DATA ACQUISITION SYSTEM

omniace III
RA2300

NEC

"Fast Measurements – Easy Operation – Every time"

Omniace III - The Newest Generation
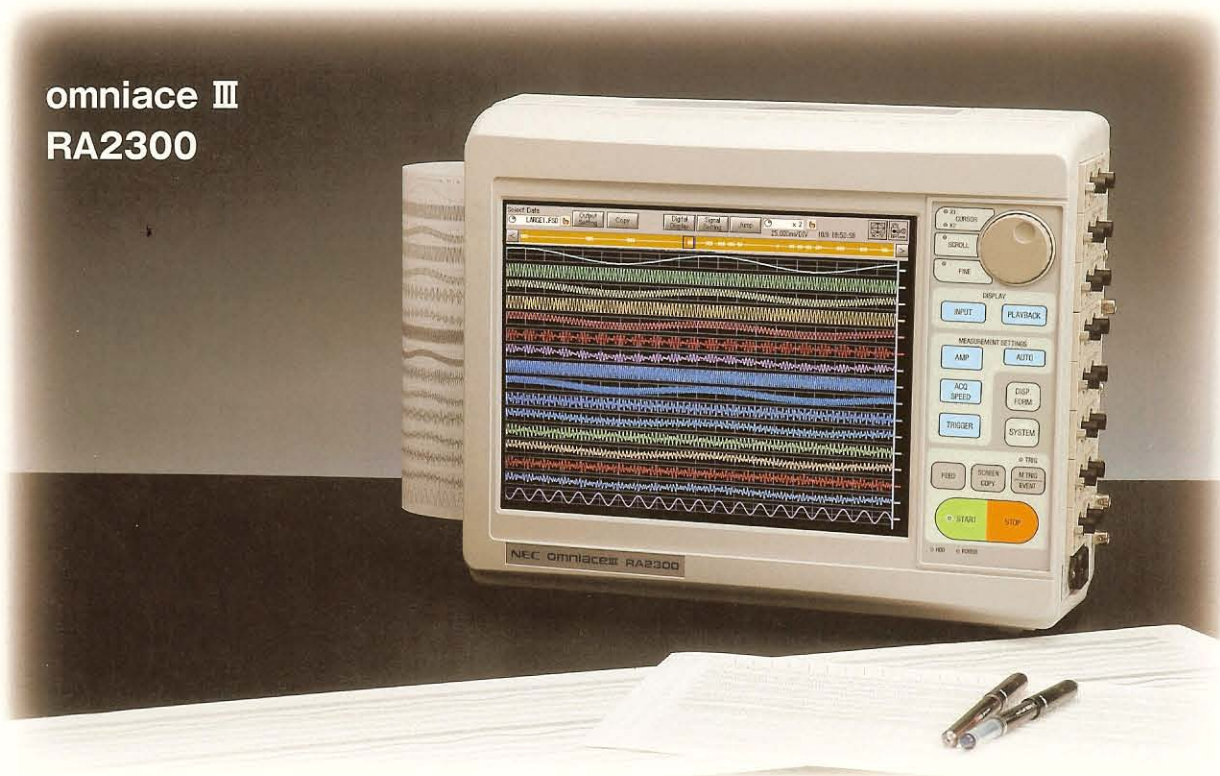
NEC San-ei Instruments, Ltd.
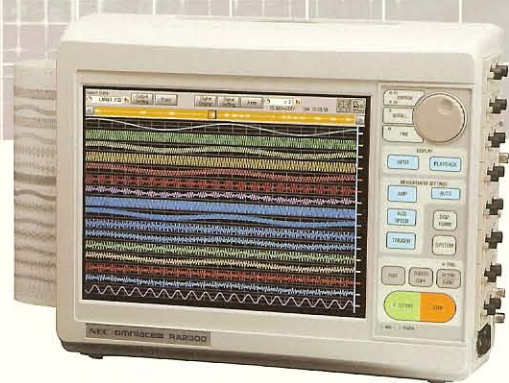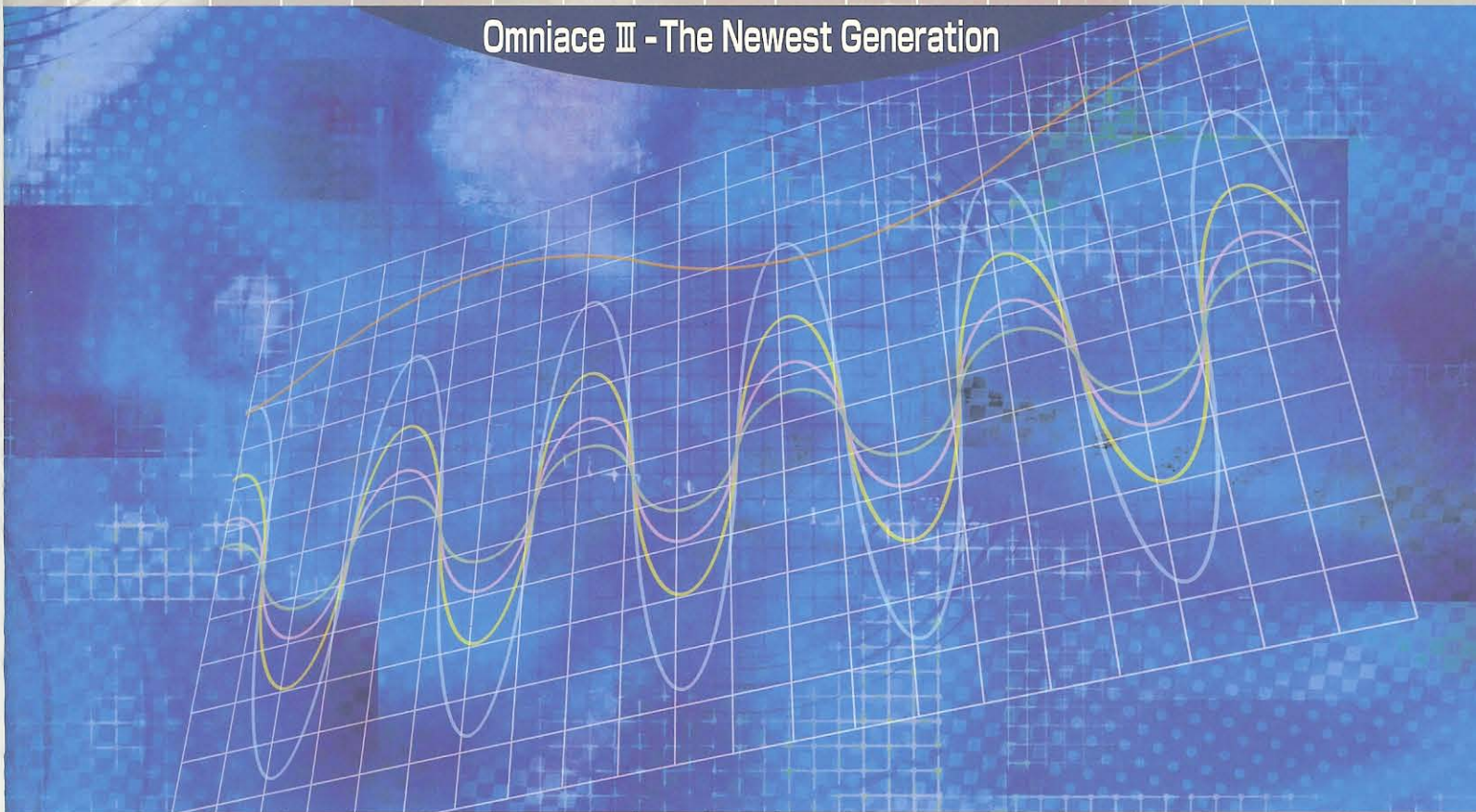
http://www.necsan-ei.co.jp/osd

◯ Easy Measurements by Anybody Any Time!!
◯ Long-term Recording on built-in HDD!!

omniace III
RA2300

The Omniace III RA2300 is a unique Data Acquisition Recorder designed for simple user operation, quick set-up, easy data acquisition, convenient color display of data, and high resolution chart recorder print-out, all in a self-contained, portable package. Graphical amplifier set-up and signal waveforms are brilliantly displayed on a large, color LCD. A full range of plug-in modules condition signals for various measuring modes including HD Recording (for long term recording on a built-in 40GB HDD), Memory Recording (high speed transients/events), and Real Time Recording (like pen recorder). The RA2300 is ideal for Maintenance, Production, Quality and R&D applications.

FEATURES

●Large Color Screen Display
A large 12.1" full color LCD touch screen displays set-up information and acquired data in real time or from memory. View before print or print while viewing data.

●Unique Pen Recorder Mode
Clear graphic, touch to set, amplifier control images eliminate complicated recorder setup. Displayed data signals appear to originate from graphic writing pen nib image while data is recording.

●Enhanced Ease of Stored Data Access
Finding and displaying recorded data has never been easier. Many search features for finding specific data points within a large data file are included. A Thumbnail Bar displays all recorded channel data, while a Jump search function finds max/min points, time, etc.

●Direct Sensor Input
Sensors may be directly connected to the wide selection of plug-in signal conditioning amplifiers to measure AC/DC Voltage, AC/DC Strain, Temperature, Vibration, Pressure, Rotation Pulses, Frequency, etc.

●Long-term Recording
A built-in 40GB HDD provides long-term, high speed data recording for 120 days on 16-channels with a 10mS simultaneous sampling rate!

