INSTRUCTION MANUAL
f o r
U N I C O R D E R
U - 8 4 1

Read this instruction manual thoroughly before use.

Thank you for purchasing this product.
Please read this manual carefully to ensure safe operation and a long service life.

Safety Precautions

To prevent malfunctions, personal injury, or potentially fatal accidents, be sure to observe all cautions indicated in this page, because they are important for Safety.
We cannot accept responsibility for any damage or accidents that may occur if the Safety Precautions are not heeded.

Safety Symbols

The following safety symbols are used in the manuals for this unit.

Symbol	Meaning	Explanation
⚠	General caution	Indicates an unspecified, general caution, warning, or danger
⚡	Electric shock	Indicates the potential for electric shock
🔥	Fire	Indicates the potential for fire
💥	Explosion	Indicates the potential for explosion
✋	Pinch	Indicates the potential for finger injury from pinching

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⚠ **C A U T I O N S**   Danger of injury and property damage may be caused.

Be sure to ground the unit.
Grounding prevents electric shock and noise.

Use only the specified fuse.
Use of incorrect fuse may cause a fire or malfunction.

Supply only the specified voltage.
Supplying incorrect voltage may cause a fire or malfunction.

Do not overload an electrical outlet.
Overloaded circuits may cause a fire.

Do not expose to chemicals, moisture, or gas.
A leak or spark may cause a fire, electric shock, or malfunction.

Do not allow metal or foreign objects to infiltrate.
A fire or malfunction may result.

Do not supply power when disassembled or broken.
Electric shock or malfunction may result.

Do not cover the unit while the power is on.
Heat will accumulate, causing the unit to deform. Fire may result.

Never carelessly put your hands in the pen moving area.
Personal injury or mechanical breakdown may result.

Never touch the metal of the input terminals.
Electric shock may result.

CAUTIONS

When the UNICORDER is brought out from Japan:
The UNICORDER is designed and manufactured to be used only in Japan.
The UNICORDER is subjected to the Foreign Exchange Control Order and Foreign Trade
Control Act and is considered as one of strategic goods under control. Therefore, it is recomme-
nded that necessary application such as export permit be made to Japanese Government before
the UNICORDER is brought out from Japan.

PANTOS reserves the right to change the specification of the UNICORDER without prior
notice.
No part of this manual may be reproduced in any form or any means, without permission in
writing from PANTOS.

This manual has been prepared carefully to cover every aspect of the UNICORDER. Whenever
you find any msitake or insufficient explanation, please contact to your local agent.

PANTOS is not responsible at all for any effect caused or resulted from usage of the UNICOR-
DER.

CONTENTS

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Precautions

Contents of this manual	It is forbidden to reproduce any part of this manual without permission. The contents of this manual may change without notice. Although this manual has been prepared carefully, if you find any mistakes or difficult to understand explanations, please contact your local distributor.
Operating the UNICORDER	The UNICORDER is designed as a general-use instrument (test,experiment, etc). It is a high-quality, reliable instrument. The UNICORDER cannot be used in situations in which breakdowns or operational errors may direct harm the human body (device for medical care, various safety devices etc.) or measurements related to money transactions. PANTOS takes no responsibility for any injuries or damage caused by or resulting from usage of the UNICORDER.
Taking the UNICORDER abroad	The UNICORDER is manufactured and sold on the conditions it will be used in Japan. Some countries prohibit use of the UNICORDER by law or regulations. PANTOS takes no responsibility for any damage caused by use of the UNICORDER in such countries. Repair and maintenance service are limited to the Japanese domestic market. The UNICORDER falls under the "Foreign Exchange and Trading Control Law " which regulates strategic goods. Therefore, to bring the UNICORDER to outside of Japan, export permission from the Japanese government is necessary.
Operation	The operation switch and EL display unit attached to the operation assembly have a movable structure. Be careful not to catch your finger between them during operation. The recording pen may be driven in high-speed by the input signal or switch operation. When placing your hands within the movement range of the recording pen to replace the pen, the operation must be correct. Be careful not to place any parts of your body within the movement range to the recording pen.
Ground connection	Be sure to connect the case ground to a proper ground connection. If the connection is not complete, electric shock may occur.

1.2 Organization of This Manual

Introduction	Explains precautions for the use of this manual and the UNICORDER as well as an explanation of the warranty.

1. INTRODUCTION

Name and
functions

Describes connections and operations together with figures.
By reading this chapter an outline of the operating method can be grasped
and the user can start to use the UNICORDER .

How to
handle the
equipment

Explains the accessories and how to install the chart paper, ink ribbon and
input unit.

Operation
panel

Describes the switches on the panel and how to operate the EL display.

Operation

This chapter explains the operations in more detail, such as troubleshooting,
interpreting recording result etc.
Also explains various functions for more convenient use as well as options.

Specifications

Specifications of the UNICORDER.

**Note; Detailed explanations of the options are described in the instruction manual for
options.**

1.3 Warranty

Warranty

The recorder is warranted for one year from the date of purchase. Should
the recorder breakdown due to a defect in manufacturing within the said pe-
riod, PANTOS shall repair it at no charge to the customer. In principle, the
customer shall bring the recorder to an PANTOS's dealer and pick it up
upon completion of repair. In the case the customer requires the repair to be
done by a serviceman at the customer's site, a porting of the repair fee, i.e.,
transportation fee, shall be borne by the customer. Costs for any breakdow-
ns caused by the customer such as ones due to operation mistakes that are
not due to manufacturing defects shall be borne by the customer even if
they occur within the warranty period for one year from the date of repair.
Cost for repair or replacement of any consumables shall be borne by the cu-
stomer. This warranty is valid only in Japan.

Note; The details of this warranty will not limit the rights of purchaser.

Repair

PANTOS will repair instruments that has been used long periods. Although
PANTOS maintains stocks of replacement parts as much as possible, there
may be some cases in which the problem cannot be repaired due to discont-
inued part.
When a repair is required, we recommend to providing detailed information
of the condition of the problem.

Periodical
inspection

Periodical inspections are necessary to maintain accuracy of the measured
values. Carry out periodic inspections every six months.

1.4 Unpacking

Unpacking

Accessory box →

Recorder →
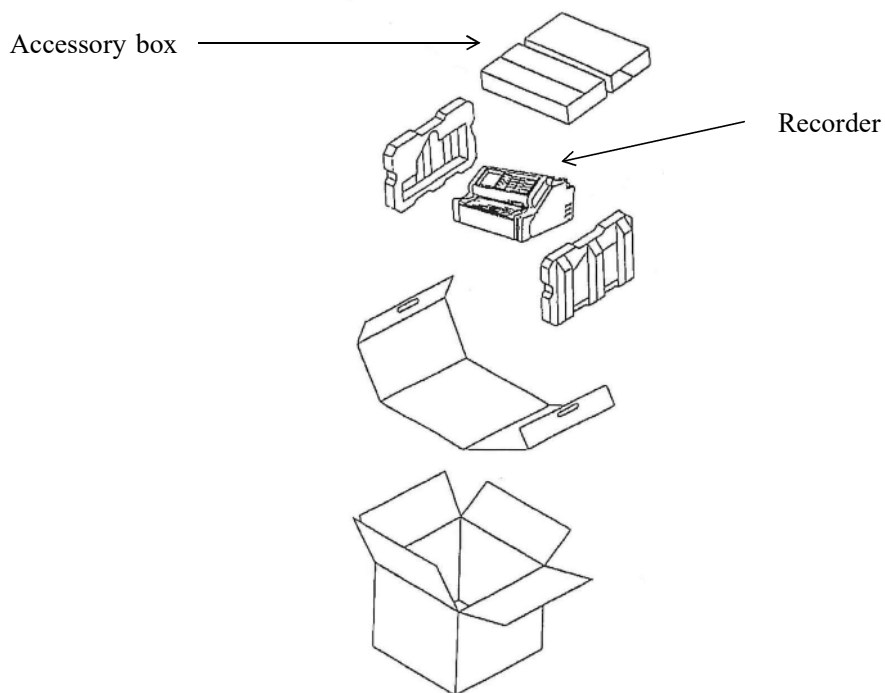
Accessories

Confirm that the following accessories are in the carton.
If a part is missing, contact the dealer in your city or our sales department.

Parts name	Model	Q'nty
Power cable		1
Chart paper（20m）	2501P50	1
IC memory card		1
Pen	NDL-**	1 each
Dust cover		1
Fuse（built-in）	5A	1
Input cover		1
Input cover stay		4
Instruction manual		1
Dropping pipet		1
Grounding adapter		1
External remote connector		1

1. INTRODUCTION

1.5 Preparing for Recording

We recommend you to read the sections in the following order before operation.

(1) Put water into the automatic pen cap. (3.3)
(2) Install the printing ribbon cassette. (3.8)
(3) Set and confirm the power and voltage. (2.2.1)
(4) Connect the power connector and turn on the power switch. (2.2.2)
(5) Load the chart paper. (3.1)
(6) Install the recording pen. (3.2)
(7) Connect the input cable. (3.6)
(8) Install the input cover. (3.9.1)

2. NAME AND FUNCTION

Top view

Display panel

Operation panel

438

Front view

IC card

Rear view
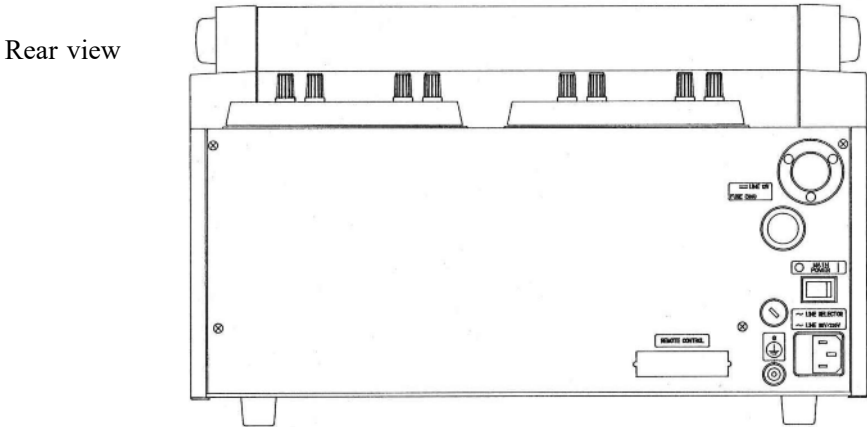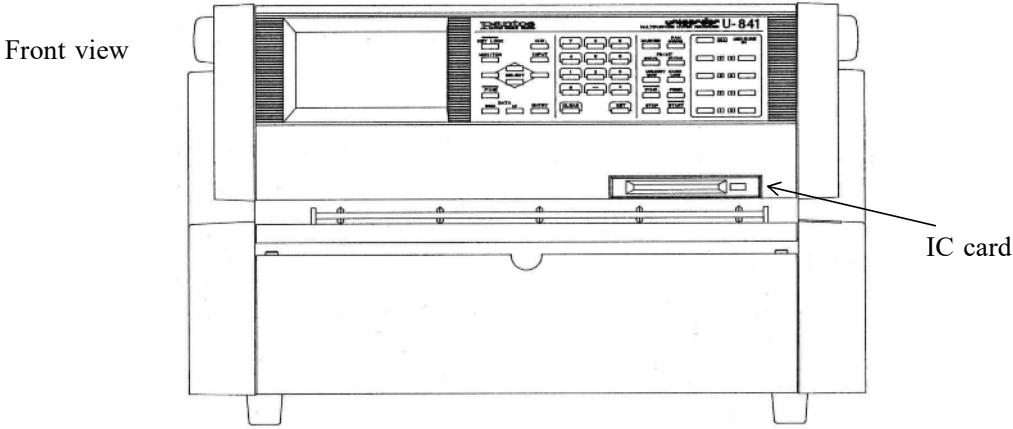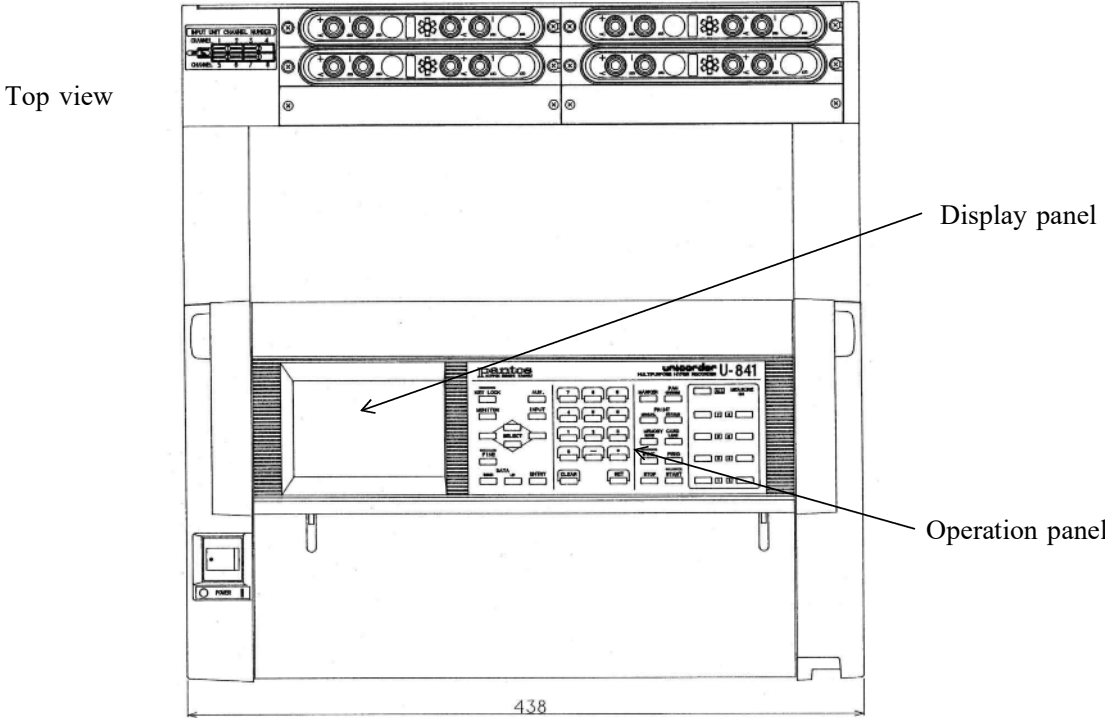
2. NAME AND FUNCTION

2.1   Operating Unit

Display panel   Setting panel   Operation panel   Measure ON/OFF control
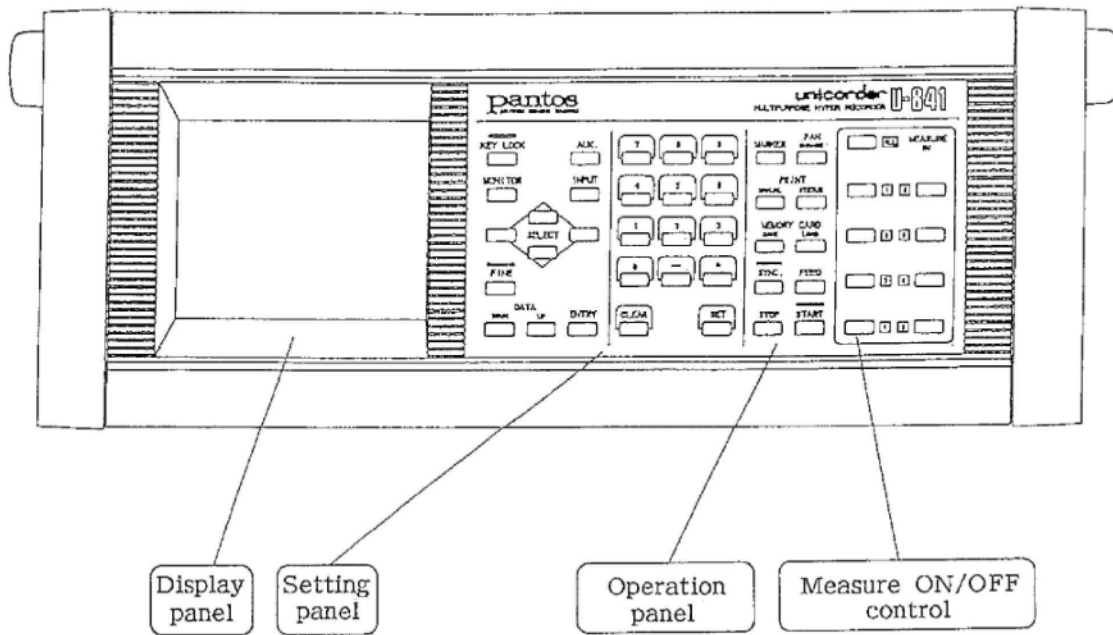
The operating unit can be moved and used at any position.
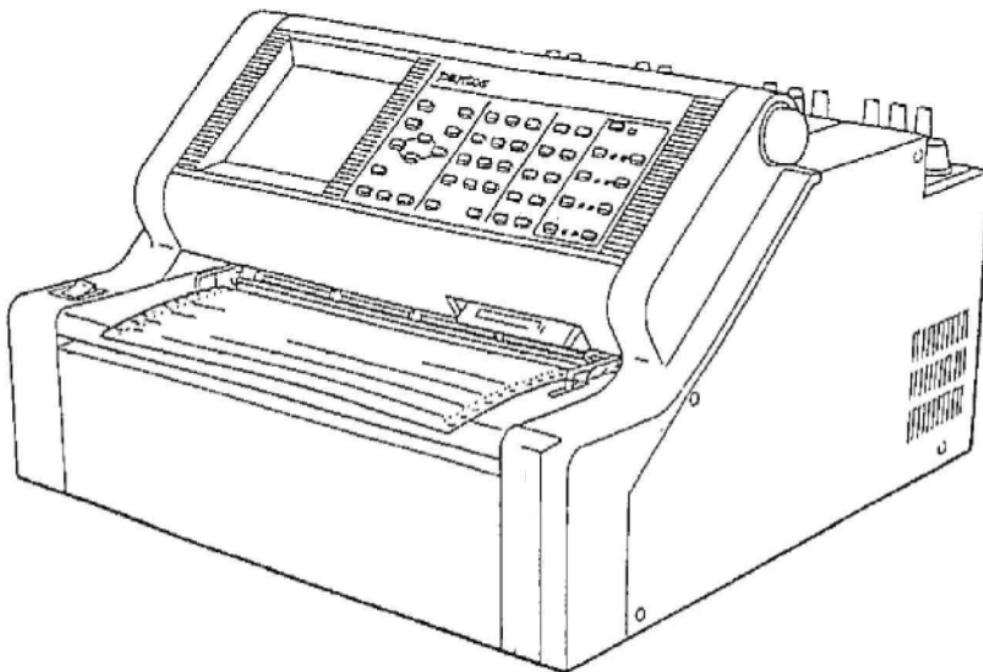
Caution: Be careful not to catch your fingers.
Keep your body away from the pen operating area.

2.1.1   Display unit

Display unit shows the analog waveform, digital display, and setting screen.
All settings for the input amplifier and auxiliary functions are done in this display unit.
Switch the display using the switch on the setting unit. Analog waveform scrolls in synch-
ronization with the chart paper feed. Digital display can be directly read physical amounts
by setting of the scale function of the auxiliary function.

Analog waveform

Digital display

2.1.2   Setting unit

Key lock
When the lamp is lit, all keys except feed switch are locked.

Auxiliary function settings
Limiter, chart paper feed, scale, time, tag name, logging, pen adjust, comment, printer, IC card

Input amplifier and chart paper feed settings
Voltage, temperature, range bias, span, filter

KEY LOCK   **AUX**

MONITOR   **INPUT**

Waveform display, chart paper feed settings
Analog waveform, digital display analog waveform scrolls in synchronization with the chart paper feed.

SELECT

Select   ↑   ↓   ←   →
Moves the cursor in the display screen.

FINE

Fine adjustment
When this lamp is lit, fine adjustments can be made. When INPUT is set, the smallest digit in the screen changes.
To increase resolution, enter a number smaller than the decimal point using the ten-key. For 1 V range, for example, inputting 1.000 V allows a fine adjustment every 0.001 V.

DATA
DOWN   **UP**   **ENTRY**

Fixing
Display channel ON/OFF
Copy function
Fixing time
Fixing character
Adjust start
IC card file fixing

Setting
Set all the setting using this UP/DOWN key along with the fine switch.

Ten key, decimal point, and minus switch are used to directly input the numerical value to set the input amplifier（INPUT）, monitor（MONITOR）, and auxiliary function（AUX）.

Set
This set switch must be pressed after inputting a data value with the ten-key.

Clear
This switch cancels any setting errors made with the ten-key.

（1） Input amplifier/chart paper feed（INPUT）
  Settings the amplifier and chart paper feed settings.

Input condition setting screen

MONITOR and AUX. keys:
switches to other functions.

Displays INPUT setting mode.
（COPY MODE, TIME BASE separately）

CH	TY PE	FIL TER	RAN. SPAN	RANGE SPAN-L	BIAS % SPAN-R
8	K	ON	SPAN	1000 ℃	10 ℃
7	V	OFF	RAN.	10.00 V	20 %
6	T	ON	SPAN	150 ℃	10 ℃
5	E	OFF	SPAN	300 ℃	0 ℃
4	R	ON	RAN.	1800 ℃	10 %
3	J	OFF	SPAN	500 ℃	100 ℃
2	mV	OFF	SPAN	100mV	100mV
1	V	OFF	RAN.	10 V	50 %

INPUT （SET MODE）

15:45:56   CHART SPEED= 10mm/min

Setting channel

SPAN-L and SPAN-R
for 6CH

Press the cursor 【←】
to set COPY MODE
and press the ENTRY key.
← displays Data at the
  ← position can be
copied by moving the
cursor on CH and key.

E

At present, the SPAN-R value
can be set.
Value can be changed with the
DATA UP or DOWN key.
Fine numerical value is set with
the FINE key ON.
（Ten-key and the SET key can be
used for the setting. Pressing the
ENTRY key is not required）

E（error） displays in this
line when the setting value
is not correct.

Display of time

When the cursor is positioned at CHART SPEED numerical
values can be changed with the DATA UP or DOWN key
and the ten-key. Pressing the ENTRY key is not required.

Input amplifier
1. Selecting the   Move the cursor with the SELECT keys.
   Channel:

2. Selecting the item: Move the cursor with the SELECT keys.

3. Setting the item: Use the DATA UP or DOWN key.
   TYPE: 16TCV1:
                     Voltage（mV. V）
                     Temperature（Thermocouples: J, K, E, T, S, R, and B）
                     Thermo resistance bulb（Pt 100 ohm:Pt）is added for 16RTD1.

   FILTER: ON（1 Hz）, OFF（10 Hz）

   RANGE/SPAN: Selects sensitivity setting method
                     RANGE: Sets sensitivity and zero point
                         Example: Full scale 1 mV（RANGE）
                                  Zero point 50%（BIAS）
                     SPAN: Sets measuring range
                         Example: 1mV（SPAN-R）- 2mV（SPAN-L）

RANGE: Determined by selection of RANGE/SPAN as described above.

