Instruction Manual

μRS1000

Models 4365□□
μRS1000 Recorder

IM 4D6B1-01E

FOR REFERENCE ONLY

4D6B101E02

YOKOGAWA

IM 4D6B1-01E
2nd Edition

INTRODUCTION

Thank you for purchasing the YOKOGAWA industrial strip-chart μRS1000 recorder. To take full advantage of numerous capabilities and to operate this instrument correctly and efficiently, please read this Instruction Manual before use.
This manual describes both pen and dot-printing models of the 100 mm chart recorder.
The following documents are provided separately:

Quick Reference Sheet	IM 4D6B1-90E
Instruction Manual for RS-422-A Communication Function (Option)	IM 4D6B1-10E

NOTE

- The contents of this manual is the subject to change without notice.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if you find any ambiguous descriptions, please inform YOKOGAWA.
- All rights reserved. No part of this manual may be reproduced or transmitted in any form.

REVISIONS

- August 1993 : First edition
- October 1993 : 2nd edition

Disk No. MR17
2nd Edition : October 1993 (YG)

SAFETY PRECAUTIONS

This recorder is developed to satisfy and to be used under the following conditions:

- The recorder is a component type instrument to be installed on an instrumentation panel or rack.
- The recorder conforms to IEC348, Safety Class I (with protective earth terminal)
- The recorder is based on EN55011 (EMI) Group 1, Class A (for commercial and industrial use).

The following safety precautions must be observed during all phases of operation, maintenance, and repair of the recorder. Even when personal injury or product damage occurs in disregard of those precautions, YOKOGAWA assumes no responsibility.

General definitions of safety symbols used on the recorder and in this manual.

Monitory symbol; the elements marked with this symbol alert the user to refer to the instruction manual to avoid personal injury or recorder damage.

Protective grounding terminal; this terminal must be connected to the ground before turning the power switch on.

This manual uses the following signs for safety precautions:

WARNING

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

CAUTION

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

Power Supply

Ensure the source voltage matches the specified power supply voltage before turning on the power.

WARNING

Power Supply
Ensure the source voltage matches the specified power supply voltage before turning on the power.

Protective Grounding
Make sure to connect the protective grounding to prevent an electric shock before turning on the power.

Necessity of Protective Grounding
Never cut off the internal or external protective grounding wire or disconnect the wiring of protective grounding terminal. Doing so poses a potential shock.

Defects of Protective Grounding and Fuse
Do not operate the recorder when protective grounding or fuse might be defective.

Fuse
To prevent a fire, use the fuse with specified ratings. Before replacing the fuse, turn off the power and disconnect the power source. Do not use an off-specification fuse or short circuit the fuseholder.

Do not Operate in an Explosive Atmosphere
Do not operate the recorder in the presence of flammable liquids or vapors. Operation of any electrical instrument in such an environment constitutes a safety hazard.

Keep Away from Live Circuits
Inside this recorder there are areas of high voltage; therefore, never touch the interior when the power supply is connected. The recorder has replacable parts and subassemblies; however, the replacement must be carried out only by YOKOGAWA service personnel or properly trained personnel only.

External Connction
Before connecting to measurement and control unit, connect the protective grounding wire.

HOW TO USE THIS MANUAL

Relationship between chapters and their purposes or timing to read is broken down in the table below:
◍ :Necessary to read
○ :Optional to read

Chapters	Purchase & Installation	Daily Operation/ Maintenance	Setting Renewing	Trouble-shooting
Safety Precautions	◍	◍	◍	◍
1 Before Installation	◍			
2 Installation	◍			
3 Component Names & Functions		◍	○	
4 Daily Operation		◍		○
5 Data Entry Guides			◍	
6 Options	○	○		
7 Troubleshooting				◍

For the communication function (option), which is not described in this manual, refer to IM 4D6B1-10E. For the specifications of this recorder, refer to the General Specification Sheet (GS 4D6B1).

CONTENTS

Chapter 1 BEFORE INSTALLATION

This chapter describes the necessary preparations before handling the recorder; read them for safe handling.

1.1 Handling Precautions

The recorder contains many plastic parts; therefore, never use chemicals such as benzine or thinner to clean the recorder.

Do not bring any objects charged with static electricity near the signal terminals. This might cause malfunction.

Do not allow any volatile substances to the front glass or key panel. Do not allow rubber or vinyl to remain in contact with the recorder for long periods.

Whenever the recorder is not used, turn the power switch off.

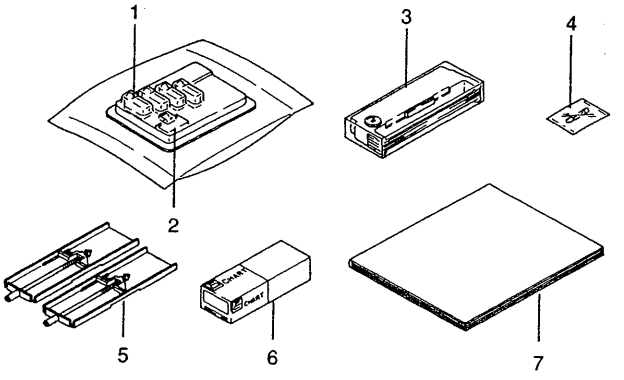
Turn the recorder power switch off as soon as any symptoms of malfunction such as unusual sound, smell, or smoke yield from the recorder. Also turn the main power switch off.
If a malfunction occurs, contact your sales representative or nearest service center.

1.2 Checking and Unpacking

This recorder has been thoroughly inspected before shipment; however, when you receive the recorder, check that all accessories are present and in the correct quantities. Also check the external appearance of the recorder to ascertain that no damage has occurred.

1.2.1 Checking Accessories and Appearance

The recorder should be accompanied by the accessories indicated in Figure 1.1. Check that all are present in the correct quantities. Also check the external appearance of the recorder to ascertain that no damage has occurred.



No.	Name	Qty	Remarks
1.	Disposable felt pen		
	1-pen mode	1	Red
	2-pen model	2	Red, green
	3-pen model	3	Red, green, blue
	4-pen model	4	Red, green, blue, violet
2.	Plotter pen	1	
3.	Ribbon cassette	1	Only for dot-printing model
4.	Fuse	1	250 V, 500 mA, time-lag type for others than /P1 model
		1	250V, 5A, time-lag type for /P1 model
5.	Mounting brackets	2	
6.	Z-fold chart paper	1	Approx. 16 m
7.	Instruction manual	1	
	Quick reference sheet	1	
	Instruction manual for communication function	1	Option

Only for pen model

Figure 1.1 Accessories

Table 1.1 Spare Parts

Name	Part No.	Qty	Remarks
Disposable felt pen (red)	B9930BP	3	Only for pen model
Disposable felt pen (green)	B9930BP	3	
Disposable felt pen (blue)	B9930BP	3	
Disposable felt pen (violet)	B9930BP	3	
Plotter pen	B9902AR	3	
Ribbon cassette	B9901AX	1	Only for dot-printing model
Fuse	A1360EF	4	250 V, 500 mA, time-lag type for others than /P1 model
	A1353EF	4	250V, 5A, time-lag type for /P1 model
Mounting brackets	B9900CW	2	
Z-fold chart paper	B9565AW	6	Approx. 16 m
Lubricating oil	B9901AZ	1	Only for dot-printing model

1.2.2 Removing Packings

The internal assembly is secured in position by packings to safeguard against damages during transit. When you unpack the recorder, remove the packings referring to Figure 1.2 and 1.3.

(1) Remove the lock screw securing the interior of the recorder during transit.
(2) Open the front door, and open the scale plate by pulling its left end after removing the adhesive tape. (For a dot-printing model, pull down the flag before opening the scale.)
(3) Remove all packings.

CAUTION

Before closing the scale of a dot-printing model, check to see that the flag is pulled down; if not, the flag may be damaged.

Pen model

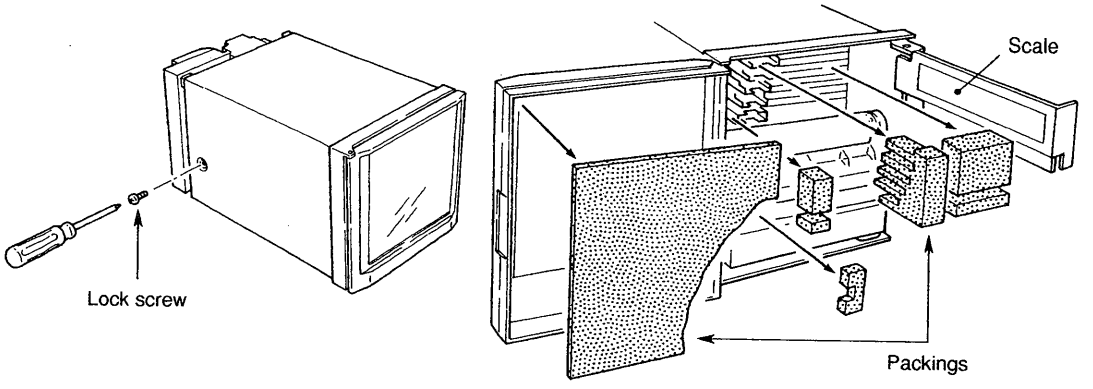


Figure 1.2 Removing Lock Screw and Packings for Transit (Pen Model)

Dot-printing model

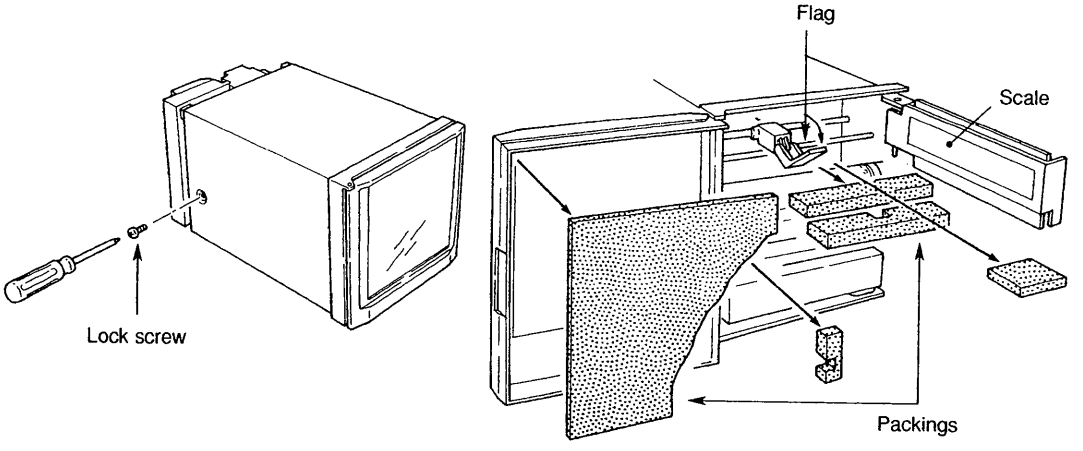


Figure 1.3 Removing Lock Screw and Packings for Transit (Dot-Printing Model)

CAUTION

Please take care not to apply any undue pressure in an upward or downward direction to the scale plate and keyboard. This might cause a strain on the hinges.

1.2.3 Checking Model Codes

Check the model codes on the nameplate to make sure they are as specified by your order.

The nameplate is visible after you removed the chart cassette and is as shown in the figure below. When you contact YOKOGAWA sales and service offices, inform the model code (MODEL) and the serial number (No.).

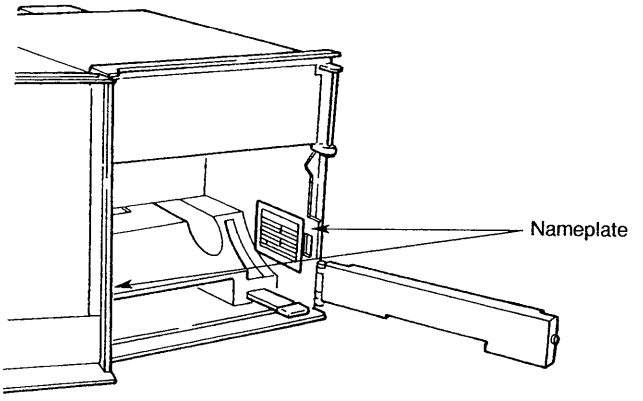


Figure 1.4 Checking Model Codes

Chapter 2 INSTALLATION

This chapter describes the installation method of the recorder: selecting the installation site, mounting and wiring methods. Read this chapter before installation.

2.1 Installation Site and Mounting Methods

2.1.1 Installation Site

The recorder should be installed according to the following conditions as close as possible.

Panel and rack mounting
The recorder is designed to be installed on an instrumentation panel or rack.

Well ventilated location
Install the recorder in a well ventilated site to prevent from internal temperature rise.

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

Horizontal installation
This recorder must be installed horizontally (however, mounting may be inclined up to 30°C backward from vertical).

Avoid direct sunshine or heater radiation.
The recorder will be adversely affected if the unit is exposed to direct sunlight or installed near a heater. Choose a location near room temperature (23°C) with minimal temperature fluctuation.

Keep out of soot, steam, moisture, dust, corrosive gases
To expose the recorder to soot, steam, moisture, dust, corrosive gases, etc., will adversely affect it.

Keep away from electro-magnetic fields
To use the recorder within strong electro-magnetic fields may cause malfunction. Please avoid installing near electro-magnetic objects.

2.1.2 Mounting Methods

(1) Mount the recorder on a steel panel whose thickness is at least 2 mm (and up to 26 mm).
(2) Insert the recorder into the panel-front face.
(3) Fix the recorder to the panel using the mounting brackets as shown in Figure 2.1. Adequate screw tightening torque is approximately 8 to 12 kg-cm. A pair of mounting brackets can be applied to the recorder's top and bottom, or to both side faces. Remove the seals covering the holes for the brackets before attaching them.

CAUTION

A tightening torque exceeding the above-mentioned adequate values may cause deformation of the recorder case or brackets.

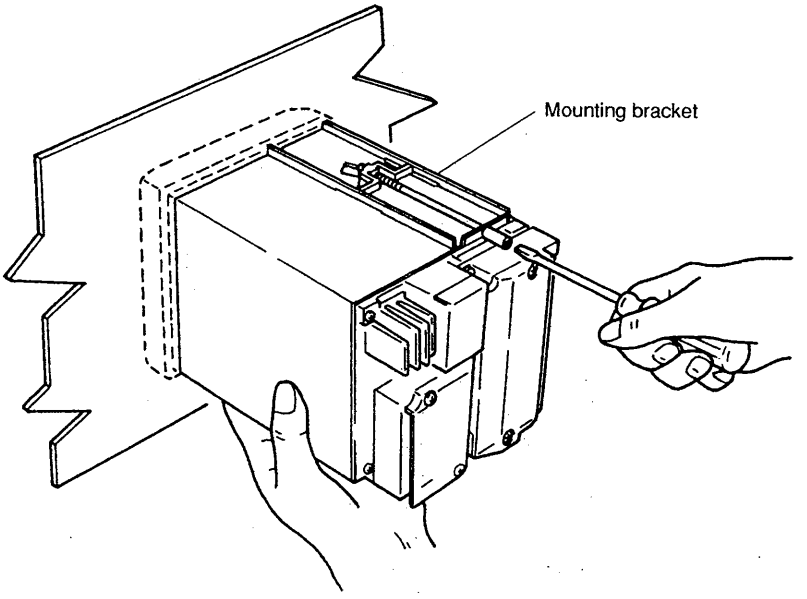
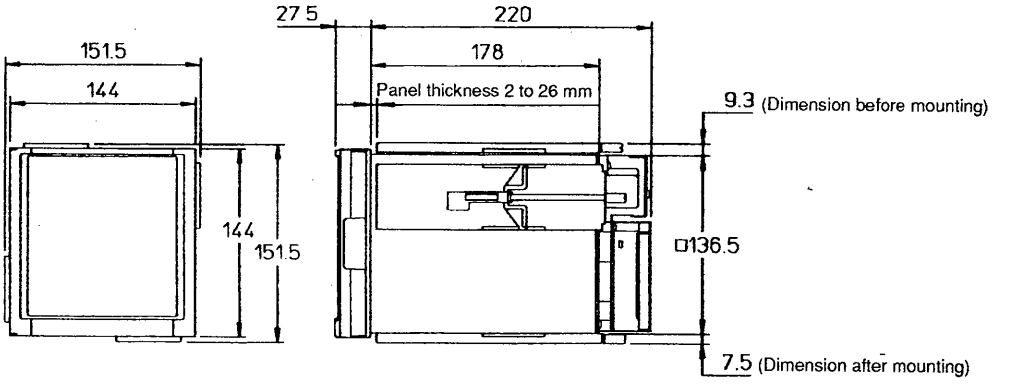


Figure 2.1 Mounting

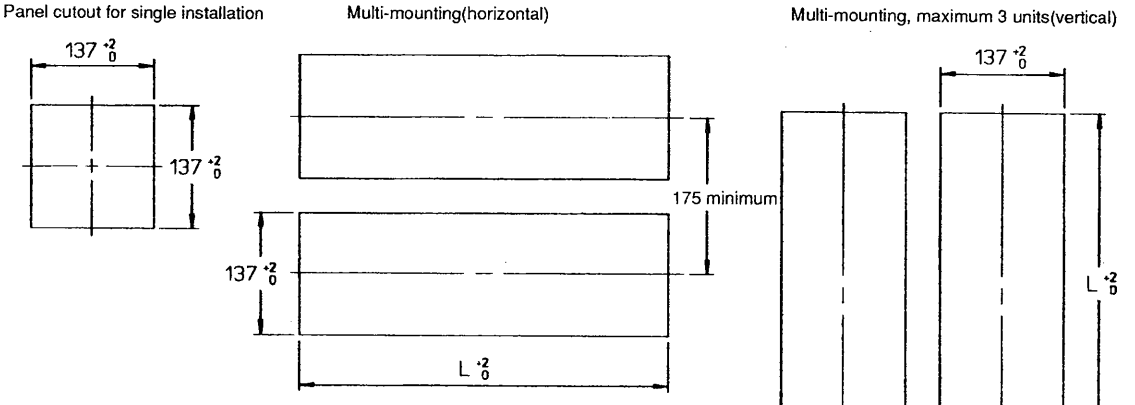
2.1.3 External Dimensions

Unit: mm

Unless otherwise specified, dimensional tolerance is ±3%; however, for less than 10 mm, it is ±0.3 mm.



