DATA ACQUISITION SYSTEM

# Omniace
## RA2300MKII/RA2300MKII-S
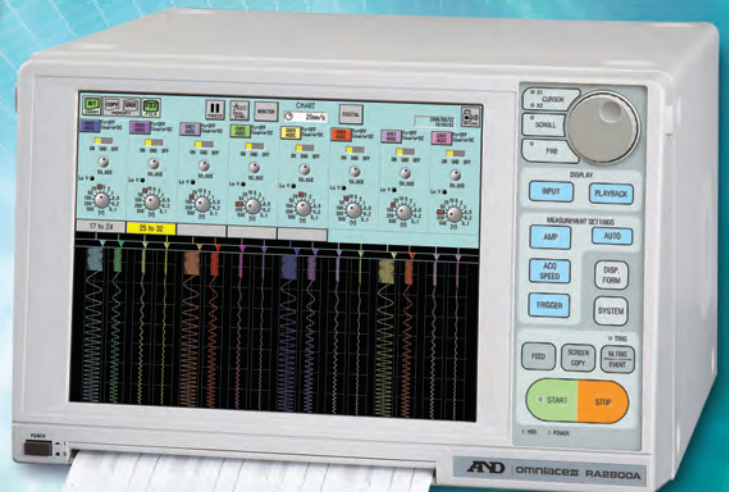## RA2800A

## Measurement by Anyone, Anywhere

**RA2300MKII** (HDD model)
**RA2300MKII-S** (SSD model)

**RA2800A**

A&D
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A&D Company, Limited
http://www.aandd.jp

# ● Easy Data Recording
# ● Long-term Recording on Built-in HDD/SSD

SSD: Solid state drive



**RA2300MKⅡ**



**RA2800A**

The RA2300MKⅡ(-S)/RA2800A Omniace is a data acquisition device that enables you to acquire/record data with simple operation. Reduced condition setting time and easy measurement can be realized by virtual amplifier settings, a touch-panel and dynamic waveform display on a large LCD. The RA2300MKⅡ(-S)/RA2800A features with various measuring modes such as HD Recorder (for long-term recording on an internal HDD*¹) or Memory Recorder (for fast-speed event recording).

Direct sensor inputs up to 32 channels (16 slots) are available for RA2800A and 16 digital input channels measure diverse signal timing and contact status.

The RA2300MKⅡ(-S)/RA2800A will bring you success in many measuring opportunities such as production line, quality inspection and R&D.

*¹ RA2300MKⅡ:160GB (HDD model) / RA2300MKⅡ-S:256GB (SSD model) / RA2800A:40GB (HDD model)

## FEATURES

### ■ Easy pen recorder mode

Easy operation of the "pen recorder" was realized by virtual amp. setup display and touch panel. Easy measurement of a "pen recorder" is yours without complicated settings.

### ■ Various features at playback mode

Various search functions are available for finding certain points in large data easily after long-term recording. Fast search using a thumbnail bar (displays all recorded data of selected one channel) and jump search (max/min, time, etc.) available.

### ■ Improved vibration resistance (RA2300MKⅡ-S)

The RA2300MKⅡ-S can withstand transportation in vehicles with rigid suspension as well as the harsh environmental conditions on land and sea transport. (satisfies 2G requirement) Standard: IEC60068-2-64

### ■ Display input waveform on a large screen

A large 12.1" LCD for better visibility of measured data. Horizontal and vertical waveform scroll is selectable for RA2800A and this function increases visibility.

### ■ Long-term HDD recording

Long-term & high speed data recording direct to internal HDD/SSD.

### ■ Standard LAN & USB ports

LAN (100BASE-TX) for data communication and USB for external storage devices (USB memories) are standard interfaces.

### ■ Computation · FFT unit equipped standard (RA2300MKⅡ/-S)

Perform four arithmetic operations, interval statistical calculation, function operation and FFT analysis.
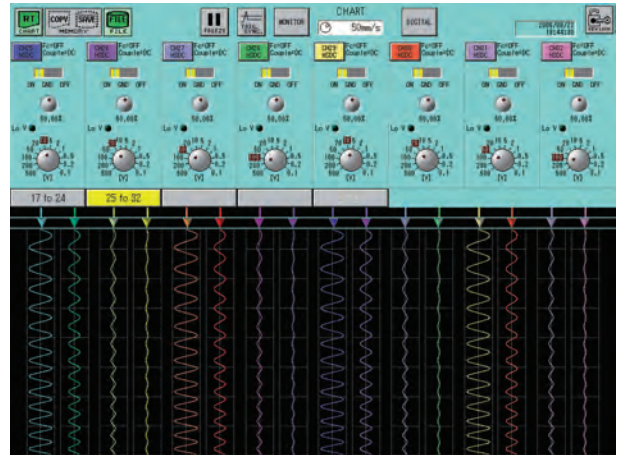
# Supporting Measurement at Various Fields (Operation & Displays)

## ■ Dynamic Waveform Display

This system has large 12.1 inch LCD and shows dynamic waveforms. Displaying number and dividing waveforms are voluntarily settable so that various waveforms to every application are available.
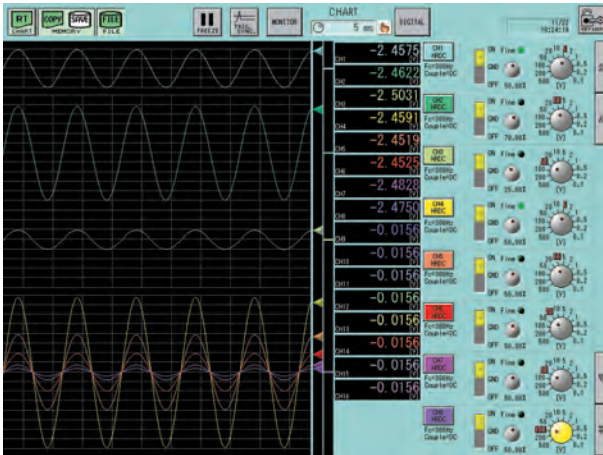


RA2300MKII(-S)    Numerical value + amp setup display



RA2800A    Image of divided waveforms and vertical scroll

## ■ Easy Operation with Rich Features

Setup displays with virtual mechanical switch or jog dial allows users to understand input amplifier settings easily.  By using both 12.1" large LCD and the touch panel, measuring conditions can be modified while monitoring waveforms at the large display.  The input amplifier can also be automatically tuned by "auto" button on actual operational panel.
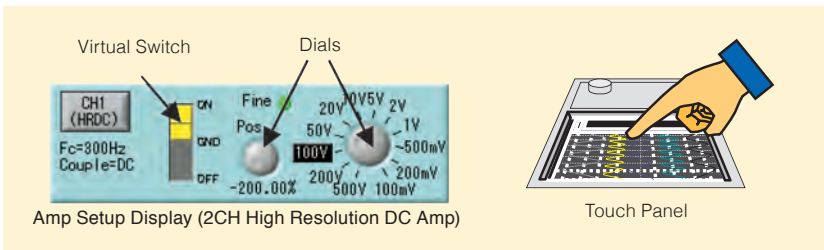


Amp Setup Display (2CH High Resolution DC Amp)

Touch Panel
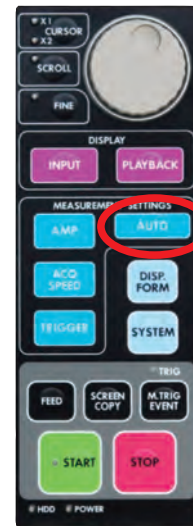


"Auto" button

Operation Panel

## ■ Direct Input from Sensors



AP Amp Series

11 types of AP amplifiers including voltage, temperature, strain, vibration and frequency (pulse) are available and they enable every signal to direct input.

| Item | Model No | Model No | 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 *1 | 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 to prevent high frequency loop-back |
| Event Amp | AP11-105 | 1μs *1 | N/A | Amp for recording open/close for contact or H/L for voltage |
| 2-CH TC/DC Amp | AP11-106A | 10μs | 15-bit | Input amp for thermocouple (R, T, J, K and W) and voltage |
| 2-CH AC Strain Amp | AP11-104A | 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 | 16-bit | Amp for converting frequency (pulse) into voltage |
| TC/DC Amp | AP11-107 | 10μs | 14-bit | 1-ch input amp for thermocouple (R, T, J and K) and voltage |

*1  2 μS for RA2800A

# User Selectable Measuring 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 |
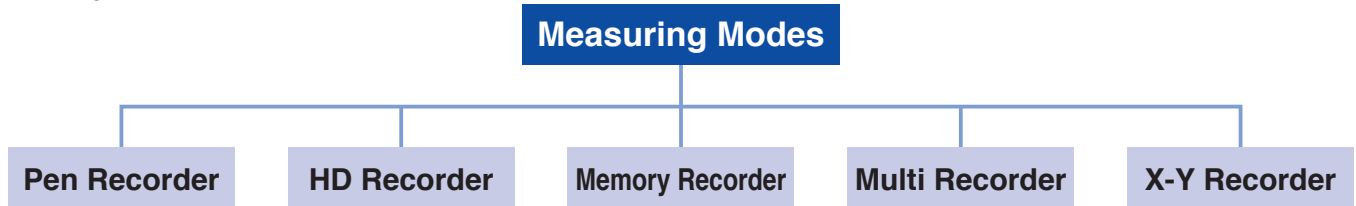
## ■ Easy "Pen Recorder"

The "Pen Recorder" is a measuring mode with simple operation of pen recorders.  The waveforms are displayed with "moving nib" images.
Also, like pen recorders, amplifier and paper feeding speed* can be setup on the touch panel.

