

BH Series **180mm CHART DOT- PRINTING TYPE** **HYBRID RECORDER**



MODEL BH □□□

The BH Series hybrid chart recorders are easy to operate and use the reliable dot-printing method to record a variety of information in analog and digital formats on a 180mm wide chart.

Not only can each measured value be read from the custom made analog scale plate but a comprehensive LED display also enables precise digital measurements to be taken by the user.

The compact BH Series instruments have depth of only 195mm which makes them suitable for space sensitive installations including panel mounting.

■ **FEATURES**

• **Ready to run immediately**

As the recorders are pre-set to meet individual customer specifications and precise application requirements, the units start indicating and recording as soon as they are switched on.

• **Dual displays for accuracy and simplicity**

Measured values can be read at a glance, directly from maximum 6 multi scale analog display plate whilst a digital display clearly indicates measured values, alarm settings and chart speed together with a range of other information.

• **Compact and easy to install**

The BH recorders are designed for use in applications where space is at a premium. With a reduced depth of 195mm and weighing 7.0kg, the instruments are ideally suited for panel mounted installations.

• **Abundant functions installed**

An abundance of easy-to-use functions including skip function, digital recording, year/month! day printing and key lock are installed. A variety of options including high-speed-dotting, external drive and alarm output are prepared to meet every requirements.

• **Input signal shift function**

Shift correction of indications can be done every point according to the sensor input signals. The indication and recording scale positions can be corrected.

• **Conforms to CE-marking**



■ **MODELS**

BH □ □ □ □ □ D □

Input signals

- 1: Thermocouple, DC voltage, Single range
- 2: Resistance thermometer, Single range
- 5: Thermocouple, DC voltage, Individual ranges by channel*
- 6: Resistance thermometer, DC voltage (5V), Individual ranges by channel*

No. of input points

- 6: 6 channels
- 2: 12 channels
- 4: 24 channels

Alarm outputs (option) 0: Not provided

- 6: 6 points (see note 1)
- 2: 12 points (see note 1)
- 4: 24 points (see note 1)
- A: 6 (mechanical relay "a" contact) alarm outputs #
- B: 12 (mechanical relay "a" contact) alarm outputs #
- D: 24 (mechanical relay "a" contact) alarm outputs #

#: Conforming to CE-marking

Note 1: Not conforming to CE-marking ones will be 'mechanical relay "c" contact' alarm outputs. Conforming to CE-marking ones will be 'MOS relay' alarm outputs.

CE-marking (option)

- : Not provided
- E: with CE-marking

Communication interface (option)

- N: Not provided
- A: RS-422A
- R: RS-232C
- S: RS-385

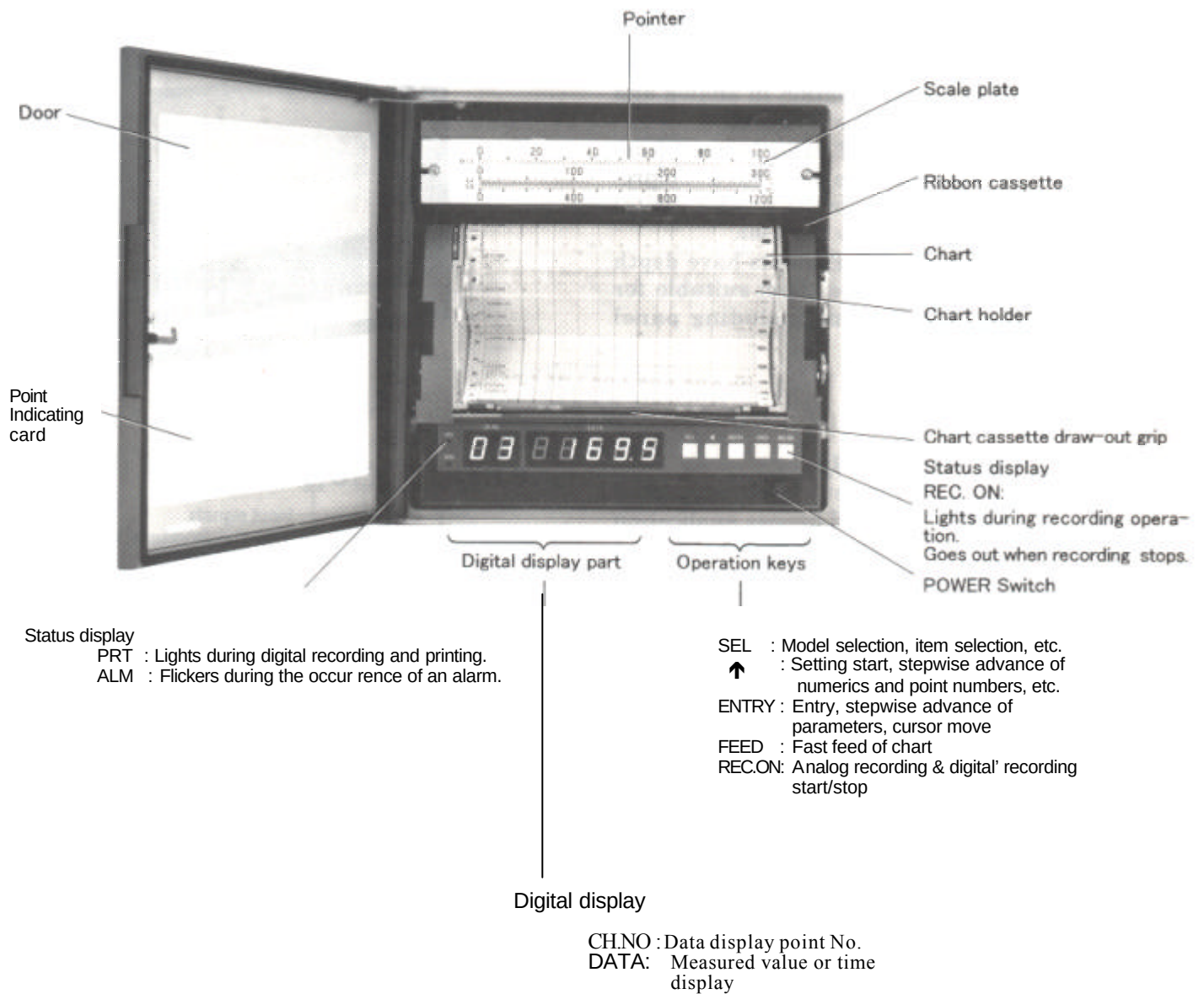
External drive (option)