Panel cutout



Number of unit	L +2 0 (mm)	
2	282	Multi-mounting(vertical)
3	426	
4	570	
5	714	
6	858	
7	1002	
8	1146	
9	1290	
10	1434	
n	(144xn)-6	

Figure 2.2 Panel Cutout and External Dimensions (Including Mounting Brackets)

NOTE A pair of mounting brackets should be used on the top and bottom, or on both sides of the recorder.

2.2 Wiring ⚠

Wiring should be done only after you have read this section. The section consists of the following subsections:

2.2.1 Rear Panel Terminal Arrangement
2.2.2 Power Supply Wiring
2.2.3 Input Signal Wiring
2.2.4 Alarm Output Wiring
2.2.5 FAIL/Chart-End Output Wiring
2.2.6 Remote Control Wiring

WARNING Make sure to fasten the wiring at the rear wall of the mounting panel and employ some kind of strain relief between the rear wall and the recorder.

2.2.1 Rear Panel Terminal Arrangement

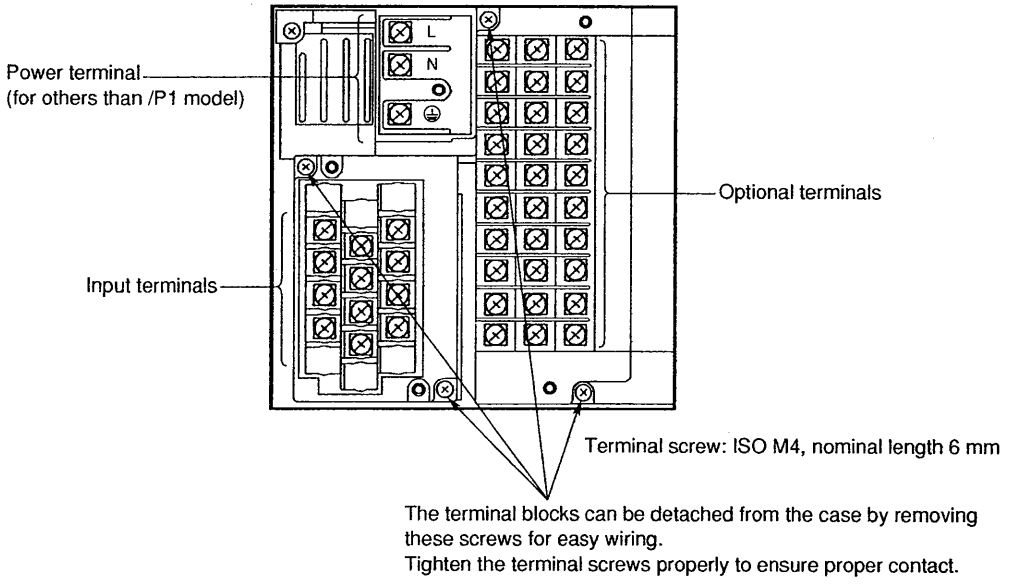


Figure 2.3 Pen Model

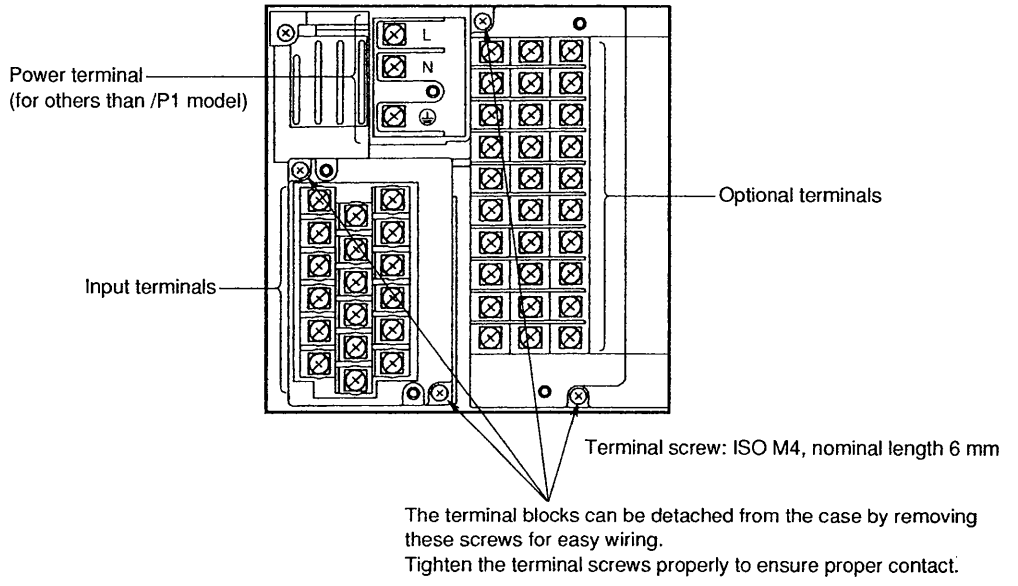


Figure 2.4 Dot-Printing Model

2.2.2 Power Supply Wiring ⚠

(1) The rated power supply voltage for the recorder is 100 to 240 V AC.
(2) Turn the recorder's power switch off.
(3) Open the transparent cover of the power terminal after releasing the cover screw.
(4) Connect the power supply wires and the protective ground wire to the terminal.
(5) Cover the terminals with the transparent cover, and secure the screw.

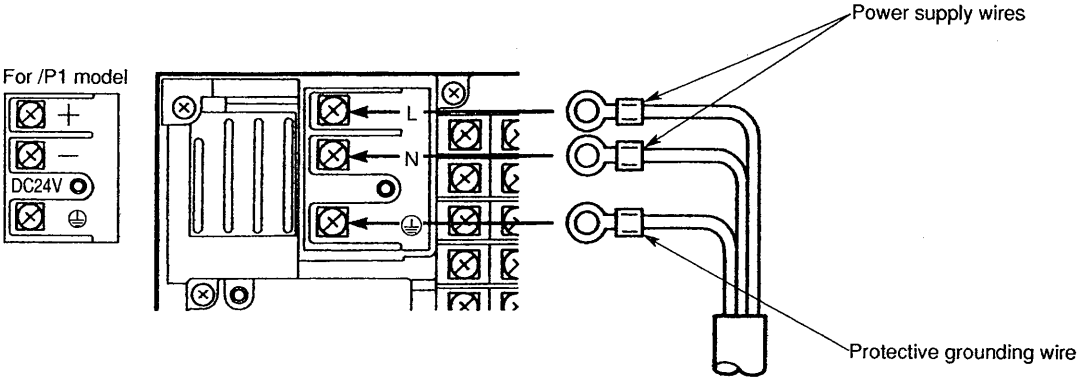


Figure 2.5 Power Supply Wiring

WARNING

- To prevent an electric shock, ensure the main power supply is turned off before wiring.
- To prevent fire, use 600 V PVC insulated wire (AWG18) for power and ground wiring (cross sectional area of 0.83 mm^2 or thicker, anti-galvanic corrosion finish, insulation thickness should be more than 0.8 mm, insulation resistance ahould be more than 50 MΩ Km at 20°C, approved EN60 320 (VDE0625)), or equivalent cables.
- Connect the protective grounding wire to the earth through grounding resistance less than 100 Ω before turning on the power.
- Use crimp on lugs (for 4 mm screws) with insulation sleeves (refer to Figure 2.6.).
- To prevent an electric shock, cover the power terminals certainly with the transparent cover.
- Make sure to apply a power switch in the power supply cord with the following characteristic:
  rated power current > 1A (> 3A for /P1 model)
  rated rush current > 60A (> 70A for /P1 model)
  fuse (s) of 2A to 15A (5A to 15A for /P1 model) is (are) necessary.

NOTE

- Do not apply a power supply in the range from 132 V to 180 V AC. Doing so might affect the measuring accuracy.

2.2.3 Input Signal Wiring ⚠

(1) Turn off the recorder power switch.
(2) Remove the transparent cover for the input signal terminals.
(3) Connect the input signal wires to the terminals.
(4) Attach the cover on the terminals, and secure the screws.

It is recommended to use the crimp-on lugs (for 4 mm screws) with insulation sleeves for lead wire ends, but they are not required for thermocouples (TC) and the clamped input terminals (option).

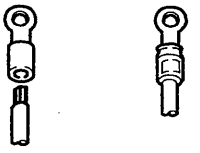


Figure 2.6 Crimp-On Lugs

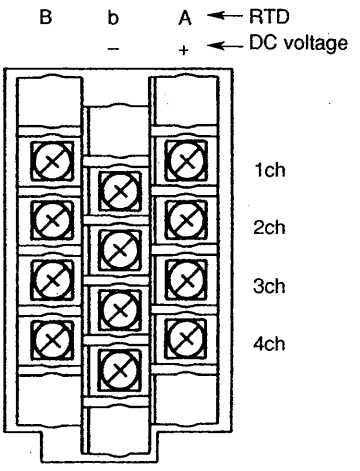
Suggestions to minimize noise pickup:
- Separate the measuring-signal wires from power lines and grounding lines
- It is desirable that the measuring object is not a noise source; if not, insulate it from the measuring signal wires and ground the object.
- It is recommended to use shielded wires to minimize noise pickup from an electrostatic induction source. The shields are connected to the recorder's grounding terminal, if necessary. In that case, avoid two-point grounding.
- To minimize the noize from an electrostatic induction noise, twist the measuring wires (a pair of wires) in short and equal intervals.
- The grounding line must have low resistance.

A thermocouple (TC) recorder is equipped with a reference junction compensator, so the ambient temperature around the recorder's terminal board should be kept as stable as possible.
- Cover the input terminals with the transparent cover.
- Do not use a large-diameter wire (cross sectional area of more than 0.5 mm^2) because it has a large radiation rate.
- Keep the ambient temperature as stable as possible; start/stop of a nearby fan affects the temperature.

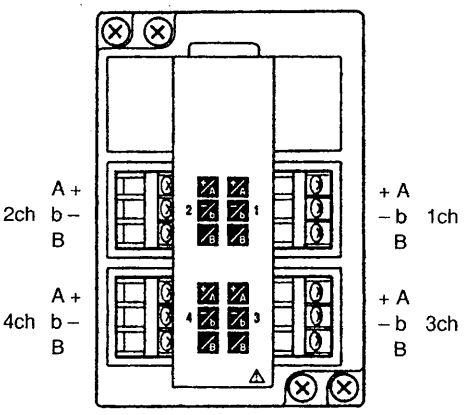
If input signal wires are connected to two or more receivers with parallel connection, measured values sometimes affect each other. The following notes should be observed for parallel connection:
- Ground each receiver at the same point.
- Do not turn on/off the power of a receiver while other receivers are in measuring operation.
- A resistance temperature sensor (RTD) cannot be used essentially in parallel connection.

WARNING To prevent an electric shock, ensure the main power switch is turned off when wiring.

CAUTION Do not apply inputs exceeding the rated range as follows to prevent the recorder from damage:
- Maximum input voltage
  ±10 V DC for TC, and for the voltage range of 2 V DC or less
  ±30 V DC for the voltage range of 6 to 20 V DC
- Maximum common mode voltage
  250 V AC rms (50/60 Hz)

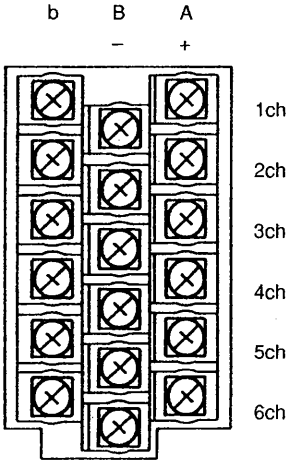


Standard input terminals

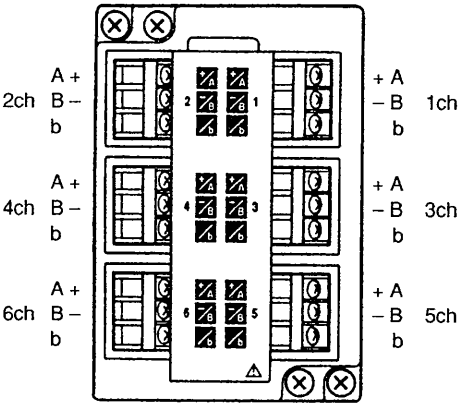


Clamped input terminals (/H2 option)
(Wire diameter: Maximum 2.5 mm)

Figure 2.7 Terminal Board (Pen Model)



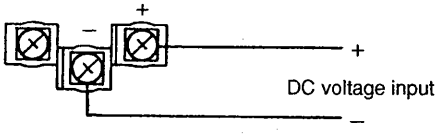
Standard input terminals



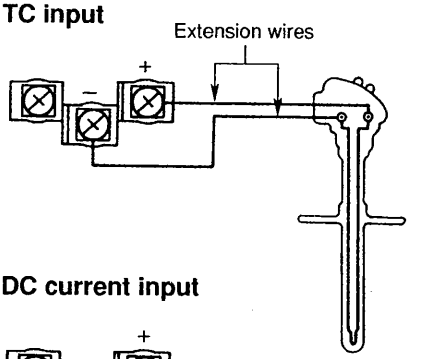
Clamped input terminals (/H2 option)
(Wire diameter: Maximum 2.5 mm)

Figure 2.8 Terminal Board (Dot-Printing Model)

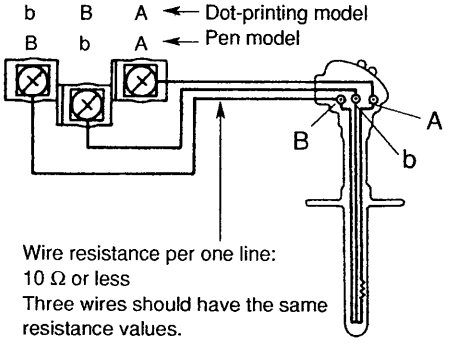
DC voltage inputs



TC input

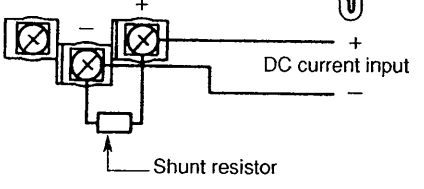


RTD input



Wire resistance per one line:
10 Ω or less
Three wires should have the same
resistance values.

DC current input



(Example)The shunt resistor rating
is 250 Ω ±0.1% for the
current input of 4 to 20 mA.

