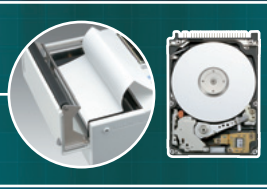
Thermal Arraycorders
WR300 NEW SERIES

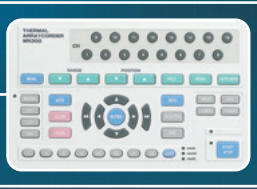
State of the art recorder!
Accurate Data capture and recording.
This machine has it all.

Direct Recording
Chart, Internal Memory, 40GB HDD



Multi-Function
Voltage / Temperature / Strain / Frequency

Direct Operation
Range, Position, Chart speed



Easy PC Connection
USB, LAN, PCMCIA

WR310: High-end model with long-term analog data recording and large-capacity data capture capabilities

Optimal for use in the research and development fields, as well as for control applications at production and manufacturing sites, quality control, and so forth

- Up to 1 MS/s sampling rate on all channels
- Bandwidth (frequency response): DC to 200 kHz (using the WR3-V amplifier)

Thermal Arraycorders

WR300 SERIES

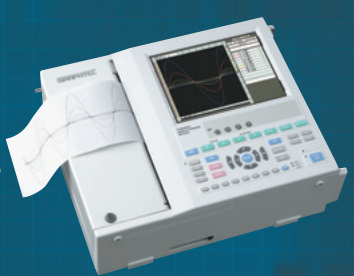
NEW

WR310-8/310-16

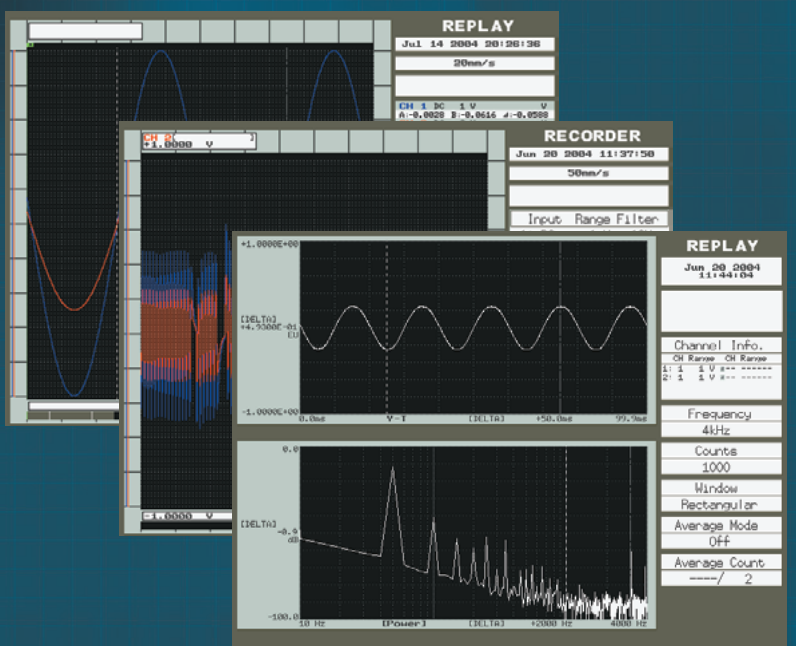
WR300: Recorder designed specifically for long-term waveform recording

- Selection of models with 4, 8, or 16 input channels
- 50-mm/s chart speed
- 100-mm recording width for 4-ch models; 200-mm recording width for 8-ch and 16-ch models

WR300-8/300-16



WR300-4



Data Capture (Large-capacity) — 40GB HDD / PCMCIA card

Long-term data capture is possible for WR300 series at high speed. WR310 enables continuous measurement for 200 minutes at 10kS/s for 8CH. 1 M words internal memory is standard.

