Instruction Manual

μR100

Model 4156
6-Point Model
100 mm Micro Recorder

IM 4D2B4-01E

YOKOGAWA ◆
Yokogawa Electric Corporation

IM 4D2B4-01E
7th Edition

CONTENTS

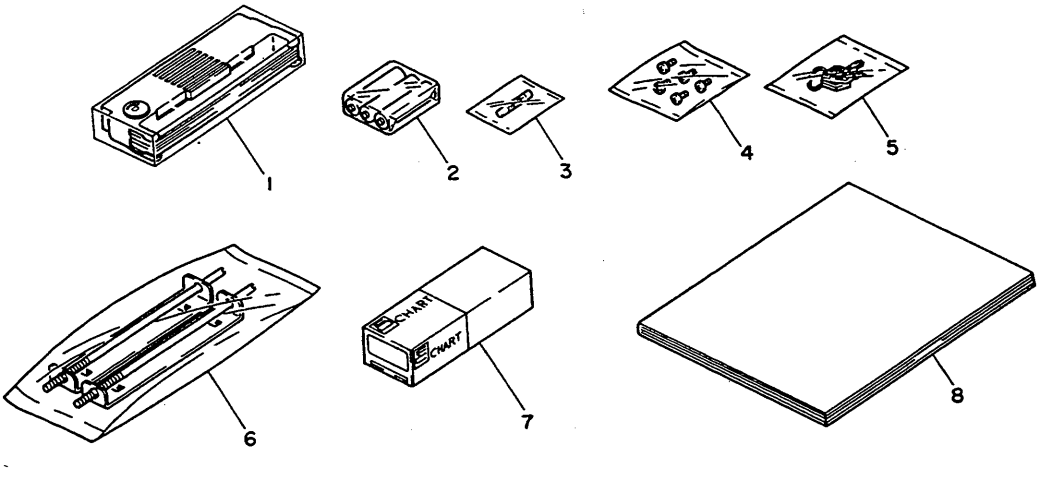
1. HANDLING CAUTIONS.

The Model μR100 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.



1. Ribbon Cassette 1
2. 1.5 V Battery (JIS SUM-3, ANSI AA) 3
3. Fuse 1
4. Terminal Screw (spare) 5
5. Key (for key lock) 2
6. Mounting Hardware 2
7. Chart . . . . . 1 box
8. Instruction Manual . . . . . 1 copy

Figure 1-1. Accessories.

•Spares

Name	Part No.	Description
Ribbon cassette	B9566DZ	6-color (1 pc./unit), order q'ty: 1 unit
Z-fold chart	B9565AW	approx. 16 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 a lock screw and packing to safeguard it against damage during transit. When the recorder is unpacked, remove the lock screw and packing.

① The shipping lock screw is located on the rear panel of the internal assembly (see Figure 1-2). Use a phillips screwdriver to remove the lock screw. The lock screw removed should be kept in a safe place.

② Open the instrument front door by inserting fingertips into the recess on the right front and pull outwards pull out the internal assembly handle, located at the bottom front of the internal assembly, as far as possible. Swing open the display door by grasping the small tab located at the lower left front corner of the display cover, gently pull outwards, and remove all the packing as shown in Figure 1-3.

CAUTION

Use the handle to pull out the internal assembly, do not use the display panel as a handle to pull out the internal assembly as the recorder may be damaged.

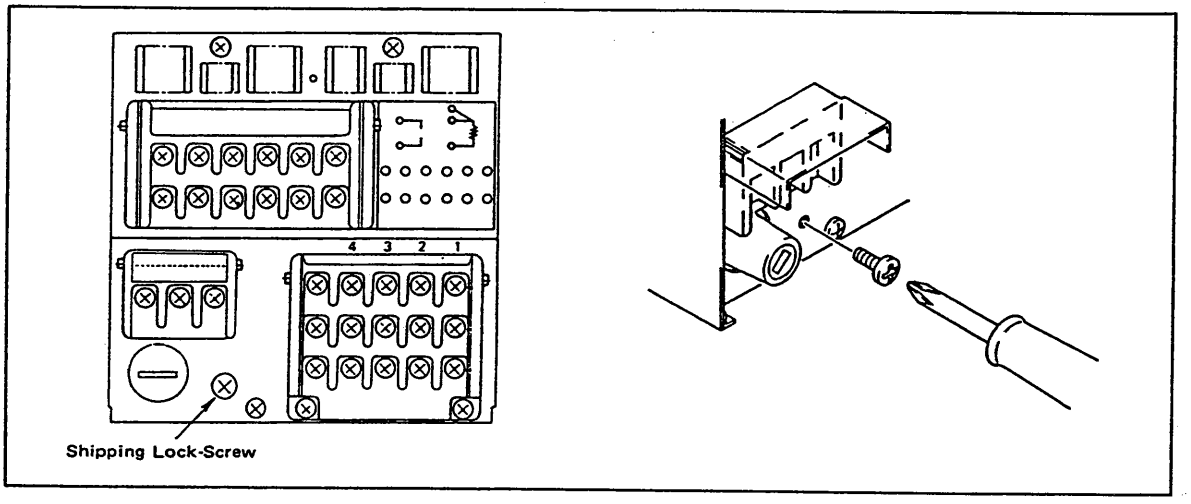


Figure 1-2.

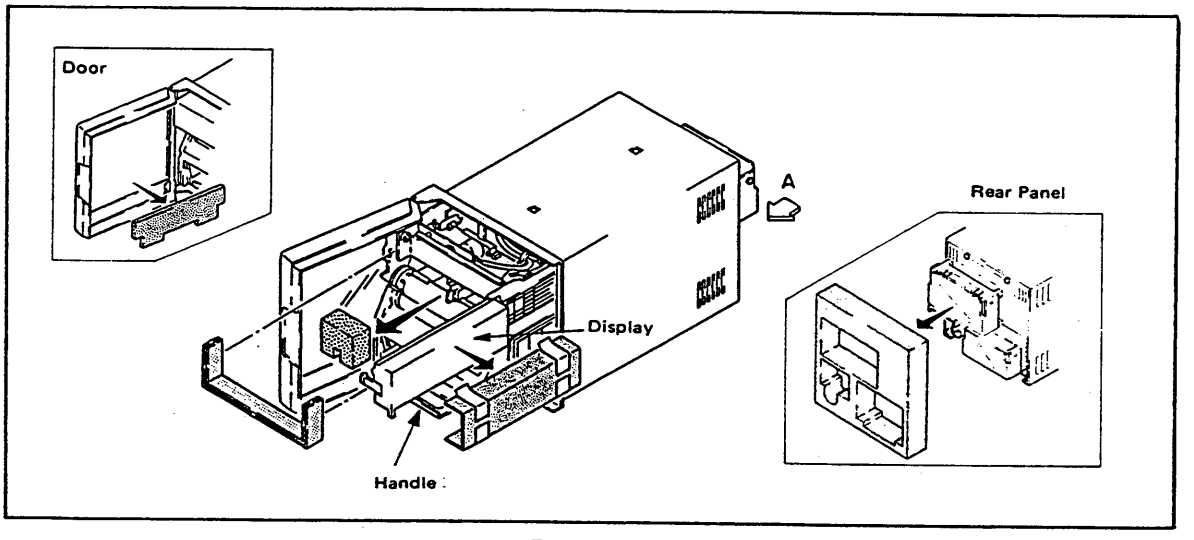


Figure 1-3.

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 (right side) the internal assembly (Figure 1-4) (Check the data plate with the chart paper compartment removed.
Refer to Section 5-1 for removing the chart paper compartment.)

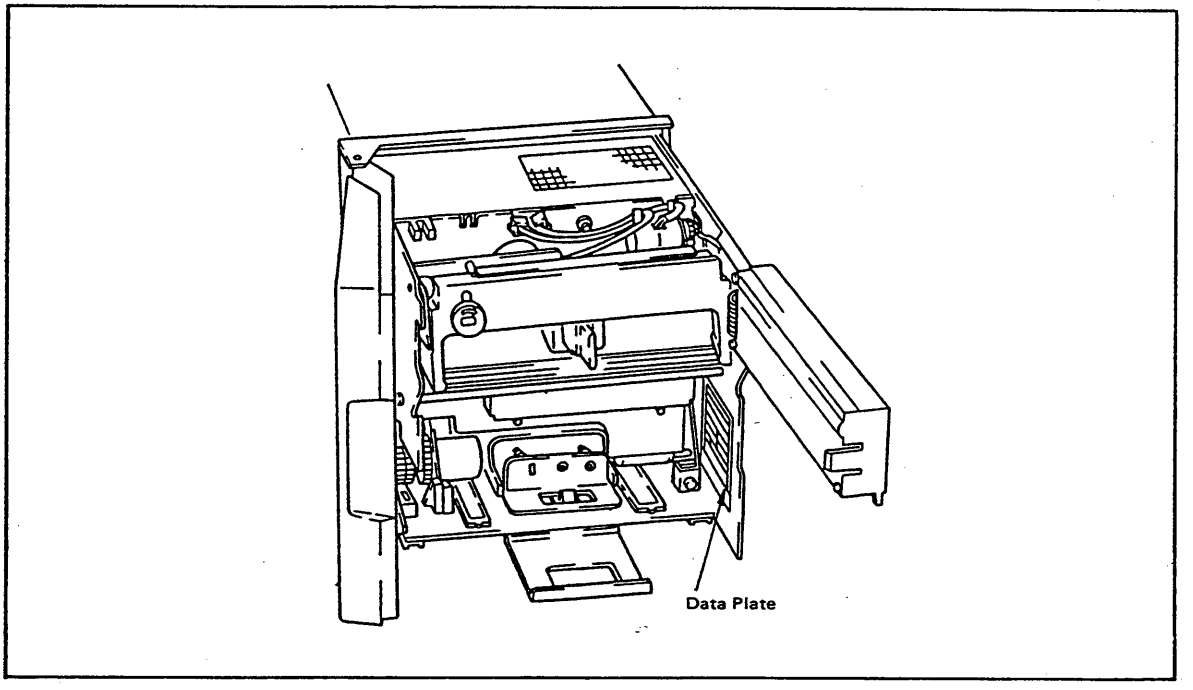


Figure 1-4.

2. GENERAL.

2-1. Description.

This manual describes the Model 4156 Recorder, a member of the μR100 series*. This six-point six-color dot-printing recorder provides analog type chart recording as well as digital printout, and digital display as well as analog (bargraph) display.

The μR100 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 side-panel keyboard. In addition to analog data writing (or printout), the μR100 also provides both digital and analog (bar graph) monitoring displays, and digital monitoring printout. The recorder is easy-to-use.

* The μR100 series also includes the one-, two- and three-pen models, which are covered in a separate manual.

2-2. Features.

(1) Programmable input types and full-scale ranges via side-panel keyboard.
Input types and full-scale ranges may be programmed for each point using the side-panel keyboard.

(2) Compact size – case depth is 230 mm (9-1/8″).

(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 (span 5 mV to 50 V). These inputs may be selected and combined.

(6) Clear, distinct color traces.
Recording colors are
CH1: purple CH2: red
CH3: green CH4: blue
CH5: brown CH6: black
The six-color ribbon cassette can be easily replaced without touching the ribbon with your fingers.

(7) Temperature difference (ΔT) recording, linear scaling 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.

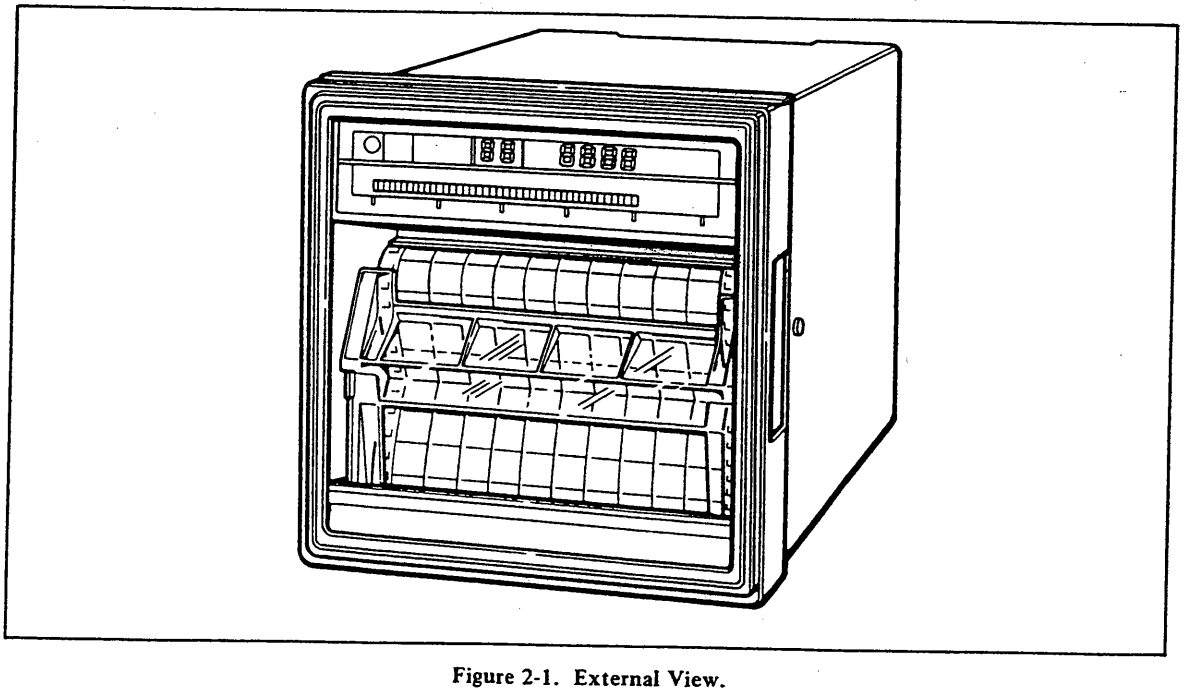


Figure 2-1. External View.

2-3. Specifications.

Model: 6-point 100mm "Micro Recorder."

Input

Number of Inputs: 6

Scan Cycle Time (or Rate): 5s/6 points.

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

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

Measuring Range: ANSI, JIS (°C) model...

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	

* μR100 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.

ANSI, DIN (°F) model

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.

DIN (°C) model

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.

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 (range codes: 00, 01, 02, 30, 31, 32, 10 to 18 and 20). ±100V DC for ranges of 6 to 50V DC (range codes: 03, 04, 05, 33, 34 and 35).

Recording

Wiring System: wire-dot printer (using six-color ribbon cassette).

Recording Colors:

CH.1 (purple) CH.2 (red)
CH.3 (green) CH.4 (blue)
CH.5 (brown) CH.6 (black)

Effective Recording Span: 100 mm (analog data).

Chart: Z-fold chart (16 m) with a calibrated width of 100 mm.

Chart Feed Speed: Arbitrarily settable within range of 1 to 1,500 mm/h in 1 mm/h steps.

Chart Feed Speed Setting: Set via keyboard (see paragraph 5-4-5 Chart Feed Speed Setting).

Display

Type of Display: LCD.

Digital Data Display:

- Measured data
  DC V.....3-1/2 digits
  Temperature.....0.1°C
- Alarms (H, L (h, l) and ALM)
- Date
- Time
- Chart feed speed (including A and F)*1
- BAT (replace! battery) display
- Other information*2

*1 See paragraph 5-4-5 Chart Feed Speed Setting.

*2 When setting measuring range or span, various setting information may be displayed.

Bar Graph Display:

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

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: Dot printing interval 5s (30s/channel).

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.
- 1000V AC (50/60 Hz) for one minute between input terminals (RTD inputs not included), leakage current 2mA or less.

Memory Backup: Approx. three months (1.5V battery × 3).

Accuracy and Resolution (Dead Band)

The following specifications apply the 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 affect upon the recorder operation). (See Table 2-2)

Table 2-2.

Input	Range	Measurement (Digital display)		Record (Analog recording)*1		Remarks
		Accuracy	Resolution	Accuracy	Dead band	
DC V 0□ 3□	20mV 200mV 2V 6V 20V 50V	±(0.2% of rdg*+3 digits) ±(0.2% of rdg+2 digits) ±(0.1% of rdg+2 digits) ±(0.3% of rdg+2 digits)	10μV 100μV 1mV 1mV 10mV 10mV	±(0.2% of rdg+0.3% of SPAN) ±(0.1% of rdg+0.3% of SPAN) ±(0.3% of rdg+0.3% of SPAN) Or ±0.5% of SPAN whichever is greater	Dead band 0.2% of recording span	*rdg: indication (display) value
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	±(Measurement Accuracy + 0.3% of SPAN) or ±0.5% of SPAN whichever is greater		
	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	JPt100 Pt 100	±(0.15% of rdg+0.3°C)	0.1°C			

*1 When recording span is set as follows.

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

JPt100 : JIS C 1604-1989, JIS C 1606-1989
Pt 100 : JIS C 1604-1989, JIS C 1606-1989, DIN IEC 751, IEC 751

Digital Printout

(prints out with plotter pen in purple color.)

Digital Printout*:

- O Time tick (− sign)
- O Time (hour and minute)
- O Date (year, month and day)
- O Chart feed speed
- O Tag number (TAG. No.)
- O Engineering unit (mV, V, °C (°F) and arbitrary unit set by ASCII codes.
- O Scale markings (prints out on both 0 and 100% scale ends)
  (Dot printing in each channel color).

* See paragraph 2-5-1 Example of Digital Printout.

Alarm Printout*:

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

* See paragraph 2-5-2 Example of Alarm Printout.

Program List Printout*:

- O Date
- O Time
- O Chart feed speed setting status
  (1; normal mode, 2; REM (optional) mode)
  (including Fix or Auto mode setting status) (see paragraph 5-4-5).
- 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 Alarm setting status

* See paragraph 2-5-3 Example of Program List Printout.

Digital Printout* when Chart Feed Speed is Changed

Note) The chart feed speed can be switched between two values with a remote control signal. However,/REM (optional feature) must be specified.

Chart feed speed change (normal to remote) "_ _"

Chart feed speed change (remote to normal) "_"

* See paragraph 2-5-4 Example of Printout in REM Setting.

Construction

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

External Dimensions: 144(W) × 144(H) × 230(D) mm (5-11/16 × 5-11/16 × 9-1/8").
(D is length from front panel to the rear of the instrument. Front door thickness 26 mm is not included. See Figure 3-1).

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

Weight (Approx.): 4.2 kg.

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.): 20VA.

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 1.4 × 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
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

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 60 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/channel (any H, L values).
Alarm Output: Four common outputs (relay output is optional feature).
Alarm Display: LCD (bar graph and "ALM").
Hysteresis: Approx. 0.5% of span.

Standard Functions

Table 2-3.

Standard function	Description
Full-scale range setting	Programmable via keyboard for each point.
Skip	Printout skips the programmed channel(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 (△V /△T) recording	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	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)

*-1 Refer to the ASCII code Table (see pages 5-30 and 5-47) 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 5-34).
*-3 Voltage span at scaling is less than 75% of measurement range (see page 5-28).

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		/AK-04
Portable type		/PBL

i) Thermocouple burnout detection (/BU/BD).
Indication scales out to 100% or 0% side on TC input burnout.
- O Burnout upscale action (/BU) common to all points.
- O Burnout downscale action (/BD) common to all points.

ii) Remote control (/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 RCD ON/OFF 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 2-5-4 Example of printout in REM mode.) mode.)

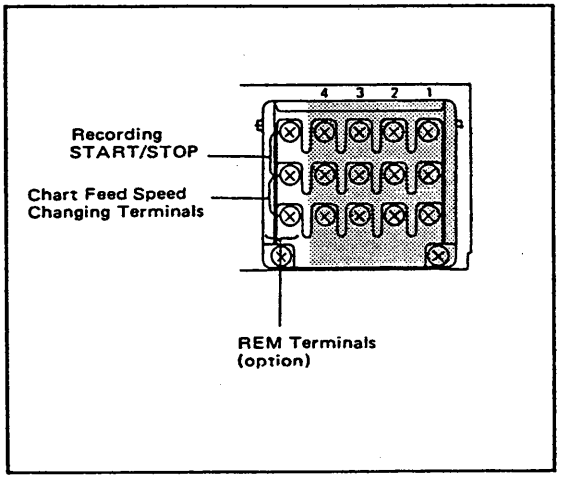


Figure 2-2.

iii) Alarm common outputs (relay) (/AK-04).
(installed in the recorder if ordered)
Number of Output Points: 4.
Relay Contact Rating: 100V AC, 01A or less or 24V DC, 1A or less (resistive load).
Terminal layout of the /AK-04 is shown in Figure 2-3.
NO, NC, C in the figure mean
O Normally open
O Normally closed
O Common respectively

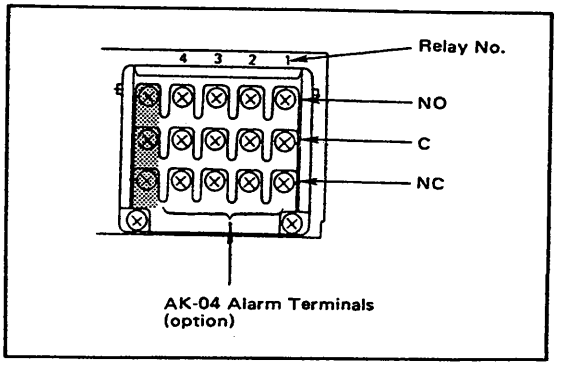
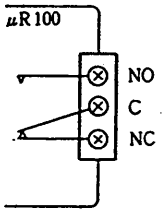


Figure 2-3.

Relay contact conditions depend on the instrument (μR100) conditions as follows:

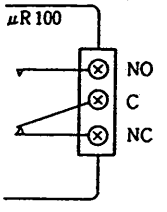
O Excitation Alarm

1 Power "OFF" state

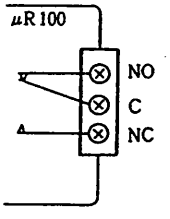


2 Power "ON" state

(a) No alarm (ALM) state



(b) Alarm (ALM) state



The relay (/AK-04) operates when the measured value reaches the instruments alarm set point.
The operation of the model is explained as an example below.
Assume that alarm points are set as follows:

CH.NO. \ Alarm output No.	1	2	3	4
CH. 1	LL_1	L_1	H_1	HH_1
CH. 2	LL_2	L_2	H_2	HH_2
CH. 3	LL_3	L_3	H_3	HH_3
CH. 4	LL_4	L_4	H_4	HH_4
CH. 5	LL_5	L_5	H_5	HH_5
CH. 6	LL_6	L_6	H_6	HH_6

(LL: Low-Low limit, L: Low limit, H: High limit, HH: High-High limit).

In this case, with the alarm output No. 1, if one or more of alarms LL_1~LL_6 set for CH.1~CH.6 respectively occur, the relay operates as shown in 2-(b) (relay No. 1).
That is the alarm output No. set on the μR100 is the same as the relay number with the /AK-04 relay.
If the measured value goes outside any of the alarm set points, the corresponding relay operates.

2-4. Models and Suffix Codes.

Model	Suffix code		Description
4156	.....		6-point dot printing model
	-100		DCV & TC (ANSI, JIS), °C
	-200		RTD (JPt 100), °C
	-300		DCV & TC (ANSI, JIS), °C
	-400		RTD (Pt 100), °C
	-500		DCV & TC (ANSI), °F
	-600		RTD (Pt 100), °F
	-700		DCV & TC (DIN), °C
	-800		RTD (Pt 100), °C
Power supply voltage		-1 ..	100V AC
		-3 ..	115V AC
		-5 ..	200V AC
		-7 ..	230V AC
Frequency		1	50Hz
		2	60Hz

DCV: DV voltage
TC: Thermocouple
RTD: Resistance Temperture Detector
JPt100 : JIS C 1604-1989, JIS C 1606-1989
Pt100 : 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.

2-5-1. Digital Printout.

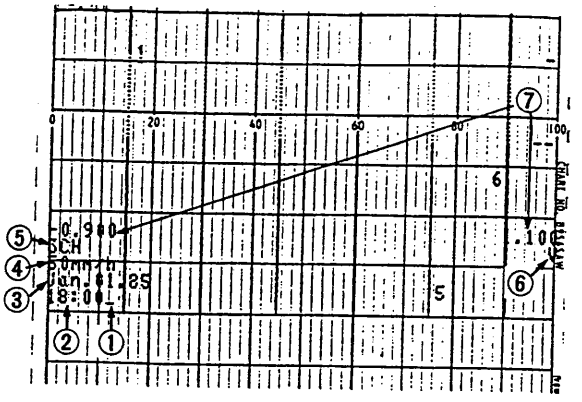


Figure 2-4.

Refer to Table 5-2 in "5-4-5 Chart Feed Speed Setting" for the digital printout interval.

The digital printout is carried out in each channel plotting color. Printout items are as follows:

1 Time tick
2 Time
3 Date
4 Chart feed speed
5 Tag (TAG No.)
When tag is not specified, X CH is printed out (X: any of 1, 2, 3 4, 5 or 6)
6 Engineering unit (mV, V, °C (°F) and arbitrary unit set by ASCII codes)
7 Scale markings (prints out at 0 and 100% of chart).

2-5-2. Alarm Printout.

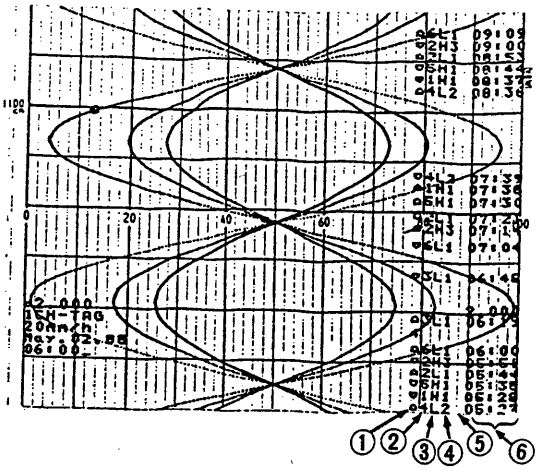


Figure 2-5.

(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)
4 Output No. (1 numeric digit)
5 * mark (printed out at alarm memory overflow)
6 Time when alarm occurred or reverted to normal

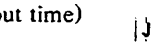
Note) When * mark is printed out, some other alarms are not printed out. The alarm ON/OFF data are stored in a memory which can store up to 30 data, and the data are output sequentially as alarm printout. However, if alarm turns ON/OFF frequently as shown in the example, the alarm printout (output from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

2-5-3. Program List Printout.

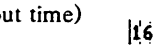
Prints out the settings for measurement and recording.

To print out a program listing, press the key.

1 Date (printout time)



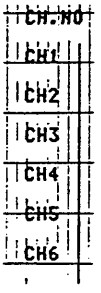
2 Time (printout time)



3 Chart feed speed for normal operation (AUTO mode)

4 Chart feed speed for remote control mode (Fixed mode)

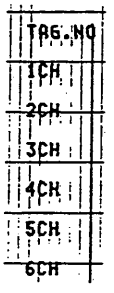
5 Channel No.



channel 1
channel 2
channel 3
channel 4
channel 5
channel 6

6 Tag

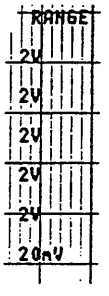
Tag No. is required to be set by ASCII codes. If it is not set, the setting shown on the right is set as an initial status.



7 Measuring range

Settings on the right show:

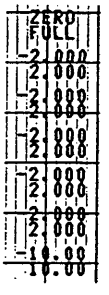
- O Channel 1 to 5: Absolute value measurement of −2 to 2V.
- O Channel 6: Absolute value measurement of −20 to 20mV.



8 Recording span:

Settings on the right shows:

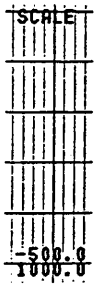
- O Channel 1 to 5: Recording −2 to 2V range.
- O Channel 6: Recording −10 to 10 mV.



9 Scaling

Settings on the right show that Scaling values are specified only for channel 6 as follows:

−500: (at 0% on the chart)
1000: (at 100% on the chart)
(Range code of channel 6 is "30").



10 Engineering unit

As channels 1 to 5 do not carry out the scaling recording, the engineering unit: V of the measuring range (−2 to 2V) which has been set is printed out.
For channel 6, some unit must be set, by ASCII code, so all spaces (no print out on the chart) are set in the status of waiting for unit setting.

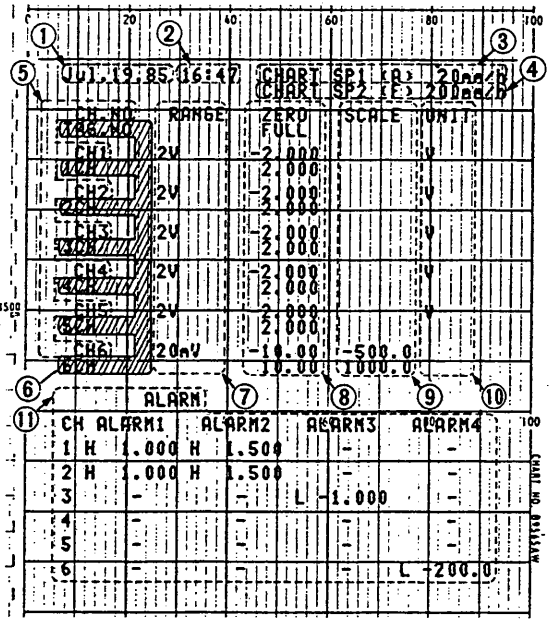


Figure 2-6.

The setting statuses shown in the below figure are as follows:

Channel 1: High alarm 1V: relay No.1, and High High alarm 1.5V: relay No.2
Channel 2: High alarm for 1V relay No. 1 High High alarm 1.5V relay No. 2
Channel 3: Low alarm −1V: relay No. 3
Channel 4: No alarm setting
Channel 5: No alarm setting
Channel 6: Low alarm −200 (scaling value): relay No. 4

2-5-4. Printout in REM (Remote) Mode.

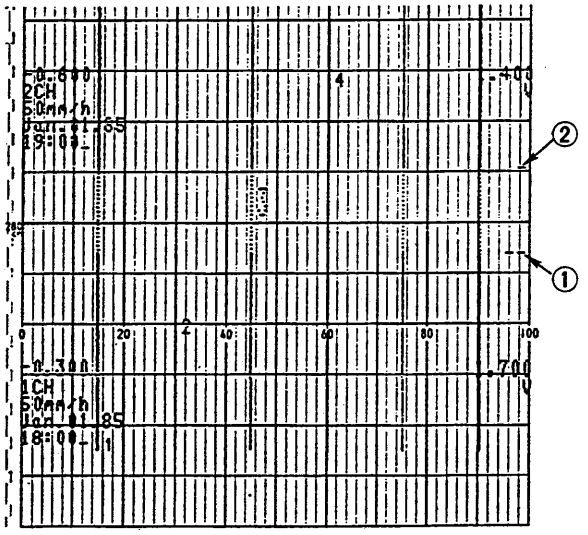


Figure 2-7.

It's possible to switch between two chart speeds using a remote control (contact) signal; the times the remote control signal turns ON and OFF are printed out on the chart.

① Shows when the chart feed speed is changed to from normal chart speed mode chart speed in remote control mode by the remove control signal. The point is indicated with "– –" mark.

② Shows the when the chart speed was reverted to normal chart speed by the remote control signal turning OFF. The point is indicated with "–" mark.

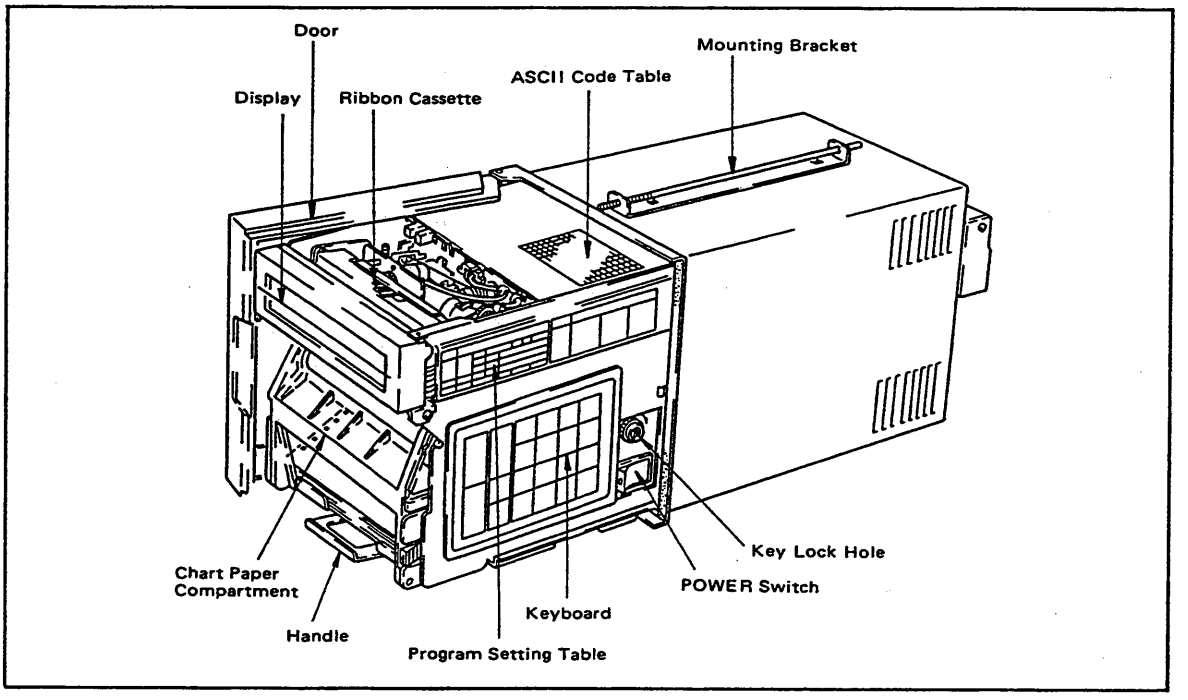


Figure 2-8. Names of Components.

3. INSTALLATION.

3-1. General.

The Model μR100 Recorder has been designed for flush panel mounting. In addition, a handle may be attached for portable use. If the handle is required, indicate so when ordering.

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 40 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.

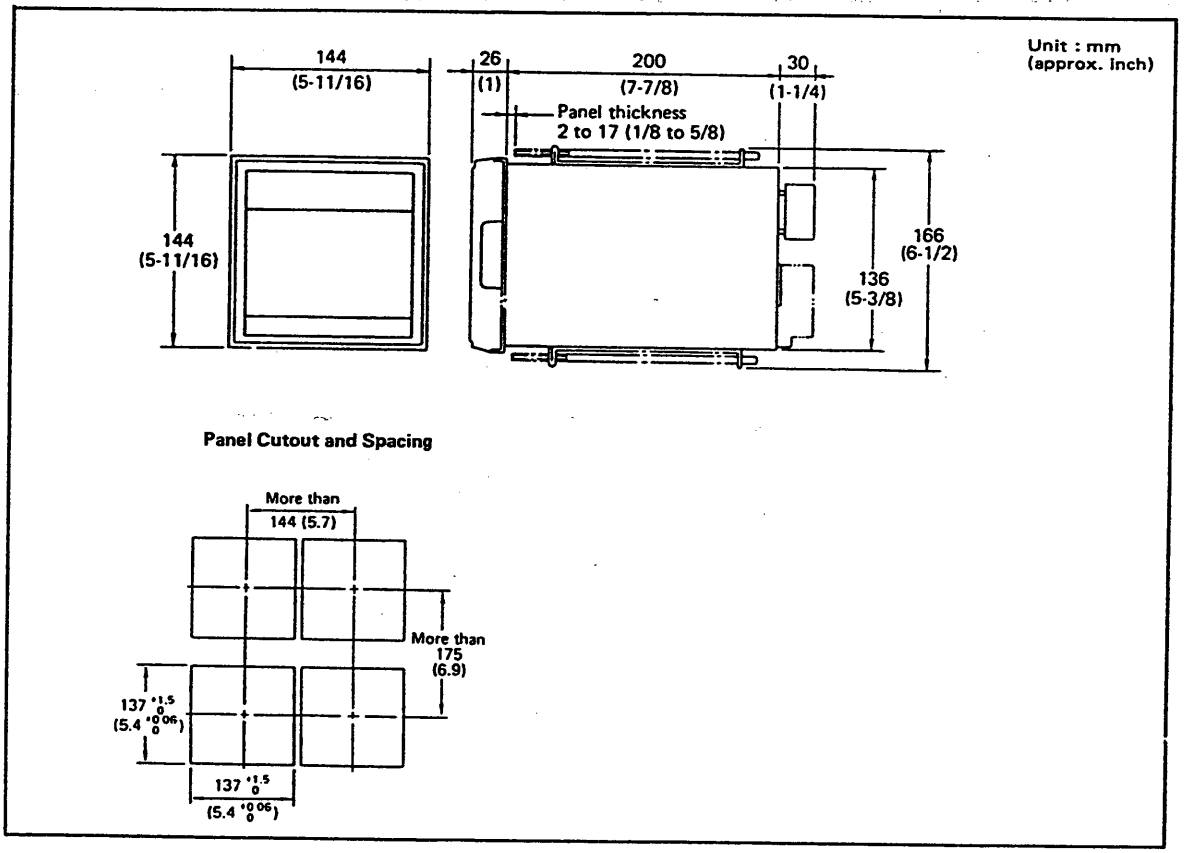


Figure 3-1. External and Panel Cutout Dimensions.

3-4. Mounting.

(1) The recorder should be mounted on a at least 2 mm thick steel panel.
(2) Insert the recorder into the panel cutout.
(3) Hold the bottom of the recorder and mouint it on the panel using the mounting bracket supplied with the recorder.

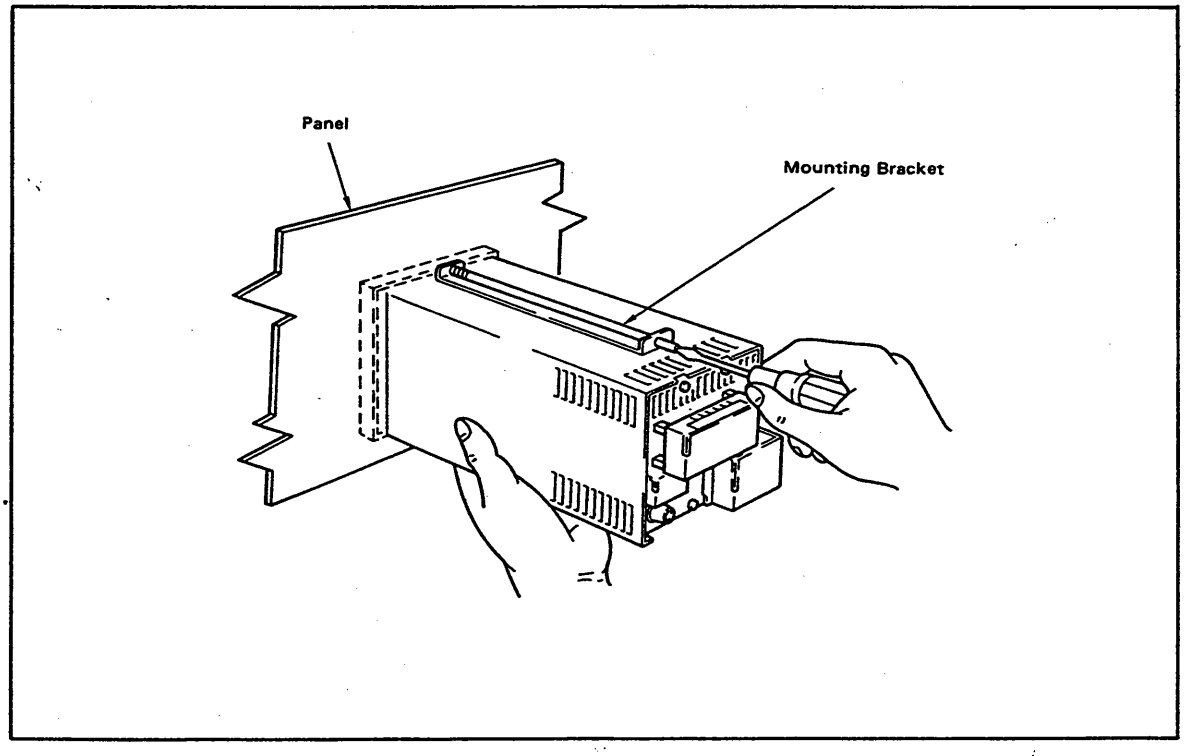


Figure 3-2. Mounting Recorder.

