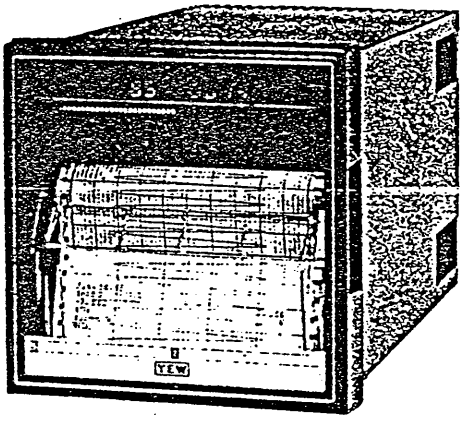
F.66 1087

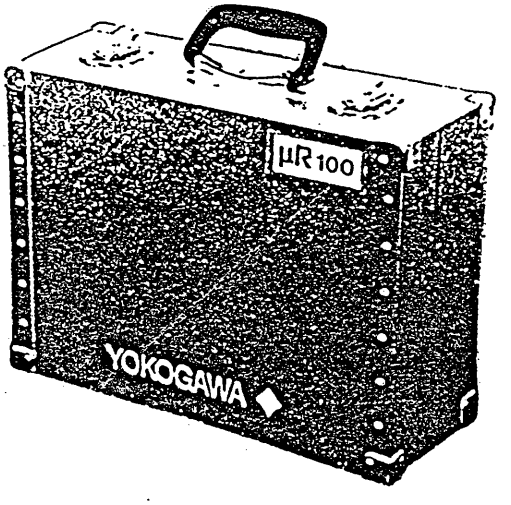
Service Manual

μR100

Model 4151, 4152, 4153

PEN-WRITING RECORDER (FOR FIELD SERVICE)





YOKOGAWA

SW-4150-003E

MICRO RECORDER MODEL 4151, 4152, 4153
PEN-WRITING RECODER FOR FIELD SERVICE

100mm
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1△	6-16-'89				
MICRO	- -				

FORM QS-G-058

YOKOGAWA
Yokogawa Engineering Service Corporation

μR 100 PEN-WRITING RECORDER SERVICE MANUAL

As a rule, this field service manual is to be used for the replacement of the Ass'y as a unit, not for individual components or parts.

(A service kit Tool No. DH03 is available to facilitate field service work.)

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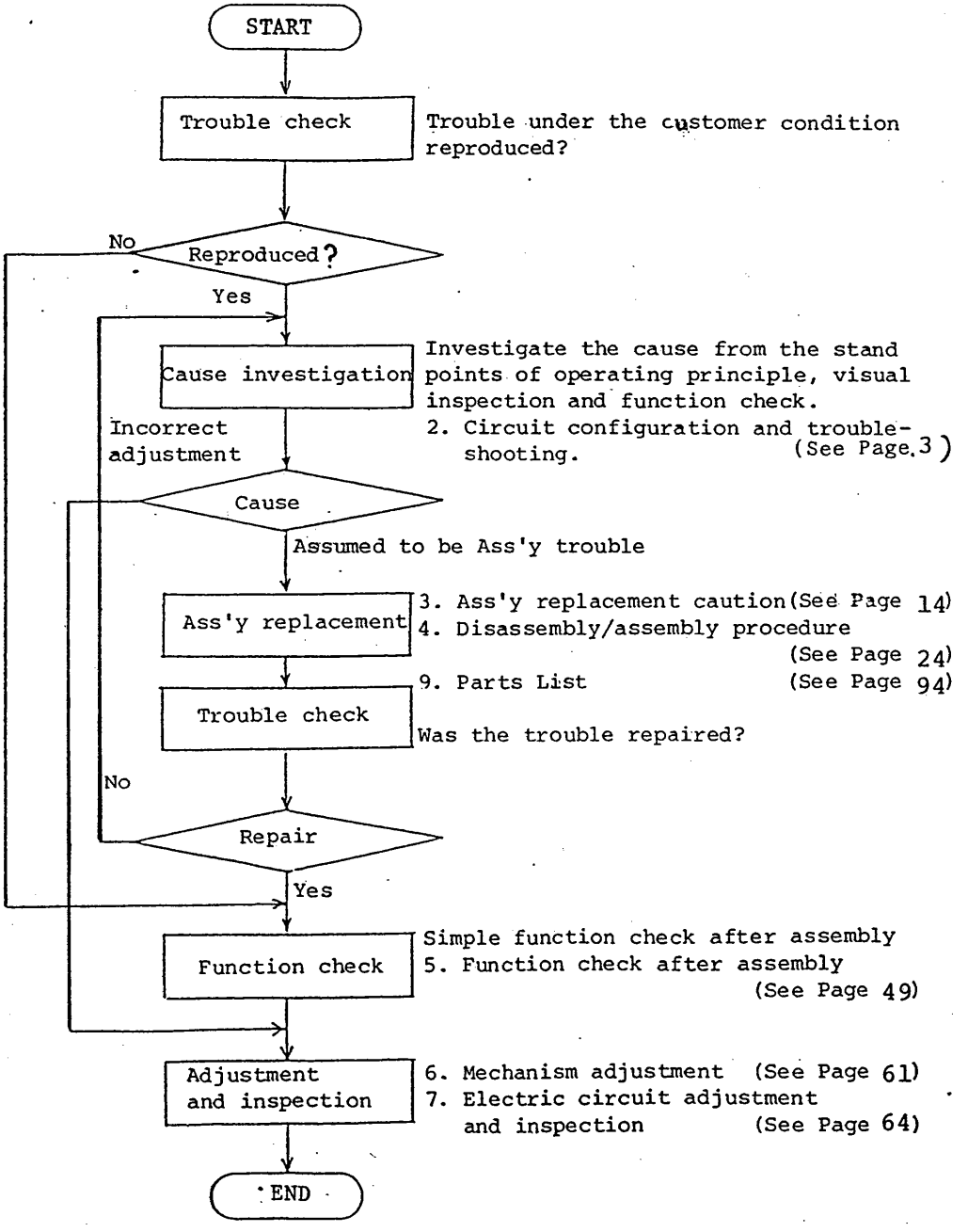
Page

1. Service Procedure Flowchart

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.



(MEMO)

2. Circuit Configuration and Troubleshooting

This chapter is described to facilitate understanding of the outline of Models 4151, 2, and 3, and to assume the faulty Ass'y from a trouble now occurring.

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2.1 Principle of Operation

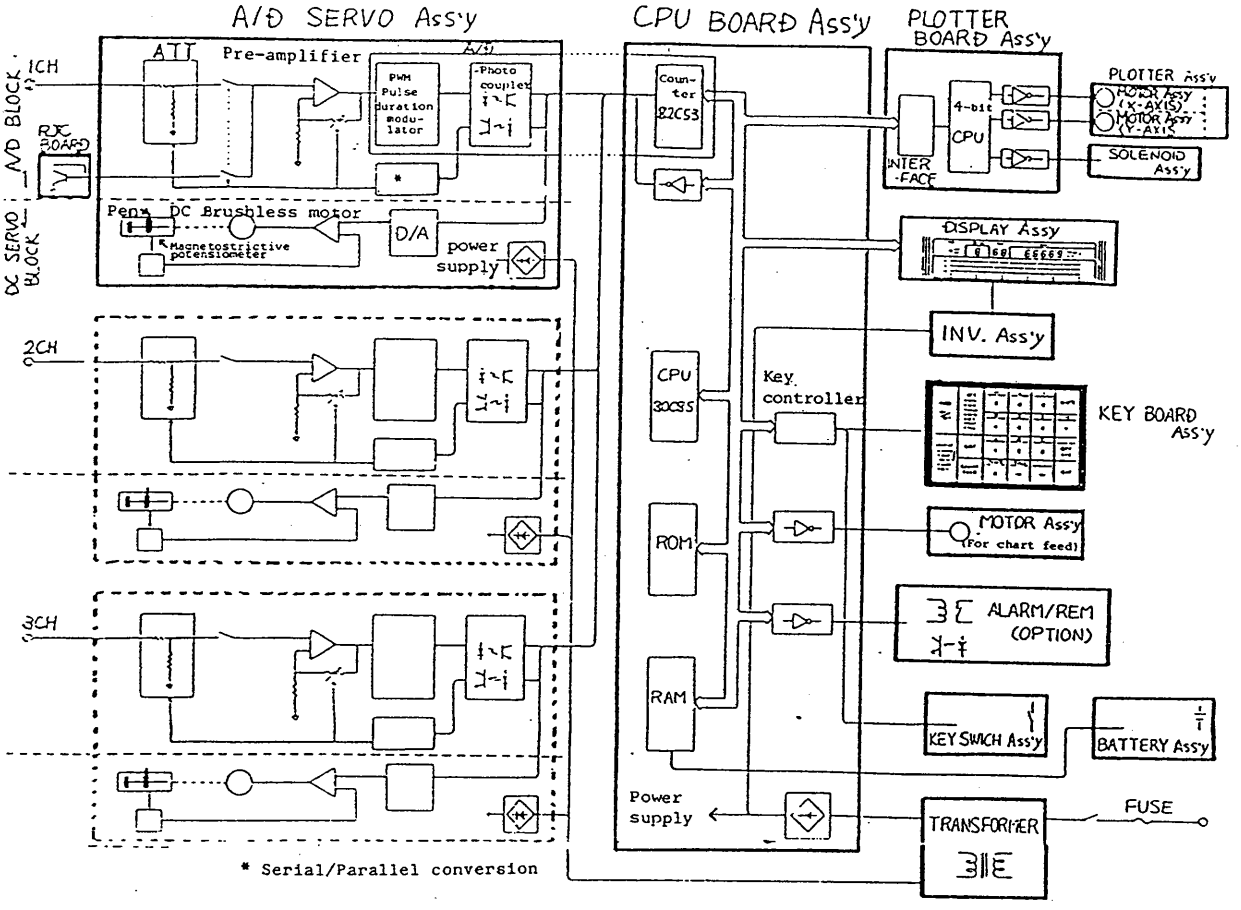


Figure 2.1

Fig. 2.1 shows a block diagram of the pen-writing μ 100 recorder.

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

The analog block consists of ATT (attenuator), a preamplifier and an A/D converter.

The integral A/D converter is used for noise rejection.
Measured data is sampled at 125ms intervals per channel. *-1
The first channel's 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.)
The digital block mainly consists of a CPU (8085), and memory (ROM and RAM).
The CPU provides the following controls and processing.

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

(. Phase synchronous recording control) .... Optional
Digital data which has under gone the specified calculation processing is converted again to analog data by the D/A converter for recording on the recorder.

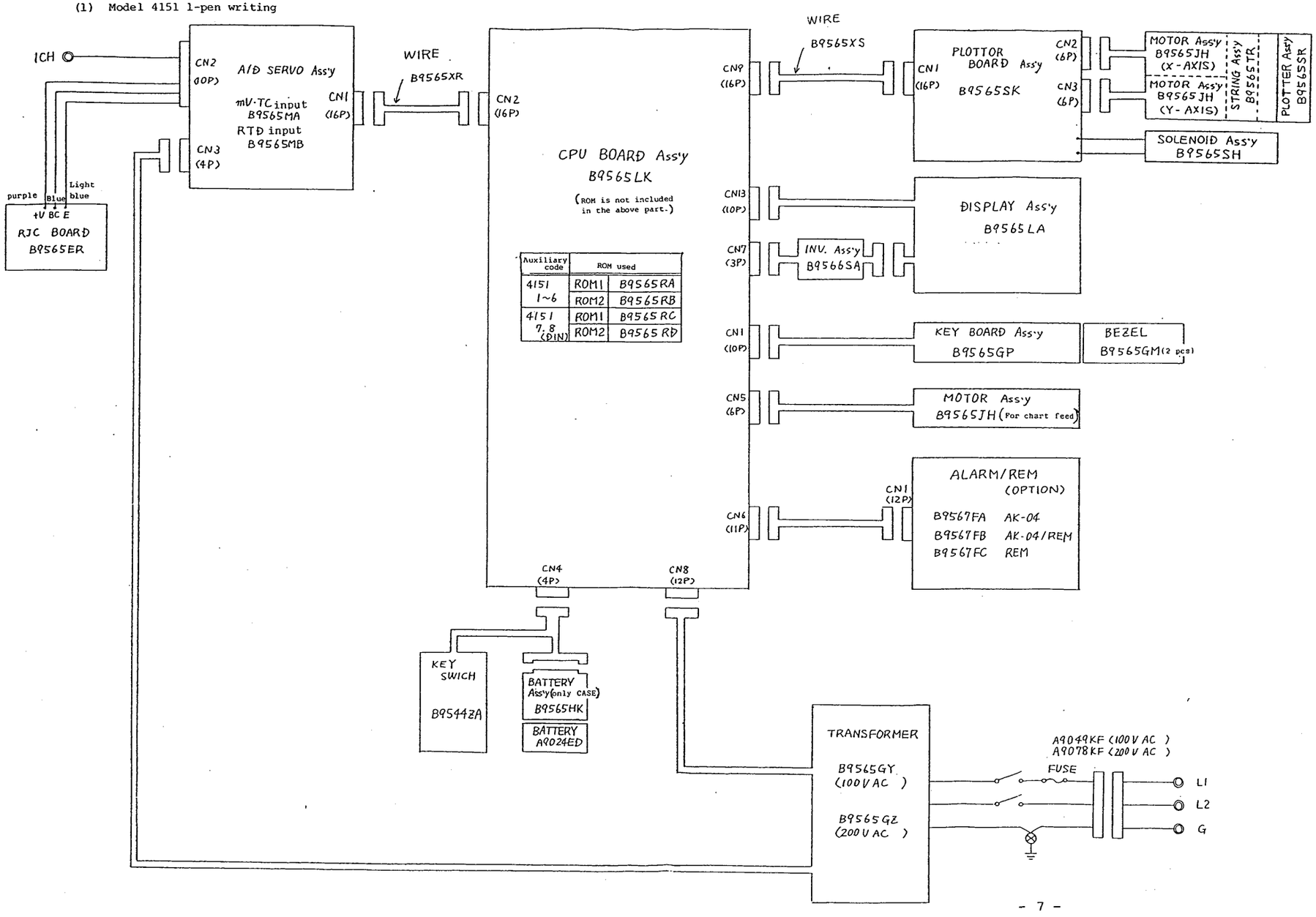
*-1

A/D converter integral time is set to 20ms at 50Hz and to 16.6ms at 60Hz for noise rejection.

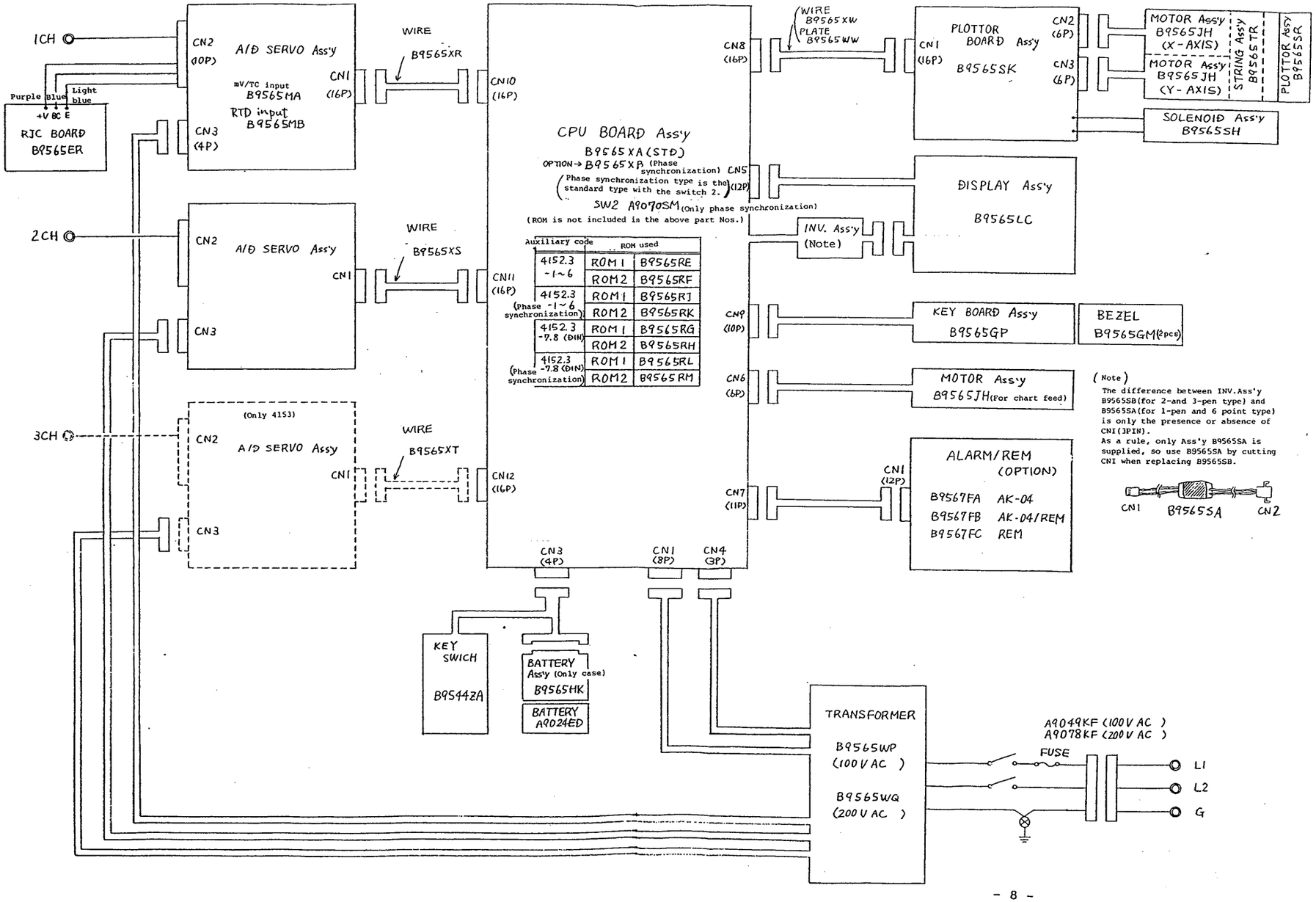
Sampling time interval is set to 125ms for each measurement in order to perform various computations, such as zero and A/D converter full-scale corrections and reference junction compensation.

2.2 Electric Circuit Ass'y Configuration

(1) Model 4151 1-pen writing



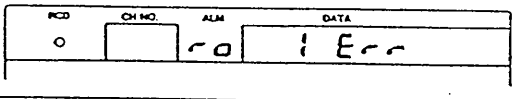
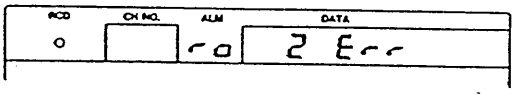
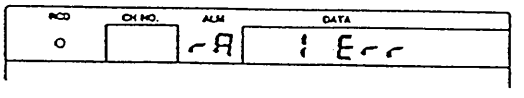
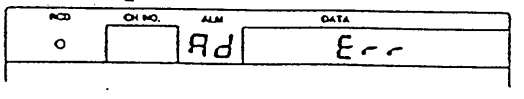
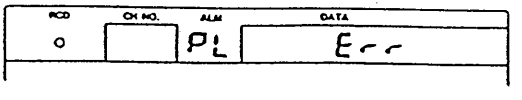
(2) Model 4152.3 2-and 3-pen writing



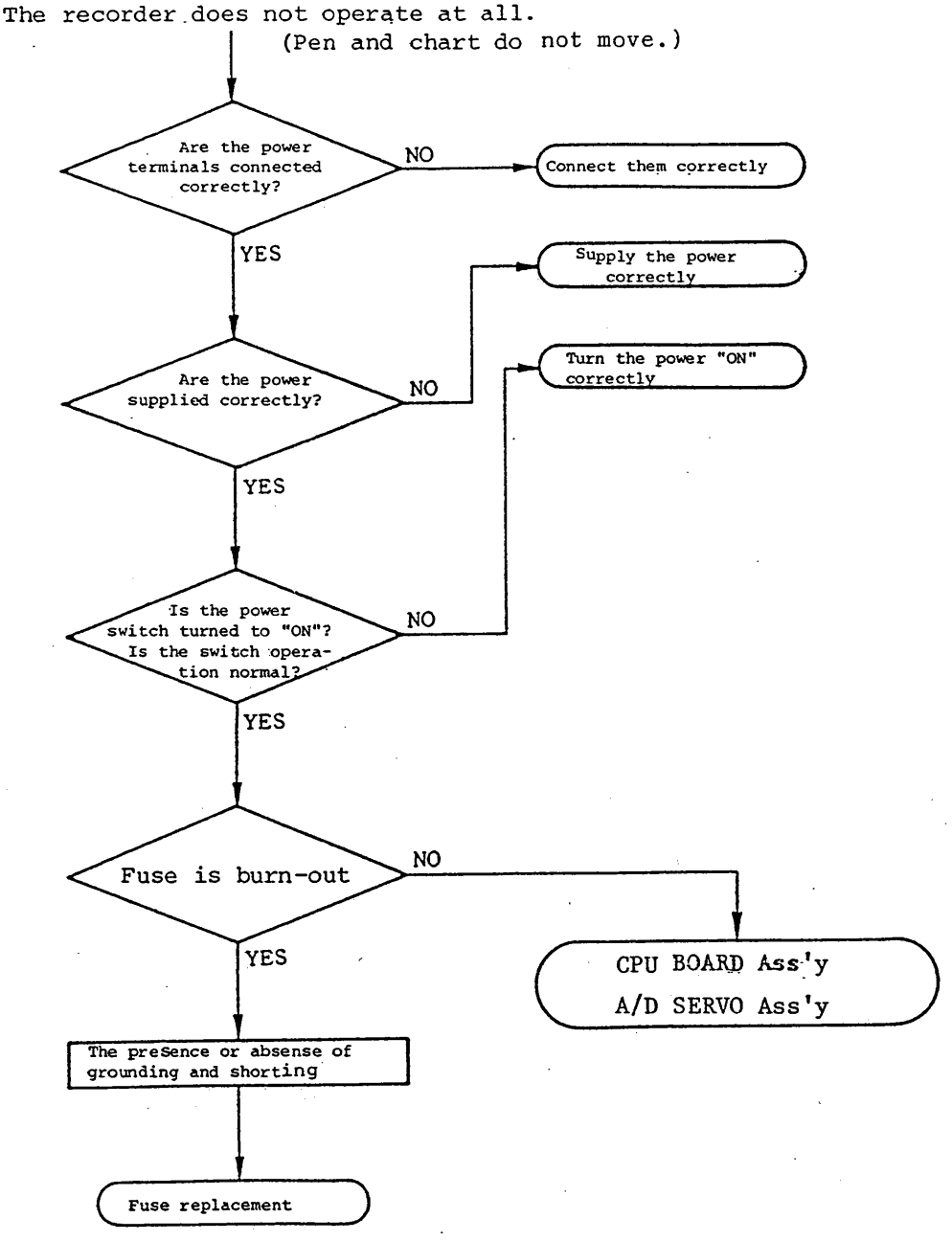
2.3 Self-Test at Power-ON

This recorder automatically checks abnormalities of specified items when the power is turned ON (power switch is turned to "ON".)

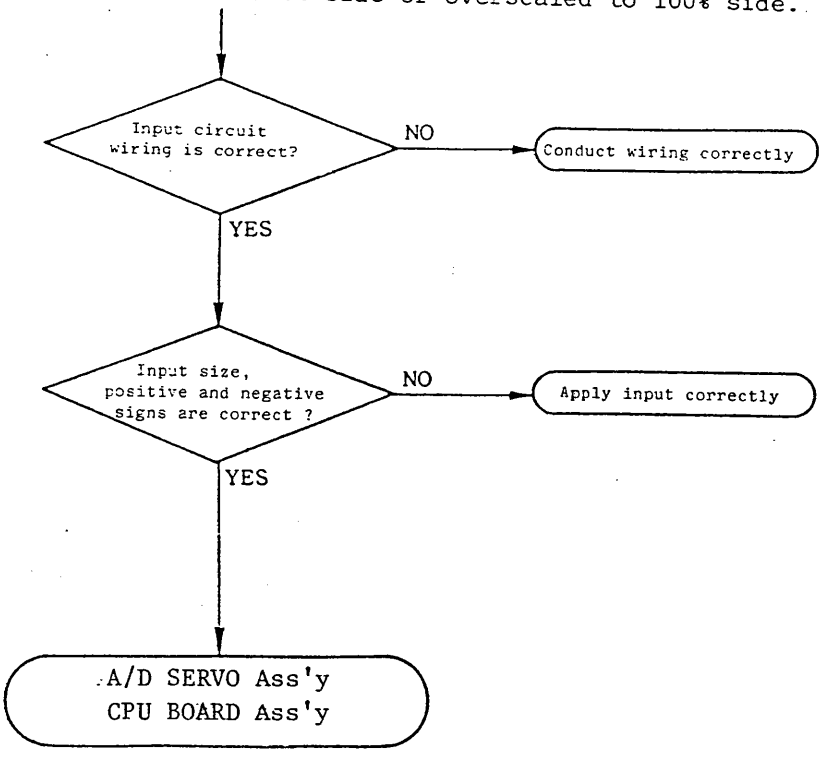
When the power switch is turned to "ON", the recorder starts checking the following items in the order given in the following table. If any abnormality is found, the recorder displays the details of the abnormality (If 2 or more abnormalities are detected, the details of the first abnormality detected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

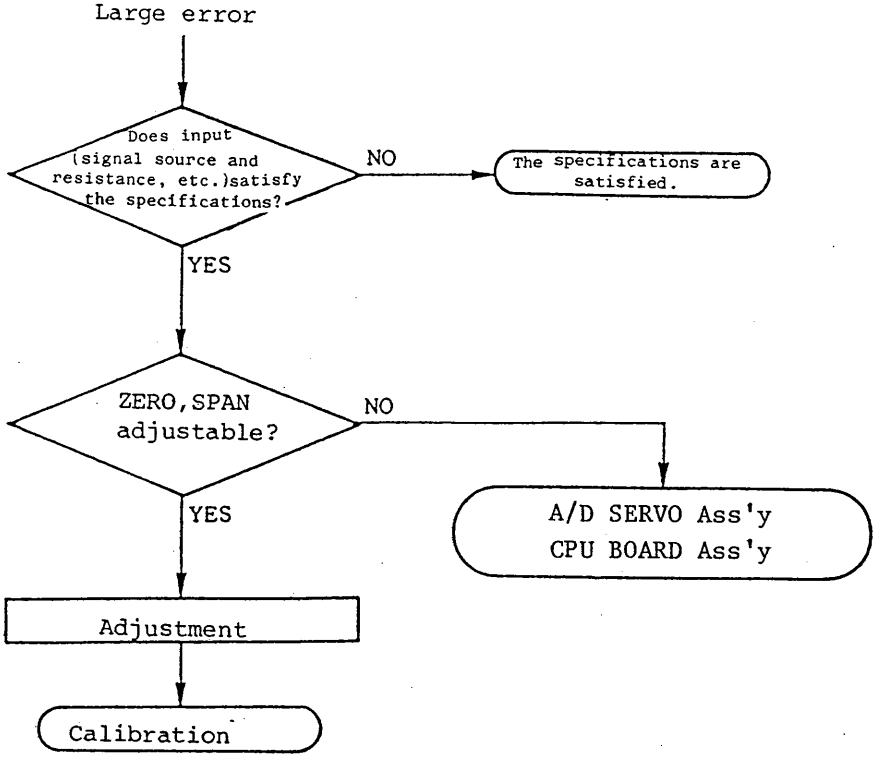
	Item	Display
①	ROM1 trouble (ROM is built in the CPU board Ass'y.)	
②	ROM2 trouble (ditto)	
③	RAM trouble (RAM is built in the CPU board Ass'y.)	
④	A/D controller trouble	
⑤	Plotter trouble	

2.4 Troubleshooting Flow



Pen is downscaled 0% side or overscaled to 100% side.





2.5 Correspondence Table between Trouble and Faulty Ass'y

(Considered theoretically)

The following table shows trouble phenomena and locations with the Ass'y considered theoretically as an unit.

MODE	TEST item	Phenomenon	Ass'y assumed to be faulty					
			CPU Ass'y	SERVO Ass'y	LCD DISPLAY	KEY BOARD	PLOTTER BOARD	Others
POWER ON		ro1 Err	○					
		ro2 Err	○					
		rAM Err	○					
		Ad Err	○	○				
		PL Err	○				○	
TEST MODE	[0] KEY	Measured value display error is large.	○	○				
	[1] [2]	Pen does not move. ZERO and span adjustment can not be made.	○	○				
	[3] [4]	Display does not light up Display is extinguished.	○		○			
	[5]	Err	○					
	[7]	Replay does not operate	○					ALARM/REM BOARD
NORMAL MODE (Normal recording operation)	List print-out	Not initialized and moved at the power ON. Characters are disordered	○				○	X axis, Y axis MOTOR
	KEY	All key entries are not accepted. The specific keys are not accepted.	○			○	△	
	Temperature measurment by TC range	Large error	○	○				R.J.C BOARD
	CHART FEED	does not move.	○					CHART MOTOR

— Table —— ○ High probability △ Low probability No marking : Extremely low probability

(Note) 1. When the keyboard is faulty, most of the tests can not be conducted.
2. Conduct a few tests to finally determine the faulty Ass'y, and Ass'y replacement priority.
3. For the test mode, see page 64.

2.6 Correspondence Table between Trouble Phenomena and Causes

(Based on experience with similar cases.)

The following table summarizes the relationship between phenomena and causes of the actual trouble in the past, along with the incidence of such trouble.
Total number of cases: 66

Phenomenon \ Cause Ass'y		Ass'y: CPU BOARD Ass'y	KEY BOARD Ass'y	A/D SERVO	LCD DISPLAY Ass'y	INVERTER Ass'y	PLOTTER Ass'y	Other than Ass'y: Incorrect mounting	Imperfect contact	Total	Remarks
Many phenomena (with 2 or more phenomena mentioned in the right)	Display does not change	12								12	
	Key entry is not accepted										
	Display does not light up										
	Faulty operation										
	Print-out scale over.										
	Display is instable										
Display relation	Display is not indicated				1	1				2	
	Display is discolored.				2					2	
	Bar display flushes			1						1	
KEY relation	Unsettable.	1	3							4	
Recording and printing relation	Pen does not move	2		5				1	1	9	
	Upscaled to 100% side			21						21	
	Downscaled to 0% side			1						1	
	Drift occurs			1						1	
	Hunting			1						1	
	* 1			1						1	*1 Span adjustment can not be made.
	Pen moves slowly			1						1	
	Whiskers appear.			1						1	
	List is not printed out	1					2			3	
Others	Noise	1								1	
	ROM error	1								1	
Total		18	3	33	3	1	2	1	1	62	

Other phenomena				
mechanism	Only the 3rd pen does not move.	Buzzer mounting position faulty. Motor Ass'y replacement.	1 case	
	Pen arm contacts with the housing.	Housing bracket	1 case	
	Recorded value suddenly changes.	Pen tip is bent. Pen replacement	1 case	
	List print-out faulty	Smoked plastic cover is removed.	1 case	

3. Cautions Required for Ass'y Replacement

This chapter describes cautions regarding Ass'y replacement.
The processing of jumper wires within the μR100 recorder mounted Ass'y varies with the models No. and the presence or absence of options.
Therefore, it is important that cautions regarding the Ass'y to be replaced must be fully understood prior to starting replacement.

