Isolated 16-Channel Recording

Network Recording Instrument for LAN

8841, 8842 MEMORY HiCORDER is a recording instrument with a unique shape which can be used with A4-wide recording paper, large-sized color screens, desktops, or flatbeds. The new addition of LAN support enables its use with PCs as a recording instrument suitable for the Internet age. It comes with a rich product lineup as input unit for measuring different types of signals. You can select a type most suitable for your needs.
- Features -

● Simultaneous measurement in up to 16 analog channels

HIOKI’s portable MEMORY HiCORDERs feature 16 isolated input channels. They allow simultaneous measurement in 16 analog + 16 logic channels.

● Dial knob with analog sensibility

The dial knob ensures superior operational ease when setting voltage ranges and zero position. This feature guarantees intuitive operation.

● Capability for PC data processing using a PC card or FD/MD

Type III PC card slot x 1 for SRAM cards up to 32 MB and flash ATA cards and hard disk cards up to 528 MB. A floppy disk drive is provided as a standard outfit, and an internal MD can be installed as an option. The MO drive accepts all disk capacities up to 640 MB.

● Compatibility with 8840 floppy disk data

Data measured with the 8840 MEMORY HiCORDER and stored on floppy disks can be read to the 8841 and 8842 and processed with the functions offered by these models.

● Large-capacity memory

In the standard memory configuration, a total of 8 mega-words can be stored. With expansion memory installed, capacity is a full 32 mega-words. This provides for up to 2 mega-words per channel when 16 channels are used. Even with high-speed sampling, long-term recording is possible.

● CE Mark compliant

Complies with the EC directive determining safety standards in Europe (within the EU).

● 10.4 inch color TFT display for easy visual identification

The color display makes it easier to identify waveforms and eases installation of devices, and makes the unit all the more easier to operate.

● Internal sampling rate of 1 MS/s, 500 kS/s external sampling rate

The A/D converter that digitizes measurement signals operates at the high sampling rate of 1 M sample/s (1 µsec cycle). Resolution for the voltage axis is 12 bits. Sampling is carried out for all channels simultaneously.

● Converts to text file used with a Wave viewer (supplied accessories, PC application software)

To open measurement data in PC applications such as Excel, the data must be converted to text data in the CSV format. The PC application software which comes standard in the package enables easy operation.

● Connects to PCs and printers on a LAN network

Its use with PCs can be selected according to the usage. It allows remote operation and data transfer via LAN connection, GP-IB connection, or RS-232C connection. External MO drive connected via an external SCSI interface is also possible.

● On-screen help

Explanation of button operations and many basic operations can be displayed on the screen with the provided online help function.

● Plug-in slots enhance versatility

The number of measurement channels can be matched to the application requirements by using plug-in modules. New types of converter amplifiers and other accessories to be introduced in the future will allow direct measurement of various physical quantities.

A LAN-Connectable Recorder! Digitally Process Test Data

With a conventional pen recorder, even if all test data is written on the paper, usually only a small portion of the data is needed. However, to look for just a small important part requires very extensive search of the recording paper.

8841, 8842 MEMORY HiCORDER stores and manages all waveform measurement data electronically. Furthermore, use of a LAN card and 9333 LAN Communicator enables high-speed data file transfer to PCs on a network.
Monitors non-visual (mechanical or electrical) operations and provides support to solving problems

- Application -

Research and development of automobiles (8841)

In vehicle and engine running tests, the relationship among various parameters must be examined. Multi-channel recorders are necessary to accomplish this. While 8841 has retained the size of its predecessor, the 8840, it allows recording with 16 analog channels + 16 logic channels. Using the 9433 DC POWER ADAPTER enables operation using the vehicle’s battery (+12 V/+24 V).

■ Engine tuning
Allows the balance between boost, oil pressure, air fuel ratio, ignition timing, engine speed, injector aperture, etc., to be observed and recorded as waveforms.

■ Analysis of engine characteristics
The pressure waveforms of injection pipes and fuel-injection pumps, etc., can be recorded and stored in the internal memory and then superimposed on a reference waveform for analysis.

■ Evaluation of electrical circuits
Quality evaluation of meter boards for use in automobiles can be performed by recording and evaluating analog waveforms.

Evaluation of machines and materials

Pressure waveforms can be measured and recorded simultaneously at various points of hydraulic machines to determine whether such machines are operating normally. Using, for example, the recorder’s X-Y recording function, performance dispersion check can be conducted by recording the relationship between one cycle operation command signal for an injection molding machine, the pressure and the position change.

■ Analysis of injection molding machine operation
The quality of molded products can be evaluated by recording the relationship between the injection molding machine’s operation command and the pressure and position change.

■ Analysis of tensile tests
When conducting stretching characteristic test and tensile test of steel tubing, the relationship between load and contraction can be recorded.

■ Recording of motor rush current
The rush current occurring when the power to a motor or a relay is turned on can be accurately measured as a waveform.

■ Servo-controller analysis
The operation of a servo-controller utilizing a PWM inverter and used to control a general motor can be accurately measured as a waveform.

Waveform judgment

After defining a reference waveform bounding area, it is possible to check whether waveforms go outside this reference area. As opposed to simple voltage level-based triggering, even complex waveforms can be evaluated quickly and reliably, because both the level direction and the time axis direction are taken into consideration simultaneously.

