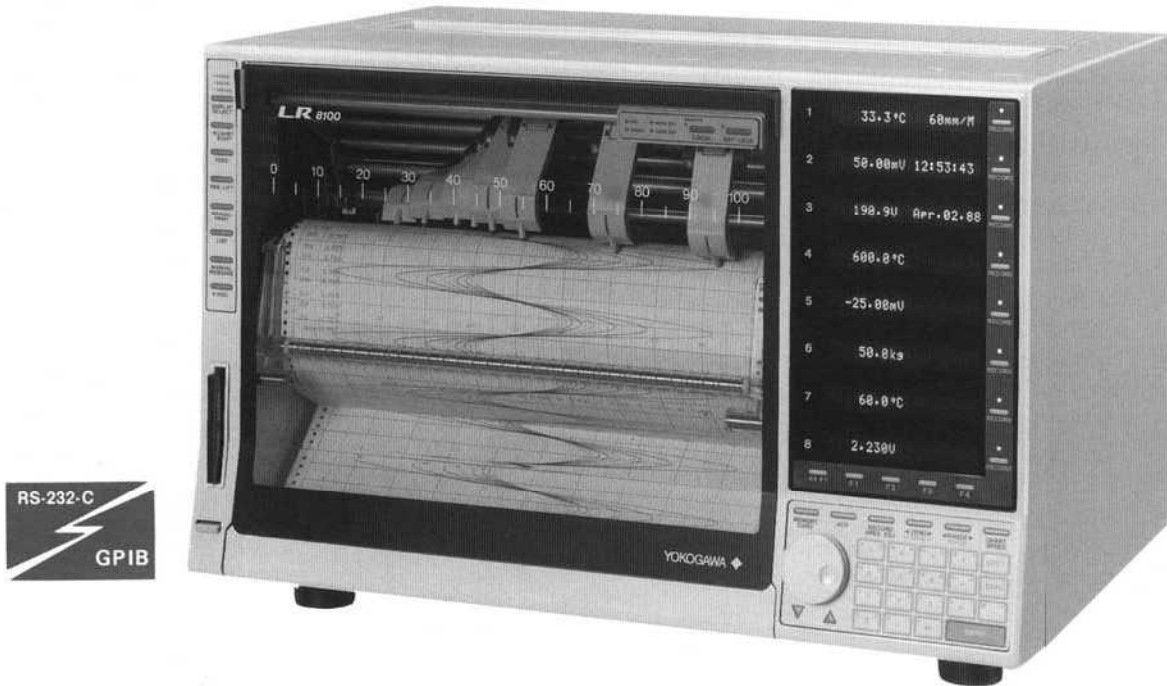


### 3701 Recorders LR8100



**37018** □ 8-channel model  
266 × 438 × 310 mm 18 kg  
(10-1/2 × 17-1/4 × 12-1/4" 39.7 lbs)

The LR8100 is a new intelligent 250 mm (10") recorder lineup including 4-, 6- and 8-channel models. All models handle a wide range of input types—DC voltage, 12 types of thermocouples and four types of resistance bulbs for each channel. In addition to clear, highly-readable color traces by using a new recording mechanism, LR8100 also provides versatile alphanumeric printout functions such as digital data printout, scale markings, alarms, message and program list printout. Notwithstanding its high performance and many advanced functions of inputs, display, programming and recording/printout, operation of LR8100 is very simple using front-panel keys, prompt type menus, and a rotating knob.

#### FEATURES

- **4-, 6-, 8-channel models**
- **A wide range of input types**  
A single instrument accepts the inputs of DC V, 12 types of TC's (ANSI, DIN, JIS) including a cryogenic TC of KP vs Au7Fe (NBS), and 4 types of RTD's including a YOKOGAWA-original cryogenic RTD J263\*B (platinum and rare cobalt).
- **New recording mechanism for long-term clear, distinct color traces**  
New recording system features a chart length of 30 m (98 ft), and total pen trace length of about 1,500 m (4,900 ft) without blotting and smudge.
- **High pen speed**—— 1,600 mm/s (5.2 ft/s) max.
- **Versatile alphanumeric printout modes**  
Full selection of alphanumeric printout modes include measured data, scale markings, alarms, message, manual, program list, and more.
- **Zone (RECORD AREA ADJ) and partially expanded-scale recording, and AUTO SPAN SHIFT mode**  
Highly diverse recording of Zone, partially expanded-scale and AUTO SPAN SHIFT are selectable for each channel. On AUTO SPAN SHIFT mode, recording span is automatically shifted to  $\pm 50\%$ , when the input exceeds the measuring span and recording continues.