Contents Page

3.1 A/D Servo Ass'y (B9565MA, B9565MB)

(1) A/D Servo Ass'y types

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

Specifications	Ass'y Parts No.	Parts installed
mV TC	B9565MA	Parts whose circuit Nos. are the 100th level and less than 100.
RTD	B9565MB	Parts whose circuit Nos. are the 200th level and less than 100.. (Note)

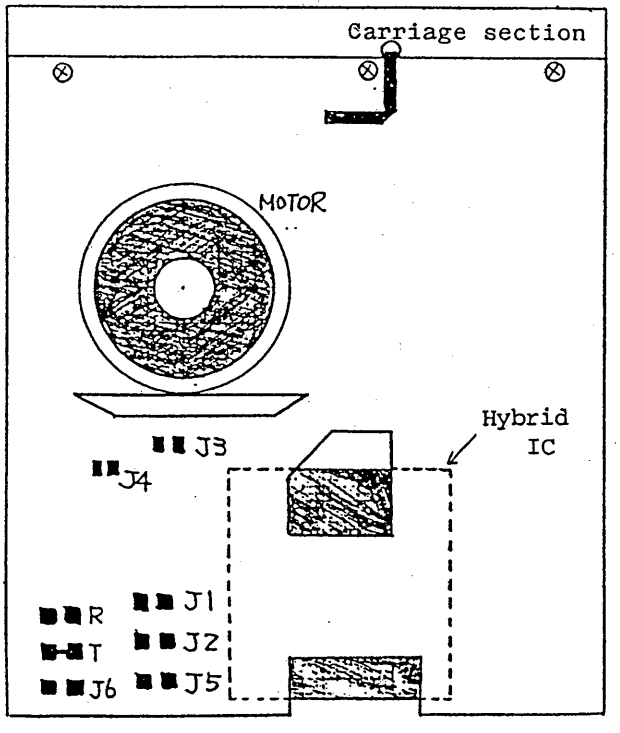
(Note) R202 and R207 are for Pt50(optional).

(2) Jumper wire processing

The processing of the 8 jumper-wire processing points on the A/D servo Ass'y, differs according to recorder specifications (Input type, additional or optional specifications.

A/D Servo Ass'y Jumper Wire Location Diagram

(Soldered surface)



T ... Pattern shorted when the printed board is manufactured.

A/D Servo Ass'y Jumper Wire Processing Table

Model No. and code 4152-□□□/□□ (3 / 7)		Ass'y Parts No.	Jumper wire processing								Remarks
			J1	J2	J3	J4	J5	J6	T	R	
1	—	B9565MA	X	X	X	X	X	X	O	X	STD
	BU		O	X	X	X	X	X	O	X	STD with burn-out upscale
	BD		X	O	X	X	X	X	O	X	STD with burn-out downscale
2	—	B9565MB	X	X	X	X	X	X	X	O	STD
	—		X	X	O	O	X	X	X	O	Optional Pt100 → Pt50
3	—	B9565MA	X	X	X	X	X	X	O	X	STD
	BU		O	X	X	X	X	X	O	X	STD with burn-out upscale
	BD		X	O	X	X	X	X	O	X	STD with burn-out downscale
4	—	B9565MB	X	X	X	X	X	X	X	O	STD
	—		X	X	O	O	X	X	X	O	Optional Pt100 → Pt50
5	—	B9565MA	X	X	X	X	X	X	O	X	STD
	BU		O	X	X	X	X	X	O	X	STD with burn-out upscale
	BD		X	O	X	X	X	X	O	X	STD with burn-out downscale
6	—	B9565MB	X	X	X	X	X	X	X	O	STD
	—		X	X	O	O	X	X	X	O	Optional Pt100 → Pt50
7	—	B9565MA	X	X	X	X	X	X	O	X	STD
	BU		O	X	X	X	X	X	O	X	STD with burn-out upscale
	BD		X	O	X	X	X	X	O	X	STD with burn-out downscale
8	—	B9565MB	X	X	X	X	X	X	X	O	STD
	—		X	X	O	O	X	X	X	O	Optional Pt100 → Pt50

(Note) 1. ○...Jumper wire shorted X...Jumper wire disconnected

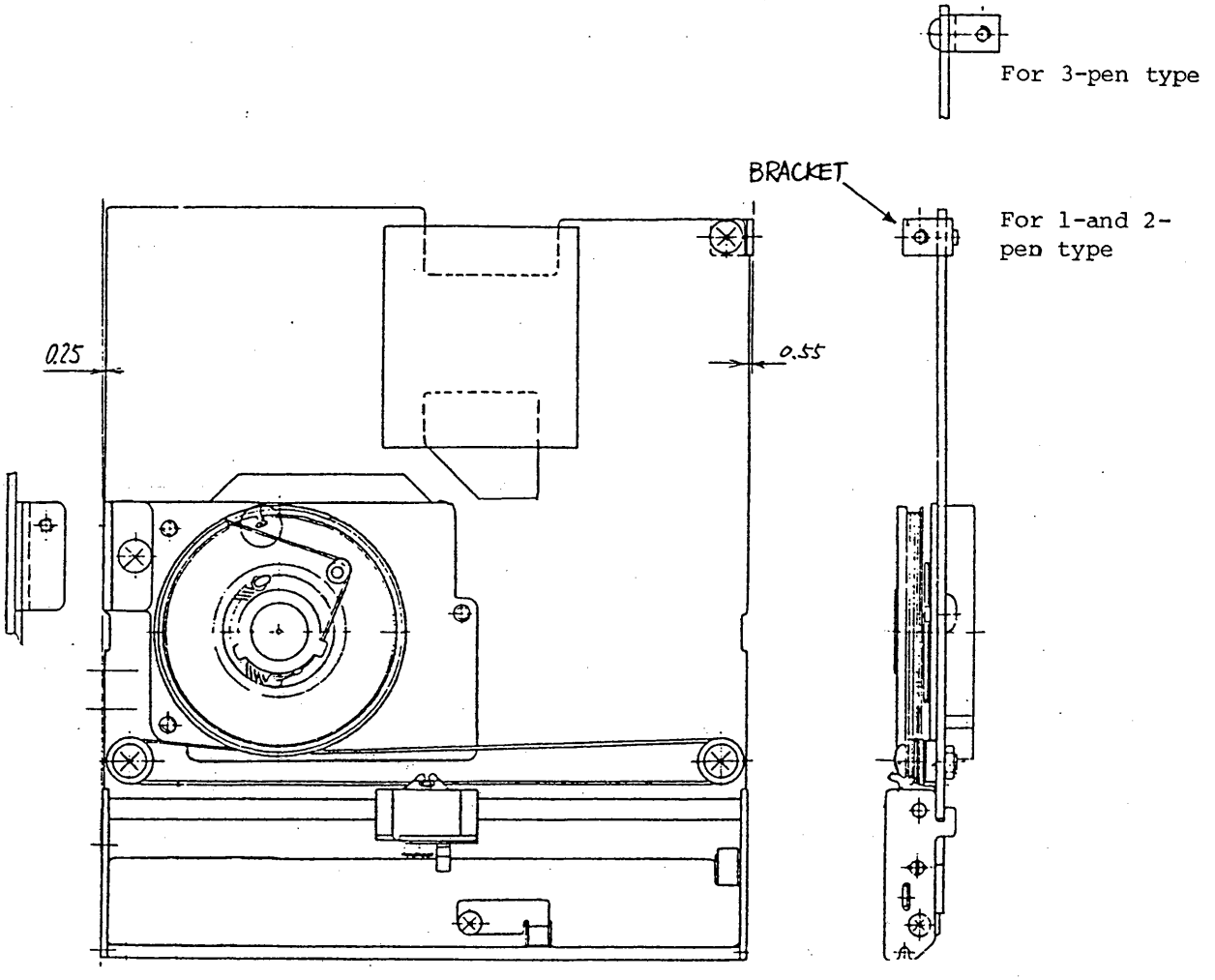
2. The following optionals in the model Nos. and codes are not related to A-D SERVO Ass'y jumper processing.

/AK-04	Alarm
/REM	Remote
/PS	Phase synchronization (Only 2-and 3-pen type)
/PBL	Portable

(3) Bracket mounting

A Bracket is used to secure the A/D Servo Ass'y to the μR mainframe. (Included in the A/D Servo Ass'y part No.)

Bracket mountings vary with the different A/D Servo Ass'y pen combinations.



3.2 CPU Board Ass'y

(1) CPU Board Ass'y type

Model No. & code 415□-□□□/□□ 1~8		CPU BOARD Ass'y parts (ROM 1 and 2 are not included.)	Remarks
1	—	B9565LK	For 1-pen type
(Note) 2 or 3	—	B9565XA	For 2-and 3-pen type
	PS	B9565XB	For 2-and 3-pen type Phase synchronization(optinal)...The switch 2 (A9070SM)is added to B9565xA

(Note) 1. The difference between the standard CPU Board Ass'y (B9565XA) and the CPU Board Ass'y with phase synchronization (optional, B9565XB) is only the presence or absence of SW2.

> If B9565XA has a phase synchronous ON/OFF switch (circuit symbol SW2: A9070SM), its model No. changes to B9565XB.

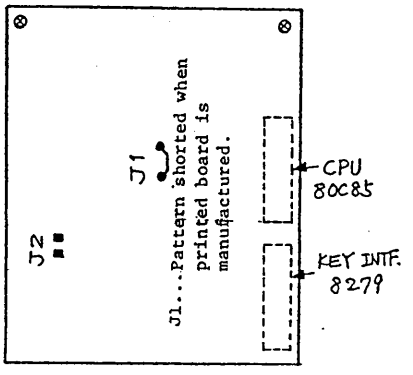
2. ROMs used for B9565XA and B9565XB differ.
(No ROM is included in the above part Nos. → See page 22.)

(2) Jumper wire processing

Jumper wire processing of the CPU board Ass'y differs with model No. and codes (auxiliary code, additional spec. and optional spec.)
The above processing is the same for 1 pen (B9565LK), 2- and 3-pen (B9565XA and B9565XB) models.

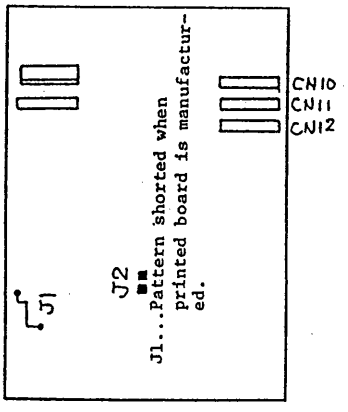
Jumper wire location diagram

• For 1-pen type (B9565LK:soldered surface)



• For 2-and 3-pen type

(B9565XA,B9565XB:Soldered surface)



CPU Board Ass'y Jumper Wire Processing

Model No. & cade 415□-□□□/□□□□		Jumper wire processing J1	J2	Remarks
1	—	△	X	
	AK-04	○	X	
		X	X	Optional...Alarm output de-energized
2	—	△	X	
	AK-04	○	X	
		X	X	Optional...Alarm output de-energized
3	—	△	○	
	AK-04	○	○	
		X	○	Optional...Alarm output de-energized
4	—	△	○	
	AK-04	○	○	
		X	○	Optional...Alarm output de-energized
5	—	△	○	
	AK-04	○	○	
		X	○	Optional...Alarm output de-energized
6	—	△	○	
	AK-04	○	○	
		X	○	Optional...Alarm output de-energized
7	—	△	○	
	AK-04	○	○	
		X	○	Optional...Alarm output de-energized
8	—	△	○	
	AK-04	○	○	
		X	○	Optional...Alarm output de-energized

Note 1. ○ — Jumper wire shorted
△ — Don't care (shorted or open)
X — Jumper wire open

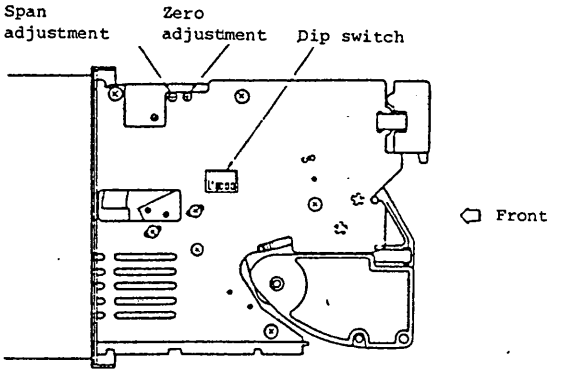
Note 2. Codes other than optional alarm(/AK-04) in the model Nos. & codes are not related to CPU Board Ass'y jumper wire processing.

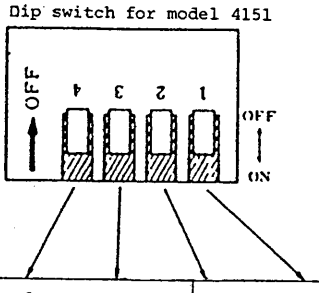
(3) Dip switch setting

Dip switch setting within the CPU Board Ass'y differs with power frequency, input type (mV/ TC or RTD) and operation mode.

When the CPU Board Ass'y is replaced, always set the dip switch after assembly.

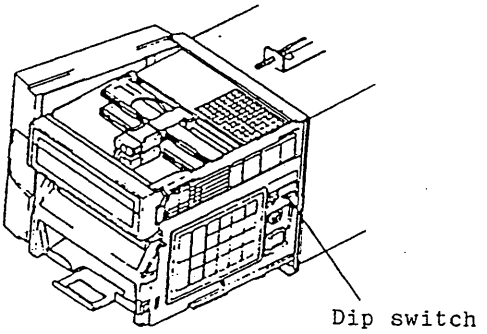
• 4151 (1-pen) type

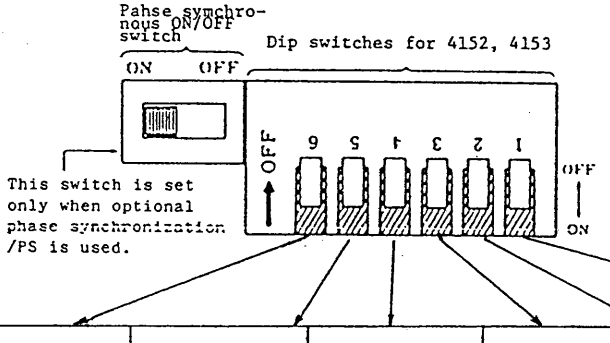




Switch	4	3	2	1
ON	R T D	T E S T	° F	50 Hz
OFF	mV/TC	N O R M A L	° C	60 Hz
Function	Input type	Operation mode selection	Units at temperature measurement	Power frequency selection
Prior to shipment	When model code [A] is 2,4,6 or 8, the switch is turned "ON". When it is 1,3,5, or 7, the switch is turned "OFF".	O F F	When model code [A] is 5 or 6, the switch is turned "ON". When it is 1,2, 3, 4, 7, or 8, the switch is turned "OFF".	When model code [D] is 50, the switch is turned "ON". When it is 60, the switch is turned "OFF".

• 4152 (2-pen) and 4153 (3-pen) types





Switch	6	5	4	3	2	1
O N	#3 R T D	#2 R T D	#1 R T D	T E S T	°F	50 Hz
O F F	mV/TC	mV/TC	mV/TC	NORMAL	°C	60 Hz
Function	The 3rd channel input type	The 2nd channel input type	The 1st channel input type	Operation mode selection	Units at temperature measurement	Power frequency selection
Prior to shipment	When model code C is 2,4,6, or 8, the switch is turned "ON". When it is 1, 3,5, or 7, the switch is turned "OFF".	When model code B is 2,4,6, or 8, the switch is turned "ON". When it is 1, 3,5, or 7, the switch is turned "OFF".	When model code A is 2,4,6, or 8, the switch is turned "ON". When it is 1, 3,5, or 7, the switch is turned "OFF".	O F F	When model code A B C is 5 or 6, the switch is turned "ON". When it is 1, 3,5, or 7, the switch is turned "OFF".	When model code D is 50, the switch is turned "ON". When it is 60, the switch is turned "OFF".

3.3 ROM Ass'y

The part Nos. of ROMs mounted in the CPU Board Ass'y differ with model code and additional specifications.

Model Code	Suffix Code	Inputs Types	ROM Part No.	ROM No.
4151	- 1 0 0	DC V & TC (ANSI & JIS), °C	B9565RA	1
	- 2 0 0	RTD (JIS), °C		
	- 3 0 0	DC V & TC (ANSI), °C		
	- 4 0 0	RTD (DIN), °C	B9565RB	2
	- 5 0 0	DC V & TC (ANSI), °F		
	- 6 0 0	RTD (DIN), °F		
	- 7 0 0	DC V & TC (DIN), °C	B9565RC	1
	- 8 0 0	RTD (DIN), °C	B9565RD	2

Model Code	Suffix Code				Description	ROM Part No.	ROM No.
	□	□	□. . . /□□				
4152	1 to 6	1 to 6	0		ANSI/JIS, DIN	B9565RE	1
	1 to 6	1 to 6	0			B9565RF	2
	1 to 6	1 to 6	0	/PS		B9565RJ	1
	1 to 6	1 to 6	0	/PS		B9565RK	2
	7 or 8	7 or 8	0		DIN/DIN	B9565RG	1
	7 or 8	7 or 8	0			B9565RH	2
	7 or 8	7 or 8	0	/PS		B9565RL	1
	7 or 8	7 or 8	0	/PS		B9565RM	2
4153	1 to 6	1 to 6	1 to 6		ANSI/JIF, DIN	B9565RE	1
	1 to 6	1 to 6	1 to 6			B9565RF	2
	1 to 6	1 to 6	1 to 6	/PS		B9565RJ	1
	1 to 6	1 to 6	1 to 6	/PS		B9565RK	2
	7 or 8	7 or 8	7 or 8		DIN/DIN	B9565RG	1
	7 or 8	7 or 8	7 or 8			B9565RH	2
	7 or 8	7 or 8	7 or 8	/PS		B9565RL	1
	7 or 8	7 or 8	7 or 8	/PS		B9565RM	2

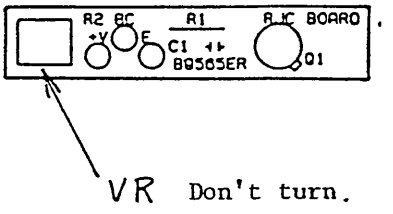
3.4 RJC Board (B9565ER)

The RJC Board is adjusted using a special jig.

Never turn the VR.

(If it has troubles, replace it as a Board Ass'y.)

RJC BOARD Mounting diagram



3.5 Pen-arm Replacement Using a Special Jig

Refer to P.33.

4. Disassembly and Assembly Procedures

The Models 4151, 2 and 3 are complicated and it may be necessary to remove other Ass'y in order to remove a specific Ass'y, so disassemble and assemble the recorder in accordance with disassembly and assembly procedure diagrams on Page 26.

Contents Page

4.1 Tools and Jigs Used

Tool and jig name	Specification	Remarks	
⊕ Screw-driver	M 3		
Ditto	M 2.3		
Radio Pliers			
Nipper			
Tweezers			
Soldering iron	Class A 20~40w	RJC BOARD, etc.	
Special spacer	B9567JE	Special jig to disconnect key board connectors	(contained in the SV kit)
Screw-driver	B9567JA	A/D SERVO Pen arm mounting jig	

Others Wire bundling band 2 to 5

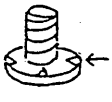
Tin plated wire (0.5φ) 20 to 30cm (For jumper wire within PCB Ass'y)

Cautions for disassembly and assembly

Special screw

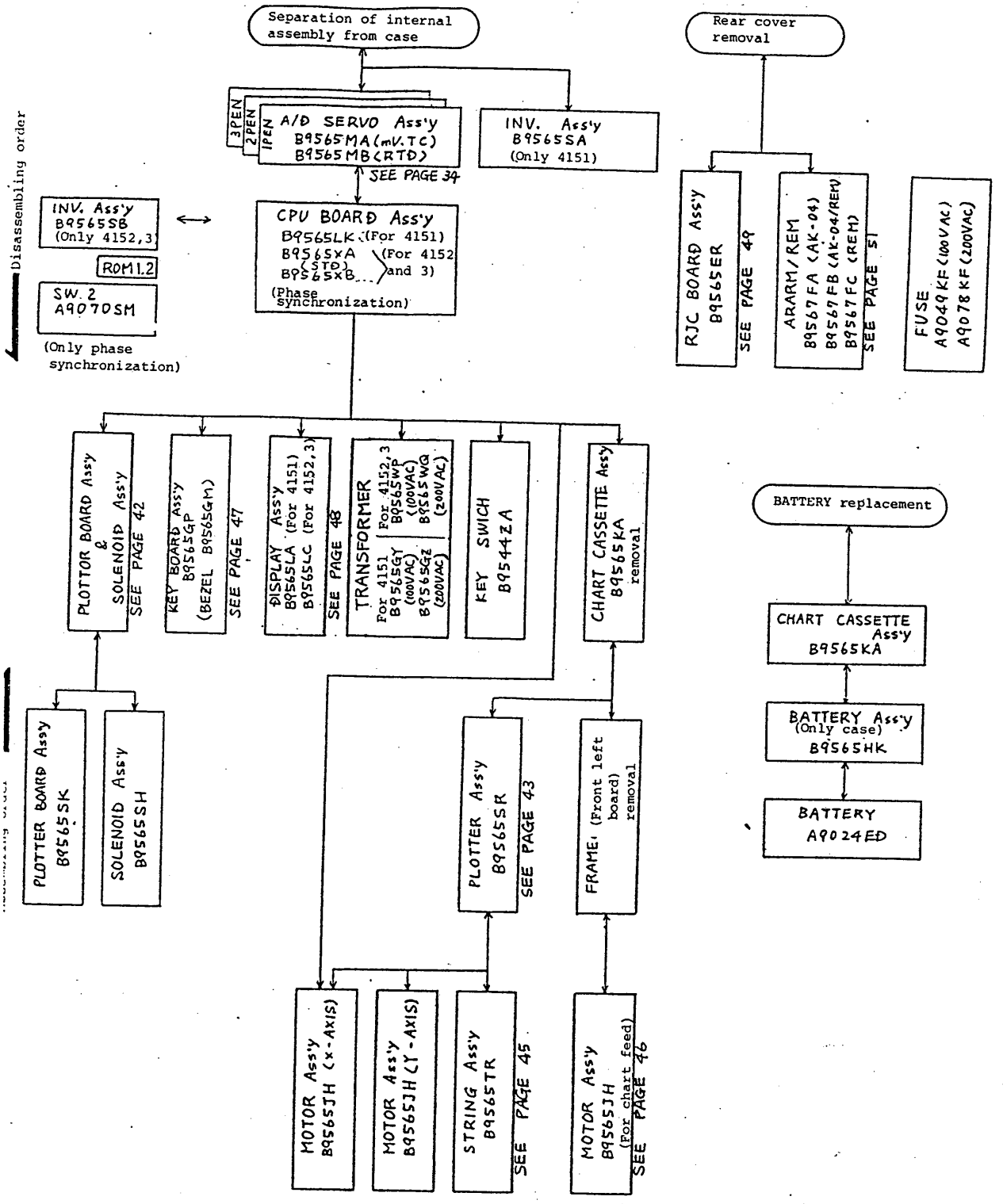
In order to ground each μR100 Ass'y, the special screws shown at right are installed at the required locations. Handle them carefully during assembly.

Part No.
B9565AY



← With projection

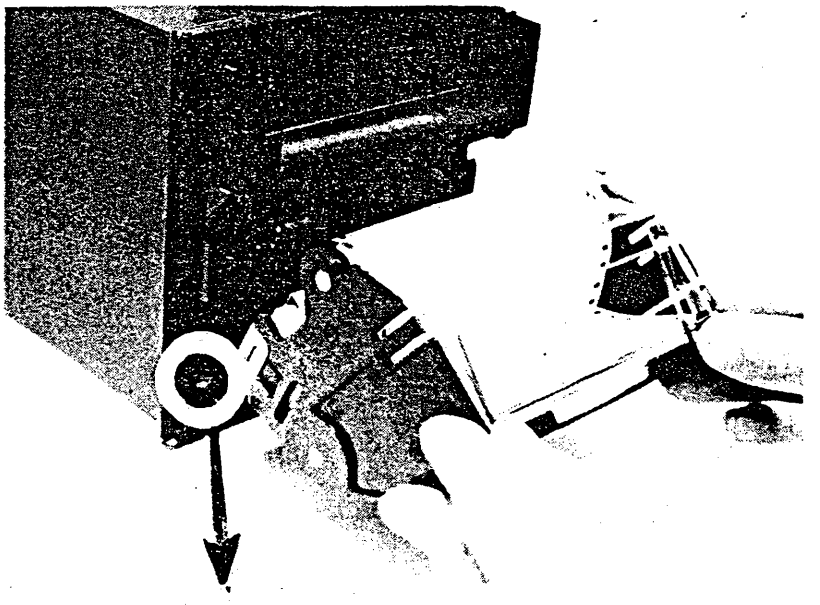
4.2 Disassembly, Assembly Procedure Diagram



(The above tree covers all the Ass'ys described in Electric Circuit Ass'y Configuration on Page 7, 8.)

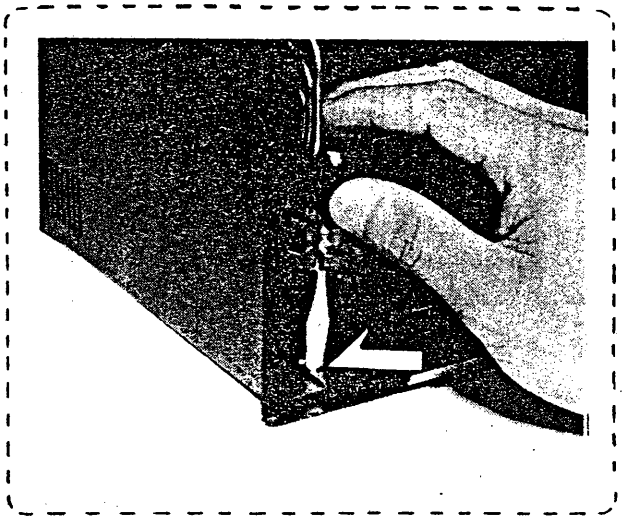
4.3 Separation of the Internal Chassis from the Case

Removal of stopper screw.

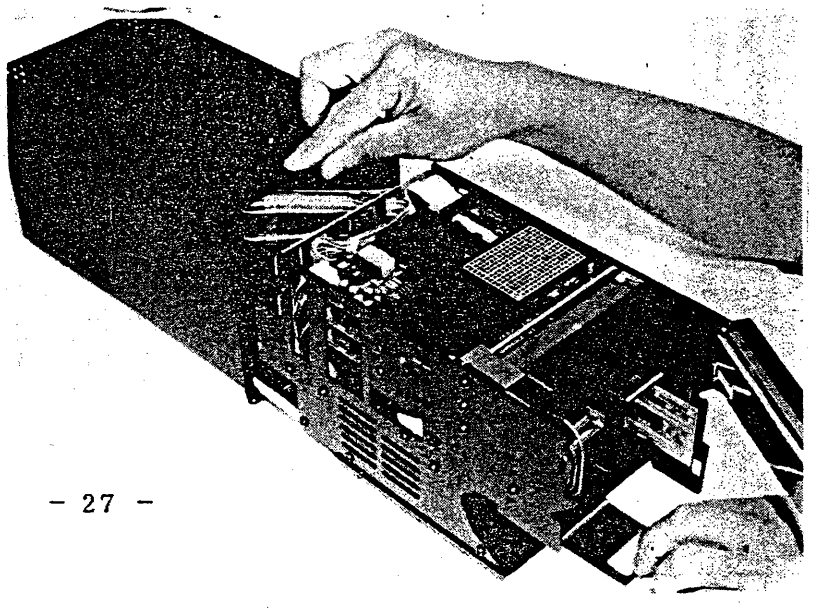


① Pull the chart cassette forward until the stopper screw appears at the lower left.

② Loosen the screw with a stubby screwdriver.
STUBBY SCREWDRIVER
or coin, being careful not scratch the surroundings.

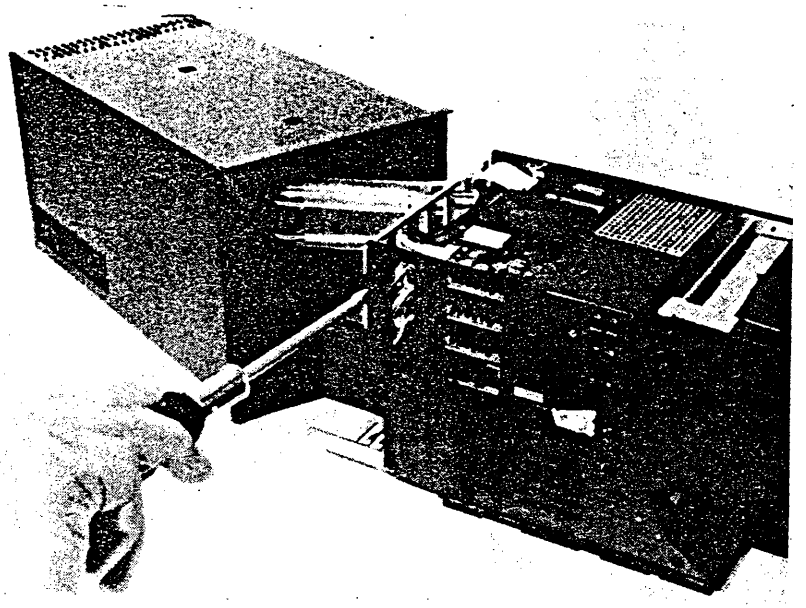


③ Thus, the internal chassis can be completely with drawn.



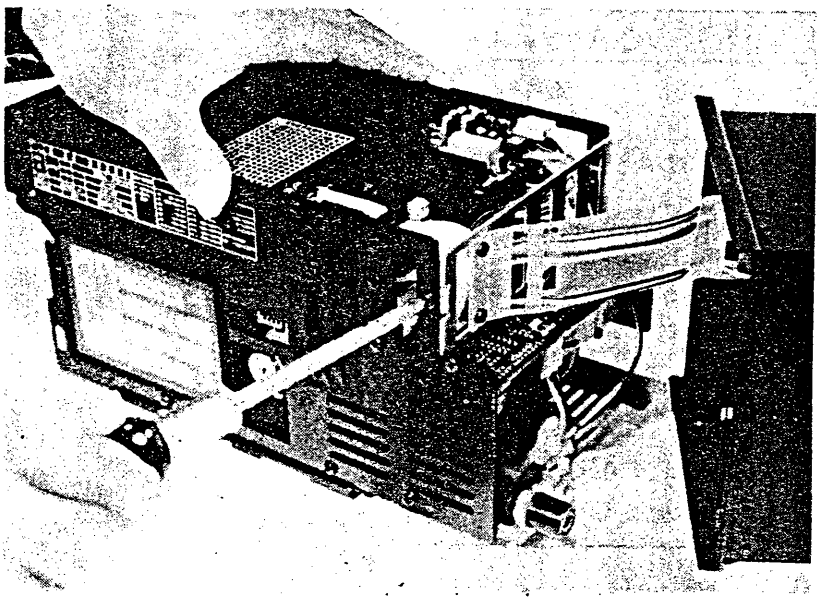
* Term Description
  STUBBY SCREWDRIVER
  ⇩
  A screwdriver with a short, thick grip.

④ Loosen the bracket mounting screws.