* Registered patent no. 2028013, in Japan

Evaluation of machines and materials

Pressure waveforms can be measured and recorded simultaneously at various points of hydraulic machines to determine whether such machines are operating normally. Using, for example, the recorder’s X-Y recording function, performance dispersion check can be conducted by recording the relationship between one cycle operation command signal for an injection molding machine, the pressure and the position change.

■ Analysis of injection molding machine operation
The quality of molded products can be evaluated by recording the relationship between the injection molding machine’s operation command and the pressure and position change.

■ Analysis of tensile tests
When conducting stretching characteristic test and tensile test of steel tubing, the relationship between load and contraction can be recorded.

■ Recording of motor rush current
The rush current occurring when the power to a motor or a relay is turned on can be accurately measured as a waveform.

■ Servo-controller analysis
The operation of a servo-controller utilizing a PWM inverter and used to control a general motor can be accurately measured as a waveform.

Recorder function X-Y display

The recording time is unlimited in the case of recording an X-Y plot of two analog channels. The channel combination is arbitrary. The X-Y plot can be viewed on the screen, and it can also be printed out as many times as desired, making this more useful than what is offered by standard X-Y recorders.

Fast response recorder function

The 8841 and 8842 have a recording function which can print out data onto paper in real-time. Recording continues until the recording paper (30 m per roll) is used up. The recorder functions offered by the 8841 and 8842 outperform others in the way that the recorder’s pen response is extremely fast in relation to the sampling speed. The maximum sampling speed is 1 µs, which is the same as the memory recorder function speed.
- Application -

Vibration analysis

When installing rotating machinery, such as agitators, that create many vibrations, damping precautions are normally taken to ensure that the vibrations are not propagated directly to the floor surface. Analysis of the vibration damping measures and effects can be conducted by measuring the natural frequency and the transfer function.

- Measurement of the damping of vibrations reaching the solid base from the rotating machinery

By striking the agitator with an impulse hammer, the vibrations propagated to the solid base can be measured by the acceleration speed pick up. Finding the transfer function can show to what extent specific frequencies are being damped.

- Measurement of the natural frequency of objects

Resonance phenomena can be avoided by ensuring that the natural frequency of an object is different from the vibration frequency of the surroundings. By striking the object with an impulse hammer and finding the transfer function, the natural frequency of the object can be found.

FFT analysis function

FFT capability includes single-signal FFT for analyzing frequency components, two-signal FFT for transfer function analysis, and octave analysis for acoustic analysis. The source signal can be selected from waveform data captured by the memory recorder, and isolating required sections is also possible. (Number of data points: 1000 - 10000)

Load shutdown tests in power generation plants and inspection of electric systems

For load shutdown tests in power generation plants, the pre-trigger function can be used to measure and record waveforms before and after the test, enabling accurate analysis. The vernier function, which can be used to perform fine adjustment of amplitudes, is also a useful tool. In the field of electricity, the recorders have many applications, such as recording of rush current frequency, recording of breaker activation timing, and monitoring of power lines for irregularities.

- Load shutdown test

Analysis of the relationship between the generator voltage, rotation speed regulation, governor servo operation condition, and the open and close timing of the pressure regulator before and after load shutdown can be performed.

- CB timing measurement

For inspection of the shutdown timing of circuit breakers for electrical circuits, the relations between logic signals and analog waveforms of multiple points can be analyzed.

- Momentary loss of power recording

Momentary loss of power in power-supply circuits can be recorded by using the voltage drop detection trigger, thus enabling accurate waveform recording of unexpected events.

- Ground fault line detection

To identify the ground fault line of transmission lines, measurement can be conducted using the trigger that combines a leak current meter and the recorder. This allows observation and recording of the waveform before and after ground faulting to identify the line.

-memory recorder function

The input signal is converted to digital form and stored in the internal memory. It can then be displayed on the screen or printed out on paper. Since the recordable signal speed is determined by the sampling rate and the memory saving rate, it is simple to capture even very fast transient events that escape normal recorders.

All channel inputs isolated

Each channel has its own dedicated A/D converter, allowing simultaneous sampling in all 16 analog channels and in all 16 logic channels.

RMS recorder function

This function is exclusively for use on 50/60 Hz power-supply lines and DC. High-speed sampling is applied to calculate the rms value from the waveform data*, and the result is recorded as a graph.

*Using 200 µs high-speed sampling, data for two waveforms are captured for calculating the rms value. This process is repeated 20 times per second, resulting in high-speed response that is 10 times faster than that of a digital tester or similar (using a 2-second update rate).
High-Speed Response for Capturing Transient Events

- Function Details -

Large memory capacity allows long-term recording of high-speed data

In the standard configuration, the 8841 and 8842 can store a total of 8 mega-words, and with memory expansion 32 mega-words, using internal solid-state memory. This provides ample capacity to store data for all 16 channels. The table at right shows possible recording times, according to the time axis setting and the number of channels in use. A reduction in the number of channels prolongs the recording time.