●Standard LAN & USB Ports
LAN (100BASE-T) for data communication and USB for external storage devices (MO/USB memories) are standard interfaces.

●Built-in Chart Printer
A high resolution, thermal array printer with wide chart paper allows high-speed real time chart printing at 100mm/sec or prints stored files, and portions thereof, on demand.
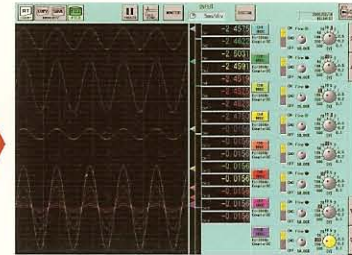
Dynamic Waveform Display

Control Settings, Real Time Recorded Data, and Data Stored in Memory are displayed on a large, 12.1" color touch screen. User selects 1 to 16 channels of waveform and/or numeric value data to be displayed.
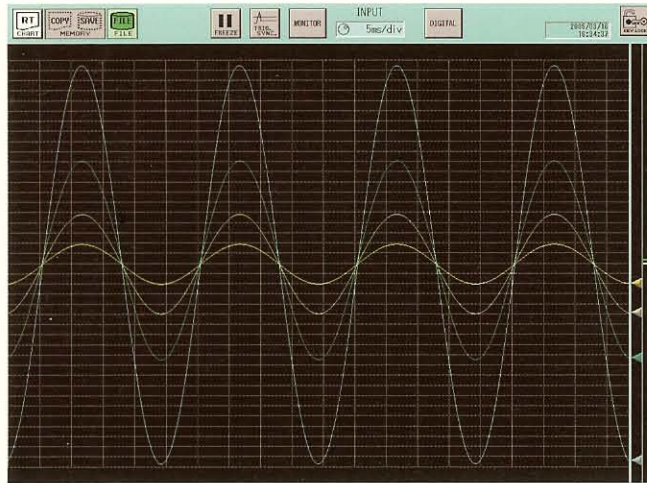
- Full Screen Display - 12.1" Color LCD

Selectable

Selectable - Numeric Value + Amp Control Display

Dividable as required

Divide 1 to 16 Channels - Select Channelized or Overlapping

Special Features for Easy Operation

Setup mode screen graphics display selector dials/switches that change position with a simple "finger touch" or using the jog dial. By using the 12.1" color touch panel LCD, measuring conditions can be modified while monitoring waveforms. Each input amplifier can also be automatically set using the "auto" pushbutton on the operation panel.

Virtual Switch

Dials

Amp Setup Display(2CH High Resolution DC Amp)

Touch Panel

"Auto" button

Operation Panel

Direct Sensor Input

The same amplifiers(AP series) from RA1000 series are available for direct input of various signals(voltage, strain, temperature, vibration, pressure and rotation pulses).

AP Amp Series

| Item	Model No	Sampling	Resolution	Description
2-ch High Resolution DC Amp	AP11-101	10μs	16-bit	DC amp for high resolution measurement
2-ch High Speed DC Amp	AP11-103	1μs	12-bit	DC amp for high speed measurement
2-ch Zero Suppression Amp	AP11-111	10μs	16-bit	DC amp for gaining signal changes by eliminating offset element of input signals
2-ch FFT Amp	AP11-102	10μs	16-bit	DC and vibration amp with high frequency anti-aliasing
Event Amp	AP11-105	1μs	N/A	Amp for recording open/close for contact or H/L for voltage
2-ch TC/DC Amp	AP11-106	10μs	15-bit	Input amp for thermocouple(R, T, J, K and W) and voltage
TC/DC Amp	AP11-107	10μs	14-bit	1-ch input amp for thermocouple(R, T, J and K) and voltage
2-ch AC Strain Amp	AP11-104	10μs	16-bit	Strain amp which reduces influence of external noises (AC bridge system)
2-ch DC Strain Amp	AP11-110	10μs	16-bit	Strain amp with DC bridge system
2-ch Vibration/RMS Amp	AP11-109	10μs	16-bit	DC/vibration amp for measuring signals in RMS
F/V Converter	AP11-108	10μs	12-bit	Amp for converting frequency (pulse) into voltage

User Selectable Measurement Modes

Users can easily select from five (5) Measurement Modes — Pen Recorder mode for real time strip chart recording, HD Recorder mode for long term recording of data to a HDD, X-Y Recorder mode for displaying/recording X-Y correlation of two signals, a Multi Recorder mode captures transients while recording steady - state signals, and a Memory Recorder mode for recording fast events.

Measuring Modes

- Pen Recorder
- HD Recorder
- Memory Recorder
- Multi Recorder
- X-Y Recorder
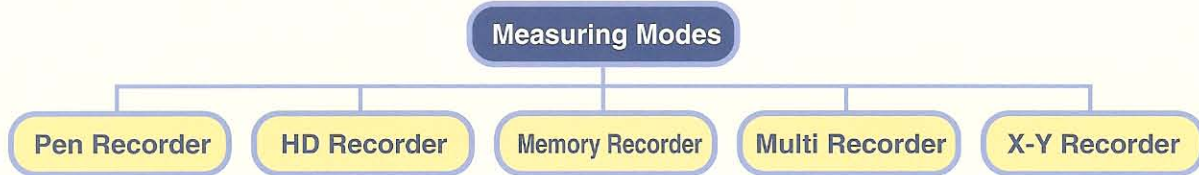
◉ Pen Recorder with Virtual Pens

The Pen Recorder mode offers the simple operation of common strip chart pen recorders. All waveforms are displayed with "moving pen nib" images. And, like pen recorders, input amplifiers and chart paper speed (100mm/s to 1/mm/min) can be changed while recording using the touch panel.

Easy change of paper feeding speed by one touch

Moving nibs write waveforms!!
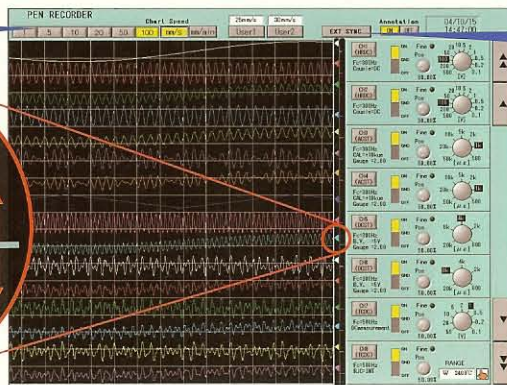
Synchronized waveform recording with external signals
***A remote unit(optional) is required.

◉ HD Recorder for Long-term Recording

Long-term data recording is available on a standard built-in HD(40GB). Fast speed recording can be done at $1\mu s$ with 1 channel and at $10\mu s$ with 16 channels. Since data is digitally saved, after-record analysis or long-period management of data, which is not an option for recording paper, is possible.
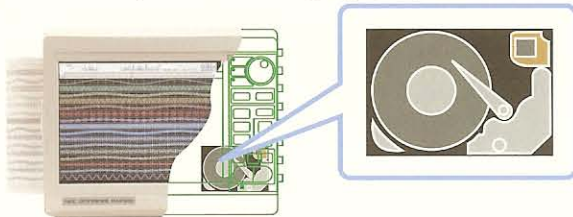
Recordable Time on HardDisk

Sampling Speed	2GB Capacity		40GB Capacity	
	w/1ch	w/16chs	w/1ch	w/16chs
$1\mu s$	17 min	N/A	4.9 hrs	N/A
$2\mu s$	34.1 min	N/A	9.7 hrs	N/A
$5\mu s$	1.4hr	N/A	1 day	N/A
$10\mu s$	2.8 hrs	10.6 min	2 days	3.1 hrs
$20\mu s$	5.5 hrs	21.0 min	4 days	6.0 hrs
$50\mu s$	13.8 hrs	52.0 min	10 days	15.2 hrs
$100\mu s$	1.1 day	1.7 hr	20.7 days	1.2 day
$200\mu s$	2.3 days	3.5 hrs	40.5 days	2.5 days
$500\mu s$	5.8 days	8.7 hrs	101 days	6.3 days
1ms	11.8 days	17.7 hrs	207 days	12.9 days
2ms	23.7 days	1.4 day	414 days	25.9 days
5ms	59.2 days	3.7 days	1037 days	64 days
10ms	118 days	7.4 days	2074 days	129 days

***Above data is calculated value.

◉ Memory Recorder Captures Fast Events

Record fast events using up to $1\mu s$ sampling rates and store to internal memory of 2MW per channel. Unused channel memory can be combined up to 32MW if only one channel is active. Multiple trigger modes ensure capture of data for a wide variety of measurement applications.

Recordable Time on Memories

| Sampling Speed	w/ 1 ch Memory(32MW)	w/ 16 chs Memory(2MW/CH)
$1\mu s$	32.768 sec	2.048 sec
$2\mu s$	1.09 min	4.096 sec
$5\mu s$	2.73 min	10.24 sec
$10\mu s$	5.46 min	20.48 sec
$20\mu s$	10.9 min	40.96 sec
$50\mu s$	27.3 min	1.7 min
$100\mu s$	54.6 min	3.41 min
$200\mu s$	1.8 hr	6.8 min
$500\mu s$	4.5 hrs	17 min
1ms	9.10 hrs	34.1 min
2ms	18.2 hrs	68.3 min
5ms	1.89 day	2.8 hrs
10ms	3.79 days	5.7 hrs
100ms	37.9 days	2.37 days

***Above data is calculated value.

Trigger Mode

- ●OR: Activates if signal of ANY selected channel reaches trigger level.
- ●AND: Activates if signals of ALL selected channels reach trigger level.
- ●WINDOW: Activates if signal of selected channel(s) enters or exceeds preset levels.

