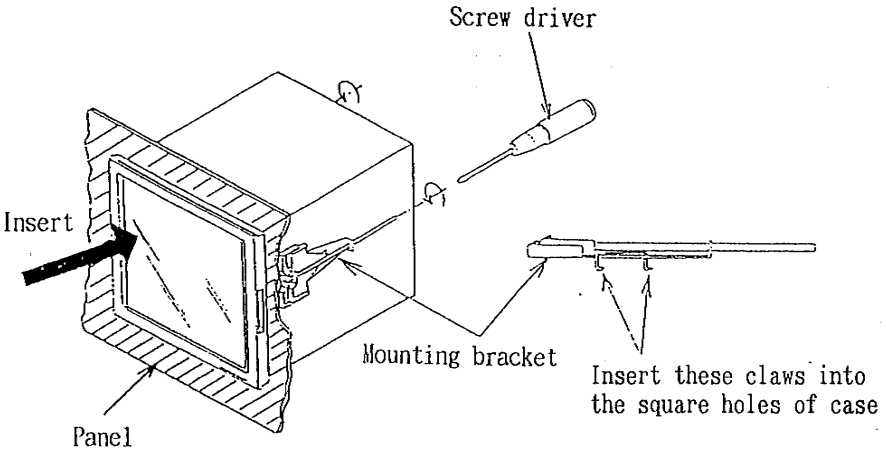

Fig. 4.3 Installing Recorder on Panel

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4.4 Fixing the Rear Part of Case to Panel (Earthquake-proof Specifications) (Option)

In case of Earthquake-proof specifications, fix the rear part of case after installing the recorder on panel as per the instruction of the article 4.3.

(1) Prepare a quakeproof support (supporting angle) by yourself.
Prepare an equilateral angle steel (60mm x 60mm) with about 5 ~ 9mm thickness.

(2) The following parts are attached in case of Earthquake-proof specifications.
- Plate (1 ea.) (Part No. H3P18271)
- Bolt M10 x 20 (2 ea.) (Flat washer and spring washer are attached.)
- Screw M6 x 14 (2 ea.) (Spring washers are attached.)

(3) Fix the rear part of case using the angle (1) and the parts (2) as per the illustration of Figure 4.4.

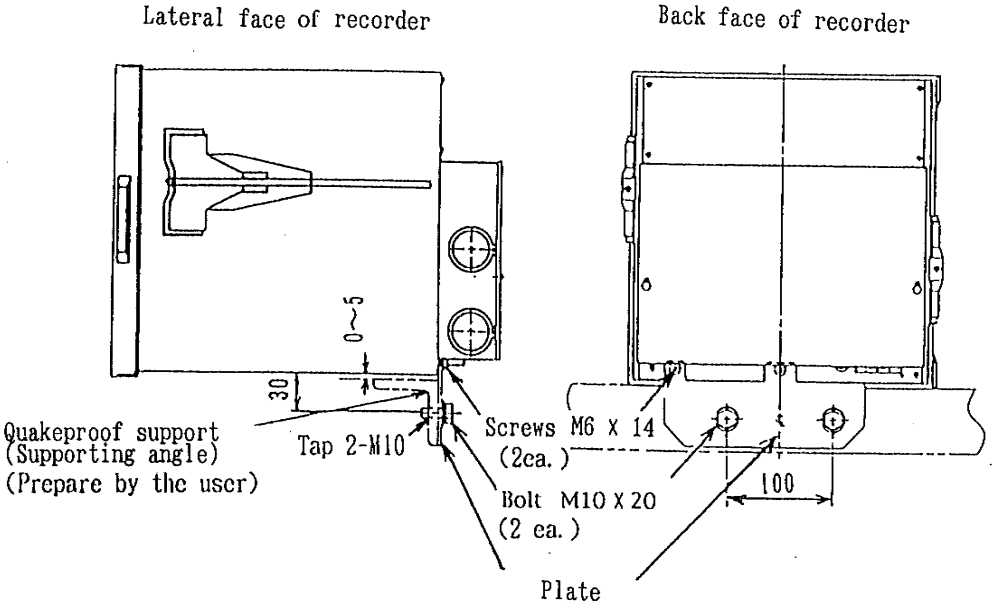

Fig. 4.4 Fixing Rear Part of Case to Panel
(Earthquake-proof Specifications)

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5. WIRING

5.1 Terminal Array

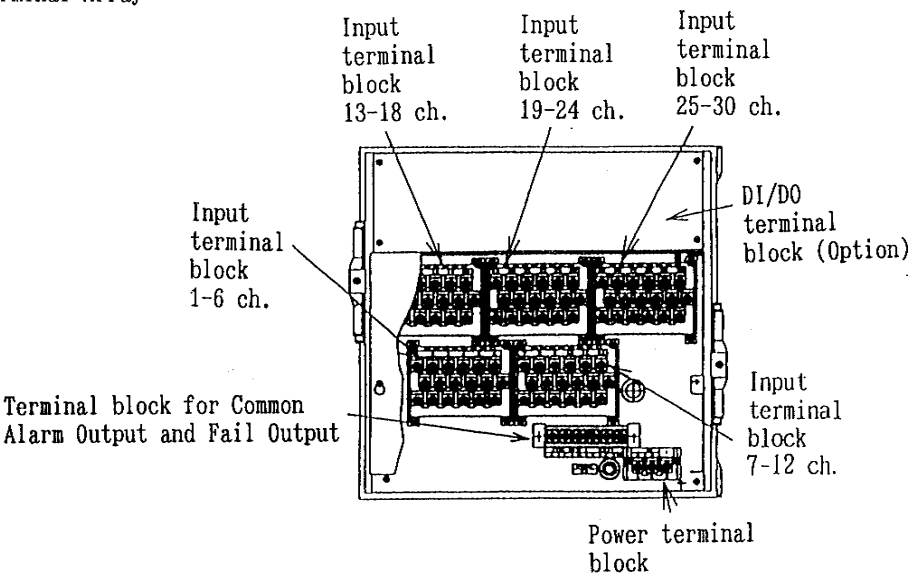


Fig. 5.1 Terminal Array (Back of the Recorder)

5.2 Wiring of Power Supply

(1) Notes on wiring of power supply

①Use a 600-V PVC insulated wire (JIS C3307) for the power supply. Use the wire with the equivalent performance or a higher-graded wire.

②Fix a solderless terminal with insulating sleeve (for M4) to a terminal of wire.

③For connection with the earth terminal, use the 3rd category-ground resistance or over (ground resistance 100Ω or lower, minimum size of ground wire 1.6mm).

④The recorder is sensitive to various noises induced electronically, particularly when the ground wire runs near the other equipment. Be sure to avoid the wiring layout close to other equipment.

(2) Wiring procedures

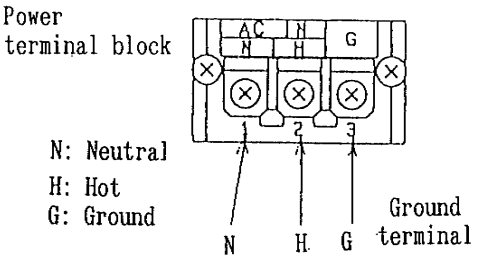
①Turn OFF the power switch of the recorder.

②Take off the clear cover of power terminal block.

③Connect the wire for power supply as per the illustration of Figure 5.2. Connect the non-ground side of power supply with the terminal-2.

④Put the clear cover onto the power terminal block.

⑤Check whether the ground is made properly.



Power supply: 85 ～ 264 VAC

Fig. 5.2 Wiring of Power Supply

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5.3 Input Wiring

(1) Notes on input wiring

①Notes on input wire

- For input wiring, be sure to avoid the induction of noise. Use the shielding wire or twisted wire in order to avoid the induction of noise in this case.
- In case of thermocouple input, use a thermocouple stand wire directly or a compensating lead wire. In this case, use of shielding input wire is recommended.
- In case of the resistive temperature detector (RTD) input, suppress the fluctuation of the three-wire resistance less than the followings:
  In case of Pt 100、JPt 100: 50mΩ or less
  In case of Pt 50、Cu 10Ω : 10mΩ or less
  In this case, use of shielding input wire is also recommended.
- Use a shielding twisted wire to avoid the induced noise, particularly when the wire runs near a high frequency source.
- Fix a solderless terminal with insulating sleeve (for M4) to a terminal of wire.

②Note on wiring

- The wiring between the recorder and a point of measurement should be installed remotely from the power circuit (if over 25 V power or sequence circuit).
- An unused input terminal short-circuits. (In case of mV, V, thermocouple input, it short-circuits between + and -. In case of resistive temperature detector input, it short-circuits among A, B, and b.)
- In case of ground with a shielding wire, etc., it should be connected with earth terminal of the recorder.

(2) Wiring procedures

①Take off the rear cover of the input terminal block.

②Install the input wire as per the illustration of Fig. 5.3, 5.4, and 5.5.

③Attach the rear cover after that.

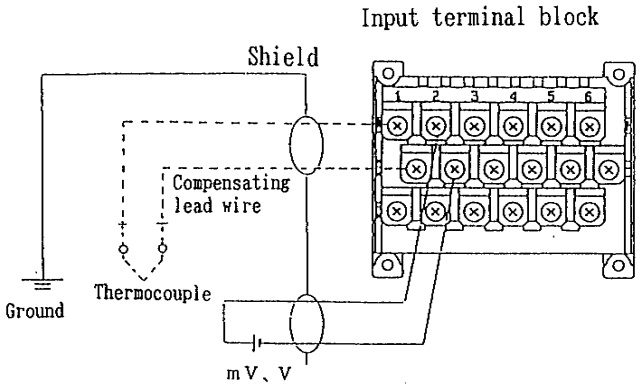

Fig. 5.3 Input Wiring (In case of mV, V input, thermocouple input)

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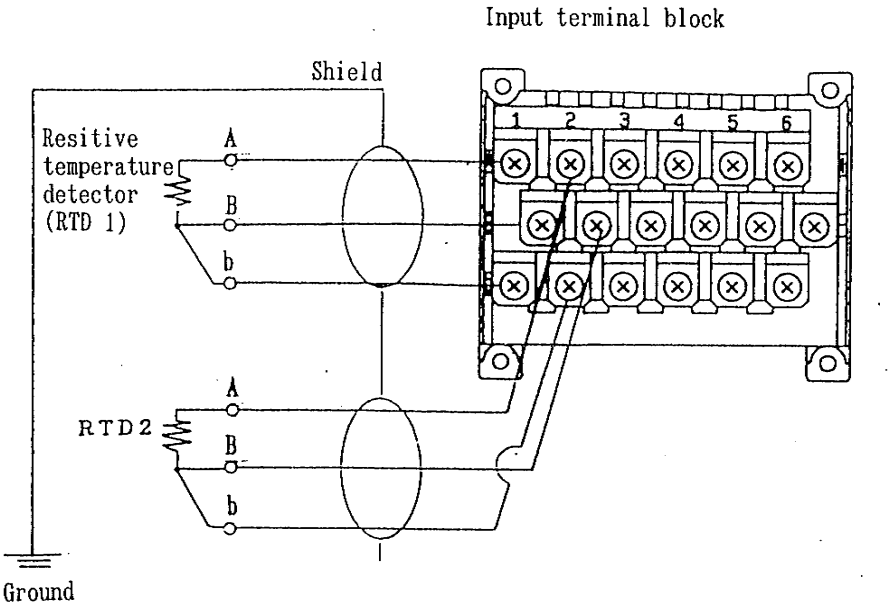

Fig. 5.4 Input Wiring (In case of resistive temperature detector)

Note: Shunt resistance is set on the terminal block (except the built-in shunt resistance specification).

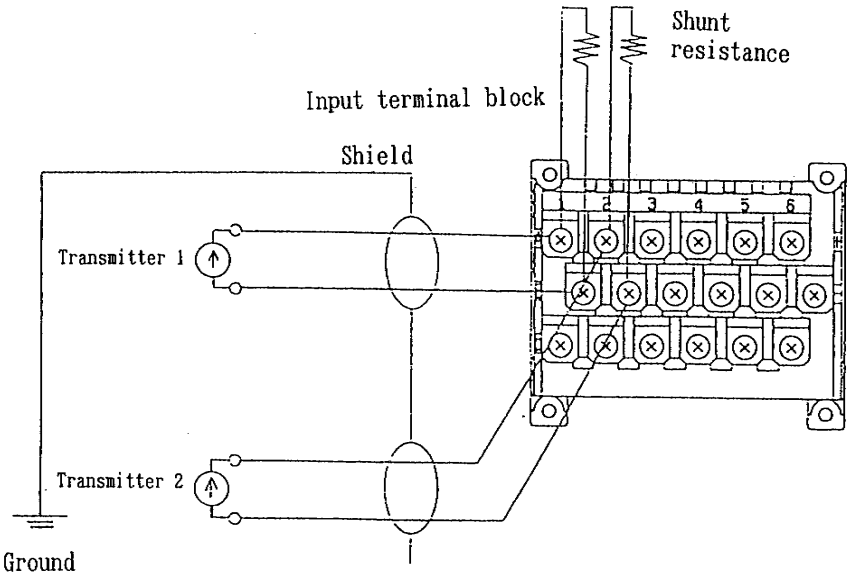

Fig. 5.5 Input Wiring (In case of mA input)

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5.4 Wiring for Common Alarm Output and Fail Output

(1) Notes on wiring:

①The contact capacities common alarm output and fail output are as follows:

250VAC 3A Max. (Resistive load)
30VDC 3A Max. (Resistive load)
125VDC 0.5A Max. (Resistive load)

②Provide a protecton network corresponding to resistive load at need, for the output terminal.

③Fix a solderless terminal with insulating sleeve (for M4) to a terminal of wire.

④Install the output wiring remotely from the input wiring.

(2) Wiring procedures:

Install the wiring for common alarm (COM ALM) output and fail output (FAIL) as per the illustration of Fig. 5.6

Terminal block for Common Alarm Output and Fail Output

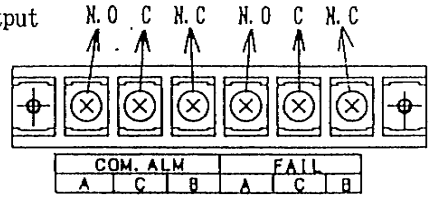

Fig. 5.6 Wiring for Common Alarm Output and Fail Output

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5.5 Wiring for DI/DO (Option)

Notes: 1. DI/DO (option) consist of a combination of 5 contacts for DI and 8 contacts for alarm output (relay output) or 30 contacts for alarm output.

2. As to wiring for 24 contacts of DI and 52 contacts of DO, refer to a separate manual for specific matter.

(1) Notes on wiring for DI:

①Do not give an increased voltage to the DI from outside, since the generating power is set in the DI.

②The contact range for DI should be set as 50 VDC for difference of withstand voltage, 16 mA or over, ON resistance of 20Ω or less (including wiring resistance).

③Do not use an unused terminal as a relay terminal.

Note: COM of the contact range for DI is connected at the inside of recorder.

(2) Notes on wiring for DO:

①The contact range for DO is as follows:

250VAC	3A Max. (Resistive load)
30VDC	3A Max. (Resistive load)
125VDC	0.5A Max. (Resistive load)

②Provide the terminal for output at need, for a protection network corresponding to resistive load.

③Fix a solderless terminal with insulating sleeve (for M4) to a terminal of wire.

④Install the wiring for DO remotely from the wiring for input.

(3) An example of wiring for DI:

An example of wiring for DI is shown below in Fig. 5.7.

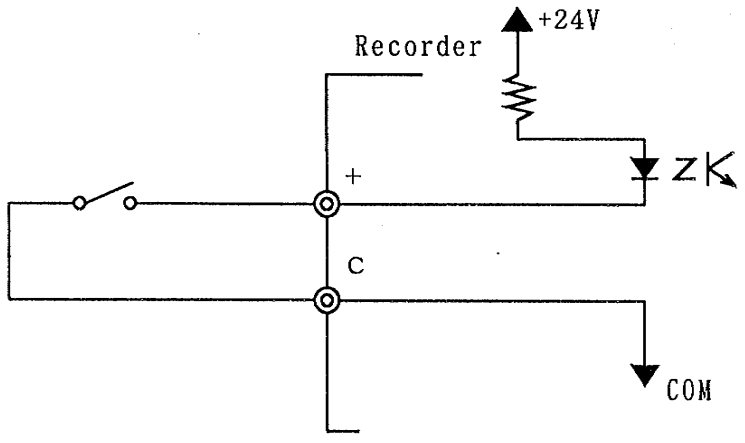

Fig. 5.7 An Example of Wiring for DI

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(4) Wiring procedures

Install the wiring for DI/DO as per the illustration shown in fig. 5.8 and 5.9.

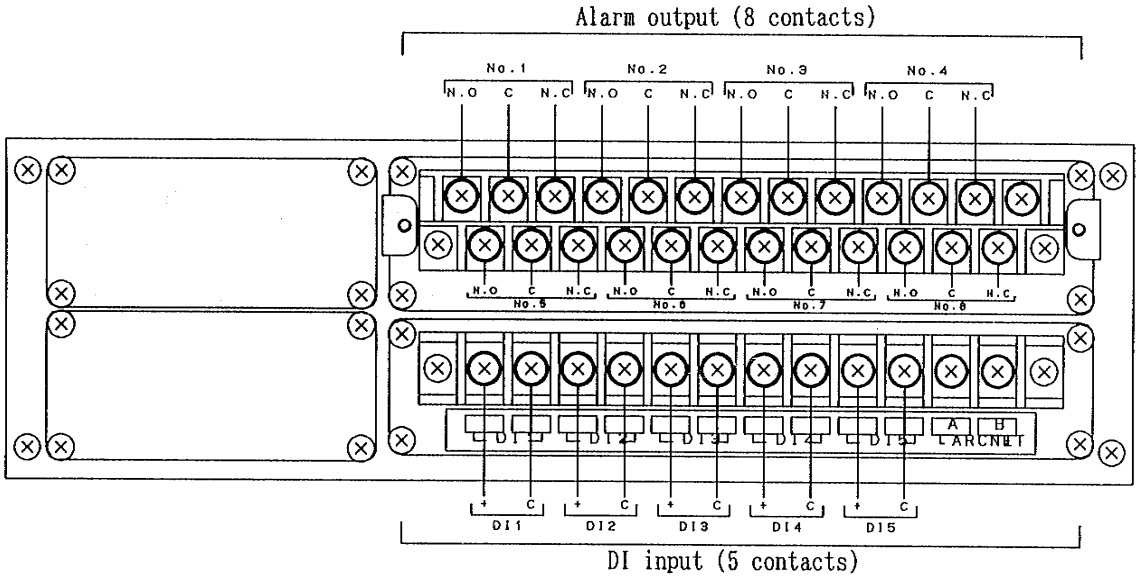

Fig. 5.8 Wiring for DI (5 Contacts) and DO (8 Contacts of alarm Output)

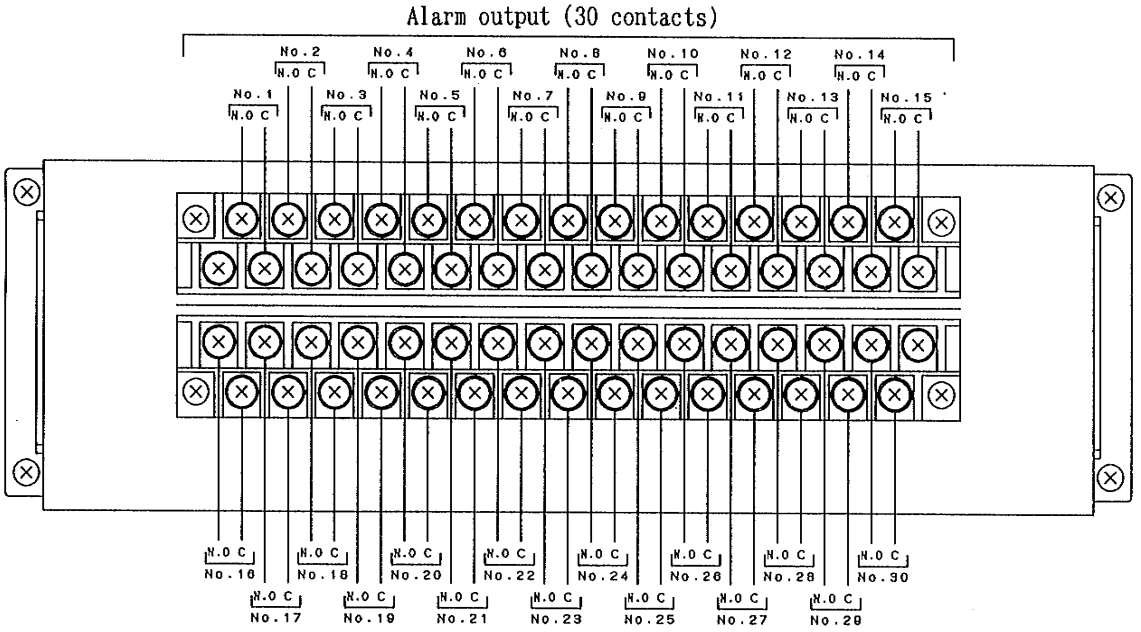

Fig. 5.9 an Example of wiring for DO (30 Contacts of Alarm Output)

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6. PREPARATION FOR OPERATION

6.1 Setting Chart Paper

Note: Use our standard chart paper for a proper recording.

(1) Make sure that the power switch is turned 'OFF'. For replacement of chart paper, depress the power switch to 'Turn OFF' or depress RUN/STOP key to stop the recording function keeping the power being turned 'ON'.

Note: It may damage the printer that the chart holder is pulled down at the RUN state of recording. Be sure to take the above action before replacement of chart paper.

(2) Open the door and remove the chart paper guide. The chart paper guide can be removed by pulling up holding its both edges with your hands.

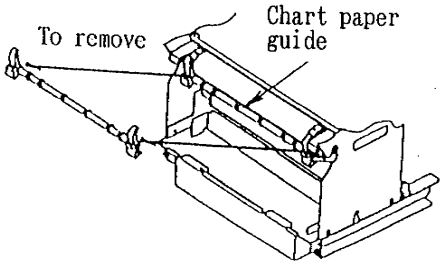

Fig. 6.1 Removing Chart Paper Guide

(3) Tilt the chart holder towards you by unlocking the levers at both ends of the chart holder with your hands.

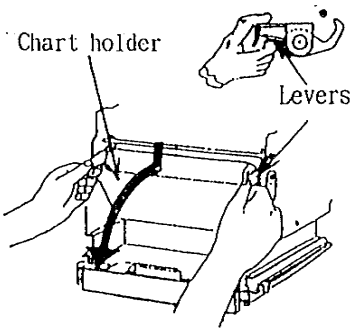

Fig. 6.2 To Tilt Chart Holder Forward

(4) Unlock the chart cover lock with your index fingers, and open the cover. Remove the chart paper from the recorder in case of replacement of the chart paper.

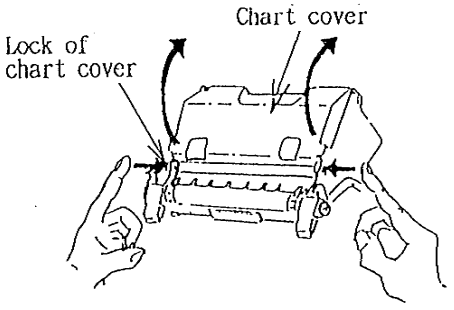

Fig. 6.3 Unlocking Chart Cover Lock

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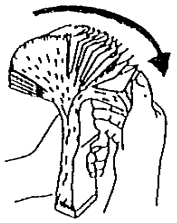
(5) Flip the edges through the whole chart paper.



Note: Perforations of chart paper may cause pages to hold to each other. In such case, the chart paper may not be fed smoothly.

Fig. 6.4 To Flip the Edge of Chart Paper

(6) Unfold about three pages of chart paper. Insert the paper into the paper housing, with its square holes being located on the left side and set the edge of first page of chart paper as per the illustrated figure below.

Note: Ckeck whether the chart paper has the perforations in this case.

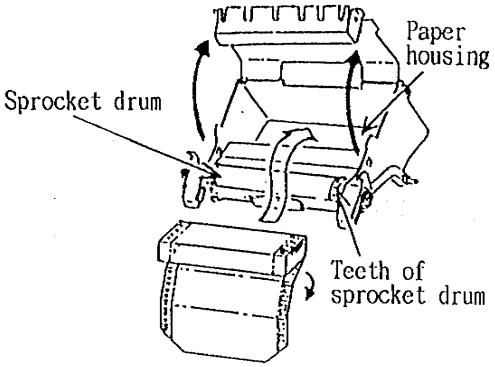


Fig. 6.5 Insertion of Chart Paper

(7) Engage the holes in the chart paper with the sprockets by bending the paper downward, then, close the chart cover to lock compeltely.
Secondly, pull up the chart holder by holding the levers at both edges with your hands.
Shake the levers lightly towards up and down, and left and right to check that the chart holder is being set with the main unit firmly.

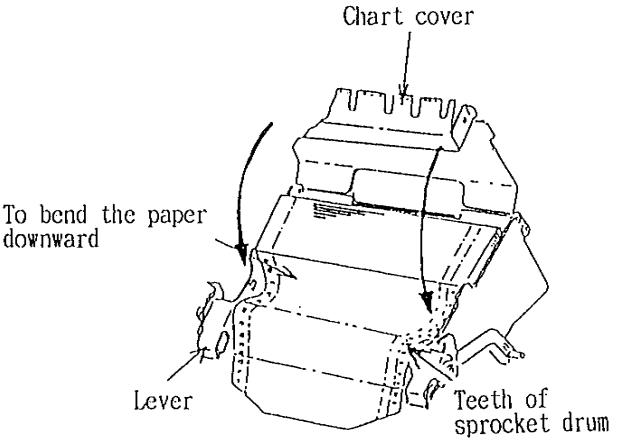


Fig. 6.6 Assembly of Chart Holder

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(8) Set the chart paper by engaging the holes in the chart paper with the sprockets, and then, set the chart paper guide properly. In this case, check whether the holes in the chart paper is being engaged with the teeth of sprocket drum correctly.

(9) Before starting recorder operation, check whether the chart paper is fed normally. To do this, depress [FEED] key on the display keyboard keeping the power switch being turned 'ON', to feed chart paper about four to six pages.

Notes: 1. Be sure to feed chart paper about four to six pages, before starting operation.
2. If chart paper cannot be fed normally even the [FEED] key is depressed, recheck how the chart paper is set.

Reference: △ mark of the chart paper presser points 20 mm ahead of the plotting point. This can be used for matching time axis also.

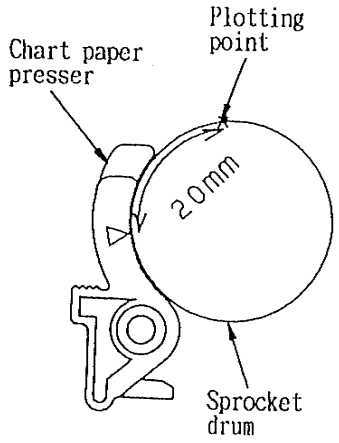

Fig. 6.7 Sprocket Drum and Plotting Point

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6.2 Setting Ribbon Cassette

(1) Depress the power switch to turn 'OFF' or stop the recording by depressing RUN/STOP key while keeping the power switch being turned 'ON'.

