HIOKI

INSTRUCTION MANUAL

EPR-3500 Series

EPR-3511
EPR-3521
EPR-3531

ELECTRONIC POLYRECORDER

HIOKI E. E. CORPORATION

Beginning

Thank you very much for your purchasing of our portable recorder.

To correctly use this unit, read this manual well and utilize it.

Please keep this manual with care.

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1. Caution on handling

1.1 Fully take care since the following operations are dangerous.

1) Don't apply more than 250VDC.
2) A fuse is replaced with power source of the recorder turned off

1.2 The following operation might damage the instrument.

1) Carry operation of changing the AC power source volage after the main power switch is turned off.

2) When changing the AC power source, be sure to replace the fuse. (See the paragraph 1.5 Power supply & 3.2.1. Connection of AC power source.)

3) Insert the internal cells so that polarity of + & − is not mistakened.

4) To prevent the corrosion by leakage of internal cells, take out them when not in use for a long period.

3) Insertion of pen

◇ Inserts the pen under condition that the pen is surely in UP position.
◇ Inserts the pen after "MEAS. ZERO" switch is set to ZERO.
◇ Inserts the pen after removing the pen cap.

1.3 Some cautions to guarantee the stable recording

1) Do not lubricate at the pen running portion. (Wipe off the dirt on the pen running portion with dry clothe.)
2) When used at the chart speed of less than 120mm/H, be sure to use the roll chart paper or ink pen for low speed. (Blot or scratching at folded section can be prevented.)
3) When not in use for a long period, be sure to put the cap on. When putting the cap, put it back to the original pen. If another color's cap is put , color of ink might be mixed.

4) Use the our exclusive Z-fold chart paper (SE-10Z-2) or roll type chart paper(SE-10). Loading of other than ours does not guarantee the stable recording in the function of recording status, chart paper forwarding and folding.

1.4 Preparation prior to usage

1.4.1. Initial inspection

When unpacking , confirm no damage occurs in transportation. Specifications of function are fully guaranteed before delivery, but check the instrument according to the specifications.

1.4.2 Configuration

Standard configuration is as follows: Confirm all parts are included.

Main body	1
Instruction manual	1
Power cord	1
Input cord	1 (1 pen), 2(2 pens), 3 (3 pens)
Ink pen	1 (1 pen), 2(2 pens), 3 (3 pens)
Plug for external DC battery	1
Chart paper	1

1.5 Supply of power source

This is operated by AC line (Mains), external DC power or internal dry cells.

AC line	100VAC ,115V, 220V,or 240V −10 to +10% (Max. 250V) Freq. covers 48 to 62Hz.
External DC power	Operates on nominal 12 to 27VDC.
Internal dry cell	6 pcs. of alkali or manganese 1.5V (UM-1, R20 or D size) cell

Caution

Unless otherwise specified, LINE SELECTOR switch is set to 100V.
There is order priority between AC, external DC & Internal cell. Refer to item 3-2-6.

1.6 Grounding

When operated by AC power source, be sure to ground the unit using the earth terminal on the rear panel to protect the operator against electrical shock. No grounding is required when 3-core power plug (with earth lead) is used.

1.7 Connecting cord for input

When connecting the input terminal of this unit to the circuit being measured, use an accessory 3-P input cord.
When external control is used, 14 pins of amphenor plug is necessary.

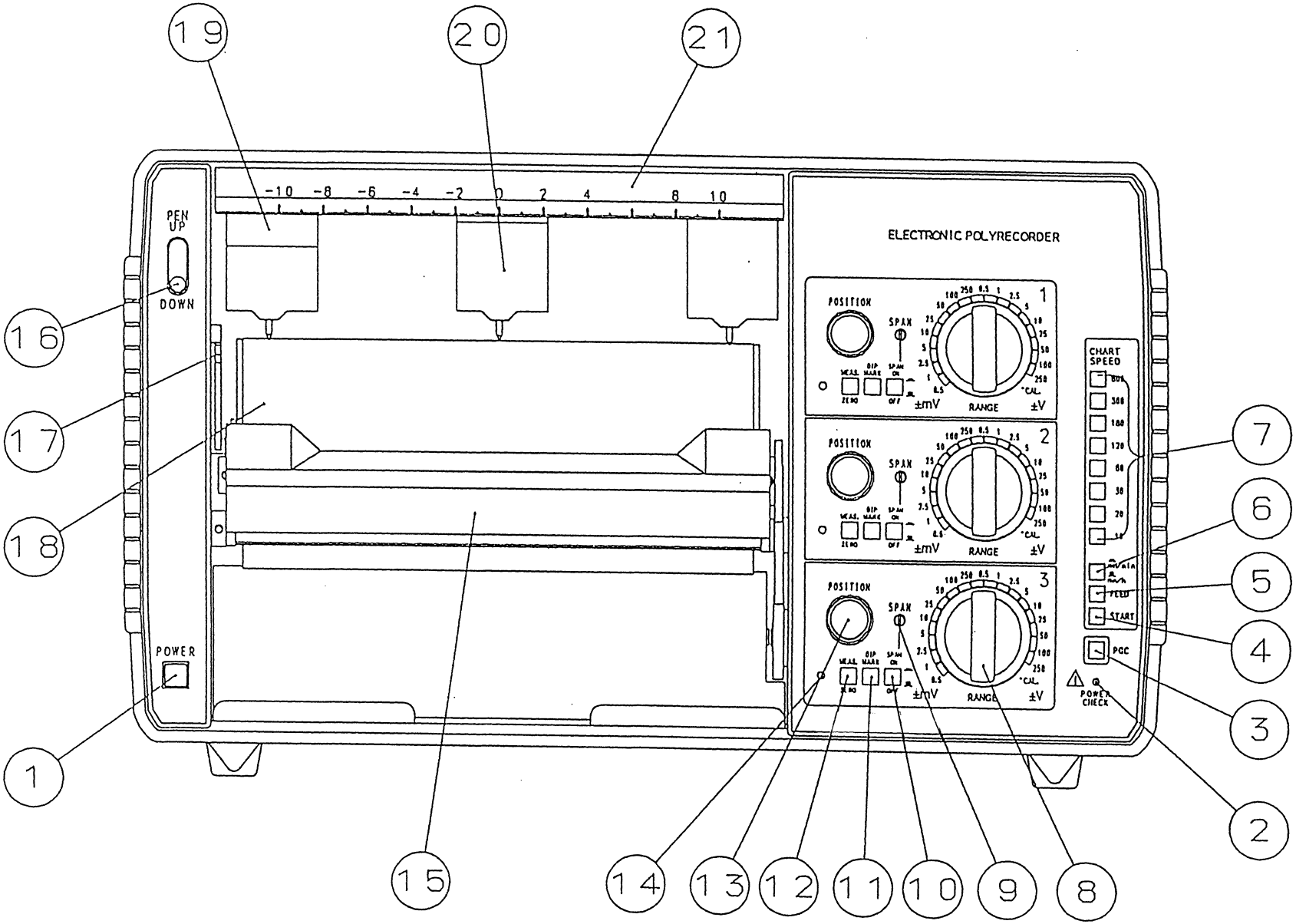


Fig. 2-1 Front panel of EPR-3500 series

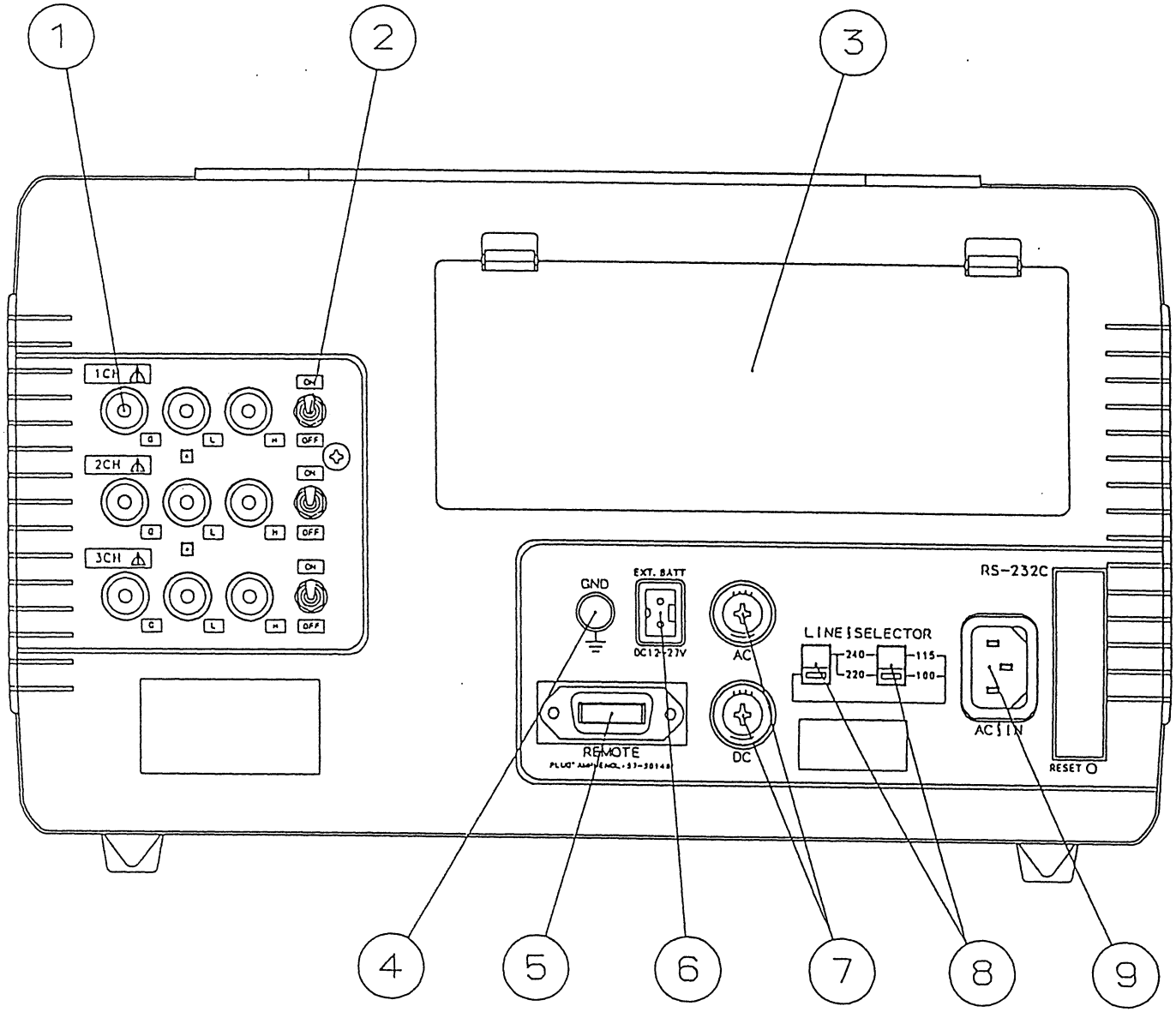


Fig. 2-2 Rear panel of EPR-3500 series

2. Name of each part and its function

2.1 General Descritpion

In this section, each switch, knob, lever & terminals are explained according to the Fig. 2-1 & 2-2.

