

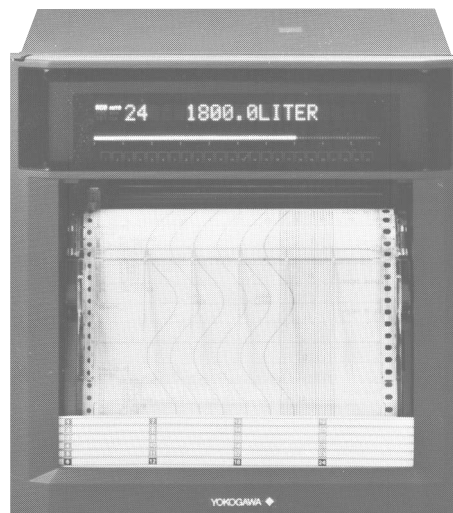
# General Specifications

## μR1800 Recorder



GS 04H03B01-01E

The μR1800 is a compact recorder with a recording width of 180mm. The model family consists of 1, 2, 3, 4 pen and 6, 12, 18, 24 dot model. Pen models realize continuous recording for each channel, whereas the dot-printing model realizes a high recording speed of 6dot / 10sec., 12dot / 15sec., 18dot / 20sec., 24dot / 30sec. Its input is universal, which means that it is freely selectable to use inputs like direct voltage, Thermo-couple, Resistance Temperature Detector, contact input, etc. In addition to analog recording, digital data like date & time, measured values, tags, units, scale values, chart speed, alarms, calculated values, etc. can also be printed. High reliability is realized by in house developed contact free technology, such as high breakdown voltage semiconductor relays, and DC brushless servomotors. Furthermore the μR1800 has a short case of only 220mm. Good readability is realized by using 5 × 7 VFD display and its setting is made easy because of the interactive program menu. Real time data is also displayed as a bargraph. The μR1800 can be used as a monitoring device and as a quality control instrument in many applications (such as process temperature monitoring, pollution, construction, furnaces, field of medical diagnosis, field of refrigerating, etc.).



μR1800  
(24-dot model)

## STANDARD SPECIFICATIONS

### General Specifications

#### Construction

##### Mounting:

Flush Panel Mounting (vertical)

Mounting may be inclined up to 30°, rear below front (with horizontal base).

**Allowable panel thickness:** 2 to 26mm

##### Material:

Case: drawn steel, front door: aluminium die casting.

##### Finish:

Case and door-frame: lamp black (Mansell 0.8Y2.5 / 0.4 or equivalent)

**Door:** Splash and dust-proof (based on DIN 40050-IP54).

##### Dimensions:

288×288×220mm (see dimensional drawings)

##### Weight (approx.):

1 pen	8.9kg	6 dot	9.1kg
2 pen	9.0kg	12 dot	9.4kg
3 pen	9.2kg	18 dot	9.5kg
4 pen	9.4kg	24 dot	9.6kg

### Model

1, 2, 3, and 4 pen, 6, 12, 18, and 24 dot-model.

### Input

**Inputs:** DCV: Direct Current Voltage input 20mV to 20V range.

TC: Thermo couple.

RTD: Resistance Temperature Detector.

DI: Digital Input (contact or DC Voltage, TTL level).

DCA: Direct Current Input (using external shunt resistor (10Ω, 100Ω, 250Ω) )

**Measuring range:** selectable per channel

Input Type	Range	Measuring Range
DC V	20 mV	-20.00 to 20.00mV
	60 mV	-60.00 to 60.00mV
	200 mV	-200.0 to 200.0mV
	2 V	-2.000 to 2.000V
	6 V	-6.000 to 6.000V
	20 V	-20.00 to 20.00V

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Input Type	Range	Measuring Range °C	Measuring Range °F
TC	R*1	0.0 to 1760.0°C	32 to 3200°F
	S*1	0.0 to 1760.0°C	32 to 3200°F
	B*1	0.0 to 1820.0°C	32 to 3308°F
	K*1	-200.0 to 1370.0°C	-328.0 to 2498°F
	E*1	-200.0 to 800.0°C	-328.0 to 1472.0°F
	J*1	-200.0 to 1100.0°C	-328.0 to 2012.0°F
	T*1	-200.0 to 400.0°C	-328.0 to 752.0°F
	N*2	0.0 to 1300.0°C	32 to 2372°F
	W*3	0.0 to 2315.0°C	32 to 4199°F
	L*4	-200.0 to 900.0°C	-328.0 to 1652.0°F
U*4	-200.0 to 400.0°C	-328.0 to 752.0°F	

Input Type	Range	Measuring Range °C	Measuring Range °F
RTD	Pt100*5	-200.0 to 600.0°C	-328.0 to 1112.0°F
	JPt100*5	-200.0 to 550.0°C	-328.0 to 1022.0°F

Input Type	Range	Measuring Range
DI (Digital Input)	Voltage Input	less than 2.4V: OFF; more than 2.4V: ON (TTL)
	Contact Input	contact ON / OFF

- \*1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1981
- \*2 N: Nicrosil-Nisil, IEC 584, DIN IEC 584
- \*3 W: W\*5% Re-W\*26% Re (Hoskins Mfg Co)
- \*4 L: Fe-CuNi, DIN 43710 U: Cu-CuNi, DIN 43710
- \*5 Pt100: JIS C 1604-1989, JIS C 1606-1989, IEC 751, DIN IEC 751  
JPt100: JIS C 1604-1981, JIS C 1606-1989

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**Measurement Interval:**

Pen model: 125ms / channel  
 Dot printing model: 2.5s / 6-, 12-, 18-, 24dot  
 In case of 100ms integration:  
 2.5s / 6 dot, 5s / 12 dot, 10s / 18 dot, 10s / 24 dot

**A / D Integration Time:**

AUTO / FIX selectable  
 AUTO: 20ms (50Hz) or 16.7ms (60Hz), automatically selected depending on the power supply frequency.  
 FIX: 20ms (50Hz), 16.7ms (60Hz) or 100ms (50 / 60Hz) can be set.  
 100ms integration time for dot printing model only

**TC Burnout:**

ON / OFF selectable (per channel)  
 Burnout upscale / downscale selectable (common for all channels)  
 Normal: less than 2kΩ, burnout: more than 10MΩ  
 Measuring current: approx. 100nA.

**Filter:**

Pen model:  
 Signal damping (ON / OFF selectable per channel; in case of ON: time constant from 2, 5, 10sec).  
 Dot printing model:  
 Moving average (ON / OFF selectable per channel; in case of ON: averaging times from 2 to 16 scans).

**Calculation:**

Differential computation:

Between any two channels, however reference channel number must be less than measuring channel number.

Available for DCV, TC, and RTD range.

Both channels must have same range.

Linear scaling:

Available for DCV, TC and RTD range.

