REC&MEM Function
New Recording Logger and Oscilloscope

These models feature personal computer-like operability with mouse and keyboard support, accelerated by internal high-speed hardware that provides simpler, faster operation. The Memory function monitors fast waveforms as easily as an oscilloscope while the Logger function records trend graphs in real time. Convenience is improved by enhanced control via LAN and USB capabilities. A broad selection of plug-in front-end modules supports a wide variety of measurement objects. Abnormal phenomena are accurately captured with 20 MS/s sampling and 16-bit resolution on isolated inputs.

NEW 80GB hard disk installed!

By installing a large-capacity hard disk as standard, the recording capacity has increased significantly compared to the storage of PC card media of the conventional models 8860-50, 8861-50.
As an Oscilloscope
As a Data Logger
Record Waveforms in Any Situation
Capabilities and Features

- 80GB hard disk standard configuration
- 20 MS/s high-speed sampling
- Up to 32 isolated input channels (high-speed signals)
- Real-time saving to hard disk
- Dual-timebase sampling for simultaneous fast and slow monitoring.
- Multi-channel logging on up to 128 channels (low-speed signals)
- Three USB 2.0 ports support a USB storage device along with mouse and keyboard
- REC&MEM (Recorder and Memory) function
  Capture waveforms of high-speed transients while simultaneously recording at slow speed
- LCD with wider viewing angle for easier waveform observation
- Uses the same input modules as previous models.
- Total 12 type modules can be used
Reliably capture waveform anomalies buried within normal signals
- Memory (Digital Oscilloscope) Function -

Memory Function for High-Speed Waveform Monitoring

Using the same operating principle as a digital oscilloscope, data is recorded to the expanded internal memory at high speed. Sampling rate is up to 20 MS/s (50-ns period) for all channels simultaneously. Capture unpredictable operating anomalies and transient waveforms.

Records to Solid-State Memory

Because instruments that rely on disk access such as hard disk drives are susceptible to vibration, they are often unsuitable for on-board measurements. MEMORY HiCORDERs are preferable for on-board testing because they write data to solid-state memory with no moving parts. You can back up data to a USB storage device when finished measuring. When the optional memory backup unit is installed, the instrument’s internal memory data is preserved when power is turned off.

All Channels Isolated, 20 MS/s Sampling

Except when using the Scanner Module, every input channel has its own A/D converter. Because all channels are sampled simultaneously, transient waveforms can be easily observed along with signals. The Scanner Module switches all inputs through a single A/D converter, but even in that case, all channels are isolated.

Large Capacity Internal Memory

Both high-speed write capability and a large memory capacity are provided to support high-speed sampling. Total memory capacity ranges from 32 megawords to 1 gigaword, enabling capture of waveform peaks by high-speed sampling, as well as long-term recording and long-period waveform capture. (Model 8861-51 provides twice the memory capacity, but with the same recording time limits.)

External Sampling Input Capability

The sampling rate for memory recording can be synchronized to an external clock signal (up to 10 MS/s). So, for example, sampling can be synchronized to the rotation cycle of an engine.

An Actual Waveform Measurement Example

For operational analysis of an inverter, the waveforms of the high frequency switched carrier and the low frequency fundamental both need to be observed. High-speed sampling, long-term memory recording and input isolation make these observations possible. Various HIOKI non-contact clamp-on sensors capable of measuring up to HF ranges can be used to observe current waveforms.

CLAMP ON PROBE 3270 Series provides flat electrical characteristics for observing current waveforms over a remarkably broad range of amplitudes from mA order to 500 A at frequencies from DC to HF.

High-Voltage Measurement

Measuring in situations where high voltage exists between channels, such as three-phase inverters, requires a measurement instrument that has all input channels isolated. In addition, when measuring signals such as those of switching circuits that include common-mode voltage with a high-frequency component, the isolated circuit’s common-mode frequency rejection characteristics can greatly affect measurements. To measure these kinds of voltages, you can use the HIGH VOLTAGE UNIT 8961 or the optional DIFFERENTIAL PROBE 9322 for CAT III 600-volt AC and DC maximum ratede voltage to earth.
Capture High-Speed Signals by Triggering During Slow Recording

- New REC&MEM Function and Real-Time Saving -

Simultaneous Long-Term Monitoring and Transient Recording (REC&MEM)

- Transient waveform recording that is impossible with a pen recorder

The new REC&MEM function can record high-speed waveforms such as intermittent noise by applying a trigger while recording long-term fluctuations just like a pen recorder. This type of measurement previously required choosing between the Recorder function (for slow trend graph recording), or the Memory function (for high-speed oscilloscope-style recording). Now both types of waveforms can be recorded simultaneously using the REC&MEM function.

- Maximum recording time for REC&MEM function (Recorder waveform)
  - The setting range depends on installed memory capacity, and whether Memory Division is enabled. Maximum recording length is available when Memory Division is disabled.
  - The timebase of the whole waveform is set automatically, and the upper limit of recording time is not applicable.
  - Recording time depends on the formatted capacity of the recording media and its available capacity, with the above being just one example.

- Maximum recording time for REC&MEM function (Memory waveform)
  - The setting range depends on installed memory capacity, and whether Memory Division is enabled. Maximum recording length is available when Memory Division is disabled.
  - The timebase of the whole waveform is set automatically, and the upper limit of recording time is not applicable.

<table>
<thead>
<tr>
<th>Memory Division</th>
<th>Recorder</th>
<th>Memory</th>
<th>Memory</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 M-words</td>
<td>128 M-words</td>
<td>512 M-words</td>
<td>1 G-word</td>
<td></td>
</tr>
<tr>
<td>REC Function</td>
<td>Sampling Time</td>
<td>Sampling Time</td>
<td>Sampling Time</td>
<td>Sampling Time</td>
</tr>
<tr>
<td>Timebase</td>
<td>Memory capacity</td>
<td>Memory capacity</td>
<td>Memory capacity</td>
<td>Memory capacity</td>
</tr>
<tr>
<td>100 ms/DIV</td>
<td>2,000 div</td>
<td>10,000 div</td>
<td>40,000 div</td>
<td>80,000 div</td>
</tr>
<tr>
<td>10 ms/DIV</td>
<td>20,000 div</td>
<td>100,000 div</td>
<td>400,000 div</td>
<td>800,000 div</td>
</tr>
<tr>
<td>1 μs/DIV</td>
<td>100,000 div</td>
<td>500,000 div</td>
<td>2,000,000 div</td>
<td>4,000,000 div</td>
</tr>
</tbody>
</table>

- Operating Principle of the Recorder Function
  - With the Recorder function, only maximum and minimum values of the data sampled within the specified timebase are written to memory, so each recorded data point consists of a pair of values, with 100 such points recorded for each waveform timebase division.