- N: Not provided
- D: Provided

* For the combinations by channels, refer to the reference measuring range.

BH SERIES

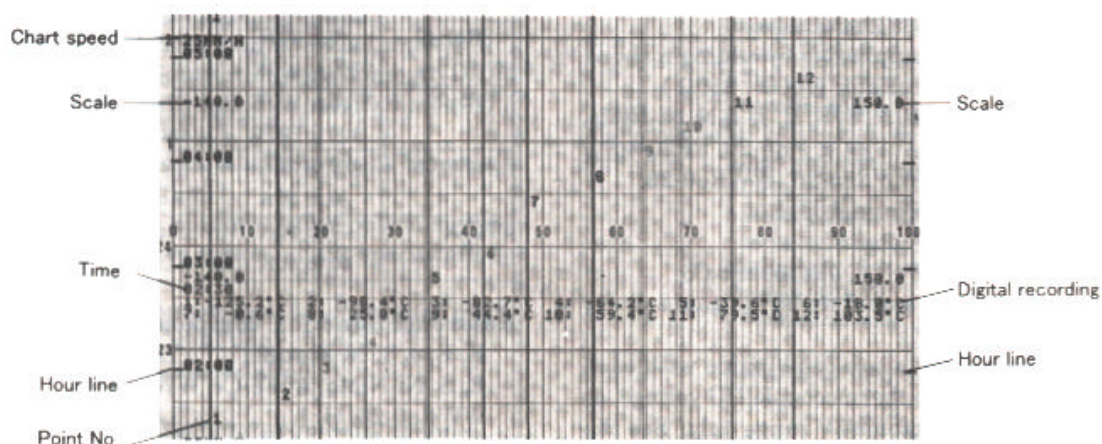
■ NAMES AND FUNCTIONS OF COMPONENT PARTS



■ RECORDING FORMAT

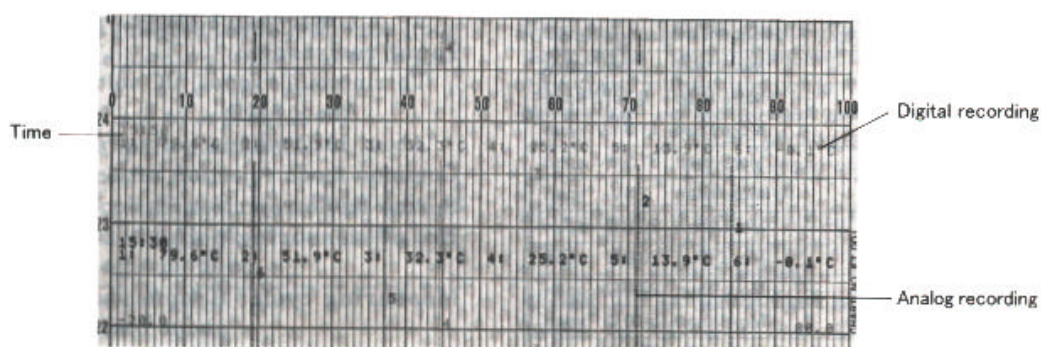
• Fixed time digital printing

Time, scale, chart speed, setting change mark, and hour lines are printed on analog recording at optional time intervals together with data recording.