Scaling limits: -20000 to 20000

Data display & printout range: -19999 to 20000

Decimal point: user selectable (should be specified when entering scale value)

Unit: user settable, up to 6 characters (alphanumerical & special characters).

Square root:

Available for DCV range.

Scaling limits: -20000 to 20000

Data display & printout range: -19999 to 20000

Decimal point: user selectable

Unit: user settable, up to 6 characters (alphanumerical & special characters).

**Recording and Printing**

**Recording Method:**

Pen model: Disposable felt pens, Plotter pen  
 Dot printing model: 6 color wire dot.

**Pen Offset Compensation:**

ON / OFF selectable (Pen model only)

**Effective Recording Width:** 180mm

**Chart:**

Plain-paper Z-fold chart (20m)

**Step Response Time (pen):**

Less than 1.5sec (acc. to IEC TC85 method).

**Recording Period:**

Pen model:  
 Continuous for each channel.  
 Dot printing model:  
 Max. 6 dot / 10sec, 12 dot / 15sec, 18 dot / 20sec, 24 dot / 30sec, AUTO / FIX selectable  
 AUTO: Analog recording interval is depending on the chart speed  
 FIX: Analog recording interval is set to shortest period

**Chart Speed:**

Pen model: 5 to 12000mm/h (82 increments)  
 Dot printing model: 1 to 1500mm/h (1mm step)

**Chart Speed Change:**

speed 1, speed 2 change by remote control signals (option).

**Chart Speed Accuracy:**

within ± 0.1% (for recordings longer than 1000mm, related to the grid of the chart paper)

**Relation between Chart Speed and Printout:**

(Pen-model)

Chart Speed	• Periodic Printout	• Alarm Printout • Message Printout • Chart Speed Change Time Printout
5 to 9mm/h	No printout	Printout
10 to 1500mm/h	Printout	Printout
1600 to 12000mm/h	No printout	No printout

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(6-, 12-dot model)

Chart Speed	• Channel No. or Tag No.	• Periodic Printout	• Alarm Printout • Message Printout • Chart Speed Change Time Printout
1 to 9mm/h	Printout	No printout	Printout
10 to 100mm/h	Printout	Printout	Printout
101 to 1500mm/h	No printout	No printout	No printout

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(18-, 24-dot model)

Chart Speed	• Channel No. or Tag No.	• Periodic Printout	• Alarm Printout • Message Printout • Chart Speed Change Time Printout
1 to 9mm/h	Printout	No printout	Printout
10 to 50mm/h	Printout	Printout	Printout
51 to 1500mm/h	No printout	No printout	No printout

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**Relation between chart speed and printing intervals of periodic printouts:**

(Pen-model)

Chart Speed	Printing Interval of Periodic Printout
5 to 9mm/h	No printout
10 to 18mm/h	Every 8 hours
20 to 36mm/h	Every 4 hours
40 to 72mm/h	Every 2 hours
75 to 135mm/h	Every hour
150 to 180mm/h	Every 30 minutes
200 to 320mm/h	Every 20 minutes
360 to 1500mm/h	Every 10 minutes
more than 1600mm/h	No printout

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(Dot-printing model)

Chart Speed	Printing Interval of Periodic Printout			
	6-dot model	12-dot model	18-dot model	24-dot model
1 to 9mm/h	No printout	No printout	No printout	No printout
10 to 19mm/h	Every 8 hours	Every 12 hours	Every 12 hours	Every 24 hours
20 to 39mm/h	Every 4 hours	Every 8 hours	Every 8 hours	Every 12 hours
40 to 50mm/h	Every 2 hours	Every 4 hours	Every 4 hours	Every 8 hours
51 to 79mm/h	Every 2 hours	Every 4 hours	No printout	No printout
80 to 100mm/h	Every hour	Every 2 hours	No printout	No printout
101 to 1500mm/h	No printout	No printout	No printout	No printout

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**Recording Colors:**

Pen model:

pen1=red, pen2=green, pen3=blue,

pen4=violet, plotter pen=purple

Dot printing model:

ch1, 7, 13, 19=purple, ch2, 8, 14, 20=red,

ch3, 9, 15, 21=green, ch4, 10, 16, 22=blue,

ch5, 11, 17, 23=brown, ch6, 12, 18, 24=black

(color can be assigned to any channel)

**Recording Format:**

1. Analog recording:

Zone recording:

Span: More than 5mm (in 1mm steps).

Partial expanded recording:

Boundary position: 1 to 99%

Boundary value: Within recording span

2. Digital printout:

Channel (dot model only):

Channel number or TAG will be printed during analog recording. Approx. every 25mm this print will occur.

Alarm:

At the right side of the chart, CH. No. or TAG, Type of alarm, ON / OFF time (h/m) will be printed. It is selectable to get ON / OFF time of alarms, or ON time, or no alarms (common for all channels).

Periodic printout:

At the left side of the chart, date (m/d), time (h/m) chart speed, and measured data of every channel will be printed.

Printing interval is INT / EXT selectable.

INT: Using internal timer. Depending on chart speed or on interval which is selectable (up to 24 hours).

EXT: Using remote control option

Channel No. or TAG printout:

Selectable, common for all channels.

Measuring printout:

ON / OFF selectable for each channel.

Scale printout:

Recording span more than 40mm, at 0% and 100% values will be printed. (When using partial expanded recording, boundary value will also be printed). ON / OFF selectable (common for all channels)

Printout of recording colors (pen model only)

Date, time and chart speed

Message printout:

Using panel key or remote control option. Up to 5 messages.

Contents: time (h/m) and message (up to 16 characters).

Record start time:

Time (h/m) will be printed when recording starts, ON / OFF selectable

Chart speed printout:

Time (h/m) when chart speed is changed will be printed, ON / OFF selectable.

- List printout:  
Listings of range and alarm setting, etc. will be printed.
- Manual printout:  
Using panel key or remote control option. Measured values of that moment will be printed, while trend recording will be interrupted.
- SET UP List printout:  
Listings of settings in SET UP Mode will be printed.

**Display**

**Display Method:**

VFD (5 × 7 dot matrix, 20 characters).

**Digital Display:**

- AUTO Channel No. or TAG No., kind of alarm, measured values, unit (when TAG No. is displayed, front 4 characters), for each channel alternately
- MANUAL Channel No., kind of alarm, measured values, unit (when TAG No. is displayed, front 4 characters), for one specific channel
- CLOCK Year / month / date and hour / min / sec will be displayed
- VIEW Operating status of IC memory card will be displayed

**Bargraph Display:**

- Measured data Left-referenced (%) bargraph and center zero bargraph (selectable for each channel).
- Alarm Setting level of alarm, in case of alarm flashing display.

