This unit expands
the field of on-site measurement.

The CF-3200 and CF-3400 portable FFT analyzers from ONO SOKKI offer advanced measurement in the field despite a compact, lightweight body. No more lugging a heavy analyzer around a large plant, and being restricted by its limited measurement functions in the field!

Versatile applications, such as precise diagnosis of facilities and equipment, field balancing, tracking analysis for evaluating the dynamic characteristics of engines and rotating machines, and real-time octave analysis ideal for analyzing sounds, make these portable FFT analyzers the only ones you'll ever need for field measurement.
Transportability with Powerful Analysis Performance
A compact body offers many advantages.
Extensive Functions Packed in a Compact, Lightweight Body

6 kg weight, AC or battery power
Compact and light, the analyzer can be carried around a large plant or field site. The CF-3200/3400 even runs on batteries for those places where AC power is not available.

10.4-inch color LCD screen
The large display is extremely useful for viewing a multiple-split display and an overlaid display. Strong back-lighting ensures good readability even outdoors, and the viewing angle can be freely adjusted.

Built-in sensor amplifier
Built-in amplifiers are provided for the acceleration sensor and microphone (constant current supply type), as well as a rotation sensor amplifier for diagnosis of rotating machines. No external amplifiers or wiring needed!

Built-in thermal printer
With the built-in printer, you can print measurements immediately, or use the built-in parallel port to print out a hard copy on a PC printer.

Built-in PCMCIA interface
Having a single PCMCIA slot, the CF-3200/3400 is ready for future expansion with a variety of Windows95 applications.

Built-in floppy disk drive and large-capacity flash memory
Windows95 (OEM) is used as the operating system. The OS and CF-3200/3400 application software are installed in flash memory, which is resistant to vibration and shock. And the built-in floppy disk drive lets you transfer data to a personal computer.

Integration of Versatile Measurement Functions

1. FFT analysis and frequency response function
Objectives: Measuring and analyzing the noise and vibration from products in order to reduce them

Household electrical appliances  Office automation equipment  Automobiles  Ships  Rotating machines  Building materials  etc.

2. Tracking analysis
Objectives: Analyzing the noise and vibration of an engine or rotating machine according to the rotating speed

Automobiles  Auto parts  Rotating machines  Machine tools  Building machines  Ships  etc.

3. Precise diagnosis of facilities and equipment
Objectives: Diagnosing facilities and equipment such as those in industrial factories and plants

Motors  Turbines  Blowers  Pumps  Machine tools  etc.

4. Field balancing
Objectives: Correcting the unbalance in a rotating machine

Various rotating mechanisms  Motors  Blowers  Pumps  Centrifugal separators  Turbines  etc.

5. Realtime octave analysis
Objectives: Sound evaluation

Environmental sounds  Audio components  Office automation equipment  Household electrical appliances  Building acoustics  Automobiles  etc.
Resonance is one of the major causes of chattering vibration of robots and machine tools, as well as vibration and noise of airplanes and land vehicles. The most popular method of analyzing resonance is to measure the frequency response of the object by hitting it with an impulse hammer. Excitation by an impulse hammer does not require the object to be installed on a vibration exciter and measurement can be done quickly, making it suitable for field measurement including troubleshooting.

Example: Measurement of Vibration Excited by Impulse Hammer

In rotating equipment such as an engine, turbine, or centrifuge that has a wide range of rotational speeds, the individual characteristic vibration frequencies of the various physical parts of the equipment resonate at different speeds, making it difficult to analyze the vibrations. The rpm tracking analysis function of the CF-3200 and CF-3400 displays a graph of the amplitude of the vibration or noise according to the varying speed, thus offering critical data for analyzing speeds at which resonance may occur (dangerous speeds).

As shown in the figure below, the three-dimensional rpm-spectrum plot provides a direct view of the frequency (rpm order) spectrum for varying rpm. In contrast, the two-dimensional rpm-tracking analysis graph indicates which order is resonating at each rpm.

Conceptual Diagram of Rpm-tracking Analysis
Industrial factories and plants contain various rotating machines such as motors, pumps, and blowers. To prevent an accident of a machine, facility and equipment conditions must be monitored, and if vibration increases, the cause must be analyzed and corrective action taken. Mechanical parts that typically need to be diagnosed include bearings and gears, and for this diagnosis, pre-processing functions such as filtering and envelope functions are required. When checking for flaws in a bearing, the cycle of the vibration due to an actual flaw is difficult to detect, so that the envelope processing is used to detect a simple, periodic waveform from this vibration waveform, then by applying FFT analysis to the result, the frequency of the vibration due to the flaw can be obtained. As shown in the figure below, the envelope processing is applied to the vibrations caused by a flaw, then the obtained frequency is compared with the predicted frequency of vibration due to the flaw in the bearing. This diagnosis pinpoints the location of the flaw in the bearing (such as the outer race, inner race, or rolling element).

