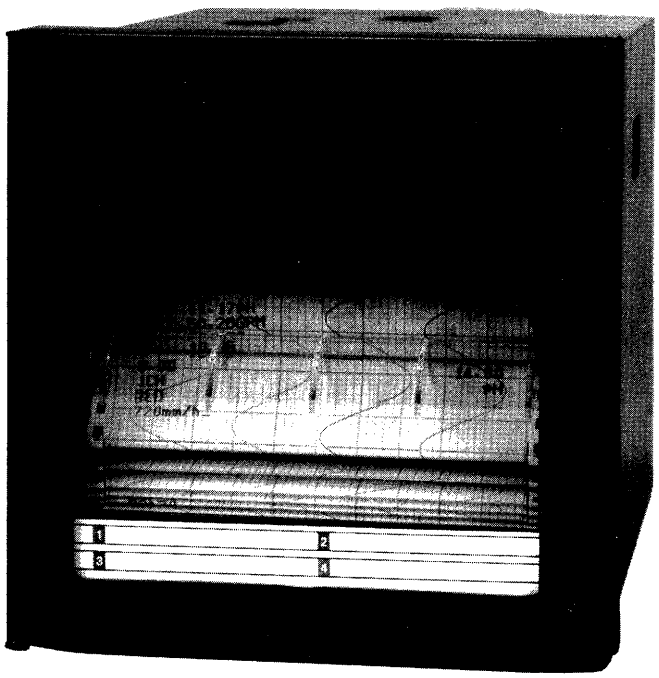
User's Guide



OMEGA®
An OMEGA Technologies Company

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RD100A
Programmable Recorder

omega.com™
ΩOMEGA®

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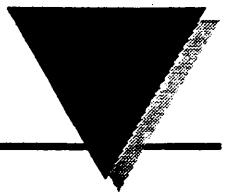
It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.



Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

- RD100A programmable recorder
- Disposable felt pen (for pen model)

  One-pen model (1)

  Two-pen model (2)

  Three-pen model (3)

  Four-pen model (4)
- Plotter pen (for pen model) (1)
- Ribbon cassette (for dot model) (1)
- Fuse (1)
- Key (2)
- Mounting brackets (2)
- Z-fold chart paper (1)
- Power cord (for portable type) (1)
- Operator's Manual (1)

If you have any questions about the shipment, please call the OMEGA Customer Service Department. When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Section Page

Section Page

Section **Page**

Section Page

Section **Page**

Section Page

1 Introduction

1.1 Safety Precautions

The RD100A (except for the portable type) conforms to IEC 348 under the following conditions:

- The RD100A is a component-type instrument and should be mounted on a panel.
- The RD100A (except for the portable type) is a Safety Class I instrument (provided with terminal for protective earth grounding).
- The RD100A (except for the portable type) is an EN55011 (EM1 standard), Group 1, Class A instrument.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. OMEGA Engineering assumes no liability for the customer's failure to comply with these requirements.

1.1.1 General Definitions of Safety Symbols Used on Equipment and in Manuals

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

Protective grounding terminal. To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.

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

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 of the product.

1.1.2 Warnings

WARNING

Power Supply

Ensure that the source voltage matches the voltage of the power supply 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 hazard.

Defect of Protective Grounding and Fuse

Do not operate the instrument when protective grounding or fuse might be defective.

Fuse

To prevent a fire, make sure to use the fuse with specified standard (current, voltage, type). Before replacing the fuse, turn off the power and disconnect the power source. Do not use a different fuse or short-circuit the fuse holder.

Do Not Operate in an Explosive Atmosphere

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

Never Touch the Interior of the Instrument

Inside this instrument there are areas of high voltage; therefore, never touch the interior if the power supply is connected. This instrument has an internal changeable system; however, internal inspection and adjustments should be done by qualified personnel only.

External Connection

To ground securely, connect the protective grounding before connecting to measurement or control unit.

1.2 How to Use this Manual

This manual describes the standard functions, operation procedures, and some of the optional functions of the pen and dot printing models of the RD100A recorder.

To use this manual in the most efficient way, please refer to the Table 1-1. In this table, the aim of the user is broken down into five broad categories. Please check which are applicable to you and refer to the corresponding chapters.

For operation procedures of options that are not described in this manual, refer to specific option manuals.

Table 1-1. Using this Manual

Section	Purchase and Installation	First Time Setting	Daily Operation	Changing Settings	Maintenance and Troubleshooting
1. Introduction					
Safety Precautions	N	N	N	N	N
Features and Functions	O	O		O	
Installation	N				
2. Component Names and Functions		N	N	N	O
3. Operation		O	N	O	
4. Entering Settings		N		N	
5. Basic Settings		N		N	
6. Auxiliary Settings		O		O	
7. Changing Settings		O		O	
8. General Specifications	O	O		O	O
9. Maintenance					N
10. Troubleshooting		O		O	N

N = Necessary to read O = Optional to read

The sections that follow describe the main features and functions of the RD100A recorder. The RD100A is equipped with all the functions that can be expected in a modern recorder; its functions also reflect the latest user requirements.

1.3 Features

The RD100A recorder is a precision measuring instrument that is equipped with many outstanding features:

- **Compact sized, high reliability** – Its compact size (depth of 220 mm, 8.7 inches) allows you to install the RD100A where only a limited space is available. In the case of the pen model, a contact-free potentiometer and a brushless dc servomotor contribute to its high reliability. In case of the dot printing model, high reliability is obtained by the use of high-breakdown-voltage, solid-state relays.

- **Universal inputs** – Inputs such as dc voltage, thermocouple (TC), resistance temperature detector (RTD), and digital input (contact) can all be conveniently used. There is no need to change any dip switches; the type of input can be set using the keyboard.
- **Easy interactive setting** – the setting procedure has been made very easy, by using only panel keys. The RD100A asks you to select the desired settings, without the need for remembering difficult setting codes.
- **Large informative operator display** – the large-sized, VFD display shows the measured data (including the engineering units) or clock, and bar graph at the same time. There are two types of bar graphs available: percentage-display, and center-zero display. Because of its one percent resolution, the bar graph displays very accurately.
- **Continuous pen recording for up to four channels** (pen model only) – depending on your RD100A model type, the RD100A can measure up to four channels simultaneously. This allows you to decrease the number of recorders you require.
- **Universal power supply** (except for –24 V model) – the RD100A accepts 90–250 Vac (except 132–180 Vac), and 50/60 Hz without any problems, or need to turn switches. Therefore the RD100A is compatible with a wide variety of power supplies.
- **High performance** – the sampling speed of the RD100A pen model is high at 125 ms, whereas the recording cycle of the RD100A dot printing model is six channels/10 seconds. The RD100A is equipped with many functions. Special functions can be ordered as an option. Furthermore, its power consumption is low (18 VA under normal operation conditions).
- **Easy maintenance** – because of the use of many contact-free parts, the need for maintenance has been decreased. The RD100A is designed in modules, which decreases the time needed for maintenance extensively.
- **Closed case** – the closed case of the RD100A allows it to be used in many environments. The front door is in accordance with DIN 40050-IP54.
- **Computer interface** – if equipped with this option, the RD100A can store and retrieve measured data as well as setting data directly from your PC. The available interface is RS-422-A.
- **Compliance with international safety standards** – the RD100A (except for the portable type) is based on international safety standards, such as the IEC 348.

1.4 Functions

This section summarizes the main functions, together with a recording example.

1.4.1 Recording

Trend: records in a way that the dots do not overlap (dot model only).

Zone: records on different bands (zones) for individual channels.

Partial: expands part of the recording range for detailed examination.

POC (Pen Offset Compensation): removes the time-axis offset between pens (pen model only).

1.4.2 Printout

Channel printout: contains channel number besides analog recording (dot model only).

List printout: contains date, time, chart speed (1 and 2), channel number or tag, range, span values, scale values, partial values, and contents of messages.

Manual printout: contains date and time, channel number, type of alarm, latest measured values, units (for all channels).

Alarm printout: contains channel or tag number, type of alarm, level, mark (Δ for occurrence, ∇ for recover; in case of the dot model, red and blue, respectively), and alarm ON/OFF time.

Periodic printout: contains date and time, tag or channel number, POC ON mark (* for pen model only), unit, scale markings (may not be printed while alarm occurs), chart speed, measured values and recording color (for pen model), and time tick (for dot model).

Message printout: contains time and message.

Recording start printout: contains time when recording starts.

Chart speed change: contains time and new chart speed.

SET UP List printout: contains initial settings concerning analog recording, digital printing, alarms, burnout, RJC, and options.

NOTE

Note: The alarm, channel (for dot model), periodic, message, recording start, and chart speed change printout depend on the chart speed. The size of the characters varies, depending on the chart speed.

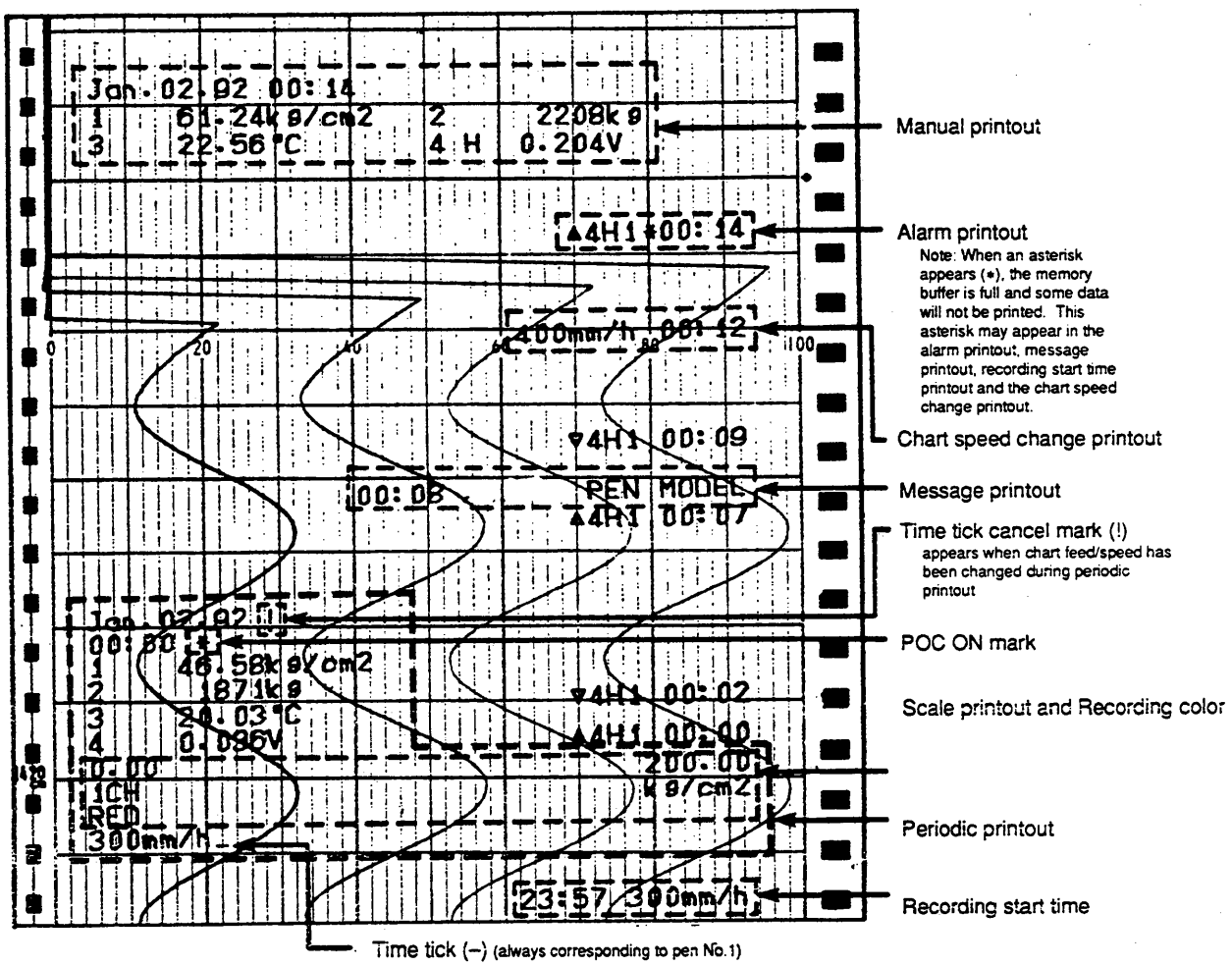


Figure 1-1. Recording Example for Pen Model

1.4.3 Alarm

Types of alarms: H = high limit
L = low limit
h = high difference limit
l = low difference limit
R = rate-of-change limit on increasing signal
r = rate-of-change limit on decreasing signal

Hysteresis: hysteresis value as a % of span that can be 0% or approximately 0.5%

Alarm output relay: when alarm occurs, the relay will be activated (optional)

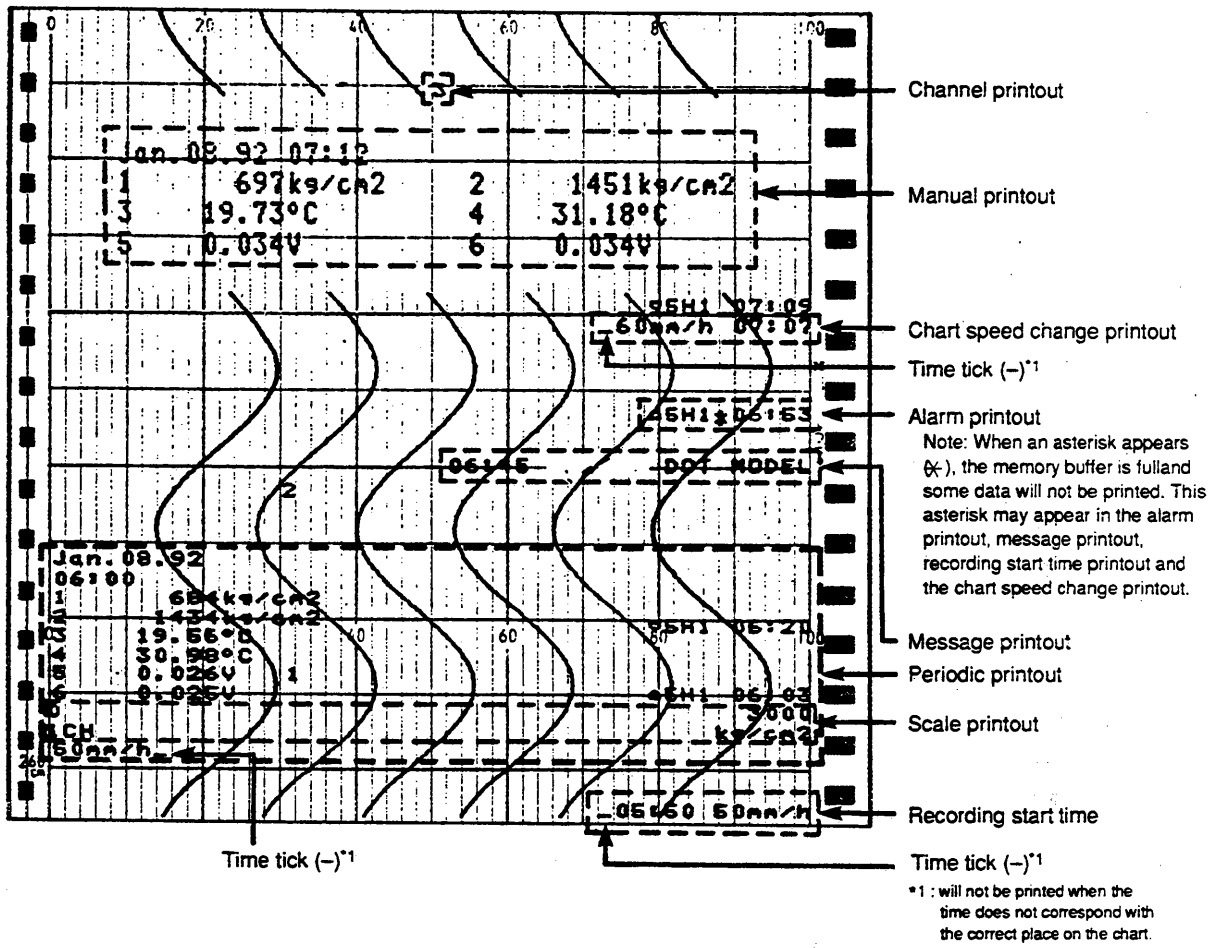


Figure 1-2. Recording Example for Dot Model

1.4.4 Input

Type of inputs: TC (thermocouple)

RTD (resistance temperature detector)

dc voltage

dc current – using optional external shunt resistor

DI (digital input, contact)

Burnout – if the TC wire is broken, pens will move to the left or right side

Filter (signal damping) – selects the time constant of signal damping (for pen model)

Moving average – selects the number of samples for moving average (for dot model)

1.4.5 Display

Left-referenced bar graph: measured data are displayed as a %, on a 0–100% scale

Center-zero bar graph: center of the recording span is reference and deviation is displayed as a bargraph

Clock: year/month/day and hours/minutes/seconds

Measured data: AUTO – all channels will be shown alternately

MAN – a specified channel only will be shown

Alarm: channel number, type of alarm (display), channel number (underneath bargraph, for dot model)

Status indicators: RCD – illuminated when recording is in progress

POC – illuminated when POC is being used (for pen model)

SET – illuminated when in SET Mode

ALM – illuminated/flashing when alarm occurs

BAT – illuminated/flashing when battery needs to be replaced

1.4.6 Calculation

Difference calc (DELT): takes the difference between the measured values of two channels

Linear scaling (SCL): sets different scale (and unit) to a specific range

Square root (SQRT): takes the square root of measured data

1.4.7 Computer Interface (optional)

RS-422-A

1.4.8 Remote Control (optional)

Message printout, manual printout, periodic printout, recording ON/OFF, chart speed change, START/STOP.

The sections that follow describe the preparations to be made before you can operate the RD100A recorder. To use the RD100A, it is necessary to read this chapter.

1.5 Handling Precautions

Cleaning. The RD100A contains many plastic parts, such as doors, windows, and panels. Therefore, never attempt to clean the RD100A with chemicals such as benzene or thinner.

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

Insecticide sprays, etc. Do not allow any volatile substances, such as insecticides etc., to come in contact with the front door, the operation panel, etc. Do not allow rubber or vinyl to remain in contact with the recorder for long periods.

After use. Ensure that the power switch is turned to the OFF position.

In case of malfunction. Never continue to use the instrument if there are any symptoms of malfunction, such as unusual sounds, smell, or smoke coming from the instrument. Immediately disconnect the power supply and stop further use of the instrument. If such abnormal symptoms occur, contact your sales representative or nearest service center.

1.6 Checking the Contents

This RD100A was thoroughly inspected before it was shipped from the factory. However, when you receive the RD100A, check that all accessories are present and are in the correct quantities. Also, check the external appearance of the RD100A to ascertain that no damage has occurred.

1.6.1 Checking Accessories and Appearance

The RD100A should be accompanied by the accessories indicated in Figure 1-3. Check that all are present in the correct quantities. Also check the external

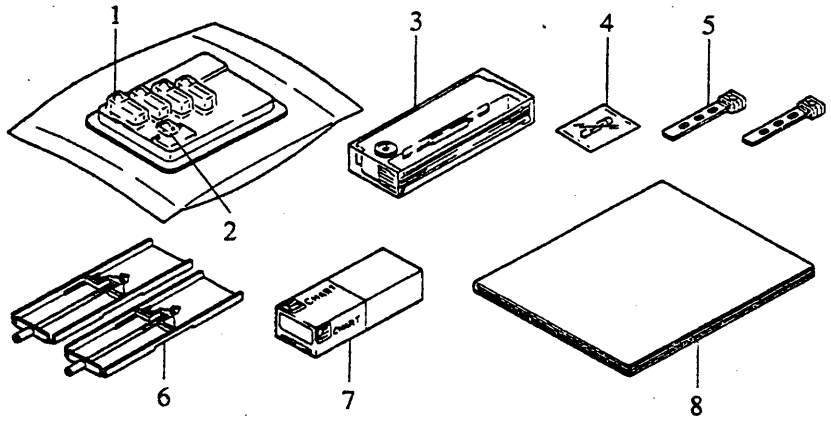


Figure 1-3. Accessories

appearance of the RD100A to ascertain that no damage has occurred. If you discover any problem concerning the quantity of accessories or external appearance, please contact your OMEGA Customer Service. Addresses may be found on the back cover of this Instruction Manual.

Table 1-1 Accessories List

No.	Description	Qty	Remarks
1.	Disposable felt pen (for pen model)		
	• One-pen model	1	Red
	• Two-pen model	2	Red, green
	• Three-pen model	3	Red, green, blue
	• Four-pen model	4	Red, green, blue, violet
2.	Plotter pen (for pen model)	1	Purple
3.	Ribbon cassette (for dot model)	1	
4.	Fuse	1	250 V 500 mA time lag (except for −24 V)
		1	250 V 5 A time lag (−24 V)
5.	Key	2	Key lock
6.	Mounting brackets	2	
7.	Z-fold chart paper	1	Approximately 16 meters
8.	Instruction Manual and Quick Reference	1 each	
9.	Power cord	1	For portable type

Table 1-2. Spares List

Name	Part Number	Description
Z-fold chart paper	RD100-ZFP	One chart/unit; order quantity: six units
Disposable felt-pen	RD100A-01	Red (three pieces/unit); order quantity: one unit
Disposable felt-pen	RD100A-02	Green (three pieces/unit); order quantity: one unit
Disposable felt-pen	RD100A-03	Blue (three pieces/unit); order quantity: one unit
Disposable felt-pen	RD100A-04	Violet (three pieces/unit); order quantity: one unit
Plotter pen	RD100A-11	Three pieces/unit; order quantity: one unit
Ribbon cassette	RD100A-RC	One piece/unit; order quantity: one unit

1.6.2 Removing Packing

The internal assembly is secured in position by a lock screw and by packing to safeguard against damages during transit. When you unpack the recorder, remove the lock screw, which is located at the left side of the recorder. See Figure 1-4.

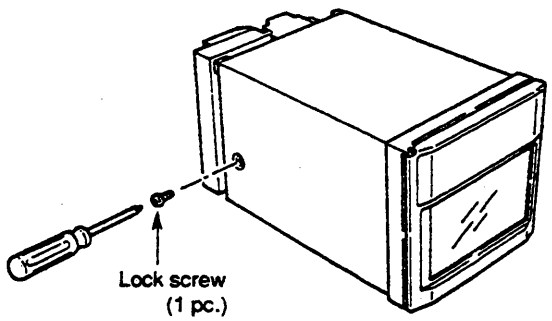


Figure 1-4. Location of Lock Screw

CAUTION

Caution: Please take care not to apply any undue pressure in an upward or downward direction to the display and keyboard. This may cause a strain on the hinges.

Packing removal is shown in Figure 1-5.

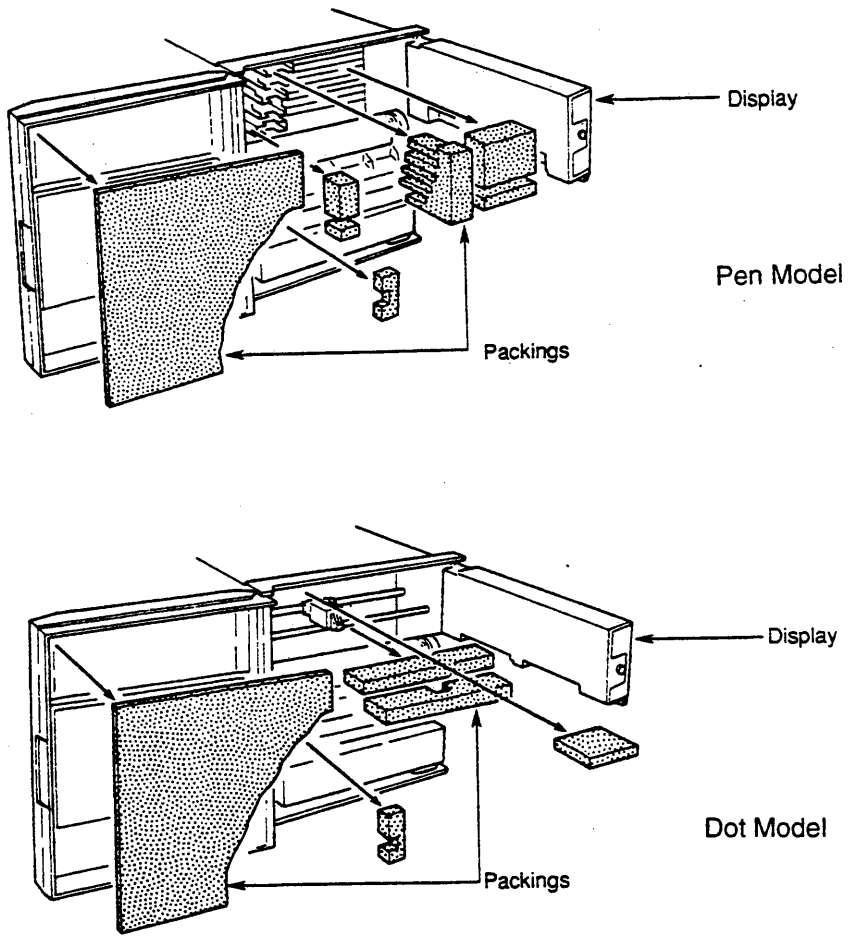


Figure 1-5. Removing Packing

1.6.3 Checking Model Code

When you receive your RD100A, check the information on the nameplate to make sure that it is as specified by your order. If you open the front door and remove the chart cassette, you will find the model code mentioned on the nameplate located as shown in Figure 1-6. Please check if the model code (MODEL) is correct.

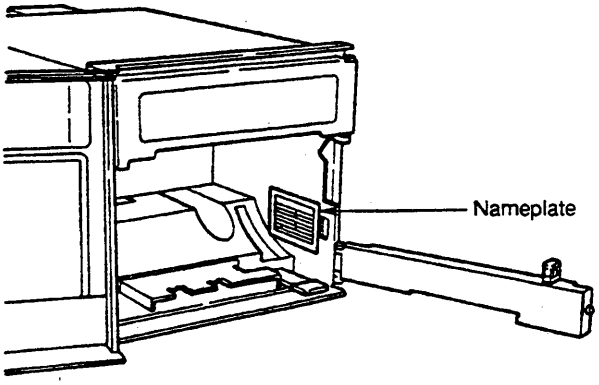


Figure 1-6. Checking Model Code

1.7 Installation

This section describes the installation of the RD100A, the installation site, and the mounting. To install the RD100A properly, it is necessary to read this section.

1.7.1 Installation Site

The RD100A installation site should be chosen to meet the following conditions as closely as possible:

- Installation site should be panel-mounted only. The RD100A has been specially designed for panel mounting.
- The RD100A should be placed in a well-ventilated area.
- The RD100A will be adversely affected if the unit is exposed to direct sunlight or installed near a heater. Choose a location that is near room temperature (23°C), with minimal temperature fluctuations.
- Exposing the RD100A to soot, steam, moisture, dust, corrosive gases, etc. will adversely affect it.
- Using the RD100A within strong electromagnetic fields may cause malfunction. Please avoid installing near electromagnetic objects.
- Installing the RD100A in a location susceptible to mechanical vibrations will adversely affect the mechanical parts and the quality of recording. Please choose an installation site characterized by minimal mechanical vibrations.
- This RD100A must be installed horizontally (however, mounting may be inclined up to 30° backwards from vertical).

1.7.2 Mounting

1. The RD100A should be mounted on at least 2 mm (and up to 26 mm) thick steel panel.
2. Insert the RD100A into the panel cutout.
3. Hold the bottom of the RD100A and mount it on the panel using the mounting brackets supplied, as shown in Figure 1-7. (If still in place, remove the seals covering the holes for the mounting brackets.)
4. Tighten the screw of the mounting bracket 8 to 12 kg/cm.

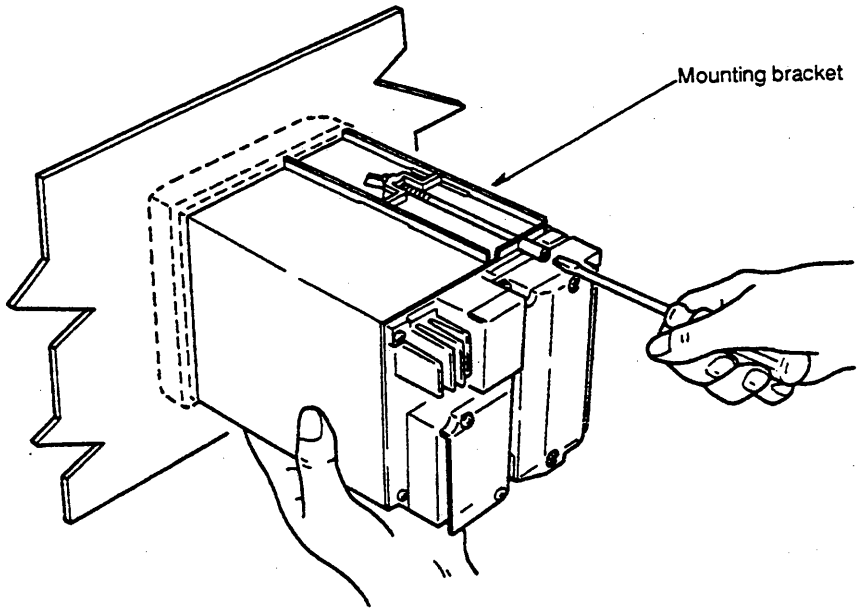


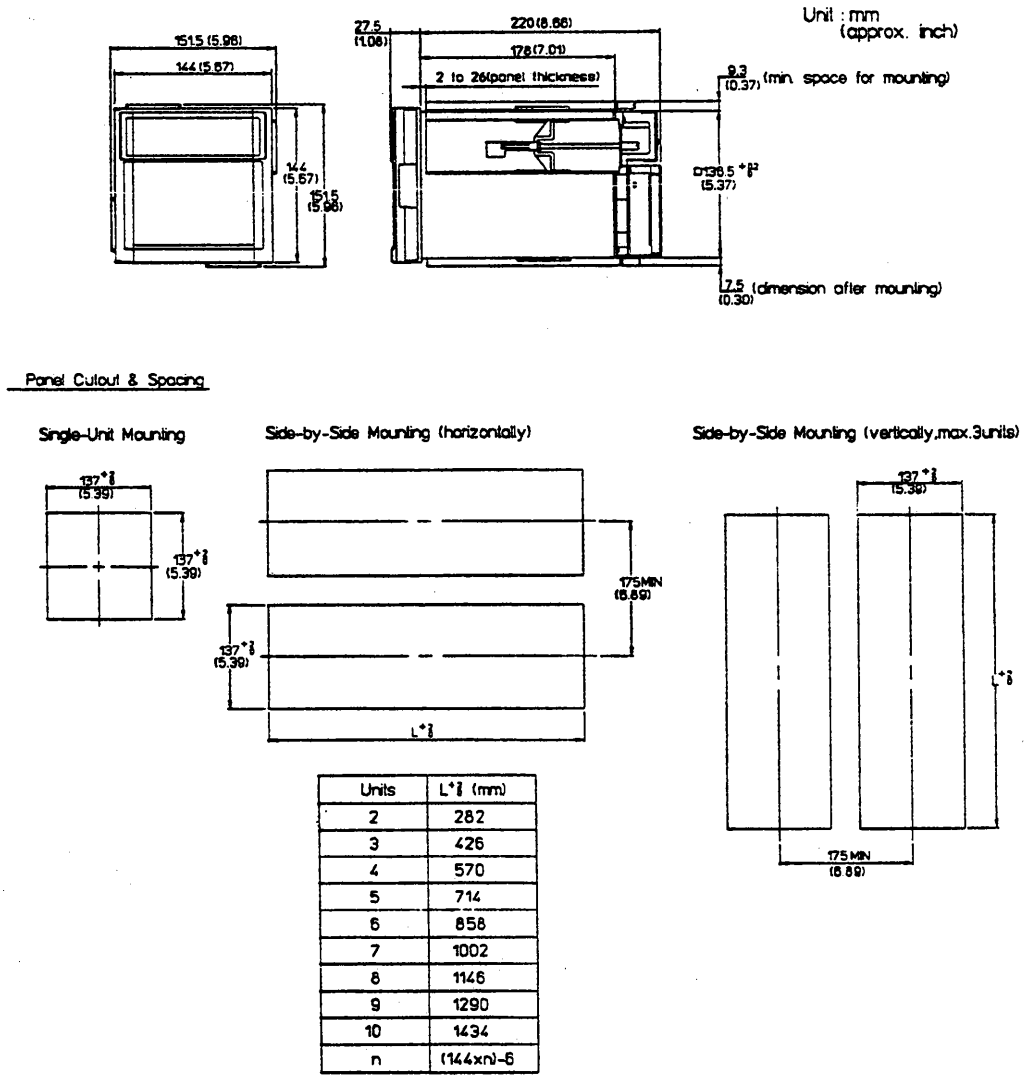
Figure 1-7. Mounting

CAUTION

Caution: Overtightening can damage the case and mounting brackets.

1.7.3 Dimensional Drawings

The RD100A should be mounted by only two brackets, either on the top and bottom of the recorder, or on the left and right side of the recorder. The portable type has different dimensions. Refer to Figure 1-8.



Units	L*0.5 (mm)
2	282
3	426
4	570
5	714
6	858
7	1002
8	1146
9	1290
10	1434
n	(144xn)-6

Figure 1-8. Panel Cutout and Dimensions (including mounting brackets)

1.8 Wiring

1.8.1 Rear Panel Arrangement

Figures 1-9 and 1-10 describe the wiring at the rear panel.

CAUTION

Caution: 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.

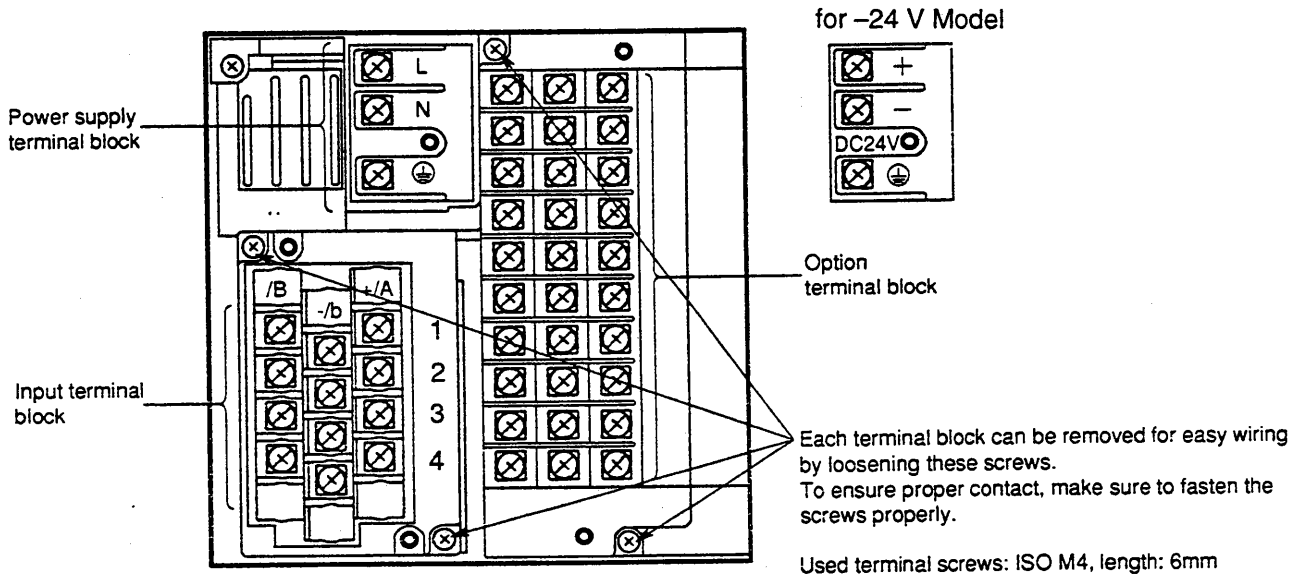


Figure 1-9. Rear Panel Arrangement of Pen Model

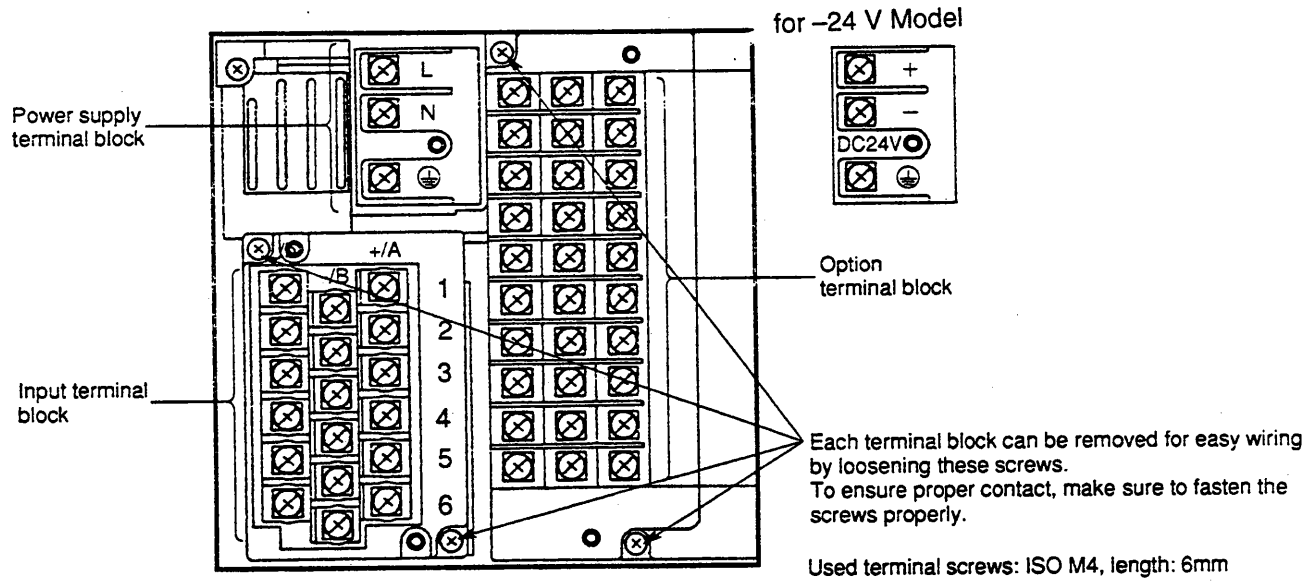


Figure 1-10. Rear Panel Arrangement of Dot Model

1.8.2 Power Supply Wiring ⚠

1 Make sure the power switch is turned OFF and remove the transparent cover at the rear of the RD100A.

2 Connect the power supply wires and the protective ground wire to the power terminals and the ground terminals, as shown in Figure 1-11.

3. Replace the transparent cover.

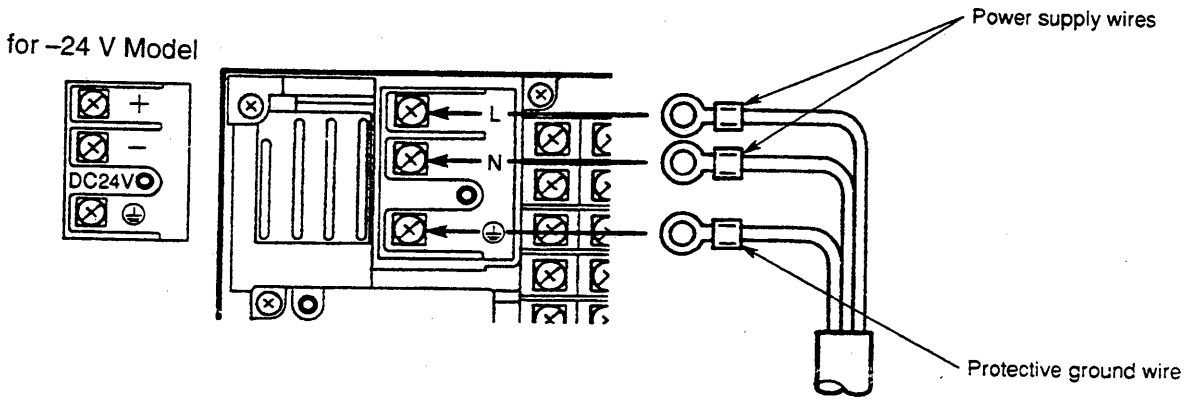


Figure 1-11. Power Supply Wiring

NOTE

Note:

- Do not apply power supply of 132 to 180 Vac; This might affect the measuring accuracy.
- In the case of the portable type, plug the female end of the power cord into the socket on the rear panel.

WARNING

Warning: To prevent an electric shock, ensure that the main power supply is turned OFF and connect the ground terminal using a class 3 resistance of 100 Ω or less. For power and ground wiring termination, use "crimp on" lugs (for 4-mm screws) with insulation sleeves (see Figure 1-12).
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 should be more than 50 MΩKm at 20°C, approved EN60 320 (VDE0625). Do not remove the transparent cover.

WARNING

Make sure to use a power switch in the power supply cord with the following characteristics:
Other than –24 V model
- Rated power current > 1 A
- Rated rush current > 60 A
- Fuse(s) of 2 A to 15 A is (are) necessary.

–24 V model
- Rated power current > 3 A
- Rated rush current > 70 A
- Fuse(s) of 5 A to 15 A is (are) necessary.

The power switch and fuse used in the power supply cord should be:
- CSA approved (for use in North America)
- VDE approved (for use in Europe).

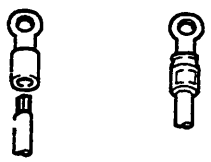


Figure 1-12. "Crimp on" Lugs

1.8.3 Input Wiring

Refer to the diagrams shown in Figures 1-13 through 1-18.

1. Make sure the power switch is turned OFF and remove the transparent cover at the rear of the RD100A.
2. Connect the input wires to the input terminal.
3. Replace the transparent cover.

It is recommended that "crimp on" lugs (for 4-mm screws) with insulation sleeves be used for leadwire ends. (See Figure 1-12.)

In case of clamped input terminals, do not use "crimp on" lugs.

Since the input terminal will be affected by changes in temperature (e.g., because of wind), make sure to replace the transparent cover after wiring. Even after replacement, take care not to expose the terminals to fans, etc. Suggestions to minimize noise pickup:

- The measuring circuit wiring should be run as remote as possible from the power and ground wires.

- It is recommended that shielded wires be used to minimize noise pickup from an electrostatic induction source. The shielding wire of the cable should be connected to the RD100A ground terminal (only one ground line).
- To minimize noise from an electromagnetic induction source, twist the measuring line cables in short and equal spaces.
- The to be measured object should be free from noise. However, if it is not make sure the measuring circuit is isolated and the to be measured object is grounded.

If TC and RJC are used, the temperature of the input terminals should be as stable as possible. Therefore, make sure to use the transparent cover. The thermal capacity of the wiring should be small (recommended $\phi < 0.3$ mm).

Refrain from wiring the input parallel. However, if you do, then

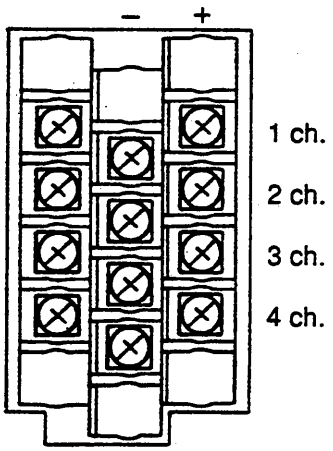
- Do not use the burnout function
- Ground the equipment at the same point
- Turning ON/OFF the power might cause a malfunction
- RTD cannot be wired parallel.

WARNING

Warning: To prevent an electric shock, ensure that the main power supply is turned OFF and connect the ground terminal using a class 3 resistance of 100 Ω or less.

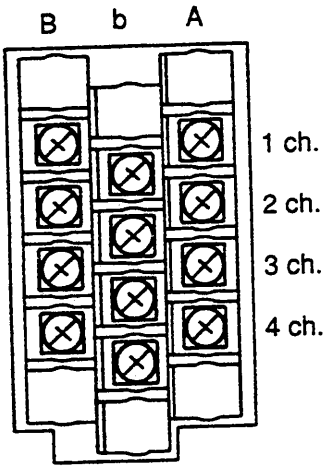
CAUTION

Caution: If you have an input of dc ≤2 V or a TC, do not apply an input voltage exceeding ±10 Vdc.



Standard Input Terminal

Figure 1-13. dc V, Thermocouple and Contact Input – Pen Model



Standard Input Terminal

Figure 1-14. RTD Input – Pen Model

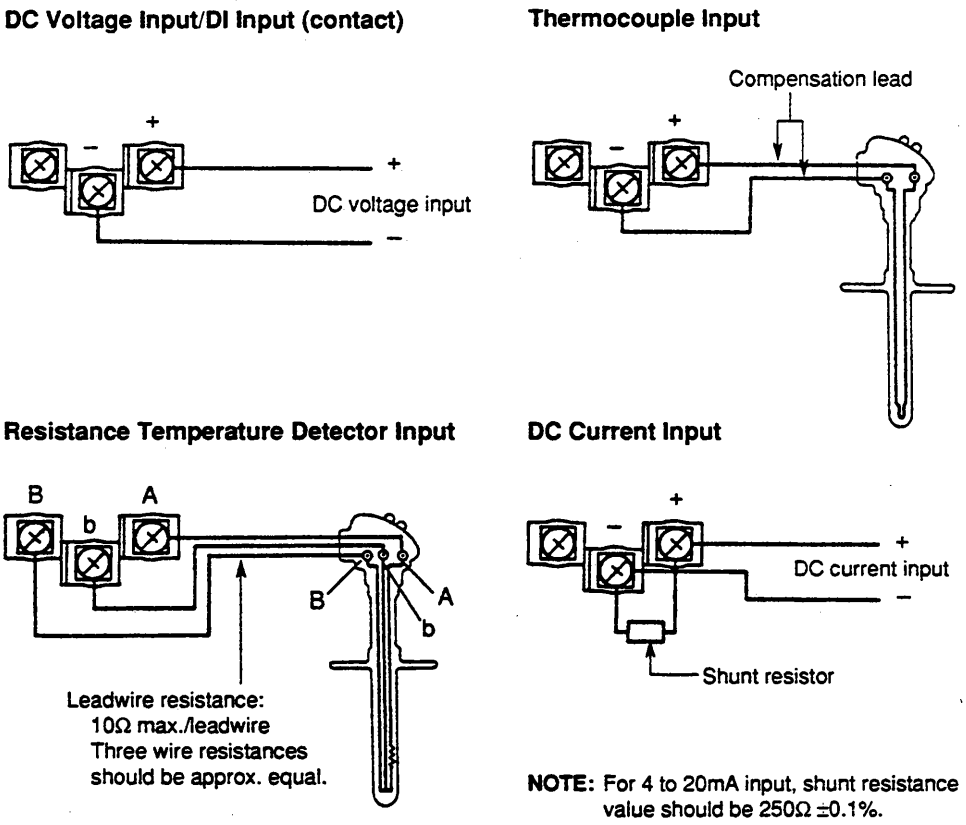


Figure 1-15. Wiring Input Terminals – Pen Models

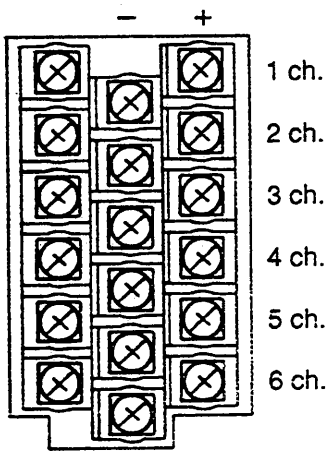


Figure 1-16. dc V, Thermocouple and Contact Input – Dot Model

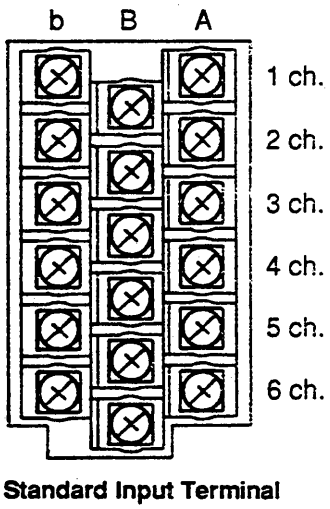


Figure 1-17. RTD Input – Dot Model

CAUTION

Caution: Do not apply a maximum common mode voltage more than 250 Vac rms (50/60 Hz). The recorder and measured values will be adversely affected.

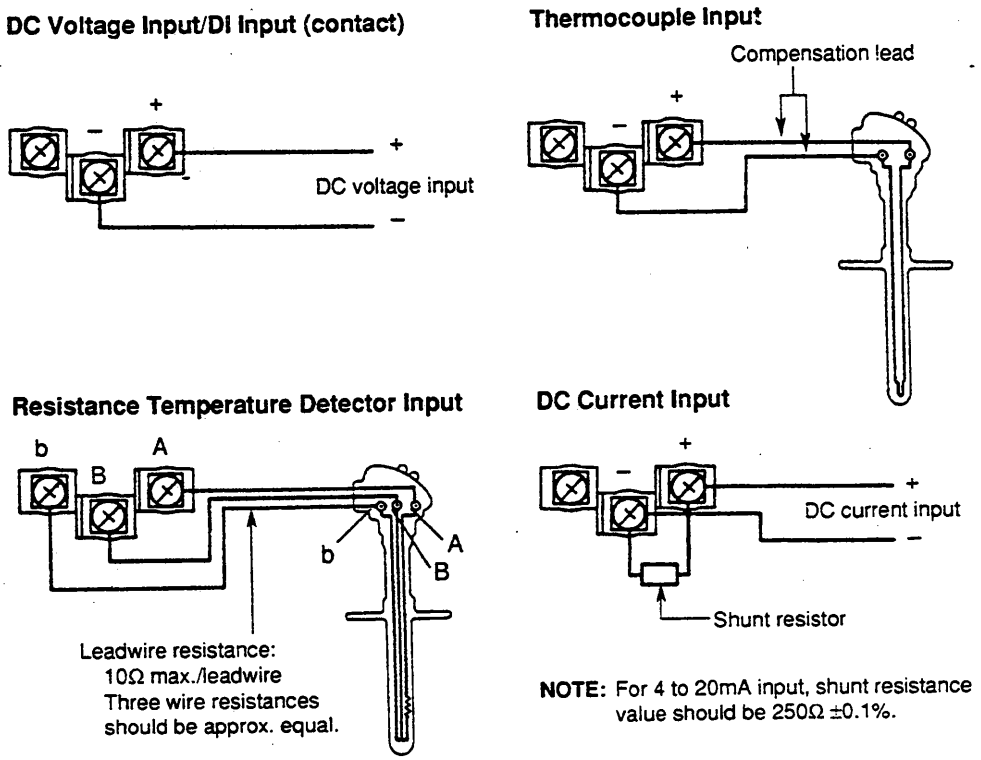


Figure 1-18. Wiring Input Terminals – Dot Models

1.8.4 Alarm Output Wiring

1. Make sure the power switch is turned OFF and remove the transparent cover at the rear of the RD100A.
2. Connect the alarm output wires to the alarm output terminal.
3. Replace the transparent cover.

Depending on your option, your alarm output terminal will look like one of the terminals show in Figure 1-19.

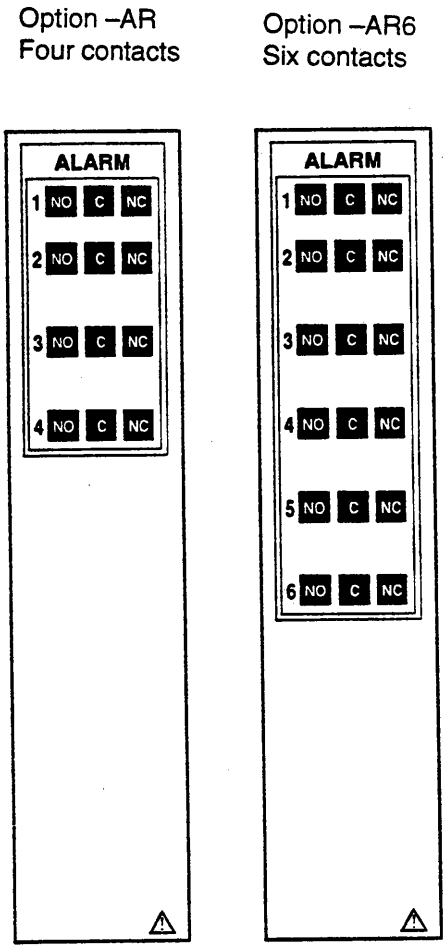


Figure 1-19. Alarm Output Terminals

Characteristics

Output type: Relay transfer contact (energize/de-energize type switchable)

Output capacity: 250 Vac (50 or 60 Hz), 3 A
250 Vdc, 0.1 A (resistive load)

Dielectric strength: 1500 Vac (50 or 60 Hz) for one minute between output terminal and ground terminal

To adjust initial settings, see Section 7.

WARNING

Warning: To prevent an electric shock, ensure that the main power supply is turned OFF during wiring and ensure that the ground terminal is connected using a class 3 resistance of 100 Ω or less.

1.8.5 Remote Control Wiring

1. Make sure the power switch is turned OFF and remove the transparent cover at the rear of the RD100A.
2. Connect the REMOTE output wires to the REMOTE output terminal. Make sure to connect every terminal with the common terminal. Use shielded wires to prevent electromagnetic interference.
3. Replace the transparent cover.

The remote control terminal (option) is shown in Figure 1-20.

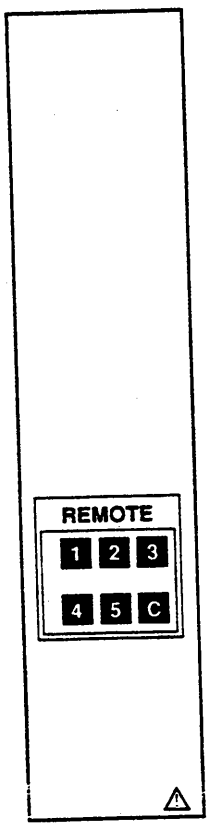


Figure 1-20. Remote Control Terminal

Characteristics

Input signals:	dry contact or open-collector (TTL or transistor)
Input types for each function:	
• Recording start/stop	level
• Change chart speed	level
• Printout messages	trigger (250-msec minimum)
• Get a manual printout	trigger (250-msec minimum)
• Get a periodic printout	trigger (250-msec minimum)
Input conditions:	ON voltage (0.5 V maximum, 30 mA dc); leakage current in OFF state (0.25 mA maximum); signal duration (250 msec minimum)
Input type:	photocoupler isolation (one side common) internal isolated power source (5 V ±5%)
Dielectric strength:	500 Vdc between input terminal and ground terminal (one minute)

To adjust initial settings, see Section 7.

WARNING

Warning: To prevent an electric shock, ensure that the main power supply is turned OFF during wiring and ensure that the ground terminal is connected using a class 3 resistance of 100 Ω or less. The outer conductor must be grounded at the ground terminal.

Notes

2 Component Names and Functions

This section describes the names of components, together with a short summary of their functions.

2.1 Front Panel (refer to Figure 2-1)

2.1.1 Power Switch

Pressing this button will result in switching the power ON or OFF.

2.1.2 Keyboard

The keyboard consists of six keys:

RCD (RCD key)

Pressing this key will result in starting or stopping the recording.