**Alarm status display:**

Channel No. will be displayed in case of alarm (dot model only)

**Other Displays:**

RCD:Recording in progress, POC: Pen offset compensation (pen model only), SET: Set mode, ALM: Shared alarm (not corresponding to any channel), CHT: Chart end indicator (optional), BAT: Low battery. AUTO, MAN, CLK: Display status of operation mode

**Power Supply**

**Rated Power Voltage:**

100 to 240VAC, automatically selected depending on the power supply voltage

**Usable power voltage ranges:**

90 to 132, 180 to 250VAC

**Rated Power Frequency:**

50 / 60 Hz, automatically selected

**Power Consumption: (approx.)**

	100VAC Power Source	240VAC Power Source	Maximum
4 pen	30VA*	40VA*	70VA
6, 12, 18, 24 dot	23VA*	32VA*	70VA

\* : In Balance

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**Alarm**

**Number of levels:**

Up to four levels for every channel (High, Low, Delta high, Delta low, High-rate-of-change, Low-rate-of change selectable).

Interval time of rate-of-change alarm is the measuring interval times 1 to 15 (selectable, and common for both rate-of-change alarms).

**Display:**

Set value:

It is indicated as a point on the bargraph.

In case of an alarm:

This point will start flashing on the bargraph and the digital display will show the kind of alarm and alarm indicator in different display will show alarm

For the dot model, the channel No. where the alarm occurred will also be displayed.

**Hysteresis:**

Approx. 0.5% of recording span (only High, Low alarm) and 0%, selectable (common for all channels and all levels).

**Alarm indication when ALARM ACK-key is pressed:**

Non-hold-type:

Alarm display is not affected when the ALARM ACK-key is pressed.

Hold-type:

When alarm occurs, alarm indicator will start flashing. After ALARM ACK-key is pressed, indicator will show status of the alarm.

Hold-type:

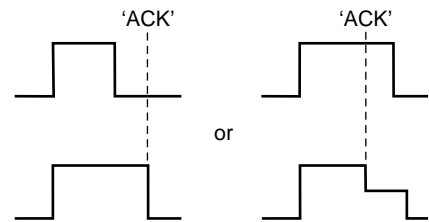
Alarm ON

Alarm OFF

Indicator BLINK

Indicator ON

Indicator OFF



Non-hold type:

No action will occur when ACK-key is pressed. ALM indicator depends on alarm status.

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**Other Specifications**

**Clock:**

With Calendar function

**Clock Accuracy:**

100 ppm, however not including error due to turning ON / OFF power

**Panel Key Lock:**

By actual key

**Internal illumination:**

By using the internal reflection of VFD indicator

**Memory backup:**

Lithium battery to protect setting parameters.

Life is approx. ten years (at room temperature, and for standard model) and is installed inside the recorder. If the battery runs down, it will be indicated on the front panel indicator.

**Insulation Resistance:**

Each terminal to ground terminal: more than 20M $\Omega$  (measured at 500VDC).

**Dielectric Strength:**

Power supply to ground terminal:

1500V AC (50 / 60Hz), 1 min

Contact output terminal to ground:

1500V AC (50 / 60Hz), 1 min

Measuring input terminal to ground:

1000V AC (50 / 60Hz), 1 min

Between measuring input terminals:

1000V AC (50 / 60Hz), 1 min

(except for RTD, since b-terminal is common).

Between remote control terminal to ground:

500V DC, 1min.

**Machine noise:**

Machine Noise Information Ordinance 3. GSGV, Jan. 18, 1991:

The maximum sound pressure level is equal or less than 60dB (A) according to ISO7779.

**Safety Standards**

Certified by CSA22.2 No. 1010.1

Complies with EN61010-1

**EMC Standards**

Complies with EN61326-1

Complies with AS/NZS 2064 1/2: 1997, Class A

**Normal Operating Conditions**

Power voltage: 90 to 132, 180 to 250VAC

Power frequency: 50Hz  $\pm$  2%, 60Hz  $\pm$  2%

Ambient temperature: 0 to 50°C

Ambient humidity: 20 to 80% RH (at 5 to 40°C)

Vibration: 10 to 60Hz, less than 0.02G

Shock: not permissible

Magnetic field: less than 400AT/m (DC and 50, 60Hz)

Noise:

Normal Mode (50 / 60Hz)

DCV Peak value including signal must be less than 1.2 times the measuring range.

TC Peak value including signal must be less than 1.2 times the measuring thermal electromotive force.

RTD less than 50mV.

Common Mode (50 / 60Hz)

less than 250VAC rms. for the whole range

Maximum Differential Noise between Channels (50 / 60Hz)

less than 250VAC rms for 6, 12, dot model

less than 200VAC rms for 18, 24 dot model

\* In case of / N2 (3 leg RTD) is combined less than 200VAC rms for 6 dot model less than 100VAC rms for 12, 18, 24 dot model

**Operating Position:**

Frontwards: 0° Backwards: within 30° from horizontal

**Warm-up Time:**

Min 30 minutes after power has been turned ON.

**Standard Performance**

**Measuring and Recording Accuracy:**

(following specifications apply to operation of the recorder under standard operation conditions: temperature  $23 \pm 2^\circ\text{C}$ , humidity  $55 \pm 10\% \text{RH}$ , power supply voltage 90 to 132V, 180 to 250V AC, power supply frequency 50/60Hz  $\pm 1\%$ , warm-up time at least 30 minutes, other ambient conditions like vibration should not adversely affect the recording operation).

Input	Range	Measuring (digital display)		Recording (analog)	
		Measurement Accuracy	Max. Resolution	Recording Accuracy	Resolution
DC V	20mV	$\pm (0.2\% \text{ of rdg}+3 \text{ digits})$	10 $\mu\text{V}$	Measurement accuracy $\pm (0.3\% \text{ of recording span})$	Pen model dead band: 0.2% of recording span  Dot printing model resolution: 0.1mm
	60mV	$\pm (0.2\% \text{ of rdg}+2 \text{ digits})$	10 $\mu\text{V}$		
	200mV	$\pm (0.2\% \text{ of rdg}+2 \text{ digits})$	100 $\mu\text{V}$		
	2V	$\pm (0.1\% \text{ of rdg}+2 \text{ digits})$	1mV		
	6V	$\pm (0.3\% \text{ of rdg}+2 \text{ digits})$	1mV		
	20V	$\pm (0.3\% \text{ of rdg}+2 \text{ digits})$	10mV		

