HIOKI

Introducing the Portable Multi-channel Data Acquisition Recorder

MEMORY HiCORDER MR8875

User Guide

INTERNET
HIOKI Website

www.hioki.com

HIOKI company overview, new products, environmental considerations and other information are available on our website.

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Introduction

This user guide introduces the MR8875 Memory HiCorder's various characteristics and applications. It is designed to be used to extend distributors' and customers' knowledge of the product.

The Memory HiCorder MR8875 provides capability for recording 16 high-speed analog channels and 8 logic signals in a compact, A4-size footprint. It is Hioki's first Memory HiCorder model to feature a touch panel to enable intuitive operation.

Simple touch screen controls

Flip the screen when the input terminals are positioned at the bottom.

Full view

Top:
Input module slots (for up to 4 modules)
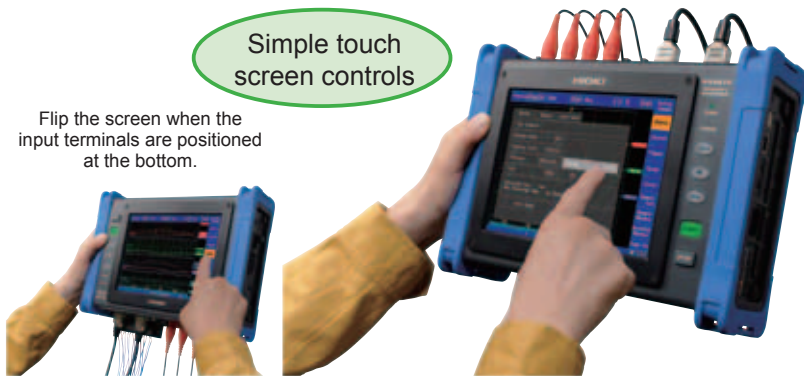
Left side:
Power connector
AC adapter outlet
Power port for
Differential Probes (x3)

Right side:
Interface
SD Card slot
Logic input port
I/O port

84 mm

224 mm
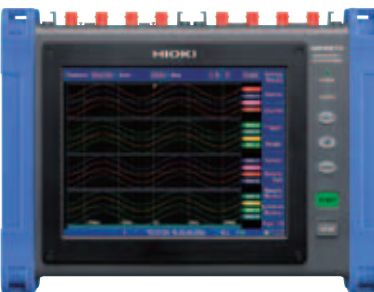
298 mm

Five input modules are available: Analog Units (2 types), Voltage/
Temperature Unit, Strain Unit, and CAN Unit.

Install input modules according to your specific needs
(4 modules can be installed at the same time).

● Analog Unit MR8901

　500 kS/s, 4 channels, 150 V DC isolated input

● Voltage/Temp Unit MR8902

　100 S/s, 15 channels, up to 100 V, support 9 thermocouple types

● Strain Unit MR8903

　200 kS/s, distortion/voltage 4 channels, converter cable included

● CAN Unit MR8904

　Networking speed 10 k to 1 Mbps, equivalent of 15 analog channels

● Analog Unit MR8905 *New*

　1000 V DC, 2 channels, 700 V AC direct input, RMS value measurements

Measurement signal	Optional input module	Measurement range	Resolution
NEW Voltage	Analog Unit MR8905	10 V f.s. to 1000 V f.s. Observe instantaneous and RMS waveforms	400 µV
Voltage	Analog Unit MR8901	100 mV f.s. to 200 V f.s.	4 µV
Voltage	Voltage/Temp Unit MR8902	10 mV f.s. to 100 V f.s.	0.5 µV
Voltage	Strain Unit MR8903	1 mV f.s. to 20 mV f.s.	0.04 µV
Current	Analog Unit MR8901 + Clamp on current sensor	Depends on current sensor(s) in use * Certain current sensors require a separate power supply	1/1250 div
RMS AC voltage	Analog Unit MR8901 + Differential Probe 9322	100 V rms to 1 kV rms	1/1250 div
Temperature (Thermocouple)	Voltage/Temp Unit MR8902	200 ˚C f.s. to 2000 ˚C f.s. * Upper and lower limit values depend on the thermocouple in use	0.01 ˚C
Distortion/Stress	Strain Unit MR8903	400 µε to 20,000 µε f.s.	0.016 µε
Analyze CAN signal	CAN Unit MR8904	2 ports/unit * 16bit analog signal: 15ch equivalent * Logic signal: 1bit/16ch equivalent	—

Directly input 1000 V DC and 700 V AC.
Plug the MR8905 into the Memory HiCorder to accommo-
date a broader range of applications requiring direct input in
CAT III (600 V) and CAT II (1000 V) environments.

The instrument is useful in applications that require recording of
waveforms for a vehicle's inverter voltage or primary- and secondary-
side ground lines that cannot be combined as a single signal.
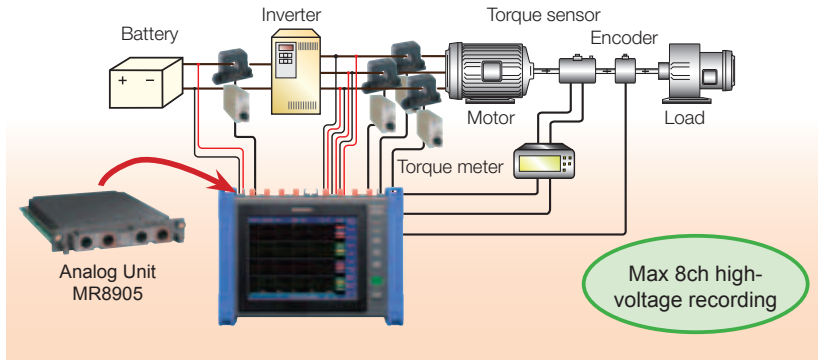
In factory environments, it can measure voltage flowing on 400 V AC
power lines and record both instantaneous waveforms and RMS values.
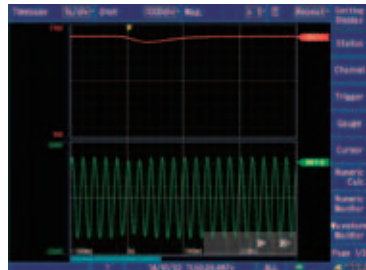
Directly input 150 V DC to accept direct input of 100 V AC power supply waveforms. And since it provides four channels of input, it can record twice as many phenomena as the MR8905.