BIAS%   Use the DATA UP or DOWN key or ten key. When input are done

SPAN-L/SPAN-R   by the ten key, be sure to press the SET key. Can set in the range of 100 µV to 50 V/FS. Accuracy is poor between 100 µV and 900 µV for measurements of fine voltage. BIAS indicates the position of the zero point.

4. Copying the   Example: To copy settings of channel 1 to channel 2 and 3
     setting: 1）Select channel 1 with the SELECT keys.
                     2）Move the cursor to the left end with the SELECT key.
                     3）Press the ENTRY key. "←" displays at left of the table.
                     4）Select channel 2 with the SELECT key, and press the ENTRY key.（Copy of channel 2 is completed.）
                     5）Select channel 3 with the SELECT key, and press the ENTRY key.（Copy of channel 3 is completed.）

Chart paper feed

   1. Move the cursor to CHART SPEED = ▮▮▮▮ .

     Set with the DATA UP or DOWN key or the ten key.

（2）Waveform display/chart paper feed（MONITOR）

Set the setting for waveform monitor and chart paper feed.

Waveform recording screen

Pressing the MONITOR key the screen through WAVE / 1 → WAVE / 2 → WAVE / 4 → DIGITAL → WAVE / 1 → ... Pressing the INPUT or AUX key to other functions.

4-split display

```
            WAVE/1   WAVE/2   WAVE/4
MONITOR     DIGITAL           chart=50.00m
```

CH
8
4
7 ←
3

1
0
0
m
m

6
2

5

1

Move the cursor up and down with the SELECT keys. Pressing the ENTRY key repeatedly turns the channel specified with the cursor ON/OFF.

（This example shows that channel 1, 3, 6, and 8 are ON.）

`12:00:00    CHART SPEED= ↑10mm/min`

Display of time

Channel No.

In this mode, CHART SPEED is variable in every hour. Numerical value can be changed with the DATA UP or DOWN key, and ten-key. Pressing the ENTRY key is not required.

Press the MONITOR key. The monitor screen（waveform display or digital value）will display. The upper portion of the screen displays the menu. Pressing the MONITOR key again moves the cursor on the menu. The screen changes according to this movement of cursor.

Waveform display

Waveform scrolls synchronously with speed of the chart paper feed.

1. WAVE / 1 : Screen is not split and all channels set are displayed on one screen.
2. WAVE / 2 : Screen is split into two screens.
3. WAVE / 4 : Screen is split into four screens.

Waveform display ON/OFF

Turn on/off with DISP.CH at the right end of the screen.

1. With the SELECT keys, move the cursor to the target channel.
2. Put the ▮ mark in the channel display by turning on, the ENTRY key.
   Waveform display is activated. To turn off the waveform display, press the ENTRY key to delete the ▮ mark.

Chart paper feed

Pressing the DATA UP or DOWN key changes CHART SPEED.

Ten key can also be used to do setting.

Remaining amount of chart paper

When CHART LENGTH is set to "ON" at the CHART setting unit of AUX., the amount of currently remaining chart paper is displayed.

（3） Digital value display/chart paper feed（MONITOR）
　　Digital display value and chart paper feed setting.

Digital value display screen

Pressing the MONITOR key the screen through WAVE / 1 →
WAVE / 2 → WAVE / 4 → DIGITAL → WAVE / 1 → ...
Pressing the INPUT or AUX key to other functions.

```
                    WAVE/1  WAVE/2  WAVE/4
         MONITOR   DIGITAL          chart=50.00m

         CH  DIGITAL      CH   DIGITAL
          7   230.5   ℃    8    2560 rpm
       →  5               6    1.562    V
          3   4.872   mV   4    783mmHg
          1   10.45    V   2   -2.564   mV

         12:00:00   CHART SPEED=  10mm/min
```

Display when CHART LENGTH
is set to "ON"

Digital display

↑,↓ are top and bottom.
When the ENTRY push, the channel designated by cursor repeats ON/OFF.
By this example,1,3,6,8CH are ON.

Display ON/OFF
Set the position with the cursor.
Pressing the ENTRY key repeats ON/OFF.

Display of time

In this mode, CHART SPEED is variable in evert hour.
Numerical value can be changed with the DATE UP or DOWN key,
and ten-key. Pressing the ENTRY key is not required.

Digital value display
Press the MONITOR key. The monitor screen（waveform display or digital value）will display. The upper portion of the screen displays the menu. Pressing the MONITOR key again moves the cursor to the menu. The screen changes according to this movement of cursor.
Press the MONITOR key until the above screen is displayed.
　Displays the measurement absolute value, conversion value specified by the scaling function, and unit.
　A ▮▮▮ mark of the unit indicates scaling.

ON/OFF of display
　Using the SELECT key, move the cursor to the left of the channel display and select the channel. Every time the ENTRY key is pressed, the display is repeatedly turned ON/OFF.

Chart paper feed
Pressing the DATA UP or DOWN key changes CHART SPEED. Ten key can also be used for the setting.
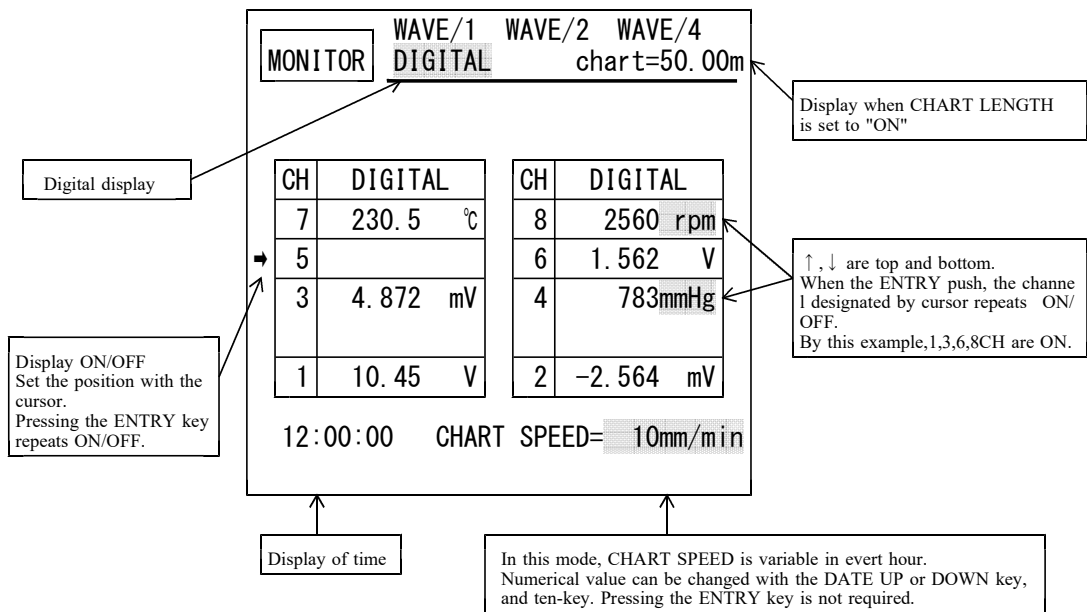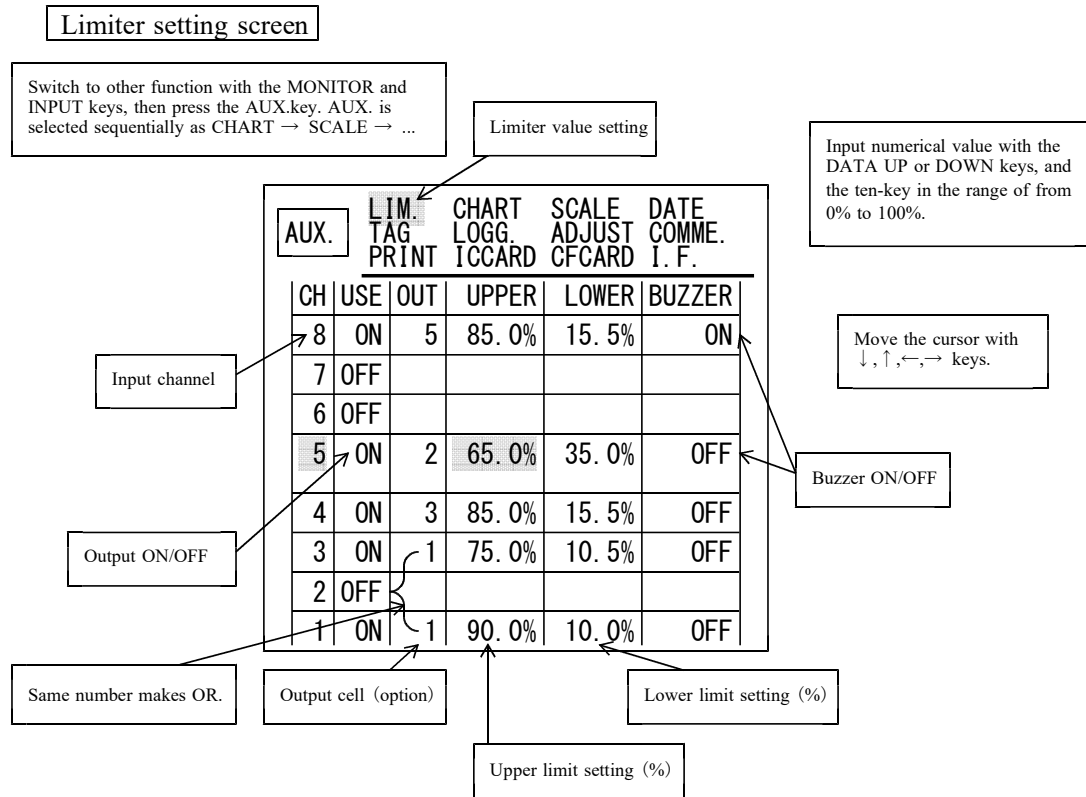

Remaining amount of chart paper
When CHART LENGTH is set to "ON" at the CHART setting unit of AUX., the amount of currently remaining chart paper is displayed.

（4） Limiter（AUX. → LIM）

    Sets alarm output setting.

Limiter setting screen

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as CHART → SCALE → ...

Limiter value setting

Input numerical value with the DATA UP or DOWN keys, and the ten-key in the range of from 0% to 100%.

```
          LIM. CHART  SCALE DATE
  AUX.    TAG   LOGG.  ADJUST COMME.
          PRINT ICCARD CFCARD I.F.

  CH USE OUT  UPPER  LOWER BUZZER
   8  ON   5  85.0%  15.5%     ON
   7  OFF
   6  OFF
   5  ON   2  65.0%  35.0%    OFF
   4  ON   3  85.0%  15.5%    OFF
   3  ON   1  75.0%  10.5%    OFF
   2  OFF
   1  ON   1  90.0%  10.0%    OFF
```

Input channel

Output ON/OFF

Move the cursor with ↓, ↑, ←, → keys.

Buzzer ON/OFF

Same number makes OR.

Output cell（option）

Lower limit setting（%）

Upper limit setting（%）

Press the AUX.key until the cursor in the menu indicates LIM.

1. Select the channel: Move the cursor using the SELECT keys.

2. Output ON/OFF: Move the cursor to the block USE with the SELECT keys and select ON or OFF with the DATA UP or DOWN key.

3. Selecting an output cell: Output is an option. Cell is from 1 to 8. Channel and output can be set individually. Can be used even if multiple numbers of the same cell are set using the DATA UP or DOWN key or the ten key.

4. Setting the upper limit: Setting range is from 0 to 100%. If the signal exceeds this value, output is shorted dircuited.

5. Setting the lower limit: Setting range is from 0 to 100%. If the signal is smaller than this value, output is shorted dircuited.
Upper value and lower value can be set even if they are reversed.

6. Alarm buzzer ON/OFF: Selects whether to activate the warning buzzer that when the signal exceeds the upper limit value or lower limit value.
The buzzer sounds for brief instant.

(5) Chart paper feed trigger (AUX. → CHART)

Setting for the chart paper remaining amount, trend function and external feed remote.

Chart paper feed trigger setting screen

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as SCALE → DATE → ...

Chart paper feed trigger value setting

Priority of order of operation

```
            LIM.  CHART  SCALE  DATE
    AUX.    TAG   LOGG.  ADJUST COMME.
            PRINT ICCARD CFCARD I.F.
```

CHART LENGTH	ON	50.00m
INTERNAL C.SPEED		40mm/min
EXTERNAL1 C.SPEED		10mm/min
EXTERNAL2 C.SPEED		20mm/min

(6)
(1)
(2)

T R E N D	CH	USE	LEVEL	SLOPE	C.SPEED
		ON	10%	OVER	30mm/min
	5	OFF			
		ON	90%	OVER	10mm/min

(3)
(4)
(5)

Chart paper remaining amount.

Set with internal chart paper feed.

External feed 1 (option)

External feed 2 (option)

Channel selection

Trend recording ON/OFF

Level setting range from 0 to 100%

Over/Under

Press the AUX. key until the cursor in the menu displays CHART. Select the item with the SELECT keys and set with the DATA UP or DOWN key, or the ten key.

CHART LENGTH: Sets the remaining amount of the recording paper.
Remaining amount is displayed on the monitor when this switch is set to ON. Turn it OFF when display of the remaining amount is not necessary. Setting is performed with UP key, DOWN key, and ten-key.
To set 50m, input in the order of 5, 0, 0, 0, with ten-key and SET key. Then, 50.00m is displayed.

INTERNAL: Values set in the INPUT or MONITOR screen will display. This screen can also be used for settings. If settings are made with this screen, the setting value in the INPUT or MONITOR screen will change. When the external remote is turned off, items can be selected.

EXTERNAL 1:   Selectable when external remote 1 is turned on. (optional)

EXTERNAL 2:   Selectable when external remote 2 is turned on. (optional)

2. NAME AND FUNCTION

TREND: Chart paper feed can be changed according to signal level.

                Setting condition

CH:	1-8CH
USE:	Operation ON/OFF
LEVEL:	0 - 100%
SLOPE:	OVER, UNDER
C.SPEED:	10mm/h - 40mm/sec

If triggers are applied simultaneously, order of operation is as follows:
EXTERNAL 1, EXTERNAL 2, TREND, and INTERNAL

（6） Scaling （AUX. → SCALE）

Set an arbitrary full scale value and unit.

Scaling setting screen

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as DATE → TAG → ...

Scaling value setting

AUX.	LIM.	CHART	SCALE	DATE↵
	TAG	LOGG.	ADJUST	COMME. ↵
	PRINT	ICCARD	CFCARD	I. F.

CH	USE	100%	0%	UNIT	UNIT↵ TABLE
8	OFF				15 g↵
					14 mg↵
7	ON	6000	600	rpm	13 rpm↵
					12 Km／h↵
6	ON	200	0	Km／h	11 m／s↵
					10 KHz↵
5	OFF				9 Hz↵
4	OFF				8 ・F↵
					7 ・C↵
3	ON	100.00	-20.00	mA	6 A↵
					5 mA↵
2	ON	200.0	0.0	μS／c	4 μA↵
					3 KV↵
E	1	ON	-10000	10000	Kg／c	2 V↵
					1 mV↵
					0

There are 64 types of units for 4 screens

Selecting OFF will not display the setting value.

Selecting ON turns on the digital display.

Current setting channel. COPYmode is available.

E （error） displays in this line when the setting value is not correct.

Input 100% value and 0% value with the DATA UP or DOWN key （FINE）, and the ten-key. If setting range （-10000 to 10000） is exceeded, "E" will display.

Shows current unit.. Input with the DATA UP or DOWN key, and the ten-key. For mA, input 5" （range 0 to 63）. Setting can be done only when the USE key is on.

Press the AUX. key until the cursor in the menu displays SCALE. Select the item with the SELECT keys and set with the DATA UP or DOWN key, or the ten-key.

1. Selecting the channel: Move the cursor using the SELECT keys.

2. Scaling ON/OFF: Move the cursor to the column USE with the SELECT keys and select ON or OFF using the DATA UP or DOWN key.

3. Full scale setting: Move the cursor to the column 100% with the SELECT keys and set an appropriate numerical value （range between -10,000 to 10,000） using the DATA UP or DOWN key, or the ten key.

4. Zero setting: Move the cursor to the column 0% to set an appropriate numerical value （range between -10,000 to 10,000） with the SELECT keys.

5. Unit setting: Move the cursor to the column UNIT using the SELECT keys and select an appropriate unit using the DATA UP or DOWN key, or the ten key. Selection can be done only when USE is On.

6. Copy: Same as copy of the INPUT screen. Refer to 2.1,（4）.

UNIT TABLE :

0 :	1 : mV	2 : V
3 : kV	4 : μA	5 : mA
6 : A	7 : °C	8 : °F
9 : Hz	10 : kHz	11 : m/s
12 : km/h	13 : rpm	14 : mg
15 : g	16 : kg	17 : t
18 : mm	19 : cm	20 : m
21 : km	22 : l	23 : l/m
24 : l/h	25 : l/mg	26 : l/g
27 : mmHg	28 : mb	29 : bar
30 : mdd	31 : pH	32 : %
33 : %RH	34 : ppm	35 : ppb
36 : W	37 : kW	38 : kg/cm
39 : t/h	40 : kg/h	41 : mmAq
42 : Kc/h	43 : μs/cm	44 : ms/cm
45 : rpm	46 : mg	47 : G
48 :	49 : mV	50 : V
51 : KV	52 : μA	53 : mA
54 : A	55 : ℃	56 : °F
57 : Hz	58 : KHz	59 : m/s
60 : Km/s	61 : rpm	62 : mg
63 : G		

（7）Time（AUX. → DATE）

Adjust the time in this screen.

Time setting screen

Switch to other function with the MONITOR and
INPUT keys, then press the AUX.key. AUX. is
selected sequentially as CHART → SCALE → ...

Setting of year, month,
day, hour, minute

```
        LIM.   CHART  SCALE  DATE
AUX.    TAG    LOGG.  ADJUST COMME.
        PRINT  ICCARD CFCARD I.F.
        ─────────────────────────────

        '04/07/23 16:53:00

             END  :  ENTRY

             CURSOR  :  ← →

             CHANGE  :  UP/DOWN
```

Setting position

When setting are completed, be
sure to press the ENTRY key.

Setting can be changed with the
DATA UP or DOWN key.
The ten-key can not used for the
setting.

Press the AUX. key until the cursor in the menu displays DATA.

Using the SELECT keys, select the setting item. Set value is changed with the DATA UP or
DOWN key. Press the ENTRY key when complete.

When the ENTRY key is pressed, 00 is displayed for a second.

（8）Tag name（AUX. → TAG.）

Adds a name to the signal.

Tag name setting screen

Switch to other function with the MONITOR and
INPUT keys, then press the AUX.key. AUX. is
selected sequentially as LOGG. → ADJUST → ...

Tag name setting

```
       LIM.    CHART   SCALE   DATE
AUX.   TAG     LOGG.   ADJUST  COMME.
       PRINT   ICCARD  CFCARD  I. F.
```

Character selection
UP: Moves cursor right
DOWN: Moves cursor left
ENTRY: Selects the character

CH	TAG NAME	CH	TAG NAME
7		8	ABCDEFGH
5	ENGINE	6	
3	SPEED	4	
1		2	

```
ABCDEF
GHIJKL
MNOPQR
STUVWX
YZ1234
567890
#%()※
+,-./:
```

```
   (SW)
SELECT
DATA
ENTRY
```

8 characters can be input.

Moves the cursor with ↓, ↑, ←, → keys.

Press the AUX. key until the cursor in the menu displays TAG.

Set the channel and character position with the SELECT keys, select character from the cha-
racter selection column using the DATA UP or DOWN key, and press the ENTRY key every
time one character is selected. Up to eight characters can be input for every channel.

To print the tag name that was input, specify ON/OFF by setting the PRINT condition in
AUX.

（9） Pen Adjust （AUX. → ADJUST）

Adjust the pen variation compensation, pen zero point, and chart paper width.

Adjust setting screen

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as COMME. → PRINT → ...

Adjust setting

When the cursor is placed at these positions, the values of all the channels change simutaneously .

At present, 5CH is being set.

Selecting LEFT of channel 5.

Standard pen

```
        LIM.   CHART   SCALE  DATE
AUX.    TAG    LOGG.   ADJUST COMME.
        PRINT  ICCARD  CFCARD I. F.

CH  PEN  LEFT  RIGHT  PEN
 8    0     0      2     ADJUST PEN
                          DIFFERENCE
 7    0    20      3   LEFT
                          CORRECT PEN
 6    0     7     -2     TO CHART LEFT
 5    0    -2      0   RIGHT
                          CORRECT PEN
 4    0     0      5     TO CHART RIGHT
 3    1     5      0       (SW)
                          SELECT, DATA
 2   -2     1      3    ENTRY
                       START, STOP
 1          0      2
                      C. S. = 10mm/min
```

① PEN: Setting of pen difference compensation value.
Range: −20 to 20
② RIGHT: Adjust the pen to the chart paper zero point.
Range: −400 to 400
③ LEFT: Adjust to the full paper.
Range: −800 to 800

To set above ①,②, and ③, use the DATA UP or DOWN key, or the TEN key and the SET key.

1 point is 16 μm.

Check function
PEN: Records the Square waveform for checking pen difference compensation by pressing the ENTRY key.
RIGHT: All pens move to zero point by pressing the ENTRY key.
LEFT: All pens move to full scale point by pressing the ENTRY key.

In this mode, CHART SPEED is variable in every hour. Numerical value can be changed with the DATA UP or DOWN key, and TEN-key.
Pressing the ENTRY key is not required.

Press the AUX. key until the cursor in the menu displays ADJUST.
To set the chart paper feed speed to 5 mm/sec, press the SELECT keys to move the cursor to the chart speed setting column at the lower right. Set 5 mm/sec with the DATA UP or DOWN key.

Pen variation compensation
To use the UNICORDER with setting the pen variation compensation （SYNC.） set to on, an adjustment is necessary, if the gap at the pen tip deviates from 4 mm. Move the cursor to PEN indication and press the ENTRY key.
Turn on the MEASURE ON key for channel 1 （standard channel） and only the channel to compensate. For example, assuming the channel to compensate is 5CH, move the cursor to 5CH with the SELECT keys and turn on the MEASURE ON "5" key.
（Refer to 2.1.4 Measure ON/OFF.）

Feed the chart paper. （START）
Adjust the standard channel overlap with record of 5CH by pressing the DATA UP or DOWN key. Do the same adjustment for the other channels.
Waveforms shown below are recorded.
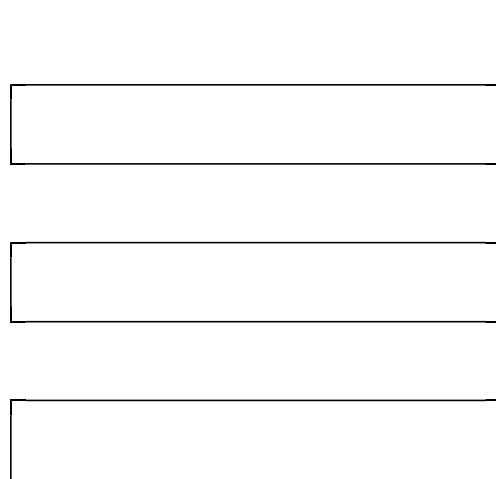
Recording waveform in pen variation compensation

The right end reference point of a pen, and the left end reference point of a pen
   The pen might be a little away from the reference point. This state is caused by the
   contraction of the recording paper,and twist of the pen.