Pre-trigger Function

This function allows user to memory-record data before trigger point. Extent of pre/post trigger point can be preset as proportion of total available memory size.

trigger

25%   75%

100%(Total available memory size)
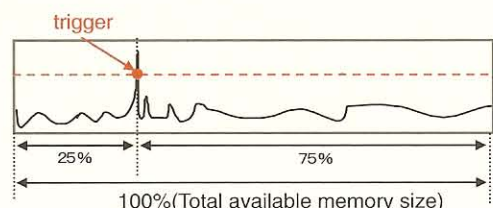
● Multi Recorder Simultaneously Records Steady-state & Transient Events

Chart printing, and recording to HDD and Memory can be simultaneously performed in this mode. A steady-state signal can be printed or recorded on the HDD while the system captures high-speed transient events to memory.

Recording Paper

Steady-state Event

Transient Event

HD

Memory

Memory Block 1 Memory Block 2
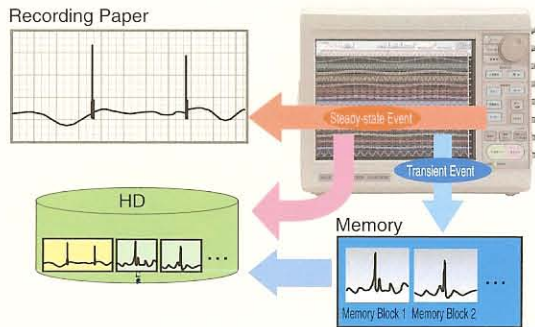
● X-Y Recorder

Select any channel as the X input and up to 3channels for the Y input. Signals are recorded and can plotted for display and printing with high resolution (1600 x 1600 dots).
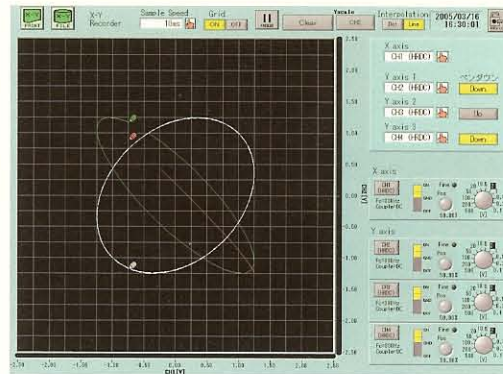
Various Features (Replay Monitor)

● Easy Search of Large Data

Below functions are available for searching long-term and large data easily.

Thumbnail Bar   Jump Search

Enlarged Image on the Monitor

Replay Monitor

Cursor
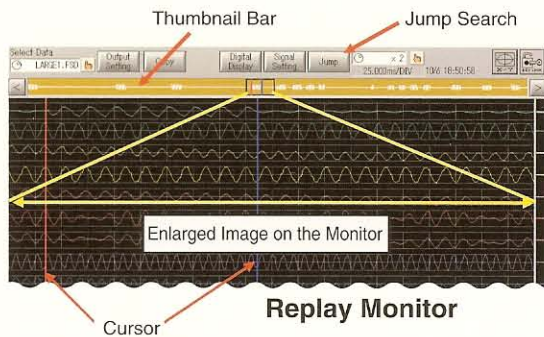
Thumbnail Bar:

This function displays a waveform image(selected one channel) of recorded data on a thumbnail bar. It does not only allow users to see whole waveform image easily but to get enlarged image by touching.

Touch & Zoom In!!
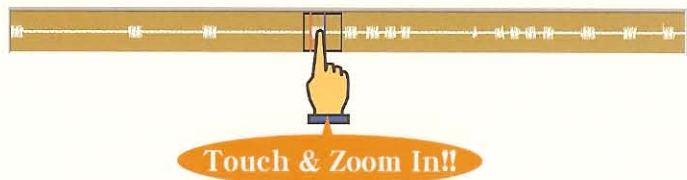
Jump Search:

There are four jump search modes as followings.
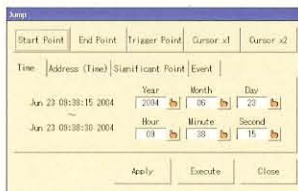
■Time···
Move to specified time

■Max/Min···
Move to max/min of recorded data
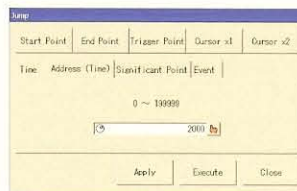
■Address(Time)···
Move to elapsed time from start
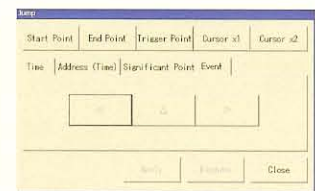
■Event···
Move to marked event

● Numeric Display of Waveform

The replay monitor can also display "scale", "signal", "numeric" and "delta T between two cursors" at user's choice.

Examples:

| | waveform+scale+signal name+△T | waveform+scale+signal name | waveform+signal name |

scale | signal name | numeric | △T

scale | signal name | △T

scale | signal name

signal name

Useful Functions

Shutdown

Power-off through "shutdown" allows users to save measurement conditions and measured data kept in memories on HD.

Simple "User Settings"

Up to four user settings are available to save input and record conditions. Users can start measurement immediately without re-entering previous settings.
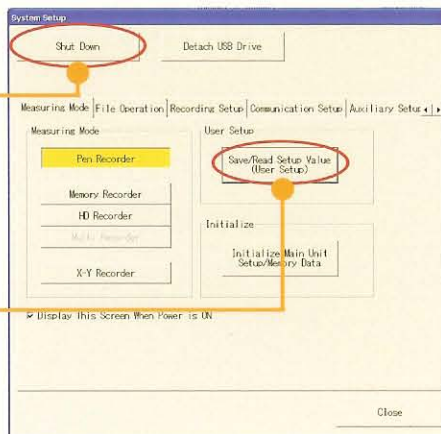
Timer-control Function

Automatic measurement with preset time and interval.
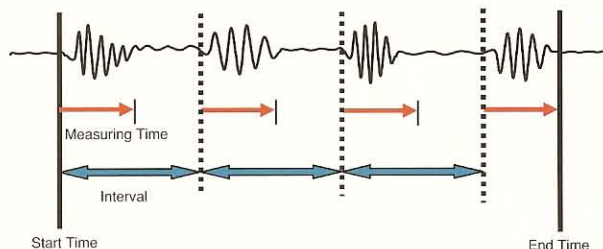
CSV File Conversion: Supports for Analysis

RA2300 can convert measured data into CSV file for analysis using Excel or other analysis software. It has functions like thinning out and batch conversions.
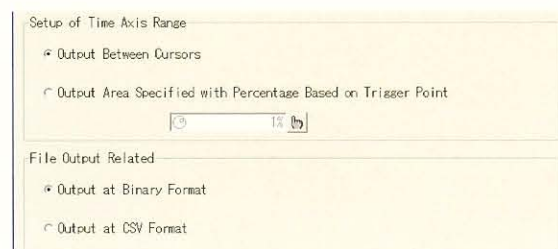
Connection to PC and Other Peripheral Devices

Connection to PC

Users can control RA2300 from PC via LAN or RS-232C. Waveforms can also be monitored at PC using an optional software(NS2100).
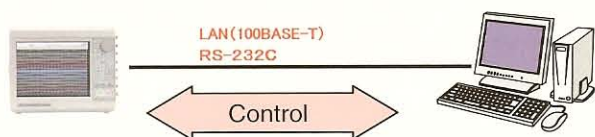
Saving Large Data on External Devices

RA2300 has two USB ports as standard. Measured data can be saved on external storage devices via USB.
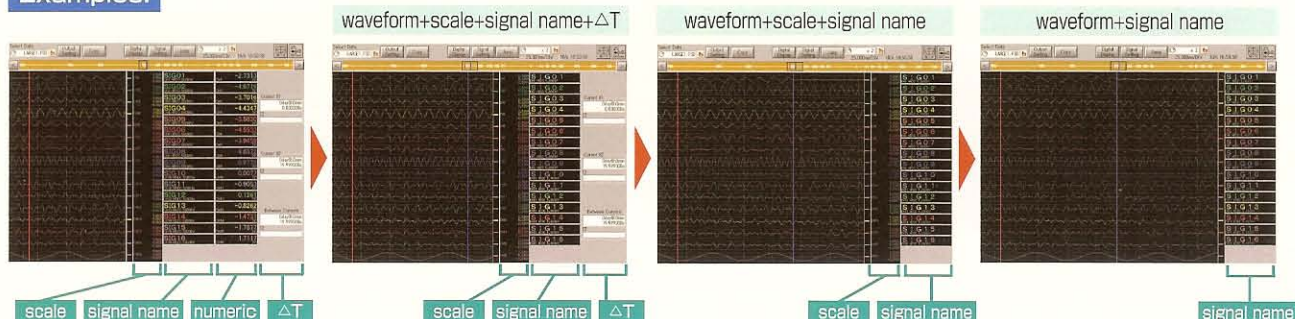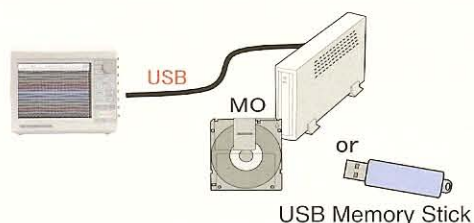

File Sharing with PC

File sharing with PC is possible by transferring recorded data to PC via LAN.
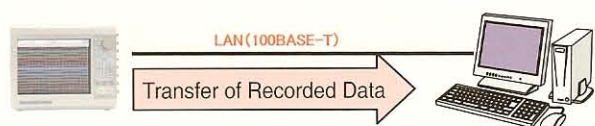
Automatic Shutdown at Blackout

By connecting to uninterruptible power supply(UPS), RA2300 will be automatically shut down at blackout. If power failure occurs during long-term measuring, RA2300 will receive a signal from UPS and power itself off after regular shutdown.