＊RA2300A chart speed : 100mm/s ~1mm/min     RA2800A chart speed : 50mm/s ~ 1mm/min
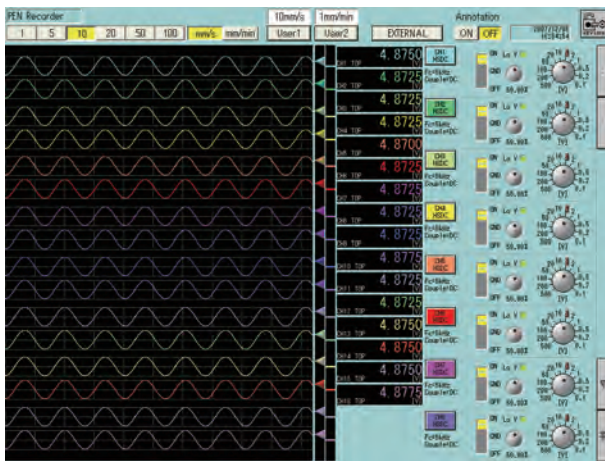


RA2300MKII(-S) display sample
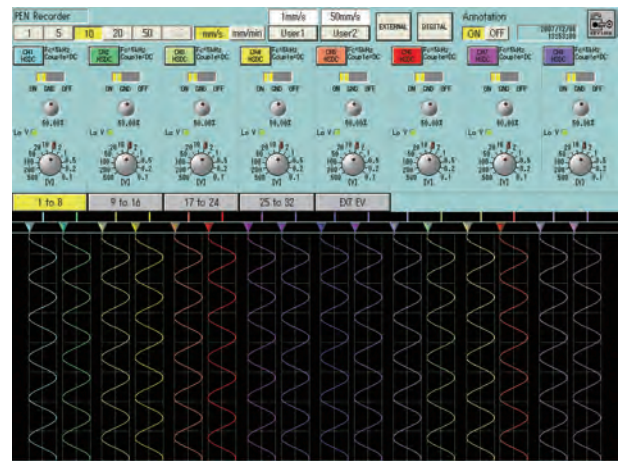


RA2800A vertical display sample

## ■ "HD Recorder": Best for Long-term Recording          Patented: Patent No. 3586801

Long-term data recording is available on a standard built-in HDD/SSD *1.

Since data is digitally saved, post-record analysis or long-period management of data, which is not an option for recording paper, is possible.

High speed recording can be done at 1 μs on 1 channel and at 10 μs over 16 channels with the RA2300MKII(-S) and at 2 μs on 1 channel and at 20 μs over 32 channels with the RA2800A.

Sample or peak style is selectable in recording.

Peak style enables to have faster sampling data with max/min value than recording interval so that it can record data in slow recording interval.

*1  Real data recording capacity (excludes area used by system)
RA2300MKII : Approx. 148GB / RA2300MKII-S : Approx. 240GB / RA2800A : Approx. 35GB

### Recordable Time on Hard Disk*2

| Sampling Speed | 2 GB Capacity*5 | | | 35 GB Capacity | | |
|---|---|---|---|---|---|---|
| | w / 1 channel | w / 16 channels | w / 32 channels*4 | w / 1 channel | w / 16 channels | w / 32 channels*4 |
| *3 1μs | 16.7 min | N/A | N/A | 4.86 hrs | N/A | N/A |
| 2μs | 33.3 min | N/A | N/A | 9.72 hrs | N/A | N/A |
| 5μs | 1.39 hrs | N/A | N/A | 24.3 hrs | N/A | N/A |
| 10μs | 2.78 hrs | 10.4 min | N/A | 2.03 days | 3.04 hrs | N/A |
| 20μs | 5.56 hrs | 20.8 min | 10.4 min | 4.05 days | 6.08 hrs | 3.04 hrs |
| 50μs | 13.9 hrs | 52.1 min | 26.0 min | 10.1 days | 15.2 hrs | 7.59 hrs |
| 100μs | 1.16 day | 1.74 hrs | 52.1 min | 20.3 days | 1.27 day | 15.2 hrs |
| 200μs | 2.32 days | 3.47 hrs | 1.74 hrs | 40.5 days | 2.53 days | 1.27 day |
| 500μs | 5.79 days | 8.68 hrs | 4.34 hrs | 101 days | 6.33 days | 3.17 days |
| 1 ms | 11.6 days | 17.4 hrs | 8.68 hrs | 203 days | 12.7 days | 6.33 days |
| 2 ms | 23.1 days | 1.45 day | 17.4 hrs | 405 days | 25.3 days | 12.7 days |
| 5 ms | 57.9 days | 3.62 days | 1.81 day | 1013 days | 63.3 days | 31.7 days |
| 10 ms | 116  days | 7.23 days | 3.62 days | 2026 days | 127 days | 63.3 days |

*2  It's a calculated value by integral number in sampling filing. Recording time will be half in peak filing.
*3  Sampling speed 1μs is available for RA2300MKII(-S) only.
*4  32ch is available for RA2800A only.
*5  Recording data is saved by every 2 GB for file protection. (in case recording data is set over 2GB)

# ■ "Memory Recorder": For Fast Event Recording

This mode is for recording fast events with internal memories[1]. Unused memories can be utilized, so maximum of 32MW is available for memory recording if used only one channel. Measurements under various conditions are also possible by using many trigger functions.

[1] RA2300MKII(-S) memory : fastest 1μs by 2MW/CH          RA2800A memory : fastest 2μs by 1MW/CH

## ● 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) reaches preset level (IN) or gets out of it (OUT).

## ● Pre-trigger (Memory recorder mode only)

Data before the trigger point can be recorded to memory. Data can be recorded before and after the trigger point which is set as a percentage of the full memory capacity of the block. The example below shows the pre-trigger set to 25%. In this case data before the trigger event will be saved to 25% of the memory capacity of the block.



Trigger point

25%          75%

100% (memory capacity)
<setting sample in pre-trigger 25%>
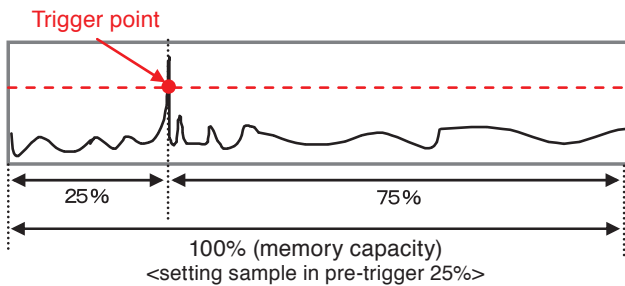
## ● Memory Block

As memory blocks are segmented, recording time is segmentalized and several recording functions are repeatable.

Total available memory size



Memory blocks are segmented by 1, 2, 4, 8, 16, 32, 64, 128.
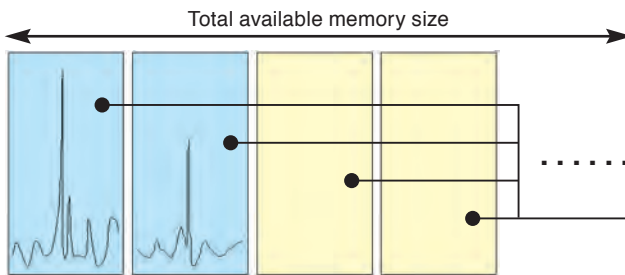
### Recordable Time on Memories[2]

| Sampling Speed | w / 1 ch | w / 16 chs | w / 32 chs[3] |
|---|---|---|---|
| [2] 1μs | 33.6 sec | 2.10 sec | N/A |
| 2μs | 1.12 min | 4.19 sec | 2.10 sec |
| 5μs | 2.80 min | 10.5 sec | 5.24 sec |
| 10μs | 5.59 min | 21.0 sec | 10.5 sec |
| 20μs | 11.2 min | 41.9 sec | 21.0 sec |
| 50μs | 28.0 min | 1.75 min | 52.4 sec |
| 100μs | 55.9 min | 3.50 min | 1.75 min |
| 200μs | 1.86 hrs | 6.99 min | 3.50 min |
| 500μs | 4.66 hrs | 17.5 min | 8.74 min |
| 1 ms | 9.32 hrs | 35.0 min | 17.5 min |
| 2 ms | 18.6 hrs | 1.12 hrs | 35.0 min |
| 5 ms | 1.94 day | 2.91 hrs | 1.46 hrs |
| 10 ms | 3.88 days | 5.83 hrs | 2.91 hrs |
| 100 ms | 38.8 days | 58.3 hrs | 29.1 hrs |

[2] Sampling speed 1μs is available for RA2300MKII(-S) only.
[3] 32ch is available for RA2800A only.

## What are sample data and peak data?

When measuring data with the RA2000 series, you can select from the recording data format used by most recording devices (sample data) and a format that samples data at high speed and records significant points (peak data). When recording with peak data, you can record high frequency noise regardless of paper feed speed. An example of the sample data and peak data recording formats at 10 ms sampling is shown below.

### ● Sample data format

Data is recorded every 10 ms (designated recording speed). This method faithfully records the raw data every 10 ms.
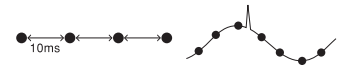
10ms

### ● Peak data format

Sampling is performed at the maximum sampling speed over the set recording interval (10 ms is this case) and the maximum and minimum values are recorded. This allows compression of data without losing peak values. Peak data requires twice the recording capacity.

1μs

10ms    10ms

# ■ "Multi Recorder": Records Steady-state & Transient Events Simultaneously

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
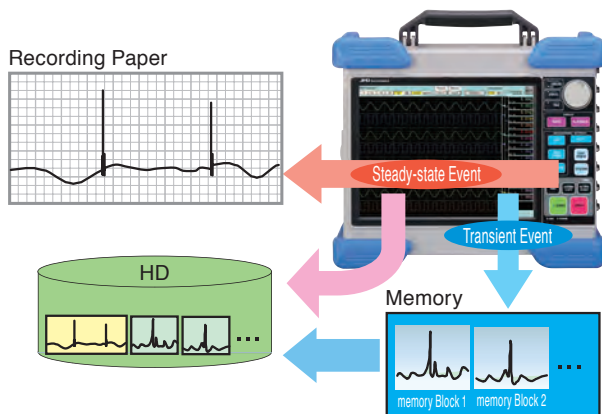
# ■ "X-Y Recorder": Displays Correlation of Two Physical Values

Select any channel as the X input and up to 3 channels for the Y input. Signals are recorded and can be plotted for display and printing with high resolution (1600 x 1600 dots).
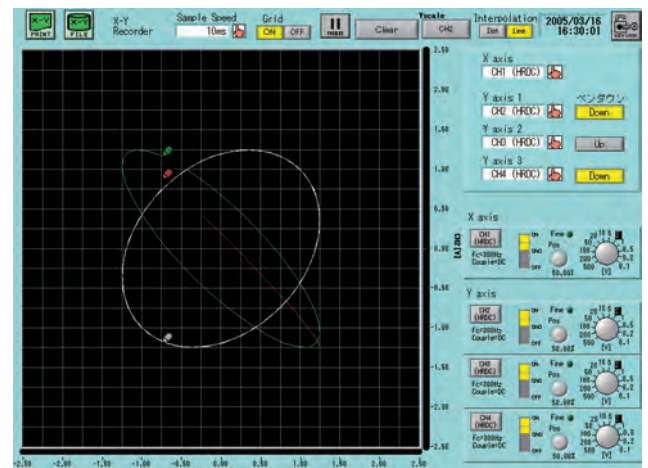
# High Speed & High Resolution Recording

- High speed* 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.