4. WIRING.

4-1. Wiring Instructions.

Turn the recorder power switch OFF. Open the recorder rear cover.

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).

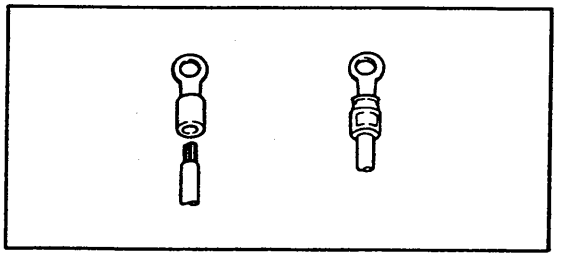


Figure 4-1. Solderless Lugs.

③ To minimize noise pickup:

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

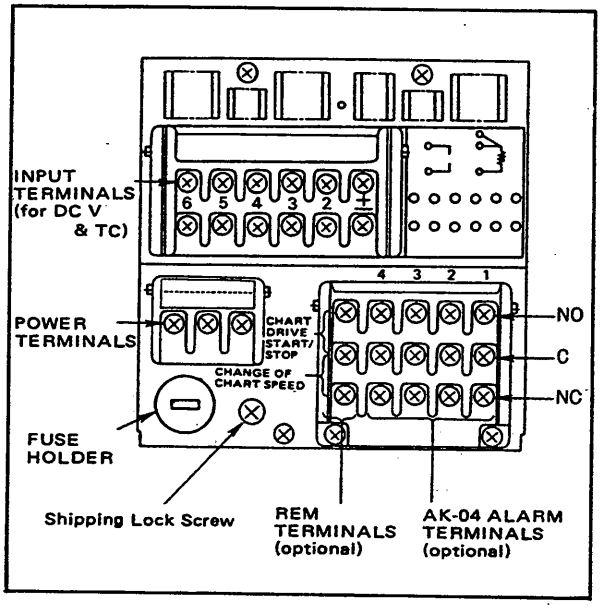
(b) It is recommended that shielded wires be used to minimize noise pickup from an electrostatic induction source. The shielding wire of the cable should be connected to the recorder ground terminal (only one ground line).

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

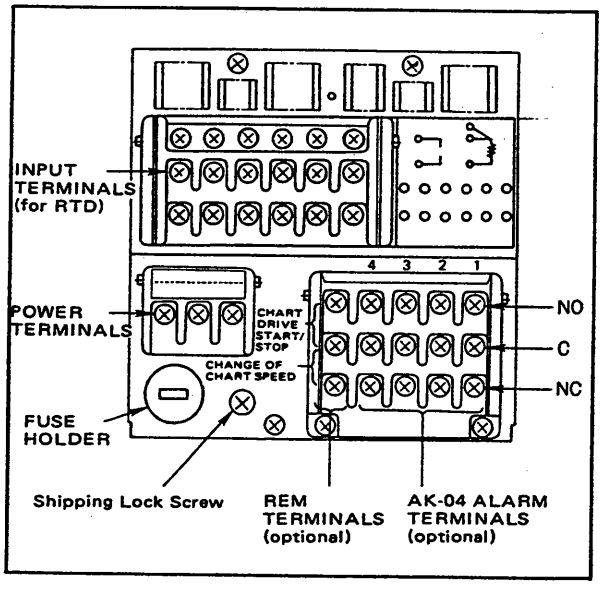
④ The ground terminal should be grounded with a low ground resistance.

4-2. Recorder Terminal Arrangement.

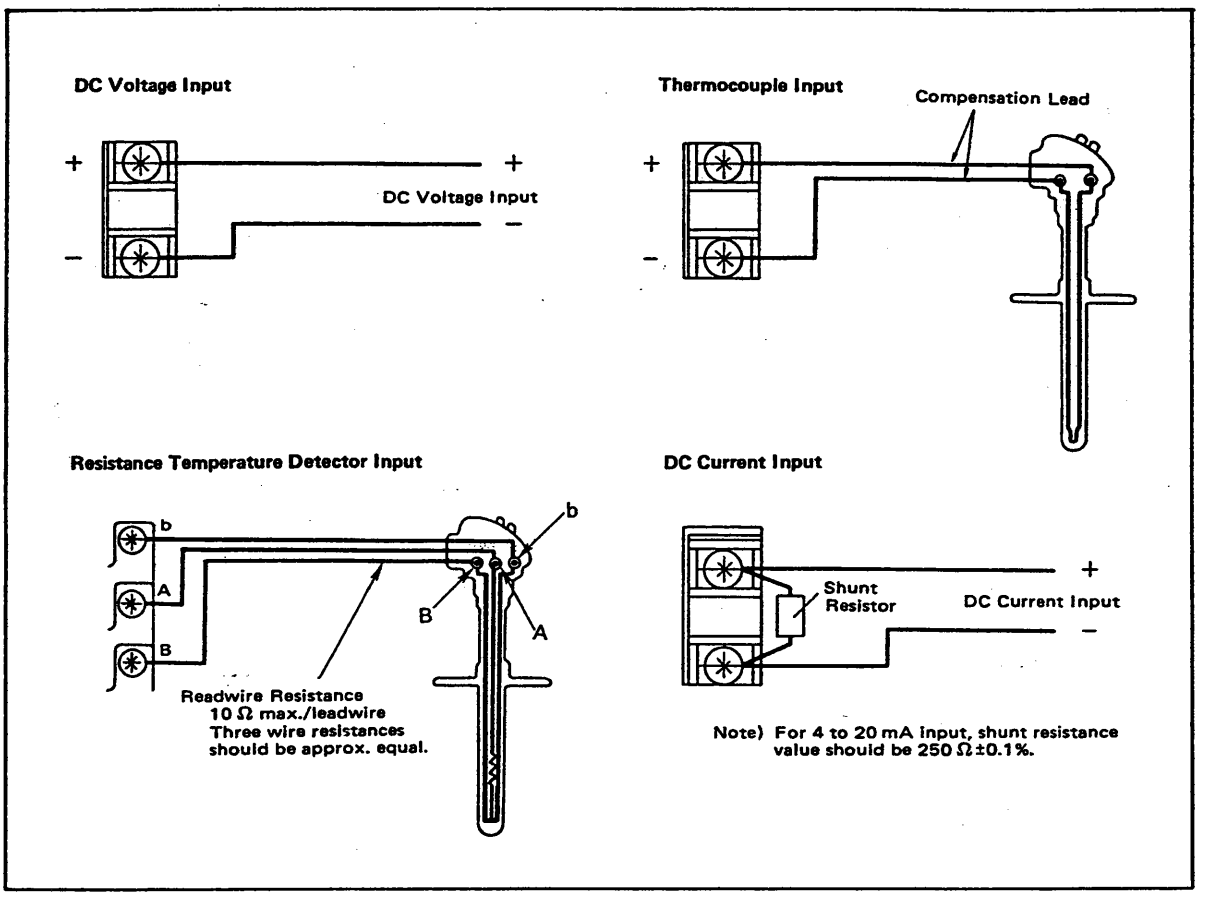
4-2-1. DC V and Thermocouple Input Models.



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



4-3. Wiring Input Terminals.



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.: B9565AW (contains three chart cartridges)).

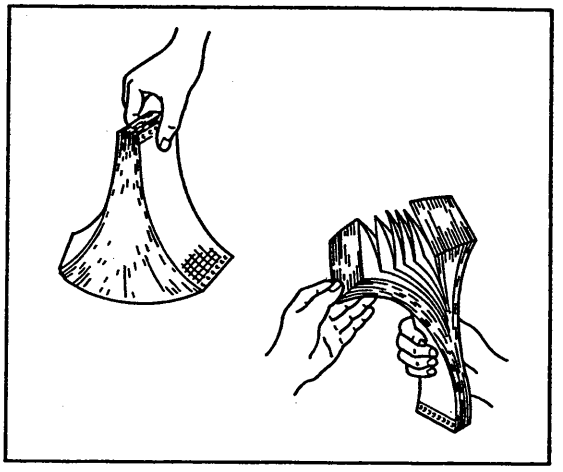


Figure 5-1.

(2) Open the unit front door by inserting fingertips into the recessed area on the right side near the front and pull outward. Grasp the internal unit handle located at the lower front of the unit and pull the internal assembly as far out as possible. (See Figure 5-2.)

CAUTION

When pulling the internal assembly out use the handle. Do not pull the internal assembly out using the display panel as a handle as the recorder may be damaged.

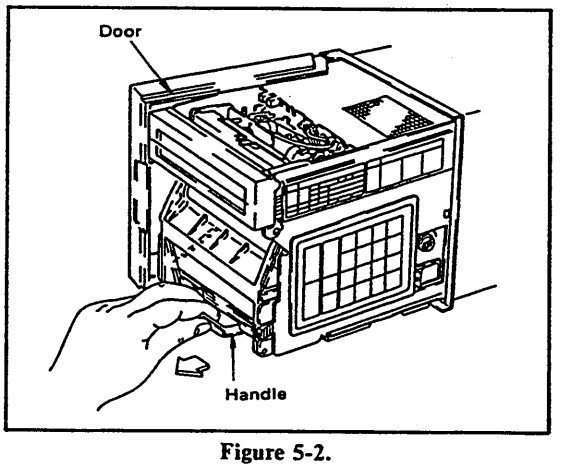


Figure 5-2.

(3) While gently pressing the chart paper compartment lock tab, located at the lower right front, in the direction of the arrow, swing and lift the compartment away from the unit. (See Figure 5-3.)

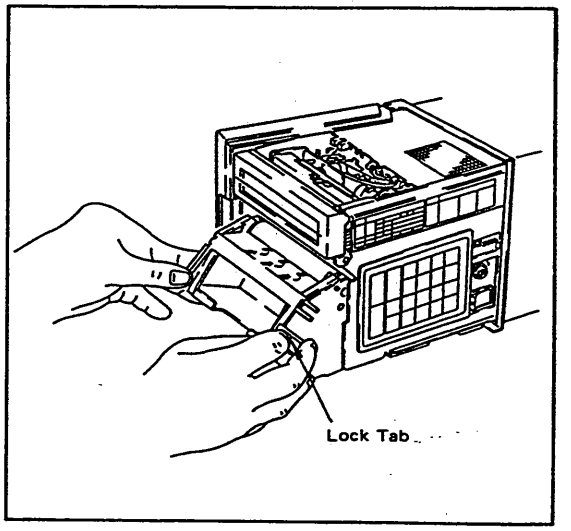


Figure 5-3.

(4) Press the sides of the chart guide plate at the top rear of the chart compartment and swing the guide plate up. (See Figure 5-4.)
(5) At the front, pull/swing the front transparent chart guide down. (See Figure 5-4.)

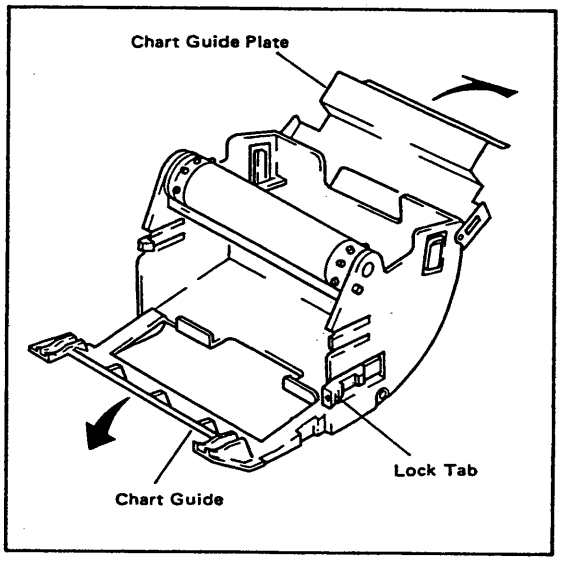


Figure 5-4.

(6) Load chart paper into the top hopper making sure that the sprocket teeth of the chart drive are properly engaged in the chart paper perforation holes. (Take care not to insert chart paper backwards.) (See Figure 5-5.)

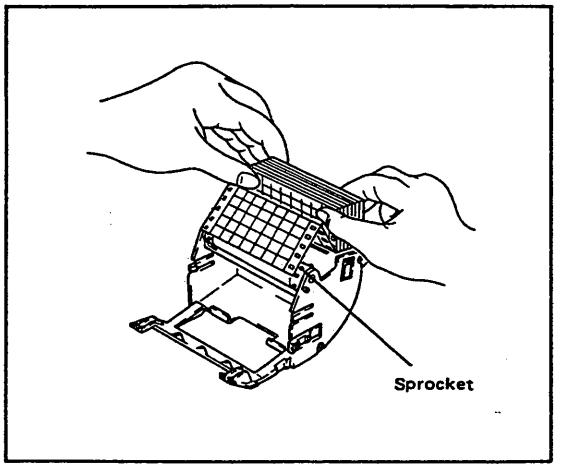


Figure 5-5.

(7) Place the rear chart guide plate back into position. Holding both right and left ends of the chart in your hands, use the middle finger of your right (left) hand, to press the rear chart guide plate down and towards you and load the chart.

(8) Place the front transparent chart guide back into position. (See Figure 5-6.)

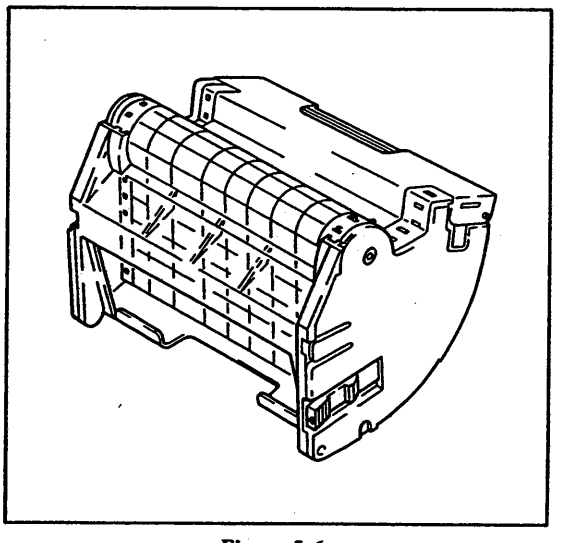


Figure 5-6.

(9) Replace the chart paper compartment back into the extended unit. Slide the protruding knurls of the chart paper compartment into the cutout grooves located on the support brackets. Push/swing the compartment into the extended unit until the lock tab clicks shut. (See Figure 5-7.)

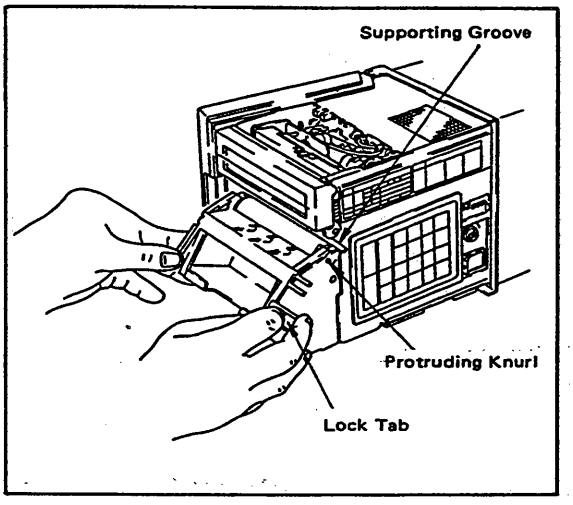


Figure 5-7.

(10) Press the Chart Feed key, and confirm that the chart is fed continuously*. (See Figure 5-8.)

* If the chart cannot be fed continuously, repeat the procedure from step (3).

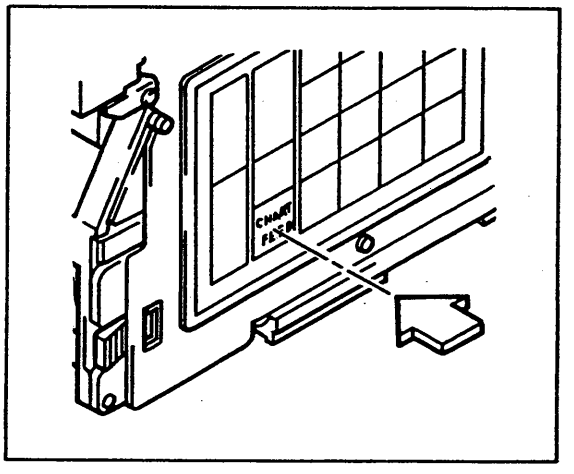


Figure 5-8.

5-1-2. Ribbon Cassette Replacement.

(1) Open the recorder front panel and pull the handle to draw out the internal assembly (see Figure 5-9).

CAUTION

Do not pull the internal assembly out using the display panel as a handle as the recorder may be damaged.

(2) Turn OFF the power switch.

(3) Open the display panel (see Figure 5-9).

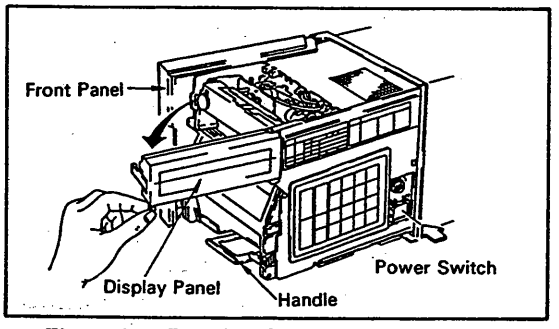


Figure 5-9. Drawing Out Internal Assembly.

(4) Hold the back section of the carriage assembly and move the carriage assembly to the right.

(5) Hold the upper left hand corner of the ribbon cassette and take it out separating it from the recorder internal assembly (see Figure 5-10).

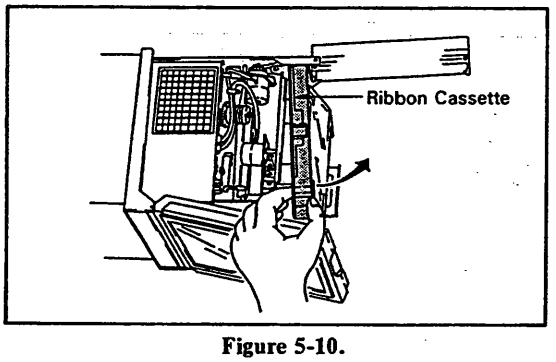


Figure 5-10.

(6) Align the ribbon feeding shaft of a new ribbon cassette (part no. B9566DZ) with the shaft hole (see Figure 5-11-1).

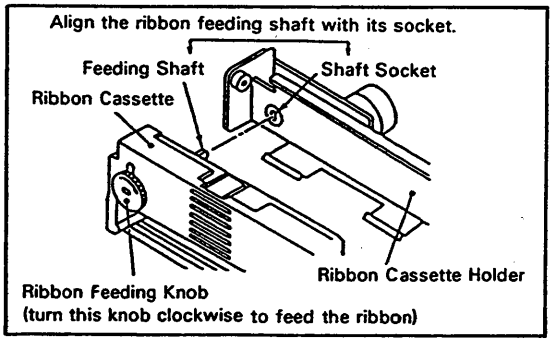


Figure 5-11-1.

(7) Insert the right side of the new ribbon cassette into the cassette holder (Figure 5-11-2).

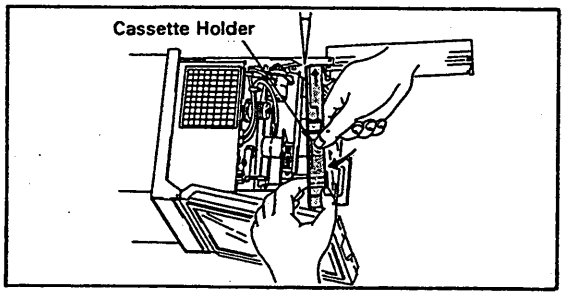


Figure 5-11-2.

(8) Insert the left side of the ribbon cassette into the cassette holder while grasping the center of both the cassette holder and ribbon cassette (clicking it into its place).

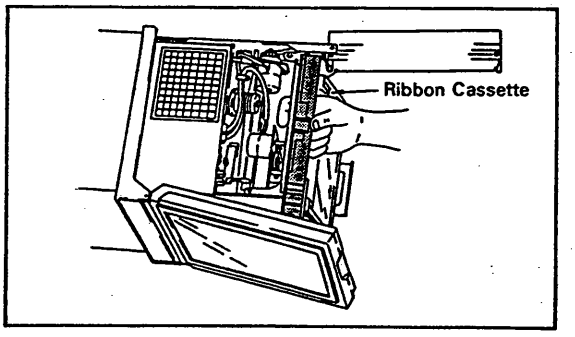


Figure 5-12.

(9) To check correct setting of the ribbon cassette, grasp the center of the cassette holder and ribbon cassette as shown in Step (8) above and rotate the ribbon feeding knob at least half a turn. This operation corrects the setting if the above setting is not complete.

(10) Turn the ribbon feeding knob to complete the ribbon cassette.

CAUTION

If the ribbon cassette is not set correctly:

(1) Recorder may print out data in a different color (correct recording color is not used).

(2) Ribbon edge is used to print out data. This damages the ribbon.

5-1-3. 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 unit front door by inserting fingertips into the recessed area on the right side near the front and pull outward. Grasp the internal unit handle located at the lower front of the unit and pull the internal assembly as far out as possible. (See Figure 5-15.)

CAUTION

When pulling the internal assembly out use the handle. Do not pull the internal assembly out using the display panel as a handle as the recorder may be damaged.

(2) Switch power on by pressing the "POWER" switch to the "ON" position. Note that the stored program may be erased if the battery is replaced with the "POWER" switch set to OFF. The power switch is located on the right side of the extended unit next to the key pad and just under the key lock. (See Figure 5-15.)

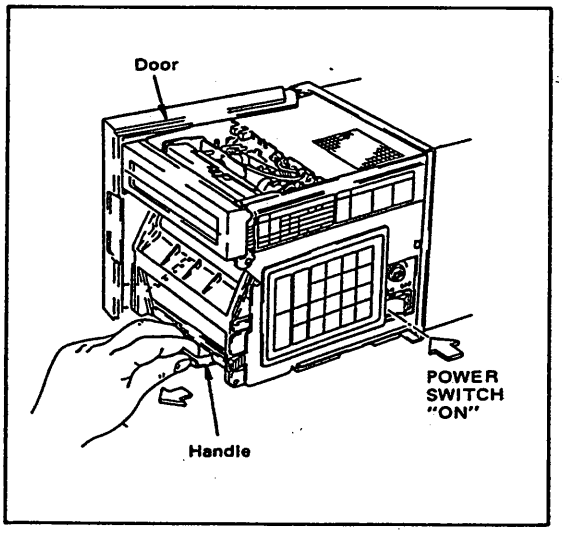


Figure 5-13.

(3) While gently pressing the chart paper compartment lock tab, located at the lower right front, in the direction of the arrow, swing and lift the compartment away from the unit. (See Figure 5-14.)

(4) Remove the battery cartridge by pressing the lock tab down and pulling the cartridge out of the internal assembly by the handle. The battery cartridge holder lock tab is located just under the middle battery under the cartridge handle. (See Figure 5-15.)

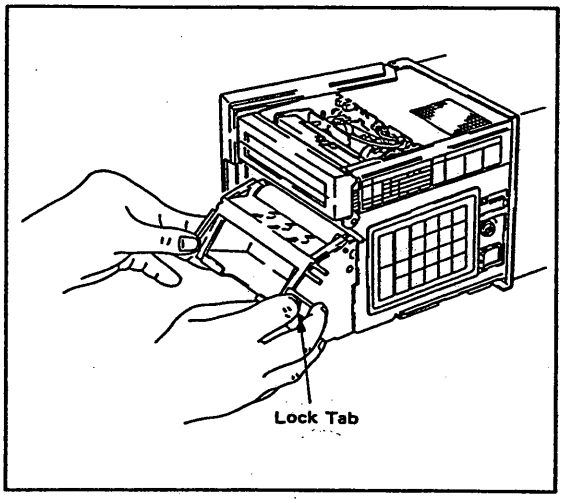


Figure 5-14.

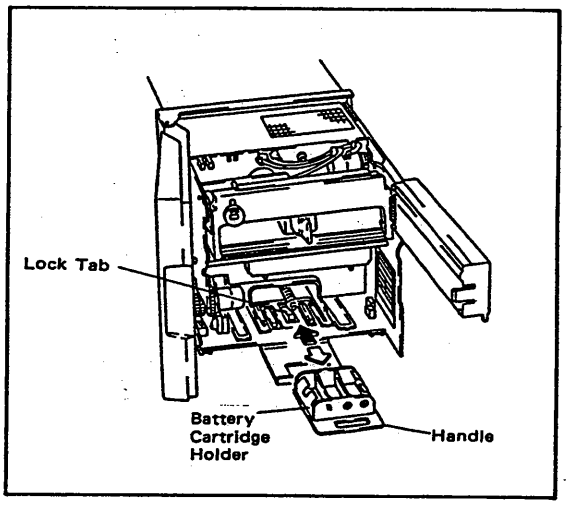


Figure 5-15.

(5) Remove the old batteries from the holder. (See Figure 5-18.)

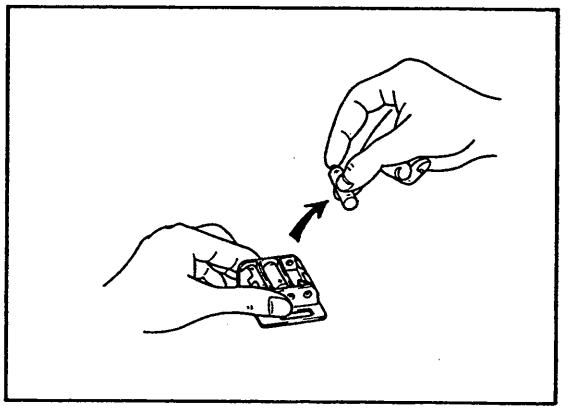


Figure 5-16.

(6) Insert new batteries. Be sure to insert the new batteries with the polarity (+ and −) the same as indicated inside the cartridge case. (See Figure 5-19.) Rotate the batteries a few times to insure contact between batteries and terminals after inserting batteries.

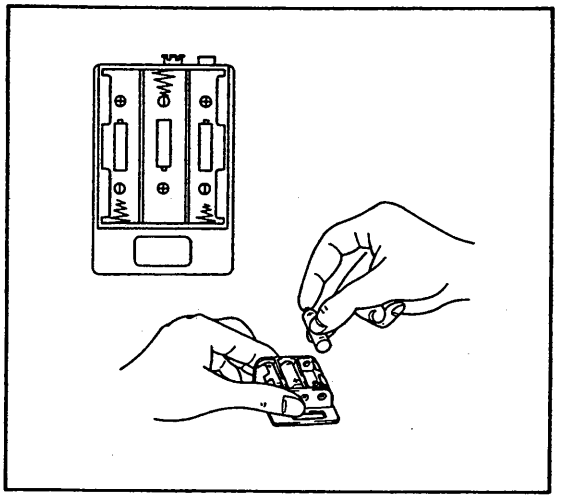


Figure 5-17.

(7) Insert the battery cartridge back into the unit confirming that the lock tab is in the locked position. (See Figure 5-20.) Confirm that "BAT" display does not light.

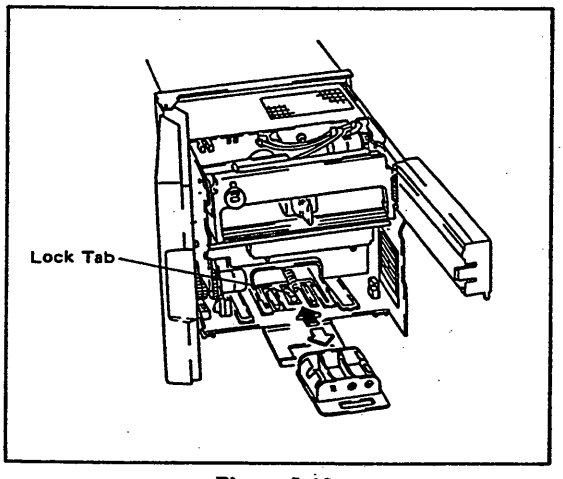


Figure 5-18.

(8) Replace the chart paper compartment back into the extended unit. Slide the protruding knurls of the chart paper compartment into the cutout grooves located on the support brackets. Push/swing the compartment into the extended unit until the lock tab clicks locked. (See Figure 5-21.)

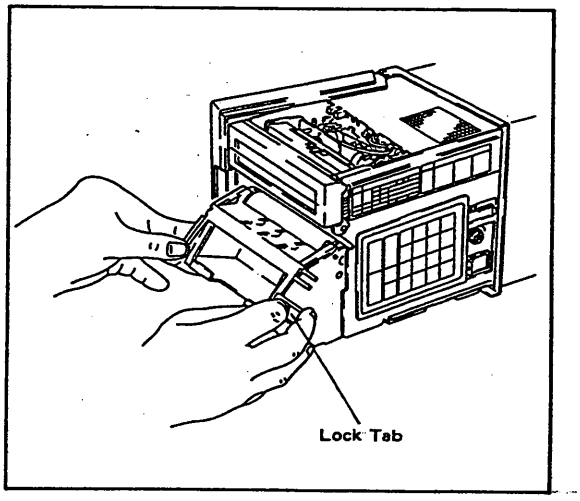
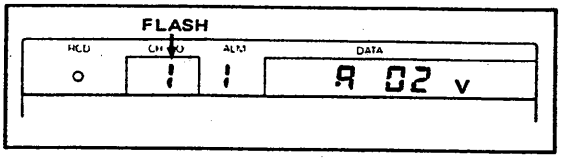


Figure 5-19.

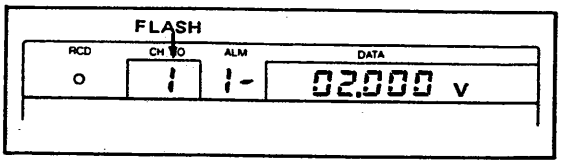
5-2. Status Settings with Power Switch "ON".

5-2-1. Initial Setting Status*.
(When the Recorder is not Backed up by Batteries.)

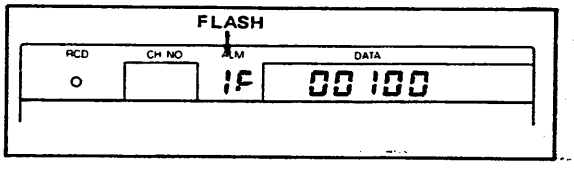
(1) RNG (range): ±2V
(for RTD input ... −200 to 550°C (or −328 to 1,022°F))



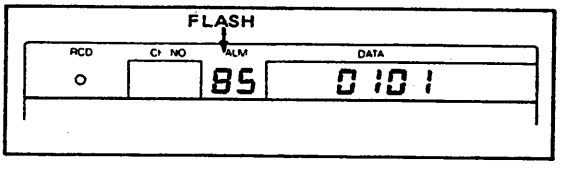
(2) ALM (alarm): All points "OFF"



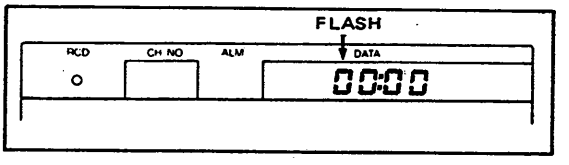
(3) mm/h (chart feed speed): 100 mm/h



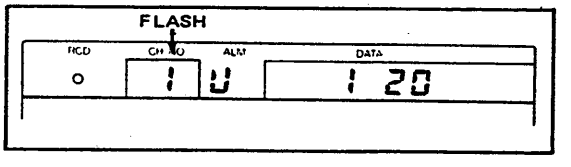
(4) DATE (date): 85.01.01



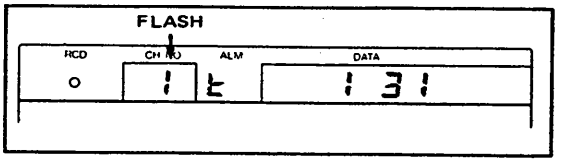
(5) CLK (time): 00:00
(When power is turned on, time is displayed first of all.)



(6) UNIT (unit): ------ (to be set by ASCII codes) (six spaces)



(7) TAG (tag number): 1CH ----
(1CH and four spaces)
(to be set by ASCII codes)



* These initial settings shown above were carried out at the factory before shipment.
After the instrument has been set according to the procedures described in "Section 5-4 Setting", the setting status will be held even when the power supply is turned off temporarily and then restored.
However, if the instrument is not backed up by batteries, the setting status will be erased and will revert to initial setting status when power is switched off.

5-2-2. Operating Statuses with Power Switch "ON". (When the Recorder is Backed up by Batteries.)

The recorder operating status depends on the status when the power switch was switched "OFF" last. See the following tables.

	When the POWER Switch is Switched to "OFF"	Operating Status at POWER "ON"
1	Either of the display statuses, (a) data measured value display (AUTO/MAN DATA) or (b) data and time display (selected by display key).	If either of the display statuses listed at the left existed, when the power switch was switched "OFF", it is restored at power ON.
2	Setting status (see page 5-11 and on).	Initiates the measured value display, measured values of each channel are displayed sequentially at three second intervals. (AUTO DATA)

5-3. Keyboard.

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

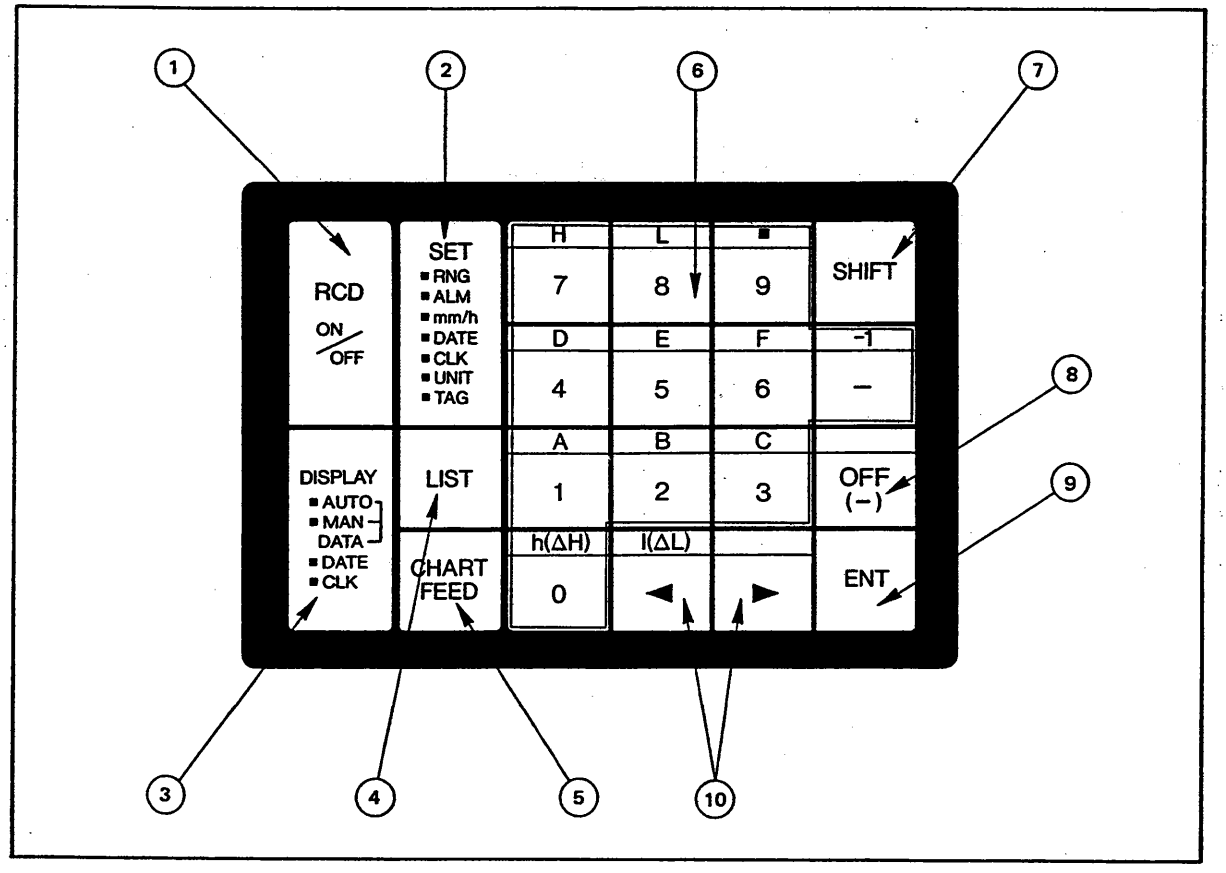
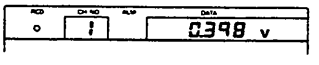
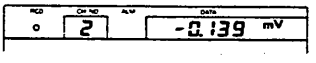
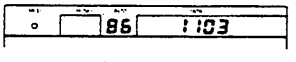
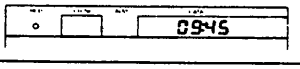


Figure 5-22. Keyboard.

Keyboard description.

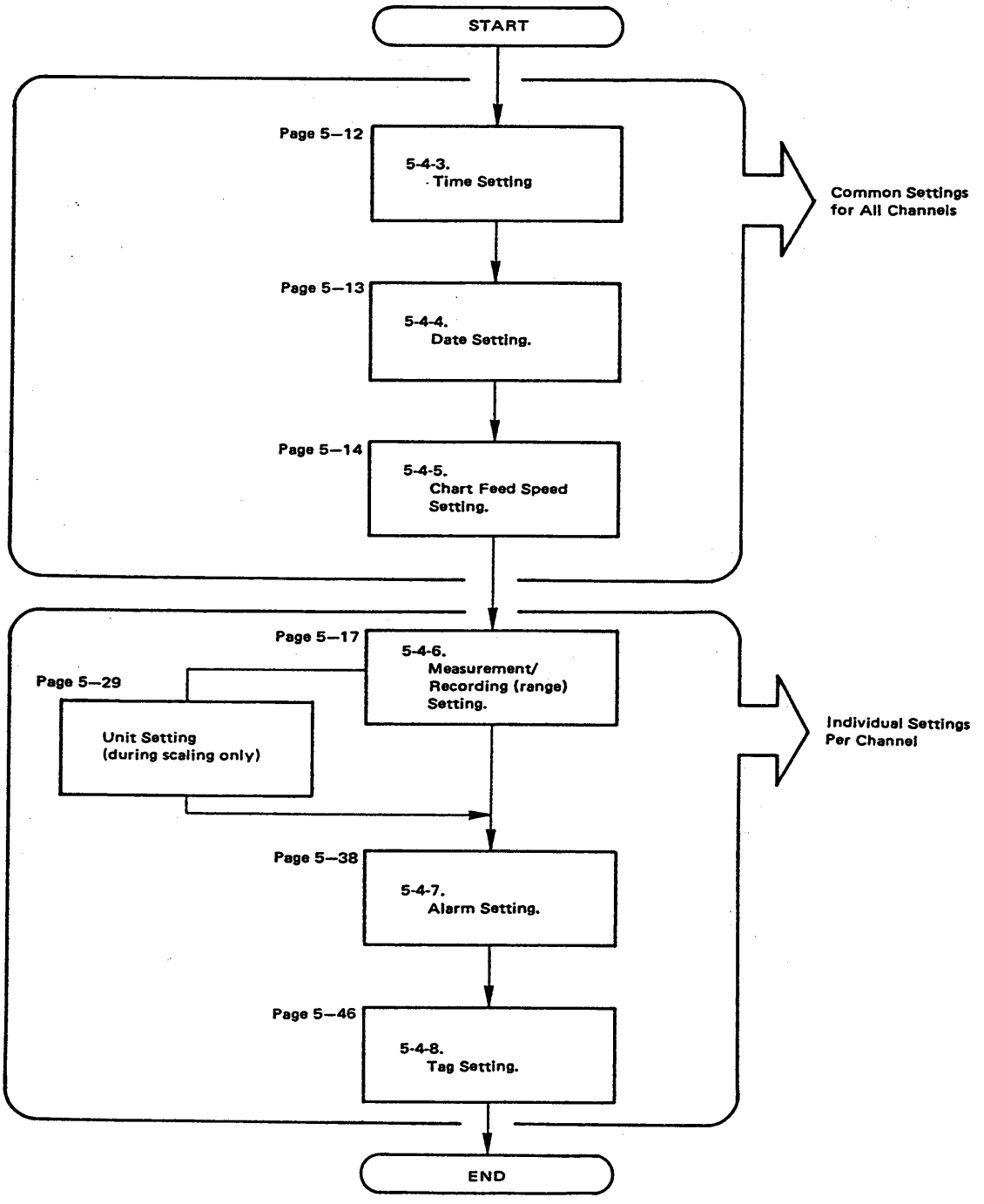
	Key	Description
1	RCD ON/OFF Recorder ("RCD") "ON"/ "OFF" key	This key is used to start or stop recording. Pressing this key toggles recording ON/OFF.
2	SET Set ("SET") key	This key selects and displays modes for which parameters are to be set. The modes are as follows: RNG: Range setting ALM: Alarm setting mm/h: Chart feed speed setting DATE: Date setting (YYMMDD) CLK: Time setting (HHMM) UNIT: Unit setting (possible only when scaling) TAG: Tag 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.
3	DISPLAY "DISPLAY" mode select key	This key selects display mode. Modes are "DATE", "CLK" (clock), "AUTO DATA" or "MAN DATA". "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. "DATE" Displays date  "CLK" (Clock) Displays hour/minute 

4	LIST "LIST" key	Lists channel parameters such as range, tag, unit, alarm (with its output relay as an option), date, and chart feed speed. (See 2-5-4 List Printout) (press again to stop list printout)
5	CHART FEED "CHART FEED" key	Feeds chart paper until the key is released.
6	7 8 9 4 5 6 — 1 2 3 0 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 SHIFT key then the 9 key. This is effective under the setting of scaling (low value). When a minus sign (—) is required, use the — key. If the SHIFT key is pressed and then the — key, the number -1 can be set with the minus sign (—) being displayed. (Effective only during the setting of scaling values.) (-1 : —1)
7	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).
8	OFF (—) Skip ("-") key	(1) This key is used when no measurement is set for a particular channel. (SKIP) (2) Used for erasing the alarm points.
9	ENT Enter ("ENT") key	Sets entered data Setting is effective when the key is pressed.
10	◄ ► 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.

