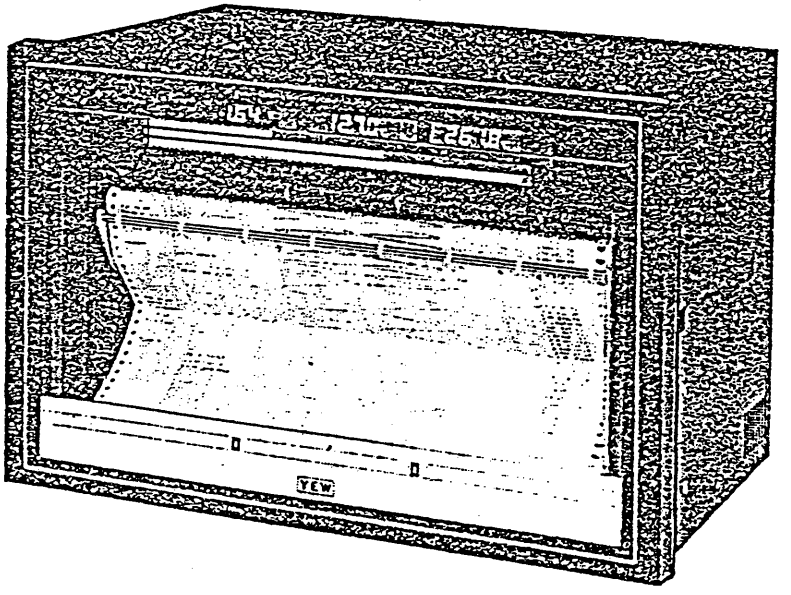
Service Manual

μR250

MODELS 4181, 4182, 4183

PEN RECORDER

(FOR FIELD SERVICE)



FCRY
05-E-001

YOKOGAWA

SW-4180-001 E

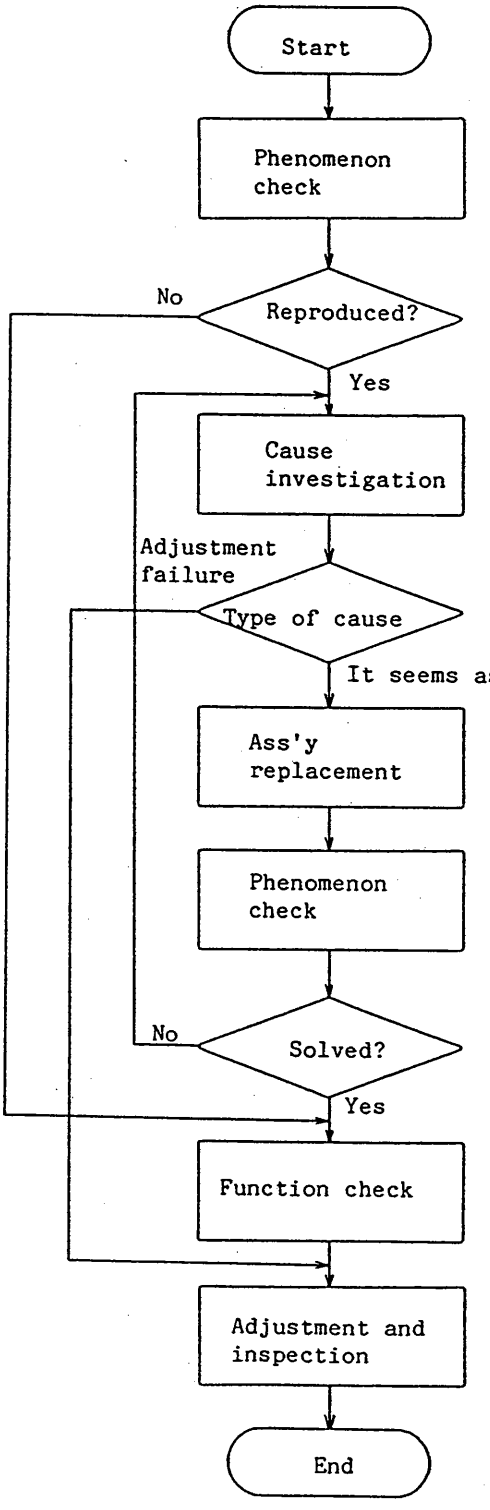
Models 4181, 4182 and 4183 Service Manual (for field service)

As a rule, a field service is made on a basis of Ass'y replacement. This service manual is used for the repair by Ass'y replacement.

Contents

1. Service Procedure Flow Chart

This flow chart is created on the assumption that the usual servicing procedure is followed when trouble occurs. While it does not apply to all problems, it is recommended that troubleshooting be conducted basically in accordance with this flowchart.



Is trouble pointed out on the basis of the customer conditions reproduced?

The cause is investigated from different angles such as a visual check, function check results, operation principle, etc.
2. Circuit Configuration and Troubleshooting (See page 3.)

3. Cautions Required for Ass'y Replacement (See page 14.)
4. Disassembly and Assembly Procedure (See page 20.)
9. Parts List (See page 87.)

Has the trouble pointed out been solved?

Simple function check after assembly
5. Functional Check after Assembly (See page 34.)

6. Mechanism Adjustment (See page 44.)
7. Electric Circuit Adjustment and Inspection (See page 50.)

MEMO

2. Circuit Configuration and Troubleshooting

This chapter is described to facilitate understanding of the outline of μ R250 (Models 4181, 2 and 3), and to assume the faulty ass'y from a trouble now occurring.

2.1 Principle of Operation

Figure 2.1 shows a block diagram of the pen-writing μ R180 recorders.

The recorder consists of analog and digital blocks, each of which is isolated by a photo-coupler. (Each channel is also isolated.)

- Analog block consists of ATT (attenuator), a pre-amplifier and an A/D converter.

  The integral A/D converter is used for noise rejection. Measured data is sampled at 125ms intervals per channel (Note).

  The first channel analog block is provided with an RJC (reference junction compensation circuit) which is used to give a reference junction compensation value when temperature is measured by thermocouple. (It is common to each channel).

Note: A/D converter integral time is set to 20 ms at 50 Hz and to 16.6 ms at 60 Hz for noise rejection. Sampling time interval is set to 125ms for each measurement in order to perform various operations such as zero correction and A/D converter full-scale correction and reference junction compensation.

■ The digital block mainly consists of a CPU(8085) and memory (ROM and RAM).

The CPU provides the following control and processing.

- o A/D converter control of each input channel
- o Linearization
- o Measured data operation (reference junction compensation, etc.)
- o Data input/output control to memory
- o A/D converter control
- o Chart feed pulse-motor control
- o Alarm processing
- o Plotter control
- o Display/keyboard control

(Phase synchronous recording control).....Optional

Digital data which has undergone the specified calculation processing is converted again to analog data by the D/A converter for recording on the recorder.

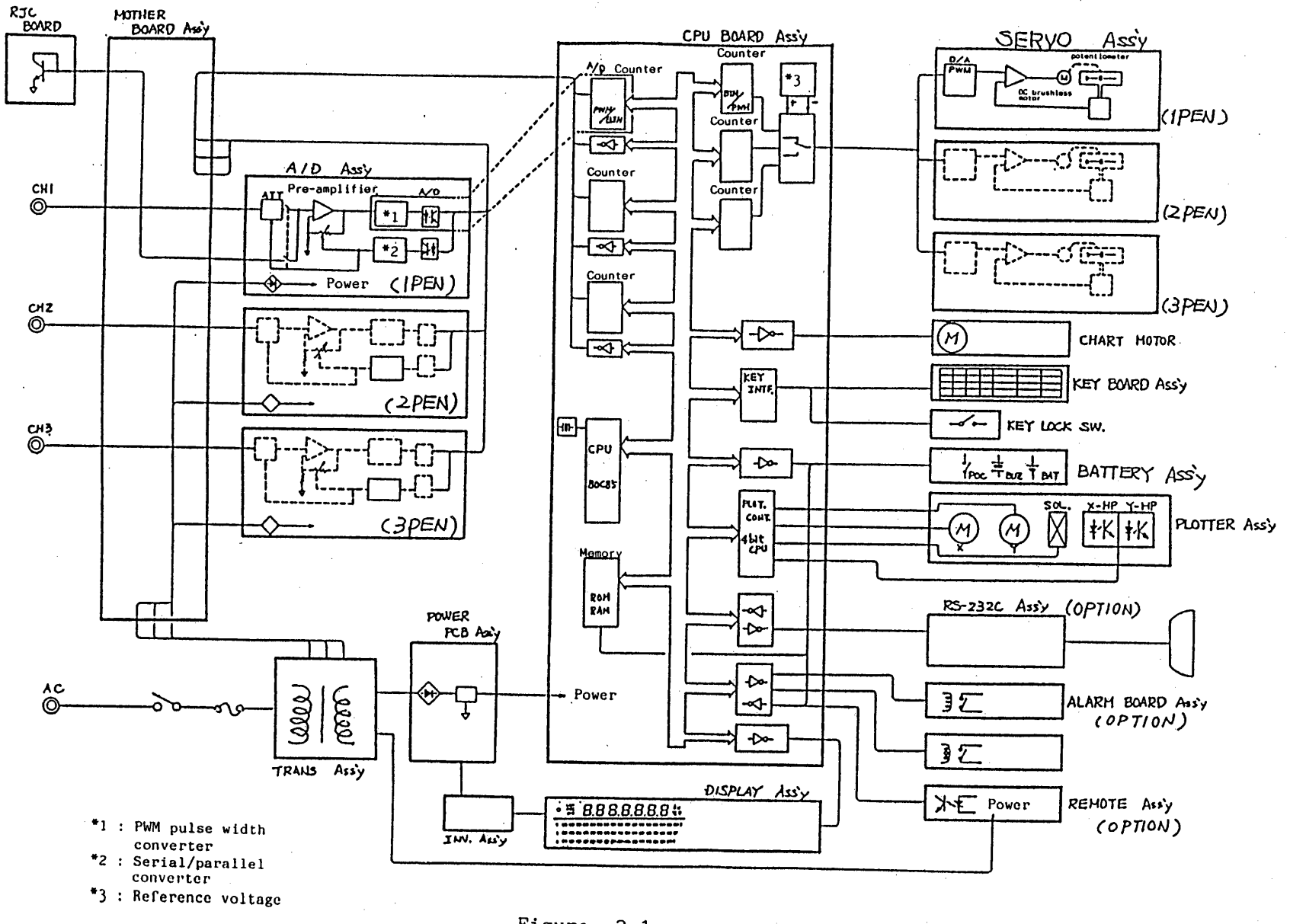

RJC BOARD
MOTHER BOARD Ass'y
CPU BOARD Ass'y
SERVO Ass'y
A/D Ass'y
Pre-amplifier
A/D
ATT
CH1
CH2
CH3
Power (1PEN)
(2PEN)
(3PEN)
A/D Counter
Counter
CPU
80C85
Memory
ROM
RAM
KEY INTF.
PLOT. CONT.
4bit CPU
D/A
PWM
potentiometer
DC brushless motor
CHART MOTOR
KEY BOARD Ass'y
KEY LOCK SW.
BATTERY Ass'y
PLOTTER Ass'y
SOL.
X-HP
Y-HP
RS-232C Ass'y (OPTION)
ALARM BOARD Ass'y (OPTION)
REMOTE Ass'y (OPTION)
AC
TRANS Ass'y
POWER PCB Ass'y
Power
INV. Ass'y
DISPLAY Ass'y
*1 : PWM pulse width converter
*2 : Serial/parallel converter
*3 : Reference voltage

Figure 2.1

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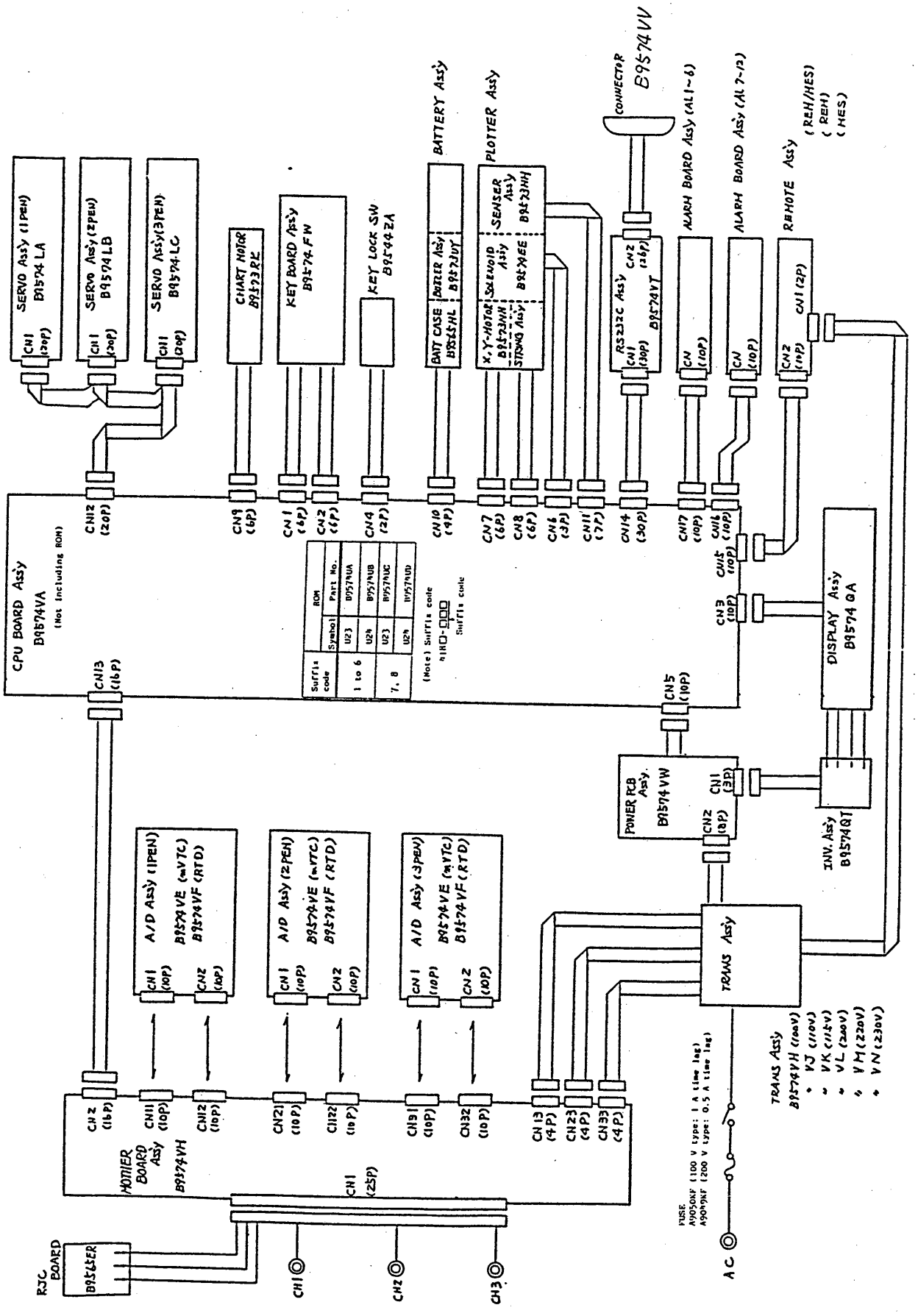
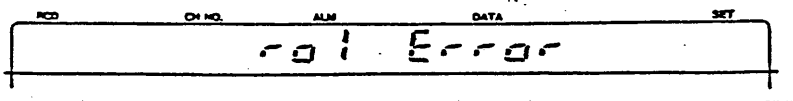
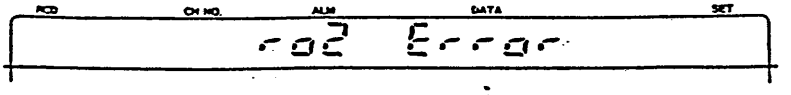
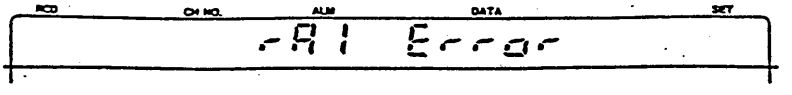
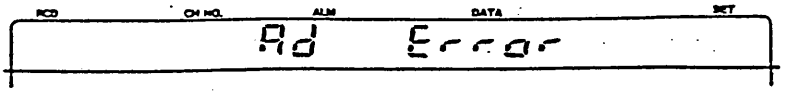
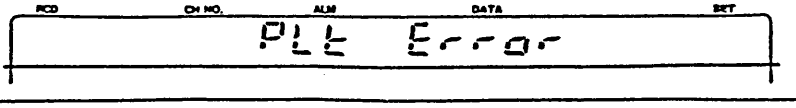
2.2 Electric Circuit Ass'y Configuration



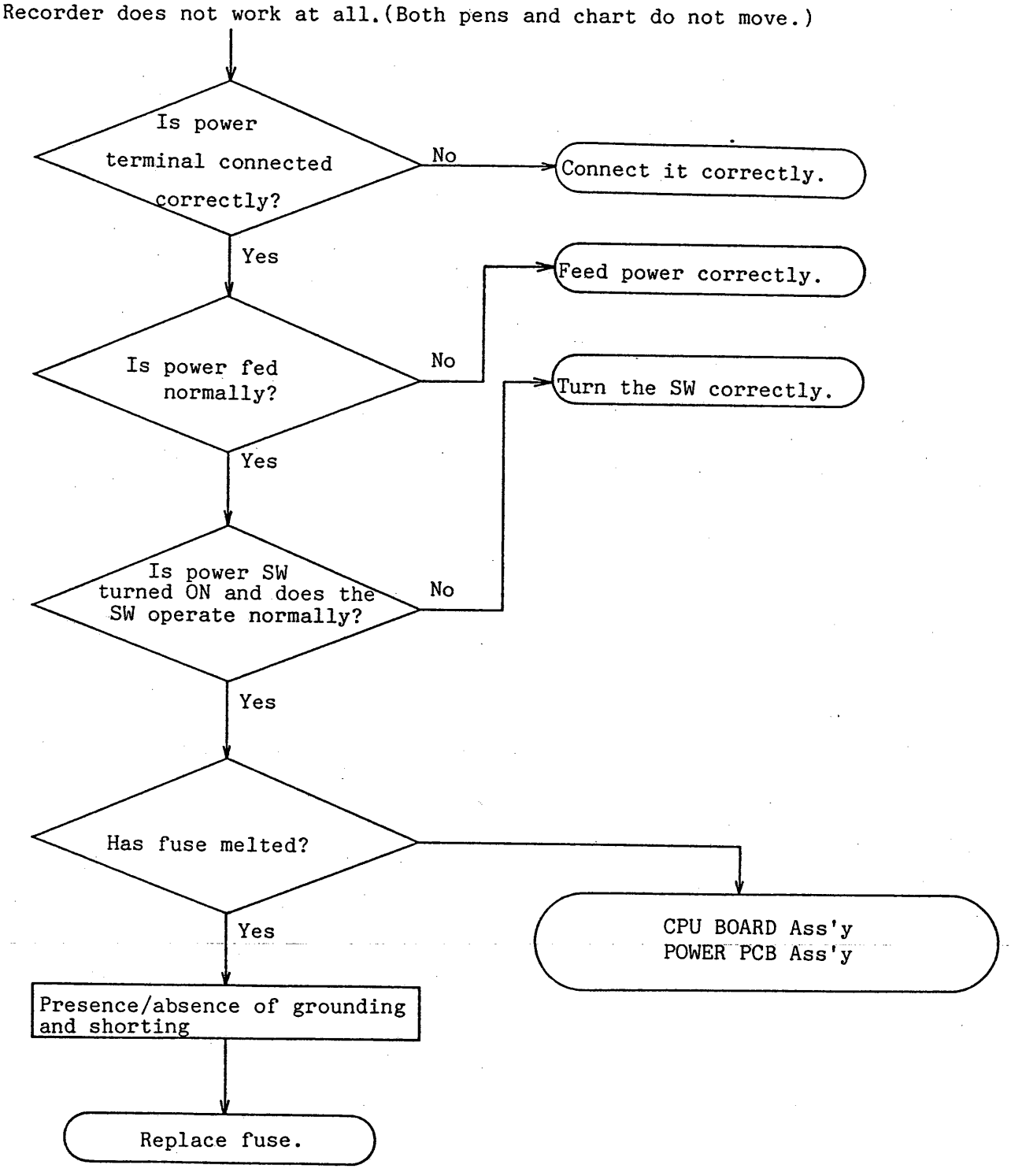
2.3 Self-test at Power-ON

This recorder automatically checks the abnormality of the specified items when the power is turned ON (Power switch is turned "ON")

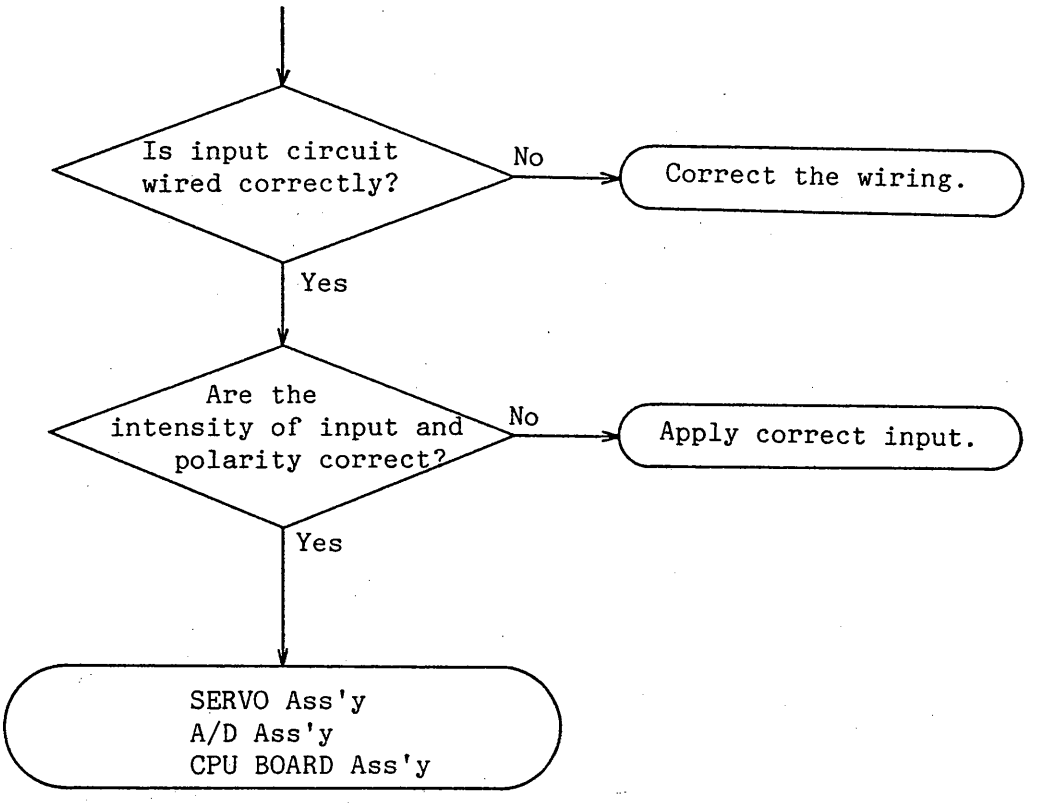
When the power switch is turned "ON", the recorder starts checking the following items in the order given in the following table. If any abnormality is found, the recorder displays the details of the abnormality. (If 2 or more abnormalities are detected, the details of the first abnormality are displayed and held and the succeeding abnormalities cannot be checked.)

Item	Display
ROM1 error (In CPU Board Ass'y)	
ROM2 error (In CPU Board Ass'y).	
RAM1 error (In CPU Board Ass'y)	
A/D controller error (In CPU Board Ass'y)	
Plotter error	

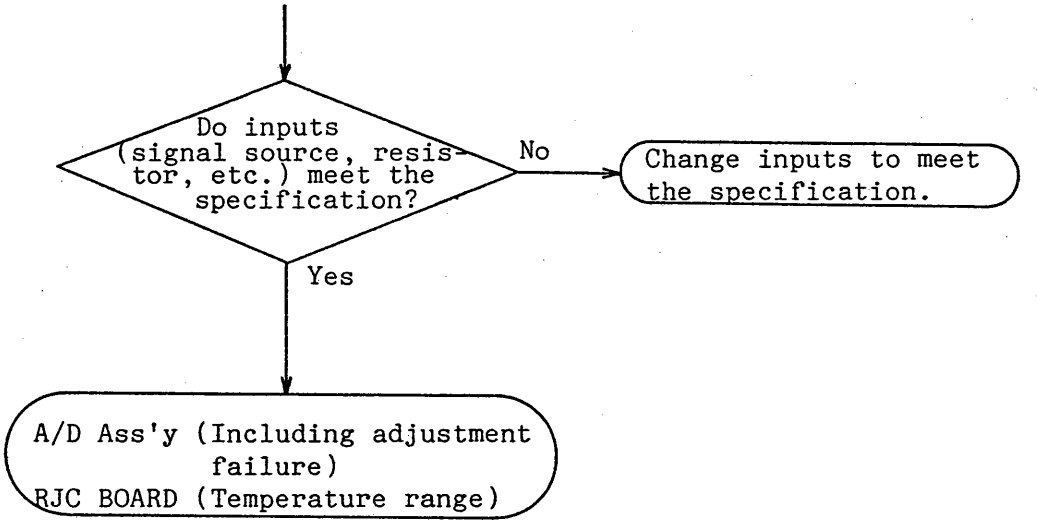
2.4 Troubleshooting Flow



A pen goes beyond the 0% or 100% limit.