- Maximum recording time for REC&MEM function (Memory waveform)
  - The setting range depends on installed memory capacity, and whether Memory Division is enabled. Maximum recording length is available when Memory Division is disabled.
  - The timebase of the whole waveform is set automatically, and the upper limit of recording time is not applicable.
  - Recording time depends on the formatted capacity of the recording media and its available capacity, with the above being just one example.

- Recording Directly to Hard Disk Media (Real-Time Save)

- Recording an Entire Waveform Anomaly

The Real-Time Save function writes measurement data to the specified destination during measurement, enabling long-term measurements independent of the instrument’s installed memory capacity. The destination storage media may be the internal hard disk, a shared network folder. Simultaneously, overall measurement data (the whole waveform) is recorded in the instrument’s internal memory, which is then saved to the storage media when measurement is finished. For analysis, specify the range to be analyzed from the overall waveform data, and reload it. The reloaded data is used with the Memory function for waveform and numerical calculations, or with the FFT function for FFT analysis.

Because of this, the volume of recorded data is compressed while following steep fluctuations of the measured input voltage.

Note: When data recorded with the Recorder function is viewed on a PC, both minimum and maximum values appear as a time series of data points.
The Next Generation Hybrid Recorder
- A single instrument provides both oscilloscope and data logger functions -

Installing a Scanner Module Creates a Multi-Channel Data Logger

Recording slowly changing physical values such as temperature has been performed by plotting recorders and hybrid recorders (combined numerical value and analog graph recording), and is currently performed by data loggers. On the other hand, for high-speed waveform observation, only an oscilloscope (or MEMORY HI-CORDER) can be used. However, because the demands of measurement sites can vary, having both of these functions in a single instrument can be advantageous.

MEMORY HI-CORDER Models 8860-51 and 8861-51 and Scanner Unit 8958 are the answer to customers’ needs.

- Economical Cost per Channel
  The Scanner Module switches 16 input channels through one A/D converter. Of course, all channels are isolated. Cost per channel is thereby remarkably reduced when compared to systems that include an A/D converter for every input channel. Installing four Scanner Modules in the 8860-51 provides 64 measurement channels, and installing eight Scanner Modules in the 8861-51 provides 128 measurement channels.

- Dual-Timebase Sampling at High and Low Speeds
  Depending on customers’ applications, there are cases in which high-speed signals need to be captured as waveforms while measuring multiple channels with a Scanner Module. Both types of signals can be measured by using a scanner module together with a common high-speed analog module, and recording with two different timebases. Two waveforms are displayed and can be monitored on the same time axis.

Sheet Display Function

The Sheet function has been introduced to support multi-channel measurements (each sheet shows 32 channels). Different display formats can be selected for each sheet, so that each sheet can be assigned and analyzed for a particular application.

Waveform Observation While Recording

- Changing Compression and Zooming While Measuring
  Models 8860-51 and 8861-51 support changing the compression ratio, turning the zoom function on and off, and scroll-back display while measuring, so you can view and analyze existing measurement data without having to wait for the measurement process to finish.

- Scroll-Back Display
  An earlier portion of the waveform can be viewed without interrupt recording. This function automatically displays earlier parts of the waveform just by turning the Scroll knob counterclockwise. Click the Scroll Trace button on the screen, to return the display to the current waveform position.
Accurately capture waveforms with diverse parameters

- Advanced trigger function -

Trigger during capturing and search after capturing

The trigger function allows you to set diverse parameters to detect a particular waveform anomaly during capturing. Setting the pre-trigger mode allows you to monitor the pre-trigger waveform. This is useful for analyzing the cause of the anomaly. On the other hand, the search function allows you to detect an anomaly after all data is captured. This allows you to search for and display an anomaly in the same manner as with the trigger function. When a waveform is unpredictable and setting a parameter during measurement is difficult, it is recommended to use the search function to locate an anomaly after capturing.

Set multiple triggers on a single channel

Unlike with conventional MEMORY HiCORDERs, the 8860 series allows you to set multiple trigger parameters on a particular single channel. This allows you to set, for example, the glitch trigger, level trigger, window-out trigger, voltage drop trigger, window-in trigger, and on the same input waveform to monitor it. (8 parameters in the 8860-51 and 16 parameters in the 8861-51 can be set.)

Stop trigger for the MEM function

Unlike with conventional MEMORY HiCORDERs, a stop trigger is supported. This enables the timing of measurement to be controlled for both the MEM and REC functions. This also allows you to set Start or Stop independently for each trigger source, thus enabling the timing of measurement to be controlled in a variety of combinations. (Start or Stop trigger can also be set to the logical source.)

Capture a sudden power loss with the drop trigger

Set the voltage drop trigger to capture a sudden power loss resulting from a blackout caused by lighting or a circuit breaker tripping.
Set the window out trigger to capture an impulse noise or surge noise (voltage swell) caused by, for example, the solenoid opening and closing.

Slope trigger

Unlike with conventional MEMORY HiCORDERs, a slope trigger is supported. This allows you to monitor a noise superimposed on periodic waveforms such as a power waveform. This also allows you to monitor a rapid change in temperature with the amount of change in slope instead of level.

Edge detection and level detection of the logic trigger

Unlike with conventional MEMORY HiCORDERs supporting only edge detection, the Models 8860-51 and 8861-51 supports level detection of the logic trigger. This function causes the trigger to be activated when a specified pattern occurs, even if the logic pattern condition is not met after the start of measurement.

Set the event times independently for each trigger source

Unlike with conventional MEMORY HiCORDERs, this allows you to set the event times independently for each trigger source, thus enabling the setting of trigger conditions in a variety of combinations.
Convert the time domain to the frequency domain for analysis

- FFT analysis function -

FFT analysis function
The single-channel FFT function is used in spectrum analysis. The two-channel FFT function analyzes transfer functions. The octave analysis function is used in acoustic analysis. The signal source for FFT analysis is a section obtained from the waveforms captured in the MEM function (the required number of pieces of data for FFT analysis are 1000 to 20,000 points). The calculation speed for the same condition (when performing the most time-consuming analysis) is about ten times faster than with the conventional Model 8855.

- Simultaneously perform up to 16 calculations
Unlike with the conventional HIOKI 8855 and 8841 models that allow for the simultaneous performing of up to two calculations, the 8860-51 and 8861-51 models allow for the simultaneous performing of up to eight (four times more) FFT calculations for analysis. Furthermore, the analysis channel can be selected independently.

- Split screen (a total of 14 patterns)
You can select a split screen format according to your needs. For example, the MEM and REC functions allow you to select a different split screen format independently for each sheet. Unlike with, for example, the conventional 8855 and 8841 models, a function to display superimposed graphs is also supported (however, the function depends on the analysis mode).

