Portable 2-channel / 4-channel FFT Analyzer

CF-9000 Series

Innovative features in a tough body
The right tool for quickly making decisions and A reliable partner that accepts no compromise.

Portable FFT analyzer

CF-9200
[For 2-channel analysis]

CF-9400
[For 4-channel analysis]

Speedy
Keys and a touch panel for quick, light and intuitive operation
With the CF-9200/9400, basic FFT analysis operations such as display, measurement, stopping, recording and readout can be made positively and quickly through the large hard keys. The touch panel provides an intuitive interface, allowing the operator to easily perform speedy and reliable operations by a swipe or tap with fingers on the screen, such as selecting the number of waveforms displayed and scaling of the X and Y axes to the desired scale.

Flexible
5 hours*1 of continuous cordless operation. Replacement of batteries while powered on
The CF-9200/9400 includes the two on-board, large capacity lithium ion secondary batteries which enable continuous cordless operation of 5 hours*1. The hot swap feature which allows battery replacement while it is power-on enables continuous measurement operation of analysis and recording without interruption. The built-in battery in the main unit can also be charged while in operation.*2

*1 CF-9400 4ch, when CCLD is ON.
*2 Full recharge takes 8 to 9 hours (depending on the usage conditions) with the power on, and 4.5 to 5 hours with the power off (at operating environment 20°C).

Silent and non-vibration by fan-less & spindle-less structure
Fan-less and spindle-less structure prevents occurrence of mechanical sound and vibration. The CF-9200/9400 itself does not become the cause of sound and vibration, and not disturb measurement and recording in a field. By installing wireless LAN adapter, you can operate remotely* without touching the main body of the CF-9200/9400.

*When Microsoft® Remote Desktop is used.

**For 4-channel analysis**
**For 2-channel analysis**

The CF-9200/CF-9400 is an all-in-one portable FFT analyzer. All FFT analysis operations can be performed with the integrated hard keys and capacitance type touch panel without requiring a PC.

Newly developed exclusive 100 kHz high-performance analysis front-end system incorporating 24-bit A/D converter analyzes sound and vibration of a piping/pump in a factory plant, motor, automobile, railway vehicle, mechanical instruments including home electrical appliances, and electrical /electronic parts.

The CF-9200/9400 help to find solutions for field workers in their FFT analysis including the resonance and frequency characteristics of mechanical structures by using an electromagnetic exciter or an impulse hammer.

FFT, RTA, excitation control & simultaneous recording

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The CF-9200/CF-9400 is an all-in-one portable FFT analyzer. All FFT analysis operations can be performed with the integrated hard keys and capacitance type touch panel without requiring a PC.

Newly developed exclusive 100 kHz high-performance analysis front-end system incorporating 24-bit A/D converter analyzes sound and vibration of a piping/pump in a factory plant, motor, automobile, railway vehicle, mechanical instruments including home electrical appliances, and electrical/electronic parts.

The CF-9200/9400 help to find solutions for field workers in their FFT analysis including the resonance and frequency characteristics of mechanical structures by using an electromagnetic exciter or an impulse hammer.

**Versatile**

**FFT, RTA, excitation control & simultaneous recording**

The CF-9000 series are compact and versatile to carry out various operations including linear/log, sweep analysis using signal output, amplitude control of electromagnetic exciter*1, as well as FFT Analysis, real-time octave analysis*1, and rotation tracking analysis*2.

It can also perform simultaneous analysis and recording operations, allowing offline analysis by CF-9200/9400 main unit and software applications*4.

*1 Real-time Octave Analysis (RTA) (CF-0923) is required.
*2 Tracking Analysis (CF-0922) is required.
*3 Log Sweep/Excitation Control (CF-0942) is required.
*4 Please refer to P.10, 11 for details.

**Quiet**

**Silent and non-vibration by fan-less & spindle-less structure**

Fan-less and spindle-less structure prevents occurrence of mechanical sound and vibration. The CF-9200/9400 itself does not become the cause of sound and vibration, and not disturb measurement and recording in a field. By installing wireless LAN adapter, you can operate remotely* without touching the main body of the CF-9200/9400.

*When Microsoft® Remote Desktop is used.
Dynamic and Steady
Various function designed through accumulated

Real-time tripartite graph display / Vibration criterion curves

The CF-9200/9400 are equipped with real-time tripartite graph*1 display as a new standard function. Three amplitude values (acceleration (m/s²), velocity (m/s) and displacement (m)) at any arbitrary frequency can be read simultaneously in real time during FFT analysis of vibration. By processing 1/3 octave and displaying VC curves*2 (Vibration Criterion Curves), allowable vibration reference or setting environment evaluation of vibration sensitive instrument, such as AFM, electronic microscope, and Laser interferometer is able to be judged quickly.

You do not need to operate differential and integral processing individually by using the frequency analysis function and conversion of amplitude values as before. Therefore, this function enables you to read three amplitude values quickly.

