



**EH SERIES
PEN-WRITING TYPE
RECORDERS/RECORDING ALARMS**

EH800-01 • EH826-01 • EH836-01
EH100-01 • EH126-01 • EH136-01
EH200-01 • EH226-01 • EH236-01
EH300-01 • EH326-01 • EH336-01
FH□□□□ • GH□□□□□□

 **INSTRUCTIONS**

RECORDER

NovaLynx

MODEL300-8730-A

■ CONTENTS

1. GENERAL AND MODELS	1
2. NAMES AND FUNCTIONS OF COMPONENT PARTS	2~3
3. INSTALLATION	4
4. CONNECTIONS	5~8
5. LOADING METHOD OF CHART	9
6. SETTING OF CHART SPEED	10
7. LOADING METHOD OF RECORDING INK	11~12
8. MOUNTING METHOD OF CARTRIDGE PENS	13
9. OPERATION	14
10. CHECK AND MEINTENANCE	15~17
11. SCALE TEST	18
12. CALIBRATION	19
13. SIMPLIFIED SCALE CHECK	20
14. SCALE CHANGE	21
15. GENERAL SPECIFICATIONS	22
16. STANDARD SCALE	23

GENERAL AND MODELS

The EH series pen-writing type recorders/recording alarms cover the 1-pen, 2-pen, 3-pen recorders and the pen-writing type recording alarms having an alarm mechanism out of the EH series electronic recording/controlling alarms using a 180mm chart. The alarm mechanism is not attached to 1st pen of the 3-pen type instrument, but this 1st pen provides recording function only.

These EH series instruments comprise the following standard models according to the combinations of the number of recording points (number of pens), kinds of input signals and alarm system. Please read corresponding items in this instruction manual after confirming your instrument model described at the lower part inside the door and the right side panel of the chassis.

MODELS OF RECORDERS

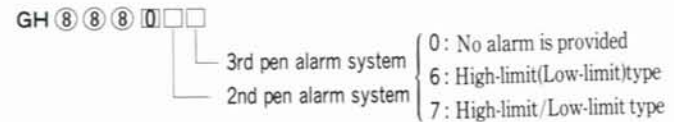
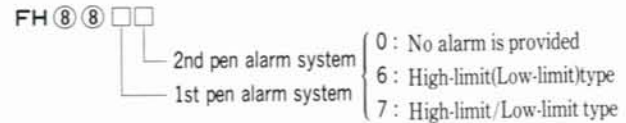
Model	Input signal			
	1st pen	2nd pen	3rd pen	
EH800-01	mV	None	None	
EH100-01	Thermocouple			
EH200-01	Resistance thermometer			
EH300-01	Thermistor			
FH8800	mV	mV	None	
FH8100		Thermocouple		
FH8200		Resistance thermometer		
FH8300		Thermistor		
FH1100		Thermocouple		
FH1200	Thermocouple	Resistance thermometer		
FH1300	Thermocouple	Thermistor		
FH2200	Resistance thermometer	Resistance thermometer		
FH2300		Thermistor		
FH3300	Thermistor	Thermistor		
GH888000	mV	mV	mV	
GH881000			Thermocouple	
GH882000			Resistance thermometer	
GH883000			Thermistor	
GH811000		Thermocouple	Thermocouple	
GH812000			Resistance thermometer	
GH813000			Thermistor	
GH822000		Resistance thermometer	Resistance thermometer	
GH823000			Thermistor	
GH833000		Thermistor	Thermistor	
GH111000		Thermocouple	Thermocouple	Thermocouple
GH112000				Resistance thermometer
GH113000				Thermistor
GH122000			Resistance thermometer	Resistance thermometer
GH123000				Thermistor
GH133000			Thermistor	Thermistor
GH222000	Resistance thermometer	Resistance thermometer	Resistance thermometer	
GH223000		Thermistor	Thermistor	
GH233000		Thermistor	Thermistor	
GH333000	Thermistor	Thermistor	Thermistor	

MODELS OF 1-PEN RECORDING ALARM

Model	Input signal	Alarm system
EH826-01	mV	High-limit or Low-limit type
EH126-01	Thermocouple	
EH226-01	Resistance thermometer	
EH326-01	Thermistor	High-limit/Low-limit type
EH836-01	mV	
EH136-01	Thermocouple	
EH236-01	Resistance thermometer	
EH336-01	Thermistor	

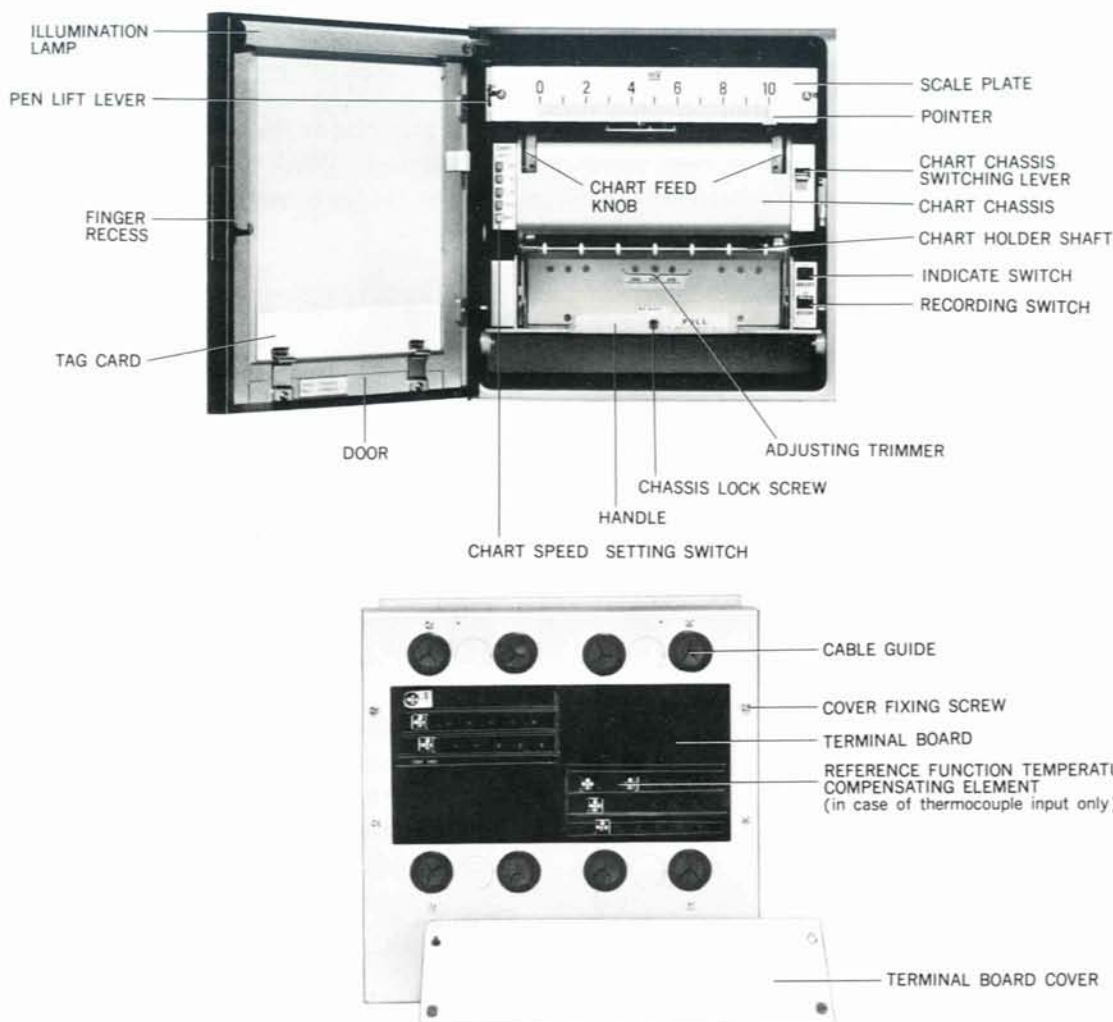
MODELS OF 2-PEN AND 3-PEN RECORDING ALARMS

For the models of 2-pen and 3-pen recording alarms, the lower significant 2 digits differ according to the alarm systems, and the combinations of input signals are the same as in recorders.



GH888000

■ NAMES AND FUNCTIONS OF COMPONENT PARTS

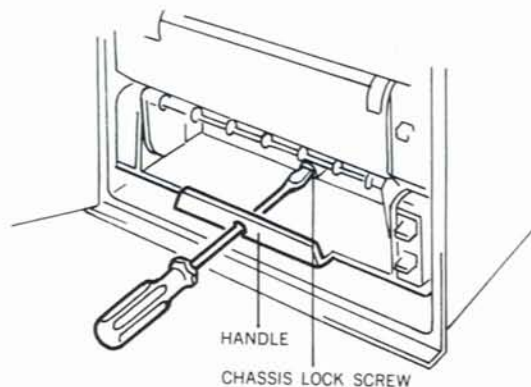


● HOW TO OPEN THE DOOR

The door can be opened by pulling it toward you by applying your fingers to the finger recess.