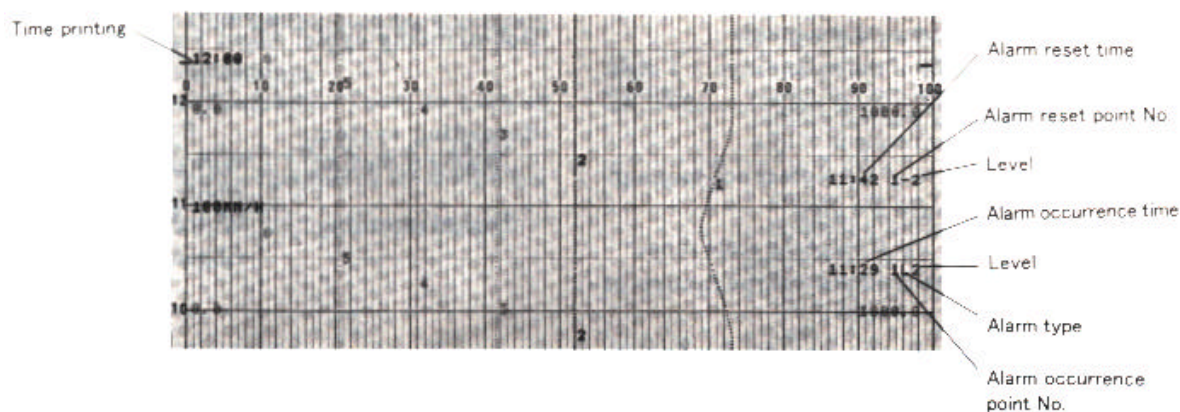
• Instantaneous digital recording

When the latest data are necessary, analog recording is interrupted at once to record these data.



• Printing of occurrence and reset of alarms

Time, point No., alarm type, and level are printed when an alarm occurred and the alarm was reset.



■ GENERAL SPECIFICATIONS

Input signals:

DC voltage $\pm 7\text{mV}$, $\pm 14\text{mV}$, $\pm 25\text{mV}$,
 $\pm 70\text{mV}$, $\pm 5\text{V}$

DC current Applicable by adding a shunt
resistor (100Ω , 250Ω)

Thermocouple B, R, S, K, E, J, T, N, Ni-NiMo,
AuFe-Cr, PR5-20, PR20-40,
WWR5-26, WWR0-26,
Platinel, U, L

Resistance thermometer

..... Pt100, JPt100, Pt-Co

Specify from the standard scale table every input point.
(These input signals are combinable with each other in
case of the thermocouple/DC voltage, or resistance
thermometer/5V range only. See the reference setting
range.)

Max. 6 multi scale plate is available.

Scale : Specify the scales within the minimum
setting range.

Reference measuring range	Minimum measuring range
7.0mV range	More than 3.2mV span
14.0mV range	More than 6.3mV span
25.0mV range	More than 11.3mV span
70.0mV range	More than 31.5mV span
5.0V range	More than 2.3V span
120 Ω range	More than 20.0 Ω span
140 Ω range	More than 20.0 Ω span
160 Ω range	More than 27.0 Ω span
220 Ω range	More than 54.0 Ω span
340 Ω range	More than 108.0 Ω span

*The reference voltage input is 0mV (0V), while the
reference resistance input is 100Ω .

*See the reference setting range.

Accuracy rating: Digital indications and printing

Thermocouple, resistance thermometer

..... $\pm 0.3\%$ of the scale range ± 1 digit.

When the scale range less 300°C , accuracy
rating is $\pm 1^\circ\text{C}$.

DC voltage $\pm 0.1\%$ of the reference measuring range $\pm$
1 digit

Analog indication $\pm 0.5\%$ of the scale range

*Note: Accuracy at a room temperature of
 $23^\circ\text{C} \pm 2^\circ\text{C}$

*Note: For thermocouple inputs, the reference junction
compensating accuracy is excluded.