* The table applies to the standard memory configuration. When the optional 9608 MEMORY BOARD is installed, recording times are extended by a factor of 4 (from 16 mega-words/channel, 160000 divisions for 2 channels to 2 mega-words/channel, 20000 divisions for 16 channels).

■ Memory segmentation function

When using the memory recorder function, the data memory can be divided into a maximum of 255 blocks. Data can be written sequentially to the memory blocks, and the waveform in a reference block and any other block can be superimposed and compared.

* In the standard memory configuration (8 mega-words), the maximum number of blocks using the 16 channel setting is 127. When the memory expansion is installed, or when the channel setting is 2 to 8, the maximum number of blocks is 255.

---

**Diagram:**

- Time axis
- Sampling period
- Input waveform
- Output waveform
- A/D conversion
- Isolation
- Write on memory
- Thermal printer

**Table:**

<table>
<thead>
<tr>
<th>Time axis</th>
<th>Sampling period</th>
<th>2-channel setting</th>
<th>16-channel setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 µs/DIV</td>
<td>1 µs</td>
<td>4x</td>
<td>0.5s</td>
</tr>
<tr>
<td>200 µs/DIV</td>
<td>2 µs</td>
<td>8x</td>
<td>1s</td>
</tr>
<tr>
<td>500 µs/DIV</td>
<td>5 µs</td>
<td>20s</td>
<td>2.5s</td>
</tr>
<tr>
<td>1 ms/DIV</td>
<td>10 µs</td>
<td>40s</td>
<td>5s</td>
</tr>
<tr>
<td>2</td>
<td>20 µs</td>
<td>1 m 20s</td>
<td>10s</td>
</tr>
<tr>
<td>5</td>
<td>50 µs</td>
<td>3 m 20s</td>
<td>25s</td>
</tr>
<tr>
<td>10</td>
<td>100 µs</td>
<td>6 m 40s</td>
<td>50s</td>
</tr>
<tr>
<td>20</td>
<td>200 µs</td>
<td>13 m 20s</td>
<td>1 m 40s</td>
</tr>
<tr>
<td>50</td>
<td>500 µs</td>
<td>33 m 20s</td>
<td>4 m 10s</td>
</tr>
<tr>
<td>100</td>
<td>1 µs</td>
<td>1 h 6 m 40s</td>
<td>8 m 20s</td>
</tr>
<tr>
<td>200</td>
<td>2 µs</td>
<td>2 h 13 m 20s</td>
<td>16 m 40s</td>
</tr>
<tr>
<td>500</td>
<td>5 µs</td>
<td>5 h 33 m 20s</td>
<td>41 m 40s</td>
</tr>
</tbody>
</table>

**Zoom function**

To make the most of the large-capacity memory, it is possible to display a compressed waveform simultaneously with a magnified waveform. Since the 8841 and 8842 are capable of storing a large amount of data, high-speed sampling is also possible for waveforms with a long duration. Accordingly, while observing the compressed image of the entire waveform, it is also possible to observe the magnified details of desired parts. Compressed display of a part of the entire waveform is also possible.

■ Clock input for external sampling

The sampling rate for the memory recorder can be controlled by the timing of an external clock signal. This is useful for example to collect data synchronized to the running cycle of an engine.
- Function Details -

Support for connection to PCs via Ethernet

8841/8842 can be connected to Ethernet, a standard network protocol in the Internet age (using the optional 9578 10BASE-T LAN CARD and 9333 LAN COMMUNICATOR). For those who frequently analyse measurement data on PCs, this function offers a good match. Also, connection to PCs using RS-232C connection or GP-IB connection is possible (using the optional 9557 RS-232C CARD and 9558 GP-IB CARD). 8841/8842 data can be sent to PCs or be remotely controlled from PCs.

* Because LAN card, GP-IB card, and RS-232C card all use the same PC card slot of 8841/8842, when one of them is inserted into the PC card slot, then any memory card (SRAM, flash ATA, or hard disk card) cannot be used at the same time.

- Connect HiCORDER to departmental LAN (using TCP/IP communication protocol)
- Save data to network server (using TCP/IP communication protocol)
- Copy or remote operations of HiCORDER data files from client PCs running 9333 (software)
- Color image output to the network printer

Advantages of Ethernet and TCP/IP Connected Systems
- Data transfer speed is faster than MO write speed.
- Cable length may be up to 100 meters using 10Base-T.
- Data can be used immediately by an application program on the PC (9333 LAN COMMUNICATOR).
- Less susceptible to errors compared with RS-232C communications, and faulty data is automatically resent.
- Installation costs at the PC side are lower than GP-IB.

Disadvantages of Ethernet and TCP/IP Connected Systems
- Transfer time depends on network usage, because the network is shared with other LAN devices.
- Transfer time between other devices on the LAN may be affected, depending on the amount of data transferred from the recorder.

Offline data exchange with PCs

The supplied waveform viewer (PC application) can convert saved waveform data to text files (CSV format). For data storage, MO (optional installation at factory) can also be used, in addition to FD/PC card (supplied as standard). This allows easy offline data exchange with PCs. Apart from the built-in MO unit, addition of external MO drive via the SCSI interface (supplied as standard) for connection is also possible. (External hard drive, however, is not supported.)