(2) Draw out the main unit until it stops at the position shown in the illustrated figure below by holding the hand grip of the drawer and pushing down the lever for unlocking.

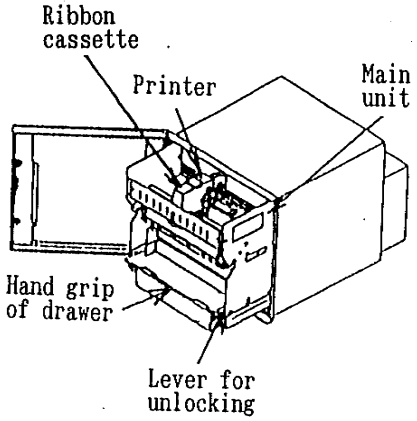

Fig. 6.8 Drawing out the Main Unit

(3) Move the printer carefully to the center of main unit with your fingers.

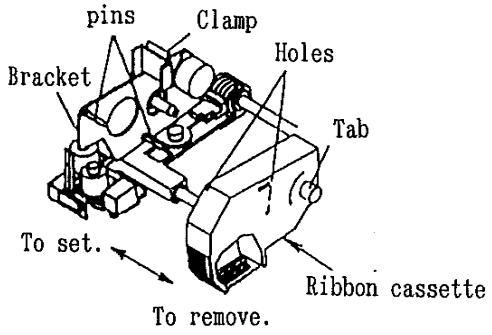

Fig. 6.9 Printer and Ribbon Cassette

(4) For replacement of ribbon cassette, remove the clamp and draw out the ribbon cassette towards the direction shown in the figure above.

Note: Be careful to replace the ribbon cassette without having any damage of the flexible printboard.

(5) Eliminate any slack of the new ribbon cassette by turning the gear on the cassette towards arrowhead (counter-clockwise).

Note: Never turn the ribbon cassette to opposite direction of arrowhead (clockwise). Otherwise, the ribbon may not be fed.

(6) Set the ribbon cassette by engaging the holes in the ribbon cassette with the bracket.

Note: Be careful to replace the ribbon cassette without having any damage of the flexible printboard.

(7) Eliminate slack of the ribbon again by turning the gear on the cassette towards arrowhead.

(8) Check whether the ribbon cassette is set correctly, and also the ribbon is set properly on the print head.

(9) Insert the main unit into the case deeply until the main unit stops.

6.3 Power-On

1. Check that the voltage of power conforms with the specifications of recorder and a correct ground is done, and then, turn on the power to the recorder.

2. Before turning on the power, check whether the chart paper is set the chart holder. The sprocket drum of chart holder can be damaged, when you operate the recorder without mounting the chart paper.

Open the front door and depress the power switch located lower right corner of the main unit to turn on. When power is turned on, a lamp of display comes on. You will see usual mode (User Mode) on the display screen, following the initial image (for about 7 seconds).

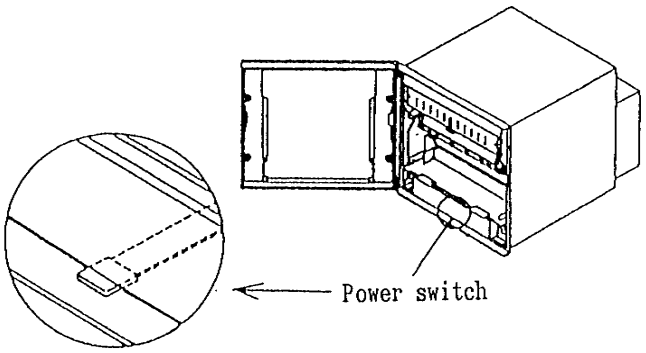

Fig. 6.10 Power-On

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6.4 Status after Initialization

After turning on the power, LED is displayed on the display screen as the initial indication, while the initialization of the recorder is executed.

After the initialization, the recorder will become the following initial state;

Initial State:

①Display Mode	: Auto-mode
②Recording - RUN/STOP	: RUN
③Data for Printing	: The data for printing, analog data, etc. before turning off the power, are all erased.
④Alarm & Self-diagnosis	: The alarm indication, output, etc. before turning off the power, are all ceased.
⑤Key Lock	: key lock mode

Notes: 1. In case of breakdown of electric current, the recorder shows the above initial state, executing the initialization automatically soon after the recovery of breakdown of electric current.

2. In the event that the power is turned off in the printing process, the printing will not be continued as mentioned in the above article ③, because of all the previous data are erased.

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7. DISPLAY AND KEYS

7.1 Display

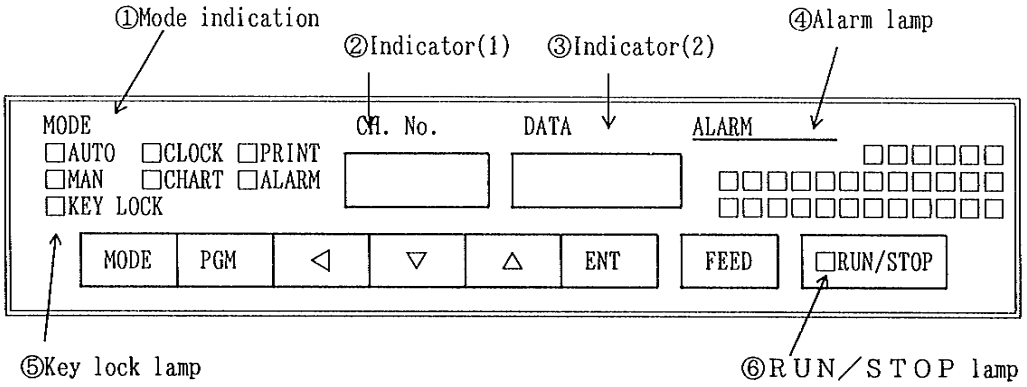

Fig. 7.1 Display

Chart 7.1 Display Indication

No.	Name	Meaning	Remarks
①	Mode indicator	The lamp of selected 'User Mode' is turned on.	For information about the 'User Mode', refer to the article 7.2.
②	Indicator(1)	Channel number and setting items are indicated. In case that an alarm is raised, an alarm type is indicated.	Information indicated varies from mode to mode.
③	Indicator(2)	Measured value,various setting values, date, time, etc. are indicated. When an accident (error) is raised, the error indication is made.	For information about 'Error' (self-diagnosis), refer to the article of 12.2.
④	Alarm lamp	Alarm lamp of alarm ON-channel number is turned on.	For Alarm ON, refer to the article ⑭ of Section 9.3.
⑤	Key lock lamp	In case that the key is locked, the lamp is turned on.	For information about the key-lock state, refer to article ① of Section 9.3.
⑥	RUN/STOP lamp	The lamp is on when the recorder is in RUN state.	For information about RUN/STOP, refer to the article ⑥ of Section 9.3.

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7.2 Functions under Usual Operation (User Modes)

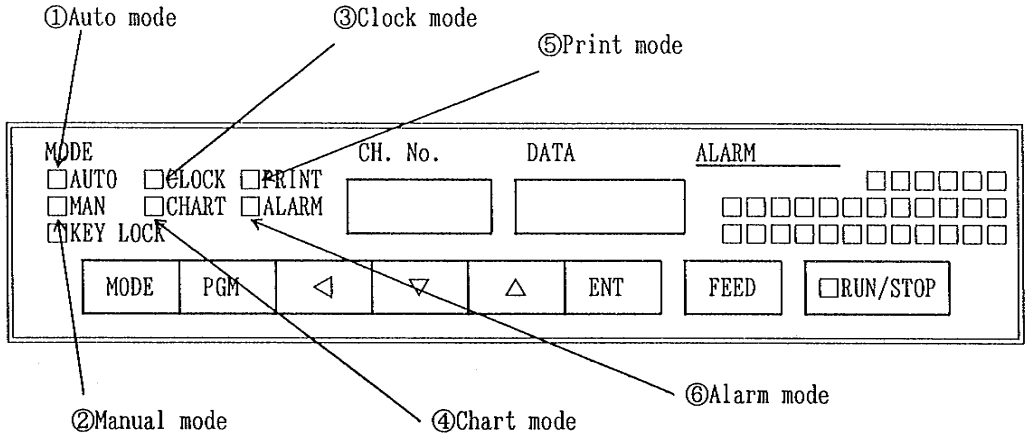

Fig. 7.2 User Mode Functions

Chart 7.2 User Mode Functions:

No.	Display	Name	Function	References
①	AUTO	Auto mode	Indicates automatically the measured values of all channels sequentially.	Article ② of Section 9.3
②	MAN	Manual mode	Indicates the measured values of selected channels by depressing [▽] [△] keys.	Article ③ of Section 9.3
③	CLOCK	Clock mode	Indicates and changes time, day, month, and year.	Article ④ of Section 9.3
④	CHART	Chart mode	Indicates and changes the feeding speed of chart paper.	Article ⑤ of Section 9.3
⑤	PRINT	Print mode	Performs log and list printing. Generates to start comment printing. Setting the interval log printing and comment printing	Articles ⑧, ⑨,⑩,⑪, and ⑫ of Section 9.3
⑥	ALARM	Alarm mode	Indicates the alarm setting and sets the alarm setting points and the alarm outputs.	Articles ⑬ and ⑭ of Section 9.3

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7.3 Names and Functions of the Keys

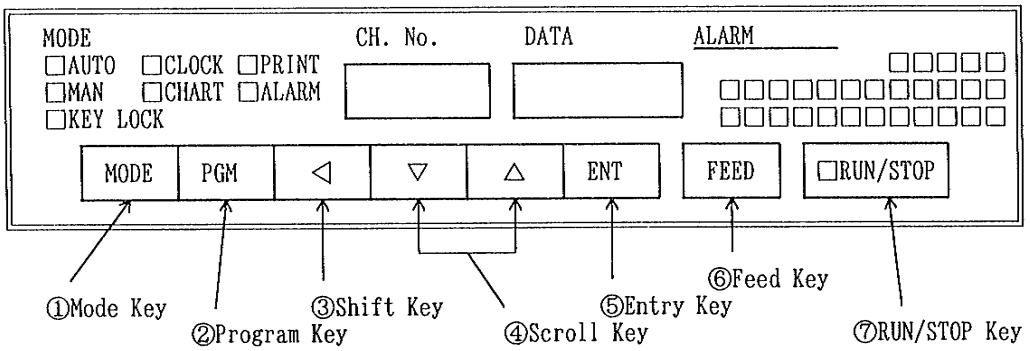

Fig. 7.3 Names of Keys

Chart 7.3 Names of Keys

No.	Key	Name	Function
①	MODE	Mode key	Changes a mode sequentially AUTO → MAN → ····· → AUTO, when you depress the key.
②	PGM	Program key	Selects the input mode at the setting various parameters.
③	◁	Shift key	Changes the selecting items sequentially in reverse order at the setting various parameters. Moves the changing digit leftward mode.
④	▽ △	Scroll key	Sets up and changes the scroll data of the items. ▽ : Count down function of value and item. △ : Count up function of value and item.
⑤	ENT	Entry key	Executes the setting selected value of item at the setting various parameter. Moves the changing digit rightward at input mode.
⑥	FEED	Feed key (quick-feeding)	Feeds the chart paper quickly.
⑦	RUN/STOP	RUN/STOP key	Selects the start or stop motion of recording.

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8. RECORD AND PRINTING

8.1 Multipoint Discrimination for 30 Channels

The multipoint discrimination for 30 channels can be done by this recorder using the 6-color ink ribbons and the discrimination of five types of mark.

Note: For protection of chart paper, the plot would not be made, in case of the interval between the previous plot point and the next plot point is being positioned less than 0.2 mm towards the chart paper feeding direction, or less than 0.5 mm towards the scale, in the same channel.

Chart 8.1 List of Multipoint Discrimination for 30 Channels

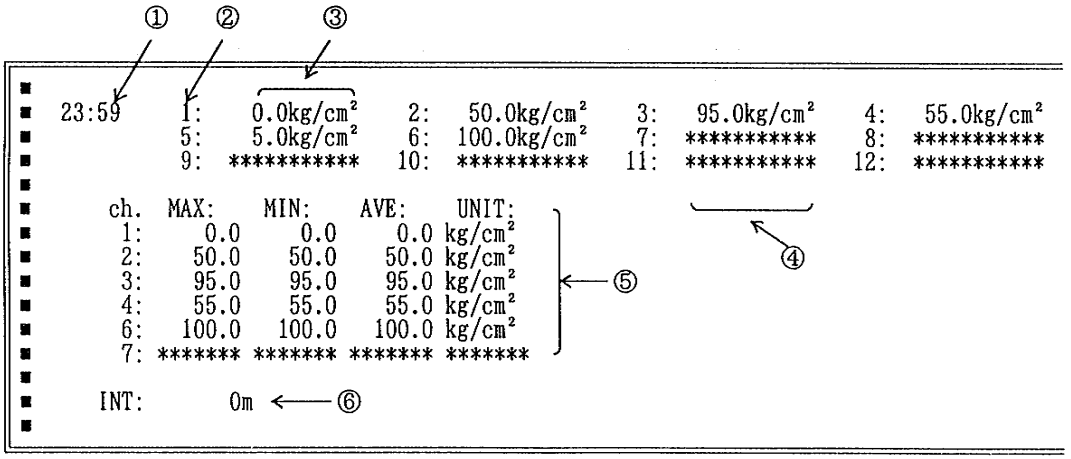
	Multipoint Channel				
Mark / Color	•	◇	+	Y	×
Purple	Ch. 1	Ch. 7	Ch. 13	Ch. 19	Ch. 25
Red	Ch. 2	Ch. 8	Ch. 14	Ch. 20	Ch. 26
Black	Ch. 3	Ch. 9	Ch. 15	Ch. 21	Ch. 27
Green	Ch. 4	Ch. 10	Ch. 16	Ch. 22	Ch. 28
Blue	Ch. 5	Ch. 11	Ch. 17	Ch. 23	Ch. 29
Brown	Ch. 6	Ch. 12	Ch. 18	Ch. 24	Ch. 30

8.2 Printing

Note: Print position is 1 mm backward from plot position on the chart paper.

(1) An example of log print (12-point recorder)

Refer to the article ⑧ and ⑩ of Section 9.3 for log print.

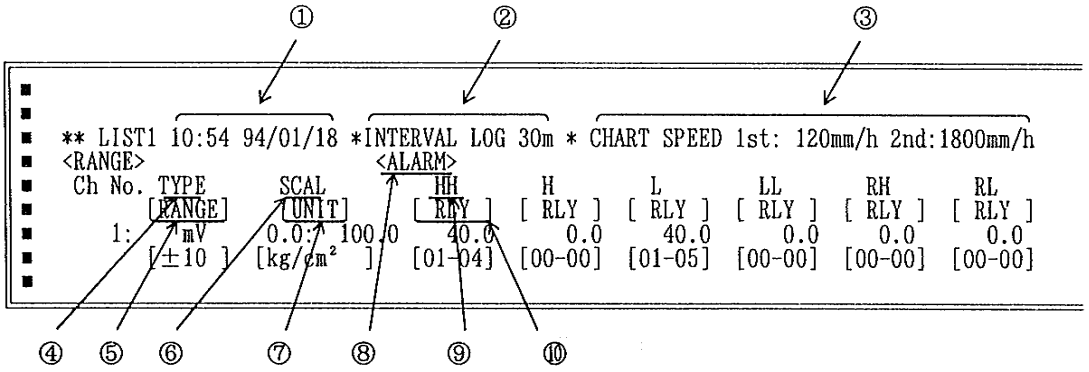


①Time ②Channel No. ③Measured value ④Setting plot skip
⑤Maximum, minimum, & average value (Option) ⑥Integrating value (Option)

Fig. 8.1 An Example of Log Print

(2) An example of list print

Refer to the article ⑨ of Section 9.3 for list print.



①Time, day, month, and year print
②Setting interval log print
③Setting feeding speed of chart
④TYPE: Type of input
⑤RANGE: Input range
⑥SCAL: Scale plate '0', span point value
⑦UNIT: Measuring unit
⑧ALARM: Setting alarm
⑨HH, H, etc.: Setting alarm point
⑩RLY: Setting alarm output

Fig. 8.2 An Example of List Print

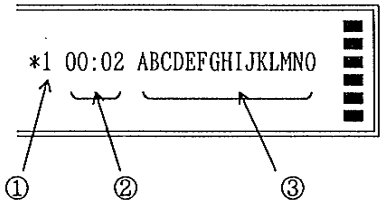
Note: Some types of input are used abbreviated words as shown below.

Type of input	Abbreviated word
PR40-20	PR4
Au-Fe	A-F
PL II	PL
JPt100	JPt
Pt100	Pt1
Pt50	Pt5
Cu10Ωat0°	Cu
Cu10Ωat25°	Cu

(3) An example of comment print

For activation and setting of comment print, refer to the article ⑪ of Section 9.3.

Note: Comment is printed on the right hand of chart paper synchronizing with paper feed.



① Comment No.
② Printing time
③ Comment

Fig. 8.3 An Example of Comment print

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(4) A print example of time and date

For information about printing function of time and date, refer to a separate volume"Engineering Data Manual".

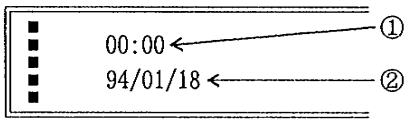
Note: Synchronized printing with paper feed

Relationship between Chart Speeds and Time Print Operation:

Chart speed	Time print operation
9mm/h or slower	Printing not performed
10～29mm/h	Printed every 6 hours
30～100mm/h	Printed every 2 hours (even-numbered time)
101mm/h or faster	Printed every 1 hour

Relationship between Chart Speeds and Date Print Operation:

Chart speed	Date print operation
4mm/h or slower	Printing not performed
5mm/h or faster	Printed at designated time

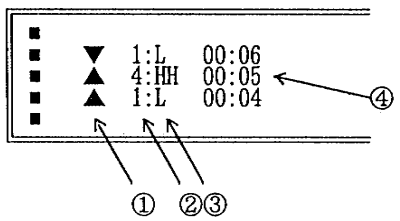


① Printing time
② Printing date

Fig. 8.4 A Print Example of Time and Date

(5) A print example of alarm mode- On/Off (Option)

Note: Synchronized printing with paper feed



① Alarm marks:
(▲: Alarm ON; ▼: Alarm OFF)
② Alarm channel No.
③ Alarm Mode
④ Alarm ON(OFF)time

Fig. 8.5 A Print Example of Alarm Mode-ON/OFF

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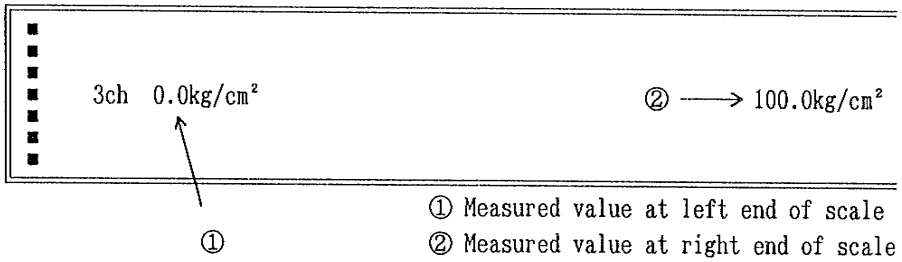
(6) A print example of measured value of scale(Option)

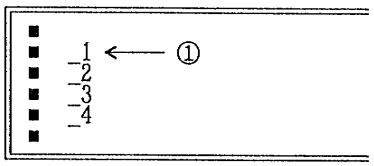


① Measured value at left end of scale
② Measured value at right end of scale
ex. The measured value at left end in CH 3 is 0.0kg/cm² and the measured value at right end in CH 3 is 100.0kg/cm².

Note: Printing of the measured value of scale is synchronized with the feeding of chart paper with an interval of 60mm, except when a forced printing is activated in a process of printing.

Fig. 8.6 A Print Example of Measured Value of Scale

(7) A print example of change of range (Option)



① Range is change at range-SW1 (DI)
Note: Synchronized printing with paper feed

Fig. 8.7 A Print Example of Change of Range

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9. RECORDING AND OPERATION (USER MODE)

9.1 Parameters for Setting User Modes

For user modes, the parameters shown in Chart 9.1 below can be set. In case that no specification for setting user modes is made on an order placed, the following initialization will be applied.
Refer to Section 9.2 and Section 9.3 for change of the setting procedures.

Notes: 1. All setting is maintained even after power-OFF.
After the setting is changed, the set parameters will not be returned to the initialization even if the power switch of recorder is turned OFF.
2. The items denoted 'Option' in the chart below, can be set only for the order specified such option.

Chart 9.1 Parameters for Setting User Modes

Setting Items	Setting Range	Initialization	Remarks
CLOCK MODE:			
Year, Month, Day, Time	Year : 1993 ～ Month : 01 ～ 12 Day : 01 ～ 31 Hour : 00 ～ 23 Minute: 00 ～ 59	Current time	
CHART MODE:			
Chart paper feeding speed Setting: 1st speed 2nd speed	 1st／2nd 1 ～ 1800 mm/h 1 ～ 1800 mm/h	 1st 30mm/h 60mm/h	
PRINT MODE:			
Specific interval log print Interval log print action	ON 1 (Asynchronous) ON 2 (Synchronous) OFF	ON 2	
Interval log print space	10,20,30 min. 1,2,3,4,6,8, 12,24 hour interval	6 hour	
Starting time of printing	0 ～ 23	—	It can be set only for 8 hr interval or over.
Max., Min., Ave. setting print (Option) Note: Set for each channel.	ON OFF	OFF	
Setting integrating print (Option)	ON OFF	OFF	

(To be continued to next page)

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(To be continued from previous page)

Setting Item	Setting Range	Initialization	Remarks
Comment print Comment data No.1 ～ No.5 (5 types) 16 characters for each	 ASCII code 20H - 7FH	Whole data 20H	H stands for hexa-code.
Setting plot skipping Note: Set for each channel.	ON - plotting OFF-no plotting	For all channels ON	
ALARM MODE:			
Setting alarm point Note: The following alarm actions for each channel can be set. (Alarm type: 6 types) HH alarm H alarm L alarm LL alarm Rate of change alarm (RH) Rate of change alarm (RL)	 -19999 ～ 99999 (Decimal point, setting point units conform with setting engineering data.)	 For all channels: HH : 0. 0 H : 0. 0 L : 0. 0 LL : 0. 0 RH : 0. 0 RL : 0. 0	Changing range specifications (Option) : OK for each range.
(Parameter for detective) Detective interval for rate of change(tc)	1 ～ 99 sampling Setting number of sampling per channel. 1 sampling: 5.0 sec./ch. × number of ch. (See footnote of the chart.)	tc : 1	
Setting new alarm mode (Option) Note: Set for each channel.	ON for alarm OFF for no alarm	OFF	
Setting alarm output Setting of 2-outputs for each alarm type of each channel can be made. Numbers of channel (30) × Alarm type (6)	00～60 Note: 00: No relay output No detective action in case two points are 00. 01 ～ 60: OK for indication & relay output	00, 00	Changing range specifications (Option) : OK for each range. (No detective action) (Relay output: option)

Note: 2.5 sec.-plotting : 2.5 sec/ch
5 sec.-plotting : 5 sec/ch
10 sec.-plotting : 10 sec/ch

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9.2 A Summary Chart of Recording and Operation (User Mode)

Refer to Section 9.3 as to the procedures.
Refer to Section 9.1 as to the parameters for setting.

Chart 9.2 A Summary Chart of Recording and Operation

Operation	User Mode	Reference
To set/Release - Key lock		9.3 - ①
To indicate measured value by auto mode.	AUTO mode	9.3 - ②
To indicate measured value by manual mode.	MANUAL mode	9.3 - ③
To indicate year, month, day, and time.	CLOCK mode	9.3 - ④
To set paper feed of chart paper and its indication.	CHART mode	9.3 - ⑤
To change paper feed RUN/STOP.		9.3 - ⑥
To feed(FEED) chart paper quickly.		9.3 - ⑦
To execute log print.	PRINT mode	9.3 - ⑧
To execute list print.	PRINT mode	9.3 - ⑨
To set interval log print.	PRINT mode	9.3 - ⑩
To set and start up comment print.	PRINT mode	9.3 - ⑪
To set plot skipping function.	PRINT mode	9.3 - ⑫
To set alarm functions.	ALARM mode	9.3 - ⑬
To check alarm ON.		9.3 - ⑭
To execute resetting new alarm function. (Option)	ALARM mode	9.3 - ⑮

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9.3 Recording and Operation Procedures

① Locking and unlocking key

The keys of recorder are locked automatically, when an initialization is executed after power-on or no key operation is executed for five minutes.

Under the circumstance of KEY LOCK lamp being turned on, the locking function is actuated so that also the data protection function (refer to the article(3)) can be actuated.

(1) Locking key
If the key operation is not executed for five minutes at user mode, KEY LOCK lamp is turned on, and the keys are locked,automatically.

(2) Unlocking key
Depress [PGM] key and [ENT] key simultaneously for five seconds, then KEY LOCK lamp is turned off, the keys are unlocked.

(3) KEY LOCK state
Under KEY LOCK state, the following setting can not be executed since [PGM] key does not work.

<Items for KEY LOCK>
① Setting alarm point and alarm output
② Chart paper feeding speed
③ Year, month, day,time
④ Setting interval log print
⑤ Setting comment print
⑥ Engineering data (Refer to a separate manual "Engineering Data Manual.")

Notes: 1. Changing of user mode, and checking its setting can be executed.
2. You cannot move to 'Engineering Mode' under the KEY LOCK state.

② Indication of measured value by auto mode (Auto Mode)

In this mode, the measured value for each channel is indicated sequentially, and the indication is changed at plot interval.

(1) Selection of Auto Mode

Depress [MODE] key to turn on the auto mode lamp of the indicator, then the indication of measured value is changed at the interval of plot automatically.

As to the indication of 'Alarm ON' or 'ERROR', refer to the article ⑭ Checking 'Alarm ON', ⑮ Execution of Resetting New Alarm, and Section 11.1.

Notes: 1. For the channel set the plot skipping, the measured value is not indicated.

2. In the event that 'Display OFF'-function (option) is being set 'ON', the measured value is not indicated.

③ Indication of measured value by manual mode (Manual Mode)

To indicate the selected fixed channel.
For 'Alarm ON Mode', refer to the articles ⑭ Checking Alarm ON', and ⑮ Execution of Resetting New Alarm'.

(1) Selection of Manual Mode

Depress [MODE] key to turn on 'MAN lamp' of the mode indicator.

Select the indication channel by operating [▽] [△] keys.

Depress [ENT] key to select Manual Mode 2.