* Exceptional setting of accuracy rating

Input type	Scale	Accuracy rating (with reference to the reference measuring range)
WWR0-26	0 to 100°C	$\pm 0.3\% \pm 1$ digit
PR20-40	0 to 300°C	$\pm 1.5\% \pm 1$ digit
PR5-20	300 to 800°C	$\pm 0.8\% \pm 1$ digit
	0 to 100°C	$\pm 4\%$
	100 to 200°C	$\pm 0.5\% \pm 1$ digit
AuFe-Cr	0 to 20K	$\pm 0.5\% \pm 1$ digit
	20 to 50K	$\pm 0.3\% \pm 1$ digit
Pt-Co	4 to 20K	$\pm 0.5\% \pm 1$ digit
	20 to 50K	$\pm 0.3\% \pm 1$ digit

Reference junction compensating accuracy:

K, E, J, T, N, Platinel Lower than $\pm 0.5^\circ\text{C}$

R, S, Ni-NiMo, AuFe-Cr, WWR5-26,

WWR0-26, U, L Lower than $\pm 1.0^\circ\text{C}$

A/D resolution: About 1/18000

Allowable signal source resistance:

Thermocouple input, DC voltage input
..... Lower than $1\text{k}\Omega$ (without burnout)

Resistance thermometer input
..... Lower than 10Ω per wire (Pt 100, JPt 100)

Input resistance:

Thermocouple input, DC voltage input
..... About $8\text{M}\Omega$

*About $1\text{M}\Omega$ when a voltage divider is used.

Common mode rejection ratio: More than 130dB

Series mode rejection ratio: More than 50dB

No. of measuring points: 6 points, 12 points,
24 points

Measuring cycle: 6 points about 5sec. 12 points
about 10sec, 24 points about
20sec

Temperature drift: $\pm 0.01\%$ of full scale/ $^\circ\text{C}$
(equivalent to E.M.F. for
thermocouple input)

Terminal board : Detachable type Removable for
connections

Dot-printing cycle: About 5 sec/point (when the
chart speed is faster than 6mm/h)

Recording system:

Analog recording Wire dot system 6-color
ribbon

Digital recording Wire dot system 6-color
ribbon

Recording color:

Analog recording Red, black blue, green, brown, purple

Digital recording

Fixed time digital recording

Repetition of 6 colors (red, black, blue, green, brown, purple)

Instantaneous digital recording

Repetition of 6 colors (red, black, blue, green, brown, purple)

Date (year, month, day) and time printing

Black

Scale, point No.

Same colors as dot printing colors

Chart speed

Black

Alarm occurrence & reset printing

Red (option)

Setting change mark..... Black

Recording chart:

Fan-fold type 200mm total width, 20m total length,

180mm effective recording width

Chart speed:

12.5, 25, and 50mm/h (standard)

3-speed selection by DIP switches

*The speeds are optionally settable.

1 to 1500mm/h (1mm step)

12.5mm/h is a special example.

Fixed time digital recording:

Time, point No., measured values, and units are printed on analog recording at every specified time interval.

Chart speed(mm/h)	Fixed time digital printing interval
0 to 5	Not printed.
6 to 15	24 hours
16 to 25	12 hours
26 to 35	8 hours
36 to 45	6 hours
46 to 65	4 hours
66 to 85	3 hours
86 to 155	2 hours
156 to 250	1 hour
251 or more	Not printed.

Instantaneous digital recording:

Time, point No., measured values, and units are printed at the request time by interrupting analog recording.

Date and time printing:

Hour lines and time are printed on the hour sharp.

Date (year, month, and day) is printed at zero hour sharp.

If this printing overlaps digital recording, time may be not printed.

*The printing intervals depend upon the chart speeds.

Chart speed (mm/h)	Time printing interval	Hour line printing interval
1	12 hours	6 hours
2	6 hours	3 hours
3	4 hours	2 hours
4	3 hours	2 hours
5 to 9	2 hours	1 hour
10 to 250	1 hour	1 hour
251 or more	Not printed.	Not printed.

Scale and point No. printing:

Point No. is printed at 6mm intervals beside the analog recording. Scales are printed sequentially every point at intervals of 48mm at 0% and 100% positions of the chart.

Chart speed printing:

The executing chart speed is printed on the 0 % side of the chart at intervals of 84mm as well as when the power supply is turned on.

*If digital printing is done halfway, the printing interval is extended at a high chart speed.

Alarm occurrence and reset printing:

Time, point No., alarm type and level are printed on the right side of the chart when an alarm occurred.

Time, point No., and level are printed on the right side of the chart when the alarm was reset.

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Setting change mark printing:

A character indicating a change item is printed on the 100% side of the chart at the end of a setting change (when communication interface option is added).

Skip function:

None of analog indications, dot-printing, digital display, and printing is done at each point.

*If the chart speed is lower than 35mm/h, the dot-printing interval may be delayed.

Analog indications: Scale plate and scale pointer

Scale plate: Max. 6 multi scale, 150 equal divisions

Status display:

Recording ON/OFF ... Green LED, illumination switch

ALM Red LED flickers when an alarm occurred.

PRT Green LED lights during printing.

Digital display:

7-segment LED, character height 15mm

2 digits... .. Point No.