5-4. Setting.

This section describes how to set specifications for the μR100 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.

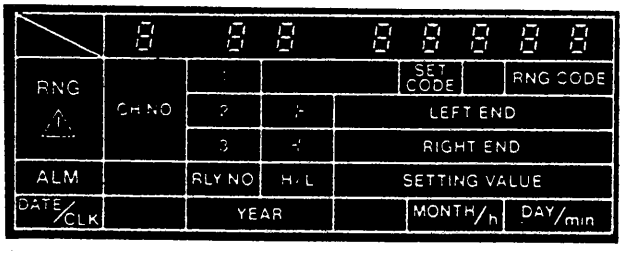


5-4-2. Setting Data Display Positions.

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

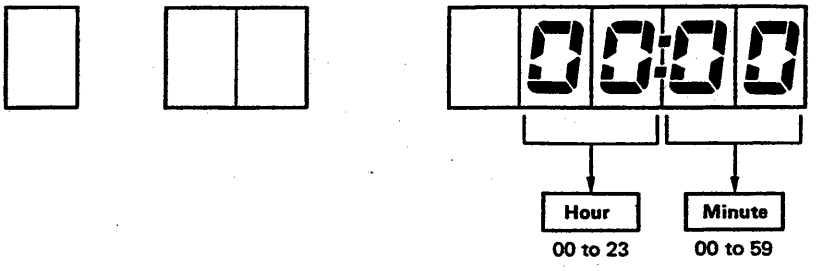
Display / Setting Item						
Time Setting					Hour	Minute
Date Setting		Year			Month	Day
Chart Feed Speed setting		Normal or Remote (option)	"A": Auto or "F": Fix	Chart Feed Speed (mm/h)		
Range Code Setting	CH No.	Panel No.		SET CODE		RANGE CODE or Reference Channel No. (case d)
Range Setting	CH No.	Panel No.	SPAN	RANGE Setting Value (The first digit position may be filled by a minus sign "—".)		
ALARM Setting	CH No.	ALARM Setting No.	ALARM Condition H,L (ΔH, ΔL)	ALARM Value		
Unit Setting	CH No.	U		Character No.		ASCII CODE
TAG Setting	CH No.	t		Character No.		ASCII CODE

* Program setting table is also attached to the instrument. Use it together with this table.



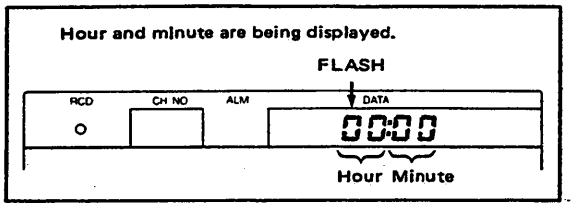
5-4-3. Time Setting.

Time Setting Table

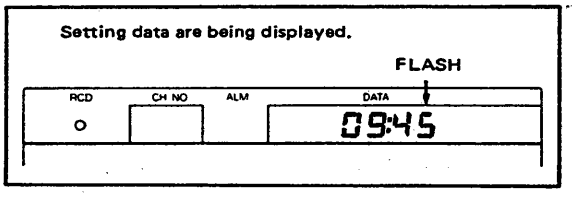


Time setting procedure:

1 Press the SET key as many times as required until the time panel is displayed.

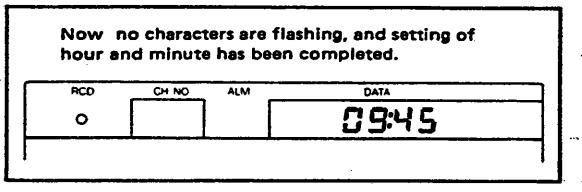


2 Set hour (HH) and minute (MM).
Example: To set time 9:45, press the numeric keys 0, 9, 4, 5.



3 Press the ENT key to store the time. (and start the clock)

Setting completed



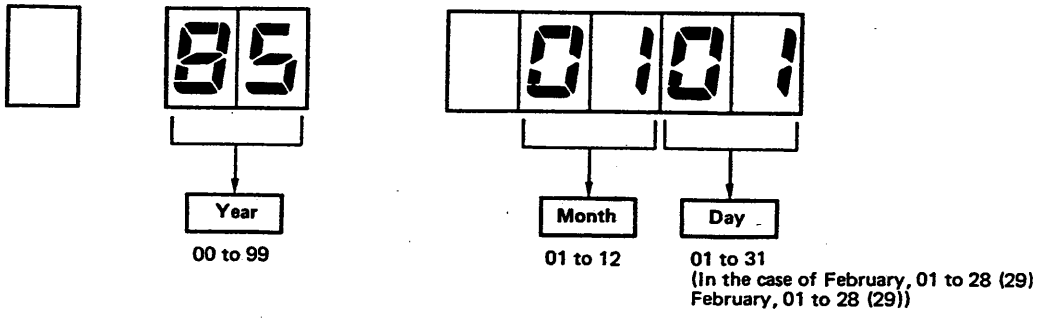
* Store the time as follows:
AM 9:45 → 09:45
PM 9:45 → 21:45

If data entry is invalid, refer to paragraph 5-4-9.

5-4-4. Date Setting.

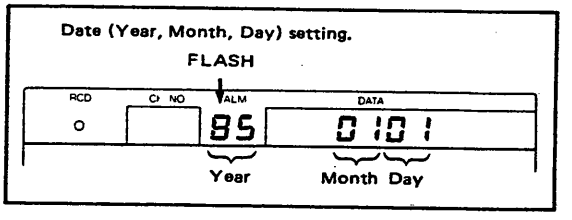
For leap year, 29 (February) is automatically provided.

Data Setting Table

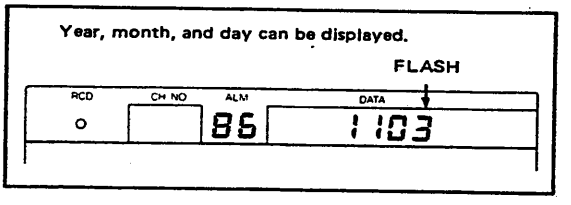


Date setting procedure:

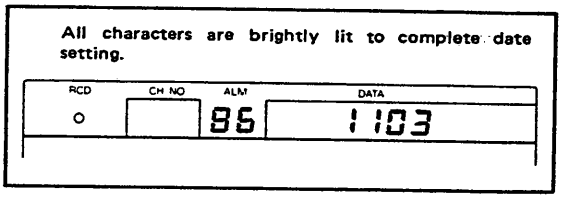
1 Press the SET key as many times as necessary until the year, month, and day are displayed. Check the display for accuracy and if necessary reset the date, or else proceed to Paragraph 5-4-5 "Chart feed speed setting".



2 Enter year (YY), month (MM), and day (DD).
Example: In the case for November 3, 1986, press the numeric keys 8, 6, 1, 1, 0, 3.



3 Press the enter ENT key to store the entered data.



Setting completed

If data entry is invalid, refer to paragraph 5-4-9.

5-4-5. Chart Feed Speed Setting.

Although chart paper feed speed can be set within a range of 1 to 1500 mm/h, the optimum setting for producing digital data printouts is in the range of 10 to 100 mm/h. (Note that the alarm printout is effective within the chart speed setting of 1 to 100 mm/h.)*-1 The procedure is as follows:

*-1 See Table 5-1.

Chart Feed Speed Setting Procedure:

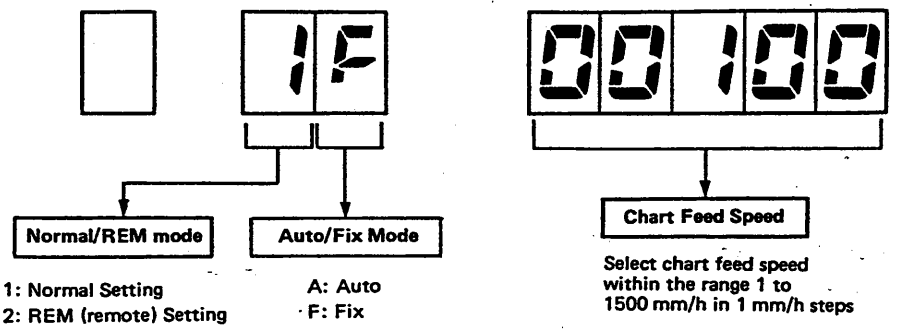
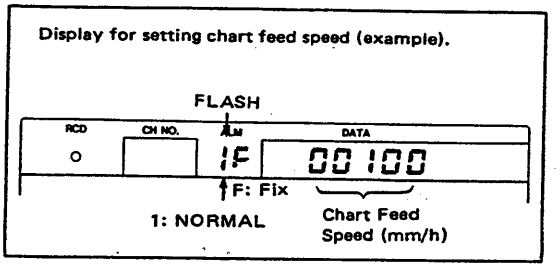


Table 5-1.

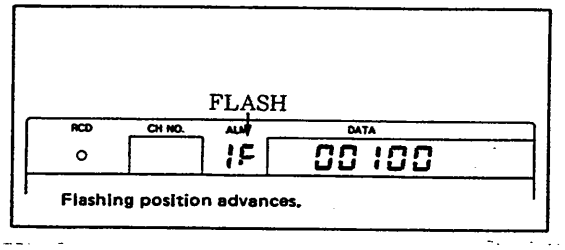
Chart feed speed (mm/h)	1 to 9	10 to 19	20 to 39	40 to 79	80 to 100	101 to 1500
Digital printout interval	Not printed out	8 Hours	4 Hours	2 Hours	1 Hour	Not printed out
Alarm printout	Printed out corresponding to alarm generation					Not printed out
Chart feed speed change printout*-2	Printed out corresponding to chart feed speed change					

*-2 Option/REM should be specified.
See paragraph 2-5-4 printout in REM (remote) mode.

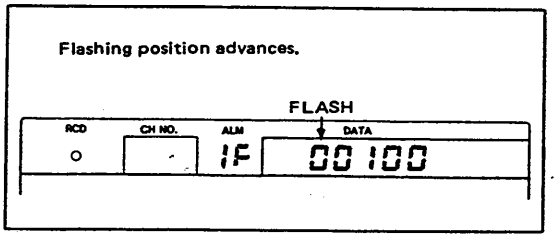
1 Press the SET key as many times as necessary until the initial chart feed speed setting (100 mm/h) is displayed.
In this case, "1F" is displayed in the ALM position indicating a ready to print status under normal operating conditions.
"F", for "Fixed", indicates that the recorder prints out at a constant print cycle-time (30 s/6 points).
"A", for "Auto", means that the print cycle time is varied automatically depending on chart speed so that dots do not overlap.
"A" mode is useful when normal chart speed is 35 mm/h or less, since with normal print cycle time of 30 s/6 points, dots will tend to overlap, and the chart paper will be prone to tearing. The initial (default) setting is "1F", with initial chart speed setting of 100 mm/h.



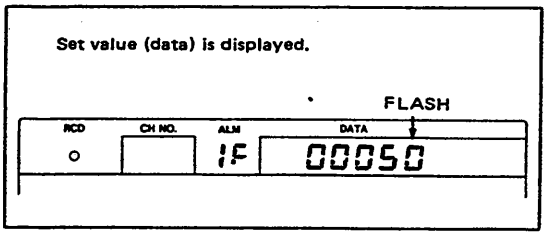
2 For normal setting, press the 1 key. [Normal: 1 (at REM: 2)]



3 Set the "Fix" or "Auto" mode.
To set the "Fix" mode, press the SHIFT key, then press the 6 key.
To set the "Auto" mode, press the SHIFT key, then press the 1 key.
The example at the right indicates the "Fix" mode has been set.

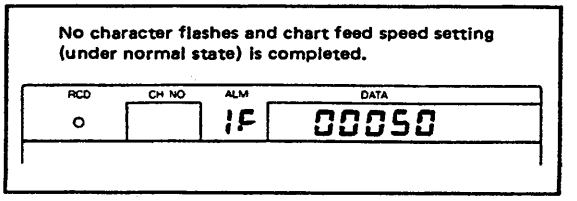


4 To set chart feed speed (5 digits, fixed, unit mm/h), use numeric keys.
Example: To set a chart feed speed of 50 mm/h, press numeric keys:
0 , 0 , 0 , 5 , 0



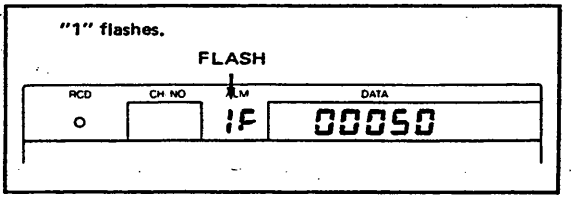
If data entry is invalid, refer to paragraph 5-4-9.

5 Press the ENT key to store the chart feed speed setting. (Chart feed speed setting is completed.)

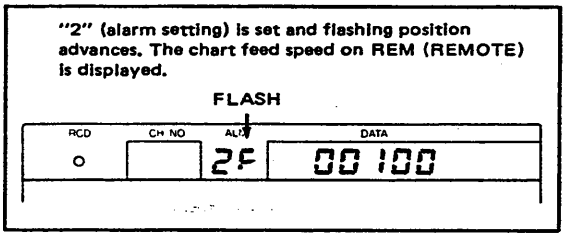


For setting the normal chart feed speed, steps 1 through 5 are followed and setting is complete. To cahnge the chart feed speed under REM (remote) input, set the chart feed speed on alarm in the following steps 6 through 10 .
Both normal and remote chart speed setting is possible (/REM (remote) is an option).
Refer to paragraph 2-5-3 for an example of a printout in REM mode.

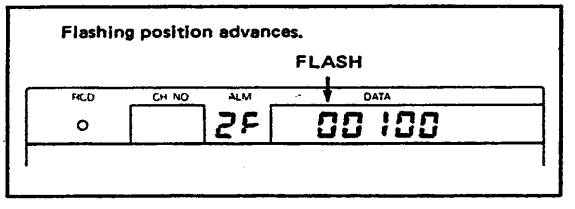
6 Press the ENT key once again.



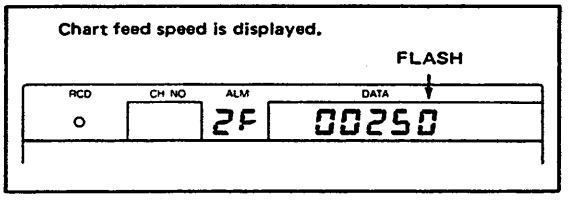
7 Press the 2 key. (Set 2 in remote setting mode).
The initial chart speed setting for remote mode is 100 mm/h.



8 Set the "Fix" or "AUTO" mode.
To set the "Fix" mode, press the SHIFT key, then the 6 key.
To set the "AUTO" mode, press the SHIFT key, then the 1 key.
The example at the right indicates the "Fix" mode has been set.

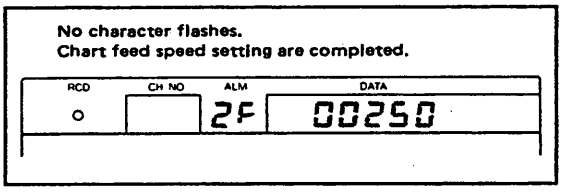


9 Set the chart feed speed (5 digits, mm/h) using numeric keys.
Example: To set the chart feed speed 250 mm/h, press numeric keys:
0, 0, 2, 5, 0



10 Press the ENT key to store the chart feed speed. Chart feed speed setting, when using the remote relay, is completed.

(Setting completed)



If data entry is invalid, refer to paragraph 5-4-9.

5-4-6. 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.

* Absolute value recording denotes the recording of the measured value "as is".

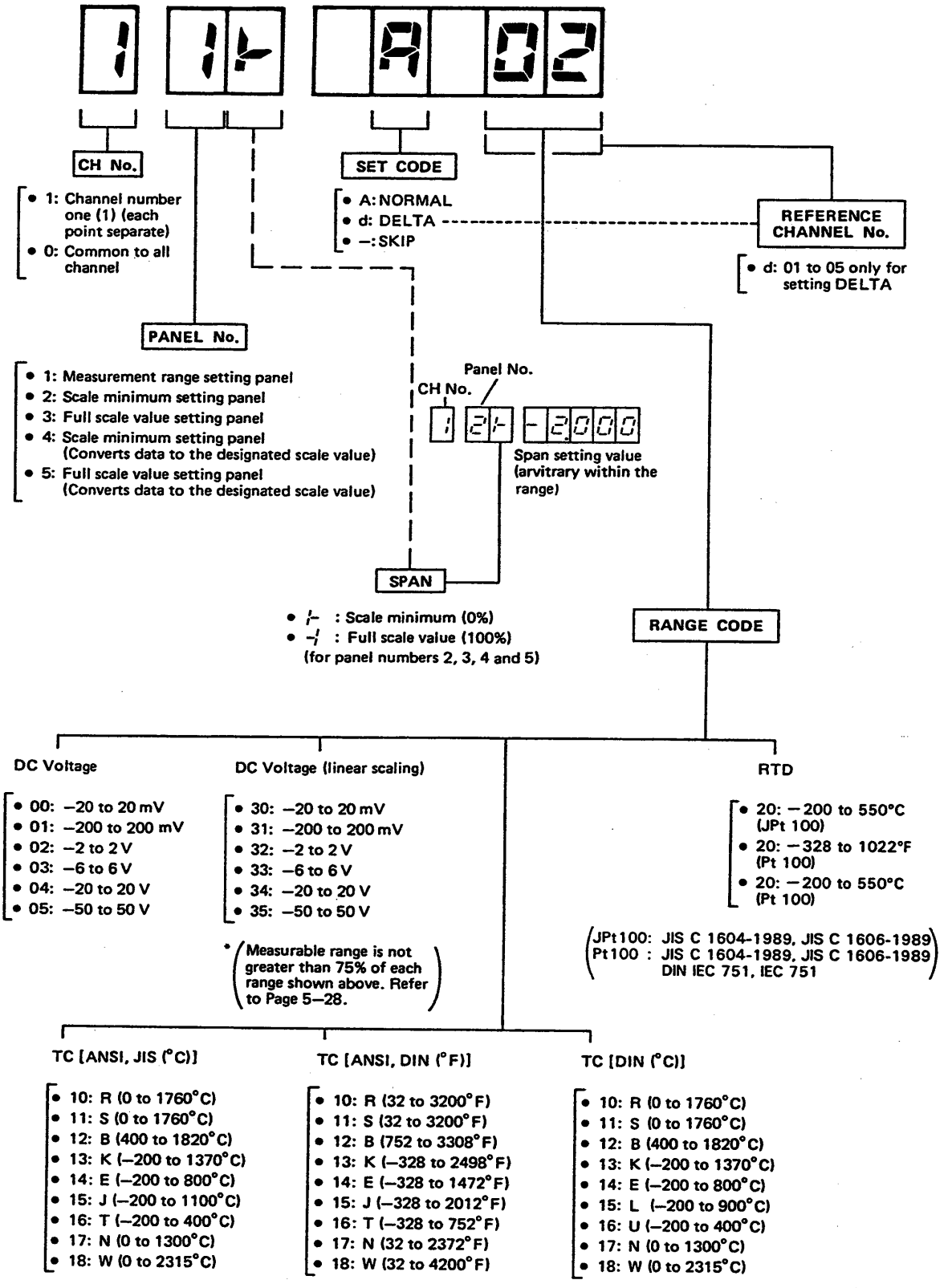
** Scaling function converts measured value (e.g. volts) to corresponding value in engineering units.

*** To be referred to even for measuring other types of input signals (such as recording DC voltage differences or RTD measurement temperature differences).

Note that some of the settings indicated above may not be available, depending on the type of μR100 (see Section 2-4 Models and Suffix Codes) recorder being used.

For example, for the model without RTD input terminals (4156-100), setting using RTD is disabled.

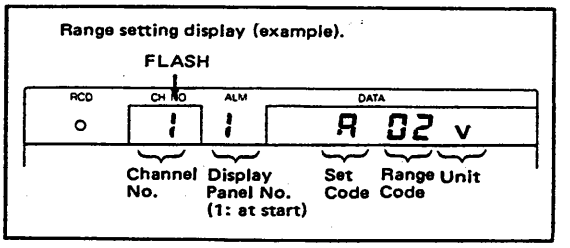
A list of measurement and recording (range) settings



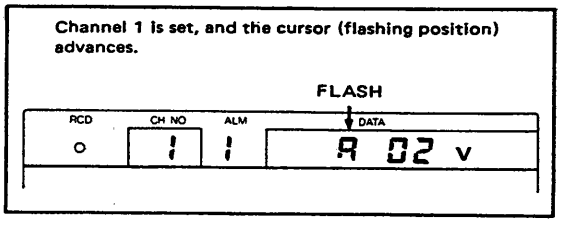
(1) Setting method for recording absolute value (1).
(DC voltage measurement/absolute value recording)

Proceed as follows.

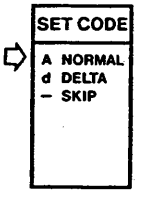
1 Press the SET key as many times as necessary until the range code is displayed for setting.

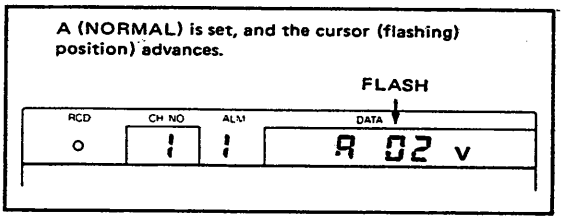


2 Set the channel number.
Example: To set channel 1, press the 1 key.

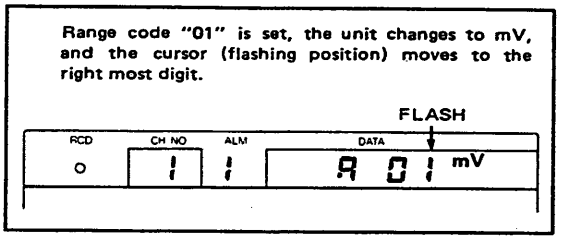


3 With A: NORMAL, chosen from SET CODE list, press the SHIFT and 1 keys.





4 Choose a measurement range from the RNG CODE list.
(DC voltage measurement.)
Example: To select the range of −200 mV to 200 mV, set "01" by pressing the 0 and 1 keys.



00 to 05

[ANSI, DIN(°F)]

RNG CODE					
00	−20-20mV	TC		16 T	−328-752°F
01	−200-200mV	10 R	32-3200°F	17 N	32-2372°F
02	−2-2V	11 S	32-3200°F	18 W	32-4200°F
03	−6-6V	12 B	752-3308°F		
04	−20-20V	13 K	−328-2498°F	RTD	Pt100
05	−50-50V	14 E	−328-1472°F	20	−328-1022°F
30-35 LIN SCALING 40-45 △		15 J	−328-2012°F		

[DIN, DIN (°C)]

RNG CODE					
00	−20-20mV	TC		15 L	−200-900°C
01	−200-200mV	10 R	0-1760°C	16 U	−200-400°C
02	−2-2V	11 S	0-1760°C	17 N	0-1300°C
03	−6-6V	12 B	400-1820°C	18 W	0-2315°C
04	−20-20V	13 K	−200-1370°C	RTD	Pt100
05	−50-50V	14 E	−200-800°C	20	−200-550°C
30-35 LIN SCALING 40-45 △					

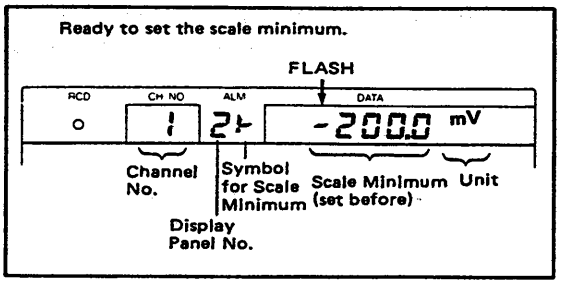
[ANSI/JIS, JIS/DIN (°C)]

RNG CODE					
00	−20-20mV	TC		16 T	−200-400°C
01	−200-200mV	10 R	0-1760°C	17 N	0-1300°C
02	−2-2V	11 S	0-1760°C	18 W	0-2315°C
03	−6-6V	12 B	400-1820°C		
04	−20-20V	13 K	−200-1370°C	RTD	JPt100
05	−50-50V	14 E	−200-800°C		Pt100
30-35 LIN SCALING 40-45 △		15 J	−200-1100°C	20	−200-550°C

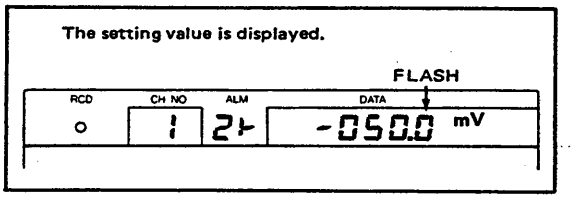
[RNG CODE list depends on the suffix code specified.]

If data entry is invalid, refer to paragraph 5-4-9.

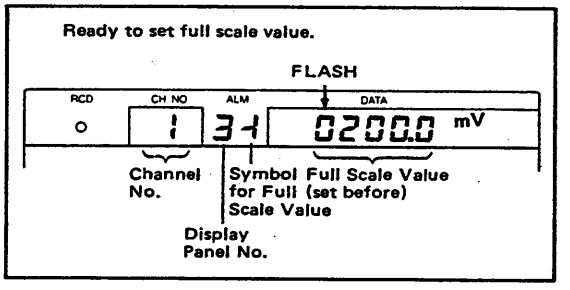
5 Press the ENT key to store the data.



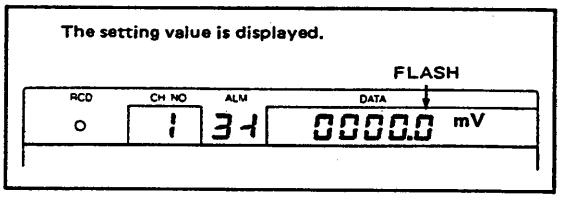
6 Set the scale minimum.
Example: To set the scale minimum to −50 mV, press −/−, 0, 5, 0 and 0 in turn.



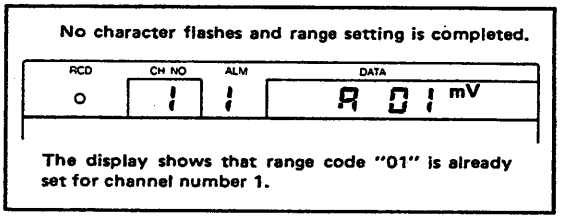
7 Press the ENT key to store the data.



8 Set the full scale value.
Example: To set the full scale value (0 mV), press the 0, 0, 0, 0 and 0 keys.



9 Press the ENT key to store the data.



(Setting completed)

The above procedures, 1 through 9, set the following data.

Channel number: 1
DC voltage absolute value recording
Measurement range: −200 mV to 200 mV
Recording range: −50 mV to 0 mV

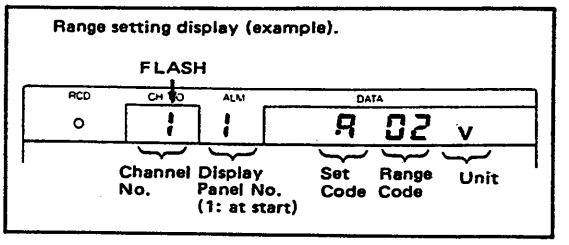
If data entry is invalid, refer to paragraph 5-4-9.

(2) Setting method for recording absolute value (2).

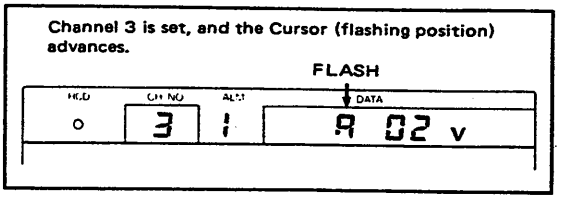
For temperature measurement by using TCs and absolute value recording.

To record temperature measurement the absolute values, proceed as follows:

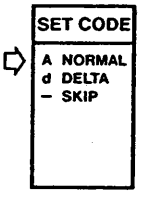
1 Press the SET key as many times as necessary until the range code is displayed for setting.

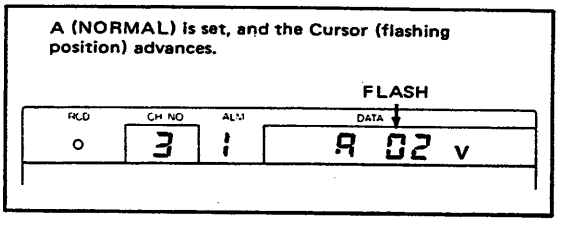


2 Set the channel number.
Example: To set channel 3, press the 3 key.



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





4 Choose a measurement range from the RNG CODE list.

10 to 18

[ANSI, DIN(°F)]

RNG CODE		
00 −20-20mV	TC	16 T −328-752°F
01 −200-200mV	10 R 32-3200°F	17 N 32-2372°F
02 −2-2V	11 S 32-3200°F	18 W 32-4200°F
03 −6-6V	12 B 752-3308°F	
04 −20-20V	13 K −328-2498°F	RTD Pt100
05 −50-50V	14 E −328-1472°F	20 −328-1022°F
30-35 LIN SCALING 40-45 △	15 J −328-2012°F	

[DIN, DIN (°C)]

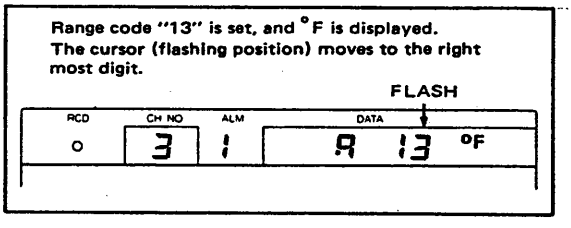
RNG CODE		
00 −20-20mV	TC	15 L −200-900°C
01 −200-200mV	10 R 0-1760°C	16 U −200-400°C
02 −2-2V	11 S 0-1760°C	17 N 0-1300°C
03 −6-6V	12 B 400-1820°C	18 W 0-2315°C
04 −20-20V	13 K −200-1370°C	RTD Pt100
05 −50-50V	14 E −200-800°C	20 −200-550°C
30-35 LIN SCALING 40-45 △		

[ANSI/JIS, JIS/DIN (°C)]

RNG CODE		
00 −20-20mV	TC	16 T −200-400°C
01 −200-200mV	10 R 0-1760°C	17 N 0-1300°C
02 −2-2V	11 S 0-1760°C	18 W 0-2315°C
03 −6-6V	12 B 400-1820°C	
04 −20-20V	13 K −200-1370°C	RTD JPt100
05 −50-50V	14 E −200-800°C	Pt 100
30-35 LIN SCALING 40-45 △	15 J −200-1100°C	20 −200-550°C

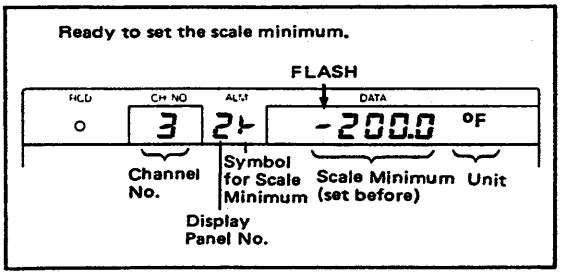
[RNG CODE list depends on the suffix code specified.]

Example: To select the thermocouple (type K) temperarure range of −328 to +2498°F, set "13" by pressing the 1 and 3 keys.

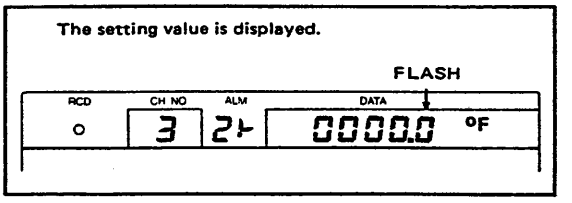


If data entry is invalid, refer to paragraph 5-4-9.

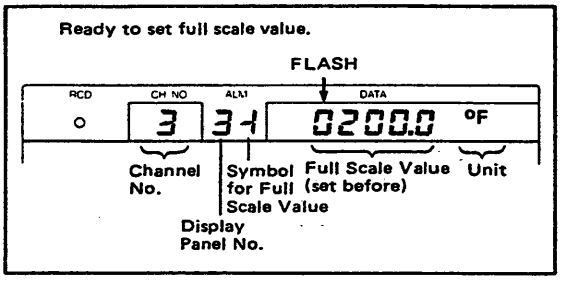
5 Press the ENT key to store the data.



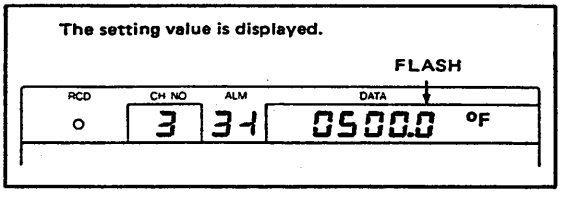
6 Set the scale minimum.
Example: To set 0°F, press the 0, 0, 0, 0, and 0 keys.



7 Press ENT key to store the data.

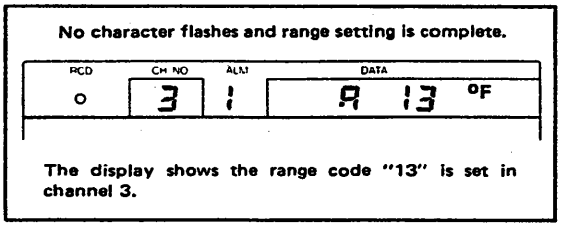


8 Set the full scale value.
Example: To set 500°F, press 0, 5, 0, 0 and 0 keys.



9 Press ENT key to store the data.

(Setting completed)



The above procedures, 1 through 9, set the following data.

Channel number: 3
TC type - K measurement, absolute value recording
Measurement range: −328°F to 2498°F
Recording range: 0°F to 500°F

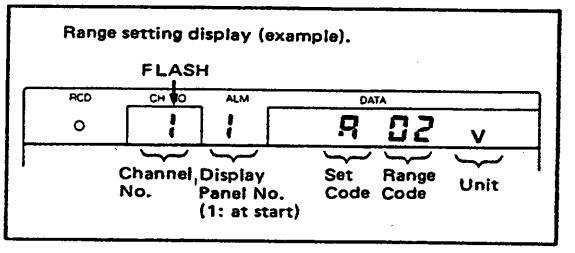
If data entry is invalid, refer to paragraph 5-4-9.

(3) Absolute value record setting (3).

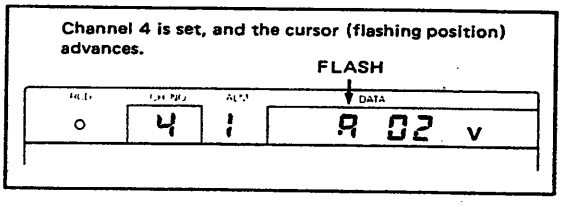
For temperature measurement using RTDs and temperature absolute value recording.

To record temperature measurement absolute values, proceed as follows:

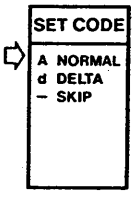
1 Press the SET key as many times as necessary until the range code is displayed for setting.

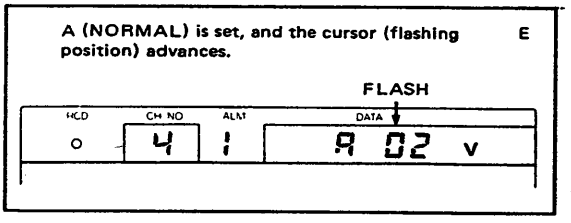


2 Set the channel number.
Example: To set channel 4, press the 4 key.

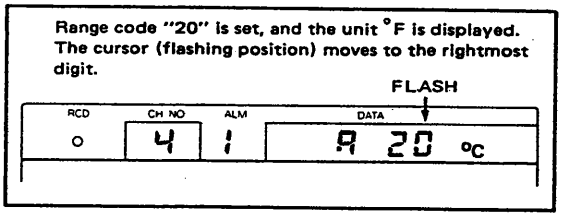


3 With A: NORMAL, chosen from the SET CODE list, press SET and 1 keys.





4 Select the desired measuring range from the RNG CODE list. For RTD measurement, select 20 (range code). Press the 2 and 0 keys.



20

[ANSI, DIN(°F)]

RNG CODE		
00 −20-20mV	TC	15 T −328-752°F
01 −200-200mV	10 R 32-3200°F	17 N 32-2372°F
02 −2-2V	11 S 32-3200°F	18 W 32-4200°F
03 −6-6V	12 B 752-3308°F	
04 −20-20V	13 K −328-2498°F	RTD Pt100
05 −50-50V	14 E −328-1472°F	20 −328-1022 F
30-35 LIN SCALING	15 J −328-2012°F	
40-45 △		

[DIN, DIN (°C)]

RNG CODE		
00 −20-20mV	TC	15 L −200-900°C
01 −200-200mV	10 R 0-1760°C	16 U −200-400°C
02 −2-2V	11 S 0-1760°C	17 N 0-1300°C
03 −6-6V	12 B 400-1820°C	18 W 0-2315°C
04 −20-20V	13 K −200-1370°C	RTD Pt100
05 −50-50V	14 E −200-800°C	20 −200-550°C
30-35 LIN SCALING		
40-45 △		

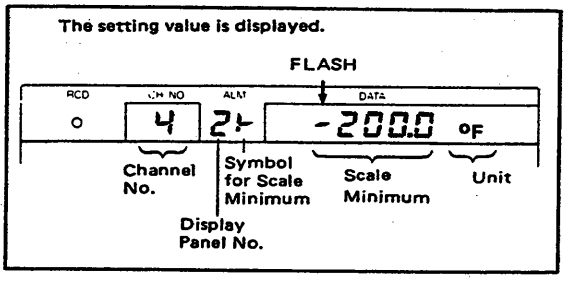
[ANSI/JIS, JIS/DIN (°C)]

RNG CODE		
00 −20-20mV	TC	15 T −200-400°C
01 −200-200mV	10 R 0-1760°C	17 N 0-1300°C
02 −2-2V	11 S 0-1760°C	18 W 0-2315°C
03 −6-6V	12 B 400-1820°C	
04 −20-20V	13 K −200-1370°C	RTD JPt100
05 −50-50V	14 E −200-800°C	Pt 100
30-35 LIN SCALING	15 J −200-1100°C	20 −200-550°C
40-45 △		

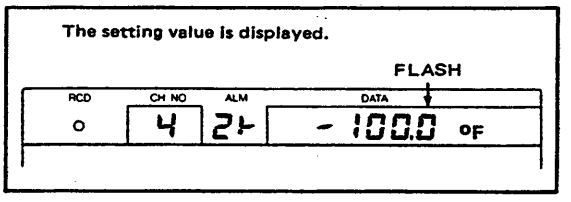
[RNG CODE list depends on the suffix code specified.]