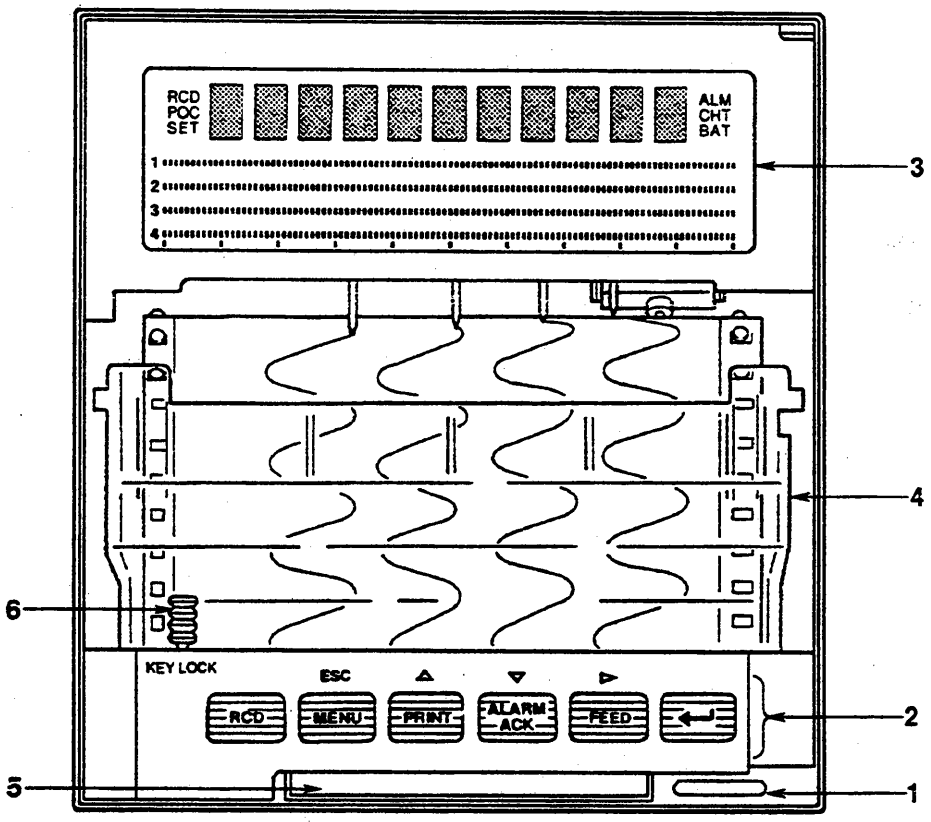


Figure 2-1. Front Panel (Four-pen Model)

ESC
MENU **(Menu key/Esc key)**

The MENU function is to select the type of display to start SET UP List printout and message printout and to switch between the Operation and SET modes.

The ESC function is to escape to the previous level in the (setting) flow while entering parameters.

△
PRINT **(Print key/Cursor Up key)**

The PRINT function is used to get a manual printout or list printout printed onto the chart.

The △ function: the display is designed in an interactive way, which means that it will ask you to enter the necessary data. In case there are several possibilities to choose from (e.g., ON or OFF), use this key to show the next choice.

▽
ALARM ACK **(Ack key/Cursor Down key)**

The ACK function is used to acknowledge alarms. Note that this function is only effective if the alarm relay is in the hold mode and if the indicator status is in the hold-mode. When you press this key in case an alarm occurs and the ALM Indicator is flashing, the current alarm situation will be indicated and the relay will be reset.

The ▽ function: the display is designed in an interactive way, which means that it will ask you to enter the necessary data. In case there are several possibilities to choose from (e.g., ON or OFF), use this key to show the previous choice.

▷
FEED **(Feed key/Move to Next Digit key)**

The FEED function feeds the chart paper until this key is released. The ▷ function moves the cursor to the next digit while setting parameters. Please note that there is not a backspace key provided. For that reason, the cursor moves from the last digit to the first digit again.

↵ **(Ent key)**

The ENT function allows you to keep the data you entered during the setting procedure. Pressing ENT results in moving to the next display in the same (setting-) flow. Pressing ENT after the SET OK display appears results in starting the same (setting-) flow again.

To take out the chart, use this keyboard like a door by pulling the upper left comer.

2.1.3 Large-sized Vacuum Fluorescent Display (VFD)

The display can show characters, bar graphs, and functions. In case you want to exchange pens or the ribbon cassette, use the display as a door by pulling the lower left corner. The backside of this display also illuminates the chart.

2.1.4 Chart and Chart Cassette

The recorder uses a Z-fold chart, 16 meters in length, with an effective analog trend recording width of 100 mm. The chart is stored inside a chart cassette.

2.1.5 Key Lock

The key supplied with the recorder should be removed from the keyhole to lock the recorder.

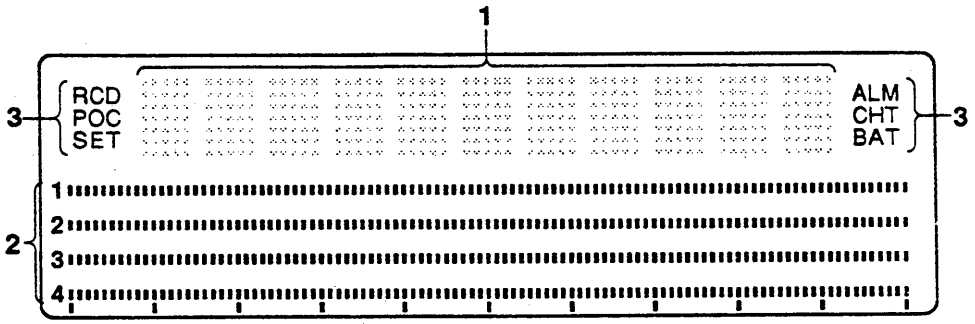


Figure 2-3. Display (four-pen model)

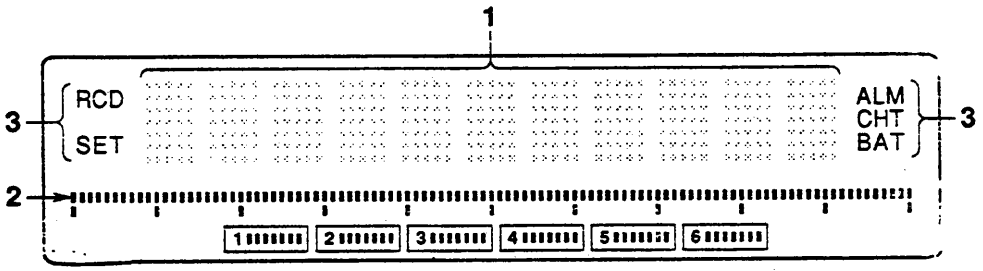


Figure 2-4. Display (dot model)

2.2 Display

2.2.1 5x7 Dot Matrix (11 characters)

Used for data display, clock display, monitor display, and setting display.

Data display: Channel number, type of alarm, measured data, units

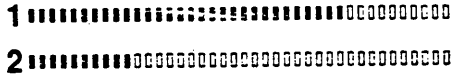
Clock display: (year, month, day) or (hour, minute, second) selectable

Setting display: Every parameter can be set by interactive display.

2.2.2 Bar Graph

Measured values of each channel will be displayed with one percent resolution (analog display). The alarm set points will also be displayed. The colors of the bar graph correspond to the colors of the pens. Two ways the display can be selected:

Left-referenced (%) bar graph



Center-zero bar graph

(center of the recording span is reference and the deviation is displayed as a bar graph)

The six squares underneath the bar graph show the occurrence of an alarm in the corresponding channel. They illuminate/flash in the same way as the ALM indicator.

2.2.3 Status Indicators

RCD: Illuminated when recording is in profess.

POC: Illuminated when Pen Offset Compensation is being used (only for pen model).

SET: Illuminated when you are working in the SET Mode.

ALM: This VFD will flash or illuminate when an alarm occurs.

- Hold-mode: If the ACK key is pressed, the flashing will stop and the VFD will illuminate. After the alarm stops, the VFD will turn off. (If the ACK key is not pressed, the flashing stays even if the alarm recovers).
- Non-hold-mode: VFD will illuminate until the alarm recovers (pressing the ACK key in this case will have no effect).

BAT: Illuminated when the battery for setting data backup needs to be replaced.

3 Operation

This section describes the daily operation of the RD100A, excluding settings. Please read this section carefully before operation.

3.1 How to Switch the Power ON/OFF

The power switch is located behind the door, at the front side, in the lower right corner (see Figure 3-1). The power is supplied to the instrument when the power switch is in the position shown at the upper right of Figure 3-1. (The power is OFF when the power switch is in the position shown at the lower right of Figure 3-1. The power can be turned ON/OFF by alternately pressing the switch. When you do not use the instrument, please turn OFF the power.

NOTE

Note: After turning ON the power, the RD100A will first perform a self-diagnostic check for several seconds.

CAUTION

Caution: The warm-up time is approximately 30 minutes. (However, just after finishing the wiring, it might take longer, especially if you removed the input terminals during wiring.)

If the input wiring is connected parallel with other equipment, you should not switch the power ON/OFF.

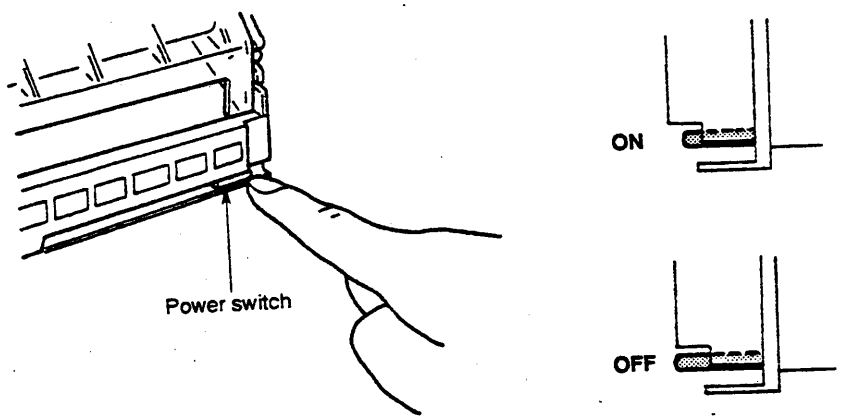


Figure 3-1. Power ON/OFF

3.2 Installation/Replacement of Chart, Pens, Ribbon Cassette, and Battery

3.2.1 How to Load and Replace the Chart

1. Open the front door of the unit.
2. The power can be either ON or OFF, but recording should be OFF.
3. Fan the chart paper thoroughly at both ends before loading.
4. Swing the keyboard open by grasping the upper left corner. While gently pressing the chart paper compartment lock tabs (located at the lower right and left front) in the direction of the arrow, swing and lift the compartment away from the unit (see Figure 3-2).

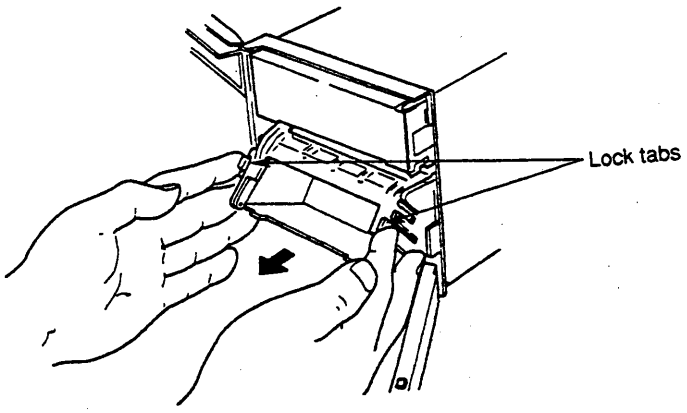


Figure 3-2. Loading the Chart-1

5. Press the sides of the chart guide plate at the top rear of the chart compartment and swing the guide plate up (see Figure 3-3).
6. At the front, pull/swing the front transparent chart guide down (see Figure 3-3).

When using cassettes from other RD100As, exercise care that a sheet is also used.

7. Load the chart paper into the top hopper, making sure that the sprocket teeth of the chart drive are properly engaged in the chart paper perforation holes. Take care not to insert the paper backwards (see Figure 3-4).
8. Place the rear chart guide plate back into position. Press the rear chart guide plate down and toward you and load the chart.

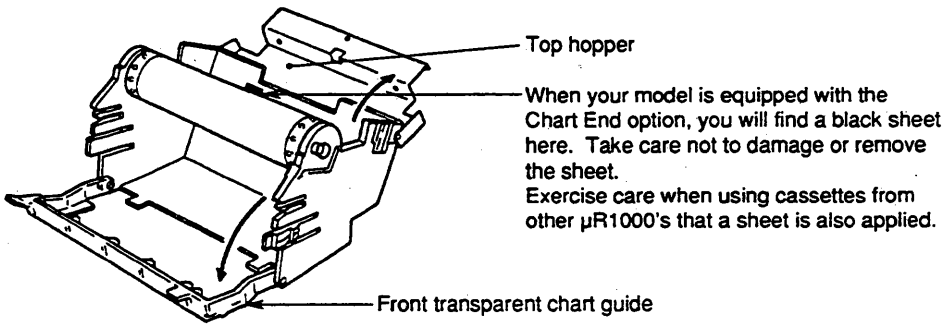


Figure 3-3. Loading the Chart-2

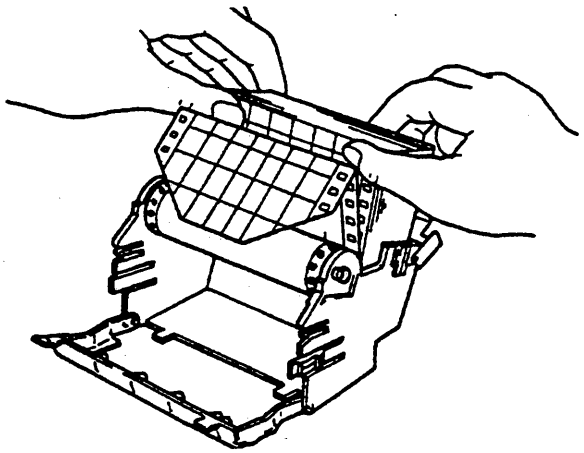


Figure 3-4. Loading the Chart-3

9. Place the front transparent chart guide back into position (see Figure 3-5).
10. Replace the chart paper compartment back into the unit. Slide the protruding knurls of the chart paper compartment into the cutout grooves located on the support brackets. Push/swing the compartment into the unit until the lock tabs click shut (see Figure 3-6).
11. Close the keyboard.

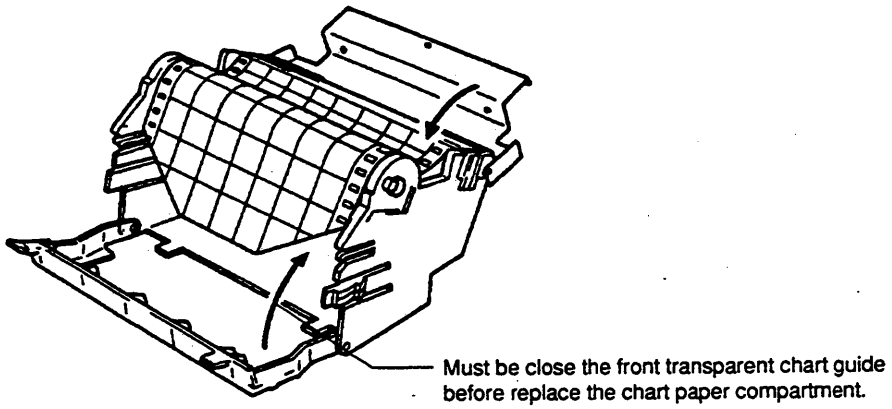


Figure 3-5. Loading the Chart-4

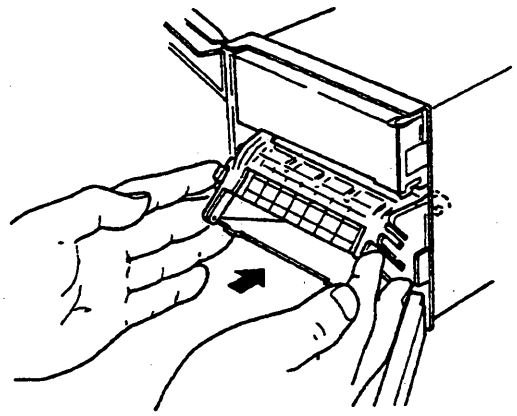


Figure 3-6. Loading the Chart-5

12. Press the FEED key (when the power is ON) until two leaves of paper are fed (or until the chart is not curled anymore) and confirm that the chart is fed continuously. If not, repeat the procedure from step 4.

NOTE

Note: A red band is printed at the end of the chart with the heading RENEW CHART to notify you when it is time to prepare a new chart.

CAUTION

Caution: If you replace the chart paper compartment back into the unit without closing the front transparent chart guide, the lock tabs might be damaged.

3.2.2 How to Install and Replace Pens and Ribbon Cassette

Normal Procedure for Felt-tip Pens

1. Open the front door and make sure the recording is not in progress (by pressing the RCD key; power can be either ON or OFF).
2. Swing open the display by grasping and pulling the lower left corner.
3. Grasp the protruding part of the felt-tip pen cartridge and gently pull/slide it out of the cartridge holder (see Figure 3-7).
4. Remove the pen cap before replacing the cartridge with a new one. Insert a new felt pen cartridge in the pen cartridge holder (see Figure 3-7). Start with the smallest pen.
5. To (re)start the recording, press the RCD key.

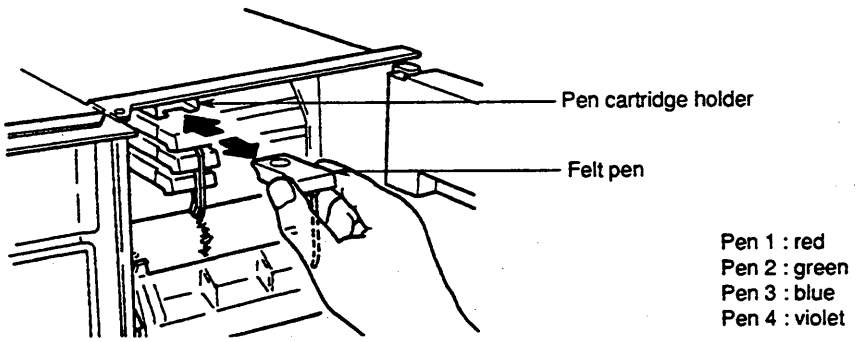


Figure 3-7. Felt-tip Pen Replacement

Second Procedure for Felt-tip Pens

This procedure is used when the pens are located at a place where it is difficult to replace them.

1. Open the front door and make sure the recording is not in progress (by pressing the RCD key; power must be ON).
2. Press the MENU key. Use the UP/DOWN keys to select the display MENU=FUNC. Press the ENT key.

3. Use the UP/DOWN keys to select the display CHANGE PEN. Press the ENT key. The pens will move to 40% of the chart, where it is easy to replace them. Note that this will leave a line on the chart.
4. Handle as described in the "Normal Procedure" above, steps 2, 3, and 4.
5. The display PRESS ENT will appear. After finishing, press the ENT key.
6. To (re)start the recording, press the RCD key.

CAUTION

Caution: To protect the pens and the internal mechanism, never grasp the pen tip or apply excessive force to the cartridge holder. Always make sure to remove the pen cap.

Procedure for Plotter Pen

1. Open the front door and make sure the recording is not in process (by pressing the RCD key; power can be either ON or OFF).
2. Swing open the display at the lower left corner.
3. While grasping the plotter holder, gently slide the plotter out of the holder (see Figure 3-8).
4 Remove the pen cap and insert a new plotter pen in the holder (see Figure 3-8). If it is difficult to replace the plotter pen, use the "Second Procedure," described above.

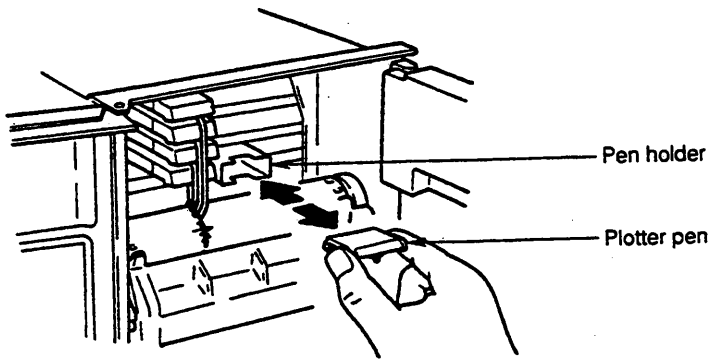


Figure 3-8. Plotter Pen Replacement

Procedure for Ribbon Cassette

1. Open the front door and make sure the power is OFF.
2. Swing open the display by grasping and pulling the lower left corner.
3. Hold the back section of the carriage assembly and move the assembly to the right.
4. Press the left lock tab to the left and use the lower left part of the cassette as a handle to pull it out of the holder. See Figure 3-9.

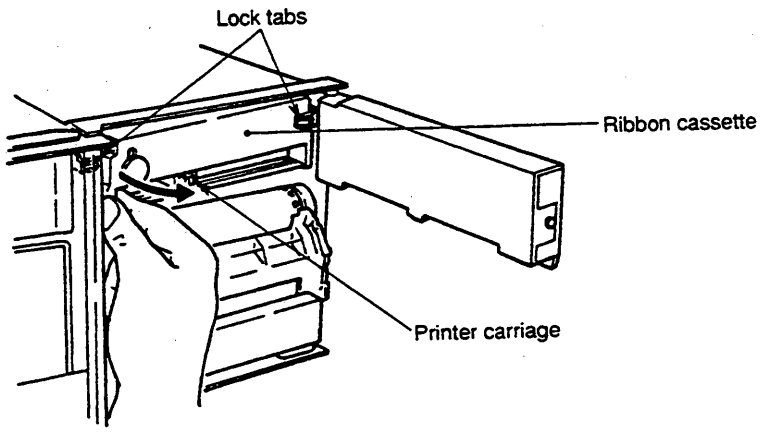


Figure 3-9. Ribbon Cassette Replacement

5. Insert the right side of the new ribbon cassette into the cassette holder. Make sure the lock tabs are shut correctly.
6. Insert the left side of the ribbon cassette into the cassette holder (clicking it into its place). If the ribbon cassette does not click into its place easily, adjust the ribbon feeding knob so that the peg fits the hole.
7. If necessary, turn the ribbon feeding knob to stretch/tighten the ribbon.

CAUTION

Caution: If the ribbon cassette is not inserted correctly:
- Data may be printed in the wrong color
- The ribbon edge will be used to print out data, which damages the ribbon.

3.2.3 How to Replace the Battery

The BAT indicator on the VFD display can either remain illuminated or flash. In case of illumination, the lithium battery needs to be replaced. However, this battery will last for 10 years under normal operation conditions. For replacement, please contact OMEGA's Customer Service Department.

CAUTION

Caution: To avoid injury, never replace the lithium battery yourself.

3.3 Basic Operation (Operation Mode)

3.3.1 How to Start/Stop the Recording

Pressing the RCD key will cause the recording to start or stop. However, if the Start/Stop function is controlled by remote control, this key will not work. (For the status of the initial recording settings, see Section 4.)

3.3.2 How to Feed the Chart

The paper can be fed by operating the FEED key. The paper will be fed as long as the FEED key is pressed.

3.3.3 How to Get a Manual Printout

A manual printout contains:

- Date and time
- Channel number or tag/type of occurred alarm/latest measured values/units (for all channels).

To get a manual printout, press the PRINT key, and the MAN START display will appear. Then, press the ENT key.

When the writing of this printout starts, the display will return to the previous one. When the writing of this printout is finished, the manual printout function is canceled automatically, and the RD100A returns to the recording previously in progress.

When you want to cancel the manual printout function while in progress, press the PRINT key again, and the display MAN STOP will appear. Press the ENT key, and the instrument returns to the recording previously in progress.

During the writing of the manual printout, the analog recording will stop; however, scanning of the input and detection of alarms will still continue. When alarms occur during the manual printout, the printing of these alarms will be done after the analog recording (re)starts. (Refer to Figures 3-10 and 3-11.)

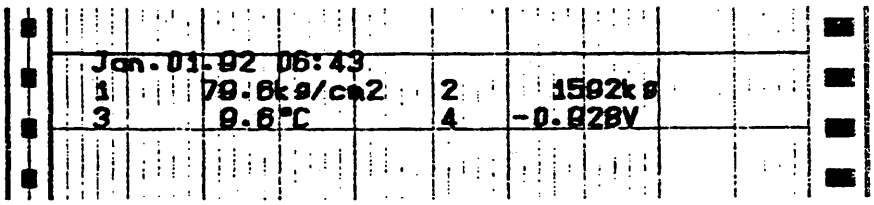


Figure 3-10. Manual Printout, Pen Model

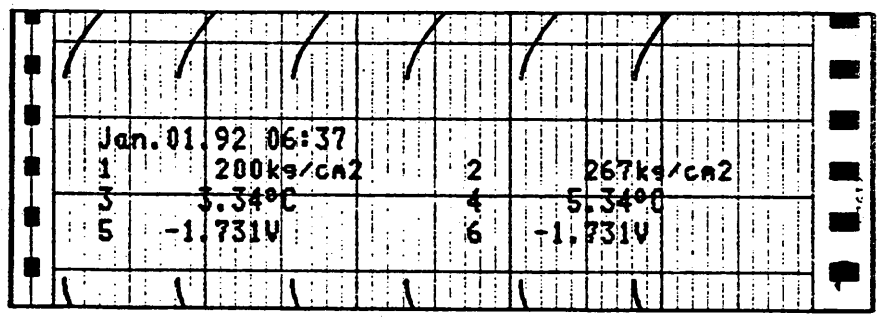


Figure 3-11. Manual Printout, Dot Model

3.3.4 How to Get a List Printout

A list printout contains:

- Date, time, and chart speed (1 and 2), and in the case of the dot model, the trend recording interval
- Channel number/tag/range/span/scaling values/unit
- Type of alarm and values, zone values, partial values, periodic printout ON/OFF
- Contents of messages (for all channels).

To get a list printout (refer to Figures 3-12 and 3-13), press the PRINT key, select LIST START using the PRINT key and press the ENT key. When the writing of this printout starts, the display will return to the previous one. When the writing of this printout is finished, this list printout function is canceled automatically, and the RD100A returns to the recording previously in progress.

When you want to cancel this list printout function while in progress, press the PRINT key again, and the display LIST STOP will appear. Press the ENT key and the RD100A returns to the recording previously in progress.

During the writing of the list printout, the analog recording will stop. However, scanning of the input and detection of alarms will still continue. When alarms occur during this printout, the printing of these alarms will be done after the analog recording (re)starts.

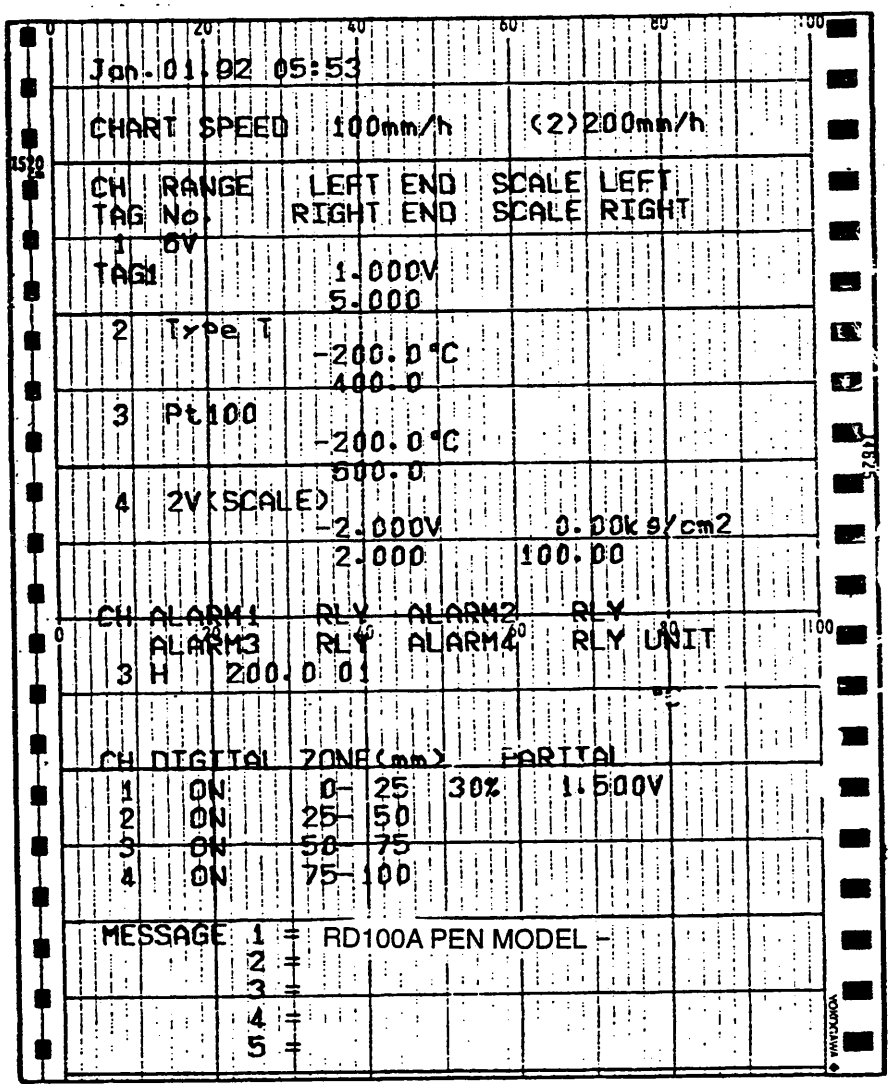


Figure 3-12. List Printout Example, Pen Model

3.3.5 How to Get a SET UP List Printout

A SET UP list printout contains:

- Initial settings; analog recording
- Initial settings; digital printing
- Initial settings; alarms
- Initial settings; burnout, RJC, and others
- Initial settings; options, if installed.

To get the SET UP list printout (refer to Figures 3-14 and 3-15), proceed as follows.

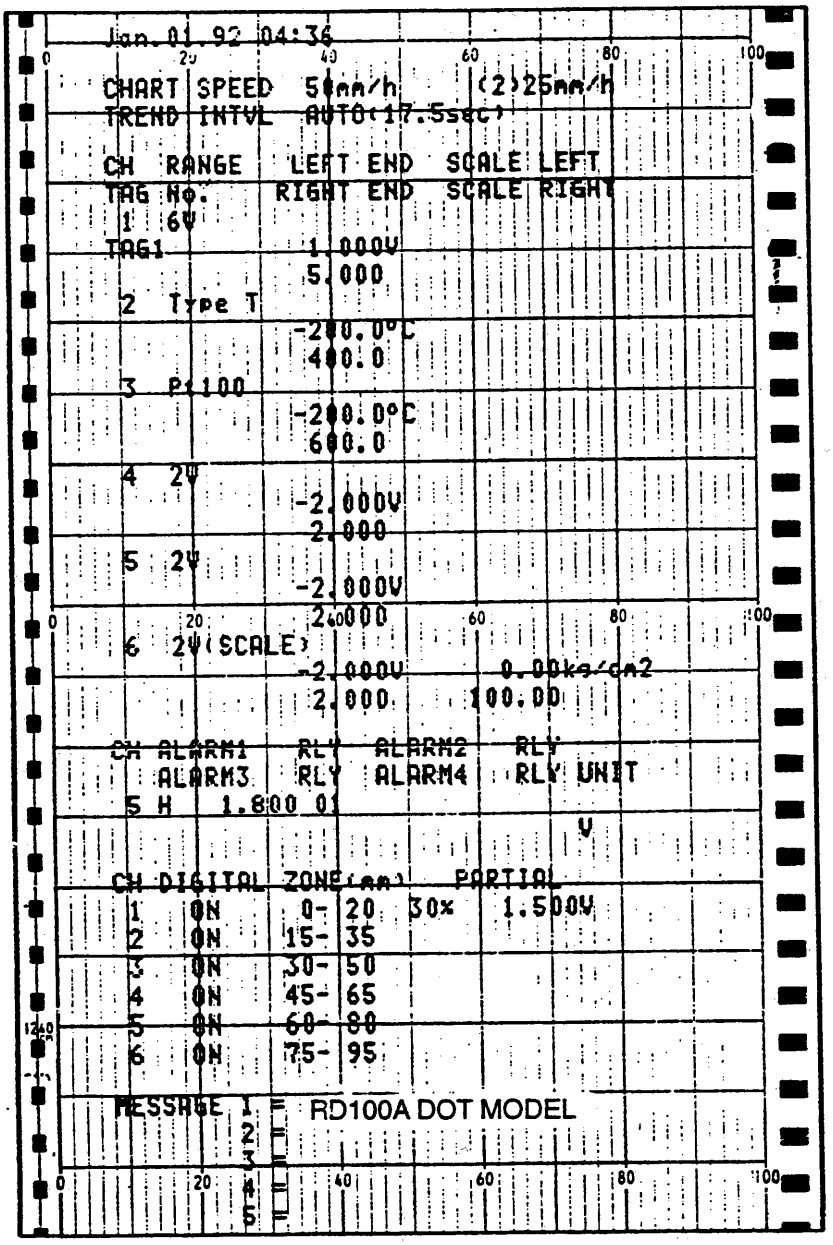


Figure 3-13. List Printout Example, Dot Model

Press the MENU key and select the MENU=FUNC display using the UP/DOWN keys. Then, press the ENT key. Select the PR S/U LIST display using the UP/DOWN keys. Press the ENT key, and the printing will start.

When the writing of this printout starts, the display will return to the previous one. When the writing of this printout is finished, this SET UP list printout function is canceled automatically, and the RD100A returns to the recording previously in progress.

When you want to cancel this SET UP list printout function while in progress, press the MENU key again, select the MENU=FUNC display and press the ENT key. Then the STOP S/U L display will appear. Press the ENT key. The RD100A returns to the recording previously in progress.

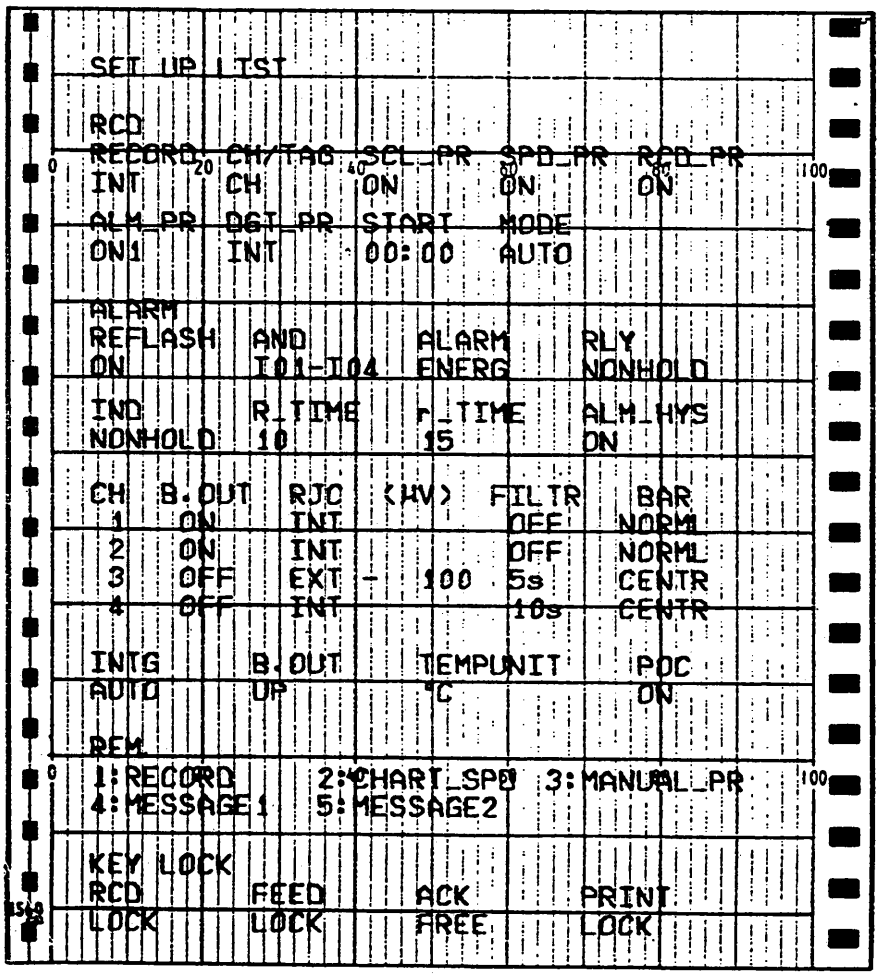


Figure 3-14. SET UP List Printout Example, Pen Model

During the writing of the SET UP list printout, the analog recording will stop. However, scanning of the input and detection of alarms will still continue. When alarms occur during this printout, the printing of these alarms will be done after the analog recording (re)starts.

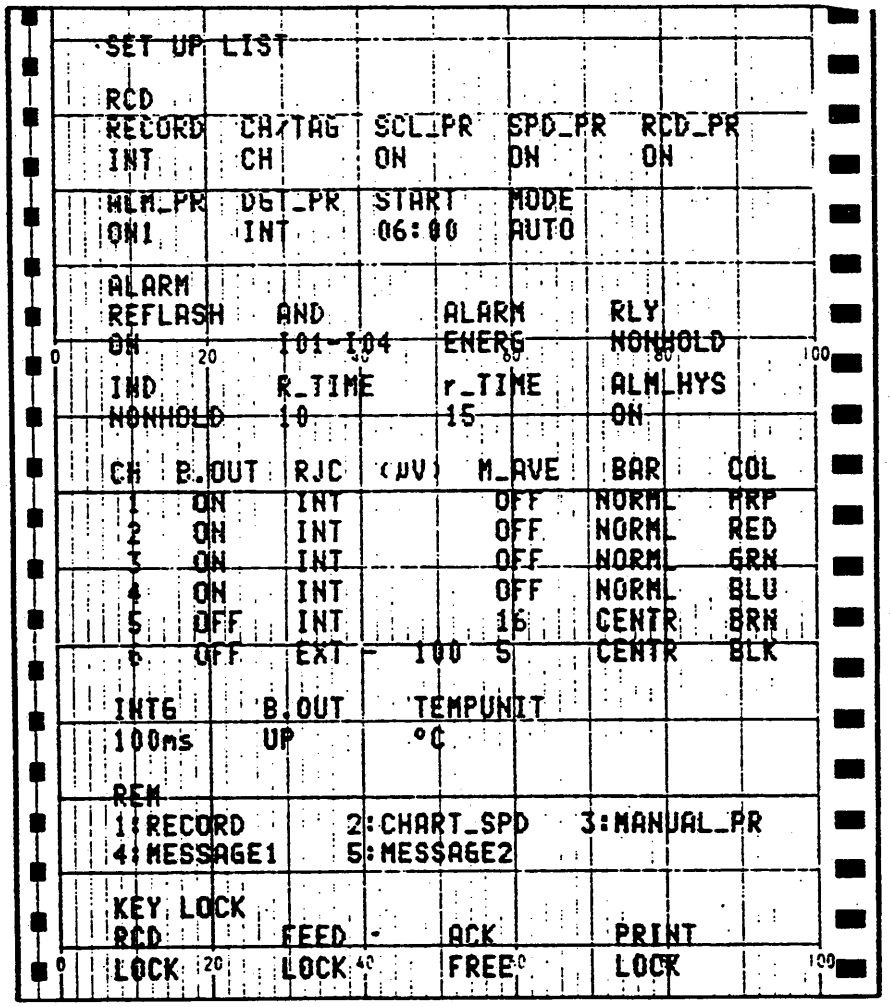


Figure 3-15. SET UP List Printout Example, Dot Model

3.3.6 How to Get a Message Printout

The contents of a message must be entered first. (To set or change a message, see Section 6.) To get a message printed on the chart, proceed as follows. (See Figures 3-16 and 3-17.)

Press the MENU key and select the MENU=FUNC display using the UP/DOWN keys, Then, press the ENT key.

Select the PR MESSAGE display using the UP/DOWN keys. Press the ENT key, and select the message you want to print out, since up to five messages can be set. Press the ENT key, and the printing will start.

No messages will be printed when the chart speed exceeds 1500 mm/h (in the case of the pen model) or 100 mm/h (in the case of the dot model), or when recording is OFF. When the writing of this printout starts, the display will return to the previous one. When the writing of this printout is finished, the RD100A returns to the recording previously in process. You cannot cancel this printout once it has started.

Messages can be triggered by the keyboard, as described above, and by remote control (option). When several messages are triggered by remote control in a short time, they will be stored in a buffer memory before printing on the chart. It is possible to clear this buffer, which can be useful for example in case the printing will take too much time. When the buffer is full, this will be indicated by an asterisk (*) in the latest message printout. As a result, the next message is lost and will not be printed. To clear the buffer memory, proceed as follows.

Press the MENU key. Select the display MENU=FUNC, using the UP/DOWN keys. Press the ENT key. Select the display CLR MSG BUF, using the UP/DOWN keys. Press the ENT key. The buffer is cleared. The display will return to the previous one used.

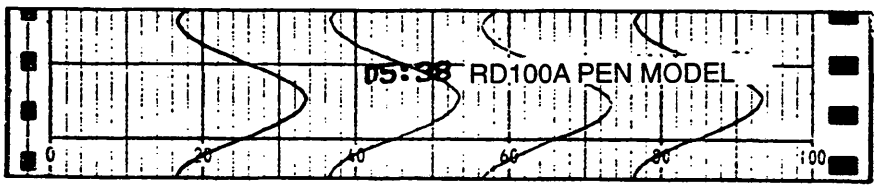


Figure 3-16. Message Printout Example, Pen Model

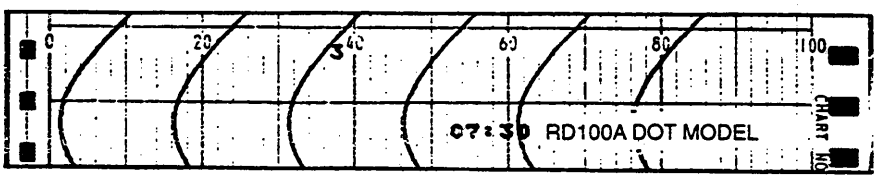


Figure 3-17. Message Printout Example, Dot Model

NOTE

Note: The RD100A will store up to five messages in a buffer memory, regardless of whether recording is ON or OFF. If more messages are generated, the new ones will not be kept in the buffer memory.

3.3.7 How to Acknowledge an Alarm

When an alarm occurs, the output relays (if installed) will be activated, and the alarm indicator will behave as described below (see also Figure 3-18).

Non-hold Type (for hold/non-hold selection, see Section 7)

When alarm occurs:

- The output relay will be activated
- The indicator will light.

When alarm recovers:

- The output relay will be reset
- The indicator will stop lighting.

Pressing the ACK key has no effect.

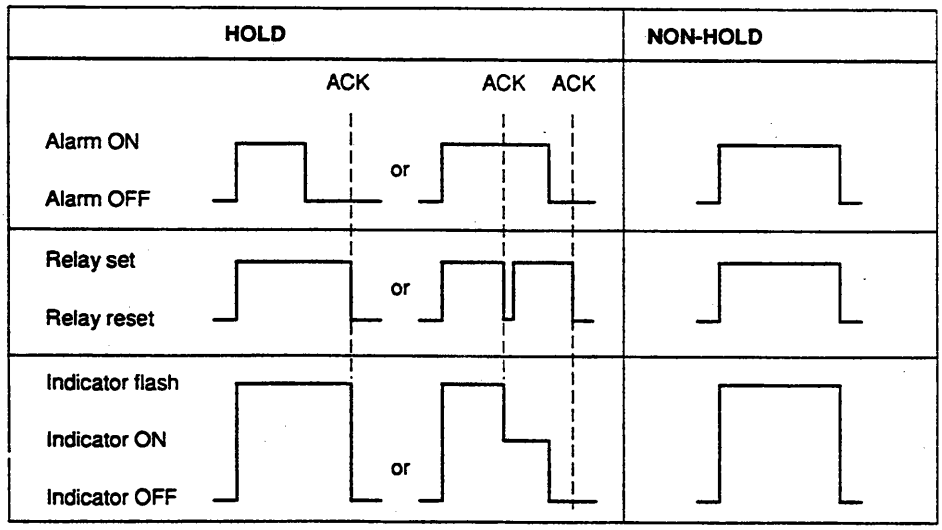


Figure 3-18. Alarm Indicator Behavior

Hold Type (for hold/non-hold selection, see Section 7)

When alarm occurs:

- The output relay will be activated
- The indicator will start flashing; however, pressing the ACK key results in showing the current alarm status (alarm in progress = ON; alarm recovered = OFF).

When alarm recovers:

- The output relay will be kept activated; however, pressing the ACK key results in resetting the relay
- The indicator will keep flashing; however, pressing the ACK key results in showing the current alarm status (alarm in progress = ON; alarm recovered = OFF).

When an alarm occurs, you will see this on the display, and alarm data will be printed on the chart.

When several alarms are generated in a short time, they will be stored in a buffer memory before printing on the chart. It is possible to clear this buffer. which can be useful, for example, in case the printing will take too much time. When the buffer is full, this will be indicated by an asterisk (*) in the latest alarm printout. As a result, the next alarm is lost and will not be printed. To clear the buffer memory, proceed as follows.

Press the MENU key. Select the display MENU=FUNC, using the UP/DOWN keys. Press the ENT key. Select the display CLR ALM BUF, using the UP/DOWN keys. Press the ENT key. The buffer is cleared. The display will return to the previous one used.

NOTE

Note: The RD100A will store up to eight (pen model) or 12 (dot model) alarms in a buffer memory. If more alarms are generated, the new ones will not be kept in the buffer memory.

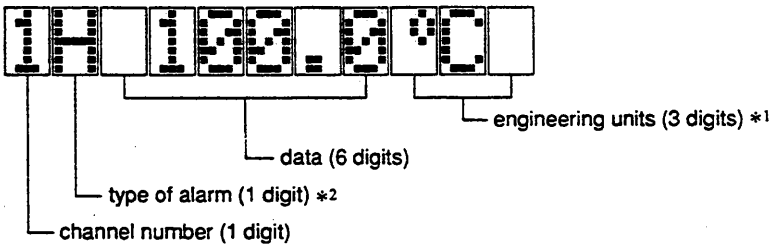
3.3.8 How to Select the Display

Four different displays can be selected. These are as follows.

Display Auto (see Figure 3-19)

Channel number, measured values, and units will appear on the display alternately. Every channel will be shown for approximately two seconds. If the input is greater than the upper limit of the recording span, + **** will appear.

If the input is less than the lower limit of the recording span, – **** will appear.



*1 Units are fixed for Voltage-input (mV/V) and for TC and RTD-input (°C/°F), and settable for SCL (scale input) and SQRT (square root input).

*2 Type of alarm:
H: high limit
L: low limit
h: high difference limit
R: rate-of-change on increasing signal
r: rate-of-change on decreasing signal
l: low difference limit

Figure 3-19. Display Auto

Display Man

Channel number, measured values and units will appear on the display for a specific channel only. This display looks the same as the AUTO display (not available on one-pen model).

Display Date (see Figure 3-20)

Date, including the year will appear on the display. Leap years are provided.

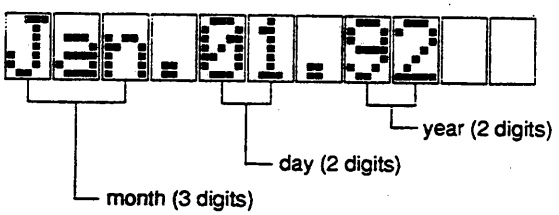


Figure 3-20. Display Date

Display Time (see Figure 3-21)

Time will appear on the display.

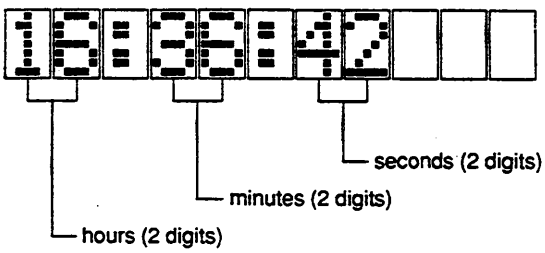


Figure 3-21. Display Time

How to select the desired display is described below.

Starting from the basic operation display, press the MENU key. Select the display MENU=DISP using the UP/DOWN keys. Then press the ENT key. You have now entered the following flow:

DISP_AUTO

DISP_MAN MAN CH=?

DISP_DATE

DISP_TIME

Moving between the different displays can be done by using the UP/DOWN keys. Once you selected the desired display, press the ENT key. (In the case of the manual display, select the channel number by using the UP/DOWN keys. Then, press the ENT key again.)

After having pressed the ENT key, the selected display will appear. If you want to change the channel number while displaying the measured values on the manual display, you can do so by pressing the ENT key.

3.4 How to Use the Key Lock

In order to use this function, the settings for the key lock must be set to USE. (See Section 7.)

The key lock is located in the keyboard at the left, top side. The keyboard is disabled when the plastic key is removed from the keyhole. (See Figure 3-22.)

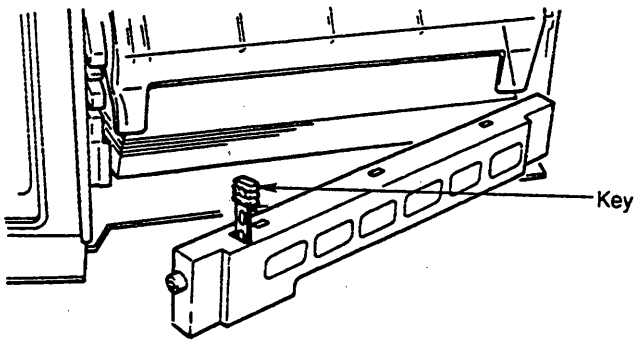


Figure 3-22. Key Lock

When you do not intend to operate the keyboard for a long time, you may lock the recorder to prevent operation by mistake. If the keys are disabled by the key lock, you can still:

- Change the displays
- Enter the SET UP Mode
- Use the ESC function.

You can set which keys will be affected by the key lock. (See Section 7.)

NOTE

Note:
- If keys are disabled by the key lock, you cannot enter the SET Mode. Pressing the MENU key for three seconds has no result.
- Remote control signals and communication signals (optional) are not affected by the key lock.

CAUTION

Caution: When locking, the key must be removed from the keyhole. Keep it in a safe place. Settings cannot be changed when the key is lost.

Notes

4 Entering Settings

This section describes the idea behind the settings of the RD100A Recorder. It is important to read this section carefully before entering or changing settings for the first time.

4.1 Modes

To make the use of the RD100A Recorder as easy as possible, the operation and setting are broken down into three modes. These are as follows.

4.1.1 Operation Mode

This mode is for basic operation, which is the operation on a daily basis, excluding settings. It includes operations such as recording, chart feed, acknowledging alarms, and printing out messages, lists, and values.

When the power to the RD100A is turned ON, the recorder will be automatically in the operation mode. The operations within this mode are described in Section 3.

4.1.2 SET Mode

This mode will be used when setting parameters must be entered or changed. The parameters include not only settings of range and span, units, alarms, chart speed, and clock, but also auxiliary settings that allow you to use the RD100A's many functions. To enter the SET Mode, press the MENU key for three seconds. To return to the operation mode, press the MENU key for three seconds again.

The settings of range and span, units, alarms, chart speed, and clock are described in Section 5. The auxiliary settings (such as example zone recording settings) are described in Section 6.

4.1.3 SET UP Mode

This mode will be used when initial settings must be changed. These settings are entered during the manufacturing of the recorder and seldom need to be changed. These settings include alarm relay adjustments, etc. To enter the SET UP Mode, press the ENT key while turning ON the power.

Note: When you are in the SET UP Mode, the recording cannot be ON, and alarms will not be detected.

For a detailed overview of the initial settings, see Section 4.5. For a description of how to perform the settings, see Section 7. Figure 4-1 shows the structure of modes.

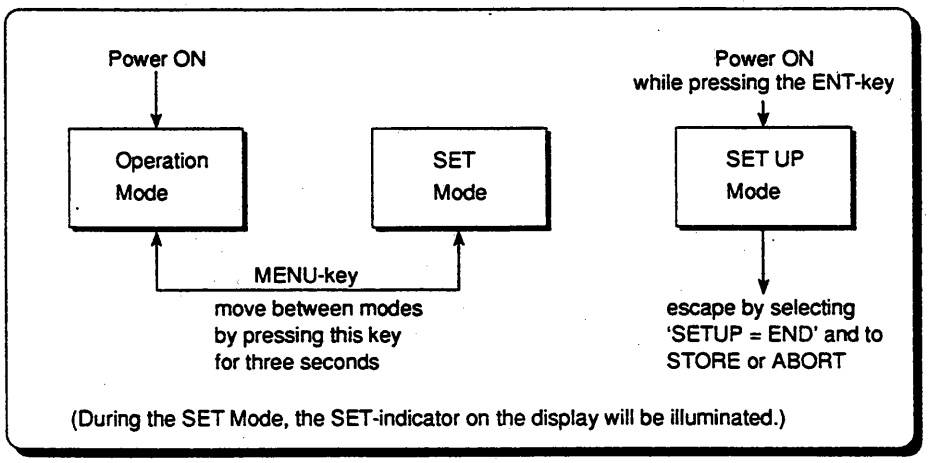


Figure 4-1. Mode Structure

4.2 Concept of Setting Parameters

4.2.1 Display

The user interface is interactive, which means that you will be asked to enter the necessary data. All data can be entered using the keyboard. When entering data, the functions that are pictured above the actual keys are valid.

The display usually consists of two parts, as shown in Figure 4-2.

Figure 4-2. Display-1

The parameters that need to be entered are shown in black with white letters in this manual. These parameters will flash on the actual display.

In this manual, you can also find another type of display. (See Figure 4-3.)

The blank means that the actual display will show your previously set data. The display *SET OK* will appear once all of the necessary parameters have been entered succesfully. Pressing the ENT, UP/DOWN, or RIGHT key at those times will result in returning to the beginning of the same flow. Pressing the ESC key will return you to the previous level in the menu.

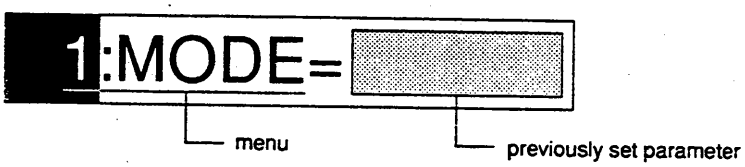


Figure 4-3. Display-2

4.2.2 Keys

The five keys on the right side of the keyboard can be used when entering data. (See Figure 4-4.)

Figure 4-4. Keyboard

ESC MENU — The MENU key is used to enter the SET Mode. The ESC key can be used to abort the setting before the *SET OK* display appears. The display will return to the previous level in the menu. After the *SET OK* display appears, pressing the ESC key will take you to the beginning of the same setting again.

PRINT ALARM ACK — The UP/DOWN keys can be used for moving through a menu. For example, when setting messages or units, these keys are used to select alphanumerical characters. UP shows the next choice, DOWN shows the previous choice.

FEED — The RIGHT key can be used for moving the cursor to the next digit (refer to Figure 4-5) while entering parameters (e.g., 0.000). Since there is no backspace key provided, this key will move to the first digit after the last digit.

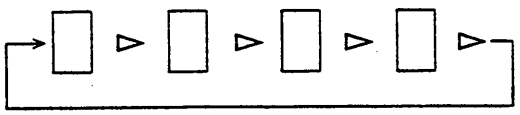


Figure 4-5. The Right Key

NOTE

Note: If the decimal point is fixed, make sure to enter all of the digits.

Example

You Entered:	Result Will Be:
2._ _	0.02 (entered value will be placed at last digit)
2.00	2.00

The ENT key is used for keeping the set parameters. After pressing this key, you will be asked to enter the next parameters. If you entered incorrect data, but have not yet pressed the ENT key, use the UP/DOWN/RIGHT keys to correct your error. If you have pressed the ENT key already, press the ESC key and enter all of the necessary data again.