- A variety of window functions
Unlike with the conventional 8855 and 8841 models that support only the three window function options “Rectangular,” “Hanning,” and “Exponential,” the 8860-51 and 8861-51 models include four additional options, thus enabling you to select a window function from a total of seven options. Furthermore, a difference in calculation results of line spectrum between other companies’ FFT analyzers and HIOKI’s analyzer can be compensated by selecting the energy attenuation compensation method when using a window function.

- Phase Highlight Display
Phase Highlight emphasizes on the display only those parts of a waveform that exceed a certain level, in order to acquire a power spectrum in the midst of phase calculation. The figure shows power and phase spectra at the same time when the highlighted display is enabled, so you can easily see important parts of the waveform that are normally difficult to see because they appear like noise.

- Change the settings on the DISP screen
The dialog bar on the top of the DISP screen (waveform monitoring screen) allows you to change the settings. The frequency resolution and capture time are also displayed.
Perform FFT calculation on the waveform from the MEM function

When performing FFT analysis on the data obtained by measurement with the MEM function, you can use the jog shuttle to specify an analysis point and view the calculation results on the same screen. Unlike with the conventional 8855 and 8841 models, you do not need to switch between the MEM function and FFT function screens to set the starting point of calculation. Furthermore, the display of “Raw Data” obtained by measurement with the MEM function and the calculation results of “Storage Waveform” on the same screen allows you to view the effect of the window function and the spectrum waveform on the same window, thus greatly enhancing operability for analysis.

Rich Analysis Capabilities

- Power Spectrum Density and LPC Analysis have been added to the calculation selections, for measuring power spectrum per Hz and spectral envelopes. As for calculation settings, former concepts such as “Channel Modes” have been eliminated, and channel settings are now automatically set according to the selected calculation type, eliminating otherwise complex settings.

Change the count of calculation points and perform re-calculation after measurement ends

After measurement is performed using less calculation points, you can change the point count and perform re-analysis. For example, if you perform measurement using 1,000 calculation points, you can then convert point count to 20,000 to perform re-analysis on the data. In this case, the frequency resolution increases 10 times. Needless to say, you can convert the point count to 1,000 to perform re-analysis on the data obtained by performing measurement using 20,000 points.

* Re-calculation by changing the point count cannot be performed when Mean Frequency is set to ON.

Scaling in “dB”

The long desired capability to scale in dB is supported. You no longer need to perform logarithmic calculation holding a calculator in one hand. The 8860-51 and 8861-51 models allow you to enter the overall value (sum of power spectrum values) in dB, thus making scaling easier. This enables signals to be easily read directly from, for example, a noise meter.
Remote control with the Internet browser
- LAN/USB, calculation function -

Remote control and automatic saving to a shared folder
The 8860 series allows for remote control using the Internet browser on the computer. When you register access to a shared folder on a computer on the network, you can store and load data to and from the shared folder on the 8860-51 or the 8861-51 file screen.

USB Mouse and keyboard connectivity
With the Windows-style interface, you can easily make settings and adjustments with the click of a mouse, and enter text and other comments with a keyboard as you would on a common PC.

USB Ports and External Monitor Output
Three USB 2.0 ports are now provided to support commonly available PC peripherals. A VGA D-sub output connector is also included to support viewing the measurement screen on an external monitor.

Automatic saving during measurement
Unlike with conventional MEMORY HiCORDERs, the 8860 series allows automatic saving during measurement.

Set 16 groups of numerical calculations
Unlike with conventional MEMORY HiCORDERs, the 8860 series allows you to set 16 groups of numerical calculations. Furthermore, each group allows you to select 16 calculation items from a total of 19. The SUB MENU screen of the waveform screen also allows you to view and change the numerical calculation settings and perform recalculation. This enables the settings of calculations in each group on the waveform screen to be changed and monitored, thus enhancing operability.

Simultaneously display timeline and XY-axis composite waveforms
The 8860 series uses a split screen to support the simultaneous display of “timeline waveform” and “XY-axis composite waveform.” Any channel can be set to the X-axis and Y-axis. The MEM function supports XY-axis waveforms. Models 8860-51 and 8861-51 can display sixteen X-Y plots simultaneously.

To access the shared folder:
Enter the host name of the computer on the file screen of the 8860-51, enter the user name and password in the account field, and then select the folder you want to share.

Restrictions
Automatic saving during measurement is restricted to 1ms/division or more of the time axis. Also, restrictions to the time axis settings differ depending on the scanner module, number of channels, storage media, and setting conditions for real-time printing.

Redundancy against errors in the storage destination
The 8860 series allows you to set up to two storage destinations. Even if, for example, an overflow error occurs on a USB during automatic saving, switching to the second backup storage destination takes place automatically to ensure saving continues.

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**Main unit Specifications**

(Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

### Basic specifications

<table>
<thead>
<tr>
<th>8860-51 (max. 4 input modules)</th>
<th>8861-51 (max. 8 input modules)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input type/number of channels</strong></td>
<td>Plug-in input modules Max. 16 analog channels (max. 64 channels with scanner unit) + 16 logic channels (standard configuration)</td>
</tr>
<tr>
<td><strong>Measurement functions</strong></td>
<td>MEM (high-speed recording)</td>
</tr>
<tr>
<td></td>
<td>REC &amp; MEM (real-time recording + high-speed recording)</td>
</tr>
<tr>
<td><strong>Real-time Save</strong></td>
<td>(records directly to storage media)</td>
</tr>
</tbody>
</table>

### Maximum sampling rate

| 20 MS/second (50 ns, all channels simultaneously, using the ANALOG UNIT 8965) | External sampling (10 MS/second, 100 ns) |

### Timebase

<table>
<thead>
<tr>
<th>9715-53: 1 Gigaword</th>
</tr>
</thead>
<tbody>
<tr>
<td>9715-51: 128 Megawords</td>
</tr>
<tr>
<td>9715-50: 32 Megawords</td>
</tr>
</tbody>
</table>

### Hard disk drive

Data storage media

- Hard disk drive: 1.8 GB, FAT-32 format

### Maximum Recording Time for the Memory Function (single timebase)

- **One Memory Board Model 9715-50 is installed in the 8860-51, and two in the 8861-51, recording length variable, with 32-MW words.**
- **Operation cannot be guaranteed when the time axis is longer than one year.**
- **For memory capacity, 32 MWs is standard as shown in the table below. Optional memory up to 1 GWs can be specified when ordering.**