Equipped with four MR8901 units, the MR8875 provides high-speed, isolated recording capability for up to 16 channels.
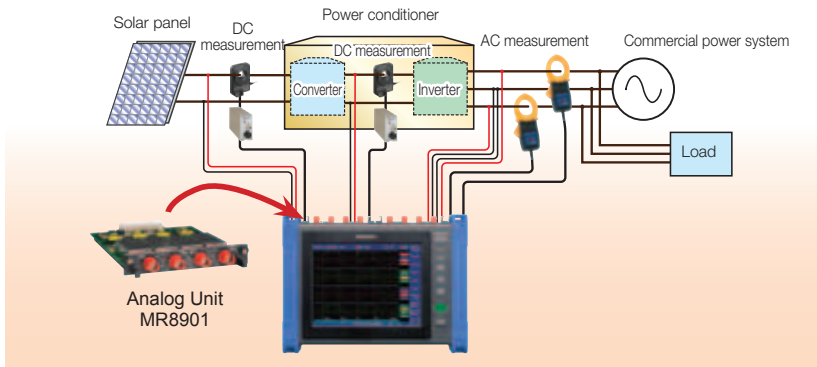
Since channels are isolated up to 100 V AC/DC, signals with different potentials can be recorded at the same time.

Equipment power supply voltage (100 V AC) and control signals can be recorded at the same time. The ability to use problematic phenomena such as a power supply, control signal, or sensor output voltage as a trigger for recording is useful when analyzing the causes of malfunctions.

5 Voltage/Temp Unit MR8902 -- Measuring multiple temperature signals

A single module lets you measure 15 channels of voltage or temperature (using thermocouples). Temperature can be recorded across up to 60 channels (with 4 modules installed) at a speed of 10 ms.
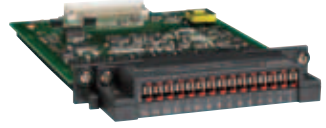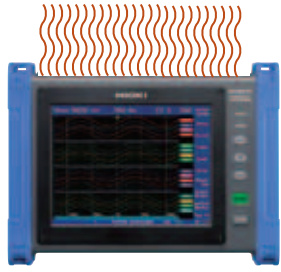
Voltage/Temp Unit MR8902

Mix-and-match different modules to simultaneously measure high voltage, distortion, CAN signals, and more, alongside temperature.
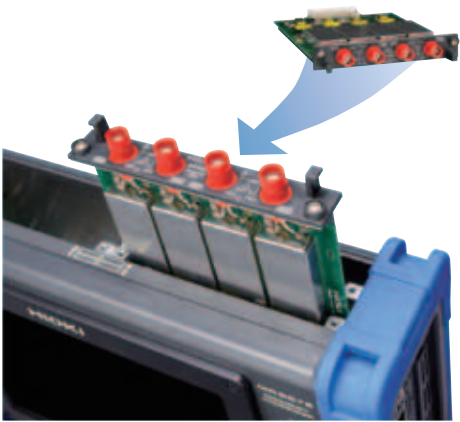
The plug-in modules use an input amplifier structure.

Customers can freely add or replace modules themselves.
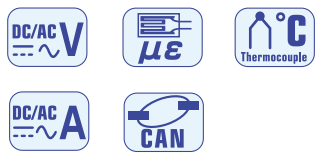
6 Strain Unit MR8903 -- Measure minuscule voltage levels from strain

With frequency characteristics up to 20 kHz, you can use acceleration sensors to record vibration waveforms.
(Highest sampling rate: 200 kS/s) A bridge box and distortion gauge can also be used to measure distortion. Real-time saving lets you get distortion data over extended periods of time.

Ships standard with a Tajimi's conversion cable, which is well known in strain measurement.

Strain Unit MR8903

In addition to distortion measurement, a highly sensitive voltage range makes the module perfect for measuring the voltages of low-output voltage sensors.
The unit can be set as low as 50 μV/DIV (1 mV full scale).

The Strain Unit MR8903 is particularly useful for measuring actinometers with low output voltages.

7 CAN Unit MR8904 -- Record CAN and analog signals simultaneously

This module lets you record the CAN bus signals that are used widely in automotive applications in the form of 15 channel analog signals. Vector's CAN database can be loaded using supplied software, allowing you to easily edit data.

CAN Unit MR8904

CAN signals and analog signals can be recorded simultaneously on a single Memory HiCorder.
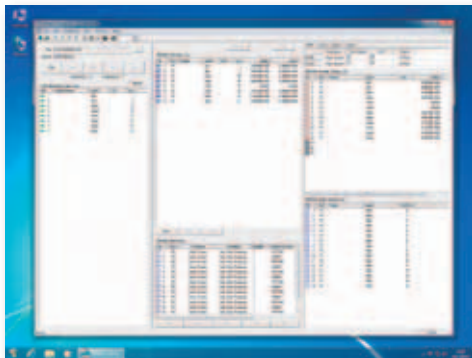
CAN Editor (bundled software)

8 Where can I use this?

Industrial Robots

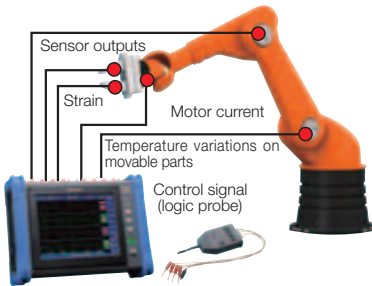| Voltage | Temperature | Strain | Control Signals |

The plug-in module-based architecture means you can mix and record a variety of signals across multiple channels. Ideal for verifying the operation of multi-axis robots.