***This function requires an optional RS-232C unit.
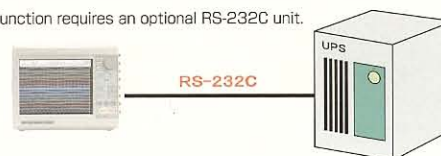
High Speed & High Resolution Recording

- High speed(100mm/s) and high resolution(80 dots/mm at 25mm/s) recording is available.
- Customizable waveform division & printing size.
- Location and amplitude of digital signals can be changed by 8 channels each.
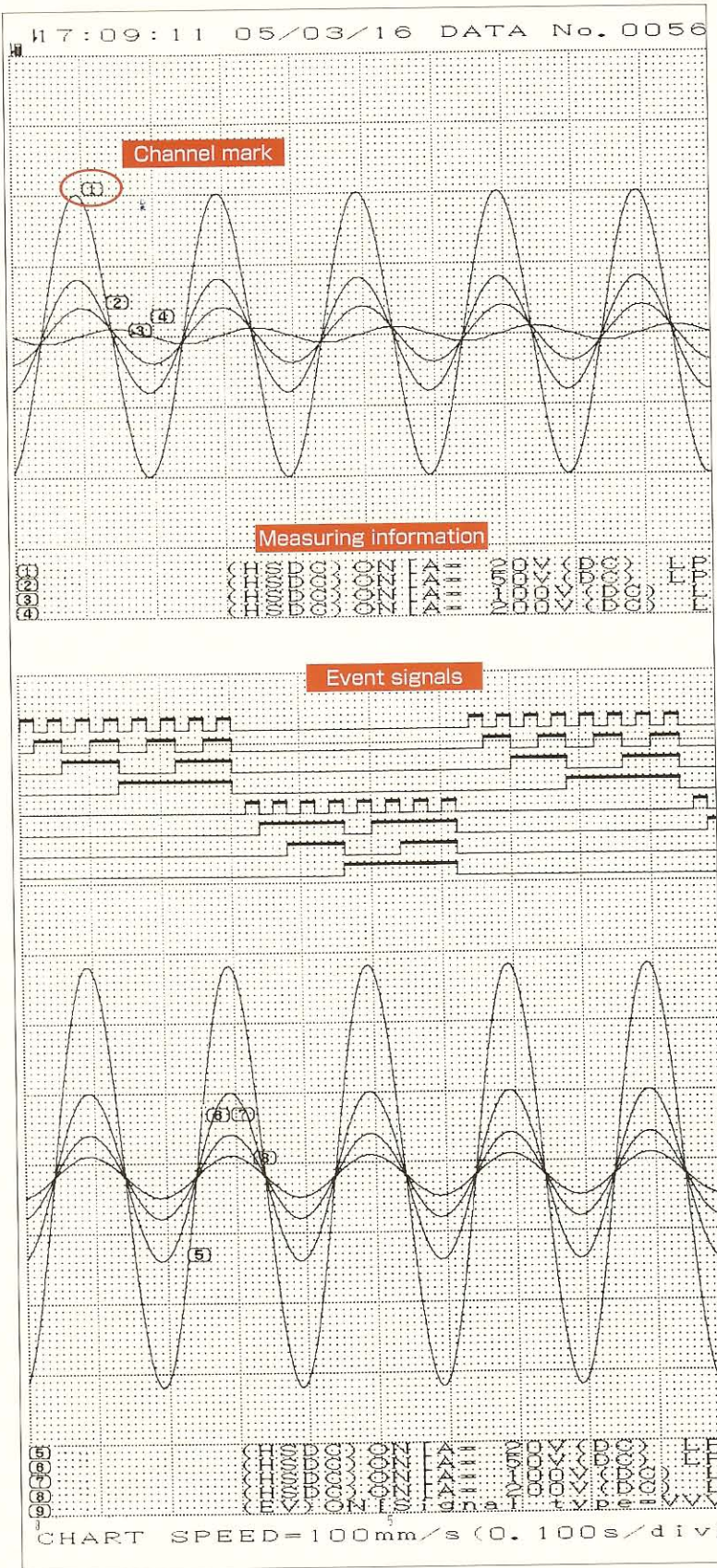
● Auto Scaling

Scales can be printed before or after waveforms.
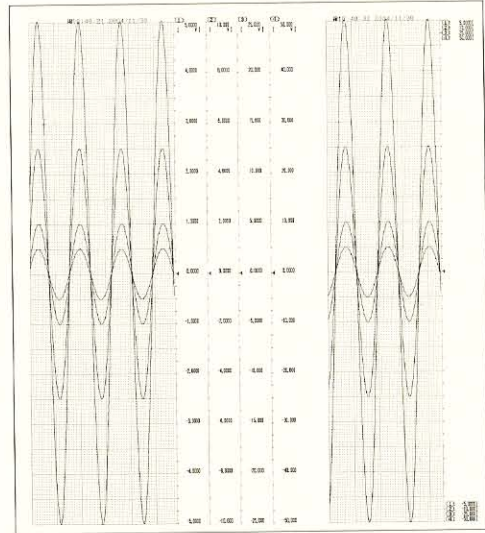
● Waveform Division

One to sixteen divisions can be selected to display or print out.
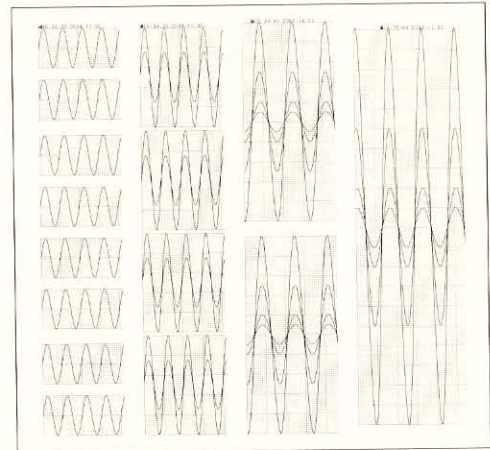
● Customizable Width Size

Users can print waveforms at selected width(10mm to 200mm).

Input Signal		Probes and Cables		Input units

Voltage

±500V (DC or AC peak)

Isolated BNC cable (0311-5175)

BNC-safety jacks adapter (0243-3021)

Current

High current
Clamp Meter 2003A
2,000A/400A
DC and 40 to 1kHz

8005
600A/100A
DC to 400Hz

Medium current
Clamp Meter 8113
200/20/2A
DC to 1kHz

Low current
Clamp Meter 8112
20/2/0.2A
DC and 40 to 10kHz

Voltage fluctuation

10% and 20%
100-V type
200-V type

This unit detects voltage fluctuations of power line. 10% and 20% of 100 VAC or 200 VAC lines can be detected

1540/1543

Voltage detection

50 VAC to 250 VAC
20V to 250V DC

This unit detects AC or DC voltage and outputs as High/Low. It supports 4 channels
50 to 150 VAC: Low
100 to 250 VAC: High
20 to 150V DC: Low
80 to 250V DC: High

1539

Temperature

Thermocouple R, T, J, K, and W*
*W can only be used in AP11-106.

Covered and seathed thermocouples

Input Signal		Sensor

Vibration (impact acceleration)

Amp-embedded charge accelerometer (SV2000 series)

Piezoelectric accelerometer (SV1000, 9F, 9G series)

Charge converter
This unit is necessary when piezoelectric accelerometers are used.