(2) Manual Modes 1 and 2

Function		Manual Mode 1	Manual Mode 2
Display	Indicator (1)	Indication of Channel No.	Blinking Channel No.
	Indicator (2)	To indicate the measured value, but indicate "SKIP" for Plot Skip Selection channel.	
Plotting		Performed	Not performed
Checking alarm		Performed	Output for indication channel only
Interval log print		Performed	Not performed
Self-diagnosis		Performed	Not performed
Sampling cycle of indication		Synchronizing with the plot	0.5 sec. cycle

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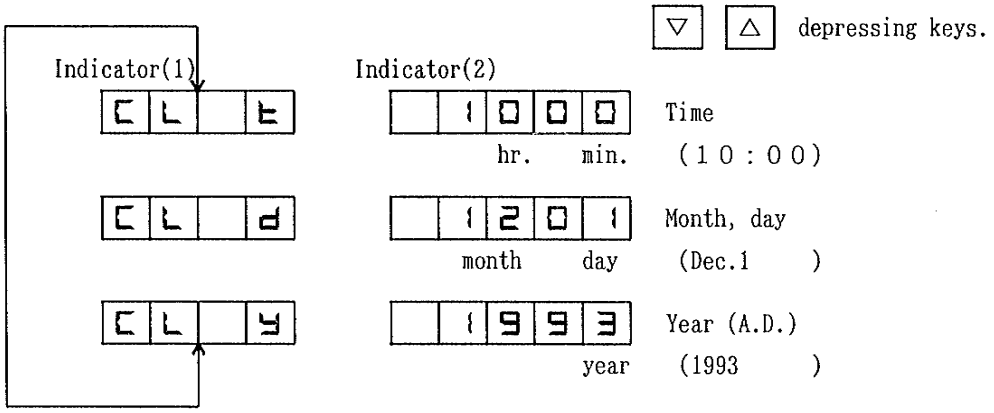
④ Setting indication of time, day, month, year (Clock Mode)

In CLOCK mode, current time, day, month, and year are indicated on the indicator-(2) as the illustration below. You can change above also. (Refer to the article (2).)

(1) Indication of time, day, month, year

Depress [MODE] key,to turn on CLOCK lamp in the mode indicator, and then, current time, day, month, and year (A.D.) are indicated.

Each item is indicated by [▽] [△] depressing keys.



The followings are to be indicated on the indicator-(1)

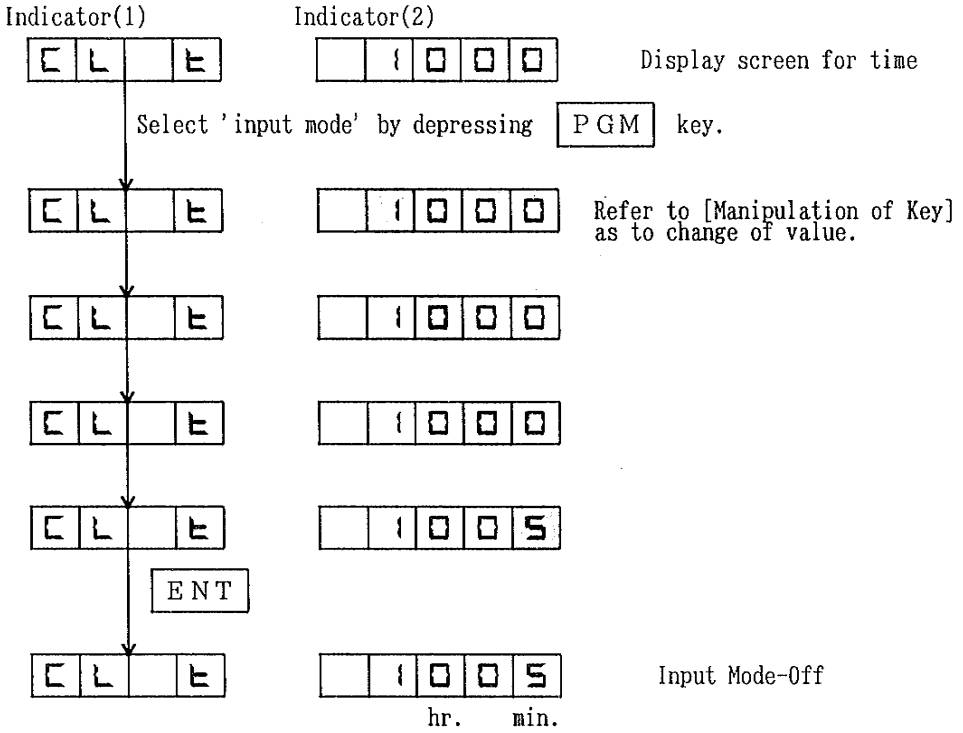
CL : Clock
t : Time
d : Date
y : Year(A.D.)

Fig. 9.1 Indicator Screen in Clock Mode

(2) Changing of time, day, month, year

Depress [MODE] key to turn on CLOCK lamp of the mode indicator and to indicate current time.

Select a digit to be changed (time, day, month, and year) by depressing [▽] [△] key to move a blinking cursor to it.



[Manipulation of Key]

: point of input (a blinking cursor)

Selection of figure: [▽] [△]

Moving to select a digit: Depress [ENT] key to move rightward (to select input point).

Depress [◁] to move leftward (moving only).

Input Mode-OFF: Depress [MODE] key (to move to 'Chart Mode')

or depress [ENT] key setting the blinking cursor at the right-end digit.

Fig. 9.2 Change of Time

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⑤ Setting and indication of feeding speed of chart paper (Chart Mode)

In setting feeding speed of chart paper, the setting of '1st speed' or the setting of '2nd speed' can be selected. For indication of each feeding speed, refer to the article (1), and refer to the article (2) for its setting.

(1) Indication of feeding speed of chart paper

Depress [MODE] key to turn on 'CHART' lamp of the mode indicator, then, the feeding speed of chart paper is indicated.

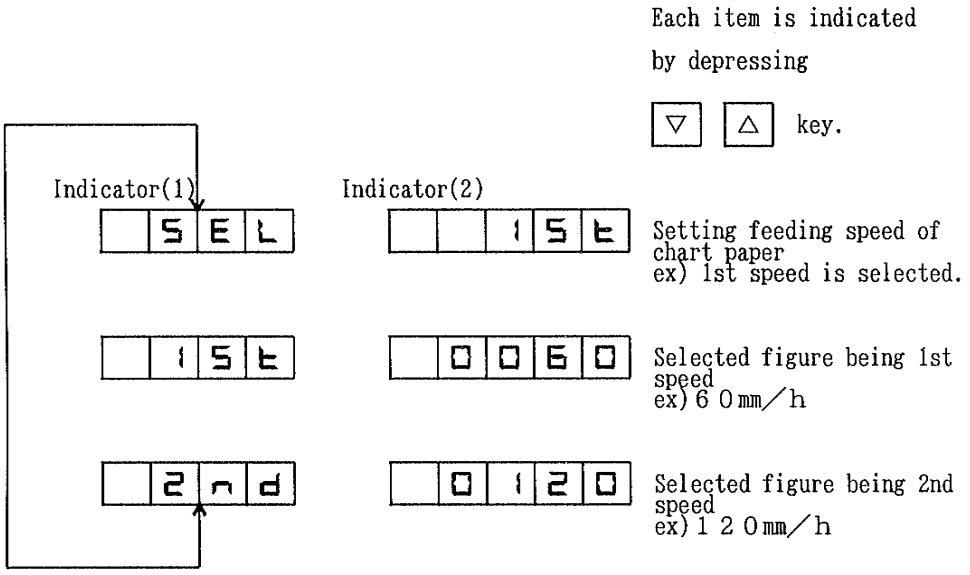

Fig. 9.3 Indication of Chart Mode

Note: For protection of chart paper, the plot would not be made in case of the interval between the previous plot point and the next plot point is being positioned less than 0.2 mm towards the chart paper feeding direction, or less than 0.5 mm towards the scale, in the same channel. It requires the following chart paper feeding speed to plot with the whole points.

Plotting Interval	Chart Paper Feeding Speed
2.5 sec. interval plot	Over 30 mm/h
5 sec. interval plot	Over 15 mm/h
10 sec. interval plot	Over 10 mm/h

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(2) Changing of setting for feeding speed of chart paper

Note: The changing method of paper speed at delivery time, is set as the changing is being made through DI. Follow the steps illustrated below, after changing of the changing method of paper feeding speed to the manipulating key method referring to the Engineering Data manual.

Depress [MODE] key to indicate the paper feeding speed as described in (1), and then, depress [PGM] key.

An example of changing the paper feeding speed from '1st' to '2nd' is shown below.

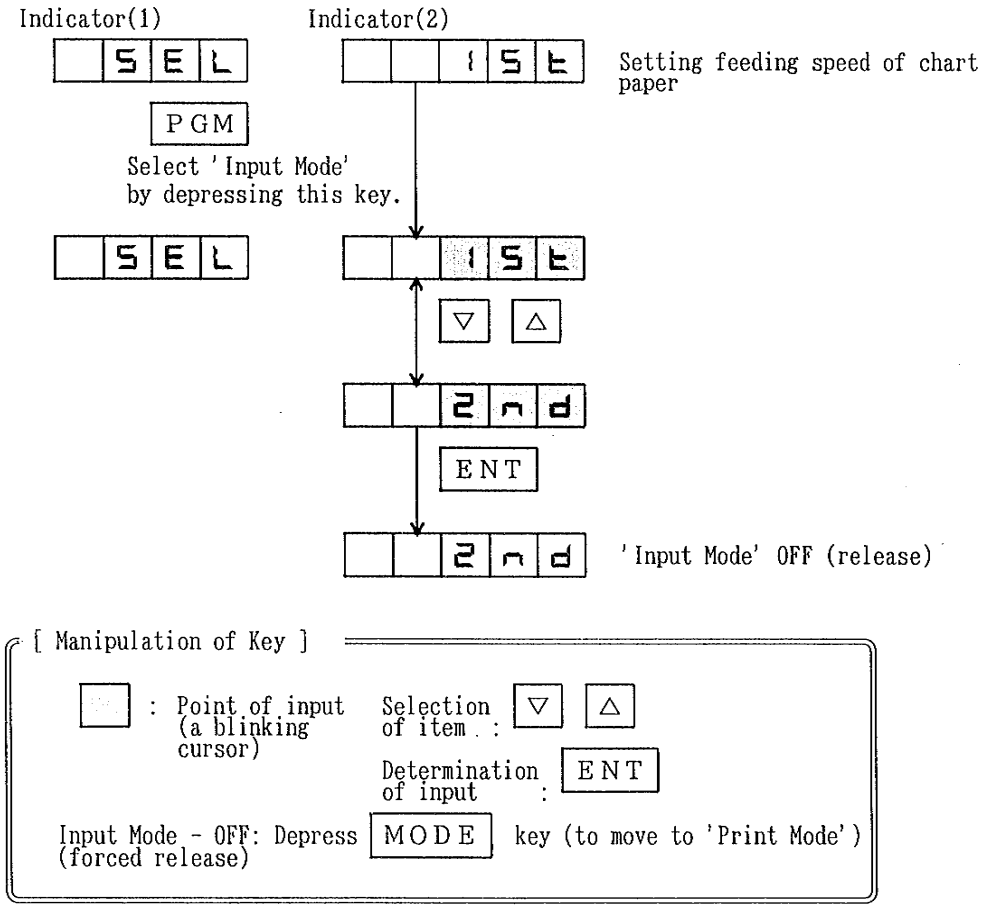

Fig. 9.4 Change of Feeding Speed of Chart Paper

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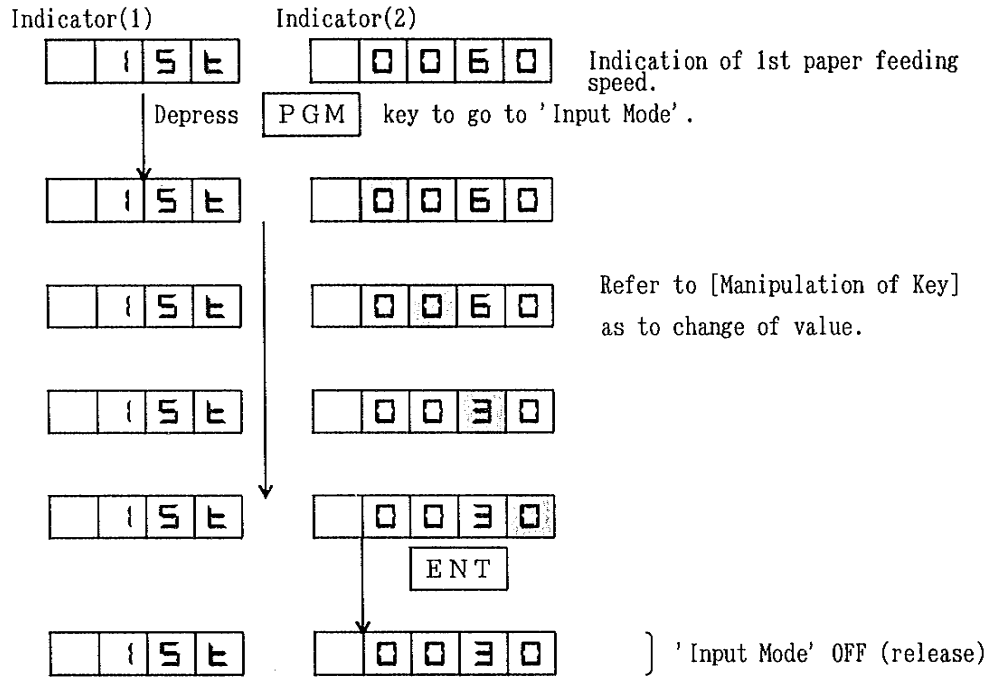
(3) Changing feeding speed (1st, 2nd)

Allowable range for setting: 1 ～ 1800 mm/h

An example of changing the set value(1st) of paper feeding speed from 60 mm/h to 30 mm/h, is illustrated below.

Depress [▽] [△] key to select the indication of paper feeding speed value (1st, 2nd) to be changed as described in the article (1).

Depress [PGM] key when the paper feeding speed value is indicated.



[Manipulation of Key]

▒ : Point of input (a blinking cursor)

Selection of figure: [▽] [△]

Moving to select a digit: Depress [ENT] key to move rightward (to select input point).

Depress [◁] key to move leftward (moving only).

Input Mode-OFF: Depress [MODE] key (to move to PRINT Mode or [ENT] key setting the blinking cursor at the left-end digit.

Fig. 9.5 Changing the 1st Feeding Speed

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⑥ Changing recording function - RUN/STOP

Start or stop of recording function is selected alternately by depressing RUN/STOP key. Also RUN/STOP lamp is turned on/off likewise.

RUN/STOP lamp	ON ; 'RUN' State of recording OFF; 'STOP' State of stopping
State of stopping	In this state,recording and sampling of data link are not executed. The value immediate before stopping is retained and indicated.

⑦ Quick-feeding (FEED) of chart paper

Depress FEED key.

Quick-feeding of chart paper goes on while FEED key is being depressed.

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⑧ Log print (Print Mode)

(1) Print mode

In this mode, log print, list print (output print of parameter established), comment print can be set to go on.
Setting of interval log print and comment print are enabled.

Note: Each print function is enabled only when the recording function is in 'RUN' state.

(2) Selection of print mode

Depress [MODE] key to turn on PRINT lamp of the mode indicator, then, the followings are indicated on the indicators(1), and(2).

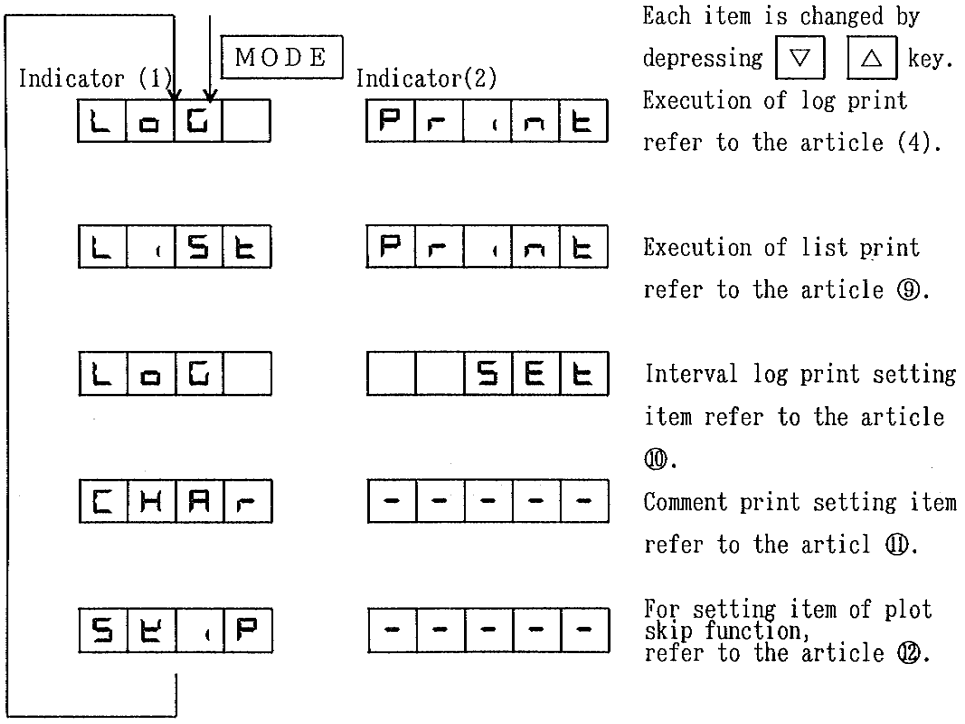

Fig.9.6 Indication in Print Mode

(3) Printing priority

The recorder has the printing priority described below. When a print operation is requested, that has a higher priority than the current print operation, the print operation with the higher priority is performed first, suspending the current print operation. Then the suspended print operation is resumed.

Priority: ←higher lower →

List print >Alarm ON print >Alarm OFF print >Log print >Comment print >Date print >Time print

Note: Several comment prints at one time can not be executed.

(4) Log print

Depress [ENT] key to start log print when 'Log'/'Print' indications are shown on both indicaters respectively. As to an example of log print, refer to Chapter 8.

Both of indicators, (1) and (2) are blinking while printing is executed.

Fig. 9.7 Execution of Log Print

Notes: 1. Printing is enabled only when the function is in the RUN state.

2. Chart paper is fed forcibly, since log print is not synchronized with paper feed.

3. Forced stop of log print

Depress [RUN/STOP] key to interrupt log print operation, then, the print operation is stopped and simultaneously, other waiting requests for print are erased also.

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⑨ List print (Print Mode)

For print mode, refer to Section ⑧ Log print.
Refer to Chapter 8 for an example of list print.

Depress [MODE] key to turn on PRINT lamp of the mode indicator for selection of Print Mode. Operate [△] [▽] key for list print selection (Fig. 9.8.).
Depress [ENT] key when list print selection is indicated, then list print is executed.

Indicator (1) LIST Indicator (2) PRINT

Both of indicators, (1) and (2) are blinking while printing is executed.

Fig. 9.8 Execution of List Print

Notes: 1. Printing is enabled only when the function is in the RUN state.
2. Chart paper is fed forcibly, since list print is not synchronized with paper feed.
3. Forced stop of list print
Depress [RUN/STOP] key to interrupt list operation, then, the print operation is stopped and simultaneously, other waiting requests for print are erased also.

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⑩ Setting interval log print (Print Mode)

For print mode, refer to Section ⑧ Log Print.

[Note] Life of ribbon will be shorter according to logging print times.
For more information, refer to Chapter 10.

(1) Setting interval log print

Depress [MODE] key to turn on PRINT lamp of the mode indicator.

Operate [▽] [△] key for interval log print selection (Fig.9.9).

Depress [ENT] key to indicate setting of interval log print function.

Depress [▽] key to indicate setting of interval log print.

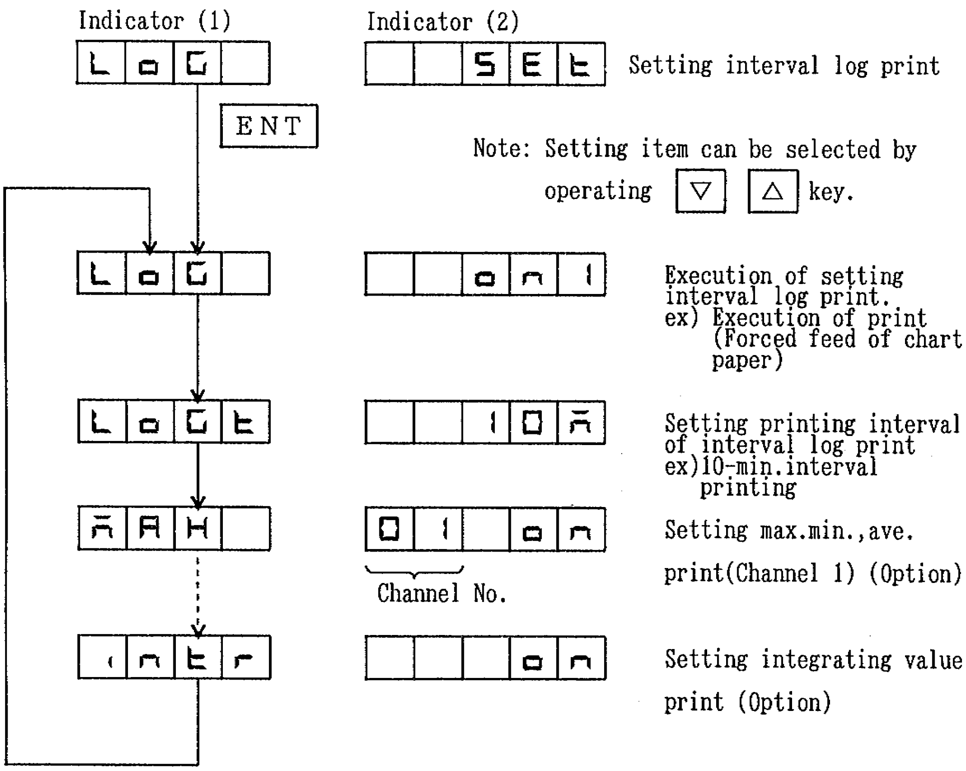

Fig. 9.9 Setting Log Print

For details of setting,refer to the article" (3) Interval Log Print Function and Printing Interval"

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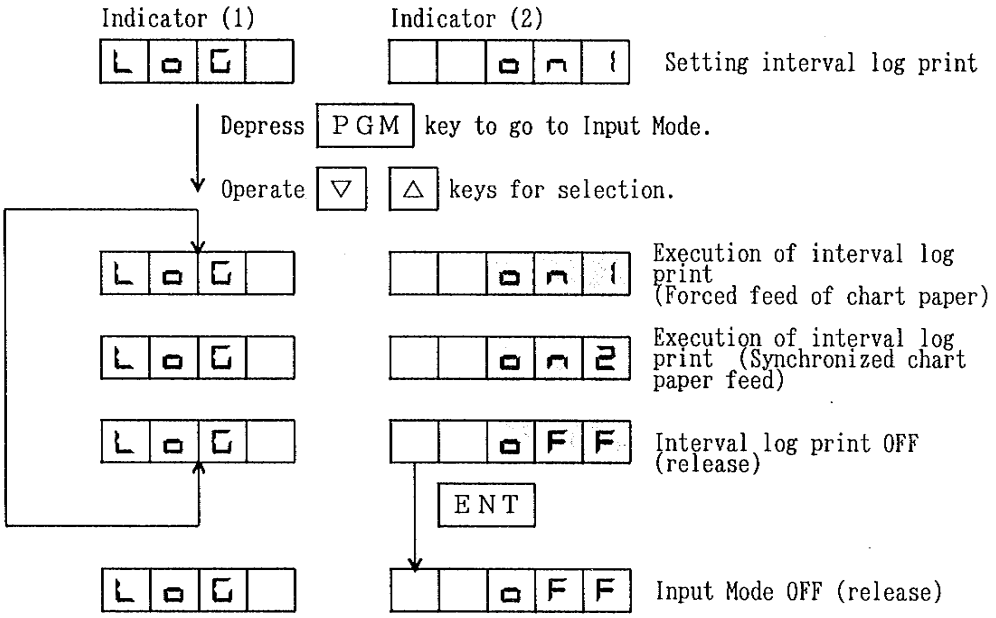
(2) Changing interval log print function

Operate [▽] [△] key for interval log print selection like the manner described in the article (1).

Depress [PGM] key to get into Input Mode.

Operate [▽] [△] keys to select print function.

Depress [ENT] key to execute.



[Manipulation of key]

: Point of input (a blinking cursor)

Selection of item: ▽ △

Determination of input: [ENT]

Input Mode - OFF:Depress [MODE] key (to go to 'Alarm Mode')

Fig. 9.10 Changing the Set Interval Log Print

(3) Interval log print function and printing interval

i) There are two types of interval log print according to the feeding method of chart paper, one is 'Forced Paper Feed Method' and the other one is 'Synchronized Paper Feed Method'.

Chart 9.3 Interval Log Print

Indicator (2)	Title of Indication	Function
on 1	Execution of interval log print (Forced feeding of chart paper)	To execute interval log print. After the start of printing, the compulsory line feed and paper feed are executed according to the printing format. Analog print will be suspended at this time.
on2	Execution of interval log print (Synchronized feeding of chart paper)	To execute log print. Analog print will not be suspended, since the printing is executed according to the set chart paper feeding speed. It requires the paper feeding with a certain speed or more (see the article ii)) to print log properly.
oFF	Interval log print OFF	No log print

ii) Printing interval of interval log print

Interval log print is executed synchronizing with the built-in clock. At the mode of "on2" (synchronized paper feed), it requires the minimum paper feeding speed shown in the below chart to print log properly.

Chart 9.4 Printing Interval of Log Print

Indicator (2)	Printing Interval	Designation of start time	Min.feeding speed of chart paper
10M	10-min. interval, every hour 00 10 20 30 40 50 min.,	Not applicable	7 2 mm/h
20M	20-min. interval, every hour 00 20 40 min.,	Not applicable	3 6 mm/h
30M	30-min. interval, every hour 00 30 min.,	Not applicable	2 4 mm/h
1H	1-hr. interval, everyhour,	Not applicable	1 2 mm/h
2H	2-hr. interval, 00 02 04.....22 hrs.,	Not applicable	6 mm/h
3H	3-hr. interval, 00 03 06.....21 hrs.,	Not applicable	4 mm/h
4H	4-hr. interval, 00 04 08.....20 hrs.,	Not applicable	3 mm/h
6H	6-hr. interval, 00 06 12.....18 hrs.,	Not applicable	2 mm/h
8H00	8-hr. interval, start time, start time + 8hrs., start time + 16hrs.,	Applicable	2 mm/h
12H00	12-hr.interval,start time,start time+12hrs.,	Applicable	1 mm/h
24H00	24-hr.interval, every day start time,	Applicable	1 mm/h

Note: In case of the printing with maximum, minimum, and average, value specifications (option); or integrating value printing specifications(option); the minimum feeding speed of chart paper needs to be set with a larger setting value than shown in Chart9.4, because of increasing of the volume of print.