Sensor outputs
Strain
Motor current
Temperature variations on movable parts
Control signal (logic probe)

Example of module combinations	Analog Unit MR8901	x 2
	Voltage/Temp Unit MR8902	x 1
	Strain Unit MR8903	x 1

R&D or Laboratory Experiments

| Voltage | Temperature |

Multi-channel/long-term recording, useful in performance/durability testing

- Record sensor output.
- Evaluate sensors and other devices.
- Use as an X-Y recorder (flatbed).

| Example of module combinations | Analog Unit MR8901 | x 2 |
| | Voltage/Temp Unit MR8902 | x 2 |

Development of Construction Machinery, Agricultural Machinery, and Automobiles

| Voltage | Temperature | Strain |

Enhanced environmental temperature and vibration resistance enable the Memory HiCorder to withstand harsh measurement environments.

Example of module combinations	Analog Unit MR8901	x 1
	Voltage/Temp Unit MR8902	x 1
	Strain Unit MR8903	x 1
	CAN Unit MR8904	x 1

Testing of power equipment

| Voltage | Temperature | Control Signals |

1000 V DC and 700 V AC direct input
Test electrical power equipment

Load rejection testing
Analyze the correlations among factors such as the generator voltage before and after circuit-breaker operation, degree of variability in RPM, governor servo operating status, and pressure regulator operation timing.

| Example of module combinations | Analog Unit MR8901 | x 2 |
| | Voltage/Temp Unit MR8902 | x 2 |

9   I want to record data from a solar power system

The Memory HiCorder can measure solar power systems using an actinometer. With the Analog Unit MR8905, you can directly input up to 1000 V DC.

Connector box

Voltage   Current

Solar radiation

Temperature
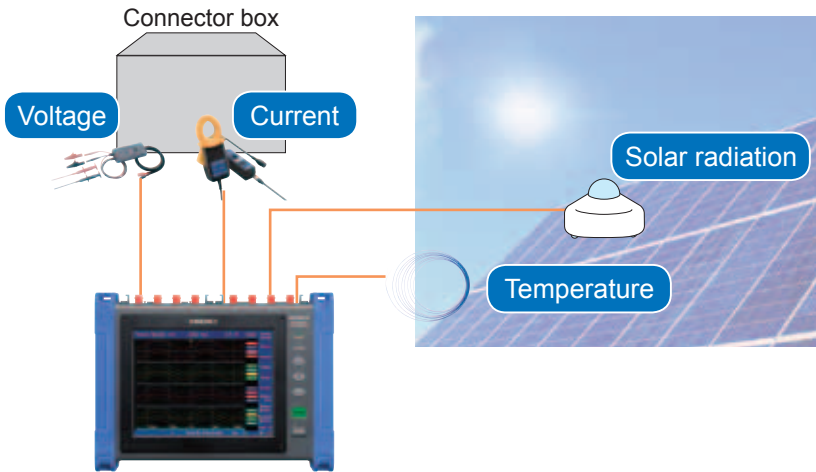
Voltage   Differential Probe

Used when measured voltage exceeds 1000 V DC (up to 2000 V DC). (When using the Analog Unit MR8901, utilize the differential probe with voltages in excess of 150 V DC.)

Current   AC/DC Clamp On Sensors

Two types of sensors are available: CT9692 (20/200 A) and CT9693 (200/2000 A).

Temperature   with thermocouple

Use any length necessary.

Solar radiation   with actinometer

Measure solar radiation.

10 | I want to record signals from automobiles

16 channels of high-speed analog signal recording lets you pick up data from inside the vehicle. Place on the dashboard or passenger seat to monitor waveforms over time.
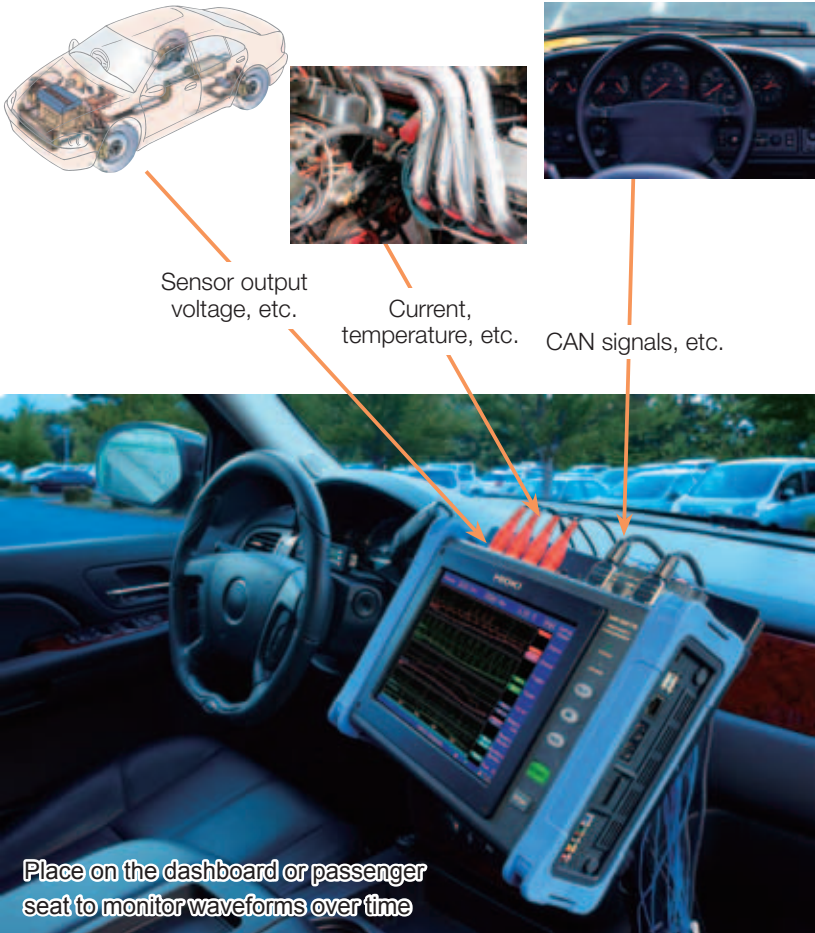

Sensor output voltage, etc.