Patented: Patent No. 3605738

*Paper-feed speed of RA2300MKⅡ(-S) is max 100mm/s and that of RA2800A is max 50mm/s.



**Channel mark**

**Measuring information**

**Event signals**
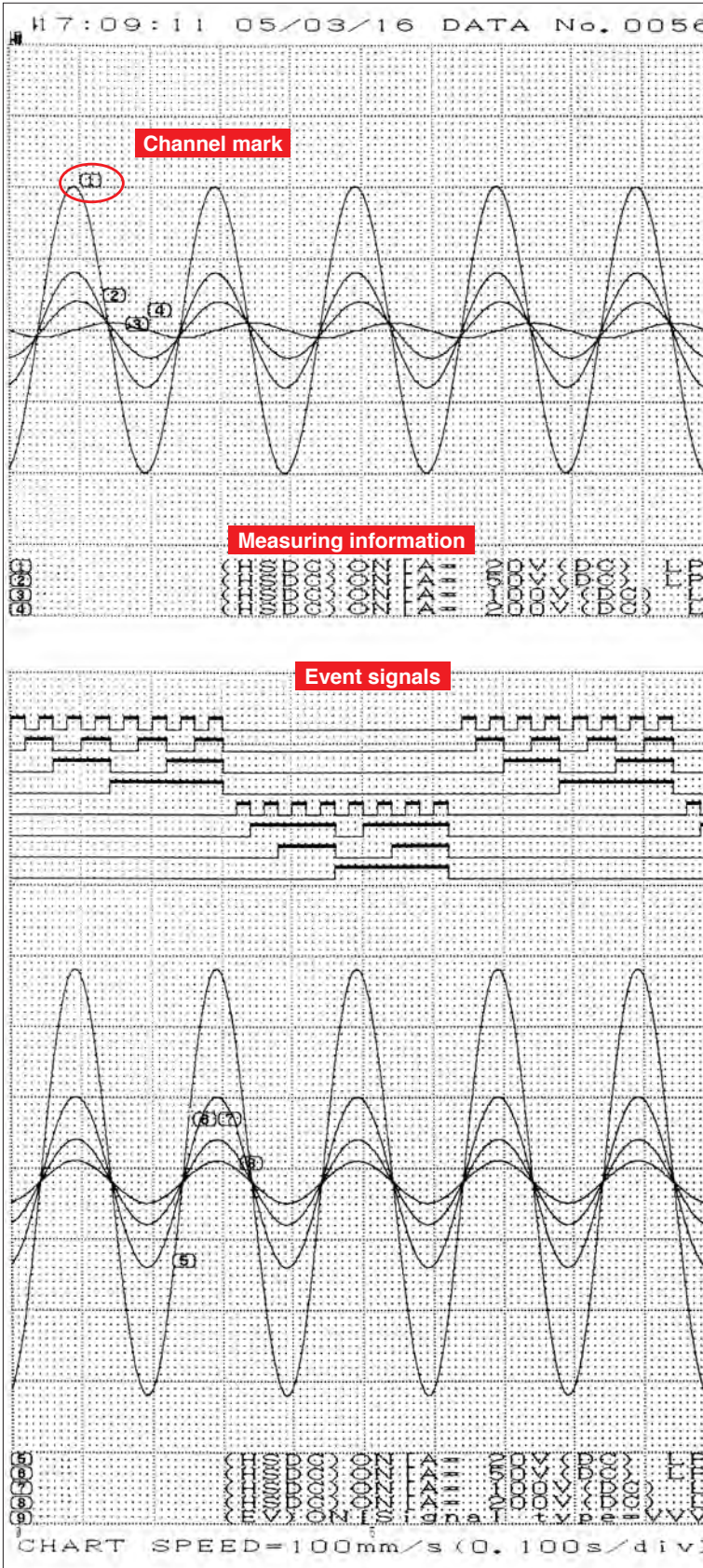
● **Auto Scaling**

Scales can be printed after waveforms.
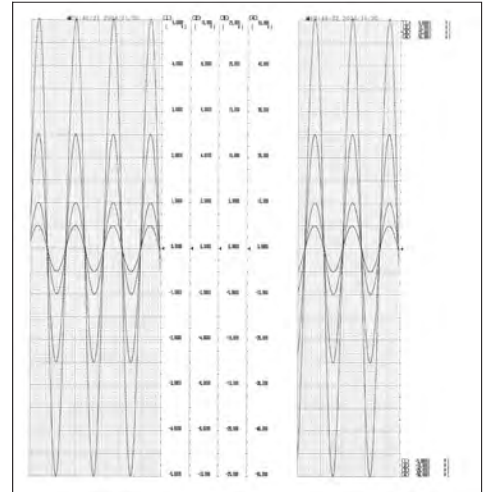


● **Waveform Division**

One to sixteen divisions can be selected to display or print out.
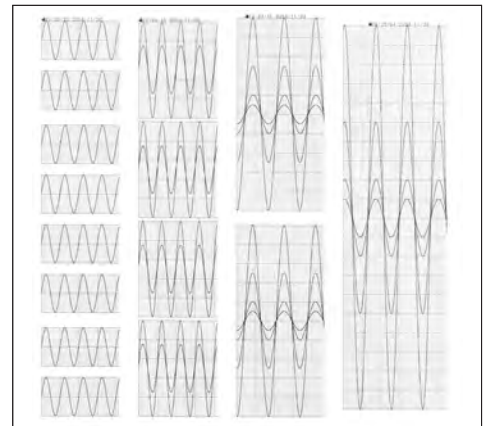


● **Customizable Width Size**

Users can print waveform at selected width (10 mm to 200 mm).
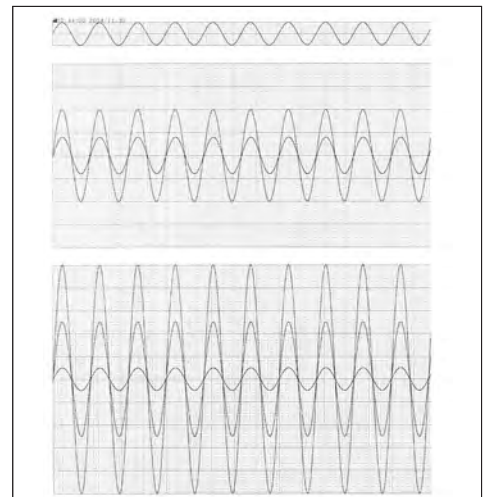
# Various Features (Replay Monitor)

## ■ Easy Search of Large Data

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

### ● Thumbnail Bar :

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

Touch & Zoom In

Thumbnail Bar          Jump Search

Enlarged Image on the Monitor

Cursor

**Replay Monitor**
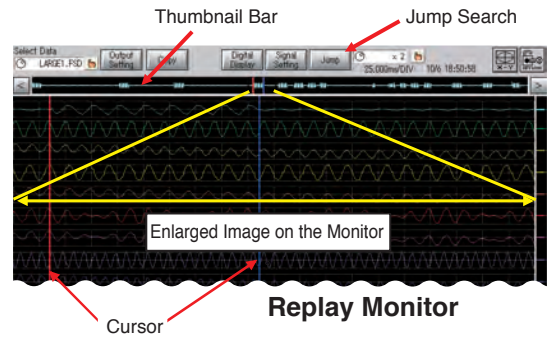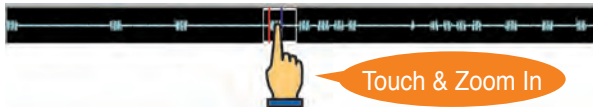
### ● Four Jump Search Modes
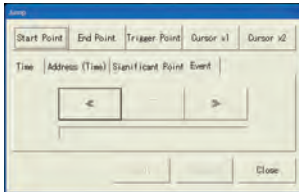
■ Event…
Move to marked event
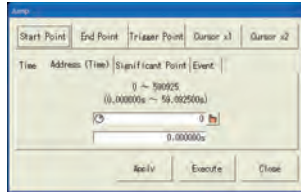
■ Address (Time)…
Move to elapsed time from start

■ Max/Min…
Move to max/min of recorded data
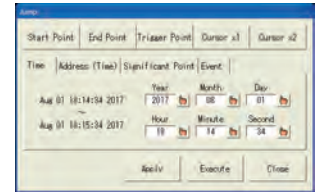
■ Time…
Move to specified time

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# Useful Functions

## ■ Level Cursors

Two level cursors that move on the voltage axis are shown on the waveform monitor and display the measurement level of that position. You can also display the difference between the cursor levels as ΔY.

Touch the digital value display to show the level cursors for the selected channel.
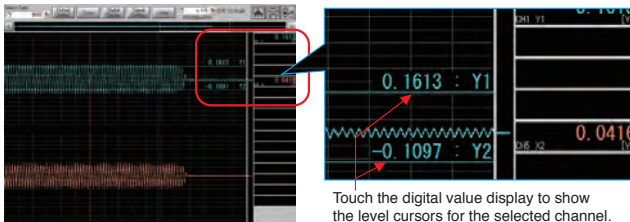
## ■ Cursor Calculations

View the maximum, minimum and average values for the area between the time axis cursors on the Replay monitor. Calculations update dynamically as the cursor is moved.

Cursor position information

Area between X1 and X2 time axis cursors

Cursor : X1

Cursor : X2

| Item | Value |
|------|-------|
| MAX | 0.1793 |
| MIN | -0.1545 |
| AVE | 0.0126 |
| P-P | 0.3338 |
| RMS | 0.0997 |
| UNIT | V |

☑ Simple Calculation
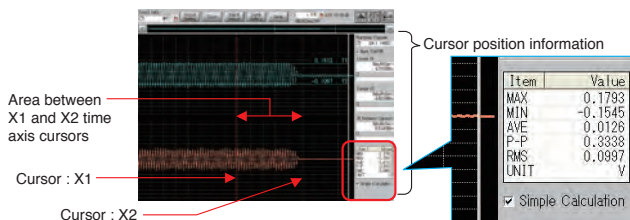
## ■ Timer-control Function

Automatic measurement with preset time and interval.