4.2.3 Menus

In the paragraphs in which the setting procedures are explained, you will find menus such as those shown in Figure 4-6.

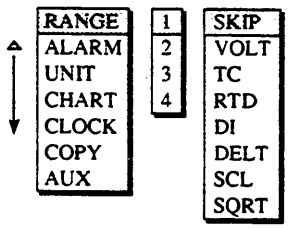


Figure 4-6. Menus

These menus will not be shown on the actual display. They make clear which steps need to be taken to set that parameter. Once you are familiar with how to operate the RD100A, these menus may be sufficient for you.

NOTE **Note**: Most of the menus used in this manual show the menu for the pen model.

4.3 Flow Charts

This section describes the setting flows of the three modes. These are the Operation Mode, SET Mode, and SET UP Mode.

4.3.1 Flow Chart of the Operation Mode

This flow can be entered by pressing the corresponding function keys. (Refer to Figure 4-7.)

4.3.2 Flow Chart of the SET Mode

This flow can be entered by pressing the MENU key for three seconds. (Refer to Figure 4-8.)

4.3.3 Flow Chart of the SET UP Mode

This flow can be entered by turning ON the power while pressing the ENT key. (Refer to Figure 4-9.)

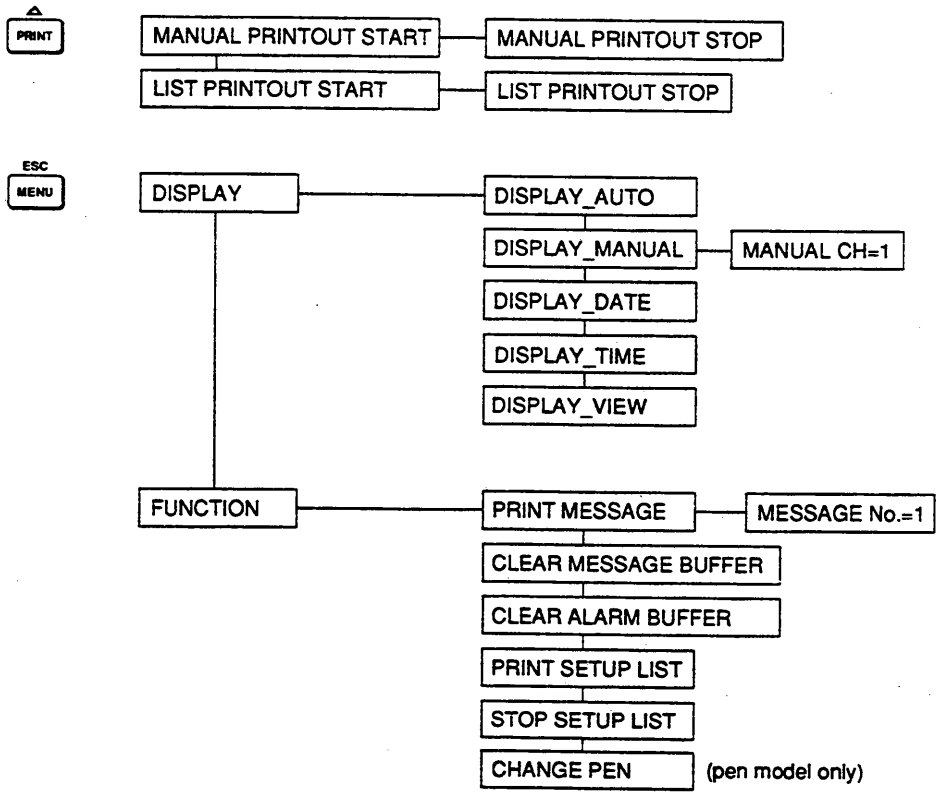


Figure 4-7. Operation Mode Flow Chart

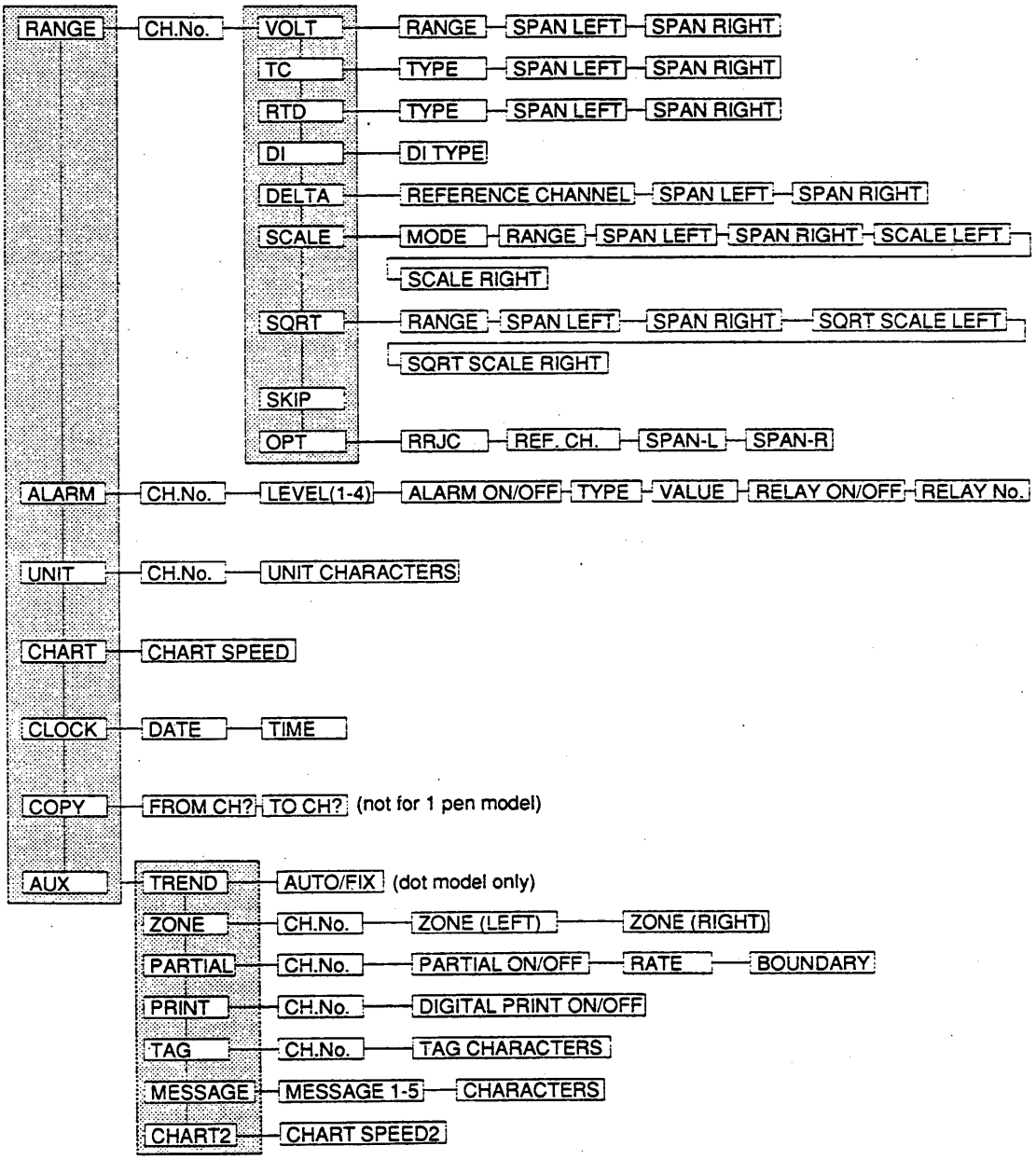


Figure 4-8. SET Mode Flow Chart

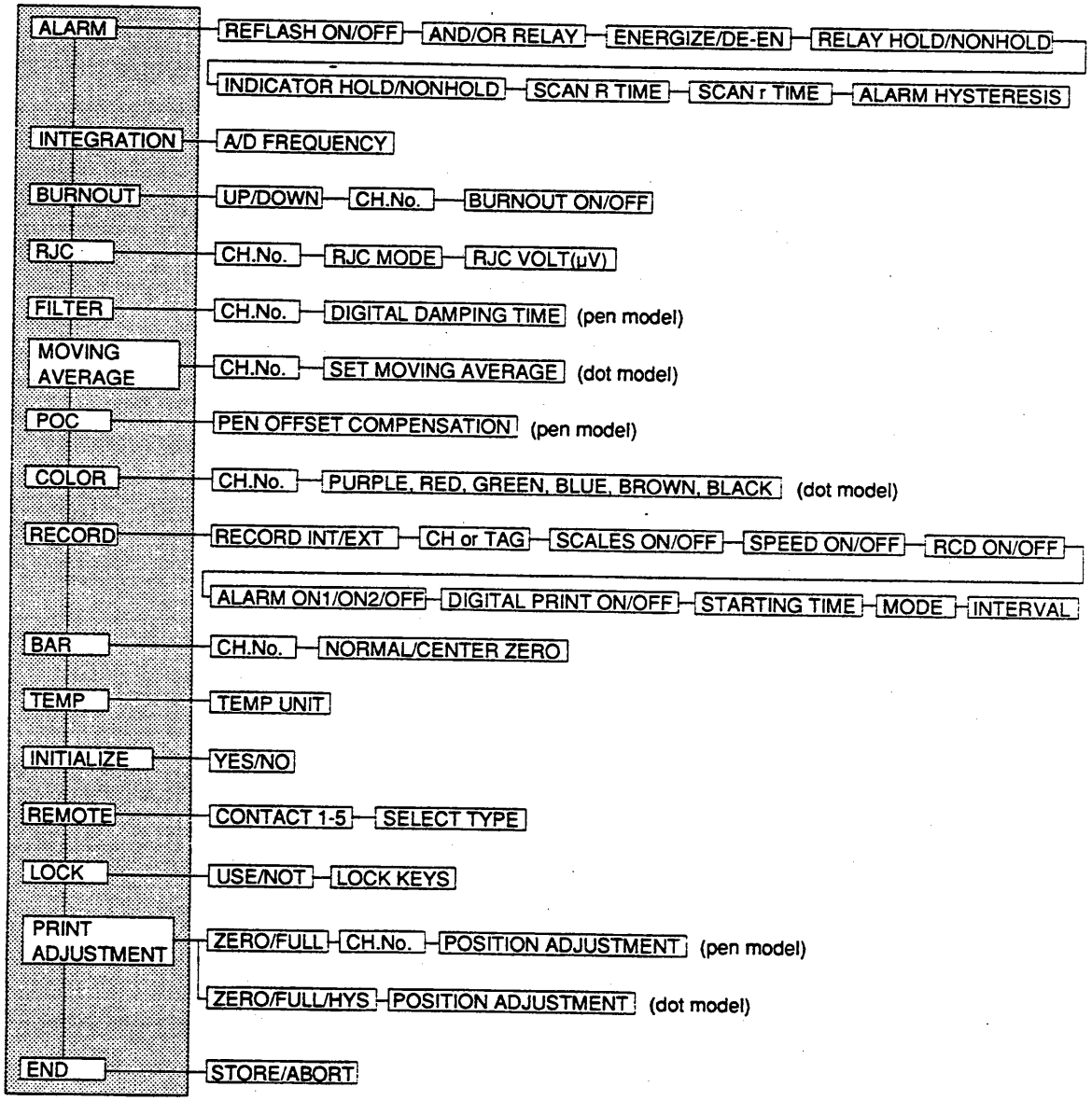


Figure 4-9. SET UP Mode Flow Chart

4.4 Setting Parameters in SET Mode

The parameters of the SET Mode are shown in Table 4-1 below.

Table 4-1. SET Mode

Setting Parameters			Values				Remarks
RANGE	MODE	VOLT	20mV	60mV	200mV	2V	DC voltage input
			6V	20V			
		TC	R	S	B	K	Thermocouple input
			E	J	T	N	
			W	L	U		
		RTD	JPT	PT			Input by Resistance Temperature Detector
		DI	LEVL	CONT			Digital Input LEVL: voltage input CONT: contact input
		DELT					Differential computation
		SCL	VOLT	TC	RTD		Assigning a different scale
		SQRT	20mV	60mV	200mV	2V	Taking square root of measured data
			6V	20V			
		SKIP					Skips a channel
ALARM	LEVEL		1	2	3	4	
	Alarm (ALM)		ON	OFF			Alarm setting ON/OFF
	TYPE		H	L	h	l	h and l can only be selected in combination
			R	r			with 'DELT' input.
	Alarm value						
	Relay (RLY)		ON	OFF			
	Relay No. (R.N.)		I01 to I12				Relay 1 to 12, depending on option
UNIT							Assigning unit to scales. Only possible in case of SCL or SQRT. Max 6 characters.
CHART							Setting chart speed
CLOCK							Setting date and time
COPY							
AUX	TREND (dot model only)		AUTO	FIX			Selecting analog recording interval
	ZONE						Zone recording
	PARTIAL	partial	ON	OFF			Partial compression ON/OFF
		rate					Compression rate
		boundary					Boundary value
	PRINT	periodic printout	ON	OFF			Periodic printout ON/OFF
	TAG						Tag setting, max 7 characters
	MESSAGE		MSG1	MSG2	MSG3	MSG4	Max 5 messages, each up to 16 characters
			MSG5				
	Chart speed 2						Chart speed for change-on-alarm & remote

4.5 Initial Setting Values

The initial setting values for the SET and SET UP Modes are shown below in Table 4-2.

Table 4-2. Initial Setting Values

SET Mode

RANGE	VOLT (–2.000V to 2.000V)
ALARM	OFF
UNIT	all spaces
CHART	20 mm/h
TREND	AUTO
ZONE	0 to 100mm
PARTIAL	OFF
PRINT	ON
TAG	all spaces
MESSAGE	all spaces
CHART2	20 mm/h

SET UP Mode

Function	Display	Initial Value
REFLASH function	REFLASH=	OFF
Output relay AND/OR	AND=	NONE
Output relay ENERG/DE-EN	ALARM=	ENERG
Output relay HOLD/NONHOLD	RLY=	NONHOLD
Alarm indicator HOLD/NONHOLD	IND=	NONHOLD
Sampling interval for rate-of-change alarm R	R TIME=	01
Sampling interval for rate-of-change alarm r	r TIME=	01
Alarm hysteresis	ALM HYS=	ON (approx. 0.5%)
A/D INTEGRATION TIME	INTG=	AUTO (pen model) 100 msec (dot model)
BURNOUT	B.OUT=	UP
BURNOUT	B.OUT=	OFF for every channel
RJC	RJC=	INT for every channel
Filter (pen model)	FILT=	OFF for every channel
Moving average (dot model)	M AVE=	OFF for every channel
Pen Offset Compensation (pen model)	POC=	OFF
COLOR (dot model)	COLOR=	1=purple, 2=red, 3=green, 4=blue, 5=brown, 6=black
Record trigger	RECORD=	INT
CH/TAG Printout	CH/TAG=	CH
Scale Printout	SCL PR=	ON
New chart speed Printout	SPD PR=	OFF
Record start time Printout	RCD PR=	OFF
Alarm Printout	ALM PR=	ON1
Periodic Printout	DGT PR=	INT. START 00:00
Periodic Printout Mode	MODE=	AUTO
Periodic Printout Interval	INTVL=	1h
Bargraph	BAR=	NORML for every channel
Temperature unit	TEMPUNIT=	°C
Remote control	CONT.No.=	1=RECORD 2=CHART SPEED 3=MANUAL PR 4=MESSAGE1 5=MESSAGE2
Key Lock	LOCK=	NOT
Key Lock Record key	RCD=	LOCK
Key Lock FEED key	FEED=	LOCK
Key Lock ACK key	ACK=	LOCK
Key Lock PRINT key	PRINT=	LOCK

Notes

5 Basic Settings

This section explains how to perform the settings (initial values are given in parentheses) of:

- Input range and recording span (VOLT, –2V to +2V)
- Alarms (OFF)
- Units (all spaces)
- Chart speed (20 mm/h)
- Clock.

Section 5.6 describes how settings can be copied to other channels.

5.1 How to Set Input Range and Recording Span

One of the following parameters can be set for every channel:

SKIP	Prevents the specified channel from being measured, recorded, and displayed (Section 5.1.1).
VOLT	Measures and records dc voltage (5.1.2).
TC	Measures and records temperatures using thermocouple (5.1.3).
RTD	Measures and records temperatures using resistance temperature detector (5.1.3).
DI	Accepts digital input (contact/voltage level) and performs ON/OFF recording (5.1.4).
DELT	Performs difference computation between two channels that have the same input range (5.1.5).
SCL	Performs scaling on voltage, TC, and RTD measurements (5.1.6); scaling results in appending a different scale to the measured values.
SQRT	Takes the square root of dc voltage measured data (5.1.7).

5.1.1 SKIP Setting

Unused channels can be skipped, which means that these channels will not be measured, recorded, or displayed. (Refer to Figure 5-1.)

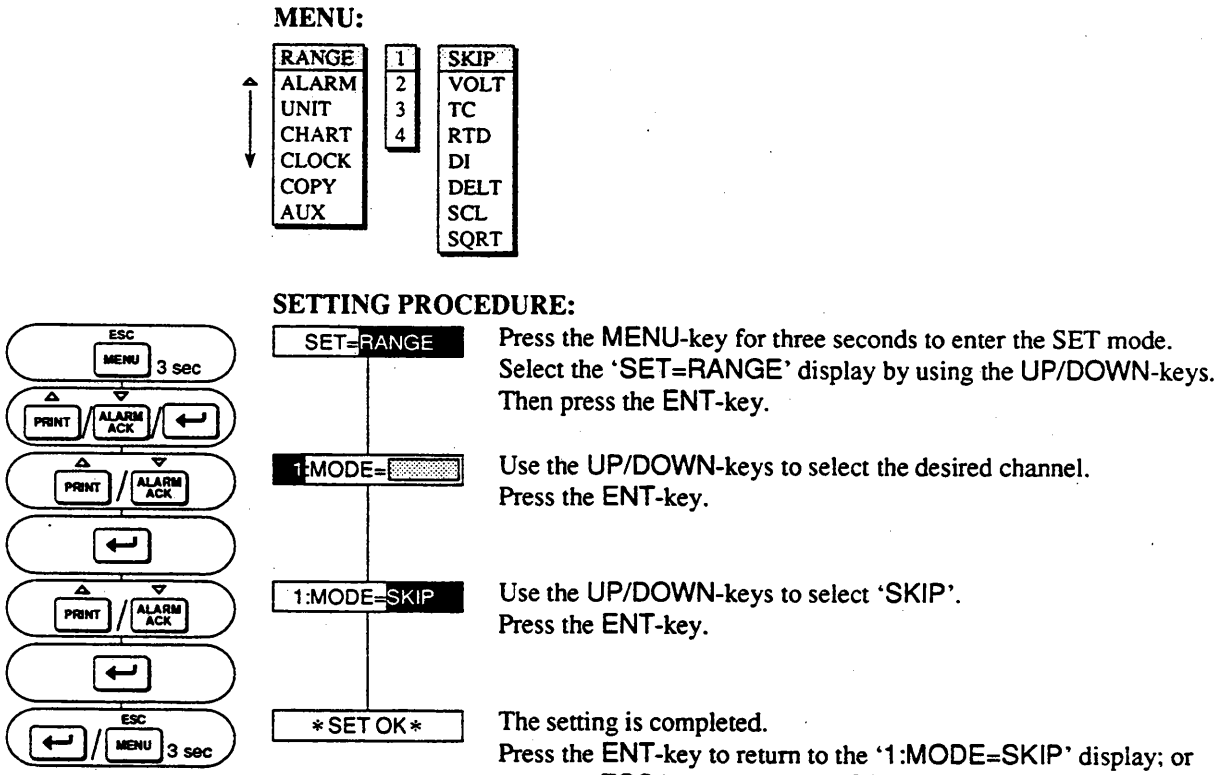


Figure 5-1. Skipping a Setting

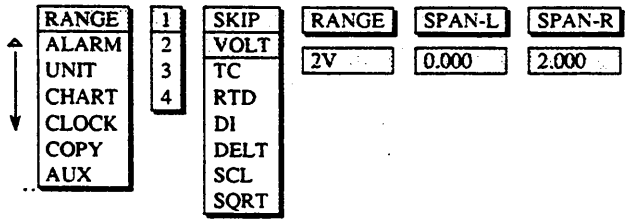
5.1.2 Voltage Measurement (VOLT) Setting

If the measured signal is a dc voltage, the range can be set as shown in Figure 5-2.

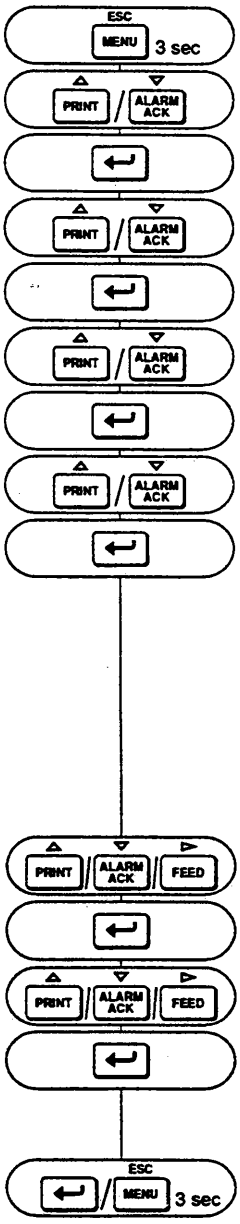
5.1.3 Thermocouple and Resistance Temperature Detector Setting

If the measured signal is a TC (thermocouple) or RTD (resistance temperature detector), the range can be set the same way as if it were a dc voltage. (Refer to Figure 5-3.)

MENU:



SETTING PROCEDURE:



SET=RANGE

Press the MENU-key for three seconds to enter the SET mode.
Select the 'SET=RANGE' display by using the UP/DOWN-keys.
Then press the ENT-key.

1:MODE=

Use the UP/DOWN-keys to select the desired channel.
Press the ENT-key.

1:MODE=VOLT

Use the UP/DOWN-keys to select 'VOLT'.
Press the ENT-key.

1:RNG=2V

Select the desired range using the UP/DOWN-keys and press the ENT-key.

Table 7.1 VOLT Input Ranges

Display	Range
20mV	-20.00 to 20.00mV
60mV	-60.00 to 60.00mV
200mV	-200.0 to 200.0mV
2V	-2.000 to 2.000V
6V	-6.000 to 6.000V
20V	-20.00 to 20.00V

1:L=0.000

Select the minimum value of the recording span (SPAN L) using the UP/DOWN and RIGHT-keys. Then press the ENT-key.

1:R=2.000

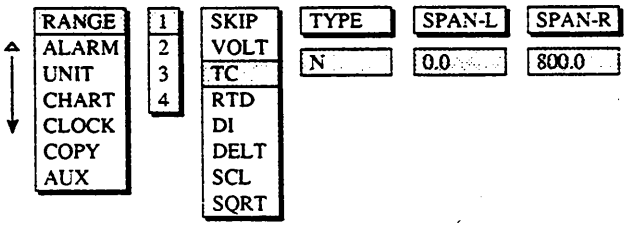
The display which appears will allow you to enter the maximum value of the recording span (SPAN R). Select it the same way as for the minimum value and press the ENT-key.
Note that the recording span cannot be beyond the input range, nor can SPAN L be equal to SPAN R.

SET OK

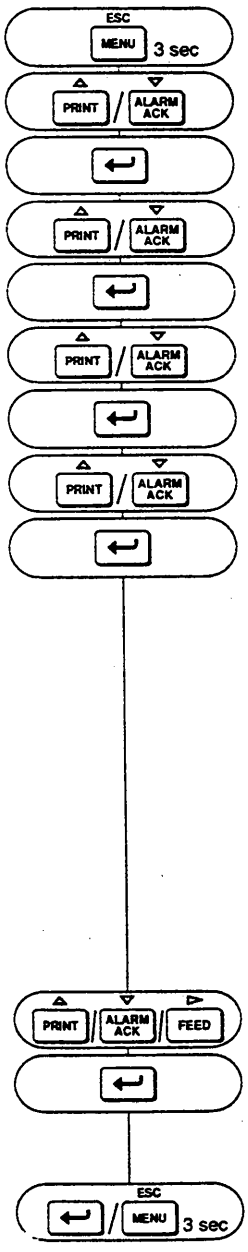
The setting is completed.
Press the ENT-key to return to the '1:MODE=VOLT' display; or press the ESC-key to go to the 'SET=RANGE' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-2. VOLT Setting

MENU:



SETTING PROCEDURE:



Press the MENU-key for three seconds to enter the SET mode.
Select the 'SET=RANGE' display by using the UP/DOWN-keys.
Then press the ENT-key.

Use the UP/DOWN-keys to select the desired channel.
Press the ENT-key.

Use the UP/DOWN-keys to select 'TC', or 'RTD'.
Press the ENT-key.

Select the desired type (R, S, B, K, E, J, T, N, W, L, U in case of TC, or PT, JPT in case of RTD) using the UP/DOWN-keys and press the ENT-key.

TC Type Description	Range	
R	0.0 to 1760.0°C	32 to 3200°F
S	0.0 to 1760.0°C	32 to 3200°F
B	0.0 to 1820.0°C	32 to 3308°F
K	-200.0 to 1370.0°C	-328 to 2498.0°F
E	-200.0 to 800.0°C	-328.0 to 1472.0°F
J	-200.0 to 1100.0°C	-328.0 to 2012.0°F
T	-200.0 to 400.0°C	-328.0 to 752.0°F
N	0.0 to 1300.0°C	32 to 2372°F
W	0.0 to 2315.0°C	32 to 4199°F
L (Fe-CuNi)	-200.0 to 900.0°C	-328.0 to 1652.0°F
U (Cu-CuNi)	-200.0 to 400.0°C	-328.0 to 752.0°F
PLT (PRATINEL)*1	0.0 to 1900.0°C	32 to 3452°F
PR (PR40-20)*1	0.0 to 1400.0°C	32 to 3552°F

*1: For /N1 model

RTD Type Description	Range	
PT (pt100Ω)	-200.0 to 600.0°C	-328.0 to 1112.0°F
JPT (Jpt100Ω)	-200.0 to 550.0°C	-328.0 to 1022.0°F
JP50 (JPt50Ω)*1	-200.0 to 600.0°C	-328.0 to 1112.0°F
CU to 6 (Cu10Ω)*2	-200.0 to 300.0°C	-328.0 to 572.0°F
CU25 (Cu25Ω)*2	-200.0 to 300.0°C	-328.0 to 572.0°F

*1: For /N3 model
*2: For /N1 model
The Pt and JPt type can't be set together with the Cu types.
Cu1: Cu10Ω GE
Cu2: Cu10Ω L&N
Cu3: Cu10Ω WEED
Cu4: Cu10Ω BAILAY
Cu5: Cu10Ω α=0.0392 at 20°C
Cu6: Cu10Ω α=0.0393 at 20°C
Cu25: Cu25Ω α=0.00425 at 0°C

Select the desired minimum value (SPAN L) and maximum value of the recording span (SPAN R) in the same way as described under 'VOLT setting'.
Note that the recording span cannot be beyond the input range, nor can SPAN L be equal to SPAN R.

The setting is completed.
Press the ENT-key to return to the '1:MODE=TC' display; or press the ESC-key to go to the 'SET=RANGE' display; or press the MENU-key for three seconds to return to the Operation mode.

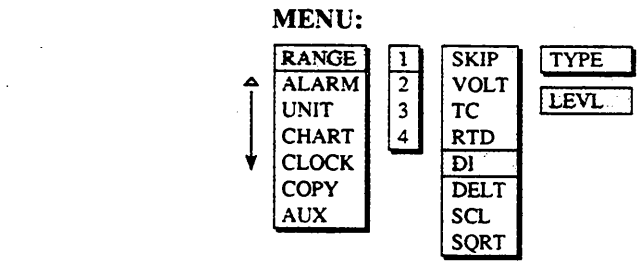
Figure 5-3. TC/RTD Setting

NOTE

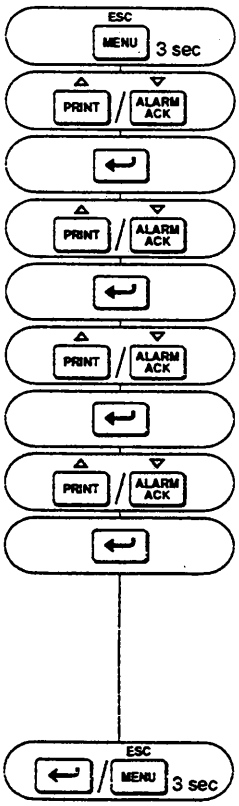
Note: There is no need to set the temperature unit in the case of TC or RTD input, since °C will be automatically provided. To change the setting of the temperature unit, which can only be changed in the SET UP Mode, see Section 7.

5.1.4 Digital Input (DI) Setting

If a digital input (contact input/voltage level input) is being used, the setting can be done as shown in Figure 5-4.



SETTING PROCEDURE:



SET=RANGE

Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=RANGE' display by using the UP/DOWN-keys. Then press the ENT-key.

1:MODE=

Use the UP/DOWN-keys to select the desired channel. Press the ENT-key.

1:MODE=DI

Use the UP/DOWN-keys to select 'DI'. Press the ENT-key.

1:TYPE=LEVL

There are two types, namely LEVEL and CONTACT.

LEVL: (VOLT) Records ON/OFF status of a voltage input (0 to 2.4V is OFF (0), 2.4V and higher is ON (1)).

CONT: (Contact) Records ON/OFF status of a contact (close is ON (1), open is OFF (0)).

Select the desired type using the UP/DOWN-keys and press the ENT-key.

SET OK

The setting is completed.

Press the ENT-key to return to the '1:MODE=DI' display; or press the ESC-key to go to the 'SET=RANGE' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-4. DI Setting

NOTE

Note: The above mentioned selections will result in a recording trace from 0 mm to 100 mm between the contact statuses OFF and ON. This is from the extreme left side of the chart to the extreme right side. If desired, a zone for the ON/OFF recording can be set. (See Section 6.)

5.1.5 Difference Computation (DELT) Setting

To obtain the difference between the measured values of two channels, proceed as shown in Figure 5-5. Note that this setting can only be applied if the reference channel is of the VOLT, TC, or RTD type.

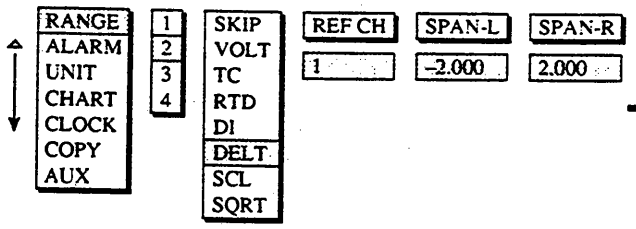
5.1.6 Scale (SCL) Setting

To assign a different scale to the measured data, the range can be set as described in Figure 5-6. Note that the measured data that can get a different scale must be of the voltage (VOLT), thermocouple (TC), or resistance temperature detector (RTD) type. To assign a unit to this new scale, refer to UNIT setting (see Section 5.3).

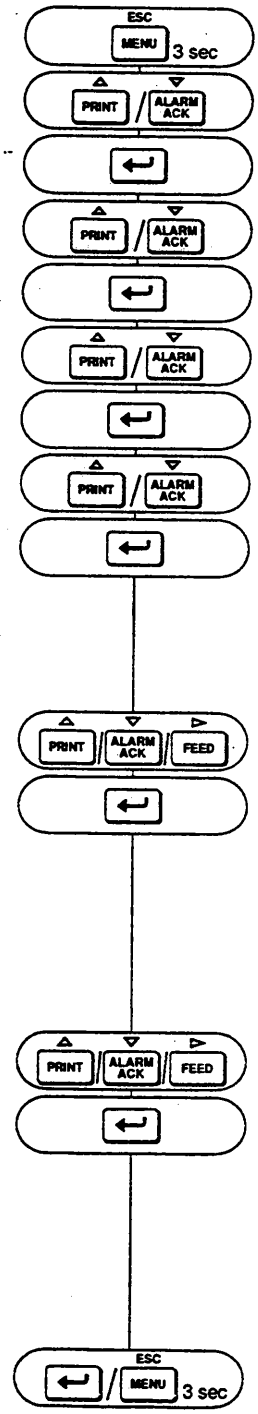
5.1.7 Setting to Obtain Square Root (SQRT)

To obtain the square root of the measured value, proceed as shown in Figure 5-7. Note that the measured data (of which the square root can be taken) can only be of the voltage type. To assign a unit, refer to UNIT setting (see Section 5.3).

MENU:



SETTING PROCEDURE:



Press the MENU-key for three seconds to enter the SET mode.
Select the 'SET=RANGE' display by using the UP/DOWN-keys.
Then press the ENT-key.

Use the UP/DOWN-keys to select the desired channel.
Note that channel No.1 cannot be of the 'DELT' type.
Press the ENT-key.

Use the UP/DOWN-keys to select 'DELT'.
Press the ENT-key.

The display which appears will allow you to enter a reference channel number. Note that the reference channel number must be lower than that of the channel being set. Therefore channel No.1 cannot be of the 'DELT' type.
Use the UP/DOWN-keys to select the desired reference channel number.
Press the ENT-key.

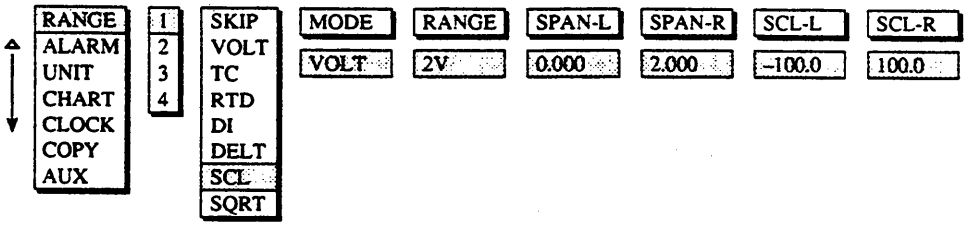
The display which appears will show the same minimum value of the recording span as of the reference channel.
Use the UP/DOWN and RIGHT-keys to select the minimum value.
Press the ENT-key.
Note that in case of VOLT, the input range of the DELT-channel must be within the range of the reference channel. The difference in measured value from the reference channel will be recorded on the DELT-channel.

The display which appears will show the same maximum value of the recording span as of the reference channel.
Use the UP/DOWN and RIGHT-keys to select the maximum value. Note that SPAN L cannot be equal to SPAN R.
Press the ENT-key.
Note that in case of TC, RTD, the maximum span values can be found by taking the ±value of the input range width. E.g. input range of TC type L = –200 to 900°C: maximum span values will be at ±1100°C.

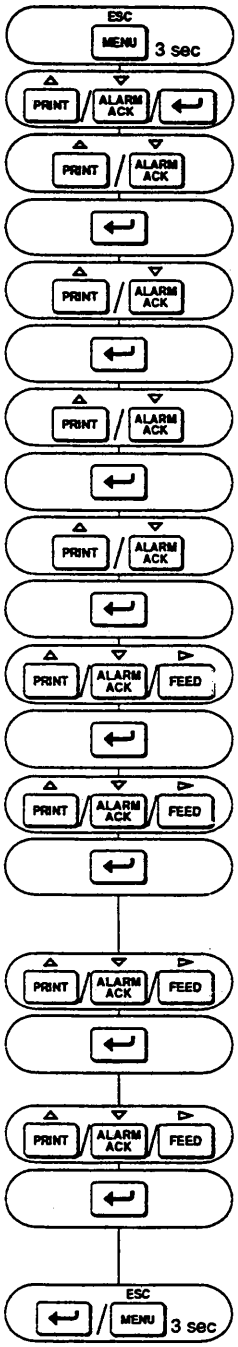
The setting is completed.
Press the ENT-key to return to the '2:MODE=DELT' display, or press the ESC-key to go to the 'SET=RANGE' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-5. DELT Setting

MENU:



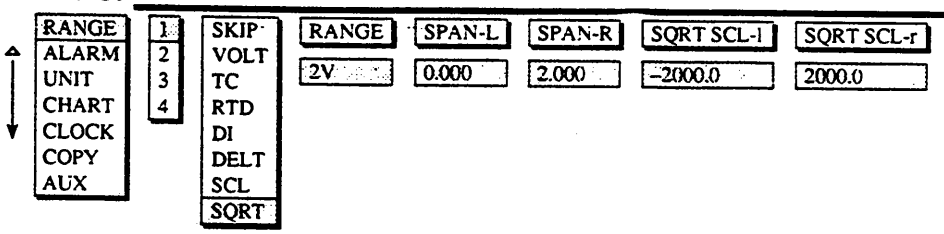
SETTING PROCEDURE:



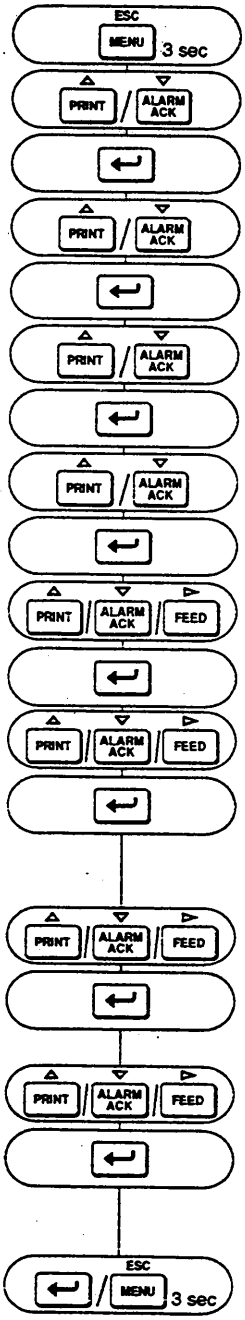
SET=RANGE	Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=RANGE' display by using the UP/DOWN-keys. Then press the ENT-key.
1:MODE=	Use the UP/DOWN-keys to select the desired channel. Press the ENT-key.
1:MODE=SCL	Use the UP/DOWN-keys to select 'SCL'. Press the ENT-key.
1:MOD'=VOLT	Select the input type using the UP/DOWN-keys and press the ENT-key.
1:RNG=2V	Select the desired range (using the UP/DOWN-keys) and press the ENT-key.
1:L=0.000	The display which appears will allow you to enter the minimum value of the recording span. Select the desired minimum value using the UP/DOWN and RIGHT-keys. Then press the ENT-key.
1:R=2.000	The display which appears will allow you to enter the maximum value of the recording span. Select it the same way as the minimum value and press the ENT-key. Note that the decimal point will be in the same position as for SPAN L. SPAN L and SPAN R cannot be same.
1:l=-100.0	This display allows you to enter the minimum value of the scale corresponding to the minimum value of the recording span. Select it using the UP/DOWN and the RIGHT-keys. Note that the allowable range is –20000 to 20000. Then press the ENT-key.
1:r=100.0	This display allows you to enter the desired maximum value of the scale corresponding to the maximum value of the recording span. Select it the same way as the minimum value. Then press the ENT-key. Note that the decimal point will be in the same position as for SCL L. SCL L and SCL R cannot be same.
SET OK	The setting is completed. Press the ENT-key to return to the '1:MODE=SCL' display; or press the ESC-key to go to the 'SET=RANGE' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-6. SCL Setting

MENU:



SETTING PROCEDURE:



SET=RANGE

Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=RANGE' display by using the UP/DOWN-keys. Then press the ENT-key.

1:MODE=

Use the UP/DOWN-keys to select the desired channel. Press the ENT-key.

1:MODE=SQRT

Use the UP/DOWN-keys to select 'SQRT'. Press the ENT-key.

1:RNG=2V

Select the desired range (using the UP/DOWN-keys) and press the ENT-key.

1:L=0.000

The display which appears will allow you to enter the minimum value of the recording span. Select the desired minimum value using the UP/DOWN and RIGHT-keys. Then press the ENT-key.

1:R=2.000

The display which appears will allow you to enter the maximum value of the recording span. Select it the same way as for the minimum value and press the ENT-key. Note that the decimal point will be in the same position as for SPAN L. SPAN L and SPAN R cannot be same.

1:l=-2000.0

This display allows you to enter the minimum value of the scale corresponding to the minimum value of the recording span. Select it using the UP/DOWN and the RIGHT-keys. Note that the allowable range is –20000 to 20000. Then press the ENT-key.

1:r=2000.0

This display allows you to enter the maximum value of the scale corresponding to the maximum value of the recording range. Select it the same way as for the minimum value. Then press the ENT-key. Note that the decimal point will be in the same position as for SCL l. SCL l and SCL r cannot be same.

* SET OK *

The setting is completed.
Press the ENT-key to return to the '1:MODE=SQRT' display; or press the ESC-key to go to the 'SET=RANGE' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-7. Obtaining an SQRT Setting

Explanation of Square Root

The RD100A uses the following square rooting method. The items are defined as follows:

V_{min} = minimum value of recording span (SPAN L)

V_{max} = maximum value of recording span (SPAN R)

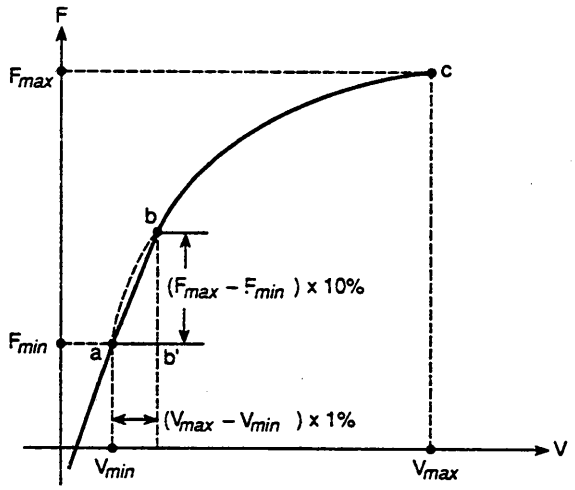
F_{min} = minimum value of scale (SQRT SCL l)

F_{max} = maximum value of scale (SQRT SCL r)

V_x = input voltage

F_x = scaling value.

The relationship between V_x (input voltage) and F_x (scaling value) is shown in Figure 5-8 (the graph configuration is approximate).



Between b and c in the graph, the following relation exists between F_x and V_x:

$$F_x = (F_{max} - F_{min}) \sqrt{\frac{V_x - V_{min}}{V_{max} - V_{min}}} + F_{min}$$

And between a and b, the relation is:

$$F_x = \frac{10\,(F_{max} - F_{min})}{V_{max} - V_{min}} (V_x - V_{min}) + F_{min}$$

Figure 5-8. The Relationship of Input Value and Scaling Value

5.2 How to Set Alarms

Alarms can be set on the measured data of any channel. If an alarm is set, and an alarm occurs, the ALM indicator will be illuminated, and alarm printout will occur. If equipped with the optional alarm output relays, these will be activated by the occurrence of an alarm.

Up to four alarm levels can be set per channel. Six types of alarms are available. These are:

H High limit alarm: alarm is generated when the measured value is higher than or equal to the alarm value.

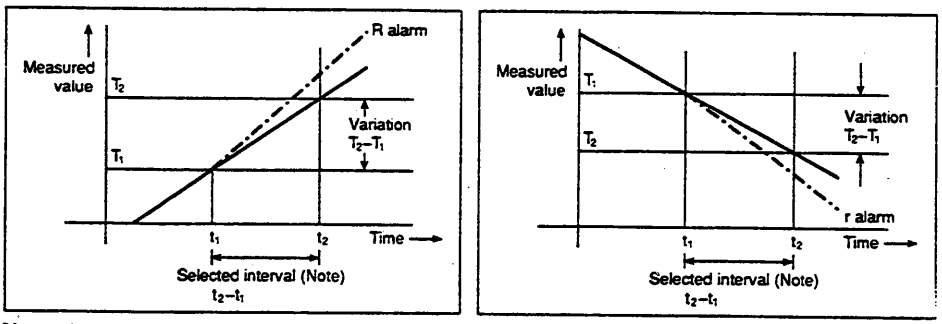
L Low limit alarm: alarm is generated when the measured value is lower than or equal to the alarm value.

R Rate-of-change limit on increase: high alarm is generated when the measured value variation in the ascending direction during a selected interval is greater than or equal to the alarm setting.

r Rate-of-change limit on decrease: low alarm is generated when the measured value variation in the descending direction during a selected interval is greater than or equal to the alarm setting. (Refer to Figure 5-9.)

h Difference high-limit alarm: alarm is generated when the difference between the measured values of two channels is more than the alarm setting. (This type of alarm can only be set when the corresponding channel is of the DELT type.)

l Difference low-limit alarm: alarm is generated when the difference between the measured values of two channels is less than the alarm setting. (This type of alarm can only be set when the corresponding channel is of the DELT type.)



Note: the selected interval is determined during rate-of-change alarm set-up.

Figure 5-9. Rate-of-change Limit on Decrease

NOTE

Note: Alarm settings are automatically canceled on the affected channel, when any of the following changes occur:

- The input type (VOLT, TC, etc.) or input range (2 V, etc.) is changed
- The decimal point for linear scaling and square root is changed
- The minimum or maximum value of the recording span is changed (in case of linear scaling and square root)
- The minimum or maximum value of the scale is changed (in case of linear scaling and square root).

Difference alarm settings (h, l) are canceled when any of the following changes occur:

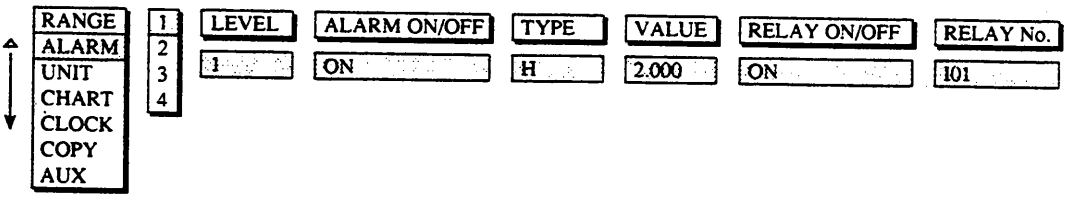
- The reference channel is changed
- The input type or range of the reference channel is changed.

The initial value is OFF for all channels and all levels. To set an alarm, proceed as shown in Figure 5-10.

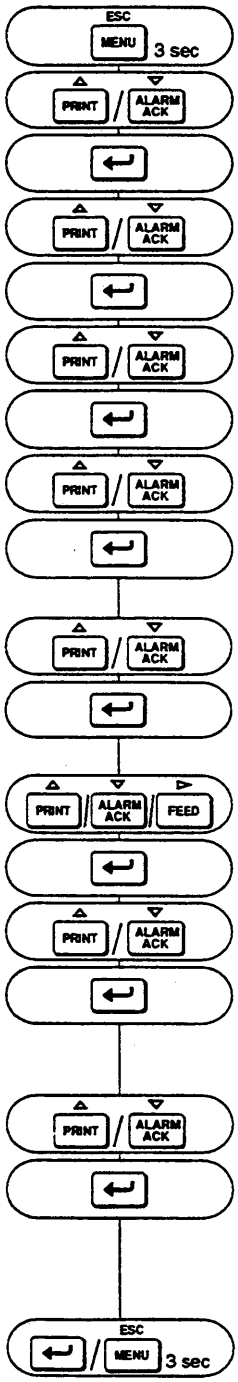
NOTE

Note: Provided that your RD100A is equipped with the –AR or –AR6 option, the chart speed can be changed when an alarms occurs. (Refer to Section 6.) The alarm relay can be of two types, the HOLD and NON-HOLD type. (See Section 7.)

MENU:



SETTING PROCEDURE:



Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=ALARM' display by using the UP/DOWN-keys. Then press the ENT-key.

Select the desired channel using the UP/DOWN-keys, and press the ENT-key.

Select the desired level of the alarm using the UP/DOWN-keys. Up to four levels can be set. Then press the ENT-key.

Select the status of the alarm (ON or OFF) by using the UP/DOWN-keys. Initially all are set to OFF. Then press the ENT-key. When OFF is selected, setting is completed. Alarms cannot be set for a SKIP or DI channel.

The display which appears will allow you to enter the type of alarm. Six types are available. After selection by using the UP/DOWN-keys, press the ENT-key. h, l will appear only if the corresponding channel is of the DELT-type.

The display which appears will allow you to enter the alarm value. Set the alarm value using the UP/DOWN and RIGHT-keys. After setting, press the ENT-key.

The display which appears will allow you to specify whether an output relay should be activated (ON) or not (OFF). Note that output relays are optional (–AR or –AR6). If the option is not installed, data entry will be ignored. After selection, using the UP/DOWN-keys, press the ENT-key.

The display which appears will prompt you to specify the output relay number. Up to 12 output relays I01 to I12 can be specified, depending on the option.
Note that when you specify a relay, with which your RD100A is not equipped, data entry will be ignored.
Select by using the UP/DOWN-keys and press the ENT-key.

The setting is completed.
Press the ENT-key to return to the '1:LEVEL=1' display; or press the ESC-key to go to the 'SET=ALARM' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-10. Setting an Alarm

5.3 How to Assign Units

When you are using scaling (SCL) or the square root setting (SQRT), it is possible to assign a different unit to the scales. Up to six characters can be set. Note that only three characters will be shown on the display, but all six will be printed on the chart. The initial value is all spaces. To set, proceed as shown in Figure 5-11.

5.4 How to Set the Chart Speed

The chart speed can be set within a range of 1 to 12000 mm/h, depending on your model. The initial value is 20 mm/h. To set the chart speed, proceed as shown in Figure 5-12.

NOTE

Note: Setting the chart speed that goes into effect following a remote control signal or an alarm occurrence (–AR or –AR6 options) is performed under the AUX settings (see Section 6).

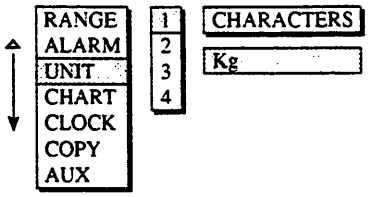
In the case of the pen model, if the chart speed is high (600 to 1500 mm/h), the time tick in the periodic printout will contain an error (e.g., if speed is 1500 mm/h, the error will be approximately 2 cm).

In the case of the dot model, if you selected a chart speed of 1 to 5 mm/h, select AUTO for the trend recording format to prevent chart paper damage (see Section 6).

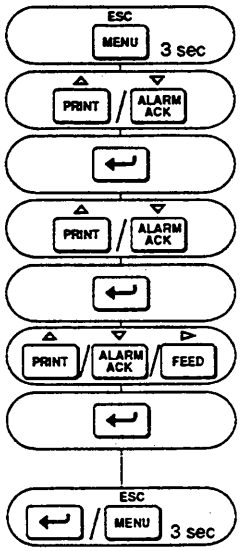
5.5 How to Set the Clock

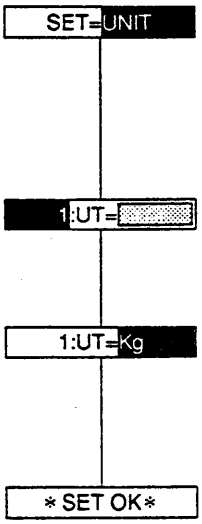
To set the date and time of the internal clock, proceed as shown in Figure 5-13.

MENU:



SETTING PROCEDURE:





Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=UNIT' display by using the UP/DOWN-keys. Then press the ENT-key.

Specify the desired channel using the UP/DOWN-keys, and press the ENT-key. If the selected channel is not of the SCL or SQRT-type, data entry will be ignored.

Type the desired unit (up to six characters) using the UP/DOWN and RIGHT-keys. Press the ENT-key.

The setting is completed.
Press the ENT-key to return to the '1:UT=Kg' display; or press the ESC-key to go to the 'SET=UNIT' display; or press the MENU-key for three seconds to return to the Operation mode.

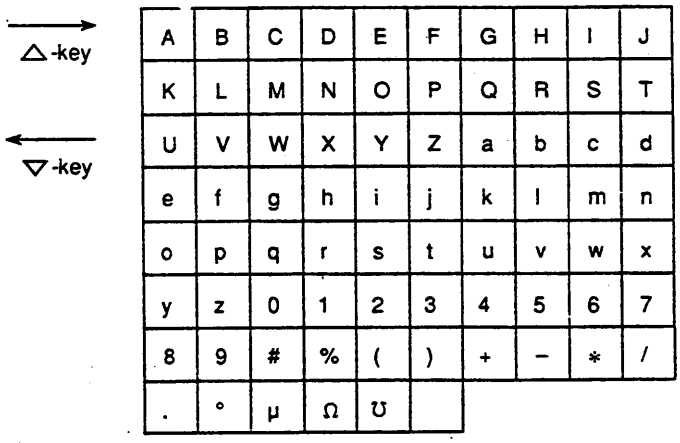
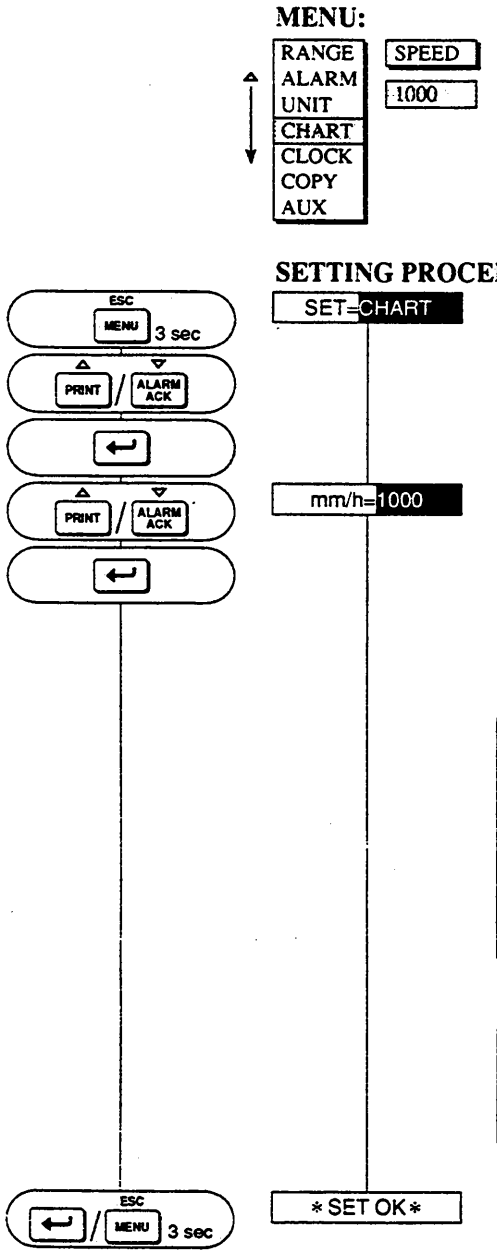


Figure 5-11. Assigning Units



Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=CHART' display by using the UP/DOWN-keys. Then press the ENT-key.