2.2 Front panel (Refer to Fig. 2-1.)

① 「POWER」 Switch	Switch to turn power supply ON or OFF. Pressing this switch turns ON, one more pressing turns OFF
② 「POWER CHECK」 Switch	Lit when the power is ON. Blicking announces the replacement time of internal battey cell.
③ 「PGC」 Switch	Switch to turn ON－OFF time-axis compensation circuit function (option). Pressing this switch turns ON and one more pressing turns OFF.
④ 「START」 Switch	Switch to activate the chart feeding Pressing it turns ON. One more pressing OFF.
⑤ 「FEED」 Switch	While pressing this switch, the chart is fed at the speed of approx. 300mm/min. Convenient for matching the pen tip to time axis.
⑥ 「mm/min., mm/h」 Switch	Switch to change the chart speed to either mm/min. or mm/h.
⑦ 「CHART SPEED」 knob	Knob to select the chart speed
⑧ 「RANGE」 Switch	Knob to select the measuring full scale range of which indication is separated plus and minus in the center. Reference volage generates at CAL. position for simplified calibration.
⑨ 「SPAN」 Volume	When SPAN switch is set to ON and turn this volume clock-wise, the span is expanded by approx. 20%. Reveresely, turning it to countercloskwise reduces the sensitivity by max. 20%. It is convenient to adjust the span, matching the extension or contraction of the chart paper.
⑩ 「SPAN」 switch	Pressing this switch turns ON which permits the operation of 「SPAN」 volume. Repressing turns OFF and restores to inner calibrated setting span.
⑪ 「DIP MARK」 switch	Pressing this switch deflects the pen to left side by 2.5 divisions. Used when required to mark on the recording line.
⑫ 「MEAS. ZERO」 switch	Pressing this switch turns MEAS. position and becomes measuring condition to apply the input signal. Pressing it again turns ZERO to disconnect the input singal
⑬ 「POSITION」 switch	Knob to adjust the zero point of the pen or move the pen. With 「MEAS. ZERO」 switch turned to ZERO, the pen can be

moved over the whole range of effective recoridng width.

⑭ LED for channel ON display — Power switch for channel on the rear sidei s turned to ON.

⑮ Chart holding cover — This cover presses the chart paper to the chart holding block , allowing stable chart feeding. Also used as supplimentary plate when writing in somthing on the paper.

⑯ 「PEN」 lever — Lever to move the pen up or down

⑰ CHART SET lever — Lever to let out the chart holding block forward when loading or changing the recording paper. If the lever is pushed up, the chart holding block will come out toward the front and recording paper can be loaded.

⑱ Chart holding block — For holding the chart paper

⑲ Pen holder — A pen is inserted into this holder.

⑳ Pen — Disposable cartridge type ink pen

21 SCALE PLATE — 10 divided graduation of full scale is printed on the basis the center is standardized.

2.3 Rear Panel (Refer to Fig. 2-2.)

① Input terminal — Terminal to connect the input leadwire. A Red (H) terminal is connected to high impedanace against the earth, while a black (L) terminal to low impedance. For handling of blue (G) terminal, refer to the item 3-4-1.

② Power switch for channel — Switch to turn off the power of unused channel and save the power consumption.

③ Battery box cover — A lid to encase the internal cells

④ 「GND」 terminal — Terminal of ground the instrument

⑤ 「REMOTE」 connector — Connector to control the chart speed externally As to usage, refer to the article 3-4-6.

⑥ 「EXT. BATT. 」 receptacle — Receptacle to connect the external DC power (12 to 27VDC) and supply the power source, using an accessary plug.

⑦ FUSE HODLER — Each specified fuse for AC power and DC power is inserted.

⑧ 「LINE SELECTOR」 switch — 2 pair slide switches to select the operating voltage when operating this recorder by AC power source. Combination of switches permits selection of 100, 115, 220 or 240VAC.

⑨ POWER RECEPTCLE — Receptacle to connect an accessory power cord

3. How to use

3.1 General Description

In this section, general item and fundamental usage are introduced.

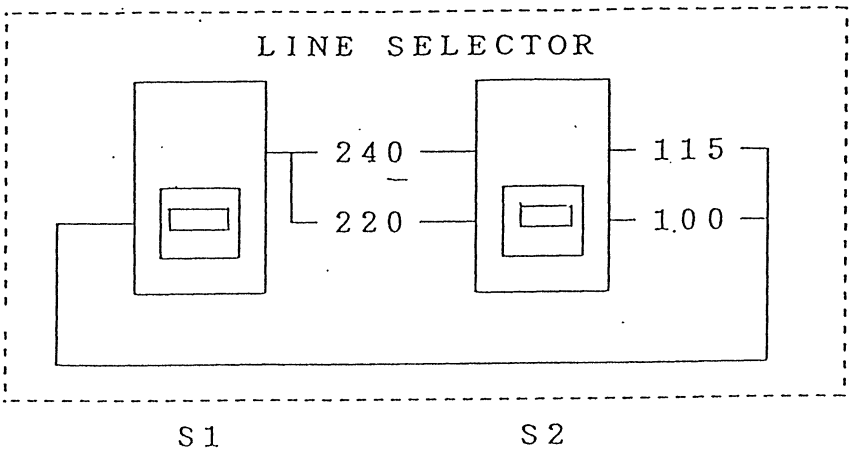
3.2 Connection of power and turning on the power

CAUTION
Following operation must be done after confirming the POWER switch is set to OFF position.

3.2.1 Connection of AC power source (Mains)

1) After reading the article 1.5 of Caution on handling, measure the voltage of power source line.

2) Set the LINE SELECTOR switches to match the line voltage being used as shown in Fig. 3-1. Line voltage is adjusted so that it should be within ±10% of selected voltage. 250VAC is max. line voltage when selecting 240VAC.



Example of 100V of LINE SELECTOR switch

Table 3-1

LINE VOLTAGE	S1	S2
100V	↓	↓
115V	↓	↑
220V	↑	↓
240V	↑	↑

Table 3-1

3) A fuse in glass tube corresponding to selected voltage is inserted into the fuse holder.

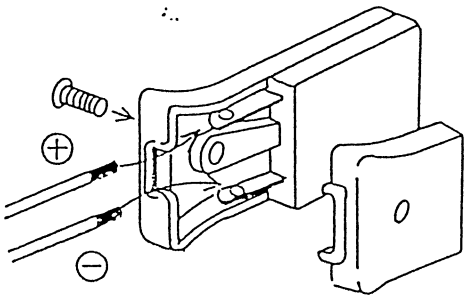
Line power source	Fuse type
100V, 115V	1A slow-blow fuse
220V, 240V	0.5A slow-blow fuse
DC	3A slow-blow fuse

CAUTION
When changing the voltage, be sure to replace the fuse.

4) Connect an accessory power cord to the receptacle AC IN to supply the power.

5) Press the POWER switch. A lamp for POWERS CHECK is lit and indicates the power is supplied to the instrument.

3.2.2 Connection of external DC power source



1) Solder the lead wires to an accessory 2P plug as shown Fig. 3-2, paying attention to the polarity.

Fig. 3 - 2

2) Insert the assembled plug into the EXT. BATT. receptacle and connect the other end to external DC power source.

CAUTION
When connecting lead wire to external DC power, be careful not to mistake the polarity. Min. output current of external DC power source is as follows: 1-pen ...0.4A , 2-pen... 0.6A, 3-pen ... 0.8A

CAUTION
When external DC power is not used, make sure the plug is disconnected.

3.2.1. Connection of internal battery power source

1) Remove the battery lid on the rear panel.

2) Load the 6 pcs. of dry cell (D size, R20 or UM-1) , paying attention not to mistake the polarity + , − .

3) After finishing loading the cells, restore the battery lid to original position.

CAUTION
To protect the corrosion by leakage of internal cell, take out dry cells when not in use for a long period.

3.2.4 Connection of internal Ni-cd cell (option)

The recorder which recharging circuit for rechageable Ni-cd cell is built in is available (separately sold).
Since recharging method is of floating constant voltage recharging, float-recharging is made during normal usage by AC power source. Connection method is done as follows:

1) Remove the cell cover on the rear panel.