Current, temperature, etc.

CAN signals, etc.

Place on the dashboard or passenger seat to monitor waveforms over time

11 | I want to save high-speed data in real time

You can record high-resolution data in real time to an SD memory card. At the fastest 2 μsec cycle, you can record approximately 36 minutes of data to a 2 GB SD Card at 1-channel settings.

Input   A/D conversion

25000 pts

Isolated

Min 2 μsec (Sampling rate: 500 kS/s)
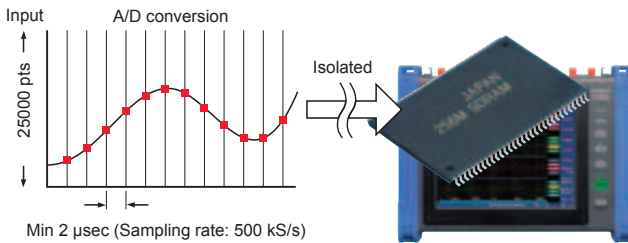
Load to internal storage

Sampling rate: 500 kS/s simultaneously across all channels
(2 μsec cycle)
16bit resolution (25000 points)
8 million data/module

Input   A/D conversion

Isolated

Min 2 μsec (Sampling rate: 500 kS/s)
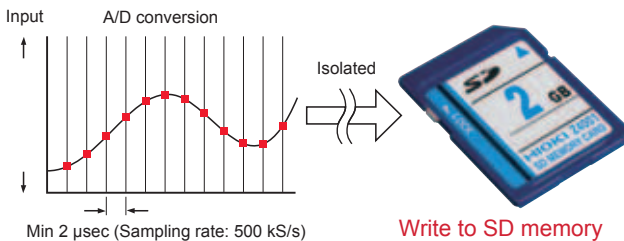
Write to SD memory card in real time

Super high-speed data saving
60-channel recording possible with a sampling rate of 50 μs or less.

Operation is guaranteed only with a genuine Hioki SD memory card.

12 I want to record logic and pulse signals

The instrument ships standard with recording terminals for eight channels of logic signal input and two channels of pulse signal input.

Since the instrument is built in with terminals for pulse input and logic probe input, input modules can be used exclusively to record analog signals.
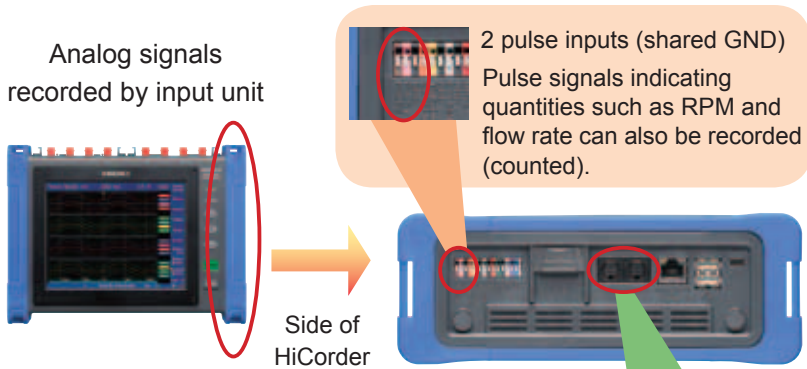
Analog signals recorded by input unit

2 pulse inputs (shared GND)

Pulse signals indicating quantities such as RPM and flow rate can also be recorded (counted).

Side of HiCorder

Logic probe terminals

Use to record ON/OFF (logic) signal waveforms of a relay and PLC.

Logic Probe 9320-01

For low voltage equipment; for voltage/contact signal ON/OFF detection up to 50 V DC, GND shared across channels

Logic Probe MR9321-01

For high voltage equipment; for ON/OFF detection of 100 V/200 V AC/DC line voltages, isolated inputs for all channels

Touch screen for intuitive operation

Operation is intuitive since the user touches the screen directly to control the instrument. This approach yields a dramatic improvement in convenience in the field. In addition, the number of hardware buttons on the instrument has been minimized, allowing the screen to be enlarged.

● Backscroll display

Display past waveforms during measurement without losing any records.
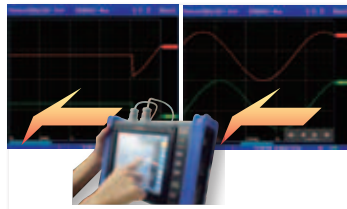
● Advanced cursor read functions

Six cursors marked A through F are available, compared with the conventional A- and B-cursors. This is useful for multi-channel waveform analysis.
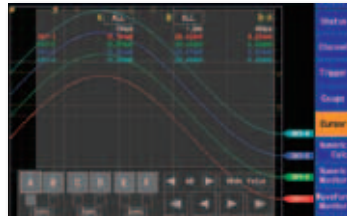
● Split screen and sheet display

The waveform screen can be divided into four windows, and you can also define up to four sheet displays.
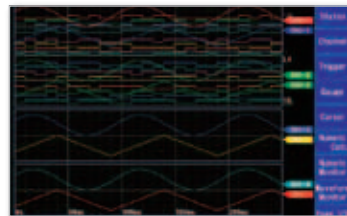
● Event marker input and jump function

Up to 1000 event markers can be entered. You can quickly jump to any mark location, letting you quickly search for the area you want.

What can I do with FFT analysis functions?

The MR8875 has featured FFT analysis functions since version 2.01.
A variety of features are included to support analysis.