● HOW TO DRAW OUT THE CHASSIS

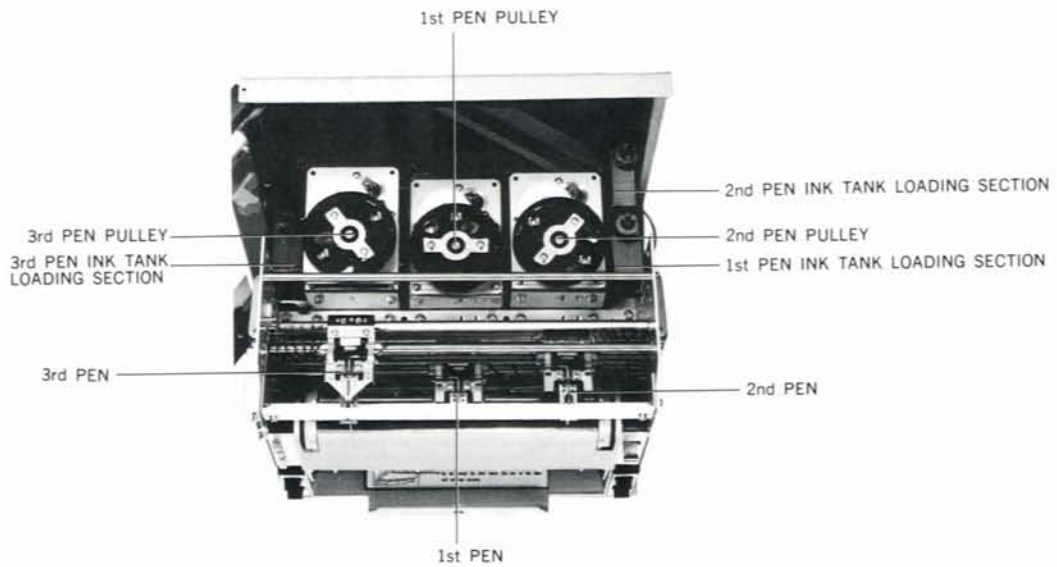
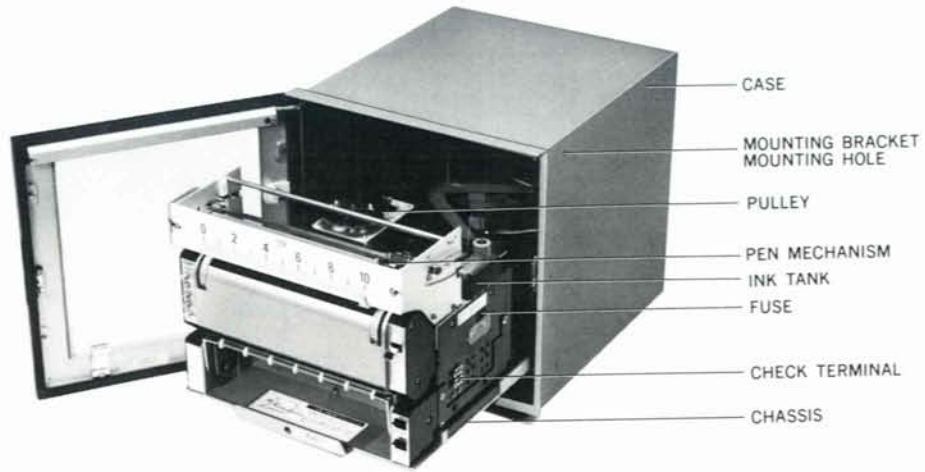
The chassis is fixed by the chassis lock screw to prevent the chassis from coming out during transportation. Loosen this screw using a \ominus screwdriver, and pull the handle toward you, and the chassis can be drawn out. Tighten this screw securely without fail when transporting the instrument again.



● HOW TO TAKE OUT THE CHASSIS

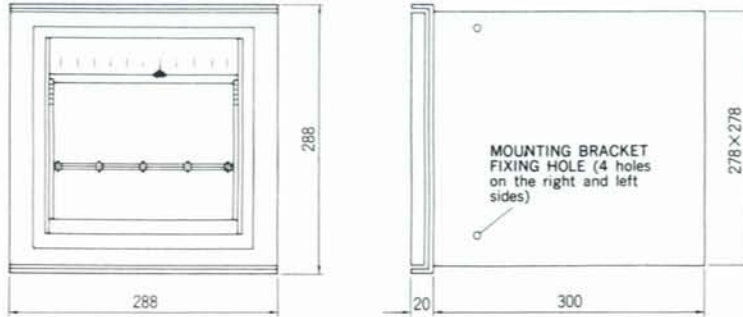
The chassis will not be drawn out of the case usually. Observe the following procedure when taking the chassis out of the case for maintenance and check.

- ① Draw out the chassis until it is stopped.
- ② Disconnect the connector after unscrewing the fixing screw of the case-chassis connecting connector by using a cross-recessed (+) screwdriver.
- ③ Depress the chassis stopper mounted at the lower left part of the chassis upward by fingers, and carefully take the chassis out of the case.

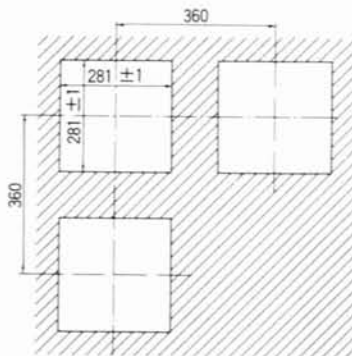


INSTALLATION

EXTERNAL DIMENSIONS

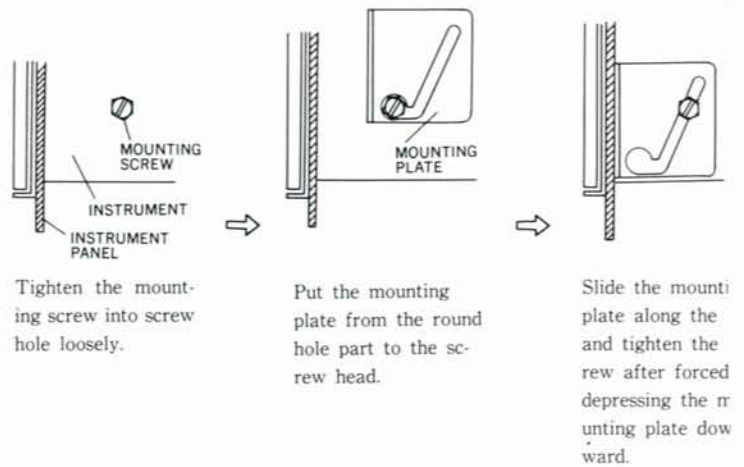


PANEL CUTOUT AND MOUNTING INTERVALS



Unit : mm

HOW TO FIX THE MOUNTING BRACKET



This instrument can be used as a desk-top type instrument. When mounting it on an instrument panel, observe the following procedure.

- ① Prepare a square panel cutout of $281 \pm 1 \text{ mm} \times 281 \pm 1 \text{ mm}$ on the instrument panel.
- ② If two or more instruments are mounted in series, separate their center lines at least 360 mm from each other.
- ③ Mount this instrument into the panel cutout.
- ④ Fasten attached mounting screws loosely into the mounting bracket mounting holes (two upper holes and two lower holes) on both sides of the case.
- ⑤ Put each attached mounting plate to the mounting screw head from the round hole part, and slide it along the slit.
- ⑥ Depress the mounting plates on both side panels forcibly downward, and fix them by a wrench or a screwdriver, while closely attaching them to the instrument panel.

- ⑦ Fix four mounting plates on both side panels, and the instrument is mounted on the instrument panel.

Caution 1

Identify the right and left mounting plates from each other, referring to the above figure when mounting them.

Caution 2

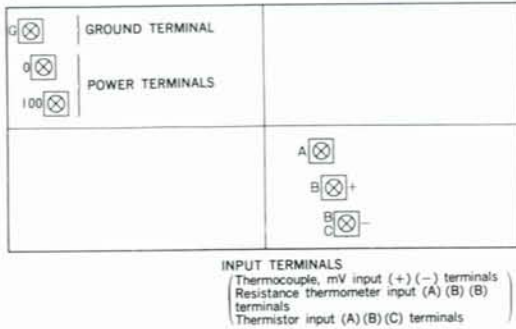
Do not mount the instrument at the following places.

- A dusty place or a corrosive gas atmosphere
- A place where ambient temperature is higher than 50°C or lower than $(-) 10^\circ\text{C}$
- A place where ambient temperature changes abruptly or a wet place
- A place near a strong power circuit or a place subjected to induction interferences
- A place subjected to mechanical vibrations and shocks
- A place subjected to strong winds, e.g. in front of a blast duct

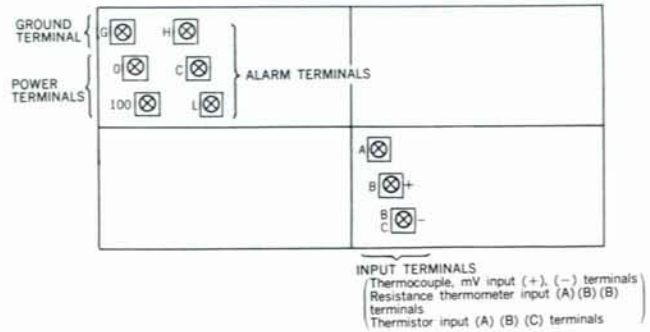
CONNECTIONS

● TERMINAL BOARD

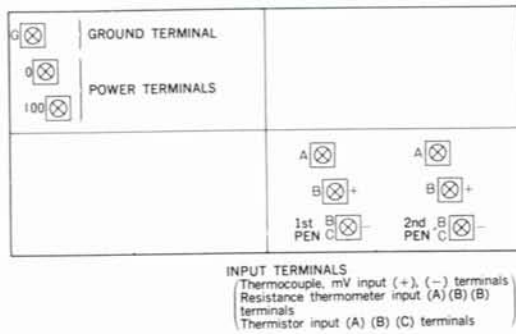
• 1-pen recorder



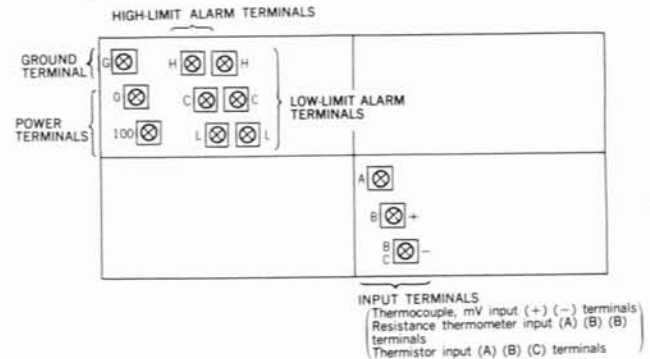
• 1-pen high-limit (low-limit) type recording alarm