Large error



2.5 Correspondence Table between Trouble and Faulty Ass'y.

	Trouble	Faulty Ass'y													Reference data
		POWER PCB Ass'y	A/D Ass'y	CPU BOARD Ass'y	SERVO Ass'y	DISPLAY Ass'y	INV. Ass'y	KEY BOARD Ass'y	PLOTTER Ass'y	RS232C Ass'y	ALARM BOARD Ass'y	REMOTE Ass'y	R/C BOARD	OTHERS	
Power ON	The recorder does not work at all.	△		○										FUSE	"Does not work at all" means that the following occur, either singly or in combination. . All the displays are ON or OFF or are wrong. . A key is not accepted. . A pen has gone beyond the 0% or 100% limit.
	rom1 Error			○											Contact failure is likely as the ROM is of the socket type.
	rom2 Error			○											
	ram Error			○											
	Ad Error		△	○											
	PLt Error (The plotter pen does not move.)			○					○					SENSER Ass'y X.Y-MOTOR In PLOTTER Ass'y	When power is turned ON, the plotter is initialized. Plotter initialization means that the plotter pens move to their home positions. In this case, if a signal indicating detection of the home position is not transmitted from the sensor Ass'y to the CPU Board Ass'y, an error is caused.
Display	A specific segment does not appear.					○									
	No displays appear.			○		○	○								The μR250 uses LCD displays in which cold cathode lamps are used to light up LCDs from the back of the unit to make them visible because the LCDs themselves do not light up.
Key	A specific key is not accepted.							○							Repetitive connection/disconnection of the key board Ass'y connector may cause the pattern to peel off, resulting in contact failure. (Specification : No trouble occur when the connector is connected/disconnected 10 times or more.) Make sure that key lock is not made.
	No keys are accepted.			○				○							
Error	Noticable display indication error		○	△											If an error is not liminated by full AD adjustment, the Ass'y should be replaced.
	A recorded value shows a noticable error even though display indication is normal.			△	○										If an error is not eliminated by span adjustment, the Ass'y should be replaced.
	Only the thermocouple range shows a noticable error.												○		
Pen	Pen movement exceeds the 0% or 100% limit.		△	△	○										
	Pen movement is too slow.				○										
	Span adjustment is not available.			△	○										
Batt	Battery backup is not available.			○											Turning the power ON with the CPU board Ass'y SW2 (DIP SW) mV TC/RTD changed over clears the previously set data.
	The battery alarm is not generated.			○											
CHART	Chart does not feed. A large error in feed			○										CHART MOTOR	
Option	Alarm relay cannot be turned ON/OFF.			○							○				
	Remote control is not available.			○								○			
	RS-232C does not output data or no setting is available.			○						○					A faulty program (on the personal computer side) and faulty DIP SW setting are likely causes of communication errors and should be checked.

○ ··· Very high trouble probability

△ ··· High trouble probability

No mark ··· Low trouble probability

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3. Cautions Required for Ass'y Replacement

This chapter describes Ass'y replacement cautions.
The connection of jumper wires within the Ass'y varies with the Model No. and the presence or absence of options.
Therefore, the greatest care must be taken in replacing the Ass'y, prior to starting replacement.

3.1 A/D Ass'y

(1) A/D Ass'y types

Two types of A/D Ass'y are available, so make sure you use the right one when replacing the Ass'y.

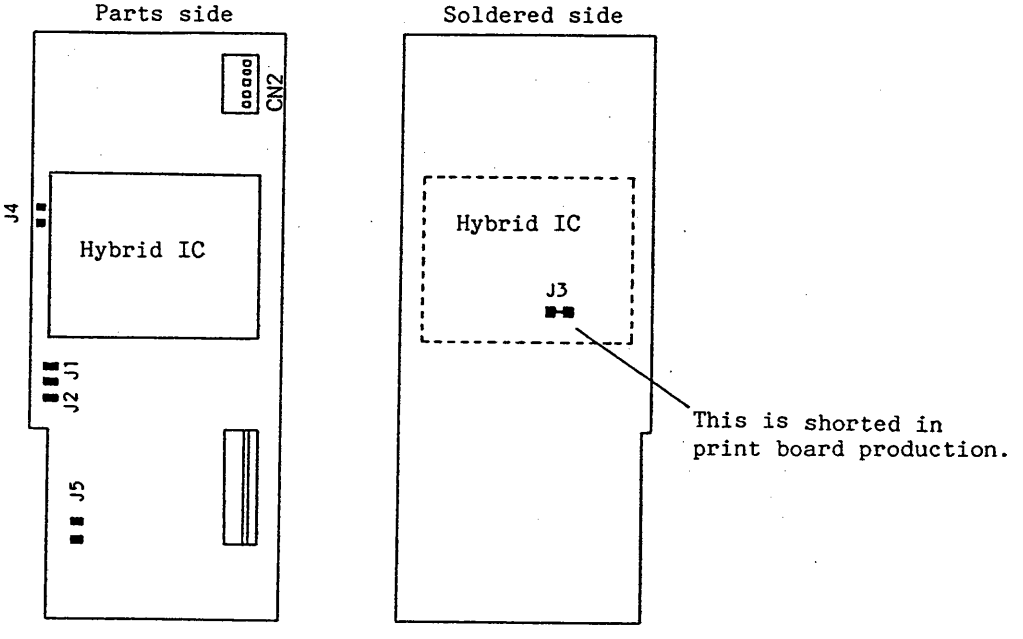
Spec.	Ass'y part No.	Mounting parts
mV TC input	B9574VE	Parts with circuit symbol of the 100 range and 99 or less
RTD input	B9574VF	Parts with circuit symbol of the 200 range and 99 or less (Note)

(Note) As R202 and R204 are optional (Pt 50Ω), usually they are not installed.

(2) Jumper wire connection

A/D Ass'y jumper wire (J1 to J5) connection differs according to the recorder specifications (Input type, additional or optional specifications)

A/D Ass'y jumper wire location diagram



A/D Ass'y Jumper Wire Connection Table

Model No. & code 4182-□□□/□□ (3 / 1)		Ass'y part No.	Jumper connection					Remarks
			J1	J2	J3	J4	J5	
1	—	B9574VE	X	X	O	X	X	STD
	BU		O	X	O	X	X	STD With burnout up scale
	BD		X	O	O	X	X	STD With burnout down scale
2	—	B9574VF	X	X	X	X	X	STD
3	—	B9574VE	X	X	O	X	X	STD
	BU		O	X	O	X	X	STD With burnout up scale
	BD		X	O	O	X	X	STD With burnout down scale
4	—	B9574VF	X	X	X	X	X	STD
5	—	B9574VE	X	X	O	X	X	STD
	BU		O	X	O	X	X	STD With burnout up scale
	BD		X	O	O	X	X	STD With burnout down scale
6	—	B9574VF	X	X	X	X	X	STD
7	—	B9574VE	X	X	O	X	X	STD
	BU		O	X	O	X	X	STD With burnout up scale
	BD		X	O	O	X	X	STD With burnout down scale
8	—	B9574VF	X	X	X	X	X	STD

1. O – Jumper shorted X – Jumper open

2. The following additional specification is not related with A/D Ass'y jumper connection.

/ AK-06, AK-12	Alarm output
/ REM	Remote
/ MES	Message printout
/ PS	Phase synchronization
/ RS232C	RS-232C interface

3.2 SEVRO Ass'y

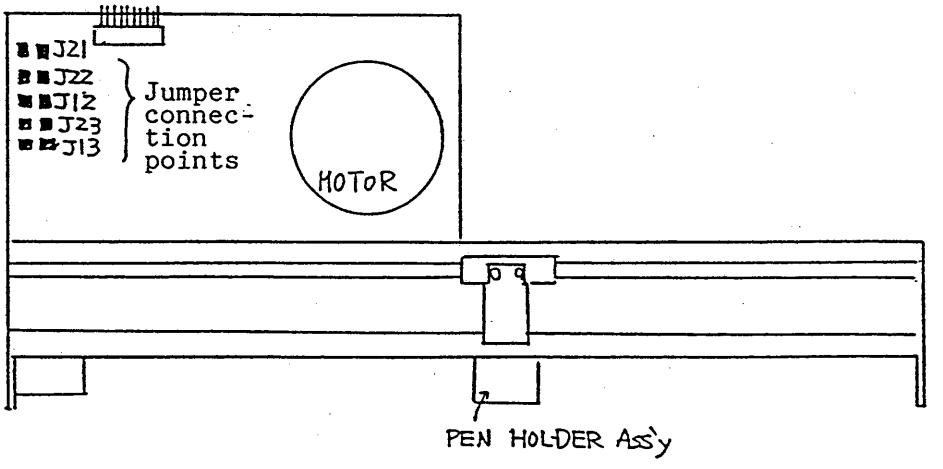
Jumper wire connection and Pen holder Ass'y of SERVO Ass'y vary with the SERVO Ass'y position (1-, 2- and 3- pen) mounted in the μ R250 recorder.

(1) Jumper wire connection

Mounting position	SERVO Ass'y part No.	J12	J13	J21	J22	J23
1 PEN	B9574LA	×	×	○	×	×
2 PEN	B9574LB	○	×	×	○	×
3 PEN	B9574LC	×	○	×	×	○

○ : Jumper shorted × : Jumper open

SERVO Ass'y Jumper Position Diagram (Parts Side)



(2) PEN HOLDER Ass'y (included in the SERVO Ass'y Part No.)

For 1-pen B9573LK

For 2-pen B9573LN

For 3-pen B9573LR

3.3 CPU Board Ass'y

(1) Dip switch 1 setting

All switches are set to OFF.

(2) Dip switch 2 setting

SW2 - No.	ON	OFF	Function	At shipment
8	50 Hz	60 Hz	Power and frequency selection	Based on the customer specification
7	°F	°C	Unit at temperature measurement	Suffix code 1, 2, 3, 4, 7, 8 = OFF 5, 6 = ON
6	Test	Normal	Operation mode setting	OFF
5	ch1 RTD	mV	ch1 input selection	Suffix code 1, 3, 5, 7 = OFF 2, 4, 6, 8 = ON
4	ch2 RTD	mV	ch2 input selection	The same as the above
3	ch3 RTD	mV	ch3 input selection	The same as the above
2	DIN	JIS	Input standard (RTD) selection	Suffix code 1, 2 = OFF 3, 4, 5, 6, 7 = ON
1	Non excitation alarm	Excitation alarm	Alarm setting	OFF

(Note) Before dip switch setting is changed, always set the dip switch to "OFF". When the power is "ON", selection by the dip switch cannot be made.
(RTD and mV/TC cannot be changed only by the dip switch because it is necessary to change measuring input terminals.)

3.4 ROM Ass'y

ROM mounted in the CPU Board Ass'y varies with Model No. and code.

Model No. & code 4180-□□□		ROM	
		Circuit symbol	Part No.
4182 1 3	1 to 6	U 23	B9574 UA
		U 24	" UB
	7 or 8	U 23	" UC
		U 24	" UD

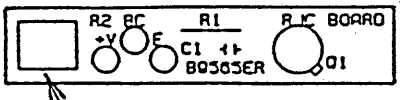
3.5 RJC Board

The RJC board is adjusted using a special jig.

Never turn the VR.

(If trouble occurs in the board, replace the entire board Ass'y.)

RJC BOARD installation diagram



VR Do not turn this.

4. Disassembly and Assembly Procedures

Disassemble and assemble the recorder in accordance with the procedure of Figure 4. 1 (See page 21).

The photos in this manual show the proto types, but not the products.

4.1 Disassembly and Assembly Procedure Diagram

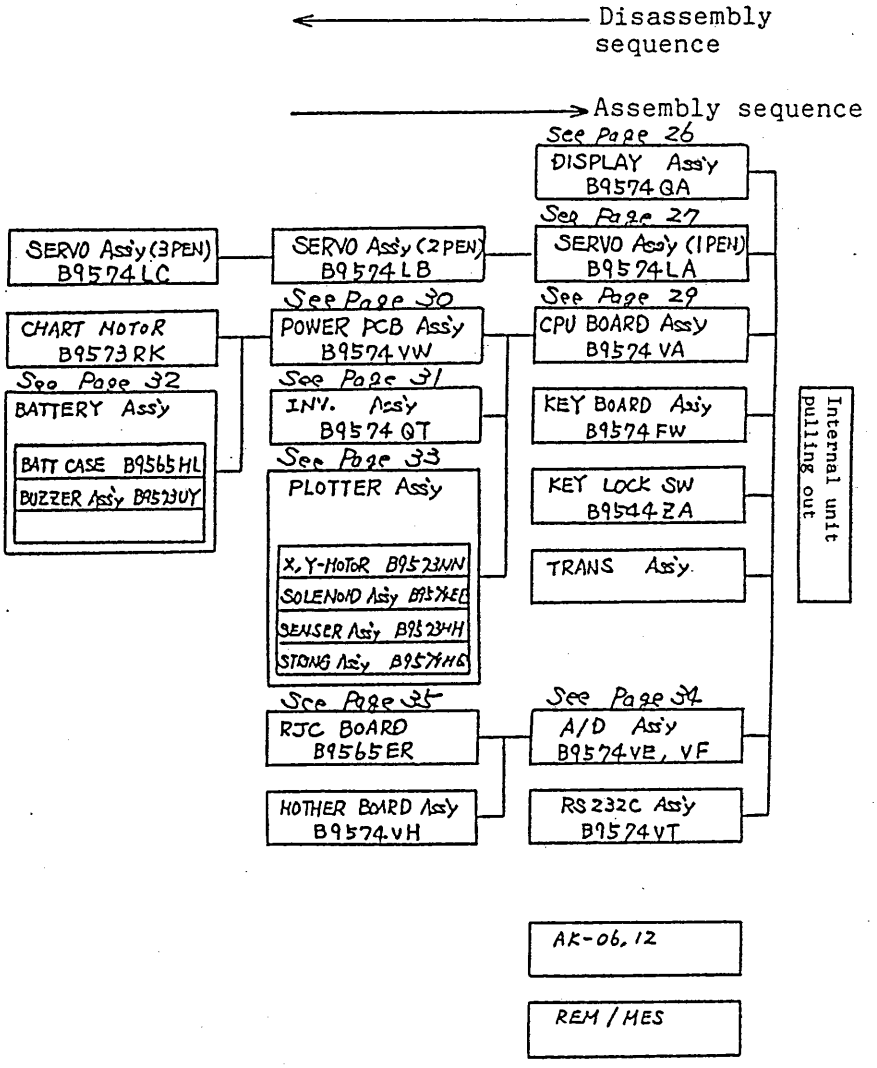


Figure 4.1

4.2 Tools (They are necessary for removing Ass'y in Figure 4.1)

Tool name	Standard, etc.	Application
Philips screwdriver	For M3	Disassembly and assembly
Philips screwdriver	For M3 (short)	
Allen spanner		Chart motor removal
Spanner	(Monkey spanner)	Display Ass'y removal
Allen spanner	For M5	Display Ass'y removal
Radio pliers		Removing wire fastening clips, etc.
Tweezers		Replacing string, key SW, etc.
Soldering iron	Class A 20 to 40 W	
Screwdriver		

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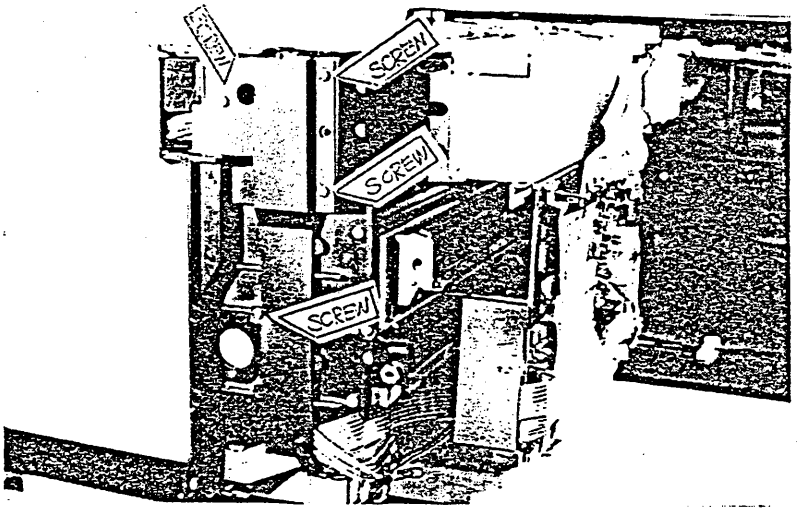
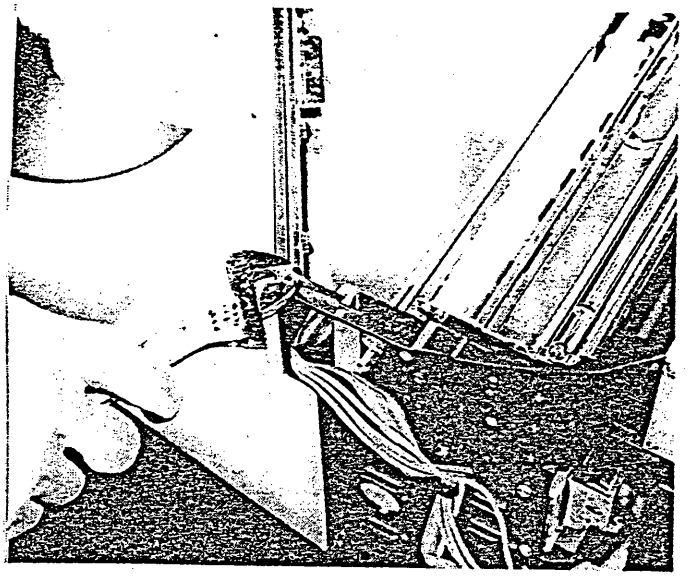
4.3 Display Ass'y Removal

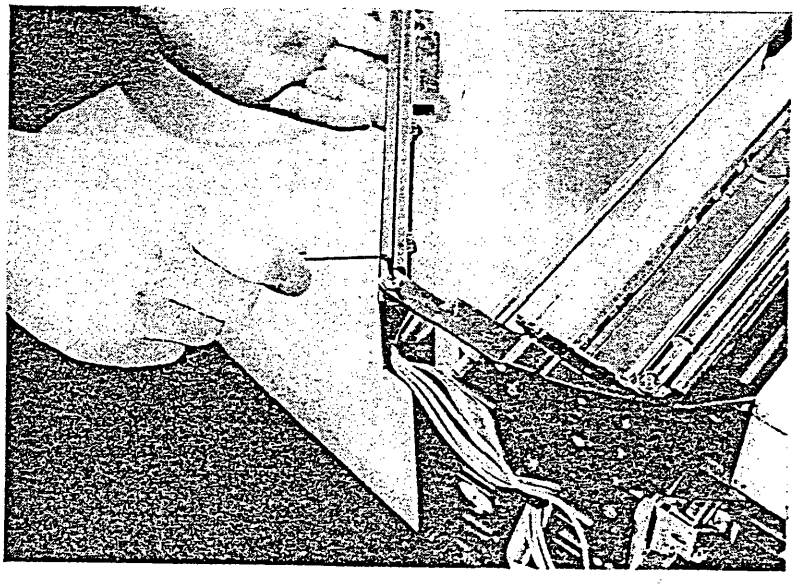
(1) Unscrew the four screws for removing the cover.



(2) Loosen the hex. nut.

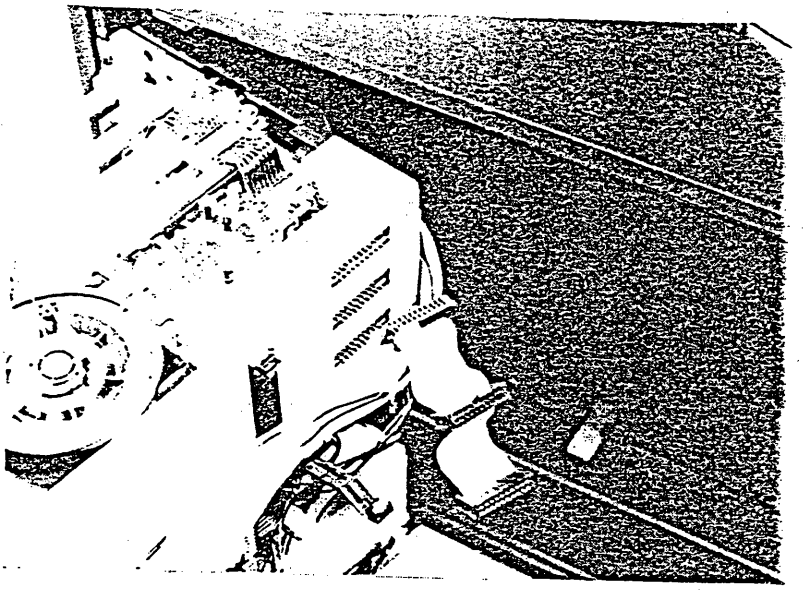


(3) Remove the display Ass'y B9574QA using the Allen wrench. Display Ass'y B9574QA

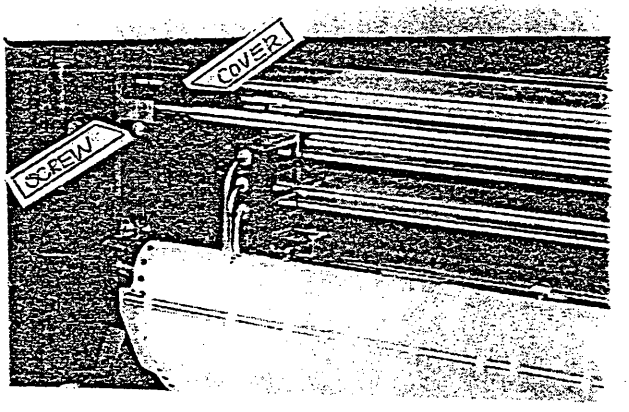


4.4 SERVO Ass'y Removal

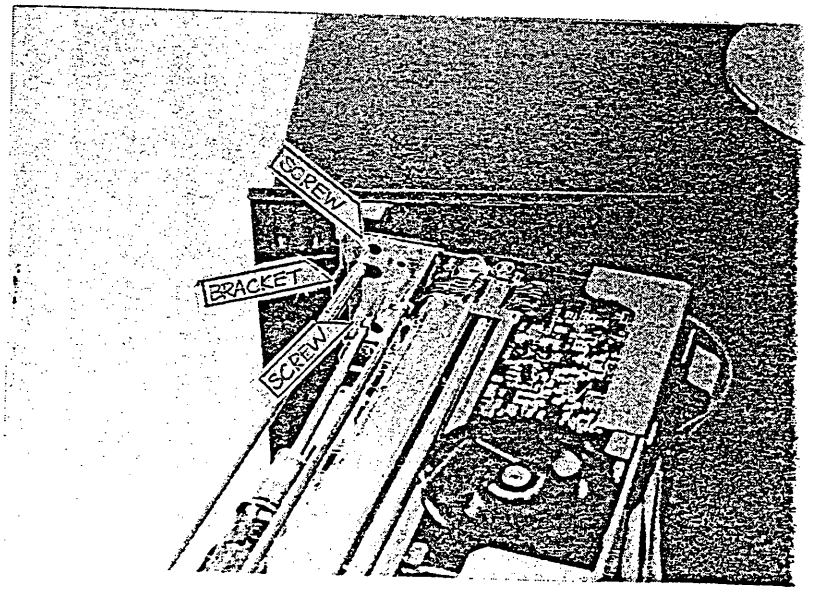
(1) Remove the connector.



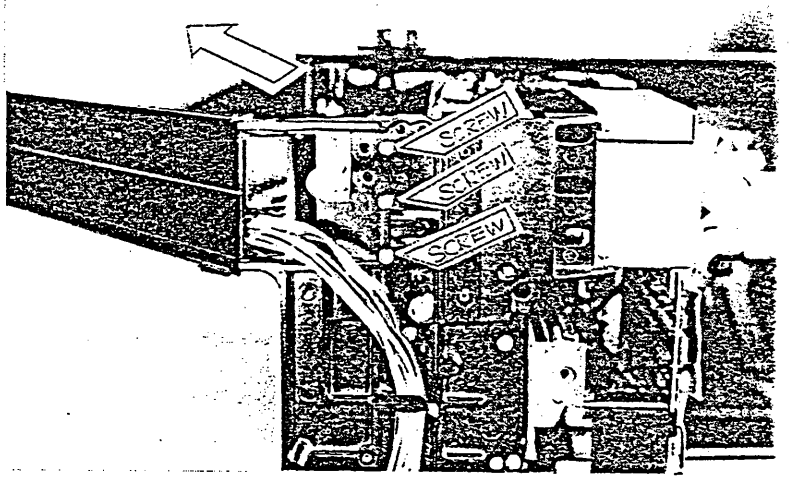
(2) Unscrew the screws for removing the cover.



(3) Loosen the 2 screws for removing the bracket.

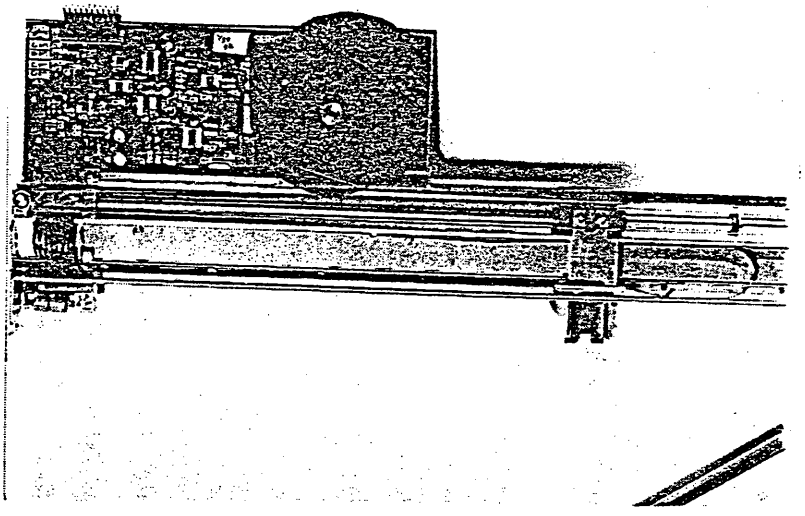


(4) Unscrew the 3 screws and withdraw the SERVO Ass'y to the arrow direction.