#### Time axis

<table>
<thead>
<tr>
<th>32MW 20,000 div</th>
<th>32MW 40,000 div</th>
<th>32MW 80,000 div</th>
<th>32MW 160,000 div</th>
</tr>
</thead>
<tbody>
<tr>
<td>5ms/DIV 90s</td>
<td>10ms/DIV 45s</td>
<td>20ms/DIV 22s</td>
<td>50ms/DIV 11s</td>
</tr>
<tr>
<td>10ms/DIV 45s</td>
<td>20ms/DIV 22s</td>
<td>50ms/DIV 11s</td>
<td>100ms/DIV 5s</td>
</tr>
<tr>
<td>20ms/DIV 22s</td>
<td>50ms/DIV 11s</td>
<td>100ms/DIV 5s</td>
<td>200ms/DIV 2s</td>
</tr>
<tr>
<td>50ms/DIV 11s</td>
<td>100ms/DIV 5s</td>
<td>200ms/DIV 2s</td>
<td>1s/DIV 500ms</td>
</tr>
<tr>
<td>100ms/DIV 5s</td>
<td>200ms/DIV 2s</td>
<td>1s/DIV 500ms</td>
<td>2s/DIV 1s</td>
</tr>
<tr>
<td>200ms/DIV 2s</td>
<td>1s/DIV 500ms</td>
<td>2s/DIV 1s</td>
<td>4s/DIV 500ms</td>
</tr>
<tr>
<td>1s/DIV 500ms</td>
<td>2s/DIV 1s</td>
<td>4s/DIV 500ms</td>
<td>8s/DIV 1s</td>
</tr>
<tr>
<td>2s/DIV 1s</td>
<td>4s/DIV 500ms</td>
<td>8s/DIV 1s</td>
<td>16s/DIV 500ms</td>
</tr>
<tr>
<td>4s/DIV 500ms</td>
<td>8s/DIV 1s</td>
<td>16s/DIV 500ms</td>
<td>32s/DIV 1s</td>
</tr>
</tbody>
</table>

### Maximum Recording Time for the Memory Function (dual timebase)

- **One Memory Board Model 9715-55 is installed in the 8860-51, and two in the 8861-51, recording length variable, with 32-MW words.**
- **Operation cannot be guaranteed when the time axis is longer than one year.**
- **For memory capacity, 32 MWs is standard as shown in the table below. Optional memory up to 1 GWs can be specified when ordering.**

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</tr>
</tbody>
</table>

### External control connectors

- **BNC connectors:** external sampling input, sampling sync output

### Calibrator Output

- **Terminal block:** Start, Stop, Pause, external input

### Standard interfaces

- **USB:** USB2.0 compliant, series A receptacle 3 ports (keyboard, mouse, HDD, USB-memory)
- **LAN:** RJ-45 connector, Ethernet 10BASE-T, 100BASE-T
- **FTP server:** server, FTP server, Send mail
- **Monitor output:** 15-pin D-sub connector, VGA output

### Environmental conditions

- **Temperature and humidity range for use:** -10°C to 50°C, 20% to 90% RH

### Compliances, standards

- **Safety:** EN61010-1
- **EMC:** EN61326
- **Power requirements:** 100 to 240 V AC (50/60 Hz)
- **Power consumption:**
  - 220 VA max. (printer not used)
  - 300 VA max. (A4 printer)

### Dimensions and mass

- **Approx. 330 mm (12.99 in) W × 184.5 mm (7.26 in) D, 8 kg**
- **Approx. 330 mm (12.99 in) W × 255.5 mm (10.05 in) D, 11.5 kg**

### Supplied accessories

- **Quick Start Manual x 1, Instruction Manual x 1, Input Module Guide x 1, Analysis Supplement Manual x 1, Power cord x 1, Input cord table x 1, Application Disk (Wave Viewer Wv, Communication Commands table) x 1**
**Main unit Specifications**

**Print/display section**  
Printers are available when optional printer unit is installed.

**Display**  
10.4 inch TFT color LCD (SVGA, 800 x 600 dots)

**Recording paper**  
- RECORDING PAPER 9231: 216 mm (8.5 in) x 30 m (98.4 ft), thermal paper roll (when using A4-size the printer 9959).
- RECORDING PAPER 9234: 112 mm (4.4 in) x 18 m (59.0 ft), thermal paper roll (when using A4-size the printer 9959).

**Recording width**  
- RECORDING PAPER 9231: 200 mm (7.8 in), full scale 20 divisions, 1 division = 10 mm (0.39 in), when using A4-size the printer 9959.
- RECORDING PAPER 9234: 100 mm (3.95 in), full scale 10 divisions, 1 division = 10 mm (0.39 in), when using A4-size the printer 9959.

**Paper feed density**  
- 10 lines/mm (when using A4-size the printer 9959), 8 lines/mm (when using A9-size the printer 9959-01).

**Recording speed**  
- Max. 25 mm (0.98 in)/sec.

**Trigger types**  
- Cumulative average, Exponential average (select 2 to 10,000 data objects to be averaged).

**Numerical calculation**
- Waveform calculation
- Divided use of memory space (up to 4096 divisions), sequential printing
- Screen and printing
- Time axis
- REC & MEM function

**Trigger functions**  
- Turn on/off independently for each trigger source of analog/logic A – D, external trigger (rise of 2.5V or terminal short circuit; timer trigger, AND/OR trigger, forced trigger.

**Standard mode**  
- Trigger source (all analog channels settable), extended mode (multiple analog sources to a single analog channel settable, up to 8 for 8860-51, and up to 8 on channels/unit 5 – 8 for 8861-51 settable).

**Trigger sources**  
- Level: Triggering occurs when preset level voltage is crossed (upwards or downwards).
- Period: Triggering occurs when window defined by upper and lower limits is entered or exited.
- Rising: Rising edge or falling edge cycle of preset voltage value is monitored and triggering occurs when defined cycle is exceeded.
- Ghītč: Triggering occurs when pulse width from rising or falling edge of preset voltage value is under/over.
- Slope: Triggering occurs when preset change degree (slope) is exceeded or under/ran.
- Voltage drop: Triggering occurs when voltage drops below peak voltage setting (for 50/60 Hz AC power lines only).
- Event setting: Event count is performed for each source, and triggering occurs when a preset count is exceeded.

**Level setting resolution**  
- 0.1% of full scale (full scale = 20 divisions)

**Trigger modes**  
- 0, 0.1, 0.01, pattern setting; AND/OR setting for groups of channels, level edge detectable (0:1 changing to any value activates trigger)

**Trigger filter (analog) logic**  
- OFF, setting range 0.1 to 10.0 divisions in 0.1 division steps.

**Other functions**  
- Pre-trigger function to capture pre- and post-trigger waveform, trigger output active (turning off with terminal block and open collector 5 volt output).
- Level display while waiting for trigger, Start/Stop trigger conditions independently selectable.