5 digits... .. Data display -9999 to 99999

Display items:

Multi-point sequential display, 1-point continuous display, and clock display are switched.

Setting mode display (setting, check, operation):

Digital display part is shared by key operation. Data printing (instantaneous digital recording) operation, chart speed setting, time setting, alarm setting (when the alarm option is added) data interval setting, skip setting

Continuous indication operation:

Input entry and continuous indications at specified points only (recording stop)

Kinds of keys:

REC. ON, FEED, ENTRY, ↑, SEL

Recording operation:

REC. ON... .. Recording operation ON/OFF

FEED Quick chart speed

Rated supply voltage:

90 to 120VAC, or 180 to 240VAC (to be specified)

Rated supply frequency:

50Hz/60Hz (selectable by DIP switches)

Maximum power consumption: Approx. 45VA

Working temperature range: 0 to 50°C

Working humidity range:

20 to 80%RH (No condensing is allowed.)

Mounting position:

Forward tilting 0° Backward tilting 0 to 30°

Lateral tilting 0°

Warm-up time: Longer than 30mm

Countermeasure against power interrupt ion:

Setting data are kept unerased by EEPROM.

Clock is backed up for longer than 10 years by a lithium battery (soldering)(assuming that the recorder is used for 8 hours a day).

Insulation resistance:

500VDC, higher than 20M Ω between measuring terminals and protective conductor terminal 500VDC, higher than 20M Ω between power terminals and protective conductor terminal 500VDC, higher than 20M Ω between measuring terminals and power terminals

Dielectric strength:

500VAC, 1min between measuring terminals and protective conductor terminal

500VAC, 1min between power terminals and protective conductor terminal

500VAC, 1min between measuring terminals and power terminals

Casing:

Door..... ABS resin (heat-resisting temperature Max. 80°C)

Rear casing ABS resin (heat-resisting temperature Max. 80°C)

Power supplySteel plate

Color:

Door..... Black (equivalent to Munsell code N3.0)

Rear casing.....Gray (equivalent to Munsell code N7.0)

Mounting method: Panel flush-mount

Weight: Approx. 7.0kg

• Transportation and storage conditions

Temperature: -20 to +60°C

Humidity: 5 to 95%RH (No condensing)

Vibrations: 10 to 60Hz 0.5G

Shock: Less than 40G

This also offers the following maintenance functions. However these functions are performed by IBM-PC at CHINO's agents, world wide.

- **ENG1 mode** (Specifications check)
Input parameters(ranges, scales, units)
Alarm(mode, output destinations, AND/OR
*when an alarm option is provided.)
Recording colors
Key lock(Key lock condition check by means of communication)
- **ENG2 mode** (Communication option setting and external drive option output specifications check)
Communication setting (addresses, baud rates, character configuration)
External drive information
- **Calibration**
Indications are calibrated on every channel.
Indication are shifted on every channel.
Chart scale position is corrected.
- **Memory clear**
Initialization of set values (Input types, ranges, scales, units, and chart speeds are reset to the set values at the delivery time from the works, and alarm is initialized to no setting)
Clock is initialized to Jan. 1, 1994. Calibration data are initialized.
- **Hardware check**
Printer check, indicator check, DIP switch check, external drive check, version check, and alarm output contact check

■ OPTIONS

Option name	Description
External drive	The following operation can be done by external contact signals. Operation type: 3-chart speed selection, recording stop, & data printing No. of contact points: 3 no-voltage contacts + 1 point (for a special request) Contact capacity: 12V DC, 2mA or higher *The depth is increased by 16mm when this option is added.

Option name	Description
Communication interface	One of RS-232C, RS-422A, and RS-485 is to be specified. Communication contents: Transmission of measured values and status information. Setting and confirmation of parameters are settable by keys. * The depth is increased by 16mm when this option is added.
Alarm output (6P)	No. of output points: 6 points Alarm type: Absolute value alarm, OR output * Differential alarm, change ratio alarm, standby alarm and AND output can be offered on request. Setting level: 2 levels/channels Contact capacity: Mechanical relay: 100V AC, 0.5A, (Resistive load) Mechanical relay output (Common to "a" contact and "c" contact) : 240V AC, 0.2A, (Resistive load) MOS relay output: 240V (AC, DC), 50mA (Resistive load) The depth is increased by 16mm when this option is added. And the depth is increased by 27mm when mechanical relay "a" contact is added.
Extended alarm output	Alarm contact outputs of 12 points and 24 points together with alarm output (6P)
High-speed dot-printing	Dot-printing cycle About 2.5sec/dot (when the chart speed is more than 12mm/h) * The dot printing cycle differs according to the chart speed when the chart speed is less than 2mm/h.
High voltage input	Voltage-dividing resistor is built in. Higher than 5VDC, but lower than 60VDC (channel fixed).
Current input	A resistor is built in. Lower than 50mA (channel fixed, the resistor is externally mounted).
Burnout	The pointer overshoots the high limit when input signals are interrupted. (except for voltage -dividing inputs, voltage/current inputs) Thermocouple input: Channels are fixed. Resistance thermometer input: All channels are fixed.
Math function	One of addition subtraction multiplication, square root, logarithm (common, natural), temperature humidity, integration is to be specified.
CE-marking	• Standards EN5501 1 Group 1 class A EN50082-2 (industrial environment) EN61010-1 +A2 • Rated supply voltage 100 to 240 VAC • Case Steel plate (add 1kg weight to standard model) • Reference junction compensation stability $\pm 5^{\circ}\text{C}$ under EMC test environment