2) Insert the plug of Ni-cd cell pack into the receptacle inside of cell holder. (Fig. 3-3)

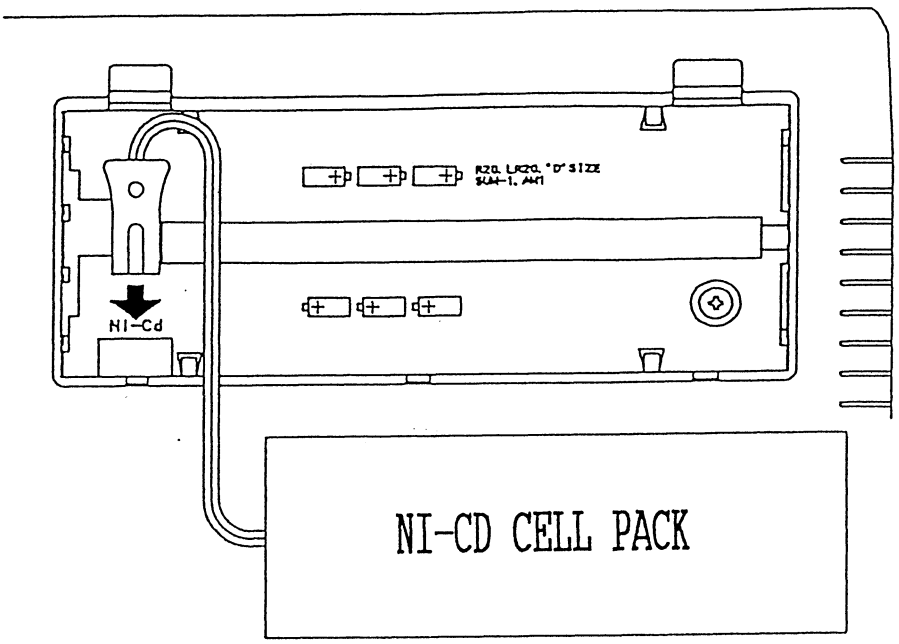


Fig. 3 - 3

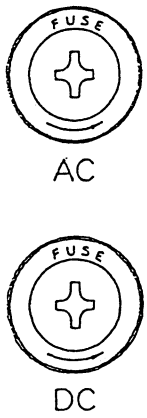
3) Load the Ni-cd cell pack into the holder and restore the cell cover to original position.

4) Recharging is made, similar to operation by AC line, by connecting the AC power cord and then turning the power switch ON.
Recharging time of entirely discharged cell is approx. 12 hours for 80% recharging.

CAUTION
Internal dry cells and Ni-cd cell can not be used simultaneously.

When disposing of this instrument, remove the Nickel Cadmium battery and dispose of battery and instrument in accordance with local regulations.

3.2.5. Replacement of fuse



A fuse for AC line and DC power source is inserted into respective FUSE holder on the rear panel. Remove the power source from the recorder, turn the fuse holder counter clockwise with a Philips (+) driver and replace it with new one.

Fig. 3 – 4

3.2.6 Order priority of AC line, external DC power and internal dry cell

If the external power voltage is over 14VDC , external power is used first , while lower than 14DC, AC line used first. Namely, when 27VDC battery is used, the battery is used first, while 12VDC used, AC line is used first.
Internal dry cell is lowest in order priority. If either AC line or external battry is connected, they have priority. An internal dry cell is used only when no external power is not connected.

(Order)

◇ When external battery is less than 14VDC

1st AC line , 2nd external battery, 3rd internal dry cell

◇ When external battery is more than 14VDC

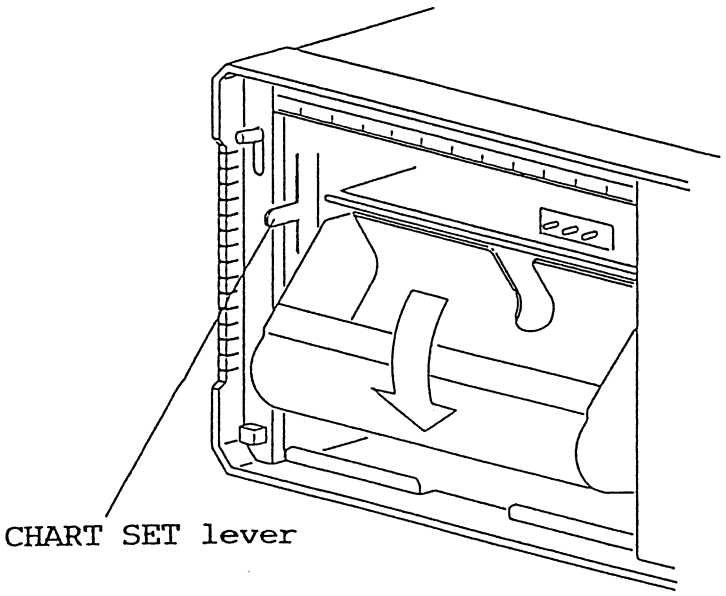
1st external baattery, 2nd AC line , 3rd internal dry cell

3.3 Preparation for measurement

3.3.1 How to load the chart paper

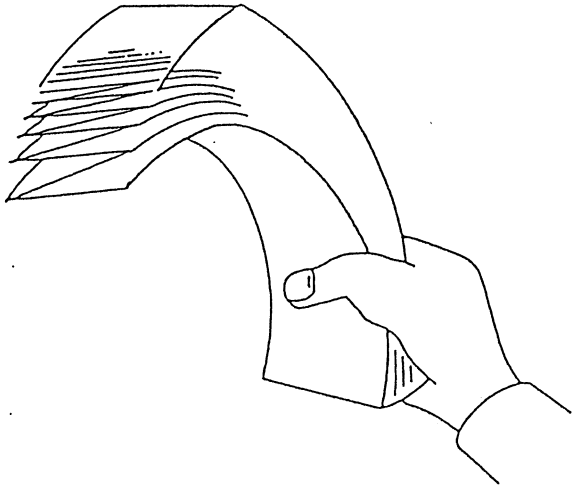
Chart paper is loaded in the following order.

1) Loading of Z-fold chart



a) Pressing CHART SET lever upward opens the chart holding block to the front as shown in Fig. 3-5.

Fig. 3 - 5



b) Shake the end of recording paper so that the folds become frayed completely. (Fig. 3-6)

Fig. 3 - 6

(c) Place the recording paper in the holder with the round perforations on the left, and pull out the tip of the recording paper by about 30cm.
(Fig. 3 - 7)

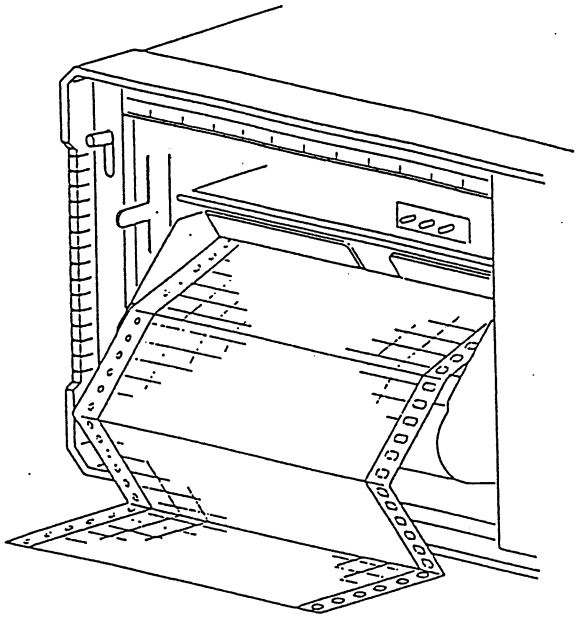


Fig. 3 - 7

(d) Restore the recording paper holding block to the original position while pushing it up. At this time. the holder will be completely locked by returning to the original position in a little forcibly
(Fig. 3- 8)

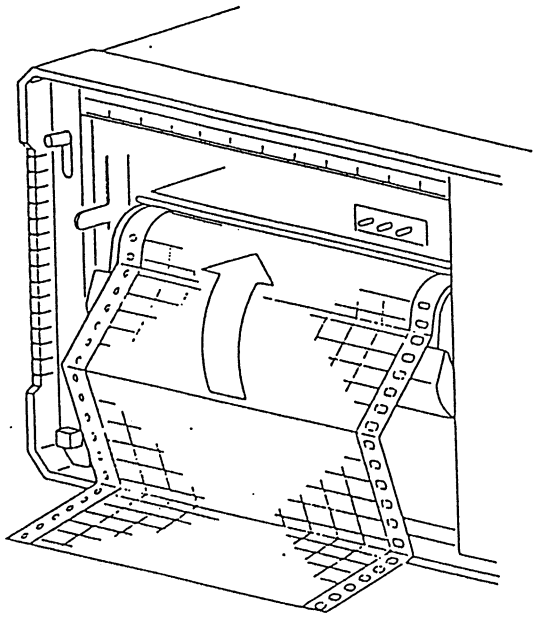


Fig. 3 - 8

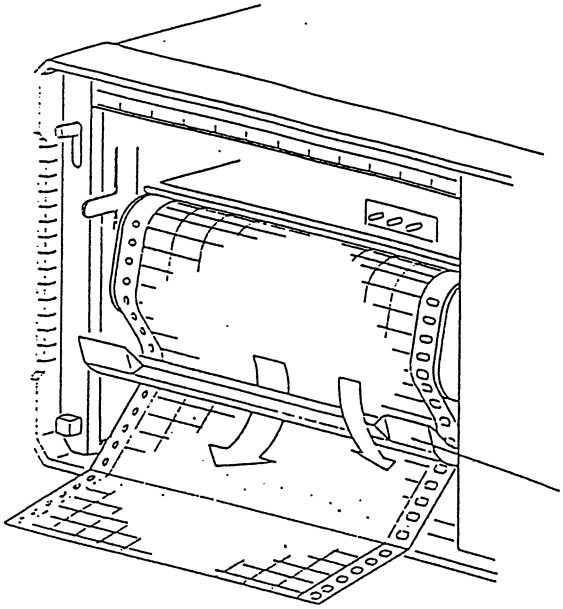


Fig. 3 – 9

(e) Open the reocrding paper holding bar to the lower side. and pass the tip of the recording paper under the bar.
(Fig. 3 –9)

(f) After setting the perforations of te reocrding paper in the gear with the sprocket, press the recording paper by lifting the recording paper holding rod.
(Fig. 3 – 10)