Measurement data capture times (when measuring on 8 channels)

	1 µs	10 µs	100 µs	1 ms	5 ms	10 ms	100 ms	1 s
1 Mword/ch memory	1 s	10 s	1.6 min	16.6 min	1.4 h	2.8 h	28 h	11 days
HDD (1 file = 2 GB)*	2.08 min	20.8 min	3.4 h	1.4 days	7.2 days	14 days	144 days	1446 days
PCMCIA card (256 MB)					22 h	1.8 days	18.5 days	185 days

*One data capture operation is up to 2 GB

Recording (Thermal recording) — Various recording papers are prepared

Built-in 200mm (8") wide thermal array printer in the 8- and 16-ch models; 100 mm wide printer in the 4-ch model.

200-mm width roll paper

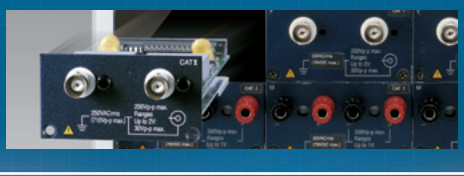
100-mm width roll paper

40-m length Z-fold paper

100-m length Z-fold paper

Multi-function input — Plug-in amplifiers

Models available with 4, 8 or 16 input channels. Plug-in 2-channel WR300 series amplifiers adapt the system to a wide variety of input types and sensors.

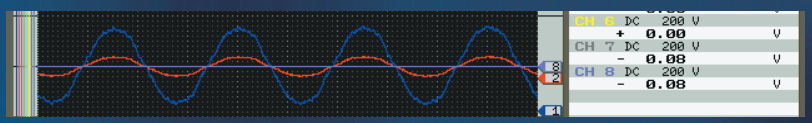


It corresponds to the time standard by IRIG interface.

Performance, reliability and ease of use.

Monitor (8.4" color LCD monitor) — Easy operation and highly visible display

8.4" color LCD monitor for data display and the graphical user interface.



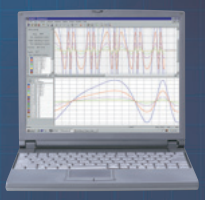
PC connection & remote interface

Data transfer in real time!

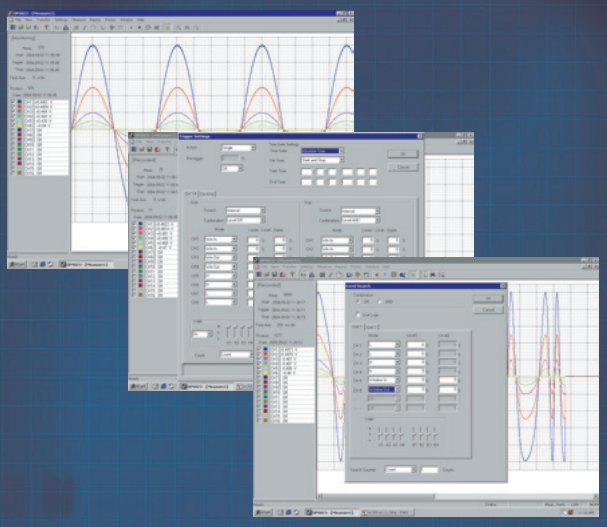
USB

LAN

PCMCIA Card



Includes Windows™ software for setup, control, data transfer



Remote Functions

Name	Function	Remarks
START/STOP (Level operation)	Measurement START/STOP Pulse width: At least I s , Repeat cycle: At least 1 s	Input: CMOS type (0/+5V)
START/STOP (Edge operation)	Measurement START/STOP Measurement starts and stops repeatedly whenever the L level is reached. Pulse width: At least I s , Repeat cycle: At least 1 s	
EXT. FEED	Chart feed Amount fed per pulse: 0.03125 mm , Max. high frequency: 660 pps (20 mm/s)	
EXT. TRIGGER	Trigger activation L level pulse width: At least 10 ms	
EXT. SAMPLE	Data capture cycle Pulse width: At least 500 ns , Repeat cycle: At least 10 µs	
TRIGGER Output	Trigger output A CMOS type "L" pulse signal is output whenever a trigger is activated. Output pulse: At least 10 ms	Output: CMOS type (0/+5V)