- **A choice of 3 display modes**——Digital data, bar graph or range data display
- **Standard or optional IC memory card**  
Standard IC memory card stores panel setting data, while optional IC memory card stores measured and panel setting data with memory capacity of 256K bytes.
- **Wide voltage range power supply of 90 to 250 V AC**
- **Simple, quick operation with conversational setting on VFD (Vacuum Fluorescent Display)**
- **Compact and lightweight**——18 kg (39.7 lbs) on 8-channel model
- **Exceptionally high reliability through the use of non-contact digital servo mechanism with compact, brushless DC servomotors**
- **GPIB or RS-232-C interface (optional)**  
An optional feature of either GPIB or RS-232-C can handle data output and panel setting data. Analog recording of digital inputs is also available through the computer interface.
- **DC power source of 10 to 32 V DC (optional)**  
DC power source allows the recorder to be used where AC power is unavailable, as in automotive and agricultural applications.
- **A wide range of optional features**——Mathematical functions, remote controls, alarms, DC power source and °F display

LR8100 features simple menu setting with interactive display. The following three steps are an example of chart speed setting:



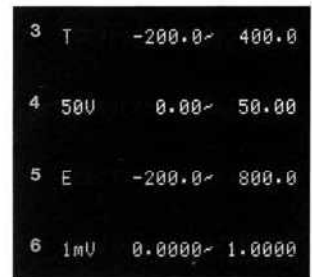
**STEP 1**  
**CHART SPEED key**  
Depress to display the chart speed.



Chart speed setting display



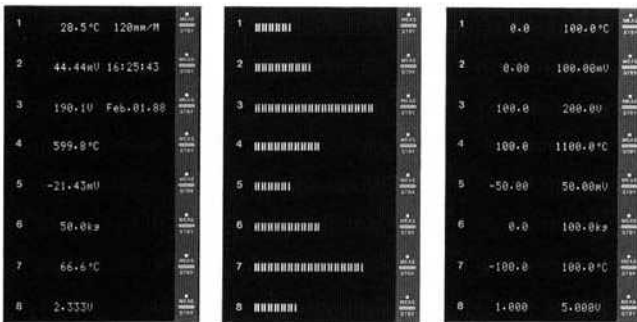
**STEP 2**  
**Menu setting knob**  
By rotating this knob, 17 chart speeds (in mm or inch) are alternately displayed. Other chart speeds can also be programmed in 1 mm or 0.1 inch steps via alphanumeric key operations.



Range setting display

## FUNCTIONS

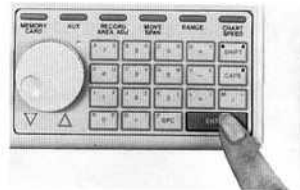
### DISPLAY & OPERATING FUNCTIONS



Measured data display

Bar graph display

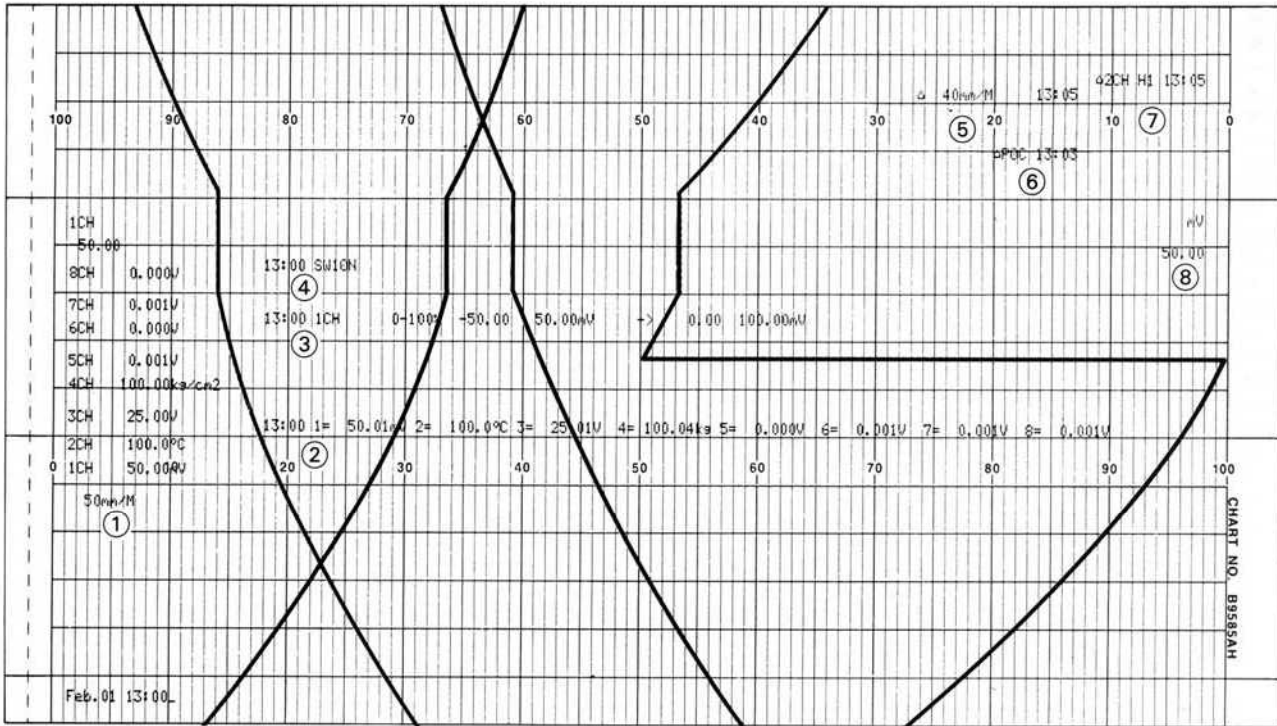
Range data display



**STEP 3**  
**ENTRY key**  
Depress ENTRY key (end of setting).



## RECORDING & PRINTING FUNCTIONS



### 1 Digital data printout

Digital data are printed out at regular time intervals (1 minute min.) corresponding to chart speed.

