



# EH SERIES

**DOTTING TYPE  
RECORDERS/RECORDING ALARMS**

EH800-01D·02·03·04·06·12

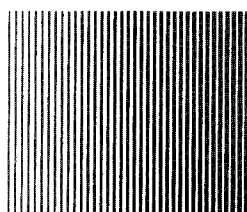
EH100-01D·02·03·04·06·12

EH200-01D·02·03·04·06·12

EH300-01D·02·03·04·06·12

EH□26-01D·02·03·04·06·12

EH□36-01D·02·03·04·06·12



# INSTRUCTIONS

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## FOR SAFE USE OF THE PRODUCT

In order to use this instrument correctly and safely, be sure to observe caution as follows.

### 1. Installation place and terminal cover

#### ① Panel mounting type

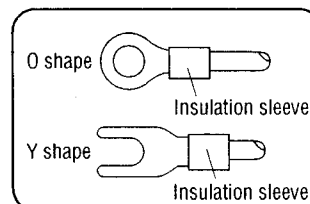
This instrument must be installed on the panel for operation. In order to avoid electric shock, provide means to prevent operators from touching any power supply section or the input/output terminals.

#### ② Mobile type

Provide a cover to the terminals section in order to avoid electrical shock.

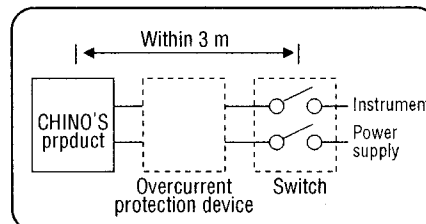
### 2. Terminal processes for connections

Crimp style terminals with insulation sleeve should be employed for the connections. O-shaped terminals should be used for the power supply and the protective grounding terminals.



### 3. Installation of a power supply circuit breaker

For the power supply, provide a switch which is suitable to the rated power supply for this instrument or an overcurrent protection device within a distance of 3 m from the unit and also within easy reach.



### 4. Provide separate safety measures for the output functions

When the instrument is to be used in a system which has output functions including controls, alarm, etc., apply separate safety measures against phenomena which would be caused by malfunction due to mis-operation, or failure of the instruments or sensors.

### 5. Symbol marks used for this instrument



This symbol is used on parts where there is an electric shock hazard. Be very careful against electric shock when wiring, maintaining or servicing these parts.



This symbol is used on parts which require protection by a ground terminal. Instruments with this symbol must to be grounded for power supply facilities before starting operation.

### Warnings

Confirm power supply voltage rates and grounding.	Before supplying power to the instrument, be sure to check that its rated voltage matches the supply voltage and that the power and protective grounding wiring has been connected correctly and securely.
Do not put your hands into the case.	Unless essential operational repairs are required, do not put your hands inside the rack or case. Electric shock or injury may occur.
Do not use in a gaseous atmosphere.	Do not operate or install the instrument in a place where there is a combustible or explosive gas or vapor.
Maintenance and modification.	When maintenance and modification become necessary, consult your nearest CHINO branch office, agent or your dealer. <Note> Only a service person designated by CHINO can perform maintenance and modification by replacing parts.

## ■ GENERAL AND MODELS

The EH series dotting type recorders/recording alarms cover dotting type recorders having 1 to 12 recording points and dotting type recording alarms having alarm mechanisms set to these recording points commonly.

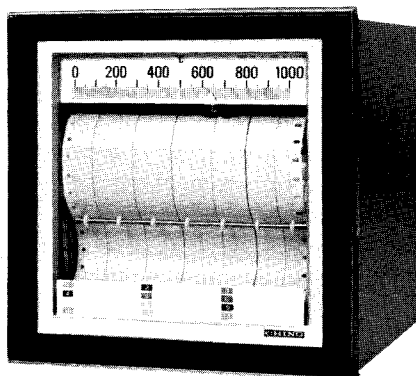
These EH series instruments comprise the following standard models according to the number of recording points, input signals and kinds of alarm systems.

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	No. of recording points	Input signal
EH800-01D	1	m V
	02	
	03	
	04	
	06	
12	12	
EH100-01D	1	Thermocouple
	02	
	03	
	04	
	06	
12	12	
EH200-01D	1	Resistance thermometer
	02	
	03	
	04	
	06	
12	12	
EH300-01D	1	Thermistor
	02	
	03	
	04	
	06	
12	12	

In case of 6 and 12 recording points instrument with "Select-off" function, "S" is affixed to the models, like EH 800-06S, 12S.