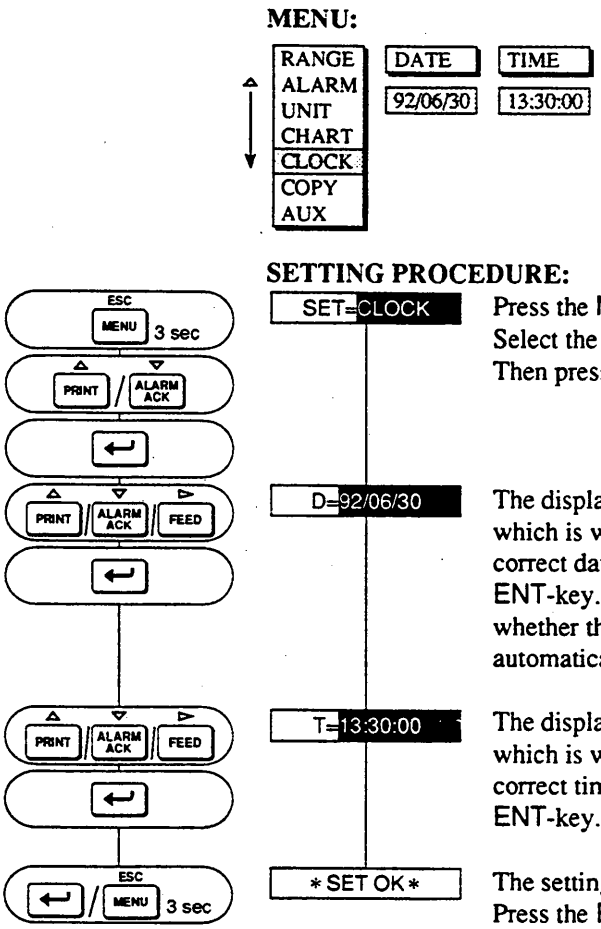
In case of the pen model, select the desired chart speed using the UP/DOWN-keys, and press the ENT-key. The different possible chart speeds are listed below in
In case of the dot model, set the desired chart speed using the UP/DOWN and RIGHT-keys, and press the ENT-key.

5	6	8	9	10	12	15	16	18	20
24	25	30	32	36	40	45	48	50	54
60	64	72	75	80	90	96	100	120	125
135	150	160	180	200	225	240	250	270	300
320	360	375	400	450	480	500	540	600	675
720	750	800	900	960	1000	1080	1200	1350	1440
1500	1600	1800	2000	2160	2250	2400	2700	2880	3000
3600	4000	4320	4500	4800	5400	6000	7200	8000	9000
10800	12000								

Model	Periodic Printout	Alarm Printout/Message Printout/ Recording Start/Chart Speed Change
pen model	5 to 9 mm/h, 1600 to 12000 mm/h	1600 to 12000 mm/h
dot model	1 to 9 mm/h, 101 to 1500 mm/h	101 to 1500 mm/h

The setting is completed.
Press the ENT-key to return to the 'mm/h=1000' display; or press the ESC-key to go to the 'SET=CHART' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-12. Setting Chart Speed



Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=CLOCK' display by using the UP/DOWN-keys. Then press the ENT-key.

The display which appears will allow you to enter the correct date, which is written as year/month/day (YY/MM/DD). Select the correct date using the UP/DOWN/RIGHT-keys. Then press the ENT-key. The date will be automatically updated, regardless whether the power is turned ON or OFF. Leap years are automatically provided.

The display which appears allows you to enter the correct time, which is written as hour:minute:second (HH:MM:SS). Select the correct time using the UP/DOWN/RIGHT-keys and press the ENT-key. When pressing the ENT-key, the clock will start.

The setting is completed.
Press the ENT-key to return to the 'D=92/06/30' display; or press the ESC-key to go to the 'SET=CLOCK' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 5-13. Setting the Clock

5.6 Copying Channel Settings to Another Channel

It is possible to copy settings from one channel to another. If executed, all settings involving range, alarm, unit, zone recording, partial expanded recording, periodic printout, and tag will be copied. (For the settings involving zone recording, partial expanded recording, periodic printout and tag, see Section 6.) These settings will all be copied; therefore, it is impossible, for example, to copy the alarm settings only.

The exact contents of these settings will be copied to the specified channel. Data entry will be ignored for the one-pen model. To copy, proceed as shown in Figure 5-14.

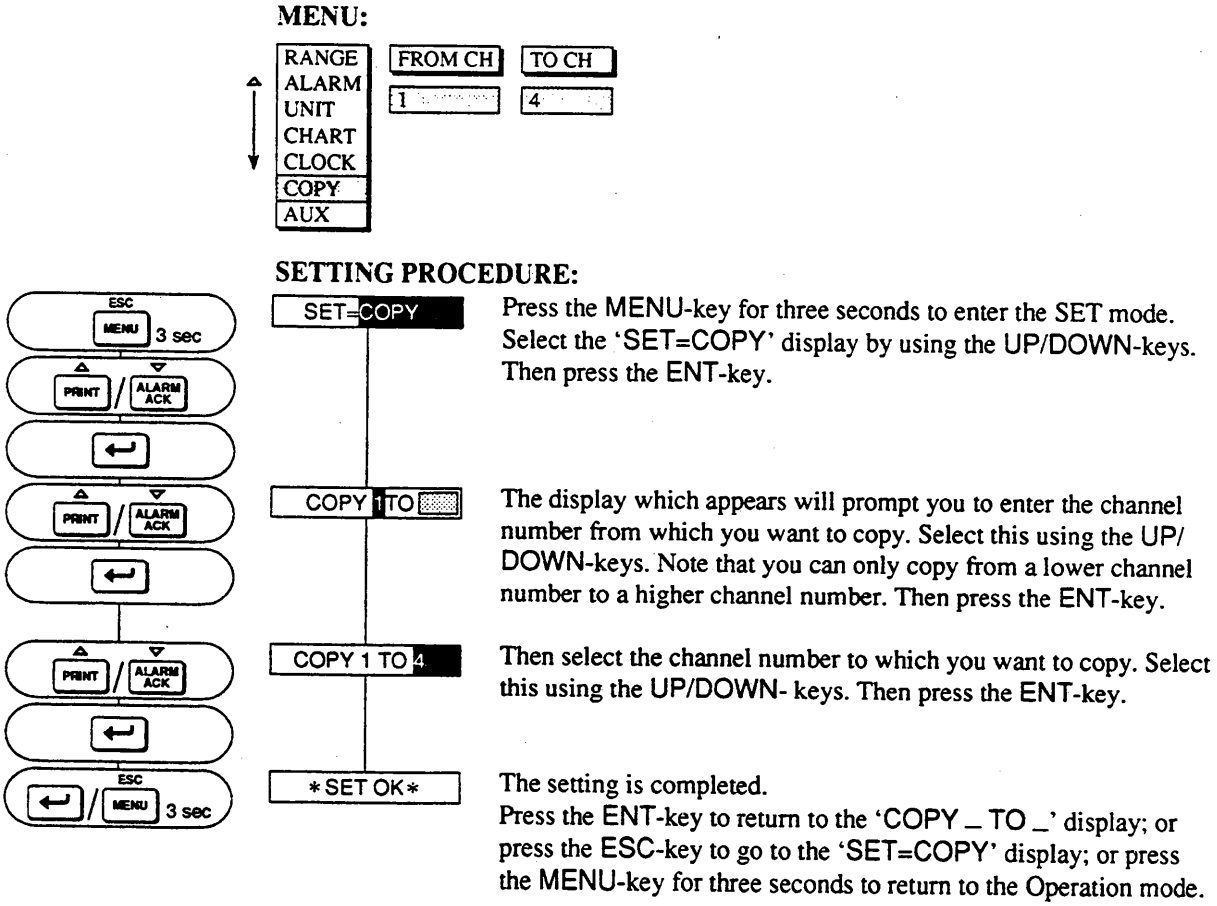


Figure 5-14. Copying Channel Settings

6 Auxiliary Settings

This section describes the auxiliary settings, which are normally kept at their initial values. However, in order to use the many functions of the RD100A, they can be changed. The settings are grouped into:

- Settings for analog recording
- Settings for digital printing
- How to set the chart speed used when change-on-alarm or remote control is selected.

6. 1 Settings for Analog Recording

This section describes:

- How to adjust the trend recording format
- How to set zone recording
- How to set partial expanded recording.

Trend recording can be done depending on a fixed interval or an interval that depends on the chart speed.

Zone recording enables you to define different bands (zones) for each channel, so the recording traces will not overlap. Partial expanded recording enables you to compress a part of the recording range in order to examine the other part of the range in more detail.

Initial values are:

TREND	AUTO
ZONE	0 to 100 mm
PART	OFF

6.1.1 How to Adjust the Trend Recording Format (Dot Model)

The RD100A prints in FIX or AUTO mode (see Figure 6-1). In FIX mode, dot printing is performed with a constant interval regardless of the chart speed (approximately 10 seconds). AUTO mode is provided to prevent the chart from being damaged during repetitive dot printing. This mode is useful for low chart speeds. The chart is protected from damage because the printout timing changes with the chart speed (approximately 10 to 90 seconds).

The initial value is AUTO. To set the trend recording mode, proceed as shown in Figure 6-2.

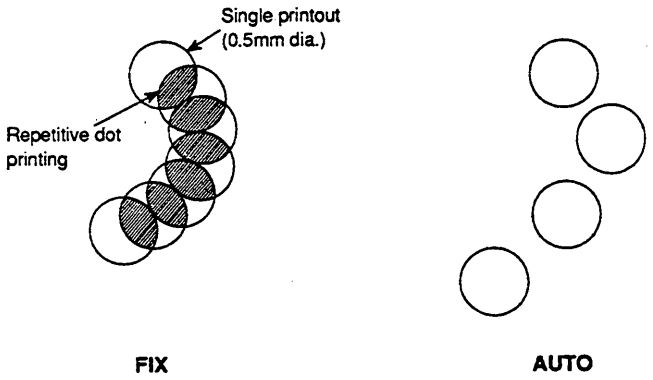
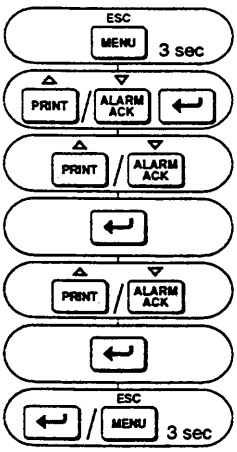


Figure 6-1. FIX and AUTO Mode Printing

MENU:

RANGE	TREND	TREND
ALARM	ZONE	AUTO
UNIT	PART	
CHART	PRINT	
CLOCK	TAG	
COPY	MSG	
AUX	CHART 2	

SETTING PROCEDURE:



SET=AUX

Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=AUX' display using the UP/DOWN-keys, and press the ENT-key.

MODE=TREND

Select the 'MODE=TREND' display using the UP/DOWN-keys. Then press the ENT-key.

TREND=AUTO

Specify AUTO or FIX using the UP/DOWN-keys. Then press the ENT-key.

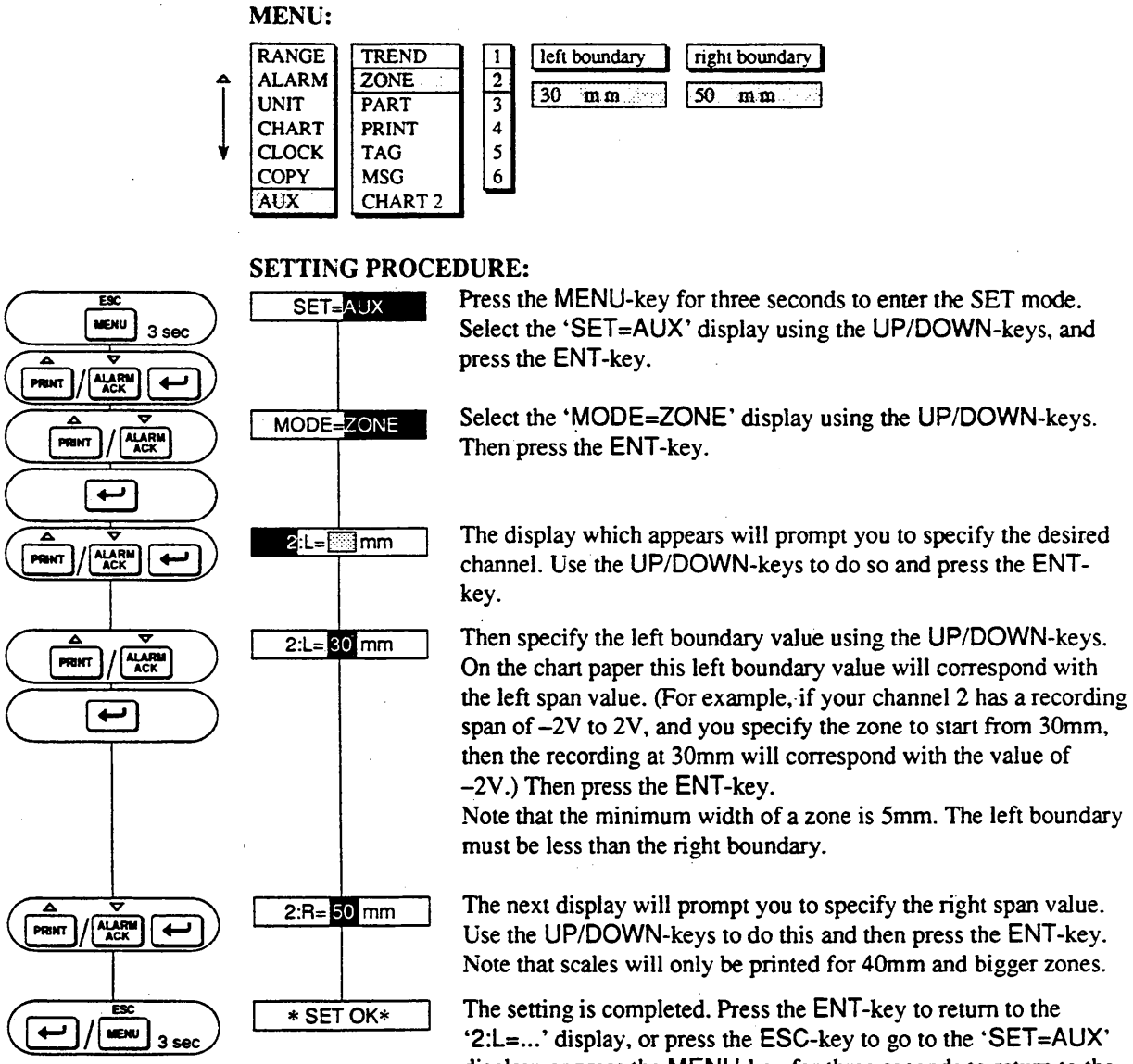
* SET OK*

The setting is completed. Press the ENT-key to return to the 'TREND=...' display, or press the ESC-key to go to the 'SET=AUX' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 6-2. Trend Recording Mode

6.1.2 How to Set Zone Recording

Zone recording enables you to define different bands (zones) for each channel, so the recording traces will not overlap during analog recording. The initial value is 0 to 100 mm. To set the zones, proceed as shown in Figure 6-3.



Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=AUX' display using the UP/DOWN-keys, and press the ENT-key.

Select the 'MODE=ZONE' display using the UP/DOWN-keys. Then press the ENT-key.

The display which appears will prompt you to specify the desired channel. Use the UP/DOWN-keys to do so and press the ENT-key.

Then specify the left boundary value using the UP/DOWN-keys. On the chart paper this left boundary value will correspond with the left span value. (For example, if your channel 2 has a recording span of –2V to 2V, and you specify the zone to start from 30mm, then the recording at 30mm will correspond with the value of –2V.) Then press the ENT-key.
Note that the minimum width of a zone is 5mm. The left boundary must be less than the right boundary.

The next display will prompt you to specify the right span value. Use the UP/DOWN-keys to do this and then press the ENT-key. Note that scales will only be printed for 40mm and bigger zones.

The setting is completed. Press the ENT-key to return to the '2:L=...' display, or press the ESC-key to go to the 'SET=AUX' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 6-3. Zone Recording

Figure 6-4 shows the chart after zone recording has been set.

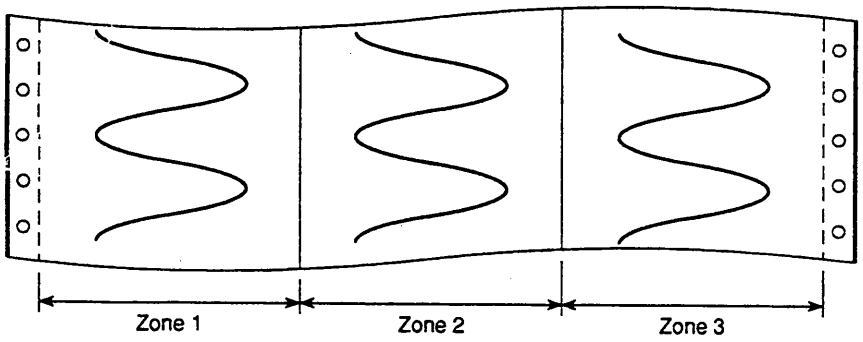


Figure 6-4. Zone Recording Example

6.1.3 How to Set Partial Expanded Recording

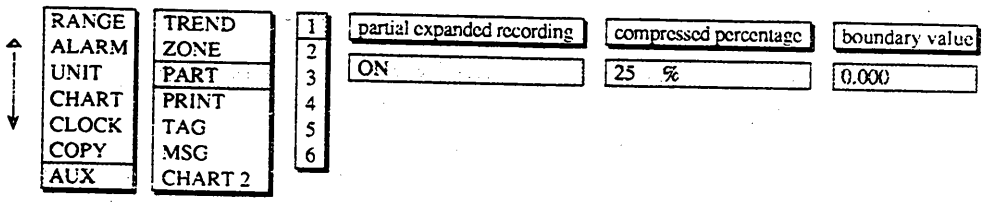
Partial expanded recording enables you to compress a part of the recording span in order to examine the expanded (other) part of the range in more detail. The initial value is OFF. To set partial expanded recording, proceed as shown in Figure 6-5.

NOTE

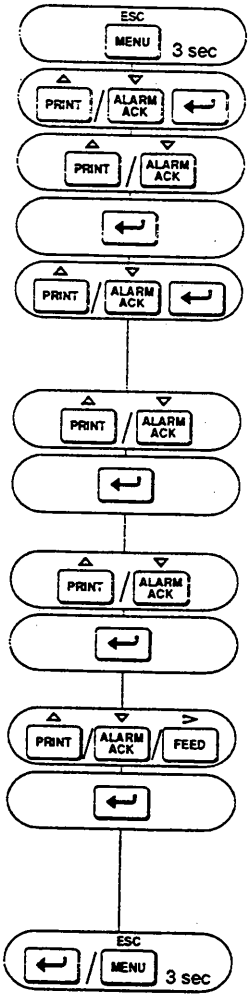
Note: Partial expanded settings are automatically canceled when any of the following changes occur:

- The input type (VOLT, TC, etc.) or input range (2 V, etc.) is changed
- The decimal point for linear scaling and square root is changed
- Minimum or maximum value of the recording span is changed (in the case of linear scaling and square root)
- Minimum or maximum value of the scale is changed (in the case of linear scaling and square root)
- The reference channel is changed
- The input type or range of the reference channel is changed.

MENU:



SETTING PROCEDURE:



Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=AUX' display using the UP/DOWN-keys, and press the ENT-key.

Select the 'MODE=PART' display using the UP/DOWN-keys. Then press the ENT-key.

The display which appears prompts you to specify the desired channel. Use the UP/DOWN-keys to do so and press the ENT-key.

Then select ON (or OFF in case you had set partial expanded recording before and want to stop it now) using the UP/DOWN-keys. Then press the ENT-key.
In the case you selected OFF, the setting is completed.

Specify the percentage (1 to 99%) of the full recording span which has to be compressed, using the UP/DOWN-keys. Press the ENT-key.

The display which appears prompts you to set the boundary value. The boundary value corresponds to the previous set compressed part. Set this value by using the UP/DOWN and the RIGHT-keys. Note that this boundary value must be within the recording span. (If scaling is ON, this value must be within the scaling range.) Then press the ENT-key.

The setting is completed. Press the ENT-key to return to the '1:PART=...' display, or press the ESC-key to go to the 'SET=AUX' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 6-5. Partial Expanded Recording

Figures 6-6 and 6-7 show the recordings before and after the above settings have been completed. As can be seen from these figures, the left side of the boundary (D') shows on 25% of the chart the data in the range –6 V to 0 V. On the right side of the boundary, you can see the range 0 V to 6 V on 75% of the chart. Thus, the scales differ on the left and right sides of the boundary.

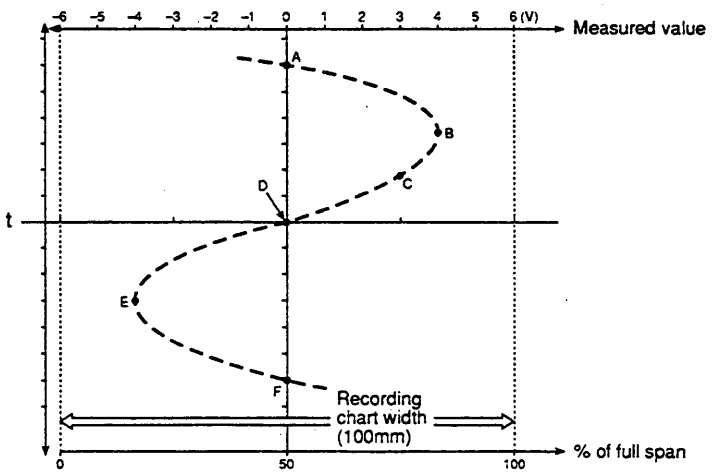


Figure 6-6. Normal Recording Example

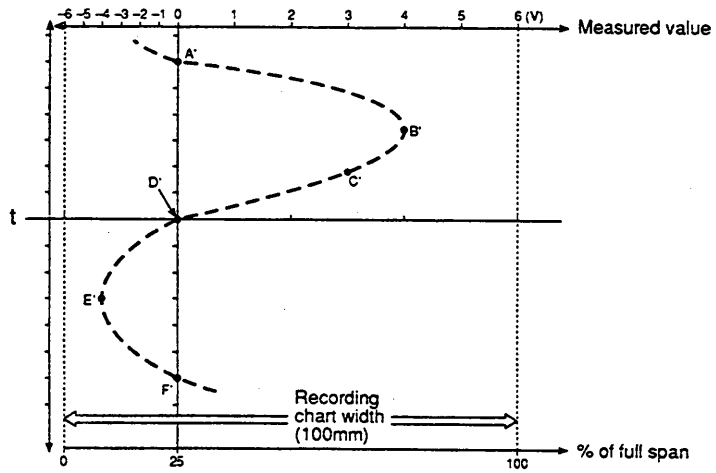


Figure 6-7. Partial Recording Example

6.2 Settings for Digital Printing

This section describes how to select the periodic printout ON/OFF, how to set a tag, and how to set a message.

Initial values are:

PRINT	ON
TAG	All spaces
MSG	All spaces

6.2.1 How to Select the Periodic Printout ON/OFF

The printing of channel number, tag, and the measured values in the periodic printout can be selected ON/OFF per channel. (Refer to Figures 6-8 and 6-9.) However, the periodic printout of date, time, chart speed, and, for the pen model, pen color and POC ON mark(*) cannot be OFF. The initial value is ON.

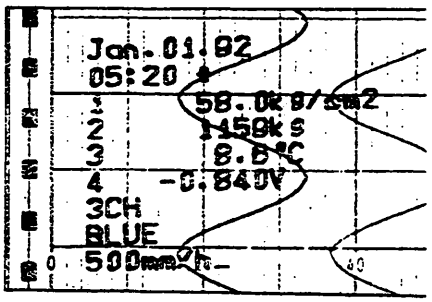


Figure 6-8. Periodic Printout (pen model)

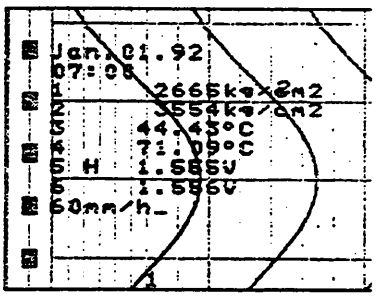


Figure 6-9. Periodic Printout (dot model)

To select this periodic printout ON or OFF, proceed as shown in Figure 6-10.

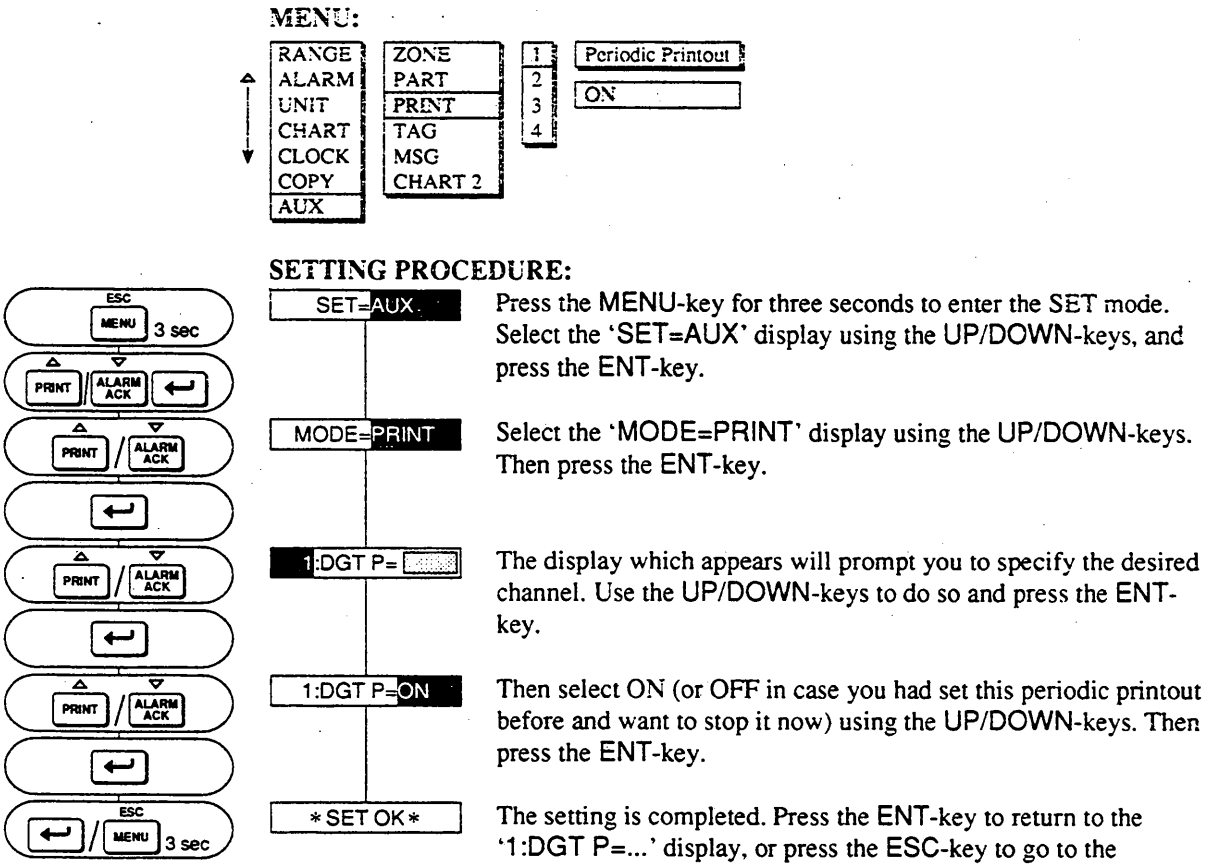


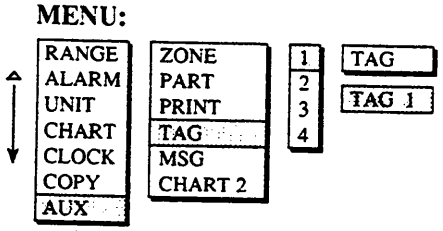
Figure 6-10. Selecting Periodic Printout

NOTE

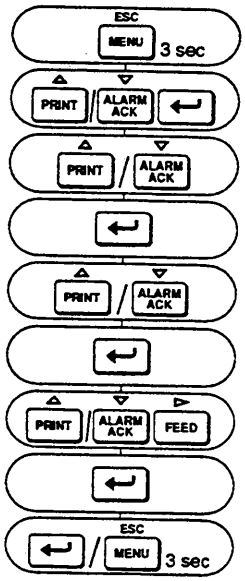
Note: If set, this printout appears on the chart with a certain regularity. To change the interval between two printouts, see Section 7.

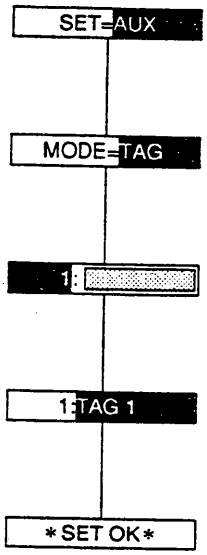
6.2.2 How to Set a Tag

The following setting enables you to set tags to be recorded instead of the usual channel numbers. Tags will appear in the periodic printout, manual printout, channel printout, and in the alarm printout. One tag can be set for every channel. The maximum length is seven characters. Note that these tags will not appear on the display. To set a tag, proceed as shown in Figure 6-11. (Also, refer to Figure 6-12.)



SETTING PROCEDURE:





Press the MENU-key for three seconds to enter the SET mode. Select the 'SET=AUX' display using the UP/DOWN-keys, and press the ENT-key.

Select the 'MODE=TAG' display using the UP/DOWN-keys. Then press the ENT-key.

The display which appears will prompt you to specify the desired channel. Use the UP/DOWN-keys to do so and press the ENT-key.

Then enter the desired characters using the UP/DOWN and the RIGHT-keys. Then press the ENT-key.

The setting is completed. Press the ENT-key to return to the '1:...' display, or press the ESC-key to go to the 'SET=AUX' display; or press the MENU-key for three seconds to return to the Operation mode.

Figure 6-11. Setting a Tag

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	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	0	1	2	3	4	5	6	7
8	9	#	%	(	)	+	−	*	/
.	°	μ	Ω	Ü					

Figure 6-12. Characters

NOTE **Note**: It is also necessary to set the CH/TAG setting in the SET UP Mode to get this tag printout. (See Section 7.)

6.2.3 How to Set Messages

The following setting enables you to set the messages. Up to five messages can be set, each of up to 16 characters. Messages can be printed onto the chart using the keyboard or by remote control, which is optional. Note that the printing of the messages will not be done when the chart speed is faster than 1500 mm/h (pen model) or 100 mm/h (dot model) or when recording is OFF. To set a message, proceed as shown in Figure 6-13. (Also, refer to Figure 6-12.)

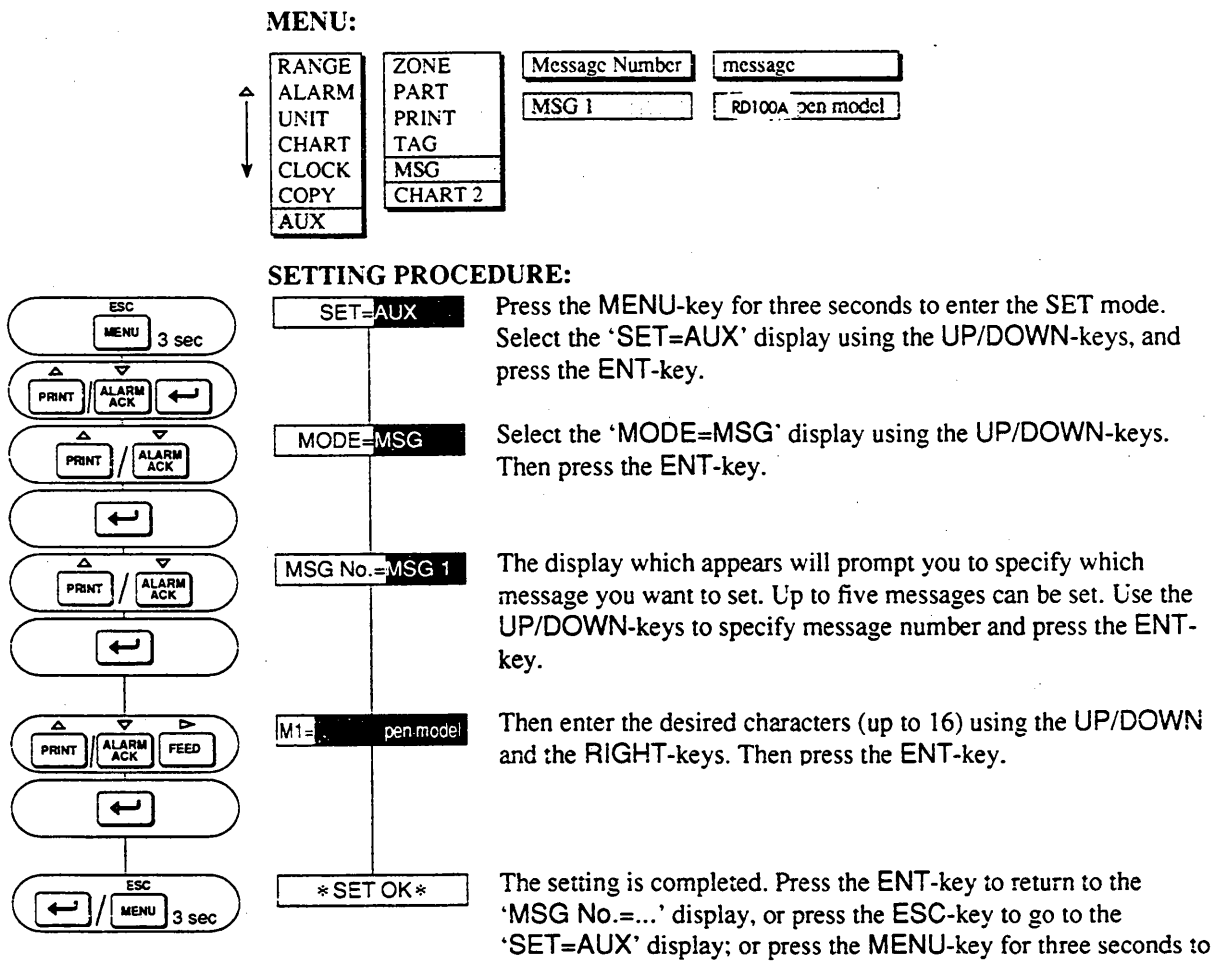


Figure 6-13. Setting Messages

NOTE

Note: If your RD100A is equipped with the –AR or –AR6 option, and you want them to be triggered by remote control, the messages must be assigned to the –AR or –AR6 terminals. (See Section 7.)

6.3 Setting the Chart Speed Used When Change-on-alarm or Remote Control is Selected

This section describes the way to use a second chart speed that is activated by remote control or by the occurrence of alarms. This function enables you to record data in more detail following a remote control trigger or following the occurrence of an alarm. However, to use this second chart speed or alarm output relays, it is necessary that your RD100A is at least equipped with the –AR or –AR6 option. If your RD100A is not equipped with the –AR or –AR6 option, data entry will be ignored.

This second chart speed will stay in effect until the remote control status changes back again or until the alarm turns OFF. The initial value is 20 mm/h. To set this chart speed, proceed as shown in Figure 6-14.

7 Changing Initial Settings

This section describes how to change initial settings. These settings are entered during the manufacturing of the recorder and seldom need to be changed. (See Section 4 for flow chart.)

NOTE

Note: While you are changing any of the following settings, recording cannot be performed, and alarms will not be detected.

7.1 How to Change Initial Settings for the Alarm Function

This section describes how to change initial settings for the alarm function:

- How to select the reflash function ON/OFF (initial value = OFF)
- How to select the output relay to be of AND/OR type (initial value = NONE)
- How to select the output relay to be energizing/de-energizing on alarm (initial value = ENERG)
- How to select the alarm output relay to be of HOLD/NON-HOLD type (initial value = NONHOLD)
- How to select the alarm indicator to be of HOLD/NON-HOLD type (initial value = NONHOLD)
- How to set the sampling interval for rate-of-change alarms (initial value = 01)
- How to select alarm hysteresis ON/OFF (initial value = ON).

7.1.1 How to Select the Reflash Function ON/OFF

Reflash is a function to indicate repeating alarm occurrences among a group of alarms sharing the same output relay. (Refer to Figure 7-1.) When the optional alarm output relays are not installed, data entry will be ignored. Note that only I01 to I03 (which should be assigned in the alarm setting also) can be used for the reflash function. The initial value is OFF.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key. The display REFLASH=... will appear. Select ON or OFF. Press the ENT key.

The reflash setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the alarm settings until the *ALARM SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display, then select the SETUP=END display.

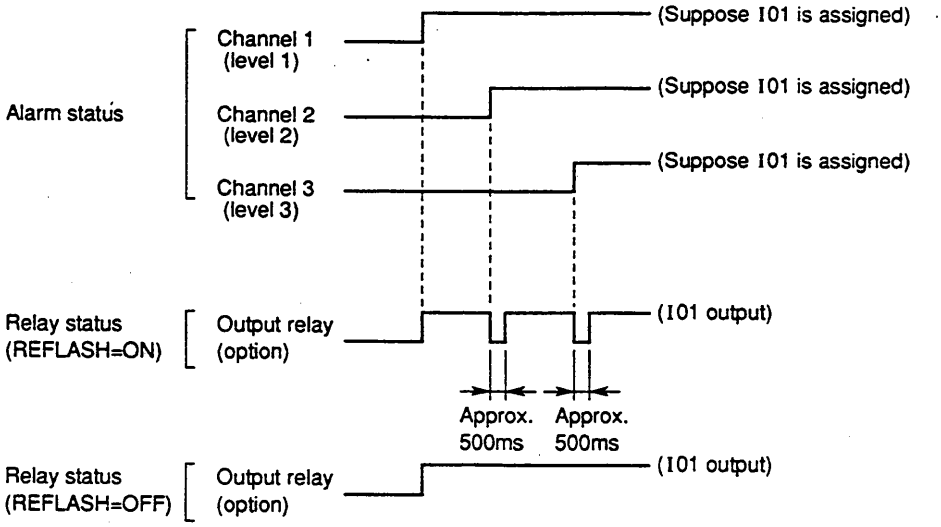


Figure 7-1. Reflash Function

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

When I01 to I03 are used for the reflash function, they cannot be used for the AND function. I01 to I03 will be exclusively used for the reflash function, regardless of the number of alarm output relays.

7.1.2 How to Select the Output Relay to be of AND/OR Type

The (optional) output relays can be specified to be AND or OR type, which is necessary when a group of alarms shares the same output relay. The initial value is NONE, which means that all relays are OR output. When the optional alarm output relays are not installed, data entry will be ignored. Note that when you set I01 to I03 to reflash, only I04 to I12 can be specified for AND/OR. (Refer to Figure 7-2.)

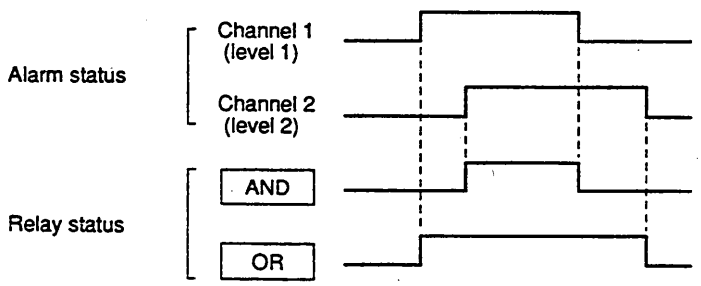


Figure 7-2. Output Relay Selection, AND/OR

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key.

Press the ENT key until the display AND=... appears. Select which relays must be of AND type. Depending on your options, you can specify up to 12 relays (I01 to I12). Relays that are not selected will be of OR type. NONE means that all relays are OR output. After selection, press the ENT key. Note that I01 will always be displayed at the left side of the display.

The AND/OR setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the alarm settings until the *ALARM SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.1.3 How to Select the Output Relay to be Energizing/De-energizing on Alarm

The alarm output relays can be selected to be energizing or de-energizing on alarm. Using de-energizing, alarm output relay is activated either when an alarm occurs or when power off occurs (common for all relays). This enables simple monitoring of the power supply. The initial value is ENERG. (Refer to Figure 7-3.)

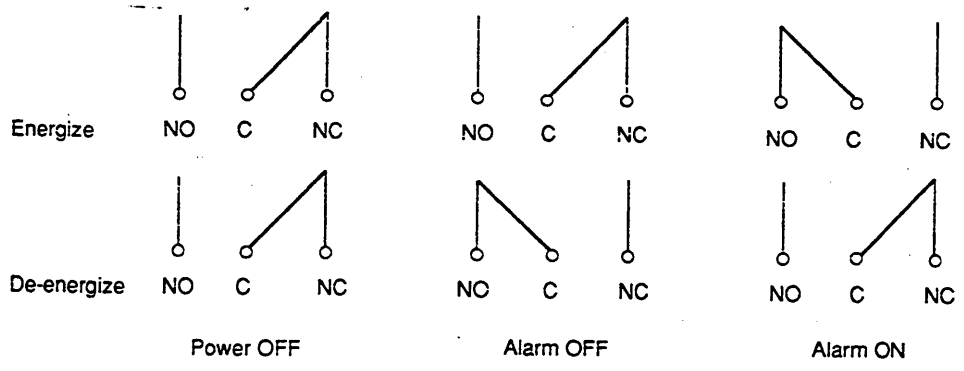


Figure 7-3. Output Relay, Energizing/De-energizing

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key.

Press the ENT key until the display ALARM=ENERG appears. Select energize (ENERG) or de-energize (DE_EN). After selection, press the ENT key.

The energize/de-energize setting has been completed, but has not been stored yet. Before you can adjust other settings in the SET UP Mode, you have to finish the alarm settings until the *ALARM SET* display appears.

Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.1.4 How to Select the Alarm Output Relay to be of HOLD/NON-HOLD Type

You can select whether or not to hold alarm output relays until reset. The initial value is NONHOLD and is common for all relays. (Refer to Figure 7-4.)

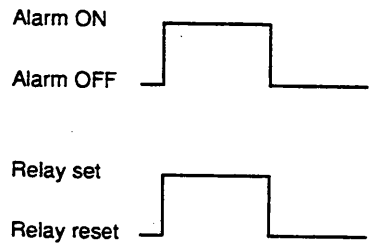
Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key. Press the ENT key until the display RLY=NONHOLD appears. Select HOLD or NONHOLD. After selection, press the ENT key.

The relay HOLD/NON-HOLD setting has been completed, but has not yet been stored. Before you can adjust other settings in the SET UP Mode, you have to finish the alarm settings until the *ALARM SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

NON-HOLD:
Output relay turns ON and OFF together with alarm.



HOLD:
Once turned ON, the alarm output relay remains ON even if the alarm turns OFF. The relay is turned OFF by pressing the ACK-key.

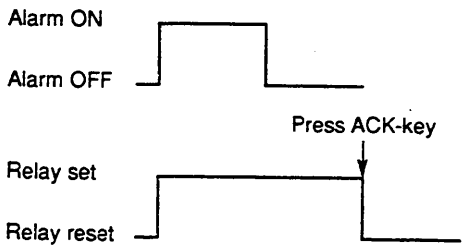


Figure 7-4. Output Relay, HOLD/NON-HOLD

7.1.5 How to Select the Alarm Indicator to Be of HOLD/NON-HOLD Type

You can select whether or not to hold the indicator until reset. The initial value is NON-HOLD and is common for all alarms. (Refer to Figure 7-5.)

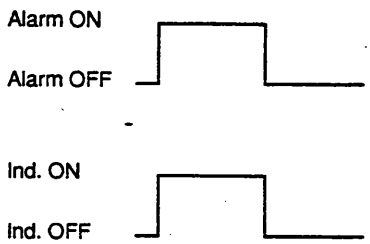
Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key. Press the ENT key until the display IND=NONHOLD appears. Select HOLD or NONHOLD. After selection, press the ENT key.

The indicator HOLD/NON-HOLD setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the alarm settings until the *ALARM SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display, then select the SETUP=END display.

NON-HOLD:
Indicator turns ON and OFF together with alarm.



HOLD:
Once flashing, the indicator remains flashing even if the alarm turns OFF. The indicator shows the current alarm status by pressing the ACK-key (in alarm = ON, alarm recovered = OFF).

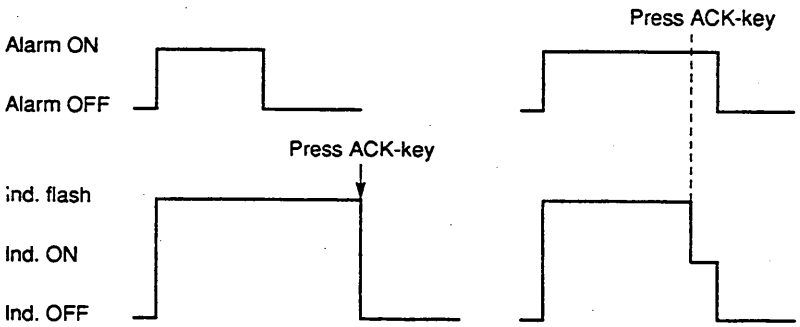


Figure 7-5. Alarm Indicator, HOLD/NON-HOLD

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.1.6 How to Set the Sampling Interval for Rate-of-change Alarms

You can change the sampling interval for rate-of-change alarms by the following setting (see Figure 7-6), which is common for all alarms. The initial value is 01 sample (pen: 125 msec, dot: 2.5 sec).

If you want to change the sampling interval for rate-of-change on increasing signal, do the following.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key,

Press the ENT key until the display R TIME=1 appears. Select the sampling interval (minimum is one sample interval, maximum is 15 sample intervals). After selection, press the ENT key.

The setting has been completed, but has not been stored yet.

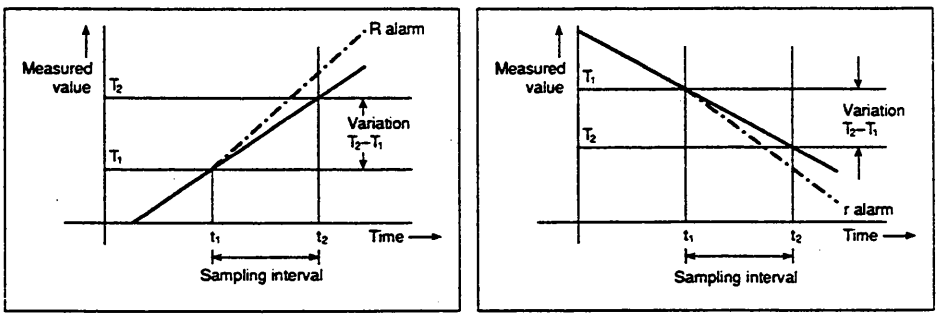


Figure 7-6. Sampling Interval for Rate-of-change Alarms

Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

If you want to change the sampling interval for rate-of-change on decreasing signal, do the following.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.

Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key. Press the ENT key until the display r TIME=1 appears. Select the sampling interval (minimum is one sample interval, maximum is 15 sample intervals). After selection, press the ENT key.

The setting has been completed, but has not been stored yet.

Before leaving the SET UP Mode, you have to store your new settings. Proceed with the alarm settings until the display *ALARM SET* appears. Press the ESC key to return to the SETUP=ALARM display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.1.7 How to Select Alarm Hysteresis ON/OFF

The alarm hysteresis is the difference between the levels of alarm occurrence and reset. (Refer to Figure 7-7.) You can choose between two levels of hysteresis: 0% (=OFF) and approximately 0.5% of the recording span (=ON), which is common for all alarms. The initial value is ON.

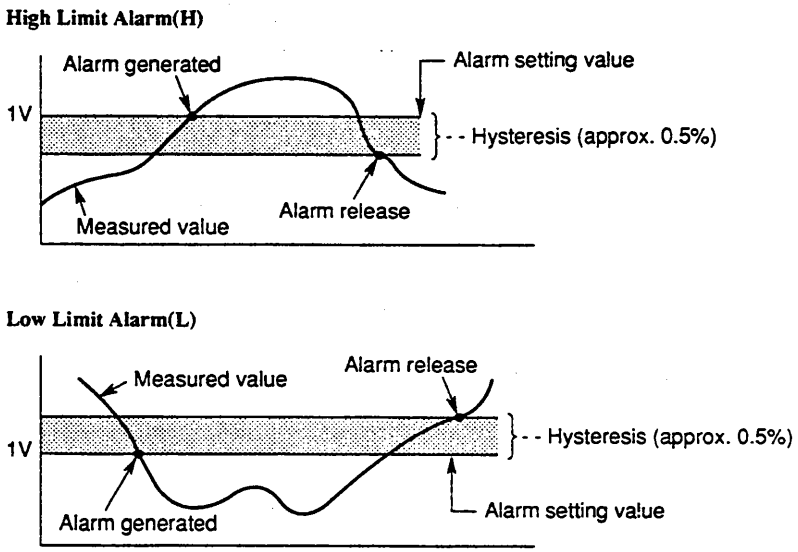


Figure 7-7. Alarm Hysteresis ON/OFF

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=ALARM. Press the ENT key.

Press the ENT key until the display ALM HYS=ON appears. Select ON or OFF. After selection, press the ENT key. The display *ALARM SET* will appear.

The alarm hysteresis setting has been completed, but has not been stored yet.

You can now adjust other settings in the SET UP Mode, by using the ESC key. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=ALARM display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

NOTE

Note: Hysteresis setting is only valid for High and Low alarms. Hysteresis setting for rate-of-change alarms and difference alarms will be ignored.

7.2 How to Change Initial Settings for the Input

This section describes how to change initial settings for the input:

- How to set the A/D integration time (initial value = AUTO for the pen model and 100 ms for the dot model)

- How to set upscale/downscale TC burnout (initial value = UP, OFF)
- How to set internal or external RJC (initial value = INT)
- How to select the input filter; initial value = OFF (pen model)
- How to select a moving average; initial value = OFF (dot model).

7.2.1 How to Set the A/D Integration Time

The purpose of the following setting is to specify which A/D integration time will be used. Depending on the power supply, the integration time will affect the ability of noise rejection and therefore the recording.

Pen Model

If the power supply of the recorder and of the measuring object are the same, the effect of noise will be automatically minimized and the (initial) value of AUTO is the recommended one.

If the power supplies are different, you should select from 50 Hz or 60 Hz integration time. The choice depends on the power supply of the instrument with the highest noise level.

There are three possibilities:

- AUTO: integration time depends on the power supply of the recorder; however, in the case of the –24 V model, the integration time is fixed to 50 Hz
- 50 Hz
- 60 Hz.

The initial value is AUTO.

Dot Model

The initial value is 100 ms, and this setting should only be changed when required because of specific optional functions. There are four possibilities:

- AUTO: integration time depends on the power supply of the recorder; however, in the case of the –24V model, the integration time is fixed to 50 Hz.
- 50 Hz
- 60 Hz
- 100 ms.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=INTG. Press the ENT key. Select AUTO, 50 Hz, 60 Hz, or 100 ms, according to your situation, using the UP/DOWN keys.

Then press the ENT key. The display *INTG SET* will appear. The A/D integration time setting has been completed, but has not been stored yet. You can now adjust other settings in the SET UP Mode, by using the ESC key.

Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=INTG display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.2.2 How to Set Upscale/Downscale TC Burnout

The purpose of the following setting is to specify where the pens will move in case of a TC burnout. You can choose from moving to the right (UP) or to the left (DOWN). This is common for every channel. You can select ON or OFF for each channel. The initial value is UP and OFF for every channel.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=B.OUT. Press the ENT key. Select UP or DOWN using the UP/DOWN keys. Press the ENT key.

This burnout processing is ON/OFF selectable per channel. Select the channel No. for which you want to specify this burnout processing. Then press the ENT key. Select ON or OFF. Then press the ENT key. The display *B.OUT SET* will appear.

The burnout setting has been completed, but has not been stored yet. You can now adjust other settings in the SET UP Mode, by pressing the ESC key.

Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=B.OUT display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.2.3 How to Set Internal or External RJC

The purpose of the following setting is to select whether internal or external reference junction compensation values are used. In the case of internal, the reference junction compensation is based on the internal RJC circuit. In the case of EXTernal, the reference junction compensation is based on an external voltage input. The initial value is INT.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RJC. Press the ENT key.

Select the channel number for which you want to specify this RJC setting. Then press the ENT key. Select INT or EXT using the UP/DOWN keys. Press the ENT key.

If You Selected INT

The RJC setting has been completed, but has not been stored yet. The display *RJC SET* will appear. You can now adjust other settings in the SET UP Mode by pressing the ESC key.

Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=RJC display, then select the SETUP=END display. Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

If You Selected EXT

Set the input voltage to use for reference junction using the UP/DOWN keys (must be within the –20000 μV to +20000 μV range; initial value is 0 μV). Then, press the ENT key.

The RJC setting has been completed, but has not been stored yet. The display *RJC SET* will appear. You can now adjust other settings in the SET UP Mode by pressing the ESC key,

Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=RJC display, then select the SETUP=END display. Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.2.4 How to Select the Input Filter (Pen Model)

Noise in the measured signal can be suppressed in the final measurement by using an input filter. This is sometimes referred to as signal damping. The purpose of this setting is to select for each channel whether or not to use a filter, and if so, to select a time constant of damping. A filter works as shown in Figure 7-8.

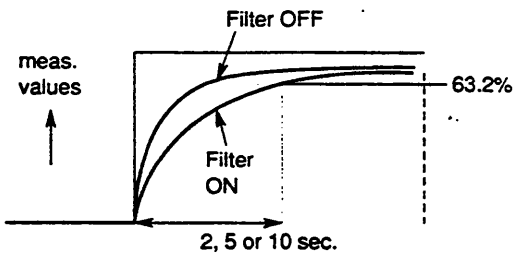


Figure 7-8. Input Filter Operation

If a filter is used, the response time can be selected from 2.0, 5.0, or 10 seconds. You can choose from three filters:

- Two seconds
- Five seconds
- 10 seconds.

The initial value is OFF.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=FILTR. Press the ENT key. Select the channel number for which you want to specify a filter. Then press the ENT key.

Select the type of filter you want to use. You can choose from no filter (OFF), two seconds, five seconds, or 10 seconds. Press the ENT key. The display *FILTR SET* will appear.

The filter setting has been completed, but has not been stored yet.

Press the ENT key to continue the setting for other channels or the ESC key to adjust other settings in the SET UP Mode.

Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=FILTR display, then select the SETUP=END display. Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.2.5 How to Select a Moving Average (Dot Model)

Noise in the measured signal can be suppressed in the final measurement by computing a moving average. It is possible to record a moving average calculated over the previous X samples, selectable from the previous two samples up to the previous 16 samples.

The purpose of the following setting is to select for each channel whether or not to compute a moving average, and if so, over how many samples. The initial value is OFF. Figure 7-9 shows an example that assumes a moving average over five samples has been selected.

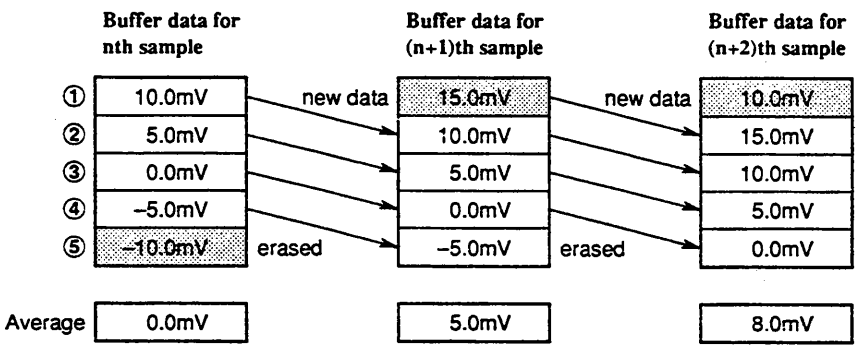


Figure 7-9. Selecting a Moving Average

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=M AVE . Press the ENT key.

Select the channel number for which you want to compute a moving average, then press the ENT key. Select the number of samples. You can choose from two samples, three samples, ... up to 16 samples. Of course, you can also select OFF. Press the ENT key. The display *M AVE SET* will appear.

The moving average setting has been completed, but has not been stored yet. Press the ENT key to continue the setting for other channels or the ESC key to adjust other settings in the SET UP Mode. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=M AVE display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.3 How to Change Initial Settings for Analog Recording

This section describes how to change initial settings for analog recording.