2.2.4 Alarm Output Wiring ⚠

(1) Turn the power switch off.
(2) Remove the transparent cover of the optional terminals.
(3) Connect the alarm output wires to the optional terminals.
(4) Cover the terminals with the transparent cover and secure the screws.

Depending on the type (the number of outputs) of alarm relay options, the terminal arrangement changes as shown in Figure 2.10:

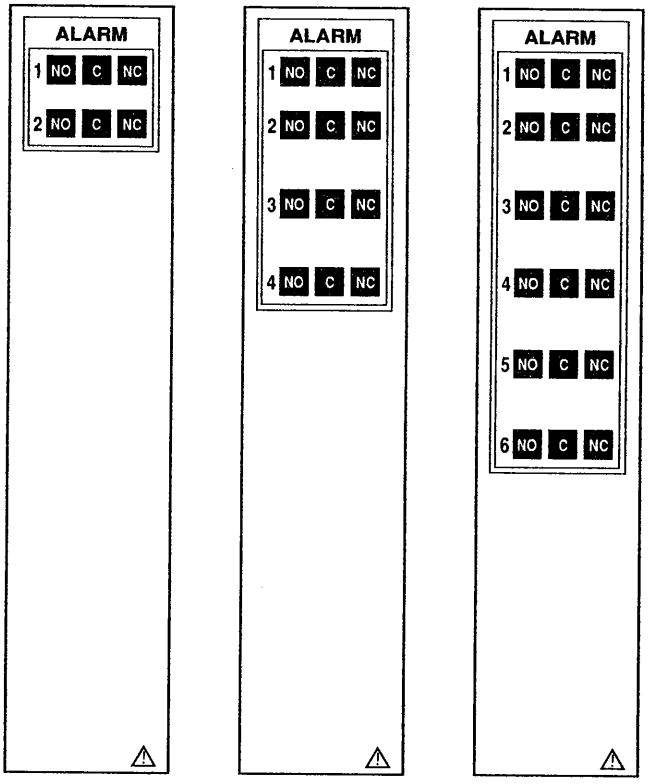


Figure 2.10 Alarm Output Terminal Arrangements

Contact characteristics:

Output type : Relay transfer contacts

Output capacity : 250 V AC (50/60 Hz), 3 A
250 V DC, 0.1 A (resistive load)

Dielectric strength : 1500 V AC (50/60 Hz) for one minute between output terminals and grounding terminals

WARNING To prevent an electric shock, ensure the main power switch is turned off before wiring.

2.2.5 FAIL/Chart End Wiring ⚠

(1) Turn the power switch off.
(2) Remove the transparent cover of the optional terminals.
(3) Connect the FAIL/Chart end output wires to the optional terminals.
(4) Cover the terminals with the transparent cover and secure the screws.

Terminal arrangements for FAIL/Chart end output signals are as follows:

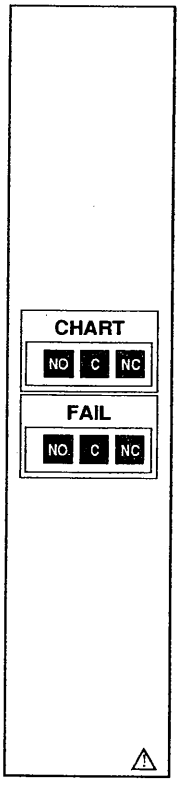


Figure 2.11 FAIL/Chart End Output Terminal Arrangements

WARNING To prevent an electric shock, ensure the main power switch is turned off before wiring.

NOTE The FAIL output is of the de-energize type.
Refer to 6.2 for details.

2.2.6 Remote Control Wiring ⚠

(1) Turn the power switch off.
(2) Remove the transparent cover of the optional terminals.
(3) Connect the wires for remote control to the optional terminals. The C is the terminal common to other 1 to 5.
(4) Cover the terminals with the transparent cover and secure the screws.

Remote control terminals are arranged as follows:

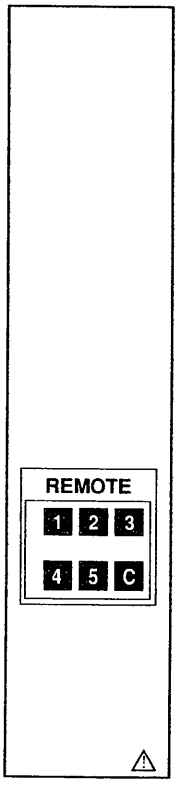


Figure 2.12 Remote Control Terminal Arrangements

Input characteristics:

Input signal : Dry contact, open-collector (TTL or transistor) signal

Control functions and signal types:

	(1) Recording start/stop	level
	(2) Chart speed change	level
	(3) Manual printing	trigger more than 250 msec
Signal characteristics :	ON voltage	0.5 V or less (30 mA DC)
	Leakage current in OFF state	0.25 mA or less
	Signal duration	250 msec or more

Input types : Photocoupler isolation (one line common)
Internal isolated power source (5 V±5%)

Dielectric strength : 500 V DC for one minute between input terminals and grounding terminal.

WARNING To prevent an electric shock, ensure the main power switch is turned off before wiring.

NOTE
- Use shielded cables for remote control signals to prevent noise pickup. The shield should be grounded at the recorder's terminal.
- No. 4 and No. 5 terminals cannot be used.

Chapter 3 COMPONENT NAMES AND FUNCTIONS

This chapter describes the names of components, and outlines their functions.

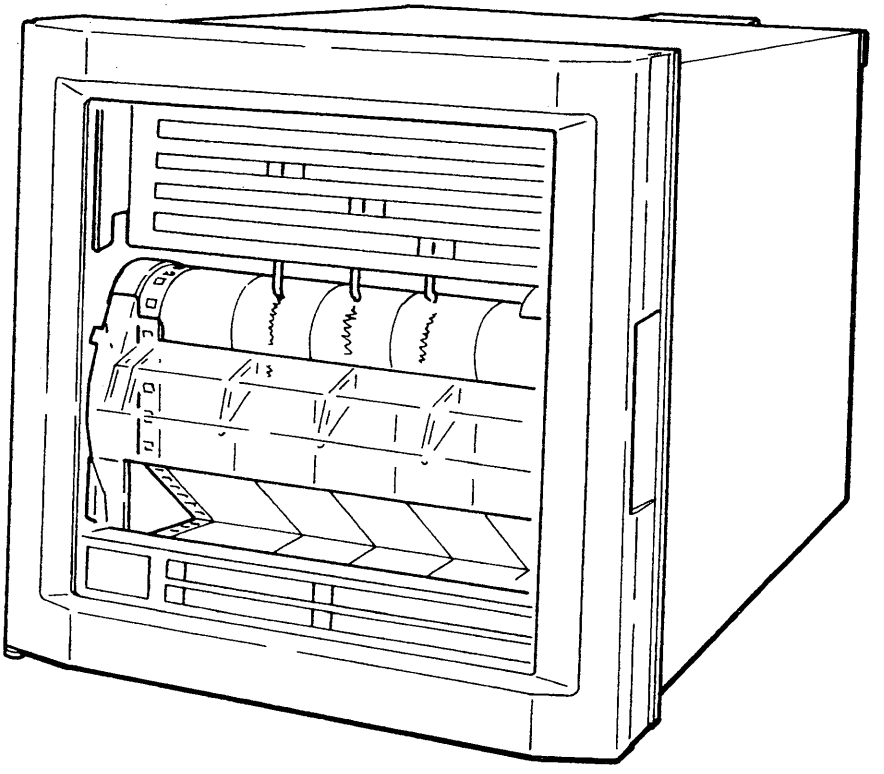


Figure 3.1 External View

3.1 Front Panel

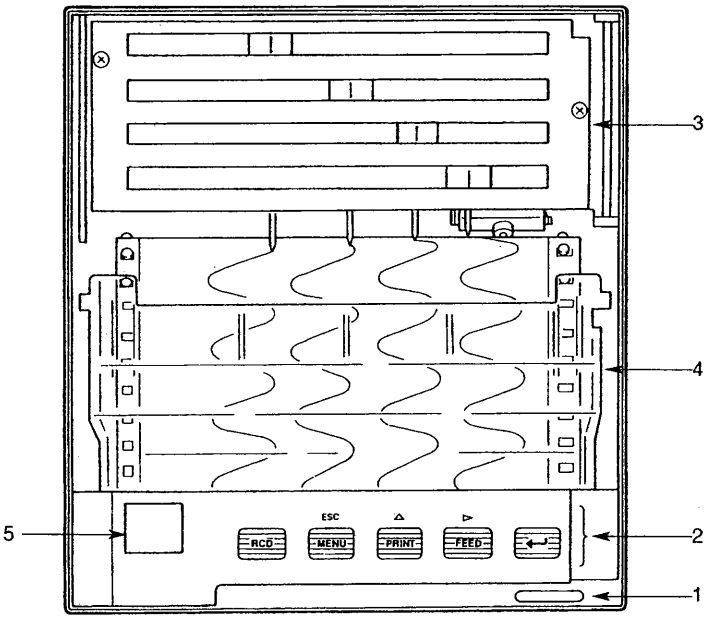


Figure 3.2 Front Panel (Pen Model)

1. Power switch (push-button type)

Pressing the switch turns the power ON and OFF.

2. Key panel (push-key type)

The panel contains five keys, and turns (opens) around the hinge which is attached at its right end. Open the panel when taking out the recorded chart from the retainer.

RCD **[RCD]** key
Pressing the key starts or stops the recording.

ESC
MENU **[MENU]** key, **[ESC]** key
(MENU function) Changes to the setting modes, executes SET UP list printout (refer to 4.6.3) and others.
(ESC function) Exits from the menu in the middle of setting or selecting procedures.

△
PRINT **[PRINT]** key, [△] key
(PRINT function) Conducts manual printout (refer to 4.6.1) and the list printout (4.6.2).
(△ function) Selects setting parameters (numerics or command codes). Selecting step is upward circulation.

[FEED] key, [▷] key

(FEED function) The chart is fed as long as this key is being pressed (refer to 4.5.2.).

(▷ function) Changes the number of digits for setting numeric values. The digit moves from high to low.

[ENT] key

Conducts parameter entry or executes functions after selecting parameters (numerics or command codes). Pressing the key executes the settings.

3. Scale

The scale plate can be turned (opened) by pulling its left end. Open the scale plate when replacing pens or ribbon cassette.

4. Chart cassette

Contains a Z-fold chart (width: 100 mm, length: 16 m).

5. Indicator

While the recorder is in operation, the indicator shows recorder's status. When data are set, the setting steps are shown successively.

3.2 Indicator

Indications (alphanumeric letters) are listed in this section.

1. **Battery failure** : [bA] (battery alarm)
2. **Chart end detection (option)** : [CA] (paper alarm)
3. **Alarm occurrence** : [AL]
4. **Recording is OFF** : [.]
5. **Recording is ON**
   Pen model : [rC] (record)
   Dot-printing model : [0X] (X is channel No.) or [rC]

Numbers preceding the items above show the order of priority. When normal recording is carried out, [0X] or [rC] is indicated; but when an alarm occurs, it changes to [AL], or to [CA] because of the chart-end detection.

The indications are listed in Table 3.1, which appear during recording or setting. Refer to Chapter 7 for error messages.

Table 3.1 Indications and Their Descriptions

Indication	Reading	Function	Remarks
7b	7B	7 BIT communication data length	For communication
8b	8B	8 BIT communication data length	For communication
Ab	AB	ABORT a setting value	
AF	AF	ADJUST FULL recording position adjustment	4.7.6/7
AH	AH	ADJUST HYSteresis of dot recording	4.7.7
AJ	AJ	ADJUSTMENT	4.7.6/7
AL	AL	ALARM occurrence	5.3
Ar	AR	ADJUST ZERO of recording position	4.7.6/7
bA	BA	BATTERY ALARM	3.2
C1	C1	CHART SPEED1	5.4
C2	C2	CHART SPEED2	5.4
CA	CA	CHART END ALARM	3.2
Cn	CM	COMMUNICATION data setting	For communication
CP	CP	CHANGE PEN	4.3
d	D	DAY setting	5.5
En	EN	END of setting	
Et	ET	EXTERNAL trigger for recording	5.6
EV	EV	EVEN number for communication parity	For communication
H	H	HIGH LIMIT alarm	5.3
H.	H.	HOUR setting	5.5
it	it	INTERNAL trigger for recording	5.6
L	L	LOW LIMIT alarm	5.3
L1	L1	LEVEL 1 of alarm level from among 1 to 4	5.3
LS	LS	LIST printout	4.6.2
m	m	MONTH setting	5.5
m.	m.	MINUTE setting	5.5
MP	MP	MANUAL PRINT	4.6.1
nE	NE	NONE of communication parity	For communication
Od	Od	ODD number for communication parity	For communication
oF	OF	OFF	
On	On	ON	
rC	RC	RECORD status of pen model	3.2
rd	RD	RECORD trigger setting	5.6
SA	SA	SETting ALARM	5.3
SC	SC	SETting CHART SPEED	5.4
Sd	SD	SETting DAY and hour	5.5
St	ST	STORE set values	
SU	SU	SET-UP LIST	4.6.3
Y	Y	YEAR setting	5.5

Chapter 4 DAILY OPERATION/ MAINTENANCE

This chapter describes the daily operation and maintenance of the μRS1000 Recorder. Read this chapter before operation.

4.1 How to Switch the Power ON/OFF

The power switch is located at the lower right-hand corner of the front face behind the door.
The switch is a push-button type. Press the switch to turn '**ON**' the recorder and press again to turn '**OFF**' (refer to Fig. 4.1).
After the power turns on, the recorder executes a self-diagnostic check for several seconds before starting measurement and recording.

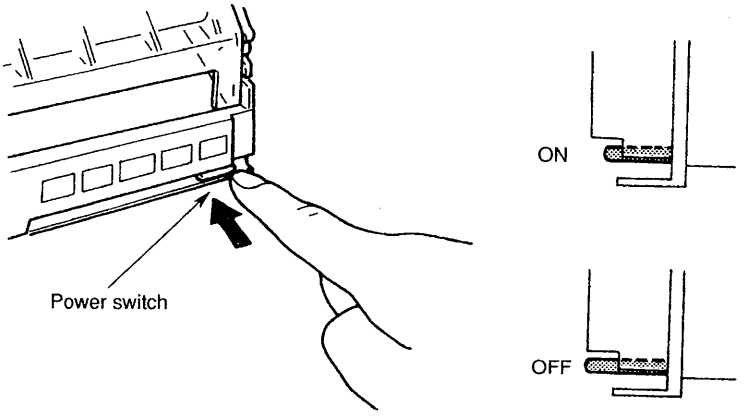


Figure 4.1

NOTE

- The warm-up time is approximately 30 minutes; however, after the initial start-up, the recorder might need more time.
- If the input wiring is connected parallel with other equipment, do not turn the power switch on/off to prevent fluctuations in measuring values.

4.2 How to Install (or Replace) Chart Paper

(1) Open the front door of the recorder.
(2) Check the recorder is not in recording state; but the power **ON** is allowed.
(3) Riffle the chart thoroughly before loading.
(4) Pull the key panel to open it around the hinge. While gently pressing the chart-cassette stoppers, located at both front ends of the cassette, lift and draw the cassette out of the recorder case.

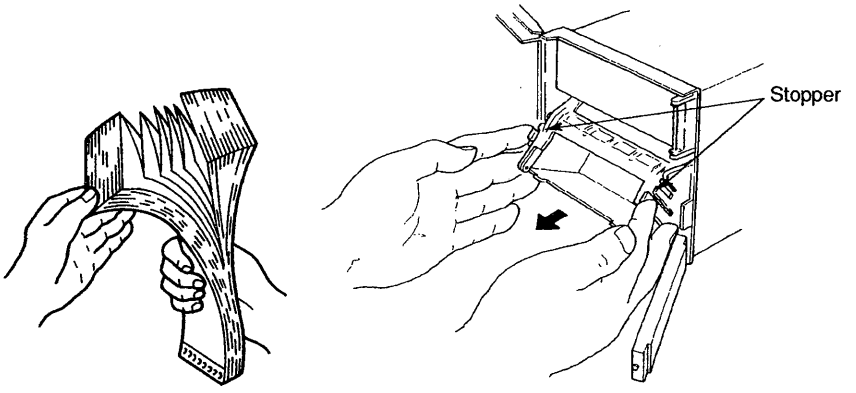


Figure 4.2

(5) Open the chart retainer backward on the cassette.
(6) Pull and open the front transparent chart guide.