(5) SERVO Ass'y

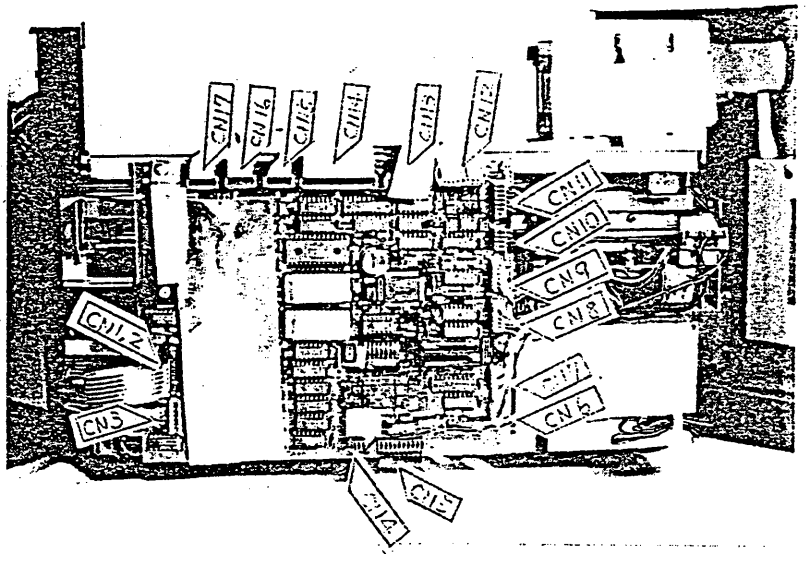
B9574LA (For 1-pen)
B9574LB (For 2-pen)
B9574LC (For 3-pen)



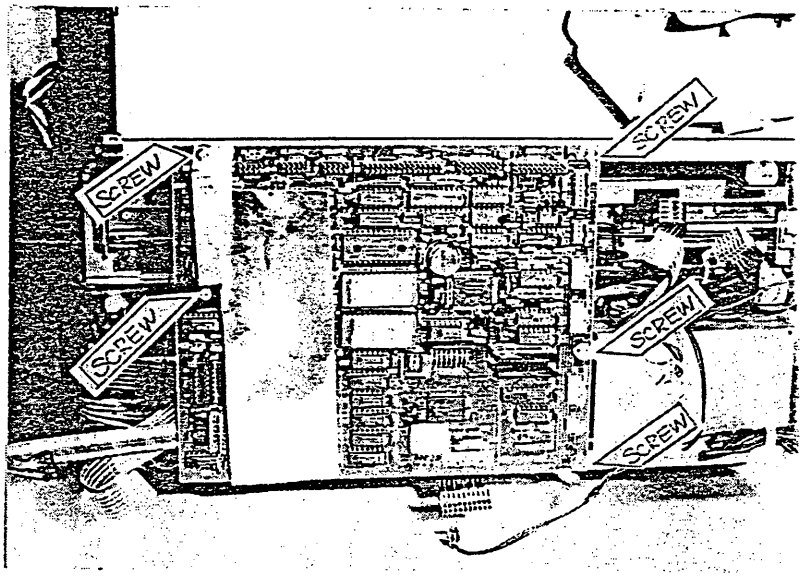
4.5 CPU Board Ass'y Removal

(1) Remove the following connectors.

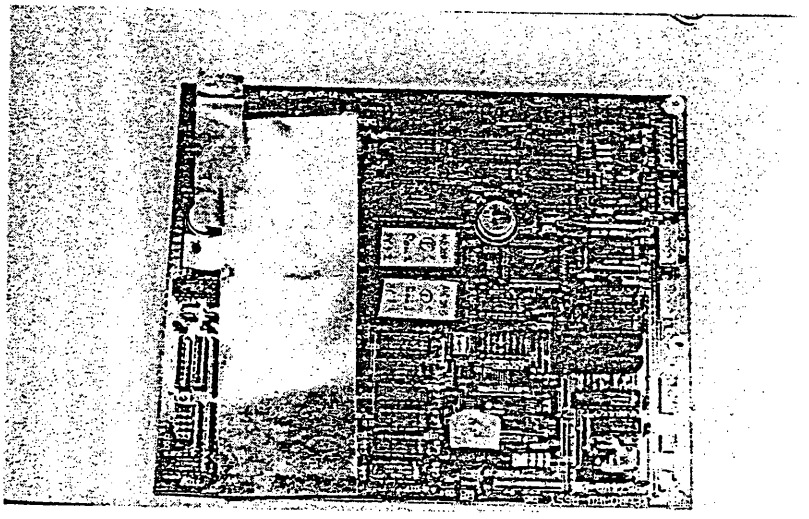
Connector	Destination
CN1.2	KEY BOARD Ass'y
CN3	DISPLAY Ass'y
CN4	KEY LOCK SW.
CN5	POWER PCB Ass'y
CN6	SOLENOID Ass'y
CN7	MOTOR (Axis Y)
CN8	MOTOR (Axis X)
CN9	CHART MOTOR
CN10	BATTERY Ass'y
CN11	SENSOR Ass'y
CN12	SERVO Ass'y
CN13	MOTHER BOARD
CN14	RS232C Ass'y
CN15	REMOTE/MES
CN16	ALARM (AL 7~ 12)
CN17	ALARM (AL 1~ 6)



(2) Unscrew the 5 screws.

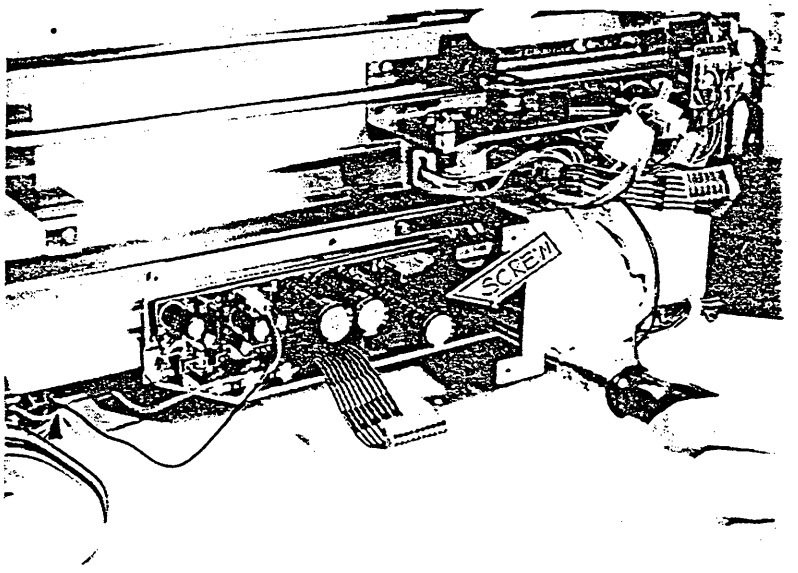


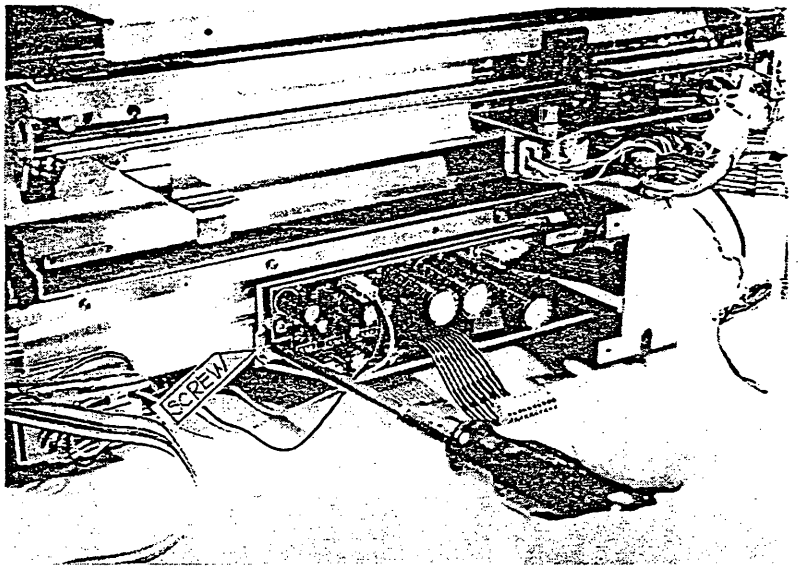
(3) CPU Board Ass'y B9574VA (excluding ROM)



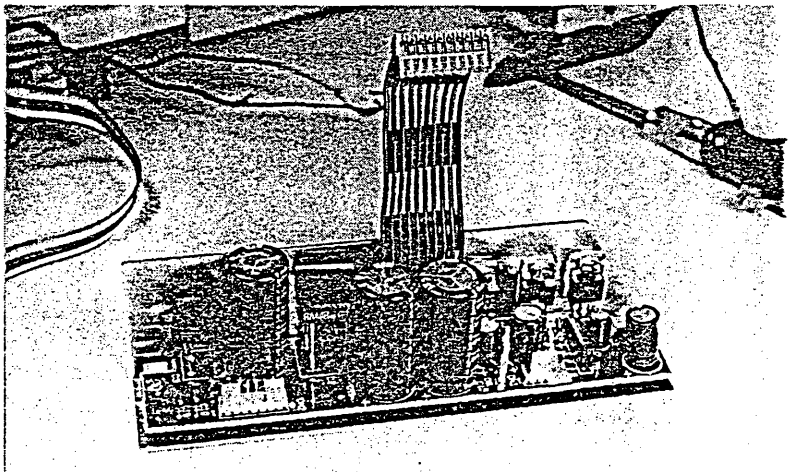
4.6 PowerPCB Ass'y Removal
After Removing CPU
Board Ass'y,

(1) loosen the 2 screws and remove the power PCB Ass'y.



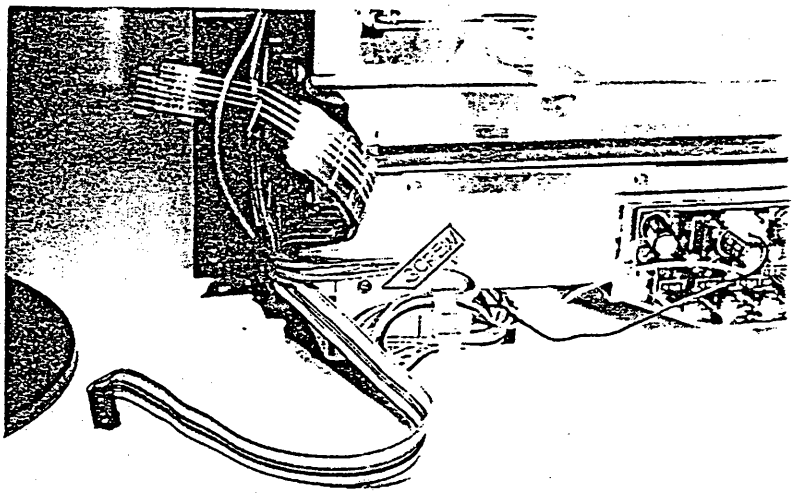


(2) Power PCB Ass'y
B9574VW

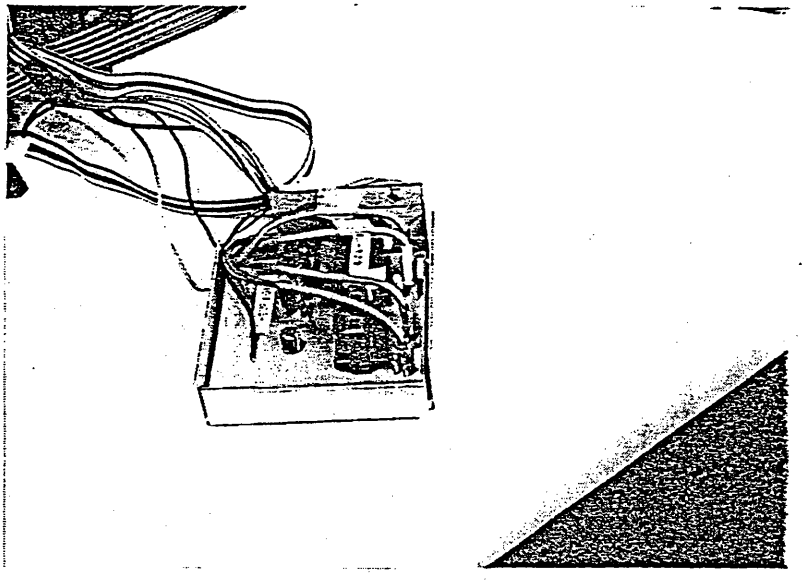


4.7 INV. Ass'y Removal
After removing the CPU Board Ass'y,

(1) unscrew the screw shown in the right photo.

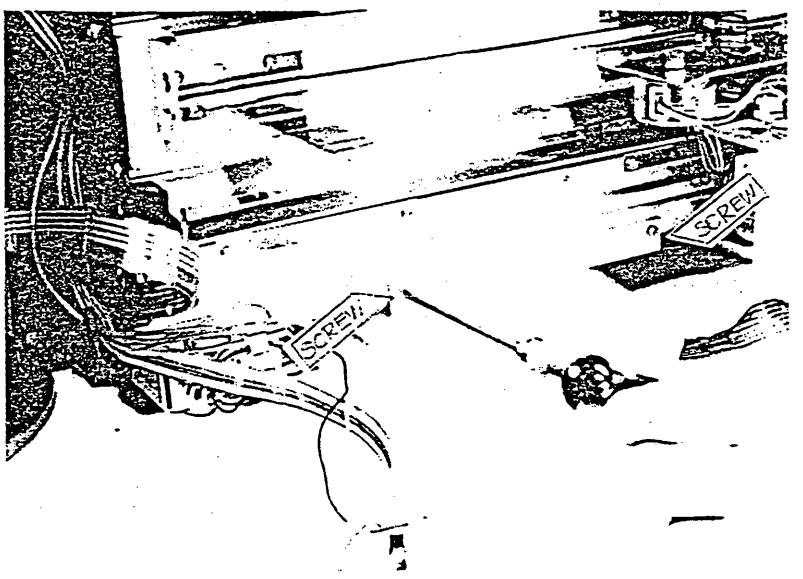


(2) INV. Ass'y, B9574 QT (only PCB)

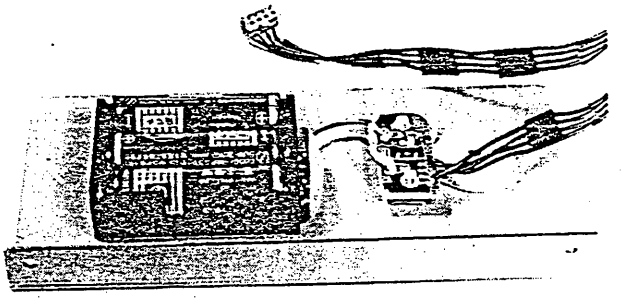


4.8 Battery Ass'y Removal
After removing the CPU Board Ass'y and Power PCB Ass'y,

(1) unscrew the 2 screws.



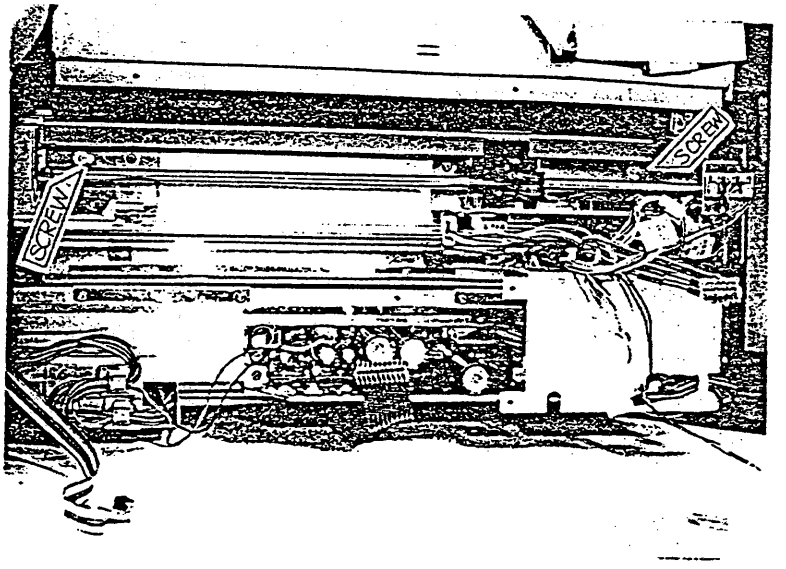
(2) Battery Ass'y



4.9 Plotter Ass'y Removal
After removing the CPU Board Ass'y,

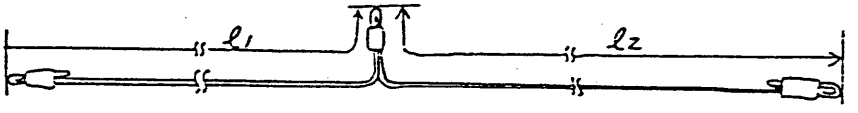
(1) plotter Ass'y can be removed by unscrewing the 2 screws.

Plotter Ass'y shown in the right photo is of the protocol type, but not the product. (The screwed positions in the photo.)

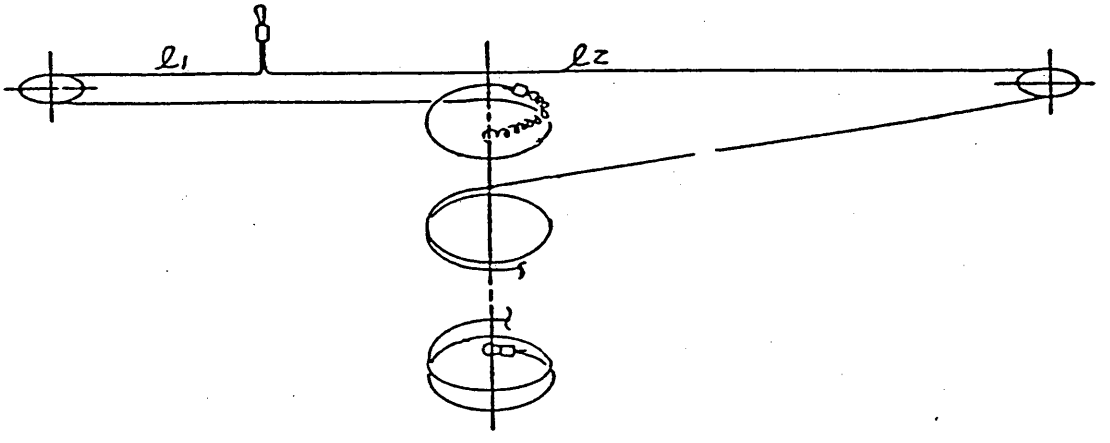


Winding the string Ass'y

STRING Ass'y B9574HQ

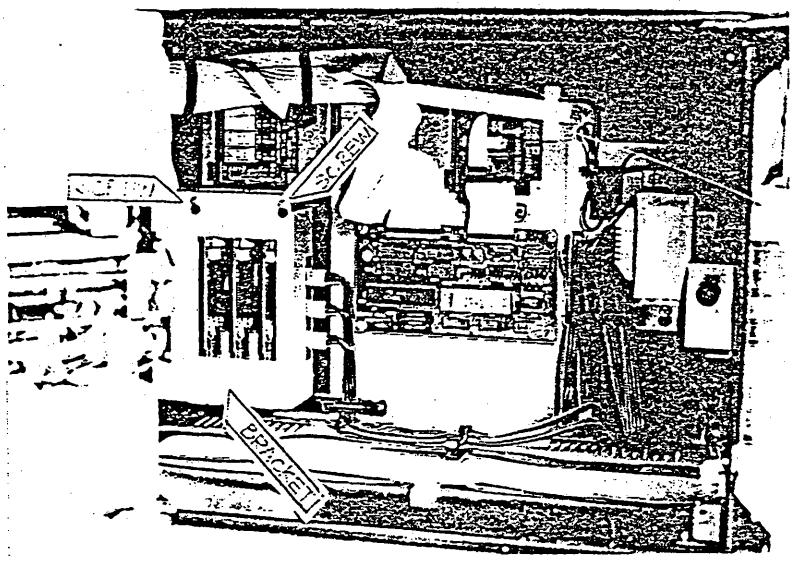


$\ell_1 < \ell_2$



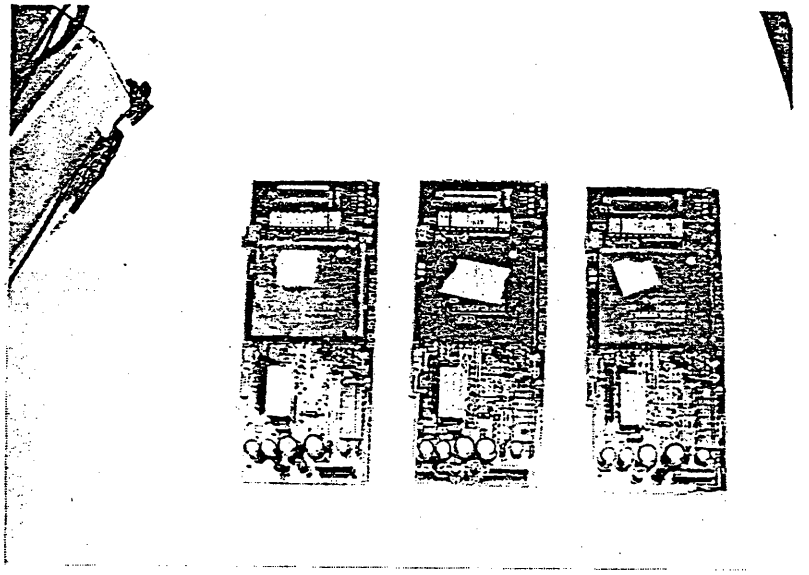
4.10 A/D Ass'y Removal

(1) Loosen the 2 screws and remove the bracket.



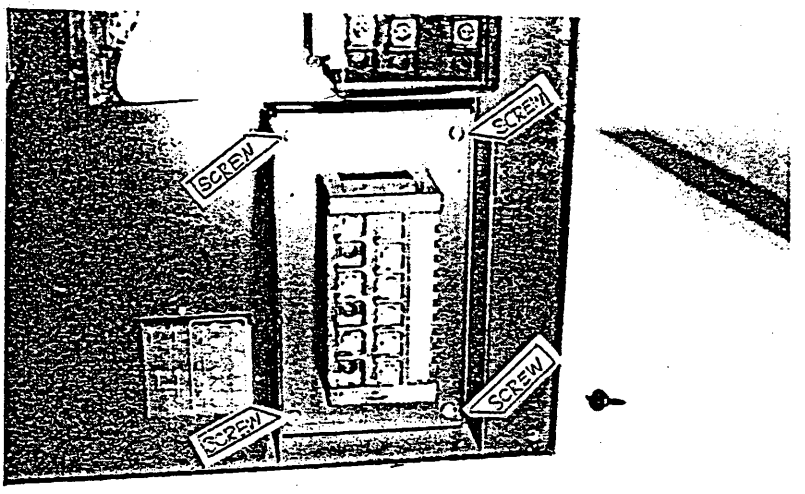
(2) A/D Ass'y

B9574VE (For mV/TC)
B9574VF (For RTD)

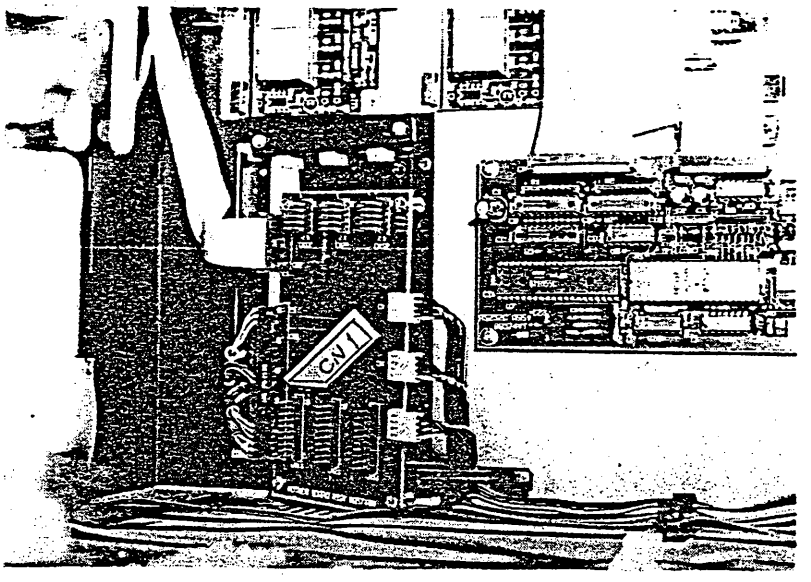


4.11 RJC Board Removal
After removing A/D Ass'y,

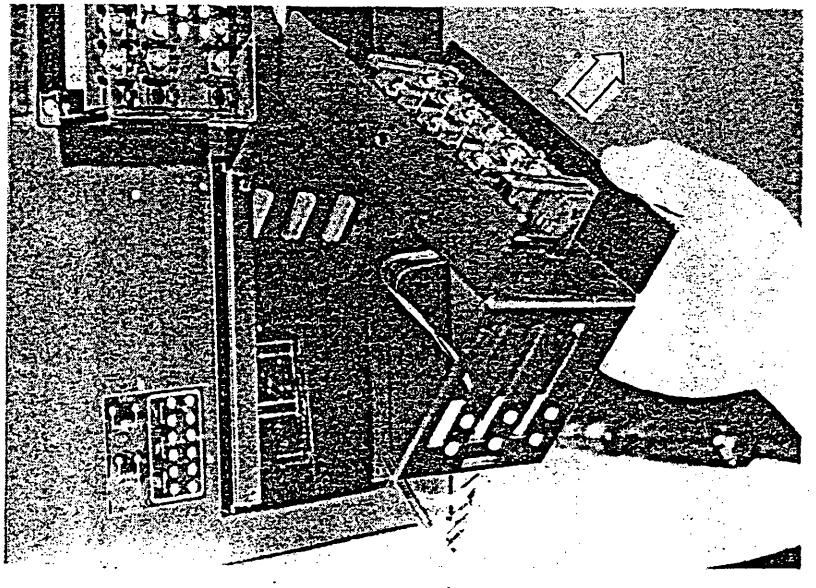
(1) Unscrew the 4 screws fixing the rear panel.