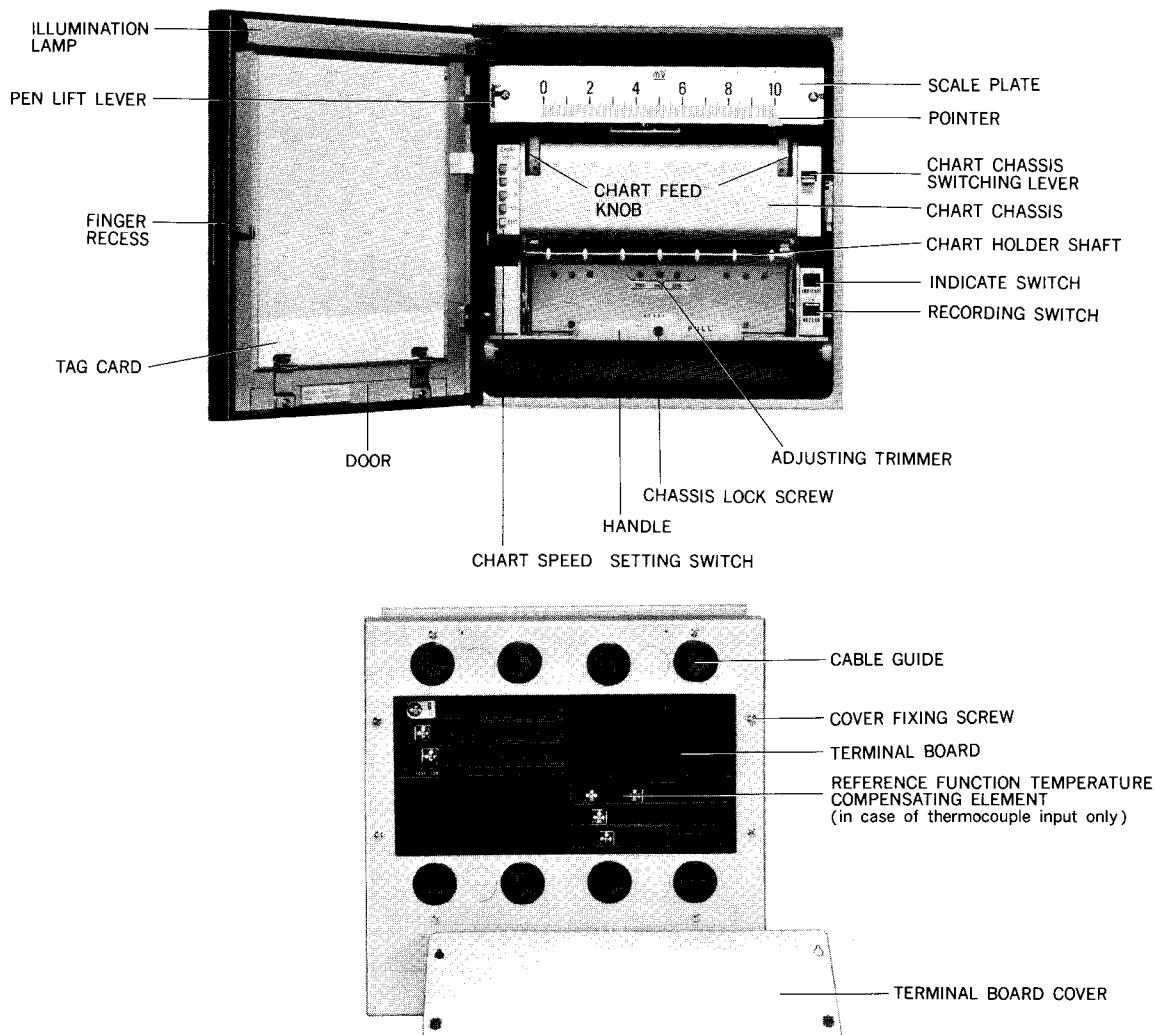
EH 100-06

### ● MODELS OF RECORDING ALARMS

Model	No. of recording points	Input signal	Alarm system
EH826-01D	1	m V	High-limit or Low-limit system
	02		
	03		
	04		
	06		
12	12		
EH126-01D	1	Thermocouple	
	02		
	03		
	04		
	06		
12	12		
EH226-01D	1	Resistance thermometer	
	02		
	03		
	04		
	06		
12	12		
EH326-01D	1	Thermistor	
	02		
	03		
	04		
	06		
12	12		
EH836-01D	1	m V	High-limit/ Low-limit system
	02		
	03		
	04		
	06		
12	12		
EH136-01D	1	Thermocouple	
	02		
	03		
	04		
	06		
12	12		
EH236-01D	1	Resistance thermometer	
	02		
	03		
	04		
	06		
12	12		
EH336-01D	1	Thermistor	
	02		
	03		
	04		
	06		
12	12		

In case of 6 and 12 recording points instrument with "Select-off" function, "S" is affixed to the models, like EH826-06S, 12S.

## ■ NAMES AND FUNCTIONS OF COMPONENT PARTS

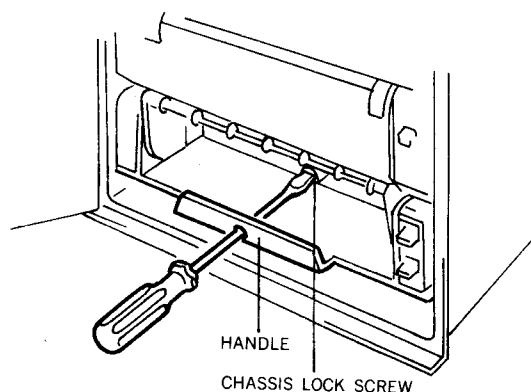


### ● HOW TO OPEN THE DOOR

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

### ● HOW TO DRAW OUT THE CHASSIS

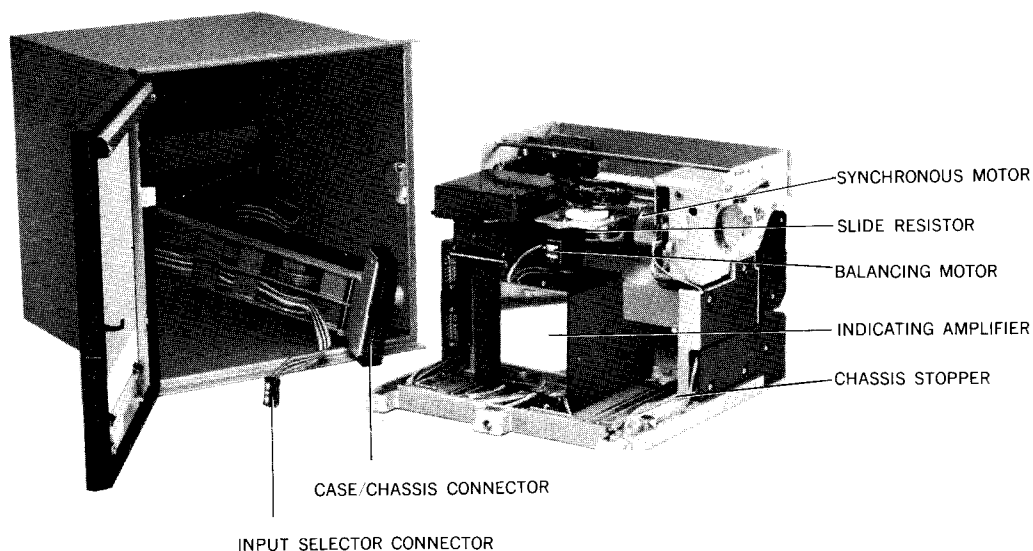
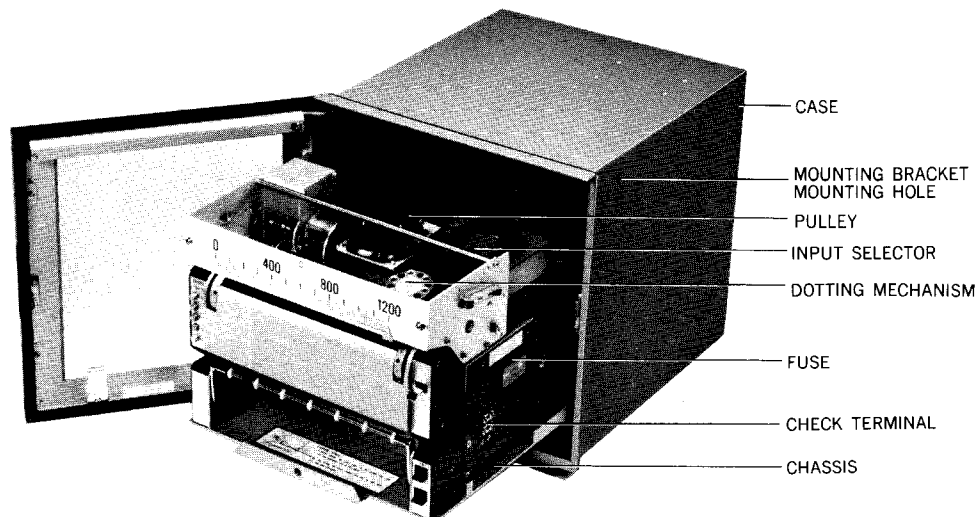
The chassis is fixed by the chassis lock screw to prevent the chassis from coming out during transportation. Loosen this screw using a  $\ominus$  screwdriver, and pull the handle toward you, and the chassis can be drawn out. Tighten this screw securely without fail when transporting the instrument again.



### ● HOW TO TAKE OUT THE CHASSIS

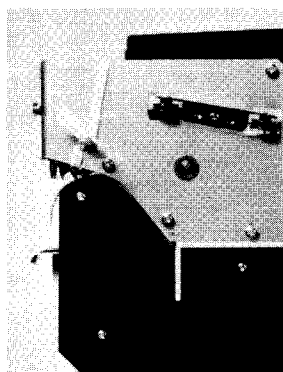
The chassis will not be drawn out of the case usually. Observe the following procedure when taking the chassis out of the case for maintenance and check.

- 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  $\oplus$  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.



● **RELEASE OF BOUND PARTS**

The dotting mechanism is bound to the chassis using a cord. Untie this cord. Bind the dotting mechanism without fail when transporting the instrument again.



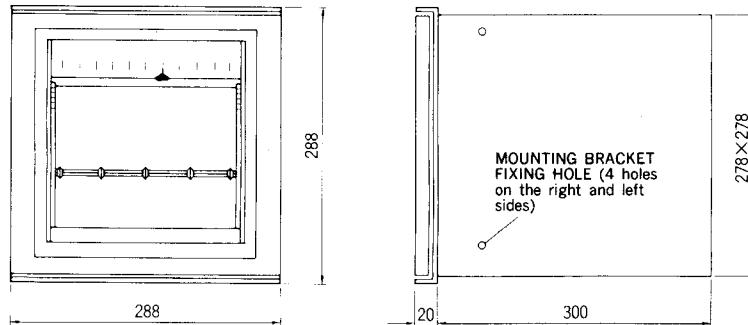
● **HOW TO TAKE OUT THE CHASSIS**

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.