If data entry is invalid, refer to paragraph 5-4-9.

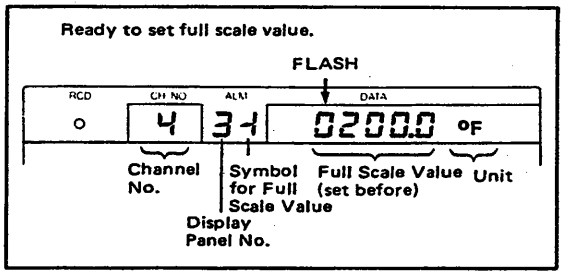
5 Press the ENT key to store the data.



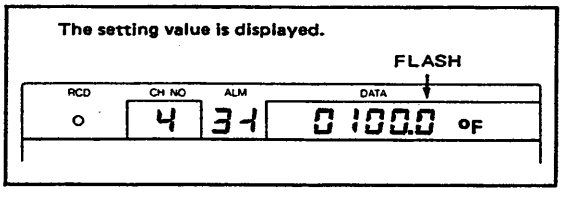
6 Set the scale minimum.
Example: To set −100°F, press −/−, 1, 0, 0, and 0 keys.



7 Press the ENT key to store the data.

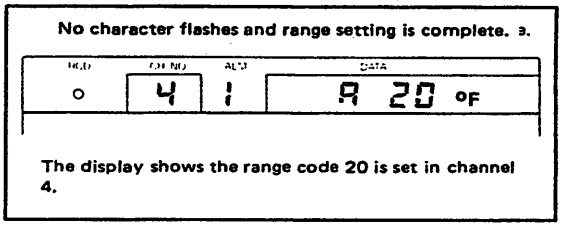


8 Set the full scale value:
Example: To set 100°F, press 0, 1, 0, 0, and 0 keys.



9 Press the ENT key to store the data.

(Setting completed)



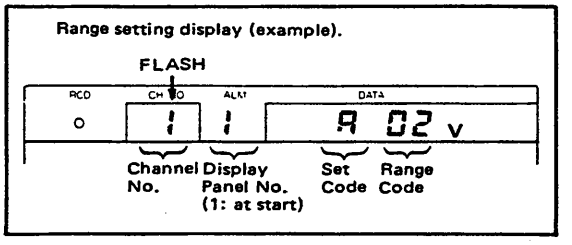
The above procedures, 1 through 9, set the following data.

Channel number: 4
Temperature measurement using a RTD and temperature absolute value record.
Measurement range: −328°F to 1022°F
Recording range: −100°F to 100°F

If data entry is invalid, refer to paragraph 5-4-9.

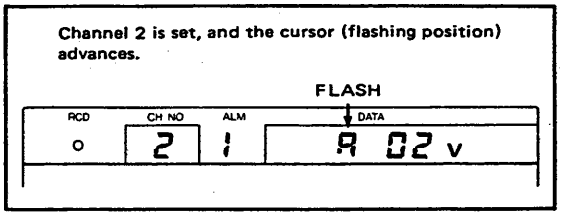
(4) Setting method for recording scaling.

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

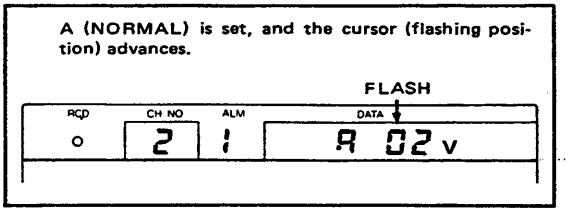


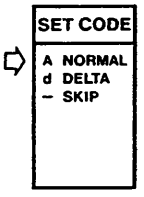
1 Press the SET key as many times as necessary until the range code is displayed for setting.

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



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





4 Select the range code for 30 to 35.
[DC Voltage Measurement Scaling.]

[ANSI, DIN(°F)]

RNG CODE			
00 −20-20mV	TC		16 T −328-752 F
01 −200-200mV	10 R	32-3200 F	17 N 32-2372 F
02 −2-2V	11 S	32-3200 F	18 W 32-4200 F
03 −6-6V	12 B	752-3308 F	
04 −20-20V	13 K	−328-2498 F	RTD Pt100
05 −50-50V	14 E	−328-1472 F	20 −328-1022 F
30-35 LIN SCALING	15 J	−328-2012 F	
40-45 Δ			

[DIN, DIN (°C)]

RNG CODE			
00 −20-20mV	TC		15 L −200-900°C
01 −200-200mV	10 R	0-1760°C	16 U −200-400°C
02 −2-2V	11 S	0-1760°C	17 N 0-1300°C
03 −6-6V	12 B	400-1820°C	18 W 0-2315°C
04 −20-20V	13 K	−200-1370°C	RTD Pt100
05 −50-50V	14 E	−200-800°C	20 −200-550°C
30-35 LIN SCALING			
40-45 Δ			

[ANSI/JIS, JIS/DIN (°C)]

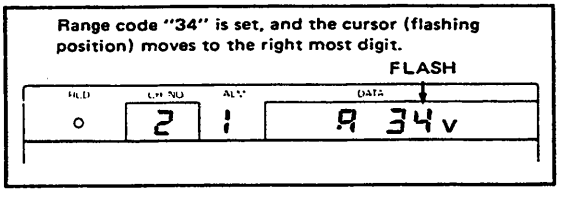
RNG CODE			
00 −20-20mV	TC		16 T −200-400°C
01 −200-200mV	10 R	0-1760°C	17 N 0-1300°C
02 −2-2V	11 S	0-1760°C	18 W 0-2315°C
03 −6-6V	12 B	400-1820°C	
04 −20-20V	13 K	−200-1370°C	RTD JPt100
05 −50-50V	14 E	−200-800°C	Pt 100
30-35 LIN SCALING	15 J	−200-1100°C	20 −200-550°C
40-45 Δ			

[RNG CODE list depends on the suffix code specified.]

Setting the range code "30 to 35" allows the DC voltage measurement in the range described below:

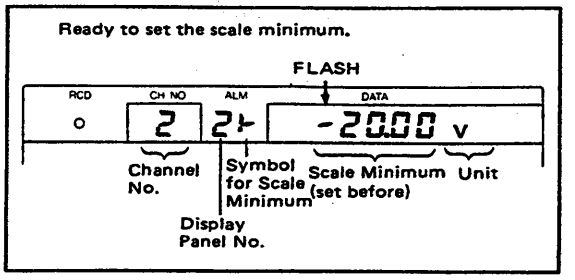
30: −20 to 20 mV
31: −200 to 200 mV
32: −2 to 2V
33: −6 to 6V
34: −20 to 20V
35: −50 to 50V

Example: To select the range of −20 to +20V, set "34" by pressing the 3 and 4 keys.

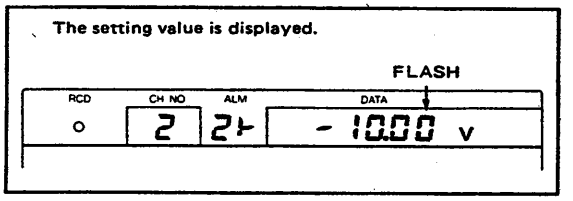


If data entry is invalid, refer to paragraph 5-4-9.

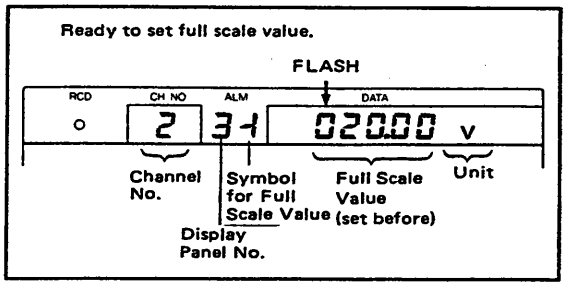
5 Press the ENT key to store the data.



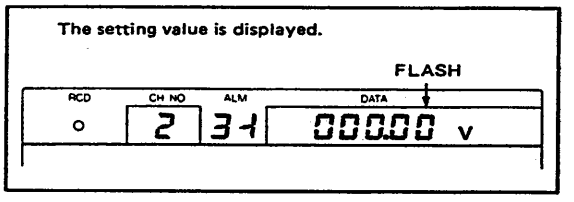
6 Set the scale minimum.
Example: To set −10V, press [−/−], [1], [0], [0], and [0] keys in turn.



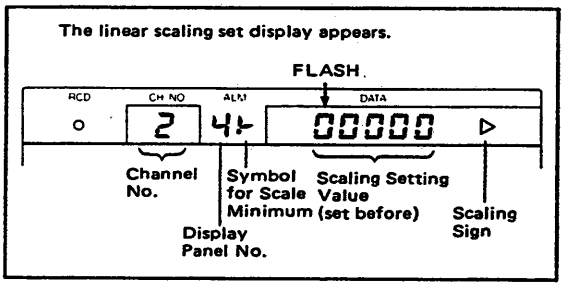
7 Press the ENT key to store the data.



8 Set the full scale value.
Example: To set 0V, press the [0], [0], [0], [0], and [0] keys in turn.



9 Press the ENT key to store the data.



If data entry is invalid, refer to paragraph 5-4-9.

10 Setting scaling values.
In the example, for step 6 , −10V was set as the minimum for the range (i.e. 0% chart recording). Furthermore, in the example, for step 8 , 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) Press keys

0 , 0 , 0 , 0 and 0

then press ENT to store the data.

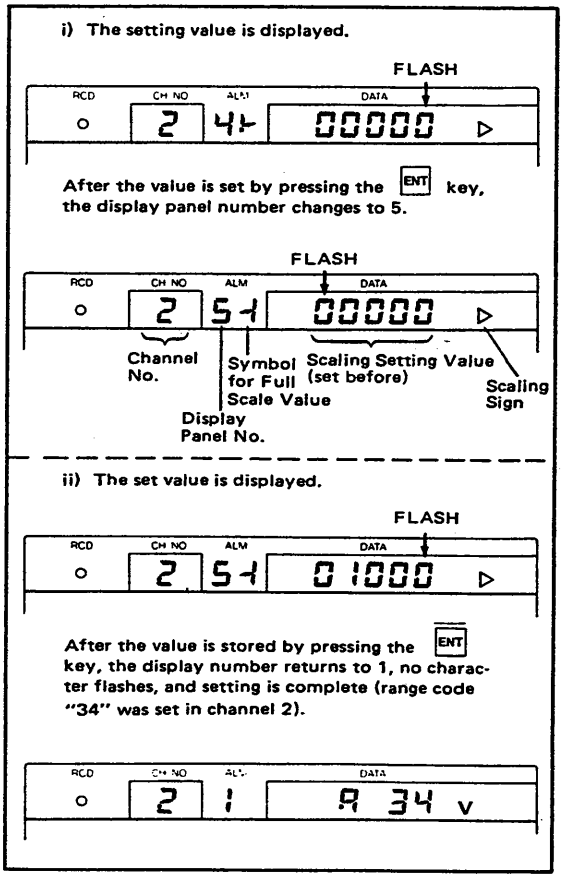
ii) Press keys

0 , 1 , 0 , 0 and 0

then press ENT to store the data.

(Setting completed)

After the scaling record setting is completed, refer to (6) Unit (UNIT) setting method.



If data entry is invalid, refer to paragraph 5-4-9.

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 5-23.

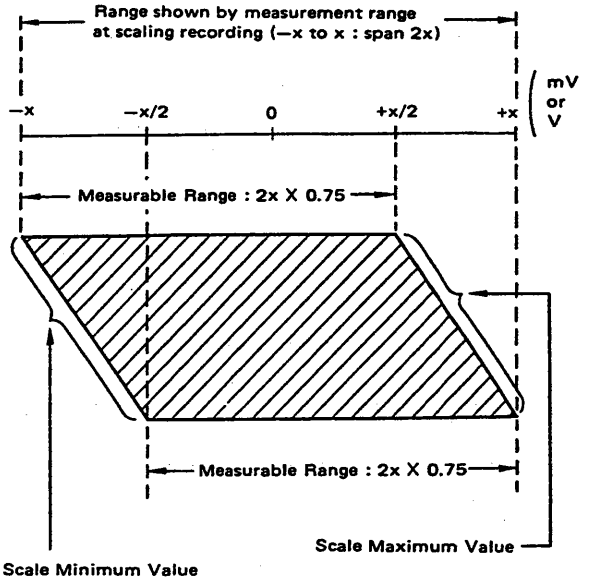


Figure 5-23.

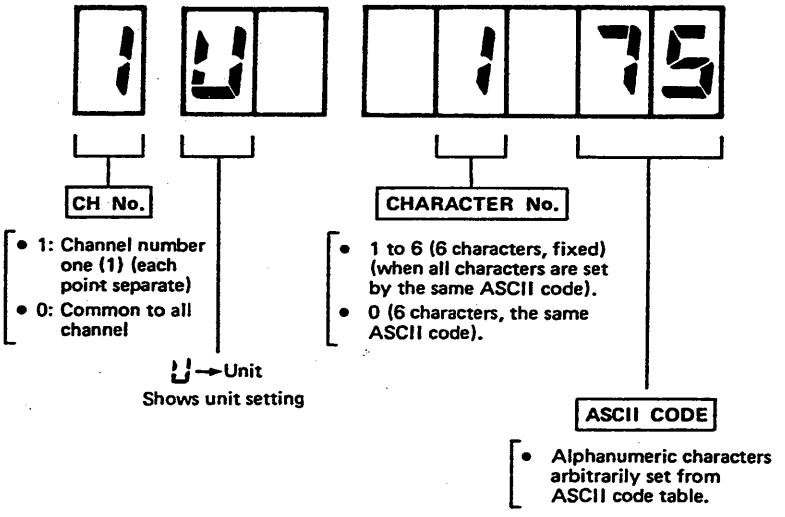
(5) Unit (UNIT) setting method.

If scaling is to be performed, it is convenient to set the unit for the channel (an appropriate unit can be printed out on the chart).

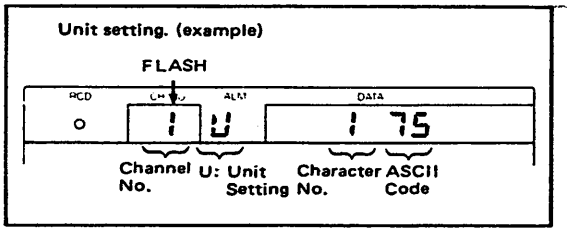
For channel recordings not requiring scaling, no unit setting is required.

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).

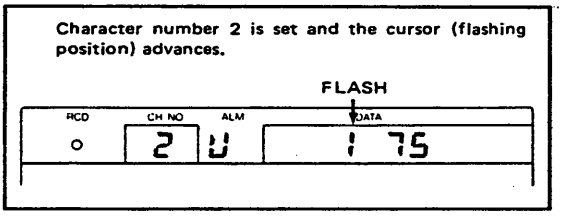
Unit (UNIT) Setting List.



1 Press the SET key as many times as necessary until the unit value is displayed for setting.

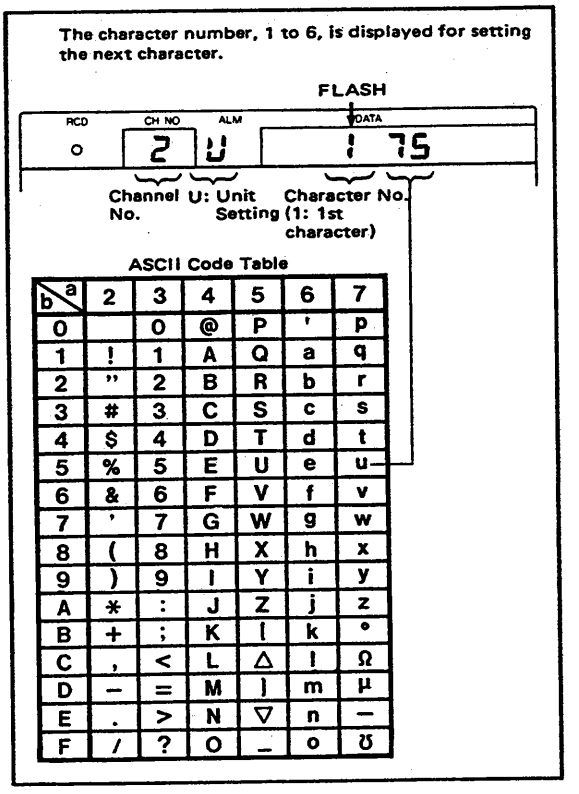


2 Select a channel number, using the numeric keys, for which the unit is to be set.
Example: To set channel 2, press the 2 key.



If data entry is invalid, refer to paragraph 5-4-9.

3 Set the unit by entering six alphanumeric characters. The example below shows that ASCII code "75" has been entered for the first character (u). 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).



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, refer to paragraph 5-4-9.

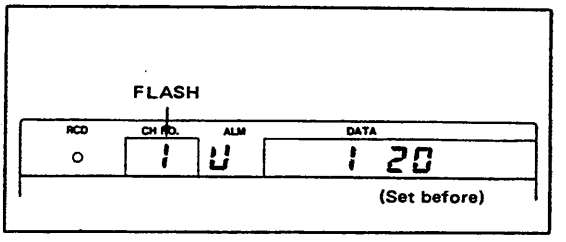
Unit (UNIT) setting example.

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

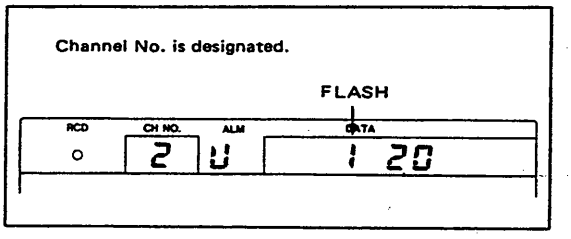
Set an Unit (UNIT) by entering six alphanumeric characters (ASCII CODE).

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).

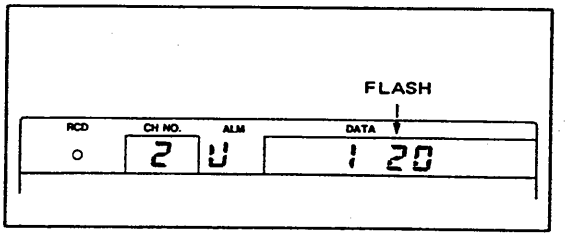
1 Press the SET key as many times as necessary to display the unit setting.



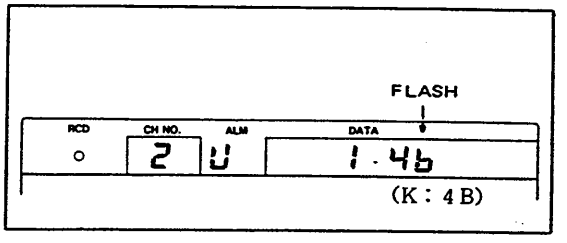
2 Select a channel number using the numeric keys for which the unit is to be set.
Example: To select channel number 2, press the 2 key.



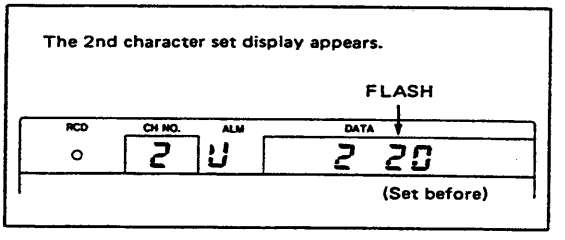
3 Select the 1st character press the 1 key.



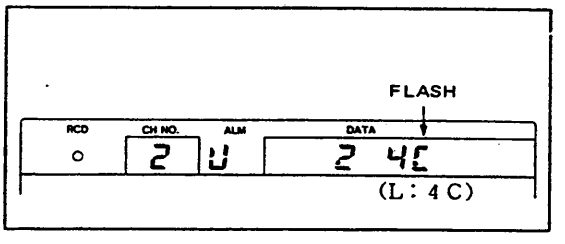
4 Select "K".
As K: 4B (ASCII code),
press the keys 4 , SHIFT and 2 in turn.



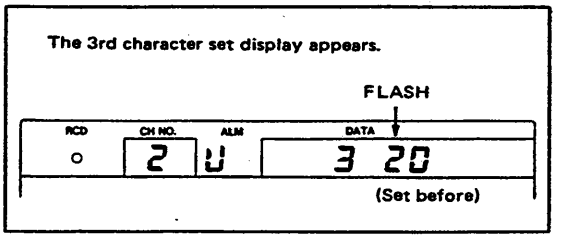
5 Press the ENT key to store "K".
(Now K is set as the 1st character).



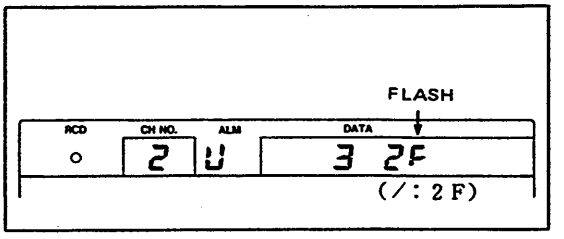
6 Select "L".
As L: 4C (ASCII code),
press the keys 4 , SHIFT and 3 in turn.



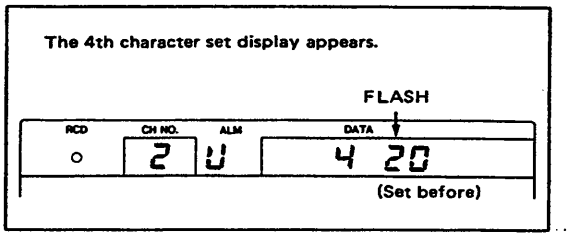
7 Press the ENT key to store "L".
(Now L is set as the 2nd character).



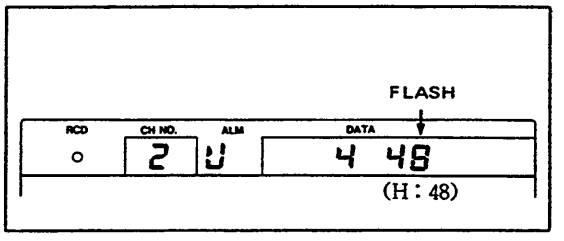
8 Select "/" (slash).
As / : 2F (ASCII code),
press the keys 2 , SHIFT and 6 in turn.



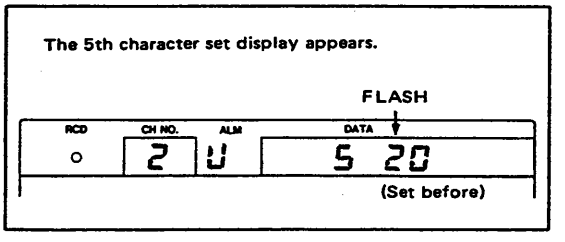
9 Press the ENT key to store "/".
(Now / is set as the 3rd character).



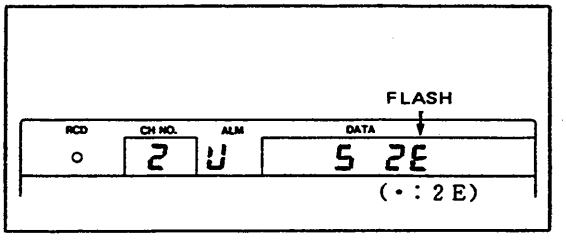
10 Select "H".
As H: 48 (ASCII code),
press the keys 4 and 8 in turn.



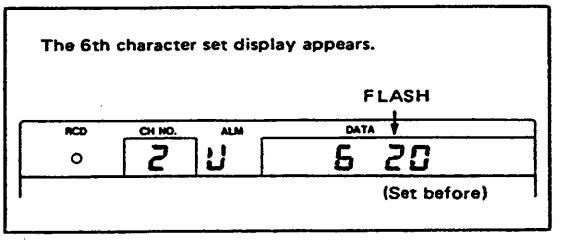
11 Press the ENT key to store "H".
(Now H is set as the 3rd character).



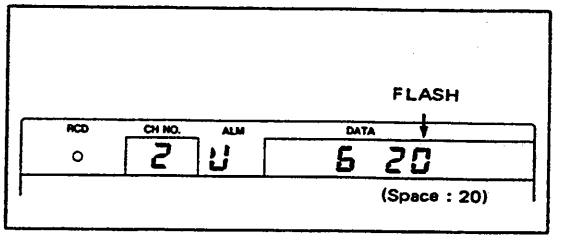
12 Select "·" (period).
As · : 2E (ASCII code),
press the keys 2 , SHIFT and 5 in turn.



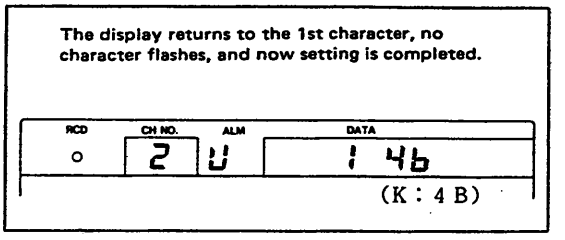
13 Press the ENT key to store "·".
(Now · is set as the 5th character).



14 Select "space".
As space: 20 (ASCII code),
press the keys [2] and [0] in turn.



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



Setting 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, refer to paragraph 5-4-9.

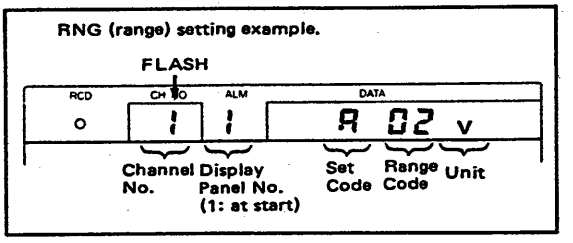
(6) Setting Method for Recording Measurement Differences.

(For thermocouple measurements and temperature difference recording).

Note) Voltage difference recording or temperature difference recording using thermocouple is also available in the same manner as following procedure.

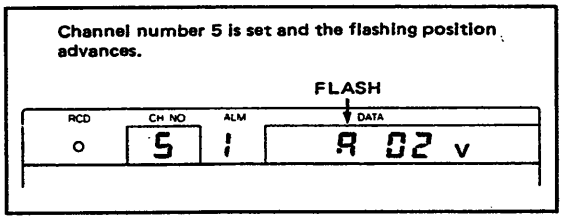
Proceed as follows:

1 Press the SET key as many times as necessary to display the range setting.



2 Using a numeric key, select the channel number.

Example: To select channel 5, press the 5 key.



Note 1: For recording a difference, a reference measurement must already be set on another channel.

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

Note 3: With the Model μR100, thermocouple (TC) input model and resistance temperature detector (RTD) input model are available independently, so TC and RTD cannot be used together.

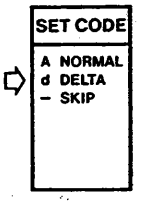
Difference Recording Channel Number:

A: Reference Channel Number
B: Difference Recording Channel Number
O Possible
×: Not possible

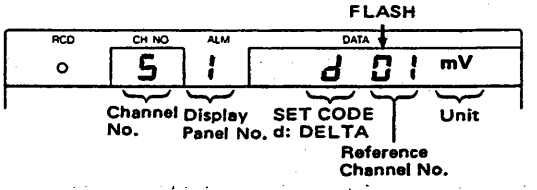
B \ A	1	2	3	4	5	6
1	×	×	×	×	×	×
2	O	×	×	×	×	×
3	O	O	×	×	×	×
4	O	O	O	×	×	×
5	O	O	O	O	×	×
6	O	O	O	O	O	×

If data entry is invalid, refer to paragraph 5-4-9.

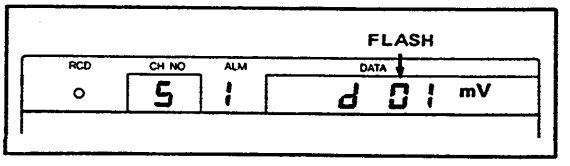
3 From the SET CODE table, select "d:DELTA." Press the SHIFT and 4 keys.



A SET CODE of "d: DELTA is set. The display then shows the measurement range unit with channel number 1 (if difference recording procedure is already performed on channel 5, any channel of channel number 1 to 4) as the reference channel.



The reference channel number will be displayed where a range code was displayed in steps (1) and (2).



4 Displayed is the measurement range unit with channel number one (1) as the reference channel. The example (at the right) shows the DC voltage unit (mv). Thermocouple measurement setting and temperature difference recording procedures are described below (so channel 1 — for DC voltage set — cannot be used for a reference channel). A reference setting should be set on a different channel. Specify the related channel number.

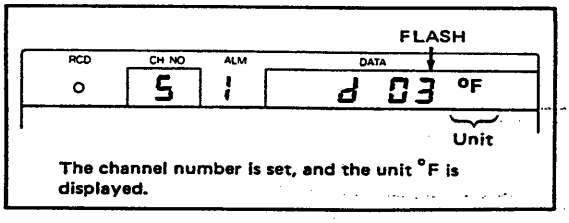
(Example)

	Input	Measuring range
CH1	DC voltage	−200 to 200 mV
CH2	TC (thermocouple)	752 to 3308°F
CH3 (reference)	TC	−328 to 1472°F
CH4	DCV	−20 to 20V

CH2 or CH3 may be selected as reference channel, here, channel 3 is selected as shown above.*

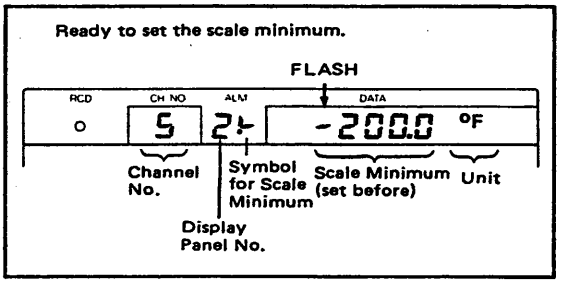
For example, when the above data has been preset, press the MAN 0 and C 3 keys.

* In this case, a TC of type E (−328 to 1472°F) must be used for channel 5 input.



The channel number is set, and the unit °F is displayed.

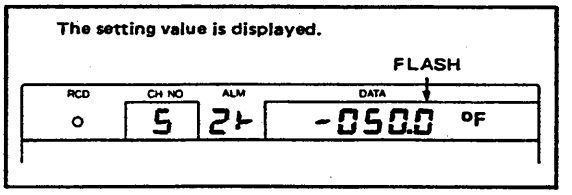
5 Press the ENT key to store the data.



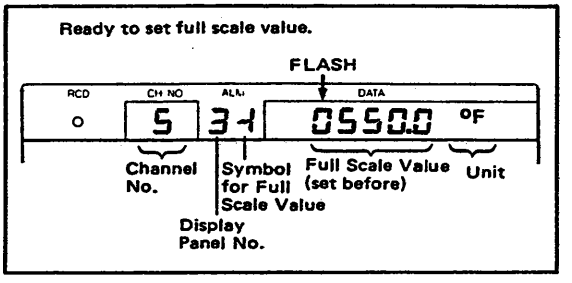
If data entry is invalid, refer to paragraph 5-4-9.

6 Set the recording range for temperature measurement difference.
First set the scale minimum by pressing numeric keys.

(Example)
To set −50°F, press [−], [0], [5], [0] and [0] keys.

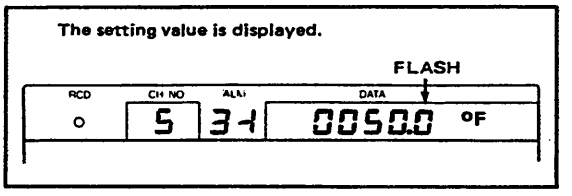


7 Press the [ENT] key to store the scale minimum.

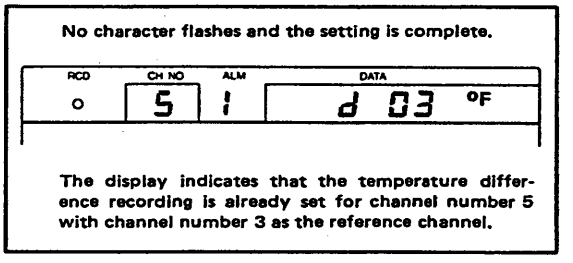


8 Next set the full scale value by pressing numeric keys.

(Example)
To set 50°F, press [0], [0], [5], [0] and [0] keys.



9 Press the [ENT] key to store the full scale value (range setting is complete).



In the above, steps 1 through 9, setting the thermocouple temperature difference measurement, ranging from −50 to 50°F, is accomplished with channel number three (3) as the reference channel.

A combination of different types of detectors (such as a thermocouple and an RTD) cannot be used.

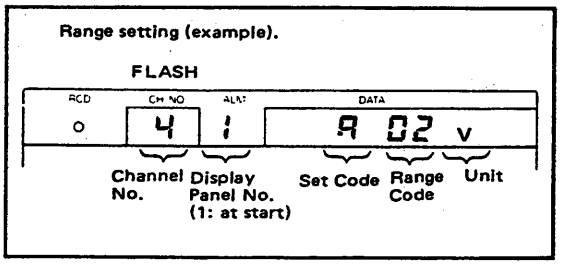
If data entry is invalid, refer to paragraph 5-4-9.

(7) SKIP Setting (when some channels are used).

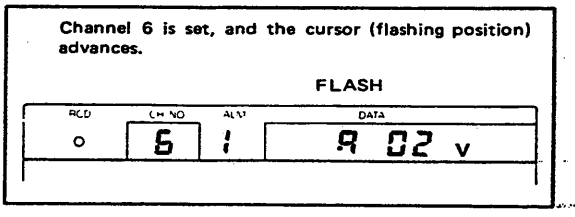
If any of the channels is not required for measurement, set "SKIP" (if "SKIP" is not set with the channel not being used, unnecessary traces will be recorded on the chart, obstructing reading of other channels).

To set SKIP, proceed as follows:

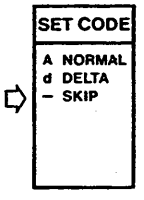
1 Press the SET key as many times as necessary to display the range setting.

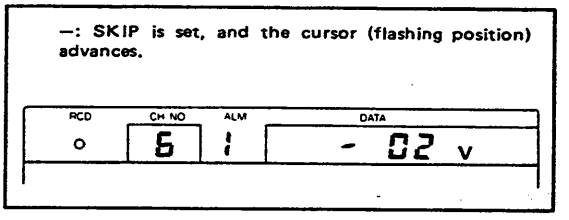


2 Set the desired channel number.
Example: To select channel 6, press the 6 key.



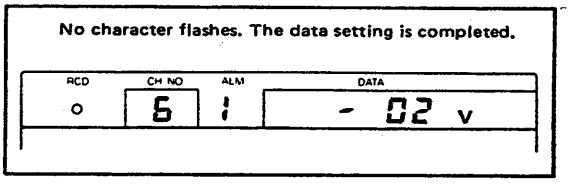
3 Select –: SKIP from the SET CODE list. Press OFF or – key.





4 Press the ENT key to set the channel SKIP.

(Setting completed)



If data entry is invalid, refer to paragraph 5-4-9.

5-4-7. Alarm Setting.

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

For each absolute value and difference recording, up to four alarm points per channel may be set.

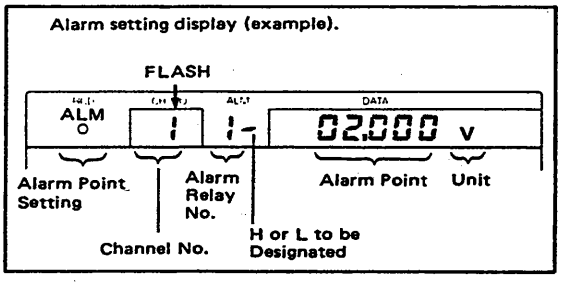
When an alarm point is set, if the measured value passes this point, the recorder displays "ALM" and performs alarm printout on the chart simultaneously (see the alarm printout example on page 2-10). Further, using the alarm output relay /AK-04*1 (optional), alarm signal output at alarm ON is available, and by combining the /AK-04 with /REM (optional), the recorder chart feed speed can be changed when alarm turns ON*2.

*-1: See page 2-7.
*-2: See pages 2-6, 2-10, 5-14.

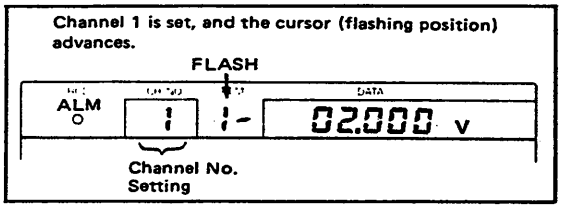
Alarm setting procedure for absolute value recording.

To set alarms, proceed as follows:

1 Press the SET key as many times as necessary until the alarm is displayed.

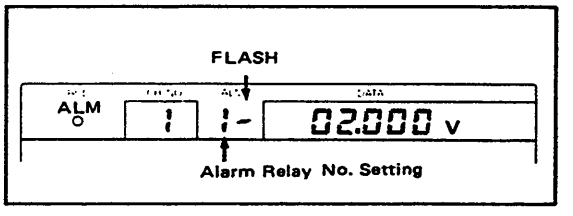


2 Set the channel number.
Example: To select channel 1, press the 1 key.



3 To set the first alarm point (i.e. alarm relay number), press the 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".

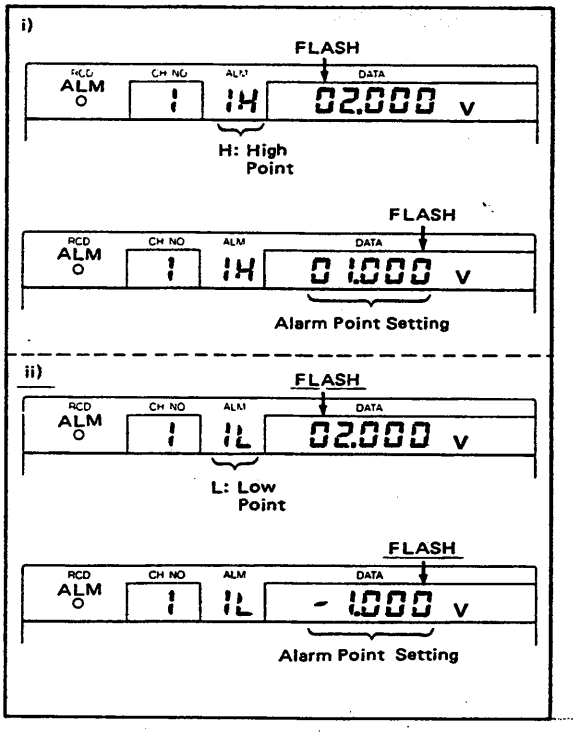


If data entry is invalid, refer to paragraph 5-4-9.

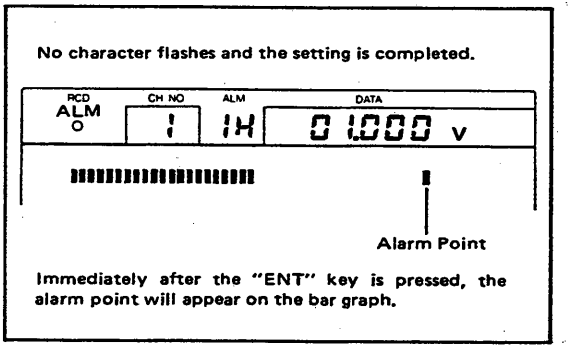
4 Assume for example, that a measurement range of −2 to 2V (RNG code: 02) is already set for channel number one (1).

i) To set a high alarm point (H) of 1V, press the SHIFT and H/7 (i.e. "H" for high) keys, and then enter 0, A/1, 0, 0, and 0.

ii) Similarly, to set a low point alarm (L) of −1V, press the SHIFT and L/8 keys, followed by, −/−, A/1, 0, 0 and 0.



