Instruction Manual

Model 4181 1-Pen Model μR250
Model 4182 2-Pen Model
Model 4183 3-Pen Model
250 mm Micro Recorders

IM 4J1B1-01E

YOKOGAWA ◆
Yokogawa Electric Corporation

IM 4J1B1-01E
5th Edition

CONTENTS

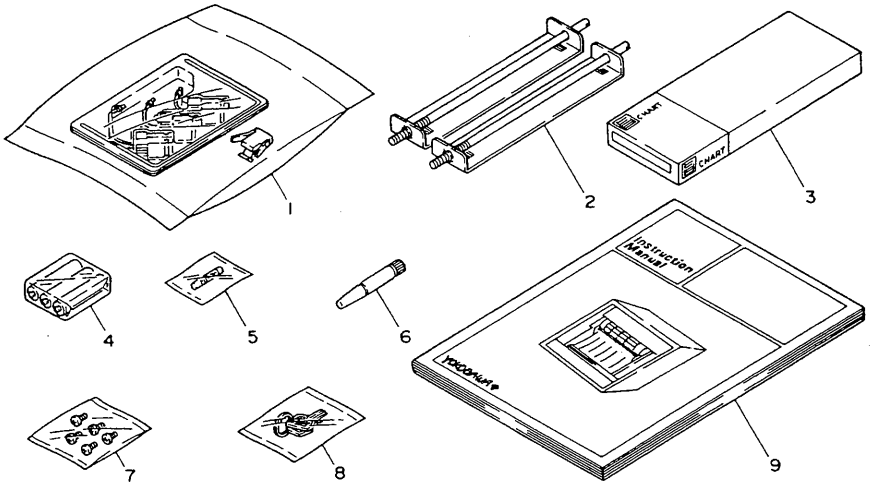
1. HANDLING CAUTIONS.

The Model μR250 Recorders are thoroughly factory-tested before shipment. When the instrument is received, however, check visually if any external damage has occurred during shipment. Confirm that all standard accessories were supplied.

If you have any problems or questions, please contact the nearest YOKOGAWA service center or the dealer from whom the recorder was purchased.

1-1. Accessories.

The accessories shown in Figure 1-1 should be supplied with the instrument. Check that nothing is missing.



Item	Description	Q'ty
1.	Disposable Felt-Tip Pen	
	1-pen Model (4181)	1 (red)
	2-pen Model (4182)	2 (red, green)
	3-pen Model (4183)	3 (red, green, blue)
	Plotter Pen (for 4181, 4182 and 4183)	1 (purple)
2.	Mounting Bracket	2
3.	Chart	1
4.	1.5V Battery (JIS SUM-3, ANSI AA)	3
5.	Fuse	1
6.	Lubricating Oil	1
7.	Terminal Screw (spare)	5
8.	Key (for key lock)	2
9.	Instruction Manual	1

Figure 1-1. Accessories.

•**Spares**

Name	Part No.	Description
Felt-tip pen	B9565AP	red (3 pcs./unit), order q'ty: 1 unit
Felt-tip pen	B9565AQ	green (3 pcs./unit), order q'ty: 1 unit
Felt-tip pen	B9565AR	blue (3 pcs./unit), order q'ty: 1 unit
Plotter pen	B9565AS	purple (3 pcs./unit), order q'ty: 1 unit
Z-fold chart	B9538RN	approx. 20 m (1 box/unit), order q'ty: 6 units

1-2. Removing Shipping Lock Screw and Packings.

The internal assembly is secured in position by packing to safeguard it against damage during transit.

Hold the lower left front corner of the display panel (see Figure 1-2 and CAUTION in the right column) and gently pull the display panel outwards. Remove all the packing material from the internal assembly.

CAUTION

The internal fluorescent lamp is at the bottom rear of the display panel. When opening the display panel, do not hold the bottom of the display panel or you are likely to break the fluorescent tube.

1-3. Data Plate Check.

The recorder model name is indicated on the data plate*.

Verify that it is specified in the order. When enquiring about the recorder, provide the model name (MODEL), and serial number (NO.).

* The data plate is attached to inside (left side of the chart compartment) the internal assembly (Figure 1-2).

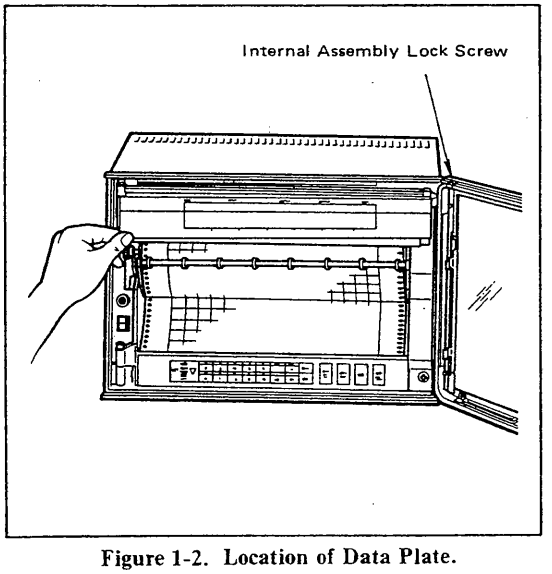


Figure 1-2. Location of Data Plate.

2. GENERAL.

2-1. Description.

This manual describes the one-, two- and three-pen recorders in the μR250 series.

The μR250 series recorders support a wide range of inputs: DC voltage, nine types of thermocouples and RTD (resistance temperature detector), and converters for pressure, differential pressure, flow rate, dewpoint, humidity and pH.

Full-scale range, chart speed and alarms can be programmed via the front panel keyboard. In addition to analog data writing (or printout), the μR250 also provides both digital and analog (bar graph) monitoring displays, and digital monitoring printout. The recorder is easy-to-use.

2-2. Features.

(1) Input types and full-scale ranges may be programmed for each pen using the front panel keyboard.
(2) 3 displays that each measured value is displayable.
(3) Versatile digital printout functions.
Periodical data, program listings and alarms can be printed out.
(4) Internal illumination (standard).
An internal fluorescent lamp is provided for quick chart reading even in low ambient light conditions.
(5) A wide range of input types – 9 types of TC's (types R, S, B, K, E, J, T, N, W), RTD (pt 100 ohms), or DC voltage inputs. These inputs may be selected and combined.
(6) Clear, distinct color traces.
1st pen: Red common to one-, two- and three-pen models.
2nd pen: Green common to two- and three-pen models.
3rd pen: Blue only for three-pen model.
(7) Temperature difference (ΔT) recording, linear scaling, and square rooting functions.
(8) Versatile recorder with a wide range of standard and optional features.
Other standard features include channel skip, battery-backup memory and bar graph analog display.
(9) Additionable communication function RS232C (additional specification).

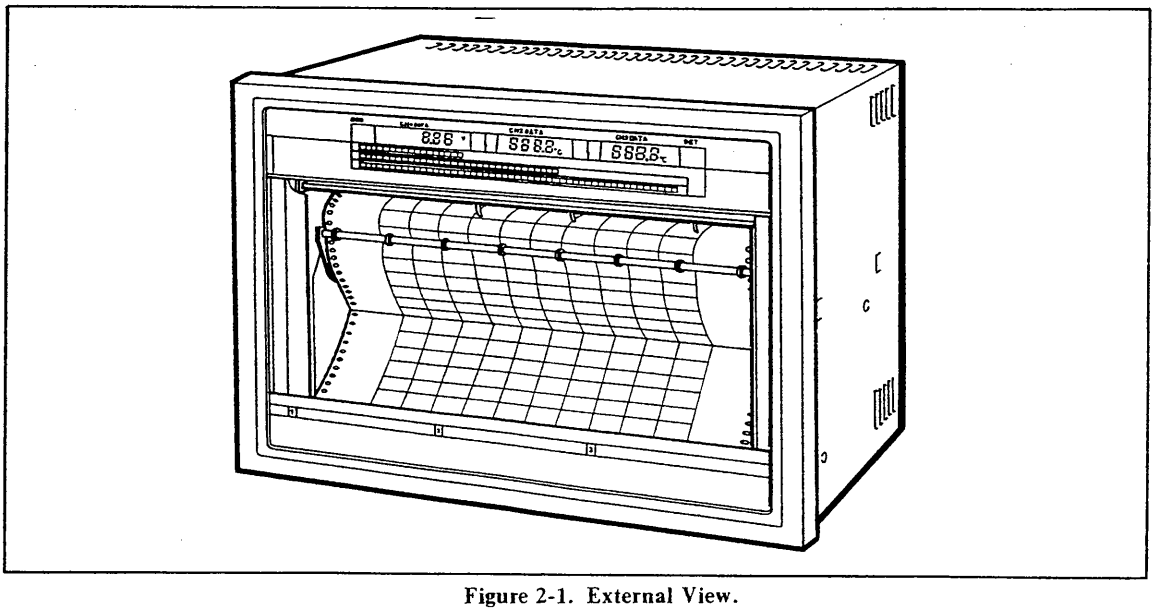


Figure 2-1. External View.

2-3. Specifications.

Model: 1-, 2-, or 3-pen 250mm recorder.

Input

Number of Inputs: 1 for Model 4181, 2 for Model 4182, 3 for Model 4183.

Type of Input Circuit: Floating, channels are isolated from each other.

Scan Cycle Time (or Rate): 125 ms/input channel.

Input Signal Levels: DC V...5 mV to 50V span, TC...more than 100°C span (and 3 mV span), RTD...more than 50°C span (Pt 100Ω).

Full-Scale Range Setting: Programmable via keyboard. (Using Range Code)

Measuring Range: See Tables 2-1-a, b, c.

ANSI, JIS (°C) model .....

Table 2-1-a.

Input type	Range code	Range	Measuring range	Remarks
DCV	00		−20.00 to 20.00mV	
	01		−200.0 to 200.0mV	
	02		−2.000 to 2.000V	
	03		−6.000 to 6.000V	
	04		−20.00 to 20.00V	
	05		−50.00 to 50.00V	
TC (JIS ANSI)	10	Type R	0 to 1760°C	
	11	Type S	0 to 1760°C	
	12	Type B	400 to 1820°C	
	13	Type K	−200 to 1370°C	Former CA
	14	Type E	−200.0 to 800.0°C	Former CRC
	15	Type J	−200.0 to 1100°C	Former IC
	16	Type T	−200.0 to 400.0°C	Former CC
	17	**Type N	0 to 1300°C	NBS
	18	**Type W	0 to 2315°C	OMEGA
RTD	20	JPt100 Pt 100	−200.0 to 550.0°C	Measuring current 1mA
DCV (linear scaling) *mA	30		−20.00 to 20.00mV	
	31		−200.0 to 200.0mV	
	32		−2.000 to 2.000V	
	33		−6.000 to 6.000V	
	34		−20.00 to 20.00V	
	35		−50.00 to 50.00V	
DC (square rooting) *mA	40		−20.00 to 20.00mV	
	41		−200.0 to 200.0mV	
	42		−2.000 to 2.000V	
	43		−6.000 to 6.000V	
	44		−20.000 to 20.00V	
	45		−50.00 to 50.00V	

* μR250 can accept a current input when a current shunt is used.

** Type N (Nicrosil-Nisil), Type W (W5%Re-W26%Re) ..... not included in ANSI, DIN and JIS.

DIN (°C) model .....

Table 2-1-b.

Input type	Range code	Range	Measuring range	Remarks
TC (DIN)	10	Type R (Pt13Rh-Pt)	0.0 to 1760.0°C	DIN IEC 584-1
	11	Type S (Pt10Rh-Pt)	0.0 to 1760.0°C	
	12	Type B (Pt30Rh-Pt6Rh)	400.0 to 1820.0°C	
	13	Type K (NiCr-Ni)	−200.0 to 170.0°C	
	14	Type E (NiCr-CuNi)	−200.0 to 800.0°C	
	15	Type L (Fe-CuNi)	−200.0 to 900.0°C	DIN 43710
	16	Type U (Cu-CuNi)	−200.0 to 400.0°C	DIN 43710
	17	Type N	0.0 to 1300.0°C	NBS
	18	Type W	0.0 to 2315.0°C	OMEGA
RTD	20	Pt 100	−200.0 to 550.0°C	Measuring current 1mA

Other ranges correspond to the ANSI, JIS (°C) model.

ANSI, DIN (°F) model .....

Table 2-1-c.

Input type	Range code	Range	Measuring range	Remarks
TC (ANSI)	10	Type R	32 to 3200°F	
	11	Type S	32 to 3200°F	
	12	Type B	752 to 3308°F	
	13	Type K	−328 to 2498°F	
	14	Type E	−328 to 1472°F	
	15	Type J	−328 to 2012°F	
	16	Type T	−328 to 752°F	
	17	Type N	32 to 2372°F	NBS
	18	Type W	32 to 4200°F	OMEGA
RTD	20	Pt 100	−328 to 1022°F	Measuring current 1mA

Other ranges correspond to the ANSI, JIS (°C) model.
JPt 100: JIS C 1604-1989, JIS C 1606-1989
Pt 100 : JIS C 1604-1989, JIS C 1606-1989
DIN IEC 751, IEC 751

Maximum Allowable Input Voltage (Continuous): ±10V DC for ranges of less than 2V DC, ±100V DC for ranges of 6 to 50V DC.

Recording

Wiring System: Ink writing using disposable felt-tip pen cartridges (analog data) and plotter (digit data).

Recording Colors: 1st pen.....Red
2nd pen.....Green
3rd pen .....Blue

Effective Recording Span: 180 mm (analog data).

Chart: Z-fold chart (20 m) with a calibrated width of 180 mm.

Step Response Time (90% step): 1.5 sec or less*
*Measuring method according to IEC TC65.

Chart Speed Setting: Any of 82 chart speeds can be set via keyboard within the range 5 to 12,000 mm/h (see paragraph 5-4-4 Chart Feed Speed Setting).

Display

(See section 5-2. Description of Display for more information)

Type of Display: LCD.

Digital Data Display:

- ○ Measured data
  DC V.....3-1/2 digits
  Temperature.....0.1°C
- ○ Alarm (H, L (h, l) and ALM)
- ○ Unit
- ○ Date
- ○ Time
- ○ Chart feed speed

Bar Graph Display:

- ○ Measured data (2% resolution)
- ○ Alarm set point
- ○ Alarm flashing display

Status Display: Digital set. · Display mode, alarm (ALM), battery replacement (BAT), record (●), list (LIST), chart feed speed (SP2).

General Specifications

Reference Junction Compensation Accuracy: (At ambient temperature of 5 to 40°C and input terminal temperature equilibrium).
For R, S, B and W type thermocouples, within ±1°C.
For K, E, J, T and N type thermocouples, within ±0.5°C.

Recording Speed: Pen.....Step response time 1.5s or less (90% step).

Input Impedance: At least 10 MΩ on 20, 200 mV and 2V DC voltage input ranges.
At least 10 MΩ on thermocouple input ranges.
Approximately 1 MΩ on 6, 20, and 50V DC voltage input ranges.

Input Bias Current: 10 nA or less, however approx. 100 nA when BU/BD (see optional features) is specified for a thermocouple.

Chart Feed Accuracy: Within ±0.1% (value when at least 1000 mm of chart is fed continuously).

Clock Accuracy: Within ±50 ppm, however clock error of up to one second may occur each time power is switched ON or OFF.

Insulation Resistance: More than 20 MΩ at 500V DC between terminals and case (ground terminal).

Dielectric Strength: 1,500V AC (50/60 Hz) for one minute between power supply and ground terminals, leakage current 2 mA or less.
1000V AC (50/60 Hz) for one minute between input and ground terminals, leakage current 2mA or less.

Accuracy and Resolution (Dead Band)

The following specifications apply to recorders operating under standard operating conditions (temperature: 23 ± 2°C humidity: 55 ± 10%, power supply voltage and power supply frequency: Rated power supply voltage (or frequency) ±1%, warmup time: at least 30 minutes, other ambient conditions should not adversely effect the recorder operation).

Table 2-2.

Input	Range	Measurement (Digital display)		Record (Analog recording)*1		Remarks
		Accuracy	Resolution	Accuracy	Dead band	
DC V 0□ 3□	20mV	±(0.2% of rdg*+3 digits)	10μV	Measurement accuracy ±(0.3% of span)	Dead band 0.2% of recording span	*rdg: indication (reading) value
	200mV	±(0.2% of rdg+2 digits)	100μV			
	2V	±(0.1% of rdg+2 digits)	1mV			
	6V	±(0.3% of rdg+2 digits)	1mV			
	20V		10mV			
	50V		10mV			
TC (Reference junction compensation accuracy is not included) 1□	R S	±(0.15% of rdg+1°C) however R,S: 0 to 100°C±3.7°C More than 100 to 300°C±1.5°C B: 400 to 600°C±2°C	0.2°C			
	B					
	K	±(0.15% of rdg+0.7°C) however, −200 to −100°C ±(0.15% of rdg+1°C)	0.1°C			
	E J T	±(0.15% of rdg+0.5°C) however j: −200 to 100°C ±(0.15% of rdg +0.7°C)				
	N	±(0.15% of rdg+0.7°C)				
	W	±(0.15% of rdg+1°C)	0.2°C			
RTD	JPt 100 Pt 100	±(0.15% of rdg+0.3°C)	0.1°C			

*1 When recording span is set as follows. (in Table 2-2)

JPt 100: JIS C 1604-1989, JIS C 1606-1989
Pt 100 : JIS C 1604-1989, JIS C 1606-1989 DIN IEC 751, IEC 751

Range	Span
20mV	≧ 5mV
200mV	> 20mV
2V	> 200mV
6V	> 600mV
20V	> 5V
50V	> 20V
TC	100°C or more and 3mV or more
RTD	50°C or more

Digital Printout

(prints out with plotter pen in purple color.)

Digital Printout*:

- O Time tick (– sign)
- O Recording color (Red...CH.1, Green...CH.2 and Blue...CH.3)
- O Chart feed speed
- O Tag number (TAG. No.)
- O Scale markings (prints out on both 0 and 100% scale ends)
- O Engineering unit (mV, V, °C (°F) and arbitrary unit set by ASCII codes.
- O Time (hour and minute)
- O Date (year, month and day)
- O Expanded-scale recording boundary (only the Expanded-scale recording set channel)

Alarm Printout*:

- O △ (Alarm ON, ▽ (Alarm OFF) signs
- O Channel No.
- O Alarm mode (H, L, ΔH and ΔL)
- O Alarm output No.
  (O *sign: prints out * sign when alarm memory capacity overflows)
- O Alarm ON/OFF time

Program List Printout*:

- O Date (list printout starting point)
- O Time (list printout starting point)
- O Chart feed speed setting status
  (1st setting speed, 2nd setting speed)
  Effective when/REM is specified
- O Pen offset compensation ON
- O Channel No.
- O Tag setting status
- O Measuring range setting status
- O Recording span setting status
- O Scaling factor setting status
- O Unit setting status
- O Zone setting status
- O Partly enlarged recording set status
- O Alarm setting status

Digital Printout* when Chart Feed Speed is Changed

The chart feed speed can be switched between two values with a remote control signal. The time of chart feed speed change can be printed out when it occurs. However,/REM (optional feature) must be specified.

- O Speed 1 or 2
- O Chart feed speed change ON (remote control signal generation)/OFF time.

* See paragraph 2-5 Recording Example 4 (Printout in REM Mode).

Construction

Material: Case.....Steel plate.
Front door.....Aluminum die-cast.

External Dimensions: All models.....444(W) × 288(H) × 290(D) mm.
(D expresses length from front panel to the rear of the instrument. Front door thickness 22.5 mm (common to 1-, 2- and 3-pen models) is not included. See Figure 3-1).

Finish: Both case and front door frame are black (Munsell N1.5).

Weight (Approx.): 1-pen model.....14 kg approx.
2-pen model.....14.5 kg approx.
3-pen model.....15.5 kg approx.

Mounting: Flush panel mounting (Vertical panel).

Mounting Angle: May be inclined up to 30° backward from vertical. However, rear bottom edge must be horizontal.

Power Supply

Power Supply Voltage: 100, 115, 200, and 230V AC ±10% (must be specified).

Power Supply Frequency: 50 or 60 Hz (must be specified)

Power Consumption (Approx.):
1-pen model.....35 VA
2-pen model.....45 VA
3-pen model.....60 VA

Normal Operating Conditions

Ambient Temperature: 5 to 40°C.

Ambient Humidity: 45 to 85% relative humidity.

Vibration: 10 to 60 Hz, 0.02G or less.

Magnetic Field: 400 AT/m or less.

External Noise:

i) Allowable normal mode voltage (50/60 Hz)
DC V range.... Peak value including signal must be 1.2 × measuring range or less.
TC range ..... Peak value including signal must be 1.2 × thermoelectric emf corresponding to range or less.
RTD range .... 50 mV or less.

ii) Allowable common mode voltage (50/60 Hz) 100V or less on each range.

Warmup Time: At least 30 minute after the power is turned ON.

Memory Backup Power Source: Three 1.5V batteries (JIS SUM-3, ANSI AA).

Effect of Operating Conditions

Power Supply:

- ○ Effect of 10% variation in rated power supply voltage.
  Digital display ..... ± (0.1% of rdg + 1 digit)
  Recording ..... ±0.2% of span
- ○ Effect of 2 Hz variation in rated frequency.
  Digital display ..... ± (0.1% of rdg + 1 digit)
  Recording ..... ±0.1% of span

Ambient Temperature: Effect of 10°C variation in ambient temperature.
Digital display ..... ± (0.1% of rdg + 1 digit)
Recording ..... ±0.3% of span
Within the ambient temperature variation range is 5 to 40°C, the reference junction compensation error changes as follows
TC R, S, B or W ..... ±1°C.
K, E, J, T or N ..... ±0.5°C.
(however, reference junction compensation error of thermocouple input is not included).

External Magnetic Field: Effect of AC or DC 400 AT/m field
Digital display ..... ± (0.1% of rdg + 10 digits)
Recording ..... ±0.5% of span

Input Signal Source Resistance: Effect of signal source resistance 1 kΩ.

i) DC V range
20, 200 mV and 2V ranges ..... ±10 μV
6, 20 and 50V ranges −0.1% or less (change in span)

ii) TC range..... ±10 μV
however, approx. ±100 μV for models with optional TC burnout protection (/BU, /BD).

iii) RTD
Effect of 10Ω variation per wire
Digital display..... ± (0.1% of rdg + 1 digit)
Recording..... ±0.1% of span
(resistance values of three wires must be equal)

External Noise: For external noise of power supply frequency (50 or 60 ± 0.1 Hz as shown in the Normal Operating Conditions above);

- ○ Normal mode noise rejection ratio 40 dB or better
- ○ Common mode noise rejection ratio 120 dB or better
  For voltage and TC inputs, the signal source resistance must not exceed 500 ohms.
  For an RTD input, each lead wire resistance must not exceed 2 ohms.

Operating Position: Effect of the recorder operating position (0 to 30° backwards inclination).
Digital display..... ± (0.1% of rdg + 1 digit)
Recording..... ±0.1% of span

Vibration: Effect when rectilinear motion of frequency 10 to 6 Hz and acceleration 0.02G is applied to the instrument in the direction of three axes,
Digital display..... ± (0.1% of rdg + 1 digit)
Recording..... ±0.1% of span

Alarms

Setting: Via keyboard.
Number of Set Points: Up to four set points/input channel (any H, L, ΔH and ΔL values).
Alarm Output: Four common outputs (relay output is optional).
Alarm Display: LCD (bar graph and "ALM").
Hysteresis: Approx. 0.5% of span (recording).

Standard Functions

Table 2-3.

Standard function	Description
Full-scale range setting	Programmable via keyboard for each channel.
Skip	Printout skips the programmed point (s)
Program listing printout	Contents of entire program memory (range, Tag No., engineering unit, alarm (output relay is optional feature), sensor combined, date and time and chart speed) are listed on the chart.
Digital printout	Date and time, Tag No., engineering unit, scale markings (0 and 100% sides) and chart speed are printed out on the chart at regular intervals.*-1
Display	Digital display: Date and time, Tag No., or each channel measured data is displayed. When setting range or other item, setting value is displayed. Bar graph display: Measured data, or alarm setting point is displayed. Flashes when alarm occurs.
Difference recording (ΔV/ΔT)	On the same measuring range, difference between the reference and any other point can be recorded.*-2 (The reference channel may be selected arbitrarily).
Scaling (Linear & square root)	Scaling for DC V ranges of 5 mV span to 50V (−19999 to 20000, span up to 30000).*-3
Battery back up of memory	Three 1.5V batteries maintain setting data, date and time, when power is removed (battery life — approx. three months)
Zone recording	Selects a recording zone in each channel.
Expanded-scale recording	Part of an important measurement rangew in full scale is expanded to make recording easy-to-read.

*-1 Refer to the ASCII code Table (see pages 5-50 and 5-65) for the characters that can be used for TAG NO. and engineering unit.
*-2 Reference channel No. must be smaller than measurement channel No. (see page 5-33).
*-3 Voltage span at scaling is less than 75% of measurement range (see page 5-41 or page 5-47).

Optional Features

The instrument can be provided with the following features listed in Table 2-4. Details of these optional features are described below.

Table 2-4.

Name		Optional code
Thermocouple burn-out protection	Up scale action	/BU
	Down scale action	/BD
Remote controls		/REM
Alarm output relay unit	6 terminals	/AK-06
	12 terminals	/AK-12
Pen offset compensation		/PS
Message printing		/MSG
RS232C		/RS232C

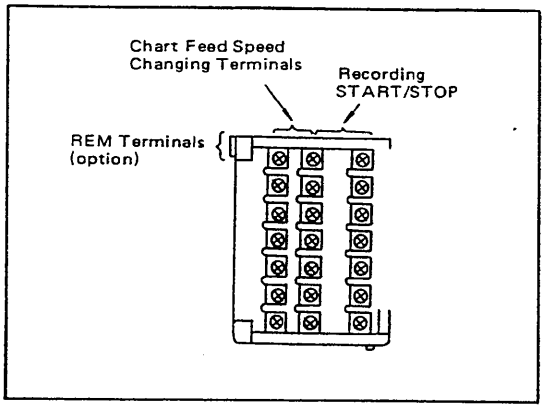


Figure 2-2.

i) **Thermocouple burnout detection (/BU/BD).**
Indication scales out to 100% or 0% side on TC input burnout.
[Burnout current 100 nA
Burnout condition 10MΩ or greater]
- O Burnout upscale action (/BU) common to all points.
- O Burnout downscale action (/BD) common to all points.

ii) **Remote controls (/REM).**
Recording start/stop (chart drive START/STOP) and chart feed speed changing.
① Recording can be started or stopped by external contact signal.
The same function as the [REC] key on the keyboard. However, the remote contact signal oversides the key.
② The chart feed speed is changed from the 1st set point (normal chart feed speed) to the 2nd set point (chart feed speed in remote control mode) by an external contact signal. (See paragraph 2-5 Example of printout in REM mode.)

iii) **Alarm output relays (installed in the recorder if ordered).**
- O /AK-06:
  Number of outputs: 6
  Relay contact rating: 240V AC, 3 A (resistive load) or 30V DC, 3 A (resistive load)
- O /AK-12:
  Number of outputs: 12
  Relay contact rating: 240V AC, 3 A (resistive load) or 30V DC, 3 A (resistive load)

Alarm output terminals for /AK-06 and /AK-12 are arranged in Figure 2-3.

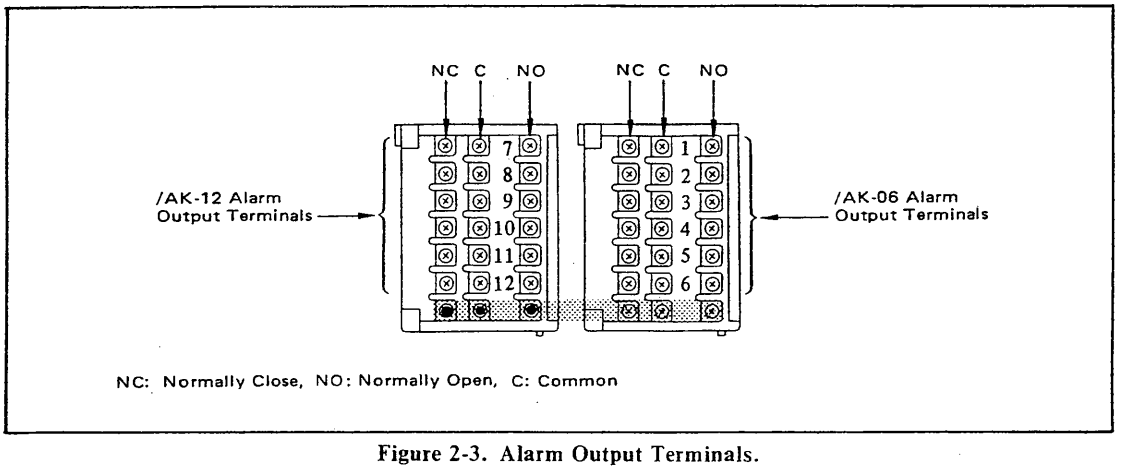


Figure 2-3. Alarm Output Terminals.

Relay contact conditions depend on the instrument (μR250) conditions as follows:

○ Excitation Alarm

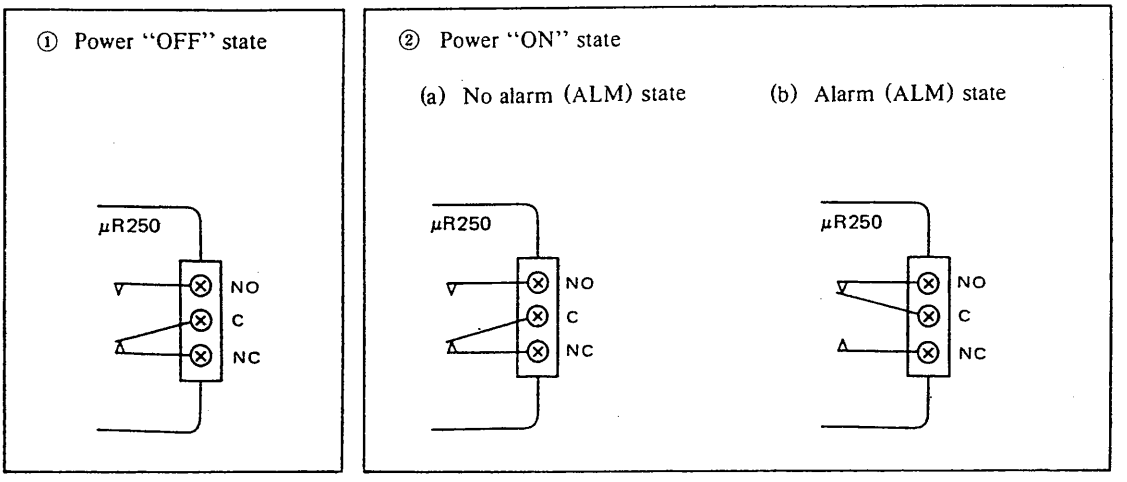
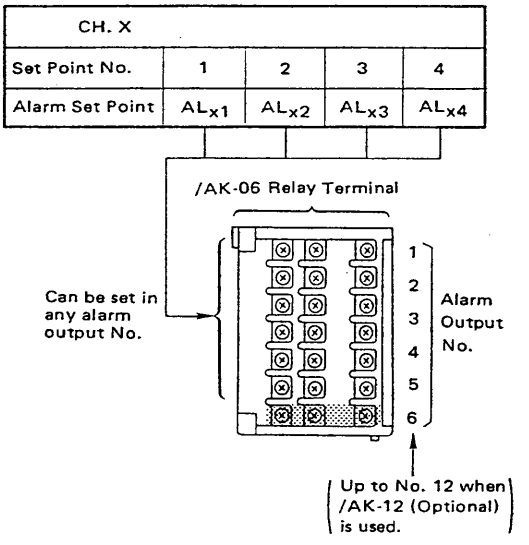


Figure 2-4.

Relays /AK-06 and /AK-12 operate when the measured value reaches the recorder alarm set point. As an example, assume that the /AK-06 relay is attached to the 3-pen recorder and the following alarm points are set.

CH.NO. \ Alarm output No.	1	2	3	4	5	6
CH. 1	AL_{11}	AL_{12}	AL_{13}	AL_{14}		
CH. 2		AL_{21}	AL_{22}	AL_{23}	AL_{24}	
CH. 3			AL_{31}	AL_{32}	AL_{33}	AL_{34}

In ALmn, m means the channel number and n means the alarm set point number. For example, AL_{32} indicates the alarm point (channel number 3 and alarm set point number 2), which is set to the alarm output number 4 (each channel can output up to four alarms (see Note 1)). For alarm output number 4, if an alarm occurs at any alarm set point of AL_{14}, AL_{23}, and AL_{32} in channels 1 through 3, the normally open contact of the relay (for alarm output no. 4) is closed (see (b) of Figure 2-5). For alarm output number 1, only the alarm point AL_{11} is set, so operation of the alarm relay (no. 1 relay) depends on whether the measured value exceeds only AL_{11}.



Note 1: Two or more alarm points cannot be set in any one channel using the same alarm setpoint number.

Note 2: An alarm point indicated by ALmn can be connected to any alarm output (alarm output numbers 1 to 6 or 1 to 12, depending on the specification).

iv) **Pen offset compensation (/PS).**

Pen offset compensation removes the time axis offset between pens.

(Pen offset compensation error ..... 1 mm max)

Let us take a 2-pen recorder (4182) as an example (3-pen recorder is similar).

Figure 2-5 shows a side view of the recording status.

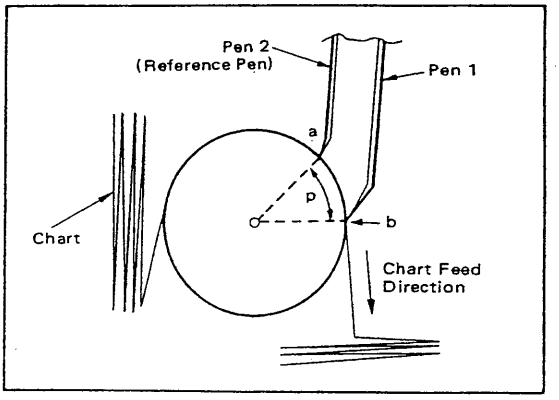


Figure 2-5.

Figure 2-5 shows that, in any pen recorder (to prevent collision between pens), the pens (1 and 2) must be offset by a distance p on the chart and, therefore, points recorded at the same time are separated on the chart time axis.

(Time offset $\Delta = P/V$

Where V: chart-feed speed)

Therefore, a delay memory is used to store measurement data compensate for pen offset.

After the chart has been fed by the time offset p, the pens record the stored (delayed) data.

Note: 1

The reference pen is:
Pen 2 for 4182
Pen 3 for 4183
The pen offset compensation switch is factory set to ON.

Note: 2

Pens other than the reference pen do not perform recording until the time corresponding to the phase difference elapses and, therefore, the pens may seem not to move accurately.
Measured values are still stored by the memory, so the recording pens do not move until the time corresponding to the time offset elapses.
Immediately after turning on power (POWER ON) only the reference pen operates normally.
The other pens do not work until the time corresponding to the time offset has elapsed, but this does not mean failure.

Note: 3

The pen offset compensation function is available only with 2- or 3-pen recorders.
When supplied, the pen offset compensation can be switched ON and OFF. The switch is located on the left side of the battery storage.
The switch cannot be changed with the POWER ON.

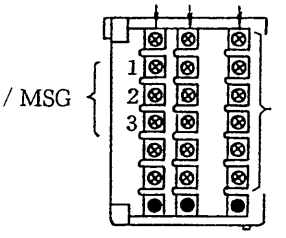
v) **Message printing (/MSG)**

The hour and at external contact ON (CLOSED) and message made with entry (maximum 16 characters) can be printed.

Number of input points: 3 (Three (3) kinds of message can be printed.)

Input signal: Non-voltage contact, 2 sec and more of signal width.

Type of input: Photocoupler isolation (One line common).



vi) **RS-232C (/RS232C)**

Transmission system: Start-stop synchronization type.

Transmission speed: *75, 150, 300, 600, 1,200, 2,400, 4,800, and 9,600 bits/s.

Data: ASCII

Data format:

*Start bit	Data parity		Stop bit
1	8	x	1
1	7	ODD	1
1	7	EVEN	1
1	7	x	2

Hardware handshake:

DTR: The selection to be used always as TRUE
RTS: or control line can be individually per-
CTS: formed.

Software handshake: At data output, it always performs the output control by Xon-Xoff transmitted from the opposite party.

* Set by the dip sw.
For detailed handling, refer to the instruction manual for μR250 RS232C (separate book).

2-4. Models and Suffix Codes.

Model Number	Suffix code	Description
4181	.....	1-pen continuous writing model
4182	.....	2-pen continuous writing model
4183	.....	3-pen continuous writing model
1st pen input for 1-, 2-, or 3-pen model	1	DC V & TC (ANSI, JIS), °C
	2	RTD (JPt 100), °C
	3	DC V & TC (JIS·ANSI), °C
	4	RTD (Pt 100), °C
	5	DC V & TC (ANSI), °F
	6	RTD (Pt 100), °F
	7	DC V & TC (DIN), °C
	8	RTD (Pt 100), °C
2nd pen input for 2- or 3-pen model	0	Specify "0" for 1-pen model
	1	DC V & TC (ANSI, JIS), °C
	2	RTD (JPt 100), °C
	3	DC V & TC (JIS·ANSI), °C
	4	RTD (Pt 100), °C
	5	DC V & TC (ANSI), °F
	6	RTD (Pt 100), °F
	7	DC V & TC (DIN), °C
	8	RTD (Pt 100), °C
3rd pen input for 3-pen model	0	Specify "0" for 1- or 2-pen model
	1	DC V & TC (ANSI, JIS), °C
	2	RTD (JPt 100), °C
	3	DC V & TC (JIS·ANSI), °C
	4	RTD (Pt 100), °C
	5	DC V & TC (ANSI), °F
	6	RTD (Pt 100), °F
	7	DC V & TC (DIN), °C
	8	RTD (Pt 100), °C
Power supply voltage	-1	100 V AC
	-3	115 V AC
	-5	200 V AC
	-7	230 V AC
Frequency	1	50 Hz
	2	60 Hz

Note: Input types are limited within the following combination of Suffix Codes:
Possible combination of suffix codes

1	3	5	7
2	4	6	8

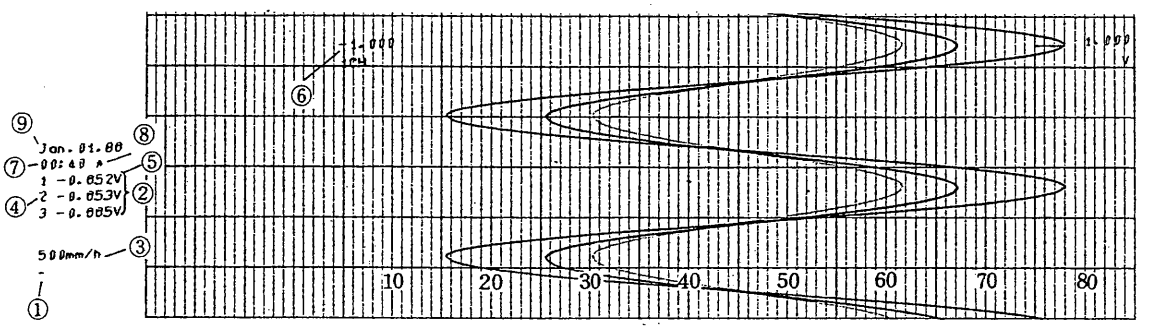
DC V: DV voltage
TC: Thermocouple
RTD: Resistance Temperture Detector
JPt 100: JIS C 1604-1989, JIS C 1606-1989
Pt 100 : JIS C 1604-1989, JIS C 1606-1989
DIN IEC 751, IEC 751

Ordering Instructions

When ordering the recorder, specify the following items.
(1) Models and suffix codes
(2) Optional features

2-5. Recording & Printout Examples.

Recording Example 1



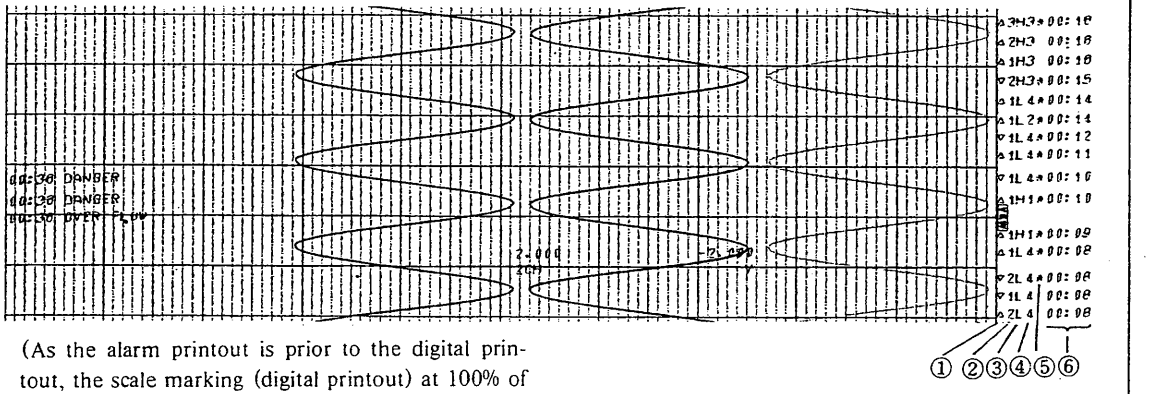
The above figure shows a recording example for the three-pen model (4183) with the pen offset compensation switch ON but without setting zones (predefined areas within the recording range) or expanded-scale recording at critical measuring points.

The digital printout is carried out (using the purple plotter pen). The printout items are as follows:

① Time tick
② Recording color (pen color)
③ Chart feed speed
④ Tag (TAG No.)
When tag is not specified, X CH is printed out (X: any of 1, 2 or 3)
⑤ Engineering unit (mV, V, °C (°F) and arbitrary unit set by ASCII codes)
⑥ Scale markings (prints out at 0 and 100% of chart)
⑦ Time
⑧ *:Printed only when the pen offset compensation switch is turned ON.
⑨ Date

An expanded scale recording boundary will be printed for any channel for which expanded-scale recording is set.

Recording Example 2



(As the alarm printout is prior to the digital printout, the scale marking (digital printout) at 100% of chart is not printed out in the figure)

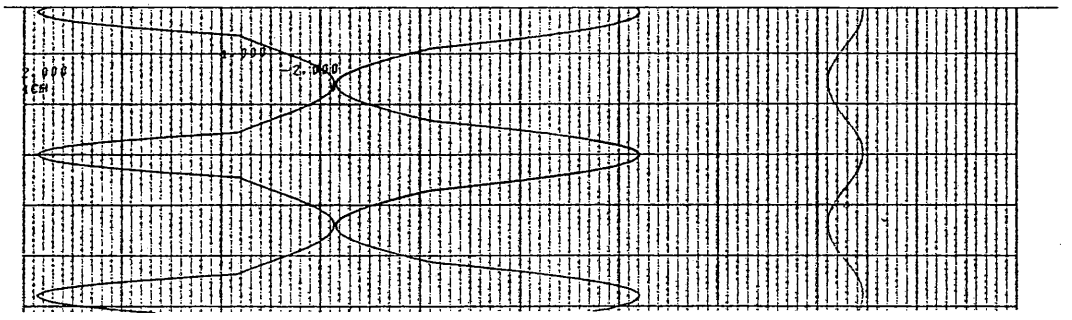
The figure shows an alarm printout example (printed using the purple plotter pen). The printout items are as follows:

① Alarm ON: △ or OFF: ▽
② Channel No. (1 numeric digit)
③ Alarm mode (High: H, Low: L, ΔHigh: h, ΔLow: ℓ)
④ Output No. (1 numeric digit)
⑤ * mark (printed out at alarm memory overflow) (See Note)
⑥ Time when alarm occurred or reverted to normal

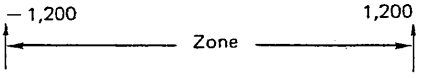
Note)

When * mark is printed out, some other alarms are not printed out. The alarm ON/OFF data are stored in a memory which can store up to 30 data, and the data are output sequentially as alarm printout. However, if alarm turns ON/OFF frequently as shown in the example, the alarm printout (output from memory) speed is slower than the alarm ON/OFF data generation speed, so memory overflow eventually occurs. The data generated on that time cannot be stored or printed out (data to printout in REM mode are included in the 30 data that can be stored).

Recording Example 3



The figure above shows a recording example using the Model 4173, in which a predefined measurement zone is set and expanded-scale recording is performed.

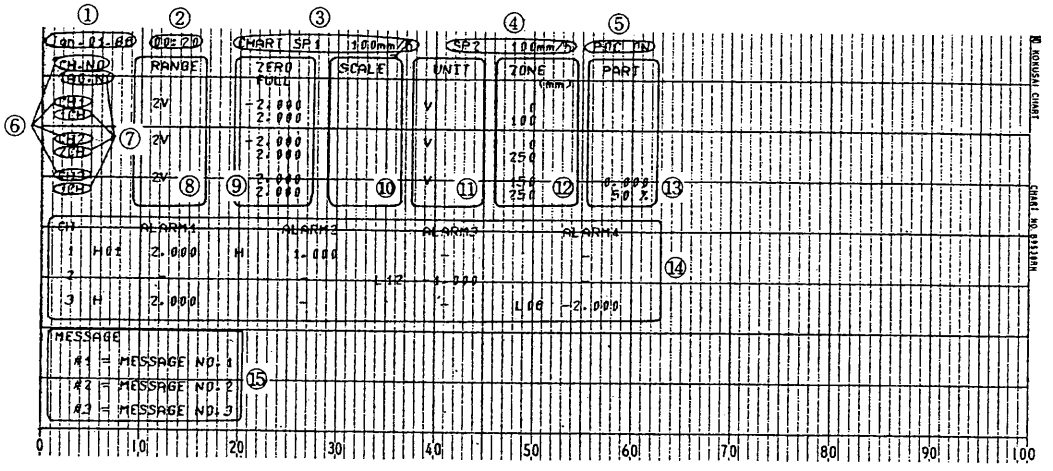


○ In the example above, zones are set for channels 1 and 2. Digital (periodical) printout is carried out for channel 2. A narrow zone (34 mm or less) is set for channel 2, so scale markings and engineering units are not printed out. When scale markings are printed, the area between the two scale markings indicates a new zone.

○ Expanded-scale recording.
Expanded-scale recording is set in a critical measuring range. In this example, this type of recording is set for channel 3 (for more information, see Section 5-4-9 for Expanded-Scale Recording Setting provided later in this manual).