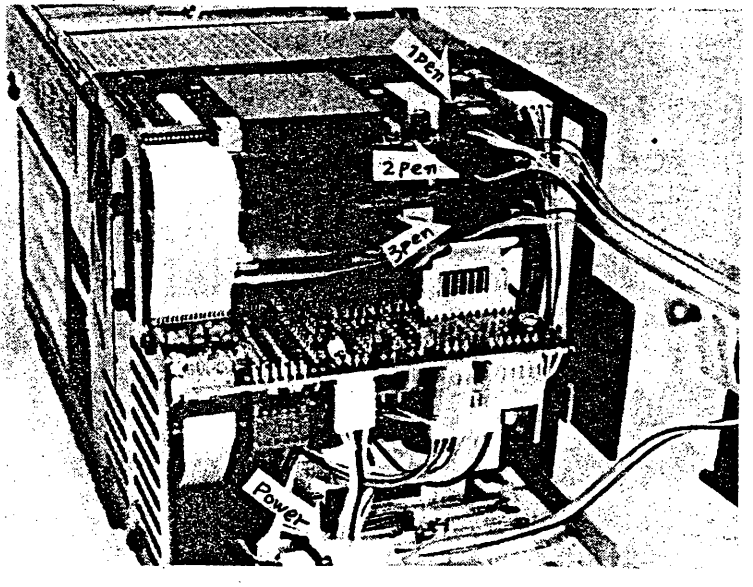
Caution
These are special screws, so handle them carefully during assembly.

⑤ Loosen each of the screws at the right and left to remove the bracket.



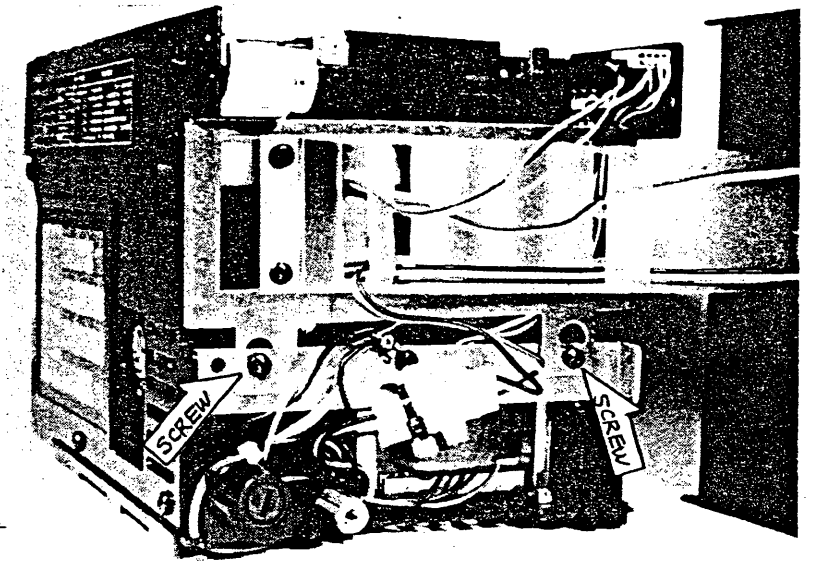
Reference
(For the initial lot products, the bracket cannot be removed if the screws are completely removed.)

⑥ Disconnect input signal connectors (CN-2) for the 1st, 2nd and 3rd pens and the power connector.



Reference

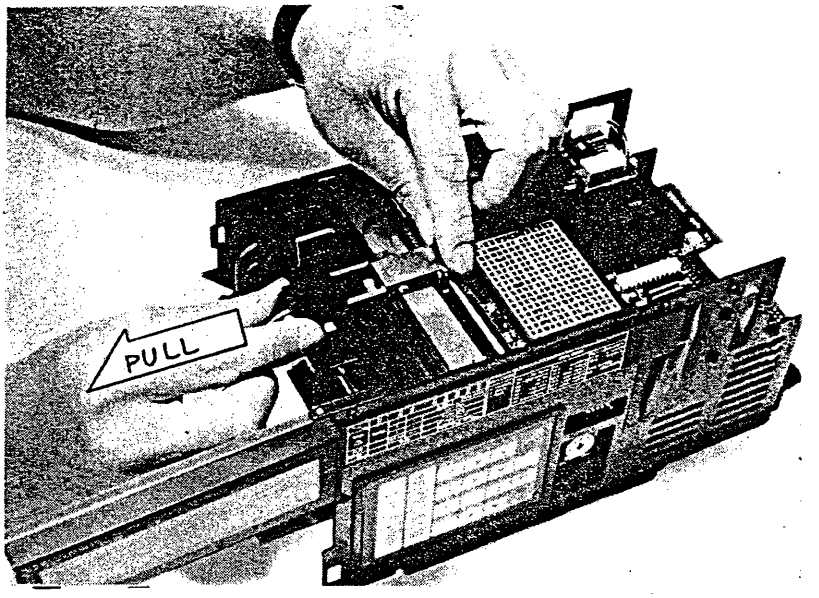
The M/4151 (1 pen) uses the bracket shown at right. Loosen the 2 screws indicated by the arrows, then pull the bracket down for removal.



4.4 A/D Servo Ass'y Removal

① Pull the pen Ass'y out forward.

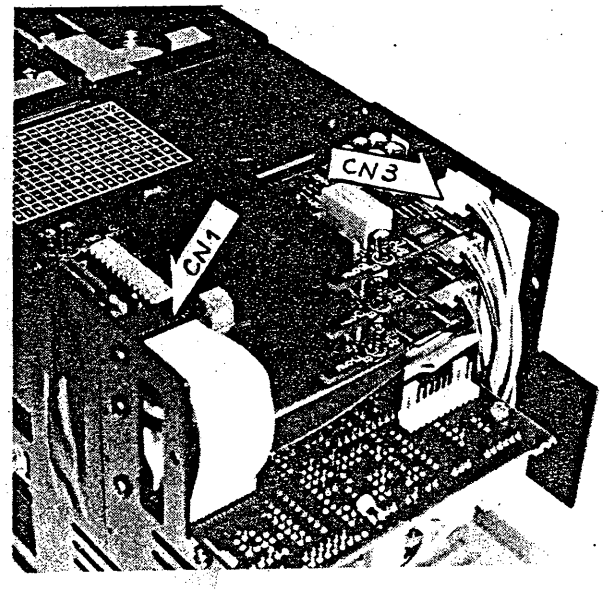
Caution
Moving the pen carriage while holding the pen arm may deform the arm. Therefore, do not apply excessive force to the arm.



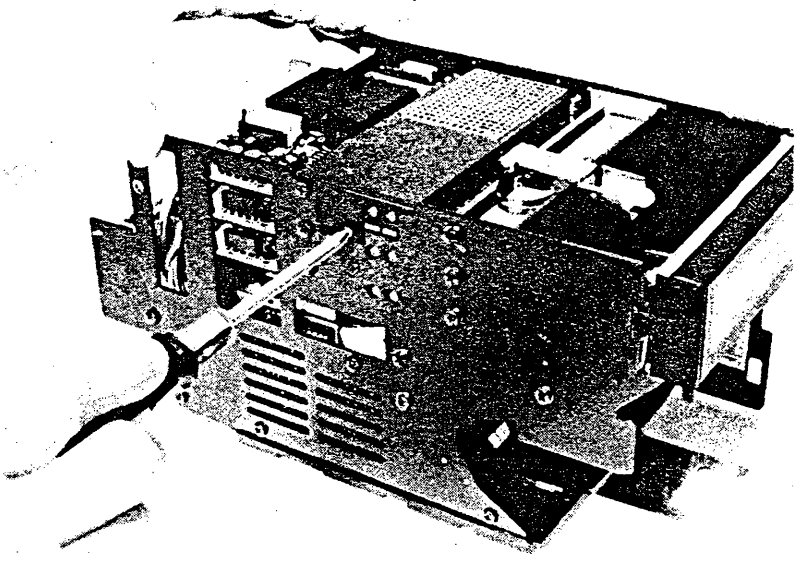
② Disconnect the connectors.

CN1 ... For CPU board

CN3 ... For power line

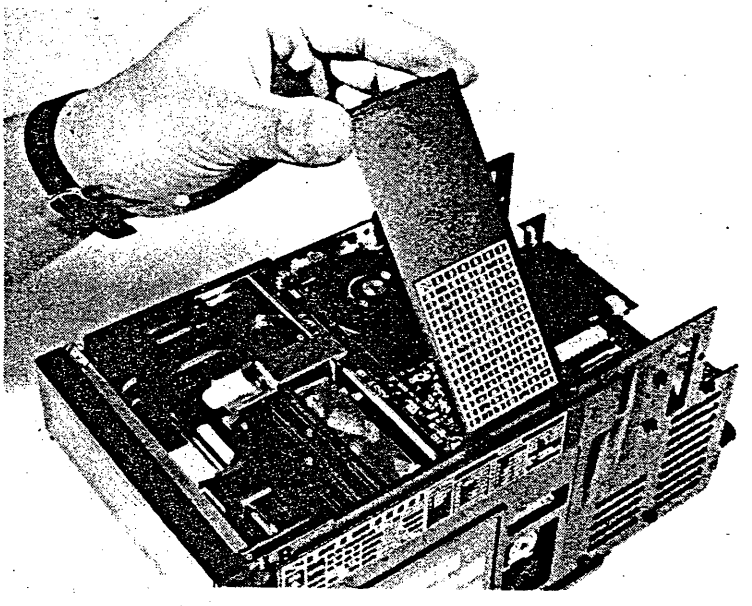


③ Remove the screws securing the ASCII code plate.

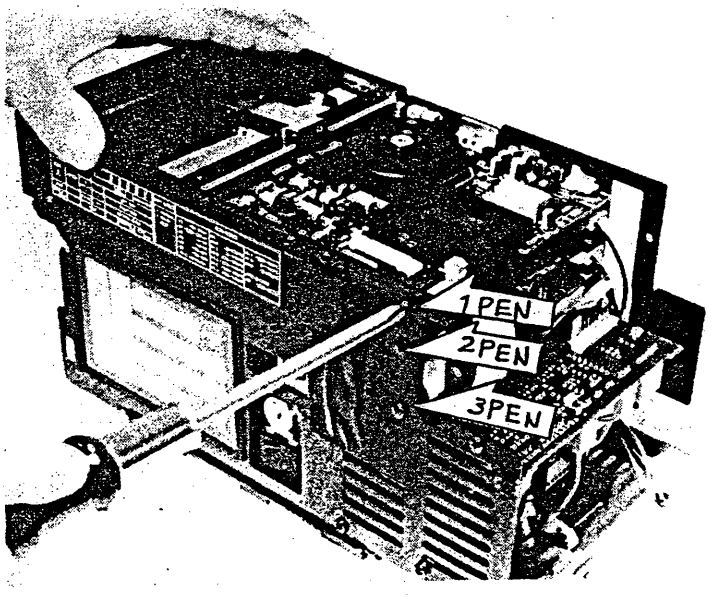


④ Lift the plate, then remove the hook at right.

This plate is also used for side-plate enforcement.



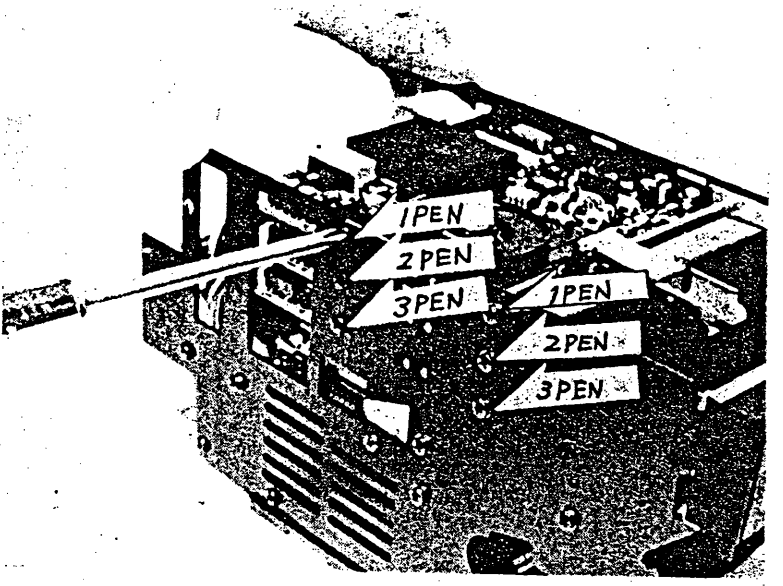
⑤ Remove the screws on the right side.



Caution

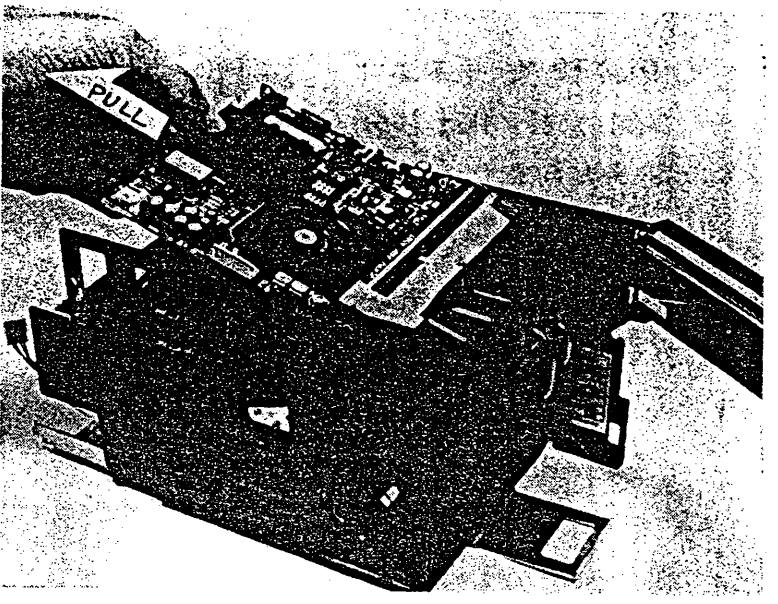
These are special screws, so handle them carefully during assembly.

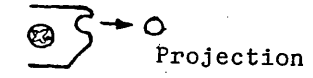
⑥ Remove the screws on the left side.



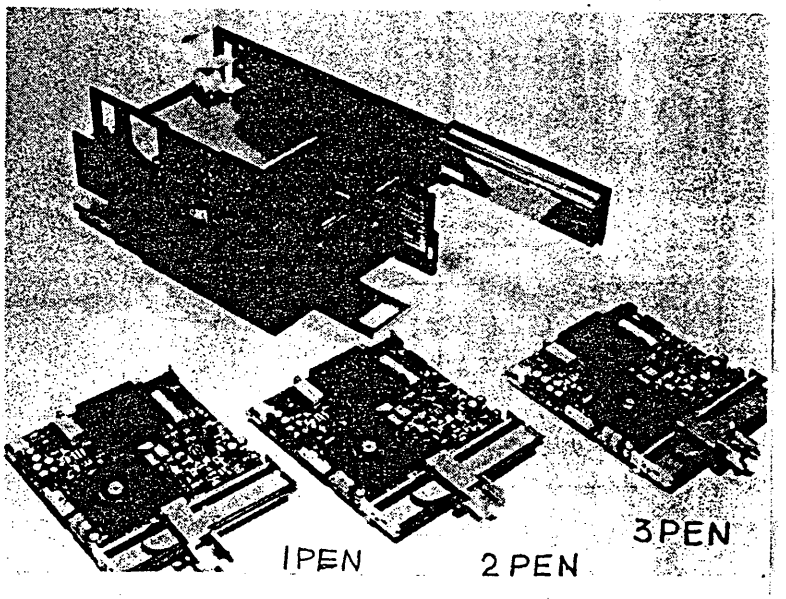
Caution
These are special screws, so handle them carefully during assembly.

⑦ Pull the Ass'y out backward while paying attention to the projections exposed on the inside of the side plate.
When assembling the Ass'y, mate its end with the 2 projections at the right and left, then tighten the screws.





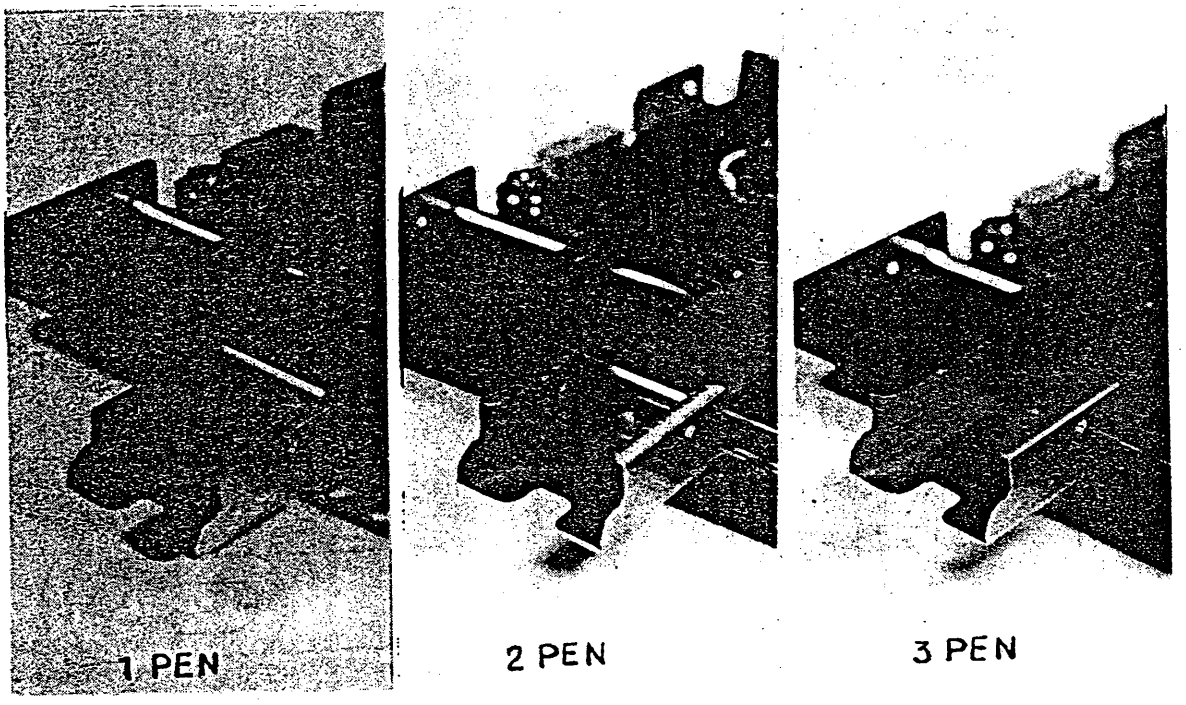
⑧ For the 2- or 3-pen Servo Ass'y disconnect the 2 connectors and remove the screws at the left and right in the same way as in the above.



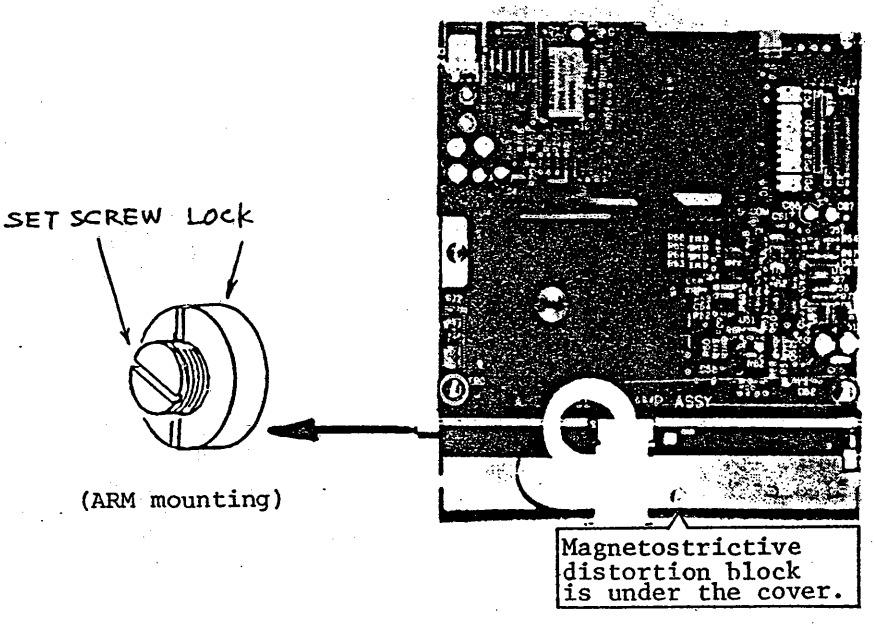
Reference

Only the pen arm of each servo Ass'y used for the 1-, 2- and 3-pen units differs. Therefore, the Ass'y can be used for any pen if the arm is replaced by loosening the arm mounting block.

Jig No. B9567JA (is kept in the Driver Ass'y service kit.)



Caution
Moving the pen arm end manually may deform the arm.



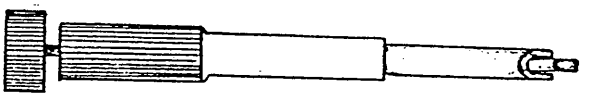
Caution
Do not disassemble the magnetic distortion block, as this may cause trouble.

Pen-arm replacement using a special jig

Use the jig at right

for pen-arm replacement.

Driver Ass'y B9567JA



. Pen-arm removal

① Use the outside of the driver Ass'y (U-shaped) to loosen the lock nut as shown in Fig. 4.1.

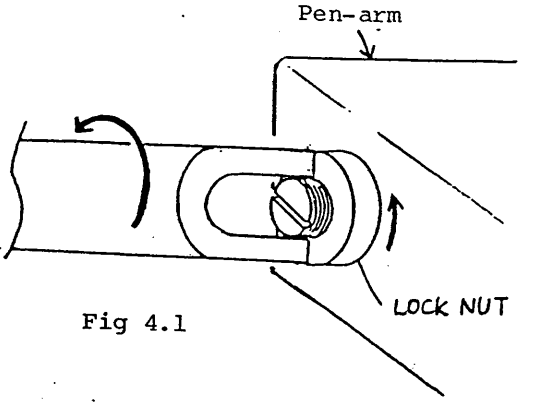


Fig 4.1

Note: The lock nut may be loosened together with the lock nut without creating any problems.

② Next, loosen the setscrew as shown in Fig. 4.2 to remove the pen arm.

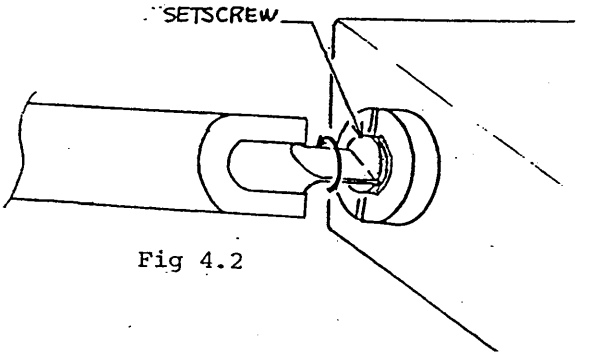
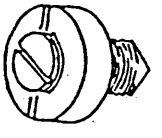


Fig 4.2

Removed screw



. Pen-arm mounting

To mount the pen-arm follow the reverse of the disassembly procedure.

If the screw is not fully tightened and the pen arm is shaky, separate the setscrew from the lock nut by removing the screw lock, as shown in Fig. 4.3, then mount the screw in the order shown in Fig. 4.4 → Fig. 4.5.

If separation is difficult, use a new setscrew and lock nut from the service kit.

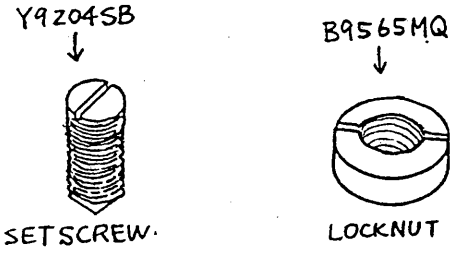


Fig. 4.3

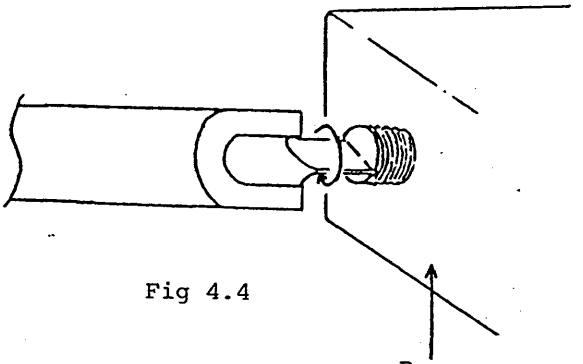


Fig 4.4

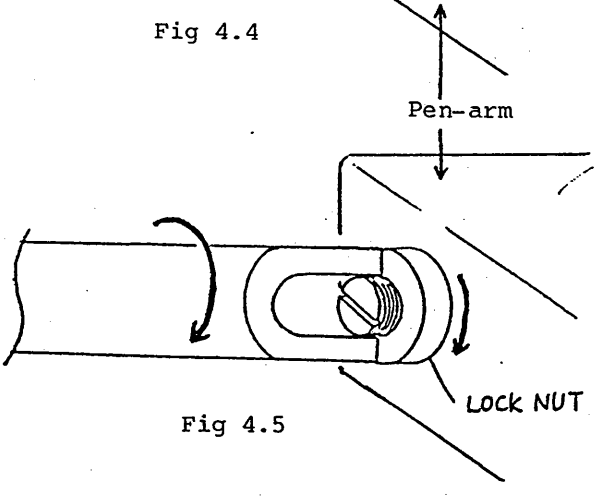


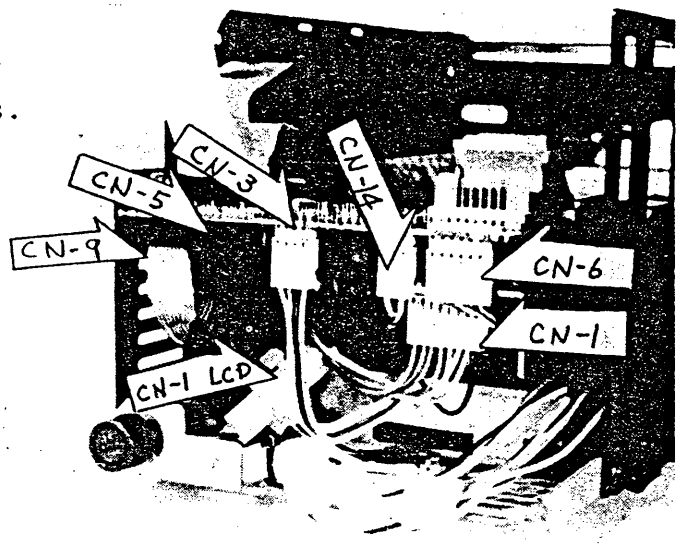
Fig 4.5

4.5 CPU Board Ass'y Removal

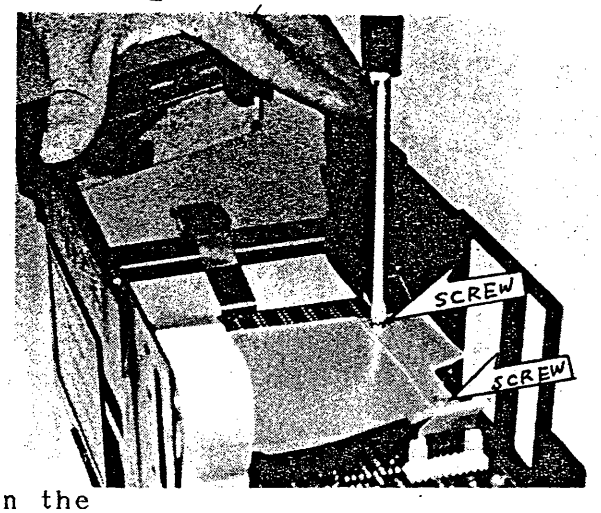
① Disconnect the 7 connectors.

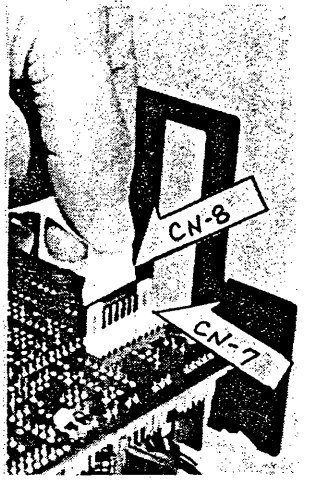
CN-1 TRANS FORMER
CN-3 KEY LOCK, BAT
CN-5 DISP
CN-6 CHART
CN-9 KEY SW
CN-14 TRANS FORMER
CN-1 LCD ±
(For illumination)

(* The picture is for the models M/4152 and 3.)



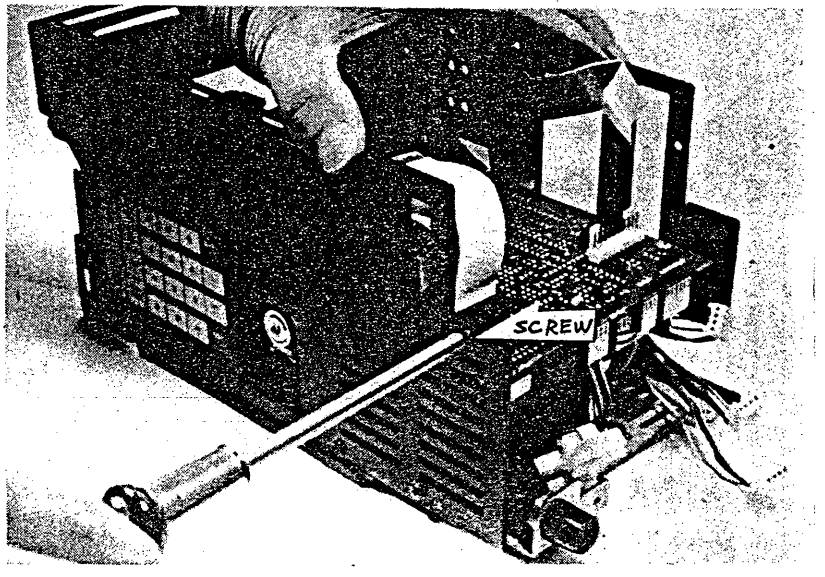
② Remove the 2 screws securing the sealed cover, pull the connector (CN-8) out, then insert a spacer into the cover so that it does not get lose. For recorders with an alarm contact, also pull out CN-7.





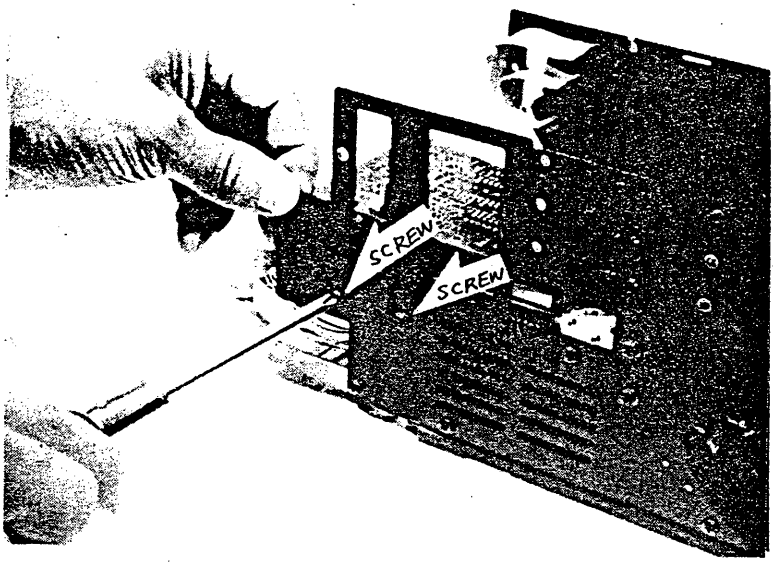
Caution
Assemble the Ass'y by paying attention to the front and rear of the sealed cover.

③ Remove one screw on the right side surface



Caution
This is a special screw, so handle it carefully when assembling.