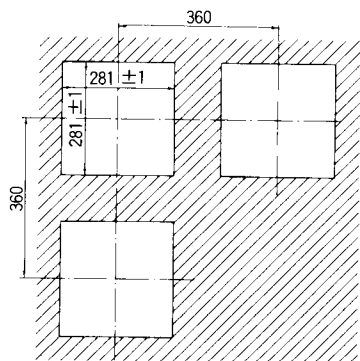
- ① Draw out the chassis until it is stopped.
- ② Disconnect the connector after unscrewing the fixing screw of the case-chassis connecting connector by using a cross-recessed ⊕ screwdriver.
- ③ Depress the chassis stopper mounted at the lower left part of the chassis upward by fingers, and carefully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

## ■ INSTALLATION

### ● EXTERNAL DIMENSIONS

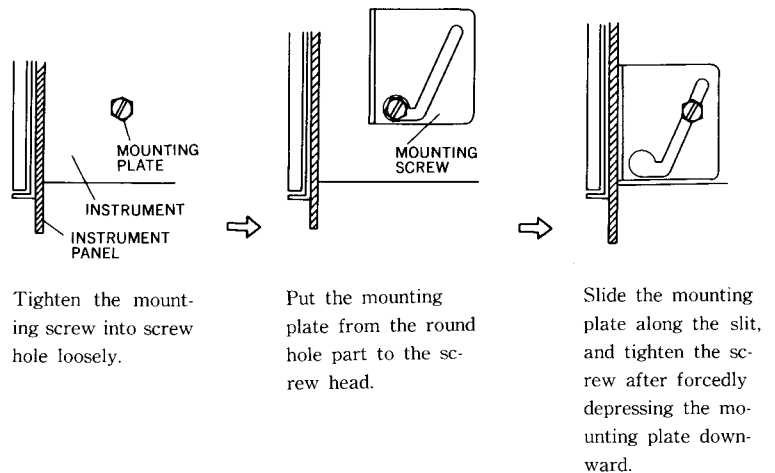


### ● PANEL CUTOUT AND MOUNTING INTERVALS



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 side 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》

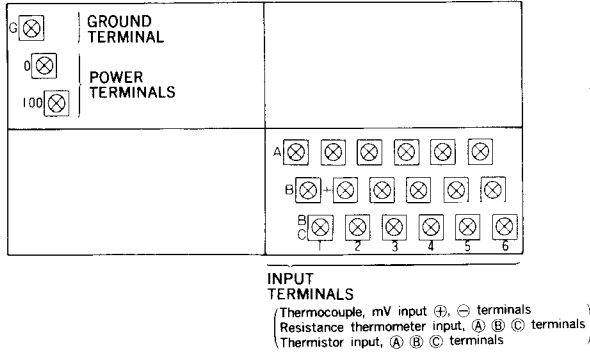
Do not mount the instrument at the following places.

- A dusty place or a corrosive gas atmosphere
- A place where ambient temperature is higher than  $50^{\circ}\text{C}$  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

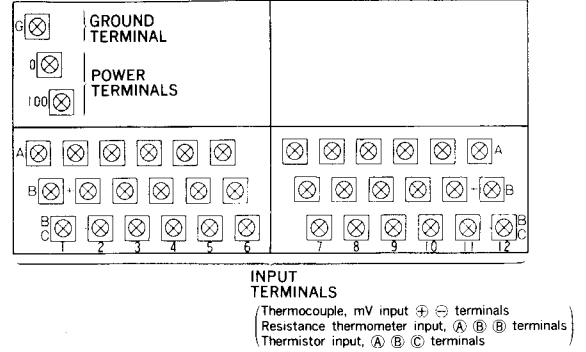
# CONNECTIONS

## TERMINAL BOARD

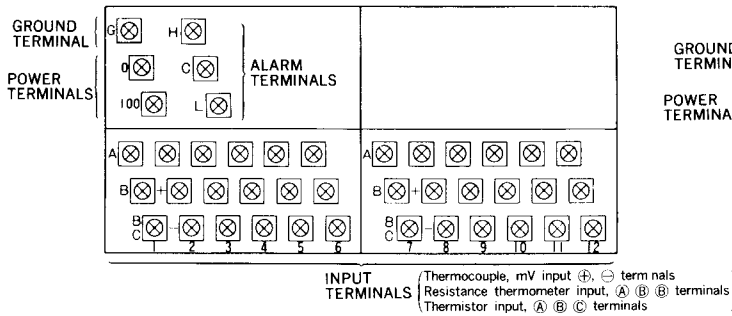
### 6-dotting type recorder



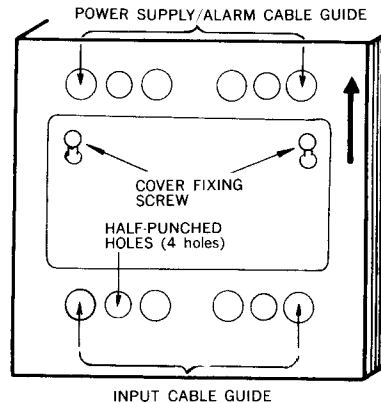
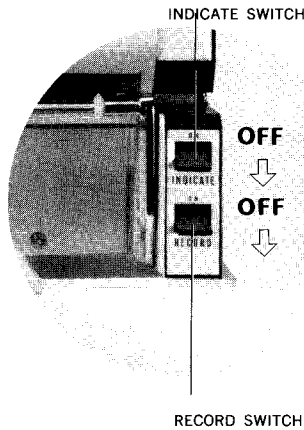
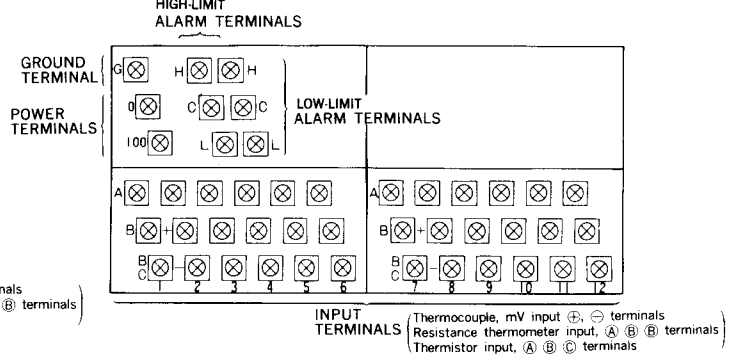
### 12-dotting type recorder



### high-limit or low-limit type recording alarm (12-dotting type)



### high-limit / low-limit (12-dotting type)



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.

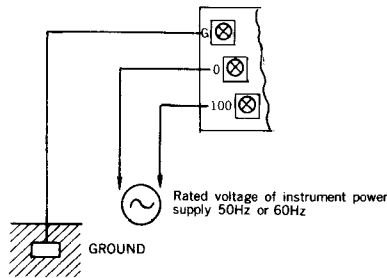
- ① Set the INDICATE and RECORD switches of this instrument to OFF (lower side) without fail before starting the connection work.
- ② Loosen two cover setscrews of the rear panel of the case using a cross-recessed ⊕ screwdriver, and remove the terminal board cover.
- ③ Lead connecting cables into the instrument through the cable guide, while separating the power cable and input cable from each other.

- ④ If four upper and lower cable guides are not enough, use the half-punched holes. (These holes can be punched out by forcibly depressing them with a screwdriver or the like.)
- ⑤ After connections, mount the terminal board cover without fail.