*1 The tripartite graph (diagram) enables you to read amplitude values of acceleration (m/s²) and displacement (m) which is based on velocity (m/s), on the frequency (Hz) axis.

*2 VC Curve is proposed as a guide of allowable small vibration for setting precise machinery. Evaluation in 1/3 octave band width when VC Curve is used. It is divided in total 5 stages at an interval of 6 dB (VC-A, VC-B, VC-C, VC-D and VC-E) by the aim of usage for various instruments such as light microscope or laser equipment with long light path.

Wide dynamic range

The CF-9200/9400 feature a new 24-bit A/D front-end system, offering more than 120 dB wide dynamic range. Changing voltage range due to A/D over is not required by this function anymore, which had been frequently performed in general acoustic or vibration measurement. Wide dynamic range allows more efficient measurement and data recording, easier to operate even for novices.

Isolated all inputs

All signal input channels are isolated (insulated). With high resistance to ground loops and super imposed noise, the main unit offers highly reliable measuring performance even in locations which is prone to potential difference. The isolation scheme also protects the crucial areas of the FFT system from sensors or signals that can be exposed to harmful transient voltages.

Equipped with CCLD*1, applicable to TEDS*2

Each channel of the CF-9200/9400 is equipped with CCLD (power supply for sensors) which can directly drive an accelerometer with built-in preamplifier or a microphone preamplifier enabling direct connection to an FFT Analyzer without using external amplifier. 2 to 4 mA of CCLD is commonly used.

*1 What is CCLD (Constant Current Line Drive)?
It means a sensor interface using constant current supply. CCLD for an accelerometer with built-in preamplifier or a microphone preamplifier enables direct connection to an FFT Analyzer without using external amplifier. 2 to 4 mA of CCLD is commonly used.

*2 What is TEDS (Transducer Electronic Data Sheet)?
It is a standardized method which describes the information relevant to a measurement sensor. It is defined in the IEEE 1451 series. As information of a TEDS sensor is automatically read to the TEDS available measurement devices, the user is ready to take measurements. It can avoid setting error and also saves you time and effort of troubleshooting and measurement preparation.
Various functions designed through accumulated technology on CF-9200 / 9400

Easy operation through a touch panel interface

The CF-9200/9400 employ a 10.4 LCD capacitance type touch panel, allowing the operator to tap and swipe graphs. The band or gain which you have selected can be widened or narrowed with a simple and intuitive action. Only a simple gesture (finger movement) operation is needed to perform the following functions; fitting waveform amplitude to the graph scale, changing positions of waveform graphs, scaling of time axis and frequency axis, offsetting of waveform, and graph span adjustment.

Reliable inputs with large hard keys

Operations such as turning the power on and off, changing data types and saving data are carried out using the new large hard keys. An excellent operational feeling of these keys assists fast and correct input even in unstable or narrow space and prevents data missing or malfunction.

Lock function (HOLD) for hard keys and touch panel are equipped in order to prevent unintended inputs and setting changes.

Highly visible LED indicators

Statues of major FFT operations are shown by LED indicators. The hard keys for major functions also have LED indicators. This enables the operator to monitor operating state of FFT, such as the power-up process, the charging state of the secondary batteries, and the excessive input to an A/D converter even from a distance.

Cable disconnection detecting function

When cable disconnection detecting function is on, the CF-9200/9400 automatically detects cable disconnection or connector trouble of an accelerometer and a microphone*, preventing trouble before measurement.

* Microphone with a built-in constant current line drive (CCLD) type preamplifier.
From the laboratory to the field, real-time waveform and simultaneous waveform recording are achieved

**CF-9200 / 9400**

**FFT Basic Analysis Function**

**Time-axis Waveform**
Performs A/D conversion of the voltage signal of vibration, noise, distortion, current probe, etc. coming from a sensor and displays the result as time-domain data. The X and Y-axis values at any point can directly be read using the search cursor. The delta cursor function makes it easier to read the time difference and level difference. The time-axis data statistical processing function enables quantitative time waveform analysis and diagnosis of such items as mean value (MEAN), root mean squared value (RMS) and crest factor.

**Power Spectrum**
The power spectrum shows the magnitude of each frequency component included in the time-axis waveform, which has been obtained with the FFT Analyzer, in the form of graph with the frequency on the horizontal axis by calculating the power of each frequency band (frequency resolution \( \Delta f \)).

Power spectrum analysis enables detection of abnormal conditions of a facility, which are difficult to be estimated through measurement of vibration, noise level, and observation of time waveform. The natural frequency of a structure can also be measured.