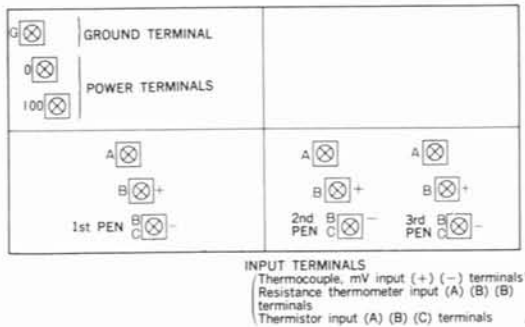
• 2-pen recorder



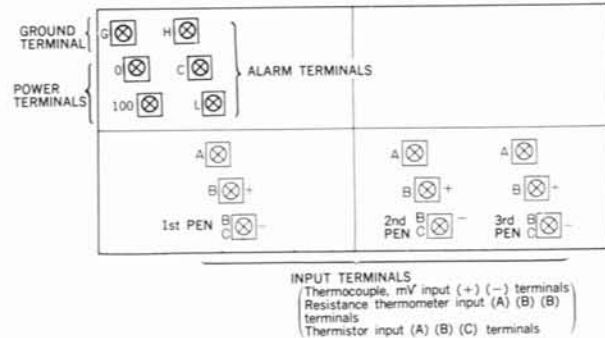
• 2-pen high-limit (low-limit) type recording alarm



• 3-pen recorder



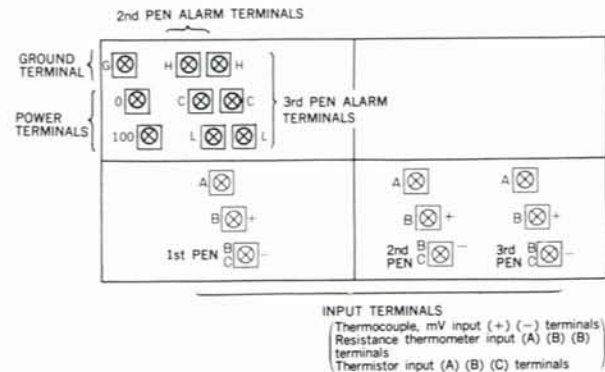
• 3-pen recording alarm (with an alarm mechanism combined)

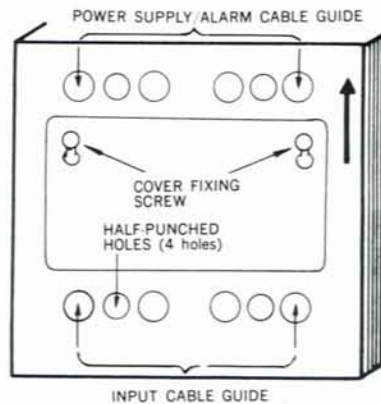


(Note)

The alarm terminals of the 2-pen recording alarm are equal to those of the 3-pen recording alarm. When two sets of alarm terminals are provided, left alarm terminals are used for 1st pen, while right ones are used for 2nd pen.

• 3-pen recording alarm (with two alarm mechanisms combined)





Connect cables to the power terminals, ground terminal and input terminals of this instrument. Connect cables to the alarm terminals in case of the recording alarm. The mounting layout of terminals on the terminal board differs according to the instrument models. Connect cables to corresponding terminals, referring to the terminal board diagram.

① Set the INDICATE and RECORD switches of this instrument to OFF (lower side) without fail before starting the connection work.

The INDICATE switches of the 2-pen and 3-pen instruments are arranged on the right and left sides of the chassis.

Turn OFF these INDICATE switches, respectively.

② Loosen two cover setscrews of the rear panel of the case using a cross-recessed ⊕ screwdriver, and remove the terminal board cover.

③ Lead connecting cables into the instrument through the cable guide, while separating the power cable and input cable from each other.

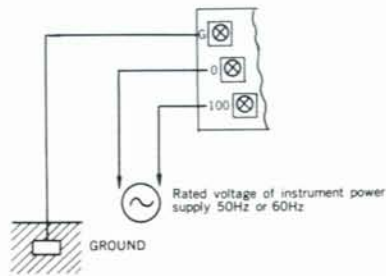
④ After connections, mount the terminal board cover without fail.

《 Cautions 》

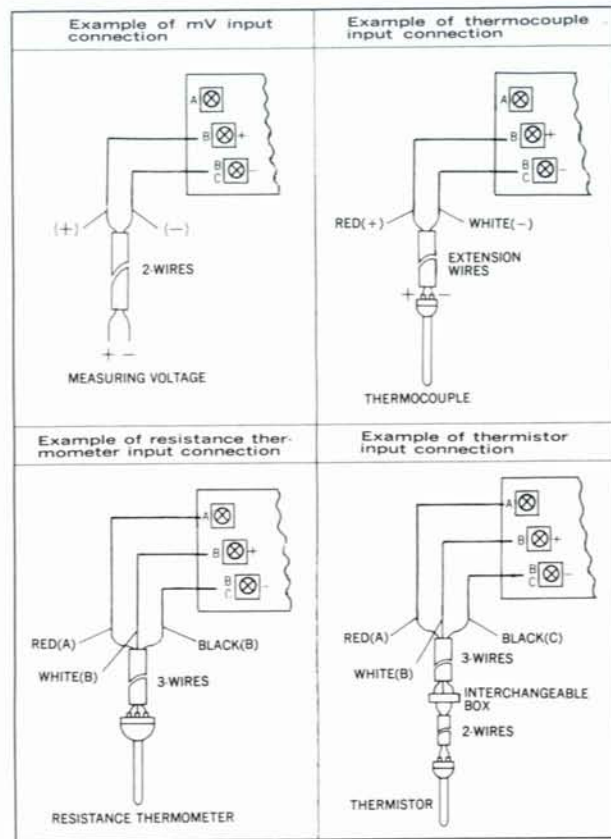
Be careful with the following items during connections.

- If the input circuit wiring is parallel to or intersects a high voltage circuit, separate the former from the latter more than 30cm.
- Separate the instrument power supply from the final control equipment power supply or the like whose voltage fluctuates abruptly.
- Solder conductors securely, and fasten terminals tightly.

● CONNECTIONS OF POWER TERMINALS AND GROUND TERMINAL



● CONNECTIONS OF INPUT TERMINALS



● CONNECTIONS OF POWER TERMINALS AND GROUNDING TERMINAL

Connect the specified power supply to the power terminals.

The power voltage of this instrument is 100, 110, 120, 130, 200, 220, 230, or 240V AC (100V, if not specified).

Use this instrument with the specified rated voltage and frequency without fail.

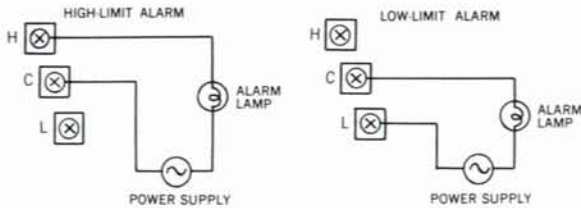
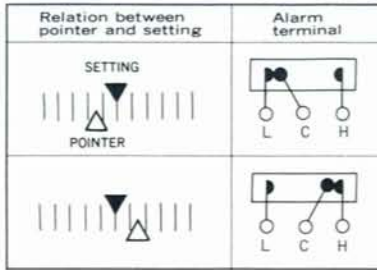
For grounding, solder a conductor to a copper plate, and bury the copper plate into a wet ground.

● CONNECTION OF INPUT TERMINALS

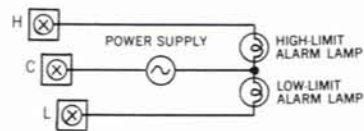
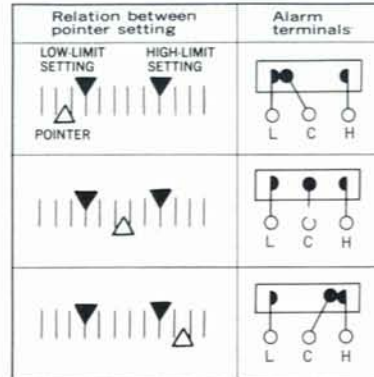
Connect a sensor to be combined with this instrument or wires to respective input terminals.