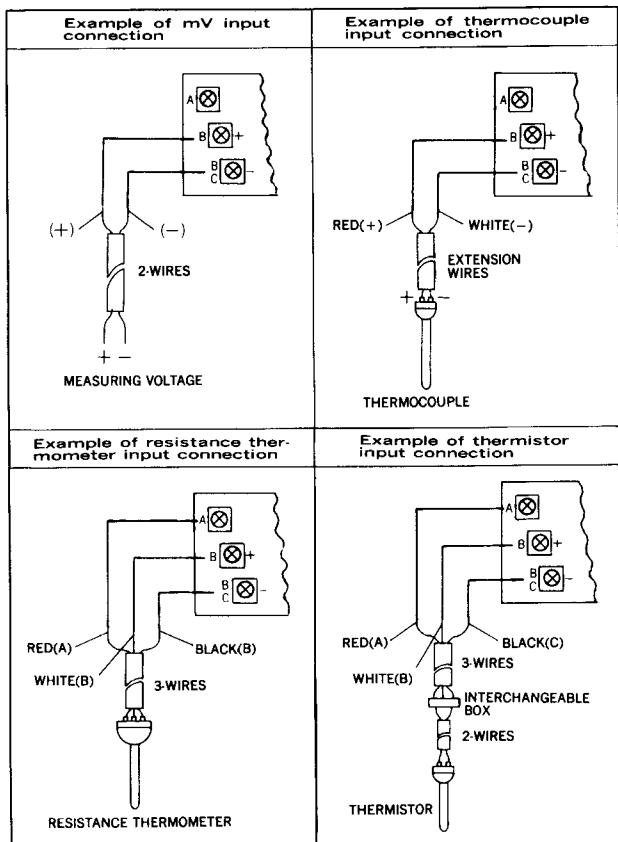
### 《Cautions》

- 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

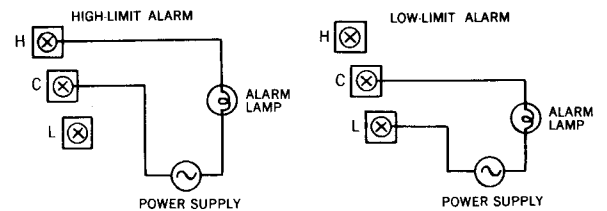
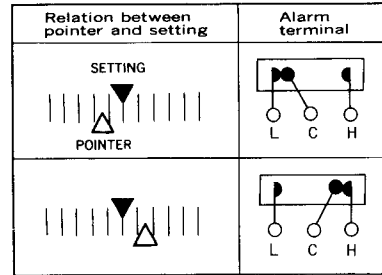
● CONNECTIONS OF POWER TERMINALS AND GROUND TERMINAL



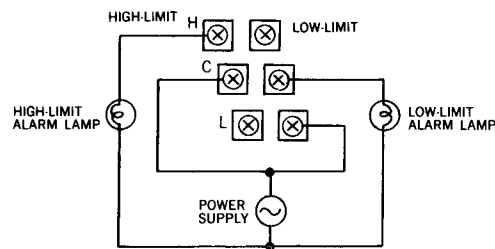
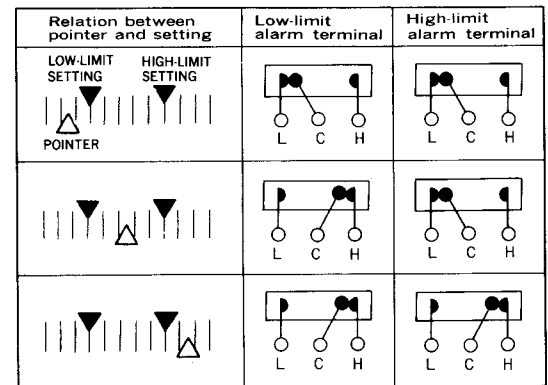
● CONNECTIONS OF INPUT TERMINALS



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



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



● 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 input — Connect to ⊕ ⊖ terminals
- Thermocouple input — Connect to ⊕ ⊖ terminals
- Resistance thermometer input — Connect to (A) (B) (B) terminals
- Thermistor input — Connect to (A) (B) (C) terminals

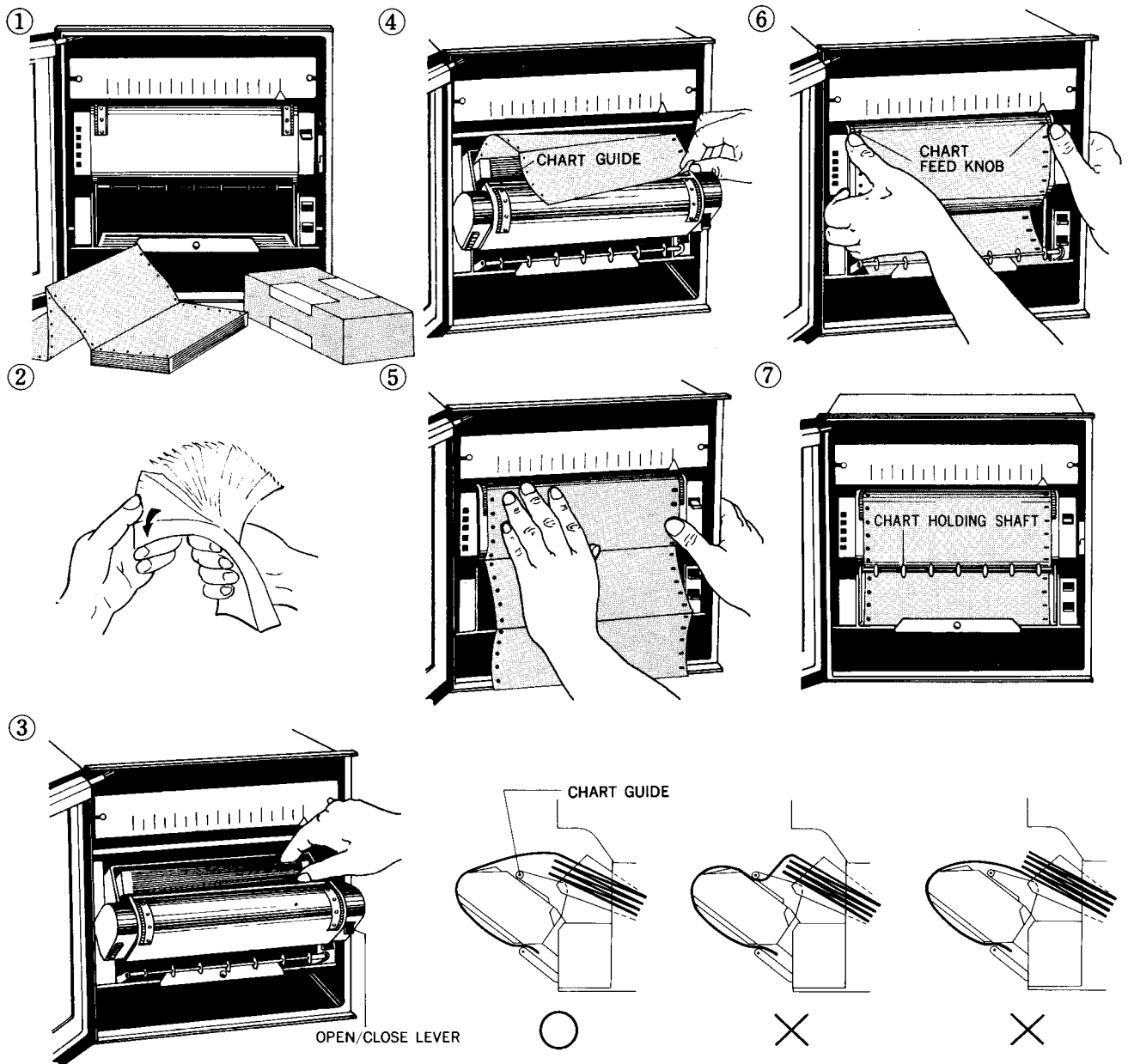
● CONNECTION OF ALARM TERMINALS (in case of recording alarm only)

A no-voltage on-off contact signal is outputted from alarm terminals (H), (C), (L) as illustrated above. Connect a lamp, a buzzer, or the like as shown in the above figure.

The alarm signal is an on-off contact signal by a microswitch. Since an alarm signal is not held in case of a multipoint alarm, connect an external hold circuit as required.