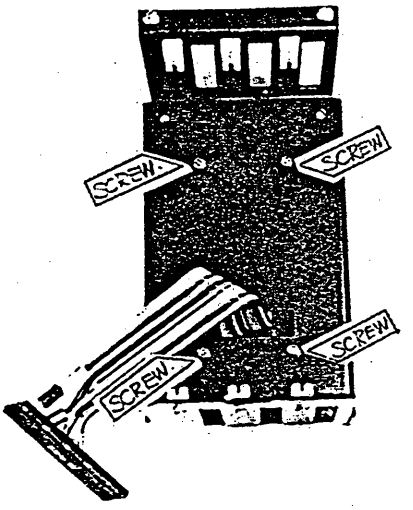
(2) Remove the connector CN1 on the mother board Ass'y in the recorder.



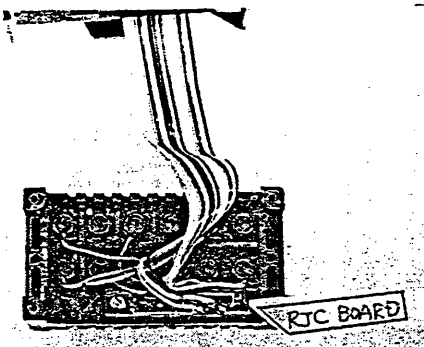
(3) Withdraw the input terminal board on the rear panel to the arrow direction.



(4) Unscrew the 4 screws.



(5) RJC Board
B9565 ER



5. Functional Check after Assembly

After the customer's problem has been solved, check all the following items in this chapter to prevent the recurrence of the trouble caused by wrong connection, etc.
(For options, check only additional functions.
Item 5.12 RS232C is only for a reference, so check the trouble of RS232C depending on its circumstances.)

5.1 Initial State Check at Power ON

(When the power is turned ON with BATT. unloaded)

DISPLAY

a. Set to the CLOCK mode and counted from "0:00 , JAN.1, 1986." (":" flashes.)

b. Battery alarm "BAT" lights up.

c. Bar graph corresponds to measured value.

d. RCD "● ", Alarm "ALM" and unit are extinguished.

PEN

Stand-by at the left front end.

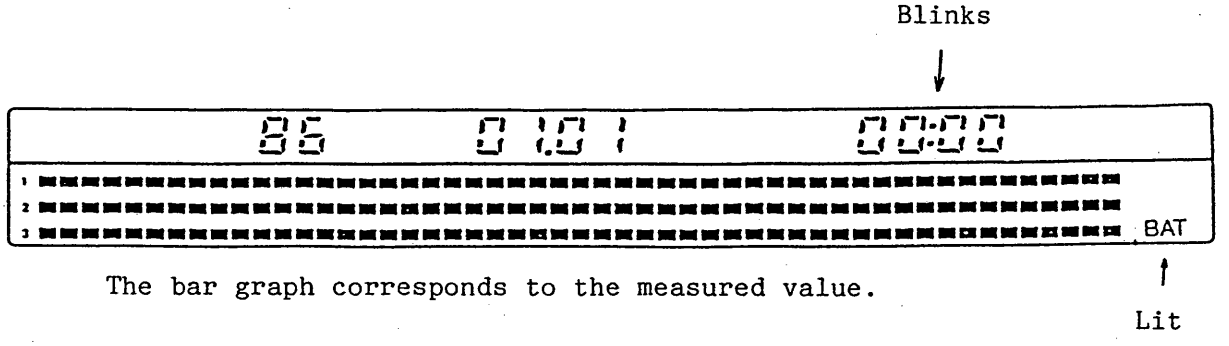
PLOTTER PEN

Moves from the position at the power ON to the left end and then moves to the right end after the position compensation (home position detection).

Stand-by near 0% on the chart.

CHART

Stop



The bar graph corresponds to the measured value.

5.2 Keyboard

Check that all keys on the keyboard shown in Figure 5.1 are accepted.

> If a BEEP sound is produced with the key pressed, it is not necessary to check the key function.

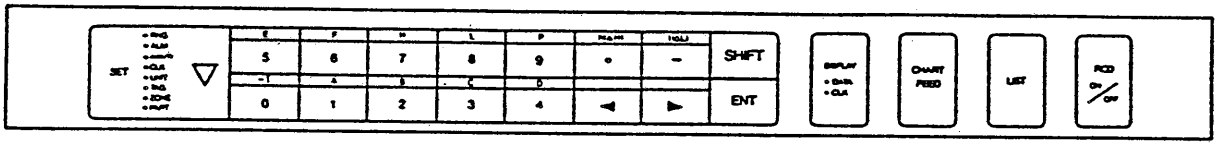


Figure 5.1

5.3 Key Lock Function

Check that keys other than the DISPLAY key are not accepted when key lock function is activated.

5.4 Battery Alarm Function

Check that "BAT" display is extinguished when the battery is loaded, and it lights up when the battery is unloaded.

5.5 Plotter Check

Check that the following format is obtained when the list is printed out by pressing the [LIST] key.

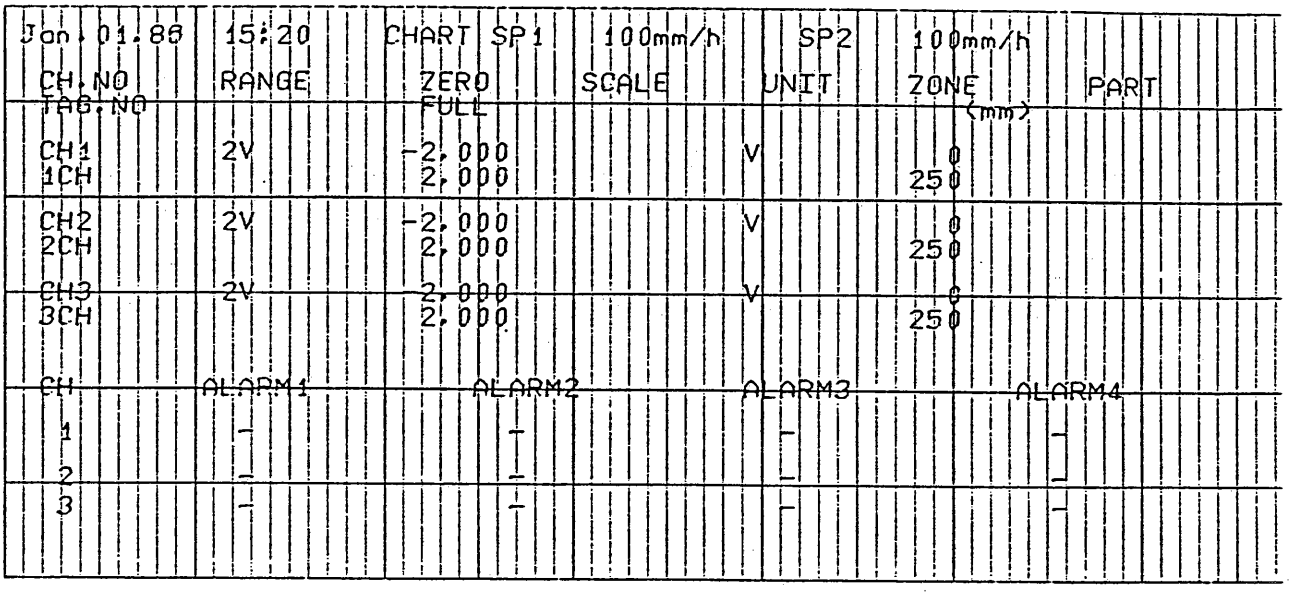


Figure 5.2

Figure 5.2 is for Model 4183-111 and an expample in which the [LIST] key is pressed just after Power-ON with the battery unloaded.

5.6 Reference Junction Compensation Function

This function is checked only for the mV/TC input specifications.

Model No. and Codes 418□ -□□□

→For 1,3,5,7: mV/TC input specification

Check that the display unit shows room temperature (actually, input terminal temperature) at RANGE "T" and input shorted. (The displayed value is accepted to be approximate.)

5.7 Burn-out Function (optional)

When input opens at any thermocouple range (nothing is connected to all channels), check that the display unit and pen movement are as shown in the following table.

Model No. & code / Check point	418□ -□□□ /BU (Burnout up scale spec.)	418□ -□□□ /BD (Burnout down scale spec.)
Display	-----	-----
Pen	A pen exceeds the 0% limit.	A pen exceeds the 100% limit.

5.8 Remote Function (optional)

Model No. & Codes 418□ -□□□ /REM

(1) Start/Stop (Level trigger)

Check that the chart feed, pen position and display RCD "0" are as shown in the following table when Start/Stop at the REM terminals is closed or opened.

Contact	Closed	Open
Chart feed	Feed	Stop
Pen position	Corresponding to measured data	The pen stops right before "OPEN".
Display RCD "0"	ON	OFF

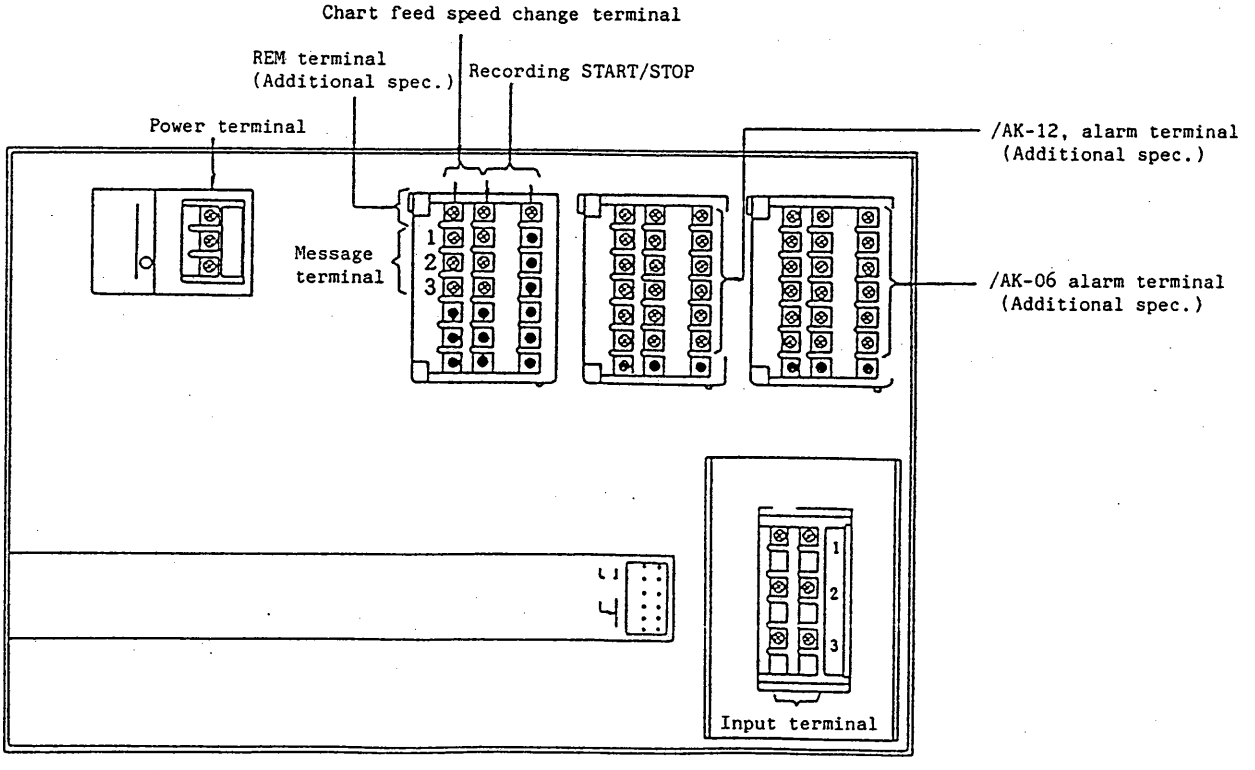
(Note) REM start/stop has priority over the RCD key.

(2) Change chart speed (Level trigger)

Check that the chart feed and recording are as shown in the following table when change chart speed at the REM terminals is closed or opened.

Check point	Close	Open
Chart feed	Chart is fed at chart speed 2 set from the key board.	Chart is fed at chart speed 1 set from the key board.
Record on the chart	SPD.2 □□ :□□	SPD. 1 □□ :□□

418□ Rear Panel



5.9 Message Print-out Function (Optional)

Model No. & Codes 418□ -□ □ □ /MES

A message is input in advance from the keyboard, and then check that the message is printed out when the terminals are closed.

↓

For more than 2 seconds.

5.10 Phase Synchronous Function (Optional)

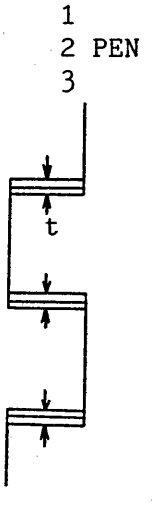
Model No. & Codes 418□ -□ □ □ /PS
(Not added to Model 4181)

① After turning ON the phase synchronous switch, turn ON the power.

② Apply an input so that pens for 1CH, 2CH and 3CH change simultaneously.

→ (Example) Apply a square wave-form input from a function generator to all mV/TC input channels.

③ Check that recording becomes as shown in the following when it is started by the RCD key.

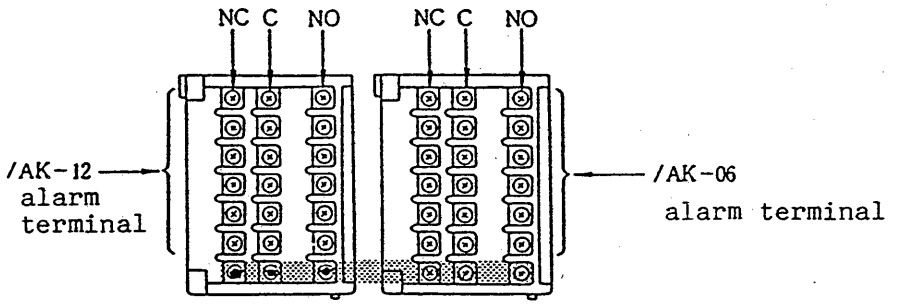


Phase synchronous deviation t should be less than 1 mm.

(Reference)
Pen offset : 3 mm/CH
Therefore, if there is no phase synchronization, becomes 6 mm.

5.11 Alarm Output Function (Optional)

Model No. & Codes 418□ -□ □ □ /AK-06 or AK-12



NC: Normally closed, NO: Normally Open, C: Common

The above NC and NO are for an energized alarm.

For a de-energized alarm, the above NC and NO actions are reversed.

→ Selection of energized and de-energized alarms is made using the dip switch on CPU board Ass'y. (See page 18.)

Check that each relay contact is output normally when an alarm is issued by setting the alarm set-value from the keyboard.

(Reference): Refer to the alarm relay test. (See page 59.)

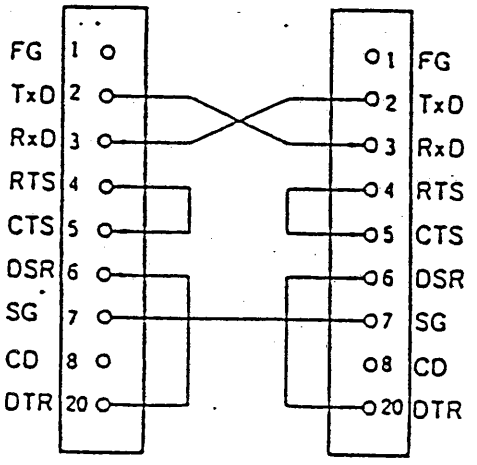
5.12 RS 232 (Optional)

Model No. & Codes 418□ -□ □ □ /RS232C

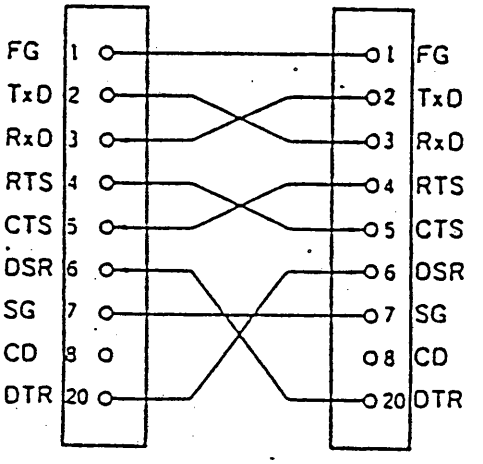
Example of PC9800 Series (NEC)

(1) Connection

Connection Between Models with Side-Mounted Terminals



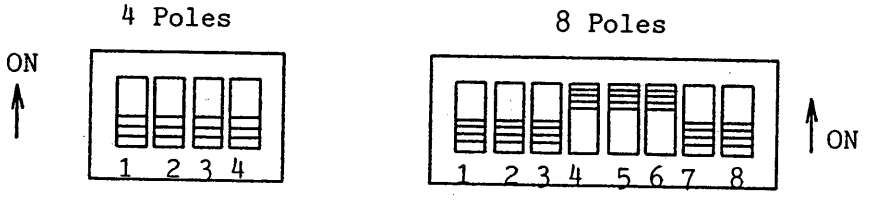
"Send" is connected to "Receive" and "Receive" to "Send".
Once it is activated, each terminal is capable of exchanging data, regardless of the status of the counterpart.
Data exchange is acknowleged by the softward.



Connecting RTS-CTS to each other enables each terminal to obtain a send enable signal for a send request signal.
Connection between terminal equipment frequently requires the use of this system. However, handshaking is difficult-in the strictest sense of the word.
Of special importance in alternating communication is the need to know if the counterpart is capable of receiving data. Accordingly, the couterpart is set to send enable in response to a send request, and the program should take this requirement into account.

(2) μ R250 setting

(Set the dip switch on RS232C Ass'y as follows.)



Mode	Data output setting mode
Transmission speed	1200 bps
Data length	8 bits
Parity check	None
Stop bit	1 bit

(3) PC9800 Series memory switch setting

Set the memory switch to full duplex communication and 1200 bps. (Other settings are executed on the BASIC program.) For details, refer to the operation manual for PC9800 Series.

(4) Pragramming example (Handshaking ...X-ON, X-OFF)

(Use PC-9801E)

```
100 '
110 ' TRANSFER DATA
120 '
130    OPEN "COM:N81X" AS #1
140 '
150     A$ = "TS0"
160     PRINT #1,A$
170
180 '
190 '  RECIVE DATA
200 '
210     LINE INPUT #1,A$
220     B$ = MID$(A$,3,1)
230     Q = VAL(B$)
240 '
250     FOR I= 1 TO 2+Q
260       LINE INPUT #1,A$
270       PRINT A$
280     NEXT
290 '
300    CLOSE
310     END
```

Output example

```
DATE860101
TIME000014222
N         UR250 1, +09895E-0
N H             2, +01853E-3
NE   LV         3, -00995E-3
```

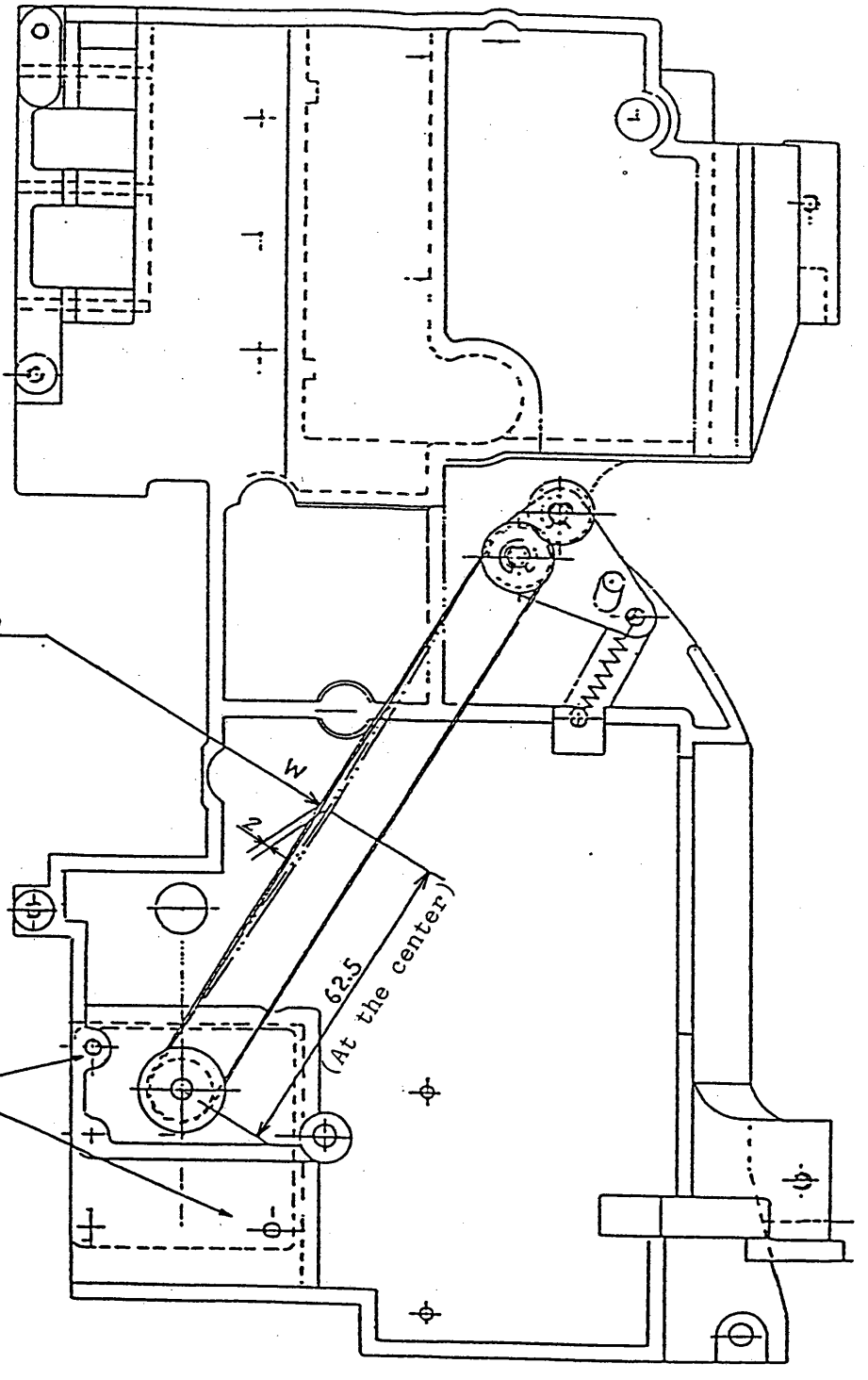
6. Mechanism Adjustment

This section describes mechanism adjustment procedures. After the trouble is remedied (after assembly), conduct adjustment in accordance with each item.

6.1 Tools and Jigs Used

Tool/jig names	Rating	Remarks
⊕ headed screwdriver	M3	
⊖ headed screwdriver		Plotter pen hieght adjustment
Clearance gauge	1.3 mm	Ditto
Tension gauge	30 to 60 g can be measured	Belt tension adjustment
Scale		Ditto
Plotter pen		New

6.2 Chart Feed Belt Tension Adjustment



Note) Belt tension

Position the motor so that weight W is 30 to 60 g at 2 mm displacement.

Adjust with these screws.

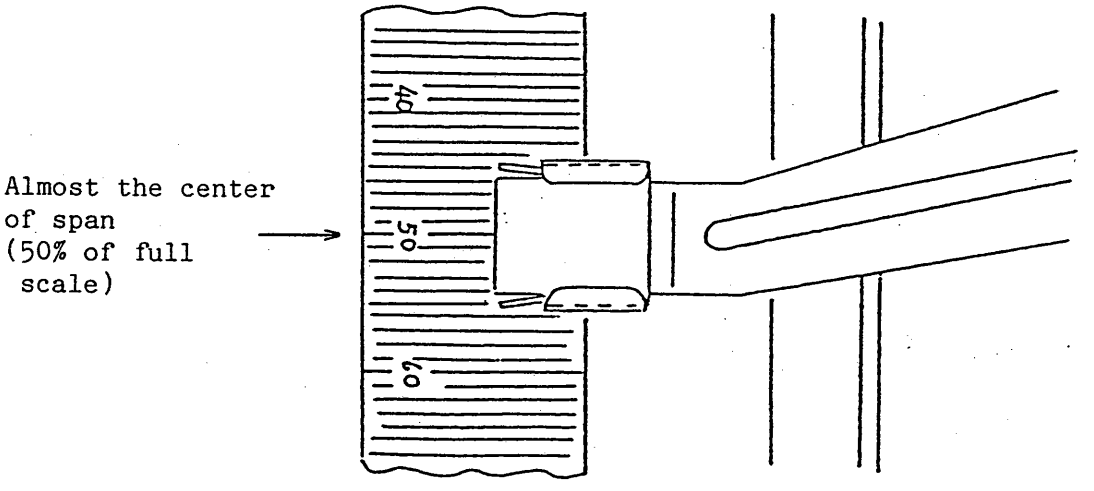
6.3 Plotter Pen Height Adjustment

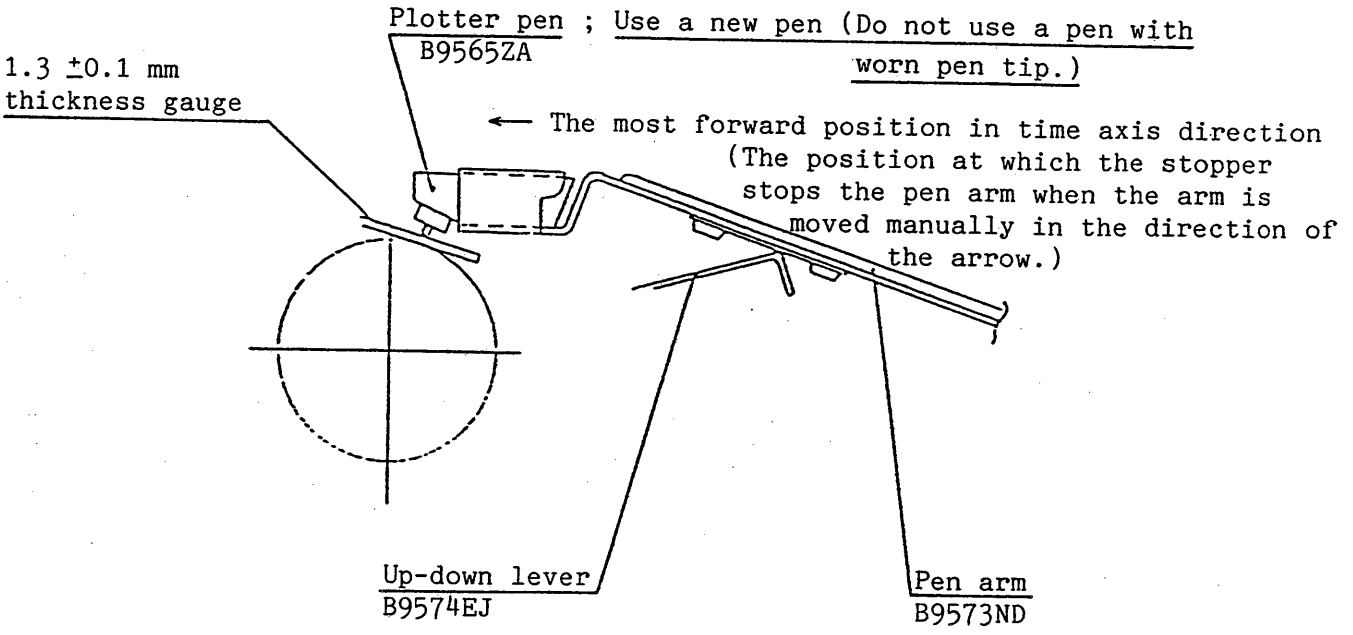
① Move the pen arm to the mid-scale point (50% of chart length).