- Connect HiCORDER to departmental LAN (using TCP/IP communication protocol)
- Save data to network server (using TCP/IP communication protocol)
- Copy or remote operations of HiCORDER data files from client PCs running 9333 (software)
- Color image output to the network printer

Scaling Functions

Actual measurements usually involve parameters other than voltage. Various physical parameters such as speed, vibration and temperature commonly need to be recorded, and this signal data should be directly readable, without having to be manually converted. In such measurement conditions, the scaling function can be used to automatically convert to the desired parameter value. Additionally, waveform amplitude can be adjusted using the Variable Gain function.

In addition, if accurate input voltage amplitude measurement is not required, the amplitude can be intentionally modified with the Vernier Adjustment function.
- Function Details -

**Real time save function** *supported in version 2.30 or later, 9607 required*

The real time save function enables data to be saved to the internal MO while waveform is being measured. The compressed waveform is displayed on the screen at real time. This function is valid at the recorder and memory function. Write to the internal MO can be up to 2 kS/s (=50 ms/DIV) for 8 channels, or up to 1 kS/s (100 ms/DIV) for 16 channels. With the real time save function, data measured at the pre-determined sampling below the maximum sampling can be saved to the MO at any time.

In addition, since the same data is compressed along the time axis and displayed on the screen, you can check how recording is going. Compressed data is saved to the MO for later retrieval.

**Maximum continuous recording time using 230 MB/640 MB MO disk** *(with 9608 memory board expansion)*

<table>
<thead>
<tr>
<th>MEM Time axis</th>
<th>Sampling period</th>
<th>230MB MO</th>
<th>640MB MO</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms/DIV</td>
<td>1h 58m 51s</td>
<td>5h 30m 54s</td>
<td></td>
</tr>
<tr>
<td>100 ms/DIV</td>
<td>1h 58m 51s</td>
<td>5h 30m 53s</td>
<td></td>
</tr>
<tr>
<td>200 ms/DIV</td>
<td>5h 54m 5s</td>
<td>11h 1m 44s</td>
<td></td>
</tr>
<tr>
<td>1 s/DIV</td>
<td>19h 46m 50s</td>
<td>2days 7h 7m 10s</td>
<td></td>
</tr>
<tr>
<td>2 s/DIV</td>
<td>14days 1h 10m 46s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 s/DIV</td>
<td>4days 46m 40s</td>
<td>11days 10h 59m 10s</td>
<td></td>
</tr>
<tr>
<td>10 s/DIV</td>
<td>3days 5h</td>
<td>22days 20h 26m 40s</td>
<td></td>
</tr>
<tr>
<td>30 s/DIV</td>
<td>2days 48h 30m</td>
<td>7days 19h 25m</td>
<td></td>
</tr>
<tr>
<td>1 min/DIV</td>
<td>6days 11h 10m</td>
<td>13days 10h 10m</td>
<td></td>
</tr>
<tr>
<td>2 min/DIV</td>
<td>1.2 s</td>
<td>208days 8h</td>
<td></td>
</tr>
<tr>
<td>5 min/DIV</td>
<td>3.0 s</td>
<td>208days 8h</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Saved at 8 channel for 50 ms/DIV, or at 16 channel otherwise.

**Storage data (MEM waveform):**

Save measurement data to MO at real time

*Time axis setting (MEM):* 50 ms/DIV to 5 minutes/DIV

*(Sampling frequency starting from 2 kS/s for 8 channels or from 1 kS/s for 16 channels)*

*Recording length setting (MEM):* depending on free capacity of MO disk

**Storage data (REC waveform):**

Save compressed data to MO after measurement

*Time axis setting (REC):* 200 ms/DIV to 1 hour/DIV

*(Sampling frequency starting from 2 kS/s for 8 channels or from 1 kS/s for 16 channels)*

*Recording length setting (REC):* up to 1000 DIV

*(or up to 5000 DIV with memory expansion)*

**Display data (REC waveform):** compressed waveform is displayed on screen

Compressed data is saved temporarily in the internal memory.

However, display time axis of REC data is 2 steps later than that of MEM data. The maximum recording time that can be set is determined by the free capacity of the MO disc, and the time axis and recording length of MEM/REC. Nevertheless, since the maximum recording length of REC is fixed at 1000 DIV, or 5000 DIV if there is memory expansion, even if there is plenty of free capacity on the MO disc, the recording time cannot exceed the value determined by REC time axis multiplied by 1000 DIV.

**Trigger functions capable of monitoring all 16 channels**

For all of the measurement functions, including record and memory recorder, triggers can be set on all 16 channels. In addition to a simple level trigger based on comparison with a single voltage value, the following trigger functions are also available:

- Window trigger based on 2 voltage values
- Voltage drop trigger for AC power lines
- Level trigger based on rms values
- Cycle trigger monitoring the rising edge of a voltage
- Pattern trigger monitoring the Hi/Low condition of a logic signal
**Example Printouts & Screen**

**Actual size printout example**
Example showing printing in 16 divisions. As illustrated by the picture on the front page, overlapping recording is also possible.

**Online help and error indication**
Simply pressing the help key will bring up relevant information on functions and operation steps. If an error has occurred, the reason for it is also displayed to ease operation.