Strain, load, displacement, acceleration and torque

Strain gauge

Bridge box

Strain gauge sensors:
Load cell, pressure transducer, displacement transducer, torque transducer, slip ring and accelerometer

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Input Signal		Probes and Cables

Logic

At voltage input
H: 2.5V or higher
L: 0.5V or lower

At contact input
Open: 2kΩ or higher
Short: 2kΩ or lower

Alligater clip cord (0311-5009)

IC clip cord (0311-5008)

Logic IC cable (0311-5007)

Rotational Signal

At voltage input
0.3V to 30V p-p
1Hz to 10kHz

Rotation pulse

Isolated BNC cable (0311-5175)

BNC-safety jacks adapter (0243-3021)

Input units

2-ch high resolution DC amp(AP11-101)
DC amp for high resolution measurement
· A/D: 16 bit
· 100KS/s (10 μs)
· ±100mV to ±500V

2-ch high speed DC amp(AP11-103)
DC amp for high speed measurement
· A/D : 12bit
· 1MS/s (1 μs)
· ±100mV to ±500V

2-ch zero suppression amp(AP11-111)
DC amp for gaining signal changes by eliminating offset element of input signals
· A/D : 16bit
· 100KS/s (10 μs)
· ±100mV to ±500V
· Suppression voltage range
±13V(at measuring range of ±100mV to 2V)
±110V(at measuring range of ±5V to 500V)

2-ch TC/DC amp(AP11-106)
Input amp for thermocouple
(R, T, J, K and W) and voltage · A/D : 15bit
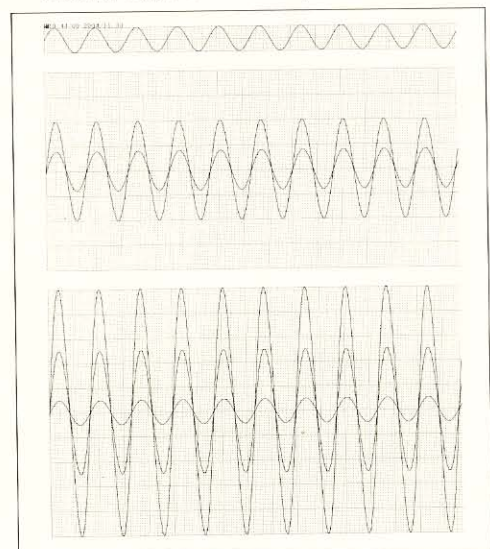· 100KS/s (10 μs)
· ±100mV to ±50V

TC/DC amp(AP11-107)
1-ch input amp for thermocouple
(R, T, J and K) and voltage
· A/D : 14bit
· 100KS/s (10 μs)
· ±10mV to ±50V

2-ch FFT amp(AP11-102)
DC and vibration amp to prevent high frequency loopback
·A/D：16bit
·100KS/s(10 μs)
· Power supply for a sensor
·Anti-aliasing filter(-72dB/OCT)
·±100mV to ±500V

2-ch vibration/RMS amp(AP11-109)
DC/vibration amp for measuring signals in RMS
· A/D : 16bit
· 100KS/s (10 μs)
· Power supply for a sensor
· ±100mV to ±500V

2-ch AC strain amp(AP11-104)
Strain amp which reduces external noises(AC bridge system)
· A/D : 16bit
· Bridge power: 5kHz
· Frequency response: 2kHz
· Auto-balance
· ±1k to ±20k μ ε

2-ch DC strain amp(AP11-110)
Strain amp with DC bridge system
· A/D : 16bit
· Bridge voltage (BV): 2VDC and 5VDC
· Frequency response: 50kHz
· Measurement range:800 to 20k μ ε (at BV=5V)
· Measurement range:2k to 50k μ ε (at BV=2V)

Event amp(AP11-105)
Amp for recording H/L for voltage or open /close for contact
· Input: 8 logic inputs, voltage or contact

F/V converter (AP11-108)
Amp for converting frequency (pulse) into voltage
· A/D : 12bit
· 0.3V to 30Vp-p
· 1Hz to 10kHz

Event unit(RA23-113)
Unit for recording H/L for voltage or open/close for contact
· Input: 16 logic inputs, voltage or contact

■Basic Specifications

Display	12.1-inch TFT color LCD
	Effective screen area: 245.76mmx184.32mm(1024x768 pixels)
Channel	16ch(8 slots) + digital input 16ch(optional)
Sampling Speed	MAX　1μs（1MS／s）
Printer	
Printing Method	Thermal printing using a thermal head
Paper Width	219.5mm
Effective Recording Width	1 division(200mm・FS) to 16 divisions(10mm・FS), number of division and printing width can be changed.
Channel Discrimination	Prints channel number in the vicinity of the printed waveform.The ON/OFF function is available.
Grid Pattern	Standard(10mm, 5mm), 10mm, 5mm, no grid
Battery Backup	Clock, setting value: approx 3 to 5 years(using a primary battery)
Storage Device	40GB Hard Disk Drive (HDD)
	MO drive or USB memory by USB connection
Interface	LAN(10/100BASE-T), USB: standard
	RS-232C, Remote terminal: optional
Operating Environment	Temperature: 5 to 40℃
	Humidity: 35 to 80%RH(without condensation)
Power Supply	90 to 264VAC, frequency 50 to 60Hz
Power Consumption	100VA(typical); with AP11-101 x 8 units *1
Dimensions	Approx 369.5(W) x 150.5(H) x 301(D) mm(excluding projections)
Weight	8.0 kg or less(main body only)
	8.7 kg or less(main body with AP11-101 x 4 units)

*1 Power supply: 100V AC, paper feeding speed: 20mm/s, input signal: 10Hz

■Communication & Storage Specifications

HDD		
	Function	Setting conditions of main unit and save/readout of measured data
	Capacity	40GB(system domain 5GB + data storage space 35GB)
LAN		
	Function	Control with communication command, Windows and file sharing with Windows PC
	Standard	10/100BASE－T
USB		
	Function	Data saving on storage device by USB connection
	Standard	1.1
	Available storage Device	MO, USB memory, HD **Products specified by NEC San-ei only

■Trigger Specifications

Trigger Mode	OR, AND, WINDOW, OFF
Trigger Source	Input signal, manual trigger, external trigger
Trigger Settings	Amps other than event amp
	Trigger slope: OR, AND…or ↑ or ↓　WINDOW…OUT or IN
	Level setting: to be set with physical values(e.g. voltage)
	Event unit(optional), event amp(AP11-105)
	State settings: H, L or OFF can be set for each input (w/o trigger slope). When Off is set, trigger condition is not applied.
	Trigger setting: AND or OR of state setting conditions of inputs from 1 to 8

Trigger Related Functions		
	Trigger output	Output signal when trigger conditions are met(0 to 5V voltage signal active LOW: pulse width, approx 10ms)
	Pre-trigger	Pre-trigger: 0 to 100%(1% step)
	Trigger mark	Record trigger point with an arrow(↓) and print year, date and time trigger occurred.
	Trigger filter	1 to 65534 samples

■Measuring Mode(Acquisition/Recording) Specifications

Pen Recorder

Waveform Printing		
	Function	Printout input signal data on recording paper(waveform)
	Measurement Starting Operation	Start with pressing start key, trigger detection or preset time. Interval recording available.
	Paper Speed	100mm/s to 1mm/min(user setting, external synchronization enabled)
	Frequency Response	DC to 100kHz(sampling: 10 points/cycle). Varies by input units.
	Printing Density	Voltage axis: 8 dots/mm
		Time axis: 80 dots/mm(at 25mm/s)
	Printing Length	Countinuous
Data Backup		N/A

HD Recorder

Data Recording		
	Function	Real-time recording of maesured date on HDD
	Recordable Size	35GB max
	Sampling Speed	1μs(w/ 1CH), 5μs(w/ 8CH), 10μs(w/ 16CH) max
	Recording Method	Normal or ring recording(repeated recording during preset time) selectable.
Waveform Printing		
	Function	Printout input signal data on recording paper(waveform)
	Measurement Starting Operation	ON/OFF of printout to recording paper while HD recording
	Paper Speed	100mm/s to 1mm/min(user setting, external synchronization enabled)
	Frequency Response	DC to 100kHz(sampling: 10 points/cycle). Varies by input units.
	Printing Density	Voltage axis: 8 dots/mm
		Time axis: 80 dots/mm(at 25mm/s)
	Printing Length	Countinuous

Memory Recorder

Data Recording		
	Function	Record measured data on memory in main unit.
	Measurement Operation	Once, repeat, and endless
	Memory Capacity	32MW when using 16 channels, 2MW/ch
	Memory Division	1, 2, 4, 8, 16, 32, 64 and 128 divisions
	Sampling Speed	1μs(1MS/s) to 100s(1S/s), user setting, external synchronization enabled
Waveform Recording		
	Function	Printout memory data on recording paper(waveform)
	Printing Density	Voltage axis: 8 dots/mm, time axis: 10 dots/mm
	Copy Magnification	x5 to x1/1000
Memory Filing		Data is saved on the memory device in binary or CSV format every time when it is stored in memories.
Data Backup		Memory backup with HDD(data saved in a specified area of HDD at shutdown)
Save/Copy Area		Copy with trigger at center: 1 to 100%(1% step), copy between two cursors.

Multi Recorder

Function	Steady-state and transient events can be recorded simultaniously on HD, memory and/or recording paper
Pen Recorder	Refer to Pen Recorder spec
HD Recorder	Refer to HD Recorder spec
Memory Recorder	Refer to Memory Recorder spec(waveform printing not available)

X-Y Recorder

Function	ON/OFF of locus enabled(pen up & down)
	Input signal monitor, freeze, copy and X-Y display during data recording available.
Axis Setting	X-axis: 1 channel, Y-axis: 3 channels
Measuring Speed	1ms to 1s
Data Recording	
Function	Record all input signals(if input channel is ON at amp setting display) on HDD.
Recordable Size	35GB max
Recording Method	Standard
Waveform Printing(Printout)	
Function	Printout displayed waveforms(X-axis: 1ch, Y-axis: 3ch) at A4 size
Resolution	1600x1600 dots(at printout), 650x650 dots(at display)

■Measured Data Display (Replay Monitor) Specifications

Function	Display recorded data at X-T or X-Y when pressed "Replay" button on operation panel.
Available Measuring Mode	All(irrelevant to actual measuring mode)
Y-T Display	
Waveform Division	1 to 16 divisions
Display Magnification	x100 to x1/10,000
Thumbnail Function	Display whole data of selected one channel on a thumbnail bar
Numeric Display	Numeric value, cursor value, numeric + cursor values(by switching over)
Search Function	Search by cursor, time, address, max/min and event
X-Y Display	
Channels Allowed	up to 1ch/X-axis and 3ch/Y-axix can be displayed (to be selected by user).
Data Output	On file and printing paper
Output File Format	Binary or CSV data