TC	R S B	$\pm (0.15\% \text{ of rdg}+1^\circ\text{C})$ but R, S : 0 to $100^\circ\text{C}$ , $\pm 3.7^\circ\text{C}$ 100 to $300^\circ\text{C}$ , $\pm 1.5^\circ\text{C}$ B : 400 to $600^\circ\text{C}$ , $\pm 2^\circ\text{C}$ accuracy less than $400^\circ\text{C}$ is not specified	0.1 $^\circ\text{C}$	Measurement accuracy $\pm (0.3\% \text{ of recording span})$	Pen model dead band: 0.2% of recording span  Dot printing model resolution: 0.1mm
	K	$\pm (0.15\% \text{ of rdg}+0.7^\circ\text{C})$ but -200 to $-100^\circ\text{C}$ $\pm (0.15\% \text{ of rdg}+1^\circ\text{C})$			
	E	$\pm (0.15\% \text{ of rdg}+0.5^\circ\text{C})$			
	J T	$\pm (0.15\% \text{ of rdg}+0.5^\circ\text{C})$ but J : -200 to $-100^\circ\text{C}$ $\pm (0.15\% \text{ of rdg}+0.7^\circ\text{C})$	0.1 $^\circ\text{C}$		
	N	$\pm (0.15\% \text{ of rdg}+0.7^\circ\text{C})$			
	W	$\pm (0.15\% \text{ of rdg}+1^\circ\text{C})$	0.1 $^\circ\text{C}$		
	L U	$\pm (0.15\% \text{ of rdg}+0.5^\circ\text{C})$ but L : -200 to $-100^\circ\text{C}$ $\pm (0.15\% \text{ of rdg}+0.7^\circ\text{C})$	0.1 $^\circ\text{C}$		

RTD	Pt100 JPt100	$\pm (0.15\% \text{ of rdg}+0.3^\circ\text{C})$	0.1 $^\circ\text{C}$	Measurement accuracy $\pm (0.3\% \text{ of recording span})$	Pen model dead band: 0.2% of recording span Dot printing model resolution: 0.1mm
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NOTE: Recording span is 180 mm.

Accuracy in case of scaling:

accuracy during scaling (digits) =

measuring accuracy (digits)  $\times$  multiplier + 2 digits  
(rounded up)

Where the multiplier = scaling span digits / recording span digits

Example:

DCV 6V range

recording span : 1.000 to 5.000V

scaling span : 0.000 to 2.000

measuring accuracy =  $\pm (0.3\% \times 5V + 2 \text{ digits})$   
 $\pm (0.015V (15 \text{ digits}) + 2)$   
 $\pm (17 \text{ digits})$

multiplier = 2000 digits (0.000 to 2.000) / 4000 digits  
(1.000 to 5.000V) = 0.5

Accuracy during scaling = 17 digits  $\times$  0.5 + 2 = 11 digits  
(rounded up)

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**Maximum Allowable Input Voltage:**

Less than 2VDC ranges and TC ranges:  $\pm 10$ VDC (cont.)

6V to 20VDC:  $\pm 30$ VDC (cont.)

**Reference Junction Compensation:**

INT / EXT selectable (per channel)

**Reference Junction Compensation Accuracy (above 0 °C):**

Type R, S, B, W:  $\pm 1$  °C

Type K, J, E, T, N, L, U:  $\pm 0.5$  °C

**Input Resistance:**

More than 10M $\Omega$  (TC, 20mV, 60mV, 200mV, 2V range)

Approx. 1M $\Omega$  (6, 20V range).

**Input Source Resistance:**

DCV, TC input: less than 2k $\Omega$

RTD input: less than 10 $\Omega$  / wire (Resistance is well-balanced between 3 wires)

**Input Bias Current:**

less than 10nA (however, when burnout is specified for TC:100nA).

**Maximum Common Mode Voltage:**

250VAC rms (50 / 60Hz)

**Maximum Differential Noise between Channels:**

250VAC rms (50 / 60Hz) for 6, 12 dot model

200VAC rms (50 / 60Hz) for 18, 24 dot model

\*In case of / N2 (3 leg RTD) is combined

200VAC rms (50 / 60Hz) for 6 dot model

100VAC rms (50 / 60Hz) for 12, 18, 24 dot model

**Interference between Channels:**

120dB (500 $\Omega$ , the deviation in the case that 30V is applied to another channel)

**Common Mode Rejection Ratio:**

120dB (50/60Hz  $\pm 0.1\%$ , 500 $\Omega$  imbalance between '–' terminal and ground)

**Normal Mode Rejection Ratio:**

40dB (50 / 60Hz  $\pm 0.1\%$ )

**Effect of Operating Conditions****Effect of Ambient Temperature:**

Effect of ambient temperature variation of 10°C.

Digital display: within  $\pm (0.1\%$  of rdg+1 digit)

Recording: within Digital display  $\pm 0.2\%$  of recording span (excluding RJC error)

**Effect of Power Supply:**

Effect of variation within 90 to 132V or 180 to 250VAC in rated power supply voltage: (50 or 60Hz is reference)

Digital display: within  $\pm 1$  digit

Recording: within  $\pm 0.1\%$  of recording span

Effect of rated power frequency variation of  $\pm 2$ Hz (100VAC is reference):

Digital display: within  $\pm (0.1\%$  of rdg+1 digit)

Recording: same as digital display

**Effect of Magnetic Field:**

Effect of AC (50 / 60Hz) or DC 400AT/m field:

Digital display: within  $\pm (0.1\%$  of rdg+10 digits)

Recording: less than  $\pm 0.5\%$  of recording span

**Effect of Radio-frequency Electromagnetic Field:**

Effect of 80-1000MHz, 10V/m field

(Pen model) Digital display: within  $\pm (5\%$  of range +1 digit)

Recording: within  $\pm (5\%$  of range)

(Dot model) Digital display: within  $\pm (20\%$  of range +1 digit)

Recording: within  $\pm (20\%$  of range)

**Effect of Radio-frequency Common Mode:**

Effect of 0.15-80MHz, 10V

Digital display: within  $\pm (5\%$  of range +1 digit)

Recording: within  $\pm (5\%$  of range)

**Effect of Input Source Resistance:**

Effect of Input Source Resistance variation of +1k $\Omega$  :

DCV range:

Ranges less than 2V: within  $\pm 10$   $\mu$ V

Ranges more than 6V: within  $-0.1\%$  of rdg

TC range:

within  $\pm 10$   $\mu$ V (However  $\pm 100$   $\mu$ V when TC burnout protection is set)

RTD range:

Effect of 10 $\Omega$  per wire (resistances of three wires must be equal):

Digital display: within  $\pm (0.1\%$  of rdg+1 digit)

Recording: within Digital display  $\pm 0.1\%$  of recording span

Effect of difference of three wires:

Digital display: 0.1°C per 40 m $\Omega$  (approx.)

**Effect of Operating Position:**

Digital display: within  $\pm (0.1\%$  of rdg+1 digit) (within 30° backwards)

Recording: within Digital display  $\pm 0.1\%$  of recording span (within 30° backwards)

**Vibration:**

Effect when sine-wave motion of frequency 10 to 60Hz and acceleration of 0.02G is applied to the instrument in the direction of three axes for two hours:

Digital display: within  $\pm (0.1\%$  of rdg+1 digit)

Recording: within Digital display  $\pm 0.1\%$  of recording span

**Transport and Storage Conditions**

No malfunction will occur under these conditions, however when returning to normal operation conditions, calibration might be necessary.