- mV—Connect to $\oplus \ominus$ terminals
- Thermocouple input—Connect to $\oplus \ominus$ terminals
- Resistance thermometer input—Connect to $\textcircled{A} \textcircled{B} \textcircled{B}$ terminals
- Thermistor input—Connect to $\textcircled{A} \textcircled{B} \textcircled{C}$ terminals

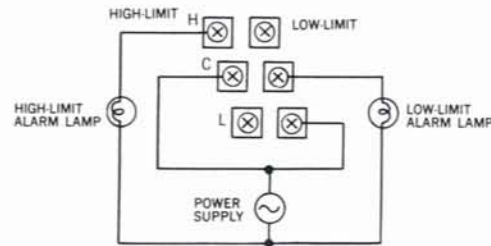
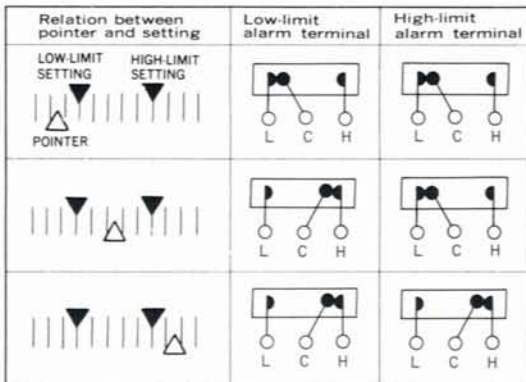
● EXAMPLE OF HIGH-LIMIT OR LOW-LIMIT TYPE ALARM ACTION AND CONNECTIONS



● EXAMPLE OF 2-PEN (3-pen) HIGH-LIMIT/LOW-LIMIT TYPE ALARM ACTION AND CONNECTIONS



● EXAMPLE OF 1-PEN HIGH-LIMIT/LOW-LIMIT TYPE ALARM ACTION AND CONNECTIONS



● CONNECTIONS OF ALARM TERMINALS

(In case of recording alarm only)

· High-limit or Low-limit type recording alarm

A no-voltage on-off contact signal is outputted across alarm terminals (H)-(C) and across alarm terminals (L)-(C) as illustrated above.

Connect an alarm device, such as a lamp, or a buzzer as illustrated above.

If the 2-pen or 3-pen recording alarm is provided with two sets of alarm mechanism, connect an alarm device to the alarm terminals of respective alarm mechanisms.

· 1-pen high-limit/low-limit type recording alarm

A no-voltage on-off contact signal is outputted across the high-limit alarm terminals (H)-(C)-(L), and also

across low-limit alarm terminals (H)-(C)-(L) as illustrated above. Connect an alarm device, such as a lamp, or a buzzer as illustrated above.

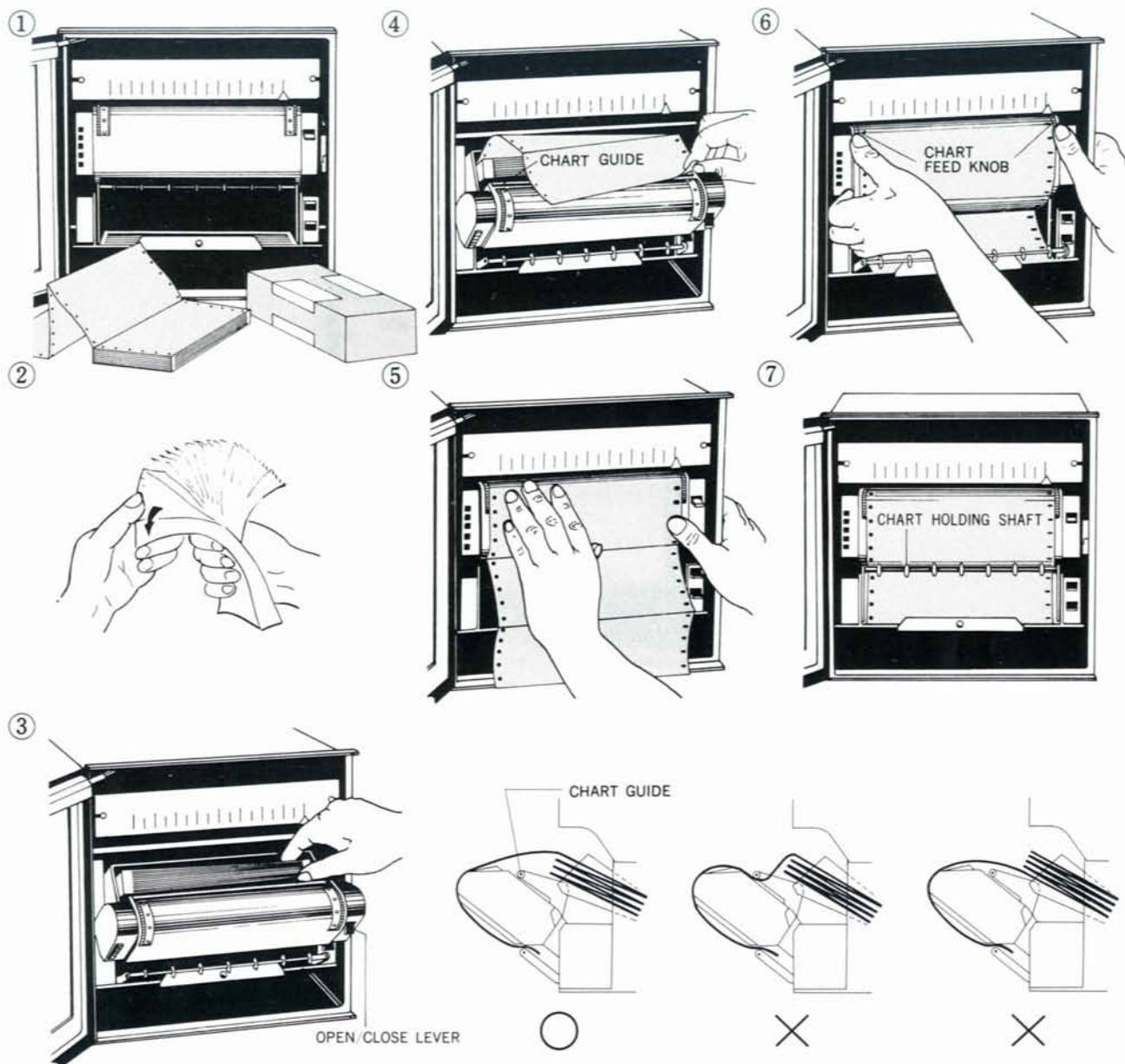
· 2-pen and 3-pen High-limit/Low-limit type recording alarm

A no-voltage on-off contact signal is outputted across alarm terminals (H)-(C)-(L) as illustrated above.

Connect an alarm device, such as a lamp, or a buzzer as illustrated above.

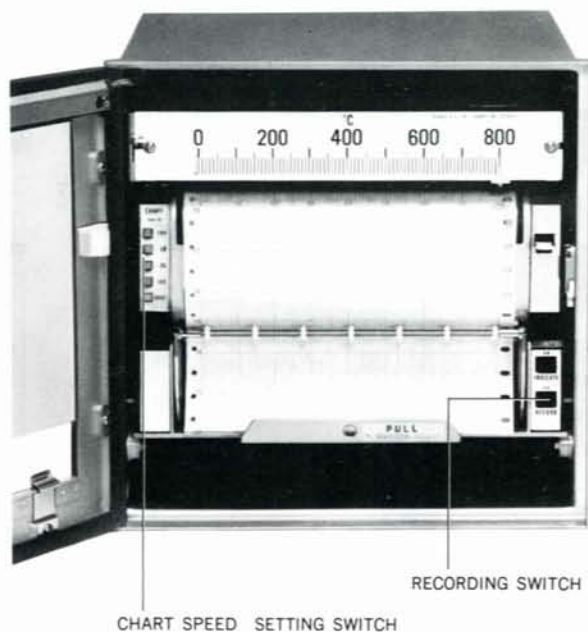
If the 2-pen or 3-pen recording alarm is provided with two sets of alarm terminals, connect an alarm device to the alarm terminals of respective alarm terminals. 1st pen of the 3-pen instrument is used for recording only.

LOADING METHOD OF THE CHART



- ① Prepare the chart from the accessory box. The scale characteristic of thermocouple and resistance thermometer input comprises linear scale and non-linear scale. Prepare a chart conforming to the scale characteristic.
- ② In order to prevent a double feed of charts, hold one end of charts and shuffle them sufficiently by oscillating them laterally. Shuffle the other end, too.
- ③ Unlock the chart chassis open/close lever by lifting it with fingers, tilt down the chassis toward you, and put the chart into the loading section at the innermost of the chassis with the start of the chart (printed character side) facing upward (so that the circular chart feed holes are positioned on the left side, and oblong holes are positioned on the right side).

- ④ Draw out the chart (Do not pass it through the position below the chart guide).
- ⑤ Set the feed holes on both sides of the chart to the sprocket, and reset the tilted chassis as before.
- ⑥ Draw out the chart about 30cm by turning the chart feed knob toward you under a tilted condition of the chart holder shaft, and fold it on the chart receiving base.
- ⑦ Reset the tilted chart holder shaft, and the chart has been set properly. The chart can be continuously recorded at a feed rate of 25mm/h for about one month. The residual amount of the chart is indicated by a red numeric at the right end of the chart. When the chart comes to an end, the end mark appears at the right end of the chart. Prepare new chart.



● SETTING OF CHART SPEED

For chart speed setting, switches are mounted at the front left end inside the door.

The chart speed is selectable in 4 steps to 12.5, 25, 50, and 100mm/H by these four switches.

Also, the chart can be fed rapidly by using the FAST switch.