Set up each pen independently.
   Move a cursor to the "RIGHT", LEFT" display （← · →）, and press the "ENTRY"
   key. Move a cursor to the channel to adjust （↑ · ↓）, and make the channel major-on.
   Feed a recording paper（START）, Push and set the "UP", "DOWN", or the
   "TENKEY" and "SET" switch so that a pen point may ride on the reference point of a
   recording paper.

Set up all pens at the same time.
   Move the cursor of a channel position to the "LEFT" or "RIGHT" character,
   and push the "UP", "DOWN", or "TENKEY" and "SET" switch.

2. NAME AND FUNCTION

（10） Comment （AUX. → COMME.）

Maximum three comments can be set.

Comment entry screen

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as PRINT → ICCARD → ...

Comment setting

```
        LIM.   CHART  SCALE  DATE↵
AUX.    TAG    LOGG.  ADJUST COMME↵
        PRINT  ICCARD CFCARD I. F.

COMMENT 1  ━━  CLR↵

   THIS RECORDER IS 8↵        ABCDEF↵
   PEN▨                       GHIJKL↵
                              MNOPQR↵
                              STUVWX↵
COMMENT 2  ━━  CLR↵           YZ1234↵
                              567890↵
                              #%()※↵
                              +,-./:

COMMENT 3  ━━  CLR            (SW)↵
                              SELECT↵
                              DATA↵
                              ENTRY
```

Comment 1 to 3 Max. 60 characters for each.

Character selection
UP: Moves cursor right
DOWN: Moves cursor left
ENTRY: Selects the character

Move the cursor with ↓, ↑, ←, → keys.

Move the cursor to this position and press the ENTRY key to clear the comment.

Press the AUX. key until the cursor in the menu indicates COMME.

Using the SELECT keys to move the cursor to the position and select the character with the DATA UP or DOWN key.

Set the comment by pressing the ENTRY key for each character.
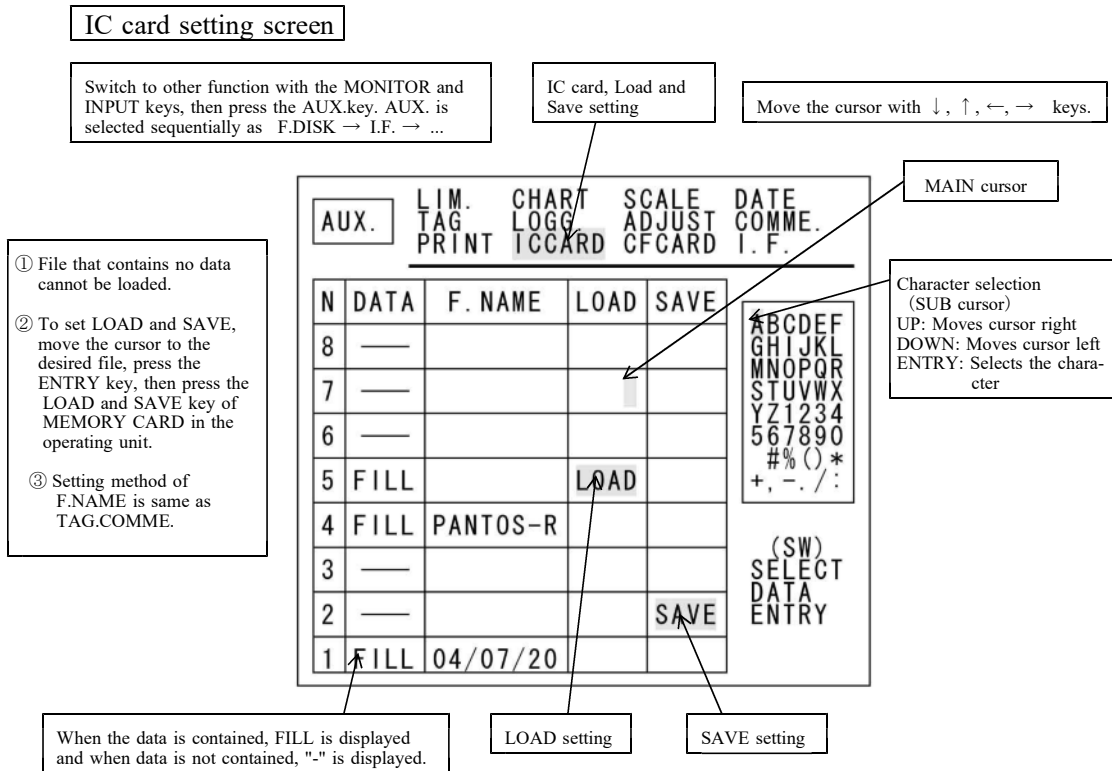
Maximum 60 characters can be set per one comment.

Set in the AUX.'S PRINT screen about the printing's ON・OFF.［Refer to 2.1.2（12） PRINT.］

To clear all comments, move the cursor to CLR of the comment and press the ENTRY key.

（11）IC card（AUX. → ICCARD）

Saves and loads setting conditions.

IC card setting screen

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as F.DISK → I.F. → ...

IC card, Load and Save setting

Move the cursor with ↓, ↑, ←, → keys.

MAIN cursor

① File that contains no data cannot be loaded.

② To set LOAD and SAVE, move the cursor to the desired file, press the ENTRY key, then press the LOAD and SAVE key of MEMORY CARD in the operating unit.

③ Setting method of F.NAME is same as TAG.COMME.

```
AUX.    LIM.  CHART  SCALE  DATE
        TAG   LOGG   ADJUST COMME.
        PRINT ICCARD CFCARD I.F.
```

Character selection （SUB cursor）
UP: Moves cursor right
DOWN: Moves cursor left
ENTRY: Selects the chara-
cter

N	DATA	F. NAME	LOAD	SAVE
8	──			
7	──			
6	──			
5	FILL		LOAD	
4	FILL	PANTOS-R		
3	──			
2	──			SAVE
1	FILL	04/07/20		

```
ABCDEF
GHIJKL
MNOPQR
STUVWX
YZ1234
567890
#%()*
+,-./:

(SW)
SELECT
DATA
ENTRY
```

When the data is contained, FILL is displayed and when data is not contained, "-" is displayed.

LOAD setting

SAVE setting

Press the AUX. key until the cursor in the menu displays ICCARD. Insert IC card. （section 3.7）

Save the setting condition
Move the cursor to the SAVE column using the SELECT keys, and select the block（1 to 8）, you want to save in the IC card. Maximam 8 data can be saved. To specify the file name, move the cursor to the F.NAME column using the SELECT keys and select the characters with the DATA UP or DOWN key. Next, press the ENTRY key. Move the cursor to the SAVE column and press the ENTRY key. This determines the file number to save. Next, press the SAVE key. When SAVE is properly done, the IC card of AUX part is flashed.

Load the setting conditions.
Move the cursor to the LOAD column using the SELECT keys, and select the file（block） loaded in the main unit. Pressing the ENTRY key determines the file number to load. The block that does not display FILL in the DATA column cannot be loaded. Next, press the LOAD key. When LOAD is done correctly, the IC card of AUX part is flashed .
When IC card is replaced, the data of IC card is read immediately and displayed on the scree-n. Because of this, the IC card can be checked easily. When operation is complete, remove the IC card. This will prevent the battery in the IC card from discharging. When the power is turned off, the current setting conditions are not erased even if the IC card is not used.

（12） I.F. （AUX. → I.F.）

    12.1　Either one of the RS-232 or the GP-IB is displayed.

| Interface setting screen |

Switch to other function with the MONITOR and INPUT keys, then press the AUX.key. AUX. is selected sequentially as　LIM. → CHART → ...

```
┌───────┐  LIM.   CHART   SCALE   DATE↵
│ AUX.  │  TAG    LOGG.    ADJUST  COMME. ↵
└───────┘  PRINT  ICCARD  CFCARD   I F↵
↵
          ═══════════════════════════
          PUSH  ENTRY  AFTER  ALL  SET!↵
↵

              ┌─────────────────┐
              │   R S - 2 3 2 C │
              └─────────────────┘


        ┌──────────────┬──────────────┐
        │  Xon-Xoff    │    OFF       │
        ├──────────────┼──────────────┤
        │  BAUD RATE   │  9600  BPS   │
        ├──────────────┼──────────────┤
        │ DATA LENGTH  │   8  BIT     │
        ├──────────────┼──────────────┤
        │   PARITY     │    OFF       │
        ├──────────────┼──────────────┤
        │  STOP BIT    │   2  BIT     │
        └──────────────┴──────────────┘
```

Setting of interface

The RS-232C is displayed.

X ON － X OFF handshake ON and OFF.

Baud rate 1200 to 38400 BPS

Date length of one word 7 BIT and 8 BIT

Parity OFF, even number, odd number

Stop bit 1 BIT and 2 BIT

Moves the cursor with ↓ or ↑ key.

Perform all the setting with the DATE UP and DOWN keys.

After setting is completed, press the ENTRY key.

When X ON － X off is ON, codes are sent with the following conditions

When the power supply is ON ----- X ON

When the unprocessed input data exceeds 1024 words ----- X off

When the unprocessed input data becomes within 512 words ----- X ON

Note that X ON is DC1 （11H）and X off is DC3 （13H）.

12.2   Either one of the RS-232 or the GP-IB is displayed.

Interface setting screen

Switch to other function with the MONITOR and
INPUT keys, then press the AUX.key. AUX. is
selected sequentially as   LIM. → CHART → ...

```
┌─────────────────────────────────────────┐
│        LIM.   CHART   SCALE   DATE↵      │
│ ┌──────┐ TAG    LOGG.    ADJUST  COMME. ↵ │
│ │AUX.  │ PRINT  ICCARD  CFCARD  I⣿F⣿     │────→ Setting of interfac
│ └──────┘↵                                 │
│        ════════════════════════════       │
│        PUSH  ENTRY  AFTER  SET!↵          │
│ ↵                                         │
│          ↵                                 │
│ ↵        ┌──────────────────┐             │
│ ↵        │     GP-IB         │─────────────→ The GP-IB is displayed.
│ ↵        └──────────────────┘             │
│ ↵                                         │
│         ┌──────────────┬─────────┐        │
│ ↵    ↵  │  ADDRESS     │   03    │────────→ Address setting
│         └──────────────┴─────────┘          With the range of 01 to 31.
│ ↵                                         │
│                                           │
└─────────────────────────────────────────┘
```
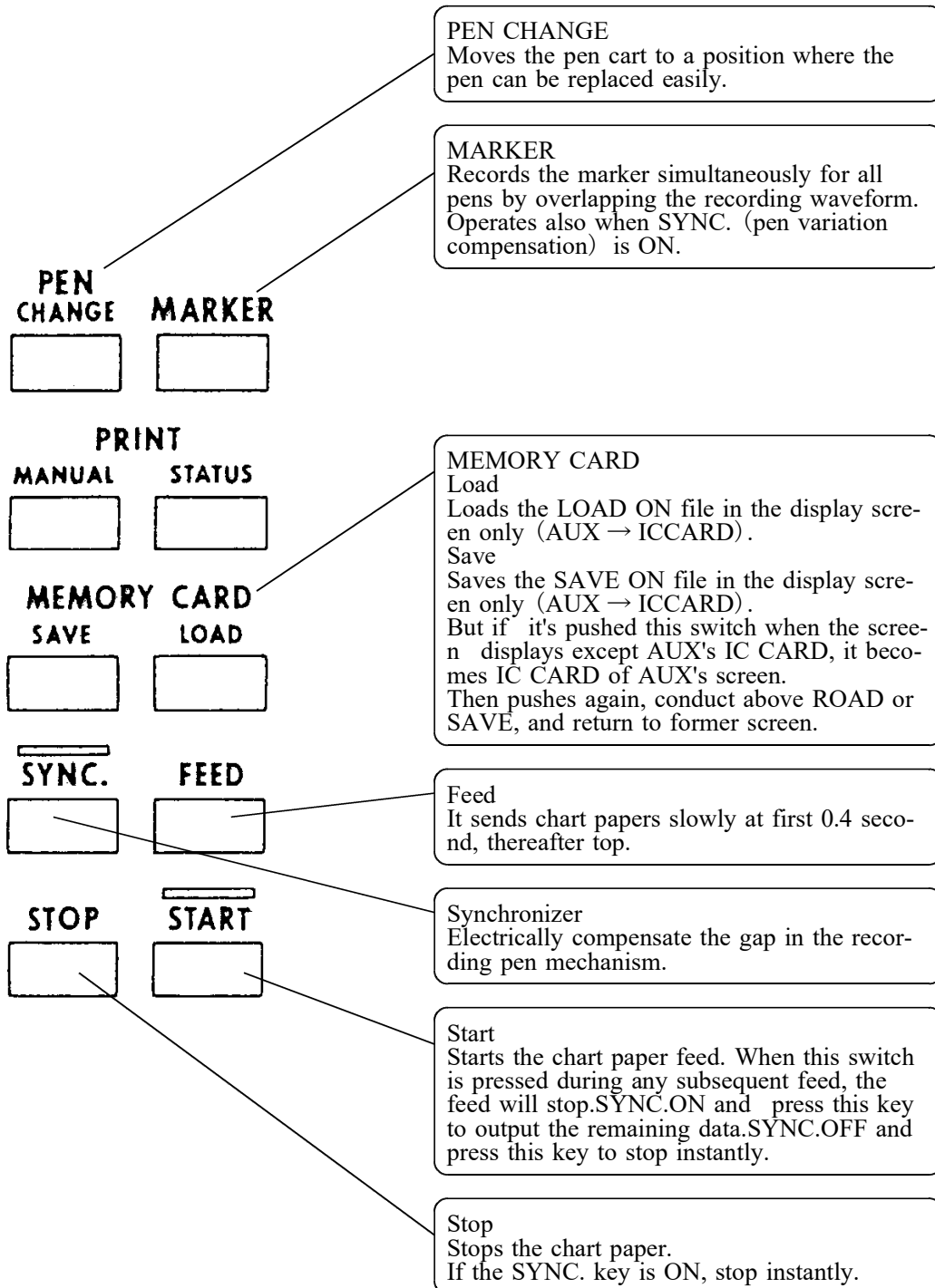
Address setting of the GP-IB is changed with the DATA UP or DOWN keys with
the range of 01 to 31.
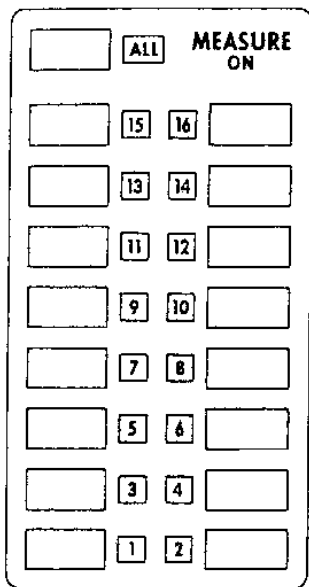After setting is completed, press the ENTRY key.

2.1.3   Operation unit

PEN CHANGE
Moves the pen cart to a position where the pen can be replaced easily.

MARKER
Records the marker simultaneously for all pens by overlapping the recording waveform. Operates also when SYNC.（pen variation compensation） is ON.

PEN
CHANGE   **MARKER**

PRINT
MANUAL   **STATUS**

MEMORY CARD
Load
Loads the LOAD ON file in the display scre-en only（AUX → ICCARD）.
Save
Saves the SAVE ON file in the display scre-en only（AUX → ICCARD）.
But if it's pushed this switch when the scre-en displays except AUX's IC CARD, it beco-mes IC CARD of AUX's screen.
Then pushes again, conduct above ROAD or SAVE, and return to former screen.

MEMORY CARD
SAVE   **LOAD**

SYNC.   **FEED**

Feed
It sends chart papers slowly at first 0.4 seco-nd, thereafter top.

STOP   **START**

Synchronizer
Electrically compensate the gap in the recor-ding pen mechanism.

Start
Starts the chart paper feed. When this switch is pressed during any subsequent feed, the feed will stop.SYNC.ON and   press this key to output the remaining data.SYNC.OFF and press this key to stop instantly.

Stop
Stops the chart paper.
If the SYNC. key is ON, stop instantly.

2.1.4   MEASURE ON/OFF unit

When the ALL key is ON, the lamp lights and recording starts press keys 1 to 8.
Press the key again to turn off the lamp, the recording pen is housed in the pen cap holder.
When the ALL key is turned off, the MEASURE for the channel keys 1 to 8 specify（the LED lamp is lit）turned off and the recording pen is housed in the pen cap holder.

2.1.5   Error display

"CHART EMPTY1"
   Display when chart paper runs out.

"IC CARD LOAD ERROR!"
   Display when IC memory card is not loaded correctly.

"IC CARD SAVE ERROR!"
   Display when IC memory card is not been saved correctly.

"IC CARD NO BATTERY"
   Display when the battery for IC memory card runs down.

"R/W   ERROR!"
   Display when CF card is not setted, locked WRITE protect, CF card is bad,etc.

"SAME FILE NAME!"
   Display when same FILE NAME designates and save.

"FILE NAME ERROR!"
   Display when it conclude the word, can't use for FILE NAME.

2.2   Input unit

Input unit : 2 channels in 1 throttle.   Channel number is specified as the diagram.

Front

8	④	7	6	③	5
4	②	3	2	①	1

Rear

Channel No.

Throttle No.   Throttle No.
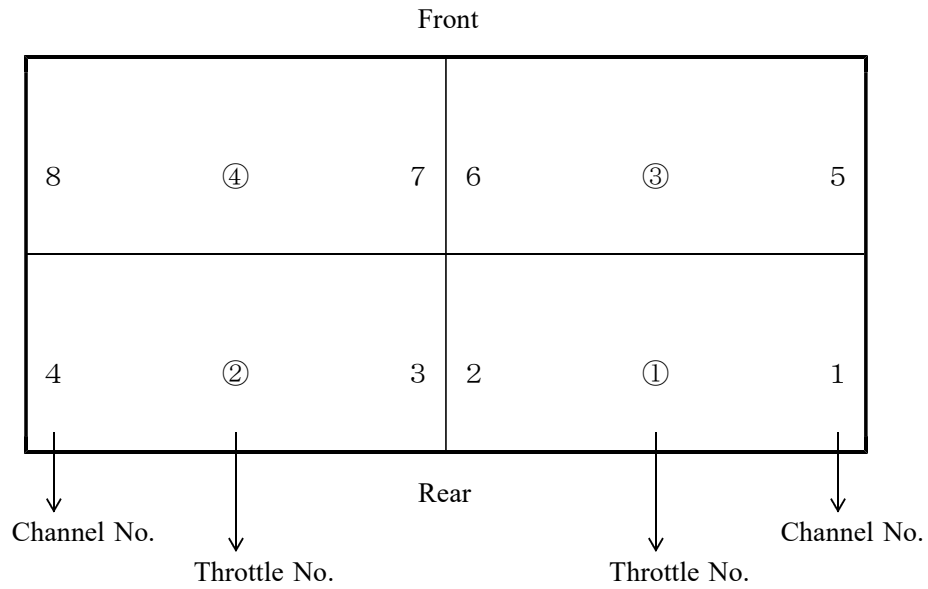
Channel No.

Connection between the channels is electrically insulated.（AC500V）

Be sure to mount the input cover when performing temperature measurement and high sensitivity measurement.（3.9.1 page）

2.3 Rear Panel

- DC power connector （option）
- DC power fuse （option）
- Power switch
- AC power connector with fuse
- Ground terminal （Please earth constantly）
- Outside remote unit
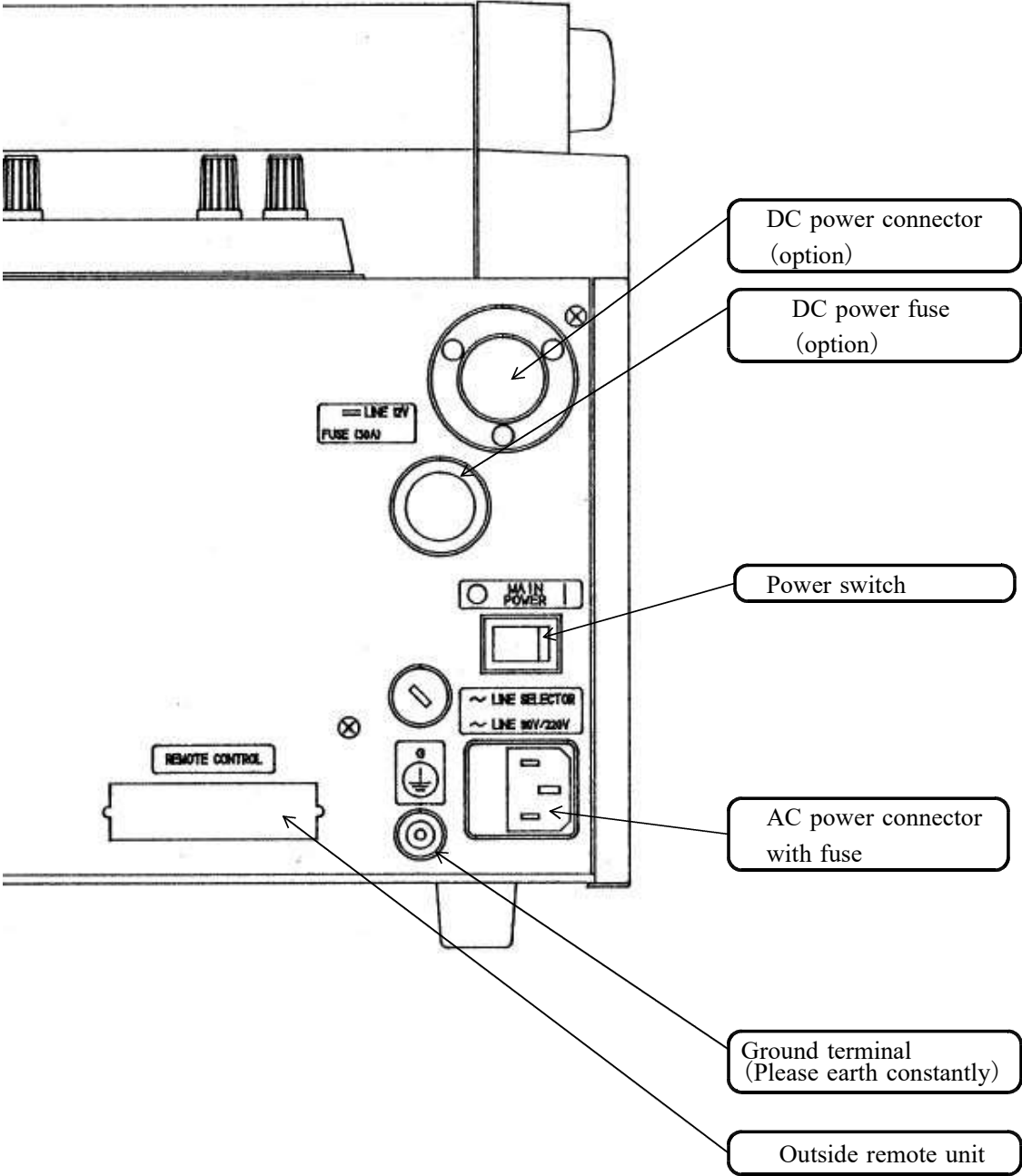
2.3.1   The power switch

（1）Main switch and Sub switch
   The power switch is 2 places, the body back position and left sleeve position.
   The back position is main switch, and the left sleeve position is sub switch.
   Please usually use the sub switch.
   Please turn off the main switch, when it isn't used long and the body is moved.