**Memory functions**  
- Time axis  
  - 5 to 5 min/division, 26 ranges or external sampling, time axis resolution 100 points/division, time axis zoom: +2 x to +10 x in 3 stages, compression: 1.2 to 1/500,000 in 17 stages
  - Sampling rate: Fixed: 1/100 of time axis range, Variable: external sampling Sampling period can be used to set time axis. Two different sampling rate settings are possible

- Recording length  
  - 32 MW memory: free setting in 1 division steps (max. 500,000 div.)*4 or built-in memory of 25 to 200,000 divisions*3
  - 128 MW memory: free setting in 1 division steps (max. 1,200,000 div.)*4 or built-in memory of 25 to 200,000 divisions*3
  - 512 MW memory: free setting in 1 division steps (max. 5,120,000 div.)*4 or built-in memory of 25 to 50,000,000 divisions*4
  - 1 GW memory: free setting in 1 division steps (max. 10,240,000 div.)*4 or built-in memory of 25 to 10,000,000 divisions*4

- Pre-trigger  
  - Record data from before the trigger point, -100 x to +100% of recording length (free setting in 1% steps)

- Screen and printing  
  - Split screen (1 x 4), X/Y screen (1 x 4), screen, maximum 16 combined, sheet display (max. 32 channels per sheet), logging (print/display measurement data as digital values), voltage axis zoom (+2 x to +100 x), compression (+12 x to +110 x), overlay, zoom, variable display, vernier display

- Memory splitting  
  - Divided use of memory space (up to 4096 divisions), sequential save, block search

- Waveform calculation  
  - Four arithmetic operations, absolute value, exponentiation, common logarithm, square root, moving average, differentiation once and twice, integration once and twice, parallel displacement along the time axis, trigonometric functions (sin, cos, tan, arc-sin, arc-cos, arc-tan), Any of 16 calculation types can be applied to recording length of up to 14 of memory capacity

- Numerical calculation  
  - Differential calculations by approximating calculations and using seven A6 (Cooperational calculation) (autonomous average saving of numerical calculation results, ensuring of existing numerical calculation results)
  - Average value, effective (rms) value, peak to peak, maximum value, time to maximum/minimum value, time to minimum value, time period, frequency rise time, full time, area value, X/Y area value, standard deviation, time to level, pulse width, duty ratio, pulse count, Up to 16 items can be selected

- Averaging  
  - Cumulative average, Exponential average (select 2 to 10,000 data objects to be averaged)

**Recorder functions**  
- Time axis  
  - 10 to 200 ms x division, 500 ms to 1 hour/div with 19 ranges, time axis resolution 100 points/division, time axis zoom: -2 x to +4 x in 2 stages, compression: 1:2 to 1/12,000 in 13 stages

- Recording length  
  - At recording length "continuous", time axis 20 ms/div to 1 hour/div with scan module 8959, time axis 50 ms/div to 1 hour/div

- Waveform memory  
  - Digital memory function: 10 to 200 ms/div recording, at least 1,000 data points, for waveform data stored in memory can be monitored on-screen. Data are stored for 5,000 hours. Alternatively the end of measurement. At recording length settings other than "continuous", the printer can print data sequentially, for follow-up printing of waveforms.

- Waveform memory  
  - Store data for most recent 5,000 x divisions, or up to 160,000 div in memory. Backward scrolling and re-printing available.

- Screen and printing  
  - Split screen (1 x 8), sheet display (max. 32 channels per sheet), logging (print/display measurement data as digital values), voltage axis zoom (+2 x to +100 x), compression (+12 x to +110 x), variable display

**REC & MEM function**  
- Time axis (REC)  
  - 100 ms to 1 hour/division, 16 ranges, time axis resolution 100 points/ division, sampling rate: same as sampling rate for MEM function. Recording data of the scanner module 8958 in REC side.

- Recording length (MEM)  
  - 10 µs to 5 minute/division, 25 ranges, time axis resolution 100 points/ division, sampling rate: 1/100 of time axis.

- Waveform memory (WAVEFORM)  
  - The last 2.500 x divisions, or up to 80,000 div *5 are saved to memory for scroll-back and re-print.

- Screen and printing  
  - Toggle REC/MEM waveform display, simultaneous display of REC/ MEM waveform with split screen, split screen (1 x 8), sheet display (max. 32 channels per sheet), logging (print/display measurement data as digital values), zoom (with MEM), variable display

- Memory divide  
  - Divided use of memory space (up to 1024 divisions), sequential save, block search

**FFT function**  
- Analysis mode  
  - Storage waveform, linear spectrum, RMS spectrum, power spectrum, power spectrum density, cross power spectrum, power spectrum density (LPF), auto-correlation function, histogram, transfer function, cross-correlation function, phase spectrum, impulse response, coherence function, octave analysis

- Analysis channels  
  - 1-channel FFT, 2-channel FFT in selected channels (up to 16 analysis functions)

- Frequency range  
  - 135 mHz to 8 MHz, resolution 1/400, 1/800, 1/2000, 1/4000, 1/8000

- No. of sampling points  
  - 1000, 2000, 5000, 10000, 20000 points

- Analysis data  
  - Selected from: Newly loaded data / MEM function waveform data / MEM waveform of REC & MEM function

- Window functions  
  - Rectangular, Hanning, Exponential, Hanning, Blackman, Blackman-Harris, Flat-top

- Screen and printing  
  - Split screen (1/2/4), Nyquist, logging (print/display measurement data as digital values), frequency axis zoom and left/right scrolling

- Averaging  
  - Time axis / frequency axis simple averaging, exponential averaging, peak hold, (free setting 2 times to 10,000 times)

**Real-time save function**  
- Time axis (Whole waveform data)  
  - 10 ms to 1 hour/division, 19 ranges, time axis resolution 100 points/div, sampling speed: same as sampling rate for "Measurement Waveform"

- Time axis (Measurement waveform data, sampling data)  
  - 100 µs to 5 minute/division, 22 ranges (limited depending on over target and number of channels), time axis resolution 100 points/div, sampling rate: 1/100 of time axis

- Save to  
  - HDD, PC via LAN

- Waveform capture  
  - Depending on available space on storage media / file system / number of channels / REC time scale, Selectable in division steps up to maximum recording length

- Waveform measurement  
  - Data can be analyzed in MEM function or FFT function

- Waveform option function  
  - Detection of trigger criteria, time, event markers and peak value

Up to 1,000 event markers can be input during and after measurement
Main unit Specifications

### Additional features

**General**
- Measurement parameter printing, cursor measurement, scaling, current clamp setting, comment input, screen hard copy, list/function, start/stop points, auto range, auto range, over-range indication, view function, key lock, level monitor, verification function, offset cancel, event marker input, waveform search function, report printing