Measuring Time

Interval

Start Time          End Time
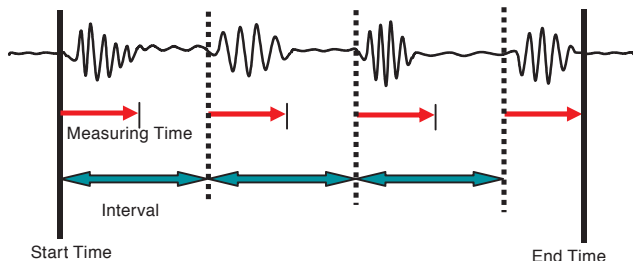
## ■ File Conversion to Support Analysis

● Convert files to CSV for processing measurement data with spreadsheet or analysis software.
The RA2000 series has functions to compress and convert measurement data.

● Analysis software*1 Direct conversion for MATLAB, FAMOS, DIAdem is possible.

**1. Converting data from the Playback Screen**
You can specify the range to convert while looking at the base waveform.
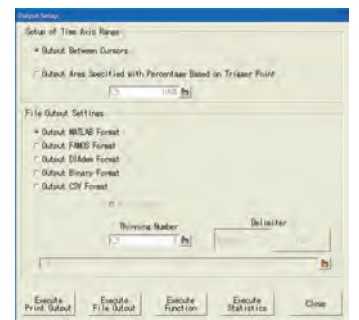
**2. Converting data from the File Operation Screen**
Convert data from the File Operation screen accessed by the System key. You can even convert multiple files at once.

*1 File Converter can be installed to the RA2000 series to convert data for analysis software. You can download this program from our homepage.

# Options and Utilities

## ■ Remote Control by PC Software - Unifizer NS3000 Series

This PC application software enables the user to remotely program set-up configurations, record data, make arithmetic computations, and analyze data.
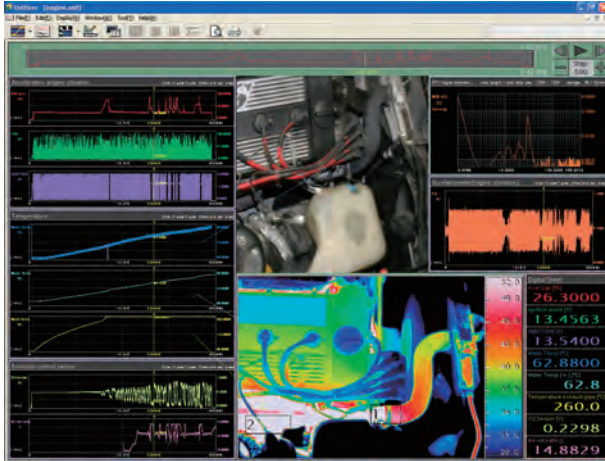


◆ **Remote Control Feature**

Remotely control all RA series units via Ethernet. Control mainframe data acquisition functions, signal conditioning amplifiers, IR thermal imager and NEC-ATI approved A/D boards and visible light cameras.

◆ **Multiple Mathematic Operations and FFT Analysis**

Perform arithmetic operations, function operations and FFT analysis on real time and recorded data.

◆ **User Defined Monitor Display**

Monitor display of Digital, Y-T & X-Y, and Bitmap data can be freely customized by user.

◆ **Report Generator and Simplified Print Feature**

You can create comments and arrows freely on the waveform display screen and print the image as a report.

Up to eight (8) RA series units can be controlled by a single PC. The PC remotely controls measuring modes and data saving functions of each RA unit.
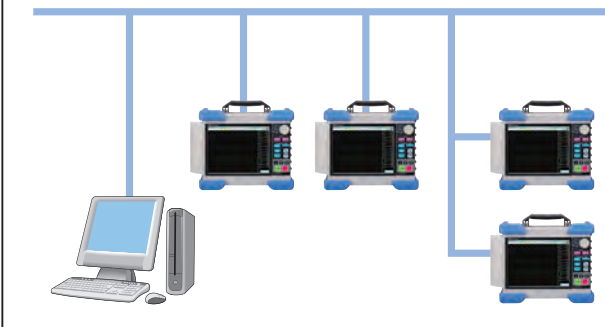


Images for reports can be easily prepared by printing added comments along with trace data and detected Max/Min and X/Y variation values.
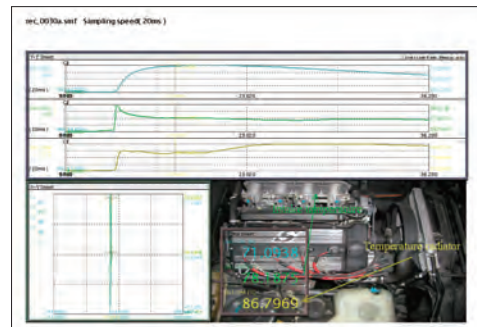


## ■ Expanded Option*¹ (Arithmetic and FFT Unit: RA23-751)

The RA23-751 software computes math operations (arithmetic/trig/log/calculus and FFT analysis) on recorded channel data and displays the results in tabular, or waveforms in time axis and frequency form, and saves the results.

*1 Equipped standard on the RA2300MKII(-S)

**Data Stored (Filed) in Memory**



| Interval Statistical Function | Mathematic Functions | FFT Analysis |
|---|---|---|
| The Max/Min and P-P data values for each channel are detected, output and/or displayed in tabular form. | Math operations between channels are calculated, output and/or displayed as Y-T waveforms. | Simultaneously perform any two (2) selected FFT analysis functions on channel data and display and/or output the data. |
| **Tabular Format Display** | **Time Domain Display** | **Frequency Domain Display** |
|  |  |  |
| **CSV format** | **Binary or CSV formats** | **Binary or CSV formats** |

## ■ Multiple Unit Synchronization – Model RA28-132 (Model RA2800A units only)

The Model RA28-132 Synchronization option allows multi-channel memory recording among multiple connected Model RA2800A units. Up to 10 units can be daisy chain connected to expand channel capacity to 320 channels. One unit is a master and the others are slaves. All recorded data is time synchronized with the sampling clock of the master unit.

Max 200m, up to 10 units

| OUT | IN | OUT | IN | OUT | IN | OUT | IN |

| **Master** | **Slave** | **Slave** | **Slave** | **Slave** |
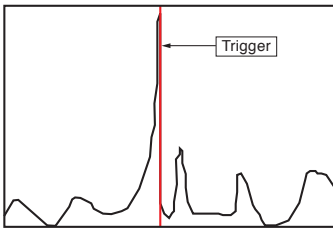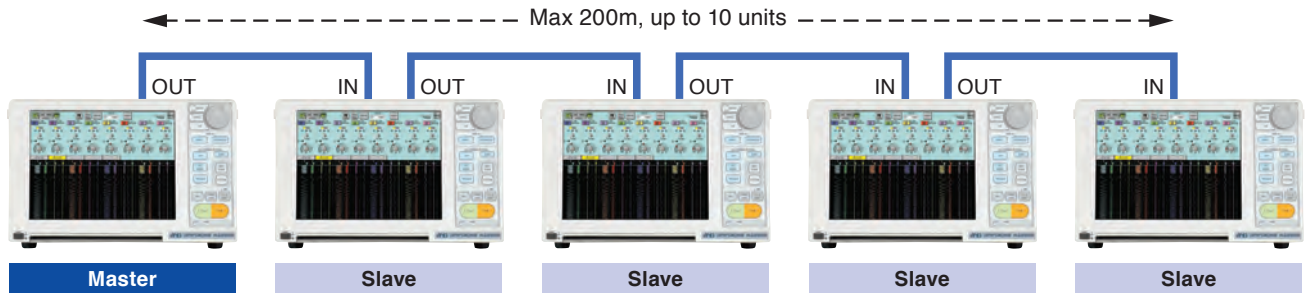
Trigger

Trigger

**Master memory data sample**
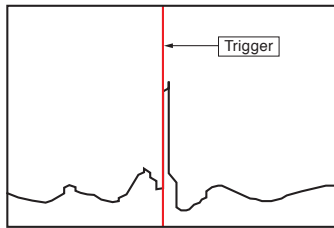
**Slave memory data sample**

The high speed, multi-channel time synchronized data recorded by the RA2800A master and slave units is also simultaneously triggered. The trigger signal to simultaneously start and end memory recording in all units can be generated by either the master or any slave unit.

The Unifizer Model 3000 series remote control software is recommended for multi-unit synchronization applications.

## ■ DIV Sensitivity Unit - Model RA28-112     (Model RA2800A units only)

The sensitivity of the LCD display and recording paper is controlled by conversion of the AC voltage RMS value for increased visibility and a feel that is similar to traditional electromagnetic oscillographs. In the AC200V/cm, AC100V/cm and AC63.5V/cm setting ranges, sensitivity is set so that the amplitude of the AC voltage (sine wave) RMS value is 1 cm.

*If AC voltage is not an accurate sine wave the recording amplitude and RMS value will not match.

**Input = AC100V; Range = 100V/cm**

1cm = Approx. 283Vp-p

### ● AC Voltage Level Detector 1540/1543

These external devices detect 100/120V & 220/240V voltage sags & surges exceeding selected 10% or 20% of AC peak value.  A Model 1539 AC/DC Multi-Range Voltage Detector (not shown) that detects presence or absence of selected low or high voltages is helpful in determining system timing sequences. All detector outputs are ideal for use with all RA series recorder Event/Logic inputs.

## ■ Unifizer LE for DAQ (PC application software)     Download Unifizer LE from the A&D homepage.

Use it to remotely control settings and data acquisition, perform calculations and analyze data on the RA2000 series.
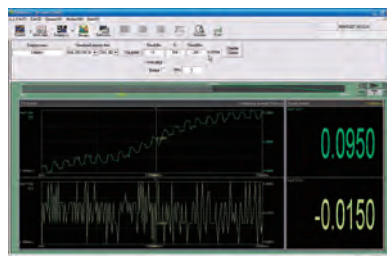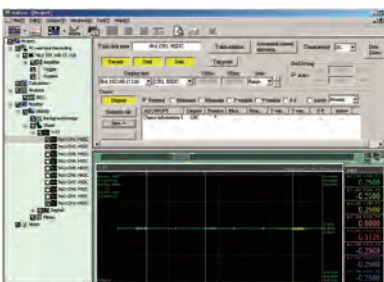
◆ **Connecting equipment**
Remote operation of the RA2000 series is possible via Ethernet. You can also read data from an SD card.