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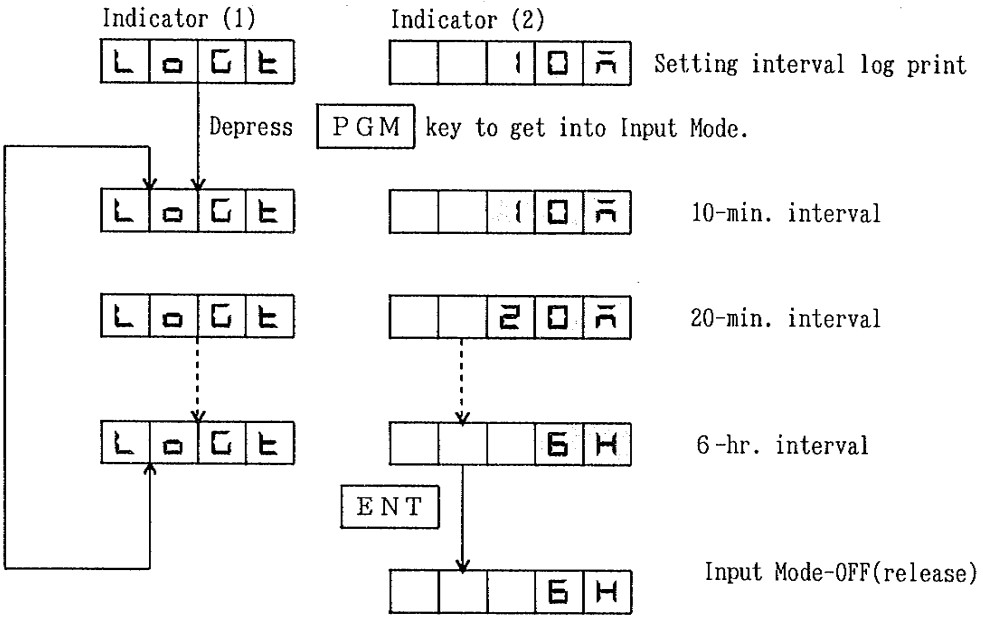
(4) Changing of printing interval of log print

Operate ▽ △ key for selection of printing interval for interval log print like the article (1).

Depress PGM key.

For details of setting, refer to the article '(3) Interval Log Function and Printing Interval'.

In the event that printing intervals are set like 8-hr., 12-hr., and 24-hr., interval; starting time has to be set. Refer to next page in this case.



[Manipulation of key]

: Point of input (a blinking cursor)

Selection of item : ▽ △

Determination of input: ENT

Input Mode-OFF:Depress MODE key (to go to Alarm Mode)

Fig. 9.11 Changing of Printing Interval of Log Print

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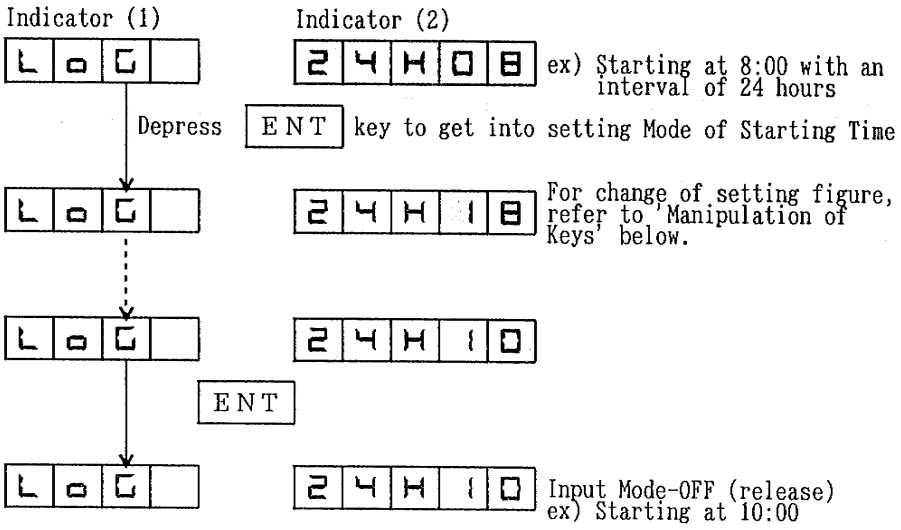
In the event that printing intervals are set just as 8-hr., 12-hr., and 24-hr., interval, starting time has to be set.

When [ENT] key is depressed in the manipulation of keys in the same manner described in previous page, the designated starting time of print is blinking on the display of indicator (2).

Note: Starting time of printing can be set at every hour.



[Manipulation of Keys]

: Point of input (a blinking cursor)

Selection of figure: [▽] [△]

Moving to a digit to be changed:

Depress [ENT] key to move rightward (to select input point).

Depress [◁] key to move leftward (moving only).

Input Mode Off: Depress [MODE] key (to move Alarm Mode)or (release)

[ENT] key setting the blinking cursor at the right-end digit.

Fig. 9.12 Changing of Starting Time of Printing

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(5) Setting of printing with maximum, minimum, and average value (Option)

Select ON/OFF of printing function with maximum,minimum,and average values for each channel at log print.

Select setting screen for printing with maximum,minimum,and average values like the manner described in the article(1).

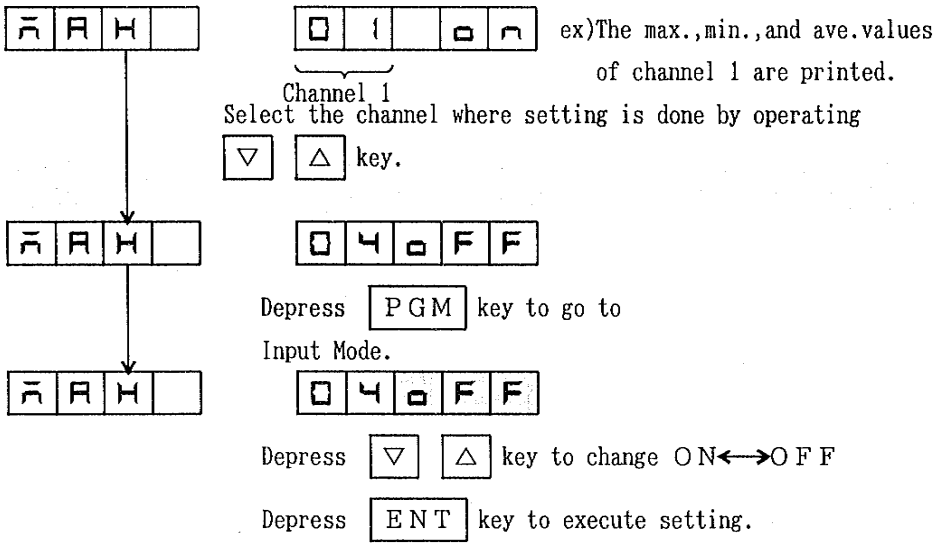

Fig. 9.13 Setting of Printing with Max., Min., & Ave. Values

(6) Setting of printing with integrating value (Option)

Select ON/OFF on log print with integrating value by DI.

Select setting of printing with integrating value following the article (1).

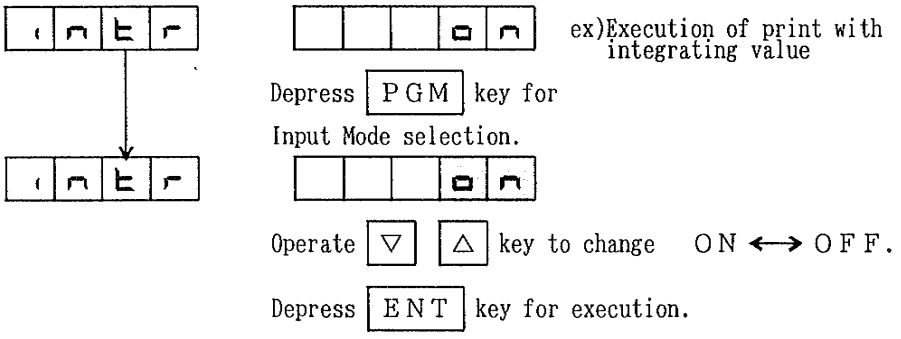

Fig. 9.14 Setting of Printing with Integrating Value

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⑪ Setting comment print and its printing (Print Mode)

For Print Mode, refer to the article '⑧ Log Printing (Print Mode)'.
For an example of comment print, refer to the article (3) of Section 8.2.

Note: The comments of No.1 to 5, and 16 characters for each comment can be set.

(1) Comment printing

Depress [MODE] key to turn on PRINT lamp of the mode indicator, and select Print Mode.

Select the setting item of comment print by operating [▽] [△] key.

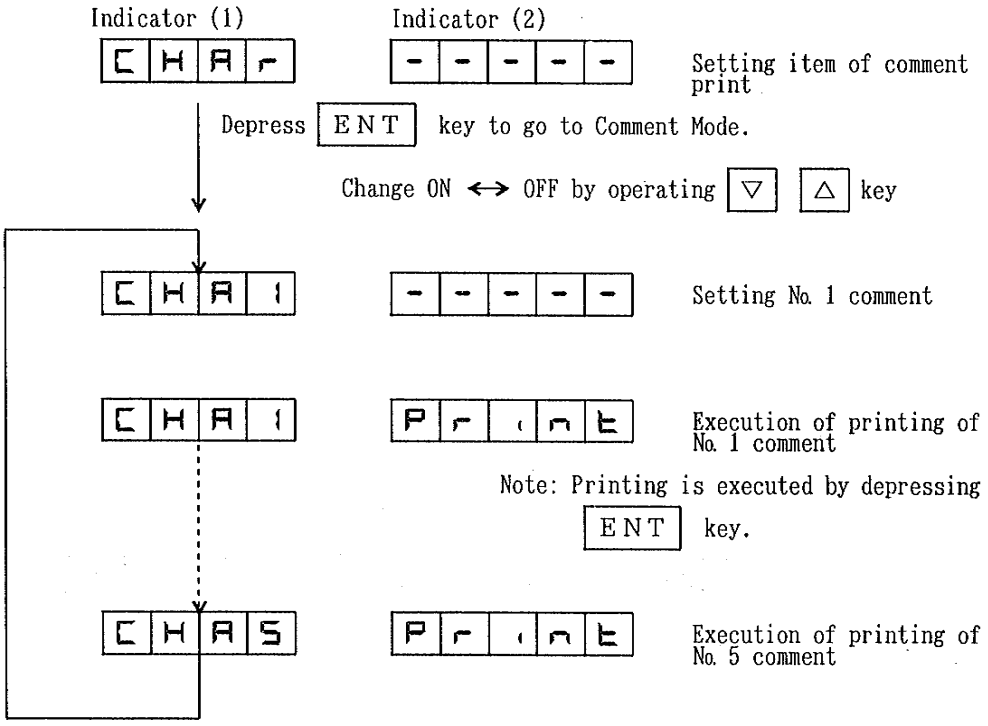

Fig. 9.15 Setting Comment Print

Note: In the event that comment print is executed at Print Mode, chart paper is feeded forcibly. In case of comment printing by DI (option), printing is made synchronizing with chart paper feeding.

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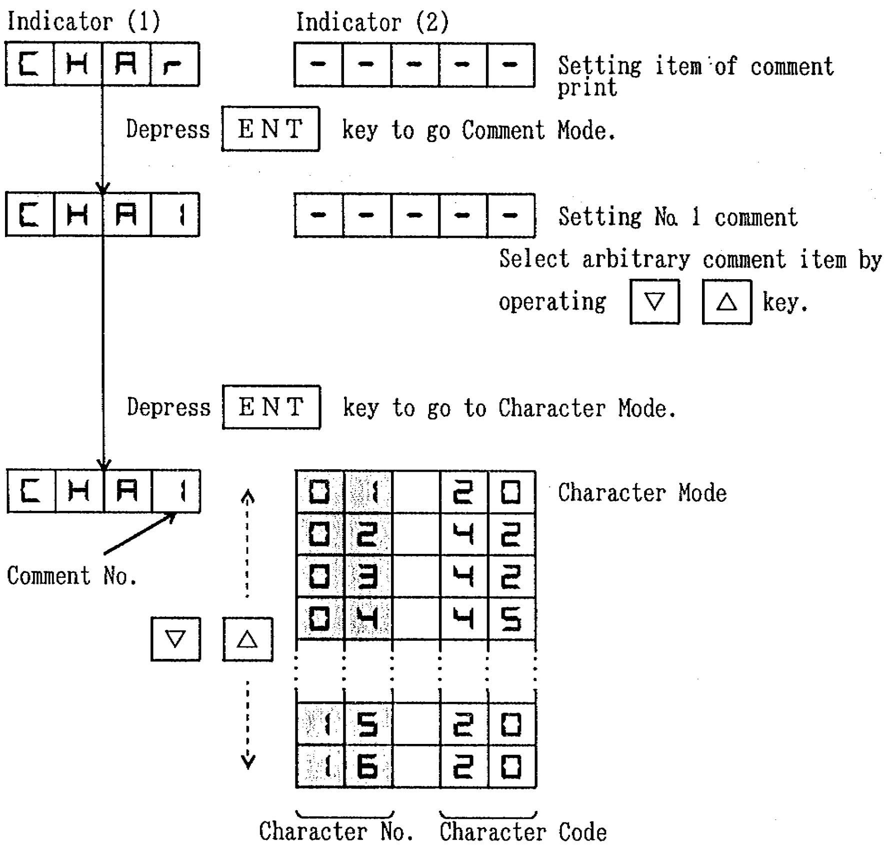
(2) Checking comment data

Depress [MODE] key to turn on PRINT lamp of the mode indicator, and select Print Mode.

Select the setting item of comment print by operating [▽] [△] key.



> [Manipulation of key]
>
> Depress [MODE] key at Input Mode (LED is blinking) to go to Alarm Mode and to release Input Mode.
>
> For the characters, refer to Chart 9.5 Character Codes.

Fig. 9.16 Checking Character Codes

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(3) A list of character codes

Note: The character is set by ASCII code.

Chart 9.5 Character Codes

High order ⟶

low order ↓

	2	3	4	5	6	7
0		0	@	P		p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	{
C	,	<	L	¥	l	|
D	−	=	M	]	m	}
E	.	>	N	^	n	~
F	−	?	O	_	o	

ex) You can locate "A" at crossing point of the vertical 4 with the across 1.

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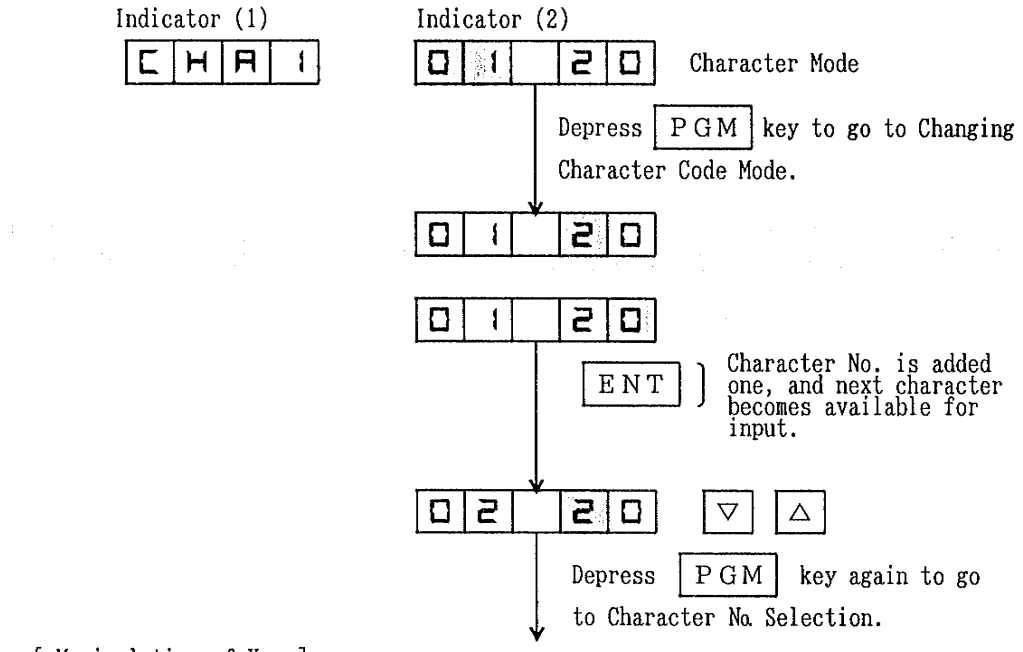
(4) Changing comment data

Select character number at Character Mode like the manner described in the article (2), by operating [▽] [△] key.

Depress [PGM] key to go to Changing Mode of Character.



[Manipulation of Key]

: Point of input (a blinking cursor)

Selection of figure or item: [▽] [△]

Moving to select a digit: Depress [ENT] key to move rightward (to select input point).

Depress [◁] key to move leftward (moving only).

Moving to next character No.: Depress [ENT] key for input, setting the blinking cursor at right-end digit.

Select character No. at Character Mode by operating [▽] [△] key.

Input Mode - Off: (release) Depress [MODE] key to go to Alarm Mode.

Return to Character Mode by depressing [PGM] key.

Fig. 9.17 Changing Comment Data

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⑫ Setting plot skip function (Print Mode)

For Print Mode, refer to the article '⑧ Printing Log (Print Mode)'.

(1) Plot skip function

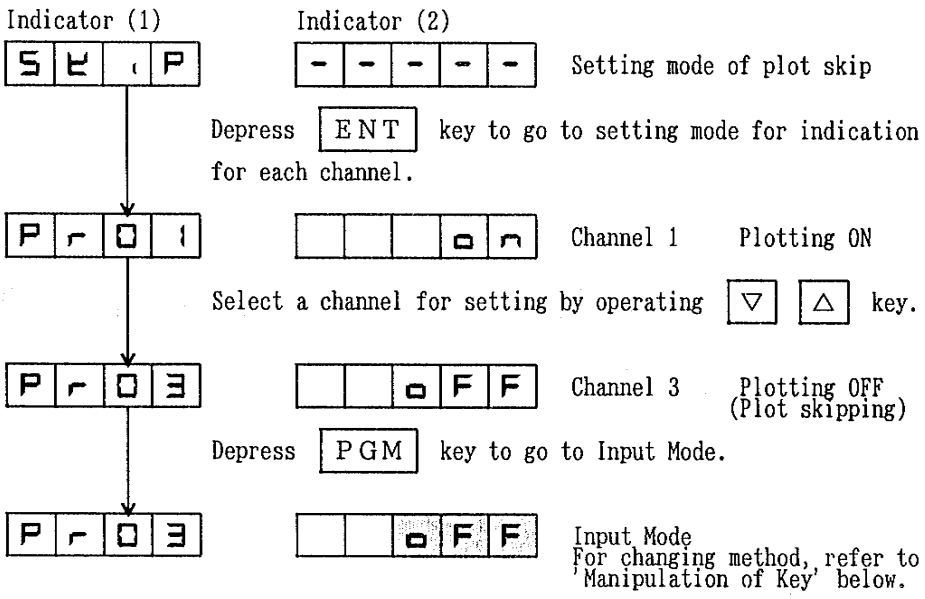
In order to skip the plotting and the indication of measured value at certain channel, set plot function OFF at the Plot Skip Mode.

The functions of the set channel are as follows;

- No plotting.
- The measured value is not indicated at Auto Mode or Manual Mode.
- No alarm detection is made.
- The measured value is indicated as "*" under the log print.

(2) Setting plotting OFF

Select the setting mode of Plot Skip according to the article '(2) of ⑧. Selection of Print Mode'



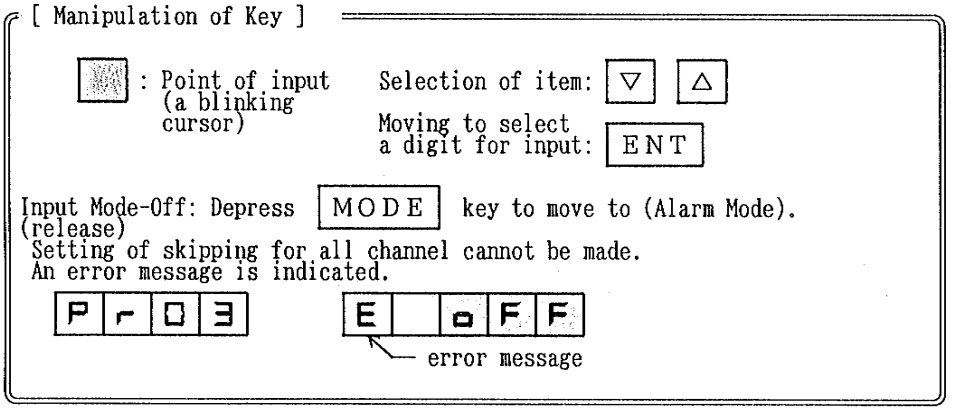


Fig. 9.18 Setting of Plotting OFF

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⑬ Setting alarm function (Alarm Mode)

(1) Alarm function

Setting of the following alarm modes and alarm outputs can be made.

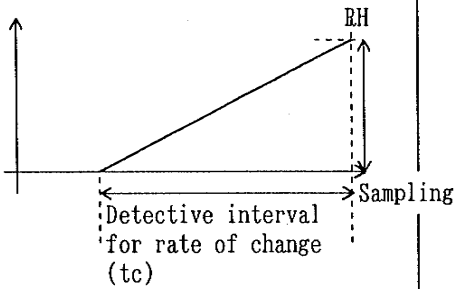
In case of the changeable range specifications (option), the above setting can be made for each range.

Setting Alarm Mode: 7 modes can be set. (See Chart 9.6.)

Alarm (output): For output, two modes can be set for each alarm mode.

(For setting, refer to the article (2).)

Chart 9.6 A summary list of Setting of Alarm Modes

Indicator(1) (ex.channel 1)	Alarm Mode	Function	Setting Range
01 HH	High-High alarm	When a measured value exceeds an alarm setting point.	-19999～99999 Note: Decimal point is set based on the setting value of Engineering Mode
H	High alarm		
LL	Low-Low alarm	When a measured value is lower than alarm setting point.	
L	Low alarm		
rH	Rate of change alarm(RH)	In case of + deviation in the measured value, arises on the detective interval for rate of change (tc) to be set in the figure shown below. Measured value  	
rL	(RL)	In case of - deviation in the measured value, arises on the detective interval for rate change, reverse to RH case.	
tc	Detective interval for rate of change	Setting a sampling interval of rate of change alarm	1～99 sample (1 sampling: plot interval x numbers of channel)

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(2) Designation of DO number

Set DO number for output when an alarm is occurred.

Notes for setting:

1) The following DO are available as optional functions.
   Alarm output: 8 points (DO No.01～08), DO: 52 points (DO No. 09～60)
   60 points in total, or alarm output: 30points (DO No.01～30).
2) Although you will be able to set DO number which is not designated at time of placing an order, alarm output cannot be made in that case.
3) In the setting of alarm output, two alarm points can be set for each alarm mode.
4) In case only one point of alarm output is being set, one of the setting points needs to be set as " 0 0 ".
5) In case of no detection of alarm is made, both of DO numbers need to be set as "0 0".
6) The same DO number can be set in different alarm mode or different channel.
7) Common Alarm (COM.ALM) at occurrence of alarm is output when DO number is designated.
8) The alarm output is made synchronizing with the plotting.

(3) Display screen of alarm mode

The alarm mode consists of the followings.
The following figures are the initial display screens for each alarm mode selected.

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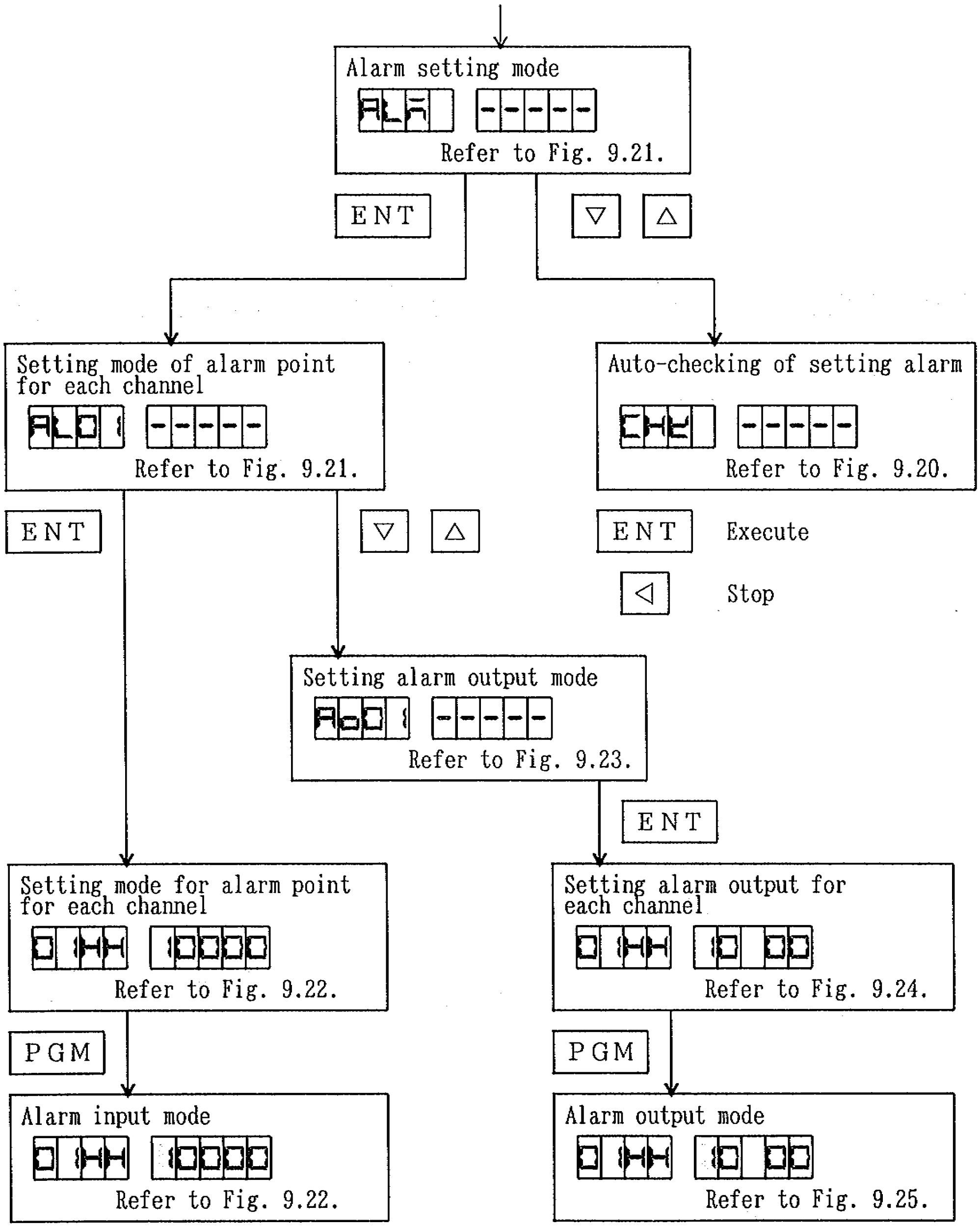
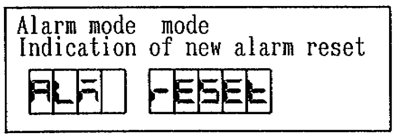
Note: To return to previous display screen by depressing ◁ key.
Alarm lamp is turned on by depressing MODE key.