List Printout (Example 4)

A list printout example is shown (using Model 4177).



Let's explain each printing item example.

① Date (Point of time printed)
② Hour (Point of time printed)
③ Recording paper feed speed at normal (First set speed)
④ Recording paper feed speed at remote (Second speed)
⑤ Indicates that the phase synchronization function is 'ON'.
(The printing is not performed when the phase synchronization function is 'OFF' or it is not used.)
⑥ Channel No.
⑦ Tag: The setting is required by the ASCII code. In case it is not particularly set, it becomes the condition of XCH (however, X: 1 to 3)
⑧ Measuring range (in objective): Setting examples are as follows:
CH1: Voltage measurement in the range of 2V.
CH2: Voltage measurement in the range of 2V.
CH3: Voltage measurement in the range of 2V.
⑨ Recording span: Setting examples are as follows:
⑩ Scaling.
⑪ Unit.
⑫ Zone width.
⑬ Part conditions.
⑭ Alarm.
⑮ Message printing.

2-6. Names of Components.

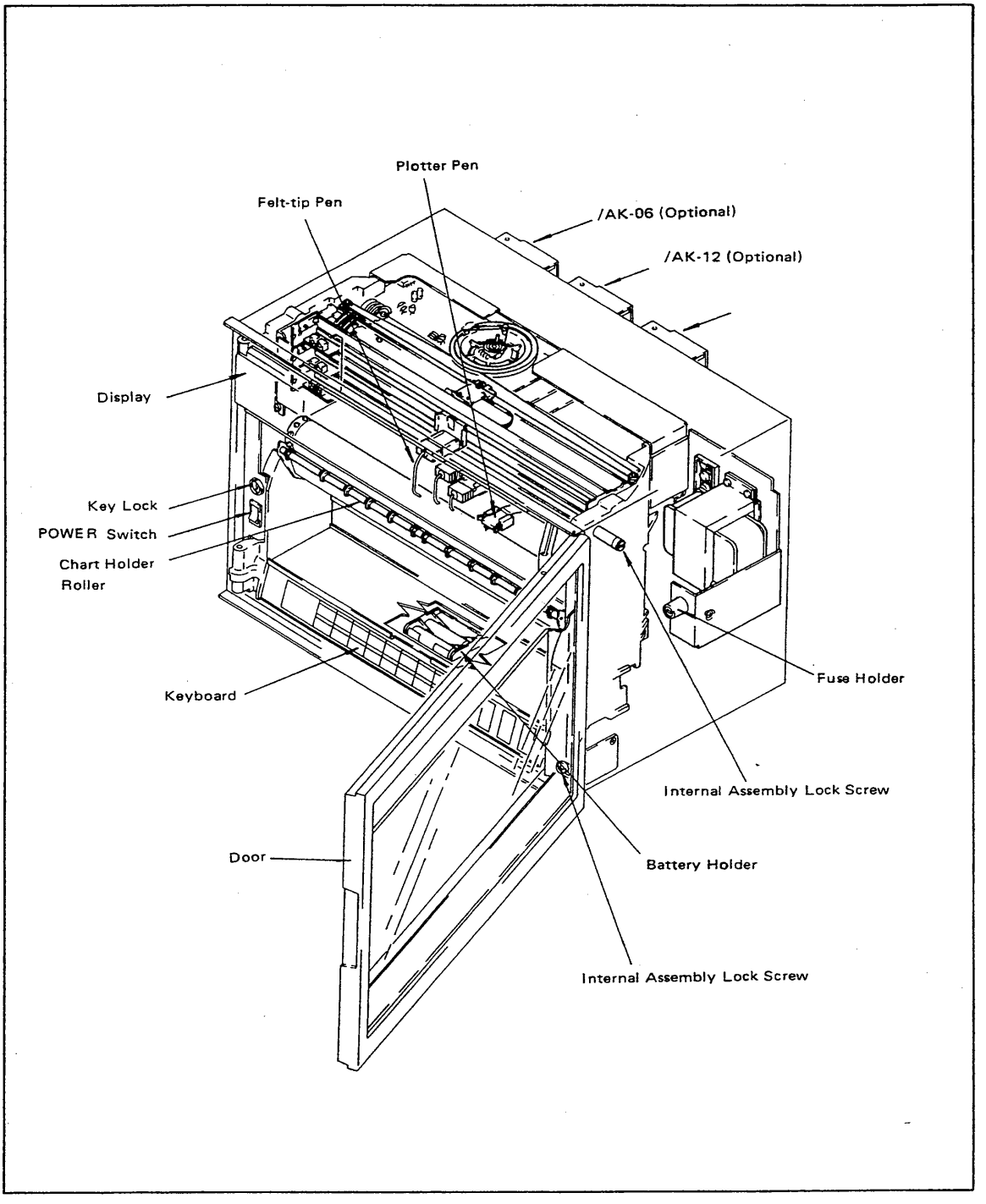


Figure 2-6. Names of Recorder (Model 4173) Components.

3. INSTALLATION.

3-1. General.

The Model μR250 Recorder has been designed for flush panel mounting.

3-2. Installation Area.

Select an installation area which:

(1) is free from mechanical vibration.
(2) is free from corrosive gases.
(3) has minimum temperature variation (area near normal temperature 23°C is preferable).
(4) is not subject to strong heat radiation.
(5) is free from strong magnetic fields.
(6) has 45 to 85% relative humidity at all times.

Note 1) The ink and chart is affected by the humidity when it is too high or too low, use the recorder in ambient humidity range of 45 to 85%.

Note 2) Install the recorder horizontally (however, may be inclined up to 30° backward from vertical).

3-3. External Dimensions and Panel Cutout.

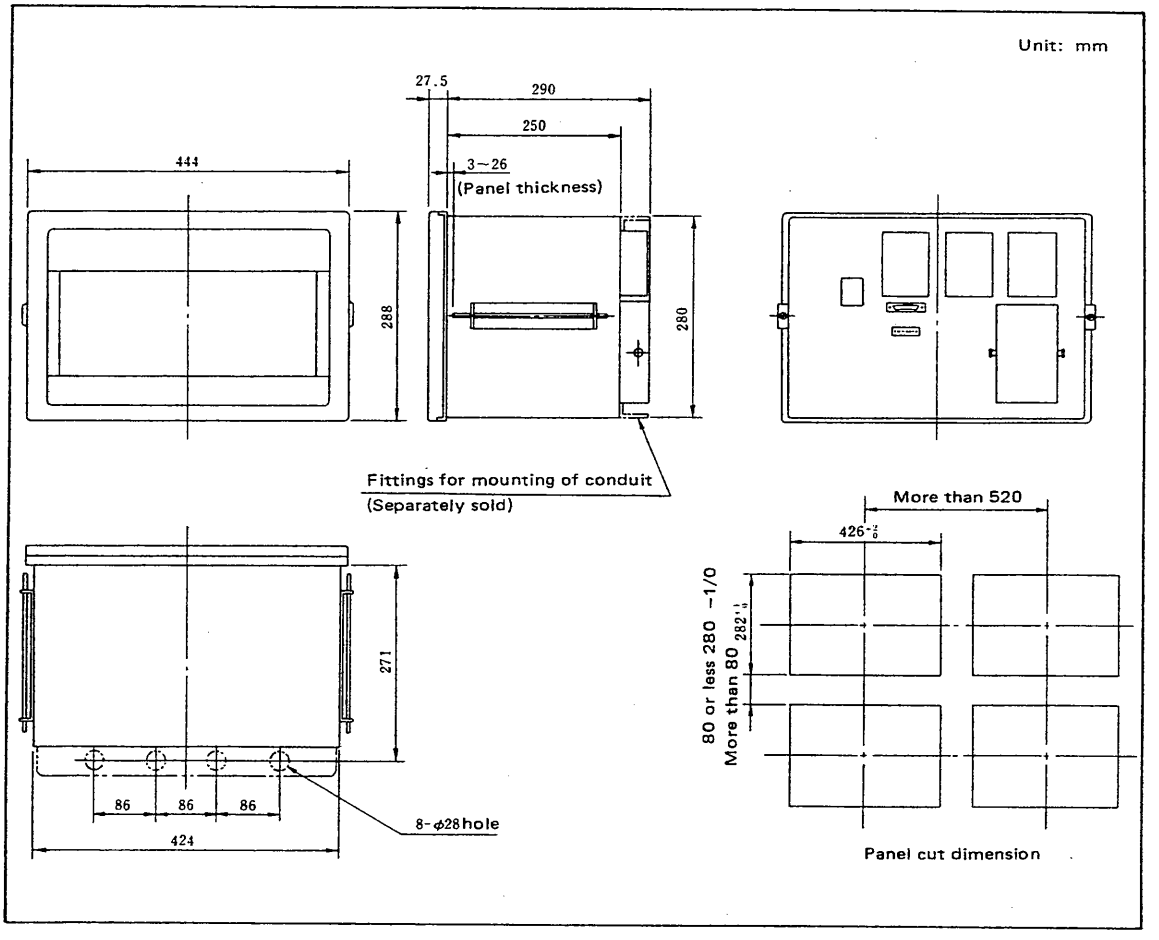


Figure 3-1. External and Panel Cutout Dimensions.

3-4. Mounting.

(1) The recorder should be mounted on a at least 2 mm thick steel panel. (Remove the shipping lock at the case side.)
(2) Insert the recorder into the panel cutout.
(3) Mount the recorder on the panel using the mounting bracket supplied.

Note: Remove the four adhesive labels attached to both sides of the recorder case.

4. WIRING.

4-1. Wiring Instructions.

Turn the recorder power switch OFF. Open the recorder rear terminal covers.

① Use 600V vinyl insulated wire (JIS C 3307) or equivalent or tough vinyl shocked cable.

② It is recommended that thermocouple wires be connected to the recorder terminals. However, where the distance between thermocouples and recorder is long, compensation lead wires can be used.*

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

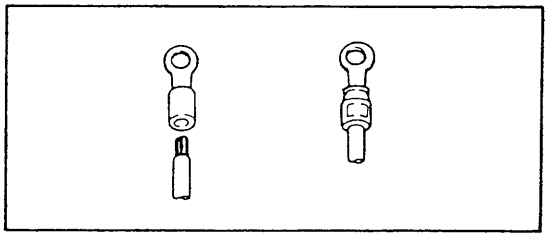


Figure 4-1. Solderless Lugs.

③ The ground terminal should be grounded with a low ground resistance.

④ To minimize noise pickup:

(a) The measuring circuit wiring should be run as remote as possible from the power and ground lines.

(b) It is recommended that shielded wires be used to minimize noise pickup from an electrostatic induction source. The shielding wire of the cable should be connected to the recorder ground terminal (only one ground line).

(c) To minimize noise from an electromagnetic induction source, twist measuring line cables in short and equal spaces.

Note:

o The input terminals are located inside the rear cover with two fasteners (see Figure 4-2). When wiring the input terminals, remove the two fasteners and pull the cover sidewise. After wiring, cover the input terminals.
(The input terminal cover is necessary for securing reference junction temperature compensation for thermocouple use. However, even in any other use, cover the input terminals.

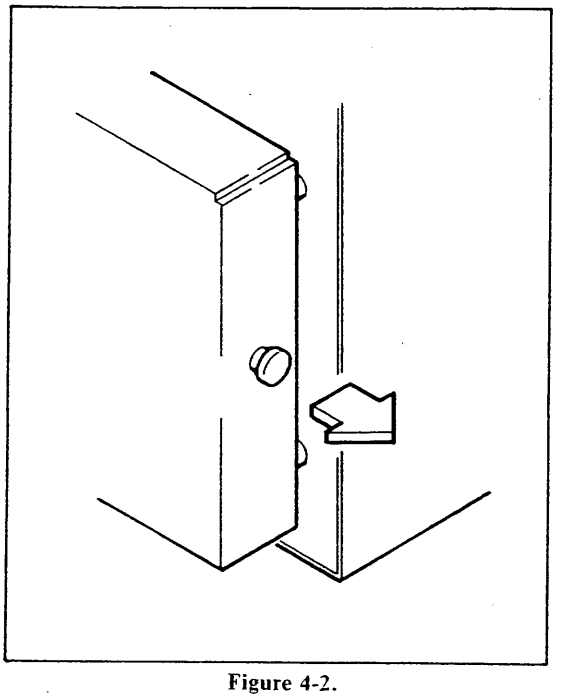


Figure 4-2.

4-2. Recorder Terminal Arrangement.

4-2-1. DC V and Thermocouple Input Models.

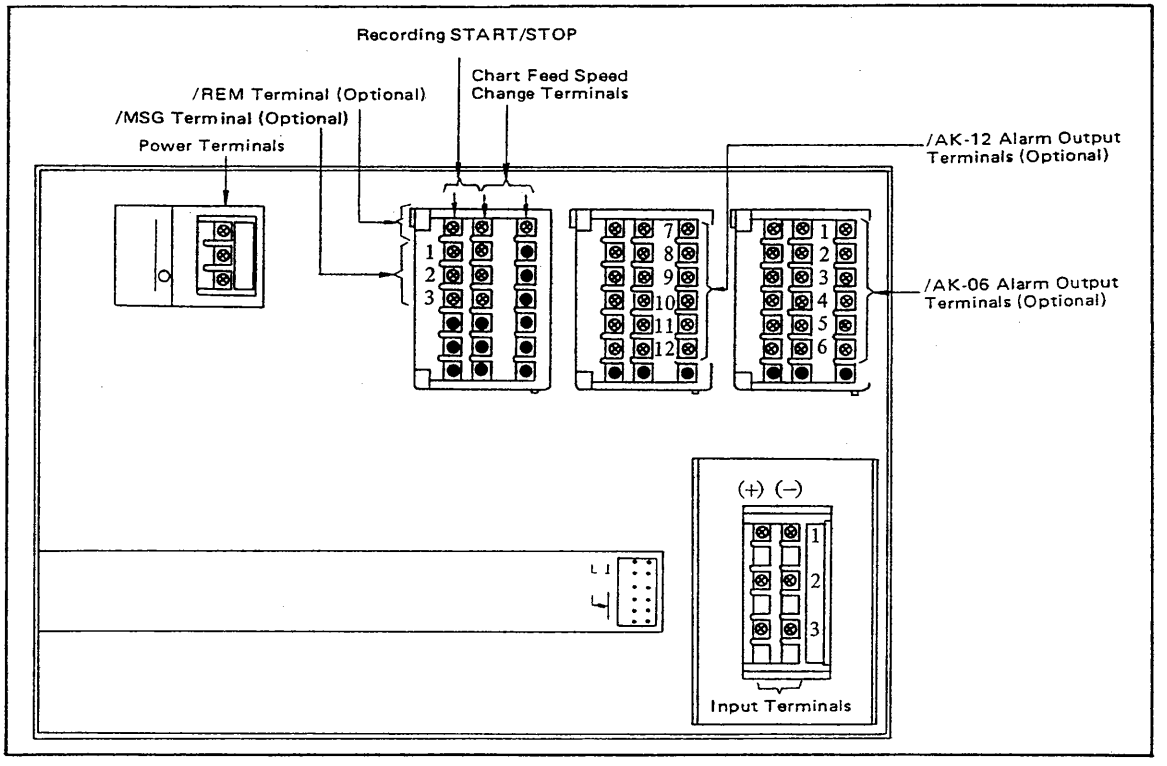


Figure 4-3.

4-2-2. Resistance Temperature Detector Input Models.

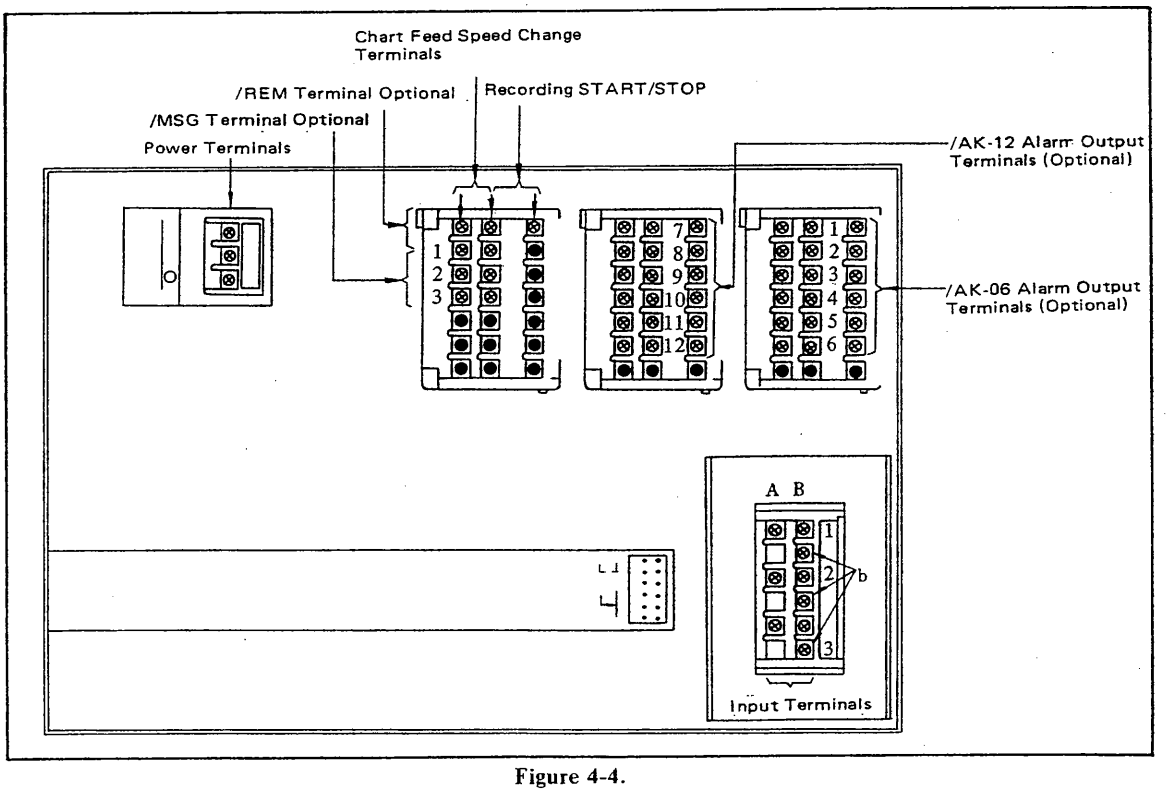


Figure 4-4.

4-3. Wiring Input Terminals.

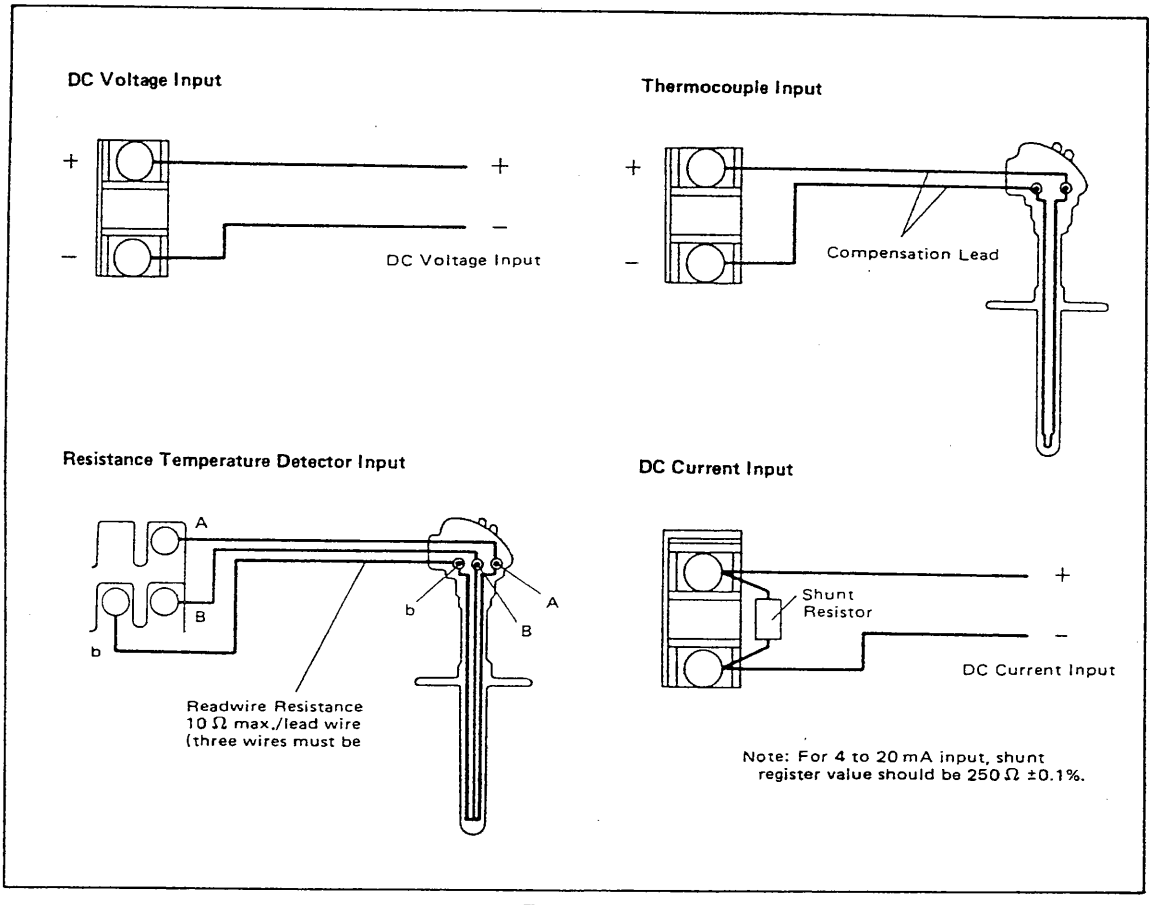


Figure 4-5.

5. OPERATION.

5-1. Preparation.

5-1-1. Loading Chart Paper (Replacing Paper).

(1) Fan chart paper thoroughly at both ends before loading (See Figure 5-1).
(Chart Part No.: B9573AN)

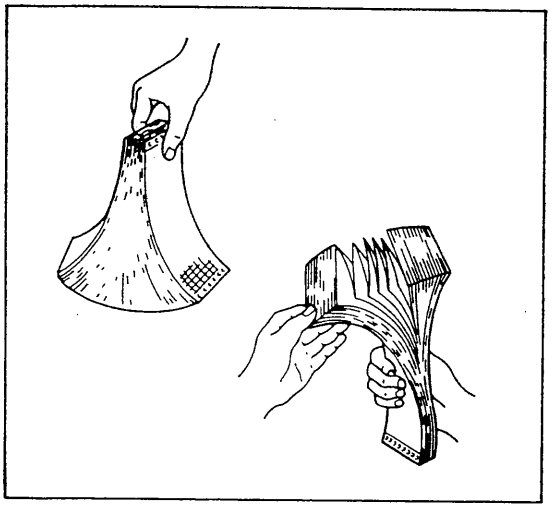


Figure 5-1.

(2) Open the recorder front door. The POWER switch may be even in the ON position.

(3) The spring mechanism is attached to the left end of the chart holder roller (see Figure 5-2). Remove the roller by moving it to the left side.

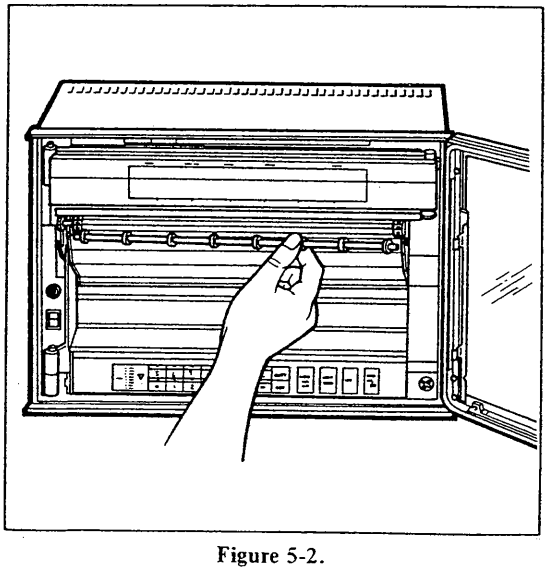


Figure 5-2.

(4) Gently pull down the chart paper compartment tabs located near the right and left ends of the chart feed roller (see Figure 5-3); the chart paper compartment comes down once and if you gently pull down the tabs again you can access the chart paper (see Figure 5-4).

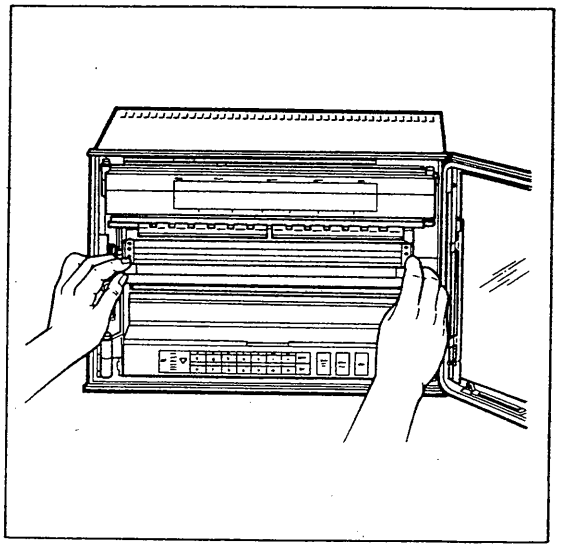


Figure 5-3.

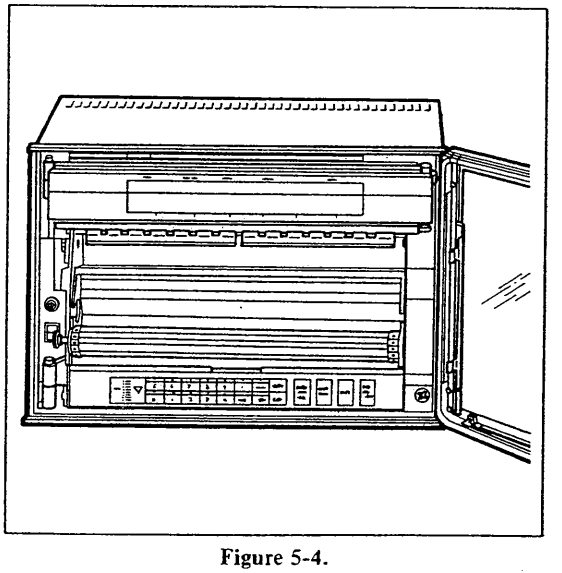


Figure 5-4.

CAUTION

Do not pull down the chart paper compartment with the lock key inserted. Otherwise the chart feed roller (platen) gear hits the key.

(5) Put the chart paper onto the chart paper compartment with the chart paper circle perforation holes facing the left side and load the chart paper making sure that the sprocket teeth of the chart drive are properly engaged in the chart paper perforation holes (see Figure 5-5).

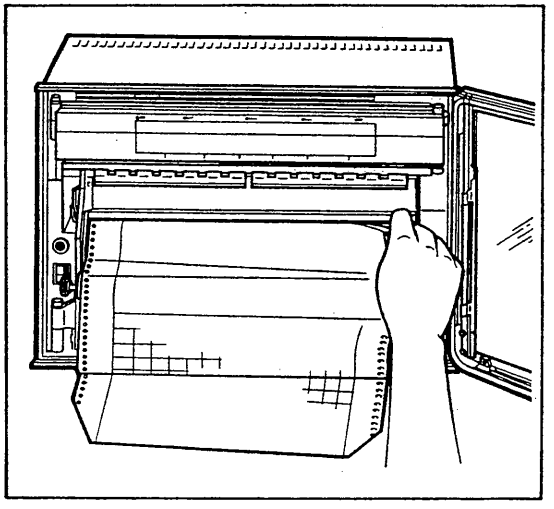


Figure 5-5.

(6) Hold the chart paper so that chart paper perforation holes are not disengaged from the chart feed roller sprocket. Place the chart paper compartment back in position by lifting it until it stops completely (see Figure 5-6).

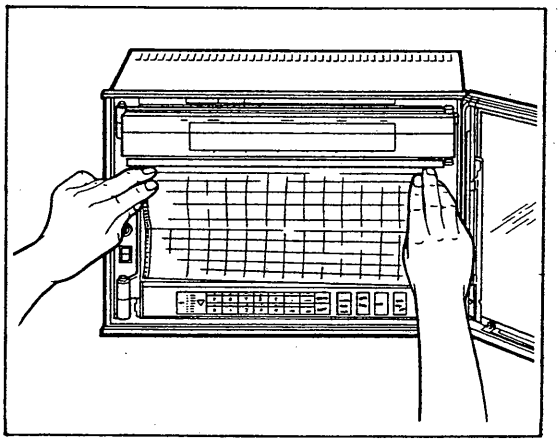


Figure 5-6.

(7) Replace the chart paper holder roller in position (see Figure 5-7).

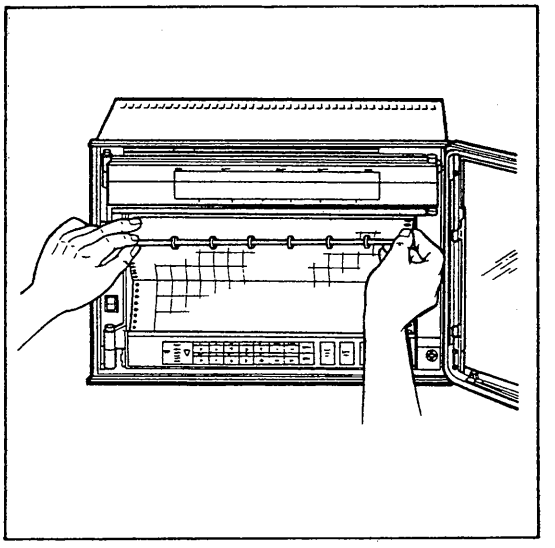


Figure 5-7.

(8) Check that the chart paper perforation holes are fit with the chart paper feed roller sprockets. Press the CHART FEED key and check that the chart paper advances correctly (see Figure 5-8).

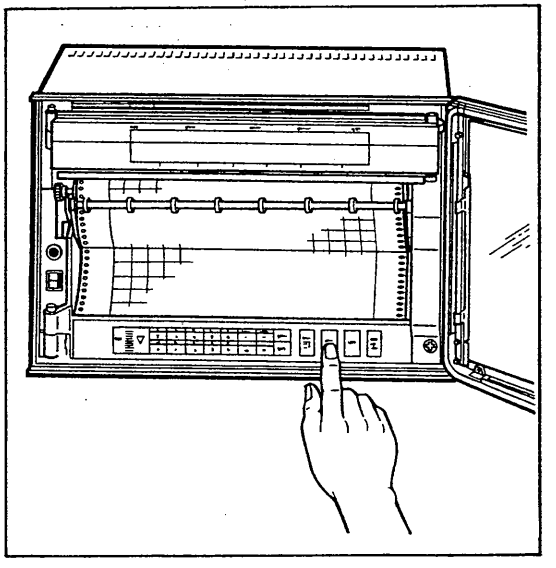


Figure 5-8.

(9) If the chart paper does not advance correctly, repeat steps (3) through (8) again.

5-1-2. Battery Replacement.

Replace the batteries with new ones if "BAT" (low battery) is displayed.

If the "POWER" is switched to "OFF" while "BAT" is displayed, the stored program may be erased.

The batteries (Three commercially available 1.5V batteries.) are shipped with the instrument; install them in the instrument as follows:

(1) Open the recorder front door.

(2) The batteries must be replaced with the POWER switch ON.

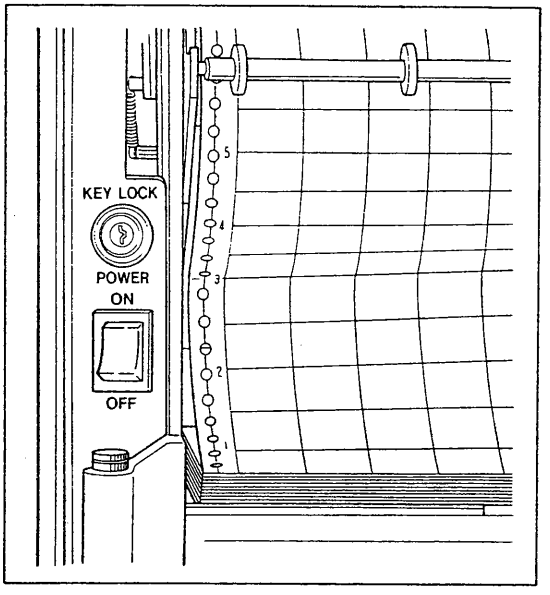


Figure 5-9.

CAUTION

Replace the batteries with the POWER switch ON. Otherwise the stored programs are erased.

(3) Lift the chart paper and lift the battery cover (see Figure 5-10).

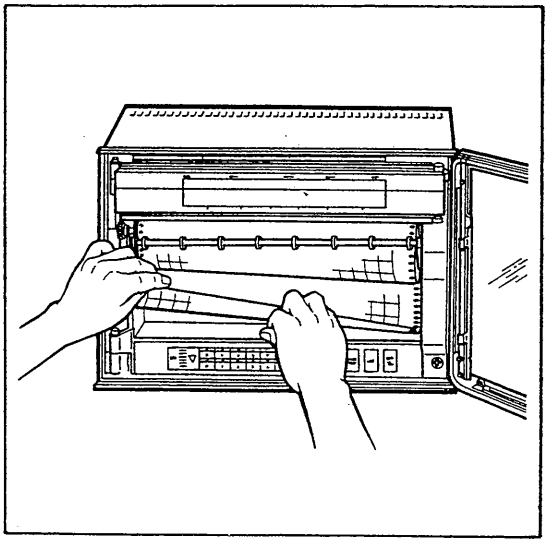


Figure 5-10.

(4) Remove the old batteries from the holder (see Figure 5-11).

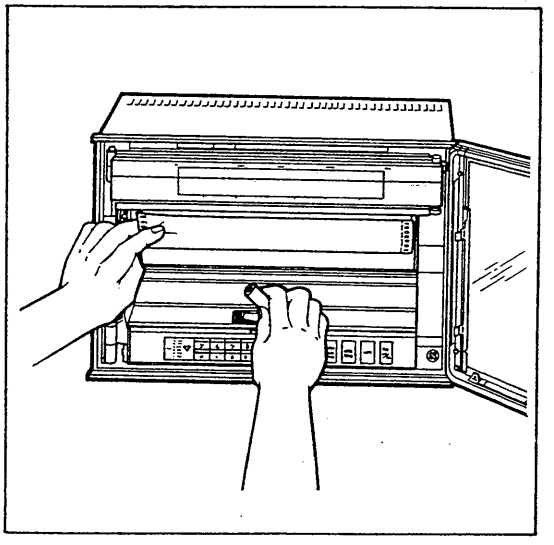


Figure 5-11.

(5) Insert new batteries. Be sure to insert the new batteries with the polarity (+ and −) the same as indicated inside the holder (see Figure 5-12).

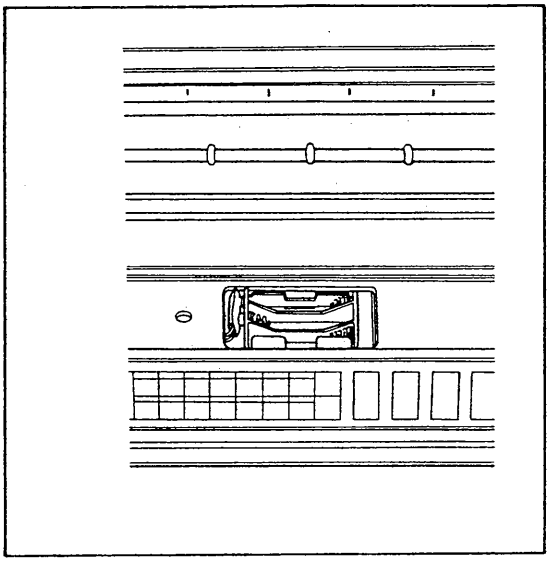


Figure 5-12.

(6) Check that the "BAT" display does not light.
(7) Place the battery cover in position (see Figure 5-13).

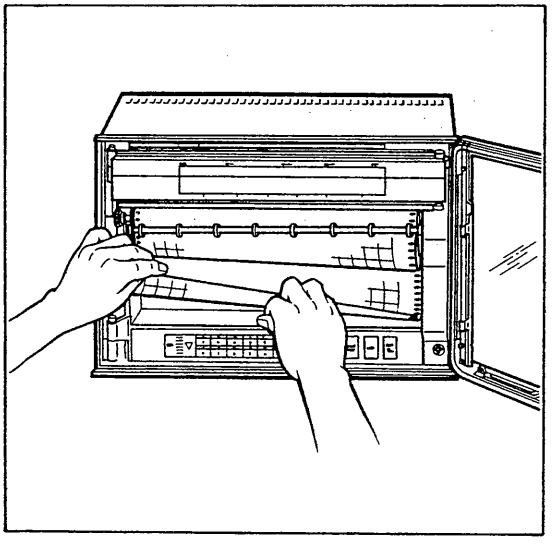


Figure 5-13.

5-1-3. Felt-Tip Pen Replacement.

(1) Open the recorder front door. Turn the POWER switch OFF (see Figure 5-14).

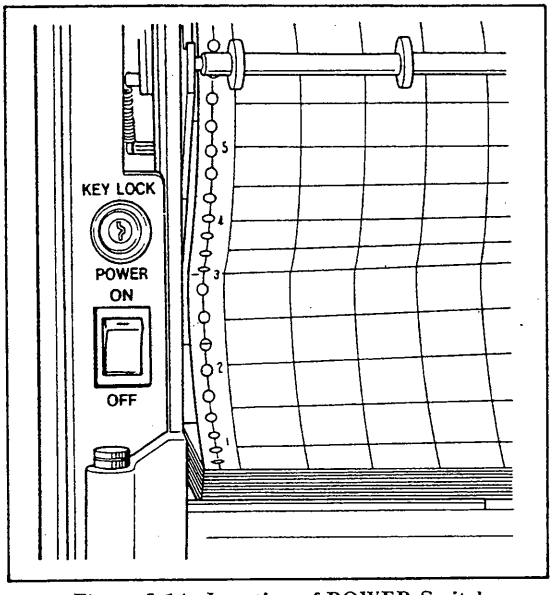


Figure 5-14. Location of POWER Switch.

(2) Hold the lower left corner of the display panel and pull it open (see Figure 5-15 and Caution below).

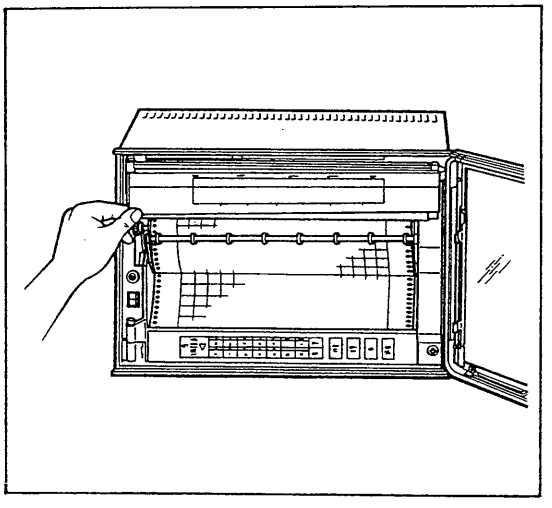


Figure 5-15. Opening Display Panel.

CAUTION

Do not hold the bottom of the display panel or you are likely to break the fluorecent lamp.

(3) Grasp the protruding part of the felt-tip pen cartridge and gently pull it out of the cartridge holder. (See Figure 5-16).

(4) Insert a new felt-tip pen cartridge in the pen cartridge holder. (See Figure 5-16).

1st pen – red (for 1-pen, 2-pen, and 3-pen types)

2nd pen – green (for 2-pen and 3-pen types)

3rd pen – blue (for 3-pen type only)

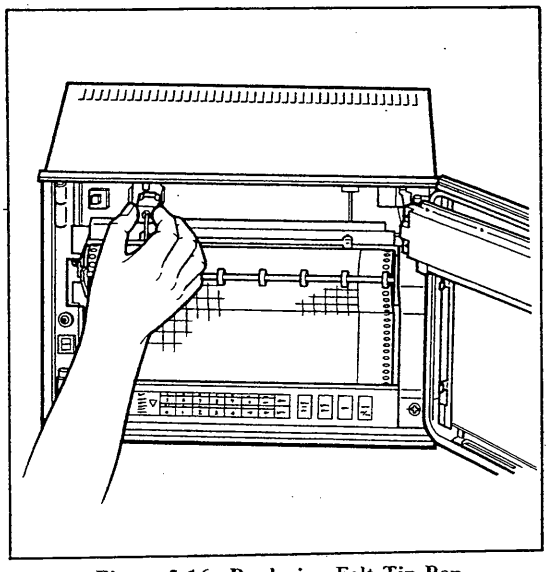


Figure 5-16. Replacing Felt-Tip Pen.

Note 1: Remove the other pen cartridge if it disturb the replacement of plotter pen.
Do not apply excessive force to the right and left direction of the cartridge holder. Mulfunction may occur in a writing function.

Note 2: Remove the pen cap before replacing the cartridge with a new one.

- The part No. of the felt-tip pens are as follows:
  - 1st pen (red) ..... B9565AP (3 in one box)
  - 2nd pen (green) ..... B9565AQ (3 in one box)
  - 3rd pen (blue)..... B9565AR (3 in one box)

5-1-4. Plotter Pen Replacement.

(1) Open the front door by inserting fingertips into the recessed area on the left side near the front and pull outward. (See Figure 5-7.)

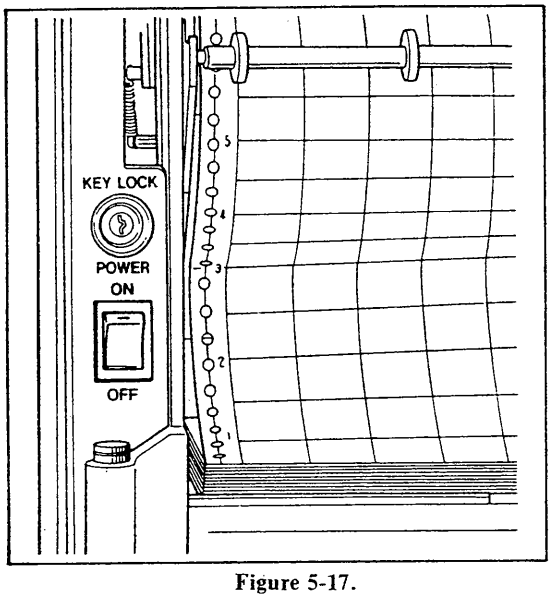


Figure 5-17.

(2) Hold the lower left corner of the display panel and pull it open (see Figure 5-18).

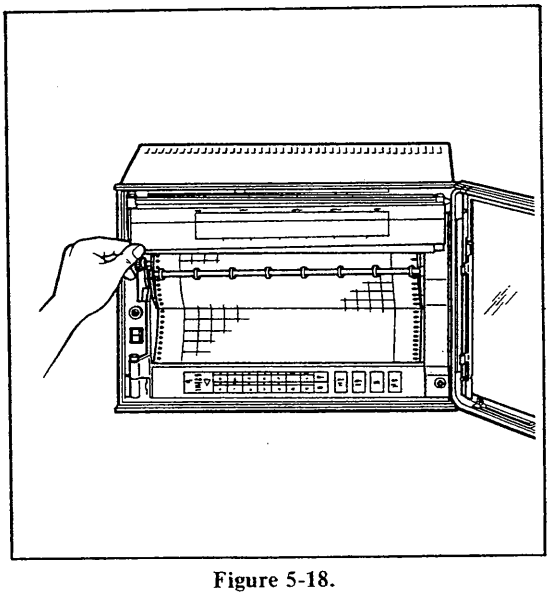


Figure 5-18.

CAUTION

When opening the display panel, do not hold the bottom of the display panel or you are likely to break the fluorescent tube.

(3) While grasping the plotter pen holder, gently pull the plotter pen out of the holder. (See Figure 5-19.)

(4) Insert a new plotter pen in the holder. (See Figure 5-19.)

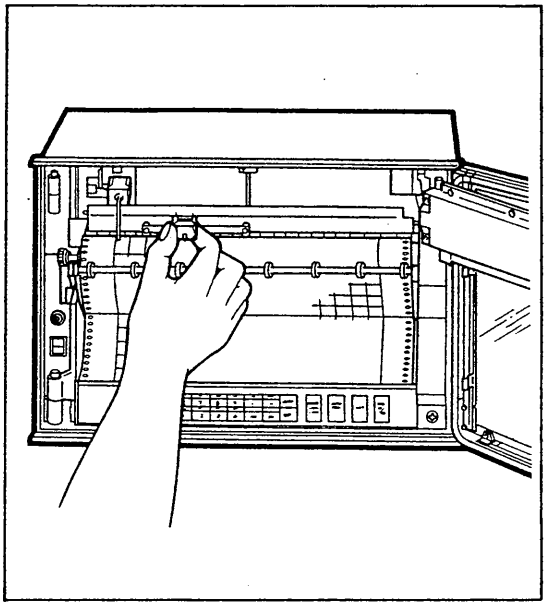


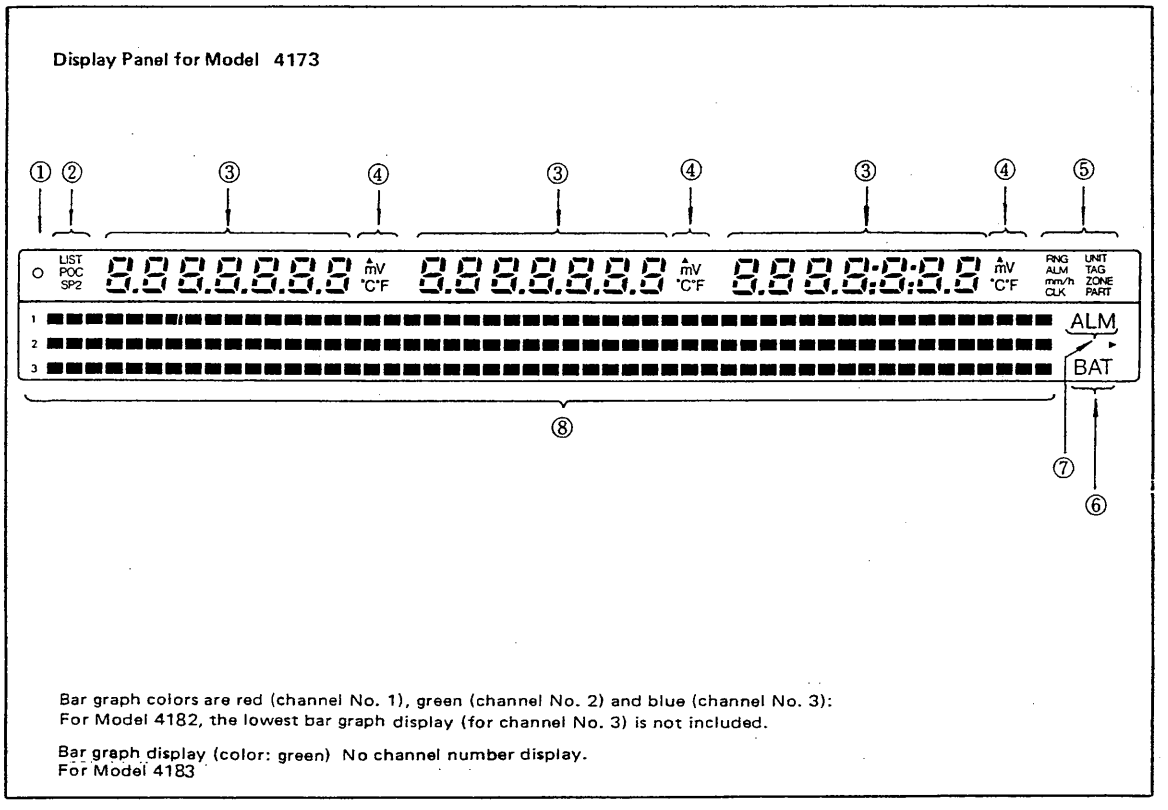
Figure 5-19. Replacing Plotter Pen.