**Large screen X-Y display mode**
In memory recorder function
X-Y waveforms can be displayed with the memory recorder function. In particular, the memory recorder function has been enhanced to provide enlarged display in a larger screen area than with display by the recorder function. This provides greater utility than with previous X-Y recorders.

*Note: Large screen display is supported from version 2.30 of the 8841 and 8842 MEMORY HICORDER. X-Y waveforms have been made easier to view by utilizing the entire screen display area.*

**Color printer output example**
Connection to standard color printer is also possible, making it easy to produce A4 color prints.
(The optional 9559 PRINTER CARD is required. ESC/P, ESC/P raster compatible.)
Select the Input Module for Your Application

- Product Specifications -

(accuracy at 23 ±5°C/ 73 ±9°F is guaranteed for 1 year)

8841, 8842 MEMORY RECORDER Basic Specifications

<table>
<thead>
<tr>
<th>Measurement functions</th>
<th>(1) Memory recorder, (2) Recorder, (3) RMS recorder (50/60 Hz or DC only). (4) Recorder &amp; Memory, (5) FFT function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type and number of channels</td>
<td>Plug-in input modules 8841: 8 analog + 16 logic, 16 analog + 16 logic / *1 when using 4-channel unit 8842: 16 analog + 16 logic / *2 when using expansion unit 8 analog + 16 logic / *3 isolated analog circuits, isolated input and output, logic low common GND</td>
</tr>
<tr>
<td>Maximum sampling rate</td>
<td>1 M samples/s (1 as cycle) / * Simultaneous sampling for 8/16 analog + 16 logic channels</td>
</tr>
<tr>
<td>Memory capacity</td>
<td>12 bits x 4 mega-words/channel (2 channels used) to 12 bits x 500 kilo-words/channel (16 channels used)</td>
</tr>
<tr>
<td>File storage</td>
<td>Floppy disk drive: 1.44 M/1.2 M/720 KB, MS-DOS format 8841: 200 MB, SCR can be expanded 4 times</td>
</tr>
<tr>
<td>Battery backup</td>
<td>Clock and settings, battery life approx. 10 years (at 25°C / 77°F)</td>
</tr>
<tr>
<td>External control connector</td>
<td>Terminal block, trigger input/output, external start/stop, print input, waveform judgment output, external sampling input</td>
</tr>
<tr>
<td>Interface (standard)</td>
<td>SCSI, for MO drive connection / * Please contact HIOKI for information on compatible MO drives</td>
</tr>
<tr>
<td>Interfaces (option)</td>
<td>GP-IB, RS-232C, LAN, external printer (PC-AT Continuous, ESC/P, ESC/P raster) / * Use only one of the following: 9597 RS-232C CARD, 9598 GP-IB CARD, LAN CARD (HIOKI-tested)</td>
</tr>
<tr>
<td>Environment conditions (no condensation)</td>
<td>Operating: +5°C to +40°C / 100% to 90% rh 10°C to 14°F / 50% to 90% rh 82°F to 122°F, 20% to 90% rh</td>
</tr>
<tr>
<td>Power requirements</td>
<td>100 to 240 VAC (50/60 Hz) / * When using the 9433 DC POWER ADAPTER: 10 to 28 V DC (AC has priority)</td>
</tr>
<tr>
<td>Power consumption (with 8936 full loaded)</td>
<td>8841: 225 VA max. (at 100 V AC) (approx. 95 VA with printer OFF) 8842: 240 VA max. (at 100 V AC) (approx. 110 VA with printer OFF) 8841: 160 VA max. (at 12 V DC) (approx. 50 VA with printer OFF) 8842: 170 VA max. (at 12 V DC) (approx. 65 VA with printer OFF)</td>
</tr>
<tr>
<td>Dimensions and mass</td>
<td>8841: Approx. 280 (11.0) W x 500 (19.7) H x 220 (8.6) D (mm) approx. 7.5 kg and 264.55 x (8.1) kg and 581.5 x (20.9) mm with Mo unit attached 8842: Approx. 280 (11.0) W x 500 (19.7) H x 220 (8.6) D (mm) approx. 7.5 kg and 264.55 x (8.1) kg and 581.5 x (20.9) mm with Mo unit attached</td>
</tr>
<tr>
<td>Supplied accessories</td>
<td>Power cord x 1, printer paper x 1, protective cover x 1, roll paper attachment x 2, PC card protector x 1, Wave viewer software x 1 *3, Wave viewer software x 1</td>
</tr>
</tbody>
</table>

Recording and Display Section

| Printer paper | 216 mm (8.5 inch) x 30 m (98.4 feet), thermal paper roll |
| Recording width | 20 divisions for full scale, 1 division = 10 mm (0.39 inch) / 80 dots |
| Paper feed density | 10 rows/mm (250 rows/inch), 20 rows/mm (500 rows/inch) / * with the memory recorder's smooth print function |
| Recording speed | Max. 25 mm/s (0.98 inches/s) |
| Display method | 10.4 inch TFT color LCD, with English/Japanese selector / 480 x 640 dots |