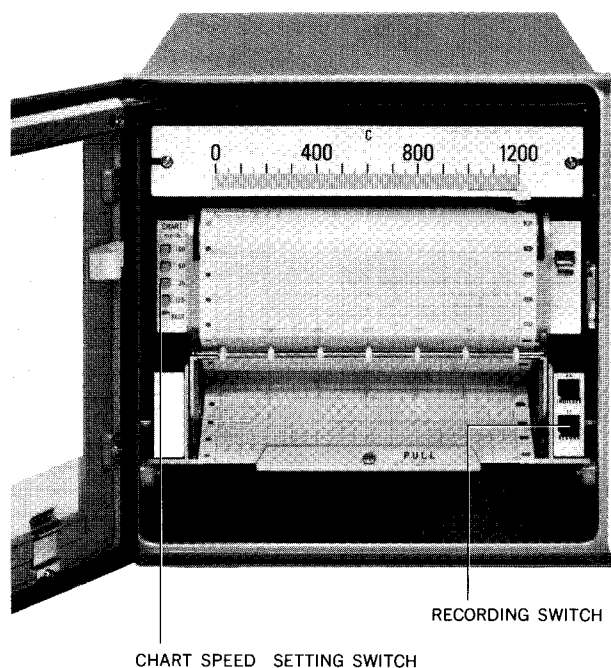
## LOADING METHOD OF THE CHART



- 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



### ● 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.

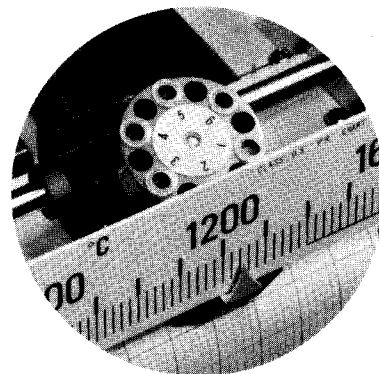
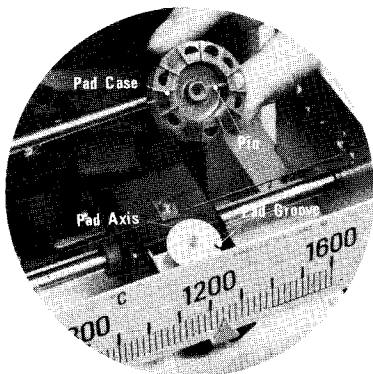
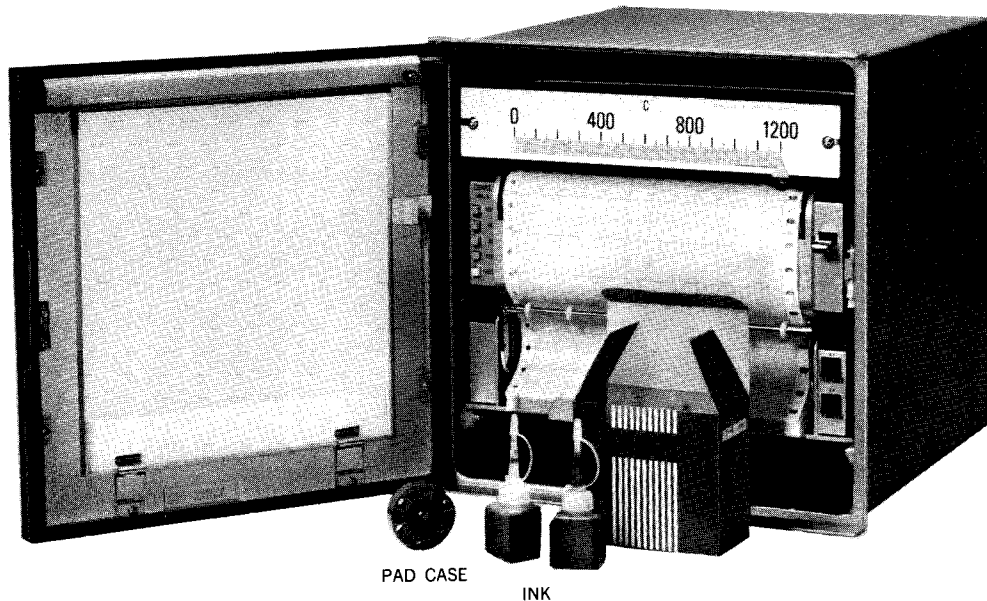
- ① Set the desired chart speed by depressing one of the four switches.
- ② The chart is fed at the set speed by turning ON the RECORD switch.

- 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



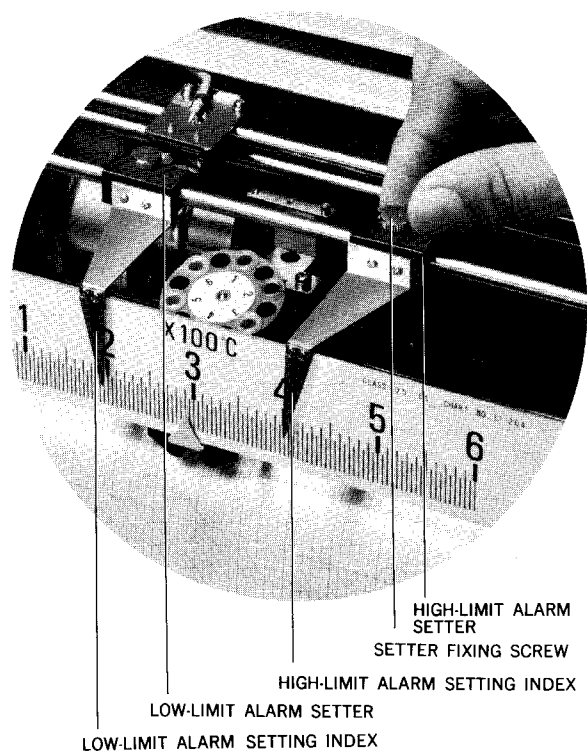
- ① Prepare the pad case from the accessory box. The ink pad of the case is colored with the following ink in advance.

No. of recording points	Recording point number and dotting colors
1-dotting type instrument	Red
2-dotting type instrument	① Red ② Black
3-dotting type instrument	① Red ② Black ③ Sky blue
4-dotting type instrument	① Red ② Black ③ Sky blue ④ Green
6-dotting type instrument	① Red ② Black ③ Sky blue ④ Green ⑤ Brown ⑥ Purple
12-dotting type instrument	① Red ② Black ③ Sky blue ④ Green ⑤ Brown ⑥ Purple ⑦ Orange ⑧ Gray ⑨ Blue ⑩ Brownish green ⑪ Scarlet ⑫ Violet

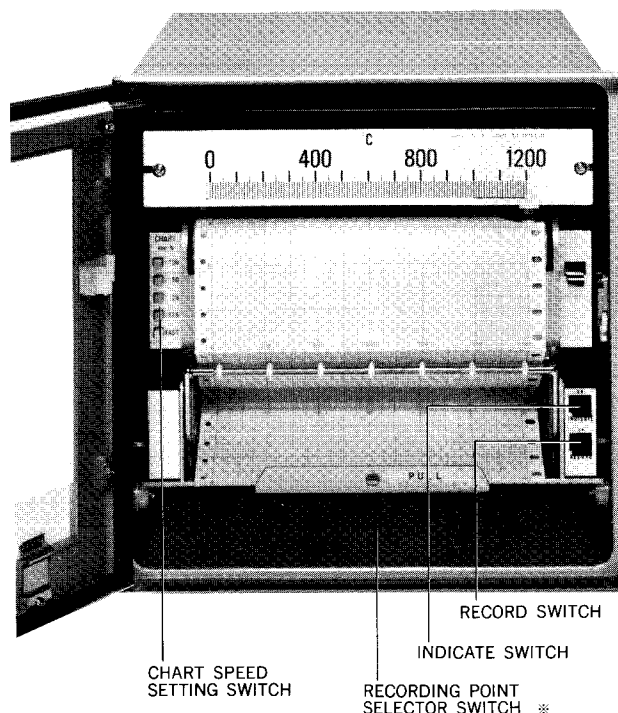
- ② Draw the chassis out of the case. If the chassis lock screw is tightened, loosen it.
- ③ Insert the pad case of the dotting mechanism so that the pin of the pad case is put into the pad groove of the dotting mechanism.
- ④ Reset the chassis as before, and the ink pad has been mounted completely. It is not necessary to tighten the chassis lock screw, except when the instrument is transported again.
- ⑤ When the ink color has become light after long-time recording, supply the attached ink about 1~2 drops. Be careful not to supply ink excessively, otherwise it may attach to the mechanical section to cause a trouble.