（2）The early set and housing the pen
   When the power switch is turned ON, the pen will slowly（several seconds）
   move to the right from the auto pen cap. When it hits the right end, it will
   start operation as the right end is zero point. After this operation, the pen will
   move to 100% side to record a color sample. This sample is used to discriminate
   the relationship of the color of the recording line and channel from the recorded
   result.
   When the power supply switch is turned OFF, the pen is housed in the auto pen
   cap and the power supply is turned OFF.

```
○ ───  Pen at the rear                    ○
○           (Pen No. 1)                    ○
○ ──                                       ○
○                                          ○
○ ──                                       ○
○                                          ○
○ ──                                       ○
○                                          ○
○ ──                                       ○
○                                          ○
○ ──                                       ○
○                                          ○
○ ──  ← 100% line                          ○
○                      0% line →           ○
○ ──  Pen at the front                     ○   Chart paper
○           (Pen No. 8)                    ○   feed direction
```
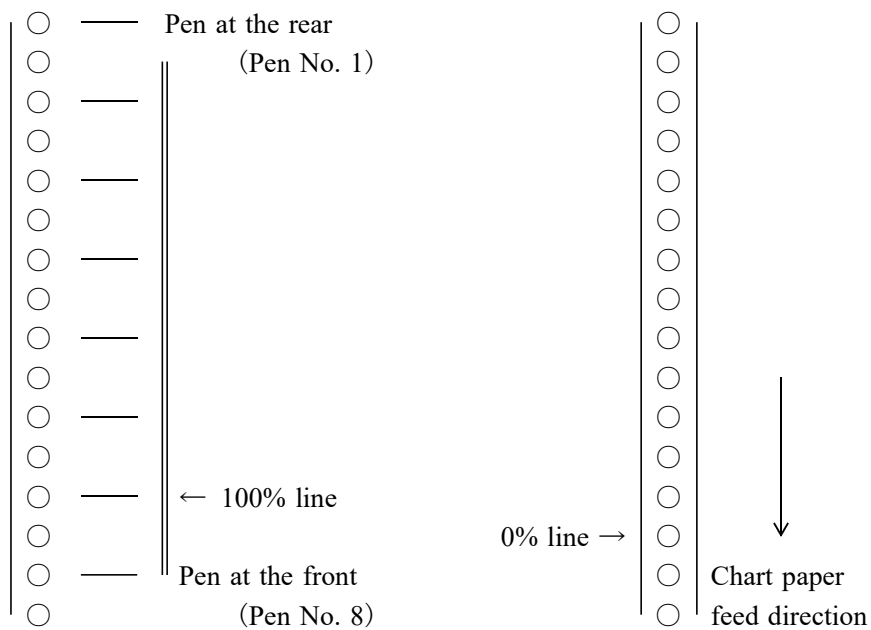
2.3.2 The DC power（option）
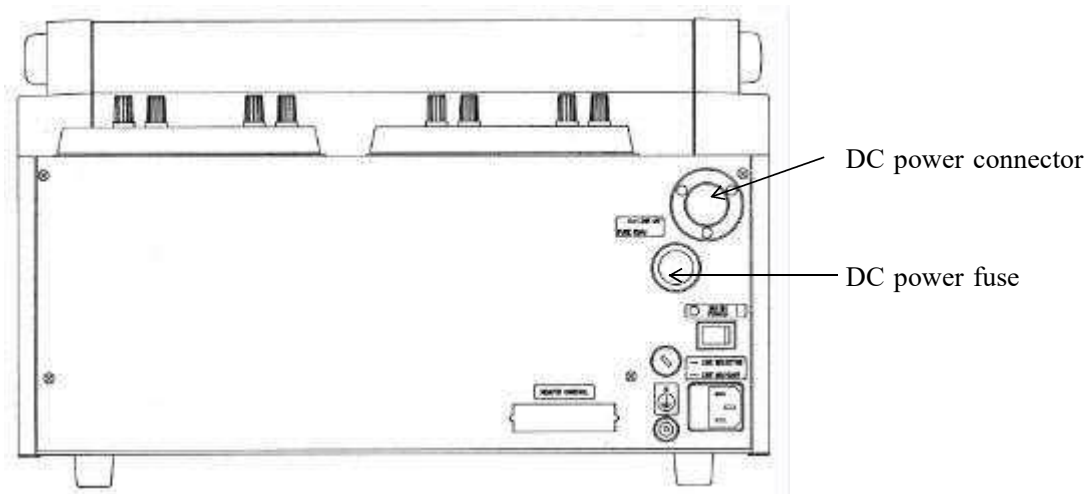
DC power connector "DC SOURCE" 12 V DC

This is an input connector for supplying DC power. Connect the attached DC power cable to this connector. To connect the DC power cable to the battery, connect white line to +12 V side.

Fuse "FUSE"

This is a fuse to prevent accident by overcurrent etc.（30A）

How to use DC power source

（1） Turn off the power switch of the recorder. Connect the attached power cable to DC-DC converter and battery. For the battery, connect white line to +12 V side.

（2） Turning on the power switch to start recorder operation. If it doesn't start, confirm that the voltage of the battery is in the normal range（9 V to 16 V DC）.

2.3.3   Outside remote

Following functions can be operated from the external devices:
                                    operation panel and OR.

Chart paper feed: Start-up and stop
                               fall   ↓   → start-up
                               launch ↑   → stop（It doesn't reply to signals less than 3ms）

Chart paper rapid feed: Start-up and stop（feed）
                               L   →   start-up
                               H   →   stop

Select of clock for   Select the external clock or internal clock.
chart-paper feed: Chart paper can be fed in synchronization with the external
                               clock.
                               L   → external
                               H   → internal

External clock input: 50 µm/1 clock TTL
                               Max. frequency: 800 Hz
                               Min. pulse width: 10 µs

Superimposed marker: Simultaneously for all channels
                               fall   ↓   → ON

Chart paper feed: Used when operating the units in parallel

Synchronous output: 1 clock/50 µm TTL

```
┌────────────────────┐        ┌──────────────────────────────────────────┐
│ U-841              │   ──→   │ U-841                                     │
│ synchronous output │        │ external clock input（Select of clock: L）│
└────────────────────┘        └──────────────────────────────────────────┘
```
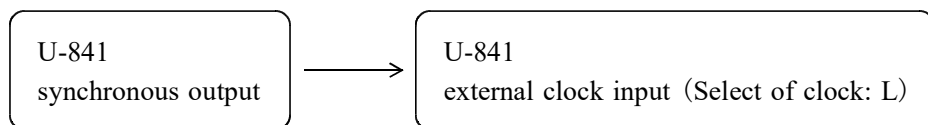
Measurment ON/OFF: Simultaneously for all channels
                          fall   ↓   → ON
                          launch ↑   → OFF（It doesn't reply to signals less than 5ms）

2. NAME AND FUNCTION

The following tables show connector pin numbers and details of operation.

Pin No.	Signal name	I/O	Pin No.	Signal name
1	External clock input	Input	19	GND
2	Manual print	Input	20	GND
3	Superimposed marker	Input	21	GND
4	Chart paper feed	Input	22	GND
5	Chart paper rapid feed	Input	23	GND
6	Measure ON/OFF	Input	24	GND
7	Selection of chart paper feed clock	Input	25	GND
8	Synchronization of chart paper feed	Output	26	GND
9	5V	Output	27	GND
10	5V	Output	28	GND
11	——————		29	GND
12	——————		30	GND
13	——————		31	GND
14	——————		32	GND
15	——————		33	GND
16	——————		34	GND
17	——————		35	GND
18	——————		36	GND

1	19
2	20
3	21
4	22
5	23
6	24
7	25
8	26
9	27
10	28
11	29
12	30
13	31
14	32
15	33
16	34
17	35
18	36

Pin Nos. 19 to 36 are digital ground.
Add a signal to the connection between these pins and the pins that correspond to respective operation.

The U-841 can be operated by any of the following signals.

Type of signal: Voltage signal of TTL level
Transistor switch
Contact point signal

3.1 Loading the Chart Paper

The U-841 uses rolled chart paper and folding chart paper（factory option）.
The sprocket pin for the chart paper drum is a circular pin type and square pin type（option）.
Use chart paper that conforms to your recorder.

Table of applicable chart paper

Type of drum pin	Circular pin			Square pin	
Type of chart paper	Rolled		Folding	Rolled	Folding
Chart paper type No. (length)	2501P50 (20 m)	25020P50 (50 m)	2501Z150 (20 m) 2501Z60 (20 m)	2516P50 (20 m)	2516Z150 (20 m) 2516Z60 (20 m)
	standard		option		

Special carriage is required for folding type paper.
When there is not a carriage, it may not fold the paper.

3.1.1 Loading the rolled chart paper

（1）Open the chart paper board upward
（Refer to Fig. 3.1-1）
（2）Place the long side of the chart paper with
the perforations to the left and insert the top
end of the chart paper into the lower side of
the drum along the guide plate. Press the
FEED key to rotate the drum and bring the
chart paper to the surface of the drum.
（Refer to Fig. 3.1-2）
（3）When the chart paper comes out above the
drum, set the light and left perforations into
the sprocket of the drum and close the chart
paper board.
（Refer to Fig. 3.1-3）
（4）Raise the chart paper holding arm. Pass the
chart paper under the chart paper cutter and
return the chart paper holding arm to the original
position.
（5）Press the FEED key to confirm that chart
paper feeds correctly.

The above procedure completes the loading of the
rolled chart paper.
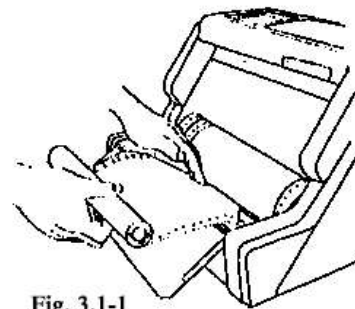
Fig. 3.1-1
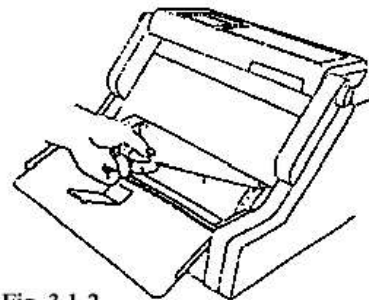
Fig. 3.1-2
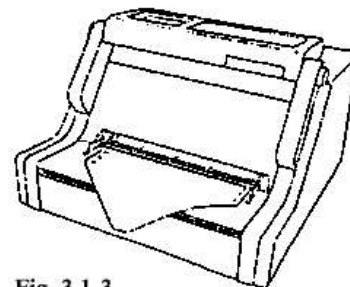
Fig. 3.1-3

3.1.2   Loading the folding chart paper（option）

（1） In order to prevent folded chart paper
from falling out of the machine, loosen
the chart paper as shown Fig. 3.1-4.

（2） Open the chart paper board. Place the
chart paper in the chart paper housing
unit with the long side of chart paper
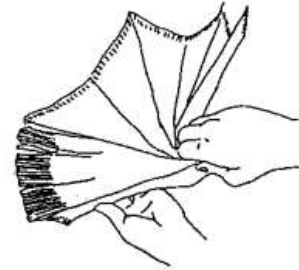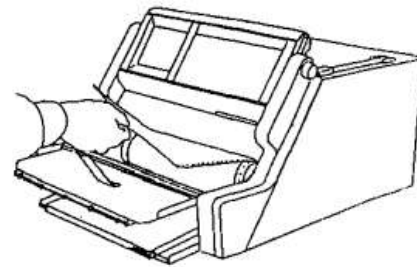perforation set at the left with the printing
surface facing upward.
At this step, lay the liner of the chart
paper under the chart paper.

（3） Pass the chart paper end under the drum
along the guide plate and press the feed
key to rotate the drum. Bring the chart
paper up to the top of the drum.
（Refer to Fig. 3.1-5）

（4） When the chart paper comes out above
the drum, set the right and left perfora-
tions into the sprocket of the drum there
is no shift between the front and the rear.
Close the chart paper board.
（Refer to Fig. 3.1-6）

（5） Raise the chart paper holding arm. Pass
the chart paper under the chart paper
cutter and return the chart paper holding
arm to the original position.

（6） Press the FEED key to confirm that
chart paper feeds correctly.

Fig. 3.1-4

Fig. 3.1-5

Fig. 3.1-6

The above procedure completes the loading of the folding chart paper.

3.2 Loading and Replacing the Recording Pen

Loading and replacing the recording pen when the power is turned on.

（1） Press the power switch to turn on the power.

（2） Press the PEN CHANGE key.

For the 8-channel U-841, this is set to allow easy loading of the pen holder by doing channels 1 to 4 by first, channels 5 to 8 by second.

（3） Pen carriage at the rear is channel 1.
Load the pen carriage starting from the rear while adjusting the ink color of the recording pen.

（4） Remove the pen cap. Holding the notched portion at both sides of the recording pen, insert the guide of the recording pen into the groove of the pen carriage until you feel light click. Be careful not to touch the pen tip to the drum.

The above procedure completes the loading of the recording pen.
To remove the recording pen, draw it out while raising the recording pen main unit identical to loading.

Pen carriage
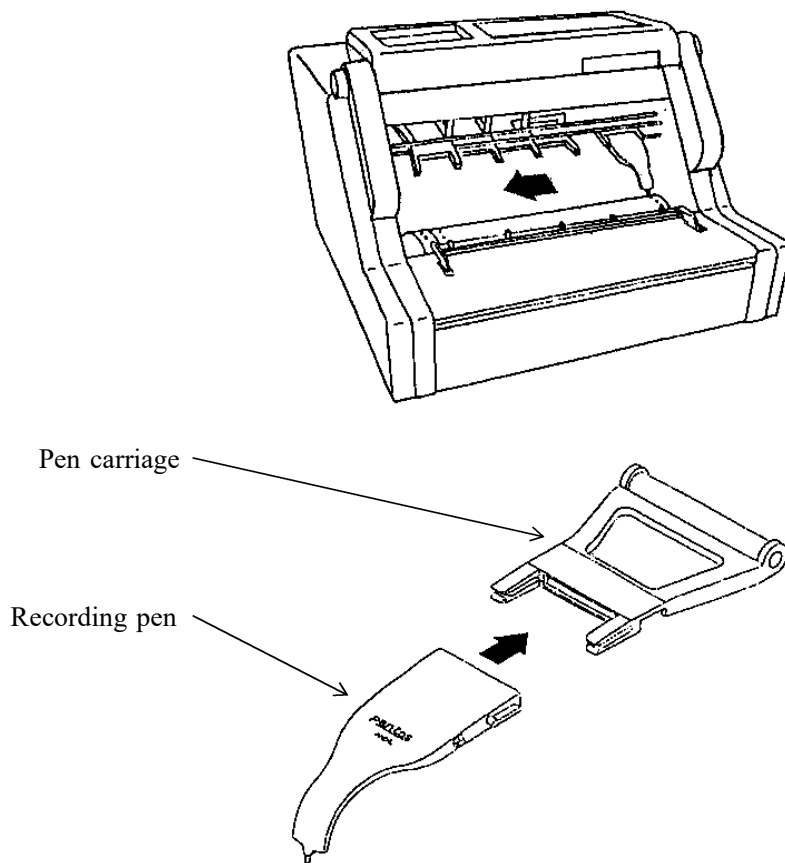
Recording pen

3. HANDLE PROCEDURE

Arrangement of channels and recording pens.

Channel No.	Model	Color	Holder position
1	NDL-01	Red	Rear
2	NDL-02	Dark green	
3	NDL-03	Brown	
4	NDL-04	Yellow green	
5	NDL-05	Dark blue	
6	NDL-06	Orange	
7	NDL-07	Blue	
8	NDL-08	Purple	Front

Cautions

（1）**When the pen change key is pressed, the pen moves at high speed.**
  Be very careful not to allow the pen to come into contact with your hands or other parts of your body.

（2）**Do not apply unnecessary and excessive force when loading the recording pen.**
  Pen shaft may bend.

3.3 Auto Pen Cap

When the power is turned off, or when MEASURE is OFF, that cap will be placed over the pen automatically to prevent the pen tip from drying.
Replenish water to the auto pen cap mechanism.
At the time of the delivery, the water is not replenished in the auto pen cap mechanism.
So please replenish the water.

（1） Supply from a pen cap hole by the attached dropping pipet.（Refer to Fig. 3.3-1）
Slowly replenish from one of the pen cap holes in the 8channels using the attached dropping pipet.（Replenish is only 1cc from one hole.）

（2） Replenish water every one month.
If replenished from more than two holes, the water will be overflown.

Auto pen cap mechanism

Replenish water
（from one hole）
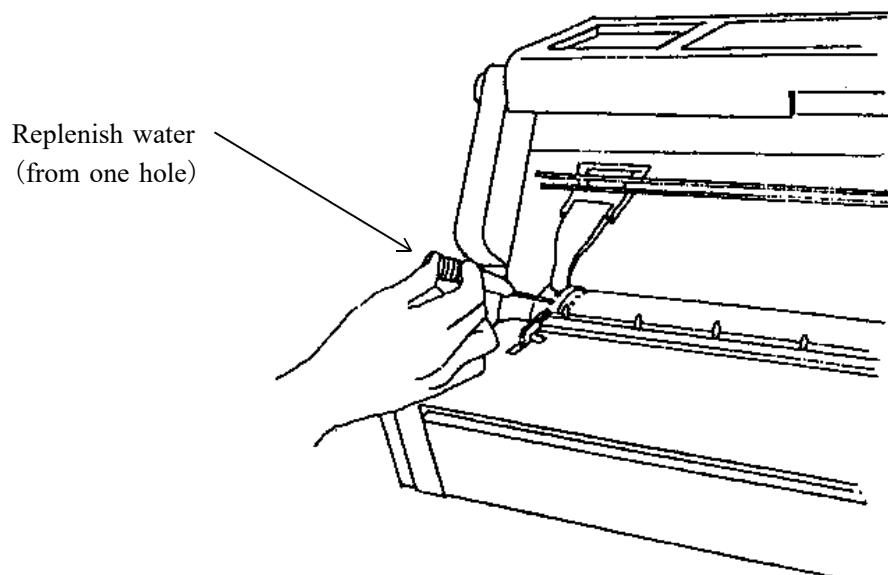
Fig. 3.3-1

Cautions

（1） **When the U-841 is not used for short period（about 1 week）, the auto pen cap mechanism functions eliminates the cap from being placed on the pen.**
When the power is turned off, all pens are automatically used in the cap mechanism unit.

（2） **When the U-841 is not used for long period or during transportation, be sure to remove the recording pen and place the cap on the pen. Putting the recording pen in the package bag and firmly sealing the bag will extend the life of the pen.**

3.4 Replace the Input Unit

The input amplifier is a unit method. Replace it depending on the type of measurement.
Be sure to turn off the power switch when replacing the input amplifier.
Remove the two fixing screws and pull out the input amplifier.That can be easily be remove.

M3 screw
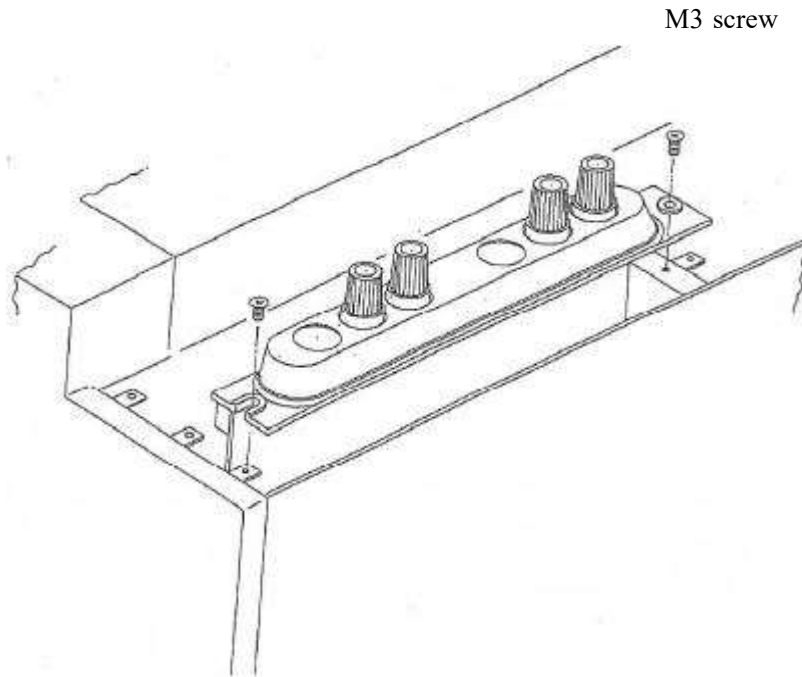
Cautions

（1） **When you perform thermometry, or change an inputting unit and put it back,**
     an error of aspproximately ±1℃ may occur when you insert it to any place
     other than a slot at the time of the shipment.
     In the case of a voltage measurement, the error doesn't occur.

（2） **When you turn on electricity without attaching a blank panel to a slot not to use,**
     it's dangerous because your hand, hair and body might touch the internal circuit.
     Please attach the blank panel by all means.

Insert the input amplifier slowly along the guide. Connect to the connector at the rear
with the screws. For temperature measurement, be sure to install the attached cover.
For safety, be sure to install the blank panel to slots not used.

（3） **The main body or inputting units may break down when you change an inputting**
     unit in the state that power switch is contained, and the main body works.

3.5 Taking-up of the Chart Paper（option）

Loading the chart paper in the following orders.

（1） Open the front door forward as shown by the diagram. （Refer to Fig. 3.5-1）

（2） Load the chart paper, referring to 3.1 "Loading the rolled chart paper".

（3） Insert the chart paper holder into both ends of the take-up accessory bobbin.

（4） Set the movable shaft chart paper holder at the left and feed the chart paper from the drum. Wind up the top end of the chart paper about two rotations on the take-up bobbin with the print surface facing upward.