■Other Specifications

Printer		
	Data Information	Measuring mode, year/month/day, measurement start time,data No., trigger conditions(trigger point, trigger date,trigger time), sampling speed, paper speed,time axis can be printed with waveforms.ON/OFF selectable.
	Channel Information	Print input unit settings when saved.ON/OFF selectable.
	Mark Print	Pen-recorder, HD-recorder, mark(date/time) print
	List Print	Printout of setting condition (sampling speed,detailed amp settings, etc.) available
	Screen Copy	Print screen image on recording paper
	Line Width for Printing	Select base line boldness for each channel(1,2,3, or 4 dots)
Auto Function		
	Function	Sampling speed and input range can be set automatically by using "auto" button on operation panel.
	Sampling Speed	Adjust sampling speed of an active channel with smallest number (1 to 16ch).
	Input Range	Rough-tuning of all active channels
Timer Function		Start time, end time and interval can be set.
CSV Conversion		Available(also batch conversion of multiple memories or files)
Screen Image Saving		Save screen image on HDD at BMP format(colored)
Save/Readout of Settings		Save up to 4 settings (input and main unit setting conditions) on the main unit HDD.
Keylock Function		Void key input to prevent operational error (password protected)
Physical Value Conversion		Physical conversion of input signals,full scale change on display, registration of units
Waveform Display of Event Input		Display position of event amp and event unit(optional) can be changed. Set reference position and pitch per 8 channels.

■Optional Unit

Remote Unit (RA23-112)

Function	Start, stop, mark print, paper feed is possible by the external signal. Synchronization pulse input.
	Output error signal, input UPS protect signal
Cables	1.5m, I/O connector 28-pin and open wire
Weight	60g or less

Event Unit (RA23-113)

Function	Input logic signal directly into main unit (independent from other amps).
Number of Signals	16
Signal Level	0 to 5V, voltage input(no contact)
Cables	1.5m, I/O connector 34-pin and open wire
Weight	60g or less

RS-232C Unit (RA23-114)

Standard	JIS X5101(former C6351) complied
Transfer Speed	38400, 19200, 9600, 4800 or 2400bps
Connector	D-sub 9-pin connector
Function	
Shutdown	Shutdown operation when using UPS
Remote Control	Remote control from PC via RS-232C cable
Weight	50g or less

AC Bridge Power Supply Unit (RA23-116)

Function	Bridge power source for 2-ch AC strain amp
Power Voltage, Carrier Wave	2Vrms, sine wave 5kHz
Synchronization	Synchronization with other RA2300s using built-in AC bridge power units is available.
Weight	60g or less

2-CH High Resolution Amp(AP11-101) & 2-CH High Speed Amp(AP11-103)

Input	2 chs/unit, isolated unbalanced input, isolated BNC connector
Input Coupling	AC and DC coupling
Input Impedance	1MΩ or higher
Measurement Range	±0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500V FS
Range Accuracy	AP11-101: within ±0.3% FS(within ±0.8% FS at ±500V)
	AP11-103: within ±0.5% FS(within ±0.8% FS at ±500V)
Offset Accuracy	AP11-101: within ±0.3% FS(at 25℃)
	AP11-103: within ±0.5% FS
Linearity	AP11-101: within ±0.1% FS(at 25℃)
	AP11-103: within ±0.2% FS
Allowable Input Voltage	Range of ±10V to 500V: ±500V max(DC or AC peak values)
	Range of ±0.1V to 5V: ±100V max(DC or AC peak values)
CMV	Unit only: 42V (DC or AC peak values)
	When using isolated BNC cable(optional): 300VAC
Frequency Response	AP11-101/at DC coupling: DC to 50kHz(+0.5, -3dB) at AC coupling: 0.3 to 50kHz(+0.5, -3dB)
	AP11-103/at DC coupling: DC to 400kHz(+0.5, -3dB) at AC coupling: 0.3 to 400kHz(+0.5, -3dB)
Low-pass Filter	AP11-101/bessel type(attenuation factor: -12dB/OCT) 30, 300, 3kHz, OFF(+0.5, -3dB)
	AP11-103/bessel type(attenuation factor: -12dB/OCT) 5, 50, 500, 5k, 50kHz, OFF(+0.5, -3dB)
A/D Converter	AP11-101: 16-bit, 100kHz max(simultaneous 2-ch sampling)
	AP11-103: 12-bit, 1MHz max(simultaneous 2-ch sampling)
Temperature Stability	AP11-101/zero point: within ±0.02% FS/℃
	AP11-103/zero point: within ±0.03% FS/℃
Gain(Range)	within ±0.01% FS/℃
Weight	AP11-101: approx 230g or less, AP11-103: approx 240g or less

2-CH TC/DC Amp(AP11-106) & TC/DC Amp(AP11-107)

Input	AP11-106: 2 chs/unit, isolated unbalanced input, terminal block M4
	AP11-107: 1 ch/unit, isolated unbalanced input, 2 binding posts
Input Coupling	DC coupling
Input Impedance	10MΩ or higher(approx 1MΩ at 5, 10, 20, 50VFS in DC range)
Thermocouple	AP11-106: R, T, J, K, W
	AP11-107: R, T, J, K

Measurement Range(Temperature)		AP11-106	AP11-107
	R:	0 to 1600℃ FS	800℃ FS(0 to 800℃), 1600℃ FS(0 to 1600℃)
	T:	-200 to 400℃ FS	200℃ FS(-200 to 200℃), 400℃ FS(-200 to 400℃)
	J:	-200 to 1000℃ FS	200℃ FS(-200 to 200℃), 1000℃ FS(-200 to 1000℃)
	K:	-200 to 1350℃ FS	200℃ FS(-200 to 200℃), 1200℃ FS(-200 to 1200℃)
	W:	0 to 2300℃ FS	N/A

Measurement Range(Voltage)	AP11-106: 100, 200, 500mV, 1, 2, 5, 10, 20, 50V FS
	AP11-107: 10, 20, 50, 100, 200, 500mV, 1, 2, 5, 10, 20, 50V FS
Range Accuracy	Temperature: ±0.5% FS(within ±1% at 0℃ or lower)
	Voltage: ±0.5% FS
Cold Junction Compensation	Internal/external switchable. Accuracy: within ±2℃ (within ±1℃ at stable temperature of 20℃ at input terminal)
Linearity	Within ±0.1% FS
Allowable Input Voltage	50V (DC or AC peak values)
CMV	AP11-106: 42V(DC or AC peak values)
	AP11-107: 300V(DC or AC peak values)
Frequency Response	DC to 40kHz(+0.5, -3dB)
Low-pass Filter	Bessel type(attenuation factor: -18dB/OCT)
	1, 30, 500, 5kHz, OFF(+0.5, -3dB)
A/D Converter	AP11-106: 15-bit, 100kHz max(simultaneous 2-ch sampling)
	AP11-107: 14-bit, 100kHz max
Temperature Stability	When used as temp amp/gain(range): within ±0.04% FS/℃
	When used as DC amp/zero point: within ±0.03% FS/℃
	gain(range): within ±0.01% FS/℃
Weight	AP11-106: 240g or less, AP11-107: 200g or less

2-CH AC Strain Amp(AP11-104) & 2-CH DC Strain Amp(AP11-110)

Input	2 chs/unit, isolated unbalanced input, isolated NDIS connector
Input Coupling	AP11-104: balanced input(isolation: between channels inside unit or between each channel and chassis) AP11-110: DC
Input Impedance	10MΩ + 10MΩ or higher (AP11-110 only)
Bridge Power Supply	AP11-104: sine wave 2Vrms, 5kHz(AC bridge power supply RA23-116 required)
	AP11-110: 2V, 5V
Applicable Gauge Resistance	AP11-104: 120 to 1kΩ
	AP11-110: 120 to 2kΩ(at BV=2V), 350 to 2kΩ(at BV=5V)
Gauge Factor	AP11-104: 1.9 to 2.2
	AP11-110: 2.0
Range of Balance	AP11-104/resistance: ±2%(10000 μ ε) or lower capacitance: 2000pF or lower
	AP11-110/±3%(15000x10-6 μ ε) or lower

Balance Method		AP11-104	AP11-110
	Resistance	Auto-balance	Auto-balance
	Capacitance	Auto-balance(500pF or lower eliminated)	N/A
	Balance Time	Within 1s at 1 channel	Within 0.5s at 1channel
	Remained Voltage Accuracy	Within ±0.5% FS	Within 0.3% FS

Max Sensitivity(AP11-104)	Over full scale at 500 μ ε (at bridge voltage of 2V or higher)

Measurement Range		AP11-104	AP11-110
	Strain	1k,2k,5k,10k,20k μ ε ·FS	2k,5k,10k,20k,50k μ ε ·FS(at BV=2V)
			800,1k,4k,8k,20k μ ε ·FS(at BV=5V)
	Voltage	N/A	2, 5, 10, 20, 50mV FS