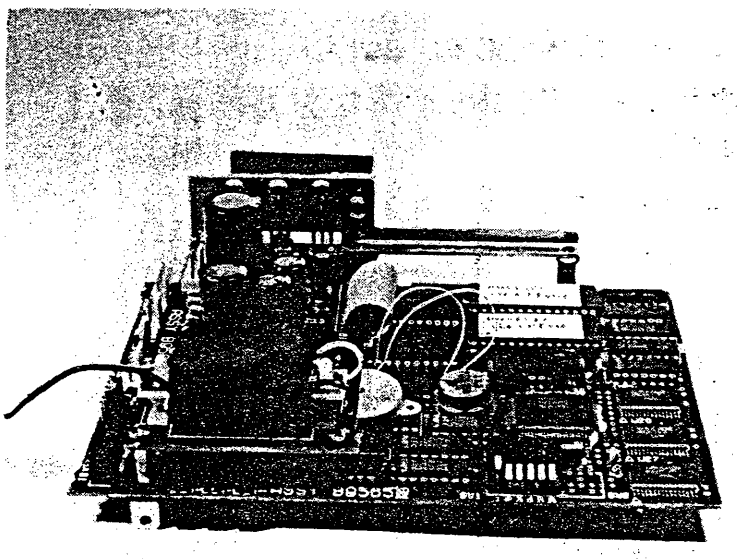
④ Remove the 2 screws on the right side surface, then pull out the CPU board while moving it backward.



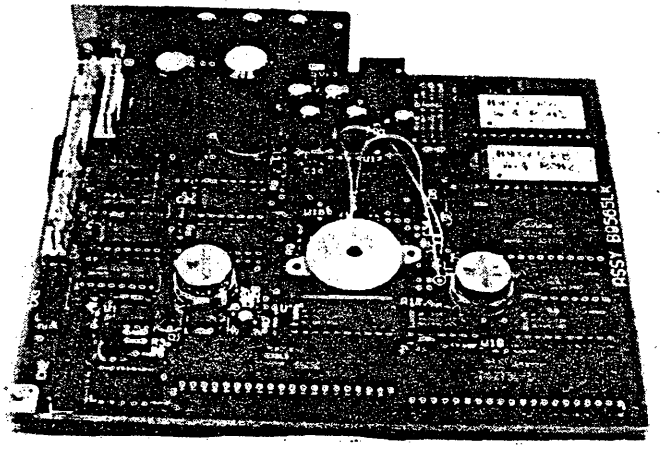
Caution
This is a special screw, so handle it carefully when assembling.

Reference

The CPU board for the M/4152 and 4153 (2-pen, 3-pen) is combined with a power board and the inverter.

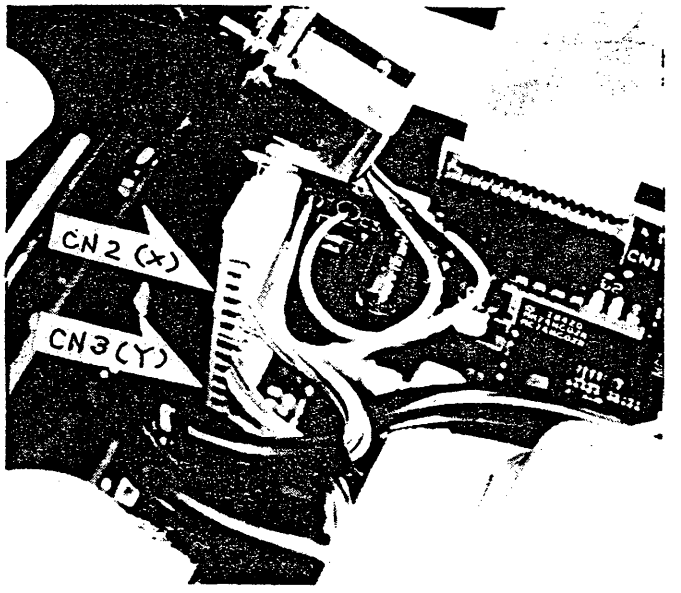


The power board is integrated with the M/4151 (1 pen) CPU board, but the inverter is mounted separately.
Therefore, the 1-pen, and 2-pen/ 3-pen CPU boards are not inter-changeable.
Be careful when replacing.



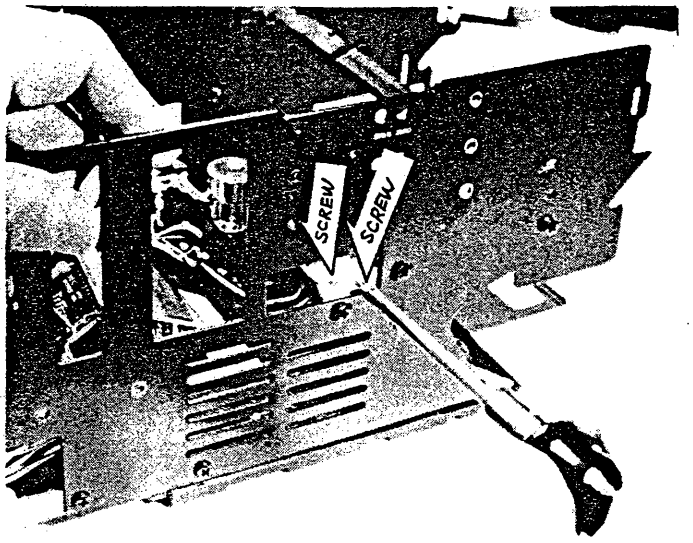
4.6 Plotter Board Ass'y Removal

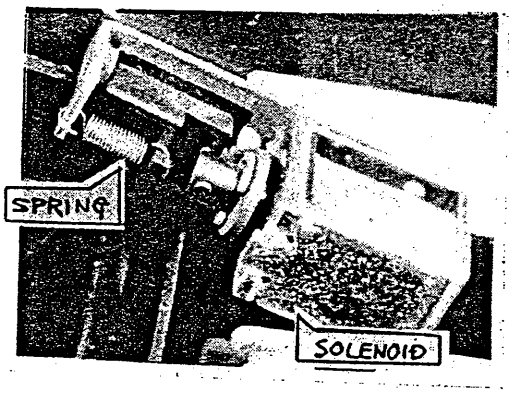
① Remove the connectors (CN-2 for the X-motor and CN-3 for the Y-motor). Prior to assembling, confirm the markings of [X] and [Y].



② Next, remove the 2 screws securring the pen-down solenoid.

(When removing the solenoid, do not lose the spring.)



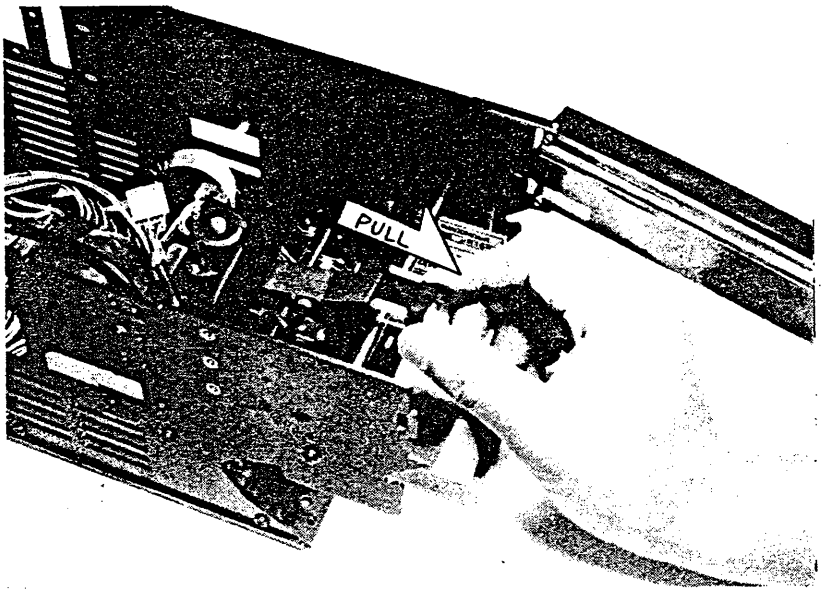


③ The plotter board can be disengaged if it is lifted strongly, so it is secured by a nail.

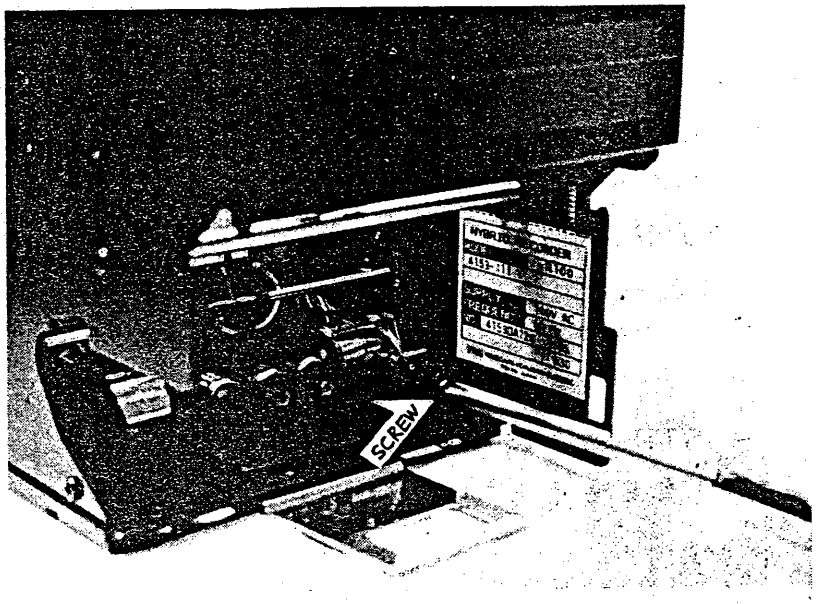
A soldering iron is required for solenoid replacement.

4.7 Plotter Ass'y Removal

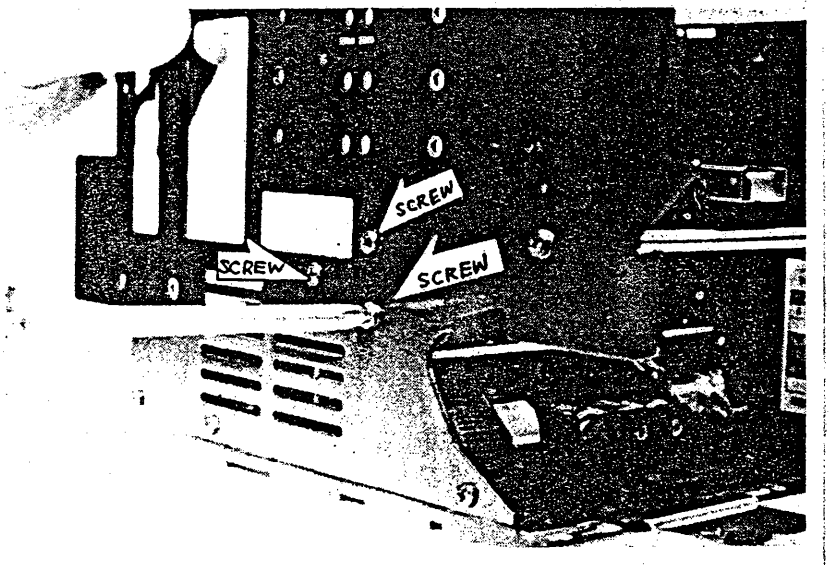
① Pull out the felt tip pen.



② Remove one screw as indicated by the arrow.

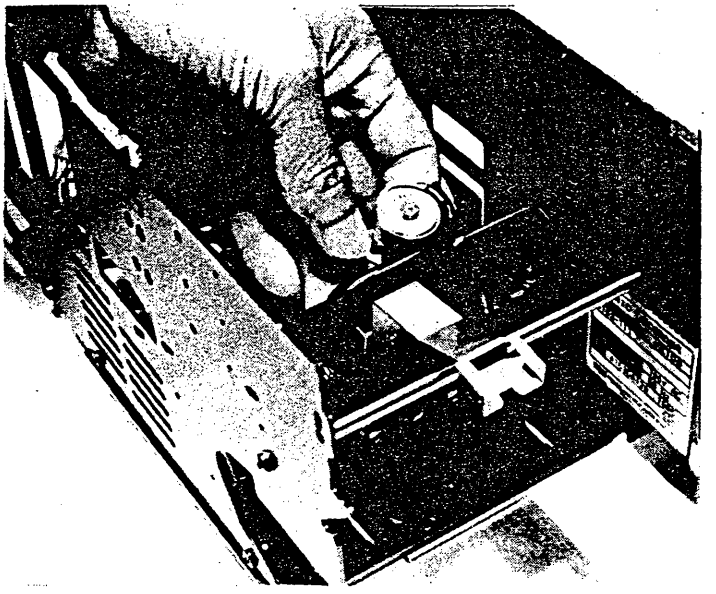


③ Remove the 3 screws as indicated by the arrows on the left side.

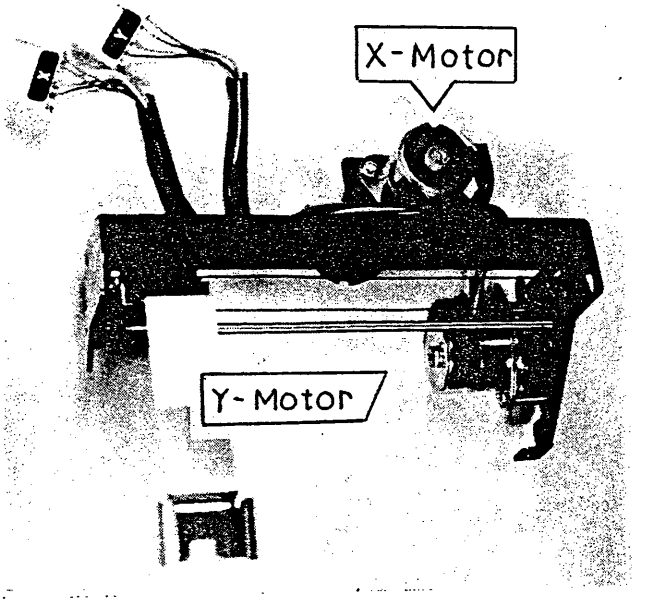


Caution
This is a special screw, so handle it carefully when assembling.

④ Thus, the plotter Ass'y can be removed.
Lift the Ass'y upward.



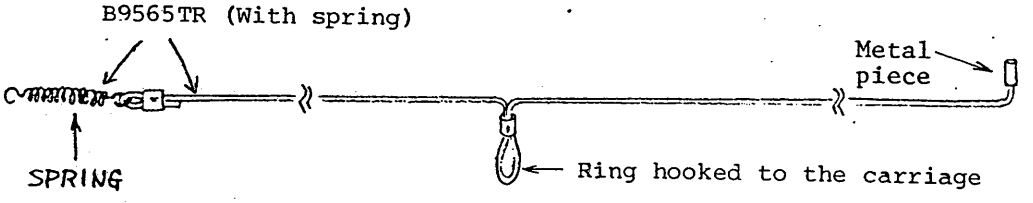
⑤ The X and Y motor Ass'y and the string Ass'y can be inspected and replaced under the above conditions.

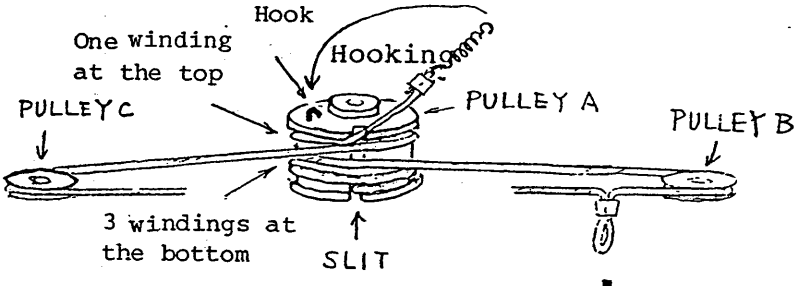


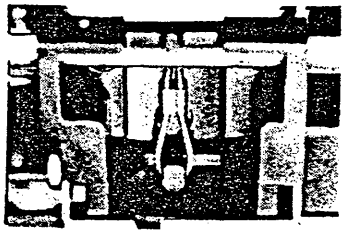
Refer to the next page for string winding.

Winding the String Ass'y [For the plotter Ass'y]

① Hook the center ring to the carriage with the spring attached to the string Ass'y located to the left.







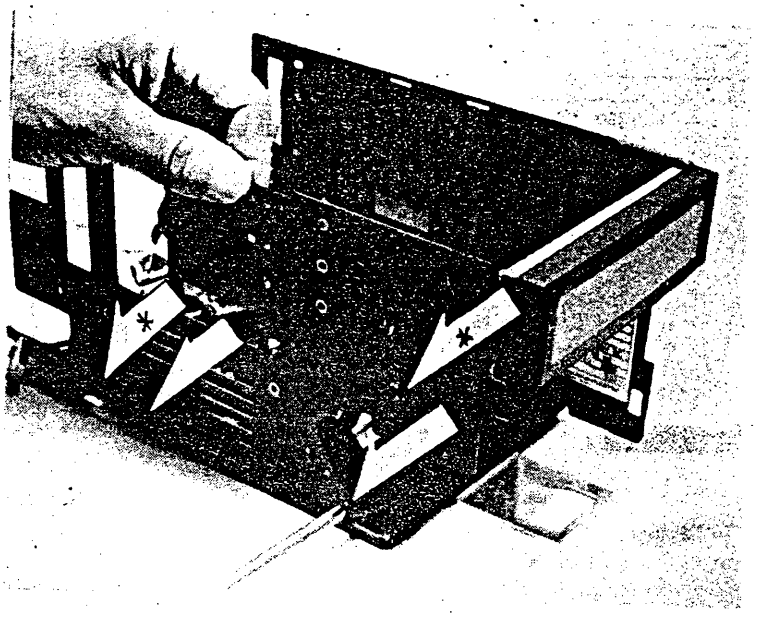
② Hold the metal piece, then pass it through the slit in pulley A from the wire side. Next, rotate pulley A clockwise via pulley B to wind the wire 3 turns round pulley A from the bottom to the top.

③ Wind the other end round pulley A via pulley C, then pull out the wire from the pulley and hook the spring end to the hook, do not pull the spring strongly.

Caution
Wind the wire round the pulley, being careful not to twist it.

4.8 Chart Motor Removal

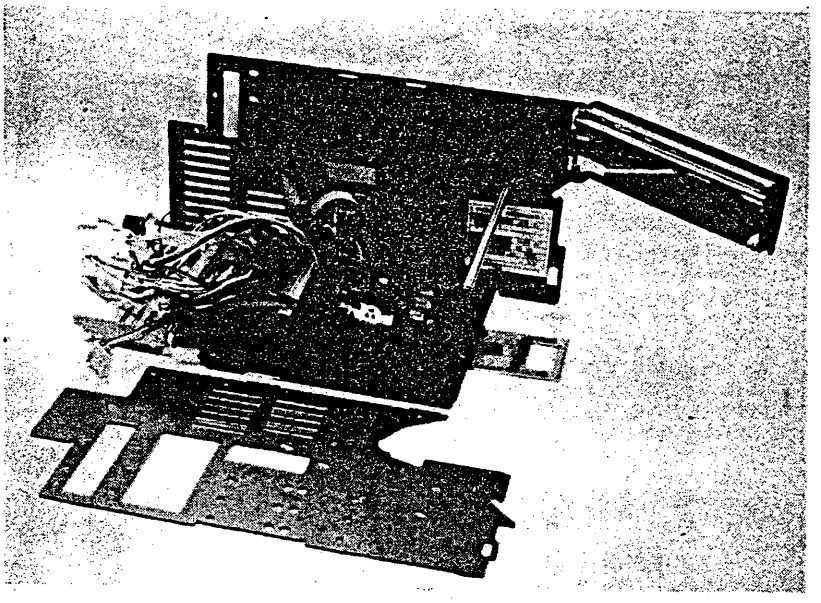
① Remove the 4 screws at the left side.



Caution
This is a special screw, so handle it carefully when assembling.

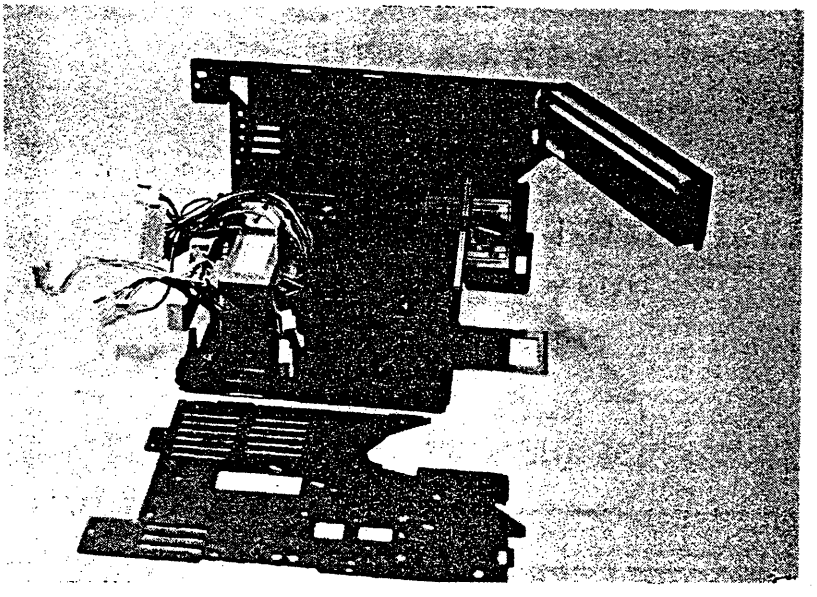
MK/4152,3

(2-and 3-pen)

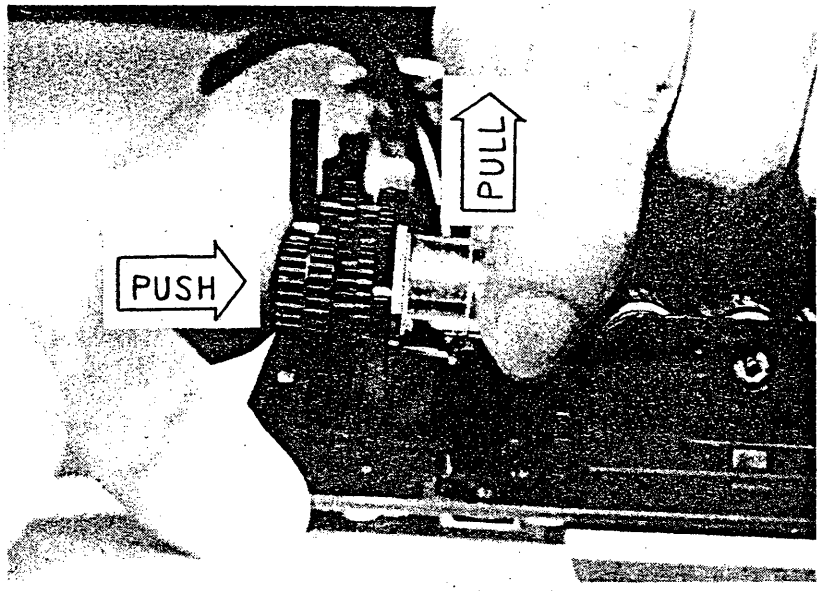


M/4151

(1-Pen)

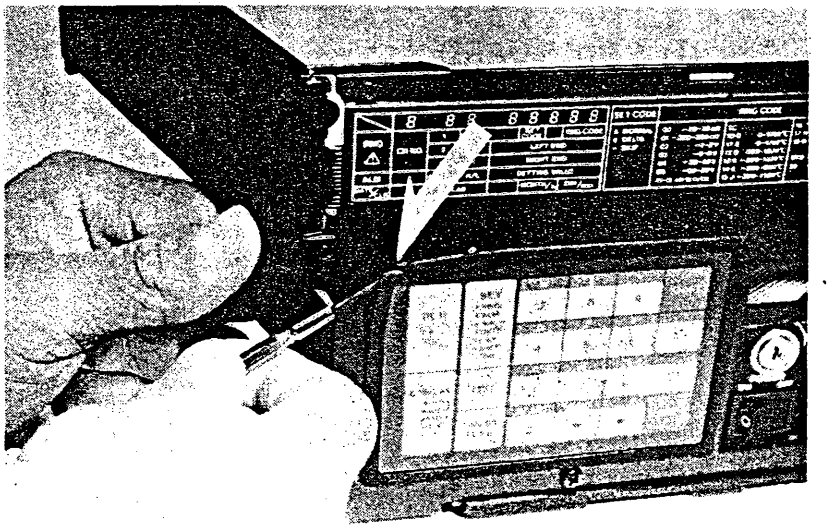


② Pull the motor upward while pushing in the gear which is secured to the frame by a nail.



4.9 Key Board Removal

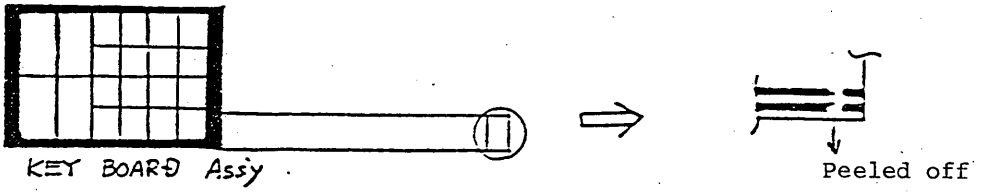
① Disconnect the CPU board connector (CN9) (For M/4151: CN1) Refer to CN1 of item 4.5 ① on page 35.



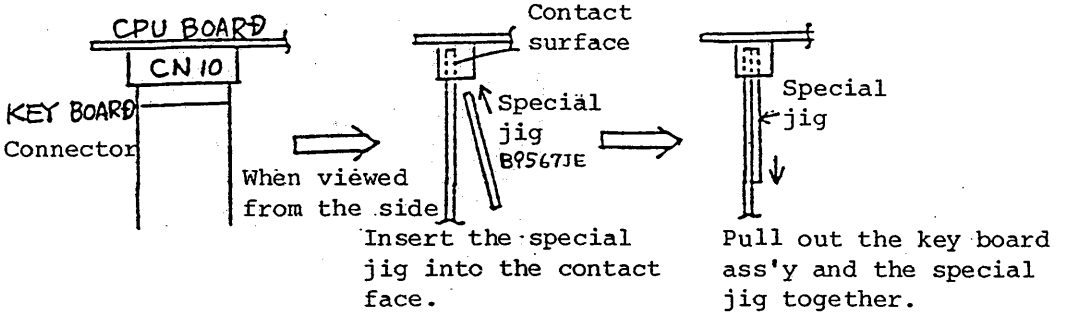
② The key board is attached to the front plate with tape (BEZEL B9565GM). Therefore, when removing it from the plate, peel the tape off from the key board corner.

The connector contact on the Key Board Ass'y may be peeled off if the connector is disconnected or connected a few times, causing key trouble. To prevent this, use a special connector puller (B9567JE) when removing the connector, (not required for its connection)

. When the connector is disconnected a few times without using the special jig.



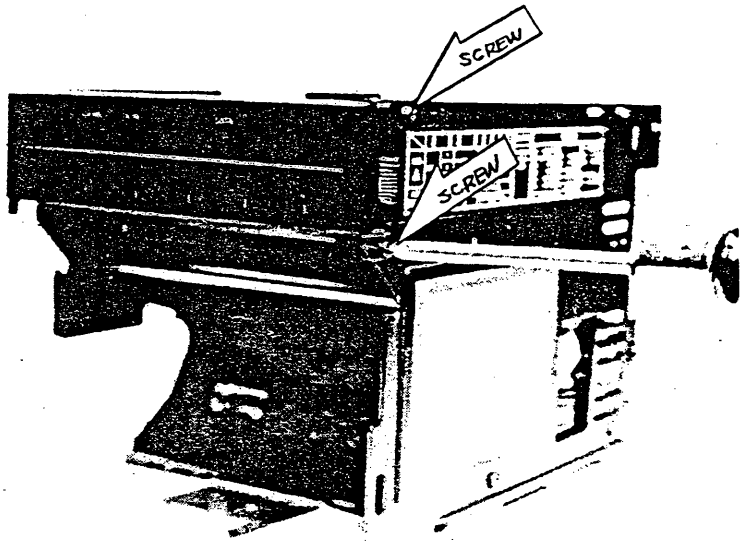
. How to use the special jig.



4.10 Display Ass'y Removal

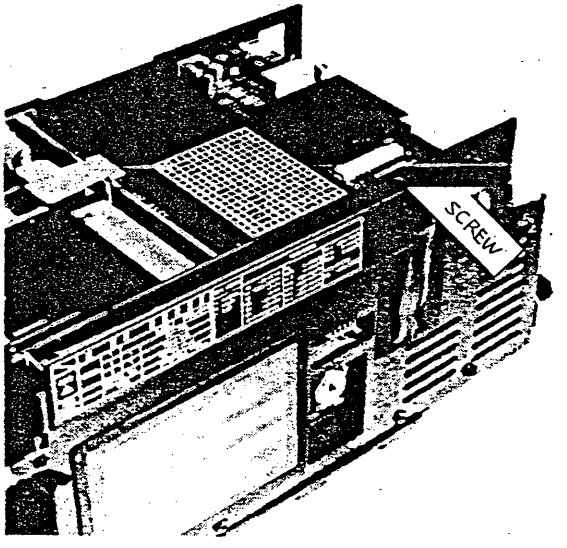
① Remove CN5 on the CPU Board Ass'y along with the inverter output CN1 connector.

② Unscrew and extract the screws in the picture to remove the DISP Ass'y.



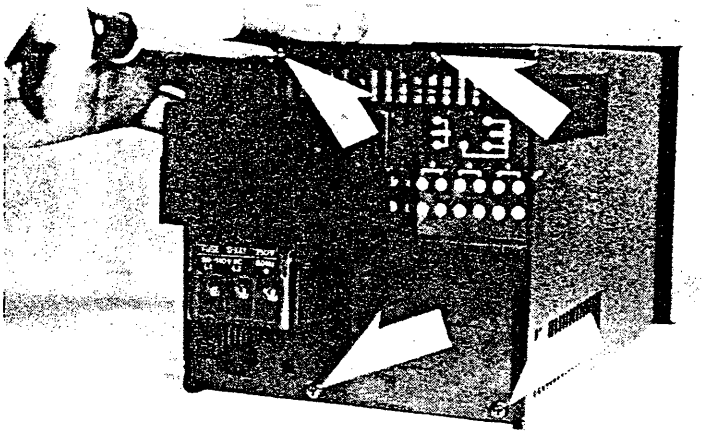
③ In order to remove the wire, unscrew one more screw.

Thus, the setting nameplate is removed to expose the wire.



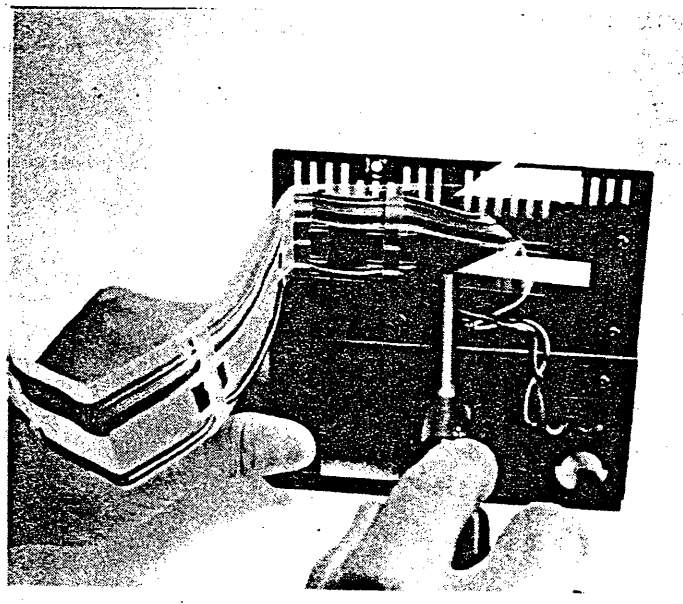
4.11 RJC Board Removal

① Remove the 4 screws fixing the rear panel.