◆ **Display customization**
**(1) Simultaneously display the recording screen and replay screen**
You can display YT graphs, XY graphs, bar graphs, the numerical display, and bit map data in customizable layout on the data display window.

**(2) Creating reports**
You can create comments and arrows freely on the waveform display screen print the image as a report.

◆ **Calculation functions**
Perform arithmetic operations, function operations and FFT analysis on real time and recorded data.

# Input Unit Selection Block Diagram

| Input Signal | | Probes and Cables |
|---|---|---|
| Voltage | ±500V (DC or AC peak) | Isolated BNC cable (0311-5175) / BNC-safety jacks adapter (0243-3021) |
| Current | High current | AC/DC clamp meter 2009R (Kyoritsu) 2,000A, 400A DC, 30 to 1kHz φ55. Input cable 0311-5184 repuired |
| Current | Medium current Low current | Clamp sensor 8115 (Kyoritsu) AC130A, DC180A DC, 40 to 1kHz φ12 / BNC-safety jacks adapter (0243-3021) / Clamp adaptor 8112 (Kyoritsu) 20A, 2A, 0.2A 40 to 10kHz φ8 |
| 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. AC/D |
| 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  AC/D |
| Temperature | Thermocouple R, T, J, K, and W* *W can only be used in AP11-106A. | 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 |

| 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 cable (0311-5007) |
| Logic | Voltage input (0-5V) H: 2.0V or more L: 0.8V less | Alligator clip cord (0311-5009) / IC clip cord (0311-5008) / Logic cable (0311-5007) / For event unit Relay cable (RA23-127) |
| 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 (10µs)
· ±100mV to ±500V

**2-CH high speed DC amp (AP11-103)**
DC amp for high speed measurement
· A/D: 12bit
· 1MS/s (1µs)
· ±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 (10µs)
· ±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 (AP11-106A)**
Input amp for thermocouple
(R, T, J, K and W) and voltage
· A/D: 15bit
· 100KS/s (10µs)
· ±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 (10µs)
· ±10mV to ±50V

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

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

**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 20kµε (at BV=5V)
· Measurement range: 2k to 50kµε (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

**Event BOX set (RA23-146)**
Unit set that inputs voltage H, L or contact open, close.
· Number of inputs: 16 logic
· Input: 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 (RA23-145)   Event unit A (RA23-145A)**
Unit for recording H/L for voltage or open/close for contact
· Input: 16 logic inputs, voltage or contact

# Basic Specifications

## ■ Basic Specifications

| Display | 12.1-inch TFT color LCD (1024 × 768 pixels) | |
|---|---|---|
| Channel | RA2300MKⅡ(-S) : 16ch (8 slots) + digital input 16ch (optional) | |
| | RA2800A : 32ch (16 slots) + digital input 16ch (Built-in (Cable is optional)) | |
| Printer | | |
| | Printing Method | Thermal printing using a thermal head |
| | Paper Width | 219.5mm |
| | Effective Recording Width | 1 division (200mm • FS) to 16 division (10mm • FS), number of division and printing width can be changed. |
| | Grid Pattern | 10mm, 5mm, No grid |
| Battery Backup | RA2300MKⅡ(-S) : Clock, Setting value: approx 3 to 5 years (using a primary battery) | |
| | RA2800A : Clock, Setting value: approx 3 years (using a primary battery) | |
| Storage Device | USB memory / RA2300MKⅡ (160GB, HDD) / RA2300MKⅡ-S (256GB, SSD) / RA2800A (40GB, HDD) | |
| Interface | Ethernet (10/100 BASE-TX), USB:standard  *** Ethernet has basis over CAT5 (shilded) | |
| | RS-232C, Remote terminal : optional | |
| Compatible Specifications | EMC : EN1326 A1/A2/A3 | |
| | Safety : EN61326 | |
| Operating Enviroment | Temperature: 5 to 40˚C, Humidity: 35 to 80 %RH (without condensation) | |
| Power Supply | 100 to 240VAC, frequency 50 to 60Hz | |
| Power Consumption | RA2300MKⅡ(-S) : 100VA (typical) : with AP11-101 × 8 units (approx 300VA max) | |
| | RA2800A : 170VA (typical) : with AP11-101 × 16 units (approx 350VA max) | |
| Dimensions | RA2300MKⅡ(-S) : W400 (±2.0) × H171 (±2.0) × D374 (±2.0) mm | |
| | RA2800A : W400 (±3.0) × H270 (±2.0) × D380 (±3.0) mm excluding projections | |
| Weight | RA2300MKⅡ(-S) : 8.6kg or less (main body only),  9.4kg or less (main body with AP-11-103 × 4 units) | |
| | RA2800A : 16.4kg or less (main body only),  18.8kg or less (main body with AP-11-103 × 16 units) | |

## ■ Communication & Storage Specifications

| HDD | | |
|---|---|---|
| | Function | Setting conditions of main unit and save/read out of measured data |
| | Capacity (Not including area used by the system) | RA2300MKⅡ : Approx. 148GB / RA2300MKⅡ-S : Approx. 240GB / RA2800A : Approx. 35GB |
| Ethernet | | |
| | Function | Control with communication command, Windows and file sharing with Windows PC |
| | Standard | 10/100 BASE-TX |
| USB | | |
| | Function | Data saving on storage device by USB connection, 2-port |
| | Standard | 2.0 |
| | Available Storage Device | USB memory (USB mouse usable) |

## ■ 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 ↓, WINDOW … OUT or IN | |
| | Level setting : To be set with physical values (e.g.voltage) | |
| | Event Amp (AP11-105), main unit event (option for RA2300MKⅡ(-S)) | |
| | State setting : H, L, or OFF can be set for each input. 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 (TTL Law active H:over 2V, L:below 0.8V, Pulse width : approx 10 ms) |
| | 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 |

## ■ Pen Recorder Specifications

| Waveform Printing | | |
|---|---|---|
| | Function | Printout input signal data on recording paper (wavefrom) |
| | Mesurement Starting Operation | Start with pressing START key or preset time. Interval recording available. |
| | Paper-feed Speed | RA2300MKⅡ(-S) : 100 mm/s to 1 mm/min (user setting, external synchronization enabled) |
| | | RA2800A : 50 mm/s to 1 mm/min (user setting, external synchronization enabled) |
| | Frequency Response | DC to 100 kHz (sampling : 10 points/cycle). Varies by input unit |
| | Printing Density | Voltage axis : 8 dots/mm, Time axis : 80 dots/mm (at 25 mm/s) |

## ■ HD Recorder Specifications

| Data Recording | | |
|---|---|---|
| | Function | Real-time recording of measured data on HDD/SSD (sample of peak style is selectable) |
| | Recordable Size | Refer to data acquisition and communication specifications |
| | Mesurement Starting Operation | Start with pressing START key, trigger detection or preset time. |
| | Sampling Speed | RA2300MKⅡ(-S) : 1μs (w/1ch), 5μs (w/8ch), 10μs (w/16ch) max  (user setting) |
| | | RA2800A : 2μs (w/1ch), 10μs (w/16ch), 20μs (w/32ch)  max  (user setting) |
| | Recording Method | Normal or Ring recording (repeated recording during preset time) selectable. |
| Waveform Printing (Refer to Pen Recorder spec) | | |
| | Function | Printout input signal data on recording paper (wavefrom) |
| | Mesurement Starting Operation | ON/OFF of printout to recording paper while HD recording |

## ■ Memory Recorder Specifications

| Data Recording | | |
|---|---|---|
| | Function | Record measured data on memory in main unit. |
| | Mesurement Operation | Once, Repeat, or Endless |
| | Memory Capacity | RA2300MKⅡ(-S) : 2MW/ch (w/16ch), 32MW/ch (w/1ch) |
| | | RA2800A : 1MW/ch (w/32ch), 32MW/ch (w/1ch) |
| | Memory Division | 1, 2, 4, 8, 16, 32, 64 or 128 divisions |
| | Sampling Speed | RA2300MKⅡ(-S) : 1μs to 100s  (user setting, external synchronization enabled) |
| | | RA2800A : 2μs to 100s  (user setting, Sampling is sychronized with RA28-132) |
| Waveform Printing | | |
| | Function | Printout input signal data on recording paper (waveform) |
| | Printing Density | Voltage axis : 8 dots/mm, Time axis : 10 dots/mm |
| | Copy Magnification | × 100 to × 1/10,000 |
| 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 Specifications

| 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 available) | |

## ■ Measuring Mode (Acquisition/Recording) Specifications
### X-Y Recorder

| Function | ON/OFF of locas 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 (for channels with input ON in the amp setting display) on HD. |
| X-Y Waveform Printing (Printout) | | |
| | Function | Printout displayed waveforms (X-axis : 1ch, Y-axis : 3ch) at A4 size |
| | Resolution | 1600 × 1600 dots (at printout), 650 × 650 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. | |
|---|---|---|
| Y-T Display | | |
| | Waveform Division | 1 to 16 divisions |
| | Display Magnification | × 100 to × 1/10,000 (*** Peak style is not enlarged) |
| | 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-axis can be displayed (to be selected by user) |
| Data Output | On file and printing paper | |
| Output File Format | Binary or CSV data | |

## ■ Output Specifications

| Printer | | |
|---|---|---|
| | Data Information | Measuring mode, year/month/day, mesurement 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 |
| | 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 | By pressing "Auto" button on an operational panel, sampling speed and input range are auto-configured in reference  to input signal. |
| | Auto Sample | Display speed, paper feed speed, memory sampling speed and file recording speed are auto-configured |
| | Auto Range | Range in input amps is auto-configured. (Except for event amp : AP11-105) |
| Timer Function | Start time, end time and interval can be set. | |
| CSV Conversion | Available (also batch conversion of multiple memories or files) with optional header (environment data) output | |
| Screen Image Saving | Save screen image on HDD at BMP format (colored) | |
| Monitor Output | Images on LCD are output to monitor by XGA (1024 × 768 dots) : RA2800A only | |
| Save/Readout of Settings | Save up to 4 settings (input and main unit settings conditions) on 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 (AP11-105) and main unit (option for RA2300MKⅡ(-S)) is movable. | |
| | (every 8ch, Standard position and pitch are configurable. In case of RA2800A with event amps, | |
| | 8 units are available for display and recording at the same time. (16 units are available for data recording) | |