**Temperature:**  $-25$  °C to 60 °C

**Humidity:** 5 to 95% RH (no condensation)

**Vibration:** 10 to 60Hz 0.5G

**Shock:** less than 40G (inside packing)

## SPECIFICATIONS OF OPTIONAL FUNCTIONS

### / A1: Alarm Output Relay (2 contacts)

### / A2: Alarm Output Relay (4 contacts)

### / A3: Alarm Output Relay (6 contacts)

### / A4: Alarm Output Relay (12 contacts)

### / A5: Alarm Output Relay (24 contacts)

When alarm occurs, output relay on rear terminal will be activated.

1. Output is AND / OR selectable.
2. Energize/ non-energize selectable (common for all relays).
3. Hold type/ non-hold type selectable (common for all relays).

#### 4. Reflash relay:

When alarms occurs, specific output relay point can reflash (can be assigned to 3 points max)

5. Relay contact rating: DC 250V / 0.1A  
AC 250V / 3A

6. Type of relay output: NO-C-NC

Note : Alarm ACK key:

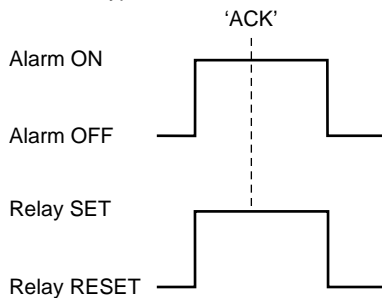
Non-Hold type:

No effect when ALARM ACK-key is pressed (no effect on output relay).

Hold type:

When-ALARM ACK-key is pressed, the output relay will be reset.

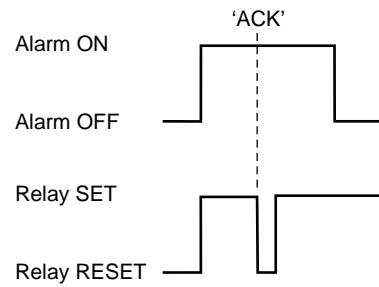
Non-hold-type:



(ex. 1)

F0801.EPS

Hold-type:



(ex. 2)

F0802.EPS

### / C3: RS-422A Communication Interface

By using this communication function, setting and control of data can be done by a host-computer.

Data can also be output to the host-computer.

1. Synchronizing format: start-stop asynchronous transmission
2. Specifications: conform to EIA RS-422A standard
3. Communication principle: 4-wire half-duplex multi-drop connection (1: N (N=1 to 16))
4. Communication rate: 75, 150, 300, 600, 1200, 2400, 4800, 9600bps
5. Data length: 7 or 8 bit
6. Stop bit: 1 or 2 bit
7. Parity: Odd, even or none
8. Communication distance: Up to 500m
9. Communication mode: ASCII (control / setting / measured data) or Binary (measured data)

### / E1: IC Memory Card Slot

Saving and retrieving setting parameters

### / E2: IC Memory Card Slot

Specifications

Memory Data : Setting data, measured data, calculated data and programmed parameter can be stored on a memory card. However, the retrieving and recording of math channels is not possible.

Sample Mode : In writing : Free mode (sampling start manually)  
Trigger mode (sampling start by external trigger)

In reading : Free mode

Sample Rate : Pen model : Measurement interval (125ms)/ 1 sec./ 1 min./ 2min.  
Dot model : Measurement interval / 1 min. / 2 min.

Memory Capacity : 1M byte, 512k byte, 256k byte, or 64k byte



Data Length : 500 / 1000 / 2000 / 4000 / 8000 / 16000 / 32000 data / ch  
(measurement channel... 2 byte / data, math channel... 4 byte / data)

Trigger Conditions : External contact \* (wire the relay output to the remote terminal in case alarm and chart-end detector is treated as trigger.)

Pre - Trigger : 0 to 100%, in ten steps

Output : Recording ;  
\* Regardless the number of inputs, the same products have interchangeability.  
ex.  $\mu$ R1800 6 dot model  $\leftarrow \bigcirc \rightarrow$   $\mu$ R1800 12 dot model  
 $\mu$ R1000 2 pen model  $\leftarrow \times \rightarrow$   $\mu$ R1800 4 pen model  
 $\mu$ R1800 2 pen model  $\leftarrow \times \rightarrow$   $\mu$ R1800 6 dot model

\* Retrieving data is according to the measurement interval of the recorder which plays back.  
\* The recording interval of the dot model depends on the setting of the recorder which plays back.

Battery Backup : Lithium battery (battery life about 4 years / 64k, about 2 years / 256k, 512k, about 1year / 1M)

**/ F1: FAIL / Chart End Detection and Output**

If an error in the CPU board occurs, or when the chart reaches its end, output relay on the rear terminal will be activated. Besides, when the chart reaches its end, 'CHT' indicator will be shown on the display.

Relay contact rating:

DC 250V / 0.1A, AC 250V / 3A

**/ H2: Clamped Input Terminal**

Using clamped input terminals as input terminal.

**/ H3: Non-glare Door Glass**

Provides non-reflective glass in the front door.

**/ H5□: Portable Type**

Provides carrying handle and power code.

**/ M1: Mathematical Functions**

1. General computation:

(1) General computation channel:

Using measurement channels

(2) Types:

Arithmetic functions (+, -,  $\times$ ,  $\div$ )

SQR (square root)

ABS (absolute value)

LOG (y=log 10X)

EXP (exponential)

Relational computation (<, >, =,  $\neq$ )

Logical computation (AND, OR, XOR,

NOT). However, between two channels only.

(3) Constant

2. Statistical computation

(1) Types of statistics: MAX, MIN, AVE, SUM (Totalization)

(2) Recording: Digital printout (time depends on interval) only. Analog recording is not possible.

**/ N2: 3 Leg Isolated RTD Input**

A, B, b legs are of isolated input type.

**/ P1: 24VDC Power Supply**

Rated supply voltage: 24VDC

Applicable supply voltage range: 21.6 to 26.4VDC

Maximum power consumption: Approx. 50VA

**/ R1: Remote Control**

5 are selectable from the below mentioned remote controls.

	Number of settings	Signal
Recording start / stop	1	level
Chart speed change	1	level
Message printout start*1	5	trigger
Manual printout start	1	trigger
Statistical computation start / stop*2	1	level
Periodic printout start	1	trigger
Start saving of measured data to IC memory card*3	1	trigger

\*1 Up to 5 messages can be set

\*2 / M1 option is necessary

\*3 / E2 option is necessary

**/ L1: French / German / English Display & Winter / Summer Time**

English, German or French display can be selected. Winter and summer time can be set.

**/ N1: Cu10, Cu25 RTD input**

Cu10 and Cu25 input become available instead of Pt100 and JPt100. If this option is specified, Pt100 and JPt100 input is not available.