● 4-channel FFT analysis function
FFT analysis can be carried out for
one input or simultaneously for up
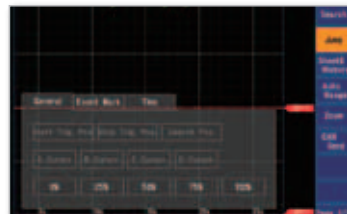to four inputs, allowing analysis of
frequency components occurring at a
single point in time on a channel-by-
channel basis.
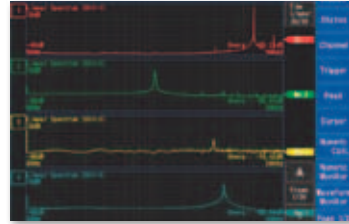
● Peak value display function
Up to 10 analyzed waveform peaks
can be calculated and displayed at
once.
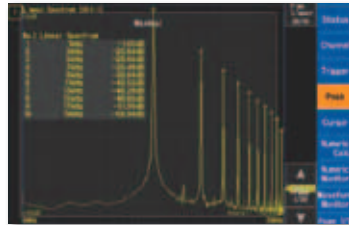
● Running spectrum display function
This function can be used to
continuously display spectra that
change over time. The 3D display
shows you how things are changing.

● Overlay display function
This function can be used to observe
variations in waveforms captured
using continuous measurement over
time.

15 | I want to use numerical/waveform calculation functions

The MR8875 has featured waveform operation functions since version 2.01. A combination of up to 8 calculations selected from the instrument's 25 numerical calculations and 24 waveform calculations can be performed simultaneously.

8 calculations at once

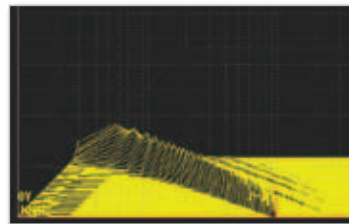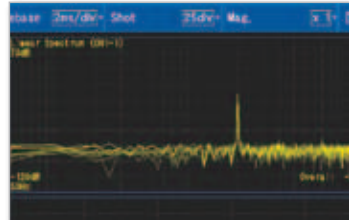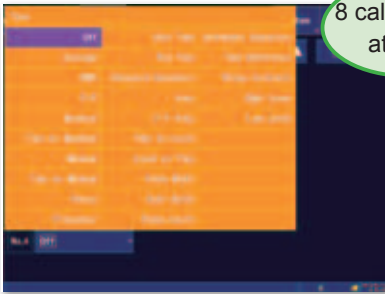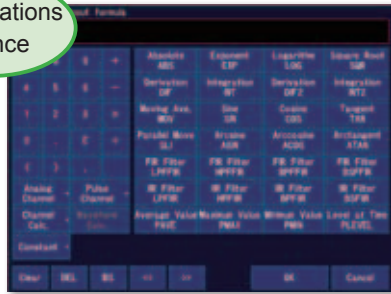Numerical calculation settings screen   Waveform calculation settings screen

● **Real-time inter-channel calculation**

This function allows you to observe and record results for up to two calculations on the same input module while measurement continues.

CH-1 measured waveform

CH-2 measured waveform

Real-time waveform calculation results
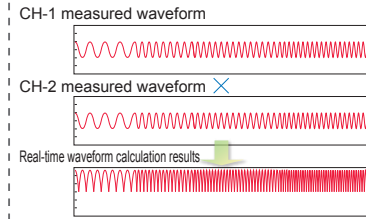
● **Digital filter calculations**

This function allows the necessary bandwidth portion of a waveform containing noise to be calculated and the resulting waveform displayed.

Measurement results of distorted waveform containing noise

Simulated results after passing through a low-pass filter to remove high-frequency distortion

L.P.F. - calculated waveform

H.P.F. - calculated waveform

B.P.F. - calculated waveform

16 | What type of PC analysis software is available?
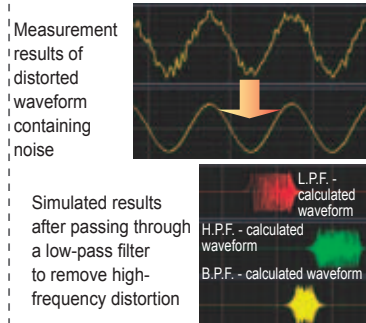
The WaveViewer (Wv) PC application software is bundled with the MR8875. Other powerful software includes Wave Processor 9335 (option) and CAN Editor, useful for CAN signal measurement.

WaveViewer Wv (bundled software)

Free software included with MR8875
- Simple waveform file display
- Text conversion (CSV)
- Display format customization

Download the latest version of the WaveViewer from the HIOKI website at www.hioki.com.
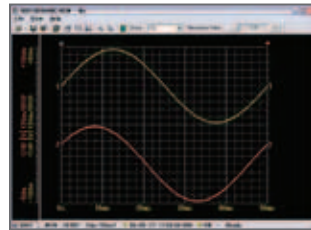
Wave Processor 9335 (option)

Offers more advanced features than WaveViewer Wv
- Waveform display
- Text conversion (CSV)
- File load

9335-only features
- Display format settings (X-Y display)
- Freely expand time axis/direction
- Numerical calculations
- Printing
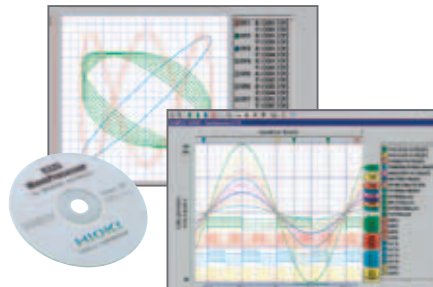
CAN Editor (bundled software)

Free software included with MR8875
For more details, refer to "I need to configure CAN settings (P. 21)".
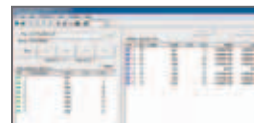
17 What are the different data communication methods?

● LAN and USB interfaces

Take advantage of the built-in 100BASE-TX LAN and USB 2.0 Mini-B interfaces to network with the PC.