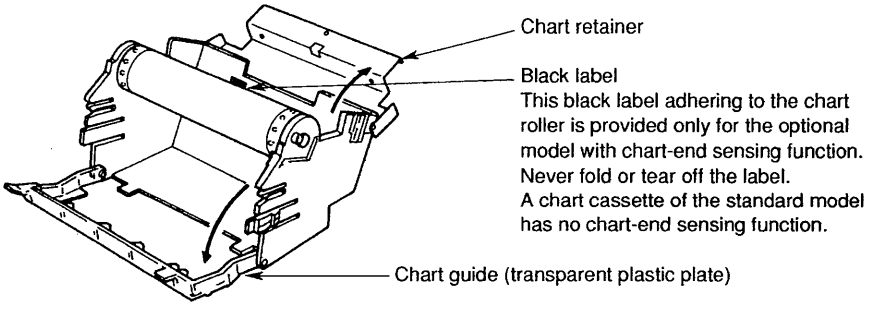


Figure 4.3

(7) Load the chart paper into the chart compartment; the small perforations should be at the left-hand. Make sure that the sprocket teeth of the chart drives are properly engaged in the chart paper perforations. Take care not to load the chart paper backwards.

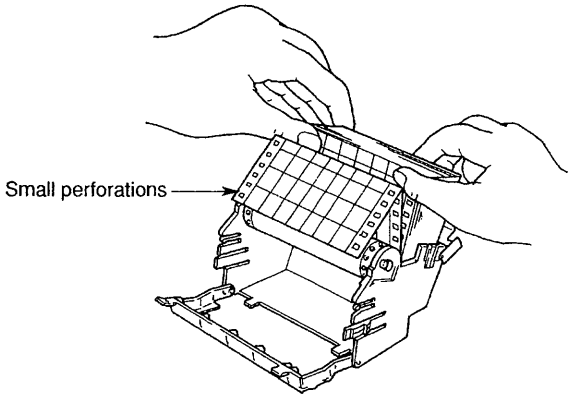


Figure 4.4

(8) Close the chart retainer.
(9) Close the chart guide (transparent plastic plate).

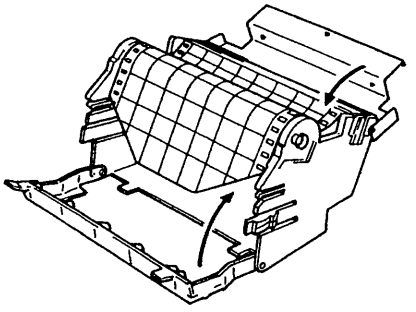


Figure 4.5

(10) Replace the chart cassette back into the recorder case; hang the knurls of the cassette to the grooves of the case, and move the cassette to trap the stopper.

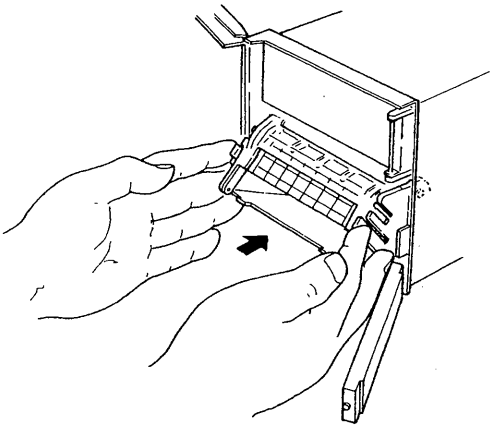


Figure 4.6

(11) Press the **[FEED]** key on the key panel to assure that the chart moves two or more folds smoothly into the chart receiver. If it moves unsteadily, do the installing procedure again from step (4).

NOTE A red band with a 'RENEW CHART' notice appears when the chart nears to its end (length of remaining chart is approximately 40 cm) to suggest you to prepare a new chart.

4.3 How to Install (or Replace) Pens (Pen Model)

Felt-tip pen

Simple replacement

(1) Open the front door, and check to see that the recording is OFF, but the power **ON** is allowed.
(2) Pull and open the scale plate around the hinge.
(3) Pull out the pen-cartridge by pulling the protruding part of the cartridge from the pen holder.

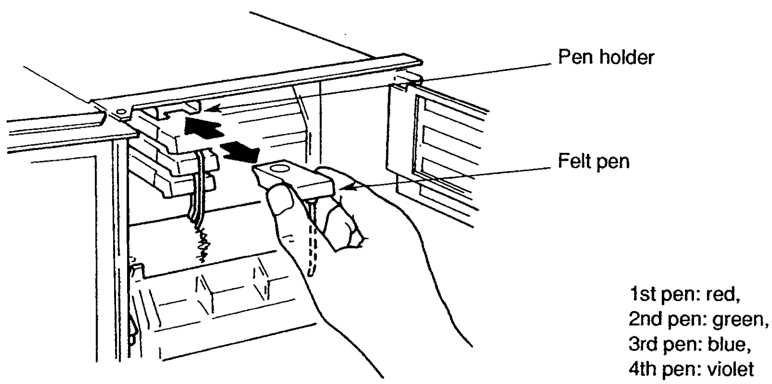


Figure 4.7

(4) Remove the cap from a new felt-tip pen, and insert the pen firmly to the pen holder.
(5) Press the **[RCD]** key to restart the recording.

CAUTION

- Do not press or pinch the felt tip to prevent deformation. Do not move the pen holder up- or down-scale to protect the driving mechanism.
- Always make sure to remove the pen cap before installation.

Replacement under pen-replacement mode

When a pen is located at a place where its replacement is difficult to do, relocate the pen by the following procedures:

(1) Check to see that the recording is OFF, but the power **ON** is necessary.
(2) Press the **[MENU]** key, then press the [△] key to display [C P], and press the **[ENT]** key.
(3) Press the [△] key to display [o n], and press the **[ENT]** key. The pens will move near to the center of the scale where the pens can be easily replaced.

NOTE When the pens move, a line is drawn on the chart.

(4) Replace the pen according to the 'simple replacement' (2), (3), and (4) described above.
(5) After pen replacement the indicator shows [E n], then press the **[ENT]** key.
(6) To restart recording, press the **[RCD]** key.

Plotter pen

(1) Open the front door, and check to see that the recording is OFF, but the power **ON** is allowed.
(2) Pull and open the scale plate around the hinge.
(3) Pull out the pen-cartridge by pulling the protruding part of the cartridge from the pen holder.

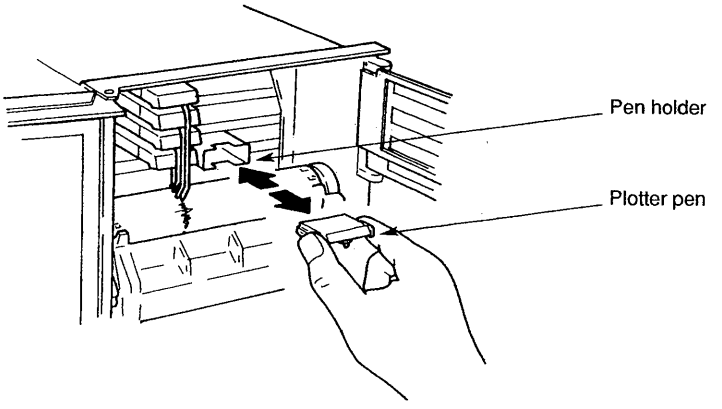


Figure 4.8

(4) Remove the cap from a new pen, and insert the pen firmly to the pen holder.

CAUTION Always make sure to remove the pen cap before installation.

4.4 How to Install (or Replace) Ribbon Cassette (Dot-Printing Model)

(1) Open the front door, and check that the power is switched **OFF**.
(2) Pull the flag downward.
(3) Open the scale plate by pulling its left end.
(4) Hold the printer carriage, and move it to the right.
(5) Hold the left-hand part of the ribbon cassette, and pull it out from the recorder case.

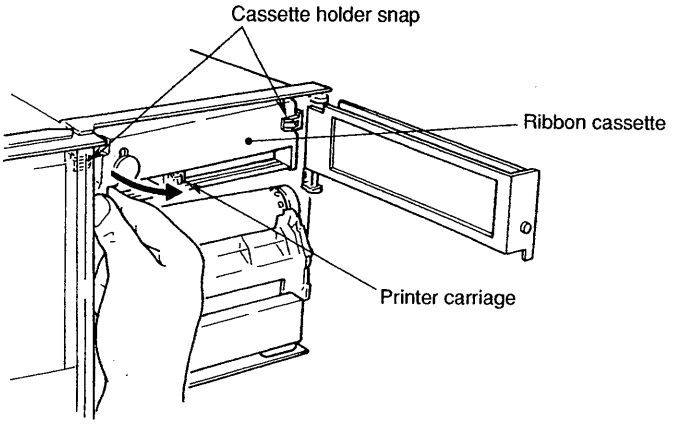


Figure 4.9

(6) Insert a new ribbon cassette into the cassette holder; first, insert the right-hand part, next the left-hand part. Check that the cassette is properly engaged with the cassette holder snap.
If the cassette is not engaged with the holder properly, turn the ribbon feeding knob in the direction of the arrow to fit the peg to the driving hole of the holder.
(7) To check that the cassette is properly inserted, turn the left-hand knob in the direction of the arrow a half or more turning.
(8) If the ribbon loosens, turn the knob in the direction of the arrow to tighten it.
(9) Turn the scale plate back to the normal position.
(10) Lift the flag upward.

CAUTION

- Improper insertion of the cassette may cause illegal-print color or damage to the cassette.
- Do not turn the scale plate back whenever the flag is lifted.

4.5 How to Get the Recording

4.5.1 How to Start/Stop the Recording

Press the **[RCD]** key to start or stop the recording.

NOTE When the remote control (option) is used for the start/stop of recording, the **[RCD]** key cannot be used.

4.5.2 How to Feed the Chart

The chart paper is fed by pressing the **[FEED]** key as long as the key is pressed.

4.5.3 Printing Samples

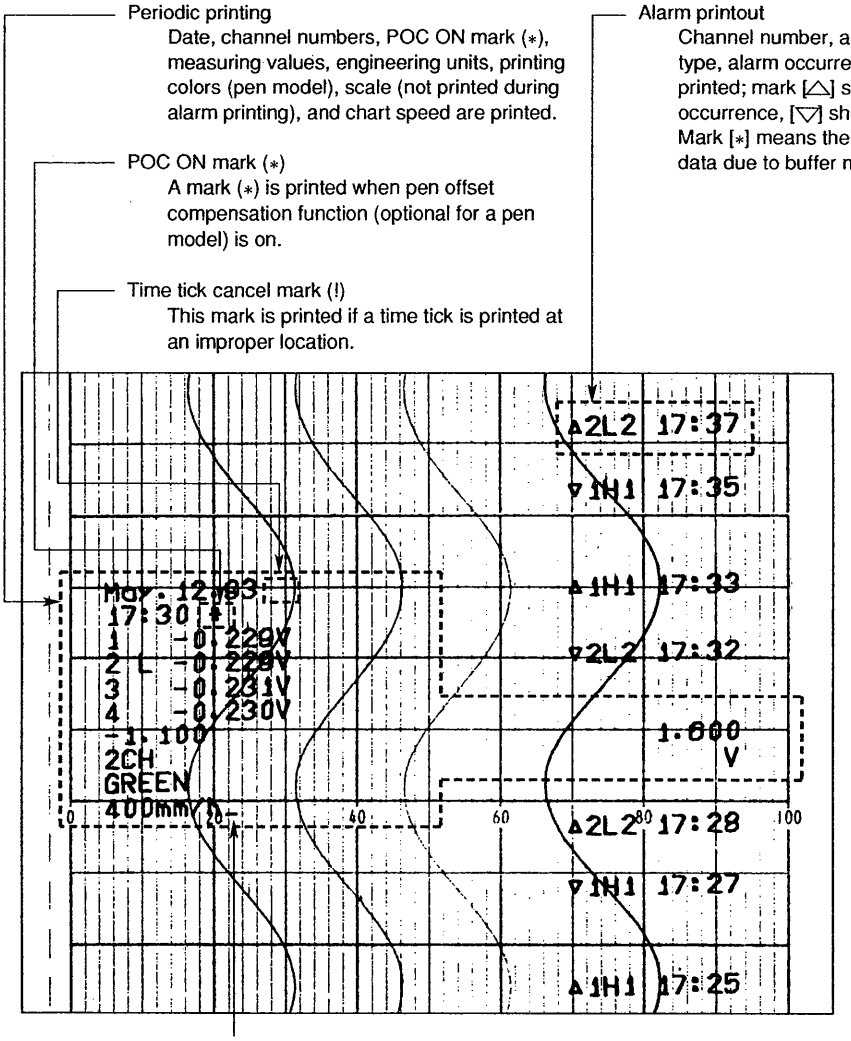


Figure 4.10 Printing Samples

4.6 How to Get a Digital Printout

A digital printout can be any one of the following:
- Manual printout
- List printout
- Set-up list printout

4.6.1 How to Get a Manual Printout

A manual printout includes:
- Date and time
- Channel number, type of alarm occurred, latest measured values with engineering units (for all channels)

Manual printing is executed by the following procedure:
(1) Press the **[PRINT]** key.
(2) Press the [△] **(PRINT)** key to call [MAN P] on the indicator, then press the **[ENT]** key.
(3) Press the [△] key to call [ON] (ON) on the indicator, then press the **[ENT]** key, and manual printing will start.

When manual printing starts, the indicator returns to recording **[ON/OFF]** indication automatically. After the printing finishes, the recorder returns to the state before starting the manual printing.

NOTE
- While a manual printing is executed, analog recording is interrupted; however, measuring and alarm detecting activities continue.
- If an alarm occurs during manual printout, the alarm printout starts just after the analog recording restarts.

If you require to interrupt a manual printing, execute the following procedure:
(1) Press the **[PRINT]** key.
(2) Press the [△] **(PRINT)** key to call [MAN P] on the indicator, then press the **[ENT]** key.
(3) Press the [△] key to call [OFF] (OFF) on the indicator, then press the **[ENT]** key. Then the manual printing will stop and the recorder will return to the state before starting the manual printing.

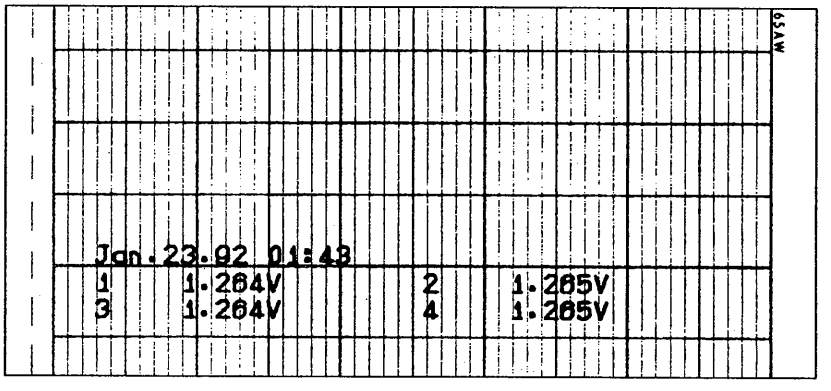


Figure 4.11 Manual Printout (Pen Model)

4.6.2 How to Get a List Printout

A list printout includes the following setting values:

- Date/time/chart speed/2nd-chart speed/trend record interval
- Channel number/range/span/scaling value/engineering unit
- Types of set alarms
- ON/OFF setting for periodic printing/zone recording/partial expanded recording
- Message printout setting

List printing is executed by the following procedure:

(1) Press the[**PRINT**] key.
(2) Press the [△] (**PRINT**) key to call [L 5] on the indicator, then press the [**ENT**] key.
(3) Press the [△] key to call [on] (ON) on the indicator, press the [**ENT**] key, and list printing will start.

When the list printing starts, the indicator returns to recording [**ON/OFF**] indication automatically. After the printing finishes, the recorder returns to the state before starting the list printing.

NOTE

- While list printing is executed, analog recording is interrupted; however, measuring and alarm detecting activities continue.
- If an alarm occurs during list printout, the alarm printout starts just after the analog recording restarts.

If you want to interrupt a list printing, proceed as follows:

(1) Press the [**PRINT**] key.
(2) Press the [△] (**PRINT**) key to call [L 5] on the indicator, then press the [**ENT**] key.
(3) Press the [△] key to call [oF] (OFF) on the indicator, and press the [**ENT**] key. The list printing will stop and the recorder will return to the state before starting the list printing.