■ REFERENCE MEASURING RANGES

Input type	Reference measuring range	Scale	Indicating resolution	Min. measuring range
DC voltage	±7mV	-7 to +7mV	1μV	32mV
	±14mV	-14 to +14mV	10μV	63mV
	±25mV	-25 to +25mV	10μV	11.3mV
	±70mV	-70 to +10mV	10μV	31.5mV
	±5V	-5 to +5V	1mV	2.3V
Thermocouple	K	±7mV	-150 to +150°C	0.1°C
		±14mV	-200 to +300°C	0.1°C
		±25mV	-200 to +600°C	0.1°C
		±70mV	-200 to +1370°C	1°C
	E	±25mV	-200 to +350°C	0.1°C
		±70mV	-200 to +900°C	1°C
	J	±25mV	-200 to +450°C	0.1°C
		±10mV	-200 to +1200°C	1°C
	T	±7mV	-150 to +150°C	0.1°C
		±14mV	-200 to +250°C	0.1°C
		±25mV	-200 to +400°C	0.1°C
	R	±25mV	0 to +1760°C	1°C
	S	±25mV	0 to +1760°C	1°C
	B	±14mV	400 to +1820°C	1°C
	N	±7mV	0 to +200°C	0.1°C
		±14mV	0 to +350°C	0.1°C
		±25mV	0 to +700°C	0.1°C
		±70mV	0 to +1300°C	1°C
	WWR5-26	±70mV	0 to +2320°C	1°C
	WWR5-26	±70mV	0 to +2320°C	1°C
	PR20-40	±7mV	0 to +1880°C	1°C
	PR5-20	±14mV	0 to +1880°C	1°C
	Ni-NiMo	±70mV	0 to +1310°C	1°C
	AuFe-Cr	±7mV	0 to 300K	0.1K
Resistance thermometer	Platinel	±7mV	-100 to +150°C	0.1°C
		±14mV	-100 to +300°C	0.1°C
		±25mV	-100 to +600°C	0.1°C
		±70mV	-100 to +1390°C	1°C
	U	±7mV	-150 to +150°C	0.1°C
		±14mV	-200 to +250°C	0.1°C
		±25mV	-200 to +450°C	0.1°C
		±70mV	-200 to +600°C	1°C
	L	±25mV	-200 to +450°C	0.1°C
		±70mV	-200 to +900°C	1°C
	Pt100	120Ω	-50 to +50°C	0.1°C
		140Ω	-100 to +100°C	0.1°C
		160Ω	-140 to +150°C	0.1°C
		220Ω	-200 to +300°C	0.1°C
	JPt100	120Ω	-50 to +50°C	0.1°C
		140Ω	-100 to +100°C	0.1°C
		160Ω	-140 to +150°C	0.1°C
		220Ω	-200 to +300°C	0.1°C
	Old Pt50	220Ω	-200 to +649°C	0.1°C
	Pt-Co	220Ω	4 to 374K	0.1K

* Caution) The minimum measuring ranges of the temperature scale are reference values. (They vary more or less according to the temperature ranges.)

* Select the combinations of input scales out of the following four kinds in case of the scales by points.

1. Thermocouple, DC voltage type 1 : 7mV, 14mV, 25mV, 5V
2. Thermocouple, DC voltage type 2 : 14mV, 25mV, 70mV, 5V
3. Resistance thermometer, 5V type 1: 120Ω, 140Ω, 160Ω, 5V
4. Resistance thermometer, 5V type 2: 160Ω, 220Ω, 340Ω, 5V