USB

LAN
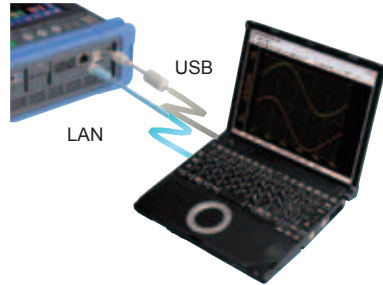
● A variety of network functions

Remotely control the MR8875 and transfer data using the LAN network.

Remote control via Web server   Receive data via FTP

WEB server   **FTP server**   **FTP client**

FTP client   **E-mail send**   **FTP server**

LAN network

Web browser

Send data via FTP   **SMTP Mail Server**

INTERNET   Attach data to E-mail
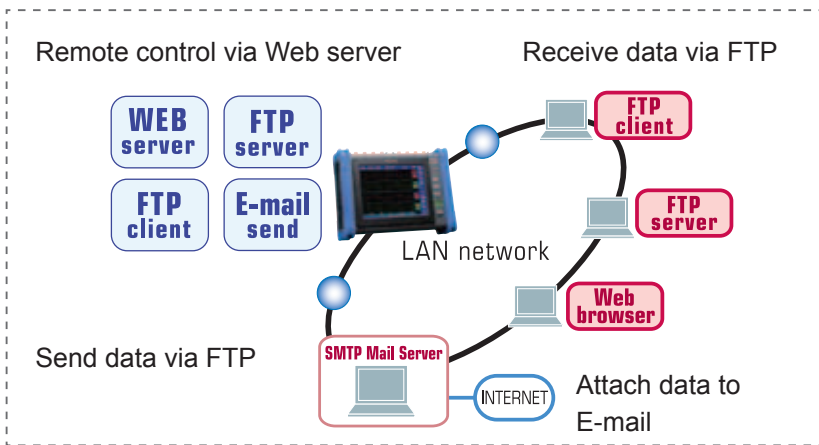
● SD memory cards/USB memory

Convenient SD memory cards or USB memory sticks can be used to copy data from the MR8875's internal storage memory. Data stored in the MR8875's SD card can also be downloaded to the PC using a USB cable.

USB memory
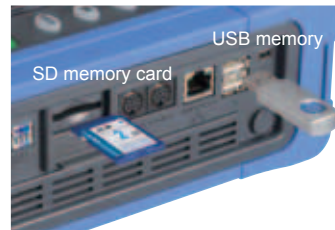
SD memory card

While it is possible to save to USB memory stick, we recommend using official HIOKI SD memory cards to ensure against data loss.

18 I need to configure the CAN settings

You can create data with the supplied CAN Editor software.
Using this software allows you to load Vector's CAN database.
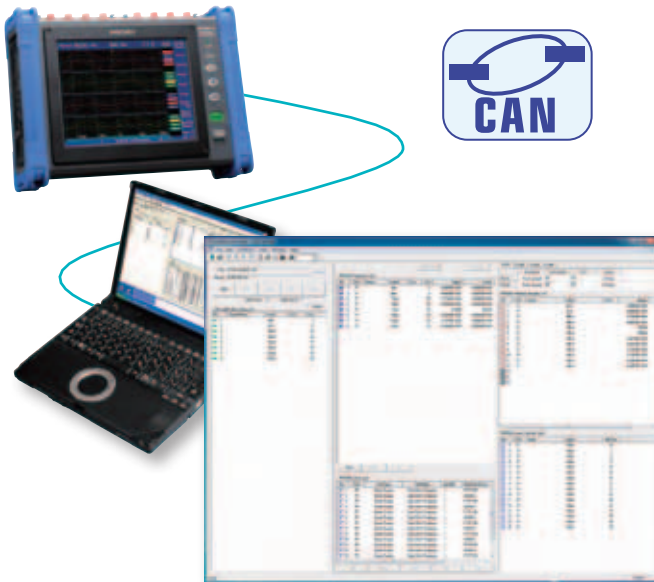
CAN Editor (bundled software)

Industry standard CANdb database files can be loaded into the sup-
plied setting software and associated to the CAN channel signals.

19 | What level of environmental resistance does the MR8875 offer?

● **Wide operating temperature range**

The operating temperature range is wider than its legacy products; from -10 ^{o}C to 50 ^{o}C, making measurement possible even in hostile environment.

Many measuring instruments work at an operating temperature range of 0 ^{o}C to 40 ^{o}C.

● **Improved anti-shock capability**

The MR8875 is compliant with the JIS D1601 for vibration resistance performance and is designed to withstand the harsh conditions for in-vehicle measurement.

● **Data saved securely, even when the power's out**

Even if power is cut while the MR8875 is saving data in real time, an internal high-capacity capacitor retains power until the data save is complete.
* For genuine Hioki SD memory cards only.

! MR8875 power cut

Data protected! Automatically restart measurement when the power's back on

20 What accessories and options are available?
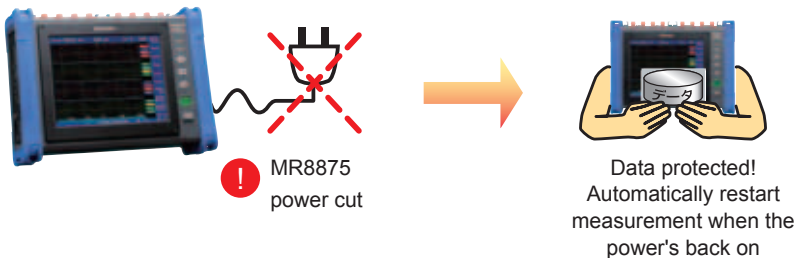
● **Battery Pack Z1003**

Large storage: 7.2 V at 4500 mAh
Continuous operating time: Approx.
1 hour with backlight on

Rear of
MR8875

Battery pack fits securely
in rear
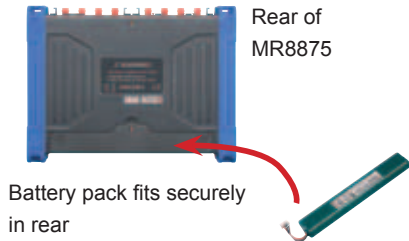
● **DC power cord**

An optional power cord terminating
in bare wires.
Connects to 12 V/24 V external
power supplies.