Notes: 1. Remove the other pen cartridge if it disturb the replacement of plotter pen.
2. Do not apply excessive force to the right and left direction of the cartridge holder. Mulfunction may occur in a writing function.

○ The part No. of the plotter pen (purple color) is B9565AS (3 in one box).

5-2. Description of Display.

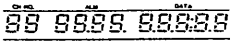
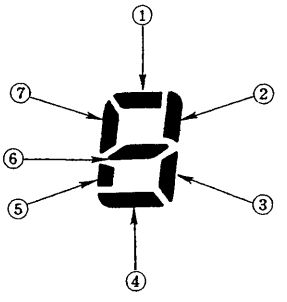
This section describes the display section which includes a digital display (measurement data, date and time) and an analog bar graph display. Figure 5-20 shows all display items.



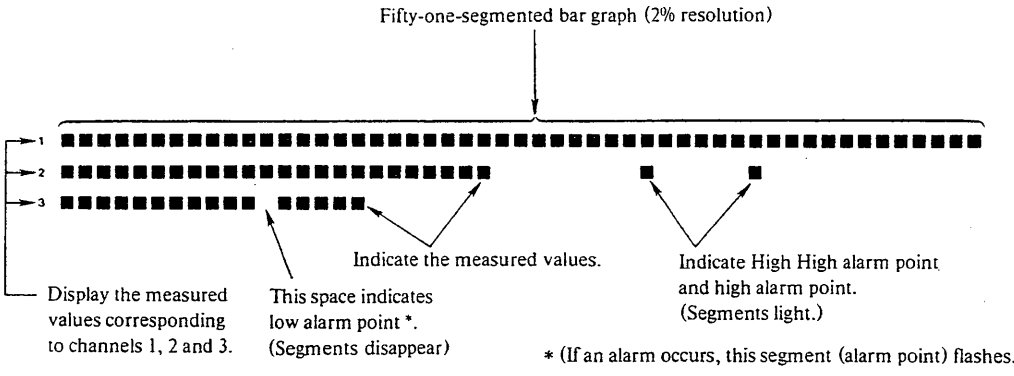
Bar graph colors are red (channel No. 1), green (channel No. 2) and blue (channel No. 3):
For Model 4182, the lowest bar graph display (for channel No. 3) is not included.

Bar graph display (color: green) No channel number display.
For Model 4183

Display Section.

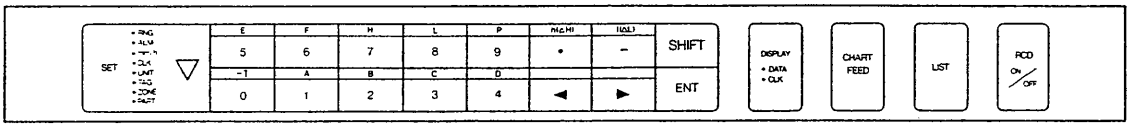
	Display	Description
①	○ (Yellow)	○ (yellow) lights during recording. Turns OFF when no recording is performed. The RCD ON/OFF key is used to turn ON and OFF.
②	LIST POC SP2 (Green)	Indicates recorder operating conditions. • **LIST** When LIST lights, list printing is performed. • **POC** When POC lights, pen offset compensation functions work. • **SP2** When SP2 lights, chart feed speed is at the second set speed (SP2).
④	 (Green and red)	• Displays alphabetic and numeric data (measurement data and set point). To display one character, 7 segments (LCD) are used.  For example, alphabet "A" uses 6 segments except segment ④ above. 

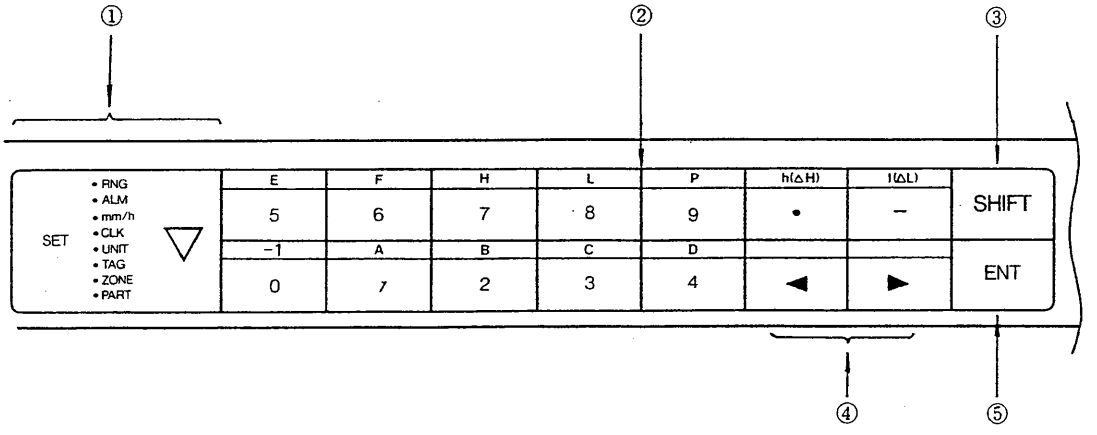
	Display	Description
⑤	▲ mV °C°F (Green)	Displays units for measured or set point data. **°C**, **°F**, **mV**, **V**, and scaling sign ▶. (two or more units cannot be displayed at the same time.)
⑥	**RNG UNIT** **ALM TAG** **mm/h ZONE** **CLK PART** (Yellow)	Select any one of the setting displays shown below. Press the SET key to set the desired display. • **RNG** When RNG lights, recording range (span) can be set. • **ALM** When ALM lights, alarms can be set. • **mm/h** When mm/h lights, chart feed speed can be set. • **CLK** When CLK lights, date and time can be set. • **UNIT** When UNIT lights, an engineering unit can be set. • **TAG** When TAG lights, a Tag No. can be set. • **ZONE** When ZONE lights, a recording zone can be set. • **PART** When PART lights, expanded-scale recording can be set.
⑦	**BAT** (Red)	Indicates that memory backup batteries should be replaced (see Section 5-1-2 Battery Replacement). BAT also lights when batteries are not installed.
⑧	**ALM** (Red)	Indicates when some alarms occur in any channel.

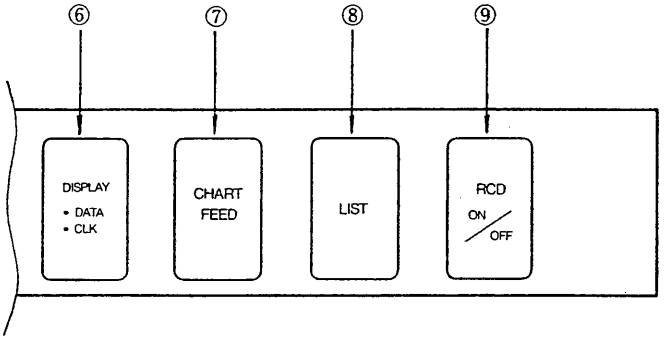
	Display	Description
⑨	Bar graph (Model 4183 as an example)  	

5-3. Keyboard.

This section describes functions of keys which are used to set parameters.

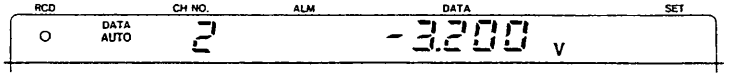
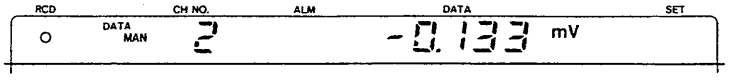
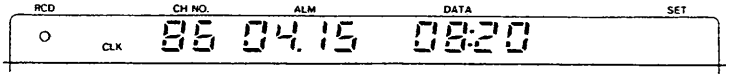






Keyboard description.

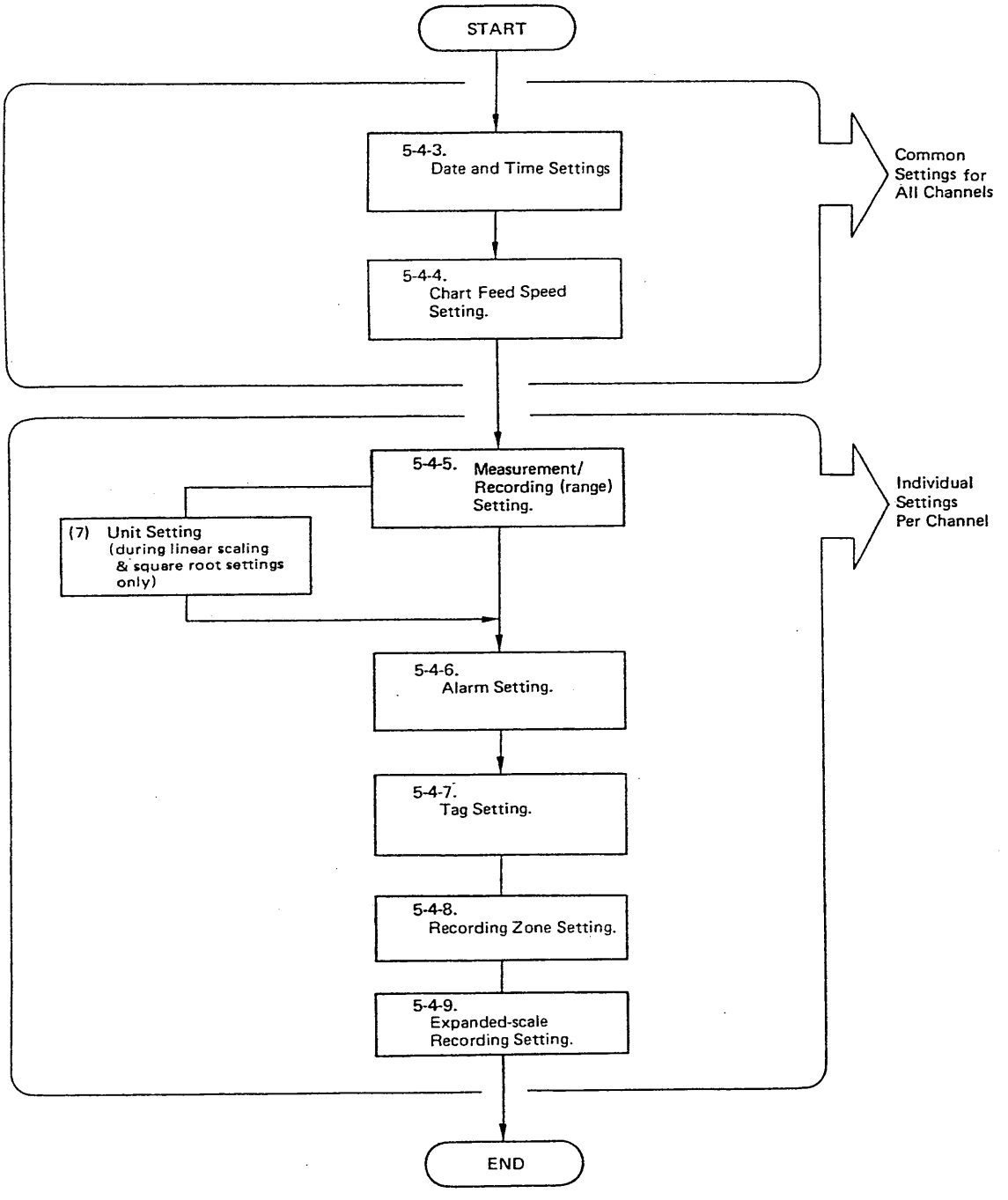
	Key	Description
①	SET • RNG • ALM • mm/h • CLK • UNIT • TAG • ZONE • PART Set ("SET") key	This key selects and displays modes for which parameters are to be set. The modes are as follows: • **RNG** : Range setting • **ALM** : Alarm setting • **mm/h** : Chart feed speed setting • **DATA** : Date setting (YYMMDD) • **CLK** : Time setting (HHMM) • **UNIT** : Unit setting (possible only when scaling) • **TAG** : Tag setting • **ZONE** : Recording zone setting • **PART** : Expanded-scale recorder setting Every time the [SET] key is pressed, the read-out screen will display the next mode. Make sure that the desired mode is the one displayed before setting parameters.
②	E F H L P 5 6 7 8 9 -1 A B C D 0 1 2 3 4 h ΔH· l·ΔL · − Alphanumeric keys	These keys are used to enter measurement and recording values for each channel and also input date and time settings. To set a decimal point (.), press the [h ΔH· / ·] key. This is effective under the setting of scaling (low value). When a minus sign (−) is required, use the [l·ΔL / −] key. If the [SHIFT] key is pressed and then the [-1 / 0] key, the number "-1" can be set with the minus sign (−) being displayed. (Effective only during the setting of scaling values.) (-1 : −1) Use the [l·ΔL / −] key when alarm setting is cancelled, expanded-scale recording is not set, or a particular channel is skipped.
③	SHIFT "SHIFT" key	Sets alphabetic characters (above numerals) using the alphanumeric key pad. To set "A", for example, press [SHIFT] and then the [A / 1] key. ([SHIFT] key is effective only for the key to be used successively).
④	◄ ► Cursor move keys	(1) These keys are used to move the cursor (flashing position) to the appropriate position when changing setting values, etc. ► : Move cursor to the right ◄ : Move cursor to the left (2) Access particular measurement data for a channel in "MAN DATA" mode. (3) These keys are used for chart speed setting.

	Key	Description
⑤	ENT Enter ("ENT") key	Sets entered data Setting is effective when the key is pressed. (If all displays flash with this key pressed, data entry is invalid.)
⑥	DISPLAY • DATA • CLK "DISPLAY" mode select key	This key selects display mode. Modes are "AUTO DATA", "MAN DATA" or "CLK" (clock). **• AUTO DATA** Displays collected data one channel after another, at 3 second intervals.  **• MAN DATA** Displays measurement for a particular channel.  Pressing the ► key calls the next channel, in ascending order, for data display. Pressing the ◄ key calls the next channel, in descending order, for data display. **• CLK** (Clock) Displays date and hour/minute 
⑦	CHART FEED "CHART FEED" key	Feeds chart paper until the key is released.
⑧	LIST "LIST" key	Lists channel parameters such as range, tag, unit, alarm (with its output relay as an option), date, and chart feed speed.
⑨	RCD ON/OFF Recorder ("RCD") "ON"/ "OFF" key	This key is used to start or stop recording. Pressing this key toggles recording ON/ OFF.

5-4. Setting.

This section describes how to set specifications for the μR180 recorder. To set specifications, follow the flowchart below. Each step indicates the related page number where a detailed explanation for that step may be found.

5-4-1. Setting Procedure Flowchart.



5-4-2. Setting Data Display Positions.

The following table lists the display positions for setting data. In actual setting operations, use this table to confirm correct data setting positions.*

Setting Item \ Display	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	モード
Data and time settings						Year				Month		Day					Hour		Minute			CLK
Chart feed speed	SPEED ID		S	P	E	E	d			Chart feed speed (mm/h)												mm/h
Range setting	CH No.		SET CODE		RANGE CODE or reference channel no.			⊢		Range setting value (Maximum and Minimum scale)					-1		Range setting value (Minimum scale)					RNG
Scaling (linear)	CH No.		A		RANGE CODE 30～35, 40～45			⊢.		Scaling value (Maximum and minimum values)					-1.		Scaling value (Minimum scale)					▶ RNG
Alarm	CH No.		Alarm setting No.	Alarm mode		Output relay No.				Alarm value												ALM
Square rooting Computation	CH No.			U	n	i	t				Character No.	—	ASCII CODE									UNIT
T A G	CH No.			t	A	g					Character No.	—	ASCII CODE									TAG
Message	Message No.		P	r	i	n	t			Character No.		—	ASCII CODE									TAG
Zone	CH No.			Minimum recording position				—		Maximum recording position												ZONE
Part	CH No.		P/_			Expanded-Scale Recording Rate (%)				Boundary setpoint for expanded-scale recording												PART

░ : Dotted parts in the Table are not displayed.

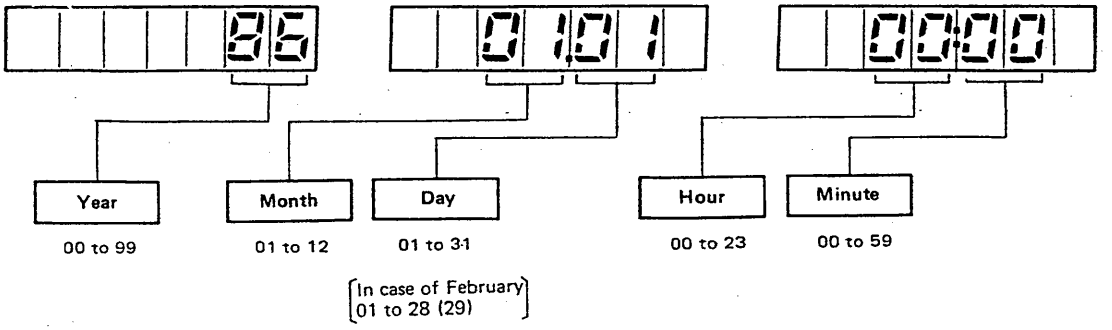
* The output relay number needs not be specified when no output relay /AK-06 or /AK-12 is installed

○ The program setting table is also provided for the instrument. Use it together with this table.

5-4-3. Date and Time Settings.

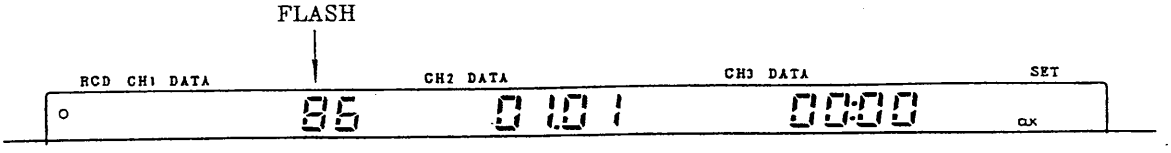
For leap year, 29 (February) is automatically provided.

Date and Time Setting Table



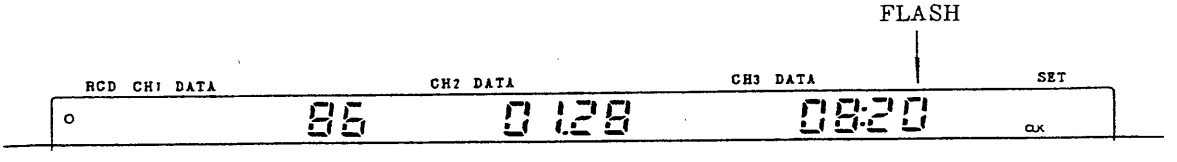
Date and time setting procedures

1 Press the [ENT] key as many times as required until the date and time panel is displayed.



2 Set year (YY), month (MM), day (DD), hour (HH) and minute (MM).

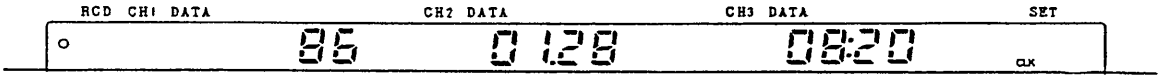
Example: To set January 28, 1986, 8:20 a.m., press [8] [6], [0] [1] [2] [8] and [0] [8] [2] [0] keys.



The setting value is displayed.

If data entry is invalid, see pages 5-81 through 5-83.

3 Press the [ENT] key to store the date and time.
No characters are flashing, and setting is completed.



Settings completed

* To store 8:20 a.m., press [-1 0], [L 8], [S 2] and [-1 0] keys.
To store 8:20 p.m., press [S 2], [-1 0], [S 2] and [-1 0] keys.

5-4-4. Chart Feed Speed Setting.

Although chart feed speed can be set within a range of 5 to 12,000 mm/h,* the optimum setting for producing digital data printouts is in the range of 10 to 1,500 mm/h.** (Note that the alarm printout is effective with the chart speeds in the range of 5 to 1,500 mm/h).

* Select chart feed speed listed in Table 5-1.

** See Table 5-2.

Chart Feed Speed Setting Table

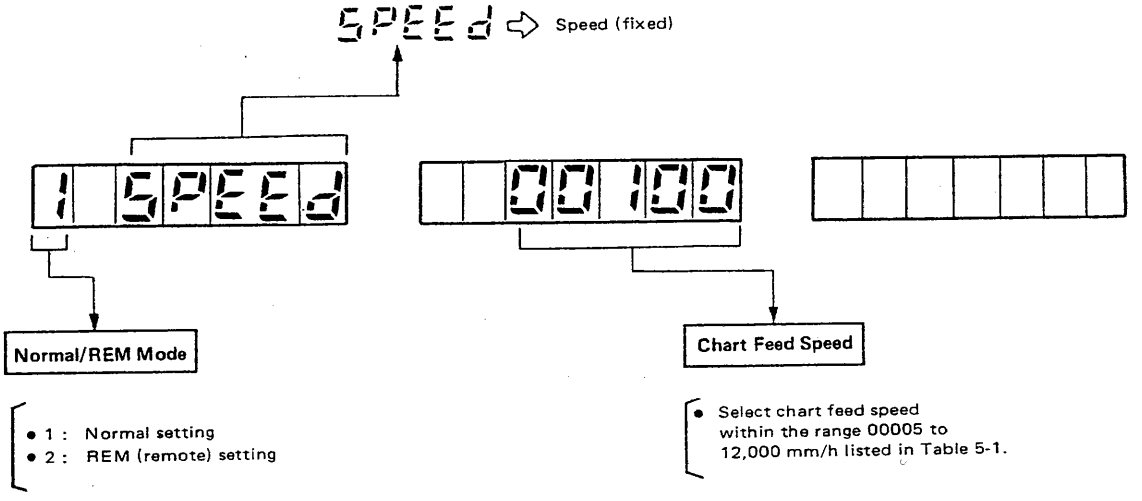


Table 5-1.

Unit: mm/h

5	30	80	240	600	1500	4320
6	32	90	250	675	1600	4500
8	36	96	270	720	1800	4800
9	40	100	300	750	2000	5400
10	45	120	320	800	2160	6000
12	48	125	360	900	2250	7200
15	50	135	375	960	2400	8000
16	54	150	400	1000	2700	9000
18	60	160	450	1010	2880	10800
20	64	180	480	1200	3000	12000
24	72	200	500	1350	3600	
25	75	225	540	1440	4000	

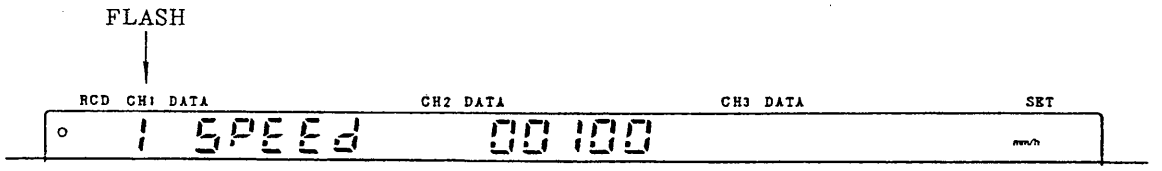
Table 5-2.

Chart feed speed (mm/h)	5 to 9	10 to 18	20 to 36	40 to 72	75 to 135	150 to 180	200 to 540	600 to 1500	1600 to 12000
Digital printout Interval	Not printed out	8 Hours	4 Hours	2 Hours	1 Hour	30 Minutes	20 Minutes	10 Minutes	Not printed out
Message printout*	Printed out corresponding to alarm or REM contact signal generation.								Not printed out

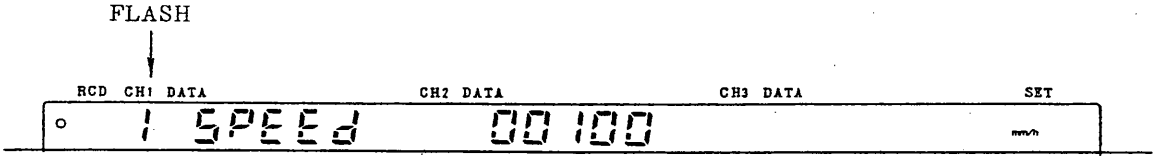
* Message printout: Printouts of alarm and chart feed speed change by REM (remote) signal.

Chart feed speed setting procedure

1 Press the [SET] key as many times as necessary until the chart feed speed setting display "mm/h" appears. (An initial value of 100 mm/h has been set.)

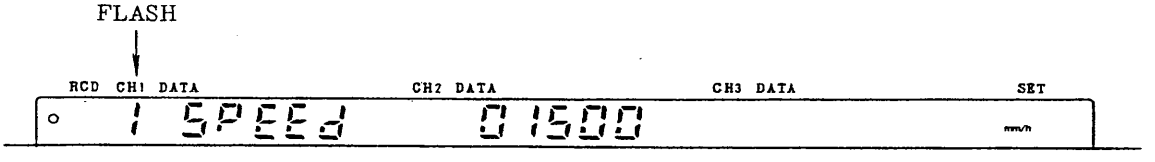


2 For normal setting, press the [A/1] key.
[Normal: 1/(at REM: 2)]



No cursor (flashing position) advances.

3 To set chart feed speed (5 digits, fixed, unit mm/h), use the [◄] or [►] key.
Example: To set a speed of 1,500 mm/h, keep pressing the [►] key until a display of 1,500 mm/h is obtained.
(If the intended value is exceeded, use the [◄] key to decrease.)



The setting value is displayed.

If data entry is invalid, see pages 5-81 through 5-83.

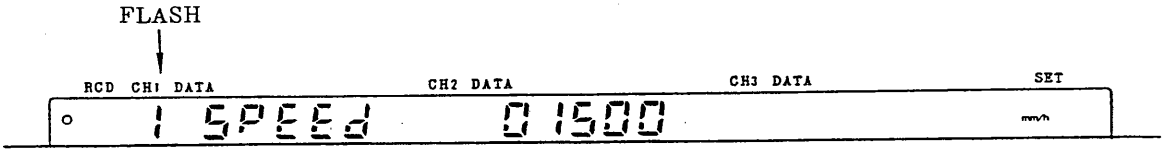
4 Press the [ENT] key to set chart feed speed.
No characters are flashing, and setting is completed.

Normal settings completed

For setting normal chart feed speed, steps **1** through **4** are followed and setting is complete. To change the chart speed with REM input, set the chart speed on alarm in the following steps **5** through **8**. Two chart feed speeds are selectable: normal and remote settings. Refer to paragraph 2-5 Recording Example (4) for Printout in REM Setting Mode.

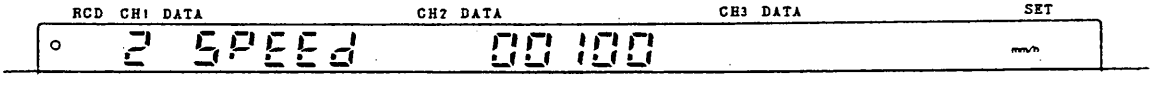
Note) /REM (remote) is optional.

5 Press the [ENT] key once again and the set chart feed speed is displayed.



Flash reopens.

6 Press the [8/2] key.
The initial value (100 mm/h) of chart feed speed in REM mode is displayed automatically.



If data entry is invalid, see pages 5-81 through 5-83.

7 Set the intended chart feed speed alarm value using the ◄ or ► key and confirm the value by reading the display. (The example shows a setting of 3,000 mm/h.)

8 Press the ENT key to store the entered data.

No characters are flashing, and setting is completed.

Settings completed

5-4-5. Measurement/Recording (Range) Setting.

There are several types of settings for measurement and recording (range) as shown below. Refer to the setting method required for a particular application.

* To be referred to even for measuring other types of input signals (such as temperature difference recording using thermocouples or RTDs).

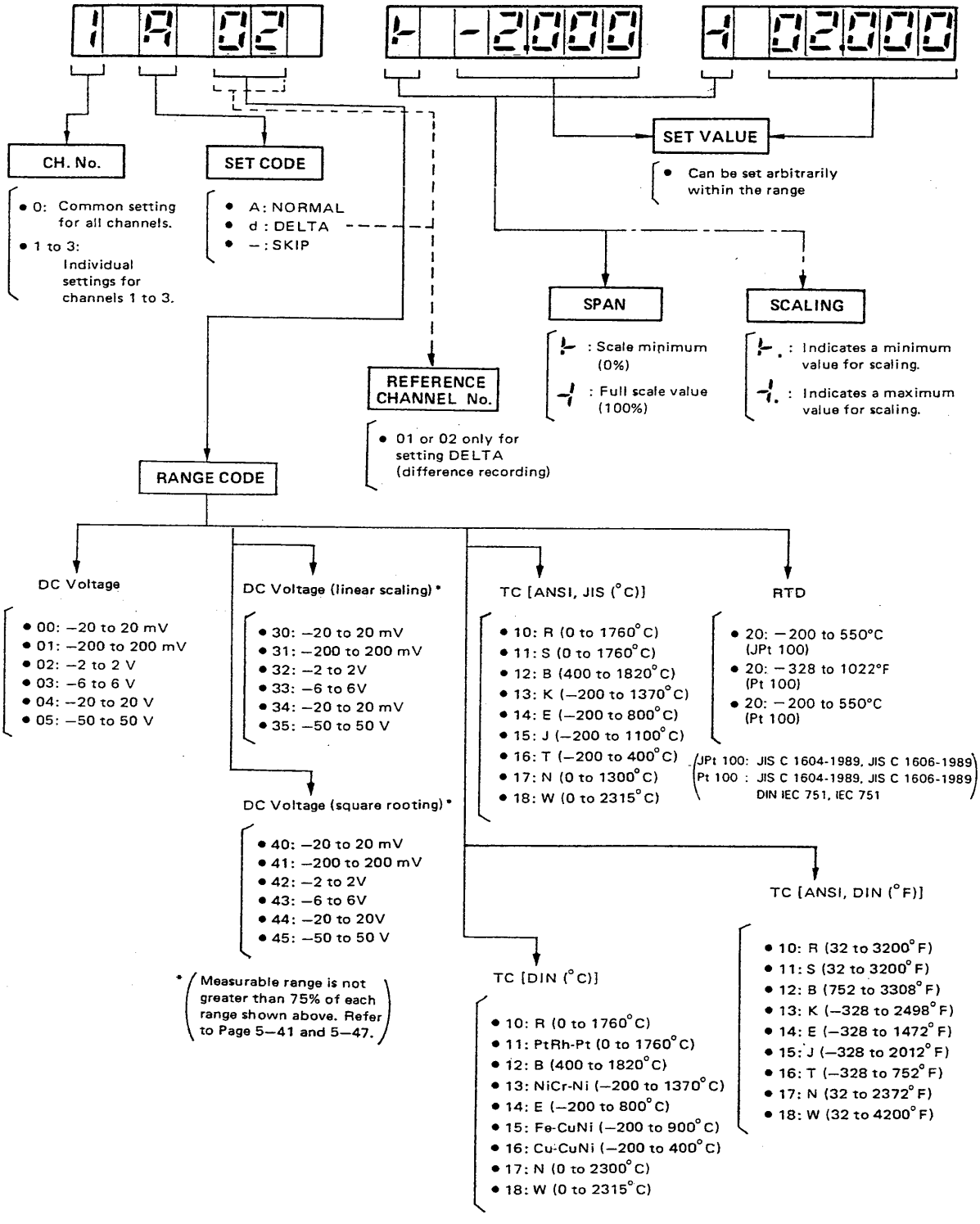
** Scaling function converts measured value (e.g. volts) to corresponding value in engineering unit.

Note that some of the settings indicated above may not be available, depending on the type of μR180 (see Section 2-4 Models and Suffix Codes) recorder being used.

For example, for the model without RTD input terminals or channels with no RTD terminals, setting using RTD is disabled.

For the 1-pen model, setting for recording measurement differences is also disabled.

A table of measurement and recording (range) settings

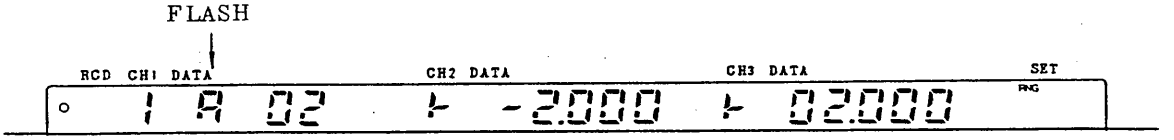


(1) Setting method for DC voltage measurement and recording.

Proceed as follows.

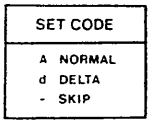
1 Press the [SET] key as many times as necessary until the range (RNG) setting display appears.

2 Set the channel number.
Example: To set channel 1, press the [A/1] key.



Channel 1 is set, and the cursor (flashing position) advances.

3 With A: NORMAL, chosen from SET CODE list, press the [SHIFT] and [A/1] keys.



A (NORMAL) is set, and the cursor (flashing position) advances.

4 Select the measuring range from the RNG code table. (See the right table.)

Example: In case the range of – 200mV to 200mV is selected, set "01". Press the keys [-1/0] and [A/1].

DC voltage measurement

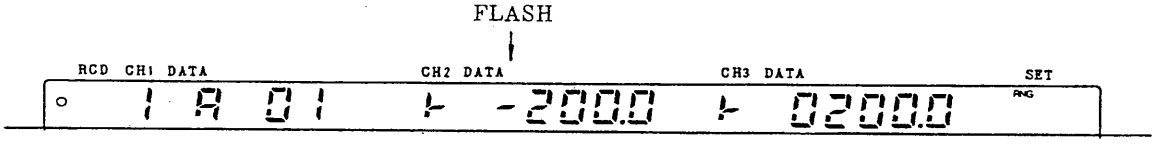
Range Code
00 to 05

[°C]

RANGE CODE		
00 -20–20mV	TC	16 T -200–400°C
01 -200–200mV	10 R 0–1760°C	U (DIN) Cu-CuNi
02 -2–2V	11 S 0–1760°C	17 N 0–1300°C
03 -6–6V	S (DIN) PtRh-Pt	18 W 0–2315°C
04 -20–20V	12 B 400–1820°C	
05 -50–50V	13 K -200–1370°C	RTD JPt 100
30–35 LIN SCALING	K (DIN) NiCr-Ni	Pt 100
40–45	14 E -200–800°C	(Pt 50)
SQUARE ROOTING (√) ⚠	15 J -200–1,100°C	20 -200–550°C
	L (DIN) Fe-CuNi	

[°F]

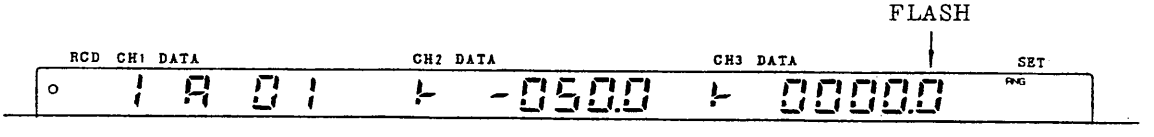
RANGE CODE		
00 -20–20mV	TC	16 T -328–752°F
01 -200–200mV	10 R 32–3200°F	
02 -2–2V	11 S 32–3200°F	17 N 32–2372°F
03 -6–6V		18 W 32–4200°F
04 -20–20V	12 B 752–3308°F	
05 -50–50V	13 K -328–2498°F	RTD Pt 100
30–35 LIN SCALING		(Pt 50)
40–45	14 E -328–1472°F	20 -328–1022°F
SQUARE ROOTING (√) ⚠	15 J -328–2012°F	



DC voltage measurement
The range code "01" is set, and the unit changes to mV.
The FLASH position shifts to the top of the span lower limit set numeral.
The position of the decimal point changes.

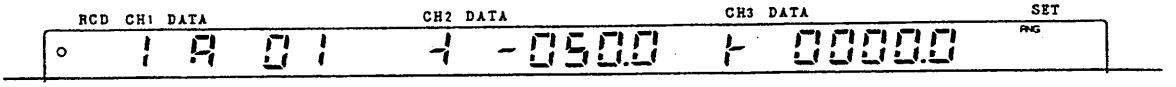
5 Perform the recording span setting.
With numeral keys, set the upper limit and lower limit values of span.

Example: – 50mV (Lower limit)
Press the keys [ΔL/–], [-1/0], [E/5], [-1/0], [-1/0], [-1/0], [-1/0], [-1/0], [-1/0], [-1/0], and [-1/0].



Set numerals are displayed.
In case the key is erroneously pressed, refer to page 5-79.

6 Press the [ENT] key to store the data.



Scale minimum value is displayed. No character flashes and the range setting is completed.

Settings completed

The above procedures, **1** through **6**, set the following data.

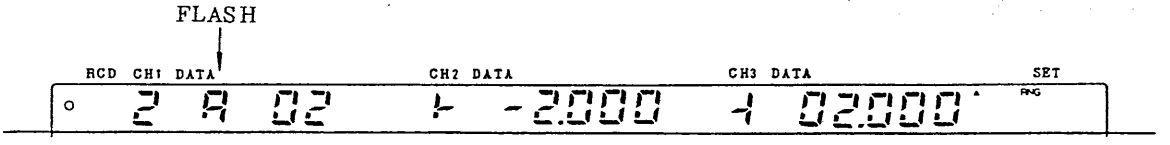
- Channel number: 1
- DC voltage measurement and voltage recording
- Measurement range: −200 mV to 200 mV
- Recording range: −50 mV to 0 mV

(2) Setting method for temperature measurement using TCs and temperature recording.

Proceed as follows:

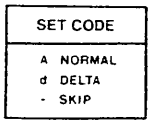
1 Press the [SET] key as many times as necessary until the range (RNG) setting display appears.

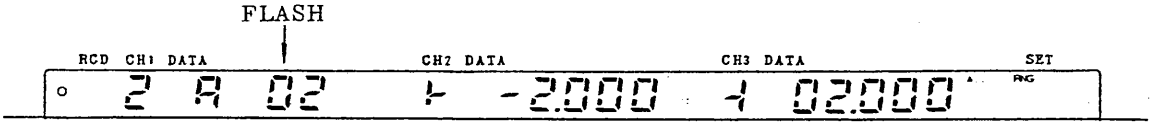
2 Set the channel number.
Example: To set channel 2, press the [B 2] key.



Channel 2 is set, and the cursor (flashing position) advances.

3 With A: NORMAL, chosen from the SET CODE list, press the [SHIFT] and [A 1] keys.





A (NORMAL) is set, and the cursor (flashing position) advances.

If data entry is invalid, see pages 5-81 through 5-83.

4 Select the measuring range from the RNG code table. (See the right table.)

Example: In case the range of thermocouple K (−200 to 1,370°C) is selected, set "13".
Press the keys [A/1] and [C/3].

Temperature measurement using TCs

Range Code 10 to 18

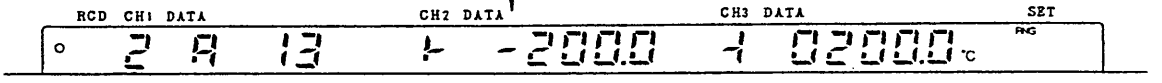
[°C]

RANGE CODE		
00 −20–20mV	TC	16 T −200–400°C
01 −200–200mV	10 R 0–1760°C	U (DIN) Cu-CuNi
02 −2–2V	11 S 0–1760°C	17 N 0–1300°C
03 −6–6V	S (DIN) PtRh-Pt	18 W 0–2315°C
04 −20–20V	12 B 400–1820°C	
05 −50–50V	13 K −200–1370°C	RTD JPt 100
30–35 LIN SCALING	K (DIN) NiCr-Ni	Pt 100
40–45	14 E −200–800°C	(Pt 50)
SQUARE ROOTING (√‾) ⚠	15 J −200–1100°C	20 −200–550°C
	L (DIN) Fe-CuNi	

[°F]

RANGE CODE		
00 −20–20mV	TC	16 T −328–752°F
01 −200–200mV	10 R 32–3200°F	
02 −2–2V	11 S 32–3200°F	17 N 32–2372°F
03 −6–6V		18 W 32–4200°F
04 −20–20V	12 B 752–3308°F	
05 −50–50V	13 K −328–2498°F	RTD Pt 100
30–35 LIN SCALING		(Pt 50)
40–45	14 E −328–1472°F	20 −328–1022°F
SQUARE ROOTING (√‾) ⚠	15 J −328–2012°F	

FLASH



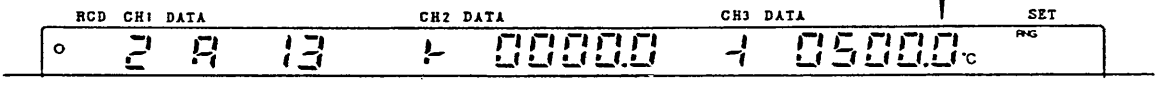
Thermocouple Measurement

The range code "13" is set, and the unit changes to °C.
The FLASH position shifts to the top of the span lower limit set numeral.
The decimal point position also changes.

5 Perform the recording span setting.
With numeral keys, set the upper limit and lower limit values of span.

Example: In case they are set to 0°C (Lower limit) and 500°C (Upper limit)
Press the keys [−1/0], [−1/0], [−1/0], [−1/0], [−1/0], [−1/0], [E/5], [−1/0], [−1/0], and [−1/0].

FLASH



6 Press [ENT] key to store the data.

No character flashes and range setting is completed.

Settings completed

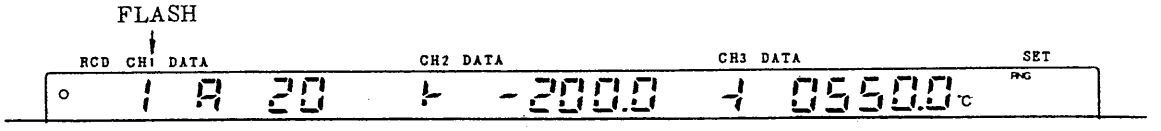
The above procedures, **1** through **6**, set the following data.

- O Channel number: 2
- O Temperature measurement and recording, using TC type K.
- O Measurement range: −200 to 1370°C
- O Recording range: 0 to 500°C

(3) Setting method for temperature measurement using RTDs and temperature recording.

Proceed as follows:

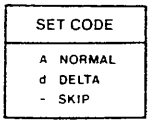
1 Press the [SET] key as many times as necessary until the range (RNG) setting display appears.



2 Set the channel number.
Example: To set channel 3, press the [C/3] key.

Channel 3 is set, and the cursor (flashing position) advances.

3 With A: NORMAL, chosen from the SET CODE list, press the [SHIFT] and [A/1] keys.



A (NORMAL) is set, and the cursor (flashing position) advances.

If data entry is invalid, see pages 5-81 through 5-83.

4 Select the measuring range from the RNG code table.

Example: In case the range of Pt 100Ω (−200 to 550°C) of resistance thermometer bulb is selected, set "20".
Press the keys [2] and [0] .

Temperature measurement

Range Code
20

[°C]

RANGE CODE		
00 −20–20mV	TC	16 T −200–400°C
01 −200–200mV	10 R 0–1760°C	U (DIN) Cu-CuNi
02 −2–2V	11 S 0–1760°C	17 N 0–1300°C
03 −6–6V	S (DIN) PtRh-Pt	18 W 0–2315°C
04 −20–20V	12 B 400–1820°C	
05 −50–50V	13 K −200–1370°C	RTD JPt 100
30–35 LIN SCALING	K (DIN) NiCr-Ni	Pt 100
40–45	14 E −200–800°C	(Pt 50)
SQUARE ROOTING	15 J −200–1100°C	20 −200–550°C
(√‾) ⚠	L (DIN) Fe-CuNi	

[°F]

RANGE CODE		
00 −20–20mV	TC	16 T −328–752°F
01 −200–200mV	10 R 32–3200°F	
02 −2–2V	11 S 32–3200°F	17 N 32–2372°F
03 −6–6V		18 W 32–4200°F
04 −20–20V	12 B 752–3308°F	
05 −50–50V	13 K −328–2498°F	RTD Pt 100
30–35 LIN SCALING		(Pt 50)
40–45	14 E −328–1472°F	20 −328–1022°F
SQUARE ROOTING	15 J −328–2012°F	
(√‾) ⚠		

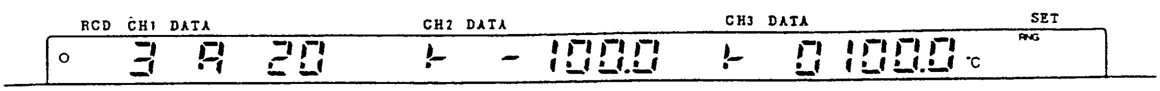
FLASH

Resistance Thermometer Bulb

The range code "20" is set, and the unit changes to °C.
The FLASH position shifts to the top of the span lower limit set numeral.
The decimal point position also changes.

5 Perform the recording span setting.
With numeral keys, set the lower limit and upper limit values of span.

Example: In case they are set to −100°C (Lower limit) and 100°C (Upper limit)
Example: Press the keys [−] , [1] , [0] , [0] , [0] , [0] , [1] , [0] , [0] , and [0] .



6 Press the [ENT] key to store the data.

The scale minimum value is displayed.
No character flashes and range setting is complete.

Settings completed

The aboce procedures, **1** through **6**, set the following data.

- Channel number: 3
- Temperature measurement using a RTD and temperature absolute value recording.
- Measurement range: −200 to 550°C
- Recording range: −100 to +100°C.

(4) Setting method for recording measurement differences.

(For DC voltage measurement and voltage difference recording*)

(Not available with Model 4181, 1-pen type recorder.)