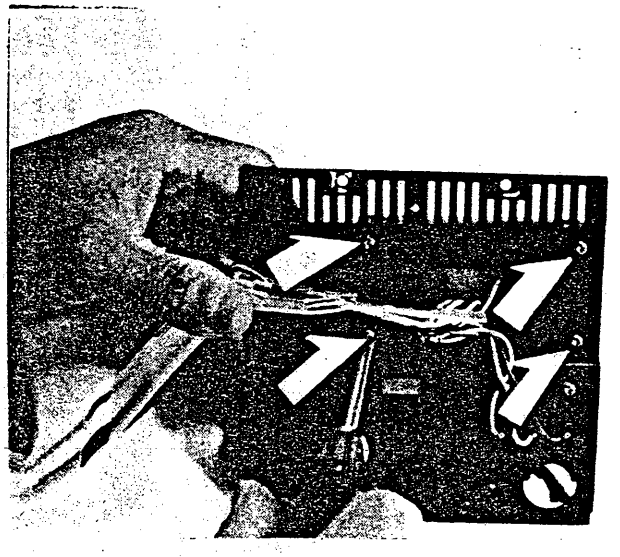


> **Caution**
> This is a special screw, so handle it carefully when assembling.

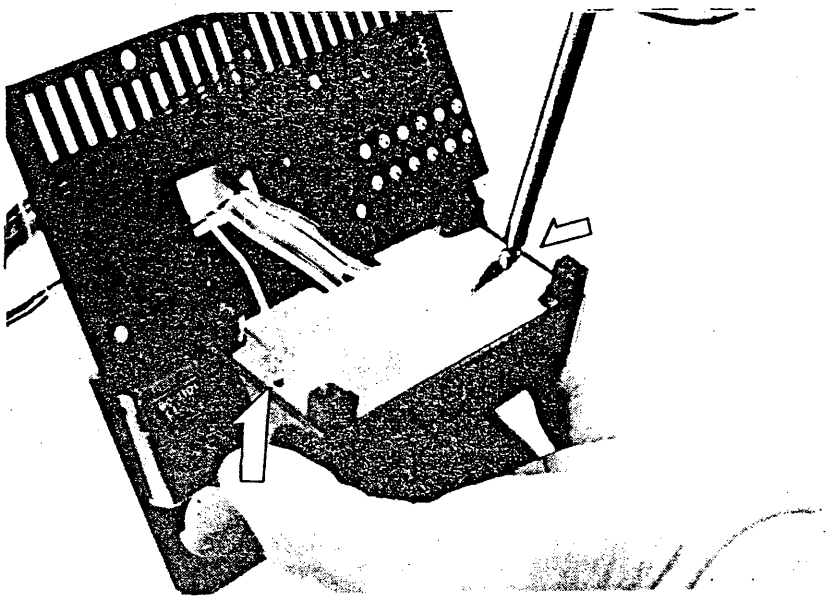
② Unscrew the 2 screws from the panel rear.



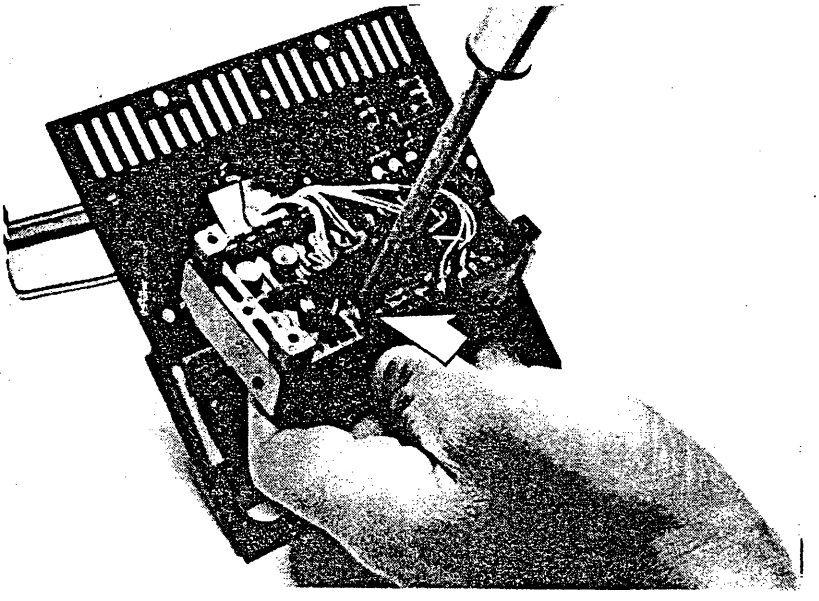
③ Unscrew the 4 screws fixing the input terminals.



④ Unscrew the 2 screws at the rear of the terminal to remove the cover.



⑤ The RJC Board is secured by 1 screw.



Soldering iron is required for replacement.

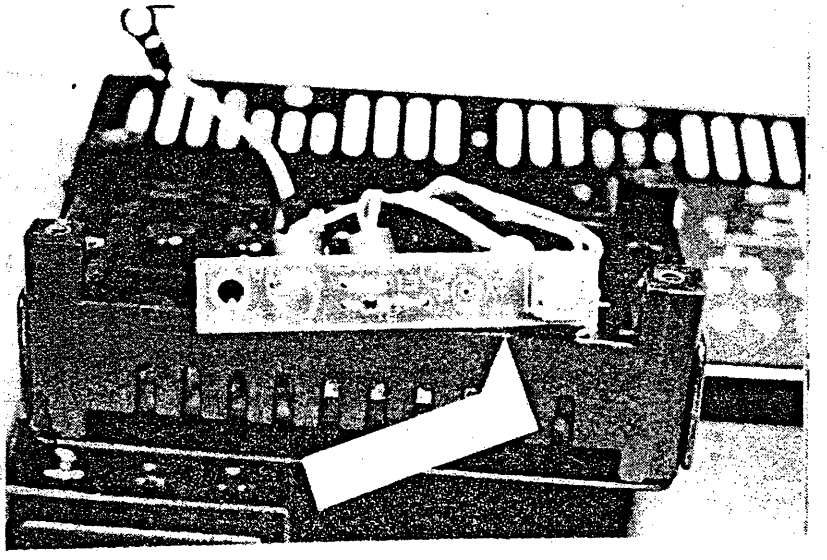
+V ... Purple

BC ... Blue

E ... Light blue

Unscrew the above 3 screws.

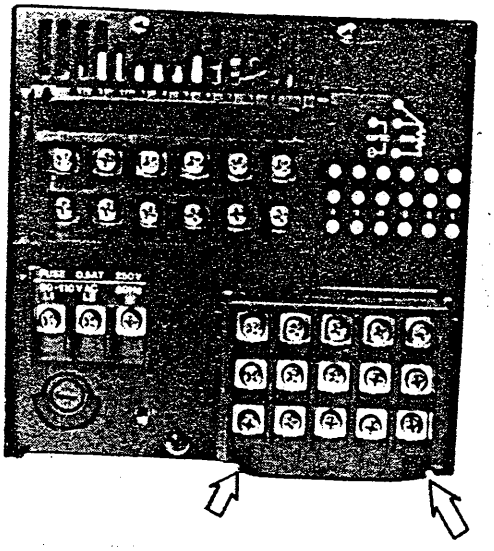
RJC: Reference cold-junction compensation



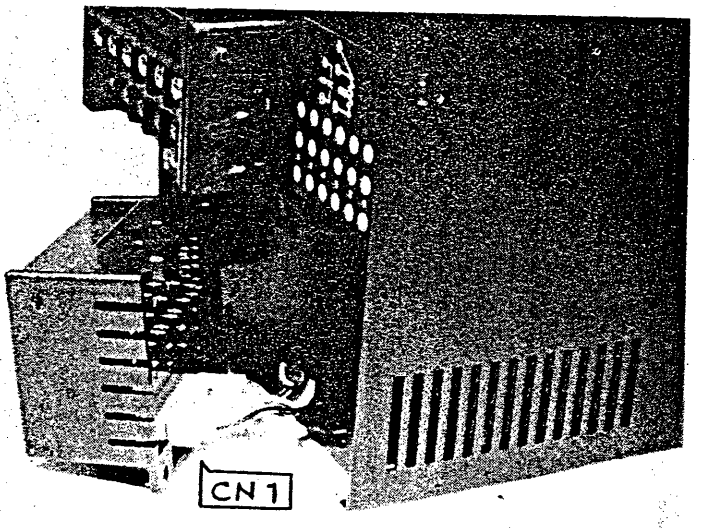
4.12 Alarm Ass'y removal

Alarm is optional.

① Unscrew the 2 screws shown by arrows on the rear panel.



② Pull the terminal board forward and out to expose the connector (CN1). The Ass'y can be separated when the connector is disconnected. This board is integrated with the terminal board.



(MEMO)

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 trouble caused by wrong connector connection, etc.

Contents

5.1 Jigs Used

Jig name	Parts No.	Remarks
Power cable	DH03-02	For internal circuit operation check
Input cable	DH03-03	Ditto (Common to mV/ TC, and RTD)

These special jigs are contained in the service kit.

5.2 How to Use the Power and Input Cables

(These are special jigs.)

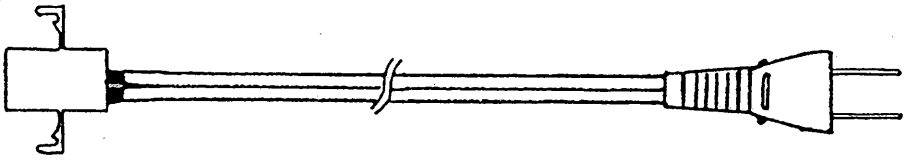
These jigs are used for checking recorder model 4151,2 and 3 operation with the internal assembly separated from its housing.

Use them for "Functional check after assembly" and "Electric circuit adjustment and inspection".

(These jigs are contained in the service kit.)

(1) Power cable (DH03-02)

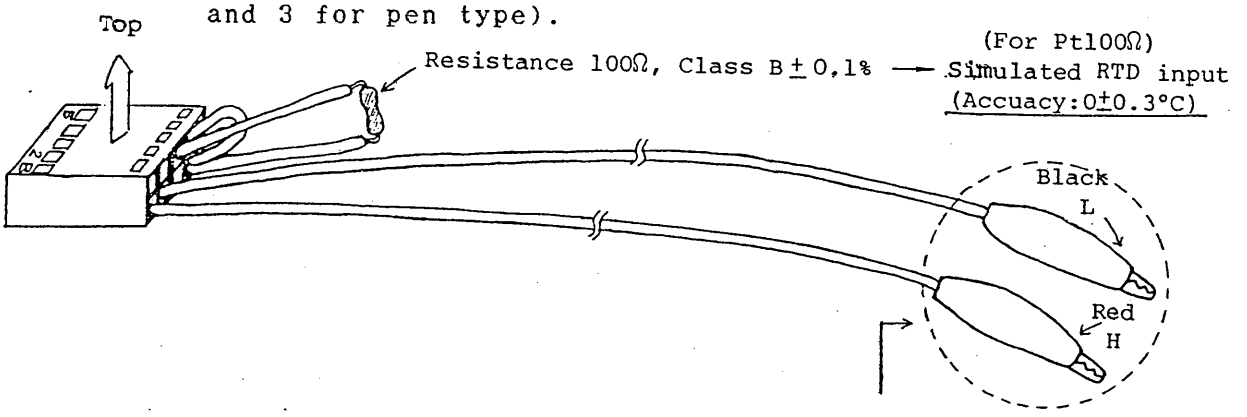
The following diagram shows the power cable.



This power cable is a power cord with the female side of the power connector on the μR100 internal assembly. If it is connected to the μR100 power connector, the μR100 can be operated with the internal assembly separated from the housing.

(2) Input cable (DH03-03)

The following diagram shows the input cable (For 4151, 2 and 3 for pen type).

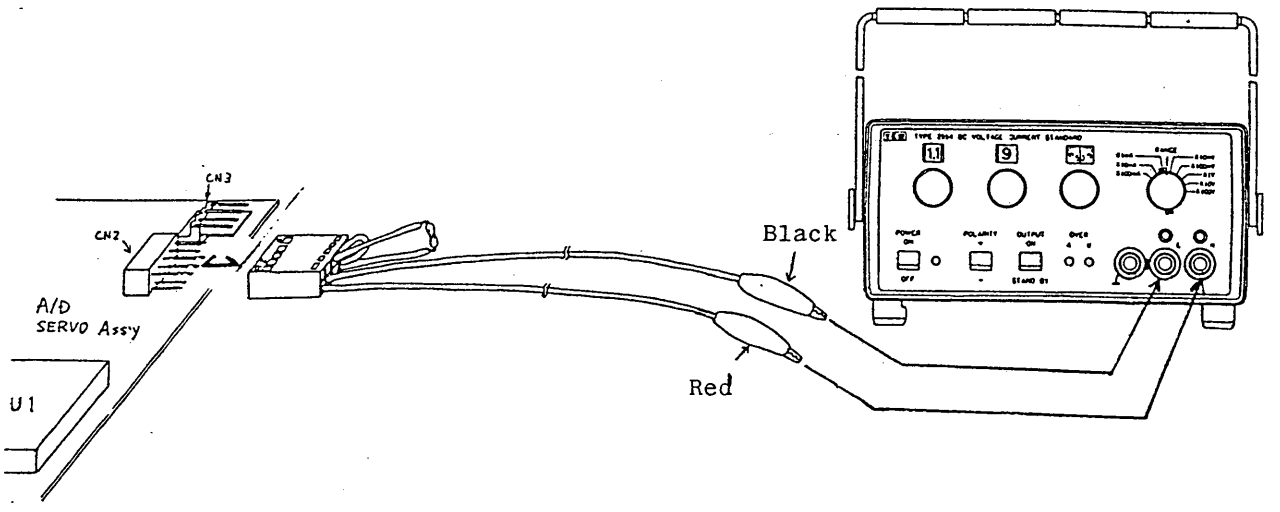


Alligator clips for mV/TC input.

Connect these clips to a DCV generator to apply simulated input or connect them to TC to apply TC input.

This cable has two alligator clips for mV/TC on the female side of the measured data input connector (CN2) on the A/D Servo Ass'y, and a 100Ω resistance for simulated RTD input.

. For mV/TC input, connect the cable as shown in the following diagram.



. For RTD input

Insert the jig into CN2 on the A/D Servo Ass'y.

At this time, the alligator clips may be either engaged or disengaged.

Accuracy of simulated RTD (Pt 100Ω) input: 0 ± 0.3°C

5.3 Initial State Check at Power-ON

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

Display a. Counted from CLOCK MODE "00:00" (note)
→ ":" flashes.

b. Battery alarm "BAT" lights up.

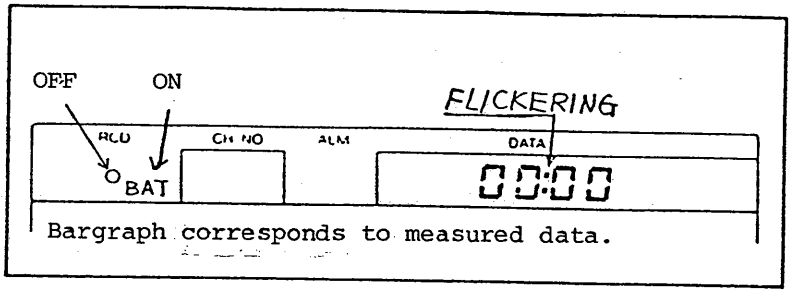
c. Bar-graphes corresponds to measured data

d. RCD "0", alarm "ALM" and units are extinguished.

PEN Stand-by after it is moved to the left front end.

Plotter Center → Left end → Center (Pen is raised.)

CHART Stop



Note: For ROM VER.8 with auxiliary codes 1 to 6 and VER.4 with auxiliary codes 7 and 8, "ur 0000 □" (ROM VER display) is displayed before the "00:00" display.

Refer to pages 22 , and 87 for the auxiliary codes.

5.4 Key Board

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

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

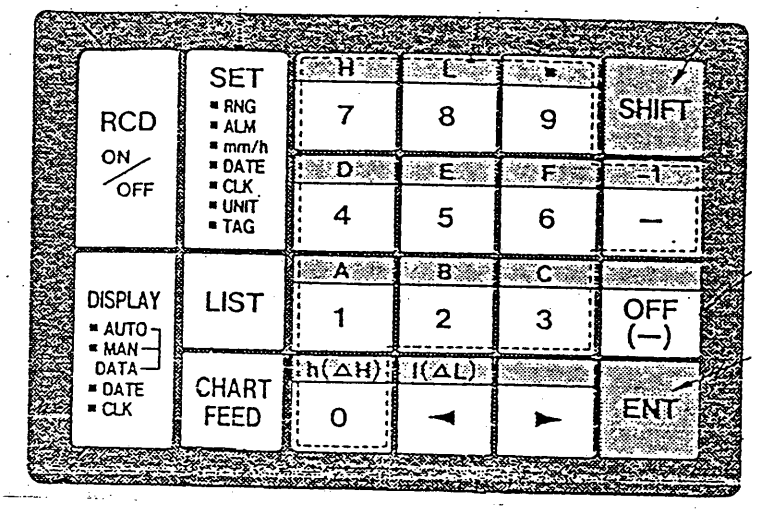


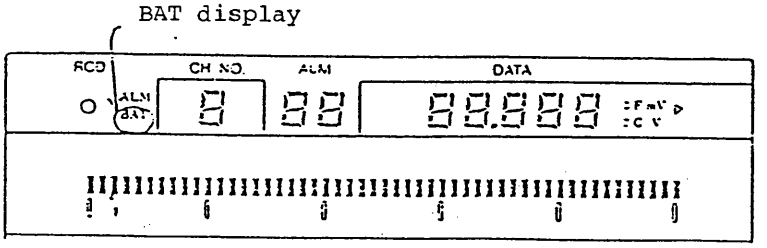
Fig. 5.1

5.5 Key Lock Function

Check that only the DISPLAY key, and the ◄ and ► keys on the data man. display are accepted when the key is locked.

5.6 Battery Alarm Function

Check that the "BAT" display is extinguished when the battery is loaded and that it lights up when the battery is not loaded.



4151 DISPLAY

5.7 Plotter Section Check

Check that the following format is obtained when the LIST key is pressed in order to perform list print-out.

(Fig. 5.2 shows when the input type is mV/TC, and the LIST key is pressed just after power-ON with the battery unloaded.)

This chart shows a list print-out Model 4152 (2-pen type).

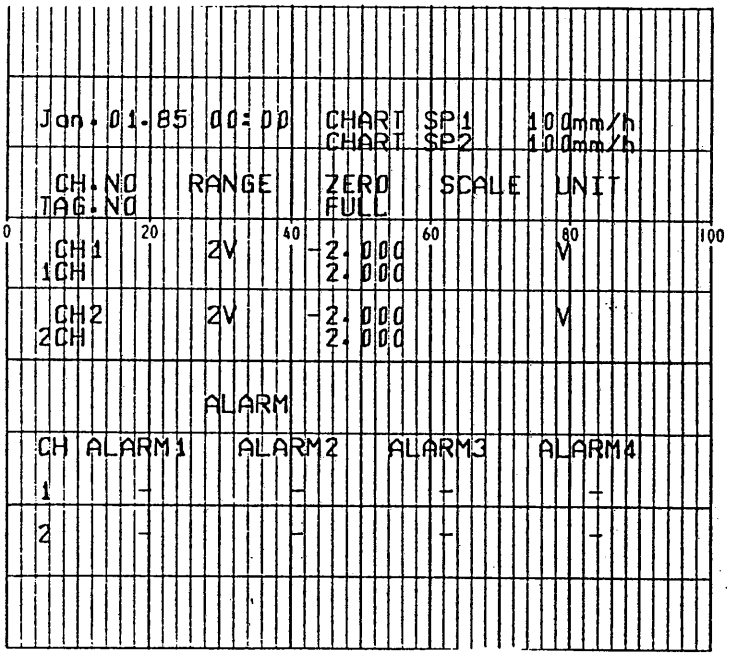


Fig. 5.2

5.8 Pen Operation Check

(1) For mV/TC input specification

① RANGE ... 2V (Set to ⊦-2V ～ +2V⊣)

Check that the pen moves in accordance with bar graph changes when the input opens. (It is acceptable when rough pen movement can be checked.)

② Next, short the input terminals to check that the pen stops at the center of the chart.

(2) For RTD (Pt 100Ω) input specification

① RTD RANGE ... (Set to ⊦-200°C ～ +200°C⊣)

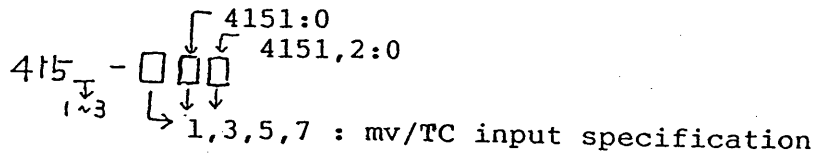
Check that the pen moves beyond 100% on the scale with input opened (between A and B opened, and B and b shorted) and also that it moves beyond 0% on the scale with input shorted (between A and B, and B and b shorted).

② Next, check that the pen stops at the center of the chart with a simulated input of 100Ω (special jig DH03-03 is used) applied.

5.9 Reference Junction Compensation Function

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

Model No. & Code



Check that the display unit shows room temperature (accurately, input terminal temperature) at RANGE "T" and input shorted. (Display is an approximate value.)

Note: Use the input terminals behind the case's rear cover.
Do not use the special jig (DH03-03).

5.10 Burnout Function (Optional)

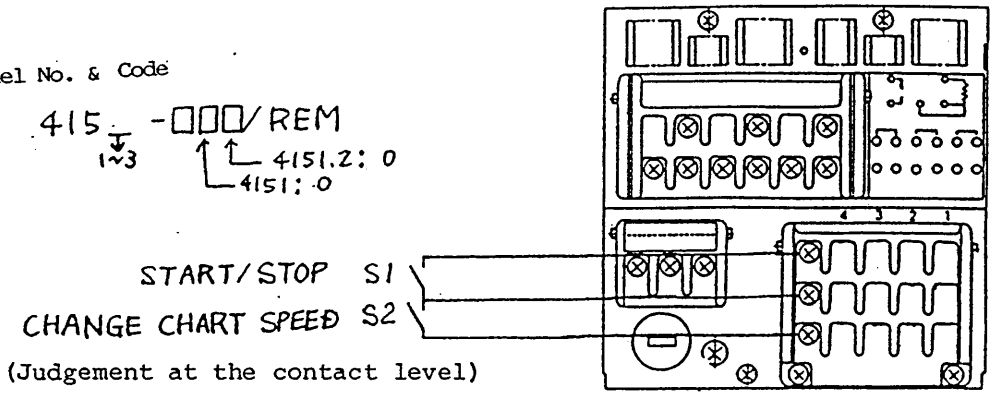
When input opens at any thermocouple range (nothing is connected to any of the channels), check that the display unit and pen movement are as shown in the following table.

Check point \ Model No.	415-□□□/BD (Burn-out downscale specification)	415-□□□/BU (Burn-out upscale specification)
Display	— — — — —	— — — — —
PEN	Downscaled to 0% side	Overscaled to 100% side

5.11 Remote Function (Optional)

Model No. & Code

415 - □□□/REM
↓ 1~3
4151.2: 0
4151: 0



(Judgement at the contact level)

Fig. 5.3

(1) Start/stop

Check that the chart feed, pen position and display RCD "0" are as shown in the following table (Table 5.1) when the REM terminals for the chart START/STOP are closed or opened (S1 in Fig. 5.3).

Table 5.1

Check Point \ S1	CLOSE	OPEN
Chart feed	START	STOP
Pen position	Corresponding to measured data	Stop at the position just before being opened
Display RCD "0"	ON	OFF

Note: The REM terminals for START/STOP has high priority over the [RCD] key.

(2) Change

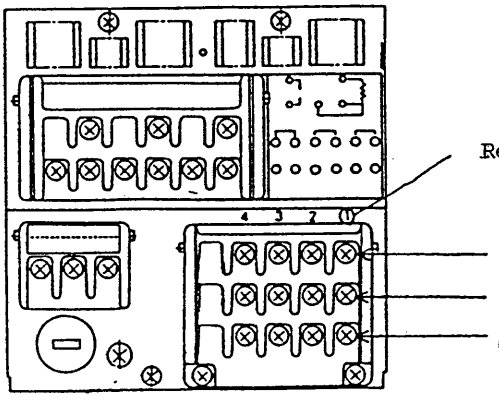
Check that the chart feed and record are as shown in Table 5.2 when the REM terminals for changing chart speed is closed or opened (S2 in Fig. 5.3)

Table 5.2

Check point \ S2	CLOSE	OPEN
Chart feed	Chart is fed at speed 2 set from the key board	Chart is fed at speed 1 set from the key board
Records on the chart	SPD.2 □□:□□	SPD.1 □□:□□

□□:□□...The time when chart speed changed.

5.12 Alarm Output Function (Optional)



Model No. & Code

415_-□□□/AK-04

1~3

4151.2: 0

4151: 0

Relay No.

NO Normally open (Shorted to "C" when an alarm occurs)

C COM

NC Normally closed (Separated from "C" when an alarm occurs)

⇩

When the alarm input is de-energized (Optional), the NO or NC actions are reversed.

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

(Reference) Refer to the alarm relay ON/OFF test. (Page 73)

5.13 Phase Synchronous Function (Optional)

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

② Apply inputs such as the 1CH, 2CH and 3CH pens change simultaneously.

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

③ Check that the recording becomes as shown in Fig. 5.3 when it is started by the [RCD] key.

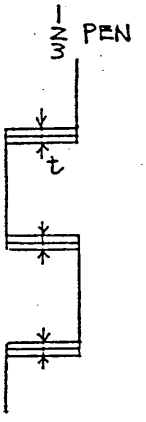


Fig. 5.3

Phase synchronous deviation should be less than 1mm.

(Reference)

Pen offset: 3mm/CH

Therefore, if there is no phase synchronization, t becomes 6mm.

Model and code

415 - □□□ / PS

2.3 ↑ 4152:0

This function is not added to model 4151(1-pen type) as an optional.

6. Mechanism Adjustment

This chapter describes the mechanism adjustment procedure.

Always carry out adjustment after assembly.

Contents

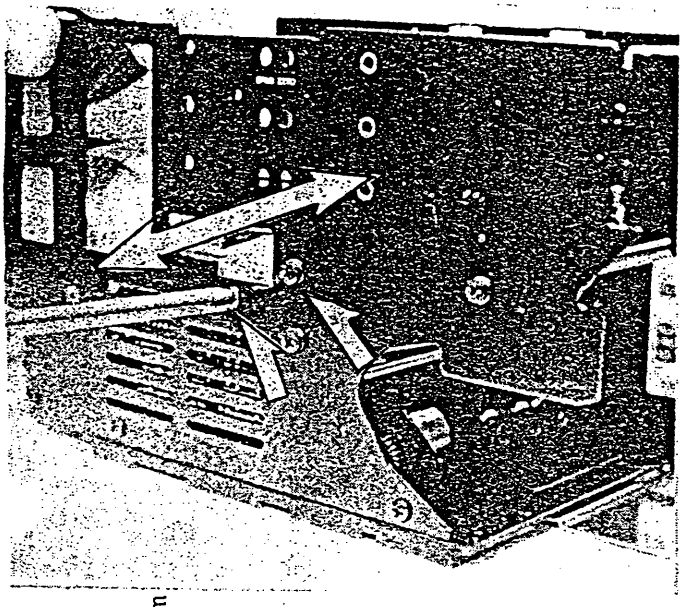
6.1 Tools and Jigs Used

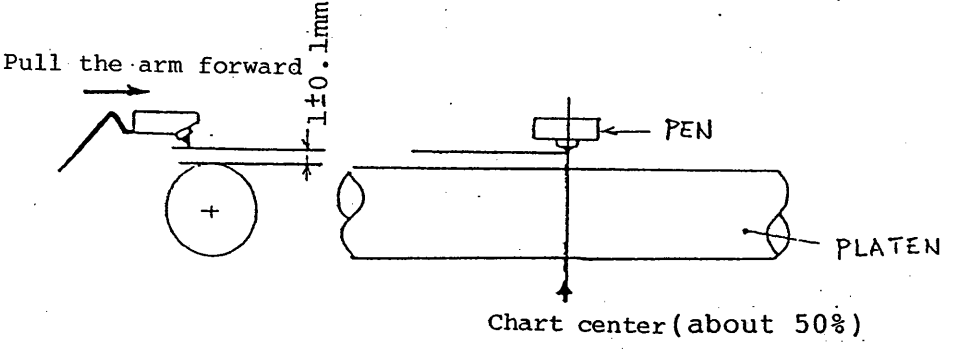
Tool and Jig Name	Specifications	Remarks
⊕ Screw driver	M3	
PLATE	B9567JB	PLOTTER PEN-height adjustment jig Special jig↵

MEMO

6.2 Plotter Pen Height Adjustment

It is necessary to adjust pen height after assembling the plotter Ass'y. Move the pen carriage to the center of the recording chart, pull the arm forward completely, then tighten the screw so that the distance between the pen end and platen becomes 1mm ± 0.1mm (use the special jig) by moving the solenoid in the directions ⟺ shown in the picture.





To adjust, use the special jig.

Jig No.: B9567JB
(Plate is contained in the service kit.)

7. Electric Circuit Adjustment and Inspection

Adjust and inspect in the test mode.

The 4151, 2 and 3 are provided with two modes:

NORMAL MODE for normal measurement and recording, and

TEST MODE for adjustment and inspection.

Contents

7.1 Measuring Instruments and Tools Used

Measuring instrument & tool name	Specification, etc.	Remarks
DCV generator	0.05% 2554	mV/TC input for A/D full scale check.
DCV generator	(0.001% 2552)	mV/TC input for A/D full scale adjustment
Digital multimeter	0.05% 2506A	RTD input for A/D full scale adjustment
Tester		For alarm (AK-04) inspection (Optional)
Screwdriver	⊕ ⊖	
⊕ Screwdriver	M3	
Power cable	DH03-2	For internal assembly operation check
Input signal cable	DH03-3	For internal assembly operation check (Common to mV/TC, RTD)

* For usage, refer to P50.

7.2 Test Mode Setting Procedure

POWER OFF

↓

Turn ON the CPU board DIP SW. 3rd bit (Note 1) Fig. 7.1

↓

POWER ON

↓

TEST MODE

(Note 1.)
Fig.7.1

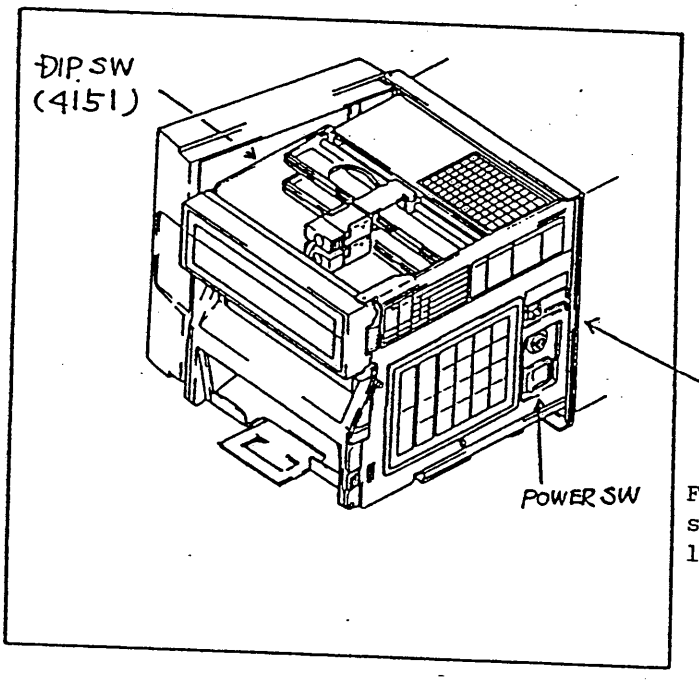


Fig. 7.1

Note 1: Prior to starting adjustment, check that each bit setting of the CPU Board DIP SW is correct.