WR300 Series Model Configuration Chart

	WR300			WR310	
No. of channels	4	8	16	8	16
100-mm roll paper	Yes	No	No	No	No
100-mm Z-fold paper (for internal use)	Opt.	No	No	No	No
100-mm internal Z-fold unit	Opt.	No	No	No	No.
200-mm roll paper	No	Yes	Yes	Yes	Yes
200-mm Z-fold paper (for internal use)	No	Opt.	Opt.	Opt.	Opt.
200-mm internal Z-fold unit	No	Opt.	Opt.	Opt.	Opt.
200-mm Z-fold paper (long-length)	No	Opt.	Opt.	Opt.	Opt.
Long-length 200-mm Z-fold unit	No	Opt.	Opt.	Opt.	Opt.
Logic amp	4-ch	8-ch	16-ch	8-ch	16-ch
IRIG	No	No	No	Yes	Yes
40-GB hard disk	No	No	No	Yes	Yes

Basic Specifications

Main Unit Specifications

Item	Details
Analog input	4-ch model: 2 slots, 8-ch model: 4 slots, 16-ch model: 8 slots (amplifier units can be intermixed)
Logic input	4-ch model: 4 channels, 8-ch model: 8 channels, 16-ch model: 16 channels
PC interface	LAN, USB
Memory capacity	1 Mword per channel
Internal memory	40 GB 2.5-inch hard disk*1, PCMCIA slot (Type II)
Isolation voltage	Between the AC power supply and casing: 1 minute at 1,500 V AC
Insulation resistance	Between the AC power supply and casing: 20 MΩ at 500 V DC
Backup functions	Setting conditions: EEPROM, Clock: Lithium batteries
Operating environment	0°C to 40°C, 30% to 80% RH (5°C to 35°C when using hard disk or printer)
Operating noise levels	Standby: 60 dBA max.
Rated power supply	100 to 120 V AC/200 to 240 V AC, 50/60 Hz (automatically selected for the voltage being used)
Power consumption	4-channel model: approx. 100 VA, 8-ch model: approx. 120 VA, 16-channel model: approx. 140 VA (when the print density is 50% and the printer is being used)
External dimensions (approximate)	380 mm (W) x 296 mm (D) x 125 mm (H), (excluding rubber feet and protrusions)
Weight (approximate)	4-ch model: 5.6 kg (including 2 amplifiers, excluding options)
	8-ch model: 6.1 kg (including 4 amplifiers, excluding options)
	16-ch model: 6.8 kg (including 8 amplifiers, excluding options)

*1: WR310 only

Monitor and Printer Specifications

	Item	Details
Display screen		8.4-inch color TFT LCD
Display details		Setting windows, mode measurement values
Thermal printer		4-ch model: 100 mm wide, 8 dots per mm 8-ch/16-ch models: 200 mm wide, 8 dots per mm
Measurement mode		Recorder mode, FFT mode
Recorder mode	Display format	Display format: Y-T Display direction: Horizontal scroll No. of display zones: Zone specification, fixed format
	Digital display	Digital display of measured values for up to 8 channels on right-hand side of screen
	Display method	Scroll, Fixed
	Print details	Waveforms and screen copy
	Chart speed	1, 2, 2.5, 5, 10, 20, 25, 50 mm/s 1, 2, 2.5, 5, 10, 20, 25, 50, 100 mm/min, mm/h
	Printing accuracy	Y: ±0.3% ±1 dot, T: ±2% ±0.5 mm
	Annotation printing	System annotation: (System, User, System & User, OFF) Channel annotation: (Amp, User, Amp & User, Value, OFF)
	No. of annotation characters	10 to 32 characters
	Annotation printing interval	10 cm to 100 cm in 10-cm steps
	Captured data replay	Waveform display/scroll, Waveform zoom-in/zoom-out, Cursor function, Calculation function, Data search function
	Waveform expansion/	Time axis fixed zoom-in/zoom-out: x 10 to x 1/1000 (data between specified cursors)
	Compression functions	Time axis variable zoom-in/zoom-out: data between specified cursors Voltage axis variable zoom-in/zoom-out: data between specified cursors
	Cursor functions	Cursor readout function/Scroll function/Zoom function
	Calculation functions	Arithmetic operations/Moving average/Log/Index mean/Absolute value/Differential and integral (two types of integral)/Second differential (two types of second integral)/Sine/Cosine/Tangent/Arcsine/Arccosine /Arctangent/Pi (π)
	Data search	Date/Time: Data search from specified time/date Level: Data search above (below) specified level
FFT mode	Analysis functions	Auto-correlation: Linear spectrum, power spectrum, power spectrum density, RMS spectrum Cross-correlation: Cross spectrum, transfer function, coherence function
	Analysis frequencies	400 kHz, 200 kHz, 100 kHz, 80 kHz, 40 kHz, 20 kHz, 10 kHz, 8 kHz,5 kHz, 4 kHz, 2 kHz, 1 kHz, 800 Hz, 500 Hz, 400 Hz, 200 Hz, 100 Hz, 80 Hz, 40 Hz, 20 Hz, 10 Hz, 8 Hz, 5 Hz, 4 Hz, 2 Hz, 1 Hz, 0.8 Hz, 0.5 Hz, 0.4 Hz, 0.2 Hz, 0.1 Hz, 0.08 Hz
	Number of analysis channels	4 ch
	Window functions	Hanning window, rectangular window
	Number of sampling points	1,000 points, 2,000 points
	Averaging	Summation, exponential, peak hold
	Display format	1 Division, 2 Divisions, 4 Divisions, Nyquist
	Print details	Screen copy