## OPERATION

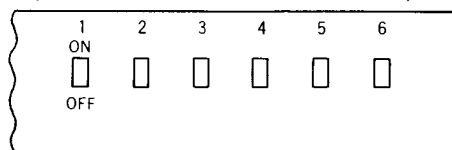
### ● SETTING OF ALARM POINT (in case of recording alarm only)



### ● OPERATION



\*RECORDING POINT SELECTOR SWITCH  
(In case of instrument with select-off function)



### ● SETTING OF ALARM POINT (in case of recording alarm only)

- ① Draw out the chassis.
- ② Loosen the fixing screw of the alarm set by turning it counterclockwise with fingers.
- ③ Relocate the alarm set 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.

### ● SELECTION OF RECORDING POINT (in case of the instrument having a select-off function)

In case of the instrument having 6-point or 12-point select-off function, recording points can optionally be selected by the recording point selector switch mounted

at the lower part of the chassis.

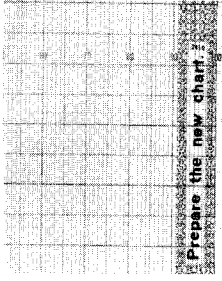
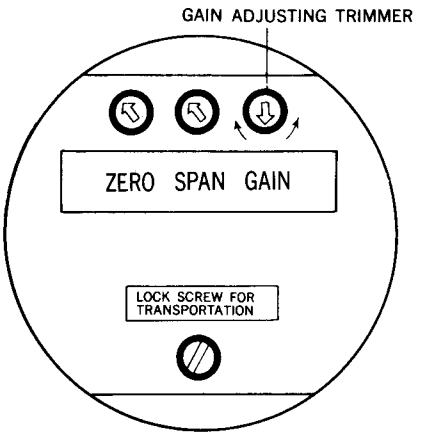
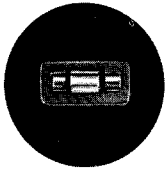
Turn ON the selector switches having corresponding numbers to be recorded by sliding them upward, and turn OFF the other selector switches by sliding them downward.

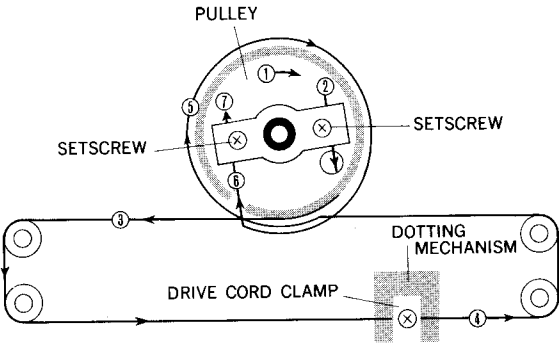
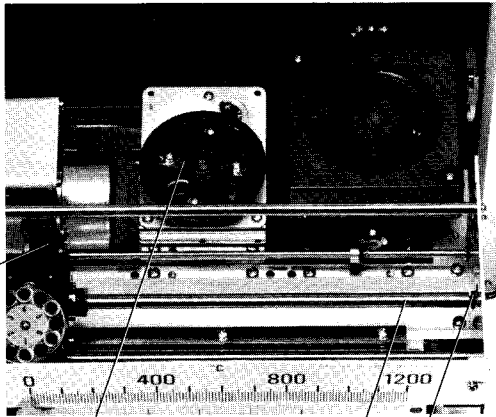
Neither indication nor dotting record is done at the OFF recording points, and these recording points are transferred to the next recording point in about 0.5 second.

### ● OPERATION

- ① Turn ON the INDICATE switch by setting it upward. The pointer will move with the illumination lamp lit.
- ② Set the chart speed setting switch to the desired speed.
- ③ Turn ON the RECORD switch by setting it upward. The chart is fed, and the input selector concurrently operates to sequentially switch the measuring points to start dot recording.

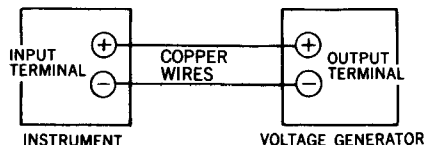
## ■ CHECK AND MAINTENANCE

Maintenance and check items	Procedures
Ink supply	<p>The consumption of recording ink differs more or less according to working conditions. The recording ink can be used for about 1.5 months in continuous recording. When the ink color has become light, supply one to two drops of the attached ink to the ink pad, referring to the "loading method of recording ink" on page 9.</p>
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. When the chart comes to an end, the end mark appears on the right end of the chart. Replace the chart with spare chart, referring to the "loading method of the chart" on page 7.</p> 
Gain adjustment	<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> 
Replacement of fuse	<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. Replace the blown out fuse with new 1A cartridge fuse.</p> 

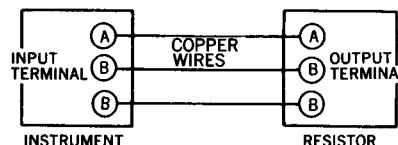
Maintenance and check item	Procedures
Replacement of drive cord	<p>After removing old (or cut) drive cord, replace it with new one according to the following procedure. Be careful with kink or scar due to the distortion during replacement.</p>  <ol style="list-style-type: none"> <li>① Turn the pulley fully clockwise.</li> <li>② Fix one end of the drive cord by setscrew ② in the figure.</li> <li>③ Pull the drive cord from ③ to ④ through the lower part of the pulley groove after passing the pulley hole.</li> <li>④ Stretch the pulley cord around the pulley by one turn through the drive cord clamp of the dotting mechanism as shown in the figure ⑤. Keep the drive cord clamp loosened.</li> <li>⑤ Pass the drive cord to ⑥ → ⑦ from the upper side of the pulley groove.</li> <li>⑥ Fix the drive cord by setscrew ⑦ while pulling it, so that it is stretched to about 500 ~600g without looseness.</li> <li>⑦ Turn the pulley fully counterclockwise by one turn.</li> <li>⑧ Shift the dotting mechanism leftward to set the pointer to the triangle mark (▲) at the left end of the scale plate.</li> <li>⑨ Fix the drive cord by fastening the drive cord setscrews of the dotting mechanism. Now, the drive cord has been set properly. Make sure that the pointer is set to triangle mark (▲).</li> </ol>
Lubrication	<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"> <li>① Remove dust and dirt from the parts to be lubricated before lubricating them. Fully clean the dotting main shaft, in particular.</li> <li>② Use the attached lubricating oil after opening the tip of its vessel.</li> <li>③ Supply oil to such an extent as it does not drip, and wipe off surplus oil.</li> <li>④ Parts to be lubricated <ul style="list-style-type: none"> <li>• Main dotting shaft and bearing for main shaft (Wipe off oil after lubricating the main shaft).</li> <li>• Servo mechanism gear and bearing</li> <li>• Switching mechanism zeneva roller and bearing</li> <li>• Other slide parts</li> </ul> </li> </ol>  <p>ZENEVA ROLLER AND BEARING OF SWITCHING MECHANISM</p> <p>GEAR AND BEARING OF SERVO MECHANISM</p> <p>MAIN DOTTING SHAFT</p> <p>MAIN SHAFT BEARING</p>