Note:



In case of designating New Alarm Function (option), the indication shown in the left figure is indicated at an initial indication of alarm mode. See the article 15. of Sec. 9.3

Fig. 9.19 Display Screen of Alarm Mode

(4) Checking alarm setting

There are two methods in checking alarm setting point and setting alarm output, as follows;

(a) To indicate each setting automatically in the indicators (1) and (2).
Refer to '(i) Auto-checking of Alarm setting' described below.

(b) To print out each setting with the list print function.
Refer to ⑨. 'List Print (Print Mode)'.

(i) Auto-checking of alarm setting:
Setting of, each alarm point and alarm output are indicated automatically in the indicators (1) and (2).

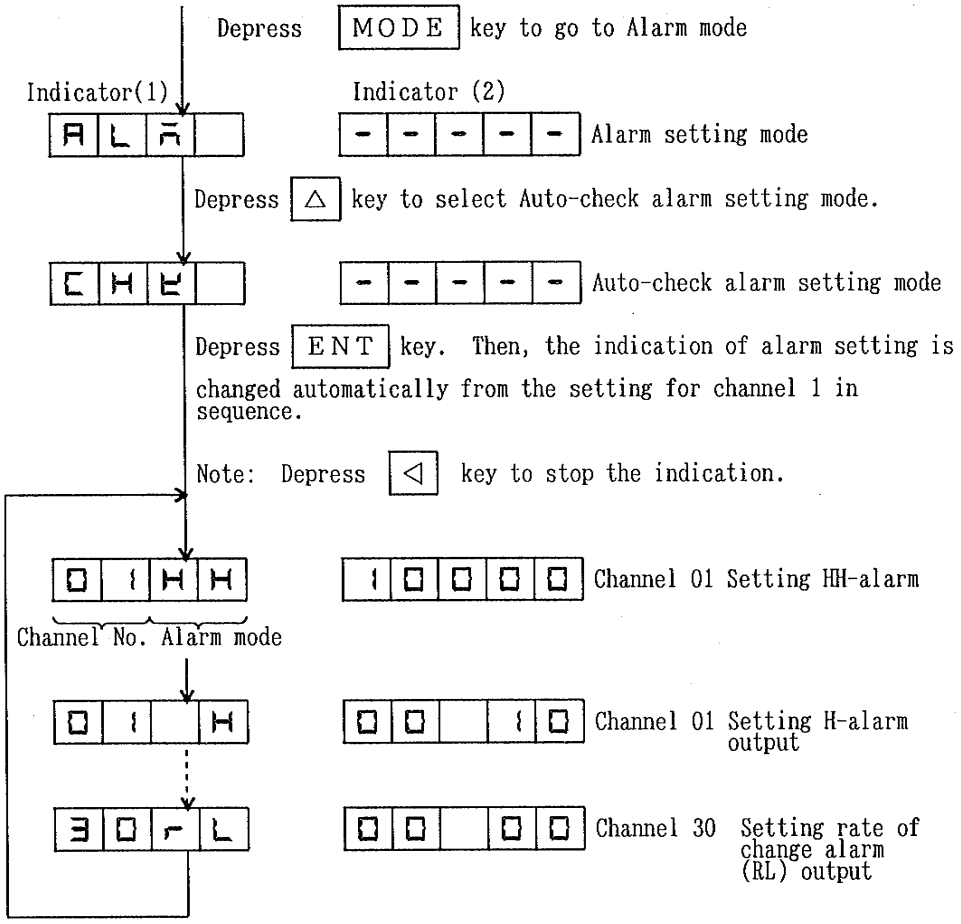


Fig. 9.20 Auto-Checking of Alarm Setting

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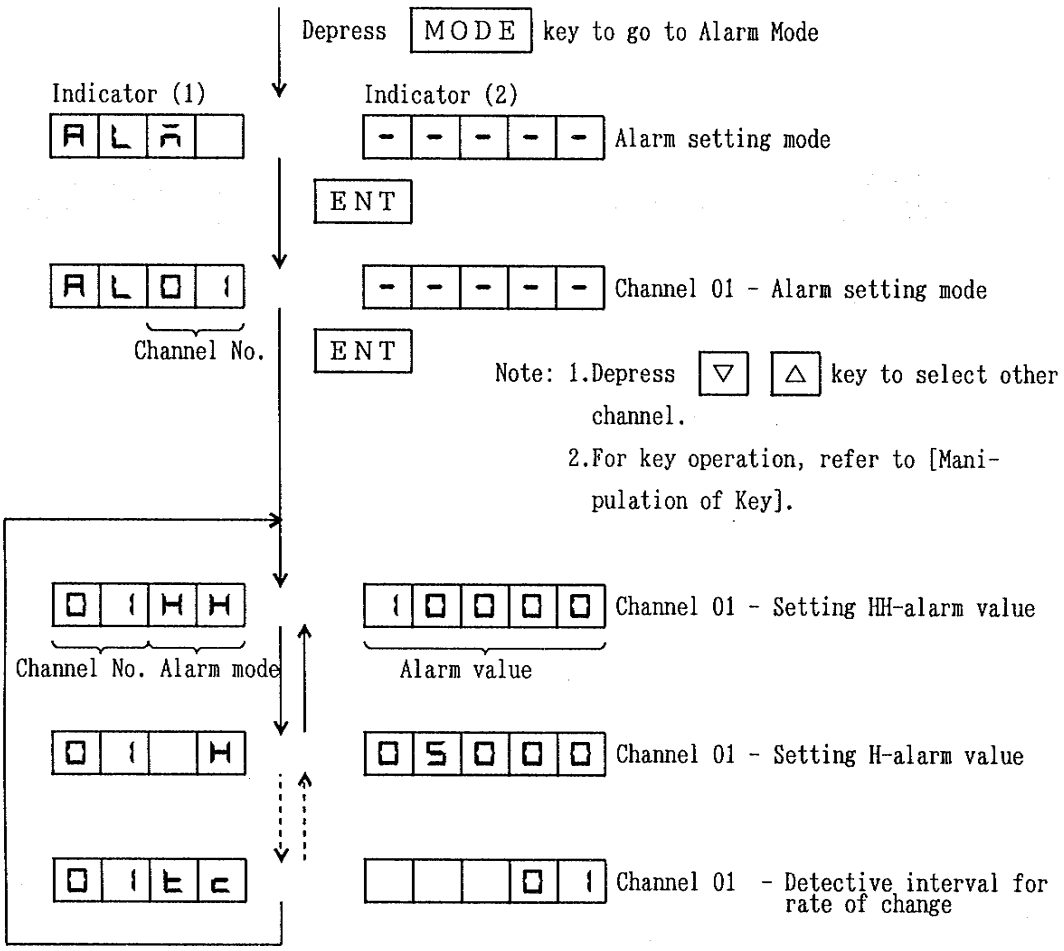
(5) Changing alarm mode setting

Set various alarm points.

For various alarm setting, refer to Chart 9.6.

(i) Selection of alarm setting point for change:



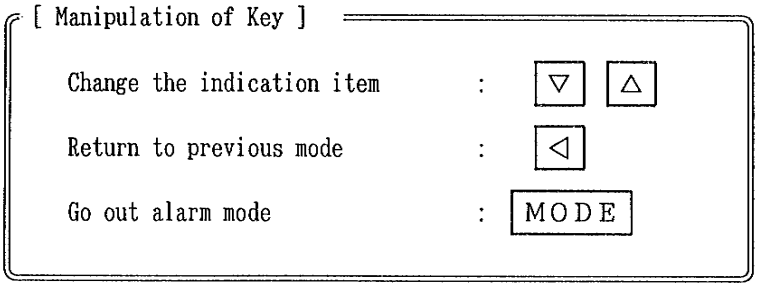
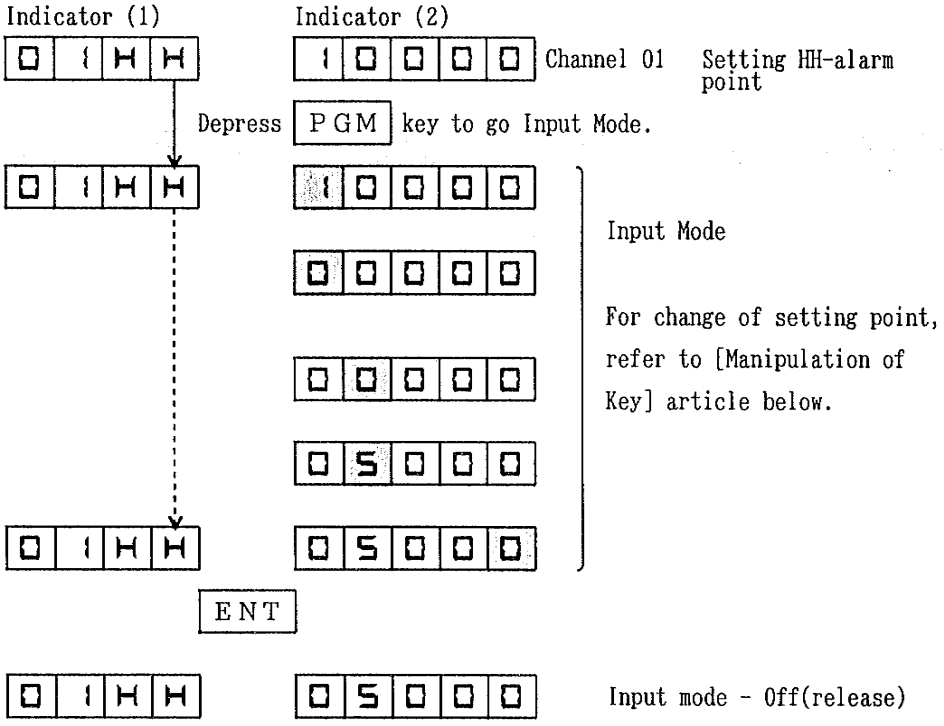


Fig. 9.21 Selection of Alarm Setting Point for Change

(ii) Changing alarm setting point:

An example of Changing HH-alarm setting point in the channel 01, from 10000 to 5000 is shown below.

Call the alarm mode like the manner described in the article (i), to indicate the alarm setting point to be changed.



[Manipulation of Key]

: Input item (a blinking cursor)

Selection of item: ▽ △

Moving to select a digit: Depress ENT key to move rightward (to select input item).

Depress ◁ key to move leftward (moving only).

Input Mode - Off : Depress MODE key (to move to Auto Mode)or depress ENT key setting the bliking cursor at right-end digit.

Fig. 9.22 Changing Alarm Setting Point

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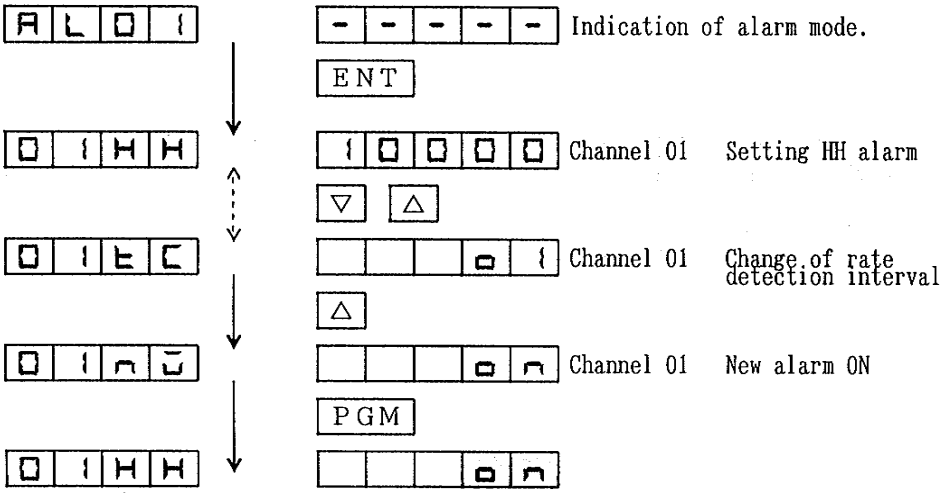
(6) Selection new alarm function On/OFF (Option)

Indication of setting new alarm ON/OFF function is indicated next to the interval indication (tC) of detecting change of rate, of the alarm point setting indication for each channel.

Select alarm setting mode as per Fig. 9.19.



Select ON/OFF according to 'Manipulation of Key' shown below.

[Manipulation of Key]

: Input point (a blinking cursor)

Selection ON/OFF by operating ▽ △ key.

Depress ENT key to set.

Input Mode OFF: Depress MODE key to move to Auto Mode.

Fig. 9.23 Selection of New Alarm ON/OFF

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(7) Changing alarm output (DO) number setting

Setting DO number for alarm output.

For setting output (DO), refer to the article (2).

(i) Selection of alarm (DO) setting for change

Note: Depress [MODE] key to go out Alarm Mode.

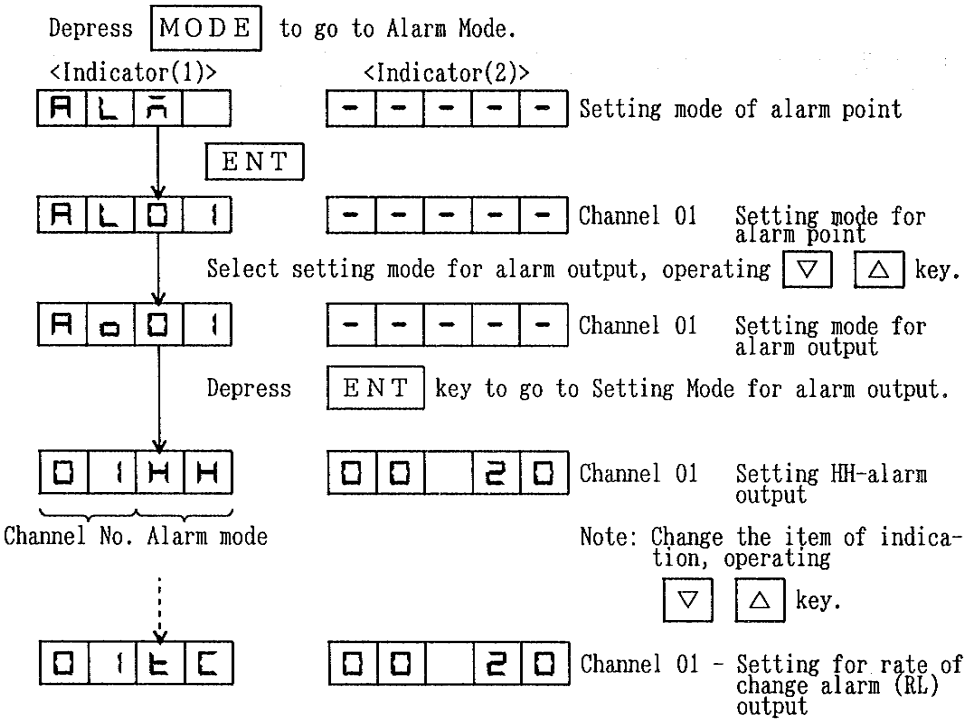

Fig. 9.24 Selection of Alarm (DO) Setting for Change

(ii) Changing alarm output (DO) number setting:

An example of change of setting alarm output from DO No. 10 to 20 and 09, is shown below;

Select the set Alarm Output for change following to the procedures of the article (1).

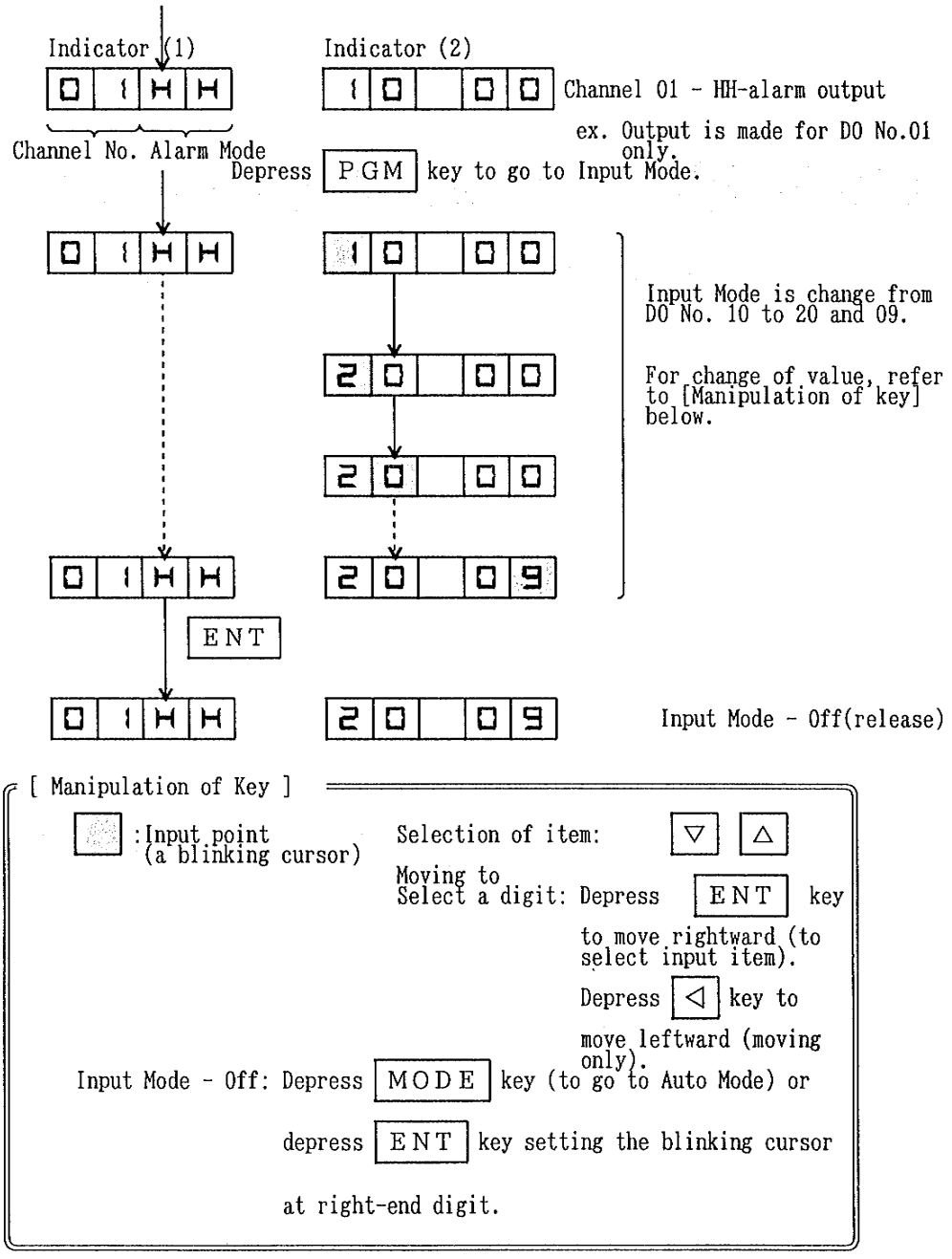

Fig. 9.25 Change of the set Alarm Output

⑭ Checking state of alarm-ON

The following alarm indication and alarm output are made according to the set alarm value at Alarm Mode.

Notes: 1. In case of the specifications of Alarm Print and Alarm Recovery Print (option), printing is executed. For the print examples, see article (5) of Section 8.2.

2. In case of the specifications of New Alarm Function (option), alarm indication and output differ from the above.
Refer to the 'article ⑮ Execution of New Alarm Reset'.

(1) Indication of alarm

- Alarm lamp of the channel where an alarm arises, is turned on.
- The alarm modes (HH-Alarm, LL-Alarm, etc.) are indicated at right hand of the indicated channel No. on the indicator (1).
- When the alarms arose in a channel, the alarm modes arisen, are indicated in sequence automatically.

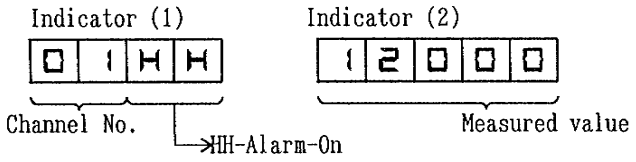

Fig. 9.26 Indication of HH-Alarm-On at Channel No. 01

(2) Alarm output

The outputs are made for the set number DO and Common Alarm Output during Alarm-On. For the details of setting, refer to the article ⑬-(2) of Section 9.3.

(3) Checking of the set alarm point and alarm output

Checking of the set point of alarm and the set output of alarm in the state of Alarm-On, can be done as follows:

Check them at Auto-Checking of Alarm Setting function in Alarm Mode.
Execute List Print.

Refer to the article ⑬-(5) of Section 9.3 "Changing Alarm Mode Setting".

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⑮ Execution of new alarm reset (Alarm Mode)

Note: New alarm function is optional.

(1) Execution of new alarm reset

New alarm reset can be executed by the following two methods.

① Depress [ENT] key at the alarm indication state in Auto Mode.

② Depress [ENT] key to select New Alarm Reset in Alarm Mode.

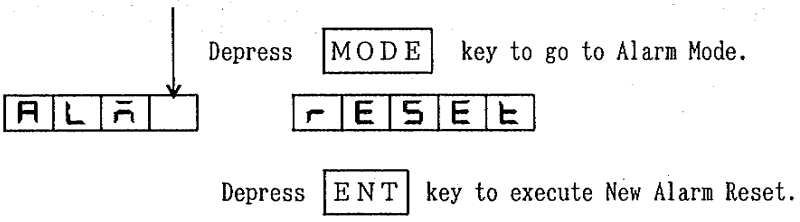

Fig. 9.27 Execution of New Alarm Reset

(2) New alarm reset function

The functions of alarm On are as follows.

(i) Indication

- Alarm lamp of the channel-alarm on, is blinking.
- In Auto Mode, only the channel-alarm on is indicated. The measured value on the alarm on state is maintained (in case of multi-occurrence of alarm, the indication is made by switching to the automatic indication).
- In the event that New Alarm Reset is executed before alarm recovery, alarm indication will be like the case without New Alarm function. (Refer to the preceding page.)
- After alarm recovery, alarm indication is maintained until New Alarm Reset is executed.

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(ii) New alarm output

Note: The relay output time and the output relay number should be set in Engineering Mode. Refer to a separate volume of manual 'Engineering Data Manual'.

Output is made for a period of the setting time, and the setting relay.

In the event that an alarm is recovered during the setting time of relay output:

..... The output is maintained from the alarm-ON until the relay output time set, expires.

In case of execution of New Alarm Reset during the setting time of relay output:

..... The output is made just as the case without a New Alarm function. (Refer to the article ⑭-(2) of Section 9.3.)

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10. MAINTENANCE

10.1 Routine Inspection

Routinely check the items listed below. If there is something wrong with the recorder, refer to Chapter 12 Trouble Shooting.

(1) Is the pointer deflected over the scale?

(2) Are recording and indication normal?
- Is there any major difference between the displayed and the analog recorded values?
- Is there any unusual analog record?
- Is analog record print faint?
- Are color of analog record and marks normal?
- Is printing operation normal?

(3) Is chart paper fed normally?
- Is chart paper folded normally?
- Is there any broken hole of chart paper feed?
- Is chart paper fed properly?

(4) Is abnormal sound made?

10.2 A List of Consumable Parts

Chart 10.1 A List of Consumable Parts

NO.	Name of Consumable Part	Part Number	Remarks
1	Chart paper	HZCAA1025AF001	100 equal divisions
2	Ribbon cassette	HPSR001H0005	
3	Lubricant	H4A12290	Launa 40 from Nippon Oil Co.or equivalent
4	Drive cable	HPSU018B10	
5	Fuse	IPS0565A0105	2A

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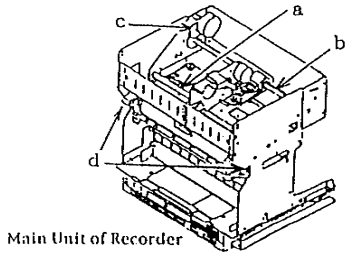
10.3 Maintenance

Chart 10.2 A Summary List of Maintenance

Maintenance Item	Procedure
Chart paper	(1) When the remaining chart paper become a few length, a printed red mark, at the right of chart paper, prompting replacement of chart paper, appears. Replace chart paper immediately. Note: 1. If print operation is continued with no chart paper loaded, the sprocket drum can be stained with ink or both of printer and sprocket drum can be damaged, resulting in a failure of the recorder. Be sure to use the recorder with chart paper loaded. 2. Be sure to use our standard chart paper to ensure normal feeding of chart paper. References: 1. A set of chart paper is 23 m long. 2. The remaining volume of chart paper can be monitored through a window set on right lateral face of the main unit, after pulling out the main unit.
Ribbon cassette	(1) Printing with a ribbon gets gradually lighter, so it is recommended that the ribbon cassette be replaced at an earlier stage for clear printing. (2) Use a ribbon cassette purchased within one year, its useful life gets shorter by the evaporation of ink. Guideline for replacement: ・Printing usage for about 3 rolls of chart paper (usually 3 months for continuous operation) under the normal circumstances. ・In case of a pause of operation, approximate 6 months after unpacking of ribbon cassette. Note: Do not use the ribbon which fiber is scraped or ravelled. The ribbon subject to be replaced in shorter term according to logging print times. Refer to "10-4" for details.
Oiling	For a use of the recorder in good condition at all times, check oil shortage of the mechanical moving parts and oil the recorder as required. Notes: 1. Oil the recorder periodically at intervals of about 6 months. 2. Remove any build up of dirt before oiling. 3. Apply just one or two drips of oil to prevent dripping, and remove any excessive oil. Oiling spots: a. Printer spindle (every 3 months) b. Grooved shaft (every 3 months) c. Ribbon rocking gear and bearing (every 3 months) d. Sprocket drum bearing (every year)  Fig. 10.1 Oiling Spots

(To be continued to next page)

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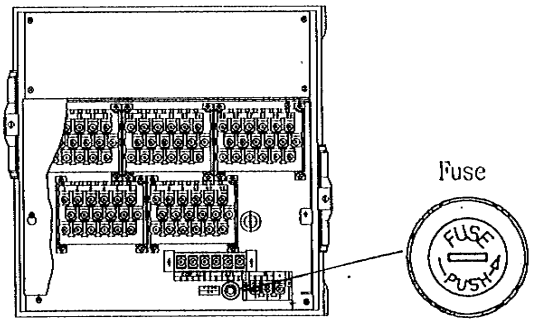
(To be continued from previous page)

Maintenance Item	Procedure
Fuse	For better maintenance, the replacement of fuse every two years is recommended. ⚠ Turn OFF the switch and also the power to replace fuse. ⚠ Use the recommended fuse by our company. (Fire prevention) Do not make a short circuit in the holder. Replacement Procedures: (1) Turn OFF the power at first, and turn off switch of the recorder. (2) Remove fuse with a minus-screw driver, since the fuse is set on the reverse side of the instrument (see Fig. 10.2) (3) Set a new fuse. Reverse side of recorder  Fig. 10.2 Set Position of Fuse

Notes: Logging Print and Ribbon Life.
Using the ribbon over life then fiber will be scraped which cause fault on ribbon feeding and defect of the printer. Life of the ribbon will be shorter according to logging print times. Following is a table of logging print times and ribbon life to be referred. Check ribbon scrape regularly, replace the ribbon if found scrape or ravel on it in spite of ribbon life described in a table.