Data Capture Function Specifications

Function	Item		Details
Internal capture	Captured data		Measurement conditions, measurement data
	Capture capacity	Memory	1 Mword per channel
		PCMCIA card	Depends on usage conditions
		Hard disk*1	40 GB (1 file: 2 GB max.)
	Sampling interval	Memory	Depends on amplifier
		PCMCIA card	Max. 5 ms
		Hard disk*1	8-ch data capture : Max. 1µs, 16-ch data capture: Max. 2µs Note: 10µs for temperature ranges
	Memory banks (Block) *2		1, 2, 4, 8, 16, 32, 64, 128
	Capture start specification		After a trigger, capture starts simultaneously with waveform recording (can be set On/Off)
Network capture	Captured data		Measurement conditions, measurement data
	Capture capacity		Depends on PC connected
	Sampling interval		Depends on amplifier
	Transfer data details	During measurement	Min./Max. values transferred in real time
		After measurement	Data captured to memory/hard disk
	Data backup*2		Memory, PCMCIA card, hard disk (data capture capacity and sampling interval are the same as for Internal capture).
	Capture start specification		After a trigger, capture starts simultaneously with waveform recording (can be set On/Off)

*1: WR310 only *2: When using memory

Trigger Specifications

Item	Details
Time gate	OFF, Relative time, Absolute time
Action	Single, Repeat
[Start condition] source	OFF: Start triggered by pressing the START key Internal: Start triggered by a combination of measured signals Manual: Start triggered by pressing the TRIGGER key External: Start triggered by a TRIGGER IN signal from the remote connector
[Stop condition] source	OFF: Stop triggered by pressing the STOP key Internal: Stop triggered by a combination of measured signals Manual: Stop triggered by pressing the TRIGGER key External: Stop triggered by a TRIGGER IN signal from the remote connector Time: Stops measurement at preset time
Combination	Level OR, Level AND, Edge OR, Edge AND
Judgment mode	Edge: Rise time (↑), Fall time (↓) Level: H (High), L (Low) Window: IN, OUT, OFF
Level	–100% to +100% of setting range in 1% steps
Trigger Counter (when the Combination setting is Level)	Number of times: 1 to 255 Filter: Product of the Sampling Interval and the Number of Times settings (can only be set when the Function setting is Memory).
Pretrigger	Internal memory: 0% to 100% in 1% steps PCMCIA card, HDD: On/Off
Logic trigger	Pattern: H (High), L (Low), X (Don't care) Judgment mode: When the pattern is matched

Software Specifications

Item	Details
Compatible operating system	Windows 2000/XP
Functions	Measurement conditions setting, data measurement, file conversion, report creation (option)
Measurement condition settings	WR300/310 control, communication conditions setting
Measurement function	Recorder mode
Display format	Y-T
Display direction	Horizontal scroll
No. of display zones	Zone specification
Digital display	Digital display of measured values for up to 8 channels on left-hand side of screen
Display method	Scroll, fixed
Captured data replay	Waveform display/scroll/waveform expansion/compression
Cursor functions	Cursor readout, data search
File conversion	TEXT, CSV, DADiSP, GBD
Report creation (option)	Report creation mode or waveform screen copy and paste