■ STANDARD SCALES

Input type	Working reference measuring range	Standard scale
DC voltage/ currenty	±7mV	-5 to +5mV, 0 to 5mV
	±14mV	-10 to +10mV, 0 to 100mV
	±25mV	0 to 20mV
	±70mV	0 to 50mV
	±5V	1 to 5V, 4 to 20mA, 10 to 50mA (The scale plate is equally divided into 0 to 100 divisions)
Thermocouple	K	±7mV
		±14mV
		±25mV
		±70mV
	E	±25mV
		±70mV
	J	±25mV
		±70mV
	T	±7mV
		±14mV
		±25mV
		±70mV
	R	±25mV
	S	±25mV
	B	±14mV
	N	±7mV
	PR20-40	±10mV
Resistance thermometer	Pt100	120Ω
		140Ω
		160Ω
		220Ω
	JPt100	120Ω
		140Ω
		160Ω
		220Ω
	U	±7mV
		±14mV
		±25mV
		±70mV
	L	±25mV
	Pt100	120Ω
		140Ω
		160Ω
		220Ω
	JPt100	120Ω
		140Ω
		160Ω
		220Ω

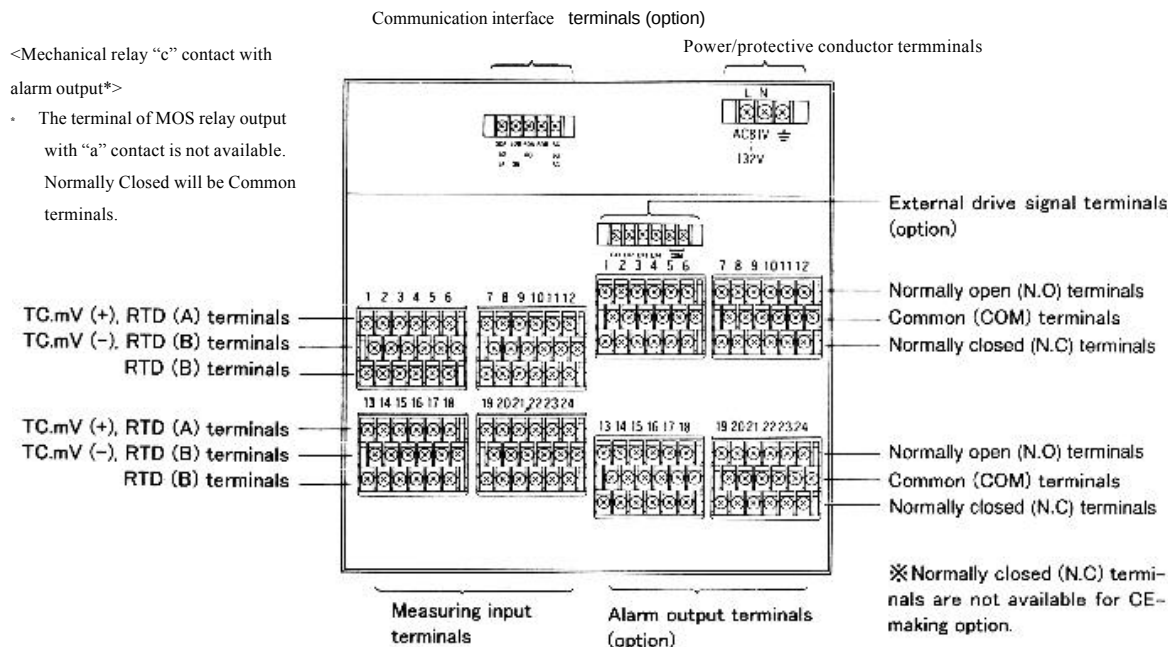
■ ACCESSORIES

Name of accessories	Q'ty	Remarks
Recording chart	1 pad	Fan-fold type, 20m in total length
Mounting bracket	2 pcs.	Used for panel mounting.
Channel indicating card	1 sheet	Attached to the door for describing the measuring titles of individual channels (The functions of DIP switches are described on the rear panel).
Ribbon cassette	1 pc.	6-color ink ribbon for analogue and digital recording
Auxiliary terminal screw	5 pcs.	Use these input (alarm) terminal screws if they are missing (3.5mm in thread diameter).
Lubricating oil	1 bottle	Contains 10cc.
Instruction manual	1 pad	
Inspection certificate	1 sheet	

■ CONSUMABLES

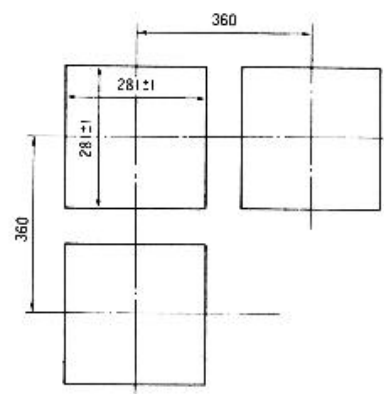
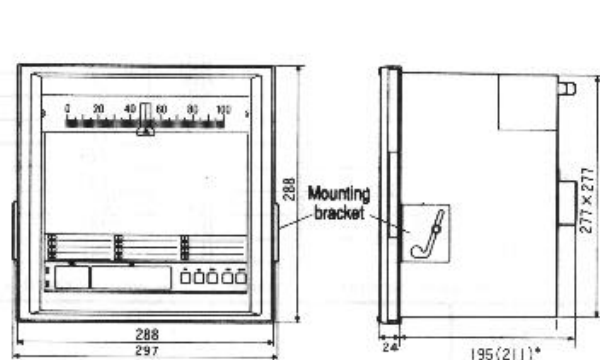
Article names	Sales unit
Recording chart	15 pads/case
6-color ink ribbon cassette	1 pc/case
Lubricating oil	1 bottle
Mounting bracket	2 pcs. (for one unit)