## ■ Optional Unit
### AC Bridge Power Supply Unit (RA23-143)

| 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 |

### RS-232C Unit (RA23-142)

| Standard | JIS X5101 (former C6361) complied | |
|---|---|---|
| Transfar 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 | |

### Remote Unit (RA23-144)

| Function | Start, Stop, Mark print, Paper feed is possible by the external signal. |
|---|---|
| | Input synchronization pulse. Output error signal. Input UPS protect signal. |
| Cables | 1.5m, I/O connector 28-pin and open wire. |
| Weight | 65g or less |

### Event Unit (A23-145)[1]  Event Unit A (RA23-145A) : RA2300MKⅡ(-S) Only

| Function | Input logic signal directly into main unit (independent from other amps) |
|---|---|
| Number of Signals | 16 |
| Input Signals | Voltage input : input voltage range 0 to +5V (Without contacts) |
| Signal Level | H : over 2.0V, L : below 0.8V |
| Cables | RA23-145 : Event Input Cable (0311-5252) |
| | RA23-145A : Event Input Extention Cable (RA23-127) |
| Weight | 60g or less |

### Event BOX Set (RA23-146) : RA2300MKⅡ(-S) Only

| Function | Input logic signal directly into main unit (independent from other amps) |
|---|---|
| Number of Signals | 16 |
| Input Type | Common ground in unit, case-free |
| Input Signals | Sets voltage or contact for each channel |
| | Voltage input : input voltage range 0 to +24 V |
| | Detection level : H level 2.5V or higher, L level 0.5V or higher |
| | Contact input : open 2kΩ or higher, close 250Ω or lower |
| Response Time | Within 1μs (at input "H", level +5V or higher) |
| Input Connector | Circular DIN connector 8P × 4, Event Amp Unit side : XT2B-0800 (conformity with DIN45326) |

[1] Event unit (RA23-145, RA23-145A)
The difference of unit style is only standard cables (0311-5252 or RA23-127) .
Units have same spacifications. Regardless of styles, "RA23-145" is printed on units.

## ■ Option Unit
### Arithmetic FFT Unit (RA23-751) [Equipped standard on the RA2300MKⅡ(-S)]

| Object Data | | internal memory data, filing data (extension : DRT, FSD) *except for peak style (extension : FPP, IDX) |
|---|---|---|
| Interval Statistical Calculation | | |
| | Calculation | max, min, P-P value, average, square, actual value, standard deviation, rising time, trailing time |
| | Output File Format | CSV data |
| Functional Culculation | | |
| | Calculation | four arithmetic operations (+,−,×,÷), absolute value, first derivation, second derivation, first integration, second integration, square root, index, common logarithm, moving average, trigonometric function (sin, cos, tan, asin, acos, atan) |
| | Output File Format | Binary or CSV data |
| FFT Analysis | | |
| | Function | One signal analysis : linear spectrum, Power spectrum, RMS spectrum, power histogram density, octave analysis (1/1, 1/3) |
| | | Two signal analysis : transfer function, cross power spectrum, coherence function |
| | Analyzed Data Length | 1000 (400), 2000 (800), 4000 (1600) |
| | Window Function | rectangular, hanning, hamming |
| | Output File Format | Binary or CSV data |

## ■ Unifizer NS3300 ( ■ online function, ■ offline function)

| OS | Windows7 Professional (32bit) / Home Premium (32bit) |
|---|---|
| Available System | RA2000 series / RA1000 series / others |
| Interface | RA2000 series : Ethernet |
| | RA1000 series : RS-232C / Ethernet |
| Connectable Quantity | MAX 8 sets |
| Remote Control | Pen recorder mode / HD recorder mode / Memory recorder mode / Multi recorder mode (RA2000 series) |
| | Memory mode / Real time mode / Transient mode / Filing mode (RA1000 series) |
| Setting Range of Real Time Transfer Speed | RA series : 1ms to 1000ms (1ms step), 1s to 1000s (1s step)*1 |
| | Max recordable time: up to the half size of specified HD in PC |
| | ** It may not transfer in set speed depending on CPU speed. |
| | Recommended CPU : over 2GHz　Recommended memory capacity : over 1GB |
| Real Time Data Display Function | Y-T waveform, X-Y waveform (split/overwriting), Digital display*2 |
| Play Data Display Function | Y-T waveform, X-Y waveform (split/overwriting), Digital display |
| | Data of RA2000 series/ RA1000 series is playable |
| | Playable extension: FSD, FPP, DRT, DAT |
| Cursor Readout of Playing Data | Readout value between cursor 1 and 2, time difference, amplitude difference, max/min value between cursors |
| Arithmetic Operation | Arithmetic operation between channels, Power method, Square root, Absolute value, Customary logarithm, Index, Actual value, Trigonometric function, Moving average, Derivation, Integration, Below functions are combined together |
| | Sine, Cosine, Tangent, Arcsine, Arccosine, Arctangent, Absolute value, Index, Logarithm natural, Customary logarithm, Square root, Cube root, Arithmetic operation CH specification, Power method, First-order derivation, Second-order derivation, First-order integration, Second-order integration, Saved data reference 1, Saved data reference 2, Moving average |
| File Conversion | Conversion into CSV file following condition can be set |
| | • Specification of conversion area point, of period (μs, ms, sec), of time |
| | • Conversion channel |
| | • Break character　comma( , ), TAB |
| | • Thinning out, simple, max/min value, average value, peak value |
| | • Adding of header information |
| | • Saved file name |
| Saving and Reading of Recorded File Condition | Available for arbitrary files |

*1 : Setting speed may not work due to constraint of main unit or CPU speed in PC.

*2 : Real time monitor is not displayed for RA1000 series.

### Sensitive DIV unit (RA28-112) : RA2800A only

| Amplifier | 2CH High resolution DC amplifier : AP11-101 |
|---|---|
| | 2CH FFT amplifier : AP11-102 (V measuring mode) |
| | 2CH High speed DC amplifier : AP11-103 Vibration |
| | 2CH RMS amplifier : AP11-109 (V measuring mode) |
| | 2CH Zero suppression amplifier : AP11-111 |
| Sensitivity Display | AC200V/cm, AC100V/cm, AC63.5/cm, 100V/cm, 50V/cm, 25V/cm, 10V/cm, 5V/cm, 2.5V/cm, 1V/cm, 0.5V/cm : Max input voltage ±500V |
| | 0.1V/cm, 0.05V/cm: Max input voltage ±100V |
| Amplitude Adjustment | All range : fine adjustment of recording amplitude |
| | AC range : fine adjustment in AC range |
| Waveform Recording | Waveform division 1/1 fixed (1 scale is 1cm on recording papers) |
| Grid | 10mm standard, 10mm, 10mm longitudinal, OFF switch, (NO 5mm grid) |
| | 1cm✕1cm grid printing by default |
| Scale Print | Print of sensitivity information (no scale value) |
| Trigger Mark | Print of trigger time, ON/OFF function (arrows are always printed) |
| Speed Display | s/div range display (Pen recorder, Memory recorder, HD recorder) |

### Synchronous unit (RA28-132) : RA2800A only

| Max Synchronous Units | | Total 10 sets |
|---|---|---|
| Connector / Cable Length | | Synchronous connector : RJ45 compliance |
| | | Connection cable: Litz wire STP (Shield Twist Pair), Straight connection wire (CAT5e or CAT6 compliance) |
| | | Cable length : max 200m |
| Setting | | Selection of synchronous mode Master/ Slave / External synchronization |
| Delay Time (including connected units to whole connection cable length and trigger detection delay time) | | |
| 8μs | | Within 200m : 2 units / 100m : 3 units / 33m : 4 units |
| 10μs | | Within 200m : 3 units / 100m : 5 units / 33m : 7 units |
| 20μs | | Within 200m : 5 units / 100m : 7 units / 33m : 10 units |
| 50μs | | Within 200m : 10 units |

### ■ Utility software
This software is available for download after completion of user registration.
### RA Viewer (RA23-701)

| OS and Display | | Windows2000 / XP / Windows7 Professional (32bit) / Home Premium (32bit), display 1024✕768 and above |
|---|---|---|
| Available System | | RA2000 series / RA1000 series |
| Y-T Display | | |
| | Peace Wise Representation | 1 to 16 split |
| | Display Magnification | ✕100 to ✕10,000 |
| | Thumbnail Function | Optional 1ch of whole data is available for display on thumbnail bar |
| | Value Display | Value, cursor value, value + cursor value (switching) |
| | Search Function | Search by cursor, time, address, max/min, event |
| X-Y Display | | |
| | Display Channel Number | Selected data can be displayed on x-axis:1ch, y-axis:3ch |
| Output File Format | | Binary or CSV data |

# Input Unit Specifications

## 2-CH High Resolution DC Amp (AP11-101) & 2-CH High Speed DC 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 |
| Range Accuracy | AP11-101 : within ±0.3% FS (within ±0.8% FS at ±500V) |
| | AP11-103 : within ±0.5% FS (within ±1% FS at ±500V) |
| Offset Accuracy | AP11-101 : within ±0.3% FS (at 23°C) |
| | AP11-103 : within ±0.5% FS |
| Linearity | AP11-101 : within ±0.1% FS |
| | AP11-103 : within ±0.1% 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/°C |
| | AP11-103 / zero point : within ±0.03% FS/°C |
| Gain (Range) | within ±0.01% FS/°C |
| Weight | AP11-101 : approx 230g or less, AP11-103 : approx 240g or less |

## F/V Converter (AP11-108)

| Input | 1 ch/unit, isolated unbalanced input, Insulated BNC connector |
|---|---|
| Input Coupling | AC and DC coupling |
| Input Impedance | 100kΩ or higher |
| Input Frequency Range | 1Hz to 10kHz (pulse width: 20μs or longer) |
| Measurement Range | 100, 200, 500, 1k, 2k, 5k, 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/°C　Gain (range) : within ±0.02% FS/°C |
| Weight | 125g 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) |
| | 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/°C　Gain (range) : within ±0.01% FS/°C |
| 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 |
| 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/OCT) |
| Low-pass Filter | Bessel type (attenuation factor : -12dB/OCT) 30, 300, 3kHz, OFF (+0.5, -3dB) |
| Anti-aliasing Filter | 20, 40, 80, 200, 400, 800, 2k, 4k, 8k, 20k, 40kHz |
| | Drop characteristics : -72dB/OCT at 1.5✕fc |
| Offset Accuracy | within ±0.3% FS (at 25°C) |
| A/D Converter | 16-bit, 100kHz max |
| Temperature Stability | Zero point : within ±0.02% FS/°C　Gain (range) : within ±0.01% FS/°C |
| Weight | 240g or less |