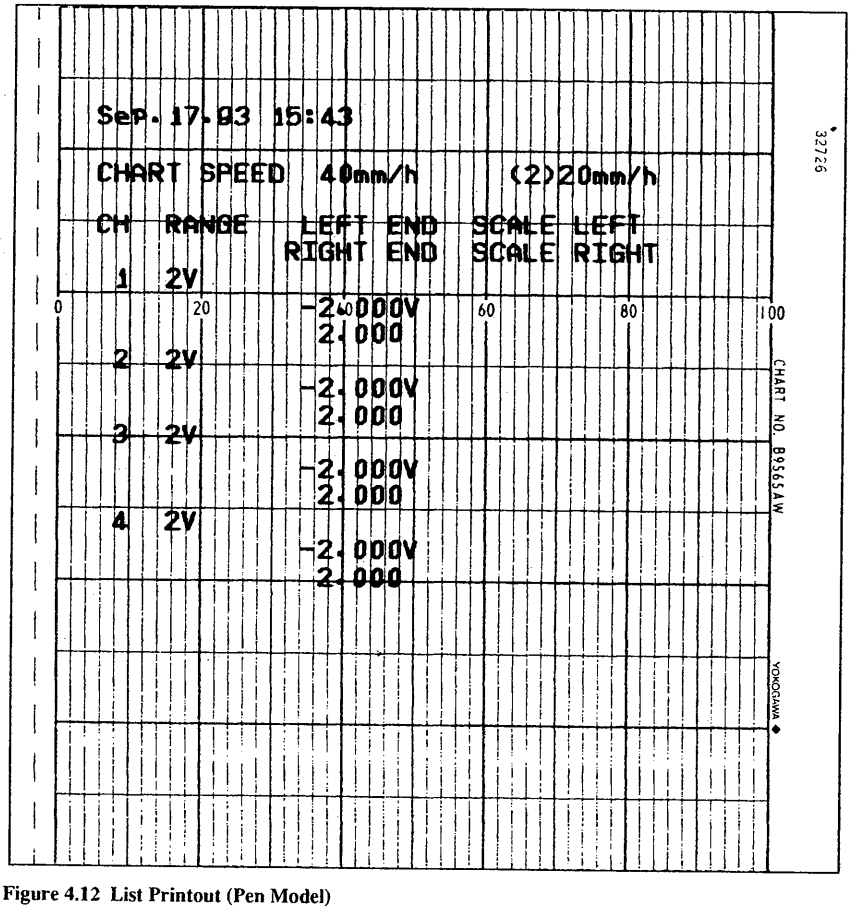


Figure 4.12 List Printout (Pen Model)

4.6.3 How to Get a SET UP List Printout

A SET UP list printout includes the setting values of the following printing functions:

- Analog recording
- Digital printing
- Burnout function, reference junction compensation (RJC) and others

SET UP list printing is executed by the following procedure:

(1) Press the [MENU] key.
(2) Press the [△] key to call [SET UP] on the indicator, and press the [ENT] key. (For a dot-printing model, do not press the [ENT] key.)
(3) Indicate [ON] (ON) using the [△] key, press the [ENT] key, and the SET UP list printing will start.

When the list printing starts, the indicator returns to recording [ON/OFF] indication automatically. After the printing finishes, the recorder returns to the state before starting the list printing procedure.

NOTE

- While list printing is executed, analog recording is interrupted; however, measuring and alarm detecting activities continue.
- If an alarm occurs during list printing, the alarm printout starts just after the analog recording restarts.

If you require to interrupt a SET UP list printing, execute the following procedure:

(1) Press the [MENU] key.
(2) Press the [△] key to call [SET UP] on the indicator, and press the [ENT] key.
(3) Press the [△] key to call [OFF] (OFF) on the indicator, and press the [ENT] key. The list printing will stop and the recorder will return to the state before starting the list printing.

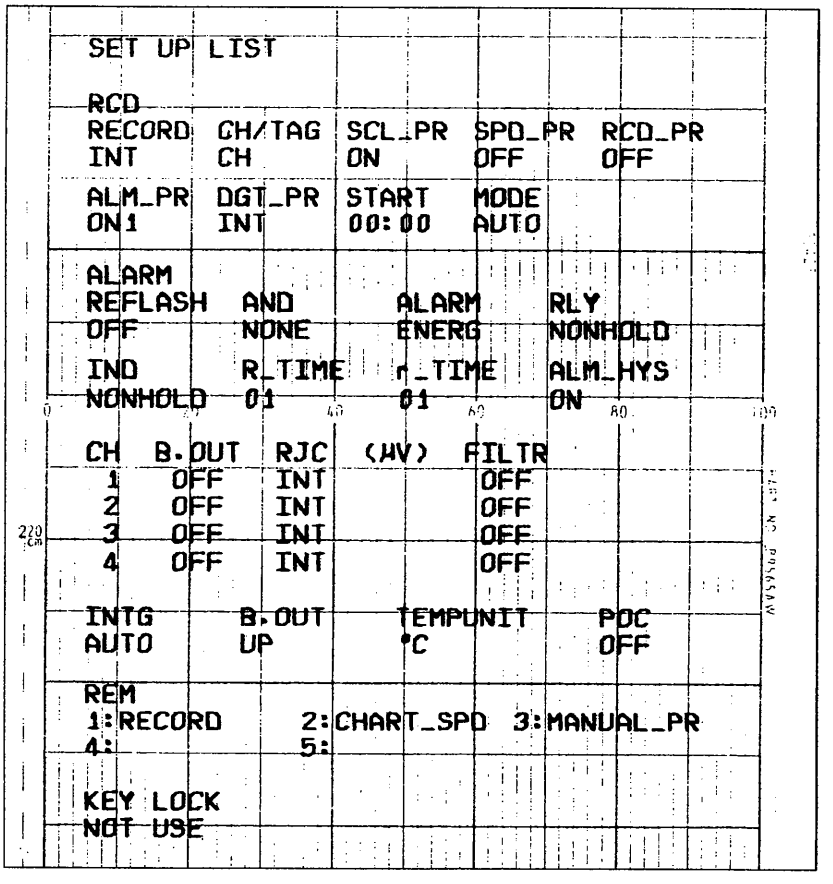


Figure 4.13 SET UP List Printout (Pen Model)

4.7 Maintenance

The activities necessary to maintain the recorder in good operating condition are shown below:

- Periodic maintenance (Refer to 4.7.1)
- Battery replacement (Refer to 4.7.2)
- Fuse replacement (Refer to 4.7.3)
- Cleaning plotter carriage shaft (Refer to 4.7.4)
- Calibration (Refer to 4.7.5)
- Pen adjustment (Refer to 4.7.6)
- Printer carriage adjustment (Refer to 4.7.7)
- Parts replacement (Refer to 4.7.8)

4.7.1 Periodic Maintenance

Check the following items periodically, and replace consumable parts, if necessary:

Are indication and recording normal?
If not, refer to Chapter 7 Troubleshooting.

Are recorded lines or printed characters clear, not blurred?
To replace a felt-tip pen or a plotter pen of a pen recorder, refer to 4.3 How to Install (or Replace) Pens; also, refer to 4.4 How to Install (or Replace) Ribbon Cassette to replace the ribbon cassette of a dot-printing model.

Is chart-paper feeding smooth, not jammed?
If not, refer to Chapter 7 Troubleshooting.

Is there enough chart paper left in the chart compartment?
Remaining chart length (cm) is printed on the left margin of the chart at intervals of 20 cm (See Fig. 4.14).
Refer to 4.2 How to Install (or Replace) Chart Paper.

Is [bA] (battery alarm) appearing on the indicator?
If it is, refer to 4.7.2 Battery Replacement as the lithium battery for memory backup needs to be replaced.

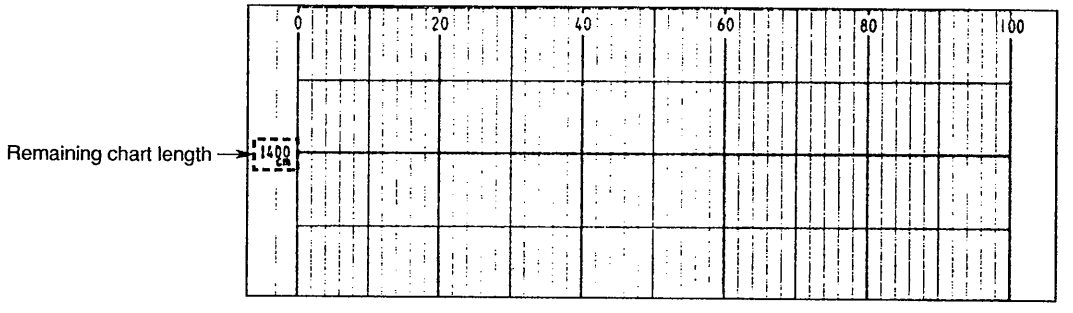


Figure 4.14 Indication of Remaining Chart Length

4.7.2 Battery Replacement

The [b A] indication shows lithium battery deterioration, which is used for memory backup. The battery has a lifetime of approximately 10 years under normal operation. When [b A] is indicated, contact your dealer or the YOKOGAWA Sales & Service Offices printed on the back cover.

WARNING

Replacing the lithium battery can be dangerous. Do not attempt to replace the battery; never disassemble the recorder for replacing the battery.

4.7.3 Fuse Replacement ⚠

Replacing the fuse every two years is recommended as preventive maintenance. Replacing procedure is as follows:

(1) Turn the power switch OFF.
(2) Take out the chart cassette; the fuse holder is found in the main unit. Turn the fuse carrier counterclockwise to release it with the fuse.
(3) Change the fuse with a new one, and insert the carrier to the fuse holder turning it clockwise for fixing.

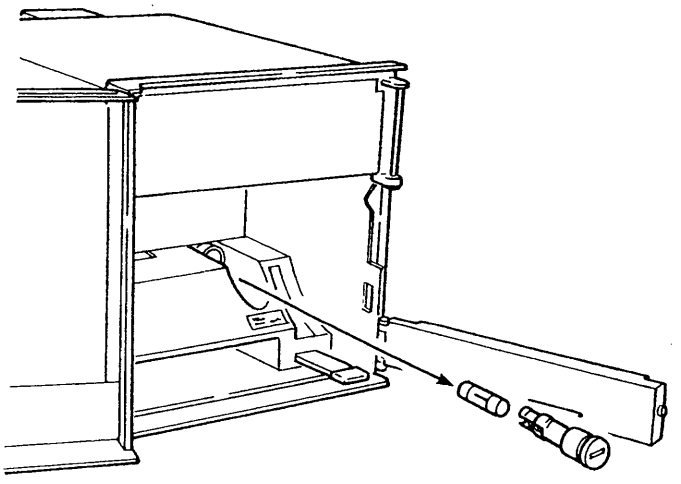


Figure 4.15 Fuse Replacement

WARNING

- To protect personal injury, turn the power switch OFF and disconnect the recorder from the main power line before replacing the fuse.
- To protect an accident such as a fire, use only the specified fuse purchased from YOKOGAWA.

4.7.4 Cleaning the Carriage Shafts

Pen model

To maintain proper recording functions, it is recommended to clean the plotter-carriage shaft once a year.
Cleaning procedure is shown below (refer to Figure 4.16):

Wipe the two shafts, the upside and downside ones for the plotter carriage, with a piece of soft cloth or paper without fluffing.
If stains are persistent, use several drops of ethyl alcohol with the cloth or paper.

CAUTION

- Do not damage the plotter's flexible-printed circuit when cleaning the shafts.
- The shafts do not require lubricating oil.

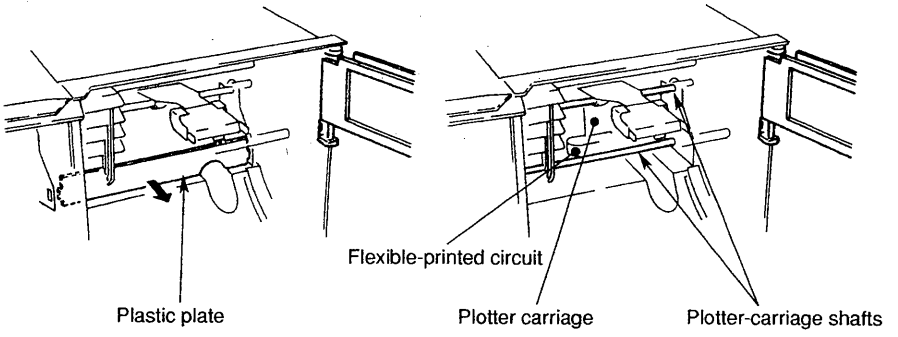


Figure 4.16 Pen Model

Dot-printing model

To maintain proper recording functions, it is recommended to lubricate the printer-carriage shaft once a year.
Lubricating procedure is shown below (refer to Figure 4.17):

(1) Wipe up dust or oil from the shaft of the printer carriage with a piece of soft cloth or paper without fluffing.
(2) Take out the tube of lubricating oil from among the spare parts.
(3) Coat the shaft with a few small drops of lubricating oil, but remove excess oil with a piece of soft cloth or paper without fluffing.

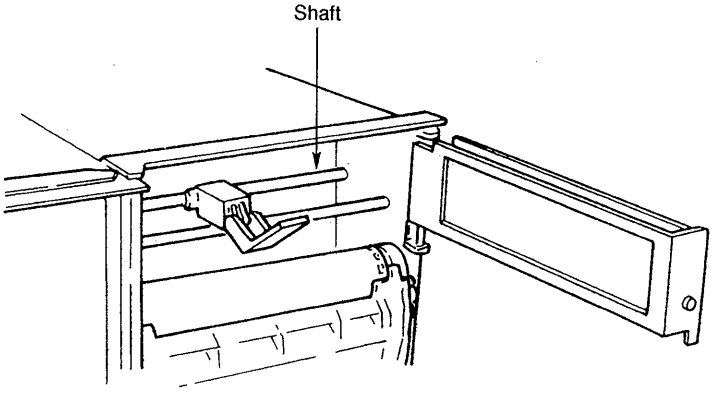


Figure 4.17 Dot-Printing Model

4.7.5 Calibration

Calibration is a comparing operation between standard inputs and measured values. It is recommended to carry out a calibration once a year to assure the measuring accuracy.

Required instruments for calibration

The instruments for calibration should have the required resolution. If necessary, ask the sales office from whom you purchased the recorder about those instruments.

Recommended instruments

DC voltage standard (YOKOGAWA Model 2552 or equivalent)
Decade resistance box (YOKOGAWA Model 2793/01 or equivalent)

Calibration procedure

(1) Connect the instruments to the recorder; connecting the terminals is shown in Figure 4.18 to 4.20. Give enough warm-up time to the instruments (more than 30 minutes for the recorder).

(2) Check that the ambient temperature and humidity are within the standard operating conditions.

Standard operating conditions

Ambient temperature	:	23±2°C
Humidity	:	55±10% RH
Power supply	:	90 to 132 V AC, or 180 to 250 V AC 21.6 to 26.4V DC (for /P1 model)
Power frequency	:	50/60 Hz±0.1%
Warm-up time	:	30 minutes or more
Mechanical vibration	:	Within the range not affecting recorder operation

However, when the calibration is conducted under normal operating conditions (referring to 4.7.7), check the accuracy influenced by the conditions.
Chart paper yields thermal expansion or shrinkage, sometimes resulting in differences from the calibrated values.
Examples of expansion are shown below assuming the reference temperature 20°C and humidity 65% RH:
Expansion at 85% RH ..... 0.4% or less
Expansion at 35% RH ..... 0.45% or less

(3) Input the standard signals equivalent to 0, 50, and 100% of the setting range of the recorder, then check the difference error between input signals and measured values.
If the error is not within the specified accuracy, contact your dealer or YOKOGAWA Sales & Service Offices shown on the back cover.

NOTE A reference input for a thermocouple (TC) signal needs temperature compensation; the temperature at the recorder input terminal should be measured to make voltage compensation (adding) due to the reference junction temperature compensation.