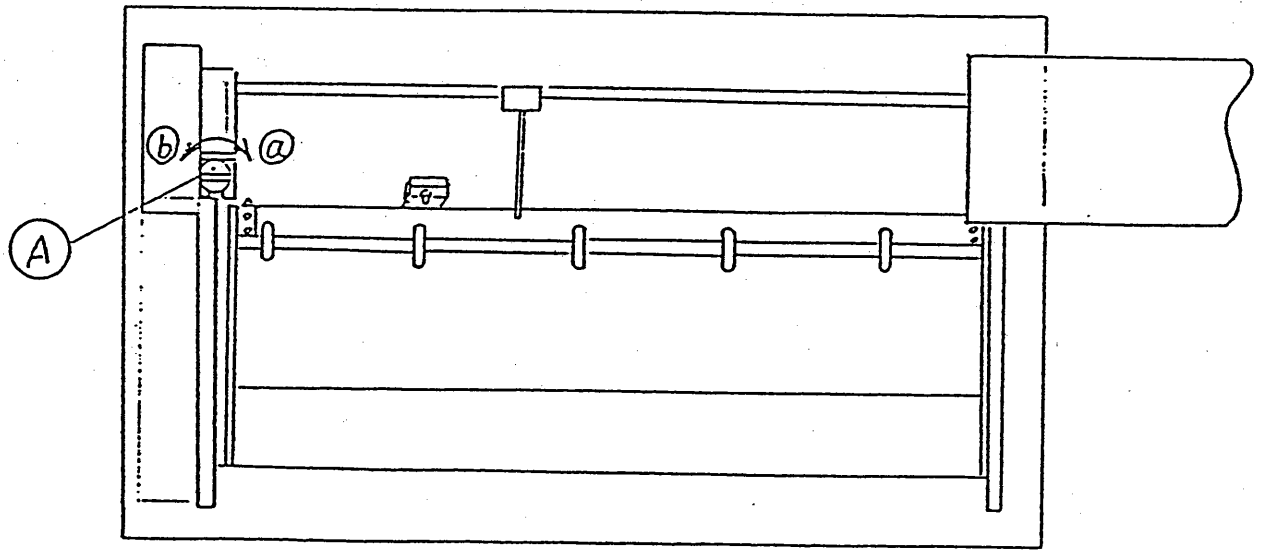
② Set the pen arm to its forefront position.

③ Turn adjustment screw Ⓐ until the clearance between the pen tip and platen is within 1.3 ± 0.1 mm (Conduct this adjustment with a new plotter pen loaded.)

④ If the above adjustment does not work, first move the solenoid A'ssy for coarse adjustment, then return to the adjustment in ③ above.




Plotter pen ; Use a new pen (Do not use a pen with worn pen tip.)
B9565ZA
1.3 ±0.1 mm thickness gauge
← The most forward position in time axis direction (The position at which the stopper stops the pen arm when the arm is moved manually in the direction of the arrow.)
Up-down lever
B9574EJ
Pen arm
B9573ND


A
b
a

MEMO

7. Electric Circuit Adjustment and Inspection

Adjustment and inspection are conducted in the TEST MODE.

The Model 4181, 2 or 3 has 2 modes, i.e, NORMAL MODE for normal measurement and recording and TEST MODE for adjustment and inspection.

7.1 Measuring Instruments and Tools Used

Measuring instruments and tools	Spec./rating	Remarks
DCV generator	0.05% 2554	For A/D fullscale check mV/TC
(DCV generator)	(0.001% 2552)	For A/D fullscale adjustment mV/TC
Digital multimeter	0.05% 2506A	For AD fullscale adjustment RTD
Circuit tester		For alarm relay test
Screwdriver	⊕ or ⊖ headed	
⊕ headed screw driver	M3	

7.2 TEST MODE Setting Procedure

POWER OFF

↓

CPU BOARD Assy SW 2 bit 6 ON (Note)

↓

POWER ON

↓

TEST MODE

(Note) · At the end of adjustment, always set the mode to the NORMAL MODE (CPU board Assy SW2 bit 6 OFF)
· For SW2 functions, refer to page 18.

7.3 Adjustment/Inspection Items

First set Model 4181, 2 or 3 to the TEST MODE, then select the relevant item from the keyboard.

Key	TEST Name	Description	Adjustment	Inspection
[0]	AD FULLSCALL	A/D circuit reference voltage adjustment	○ (Check)	
[1]	SPAN 50%	Moves the pen carriage to 50% of fullscale. (Each pen can be changed by the [8] key.)	○	
[2]	SPAN 100%	Moves the pen carriage to 100% of fullscale. (Each pen can be changed by the [8] key.)	○	
[3]	SPAN 0%	Moves the pen carriage to 0% of fullscale. (Each pen can be changed by the [8] key.)	○	
[4]	LCD ON	Turns ON all LCD display segments.		○
[5]	LCD OFF	Turns OFF all LCD display segments.		○
[6]	AUTOMATIC RANGE SETTING	Range, span and alarm are automatically set.		
[7]	ALARM RELAY ON/OFF	Turns ON and OFF in due order alarm relays (1 to 12) at 2-sec. intervals.		△
[9]	DIP SW READ	Reads the status of DIP SW1, SW2 and phase synchronous SW on CPU board Assy.		

(Note) Always adjust and inspect items marked with ○.
△ : Conduct adjustment and inspection when AK-06 or AK-12 is attached.

(1) [0] Key : AD fullscale adjustment (Check)

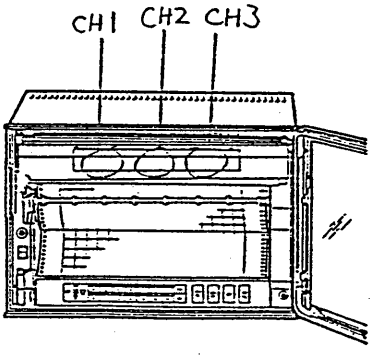
For mV/TC input specification

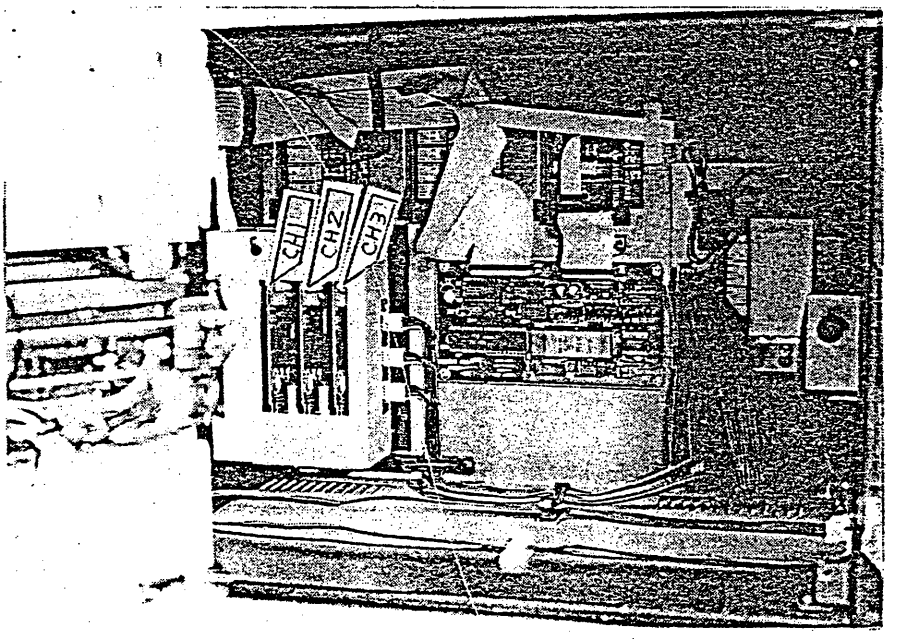
. As a rule use generator 2554 for checking in the field.
  ① Press the AD fullscale test key ([0] key.)
  ② Apply +2,000 V to the input terminals.
  ③ Check that data display on the display unit shows "20000 ± 22". (When it is assumed that no error exists in the 2554)
  ④ Check for all CHs.

. Generator 2552 is required for adjustment and calibration with test record. Therefore, as a rule the recorder is adjusted at our repair shop.
  ① Press the AD fullscale test key. ([0] key)
  ② Apply +2,0000V to the input terminals.
  ③ Turn R4 on the A/D Assy until data display on the display unit shows "20000 ± 4".
  ④ Check for all CHs.

R4 location

Display

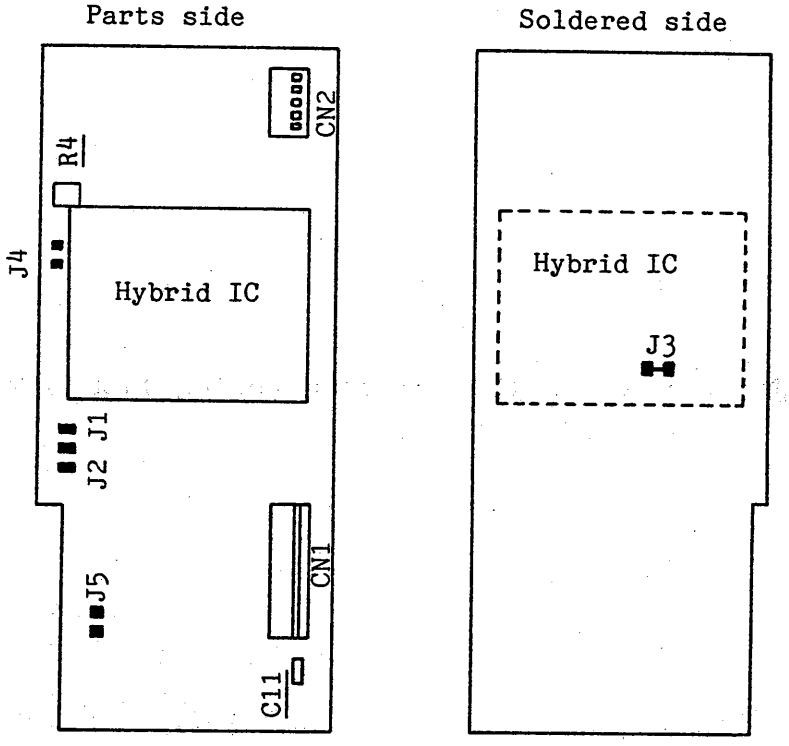




For RTD input specification

It is not required to the TEST item from the keyboard. Connect the multimeter to the both ends of C11 on the A/D Assy, then turn R4 until voltage becomes 5 ± 0.1 V.

A/D A'ssy



(2) [1], [2], [3] and [8] keys Recording span adjustment

① Select 50% of SPAN adjustment ([1] key).

② Press the [FEED] key, then turn R1 on the SERVO Assy until the recorded result is within 125 ± 0.7 mm on the chart.

③ Select 100% of SPAN adjustment ([2] key).

④ Press the [FEED] key, then turn R2 on the SERVO Assy until the recorded result is within 250 ± 0.7 mm on the chart.

⑤ Select 0% of SPAN ([3] key).

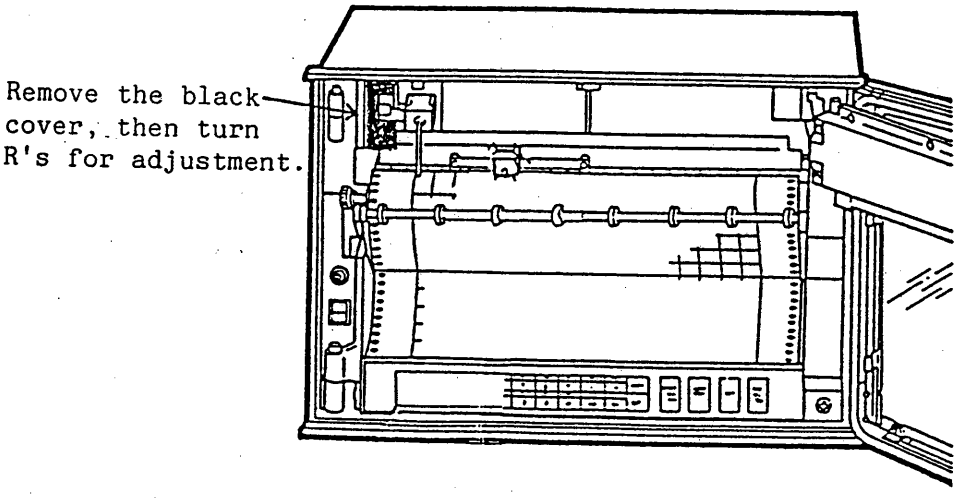
⑥ Press the [FEED] key, then check that the recorded result is within 0 ± 0.7 mm.

⑦ R1 and R2 interfere each other.

Therefore, repeat the above procedures, ① to ⑥ until 50%, 100% and 0% of SPAN are within the allowable ranges.

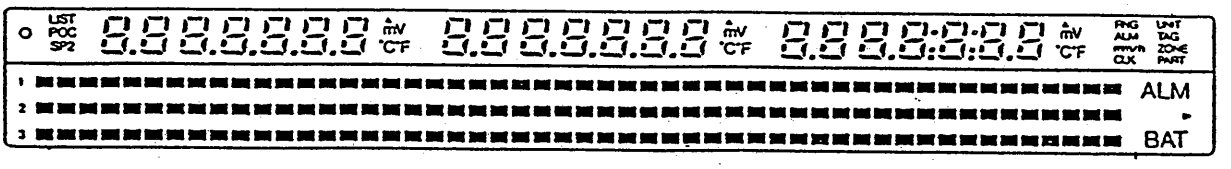
⑧ Conduct the procedures ① to ⑦ for all CHs.

→ CH. can be changed by the [8] key.



(3) [4] key LCD ON

All LCD segments light up.



(4) [5] key LCD OFF

All LCD segments are extinguished.

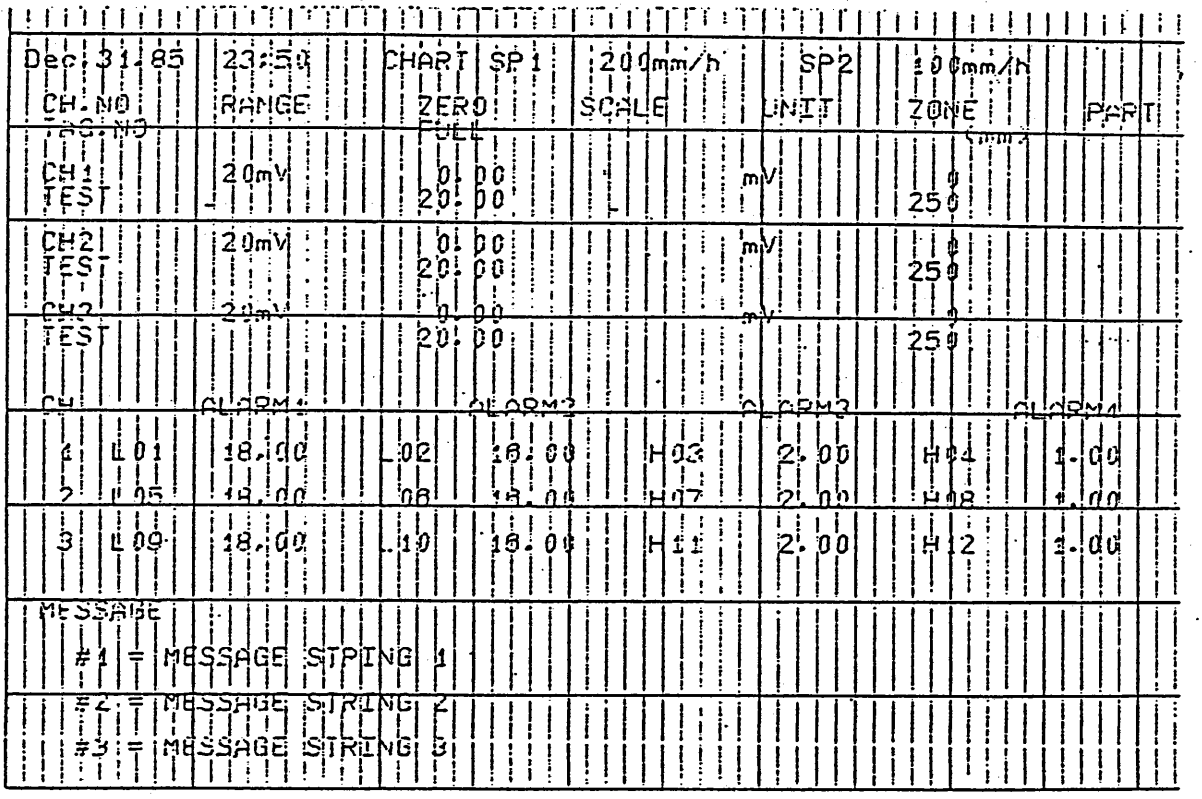
(5) [6] key Automatic RANGE setting

① The display unit shows "SEt rAnGE" for about 2 sec, then the display disappears.

② The following contents are set when the test mode is transferred to the normal mode.

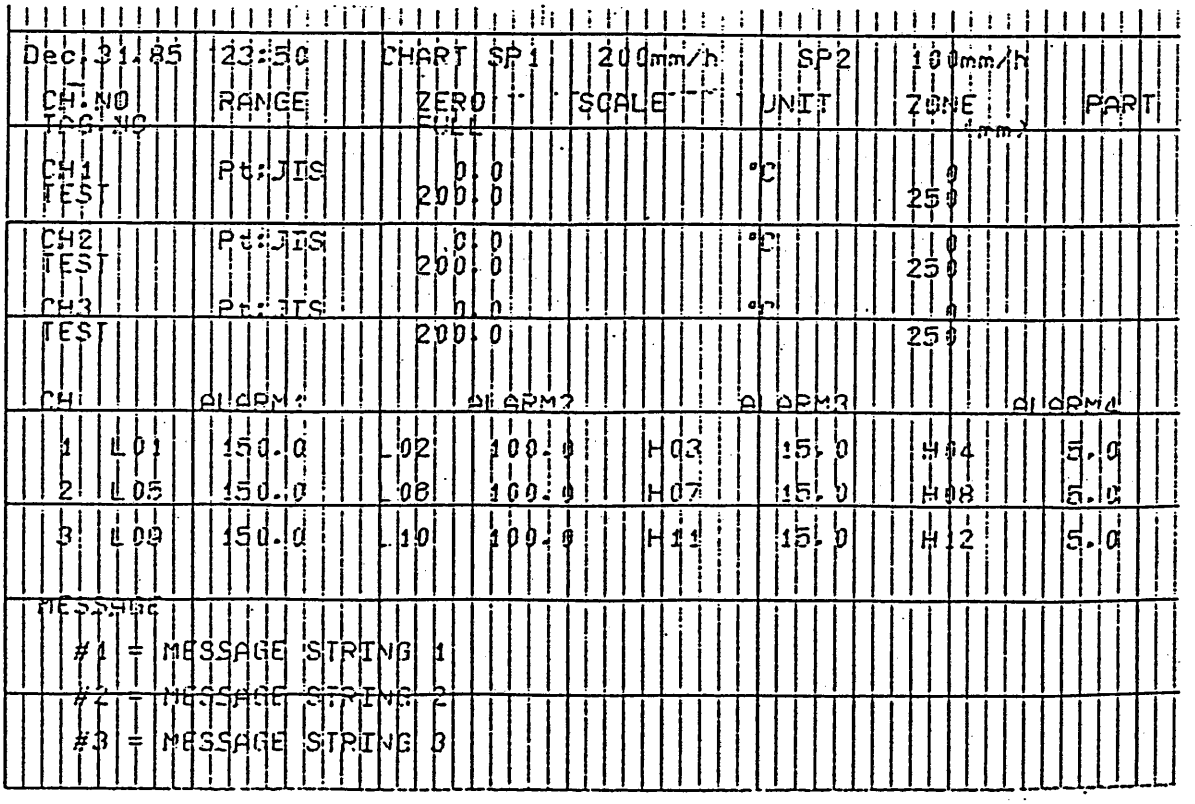
● mV/TC input specification

(Example of 4183-111)



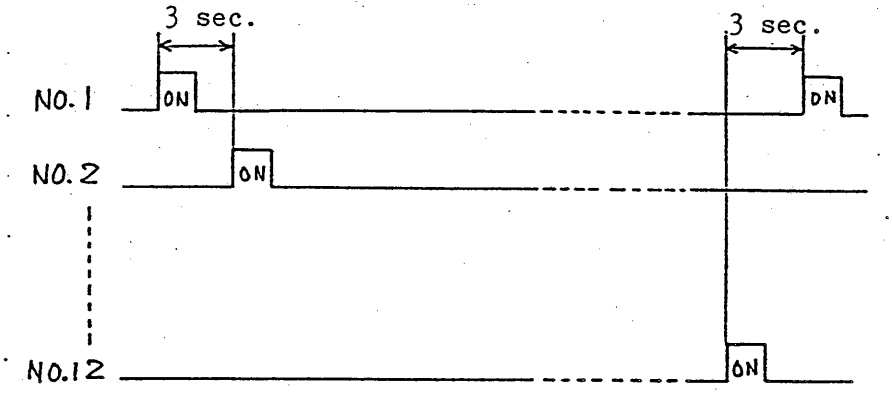
● RTD input specification

(Example of 4183-222)

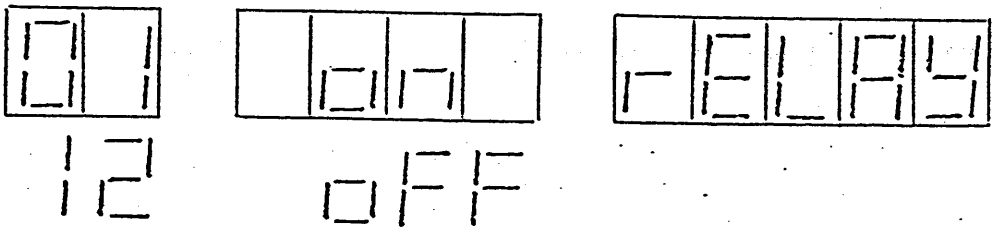


(6) [7] key Alarm relay ON/OFF

Alarms relays from No.1 to No.12 (optional) are turned ON and OFF at about 3-sec. intervals.



DISPLAY

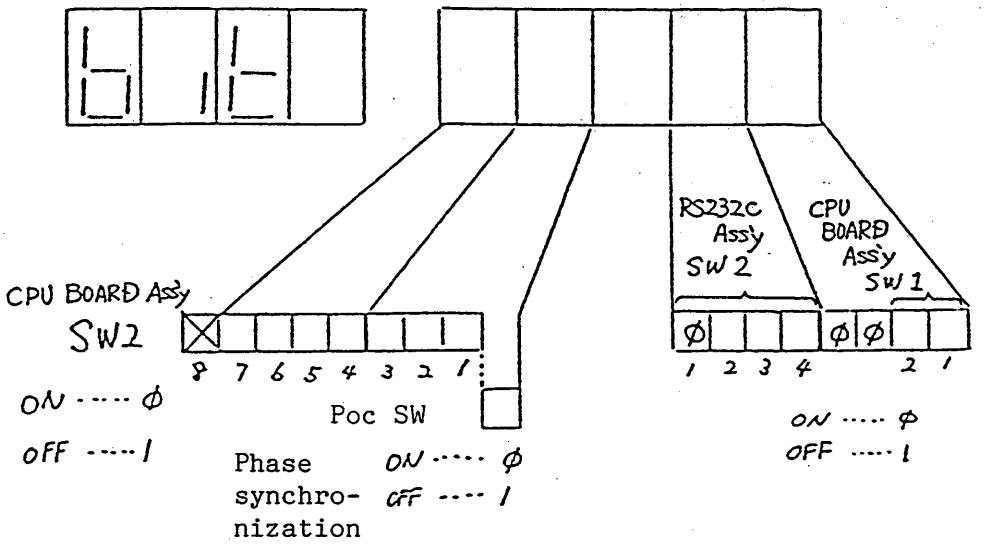


Ø1 ~ 12

Relay No.

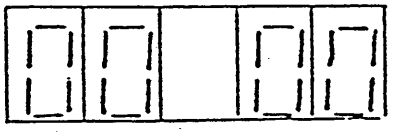
(7) [9] key DIS SW. read

The status of SW1 and SW2 on the CPU board Assy and SW2 on the RS232C Assy (optional) and phase synchronous (optional) SW. is displayed on the display unit.

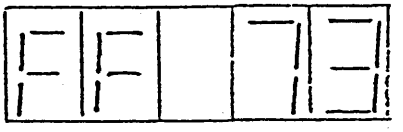


ex)

When all ON



When all OFF



CPU board Assy SW1 ... Always OFF

SW2 ... For spec. change of power frequency, input type, etc.

RS232C Assy SW2 ... 4-pole DIP SW at the rear

Note : The display of RS232C Assy SW2 and phase synchronous SW, when no RS232C and phase synchronization are provided, is the same as "OFF" when provided.