- How to select pen offset compensation ON/OFF; initial value = OFF (pen model)
- How to assign different colors to channels (dot model)

Related settings concern the way to adjust the position of pens and printer carriage, which is described in Section 9.

7.3.1 How to Select Pen Offset Compensation (POC) ON/OFF (Pen Model)

The POC function eliminates deviation (phase difference) between the pens on the time axis. Figure 7-10 shows a side view of the recording status for the two-pen model (three- and four-pen models are similar). The initial value is OFF.

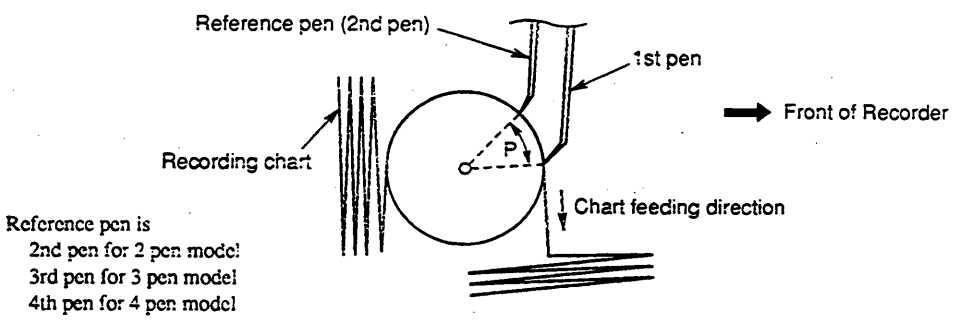


Figure 7-10. Side View of Recording Status

Figure 7-10 shows that, in any pen recorder (in order to prevent collisions between pens), the pens must be offset by a distance p. Therefore, points recorded at the same time are separated on the time axis. In the case of Pen Offset Compensation, a delay memory is used to store measurement data, equivalent to the time offset p of the pens (other than the reference pen). The pens will start to record these stored data when the chart is fed by the amount of p (time offset).

NOTE

Note: Immediately after the recording has been started, only the reference pen operates normally. The other pens might not seem to operate correctly, but this is due to the time offset. When you stop the recording, the chart will stop. Therefore, data stored in the delay memory will not be recorded anymore, and these data will be lost.

Pen Offset Compensation is meaningless for the one-pen model. Therefore, POC setting will be ignored for the one-pen model. Note that an asterisk will be printed in the periodic printout when POC is ON.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=POC. Press the ENT key. Select ON or OFF, then press the ENT key. The display *POC SET* will appear.

The POC setting has been completed, but has not been stored yet.

You can now adjust other settings in the SET UP Mode, by using the ESC key. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=POC display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.3.2 How to Assign Different Colors to Channels (Dot Model)

You can assign any of the six provided colors to any channel. The initial settings are as follows:

- Channel 1 = purple
- Channel 2 = red
- Channel 3 = green
- Channel 4 = blue
- Channel 5 = brown
- Channel 6 = black.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=COLOR. Then, press the ENT key.

Select the channel number for which you want to change a color. Then, press the ENT key. Select the color, then press the ENT key again. The display *COLOR SET* will appear.

The color setting has been completed, but has not been stored yet.

Press the ENT key to set the color for other channels or press the ESC key to adjust other settings in the SET UP Mode. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=COLOR display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.4 How to Change Initial Settings for Digital Printouts

This section describes how to change initial settings for digital printouts:

- How to select channel numbers or tag printout (initial value = CH)
- How to select scales printout ON/OFF (initial value = ON)
- How to select the new chart speed printout ON/OFF (initial value = OFF)
- How to select the record start time printout ON/OFF (initial value = OFF)
- How to select alarm settings and alarm printout (initial value = ON1)
- How to select to trigger the periodic printout (initial value = INT, AUTO).

7.4.1 How to Select Channel Numbers or Tag Printout

You can select channel numbers or tags printed out in the periodic, manual, channel, and alarm printout. The initial value is GH, and this setting is common for all channels.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key. Press the ENT key until the display CH/TAG=... appears. Select CH or TAG. Press the ENT key.

This setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the recording settings until the *RCD SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the recording settings until the display *RCD SET* appears. Press the ESC key to return to the SETUP=RCD display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.4.2 How to Select Scales Printout ON/OFF

You can select to get scales printed on the chart. The initial value is ON.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key. Press the ENT key until the display SCL PR=... appears. Select ON or OFF. Press the ENT key.

This setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the recording settings until the *RCD SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the recording settings until the display *RCD SET* appears. Press the ESC key to return to the SETUP=RCD display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.4.3 How to Select the New Chart Speed Printout ON/OFF

You can select the new chart speed printed on the chart when the chart speed changes. The initial value is OFF.

Note: The chart speed will not be printed when the chart speed exceeds 1500 mm/h (pen model) or 100 mm/h (dot model).

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key. Press the ENT key until the display SPD PR=... appears. Select ON or OFF. Press the ENT key.

This setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the recording settings until the *RCD SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the recording settings until the *RCD SET* display appears. Press the ESC key to return to the SETUP=RCD display and then select the SETUP=END display. Press the ENT key.

Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.4.4 How to Select the Record Start Time Printout ON/OFF

You can select to get the time printed on the chart when the recording starts. The initial value is OFF.

NOTE **Note**: The time will not be printed when the chart speed exceeds 1500 mm/h (pen model) or 100 mm/h (dot model).

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key. Press the ENT key until the display RCD PR=... appears. Select ON or OFF. Press the ENT key.

This setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the recording settings until the *RCD SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the recording settings until the *RCD SET* display appears. Press the ESC key to return to the SETUP=RCD display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.4.5 How to Select Alarm Settings and Alarm Printout

When alarms occur, the channel number, type of alarm, and ON/OFF time can be printed on the right side of the chart. It is selectable to get the ON/OFF time of alarms (ON1), the ON time only (ON2) or to get no printout (OFF).

NOTE **Note**: Alarms will not be printed when the chart speed exceeds 1500 mm/h (pen model) or 100 mm/h (dot model).

The initial value is ON1, and this setting is common for all channels.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key. Press the ENT key until the display ALM PR=... appears. Select ON1 (ON/OFF time of alarms will be printed), ON2 (ON time only will be recorded), or OFF (no alarm will be recorded). Press the ENT key.

This setting has been completed, but has not been stored yet.

Before you can adjust other settings in the SET UP Mode, you have to finish the recording settings until the *RCD SET* display appears. Before leaving the SET UP Mode, you have to store your new settings. Proceed with the recording settings until the *RCD SET* display appears. Press the ESC key and return to the SETUP=RCD display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.4.6 How to Select to Trigger the Periodic Printout

The selections are structured as follows:

- The first selection is to specify whether the periodic printout should be triggered internally or externally
- If you select INTernal, you should set the reference time of the first periodic printout (initial value is 00:00)
- Next, you have to specify which interval should be used between two periodic printouts
- You can choose from AUTO, which means that the interval depends on the chart speed, and MAN, which means that you can specify the interval yourself
- If you select EXTernal, you should also specify this at the settings for the REMOTE option, and the setting is completed.

The initial value is INT, AUTO.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key.

Press the ENT key until the display DGT PR=... appears. Select INT (in the case of internal triggering) or EXT (in the case of external triggering). Press the ENT key.

If You Selected INT

The display START=00:00 will appear. Specify the reference time of the first periodic printout using the UP/DOWN keys. Press the ENT key. Note that you cannot specify minutes.

Specify which interval between the periodic printouts you prefer. Choose from AUTO (the interval depends on the chart speed) or MAN (you can specify the interval yourself). Then press the ENT key. In the case of AUTO, the relationship between the chart speed and the printing intervals of periodic printouts will be as shown in Table 7-1.

Table 7-1. Chart Speed vs. Printing Interval

Pen Model

Chart Speed	Printing Interval of Periodic Printout
5 to 9 mm/h	no printout
10 to 18 mm/h	every 8 hours
20 to 36 mm/h	every 4 hours
40 to 72 mm/h	every 2 hours
75 to 135 mm/h	every hour
150 to 180 mm/h	every 30 minutes
200 to 320 mm/h	every 20 minutes
360 to 1500 mm/h	every 10 minutes
more than 1500 mm/h	no printout

Dot Model

Chart Speed	Printing Interval of Periodic Printout
1 to 9 mm/h	no printout
10 to 19 mm/h	every 8 hours
20 to 39 mm/h	every 4 hours
40 to 79 mm/h	every 2 hours
80 to 100 mm/h	every hour
101 to 1500 mm/h	no printout

If You Selected MAN

Specify the interval using the UP/DOWN keys. You can choose from 10, 15, 20, and 30 minutes and 1, 2, 3, 4, 6, 8, 12, and 24 hours. Then, press the ENT key.

This setting has been completed, but has not been stored yet. The display *RCD SET* will appear. You can now adjust other settings in the SET UP Mode, by using the ESC key.

If You Selected EXT

The setting has been completed, but has not been stored yet. The display *RCD SET* will appear. You can now adjust other settings in the SET UP Mode, by using the ESC key. Make sure to specify this also at the settings of the REMOTE option.

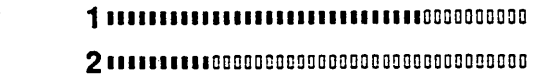
Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=RCD display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.5 How to Select the Type of Bar Graph

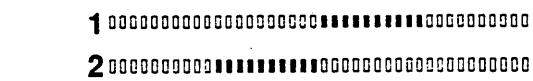
The RD100A can display two types of bar graphs, as shown in Figure 7-11. The type of bar graph can be selected for each channel individually. The initial value for all channels is left-referenced bar graph (NORML).

1) **Left-referenced (%) bargraph (NORML)**



The left side of the bargraph represents the left span value, the right side of the bargraph represents the right span value. The display will show the measured value as a percentage of the span.

2) **Center-zero bargraph (CENTR)**



The center of the bargraph represents the center value of the span. The left side and the right side of the bargraph represent the left and right span values respectively. This bargraph will display the deviation between the actual measured value and the center of span.

Figure 7-11. Bar Graphs

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=BAR. Press the ENT key. Select the channel number for which you want to change the type of bar graph. Press the ENT key.

Select NORML (for the left-referenced bar graph) or CENTR (for the center-zero bar graph) using the UP/DOWN keys. Press the ENT key. The display *BAR SET* will appear.

This setting has been completed, but has not been stored yet.

Press the ENT key to set the bar graph for other channels or press the ESC key to adjust other settings in the SET UP Mode. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=BAR display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

NOTE

Note: The bar graph has the same resolution as the data shown on the display. By adding/deleting a digit of the displayed data (done during setting of the recording span), you can affect the resolution of the bar graph. The maximum resolution is 1% (100 steps).

7.6 How to Change the Temperature Unit

For the TC or RTD type, the RD100A will automatically append the temperature unit (°C or °F). The initial value is °C and is common for all channels.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=TEMP. Press the ENT key. Select °C or °F using the UP/DOWN keys. Press the ENT key. The display *TEMP SET* will appear.

This setting has been completed, but has not been stored yet.

You can now adjust other settings in the SET UP Mode, by using the ESC key. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=TEMP display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

CAUTION

Caution: When you change this setting, all settings in the SET Mode will return to their initial values. In the SET UP Mode, the RJC setting and the input filter setting will return to their initial values. Other settings in the SET UP Mode will not be affected. (Refer to Table 4-2.)

7.7 How to Initialize Settings

The settings that can be initialized are those done in the SET Mode only. This initialization does not affect any settings in the SET UP Mode. (For a list of the initial settings of the SET Mode, refer to Table 4-2.)

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=INIT. Press the ENT key. Select YES or NO using the UP/DOWN keys. Press the ENT key. The display *INIT SET* will appear.

This setting has been completed, but, if you selected YES, settings have not been initialized yet. This will happen when you leave the SET UP Mode.

You can now adjust other settings in the SET UP Mode by using the ESC key. When leaving the SET UP Mode, if you want to initialize your settings, press the ESC key. You will return to the SETUP=INIT display, then you should select the SETUP=END display. Press the ENT key. Select END=STORE to initialize or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.8 How to Change Initial Settings for the REMOTE Option

This section describes the way to change initial settings for the REMOTE option. The settings concerning the REMOTE option are always accessible, and data entry will be ignored if your RD100A is not equipped with this option.

The –AR and –AR6 options allow you to execute functions on the RD100A by a remote trigger (contact input). The functions that can be executed by a remote trigger are:

- Start/stop the recording
- Change the chart speed to a preset second chart speed
- Have messages printed out (up to five messages)
- Get a manual printout
- Get a periodic printout.

However, the remote terminal has only five terminals, which means that only five functions can be triggered. The printing out of one message takes up one terminal. Initially, the functions are assigned to the terminals as follows:

1: Start/stop the recording (RECORD)

2: Change the chart speed to a preset second chart speed (CHART SPD)

3: Get a manual printout (MANUAL PR)

4: Have message 1 printed out (MESSAGE1)

5: Have message 2 printed out (MESSAGE2).

The purpose of this setting is to assign the to-be-triggered functions to the five terminals.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=REM. Press the ENT key.

Select the terminal number (CONT 1 to 5; remote has five terminals.) Press the ENT key. Select the function that you want to assign to that terminal. You can choose from RECORD (start/stop recording); CHART SPD (second chart speed); MESSAGE 1, 2, 3, 4, or 5 (message number 1, 2, 3, 4, and 5); MANUAL PR (manual printout); or DGT PR (periodic printout). Press the ENT key. The display *REM SET* will appear.

This setting has been completed, but has not been stored yet.

Press the ENT key to set other terminals or press the ESC key to adjust other settings in the SET UP Mode. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=REM display, then select the SETUP=END display.

Press the ENT key, Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.9 How to Select to Trigger the Recording to Start/Stop

The start/stop of the recording can be triggered by the RCD key on the keyboard (INTernally triggered) or by remote control input (EXTernally triggered). The initial value is INT.

NOTE

Note: If you specify the recording to start/stop in the REMOTE setup and you fail to specify EXT here, the recording start/stop will not be controlled by remote control.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=RCD. Press the ENT key.

The display RECORD=... will appear. Select INT or EXT. Press the ENT key.

This setting has been completed, but has not been stored yet. Before you can adjust other settings in the SET UP Mode, you have to finish the recording settings until the *RCD SET* display appears.

Before leaving the SET UP Mode, you have to store your new settings. Proceed with the recording settings until the *RCD SET* display appears. Press the ESC key to return to the SETUP=RCD display, then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

7.10 How to Change Key Lock Settings

You can choose to use the key lock or not.

NOT: All keys are operable, even when the key is removed from the keyhole.

USE: To select to USE the key lock affects the three modes in different ways.

Operation Mode

- Even if you disable the keys (by removing the key from the keyhole), you can still change displays.
- If you disable the keys (by removing the key from the keyhole), you cannot operate FUNC in the Operation Mode.
- The keys RCD/PRINT/ALARM ACK/FEED can be unlocked/locked individually.

SET Mode

If you disable the keys (by removing the key from the keyhole), you cannot enter the SET Mode. If you try, the display will not change.

SET Mode

If you disable the keys (by removing the key from the keyhole), you cannot enter the SET Mode. If you try, the display will not change.

SET UP Mode

Even if you disable the keys (by removing the key from the keyhole), you can always enter and operate the SET UP Mode.

The initial values are NOT and LOCK for all keys.

Setting Procedure

Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears. Use the UP/DOWN keys to select the display SETUP=LOCK. Press the ENT key. Select to USE the key lock or NOT. Press the ENT key. If you selected NOT, the setting is completed.

Select for the RCD, FEED, ALARM ACK, and PRINT key respectively to have them LOCKed or to have them FREE. Press the ENT key after each selection. The display *LOCK SET* will appear.

This setting has been completed, but has not been stored yet.

You can now adjust other settings in the SET UP Mode by using the ESC key. Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=LOCK display and then select the SETUP=END display.

Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

8 Specifications

This section involves the one-, two-, three-, and four-pen, as well as the six-dot printing models.

Types

DCV: Direct Voltage input; 20 mV to 20 V range
TC: Thermocouple
RTD: Resistance Temperature Detector
DI: Digital Input (contact or dc voltage, TTL level)
DCA: Direct Current Input (using external shunt resistor; 10 Ω, 100 Ω, and 250 Ω)

Measuring Range (Selectable per channel) – DCV

Range	Measuring Range
20 mV	–20.00 to 20.00 mV
60 mV	–60.00 to 60.00 mV
200 mV	–200.0 to 200.0 mV
2 V	–2.000 to 2.000 V
6 V	–6.000 to 6.000 V
20 V	–20.00 to 20.00 V

Measuring Range (Selectable per channel) – TC

Range	Measuring Range (°C)	Measuring Range (°F)
R[1]	0.0 to 1760.0°C	32 to 3200°F
S[1]	0.0 to 1760.0°C	32 to 3200°F
B[1]	0.0 to 1820.0°C	32 to 3308°F
K[1]	–200.0 to 1370.0°C	–328 to 2498°F
E[1]	–200.0 to 800.0°C	–328.0 to 1472.0°F
J[1]	–200.0 to 1100.0°C	–328.0 to 2012.0°F
T[1]	–200.0 to 400.0°C	–328.0 to 752.0°F
N[2]	0.0 to 1300.0°C	32 to 2372°F
W[3] (C)	0.0 to 2315.0°C	32 to 4199°F
L[4] (J DIN)	–200.0 to 900.0°C	–328.0 to 1652.0°F
U[5] (T DIN)	–200.0 to 400.0°C	–328.0 to 752.0°F

Measuring Range (Selectable per channel) – RTD

Range	Measuring Range (°C)	Measuring Range (°F)
PT100[6]	–200.0 to 600.0°C	–328.0 to 1112.0°F
JPT100[6]	–200.0 to 550.0°C	–328.0 to 1022.0°F

[1] R,S,B,K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1981
[2] N: Nicrosil-Nisil, IEC 584,DIN IEC 584
[3] W: W•5% Re/W•26% Re (also known as OMEGA's type C)
[4] L: Fe-CuNi, DIN 43710 (also known as OMEGA's J DIN type)
[5] U: Cu-CuNi, DIN 43710 (also known as OMEGA's type T DIN)
[6] PT100: JIS C 1604-1989, JIS C 1606-1989, IEC 751, DIN IEC 751
JPT100: JIS C 1604-1981, JIS C 1606-1989

Measuring Range (Selectable per channel) – RTD – DI (Digital Input)

Range	Measuring Range
Voltage input	Less than 2.4 V is OFF; more than 2.4 V is ON (TTL)
Contact input	Contact ON/OFF

Calculation

Differential computation: Between any two channels; however, the reference channel number must be less than the measuring channel number. Available for DCV, TC, and RTD range. Both channels must have same range.

Linear scaling (scaling): Available for DCV, TC, and RTD range.
Scaling limits: –20000 to 20000
Data display and printout range: –19999 to 20000
Decimal point: user-selectable (should be specified when entering scale value)
Unit: user-settable, up to six characters (alphanumerical and special characters).

Square root: Available for DCV range.
Scaling limits: –20000 to 20000
Data display and printout range: –19999 to 20000
Decimal point: user-selectable.
Unit: user-settable, up to six characters (alphanumerical and special characters).

Measuring and Recording Accuracy

The following specifications apply to the operation of the recorder under standard operation conditions: temperature, 23±2°C; humidity, 55±10% RH; power supply voltage according to the specifications; power supply frequency, 50/60 Hz ±1%; warmup time at least 30 minutes.Other ambient conditions should not adversely affect the recording operation).

Measuring and Recording Accuracy – DCV

Range	Measuring (digital display) Measuring Accuracy	Maximum Resolution	Recording (analog) Recording Accuracy	Resolution
20 mV	±(0.2% of rdg + 3 digits)	10 µV	Measurement accuracy ±(0.3% of recording span)	Pen: dead band: 0.2% of recording span; dot: 0.1 mm
60 mV	±(0.2% of rdg + 2 digits)	10 µV		
200 mV	±(0.2% of rdg + 2 digits)	100 µV		
2 V	±(0.1% of rdg + 2 digits)	1 mV		
6 V	± (0.3% of rdg + 2 digits)	1 mV		
20 V	±(0.3% of rdg + 2 digits)	10 mV		

Measuring and Recording Accuracy – TC

	Measuring (digital display) Measuring Accuracy	Maximum Resolution	Recording (analog) Recording Accuracy	Resolution
R S	±(0.15% of rdg + 1°C) but R,S: 0 –100°C, ±3.7°C	0.1°C		
B	100–300°C, ±1.5°C B: 400–600°C, ±2°C accuracy less than 400°C is not specified		Measurement accuracy ±(0.3% of recording span)	Pen: dead band: 0.2% of recording span; dot: 0.1 mm
K	±(0.15% of rdg + 0.7°C) but –200 to 100°C ±(0.15% of rdg + 1°C)	0.1°C		
E	±(0.15% of rdg + 0.5°C)	0.1°C		
J T	±(0.15% of rdg + 0.5°C) but J: –200 to 100°C ± (0.15% of rdg + 0.7°C)	0.1°C		
N	± (0.15% of rdg + 0.7°C)			
W (C)	± (0.15% of rdg + 1.0°C)			
L (J DIN) U (T DIN)	± (0.15% of rdg + 0.5°C) but L: –200 to 100°C ± (0.15% of rdg + 0.7°C)	0.1°C		

Measuring and Recording Accuracy – RTD (Measuring Current = 1 mA)

	Measuring (digital display)		Recording (analog)	
	Measuring Accuracy	Maximum Resolution	Recording Accuracy	Resolution
PT100 JPT100	±0.15% of rdg + 0.3°C	0.1°C	Measurement accuracy ±(0.3% of recording span)	Pen: dead band: 0.2% of recording span; dot: 0.1 mm

Note: Recording span is 100 mm.

Accuracy in Scaling

Accuracy during scaling (digits) =

measuring accuracy (digits) x multiplier + two digits (rounded up)

where the multiplier = scaling span digits/measuring span digits

Example: DCV 6 V range

Measuring span: 1.000 to 5.000 V

Scaling span: 0.000 to 2.000

Measuring accuracy = ±(0.3% x 5 V + 2 digits)

[0.015 V (15 digits) + 2]

±(17 digits)

Multiplier = 2000 digits (0,000 to 2.000)/4000 digits (1.000 to 5.000 V) = 0.5

Accuracy during scaling = 17 digits x 0.5 + 2 = 11 digits (rounded up)

Maximum Allowable Input Voltage

Less than 2 Vdc ranges and TC ranges: ±10 Vdc (cont.)
6 V to 2 Vdc: ±30 Vdc (cont.)

Reference Junction Compensation

INT/EXT selectable (per channel)

Reference Junction Compensation Accuracy (above 0°C)

Type R, S, B, W (C): ±1°C

Type K, J, E, T, N, L (J DIN), U (T DIN): ±0.5°C

Measurement Interval

Pen: 125 ms/channel

Dot: 2.5 s/6 dot

A/D Integration Time

Auto: 20 ms (50 Hz) or 16.7 ms (60 Hz), selected automatically

50 Hz: 20 ms

60 Hz: 16.7 ms -

100 ms (dot model)

TC Burnout

ON/OFF selectable (per channel)

Burnout upscale/downscale selectable (common for all channels)

Normal: less than 2 kΩ; burnout: more than 10 MΩ

Measuring current: approximately 100 nA

Filter

Pen: Signal damping (ON/OFF selectable per channel, in case of ON: time constant from 2, 5, 10 seconds selectable per channel)

Dot: Moving average (ON/OFF selectable per channel, in case of ON: averaging times from 2 to 16)

Recording and Printing

Recording Method: Pen: disposable felt pens, plotter pen

Dot: six-color wire dot

Pen Offset Compensation: ON/OFF selectable (for pen model only)

Effective Recording Width: 100 mm

Chart: Plain paper, Z-fold chart (16 m)

Step Response Time: Less than one second (acc. to IEC TC85 method), for pen model only

Recording Period: Pen: Continuous for each channel

Dot: maximum six-channel/10 seconds, AUTO/FIX selectable

AUTO: Analog recording interval is dependent on the chart speed

FIX: Analog recording interval is set to shortest period

Chart Speed: Pen: 5 to 12000 mm/h (82 increments)

Dot: 1 to 1500 mm/h (1-mm steps)

Chart Speed Change: Speed 1, speed 2 change by remote control signals (option)

Chart Feed Accuracy: Within ±0.1% (for recordings longer than 1000 mm), related to the grid of the chart paper

Recording Colors: Pen: pen 1 = red, pen 2 = green, pen 3 = blue, pen 4 = violet, plotter pen = purple
Dot: channel 1 = purple, channel 2 = red, channel 3 = green, channel 4 = blue, channel 5= brown, channel 6 = black (color can be assigned to any channel)

Recording Format

Analog Recording:

Zone recording: span more than 5 mm, 1.0-mm steps

Partial expanded recording: Boundary position: 1 to 99%
Boundary value: within recording span

Digital Printout:

Channel or tag printout (dot model only): Channel number or tag will be printed during analog recording; every 25 mm, this print will occur; selectable, common for all channels

Alarm printout: At the right side of the chart; channel number or tag, type of alarm, ON/OFF time (h/m) will be printed. It is selectable to get ON/OFF time of alarms printed, or ON time only, or no alarms (common for all channels)

Periodic printout: At the left side of the chart; date (m/d), time (h/m), chart speed, and measured data of every channel will be printed. Printing interval is INT/EXT selectable

INT: Using internal timer. Dependent on chart speed or on interval, which is selectable (up to 24 hours)

EXT: Using remote control option

Channel number or TAG printout: Selectable, common for all channels

Printout of measured data: ON/OFF selectable for each channel

Scale printout: For 40-mm zones and bigger, at 0% and 100% values

Message printout: Using keyboard or remote control option; up to five messages

Record start time: Time (h/m) will be printed when recording starts; ON/OFF selectable

Chart speed printout: Time (h/m) when chart speed is changed will be printed; ON/OFF selectable

List printout: Listings of range and alarm settings will be printed; ON/OFF selectable

SET UP list printout: Listings of settings in SET UP Mode will be printed

Manual printout: Using keyboard or remote control option

Relation between Chart Speed and Printout:

Pen Model

Recording Chart Speed	Periodic Printout	Alarm Printout/ Message Printout/ Time of Chart Speed Change/ Channel or Tag Printout
5 to 9mm	no printout	printout
10 to 1500mm	printout	
1600 to 12000mm	no printout	

Dot Model

Recording Chart Speed	Periodic Printout	Alarm Printout/ Message Printout/ Time of Chart Speed Change/ Channel or Tag Printout
1 to 9mm	no printout	printout
10 to 100mm	printout	
101 to 1500mm	no printout	

Relation between Chart Speed and Intervals of Periodic Printout:

Pen Model

Chart Speed	Printing Interval of Periodic Printout
5 to 9 mm/h	no printout
10 to 18 mm/h	every 8 hours
20 to 36 mm/h	every 4 hours
40 to 72 mm/h	every 2 hours
75 to 135 mm/h	every hour
150 to 180 mm/h	every 30 minutes
200 to 320 mm/h	every 20 minutes
360 to 1500 mm/h	every 10 minutes
more than 1500 mm/h	no printout

Dot Model

Chart Speed	Printing Interval of Periodic Printout
1 to 9 mm/h	no printout
10 to 19 mm/h	every 8 hours
20 to 39 mm/h	every 4 hours
40 to 79 mm/h	every 2 hours
80 to 100 mm/h	every hour
101 to 1500 mm/h	no printout

Display

Display Method: VFD (5 x 7 dot matrix, 11 characters)

Digital Display: AUTO: Channel number, type of alarm, measured values, unit (front three digits), for each channel alternately
MAN: Channel number, type of alarm, measured values, unit (front three digits) for one specific channel
DATE: Year/month/date will be displayed
TIME: Hour/minute/second will be displayed

Bar Graph Display: Measured data: Left-centered (%) bar graph and center-zero bar graph (selectable for each channel)
Alarm: Setting level of alarm, flashing display in case of alarm

Other Displays: RCD: Recording in progress

POC: Pen offset compensation (pen model only)

SET: SET Mode

ALM: Shared alarm (not corresponding to any channel)

CHT: Chart end indicator (optional)

BAT: Low battery

Alarm

Number of Levels: Up to four levels for every channel (High, Low, Delta high, Delta low, High rate-of-change, Low rate-of-change selectable)
Interval time of rate-of-change alarm is the measuring interval multiplied by 1 to 15 (selectable and common for both rate-of-change alarms)

Display: Set value is indicated as a segment on the bar graph
In case of alarm, this segment will start flashing on the bargraph and the digital display will show the type of alarm; the alarm indicator in different display will show alarm

Hysteresis: Approximately 0.5% of recording span (only High, Low) and 0%, selectable (common for all channels and all levels)

Alarm Indication (When ALARM ACK key is pressed):

Non-hold type: Alarm display is not affected when the ALARM ACK key is pressed
Hold type: When alarm occurs, alarm indicator will start flashing; After pressing the ALARM ACK key, the indicator will show the status of the alarm (see Figure 8-1)

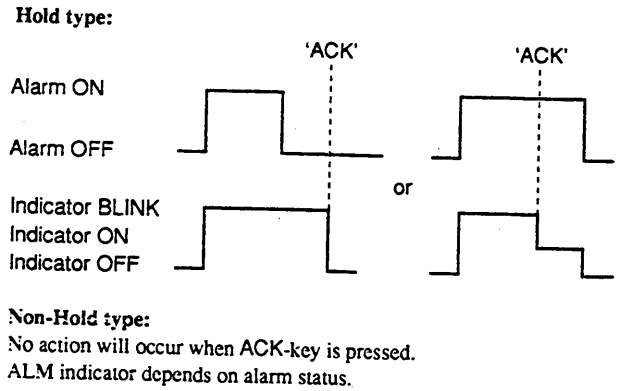


Figure 8-1. Alarm Indication, ALARM ACK

Performance and Characteristics

Input Resistance: More than 10 MΩ (TC, 20 mV, 60 mV, 200 mV, 2 V range); approximately 1 MΩ (6, 20 V range)

Input Source Resistance: DCV, TC input: less than 2kΩ

RTD input: Less than 10 Ω/wire (resistance is balanced between three wires)

Input Bias Current: Less than 10 nA (however, when burnout is specified for TC, 100 nA)

Maximum Common Mode Voltage: 250 Vac rms (50/60 Hz)

Common Mode Rejection Ratio: 120 dB (50/60 Hz ±0.1%, 500 Ω imbalance between negative terminal and ground)

Normal Mode Rejection Ratio: 40 dB (50/60 Hz ±0.1%)

Insulation Resistance: Each terminal to ground terminal: more than 20 MΩ (measured at 500 Vdc)

Dielectric Strength:

Power supply to ground terminal	1500 Vac (50/60 Hz), 1 minute
Contact output terminal to ground	1500 Vac (50/60 Hz), 1 minute
Measuring input terminal to ground	1000 Vac (50/60 Hz), 1 minute
Between measuring input terminals (except for RTD)	1000 Vac (50/60 Hz), 1 minute
REMOTE terminal to ground	500 Vac, 1 mm

Construction

Mounting: Flush panel mounting (vertical), mounting next to each other (horizontal); mounting may be inclined up to 30°, rear below front (with horizontal base)

Allowable Panel Thickness: 2 to 26 mm

Material: Case: drawn steel; front door: aluminium die casting

Finish: Case and door-frame: lampblack (Mansell 0.8Y 2.5/0.4 or equivalent)

Door: Splash-proof (in accordance with DIN 40050-IP54)

Dimensions: 144 (W) x 144 (H) x 220 (D) mm

Weight:

One-pen model	3.2 kg
Two-pen model	3.4 kg
Three-pen model	3.6 kg
Four-pen model	3.8 kg
Six-dot model	3.5 kg

Power Supply

Rated Power Voltage: For other than –24 V model: 100 to 240 Vac, automatically selected, depending on the power supply voltage; 45 to 65 Hz, automatically adjusted; –24 V model: 24 Vdc

Usable Power Voltage Ranges: For other than –24 V model: 90 to 132, 180 to 250 Vac; –24 V model: 21.6 to 26.4 Vdc

Rated Power Frequency: 50/60 Hz, no need to change switches (for other than –24 V model)

Power Consumption (for other than –24V model):

	100 Vac Power Source	240 Vac Power Source	Maximum
Four-pen	18 VA*	25 VA*	70 VA
Six-dot	18 VA	25 VA	50 VA

* In balance

Normal Operating Conditions

Power Voltage: For other than –24 V model, 90 to 132, 180 to 250 Vac

–24 V model, 21.6 to 26.4 Vdc

Power Frequency: 50 Hz ±2%, 60 Hz ±2% (for others than –24 V model)

Ambient Temperature: 0 to 50°C

Ambient Humidity: 20 to 80% RH (at 5 to 40°C)

Vibration: 10 to 60 Hz, less than 0.02 G

Shock: Not permissible

Magnetic Field: Less than 400 AT/m (dc and 50, 60 Hz)

Noise: Normal Mode (50, 60 Hz)

DCV: Peak value including signal must be less than 1.2 times the measuring range

TC: Peak value including signal must be less than 1.2 times the measuring mV

RTD: Less than 50 mV

Common Mode (50, 60 Hz): Less than 250 Vac rms for the whole range

Operating Position: Frontwards, 0°; backwards, within 30°

Warmup Time: At least 30 minutes after the power has been turned ON

Effect of Operation Conditions

Effect of Ambient Temperature Variation of 10°C:

Digital display:	Within ±(0.1% of rdg + 1 digit)
Recording:	Within digital display ±0.2% of recording span (excluding RJC error)

Effect of Power Supply: Effect of variation in rated power supply voltage (50 or 60 Hz is reference), rated power supply voltage is according to specifications):

Digital display:	Within ±1 digit
Recording:	Within +0.1% of recording span

Effect of Rated Power Frequency Variation of ±2 Hz (100 Vac is reference):

Digital display:	Within ±(0.1% of rdg + 1 digit)
Recording:	Same as digital display

Effect of Magnetic Field: Effect of ac (50/60 Hz) or dc (400 AT/m field):

Digital display:	Within ±(0.1% of rdg + 10 digit)
Recording:	Within ±0.5% of recording span

Effect of Input Source Resistance (variation of +l kΩ: DCV range):

Ranges <2 V:	Within ±10 μV
Ranges >6 V:	Within –0.1% of rdg
TC range:	Within ±10 μV (±100 μV when TC burnout protection is set)

Effect of Input Source Resistance (RTD range):

Effect of 10 Ω per wire (resistances of three wires must be equal):

Digital display:	Within ±(0.1% of rdg + 1 digit)
Recording:	Within digital display ±0.1% of recording span

Effect of difference of three wires: Digital display: 0.1°C per 40 mΩ (approximate)

Effect of Operating Position:

Digital display:	Within ± (0.1% of rdg + 1 digit) (within 30° backwards)
Recording:	Within digital display ±0.1% of recording span (within 30° backwards)

Vibration: Effect when sine-wave motion of frequency 10 to 60 Hz and acceleration of 0.02 G is applied to the instrument in the direction of three axes each for two hours:

Digital display:	Within ±(0.1% of rdg + 1 digit)
Recording:	Within digital display ±0.1% of recording span

Transport and Storage Conditions

No malfunction will occur under these conditions; however, when returning to normal operation conditions, calibration might be necessary

Temperature:	–25 to 60°C
Humidity:	5 to 95% RH (no condensation)
Vibration:	10 to 60 Hz, 0.5 G
Shock:	Less than 40 G (inside packings)

Other Specifications

Clock: With calendar function

Accuracy: ±100 ppm, not including error due to turning ON/OFF power

Panel Key Lock: By actual key; panel keys that should not be locked can be assigned

Internal Illumination: Using internal reflection of VFD display

Memory Backup: Lithium battery to preserve setting parameters; life is approximately 10 years (at room temperature for standard model) and is installed inside the recorder; if the battery runs out, this will be shown on the front panel indicator

Safety Standards

Based on IEC 348/EMI Standard EN55011 Group 1 Class A

9 Maintenance

9.1 Periodic Maintenance

Check the recorder operation periodically to keep the recorder in good operating condition. In particular, replace consumable parts (such as charts, disposable felt-tip pens, fuses, and batteries, etc.) as needed and check the following items:

- Are display and recording functioning properly? If not, see Section 10, Troubleshooting.
- Are there blurred or broken sections of recording or printout characters? If so, replace the relevant felt-tip pen or plotter pen. (For replacement, see Section 3.)
- Is the chart paper feeding properly? If not, see Section 10, Troubleshooting.
- Is there enough chart paper left? The remaining chart paper length is printed on the chart's left-side margin at intervals of 20 cm. (See Figure 9-1.) For replacement of the chart paper, see Section 3.

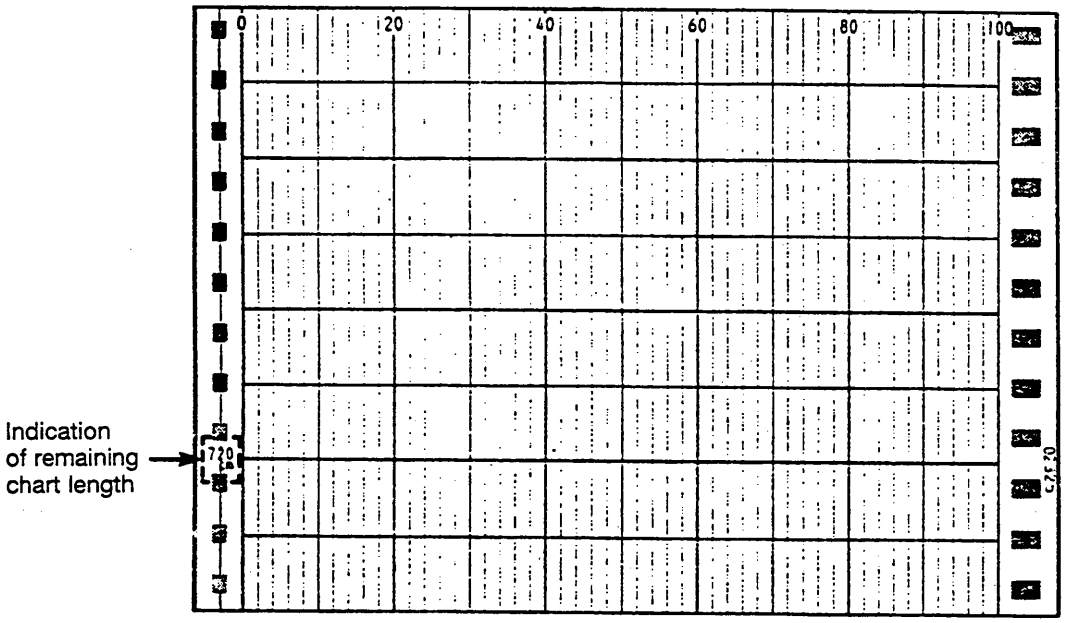


Figure 9-1. Indication of Remaining Chart Length

- Is the indicator BAT illuminated or flashing? If the indicator is illuminated, the lithium battery needs to be replaced. For replacement, contact OMEGA Engineering. Addresses may be found on the inside front cover of this manual.

WARNING

Warning: To avoid injury, the lithium battery should only be serviced by a qualified technician.

9.2 Fuse Replacement ⚠

Replace the fuse at least once every two years for preventive maintenance. To replace the fuse, turn OFF the main power supply.

1. Remove the chart compartment. Do this as follows:

   Swing the keyboard open at the upper left corner. While gently pressing the chart paper compartment lock tabs, located at the lower right and left front, in the direction of the arrow, swing and lift the compartment from the unit.

2. The fuse is now visible in the right lower front of the plate. (Refer to Figure 9-2.) Turn the knob of the fuse holder counterclockwise, and the holder will slide out with the fuse.

3. Make sure that the new fuse rating is correct and mount the new fuse by turning the knob clockwise.

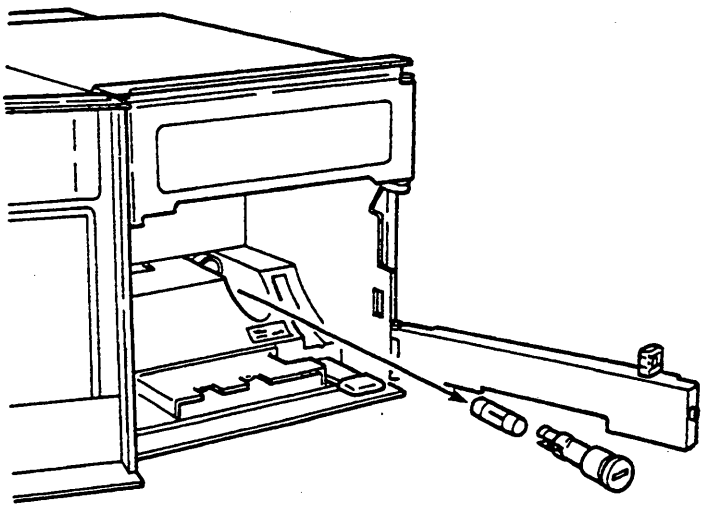


Figure 9-2. Fuse Replacement

WARNING

Warning: Before replacing the fuse, make sure to turn OFF the power supply and disconnect the power source. Use only specified fuses, which should be obtained from OMEGA Engineering. The use of other fuses could cause a fire.

9.3 Pen Adjustment (Pen Model)

It is recommended that you adjust the position of the pens once a year. To adjust the pens, proceed as follows:

1. Allow a warmup time for the recorder of at least 30 minutes. Check that the ambient temperature and humidity are within Normal Operating Conditions (see Section 8, Specifications).
2. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ. Press the ENT key.
4. You can now adjust the ZERO position of the pens (left side of the chart) or the FULL position of the pens (right side of the chart). It is recommended that you adjust the ZERO position before the FULL position. After selection, press the ENT key.
5. Select the channel number (= pen number) that you want to adjust. Then press the ENT key.
6. Change the numeric value, and the pen will move to its new position after the ENT key has been pressed. Continue this procedure until the pen is in its correct position. Changing the value 1 digit will result in a pen movement of approximately 0.02 mm. A + change will result in movement to the right. The correct position can be checked by the use of the grid on the chart.
7. This adjustment has been completed, but before leaving the SET UP Mode, you have to store these settings. Press the ESC key to return to the SETUP=P ADJ display, then select the SETUP=END display.
8. Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

9.4 Printer Carriage Adjustment (Dot Model)

It is recommended that you adjust the position of the carriage once a year. To adjust the carriage, proceed as follows:

1. Allow a warmup time for the recorder of at least 30 minutes. Check that the ambient temperature and humidity are within Normal Operating Conditions (see Section 8, Specifications).
2. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ. Press the ENT key.

4. You can now adjust the ZERO position of the carriage (left side of the chart), the HYS position of the carriage (middle of the chart), or the FULL position of the carriage (right side of the chart). It is recommended that you adjust the HYS position first, and ZERO position before the FULL position. Select HYS and press the ENT key.

The carriage should print a straight line, but might print as shown in Figure 9-3.

Figure 9-3. Carriage Printing

5. If the line looks like the one shown at the left of Figure 9-3, adjust the value on the display to a bigger value. Then, press the ENT key. If the line looks like the one shown at the right of Figure 9-3, adjust the value on the display to a smaller value and press the ENT key.
6. Continue this procedure until the carriage prints a straight line. Changing the value 1 digit will result in a carriage movement of approximately 0.1 mm.
7. Next, select ZERO. The carriage will print a line on the left side of the chart. This line should be the 0 position. If the line is printed before the 0 position (which can be seen from the grid on the chart), adjust this by entering a larger value. After adjusting, press the ENT key.
8. Then, select FULL. The carriage will print a line on the right side of the chart. This line should be the 100 position. If the line is printed before the 100 position (which can be seen from the grid on the chart), adjust this by entering a larger value. After adjusting, press the ENT key.
9. This adjustment has been completed, but before leaving the SET UP Mode, you have to store these settings. Press the ESC key to return to the SETUP=P ADJ display, then select the SETUP=END display.
10. Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

9.5 Calibration

The RD100A recorder comes fully calibrated; however, it is recommended that you perform a calibration once a year to ensure measuring accuracy. The required instrumentation is the OMEGA Model CL27 or equivalent.

9.5.1 Calibration Procedure

1. Connect the calibration instrument to the input terminals of the recorder, as shown in Figures 9-4, 9-5, 9-6, and 9-7 and allow the recorder to warm up for at least 30 minutes. (Allow the instrument to warm up according to its specifications.)
2. Check that the ambient temperature and humidity are within Normal Operating Conditions (see Section 8, Specifications).
3. Apply an input corresponding to 0, 50, and 100 percent of the entered setting range, then calculate errors from the readings on the display.
4. If the error is at any point outside the accuracy limits (for accuracies, see Section 8, Specifications), contact OMEGA Engineering. Addresses may be found on the inside front cover of this manual.

NOTE

Note: For a TC input, it is necessary to measure the temperature of the input terminals and add a voltage corresponding to the reference temperature.

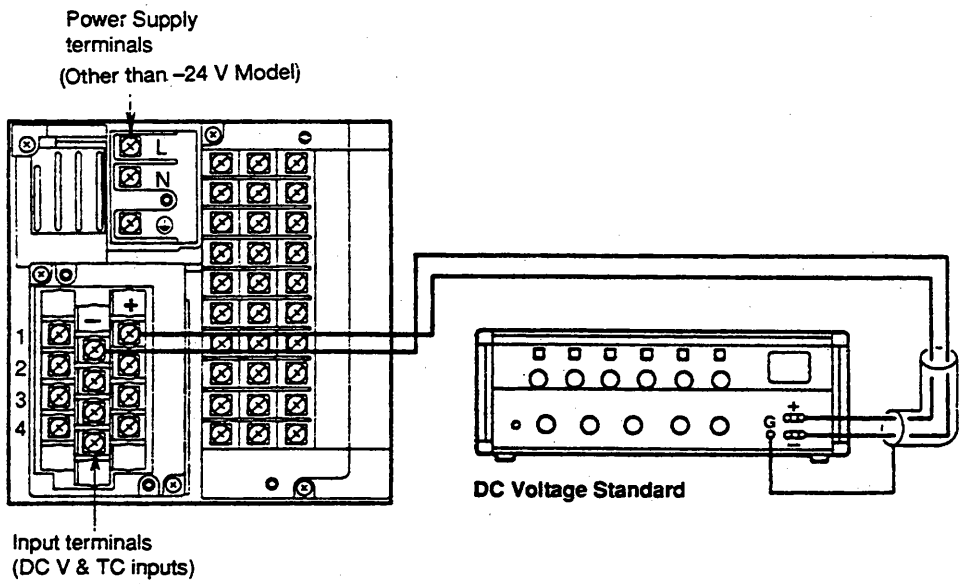


Figure 9-4. dc Voltage Measurement

Figure 9-4 shows the pen model; however, connections should be done in the same way for the dot model.

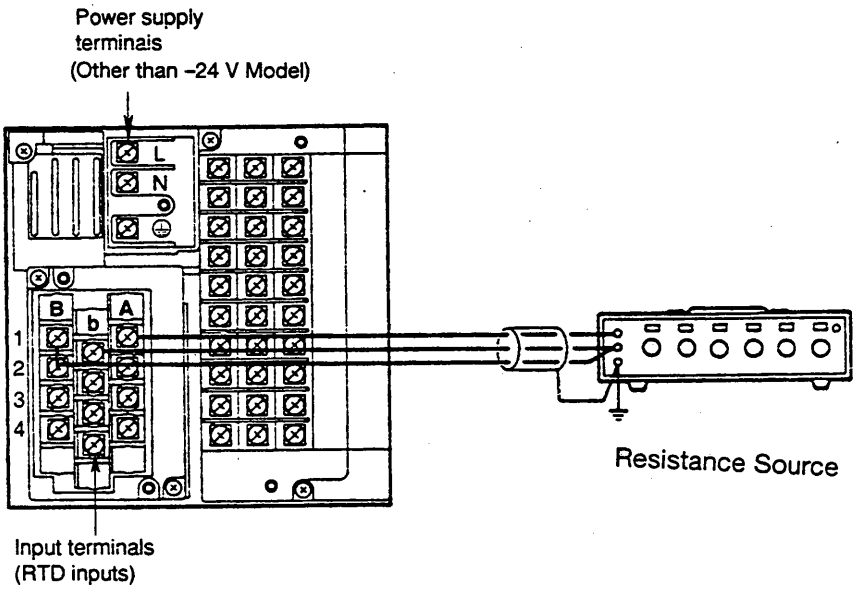


Figure 9-5. Temperature Measurement Using RTD, Pen Model

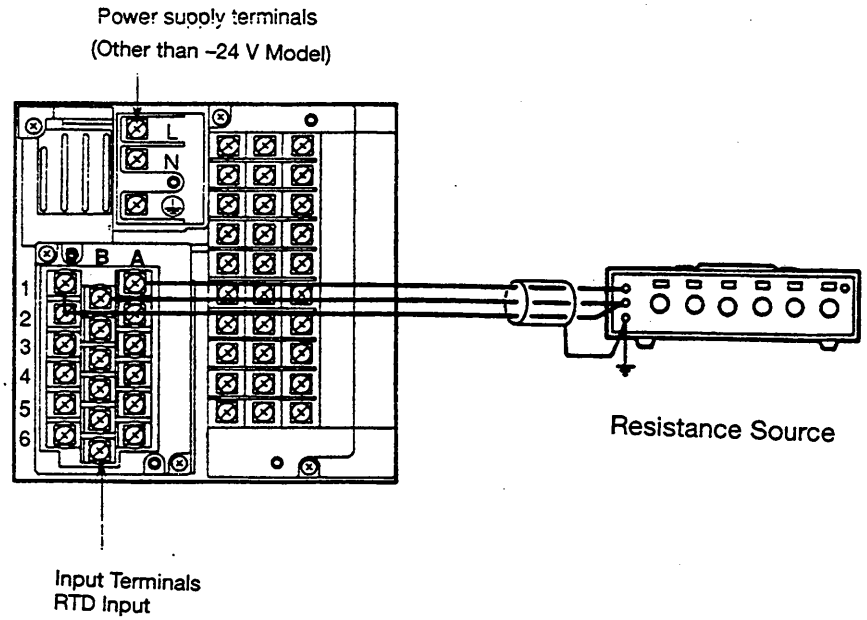


Figure 9-6. Temperature Measurement Using RTD, Dot Model

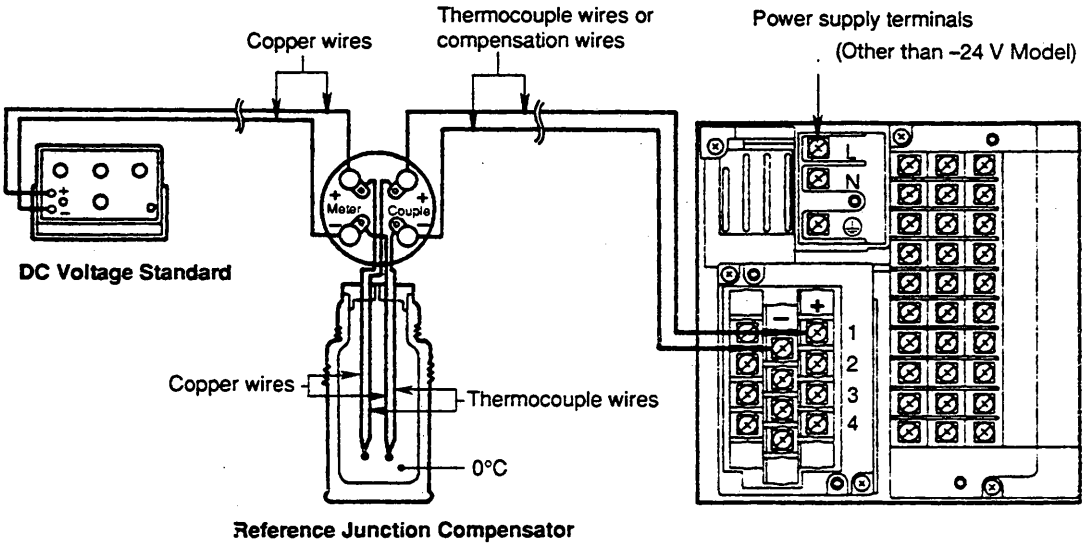


Figure 9-7. Temperature Measurement Using TC

9.5.2 Reference Junction Compensation for Thermocouple Input

As the temperature at the measurement terminal of the recorder is generally equal to the room temperature, a voltage is applied to the inside circuit to obtain the equivalent of 0°C. Therefore, when the measurement terminals are shorted (equivalent to 0°C at detector tip in the reference table), the room temperature (which equals the temperature at the measurement terminal) is displayed. As a result, the recorder is measuring the temperature of the input terminal and compensates this value. When calibrating the recorder, the input voltage without subtracting the compensation voltage should be applied (For example, use the TRC111 reference junction compensator.)

9.6 Cleaning the Plotter Carriage Shaft (Pen Model)

When using the recorder under normal operating conditions, periodically inspect the plotter carriage shaft for dirt. It is recommended that the plotter carriage be cleaned at least once a year. To clean, proceed as follows:

1. Remove the plastic plate at the plotter carriage shaft (see Figure 9-8).
2. Two shafts (the upside and the downside of the plotter carriage) are visible (see Figure 9-8). Wipe off dirt using a soft cloth without fibers. If the dirt is persistent, you may use ethyl alcohol.

CAUTION

Caution: Be careful not to damage the flexible wiring strip connected to the printer carriage. Do not apply oil to the shafts.

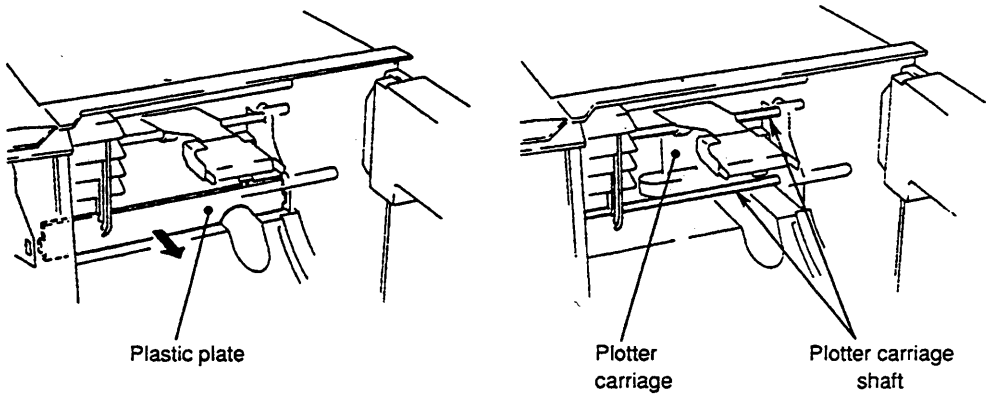


Figure 9-8. Cleaning the Plotter Carriage Shaft

9.7 Lubrication (Dot Model)

When using the recorder under normal operating conditions, periodically inspect the carriage shaft for adequate lubrication. It is recommended that the carriage be lubricated at least every year.

To lubricate, proceed as follows (see Figure 9-9):

1. Wipe off dirt and accumulated oil from the carriage shaft with a soft cloth (without fibers).
2. Use only the specified lubricating oil.
3. Put a small amount of lubricating oil on the shaft. Wipe off any excess oil with a soft cloth (without fibers).