→ Refer to CPU Board DIP SW setting on pages 20 and 21.

Note 2: When transferring from the test mode to the normal mode, follow the order POWER OFF → 3rd bit OFF → POWER ON

7.3 Adjustment and Inspection Items

Select each item via the Key board after setting the Model 4151, 2 or 3 to the test mode. However, note that depending on ROM.VER.used, this function may not be provided.

TEST KEY	TEST	Details	Adjustment	Inspection	The presence or absence of the function according to ROM VER.
0	A/D FULL SCALE	A/D circuit reference voltage adjustment (check)	○		VER. 3, 4 (Auxiliary code 1~6) / VER. 0 (〃 7.8)
1	SPAN 0%	Moves the pen carriage to the 0% side	○		
2	SPAN 100%	Moves the pen carriage to the 100% side	○		
3	DISPLAY ON	All LCD display segments are turned ON.		○	
4	DISPLAY OFF	All LCD display segments are turned OFF.		○	
5	RTC	Checks CPU RST6.5 ISEC accuracy		○	
6	RANGE AUTO SET	Range and span are set automatically.			VER. 5, 6, 7 (Auxiliary code 1~6) / VER. 1, 2, 3 (〃 7.8)
7	ALARM RELAY ON/OFF	Alarm relay is turned ON/OFF in order at 2 sec. intervals.		△	
8		For SERVO zero, span test pen shift			After VER. 8 (Auxiliary code 1~6) / After VER. 4 (〃 7.8)

Always adjust and inspect items marked with ○.

△ : Optional (AK-04)

Note: Refer to pages 22 and 87 for the auxiliary codes.

(1) [0] key A/D full-scale adjustment (checking)

For mV/TC CH

. As a rule, use the 2554 generator for checking in the field.

① Press the A/D full-scale test key. ([0] KEY)

② Apply + 2.000V to the input terminals of the CH (1 to 3) to be checked.

③ Match the display CH No. to the CH to be adjusted using the ◀ KEY (or ▶ KEY) and, if the data display is "20000 ± 22", the test is acceptable.

(When the 2554 has no error.)

④ For all mV or TC CHs, perform ② and ③.

. Test record adjustment and calibration requires the use of a 2552 generator, and are therefore performed at our service shop.

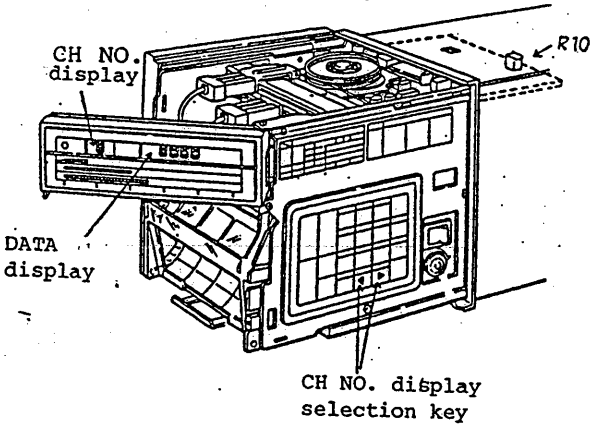
① Press the A/D full-scale test key. ([0] KEY)

② Apply + 2.000V to the input terminals of the CH (1 to 3) to be adjusted.

③ Match the display CH No. to the CH to be adjusted using the ◀ KEY (or ▶ KEY) then turn R10 in the Servo Ass'y so that data display becomes "20000 ± 4".

Remove the internal stopper and then pull out the internal Ass'y.

④ For all mV/TC CHs, perform ② and ③.



For RTD CH

It is not necessary to select the test item via the keyboard.

Instrument used: Multi-meter Accuracy: 0.05% (2506A, etc.)

Connect the multi-meter between *COM (A/D block COM) on the SERVO Ass'y and Pin No. 10 of U1 (Pin No.5 of CN2 is also acceptable.), then turn R10 until voltage becomes 5 ± 0.1V.

For RTD, follow the above procedure for all CHs.

*Such as 3P of U2, and 21-P and 28-P of U1. (Refer to Fig. 7.2)

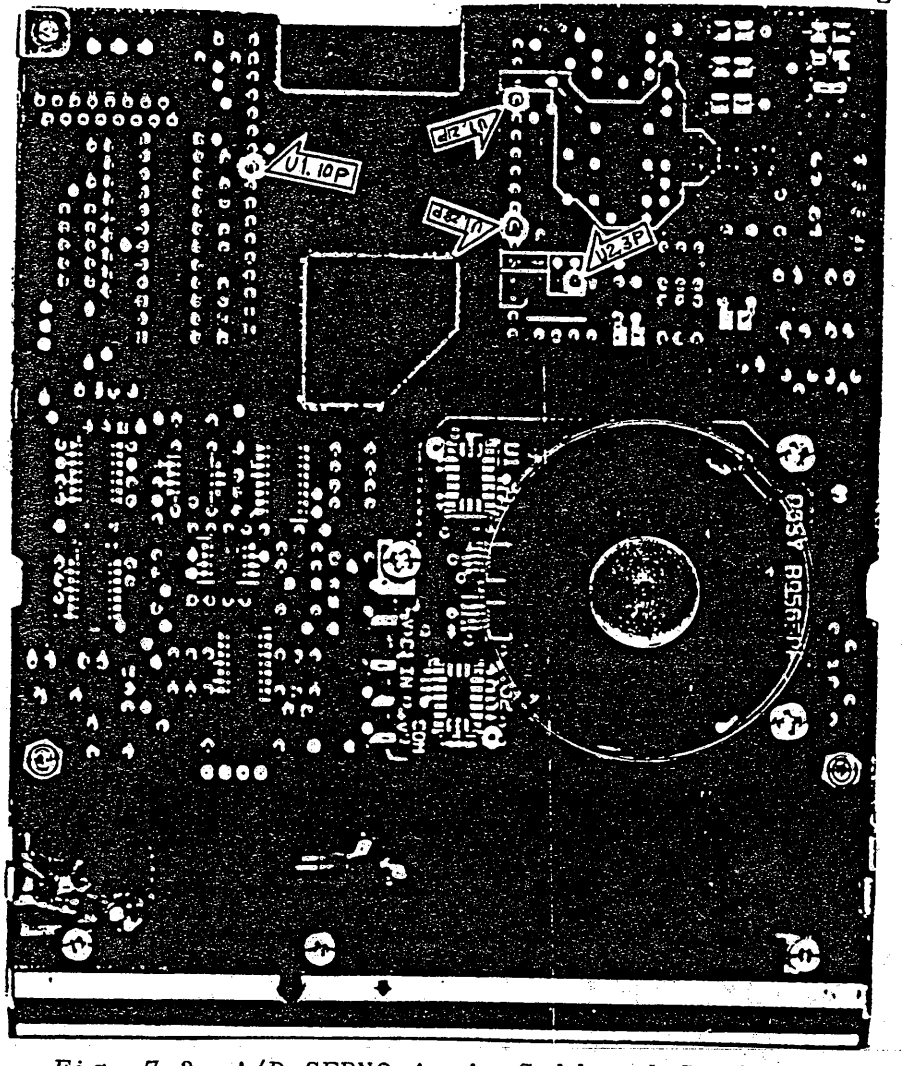


Fig. 7.2 A/D SERVO Ass'y Soldered Surface

(2) [1] key Span 0% adjustment

[2] key Span 100% adjustment

① Press Servo zero key on the keyboard ([1] KEY)

② Press the [FEED] key, then adjust R71 on the Servo Ass'y so that the recorded result becomes 0 ± 0.3mm.

→ (Note 1)

③ Press Servo span key on the keyboard. ([2] KEY)

④ Press the [FEED] key, then adjust R72 on the Servo Ass'y so that the recorded result becomes 0 ± 0.3mm.

→ (Note 1)

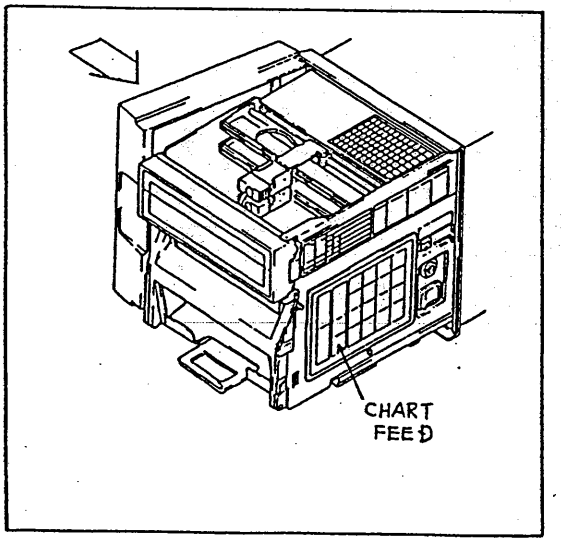
⑤ Zero and span interfere mutually, so repeat the procedures in ① to ④ until 0mm and 100mm are achieved.

⑥ Carry out ① to ⑤ for all CHs.

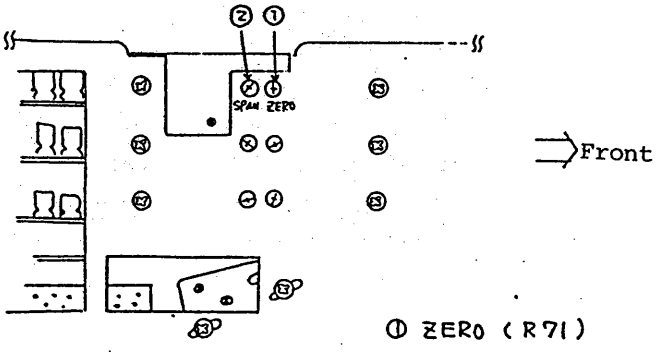
Note 1: PEN operation differs with the ROM version used. (The 4152 and 4153)

- For VER.3, 4 and 5 of auxiliary codes 1 to 6, and VER 0 and 1 of auxiliary codes 7 and 8, pens 1, 2 and (3) are operated simultaneously by the [1] and [2] keys.
- For VER 6 and 7 of auxiliary codes 1 to 6, and VER 2 and 3 of auxiliary codes 7 and 8, pens 1, 2 and (3) are operate independently by pressing the [1] and [2] keys cyclically.
- For VER 8 on and after auxiliary codes 1 to 6 and VER 4 on and after auxiliary code 7 and 8, pens 1 and 2 (3) operate independently by pressing the [1] or [2] key and then by presing the [8] key cyclically.

→ Refer to P.87 for the auxiliary codes.



When viewed from the ⇖ direction

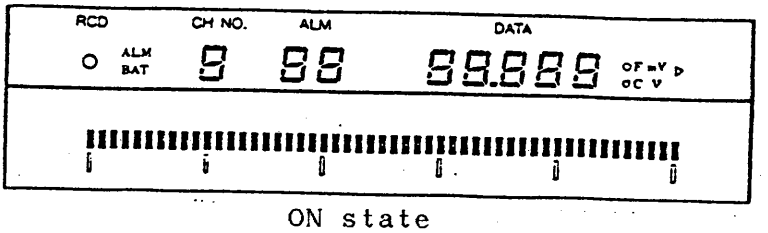


① ZERO (R71)

② SPAN (R72)

(3) [3] key Display ON test

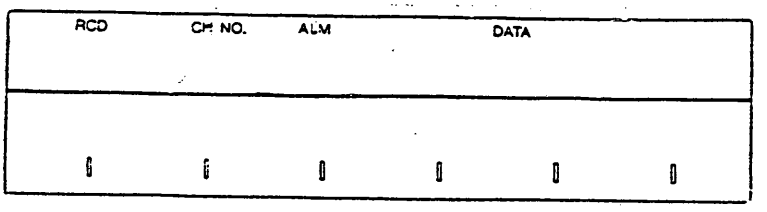
All LCD display segments light up.



ON state

(4) [4] key Display OFF test

All LCD display segments are extinguished.



OFF state

(5) [5] key RTC (Real Time Clock) test

Two crystal oscillators for the CPU and time clocks are used. (Within the CPU Board Ass'y)

This test shows time clock error on the display unit

KEY PUSH Displays " 1 SEC "

↓ After about 12 sec.

"Good" When error is within 30 ppm.

"00070" Error is displayed.

(Example of 70 ppm)

" Err " When error is more than 2500 ppm.

Note:1. This test is repeated until power is turned ON or OFF. When this test is executed, no other test items can be slected.

2. A display other than "Good" means a large error.
→ CPU board Ass'y replacement

(6) [6] key Range AUTO setting

The contents of Table 7.1 are automatically set by pressing the [6] KEY.

→ Test conducted in continuous operation test.

When measured using the contents set, follow the procedure below.

① Press the test mode set key [6].

② Check that the "St rAnGE" display has disappeared.

③ Power OFF → DIP SW. 3 bit OFF → Power ON

(turned to the normal mode)

④ Measurement

Check before hand that the DIP SW. setting is correct (frequency input type, etc.)

Table 7.1

		mV TC	RTD
DATE. TIME		'84 12 31 23:50	
SET CODE		A	A
RANGE CODE		00	20
SPAN		0 ~ 20 mV	0 ~ 200 °C
ALARM	1CH 1L	18 mV	150 °C
	1CH 2L	16 mV	100 °C
	1CH 3H	2 mV	15 °C
	1CH 4H	1 mV	5 °C
CHART SPEED		200 mm/h	
TAG.		TEST	

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

This test is conducted when an alarm (AK-04) is added as an option. Output contact is turned ON and OFF at the timings shown in Fig. 7.3.

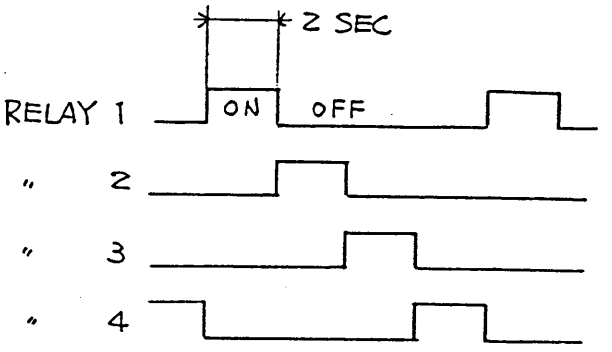


Fig. 7.3

(8) [8] key Operation pen select key for adjustment of 0% and 100% spans

When shifting the pen to the 0% or 100% side, press the [1] or [2] KEY, then press the [8] KEY cyclically to operate 1, 2 and 3 pens independently.

Operation (8) may or may not be performed: It depends on the ROM version used. Refer to page 70 (note 1).

(MEMO)

8. Reference Data

Contents

8.1 Specifications

Input section

Recorder type: 1-,2-, and 3-pen and 6-point printing

Input signal : DC potential difference input ----- 5mV span to 50V Max.

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

Measurement range

Input type	Range code	Measuring Range	Remarks
DC voltage	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	
Thermocouple (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	
	14	Type E -200.0 to 800.0°C	
	15	Type J -200.0 to 1100°C	

Input type	Range code	Measuring Range	Remarks
	16	Type T -200.0 to 400.0°C	
	17	Type N 0 to 1300°C	
	18	Type W 0 to 2315°C	
RTD (JIS)	20	Pt 100Ω -200.0 to 550.0°C	
	30	-20.00 to 20.00mV	
DC	31	-200.0 to 200.0mV	
voltage	32	-2.000 to 2.000V	
(Linear	33	-6.000 to 6.000V	
scaling)	34	-20.00 to 20.00V	
	35	-50.00 to 50.00V	

Max. input voltage : For measuring range of 2V DC or less
... 10V DC (continuous)
For measuring range of 6 to 50V DC
... 100V DC (continuous)

Measuring accuracy: ±(0.1% reading + 2 digit) at reference range (2V)

Recording accuracy: ±0.5% of span at reference range (2V)

Recording section

Recording method : For pen writing ... Disposable felt pen
For printing ..... 6-color wire dot

Effective recording width: 100mm

Step response time (90% step): 1 sec.* (for pen writing) or less

* When measured in accordance with IEC TC65.

Measurement intervals: 125mS .....1-,2-, and 3-pen

5 sec/6 points ... 6-point printing

Recording interval: 30 sec/6 points

Chart: Scan-fold strip ..... Total length:16m

Chart feed speed: For pen writing ..... 5 to 12.000mm/h

For dot printing .... 5 to 1,500mm/h

(1mm STEP optional)

Speed setting: Set from the keyboard

Recording color: For pen writing: 1st pen (red)

2nd pen (green)

3rd pen (blue)

For printing: No.1 (purple), No.2 (red),

No.3 (green), No.4 (blue),

No.5 (brown) and

No.6 (black)

Display unit

Display method: LCD color display

Digital display: Measured value (DC voltage ...3 1/2 digits,

Temperature ... 1 digit below decimal

point), Alarm (H or L) Year/month/day/time and Chart feed speed

Bar graph display: Measured value, Alarm set value and Flashing display during alarm (Resolution: 2%)

Printer (Plotter is provided for pen writing)

Fixed-time print-out: Day/hour, Tag No., Unit, Scale characters (0% and 100% sides) and Chart feed speed

List print-out: Day/hour, Input range, Tag No., Unit, Alarm and Chart feed speed

Alarm print-out: CH No., H/L and ON/OFF time and marking

Performance/Characteristics

Dead band: Less than 0.2% of span

Input resistance: 10MΩ or more (No voltage divider provided)
1MΩ (Voltage divider provided, 6V, 20V, 50V, range.)

Input external resistance: DC voltage/thermocouple input
...2KΩ or less
RTD input ... 10Ω /lead (Pt 100Ω) or less (Each lead resistance should balance for 3- wire system)

Insulation resistance: Between terminals and grounding ... 20MΩ or more at 500V DC

Dielectric strength:
- Between mutual inputs ... 1 minute at 500V AC. (except RTD bulb input)
- Between power terminals and grounding 1 minute at 1.500V AC.
- Between input terminal and grounding ··· 1 minute at 500V AC.

Construction

Mounting: Panel flush mounting (Horizontal panel)
However, it is possible to mount the recorder by slanting it backward down to 30°.

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

Weight: 1-pen ... Approx. 4kg, 2-pen ... Approx. 4.8kg, 3-pen ... Approx. 5kg, 6-point printing ... Approx. 4.2kg

Dimensions: 1-pen and 6-point printing ... 144 x 144 x 230mm
2-pen and 3-pen ... 144 x 144 x 290mm

Finishing : Case ... Black
Front door frame ... Black

Power supply unit

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

Power frequency: 50 or 60Hz (Designated)

Power consumption: 1-pen ... Approx. 20VA
2-pen ... Approx. 23VA
3-pen ... Approx. 26VA
6-point printing ... Approx, 20VA

Normal operating condition

Ambient temperature: 5 to 40°C

Ambient humidity: 45 to 85% RH

External noise: Normal mode noise...

- DC voltage: 1.2 times of the range or less
- TC: 1.4 times of measuring mV or less
- RTD: 50mV or less

Common-mode noise ...
100V AC or less, 50 and 60Hz

Magnetic field: 400AT/m or less

Effect of operating condition

Effect of ambient temperature:

With respect to temperature change of 10°C,

Indication variation; ±(0.1% reading +1 digit)

Recording variation; less than ±0.3 % of span (except TC input cold junction compensation).

Effect of external noise: Normal mode noise (50,60Hz±0.1Hz) ... 40dB

Common mode noise (50 or 60Hz ±0.1Hz) ... 120dB

Effect of power variation:

With respect to voltage of ±10%,

Indication variation; ±(0.1% reading + 1 digit)

Recording variation; less than ±0.2% of span

Indication variation with respect to frequency of ±2Hz; less than ±0.1% of span

Effect of external magnetic field:

By external AC and DC magnetic field of 400 AT/m,

Indication variation; ±(0.1% reading + 10 digits)

Recording variation; less than ±1% of span

Effect of external resistance:

Indication variation with respect to external resistance change of 2KΩ ; less than ±10μ V
However, when burnout circuit is provided; 100μV or less.

Variation with respect to RTD input of 10Ω ; Resistance of each lead should be equal ±(0.1% reading + 1 digit)

Effect of mounting position:

Indication variation with respect to backward slanting mounting within 30° from normal position; less than ±0.1% of span

Alarm

Setting method: Setting from keyboard

No. of setting points: Up to 4/channel (high/low limits, any position)

Output: 4 Common outputs (relay output is optional)

Display: LDC (Bar graph and "ALM")

Hysteresis band: Approx. 0.5% of recording span

Standard functions list

Function	Details
Any range setting	Any range is settable for each channel
Printing skip function	For 6-point printing recorder, any measured-point recording is skipped.
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., of each channel.
Fixed time print-out function	Prints out date, Tag No., unit characters on scale (0% side, 100% side) and chart feed speed.
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.

Function	Details
Temperature difference (△T) recording	For the same range, records the temperature difference between reference channel and each channel. (Any reference channel can be set.)
Scaling function	Any scaling of voltage from 5mV span up to 50V. (Scaling value: Within 30000 span in the range of -19999 to 20000.)
Memory back-up function	Data setting and clock functions are built in the recorder and is protected by 3 cells (Type UXX). (Battery life: 3 months)

Additional specifications

(Codes in ( ) show additional specifications)

1. Thermocouple input burnout: When input is disconnected, indication is overscaled beyond 100% or downscale below 0%.
   - Burnout upscale (/BU): Common to all points
   - Burnout downscale (/BD): Common to all points
2. With common alarm 4-output relay (/AK-04)
   - No. of points: Common 4-output (built in the recorder)
   - Relay contact capacity: 100V AC, 0.1A or 24V DC 1A (resistive load)
3. Chart start/stop changing chart speed (/REM)
   - When remote signal (contact signal) is received, chart feed speed changes automatically.
4. Phase synchronization (/PS)

   Additional specification for pen writing

   . Function to eliminate the deviation (phase difference) of times existing between the 2nd and 3rd pens.

   Pens other than the reference pen does not record input until the time corresponding to the phase difference passes.

8.2 Model & Codes

1PEN 4151-□00/--------/XXX-XX

Auxiliary code | Additional specification | Specified item

2PEN 4152-□□0/-------/XXX-XX

3PEN 4153-□□□/-------/XXX-XX

□ 3-pen input
□ 2-pen input
□ 1-pen input

(1) Auxiliary code

Code	Details	
1	mVTC JIS ANSI °C	For domestic use
2	RTD JIS °C	
3	mVTC ANSI °C	For U.K
4	RTD DIN °C	
5	mVTC ANSI °F	For U.S.A
6	RTD DIN °F	
7	mVTC DIN °C	For E.C
8	RTD DIN °C	

(2) Additional specifications

/BU: Burnout up scale (TC only)

/BD: Burnout down scale (TC only)

/AK-04: Built-in alarm

/REM: Remote control (Recording start/stop, change chart speed)

/PS: Phase synchronization

/PBL: Portable type (With handles & rubber legs)

(3) Specified items

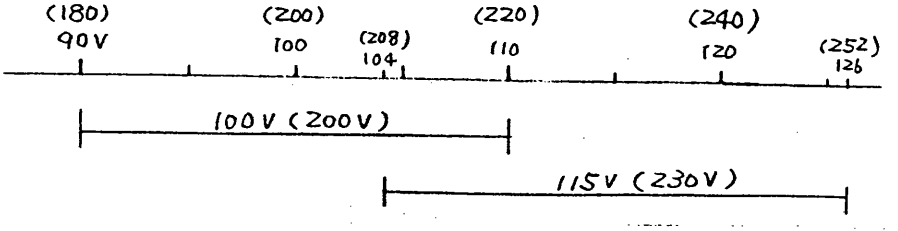
• Power voltage and frequency:

100, 115, 200, and 230V/50 and 60Hz

There are two kinds of transformers, for 100V and 200V.

⟶ Change from 100 to 115V and vice versa, and from 200 to 230V and vice versa is made by changing internal wiring.

The applicable power voltage range is shown below.



- Power voltage usable range -

(Note) Auxiliary code to be combined

(1) 1 and 2

(2) 3 and 4

(3) 5 and 6

(4) 7 and 8

8.3 Reference Value of Part Replacement Intervals

Table 8.1 and 8.2 show the reference values of the parts replacement intervals. However, as the values may differ widely with μR100 setting conditions and operating environment, the values should be determined with flexibility.

(Note: The reference values are basically under the condition of power-ON 24 hours)

Table 8.1

Part Name	Part Number	Lifetime reference value	Remarks
LCD Ass'y	B9565LA/LC	5 years	
Cold cathode discharge tube	B9565LD	5 years	
Motor Ass'y	B9565PA	5 years	For servo Ass'y
Motor Ass'y	B9565JH	5 years	For chart drive
Motor Ass'y	B9565JH	5 years	For plotter (X-axis, Y-axis)
String Ass'y	B9565TR	5 years	For plotter (X-axis, Y-axis)
Solenoid	B9565SD	5 years	For pen up/down
Fuse	A9049KF(100V) A9078KF(200V)	2 years	
Key board	B9565GP	10 years	

Table 8.2

▶ Consumables ◀

Disposal felt-pen	B9565AP/AQ/AR (note 1)	1 month / pcs.	1200m/ pcs
Pen for plotter	B9565AS (note 2)	2 to 3 weeks / pcs.	200m/ pcs (20000 characters, continuous)

(note 1) B9565AP (Red; 1 set 3 pcs.)

B9565AQ (Green; 1 set 3 pcs.)

B9565AR (Blue; 1 set 3 pcs.)

(note 2) B9565AS (Purple; 1 set 3 pcs.)

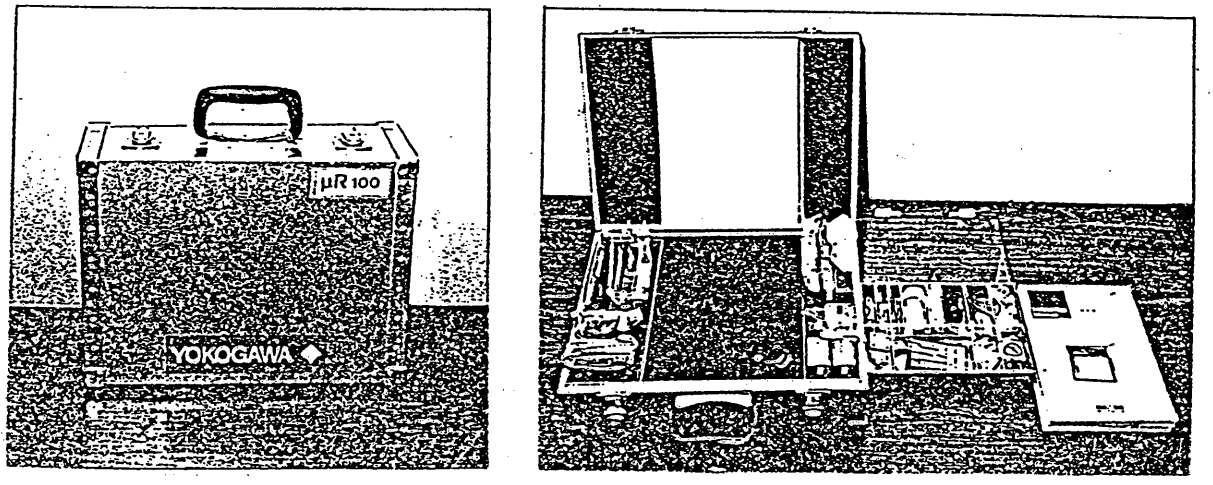
8.4 Service Kit

1) Outline

This service trunk includes various calibration tools excluding standard calibrators for recorder field service to make repair work effective, when any trouble occurs in μR100 series recorders. (Models 4151, 2 and 3 for pen and Model 4156 for printing).

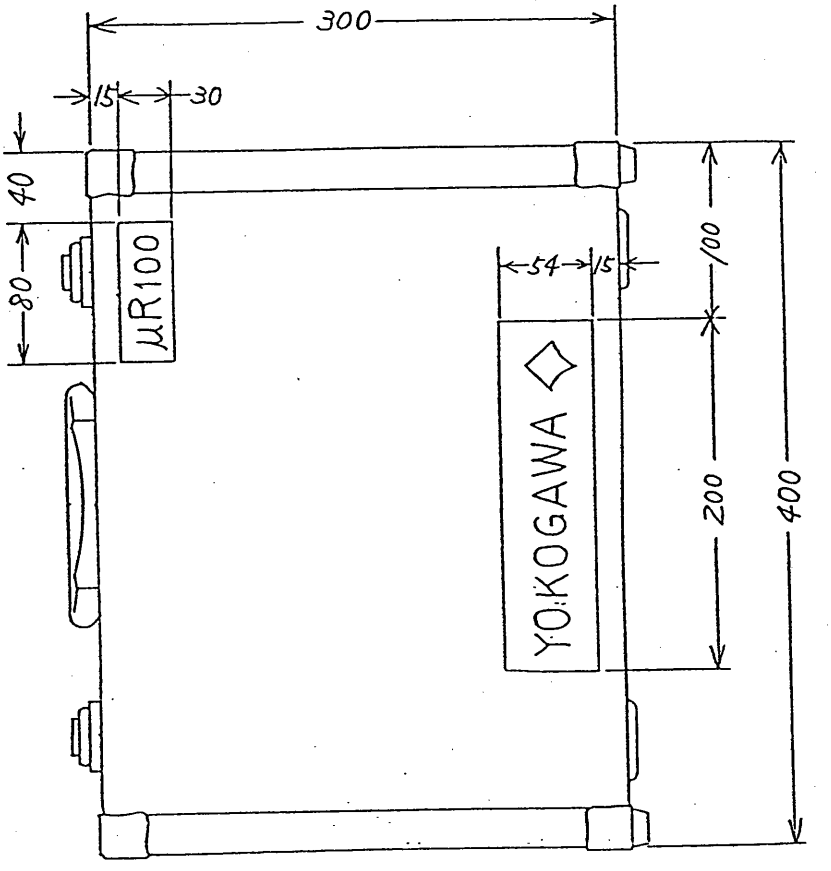
2) Construction Specifications

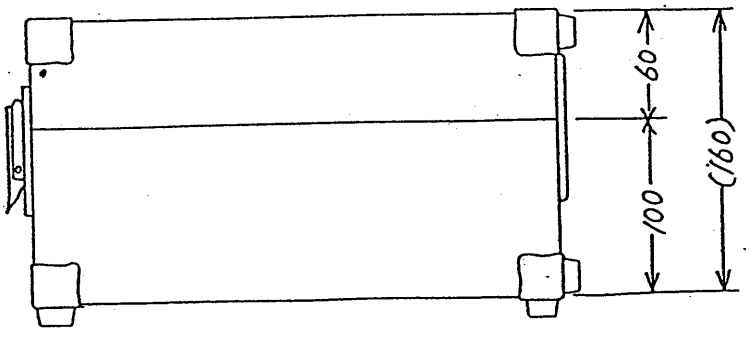
- Name ..... Service Kit μR100
- Model No. DH03
- Construction ... A service kit trunk includes the following:
  (1) Assemblies, parts and consumables for replacement (1 set)
  (2) Special tools and jigs for adjustment (1 set)
  (3) Service document (1 set)
  (4) Card case for SR and field service kit against static electricity (1 set)
- Dimensions .... Refer to the attached sheet.