**Options specifications (sold separately)**
- For the 8950 series only

**Dimensions and mass:**
- Dimensions and mass: approx. 170 (6.69in) W × 145.5 (5.85in) D mm, approx. 290 g (10.2 oz)
- Accessories: None

**ANALOG UNIT 8956**
- Measurement functions:
  - Number of channels: 2, for voltage measurement
- Input connectors:
  - Isolated BNC connector (input impedance: 1MΩ input capacitance: 40pF)
  - Max. rated voltage to earth: 300V AC (DC input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage)
- Measurement range:
  - 5mV to 200mV/20, 12 ranges, full scale: 200mV, AC voltage for possible measurement/display using the memory function: 200mV, low-pass filter: 5kHz/50kHz/5kHz/1MHz
  - Measurement resolution: 1/100 of full scale (using 12-bit AD conversion, installed in 8800 series)
- Highest sampling rate:
  - 20MS/s (simultaneous sampling in 2 channels)
- Accuracy:
  - DC channel: ±0.4% of full scale with filter (filter 5Hz)
  - Zero position: ±0.1% of full scale with filter (filter 5Hz, after zero adjustment)
- Frequency characteristic:
  - DC to 10kHz ±x, (with AC coupling: 7Hz to 10kHz ±x)
- Input coupling:
  - D, GND, AC
- Max. allowable input:
  - 400V DC (the maximum voltage that can be applied across input pins without damage)

**HIGH-RESOLUTION UNIT 8957**
- Measurement functions:
  - Number of channels: 2, for voltage measurement
- Input connectors:
  - Isolated BNC connector (input impedance: 1MΩ input capacitance: 40pF)
  - Max. rated voltage to earth: 300V AC (DC input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage)
- Measurement range:
  - 5mV to 200mV/20, 12 ranges, full scale: 200mV, AC voltage for possible measurement/display using the memory function: 200mV, low-pass filter: 5kHz/50kHz/5kHz/50kHz
- Anti-aliasing filter:
  - Integrator filter for suppressing aliasing distortion caused by FFT processing (automatic cutoff frequency setting OFF)
- Measurement resolution:
  - 1/100 of full scale (using 16-bit A/D conversion, installed in 8800 series)
- Highest sampling rate:
  - 2MS/s (simultaneous sampling in 2 channels)
- Accuracy:
  - DC channel: ±0.4% of full scale with filter (filter 5Hz)
  - Zero position: ±0.1% of full scale with filter (filter 5Hz, after zero adjustment)
- Frequency characteristic:
  - DC to 200kHz ±x, (with AC coupling: 7Hz to 200kHz ±x)
- Input coupling:
  - D, GND, AC
- Max. allowable input:
  - 400V DC (the maximum voltage that can be applied across input pins without damage)

**16th SCANNER UNIT 8958**
- Measurement functions:
  - Number of channels: 16, for voltage measurement/temperature measurement with thermopile
- Input connectors:
  - Voltage input/Thermocouple input: screw-type terminal strip, recommended wire diameter: 0.1mm to 1.5mm, detachable terminal block (with cover), 10mm pitch, 25mm screw indentation, 10 times, 50 times, 100 times, 200 times (2.5 times)
  - Thermocouple range (J, K, T, E, N):
    - J: 20°C to 1250°C, K: -200°C to 1300°C, L: -100°C to 2000°C, M: -30°C to 300°C, R: -100°C to 1200°C, S: -100°C to 1800°C, T: 0°C to 400°C, U: 0°C to 400°C, W: 0°C to 40°C, V: 0°C to 50°C, X: 0°C to 50°C, Y: 0°C to 50°C
  - Data refresh rate:
    - 50ms/666 channels, 300ms/666 channels (digital filter: 50Hz/50Hz), 1.4 kHz/666 channels (digital filter: 10kHz)
- Accuracy:
  - ±0.2% of full scale, thermocouple (J, K, T, E, N): ±0.05% of full scale ±x°C, (F, S, B, W): ±0.05% of full scale ±x°C, ±0.05% of full scale ±2°C, ±0.05% of full scale ±3°C (less than 400°C), ±0.05% of full scale ±3°C (less than 400°C), reference junction compensation accuracy: ±x°C (added to measurement accuracy with internal reference junction compensation)
- Max. allowable input:
  - 40V DC (the maximum voltage that can be applied across input pins without damage)
### ANALOG UNIT 8936

**Dimensions and mass:** approx. 170 (6.69in) W × 200 (7.79in) H × 145.8 (5.75in) D mm, approx. 290 (10.2 oz) Accessories: None

**Input connectors:** Isolated BNC connector (open impedance, 10Mohm, input capacitance 3pF). Max. rated voltage to earth: 730V AC, 480V DC (4pF input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage).

**Measurement range:** 5V to 20V/DC, 12 ranges, full scale: 20DIV, AC voltage for possible measurement display using the memory function: 200mV rms, low-pass filter: 5kHz/50kHz/5kHz, 1kHz/10kHz.

**Measurement resolution:** 1/30 of measurement range (25μA A/D conversion, installed in 8860 series).

**Highest sampling rate:** 1MS/s (time constant sampling in 2 channels).

**Accuracy:** DC amplitude: ±0.4% of full scale, zero position: ±0.5% of full scale (after zero adjustment).

**Frequency characteristics:** DC to 40kHz ±3dB, (with AC coupling: ±7Hz to 40kHz ±3dB).

**Input coupling:** DC, GND, AC.

**Max. allowable input:** 400V DC (the maximum voltage that can be applied across input pins without damage)

**Note:** When using Model 8860-50/8861/8860, residual noise will be 80μV p-p.

### VOLTAGE/TEMP UNIT 8937

**Dimensions and mass:** approx. 170 (6.69in) W × 200 (7.79in) H × 145.8 (5.75in) D mm, approx. 300 (10.6 oz) Accessories: None

**Measurement functions:** Number of channels: 2, for voltage measurement

**Input connectors:** Voltage input: metallic BNC connector (open impedance, 10Mohm, input capacitance 3pF), plug-in connector (input impedance min. 3Mohm). Max. rated voltage to earth: 30Vrms or 60V DC (with input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage).

**Voltage measurement range:** 50μV to 2 V/DC, 12 ranges, full scale: 20DIV, low-pass filter: 5kHz/50kHz/5kHz/10kHz, Measurement resolution: 1/30 of measurement range (using 12-bit A/D conversion, installed in 8860 series).

**Temperature measurement range:** 10°C to 100°C/CDIV, 4 ranges, full scale: 20DIV, high-pass filter: 10kHz/100kHz, Measurement resolution: ½ of measurement range (using 12-bit A/D conversion, installed in 8860 series).