5 Press the ENT key to store the data.



For setting another alarm point, return to Step 2 above and designate the channel number again (See Note.). Then in 3 above, set the second alarm point (i.e. setting of another alarm relay number).

Repeat Steps 4 and 5 for setting the second alarm point. The 3rd and 4th alarm relay numbers are set in the same manner.

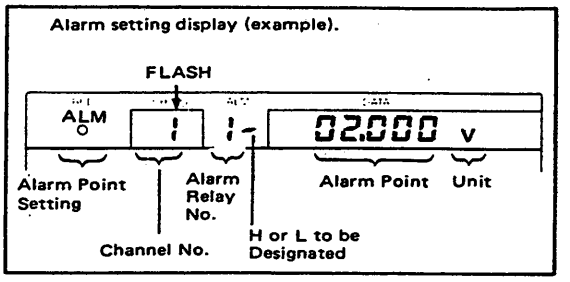
Note: It is possible to designate a new channel number here, and proceed to the setting of alarm points for the new channel.

If data entry is invalid, refer to paragraph 5-4-9.

Alarm setting for difference recording.

Proceed as follows.

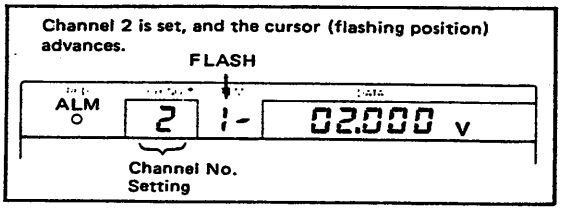
1 Press the SET key as many times as necessary until the alarm is displayed.



2 Set the channel number.

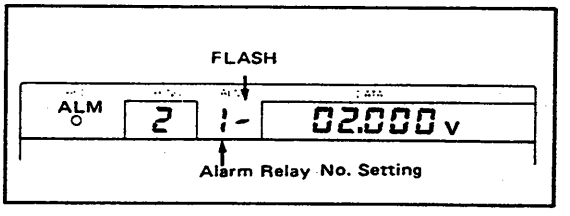
Note: It is assumed here that difference recording has already been set for the chosen channel number.

Example: To select channel 2 press the 2 key.



3 To set the alarm point (i.e. alarm relay number) for the first setting, press the 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".

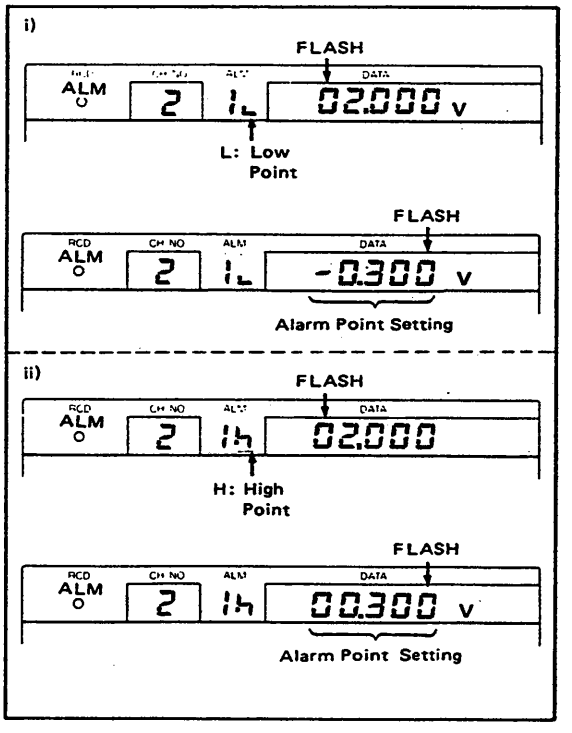


4 It is assumed here, as an example, that with channel number one (1) as its reference, channel number two (2) has been set as follows.

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

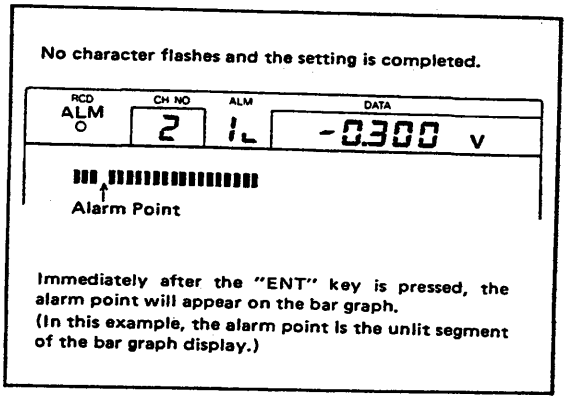
i) To set −0.3V as channel number two's low alarm point (ΔL) recording difference, press the SHIFT and ◄ /(i.e. 1(ΔL) for low) keys, and then enter −, 0, 3, 0 and 0.

ii) Similarly, to set a high alarm point (ΔH) of 0.3V, press the SHIFT and 0 keys, followed by 0, 0, 3, 0 and 0.



If data entry is invalid, refer to paragraph 5-4-9.

5 Press the ENT key to store the data.



For setting another alarm point, return to Step 2 above and designate the channel number again (See Note.). Then in 3 above, set the second alarm point (i.e. setting of another alarm relay number).

Repeat Steps 4 and 5 for setting the second alarm point. The 3rd and 4th alarm relay numbers are set in the same manner.

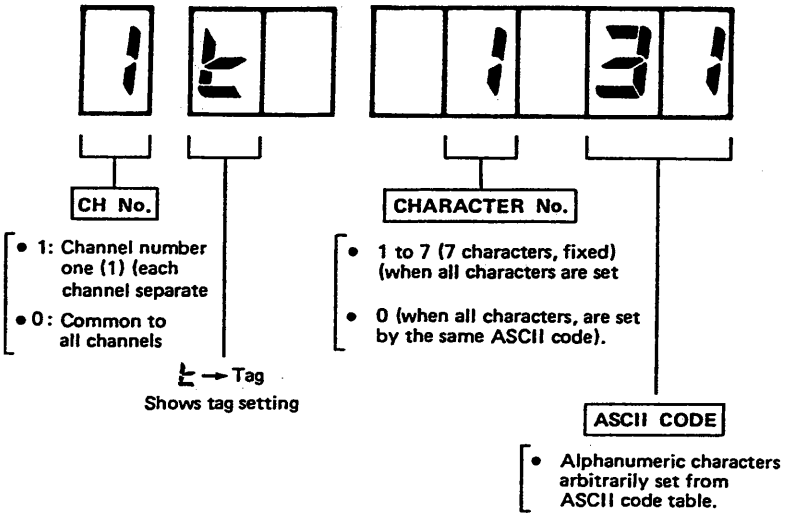
Note: It is possible to designate a new channel number here, and proceed to the setting of alarm points for the new channel.

If data entry is invalid, refer to paragraph 5-4-9.

5-4-8. Tag Setting.

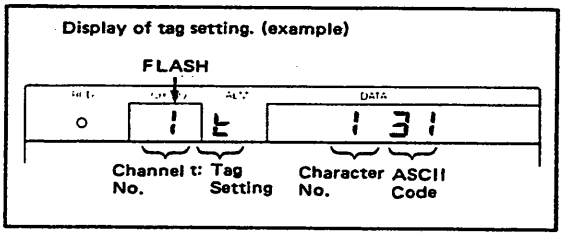
A tag is set to help identify the object being measured/recorded. A tag of 7 alphanumeric characters can be set for each channel.

Tag setting list

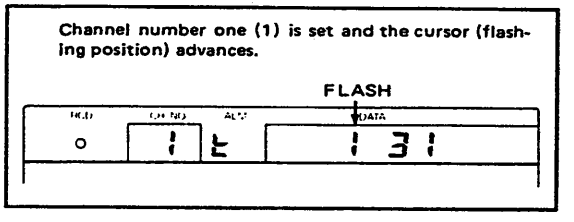


Proceed as follows.

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



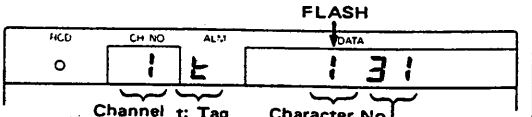
2 Set the channel number, using the numeric key for which tag is to be set.
Example: To set channel number 1, press the 1 key.



If data entry is invalid, refer to paragraph 5-4-9.

3 A tag is set by entering 7 alphanumeric characters. In the example 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.
An example of tag setting is given below.

The numbers, 1 to 7, for the next character setting are displayed.



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	ʊ

If data entry is invalid, refer to paragraph 5-4-9.

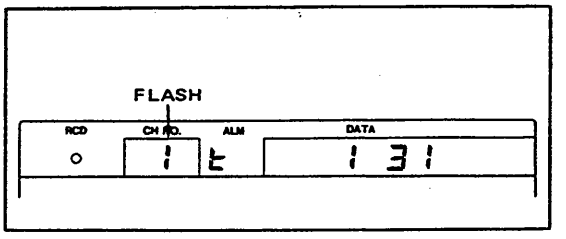
Tag (TAG) setting example.

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

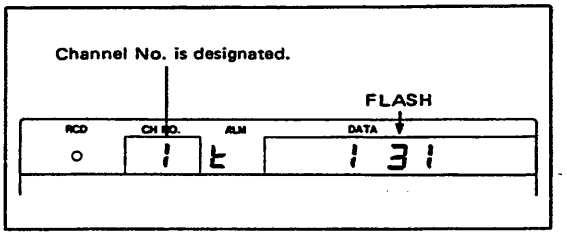
Set a tag by entering seven alphanumeric characters.

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

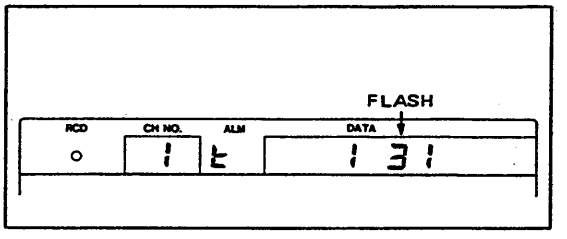
1 Press the SET key as many times as necessary to display the tag setting.



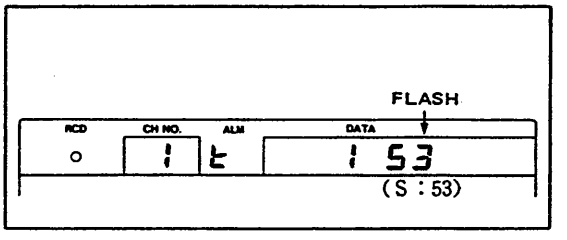
2 Use the numeric keys to set the channel number which is to be labelled with a tag number.
Example: To select channel No. 1, press the 1 key.



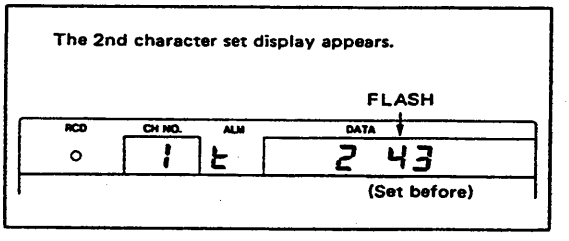
3 Select the 1st character, press the 1 key.



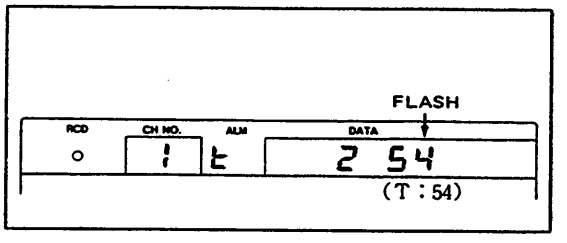
4 Select "S".
As S: 53 (ASCII code), press the 5 and 3 keys.



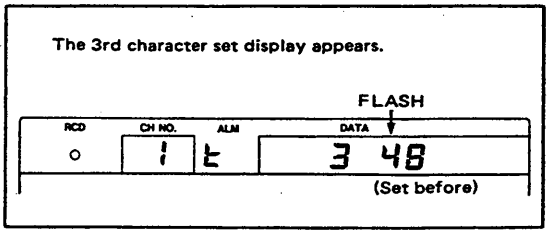
5 Press the ENT key to store "S".
*Now S is set as the 1st character).



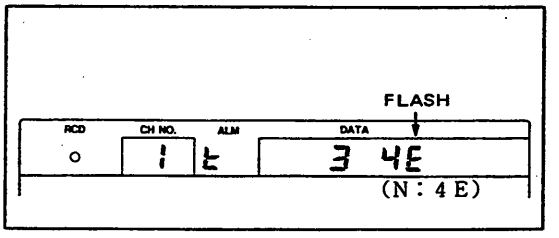
6 Select "T".
As T: 54 (ASCII code), press the 5 and 4 keys.



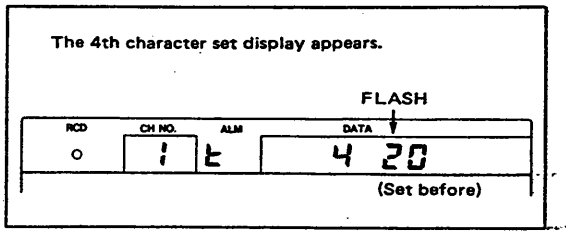
7 Press the ENT key to store "T".
(Now T is set as the 2nd character).



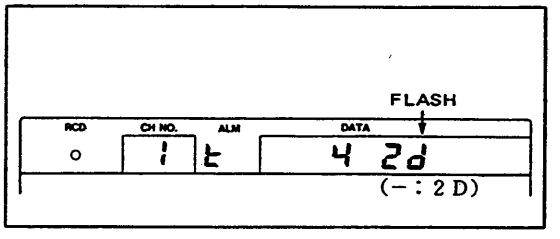
8 Select "N".
As N: 4E (ASCII code),
press the keys 4, SHIFT and 5 in turn.



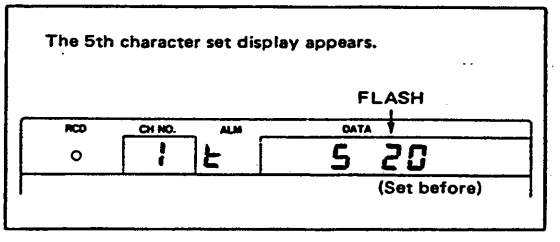
9 Press the ENT key to store "N".
(Now N is set as the 3rd character).



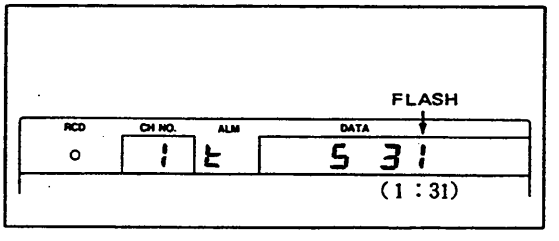
10 Select "-" (hyphen).
As -: 2D (ASCII code),
press the keys 2, SHIFT and 4 in turn.



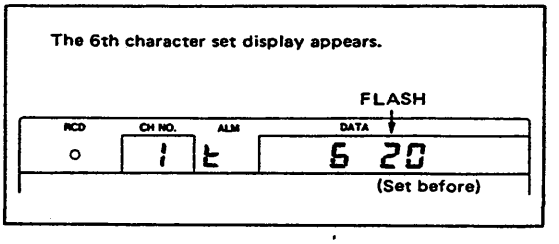
11 Press the ENT key to store "-".
(Now - is set as the 4th character).



12 Select "1".
As 1: 31 (ASCII code),
press the keys 3 and 1.

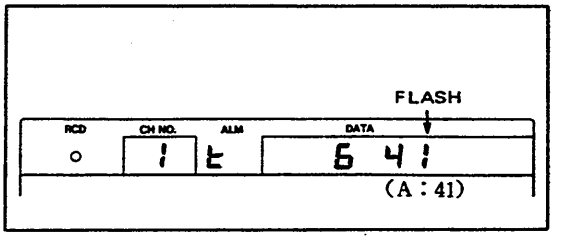


13 Press the ENT key to store "1".
(Now 1 is set as the 5th character).

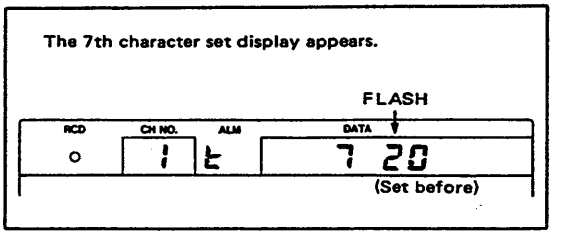


If data entry is invalid, refer to paragraph 5-4-9.

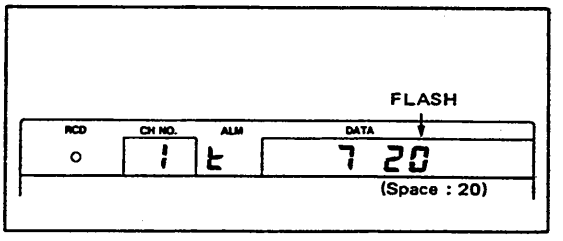
14 Select "A".
As A: 41 (ASCII codes),
press the keys [4] and [1].



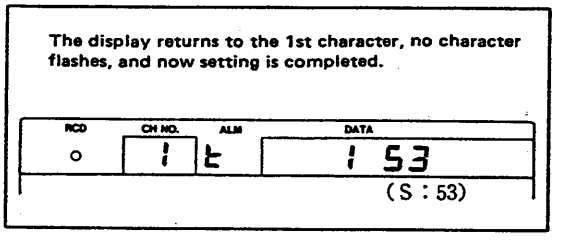
15 Press the [ENT] key to store "A".
(Now A is set as the 6th character).



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



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



Setting completed

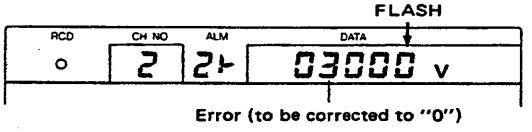
At this time, it can be confirmed by executing list printout whether the tag (TAG) is set correctly to the desired measurement channel or not.

If data entry is invalid, refer to paragraph 5-4-9.

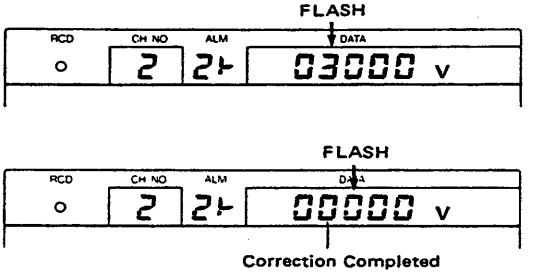
5-4-9. Incorrect Data Entry.

(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 00.000 is correct.

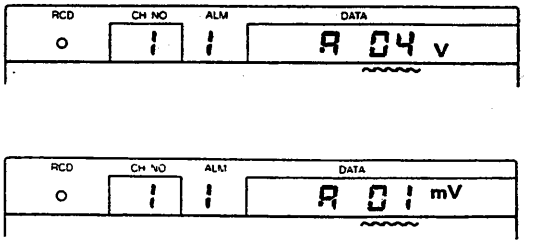


Press the [◄] key three times to position the cursor (flashing position) to the incorrect data ("3"). Correct the data by pressing the [0] key and then set the new data ("0") by pressing the [ENT] key.

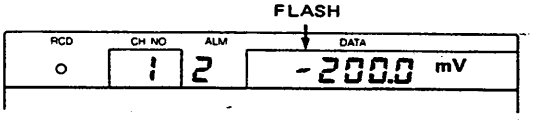


(2) If incorrect data has been entered and the [ENT] key was pressed (i.e. wrong data is already set), proceed as follows.

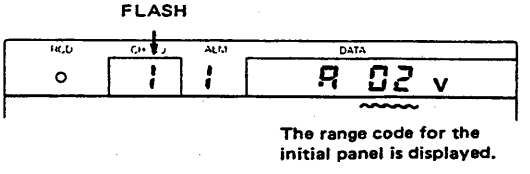
Example: For the setting of a range, code "01" (wrong) was set while the desired range code is "04".



Upon completion of the entry ("ENT") command, the display will show the range setting. (In this example, the code "01" was set and, so, the display is as shown below (i.e. range 01: −200 to 200 mV).



When the data to be corrected is not yet displayed, use the [SET] key to again call the initial display panel (for range setting in this example). (Repetitive "beep" sounds for incorrect key setting.)
Press the [SET] key (7 times for this example) and obtain the initial display panel (for range setting).



Position the cursor (flashing position) to the incorrect data using the [►] key, correctly enter the data, and then press the [ENT] key to set the new data.

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).

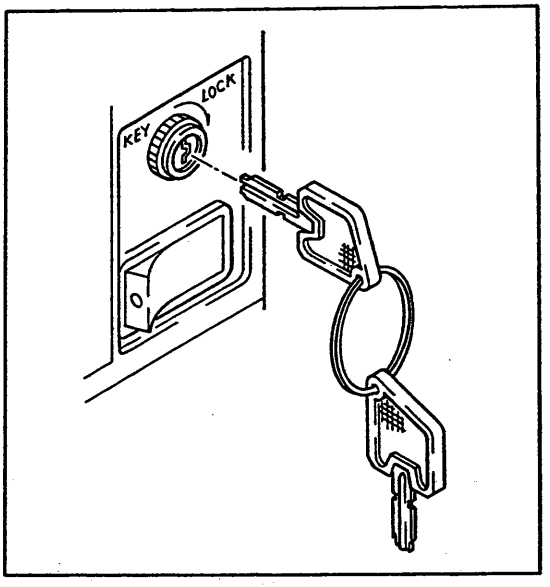
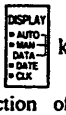


Figure 5-24.

After key lock, the 

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, 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 ribbon cassette. Refer to "paragraph 5-1-2 Ribbon Cassette Replacement".

*-2 The numerals showing remaining chart paper length are printed on the chart left side margin at intervals of 20 centimeters (see Figure 6-1). When the internal assembly is pulled out, there is a window — through which you can see remaining chart in the chart paper compartment — on the left side panel of the internal assembly (see Figure 6-2).
Check these portions described above to estimate when chart replacement is due. Refer to "paragraph 5-1-1 Loading Chart Paper" for replacement method.

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

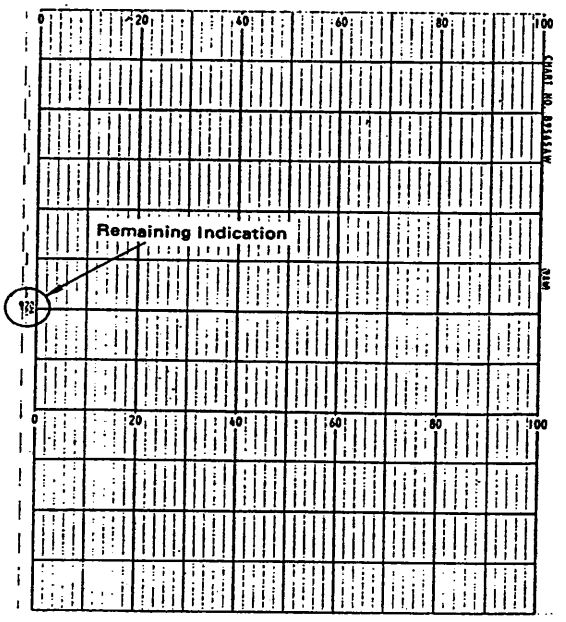


Figure 6-1. Chart Paper.

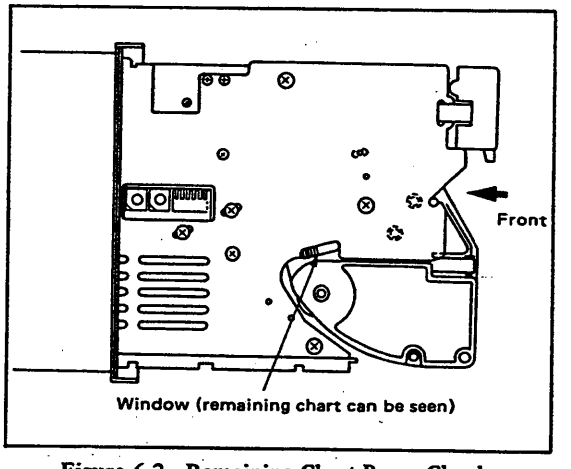


Figure 6-2. Remaining Chart Paper Check.

6-2. Parts Replacement.

6-2-1. Fuse Replacement.

Replace the fuse at least once every two years for preventive maintenance.

(1) Pull out the internal assembly (be sure to use the handle) and turn the power supply switch "OFF" (see Figure 6-3).

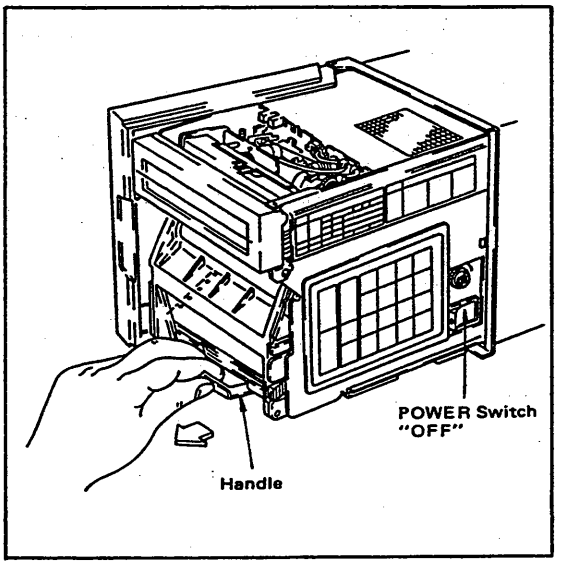


Figure 6-3. Handle.

(2) The fuse is mounted on the recorder rear panel (see Figure 6-4).
Turn the knob of the fuse holder counterclockwise, and the holder will slide out with the fuse (see Figure 6-5).

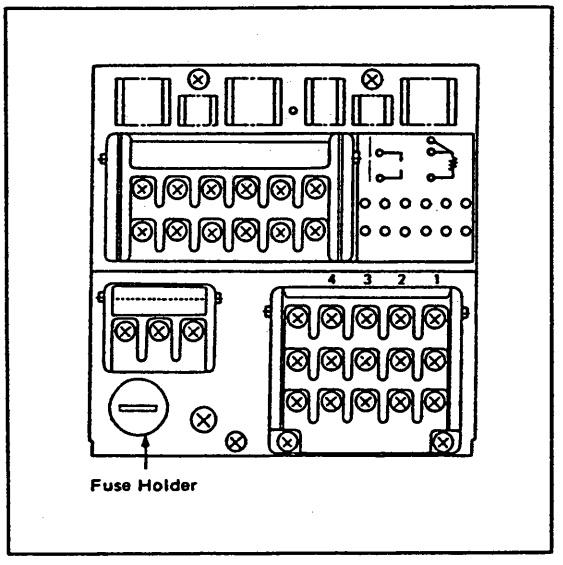


Figure 6-4.

(3) Make sure that the new fuse rating is correct, and mount the fuse by turning the knob clockwise (see Figure 6-5).

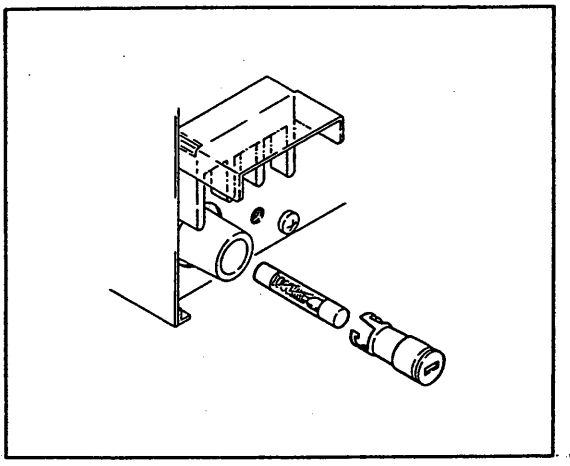


Figure 6-5.

6-3. Calibration.

6-3-1. 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:

YOKOGAWAModel 2793-01 or equivalent

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

6-3-2. 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 section 2-3 Specifications).

(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 6-4 Adjustment".
*Warmup time necessary for the μR100 recorder is at least 30 minutes.

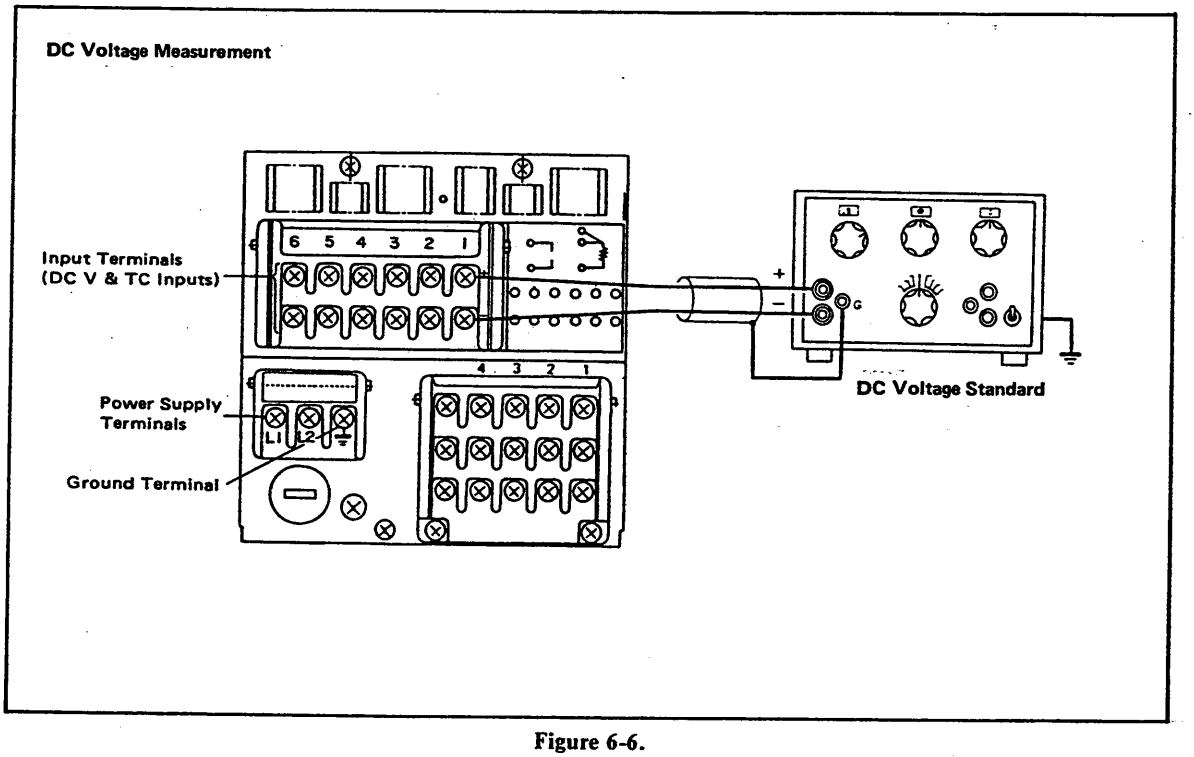


Figure 6-6.

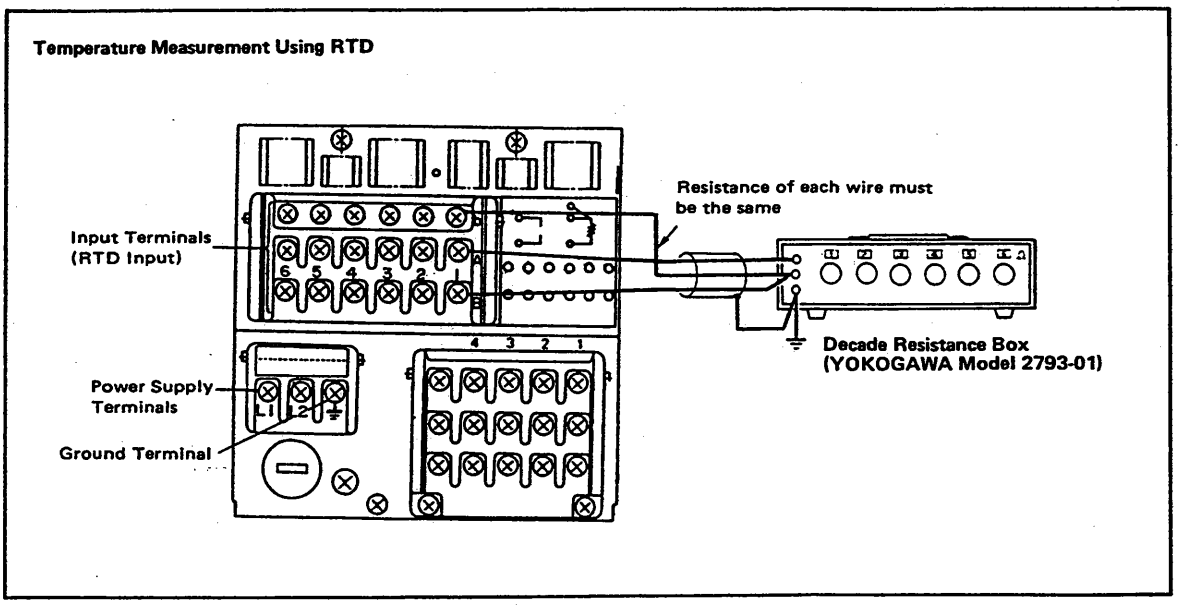
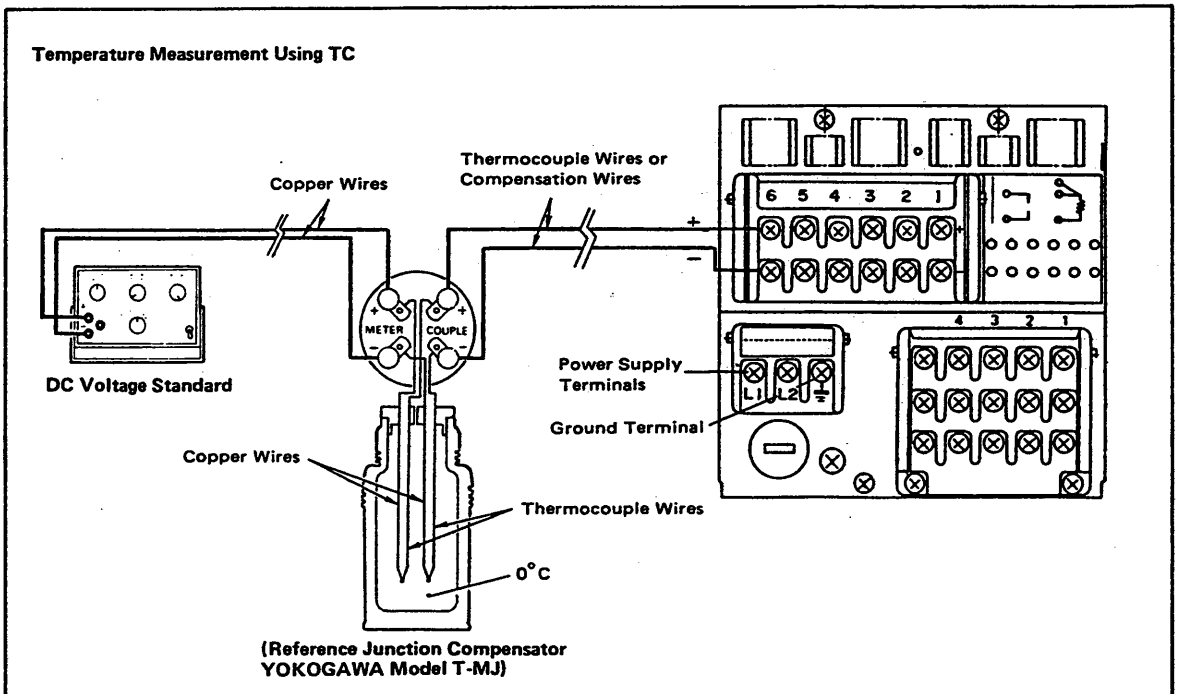


Figure 6-7.



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.

6-4. Adjustment.

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

Proceed as follows:

(1) Recorder front door removal.
While inserting a pointed tip (like a pen tip) into the shaft hole of the door, move the door to remove it. Be careful not to drop the door when it is removed.

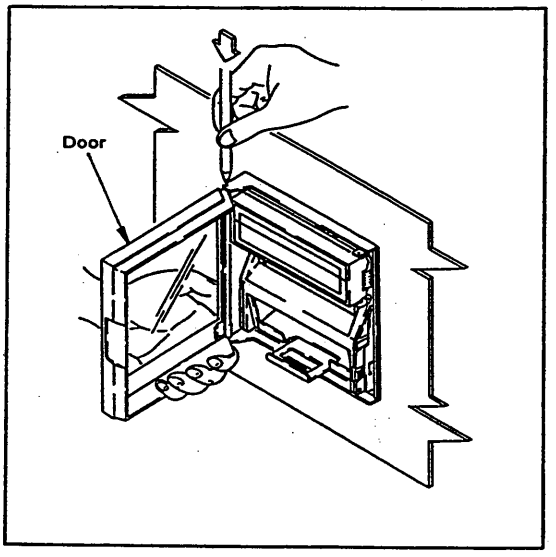


Figure 6-9.

(2) Pull out the internal assembly as far as possible.
(To pull out the internal assembly, be sure to use the internal assembly handle as shown in Figure 6-10).

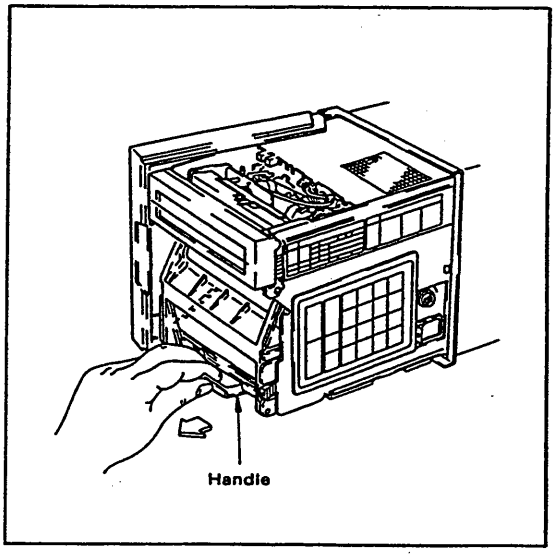


Figure 6-10.

(3) Turn the POWER switch ON.

(4) With the input applied, adjust the zero and span adjustments using a jewellers' screwdriver (see Figure 6-11).
The zero and span adjustments are located on the left side panel of the internal assembly (see Figure 6-12).

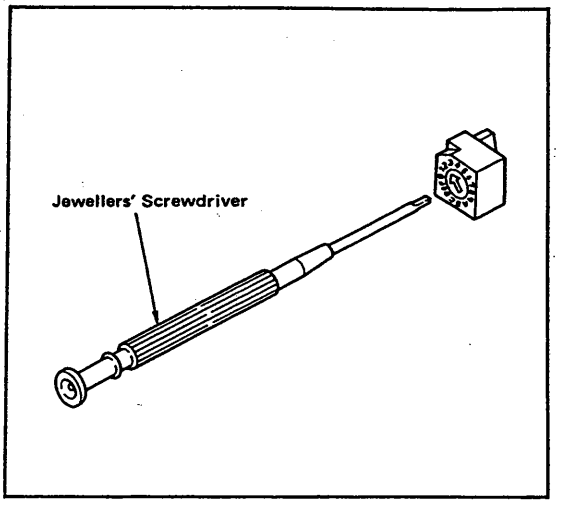


Figure 6-11.

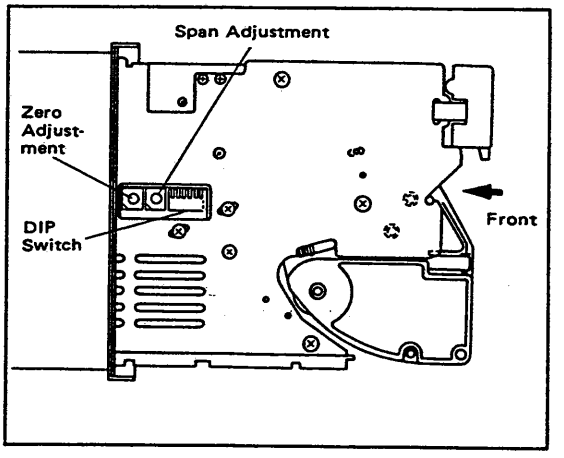


Figure 6-12.