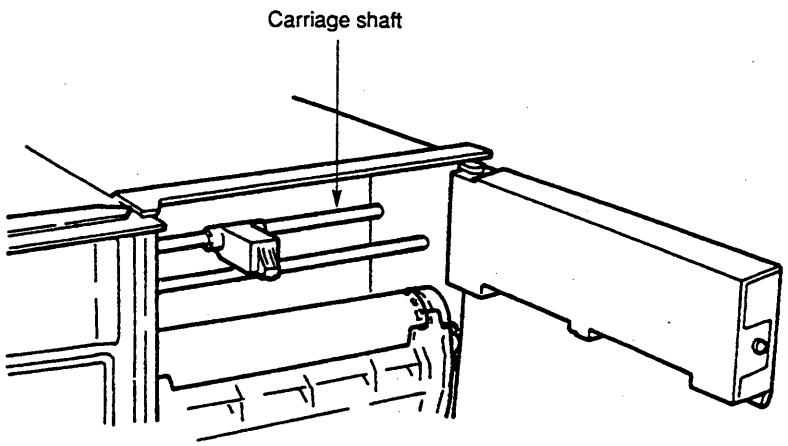


Figure 9-9. Lubrication

10 Troubleshooting

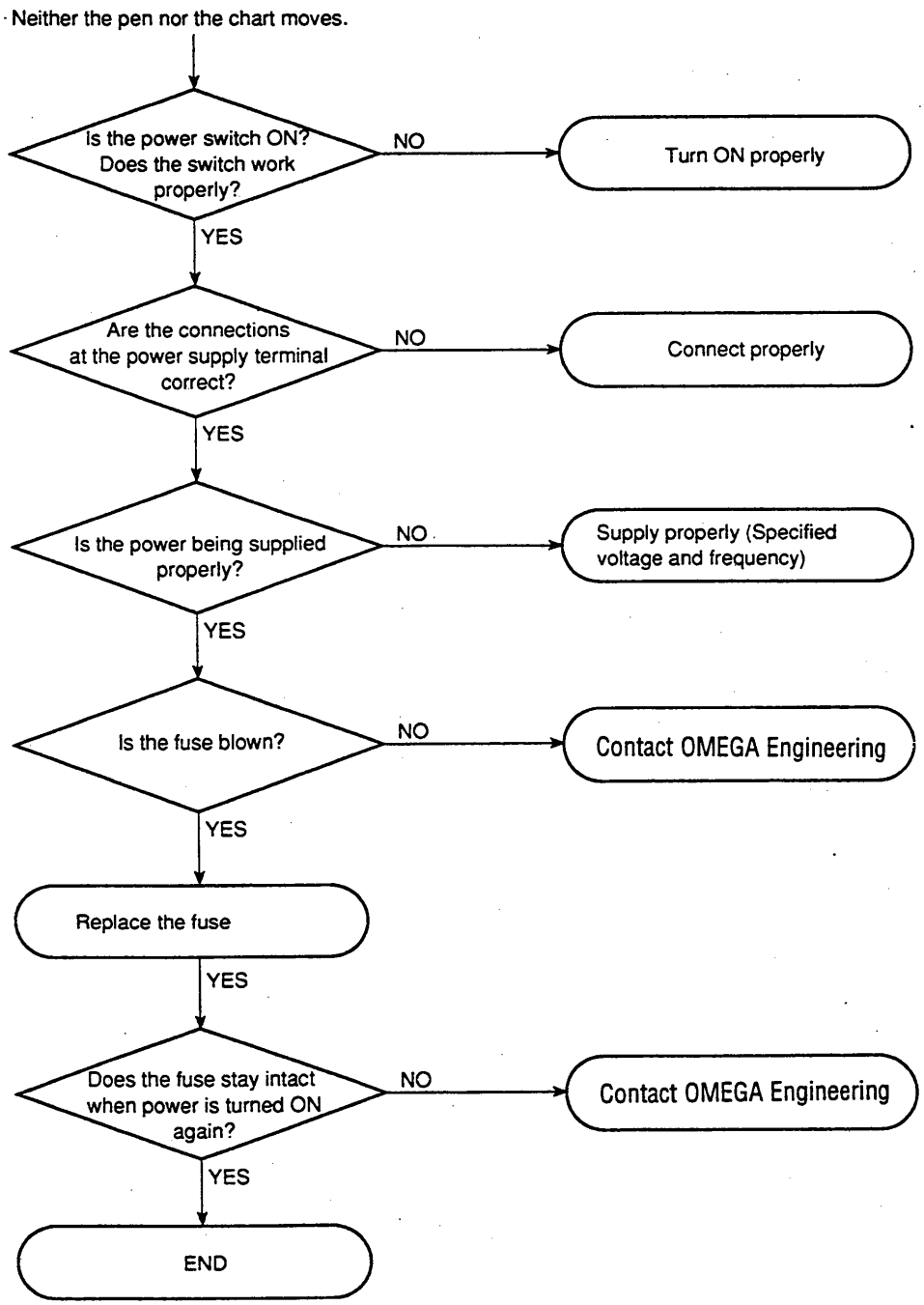
This section describes the causes and countermeasures to be taken in case errors or failures occur.

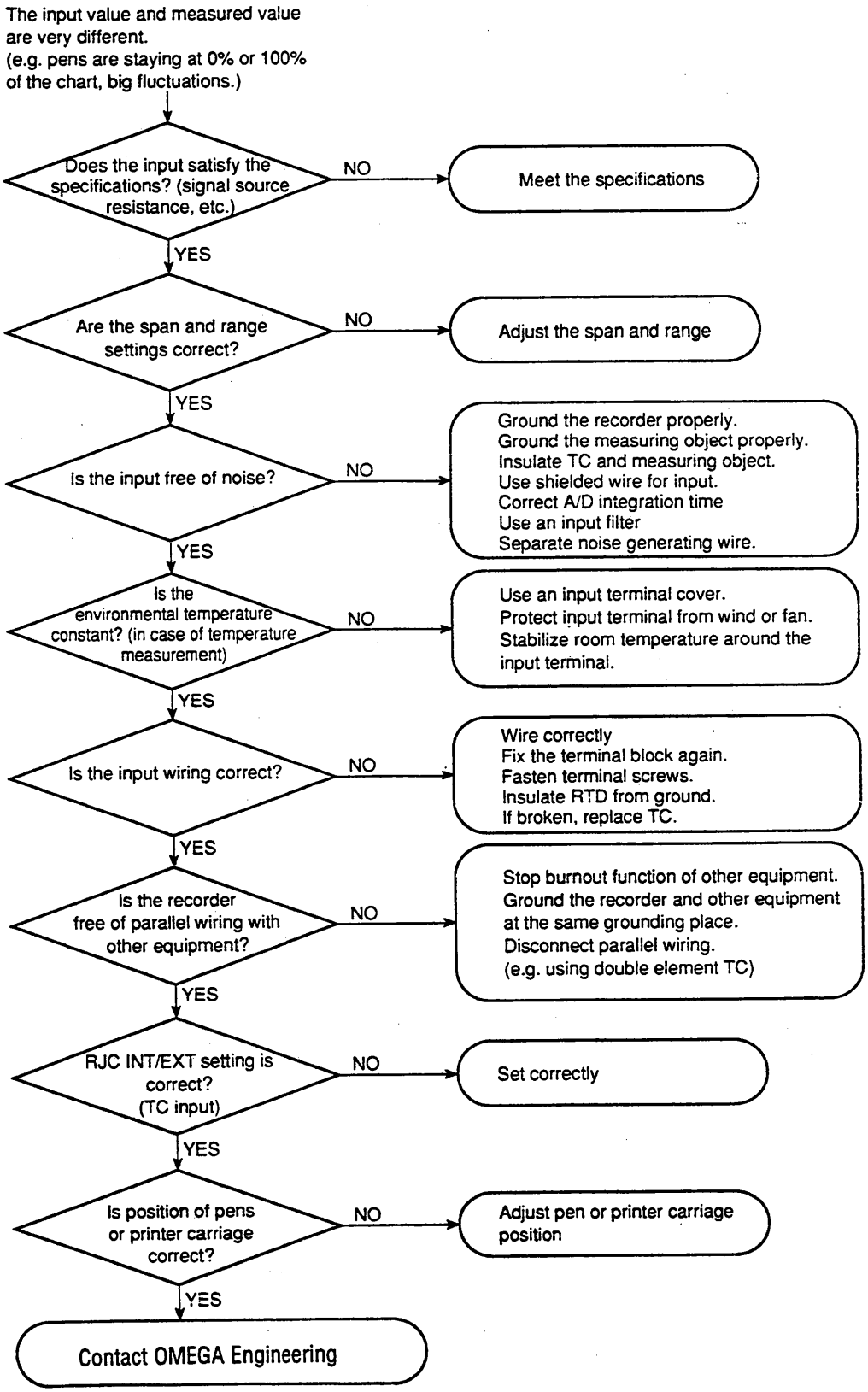
10.1 Error Messages

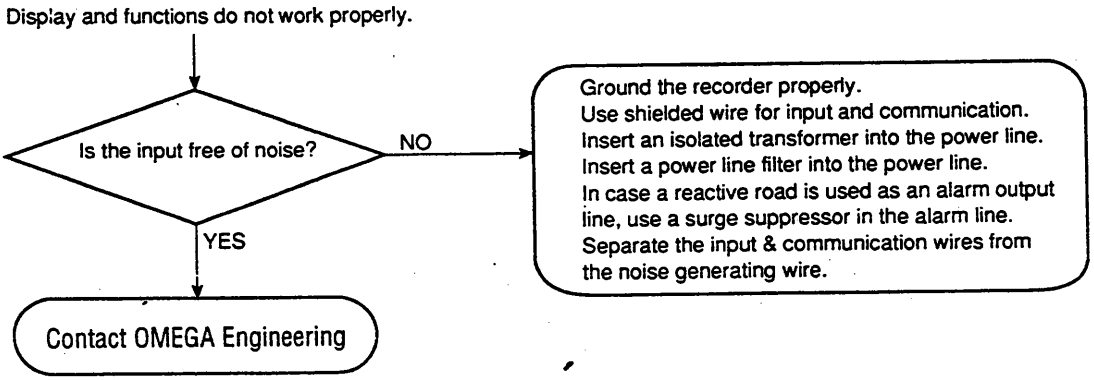
Error Message (on display)	Error Description	Countermeasure
ERROR 001	Main recorder related errors other than those below	Contact OMEGA Engineering
ERROR 002	Value entered exceeds allowable setting range	Enter correct value
ERROR 003	Time setting error	Enter correct time
ERROR 004	Attempted to enter a channel that cannot be selected	Enter correct channel
ERROR 006	Attempted to select illegal option	
ERROR 011	Attempted to perform a list, setup, manual, or message printout when out of chart	Insert chart (see Section 3)
ERROR 012	Attempted to change pens while recording	Stop recording (see Section 3)
ERROR 040	Reference channel nunber is larger than the DELTA channel number	Enter correct ref. channel (see Section 5)
ERROR 041	DELTA reference channel set up for SKIP	Change range setting (see Section 5)
ERROR 042	DELTA reference channel set up for DI	Change range setting (see Section 5)
ERROR 043	DELTA reference channel set up for SCALE or SQRT	Change range setting (see Section 5)
ERROR 045	Left span value is the same as the right span value	Change span value (see Section 5)
ERROR 046	Left scale value is the same as the right scale value	Change scale value (see Section 5)
ERROR 060	Attempted to set alarm on SKIP channel	Change range setting (see Section 5)
ERROR 061	Attempted to set alarm on DI channel	Change range setting (see Section 5)
ERROR 083	Channel set to PARTIAL has a range set to SKIP	Change range setting (see Section 5)
ERROR 084	Channel set to PARTIAL has a range set to DI	Change range setting (see Section 5)
ERROR 086	Left zone value is the same as the right zone value	Change zone value (see Section 6)
ERROR 087	Left zone value is bigger than the right zone value	Change zone value (see Section 6)
ERROR 088	Band between left and right zone values is less than 5 mm	Change zone value (see Section 6)
ERROR 160	Conmunication-related error	See special option manual
ROM ERROR	System ROM failure	Contact OMEGA Engineering
RAM ERROR	Main memory failure	Contact OMEGA Engineering
NV ERROR 1	Main NV RAM failure	Contact OMEGA Engineering
NV ERROR 2	All A/D NV RAM failure	Contact OMEGA Engineering
AD NV ERR □	ch AD NV RAM failure (□ch will be skipped)	Contact OMEGA Engineering
AD ADJ ERR □	ch A/D calibration data error (□ch will be skipped)	Contact OMEGA Engineering
PLOTTER ERR	Plotter board failure	Contact OMEGA Engineering
COMM ERR	Communication board error	Contact OMEGA Engineering
COMM REMOVE	The communication function is now out of use	Contact OMEGA Engineering

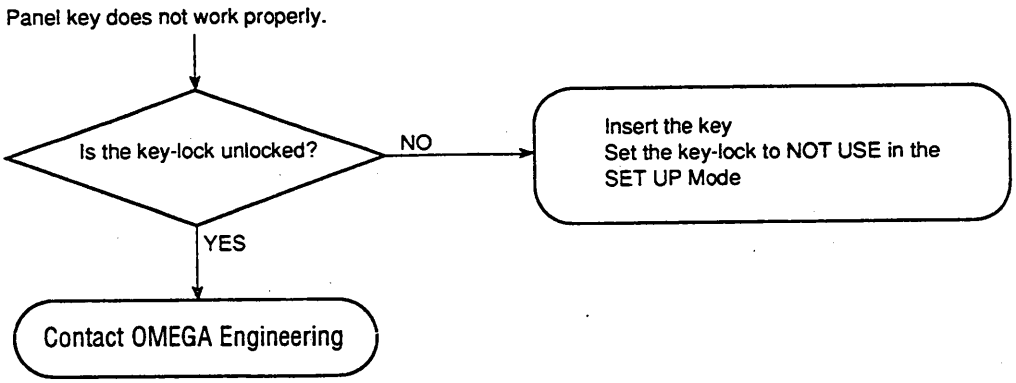
Self-Diagnostic Message (Printout)	Description
STORE SET UP SETTINGS AGAIN	SET UP settings must be reconfirmed to maintain reliability. Proceed as follows: Enter the SET UP Mode. Select the SETUP=END display Press the ENT key and STORE (refer to Section 7)

10.2 Troubleshooting Flow Chart




The input value and measured value are very different.
(e.g. pens are staying at 0% or 100% of the chart, big fluctuations.)
Does the input satisfy the specifications? (signal source resistance, etc.)
NO
Meet the specifications
YES
Are the span and range settings correct?
NO
Adjust the span and range
YES
Is the input free of noise?
NO
Ground the recorder properly.
Ground the measuring object properly.
Insulate TC and measuring object.
Use shielded wire for input.
Correct A/D integration time
Use an input filter
Separate noise generating wire.
YES
Is the environmental temperature constant? (in case of temperature measurement)
NO
Use an input terminal cover.
Protect input terminal from wind or fan.
Stabilize room temperature around the input terminal.
YES
Is the input wiring correct?
NO
Wire correctly
Fix the terminal block again.
Fasten terminal screws.
Insulate RTD from ground.
If broken, replace TC.
YES
Is the recorder free of parallel wiring with other equipment?
NO
Stop burnout function of other equipment.
Ground the recorder and other equipment at the same grounding place.
Disconnect parallel wiring.
(e.g. using double element TC)
YES
RJC INT/EXT setting is correct? (TC input)
NO
Set correctly
YES
Is position of pens or printer carriage correct?
NO
Adjust pen or printer carriage position
YES
Contact OMEGA Engineering


Display and functions do not work properly.
Is the input free of noise?
NO
YES
Contact OMEGA Engineering
Ground the recorder properly.
Use shielded wire for input and communication.
Insert an isolated transformer into the power line.
Insert a power line filter into the power line.
In case a reactive road is used as an alarm output line, use a surge suppressor in the alarm line.
Separate the input & communication wires from the noise generating wire.


Panel key does not work properly.
Is the key-lock unlocked?
NO
YES
Contact OMEGA Engineering
Insert the key
Set the key-lock to NOT USE in the SET UP Mode

A Appendix – Servicing the RD100A

This appendix describes the servicing procedure for the RD100A pen and dot printing recorder. These procedures are meant to be used by qualified personnel only. Be sure to read the safety precautions at the beginning of this manual and the warning cautions contained prior to carrying out any service procedures.

A.1 Principle of Operation

This section describes the principle of operation for the RD100A pen and dot printing model. The description below corresponds to Figures A-1 and A-2.

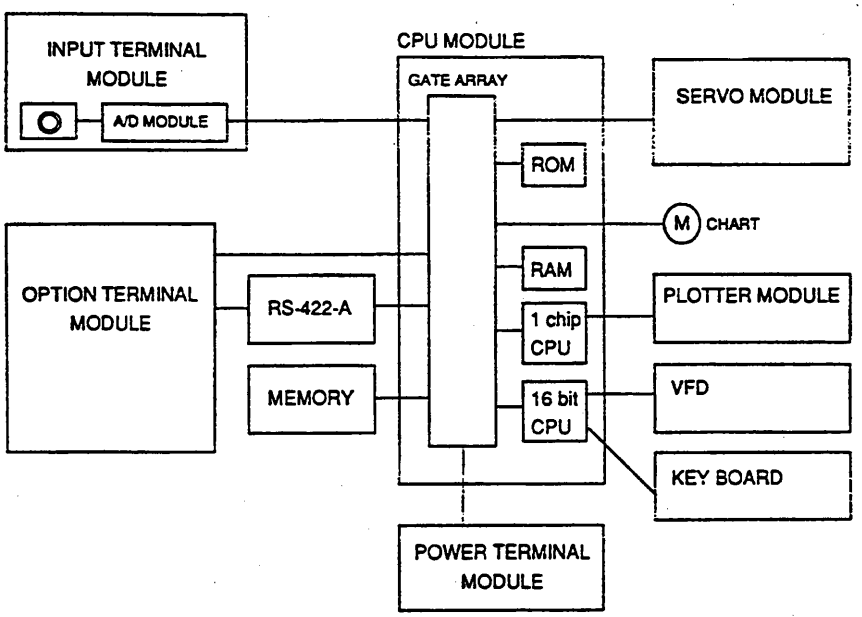


Figure A-1. Block Diagram of the RD100A Pen Model

A.1.1 Input Terminal

The A/D converter uses feedback pulse width modulation. To meet the requirements of small size, small power consumption, and low cost, almost all of the input terminal functions have been joined into the one-chip analog ASIC. This ASIC is a full custom IC using BICMOS process and works as a MOS switch, etc., which is necessary for excellent analog data and self-calibration.

The input terminal can drive relays or photo-couplers directly, because such items as programmable gain amp, voltage reference, PWM modulator, current source for RTD measurements, differential amp, voltage source for RJC, serial parallel converter, etc. are provided.

The input terminal uses a self-resonant switching power supply (dc-dc connector), which is of the sine wave oscillating type, for the power supply terminal. Noise filtering is being integrated.

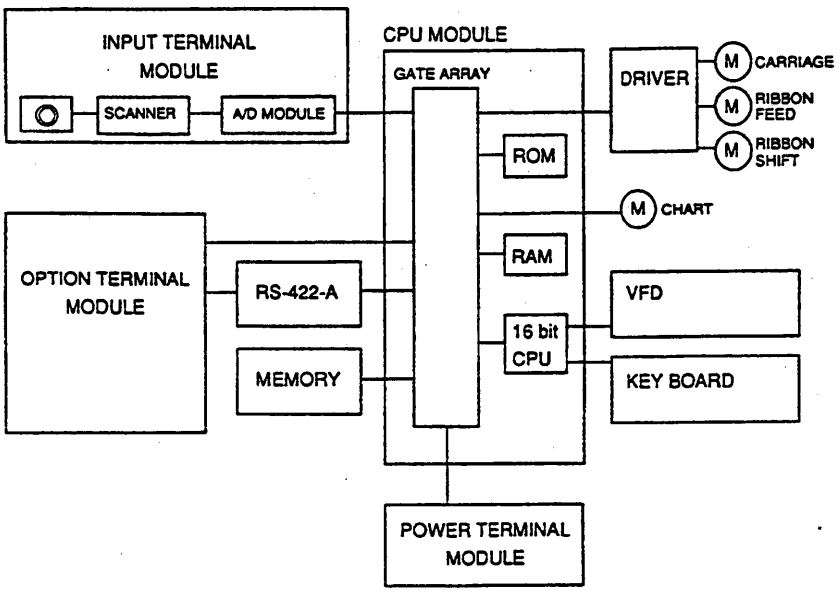


Figure A-2. Block Diagram of the RD100A Dot Printing Model

The input terminal detects the frequency of the power, while the integrated time becomes 20 ms or 16.67 ms. The input terminal carries a very high rate of noise rejection of the power frequency.

If the power frequency of the instrument and the object to be measured are different, the appropriate integrated time is manually selectable. In the dot model, the selection of 100 ms for 50/60 Hz is also available. A 16-bit resolution is achieved, regardless of the integrated time.

The input terminal is removable. The internal print board is isothermal because a print board with metal core is used. Therefore, stable reference junction compensation is realized.

A.1.2 Scanner

An in-house-developed SSR (solid-state relay) is being used for the scanner. The SSR, with a semiconductor switch, has the characteristic of withstanding voltage of as high as 1500 V and a leakage current of only 1 nA. For that reason, it has the following features:

- A semi-infinite life because of no mechanical contacts
- Silent operation
- No occurrence of thermoelectric power.

On the other hand, the SSR has, compared to a mechanical relay, the disadvantage of a bigger ON resistance and OFF capacity. As a result, this effects RTD measurement and noise resistance characteristics. Regarding RTD measurements, a differential amp was inserted into the previously mentioned analog ASIC, and a circuit

was realized that receives no influence of ON resistance, without increasing the number of parts.

For RTD measurements, there is generally non-insulation between channels. By changing the terminal and adding an insulated scanner board, insulation between channels was easily established, and RTD measurements became possible at the RD100A.

A.1.3 Pen Servo

The pen servo is a unit where the pens are balanced on the chart paper based on a signal sent from the arithmetic/control component. The unit is a specially designed, ultrathin component where, in a height of 12 mm, the brushless dc motor and driving system, the ultrasonic position detector, and the control circuit are all located. The brushless dc motor within the unit is of the revolving field type (noncontact hole motor). The contactless, ultrasonic position detector measures the carriage position by the propagation delay time of the ultrasonic pulse, and gives position feedback to the pen

A.1.4 Plotter

The pen model includes a small XY plotter for digital printing. This plotter module is realized by placing solenoid for the pen up, adding a Y-axis drive motor, and by using PPS resin for good sliding and heat resistance of the carriage.

A.1.5 Recording

The length of the pen recording has been increased to 1.5 times the conventional type (approximately 2 km straight line). The capacity of the plotter pen has become twice the conventional type (approximately 10,000 characters). And ink bleeding along the chart folds has been eliminated by using precision slots along the platen.

A.1.6 Dot Mechanism

A field-proven, six-color, wire dot ink ribbon is being used for the dot mechanism. Because of the small size of the moving parts, the dot frequency is three times faster than the conventional type.

By improving the dot sequence (in two scans, six channels can be printed), the cycle time has been shortened to 10 seconds/six channels.

A.1.7 Display

A luminescent VFD, consisting of 11 characters and 1% resolution bar graphs, is being used for the display. High brightness, high angle of visibility, and low reflection are therefore realized.

Colors are realized by applying a color filter in front of the VFD display. The back side of the VFD display illuminates the chart.

A.1.8 Keyboard

The keyboard can be operated in interaction with the displays.

A.1.9 Power Module

By switching the power supply itself, universal power supply is realized without the need for changing voltages. In addition, there is no need to switch between 50/60 Hz either.

A.2 Testing

A.2.1 Acceptance Test

This section describes the procedure to perform the acceptance test.

1. Verify that the RD100A is complete, with all of its accessories included.
2. Be sure that you understand the operating procedures, which are described in Sections 1 through 10 of this manual.
3. Check each function using this manual.
4. Read and implement the Self-diagnosis Test section of this appendix.
5. Read and implement the Performance Test section of this appendix.

A.2.2 Self-diagnosis Test

The RD100A is provided with complete self-diagnosis functions to enhance reliability in measurement and serviceability.

When you turn ON the power, the RD100A will automatically execute the following types of diagnoses alternately and display the results. (After these tests are completed, the RD100A is in operating condition.)

Tests for the pen model:

1. System ROM test
2. RAM test
3. NV RAM test
4. Plotter board test
5. Communication board test.

Tests for the dot printing model:

1. System ROM test
2. RAM test
3. NV RAM test
4. Recording mechanics test
5. Communication board test.

Tables A-1 and A-2 show the order and results of the self-diagnosis tests.

Table A-1. Self-diagnosis Test for the Pen Model

No.	Item	Display in case of Failure Detection	Remarks
1	ROM test	ROM ERROR	System ROM failure
2	RAM test	RAM ERROR	Main memory failure
3	NV RAM test	NV ERROR 1 AD NV ERR□ AD ADJ ERR□ NV ERROR 2	Main NV RAM failure ch□will be skipped ch□will be skipped All A/D NV RAM failure
4	Plotter board test	PLOTTER ERR	Plotter board failure
5	Communication board test	COMM ERR COMM REMOVE	Communication board error Comm. function is out of use

Table A-2. Self-diagnosis Test for the Dot Printing Model

No.	Item	Display in case of Failure Detection	Remarks
1	ROM test	ROM ERROR	System ROM failure
2	RAM test	RAM ERROR	Main memory failure
3	NV RAM test	NV ERROR 1 AD NV ERR AD ADJ ERR	Main NV RAM failure A/D NV RAM failure A/D calibration data error
4	Recording mechanics test	RIBBON ERR PRINTER ERR	Ribbon shift failure Printer carriage failure
5	Communication board test	COMM ERR COMM REMOVE	Communication board error Comm. function is out of use

As a result of the self-diagnosis test, you may find the following message printed on the chart:

STORE SET UP SETTINGS AGAIN

When this message appears, the SET UP settings must be reconfirmed. Enter the SET UP Mode, select the SETUP=END display, press the ENT key, select STORE, and then press the ENT key again.

A.2.3 Performance Test

This paragraph describes several tests to verify the operation of the RD100A performance against published specifications. These tests need not be performed in any specific order.

A.2.3.1 Before You Begin

Testing Conditions

When carrying out the performance tests that follow, make sure that the instrument is tested under the following conditions:

- Ambient temperature: 23±2°C
- Humidity: 55±10% RH
- Power supply voltage: 90 to 132 Vac, 180 to 250 Vac
- Power supply frequency: 50/60 Hz±1%.

Preparation

Before carrying out the performance tests in this section follow, proceed as follows:

- Turn ON the power supply
- Verify that the RD100A passes the self-diagnostic function without any problems
- Allow a warmup time of at least 30 minutes.

A.2.3.2 Measurement Accuracy Test

The specifications are as follows:

dc Voltage

20 mV: ±(0.2% of rdg + 3 digits)

60 mV: ±(0.2% of rdg + 2 digits)

200 mV: ±(0.2% of rdg + 2 digits)

2 V: ±(0.1% of rdg + 2 digits)

6 V: ±(0.3% of rdg + 2 digits)

20 V: ±(0.3% of rdg + 2 digits)

RTD

PT100, JPT100: ±(0.15% of rdg + 0.3°C)

NOTE

Note: The error of a connected apparatus is not included in the tolerance. Refer to Table A-3.

Table A-3. Measurement Accuracy Test Tolerance

Range	Applied Input	Tolerance
20 mV	+20.00 mV 0.00 mV	19.94 mV to 20.06 mV –0.01 mV to 0.01 mV
60 mV	+60.00 mV 0.00 mV	59.89 mV to 60.11 mV –0.01 mV to 0.01 mV
200 mV	+200.0 mV 0.0 mV	199.4 mV to 200.6 mV –0.1 mV to 0.1 mV
2 V	+2.000 V 0.000 V	1.998 V to 2.002 V –0.001 V to 0.001 V
6 V	+6.000 V 0.000 V	5.984 V to 6.016 V –0.002 V to 0.002 V
20 V	+20.00 V 0.00 V	19.94 V to 20.06 V –0.02 V to 0.02 V
PT100	18.49Ω 100.00Ω 313.59Ω	–199.5°C to –200.5°C –0.2°C to 0.2°C 599.0°C to 601.0°C

Required equipment is a dc voltage generator (with a DCV accuracy of ±50 µV) and a resistance simulator (CL8300 or equivalent), with an accuracy of ±10 µV. The connection is shown in Figure A-3.

The procedure for this test is as follows.

1. Connect the equipment as shown in the upper left portion of Figure A-3
2. Carry out the preparations as described in Section A2.3.1.
3. Turn on the power of the dc voltage generator and allow it to warm up according to its specifications.
4. Set the input range at the RD100A and the output of the dc voltage generator to 20 mV (applied input).

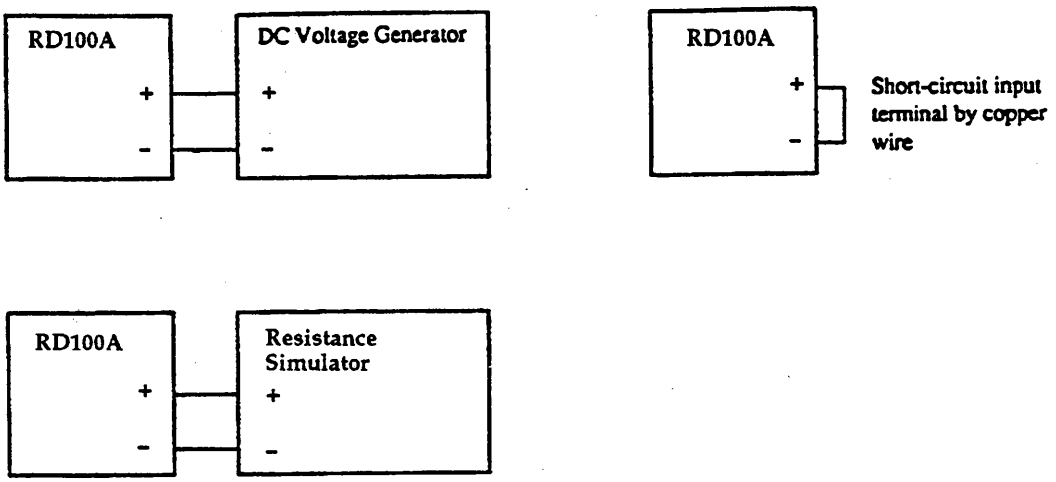


Figure A-3. Measurement Accuracy Test Connections

5. Turn on the dc voltage generator output and verify that the measured value lies within the tolerance.
6. Repeat steps 4 and 5 for all other applied inputs (see Table A-3) – 60 mV, 200 mV, 2 V, 6V, and 20 V). Do not apply inputs of 0.00 mV or 0.00 V.
7. Turn off the power of the RD100A and the dc voltage generator.
8. Connect the equipment as shown in the upper right portion of Figure A-3.
9. Turn on the power of the RD100A.
10. Set the input range at the RD100A to 20 mV.
11. Verify that the measured value lies within the tolerance (for an input of 0.000 mV).
12. Repeat steps 10 and 11 for all other applied input (as mentioned in Table A-3) – 60 mV, 200 mV, 2 V, 6 V, and 20 V.
13. Turn off the power of the RD100A.
14. Connect the equipment as shown in the bottom left portion of Figure A-3.
15. Turn on the power of the RD100A.
16. Verify that the RJC settings in the SET UP Mode are set to EXT, with a reference value of 0 μV.
17. Set the input range at the RD100A and the resistance of the resistance simulator to the values specified at PT in Table A-3 (applied input).
18. Verify that the measured values lie within the tolerance.
19. The testing is completed. You may now turn off the RD100A's power.

A.2.3.3 Recording Accuracy Test

This test is to verify that the measured values are recorded at the proper place on the chart. Recording accuracy is a measurement accuracy of ±0.3% of recording span. Tolerance is given in Table A-4.

Table A-4. Recording Accuracy Test Tolerance

Measured Value	Recording at	Tolerance
–2.000 V	0 mm	–0.3 mm to 0.3 mm
–1.000 V	25 mm	24.7 mm to 25.3 mm
0.000 V	50 mm	49.7 mm to 50.3 mm
1.000 V	75 mm	74.7 mm to 75.3 mm
2.000 V	100 mm	99.7 mm to 100.3 mm

Required equipment is a dc voltage generator (CL8300), with a DCV accuracy of ±50 µV, and a glass scale, with an accuracy of ±105 mm. The connection is shown in Figure A-4.

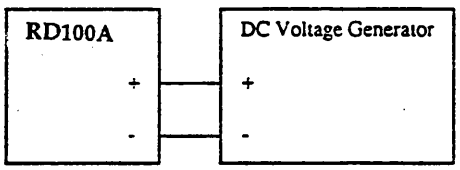


Figure A-4. Recording Accuracy Test Connection

The procedure for this test is as follows.

1. Connect the equipment as shown in Figure A.4.
2. Carry out the preparations described in Section A.2.3.1.
3. Turn on the power of the dc voltage generator and allow it to warm up according to its specifications.
4. Set the input range at the RD100A to 2 V.
5. Adjust the output of the dc voltage generator so that the measured value at the RD100A becomes –2.000 V.

6. Using the glass scale, verify that the recording lies within the tolerance.
7. Repeat steps 5 and 6 until all measured values stated in Table A-4 are verified.
8. The testing is completed. You may turn OFF the power of both pieces of equipment.

A.2.3.4 Chart Speed Accuracy Test

This test requires a chart feed accuracy of ±0.1% (for recordings that are longer than 1000 mm). The tolerance for a 1000-mm chart feed is 999 to 1001 mm. The required equipment is a chart with scale indication (CL8300).

The procedure for this test is as follows.

1. Carry out the preparations as described in Section A.2.3.1.
2. Set the chart speed to 1000 mm/hour.
3. Start feeding the start by pressing the FEED key.
4. After one hour, stop the feeding by pressing the FEED key again,
5. Measure the scale on the chart (you may also use the time tick) and verify that the feeding lies within the tolerance.
6. The testing is completed. You may turn OFF the power.

A.2.3.5 Reference Junction Compensation Accuracy Test

The specification for thermocouple types R, S, B, and W is ±1°C. For thermocouple types K, J, E, T, N, L, and U it is ±0.5°C. The tolerance for thermocouple types R, S, B, and W is –1°C to 1°C. For thermocouple types K, J, E, T, N, L, and U, it is –0.5°C to 0.5°C. The required equipment is a temperature generator, with a generated temperature of ±0.01°C (TRC111), and a thermocouple that is, at most, 0.3 mm in diameter (Type T recommended). The connection is shown in Figure A-5.

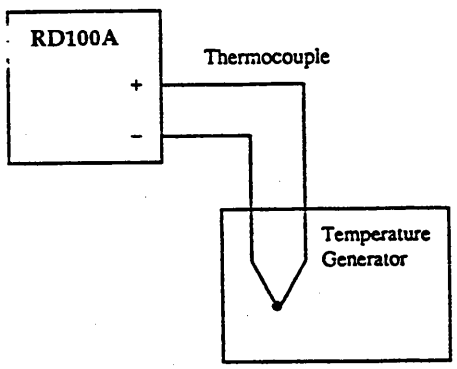


Figure A-5. Reference Junction Compensation Accuracy Test Connection

The procedure for this test is as follows.

1. Connect the equipment as shown in Figure A-5.
2. Carry out the preparations as described in Section A.2.3.1.
3. Turn on the power of the temperature generator and allow it to warm up according to its specifications.
4. Set the input range to the used thermocouple at the RD100A.
5. Adjust the output of the temperature generator to 0°C.
6. Verify that the measured value lies within the tolerance.
7. Testing is now complete. You may turn OFF the power of both pieces of equipment.

A.3 Replacing Parts

This section describes what to do if parts need to be replaced, either because of preventive maintenance or because of failure.

A.3.1 Replaceable Parts

When the replacement of parts is necessary, we strongly recommend replacement with an assembly unit. OMEGA instruments have been designed so that the replacement of parts can be done on an assembly (module) basis by the user.

Parts supplied by OMEGA are listed in the Customer Maintenance Parts List (CMPL). (See Section A.7.) Smaller parts than listed in the CMPL are not supplied. The CMPL comprises the following:

- Item number
- OMEGA part number
- Quantity
- Description.

The following values show the recommended intervals for preventive maintenance. However, these values apply to a basic model under standard operating conditions and vary considerably with operating conditions. Therefore, exercise care when using these values.

When ordering parts from the CMPL, inform OMEGA Sales/Service of the OMEGA part number and the required quantity.

Table A-5. Preventative Maintenance, Pen Model

Description	Part No.	Q'ty	Exchange Period	Remarks
Chart	B9565AW	1	33 days	at 20mm/h
Pen ass'y	RD100A-01 RD100A-02 RD100A-03 RD100A-04	1 1 1 1	2km 2km 2km 2km	felt pen red felt pen green felt pen blue felt pen violet } at 10cm/s
Pen ass'y	RD100A-11	1	100.000 characters	plotter pen
Fuse	A1360EF	1	2 years	250V 500mA time lag
Display ass'y	B9900JH B9900JJ	1 1	5 years 5 years	for 1, 2 pen model for 3, 4 pen model
Motor ass'y	B9900HK	1	5 years	chart motor
Carriage ass'y	B9900QB	1	5 years	plotter carriage
Motor ass'y	B9900RG	1	5 years	plotter motor (X-axis)
Lever ass'y	B9900RH	1	5 years	for plotter
Servo ass'y	B9900MA	1-4	5 years	
Bearing	B9900PJ B9900PK	1 1	3 years 3 years	Bearing on the servo ass'y
Battery ass'y	B9900BR	1	10 years	for main unit

A.3.2 Disassembly and Reassembly of the Pen Model

This section describes the procedure for disassembling and reassembling the RD100A pen model.

Warning: Always make sure that you turn OFF the power before starting to disassemble. Be sure to disconnect the power cable and make sure that you disconnect the input terminal.

Table A-6. Preventative Maintenance, Dot Model

Description	Part No.	Q'ty	Exchange Period	Remarks
Chart	B9565AW	1	33 days	at 20mm/h
Ribbon Cassette	B9901AX	1	3 months	
Fuse	A1360EF	1	2 years	250V 500mA time lag
Display ass'y	B9901BG	1	5 years	
Motor ass'y	B9900HK	1	5 years	chart motor
Lever ass'y	B9901EK	1	3 years	for carriage
Pulley	B9901EY	2	3 years	for carriage
Motor ass'y	B9901ER	1	5 years	carriage motor
Carriage ass'y	B9901FA	1	5 years	
Motor ass'y	B9901GY	1	5 years	ribbon swing motor
Ribbon Swing Gear ass'y	B9901JS	1	5 years	
Motor ass'y	B9901GW	1	5 years	ribbon feed motor
Ribbon Feed Gear ass'y	B9901JR	1	5 years	
Battery ass'y	B9900BR	1	10 years	for main unit
Battery	B9586JU B9586JV B9586JV B9586JV	1 1 1 1	4 years 2 years 2 years 1 year	for IC Card 378903 (64KB) for IC Card 378904 (256KB) for IC Card 378905 (512KB) for IC Card 378906 (1MB)

A.3.2.1 How to Remove the Door

Remove the door by pressing the spring-loaded peg, which is located in the upper left side of the bezel, with a pen or similar item. The door can be removed by pulling it gently toward the front.

A.3.2.2 How to Remove the Internal Assembly

Refer to the CMPL Section, A.7.1.1.

1. The internal assembly is secured in position by a lock screw to safeguard against damage during transit. If the lock screw (13) is still in place at the left side of the recorder, remove this screw.
2. Remove the chart cassette.
3. Unscrew the two screws (12) in the lower pan of the internal assembly.
4. Unscrew the spring-loaded screw(s) (14) that fasten(s) the internal assembly to the A/D assembly.
5. Lift the shaft that is located closest to you and pull the internal assembly forward.
6. The A/D assembly(s) is (are) connected to the mother board, but can be easily removed by pulling to the front. Note that the A/D assembly can only be mounted in one position.

NOTE

Note: Make sure that the A/D assemblies are properly connected to the mother board before reinstalling the internal assembly.

A.3.2.3 How to Remove the CPU Assembly

Refer to the CMPL Section, A.7.1.4.

1. Remove the internal assembly (see Section A.3.2.2) and turn the internal assembly upside down.
2. Unscrew the four screws (10) that hold the CPU assembly.
3. The CPU assembly is connected to the CONN assembly. Pull the CPU assembly to separate it from the CONN assembly. When reinstalling the CPU assembly, make sure the connector fits properly.

A.3.2.4 How to Remove the Display Assembly

Refer to the CMPL Section, A.7.1.4.

1. Remove the internal assembly (see Section A.3.2.2).
2. Remove the CPU assembly (see Section A.3.2.3).
3. Disconnect the connector of the Display assembly from CN6 of the CONN board assembly (5).
4. Remove the transparent plate (Section A.7.1.3, no. 6) protecting the flexible cable coming from the Display assembly. Unscrew the two screws (no. 8, Section A.7.1.3) of the transparent plate and peel off the double-sided tape.

5. Unscrew the two screws (12) of the hinge of the Display assembly.

NOTE

Note: To remove the double-sided tape from the transparent plate, insert a cutter between the transparent plate and frame and cut the tape. Take care not to bend the transparent plate, when removing it. The double-sided tape has the following characteristics:

Classification: Scotch GHP acryl foam
Dimensions: 5 x 10 mm

NOTE

Note: When installing the Display assembly, the flexible cable of the Display assembly lies on top of the cable of the Keyboard assembly. After you have installed the transparent plate, verify that, when opening and closing the display, the flexible cables of the Keyboard assembly and Display assembly can slide.

A.3.2.5 How to Remove the Keyboard Assembly

Refer to the CMPL Section, A.7.1.3.

1. Remove the internal assembly (see A.3.2.2).
2. Remove the CPU assembly (see A.3.2.3).
3. Disconnect the connector of the Keyboard assembly from CN7 of the CONN board assembly.
4. Remove the transparent plate (6) protecting the flexible cable coming from the Keyboard assembly. Unscrew the two screws (8) of the transparent plate and peel off the double-sided tape.
5. Unscrew the two screws (7) of the hinge of the Keyboard assembly.

NOTE

Note: To remove the double-sided tape from the transparent plate, insert a cutter between the transparent plate and frame and cut the tape. Take care not to bend the transparent plate when removing it. The double-sided tape has the following characteristics:

Classification: Scotch GHP acryl foam
Dimensions: 5 x 10 mm

NOTE

Note: When installing the Keyboard assembly, the flexible cable of the Display assembly lies on top of the cable of the Keyboard assembly. After you have installed the transparent plate, verify that, when opening and closing the keyboard, the flexible cable of the Keyboard assembly can slide.

A.3.2.6 How to Remove the Chart Motor Assembly

Refer to the CMPL Section, A.7.1.5.

1. Remove the internal assembly (see Section A3.2.2).
2. Remove the CPU assembly (see Section A3.2.3).
3. Disconnect the connector of the Motor assembly from CN2 of the CONN board assembly.
4. Unscrew the two screws (32) that fasten the Chart Drive assembly and separate it from the main unit. If necessary, loosen the CONN board by loosening the two screws (Section A.7.1.4) of the CONN board assembly.

A.3.2.7 How to Remove the Servo Assembly

Refer to the CMPL Section, A.7.1.5.

1. Remove the internal assembly (see A.3.2.2).
2. Remove all the pens.
3. Disconnect the connector (no. 11, Section A.7.1.4) from all Pen Servo assemblies and unscrew the four screws (27) of the heat sink.
4. Unscrew the three screws (24) at the top of the Pen Servo assembly (3–3.5 Kg • cm), and the pen servo and bracket can be removed.

NOTE

Note: When disassembling or reassembling the Servo assembly, do not touch the magneto-restrictive delay line at the bottom of the Carriage assembly. When reassembling the Servo assembly, press the left and right side of Servo assembly to the frame and fasten the three screws at the top of the Servo assembly before installing the heat sink. (When the Servo assembly is not applied to the frame properly, the pens can interfere with each other, so exercise care.) When installing the bracket at the right side of the main unit, fasten the Servo assembly while pressing it down.

5. The Pen Arm assembly can be removed by pushing the pin of the carriage (22) at the front right side.

NOTE

Note: When you remove the Pen Arm assembly, take care not to lose the pin and the spring from the carriage, since these will be unfastened too.

6. To remove the bearing of the Motor assembly from the Servo assembly, pull the Lever assembly, and while bending the belt enough, remove the belt from the Motor assembly. Push the shaft of the Rotor assembly from the back side with a screwdriver or something similar. Remove the Rotor assembly, and the bearing can be removed from the shaft.

NOTE

Note: After reassembling the Pen Servo assembly, verify that the Pen Arm assembly leans over by its own weight. The Pen Servo assemblies cannot be mounted at different positions.

A.3.2.8 How to Remove the Plotter Assembly

Refer to the CMPL Section, A.7.1.5.

1. Remove the internal assembly (see A.3.2.2).
2. Remove the CPU assembly (see A.3.2.3).
3. Remove the CONN board assembly by disconnecting the connectors CN1, CN2, CN6, and CN7 of the cable connected to CONN board assembly.
4. Next, remove the two screws (no. 6, A.7.1.4) that fasten the CONN board assembly.
5. Shifting the location of the CONN board assembly. disconnect the remaining connectors CN4 and CN5.

NOTE

Note: The connections of the CONN Board are as follows:

CN1 (X)	Plotter assembly (X axis)
CN5 (Y)	Carriage assembly (Y axis)
CN2 (C)	Chart Drive assembly
CN6 (D)	Display assembly
CN3	–
CN7 (K)	Keyboard assembly
CN4 (S)	Servo assembly
CN8	CPU assembly

6. Remove all Servo assemblies (see A.3.2.7).
7. Separate the Plotter assembly from the internal assembly by unscrewing the two screws (29,30) that fasten the Plotter assembly to the back side of the internal assembly.

A.3.2.9 How to Remove the Plotter Carriage Assembly

Refer to the CMPL Section, A.7.1.5.

1. Remove the Plotter assembly (see A.3.2.8).
2. Unscrew the screw (6) that fastens the flexible cable.

NOTE

Note: The flexible cable is adhered using double-sided tape; therefore, exercise care when removing the cable. Furthermore, when (re)installing the flexible cable, align the two arrow signs and apply the cable using the double-sided tape on the rear surface of the cable.

3. Remove the belt from the carriage.

NOTE

Note: When (re)installing the belt, match the recess part of the belt to the edge of the carriage.

4. Unscrew the two screws (9) of the carriage main shaft and the screw (9) of the adjustment shaft and separate the carriage.

NOTE

Note: When reassembling, verify that the carriage can move smoothly over the shaft. Furthermore, verify that the flexible cable moves smoothly over the base and that there is no contact with the belt. After reassembling, mount the pen up assembly and adjust the pen-up distance at 50% of the chart. (see A.4.1.4 for further details).

A.3.2.10 How to Remove the Plotter Motor Assembly

Refer to the CMPL Section, A.7.1.5.

1. Remove the internal assembly (see A.3.2.2).
2. Remove the Plotter assembly (see A.3.2.8).
3. Unscrew the two screws (5) that fasten the Motor assembly.
4. For removal of the Bracket assembly, unscrew the screw (10) that fastens the Bracket assembly.

A.3.2.11 How to Remove the Plotter Lever Assembly

Refer to the CMPL Section, A.7.1.5.

1. Remove the internal assembly (see A.3.2.2).
2. Remove the Plotter assembly (see A.3.2.8).

3. Remove the belt and unscrew the screw (13) that fastens the Lever assembly. As a result, the Lever assembly, Spring, and Collar, can be removed individually. (The collar is put between the screw and Lever assembly.)

A.3.2.12 How to Remove the Battery Assembly

Refer to the CMPL Section, A.7.1.4.

1. Remove the CPU assembly (see A.3.2.2).
2. To remove the Battery assembly, disconnect the cable from the CPU assembly and pull the pegs of the battery holder from the holes of the CPU assembly.

NOTE

Note: To prevent shorting of the battery during storage of the CPU assembly, remove the Battery assembly from the CPU assembly or remove the connector of the CPU assembly.

A.3.3 Disassembly and Reassembly of the Dot Printing Model

This section describes the procedure for disassembling and reassembling the RD100A dot printing model.

WARNING

Warning: Always make sure that you have turned OFF the power before starting to disassemble. Make sure to disconnect the power cable and the input terminal.

A.3.3.1 How to Remove the Door

Remove the door by pressing the spring loaded peg, which is located in the upper left side of the bezel, with a pen or similar. The door can be removed by pulling it gently toward the front,

A.3.3.2 How to Remove the Internal Assembly

Refer to the CMPL Section, A.7.2.1.

1. The internal assembly is secured in position by a lock screw to safeguard against damage during transit. If the lock screw (12) is still in place at the left side of the recorder, remove the screw.
2. Remove the chart cassette.
3. Remove the two screws (11) in the lower part of the internal assembly.
4. Pull the shaft that is located closest to you and remove the internal assembly.

A.3.3.3 How to Remove the CPU Assembly

Refer to the CMPL Section, A.7.2.4.

1. Remove the internal assembly (see A.3.3.2) and turn it upside down.
2. Remove the four screws (13) that fasten the CPU assembly.

3. The CPU assembly is connected to the CONN assembly. Pull the CPU assembly to separate it from the CONN assembly. When reinstalling the CPU assembly, make sure the connector fits properly.

A.3.3.4 How to Remove the Display Assembly

Refer to the CMPL Section, A.7.2.4.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the CPU assembly (see A.3.3.3).
3. Disconnect the connector of the Display assembly from CN6 of the CONN board assembly (8).
4. Remove the transparent plate (no. 6, A.7.2.3) protecting the flexible cable coming from the Display assembly. Unscrew the two screws (no. 8, A.7.2.3) of the transparent plate and peel off the double-sided tape.
5. Unscrew the two screws (4) of the hinge of the Display assembly.

NOTE

Note: To remove the double-sided tape of the transparent plate, insert a cutter between the transparent plate and frame and cut the tape. When removing the transparent plate, take care not to bend it. The double-sided tape has the following characteristics:

Classification: Scotch GHP acryl foam

Dimensions: 5 x 10 mm

NOTE

Note: When installing the Display assembly, the flexible cable of the Display assembly lies on top of the flexible cable of the Keyboard assembly. After you have installed the transparent plate, verify that, when opening and closing the display, the flexible cables of the Keyboard assembly and the Display assembly can slide.

A.3.3.5 How to Remove the Keyboard Assembly

Refer to the CMPL Section, A.7.2.3.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the CPU assembly (see A.3.3.3).
3. Disconnect the connector of the Keyboard assembly from CN7 of the CONN board assembly (no. 8, A.7.2.4).

4. Remove the transparent plate (6) protecting the flexible cable coming from the Keyboard assembly. Unscrew the two screws (8) of the transparent plate and peel off the double-sided tape.
5. Unscrew the two screws (7) of the hinge of the Keyboard assembly.

NOTE

Note: To remove the double-sided tape of the transparent plate, insert a cutter between the transparent plate and frame and cut the tape. When removing the transparent plate, take care not to bend it. The double-sided tape has the following characteristics:

Classification: Scotch GHP acryl foam

Dimensions: 5 x 10 mm

NOTE

Note: When installing the Keyboard assembly, the flexible cable of the Display assembly lies on top of the flexible cable of the Keyboard assembly. After you have installed the transparent plate, verify that, when opening and closing the keyboard, the flexible cable of the Keyboard assembly can slide.

A.3.3.6 How to Remove the Chart Motor Assembly

Refer to the CMPL Section, A.7.2.5.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the CPU assembly (see A.3.3.3).
3. Remove the cable of the Motor assembly from CN2 of the CONN board assembly (no. 8, A.7.2.4).
4. Remove the two screws (27) that fasten the Chart Drive assembly and separate it from the main unit. If necessary, loosen the CONN board by loosening the two screws (no. 9, A.7.2.4) of the CONN board assembly.

A.3.3.7 How to Remove the Ribbon Swing Assembly

Refer to the CMPL Section, A.7.2.5.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the CPU assembly (see A.3.3.3).
3. Disconnect the cable of the Motor assembly from CN3 of the Driver board assembly (no. 1, A.7.2.4). Cut the cable bundling clamps at four places.

NOTE **Note**: The part number of the cable bundling clamps (four pieces) is B9565TZ.

4. Remove the two screws (38) that fasten the Ribbon Swing assembly.
5. While pulling the latch claws of the Motor assembly, turn the Motor assembly counterclockwise and separate the Motor assembly and the Ribbon Swing Gear assembly.

NOTE **Note**: Be careful not to use too much force on the latch claws, since they might be damaged.

NOTE **Note**: When mounting the Motor assembly, place it on top of the Ribbon Swing Gear assembly with the grounding wire facing up, and turn the Motor assembly clockwise until it clicks. Verify that the flange of the Motor assembly fits the latch claw stoppers of the Ribbon Swing Gear perfectly.

A.3.3.8 How to Remove the Ribbon Feed Assembly

Refer to the CMPL Section, A.7.2.5.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the cable of the Motor assembly from CN4 of the Driver board assembly (no. 1, A.7.2.4). Cut the cable bundling clamps.
3. Remove the bracket (42) by removing the two screws (40) that fasten the bracket.
4. Unscrew the hexagonal screw (8) that holds the shaft to the left side of the Ribbon holder assembly and remove the holder.

NOTE **Note**: Take case not to lose the shaft and bearing, since these will also be unfastened.

NOTE **Note**: When mounting the holder, fasten the screw while pressing the shaft at the left side of the ribbon holder slightly in the left direction (tolerance of less than 0.1 mm). Exercise care not to put too much force on the shaft. Fasten until the tolerance of the ribbon holder is zero.

5. While pulling the latch claws of the Motor assembly, turn the Motor assembly clockwise.

6. To remove the Ribbon Feed Gear Assembly, unscrew the screw (4) that fastens the Ribbon Feed Gear (1.5–2 Kg • cm) and disconnect the three latch claws. Then you can remove the Ribbon Gear assembly.

NOTE

Note: When you install the Ribbon Feed Gear assembly to the ribbon holder, verify that the latch claws fit properly.

NOTE

Note: When you install the Motor assembly, place the Motor assembly on the Ribbon Feed Gear assembly with the grounding wire facing up, and turn the Motor assembly counterclockwise until it clicks. Verify that the flange of the Motor assembly fits the latch claw stoppers of the Ribbon Feed Gear assembly perfectly.

NOTE

Note: Use the bundling clamps so that the minimum clearance between the holder and the lead wires ranges from 1 to 5 mm. The lead wires and ribbon holder can still be swinging.

A.3.3.9 How to Remove the Pulley and Belt Tension Lever Assembly

Refer to the CMPL Section, A.7.2.5.

1. Remove the internal assembly (see A.3.3.2).
2. Unscrew the hexagonal screw (8) that holds the shaft to the left side of the Ribbon Holder assembly, and remove the holder.
3. To remove the Lever assembly, remove the two screws (16, 17) of the Lever assembly.
4. To remove the pulley on the left side, unscrew the screw (17) of the Lever assembly, and remove the belt. Then remove the screw (20) of the pulley.
5. To remove the pulley on the right side, unscrew the screw (17) of the Lever assembly, and remove the belt. Then, remove the two screws (38) that fasten the Ribbon Swing assembly and remove the screw (20) of the pulley.

A.3.3.10 How to Remove the Carriage Assembly

Refer to the CMPL Section, A.7.2.5.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the cable of the Carriage assembly from CN6 of the Driver Board assembly (no. 1, A.7.2.4). Remove the screw (34) that holds the flexible cable to the bracket. Cut the cable bundling clamp.

3. Unscrew the screw (16) of the Lever assembly and remove the belt from the Pulley assembly.
4. Remove the screw (41) that fastens the main shaft at the left side of the internal unit and remove the main shaft.
5. Remove the screw (41) that fastens the adjust shaft at the left side of the internal unit and remove the adjust shaft.
6. The carriage can now be removed.