Trigger Function

| Trigger source | CH1 to CH16 (analog), CHA to CHD (logic), external, timer, manual (either ON or OFF for each source), logical AND/OR of sources |
| Trigger types (Analog) | Level: Digital setting of voltage. Triggered when set value is exceeded in UP or DOWN direction. Window: When entering or exiting a level range defined by upper or lower limit Voltage drop: Only for AC power lines. Triggered when the peak voltage falls below setting value RMS level: Only for DC and AC power lines. Triggered when rms value crosses set value in UP or DOWN direction Period: When rising or falling edge of set voltage does not fall within cycle range |
| Level setting resolution | Equivalent to 0.25% when full scale is set to 20 divisions |
| Trigger types (Logic) | Pattern trigger: 1, 0, or x (disregard), logical product (AND) or logical sum (OR) set for 4 channels |

RMS Recorder Function

| Time axis | 100 μs to 5 minutes/division, 20 settings. External sampling (100 samples/division), Time axis zoom x2 x 10; 3 settings Compression 1/2 x 1/10000; 12 settings |
| Sampling period | 1/100 of time axis ranges (minimum sampling period 1 μs) |
| External sampling | Max. 500 Ks / (minimum sampling period 2 μs) |
| Recording length | Settable in 1-step divisions, 25 to 40000 divisions / * Depending on the number of channels in use and amount of installed memory. With memory expansion max. 16000 divisions |
| Pre-trigger | Can record data from before the trigger point, from 100% or 95% of recording length, 15 settings |

Other functions | Waveform processing, waveform parameter processing, waveform averaging, memory segmentation (max. 255 segments), logging (numerical printout), X-Y waveform plot, voltage axis zoom x2 x 10; 3 settings, compression 1/2, zoom, variable display, graph superimposition |

Recorder Function

| Time axis | 20 μs to 1 h / division: 16 settings, 1 division = 100 samples, time axis compression 1/2 to 1/500; 8 settings *3 μs to 50 ms / division ranges shown on display. Printout speed is 20 mm/s |
| Sampling period | 1 μs to 100 μs: 6 settings (selectable from 1/100 or less of time axis) |
| External sampling | Max. 500 Ks / (minimum sampling period 2 μs) |
| Recording length | Changeable in 1-step divisions, 25 to 20000 divisions / *1, continuous / *2, only continuous for X-Y plotting / *3 With memory expansion max. 10000 divisions |
| X-Y axis resolution | 32 dots / division (display), 80 dots (horizontal) / x 60 dots (vertical) / division (printer) |
| Other functions | Reprinting of stored data (last 2000 divisions), logging (numerical printout), virtual recording (data are written to internal memory without the use of printer paper), additional recording (recording is resumed without overwriting previous data), voltage axis magnification x2 x 10; 3 settings, compression 1/2; 1 setting, variable display |

RMS Recorder Function (for 50/60 Hz and DC)

| Time axis | 5 μs to 1 h / division: 9 settings, time axis compression 1/2 to 100: 8 settings |
| Sampling period | 200 μs fixed (20 rms data/s) |
| RMS calculation accuracy | ± 0.1% f.s. |
| Recording length | Settable in 1-step divisions, 25 to 2000 divisions / *1, continuous / *2 With memory expansion max. 10000 divisions |
| Other functions | Reprinting of stored data (last 2000 divisions), logging (numerical printout), additional recording (recording is resumed without overwriting previous data), voltage axis magnification x2 x 10; 3 settings, compression 1/2; 1 setting, variable display |

Auxiliary Functions

| General | Printing of settings including input range, trigger time, etc, cursor measurement, scaling, comment input, screen hard copy, start condition retention, auto setup, auto saving, remote control, auto ranging, view function, online help key, key list printing, level monitor function |
| Scaling | Scaling: Translation of amplitude gradation only Variable: Arbitrary setting of the upper and lower limit of the waveform display range |
| Vernier function | Allows precision adjustment of input voltage. |
| Waveform judgment function (Memory recorder (FFT)) | Type: Area judgment using reference waveform for time axis waveform, X-Y plot, or FFT display. Parameter judgment for waveform parameter processing. Judgment output: pass/fail output, open-collector 5 V voltage output |
| Waveform parameter calculation (Memory recorder) | Average value, effective (rms) value, peak to peak value, maximum value, time to maximum value, minimum value, time to minimum value, period, frequency, rise time, fall time, area value, X-Y area value, and standard deviation |
| Waveform processing calculations (Memory recorder) | Average value, effective (rms) value, peak to peak value, maximum value, time to maximum value, minimum value, time to minimum value, period, frequency, rise time, fall time, area value, X-Y area value, and standard deviation |

CE mark compliance

| Applicable standards | Safety: EN61010 EM: EN55011, EN500082 |
**Reacorder & Memory Function**

- **Time axis (real-time recorder)**
  - 20 ms to 1 hour/ division; 16 settings, 1 division ≈ 100 samples, time axis compression 1/2 to 1/1000, 8 settings
  - Sampling period 1/100 of time axis range at memory recorder function

- **Time axis (memory recorder)**
  - 100 μs to 5 minutes/ division; 20 settings, 1 division ≈ 100 samples, time axis zoom x2 to x10; 3 settings, compression 1/4 to 1/10000, 12 settings
  - Sampling period 1/100 of less of time axis range (max. 1 μs)