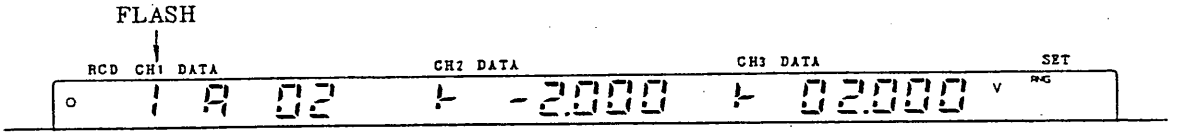
DC voltage measurement/ Voltage difference recording

Note 1: For recording TC or RTD measurement/voltage differences follow steps (1) through (8). A combination of different inputs such as TC and RTD will not work.

Note 2: For any channel, for which linear scaling or square rooting is set, measurement difference recording cannot be set.

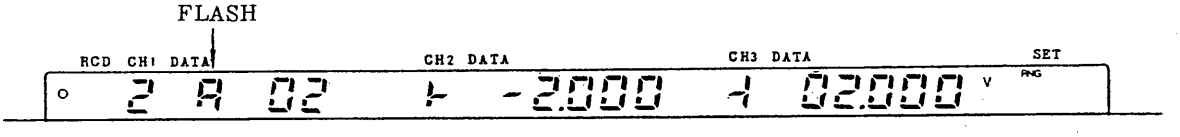
Proceed as follows.

1 Press the [SET] key as many times as necessary until the RNG (range) is displayed.



2 Set the channel number.

Example: To select channel 2, press the [2] key.



Channel 2 is set, and the cursor (flashing position) advances.

Note 1: For a 2-pen model, this setting is only possible for channel number 2. (May not be possible depending on the model purchased.)
For a 3-pen model, this setting is possible for channel numbers 2 and 3. (May not be possible depending on the model purchased.)

Note 2: For recording a difference, a reference measurement must already be set on another channel.

Note 3: Make the value for the channel recording the difference larger than that of the reference channel. (See the table.)
For example, if channel number 2 is the reference channel, a recording difference cannot be set for channel number 1.

Recording Difference Channel Number:

A: Reference channel number
B: Recording Difference Channel Number
○: Possible
×: Not possible

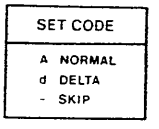
○ 2-pen type (4182)

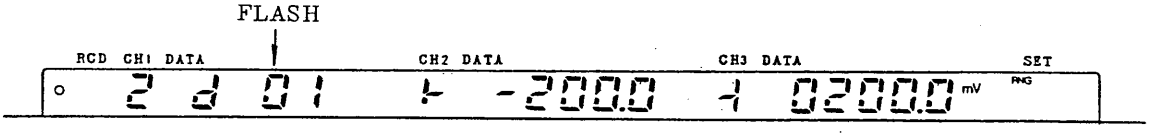
A / B	1	2
1	×	×
2	○	×

○ 3-pen type (4183)

A / B	1	2	3
1	×	×	×
2	○	×	×
3	○	○	×

3 With d: DELTA, chosen from the SET CODE list, press the SHIFT and D/4 keys.





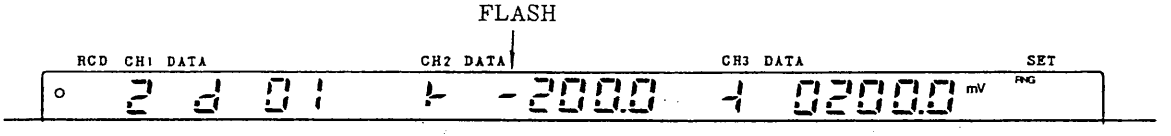
A SET CODE of d (DELTA) is set. The display then shows the measurement range unit with channel number one (1) as the reference channel.
(The reference channel number will be displayed where a range code was displayed in steps **1** and **2**)

4 On the display the unit of measuring range in case the channel 1 is made as reference is displayed.
In the example, hereupon, the unit of DC voltage (mV) is displayed.
Besides, the display to set the span lower limit value in operating the difference making the channel 1 as reference is performed.
Hereupon, making the channel 1 as reference as an example, suppose the case to perform the differential recording setting to the channel 2, proceed the procedure explanation later on.

Press the keys [-1 0] and [A 1].

* It indicates 1 channel with 01.
The designation with 2 digits is required.

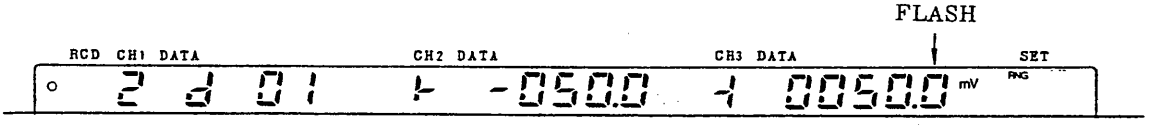
[In the display, since the channel 1 is made as reference, it seems that this operation is unnecessary, however, perform it without fail in the sense of designating the channel 1 anew as reference.]



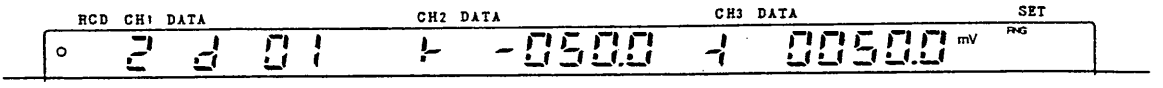
The channel 1 is set as reference channel.
The FLASH position shifts.

5 Perform the span (differential recording) setting.
With numeral keys, set the lower limit and upper limit values of span.

Example: In case they are set to −50mV (Lower limit) and 50mV (Upper limit)
Press the keys [R∆L −], [-1 0], [E 5], [-1 0], [-1 0], [-1 0], [-1 0], [E 5], [-1 0], and [-1 0].



6 Press the [ENT] key to store the data.



No character flashes and setting is complete.
(The scale minimum for voltage difference recording is displayed.)

Settings completed

So far, by performing steps **1** through **6**, the set data is as follows:

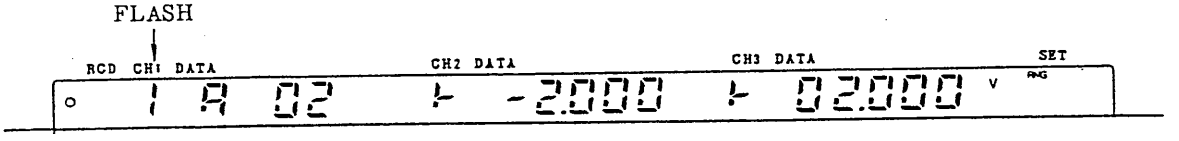
- Recording DC voltage/measurement difference in relation to a reference value (measurement) set for channel number (1)

For recording TC or RTD measurement/voltage difference , follow the above procedure. (When recording measurement differences, do not combine different inputs such as TC and RTD.).

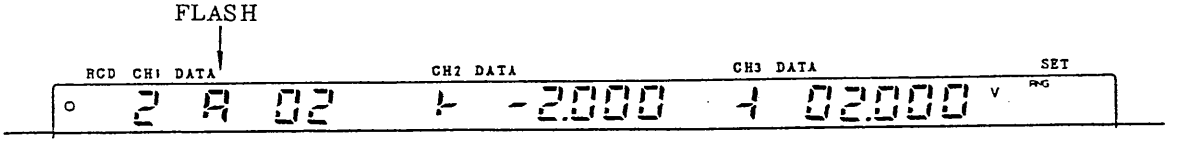
(5) Setting method for recording scaling.

To measure a DC voltage and make a (linear) scaling recording, proceed as follows:

1 Press the [SET] key as many times as necessary until the range (RNG) setting display appears.



2 Set the channel number.
Example: To set channel 2, press the [2] key.

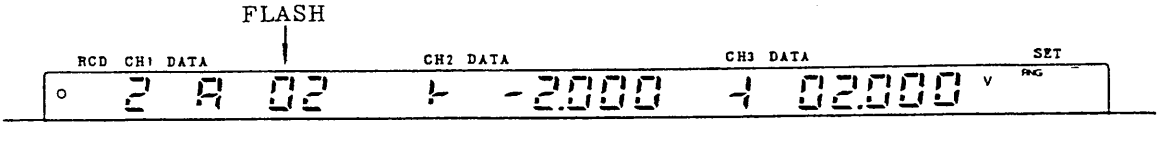


advances.

3 With A: NORMAL, chosen from the SET CODE list.

SET CODE
A NORMAL
d DELTA
- SKIP

press the [SHIFT] and [1] keys.



A (NORMAL) is set, and the cursor (flashing position) advances.

4 Select the measuring range from the RNG code table.
Range codes 30 thru 35 correspond to the following measuring ranges, respectively.

30: –20 to 20mV
31: –200 to 200mV
32: –2 to 2V
33: –6 to 6V
34: –20 to 20V
35: –50 to 50V

DC Voltage Measurement

Scaling

Range Code
30 to 35

[°C]

RANGE CODE		
00 –20–20mV	TC	16 T –200–400°C
01 –200–200mV	10 R 0–1760°C	U (DIN) Cu-CuNi
02 –2–2V	11 S 0–1760°C	17 N 0–1300°C
03 –6–6V	S (DIN) PtRh-Pt	18 W 0–2315°C
04 –20–20V	12 B 400–1820°C	
05 –50–50V	13 K –200–1370°C	RTD JPt 100
30–35 LIN SCALING	K (DIN) NiCr-Ni	Pt 100
40–45	14 E –200–800°C	(Pt 50)
SQUARE ROOTING	15 J –200–1100°C	20 –200–550°C
(√‾) ⚠	L (DIN) Fe-CuNi	

[°F]

RANGE CODE		
00 –20–20mV	TC	16 T –328–752°F
01 –200–200mV	10 R 32–3200°F	
02 –2–2V	11 S 32–3200°F	17 N 32–2372°F
03 –6–6V		18 W 32–4200°F
04 –20–20V	12 B 752–3308°F	
05 –50–50V	13 K –328–2498°F	RTD Pt 100
30–35 LIN SCALING		(Pt 50)
40–45	14 E –328–1472°F	20 –328–1022°F
SQUARE ROOTING	15 J –328–2012°F	
(√‾) ⚠		

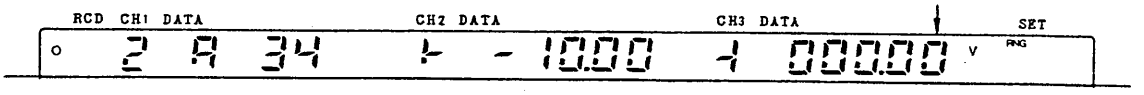
FLASH

The range code "34" is set.
The FLASH positon shifts to the top of the measuring span lower limit set numeral.

5 Perform the measuring span setting. (See the note.)
With numeral keys, set the lower limit and upper limit values of span.

Example: In case they are set to –10V (Lower limit) and 0V (Upper limit)
Press the keys [AL] –, [A] 1, [–1] 0, [–1] 0, and [–1] 0.

FLASH



6 Press the [ENT] key to store the data.

The linear scaling set display appears.
(Setting of scale minimum)

7 Setting scaling values.
In the example, for step **5**, −10V was set as the minimum for the range (i.e. 0% chart recording). Furthermore, in the example, for step **7**, 0V was set as the maximum (100%).
Here, the setting of scaling values is carried out so that the measurement data is converted into units which are appropriate for use by the recorder. (Scaling values are to be set with a span of 30000 within the range of −19999 to +20000.)

Example: To set scaling values such as:

Measurement value	⇨	Recording value
−10V		0
0V		1000

i) ① Press the [−1/0] key five times.

The setting value is displayed.

② Then press [ENT] to store the data.

The full scale value setting display appears.

Settings completed

After the scaling record setting is completed, proceed to (7) Unit (UNIT) setting method (see page 5-48).

Note) In scaling record mode, the actual measurable range (measurement span) is up to 75% of the measurement range shown by each range code.
For example, for the example in step **4**, when the range code "34" is set, the measurement range is −20 to 20V with span of 40V. However, the actual measurable range can be derived from the following calculation:
40 (V) × 0.75 = 30 (V)
So the maximum span is 30V within the measurement range described above. (If 0V is the center of range, the maximum measurable range is −15V to 15V).
The measurable range (span) for the measurement range is expressed by shadowed portion shown in Figure 5-22.

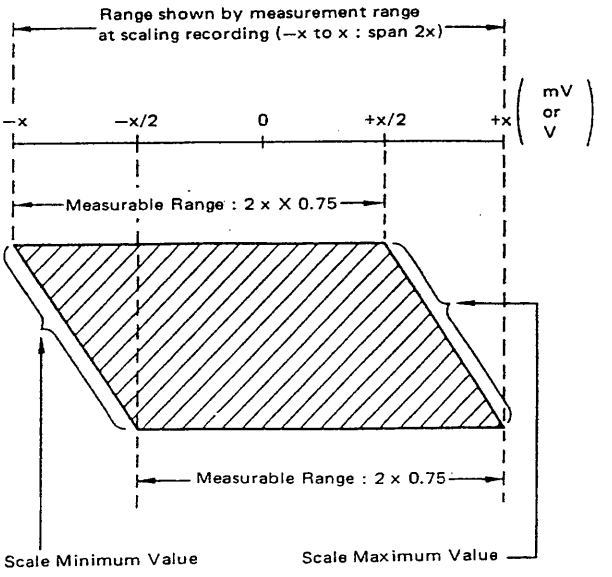
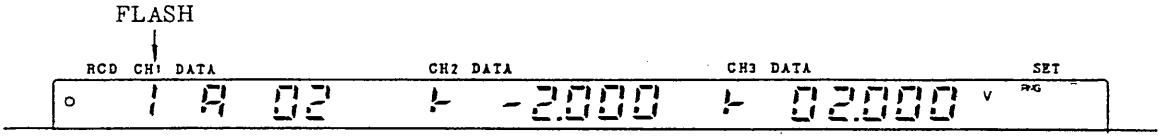


Figure 5-22.

(6) Setting method for square rooting ($\sqrt{\ }$).

To measure a DC voltage and take a square root recording, proceed as follows:

1 Press the [SET] key as many times as necessary until the range code is displayed for setting.
Range setting display (example).

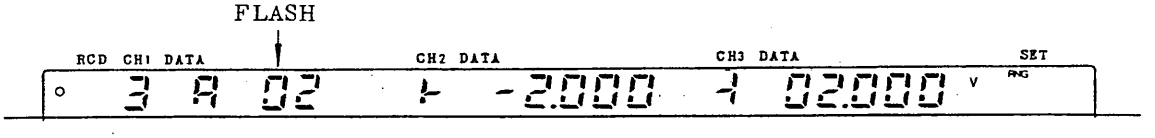


2 Set the channel number.
Example: To set channel 3, press the [C 3] key.

Channel number 3 is set, and the cursor (flashing position) advances.

3 With A: NORMAL, chosen from the SET CODE list. press the [SHIFT] and [A 1] keys.

SET CODE
A NORMAL
d DELTA
- SKIP



A (NORMAL) is set, and the cursor (flashing position) advances.

4 Select the measuring range from the RNG code table.
Range codes 40 thru 45 correspond to the following measuring ranges, respectively.

40: –20 to 20mV
41: –200 to 200mV
42: –2 to 2V
43: –6 to 6V
44: –20 to 20V
45: –50 to 50V

DC Voltage measurement

Square rooting

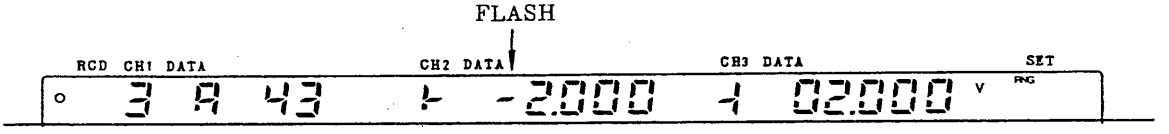
Range Code
40 to 45

[°C]

RANGE CODE		
00 –20–20mV	TC	16 T –200–400°C
01 –200–200mV	10 R 0–1760°C	U (DIN) Cu-CuNi
02 –2–2V	11 S 0–1760°C	17 N 0–1300°C
03 –6–6V	S (DIN) PtRh-Pt	18 W 0–2315°C
04 –20–20V	12 B 400–1820°C	
05 –50–50V	13 K –200–1370°C	RTD JPt 100
30–35 LIN SCALING	K (DIN) NiCr-Ni	Pt 100
40–45	14 E –200–800°C	(Pt 50)
SQUARE ROOTING	15 J –200–1100°C	20 –200–550°C
(√‾) ⚠	L (DIN) Fe-CuNi	

[°F]

RANGE CODE		
00 –20–20mV	TC	16 T –328–752°F
01 –200–200mV	10 R 32–3200°F	
02 –2–2V	11 S 32–3200°F	17 N 32–2372°F
03 –6–6V		18 W 32–4200°F
04 –20–20V	12 B 752–3308°F	
05 –50–50V	13 K –328–2498°F	RTD Pt 100
30–35 LIN SCALING		(Pt 50)
40–45	14 E –328–1472°F	20 –328–1022°F
SQUARE ROOTING	15 J –328–2012°F	
(√‾) ⚠		



The range code "43" is set.
The FLASH position shifts to the top of the span lower limit value set numeral.

5 Perform the span setting.
With numeral keys, set the lower limit and upper limit values of span.

Example: In case they are set to 1V (Lower limit) and 5V (Upper limit)

Press the keys [-1/0], [A/1], [-1/0], [-1/0], [-1/0], [-1/0], [E/5], [-1/0], [-1/0], and [-1/0].

6 Press the [ENT] key to store the data.

The value set display for square rooting record appears (for scale minimum).

7 Setting scaling values for square root recording. In the example, for step **5**, 1V was set as the minimum for the range (i.e. 0% chart recording). Furthermore, in the example, for step **7**, 5V was set as the maximum. Here, the setting of scaling values is carried out so that the measurement data is made appropriate in the units which are actually managed for display and recording when subjecting them to display and recording. (Values are to be set with a span of 30000 within the range of −19999 to +20000.)

Example: Let us perform setting so that the recording value will be 0 → 10000 when the input is 1 — 5V.

i) Press the [→1 0] key five times.

The setting value is displayed.

Then press [ENT] to store the data.

The full scale value setting display appears.

Settings completed

After the end of square root record setting, proceed to (7) Unit (UNIT) setting method (see page 5-48).

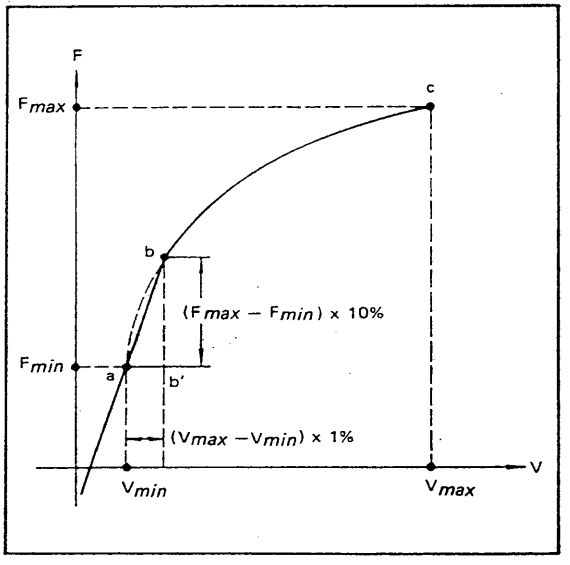
Square root

The square rooting method by this instrument is as follows:

Let us define the items as follows.

- ○ V*min* : scale minimum (see step 5)
- ○ V*max* : full scale value (see step 7)
- ○ F*min* : scaling minimum (see step 9 i))
- ○ F*max* : scaling full scale value (see step 9 ii))
- ○ V*x* : input voltage
- ○ F*x* : scaling value

The relationship between V*x* (input voltage) and F*x* (scaling value) of this instrument is expressed by the graph below. (The graph configuration is approximate.)



Between b and c on the graph, the following relation holds between F*x* and V*x*

$$Fx = (Fmax - Fmin)\sqrt{\frac{Vx - Vmin}{Vmax - Vmin}} + Fmin$$

And, between a and b, the relation:

$$Fx = \frac{10\,(Fmax - Fmin)}{Vmax - Vmin}(Vx - Vmin) + Fmin$$

holds.

Measurement span settable range

When setting of the square rooting record is carried out, an actually measurable range (measurement span) is up to 75% of the measurement range indicated by a relevant range code.

When a measurement range code "43" is set (see step 4), for example, its measurement range is −6 to +6V, having a range of 12V, but the maximum range of actual measurement is

12 (V) × 0.75 = 9 (V)

If −4V is set for V*min* (see step 5),

V*max* ≦ 5V

holds. (6V cannot be set for V*max*)

As shown in the examples for steps 5 and 7 , when V*min* = 1V and V*max* = 5V are set, the span is 4V, which is within the range of 9V, and is settable accordingly.

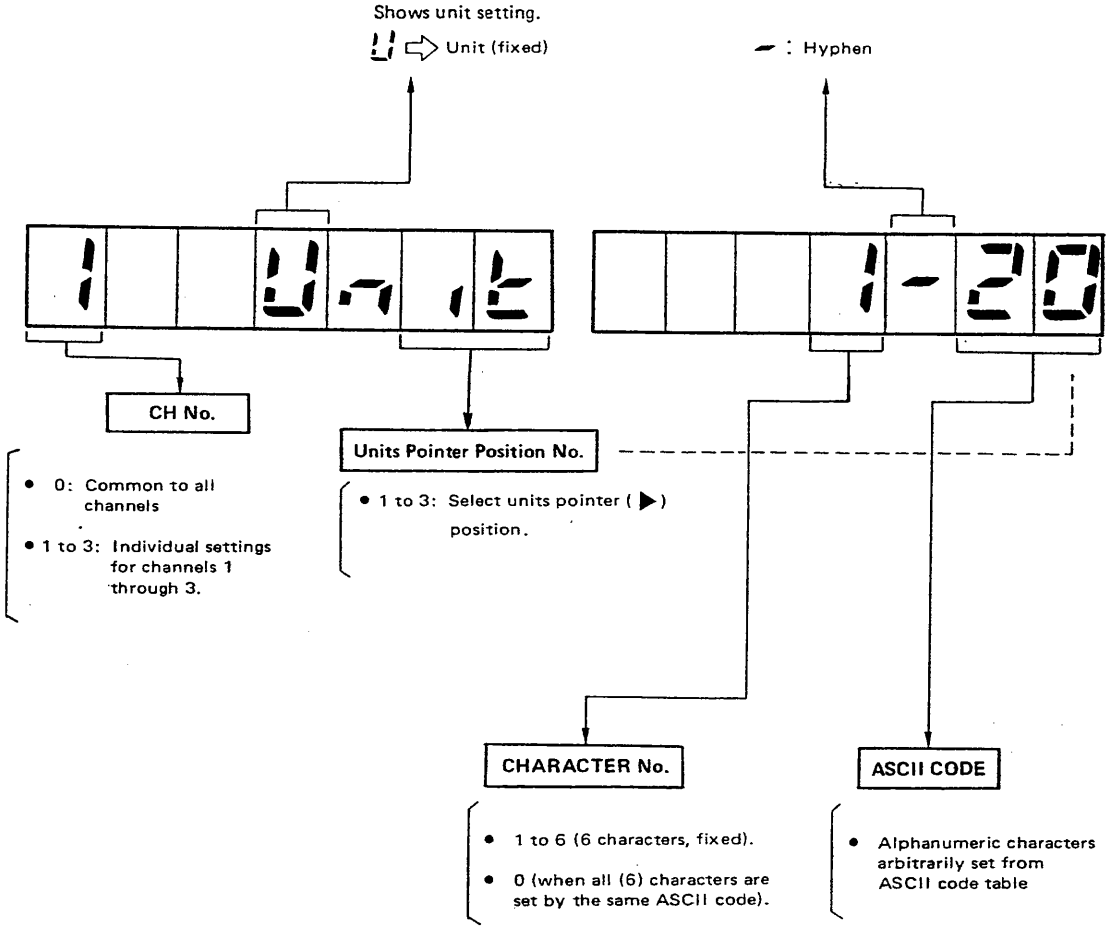
(7) Unit (UNIT) setting method.

When linear scaling recording or square rooting recording is to be performed, it is convenient to set for the channel. (an appropriate unit is printed out on the chart).

For channel not requiring scaling (linear scaling and square rooting ($\sqrt{\ }$)), no unit setting is required.

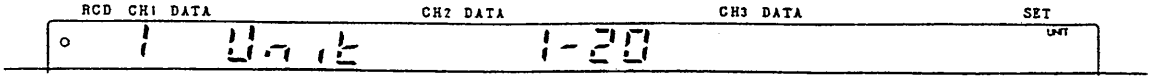
Even if units are set, they cannot be displayed or printed out (in this case, the unit corresponding to the measurement range code is displayed or printed out).

Unit (UNIT) Setting Table

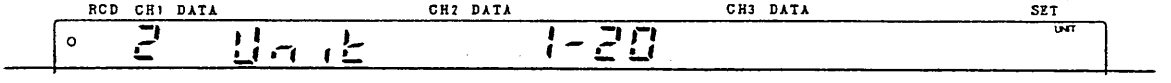


Proceed as follows:

1 Press the [SET] key as many times as necessary until the unit display panel appears.



2 Set the channel number, using the numeric keys, for which the unit is to be set.
Example: To set channel number 2, press the [2] key.

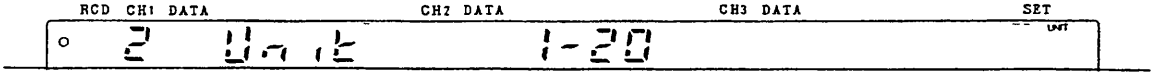


Channel 2 is set, and the cursor (flashing position) advances.

3 Set the unit pointer position number with a numeric key (see Note below).
The UNIT can be printed out but cannot be displayed. If the UNIT to be used is preattached following the pointer (▶), this helps you know the unit in the current display channel.

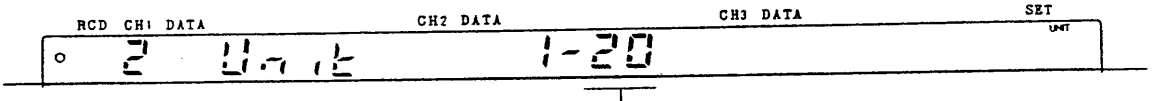
Example: Press the [2] key to set the unit to the middle of the display panel.

Note: The unit pointer position is set with a number 1, 2 or 3.
When no. 1 is set, the unit pointer is displayed on top of the panel.
When no. 2 is set, the unit pointer is displayed on the middle of the panel.
When no. 3 is set, the unit pointer is displayed on the bottom of the panel.



The unit pointer position number 2 is set and the pointer goes down to the middle of the display panel.

4 Set the unit by entering up tp six alphanumeric characters. The example below shows that the first character is displayed with an ASCII code (space).
As desired, set a new first character by entering the ASCII code and then pressing the ENT key. Then, the second character (with numeral 2 shown) is automatically displayed. Enter an ASCII code for the second character and press the ENT key. Thus, proceed until all of the 6 new characters are entered (by ASCII codes) and set. (one concrete example is shown on the next page for your reference).



ASCII Code Table

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

If data entry is invalid, see pages 5-81 through 5-83.

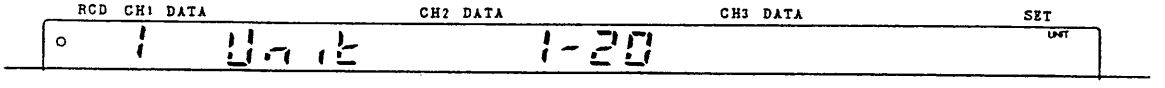
Unit (UNIT) setting example.

This example shows the setting of the unit (UNIT) KL/H.

Set a Unit (UNIT) by entering six alphanumeric characters.

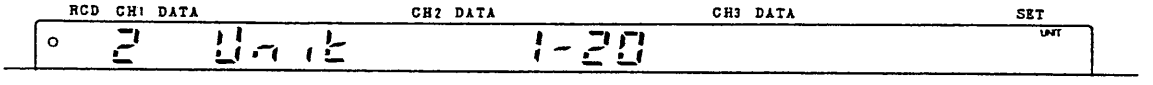
The unit example given above comprises five characters including a period, in such a case, enter six characters in total by adding a space (code 20).

1 Press the [SET] key as many times as necessary to display the unit setting.



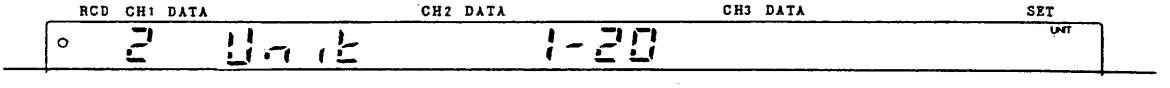
2 Select a channel number using the numeric keys for which the unit is to be set.

Example: To select channel number 2, press the [2] key.

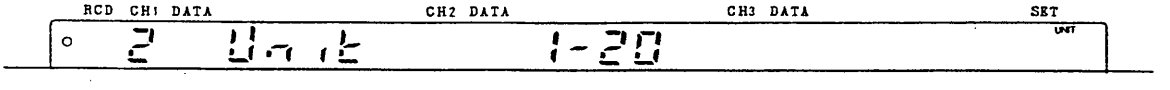


3 Set units pointer position no.

Example: To set the pointer No. 2, press the [2] key.

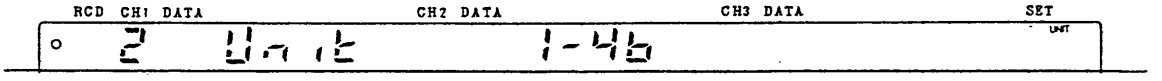


4 Press the [1] key to select the 1st character.

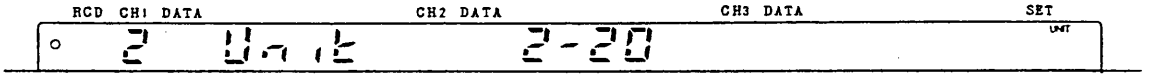


If data entry is invalid, see pages 5-81 through 5-83.

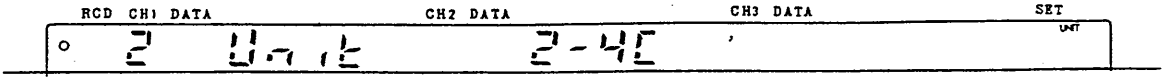
5 Select "K".
As K: 4B (ASCII code),
press the keys [D 4], [SHIFT] and [B 2] in turn.



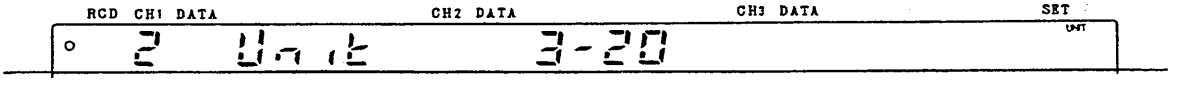
6 Press the [ENT] key to store "K".
(Now K is set as the 1st character).



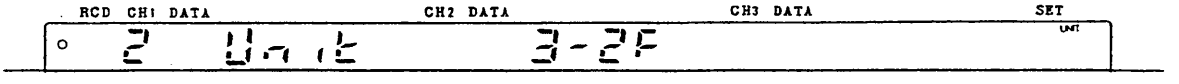
7 Select "L".
As L: 4C (ASCII code),
press the keys [D 4], [SHIFT] and [C 3] in turn.



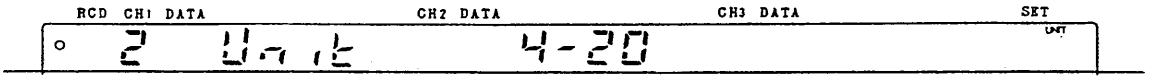
8 Press the [ENT] key to store "L".
(Now L is set as the 2nd character).



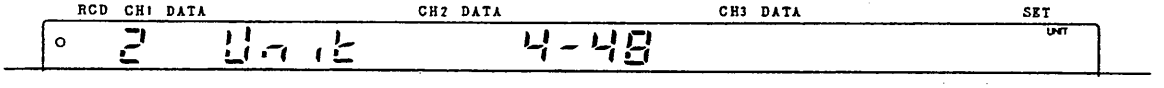
9 Select "/" (slash).
As / : 2F (ASCII code),
press the keys [B 2], [SHIFT] and [F 6] in turn.



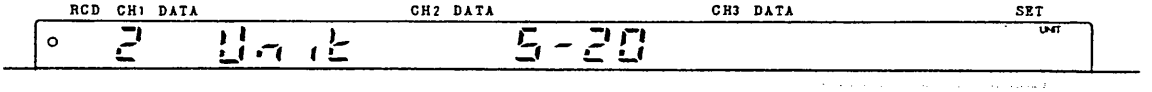
10 Press the [ENT] key to store "/".
(Now / is set as the 3rd character).



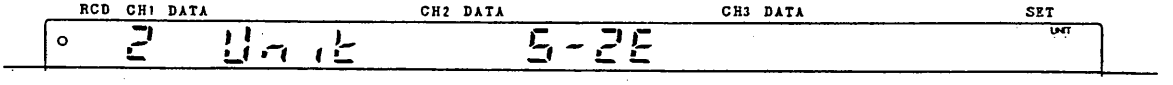
11 Select "H".
As H: 48 (ASCII code),
press the keys [4] and [8] in turn.



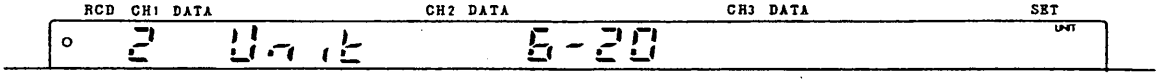
12 Press the [ENT] key to store "H".
(Now H is set as the 4th character).



13 Select "·" (period).
As · : 2E (ASCII code),
press the keys [2] , [SHIFT] and [5] in turn.

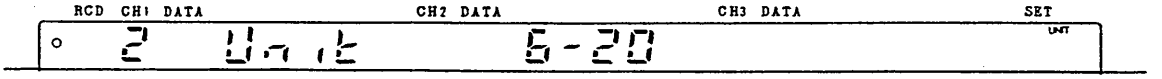


14 Press the [ENT] key to store "·".
(Now · is set as the 5th character).

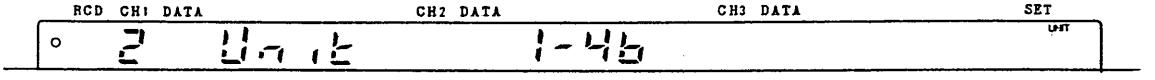


If data entry is invalid, see pages 5-81 through 5-83.

15 Select "space".
As space: 20 (ASCII code),
press the keys [8/2] and [-1/0] in turn.



16 Press the [ENT] key to store "space".
(Now space is set as the 6th character).



The display returns to the 1st character, no character flashes, and now setting is completed.

Settings completed

At this time, it can be confirmed by executing list printout whether the unit (UNIT) is set correctly to the desired measurement channel or not.

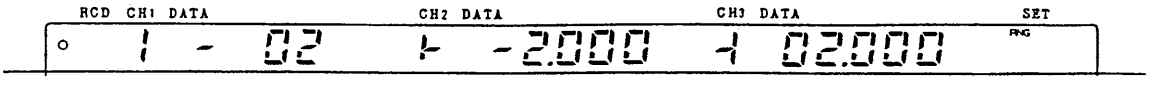
If data entry is invalid, see pages 5-81 through 5-83.

(8) Setting method for SKIP (not measured).

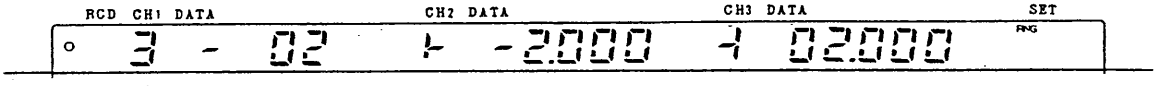
If any of the channels is not required for measurement, set "SKIP." (if "SKIP" is not set with the channel not being used, unnecessary trace will be recorded on the chart, obstructing reading of other channels)

To set SKIP, proceed as follows:

1 Press the [ENT] key as many times as necessary until the range setting panel appears.



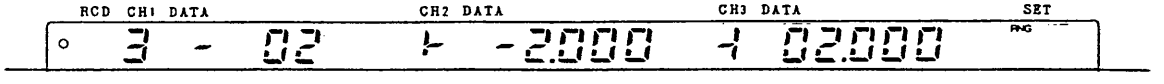
2 Set the desired channel number.
Example: To select channel 3, press the [C 3] key.



Channel 3 is set, and the cursor (flashing position) advances.

3 Select –: SKIP from the SET CODE list. Press [(SKIP) –] key.

SET CODE
A NORMAL
d DELTA
- SKIP



–: SKIP is set, and the cursor (flashing position) advances.

If data entry is invalid, see pages 5-81 through 5-83.

4 Press the ENT key to set the channel SKIP.

No character flashes. The data setting is completed.

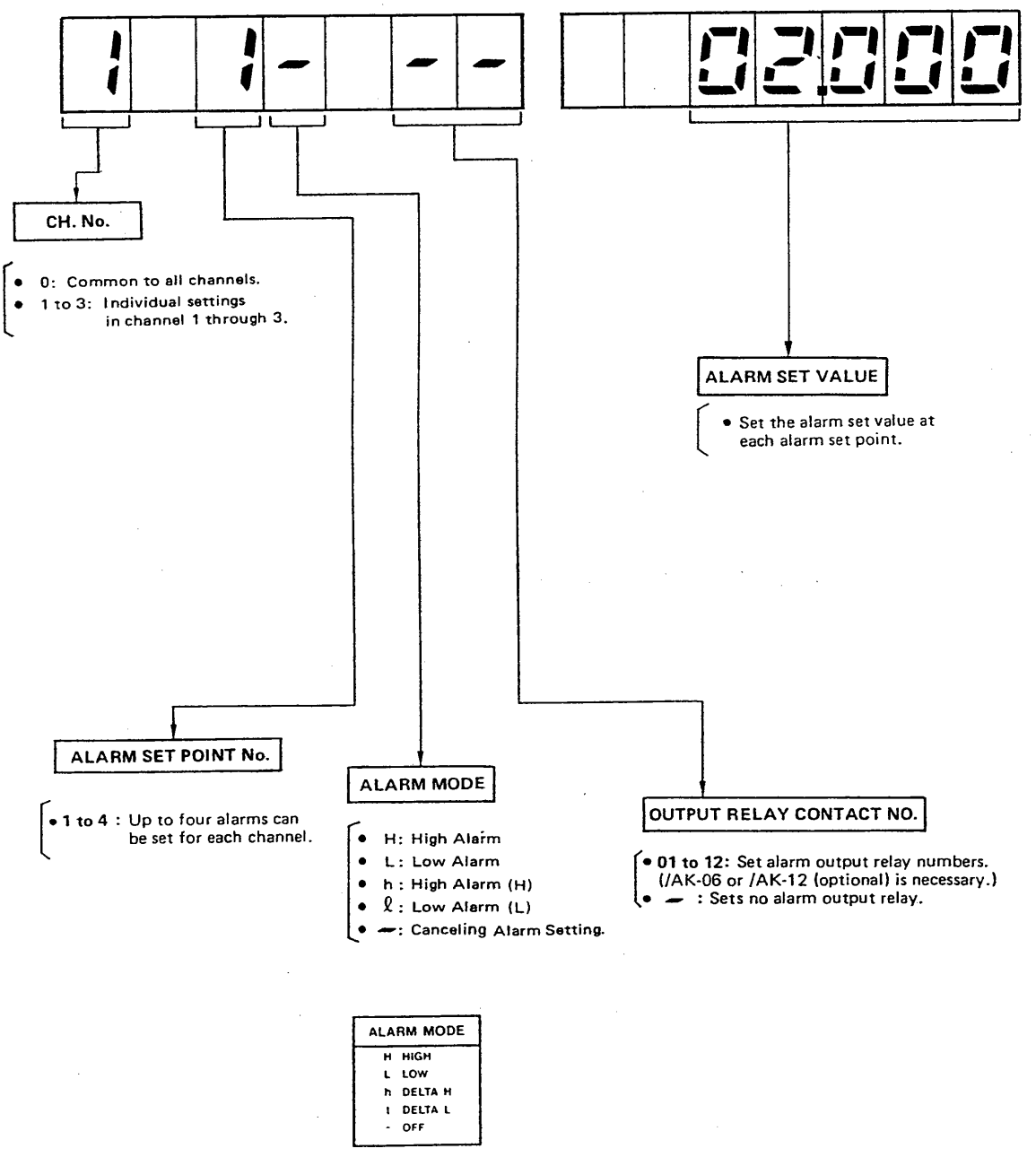
Settings completed

○ It is recommended that you remove the felt-tip pen of the channel which is set as the SKIP channel.

If data entry is invalid, see pages 5-81 through 5-83.

5-4-6. Alarm Setting.

Alarm Setting Table



The procedure for setting alarms is explained below (if alarm setting is not required, omit this setting).

Up to four alarm points per channel may be set.

If the measured value exceeds the alarm set point, the recorder displays "ALM" and performs alarm printout example on page 2-10). Further, using the alarm output relay /AK-06 or /AK-12*-1 (optional), alarm signal output at alarm ON is available, and by combining the /AK-06 or /AK-12 with /REM (optional), the recorder chart feed speed can be changed when alarm turns ON*-2.

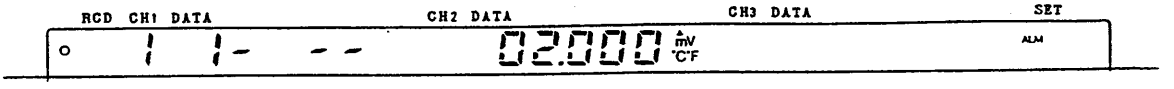
*-1: See pages 2-7 and 2-8.

*-2: See page 2-11.

I Alarm setting procedure for voltage measurement.

To set alarms, proceed as follows:

1 Press the [SET] key as many times as necessary until the ALM (alarm) is displayed.



2 Set the channel number.
Example: To select channel 6, press the [A 1] key.

Channel 1 is set, and the cursor (flashing position) advances.

If data entry is invalid, see pages 5-81 through 5-83.

3 To set the first alarm point (i.e. alarm relay number), press the [A/1] key.

Note 1: Up to 4 alarm points can be set per channel.
Note 2: The above setting may start with other than "1".

The first alarm point (No. 1) in set and the cursor (flashing position) advances.

4 Set the alarm mode.
Two alarms can be set.
- O H: High alarm *
- O L: Low alarm

* For h (ΔH) and ₂ (ΔL), see Page 5-61 for Alarm Setting for Difference Recording.

Press the [SHIFT] and [H/7] keys to set the high alarm point.
Press the [SHIFT] and [L/8] keys to set the low alarm point.
To cancel the alarm setting, press the [CAL/−] key.
Assume that for example, a measurement range of −2 to 2V (RNG code: 02) is already set for channel number one (1).
To set a high alarm point (H), press the [SHIFT] and [H/7] (i.e. "H" for high) keys.

If data entry is invalid, see pages 5-81 through 5-83.

5 Set the alarm output relay contact number (when the relay /AK-06 or /AK-12 is not used, omit this setting. Press the [▶] key twice to advance the flashing position.)
Example: To set the relay contact number 01, press the [-1/0] and [A/1] keys.

The cursor (flashing position) advances.

6 Set the alarm point.
To set the alarm point at 1V (as a high alarm set point), press the keys [-1/0] and [A/1], then [-1/0] three times.

The high alarm set point is displayed. The cursor (flashing position) moves to the right most digit (see the display above).

7 Press the [ENT] key to store the alarm set point data.

No character flashes. The alarm set point settings are completed. After the [ENT] key is pressed, the alarm set point appears on the bar graph. (See page 5-10, ⑨)

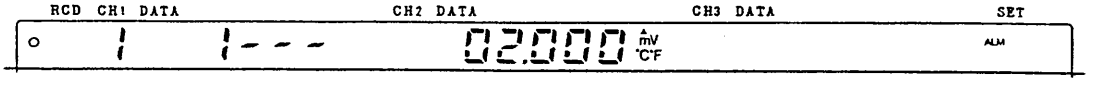
To set another alarm point, press the [ENT] key once again. Repeat Steps **2** through **7**.

If data entry is invalid, see pages 5-81 through 5-83.

II Alarm setting for difference recording.

Proceed as follows.

1 Press the [SET] key as many times as necessary until the ALM (alarm) is displayed.



2 Set the channel number.

Example: To select channel 2 press the [B 2] key.

The channel 2 is set, and the cursor (flashing position) advances.

3 To set the alarm point (i.e. alarm relay number) for the first setting, press the [A 1] key.

Note 1: Up to 4 alarm points can be set per channel.
Note 2: The above setting may start with other than "1".

The alarm point (No. 1) is set and the cursor (flashing position) advances.

4 Set the alarm mode – h (ΔH) for differential high alarm or ℓ (ΔL) for differential low alarm. It is assumed here, as an example, that with channel number one (1) as its reference, channel number two (2) has been set as follows.

*For H and L, see page 5-59.

	Measurement range	Range	Recording method
CH. 1	−2 to 2V	0 to 1V	Measured value recording
CH. 2	−2 to 2V	−0.5 to 0.5V	Difference recording

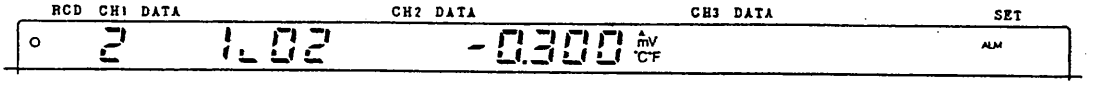
To set a low alarm point (ΔL) for recording difference in channel 2, press rhe [SHIFT] and [H ΔL −] keys.

5 Set the alarm relay contact No. (When no alarm output relay /AK-06 or /AK-12 is used, omit this setting. Press the key [►] twice to advance the cursor.)
Example: To seg the relay contact No. 02, press the [-1 0] and [B 2] keys.

The cursor (flashing position) advances.

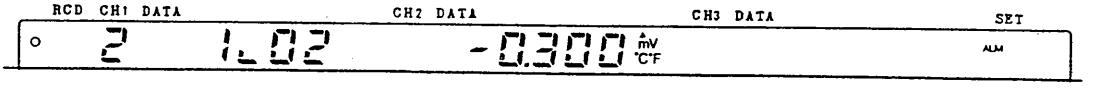
If data entry is invalid, see pages 5-81 through 5-83.