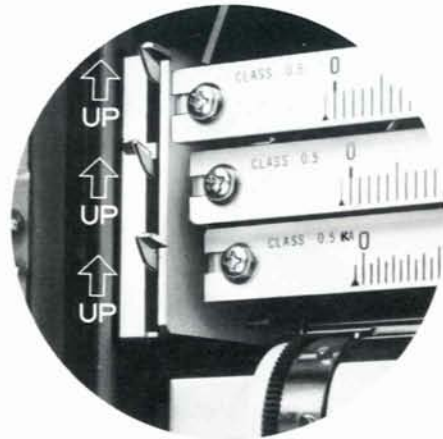
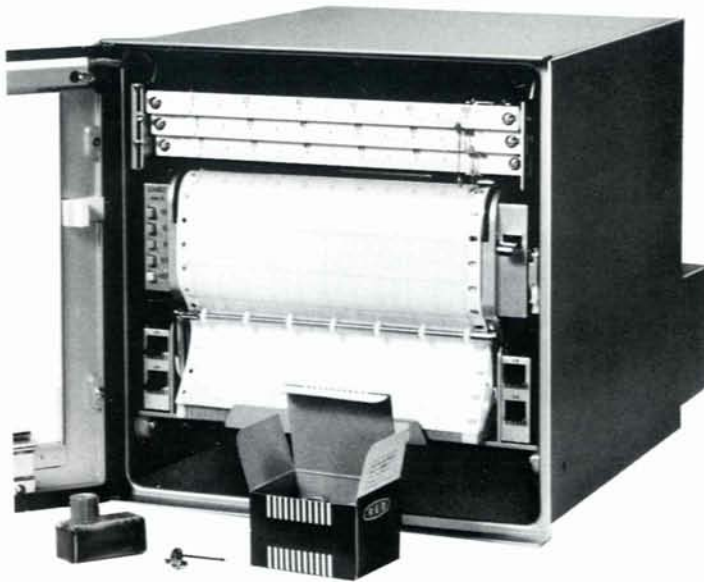
- ① Set the desired chart speed by depressing one of the four switches.
- ② The chart is fed at the set speed by turning ON the RECORD switch.

- ③ If it is desired to set the start point of recording to a chart scale, set it to the chart scale by depressing the FAST switch.

For manual feeding of the chart, turn the chart feed knob mounted near the sprocket by hand.

- ④ For stopping the chart feed, turn OFF the RECORD switch.

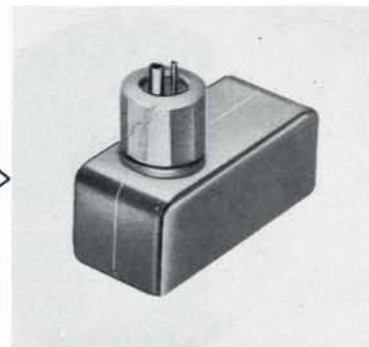
LOADING METHOD OF RECORDING INK



Prepare the ink tank and tube connector for each pen.



After removing the cover from the ink tank, remove the intermediate cover, and put the tube connector instead.



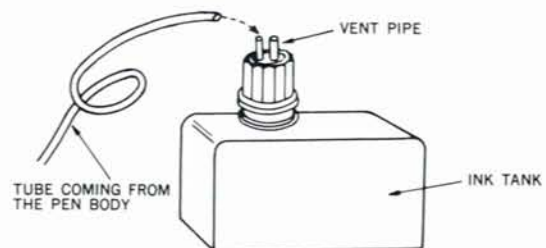
Put cover.

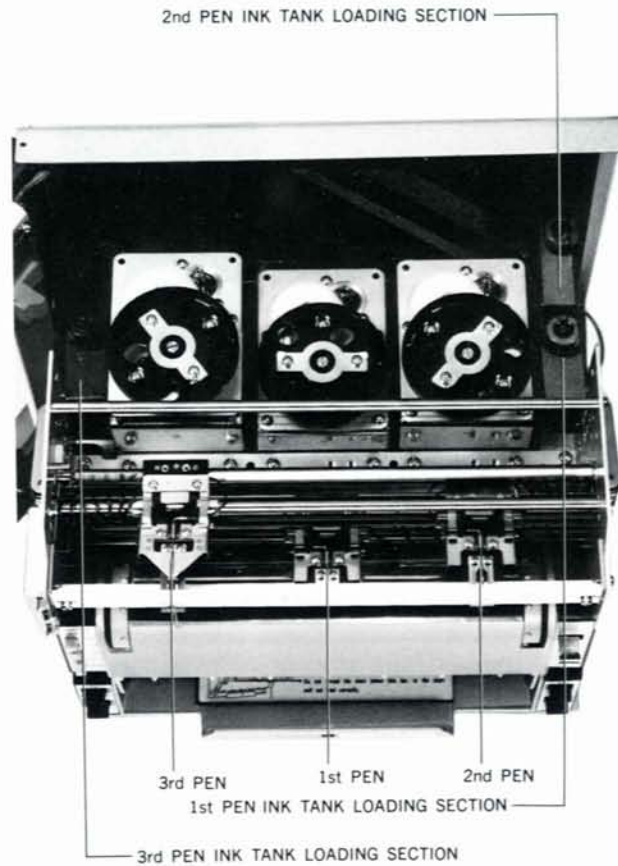
- ① Prepare the recording ink (ink tank) and tube connector from the accessory box.
1st, 2nd, and 3rd recording pens are mounted as viewed from the innermost, and the ink colors of these pens are as shown below.

Instruments	Ink colors
1-pen instrument	Red
2-pen instrument	1st pen : Red, 2nd pen : Green
3-pen instrument	1st pen : Red, 2nd pen : Green, 3rd pen : Blue

- ② Draw the chassis out of the case. If the chassis lock screw is tightened, loosen this screw using a (-) screwdriver.
③ Lift the pen lift lever of each pen to lift all pens from the chart.

- ④ After removing the cover and intermediate cover of the ink tank of each pen, put the tube connector instead, and put the cover.
⑤ Connect the tube coming from 1st pen body to the thinner metal pipe of the red ink tank.



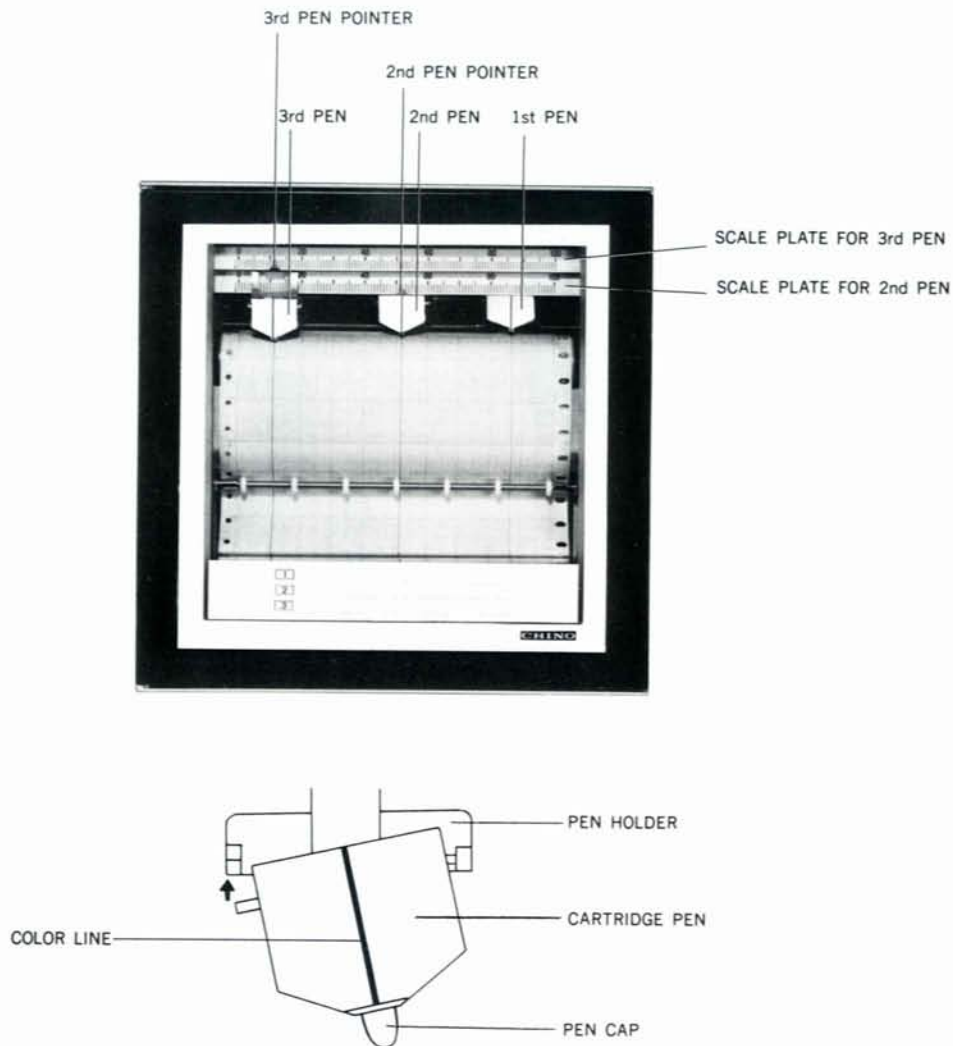


- ⑥ Lift the red ink tank, and depress the tank by the thumb and the middle finger slowly, while holding the vent pipe by the forefinger.
- ⑦ When ink overflows the 1st pen tip slightly, release the forefinger, and stop depressing the tank.
- ⑧ Mount the ink tank into the 1st pen ink tank loading section. Now, 1st pen recording ink has been set.
- ⑨ In case of multipen instruments, set 2nd pen (green) and 3rd pen (blue) recording ink according to the same procedure as specified in ⑤~⑧.
- ⑩ Reset the chassis as before and the recording ink has been set completely.
It is not necessary to tighten the chassis lock screw, except when relocating the instrument again.

《 Caution 》

If recording is interrupted for a long time, lift the pen lift to lift the pen from the chart to prevent the chart from being stained with blur or ink.
To prevent the adhesion of the pen tip ink, suck ink from the pen tube into the ink tank.