NOTE

Note: After exchanging the Carriage assembly, the height of the Carriage assembly must be properly adjusted.

NOTE

Note: The carriage and the main shaft are combined as a pair and, therefore, should not be used in an other way.

A.3.3.11 How to Remove the Carriage Motor Assembly

Refer to the CMPL Section, A.7.2.5.

1. Remove the internal assembly (see A.3.3.2).
2. Remove the Driver Board assembly (no. 1, A.7.2.4) by removing the three screws (no. 2, A.7.2.4) and disconnecting all the connectors.
3. Remove the Ribbon Swing assembly (see A.3.3.7).
4. Remove the Ribbon Feed assembly (see A.3.3.8).
5. Unscrew the screw (16) of the Lever assembly and remove the belt from the Pulley assembly.
6. Remove the left and right fixing screws (39) of the bracket and remove the bracket by lifting it up.
7. Remove the two screws (15) that fasten the Motor assembly to the bracket, and remove the Motor assembly.

NOTE

Note: Fasten the screw of the Lever assembly only after having moved the carriage from left to right and back.

NOTE

Note: Bundle the shielded grounding wires at the outside of the protection tube using a bundling cord. The bundling position should be that of 5 to 10 mm from the motor side edge on the protection tube.

A.3.3.12 How to Remove the Battery Assembly

Refer to the CMPL Section, A.7.2.4.

1. Remove the CPU assembly (see A.3.3.3).
2. To remove the Battery assembly, disconnect the cable from the CPU assembly and pull the pegs of the battery holder from the holes of the CPU assembly.

NOTE

Note: To prevent the battery from shorting during storage of the CPU assembly, remove the battery assembly from the CPU assembly or remove the connector of the CPU assembly.

A.4 Adjustments

This section describes the adjustment method that is necessary when the recording quality or printing quality is faulty or any assembly has been replaced. The adjustments of parts that are not described in this chapter require dedicated tools. The user should not perform such adjustments.

A.4.1 Adjusting the Pen Model

A.4.1.1 Initializing the RAM

This operation should be done after having replaced any assemblies. The settings that can be initialized concern the settings of the SET Mode only. This initialization does not affect any settings of the SET UP Mode.

Use the following procedure.

1. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
2. Use the UP/DOWN keys to select the display SETUP=INIT, then press the ENT key.
3. Select YES using the UP/DOWN keys and press the ENT key.
4. The display *INIT SET* will appear. Press the ESC key.
5. Select the SETUP=END display using the UP/DOWN keys and press the ENT key.
6. Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.1.2 Adjusting the Zero Position of the Pens

When the recording accuracy is out of range, it might be necessary to adjust the zero position of the pens.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure that the operating conditions are in accordance with the testing conditions described in Section A.2.3.1.

2. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ. Press the ENT key.
4. Use the UP/DOWN keys to select the display P ADJ=ZERO. Press the ENT key.
5. Select the channel number (=pen number) that you want to adjust. Then, press the ENT key.
6. Adjust the value so that the recording position is 0±0.2 mm. Changing the numeric value by 1 will result in a pen movement of approximately 0.02 mm. The pen then moves to its new position after the ENT key has been pressed. The display *ZERO SET* will appear. Verify the correct position using the grid of the chart. Repeat this procedure (using the ENT key) until the pen is in its correct position. The display *ZERO SET* will appear. Press the ESC key.
7. Select the SETUP=END display using the UP/DOWN keys, and press the ENT key.
8. Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.1.3 Adjusting the Full Span Position of the Pens

When the recording accuracy is out of range, it might be necessary to adjust the full span position of the pens.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure the operating conditions are in accordance with the testing conditions described in Section A.2.3.1.
2. Enter the SET Up Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ. Press the ENT key.
4. Use the UP/DOWN keys to select the display P ADJ=FULL and press the ENT key.
5. Select the channel number (=pen number) that you want to adjust. Then, press the ENT key.
6. Adjust the value so that the recording position is 100±0.2 mm. Changing the numeric value by 1 will result in a pen movement of approximately 0.02 mm. The pen moves to its new position after the ENT key has been pressed. The display *FULL SET* will appear. Verify the correct position using the grid of the chart. Repeat this procedure (using the ENT key) until the pen is in its correct position. The display *FULL SET* will appear. Press the ESC key.
7. Select the SETUP=END display using the UP/DOWN keys and press the ENT key.
8. Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.1.4 Adjusting the Height of the Plotter Pen

When the printing quality is insufficient, it might be necessary to adjust the height of the plotter pen. See Figure A-6.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure that the operating conditions are in accordance with the testing conditions described in Section A.2.3.1. Then remove the internal assembly from the case (see Section A.3.2.2).
2. Make sure that chart paper is located on the platen and that the reference pen for pen-up adjustment is used (B9900WA).

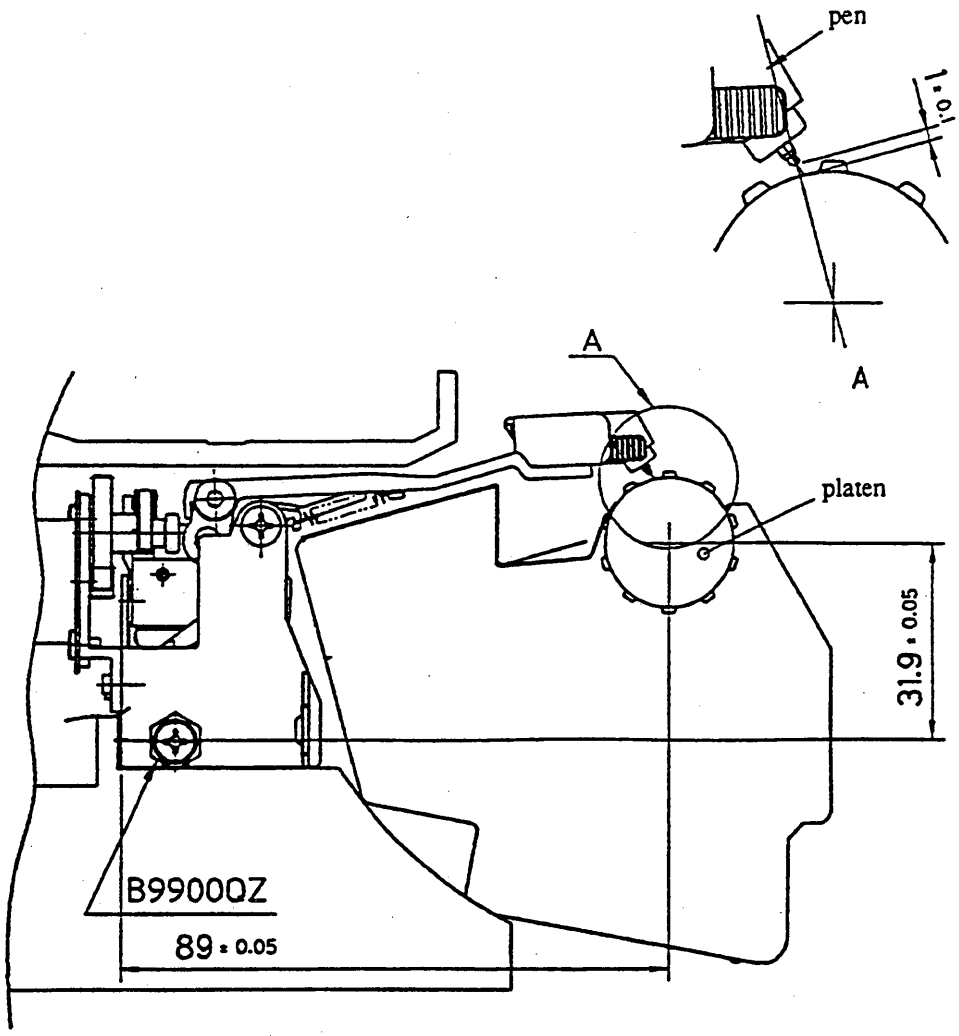


Figure A-6. Adjusting the Height of the Plotter Pen

3. Move the plotter pen to the center of the chart (50%). (To move the carriage, release the chart stock with the power turned OFF. Then, hold the main shaft part of the carriage and move it.)
4. Hold and pull the pen holder forward so that the tip of the plotter pen is positioned at the point closest to you.
5. Loosen the fixing screw of the Plotter assembly adjusting shaft at its 100% side.
6. Place the pen-up distance adjusting clearance gauge on the platen and turn the 0% side boss of the adjusting shaft so that the clearance between the pen tip and platen is 0.9±0.1 mm.
7. Tighten the fixing screw of the adjusting shaft at the 100% side (screw-tightening torque must be 6 –7 Kg • cm).

NOTE

Note: Use the cover (B9900WC pen-up distance adjustment clearance gauge) for adjusting the clearance between the pen tip and the platen.

A.4.2 Adjusting the Dot Printing Model

A.4.2.1 Initializing the RAM

This operation should be done after any assemblies have been replaced. The settings that can be initialized involve the settings of the SET Mode only. This initialization does not affect any settings of the SET UP Mode.

Use the following procedure.

1. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
2. Use the UP/DOWN keys to select the display SETUP=INIT and press the ENT key.
3. Select YES using the UP/DOWN keys and press the ENT key.
4. The display *INIT SET* will appear. Press the ESC key.
5. Select the SETUP=END display using the UP/DOWN keys and press the ENT key.
6. Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.2.2 Adjusting the Hysteresis Position of the Printing Carriage

When the recording accuracy is out of range, it might be necessary to adjust the hysteresis position of the printing carriage.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure the operating conditions are in accordance with the testing conditions described in Section A.2.3.1.

2. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ and press the ENT key.
4. Use the UP/DOWN keys to select the display P ADJ=HYS and press the ENT key.
5. While observing the recording, change the numerical value to the extent that deviation between records in both travel directions is minimized. The carriage will print one dot after you press the ENT key (the display *HYS SET* will appear). Proceed with adjusting the numerical value (use the ENT key to return to the proper menu) until a straight line has been achieved. Changing the numerical value by 1 will result in a carriage movement of approximately 0.1 mm.
6. The display *HYS SET* will appear. Press the ESC key.
7. Select the SETUP=END display using the UP/DOWN keys and press the ENT key.
8. Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.2.3 Adjusting the Zero Position of the Printing Carriage

When the recording accuracy is out of range, it might be necessary to adjust the zero position of the printing carriage.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure the operating conditions are in accordance with the testing conditions described in Section A.2.3.1.
2. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ. Press the ENT key.
4. Use the UP/DOWN keys to select the display P ADJ=ZERO and press the ENT key.
5. While observing the recording, change the numerical value to the extent that deviation between records in both travel directions is minimized (located at 100±0.2 mm). The carriage will print one dot after you press the ENT key (the display *ZERO SET* will appear). Proceed with adjusting the numerical value (use the ENT key to return to the proper menu) until a straight line has been achieved. Changing the numerical value by 1 will result in a carriage movement of approximately 0.1 mm.
6. The display *ZERO SET* will appear. Press the ESC key.
7. Select the SETUP=END display using the UP/DOWN keys, and press the ENT key.
8 Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.2.4 Adjusting the Full Span Position of the Printing Carriage

When the recording accuracy is out of range, it might be necessary to adjust the full span position of the pens.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure the operating conditions are in accordance with the testing conditions described in Section A.2.3.1.
2. Enter the SET UP Mode by turning ON the power while pressing and holding the ENT key until the SET UP display appears.
3. Use the UP/DOWN keys to select the display SETUP=P ADJ and press the ENT key.
4. Use the UP/DOWN keys to select the display P ADJ=FULL and press the ENT key.
5. While observing the recording, change the numerical value so that the deviation between records in both travel directions is minimized (located at 100±0.2 mm). The carriage will print one dot after you pressed the ENT key (the display *FULL SET* will appear). Proceed with adjusting the numerical value (use the ENT key to return to the proper menu) until a straight line has been achieved. Changing the numerical value by 1 will result in a carriage movement of approximately 0.1 mm.
6. The display *FULL SET* will appear. Then press the ESC key.
7. Select the SETUP=END display using the UP/DOWN keys, and press the ENT key.
8. Select the END=STORE display and press the ENT key. The settings will be initialized, and after a few seconds, the Operation Mode will appear.

A.4.2.5 Adjusting the Height of the Printing Carriage

When the printing quality is insufficient, it might be necessary to adjust the height of the plotter pen. See Figure A-7.

Use the following procedure.

1. Carry out the preparations as described in Section A.2.3.1 and make sure the operating conditions are in accordance with the testing conditions described in Section A.2.3.1.
2. Make sure that there is no chart paper on the platen.
3. Move the carriage to the center of the platen (50%).
4. Loosen the fixing screw (C) on the 0% side of the adjustment shaft.
5. Put a pin (B) into the hole (A) on the 100% side of the adjustment shaft to rotate the carriage so that the gap between the carriage and the platen is within 1.2±0.1 mm.
6. Tighten the fixing screw (C) on the 0% side of the adjustment shaft.
7. After adjustment, confirm that the gap between the carriage and the platen is within 1.2±0.1 mm.

NOTE

Note: Use the carriage height adjustment clearance gauge (B9901JZ) for carriage height adjustment.

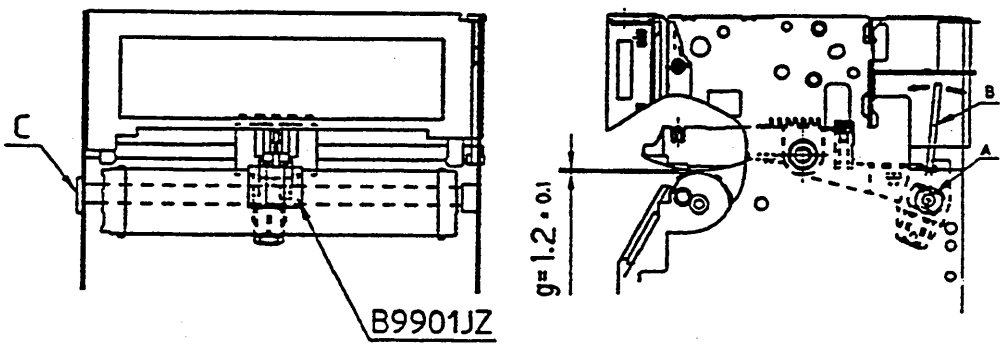


Figure A-7. Adjusting the Height of the Printing Carriage

A.5 Troubleshooting

This section explains the causes of problems with the RD100Aand how to determine faulty assemblies using self-diagnosis and troubleshooting flow.

A.5.1 Procedure

1. Recognize the trouble; i.e, make sure what kind of trouble it is.
2. Check to see if it is a handling mistake. Check the connections and the settings of the equipment to make this determination.
3. Execute the self-diagnosis function by turning the power ON and finding the problem items.
4. Analyze the cause of the problem according to the troubleshooting flow chart.

WARNING

Warning: Do not touch the circuit and voltage live pads, because the power unit contains the high-voltage electrical circuit. The power unit is furnished with a dedicated cover to prevent electric shock. Do not remove this cover. Never touch any pad that is not subject to adjustment.

CAUTION

Caution: Make sure that you connect the input terminals (voltage or current) correctly. The internal circuit may be damaged if it is improperly connected.

A.5.2 Flow Chart

This flow chart consists of general service operations when a fault occurs. This chart is not always suitable for every fault; however, it is recommended that you perform operations according to the flow chart.

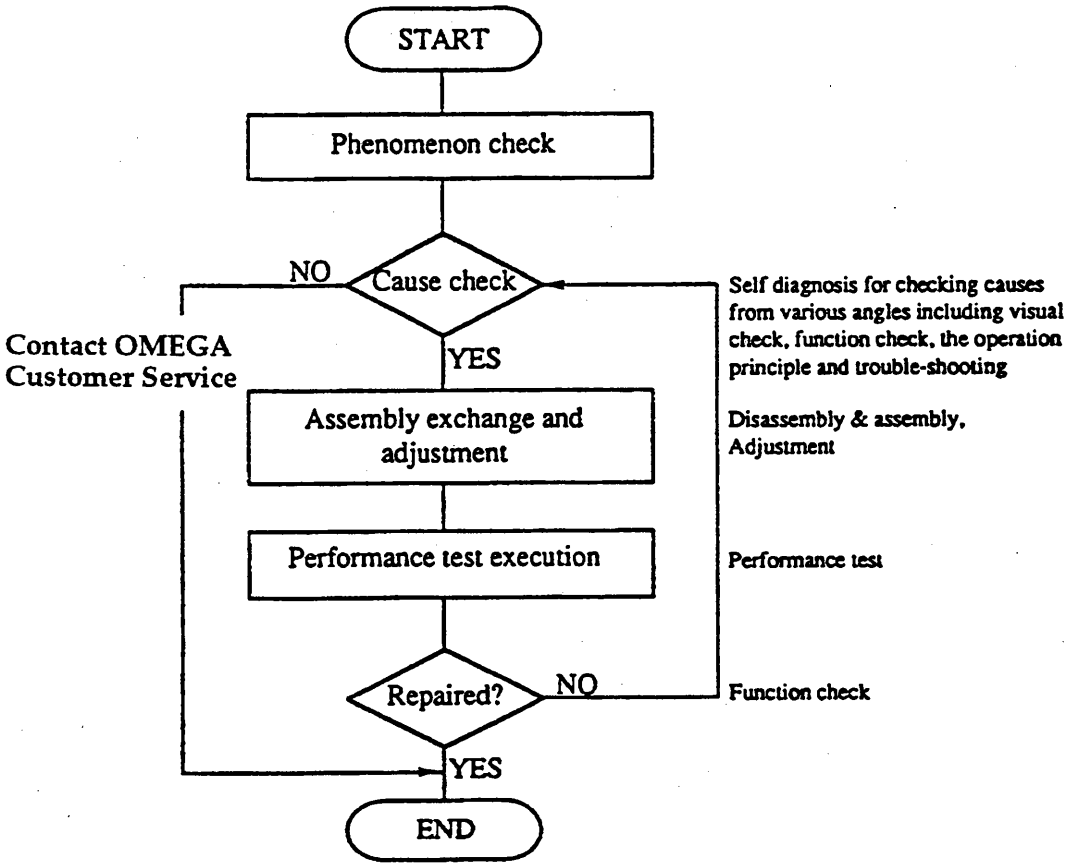


Figure A-8. Troubleshooting Flow Chart

A.5.3 Troubleshooting List

Trouble	Operation			Check Item
	Check	Adjust	Exchange	
Power is not turned ON	•			Power cable connection
	•		•	Fuse (in the AC socket) is blown
			•	MAIN ass'y
			•	CPU ass'y
FAIL state			•	CPU ass'y
			•	Option Terminal ass'y
Memory cannot be backed up	•			Battery connector is disconnected?
	•			Battery voltage is low (less than +3.0V)
			•	CPU ass'y
Keyboard operation is not normal	•			Check the keylock
	•			FPC ass'y of the keyboard is disconnected/broken
	•			Check connector of Conn board ass'y
			•	Keyboard ass'y
			•	CPU ass'y
Display is not normal	•			Check connector of Conn board ass'y
	•			FPC ass'y of the display is disconnected/broken
			•	CPU ass'y
			•	Display ass'y
Measured value is incorrect	•			Input wiring is disconnected
	•			Noise
			•	A/D ass'y
			•	Scanner ass'y (dot model only)
Measured temperature is incorrect	•			Input is disconnected
	•			Noise
	•			Terminal cover is removed
	•			RJC INT/EXT setting
			•	A/D board ass'y
			•	Input terminal
			•	Scanner board ass'y
Measured value fluctuates	•			Power frequency setting is incorrect
Printer carriage does not move	•			RCD is OFF
	•			Motor wiring
			•	CPU ass'y
			•	Driver board ass'y
Pen carriage does not move	•			RCD is OFF
	•			Motor wiring
			•	CPU ass'y
			•	Pen servo ass'y

A.5.3 Troubleshooting List (continued)

Trouble	Operation			Check Item
	Check	Adjust	Exchange	
Trend recording is incorrect		•		Printer adjust in SET UP is incorrect
	•			Chart or ribbon is not installed properly
			•	CPU ass'y
			•	Driver board ass'y
Pen recording is incorrect		•		Pen adjust in SET UP is incorrect
	•			Chart cassette is not installed properly
	•			Pen ass'y is not installed properly
			•	CPU ass'y
Ink ribbon is not fed	•			Ribbon cassette is not installed properly
	•			Ribbon feed motor cable is disconnected
			•	CPU ass'y
			•	Driver board ass'y
			•	Ribbon feed motor ass'y
Chart is not fed	•			Chart cassette is not installed properly
	•			Chart paper is not installed properly
	•			Chart feed motor cable is disconnected
			•	Driver board ass'y
			•	CPU ass'y
			•	Chart feed motor ass'y
Alarm is not output	•			Setting value is incorrect
			•	CPU ass'y
			•	Option terminal ass'y

A.5.4 When Repair is Necessary

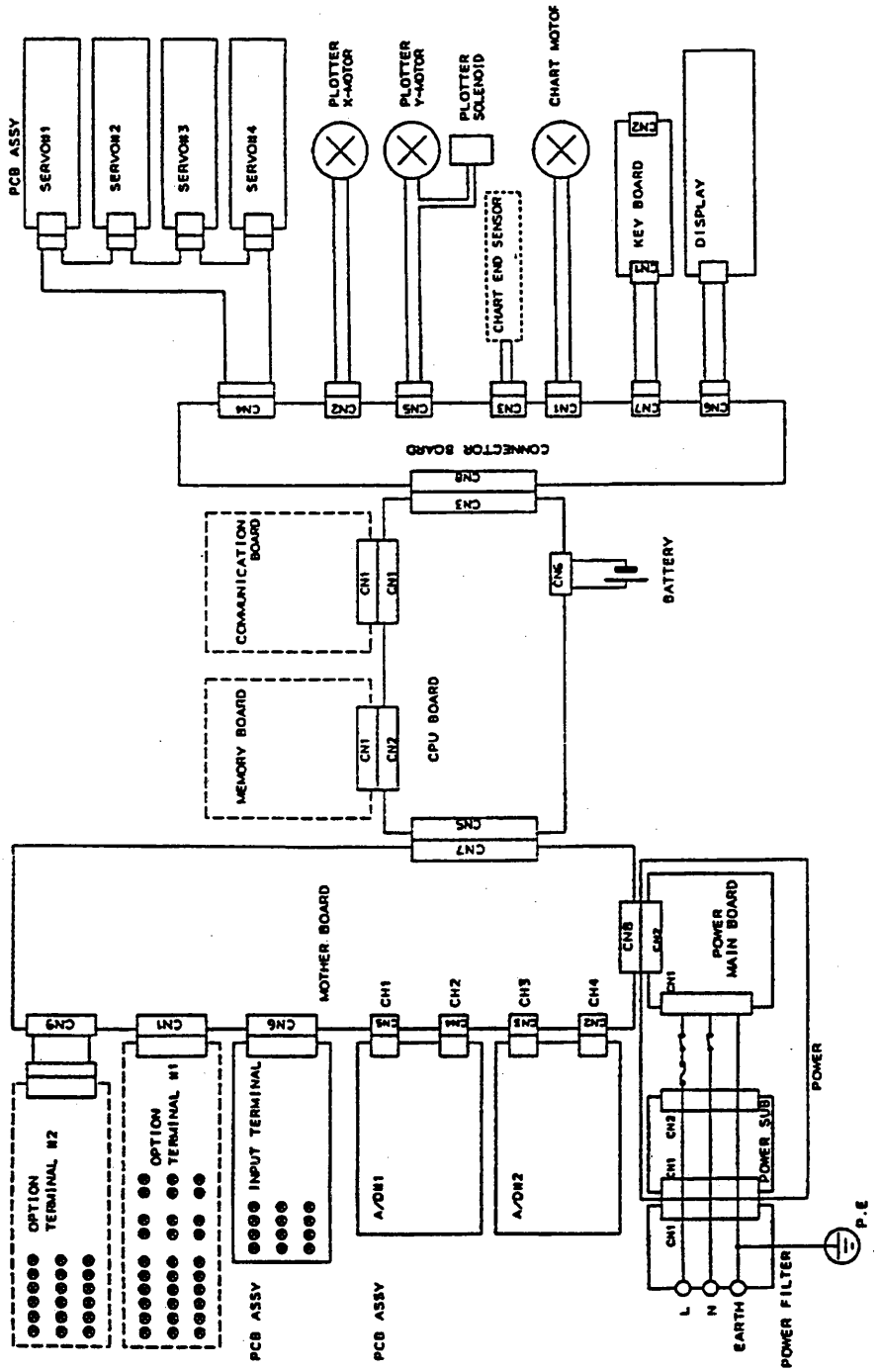
When a repair is necessary, call OMEGA Customer Service. Have ready the following information:

- Your address
- The name and telephone number of the person in charge
- The Model and Suffix Codes of the instrument, which can be found on the name plate. The name plate can be seen on the right side, once the chart cassette has been removed.
- A detailed explanation of the problem, including the measures taken and the displayed messages.

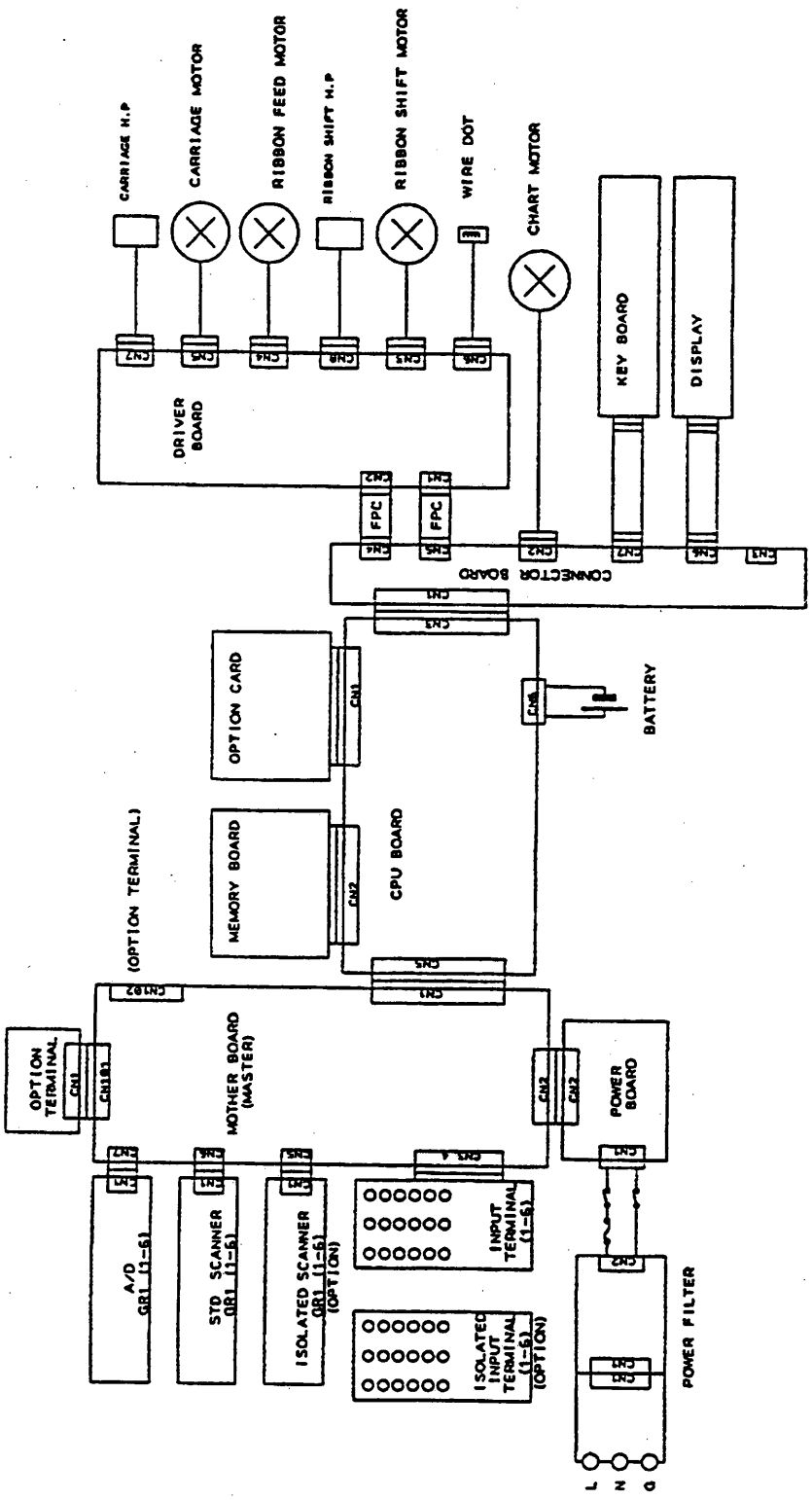
A.6 Schematic Diagrams

This section contains the schematic diagrams of the RD100A pen and dot printing models.

A.6.1 Pen Model Schematic

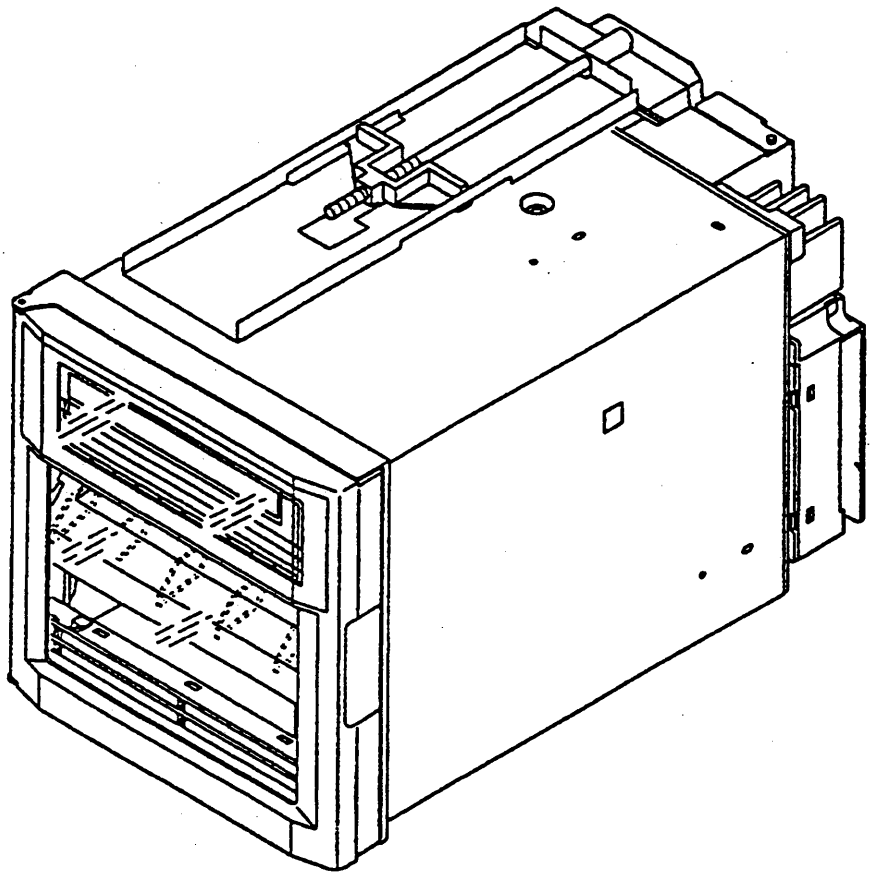


A.6.2 Dot Model Schematic

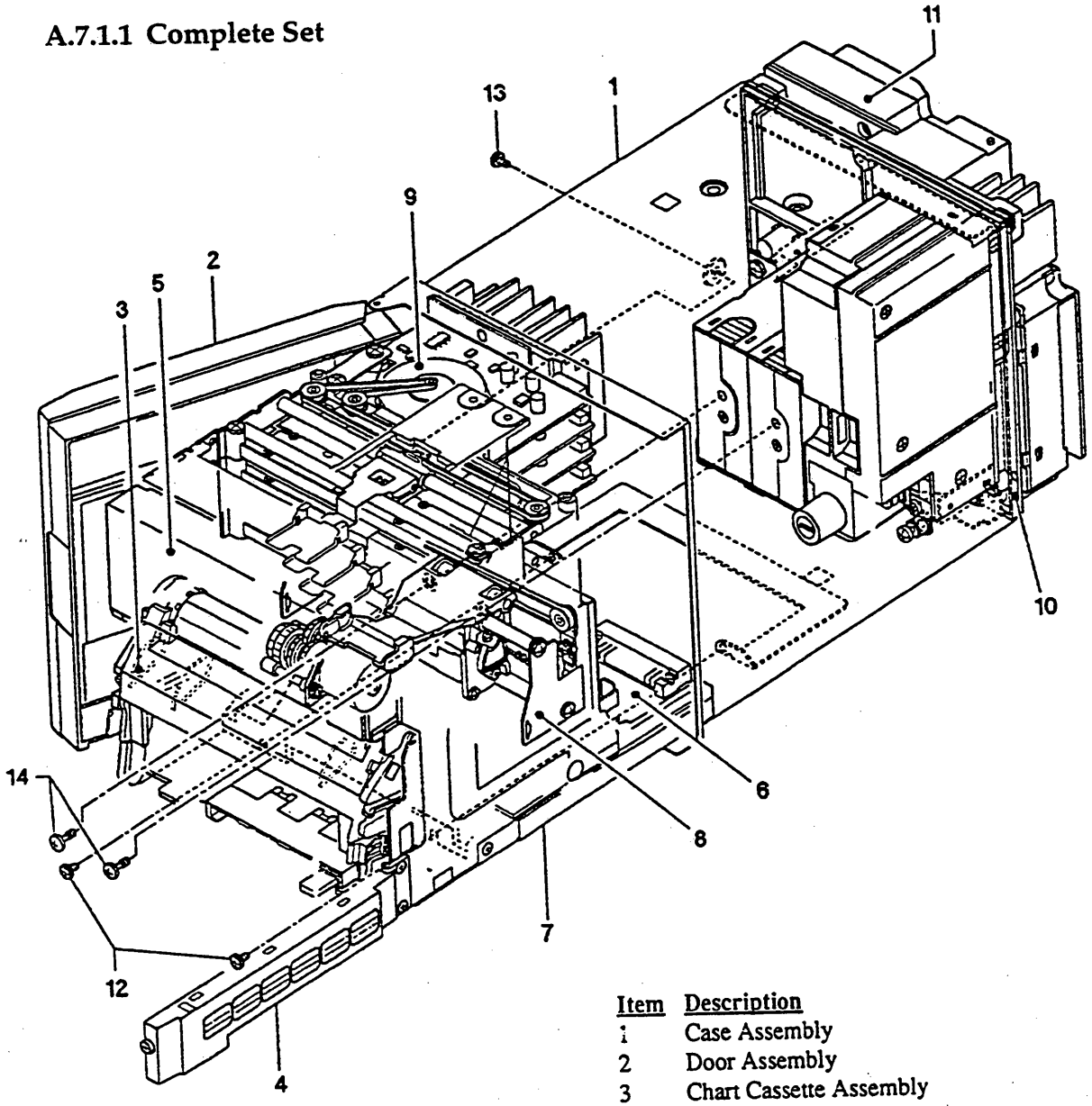


A.7 Customer Maintenance Parts List (CMPL)

A.7.1 Pen Model

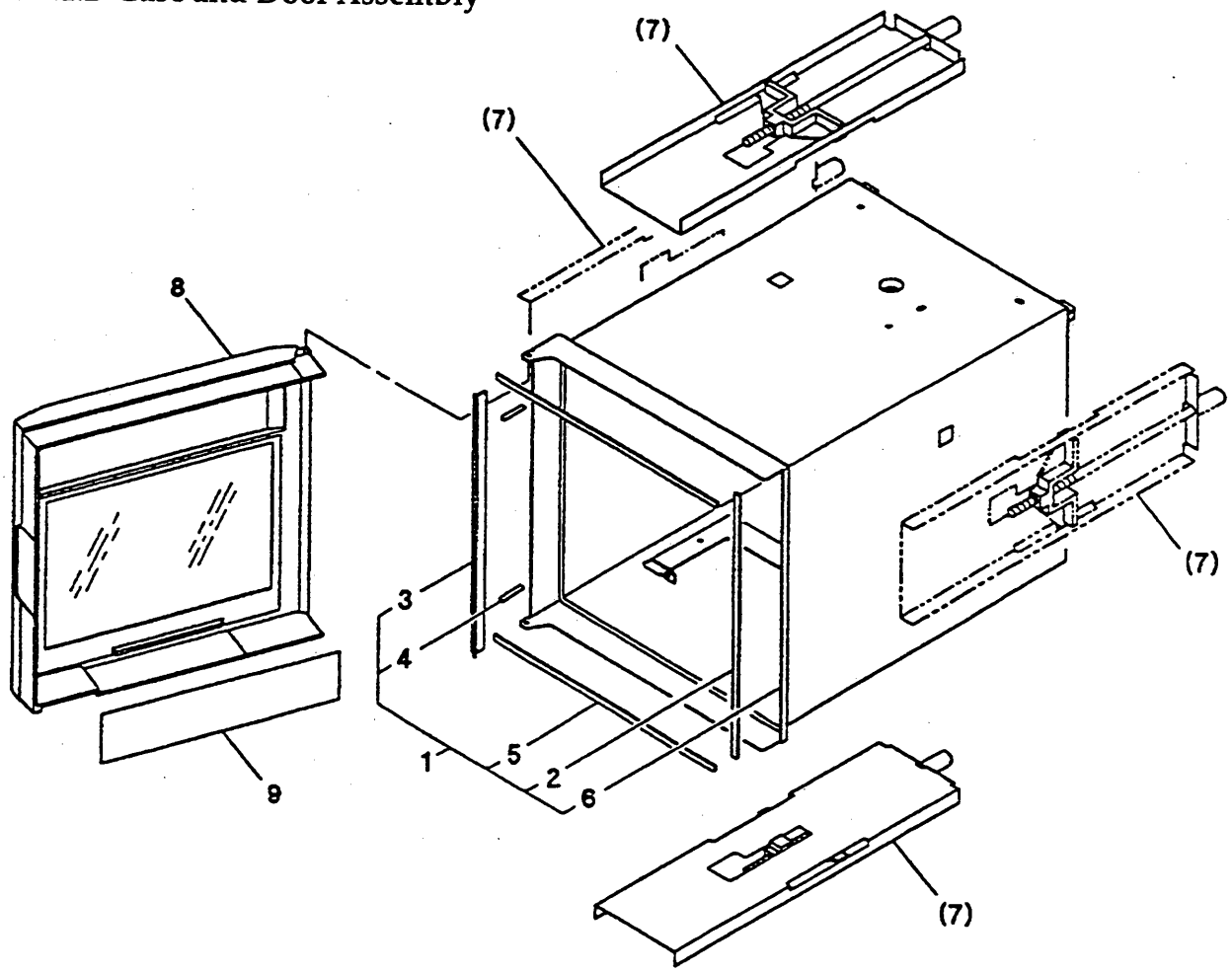


A.7.1.1 Complete Set



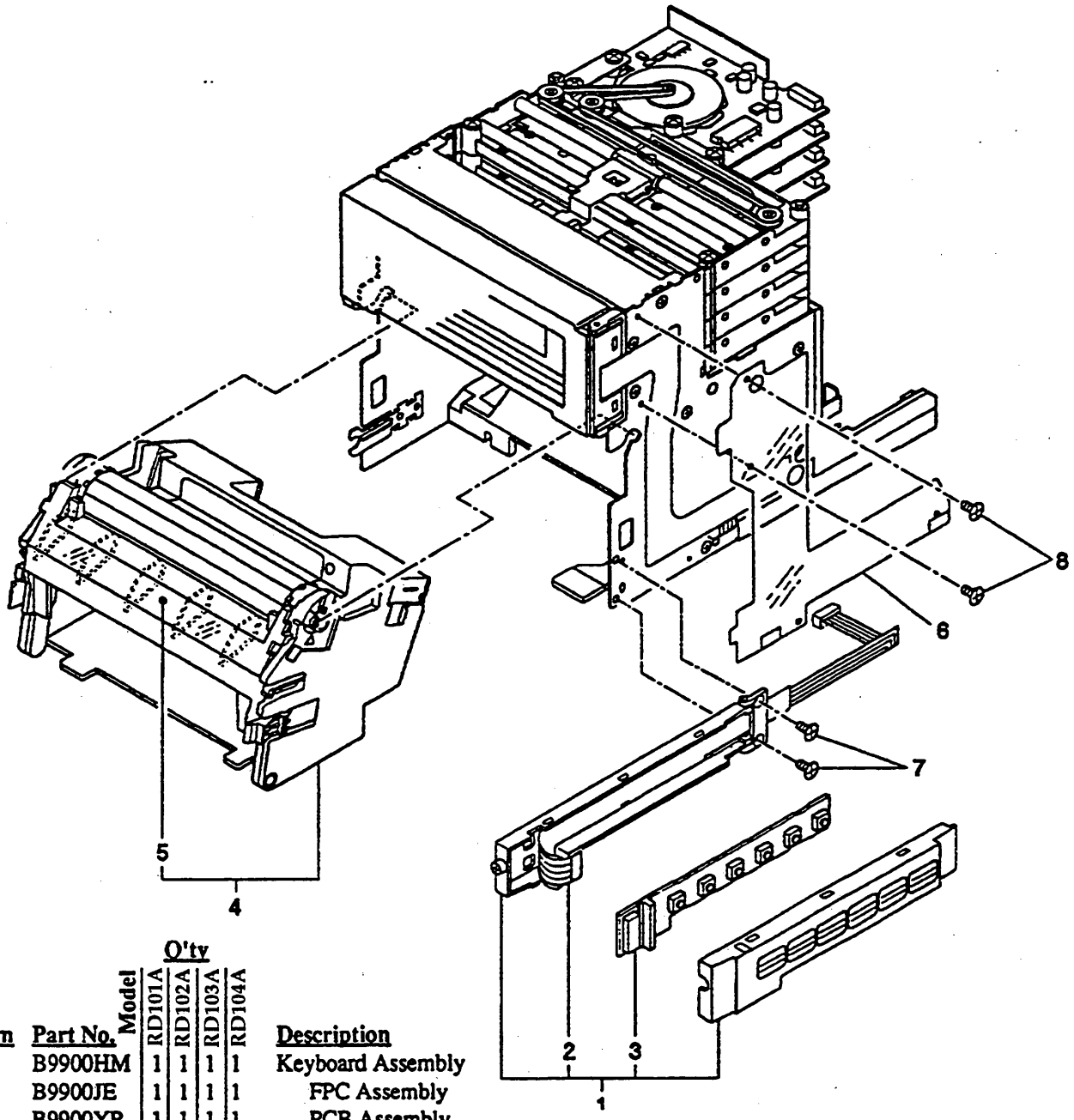
Item	Description
1	Case Assembly
2	Door Assembly
3	Chart Cassette Assembly
4	Keyboard Assembly
5	Display Assembly
6	CPU Board Assembly
7	Frame Assembly
8	Plotter Assembly
9	Pen Servo Assembly
10	Panel Assembly
11	Terminal Assembly
12	Pan H. Screw M3x6, 2ea (Y9306FB)
13	B.H. Screw M4x5, (Y9405LS)
14	Screw (B9900FW)

A.7.1.2 Case and Door Assembly



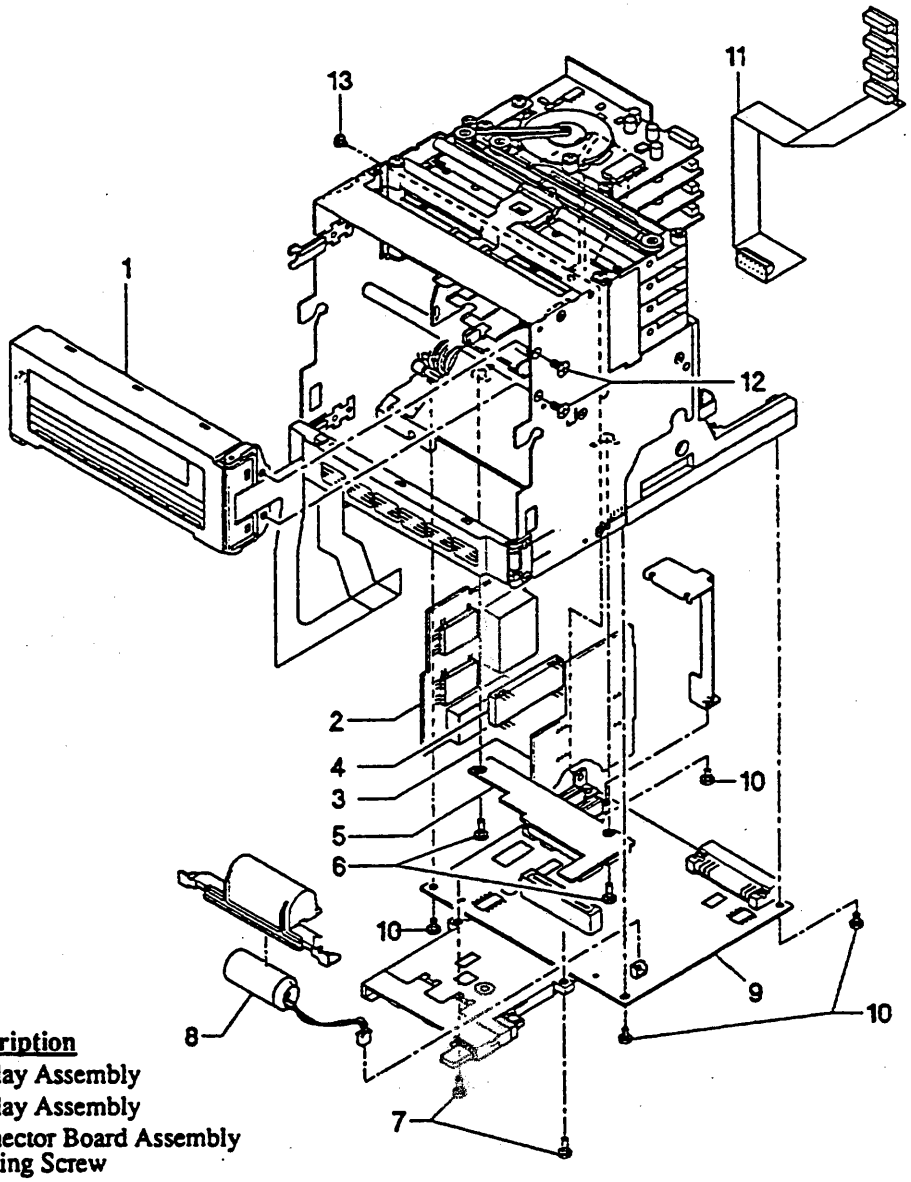
Item	Part No.	Model	Q'tv RD101A	RD102A	RD103A	RD104A	Description
1	B9900CA		1	1	1	1	Case Assembly
2	B9900CB		1	1	1	1	Gasket
3	B9900CC		1	1	1	1	Gasket
4	B9900CE		2	2	2	2	Gasket
5	B9900CF		2	2	2	2	Gasket
6	B9900CH		1	1	1	1	Case Assembly
(7)	B9900CW		2	2	2	2	Bracket Assembly (accessory)
8	B9900DA		1	1			Door Assembly
	B9900DE				1	1	Door Assembly
9	B9900AE		1				Nameplate ┐
	B9900AF			1			Nameplate ├ select
	B9900AG				1		Nameplate ├ select
	B9900AH					1	Nameplate ┘ select

A.7.1.3 Chart Cassette and Keyboard Assembly



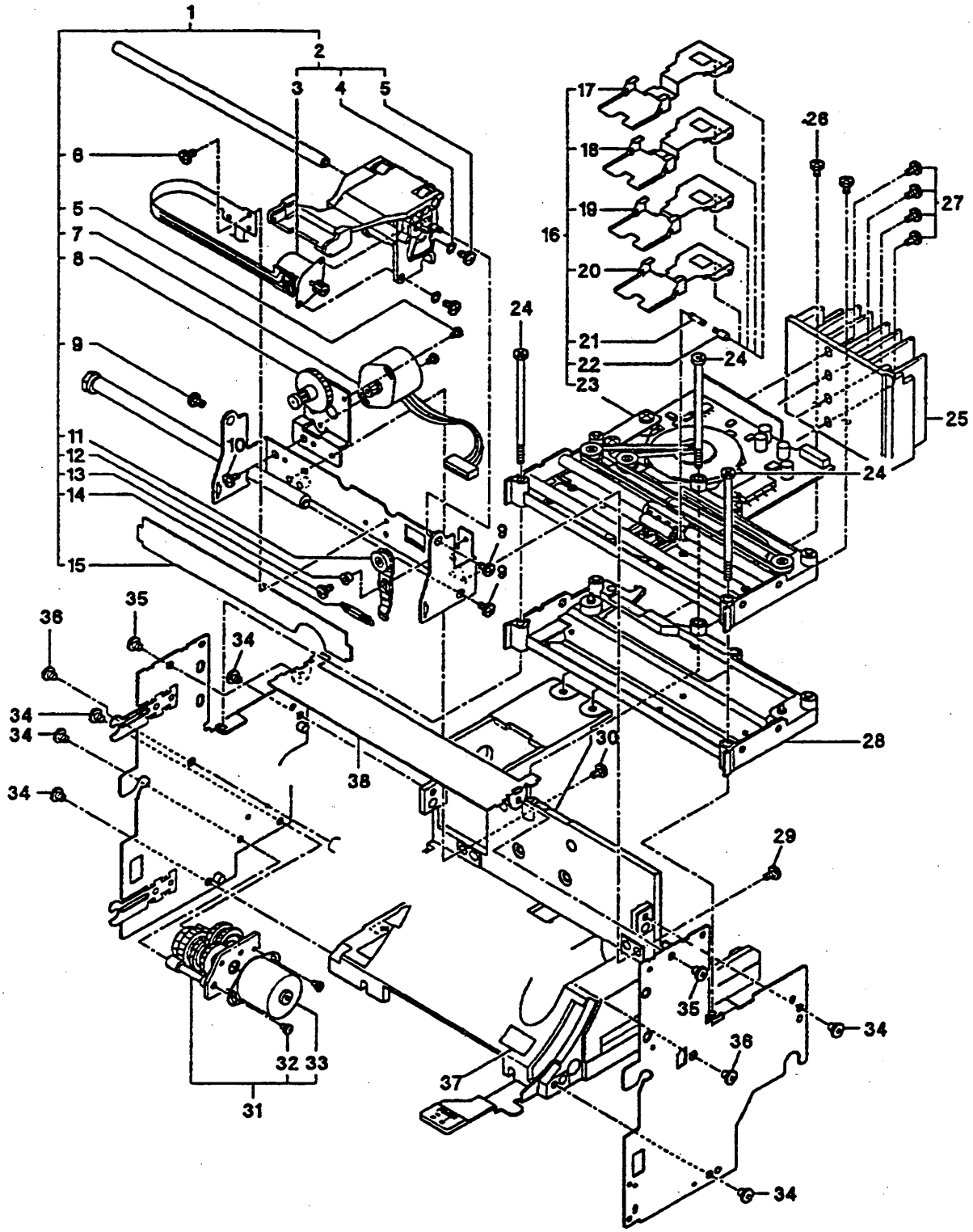
Item	Part No.	Q'ty Model RD101A	RD102A	RD103A	RD104A	Description
1	B9900HM	1	1	1	1	Keyboard Assembly
2	B9900JE	1	1	1	1	FPC Assembly
3	B9900YP	1	1	1	1	PCB Assembly
4	B9900GA	1	1	1	1	Chart Cassette Assembly
5	B9900GC	1	1	1	1	Cover
6	B9900EW	1	1	1	1	Cover
7	Y9203DB	2	2	2	2	F.H. Screw M2.3x3
8	B9900ET	2	2	2	2	Screw

A.7.1.4 Display and CPU Board Assembly



Item	Part No.	Model	Q'ty RD101A	RD102A	RD103A	RD104A	Description
1	B9900JH		1	1			Display Assembly
	B9900JJ				1	1	Display Assembly
5	B9900YW		1	1	1	1	Connector Board Assembly
6	Y9306TY		2	2	2	2	Tapping Screw
7	Y9306TY		2	2	2	2	Tapping Screw
8	B9900BR		1	1	1	1	Battery Assembly
9	B9900XB		1	1	1	1	CPU Assembly
	B9900YB		1	1	1	1	CPU Assembly*2
10	Y9304LS		4	4	4	4	B.H. Screw M3x4
11	B9900WR		1				FPC Assembly
	B9900WS			1			FPC Assembly
	B9900WT				1		FPC Assembly
	B9900NY					1	FPC Assembly
12	Y9203DB		2	2	2	2	F.H. Screw M2.3x3
13	B9900FJ		1	1	1	1	Screw

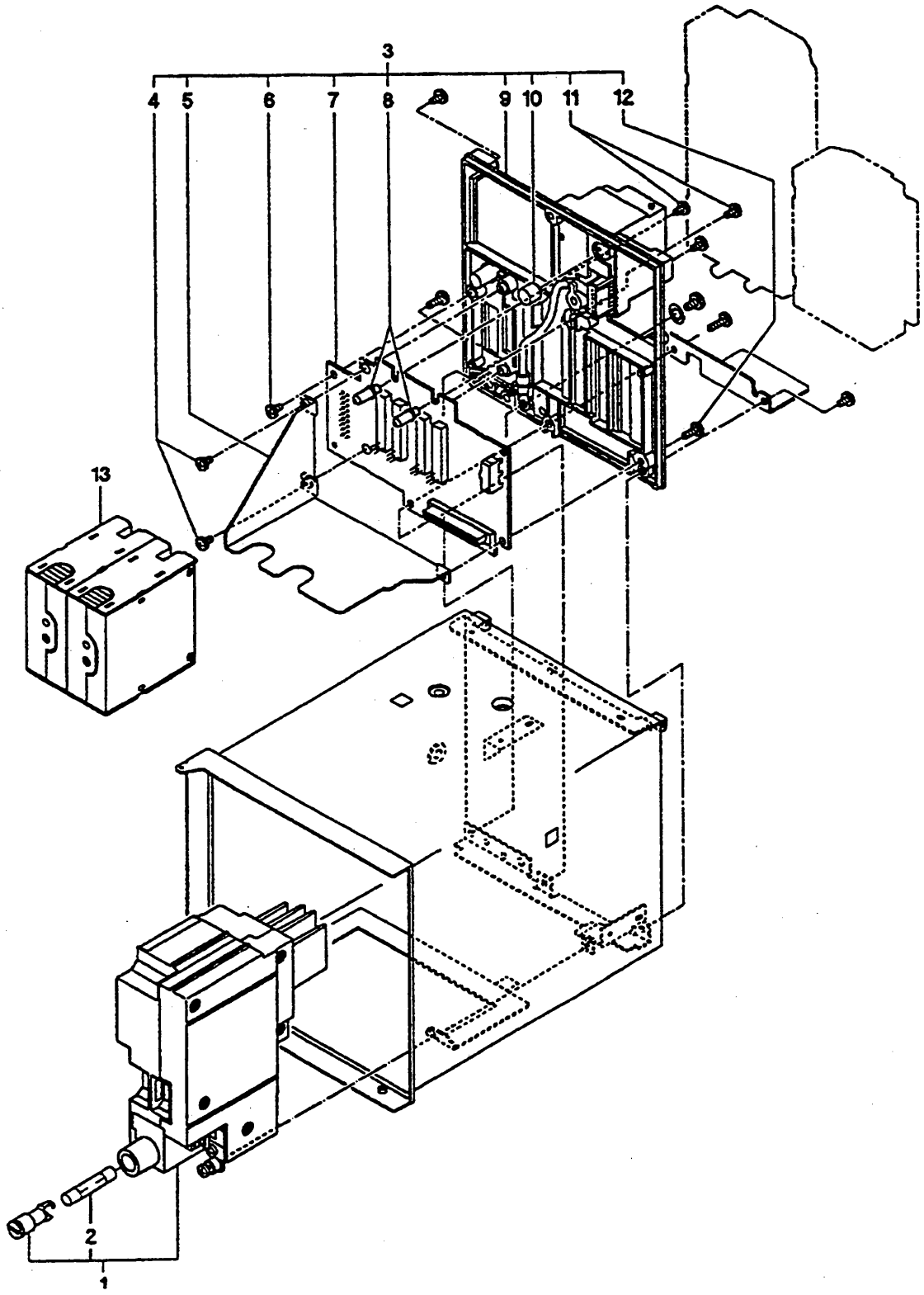
A.7.1.5 Frame and Swing Bracket Assembly