6 Set the alarm point.
To set the alarm point at −0.3V, press the [(-)], [-1 0], [C 3], [-1 0] and [-1 0] keys.



The alarm point is set, and the cursor (flashing position) mores to the right most digit.

7 Press the [ENT] key to store the alarm set point data.



Immediately after the "ENT" key is pressed, the alarm point will appear on the bar graph. (See page 5-10, ⑨)

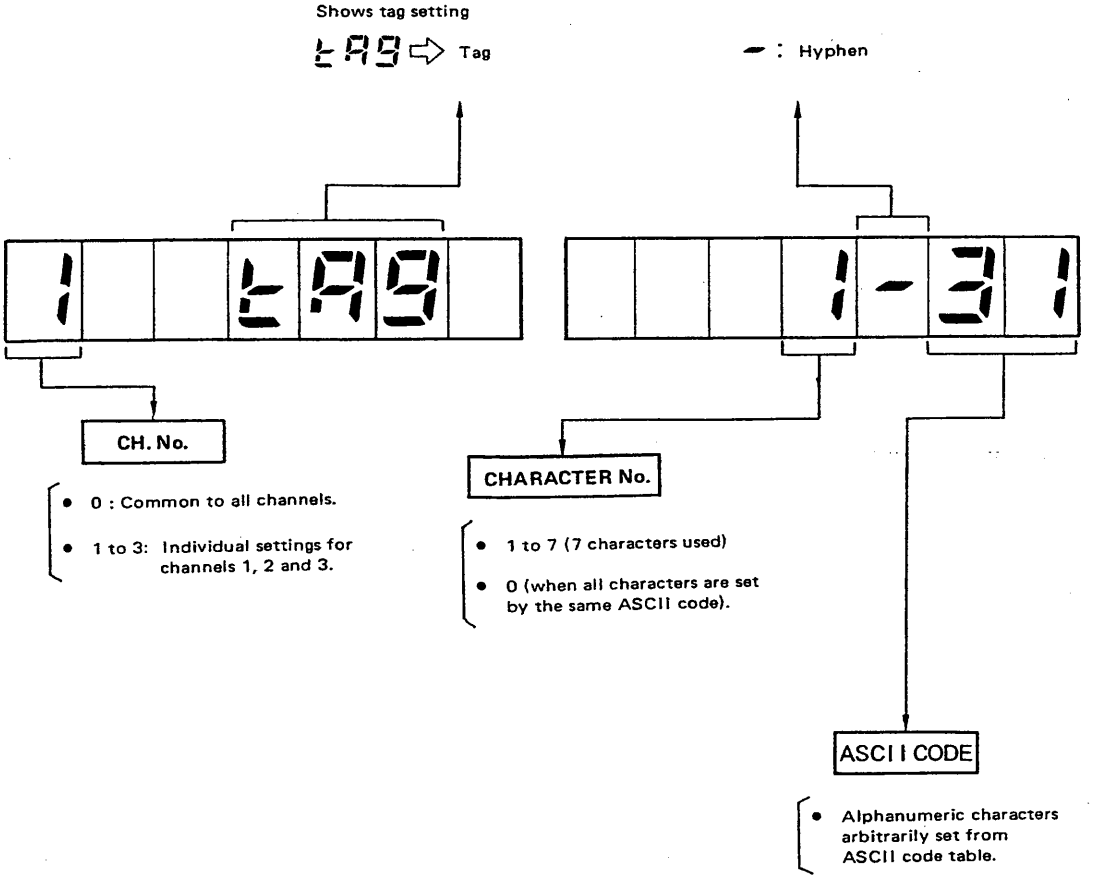
To set another alarm point, press the [ENT] key and return to step **2**. Repeat Steps **2** through **7** to complete another alarm setting.

If data entry is invalid, see pages 5-81 through 5-83.

5-4-7. Tag Setting.

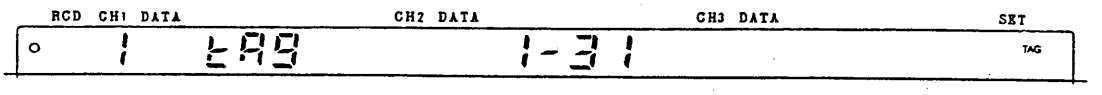
A tag is set to help identify the object being measured/recorded. A tag of 7 alphanumeric characters can be set for each channel.

Tag setting table

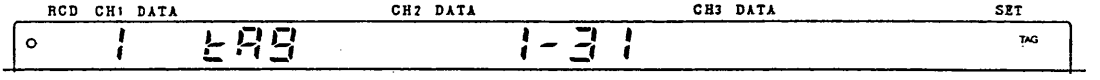


Proceed as follows.

1 Press the [SET] key as many times as necessary to display the tag setting.



2 Set the channel number, using the numeric key for which tag is to be set.
Example: To set channel number 1, press the [A/1] key.

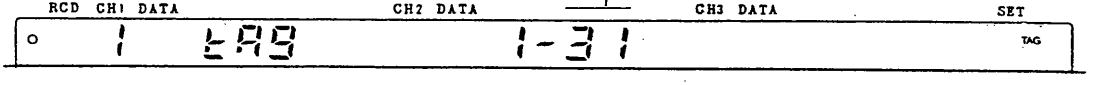


Channel number one (1) is set and the cursor (flashing position) advances.

3 A tag is set by entering 7 alphanumeric characters.
In the display example below, the ASCII code "31" for the first character "1" is shown.
As required, set a new first character by entering an ASCII code and press the [ENT] key to store the new first character.
Then, the second (2nd) character (with a character number two (2) shown) will be displayed. Set a new second (2nd) character and press the [ENT] key. Proceed until all seven (7) characters are entered (by ASCII codes) and set.
(one concrete example is shown on the next page for your reference)

ASCII Code Table

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



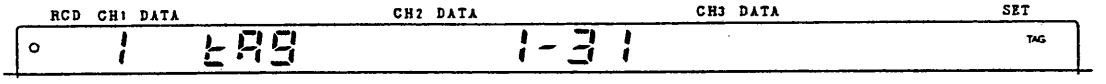
Tag (TAG) setting example.

This example shows the setting of the tag (TAG) STN-1A.

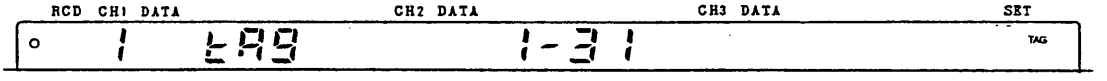
Set a tag by entering seven alphanumeric characters.

The tag example given above comprises six characters. In such a case, enter seven characters in total by adding a space (code 20).

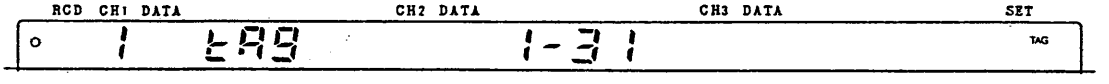
1 Press the [SET] key as many times as necessary to display the tag setting.



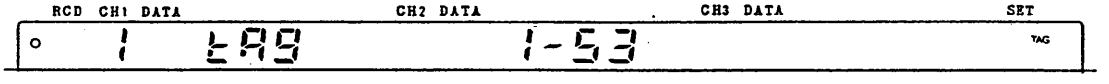
2 Use the numeric keys to set the channel number which is to be labelled with a tag number.
Example: To select channel No. 1, press the [A/1] key.



3 Select the 1st character, press the [A/1] key.

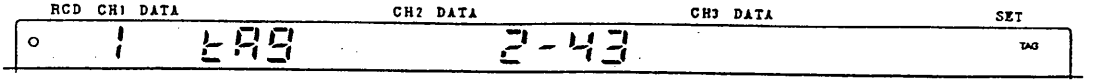


4 Select "S".
As S: 53 (ASCII code),
press the [E/5] and [C/3] keys.

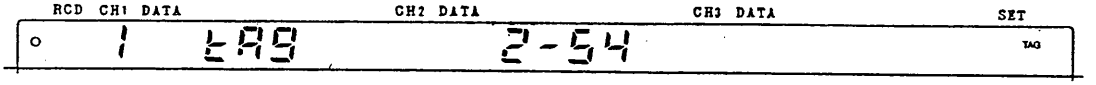


If data entry is invalid, see pages 5-81 through 5-83.

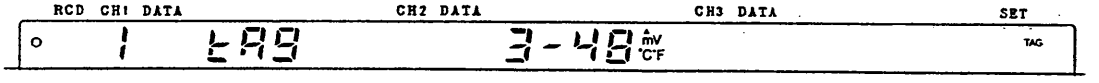
5 Press the [ENT] key to store "S".
*Now S is set as the 1st character).



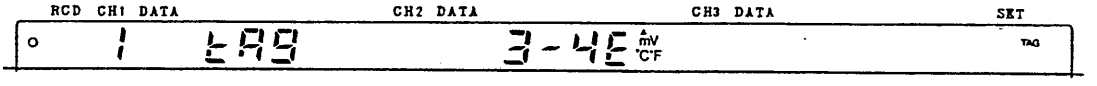
6 Select "T".
As T: 54 (ASCII code),
press the [E 5] and [D 4] keys.



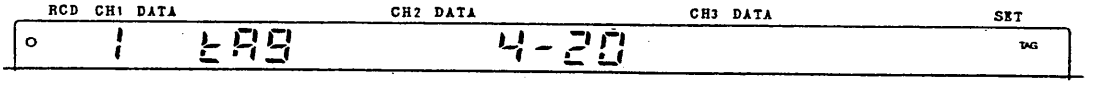
7 Press the [ENT] key to store "T".
(Now T is set as the 2nd character).



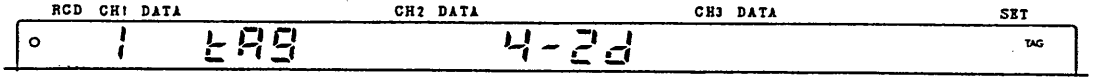
8 Select "N".
As N: 4E (ASCII code),
press the keys [D 4], [SHIFT] and [E 5] in turn.



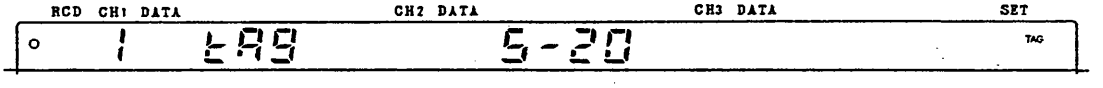
9 Press the [ENT] key to store "N".
(Now N is set as the 3rd character).



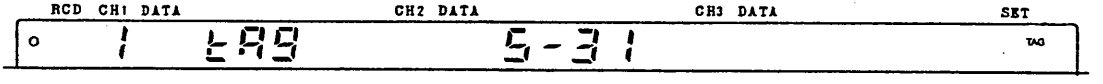
10 Select "-" (hyphen).
As -: 2D (ASCII code),
press the keys [8/2] , [SHIFT] and [D/4] in turn.



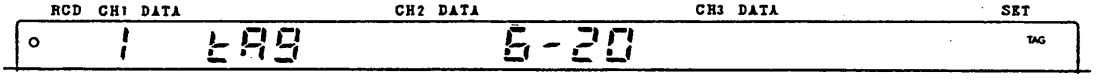
11 Press the [ENT] key to store "-".
(Now - is set as the 4th character).



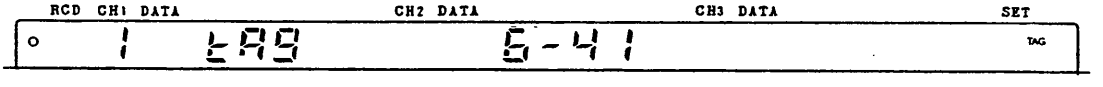
12 Select "1".
As 1: 31 (ASCII code),
press the keys [C/3] and [A/1] .



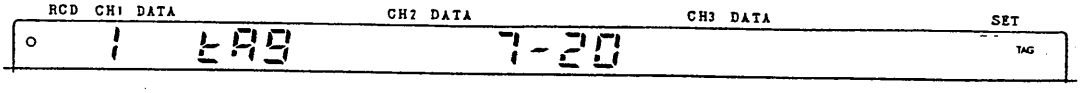
13 Press the [ENT] key to store "1".
(Now 1 is set as the 5th character).



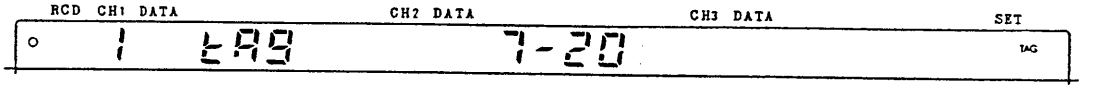
14 Select "A".
As A: 41 (ASCII codes),
press the keys [D/4] and [A/1] .



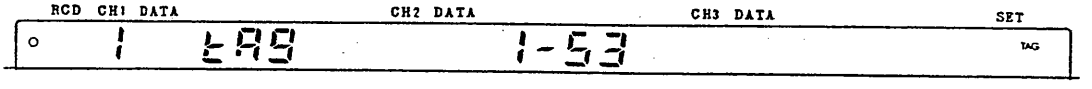
15 Press the [ENT] key to store "A".
(Now A is set as the 6th character).



16 Select "space".
As space: 20 (ASCII codes),
press the keys [8 2] and [-1 0].



17 Press the [ENT] key to store "space".
(Now space is set as the 7th character).



(S: 53)

The display returns to the 1st character, no character flashes, and now setting is completed.

Settings completed

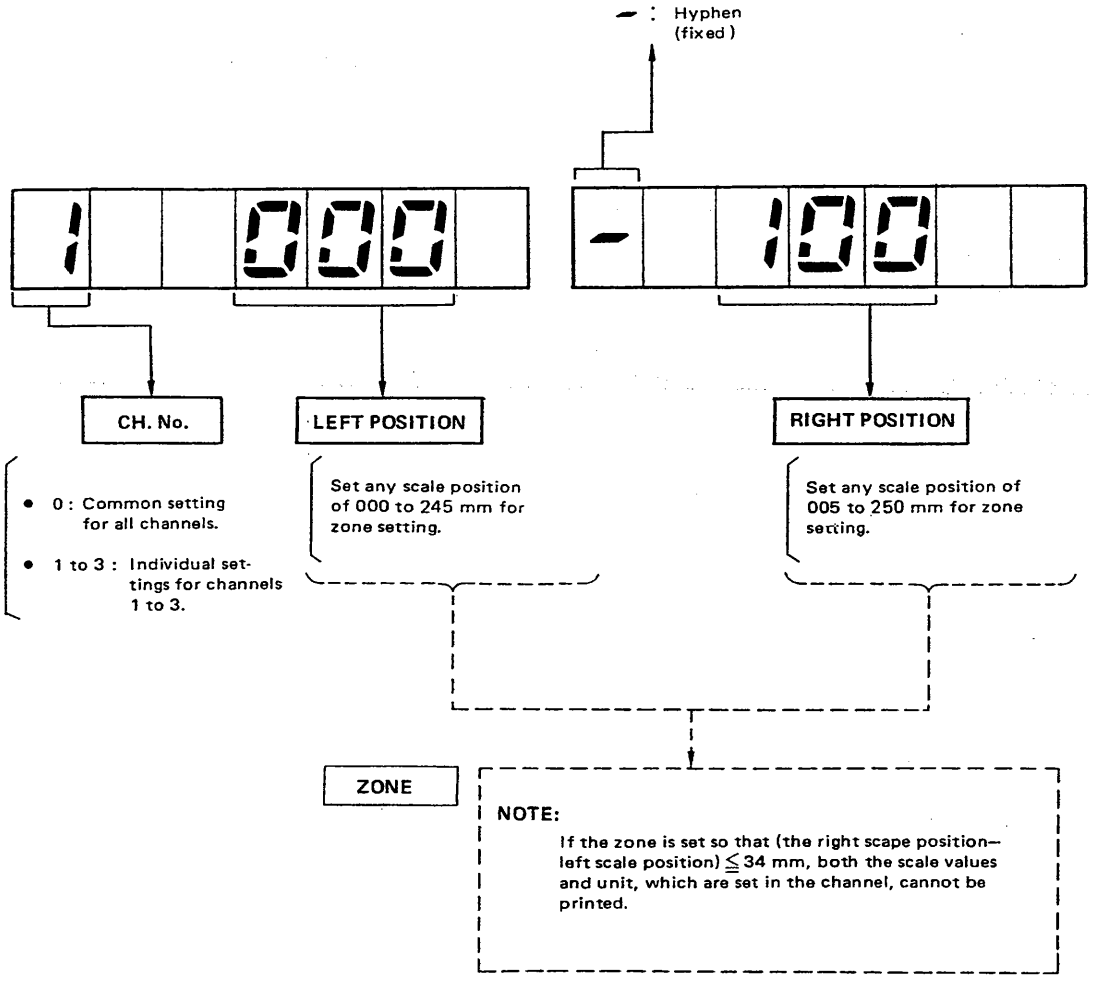
At this time, it can be confirmed by executing list printout whether the tag (TAG) is set correctly to the desired measurement channel or not.

If data entry is invalid, see pages 5-81 through 5-83.

5-4-8. Recording Zone Setting.

Set the recording zone to use the 250 mm recorder chart width effectively. The zone setting in each channel prevents overlapping recording with different channels, thus making recording easy-to-read. In addition, this recording zone setting can prevent analog recording over digital printout.

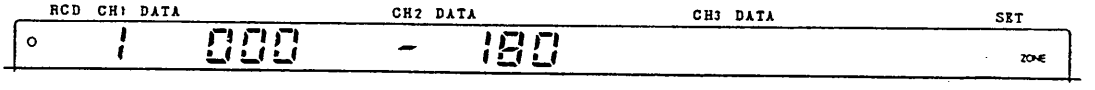
Recording Zone Setting Table



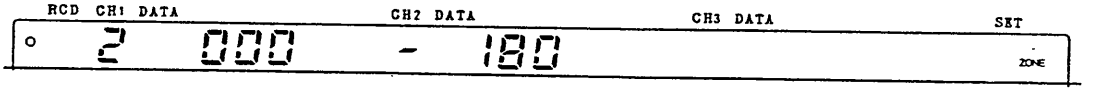
Recording Zone Setting Procedures.

To set the recording zone, proceed as follows:

1 Press the [SET] key as many times as necessary to display the zone setting.



2 Use the numeric keys to set the channel number (see Note).
Example: To set the channel number 02, press the [8 2] key.



The channel number 02 is set and the cursor (flashing position) advances.

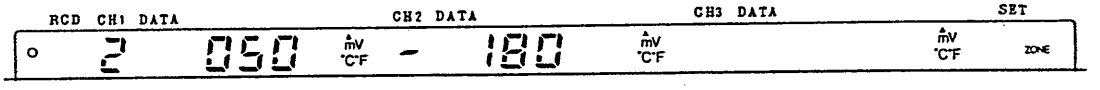
3 Set the recording zone (positions of scale minimum and full scale value) on the chart in 1 mm units. Assume that the measurement range and recording range for the channel number 02 are set as follows.

- Measurement range: −20 to 20 (see Note below)
- Recording range: 1 to 5V

↑ ↑
Vmin Vmax

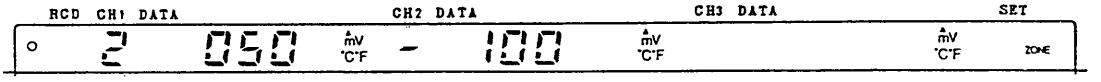
Note: Temperature measurement using TCs and RTDs can also be set in the same manner.

To set the positions of scale minimum at 50 mm (Vmin) on the chart, press the [-1 0], [E 5] and [-1 0] keys.



The position of the scale minimum is set and the cursor (flashing position) advances.

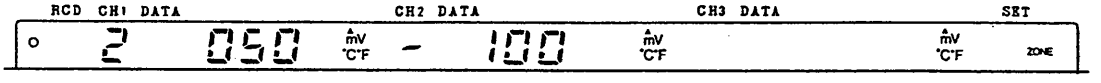
To set the position of full scale value at 100 mm (Vmax), press the [A 1], [-1 0] and [-1 0] keys.



The full scale value recording position is set and the cursor (flashing position) advances.

If the zone is set so that (the right scale position – left scale position) ≦ 34 mm, both the scale values and unit, which are set in the channel, cannot be printed.

4 Press the [ENT] key to store the zone setting data.



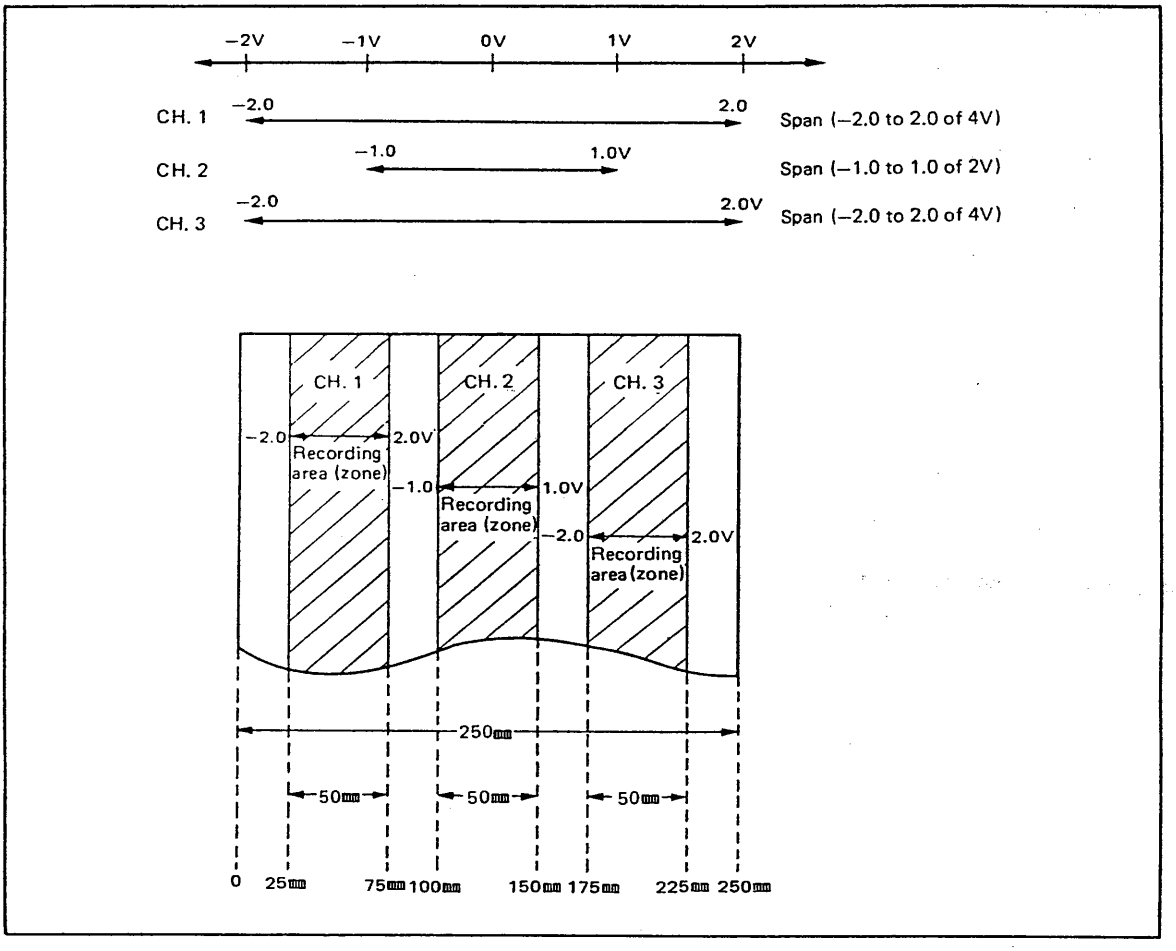
No character flashes and the zone setting is completed.

Zone setting completed

○ **Zone Recording.**

The zone setting for each channel on the 180 mm recorder chart prevents overlap recording between different channels. This setting can divide the full scale range into the desired recording zone for each channel (see the zone setting example below).

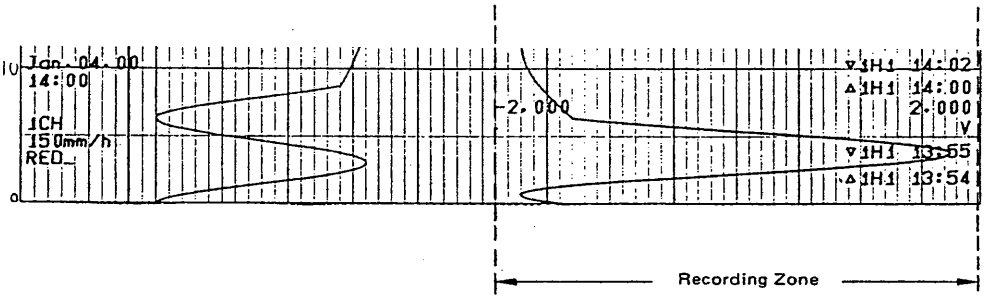
● **Zone Setting Example.**



● **Zone Setting (on the recorder chart).**

	Position of scale minimum	Position of full scale value	Zone width
CH. 1	−2.0V: 25mm	2.0V: 75mm	50mm
CH. 2	−1.0V: 100mm	1.0V: 150mm	50mm
CH. 3	−2.0V: 175mm	2.0V: 225mm	50mm

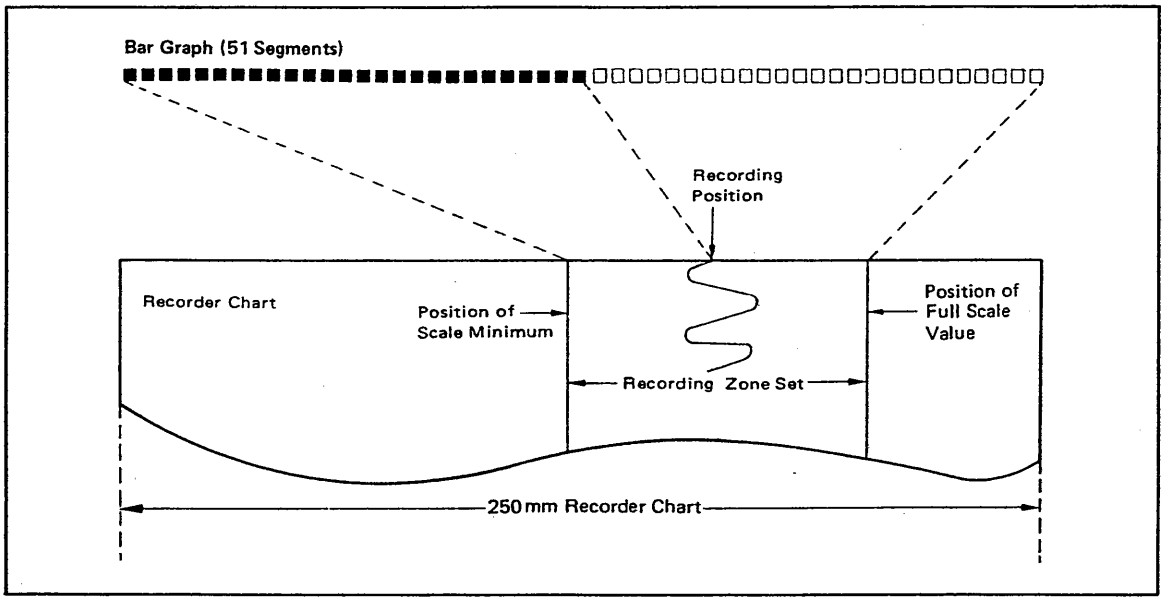
Zone Setting and Recording Example (Model 4173).



This recording example shows the recording zone for channel 1, which is set within the broken lines above.

■ **Relations between the Recording Zone and Bar Graph Display.**

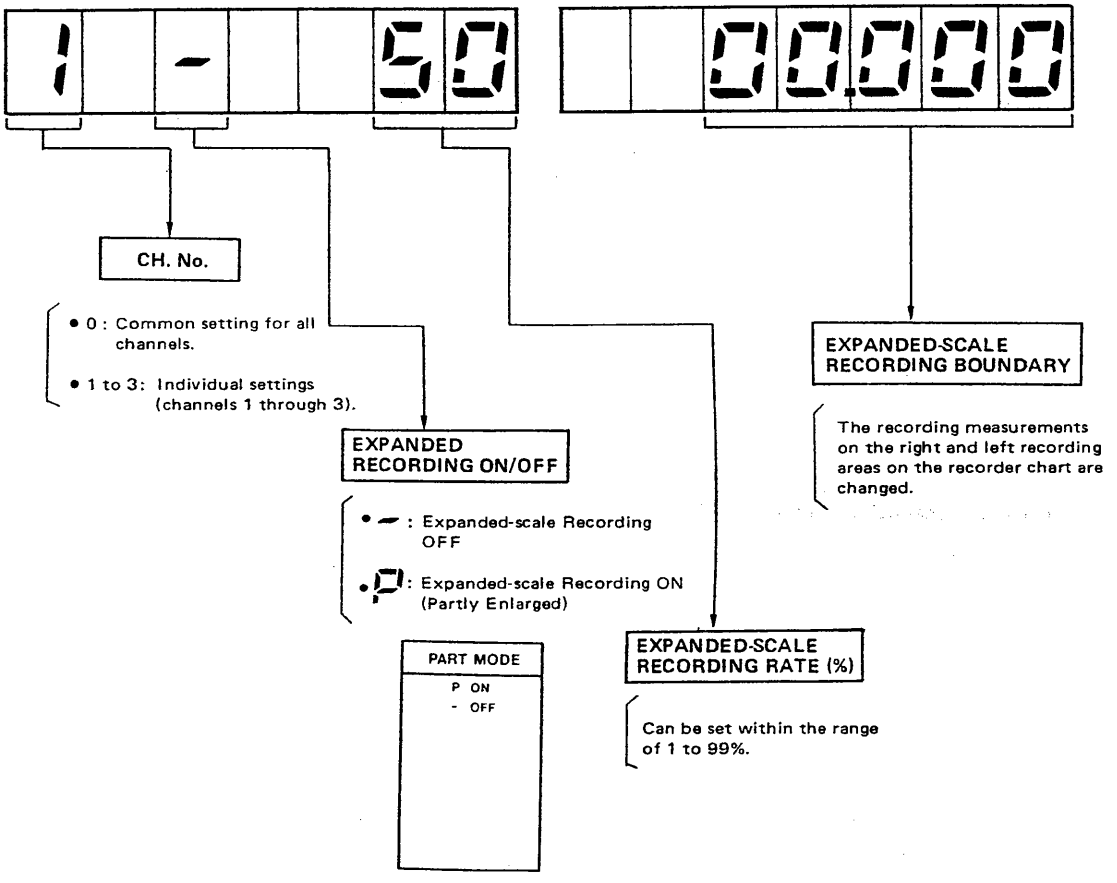
The figure below shows the relations between the recording position within the zone set and the measurement display with a bar graph.



5-4-9. Expanded-Scale Recording Setting. (Partly Enlarged Recording Setting)

The recording area can be partly expanded in a critical measuring range between two values on the recording chart.

Setting Expanded-Scale Recording Ranges.



Setting Procedures for Expanded-Scale Recording

Proceed as follows:

1 Press the [SET] key as many times as necessary until the expanded-scale recording range setting display appears.

2 Set the channel number.
Example: To set the expanded-scale recording range for channel 3, press the [C] [3] keys.

The channel 3 is set and the cursor (flashing position) advances.

3 Set P (initial letter of Part, meaning "partly expanded") and then press the [SHIFT] and [P 9] keys.

The "P" is set and the cursor (flashing position) advances.

4 Set the expanded-scale recording rate (see Page 5-79).

Example: To set 30%, press the [C 3] and [-1 0] keys.

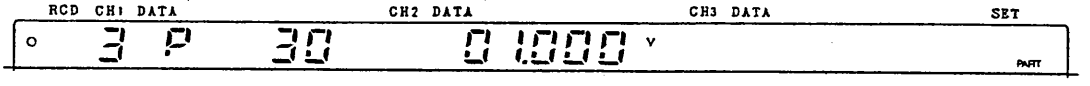
The cursor (flashing position) advances.

5 Set the expanded-scale recording boundary (see Page 5-79).

Example: Assume that the measuring range for channel 3 is −2 to 2V (range code 02). To set the expanded-scale recording boundary to 1V, press the [-1 0], [A 1], [-1 0], [-1 0] and [-1 0] keys.

The cursor (flashing position) advances.

6 Press the [ENT] key to store the expanded-scale recording data.



No character flashes. The expanded-scale recording setting is completed.

Expanded-scale recording setting completed

If data entry is invalid, see pages 5-81 through 5-83.

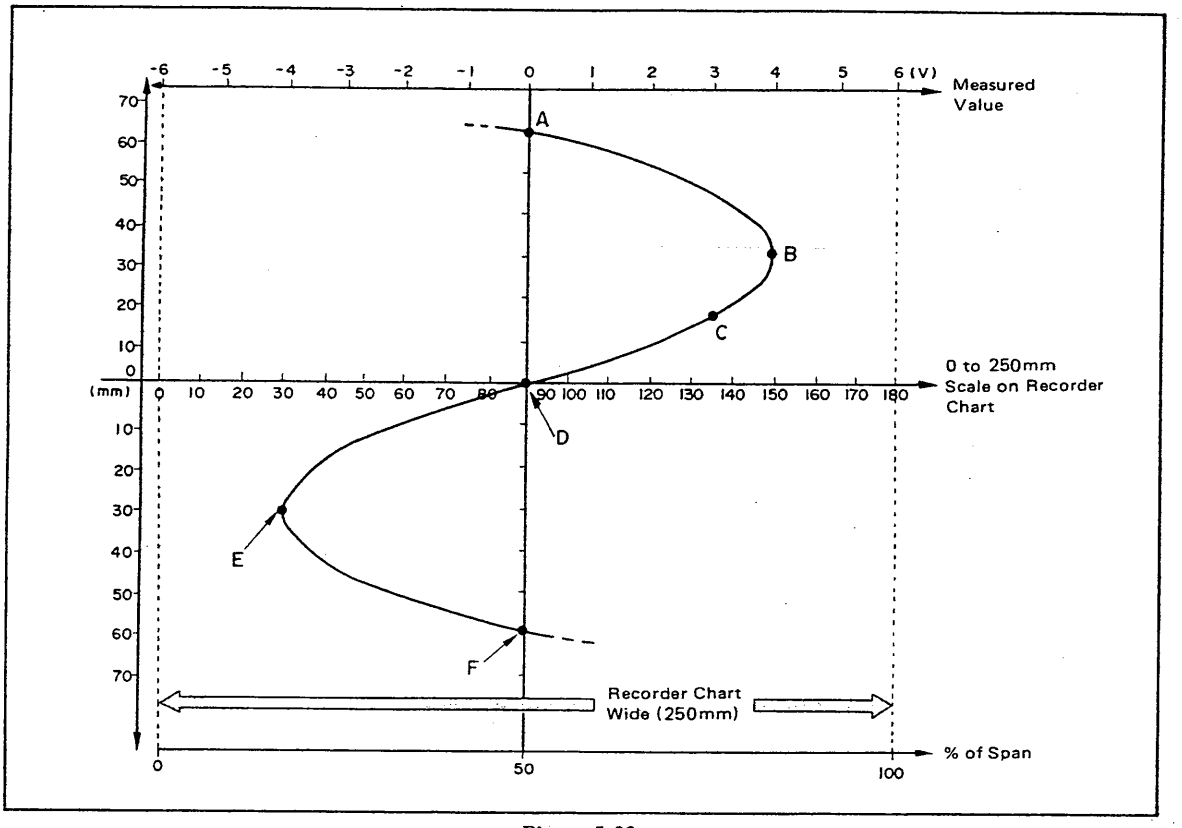


Figure 5-23.

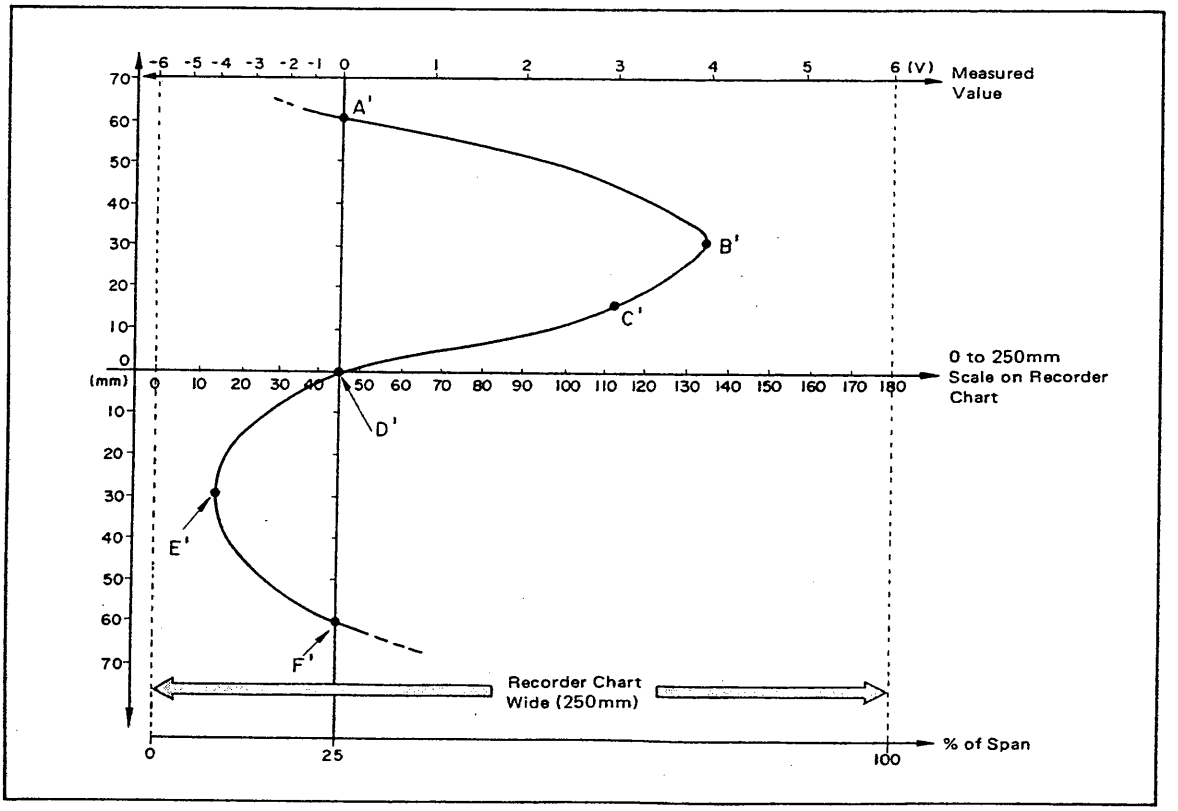


Figure 5-24.

Figures 5-23 and 5-24 show the examples of normal recording and expanded-scale recording for measured values. In these examples, the chart feed speeds are the same and A through F and A' through F' are the same measured values. Tables 5-1 and 5-2 list the recording positions (mm) for measured values.

Table 5-1.

	Measured value (V)	Recording position (mm)
A	0	90
B	4	150
C	3	135
D	0	90
E	−4	30
F	0	90

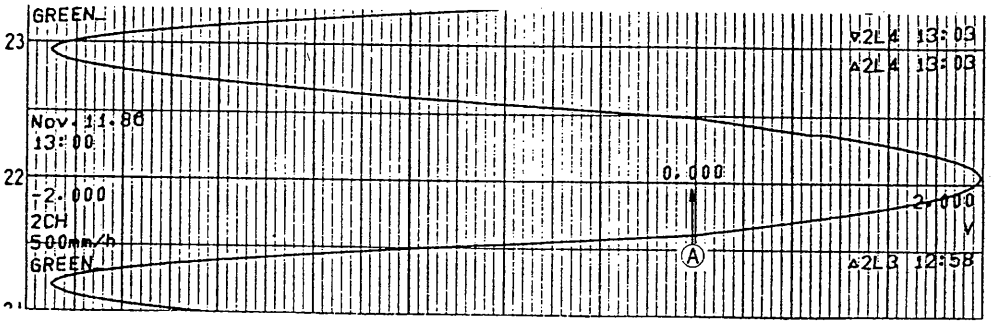
Table 5-2.

	Measured value (V)	Recording position (mm)
A'	0	45
B'	4	135
C'	3	112.5
D'	0	45
E'	−4	15
F'	0	45

If the expanded-scale recording setting is carried out, two unit measures for recording are used. So the recording positions with even the same measured values are different. To decide these two measures, steps **4** and **5** above are used (see Page 5-77). In Figure 5-23 for normal recording, 0V positions 90 mm on the chart (50% scale) and the full scale ranges −6 to 6V.

Figure 5-24 shows the expanded-scale recording example, in which 0V positions 45 mm from the left end of the chart (full scale ranging −6 to 6V). In this case, the expanded-scale recording boundary is set to 0V. As shown in Figure 5-24, in the positive voltage range (the right side of the Y-axis), assigned is the following: the recording span × {100% − expanded-scale recording rate (%)}; in the negative voltage range (the left side of the Y-axis), assigned is the following: the recording span × expanded-scale rate (%) ("compressed" recording width in this area).

Recording Example (for Model 4173).



In the expanded-scale recording example above, position Ⓐ indicates the position of expanded-scale recording boundary set to 0V. Periodical printout is carried out in the channel in which expanded-scale recording is set.

When five digits 0.000 is printed as shown above, the expanded-scale recording boundary is as follows:

0.000

Expanded-Scale Recording Boundary.

(Center character indicates the position of expanded-scale recording boundary on chart paper.)

5-4-10. Incorrect Data Entry.

1 If incorrect data has been displayed, but the [ENT] key has not been pressed, move the cursor (flashing position) to the incorrect data by pressing the [◄] or [►] key, correctly enter the data and then press the [ENT] key to store the new data.

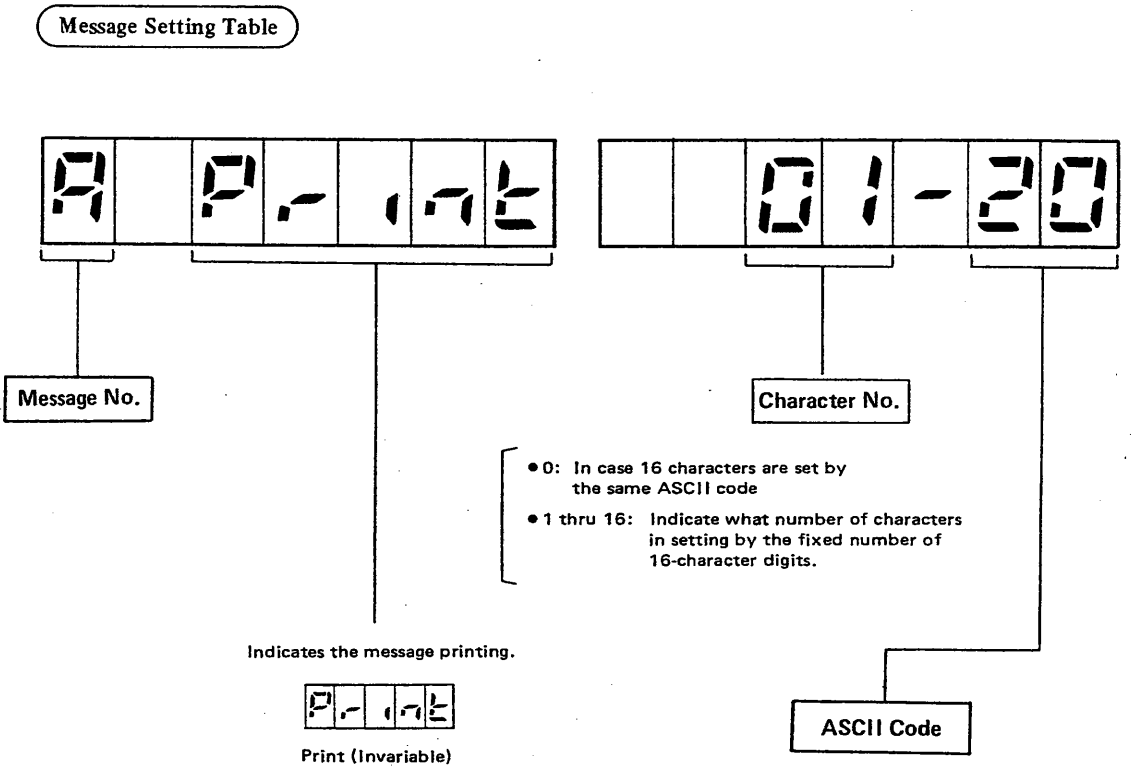
Example: When 0000.0 is correct.

Press the [◄] key three times to position the cursor (flashing position) to the incorrect data ("3").

Correct the data by pressing the [-1/0] key and then set the new data ("0") by pressing the [ENT] key.

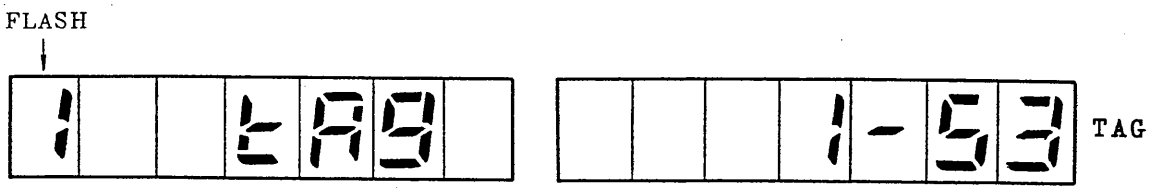
5.4.11. Message Printing (Optional) Setting

This setting is optionally applied to machine models added with message printing function (/MSG), and the hour and message made with entry are printed at contact input ON (CLOSED).



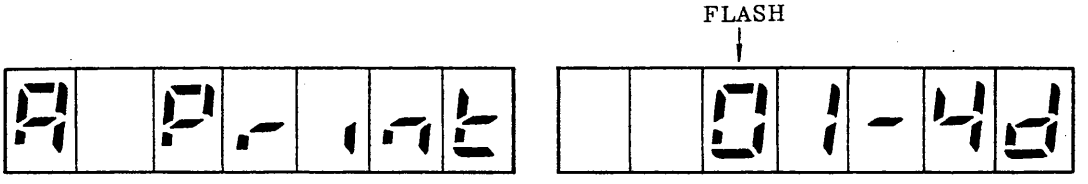
Hereinafter, the setting procedure is described.

1 Press the key [SET] several times (each point of time the frequency is different), and make the display to the tag setting display.