■ MOUNTING METHOD OF CARTRIDGE PENS (options)



- ① Prepare the cartridge pens from the accessory box. Each cartridge pen is made of plastic and marked with an ink color mark on the front face. 1st pen of the 3-pen instrument shares the scale plate with 2nd pen.
- ② 1st pen, 2nd pen and 3rd pen are arranged as viewed from the innermost. Ink colors of these pens are as shown below.

Instruments	Ink colors
1-pen instrument	Red
2-pen instrument	1st pen : Red, 2nd pen : Green
3-pen instrument	1st pen : Red, 2nd pen : Green, 3rd pen : Blue

- ③ Lift the pen lift lever of each pen, insert the protrusion on the right side of the cartridge pen into the pen holder hole with its color line mark facing forward as illustrated above, and mount the cartridge pen to the pen holder by turning it clockwise.
- ④ Remove the pen cap and the cartridge pen has been mounted.
- ⑤ For removing the pen from the pen holder, turn the pen counter-clockwise, while twisting its left protrusion downward, and the cartridge pen is easily removable.
- ⑥ If the pen is not used for a long time, remove the cartridge pen and mount the pen cap without fail to prevent the dryness at the pen tip and prolong the ink life.
- ⑦ The recording ink consumption more or less differs according to the working conditions. It lasts about 600m~1000m in continuous recording.

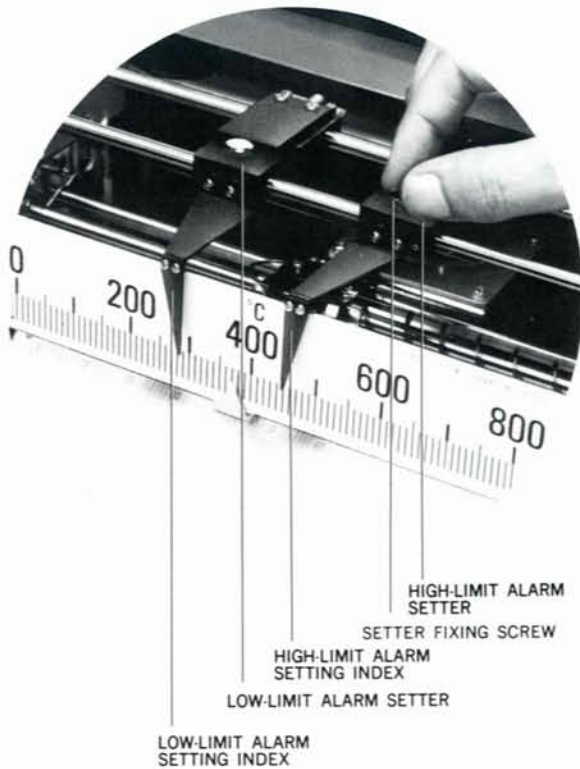
《 Caution 》

- Since the pen tip is made of nylon fiber, don't break it by depressing it forcibly.
- It is possible that ink does not come out of new cartridge pen smoothly. In such a case, lightly rub the pen tip on the paper by holding the pen by hand.

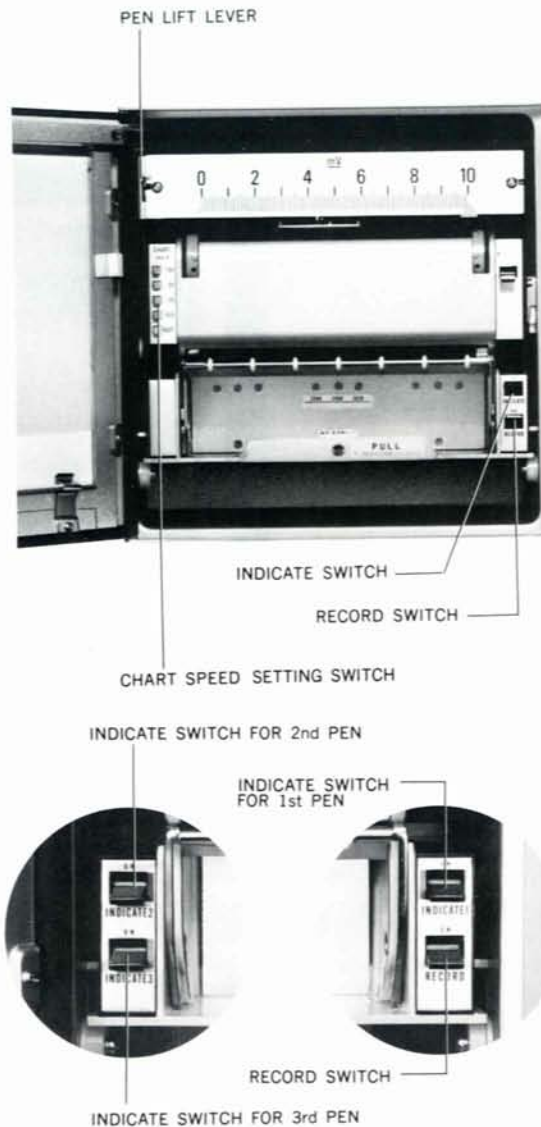
OPERATION

● SETTING OF ALARM POINT

(in case of recording alarm only)



● OPERATION



● SETTING OF ALARM POINT

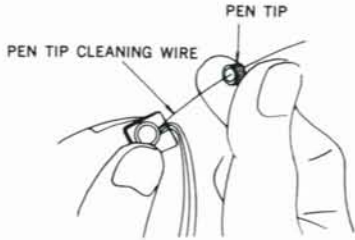
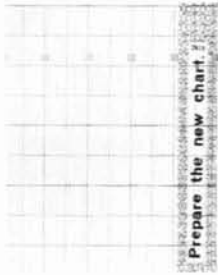
(in case of recording alarm only)

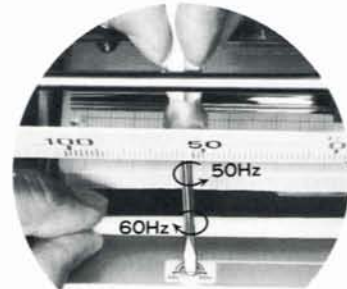
- ① Draw out the chassis.
- ② Loosen the fixing screw of the alarm setter by turning it counterclockwise with fingers.
- ③ Relocate the alarm setter leftward or rightward by holding the fixing screw with fingers, and set the setting index to a desired scale on the scale plate. The set point on the scale plate serves as an alarm point.
- ④ After setting, tighten the fixing screw securely.
- ⑤ The high-limit/low-limit recording alarm has two alarm setters for low-limit and high-limit. Set two setters.
- ⑥ If the alarm mechanism is added to both 1st pen and 2nd pen in the 2-pen (3-pen) recording alarm (to both 2nd pen and 3rd pen in case of 3-pen recording alarm), set respective alarm points.

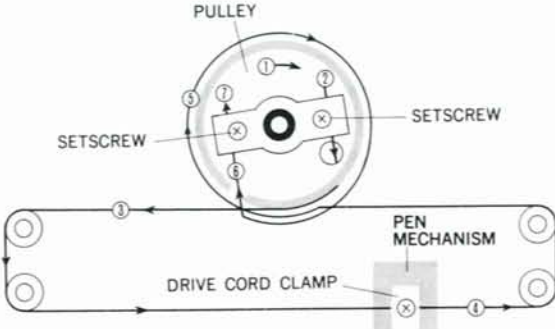
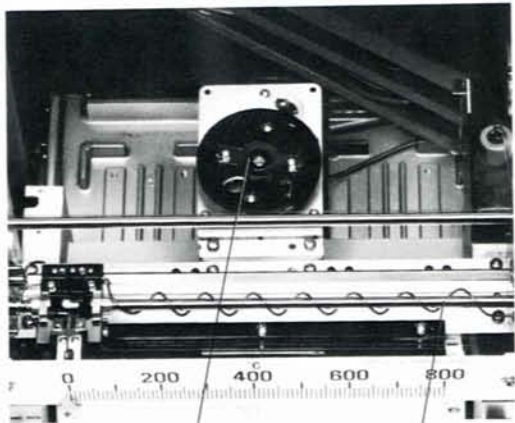
● OPERATION

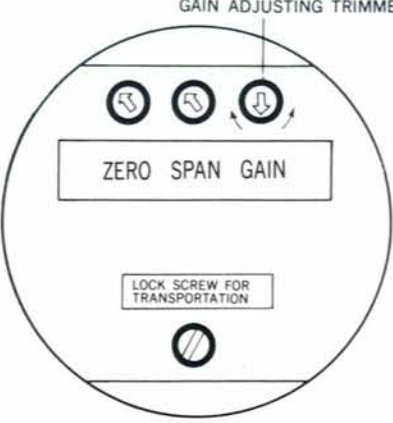

- ① Turn ON the INDICATE switch by setting it upward. The pointer will move with the illumination lamp lit. Turn on respective INDICATE switches in case of the 2-pen and 3-pen instruments.
- ② Lower the pen lift lever of each pen, and put the recording pen onto the chart slowly.
- ③ Set the chart speed setting switch to the desired speed.
- ④ Turn ON the RECORD switch by setting it upward. The instrument is placed to the operating condition, and the chart starts feeding.