**Cu10, Cu25 Measurement Range**

	Input Type	Measurement Range
RTD	Cu10(GE) : $\alpha = 0.003855$ at 25°C Cu10(L&N) : $\alpha = 0.003852$ at 25°C Cu10(WEEP) : $\alpha = 0.003862$ at 25°C Cu10(BAILEY) : Non-Linear Cu10 : $\alpha = 0.00392$ at 20°C Cu10 : $\alpha = 0.00393$ at 20°C Cu25 : $\alpha = 0.00425$ at 0°C	-200 to 300°C (-328 to 572°F)

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**Measurement / Recording Accuracy**

Input Type	Measurement Accuracy	Recording Accuracy
Cu10(GE) : $\alpha = 0.003855$ at 25°C Cu10(L&N) : $\alpha = 0.003852$ at 25°C Cu10(WEED) : $\alpha = 0.003862$ at 25°C Cu10(BAILEY) : Non-Linear Cu10 : $\alpha = 0.00392$ at 20°C Cu10 : $\alpha = 0.00393$ at 20°C	$\pm (0.4\% \text{ of rdg} + 1.0^\circ\text{C})$	Measurement Accuracy $\pm (0.3\% \text{ of Recording span})$
Cu25 : $\alpha = 0.00425$ at 0°C	$\pm (0.3\% \text{ of rdg} + 0.8^\circ\text{C})$	

T1001.EPS

**/N3: Pt50, RTD, PR20-40, Platinel TC input**

Pt50, PR20-40 and Platinel input become available. These inputs can be used in combination with all other standard inputs.

**Pt50, PR20-40, Platinel Measurement Range**

Input Type		Measurement Range
TC	PR20-40	0 to 1900°C (32 to 2552°F)
	Platinel	0 to 1400°C (32 to 2552°F)
RTD	Pt50	-200 to 600°C (-328 to 1112°F)

T1002.EPS

**Measurement / Recording Accuracy**

Input Type	Measurement Accuracy	Recording Accuracy
PR20-40 0 to 450°C 450 to 750°C 750 to 1100°C 1100 to 1900°C	Not specified $\pm (0.9\% \text{ of rdg} + 3.2^\circ\text{C})$ $\pm (0.9\% \text{ of rdg} + 1.3^\circ\text{C})$ $\pm (0.9\% \text{ of rdg} + 0.4^\circ\text{C})$	Measurement Accuracy $\pm (0.3\% \text{ of Recording span})$
Platinel	$\pm (0.25\% \text{ of rdg} + 2.3^\circ\text{C})$	
Pt50	$\pm (0.3\% \text{ of rdg} + 0.6^\circ\text{C})$	

T1003.EPS

**/ N5: Remote RJC**

Remote RJC function (compensating wire saving type) becomes available.

- \* Measurement is possible only if the thermocouples of the reference channel (RJC channel) and the measurement channel are of the same type.
- \* RJC channel must be smaller than the measurement channel.

**MODEL AND SUFFIX CODES**

Model Code	Option Code	Description
437001		μR1800 1 pen recorder
437002		μR1800 2 pen recorder
437003		μR1800 3 pen recorder
437004		μR1800 4 pen recorder
437006		μR1800 6 dot recorder
437012		μR1800 12 dot recorder
437018		μR1800 18 dot recorder
437024		μR1800 24 dot recorder
	/ □	See option code table.

- \*1: only one of /A1, /A2, /A3, /A4, /A5 can be selected
  - \*2: /F1 cannot be combined with /A5. In case of 6-dot model, /F1 cannot be combined with /A4.
  - \*3: /H2 cannot be combined with /N2.
  - \*4: If /N1 is specified, Pt100 and JPt100 input is not available.
  - \*5: /H5□
    - B: Power cord JIS st'd
    - D: Power cord UL st'd
    - F: Power cord VDE st'd
    - R: Power cord AS st'd
    - J: Power cord BS st'd
- /H5□ cannot be combined with /P1.

**OPTION CODES**

Option Code	Description
/ A1	Alarm output relay (2 contacts)
/ A2	Alarm output relay (4 contacts)
/ A3	Alarm output relay (6 contacts)
/ A4	Alarm output relay (12 contacts) (dot printing model only)
/ A5	Alarm output relay (24 contacts) (12, 18, 24 dot model only)
/ C3	RS-422A Interface
/ E1	IC Memory Card Slot with SET UP data read / write function
/ E2	IC Memory Card Slot with SET UP, measurement data read / write function
/ F1	FAIL / Chart end detection and output *2
/ H2	Clamped input terminal *3
/ H3	Non-glare door glass
/ H5□	Portable type *5
/ M1	Mathematical Computations
/ N1	Cu10, Cu25 RTD input *4
/ N2	3 leg RTD (dot printing model only) *3
/ N3	Pt50 RTD, PR20-40, Platinel TC input
/ N5	Remote RJC
/ P1	24VDC power supply
/ R1	Remote controls (5 plugs)
/ L1	

**STANDARD ACCESSORIES**

Name	1 pen	2 pen	3 pen	4 pen	6, 12, 18, 24 dot
Z-fold chart	1	1	1	1	1
6 color ribbon cassette	—	—	—	—	1
Disposable felt-pen cartridge	Red	1	1	1	—
	Green	—	1	1	—
	Blue	—	—	1	1
	Violet	—	—	—	1
Plotter pen	Purple	1	1	1	—
Mounting brackets	2	2	2	2	2
Key (for key lock)	2	2	2	2	2
Fuse (250V 800mA Timelag) (24VDC model : 250V 5A Timelag)	1	1	1	1	1
Instruction Manual	1	1	1	1	1
Reference sheet (Quick operation guide)	1	1	1	1	1

**SPARES**

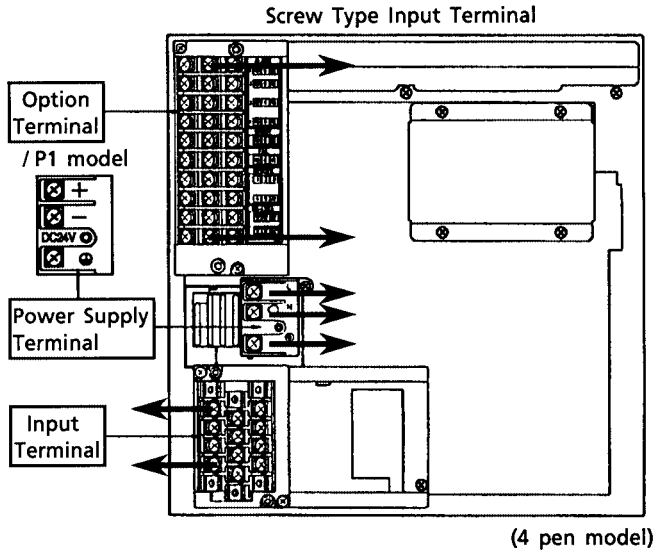
Name	Parts No.	Order Q'ty (units)	Description
Z-fold chart	B9573AN	10	1 chart / unit
6 color ribbon cassette	B9906JA	1	1 piece / unit
6 color ribbon cassette (for TAIWAN)	B9906JF*	1	1 piece / unit
Disposable felt-pen cartridge	Red	B9902AM	1
	Green	B9902AN	1
	Blue	B9902AP	1
	Violet	B9902AQ	1
Plotter pen	Purple	B9902AR	1
Mounting brackets	B9900BX	2	1 piece / unit
Key (for key lock)	B9900HZ	2	1 piece / unit
Fuse (250V 800mA Timelag)	A1512EF	1	4 pieces / unit
Fuse for 24VDC model (250V 5A Timelag)	A1513EF	1	3 pieces / unit
Lubricating oil (for dot printing model)	B9901AZ	1	1 piece / unit

\* In case of orders for spares for TAIWAN, please order this part No.