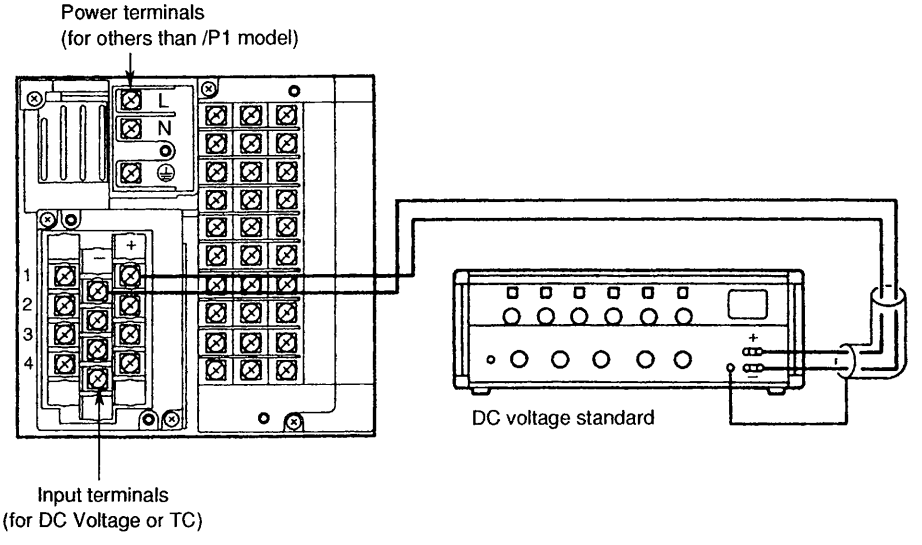


Figure 4.18 DC Voltage Signal for Pen Model (same as Dot-Printing Model)

Temperature Measurement for Resistance Temperature Detector (RTD)

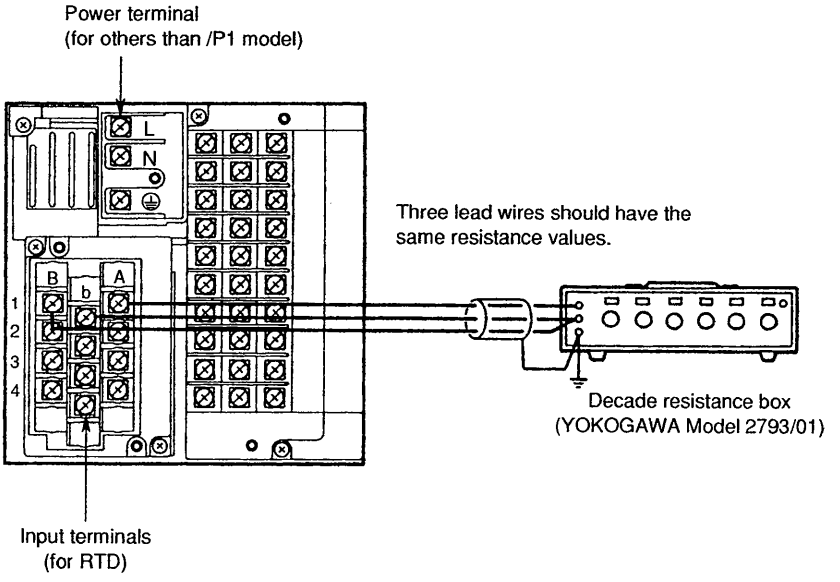
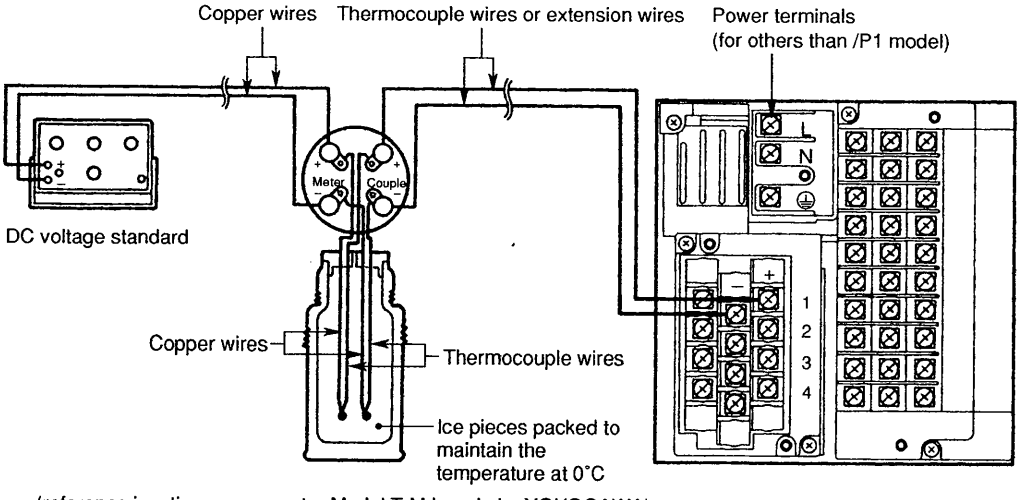


Figure 4.19 Temperature Signal as RTD for Pen Model
(for dot-printing model, the wire connection exchanges between the terminal B and b.)

Temperature Compensation for Thermocouple Signal



(reference junction compensator Model T-MJ made by YOKOGAWA)

Reference Junction Compensation for Thermocouple Input

A DC voltage generated by a thermocouple differs from a value calculated from the table of thermo-electromotive force (EMF) because the table is based on the 0°C reference temperature but the temperature at the recorder input terminal is generally equal to the room temperature.

The recorder measures the temperature at the input terminal for compensation; when the input terminals are shorted (equivalent to 0°C of the thermocouple in the EMF table), the recorder indicates the temperature at the input terminal.

For calibrating a recorder, an input voltage after the compensation (after subtraction of the compensating voltage) should be applied to the recorder; an example is shown in Figure 4.20 (the YOKOGAWA Model T-MJ reference junction compensator is used).

Figure 4.20 Reference Temperature Compensating Connection for Pen Model
(same as Dot-Printing Model)

4.7.6 Pen-Position Adjustment (Pen Model)

It is recommended to adjust pen positions on the chart at least once a year.

Adjusting procedure

(1) Turn the recorder power on and allow a warm-up time of more than 30 minutes.

(2) Check that the environmental conditions are within normal operating conditions.

Normal operating conditions

Power supply	:	90 to 132 V AC, or 180 to 250 V AC 21.6 to 26.4 V DC (for /P1 model)
Power frequency	:	50/60 Hz±2%
Ambient temperature	:	0 to 50°C
Ambient humidity	:	20 to 80% RH (under 5 to 40°C)
Mechanical vibration	:	10 to 60 Hz, 0.2 m/s² or less
Mechanical shock	:	Not permitted
Magnetic field	:	400 AT/m or less (DC and 50/60 Hz)
External noise	:	Normal mode (50/60 Hz) DC voltage ..... Noise peak value with signal is limited to 1.2 times larger value than the measuring range. TC signal ..... Noise peak value with signal is limited to 1.2 times larger value than the measuring thermoelectromotive force. RTD signal ..... 50 mV or less Common mode noise (50/60 Hz): 250 V AC rms or less for any range Maximum noise voltage between channels (50/60 Hz): Pen model, dot-printing model (6, 12-point) ..... 250 V AC rms or less Dot-printing model (18, 12-point) ..... 200 V AC rms or less
Mounting inclination	:	Backward 0 to 30°

Chart paper yields thermal expansion or shrinkage, sometimes resulting in differences from the calibrated values. Adjust the pen position, if necessary.

Examples of expansion are shown below assuming the reference temperature 20°C and humidity 65% RH:

Expansion at 85% RH ..... 0.4% or less

Expansion at 35% RH ..... 0.45% or less

(3) To enter the SET UP mode, turn the power switch off, and turn on again while pressing the **[ENT]** key.

(4) Select [AJ] using the [△] key, and press the **[ENT]** key.

(5) Select [Ar] (ZERO: leftward movement) or [AF] (FULL: rightward movement) using the [△] key, and press the **[ENT]** key.

(6) Select the number of the channel to be adjusted using the [△] key, and press the **[ENT]** key.

(7) The selected pen moves leftward (for ZERO) or rightward (for FULL). Increase or decrease the setpoint value to make the pen accurately overlap the graduated line of the chart.

The setting consists of a number of six digits, but only two numeric codes are shown at the same time on the indicator: the left-hand code means the digit position and the right-hand shows the numeral on that digit.

For example, the number "150" is decomposed into six codes [60], [50], [40], [31], [25], and [10] (refer to 5.2).

Select the digit by pressing the [▷] key, and select a numeral by the [△] key. Setting range is 7950 to 11350 for ZERO, 14500 to 19500 for FULL. Finally press the **[ENT]** key after all codes are entered.

The pen will move after pressing the **[ENT]** key. The pen movement corresponding to **[1]** of the 1st digit position is 0.0057 mm. Decreasing the numeral moves the pen leftward, and increasing moves the pen rightward.

NOTE If the **[ENT]** key is pressed while setting the numeric codes, the indicator returns to **[Ar]** or **[AF]**, and the numeric codes already set stay valid. However, they become invalid when pressing the **[ESC]** key.

(8) The indicator displays [A 0], and the pen will move to the adjusted position. Confirm the pen position and press the **[ENT]** key.

(9) The indicator returns to [A r] or [A F]. When you want to carry out the position adjustment again, press the **[ENT]** key and carry out step (6) again. When another adjustmens are required, select [A r] or [A F] again by pressing the [△] key. In order to finish the adjustment, press the **[ESC]** key to return to the [A J] indication.

(10) Before leaving the SET UP mode, its contents should be stored. Select [E n] by pressing the [△] key, and press the **[ENT]** key.

(11) Select [S t] to keep setting values valid, or select [A b] to abort them by pressing the [△] key, and press the **[ENT]** key.
The SET UP mode finishes, and several seconds after, the mode returns to the operation mode.

4.7.7 Dot-Position Adjustment (Dot-Printing Model)

It is recommended to adjust the position of dots at least once a year.

Adjusting procedure

(1) Turn the recorder power on and allow a warm-up time of more than 30 minutes.

(2) Check that the environmental conditions are within normal operating ranges (refer to 4.7.6).

(3) To enter the SET UP mode, turn the power switch off, and turn on again while pressing the **[ENT]** key.

(4) Select [A J] by pressing the [△] key, and press the **[ENT]** key.

(5) Select [A r] (ZERO: leftward movement) or [A F] (FULL: rightward movement) or [A H] (HYS: movement toward the center of dotted line) by pressing the [△] key, and press the **[ENT]** key.
Selection and adjustment should be made in the order of HYS→ZERO→FULL.

(6) First, the HYS (A H) should be adjusted. A zigzag line will be drawn in the center area of the chart. When the line is as Figure a, increase the set value, but in case of Figure b, decrease it.

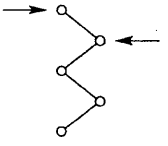


Figure a

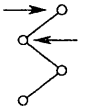


Figure b

The arrows show the moving direction of the printer head.

The setting consists of a number of six digits, but only two numeric codes can be shown at the same time on the indicator: the left-hand code means the digit position and the right-hand shows a numeral on that digit. For example, the number [–7] is decomposed into six codes [6 -], [5 0], [4 0], [3 0], [2 0], and [1 7].
Select the digit by pressing the [▷] key, and select a numeral by the [△] key; the setting range is –7 to 7. Finally press the **[ENT]** key after all codes are entered.
The pen movement corresponding to **[1]** of the 1st digit position is 0.1 mm.

NOTE If the **[ENT]** key is pressed while setting the numeric codes, the indication returns to **[A H]**, and the numeric codes already set stay valid. However, pressing the **[ESC]** key turns them invalid.

(7) The indicator displays [A 0], and the dot carriage will move to the adjusted position.
Confirm the dot carriage position and press the **[ENT]** key.

(8) The indication returns to [A H] and recording stops. If the recording position is illegal, press the **[ENT]** key and repeat step (6); if correct, press the [△] key and select [A r] **or** [A F].

(9) Next, the ZERO (A r) and FULL (A F) should be adjusted. Increase or decrease the setpoint value to make the dot position accurately overlap the graduated line of the chart.
The setting consists of is a number of six digits, but only two numeric codes are shown at the same time on the indicator: the left-hand code means the digit position and the right-hand shows a numeral on that digit (refer to 5.2). Select the digit by pressing the [▷] key, and select a numeral by the [△] key.
The setting range is 1 to 15 for ZERO, and 970 to 1030 for FULL. Finally press the **[ENT]** key after all codes are entered.
The pen movement corresponding to **[1]** of the 1st digit position is 0.1 mm.
Decreasing the numeral moves the dot position leftward, and increasing moves it rightward.

NOTE If the **[ENT]** key is pressed while setting the numeric codes, the indication returns to **[AR]** or **[AF]**, and the numeric codes already set stay valid. However, pressing the **[ESC]** key turns them invalid.

(10) The indicator displays [A0], and the dot carriage will move to the adjusted position.
Confirm the dot carriage position and press the [**ENT**] key.

(11) The indication returns to [AR] or [AF]. When you want to carry out the position adjustment again, press the [**ENT**]key and carry out step (9) again. When another adjustments are required, select [AR], [AF] or [AH] again by pressing the [△] key. In order to finish the adjustment, press the [**ESC**] key to return to the [AJ] indication.

(12) Before leaving the SET UP mode, its contents should be stored.
Select [En] by pressing the [△] key, and press the [**ENT**] key.

(13) Select [St] to keep setting values valid, or select [Ab] to abort them by pressing the [△] key, and press the [**ENT**] key.
The SET UP mode finishes, and several seconds after, the mode returns to the operation mode.

Chapter 5 DATA SETTING GUIDES

This chapter describes the setting modes listed below and how to enter setting data to the recorder. Values shown in parentheses are default values.
Read this chapter before you enter settings for the first time.

5.1 Various Modes

The recorder has three modes which are described below:

Operation mode

This is the mode for daily operation; when the power turns on, the recorder automatically enters this mode. For details, refer to "Chapter 4 DAILY OPERATION AND MAINTENANCE".

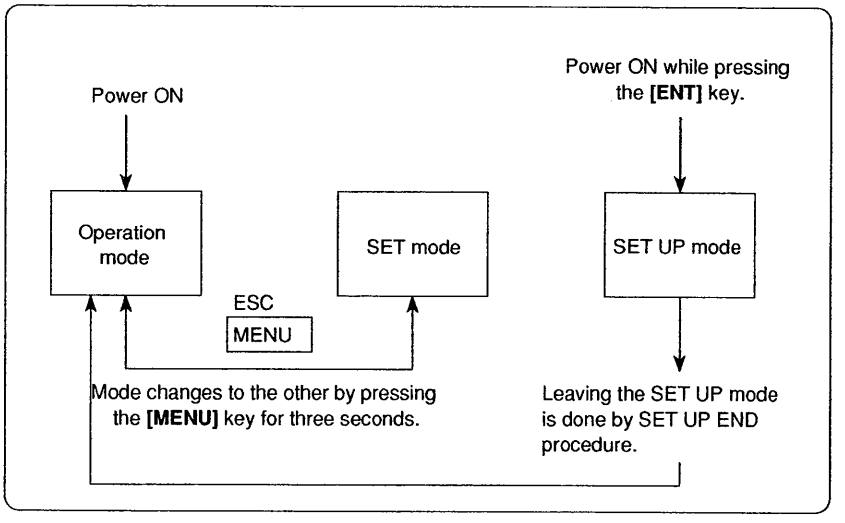
SET mode

In this mode, daily-used data such as alarm setpoints, date, and time are set. Pressing the [MENU] key three seconds in the operation mode changes the mode to the SET mode.

SET UP mode

In this mode, interface functions for communication are set, and pen or dot-printing position are adjusted. You can enter this mode by turning the power on while pressing the [ENT] key.

NOTE While in the SET mode, measurement, recording, and alarm detection are not carried out.



5.1.1 Operation Mode

Select the following functions by pressing the keys on the key panel.