Example: Diagnosis of Rotating Machine

The most likely cause of an abnormality in a rotating machine is unbalance, and hence any unbalance must always be corrected. However, the traditional method of drawing a vector graph and performing vector calculations is time-consuming, making it difficult to carry out balancing in the field. The optional field balancing function of the CF-3200 and CF-3400 performs such tiresome calculations internally and displays the result, thus allowing the machine to be balanced quickly even by non-skilled operators. Furthermore, by using two channels of signal inputs for measuring a point on each of two planes simultaneously, the two planes can be balanced quickly and easily.

Example: Field Balancing by Measuring Two Planes Simultaneously

The most likely cause of an abnormality in a rotating machine is unbalance, and hence any unbalance must always be corrected. However, the traditional method of drawing a vector graph and performing vector calculations is time-consuming, making it difficult to carry out balancing in the field. The optional field balancing function of the CF-3200 and CF-3400 performs such tiresome calculations internally and displays the result, thus allowing the machine to be balanced quickly even by non-skilled operators. Furthermore, by using two channels of signal inputs for measuring a point on each of two planes simultaneously, the two planes can be balanced quickly and easily.
An FFT analyzer is optimum for high-resolution analysis of abnormal frequencies in sounds and vibrations; however, in order to evaluate how a sound is perceived by a person, a realtime analyzer is used. The optional realtime octave analysis allows the CF-3200 or CF-3400 to be used as a 2-channel realtime analyzer. (Note that the CF-3400 is a 4-channel FFT analyzer, but when used as a realtime analyzer, it functions as a 2-channel analyzer.) Using a digital filter, both models can display the realtime level of each octave or each 1/3 octave. With full use of two channels, two data can be measured simultaneously and compared to each other with ease.

Example: Measurement of Noise Insulation

Performance of Building Materials

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Example of Sound Measurement

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Option Selection Table

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<td>Available*</td>
<td>Available</td>
<td>Available</td>
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<tr>
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<td>Not Available</td>
<td>Available</td>
<td>Available (only for two channels)</td>
<td>Available (only for two channels)</td>
</tr>
</tbody>
</table>

*CF-0360 and CF-0361 cannot be installed together.
A compact body offers many advantages.

A wealth of options and peripherals expand the potential of your FFT analyzer.

**System Configuration**

**Sensors**
- NP-3331 acceleration pickup
- NP-0143 series sensor cable
- NP-3000 series acceleration pickup with built-in amplifier
- NP-0120/130 series sensor cable
- SK-3100 impulse hammer
- LA series sound level meter
- MI series microphone
- MI-3110 preamplifier
- MX-100 series coaxial cable with BNC connectors on both sides
- MP-9831/916 rotation detectors
- MX-800 series cable
- Other amplifiers

**Recording and Data Processing**
- Personal computer
- Floppy disk
- VGA monitor
- SVGA monitor
- SVGA output
- Built-in printer
- Color printer
- Centronics
- Keyboard (PS/2)
- External keyboard
- Mouse
- Mouse input
- Headphone amplifier
- Headphones
- Headphone output
- Monitor output
- External oscilloscope

**Optional Carrying Case**

1. **CC-0031 Soft Carrying Case**
   - Carries the analyzer with a power cable and sensors, etc.

2. **CC-0032 Hand Carrying Case**
   - Carries the analyzer with batteries, a battery charger, cables and sensors, etc.

Note: The headphone and monitor outputs are available only for the CF-3200 with the optional pre-processing function. Not available for the CF-3400.
Specifications

**Input section**
- Number of channels: 2 (CF-3200), 4 (CF-3400)
- Connectors: Input sections are switched between the following two types (at 1 P/R input).
- **Configuration**: Single-ended
- **Impedance**: 1 MΩ, 100 pF or less
- **Coupling**: DC and AC (0.5 Hz, -3 dB)
- **Amplitude range**: -80 dBm to 20 dBm (10 mV to 10.0 V) in 10-dB steps
- **Level monitor**: Excessive input (red LED)
- **A/D converter**: 16 bits (successive comparison type)
- **Dynamic range**: 75 dB or more
- **Input noise level**: -130 dBm or less
- **Harmonic distortion**: -70 dB or less (20 k to 40 kHz)
- **Amplifier distortion**: -75 dB or less (20 kHz or less)
- **Aliasing**: -70 dB or less
- **Amplifier flatness**: ±0.2 dB
- **Full scale accuracy**: ±0.1 dB (at 1 kHz)
- **Amplifier linearity**: ±0.015 % F.S.
- **Cross-talk**: -100 dB or less
- **Gain accuracy between channels**: ±0.1 % (for the same voltage range)
- **Phase accuracy between channels**: ±0.1 degree
- **DC offset**: -60 dB or less (Auto zero function always on)
- **Trigger function**: Mode, Free, repeat, single, and one-shot
- **Position**: A or B, Position 3
- **External sampling input**: ±10 V (AC/DC selectable); maximum input frequency: 25.6 kHz BNC or dedicated input (terminal for L891/BM98)
- **Sensor power supply output**: ±15 V, 30 mA