External
power supply
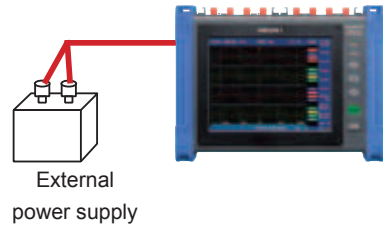
● **Differential Probe 9322**

Measure 2000 V DC or 1000 V AC
with the Analog Unit MR8901.

● **Current measurements**

A wide selection of optional sensors are available, from commercial frequency current to DC and high-frequency current probes.

Leak current/load current
measurement

Current waveform observation

Application Example 1
Magnetic field measurement and FFT analysis

Development of high-output train cars and electric vehicles is leading to stronger magnetic fields in the passenger spaces of train cars and in automobiles. The strength of a given magnetic field varies with the output (current) of the motor producing it. By using the Memory HiCorder MR8875 in conjunction with a magnetic field tester, it is possible not only to record measurements of instantaneous values while stopped and time-axis measurements of magnetic fields during operation, but also to perform simultaneous three-axis FFT analysis (for the X-, Y- and Z-axes).

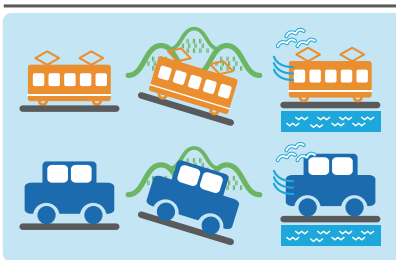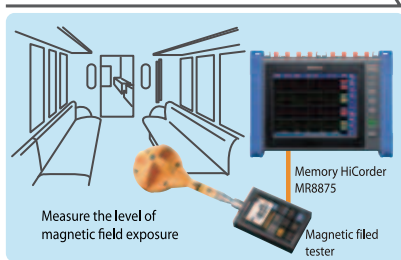(1) Magnetic field strength inside vehicles varies with the environment and location

(2) Use Memory HiCorder MR8875 to record the monitor output of a magnetic field tester

Memory HiCorder MR8875

Measure the level of magnetic field exposure

Magnetic filed tester

(3) Performing the FFT analysis on the measuring field strength

Magnetic waveforms in
X-axis
Y-axis
Z-axis

FFT analysis results

You can perform the FFT analysis of up to 4 channels simultaneously
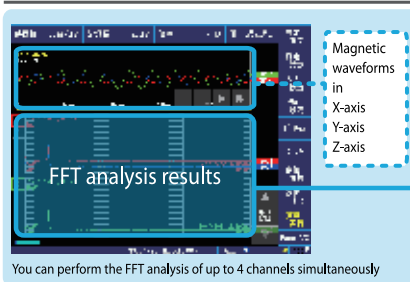
(4) will let you see which frequency band has a strong field
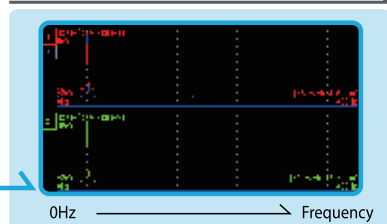
0Hz — Frequency

Any device or equipment associated with a peak frequency is considered to be the source of a magnetic field

FFT analysis provides an understanding of operating frequencies so that you can estimate which equipment is producing magnetic fields, allowing implementation of effective countermeasures such as shielding.

Application Example 2
Energy-saving measures for machine tools

The Memory HiCorder MR8875 can be used to monitor the power (motor power, heater power, etc.) for individual manufacturing (molding) process-es. By using the Voltage/Temp Unit MR8902, it is also possible to simulta-neously record heater temperature waveforms.

Sensor output signals

Process signals

Machine power consumption

Memory HiCorder MR8875

Clamp-on power HiTester 3169-21

Logic Probe 9320-01

Analog signal

Logic signal

1. Record process signals from a machine tool as logic signal waveforms from logic probes with the Memory HiCorder MR8875.
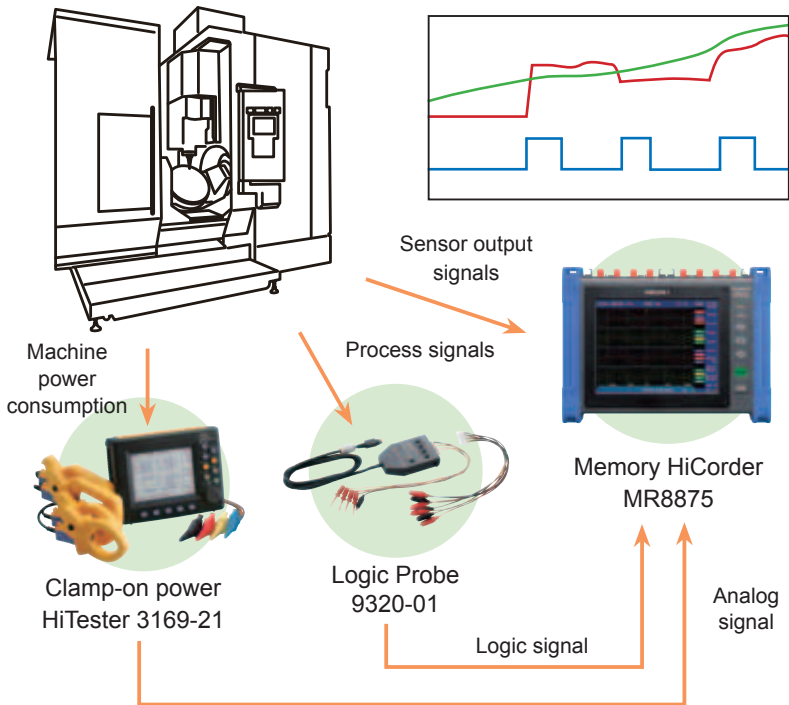2. Measure motor power or heater power with the Clamp On Power HiTester 3169-01 and record that instrument's analog signal output with the MR8875.
3. By carrying out a comparative analysis of the resulting waveforms and optimizing machine tool parameters such as voltage and flow rate accordingly, you can reduce the amount of energy used by the equipment.