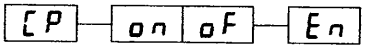
[PRINT] key

(Manual printing start/stop) (Refer to 4.6.1)

(List printing start/stop) (Refer to 4.6.2)

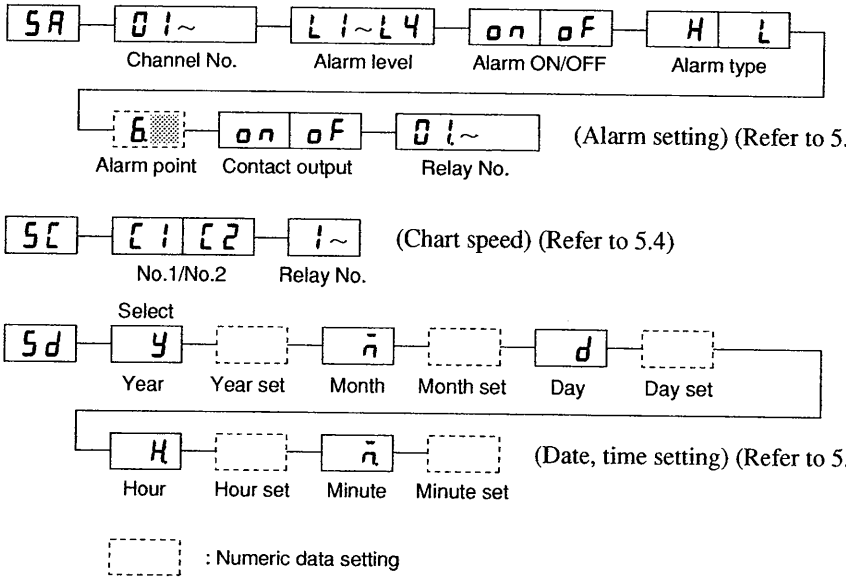
[MENU] key

(SET UP list printing start/stop) (Refer to 4.6.3)



(Pen replacement, only for pen model) (Refer to 4.3)

5.1.2 SET Mode

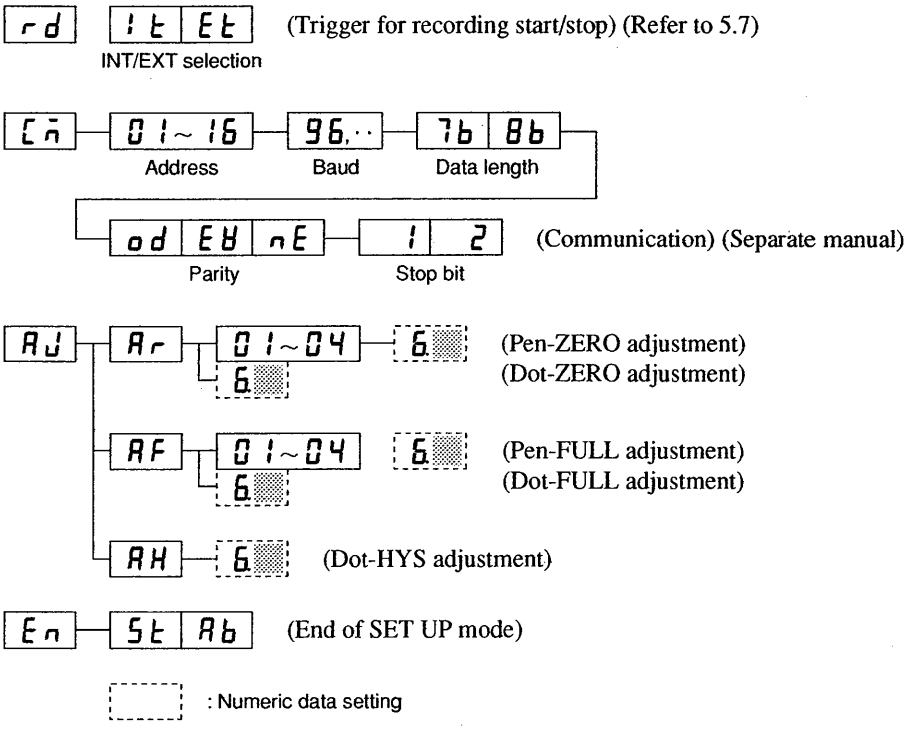


(Alarm setting) (Refer to 5.3)

(Chart speed) (Refer to 5.4)

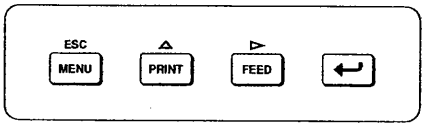
(Date, time setting) (Refer to 5.5)

5.1.3 SET UP Mode



5.2 Procedures to Enter Setting Data

Data setting is done by the four keys on the key panel which are referred to by the marks on the keys.



ESC MENU **[ESC]** key : Cancels the already set data in the middle of a setting; after canceling, the previous indication will be shown on the indicator.

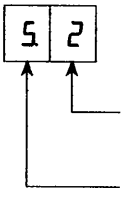
PRINT **[△]** key : Selects parameters of any setting, or selects any numeric characters in case of alarms or date/time.

FEED **[▷]** key : Moves the cursor on the indicator from the left segment to right or from right segment to left.
In case of three digits or more for alarm setpoints or pen/dot position adjustments, this key is used to set a digit of numeric data, which is shown on the left-hand segment.

[ENT] key : Confirms a set value for entry. Pressing the key moves the indication to the next setting display.

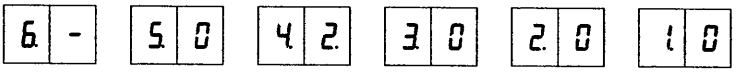
Numeric data setting

A numeric data of more than three digits is set for alarm setpoints or pen/dot position adjustments. The left segment shows the number of the digit. The right segment shows the numeric value.
The [▷] key shifts the digits, and the [△] key changes the numeric value on that digit.



Shows that the numeric value on the 5th digit is '2' which can be changed with the [△] key.
Shows 5th digit which can be changed with the [▷] key.

An example of an alarm setpoint '–2.000' is shown below (engineering unit and the decimal point are predetermined by the input range).

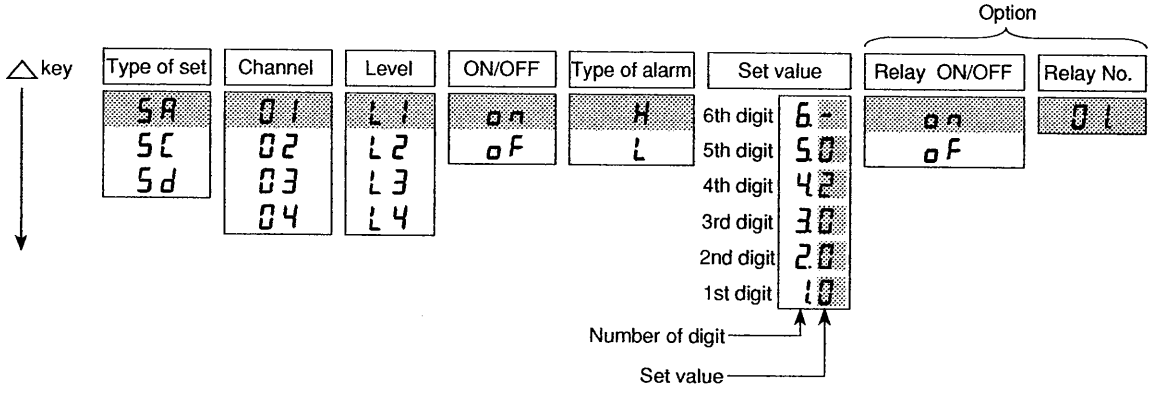


5.3 Setting Alarms

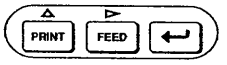
Alarms can be set on the measured data of any channel.
Up to four alarms (i.e. four levels) can be set on one channel.
After setting an alarm, and the measured value reaches the setpoint, [AL] will be shown on the indicator and an alarm printout will be made on the chart. (Refer to 1.2.)

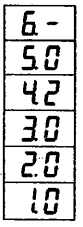
H : High alarm Occurs when a measuring value is over the alarm setpoint.
L : Low alarm Occurs when a measuring value is under the alarm setpoint.

Menu



Key operation	Indication	Description
ESC MENU 3 sec	SA	Enter the set mode by pressing the [**MENU**] key for three seconds. Select [SA] by pressing the [△] key, and press the [**ENT**] key.
PRINT ↵		
PRINT ↵	01	Select a channel by the [△] key, and press the [**ENT**] key.
PRINT ↵	L1	Select an alarm level by the [△] key, and press the [**ENT**] key. Up to four levels can be set.
PRINT ↵	on	Select ON/OFF of the alarm settings by the [△] key, and press the [**ENT**] key. Setting [oF] shows [SA] and ends this setting.
PRINT ↵	H	Select a type of alarms by the [△] key, and press the [**ENT**] key.



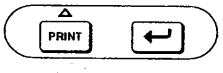


A numerical setpoint is determined. The left segment shows the number of the digit, the right shows the numerical set value on that digit. The digit on the left segment can be selected by the [▷] key, and the numerical value on the right can be selected by the [△] key. After setting one combination, pressing the [▷] key moves the setting to the next combination. After all combinations are set (and the numerical setpoint is determined), press the **[ENT]** key.
The decimal point is predetermined by the input range. Note that if the **[ENT]** key is pressed in the middle of this operation, the indication changes to the next setting stage.

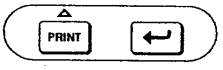
Table 5.1 Relationship between Input Range and Decimal Points

Type of Input		Standard Range Codes	Position of Decimal Point
DC Voltage	–20.00 to 20.00 mV	–00/–30/–40	XXX. XX
	–200.0 to 200.0 mV	–01/–31/–41	XXXX. X
	–2.000 to 2.000 V	–02/–32/–42	XX. XXX
	–6.000 to 6.000 V	–03/–33/–43	XX. XXX
	–20.00 to 20.00 V	–04/–34/–44	XXX. XX
Thermocouple/RTD		–10 to –21	XXXX. X

The following settings are available only for the model with relay options (A1/A2/A3). For models without these options, the alarm setting ends by pressing the **[ENT]** key until [5A] appears.

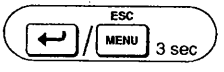


Determines whether the relay outputs a signal or not when an alarm occurs. Select ON/OFF by the [△] key, and press the **[ENT]** key.



Sets the number of the relay after the alarm output ON is selected. A numeric to be set is selected from 01 to 12 by the [△] key. Then press the **[ENT]** key.

NOTE If a number larger than the available number of output relays is selected, the alarm output will not implemented.



The setting ends with the [5A] indication.
When you want to set alarm settings for other channels continuously, press the **[ENT]** key to return to thechannel setting.
In order to return to the operation mode, press the **[MENU]** key for three seconds.

NOTE

- As a merged function, a combination of remote control option (/R1) and alarm output relay option is available to change the chart speed when an alarm occurs.
- If you press the **[ESC]** key in the middle of setting, the indication returns to the **[5A]** and already set data will be aborted.

5.4 Setting Chart Speed

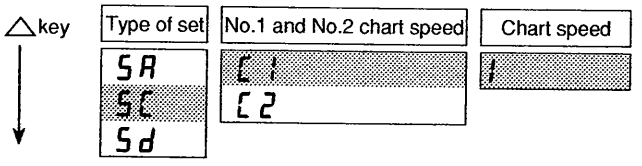
Relationships between chart speeds and their code numbers are shown in Table 5.2.

Table 5.2 Chart Speed (unit: mm/h)

Code No.	1	2	3	4	5	6	7	8	9	10
Chart Speed	10	15	20	25	30	40	50	60	75	80
Code No.	11	12	13	14	15	16	17	18	19	20
Chart Speed	90	100	120	150	160	180	200	240	300	360
Code No.	21	22	23	24	25	26	27	28	29	30
Chart Speed	375	450	600	720	750	900	1200	1500	1800	2400
Code No.	31	32	33	34	35	36	37	38	39	40
Chart Speed	3000	3600	4500	4800	5400	6000	7200	9000	10800	12000

The data for a dot-printing model (10 mm/h to 1500 mm/h) are shown within the thick lined area.

Menu



Key operation	Indication	Description
ESC MENU 3 sec	SC	Press the **[MENU]** key for three seconds to enter the SET mode, and select [SC] using the [△] key. Then press the **[ENT]** key.
PRINT ↵		
PRINT ↵	C1	Using the [△] key, select one of the two kinds of chart speed, the No.1 and No.2 chart speeds. Then press the **[ENT]** key.

NOTE The No.2 chart speed identifies the chart speed which takes effect in case the speed is changed by remote control (optional function).
For models without the remote control function, the setting of the No.2 chart speed is invalid.

PRINT ↵	1	Select a numeric code referring to Table 5.2 using the [△] key and press the **[ENT]** key.

NOTE Digital printing will not be carried out when the chart speeds are:
1800 mm/h or more for a pen model
120 mm/h or more for a dot-printing model
When a pen model uses a fast chart speed such as 600 mm/h to 1500 mm/h, the position error of the time tick of a periodic printout may become as large as 2 cm for 1500 mm/h.

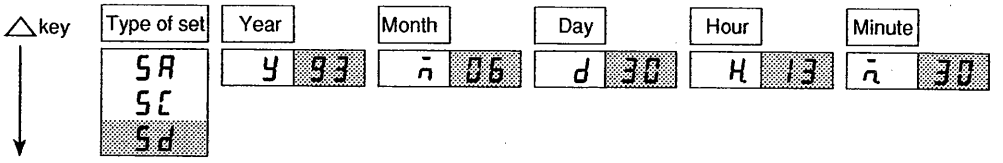
ESC ↵/MENU 3 sec	SC	The setting ends with the [SC] indication. When you want to set another chart speed continuously, press the **[ENT]** key. In order to return to the operation mode, press the **[MENU]** key for three seconds.

NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the [SC] and already set data will be aborted.

5.5 Setting Date/Time (Clock)

Menu

An example of the date and time setting procedure is shown below:



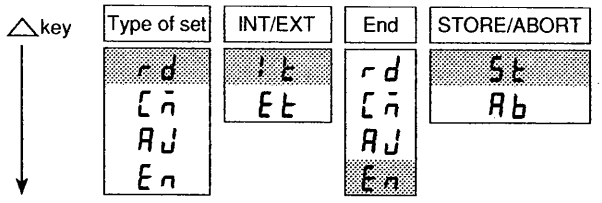
Key operation	Indication	Description
ESC MENU 3 sec	Sd	Press the [MENU] key for three seconds to enter the SET mode, and select [Sd] by pressing the [△] key. Then press the [ENT] key.
↵	Y	Press the [ENT] key after 'Y' of 'YEAR' appears, and enter the two digits of the year. Shifting the digit is done by the [▷] key, and selecting the number is done by the [△] key.
PRINT FEED ↵	93	Press the [ENT] key after finishing the setting.
↵	M	Press the [ENT] key after 'M' of the 'MONTH' appears, and enter the month by selecting numerics; shifting the digit is done by the [▷] key, and selecting the number is done by the [△] key.
PRINT FEED ↵	06	Press the [ENT] key after finishing the setting.
↵	d	Press the [ENT] key after 'd' of the 'DAY' appears, and enter the date by selecting numerics; shiftingthe digit is done by the [▷] key, and selecting the number is done by the [△] key.
PRINT FEED ↵	30	Press the [ENT] key after finishing the setting.
↵	H	Press the [ENT] key after 'H' of the 'HOUR' appears, and enter the time (hour) by selecting numerics; shifting the digit is done by the [▷] key, and selecting the number is done by the [△] key.
PRINT FEED ↵	13	Press the [ENT] key after finishing the setting.
↵	M	Press the [ENT] key after 'M' of the 'MINUTE' appears.
PRINT FEED ↵		**NOTE** The 'M' of the 'MINUTE' has a period '.' differing from the 'M' of the 'MONTH'.
	30	Enter the minute (s) by selecting numerics; shifting the digit is done by the [▷] key, and selecting the number is done by the [△] key. Press the [ENT] key after finishing the setting.
ESC MENU 3 sec	Sd	The setting ends with the [Sd] indication. In order to return to the operation mode, press the [MENU] key for three seconds.
		NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the **[Sd]** and already set data will be aborted.

5.6 Setting Triggers for Recording Start/Stop

The start/stop of recording can be triggered by the **[RCD]** key on the key panel (as internal trigger: INT) as well as by a remote control signal (as external trigger: EXT).
The default value is 'INT' (trigger by the **[RCD]** key).

NOTE If 'EXT' is not selected, triggers from the remote control (option) will not be implemented to start/stop the recording.

Menu



Key operation	Indication	Description
Power ON	rd	Turn the power ON while pressing the **[ENT]** key to enter the SET UP mode, and select [rd] using the [△] key. Then press the **[ENT]** key.
PRINT ↵	It	Select [It] (INT) or [Et] (EXT), and press the **[ENT]** key.
PRINT ↵	En	The indicator shows [rd] of the SET UP mode menu. In order to finish the setting, select [En] using the [△] key, and then press the **[ENT]** key.
PRINT ↵	St	Select [St] (STORE) for set data valid or [Ab] (ABORT) for invalid using the [△] key, then press the **[ENT]** key. The setting process returns to the operation mode to begin normal recording.