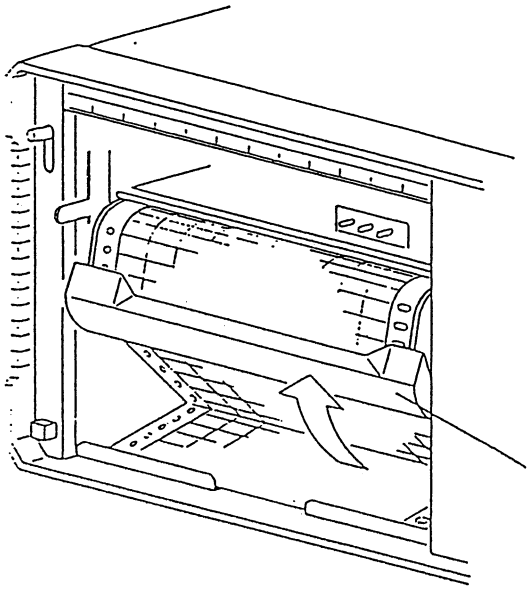


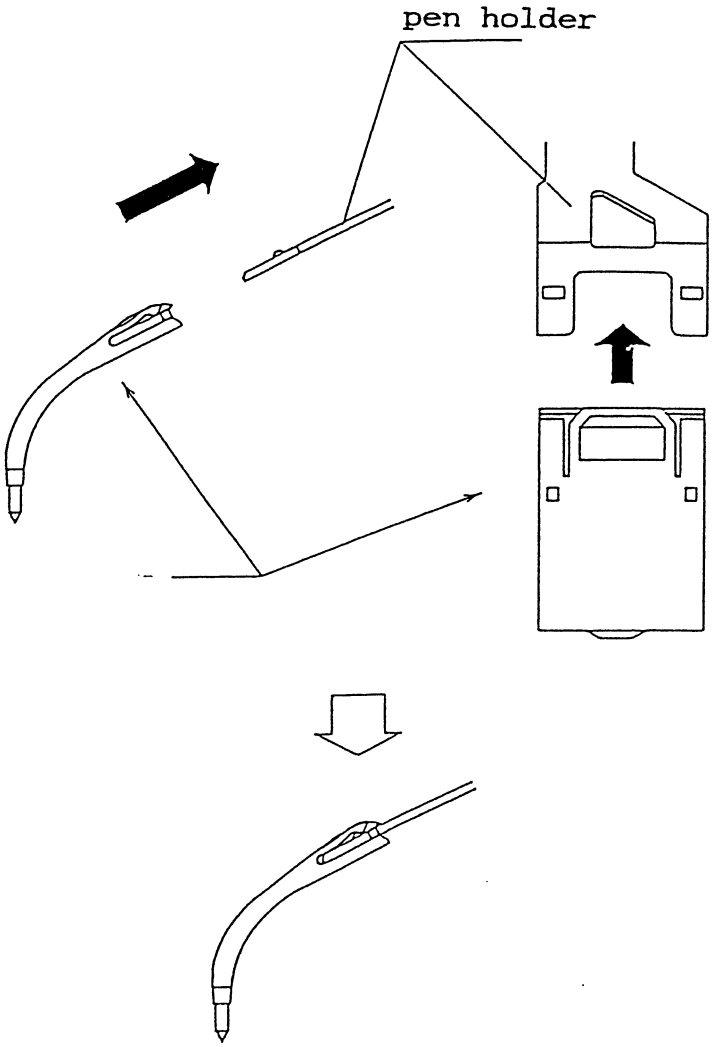
Fig. 3 – 10

2) Loading of roll recording chart paper
The load of roll recording chart is completed in the same operation as the folding type recording paper mentioned in the above, except the operation (b) of the folding type recording paper.

CAUTION
Use our appointed Z-folding recording paper (SE-10Z-2) and roll type recroding paper (SE-10). If other recording paper is used, we can not guarantee the stable recording in recording , chart speed, Z-folding .

3.3.2 Insertion of pen

CAUTION
Pen is inserted in the condition that the Pen is up.



1) While paying attention a new pen without pen cap is not touched to chart paper or chart drum, press the pen to the arrow direction and insert it to pen holder.(Fig. 3-11) In this case, confirm it is locked surely.

Fig. 3 - 11

2) When disassembling the pen, it can be disassembled easily by pulling it down.
3) Pen holder for 1st channel is arranged and next one for 2nd ch. ..... in turn.

4) The pen cap removing from pen is put to the receiver pin located at the inner part of front side not to loose it.
When ink pen is not used, be sure to put the cap on.

3.4 Measurement

3.4.1. Connection of input lead

Connect each measured circuit to the input terminals on the rear panel by using accessory 3P input leadwire.
When applying (+) voltage to the red (H) terminal, the pen moves to the right.
For 3-pin input leadwire connection, choose any of the following connection.

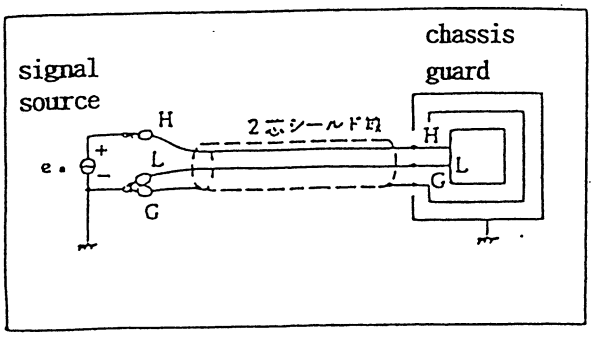


Fig. 3-12

1. When signal source is grounded, connect G to the grounding side of signal source.

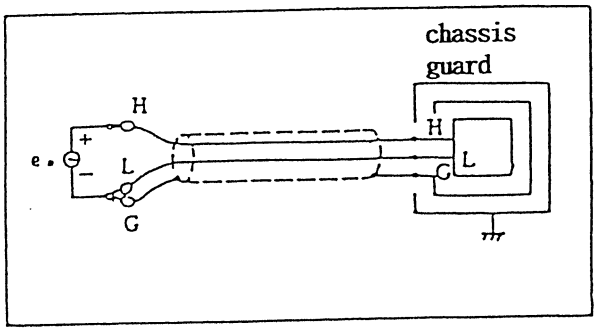


Fig. 3-13

2. When signal source is not grounded, connect L and G to minus side as a rule.

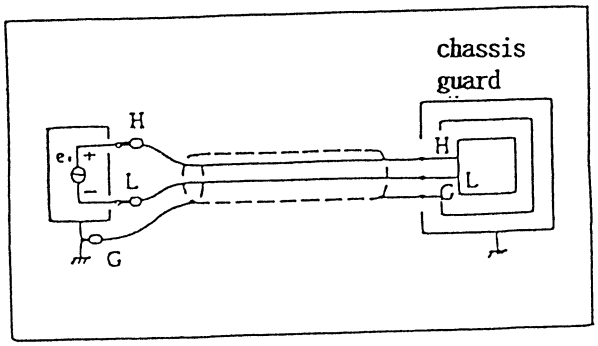
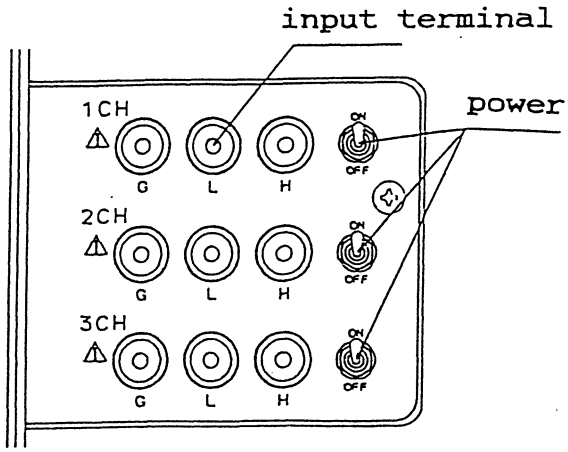


Fig. 3-14

3. When signal source is shielded.

3.4.2 Appointment of channel



Turn on the channel being used by the power switch on the rear panel.

Fig. 3 – 15

When internal cell is used, the power of unused channel is recommended to be turned off for power saving.

CAUTION
Even if main power switch is turned on, the unit does not operates at all, with the power switch for channel turned off.

3.4.3 Setting of measuring range

Set the optinum range matching the voltage being measured.

CAUTION
When unexpected singal voltage is measured, be sure to raise the sensitivity in turn from maximum voltage range. The maximum input voltage is 250VDC at V range & 30V at mV range.

3.4.4 Setting of chart speed

An adequate speed is set according to the movement of input signal.

3.4.5 ON/OFF setting of SPAN volume

Normally, set SPAN switch off. When the span is adjusted accurately to the expansion or

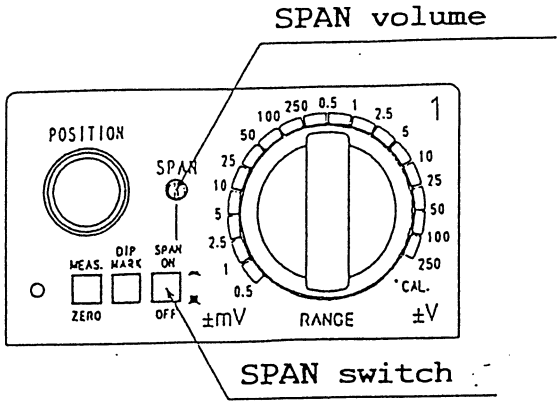
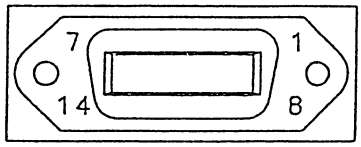


Fig. 3 – 16

extraction of chart paper, or the span is optionally changed,set the SPAN volume to on and adjust it by +20% with the variable resistor.

3.4.6 REMOTE (External control)

Setting of chart speed , chart start/stop,and dip marker can be remotely controlled by external TTL level signal or open/short. Connect the amphenol 14-pin plug to the REMOTE connector to transmit or receive the control signal. Pin arrangement and function of REMOTE connector are shown in Fig.3-17.