1. Logging or ribbon life: 100,000 letters
(1,200,000 dotting: 12 dotting per letter)

2. Logging print and ribbon life

Model	LOGGING PRINT INTERVAL / RIBBON LIFE										THE NUMBER OF LETTERS PER LOGGING (STANDARD)
	10M	20M	30M	1H	2H	3H	4H	6H	8H	12H	24H	
6CH RECORDER	11 DAYS	23 DAYS	34 DAYS	69 DAYS	90 DAYS	→	→	→	→	→	→	60 LETTERS
12CH RECORDER	5 DAYS	11 DAYS	17 DAYS	34 DAYS	69 DAYS	90 DAYS	→	→	→	→	→	120 LETTERS
24CH RECORDER	2 DAYS	5 DAYS	8 DAYS	17 DAYS	34 DAYS	52 DAYS	69 DAYS	90 DAYS	→	→	→	240 LETTERS
30CH RECORDER	2 DAYS	4 DAYS	6 DAYS	13 DAYS	27 DAYS	41 DAYS	55 DAYS	83 DAYS	90 DAYS	→	→	300 LETTERS

3. Ribbon life subject to be shorter than described in above according to the number of letters for scale, comment, list, alarm or logging print.

4. The longest ribbon life: 90 days (Recording cycle: 5,10 sec/CH)
45 days (Recording cycle: 2.5sec/CH)

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10.4 Replacement of Drive Cable

The printer of the recorder is connected with motor by using a drive cable. The cable is covered with nylon. If this cover cracks or is peeled off, an increased recording error or abnormal printing can be caused. For keeping better recording quality, it is recommendable to replace the cable at intervals of 2 years.

(1) Pulling out the main unit:

① Depress the power switch to turn OFF power.

② Pull out the main unit holding the hand grip of drawer, until it stops at the point shown in the figure below while pushing down the unlocking lever.

Note: Pull out the main unit slowly holding it with your hands.

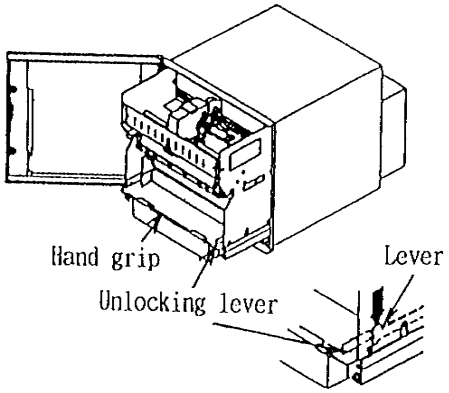

Fig 10.3 Pulling out the main unit

③ The printed-circuit board installed in a case of main unit is connected with a flat cable. Flip over the levers at both ends of the connector of the main unit for unlocking, and then, disconnect the flat cable.

Note: Disconnecting connector should be done at the connector of main unit side. Do not disconnect the connector of the printed-circuit board in the case. (For preventing damage of the printer CPU card)

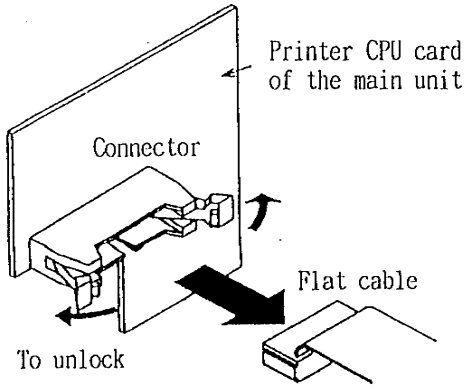

Fig. 10.4 Disconnecting Flat Cable

(2) Replacement of drive cable:

① Remove the ribbon cassette from the printer.

② Loosen and remove the screw of the bracket securing a drive cable with a screw driver to remove the bracket of drive cable.

③ Loosen the screws on the adjusting flange of drive cable and pulley with an Allen wrench, and then, remove the pulley from the motor axis.

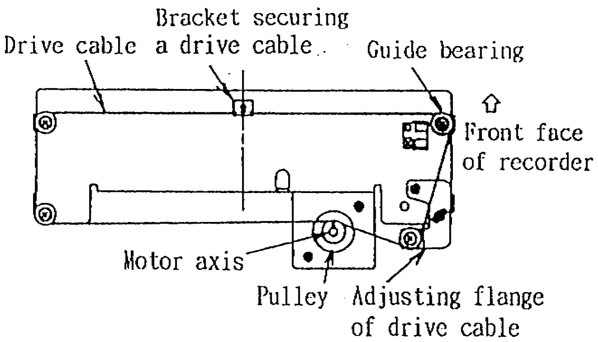

Fig. 10.5 Removing Drive Cable
(Top Eye View)

④ Remove the drive cable from the guide bearing.

⑤ Push the small ball attached to one end of a new drive cable into the groove of pulley, and wind up the cable around the pulley by two turns.

⑥ Then, wind up the other end of cable around the pulley by five turns.

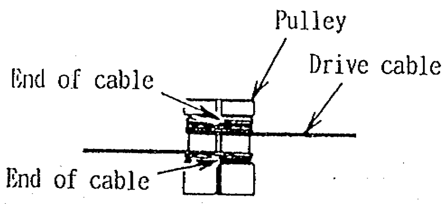

Fig. 10.6 Winding up Drive Cable with Pulley

⑦ Fix the drive cable with the pulley with adhesive tape to prevent the cable from looseness.

⑧ As shown the below figure, put the drive cable over the guide bearing, then insert the motor shaft into the pulley.

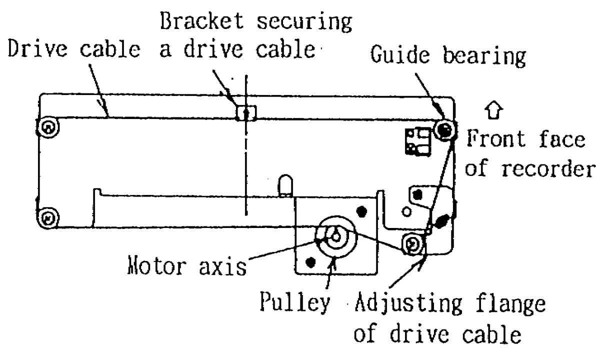

Fig. 10.7 Fitting Drive Cable
(Top Eye View)

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⑨ Remove the adhesive tape attached the pulley temporarily. Fasten the screw set with the pulley with an Allen wrench, to fix the pulley with the motor shaft.
Note: The pulley has to be fixed with plate, 0.5 mm remotely from it.

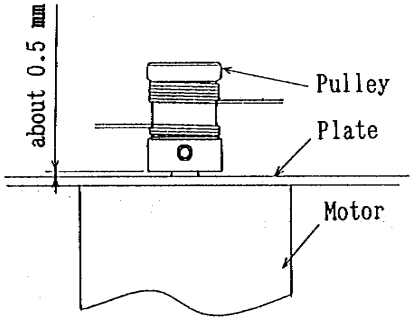

Fig. 10.8 Fixing Pulley with Motor (A Lateral View)

⑩ Pull the drive cable to right and left several times, so that the wound drive cable can be firmly fit with the pulley.

⑪ Fix the adjusting flange of drive cable with the screws to the frame of the main unit, by adjusting it is being fixed parallel with the frame.

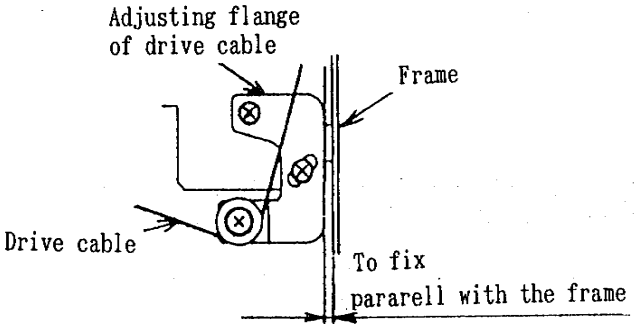

Fig. 10.9 Adjusting Flange of Drive Cable

⑫ Attach the adjusting flange of drive cable to the printer.

⑬ Move the printer to right and left to check that the drive cable moves smoothly.

(3) Installing main unit:

① Connect the flat cable attached to the printed circuitboard with the connector at the main unit.

② Insert the main unit into the case until it stops.

11. CALIBRATION

Note: 1. Calibrate the recorder when there is a large error.
For an accurate measuring, it is recommendable to calibrate the recorder for every year.

2. Calibration involves the following four tasks,and those adjustments of the item ② ～ ③ have to be done according to input mode.
① Pointer adjustment
② Range adjustment 1(mV,V,mA,thermocouple input)
③ Range adjustment 2(resistive temperature detective input)
④ Cold junction compensating adjustment of input terminal block (thermocouple input)

3. Do the calibration later than 30 minutes after turning on the power.

4. Checking the pointer position can be made according to the article '⑤ Checking Channel Data'.

5. During the calibration mode, no measurement and no analog printing can be done. Printing can be executed whenever the user mode is set.

①Pointer Adjustment

Notes: 1. It is essential to calibrate channel each.

2. Do not move the pointer exceedingly towards both of zero side and span side. If so, abnormal noise or unusual recording could be happened. Further, when returning to user mode, the "1 Error" mode is indicated, and it can be released by depressing [RUN/STOP] key.

① Depress [MODE] key to select 'MAN' mode in the unlocking state.
Depress [ENT] key and [◁] key simultaneously for 10 seconds.
All the 6 indicator lamps are turned on,and the Pointer Adjustment Mode(CAL. P) is shown in the indicator. (Calibration Mode)

② Further,depress [ENT] key,then "□□" is shown in the indicator (2) as follows;

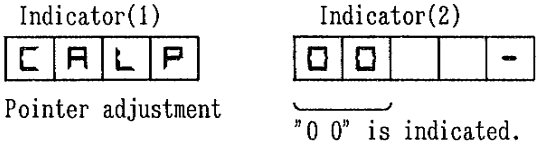

Fig. 11. 1 Indication of Pointer Adjustment

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<Zero side adjustment>

④ Depress [PGM] key to show a indication of blinking "□□ □" in the indicator (2) and to left the pointer indicate zero point. (□ Blinking)
You can move to left depressing [▽] key and to right depressing [△] key.
Depress [ENT] key after setting the pointer with zero point of scale plate.
Print with a purple dot on the zero point of chart paper at that time, after checking that the plotting point matches with the zero point.

Notes: In the event that the zero point of scale plate does not match with the zero point of chart paper, position of the scale plate should be adjusted to match its zero point with that of the chart paper.

<Span side adjustment>

⑤ "□□ S" in the indicator (2) blinks, and the pointer indicates pan point, after (S Blinking)
depressing [ENT] key in the steps of preceding article ④.
Depress [ENT] key to print a purple dot on the span point of the chart paper after setting the pointer with span point according to the article ⑤.

Note: 1. The pointer moves the same distance as determined for zero side adjustment.
2. Adjust the position of scale plate as zero point, since span point recording position of chart paper may be varied due to expansion and contraction of chart paper.

⑥ Return to the state described in the article (1) after the last step of the article (4). Depress [MODE] key to indicate 'End-----' for finish of pointer adjustment, and then, depress [ENT] key to move to Auto Mode.

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ex) Pointer adjustment:

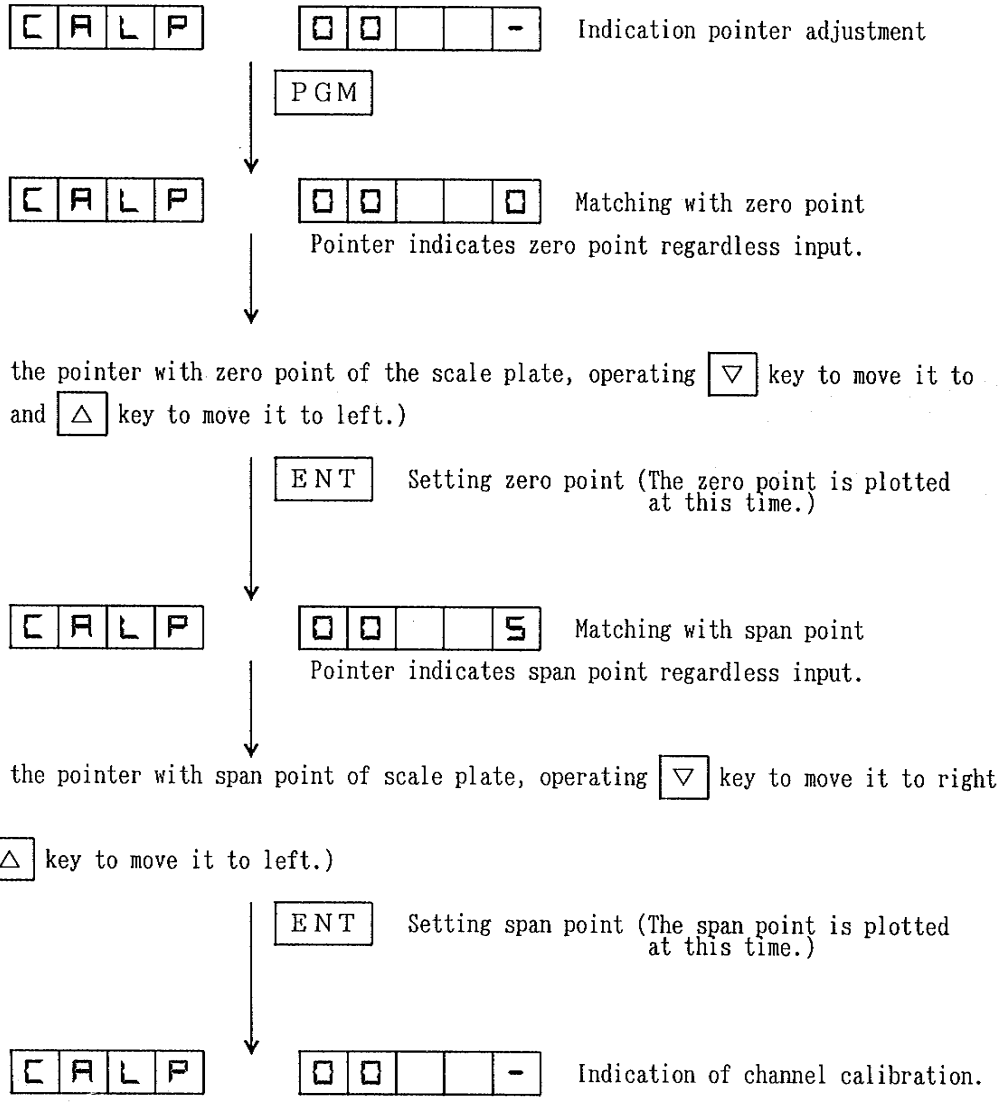

Fig. 11.2 An Example of Pointer Adjustment

②Range Adjustment 1 (An adjustment is made in case of mV, V, mA, thermocouple input.)

◈ Select the voltage input point for calibration by a switch. The switch is locates the position front below right.
Select "OFF" to input to the rear input terminal, or select "ON" to input to the front calibration terminal.

Note: The front calibration terminal is an optional function for the RM18G/N Multipoint Recorders.

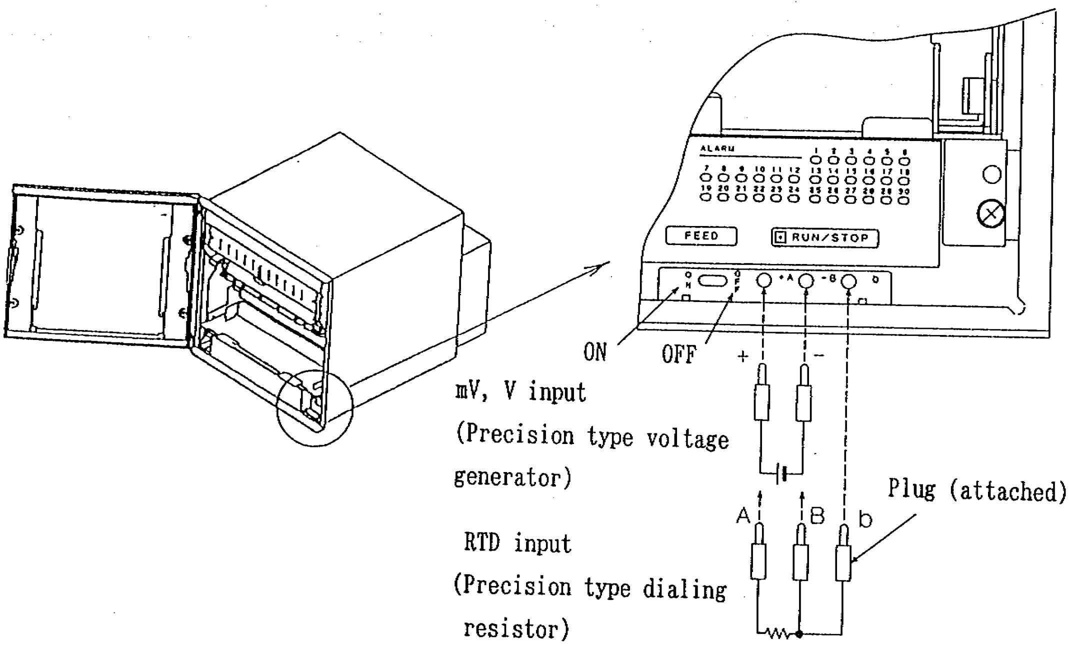

Fig. 11.3 Input from Front Calibration Terminal (Option)

◈ Get into Calibration Mode through the steps just as the article ①-◈.

Depress MODE key to select 'Range Adjustment 1 Mode'.

At this time, in the indicator (2), "F" is indicated in case that the switch of front calibration terminal is being ON; "r" is indicated in case that switch is being OFF, or there is no front calibration terminal. And "A" is blinking at the right-end digit.

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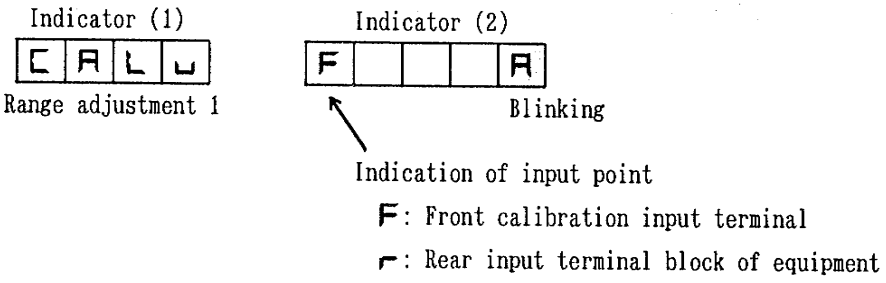

Fig. 11.4 Indication of Range Adjustment 1

④ Depress [ENT] key once to indicate the blinking "□ 1" in the indicator (2). The blinking "□□" is indicated in case of front calibration mode and is fixed.

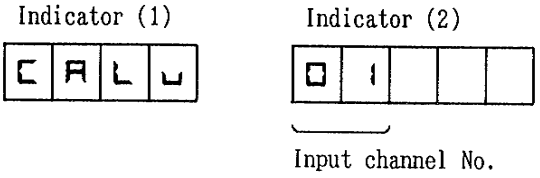

Fig. 11.5 Indication of Input Channel No. (Range Adjustment 1)

⑤ Select the impressed input channel operating [▽] [△] key in case of rear part input.

⑥ In case of rear part input, the input wiring at the impressed input channel terminal selected by the step in the article ⑤, has to be installed (see Fig. 11.6 shown below). In case of front calibration input, the wiring has to be installed using the attached plug with a lead wire according to Fig. 11.3.

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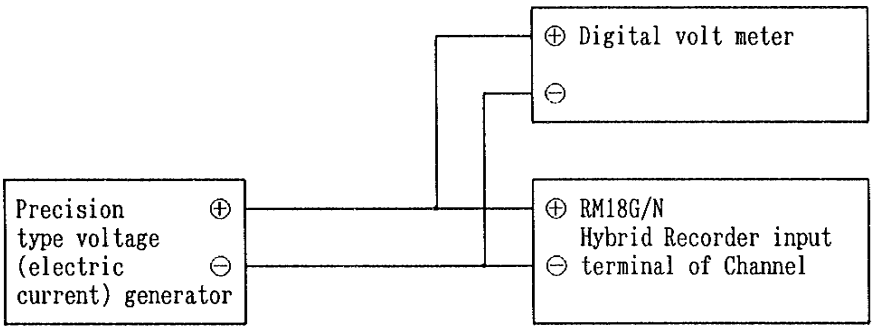

Fig. 11.6 Wiring for Range Adjustment 1
(Rear Part Input)

◈ Depress [PGM] key to indicate the input voltage in the indicator (1) and counter value of input in the indicator (2)
At this time, input voltage indicated in the indicator (1) in sequence, and depress [ENT] key at 30 seconds, after that.
For input of voltage, refer to Chart 11.1.

Note: Counter value of input would be about '0' count, in case of 0mV input, otherwise about 60000 counts.

Chart 11.1 Input Voltage (Range Adjustment 1)

Indicated Input Voltage	Input Voltage
V000	0.000mV ±2μV
V010	10.000mV ±2μV
V015	15.000mV ±2μV
V020	20.000mV ±2μV
V030	30.000mV ±5μV
V035	35.000mV ±5μV
V045	45.000mV ±5μV
V055	55.000mV ±5μV
V070	70.000mV ±5μV
V200	200.000mV ±10μV
V55V	5.500 V ±1mV

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ex) Range adjustment 1

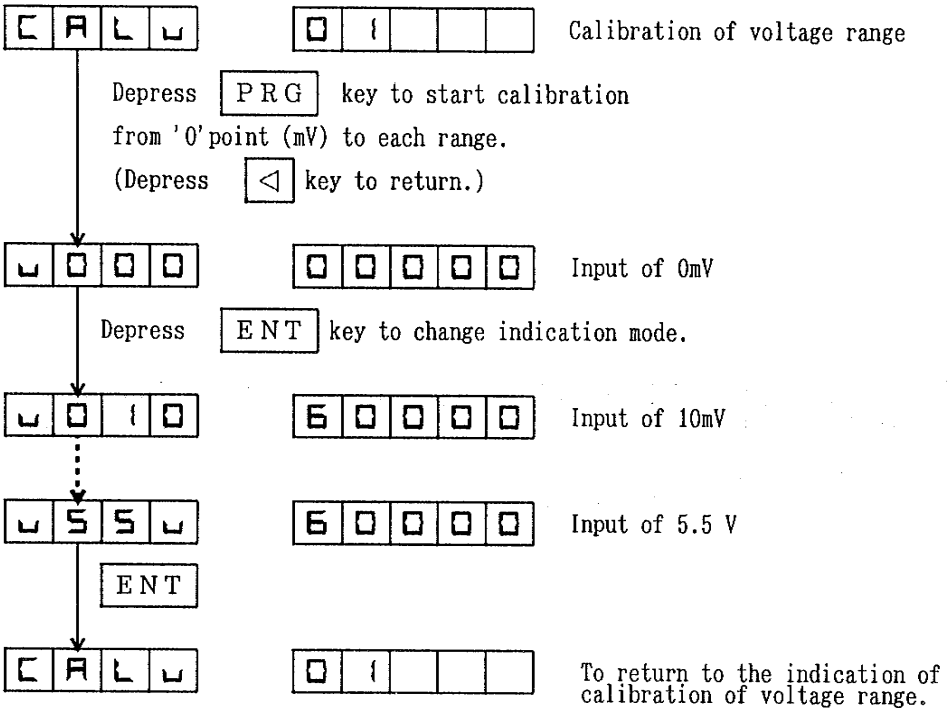

Fig. 11.7 An Example of Range Adjustment 1

Note: It takes about 30 seconds that input voltage by the voltage generator becomes stable. So, before depressing of ENT key, wait at least 30 seconds after voltage input.

③ Range Adjustment 2 (An adjustment is made in case of the resistive temperature detector input.)

Notes: In case of several input modes are to be made, range adjustment 2 should be made after range adjustment 1.

① Select the voltage input point by a switch for calibration like in the manner described in the article ①-①.

② Enter into the Calibration Mode just as the manner described in the article ①-②.
Depress MODE key to select Range Adjustment 2 Mode.
In the indicator (2) at this time, "F" is indicated in case that switch of front calibration terminal is being ON; "⌐" is indicated in case that switch is being OFF, or there is no front calibration terminal.
And "R" is blinking at the right-end digit.

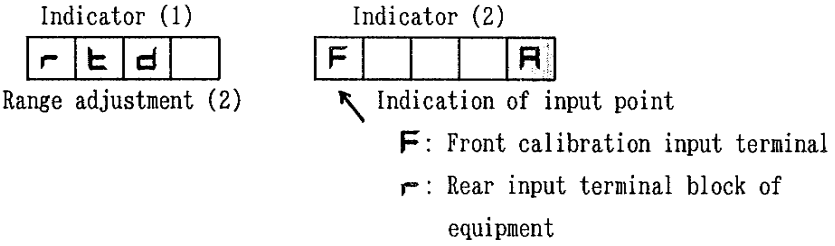

Fig. 11.8 Indication of Range Adjustment 2

③ Depress ENT key once to indicate the blinking "□ 1" in the indicator (2), "□□" is indicated in case of the front calibration and is fixed.

④ Select the impressed input channel by operating ▽ △ key.

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⑤ In case the rear part input, install input wiring to the impressed input channel terminals selected as described in the article ④ (see Fig. 11.9).

Note: Dispersion of resistance of each wire should be less than 6 mΩ.

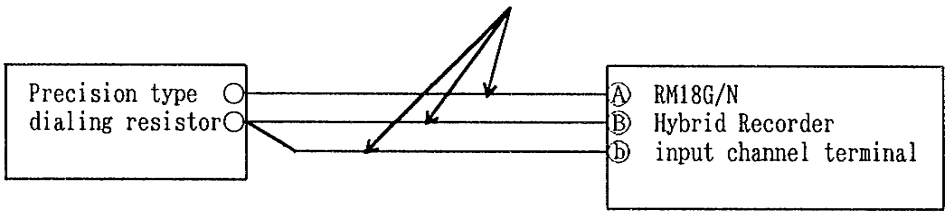

Fig. 11.9 Wiring for Range Adjustment 2 (Rear Part Input)

⑥Depress [PGM] key to indicate the input voltage in the indicator (1) and counter value of input in the indicator (2).
At this time,input resistances corresponding to the voltages indicated in the indicator (1).
Before depressing [ENT] key, wait at least 30 seconds after input of resistance.
For input of resistance, refer to Chart 11.2.
The indication of each resistance input can be changed by operating [▽] [△] key.
Execute calibration by changing the resistance indication sequentially.

Chart 11.2 Input Resistance (Range Adjustment <2>)

Indicated Input Resistance	Input Resistance
r010	10.000Ω±5mΩ
r020	20.000Ω±5mΩ
r050	50.000Ω±5mΩ
r080	80.000Ω±5mΩ
r100	100.000Ω±5mΩ
r150	150.000Ω±5mΩ
r300	300.000Ω±5mΩ

Notes: 1. It takes about 30 seconds that input resistance after changing input, becomes stable. So, before depressing of [ENT] key, wait at least 30 seconds after input of resistance.
2. Counter values are indicated within a range of 5000 ～ 50000.