- **Recording length**
  - Recorder: 25 to 10000+ divisions, continuous
  - Memory recorder: 25 to 20000+ divisions

- **Real-time-safe function**
  - Functions to be added, (version 2.30 or later)
  - Time axis (REC: recorder)
    - 200 μs to 1 hour/ DIV; 12 settings (less than 8 ch), 500 μs to 1 hour/ DIV; 12 settings (less than 1 ch), 1 DIV = 100 samples
  - Sampling period 1/100 of time axis range
  - Time axis (MEM: memory recorder)
    - 50 μs to 5 minutes/ DIV; 12 settings (less than 8 ch), 100 μs to 5 minutes/ DIV; 11 settings (less than 1 ch), 1 DIV = 100 samples
  - Sampling period 1/100 of less of time axis range

- **Waveform monitor**
  - Switching of recorder/memory recorder, and fixing recorder waveform during measurement

- **Trigger source**
  - Time trigger

- **Waveform memory (on semiconductor memory of main unit)**
  - For MEM waveform, the last 2000 DIV portion (or 10000 DIV if there is memory expansion) of data is saved to the semiconductor memory of the main unit, enabling reversed scroll monitoring and re-printing.

- **Storage media**
  - MO disk, driven by 9607 MO UNIT (factory option)

- **Saved contents in MO disk**
  - MEM waveform data (Real-time safe data), REC waveform data (Compressed data), Index file

- **FFT Functions**
  - Functions to be added, (version 2.00 or later)

1. **Signal analysis**
   - Linear spectrum, RMS spectrum, power spectrum, auto-correlation, histogram, octave analysis

2. **Correlation analysis**
   - Transfer function, cross-power spectrum, cross-correlation function, impulse response, coherence function

- **Frequency range**
  - 133 kHz to 400 kHz, resolution 1/400, 1/800, 1/2000, 1/4000

- **Number of sampling points**
  - 1000, 2000, 5000, 10000 points

- **Window functions**
  - Rectangular, Hann, Exponential

- **Wave viewer (Wv) software**
  - (Supplied accessories, added from Aug. 2000)
    - Simple display of waveform files, Converts binary files to text files; CSV:space/tab pause selectable, a selection can be specified and thinning enabled.
    - Display format settings: scroll function, enlarge/reduce display, display CH settings
    - Trace the value, jump to the point of cursor/trigger, etc.

- **Operating environment**
  - Windows95/98/Me, Windows NT 4.0, OSR3 or later/2000/XP

**Options (sold separately)**

- **Dimensions and mass**
  - Analog UNIT: approx. 170 (6.69) W (MO unit attached)
  - Analog UNIT: approx. 170 (6.69) W (MO unit not attached)
  - Analog UNIT: approx. 280 (10.87) W (MO unit attached)
  - Analog UNIT: approx. 280 (10.87) W (MO unit not attached)

  - Voltage measurement: 250 +/− 3 dB, 1% steps

- **Accuracy**
  - DC amplitude ±0.4% f.s. ±0.15%
  - Temperature measurement: ±0.1°C, ±0.1% of f.s. ±2°C

- **Zero position**
  - ±0.1% of range

- **Frequency characteristics**
  - DC to 400 kHz ±3 dB, AC coupling

- **Input resistance and capacitance**
  - 10 MΩ, 60 V DC

- **FFT ANALOG UNIT**
  - Accuracy at 23 ±5˚C/ 73 ±9°F after 30 min of warm-up time, accuracy guaranteed for 1 year.

- **Anti-aliasing filter**
  - Cutoff frequency 20, 40, 80, 200, 400, 800, 3k, 4k, 8k, 20k kHz, 40 kHz auto-select

- **Other functions**
  - Same as the 8936 ANALOG UNIT

**VOLTAGE/TEMPERATURE UNIT**

- **Dimensions and mass**
  - Voltage measurement range: 250 +/− 3 dB, accuracy guaranteed for 1 year.

- **Accuracy**
  - DC amplitude ±0.4% f.s. ±0.15%
  - Temperature measurement: ±0.1°C, ±0.1% of f.s. ±2°C

- **Zero position**
  - ±0.1% of range

- **Frequency characteristics**
  - DC to 400 kHz ±3 dB

- **Input resistance and capacitance**
  - 10 MΩ, 60 V DC

- **FFT ANALOG UNIT**
  - Accuracy at 23 ±5˚C/ 73 ±9°F after 30 min of warm-up time, accuracy guaranteed for 1 year.