## SCALE TEST

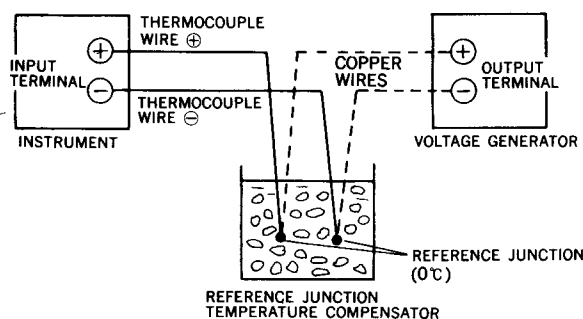
### ● CONNECTION OF mV INPUT



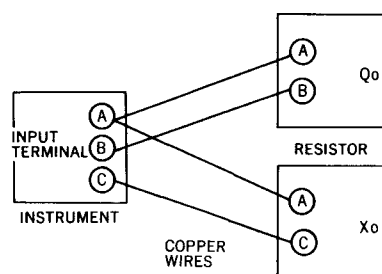
### ● CONNECTION OF RESISTANCE THERMOMETER INPUT



### ● 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 :  $\Omega$ )

##### • 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 :  $\Omega$ )

#### ② Turn OFF the INDICATE switch and RECORD switch of this instrument, and connect 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 14.

### 《 Cautions 》

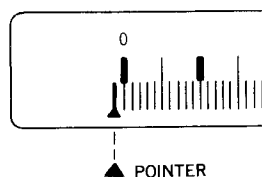
- In case of a thermocouple input, confirm that the reference junction temperature is at  $0^\circ\text{C}$  by using a mercury thermometer. If you use an electronic reference junction temperature compensator, refer to an instruction manual of the compensator.
- In case of a resistance thermometer input, 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.
- 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.

### (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

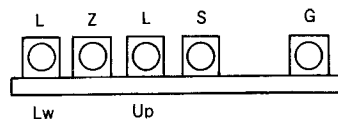
By feeding an input whose value corresponds to the maximum scale reading, calibrate the scale using the span adjusting trimmer of servoamplifier.

Accuracy of indication :

mV input :  $\pm 0.25\%$

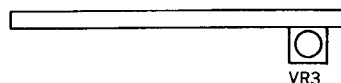
Thermocouple input :  $\pm 0.5\%$

### ● 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.

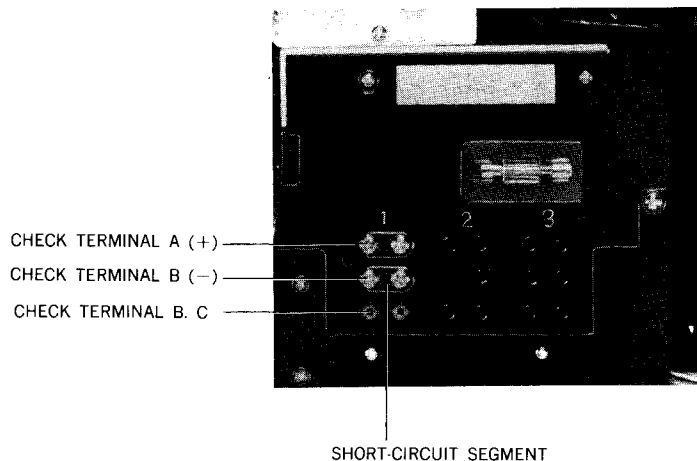
Room temperature :  $23 \pm 2^\circ\text{C}$

Humidity :  $55 \pm 10\%$  RH

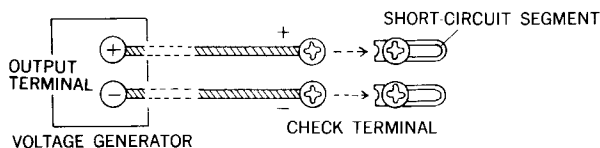
Power supply : Rated voltage  $\pm 2\%$



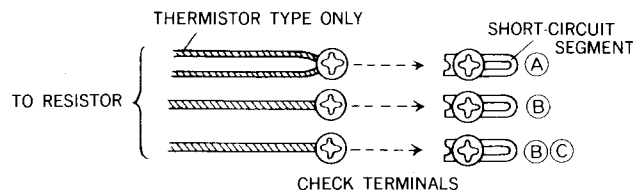
## ■ SIMPLIFIED SCALE CHECK



### ● IN CASE OF mV AND THERMOCOUPLE INPUTS



### ● IN CASE OF RESISTANCE THERMOMETER AND THERMISTOR INPUTS



Check terminals are accessible on the right side panel after drawing the chassis of this instrument. The scale can be checked easily by these terminals without disconnecting external cables.

- ① Loosen the check terminal screws, and open the right and left terminals by shifting the short-circuit segment tightward.
- ② Connect a DC standard voltage generator or precision variable resistor to the left check terminals.
- ③ The connecting method differs according to the kinds of input signals. Refer to corresponding item.
- ④ After check, reset the short-circuit segment as before without fail.

#### ● IN CASE OF mV INPUT

- ① Connect the DC standard voltage generator to check terminals  $\oplus$   $\ominus$ .
- ② Set the DC standard voltage generator to an input value corresponding to the scale to be checked, and check the scale.

#### ● IN CASE OF THERMOCOUPLE INPUT

- ① Connect the DC standard voltage generator to check terminals  $\oplus$   $\ominus$ .
- ② Read the temperature at the input terminals on the rear panel of this instrument by using a glass rod thermometer.
- ③ Set the DC standard voltage generator to the value

obtained by subtracting the thermoelectromotive force corresponding to the temperature measured in ② from an input value (normal thermoelectromotive force) corresponding to the scale to be checked, and check the scale.

#### ● IN CASE OF RESISTANCE THERMOMETER INPUT

- ① Connect the precision variable resistor to check terminals  $\textcircled{A}$   $\textcircled{B}$   $\textcircled{B}$ . For the connection method, refer to the scale test on page 13.
- ② Set the precision variable resistor to an input value corresponding to the scale to be checked, and check the scale.

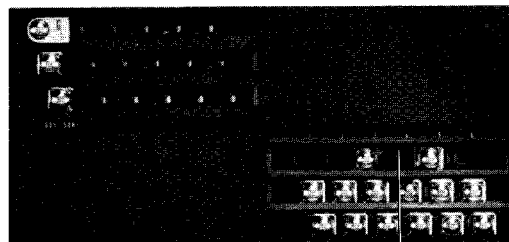
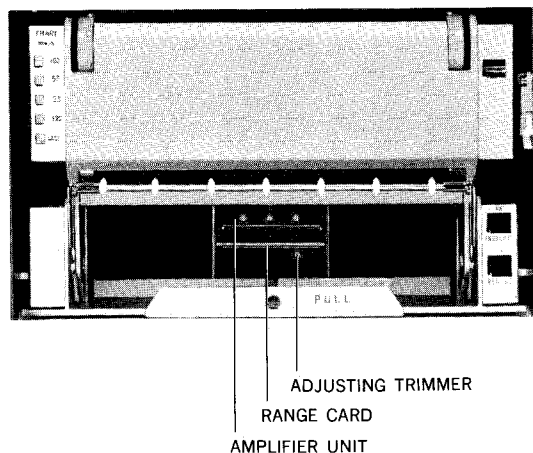
#### ● IN CASE OF THERMISTOR INPUT

- ① Connect the precision variable resistor to check terminals  $\textcircled{A}$   $\textcircled{B}$   $\textcircled{C}$ . For the connection method, refer to the scale test on page 13.
- ② Set the precision variable resistor to an input value corresponding to the scale to be checked, and check the scale.