Frame and Swing Bracket Assembly (continued)

Item	Part No.	Model	Q'ty RD101A	RD102A	RD103A	RD104A	Description
1	B9900QA		1	1	1	1	Plotter Assembly
2	B9900QB		1	1	1	1	Carriage Assembly
3	B9900QH		1	1	1	1	Motor Assembly
4	Y9201WB		2	2	2	2	Washer
5	Y9204LS		4	4	4	4	B.H. Screw M2x4
6	Y9204LS		1	1	1	1	B.H. Screw M2x4
7	B9900RG		1	1	1	1	Motor Assembly
8	B9900RB		1	1	1	1	Bracket Assembly
9	Y9304LS		3	3	3	3	B.H. Screw M3x4
10	Y9304LS		1	1	1	1	B.H. Screw M3x4
11	B9900RH		1	1	1	1	Lever Assembly
12	B9900RK		1	1	1	1	Collar
13	Y9306LS		1	1	1	1	B.H. Screw M3x6
14	B9900RM		1	1	1	1	Spring
15	–		1	1	1	1	Plate
16	B9900LA		1	1	1	1	Pen Servo Assembly
	B9900LB			1	1	1	Pen Servo Assembly
	B9900LC				1	1	Pen Servo Assembly
	B9900LD					1	Pen Servo Assembly
17	B9900LE		1	1	1	1	Pen Arm Assembly
18	B9900LH			1	1	1	Pen Arm Assembly
19	B9900LK				1	1	Pen Arm Assembly
20	B9900LM					1	Pen Arm Assembly
21	B9900LQ		1	2	3	4	Spring
22	B9900LP		1	2	3	4	Pen
23	B9900MA		1	2	3	4	Servo Assembly
24	B9900KX		3	3	3	3	Screw
25	B9900KW		1	1	1	1	Heat Sink
26	Y9305LE		2	2	2	2	B.H. Screw M3x5
27	Y9305LE		1	2	3	4	B.H. Screw M3x5
28	B9900MD		3	2	1		Base Assembly
29	Y9304LS		1	1	1	1	B.H. Screw M3x4
30	Y9306LS		1	1	1	1	B.H. Screw M3x6
31	B9900HA		1	1	1	1	Motor Assembly
32	Y9204LB		2	2	2	2	B.H. Screw M2x4
33	B9900HK		1	1	1	1	Motor Assembly
34	B9900FJ		6	6	6	6	Screw
35	B9900FJ		2	2	2	2	Screw
36	B9900FJ		2	2	2	2	Screw
37	B9900AJ		1	1	1	1	Nameplate
38	B9900FR		1	1	1	1	Bracket

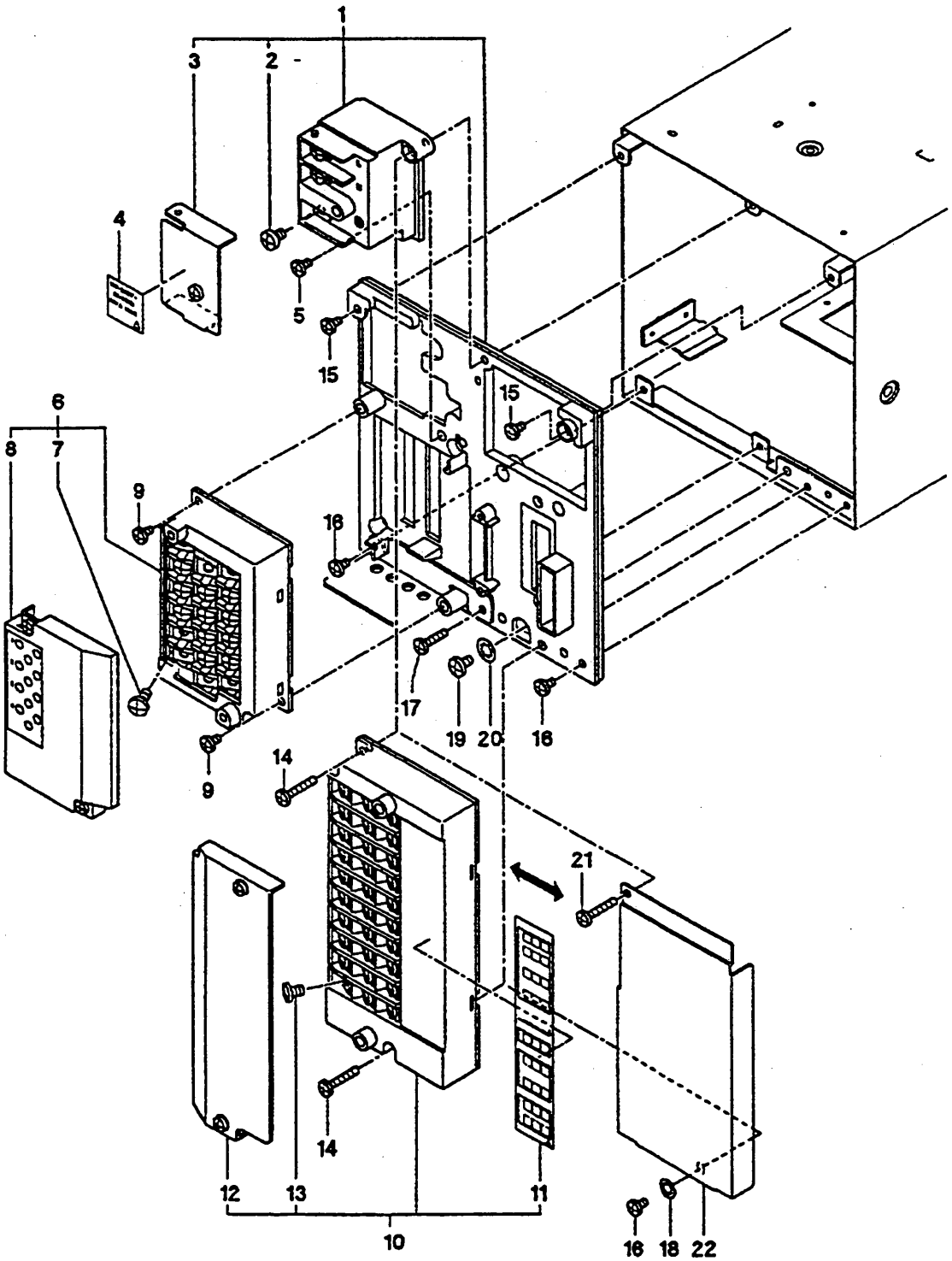
A.7.1.6 Panel Assembly



Panel Assembly (continued)

Item	Part No.	Model	Q'ty RD101A	RD102A	RD103A	RD104A	Description
1	B9900TA		1	1	1	1	Power Assembly
2	A1360EF		1	1	1	1	Fuse (Accessory)
3	B9900EA		1	1	1	1	Panel Assembly
4	Y9308LS		2	2	2	2	B.H. Screw M3x8
5	B9900EF		1	1	1	1	Bracket
6	Y9305LE		1	1	1	1	B.H. Screw M3x5
7	B9900YS				1	1	Mother Board Assembly
	B9900YR		1	1			Mother Board Assembly
8	B9900EG		2	2	2	2	Pin
9	B9900EC		1	1	1	1	Panel Assembly
10	A1435EF		1	1	1	1	Fuse
11	Y9305LE		2	2	2	2	B.H. Screw M3x5
12	Y9305LE		1	1	1	1	B.H. Screw M3x5
13	B9900RT		1		1		AD Assembly
	B9900RW			1	1	2	AD Assembly

A.7.1.7 Terminal Assembly



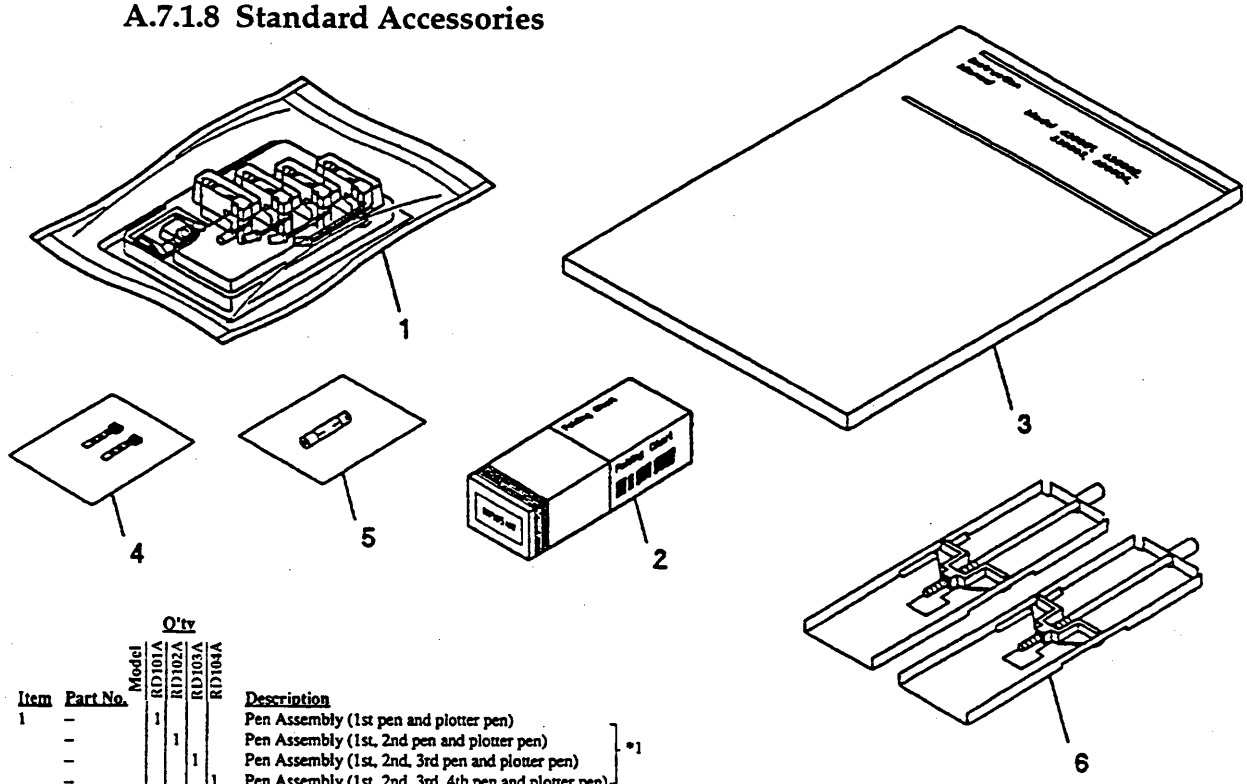
Terminal Assembly (continued)

Item	Part No.	Model	Q'ty RD101A	RD102A	RD103A	RD104A	Description
1	–		1	1	1	1	Panel Assembly
–	–		1	1	1	1	Power Terminal Assembly
2	E9655FX		3	3	3	3	B.H. Screw M4x6(±)
3	B9900EQ		1	1	1	1	Cover Assembly
4	B9900ES		1	1	1	1	Nameplate
5	Y9305LE		1	1	1	1	B.H. Screw M3x5
6	B9900SD		1	1	1	1	Terminal Assembly
–	–		1	1	1	1	Terminal Assembly
7	E9655FX		12	12	12	12	B.H. Screw M4x6(±)
8	B9900SE		1	1	1	1	Cover Assembly
9	Y9305LE		2	2	2	2	B.H. Screw M3x5
10	B9902BF		1	1	1	1	OPT Terminal Assembly *5
	B9902BL		1	1	1	1	OPT Terminal Assembly *10
	B9902BM		1	1	1	1	OPT Terminal Assembly *11
11	B9902DF		1	1	1	1	Nameplate *5
	B9902DL		1	1	1	1	Nameplate *10
	B9902DM		1	1	1	1	Nameplate *11
12	B9902BA		1	1	1	1	Cover Assembly
13	E9655FX		30	30	30	30	B.H. Screw M4x6(±)
14	Y9322JB		2	2	2	2	Pan H. Screw M3x22
15	Y9305LE		2	2	2	2	B.H. Screw M3x5
16	Y9308LS		3	3	3	3	B.H. Screw M3x8
17	Y9316LS		1	1	1	1	B.H. Screw M3x16
18	Y9301WL		1	1	1	1	Toothed Lockwasher
19	Y9405LS		1	1	1	1	B.H. Screw M4x5
20	Y9401WL		1	1	1	1	Toothed Lockwasher
21	Y9322JB		1	1	1	1	Pan H. Screw M3x22
22	B9900BQ		1	1	1	1	Bracket

Option Code

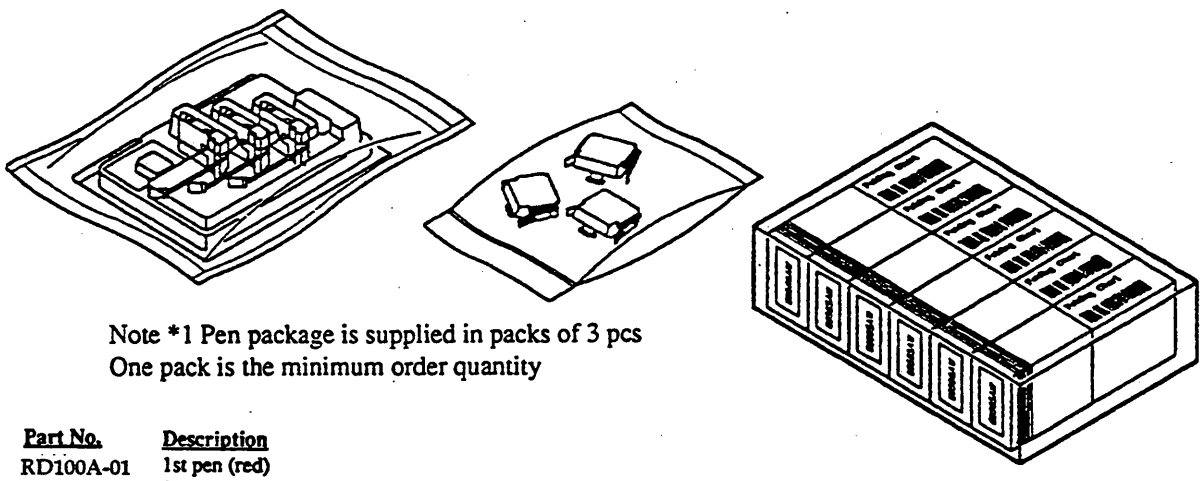
–S4	*5
–AR–S4	*10
–AR6–S4	*11

A.7.1.8 Standard Accessories



Item	Part No.	Model	Q'ty RD101A	RD102A	RD103A	RD104A	Description	
1	–		1				Pen Assembly (1st pen and plotter pen)	
	–			1			Pen Assembly (1st, 2nd pen and plotter pen)	*1
	–				1		Pen Assembly (1st, 2nd, 3rd pen and plotter pen)	
	–					1	Pen Assembly (1st, 2nd, 3rd, 4th pen and plotter pen)	
2	B9565AW		1	1	1	1	Chart*2	
3	–		1	1	1	1	Instruction Manual	
4	B9900HZ		2	2	2	2	Key	
5	A1360EF		1	1	1	1	Fuse	
6	B9900CW		2	2	2	2	Bracket Assembly	

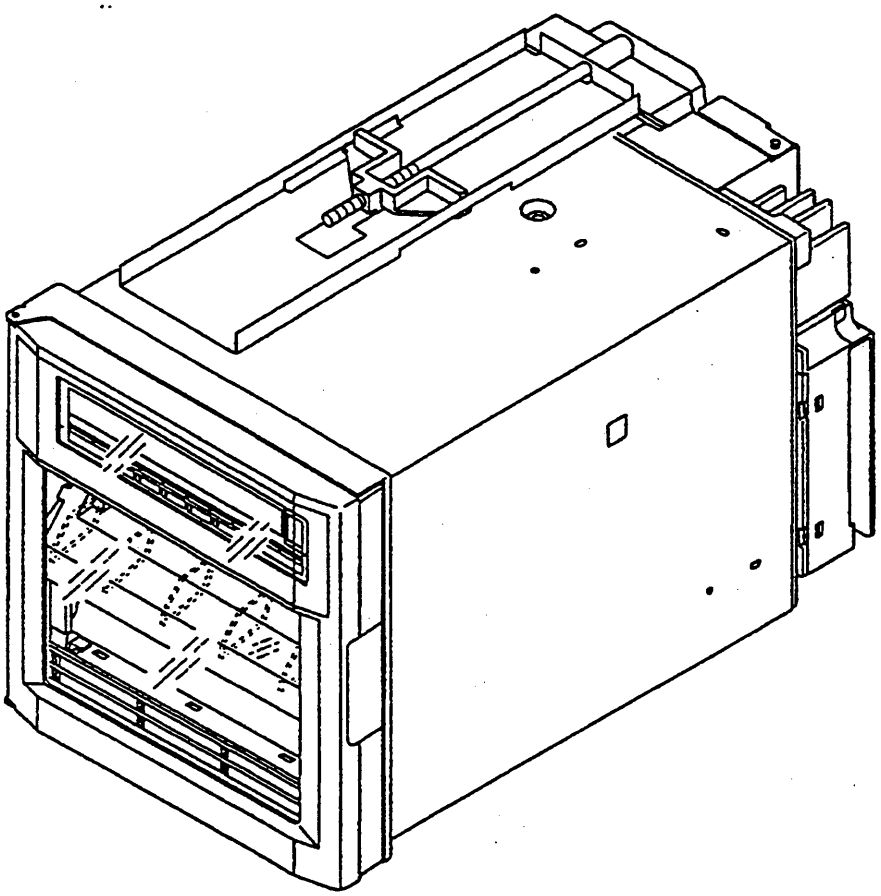
A.7.1.9 Spares



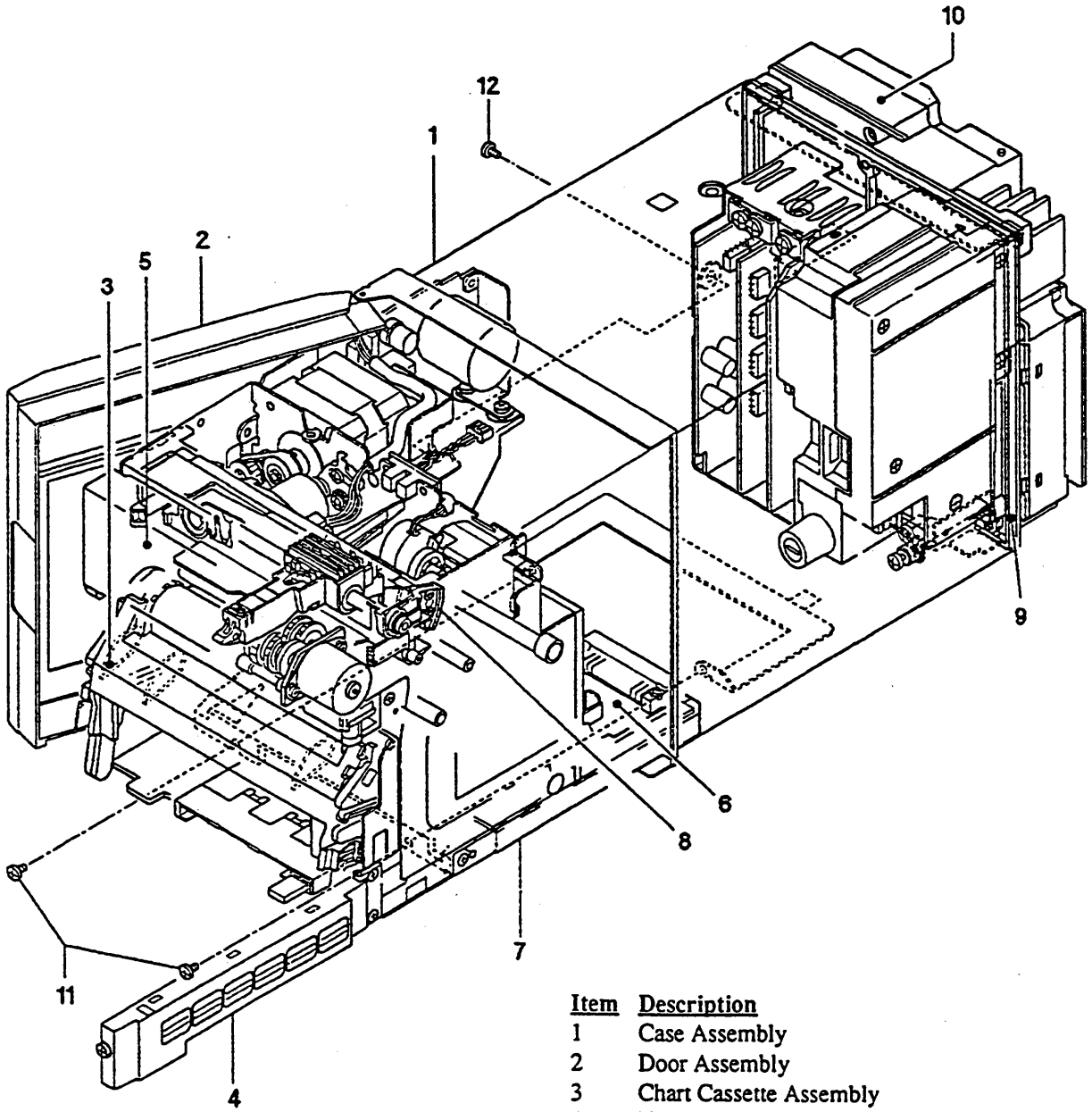
Note *1 Pen package is supplied in packs of 3 pcs
One pack is the minimum order quantity

Part No.	Description
RD100A-01	1st pen (red)
RD100A-02	2nd pen (green)
RD100A-03	3rd pen (blue)
RD100A-04	4th pen (violet)
RD100A-11	Plotter pen (purple)

A.7.2 Dot Printing Model

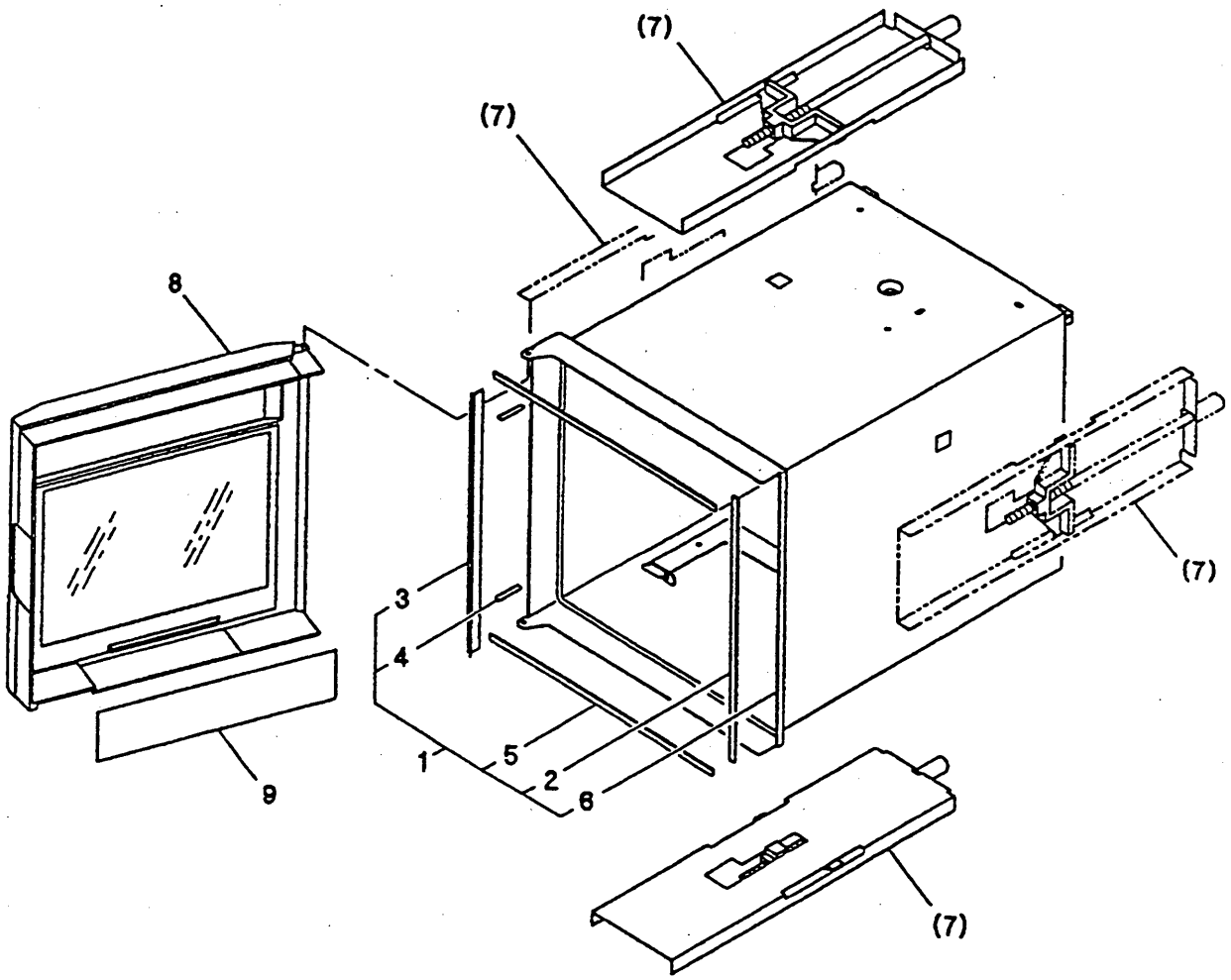


A.7.2.1 Complete Set



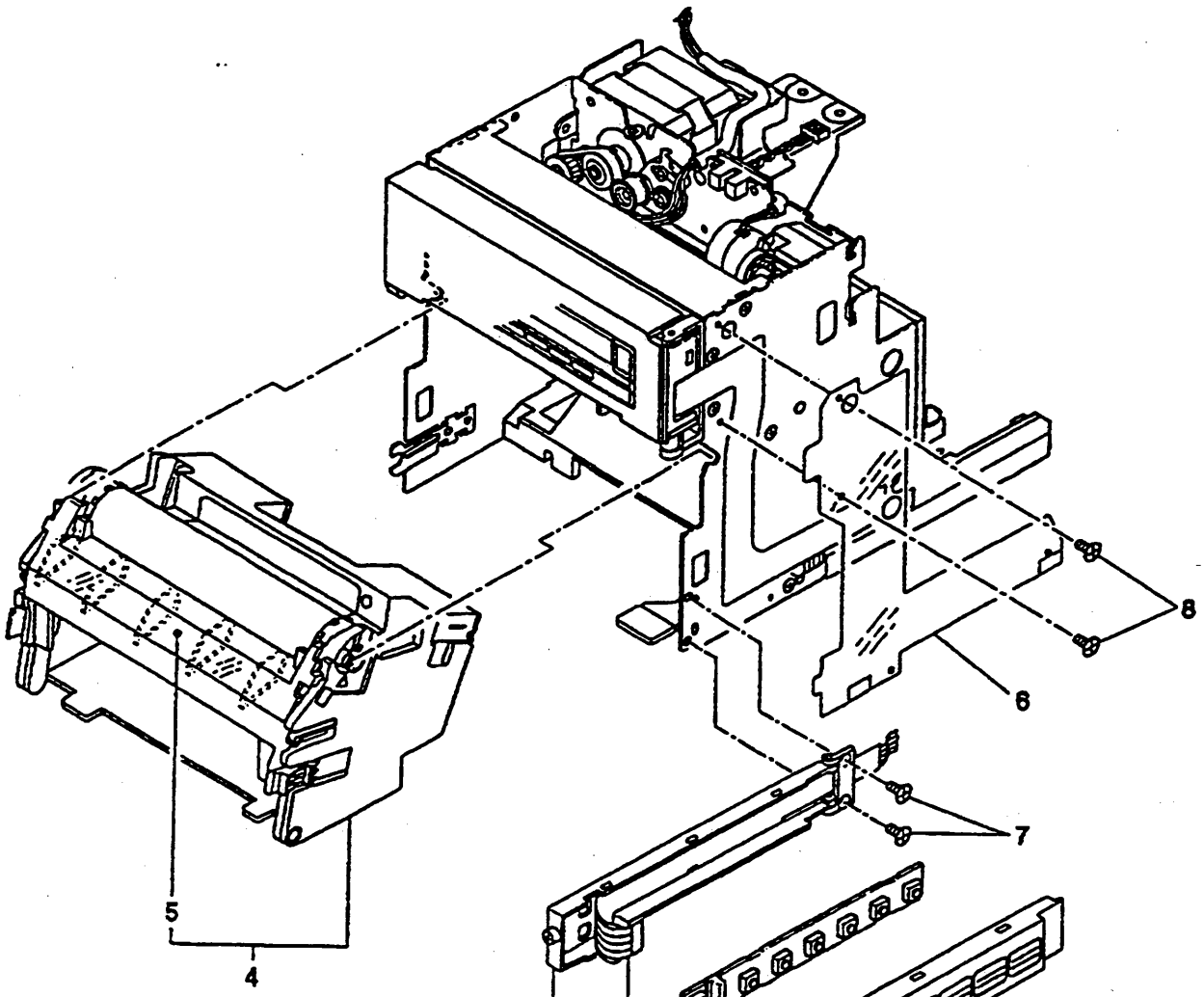
Item	Description
1	Case Assembly
2	Door Assembly
3	Chart Cassette Assembly
4	Keyboard Assembly
5	Display Assembly
6	CPU Board Assembly
7	Frame Assembly
8	Swing Bracket Assembly
9	Panel Assembly
10	Terminal Assembly
11	Pan H. Screw M3x6, 2ea (Y9306JB)
12	B.H. Screw M4x5, (Y9405LS)

A.7.2.2 Case and Door Assembly



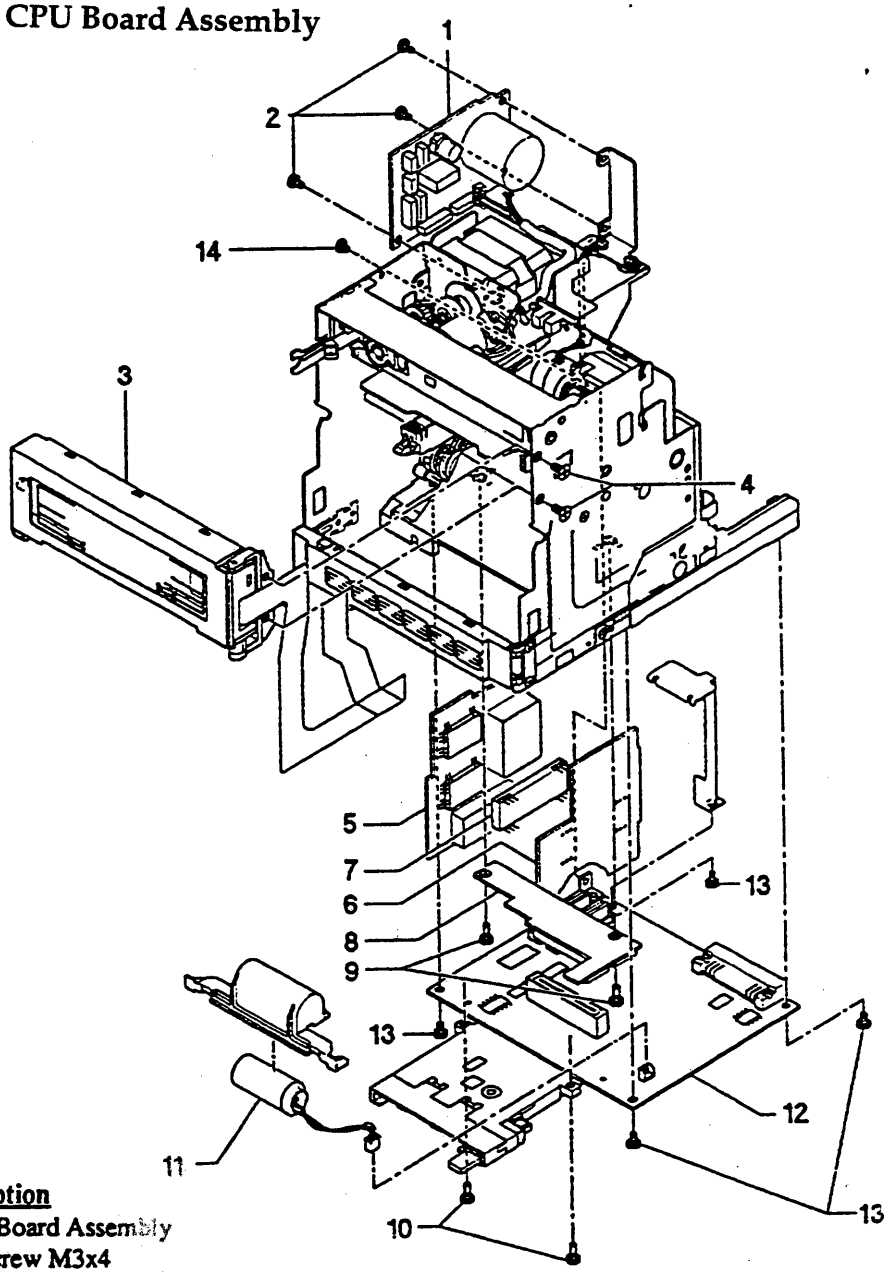
Item	Part No.	Q'tv	Description
1	B9900CA	1	Case Assembly
2	B9900CB	1	Gasket
3	B9900CC	1	Gasket
4	B9900CE	2	Gasket
5	B9900CF	2	Gasket
6	B9900CH	1	Case Assembly
(7)	B9900CW	2	Bracket Assembly (accessory)
8	B9900DA	1	Door Assembly
9	B9901AE	1	Nameplate

A.7.2.3 Chart Cassette and Keyboard Assembly



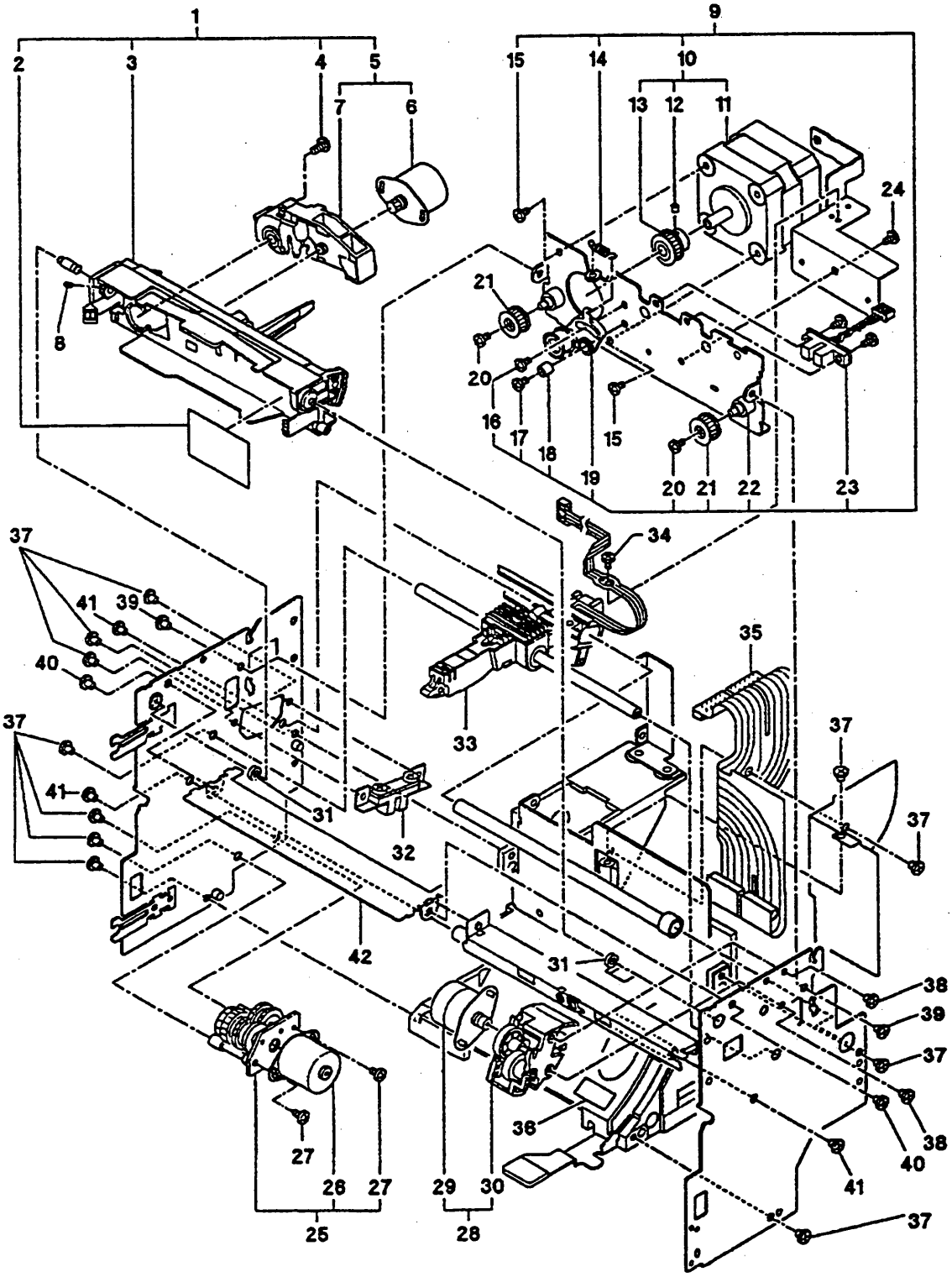
Item	Part No.	Q'ty	Description
1	B9900HM	1	Keyboard Assembly
2	B9900JE	1	FPC Assembly
3	B9900YP	1	PCB Assembly
4	B9901DA	1	Chart Cassette Assembly
5	B9900GC	1	Cover
6	B9900EW	1	Cover
7	Y9203DB	2	F.H. Screw M2.3x3
8	B9900ET	2	Screw

A.7.2.4 Display and CPU Board Assembly



Item	Part No.	Q'ty	Description
1	B9901SD	1	Driver Board Assembly
2	Y9304LS	3	B.H. Screw M3x4
3	B9901BG	1	Display Assembly
4	Y9203DB	2	F.H. Screw M2.3x3
8	B9901SF	1	Connector Board Assembly
	B9901SG		
9	Y9306TY	2	Tapping Screw
10	Y9306TY	2	Tapping Screw
11	B9900BR	1	Battery Assembly
12	B9901RB	1	CPU Assembly
13	Y9304LS	4	B.H. Screw M3x4
14	B9900FJ	1	Screw

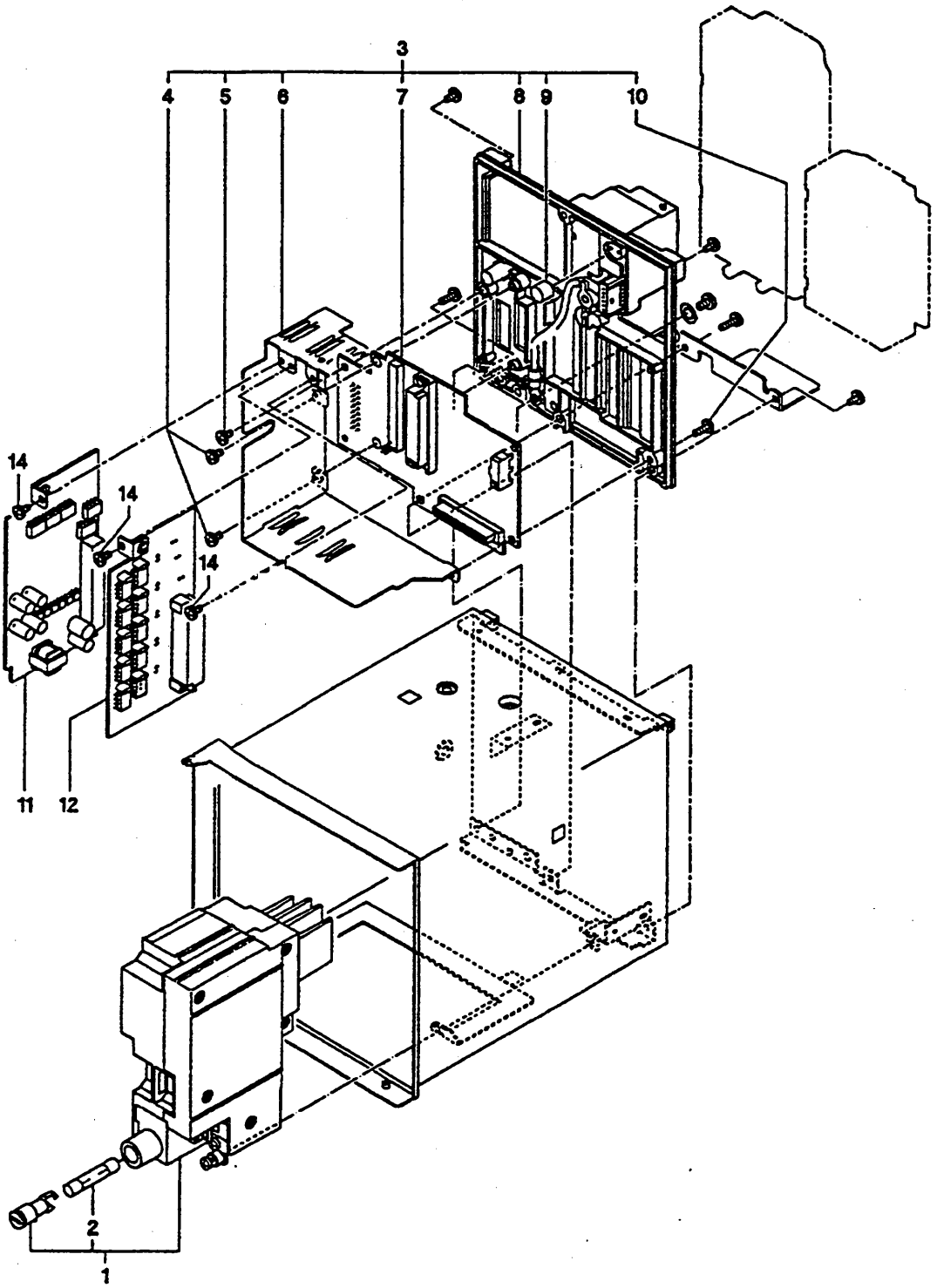
A.7.2.5 Frame and Swing Bracket Assembly



Frame and Swing Bracket Assembly (continued)

Item	Part No.	Q'ty	Description
1	B9901HA	1	Ribbon Holder Assembly
2	B9901HZ	1	Nameplate
3	B9901HB	1	Holder Assembly
4	B9901DT	1	Screw
5	B9901HJ	1	Ribbon Feed Assembly
6	B9901GW	1	Motor Assembly
7	B9901JR	1	Ribbon Feed Gear Assembly
8	Y9203SE	1	Setscrew
9	B9901EF	1	Frame Assembly
10	B9901ER	1	Motor Assembly
11	B9901ES	1	Motor
12	Y9303SJ	1	Setscrew
13	B9901ET	1	Drive Pulley
14	B9901EN	1	Spring
15	Y9306LS	2	B.H. Screw M3x6
16	Y9306LS	1	B.H. Screw M3x6
17	Y9308LS	1	B.H. Screw M3x8
18	B9901EP	1	Bushing
19	B9901EK	1	Lever Assembly
20	Y9203HB	2	Pan H. Screw M2.3x3
21	B9901EY	2	Pulley
22	B9901EG	1	Frame Assembly
23	B9901EW	1	Sensor Assembly
24	B9900FJ	1	Screw
25	B9900HA	1	Motor Assembly
26	B9900HK	1	Motor Assembly
27	Y9204LB	2	B.H. Screw M2x4
28	B9901HS	1	Ribbon Swing Assembly
29	B9901GY	1	Motor Assembly
30	B9901JS	1	Ribbon Swing Gear Assembly
31	B9901JW	2	Bearing
32	B9901GL	1	Sensor Assembly
33	B9901FA	1	Carriage Assembly
34	Y9203KB	1	B.H. Screw M2.3x3
35	B9901DW	1	F.P.C Assembly
36	B9900AJ	1	Nameplate
37	B9900FJ	11	Screw
38	B9901DS	2	Screw
39	B9900FJ	2	Screw
40	B9900FJ	2	Screw
41	B9900FJ	3	Screw
42	B9900FR	1	Bracket

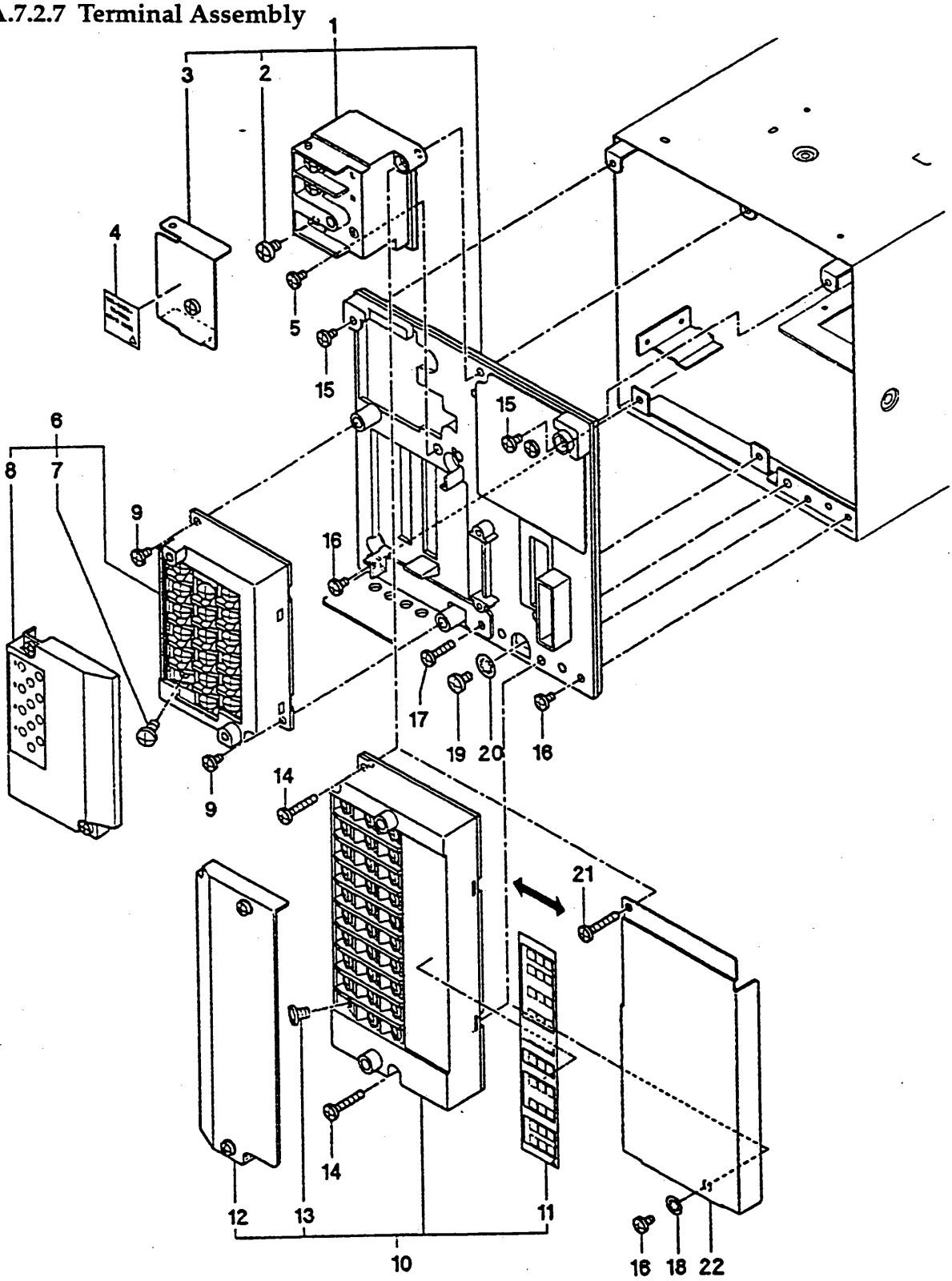
A.7.2.6 Panel Assembly



Panel Assembly (continued)

Item	Part No.	Q'ty	Description	
1	B9900TA	1	Power Assembly	
2	A1360EF	1	Fuse (Accessory)	
3	B9901BA	1	Panel Assembly (std type)	} select
	B9901BB	1	Panel Assembly (ISO type)*1	
4	Y9308LS	2	B.H. Screw M3x8	
5	Y9305LE	1	B.H. Screw M3x5	
6	B9901BE	1	Bracket	
7	B9901SR	1	Mother Board Assembly (std type)	} select
	B9901SS	1	Mother Board Assembly (ISO type)*1	
8	B9900EC	1	Panel Assembly	
9	A1435EF	1	Fuse	
10	Y9305LE	1	B.H. Screw M3x5	
11	B9901SH	1	AD Board Assembly	
12	B9901SK	1	Scanner Board Assembly	
14	Y9304LS	3	B.H. Screw M3x4	

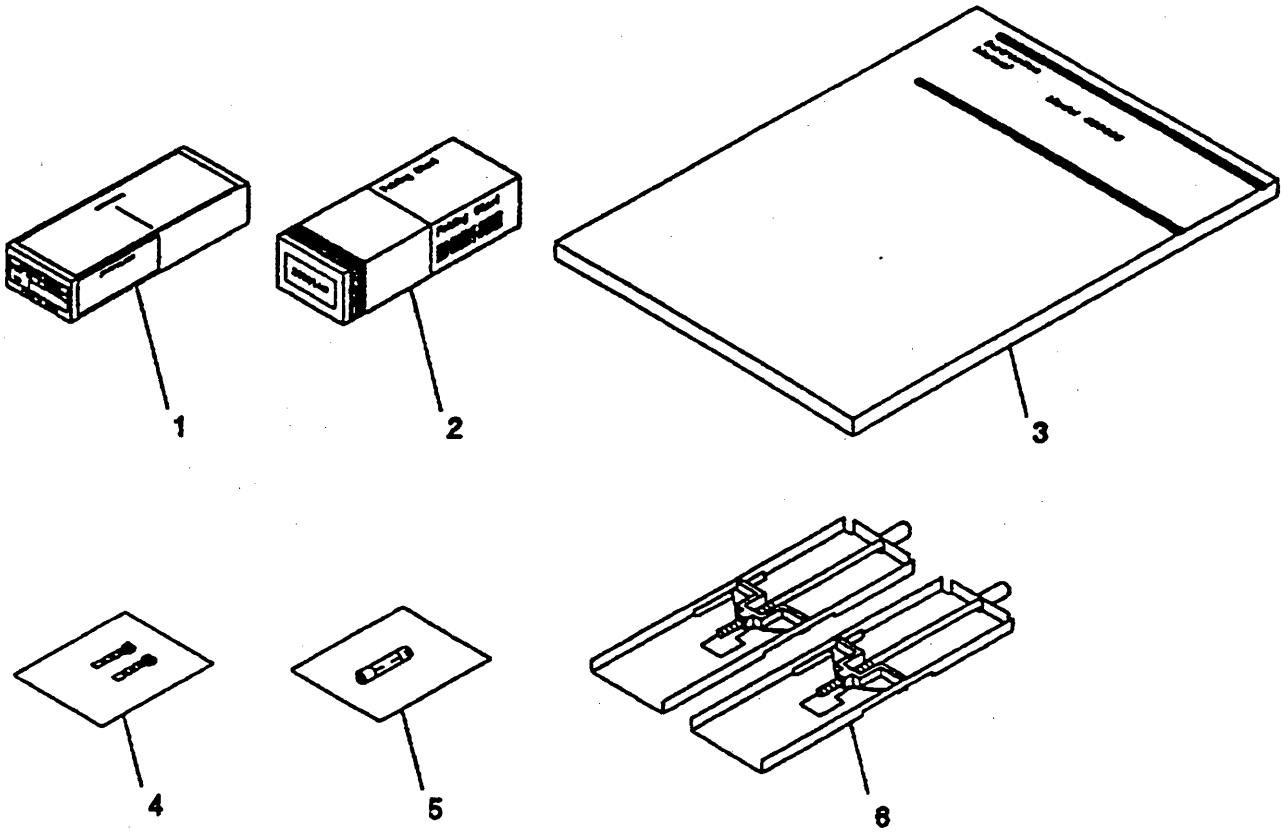
A.7.2.7 Terminal Assembly



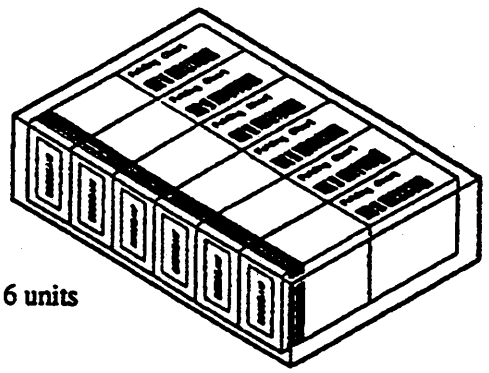
Terminal Assembly (continued)

Item	Part No.	Q'ty	Description	
1	–	1	Panel Assembly	
–	–	1	Power Terminal Assembly	
2	E9655FX	3	B.H. Screw M4x6(±)	
3	B9900EQ	1	Cover Assembly	
4	B9901BL	1	Nameplate	
5	Y9305LE	1	B.H. Screw M3x5	
6	B9901JA	1	Input Terminal Assembly	
–	–	1	Terminal Assembly	
7	E9655FX	18	B.H. Screw M4x6(±)	
8	B9901JC	1	Cover Assembly	
9	Y9305LE	2	B.H. Screw M3x5	
10	B9902BL	1	OPT Terminal Assembly *11	Option Code
	B9902BM	1	OPT Terminal Assembly *12	–AR-S4 *11
11	B9902DL	1	Nameplate *11	–AR-S4 *12
	B9902DM	1	Nameplate *12	
12	B9902BA	1	Cover Assembly	
13	E9655FX	30	B.H. Screw M4x6(±)	
14	Y9322JB	2	Pan H. Screw M3x22	
15	Y9305LE	2	B.H. Screw M3x5	
16	Y9308LS	3	B.H. Screw M3x8	
17	Y9316LS	1	B.H. Screw M3x16	
18	Y9301WL	1	Toothed Lockwasher	
19	Y9405LS	1	B.H. Screw M4x5	
20	Y9401WL	1	Toothed Lockwasher	
21	Y9322JB	1	Pan H. Screw M3x22	
22	B9900BQ	1	Bracket	

A.7.2.8 Standard Accessories



Item	Part No.	Q'ty	Description
1	RD100-RC	1	Ribbon Cassette
2	RD100-ZFP	1	Chart*1
3	–	1	Instruction Manual
4	B9900HZ	2	Key
5	A1360EF	1	Fuse
6	B9900CW	2	Bracket Assembly



Note *1 Minimum order quantity: 6 units
(1 chart/unit)

Notes

Notes

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

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- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
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