### 2 Manual printout

When MANUAL PRINT key is depressed, digital data of time and measured data for all channels are printed out in a single line.

### 3 Change of range printout

When range is changed, old and new ranges and the time are printed out.

### 4 Message printout

The time and message (up to 70 characters) can be printed by depressing MANUAL MESSAGE key, or by external contact signal.

### 5 Change of chart speed printout

When chart speed is changed, new chart speed and time can be printed.

### 6 Pen offset compensation ON/OFF printout

ON ( $\Delta$ POC) or OFF ( $\nabla$ POC) and time are printed out.

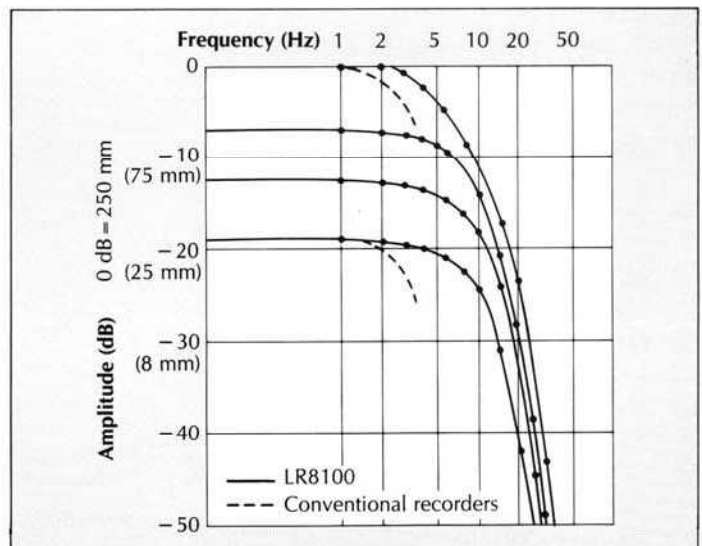
### 7 Alarm printout

Channel number, alarm type and time of alarm ON/OFF are printed.

### 8 Scale markings

Scale values of 0% and 100% are printed at regular intervals corresponding to chart speed.