2 Make it from "TAG" to the message printing.

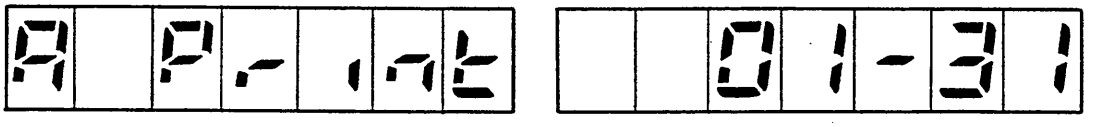
Example: In case it is set to the message No. A, press the keys [SHIFT] and [A/1].
The message No. A is set, and the FLASH position shifts.



3 Set the message (Print).
Set the message with 16 characters (alphanumeric symbols).
In the example of display illustrated to the right, at present, the first character is displayed by the ASCII code, and it is known that the first character is 31 ..... 1.
When registering it by the key [ENT] after first setting, the second character is similarly displayed on the display, and later on, till 16th character automatically designated, and the character No. to be set next comes to be designated.
Respectively, register set characters by the ASCII code table. (See the next page where concrete examples of setting are indicated.)

ASCIIコード表

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



5-5. Key Lock.

After the recorder setting has been completed, if the items set will not be required to be changed for a while, it is recommended that you lock the recorder with a key to prevent the set items from being changed by mistake. Insert the key supplied with the recorder in the keyhole on the recorder side panel and turn it clockwise to "lock" (POWER Switch may be turned "ON" or "OFF". However, when the power switch is turned "OFF", the memory backup using batteries is required).

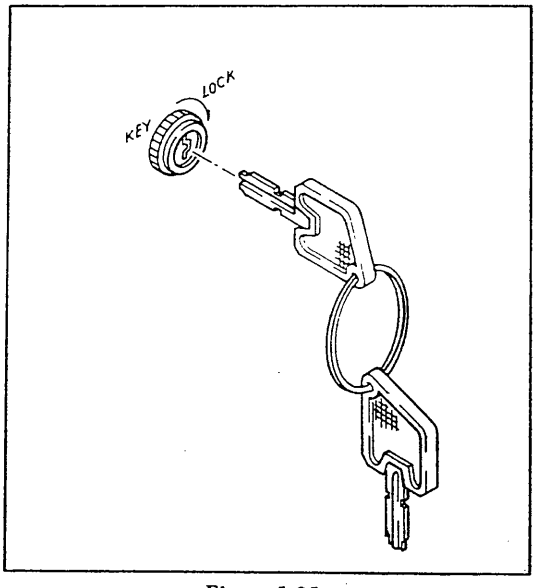


Figure 5-25.

After key lock, the DISPLAY • DATA • CLK key is still effective.*

* After key lock, selection of measurement data Auto/manual display, and check for date and time are still available, but chart feed start/stop operation via the keyboard is disabled. In this case key Lock must be released.
However, the chart feed by REM (remote) control signal over rides the keyboard setting, so chart feed start/stop operation is available even in key lock state (/REM option is required).

CAUTION

After operating key lock, remove the key and keep it in a safe place.
If it is lost, setting cannot be changed.

6. MAINTENANCE.

6-1. Periodic Maintenance.

Check the recorder operation periodically to keep the recorder in good operating condition.

Especially, check the following items and replace consumable parts such as chart, disposable felt-tip pens, fuse and batteries, etc. as needed.

(1) Are display and recording functioning properly?
(2) Are there no blurred or broken sections of recording or printout characters?*1
(3) Is chart paper feeding properly?
(4) Is there enough chart left?*2
(5) Is "BAT" displaying? (Memory backup batteries must be replaced).*3

*1 If any blurred or broken sections are found, replace the disposable felt-tip pen or plotter pen. Refer to "paragraph 5-1-3 Felt-tip pen replacement" or "paragraph 5-1-4 Digital printout plotter pen replacement" for replacing pens.

*2 Refer to "Paragraph 5-1-1 Loading Chart Paper" for replacement method.

*3 If "BAT" is displayed, replace the batteries immediately. Refer to "Paragraph 5-1-2 Battery Replacement" for replacement method.

6-2. Fuse Replacement.

To replace the fuse, turn the power supply switch OFF.

(1) Open the recorder front door and remove the internal assembly lock screw with a Phillips screwdriver (see Figure 6-1).

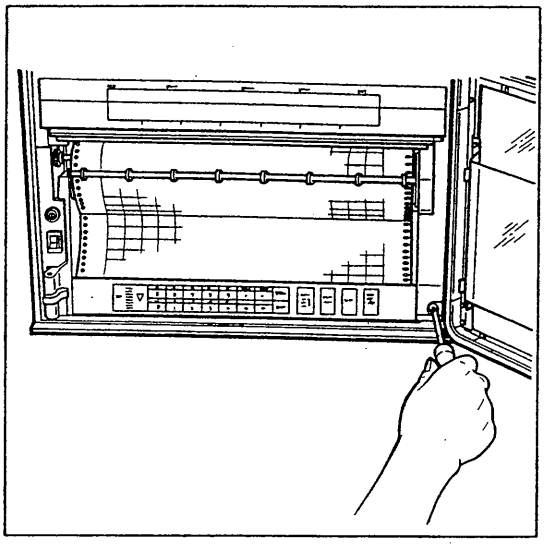


Figure 6-1. Unlocking Internal Assembly.

(2) Open the internal assembly (see Figure 6-2).

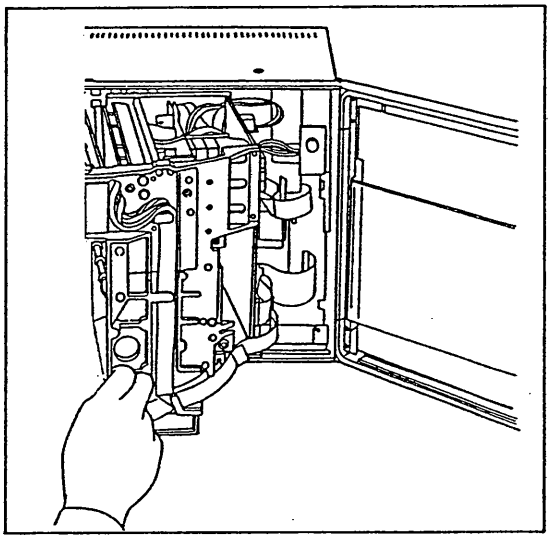


Figure 6-2. Opening Internal Assembly.

CAUTION

When replacing the fuse, turn the power supply switch OFF.

(3) Using a flat-blade screwdriver, counterclockwise turn the fuse holder carrier (located on the right side of the recorder interior) and remove the fuse with the carrier (see Figure 6-3). Replace it with a new one with the correct rating.

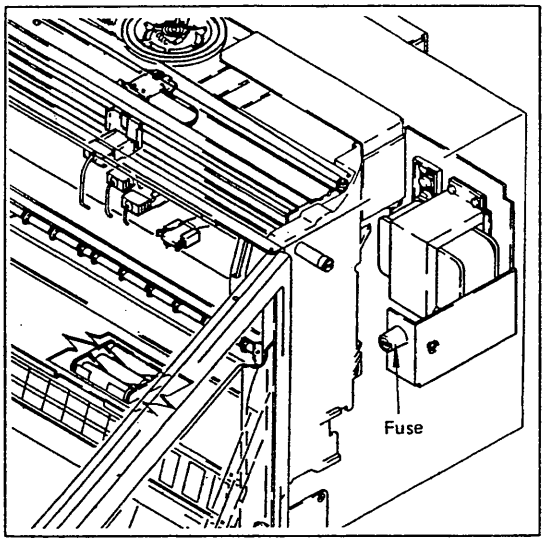


Figure 6-3. Fuse Removal.

(4) After replacing the fuse, reposition the internal assembly and tighten the lock screw.

6-3. Lubrication.

To use the recorder in normal operating conditions, periodically inspect moving parts for adequate lubrication. This section describes how to lubricate the moving parts (see Figure 6-4 and 6-5 for details). It is recommended that the moving parts be lubricated at least every three months.

To lubricate the moving parts, proceed as follows:

(1) Wipe off dirt and accumulated oil from the bearings which require lubrication.
(2) Use the lubricating oil supplied with the recorder.
(3) Make a hole in the tip of the lubricating oil container.
(4) Place several drops of lubricating oil on the bearings. Wipe off any excess oil.

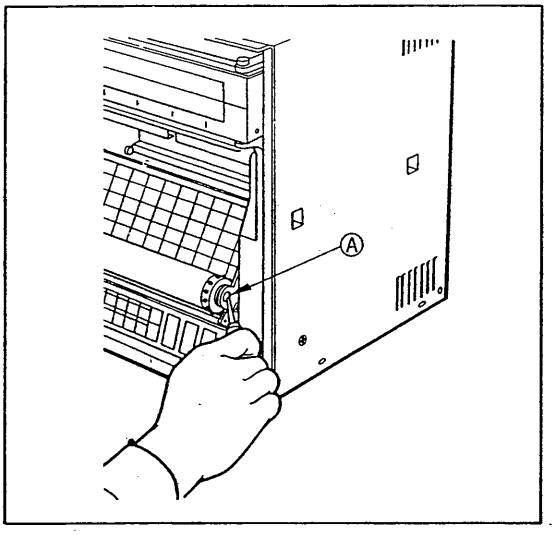


Figure 6-4. Lubricating Bearing for Sprocket.

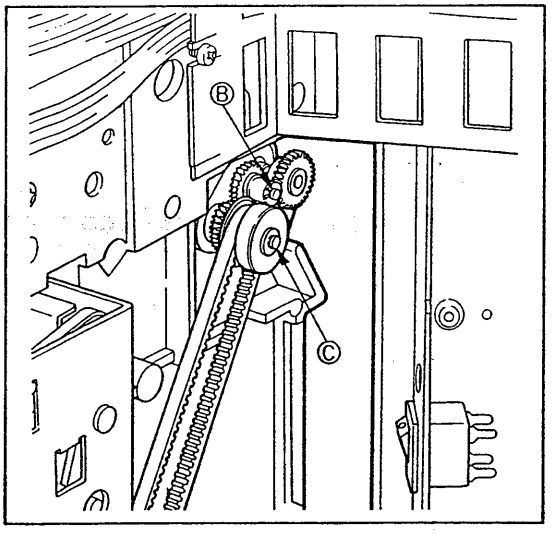


Figure 6-5. Lubricating Bearings for Chart Feed Mechanism.

CAUTION

When opening the recorder internal assembly, turn the power supply switch OFF.

6-4. Calibration.

6-4-1. Calibration Instruments Required.

With the recorder calibration, the following calibration instruments with necessary accuracies are required. For example, calibration instruments are as follows:

DC Voltage Standard: YOKOGAWA Model 2552 or equivalent.

Decade Resistance Box: YOKOGAWA Model 2793-01 or equivalent.

(When ordering the calibration instruments, contact the dealer from whom the recorder was purcvhased.)

6-4-2. Calibration Procedure.

(1) Connect calibration instrument to the input terminals as shown in Figures 6-6 to 6-8 and allow the instrument to warm up thoroughly.*

(2) Check that the ambient temperature and humidity are within the normal operating conditions (see Normal Operating Conditions on page 2-5).

(3) Apply input corresponding to 0, 50 and 100 percentage points on entered setting range, and calculate errors from reading on the recording chart.

Note) For a TC input, it is necessary to measure the temperature of the input terminals, and add a voltage corresponding to the reference temperature.
If the error at any point is outside the accuracy limits, adjust the recorder according to "Section 6-5 Adjustment".

* Warm up time necessary for the μR250 recorder is at least 30 minutes.

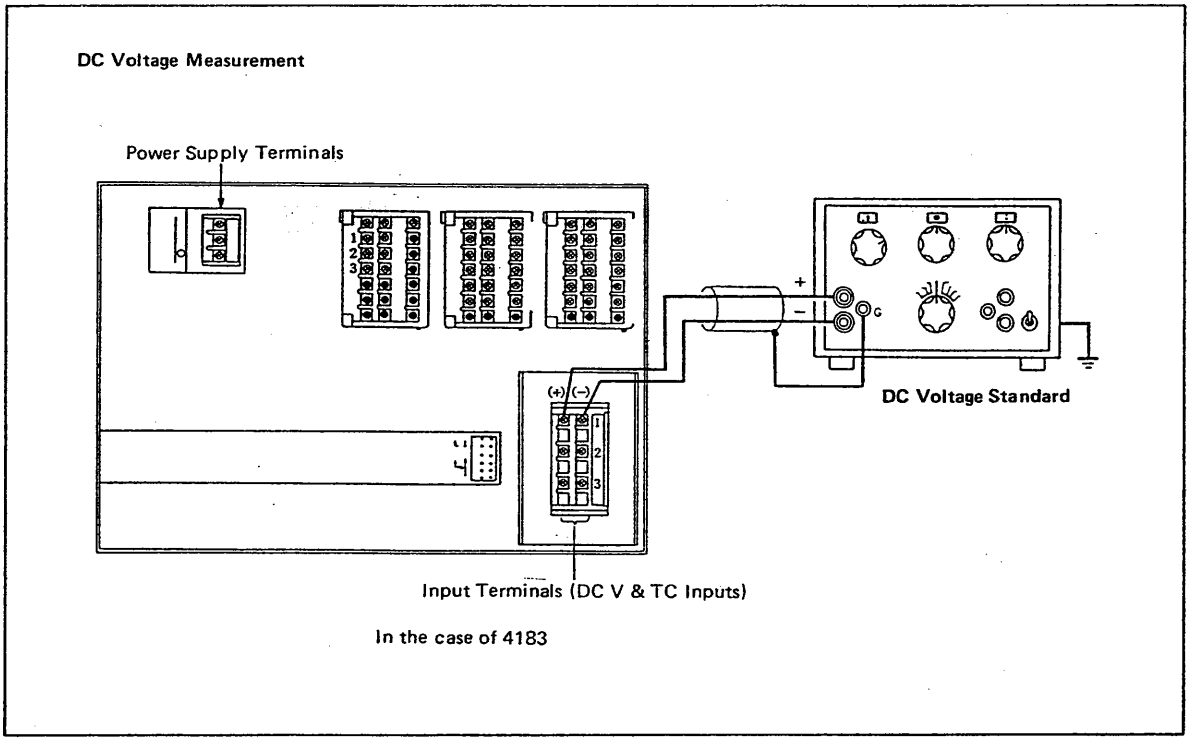


Figure 6-6.

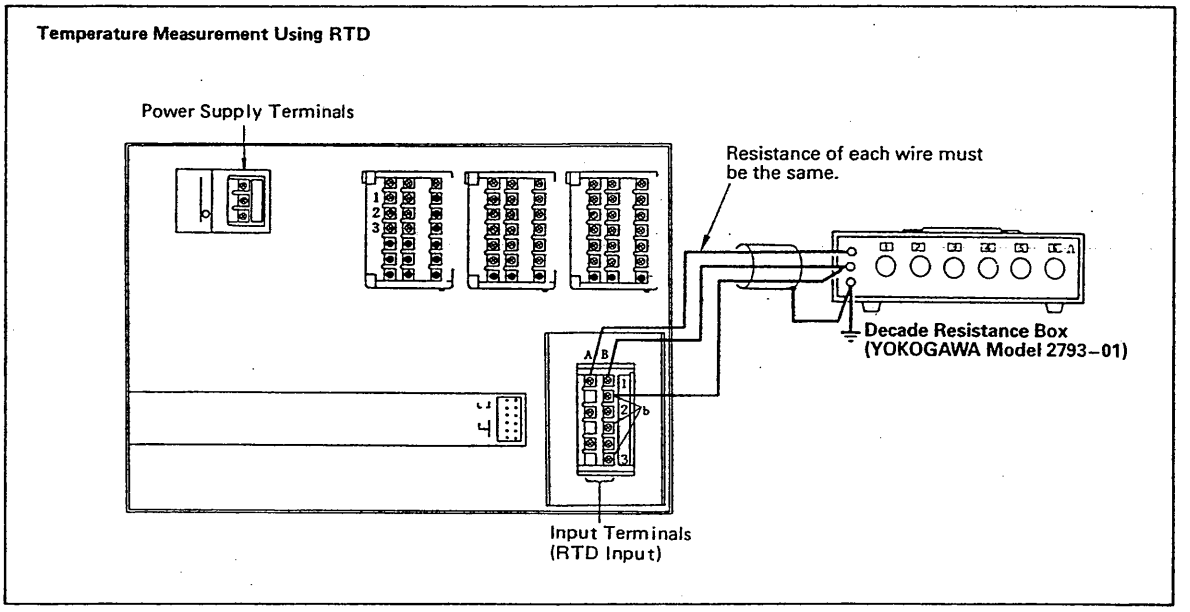
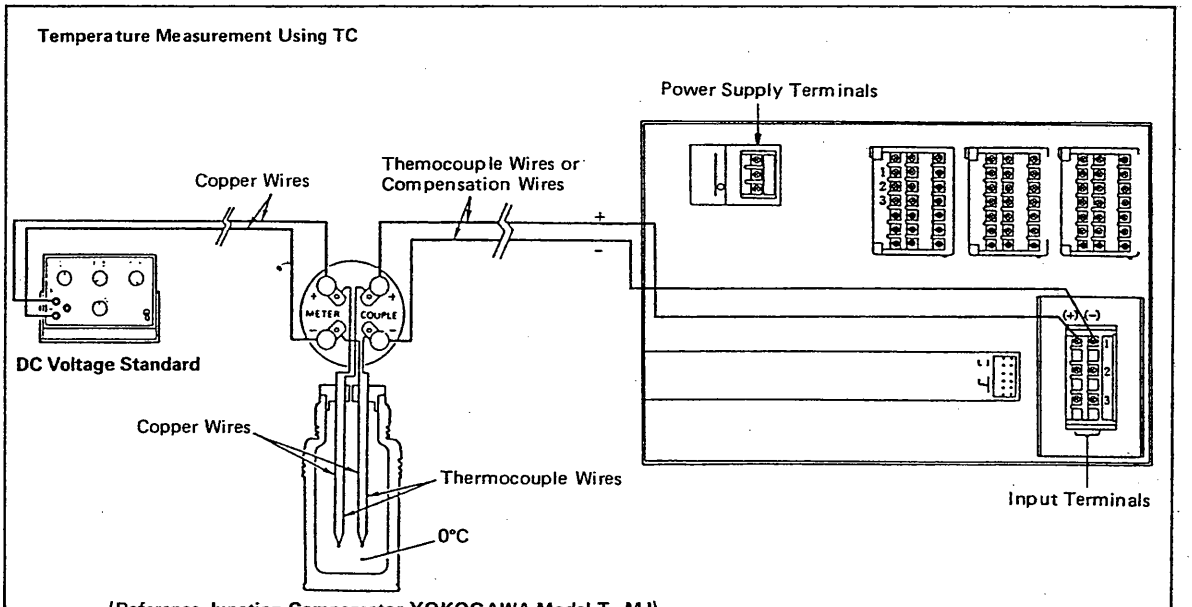


Figure 6-7.



Reference Junction Compensation for Thermocouple Input

As the temperature of the recorder measurement terminal section is generally equal to the room temperature, a voltage is applied to inside the circuit so that equivalent 0°C is obtained. Therefore, when the measurement terminals are shorted (equivalent to 0°C at detector tip in the reference table) the room temperature (temperature of measurement terminals) is displayed. When calibrating the recorder, the input voltage subtracting compensation voltage should be applied (various methods are available for calibration. For example, use the YOKOGAWA Model T-MJ reference Junction compensator shown above).

Figure 6-8.

6-5. Adjustment.

(With the same wiring as in Section 6-3 Calibration, allow the instrument to warm up thoroughly.

Proceed as follows:

(1) Turn the POWER switch ON.

(2) With the input applied, adjust the zero and span adjustments using a jewellers' screwdriver (see Figure 6-9).

The zero and span adjustments are located on the left of the front (see Figure 6-10).

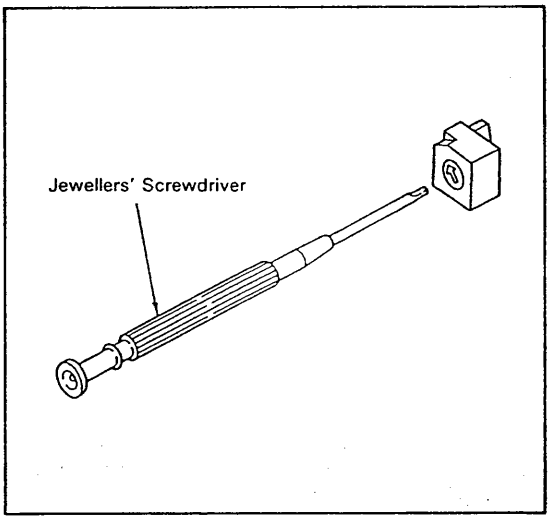


Figure 6-9.

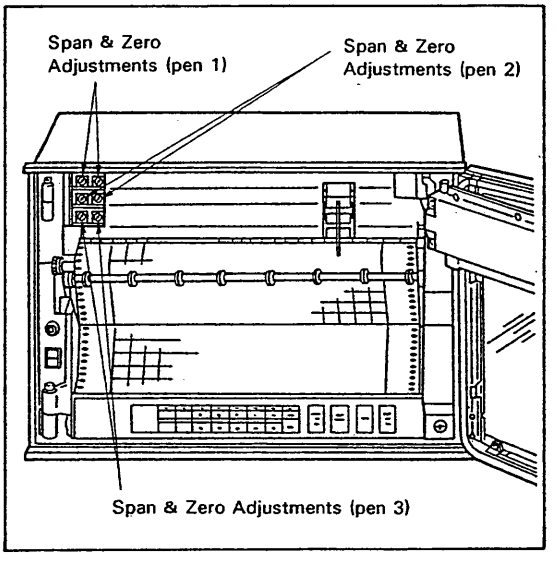


Figure 6-10.

i) Zero adjustment.

Adjust the zero adjustment with a jewellers' screwdriver so that when an input corresponding to 50% of recording span is applied, the recording result indicates 50%. (Note that the 100% point will be moved by the same amount as the zero was shifted.)

ii) Span adjustment.

Adjust the span with a jewellers screwdriver so that when an input corresponding to 100% of recording span is applied, the recording result indicates 100%. (Note that the zero point is slightly affected by span adjustment.)

Repeat (a) and (b) until the error falls within tolerance for inputs of both 0% and 100%.

(3) Apply inputs of 0, 50 and 100% in increasing order (i.e. 0 to 100%) and, then in decreasing order (i.e. 100 to 0%) for each channel. Check error at each input value and make sure that the error falls within tolerance limits.

6-6. Power Supply Frequency.

Power supply frequency may be selected with a DIP switch.

Before switching frequency, turn the POWER switch OFF.*

* Power supply frequency cannot be changed with the POWER switch turned "ON".

i) Open the recorder front door and remove the internal assembly lock screw with a Phillips screwdriver (see Figure 6-11).

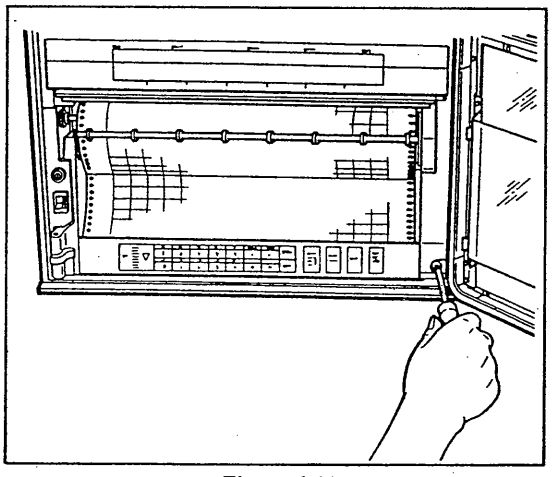


Figure 6-11.

ii) A eight pole type DIP switch is provided with the pen model (see Figure 6-12).
When the No. 8 switch is set to the ON position, a power frequency of 50 Hz is selected, and when it is set to the OFF position a power frequency of 60 Hz is selected.

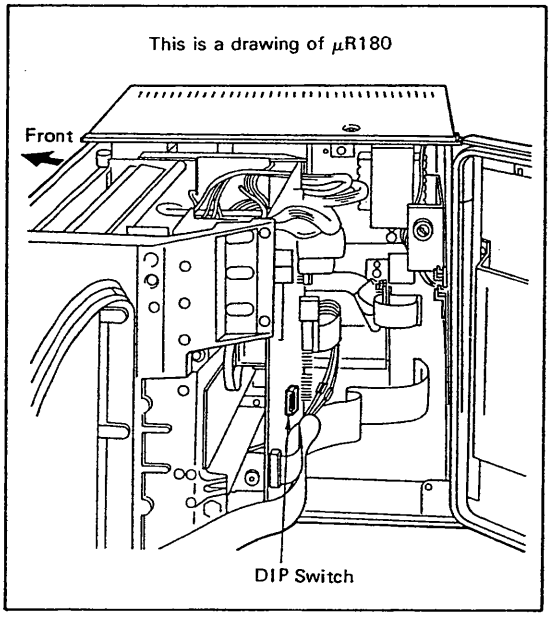


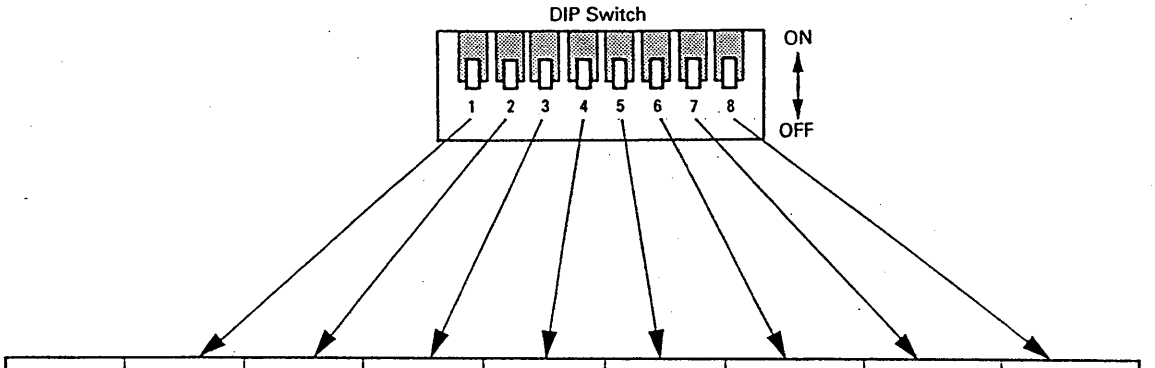
Figure 6-12.

The functions of each DIP switch are shown in Figure 6-13. When the DIP switch is to be changed, be sure to turn the POWER switch "OFF".

When the POWER switch is turned "ON", the DIP switch cannot be changed (with switching between RTD and mV/TC, the measurement terminals must be rewired, so switching of RTD and mV/TC cannot be performed only by operating the DIP switch).

CAUTION

When changing the DIP switch, do not change switches other than the No. 8 switch, otherwise, the measurement and recording data entered (stored according to section 5-4 on) may be erased.



Switch	1	2	3	4	5	6	7	8
ON	Non-Excitation Alarm	Pt 100	#3 RTD	#2 RTD	#1 RTD	TEST	°F	50 Hz
OFF	Excitation Alarm	JPt 100	mV/TC	mV/TC	mV/TC	NORMAL	°C	60 Hz
Function	Alarm selection	Input (RTD) Selection	CH3 Input type	CH2 Input type	CH1 Input type	Operating mode selection	Unit for temperature measurement	Power frequency selection
When Shipping	OFF	ON when suffix code [A][B][C] is 3, 4, 5, 6 or 7 and OFF when suffix code [A][B][C] is 1 or 2	ON when suffix code [C] is 2, 4, 6 or 8 and OFF when suffix code [C] is 1, 3, 5 or 7	ON when suffix code [B] is 2, 4, 6 or 8 and OFF when suffix code [B] is 1, 3, 5 or 7	ON when suffix code [A] is 2, 4, 6 or 8 and OFF when suffix code [A] is 1, 3, 5 or 7	OFF	ON when suffix code [A], [B] & [C] is 5 or 6 and OFF when suffix code [A], [B] & [C] is 1, 2, 3, 4, 7 or 8	ON when suffix code [E] is 50 and OFF when suffix code [E] is 60

JPt100: JIS C 1604-1989, JIS C 1606-1989
Pt100 : JIS C 1604-1989, JIS C 1606-1989 DIN IEC 751, IEC 751

Figure 6-13.

7. TROUBLESHOOTING.

When the recorder fails, observe the fault conditions carefully, follow the troubleshooting flow sequence given in Section 7-2, and find a suitable remedy for the problem.

However, if a complicated problem does occur, please contact the dealer from whom the recorder was purchased or the nearest YOKOGAWA service center.

7-1. Block Diagram.

Recorder, Block Diagram.

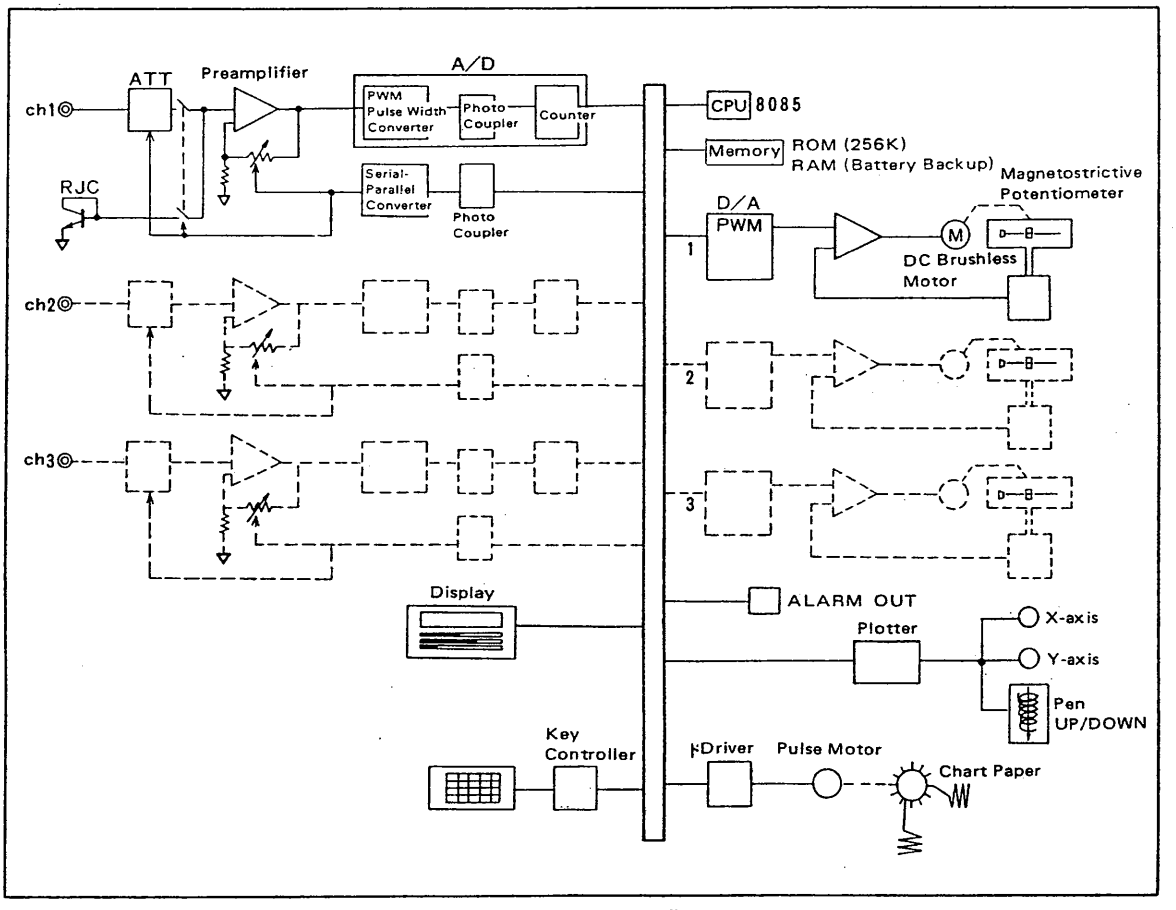
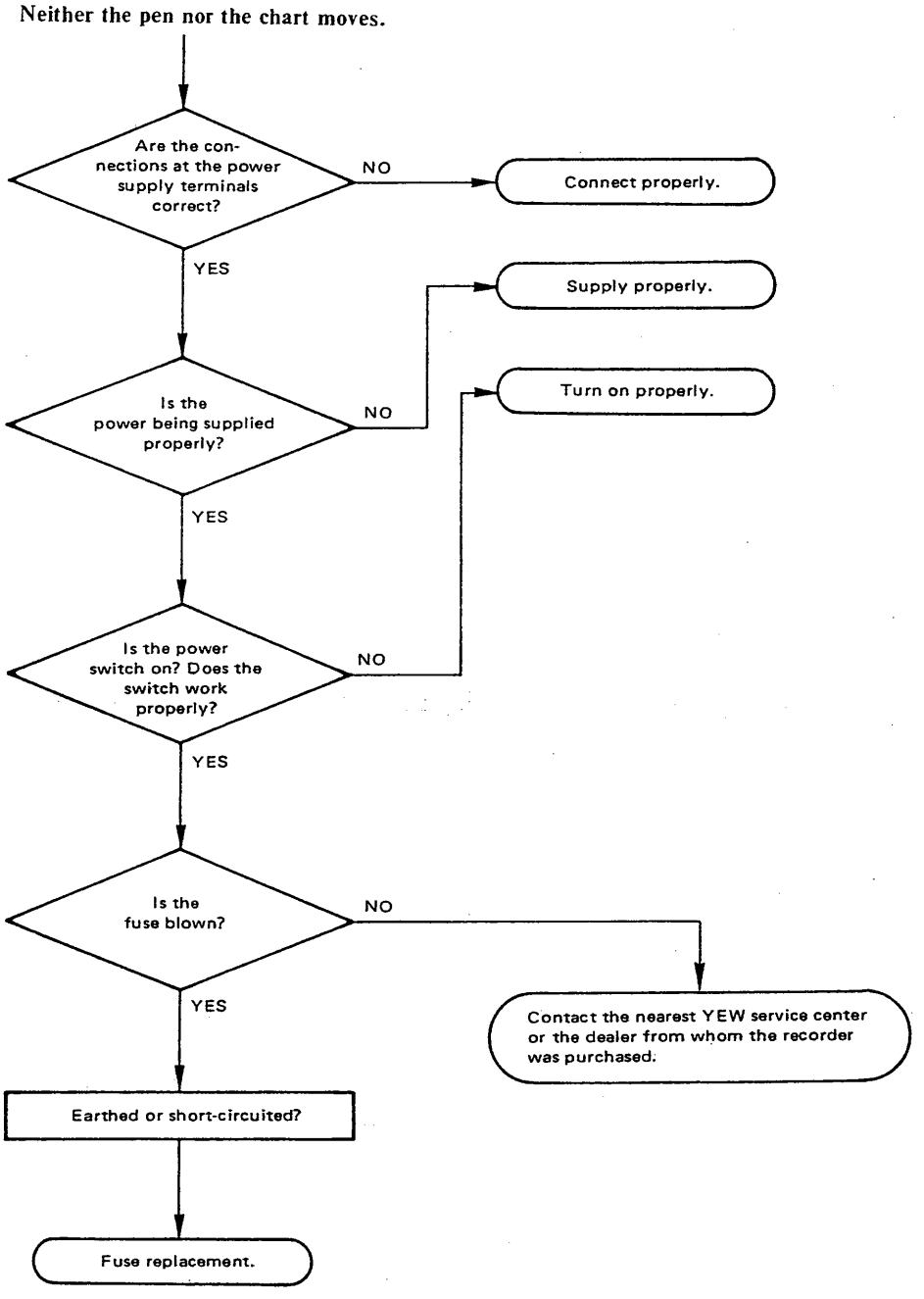
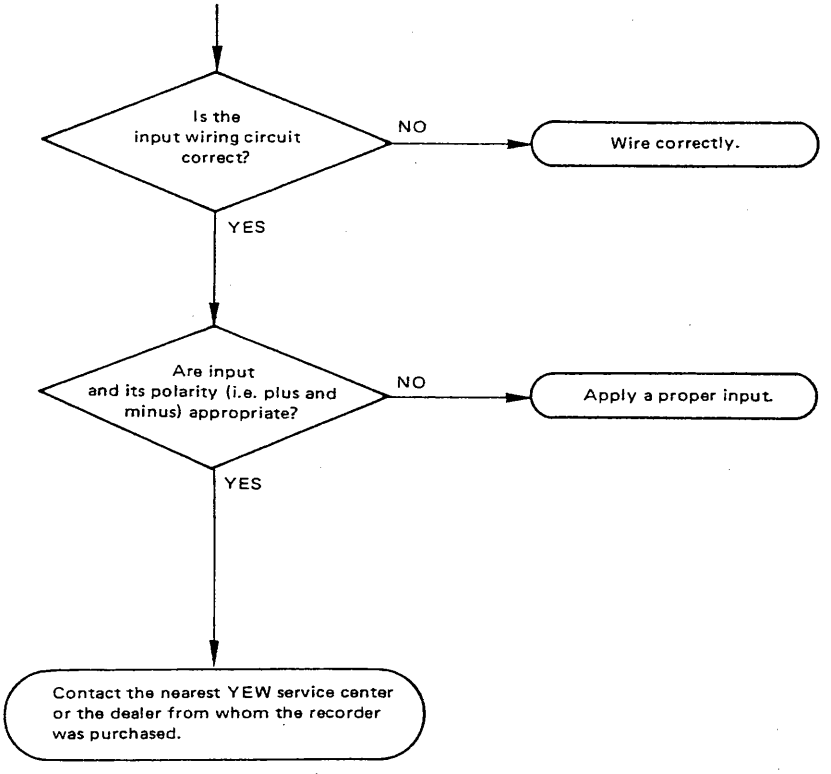


Figure 7-1. Recorder, Block Diagram.

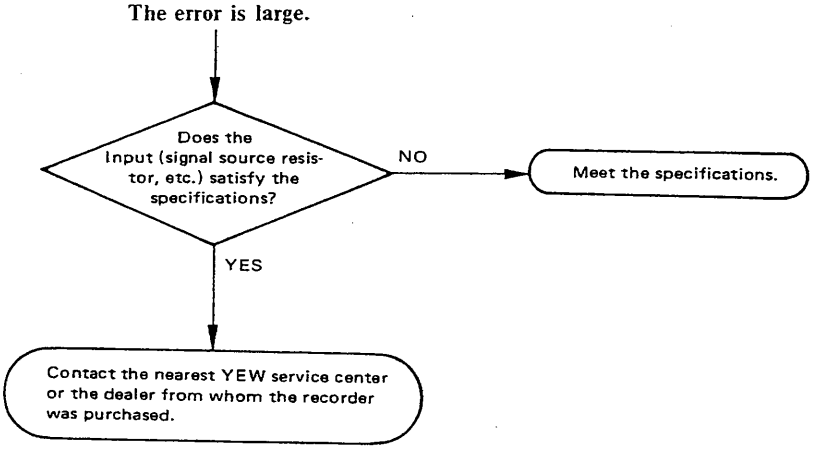
7-2. Troubleshooting Flow Sequence.



The pen improperly swings to 0 or 100% on the chart.



The error is large.



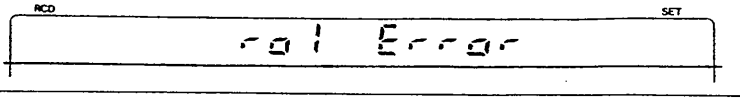
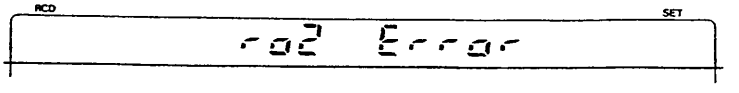
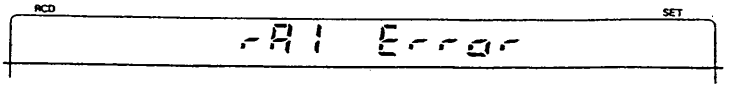
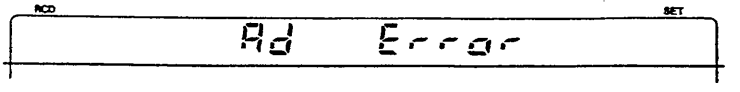
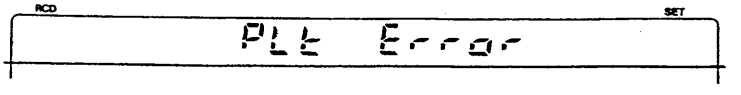
8. SELF-DIAGNOSTIC FUNCTION.

Each time the recorder POWER switch is turned "ON", the recorder performs an internal check to check for abnormalities.

When the POWER switch is turned "ON", the recorder checks such items sequencially as shown in Table 8-1, and if any abnormality is found, the recorder displays the abnormality type (if two or more abnormalities occur, the first abnormality type is displayed and held, so the other abnormality types are unknown).

If any items shown in Table 8-1 is displayed immediately after the POWER switch is turned "ON", contact the nearest YOKOGAWA service center or the dealer from whom the recorder was purchased.

Table 8-1.

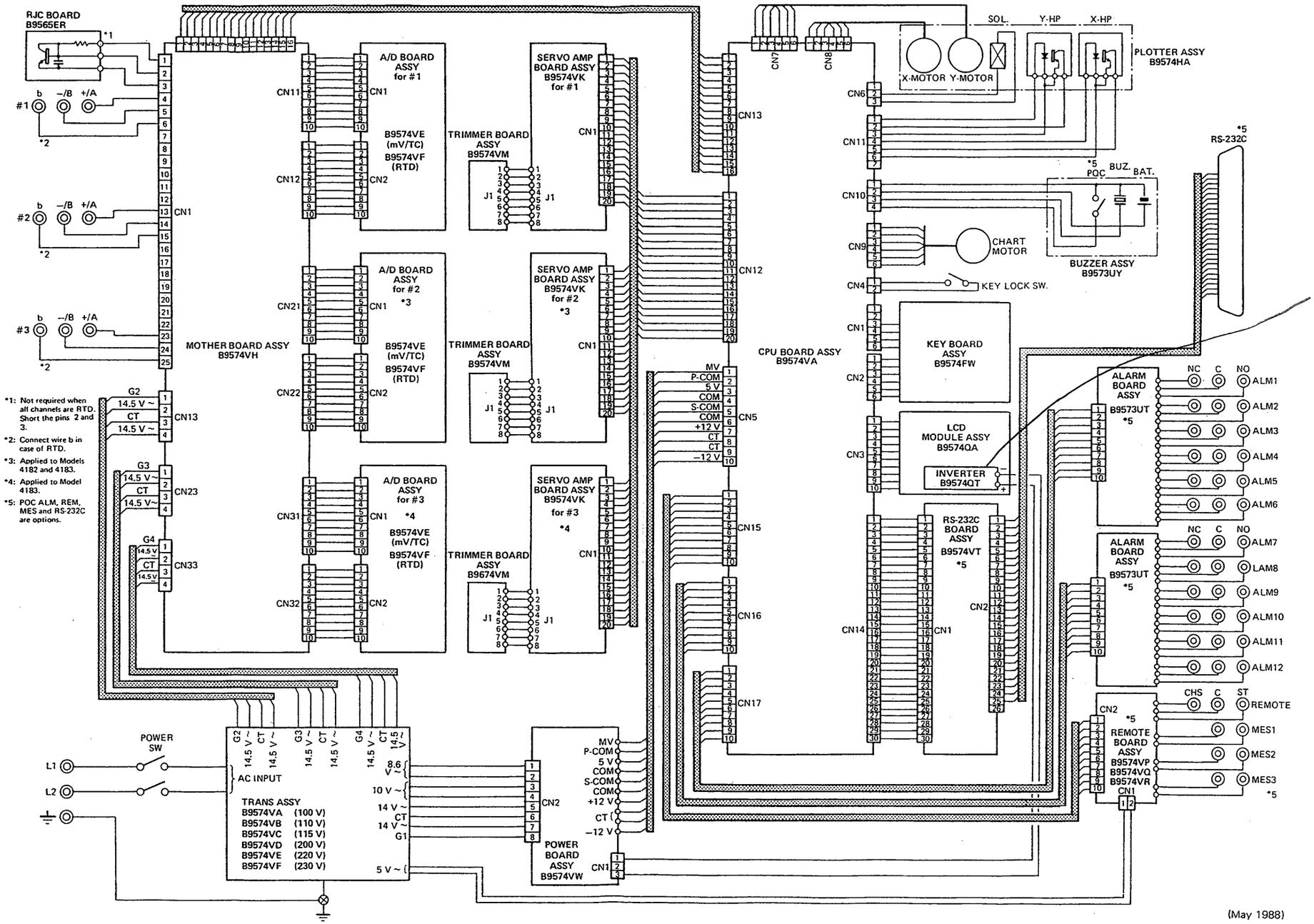
Item		Display
①	ROM1 Failure	
②	ROM2 Failure	
③	RAM1 Failure	
④	A/D Controller Failure	
⑤	Plotter Failure	

9. SCHEMATIC DIAGRAMS.

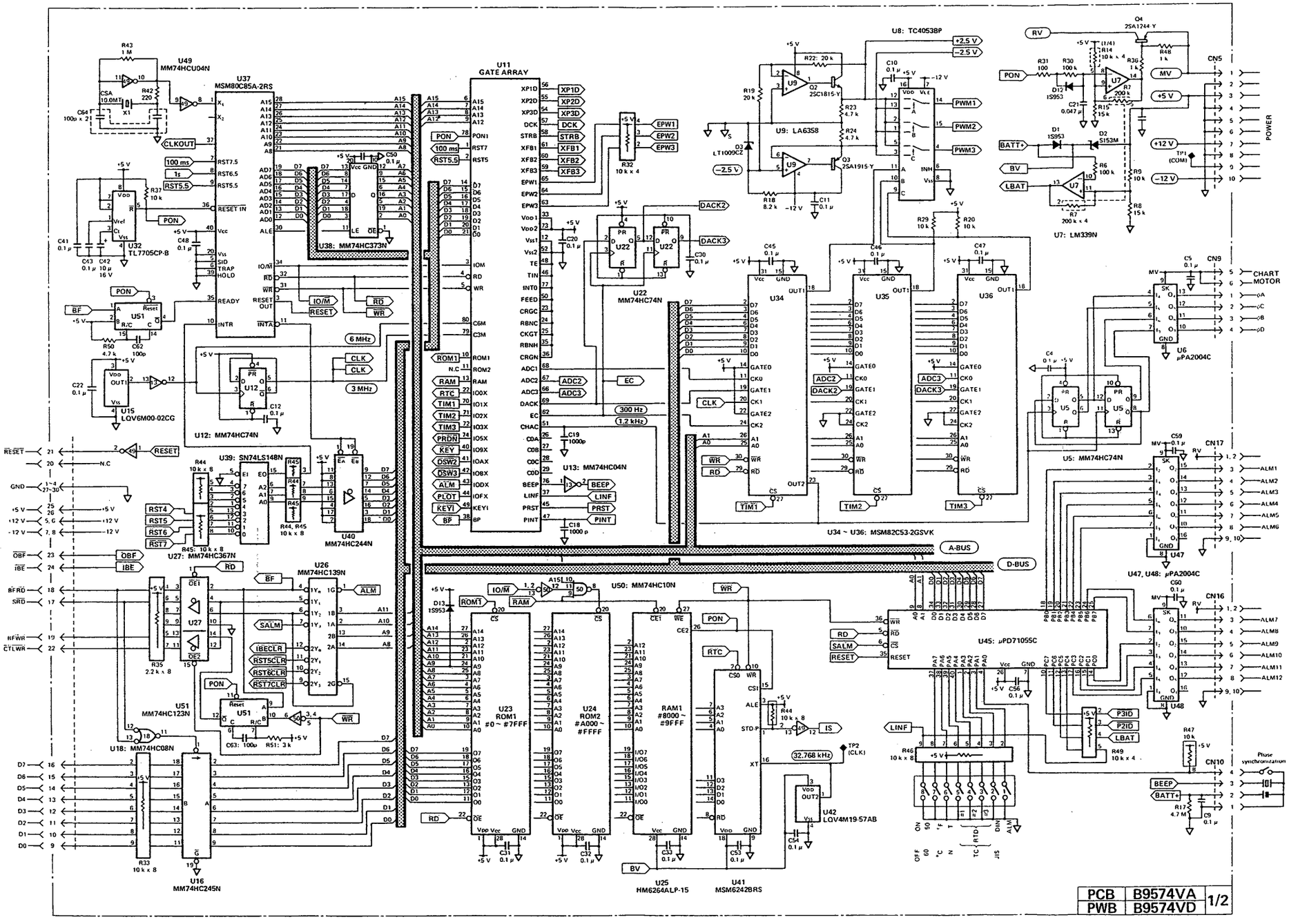
Note 1: The circuit of this instrument may be subject to modification without notice.