Application Example 3
Phase synchronized testing at power plants

The MR8875 can be used to conduct Phase Synchronized Testing when connecting generators to power circuits.

■ When connecting output from a generator to a power circuit, it is necessary to match the phases of the generator output with the phases of the power circuit. Commands should be issued to the synchronization equipment so that the generator is connected to the circuit when the beat voltage, which indicates the phase difference, reaches its minimum value.

■ The MR8875 MEMORY HiCORDER can be used to capture the command signal, contact operation, beat voltage, and current flowing from the generator to the power circuit.

■ This type of testing is necessary when departments involved with generation at power companies deploy new circuit breakers and synchronization equipment, and during maintenance of that equipment.

■ Personnel observe the timing at which the circuit breaker contact operation and beat voltage converge based on the input command from the synchronization equipment and verify that operation falls within specifications.
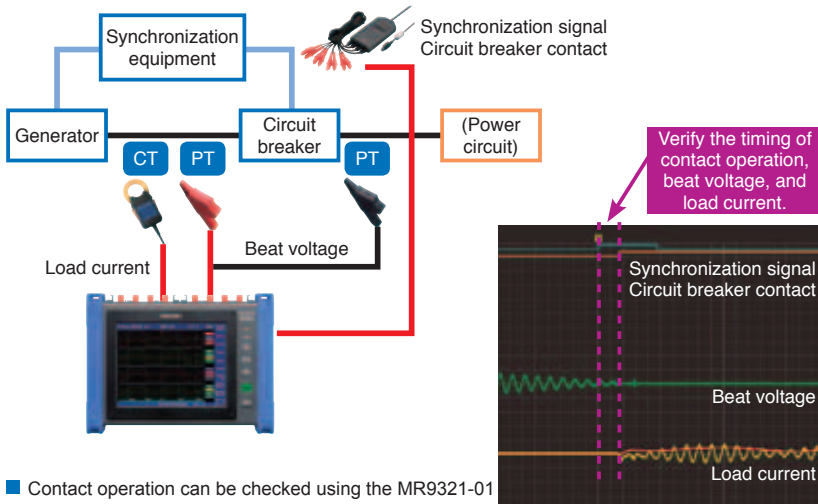
■ Contact operation can be checked using the MR9321-01 Logic Probe, and the load current can be checked using the CT9691-90 AC/DC Sensor.

■ The instrument is compact and can be used with an optional battery and printer, making it easy to transport in the field.

■ The instrument's scaling function can be used to directly read PT/CT primary-side values.

■ Analog input channels are isolated, and there is no need to use a common ground as with an oscilloscope.
*Maximum ratings: 600 V AC/DC terminal-to-terminal, 600 V AC/DC terminal-to-ground

24 Application Example 4
Timing testing of circuit breakers (switches) at power plants and electrical substations

> The MR8875 Memory HiCorder can be used to test the operational timing of circuit breakers (switches) at power plants and electrical substations.

- This capability can be used when deploying new circuit breakers and during regular testing of circuit breakers at power plants and electrical substations.
- Using the introduction of the command current as the reference, check the operational timing for each phase contact as well as the operational variation time for each phase and verify that the obtained values are within specifications.
- This capability is used by power companies' generation and distribution maintenance groups and by electrical companies that perform contract work for power companies.

Time from introduction of command current until each phase contact operates
Variation in the contact operating times for each phase

Isolate   Isolate

Circuit breaker control panel

Ground for safety

Command current

Contact operation

Command current

Supply voltage

- Contact operation can be checked using the 9320-01 Logic Probe, and the command current can be checked using the CT9691-90 AC/DC Sensor.
- The instrument is compact and can be used with an optional battery and printer, making it easy to transport in the field.
- Analog input channels are isolated, and there is no need to use a common ground as with an oscilloscope.
  *Maximum ratings: 600 V AC/DC terminal-to-terminal, 600 V AC/DC terminal-to-ground
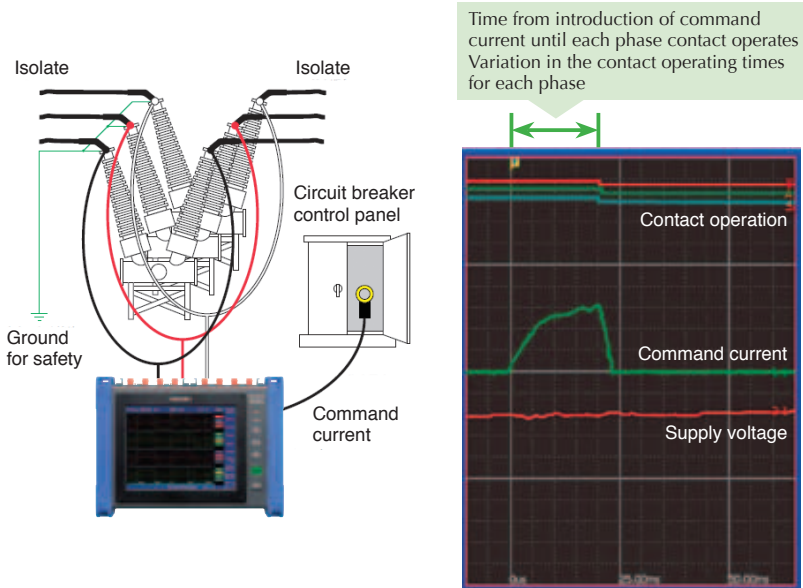
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UG_MR8875E1-4XB