REMOTE

PLUG" AMPHENOL:57-30140"

1) INT. or EXT (Internal or external chart speed setting)
When terminals 3 – 10 are open, it becomes chart speed setting on the front panel. If they short-circuited, chart speed is controlled by external frequency.

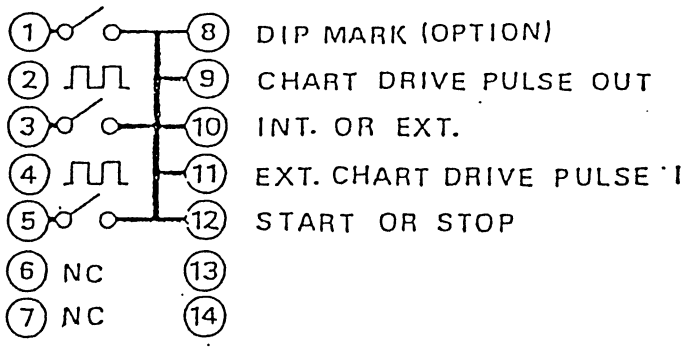


Fig. 3 – 17

2) EXT. CHART DRIVE PULSE IN (Synchronous input terminal of chart speed)
If 14-P connector is connected and make short between INT.or EXT. (3-10), chart speed is controlled by the input 4-11 terminal, irrespective of setting of chart speed on the panel. If pulse voltage of TTL level is applied to this input terminal, chart is forwarded by 0.05mm per pulse.
The following relationship between desired chart speed L(mm/H or mm/min) and pulse frequency f (P.P.S).

L= 180f mm/h or L= 3f mm/min.

The upper limit frequency of pulse (f max.) is 200 P.P.S .

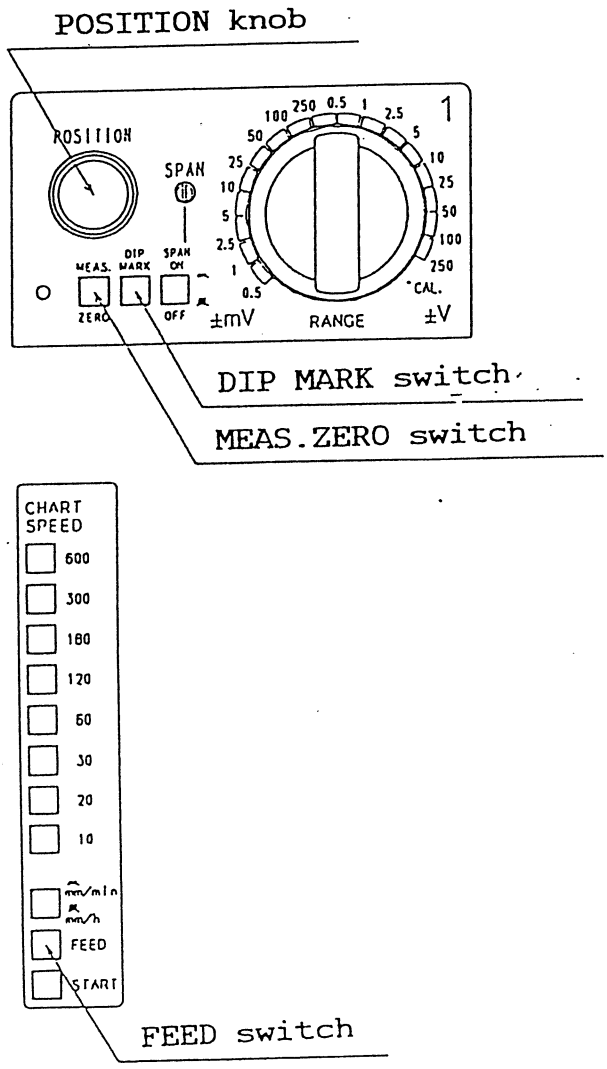
3) CHART DRIVE PULSE OUT(synchronous output terminal of chart speed)
If INT. or EXT. is left open and CHART DRIVE PULSE OUT is set, normally pulse in frequency corresponding to chart speed set on the panel is output.
It is assumed that two recorder are used. One recorder is used as master which outputs chart drive pulse from 2 and 9. The other is used as salve which receives the output from the master at 4 and 11 after 3 and 10 of INT. or EXT. are short-circuited. Thus , chart speeds of these two recorders perfectly coincides each other to be effective in synchronized recording of long hours. It is possible to increase the number of recorder to 2,3 or more in the same way

4) START or STOP (start/stop of chart speed)

With terminal 5 & 12 opened, chart drive operates, while short-circuited , it stops.

5) DIP MARK (Dip marker somultaneous drive) Option
With terminal 1 & 8 short-circuited, all pen move simultaneously to apply the dip mark overlapping the recording data.

3.4.7 Commencement of recording



1) Pull PEN lever down, move the zero point with a POSITION knob and press the FEED button to determine the start position.

2) Turn CHART ON/OFF switch ON, ZERO/MEAS.sw.to MEAS., the recording starts.

3) If zero point is required to confirm during measu-ment, the pen moves to zero point with ZERO/ MEAS. set to ZERO.

4) When you need the mark on recording wavefrom during mesurement, the pen moves left side by approx. 2.5 divisions , with the DIP MARK switch pressed.

Fig. 3 - 18

3.5 Treatment after measurement finish

3.5.1 Suspension of measurement

(1) If necessary recording is finished, turn CHART ON/OFF switch OFF, turn the PEN lever upward, and feed the FEED button to feed the appropriate length of blank chart paper.

(2) When using the Z-fold chart paper, cut folded sewing notch portion. When using roll chart paper, cut the paper, using the angle under the chart holding bar.

(3) When used continuously , repeat the procedure of the item 3.4.7 Recording start.

3.5.2 When not recording

After operation of items (1) & (2) of 1) 3.5.1 , turn the POWER switch OFF.

CAUTION
After completion of measurement, lift the pen lever up and remove the pen from pen holder, be sure to put the pen cap on the tip for storage.

4. Maintenance

4.1 Chart replacement

As the length of one sheaf of strip recording chart (SE-10Z-2) is approx.15 m, while that of one roll of roll recording chart (SE-10) is approx. 20m , it is necessary to replace the chart with new one in accordance with following schedule.

When chart approaches near the end, there will appear a warning printed in red, "NEW PAPER REQUIRED".

chart speed	Running time		Chart speed	Running time	
	15m chart	20m chart		15m chart	20m chart
600mm/min	Abt.25min	33 min.	600mm/h	abt.25hrs.	33 hrs
300 "	50 "	66 "	300 "	2 days	2.7days
180 "	80 "	1.8hrs.	180 "	3.5 "	4.6 "
120 "	2 hrs.	2.7 "	120 "	5 "	6.9 "
60 "	4 "	5.5 "	60 "	10 "	13 "
30 "	8 "	11 "	30 "	20 "	27.7"
20 "	12 "	16.1"	20 "	1 month	1.3months
10 "	25 "	33 "	10 "	2months	2.7months

Table 4 - 1

4.2 Replacement of recording pen

Disposable ink pen are good for recording in a straight line, approximately 1,600 meters.
The pen, whose ink has been used up or having become too thick and too short, cannot be used any longer and must be replaced with a new one.
Storage period of the pen is approximately one year. Keep it in a polyvinyl chloride bag and store in a cool & dark place.

4.3 Replacement of internal cell

While a lamp of POWER CHECK at the lower right on the front panel keeps lightning, the recorder operates normally.
If it becomes flickering , the cell is dead and must be replaced with a new one.
The life span of cell differs according to input signal, chart speed, type and manufacturer, etc., but the following example may be used as a guide.

Type of cell	constitution	Input signal	Chart speed	1-pen	2-pen	3-pen
Alkaline dry cell	standard	0.01Hz sine oscillating width:150mm	60mm/hr.	40hr.	22hr.	12hr.
	MC-3500 IF-3500 with option	〃	〃	18hr.	8hr.	4hr.
Ni-cd cell	standard	〃	〃	14hr.	8hr.	5.5hr.
	MC-3500 IF-3500 with option	〃	〃	5.5hr.	3hr.	2hr.

4.4 Calibration of sensitivity

At times, satisfactory accuracy of the recording result may not be obtained due to chart expansion and contraction. In such a case, follow the procedure described below to calibrate sensitivity.

1) Set the MEAS.ZERO switch to ZERO and turn the POSITION knob so that zero point moves to the left end.

2) Set the RANGE knob to "CAL" position, and the MEAS.ZERO switch to MEAS. position.

3) After turning SPAN switch On, turn the variable volume so that the pen accurately moves right end.

◇With above procedure , calibration of sensitivity is completed.
With the SPAN switch turned to "OFF" , the sensitivity changes to internal span having calibrated with no expansion/extration paper.

5. General Description

This recorder is a high performance portable recorder designed to mainly use outdoor. It has features of small size, light weight, robust, and endures the usage in bad environmental condition such a light rain with drip-proof vinyl cover (option) on.
It features 3-way power source which permits usage freely where commercial AC power is not available, calibration of sensitivity on the front panel, chart feed function which is convienient for time axis adjustment at recording start and supplimentary plate for writing, all of which full up the operationabilty more.
Optimum optional function's constitution can be selected as occasion demands; i.e. ,data storage by memory card, data remote monitor & storage by both RS-232C and waveform acquisition soft, or data analysis by software "recopal 1.2.3."

6. Constitution

This recorder has some blocks of functions,i.e. input unit section for voltage-division/amplifier of input signal voltage, and main board section ,which consists of servo amp. section to drive the pen, power source section to supply the power and chart drive section to feed the chart paper.