Full view of Service Kit μR100

3) Service kit dimentional diagram





(Aluminum trank)

9. Parts List

Assemblies and parts whose parts Nos. are described in the parts list can be supplied.
When it is necessary to repair assemblies and parts whose parts Nos. are not described in it, the recorder is repaired at our service shop.

Contents Page

9.1 Corresponding Table between "Electric Circuit Ass'y Configuration" and "Parts list and exploded drawing"

(1) Model 4151 (1-pen type)

(Refer to P.)

Electric circuit Ass'y configuration		PARTS LIST & exploded drawing	
Name	Part No.	Title	Page
DISPLAY Ass'y	B9565LA	Chart Cassette and Display Assemblies	104
KEY BOARD	B9565GP		"
BEZEL	B9565GM		"
TRANSFORMER (100VAC)	B9565GY	Chassis Assemblies Model 4151	105
Ditto (200VAC)	B9565GZ		"
KEY SWITCH	B9544ZA		"
MOTOR Ass'y (For chart feed)	B9565JH		"
BATTERY Ass'y (only case)	B9565HK		"
FUSE (100VAC)	A9049KF		"
Ditto (200VAC)	A9078KF		"
BATTERY	A9024ED		"
PLOTTER Ass'y	B9565SR	Plotter Assembly	107
MOTOR Ass'y (X-AXIS)	B9565JH		"
MOTOR Ass'y (Y-AXIS)	B9565JH		"
PLOTTER BOARD Ass'y	B9565SK		"
WIRE (PLOTTER B. ↔ CPU)	B9565XS (For 4151)		"
SOLENOID Ass'y	B9565SH		"
STRING Ass'y	B9565TR		"
A/D SERVO Ass'y (mV.TC input)	B9565MA	Servo.CPU Board and Inverter Assemblies Model 4151	108
" (mV.TC input)	B9565MB		"
CPU BOARD Assy (For 4151)	B9565LK		"
WIRE (A/D SERVO ↔ CPU)	B9565XR		"
INV. Ass'y	B9565SA		"
ROM1, ROM2	Refer to P. 22.		"

(Refer to P.)

Electric circuit Ass'y configuration		PARTS LIST & exploded drawing	
Name	Part No.	Title	Page
RJC BOARD (For mV.TC input)	B9565ER	Terminal Assembly	112
AK-04 (OPTION)	B9567FA		"
REM (OPTION)	B9567FB		"
AK-04/REM (OPTION)	B9567FC		"

(All Ass'y described in "electric circuit ass'y configuration" on page 7 are included in this table.)

(2) Model 4152 and 3 (2- and 3-pen type)

(Refer to P.)

Electric circuit Ass'y configuration		PARTS LIST & exploded drawing	
Name	Part No.	Title	Page
DISPLAY Ass'y	B9565LC	Chart Cassette and Display Assemblies	104
KEYBOARD	B9565GP		"
BEZEL	B9565GM		"
TRANSFORMER (100VAC)	B9565WP (For 4152,3)	Chassis Assembly Model 4152 and 4153	106
TRANSFORMER (200VAC)	B9565WQ (For 4152,3)		"
KEY SWITCH	B9544ZA		"
MOTOR Ass'y (For chart feed)	B9565JH		"
BATTERY Ass'y (only case)	B9565HK		"
FUSE (100VAC)	A9049KF		"
Ditto (200VAC)	A9078KF		"
BATTERY	A9024ED		"
PLOTTER Ass'y	B9565SR	Plotter Assembly	107
MOTOR Ass'y (X-AXIS)	B9565JH		"
MOTOR Ass'y (Y-AXIS)	B9565JH		"
PLOTTER BOARD Ass'y	B9565SK		"
SOLENOID Ass'y	B9565SH		"
STRING Ass'y	B9565TR		"
A/D SERVO Ass'y (mV.TC input)	B9565MA	Servo and CPU Board Assemblies	110
Ditto (RTD input)	B9565MB		"
ROM1, ROM2	Refer to P.22		"

(Refer to P.)

Electric circuit Ass'y configuration		PARTS LIST & exploded drawing	
Name	Part No.	Title	Page
CPU BOARD Assy (For 4152.3)	B9565xA (STD)	Servo and CPU Board Assemblies	110
Ditto	B9565xB (For phase synchoronization)		"
WIRE (PLOTTER B. ↔ CPU)	B9565XW (For 4152.3)		"
PLATE	B9565WW		"
WIRE (A/D SERVO ↔ CPU)	B9565XR (1PEN)		"
WIRE (A/D SERVO ↔ CPU)	B9565XS (2PEN)		"
WIRE (A/D SERVO ↔ CPU)	B9565XT (3PEN)		"
SWICH (For phase synchronization)	4070SM		"
RJC BOARD (For mV/TC input)	B9565ER	Terminal Assembly	112
AK-04 (OPTION)	B9567FA		"
REM (OPTION)	B9567FB		"
AK-04/REM (OPTION)	B9567FC		"

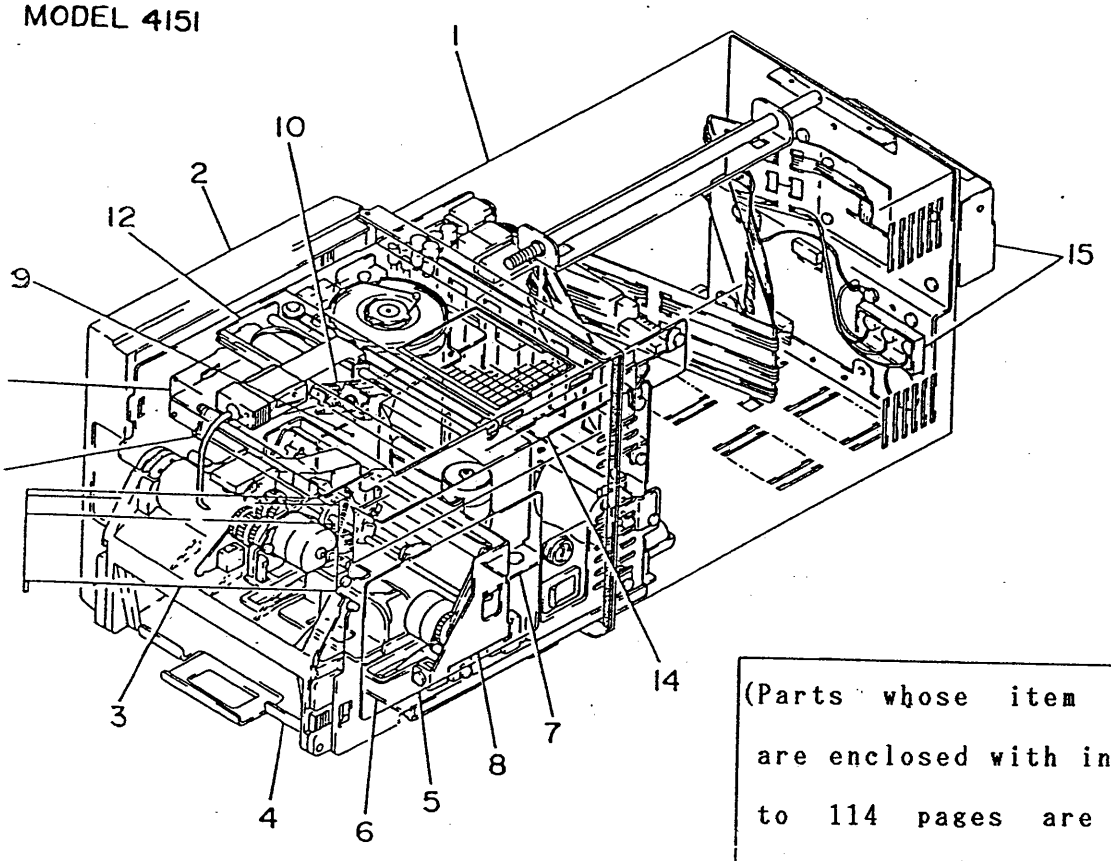
(All ass'y described in "electric circuit ass'y configuration" on page 8 are included in this table.)

Model 4151 1-PEN MODEL
Model 4152 2-PEN MODEL
Model 4153 3-PEN MODEL
100 mm MICRO RECORDERS

Complete Set

9.2 Parts List & Exploded Drawings

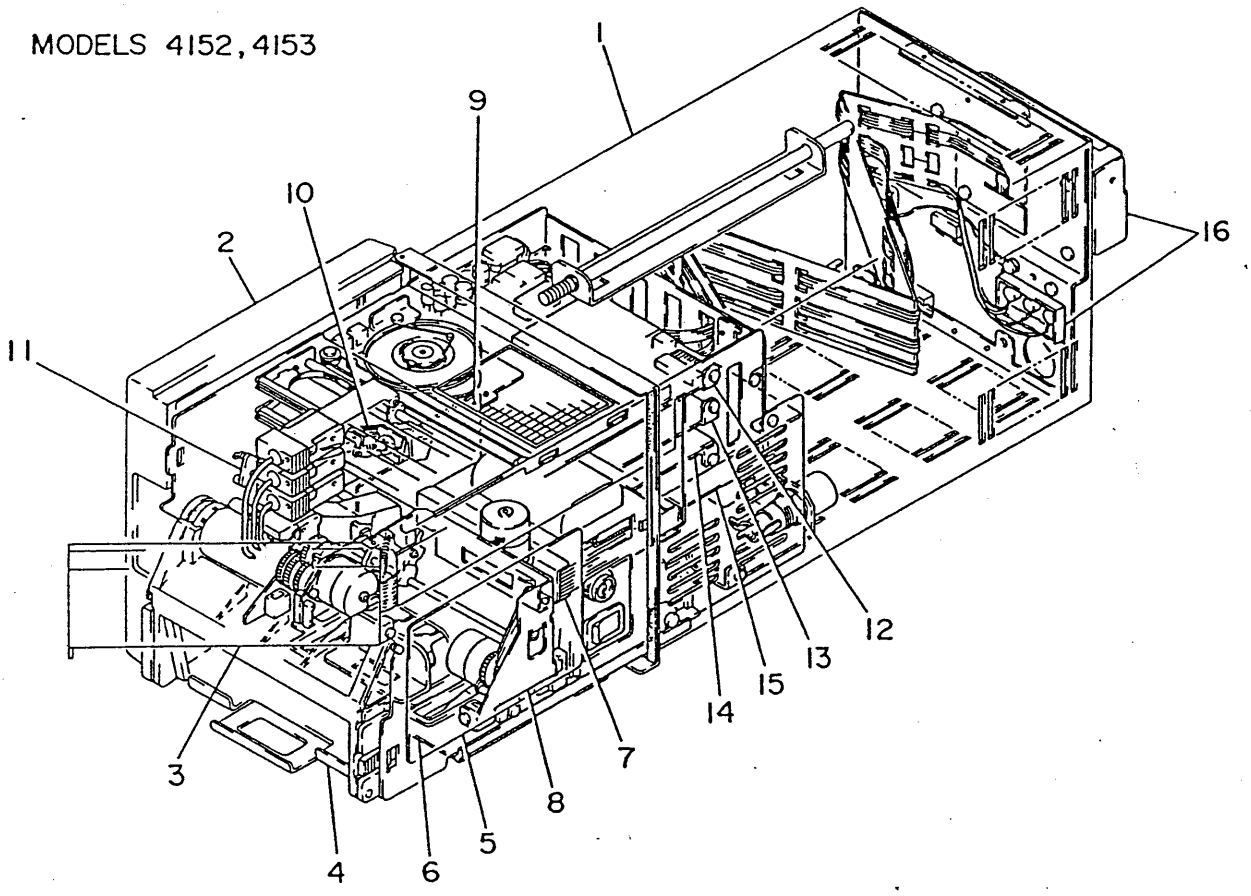
MODEL 4151



(Parts whose item Nos. are enclosed with in 102 to 114 pages are contained in the service kit.)

Item	Description	
1	Case Assembly	(see page 102)
2	Door Assembly	
3	Display Assembly	(see page 104)
4	Chart Cassette Assembly	
5	Keyboard Assembly	
6	Chassis Assembly	(see page 105)
7	Transformer Assembly	
8	Plotter Assembly	(see page 107)
9	Plotter Board Assembly	
10	Solenoid Assembly	
11	Lever	
12	Servo Assembly	(see page 108)
13	Cover	
14	CPU Board Assembly	
15	Terminal Assembly (see page 112)	
–	Portable Type (see page 103)	
–	Standard Accessory (see page 114)	

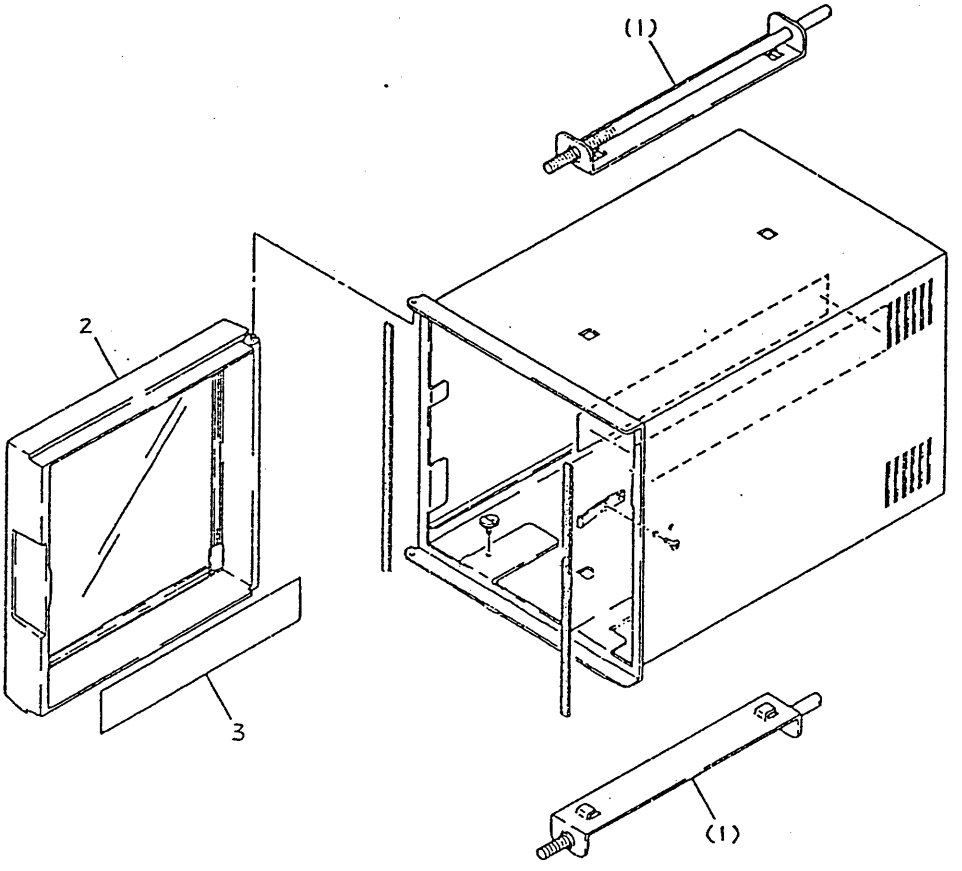
Complete Set



Item	Description	
1	Case Assembly	(see page 3)
2	Door Assembly	
3	Display Assembly	(see page 104)
4	Chart Cassette Assembly	
5	Keyboard Assembly	
6	Chassis Assembly	(see page 106)
7	Transformer Assembly	
8	Plotter Assembly	(see page 107)
9	Plotter Board Assembly	
10	Solenoid Assembly	
11	Lever	
12	Servo Assembly (for 1st pen)	(see page 110)
13	Servo Assembly (for 2nd pen)	
14	Servo Assembly (for 3rd pen)	
15	Main PCB Assembly	
16	Terminal Assembly (see page 112)	
–	Portable Type (see page 103)	
–	Standard Accessory (see page 114)	

(1) Case and Door Assemblies

Model 4151

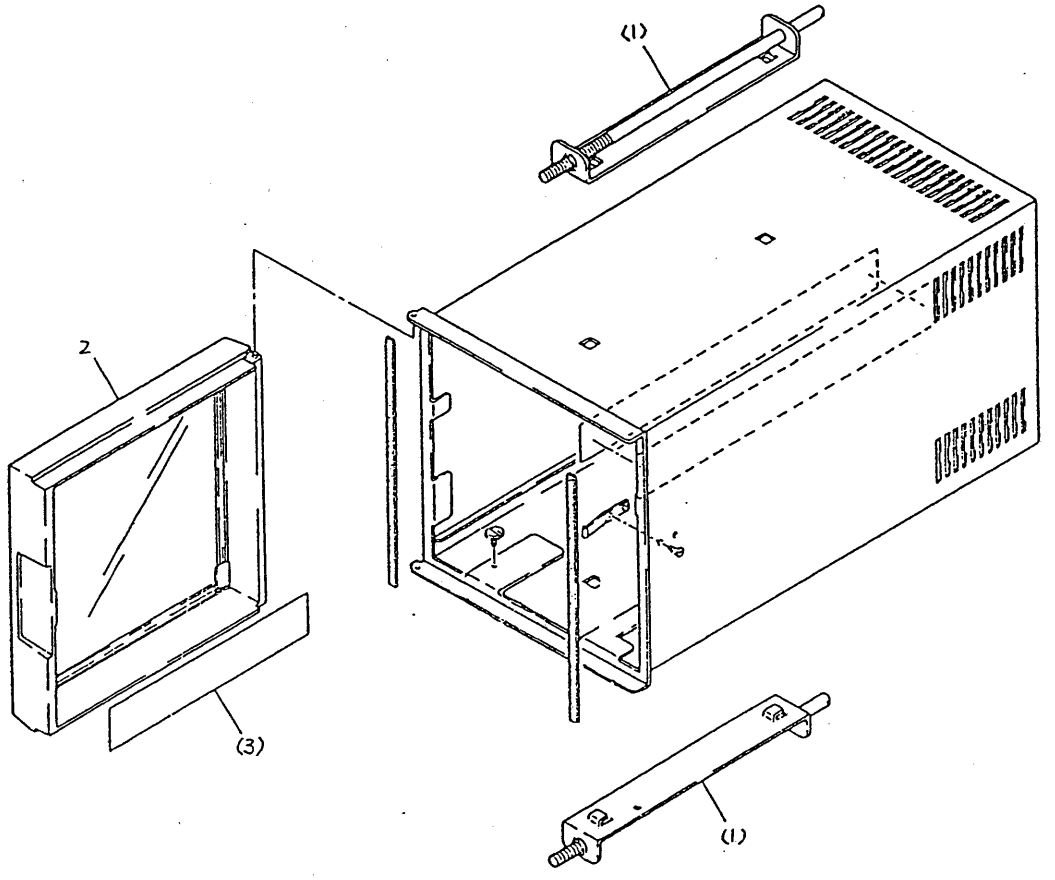


	Item	Part No.	Qty	Description
	1	B9565CR	2	Bracket Assembly (accessory)
⚠1 B9567AF	2	~~B9565DA~~	1	Door Assembly
	3	B9565BW	1	Nameplate

1 : Jun.16,'89.

(2) Case and Door Assemblies

Models 4152 and 4153



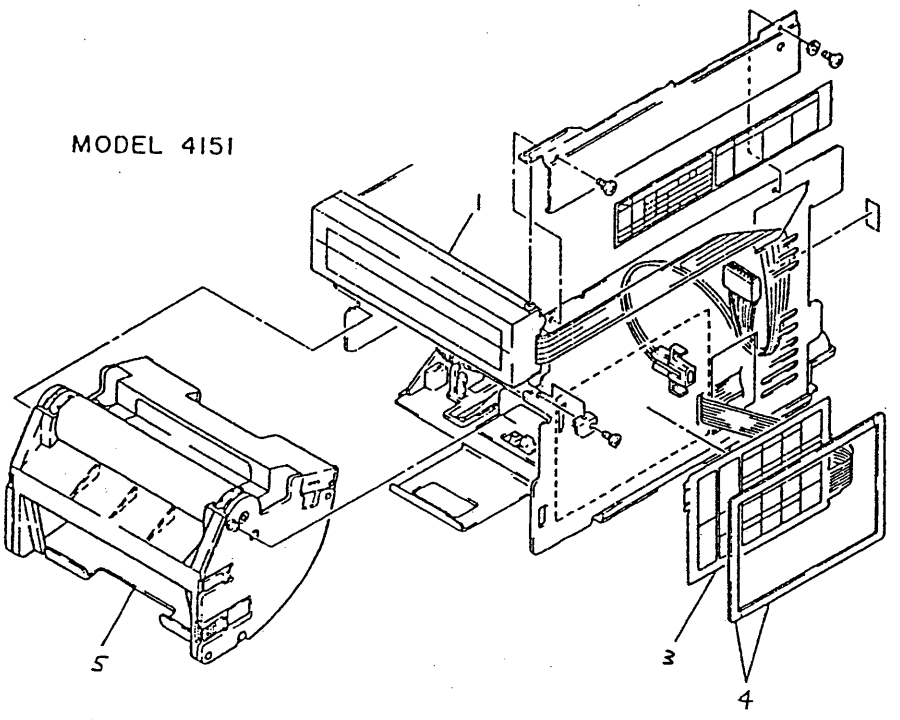
⚠1 B9567AF

Item	Part No.	Qty	Description
1	B9565CR	2	Bracket Assembly (accessory)
2	~~B9565DA~~	1	Door Assembly
3	B9565BX	1	Nameplate (for Model 4152)
	B9565BY	1	Nameplate (for Model 4153)

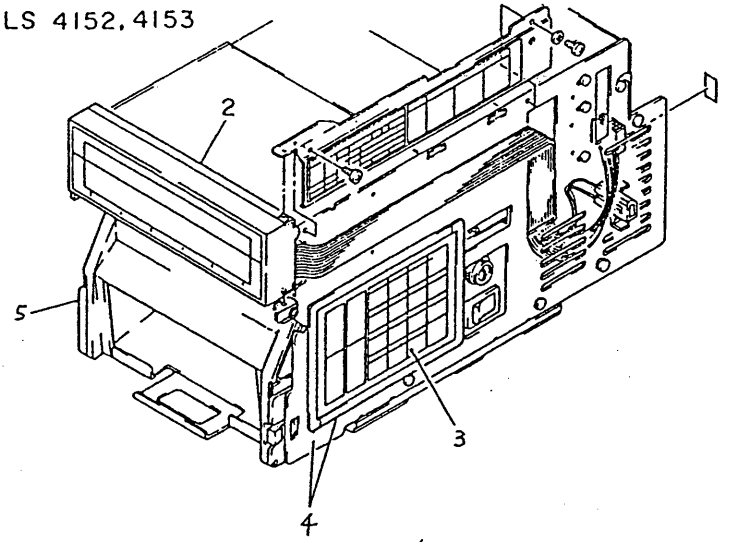
1 :Jun.16,'89.

(3) Chart Cassette and Display Assemblies

MODEL 4151



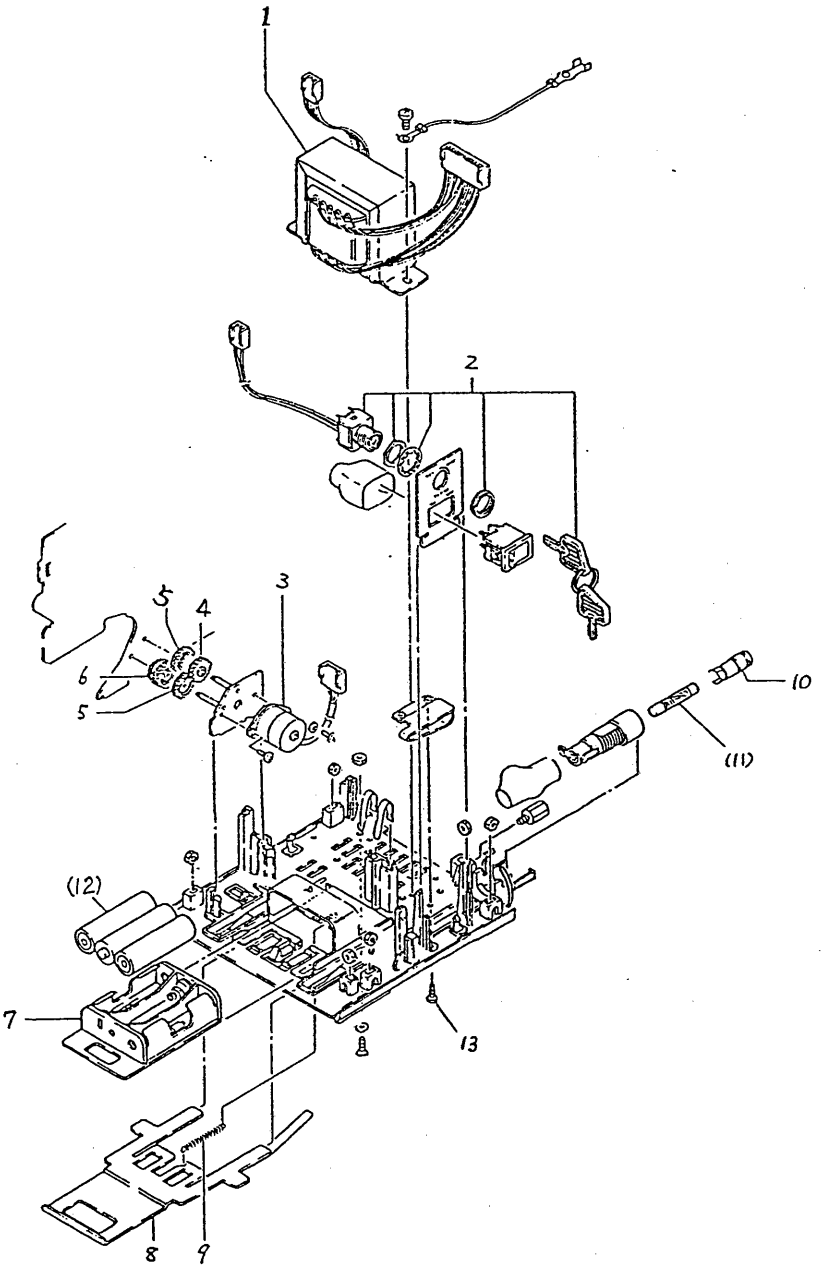
MODELS 4152, 4153



Item	Part No.	Qty	Description
①	B9565LA	1	Display Assembly (for Model 4151)
②	B9565LC	1	Display Assembly (for Models 4152 and 4153)
③	B9565GP	1	Keyboard
④	B9565GM	2	Bezel
5	B9565KA	1	Chart Cassette Assembly

(4) Chassis Assembly

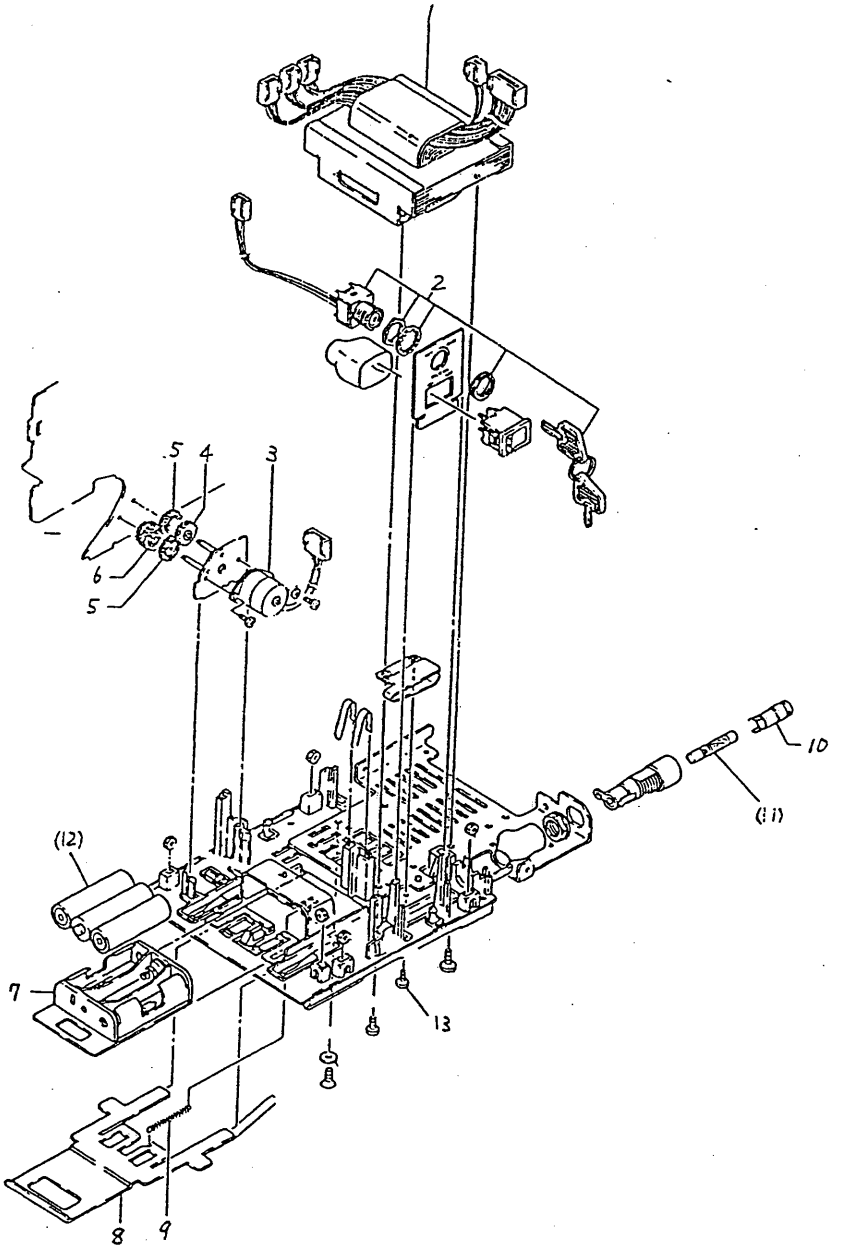
Model 4151



Item	Part No.	Qty	Description
1	B9565GY	1	Transformer (100 V AC, series)
	B9565GZ	1	Transformer (200 V AC, series)
2	B9544ZA	1	Key Switch
(3)	B9565JH	1	Motor Assembly
4	B9565JD	1	Gear
5	B9565JC	2	Gear
6	B9565JB	1	Gear
7	B9565HK	1	Battery Assembly
8	B9565HW	1	Bracket Assembly
9	A9023KN	1	Spring
10	A9073KF	1	Fuse Carrier
(11)	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) }
12	A9024ED	3	Battery (accessory)
(13)	B9565AY	2	Screw