**Thermocouple range:** K: -200 to 1350°C, E: -200 to 800°C, J: -200 to 1100°C, T: -200 to 400°C, N: -200 to 100°C, R: 0 to 1700°C, S: 0 to 1500°C, B: 300 to 1800°C, Reference junction compensation: internal: external (suitable).

**Highest sampling rate:** Voltage input: 1MS/s, Temperature measurement: 50kHz (2-channel simultaneous sampling).

**Accuracy:** DC amplitude: ±0.5% of full scale, zero position: ±0.5% of full scale (after zero adjustment).

**Input coupling:** DC, GND, AC.

**Max. allowable input:** 50Vrms or 60V DC (the maximum voltage that can be applied across input pins without damage)

### STRAIN UNIT 8939

**Dimensions and mass:** approx. 170 (6.69in) W × 200 (7.79in) H × 145.8 (5.75in) D mm, approx. 250 (8.9 oz) Accessories: Conversion cable: x 2

**Measurement functions:** Number of channels: 2, for distortion measurement (electronic auto-balancing, balance adjustment range within ±0.10%)

**Input connectors:** Via conversion cable: TAI9319-pro-C22(2AM)-TM15. Max. rated voltage to earth: 300Vrms or 60V DC (with input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage).

**Suitable transducer:** Strain gauge converter, bridge impedance: 120kΩ to 1kΩ, bridge voltage: 2 ±0.10V.

**Measurement range:** 20με to 100με/DC, 6 ranges, full scale: 20DIV, low-pass filter: 10Hz/30Hz/300Hz/3kHz.

**Measurement resolution:** 1/30 of measurement range (using 12-bit A/D conversion, installed in 8860 series).

**Highest sampling rate:** 1MS/s (2-channel simultaneous sampling).

**Accuracy:** DC amplitude: ±0.5% of full scale, zero position: ±0.5% of full scale

**Frequency characteristics:** DC to 20 kHz ±3dB

**Max. allowable input:** 10V DC ±AC peak (the maximum voltage that can be applied across input pins without damage)

### 4CH ANALOG UNIT 8946

**Dimensions and mass:** approx. 170 (6.69in) W × 200 (7.79in) H × 145.8 (5.75in) D mm, approx. 310 (11.0 oz) Accessories: None

**Input connectors:** Voltage input: metallic BNC connector (open impedance, 10Mohm, input capacitance 3pF), plug-in connector (input impedance min. 3Mohm). Max. rated voltage to earth: 30Vrms or 60V DC (with input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage).

**Measurement range:** 10μV to 2DIV/DC, 8 ranges, full scale: 20DIV, low-pass filter, 5kHz/50kHz/50kHz/10kHz, Input coupling: DC, GND, AC.

**Measurement resolution:** 1/30 of measurement range (using 12-bit A/D conversion, installed in 8860 series).

**Highest sampling rate:** 1MS/s (4-channel simultaneous sampling).

**Accuracy:** DC amplitude: ±0.5% of full scale, zero position: ±0.5% of full scale (after zero adjustment).

**Frequency characteristics:** DC to 10kHz ±3dB

**Max. allowable input:** 30Vrms or 60V DC (the maximum voltage that can be applied across input pins without damage)

### CHARGE UNIT 8947

**Dimensions and mass:** approx. 170 (6.69in) W × 200 (7.79in) H × 145.8 (5.75in) D mm, approx. 250 (8.9 oz) Accessories: None

**Input connectors:** Voltage input: integral/preamplifier input: metallic BNC connector (open impedance, 10Mohm, input capacitance 3pF), charge input: miniature connector (10-32 UNF). Max. rated voltage to earth: 30Vrms or 60V DC (with input isolated from the unit, the maximum voltage that can be applied between input channel and chassis and between input channels without damage).

**Suitable transducer:** Charge input: Output type piezoelectric acceleration pick-up sensor Internal preamp input: Acceleration pick-up sensor with an internal preamp.

**Measurement range:** 50με to 2DIV/DC, 12 ranges ±3dB, types: charge input sensitivity; ±10με/50V rms, high impedance pre-amplifier input (BNC connector), ±1με/200Vrms, maximum input sensitivity: ±2% of full scale, frequency characteristics: 1 to 50kHz, ±1dB, low-pass filter: 50Hz/5kHz/50Hz, pre-amplifier drive power source: ±1με±200Vrms, maximum input charge: ±800μC, (high-sensitivity setting, 5με), ±500μC, (low-sensitivity setting, 5με).

**Measurement resolution:** 1/30 of measurement range (depending on measurement sensitivity), installed in 8860 series.

**Highest sampling rate:** 1MS/s (2-channel simultaneous sampling).

**Integrated filter:** Integrated filter for suppressing aliasing distortion caused by FFT processing (automatic cutoff frequency setting OFF).

**Note:** When using Model 8847 with serial number earlier than 04092537 on Models 8861-51/8860-51/8861-50/8860-50, residual noise will be 340μV p-p.
**LOGIC PROBE 9320-01/9327**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Detection of voltage signal or relay contact signal for High/Low state recognition. Can also be used for power line interruption detection.</td>
</tr>
<tr>
<td>Input</td>
<td>Detection of AC or DC relay drive signal for High/Low state recording.</td>
</tr>
<tr>
<td>AC mode</td>
<td>For detection of power line surge noise, including AC RMS output detection.</td>
</tr>
<tr>
<td>DC mode</td>
<td>For waveform monitor output, including DC to 10 MHz (±3 dB) frequency properties and RMS to 100 kHz (±6 dB).</td>
</tr>
</tbody>
</table>

**Dimensions and mass:**
- Unit: main unit 1.5 m (4.92 ft), input section cable 30 cm (1.0 ft), approx. 150 g (5.3 oz)

**Accessories:**
- Instruction manual × 1, Alligator clip × 2, Carrying case × 1

**Operating environment:**
- Computer running under Windows 7 (32-bit, Vista 32-bit, XP, 2000)

**Data loading:**
- USB memory (only for 8860 series data) (MEM, REC, FFT, RSM, RSR, SEQ, IDX, RSL, R-M, SET)
- Maximum file size: 2 GB

**Data saving:**
- Saved contents: measurement data (binary and ASCII), (partial saving of the area between cursors A and B), setting conditions, screen image (BMP, PNG), and calculation results

**Other functions:**
- Wave display: 1-, 2-, 3-, 4-, 6-, and 8-split screen, horizontal, vertical, consecutively scroll, and zoom in/out along the time axis, move the zero position, zoom in/out, setting of variables independently for each channel

**Print:**
- Supported printer: printer compatible with the OS
- Print format: waveform image (1-, 2-, 3-, 4-, 6-, and 8-split), numerical print, report format, list print, calculation results, screen image

**Data Analysis and Presentation Software**

**FlexPro**

FlexPro is a powerful data analysis and presentation software for importing and organizing data from the 8860-51/8881-51 Series.