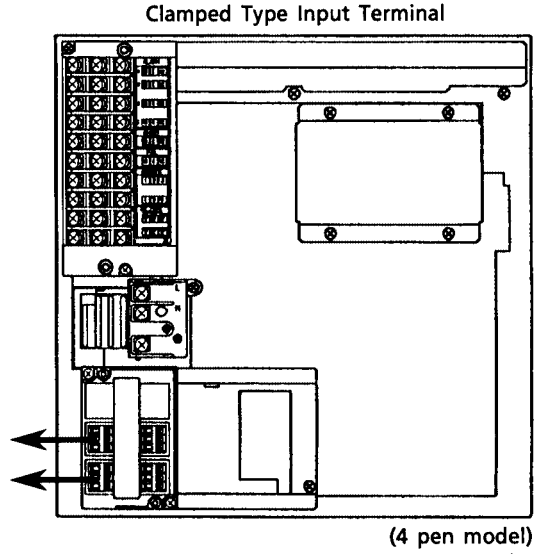
**OPTIONAL ACCESSORIES**

Name	Model Code	Specification
Shunt resistor (for screw input terminal)	4159 20	250Ω ± 0.1%
	4159 21	100Ω ± 0.1%
	4159 22	10Ω ± 0.1%
Shunt resistor (for clamped input terminal)	4389 20	250Ω ± 0.1%
	4389 21	100Ω ± 0.1%
	4389 22	10Ω ± 0.1%
IC Memory Card	3789 04	256k byte
	3789 05	512k byte
	3789 06	1M byte

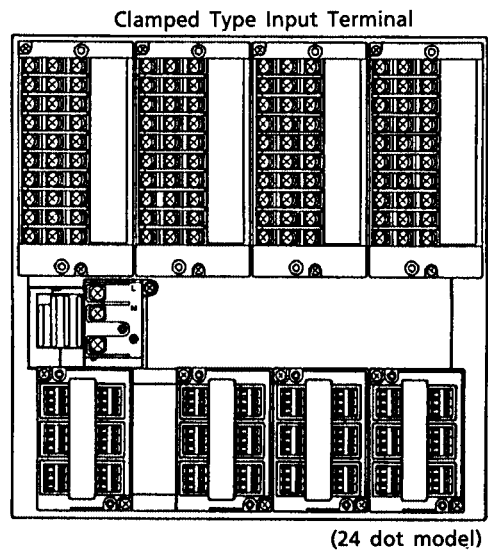
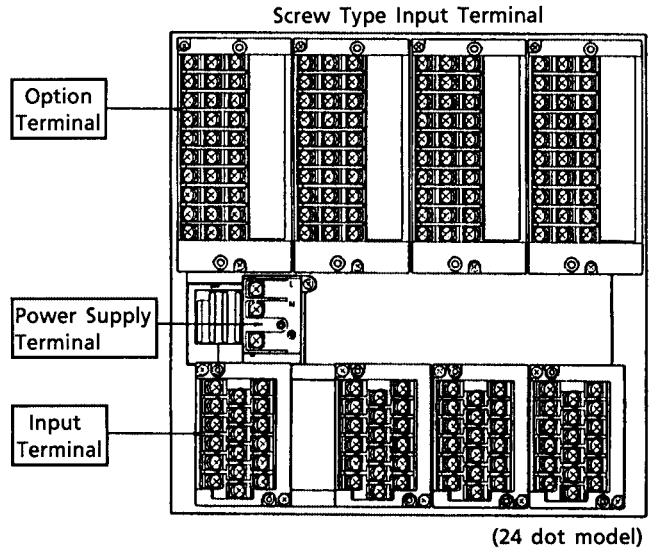
REAR TERMINAL ARRANGEMENTS



Note: The arrows show the direction in which the wires will be running when connected to the terminal.



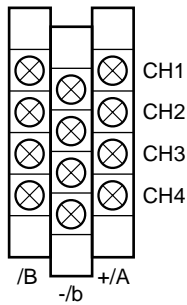
Weight 4370 01 : Approx. 8.9kg  
 4370 02 : Approx. 9.0kg  
 4370 03 : Approx. 9.2kg  
 4370 04 : Approx. 9.4kg



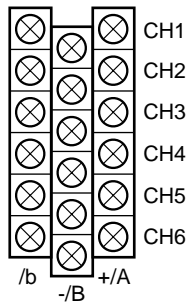
Weight 4370 01 : Approx. 9.1kg  
 4370 02 : Approx. 9.4kg  
 4370 03 : Approx. 9.5kg  
 4370 04 : Approx. 9.6kg

Input Terminals

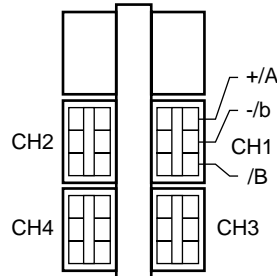
4 Pen Screw Type



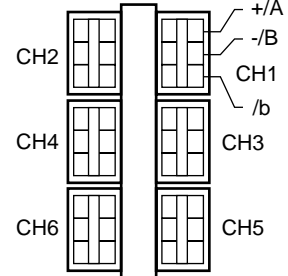
6 Dot Screw Type



4 Pen Clamped Type (/H2)



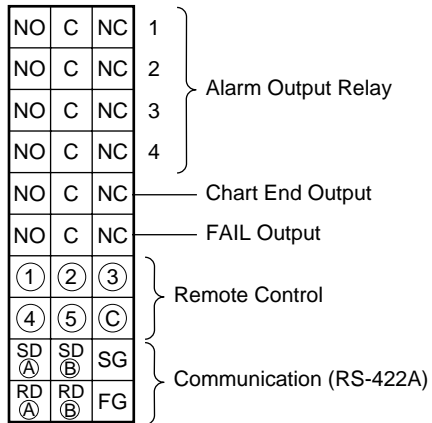
6 Dot Clamped Type (/H2)