Accuracy	Within 0.3% FS(AP11-110 only)
Internal Calibrator and Accuracy	±0.5k, 1k, 2k, 3k, 5k μ ε Accuracy: within ±0.5% FS (AP11-104 only)
Linearity	AP11-104: ±0.2% FS,
	AP11-110: ±0.1% FS
CMV	300VAC
Allowable Input Voltage	±8V(DC or AC peak value)
Frequency Response	AP11-104: DC to 2kHz(+1, -3dB)
	AP11-110: DC to 50kHz(+0.5, -3dB)
Low-pass Filter	AP11-104: butterworth type(attenuation factor: -12dB/OCT) 10, 30, 100, 300Hz and OFF(+1, -3dB)
	AP11-110: bessel type(attenuation factor: -12dB/OCT) 10, 30, 100, 300Hz and OFF(+1, -3dB)
A/D Converter	16 bits, 100kHz max
Temperature Stability	Zero point: within ±0.05% FS/℃(AP11-104), within ±0.1% FS/℃(AP11-110)
	Gain(range): within ±0.05% FS/℃(AP11-104), within ±0.01% FS/℃(AP11-110)
Weight	285g or less(AP11-104), 240g or less(AP11-110)

Event Amp(AP11-105)

Input	8 channels/unit
Input Type	Common ground in unit, case-free
Input Signals	Sets voltage or contact for each channel
	Voltage input: input voltage range 0 to +24V
	detection level: H level 2.5V or higher
	L level 0.5V or lower
	Contact input: open 2kΩ or higher, close 250Ω or lower
Response Time	Within 1 μs (at input "M", level +5V or higher)
Input Connecter	Logic IC cord(0311-5007) x 2; alligator clip cord(0311x5009) x 2
	IC clip cord(0311-5008) x 2
Weight	100g or less

2-CH Vibration/RMS Amp(AP11-109)

Input	2 chs/unit, isolated unbalanced input, isolated BNC connector
Input Coupling	AC and DC coupling
Input Impedance	1MΩ or higher
Power Supply for Sensor	2mA, 18V or higher
Measurement Range	0.1,0.2,0.5,1,2,5,10,20,50,100,200,500V
Accuracy — Voltage	Within ±0.3% FS(within ±0.8% FS at ±500V)
Accuracy — RMS	Within ±2% FS(at DC and 40Hz to 20kHz)
Linearity	within ±0.1% FS
Crest Factor	2.8 max(when used as RMS amp)
CMV	Unit only: 42V (DC or AC peak values)
	When using isolated BNC cable(optional): 300VAC
Frequency Response	DC coupling: DC to 50kHz(+1, -3dB) AC coupling: 1 to 50kHz(+1, -3dB)
Low-pass Filter	Butterworth type(attenuation factor: -24dB/OCT) 30, 100, 300Hz, 1kHz and OFF
High-pass Filter	Butterworth type(attenuation factor: -24dB/OCT) 10, 30, 100Hz and OFF
A/D Converter	16-bit, 100kHz max
Temperature Stability	Zero point: within ±0.02% FS/℃ Gain(range): within ±0.01% FS/℃
Weight	270g or less

2-CH FFT Amp(AP11-102)

Input	2 chs/unit, isolated unbalanced input, isolated BNC connector
Input Coupling	AC and DC coupling(only AC coupling when connected with amp-embedded piezoelectric accelerometer)
Input Impedance	1MΩ or higher
Power Supply for Sensor	2mA, +18V or higher
Measurement Range	±0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500V FS
Range Accuracy	Within ±0.3% FS(within ±0.8% FS at ±500V)
Linearity	within ±0.1% FS
Allowable Input Voltage	±500V (DC or AC peak values) (±30V at AC coupling in ±0.1 to 5V range)
CMV	Unit only: 42V (DC or AC peak values)
	When using isolated BNC cable(optional): 300VAC
Frequency Response	DC coupling: DC to 50kHz(+0.5, -3dB) AC coupling: 0.3 to 50kHz(+0.5, -3dB)
Low-pass Filter	Bessel type(attenuation factor: -12dB/OCT) 30, 300, 3kHz, OFF(+0.5, -3dB)
Anti-aliasing Filter	20, 40, 80, 200, 400, 800Hz, 2, 4, 8, 20, 40kHz
	Drop characteristics: -72dB/OCT at 1.5 x fc
Offset Accuracy	within ±0.3% FS(at 25℃)
A/D Converter	16-bit, 100kHz max
Temperature Stability	Zero point: within ±0.02% FS/℃ Gain(range): within ±0.01% FS/℃
Weight	240g or less

F/V Converter(AP11-108)

Input	1 ch/unit, isolated unbalanced input, BNC connector
Input Coupling	AC and DC coupling
Input Impedance	100kΩ or higher
Input Frequency Range	1Hz to 10kHz(pulse width: 20 μs or longer)
Measurement Range	0.1, 0.2, 0.5, 1, 2, 5, 10kHz FS
Accuracy	Within ±0.5% FS
Linearity	Within ±0.3% FS
Trigger Level	Selectable from 0V or 2.5V
Allowable Input Voltage	±100V (DC or AC peak values)
CMV	Unit only: 42V (DC or AC peak values), when using isolated BNC cable (optional): 300VAC
Response Time	Approx 20ms(at the range of 10kHz)
A/D Converter	16-bit, 100kHz max
Temperature Stability	Zero point: within ±0.03% FS/℃ Gain(range): within ±0.02% FS/℃
Weight	125g or less

2-CH Zero Suppression Amp(AP11-111)

Input	2 chs/unit, isolated unbalanced input, isolated BNC connector
Input Coupling	AC and DC coupling(max allowable input ±30V at AC coupling for measurement range ±0.1 to 2V)
Input Impedance	1MΩ or higher
Measurement Range	±0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500V FS
Range Accuracy	Within ±0.5% FS(within ±0.8% FS at ±500V FS)
Offset Accuracy	within ±0.5% FS
Linearity	within ±0.2% FS
Allowable Input Voltage	range of ±5V to ±500V: ±500V max(DC or AC peak value)
	range of ±0.1V to ±2V: ±100V max(DC or AC peak value)
CMV	42V (DC or AC peak values)
	When using isolated BNC cable(optional): 300VAC
Frequency Response	At DC coupling: DC to 5kHz(+0.5, -3dB) At AC coupling: 0.3 to 5kHz(+0.5, -3dB)
Low-pass Filter	Bessel type(attenuation factor: -12dB/OCT) 30, 300, 3kHz, OFF(+0.5, -3dB)
Suppression Voltage	±13V at ±0.1, 0.2, 0.5, 1 and 2V range
	±110V at ±5, 10, 20, 50, 100, 200, 500V range
	Resolution: 500 μV or less at ±0.1, 0.2, 0.5, 1 and 2V range
	5mV or less at ±5, 10, 20, 50, 100, 200, 500V range
	Accuracy: within ±0.5%(at suppression voltage ±13V max)
	Temp Stability: ±0.005%/℃ (at suppression voltage +13V max)
Auto Zero Suppression	Recognize current input voltage and suppress the voltage automatically.
	Time: within 1 sec
	Remain voltage: within ±(resolution of suppression voltage x 10)V
A/D Converter	16-bit, 100kHz max(simultaneous sampling of 2chs)
Temperature Stability	Zero point: within ±0.03% FS/℃ Gain(range): within ±0.01% FS/℃
Weight	260g or less

Charge Converter(AP11-901, AP11-902, AP11-903)

Gain	1.0mV/pC±5%(AP11-901, AP11-902), 0.1mV/pC±5%(AP11-903)
Max Input Charge	5000pC(AP11-901, AP11-902), 50000pC(AP11-903)
Frequency Range	Approx 1.6Hz to 50Hz
Max Output Voltage	5Vp-p or lower
Drive Voltage	12 to 25 VDC
Drive Current	0.5 to 5mA
Rated Noise	20 μVrms or lower
Phase	180°
Operating Temperature	-20 to 80℃(AP11-901), -20 to 110℃(AP11-902, AP11-903)
Connector	Input: miniature connector(10-32UNF)
	Output: male BNC terminal(AP11-901)
	female BNC connector(AP11-902, AP11-903)
Weight	20g or less(AP11-901), 65g or less(AP11-902, AP11-903)

	Item		Model	Rating
Main Unit	Main Unit[*1]	Omniace Ⅲ	RA2300	
	Standard Accessories			AC power cable(w/adaptor) x1, recording paper x1, paper holder x1, input unit slot cover plate x1 set and user's manual x1

※1 Input units are not included.

	Item		Model	Rating
Input Unit	Input Unit	2-ch High Resolution DC Amp	AP11-101	Input: ±100mV to ±500V, A/D resolution: 16-bit, sampling: 10 μ s
		2-ch High Speed DC Amp	AP11-103	Input: ±100mV to ±500V, A/D resolution: 12-bit, sampling: 1 μ s
		2-ch Zero Suppression Amp	AP11-111	Input: ±100mV to ±500V, A/D resolution: 16-bit, sampling: 10 μ s
		2-ch FFT Amp	AP11-102	Anti-aliasing filter: 72dB/OCT, with power supply for sensor
		Event Amp	AP11-105	Input: 8 logics(voltage/contact)
		2-ch TC/DC Amp	AP11-106	Input: R, T, J, K, W(±100mV to ±500V), A/D resolution: 15-bit
		TC/DC Amp	AP11-107	Input: R, T, J, K, (±10mV to ±50V), A/D resolution: 14-bit
		2-ch AC Strain Amp[*2]	AP11-104	Frequency response: 2kHz, bridge power supply: 5kHz
		2-ch DC Strain Amp	AP11-110	Input: 800 μ ε to 20k μ ε (BV=5V), 2k μ ε to 50k μ ε (BV=2V)
		2-ch Vibration/RMS Amp	AP11-109	Input: ±100mV to ±500V, sampling: 10 μ s, power supply for sensor
		F/V Converter	AP11-108	Input: 1Hz to 10kHz

※2 Optional AC bridge power unit(RA23-116) required.