#### 《Caution》

The scale check by check terminals is a handy method for checking the operation of this instrument. For accurate scale test, refer to the scale test on page 13.

## SCALE CHANGE (Replacement of scale plate, preamplifier unit and reference junction temperature compensating element)



REFERENCE JUNCTION  
TEMPERATURE  
COMPENSATING ELEMENT

This instrument can easily change the scale by replacing the scale plate and preamplifier unit.

When the scale plate, preamplifier unit and/or reference junction temperature compensating element have been replaced due to a scale change or a trouble, perform zero adjustment and span adjustment without fail, referring to the scale test and calibration on pages 13 and 14. If the preamplifier unit or reference junction temperature compensating element was replaced in case of a thermocouple input, apply an input corresponding to the minimum scale as specified in the scale test on page 13, and adjust the CJ adjusting trimmer at the front lower part of the servoamplifier unit by turning it under the detached condition of the front panel, so that the indication meets the minimum scale of the scale plate. Then calibrate scale.

### ● SCALE CHANGE

- ① For the mV input and thermocouple input, the scale can optionally be changed, irrespective of the kinds of input and scale range.  
Be careful with the following items.
  - When changing from the mV input to the thermocouple input, mount the reference junction temperature compensating element, in principle.
  - When changing from the thermocouple input to the mV input, remove the reference junction temperature compensating element.
  - A semiconductor element is employed as the reference junction temperature compensating element, and it is not necessary to replace this element according to the kinds of thermocouple.
- ② For the resistance thermometer input and thermistor input, the scale can optionally be changed, irrespective of the kinds of inputs and scale range.
- ③ The scale cannot be changed from the mV input or thermocouple input to the resistance thermometer input or thermistor input, or from the resistance thermo-

meter input or thermistor input to the mV input or resistance thermometer input.

### ● REPLACEMENT OF SCALE PLATE

The scale plate is fixed to the chassis by right and left setscrews.

Observe the following procedure when replacing the scale plate due to the scale change, etc.

- ① Remove the scale plate by removing the setscrews.
- ② Temporarily fix the scale plate to be mounted.
- ③ Turn OFF the INDICATE switch, and shift the pointer leftward by turning the pulley counterclockwise until the pointer is stopped by the stopper.
- ④ Slide the scale plate rightward or leftward while holding it, and set the mark ▲ of the scale plate to the pointer.
- ⑤ Fix the scale plate by tightening the right and left setscrews.

### ● REPLACEMENT OF PREAMPLIFIER UNIT

- ① Remove the front panel by removing the right and left setscrews at the front lower part of the chassis.
- ② The preamplifier unit is mounted in the indicating amplifier unit by connector connection.  
The preamplifier unit can be pulled out by drawing it toward you by applying your fingers to its drawer handle.
- ③ Depress the new preamplifier unit into the innermost along the guide groove in the indicating amplifier unit.
- ④ Mount the front panel as before, and the replacement of the preamplifier unit is completed.

### ● REPLACEMENT OF REFERENCE JUNCTION TEMPERATURE COMPENSATING ELEMENT

The reference junction temperature compensating element is fixed by two setscrews to the rear terminal board and it is easily detachable. When fixing it, the arrow “⇩” should point to up.

## ■ 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  $\Omega$ )

Thermistor —

~250°C : minimum 30°C span

250~300°C : minimum 40°C span

SCALE LENGTH : 180mm

INDICATING ACCURACY

: mV input —  $\pm 0.25\%$  of input span

Thermocouple, resistance thermometer,  
 thermistor input  $\pm 0.5\%$  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 width 180mm (total  
 width 200mm), Total length 20m

NO. OF RECORDING POINTS :

: 6 kinds of 1, 2, 3, 4, 6, 12 points and  
 select-off function of 6 points and 12  
 points

RECORDING SYSTEM

: Ink pad dot recording at each point using  
 each color

Dotting colors

1 point Red  
 2 points ① Red ② Black  
 3 points ① Red ② Black ③ Sky blue  
 4 points ① Red ② Black ③ Sky blue  
 ④ Green  
 6 points ① Red ② Black ③ Sky blue  
 ④ Green ⑤ Brown  
 ⑥ Purple  
 12 points ① Red ② Black ③ Sky blue  
 ④ Green ⑤ Brown ⑥ Purple  
 ⑦ Orange ⑧ Gray ⑨ Blue  
 ⑩ Brownish green ⑪ Scar-  
 lette ⑫ Violet

CHART SPEED : 12.5, 25, 50, 100mm/h and Fast

DOTTING INTERVAL : 6sec (50Hz), 5sec (60Hz)

ALARM SYSTEM : High-limit (Low-limit) system  
 High-limit/Low-limit system  
 (Common setting at each point)

SETTING ACCURACY :  $\pm 0.5\%$  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 240  
 V (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

ALLOWABLE SIGNAL SOURCE RESISTANCE : mV input —

3mV  $\leq$  span voltage  $\leq$  500mV —

Lower than 10k  $\Omega$

1mV  $\leq$  span voltage < 3mV —

Lower than 10k  $\Omega$

500mV < span voltage  $\leq$  100V —

Lower than 1k  $\Omega$

Thermocouple input — Lower than  
 10k  $\Omega$  (Lower than 150  $\Omega$  if burn-out  
 function is provided)

Resistance thermometer input —

Lower than 10  $\Omega$  per wire

INPUT RESISTANCE : mV input —

3mV  $\leq$  span voltage  $\leq$  500mV —

About 8M  $\Omega$

1mV  $\leq$  span voltage < 3mV —

About 8M  $\Omega$

500mV < span voltage  $\leq$  100V —

About 1M  $\Omega$

Thermocouple input — About 8M  $\Omega$

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  $\Omega$  or more between mea-  
 suring and ground terminals

1000V DC, 20M  $\Omega$  or more between po-  
 wer and ground terminals

1000V DC, 20M  $\Omega$  or more between mea-  
 suring and power terminals

DIELECTRIC STRENGTH

: 500V AC, 1min between measuring and  
 ground terminals

Between power terminal and ground ter-  
 minals —

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 : About 24VA

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 : About 13.5kg

\* Option

## STANDARD SCALE

Input	Scale	Minimum scale	Standard chart		Input	Scale	Minimum scale	Standard chart	
			Character-istic scale	Linear scale				Character-istic 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					
K	0~1200	10	ET201	EH05035	Pt	0~ 500	5	ET601	EH05039
	0~1000	10	ET202	EH05036		0~ 400	5	ET602	EH05040
	0~ 800	10	ET203	EH05037		0~ 300	2(5)	ET603	EH05041
	0~ 600	5	ET204	EH05038		0~ 250	2	ET634	EH05042
	0~ 500	5	ET205	EH05039		0~ 200	2	ET604	EH05043
	0~ 400	5	ET206	EH05040		0~ 150	1(2)	ET605	EH05044
	0~ 300	2(5)	ET207	EH05041		0~ 100	1	ET606	EH05001
	0~ 200	2	ET219	EH05043		0~ 50	0.5	ET607	EH05045
	0~ 150	1(2)	ET223N	EH05044		100~ 250	1(2)	ET764	EH05049
	600~1200	5(10)	ET273	EH05062		50~ 100	0.5	ET614	EH05050
	100~ 250	1(2)	ET244N	EH05049		(-)20~ 80	1	ET662	EH05056
	(-)100~ 200	2(5)	ET1248N	EH05065		(-)40~ 80	1	ET671	EH05055
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					
E	0~ 300	2(5)	ET3540N	EH05041	Ther-mistor	0~ 200	(2)	EH21007	/
	0~ 200	2	ET1511	EH05043		0~ 100	(1)	EH21008	
	0~ 150	1(2)	ET4510	EH05044	(-)50~ 50	(1)	EH21009		
	(-)50~ 150	2	ET5508	EH05052	Evenly	Evenly 0~100	1	EH01001	

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

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