Drawing of constitution

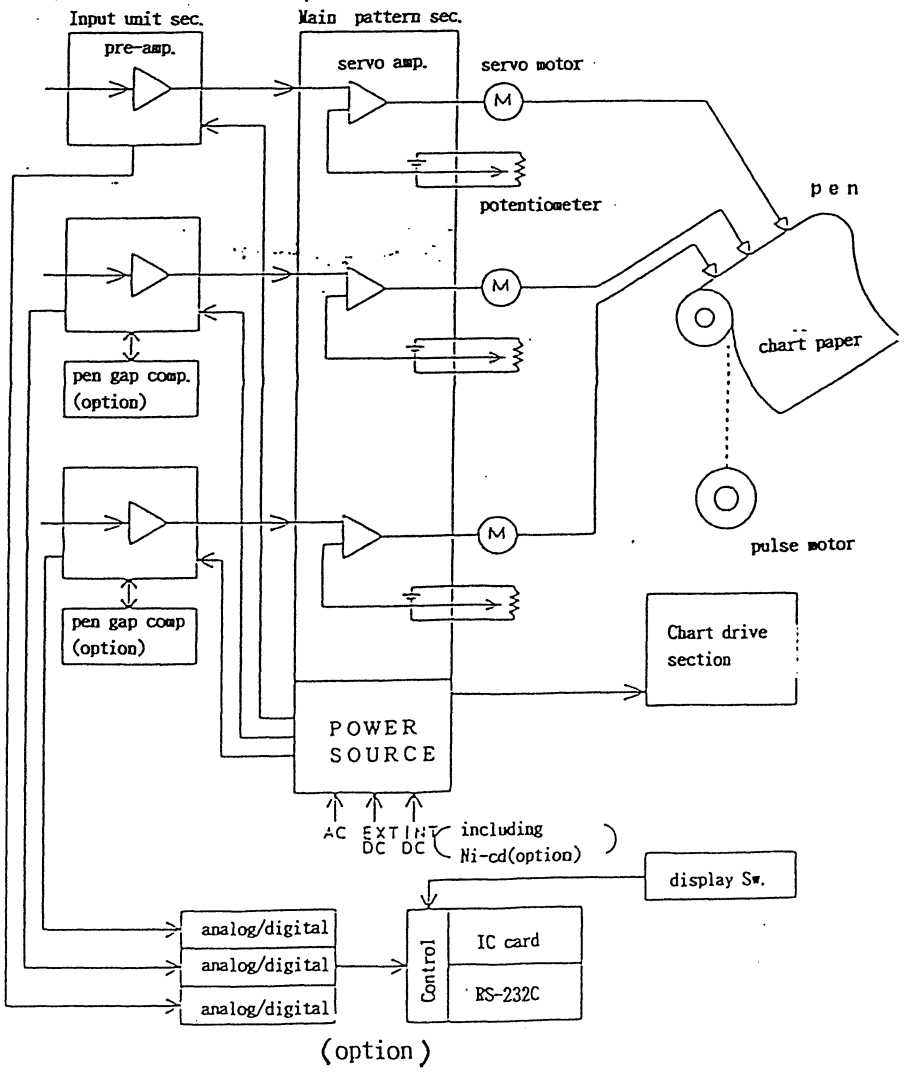


Fig. 6 - 1

7. Specifications

1) Standard constitution

Operating method	Self-balancing method
Pen number	1 , 2 or 3 pens
Input	on rear panel fixed
Color of felt-tip pen	1st pen CH1 red (standard) 2nd pen CH1 red ,CH2 green (standard) 3rd pen CH1 red ,CH2 green ,CH3 blue (standard)
Measuring range	±0.5,1,2.5,5,10,25,50,100,250mV & V 18 ranges
Input resistance	Approx. 2MΩ
Permissible signal resistance	Less than 10kΩ
Recording accuracy	±0.5% of effective recording width (including linearity at ref. range) Ref. range: 250mV
Dead band	Less than ±0.2% of effective width
Error between ranges	±0.25% of pen deflection width
Temp. coefficient	Zero: 0.6uV/ C +0.075% of range/°C FS : 0.075% of range /°C
Effective recording width	150mm
Pen interval	approx. 5mm
Pen speed	approx. 800mm/sec. (at AC line)
Zero adjustment zone	Full range possible for each range
Span ADJ.	Approx. +20% of full scale with OFF switch (on the front panel)
Span calibration	Self-calibration is possible by setting the RANGE Switch to CAL. and turning the SPAN volume.
Zero check	Possible during measurement using the switch on the front panel
Recording paper	Effective recording width x length roll chart paper (SE-10) 150mm x 20m Z-fold chart paper (SE-10Z-2) 150mm x 15m
Chart speed	10, 20,30,60,120,180,300,600mm/h & mm/min., 16 ranges in case of external pulse forwarding 0.05mm/pulse
Accuracy of chart feeding	±0.25% (reference: crystal oscillator)
Pen lift up mechanism	Simultaneous lift up
Chart feeding	300mm/ min constant
Construction	Vertical
Max. input range	250VDC (contineously)
Ambient condition	0 to 40°C, 40 to 80%RH
Power source	Internal cell UM-1, 6F22 or D size (1.5V) 6 pcs. Ni-cd cell as option (with recharging circuit) AC line 100,115,220,240V +/-10% 50/60Hz (with selector switches) External battery 12 to 27VDC

Power consumption	AC line 1 pen approx.12VA at balance 2 pen approx.15VA at balance 3 pen approx.18VA at balance
Dimensions	W:355 x H: 200 x D: 212 m
Weight	1 pen approx. 5.8kgs 2 pen approx. 6.3kgs 3 pen approx. 6.8kgs
External control	Start/stop of chart feed Synchronous input/output of chart feed Simultaneous drive of dip marker (option)
Battery check	Blicking of LED (for interal cell)
Dip marker	for each channel (approx. 2.5 div.)

7.2 Standard accessories

Disposable felt-tip pen	each 1 (P-1201 to 1203A)
Chart paper(Z-fold)	1 (SE-10Z-2)
Power cord	1 pc.
Input cord	1 ea/ pen
External DC plug	1 pc.
Instruction manual	1 copy

7.3 Consumables

chart paper

Z-fold type (SE-10Z-2)
Roll type (SE-10)

Disposable felt-tip pen

P - 12□□□
- □□: 01 to 12 : color
- □: A: standard, C: low speed

Disposable pen can be used according to application for standard or low speed.

Its standard is as follows:
Standard type : General recording
Low speed type: Recording at low chart speed of less than approx. 120mm/h

8. Handling of Options

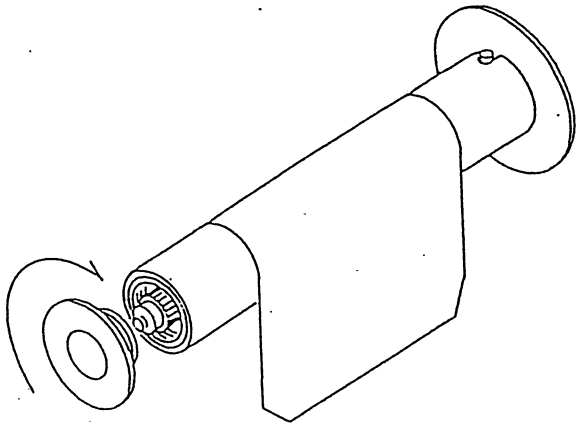
8.1 Chart reroll adapter

This is built in the recorder to reroll the recorded roll chart.

8.1.1 Loading of chart

The roll chart is loaded into the recorder. (Refer to item 3-3-1 of this manual.
In this case, previously pull out the chart paper by approx. 30cm forward in order to reroll it to chart bobbin.

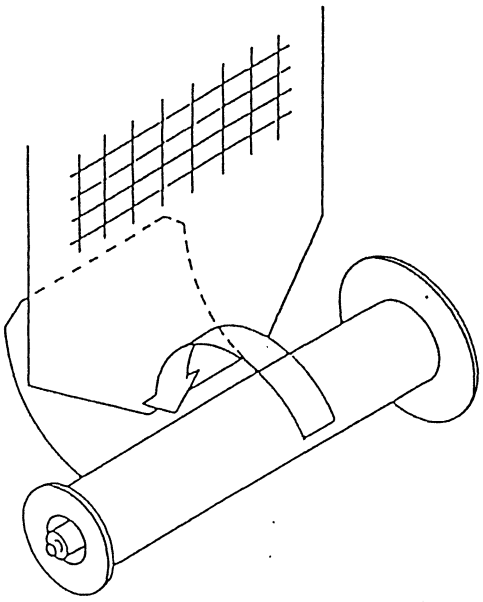
8.1.2 Setting of chart bobbin to chart reroller



A left bobbin receiver of reroller is of screw in type and disconnect by turning lt clockwise.
Insert the bobbin so that chart holding chart is set as shown in Fig. 8-1 and restore the left bobbin receiver to the original position.
In this case, a dent at the end of bobbin is set to the pin of right bobbin receiver.

Fig. 8-1

8.1.3. Setting of chart bobbin for chart



Insert the tip of chart loaded in the recorder, facing the printed side to outside, between chart bobbin and chart holding paper as shown in Fig. 8 - 2 and reroll it to arrow direction 4 or 5 times.

Fig. 8 - 2

8.1.4 Insertion & removal of chart reroll adapter

Hold the center of the chart rolled bobbin , insert the right end (gear side) of it to the hole of spring plate and right end of it to the left axis receiver, while pressing it strongly right.