8. Reference Data

Contents

8.1 Specifications

Type : 1-pen, 2-pen and 3-pen writing 250 mm recorder

Input section

Measuring points	:	1 point (4181), 2 points (4182) 3 points (4183)
Input circuit	:	Floating, Isolated between channels.
Measuring interval	:	125 ms/ input channel
Input signal	:	DC voltage input ... 20 mV to 50 V range Thermocouple input.. 100° C span and 3 mV or more RTD input..... 50° C span or more (Pt 100Ω)
Range setting	:	Any range setting from keyboard (Range code is used.)
Measuring range	:	Described in the following Table 8.1

Table 8.1

Input type	Range code	Measuring range	Remarks
DC voltage	00 01 02 03 04 05	-20.00~ 20.00 mV -200.0~ 200.0 mV -2.000~ 2000 V -6.000~ 6.000 V -20.00~ 20.00 V -50.00~ 50.00 V	
Thermocouple (JIS.ANSI)	10 11 12 13 14 15 16 17 18	Type R 0~ 1760° C Type S 0~ 1760° C Type B 400~ 1820° C Type K -200~ 1370° C Type E -200.0~ 800.0° C Type J -200.0~ 1100° C Type T -200.0~ 400.0° C Type N 0~ 1300° C Type W 0~ 2315° C	
RTD (JIS.)	20	Pt100Ω -200.0~ 550.0° C	
DC voltage (Linear scaling)	30 31 32 33 34 35	-20.00~ 20.00 mV -200.0~ 200.0 mV -2.000~ 2.000 V -6.000~ 6.000 V -20.00~ 20.00 V -50.00~ 50.00 V	75% of the range in the left is measurable.
DC voltage (Square root Extraction scaling)	40 41 42 43 44 45	-20.00~ 20.00 mV -200.0~ 200.0 mV -2.000~ 2.000 V -6.000~ 6.000 V -20.000~ 20.00 V -50.00~ 50.00	75% of the range in the left is measurable.

Max. allowable input voltage :

For measuring range of 2V DC or less (range codes : 00, 01, 02, 30, 31, 32, 40, 41, 42, 10 to 18, 20)...± 10 V DC (continuous)

For measuring range of 6 to 50V DC or less (range codes : 03, 04, 05, 33, 34, 35, 43, 44, 45)...± 100 V DC (continuous)

Recording section

Recording method : Disposable felt pen

Recording color : 1st pen (red), 2nd pen (green),
3rd pen (blue)

Effective recording width
: 250 mm

Chart : Scan-fold strip.....Total length 20 m

Step response time (90% step)
: 2.0 sec. or less *

*When measured in accordance with IEC TC65.

Chart feed speed : Set from the keyboard from 5 to
12,000 mm/h in steps of 82.

Display unit

Display method : LCD color display

Digital display : Measured value (3 display panels)
DC voltage....3.5 digits
Temperature...Up to 1 digit below
decimal point (°C)
. Alarm (H, L (h, l) and ALM)
. Unit
. Year/month/day
. Time
. Chart feed speed

Bar-graph display : . Measured value (Resolution : 2% of span)
. Alarm set value
. Flashing display during alarm

Status display : Digital setting and display modes, Alarm (ALM), Battery replacement request display (BAT), Record ON (●), List (LIST), Phase synchronization (POC), chart feed speed (SP2)

Reference performance

Reference junction compensation accuracy :

(When input terminal temperature balances at the ambient temperature 5 to 40° C)

R, S, B, W.....± 1° C

K, E, J, T, N....± 0.5° C

Recording speed : Pen-writing... Step response time; 2 sec. or less (90%)

Input resistance : DC voltage (at 20, 200 mV, and 2 V ranges) 10 MΩ or more

Thermocouple 10 MΩ or more

DC voltage (at 6, 20 and 50 V ranges) Approx. 1 MΩ

Input bias current: 10 nA or less For thermocouple with BU or BD (optional) Approx. 100 nA

Chart feed accuracy

: Less than ± 0.1% (chart feed length 1,000 mm or more)

Clock accuracy : Less than ± 50 ppm Excluding delay (1 sec. or less) when the power is turned ON or OFF.

Insulation resistance

: 20 MΩ or more (Between terminal and grounding at 500 V DC)

Dielectric strength

: . Between power terminal and grounding 1 minute at 1,500 V (50/60 Hz). Leakage current 2 mA or less

. Between measuring terminal and grounding 1 minute at 1,000 V(50/60 Hz). Leakage current 2 mA or less

Accuracy/Resolution (Dead band)

This performance is under the reference operating condition. (Temperature; 23 ± 2° C, Humidity; 55 ± 10%, Power voltage and power frequency error; Within ± 1% of rating, Warming-up time; 30 min. or more.

(See the following Table 8.2.)

Input	Range	Measurement (Digital display)		Recording (Analog) *1		Remarks
		Accuracy	Resolution	Accuracy	Dead zone	
DC voltage 0□ 3□	20 mV	±(0.2% of rdg *+ 3 digits)	10 μV	Measuring accuracy: ±(0.3% of span)	0.2% of recording span	*rdg: Indicated (displayed) value
	200 mV	±(0.2% of rdg + 2 digits)	100 μV			
	2 V	±(0.1% of rdg + 2 digits)	1 mV			
	6 V	±(0.3% of rdg + 2 digits)	1 mV			
	20 V		10 mV			
	50 V		10 mV			
TC (Not including reference junction compensation accuracy) 1□	R, S	±(0.15% of rdg + 1 ℃) Provided that R, S: 0~100℃ ± 3.7℃, 100~300℃ ± 1.5℃	0.2 ℃			
	B	B: 400~600℃ ± 2℃				
	K	±(0.15% of rdg + 0.7 ℃) Provided that −200~−100℃ ±(0.15% of rdg + 1 ℃)	0.1 ℃			
	E, J, T	±(0.15% of rdg + 0.5 ℃) Provided that J: −200~100℃ ±(0.15% of rdg + 0.7 ℃)				
	N	±(0.15% of rdg + 0.7 ℃)				
	W	±(0.15% of rdg + 1 ℃)	0.2 ℃			
RTD	Pt 100	±(0.15% of rdg + 0.3 ℃)	0.1 ℃			

*1 When the recording span (Table 8.2) is set to that in the following table.

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

Printer

(Printed using plotter pen (color: purple))

Fixed-time print-out*

:. Time tick (printed out as -)
. Measured value
. Chart feed speed
. Tag (Tag. No.)
. Scaling value (printed out on both side of 0, 100%)
. Unit (mV, V,°C (°F) and any unit set by ASCII code.)
. Hour/minute
. Year/month/day
. Partially compressed boundary (Only for partial recording)

Alarm print-out* : . △ (alarm generation) sign
▽ (release) sign
. Channel No.
. Alarm mode (High, low-limit/H, L)
. Alarm setting NO.
(*mark: printed-out only when alarm memory capacity limit is exceeded.)
. Alarm generation or release time

List print-out* : . Date (List starting point)

. Time (List starting point)

. Chart feed speed setting (1st setting speed, 2nd setting speed), Effective when REM is added.

. Phase synchronous function is turned ON

. Channel No.

. Tag setting

. Measured range setting

. Recording span setting

. Scaling value setting

. Unit setting

. Zone width setting

. Partial setting

. Alarm setting

. Message setting

Print-out when chart feed speed is changed. *Note)

(Note) Chart feed speed changes in 2 steps by a remote signal. At this time, printing to show that the speed has been changed is made. However, in this case, the additional code of REM is required.

. Speed 1 or 2

. Speed change (a remote signal generation) or release time

Construction

Material : Case...Steel plate
Front door...Aluminum diecast

Dimensions : For Models 4181, 4182 and 4183
444 × 288 × 290 mm D
(D: Length from the front panel excluding door thickness of 22.5 mm (common to 1-, 2- and 3-pen))

Finish : Case and front door frame....black (Munsell N 1.5)

Weight : 1-pen (4181)....Approx. 19.0 kg
2-pen (4182)....Approx. 19.5 kg
3-pen (4183)....Approx. 20.0 kg

Mounting : Panel flush mounting (Vertical panel)
Mounting angle; it is possible to mount the recorder by slanting it backward from 0° to 30°. However, the right and left sides should be horizontal. (with internal illumination)

Power supply unit

Power supply voltage : 100, 115, 200, 230 V AC ± 10%
(Specify one of them.)

Power frequency : 50 or 60 Hz (Specify either one.)

Power consumption : For 1-pen (4181)....50 VA
For 2-pen (4182)....55 VA
For 3-pen (4183)....60 VA

Normal operating conditions

Ambient temperature : 5 to 40° C

Ambient humidity : 45 to 85% RH (relative humidity)

Vibration : 0.02G or less at 10 to 60 Hz

Magnetic field : 400 AT/m or less

External noise :

i) Allowable normal mode voltage (50/60 Hz)

DC voltage range.....Peak value including a signal component is 1.2 times of or less than measured range.

Thermocouple range.....Peak value including a signal component is 1.2 times of or less than measured i.m.f.

R T D range.....50 mV or less

ii) Allowable common mode voltage (50/60Hz)

100 V or less at all ranges

Warming-up time : 30 min. or more since the power is turned ON.

Power supply for memory back-up

: Type (S)UM-3* Battery 3pcs.
(1.5 V × 3)
*Equivalent to R6(IEC, BS and DIN),AA(ANSI) and 15(NEDA).

Influence on operating conditions

Power supply : . Variation effected by the change of 10% rating voltage, Indication.....± (0.1% of reading + 1 digit) or less

Recording.....0.2% of span or less

. Variation effected by the change (rating frequency ± 2 Hz), Indication.....± (0.1% of reading + 1 digit) or less

Recording.....± 0.1% of span or less

Ambient temperature

: Variation effected by the temperature change of 10° C

Indication.....± (0.1% of reading +1 digit) or less

Recording.....± 0.3% of Span or less

Reference junction compensation errors become as follows at the range of the ambient temperature of 5 to 40° C.

Thermocouple R, S, B, W.....± 1° C

K, E, J, T, N...± 0.5° C

(Excluding the reference junction compensation error for thermocouple input)

External magnetic field

: Variation effected by AC/DC 400 AT/m

Indication.....± (0.1% of reading + 10 digits) or less

Recording.....± 0.5% of span or less

Input signal source resistance

: Variation effected by signal source resistance of 1 kΩ .

i) Voltage range

20, 200 mV, 2 V range.....± 10 μ V or less

6, 20, 50 V range.....– 0.1% (span change)

ii) Thermocouple range.....± 10 μ V or less

Approx. ± 100 μ V or less with burn-out(/BU, /BD)

iii) RTD

Variation effected by the change of 10 Ω per wire

Indication.....± (0.1% of reading + 1 digit) or less

Recording.....± 0.1% of span or less (3 wires should be the same resistance values.)

External noise : Noise under the normal operating condition (Frequency: 50, 60 ± 0. 1Hz)

. Normal mode noise rejection ratio..... 40dB or more

. Common mode noise rejection ratio..... 120dB or more

(Signal source resistance is 500 Ω or less for voltage input and thermocouple input. Lead wire resistance is 2 Ω or less per wire for RTD input)

Mounting position : Variation effected by backward slant-mounting within 30°

Indication .... ± (0.1% of reading + 1 digit) or less

Recording .... ± 0.1% of span or less

Vibration : Vibration when linear vibration at frequency of 10 to 60 Hz and acceleration of 0.02G, is added to 3 axes of the recorder

Indication .... ± (0.1% of reading + 1 digit)

Recording .... ± 0.1% of span or less

Alarm

Setting method : Set from keyboard

No. of setting points

: Up to 4/channel (High/low limits)

Output : Common 6 or 12 outputs

(Relay output: Optional)

(Print-out on chart : Standard function)

Display : LCD (Bargraph and "ALM")

Hysteresis band : Approx. 0.5% of recording span

Standard functions

Standard functions are described in the following Table 8.3.

Table 8.3

Function	Details
Any range setting	Any range is settable for each channel.
Skip function	Measurement at any channel is skipped (not measuring)
List print-out function	Prints out the list of range, Tag No., unit, alarm (output relay: optional), combined sensor, date and chart feed speed, etc. for each channel
Fixed time print-out function	Prints out date, measured value, Tag No., unit, characters on scale (0% side, 100% side), chart feed speed and recording color on the chart at the fixed interval. *-1
Display function	Digital display: Displays year/month/day, time or measured value for each channel. Also, displays range setting and the contents of setting. Bar-graph display: Displays measured value, alarm set-value and also flashes alarm points.
Difference recording	For the same range, records the difference between reference channel and each channel. *-2 (Any reference channel can be set)
Linear scaling function	Scaling at the voltage measuring range from 5 mV span up to 50 V. (Scaling value; within 30000 span in the range of -19999 to 20000) *-3
Square root extraction ($\sqrt{}$) function	Extraction of the square root ($\sqrt{}$) at the voltage measuring range from 5mV span up to 50 V (Scaling value: within 30000 span in the range of -19999 to 20000) *-4
Zone recording function	Selects and records zone at each channel.
Partial suppression (expansion) recording	Suppresses the measuring range of the unsignificant part and records a wide measuring range in order to use the recording width efficiently.
Memory back-up function	Data setting and date/time are protected by 3 cells (Type (S)UM) (Battery life; 3 months)

* -1 For characters which are useable to Tag No. units, refer to the ASCII code list.

* -2 Reference channel No. should be smaller than measured channel No.

* -3 Linear scaling voltage span is 75% of or less than the measuring range.

* -4 Square root extraction voltage span is 75% of or less than the measuring range.

Additional specifications

The options described in the Table 8.4 can be added to this recorder.

Table 8.4

Model name		Additional code
Thermocouple input burnout	Upscale	/BU
	Downscale	/BD
Remote terminal		/REM
Alarm output relay unit	6 terminals	/AK-06
	12 terminals	/AK-12
Phase synchronization		/PS
Message print-out		/MSG
RS232C		/RS232C

i) Thermocouple input burnout (/BU, /BD)

When input is disconnected, indication is overscaled beyond 100% or downscaled below 0%

[Burnout current : Approx. 100nA,
Burnout condition : 10 MΩ or more]

. Burnout upscale : Common to all points (/BU)

. Burnout downscale : Common to all points (/BD)

ii) Remote terminals (/REM)

Starts/stops recording (chart START/STOP) and changes chart feed speed.

① Starts/stops recording operation according to contact signal.

This function is the same as 

key on the keyboard, but start/stop by remote contact signal has priority over the above.

② Chart feed speed changes from the 1st setting speed (normal chart feed speed) to the 2nd setting speed (remote chart feed speed) by the contact signal. When the signal is released, the speed returns to the 1st setting speed.

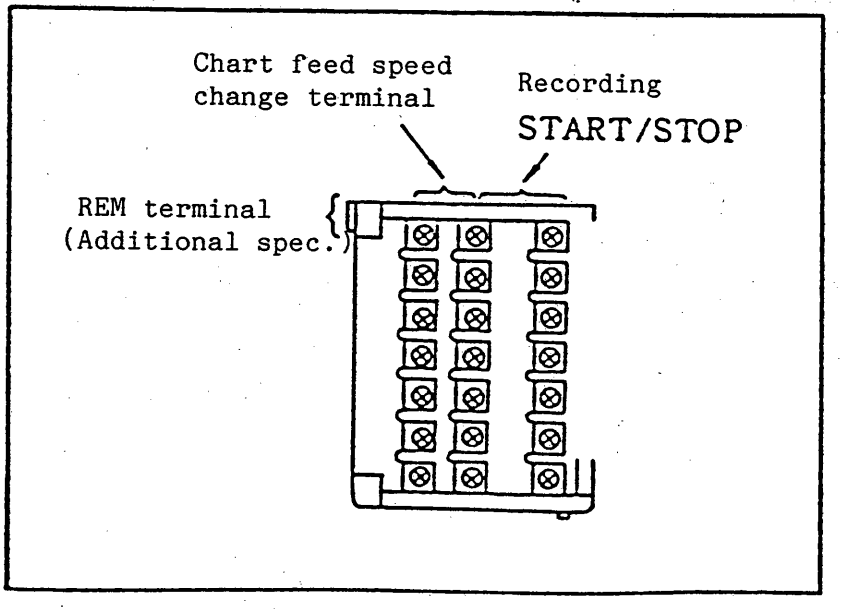


Figure 8.2

iii) Alarm output relay unit (built in the recorder as option)

. /AK-06

No. of output points	: 6 points
Relay contact	: . 240 V AC, 3A (non-inductive load)
Capacity	: . 30 V DC, 3A (non-inductive load)

. /AK-12

No. of output points	: 12 points
Relay contact	: . 240 V AC, 3A (non-inductive load)
Capacity	: . 30 V DC, 3A (non-inductive load)

/AK-06 and /AK-12 terminals are arranged as shown in the Figure 8.3. (For /AK-12, there are 2 alarm terminal rows so that No. of output points becomes 12.)

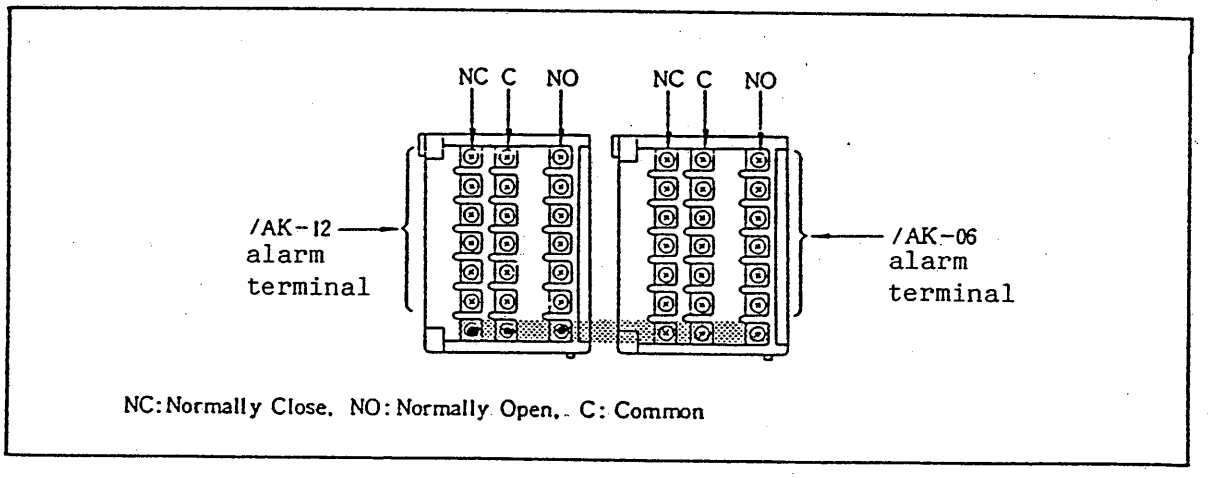
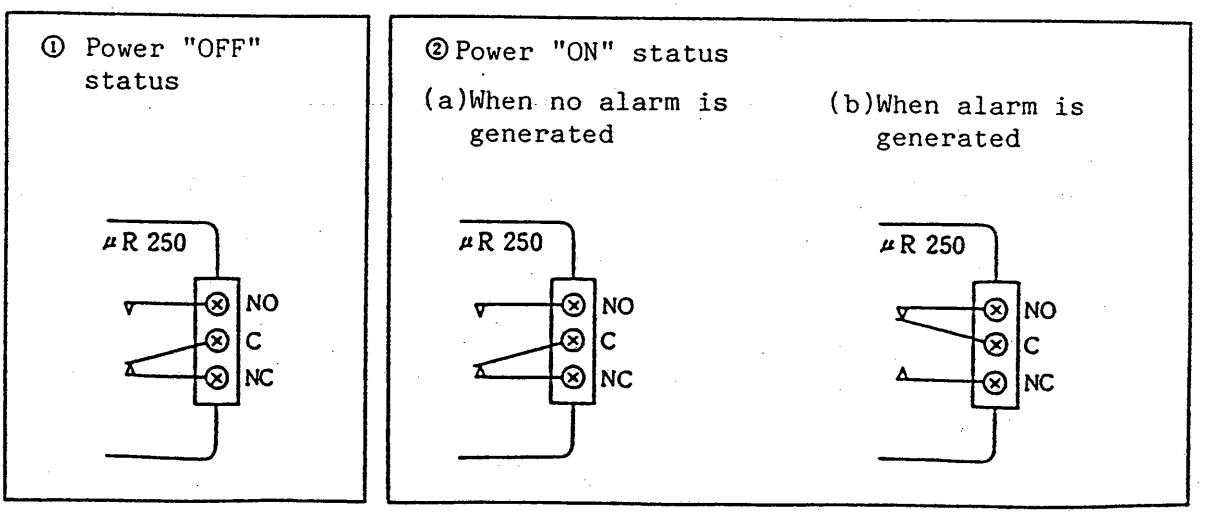


Figure 8.3

Relay contact status changes as follows according to power supply status. (Energized alarm)



Each relay /AK-06 and /AK-12 is activated when a measured value reaches the alarm point set to the recorder.
It is assumed that alarm points are set as follows.
(As an example, it is assumed that /AK-06 is added to 3-pen writing (Model 4183). For other combinations the principle of operation is also the same as the above example.)

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

In ALmn above, m denotes channel NO. and n, alarm setting NO. in that channel NO.

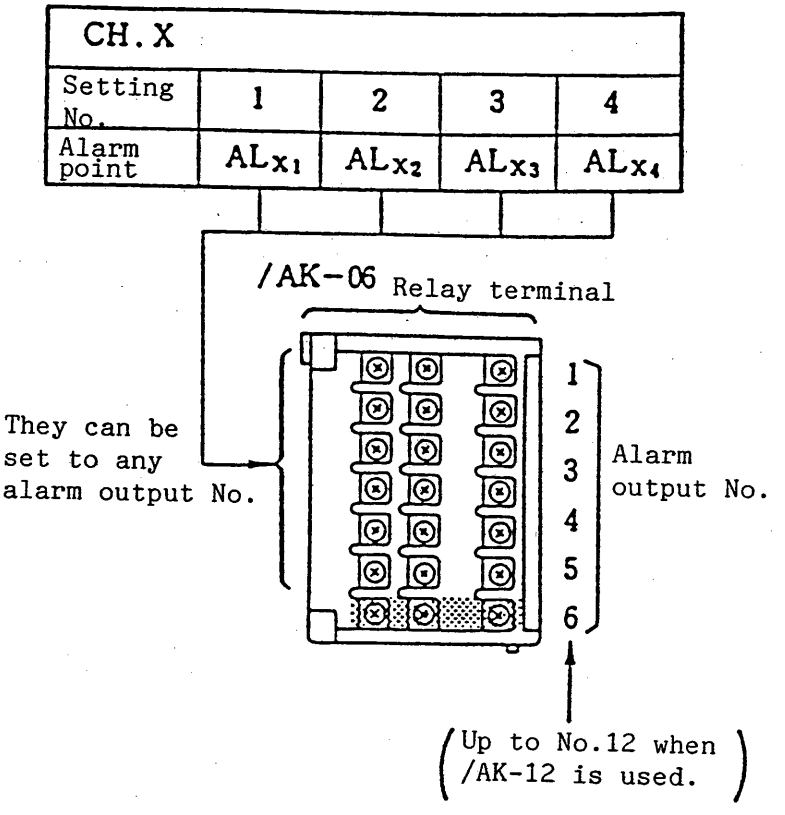
For example, AL_{32} is the alarm point set to alarm setting NO. in channel NO. 3, and from the above table AL_{32} is set to alarm output No.4. (Setting No. : Up to 4 for each channel *-1).

Now, pay attention to alarm output No.4 in the above table.

When any one of AL_{14}, AL_{23} and AL_{32}, set to CH. 1 to CH. 3 generates an alarm, the relay operates to be in the state ② -(b) in the figure of the previous page. (No.4 relay *-2)

For alarm output No. 1, only AL_{11} is set, so that the generation of this alarm determines relay action.

(No.1 relay)



*-1 2 or more different alarm points can not be set to the same channel using the same setting No.

*-2 Alarm output No. = Relay No.

An alarm indicated by ALmn can be set to any alarm output No. one to one (within the limitation of 1 to 6 or 1 to 12).

iv) Phase synchronization (/ps)

This function eliminates the deviation (phase difference) between the 2nd and 3rd pens existing on the time axis. (Pen off-set compensation error.....1 mm or less)

As an example, the 2-pen type (Model 4182) is described in this section. (The principle is the same as that of the 3-pen type.)

Figure 8.4 shows recordings on chart with pens (1st and 2nd) is viewed from the side.

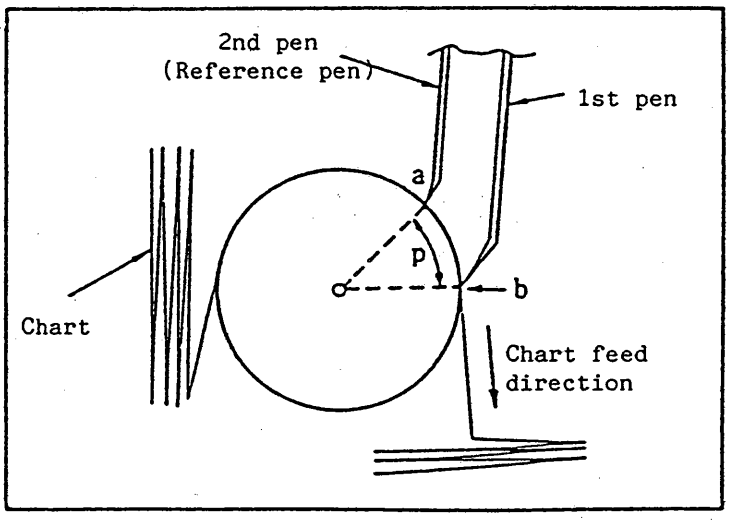


Figure 8.4

From Figure 8.4, the distance between the 1st and 2nd pens deviates by length P on the chart. Measured value recordings at the same time also deviate on the time axis.

(Time deviation $\triangle T = P/V$

Where, V : Chart feed speed)

Therefore, the memory stores measured data corresponding to the phase difference (time) between the reference pen and other pens and if the chart advances by the time corresponding to the phase difference, each pen records the stored data to eliminate the deviation on the time axis.