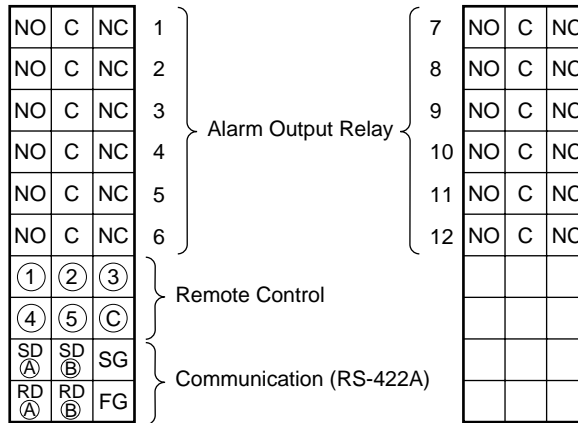
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Option Terminals

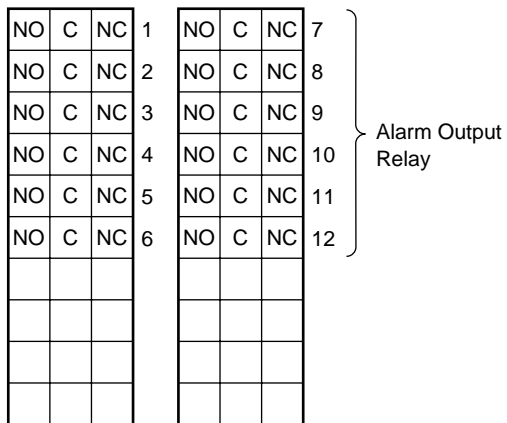
/A2 /C3 /F1 /R1 Combination



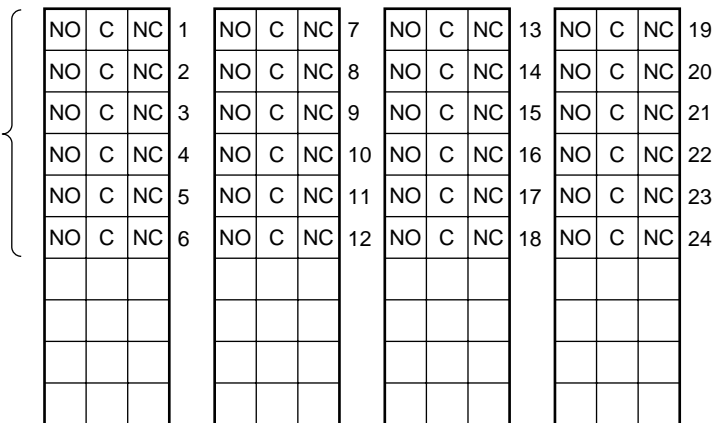
/A4 /C3 /R1 Combination



/A5



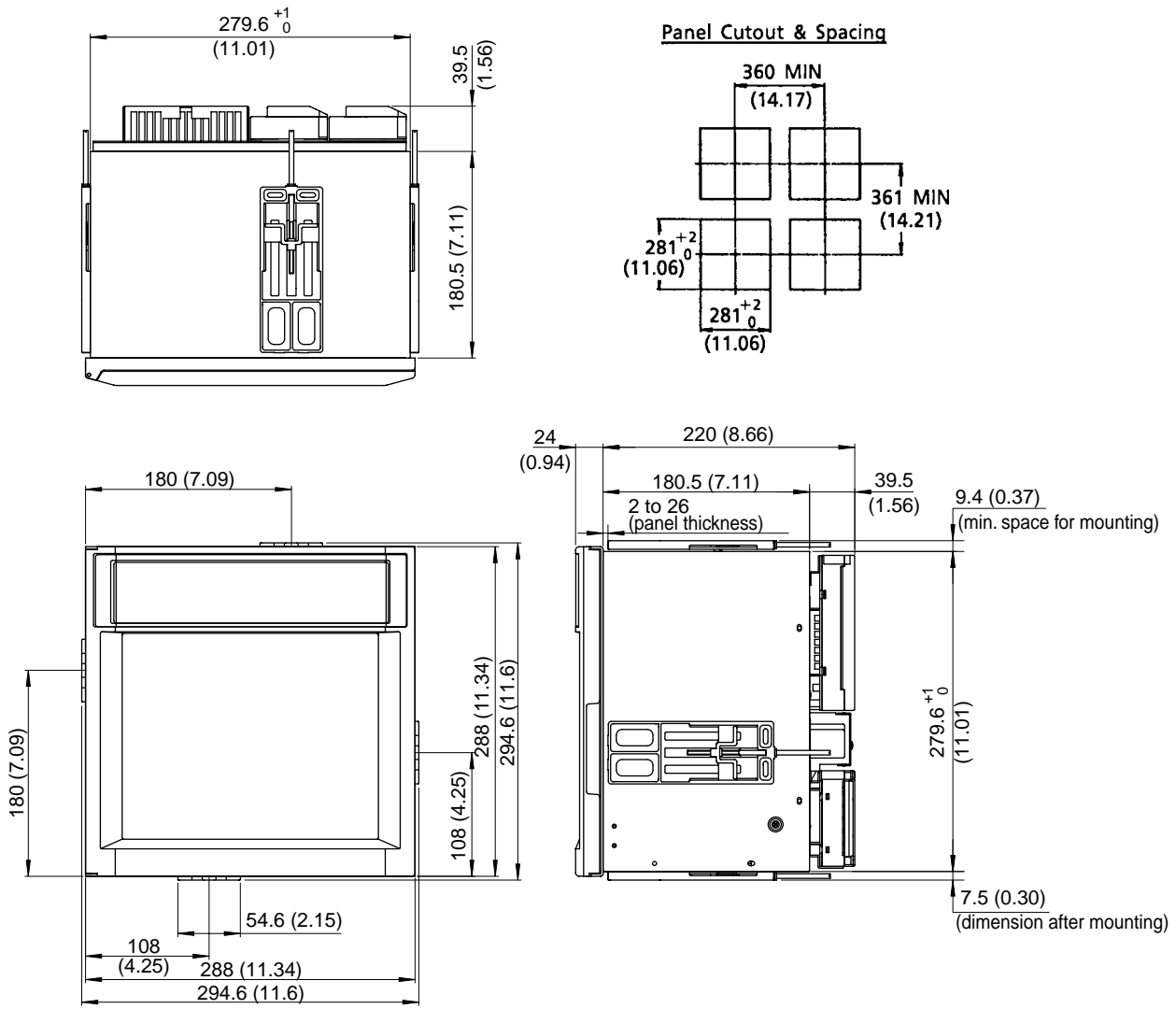
/A6



F1301.EPS

**DIMENSION**

Unit : mm  
(approx. inch)



Note) The μR1800 should be mounted by only two brackets, either on the top & bottom of the recorder, or on the left & right side of the recorder.  
If not specified, the tolerance is  $\pm 3\%$ . However, in cases of less than 10mm, the tolerance is  $\pm 0.3\text{mm}$ .