Standard Accessories

Thermal paper (4ch PR230 100mm , 8ch-16ch PR231A 200mm)	1 roll
Roll paper bobbins	2
REMOTE connector	1
LCD Protector	1
User Guide CD-ROM with OPS023 Application Software , USB Driver	1
Quick Guide	2
AC cable (RSC-110)	1

Plug-in Amplifier Specifications

WR3-V Amplifier
(for voltage measurement)

Item	Details
No. of channels	2 channels per unit
Input configuration	Independent unbalanced input for each channel (floating ground)
Input resistance	1 MΩ ±1%
Input coupling	AC, DC, GND, CAL, (1/2 F.S.), OFF
Measurement range	50, 100, 200, 500 mV/F.S. 1, 2, 5, 10, 20, 50, 100, 200 V/F.S.
Input filters	Line: 1.5 Hz (–3 dB) at –6 dB/oct Low-pass : 5 Hz, 10 Hz, 50 Hz, 500 Hz, 5 kHz, 50 kHz (–3 dB) at –6 dB/oct
Accuracy (23±3°C)	±0.25% of F.S.
Temperature coefficients	Zero point: 0.02% of F.S. /°C Gain: 0.02% of F.S. /°C
Insulation resistance	100 MΩ (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
Permissible signal source resistance	Max. 1 kΩ
A/D converter	Sampling interval: 1 µs A/D resolution: 12 bits
Common mode rejection ratio	80 dB (typ) (50/60 Hz, Signal source resistance: max. 500Ω)
Signal/noise ratio	–46 dB (typ) 200(Vp-p at 50 mV range (with +/– shorted)
Frequency response	DC coupling: DC to 200 kHz (+/–3 dB Typ.) AC coupling: 10 Hz to 200 kHz (+1/–4.5 dB Typ.)
Max permissible input voltage	Between +/– terminals: 5 V to 200 V range : 200 V DC (DC + AC_{P-P}) 50 mV to 2 V range: 30 V DC (DC + AC_{P-P}) Between input terminals and GND: 33 V AC rms
Input terminal type	BNC

WR3-M Amplifier
(for voltage/temperature measurement)

Item	Details
No. of channels	2 channels per unit
Input configuration	Independent unbalanced input for each channel (floating ground)
Input resistance	1 MΩ ±1% constant
Input coupling	AC, DC, TEMP., GND, CAL (1/2 F.S.), OFF
Measurement range	[Voltage] 20, 50, 100, 200, 500 mV 1, 2, 5, 10, 20, 50, 100, 200, 500 V Auto [Temperature] TC-K: –200 to 1300 °C TC-J: –200 to 1100 °C TC-T: –200 to 400 °C TC-R: 0 to 1600 °C TC-E: –200 to 800 °C TC-B: 600 to 1700 °C
Input filters	[Line] 1.5 Hz (–3 dB) at –6 dB/oct. [Low-pass] 5, 10, 30, 50, 500Hz, 5 kHz (–3 dB) at –6 dB/oct.
Accuracy (23°C ±3 °C) (Temperature accuracy includes reference contact compensation accuracy)	[Voltage] ±0.25% of F.S. [Temperature] < TC-K, J, E > –200 °C to 0 °C: ± (1% of rdg + 3.5 °C) Other: ± (0.2% of rdg + 3.5 °C) < TC-T> –200 °C to 0 °C : ± (0.8% of rdg + 3 °C) Other: ± (0.2% of rdg + 3 °C) < TC-R > 0 °C to 200 °C: ± 9.5 °C 200 °C to 800 °C: ± 6.5 °C Other: ±(0.2% of rdg + 4.5 °C) < TC-B > 600 °C to 700 °C: ± 9.5 °C Other: ± (0.2% of rdg + 5.5 °C)
Temperature coefficient	Zero point: 0.01% of F.S./ °C Gain: 0.02% of F.S./ °C
Insulation resistance	100 MΩ (at 500 V DC)
Isolation voltage	Between input terminal and casing: 1 minute at 1,000 V AC
Permissible signal source resistance	Max. 1 kΩ
Input bias current	2nA (typ.)
A/D converter	Sampling interval: 10 µs A/D resolution: 16 bits (out of which 14 are internally acknowledged)
Common mode rejection ratio	100 dB typ (120 dB with Line Filter on)
Signal/noise ratio	–46 dB (typ) 100 µVP-P at 20 mV range (with +/– shorted)
Frequency response	DC coupling: DC to 20 kHz (+1/– 3 dB Typ.) AC coupling: 10 Hz to 20 kHz (+1/– 4.5 dB Typ.)
Max permissible input voltage	Between +/– terminals: 2 V to 500 V range : 500 V DC (DC + AC_{P-P}) 20 mV to 1 V range: 100 V DC (DC + AC_{P-P}) Between input terminals and GND: 33 V AC rms
Input terminal type	Banana connector (two connectors)