**Frequency Response Function**
The frequency response function (FRF), in a mechanical system or an electrical circuit system, shows the input-to-output ratio as gain and phase characteristics on the axis representing frequency. The gain characteristics indicate how the amplitude of input signals changes as they pass through the transfer system being evaluated. The ratio of the output amplitude to the input amplitude is plotted on the Y-axis. The phase characteristics indicate phase advance/delay between the input and output signals with the Y-axis plotted in degrees or radians.
CF-9200 / 9400

Optional Software for Analysis

Tracking Analysis (CF-0922)

CF-0922 Tracking analysis function automatically stores FFT values during calculating the vibration or noise which has occurred when rotating with wide variation speed, and analyzes the physical phenomena with reference to the rotation speed, such as vibration and noise changing with speed. Since machines (rotary machine) turning at their axes including an engine, a gearbox turbine, and a motor turn in wide range of rotation speed from low to high, they may produce large vibration and noise by the resonance of component parts at specific rotation speed. To reduce the risk of destruction and to increase quietness, it is necessary to evaluate the relationship of natural vibration frequency between rotation speed and component parts.

By using the CF-0922 Tracking Analysis software, you can see and analyze the relationship between rotation speed and physical phenomena at specific rotation speed range in various expressions such as color map, 3D graph, and order components on the basis of one rotation.

Real-time Octave Analysis (RTA) (CF-0923)

The highest note of an octave has twice the frequency of the octave’s lowest note. As the feeling of human hearing has characteristics in equal ratio to frequencies, the Real-time Octave Analysis (RTA) software (CF-0923) is an effective tool for noise analysis. The sound pressure level of every band can be obtained through band-pass filter which is defined by standard of 1/1 or 1/3 octave in the noise frequency range to be measured.

Log Sweep / Excitation Control (CF-0942)

The Log Sweep function is used to evaluate the resonance points of a transfer system by continuously changing the frequency of the driving sine waves from the 1ch Signal Output Module (CF-0971). By sine-sweeping the frequency axis with a logarithmic scale, it is possible to obtain the gain and phase for each single frequency and an accurate response function with a high S/N ratio. The Excitation Control limits the amplitude of an electromagnetic exciter to a desired range, enabling vibration testing without considering the frequency characteristics of the exciter.

* 1 ch Signal Output Module (CF-0971) is required for this software.
System Configurations

From detection to processing, analysis, and graph creation. The CF-9200/9400 are supported by a wide range of peripherals including sensors for excitation, sound, vibration and rotation.
Memory & Interface

CF-9200/9400 have wide variety of memory mediums and interfaces including wire/wireless, such as SSD (Solid State Drive) and SD/SDHC memory card. You can choose a suitable one according to the field or office environment.

**MEMORY**

**SSD (Built-in CF-9200/9400)**
SSD built-in the CF-9200/9400 can record and read waveforms, analysis data, waveform images, setting condition, and digital recording data. An SSD is less affected from noise and vibration because this medium does not have drive section which produces noise and vibration.

**SD/SDHC Memory Card**
The CF-9200/9400 have a memory card slot(x1) for SD/SDHC. Waveforms, analysis data, waveform images, setting conditions, and digital recording data can be recorded and read via an SD/SDHC memory card. Data which was recorded in a built-in SSD is copied and transferred easily into an SD card or a USB memory card.

**USB memory**
The CF-9200/9400 have USB A terminals (x3). Waveforms, analysis data, waveform images, setting conditions, and digital recording data can be recorded and read via a USB memory. Data transfer and copy of data which has been stored in a built-in SSD are easy, such as data transfer/copy to a USB memory.

* Not all types of USB memory are guaranteed for the operation. Encrypted USB memory cannot be used.

**INTERFACE**

**USB mass storage class function**
You can directly access the FFT measurement data and recorded data (ORF) which have been stored in a built-in SSD of the CF-9200/9400 by a Windows®-based PC.

It is easy to copy the stored data in the CF series to a PC.

**PC environment conditions for connection**
Windows®7 (32 bit, 64 bit), Windows®10 (32 bit, 64 bit)

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**LAN Connection function**
Connecting the CF-9200/9400 to Windows®-based PC with LAN cable provides various operations as below.

- Copying and saving measurement data
- Operation remotely from a PC side using Remote Desktop Function*1
- Projecting the screen of the CF-9200/9400 by a projector
- Controlling the CF-9200/9400 by program (CF-0947: LAN external control function (option) is required.)

**PC environment conditions for connection**
Windows®7 (32 bit, 64 bit), Windows®10 (32 bit, 64 bit)

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**Wireless LAN connection function**
Mounting wireless LAN adapter*2 allows remote control*1 of the CF-9200/9400 including screen display etc. by Windows®-based PC or mobile information terminal.

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**Bluetooth® connection function**
Mounting Bluetooth® receiver*2 enables wireless output of graph displaying screen to a mobile printer*1 by PRINT button operation. A keyboard can also be connected wirelessly.

*1 Microsoft® Remote Desktop is used.  *2 Please use the recommended product by Ono Sokki.
CF-9200/9400 x O Series

O series software is useful for secondary processing for the data recorded by the CF-9200/9400. By import and browse of the data, O series software helps smooth data organization, processing, analysis and graph creation.

OC-1300 Series Toolbox

The OC-1300 Toolbox software system supports organization and graph creation of the data which has been obtained by FFT Analyzer. Two kinds of software tool support visualization of the obtained data.