(a) Zero adjustment.

i) Apply an input corresponding to 0% of measurement range on an arbitrary channel (it's not necessary to repeat this for all channels).

ii) Check for error produced on the chart by dotted point of the channel designated in i)*Note 1 (in normal measurement operation mode, so the instrument should be set in recording mode using the  key).

*Note-1 The dot printing color of the channel to which the input is applied should be identified.

iii) Using a jeweller's screwdriver, turn the zero adjustment by an amount corresponding to the magnetude of the error.
The zero adjustment can be turned in steps (16 steps/revolution).
The dot recording position shifts 0.1 mm per step.
(When the adjustment is turned clockwise, the dot recording position shifts to the right.)

iv) When the zero adjustment has been shifted by an amount which is calculated to be sufficient to cancel the error, turn the instrument POWER switch "OFF"*Note-2.

v) Then turn the instrument POWER switch "ON" again.
The dot recording position shifts either to the left or right.
Check the error at the new dot recording position.

*Note-2 In step iii) above, the dot recording position is not immediately shifted either left or right. After performing steps iv) and v), the dot recording position is shifted to the left or right by an amount corresponding to the amount of zero adjustment (0.1 mm × n steps) carried out in step iii).

Estimate the error in 0.1 mm units, and adjust the zero adjustment accordingly.
If the error is still out of tolerance after completing steps iii) thru v), repeat from step iii) on.

vi) If the error for the 0% point is within tolerance, the zero adjustment is completed.

(b) SPAN adjustment (should be performed after ZERO adjustment).

1 Apply an input corresponding to 100% of the measurement range for the channel on which zero adjustment is being performed.

2 Check for error by the dot recording position.

3 Using a jewellers screwdriver, turn the span adjustment corresponding to the magnitude of the error.
The span adjustment can be turned in steps (16 steps/revolution).
The dot recording position shifts 0.1 mm per step.*Note-3
(When the adjustment is turned clockwise, the dot recording position shifts to the right and when the adjustment is turned counterclockwise, the dot recording position shifts to the left.)

4 When the span adjustment has been shifted by an amount which is calculated to be sufficient to cancel the error, turn the instrument POWER switch "OFF"*Note-3.

5 Then turn the instrument POWER switch "ON"*Note-3 again.
The dot printing position shifts either to the left or right. Check the error at the new dot printing position.

*Note-3 In step 3 above, the dot recording position is not immediately shifted either left or right. After performing steps 4 and 5, the dot recording position shifts to the left or right by an amount corresponding to the amount of span adjustment (0.1 mm × n steps) carried out in step 3.
Estimate the error in 0.1 mm units, and adjust the zero adjustment accordingly. If the error is still out of tolerance after completing steps 3 thru 5, repeat from step 3 on.

6 If the error for the 100% point is within tolerance, the span adjustment is completed.

6-5. Power Supply Frequency.

Power supply frequency shall be set on the DIP switch located on the internal assembly left panel. See Figure 6-13.

Before switching frequency, turn the POWER switch OFF.

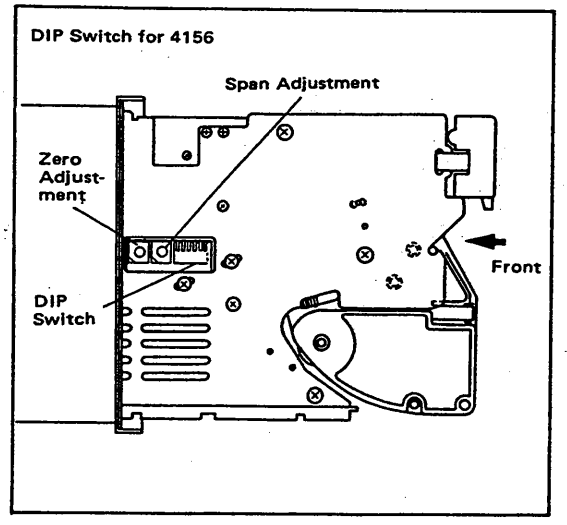


Figure 6-13.

i) First the recorder front door should be removed. While inserting a pointed tip (like a pen tip) into the shaft hole of the door, move the door to remove it. Be careful not to drop the door when it is removed (see Figure 6-14).

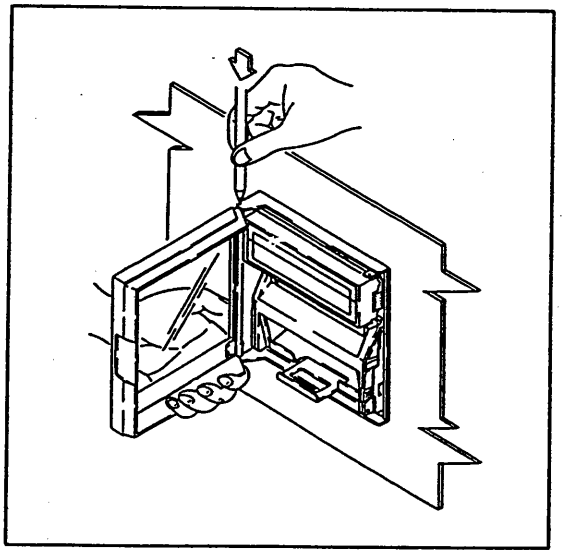
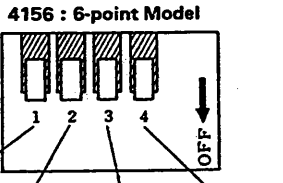


Figure 6-14.

ii) A four pole type DIP switch is provided with the recorder (see Figure 6-15). When the No. 1 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. The functions of each DIP switch are shown in Figure 6-15.
When the DIP switch setting 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 (when switching between RTD and MV/TC, the measurement terminals must be rewired, so switching between 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. 1 switch, otherwise, the program data entered (stored according to section 5-4 on) may be erased.



Switch	1	2	3	4
ON	50 Hz	°F	TEST	RTD
OFF	60 Hz	°C	NORMAL	mV TC
Function	Power frequency selection	Unit for temperature measurement	Operating mode selection	Input type selection
When Shipping	ON when suffix code B is 50 and OFF when suffix code B is OFF	ON when suffix code A is 5 or 6 and suffix code A is 1, 2, 3, 4 or 7 or 8	OFF	On when suffix code A is 2, 4, 6 or 8 and OFF when suffix code A is 1, 3, 5 or 7

Figure 6-15.

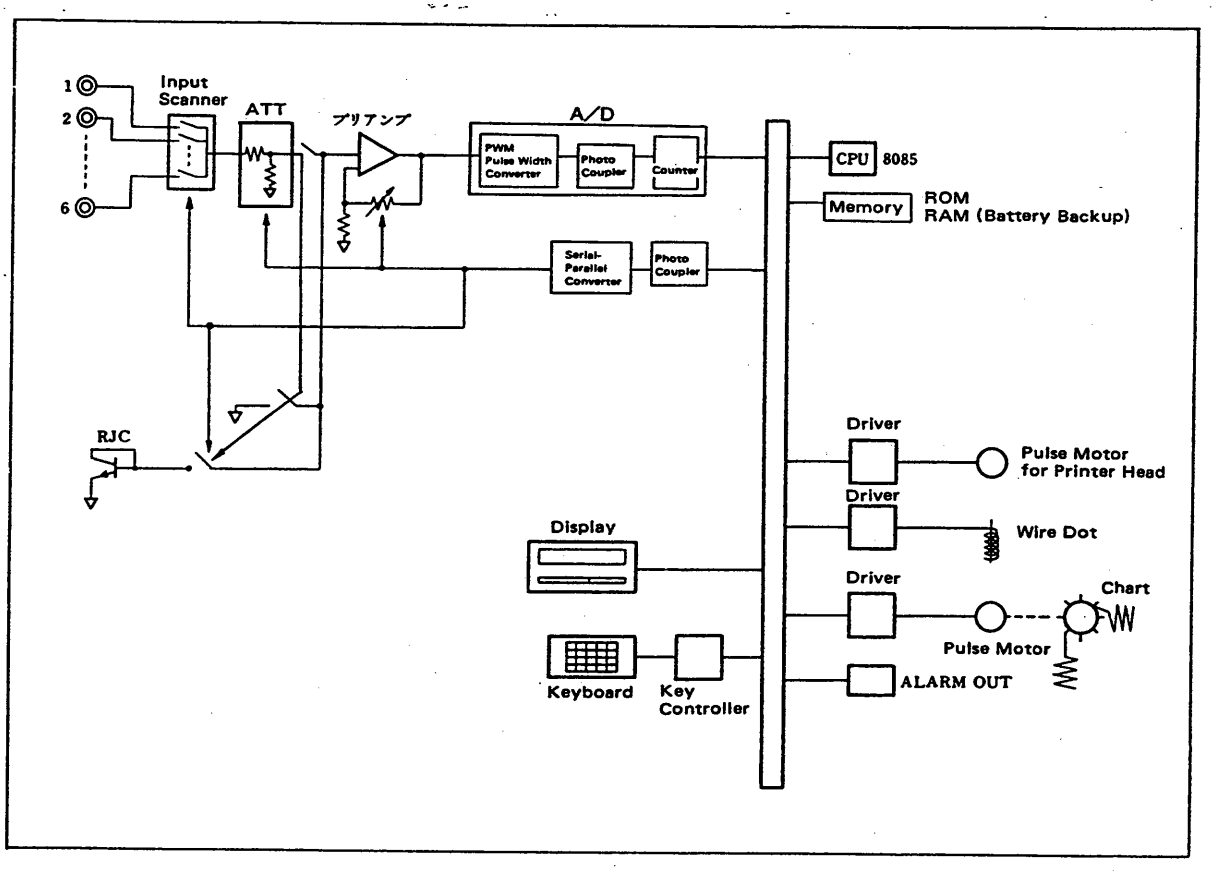
7. TROUBLESHOOTING.

When the recorder fails to operate properly, 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.

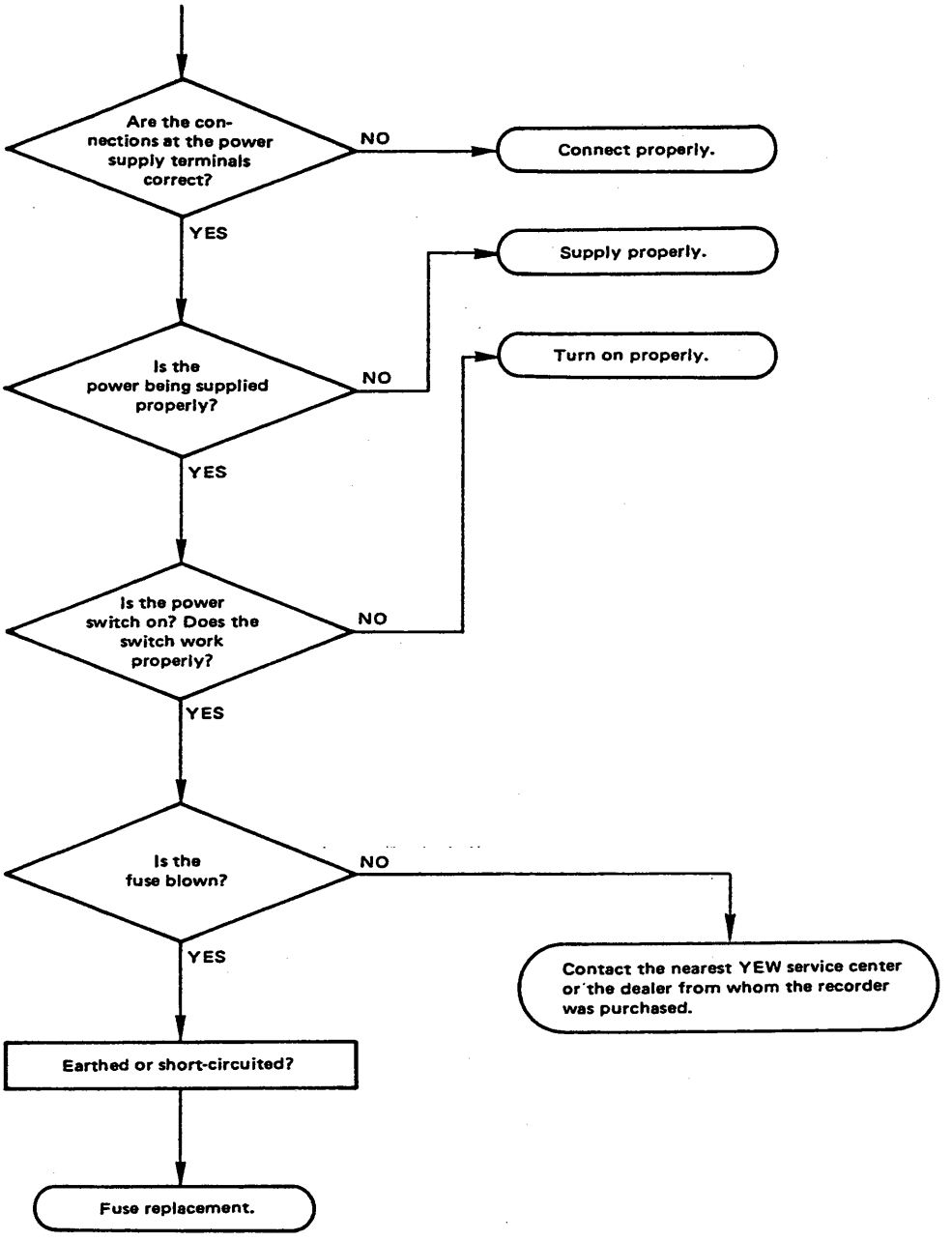
7-1. Block Diagram.

μR100 Dot-printing Type Block Diagram.

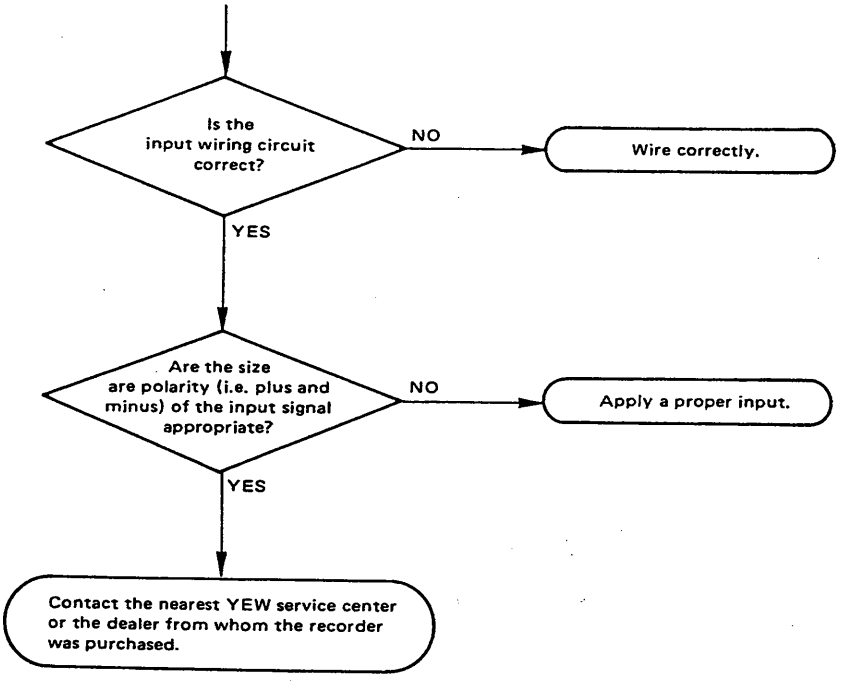


7-2. Troubleshooting Flow Sequence.

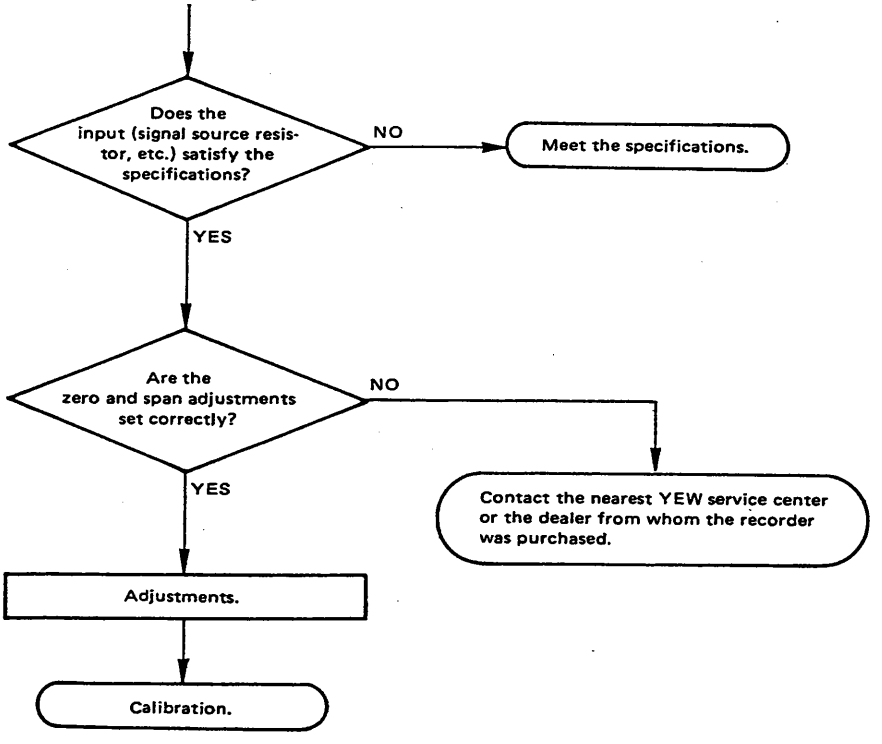
Neither the carriage nor the chart moves.



The recording points improperly swing to 0 or 100% on the chart.



The error is large.



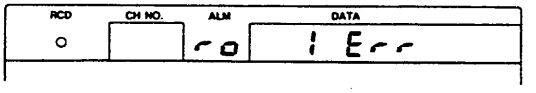
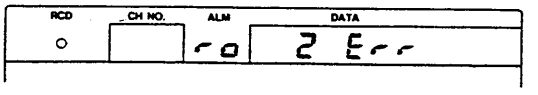
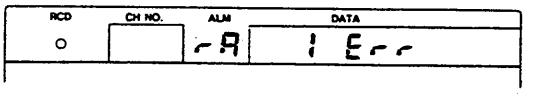
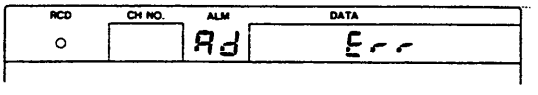
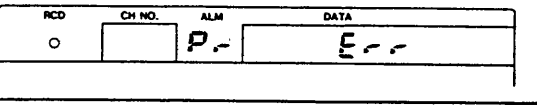
8. SELF DIAGNOSTIC FUNCTION.

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).

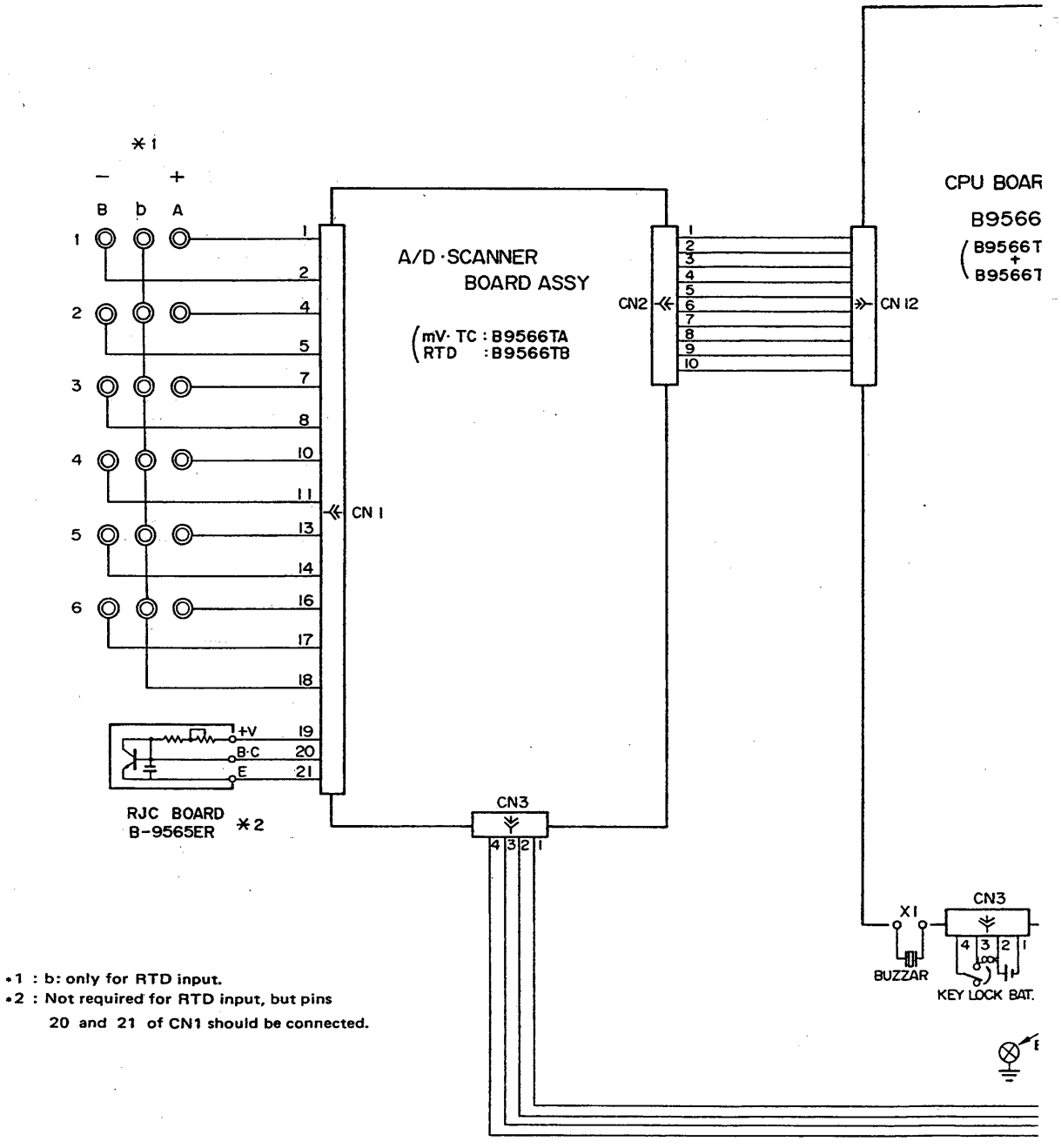
If any items shown in Table 8-1 is displayed immediately after the POWER switch is turned "ON", contact the nearest YOKOGAWA service center or the dealer from whom the recorder was purchased.

Table 8-1.

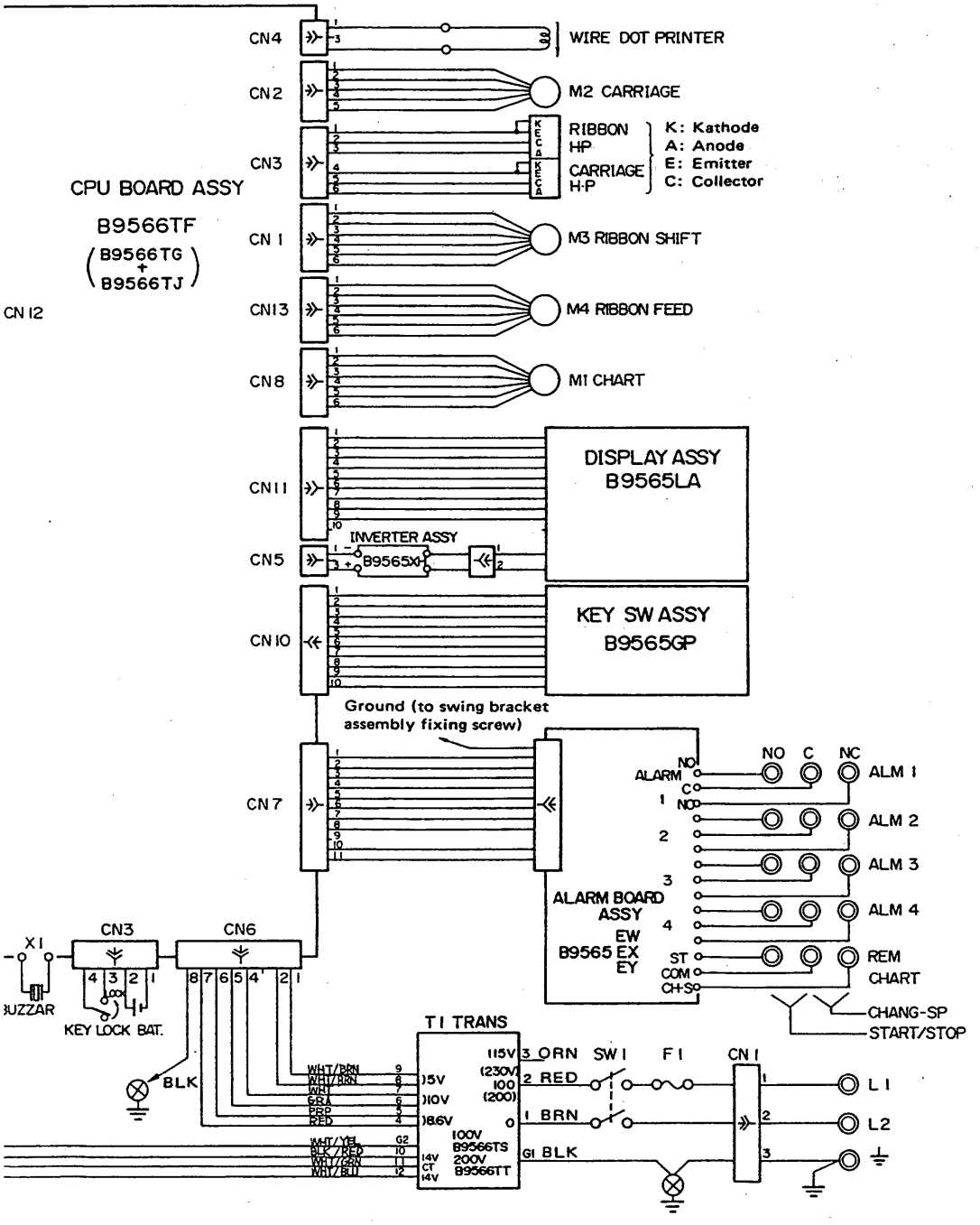
	Item	Display
①	ROM1 failure	
②	ROM2 failure	
③	RAM failure	
④	A/D converter failure	
⑤	Printer failure	

9. SCHEMATIC DIAGRAMS AND ELECTRONIC PARTS LISTS.

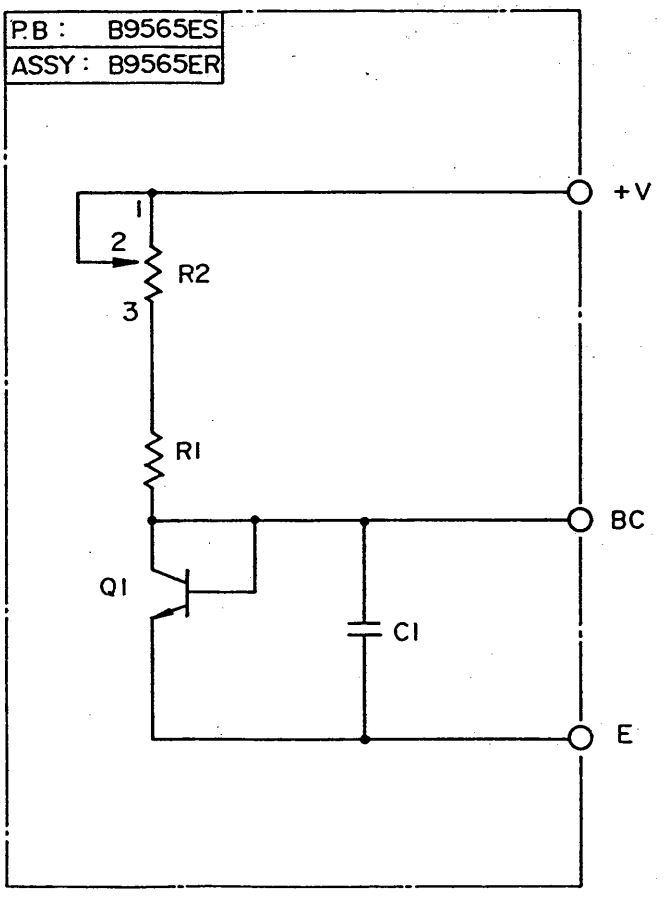
9-1. Wiring Diagrams.



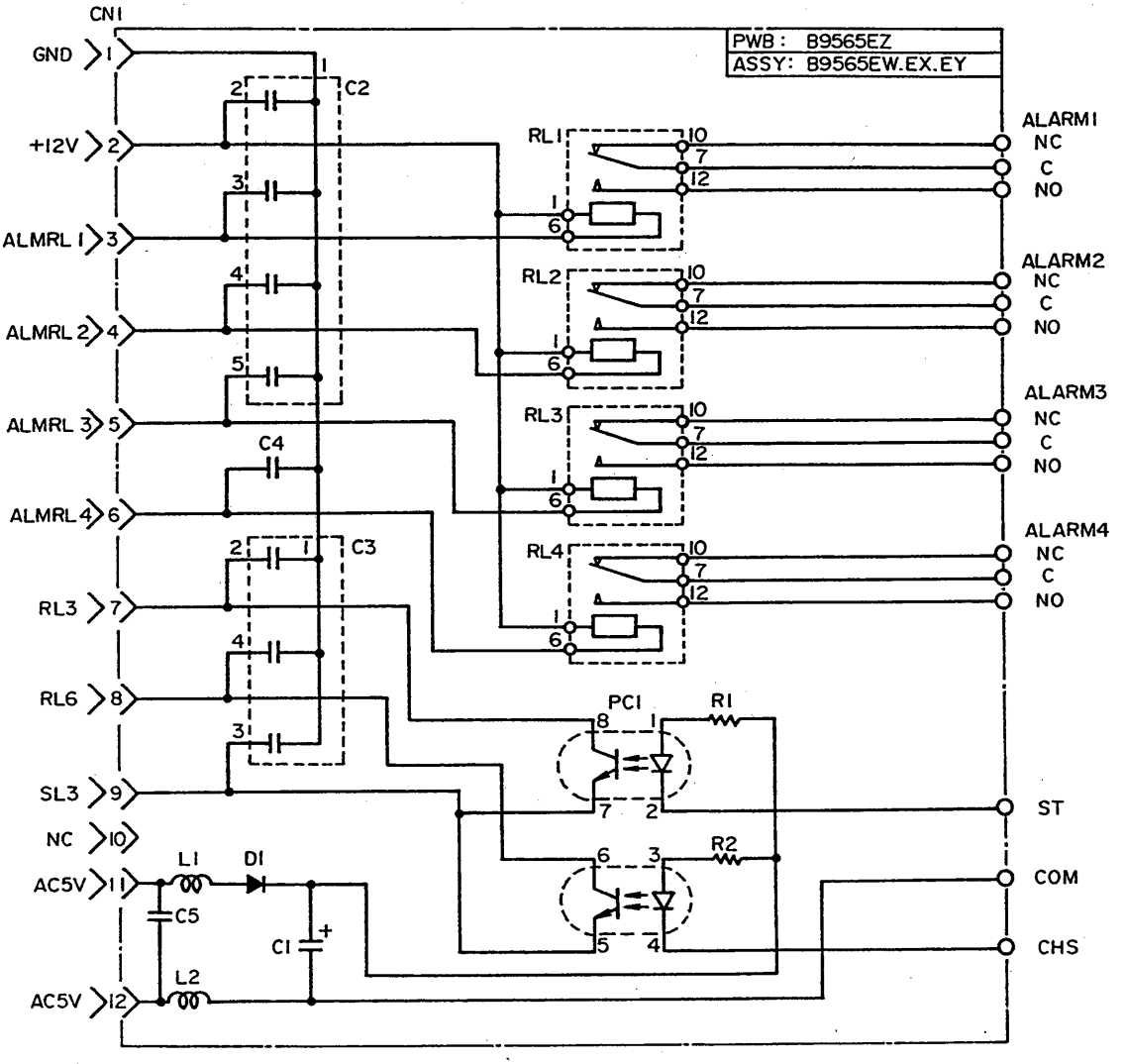
•1 : b: only for RTD input.
•2 : Not required for RTD input, but pins
20 and 21 of CN1 should be connected.


CPU BOARD ASSY
B9566TF
(B9566TG + B9566TJ)
CN4
WIRE DOT PRINTER
CN2
M2 CARRIAGE
CN3
RIBBON H·P
CARRIAGE H·P
K: Kathode
A: Anode
E: Emitter
C: Collector
CN1
M3 RIBBON SHIFT
CN12
CN13
M4 RIBBON FEED
CN8
M1 CHART
CN11
DISPLAY ASSY
B9565LA
INVERTER ASSY
B9565XJ
CN5
CN10
KEY SW ASSY
B9565GP
Ground (to swing bracket assembly fixing screw)
CN7
NO C NC
ALARM
ALM 1
ALM 2
ALM 3
ALM 4
ALARM BOARD ASSY
B9565 EW EX EY
ST
COM
CH-S
REM CHART
CHANG-SP
START/STOP
X1
CN3
CN6
BUZZAR
KEY LOCK BAT.
BLK
T1 TRANS
115V
(230V)
100
(200)
3 ORN
2 RED
1 BRN
0
SW1
F1
CN1
L1
L2
WHT/BRN
WHT/BRN
WHT
GRA
PRP
RED
5V
10V
8.6V
WHT/YEL
BLK/RED
WHT/GRN
WHT/BLU
14V
CT
14V
100V
B9566TS
200V
B9566TT
G1 BLK

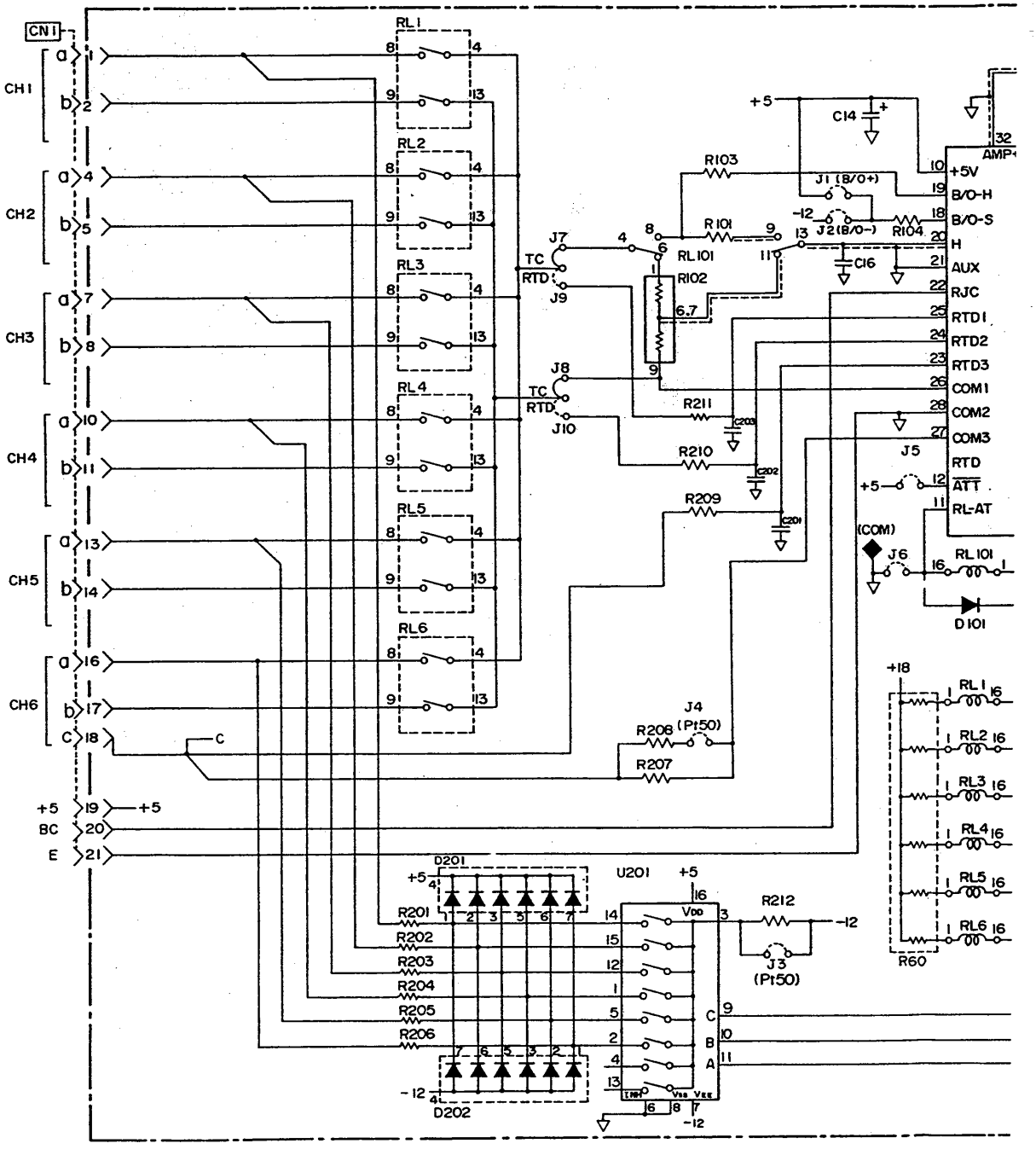
(1) RJC BOARD ASSY. (2) ALARI



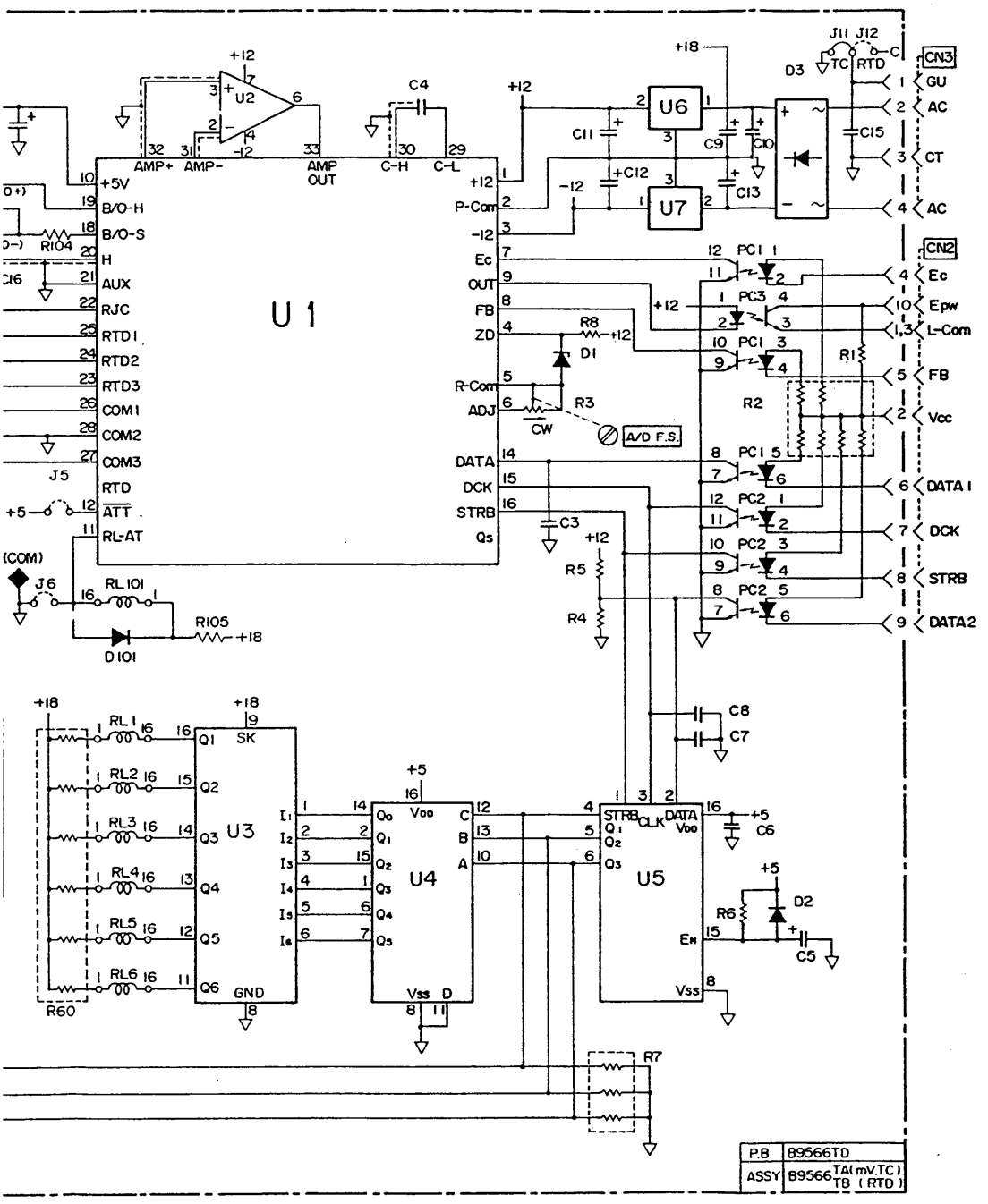
(2) ALARM BOARD ASSY.