■ CHECK AND MAINTENANCE

Check and maintenance items	Remedy
Replacement of ink tank	<p>The recording ink consumption more or less differs according to the working conditions. It lasts about one month in continuous recording.</p> <p>When the ink has run short, replace the ink tank with new one, referring to the loading method of recording ink on page 11~12.</p>
Cleaning of pen tip	<p>Since ink becomes dry, it is possible that the pen tip is clogged with ink during the long-time interruption of recording.</p> <p>When the pen tip has been clogged, remove the pen body by turning the pen tip counter-clockwise, immerse the pen tip into hot water, and clean it with the attached cleaning wire.</p> 
Replacement of pen tip	<p>If the recording line becomes thick or obscure due to the wear of the pen tip, replace the pen tip with new one.</p>
Replacement of cartridge pen (option)	<ul style="list-style-type: none"> · The recording ink consumption more or less differs according to the working conditions, and it can record about 1km in continuous recording. When the ink color been light, replace the cartridge pen with new one, referring to the mounting method of the cartridge pen on page 12. · The storage period of the cartridge pen is about one year. Use it, while it is still new. · When the pen tip has become dry, it cannot write any longer. Mount the pen cap after use.
Replacement of chart	<p>The chart can be used for about 1 month when the instrument is continuously operated at the chart speed of 25mm/h.</p> <p>When the chart comes to an end, the end mark appears on the right end of the chart.</p> <p>Replace the chart with spare chart, referring to the "loading method of chart" on page 9.</p> 

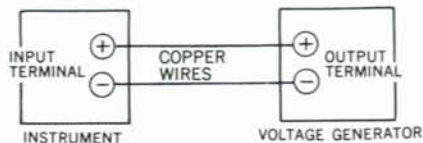


Check and maintenance items	Remedy
<p>Replacement of drive cord Lubrication</p>	<p>After removing old (or cut) drive cord, replace it with new one according to the following procedure. Be careful with kink or scar due to the distortion during replacement.</p>  <ol style="list-style-type: none"> ① Turn the pulley fully clockwise. ② Fix one end of the drive cord by setscrew ② in the figure. ③ Pull the drive cord from ③ to ④ through the lower part of the pulley groove after passing the pulley hole. ④ Stretch the pulley cord around the pulley by one turn through the drive cord clamp of the pen body as shown in the figure ⑤. Keep the drive cord clamp loosened. ⑤ Pass the drive cord to ⑥ → ⑦ from the upper side of the pulley groove. ⑥ Fix the drive cord by setscrew ⑦ while pulling it, so that it is stretched to about 500 ~600g without looseness. ⑦ Turn the pulley fully counterclockwise by one turn. ⑧ Shift the pen body leftward to set the pointer to the triangle mark (▲) at the left end of the scale plate. ⑨ Fix the drive cord by fastening the drive cord setscrews of the pen body. Now, the drive cord has been set properly. Make sure that the pointer is set to triangle mark (▲).
<p>Lubrication</p>	<p>Lubricate the mechanical parts periodically once every 6 months or so in order to prevent wear of mechanical parts and maintain the instrument under a good operating condition.</p> <ol style="list-style-type: none"> ① Remove dust and dirt from the parts to be lubricated before lubricating them. Fully clean the pen body shaft, in particular. ② Use the attached lubricating oil after opening the tip of its vessel. ③ Supply oil to such an extent as it does not drip, and wipe off surplus oil. ④ Parts to be lubricated <ul style="list-style-type: none"> · Pen shaft (After lubrication, wipe off oil sufficiently) · Servo mechanism gear and bearing · Other slide parts  <p>GEAR AND BEARING OF SERVO MECHANISM PEN BODY SHAFT</p>

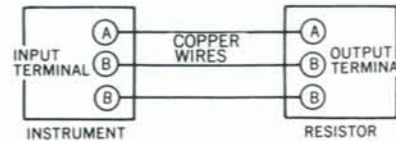
Check and maintenance items	Remedy
<p>Gain adjustment</p>	<p>If the pointer moves dull or the pointer oscillates and remains unstable during balancing due to a change of the indicating amplifier gain, adjust the gain by turning the GAIN adjusting trimmer on the front panel of the chassis. The gain increases when turning the GAIN trimmer clockwise.</p> <p>《 Caution 》 For moving the pointer, connect an input to check terminals, or move it by holding the pulley. Never move the pointer forcedly by holding it by hand when checking the operating condition of the pointer.</p> 
<p>Replacement of fuse</p>	<p>If the fuse was blown out, draw out the chassis, and remove the fuse cover mounted on the right side panel of the chassis.</p> <p>Replace the blown out fuse with new 1A cartridge fuse.</p> 

SCALE TEST

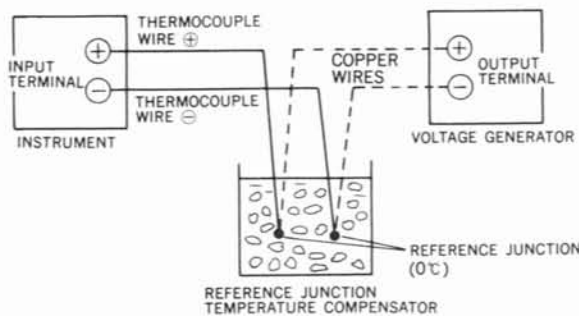
● CONNECTIONS OF mV INPUT



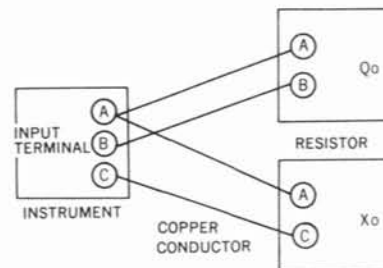
● CONNECTION OF RESISTANCE THERMOMETER INPUT



● CONNECTION OF THERMOCOUPLE INPUT



● CONNECTION OF THERMISTOR INPUT



● PREPARATION

The scale testing method differs according to the kinds of input signals.

Please read corresponding item.

In case of multipen instruments, test the scale every pen.

① Preparation of tools

· In case of mV input

Prepare a DC standard voltage generator.

· In case of thermocouple input

Prepare a DC standard voltage generator, a reference junction temperature compensator, and a testing thermocouple.

· In case of resistance thermometer

Prepare a precision variable resistor (variable up to 3 digits above decimal point and 2 digits below decimal point. Unit : Ω)

· In case of thermistor input

Prepare two precision variable resistors (For Q_0 —variable up to 3 digits above decimal point and 2 digits below decimal point For X_0 —variable up to 4 digits above decimal point and 1 digit below decimal point. Unit : Ω)

② Turn OFF the INDICATE switch and RECORD switch of this instrument, and connect lead wires to corresponding input terminals at which the scale test is done.

③ Turn ON the corresponding INDICATE switch.

● SCALE TEST

Wait for longer than 15 minutes after turning ON the INDICATE switch, before testing the scale.

- ① Set the DC standard voltage generator or precision variable resistor to the input value corresponding to the scale to be tested.
- ② Read the indicating value. The instrument is normal when error is within the specified value. The indicating accuracy of this instrument is $\pm 0.25\%$ in case of mV input and $\pm 0.5\%$ in other cases.
- ③ Test the scales at least 3 points (both end and center of the scale). It is desirable to test the scale at 5 or more points at almost equal intervals.
- ④ If the accuracy exceeds the specified range as a result of this scale test, calibrate the scale, referring to the calibration on page 19.

< Cautions >

- In case of a thermocouple input, confirm that the reference junction temperature is at 0°C by using a mercury thermometer. If you use an electronic reference junction temperature compensator, refer to an instruction manual of the compensator.
- In case of a resistance thermometer input, use the same three wires in length and diameter.

CALIBRATION

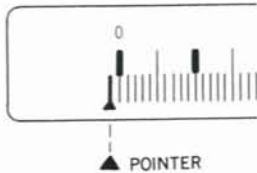
If the indicating accuracy exceeds the specified range as a result of the scale test and the instrument requires the calibration, observe the following procedure.

(1) CONFIRMATION OF TRIANGULAR MARK (▲)

- ① Turn OFF the INDICATE switch.
- ② After drawing out the chassis, shift the pointer to the minimum scale line by turning the pen pulley (with which the scale test is done) counterclockwise by hand.

In case of the pulleys of the multipen instrument, the center pulley is used for 1st pen, the right pulley is used for 2nd pen, and the left pulley is used for 3rd pen.

- ③ Mark sure that the pointer indicates mark (▲) when turning the pulley until it is stopped by the stopper.



- ④ If the pointer does not indicate mark (▲), loosen the drive cord clamp of the pen mechanism, and set the pointer to mark (▲) correctly.
- ⑤ Tighten the clamp, and reset the chassis as before. Now, mark (▲) has been confirmed.

- (2) More than 15 minutes after turning ON the INDICATE switch, adjust the ZERO adjusting trimmer and SPAN adjusting trimmer mounted on the front panel of the chassis. Unload the chart during calibration. The center trimmer of the multipen instrument adjusting trimmers is used for 1st pen, the right trimmer is used for 2nd pen, and the left trimmer is used for 3rd pen.

(3) UPPER LIMIT ADJUSTMENT

Turn clockwise the adjusting trimmer for preventing pointer from reading off-scale.

Lower limit :

Turn counterclockwise the adjusting trimmer for preventing pointer from reading off-scale.

(4) ZERO-POINT ADJUSTMENT

- ① In case of thermocouple type (with CJ)
By feeding an input whose value corresponds to the minimum scale reading, adjust the zero-point using the adjusting trimmer VR3 of pre-amplifier.
- ② In case of mV type and thermocouple type (without CJ)
By feeding an input whose value corresponds to the minimum scale reading, calibrate the scale using the zero-point adjusting trimmer of servoamplifier.

(5) SPAN ADJUSTMENT

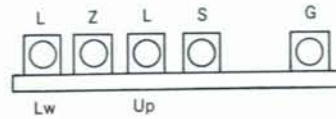
By feeding an input whose value corresponds to the maximum scale reading, calibrate the scale using the span adjusting trimmer of servoamplifier.