- **CF-9200/9400 Data file corresponding**
- **DAT Browser**
  - Time domain waveform, power spectrum, bundled octave, Fourier spectrum (Real, Imag, Mag, Phase), frequency response function (Real, Imag, Mag, Phase), coherence, tracking, RTA (1/1, 1/3)
- **TRC Browser**
  - Constant width (time, revolution), constant ratio (time, revolution), RTA (1/1, 1/3 (time, revolution))

OS-2000 Series

Time-series Data Analysis Tool

The OS-2000 series can freely edit, process, and analyze time-series data recorded by the CF-9200/9400. This software enables advanced data processing and analysis such as calculus processing of time-series data recorded, playback of recorded data, filter processing, sound fluctuation analysis etc.

The OS-2000 series allows to edit and analyze long time-series data freely that is not able to be handled by Microsoft® Excel®. Various data formats of recorder made by other company are able to be used as well as general formats including CSV and WAVE. Simultaneous display, side-by-side display, and overlapping display are enabled without restriction of data format or sampling frequency.

**OS-2000 series Product list**

<table>
<thead>
<tr>
<th>Model name</th>
<th>Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS-2100</td>
<td>Basic</td>
</tr>
<tr>
<td>OS-2600</td>
<td>Standard</td>
</tr>
<tr>
<td>OS-2700</td>
<td>Professional</td>
</tr>
<tr>
<td>OS-2720</td>
<td>FFT Analysis package</td>
</tr>
<tr>
<td>OS-2740</td>
<td>Sound Quality Evaluation package</td>
</tr>
<tr>
<td>OS-2760</td>
<td>Fluctuation Sound Analysis package</td>
</tr>
<tr>
<td>OS-0251</td>
<td>Statistical Analysis</td>
</tr>
<tr>
<td>OS-0252</td>
<td>FFT Analysis</td>
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<tr>
<td>OS-0253</td>
<td>FIR filter</td>
</tr>
<tr>
<td>OS-0254</td>
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<tr>
<td>OS-0255</td>
<td>Time Frequency Analysis</td>
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<tr>
<td>OS-0256</td>
<td>1/N Octave Analysis</td>
</tr>
<tr>
<td>OS-0257</td>
<td>Tracking Analysis</td>
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<tr>
<td>OS-0258</td>
<td>Fluctuation Sound Evaluation Analysis</td>
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<tr>
<td>OS-0259</td>
<td>Fluctuation Sound Analysis</td>
</tr>
<tr>
<td>OS-0260</td>
<td>Fluctuation Sound Simulator</td>
</tr>
<tr>
<td>OS-0261</td>
<td>Video Playback</td>
</tr>
</tbody>
</table>

* Please refer to each brochure for the OS-1300 series and OS-2000 series for more details.
High performance software supports various analysis
CF-9200/9400 record simply, analyze smoothly.

**OC-1300 Series**
Graph Creation Tool

The OC-1300 series is software that anyone can make a beautiful graph easily, quickly, and smoothly. You can design a graph layout freely by dragging the axis with a mouse. A complicated multi-axis graph that is difficult to be created by spread sheet software is able to be created easily.

Graphs which have been created in the OC-1300 Toolbox or the OC-2000 series are easily exported to the OC-1300 series by one-click operation. You can create a visually appealing graph by writing marker value in the waveform and pasting a photo image on the graph.

Sound pressure which is emitted from the machines is expressed smoothly in a contour map by the OC-1300 series. For further analysis, you can acquire concrete image of the result by superposing a contour map with the exported photo image etc. Specifying the transparency of the contour map allows you to see them clearly.

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<td>OC-1340</td>
<td>DAT-TRC Browser package*1</td>
</tr>
<tr>
<td>OC-0341</td>
<td>Digital map*1</td>
</tr>
<tr>
<td>OC-0330</td>
<td>Cube controller*2</td>
</tr>
<tr>
<td>OC-0340</td>
<td>DAT Browser*2</td>
</tr>
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*1 OC-1340 includes OC-0340 and OC-0341.
*2 OC-0320, 0330, 0340, 0341 are able to be used singly.

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**Model name**

<table>
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<th>Tracing Analysis</th>
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<td>FIR filter</td>
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<td>Fluctuation sound analysis</td>
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<tr>
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<td>Standard</td>
</tr>
<tr>
<td>OC-1330</td>
<td>Professional</td>
</tr>
<tr>
<td>OC-0310</td>
<td>Control API</td>
</tr>
</tbody>
</table>

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TRC Browser OC-0341

TRC Browser is software to create graphs from the tracking data stored in the CF-9200/9400 or a PC. TRC Browser can import multiple tracking data files and create graphs with multiple windows.