	Item		Model	Rating
Optional Unit	Interface	Remote Unit	RA23-112	w/ cable(1.5m, I/O connector 28-pin and open wire
		Event Unit	RA23-113	w/ cable(1.5m, I/O connector 28-pin and open wire
		RS-232C Unit	RA23-114	
		AC Bridge Power Supply Unit	RA23-116	
	Hard Carrying Case(w/ Casters)		RA11-117	
	Soft Carrying Case		RT36-115	
	Dust Cover		RA11-121	
	Roll Paper Take-up		RT31-164	
	Z-fold Paper Storage Box		RA12-103	including Z-fold paper adaptor(RA12-301)
	Z-fold Paper Adaptor		RA12-301	
	Mobile Cart		RA11-118	
	Charge Converter*3		AP11-901	1.0mV/pC, small type(connected to input amp),connectors(input: miniature connector, output: BNC male)
			AP11-902	1.0mV/pC, connectors(input: miniature connector, output: BNC female)
			AP11-903	0.1mV/pC, for high sensitivity sensors connectors(input: miniature connector, output: BNC female)
	AC/DC Voltage Detector		1539	4 inputs
	AC Voltage Level Detector		1540	1 input, 100VAC/120VAC
			1543	1 input, 220VAC/240VAC
	Voltage Output Cable		0311-5004	length: 1.5m, connectors: pin tip and banana plug
	Voltage Output Extension Cable		0311-5006	length: 1.4m, connectors: pin tip and pin tip jack
	Digital Clamp Meter		2003A[*4]	for high current(2000A, 400A/DC and 40 to 1kHz)
	AC/DC Clamp Meter		8005[*5]	for high current(600A, 100A/DC to 400Hz)
			8113[*5]	for medium current(200A, 20A, 2A/DC to 1kHz)
	Clamp Meter		8112[*5]	for low current(20A, 2A, 0.2A/DC40 to 10kHz)
	Signal Input Cable(for Clamp Meter Output)		0311-5184[*6]	length: 2m, small plug for microphone and isolated BNC

※3 Required for using piezoelectric accelerometer with 2-ch vibration/RMS amp or 2-ch FFT amp.
※4 Use signal input cable(0311-5184) if connecting output from 2003A to RA2300.
※5 Use a BNC adaptor(0243-3021) if connecting output from 8005, 8112 and 8113 to RA2300.
※6 Cable for inputting output from 2003A to isolated BNC connector of RA2300.

	Item	Model	Rating
Optional Unit	Signal Input Cable	0311-5175	length: 2m, isolated BNC connector and alligator clip (+: red, -: black)
		0311-5200	length: 2m, isolated BNC connector and metal BNC
		0311-7155	length: 2m, isolated BNC connector and open wire
		0311-5158[*7]	length: 2m, S terminal and alligator clip(+: red, -: black)
		0311-5155[*7]	length: 2m, S terminal and open wire
		0311-5173[*7]	length: 2m, S terminal and BNC
		0311-5160[*7]	length: 2m, 2-banana and alligator clip(+: red, -: black)
		0311-5174[*7]	length: 2m, 2-banana and BNC
		0311-5177[*7]	length: 2m, safety-BNC and open wire
	AC Bridge Power Distribution Cable	0311-2057	length: 2m, BNC connector and alligator clip(+: red, -: black), mold color: black
		0311-5084	length: 2m, BNC connector and alligator clip(+: red, -: black), mold color: red
		47226	length: 2m, BNC connector and BNC connector
	Logic IC Cable	0311-5007	logic IC cord(1 pc)
		0311-5008	IC clip cord(4 pcs/set)
		0311-5009	alligator clip cord(4 pcs/set)
	Event Input Cable	0311-5001	1.5m, DIN8P and open wire
	Event Input Extension Cable	0311-5005	1.5m, DIN8P plug and DIN8P socket
	BNC Adaptor	0243-3021	Isolated BNC and S terminal plug
	BNC Adaptor(for distribution)	0243-2118	AC bridge power distribution
	AC Power Cable	47326	length: 2.5m with adaptor
	DC Power Cable	0311-5167	

※7 BNC adaptor(0243-3021) required if connecting to input unit with isolated BNC terminal.

	Item	Model	Rating
Recording Paper	Recording Paper	YPS106	220x30m roll paper(5 rolls/box)
	Recording Paper(w/ perforated line)	YPS108	220x30m roll paper(5 rolls/box)
	Recording Paper(Z-fold paper)	YPS112	220x201m Z-fold paper(1 set/box)

※8 Quality not assured if used papers other than above.

	Item	Model	Rating
Software	Omniviewer	NS2100	
	Additional License(1 license)	NS2100-L01	

Main Unit Appearance

Remote Unit (optional)　　Event Unit (optional)　　RS-232C Unit (optional)

Input Unit

AC Bridge Power Unit (optional)

USB(2 ports)

LAN

Trigger OUT

Trigger IN

Printer

Display (12.1" LCD)

Operation Panel

Power Supply

Option Unit Appearance

Remote Unit(RA23-112)

Event Unit (RA23-113)

RS-232C Unit(RA23-114)

AC Bridge Power Unit (RA23-116)

Z-fold paper Storage box

Z-fold paper adaptor

Z-fold Paper Storage Box (RA12-103)

Roll Paper Take-up (RT31-164)

Soft Carrying Case (RT36-115)

Hard Carrying Case with Casters (RA11-117)

⚠ **CAUTION FOR SAFETY** | Please read "WARNING" & "CAUTION" in the operation manual attached to the product carefully for proper operation before using the product.

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Remote Unit (optional)
Event Unit (optional)
RS-232C Unit (optional)

Input Unit
AC Bridge Power Unit (optional)
USB (2 ports)
LAN
Trigger OUT
Trigger IN

Printer
Display (12.1" LCD)
Operation Panel
Power Supply

Remote Unit (RA23-112)
Event Unit (RA23-113)
RS-232C Unit (RA23-114)
AC Bridge Power Unit (RA23-116)

Z-fold paper Storage box
Z-fold paper adaptor

Z-fold Paper Storage Box (RA12-103)
Roll Paper Take-up (RT31-164)
Soft Carrying Case (RT36-115)
Hard Carrying Case with Casters (RA11-117)

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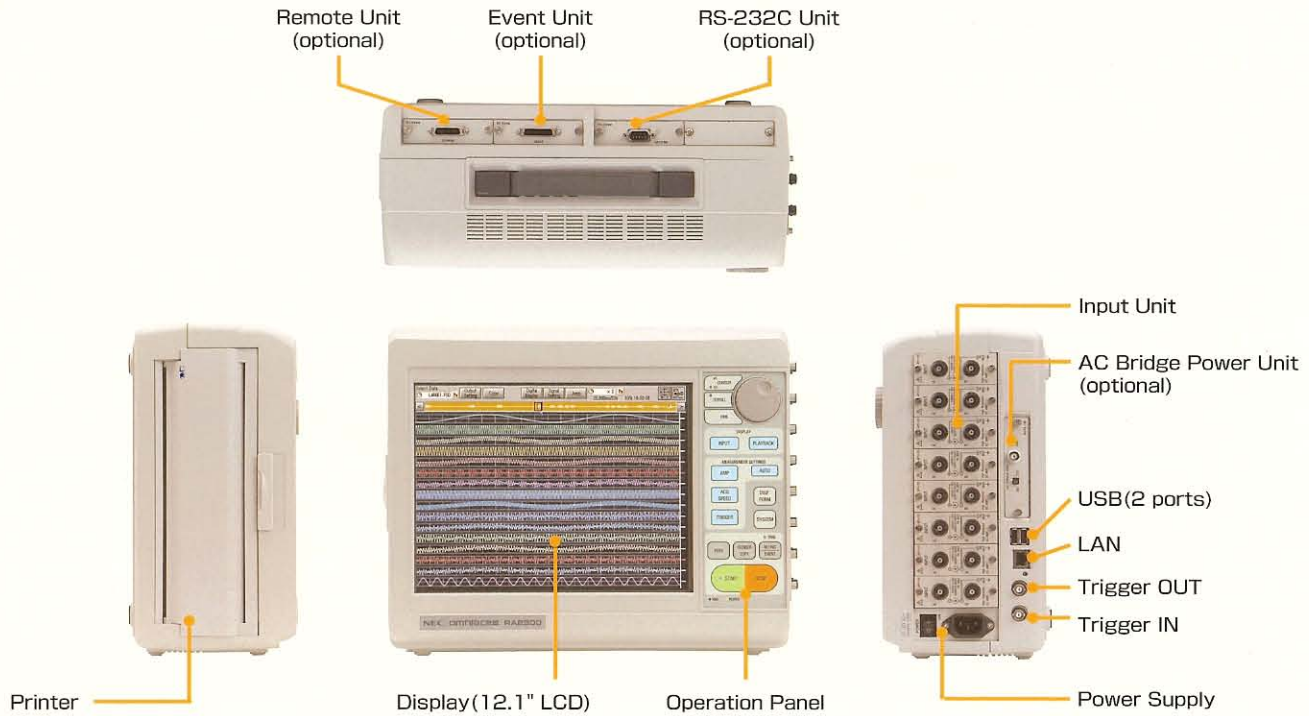
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