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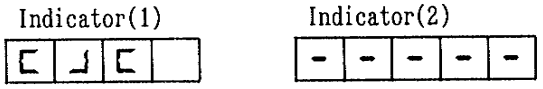
④ Cold Junction Compensating Adjustment of Input Terminal Block

<An adjustment is made in case of thermocouple input.>

Notes:
1. The cold junction compensating adjustment is made for each terminal block. For instance, in case of the 30-multipoint recorder, the 5 terminal blocks are adjusted in the same procedure as shown in Fig. 11.11.
2. For cold junction compensating adjustment, the common value for all terminal blocks are set.

㋔ Get into the Calibration Mode according to the procedures of the article ①-㋔.
Depress [MODE] key to select the Cold Junction Compensating Adjustment Mode.



Cold junction compensation adjustment

Fig. 11.10 Indication of Cold Junction Compensation Adjustment

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◈ Operating [▽] [△] key to select the terminal block for calibration, after depressing [ENT] key.

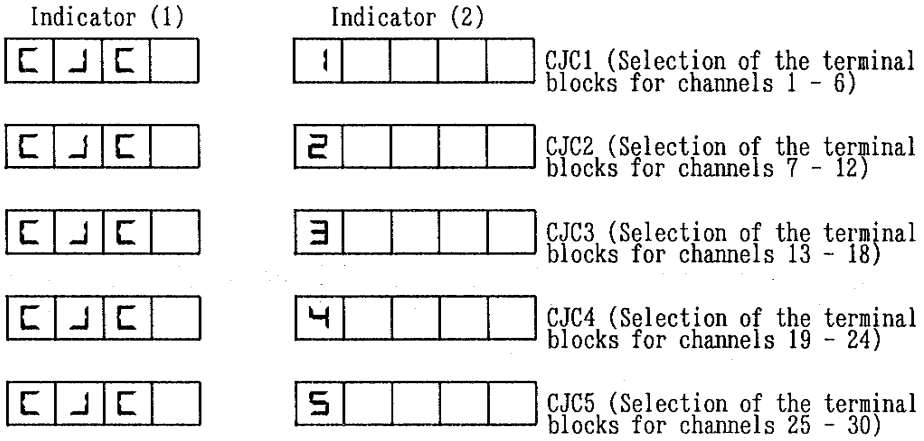

Fig. 11.11 Selection of Terminal Block (Cold Junction Compensating Adjustment)

④ Connection of the cold junction compensating adjustment is made as per Fig. 11.12.

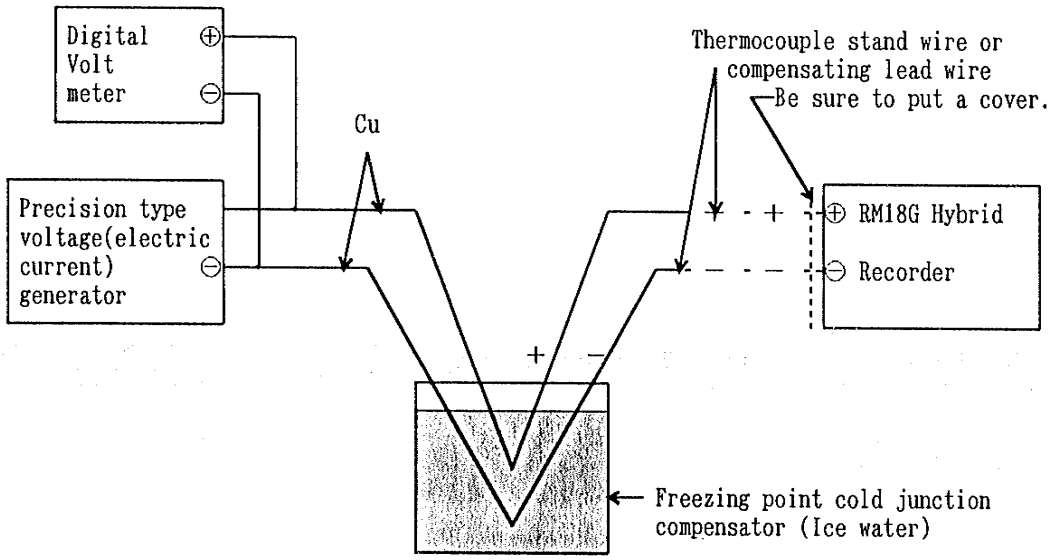

Fig. 11.12 Connection of Cold Junction Compensating Adjustment

Note: Before calibration, wait at least 5 minutes after the wiring, and putting a cover for the terminals.

⑤ Check the thermocouple input beforehand, in the event that 0.000 mV ±2μV is being impressed by the voltage generator.
If the thermocouple input is 0.0°C, the calibration would not be needed.
Since there is a difference in case of other than 0.0°C, compensate the difference.

⑥ When [ENT] key is depressed in the state of (2), current temperature is indicated in the indicator (2).

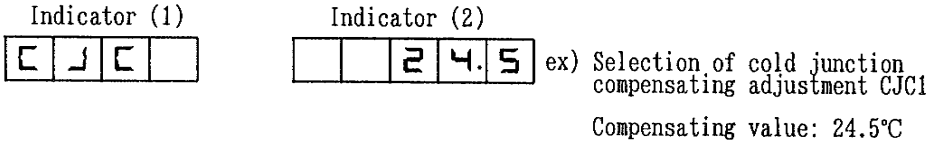

Fig. 11.13 Indication of Cold Junction Compensating Adjustment

⑯ Depress [PGM] key to change the indication the cold junction compensating adjustment value, and the value indicated in the indicator (2) is changed to the cold junction compensating adjustment value calculated at the article (5).

[Manipulation of key]

[ ] ; Input digit

Moving of Digit: Depress [ENT] key to move to right or [◁] to left.

Changing Value: Depress [▽] or [△]

ex)

In the event that thermocouple input is being -0.5℃, and the normal temperature of room indicated in the indicator (2) is being 24.5℃; 25℃ of the difference is the value of cold junction compensating adjustment.

⑰ Depress [ENT] key at the state of right-end digit being blinking.

⑱ The value of cold junction compensating adjustment of other terminal block is changed to the value as inputted in the article (6).

⑲ Depress [MODE] key to select "CAL End", and depress [ENT] key to move to Auto Mode from Calibration Mode.

⑳ Check the data of each channel at normal mode.
Do calibration again in case that the data is inaccuracy.

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⑤ Checking Channel Data Designation

This function is to check channel data designation by optional inputting at Channel 1.

At Calibration Mode, the input channel number is set, and the designation of each channel data are checked at user mode.

Notes: 1. The function is for checking only but not for adjustment.
2. Also the function is for the Multipoint Recorders but not for the Pen Recorders.

① Connect the input signal with the input terminal of optional channel.

② Get into Calibration Mode in the manner just as the article ①-(①).
Depress [MODE] key to select Checking Channel Data Designation Mode.

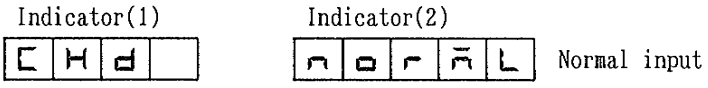


Fig. 11.14 Indication of Checking Channel Data Designation

③ Depress [PGM] key to have the indicator (2) blinked, and operate [▽] [△] key to select input channel and depress [ENT] key.

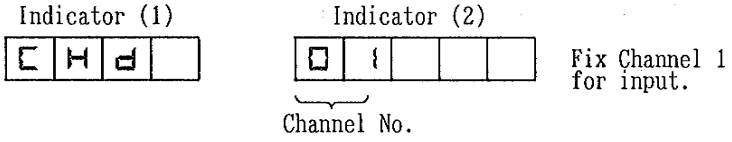


Fig. 11.15 Selection of Input Channel

④ Depress [MODE] key to select "CAL End" mode, and depress [ENT] key to return to user mode.

㊈ Depress [MODE] key to change to the manual mode of user mode.
The checking scale of each channel can be made at the state of an input.
Each channel is set as shown below chart for actuation.
For changing channel, operate [▽] [△] key to select channel number for checking, and then check the scale.

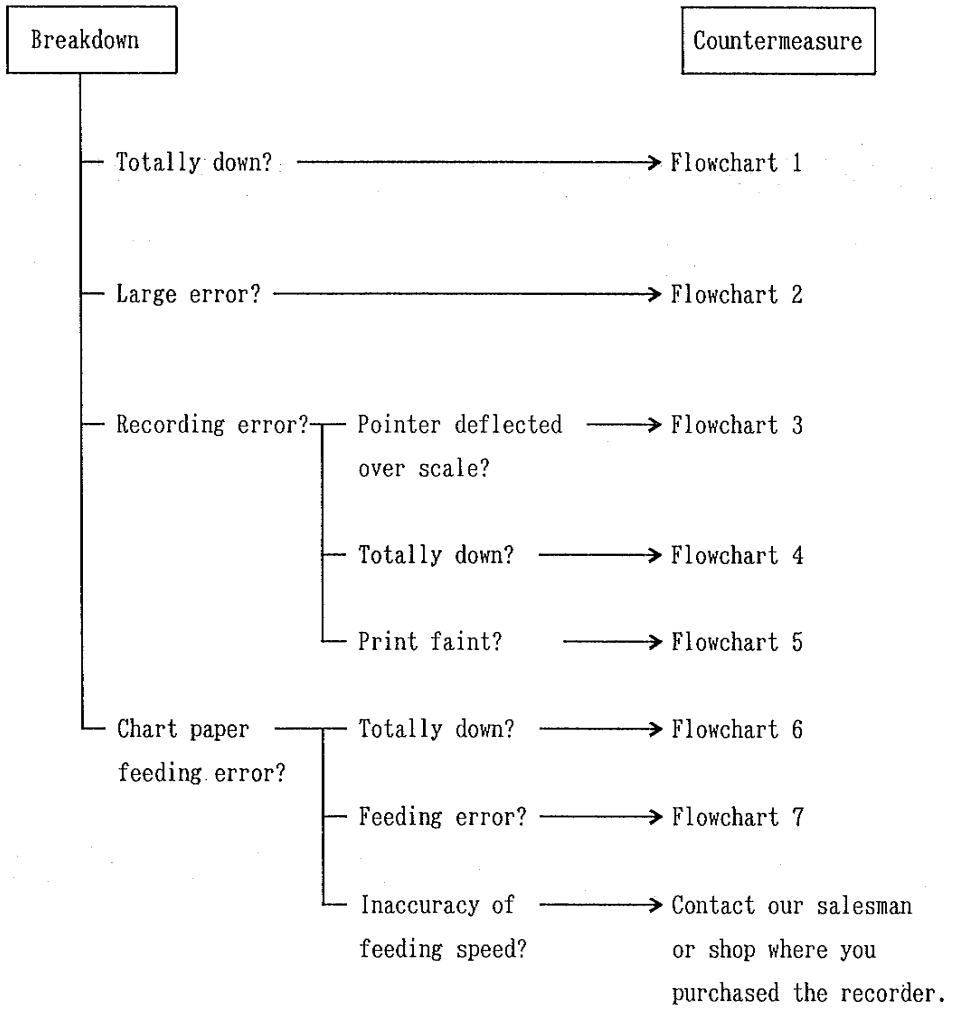
Input	Range, Scale and Setting Alarm	CJC Using Value
Fixing of channel set in Art. ㊈	Channel number range changed by operating [▽] [△] key.	Fixing of Channel set in Art. ㊈

㊈ For returning to normal, return the indication of indicator (2) to "nor AL" after getting into Calibration Mode in the manner just as the article ㊈.

12.TROUBLESHOOTING

12.1 Troubleshooting

(1) Troubles



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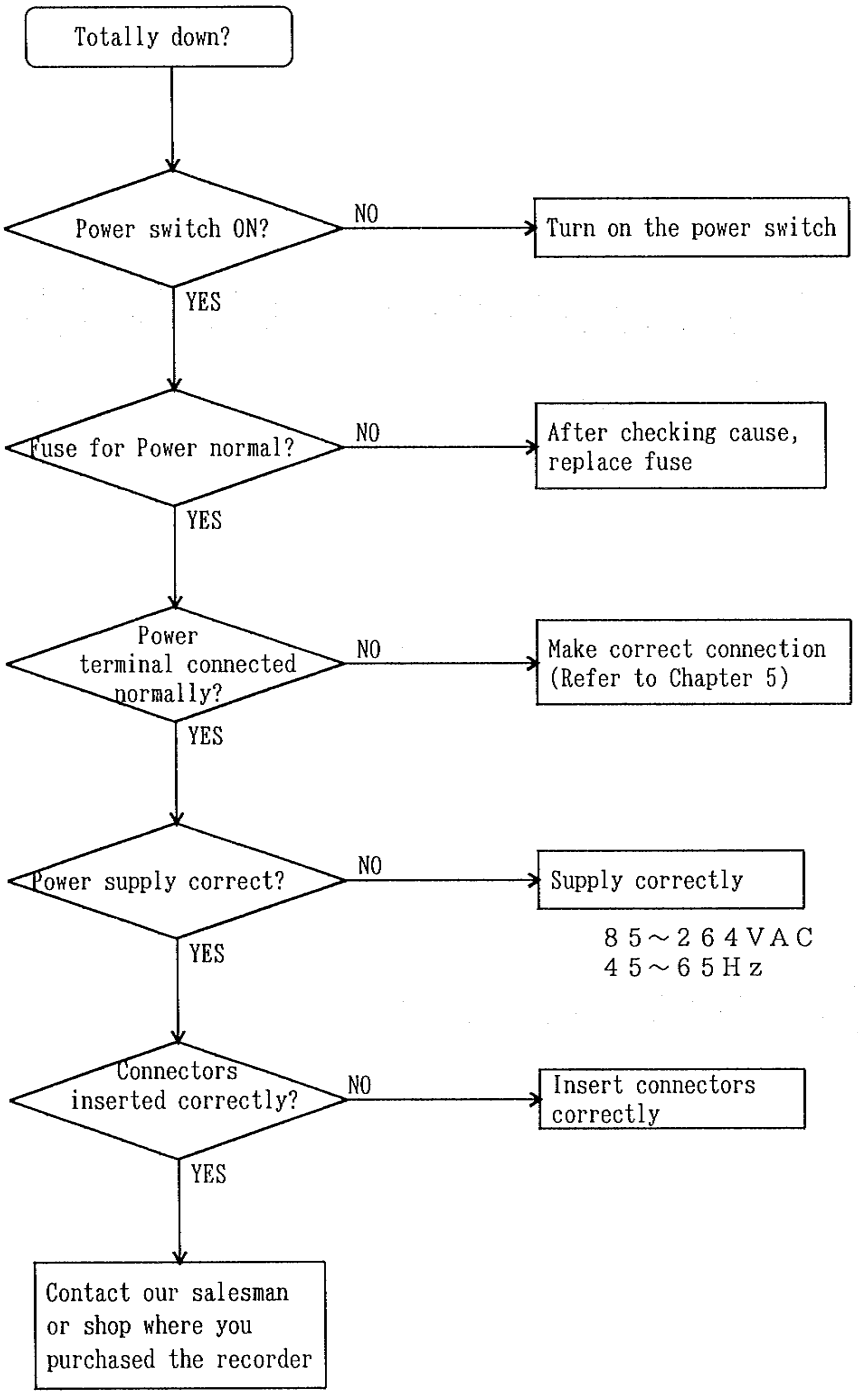
(2) Flowcharts of countermeasure for trouble:

① Flowchart 1



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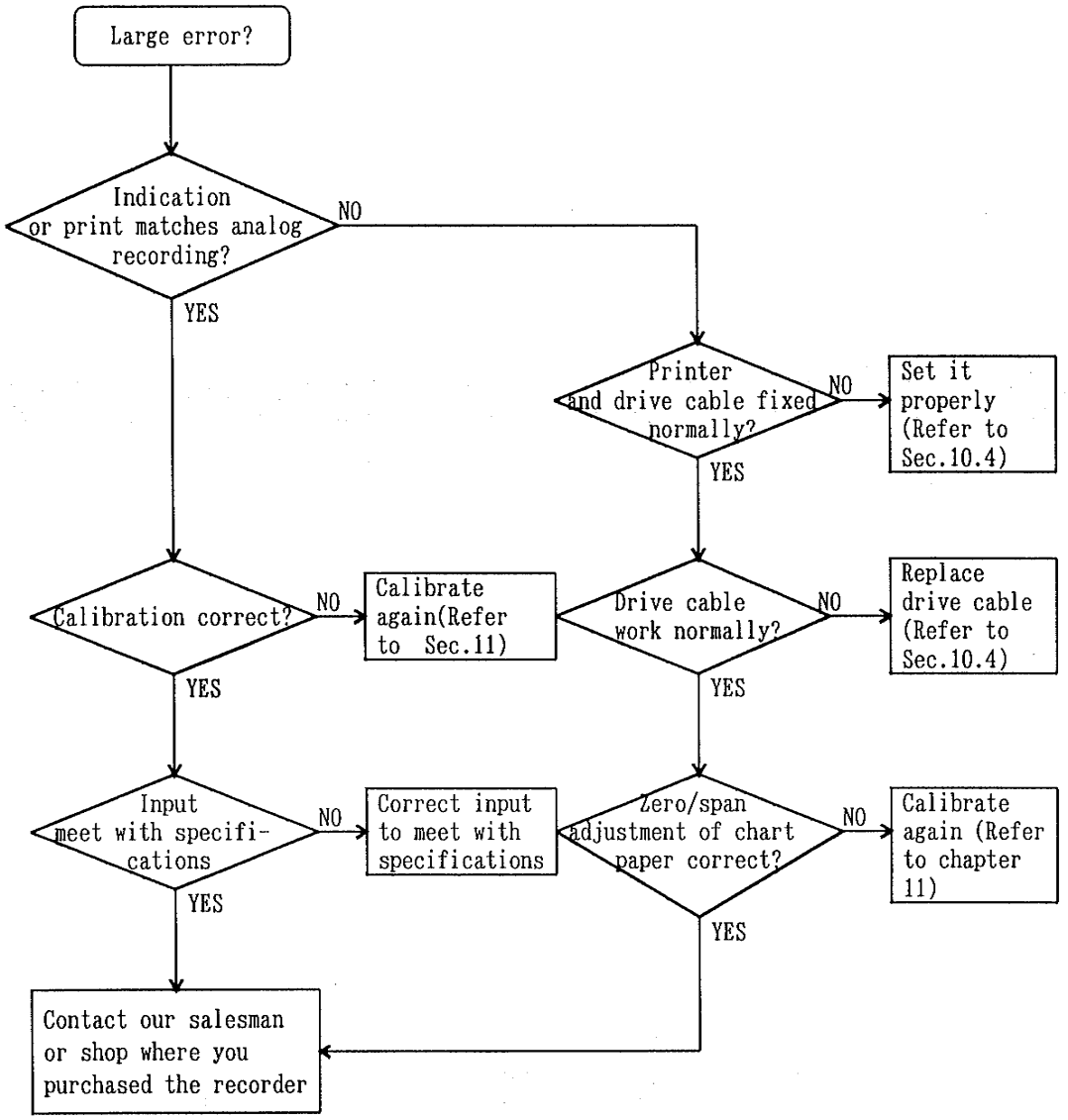
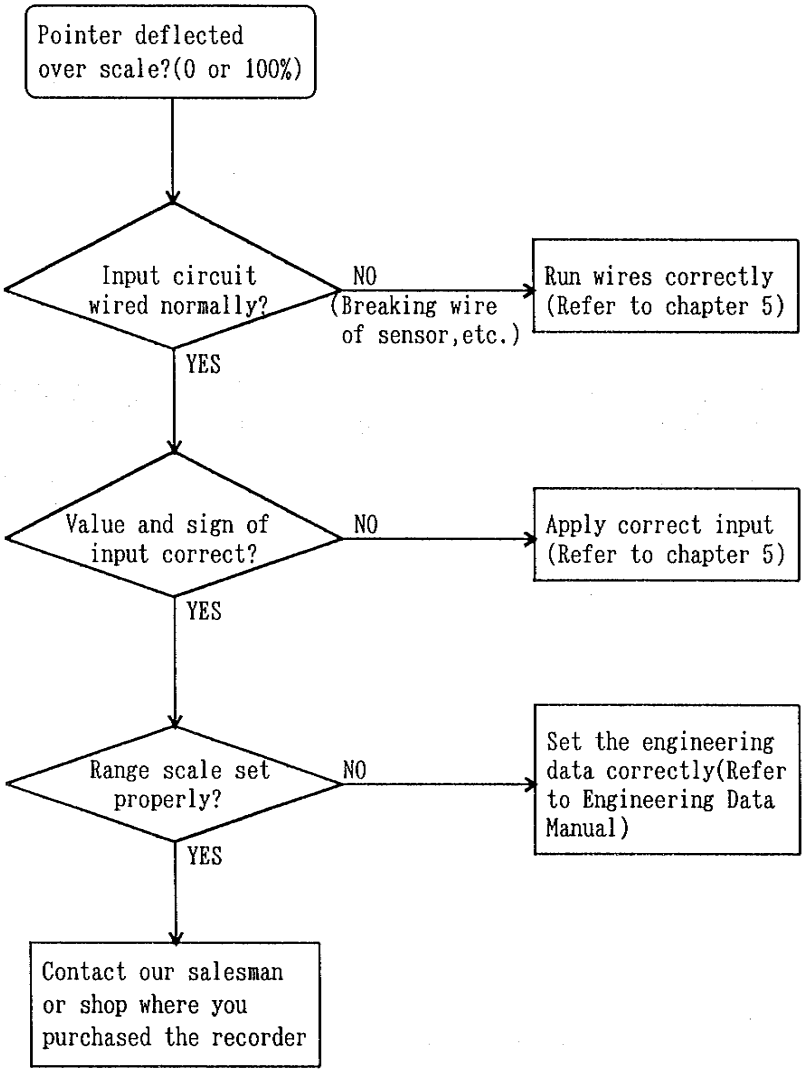
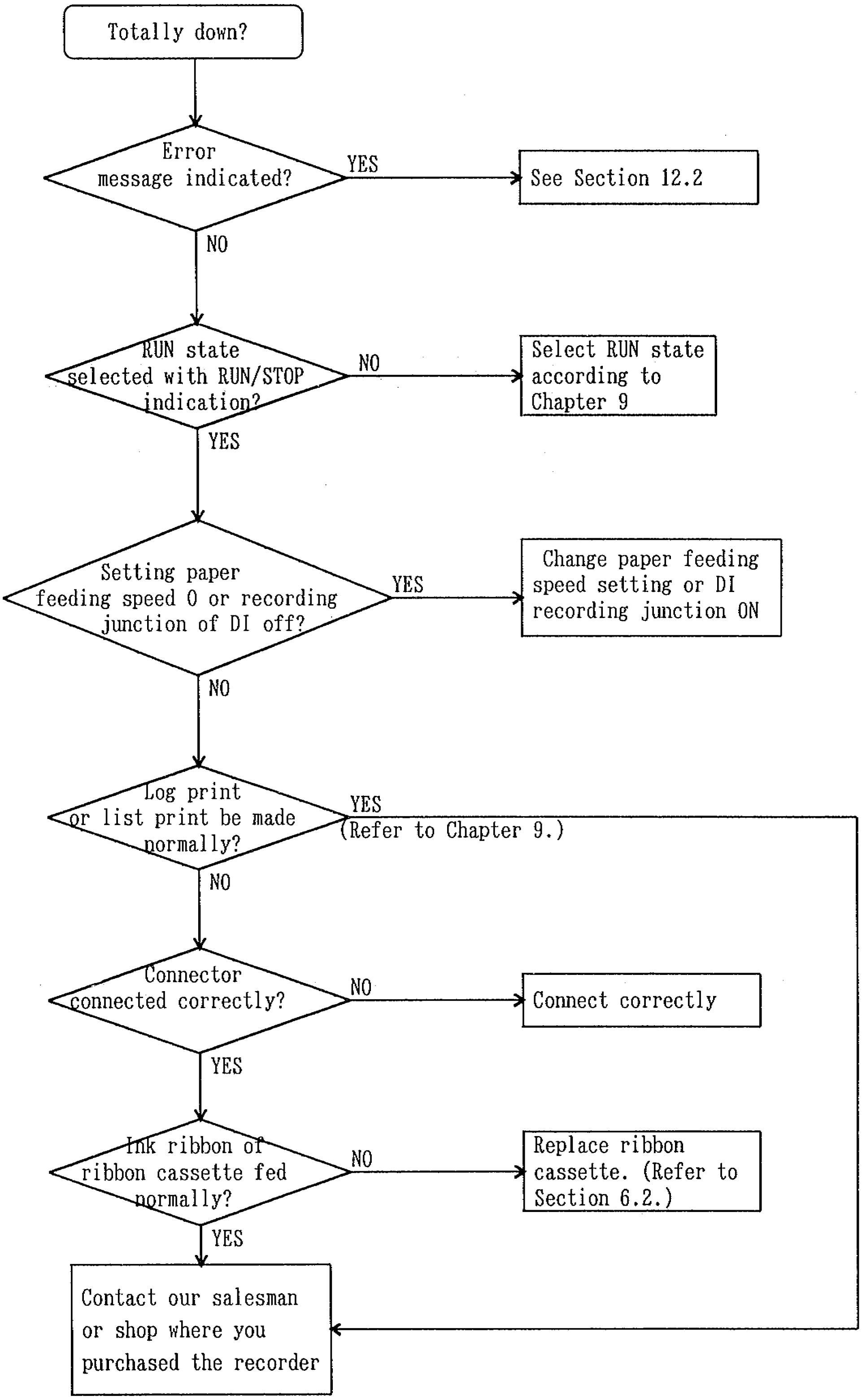
② Flowchart 2