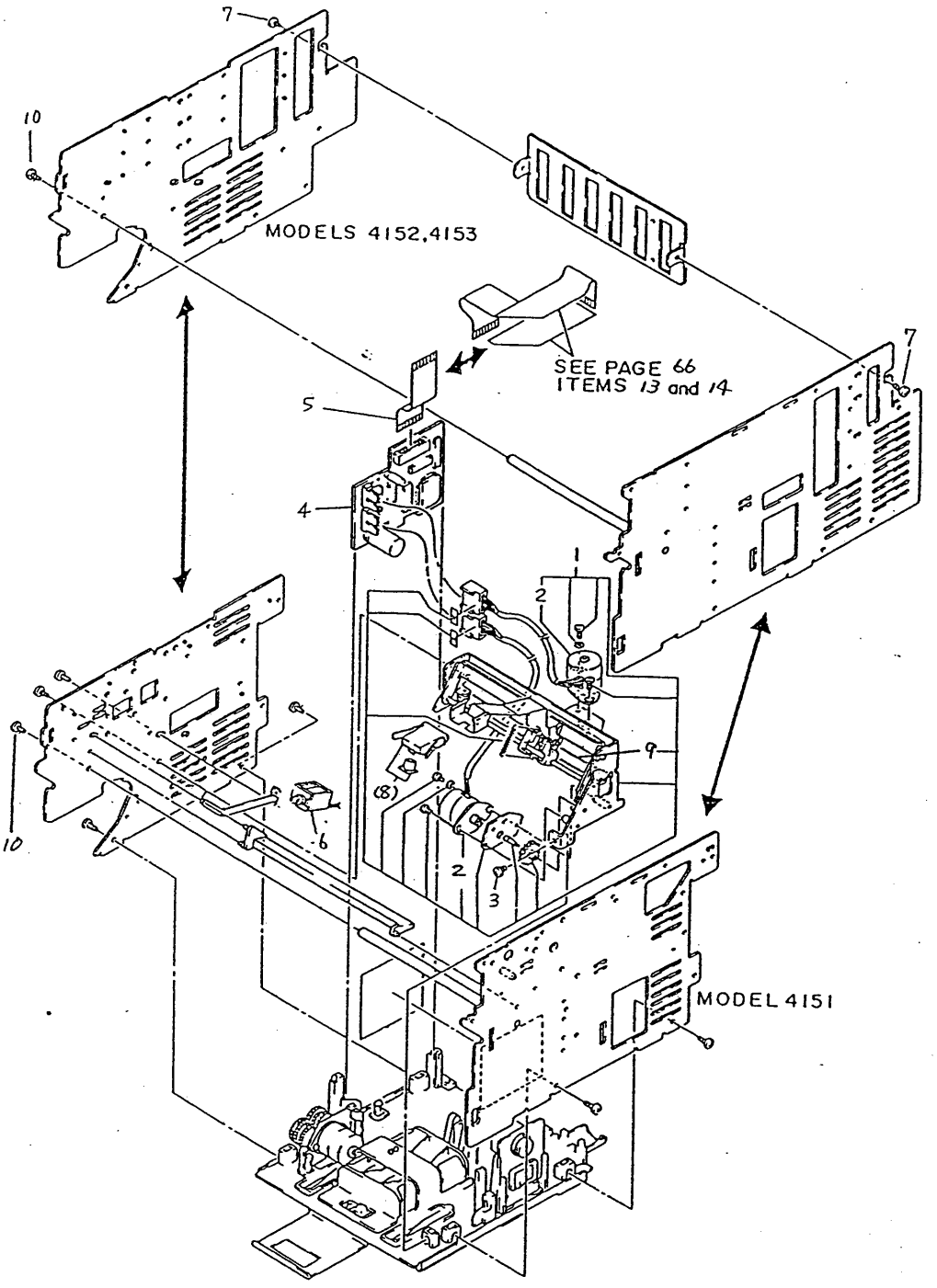
(5) Chassis Assembly

Model 4152 and 4153



Item	Part No.	Qty	Description
1	B9565WP	1	Transformer (100 V AC series)
	B9565WQ	1	Transformer (200 V AC series)
2	B9544ZA	1	Key Switch
③	B9565JH	1	Motor Assembly
4	B9565JD	1	Gear
5	B9565JC	2	Gear
6	B9565JB	1	Gear
7	B9565HK	1	Battery Assembly
8	B9565HW	1	Bracket Assembly
9	A9023KN	1	Spring
10	A9073KF	1	Fuse Carrier
⑪	A9049KF	1	Fuse (100 V AC series, 0.5 A time lag) } select (accessory)
	A9078KF	1	Fuse (200 V AC series, 0.315 A time lag) } select (accessory)
12	A9024ED	3	Battery (accessory)
⑬	B9565AY	2	Screw

(6) Plotter Assembly

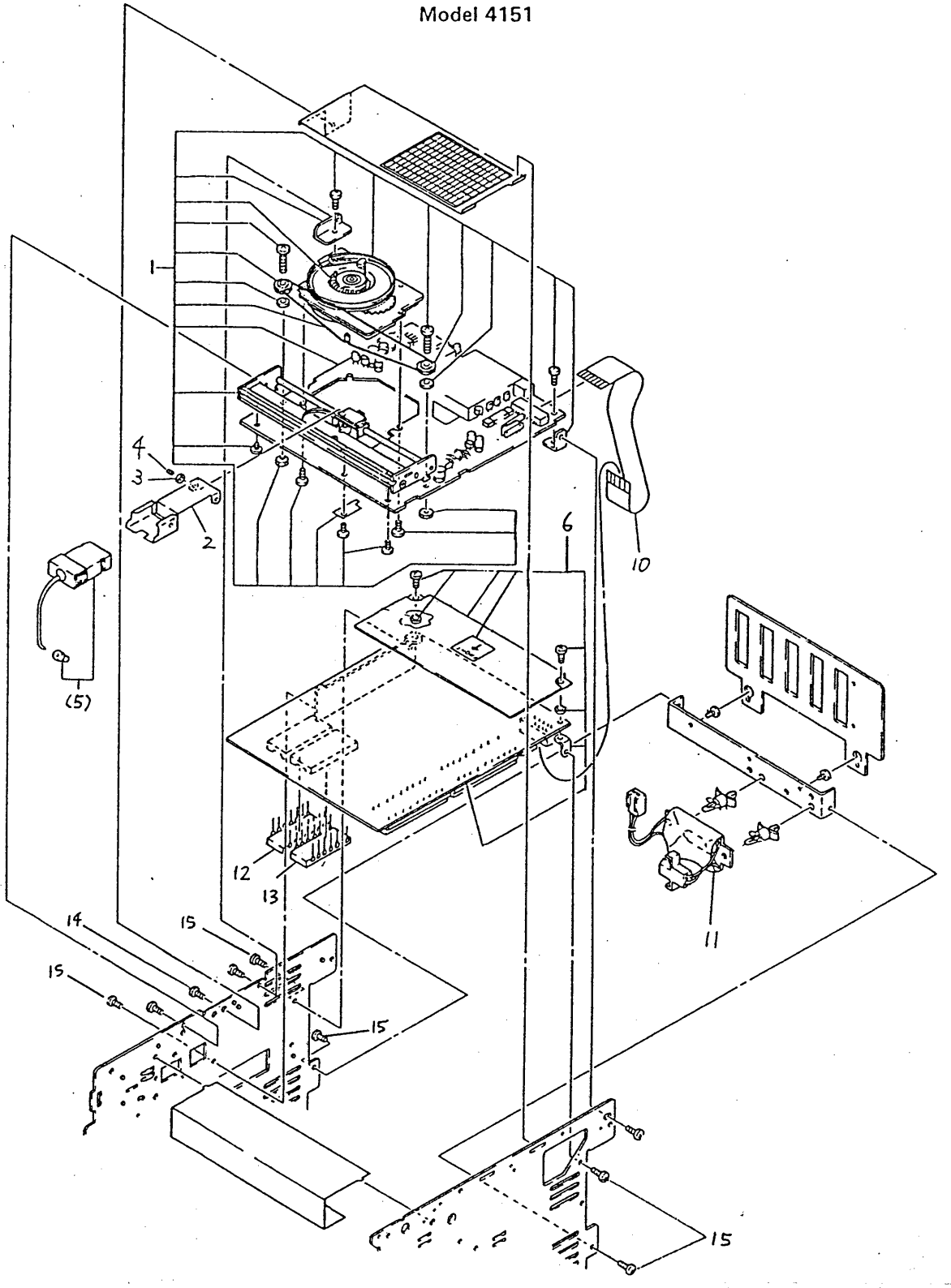


Item	Part No.	Qty	Description
1	B9565SR	1	Plotter Assembly
②	B9565JH	2	Motor Assembly
3	Y9305LE	1	B.H. Screw, M3 x 5
④	B9565SK	1	P. Board Assembly (plotter board)
⑤	B9565XS	1	Wire*1 (plotter board ↔ C.P.U. board)
⑥	B9565SH	1	Solenoid Assembly (Levers and springs are not included.)
⑦	B9565AY	2	Screw
⑧	B9565ZA	1	Pen Assembly (accessory)
⑨	B9565TR	1	String Assy
⑩	B9565AY	1	Screw

Note:
*1: For Model 4151
*2: For Models 4152 and 4153

(7) Servo, CPU Board and Inverter Assemblies

Model 4151

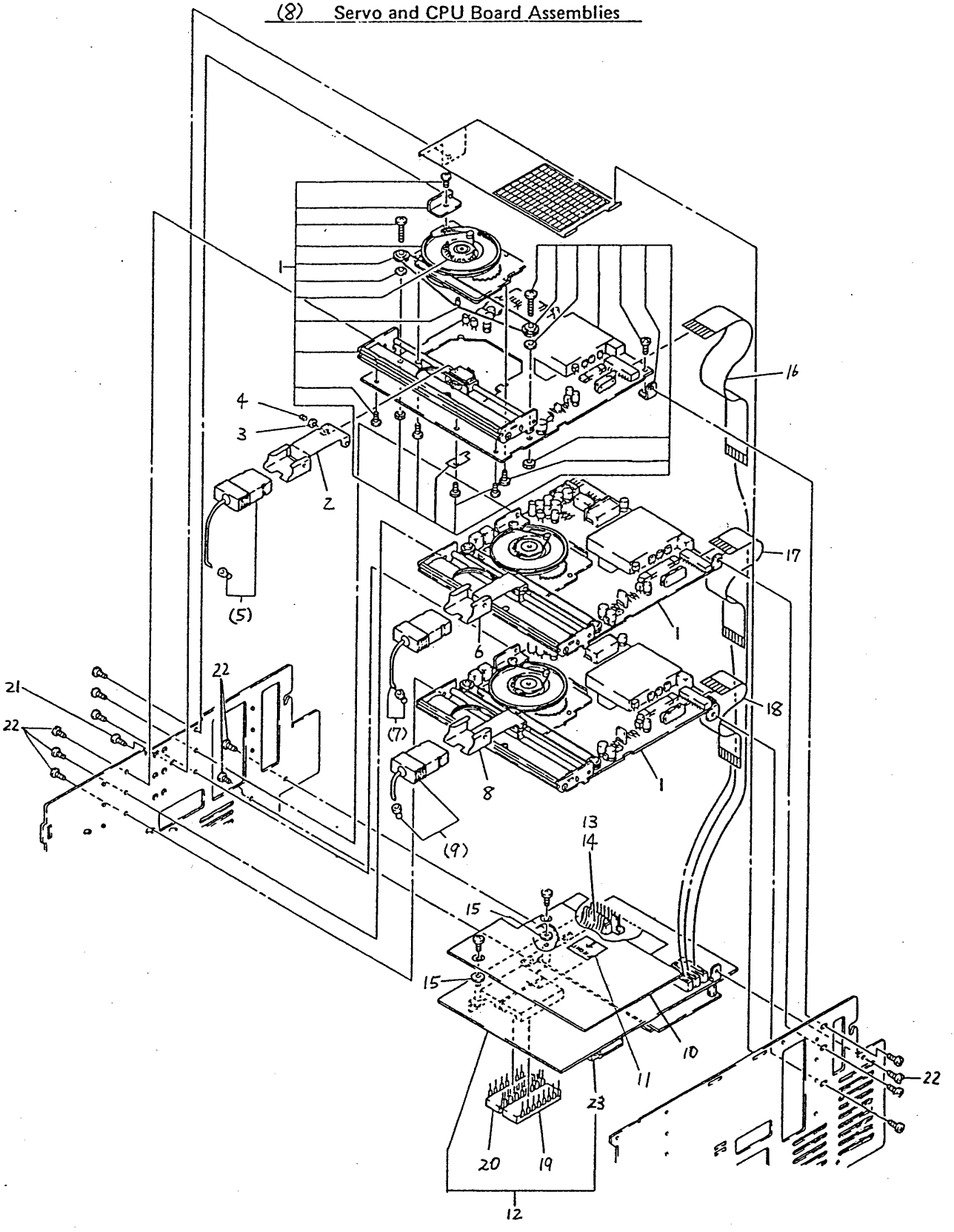


Item	Part No.	Qty	Description
①	B9565MA	1	Servo Assembly (mV and TC inputs) } (select)
	B9565MB	1	Servo Assembly (RTD Input) }
2	B9565ME	1	Pen Arm Assembly
③	B9565MQ	1	Nut
④	Y9204SB	1	Setscrew
⑤	B9565YA	1	Pen Assembly
⑥	B9565LK	1	CPU Board Assembly
		1	Plate (for insulator)
		1	Nameplate
		2	Spacer
⑩	B9565XR	1	Wire (servo assembly ↔ C.P.U board)
⑪	B9565SA	1	INV Assembly (for inverter power supply)
12	See Note	1	ROM Assembly (1)
13	See Note	1	ROM Assembly (2)
⑭	B9565CX	1	Screw
⑮	B9565AY	5	Screw

Note:

Model Code	Suffix Code	Inputs Types	ROM Part No.	ROM No.
4151	-100	DC V & TC (ANSI & JIS), °C	B9565RA	1
	-200	RTD (JIS), °C		
	-300	DC V & TC (ANSI), °C		
	-400	RTD (DIN), °C	B9565RB	2
	-500	DC V & TC (ANSI), °F		
	-600	RTD (DIN), °F		
	-700	DC V & TC (DIN), °C	B9565RC	1
	-800	RTD (DIN), °C	B9565RD	2

(8) Servo and CPU Board Assemblies



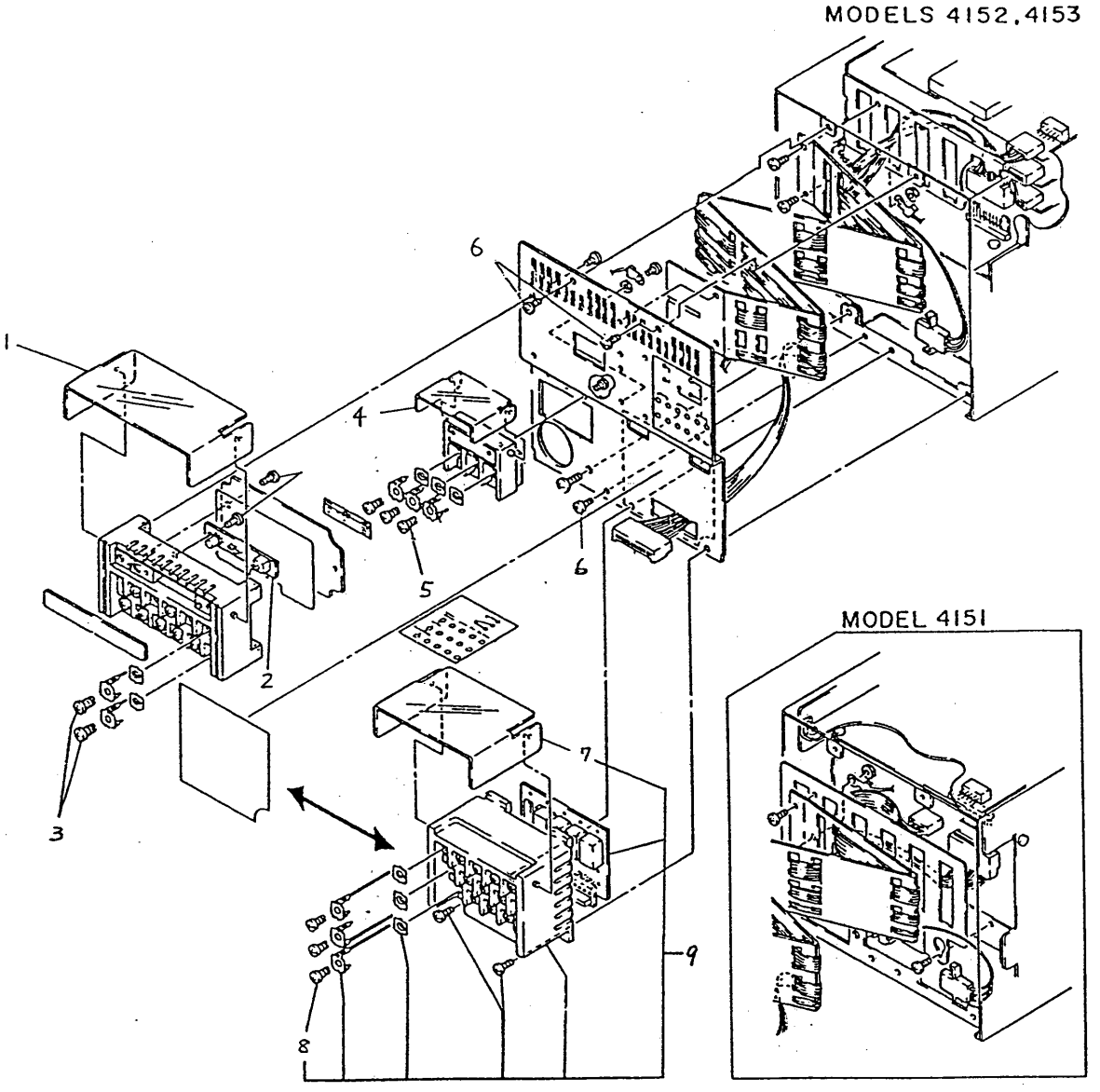
Item	Part No.	Qty Model 4152	Qty 4153	Description
①	B9565MA	1 to 2	1 to 3	Servo Assembly (mV and TC inputs) } (select)
	B9565MB	1 to 2	1 to 3	Servo Assembly (RTD Input) } (select)
2	B9565ME	1	1	Pen Arm Assembly (1st pen)
③	B9565MQ	2	3	Nut
④	Y9204SB	2	3	Setscrew
⑤	B9565YA	1	1	Pen Assembly (accessory) (1st pen)
6	B9565MJ	1	1	Pen Arm Assembly — (2nd pen)
⑦	B9565YB	1	1	Pen Assembly (accessory) — (2nd pen)
8	B9565MM		1	Pen Arm Assembly — (3rd pen)
⑨	B9565YC		1	Pen Assembly (accessory) — (3rd pen)
10	B9565XC	1	1	Plate (for insulator)
11	B9565LQ	1	1	Nameplate
⑫	B9565XA	1	1	Main PCB Assembly } (select)
	B9565XB	1	1	Main PCB Assembly *1 } (select)
⑬	B9565XW	1	1	Wire } (plotter board ↔ C.P.U board)
14	B9565WW	1	1	Plate } (plotter board ↔ C.P.U board)
15	Y9902YA	2	2	Spacer
⑯	B9565XR	1	1	Wire (1st pen servo ↔ Main PCB)
⑰	B9565XS	1	1	Wire (2nd pen servo ↔ Main PCB)
⑱	B9565XT		1	Wire (3rd pen servo ↔ Main PCB)
19	See Note	1	1	ROM Assembly (1)
20	See Note	1	1	ROM Assembly (2)
㉑	B9565CX	1	1	Screw
㉒	B9565AY	5	6	Screw
㉓	A9070SM	(1)	(1)	Swich *1

Only B9565xA is contained in the service kit

Note : *1 ; For Model 4150 ..... /PS (option)

Model Code	Suffix Code □	□	□.../□□		Description	ROM Part No.	ROM No.
4152	1 to 6	1 to 6	0		ANSI/JIS, DIN	B9565RE	1
	1 to 6	1 to 6	0			B9565RF	2
	1 to 6	1 to 6	0	/PS		B9565RJ	1
	1 to 6	1 to 6	0	/PS		B9565RK	2
	7 or 8	7 or 8	0		DIN/DIN	B9565RG	1
	7 or 8	7 or 8	0			B9565RH	2
	7 or 8	7 or 8	0	/PS		B9565RL	1
	7 or 8	7 or 8	0	/PS		B9565RM	2
4153	1 to 6	1 to 6	1 to 6		ANSI/JIF, DIN	B9565RE	1
	1 to 6	1 to 6	1 to 6			B9565RF	2
	1 to 6	1 to 6	1 to 6	/PS		B9565RJ	1
	1 to 6	1 to 6	1 to 6	/PS		B9565RK	2
	7 or 8	7 or 8	7 or 8		DIN/DIN	B9565RG	1
	7 or 8	7 or 8	7 or 8			B9565RH	2
	7 or 8	7 or 8	7 or 8	/PS		B9565RL	1
	7 or 8	7 or 8	7 or 8	/PS		B9565RM	2

(9) Terminal Assembly



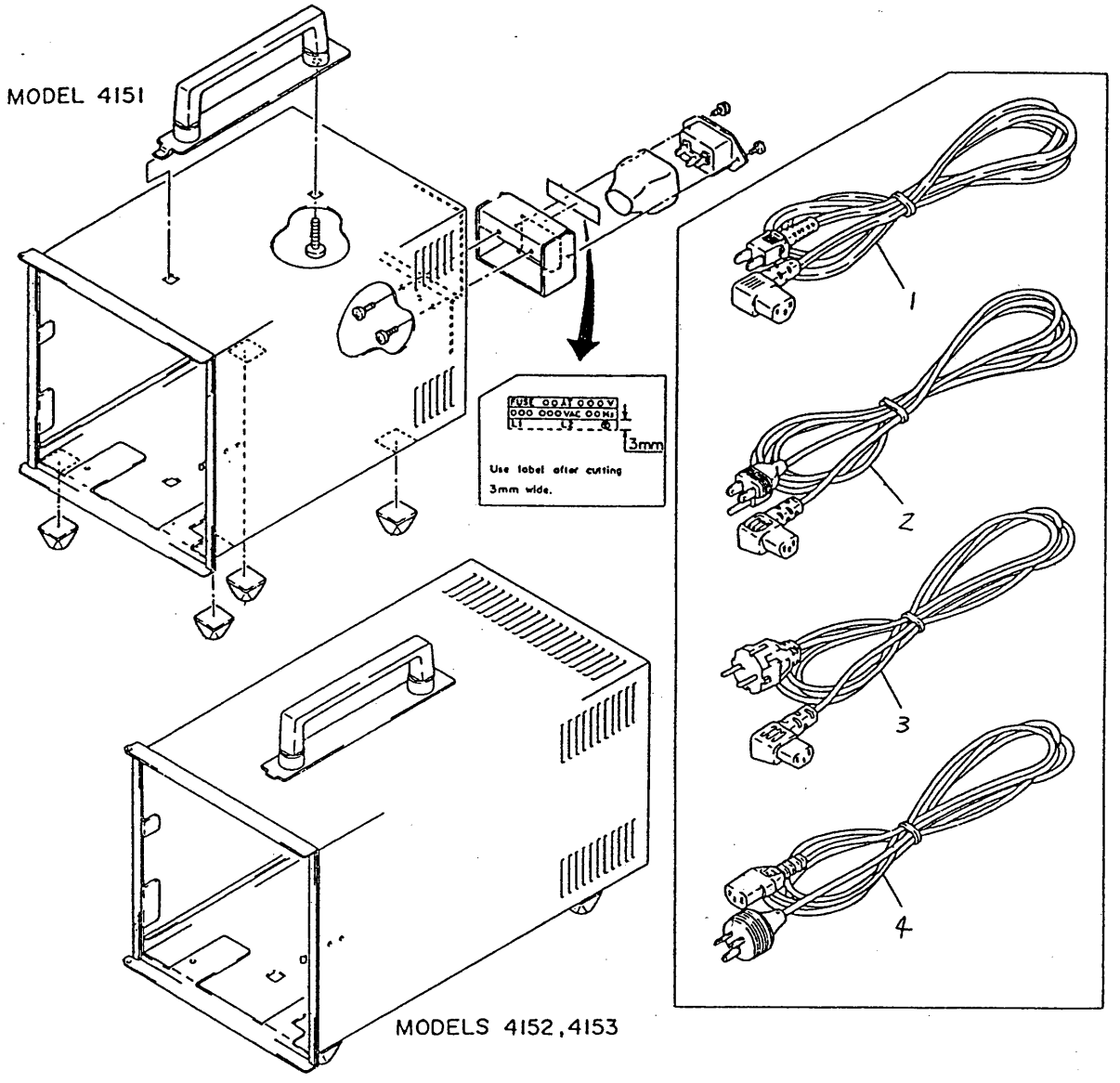
Item	Part No.	Qty	Description
1	B9565FP	1	Cover
②	B9565ER	1	PCB Assembly (for RJC) (mV and TC inputs)
③	B9565AZ	4 to 9	Screw
4	B9565FK	1	Cover
⑤	B9565AZ	3	Screw
⑥	B9565AY	3	Screw
7	B9565FQ	1	Cover
⑧	B9565AZ	3	Screw*3
	B9565AZ	12	Screw*1
⑨	B9567FA	1	*1
	B9567FB	1	*2
	B9567FC	1	*3

Only B9567FB is contained in the service kit.

Note
- *1: For Model 4150 □□□.../AK-04
- *2: For Model 4150 □□□.../AK-04/REM
- *3: For Model 4150 □□□...../REM

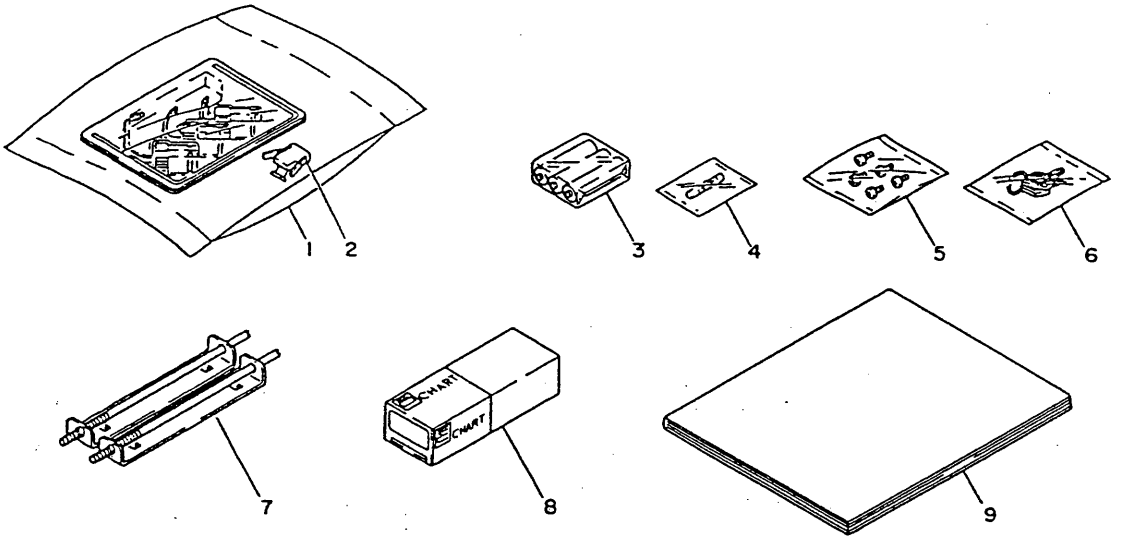
(10) Portable Type (option)

Model 415□·····/PBL



Item	Part No.	Qty	Description	
1	A9009WD	1	Power Code (other than below)	(select)
2	A9008WD	1	Power Code (UL standard)	
3	A9011WD	1	Power Code (VDE standard)	
4	A9015WD	1	Power Code (SAA standard)	

(11) Accessory



Item	Part No.	Qty	Description	
①		1	Pen Package (Model 4151: Contain 1) Part No. of 1st pen: B9565YA	
		1	Pen Package (Model 4152: Contains 2) Part No. of 1st pen: B9565YA Part No. of 2nd pen: B9565YB	*1 (select)
		1	Pen Package (Model 4153: Contains 3) Part No. of 1st pen: B9656YA Part No. of 2nd pen: B9565YB Part No. of 3rd pen: B9565YC	
②	B9565ZA	1	Pen Assembly (for plotter) *1	
3	A9024ED	3	Battery	
④	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)	
⑤	B9565AZ	5	Screw (for terminal)	
6		1	Key (see page	
7	B9565CR	2	Bracket Assembly	
⑧	B9565AW	1	Chart *2	
9			Instruction Manual	

ote

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

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

(one pack is the minimum order quantity)

*2: Min. No. of charts to be ordered simultaneously is 6 pcs. multiplied by integer numbers.

Please order them as follows:

A9565AW × 6
×12
×18
.
.
.

9.3 Available Parts List

Part No.	Description	Parts contained in the service kit (o mark)
A9023KN	Spring	
A9073KF	Fuse Carrier	
B9544ZA	Key Switch	
B9565AY	Screw	O
B9565AZ	Screw	O
B9565BW	Nameplate	
B9565BX	Nameplate (for Model 4152)	
B9565BY	Nameplate (for Model 4153)	
B9565CX	Screw	O
B9565DA	Door Assembly	
B9565ER	PCB Assembly (for RJC) (mV and TC inputs)	O
B9565FK	Cover	
B9565FP	Cover	
B9565GM	Bezel	O
B9565GP	Keyboard	O
B9565GY	Transformer (100 V AC, series)	
B9565GZ	Transformer (200 V AC, series)	
B9565HK	Battery Assembly	
B9565HW	Bracket Assembly	
B9565JB	Gear	
B9565JC	Gear	
B9565JD	Gear	
B9565JH	Motor Assembly	O
B9565KA	Chart Cassette Assembly	
B9565LA	Display Assembly (for Model 4151)	O
B9565LC	Display Assembly (for Models 4152 and 4153)	O
B9565LK	CPU Board Assembly	O
B9565LQ	Nameplate	
B9565MA	Servo Assembly (mV and TC inputs)	O
B9565MB	Servo Assembly (RTD Input)	O
B9565ME	Pen Arm Assembly	
B9565MJ	Pen Arm Assembly	
B9565MM	Pen Arm Assembly	
B9565MQ	Nut	O
B9565RA	ROM Assembly (1)	
B9565RB	(2)	
B9565RC	(1)	
B9565RD	(2)	
B9565RE	(1)	
B9565RF	(2)	
B9565RG	(1)	
B9565RH	(2)	
B9565RJ	(1)	
B9565RK	(2)	
B9565RL	(1)	
B9565RM	(2)	
B9565SA	INV Assembly (for inverter power supply)	O
B9565SH	Solenoid Assembly	O
B9565SK	P. Board Assembly (plotter board)	O
B9565SR	Plotter Assembly	

Part No.	Description	Parts contained in the service kit (O mark)
B9565TR	String Ass'y	O
B9565WP	Transformer (100 V AC series)	
B9565WQ	Transformer (200 V AC series)	
B9565WW	Plate	
B9565XA	Main PCB Assembly (Standard type for 4152, 3)	O
B9565XB	Main PCB Assembly (Phase synchronization type for 4152, 3)	
B9565XC	Plate (for insulator)	
B9565XR	Wire (1st pen servo ↔ Main PCB)	O
B9565XS	Wire (2nd pen servo ↔ Main PCB) Wire*1 (plotter board ↔ C.P.U. board,only 4151)	O
B9565XT	Wire (3rd pen servo ↔ Main PCB)	O
B9565XW	Wire (plotter board ↔ C.P.U board)	O
Y9204SB	Setscrew	O
Y9305LE	B.H. Screw, M3 x 5	
Y9902YA	Spacer	
accessory		
A9024ED	Battery	
A9049KF	Fuse (100 V AC series, 0.5 A time lag)	O
A9078KF	Fuse (200 V AC series, 0.315 time lag)	O
B9565AP	1st Pen (red)	O
B9565AQ	2nd Pen (green)	O
B9565AR	3rd Pen (blue)	O
B9565AS	Plotter Pen (purple)	O
B9565AW	Chart paper	O
B9565CR	Bracket Assembly	
option		
A9008WD	Power Code (UL standard)	
A9009WD	Power Code (other than below)	
A9011WD	Power Code (VDE standard)	
A9015WD	Power Code (SAA standard)	
A9070SM	SWITCH	O
B9567FA	For Model 4150 000.../AK-04	
B9567FB	For Model 4150 000.../AK-04/REM	O
B9567FC	For Model 4150 000...../REM	
	*The switch is added when CPUB9565×A for 2 or 3-pen is changaed to	
	B9565×B for phase syncronization.	