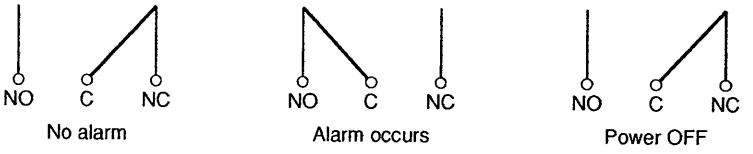
NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the [rd] and already set data abort.

Chapter 6 OPTIONS

This chapter outlines the following optional functions. Operating procedures are not shown; therefore, you may skip paragraphs if not applicable.

6.1 Alarm Outputs

The recorder outputs contact signals when an alarm occurs. The output relays adopt the energizing system.



6.2 FAIL/Chart End Detection

If an error of the CPU (central processing unit) or the end mark of the chart is detected, the recorder outputs contact signals.
Respective relay contact outputs are provided for each FAIL and chart end detection.
Refer to 2.2.5 for the wiring.

FAIL

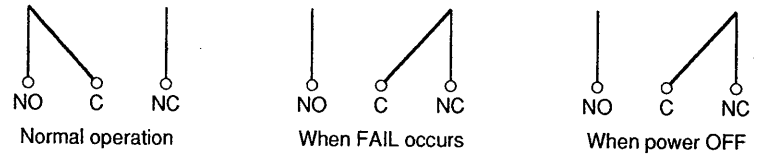
If an error occurs in the CPU, a relay contact signal is output; however, the error will not be shown on the indicator.
This relay is of the de-energize type; so the signal is also output when the power turns off (such as in case of power failure). Relay terminal connection is shown in figures below.
If a relay signal is output even when the power turns on, contact your sales representative or YOKOGAWA Sales and Service Offices listed on the back cover.

Chart end detection

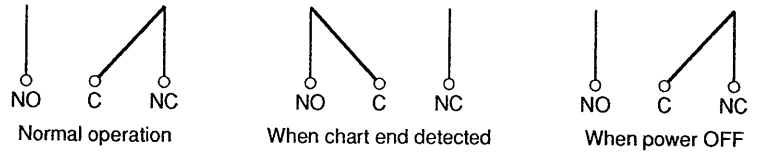
When the remaining chart reduces to approximately 2 cm, the recording stops automatically with an indication of [C A], and a relay contact signal is output. This relay output is an energize type (refer to the figures below).
For the replacement of chart, refer to 4.2.

Relay terminal connection

Relay output for FAIL (de-energize type)



Relay output for chart end (energize type)



6.3 Remote Control Functions

The following functions are carried out by remote-controlled input signals (contact signals):

Remote-input terminal	Functions
No.1	Recording start/stop
No.2	Change of chart speed
No.3	Manual printing

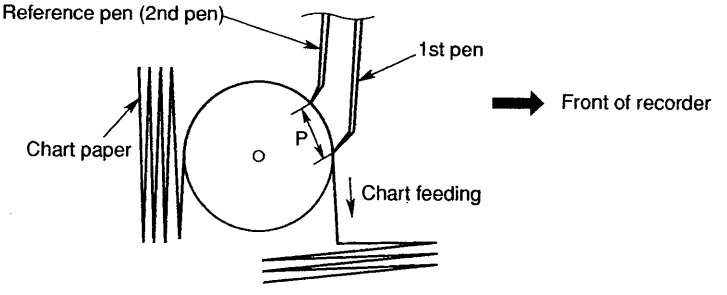
NOTE In order to implement the remote control for recording start/stop, select 'EXT' as described in '5.6 Setting Triggers for Recording Start/Stop.'

6.4 Burnout Functions

If a wire disconnection (burnout) occurs in a thermocouple circuit, this function moves the measuring value upward or downward on the scale. The moving direction is the same for every channel.

6.5 Pen Offset Compensation (Only for Pen Model)

Pen offsets are phase deviations (phase shifts) on the time axis, which are produced on a two-, three-, or four-pen model.
The pen offset compensation function is used to eliminate those deviations between the pens referring to the time axis.
The compensation function is described below; the figure shows an example between two pens, but the description is similar for three- or four-pen model.



The figure shows there is a phase shift (P) between two pens, so the recordings of both pens are not aligned horizontally even when recordings are made at the same time.
The recorder with the pen offset compensation function has a memory. The data of the channels other than that of the reference pen are temporarily stored in the memory, and written on the chart after the chart is fed the length corresponding to the phase shift (P).

NOTE
- When the recording is stopped, chart feeding also stops, and data stored in the memory will not be recorded.
- The compensation applies to the pens other than the reference one, so those pens sometimes appear to be malfunctioning. Immediately after the recording starts, only the reference pen operates but the other pens do not start; this is not a recorder defect.

Chapter 7 TROUBLESHOOTING

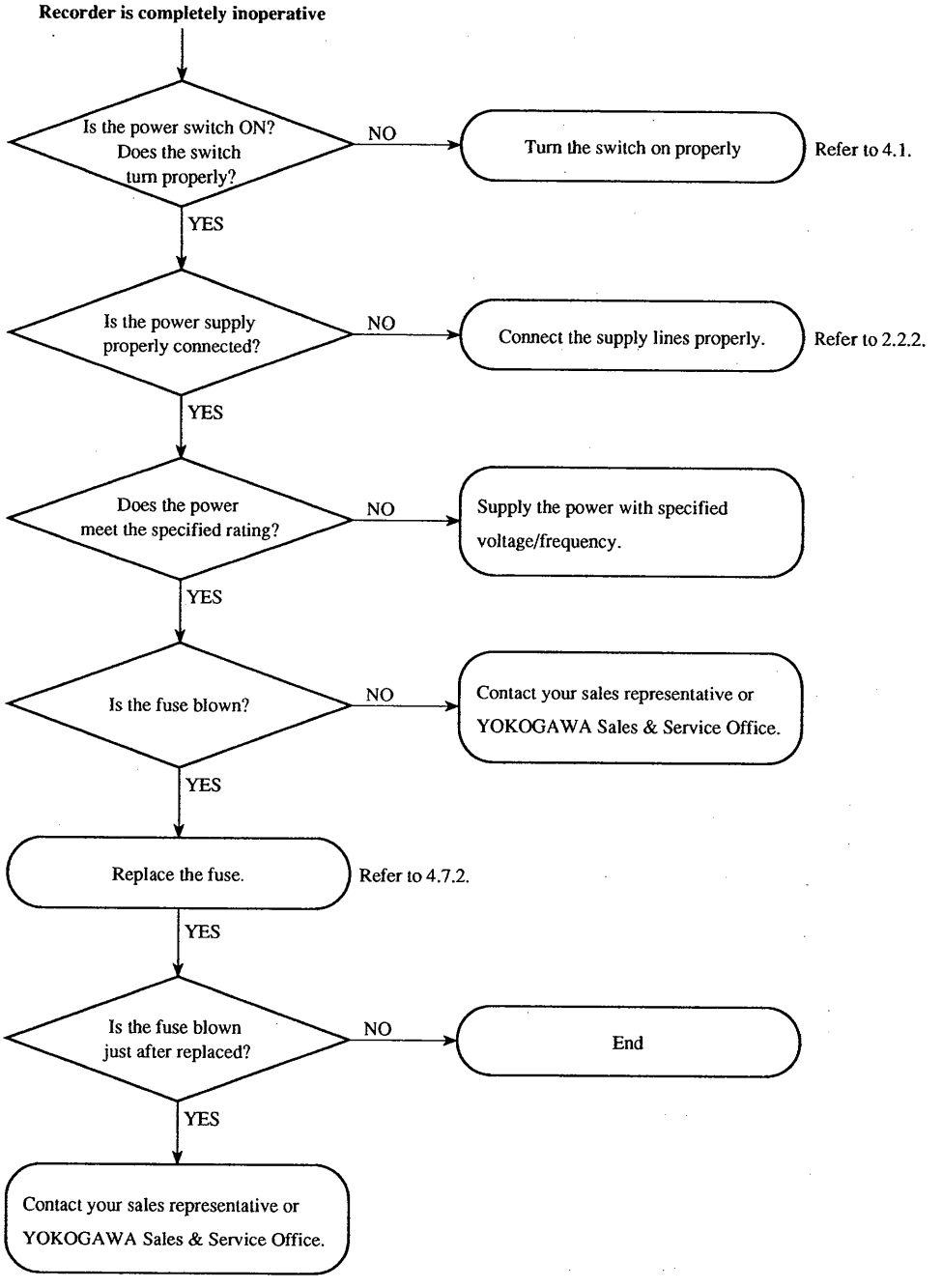
This chapter describes the causes and recovering methods of recorder errors.

7.1 Error Code List

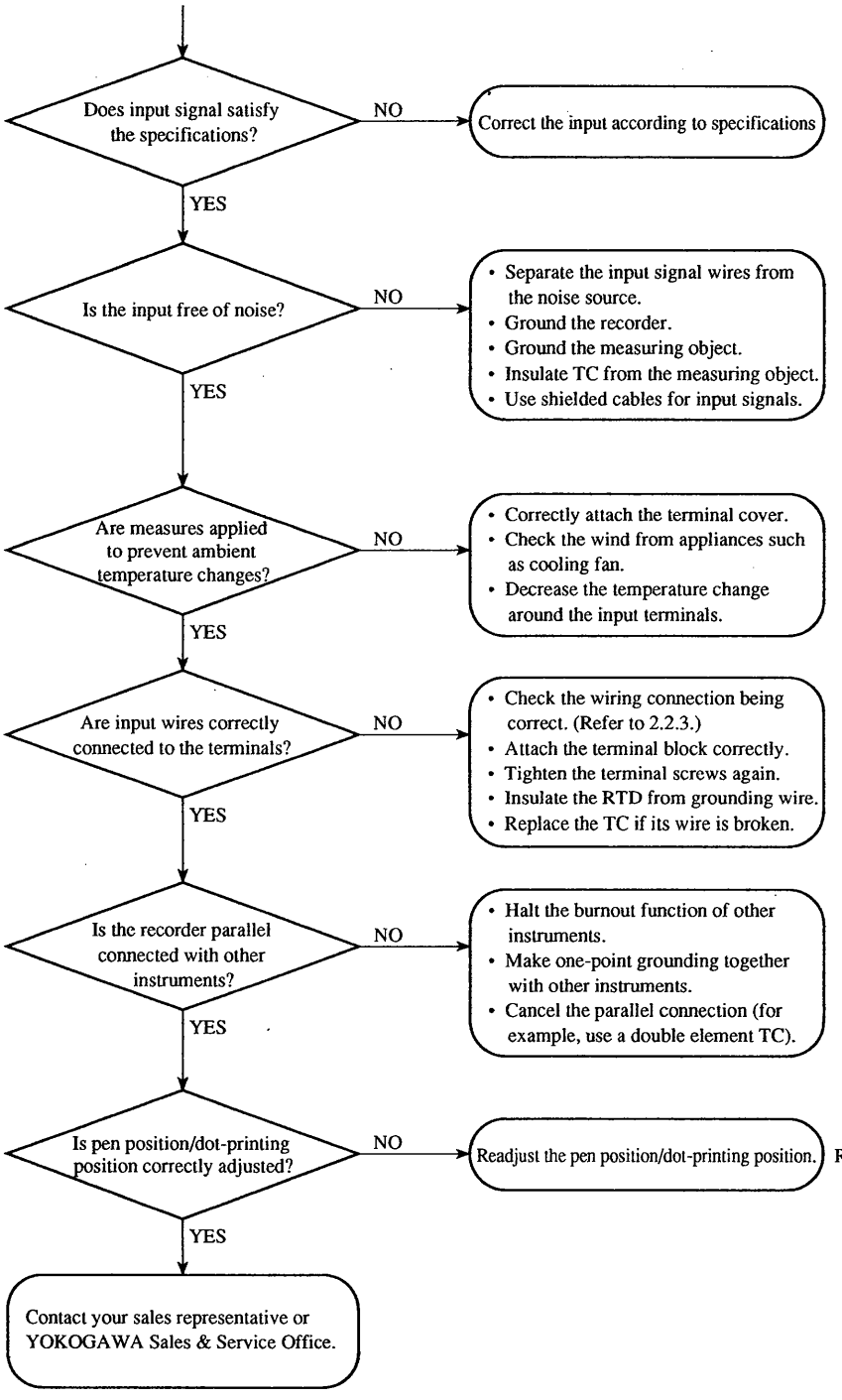
Error Codes	Meaning	Recovery
A□	Memory error of Xchannel input A/D converter [No Xchannel recording (skipped)]	Contact your nearest Sales and Service center.
A□.	Calibration data error of Xchannel input A/D converter [No Xchannel recording (skipped)]	Contact your nearest Sales and Service center.
A5	Main memory reading error	Contact your nearest Sales and Service center.
A6	Main memory writing error	Contact your nearest Sales and Service center.
A7	A/D converter memory reading error	Contact your nearest Sales and Service center.
A8	A/D converter memory writing error	Contact your nearest Sales and Service center.
A9	Range memory reading error	Contact your nearest Sales and Service center.
AA	System ROM failure	Contact your nearest Sales and Service center.
AC	Main memory failure	Contact your nearest Sales and Service center.
Ad	Plotter card failure (pen model)	Contact your nearest Sales and Service center.
AE	Ribbon shift, ribbon feed failure (dot-printing model)	Contact your nearest Sales and Service center.
AC	Printer failure (dot-printing model)	Contact your nearest Sales and Service center.
An	Communication card failure (separating communication function)	Contact your nearest Sales and Service center.
E.1	System failure	Contact your nearest Sales and Service center.
E.2	Entered value exceeds allowable setting range	Enter correct data.
E.3	Time setting error	Enter correct time.
E.5	Attempt to print manual, list, SET UP list when out of chart	Install new chart (refer to 4.2.).
E.6	Attempt to replace pen (CP) while recording	Stop recording (refer to 4.3.).
E.7	Attempt to set alarm to SKIPped channel	Select OFF for setting (refer to 5.3).
E.8	Attempt to set alarm to DI (contact input) channel	Select OFF for setting (refer to 5.3).
E.F	Error about communication	Refer to IM 4D6B1-10E.

Self-diagnostic Message Printout	Meanings
STORE SET UP SETTINGS AGAIIN	Check the settings to maintain the reliability of the internal data. • Enter the SET UP mode, and select [En]. • Select [St], and press the [ENT] key.
CONTACT YOUR NEAREST SALES OR SERVICE CENTER	Failure occurs in nonvolatile storage. Contact YOKOGAWA sales and service office.

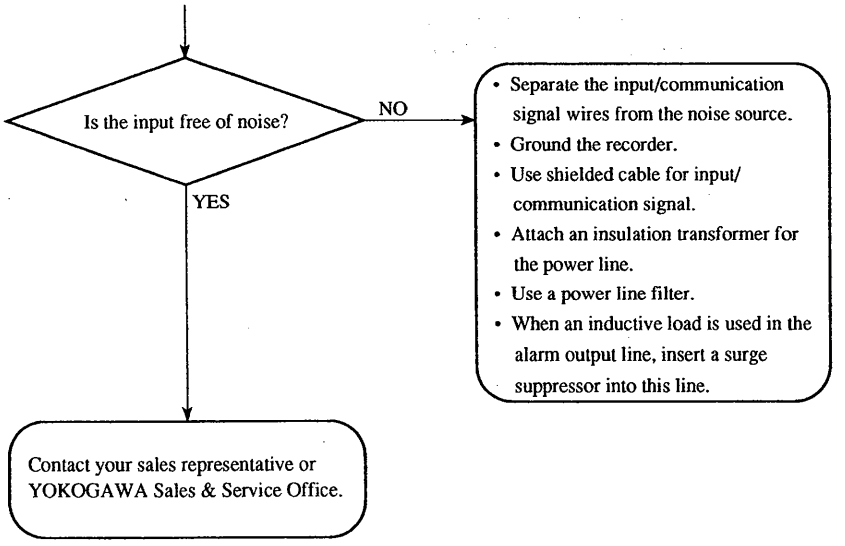
7.2 Troubleshooting



- **Errors exceed specified limits**
- **Measuring value indications fluctuate**
- **Pen/printer carriage goes off-scale at 0% or 100%.**



Glitch is found other than the previously mentioned ploblems.



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