（5） Insert the movable shaft chart paper holder into the left bearing. With pushing the take-up bobbin to the left, insert the fixed shaft recording paper holder into the right bearing.

（6） Rotate the chart paper take-up bobbin to confirm that the concave portion of the top end of the fixed shaft chart paper holder firmly fits into the convex portion of the bearing and turn on the take-up switch.

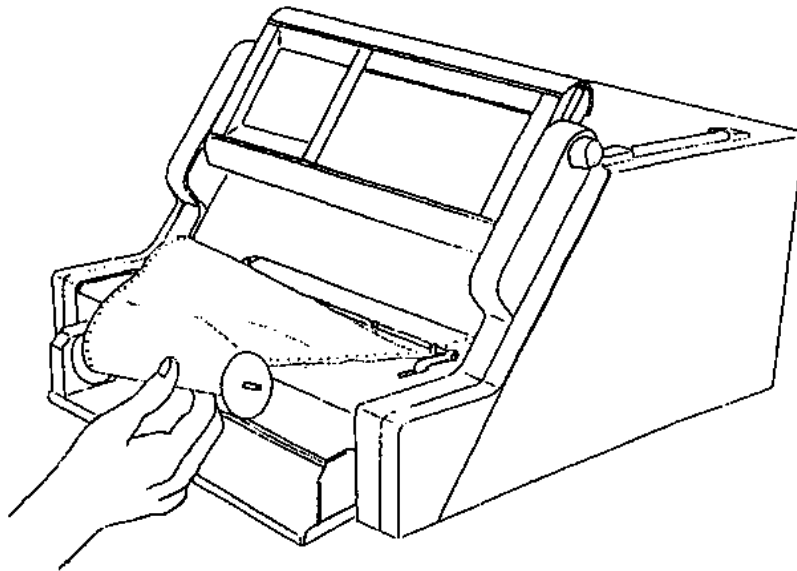（7） Press the FEED key to confirm the chart paper is correctly taken up.

Fig. 3.5-1

3. HANDLE PROCEDURE

3.6 Connecting the Input Cable

For measuring DC voltage, a special input cable（938CAB-XX）is provided as an option.
If you use a general wire rod, please use good quality shield wire to avoid noise problems.
To use for high sensitivity measurements such as 1 mV F.S, be careful the measurement are
not affected by thermoelectromotive force.

3.6.1 DC voltage and thermocouple input

Three input terminals are provided: positive（+）, negative（−）, and for RTD（b）.
（RTD is an option.）

（1）To use the U-841 in a normal environment or in high voltage range, make connections
as follows.
1）Connect the input cable between（+）, terminal and（−）terminal.
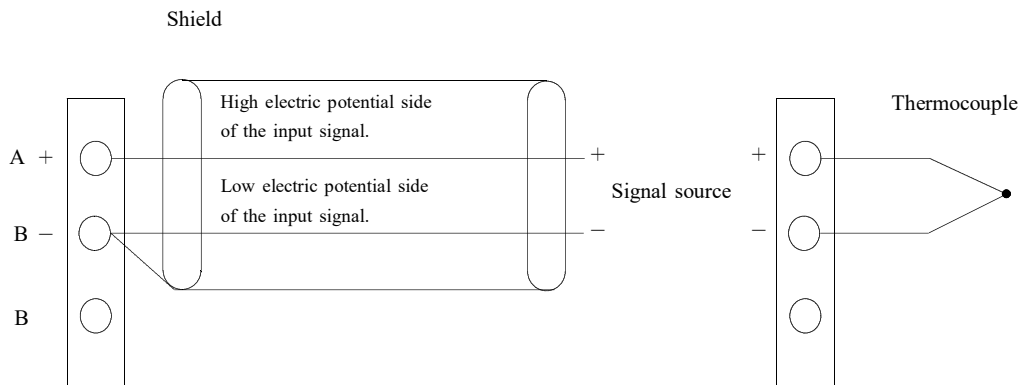
Cautions
Cautions during temperature measurement and high sensitivity measurement

（1）**Change in temperature difference between inside and outside of the U-841 will
cause zero drift. Pay attention to the following points when mounting the recorder.**
1）**Do not use an air conditioner or the U-841 in a location that is free from radical
changes of temperature.**
（**Since environmental temperature changes considerably when the air conditioner
is activated or stopped, the U-841 is affected by thermoelectromotive force.**）
2）**Avoid using the U-841 in a windy location or where it is exposed to direct sun-
light. Use the U-841 in the place where temperature change between day and
night is small.**
3）**To maintain temperature of the terminal section at a stabilized level, be sure to
use the attached terminal cover. Do not clog the ventilation hole in the case
during use.**

（2）**If the metal tip or wire materials other than copper are used for wiring of the input
cable, a thermoelectromotive force of several µV may be generated.
Therefore, be sure to use copper wire in high-sensitivity measurement. Make the
input cable as short as possible.**

（3） **During thermocouple measurements, if the pressure connection terminal with a high thermal capacity is used, there is possibility temperature changes in the terminal section and standard contact compensation error may occur.**
Try to connect the thermocouple cable directly.

（2） For high-sensitivity measurements or when noise is generated because the input signal line is long, make the connection as shown below.
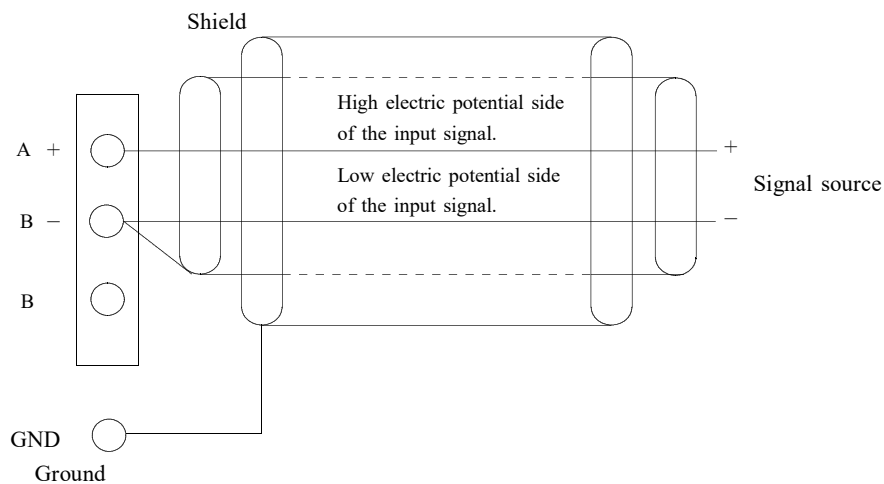
Cautions

（1） **Maximum allowable input voltage is shown below. If the input voltage exceeds the range of allowable input voltage, the input circuit may be damaged. Be careful not to apply excessive input.**

| Measuring range	Range of allowable input voltage
0 - 500 mV	30 V or less
1 V - 100 V	200 V or less

（2） **Allowable signal source resistance is less than 1K ohm for DC voltage,thermocouple.**
If the internal resistance of the signal source to measure is too large, it will
cause errors in the recorded value.

（3） **Maximum common mode voltage is 250 Vrms.**
If it exceeds 250 Vrms, error may occur and damage the input circuit.

3.6.2 Resistance thermometer bulb input（option）

Use a 3-wire resistance thermometer bulb.
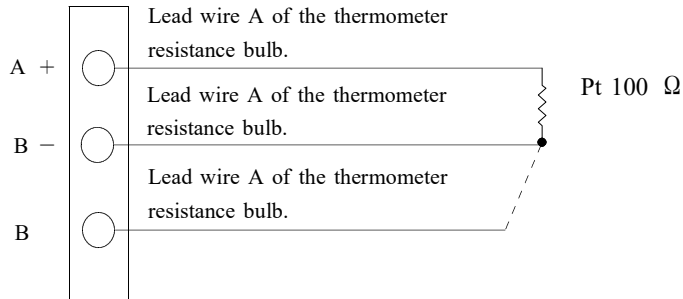
Cautions

（1）**For the resistance thermometer bulb input, balance the three lead wire resistances. Following error will be generated by the lead wire resistance.**
Pt 100 ohm : 0.1 ℃ at 10 ohm

（2）**Maximum common mode voltage is 250 Vrms. If it exceeds 250 Vrms, error may occur and damage the input circuit.**

3.7 IC Memory Card

3.7.1 How to insert the card

With the surface printed △ mark facing upward, insert the IC memory card into the insertion port at the right of the U-841 operation unit as shown in Fig. 3.7-1.
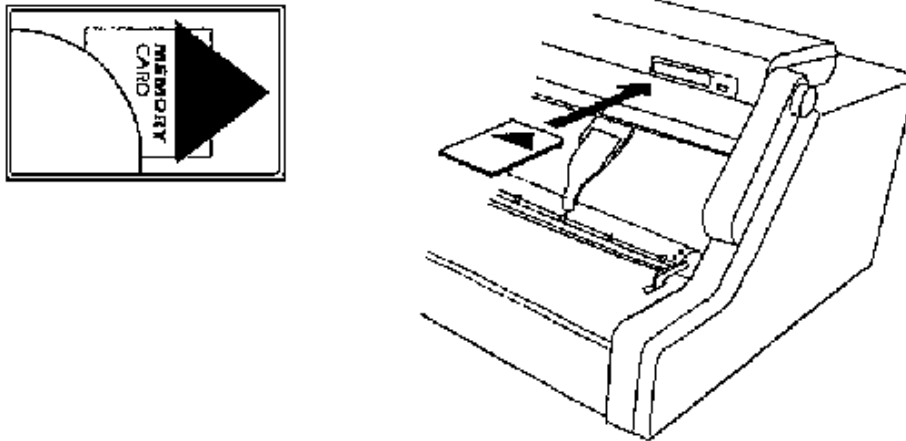

Fig. 3.7-1

Cautions

If the direction of the IC memory card is reversed and upside down, it cannot be completely inserted into the slot. If it is forcibly inserted, the IC memory card and connector of the U-841 may be broken.

3.7.2   Loading and replacing the battery

When it's used for the first time, the battery is not put on.
So, load the battery included with the U-841.

（1） Loading
    1） Face downward the △ mark print of IC memory card.
    2） Release the lock of the battery holder unit. Pull the holder by hooking a nail in the slot of the battery holder and remove it.
    3） Set a new battery in the battery holder.
    4） Insert the battery holder into the IC memory card.

The above procedure completes the loading of the battery.
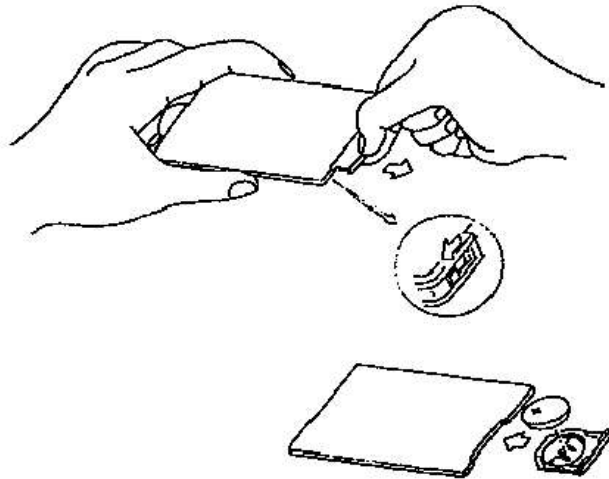
（2） Replacing
    1） Select IC CARD in AUX and insert the IC memory card. Message "IC CARD NO BATTERY" will display in the main display of the operation panel. Replace the battery when the indicator flashes on and off.
    2） Replace the battery when the power is on and the IC memory card is loaded in the main unit. If the battery is changed when the power is turned off or the IC memory card is removed from the main unit, any information saved will be erased. Please be careful enough.
    3） Pull out the battery holder by hooking a nail in the slot of the battery holder.
    4） Replace with new battery and insert the battery holder into the IC memory card.

The above procedure completes the battery replacement.

**Cautions**
（1） **When loading or replacing the battery, confirm that the polarity is correct.**
（2） **After inserting the battery holder in the IC memory card, be sure to set the lock of the battery holder to the LOCK side.**
（3） **Battery: BR2325**

3.8 Precautions During Operation

3.8.1 Mounting the input cover

（1）When performing temperature measurement and high-sensitivity measurements, be sure to mount the attached input cover. It will reduce errors generated by the operations shown below.

　　1）If the U-841 is used in direct sunlight or windy locations, differences of temperature in the terminal and the inside of the machine will cause errors.

　　2）When connecting the thermocouple, If a terminal plate is used, temperature changes may occur in the terminal unit resulting in errors. Connect the thermocouple line direct to the terminal.

　　3）Sudden changes of temperature will cause errors.

（2）Remove the fixing screws for input unit No.2 and 3 and attach the input cover stay by hand. Connect the cable or thermocouple to the input terminal, then mount the input cover.
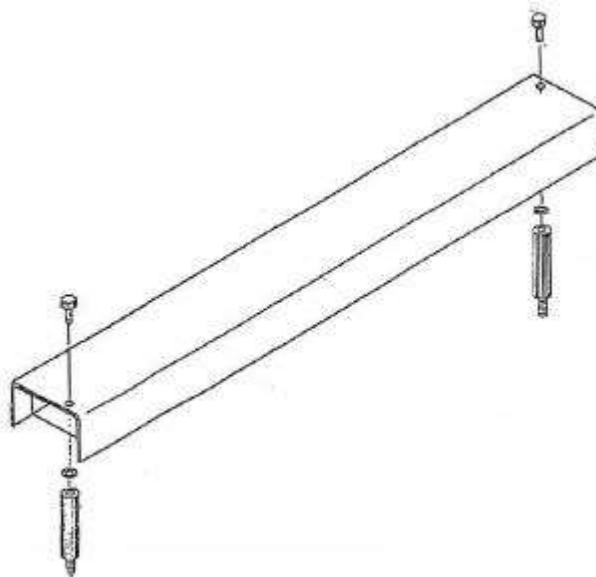
3.8.2 Recording pen

Fiber tip is used in the recording pen. Therefore, if the U-841 is not used for long periods with the auto pen cap mechanism set, ink may dry at the pen tip. If the U-841 will not be used for long period, be sure to cover the recording pen with the attached cap, put it in the package bag and surely seal the bag.

3.8.3 Environment

Use the U-841 in temperature 5 to 45 ℃ and a humidity 35 to 80%. Outside these ranges will adversely affects the main body of record. It is also recommended to use the U-841 in the environment with no vibration and with small amount of dust.

3. HANDLE PROCEDURE

3.9 Maintenance

3.9.1   Replacing the fuse

For safety, it is recommended to replace the fuse every two years.

（1）AC power
    1）Fuse holder is located at the lower portion of the power connector on the rear panel.
    2）Insert a flat-head screwdriver into the slot of the fuse holder and pull it forward. Fuse holder can be taken out.
      The fuse holder contains the fuse being used and a spare fuse.
    3）Replace the used fuse with the spare fuse or a new fuse.
         Fuse used: 250 V, 5 A time-lag type
    4）Replace the fuse holder at the original position to complete replacement.

（2）DC power（option）
    1）Fuse holder is located at the lower portion of the DC power connector of the rear panel.
    2）By rotating the head of the fuse holder to the left, the holder can be removed.
    3）Replace the battery.
         Used fuse: 250 V, 30 A
    4）Replace the fuse holder at the original position to complete replacement.
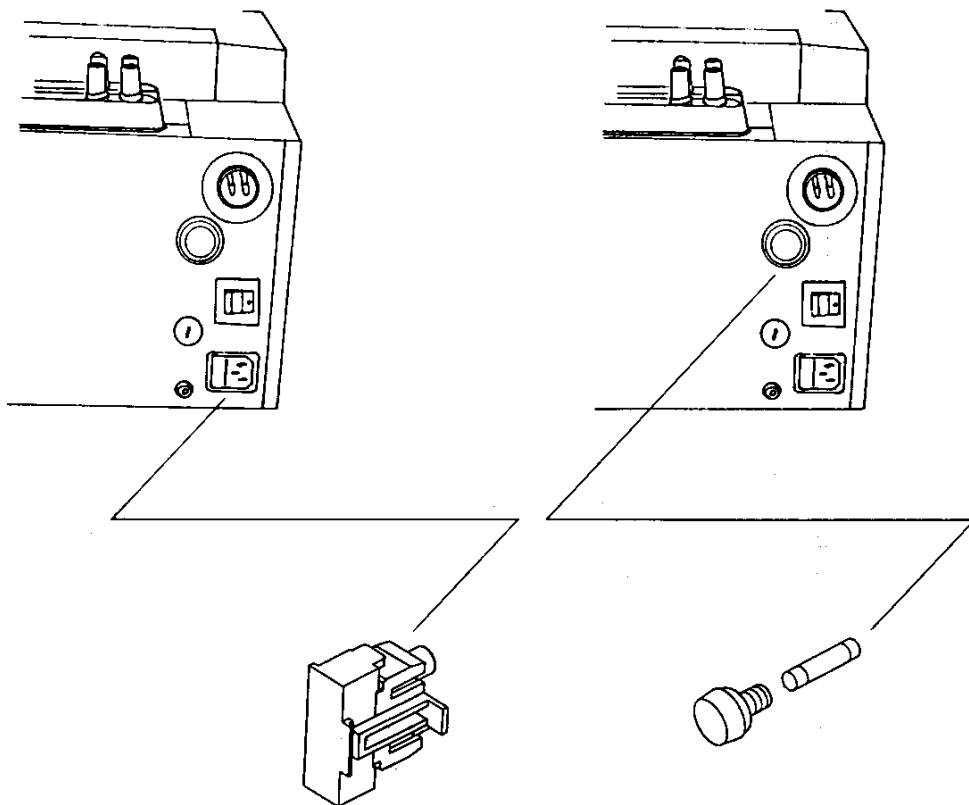
3.9.2   Cleaning

   Clean the surface of the U-841 by wiping it with soft cloth.
   Do not use thinner or alcohol.

3.9.3 Initialize

   If the movement is unidentified and becomes abnormal, turn on the power switch
   while pressing the FEED key. Setting conditions will be initialized.
   Please perform the reset of the range by all means afterwards.
   If the abnormal operation continues, contact the agent from whom you purchased the
   U-841 or PANTOS.

4. OPERATION

4.1 Description of Switch

KEY LOCK   By pressing the KEY LOCK switch several times, the red LED will repeat light and go out. While the red LED is lit, the recorder is in the key lock state. In the key lock state, keys other than the KEY LOCK switch and FEED switch are not accepted. To escape from the key lock state, press the KEY LOCK key to turn off the red LED.

MONITOR/INPUT/AUX.
                These three keys change the contents displayed in the EL display. As the function of the function part is changed by the indication contents of the EL indicator, refer to 4.2 "Description of Function" for details.

MONITOR   The MONITOR switch is used to display waveform or numeric display. Pressing this switch several times changes the display style.

INPUT   The INPUT switch sets the EL display in the mode to set the condition for the input amplifier. Input amplifier state will display. Range of the input amplifier can be changed by operating other switches.

AUX.   The AUX. switch sets the EL display in the mode to set the operating conditions for the main unit. Continuously pressing this key several times will display various condition setting screens to perform the confirmation of the condition and a change.

SELECT   Four SELECT switches move the cursor in the EL display up/down and right/left. Some differences of screen or cursor position will restrict the movement of the cursor to vertical or horizontal only. In any case, this switch is used to change the setting item.

DATA   The DATA switch changes numerical value and mode of the item selected by the SELECT switch. Numerical value and mode are automatically selected according to the setting item.

UP/DOWN   The UP or DOWN switch change the numerical values and mode. By conti-nuously pressing the switch, values and mode are continuously changed. Pressing it for short time changes only one step.

FINE　　　　　　Each time the FINE key is pressed, the yellow LED repeatedly light and go out. By pressing the UP or DOWN key when the yellow LED is lit, the step amount to change decreases. To increase the step amount, press the FINE key so the yellow LED goes out.

To increase resolution enter a value smaller than decimal point with the ten key. For an example in the 1 V range; inputting as 1.000 V, fine adjustment can be made at every 0.001 V.

ENTRY　　　　　Use the ENTRY key for some setting item. Basically, the ENTRY key is used to switch between ON and OFF.

TEN KEY　　　　Used to directly input numerical values for data or selecting item.
0 – 9 . –　　　　Numerical value can be set with the DATA UP or DOWN key or FINE key, and the ten key can also be used to set. Data without a negative（－）mark at the top is treated as positive value.

SET　　　　　　When the data value is entered with the ten key, be sure to press the SET key to complete the setting. Numerical values change when the SET key is pressed.

CLEAR　　　　　Pressing the CLEAR key clears the set switch of that item. This key is used when a ten key setting is incorrect.

MARKER　　　　Pressing the MARKER key records the marker in overlapping the recorded waveform. Draws a line of approximately 4 scales in the left direction viewed from the front. Operating time is approximately 80 ms.

Accordingly, when the chart paper is fed at 40 mm/s, it is recorded as a trapezoid signal of approximately 2 scales. Marker is overlapped to the input value simultaneously for all channels.

This key is used to check that the record and marking of a phenomenon are simultaneous.

At SYNC on　　　When the SYNC（synchronizer）key is on, the recording is made simultaneous against time axis. Therefore, the maker is also recorded simultaneously for the time axis. If the marker is deviated from the time axis, it can be corrected by fine adjustment（operating method : description of function : synchronizer fine adjustment）. Pen No.1 records simultaneously with pressing the MARKER key.

At SYNC off　　　By pressing the MARKER key when the real time recording is complete, all pens record the marker simultaneously. Accordingly, deviation of the marker is deviation of time axis.

PEN CHANGE   When the PEN CHANGE key is pressed, a pen cartridge moves to the position that allows easy pen replacement. Four states can be set for pen change and change the pen one after another. To escape from pen change state, press the PEN CHANGE key several times.

PRINT   This key operates the printer manually. By pressing this key while the chart paper feed is stopped, the pen recording will stop and print. While the chart paper is being fed, prints the record conforming to the chart paper feed so print does not overlap.

MANUAL   Prints the input value when the key is pressed. Only prints the channel that the logging print is ON.

STATUS   Prints the set condition and limiter value of the input amplifier.
Only prints STATUS for the channel that the EL display is ON.

MEMORY   The MEMORY key writes and reads the setting condition to/from an IC
CARD   memory card. If an IC memory card is not correctly inserted, this key will not work.

SAVE   Press this key to write data such as the sensitivity of the input amplifier currently set to an IC memory card.
Because several seconds are required to write, wait a short time after pressing this key before removing out an IC memory card or turning off the power.

LOAD   Press the LOAD key to read the set conditions stored in an IC memory card. By pressing the LOAD key, conditions previously set will be lost.
If the previous set conditions are required, save them beforehand.

SYNC   The recording pen is designed to move the time axis separated by approximately 4 mm. Therefore, real-time recording generates a deviation in the time axis by 4 mm during recording between the channels. Synchronizer and compensate this deviation of the time axis using the built-in memory and adjust the time axis for all channels on the record.
When the SYNC key is pressed and the orange LED lights, the synchronizer is on and compensating deviations in the time axis.