## 2-CH TC/DC Amp (AP11-106A)

| Input | | 2 chs/unit, isolated unbalanced input, terminal block M4 |
|---|---|---|
| Input Coupling | | DC coupling |
| Input Impedance | | 10MΩ or higher (approx 1MΩ at 5, 10, 20, 50VFS in DC range) |
| Thermocouple | | R, T, J, K, W |
| Measurement Range (Temperature) | R : | 1760°C FS (0 to 1760°C) |
| | T : | 400°C FS (-200 to 400°C) |
| | J : | 1100°C FS (-200 to 1100°C) |
| | K : | 500°C FS (-200 to 500°C), 1370°C FS (-200 to 1370°C) |
| | W : | 2300°C FS (0 to 2300°C) |
| Measurement Range (Voltage) | | 100, 200, 500mV, 1, 2, 5, 10, 20, 50V FS |
| Range Accuracy | Temperature | ±0.5% FS (within ±1% at 0°C or lower) |
| | Voltage | ±0.3% FS |
| Cold Junction Compensation | | Internal/external switchable. Accuracy: within ±2°C (within ±1°C at stable temperature of 20°C at input terminal) |
| Linearity | | Within ±0.1% FS |
| Allowable Input Voltage | | ±50V (DC or AC peak values) |
| CMV | | ±42V (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 | | 15 bits,100kHz max (simultaneous 2-ch sampling) |
| Temperature Stability | | When used as temp amp  gain (range): within ±0.04% FS/°C  When used as DC amp  zero point: within ±0.03% FS/°C    gain (range): within ±0.01% FS/°C |
| Weight | | 240g or less |

## 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 1μs (at input "H", level +5V or higher) |
| Input Connector | 2 circular 8 pin DIN connectors, event amplifier unit side: XT2B-0800 (DIN45326 compliant) |
| Cables | Logic cable (0311-5007) × 2; alligator clip cord (0311-5009) × 2  IC clip cord (0311-5008) × 2 |
| Weight | 100g or less |

*When installed to the RA2800A, up to 8 units can record and display simultaneously. Up to 16 units can be used for just recording.

## 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 | 20μVrms or lower (AP11-902), 100μVrms or lower (AP11-901, AP11-903) |
| Phase | 180° |
| Operating Temperature | -20 to 80°C (AP11-901), -20 to 110°C (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) |

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

| Input | | | 2 chs/unit, isolated unbalanced input, isolated NDIS connector | |
|---|---|---|---|---|
| Input Coupling | | | AP11-104A: 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 | | | AP11-104A : sine wave 2Vrms, 5kHz (AC bridge power supply RA23-143 required)  AP11-110 : 2V, 5V | |
| Applicable Gauge Resistance | | | AP11-104A : 120 to 1kΩ  AP11-110 : 120 to 2kΩ (at BV=2V), 350 to 2kΩ (at BV=5V) | |
| Gauge Factor | | | 1.5 to 2.5 | |
| Range of Balance | | | AP11-104A / resistance: ±2% (10000με) or lower  capacitance: 2000pF or lower  AP11-110 / ±3% (15000x10-6με) or lower | |
| Balance Method | | | AP11-104A | 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 1 channel |
| | Remained Voltage Accuracy | | Within ±0.5% FS | Within 0.3% FS |
| Max Sensitivity (AP11-104A) | | | Over full scale at 500με (at bridge voltage of 2V or higher) | |
| Measurement Range | | | AP11-104A | AP11-110 |
| | Strain | | 1k,2k,5k,10k,20kμε·FS | 2k,5k,10k,20k,50kμε·FS (at BV=2V)  800,2k,4k,8k,20kμε·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, 5kμε  Accuracy : within ±0.5% FS (AP11-104A only) | |
| Linearity | | | AP11-104A: within ±0.2% FS,  AP11-110: within ±0.1% FS | |
| CMV | | | 300VAC | |
| Allowable Input Voltage | | | ±8V (DC or AC peak value) (AP11-110 only) | |
| Frequency Response | | | AP11-104A : DC to 2kHz (+1, -3dB)  AP11-110 : DC to 50kHz (+0.5, -3dB) | |
| Low-pass Filter | | | AP11-104A : 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/°C (AP11-104A), within ±0.1% FS/°C (AP11-110)  Gain (range) : within ±0.05% FS/°C (AP11-104A), within ±0.01% FS/°C (AP11-110) | |
| Weight | | | 285g or less (AP11-104A), 240g or less (AP11-110) | |

## 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 : 500μV 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%/°C (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/°C   Gain (range) : within ±0.01% FS/°C |
| Weight | 260g or less |

# Main Unit & Accessories

| | Item | Model | Rating |
|---|---|---|---|
| **Main Unit *1** | Omniace | RA2300MKII | HDD (160 GB) specification : Max 8 amplifier units |
| | | RA2300MKII-S | SSD (256GB) specification : Max 8 amplifier units |
| | | RA2800A | HDD (40GB) specification : Max 16 amplifier units |
| | Standard accessories | | RA2300MKII(-S) : AC power cable × 1, recording paper × 1, paper holder × 1, input unit slot cover plate × 1 set, display protection board × 1 |
| | | | RA2800A : AC power cable × 1, recording paper × 1, paper holder × 1, input unit slot cover plate × 1 set, user's manual × 1 |

*1 Input units are not included.

| | Item | Model | Rating |
|---|---|---|---|
| **Input Unit** | 2-ch High Resolution DC Amp | AP11-101 | Input : ±100mV to ±500V, A/D resolution : 16-bit, sampling : 10μs |
| | 2-ch High Speed DC Amp | AP11-103 | Input : ±100mV to ±500V, A/D resolution : 12-bit, sampling : 1μs (RA2800A : 2μs) |
| | 2-ch Zero Suppression Amp | AP11-111 | Input : ±100mV to ±500V, A/D resolution : 16-bit, sampling : 10μs |
| | 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 | AP11-106A | Input : R, T, J, K, W (±100mV to ±50V), A/D resolution : 15-bit |
| | 2-ch AC Strain Amp*2 | AP11-104A | Frequency response : 2kHz, bridge power supply : 5kHz |
| | 2-ch DC Strain Amp | AP11-110 | Input : 800με to 20k με (BV=5V), 2kμε to 50k με (BV=2V) |
| | 2-ch Vibration/RMS Amp | AP11-109 | Input : ±100mV to ±500V, sampling :10μs, with power supply for sensor |
| | F/V converter | AP11-108 | Input : 1 Hz to 10k Hz |
| | TC/DC Amp | AP11-107 | Input : R, T, J, K (±10mV to ±50V), A/D resolution : 14-bit |

*2 Optional AC bridge power unit (RA23-143) required.

| Item | | Model | Rating |
|---|---|---|---|
| Arithmetic FFT Unit | | RA23-751 | RA2800A only |
| Sensitivity DIV setting Unit | | RA28-112 | RA2800A only |
| Synchronous Unit | | RA28-132 | RA2800A only |
| Interface | Remote Unit | RA23-144 | W/cable (1.5m, I/O connector 28-pin and open wire) |
| | RS-232C Unit | RA23-142 | |
| AC Bridge Power Supply Unit | | RA23-143 | 2 Vrms sine wave 5kHz required when using the AP11-104A |
| Dust Cover | | RA11-121 | RA2300MKII(-S) only |
| | | RA28-114 | RA2800A only |
| Touch Panel Protective Sheet | | RA23-178 | RA2300MKII(-S) only, 1 sheet |
| Display cover | | RA23-179 | RA2300MKII(-S) only |
| Event Input | Event Unit | RA23-145 | RA2300MKII(-S) only, W/Cable (0311-5252) |
| | Event Unit A | RA23-145A | RA2300MKII(-S) only, With event unit relay cable (RA23-127) |
| | Event Box Set | RA23-146 | RA2300MKII(-S) only (Consists with RA23-328, 0311-5257 as a set.) |
| Hard Carring Case (w/Casters) | | RA23-177 | RA2300MKII(-S) only |
| | | RA28-113 | RA2800A only |
| Soft Carryig Case | | RT36-115 | RA2300MKII(-S) only |
| Z-fold Paper Storage Box | | RA12-103 | RA2300MKII(-S) only, Including Z-fold paper adaptor (RA12-301) |
| | | RA28-115 | RA2800A only, Including Z-fold paper adaptor (7191-5010) |
| Z-fold Paper Adaptor | | RA12-301 | RA2300MKII(-S) only |
| | | 7191-5010 | RA2800A only |
| Rack Mount Bracket for JIS | | RA28-117 | RA2800A only |
| Rack Mount Bracket for EIJ | | RA28-118 | RA2800A only |
| Charge Converter*1 | | AP11-901 | |
| | | AP11-902 | |
| | | AP11-903 | |
| AC/DC Voltage Detector | | 1539 | Voltage (4 input) variation converted to logic signal (H, L) and output |
| AC Voltage Level Detector | | 1540 | AC100V, AC120V voltage variation (±10%, ±20%) output as pulse |
| | | 1543 | AC220V, AC240V voltage variation (±10%, ±20%) output as pulse |
| Signal Input Cable | | 0311-5184*2 | Length: 2m, small plug for microphone and insulated BNC, 2009R clamp meter |
| AC/DC Digital Clamp Meter | | 2009R*2 | For high current (2000A, 400A / DC, 40 to 1 kHz), φ55, 0311-5184 required |
| Clamp Adaptor | | 8112*3 | For low current (20A, 2A, 0.2A / 40 to 10 kHz), 0243-3021 required |
| AC/DC Clamp Sensor | | 8115*3 | For low current (AC / 130A, DC / 180A / DC, 40 to 1kHz), φ12, 0243-3021 required |
| UPS Cable | | 0311-5256*4 | Length: 2.5m |

*1 Required for using piezoelectric accelerometer with 2-ch vibration/RMS amp or 2-ch FFT amp.
*2 Use signal input cable (0311-5184) if connecting output from 2009R to RA2300MKII(-S)/RA2800A
*3 Use a BNC adaptor (0243-3021) if connecting output from 8112 and 8115 to RA2300MKII(-S)/RA2800A
*4 Required for RS-232C Unit (RA23-142), UPS cable (0311-5256) to use auto shutdown function.