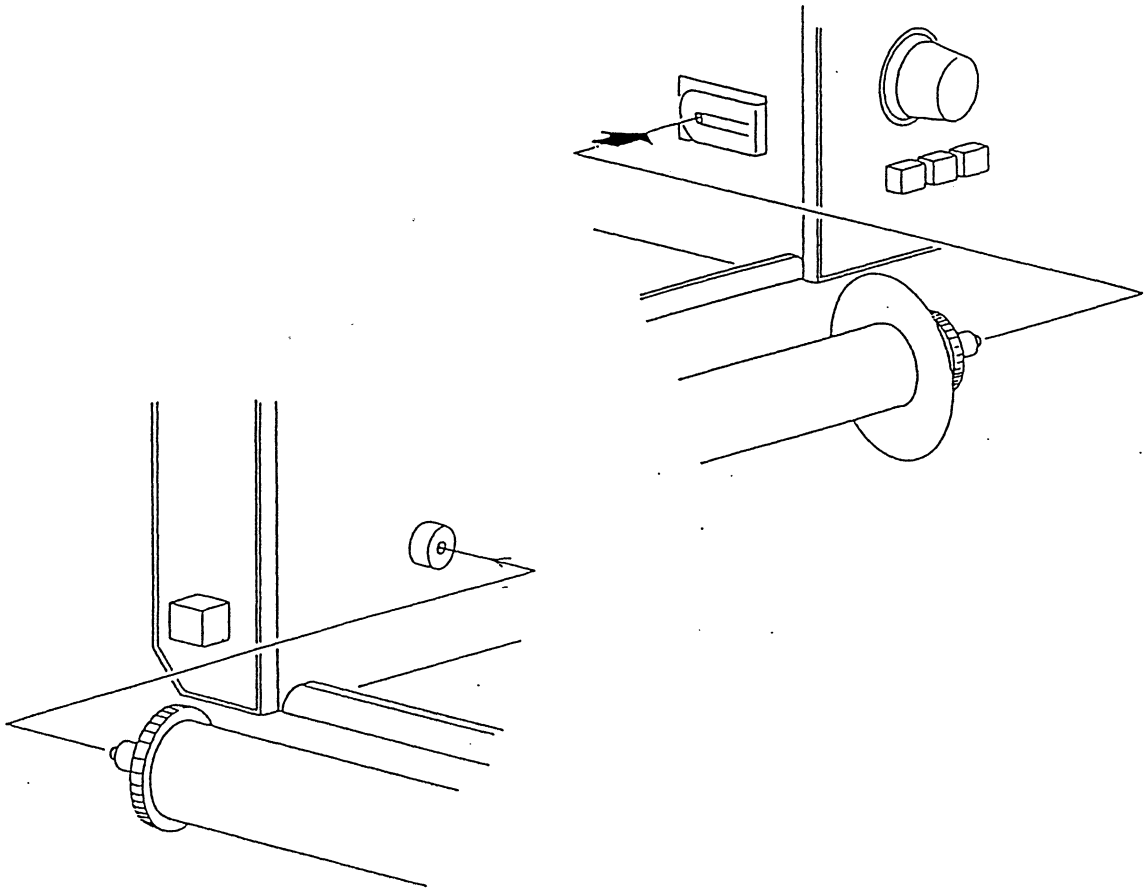


Fig. 8 - 3

CAUTION

◇ When loading to the recorder, confirm that the gear of reroller is securely engaged to that of the main body.

◇ Do not turn torque adjusting knob of the reroller. If so, the torque may change and not function properly .
Do not give the shock due to dropping etc. to it.

◇ Opening or closing of chart holding block is made after unloading the chart reroller.
The chart holding block can not be opened or closed with the reroller as it is loaded.

8.2 Acrylic door

This exhibits dust-proof effect when the recorder is used outdoor or at the place much dust exist.

8.2.1. Removal or attachment of the door

Open the door forward and remove the right door axis forward in the state that the slide pin located at right rotating section is slided left side. Next, while whole door is slided right side, unhook the left door axis from the axis receiver.

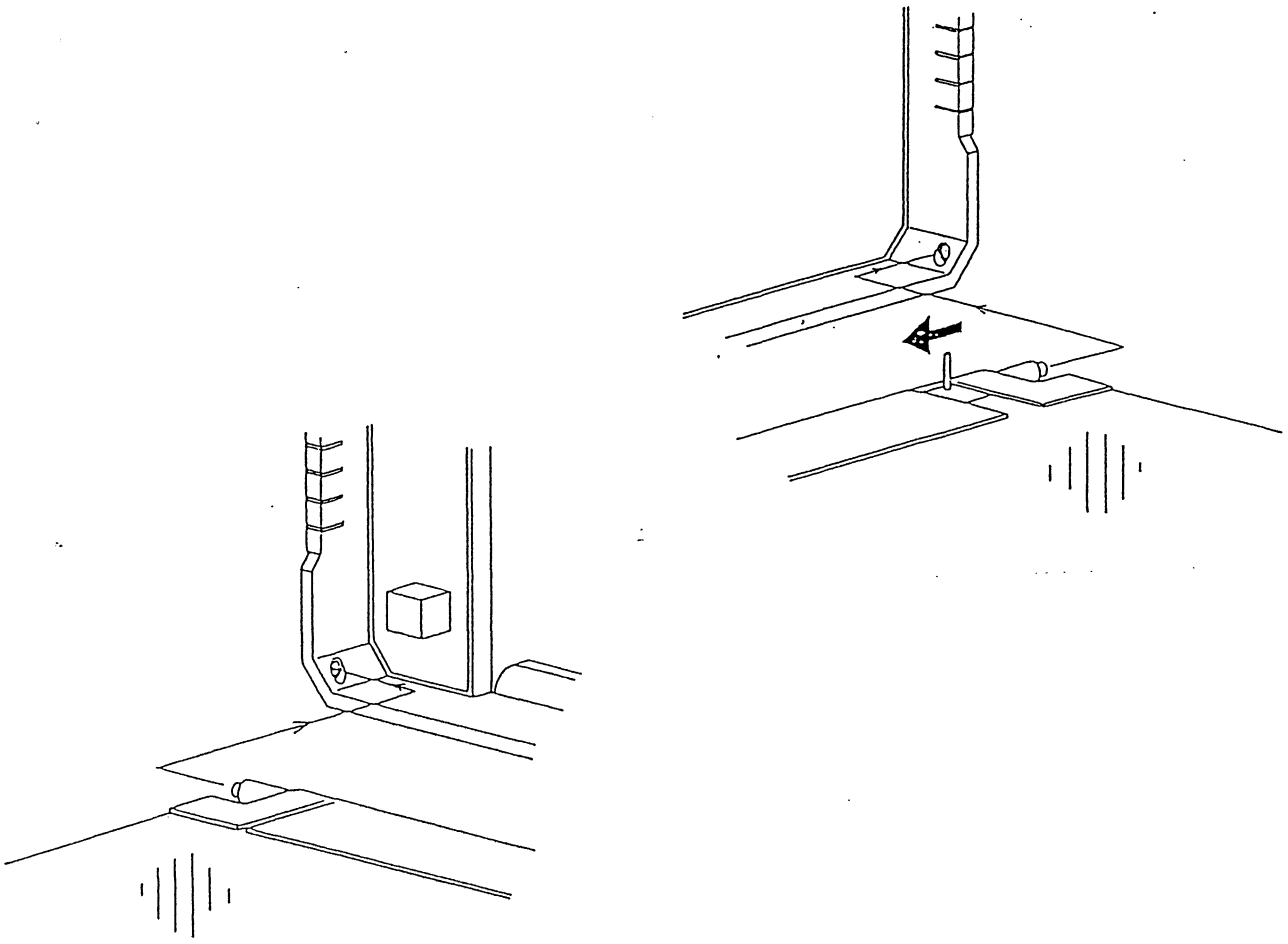


Fig. 8 - 4

For attachment,first of all, insert the left door axis into the left axis hole and insert the right door axis to the right axis hole, in the state right slide pin is slided to left side.

8.2.2. Opening and closing the door

With the PUSH OPEN label pushed, the lock is unlocked and the door can be opened. Pressing it gain locks to close the door.

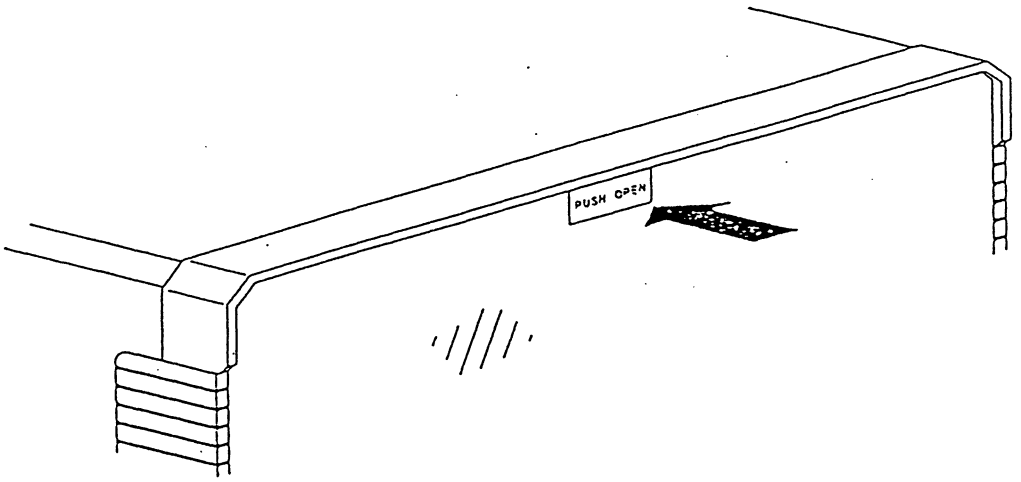


Fig. 8 – 5

CUATION
Opening angle of door is 90°C. If opens more or put the somthing on it, rotating section might be damaged.

8.3 Time axis compensation circuit (PGC : Pen Gap Compensation)

There is physically approx. 5mm distance between the each pen of EPR-3521/3531. Even if the same waveform is applied to each channel at the same time, it seems that time difference signal is applied from the chart paper as shown in Fig. 8-6
Therefore, when the phenomenon is analyzed from the recording result, it is necessary to check the mutual relationship of recorded waveforms, always considering the approx. 5 mm distance exists between channels.
PGC resolves this trouble and changes the recording of Fig. 8-6 to Fig. 8-7 , permitting understanding of mutual relationship of each waveform at a glance.

Time axis compensation function of EPR-3500 series provides data overflowing function with the PGC board loaded.
Conventionally, when the chart feed stops and measurement ends , the channel during time axis compensation stops at that time.
With this overflowing function, measured data of time axis compensated channel is overflowed at the approx. 300mm/min. speed when the chart speed stops. Important data can be recorded to the end without any loss.