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**Video Playback**

- Fluctuation Sound Simulator
- Fluctuation Sound Analysis
- Sound Quality Evaluation Analysis
- Tracking Analysis
- 1/N Octave Analysis
- Time Frequency Analysis
- IIR filter
- FIR filter
- FFT Analysis
- Statistical Analysis
- Fluctuation Sound Analysis package
- Sound Quality Evaluation package

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*1 OC-1340 includes OC-0340 and OC-0341.
*2 OC-0320, 0330, 0340, 0341 are able to be used singly.
1. Input Section

- Number of input channels (CF-9200): 2
- Number of input channels (CF-9400): 4
- Input connector: BNC (Type C20)
- Input configuration: 24-bit type ΔΑ
- Isolation: 1.0 MHz ± 0.5%, 100 dB or less
- Input coupling: DC or AC (0.5 Hz - 3 dB ± 10%)
- Input power supply (CCLD): ±24 V mA
- Cable disconnection detecting function: Automatically detects cable disconnection when using CCLD

2. Display Unit

- Screen: 10.4-inch
- Resolution: 800 x 600 dots
- Method: TFT color LCD with capacitive type touch panel
- Brightness adjustment: 2 levels (bright/dark)
- Lighting (Back light): LED

3. Operation Section

- Power switch: Power ON: Press and hold the switch more than 1 second
- Power OFF: For turning off, press and hold the switch for a second or more, and after beep sound, release your finger. When the switch is pressed continuously, the power is forcibly OFF.

4. Analysis Section

- Frequency range: 100 Hz to 100 kHz
- Frequency accuracy: ±0.005 % (±50 ppm) of the reading values
- Sampling frequency: Range x 2.56 (Internal sampling)
- Number of sampling points: Number of Analysis points
- FFT calculation: 6400

- Display: Power ON: Press and hold the switch for a second or more, and after beep sound, release your finger. When the switch is pressed continuously, the power is forcibly OFF.

- Input sampling input

- Input connector: BNC (Type C20)
- Input voltage range: ±2 V
- Input impedance: 100 KΩ
- Input coupling: DC or AC
- Detection level: ±12 V to ±12 V step 0.025 V
- Slope: + (Rising) - (Falling)
- Hysteresis level: Optional settings (default: 0.5 V range 0.025 V to 24 V)
- Input frequency range: 0 to 300 Hz (out-of-band filter 300 Hz - 3 dB)
- Absolute maximum input voltage: 30 VAC/DC VDC
- Number of points of analysis points: 1024 FPR
- Output data: SIGNAL OUT

- Analog trigger input

- Input connector: BNC (Type C20)
- Input voltage range: ±12 V
- Input impedance: 100 KΩ
- Input coupling: DC or AC
- Detection level: ±12 V to ±12 V step 0.025 V
- Slope: + (Rising) - (Falling)
- Hysteresis level: Optional settings (default: 0.5 V range 0.025 V to 24 V)
- Input frequency range: 0 to 300 Hz (out-of-band filter 300 Hz - 3 dB)
- Absolute maximum input voltage: 30 VAC/DC VDC
- Waveform monitor: Waveforms can be checked on the screen.
- External trigger input: Green LED (EXT TRIG) lights when pulse is detected.

- External trigger input

- Input connector: BNC (Type C20)
- Input voltage range: ±12 V
- Input impedance: 100 KΩ
- Input coupling: DC or AC
- Detection level: ±12 V to ±12 V step 0.025 V
- Slope: + (Rising) - (Falling)
- Hysteresis level: Optional settings (default: 0.5 V range 0.025 V to 24 V)
- Input frequency range: 0 to 300 Hz (out-of-band filter 300 Hz - 3 dB)
- Absolute maximum input voltage: 30 VAC/DC VDC
- Waveform monitor: Waveforms can be checked on the screen.
- External trigger input: Green LED (EXT TRIG) lights when pulse is detected.

- Trigger function: Green LED (TRIG) blinks when triggered

- FFT calculation: 32-bit floating point (IEEE single-precision format)
5. Processing Functions

Time domain
- Time waveform/auto-correlation function/cross-correlation function/ impulse response/cepstrum

Amplitude domain
- Amplitude probability density function/amplitude probability distribution function

Frequency domain
- Power spectrum/periodic graph/4th order spectrum/filtered spectrum/
  cross spectrum/frequency response function/coherence function/
  coherence output power

Calculation function
- Mean value/absolute mean value/mean value/standard deviation/
  maximum value/minimum value/crest factor/skewness/kurtosis

6. Memory Functions

Recording device
- Selectable from internal storage in main unit or SD/SDHC card

Recording function
- Frequency range: 100 kHz (max.)
  - Recording channel: Ch1/Ch2 (CF-9400), Ch1 to Ch4 (CF-9400)
  - Also rotation information recording is possible.

Recording time
- Approx. 32 min. (At 50 kHz range 4ch recording, rotation information OFF, max. 4 GB)

Marker
- Pressing [ESC] during recording allows marking.

Recording format
- CHF

Maximum recording capacity
- Internal storage approx. 6 GB
  - SDHC memory card (32 GB max.)

Data file
- 9990 (999 data x 10 blocks) data

Panel condition memory
- Memorizes and recalls measurement conditions. (50 types max.)