| Item | Model | Rating |
|---|---|---|
| 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 connector |
| | 0311-5160*5 | Length : 2m, 2-banana and alligator clip (+: red, -: black) |
| | 0311-5174*6 | Length : 2m, 2-banana and metal BNC connector |
| AC bridge Power Distribution Cable | 0311-2057 | Length : 2m, metal BNC connector and alligator clip (+: red, -: black), mold color: black |
| | 47226 | Length : 2m, metal BNC connector and metal BNC connector |
| Logic IC Cable | 0311-5007 | Logic IC cord (1 pc), 2 pairs included standard with event amplifier (AP11-105) |
| | 0311-5008 | IC clip cord (4 pcs/set), 2 pairs included standard with event amplifier (AP11-105) |
| | 0311-5009 | Alligator clip cord (4 pcs/set), 2 pairs included standard with event amplifier (AP11-105) |
| Event Input Cable | 0311-5001 | Length : 1.5m, DIN8P and open wire |
| Event Input Extension Cable | 0311-5005 | Length : 1.5m, DIN8P plug and DIN8P socket |
| BNC Adaptor | 0243-3021 | Isolated BNC connector and S terminal plug |
| BNC Adaptor (for AC bridge power distribution) | 0243-2118 | Jack, plug, jack T-branch for AC bridge power distribution, 47226 required for sync |
| AC Power Cable | 0311-5044 | Length : 2.5m |

*5 BNC adaptor (0243-3021) required if connecting to input unit with isolated BNC terminal.
*6 The common mode input voltage of metal BNC is 30 Vrms, 60 VDC or less.

| Item | Model | Rating |
|---|---|---|
| Recording Paper | YPS106 | 220 × 30m roll paper (5 rolls/box) |
| Recording Paper (w/perforated line) | YPS108 | 220 × 30m roll paper (5 rolls/box) |
| Recording Paper (100m roll paper) | YPS114 | 220 × 100m roll paper (1 roll/box) RA2800A only |
| Recording Paper (Z-fold paper) | YPS112 | 220 × 201m Z-fold paper (1 set/box) RA12-103 required |

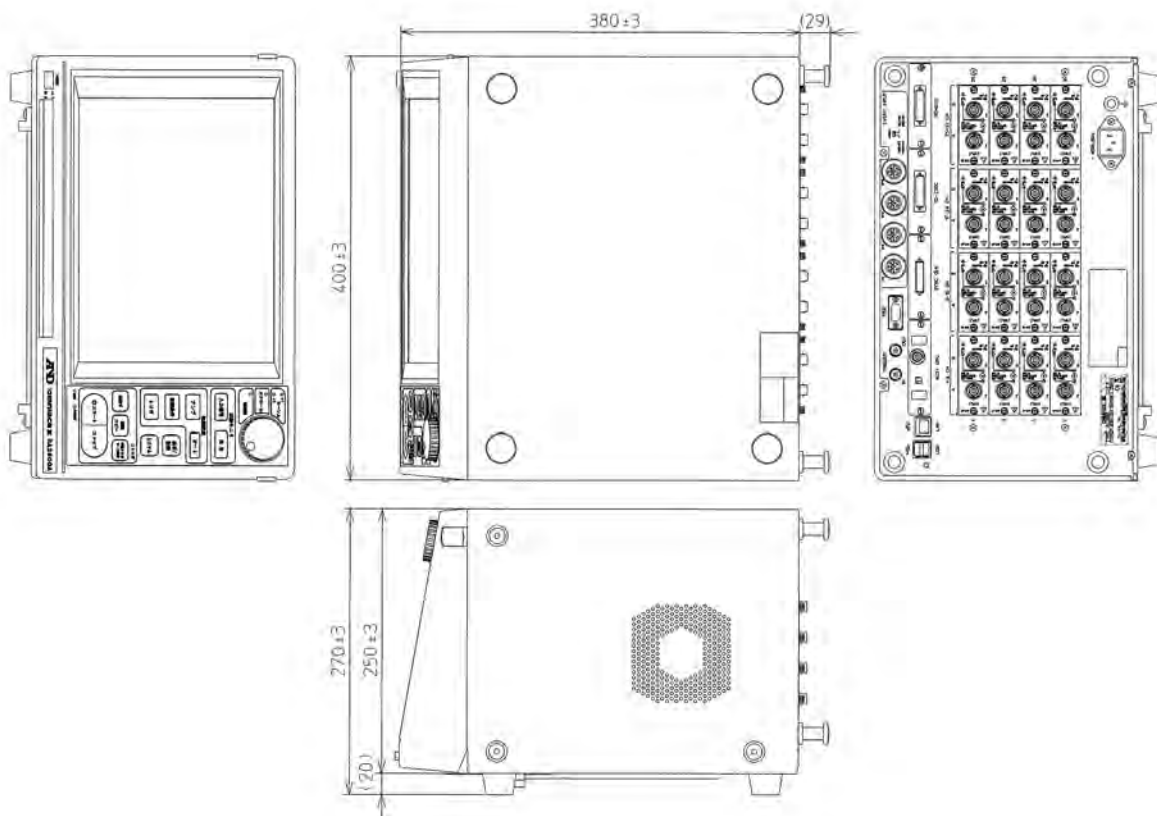*7 Quality not assured if used papers other than above.

| Item | Model | Rating |
|---|---|---|
| Unifizer | NS3300 | Windows7 Professional (32 bit) / Home Premium (32 bit) |

## ■ Dimensions of RA2300MKⅡ(-S)
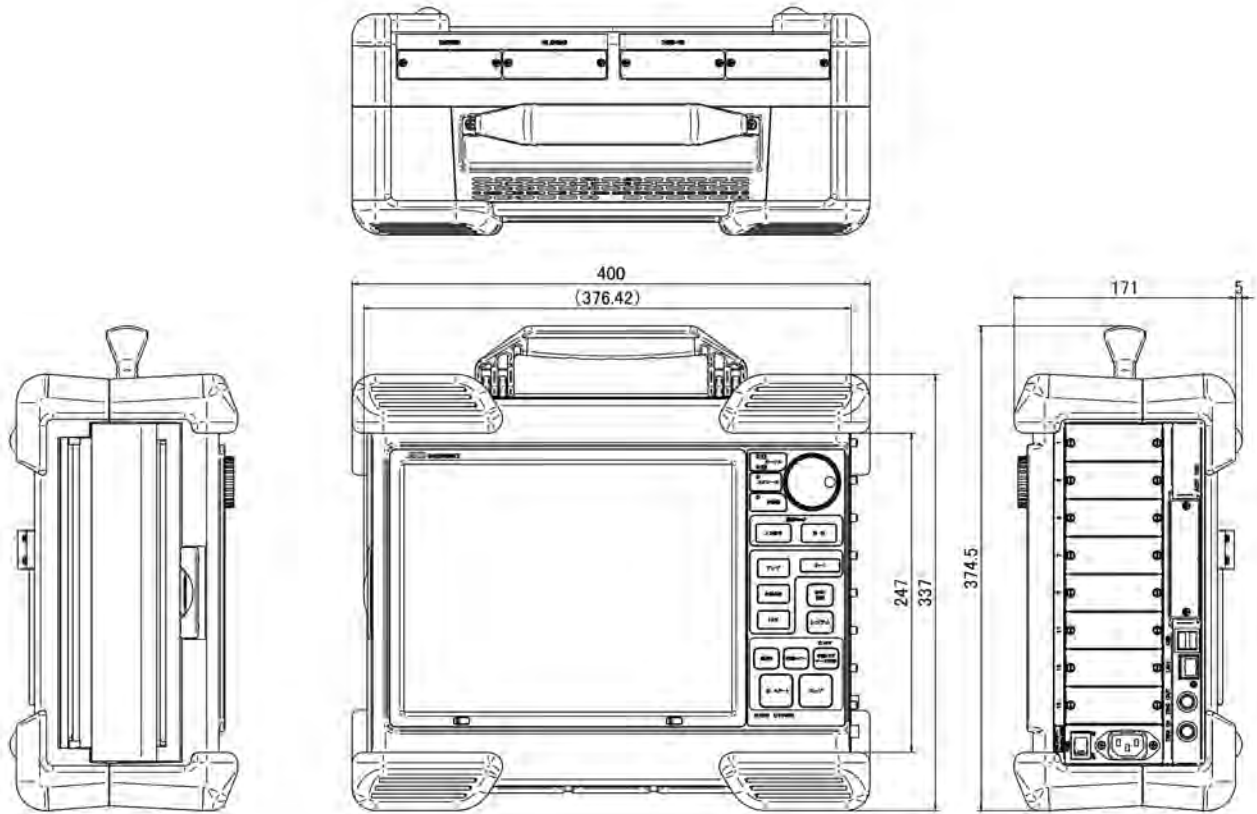


## ■ Dimensions of RA2800A

# Option Unit Appearance

### RA2300MKII(-S) / RA2800A



Remote Unit (RA23-144)
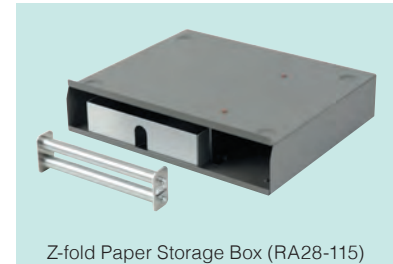


RS-232C Unit (RA23-142)

### RA2300MKII(-S) / RA2800A



AC Bridge Power Unit (RA23-143)

### RA2800A Only



Synchronous Unit (RA28-132)

### RA2300MKII(-S) Only



Event Unit (RA23-145)
Event Unit A (RA23-145A)

### RA2300MKII(-S) Only



Z-fold Paper Storage Box (RA12-103)

### RA2800A Only



Z-fold Paper Storage Box (RA28-115)

### RA2300MKII(-S) Only



Event BOX Set (RA23-146)

### RA2300MKII(-S) Only



Hard Carrying Case with Casters (RA23-117)

### RA2800A Only



Hard Carrying Case with Casters (RA28-113)

### RA2300MKII(-S) Only



Soft Carrying Case (RT36-115)

⚠ **Attention to Safety!**  ● For proper use, read the instruction manuals cafully before use

**A&D**  ...*Clearly a Better Value*

● Appearance and/or specifications subject to change for improvement without notice.
● Contents of this catalog last updated November 2017

✻RA-ADCC-02-ZW2-17b02GP