■ TERMINAL BOARD



EXTERNAL DIMENSIONS

Panel Cutout/Minimum instrument mountin Space



*: 211mm (for external drive, alarm output and communication interface)
222mm (for mechanical relay "a" contact output)

Unit : mm

HOW TO ORDER

- Model : BH□□□□□□□□
- Power source : 100VAC line or 200VAC line
(To be specified)
- Chart speed : Standard 12.5, 25, 50mm/h
Specified _____, _____, _____ mm/h
- Input type and scale:

Point No.	Input type	Scale range (incl.deci.point)	Printing unit
		to	
		to	
		to	
		to	
		to	
		to	
		to	
		to	
		to	
		to	
		to	

Example

Point No.	Input type	Scale range	Printing unit
1-3	K	0.0 to 400.0	°C

Printing unit is 2 digits. (°C shows 2 digits.)

Shunt resistor for current input:

Built-in or external

5. Scale Plate:

	Scale range	Unit
1.		
2.		
3.		
4.		
5.		
6.		

*Maximum 6 multi scale

Unit: Max. 10 characters (Single scale)

Max.6 characters (Multi scale)

6.Alarm option:

Alarm designation: Standard Exclusive

- In case exclusive is specified, write exclusive specifications in the right table.
- Parenthesized () settings show the standard settings.
- Enter alarm set values by keys.
- Alarm output is up to 2 levels per channel.
- Alarm type: H; High limit absolute value alarm, L; Low limit absolute value alarm, B; Differential high limit alarm, S; Differential low limit alarm, U; Change ratio increase limit alarm, D; Change ratio decrease limit alarm These alarms are settable. Fill the option parameters

with a reference channel when the differential alarm is selected, or fill the option parameter with scanning cycle (1 to 9) when the change ratio alarm is selected. Add W to the alarm type, if a standby alarm is necessary. (Example: WH, WL)

- An alarm output AND connection is possible. Write in the option parameters.

OR output: Alarm output is executed when one of alarm points becomes alarm condition.

AND output: Alarm output is executed when all alarm points become alarm condition.

- Alarm output numbers are freely settable. Example: 24-point alarm outputs are possible on 12-point instrument. (when using extended alarm output 24 points)

Points	Level	Alarm type	Output No.	Alarm set value	Parameters
1	1	(H)	(1)		
	2	(L)	(1)		
2	1	(H)	(2)		
	2	(L)	(2)		
3	1	(H)	(3)		
	2	(L)	(3)		
4	1	(H)	(4)		
	2	(L)	(4)		
5	1	(H)	(5)		
	2	(L)	(5)		
6	1	(H)	(6)		
	2	(L)	(6)		
7	1	(H)	(7)		
	2	(L)	(7)		
8	1	(H)	(8)		
	2	(L)	(8)		
9	1	(H)	(9)		
	2	(L)	(9)		
10	1	(H)	(10)		
	2	(L)	(10)		
11	1	(H)	(11)		
	2	(L)	(11)		
12	1	(H)	(12)		
	2	(L)	(12)		
13	1	(H)	(13)		
	2	(L)	(13)		
14	1	(H)	(14)		
	2	(L)	(14)		
15	1	(H)	(15)		
	2	(L)	(15)		
16	1	(H)	(16)		
	2	(L)	(16)		
17	1	(H)	(17)		
	2	(L)	(17)		
18	1	(H)	(18)		
	2	(L)	(18)		
19	1	(H)	(19)		
	2	(L)	(19)		
20	1	(H)	(20)		
	2	(L)	(20)		
21	1	(H)	(21)		
	2	(L)	(21)		
22	1	(H)	(22)		
	2	(L)	(22)		
23	1	(H)	(23)		
	2	(L)	(23)		
24	1	(H)	(24)		
	2	(L)	(24)		

Specifications subject to change without notice. Original 2001.5

CHINO CORPORATION

32-8, KUMANO-CHO, ITABASHI-KU, TOKYO 173-8632

PHONE: +81-3-3956-2171

FAX: +81-3-3956-0915

E-mail: inter@chino.co.jp

Website : http://www.chino.co.jp