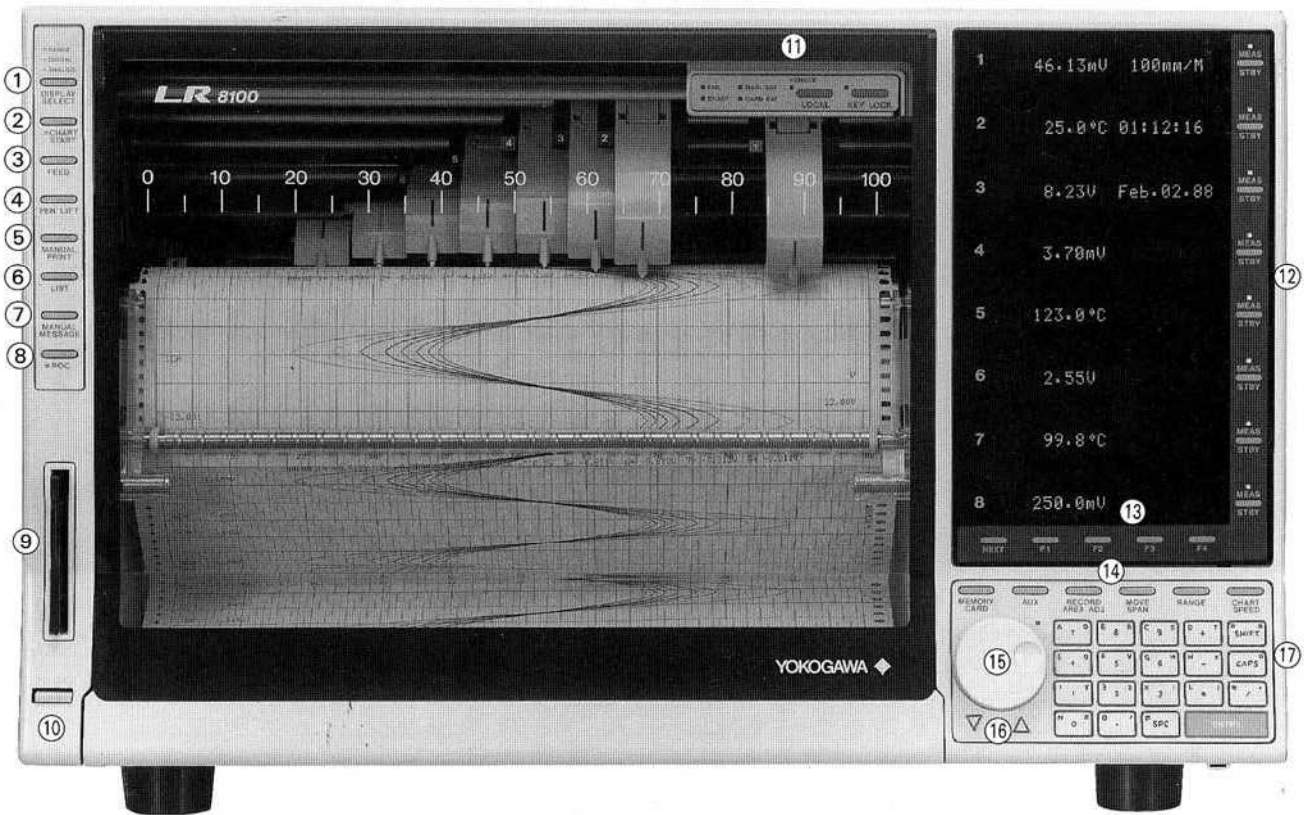
### Frequency characteristics





## ■ PANEL LAYOUT & OPERATING FUNCTIONS

3 LR SERIES RECORDERS



### 1 DISPLAY SELECT

Selects the display (measured data, bar graph or range).

### 2 CHART START

Starts the chart drive.

### 3 FEED

Feeds the chart.

### 4 PEN LIFT

Lifts or lowers all the pens simultaneously.

### 5 MANUAL PRINT

Prints out measured data in a single line.

### 6 LIST

Used for program list printout.

### 7 MANUAL MESSAGE

Starts to print the message of up to 70 characters.

### 8 POC

Pen offset compensation ON/OFF key.

### 9 Memory card slot

### 10 Power ON/OFF key

### 11 Alarm & remote indicators

**FAIL:** Lights up in fail condition.

**CHART:** Lights up before out-of-chart condition.

**MAIN BAT:** Lights up to indicate low battery (mainframe).

**CARD BAT:** Lights up to indicate low battery (memory card).

**REMOTE/LOCAL:** For setting GPIB remote/local (optional).

**KEY LOCK:** Used for locking 13 to 17 key entries.

### 12 RECORD

Recording ON/OFF keys for each channel.

### 13 Function keys

**NEXT:** Selects the next menu on display.

**F1 to F4:** Function keys for menu setting.

### 14 Function keys

**MEMORY CARD:** For setting the memory card.

**AUX:** For setting alarms, tag number message and clock.

**RECORD AREA ADJ:** For setting recording span for each channel (zone recording).

**ZERO SPAN:** Used for zero adjustment or change of recording span.

**RANGE:** For setting measuring range.

**CHART SPEED:** For setting chart speed.

### 15 Menu setting knob

Displays menu setting of range and chart speed.

### 16 Cursor keys

Shift the cursor on screen up and down.

### 17 Alphanumeric keys

18-key setting key pads.

**ENTRY:** Depress to make entry setting.

## SPECIFICATIONS

### MEASUREMENTS

**Drive System:** Automatic null-balancing digital servo mechanism with brushless DC servomotor.

**Type of Input:** Floating, guarded and shielded (No guard on 10 mV F.S. model).

**Input Types & Measuring Ranges:** DC V ... 10 mV to 200 V F.S., 1 mV to 200 V F.S., or 0.1 mV to 200 V F.S.

TC (ANSI, DIN, JIS) ... type R, S, B, K, E, J, T, N, W, L (DIN), U (DIN).

TC (NBS) ... KPvsAu7Fe (4 to 280K).

RTD ... Pt100 (1 mA), JPt100 (1 mA), Pt50 (1 mA), Ni100 (1 mA), J263\*B

Pt100: JISC 1604-1989, JISC 1606-1989,; DIN IEC 751, IEC 751, JPt100: JISC 1604-1989, JISC 1606-1989,

Pt50: JISC 1604-1981, JISC 1606-1986,

Ni100: DIN, SAMA

**Accuracy:** DC V ...  $\pm(0.05\%$  of rdg +  $0.03\%$  of range +  $0.5 \mu\text{V}$ ).

TC ...  $\pm(0.05\%$  of rdg +  $0.5^\circ\text{C}$ ) for K, E, J, T, L, U and KPvsAu7Fe,  $\pm(0.05\%$  of rdg +  $1^\circ\text{C}$ ) for R, S and B,  $\pm(0.1\%$  of rdg +  $0.5^\circ\text{C}$ ) for N,  $\pm(0.1\%$  of rdg +  $1^\circ\text{C}$ ) for W.

RTD ...  $\pm(0.05\%$  of rdg +  $0.2^\circ\text{C}$ ) for Pt100, JPt100 and Ni100,  $\pm(0.05\%$  of rdg +  $0.3^\circ\text{C}$ ) for Pt50 and J263\*B. (at  $23 \pm 2^\circ\text{C}$ ,  $55 \pm 10\%$  R.H.).

**Reference Junction Compensating Accuracy (TC):**  $\pm 0.5^\circ\text{C}$  for K, E, J, T, N, W, L, U and KPvsAu7Fe,  $\pm 1^\circ\text{C}$  for R, S and B (measuring range down to  $-100^\circ\text{C}$ ).

**Bias Current:** 4 nA.

**Filter:** 0.1, 1 Hz or OFF (selectable).

**Zero Set:** Adjustable.

**Measuring Cycle:** 135 Hz.

**Pen Offset Compensation (Standard):** Average, max./min. recording selectable (with compensation ON/OFF switch), resolution on time axis ... 0.05 mm, automatic sweep function for pen offset data, and selectable POC (pen offset compensation) reference pen.