WR3-DCB Amplifier
(for strain measurement)

Item		Details
No. of channels		2 channels per unit
Input terminals/format		Independent balanced input for each channel (NDIS strain input connectors)
Input coupling		DC, CAL+, CAL–, ZERO, OFF
Measurement range		Voltage: 1000 to 20,000 x 10^{-6} strain FS (1/2/5 steps)
Max permissible input	Differential input	10 VDC (DC+ACp-p)
	Sync voltage	100 VACrms
Insulation resistance		Min. 100 MΩ (at 500 V DC)
Isolation voltage		Between input terminal and casing: 1 minute at 1,000 V AC
A/D converter		Sampling interval: 10 µs Resolution: 16 bits (out of which 14 are internally acknowledged)
Common mode rejection ratio		80 dB typ (50/60 Hz)
Signal/noise ratio		Max. 50 x 10^{-6} strain (2 V DC, 350 Ω)
Input resistance		Approx. 10 MΩ (5 M + 5 M)
Accuracy (23 °C ±3 °C)		±(0.3% of F.S. +1.2 x 10^{-6} strain)
Frequency bandwidth		DC to 20 kHz (+1/–3 dB)
Stability	Zero point	±1.2 x 10^{-6} strain/ °C ±10 x 10^{-6} strain/8 h ±10 x 10^{-6} strain/0.5 h (initial drift / from 10 s after power on)
	Gain	±0.02% of F.S./ °C 0.10% of F.S./8h
Filters	Line	1.5 Hz (+1/–3 dB) at –6 dB/oct
	L.P.F	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz (–3dB) at –12 dB/oct
Gauge ratio		2.0 fixed
Gauge resistance		120 to 1000 Ω
Bridge voltage	Voltage	DC 2 V
	Accuracy	±0.2%
	Stability	±0.01%/ °C
Balance adjustment	Method	Auto balance adjustment method
	Accuracy	±10 x 10^{-6} strain
	Range	Resistance ±2% (10,000 x 10^{-6} strain)

WR3-FV Amplifier
(for frequency measurement)

Item		Details
Input terminals/format		Independent unbalanced input for each channel (floating ground)
Input coupling		DC (0 V reference), OC (+2.5 V reference), OFF
Measurement range		200 Hz to 40 kHz F.S. (1/2/4/5 steps)
Max permissible input	Between +/– terminals	DC 60 V (DC+ACp-p)
	Between floating terminals	30 VACrms
A/D converter		Sampling interval: 4 µs (250 kHz) Resolution : 12 bits (out of which 14 are internally acknowledged)
Input resistance		DC: Approx. 100 k Ω OC: Approx. 10 k Ω
Accuracy		±0.5% of F.S.
Max. input frequency		40 kHz
Min pulse width		Min. 2.5 µs
Min. voltage		Min. ±1 V relative to the reference value
Low-pass filters		100 Hz, 1 kHz, 10 kHz (–3 dB) at –6 dB/oct

Logic Amplifier
(for measurement of logic signals)