Handwritten memo memory
- Hand written memo on the touch panel can be recorded.

7. Interface

USB
- Number of ports: 3 (Type A)
  - USB: USB 2.0 memory, wireless LAN module, Bluetooth® module

DATA
- Number of ports: 1 (Type mini B)

Wireless connection
- Wireless LAN module
  - Recommended product made by Logitec Corp.

Bluetooth® module
- Recommended product made by Buffalo, Inc.

SD card slot
- Number of slots: 1
  - Capacity for SD/SDHC: 4 GB to 32 GB*

LAN
- Number of ports: 1
  - 10BASE/100BASE-TX/1000BASE-T: Remote Desktop, external control

Printer output
- Print by PRINT: key of the main unit.
  - Interface: USB or Bluetooth® (When Bluetooth® module mounted)
  - Applicable printer: MW-260 Type A
  - Brother Industries, Ltd.

8. Other Function

Condition view
- List display of specified conditions

Clock
- Year, month, and date in western calendar
  - Hour, minute, and second display

Operation sound/ alarm sound
- Can be specified ON/OFF

9. General Specification

Power supply
- AC adapter or batteries (Both provided as standard)

Power consumption
- CM-9400 (When the CM-9401 is installed)
  - 87 VA or less (When AC adapter is used, battery charging)

Operating temperature range
- 0 to +40 °C (Humidity 20 to 80 %RH, with no condensation)

Storage temperature range
- 10 to +50 °C (Including lithium ion secondary batteries)
  - (Humidity: 20 to 80 %RH, with no condensation)

Functional ground terminal
- Grounding terminal for noise elimination
  - (50, binding head screw M6-L8 recommended)

Main unit cooling
- Naturally air-cooling (Fanless)

Weight
- Without batteries: Approx. 3.9 kg
  - With two batteries: Approx. 4.9 kg

CE marking
- Applicable Low Voltage Directive: 2006/95/EC (EN50160-1)
  - EMC Directive: 2014/30/EU EN61326-1
  - RoHS Directive: 2011/65/EU EN55581

Vibration resistance
- 9.8 m/s² (Frequency 10 to 150 Hz, 150 min. in each of X, Y and Z direction)

Shock resistance
- 1500 m/s² (11 ms duration)

10. AC Adapter (PS-P20023A)

Input voltage
- 100 to 240 VAC

Input frequency
- 50/60 Hz

Output voltage
- Rated 16 V

Output current
- 4 A

Safety standard
- PSE/CE/UL/CSA

11. Battery

Battery
- Lithium ion secondary batteries
  - Mounted in main unit (‘Hot swap’ available)

Quantity
- Two batteries can be mounted.

Battery life
- Continuous operating time (When new two batteries are mounted)
  - 4CH 100 kHz/signal output OFF/liquid crystal backlight (brightness) of USB port is not used

Battery status display
- Main unit screen: Displays the remaining battery level on the main unit screen when operating on the secondary battery.

Battery LED
- (BATT 1, BATT2)
  - Orange LED is on during charging, green LED is on when full charged.
  - When connecting AC adapter

LED indicator
- Red LED is on when LOW BATT
  - (When remaining battery becomes less than 5 % and not mounted AC adapter)

Display icon
- Charging completed/charging stop/battery not mounted/ LOW BATT

Processing when battery level drops
- When remaining battery becomes less than 3 %, displays a warning message and shuts down automatically.

Charging time
- Charging time when main unit is in operation
  - Approx. 8 to 9 hours