**Note:** Product Company: Weisang GmbH (Germany)

**Contact Email:** info@weisang.com

**http://www.weisang.com/**

**PC Software Specifications**

Bundled with the 8860-51/8881-51 in the CD-R.

**WaveView (Wv) Software**

**Functions:**
- Simple display of waveform file
- Text conversion: convert binary data file to text format, with selectable space or tab separators in addition to CSV, and specific file extension, thinning available
- Display format settings: scroll functions, enlarge/reduce display, display channel settings
- Others: voltage value trace function, jump to cursor/trigger position function

**Operating environment:**
- Windows 10/8/7 (32/64-bit), Vista (32-bit), XP

**Additional Information:**
- Note: Only use one of the DC Power Unit 9864 or Probe Power Unit 9897 if both cannot be installed at the same time. Please contact your HIOKI representative if concurrent installation is required.

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**Options specifications (sold separately)**

**Cable length and mass:**
- Main unit cable: 1.5 m (4.92 ft), input section cable: 30 cm (1.0 ft), approx. 150 g (5.3 oz)

**Note:** The unit-side plug of the 9320-01 is different from the 9320.

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**MEMORY HIPLIER 9725**

**Compatible devices:** Memory HIOrder 8860-51, 8861-51, 8860-50, 8861-50, 8860, 8861

**Operating environment:** Computer running under Windows 8/7 (32/64-bit), Vista (32-bit), XP, 2000

**File loading:**
- USB memory (only for 8860 series data) (MEM, REC, FFT, RSM, RSR, SEQ, IDX, RSL, R-M, SET)
- Maximum file size: 2 GB

**File saving:**
- Saved contents: measurement data (binary and ASCII), (partial saving of the area between cursors A and B), setting conditions, screen image (BMP, PNG), and calculation results

**Other functions:**
- Wave display: 1-, 2-, 3-, 4-, 6-, and 8-split screen, horizontal, vertical, consecutively scroll, and zoom in/out along the time axis, move the zero position, zoom in/out, setting of variables independently for each channel

**Print:**
- Supported printer: printer compatible with the OS
- Print format: waveform image (1-, 2-, 3-, 4-, 6-, and 8-split), numerical print, report format, list print, calculation results, screen image

**Data Analysis and Presentation Software**

**FlexPro**

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**Note:** Product Company: Weisang GmbH (Germany)

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**PC Software Specifications**

Bundled with the 8860-51/8881-51 in the CD-R.

**WaveView (Wv) Software**

**Functions:**
- Simple display of waveform file
- Text conversion: convert binary data file to text format, with selectable space or tab separators in addition to CSV, and specific file extension, thinning available
- Display format settings: scroll functions, enlarge/reduce display, display channel settings
- Others: voltage value trace function, jump to cursor/trigger position function

**Operating environment:** Windows 10/8/7 (32/64-bit), Vista (32-bit), XP

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**DIFFERENTIAL PROBE 9322**

**Accuracy guaranteed for 1 year**

**Functions:**
- For high-voltage floating measurement, power line surge noise detection, RMS rectified output measurement

**DC mode:**
- For waveform monitor output, including DC to 10 MHz (±3 dB) frequency properties and RMS to 100 kHz (±6 dB).

**AC mode:**
- For detection of power line surge noise, including AC RMS output detection.

**RMS mode:**
- AC mode: voltage RMS output detection. For waveform monitor output, including DC to 10 Hz (±3 dB).
- RMS to 100 kHz (±6 dB), Response speed: 200 ms or less (40 V AC), accuracy: ±1 % of full scale (±0.1 % of full scale at max. 100 V DC), ±0.5 % of full scale (±0.5 % of full scale at max. 100 V DC).

**Input:**
- Input type: balanced differential input

**Max. allowable input:**
- 2000 V DC, 3000 V AC (H-L), 600 V AC/DC (CAT II)

**Output:**
- Voltage divider for 1/1000 of input, BNC connectors (output available for 3 modes DC, AC, RMS).

**Power source:**
- (1) Connect the AC ADAPTOR 9415-15, (2) Connect to the PROBE POWER UNIT 9687 via the POWER CORD 9248, (3) Connect to HIOKI logic terminal via the POWER CORD 9324 and CONVERSION CABLE 9132, (4) Connect to the EV4 UNIT 9804 via the POWER CORD 9242.

**Dimensions and mass:**
- Approx. 313.8 (12.343 in) W × 29.1 (1.149 in) H × 244.4 (9.621 in) D mm, approx. 1.235 kg (4.413 lb)

**Note:** Only use one of the DC Power Unit 9864 or Probe Power Unit 9897 if both cannot be installed at the same time. Please contact your HIOKI representative if concurrent installation is required.

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**DIFFERENTIAL PROBE P9000**

**Accuracy guaranteed for 1 year**

**Measurement modes:**
- P9000-01: For waveform monitor output, Frequency properties: DC to 100 kHz (±3 dB)
- P9000-02: Switches between waveform monitor output/AC effective value output Wave mode frequency properties: DC to 100 kHz (±3 dB), RMS mode frequency properties: 30 Hz to 1 kHz, Response time: Rise 360 ms, Fall 600 ms

**Division ratio:**
- Switches between: 1, 0.1, 0.01, 0.001, 0.0001

**DC output accuracy:**
- ±0.5 % F.S. (±0.05 V, division ratio 1000 V, ±3 V, division ratio 100)

**Effective value measurement accuracy:**
- ±3 % F.S. (100 Hz to 1 kHz, sine wave), ±5 % F.S. (1 kHz to 10 kHz, sine wave)

**Input resistance/capacitance:**
- H-L: 10.5 MΩ, ±5 pF or less (1 kHz)

**Maximum input voltage:**
- 1000 V AC, DC

**Maximum rated voltage to ground:**
- 1000 V AC, DC (CAT III)

**Operating temperature range:**
- From -40°C to 80°C (-40°F to 176°F)

**Power supply:**
- (1) AC adapter Z1008 (100 to 240 V AC, 50/60 Hz), 6 VA (including AC adapter)
- (2) USB bus power (5 V DC, USB-bus terminal), 0.8 VA
- (3) External power source 2.7 V to 15 V DC, 1 VA

**Accessories:**
- Instruction manual × 1, Alligator clip × 2, Carrying case × 1
**Input options**

- **DC Power Unit 9684**
  - Built-in type
  - DC input: 100 to 240 V AC

**Printer options**

- **Power Supply**
  - Necessary for use with high-speed current probes
  - Power Supply 3269
  - For the 12 Mwords, connect up to four sensors.

**Note:** The 8860/8861 can be used with various types of current sensors and probes. For details, see product information on Hioki's website.