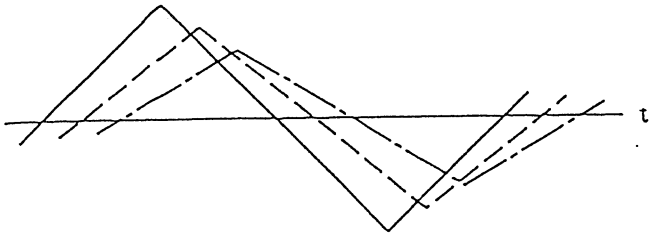


Fig. 8-6

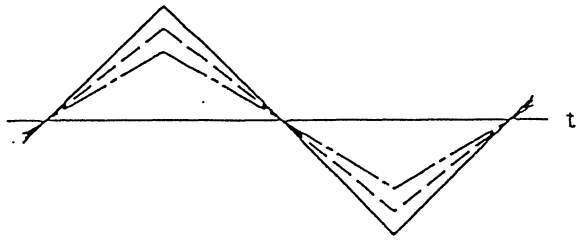


Fig. 8-7

	2-PEN	3-PEN
Required number of PGC-3000	1	2

8.4 Simultaneous drive of dip marker

Refer to item 3-4-6 REMOTE.

8.5 Ni-cd cell pack (with recharging circuit)

This is a Ni-cd cell pack for this recorder only. It is small size , light weight and ecomically superior 2nd dry cell, having capacity of 2800mmAH.
As to handling method, refer to item 3-2-4 Connection of Ni-cd cell.

8.6 Drip-proof vinyl cover

It protects the recorder itself and measuring recording data when the recorder is used in the bad environment such as in the rain (small rain), tunnel where water drips are dropped,etc. The recorder can be carried with the vinyl cover on. It is transparent vinyl with the zippers, so it is easy to open or close the front part and confirm the measured data easily.

8.6.1 Attachment of drip-proof vinyl cover

(1) While inserting the strap cover of vinyl cover to the arrow direction as shown in Fig. between the case of recorder and the strap , put the vinyl cover on the recorder.

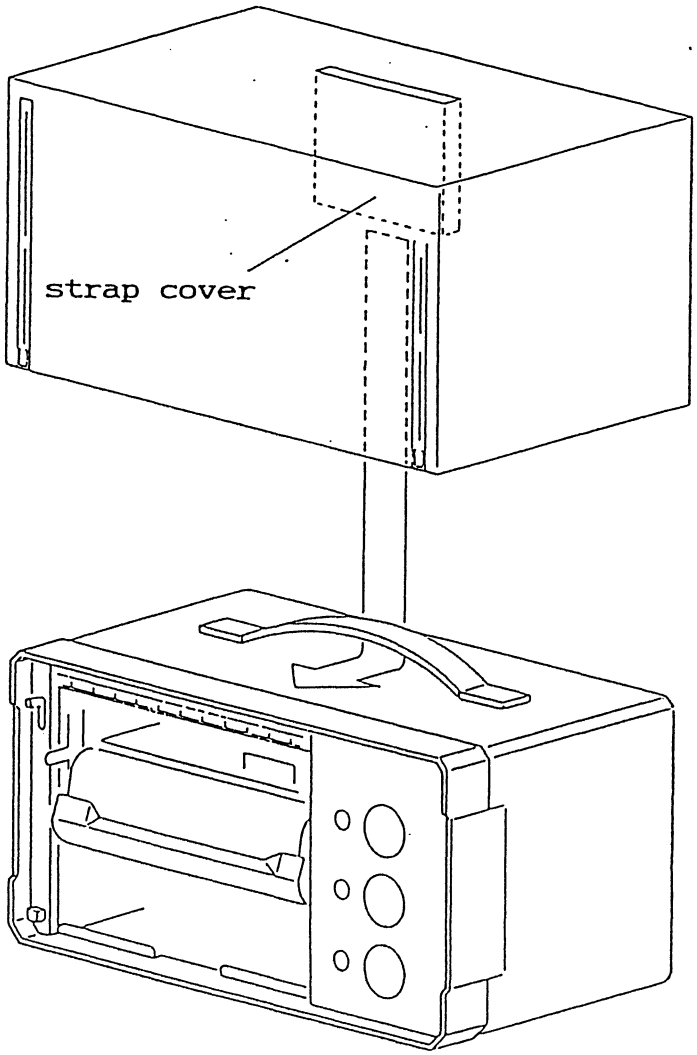
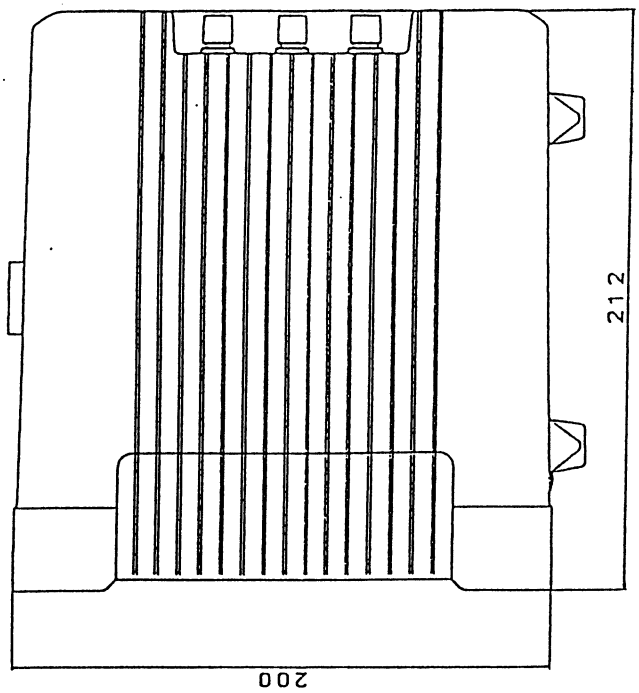
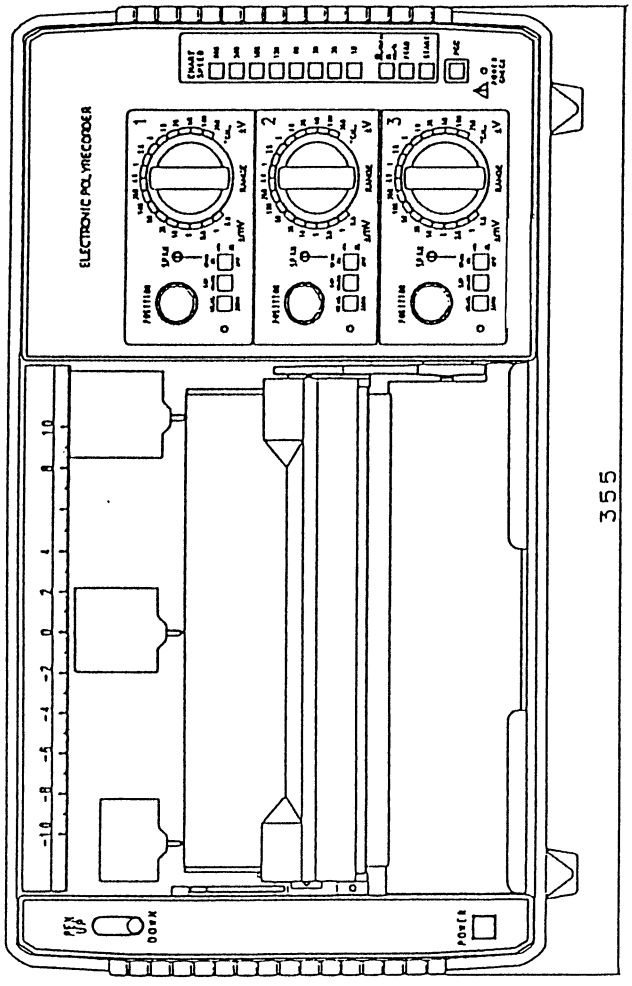
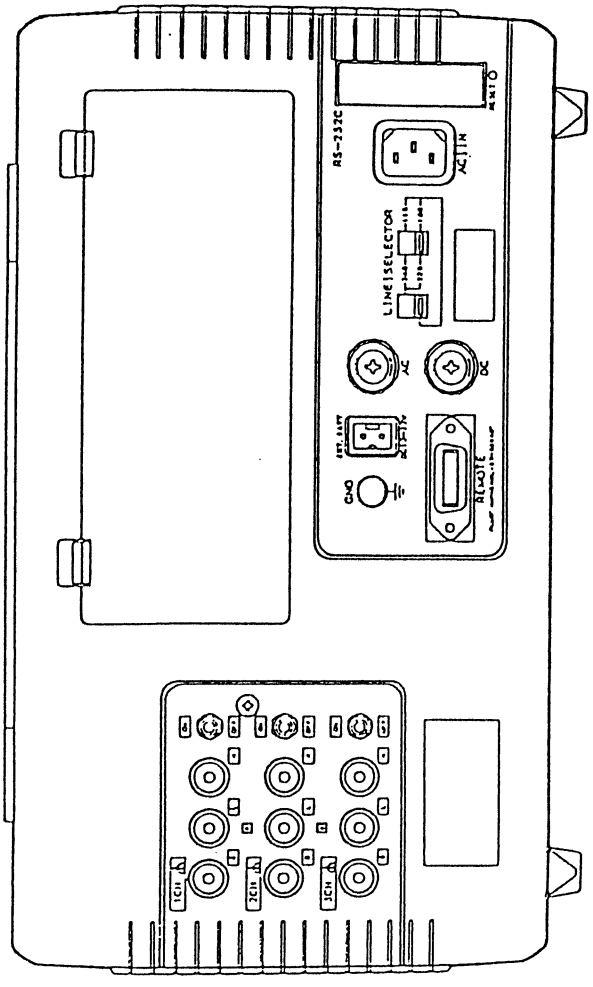


Fig. 8 - 8

9. External drawing (EPR-3500 SERIES)







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Instruction Manual

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