Charging time when the power OFF
- Approx. 4.5 to 5 hours

External battery charger
- Approx. 4.5 to 5 hours

12. Accessory
**Signal Output (CF-0971 1CH Signal Output Module): Hardware Option**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>1</td>
</tr>
<tr>
<td>Output connector</td>
<td>BNC (Type C02)</td>
</tr>
<tr>
<td>Isolation</td>
<td>Non-isolated</td>
</tr>
<tr>
<td>Output voltage amplitude</td>
<td>±1 mV to ±10 V (amplitude+DC offset)</td>
</tr>
<tr>
<td>Offset voltage</td>
<td>±10 V</td>
</tr>
<tr>
<td>Output format</td>
<td>Unbalanced output</td>
</tr>
<tr>
<td>Output coupling</td>
<td>DC</td>
</tr>
<tr>
<td>Protection circuit</td>
<td>Short-circuit protection</td>
</tr>
<tr>
<td>Output impedance</td>
<td>0 Ω or 50 Ω, Ω±10 %</td>
</tr>
<tr>
<td>Maximum output current</td>
<td>10 mA</td>
</tr>
<tr>
<td>D/A converter</td>
<td>16-bit</td>
</tr>
<tr>
<td>Conversion rate</td>
<td>max. 512 kHz</td>
</tr>
<tr>
<td>Output waveform</td>
<td>Sine wave/sweep-sine/pseudo random/random/impulse</td>
</tr>
<tr>
<td>THD and spurious</td>
<td>≤75 dB or less (at sine wave 1 kHz, amplitude ±1 V output)</td>
</tr>
<tr>
<td>FFT Analysis length</td>
<td>256 to 16384</td>
</tr>
<tr>
<td>Zoom analysis</td>
<td>Available linked with the zoom analysis range</td>
</tr>
<tr>
<td>Voltage amplitude accuracy</td>
<td>±0.5 dB or less (at 1 kHz, 1 V0-p, 1 MΩ load)</td>
</tr>
<tr>
<td>Frequency accuracy</td>
<td>±50 ppm</td>
</tr>
<tr>
<td>Digital filter</td>
<td>Smoothing filter, at baseband: 10th order ellipse</td>
</tr>
<tr>
<td>Burst function</td>
<td>Single burst, continuous burst</td>
</tr>
<tr>
<td>Burst cycle</td>
<td>Sine wave, 1 to 32767 cycles, 1 ms to 32 s</td>
</tr>
<tr>
<td>Cycle setting unit and burst interval</td>
<td>Sine wave, 1 to 32767 cycles, 1 ms to 32 s</td>
</tr>
<tr>
<td>Taper function</td>
<td>Can be set individually when the signal is turned ON or OFF</td>
</tr>
<tr>
<td>Spectrum flatness</td>
<td>20 kHz to 100 kHz, ±1.0 dB or less</td>
</tr>
<tr>
<td>Crest factor</td>
<td>0 to 20 kHz, ±0.2 dB or less</td>
</tr>
<tr>
<td>Pink filter</td>
<td>Analog method -3 dB/dec ± 1.0 dB (prescribed for 20 Hz to 20 kHz)</td>
</tr>
<tr>
<td><strong>Burst function</strong></td>
<td>Single burst, continuous burst</td>
</tr>
<tr>
<td><strong>Burst cycle</strong></td>
<td>Sine wave, 1 to 32767 cycles, 1 ms to 32 s</td>
</tr>
<tr>
<td><strong>Cycle setting unit and burst interval</strong></td>
<td>Sine wave, 1 to 32767 cycles, 1 ms to 32 s</td>
</tr>
</tbody>
</table>

**Log Sweep/Excitation Control CF-0942**

| Measurement mode (FRA mode)                  | 120 dB (FRA)                                                                 |
| Measurement frequency range                 | 10 mHz to 100 kHz                                                            |
| Frequency resolution (Log sweep)             | 10, 20, 40, 50, 80, 100, 120, 160, 200, 250, 300, 320, 400, 500 lines/decade  |
| Frequency resolution (Linear sweep)          | 100, 200, 400, 500, 800, 1000, 2000, 2500, 4000, 5000 lines/decade             |
| Frequency range dividing setup mode         | Additional times and signal output level can be changed for each measurement  |
| Frequency resolution auto adjusting function | Automatically adjusts the decade of each frequency band and resolution to see  |
| Frequency resolution increase function       | Enables remeasurement of the specified frequency range resolution with a      |
| Calculation function                        | Frequency axis differential and integral calculation function                |
| Measurement                                | First-order differential, second-order differential, single integral, double  |
| Calculation                                | integral, four arithmetic operations                                        |

**Display**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display of Frequency Response Function</td>
<td>Bode diagram (horizontal axis: frequency/vertical axis: gain and phase)</td>
</tr>
<tr>
<td>Display mode</td>
<td>Nyquist diagram (horizontal axis: real number part/vertical axis: imaginary</td>
</tr>
<tr>
<td></td>
<td>number part) enables logarithmic scale display of amplitude</td>
</tr>
<tr>
<td></td>
<td>FRF mode (triple screen display)</td>
</tr>
<tr>
<td></td>
<td>1) FRF (Bode diagram), COH (enables ON, OFF of display)</td>
</tr>
<tr>
<td></td>
<td>2) Nyquist or SPEC (1, 2ch overlay)</td>
</tr>
<tr>
<td></td>
<td>3) TIME, instantaneous spectrum (enables overlay display and specifying</td>
</tr>
<tr>
<td></td>
<td>channel)</td>
</tr>
<tr>
<td></td>
<td>List mode (single screen display)</td>
</tr>
<tr>
<td></td>
<td>1) Measurement condition</td>
</tr>
<tr>
<td></td>
<td>2) List of No, frequency/FRF gain/FRF phase/COH/FRF real number part/FRF</td>
</tr>
<tr>
<td></td>
<td>imaginary number part/SPEC1/SPEC2/number of summations for all measurement</td>
</tr>
<tr>
<td></td>
<td>data</td>
</tr>
<tr>
<td>Display mode</td>
<td>Peak List mode (double or triple screen display)</td>
</tr>
<tr>
<td></td>
<td>List of frequency, gain and phase on the FRF bode diagram display using two</td>
</tr>
<tr>
<td></td>
<td>ways.</td>
</tr>
<tr>
<td></td>
<td>1. Peak point of gain (automatic search)</td>
</tr>
<tr>
<td></td>
<td>2. Optionally specified point</td>
</tr>
<tr>
<td>Memory mode</td>
<td>1) FRF of current status data</td>
</tr>
<tr>
<td></td>
<td>2) List of saved waveforms</td>
</tr>
<tr>
<td></td>
<td>3) Overlay display of waveforms selected from 2) (Up to 8 screens)</td>
</tr>
<tr>
<td>Calculation screen</td>
<td>(Quad screen display)</td>
</tr>
<tr>
<td></td>
<td>1) FRF of current status data</td>
</tr>
<tr>
<td></td>
<td>2) FRF of saved data</td>
</tr>
<tr>
<td></td>
<td>3) Waveform of four arithmetic operations and differential and integral</td>
</tr>
<tr>
<td></td>
<td>calculus of 1), 2)</td>
</tr>
<tr>
<td></td>
<td>* Waveform of calculation result also can be displayed.</td>
</tr>
<tr>
<td></td>
<td>4) Nyquist diagram of calculation result of 3)</td>
</tr>
<tr>
<td>Display function</td>
<td>Phase unwrap display</td>
</tr>
<tr>
<td></td>
<td>Search delta function</td>
</tr>
</tbody>
</table>
**Tracking Analysis CF-0922**