Note -1

Reference pen : For Model 4182.....2nd pen

For Model 4183.....3rd pen

The phase synchronous function is set to "OFF" prior to shipment.

Note -2

Since each pen other than the reference pen does not record the data until the time corresponding to the phase difference passes, it may be seen than the pen does not operate correctly. This is for the reason that the pen waits for starting recording until the phase difference is eliminated while the memory stores the measured data. Just after power ON when the phase synchronization function is used, only the reference pen operates normally

for a while but other pens do not.
However, this is not abnormal.

Note -3

The phase synchronization function can be added to only the 2-pen and 3-pen recorders.
The function can be selected by switch. The switch is located near the battery holder.
(Open the battery holder cover.)
Always select the switch after the power switch is turned OFF.

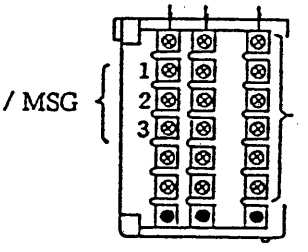
V) Message print-out (/MSG)

Time and message (Up to 16 characters) entered with the external contact closed can be printed out.

No. of input points : 3 points (3 types of message can be printed out.)

Input signal : Dry contact, Signal width 2 sec. or more.

Input type : Photo coupler isolation (One-line common)



Vi) RS - 232C (/RS 232C)

Transmission method : Start stop synchronization

Transmission speed : *75, 150, 300, 600, 1200, 2400, 4800, 9600bit/s

Data : ASCII

Data format :

*Start bit	Data	Parity	Stop bit
1	8	X	1
1	7	ODD	1
1	7	EVEN	1
1	7	X	2

Hardware handshaking :

* $\overline{\text{DTR}}$, $\overline{\text{RTS}}$, $\overline{\text{CTS}}$ — Their use as TRUE or control line is selectable independently.

Software handshaking :

Always controls output by Xon-Xoff output from the other during data outputting.

* Set by the dip switch.

For more details, refer to Instruction Manual, μ R250/RS232C.

8.2 Model No. and Codes

μR250 Basic Code Table

Model	Basic spec. code	Spec.	
4181		1-pen recorder	
4182		2-pen recorder	
4183		3-pen recorder	
1-pen recorder input and 1st pen inputs of 2-pen and 3-pen recorders	−1	DCV, TC input (JIS, ANSI)	℃
	−2	RTD (JIS)	℃
	−3	DCV, TC input (ANSI)	℃
	−4	RTD (DIN)	℃
	−5	DCV, TC input (ANSI)	℉
	−6	RTD (DIN)	℉
	−7	DCV, TC input (DIN)	℃
	−8	RTD (DIN)	℃
2nd pen inputs of 2-pen and 3-pen recorders	0	Set "0" to all 1st pens.	
	1	DCV, TC input (JIS, ANSI)	℃
	2	RTD (JIS)	℃
	3	DCV, TC input (ANSI)	℃
	4	RTD (DIN)	℃
	5	DCV, TC (ANSI)	℉
	6	RTD (DIN)	℉
	7	DCV, TC input (DIN)	℃
	8	RTD (DIN)	℃
3rd pen input of 3-pen recorder	0	Set "0" to all 1st and 2nd pens.	
	1	DCV, TC input (JIS, ANSI)	℃
	2	RTD (JIS)	℃
	3	DCV, IC input (ANSI)	℃
	4	RTD (DIN)	℃
	5	DCV, TC input (ANSI)	℉
	6	RTD (DIN)	℉
	7	DCV, TC input (DIN)	℃
	8	RTD (DIN)	℃

Note) 4181 → 1 to 8
4182, 4183 → Only combinations of 1 or 2, 3 or 4, 5 or 6, and 7 or 8 are available.

Items to be specified at procurement

(1) Model No. and basic spec. code
(2) Additional specification code
(3) Supply voltage (100, 115, 200, and 230 V AC) and frequency (50/60 Hz) designation

Additional specification		
	Burnout up scale	/BU
	Burnout down scale	/BD
	With alarm 6 output relay	/AK-06
	With alarm 12 output relay	/AK-12
	Remote control	/REM
	Phase synchronization	/PS
	Message printout	/MSG
	With RS-232C	/RS232C

8.3 Ass'y Parts Replacement Intervals (Reference)

Part name	Part No.	Replacement intervals (Reference)	Remarks
DISPLAY ASS'Y	B9574QA	5 years	Used at normal temperature
MOTOR	B9573RK	5 years	Chart motor
	B9573NN	5 years	Plotter x,y axes
SERVO ASS'Y	B9574LA B9574LB B9574LC	5 years	Motor in the servo Ass'y and the string Ass'y
STRING ASS'Y	B9574HQ	5 years	Plotter
SOLENOID ASS'Y	B9574EE	5 years	Plotter
KEY BOARD ASS'Y	B9574FW	10 years	
FUSE	A9050KF A9049KF	2 years 2 years	100 V AC series 200 V AC series
/AK-06,12			NOTE1

Spare parts

PEN	B9565AP B9665AQ B9565AR	1 month/pc.	1200 m/pc.
PEN (FOR PLOTTER)	B9565AS	2-3 weeks/pc.	200 m/pc.
BATTERY	A9005ED	Approx.3 months	SUM-3(1.5V) *3

Note 1:
Relay lifetime

Mechanical lifetime	50,000,000 times or more	
Electric lifetime	250 V AC 5A 30 V DC 5A	100,000 times or more (Resistive load)

MEMO

9. Parts List

Contents

9.1 Correspondence Table between "Electric Circuit Ass'y Configuration " and "Parts List and Exploded Drawing"

Electric circuit configurating Ass'y		Parts list & exploded drawing	
Name	Part No.	Title	PAGE
A/D ASS'Y	B9574VE B9574VF	9.2(5) A/D BRACKET AND TRANSFORMER ASSEMBLIES	84
ALARM BOARD ASS'Y(AK-06,12)		9.2(6) TERMINAL ASSEMBLY	86
BATTERY CASE	B9574HL	9.2(3) MAIN FRAME ASSEMBLY 2	80
BUZZER ASS'Y	B9573UY	↓	
CPU BOARD ASS'Y	B9574VA	9.2(4) SERVO AND PLOTTER ASSEMBLIES	82
CHART MOTOR	B9573RK	9.2(3) MAIN FRAME ASSEMBLY 2	80
CONNECTOR (RS232C)	B9574VV	9.2(5) A/D BRACKET AND TRANSFORMER ASSEMBLIES	84
DISPLAY ASS'Y	B9574QA	9.2(2) MAIN FRAME ASSEMBLY 1	78
FUSE	A9050KF A9049KF	9.2(5) A/D BRACKET AND TRANSFORMER ASSEMBLIES	84
INV. ASS'Y	B9574QT	9.2(3) MAIN FRAME ASSEMBLY 2	80
KEY BOARD ASS'Y	B9574FW	9.2(2) MAIN FRAME ASSEMBLY 1	78
KEY LOCK SW.	B9544ZA	9.2(5) A/D BRACKET AND TRANSFORMER ASSEMBLIES	84
MOTHER BOARD ASS'Y	B9574VH	↓	
MOTOR	B9573NN	9.2(4) SERVO AND PLOTTER ASSEMBLIES	82
POWER PCB ASS'Y	B9574VW	9.2(4) SERVO AND PLOTTER ASSEMBLIES	82
REMOTE ASS'Y (REM,MSG)		9.2(6) TERMINAL ASSEMBLY	86
RJC BOARD	B9565ER	9.2(5) A/D BRACKET AND TRANSFORMER ASSEMBLIES	84
RS232C ASS'Y	B9574VT	9.2(4) SERVO AND PLOTTER	82
ROM ASS'Y	B9574UA B9574UB B9574UC B9574UD	ASSEMBLIES	
SERVO ASS'Y	B9574LA B9574LB B9574LC		
SENSER ASS'Y	B9573HH	↓	
SOLENOID ASS'Y	B9574EE		
TRANSFORMER ASS'Y	B9573VH B9573VJ B9573VK B9573VL B9573VM B9573VN	9.2(5) A/D BRACKET AND TRANSFORMER ASSEMBLIES	84

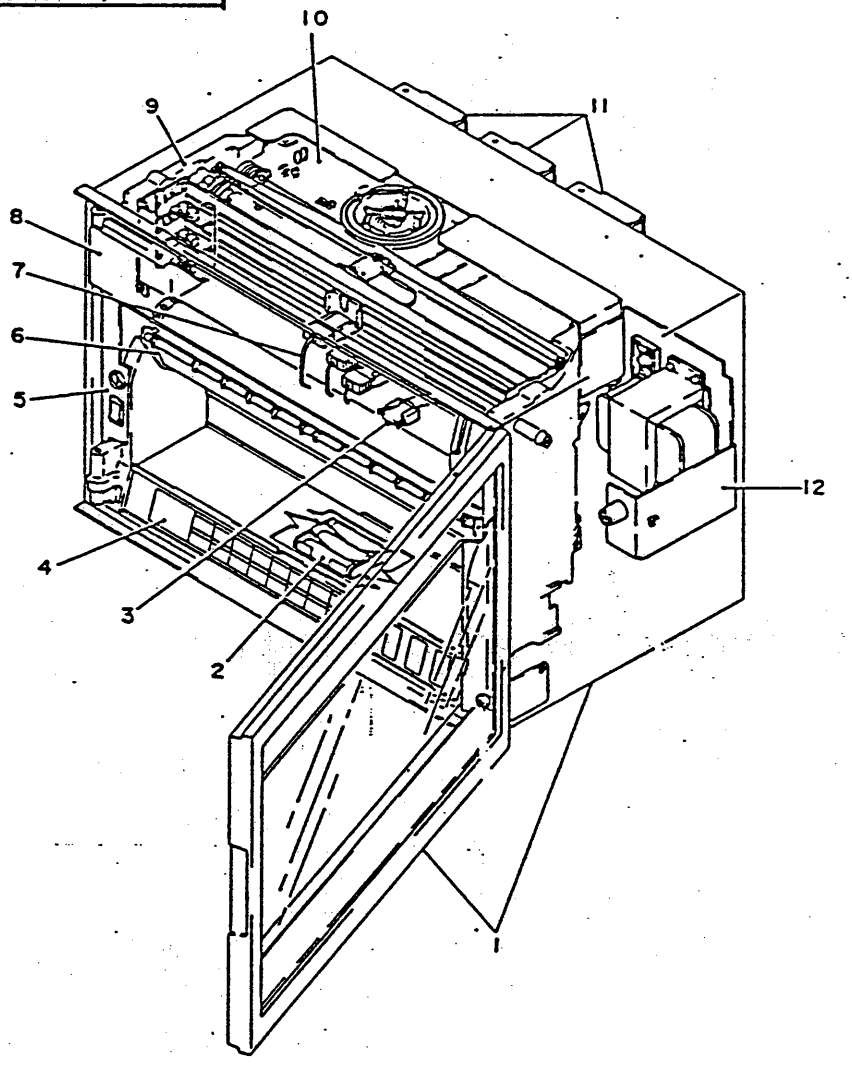
9.2

Parts List

& Exploded Drawing

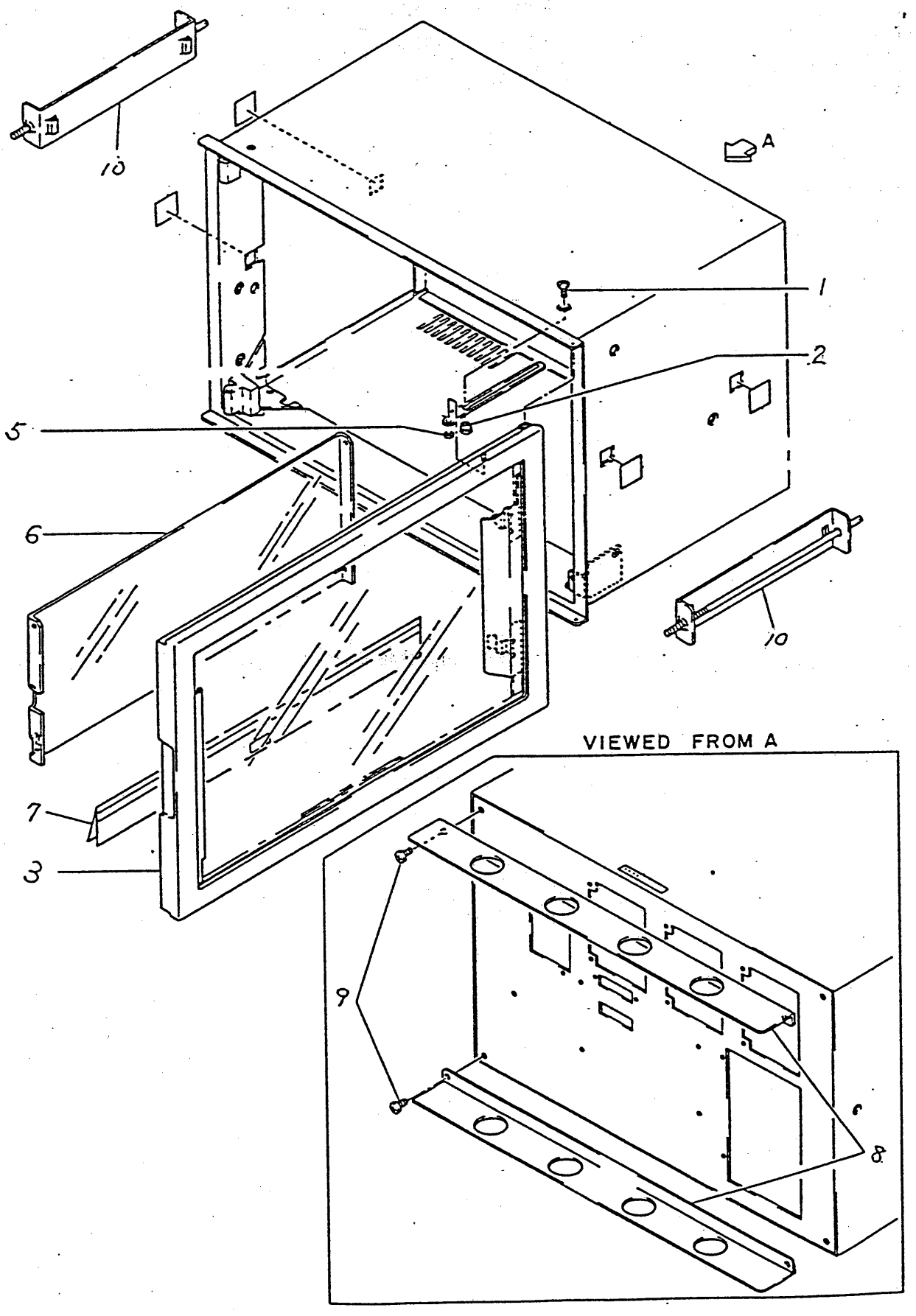
Model 4181
Model 4182
Model 4183
250 mm MICRO RECORDERS

µR250



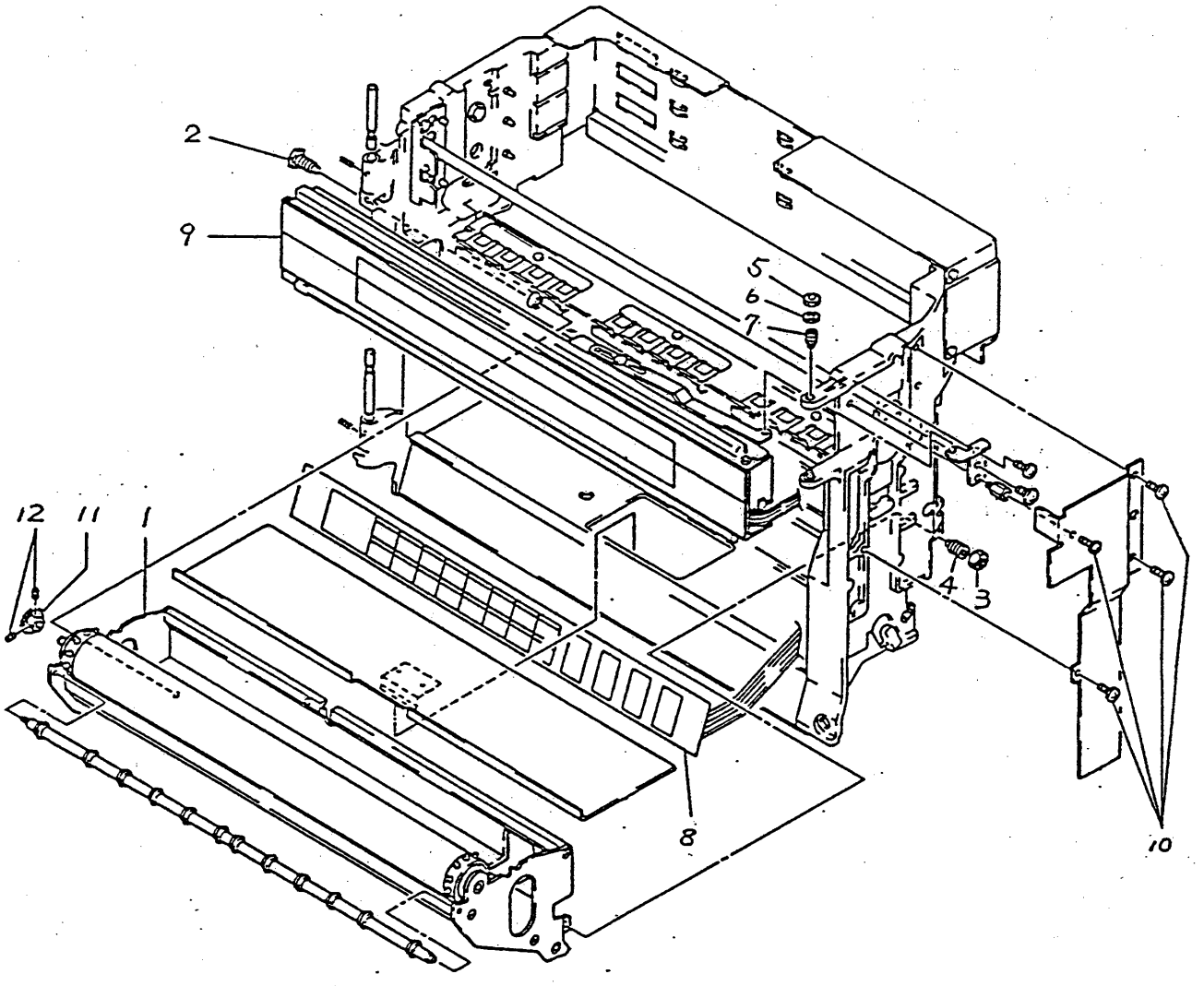
Item	Description
1	Case and Door Assemblies (see page 90)
2	Battery Case (see page 94)
3	Plotter Pen (see page 96)
4	Keyboard (see page 92)
5	A/D Bracket Assembly (see page 98)
6	Chart Guide Assembly (see page 92)
7	Pen Assembly (see page 96)
8	Display Assembly (see page 92)
9	Main Frame Assembly (see pages 92 and 94)
10	Servo Assembly (see page 96)
11	Option Terminal Assembly (see page 100)
12	Power Assembly (see page 96)

(1) Case and Door Assemblies



ITEM	PARTS No.	QTY	DESCRIPTION
1	Y9304LE	1	B.H.SCREW,M3*4
2	B9573BQ	1	ROD
3	B9574CA	1	DOOR ASS'Y
5	Y9300ET	1	E-RING
6	B9574CF	1	PLATE
7	B9574AT	1	NAMEPLATE...FOR MODEL 4181
	B9574AU	1	NAMEPLATE...FOR MODEL 4182
	B9574AV	1	NAMEPLATE...FOR MODEL 4183
8	B9574BE	2	BRACKET (OPTION)
9	Y9405LE	4	B.H.SCREW,M4*5 (OPTION)
10	B9573BW	2	BRACKET ASS'Y...FOR PANEL MOUNTING (ACCESSORY)

(2) Main Frame Assembly



ITEM	PARTS NO.	QTY	DESCRIPTION
1	B9574EA	1	CHART GUIDE ASS'Y
2	E9660FM	1	SCREW
3	Y9601CS	1	NUT
4	E9660GN	1	SCREW
5	B9573FR	1	NUT
6	Y9501WL	1	WASHER...WITH TOOTHED LOCKWASHER
7	B9573FQ	1	SCREW
8	B9574FW	1	KEY BOARD
9	B9574QA	1	DISPLAY ASS'Y
10	Y9304LE	4	B.H.SCREW,M3*4
11	B9541NR	1	GEAR Ass'y
12	Y9304SJ	2	SETSCREW

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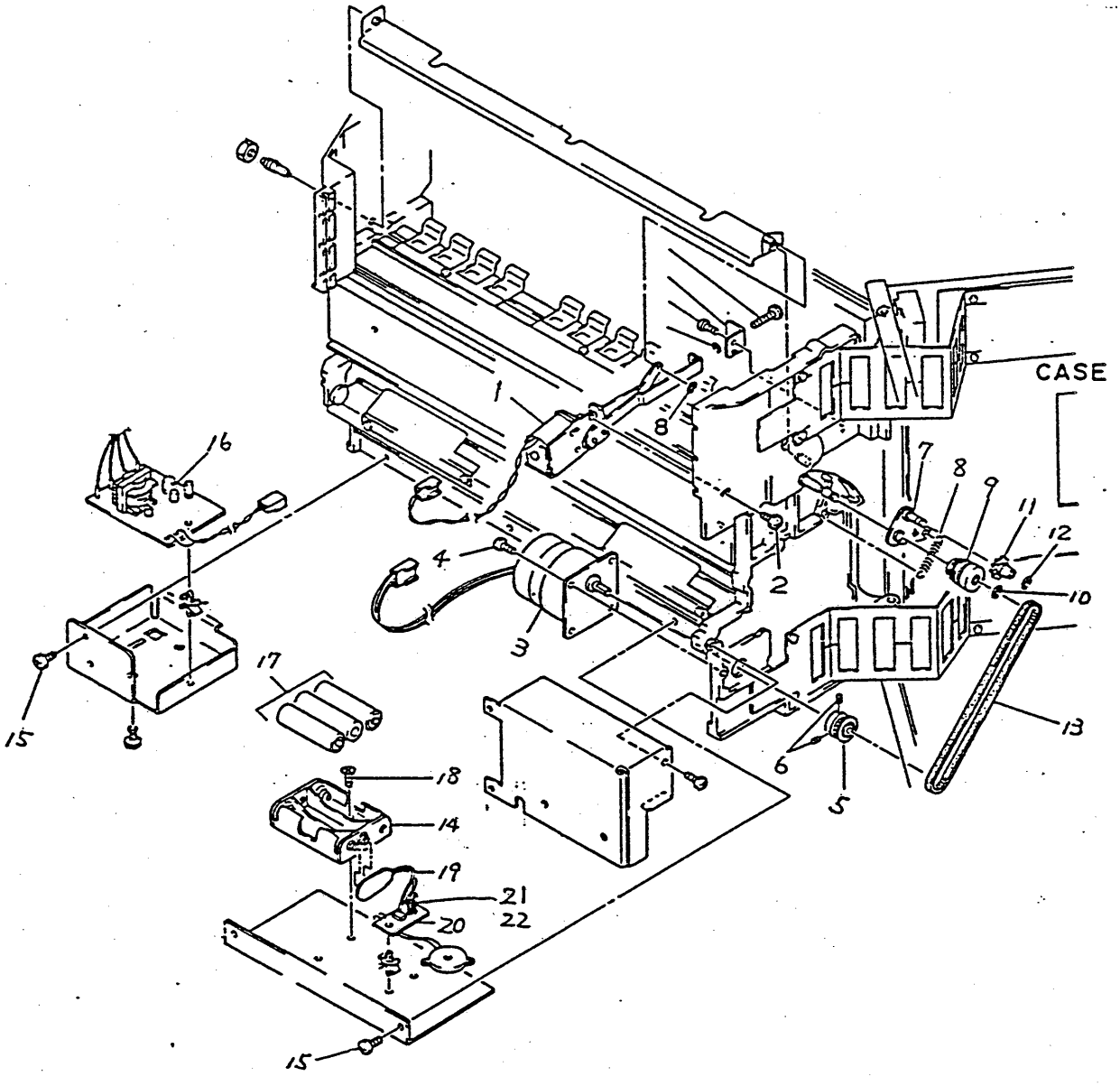
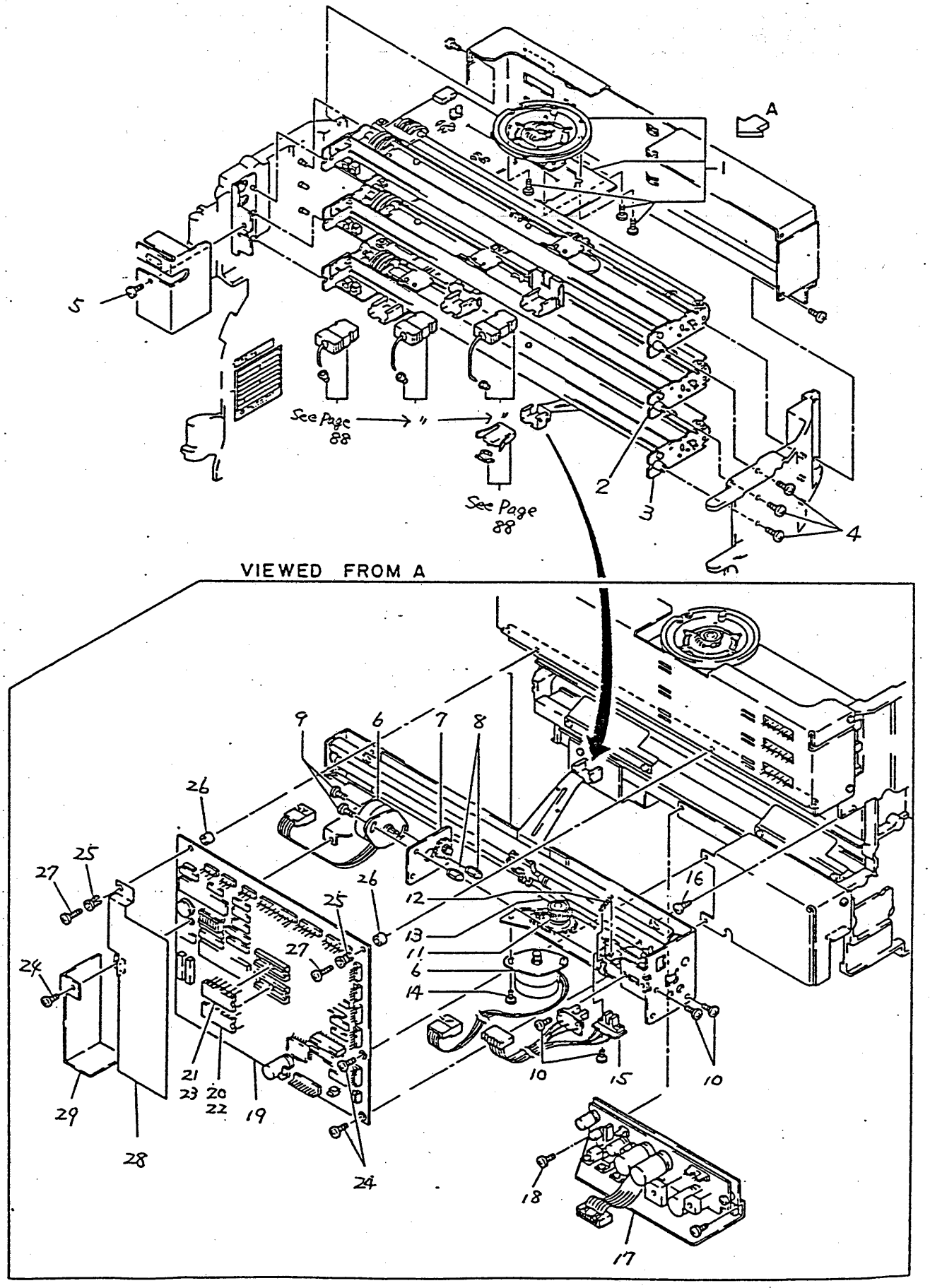
(3) Main Frame Assembly 2