**Signal processing (Optional, CF-360)**
- **High-pass filter**: 10, 1, 0.1 kHz
- **Low-pass filter**: 100, 1, 0.1 kHz
- **Envelope converter**: Absolute value detection
- **Integrator**: Single, integral, double integral
- **Pre-processing gain**: ×0.1, ×1, ×10, ×300 Pre-processing can be set for each channel.
- **Headphone output**: Outputs the pre-processed analog signal of ch1.
- **Rotation diagnostic function**: Calculation of rotation frequency, bearing fault frequency, and gear fault frequency

**Output section**
- **Signal types**: Sine, swept sine, pseudo-random, random, periodic random, impulse, and linear sine sweep

**Analysis section**
- **Frequency accuracy**: ±0.005% (±50 ppm) of the reading value
- **Frequency range**: 1 Hz to 40 kHz
- **Sampling frequency**: 2.5 times the selected sampling range
- **Frequency resolution**: 25, 50, 100, 200, 400, 800, and 1600 lines
- **Overlapping process**: Maximum, 30%, 0%
- **Window functions**: Rectangular, Hanning, flat-top, force, and exponential
- **Time-domain waveform processing**: Absolute value processing, polarity conversion, DC cancellation
- **Averaging modes**: Real-time averaging
  - 20 kHz or more (CF-3200)
  - 10 kHz or more (CF-3400)
- **FFT processing**: 32-bit floating point (IEEE single-precision format)

**Display section**
- **Display**: 10.4-inch TFT color LCD
- **Resolution**: 800 x 600 dots (256 colors)

**Processing functions**
- **Time domain**: Time axis waveform, orbit (Lissajous)
- **Frequency domain**: Power spectrum, linear power spectrum, phase spectrum, cross spectrum, FRF, coherence function

**Other display modes**
- Single, dual, triple and quadruple screen display, overlay display, list display, waterfall display

**Memory functions**
- 3.5 inch HDD
- Built-in memory: Screen memory, panel condition memory
- **Time record**: 1M words/ch (CF-3200), 512k words/ch (CF-3400)

**Tracking analysis function**
- **Order analysis range**: 6.2 kHz, 12.5 kHz, 25 kHz, 50 kHz, 100 kHz, 200 kHz, 400 kHz
- **Measured rpm ranges**:
  - 6.2 kHz to 12.5 kHz: 0 to 12,500 rpm
  - 12.5 kHz to 25 kHz: 0 to 25,000 rpm
  - 25 kHz to 50 kHz: 0 to 50,000 rpm
  - 50 kHz to 100 kHz: 0 to 100,000 rpm
  - 100 kHz to 200 kHz: 0 to 200,000 rpm
  - 200 kHz to 400 kHz: 0 to 400,000 rpm
- **Number of tracking points**: 200 or 400
- **Processing functions**: RPM order analysis, fixed order tracking, rpm and shock, memory tracking

**Real time Octave Analysis Function (Optional, CF-320)**
- 1/1 and 1/3 octave

**Field Balancing Function (Optional, CF-320)**
- For one or two planes; simultaneous measurement of two planes

**General specifications**
- **Battery**: Lithium-ion secondary cell, 4500 mAh
- **AC power supply**: 100 to 240 V AC
- **Power consumption**: Approx. 50 VA
- **Operating temperature**: 0 to +40 °C
- **Storage temperature**: -10 to +60 °C
- **External dimensions**: 408 (W) x 280 (D) x 125 (H) mm
- **Weight**: Approx. 5 kg (CF-3200), Approx. 5.5 kg (CF-3400)
- **Accessories**: Battery, battery charger, recording paper x 1 roll

*Windows is a trademark of Microsoft Corporation, U.S.A. in the United States and other countries.

**Portable FFT Analyzer CF-3200 (2 channel)/CF-3400 (4 channel)**

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