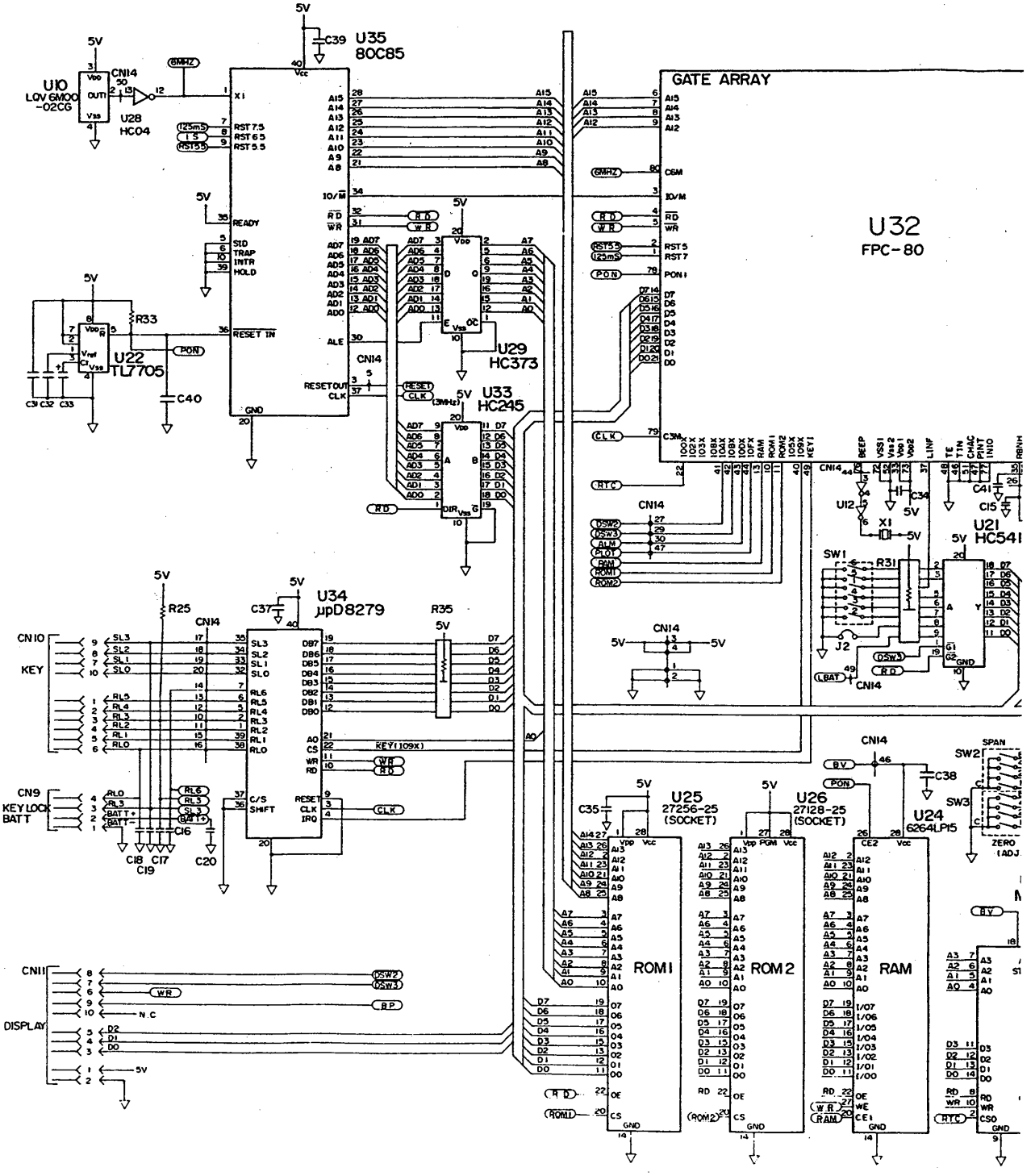
(3) A/D SCANNER BOARD ASSY.



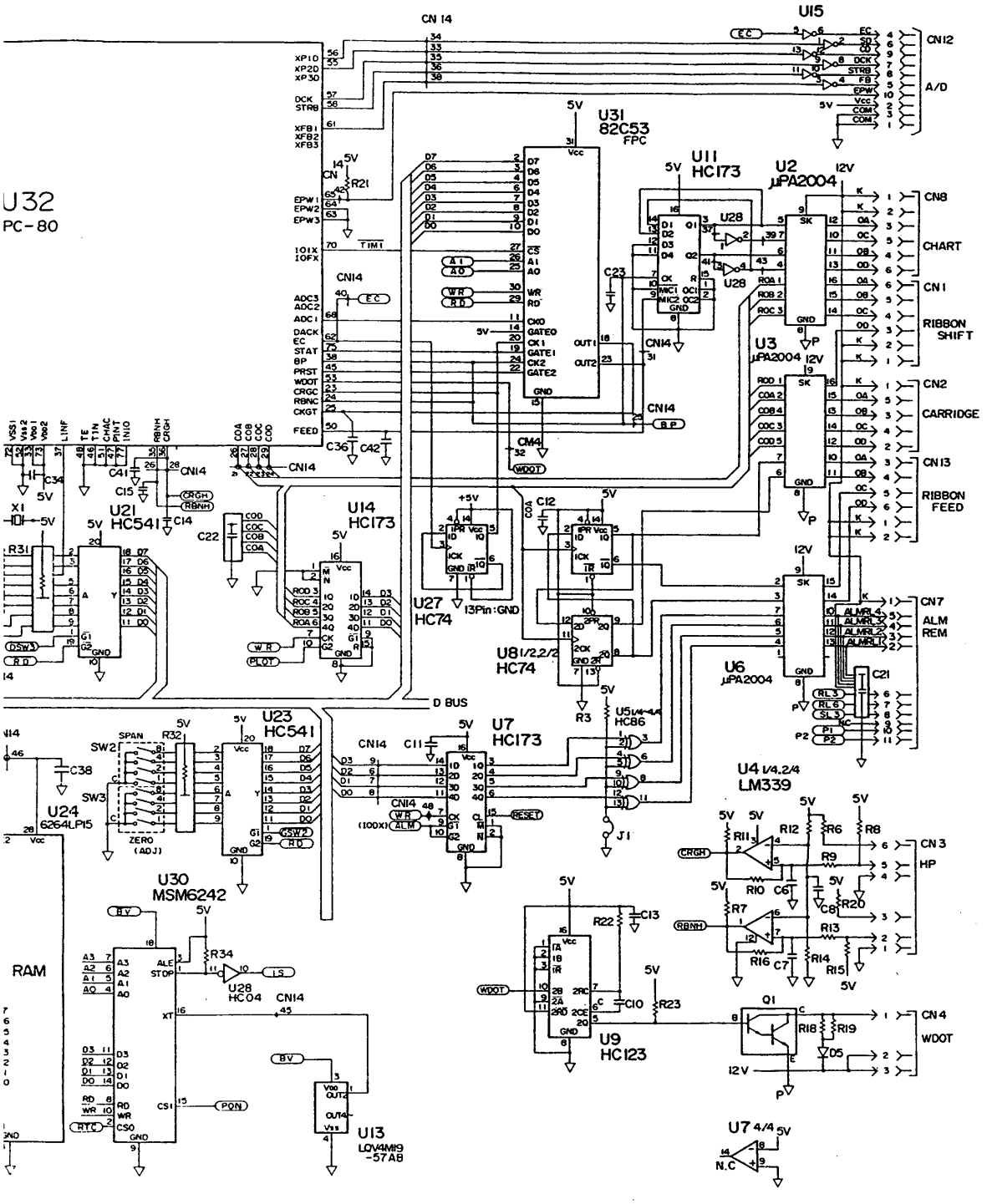
UNLESS OTHERWISE NOTED. ALL RESISTERS ARE METAL FILM RESISTERS, 1%, 1/4W, 50ppm/°C

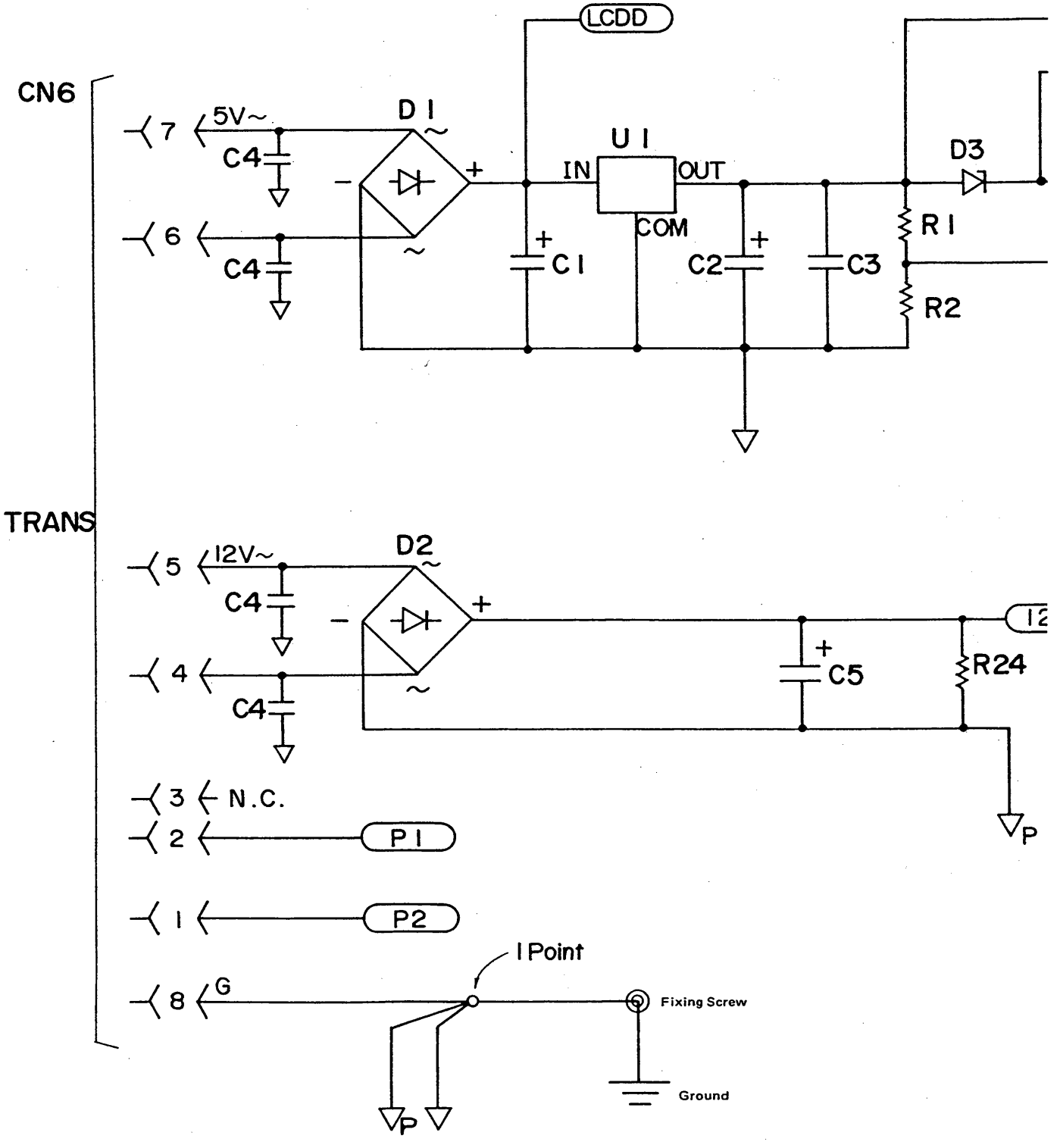

U1
U2
U3
U4
U5
U6
U7
+12
+18
+5
-12
C4
C3
C5
C6
C7
C8
C9
C10
C11
C12
C13
C15
R1
R2
R3
R4
R5
R6
R7
R8
R104
R105
R60
D1
D2
D3
D101
RL101
RL1
RL2
RL3
RL4
RL5
RL6
PC1
PC2
PC3
J5
J6
J11
J12
CN2
CN3
CW
A/D F.S.
(COM)
+5V
B/O-H
B/O-S
H
AUX
RJC
RTD1
RTD2
RTD3
COM1
COM2
COM3
RTD
ATT
RL-AT
AMP+
AMP-
AMP OUT
C-H
C-L
P-Com
R-Com
ADJ
FB
ZD
OUT
Ec
DATA
DCK
STRB
Qs
TC
RTD
GU
AC
CT
AC
Ec
Epw
L-Com
FB
Vcc
DATA1
DCK
STRB
DATA2
SK
GND
Voo
Vss
STRB
CLK
DATA
EN
P.B B9566TD
ASSY B9566TA(mV,TC)
TB (RTD)

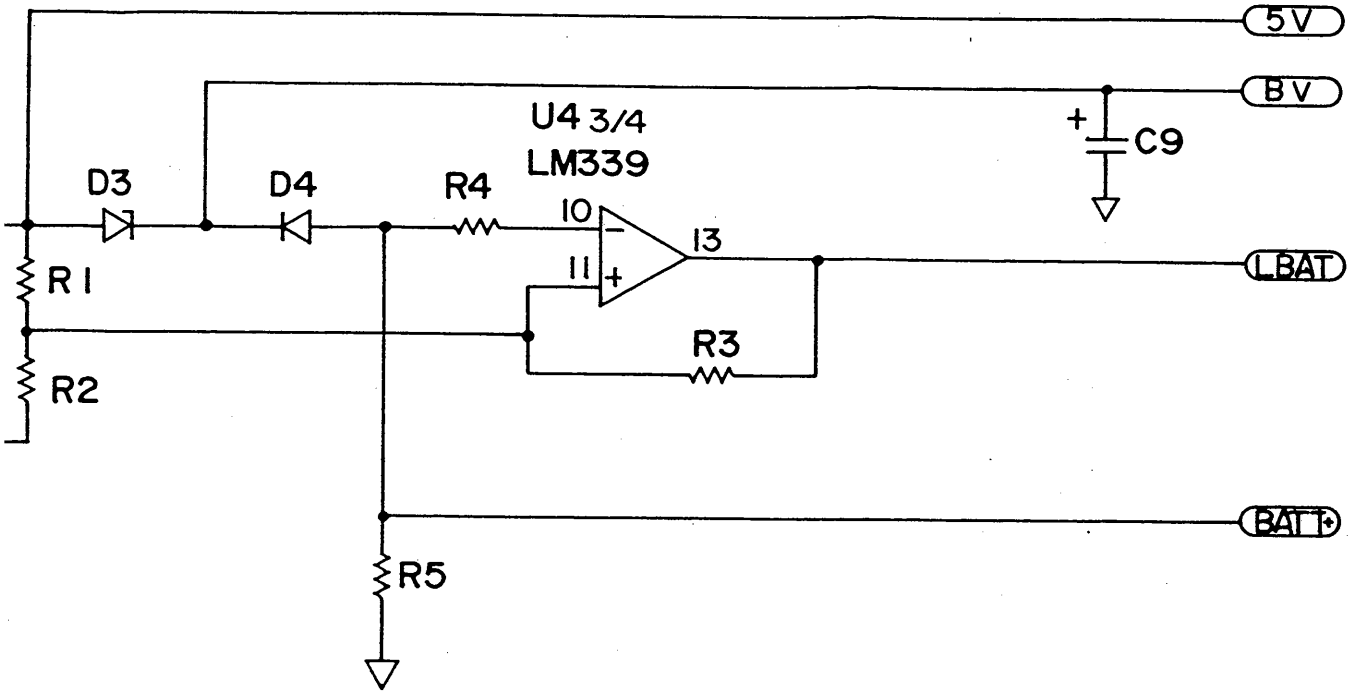
(4) ① 6P CPU1 BOARD ASSY.
② 6P CPU2 BOARD ASSY.

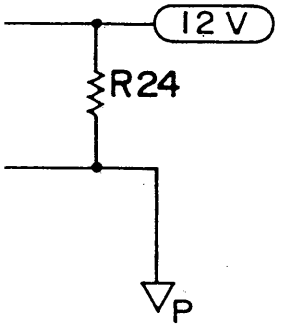


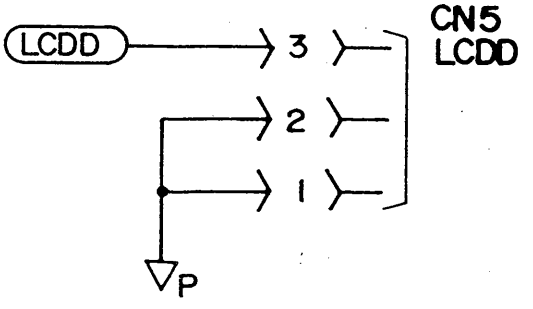
PWB	PCB.ASSY		CPU ASSY
B9566 TH(6P CPU2 BOARD ASSY.)	B9566 TG	U1 U15	B9566TF
B9566 TK(6P CPU1 BOARD ASSY.)	B9566 TJ	U21 U35	


U32
PC-80
CN 14
U15
CN12
A/D
U31
82C53
FPC
U11
HC173
U2
µPA2004
CN8
CHART
CN1
RIBBON SHIFT
U3
µPA2004
CN2
CARRIDGE
CN13
RIBBON FEED
CN7
ALM REM
U6
µPA2004
U21
HC541
U14
HC173
U27
HC74
13Pin:GND
U81/2/2/2
HC74
D BUS
U23
HC541
U7
HC173
U5 1/4-4/4
HC86
U4 1/4.2/4
LM339
CN3
HP
U24
6264LP15
RAM
U30
MSM6242
U28
HC04
U13
LOV4MI9
-57AB
U9
HC123
Q1
CN4
WDOT
U7 4/4
N.C

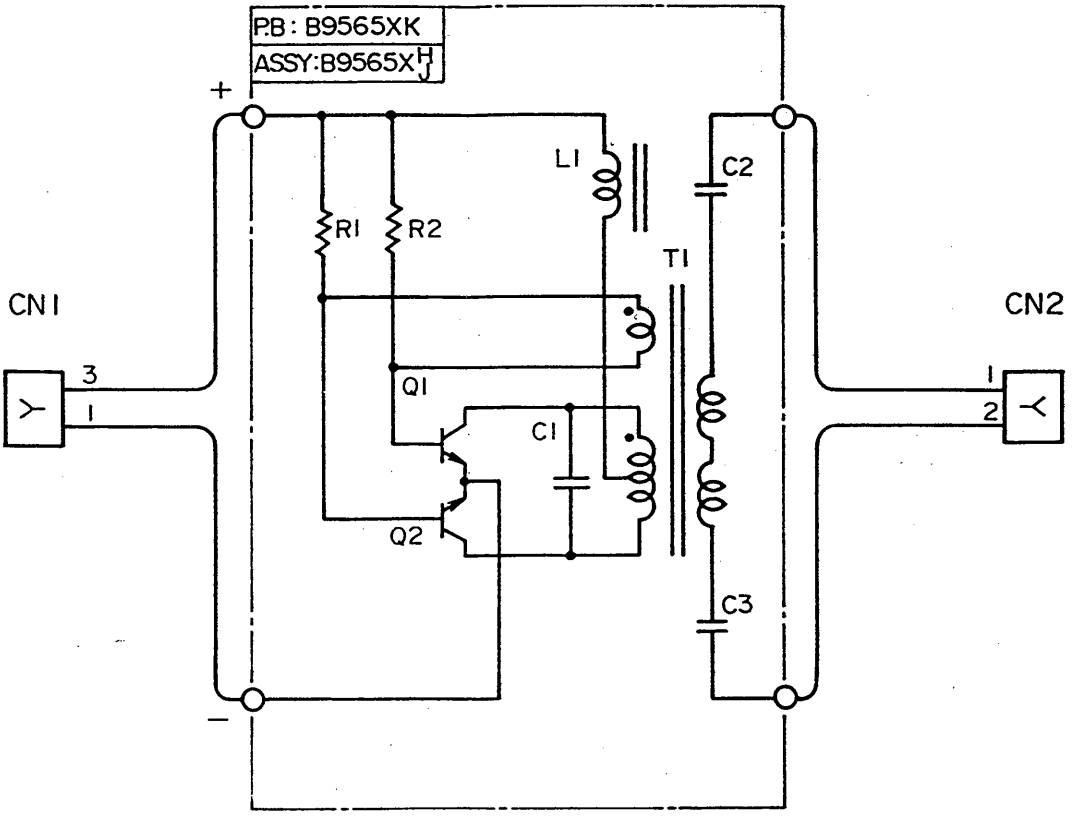

CN6
TRANS
7
6
5V~
C4
C4
D1
LCDD
U1
IN
OUT
COM
C1
C2
C3
D3
R1
R2
5
4
12V~
C4
C4
D2
C5
R24
12
P
3
N.C.
2
P1
1
P2
8
G
I Point
Fixing Screw
Ground
P


5V
BV
U4 3/4
LM339
C9
D3
D4
R4
10
11
13
R1
R2
R3
LBAT
BATT
R5


12V
R24
P


LCDD
3
2
1
CN5
LCDD
P

(5) INVERTER BOARD ASSY.



9-2. Electronic Parts Lists.

(1) RJC BOARD ASSY.

Item	Part No.	Description		
R1	B9566YM	Resistor: CB	50kΩ±50%	1/4W
R2	A9269RV	Resistor: VAR	50kΩ±20%	1/4W
C1	A9114CC	Capacitor: CERAMIC	0.1μF	50V
Q1	G9197HQ	Transistor: NPN	2SC943P	

(2) ALARM BOARD ASSY.

Item	Part No.	Description		
R1	A9049RG	Resistor: MF	1kΩ±1%	1/4W
R2	A9049RG	Resistor: MF	1kΩ±1%	1/4W
C1	A9413CA	Capacitor: AL	47μF	25V
C2	A9008CL	Capacitor: CERAMIC	0.001μFx8	50V
C3	A9008CL	Capacitor: CERAMIC	0.001μFx8	50V
C4	A9244CY	Capacitor: FILM	0.001μF	50V
C5	A9114CC	Capacitor: CERAMIC	0.1μF	50V
D1	A9248HD	Diode	1S953	
L1	A9009EC	Inductor	100μH	
L2	A9009EC	Inductor	100μH	
PC1	A9072HL	Photo Coupler	PC827	
CN1	A9573KP	CONN: PLUG	5045-12A	
RL1	A9251MR	Relay	DS1E-S-DC12V	
RL2	A9251MR	Relay	DS1E-S-DC12V	
RL3	A9251MR	Relay	DS1E-S-DC12V	
RL4	A9251MR	Relay	DS1E-S-DC12V	

(3) A/D SCANNER BOARD ASSY.

Item	Part No.	Description		
R212	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R201	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R202	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R203	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R204	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R205	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R206	A9071RG	Resistor: MF	8.2kΩ±1%	1/4W
R207	A9344RQ	Resistor: MF	300Ω±0.05%	1/10W
R60	A9108RL	Resistor: Module	300Ωx8	1/8W
C14	A9412CA	Capacitor: AL	22μF	16V
C6	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C15	A9114CC	Capacitor: CERAMIC	0.1μF	50V
D202	A9085HL	Diode: Module	μPA64H	
D201	A9084HL	Diode: Module	μPA54H	
D2	A9248HD	Diode:	1S953	
R6	B9566YM	Resistor: CB	51kΩ±5%	1/4W
R7	A9102RL	Resistor: Module	100kΩx4	1/8W
R8	A9073RG	Resistor: MF	10kΩ±10%	1/4W
U5	B9566ZL	IC: DIGITAL	4094 (NEC)	
U4	A9019LM	IC: DIGITAL	4028	
U3	A9096HL	IC: ANALOG	μPA2004C	
U201	A9060LM	IC: DIGITAL	4051	
RL1	A9250MR	RELAY	DS2VE-S-DC12V	
RL2	A9250MR	RELAY	DS2VE-S-DC12V	
RL3	A9250MR	RELAY	DS2VE-S-DC12V	
RL4	A9250MR	RELAY	DS2VE-S-DC12V	
RL5	A9250MR	RELAY	DS2VE-S-DC12V	
RL6	A9250MR	RELAY	DS2VE-S-DC12V	
CN3	A9295KP	CONN	5045-04A	
CN2	A9641KP	CONN	HLEM-10S-1	
CN1	A9645KP	CONN	PS-22PE-S4T1-PN1	
R103	A9630RK	Resistor: MG	47MΩ±5%	1/2W
R104	B9566YT	Resistor: CB	330kΩ±5%	1/4W
R101	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R102	A9142RL	Resistor: Module	1294 1/100ATT	
R209	A9041RG	Resistor: MF	470Ω±1%	1/4W
R210	A9041RG	Resistor: MF	470Ω±1%	1/4W
R211	A9041RG	Resistor: MF	470Ω±1%	1/4W
R105	B9566YA	Resistor: CB	330Ω±5%	1/4W
R4	B9566YC	Resistor: CB	1.2kΩ±5%	1/4W
R5	B9566YD	Resistor: CB	2.2kΩ±5%	1/4W
R3	A9383RV	Resistor: VAR	5kΩ±20%	1/4W
R2	A9125RL	Resistor: Module	470Ωx8±5%	1/8W
R1	A9053RG	Resistor: MF	1.5kΩ±1%	1/4W
R7	A9102RL	Resistor: Module	100kΩ±5%	1/8W
D101	A9248HD	Diode:	1S953	
D3	A9092HL	Diode: Module	1G4B41	
D1	A9211LA	Diode: BAND GAP	LT1009CZ	
U1	B9565LZ	HYBRID IC	MC-5642	
U2	A9188LA	IC	LT1012CN8	
U6	A9212LA	IC	TA78L012	
U7	A9213LA	IC	NJM79L12	
PC1	B9566ZH	Photo Coupler	TLP-521-3-GB	
PC2	B9566ZH	Photo Coupler	TLP-521-3-GB	
PC3	B9566ZG	Photo Coupler	TLP-521-1-GB	
RL101	A9250MR	RELAY	DS2VE-S-DC12V	
C5	A9412CA	Capacitor: AL	22μF	16V
C4	A9248CY	Capacitor: FILM	0.0047μF	50V
C11	A9412CA	Capacitor: AL	22μF	16V
C12	A9412CA	Capacitor: AL	22μF	16V
C9	A9422CA	Capacitor: AL	220μF	25V
C10	A9422CA	Capacitor: AL	220μF	25V
C13	A9413CA	Capacitor: AL	47μF	25V
C3	A9244CY	Capacitor: FILM	0.001μF	50V
C7	A9244CY	Capacitor: FILM	0.001μF	50V
C8	A9244CY	Capacitor: FILM	0.001μF	50V
C1	A9008CL	Capacitor: CERAMIC	0.001μFx8	50V
C201	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C202	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C203	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C16	A9245CY	Capacitor: FILM	1500pF	50V

(4) ① 6P CPU1 BOARD ASSY.

Item	Part No.	Description		
	B9566TK	P. BOARD		
R31	A9095RL	Resistor: Module	10kΩx8	1/8W
R32	A9095RL	Resistor: Module	10kΩx8	1/4W
R33	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R34	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R35	A9070RL	Resistor: Module	4.7kΩx8	1/8W
C31	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C32	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C33	A9411CA	Capacitor: AL	10μF	16V
C34	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C35	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C36	A9247CY	Capacitor: FILM	0.0033μF	35V
C37	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C38	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C39	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C40	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C41	A9245CY	Capacitor: FILM	0.0015μF	50V
C42	A9244CY	Capacitor: FILM	0.001μF	50V
U21	B9566ZK	IC 74HC541		
U22	A9438LB	IC TL7705		
U23	B9566ZK	IC 74HC541		
U24	A9031LD	IC 6264LP-15		
U27	A9014LN	IC 74HC74		
U28	A9003LN	IC 74HC04		
U29	A9066LN	IC 74HC373		
U30	A9046LC	IC MSM6242		
U31	A9047LC	IC 82C53		
U32	B9565LS	IC MB63H156 GATE ARRAY		
U33	A9052LN	IC 74HC245		
U34	A9145LM	IC μPD8279		
U35	A9030LC	IC MSM80C85(Socket)		
	A9628KP	IC Socket 28 pin For U25, U26		
	A9629KP	IC Socket 40 pin For U35		
SW1	A9146SS	SWITCH DNP6		
SW2	A9370SR	SWITCH S-1031		
SW3	A9370SR	SWITCH S-1031		
CN14	B9566ZM	CONN PS-50PA-D4T1-PKL		

② 6P CPU2 BOARD ASSY.

Item	Part No.	Description		
	B9566TH	P. BOARD		
R1	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R2	A9077RG	Resistor: MF	15kΩ±1%	1/4W
R3	A9104RG	Resistor: MF	200kΩ±1%	1/4W
R4	A9097RG	Resistor: MF	100kΩ±1%	1/4W
R5	A9137RG	Resistor: MF	4.7MΩ±1%	1/4W
R6	A9031RG	Resistor: MF	180±1%	1/4W
R7	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R8	A9080RG	Resistor: MF	20kΩ±1%	1/4W
R9	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R10	A9104RG	Resistor: MF	200kΩ±1%	1/4W
R11	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R12	A9077RG	Resistor: MF	15kΩ±1%	1/4W
R13	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R14	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R15	A9080RG	Resistor: MF	20kΩ±1%	1/4W
R16	A9104RG	Resistor: MF	200kΩ±1%	1/4W
R17	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R18	A9008RG	Resistor: MF	20Ω±1%	1/4W
R19	A9008RG	Resistor: MF	20Ω±1%	1/4W
R20	A9031RG	Resistor: MF	180Ω±1%	1/4W
R21	A9073RG	Resistor: MF	10kΩ±1%	1/4W
R22	A9093RG	Resistor: MF	68kΩ±1%	1/4W
R23	A9061RG	Resistor: MF	3.3kΩ±1%	1/4W
R24	A9097RG	Resistor: MF	100kΩ±1%	1/4W
R25	A9073RG	Resistor: MF	10kΩ±1%	1/4W
C1	A9419CA	Capacitor: AL	3300μF	16V
C2	A9416CA	Capacitor: AL	220μF	16V
C3	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C4	A9009CL	Capacitor: CERAMIC	1000pFx4	50V
C5	A9425CA	Capacitor: AL	2200μF	25V
C6	A9251CY	Capacitor: FILM	0.015μF	35V
C7	A9251CY	Capacitor: FILM	0.015μF	35V
C8	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C9	A9415CA	Capacitor: AL	100μF	16V
C10	A9252CY	Capacitor: FILM	0.022μF	50V
C11	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C12	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C13	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C14	A9247CY	Capacitor: FILM	0.0033μF	50V
C15	A9247CY	Capacitor: FILM	0.0033μF	50V
C16	A9244CY	Capacitor: FILM	0.001μF	50V
C17	A9244CY	Capacitor: FILM	0.001μF	50V
C18	A9244CY	Capacitor: FILM	0.001μF	50V
C19	A9244CY	Capacitor: FILM	0.001μF	50V
C20	A9114CC	Capacitor: CERAMIC	0.1μF	50V
C21	A9008CL	Capacitor: CERAMIC	1000pFx8	50V
C22	A9009CL	Capacitor: CERAMIC	1000pFx4	50V
C23	A9244CY	Capacitor: FILM	0.001μF	50V
D1	A9092HL	Diode 1G4B41		
D2	A9136HL	Diode 2D4B41		
D3	A9392HD	Diode S1S3M		
D4	A9248HD	Diode 1S953		
D5	A9358HD	Diode F114D		
Q1	A9405HQ	TSTR 2SD633		
U1	A9215LA	IC LM2940CT-5.0		
U2	A9096HL	IC μPA2004		
U3	A9096HL	IC μPA2004		
U4	A9019LA	IC LM339		
U5	A9018LN	IC 74HC86		
U6	A9096HL	IC μPA2004		
U7	A9082LN	IC 74HC173		
U8	A9014LN	IC 74HC74		
U9	A9022LN	IC 74HC123		
U10	A9105EX	IC LQV 6M00-02CG		
U11	A9082LN	IC 74HC173		
U12	A9003LN	IC 74HC04		
U13	A9104EX	IC LQV 4M19-57AB		
U14	A9082LN	IC 74HC173		
U15	A9003LN	IC 74HC04		

② 6P CPU2 BOARD ASSY.

Item	Part No.	Description	
CN1	A9303KP	CONN	5045-06A
CN2	A9315KP	CONN	5045-05A
CN3	A9303KP	CONN	5045-06A
CN4	A9244KP	CONN	5045-03A
CN5	A9244KP	CONN	5045-03A
CN6	A9305KP	CONN	5045-08A
CN7	A9360KP	CONN	5045-11A
CN8	A9303KP	CONN	5045-06A
CN9	A9295KP	CONN	5045-04A
CN10	A9641KP	CONN	HLEM10S-1
CN11	A9153KP	CONN	PS-10PA-D4T1-PN1-K
CN12	A9641KP	CONN	HLEM 10S-1
CN13	A9303KP	CONN	5045-06A
CN14	A9354KP	CONN	PS-50SD-D4TS1-1
X1	A9009ER	BUZZER	PB2215-BC
	B9566ZN	Socket	for F1
F1	B9566ZS	Fuse	0.315A T.L.

(5) INVERTER BOARD ASSY.

Item	Part No.	Description		
C1	A9365CY	Capacitor: FILM	0.068μF	63V
C2	B9566ZQ	Capacitor: CERAMIC	470pF	1kV
C3	B9566ZQ	Capacitor: CERAMIC	470pF	1kV
CN1	A9243KP	Connector	5051-03	
CN1	A9374KP	Contact	5159T	
CN2	A9566ZC	Connector	1625-02R	
CN2	A9566ZF	Contact	1855 TL	
L1	B9565XL	Inductor		
T1	B9565XM	Trans		
Q1	A9452HQ	Tester: NPN	2SC2235 O, Y	
Q2	A9452HQ	Tester: NPN	2SC2235 O, Y	
R1	A9053RG	Resistor:	1.5kΩ±1% 1/4W	
R2	A9053RG	Resistor:	1.5kΩ±1% 1/4W	
	G9012VN	WIRE		
	A9426XK	TUBE		

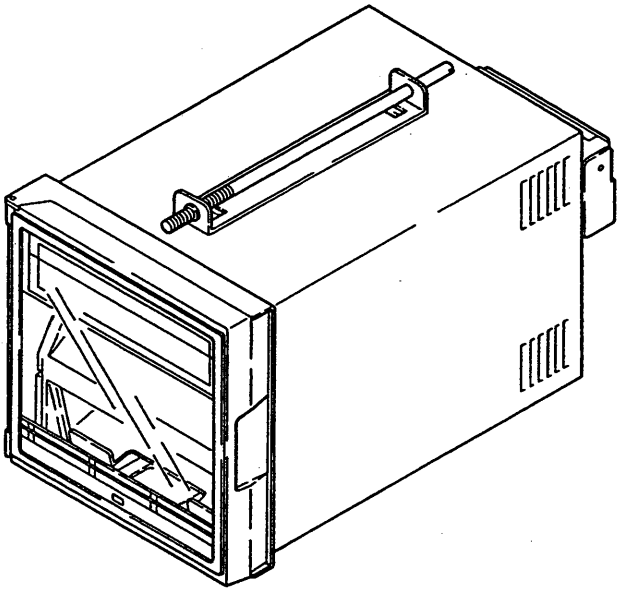
(6) DETECTOR BOARD ASSY.

Item	Part No.	Description
PI1	A9122HL	PHOTO INT.