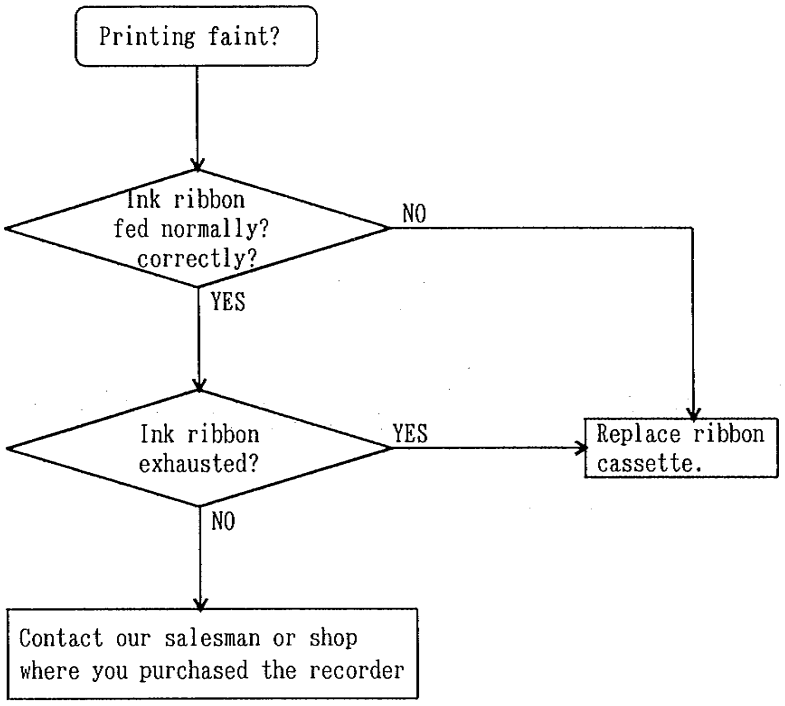
③ Flowchart 3



④ Flowchart 4



⑤ Flowchart 5



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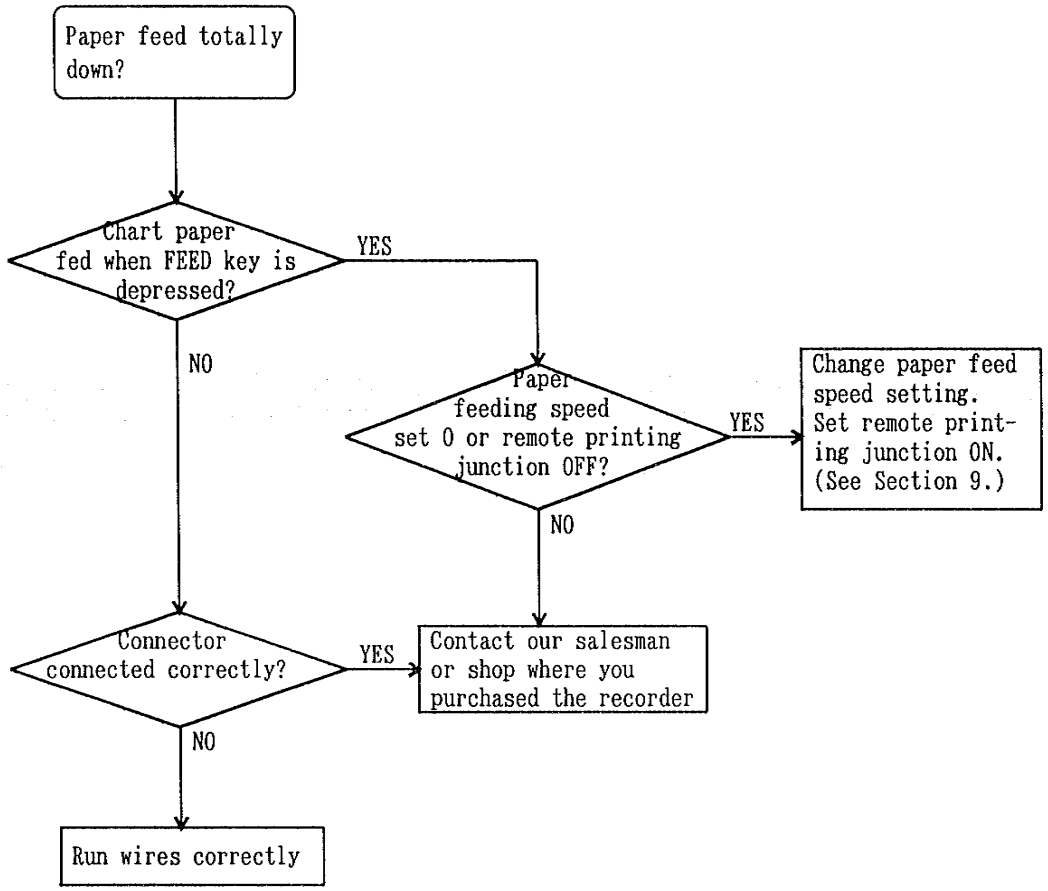
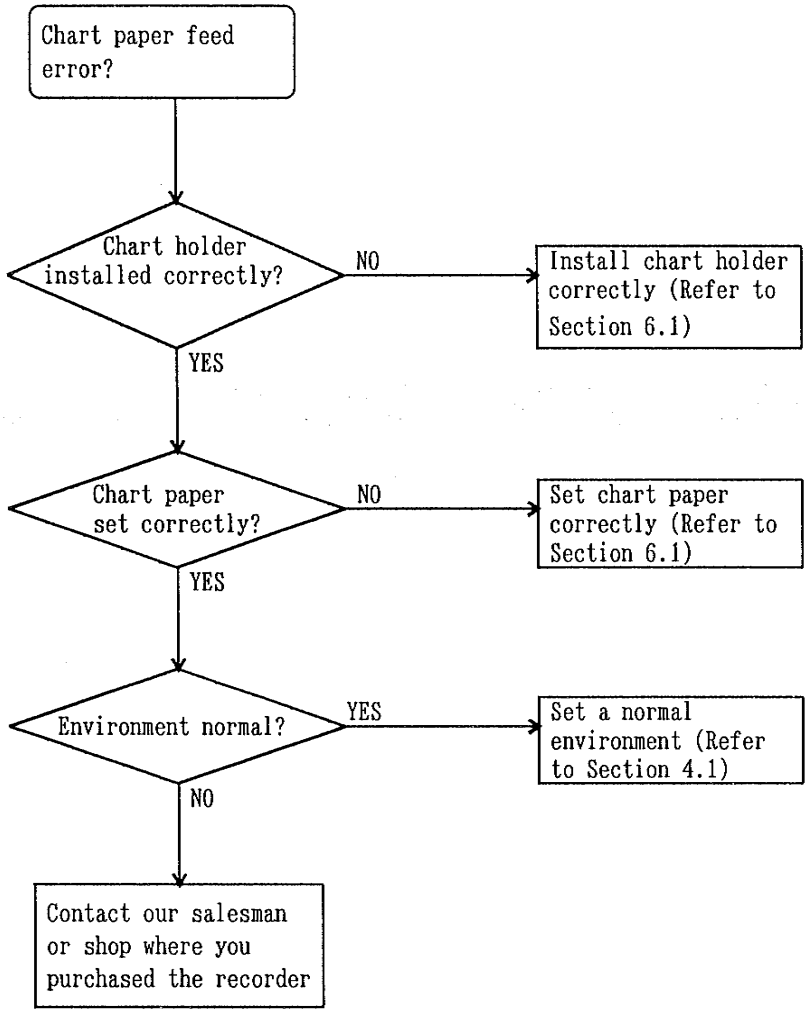
⑥ Flowchart 6



⑦ Flowchart 7



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12.2 Self-diagnosis of Error

The recorder always diagnoses by itself the troubles described in Section 12.1. It shows error indication(refer to the articles (2) and (3) by its self-diagnosis function when something is wrong(an error arises).

(1) Self-diagnosing items:

Chart 12.1 A List of Self-diagnosing Items

Error No.	Diagnosing Items	Countermeasures
01	Something wrong about printer servo. The printer head could not move freely.	1)Set drive cable correctly. (Refer to Section 10.1.) 2)Set ribbon cassette properly. Refer to Section 6.2.) 3)Set connector of printer correctly. (Refer to the article (4) of Section 10.1.)
02	Zero point of printer is wrong. Zero point of printer cannot be detected.	
03	The position of printer ribbon is wrong. The position of printer ribbon cannot be detected.	
04	Marking of the printer CPU card is wrong. Selection of mark cannot be done.	
05	Disconnection between main CPU card and printer CPU card	Contact our salesman or shop where you purchased the recorder.
06	Command of printer CPU card is wrong.	
07	Recorder does not work.	Fit ADC card correctly.
08	ADC card is wrong.	
09	Recorder does not work.	
10		
11		
12	The calibrated value of ADC card is wrong.	
13	Recorder does not work.	
14		
15		
16	Nonvolatile memory of ADC card is wrong.	
17	Recorder does not work.	
18		
19	The calibrated value of the terminal block for channels 1 - 6 are wrong.	Set input terminal block correctly. (Refer to Chapter 5.)
20	The calibrated value of the terminal block for channels 7 - 12 are wrong.	
21	The calibrated value of the terminal block for channels 13 - 18 are wrong.	
22	The calibrated value of the terminal block for channels 19 - 24 are wrong.	
23	The calibrated value of the terminal block for channels 25 - 30 are wrong.	
24	Nonvolatile memory of terminal block of channels for 1 - 6 are wrong.	

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Error No.	Diagnosing Items	Countermeasures
25	Nonvolatile memory of terminal block for channels 7 - 12 are wrong.	Set input terminal block correctly. (Refer to Chapter 5.)
26	Nonvolatile memory of terminal block for channels 13 - 18 are wrong.	
27	Nonvolatile memory of terminal block for channels 19 - 24 are wrong.	
28	Nonvolatile memory of terminal block for channels 25 - 30 are wrong.	
29	Recorder does not work.	
30	Recorder does not work.	
31		
32		
33		
34		
35		
36		
37	The designated calibration value of Multipoint Recorder is wrong.	Contact our salesman or shop where you purchased the recorder.
38	Writing to nonvolatile memory is wrong.	
39	The data of nonvolatile memory is wrong.	
40	The front calibrated terminal is wrong.	
41	Clock memory is wrong.	
42	Watch dog timer is wrong	
43	Something wrong is software	

(2) Error message:

- Error message is indicated only when the display indicates Auto Mode.
- When multiple errors arise, the error number is indicated automatically in sequence.

Note: The indication of alarm ON is not made, while indication of error.

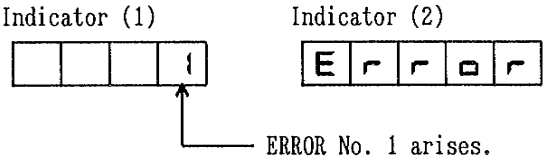

Fig. 12.1 Indication of Error No. 1

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(3) Error Output (FAIL)

When an error is occurred, FAIL output is made as follows:

i) In case of standard specification.
When an error is occurred, the error output (FAIL) will become 'ON' state.

ii) In case of Designation of power off (Option):
When an error is occurred, the error output (FAIL) will become 'OFF' state.

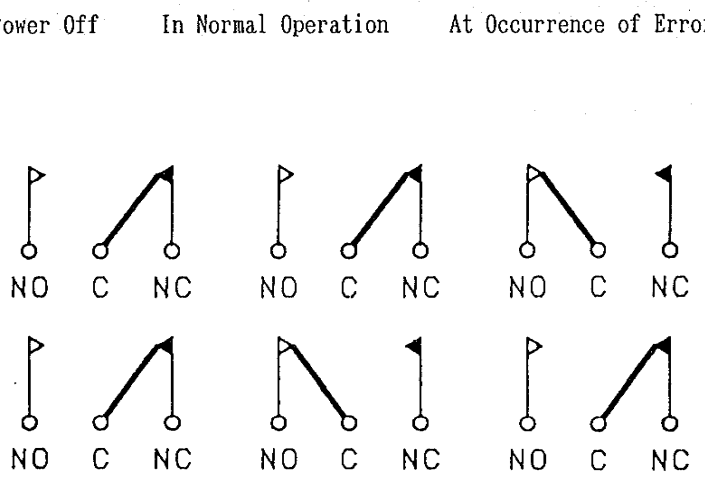

Fig. 12.2 Error Output (FAIL)

13. SPECIFICATIONS

Standard Specifications

● Input Signals
DC voltage: 4mV range or over, Max 20V DC
Thermocouple: K、T、J、E、B、S、R、G、C、N、
PR40-20、PL II、Au-Fe、U、L
Resistive temperature: Pt100、JPt100、Pt50
detector Cu 10 Ω at 0℃
Cu 10 Ω at 25℃
DC current : 4～20mA DC
Electric : 1μS/cm～20000μS/cm
conductivity (Option)

● Performance and characteristics
Indication accuracy rating: ±0.5% or less
Dead band : 0.2% or less
Input resistance: mV、TC(without burn-out)
; 10MΩ or over
mV、TC(with burn-out);
200KΩ or over
V ;1MΩ or over
mA ;100Ω(external
shunt resistance)
Signal source resistance:
mV、TC(without burn-out); 10KΩ or less
mV、TC(with burn-out): 200Ω or less
V : 1KΩ or less
Resistive temperature detector
: 10Ω or less (per line)

Normal mode rejection ratio:
60dB or more (at 50/60±0.5Hz)
common mode rejection ratio:
140dB or more (at 50/60±0.5Hz)
Isolation resistance :
0.5kV AC 20MΩ or more between
each terminal and ground
Dielectric strength : Between power terminal
and ground:2KV AC for one minute
Between input terminal
and ground:0.5kV AC for one minute
Vibration resistance:10 ～ 60Hz 1m/s²or less
Shock resistance : 2m/s² or less

Clock accuracy : ±50ppm

Feeding speed accuracy : ±0.1%
of chart paper

● Structure
Case structure : Dust-resistant structure
Installation : Encased in vertical panel,
Permissible inclination up
to 30° back
Material : Case ;steel
Door frame ;Aluminum die
casting
Paint : Case ;Metallic silver
Door frame ;Black(standard)

●Power supply
Supply voltage : 85～264VAC
Wave-frequency : 45～65Hz

●Normal operating range
Operation temperature : －5～50℃
Operation humidity: 35～85%RH

●Alarm (relay output: Option)
Alarm modes :6 modes per channel (H,HH,L
LL,RH,RL)
Number of drives:2 relay drives per setting
Contact :250V AC 3A Max(resistive load)
Rating :125V DC 0.5A Max(resistive load)
: 30V DC 3A Max(resistive load)

Hysteresis amplitude :0.5±0.2%
Setting accuracy : ±0.5%

Multipoint Recorder Specifications

Mode	Item	Multipoint Recorder Specifications
Input	Number of measuring	6, 12, 24, 30,
	Measuring cycle	2.5 / 5 / 10 sec/CH
Recording Printing	Recording	5 kinds of mark (• ∘ + Y ×)
	Printing	Wire dot printing (6-color ribbon)
	Effective recording width	180 mm
	90% step response or less	——
	Recording cycle	2.5 / 5 / 10 sec/CH
	Chart paper	23m(length)× 210mm (width) Folding width : 60mm
	Paper feeding speed	1～1800mm／h
	Recording color	(•)(∘)(+)(Y)(×) No. 1, 7, 13, 19, 25 (Purple) No. 2, 8, 14, 20, 26 (Red) No. 3, 9, 15, 21, 27 (Black) No. 4, 10, 16, 22, 28 (Green) No. 5, 11, 17, 23, 29 (Blue) No. 6, 12, 18, 24, 30 (Brown)
	Print color	Purple (Red)
Outside dimension (W X H X D) (Std.)		G type 288 X 288 X 340 N type 288 X 322 X 340
Weight (Std.)		15.0 kg or less
Maximum power consumption		45VA

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Standard Functions

Function	Description
Analog indication	The measured value is indicated by the scale plate and the pointer. In the manual mode, the recorder can be used as the 1-point recorder with 0.5 sec. cycle.
Analog recording	Analog recording can be made with 5-mark and 6-color ink ribbon.
Unit of indication	Unit of the measured value is indicated on the scale plate.
Digital indication	Channel number, measured value, date, paper feeding speed, alarm setting, etc. are indicated in the indicators (1) and (2).
Interval log print	The measured value and its unit for each channel are printed at set intervals. Either one of printing modes such as "Forced paper feed" and" "Synchronizing paper feed".
Date print	Date is printing at the designated time.
List print	To the print type of sensor each channel, measuring range, unit, alarm setting, date, time, paper feeding speed, scale value, and setting condition of interval log.
Random setting function	Setting of, paper feeding speed, alarm point, interval of interval log print, date, and time can be made.
Backup memory	Clock is protected with lithium cell built in. Life-time of the cell is about 10 years (total non conducting-period of the instrument is 5 years). The set data are protected with non-volatile memory.
Key lock	If you don't use key for more than 5 minutes in a user mode, the key would be locked automatically.
Alarm	Six types of alarm mode can be set for one channel.
Paper feeding speed	Two types of paper feeding speed(1st and 2nd)can be selected for setting.
Clock	Year, month, day, hour, and minute are indicated. Year is set with the dominical year, and for a leap year, the calendar is adjusted automatically.
Self-diagnosis	The indication of error is made when any one errors arises.

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Optional Functions

Function	Description
Burn-out	To deflect over either one of 0% side or 100% side, in designating of input disconnection. Setting UP and DOWN for each channel can be made. (mV, thermocouple input)
Zone recording (Recording of track)	Segregating recording of track, by designating recording zone for each channel can be done.
Partial compression and enlargement	Partial compression and enlargement in the same range can be done.
Scale print	The scale values of zero point and span point of each channel are printed.
Alarm print	When an alarm arises, alarm-on time, alarm-on channel, alarm setting number, and alarm mode are printed in purple color.
Alarm recovery print	When an alarm is recovered, the time of recovery, the recovered channel, alarm setting number, and alarm mode are printed in purple color.
Front calibration terminal	The designated front calibration of voltage can be made by changing input.
DE wire connection input	To execute the compensating temperature, taking in, the inside temperature of outside compensating box by thermocouple input of the set channel.
DH wire connection input	To execute the compensating temperature, taking in, the inside temperature of outside compensating box by the voltage wire (copper wire) of the set channel.
Calculation of channels	The sum of channels or difference between channels are communicated to the designated channel and recorded.
Temperature difference input	The actual temperature after subtracting the reference temperature of reference channel is designated and recorded.
Scaling	Input of standard signal, etc. is converted into actual scale and recorded.
Display OFF	To turn off the designated value in the display through Auto Mode.
New alarm	New alarm channel is output in one-shot relay.
Changing range (two ranges)	To change two types of range through DI signal.
Alarm hysteresis range	The hysteresis range can be set optionally. (Standard : 0.5% FS)

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Special Optional Functions

●Remote Functions by DI

Function	Description
Chart Start/Stop	Setting contact "ON" to start,and "OFF" to stop.
Changing feeding speed of chart paper	Changing contact to "ON" to set 1st position, and to "OFF" for 2nd position.
Chart feeding pulse	Feeding amount at outside of chart.
Changing chart feeding speed INT/EXT	Changing contact "OFF" to internal speed changing mode, and "ON" to external speed changing mode.
Comment print	The set characters are printed (up to 16 characters per line).
Outside log print	Setting contact "ON" to print.
Outside date print	Setting contact "ON" to print.
Integrating input	To integrate the input with a certain amount in proportion to the numbers of setting contact "ON"
Reset of integration	To reset the integrated value.
Changing range	To change the range setting contact "ON" to 'Range 1', "OFF" to 'Range 2'.
New alarm reset	To execute new alarm reset, setting contact "ON".

●Inside Alarm : Number of relay : 8

●Optional Communication Unit :

Function	Description
Communication unit	RS−232C
	RS−422A
	ARCNET®

ARCNET® is the trade mark of Data Point Inc., in U.S.A.

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Appendix 1. Technical Terms

ARCNET®	Serial communication system of Data Point Inc. in U.S.A., which characterizes a high speed multiple communications for long distance.
bracket	A bar type part that fits ribbon cassette with right position.
burn out	To deflect the recording over + side or - side at disconnection of detector.
cold junction compensation	Compensation for lessening of measurement error by circumstance temperature variation of reference terminal at theremocouple input.
common mode rejection ratio	Ratio for voltage in common mode (voltage between input and ground) versus its indicated error voltage. It is represented by decibel (dB).
cramp	A part that fix the ribbon cassette.
DC brushless motor	A motor utilizing electronic circuit with the hole elements, instead of the rectifying mechanism of, brush and rectifier of DC motor.
DI	Digital input. Input of signalizing relay contact, or ON/OFF of open collector, etc.
dielectric strength	Voltage, for which the insulation of instrument could withstand for a certain period of time.
DO	Digital output --- external output (ON/OFF. signals) by relay contact or open collector.
electric conductivity	Representing value for richness or purity of water solution
electric insulation	Electrical resistance between the two insulated conductors.
hysteresis amplitude	The maximum amplitude caused between the designation ON/OFF
non-volatile memory	Memory that maintains the input data while disconnection of the power.

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(Technical Terms)

normal mode rejection ratio	Ratio for voltage in normal mode (differential input voltage) versus an increase of its signal. It is represented by decibel (dB).
precision	Means a synthetic fineness --- the accuracy, and minuteness of measurement by an instrument.
RS-232C	One of the standard specifications for serial communication assigned by the EIA (Electronic Industry Association -U.S.A.)
RS-422A	One of the standard specifications for serial communication assigned by the EIA (Electronic Industry Association -U.S.A.)
shunt resistance	Resistor to be set with terminal block for converting the input electric current into signal voltage.
sprocket drum	Chart paper feeding cylinder with gear teeth
thermocouple	Thermo sensor consists of a couple of the different materials that generate electromotive force by the thermoelectric effect at the junction.
warming-up time	After turning on the power of an instrument, it is the time required to meet all of its facilities with its rating.
watch dog timer function	Monitoring function of CPU that monitors whether CPU finishes a work within a certain period of time, and if not, determines that CPU is abnormal.

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Appendix 2. A Cross Reference List of Display Indication

The indicators (1) and (2) notate alphabet for its indication, because of 7 segments of LED, so that refer to the cross reference list shown below.

Note : There is no distinction between a capital letter and small letter.

													
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	

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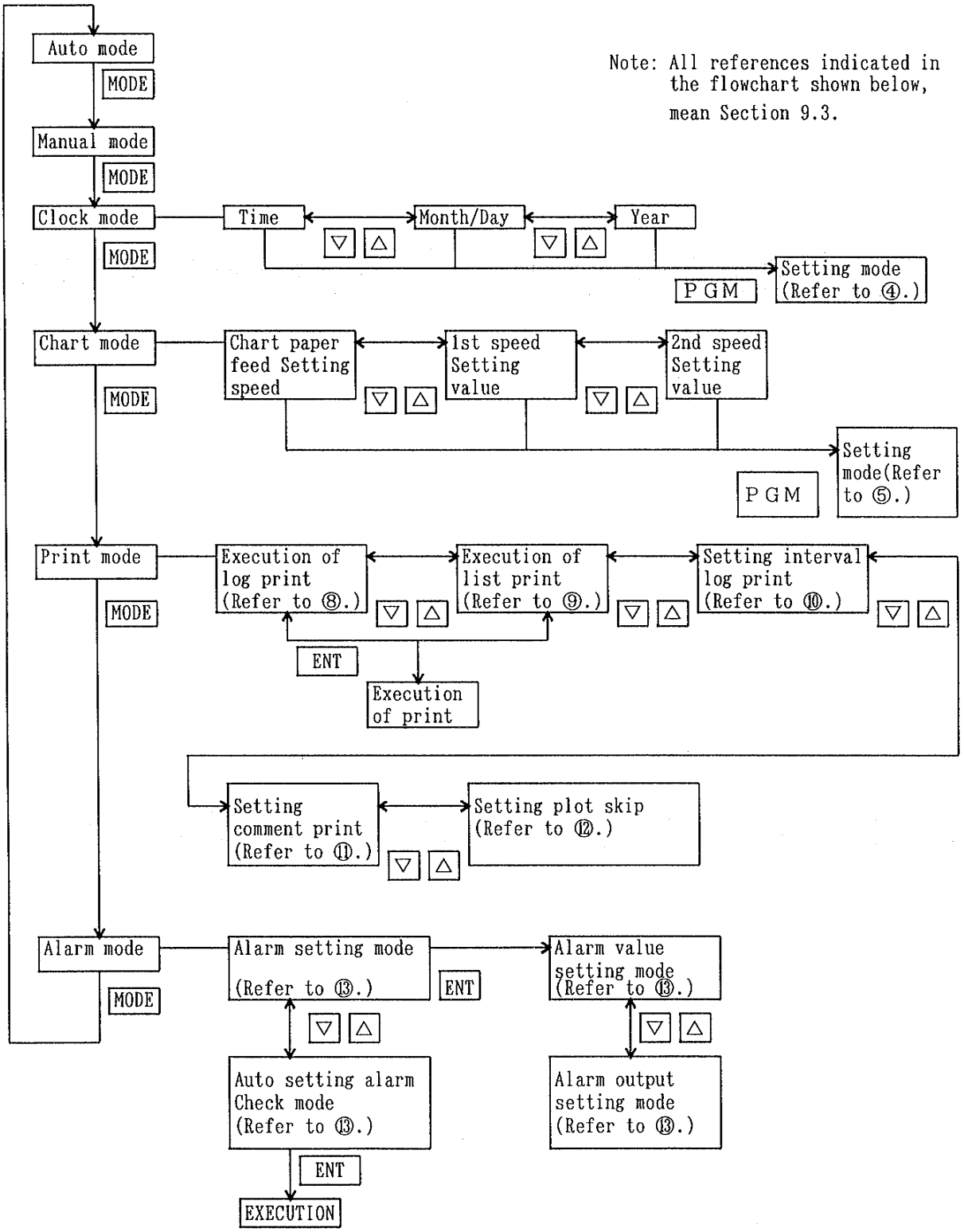
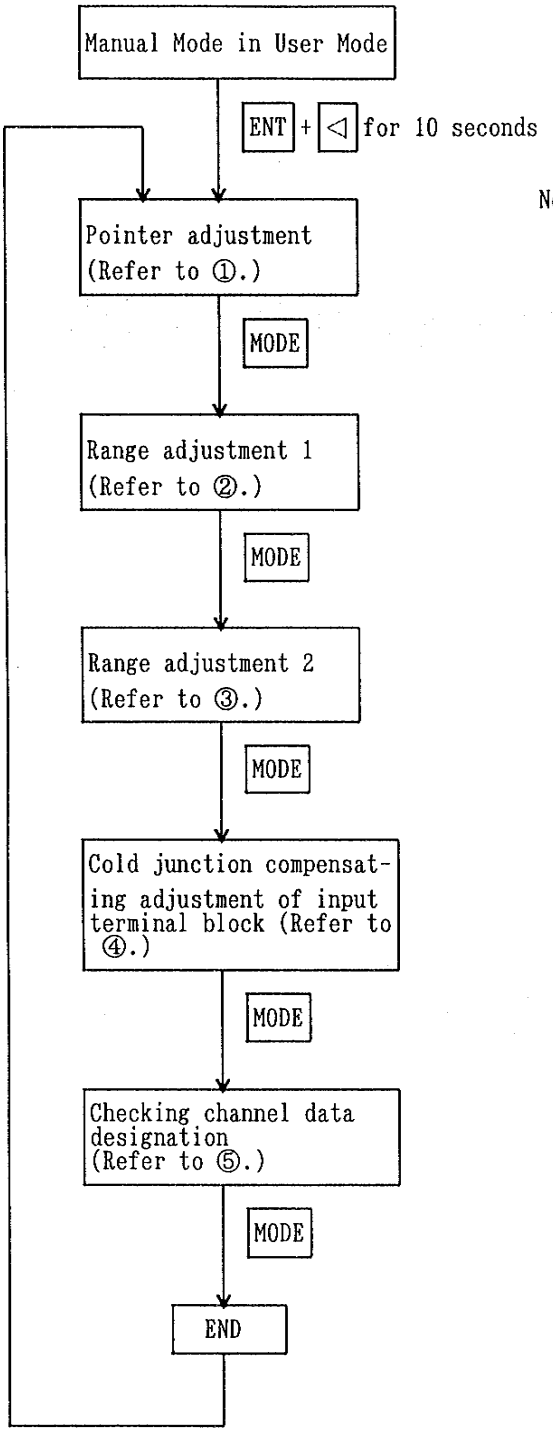
Appendix 3. Display

(1) User Mode:



Note: All references indicated in the flowchart shown below, mean Section 9.3.

(2) Calibration Mode:



Note: All references in this flowchart mean Chapter 11.