**Tracking analysis type**
Phase
Amplitude

**Sampling method**
Constant ratio tracking (external sampling):
Up to maximum frequency analysis order

**Number of FFT points**
256 to 16384 points (power-of-two step)

**Averaging function**
Power spectrum exponential average
Fourier spectrum exponential average

**Max. number of blocks**
100, 200, 400, 800, 1000

**Display function**
Time-axis waveform, frequency analysis (amplitude, phase), order ratio analysis (amplitude, phase), constant-ratio tracking analysis (amplitude, phase), constant-width tracking analysis (amplitude, phase), time-tracking analysis (amplitude, phase), 3D map, Campbell plot

**Display of Frequency Response Function**
Up to 8 screens (Data overlay display available)

**Simultaneous recording & analysis function**
Available for constant-width tracking

**Related software**

- Model name: OC-1340
  Product name: OC-1300 Toolbox DAT+TRC browser package
  OC-0340 DAT browser and OC-0341 TRC browser are included.
  For graph image, refer to P 10 and 11.

- Model name: OC-0340
  Product name: OC-1300 Toolbox DAT browser
  Graph software for exclusive Ono Sokki FFT series* (DAT files)

- Model name: OC-0341
  Product name: OC-1300 Toolbox TRC browser
  Graph software for exclusive Ono Sokki FFT series* (TRC files)

* CF-7200(A), CF-9200/9400, DS-2000 series, DS-3000 series

**Real-time Octave Analysis (RTA) CF-0923**

**Octave type**
1/1 octave
1/3 octave (filter: 6th order Butterworth)

**Time weighting**
10 ms, 35 ms, 125 ms (FAST), 630 ms, 1 s (SLOW), 8 s (TIME constant)

**Analysis frequency range**
10 Hz to 20 kHz (1/1 octave)
1 to 16 kHz (1/1 octave)

**Calculation function**
Instantaneous value, maximum value of every one second, maximum value hold, and minimum value hold, power averaging value, power summation value, linear Leq

**Analysis display range**
Up to 8 screens (Data overlay display available)
List display of real-time octave

**LAN External Control Function CF-0947**

**Client PC**
Windows® 7
Windows® 8

**Recommended Products**

- Model name: PS-P20023A
  Product name: Battery charger set
  Battery charger and AC Adapter
  (sold separately)

- Model name: VM1172-VM1276-2M
  Product name: AC line cable for PS-P20021A for Japan
  For AC100, 3P, equipment side angle type

- Model name: VM0233-VM0768-2M
  Product name: AC line cable for PS-P20021A for North America
  For AC100, 3P, equipment side angle type

- Model name: VM0236B-VM0348-2M
  Product name: Installation required before shipment.
  Must be installed at the Ono Sokki factory in Japan after the shipment.
Innovative features in a tough body

**CF-9000 Series**

Portable 2-channel / 4-channel FFT Analyzer

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**Outer Dimensions (Unit: mm)**

**CF-9200**

* Common to CF-9200/9400

<table>
<thead>
<tr>
<th>Dimension</th>
<th>CF-9200</th>
<th>CF-9400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>333 (345)</td>
<td>333 (345)</td>
</tr>
<tr>
<td>Height</td>
<td>112 (125.5)</td>
<td>112 (125.5)</td>
</tr>
</tbody>
</table>

* Option: BNC (type C02) is mounted when CF-0971 (1CH Signal Output Module) is installed.

**CF-9400**

* Option: BNC (type C02) is mounted when CF-0971 (1CH Signal Output Module) is installed.

**Soft Carrying Case CC-0025**

- 320 x 225 x 440

**Hard Carrying Case CC-0091**

- 587 x 230 x 420

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**URL:** https://www.onosokki.co.jp/English/engiish.htm