While SYNC on   Compensates deviations of the time axis in the record. Accordingly, pen movement is slower than the input signal.
When the chart paper feed stops, pen movement stops.

While SYNC off   Deviates the time axis in the record is deviated. Pen moves in real time following the input signal. This is convenient for fine adjustment of the zero point in the record.

FEED   Feeds chart paper only while the FEED key is pressed. Operates at the maximum speed irregardless of the chart paper speed setting. Feeds the chart paper with the pen lowered. After stopping the chart paper by SYNC. ON, pressing the FEED key outputs the remaining data.

STOP   Stops the chart paper feed.

START   Pressing the START key starts the feed of chart paper. By pressing the START key during start again, the chart paper feed will stop.

MEASURE ON   When the ALL key is on, press keys 1 to 8. If the indicator lamp is lit,
ALL/1−8   recording will start. Press the ALL key once again. When the indicator lamp goes out, recording pens will be stored in the pen cap holder. When the ALL key is turned off, channels with keys 1 to 8 on（LED lamp is lit）will simultaneously measure off and then store the recording pens in the pen cap holder.

4. OPERATION

4.2 Description of Function

MONITOR   Pressing the MONITOR key will display waveform or numerical values.

WAVE/1:   All waveform are overlapped and displayed. This is identical to an image
                 of the record with pen.

WAVE/2,   Displays recordings in two divisions or four divisions. All though the ima-
WAVE/4:   ge is different from that of a record, this is convenient for monitoring spe-
                 cific channels separately.

DIGITAL: Displays numerical values. For channels with scale conversion on, displays
                 the value will be convert into a scale and then displayed. Exact values can
                 be read.

SELECT（UP, DOWN）
ENTRY   Operates keys to move the cursor up and down. Does not operate the cur-
                 sor right and left. When the ENTRY key is pressed, the waveform of the
                 channel will display in reverse in black and white. The same display will
                 also display a DIGITAL numerical value. In the DIGITAL value display,
                 the display ON/OFF can be changed. Recording with a pen can be done
                 even though a waveform is not displayed.

UP/DOWN   The DATA UP or DOWN key changes the chart speed. The FINE key can
ten key   also be used. The ten key can also be used to change the chart speed.

INPUT   Pressing the INPUT key calls the setting for the input unit. Because the in-
                 put unit is directly operated by the INPUT key, set values that do not carry
                 out scale conversion.

SELECT（UP/DOWN, right and left）
                 The SELECT key operates all up, down, right, and left keys. The selected
                 items are displayed in reverse in black and white.
                 Cursor is moved by this key.

UP DOWN   The DATA UP or DOWN key or ten key sets a numerical value or selects
ten key   an item. The FINE key can also be used. The ten key can also be used to
                 set items that are set with numerical values.

Displays   Selected channel in reverse in black and white.
CH   Selection of channel is carried out simultaneously when item is selected.

TYPE | Selects the input type when the selected item is TYPE. Displays the type of voltage and thermocouple. Type can change with the DATA UP or DOWN key.

V ⟷ mV ⟷ J ⟷ K ⟷

FILTER | The FILTER ON/OFF changes with the DATA UP or DOWN key.
When the FILTER key is on, a 1 Hz filter is added.

RAN. SPAN | RAN. SPAN selects two types of ranges. It is changed with the DATA UP or DOWN key.
When RANGE is displayed, the measuring range is determined with range and bias. Bias, indicated in % , can be set within a range of ± 100%.
Bias is a value showing the pen position on the chart paper when the input signal is 0. When the bias is set at 50%, the center of the chart paper is the zero point. Range is the level of the entire width of the chart paper.
When 1 V range is specified, the difference of the level at the right end and left end of the chart paper is 1 V. When SPAN is displayed, input the measured value at the left end and right end of the chart paper.
Example : If right end is −1 V, and left end is +1 V, input signal of range −1 V to +1 V is recorded.

RANGE/ SPAN−L | Sets the range for the range mode, and the level at the left end position for the span mode. The RANGE/SPAN−L is valid when the display is reversed in black and white. This display automatically changes for individual channels depending on the RAN/SPAN selection.

BIAS%/ SPAN−R | Sets the bias for the range mode and level at the right end position for the span mode.

"E" | If the setting is not correct, E will display at the outside of the frame for the CH display. Possible causes may be that the range and bias values are outside the maximum range and the span value is outside the range settings.

Auxiliary （AUX.） | Press the AUX. key to set the auxiliary functions. Pressing the AUX. key several times changes the items to be set one by one. Press the key several times until the screen that displays the function you want to change appears. To do a only check without changing any settings, do the same operation.

SELECT （up/down.　right/left）
The SELECT key selects all items depending on the type of auxiliary function.

4. OPERATION

UP/DOWN FINE	These keys set the numerical value or change the item（ON/OFF change）and select characters. In any of these cases, they are used to change the contents of the item.
ENTRY	The ENTRY key is an auxiliary key used when changing the contents of the item with the DATA UP or DOWN key, such as when selecting characters or starting the clock in a time setting.

List of auxiliary functions

Name	Functions
Limiter LIM.	Controls the limiter printing and operation of external switch（option）.
Chart paper feed trigger CHART	Speed of chart paper feed changes depending on trigger setting.
Scale SCALE	Sets the numerical values and at scaling unit.
Date DATA	Sets the time for the built-in clock. Clock starts instantly when the ENTRY key is pressed.
Name TAG	Sets the name for each channel.
Fine adjustment ADJUST	Fine adjustment of the pen. PEN is for pen interval of synchronizer, ZERO is for the zero point, and WIDTH is for full-scale point. By pressing the ENTRY key after selecting the item with the SELECT key, calibration signal will be generated.
IC card ICCARD	Controls IC memory card. Up to 8 types of status can be memorized.

5.   DESCRIPTION OF OPERATION

5.1 Waveform Recording

This section explains operations until the input signal is recorded by the pen.

Input amplifier
Input unit   Maximum voltage applied to the input terminal is $\pm$ 30 V when the input range is a thermocouple or at a high sensitivity of 30 V. When the range is 1 V or more, the unit will not be damaged even if voltages up to 200 V are applied. Voltage widths that can be recorded are less than the maximum voltage and are determined by the range.

Range   When the range is determined by the bias, the bias become the range. The range and bias that are set at the right end and left end are determined indirectly. In this case, the level with a larger absolute value is converted into the range. For example, if a setting is made with the range of 9 V to 10 V, 10 V is the standard range, the recording is 1 V (10 V － 9 V = 1 V) and the measurement span is 10 V. Accordingly, the measurement is carried out in a span from 0 to 10 V, and only the portion of 9 V to 10 V is recorded. In this case, resolution of the record is approximately 1/10 of a recording from 0 V to 1 V.

Filter   10 Hz digital filter is supplied. When using 50/60 Hz, noise levels of －50 dB cab be removed.（Normal mode）It is also possible to set a filter of approximately 1 Hz separately. This filter is the primary filter.

A/D converter   The input signal amplified by the input amplifier is converted into a digital value by A/D conversion. For the A/D conversion, all channels are divided into two blocks with each block converted alternately in 2 ms intervals. Therefore, you can get data A/D conversion every 4 ms from each channel.

Data processing   Data from the A/D converter is processed at every 4 ms for each channel irregardless of the thermocouple and voltage. For the thermocouple, temperature offset（linearize）is carried out at every 4 ms.
Cold contact point compensation is also carried out.

Cold contact point compensation, CJC
Temperature at the input terminal is measured with one temperature sensor for one unit. During measurement by the thermocouple, compensation processing is carried out with this input terminal temperature. Temperature at the cold contact point is measured every 256 ms and updated. When measuring the temperature, _be sure to mount the input cover._

5. DESCRIPTION OF OPERATION

Pen operation   The pen is driven to its position following the input signal that is proc-
essed. If a square wave is input simultaneously to all pens, the motors
for all pens will consume the maximum voltage. So, to limit maximum
power consumption, the pen speed is made slow for square waves input
simultaneously to all pens.

Synchronizer

   SYNC   The synchronizer memorizes the data with a resolution of time axis eq-
ual to 0.05 m（1/20 mm）. Synchronized with the chart paper feed, it
outputs the data of the proper channel at proper timing in order to make
the time axis in the record agreed.

Input value   Synchronizer compares the data with the stored data every 4 ms and st-
ores the maximum and minimum values between 0.05 mm feed and the
mode. The time to send the 0.05 mm is different depending on the chart
speed. The comparison is carried out at a fixed timing of 4 ms.
Accordingly, phenomenon that occurs for short times is stored irregard-
less of the chart speed.

Mode   For the mode value, the existence of a maximum value and minimum
value and values generated later are stored.

Mode table

Phenomenon	Maximum value	Minimum value	Final valueDoes not
Fixed	Does not exist	Does not exist	exist
Single increment	Exist	Does not exist	Maximum value
Single decrement	Does not exist	Exist	Minimum value
Complex 1	Exist	Exist	Maximum value
Complex 2	Exist	Exist	Minimum value

5.2 Setting Function

Same range   For setting multiple numbers of input units in the same condition and for setting partial numbers in different conditions, you can copy the setting of only one channel.

COPY MODE   Press the INPUT key to call the screen to set the input condition. With the SELECT key, move the cursor to the location where the copy source channel is displayed. Condition of copy source channel will be copied. After placing the cursor at the channel display, press the ENTRY key. ← will display at the outside of the column for copy source channel. Determine the copy source in this way. Using the SELECT key, move the cursor to the channel display you want to set the same condition as the copy source and press the ENTRY key. When the same condition of the channel to copy as the copy source displays, you can copy it. By changing the copy destination one by one, you can copy as many times as you want. Moving the cursor to a location other than channel display terminates copy mode. For multiple copy sources, escape from the copy mode and enter the copy mode again. Setting for the copy source is again possible.
Even if a portion of the condition are different, settings are easily done by copying and changing the conditions.

Same scaling   When many inputs units are the same scaling, copy mode can be used in the scaling setting screen. The same method for the same range is available.

Built-in clock   For the built-in clock, set the time as 00 seconds the instant the ENTRY key is pressed. Error of this setting is within one second. Because the built-in clock is baked up by the battery, it will continue operation approximately one month even if the power is disconnected. If some errors in the setting are detected, move the cursor to the location of the detected value, and correct the setting.
Example of error: Month of 18 or February 31st.

5. DESCRIPTION OF OPERATION

5.3 Display Function

Waveform display sampling

Waveform displays using data sampled at every 64 ms.
Because approximately 15.6 samplings are carried out in one second,
the display is around −3dB for an input signal of approximately 3 Hz.
Since this sampling is not related to the chart speed, waveform up to
approximately 3 Hz can be displayed at any time.
However, if the input signal changes extremely when chart speed is slow,
waveform is written over.

Digital display sampling

Digital display sampling is not fixed. The current value appears one by
one. If there are only a few display channels, the sampling cycle will
become short. If the input signal exceeds 1 Hz, it may be synchronized
with the sampling. When it is synchronized, digital value becomes a co-
nstant although the waveform display and pen record will change. By
changing the number of the displayed channels, the synchronization of
digital display stops. In any case, even if the digital display is done aga-
inst for an input signal exceeding 1 Hz, the value read will be not impo-
rtant.

6. OPTION

6.1 Setting information of CFCARD and analyses of the measurement date

Can be processed by Windows.

6.1.1   File type

The extension is DAT and CSV.
（Example）TEST-1.　DAT （ Measurement data file ）
　　　　　　　　TEST-1.　CSV　（ When measured data is preserved, it's converted to a
　　　　　　　　　　　　　　CSV file automatically.
　　　　　　　　　　　　　　It is approximately 3.5 times of the DAT file.）

6.1.2   Setting information
Setting information is stored in the initial 1KB（1024 bytes）of the file.

Address	Item	Contents
0 1 2 3	Special KEY CODE for the U-841.	(0) ＝　43H (1) ＝　82H (2) ＝　F6H (3) ＝　A5H
4	CHART SPEED No.	0 :　INTERNAL 1 :　EXTERNAL 1 2 :　EXTERNAL 2 3-5 : TREND
5 6	CHART SPEED	1 － 2400
7	CHART SPEED UNIT	0 :　mm/h 1 :　mm/min 2 :　mm/sec
8 9	Information of the loaded analog unit 　ON at '1' 　OFF at '0'	bit7 ←————— bit0 (8) ＝ ○ ○ ○ ○ ○ ○ ○ ○ 8CH ←————— 1CH
10 11	SAVE CH at the time of SAVE 　ON at '1' 　OFF at '0'	bit7 ←————— bit0 (10) ＝ ○ ○ ○ ○ ○ ○ ○ ○ 8CH ←————— 1CH
12 13	Sampling time at SAVE（mSec）	Range : 4 － 9996
14 15	Recording length（KB）	
16	DATE TYPE	0 :　NORMAL 1 :　MAX／MIN
17 ↓ 24	INPUT TYPE　　1CH ↓ 8CH	0 : V　　1 : mV　　2 : J 3 : K　　4 : E　　5 : T 6 : S　　7 : R　　8 : B 9 : Pt

Address	Item		Contents
33 ↓ 40	INPUT FILTER	1CH ↓ 8CH	0：5Hz（Filter OFF） 1：1Hz（Filter ON）
49 ↓ 56	SPAN／RANGE	1CH ↓ 8CH	0：SPAN（SPAN-L，SPAN-R） 1：RANGE（RANGE，BIAS）
65 66 ↓ 111 112	RANGE／SPAN-L	L of 1CH H of 1CH ↓ L of 8CH H of 8CH	SPAN-L when SPAN/RANGE is 0 RANGE when SPAN/RANGE is 1
129 ↓ 136	The position of decimal point for RANGE／SPAN-L	1CH ↓ 8CH	0：xxxx 1：xxx.x 2：xx.xx
145 ↓ 136	The position of decimal point for BIAS／SPAN-R	1CH ↓ 8CH	3：x.xxx
161	USE of SCALE（ON／OFF） ON at '1' OFF at '0'		bit7 ←————— bit0 （161）＝ ○ ○ ○ ○ ○ ○ ○ ○ 8CH ←————— 1CH
163 164 ↓ 177 178	SCALE of 0% point DATE	L of 1CH H of 1CH ↓ L of 8CH H of 8CH	
195 ↓ 202	SCALE of 0% point The position of decimal point for DATE	1CH ↓ 8CH	0：xxxx 1：xxx.x 2：xx.xx 3：x.xxx
211 212 ↓ 225 226	SCALE of 100% point DATE	L of 1CH H of 1CH ↓ L of 8CH H of 8CH	
204 ↓ 250	SCALE of 100% point The position of decimal point for DATE	1CH ↓ 8CH	0：xxxx 1：xxx.x 2：xx.xx 3：x.xxx

Address	Item		Contents						
259 ↓ 266	UNIT No. of SCALE	1CH ↓ 8CH	0: 3: KV 6: A 9: Hz 12: km/h 15: g 18: mm 21: km 24: ℓ/h 27: mmHg 30: mdd 33: %RH 36: W 39: t/h 42: kc/h 45: G 48: m^3/m 51: KV 54: MPa 57: g/sec 60: kgf·m 63: 66: M Ω 69: cm/m 72: %rpm 75: kg/mm 78: μ e	1: mV 4: A 7: ℃ 10: kHz 13: rpm 16: kg 19: cm 22: ℓ 25: mg/ℓ 28: mb 31: pH 34: ppm 37: kW 40: kg/h 43: μ s/cm 46: N 49: m^3/s 52: msec 55: kPa 58: mg/m^3 61: N·m 64: Ω 67: gf 70: N m^3/h 73: kg/s 76: mmH20	2: V 5: mA 8: ° F 11: m/s 14: mg 17: t 20: m 23: ℓ/m 26: g/ℓ 29: bar 32: % 35: ppb 38: Kg/cm 41: mmAq 44: ms/cm 47: mile 50: ℓ/min 53: kc m^2 56: Pa 59: deg 62: ppmC 65: k Ω 68: kgf 71: μ .m 74: kg/cm 77: μ						
275－282 ↓ 331－338	TAG NAME	1CH ↓ 8CH	8 BYTE／CH ASCII - CODE						
403 ↓ 462	COMMENT 1		Each 60 bytes ASCII - CODE						
463 ↓ 522	COMMENT 2								
523 ↓ 582	COMMENT 3								
583 ↓ 589	＊1		0						

Address	Item		Contents
590 591	YEAR		Time and date at the time of SAVE Each 2 BYTE
592 593	MONTH		ASCII - CODE
594 595	DAY		
596 597	HOUR		
598 599	MINUTE		Time at the time of SAVE Each 2 bytes
600 601	SEC		ASCII - CODE
602 ↓ 609	＊1		0
610 ↓ 617	Decimal point of the measurement date	1CH ↓ 8CH	0 : xxxx 1 : xxx.x 2 : xx.xx 3 : x.xxx
626 ↓ 633	UNIT of measurement date	1CH ↓ 8CH	
642 ↓ 1023	＊1		0

＊1　With no date,　0 is written.

6.1.3　Measurement date

All the date except those in the initial 1 KB（1024 bytes）of the file becomes measurement date.　The date per 1 CH consists of 2 byte, binary.
The first byte becomes the lower date and the second byte becomes the upper date.

Polarity　　0 : Plus　　　1 : Minus
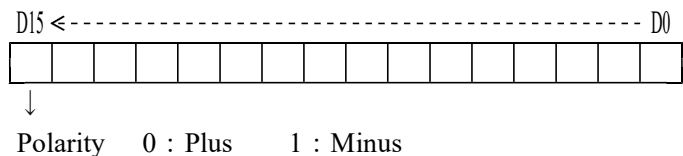
6.1.4   How to determine the measurement value

（1）Determine the SAVE CH（address 10 and address 11）of the setting information.
For example, when address 10 is 15H and address 11 is 0, the channels become 1 CH, 3 CH, 5 CH, so the measurement date are written in the repetition of 1, 3, 5, 1, 3, 5, 1, 3, 5, --- CH.

（2）Determine the position of decimal point and their units of the measurement date corresponding to the SAVE channels obtained in（1）.
For example, when SAVE CH are 1, 3, and 5 CHs.

CH	Position of decimal point	UNIT
1 CH	address 610 -- 1	address 626 -- 0
3 CH	address 612 -- 0	address 628 -- 1
5 CH	address 614 -- 2	address 630 -- 2

In the above case, the measurement date for each channel becomes as follows.

1 CH :   xxx.x μ V
3 CH :   xxxx   mV
5 CH :   xx.xx   V

（3）ASCII conversion software
ASCII conversion can be carried out with the above procedure of（1）and（2）.
It is, however, easier with our ASCII conversion software "KAMIT".

6.1.5   Error information

 Occurrence of an error is displayed as follows.

（1）R/W ERROR!
This error occurs when a CFCARD is not loaded, a CFCARD is writeprotected, a CFCARD is damaged.

（2）SAME FILE NAME!
This error is displayed when the same file name as that of the save time is specified.

（3）FILE NAME ERROR!
When the character which I cannot use is included it is displayed.

6.2   Connection of the interface and command

6.2.1   RS-232C

(1) Connection

D-sub connector 25P is used.

| Pin No.	Signal mark	Signal name	Direction
1	(GND)	Grounding	
2	SD (TXD)	Send dte	Input
3	RD (RXD)	Received date	Output
4	RS (RTS)	Request to send	Input
5	CS (CTS)	Clear to send	Output
6	DR (DSR)	Date set ready	Output
7	SG (GND)	Grounding	
20	ER (DTR)	Date terminal ready	Input
8 − 19 21 − 25	No grounding		

Note : DCE connection applies to the connectors of this unit. As the directions of their signals are opposite to those of the device with DTE connection, be sure to check the specifications of the device before use.

6.2.2   GP-IB

(1) Connection
Connection is done with the cables of GP-IB standard (IEEE-Std, 488).
Names of the connector signals of GP-IB standard are shown below.
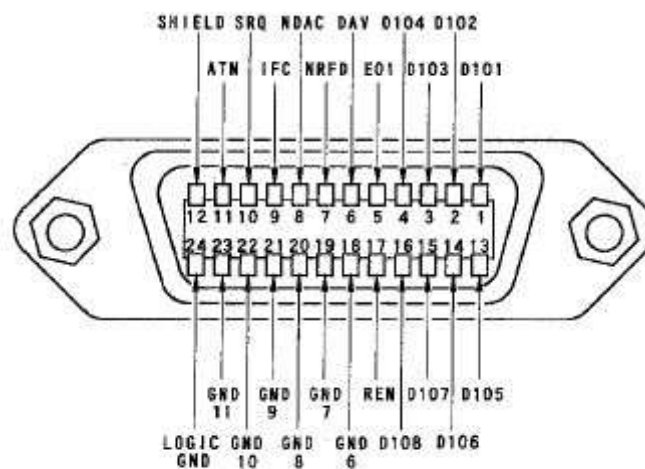
6.2.3   Command table

Following is the interface command table.
This is common with both the GP-IB and the RS-232.

No.	Command	Contents	Example
1	IN	Setting of the input unit	IN3/1/0/0/200/50
2	LM	Setting of the limiter	LM2/1/80.0/10.0/1
3	SC	Setting of the scaling	SC1/0/10000/-100/15
4	TG	Setting of the tag name	TG4/ENGINE
5	CM	Setting of the comment	CM2/THIS RECORDER IS 8CH
6	TM	Setting of the year, month, date, time, and minute	TM93/09/06/18/32
7	CS	Setting of the chart speed	CS20/1
8	SA	Start ON ／ OFF	SA1
9	SY	Synchronizer ON ／ OFF	SY0
10	ME	Measure ON ／ OFF	ME1/1/2/3/5/6
11	FD	Constant amount feed	FD
12	MK	Marker	MK
13	CN	Setting of the transmission channel No.	CN1/5/7
14	AD	ASCII date transmission request	AD
15	HD	Hexadecimal date transmission request	HD ※ 1
16	RI	Input unit status	RI 3 (Example of response) 1/0/0/200/50
17	RL	Limiter status	RL2 (Example of response) 1/80.0/10.0/1
18	RS	Scaling status	RS1 (Example of response) 0/10000/-100/15
19	RT	Tag name status	RT4 (Example of response) ENGINE
20	RO	Comment status	RO2 (Example of response) THIS RECORDER IS 8CH
21	RM	Year, month, day, hour minute status	RM (Example of response) 93/09/06/18/32
22	RC	Chart speed status	RC (Example of response) 20/1
23	RA	Start ON/OFF status	RA (Example of response) 0
24	RY	Synchronizer status	RY (Example of response) 0
25	RE	Major ON/OFF status	RE (Example of response) 1/2/3/5/6

※ 1   It is effective only in GP-IB.