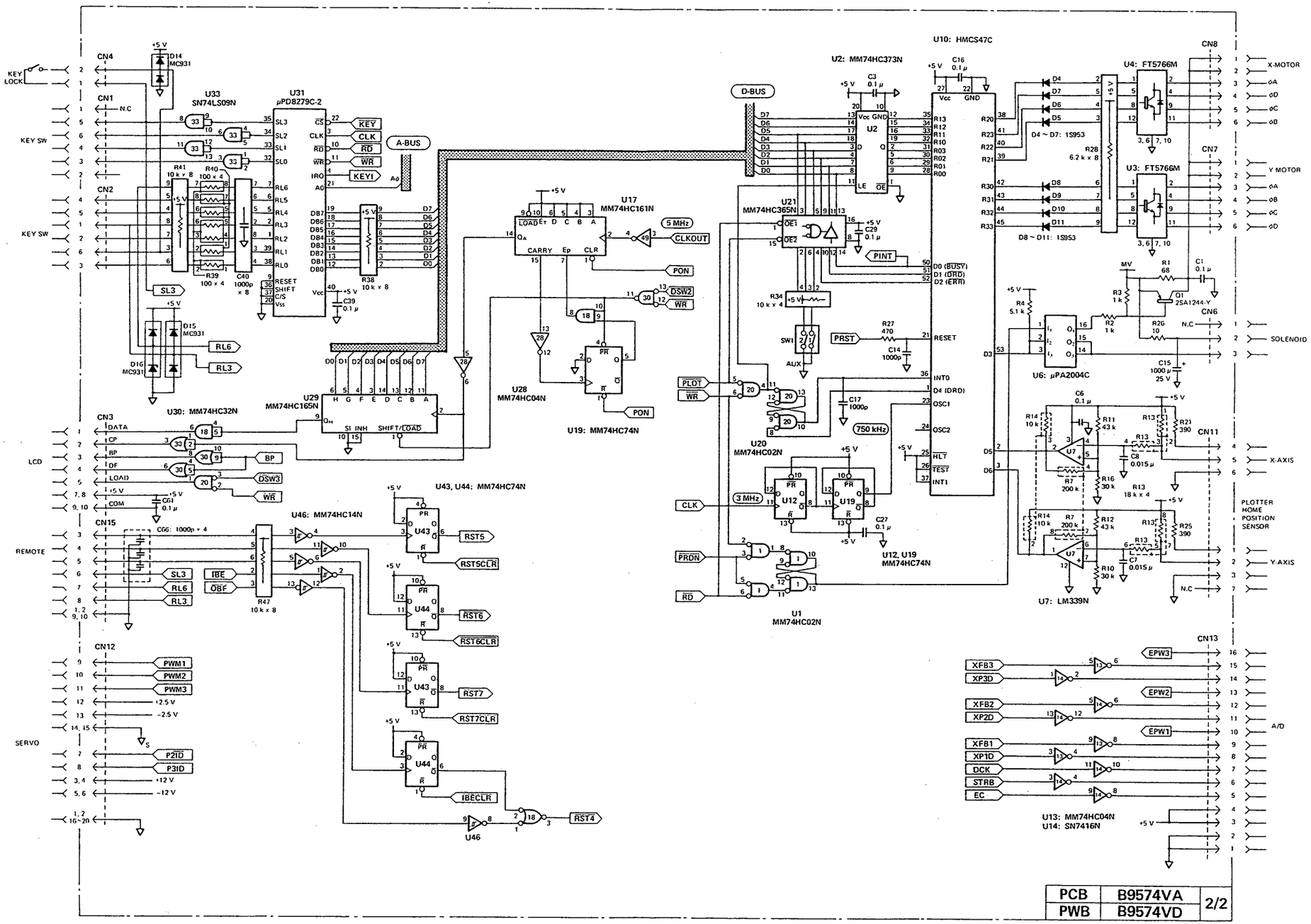
Note 2: The semiconductors used in this instrument may be those equivalent to the specified ones.

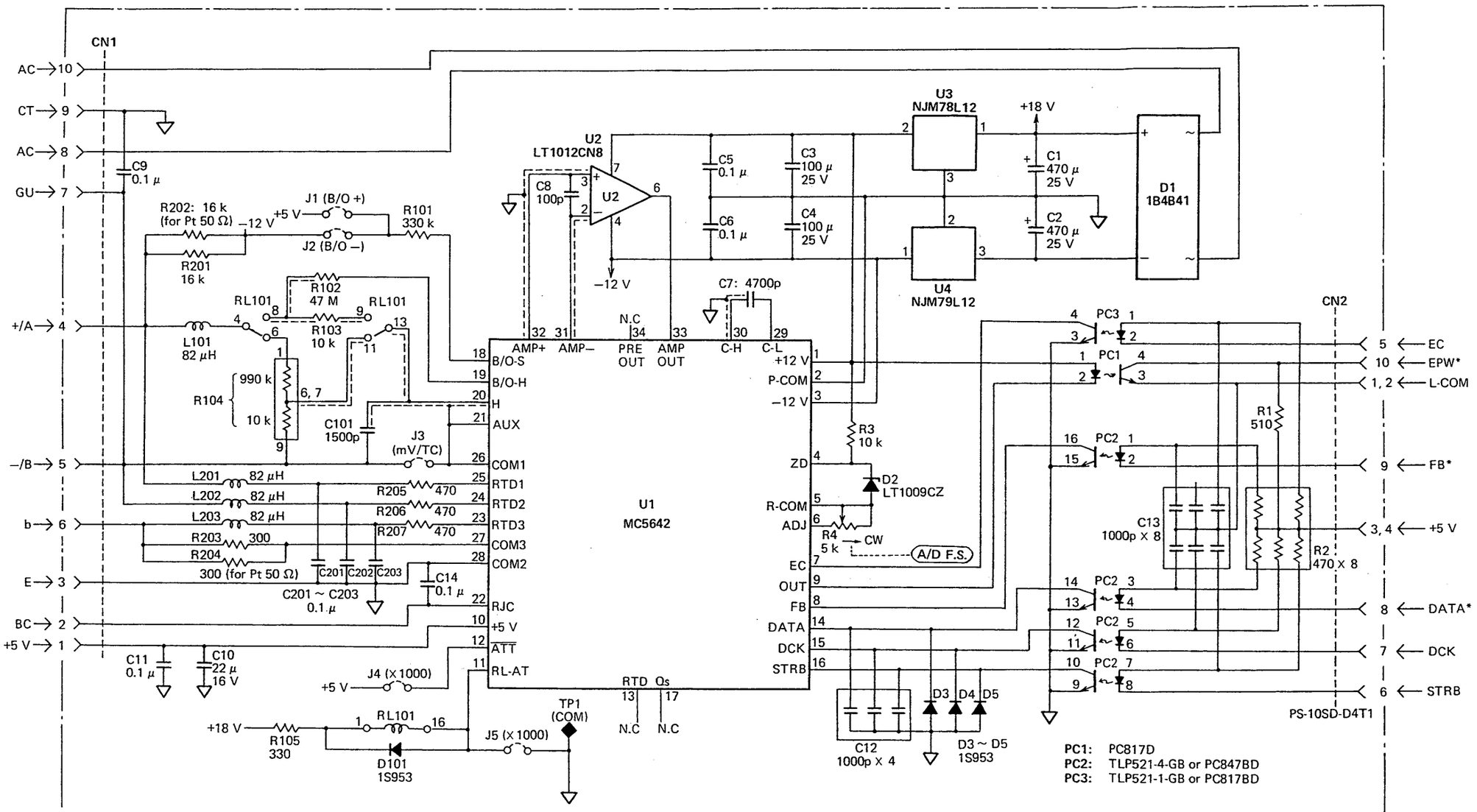
Note 3: If any of the parts composign the "Board Assembly" is replaced with a new one by the user, YOKOGAWA shall not be obligated to bear responsibility for trouble and/or damage caused by the replaced part.


RJC BOARD B9565ER
*1
#1 b –/B +/A
#2 b –/B +/A
#3 b –/B +/A
*2
CN1
MOTHER BOARD ASSY B9574VH
A/D BOARD ASSY for #1
A/D BOARD ASSY for #2 *3
A/D BOARD ASSY for #3 *4
B9574VE (mV/TC)
B9574VF (RTD)
CN11
CN12
CN21
CN22
CN31
CN32
CN2
TRIMMER BOARD ASSY B9574VM
TRIMMER BOARD ASSY B9674VM
J1
SERVO AMP BOARD ASSY B9574VK for #1
SERVO AMP BOARD ASSY B9574VK for #2 *3
SERVO AMP BOARD ASSY B9574VK for #3 *4
CN13
CN5
CN15
CN16
CN17
CPU BOARD ASSY B9574VA
MV
P-COM
5 V
COM
S-COM
+12 V
CT
–12 V
CN6
CN7
CN8
CN9
CN10
CN4
CN3
CN14
SOL.
Y-HP
X-HP
X-MOTOR
Y-MOTOR
PLOTTER ASSY B9574HA
CHART MOTOR
BUZ.
BAT.
POC
BUZZER ASSY B9573UY
KEY LOCK SW.
KEY BOARD ASSY B9574FW
LCD MODULE ASSY B9574QA
INVERTER B9574QT
RS-232C BOARD ASSY B9574VT *5
RS-232C *5
ALARM BOARD ASSY B9573UT *5
NC C NO
ALM1
ALM2
ALM3
ALM4
ALM5
ALM6
ALM7
LAM8
ALM9
ALM10
ALM11
ALM12
CHS C ST
REMOTE
MES1
MES2
MES3
REMOTE BOARD ASSY B9574VP B9574VQ B9574VR
*1: Not required when all channels are RTD. Short the pins 2 and 3.
*2: Connect wire b in case of RTD.
*3: Applied to Models 4182 and 4183.
*4: Applied to Model 4183.
*5: POC ALM, REM, MES and RS-232C are options.
POWER SW
L1
L2
AC INPUT
TRANS ASSY
B9574VA (100 V)
B9574VB (110 V)
B9574VC (115 V)
B9574VD (200 V)
B9574VE (220 V)
B9574VF (230 V)
8.6 V~
10 V~
14 V~
CT
14 V~
G1
5 V~
POWER BOARD ASSY B9574VW

(May 1988)


U49 MM74HCU04N
U37 MSM80C85A-2RS
U11 GATE ARRAY
U8: TC40538P
U9: LA6358
U7: LM339N
U32 TL7705CP-8
U38: MM74HC373N
U22 MM74HC74N
U12: MM74HC74N
U15 LOV6M00-02CG
U39: SN74LS148N
U40 MM74HC244N
U27: MM74HC367N
U26 MM74HC139N
U51 MM74HC123N
U18: MM74HC08N
U16 MM74HC245N
U13: MM74HC04N
U34 ~ U36: MSM82C53-2GSVK
U5: MM74HC74N
U6 μPA2004C
U47, U48: μPA2004C
U45: μPD71055C
U50: MM74HC10N
U23 ROM1 #0 ~ #7FFF
U24 ROM2 #A000 ~ #FFFF
RAM1 #8000 ~ #9FFF
U25 HM6264ALP-15
U41 MSM6242BRS
U42 LOV4M19-57AB
A-BUS
D-BUS
POWER
CHART MOTOR
PCB B9574VA
PWB B9574VD
1/2


KEY LOCK
KEY SW
KEY SW
LCD
REMOTE
SERVO
CN4
CN1
CN2
CN3
CN15
CN12
CN8
CN7
CN6
CN11
CN13
U33 SN74LS09N
U31 μPD8279C-2
U30: MM74HC32N
U29 MM74HC165N
U17 MM74HC161N
U28 MM74HC04N
U19: MM74HC74N
U43, U44: MM74HC74N
U46: MM74HC14N
U46
U2: MM74HC373N
U10: HMCS47C
U21 MM74HC365N
U20 MM74HC02N
U12, U19 MM74HC74N
U1 MM74HC02N
U4: FT5766M
U3: FT5766M
U6: μPA2004C
U7: LM339N
U13: MM74HC04N
U14: SN7416N
D-BUS
A-BUS
X-MOTOR
Y MOTOR
SOLENOID
X-AXIS
Y-AXIS
PLOTTER HOME POSITION SENSOR
A/D
PCB B9574VA 2/2
PWB B9574VD

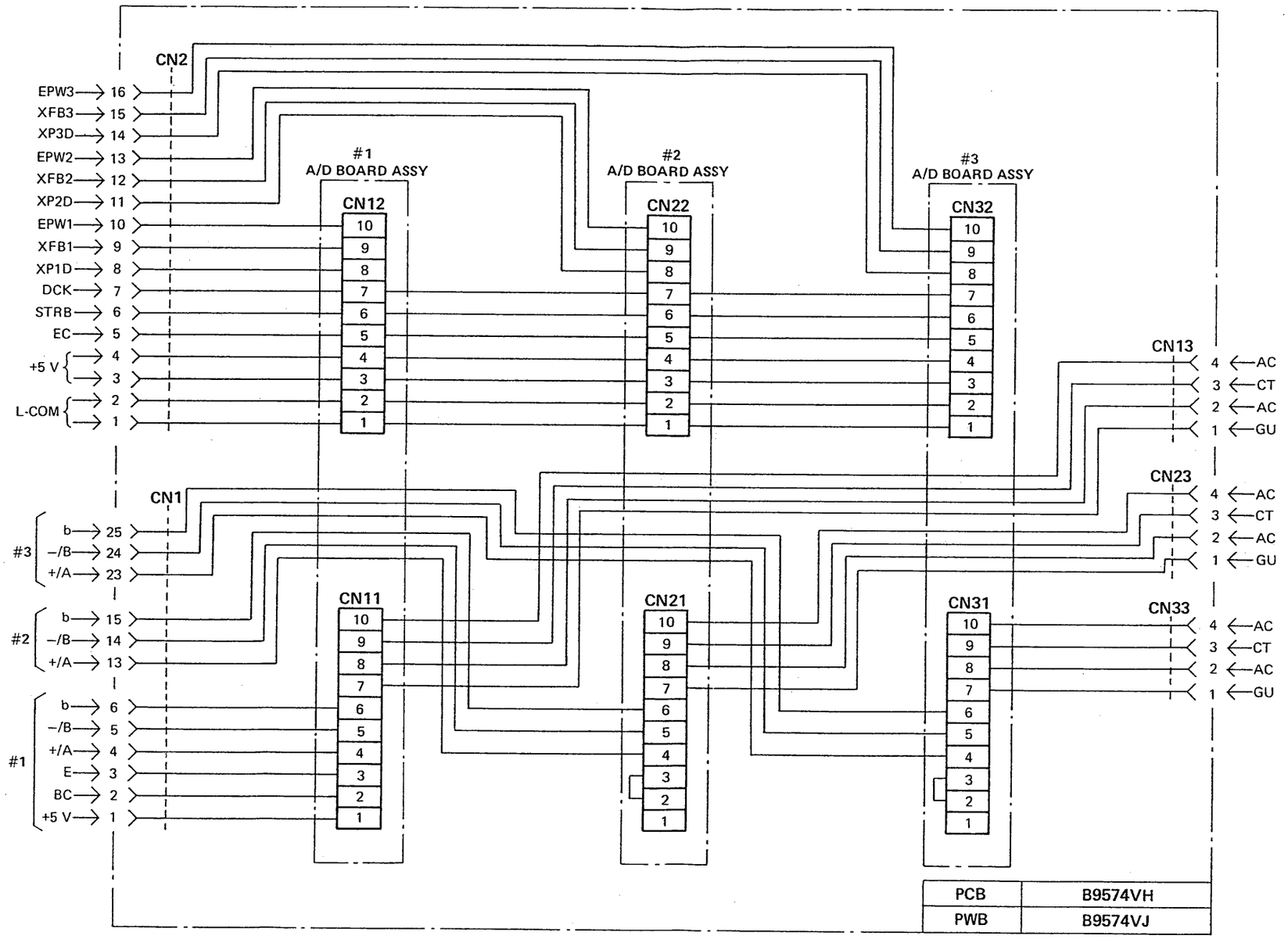


Note: Parts bearing Part No. 100 to 199 are for mV/TC, and those bearing Part No. 200 to 299 are for RTD.
All other parts than the above are used commonly.

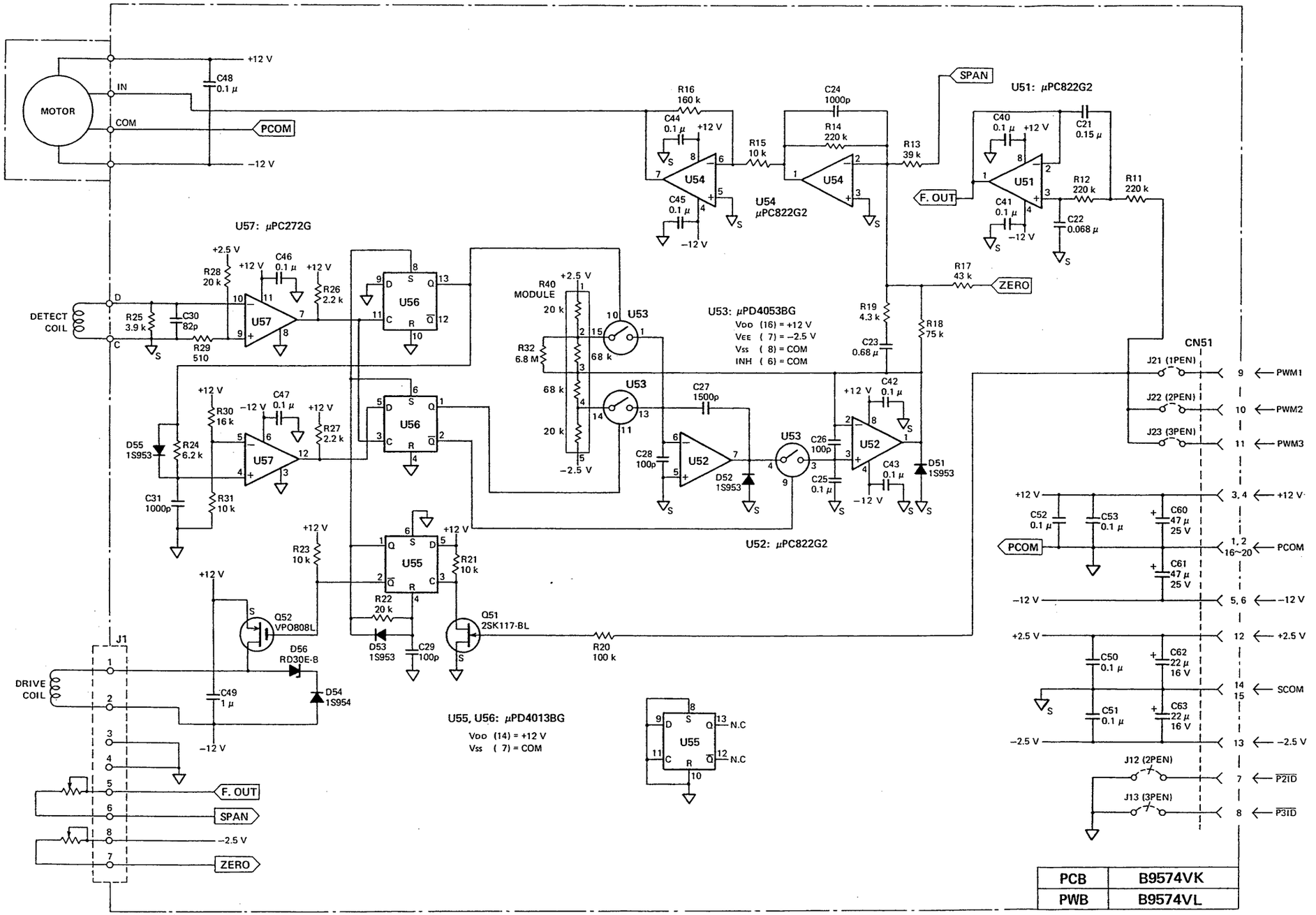
PCB	B9574VE (mV/TC)
	B9574VF (RTD)
PWB	B9574VG

(May 1988)

Figure 9-3. A/D Board Ass'y: B9574VE/VF Schematic Diagram.


CN2
EPW3 16
XFB3 15
XP3D 14
EPW2 13
XFB2 12
XP2D 11
EPW1 10
XFB1 9
XP1D 8
DCK 7
STRB 6
EC 5
+5 V 4
3
L-COM 2
1
#1 A/D BOARD ASSY
CN12
#2 A/D BOARD ASSY
CN22
#3 A/D BOARD ASSY
CN32
CN1
#3 b 25
–/B 24
+/A 23
#2 b 15
–/B 14
+/A 13
#1 b 6
–/B 5
+/A 4
E 3
BC 2
+5 V 1
CN11
CN21
CN31
CN13
4 AC
3 CT
2 AC
1 GU
CN23
4 AC
3 CT
2 AC
1 GU
CN33
4 AC
3 CT
2 AC
1 GU
PCB B9574VH
PWB B9574VJ

(May 1988)


MOTOR
IN
COM
+12 V
C48 0.1 μ
PCOM
–12 V
U57: μPC272G
DETECT COIL
R25 3.9 k
C30 82p
R29 510
R28 20 k
C46 0.1 μ
R26 2.2 k
U57
U56
R30 16 k
C47 0.1 μ
R27 2.2 k
D55 1S953
R24 6.2 k
C31 1000p
R31 10 k
R40 MODULE
20 k
R32 6.8 M
68 k
20 k
–2.5 V
U53
U53: μPD4053BG
VDD (16) = +12 V
VEE (7) = –2.5 V
VSS (8) = COM
INH (6) = COM
C27 1500p
C28 100p
D52 1S953
U52
C26 100p
C25 0.1 μ
C42 0.1 μ
C43 0.1 μ
D51 1S953
U52: μPC822G2
R16 160 k
C44 0.1 μ
R15 10 k
R14 220 k
C24 1000p
R13 39 k
U54
U54 μPC822G2
C45 0.1 μ
SPAN
U51: μPC822G2
C40 0.1 μ
C21 0.15 μ
U51
C41 0.1 μ
R12 220 k
R11 220 k
C22 0.068 μ
F. OUT
R17 43 k
ZERO
R19 4.3 k
C23 0.68 μ
R18 75 k
CN51
J21 (1PEN)
J22 (2PEN)
J23 (3PEN)
9 ← PWM1
10 ← PWM2
11 ← PWM3
3, 4 ← +12 V
1, 2 16~20 ← PCOM
5, 6 ← –12 V
12 ← +2.5 V
14 15 ← SCOM
13 ← –2.5 V
J12 (2PEN)
J13 (3PEN)
7 ← P2ID
8 ← P3ID
C52 0.1 μ
C53 0.1 μ
C60 47 μ 25 V
C61 47 μ 25 V
C50 0.1 μ
C51 0.1 μ
C62 22 μ 16 V
C63 22 μ 16 V
R23 10 k
R21 10 k
R22 20 k
D53 1S953
C29 100p
U55
Q52 VPO808L
Q51 2SK117-BL
D56 RD30E-8
D54 1S954
R20 100 k
C49 1 μ
J1
DRIVE COIL
F. OUT
SPAN
–2.5 V
ZERO
U55, U56: μPD4013BG
VDD (14) = +12 V
VSS (7) = COM
N.C
N.C
PCB B9574VK
PWB B9574VL

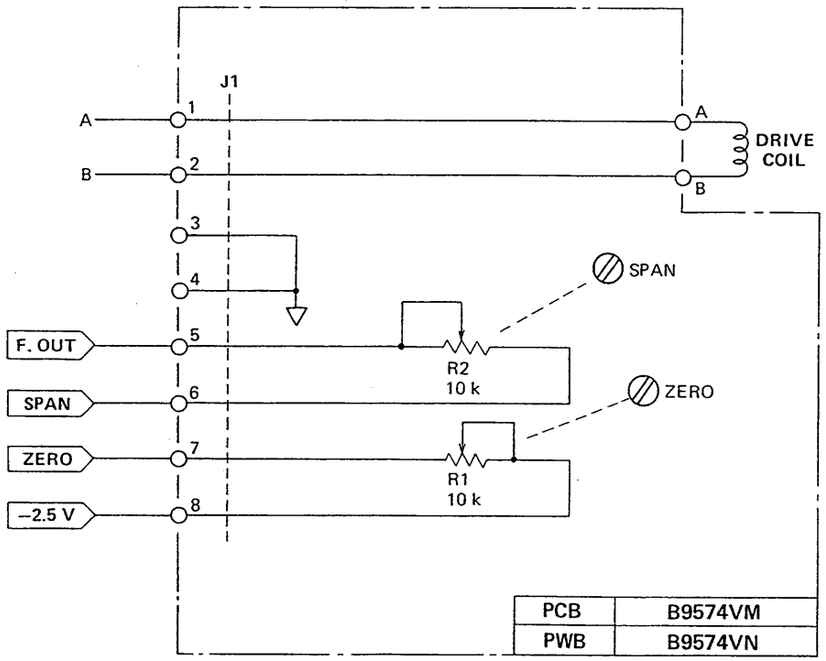


Figure 9-6. Trimmer Board Ass'y: B9574VM Schematic Diagram.

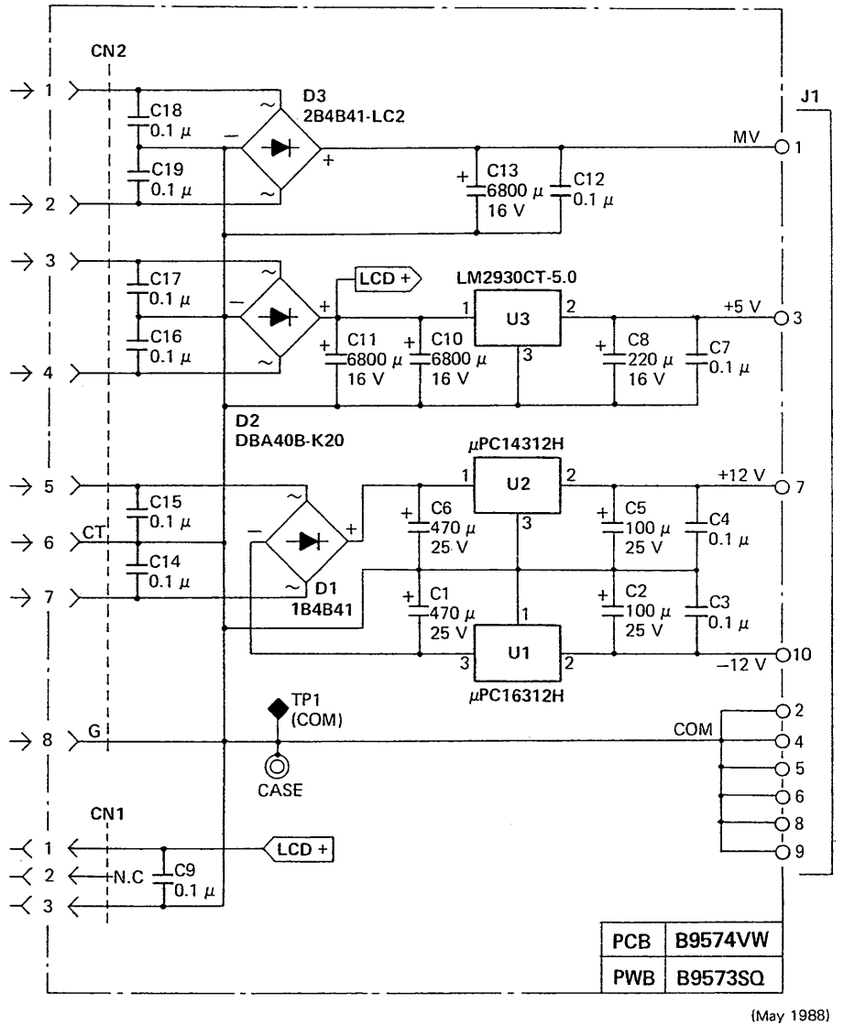


Figure 9-7. Power Board Ass'y: B9574VW Schematic Diagram.

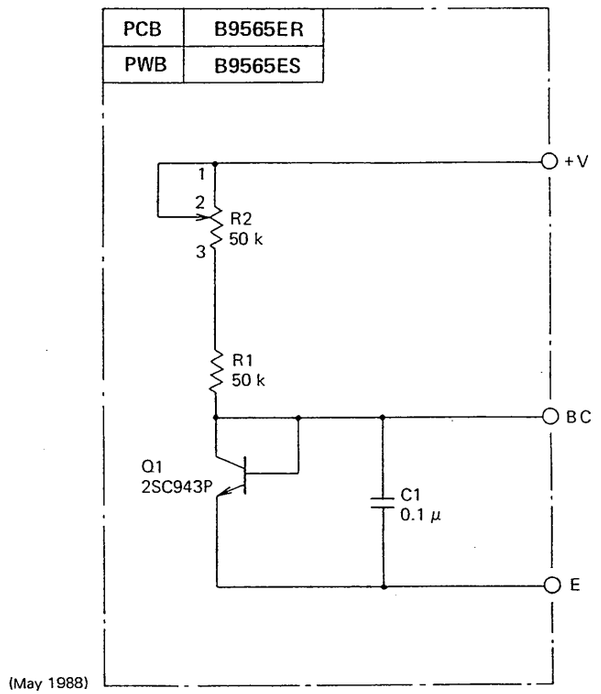
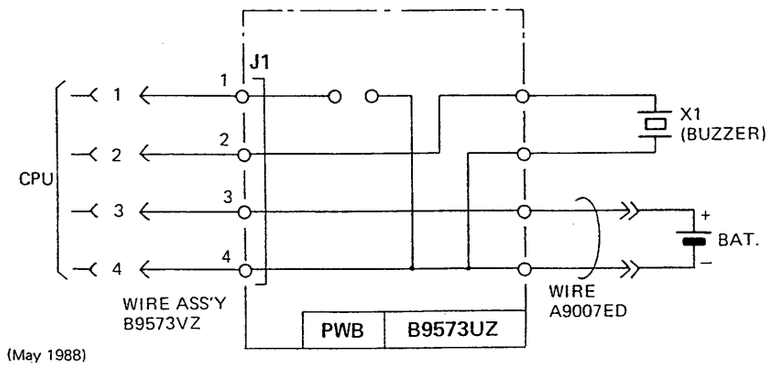
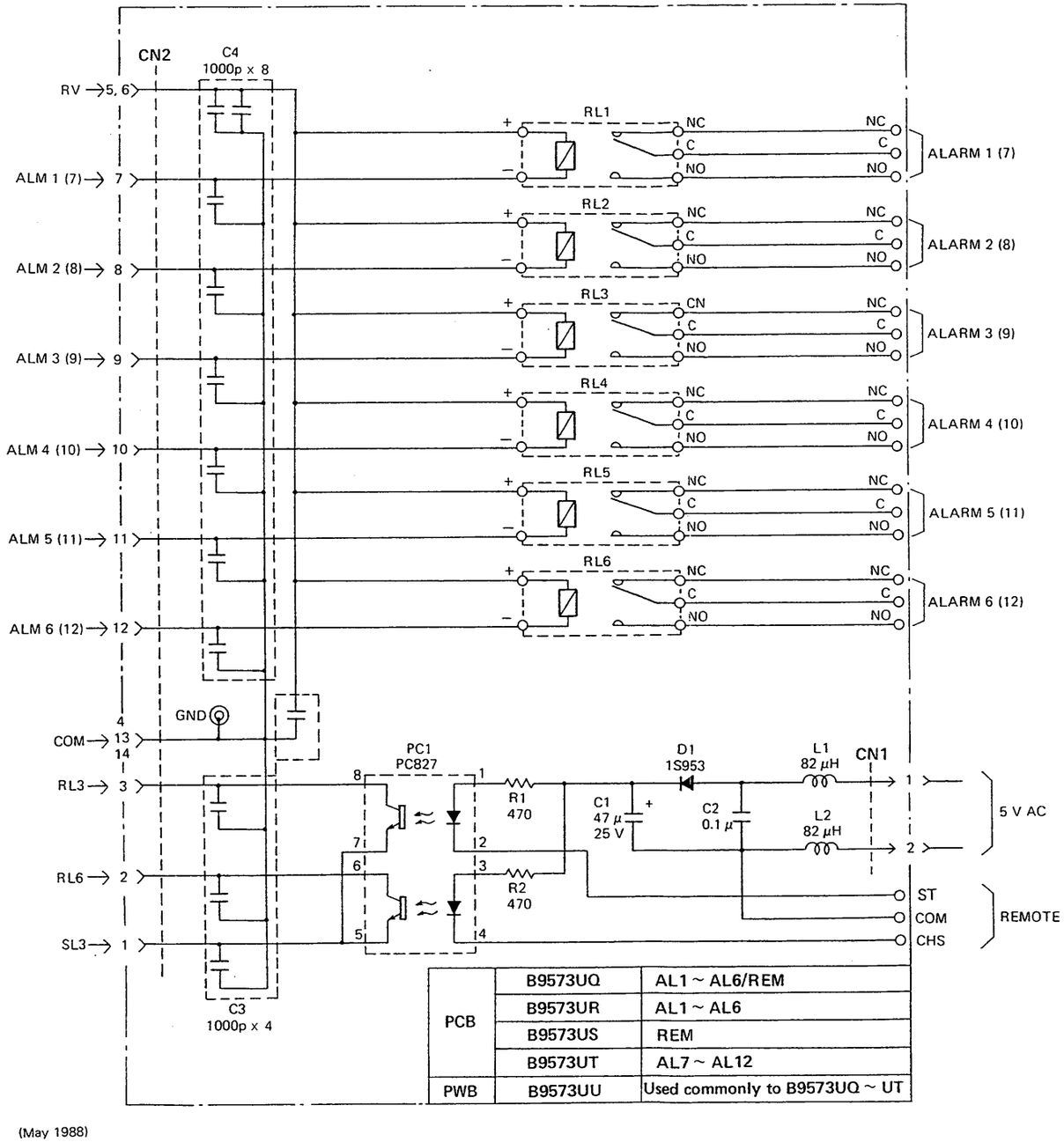
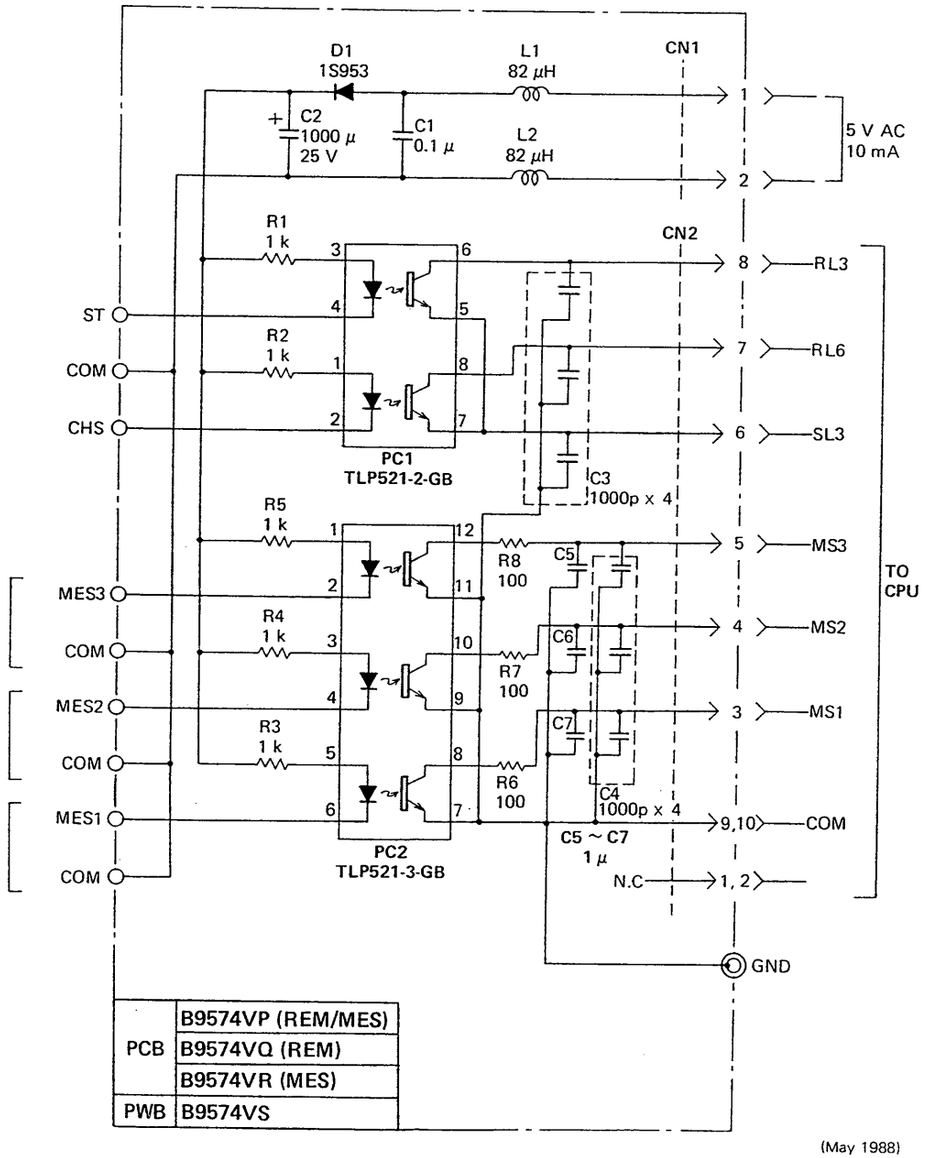


Figure 9-8. RJC Board Ass'y: B9565ER Schematic Diagram.

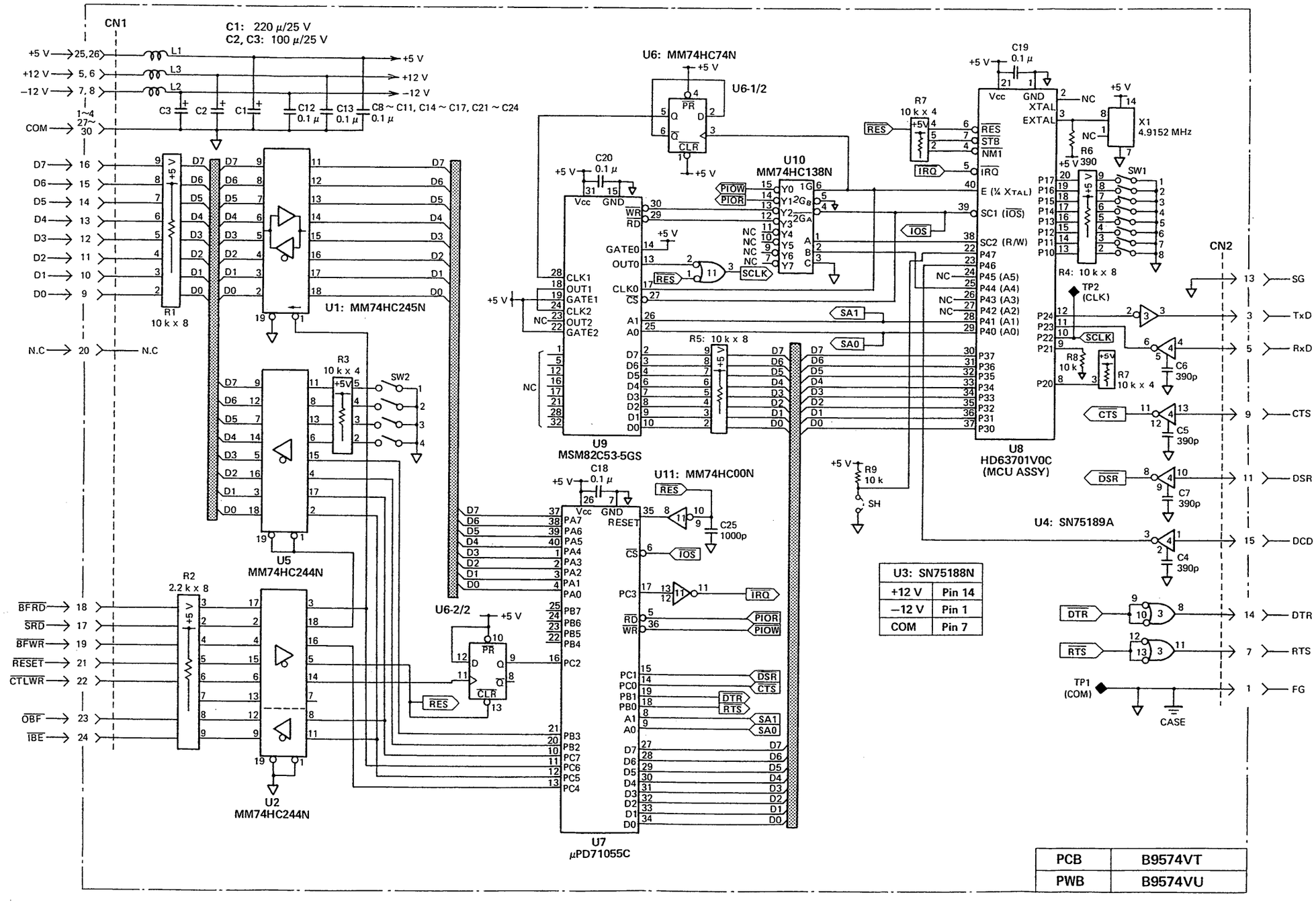






PCB	B9574VP (REM/MES)
	B9574VQ (REM)
	B9574VR (MES)
PWB	B9574VS

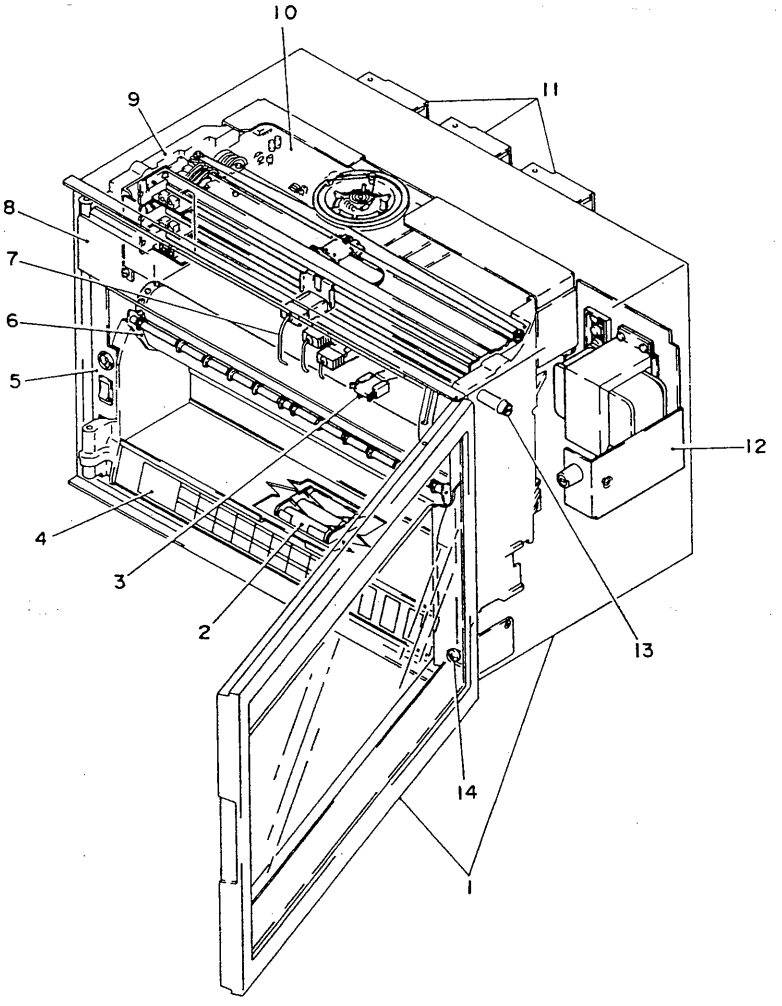
(May 1988)