**Input Impedance:** Approx. 1 M $\Omega$  (DC V & TC).

**Allowable Source Resistance:** Less than 1 k $\Omega$  (DC V & TC).

**Temperature Coefficient:** Zero drift;  $0.05 \mu\text{V}/^\circ\text{C}$  +  $0.01\%$  of range/ $^\circ\text{C}$  F. S. drift;  $0.01\%$  of range/ $^\circ\text{C}$ .

**Maximum Allowable Input Voltage:** 250 V DC.

**Maximum Common Mode Voltage:** 250 Vrms AC.

**Common Mode Rejection:** More than 150 dB at AC.

**Normal Mode Rejection:** More than 50 db at 50 or 60 Hz.

### RECORDING & PRINTING

**Writing & Printing System:** Ink writing using disposable felt tip pen cartridges (analog data), and wire-dot printer using ribbon cassette (digital data).

**Effective Recording Span:** 250 mm (10") (analog data).

**Pen Offset between Channels:** Approx. 4 mm on the time axis.

**Number of Channels:** 4, 6 or 8.

**Recording Colors:**

1st	2nd	3rd	4th	5th	6th	7th	8th
Red	Green	Blue	Brown	Black	Purple	Orange	Violet

**Recording Accuracy:** Measurement accuracy +  $\pm 0.2\%$  of effective recording span (including non-linearity, deadband and error between ranges).

**Maximum Pen Speed:** Approx. 1,600 mm/s.

**Maximum Acceleration:** Approx. 8 G.

**Printing Rate:** Approx. 1.5 s/line.

**Chart:** Z-fold chart (270 mm x 30 m, 10-1/2" x 98').

**Chart Speeds:** 10 to 1,200 mm/min & mm/h (1 mm steps), and 0.5 to 45.0 inch/min & inch/h (0.1 inch steps).

**Change of Chart Speed:** Changes chart speed with remote control signals (optional).

**RECORD ON/OFF Selectors:** Provided separately for each channel on the front panel (ON ... measurement/recording, OFF ... measurement).

**Pen Lift:** All pens are simultaneously lifted and lowered.

**Chart Drive:** Pulse motor drive.

**Chart Speed Accuracy:**  $\pm 0.1\%$  (recordings over 1 m).

**Digital Data Printout:** Time, chart speed, channel number (tag number), measured data and engineering unit are printed out at the following intervals:

Chart Speed		Printing Intervals
mm/min	mm/h	
1,200 to 300	—	1 min
299 to 30	—	10 min
29 to 10	1,200 to 120	1 h
—	199 to 60	2 h
—	59 to 40	3 h
—	39 to 20	6 h
—	19 to 10	12 h

**Tag Number Printout:** Tag number can be printed out in place of channel number (up to 7 alphanumeric).

**Alarm Printout:** Channel number, alarm type, and the time of alarm ON/OFF are printed.

**Scale Markings Printout:** 0% and 100% scale values can be printed out.

**Program List Printout:** Contents of entire setting memory can be listed on the chart.

**Manual Printout:** Time and measured data for all channels can be printed out in a single line by a push of MANUAL PRINT key.

**Message Printout:** Message of up to 70 characters can be printed at a push of MANUAL MESSAGE key (Message 0), or by external contact signal (Message 1 to 4; optional).

**Change of Chart Speed Printout:** Chart speed and time can be printed out at the change of chart speed.

**Pen Offset Compensation ON/OFF Printout:** ON, OFF mark and time can be printed out.

**Change of Range Printout:** Range changes and time can be printed (Auto recording span shift mode).

**Partially Expanded-Scale Recording:** Any portion within full scale can be expanded or reduced for each channel.

**Auto Span Shift Mode:** Automatically shifts to  $\pm 50\%$  of span, when the input exceeds the measuring span and recording continues.

**External Input Span:** Small error of external converter can be corrected by setting the span with actual input voltage (zero ... span left, full ... span right).

### DISPLAY

**Type of Display:** Vacuum fluorescent display (5 x 7 dot matrix, blue), 20 characters for each channel.

**Display Modes:** 3 display modes can be selected by pushing DISPLAY SELECT key; Digital data display ... Measured data (7 digits), date and time, and chart speed, Bar graph display (2.5% resolution), Range data display.

### ALARMS

**Number of Alarm Set Levels:** Up to 2 levels/channel.

**Alarm Types:** High(H), low(L), delta high(dH), and delta low(dL).

**Alarm Outputs (Optional):** Up to 8 points (internal), contact rating ... 24V AC 1 A

### COMPUTING FUNCTIONS

**Standard Functions:** Scaling (ranges .. -22,000 to +22,000), and  $\Delta T$ .

**Optional Mathematical Functions:** +, -, x, /, Square root, absolute value, logarithm, exponential function (up to 8 channels).

### GENERAL SPECIFICATIONS

**Standard IC Memory Card:** For storing setting data (memory capacity of 8K bytes), standard accessory ... lithium battery, 1 pc. (battery life of about 5 years).