Item	Details
No. of channels	4-ch model: (4 channels/logic input terminal x 1) 8-ch model: (8 channels/logic input terminal x 2) 16-ch model: (16 channels/logic input terminal x 4)
Input voltage range	0 to 25 V max. (single ground input)
Threshold level	TTL (+1.4 V), CMOS (+2.5 V), Contact (+5.0 V)
Sampling interval	1 µs max. (irrespective of analog amplifiers installed)
Trigger setting	8-channel pattern trigger
Display/Recording	On/Off switchable for each group (1 group: 4 channels)
Display/Record position specification	Display/Recording position can be specified for each group in each zone

IRIG
(Time Code) (WR310 only)

Item	Details
Input signal type	Modulated, demodulated
Output signal type	Demodulated
Input signal format	IRIG-B, IRIG-E
Print record	System annotation printing
Display	Asterisk mark [*] displayed when time code received When a time code has not been received, the recorder's internal time is displayed The year displayed is the internal function clock
Input connector	BNC

Options/Accessories/Supplies Charts

Units

Unit	Model No.	Details
Voltage measurement amplifier	WR3-V AMP	Can be added later
Voltage/temperature measurement amplifier	WR3-M AMP	Can be added later
DC strain measurement amplifier	WR3-DCB AMP	Can be added later
Frequency measurement amplifier	WR3-FV AMP	Can be added later
200-mm long-length Z-fold unit	B-522	Can be added later
100-mm internal Z-fold unit	B-523	Can be added later
200-mm internal Z-fold unit	B-524	Can be added later

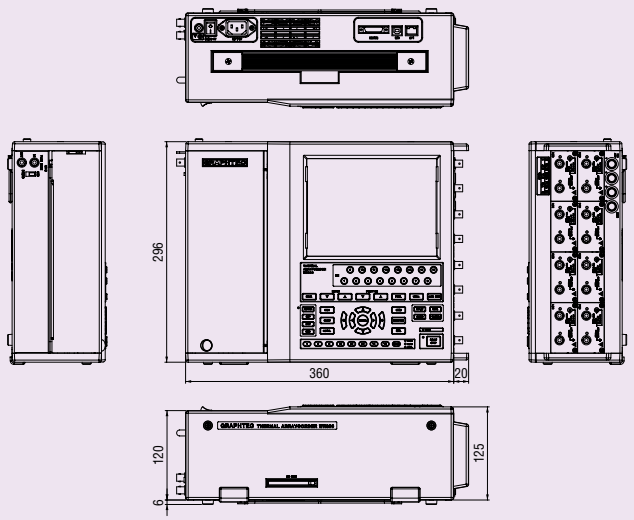
Accessories

Accessories	Model No.	Details
Input cable (8-cable set)	B-331	2-pin cable (banana terminal) bare tips
Input cable (16-cable set)	B-335	2-pin cable (banana terminal) bare tips
Clamp adapter (1200 A)	CM-102	
Digital clamp meter	CM-111	
Logic amplifier probe	RIC-07	
Alligator clip cable	RIC-08	
IC clip cable	RIC-09	
Probe set (Set RIC-07 to 09)	RIC-10	
Floating voltage input probe	CM-105	
Voltage conversion probe	CM-106	
Clamp meter temperature probe	RIC-110	
Line separator	CM-108	
Safety adapter	SMA-102	High-voltage BNC-to-banana conversion adapter

Supplies

Supplies	Model No.	Min. Qty.	Details
Roll paper (thermal recording paper)	PR230	5 rolls	100-mm wide, 40-m length
Z-fold paper (thermal recording paper)	PZ230	5 packs	100-mm wide, 40-m length
Roll paper (thermal recording paper)	PR231A	10 rolls	200-mm wide, 40-m length
Z-fold paper (thermal recording paper)	PZ233	5 packs	200-mm wide, 40-m length
Z-fold paper (thermal recording paper)	PZ231A	5 packs	200-mm wide, 100-m length
Head cleaner	B-368	1 set	For cleaning the thermal recording head

External Dimensions



The dimensional diagram shown above is for the WR310-16 model.
Dimensional precision: ±5 mm Unit: mm