CN1
C1: 220 μ/25 V
C2, C3: 100 μ/25 V
+5 V
+12 V
–12 V
COM
L1
L3
L2
C3
C2
C1
C12 0.1 μ
C13 0.1 μ
C8 ~ C11, C14 ~ C17, C21 ~ C24 0.1 μ
D7
D6
D5
D4
D3
D2
D1
D0
N.C
R1 10 k x 8
U1: MM74HC245N
R3 10 k x 4
SW2
U5 MM74HC244N
R2 2.2 k x 8
BFRD
SRD
BFWR
RESET
CTLWR
OBF
IBE
U2 MM74HC244N
U6: MM74HC74N
U6-1/2
U6-2/2
PR
CLR
C18 0.1 μ
C20 0.1 μ
U10 MM74HC138N
PIOW
PIOR
WR
RD
GATE0
OUT0
CLK1
OUT1
GATE1
CLK2
OUT2
GATE2
CLK0
CS
A1
A0
SCLK
U9 MSM82C53-5GS
R5: 10 k x 8
U11: MM74HC00N
C25 1000p
IOS
IRQ
U7 μPD71055C
PA7
PA6
PA5
PA4
PA3
PA2
PA1
PA0
PB7
PB6
PB5
PB4
PC2
PB3
PB2
PC7
PC6
PC5
PC4
PC1
PC0
PB1
PB0
SA1
SA0
C19 0.1 μ
R7 10 k x 4
RES
STB
NM1
IRQ
E (¼ XTAL)
SC1 (IOS)
SC2 (R/W)
P47
P46
P45 (A5)
P44 (A4)
P43 (A3)
P42 (A2)
P41 (A1)
P40 (A0)
P37
P36
P35
P34
P33
P32
P31
P30
U8 HD63701V0C (MCU ASSY)
R9 10 k
SH
X1 4.9152 MHz
R6 390
SW1
R4: 10 k x 8
TP2 (CLK)
R8 10 k
C6 390p
C5 390p
C7 390p
C4 390p
U4: SN75189A
U3: SN75188N
+12 V Pin 14
–12 V Pin 1
COM Pin 7
SG
TxD
RxD
CTS
DSR
DCD
DTR
RTS
FG
TP1 (COM)
CASE
PCB B9574VT
PWB B9574VU

Customer Maintenance Parts List

Models 4281, 4182 and 4183
250 mm Micro Recorders

μR250

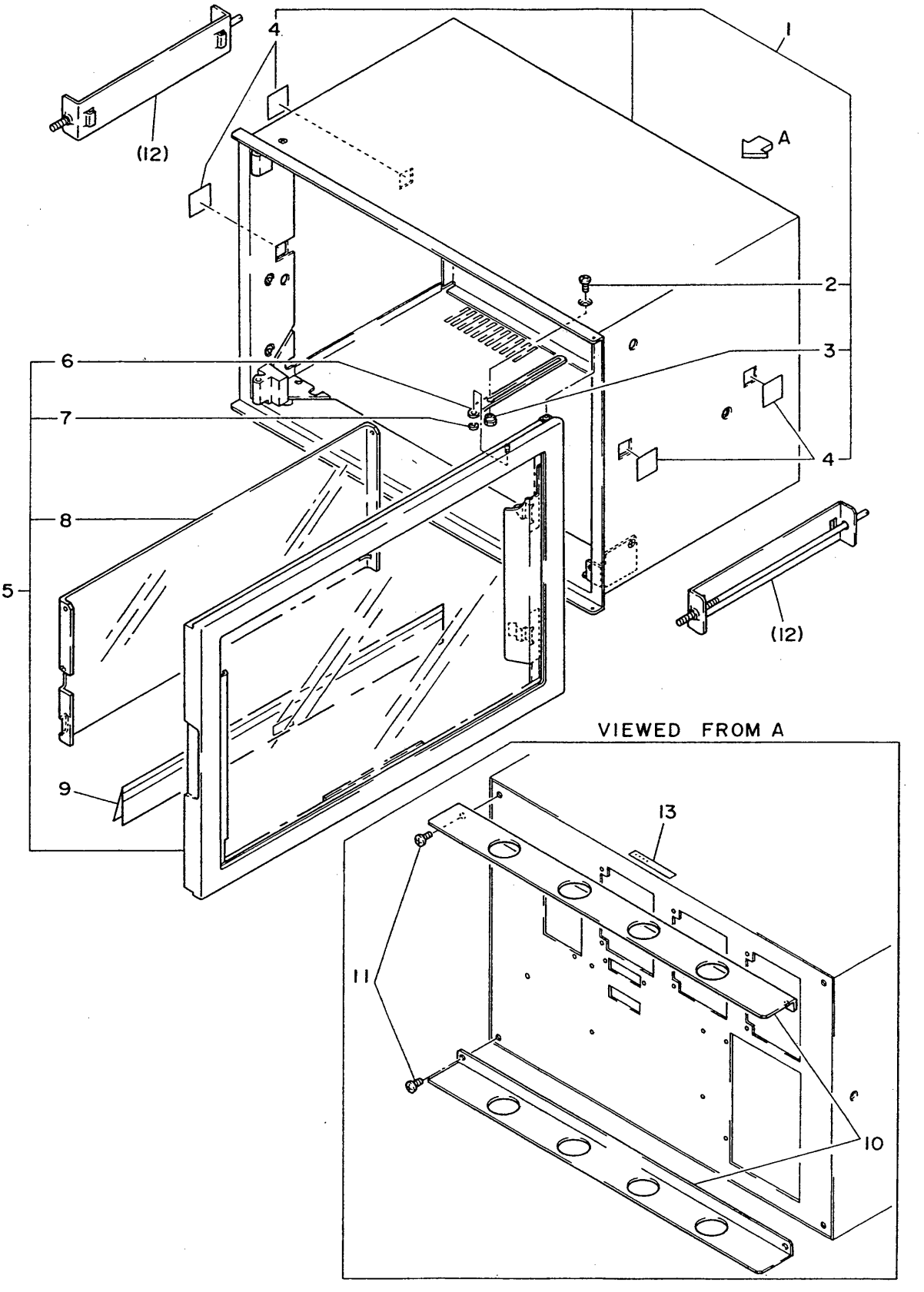


Item	Description
1	Case and Door Assemblies (see page 2)
2	Battery Case (see page 5)
3	Plotter Pen (see page 6)
4	Keyboard (see page 4)
5	A/D Bracket Assembly (see page 8)
6	Chart Guide Assembly (see page 4)
7	Pen Assembly (see page 6)
8	Display Assembly (see page 4)
9	Main Frame Assembly (see pages 4 and 5)
10	Servo Assembly (see page 6)
11	Option Terminal Assembly (see page 10)
12	Power Assembly (see page 8)
13	Internal Mechanism Stopper Screw (Part No.: B9574DS)
14	Internal Mechanism Stopper Screw (Part No.: Y9508LS B.H. Screw, M5 x 8)

YOKOGAWA
Yokogawa Electric Corporation

CMPL 4J1B1-01E

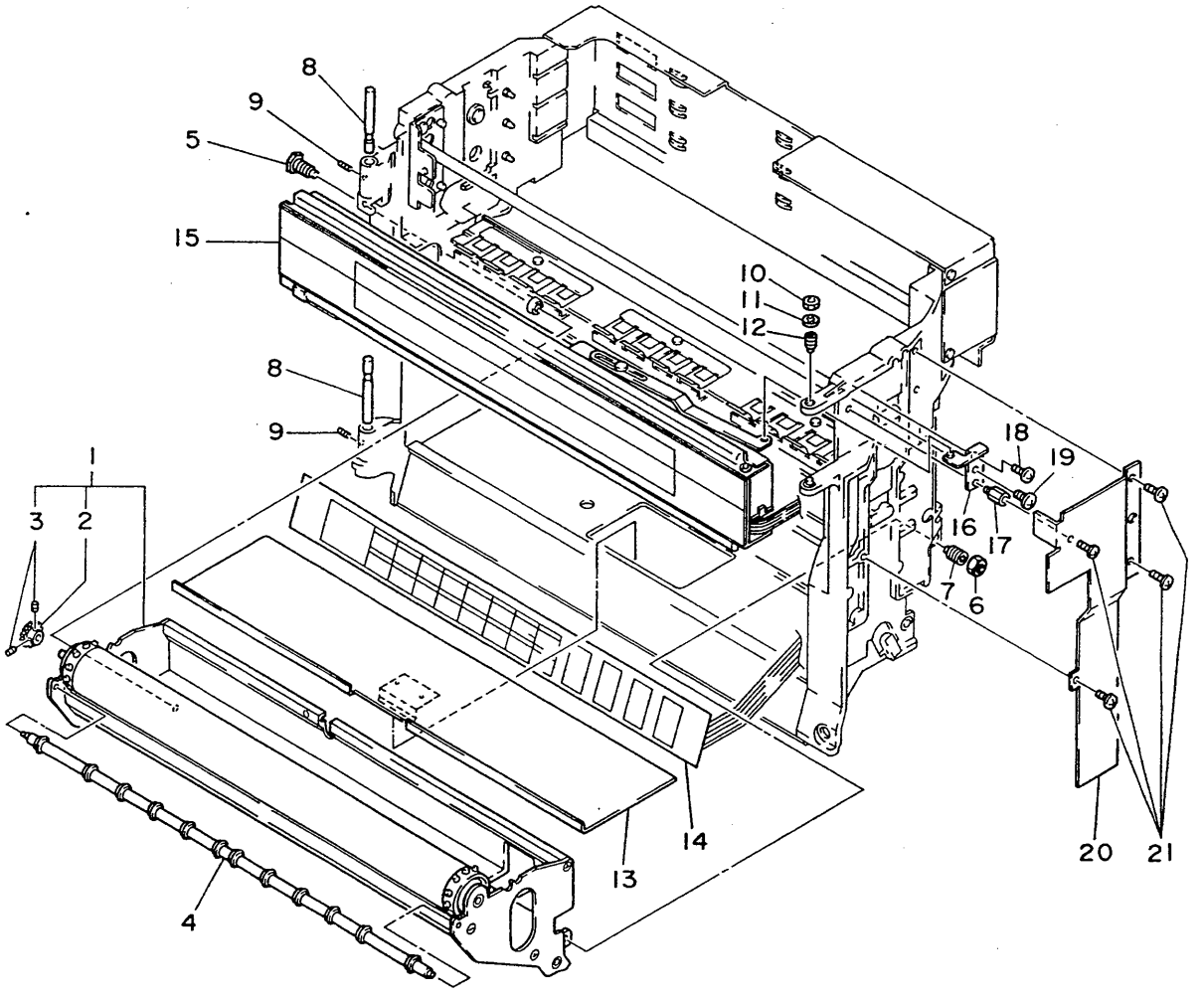
Case and Door Assemblies



Item	Part No.	Qty	Description
1	B9574BG	1	Case Assembly
2	Y9304LE	1	B.H. Screw, M3 x 4
3	B9573BQ	1	Rod
4	B9573AX	4	Plate
5	B9574CA	1	Door Assembly
6	B9544DP	1	Plate
7	Y9300ET	1	E-Ring
8	B9574CF	1	Plate
9	B9574AT	1	Nameplate *1 }
	B9574AU	1	Nameplate *2 } (select)
	B9574AV	1	Nameplate *3 }
10	B9574BE	2	Bracket }
11	Y9405LE	4	B.H. Screw, M4 x 5 } (option)
(12)	B9573BW	2	Bracket Assembly (for panel mounting) (accessory)
13	—	1	Tag No. Plate

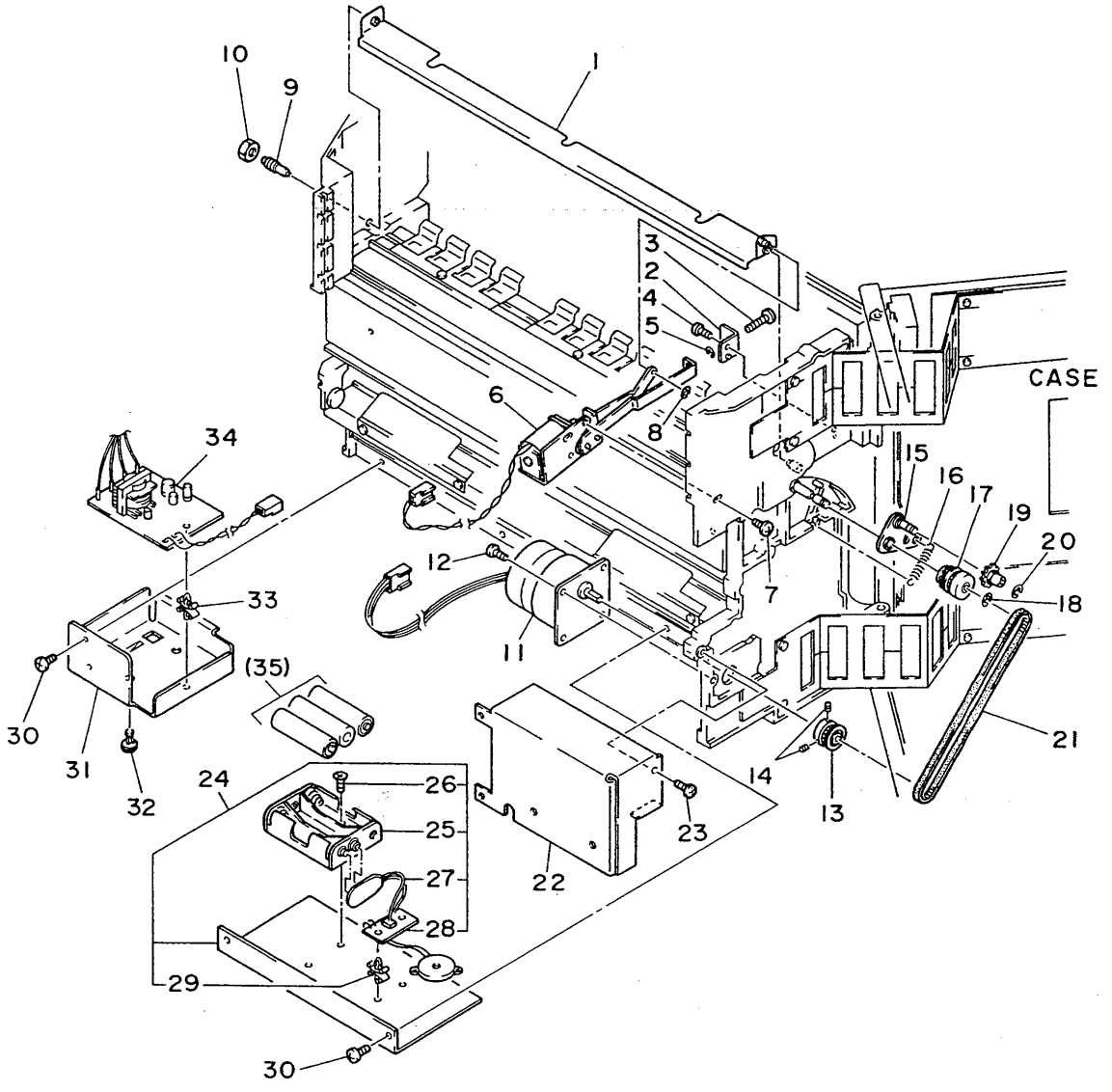
Note
- *1: For Model 4181
- *2: For Model 4182
- *3: For Model 4183

Main Frame Assembly



Item	Part No.	Qty	Description
—	B9574DA	1	Main Frame Assembly
1	B9574EA	1	Chart Guide Assembly
2	B9541NR	1	Gear Assembly
3	Y9304SJ	2	Setscrew
4	B9574FA	1	Shaft Assembly
5	E9660FM	1	Screw
6	Y9601CS	1	Nut
7	E9660GN	1	Screw
8	B9573FJ	2	Shaft
9	Y9304SJ	2	Setscrew
10	B9573FR	1	Nut
11	Y9501WL	1	Washer (with toothed lockwasher)
12	B9573FQ	1	Screw
13	B9574EU	1	Cover Assembly
14	B9574FW	1	Keyboard
15	B9574QA	1	Display Assembly
16	B9574FE	1	Bracket Assembly
17	B9573ZL	1	Rod
18	Y9304LE	1	B.H. Screw, M3 x 4
19	Y9406LE	1	B.H. Screw, M4 x 6
20	B9573ZK	1	Cover
21	Y9304LE	4	B.H. Screw, M3 x 4

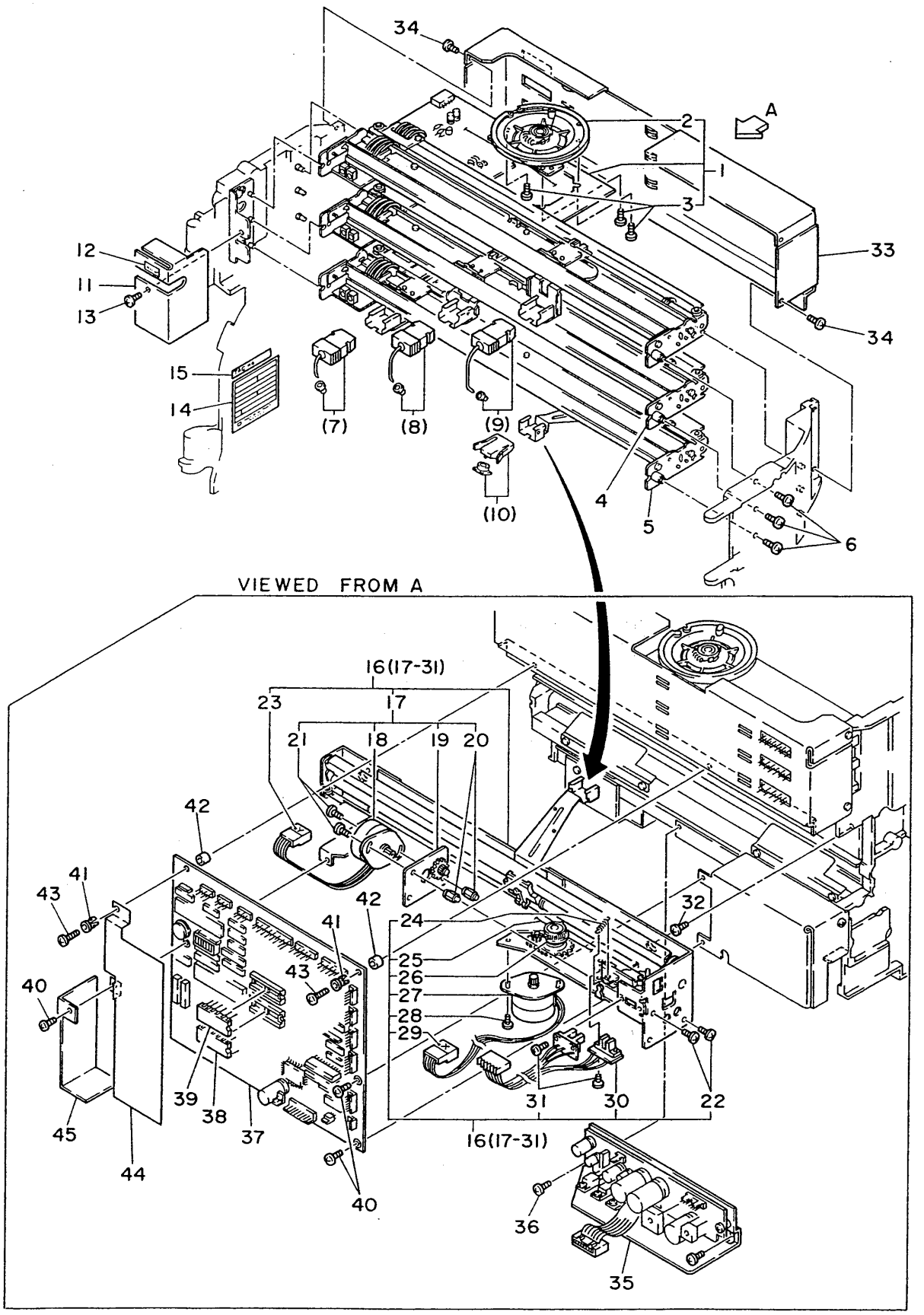
Main Frame Assembly



Item	Part No.	Qty	Description
—	B9574DA	1	Main Frame Assembly
1	B9574EJ	1	Bracket Assembly
2	B9574EX	1	Bracket
3	B9574EZ	1	Screw
4	Y9304LS	1	B.H. Screw, M3 x 4
5	Y9150ET	2	E-Ring
6	B9574EE	1	Solenoid Assembly
7	Y9304LS	2	B.H. Screw, M3 x 4
8	Y9200ET	1	E-Ring
9	B9574EN	1	Screw
10	Y9601CS	1	Nut
—	B9574DB	1	L-Frame Assembly
11	B9573RK	1	Motor
12	Y9305TS	2	Tapping Screw, M3 x 5
13	E9670LE	1	Pulley Assembly
14	Y9304SJ	2	Setscrew
15	B9573DK	1	Plate Assembly
16	B9573DY	1	Spring
17	B9573DQ	1	Pulley Assembly

Item	Part No.	Qty	Description
18	Y9300ET	1	E-Ring
19	B9573DM	1	Gear Assembly
20	Y9250ET	1	E-Ring
21	B9573DU	1	Belt
22	B9574DT	1	Bracket
23	Y9305TS	1	Tapping Screw, M3 x 5
24	B9574DN	1	Battery Assembly
25	B9565HL	1	Battery Case
26	Y9304EB	2	F.H. Screw, M3 x 4
27	A9007ED	1	Wire
28	B9573UY	1	Buzzer Assembly
29	B9573EZ	2	Stud
30	Y9308TS	3	Tapping Screw, M3 x 8
31	B9573FH	1	Bracket
32	B9573FT	2	Stud
33	B9573EZ	2	Stud
34	B9574QT	1	Inverter Assembly
(35)	A9005ED	3	Battery (accessory)

Servo and Plotter Assemblies

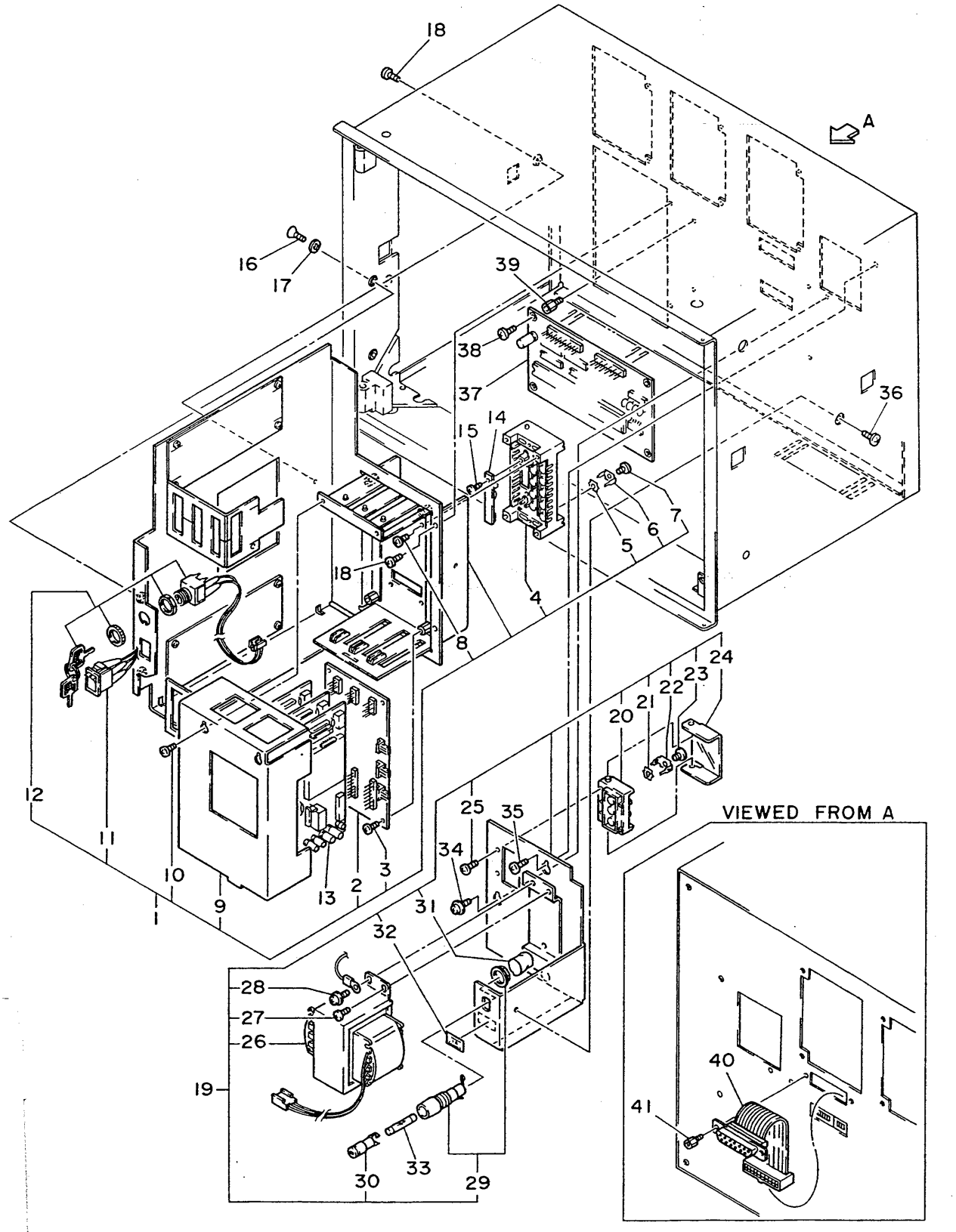


Item	Part No.	Model Qty 4181	4182	4183	Description
1	B9574LA	1	1	1	Servo Assembly
–	B9574MF	1	1	1	Servo Assembly
2	B9573MX	1	1	1	Motor Assembly
3	Y9304LB	3	3	3	B.H. Screw M3 x 4
4	B9574LB		1	1	Servo Assembly
5	B9574LC			1	Servo Assembly
6	Y9306LS	1	2	3	B.H. Screw M3 x 6
(7)	B9565YA	1	1	1	Pen Assembly
(8)	B9565YB		1	1	Pen Assembly
(9)	B9565YC			1	Pen Assembly } (accessory)
(10)	B9565ZA	1	1	1	Pen Assembly (for plotter)
11	B9574BW	1	1	1	Cover
12	B9573AW	1	1	1	Nameplate
13	Y9304LS	1	1	1	B.H. Screw, M3 x 4
14	–	1	1	1	Nameplate
15	–	1	1	1	Tag No. Plate
–	B9574DA	1	1	1	Main Frame Assembly
16	B9574HA	1	1	1	Plotter Assembly
17	B9573NK	1	1	1	Motor Assembly (for Y-axis)
18	B9573NN	1	1	1	Motor Assembly
19	B9573NW	1	1	1	Plate Assembly
20	B9573NS	2	2	2	Rod
21	Y9204KS	2	2	2	B.H. Screw, M2, 3 x 4
22	Y9308LS	2	2	2	B.H. Screw, M3 x 8
23	–	1	1	1	Nameplate [Y]
24	A9027KN	1	1	1	Spring
25	B9574HQ	1	1	1	String Assembly
26	A9026KN	1	1	1	Spring
27	B9573NN	1	1	1	Motor Assembly (for X-axis)
28	Y9204KS	2	2	2	B.H. Screw, M2, 3 x 4
29	–	1	1	1	Nameplate [X]
30	B9573HH	1	1	1	Senser Assembly
31	Y9308LS	2	2	2	B.H. Screw, M3 x 8
32	Y9305TS	2	2	2	Tapping Screw, M3 x 5
33	B9574DJ	1	1	1	Bracket
34	Y9305TS	4	4	4	Tapping Screw, M3 x 5
35	B9574VW	1	1	1	Power PCB Assembly
36	Y9308TS	2	2	2	Tapping Screw, M3 x 8
37	B9574VA	1	1	1	CPU Board Assembly
38	B9574UA	1	1	1	ROM Assembly *1 } (U23)
	B9574UC	1	1	1	ROM Assembly *2 } (U23) (select)
39	B9574UB	1	1	1	ROM Assembly *1 } (U24)
	B9574UD	1	1	1	ROM Assembly *2 } (U24) (select)
40	Y9304LS	3	3	3	B.H. Screw, M3 x 4
41	A9044KY	2	2	2	Bushing
42	A9045KY	2	2	2	Bushing
43	Y9312LS	2	2	2	B.H. Screw, M3 x 12
44	B9574CX	1	1	1	Sheet
45	B9574CY	1	1	1	Cover

Note

Model Code	Suffix Code	Input Type		
418□	1 2	DC V, TC (JIS, ANSI) RTD (JIS)	°C	*1
	3 4	DC V, TC (ANSI) RTD (DIN)	°C	*1
	5 6	DC V, TC (ANSI) RTD (DIN)	°F	*1
	7 8	DC V, TC (DIN) RTD (DIN)	°C	*2

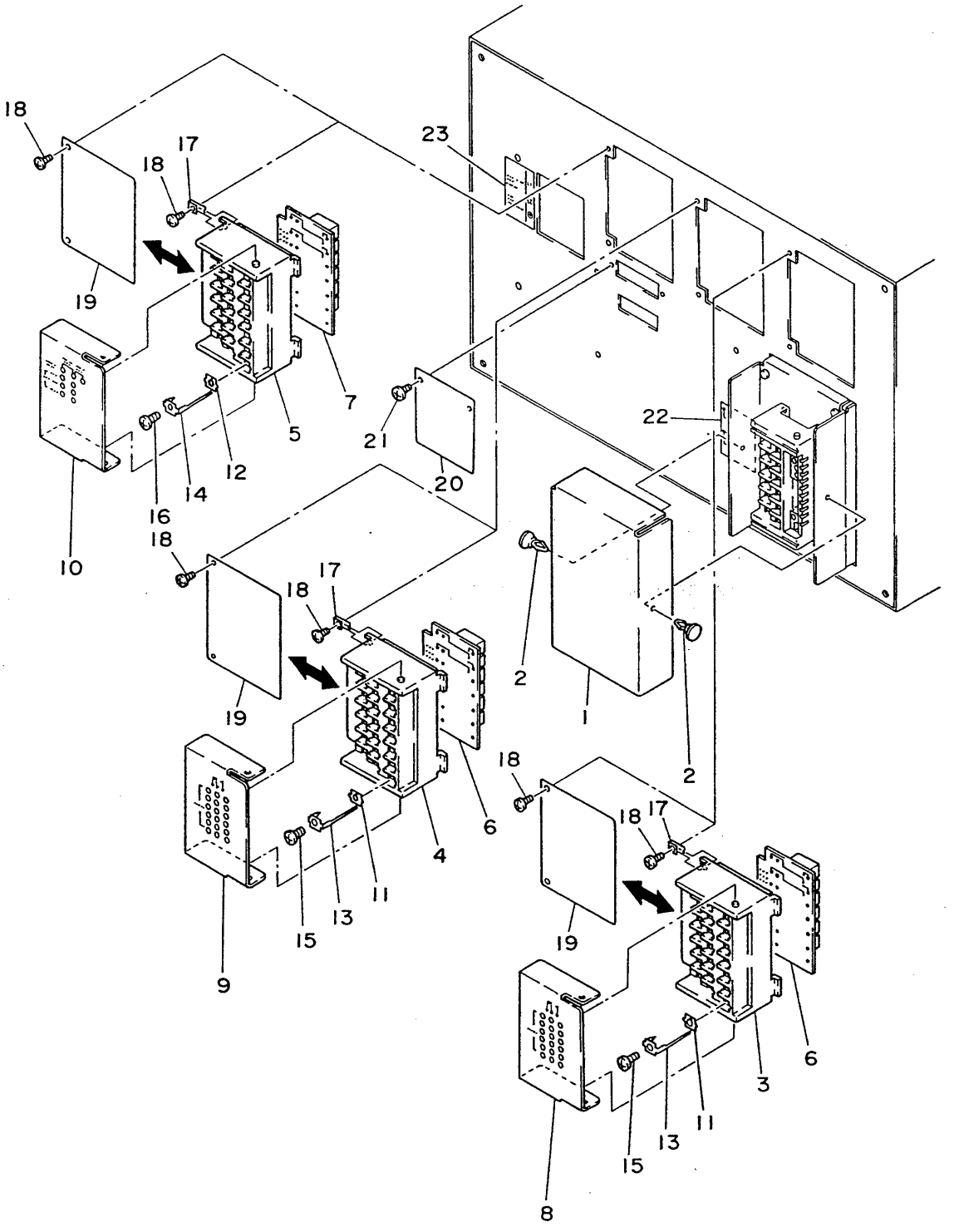
A/D Bracket and Transformer Assemblies



Item	Part No.	Qty Model 4181	4182	4183	Description
1	B9574GF	1	1	1	A/D Bracket Assembly
2	B9574VH	1	1	1	Mother Board
3	Y9304LB	4	4	4	B.H. Screw, M3 x 4
4	B9565FA	1	1	1	Terminal
5	B9565FB	9	9	9	Nut
6	B9565FC	9	9	9	Bracket
7	B9565AZ	9	9	9	Screw
8	Y9308TS	4	4	4	Tapping Screw, M3 x 8
9	B9574GM	1	1	1	Cover
10	Y9304LB	2	2	2	B.H. Screw, M3 x 4
11	B9708FH	1	1	1	Switch
12	B9544ZA	1	1	1	Switch
13	B9574VE	1	2	3	A/D PCB Assembly
14	B9565ER	1	1	1	PCB Assembly (DC V and TC inputs)
15	Y9310TS	1	1	1	Tapping Screw M3 x 10
16	Y9406EE	2	2	2	F.H. Screw, M4 x 6
17	Y9401WL	1	1	1	Washer (with toothed lockwasher)
18	Y9304LS	3	3	3	B.H. Screw, M3 x 4
19	B9573VA	1	1	1	Transformer Assembly *1
	B9573VB	1	1	1	Transformer Assembly *2
	B9573VC	1	1	1	Transformer Assembly *3
	B9573VD	1	1	1	Transformer Assembly *4 (select)
	B9573VE	1	1	1	Transformer Assembly *5
	B9573VF	1	1	1	Transformer Assembly *6
20	B9565FD	1	1	1	Terminal
21	B9565FB	3	3	3	Nut
22	B9565FC	3	3	3	Bracket
23	B9565AZ	3	3	3	Screw
24	B9565FK	1	1	1	Cover
25	Y9308TS	2	2	2	Tapping Screw, M3 x 8
26	B9573VH	1	1	1	Transformer Assembly *1
	B9573VJ	1	1	1	Transformer Assembly *2
	B9573VK	1	1	1	Transformer Assembly *3
	B9573VL	1	1	1	Transformer Assembly *4
	B9573VM	1	1	1	Transformer Assembly *5
	B9573VN	1	1	1	Transformer Assembly *6
27	Y9405LS	3	3	3	B.H. Screw, M4 x 5
28	Y9406LK	1	1	1	B.H. Screw, M4 x 6 (with toothed lockwasher)
29	A9072KF	1	1	1	Fuse Holder
30	A9073KF	1	1	1	Fuse Carrier
31	A9425XK	1	1	1	Tube
32	B9573YL	1	1	1	Nameplate (100V series) (select)
	B9573YM	1	1	1	Nameplate (200V series) (select)
33	A9050KF	1	1	1	Fuse (100V AC series) (1A timelag) (select)
	A9049KF	1	1	1	Fuse (200V AC series) (0.5A timelag) (select)
34	Y9406LK	1	1	1	B.H. Screw, M4 x 6 (with toothed lockwasher)
35	Y9405LS	2	2	2	B.H. Screw, M4 x 5
36	Y9304LE	1	1	1	B.H. Screw, M3 x 4
37	B9574VT	1	1	1	RS 232 C Assembly (option)
38	Y9304LS	4	4	4	B.H. Screw, M3 x 4 (option)
39	B9574BV	4	4	4	Stud (option)
40	B9574VV	1	1	1	Connector (option)
41	B9574BU	2	2	2	Stud (option)

Note
*1: 100V AC
*2: 110V AC
*3: 115V AC
*4: 200V AC
*5: 220V AC
*6: 230V AC

Terminal Assembly

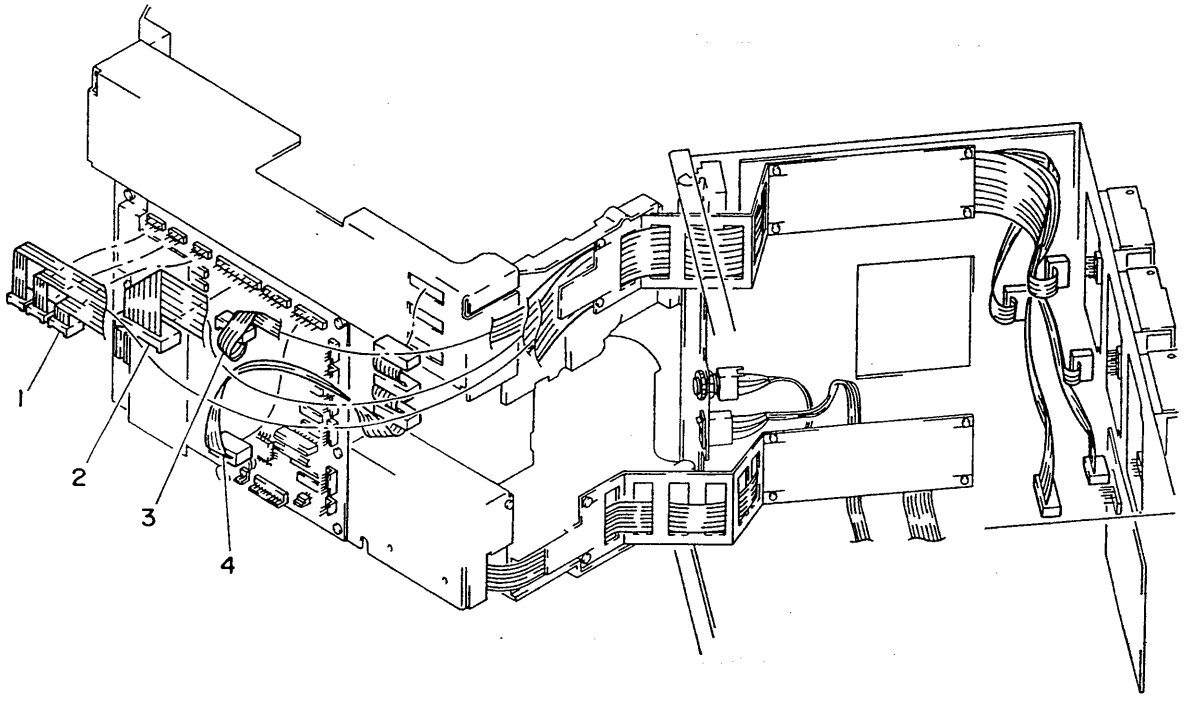


Item	Part No.	Qty	Description
1	B9574BF	1	Cover
2	B9544DL	2	Clip
3	B9573BT	1	Terminal *1
4	B9573BT	1	Terminal *2
5	B9573BT	1	Terminal *4
6	B9573UT	1	Alarm Board Assembly *1
	B9573UT	2	Alarm Board Assembly *2
7	B9574VP	1	Remote Assembly *3
	B9574VQ	1	Remote Assembly *5
	B9574VR	1	Remote Assembly *6
8	B9574BS	1	Cover *1
9	B9573BF	1	Cover *2
10	B9574BT	1	Cover *4
11	B9565FB	18	Nut *3
	B9565FB	36	Nut *1
12	B9565FB	3	Nut *5
	B9565FB	6	Nut *6
13	B9565FE	18	Bracket *3
	B9565FE	36	Bracket *1
14	B9565FE	15	Bracket *4
15	B9565AZ	18	Screw *3
	B9565AZ	36	Screw *1
16	B9565AZ	3	Screw *5
	B9565AZ	6	Screw *6
17	B9573BV	3	Bracket } *1 *2 *3 *4 *5 *6
18	Y9306LS	6	B.H. Screw, M3 x 6 } *1 *2 *3 *4 *5 *6
19	B9573AY	3	Plate (for recorder without option terminal)
20	B9574AY	1	Plate } (for recorder without RS 232 C Assembly)
21	Y9904LS	2	B.H. Screw, M2, 6 x 4 } (for recorder without RS 232 C Assembly)
22	—	1	Nameplate (for input terminal)
23	Below	—	Nameplate
	B9573YA	1	100V AC, 50Hz } (select)
	B9573YB	1	100V AC, 60Hz } (select)
	B9573YC	1	115V AC, 50Hz } (select)
	B9573YD	1	115V AC, 60Hz } (select)
	B9573YE	1	200V AC, 50Hz } (select)
	B9573YF	1	200V AC, 60Hz } (select)
	B9573YG	1	230V AC, 50Hz } (select)
	B9573YH	1	230V AC, 60Hz } (select)

Note

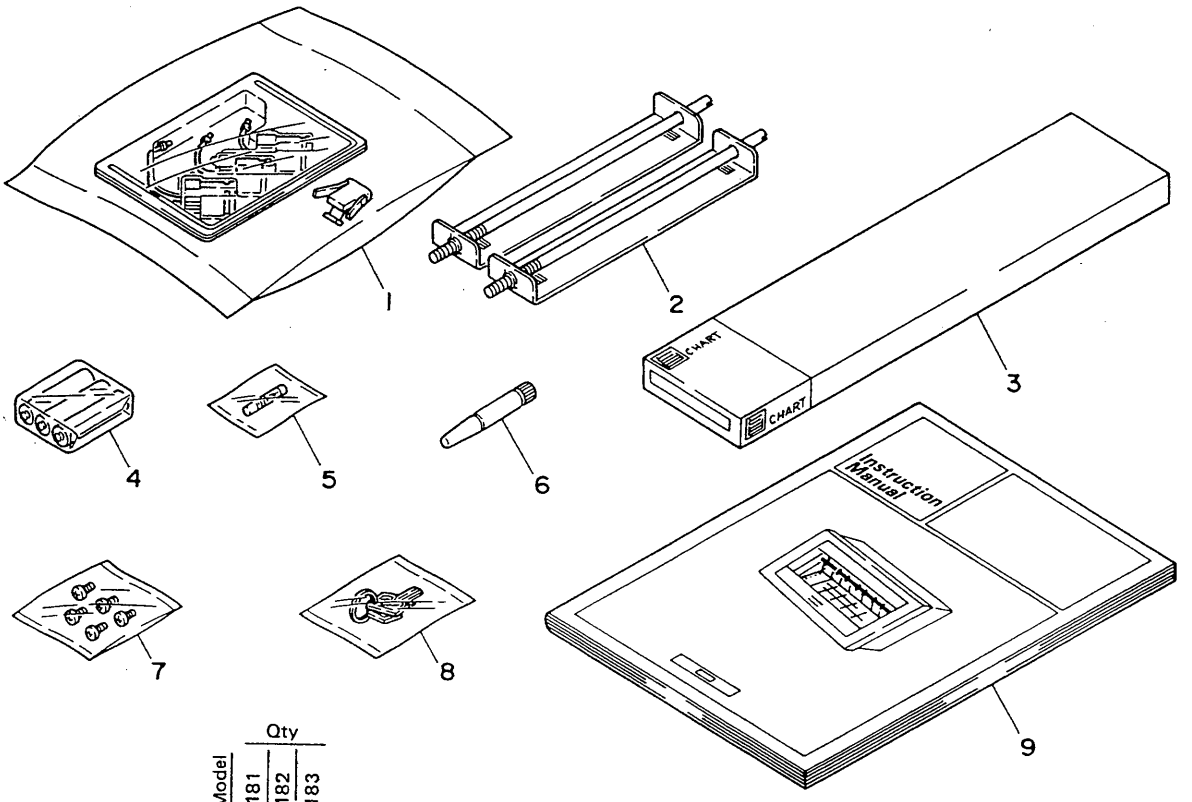
*1: For Model 418□ □□□. . . . /AK-06, /AK-12
*2: For Model 418□ □□□. . . . . /AK-12
*3: For Model 418□ □□□. . . . /AK-06
*4: For Model 418□ □□□. . . . . /REM, /MSG
*5: For Model 418□ □□□. . . . . /REM
*6: For Model 418□ □□□. . . . . /MSG

Wire Assembly

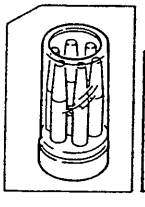


Item	Part No.	Qty	Description
1	B9574WY	1	Wire Assembly (CPU ↔ alarm, remote assemblies)
2	B9574WZ	1	Wire Assembly (CPU ↔ RS 232 C assembly)
3	B9574WX	1	Wire Assembly (CPU ↔ mother board assembly)
4	B9574WW	1	Wire Assembly (CPU ↔ servo assembly)

Standard Accessories

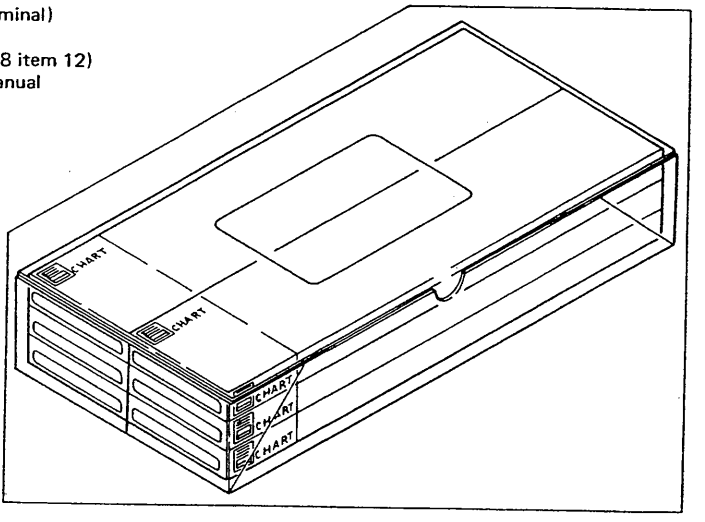


Item	Part No.	Model	Qty 4181	Qty 4182	Qty 4183	Description
1	—		1			Pen Assembly (1st pen & plotter pen) } *1
	—			1		Pen Assembly (1st, 2nd pens & plotter pen) } *1
	—				1	Pen Assembly (1st, 2nd, 3rd pens & plotter pen) } *1
2	B9573BW		2	2	2	Bracket Assembly (for panel mounting)
3	—		1	1	1	Chart *2
4	A9005ED		3	3	3	Battery
5	A9050KF		1	1	1	Fuse (100V series) (1A, timelag) } (select)
	A9049KF		1	1	1	Fuse (200V series) (0.5A, timelag) } (select)
6	—		1	1	1	Lubricating Oil *3
7	B9565AZ		5	5	5	Screw (for terminal)
8	—		1	1	1	Key (see page 8 item 12)
9	B9573AG		1	1	1	Instruction Manual



Note
*1: Pen package is supplied in packs of 3 pcs — order part number see below.

Part No.	Qty	Description
B9565AP	3	1st Pen (red)
B9565AQ	3	2nd Pen (green)
B9565AR	3	3rd Pen (blue)
B9565AS	3	Plotter Pen (purple)



Note
*3: Lubricant is supplied in packs of 6 bottle — order part number G9621AD

*2: Chart paper is supplied in packs of 6 sheaves — order part number B9538RN

*1 *2 *3 : One pack is the minimam order quantity