6.2.4   Description of the commands

(1) IN（Setting of the input unit）
Format：IN（CH）／（TYPE）／（FILTER）／（SPAN）／（SPAN-L）／（SPAN-R）

（CH）   ＝   Channel No.   Range : 1 to 8
（TYPE）   ＝   Input type   Range : 0 to 9
                 Each of them stands for V, mV, J, K, E, T, S, R, B, and Pt.
（FILTER）   ＝   Filter ON ／ OFF
                 OFF at 0 , ON at 1
（SPAN）   ＝   SPAN or RANGE
                 SPAN at 0 , RANGE at 1
（SPAN-L）   ＝   SPAN-L at SPAN, RANGE at RANGE
                 The range is determined by the TYPE.
（SPAN-R）   ＝   SPAN-R at SPAN, BIAS at RANGE
                 The range is determined by the TYPE.

Example :   IN3 ／ 1 ／ 0 ／ 0 ／ 200 ／ 50
              ↓   ↓
             3CH   mV
                        SPAN   SPAN-R is 50 mV.
                            FILTER OFF
                                       SPAN-L is 200 mV.

(2) LM（Setting of the limiter）
Format：LM（CH）／（USE）／（OUT）／（HIGH）／（LOW）／（BUZZER）

（CH）   ＝   Channel No.   Range : 1 to 8
（USE）   ＝   Display, ON ／ OFF of the output
                 OFF at 0 , ON at 1
（OUT）   ＝   Output cell No.   Range : 1 to 8
（HIGH）   ＝   Upper limit setting,   Range : 0.0 to 99.9
（LOW）   ＝   Lower limit setting,   Range : 0.0 to 99.9
（BUZZER）   ＝   Buzzer ON ／ OFF
                 OFF at 0 , ON at 1

Example :   LM2 ／ 1 ／ 8 ／ 80.0 ／ 10.0 ／ 1
              ↓
             2CH   Buzzer ON
                                             Lower limit value is 10.0%
                                  Upper limit value is 80.0%
         Display, output ON   Output cell No.8

（3）SC（Setting of the scaling）
Format：SC（CH）／（USE）／（FULL）／（ZERO）／（UNIT）

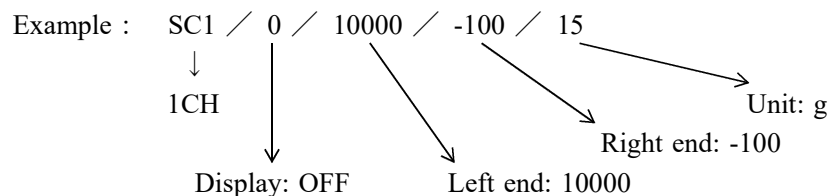（CH）   ＝   Channel No.   Range：1 to 8
（USE）   ＝   ON／OFF of the scaling
                  OFF at 0 , ON at 1
（FULL）   ＝   Value of the scaling at the left end   Range：-10000 to 10000.
（ZERO）   ＝   Value of the scaling at the right end   Range：-10000 to 10000.
（UNIT）   ＝   Unit No.   Range：0 to 63.（Refer to the table below.）

Note： The range for FULL and ZERO is in four digits.
        Be careful of placing the decimal point.
        For example, 80.00 is within the range while 80.000 becomes an error.

0 :	1 : mV	2 : V
3 : kV	4 : uA	5 : mA
6 : A	7 : ˚C	8 : ˚F
9 : Hz	1 0 : kHz	1 1 : m/s
1 2 : km/h	1 3 : rpm	1 4 : mg
1 5 : g	1 6 : kg	1 7 : t
1 8 : mm	1 9 : cm	2 0 : m
2 1 : km	2 2 : l	2 3 : l/m
2 4 : l/h	2 5 : mg/l	2 6 : g/l
2 7 : mmHg	2 8 : mb	2 9 : bar
3 0 : mdd	3 1 : pH	3 2 : %
3 3 : %RH	3 4 : ppm	3 5 : ppb
3 6 : W	3 7 : kW	3 8 : kg/cm
3 9 : t/h	4 0 : kg/h	4 1 : mmAq
4 2 : Kc/h	4 3 : us/cm	4 4 : ms/cm
4 5 : G	4 6 : N	4 7 : mile
4 8 : m^3/m	4 9 : m^3/s	5 0 : l/min
5 1 : l/sec	5 2 : msec	5 3 : kcm^2
5 4 : MPa	5 5 : kPa	5 6 : Pa
5 7 : g/sec	5 8 : mg/m^3	5 9 : deg
6 0 : kgf・m	6 1 : N・m	6 2 : ppmC
6 3 :	6 4 : Ω	6 5 : kΩ
6 6 : MΩ	6 7 : gf	6 8 : kgf
6 9 : cm/m	7 0 : Nm^3/h	7 1 : um
7 2 : %rpm	7 3 : kg/s	7 4 : kg/cm
7 5 : kg/mm	7 6 : mmH2O	7 7 : u
7 8 : ue		

Example：   SC1／0／10000／-100／15
                ↓
              1CH   Unit: g
                                              Right end: -100
                 Display: OFF   Left end: 10000

（4） TG（Setting of the tag names）
　　Format：TG（CH）／（TAGNAME）

　　　（CH）　　　＝　　Channel No.　　Range：1 to 8
　　（TAGNAME）＝　　Maximum 8 characters

　　　Example：　TG4 ／ ENGINE
　　　　　　　　　↓　　　　　↓
　　　　　　　　　4CH　　　　Tag name

（5） CM（Setting of the comment）
　　Format：CM（NO）／（COMMENT）

　　　（NO）　　　　＝　　Comment No.　　Range：1 to 3
　　（COMMENT）　＝　　Maximum 60 characters

　　　Example：　CM2 ／ THIS RECORDER IS 8 CH
　　　　　　　　　　↓　　　　　　　　↓
　　　　　　　　Comment No.=2　　　Comment

（6） TM（Setting of year, month, day, hour, and minute）
　　Format：TM（YEAR）／（MONTH）／（DAY）／（HOUR）／（MINUTE）

　　　（YEAR）　　＝　　Range：00 to 99
　　　（MONTH）　＝　　Range：01 to 12
　　　（DAY）　　　＝　　Different depending on the month
　　　（HOUR）　　＝　　Range：00 to 23
　　　（MINUTE）　＝　　Range：00 to 59

　　　Example：　TM93 ／ 09 ／ 06 ／ 18 ／ 32
　　　　　　　　　1993, September 6, 6 o'clock and 32 minutes p.m, is set.

（7） CS（Setting of the chart speed）
　　Format：CS（SPEED）／（UNIT）

　　　（SPEED）　　＝　　Chart speed　　Range：1 to 2400
　　　　　　　　　　　　The range is from 1 to 40 when measured by mm/sec.
　　　（UNIT）　　　＝　　Unit No.　　Range：0 to 2 mm/h, mm/min, mm/sec.

　　　Example：　CS20 ／ 1
　　　　　　　　　Make the chart speed at 20 mm/min.

（8）SA（Start ON ／ OFF）
　　Format：SA（SW）

　　　　（SW）　＝　ON ／ OFF of start
　　　　　　　　　　OFF at 0 , ON at 1

　　　Example：　SA1
　　　　　　　　　Turn ON Start.

（9）SY（Synchronizer ON ／ OFF）
　　Format：SY（SE）

　　　　（SW）　＝　ON ／ OFF of the synchronizer
　　　　　　　　　　OFF at 0 , ON at 1

　　　Example：　SY0
　　　　　　　　　Synchronizer OFF

（10）ME（Measure ON ／ OFF and CH setting）
　　Format：ME（SW）／（CH）／----- ／（CH）

　　　　（SW）　＝　Measure ON ／ OFF
　　　　　　　　　　OFF at 0 , ON at 1
　　　　（CH）　＝　Channel No.　　Range：1 to 8
　　　　　　　　　　（CH）can be omitted. In that case, all the channels are turned
　　　　　　　　　　ON ／ OFF.

　　　Example：　ME1 ／ 1 ／ 2 ／ 3 ／ 5 ／ 6
　　　　　　　　　Set 1, 2, 3, 5, and 6 channels to measure ON.

　　　Example：　ME0
　　　　　　　　　Set all the channels to measure OFF.

（11）FD（Constant amount feed）
　　Format：FD

　　　Example：　FD
　　　　　　　　　10 mm feed

（12）MK（Marker Start）
　　Format：MK

　　　Example：　MK
　　　　　　　　　Recording of the marker

（13） CN（Setting of the transmission channel）
Format : CN（CH）／（CH）／-----／（CH）

（CH）　　　＝　Channel No.　Range : 1 to 8

Example :　CN1／5／7
　　　　　　　Transmission channels are 1, 5, and 7 CH.

（14） AD（Transmission Request of ASCII Date）
Format : AD
Transmission date format :
　　　　　　　　（DATE）／（POINT）／（UNIT）, -----,（DATE）／（POINT）／（UNIT）

（DATE）　＝　Transmission date　　Range : -32768 to 32767
（POINT）　＝　Indicates the position of decimal point　　Range : 0 to 3

As it becomes ---　0 ＝ xxxx　　1 ＝ xxx.x
　　　　　　　　　　　2 ＝ xx.xx　　3 ＝ x.xxx

When the value of （POINT） is N, the actual date becomes
（DATE）／10^N.
（UNIT）　　＝　Unit No.　　Range : 0 to 3
　　　　　　　0 ＝ μ V, 1 ＝ mV, 2 ＝ V, 3 ＝℃

Example :　AD　　（Transmission channels are 1, 5, and 7 CHs.）

Response example :　12563／1／1,　8296／3／2,　5000／1／3

1CH is 1256.3 mV.

5CH is 8.926 V.

7CH is 500.0 ℃

Note : When the DISPLAY of the main unit is performing MONITOR display
　　　 （especially DIGITAL display）, response to AD is delayed.

（15） HD（Transmission Request of Hexadecimal Date）
Valid only with the GP-IB.
Format : HD

Format of the transmission date :
　　　　　　　　（DATE）／（POINT）／（UNIT）, -----,（DATE）／（POINT）／（UNIT）

（DATE）　＝　Transmission date
　　　　　　　Transmitted in the order of lower date and then, upper date.
　　　　　　　Upper MSB represents date sign.
（POINT）　＝　The same as （POINT） of AD
（UNIT）　　＝　The same as （UNIT） of AD

Example :　　HD　　（Transmission channels are 1, 5, and 7 CHs.）

Response example :　　56^{H}32^{H}02^{H}01^H　　31^{H}43^{H}03^{H}02^H　　58^{H}B9^{H}02^{H}01^H

1CH is 128.86mV.

5CH is 17.201 V.

7CH is -180.88 mV.

Note : An END message is transmitted ater the final date transmission.
While the DISPLAY of the main frame is performing MONITOR display
（especially DIGITAL display）,　response of HD is displayed.

（16）RI（Input unit status）
Format : RI（CH）
（CH）　　　 ＝　Channel No.　　Range : 1 to 8

Transmission date format :
（TYPE）／（FILTER）／（SPAN）／（SPAN-L）／（SPAN-R）

（TYPE）　　＝　Input type　　　Range : 0 to 9
　　　　　　　　Stands for　0 : V, 1 : mV, 2 : J, 3 : K, 4 : E, 5 : T, 6 : S, 7 : R
　　　　　　　　　　　　　8 : B, and 9 : Pt.
（FILTER）　＝　Filter ON ／ OFF
　　　　　　　　OFF at 0 , ON at 1
（SPAN）　　＝　SPAN or RANGE
　　　　　　　　SPAN at 0 , RANGE at 1
（SPAN-L）　＝　SPAN-L at SPAN, RANGE at RANGE
　　　　　　　　The range is determined by the TYPE.
（SPAN-R）　＝　SPAN-R at SPAN, BIAS at RANGE
　　　　　　　　The range is determined by the TYPE.

Example : RI3（What is the input information of CH 3）
Example of response :　1 ／ 0 ／ 0 ／ 200 ／ 50

mV

FILTER OFF

SPAN

SPAN-L is 200 mV.

SPAN-R is 50 mV.

（17） RL（Limiter status）
　　　Format : RL（CH）
　　　（CH）　　　＝　Channel No.　　Range : 1 to 8

　　　Transmission date format : （USE）／（OUT）／（HIGH）／（LOW）／（BUZZER）

　　　（USE）　　　＝　Display,　ON／OFF of the output
　　　　　　　　　　　OFF at 0 , ON at 1
　　　（OUT）　　　＝　Output cell No.　　Range : 1 to 8
　　　（HIGH）　　　＝　Upper limit setting,　Range : 0.0 to 99.9
　　　（LOW）　　　＝　Lower limit setting　Range : 0.0 to 99.9
　　　（BUZZER）　＝　Buzzer ON／OFF
　　　　　　　　　　　OFF at 0 , ON at 1

　　　Example : RL2（What is the limiter information of CH 2?）
　　　Example of response : 1／8／80.0／10.0／1

　　　　　　　　　　　　　　　　　　　　　　　　Buzzer ON
　　　　　　　　　　　　　　　　　　　Lower limit value is 10.0 %
　　　　　　　　　　　　　　Upper limit value is 80.0 %」
　　　　　　　　　　Output cell No.8
　　　　　　　Display, output ON

（18） RS（Scaling status）
　　　Format : RS（CH）
　　　（CH）　　　＝　Channel No.　　Range : 1 to 8

　　　Transmission date format :　（USE）／（FULL）／（ZERO）／（UNIT）

　　　（USE）　　　＝　ON／OFF of the scaling
　　　　　　　　　　　OFF at 0 , ON at 1
　　　（FULL）　　　＝　Value of the scaling at the left end　　Range : -10000 to 10000.
　　　（ZERO）　　　＝　Value of the scaling at the right end　　Range : -10000 to 10000.
　　　（UNIT）　　　＝　Unit No.　　Range : 0 to 78（Refer to the table below.）

　　　Example : RS1（What is the scaling of CH 1?）
　　　Example of response : 0／10000／-100／15

　　　　　　　　　　　　　　　　　　　　　　　Unit : g
　　　　　　　　　　　　　　　　　　Right end : -100
　　　　　　　　　　　　Left end : 10000
　　　　　　　　Display : OFF

```
    0：              1：  mV       2：    V
    3：  kV        4：  uA       5：   mA
    6：   A        7：  ˚C       8：   ˚F
    9：  Hz      1 0：  kHz     1 1：  m/s
  1 2：km/h      1 3：  rpm     1 4：   mg
  1 5：   g      1 6：   kg     1 7：    t
  1 8：   mm     1 9：   cm     2 0：    m
  2 1：   km     2 2：    l     2 3：  l/m
  2 4：  l/h     2 5：mg/l      2 6：  g/l
  2 7：mmHg      2 8：   mb     2 9：  bar
  3 0： mdd      3 1：   pH     3 2：    %
  3 3：%RH       3 4：  ppm     3 5：  ppb
  3 6：   W      3 7：   kW     3 8：kg/cm
  3 9：  t/h     4 0：kg/h      4 1：mmAq
  4 2：Kc/h      4 3：us/cm     4 4：ms/cm
  4 5：   G      4 6：   N      4 7：mile
  4 8：m³/m      4 9：m³/s      5 0：l/min
  5 1：l/sec     5 2：msec      5 3：kcm²
  5 4： MPa      5 5：  kPa     5 6：   Pa
  5 7：g/sec     5 8：mg/m³     5 9：  deg
  6 0：kgf·m     6 1：  N·m     6 2：ppmC
  6 3：          6 4：    Ω     6 5：   kΩ
  6 6：  MΩ      6 7：   gf     6 8：  kgf
  6 9：cm/m      7 0：Nm³/h     7 1：   um
  7 2：%rpm      7 3：kg/s      7 4：kg/cm
  7 5：kg/mm     7 6：mmH20     7 7：    u
  7 8：  ue
```

（19）RT（Tag name status）

 Format：RT（CH）

 （CH） = Channel No. Range：1 to 8

 Transmission date format：（TAGNAME）

 Example：RT4（What is the tag name of CH 4?）

 Example of response：<u>ENGINE</u>

<div align="center">↓</div>

<div align="center">Tag name</div>

 （TAGNAME） = Maximum 8 characters

（20）RO（Comment status）
Format：RO（NO）
（NO）　　　　　＝　Channel No.　Range：1 to 3

Transmission date format：（COMMENT）

Example：RO2（What is the content of Comment No.2?）
Example of response：<u>THIS RECORDER IS 16CH</u>
↓
comment

（COMMENT）　＝　Maximum 60 characters

（21）RM（Status of year, month, day, hour, and minute）
Format：RM

Transmission date format：（YEAR）／（MONTH）／（DAY）／（HOUR）／（MINUTE）

Example：RM
Example of response：<u>93 ／ 09 ／ 06 ／ 18 ／ 32</u>
↓
1993, September 6, 6 o'clock and 32 minutes p.m, is set.

（YEAR）　　　＝　Range：00 to 99
（MONTH）　　＝　Range：01 to 12
（DAY）　　　 ＝　Range：01 to 31　　　Differenrt depending on the month
（HOUR）　　　＝　Range：00 to 23
（MINUTE）　　＝　Range：00 to 59

（22）RC（Chart speed status）
Format：RC

Transmission date format：（SPEED）／（UNIT）

（SPEED）　　＝　Chart speed　Range：1 to 2400
　　　　　　　　　The range is from 1 to 40 when measured by mm/sec.
（UNIT）　　　＝　Unit No.　Range：0 to 2 mm/h, mm/min, mm/sec.

Example：RC
Example of response：<u>20 ／ 1</u>
↓
Make the chart speed at 20 mm/min.

（23）RA（Start ON ／ OFF status）
　　　Format：RA

　　　Transmission date format：（SW）

　　　　　（SW）　＝　ON ／ OFF of start
　　　　　　　　　　　OFF at 0 , ON at 1

　　　 Example：RA
　　　 Example of response： 0
　　　　　　　　　　　　　　　 ↓
　　　　　　　　　　　　　 Start OFF

（24）RY（Synchronizer status）
　　　Format：RY

　　　Transmission date format：（SW）

　　　　　（SW）　＝　Synchronizer ON ／ OFF
　　　　　　　　　　　OFF at 0 , ON at 1

　　　 Example：RY
　　　 Example of response： 0
　　　　　　　　　　　　　　　 ↓
　　　　　　　　　　　　 Synchronizer OFF

（25）RE（Measure ON ／ OFF status）
　　　Format：RE

　　　Transmission date format：（CH）／-------／（CH）

　　　　　（CH）　＝　Set all the channels to measure ON

　　　 Example：RE
　　　 Example of response： 1 ／ 2 ／ 3 ／ 5 ／ 6
　　　　　　　　　　　　　　　　　　↓
　　　　　　　　　　　　　　Set 1, 2, 3, 5, and 6 channels to Measure ON

6. OPTION

6.2.5   Error information

When an error occurs, error information is transmitted to the host side.

Error type	GP-IB	RS-232C
Command error	SRQ 65	ERROR 1
Format error	SEQ 66	ERROR 2
Parameter error	SEQ 67	ERROR 3

Command error :   This error occurs when a command other than those in the
command table is transmitted.

Format error   :   This error occurs when the format is different from that of
each command.

Parameter error :   This error occurs when each value is not within the range.

6.3   Limit Output
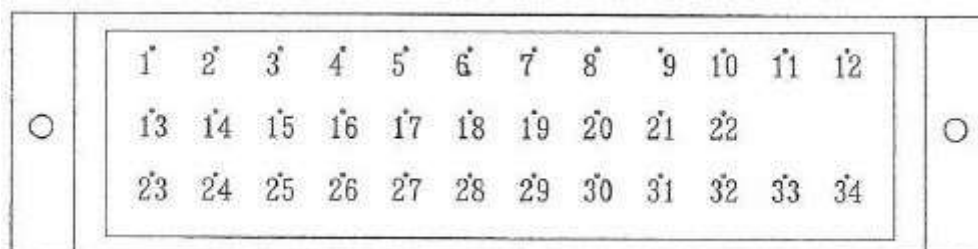
6.3.1   Output

（1）Upper   Output   （2）Lower Output

OUTPUT 1	
Output cell	Pin No.
8	6 - 17
7	5 - 27
6	16 - 26
5	4 - 15
4	3 - 25
3	14 - 24
2	2 - 13
1	1 - 23

OUTPUT 2	
Output cell	Pin No.
8	6 - 17
7	5 - 27
6	16 - 26
5	4 - 15
4	3 - 25
3	14 - 24
2	2 - 13
1	1 - 23

6.3.2   Pin arrangement

MR-34LF

Rear view

7. SPECIFICATIONS

7.1 Main Unit

Basic specifications

Model:	U-841
Number of input:	4 to 8
Operation method:	Automatic balancing system（digital servo system）
Type or input unit:	Plug-in type（2 channels for 1 unit）
Reference point:	Right end of chart paper （Possible to change to left standard by setting）

Recording

Recording pens:	Felt-point pen
Effective recording width:	250 mm
Pen interval:	4 mm
Pen name:	NDL-＊＊
Accuracy:	± 0.25% of measurement accuracy and effective recording width including linearity and dead band
Maximum pen speed:	Approx. 1600 mm/s
Synchronizer:	ON, OFF 20 data/mm
Measure ON/OFF:	Each channel individually
Recording paper:	Roll paper No.25020P50（50 m）, No.2501P50（20 m）
Paper speed:	10 - 2400 mm/min, /h Set at every 1 mm
Resolution of time axis:	0.05 mm
Sampling speed:	Max. 4 ms

7. SPECIFICATIONS

Rapid chart drive:	2400 mm/min（Reverse rotation not allowed.）
Accuracy for chart drive:	± 0.1% when a recording length is 1 m over.
Chart end detection:	Provided（CHART EMPTY is displayed.） Pen-up and Feed stop
Swing-out protection:	Signal limiter
Paper winding-up:	Equipped（option）
Superimposed marker:	Operates by operation switch and external remote controller Link with synchronizer ON/OFF Width: approx. 10 mm On time: 50 ms
Auto pen cap:	Pen is automatically stored at the specified position during power OFF and measurement OFF.

Display section

Display:	5" EL display, 320 x 256 dots
Display mode:	（1）Range display Simultaneous display for all channels （2）Digital measurement value display 6 digits（Mark, measurement data, decimal point） Date, chart speed （3）Wave （4）AUX（optional screen） Limiter, Chart paper feed trigger, Scaling（physical amount）, Time, Tag name, Logging printing, Pen adjustment, Comment, Printing, IC card, CFCARD（option）

Trend function

Number of transmission:	3 steps

Operation

Scaling:	Range: −10000 to +10000 Decimal point and unit are set arbitrarily

Limit switch（output is an option）

    Number of level: 2 for each channel

    Type: Both upper and lower limit

    Warning indicator: If the limit value is exceeded, an alarm sounds.
        With ON/OFF function

    Output（option）:   2 contact points/ch, photo-MOS output
        Max. 8 channels
        Contact-point capacity: 400 VDC，0.1A

GP-IB interface（extra-cost option）

    Standard: Based on IEEE standard 488−1978

    Mode: Both input and output of setting value and measurement
        value

RS-232C interface（extra-cost option）

    Standard: Based on EIA RS-232C

    Mode: Both input and output of setting value and measurement
        value

    Speed: 75, 150, 300, 600 bps
        1.2K, 2.4K, 4.8K 9.6K bps

IC memory card

    Function: Set value

    Capacity: 256 K bytes

    Model: JS256G3-CZ-15

    Battery: 2016 series
        If the battery has run down, the message "NO BATTERY"
        is displayed.