**Battery-Backup Memory:** Maintains all settings for about 10 years (at room temperature) when power is removed.

**FAIL Alarm:** FAIL LED lights up when the instrument is in fail condition (FAIL output; optional).

**Chart END Alarm:** CHART LED lights up before out-of-chart condition, and recording stops (alarm output, optional).

**Mounting:** Desk-top or flush panel mounting (may be inclined up to 30° backward from vertical).

**Operating Temperature Range:** 0 to 40°C (32 to 104°F).

**Humidity Range:** 30 to 80% relative humidity.

**Insulation Resistance:** More than 100 MΩ at 500V DC between power line and case, and between input terminals and case.

**Dielectric Strength:** 1,500V AC for one minute between power line and case.

**Power Requirements:** Wide voltage range power supply from 90 to 250V AC, for both 50 and 60 Hz.

**Power Consumption:** 4-channel model ... 130 VA max., 60 VA balanced, 6-channel model ... 160 VA max. 70 VA balanced, 8-channel model ... 190 VA max., 80 VA balanced.

**Weight (Approx.):** 4-channel model ... 16 kg (35.3 lbs), 6-channel model ... 17.5 kg (38.6 lbs), 8-channel model ... 18 kg (39.7 lbs).

■ **OPTIONAL FEATURES**

● **GP-IB INTERFACE (/GP-IB)**

**Functional, Electrical and Mechanical Specifications:** Meets the IEEE Standard 488-1978.

**Talker Functions:** Input of measured data (ASCII), output of measured data (ASCII and binary), input/output of setting data (ASCII), output of memory data (ASCII and binary).

**Listener Functions:** Controls except for power ON/OFF, key lock ON/OFF and chart drive.

● **RS-232-C INTERFACE (/RS232C)**

**Functional, Electrical and Mechanical Specifications:** Meets the EIA RS-232-C.

**Controller Interface Functions:** Input of measured data (ASCII), output of measured data (ASCII and binary), input/output of setting data (ASCII), output of memory data (ASCII and binary).

**Data Transfer Rates:** 75, 150, 300, 600, 1,200, 2,400, 4,800, 9,600 bps

● **REMOTE CONTROLS (/REM)**

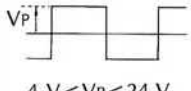
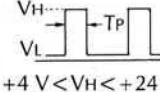
**Remote Control Signals:** External contact, open collector or TTL-level signal.

**Chart Drive Control:** Chart drive start/stop.

**Change of Chart Speed:** Selectable chart speed 1 or 2.

**Manual Printout:** Printout date & time and measured data.

**Chart Speed:**

Remote Control Signal Waveforms	Sine, Triangular, Rectangular Waves	Pulse Train
Signal level	 4 V < V <sub>p</sub> < 24 V	 +4 V < V <sub>H</sub> < +24 V -24 V < V <sub>L</sub> < +0.5V T <sub>P</sub> > 300 μs
Max. signal source impedance	600 Ω	50 Ω
Chart speed	0.15 f cm/min (f ... Hz or pps)	
Max. frequency	800 Hz	800 PPS

**Message Printout:** Printout time and message (4; up to 70 characters each).

**Pen Lift:** All recording pens lowered and lifted.

**RECORD ON/OFF Selection:** OFF (measurement) and ON (measurement/recording).

**External Trigger:** Start ... write to memory card (optional).

● **ALARMS (/AK-08)**

**Number of Outputs:** 8 points (internal).

**Contact Rating:** 24V DC and AC 1 A.

**Outputs:** Alarm, FAIL alarm and chart END alarm outputs.

● **DC Power Source (/DC)**

**Normal Operating Voltage:** 10 to 32V DC.

**Power Consumption:** 60 VA (average value), 200 VA (maximum).

**Accessories:** Connector (1 pc.), fuse (1 pc.).

■ **OPTIONAL ACCESSORY**

● **IC MEMORY CARD (256KB)**

**Data Format:** MS-DOS.

**Sampling Rate:** 135, 9, 5, 3, 1, 0.5 and 0.2 Hz.

**Memory Capacity:** 256K bytes.

**Data Length:** 1,000, 2,000, 4,000, 8,000, 16,000 and 32,000 data/channel (common setting to each channel, 2 bytes/data)

**Trigger Condition:** Manual alarm detection, CHART END or external contact input (optional).

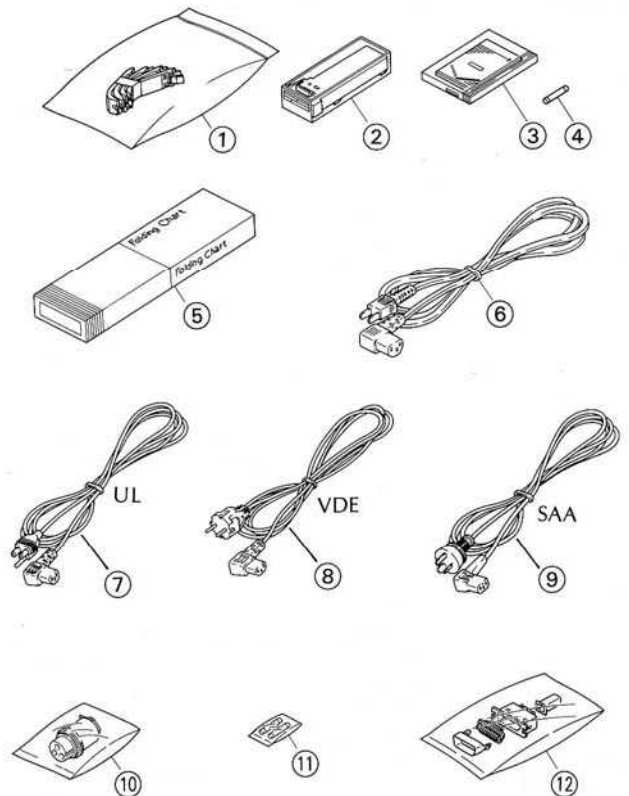
**Pre-Trigger:** 0 to 100% (10% steps).