Accuracy of indication :

mV input : $\pm 0.25\%$

Thermocouple input : $\pm 0.5\%$

● POSITION OF SERVOAMPLIFIER TRIMMER



Z : Zero-point adjusting trimmer

S : Span adjusting trimmer

L : Adjusting trimmer for preventing pointer from reading off-scale

Up : Upper limit

Lw : Lower limit

G : Gain adjusting trimmer

● POSITION OF PRE-AMPLIFIER TRIMMER



VR3 : Zero-point adjusting trimmer
(with CJ)

(6) ADJUSTMENT OF ADJUSTING TRIMMER FOR PREVENTING POINTER FROM READING OFF-SCALE

● UPPER LIMIT :

By feeding an input whose value is about 5% greater than the corresponding maximum scale reading adjust the adjusting trimmer for prevention of reading off-scale so that the pointer indicates the middle point between the maximum scale reading and the mechanical stopper.

● LOWER LIMIT :

By feeding an input whose value is about 5% smaller than the corresponding minimum scale reading adjust the adjusting trimmer for prevention of reading off-scale so that the pointer indicates the middle point between the minimum scale reading and the mechanical stopper.

● LOWER LIMIT : (applied up to Serial No. EH3Z)

By feeding an input whose value is about 5% smaller than the corresponding minimum scale reading make sure the pointer indicates a point whose value is smaller than the minimum reading of the scale and moreover it does not hit against the mechanical stopper.

< Caution >

Test and calibrate the scale under the following standard conditions as much as possible.

Room temperature : $23 \pm 2^\circ\text{C}$

Humidity : $55 \pm 10\%$ RH

Power supply : Rated voltage $\pm 2\%$

GENERAL SPECIFICATIONS

INPUT SIGNAL	: mV —
	Minimum 3mV DC span } Maximum 500mV DC span } Minimum 1mV DC span } * Maximum 3mV DC span } * Minimum 500mV DC span } * Maximum 100V DC span } *
Thermocouple	—
	K, E, J, T : Minimum 100°C span. R : Minimum 450°C span B : Minimum 1000°C span S : Minimum 500°C span
Resistance thermometer	—
	Minimum 30°C span (pt 100 Ω)
Thermistor	—
	~250°C : minimum 30°C span 250~300°C : minimum 40°C span
SCALE LENGTH	: 180mm
INDICATING ACCURACY	: mV input — ±0.25% of input span Thermocouple, resistance thermometer, thermistor input — ±0.5% of input span
DEAD BAND	: 0.1% of input span
BALANCING TIME	: About 2.0sec (50Hz) or about 1.6sec (60Hz) for full scale
CHART	: Fanfold chart — Effective recording with 180mm (total width 200mm) Total length : 20m
NO. OF RECORDING POINTS	: 1-pen, 2-pen and 3-pen (3 kinds)
RECORDING SYSTEM	: Continuous recording with ink pen or cartridge pen* 1st pen : Red, 2nd pen : Green, 3rd pen : Blue
CHART SPEED	: 12.5, 25, 50, 100mm/h and Fast
ALARM SYSTEM	: High-limit (Low-limit system High-limit/Low-limit) system (Common setting at each point)
SETTING ACCURACY	: ±0.5% of input span
ALARM DEAD BAND	: 0.6% of input span
CONTACT CAPACITY	: 100V AC 1A, 200V AC 0.5A
POWER SUPPLY	: 100, 110, 120, 130, 200, 220, 230, or 240V AC (100V, if not specified) 50/60Hz
ALLOWABLE VOLTAGE FLUCTUATION	: (+)10%~(-)10% of rated value
AMBIENT TEMPERATURE	: (-)10°C ~ (+)50°C
AMBIENT HUMIDITY	: 30~90% RH

*Option

ALLOWABLE SIGNAL SOURCE RESISTANCE	: mV input — 3mV ≤ span voltage ≤ 500mV — Lower than 10k Ω 1mV ≤ span voltage < 3mV — Lower than 10k Ω 500mV < span voltage ≤ 100V — Lower than 1k Ω Thermocouple input — Lower than 10k Ω (Lower than 150 Ω if burn-out function is provided) Resistance thermometer input — Lower than 10 Ω per wire
INPUT RESISTANCE	: mV input — 3mV ≤ span voltage ≤ 500mV — About 8M Ω 1mV ≤ span voltage < 3mV — About 8M Ω 500mV < span voltage ≤ 100V — About 1M Ω Thermocouple input — About 8M Ω
MAXIMUM COMMON MODE VOLTAGE	: 250V AC
COMMON MODE REJECTION RATIO	: More than 150dB
SERIES MODE REJECTION MODE	: More than 50dB
INSULATION RESISTANCE	: 500V DC, 20M Ω or more between measuring and ground terminals 1000V DC, 20M Ω or more between power and ground terminals 1000V DC, 20M Ω or more between measuring and power terminals
DIELECTRIC STRENGTH	: 500V AC, 1min between measuring and ground terminals Between power terminal and ground terminals — 1000V AC (100V system power supply), 1 min 1500V AC (200V system power supply), 1 min Between measuring and power terminals — 1000V AC (100V system power supply), 1 min 1500V AC (200V system power supply), 1 min
ILLUMINATION	: Fluorescent lamp
POWER CONSUMPTION	: 1-pen : About 23 VA, 2-pen : About 28 VA, 3-pen : About 34 VA
CASING	: Front door — Diecast aluminum Rear case — Steel plate
COATING	: Door — Munsell N1.5 (black) Case — Metallic silver
MOUNTING	: Flush panelmount
MOUNTING POSTURE	: Horizontal in lateral direction Forward tilting — Less than 0° Backward tilting — Less than 30°
WEIGHT	: 1-pen : About 12kg, 2-pen : About 13.5kg, 3-pen : About 15kg

STANDARD SCALE

Input	Scale	Minimum scale	Standard chart		Input	Scale	Minimum scale	Standard chart	
			Characteristic scale	Linear scale				Characteristic scale	Linear scale
R	0~1600	20	ET101N	EH05034	J	0~ 600	5	ET401N	EH05038
	0~1400	10 (20)	ET102	EH05031		0~ 400	5	ET403	EH05040
	0~1200	10	ET108N	EH05035		0~ 300	2 (5)	ET404N	EH05041
	800~1600	10	ET103N	EH05063		0~ 200	2	ET405	EH05043
	400~1600	10	ET104N	EH05048					
	700~1400	5 (10)	ET105N	EH05047					
B	0~1800*	20	ET509N	EH05046		0~ 500	5	ET601	EH05039
K	0~1200	10	ET201	EH05035	Pt	0~ 400	5	ET602	EH05040
	0~1000	10	ET202	EH05036		0~ 300	2 (5)	ET603	EH05041
	0~ 800	10	ET203	EH05037		0~ 250	2	ET634	EH05042
	0~ 600	5	ET204	EH05038		0~ 200	2	ET604	EH05043
	0~ 500	5	ET205	EH05039		0~ 150	1 (2)	ET605	EH05044
	0~ 400	5	ET206	EH05040		0~ 100	1	ET606	EH05001
	0~ 300	2 (5)	ET207	EH05041		0~ 50	0.5	ET607	EH05045
	0~ 200	2	ET219	EH05043		100~ 250	1 (2)	ET764	EH05049
	0~ 150	1 (2)	ET223N	EH05044		50~ 100	0.5	ET614	EH05050
	600~1200	5 (10)	ET273	EH05062		(-)20~ 80	1	ET662	EH05056
	100~ 250	1 (2)	ET244N	EH05049		(-)40~ 80	1	ET671	EH05055
	(-)100~ 200	2 (5)	ET1248N	EH05065		(-)50~ 150	2	ET615	EH05052
						(-)50~ 100	1 (2)	ET635	EH05053
				(-)50~ 50	1	ET618	EH05054		
				(-)100~ 50	1 (2)	ET627	EH05051		
T	0~ 300	2 (5)	ET306	EH05041	mV	0~1 (V)	0.01	/	EH42007
	0~ 200	2	ET304	EH05043		0~100	1		EH42005
	0~ 150	1 (2)	ET303	EH05044		0~ 10	0.1		EH42003
	0~ 100	1	ET307	EH05001		0~ 5	0.05		EH42004
	(-)50~ 200	2	ET325N	EH05064		1~5 (V)	0.05		EH42008
	(-)50~ 150	2	ET302N	EH05052		(-)5~ 5	0.1		EH42006
	(-)50~ 100	1 (2)	ET301N	EH05053					
	(-)50~ 50	1	ET331N	EH05054					
(-)100~ 200	2 (5)	ET384N	EH05065	Ther- mistor	0~ 200	(2)	EH21007		
					0~ 100	(1)	EH21008		
					(-)50~ 50	(1)	EH21009		
E	0~ 300	2 (5)	ET3540N	EH05041	Evenly	Evenly	1	/	EH01001
	0~ 200	2	ET1511	EH05043		0~100			
	0~ 150	1 (2)	ET4510	EH05044					
	(-)50~ 150	2	ET5508	EH05052					

The unit is °C, except for mV in case of mV input. The thermocouple input and resistance thermometer input are indicated by either characteristic scale or linear scale. The characteristic scale is employed, unless otherwise specified by the client. The parenthesized values () in the minimum scale column indicate those in the characteristic scale.

*The linear scale is graduated over a range of 400 to 1800°C.

CHINO

CHINO CORPORATION

*Distributed by
NovaLynx Corporation
3235 Sunrise Blvd. # 1
Rancho Cordova, CA 95742
916-852-9174 / fax 852-6436*