Customer Maintenance Parts List

Model 4156
100 mm Micro Recorder

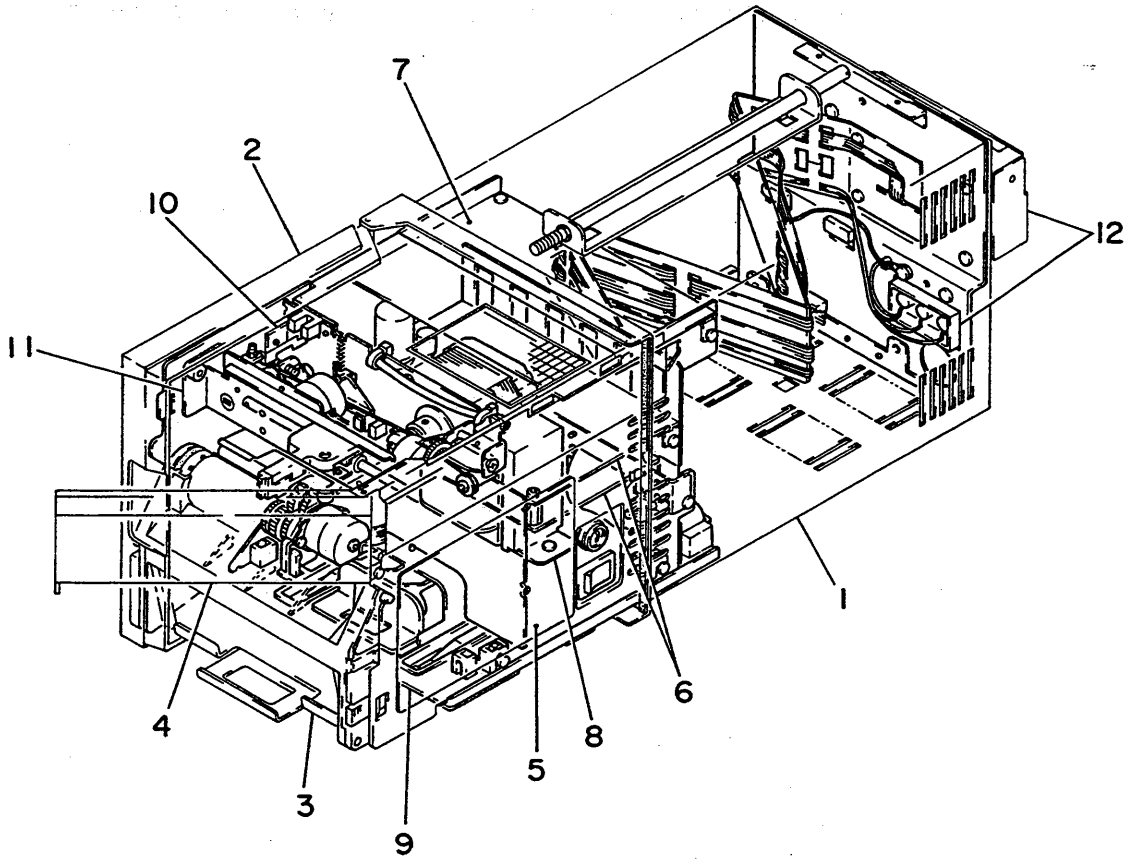
µR100



YOKOGAWA ◆
Yokogawa Electric Corporation

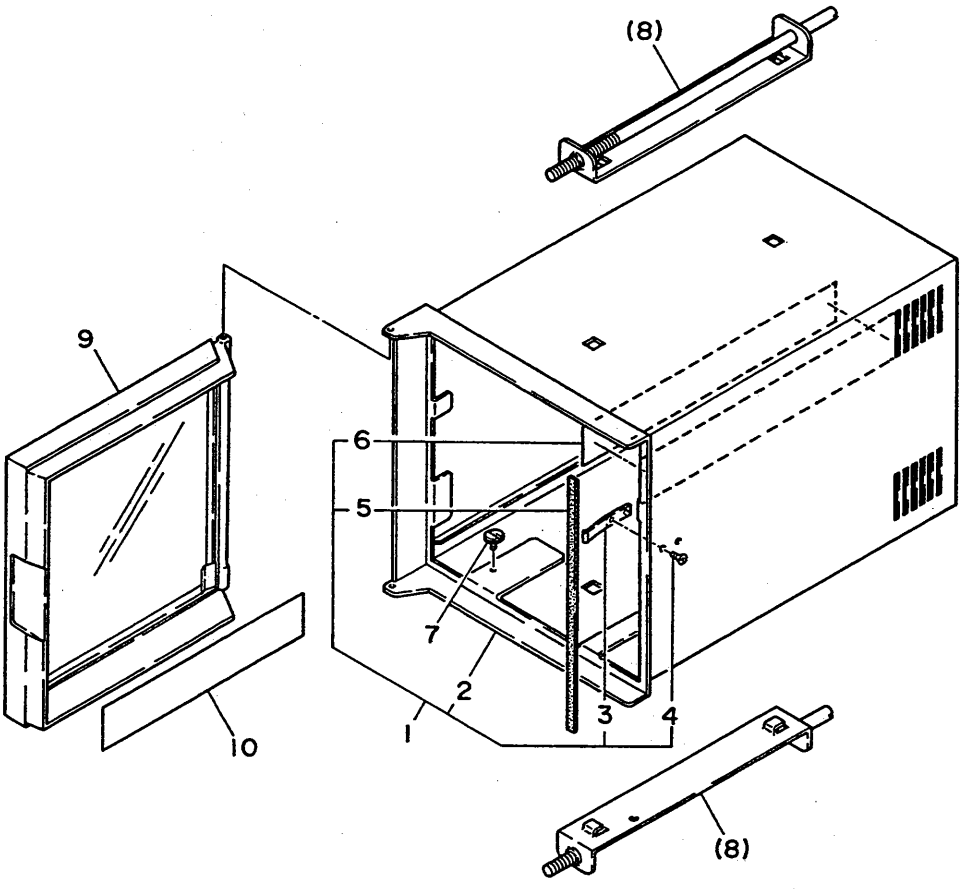
CMPL 4D2B4-01E

Complete Set



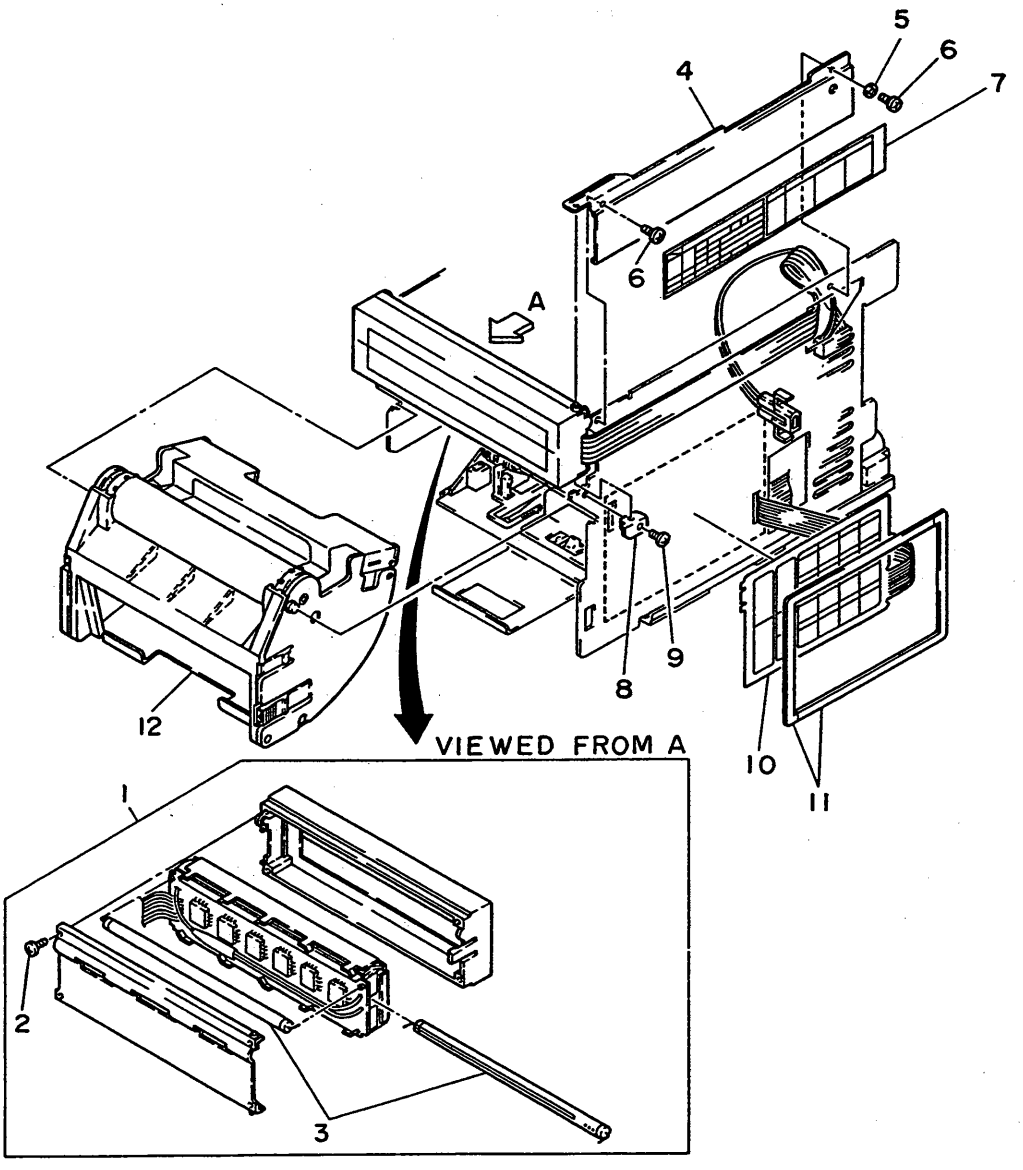
Item	Description	
1	Case Assembly	(see page 3)
2	Door Assembly	
3	Chart Cassette Assembly	(see page 4)
4	Display Assembly	
5	Keyboard Assembly	
6	CPU Board Assembly	(see page 5)
7	Scan PCB Assembly	
8	Transformer Assembly	(see page 7)
9	Chassis Assembly	
10	Frame Assembly	(see page 8)
11	Swing Bracket Assembly	
12	Terminal Assembly (see page 10)	
—	Portable Type (option) (see page 12)	
—	Standard Accessory (see page 13)	

Case and Door Assemblies



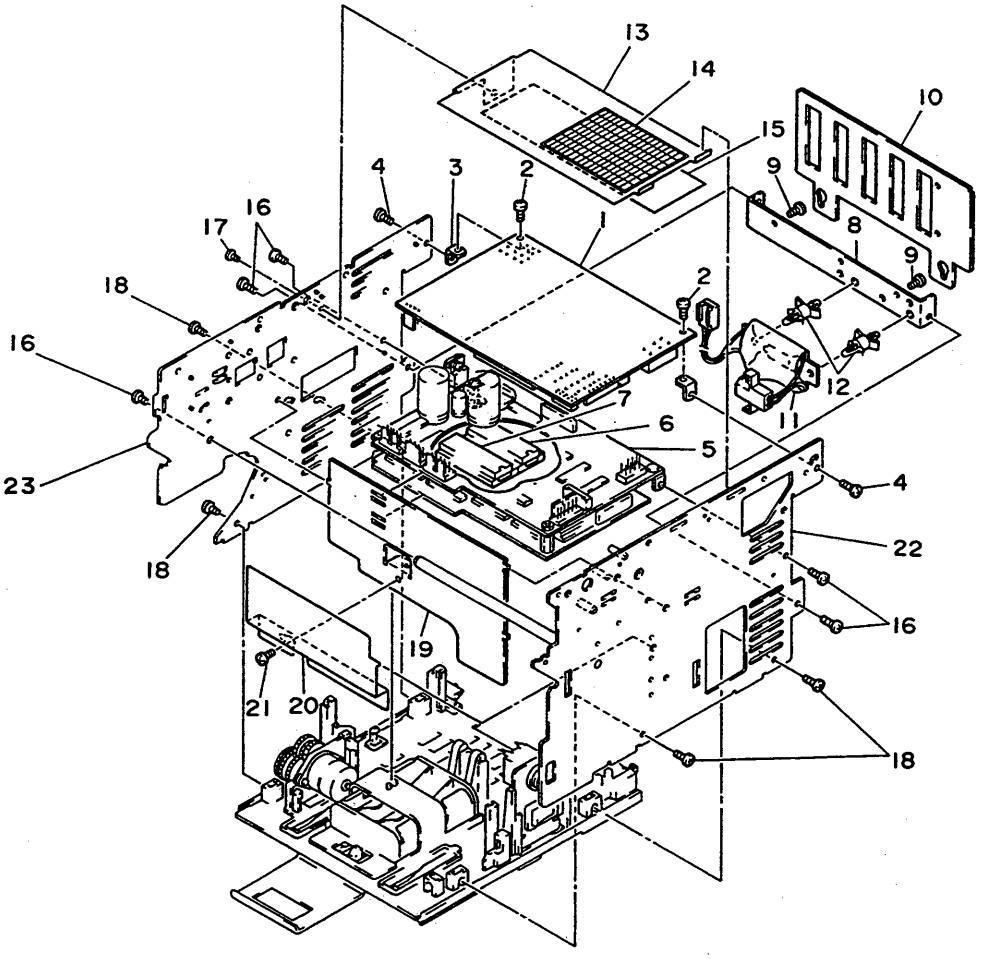
Item	Part No.	Qty	Description
1	B9567AA	1	Case Assembly
2	B9565CE	1	Case Assembly
3	B9565CD	1	Spring
4	B9565CW	2	Screw
5	B9565CB	1	Gasket
6	B9565CQ	1	Tape (length : 160 mm)
7	B9565AJ	1	Screw (for internal mechanism stopper)
(8)	B9565CR	2	Bracket Assembly (accessory)
9	B9567AF	1	Door Assembly
10	B9566BC	1	Nameplate

Chart Cassette and Display Assemblies



Item	Part No.	Qty	Description
1	B9565LA	1	Display Assembly
2	B9567AZ	4	Tapping Screw
3	B9565LD	2	Cold Cathode Fluorescent Lamp
4	B9565GJ	1	Cover
5	Y9231WL	1	Washer (with toothed lockwasher)
6	Y9203KE	2	B.H. Screw, M2.3 x 3
7	B9565GN	1	Nameplate (for °C) } (select)
	B9565GR	1	Nameplate (for °F)
	B9565GT	1	Nameplate (for DIN/DIN)
8	G9565GH	1	Bracket
9	Y9203KE	1	B.H. Screw, M2.3 x 3
10	B9565GP	1	Keyboard
11	B9565GM	2	Bezel
12	B9565KA	1	Chart Cassette Assembly

CPU Board, Scan Board and Inverter Assemblies



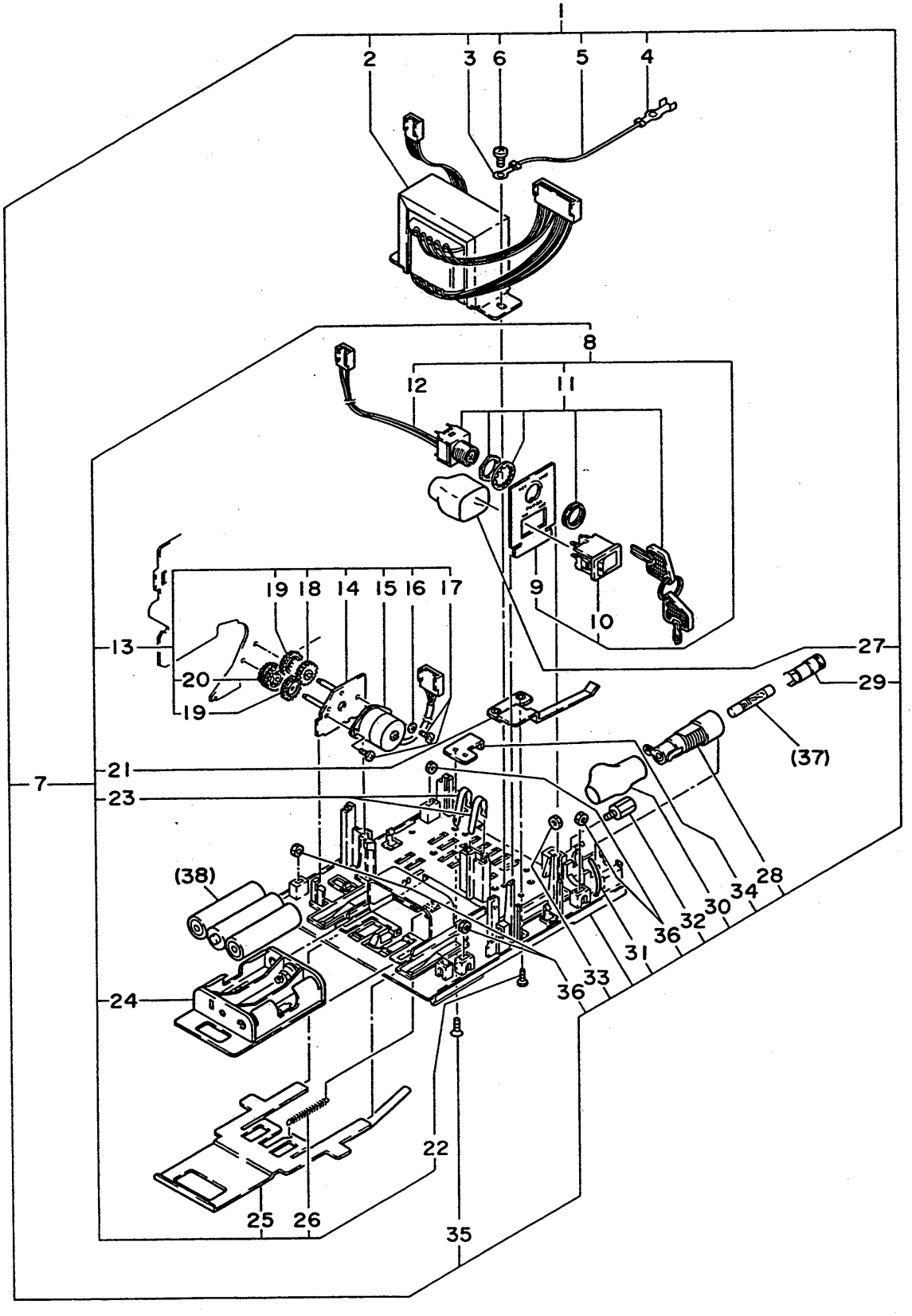
Item	Part No.	Qty	Description
1	B9566TA	1	Scan PCB Assembly (mV and TC inputs)
	B9566TB	1	Scan PCB Assembly (RTD input)
2	Y9304LE	2	B.H. Screw, M3 x 4
3	B9565LL	2	Bracket
4	Y9304LE	2	B.H. Screw, M3 x 4
5	B9566TF	1	CPU Board Assembly
6	See Note	1	ROM (1)
7	See Note	1	ROM (2)
8	B9565GL	1	Bracket
9	Y9306LE	2	B.H. Screw, M3 x 6
10	B9565GF	1	Bracket

Item	Part No.	Qty	Description
11	B9565XH	1	INV Assembly
12	G9320KH	2	Stud
13	B9566DS	1	Cover
14	B9565GQ	1	Nameplate
15	B9566DT	1	Plate (for insulator)
16	B9566AY	5	Screw
17	B9566CX	1	Screw
18	Y9306LE	4	B.H. Screw, M3 x 6
19	B9566DJ	1	Plate
20	B9566DK	1	Cover
21	B9566AY	1	Screw
22	B9566ED	1	Frame Assembly
23	B9565GB	1	Frame

Note

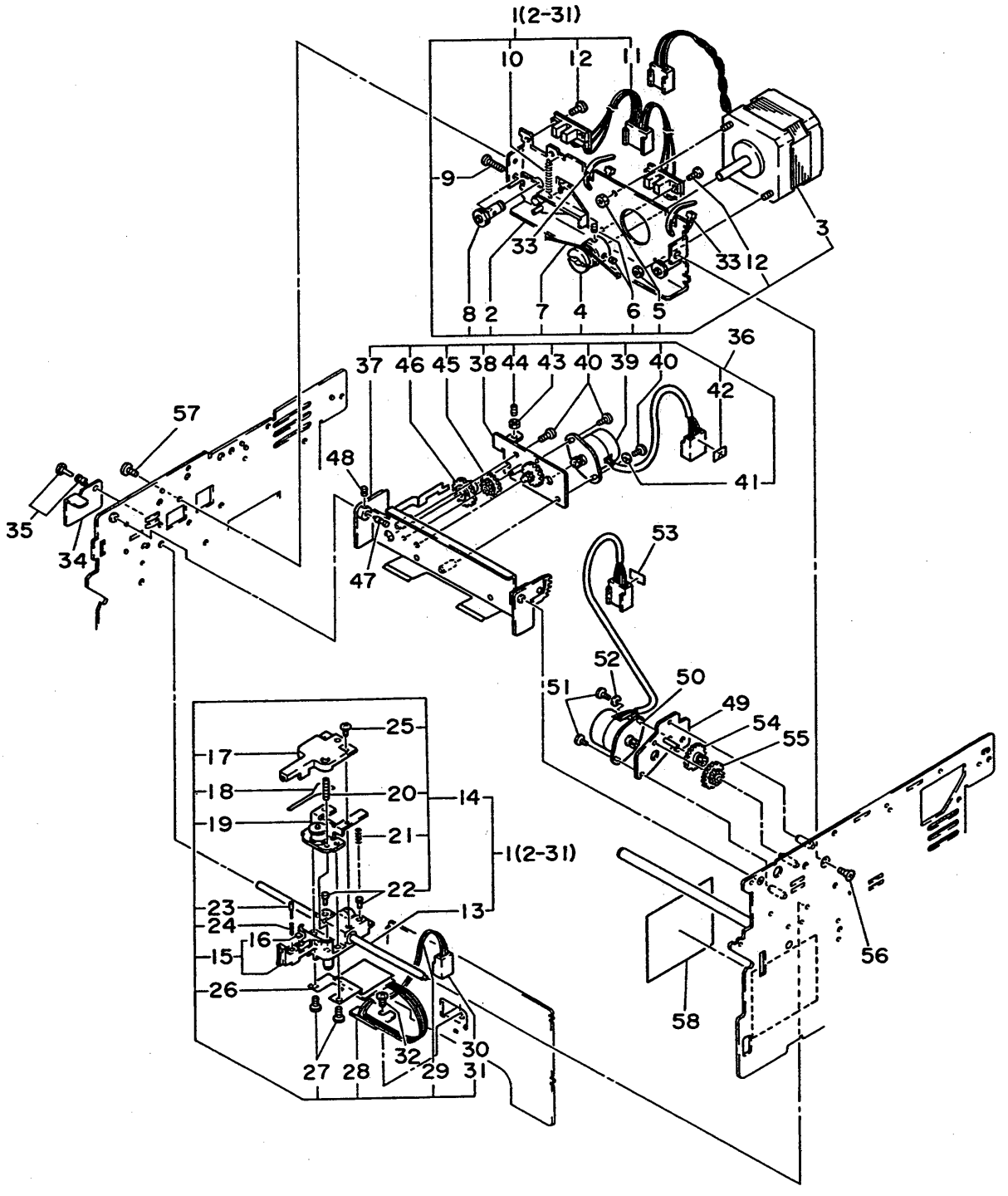
Model Code	Suffix Code	Inputs Types	ROM Part No.	ROM No.
4156	- 1 0 0	DC V & TC (ANSI & JIS), °C	B9566RA	1
	- 2 0 0	RTD (JIS), °C		
	- 3 0 0	DC V & TC (ANSI), °C		
	- 4 0 0	RTD (DIN), °C	B9566RB	2
	- 5 0 0	DC V & TC (ANSI), °F		
	- 6 0 0	RTD (DIN), °F		
	- 7 0 0	DC V & TC (DIN), °C	B9566RC	1
	- 8 0 0	RTD (DIN), °C	B9566RD	2

Chassis Assembly



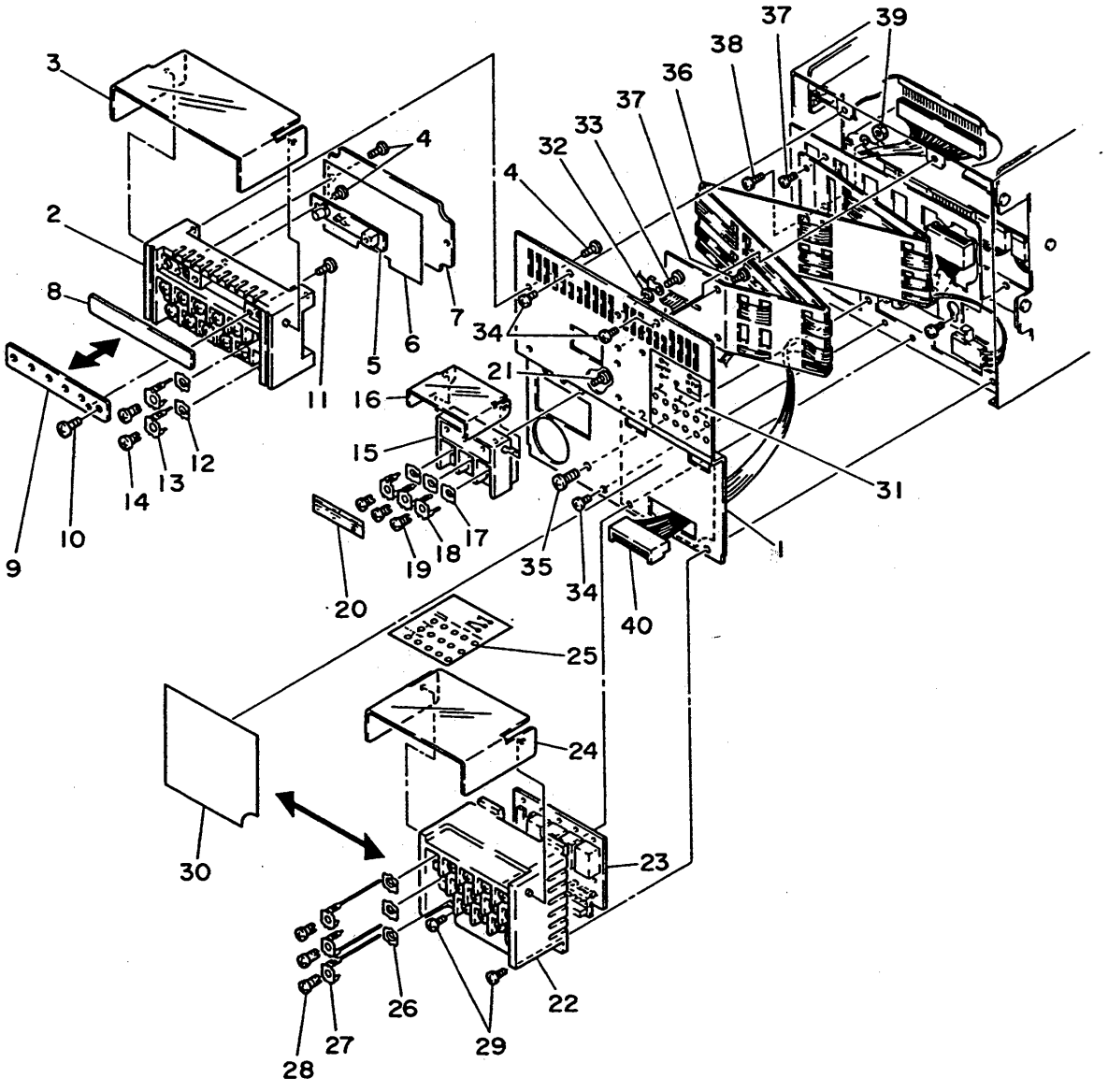
Item	Part No.	Qty	Description	
1	B9566JA	1	Chassis Assembly (100 V AC, series)	select
	B9566JB	1	Chassis Assembly (200 V AC, series)	
2	B9566TS	1	Transformer (100 V AC, series)	
	B9566TT	1	Transformer (200 V AC, series)	
3	Y9401TP	1	Tip	
4	Y9302TP	1	Tip	
5	A9181WW	1	Wire	
6	Y9406TS	2	Tapping Screw, M4 x 6	
7	B9565HA	1	Chassis Assembly	
8	B9565HN	1	Switch Assembly	
9	B9565HP	1	Panel	
10	B9708FH	1	Switch	
11	B9544ZA	1	Key Switch	
12	B9565HG	1	Wire Assembly	
13	B9565JA	1	Chart Drive Assembly	
14	B9565JE	1	Plate Assembly	
15	B9565JH	1	Motor Assembly	
16	Y9201WB	1	Washer	
17	Y9203JB	2	Pan H. Screw, M2.3 x 3	
18	B9565JD	1	Gear	
19	B9565JC	2	Gear	
20	B9565JB	1	Gear	
21	B9567AJ	1	Spring	
22	B9565AY	2	Screw	
23	B9565HF	2	Contact	
24	B9565HK	1	Battery Assembly	
25	B9565HW	1	Bracket Assembly	
26	A9023KN	1	Spring	
27	A9426XK	1	Tube	
28	A9072KF	1	Fuse Holder	
29	A9073KF	1	Fuse Carrier	
30	A9425XK	1	Tube	
31	B9565HE	1	Band	
32	B9565GS	1	Rod	
33	Y9401BB	1	Nut	
34	B9567AK	1	Bracket	
35	Y9305EB	1	F.H. Screw, M3 x 5	
36	Y9301BB	4	Nut	
(37)	A9049KF	1	Fuse (100 V AC series, 0.5 A time lag)	select (accessory)
	A9078KF	1	Fuse (200 V AC series, 0.315 time lag)	
(38)	A9024ED	3	Battery (accessory)	

Frame and Swing Bracket Assemblies



Item	Part No.	Qty	Description
1	B9566EH	1	Frame Assembly
2	B9566EJ	1	Frame Assembly
3	B9566EX	1	Motor Assembly
4	B9566EW	1	Pulley
5	Y9301BB	2	Nut
6	Y9304SJ	2	Setscrew
7	B9566EY	1	String Assembly
8	E9566ER	1	Bearing Assembly
9	Y9312LB	1	B.H. Screw, M3 x 12
10	A9027KN	1	Spring
11	B9566EZ	1	Detector Assembly
12	Y9306LE	4	B.H. Screw, M3 x 6
13	B9566DM	1	Shaft
14	B9566GA	1	Carriage Assembly
15	B9566HK	1	Carriage Assembly
16	B9566GR	1	Bumper
17	B9566GM	1	Cover Assembly
18	B9566GD	1	Plate Assembly
19	B9566HA	1	Coil Assembly
20	Y9312SK	1	Setscrew
21	A9028KN	1	Spring
22	B9566GK	2	Rod
23	B9566GG	1	Wire Assembly
24	B9566GF	1	Spring
25	Y9203KE	2	B.H. Screw, M2.3 x 3
26	B9566GC	1	Bracket
27	Y9304JB	2	Pan H. Screw, M3 x 4
28	B9566GZ	1	P. Board
29	G9006VN	1	Wire (length : 90 mm)
30	A9243KP	1	Connector Plug
31	A9374KP	2	Pin
32	Y9304LE	1	B.H. Screw, M3 x 4
33	B9566TZ	2	Band
34	B9566DD	1	Bracket
35	B9543SQ	1	Rivet
36	B9566FA	1	Swing Bracket Assembly
37	B9566FD	1	Bracket Assembly
38	B9566FP	1	Bracket
39	B9565JH	1	Motor Assembly
40	Y9203JB	3	Pan H. Screw, M2.3 x 3
41	Y9201JB	3	Washer
42	G9325DF	1	Nameplate
43	Y9301BB	1	Nut
44	Y9308SK	1	Setscrew
45	B9565JD	1	Gear
46	B9566FC	1	Gear
47	B9566DP	1	Shaft
48	Y9203SE	1	Setscrew
49	B9566HQ	1	Plate Assembly
50	B9565JH	1	Motor Assembly
51	Y9203JB	2	Pan H. Screw, M2.3 x 3
52	Y9201WB	1	Washer
53	G9325DG	1	Nameplate [Y]
54	B9566HT	1	Gear
55	B9565JD	1	Gear
56	Y9304EB	1	F.H. Screw, M3 x 4
57	B9565AY	1	Screw
58	B9565BF	1	Nameplate (data plate)

Terminal Assembly

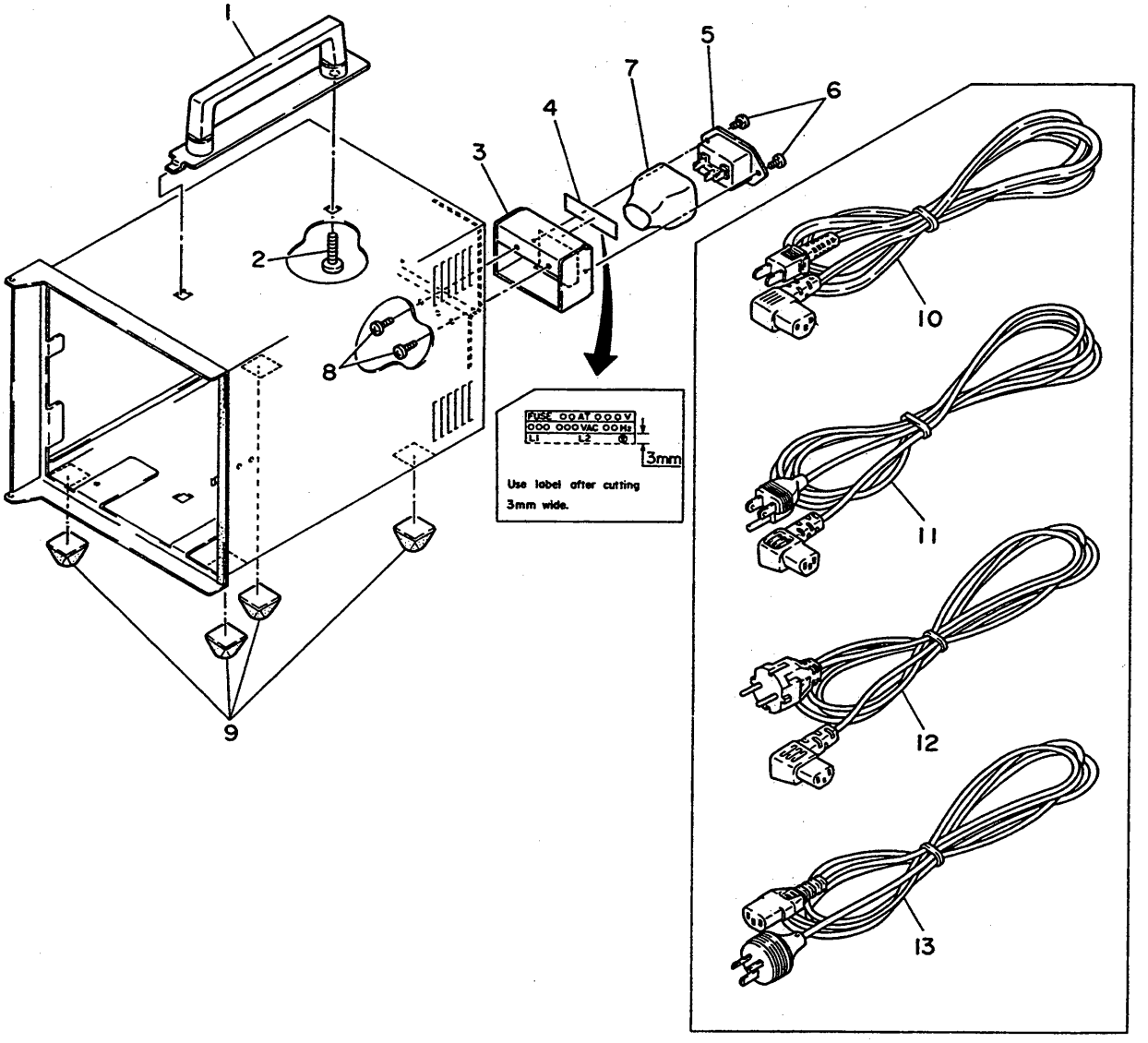


Item	Part No.	Qty	Description	
1	B9565EN	1	Panel	
2	B9565FA	1	Terminal	
3	B9565FP	1	Cover	
4	Y9310TS	3	Tapping Screw, M3 x 10	
5	B9565ER	1	PCB Assembly (for RJC) (mV & TC inputs)	
6	B9565FW	1	Plate	
7	B9565FH	1	Plate	
8	B9565FJ	1	Plate (for mV & TC inputs)	
9	B9566BF	1	Plate	} (for RTD input)
10	E9655FX	6	B.H. Screw, M4 x 6 (±)	
11	Y9304LB	1	B.H. Screw, M3 x 4	
12	B9565FB	12	Nut	
13	B9565FC	12	Bracket	
14	B9565AZ	12	Screw	
15	B9565FD	1	Terminal	} (for power supply)
16	B9565FK	1	Cover	
17	B9565FB	3		
18	B9656FC	3		
19	B9565AZ	3		
20	Below	—	Nameplate	
	B9565BK	1	100 V AC 50 Hz	} (select)
	B9565BL	1	100 V AC 60 Hz	
	B9565BM	1	115 V AC 50 Hz	
	B9565BN	1	115 V AC 60 Hz	
	B9565BP	1	200 V AC 50 Hz	
	B9565BQ	1	200 V AC 60 Hz	
	B9565BR	1	230 V AC 50 Hz	
	B9565BS	1	230 V AC 60 Hz	
21	Y9310TS	2	Screw	} (option)
22	B9565ET	1	Terminal	
23	B9565EW	1	PCB Assembly*1	
	B9565EY	1	PCB Assembly*2	
	B9565EX	1	PCB Assembly*3	
24	B9565FQ	1	Cover	
25	B9565FM	1	Nameplate	
26	B9565FB	3	Nut*2	} (option)
	B9565FB	12	Nut*1	
27	B9565FE	3	Bracket*2	
	B9565FE	12	Bracket*1	
28	B9565AZ	3	Screw*2	
	B9565AZ	13	Screw*1	
29	Y9306LE	2	B.H. Screw, M3 x 6	
30	B9565EP	1	Plate (for recorder without option terminal)	
31	B9566BD	1	Nameplate	
32	Y9301WL	1	Washer (with toothed lockwasher)	
33	Y9304LE	1	B.H. Screw, M3 x 4	
34	B9565AY	3	Screw	
35	Y9406LB	1	B.H. Screw, M4 x 6	
36	B9565FF	1	Guide	
38	Y9308LB	1	B.H. Screw, M3 x 8	
39	Y9301BB	1	Nut	
40	B9565FT	1	Wire Assembly	

Note:
*1: For Model 4156 □□□ . . . /AK-04
*2: For Model 4156 □□□ . . . . . /REM
*3: For Model 4156 □□□ . . . /AK-04/REM

Portable Type (option)

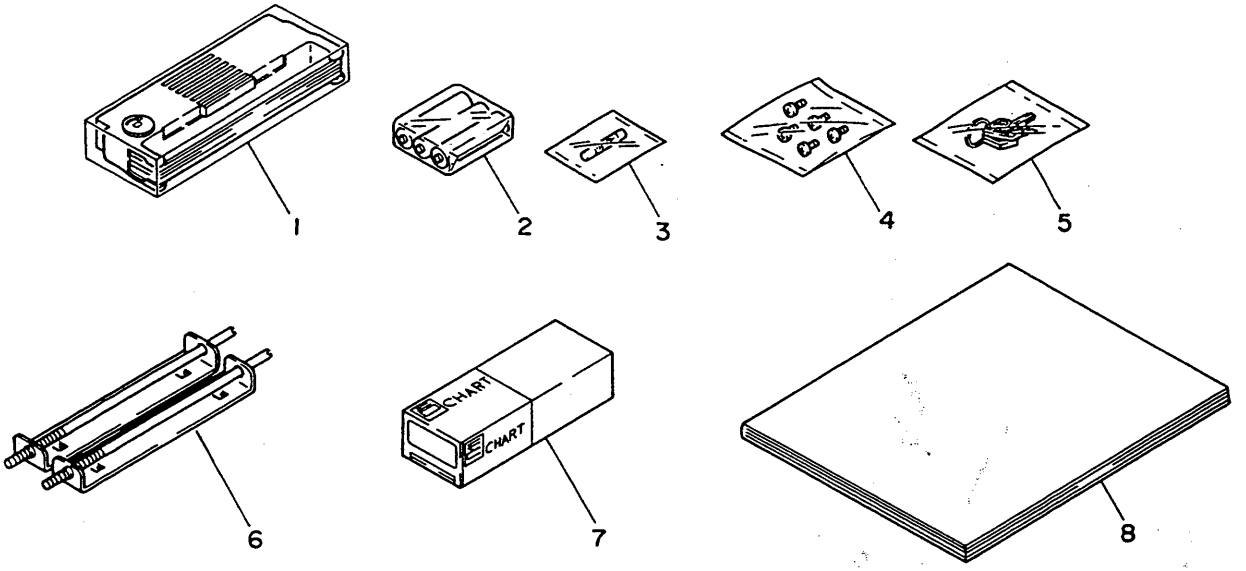
Model 4156·····/PBL



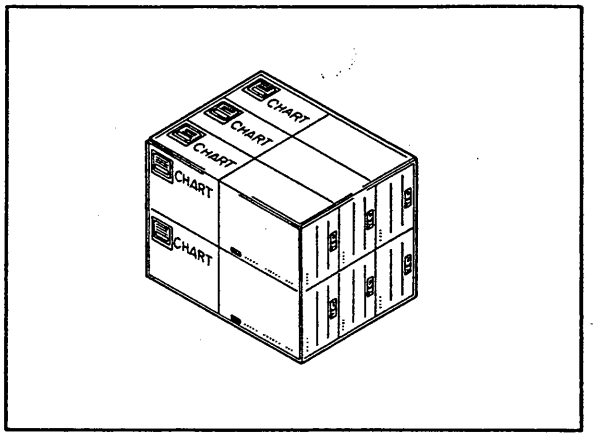
Item	Part No.	Qty	Description
1	B9567BA	1	Handle Assembly
2	Y9518LB	1	B.H. Screw, M5 x 18
3	B9567BG	1	Bracket
4	Below	–	Nameplate
	B9565BK	1	100 V AC 50 Hz
	B9565BL	1	100 V AC 60 Hz
	B9565BM	1	115 V AC 50 Hz
	B9565BN	1	115 V AC 60 Hz (select)
	B9565BP	1	200 V AC 50 Hz
	B9565BQ	1	200 V AC 60 Hz
	B9565BR	1	230 V AC 50 Hz
	B9565BS	1	230 V AC 60 Hz

Item	Part No.	Qty	Description
5	A9172KC	1	Connector
6	Y9306LE	2	B.H. Screw, M3 x 6
7	A9425XK	1	Tube
8	Y9306LK	2	B.H. Screw, M3 x 6
9	B9529LM	4	Bumper
10	A9009WD	1	Power Code (other than below)
11	A9008WD	1	Power Code (UL standard) (select)
12	A9011WD	1	Power Code (VDE standard) (select)
13	A9015WD	1	Power Code (SAA standard) (select)

Accessory



Item	Part No.	Qty	Description	
1	B9566DZ	1	Ribbon Cassette	
2	A9024ED	3	Battery	
3	A9049KF	1	Fuse (100 V AC series, 0.5 A, time lag)	(select)
	A9078KF	1	Fuse (200 V AC series, 0.315 A time lag)	
4	B9565AZ	5	Screw	
5	—	1	Key (see page 6)	
6	B9565CR	2	Bracket Assembly	
7	—	1	Chart*1	
8	—		Instruction Manual	



Note *1: Chart paper is supplied in packs of 6 sheaves — order part number B9565AW (one pack is the minimum order quantity).

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