**Memory Data:** Measured data, interface input data and computed data.

**Output:** Communication interface and recording output.

■ **STANDARD ACCESSORIES**

No.	Name	Part No.	Q'ty	Description
①	Pen cartridge	B9586YR	1/color	For 4-pen model
		B9586YS	1/color	For 6-pen model
		B9586YT	1/color	For 8-pen model
②	Ribbon cassette	B9585SH	1	Black
③	IC memory card	378901	1	For setting data, 8K bytes
④	Fuse	A9134KF	1	Installed fuse holder
⑤	Z-fold chart	B9585AH	1	30 m
⑥	Power supply cord	A9009WD	1	JIS standard
⑦		A9008WD	1	UL standard
⑧		A9011WD	1	VDE standard
⑨		A9026WD	1	SAA standard
⑩	DC power source connector	A9271KC	1	For /DC
⑪	Fuse	B9586UV	2	20 A time lag (for /DC)
⑫	Connector	A9026KC	1	For /AK-08
—	Connector	A9027KC	1	For /AK-08 & /REM
—	Instruction manual	—	1	—





## AVAILABLE MODELS

Model		Suffix Codes	Description
3701			LR8100 recorder
No. of channels	4		4-pen model
	6		6-pen model
	8		8-pen model
Input types & max. sensitivity	1		10 mV F.S. (DC V, TC)
	2		1 mV F.S. (DC V, TC)
	3		0.1 mV F.S. (DC V, TC)
	4		10 mV F.S. (DC V, TC, RTD)
	5		1 mV F.S. (DC V, TC, RTD)
6		0.1 mV F.S. (DC V, TC, RTD)	
Version up	- B		-
Power requirement	- 0		90 to 250 V AC
Power cord	/B		JIS standard
	/D		UL standard
	/F		VDE standard
	/G		SAA standard
Optional features	/□	....	Refer to OPTIONAL FEATURES

## OPTIONAL FEATURES

Option Code	Description
/GP-IB	GP-IB interface
/RS232C	RS-232-C interface
/MATH	Mathematical functions
/AK-08	Alarms (internal, 8 points)
/REM	Remote controls
/DC	DC power source
/DF	°F display

## OPTIONAL ACCESSORIES

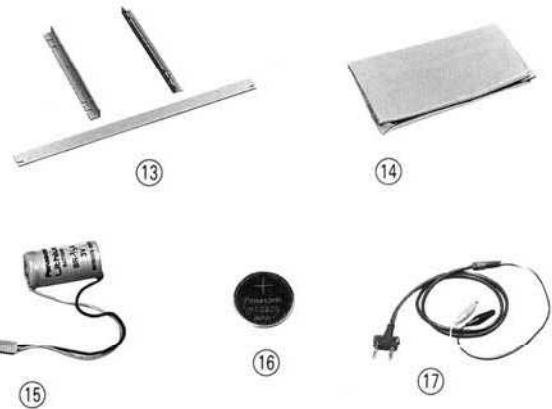
No.	Name	Part No.	Order Q'ty
⑬	Rack adapter (ANSI & JIS)	378981	1 unit (1 pc./unit)
③	IC memory card (setting & measured data, 256K bytes)	378904	1 set

## SPARES

No.	Name	Part No.	Order Q'ty
②	Ribbon cassette	B9585SH	1 unit (1 pc./unit)
⑤	Z-fold chart (270 mm x 30 m)	B9585AH	10 units (1 chart/unit)
①	*Disposable felt-tip pen cartridge	1st channel (red)	B9586□A
		2nd channel (green)	B9586□B
		3rd channel (blue)	B9586□C
		4th channel (brown)	B9586□D
		5th channel (black)	B9586□E
		6th channel (purple)	B9586□F
		7th channel (orange)	B9586□G
		8th channel (violet)	B9586□H
	1st to 4th channels	B9586□R	1 unit (3 pcs./unit)
	1st to 6th channels	B9586□S	
1st to 8th channels	B9586□T	1 unit (1 pc. each/unit)	
③	Memory card (setting data), 8K bytes	378901	1 unit (1 pc./unit)
⑮	Lithium battery (for mainframe)	B9588ZB	1 unit (1 pc./unit)
⑯	Lithium battery (for 378901)	B9586JU	2 units (1 pc./unit)
	Lithium battery (for 378904)	B9586JV	2 units (1 pc./unit)
⑭	Dust cover	B9585AY	1 pc.
⑰	Measurement leads (1 m)	B9409JA	1 set

\*Note: Specify X, Y or Z in □.