- **Anti-aliasing filter**
  - Cutoff frequency 20, 40, 80, 200, 400, 800, 3k, 4k, 8k, 20k kHz, 40 kHz auto-select

- **Other functions**
  - Same as the 8936 ANALOG UNIT

**Memory recorder:** Depending on free capacity of MO disk

**Additional recording function:** Recording is resumed without re-printing. (version 2.30 or later)

**Additional recording function:** Recording is resumed without re-printing. (version 2.00 or later)

**Memory recorder:** Depending on free capacity of MO disk

**Anti-aliasing filter:** Cutoff frequency 20, 40, 80, 200, 400, 800, 3k, 4k, 8k, 20k kHz, 40 kHz auto-select

**Other functions:** Same as the 8936 ANALOG UNIT

**Accessories:** None

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

**Max. allowable input:** 400 V DC (upper voltage which when applied to between input pins does not damage front)

**Max. rated voltage to earth:** 370 V AC, DC (upper voltage which when applied to input channel casing or between input channel does not damage front)

**Accessories:** None

**Input card is optional**

**Dimensions and mass:**
- Approx. 170 (6.69) W (MO unit attached)
- Approx. 280 (10.2 oz) (MO unit not attached)
### 8939 STRAIN UNIT

**Dimensions and mass:**
- Approx. 170 (6.69) W × 200 (7.87) H × 148 (5.83) D mm (inch), approx. 250 g (8.8 oz)

**Inputs**
- Number of channels: 4
- Frequency characteristics: DC to 100 kHz ±3 dB
- Voltage input pull-up: DC, GND
- Voltage and pre-amplifier internal inputs: BNC terminals
  - With voltage input: input resistance, 1 MΩ; input capacitance, less than 200 pF
  - Charge input: miniature connector

**Suitable converters**
- Charge input: piezoelectric charge output acceleration pickup sensors, Internal pre-amplifier input: acceleration pickup sensors with inputs built-in pre-amplifier

**Measurement ranges**
- Charge input: 500/2 V/DIV to 100 kV/DIV
- Pre-amplifier internal input: (BNC terminal)
  - ±(0.5 %f.s. +2 μV) / ±(1 %f.s. +5 μV)

**Accuracy**
- ±0.05 %f.s.
- ±0.1 %f.s.

**Zero-position**
- ±0.5 %f.s.
- ±0.1 %f.s.

**Frequency characteristics**
- DC to 1 kHz ±13 dB
- Frequency resolution: 1/64 of range

**Balancing**
- Accuracy: ±10000 με

**Accessories**
- Conversion cable ×2

### 8940 F/V UNIT

**Dimensions and mass:**
- Approx. 170 (6.69) W × 200 (7.87) H × 148 (5.83) D mm (inch), approx. 300 g (10.6 oz)

**Inputs**
- Number of channels: 4
- Frequency characteristics: DC to 100 kHz ±3 dB
- Voltage input pull-up: DC, GND, A/D, AC (voltage, current), DC (others)

**Other functions**
- Voltage input pull-up: ON: (10 kΩ)/OFF
- Input coupling: DC, GND, AC (voltage, current), DC (others)

**Measurement ranges**
- Voltage input: 50 V rms or 60 V DC
- Max. rated voltage to earth: 30 V rms or 60 V DC

**Accessories**
- Input cord: not included

### 9320 LOGIC PROBE

**Dimensions and mass:**
- Approx. 122 (4.81) W × 27 (1.06) H × 42 (1.65) D mm (inch), approx. 150 g (5.3 oz)

**Input**
- Channels: common ground, digital / contact signal detection
- Input impedance: at least 500 kΩ digital input, at least 1 MΩ analog input

**Pull up resistance**
- 2 kΩ (contact input: pull-up at +5 V internal)

**Threshold level**
- +1.4 V, +2.5 V, +4.0 V

**Detect resistance**
- Open: at least 1 MΩ, short to earth

**Response time**
- 500 μs maximum

### 9335 LAN COMMUNICATOR

**Supported protocols:**
- 8626 (ver. 1.00 to 1.30), 8625 (ver. 1.10 or later, except ver 5.09), 8841, 8842 (ver. 2.0 to 2.09), 8720 (ver 2.0 to 2.09), 8826

**Provided media:**
- CD-ROM (1)

**Operating environment:**
- IBM PC/AT or compatible, (1024 × 768 or higher screen resolution)

**Recorder operating environment:**
- Compatible PC Card: LAN CARD (HOKI-tested), Connector: 10BASE-T

### 9333 LAN COMMUNICATOR

**Supported protocols:**
- 8626 (ver. 1.00 to 1.30), 8625 (ver. 1.10 or later, except ver 5.09), 8841, 8842 (ver. 2.0 to 2.09), 8720 (ver 2.0 to 2.09), 8826

**Supported media:**
- CD-ROM (1)

**Operating environment:**
- IBM PC/AT or compatible, (1024 × 768 or higher screen resolution)

**Recorder operating environment:**
- Compatible PC Card: LAN CARD (HOKI-tested), Connector: 10BASE-T

### 9321 LOGIC PROBE

**Dimensions and mass:**
- Approx. 170 (6.69) W × 200 (7.87) H × 148 (5.83) D mm (inch), approx. 310 g (10.9 oz)

**Inputs**
- Number of channels: 4
- Frequency characteristics: DC to 100 kHz ±3 dB

**Measurement ranges**
- Voltage input: 50 V rms or 60 V DC

**Accessories**
- Input cord: not included

### 8946 4ch ANALOG UNIT

**Dimensions and mass:**
- Approx. 170 (6.69) W × 200 (7.87) H × 148 (5.83) D mm (inch), approx. 310 g (10.9 oz)

**Inputs**
- Number of channels: 4
- Frequency characteristics: DC to 100 kHz ±3 dB

**Measurement ranges**
- Voltage input: 50 V rms or 60 V DC

**Accessories**
- Input cord: not included