ITEM	PARTS NO.	QTY	DESCRIPTION
1	B9574EE	1	SOLENOID ASS'Y
2	Y9304LS	2	B.H.SCREW,M3*4
3	B9573RK	1	MOTOR
4	Y9305TS	2	TAPPING SCREW,M3*5
5	E9670LE	1	PULLEY ASS'Y
6	Y9304SJ	2	SETSCREW
7	B9573DK	1	PLATE ASS'Y
8	B9573DY	1	SPRING
9	B9573DQ	1	PULLEY ASS'Y
10	Y9300ET	1	E-RING
11	B9573DM	1	GEAR ASS'Y
12	Y9250ET	1	E-RING
13	B9573DU	1	BELT
14	B9565HL	1	BATTERY CASE
15	Y9308TS	3	TAPPING SCREW,M3*8
16	B9574QT	1	INVERTER ASS'Y
17	A9005ED	3	BATTERY (ACCESSORY)
18	Y9304EB	2	F.H.SCREW,M3*4
19	A9007ED	1	WIRE
20	B9573UY	1	BUZZER ASS'Y
21	A9064SM	1	SWITCH] Phase synchronization (Option)../PS
22	B9573AS	1	NAME PLATE

(4) Servo and Plotter Assemblies

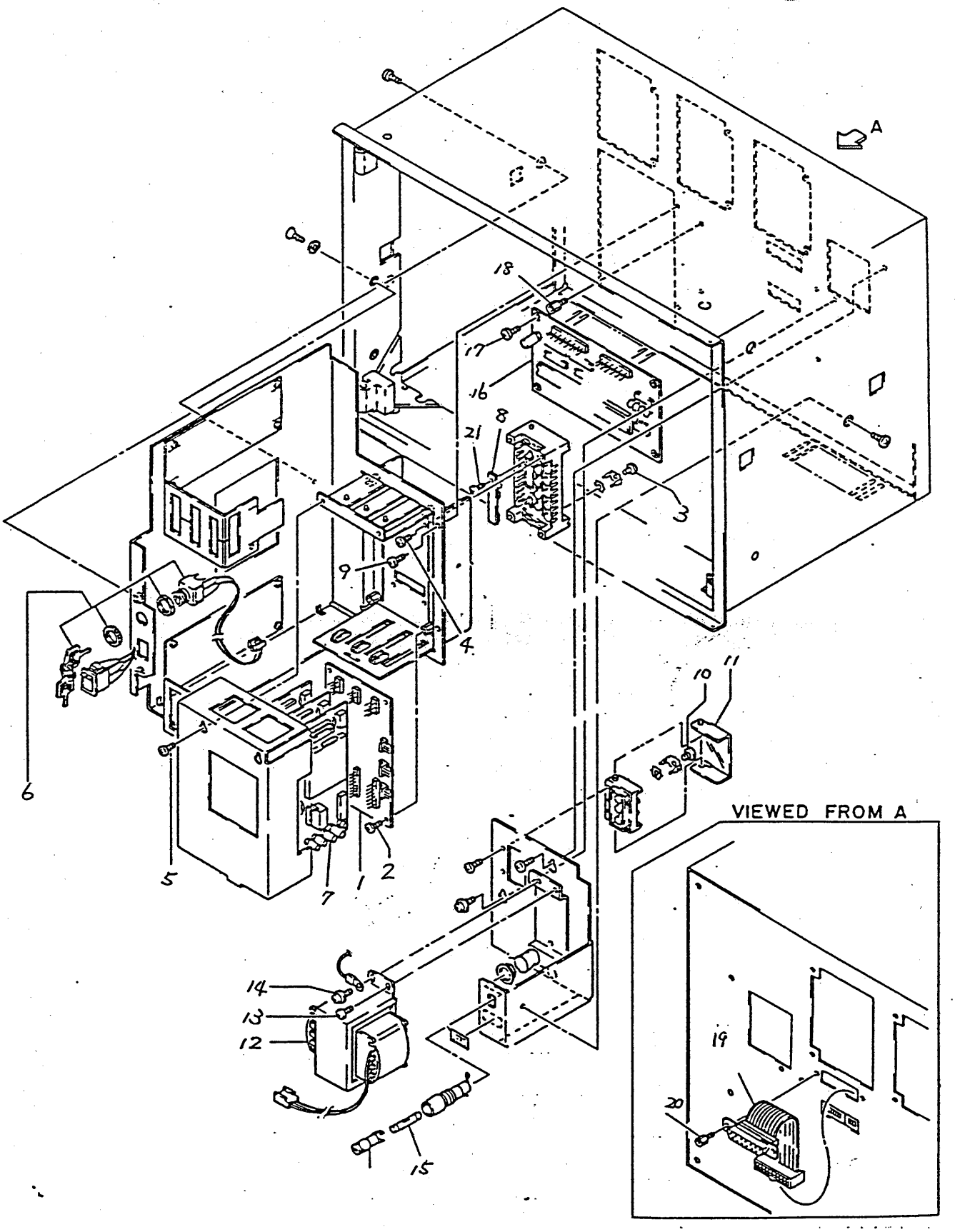


ITEM	PARTS No.	QTY	DESCRIPTION
1	B9574LA	1	SERVO ASS'Y...CH 1(1 PEN)
2	B9574LB	1	SERVO ASS'Y...CH 2(2 PEN)
3	B9574LC	1	SERVO ASS'Y...CH 3(3 PEN)
4	Y9306LS	1	B.H.SCREW,M3*6...FOR MODEL 4181
		2	B.H.SCREW,M3*6...FOR MODEL 4182
		3	B.H.SCREW,M3*6...FOR MODEL 4183
5	Y9304LS	1	B.H.SCREW,M3*4
6	B9573NN	2	MOTOR
7	B9573NW	1	PLATE ASS'Y
8	B9573NS	2	ROD
9	Y9204KS	2	B.H.SCREW,M2.3*4
10	Y9308LS	4	B.H.SCREW,M3*8
11	A9026KN	1	SPRING
12	A9027KN	1	SPRING
13	B9574HQ	1	STRING ASS'Y
14	Y9204KS	2	B.H.SCREW,M2.3*4
15	B9573HH	1	SENSER ASS'Y
16	Y9305TS	2	TAPPING SCREW,M3*5
17	B9574VW	1	POWER PCB ASS'Y
18	Y9308TS	2	TAPPING SCREW,M3*8
19	B9574VA	1	CPU BOARD ASS'Y
20	B9574UA	1	ROM ASS'Y...#1(SEE NOTE)
21	B9574UB	1	ROM ASS'Y...#1(SEE NOTE)
22	B9574UC	1	ROM ASS'Y...#2(SEE NOTE)
23	B9574UD	1	ROM ASS'Y...#2(SEE NOTE)
24	Y9304LS	3	B.H.SCREW,M3*4
25	A9044KY	2	BUSHING
26	A9045KY	2	BUSHING
27	Y9312LS	2	B.H.SCREW,M3*12
28	B9574CX	1	SHEET
29	B9574CY	1	COVER

NOTE:

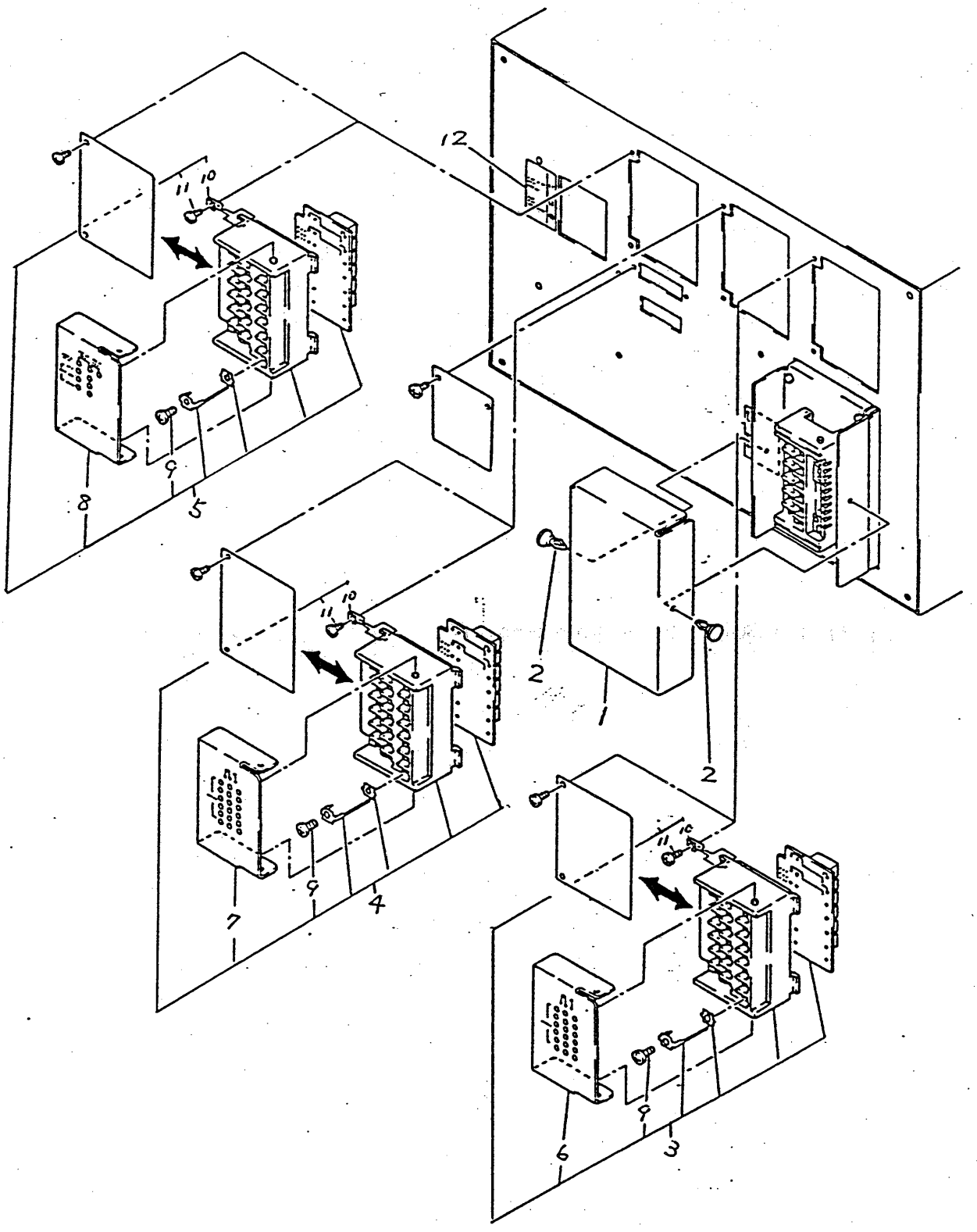
Model Code	Suffix Code	Input Type		B9574
418□	1 2	DC V, TC (JIS, ANSI) RTD (JIS)	°C	UA
	3 4	DC V, TC (ANSI) RTD (DIN)	°C	UB
	5 6	DC V, TC (ANSI) RTD (DIN)	°F	
	7 8	DC V, TC (DIN) RTD (DIN)	°C	UC UD

(5) A/D Bracket and Transformer Assemblies



ITEM	PARTS No.	QTY	DESCRIPTION
1	B9574VH	1	MOTHER BOARD ASS'Y
2	Y9304LB	4	B.H.SCREW,M3*4
3	B9565AZ	9	SCREW
4	Y9308TS	4	TAPPING,M3*8
5	Y9304LB	2	B.H.SCREW,M3*4
6	B9544ZA	1	SWITCH
7	B9574VE		A/D ASS'Y...MVTC INPUT
	B9574VF		A/D ASS'Y...RTD INPUT
8	B9565ER	1	RJC BOARD
9	Y9304LS	3	B.H.SCREW,M3*4
10	B9565AZ	3	SCREW
11	B9565FK	1	COVER
12	B9573VH	1	TRANSFORMER ASS'Y...100V AC ┐
	B9573VJ	1	TRANSFORMER ASS'Y...110V AC ┤
	B9573VK	1	TRANSFORMER ASS'Y...115V AC ┤ (SELECT)
	B9573VL	1	TRANSFORMER ASS'Y...200V AC ┤
	B9573VM	1	TRANSFORMER ASS'Y...220V AC ┤
	B9573VN	1	TRANSFORMER ASS'Y...230V AC ┘
13	Y9405LS	3	B.H.SCREW,M4*5
14	Y9406LK	1	B.H.SCREW,M4*6...WITH TOOTHED LOCKWASHER
15	A9050KF	1	FUSE...100V AC SERIES(1A TIMELAG)
	A9049KF	1	FUSE...200V AC SERIES(0.5A TIMELAG)
16	B9574VT	1	RS232C ASS'Y ┐
17	Y9304LS	4	B.H.SCREW,M3*4 ┤
18	B9574BV	4	STUD ┤ (OPTION)
19	B9574VV	1	CONNECTOR ┤
20	B9574BU	2	STUD ┘
21	Y9310TS	1	TAPPING SCREW, M3×10

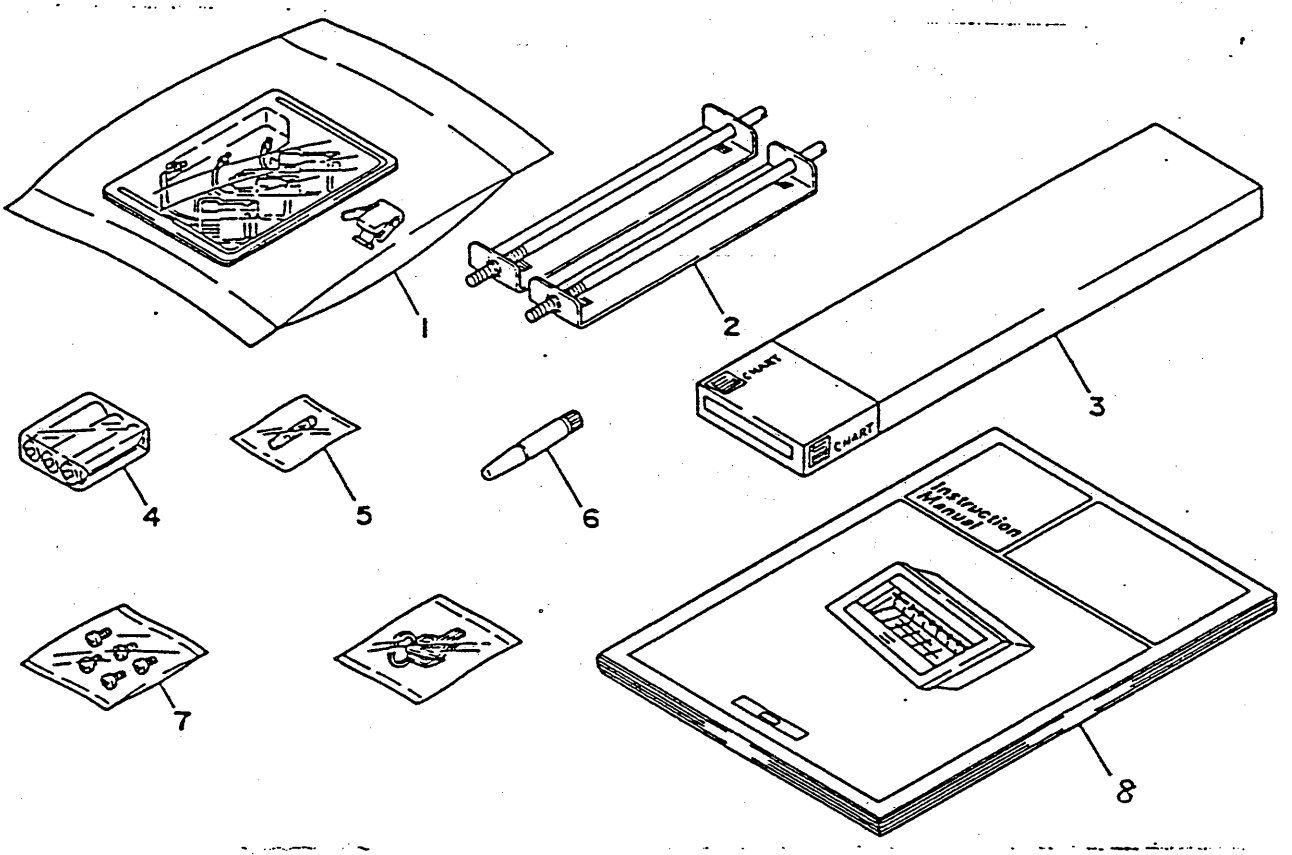
(6) Terminal Assembly



ITEM	PARTS No.	QTY	DESCRIPTION
1	B9574BF	1	COVER
2	B9544DL	2	CLIP
3			AK-06
4			AK-12
5			REM
			REM,MSG
			MSG
6	B9574BS	1	COVER...#1
7	B9573BF	1	COVER...#2
8	B9574BT	1	COVER...#4
9	B9565AZ		SCREW
10	B9573BV	3	BRACKET
11	Y9306LS	3	B.H.SCREW,M3*6
12	B9573YA	1	NAMEPLATE...100V AC,50HZ
	B9573YB	1	NAMEPLATE...100V AC,60HZ
	B9573YC	1	NAMEPLATE...115V AC,50HZ
	B9573YD	1	NAMEPLATE...115V AC,60HZ (SELECT)
	B9573YE	1	NAMEPLATE...200V AC,50HZ
	B9573YF	1	NAMEPLATE...200V AC,60HZ
	B9573YG	1	NAMEPLATE...230V AC,50HZ
	B9573YH	1	NAMEPLATE...230V AC,60HZ

NOTE
#1:FOR MODEL418□-□□□.../AK-06,/AK-12
#2:FOR MODEL418□-□□□.../AK-12
#3:FOR MODEL418□-□□□.../AK-06
#4:FOR MODEL418□-□□□.../REM,/MSG
#5:FOR MODEL418□-□□□.../REM
#6:FOR MODEL418□-□□□.../MSG

(7) Standard Accessories



ITEM	PARTS No.	QTY	DESCRIPTION
1	B9565AP	1	1ST PEN(RED)
	B9565AQ	1	2ND PEN(GREEN)...FOR MODEL4182,4183
	B9565AR	1	3RD PEN(BLUE)...FOR MODEL4183
	B9565AS	1	PLOTTER PEN(PURPLE)
			NOTE:
			PEN PACKAGE IS SUPPLIED IN PACKS OF 3 PCS.
2	B9573BW	2	BRACKET ASS'Y...FOR PANEL MOUNTING
3	B9538RN	1	CHART
			NOTE:
			CHART PAPER IS SUPPLIED IN PACKS OF 6 SHEAVES.
4	A9005ED	3	BATTERY
5	A9050KF	1	FUSE...100V SERIES,1A TIMELAG(SELECT)
	A9049KF	1	FUSE...200V SERIES,0.5A TIMELAG(SELECT)
6	G9621AD	1	LUBRICATING OIL
			NOTE:
			LUBRICANT IS SUPPLIED IN PACKS OF 6 BOTTLE.
7	B9565AZ	5	SCREW...FOR TERMINAL
8	B9573AG	1	INSTRUCTION NANUAL

9.3 Supplied Ass'y Parts List

PARTS NO.	DESCRIPTION
A9005ED	BATTERY
A9007ED	WIRE
A9026KN	SPRING
A9027KN	SPRING
A9044KY	BUSHING
A9045KY	BUSHING
A9049KF	FUSE...200V AC SERIES,0.5A TIMELAG
A9050KF	FUSE...100V AC SERIES,1A TIMELAG
A9073KF	FUSE CARRIER
B9538RN	CHART (6 rolls as a set)
B9541NR	GEAR ASS'Y
B9544DL	CLIP
B9544ZA	SWITCH
B9565AP	1ST PEN(RED) (3 pens as a set)
B9565AQ	2ND PEN(GREEN) (3 pens as a set)
B9565AR	3RD PEN(BLUE) (3 pens as a set)
B9565AS	PLOTTER PEN (3 pens as a set)
B9565AZ	SCREW
B9565ER	RJC BOARD
B9565FK	COVER
B9565HL	BATTERY CASE
B9573AG	INSTRUCTION MANUAL
B9573BF	COVER
B9573BQ	ROD
B9573BW	BRACKET ASS'Y...FOR PANEL MOUNTING
B9573DK	PLATE ASS'Y
B9573DM	GEAR ASS'Y
B9573DQ	PULLEY ASS'Y
B9573DU	BELT
B9573DY	SPRING
B9573BV	BRACKET
B9573FQ	SCREW
B9573FR	NUT
B9573HH	SENSER ASS'Y
B9573NN	MOTOR
B9573NS	ROD
B9573NW	PLATE ASS'Y
B9573RK	MOTOR
B9573UY	BUZZER ASS'Y
B9573VH	TRANSFORMER ASS'Y...100V AC
B9573VJ	...110V AC
B9573VK	...115V AC
B9573VL	...200V AC
B9573VM	...220V AC

PARTS NO.	DESCRIPTION
B9573VN	TRANSFORMER ASS'Y...230V AC
B9573YA	NAMEPLATE...100V AC,50HZ
B9573YB	...100V AC,60HZ
B9573YC	...115V AC,50HZ
B9573YD	...115V AC,60HZ
B9573YE	...200V AC,50HZ
B9573VF	...200V AC,60HZ
B9573YG	...230V AC,50HZ
B9573YH	...230V AC,60HZ
B9574AT	NAMEPLATE...FOR MODEL4181
B9574AU	NAMEPLATE...FOR MODEL4182 (SELECT)
B9574AV	NAMEPLATE...FOR MODEL4183
B9574BE	BRACKET
B9574BF	COVER
B9574BT	COVER
B9574BU	STUD
B9574BS	COVER
B9574BV	STUD
B9574CA	DOOR ASS'Y
B9574CX	SHEET
B9574CY	COVER
B9574EA	CHART GUIDE ASS'Y
B9574EE	SOLENOID ASS'Y
B9574FW	KEY BOARD ASS'Y
B9574HQ	STRING ASS'Y
B9574LA	SERVO ASS'Y...CH1(1PEN)
B9574LB	SERVO ASS'Y...CH2(2PEN)
B9574LC	SERVO ASS'Y...CH3(3PEN)
B9574QA	DISPLAY ASS'Y
B9574QT	INV.ASS'Y
B9574UA	ROM ASS'Y
B9574UB	ROM ASS'Y
B9574UC	ROM ASS'Y
B9574UD	ROM ASS'Y
B9574VA	CPU BOARD ASS'Y
B9574VE	A/D PCB ASS'Y(MVTC)
B9574VF	A/D PCB ASS'Y(RTD)
B9574VH	MOTHER BOARD ASS'Y
B9574VT	RS232C ASS'Y
B9574VV	CONNECTOR
B9574VW	POWER PCB ASS'Y
E9660FM	SCREW
E9660GN	SCREW
E9670LE	PULLEY ASS'Y
G9621AD	LUBRICATING OIL
B9574CF	PLATE

PARTS NO.	DESCRIPTION
Y9204KS	B.H.SCREW,M2.3*4
Y9250ET	E-RING
Y9300ET	E-RING
Y9304EB	F.H.SCREW,M3*4
Y9304LE	B.H.SCREW,M3*4
Y9304LB	B.H.SCREW,M3*4
Y9304LS	B.H.SCREW,M3*4
Y9304SJ	SETSCREW
Y9305TS	TAPPING SCREW,M3*5
Y9306LS	B.H.SCREW,M3*6
Y9308TS	TAPPING SCREW,M3*8
Y9308LS	B.H.SCREW,M3*8
Y9310TS	TAPPING SCREW,M3*10
Y9312LS	B.H.SCREW,M3*12
Y9405LE	B.H.SCREW,M4*5
Y9405LS	B.H.SCREW,M4*5
Y9406LK	B.H.SCREW,M4*6(WITH TOOTHED LOCKWASHER)
Y9501WL	WASHER(WITH TOOTHED LOCKWASHER)
Y9601CS	NUT

A9064SM SWITCH
B9573AS NAME PLATE] Phase synchronization (Option) ... /PS

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