- Y ... Standard (pen speed of lower than approx. 800 mm/s)
- Z ... High speed (pen speed of higher than approx. 800 mm/s)
- X ... Low speed (pen speed of lower than approx. 100 mm/h)



3  
LR SERIES RECORDERS

## ORDERING INFORMATION

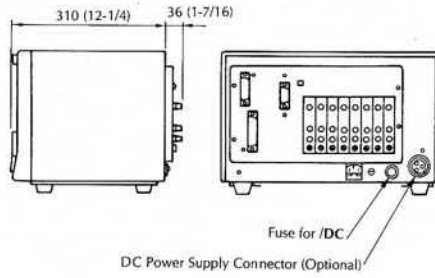
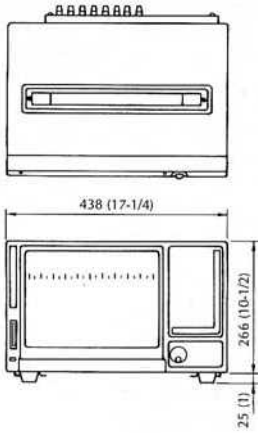
When ordering, specify:

1. Instrument name, model and codes.
2. Accessories & spares, if required.

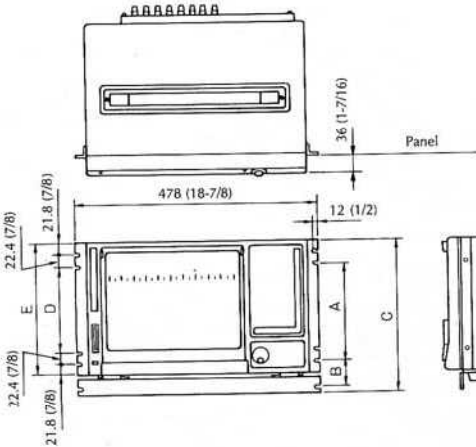


## DIMENSIONS

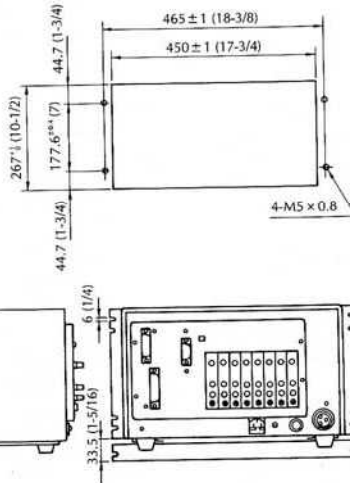
Unit: mm (inch)



## < Rack Mount >

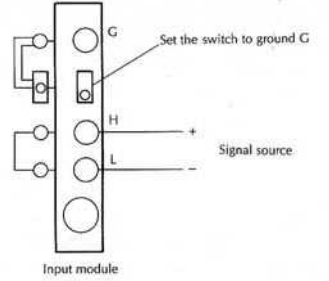


## < Panel Cutout >

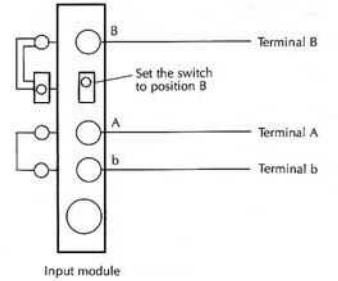


## < Wiring of Input Modules >

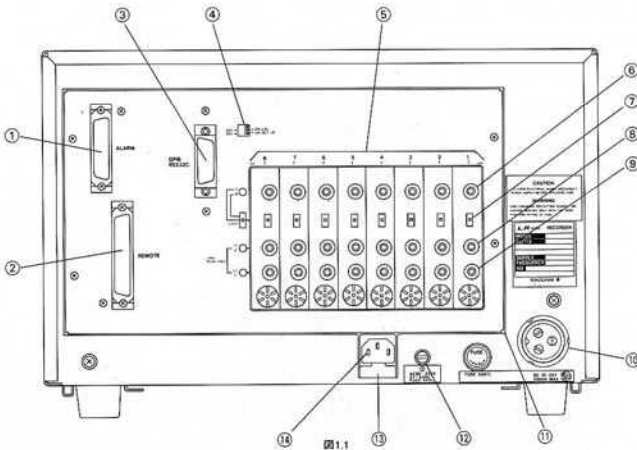
### • DC Voltage and TC



### • RTD



## < Rear Panel >



- ① Alarm connector (optional)
- ② Remote control connector (optional)
- ③ GPIB and RS-232-C connector (optional)
- ④ CAL/SET UP switch
- ⑤ Input module
- ⑥ Guard terminal or B-terminal
- ⑦ Guard/B-terminal select switch
- ⑧ Terminal +/A
- ⑨ Terminal -/b
- ⑩ DC power source connector (optional)
- ⑪ Reference junction compensating section
- ⑫ Ground terminal
- ⑬ Fuse holder
- ⑭ AC power supply connector

Rack Mounting	A	B	C	D	E
JIS	200	50	299.5	—	—
ANSI	—	—	—	177.6	266