        Life: 5 years or more.（using BR2325 battery, in the ambi-
        ent temperature 25 ℃, in the state removed from the main
        unit）

7. SPECIFICATIONS

CF card（extra-cost option）

Disk used:	3.5" 2HD
Format:	Windows
Date capacity:	64 M bytes ~ 4 G bytes

External remote controller 1

Signal: TTL level
Transistor switch
Contact signal

Following functions can be operated from the external devices:
Operation panel and OR.

Chart paper feed: Start-up and stop

Chart paper rapid feed: Start-up and stop（feed）
     L: start-up
     H: stop

Select of clock for chart-paper feed:
Select the external clock or internal clock.
Chart paper can be fed in synchronization with the external clock.
     L: external
     H: internal

External clock input: 50 µm/1 clock TTL
Max. frequency: 800 Hz
Min. pulse width: 10 µs

Superimposed marker: Simultaneously for all channels
     L: ON

Chart paper feed: Used when operating the units in parallel

Synchronous output: 1 clock/25 µm TTL

Measurment ON/OFF: Simultaneously for all channels
     L: OFF
     H: ON

External remote controller 2 （extra-cost option）

    EXT 1: Chart speed 1
    EXT 2: Chart speed 2

Built-in clock

Accuracy:	$\pm$ 4 seconds by day
Recording digit:	NN year NN month NN day NN hour
	NN minute NN second

Back-up

Item:	Each setting, built-in clock
Battery:	Lithium battery, built-in the body
Memory holding time:	Approx.1 month (at 25 ℃)

Operation

Pen lift:	All pens move to the pen rest when the power is turned OFF. (All pen simultaneous operation type)

                                    Measurement key is OFF －－ Pen up －－ Pen-rest
                                      (During this operation, pens other than the one that is in the measure OFF operation dose not move.)

                                    Measurement key is ON －－ Pen up －－ Moves to recording position －－ Pen down
                                      (During this operation, other pens than the one that is in the measure ON operation does not move.)

7. SPECIFICATIONS

Standard specification

Withstand voltage: Between power supply and control signal:

                                                      3750 V AC, 1 minute

                     Between power supply and chassis（GND）：

                                                      1500 V AC, 1 minute

                     Between analog input and chassis（GND）：

                                                      500 V AC, 1 minute

                     Between each analog input:

                                                      500 V AC, 1 minute

Insulation resistance: Between power supply and chassis（GND）：

                                                  100 Mohm or more at 500 V DC

                     Between I/O control and chassis（GND）：

                                                  20 Mohm or more at 250 V DC

                     Between analog input and chassis（GND）：

                                                  100 Mohm or more at 500 V DC

Operating environment: 5 to 45 ℃, 35 － 80%RH

Storage environment: −5 to 50 ℃, 35 － 80%RH

Power supply: 90 － 132 V AC / 170 － 265 V（Changeover method），

                             47 － 440 Hz

                             9 － 16 V DC（extra-cost option）

Vibration: 0.1 G or less

Shock: Not accept

Power consumption   Maximum   4 pens, 240 W
                                            6 pens, 240 W
                                            8 pens, 250 W
                     At balanced   4 pens, 150 W
                                            6 pens, 155 W
                                            8 pens, 160 W

Dimensions: Approx. 438（W）x 290（H）x 520（D）mm

Weight（including AC voltage/temperature input unit）：

                              4 ch : 13 kg
                              6 ch : 16 kg
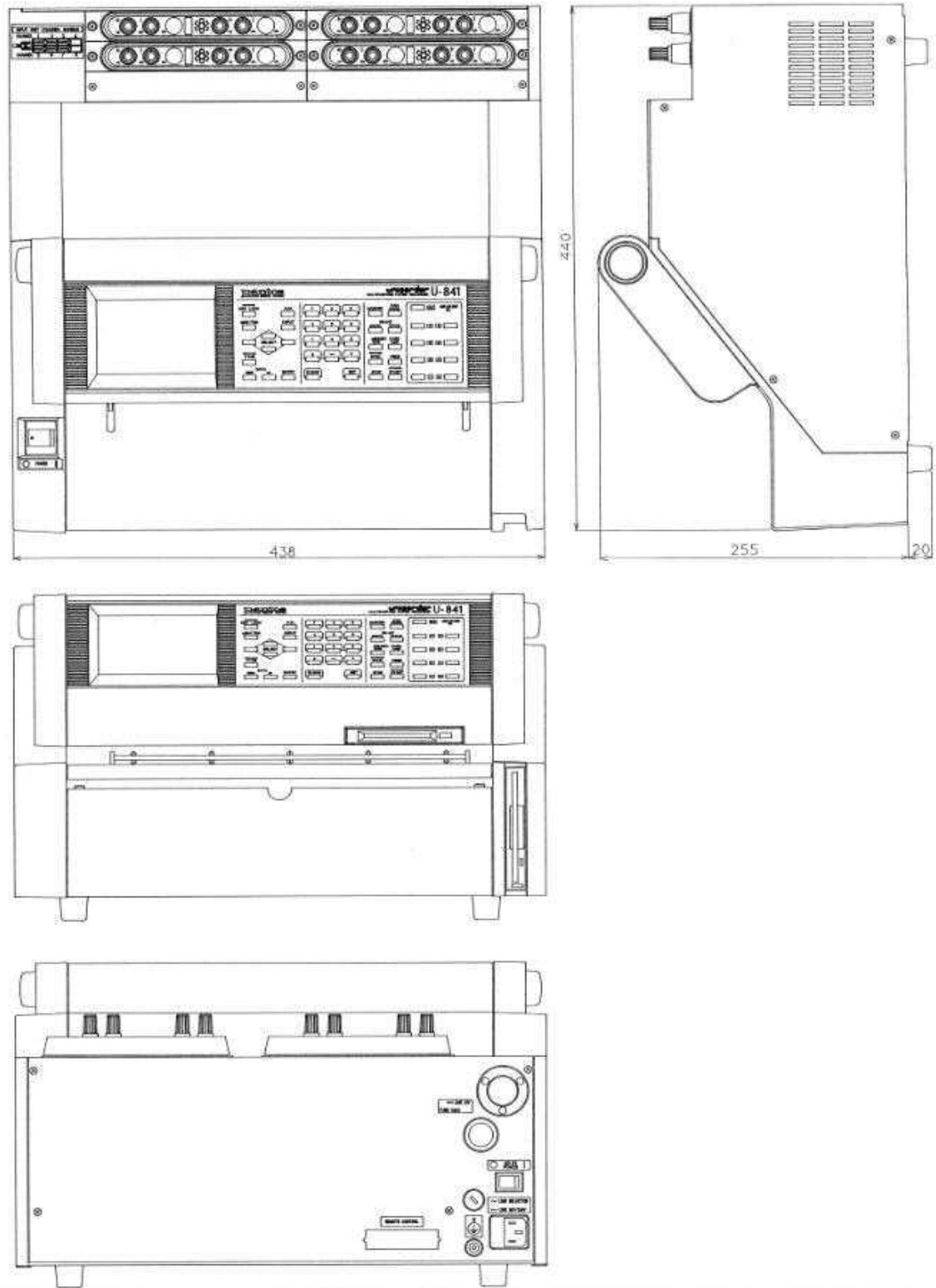   8 ch : 19 kg

Accessories:

Power cable:	1
20 m chart paper No.2501P50:	1
IC card:	1
Pens（various colors）NDL:	1 each
Dust cover:	1
5A fuse（built-in type）:	1
Input cover:	1
Input cover stay:	4
Dropping pipet:	1
Grounding adapter:	1
Instruction manual:	1

External view

U-841

7.2 Input Unit 16TCV1

7.2.1 Introduction

This unit is used as a DC voltage/Temperature input unit for the U-841 series. Two channel measurements can be done with one unit. The settings for each channel are done independent as well as being insulated from each other.

7.2.2 Input

Model name: DC voltage/Temperature input unit 16TCV1

Compatible machines: U-1641 and U-841 series

Input format: Unbalanced, floating

Input resistance: 1 Mohm fixed

Signal source resistance: Less than 1 Kohm

Types of inputs: Voltage
Thermocouple:
JIS 7 types（J, K, E, T, S, R, B）
Temperature measurement resister:
Pt 100 ohm 3 wire（option）

Measurement range: Voltage: $\pm$ 100 µV to $\pm$ 50 V
Measurement for range 100 µV to 500 µV is carried out with magnifying function.
By using a voltage divider（option）, measurements can be made up to $\pm$ 500 V.（When a voltage divider is used, a digital value multiplied by 10 is input.）
Thermocouple（Conforms to JIS）
    J: -210 ℃ to 1200 ℃
    K: -270 ℃ to 1372 ℃
    E: -270 ℃ to 1000 ℃
    T: -270 ℃ to   400 ℃
    S: -50 ℃ to 1767 ℃
    R: -50 ℃ to 1767 ℃
    B: 100 ℃ to 1820 ℃
Temperature measurement resistor:
-200 to 660 ℃ Pt 100 ohm 3 wire（option）

7. SPECIFICATIONS

Zero point movement range: Setting with RANGE and BIAS:

0 to ± 200%, 0.1% increment

Setting with SPAN-L, SPAN-R:

± 1.000%

（Setting in the range 1.0 to 1.1 V is possible.）

Measurement accuracy: Voltage input:

± (0.05% （rdg） + 0.03% （range） + 1 μV)

Thermocouple input:

± (0.05% （rdg） + 0.5 ℃） J, K, E, T

± (0.05% （rdg） + 1 ℃） S, R, B

Temperature measurement resister （option）:

± (0.05% （rdg） + 0.2 ℃） Pt100 ohm

Cold junction compensation:

± 0.5 ℃   J, K, E, T

± 1 ℃   S, R, B

Temperature characteristics: Zero ± (0.2μV/℃ + 0.01% （range）/FS/℃

FS ± 0.01 （range）/FS/℃

30 minutes after power is applied ± 0.5% /FS

Noise-proof characteristics: Common mode reduction ratio （CMRR）:

More than −150 dB （50/60 Hz）

Normal mode reduction ratio （NMRR）:

More than −50 dB （50/60 Hz）

Resolution: 14 bits

Sampling period: 4 ms

Withstand voltage: Between analog input and chassis （GND）:

500 V AC for 1 minute

Between each analog input:

500 V AC for 1 minute

Insulation resistance: Between analog input and chassis （GND）:

More than 100 Mohm at 500 V DC

Filter: ON: 1 Hz, OFF 10 Hz （−3 dB）

*1　range　　Select range from Table 2 in accordance with setting values.

1）When input setting is "SPAN": Range of setting value is either of SPAN-L or
　　SPAN-R, larger one.

Example:
If setting is SPAN-L: 1.2 V and SPAN-R: 1 V, range 1 to 1.2 V is recorded.
As the setting value range is 1.2 V, measurement calculation range is 2.048 V, and accuracy is calculated as:
　$\pm$（0.05% x 0.2 V + 0.03% x 2.048 V + 1 μV）= $\pm$ 0.714 mV

2）When input setting is "RANGE":
　（1）Zero point setting: 0 to 100%
　　　From Table 2, decide the setting value range and measurement accuracy calculation
　　　range.

Example:
If setting range is 1.5 mV and zero point is set to 20%, the range between −0.7 mV to
1.2 mV is recorded. As the setting value range is 1.5 mV, measurement calculation is
2 mV, and accuracy can be calculated as follows:
　$\pm$（0.05% x 1.5 mV + 0.03% x 2 mV + 1 μV）= $\pm$ 2.35 μV

　（2）Zero point is − side and +100% or more
　　　Numerical value of the setting value plus zero point position becomes the setting
　　　value range in Table 2.

Example:
If setting range is 1.5 mV and zero point is set +200%, the range between 3 mV to
4.5 mV is recorded. As the setting value range is 1.5 mV x 200% + 1.5 mV = 4.5 mV,
measurement calculation is 8 mV, and accuracy can be calculated as follows:
　$\pm$（0.05% x 4.5 mV + 0.03% x 8 mV + 1 μV）= $\pm$ 5.65 μV

Set value range	Range
100 μV　−　999 μV	1 mV
1 mV　−　1.999 mV	2 mV
2 mV　−　3.999 mV	4 mV
4 mV　−　7.999 mV	8 mV
8 mV　−　15.99 mV	16 mV
16 mV　−　31.99 mV	32 mV
32 mV　−　63.99 mV	64 mV
64 mV　−　127.9 mV	128 mV
128 mV　−　255.9 mV	256 mV
256 mV　−　511.9 mV	512 mV
512 mV　−　1023 mV	1024 mV
1.024 V　−　2.047 V	2.048 V
2.048 V　−　4.095 V	4.096 V
4.096 V　−　8.191 V	8.192 V
8.192 V　−　16.37 V	16.38 V
16.38 V　−　32.76 V	32.76 V
32.77 V　−　65.53 V	65.54 V

7.2.3 External view

- 89 -
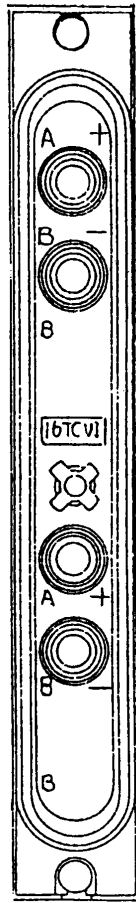
7.3 Input Unit 16RTD1 （option）

7.3.1 Introduction

The 16RTD1 is a platinum resistance thermometer bulb for the and incorporated in the
DC voltage/temperature unit（16TCV1）. It can measure two channels by one unit.
Each channel is set independently and insulated electrically.

7.3.2 Input

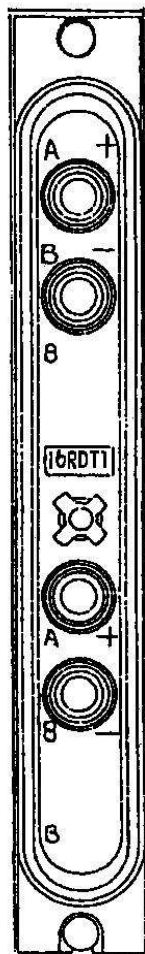Model name: DC voltage/Temperature input unit 16TCV1

Compatible machines: U-1641 and U-841 series

Temperature measurement resistor:
                                Pt 100 ohm 3 wire, 1 mA

Measurement range: −200 to 660 ℃

Measurement accuracy: ±（0.05%（rdg）＋0.2 ℃）Pt 100 ohm

7.3.3 External view

7. SPECIFICATIONS

7.4 DC-DC Converter 16DCP1　　（option）

7.4.1　Introduction

This converter is installed inside the main body of power supply equipment which used DC drives. It is applicable for automotive use but, since it can be used with AC drives also, it can be used as a back-up of an AC power supply.

7.4.2　Specifications

Model name:	84DCP1（-00 version）DC-DC converter
Circuit type:	Switching type
Input voltage:	12 V DC（9 V DC to 16 V DC）
Input protection:	Equipped with protection circuits for decreases and increases in input voltage and reverse connections. If the input voltage goes outside the normal range（9 V DC to 16 V DC）, the unit will not operate.

Power consumption:

Maximum:	8 pens,	145 VA
	6 pens,	138 VA
	4 pens,	132 VA
When balanced:	8 pens,	50 VA
	6 pens,	47 VA
	4 pens,	45 VA

|	
Operating environment:	Corresponds to main unit
Insulation resistance:	Between power supply and chassis（GND）: More than 50 Mohm（500 V DC mega）
Withstand voltage:	Between power supply and chassis（GND）: 500 V DC for 1 minute
Shape:	Internal in main unit
Weight:	Approximately 800 g（Not including weight of main unit and power supply cord）
Accessory items:	Fuse 30 A:　1 DC power supply cord:　1

7.4.3   External view
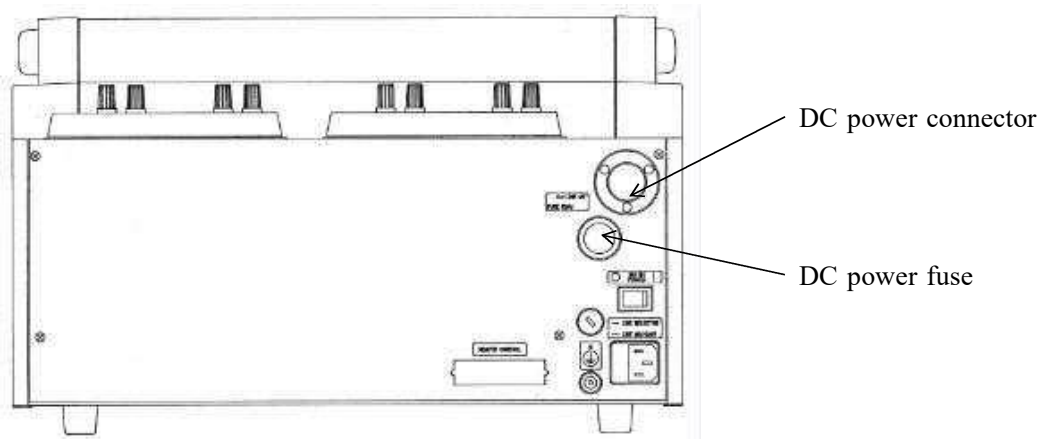
7.5 Chart Paper Take-up Device 84TAK1 （option）

|	
Model:	84TAK1 （-00 version）
Applicable chart paper:	Roll type chart paper No.25020P50 （50 m） No.2501P50 （20 m）
Action:	Independent drive （not interlocked with the chart paper feed mechanism of the U-841.）
Weight:	Approx. 300 g
Accessaries:	Chart paper take-up bobbin 1 Chart paper holder, right 1, left 1

7.6 Cart for U-841 84CART1 （option）

External view

Base plate
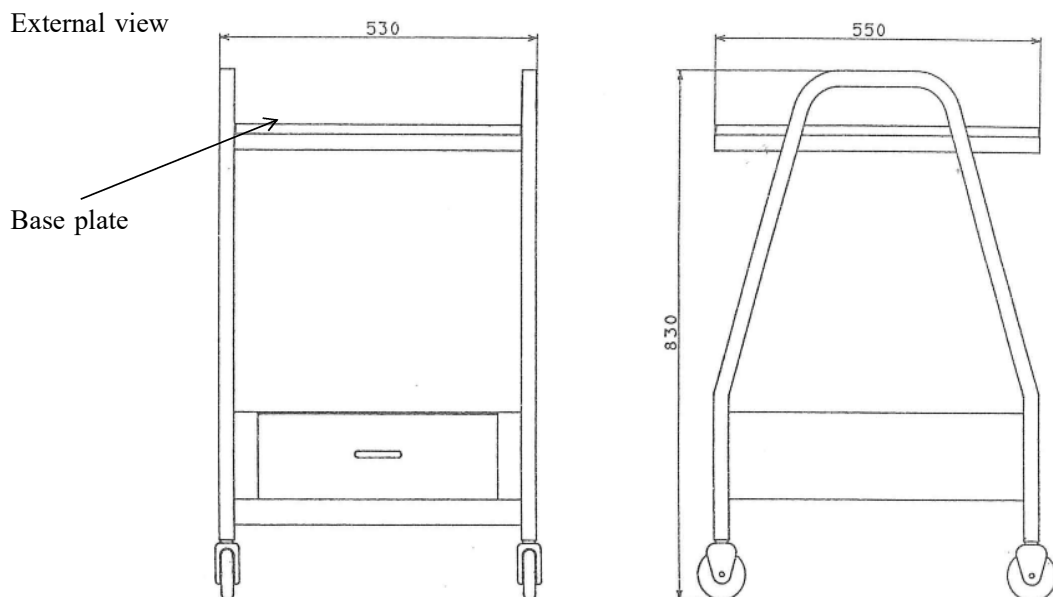
7. SPECIFICATIONS

7.7 CFcard Unit　　16MEM1（option）

Applicable main frame:	U-1641 and U-841 series
Media:	CFcard
Format:	Windows
Data capacity:	64 Mbyte ～ 4 Gbyte
Save:	Real time data is forwarded to a CFcard.
Road:	Save the data of the CFcard.
Delete:	Delete the data of the CFcard
Sampling time:	Can be established irrespective of the chart speed. Setting area　4 msec ～ 9996 msec
Record time:	Set automatically from a save, length, sampling time, and displayed by a screen.

7.7.1　External view
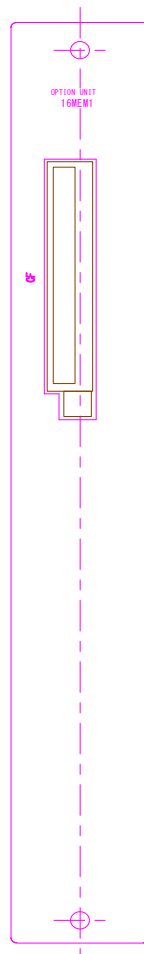
7.8 Interface Unit 161NF2　（option）

      Applicable main frame: U-1641 and U-841 series

      Standard: Conforms to EIA RS-232C

      Mode: Input ／ Output of the setting values and measurement
      values

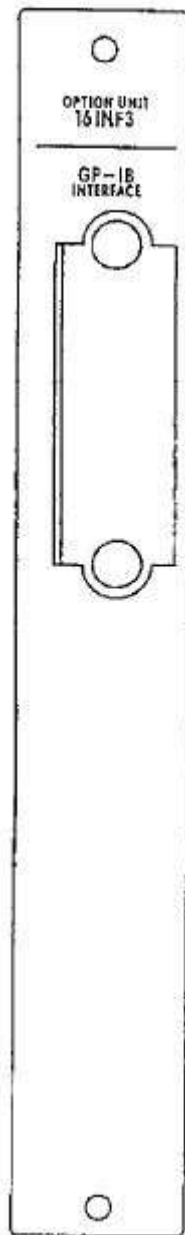   Transmission speed: 1.2 K, 2.4 K, 4.8 K, 9.6 K bps

7.8.1 External view

7. SPECIFICATIONS

7.9 Interface Unit 161NF3 (GP-IB) (option)

Applicable main frame: U-1641 and U-841 series

Standard: Conforms to IEEE std 488-1978

Mode: Input ／ Output of the setting values and measurement values

7.9.1 External view

7.10 Limit Output　16LIM2　　（option）

       Applicable main frame:　　　　U-841

       Output element:　　　　Photomos relay

       Load:　　　　Combined use for AC／DC

       Load voltage:　　　　400V（AC peak value）

       Load current:　　　　150 mA max.

       On resistance:　　　　16 ohm max.

       Accessory:　　　　Connector　　　2

7.10.1　External view