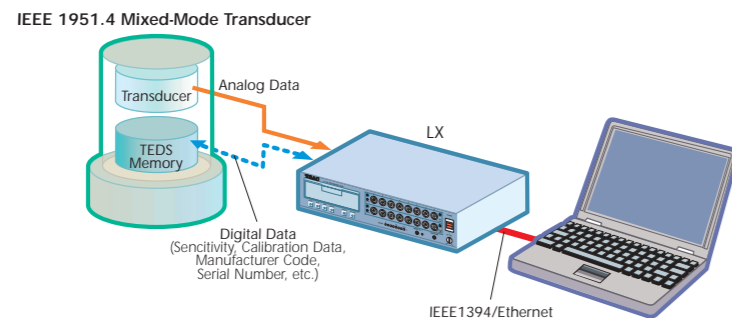# Connecting with Applications

The LX Series provides a diverse set of connections to popular data analysis applications, which enables efficiency in all steps of the process: from experiment setup to data recording and processing.

Connecting to Sensors

Using the constant current excitation type accelerometer input amp card, you can directly connect to ICP® accelerometers and ICP® microphones. You can also read values such as sensitivity and calibration values for connected transducers. For experiment setup, these features reduce the need for additional equipment and can automate coefficient settings, thereby eliminating setup errors, and greatly reducing the effort required for experiment setup and data processing.

IEEE 1951.4 Mixed-Mode Transducer

- Transducer
- TEDS Memory
- Analog Data
- Digital Data (Sensitivity, Calibration Data, Manufacturer Code, Serial Number, etc.)
- LX
- IEEE1394/Ethernet

Connecting to Network

Using the 10BASE-T/100BASE-TX Ethernet interface, you can build distributed multi-channel data recording systems. Synchronizing pulses generated by, for example, a GPS signal can synchronize the internal clocks by using +/-30 seconds' adjustment function of the LX and you can control the recording of multiple devices connected to the network. The data collected by each LX main unit can be collected over the network, which reduces the effort required to physically collect media from different locations.

- GPS
- Switching Hub
- Multiple LXs
- LX
- Ethernet
- Ethernet 10BASE-T/100BASE-TX
- Internet/WAN
- Router
- NETWORK
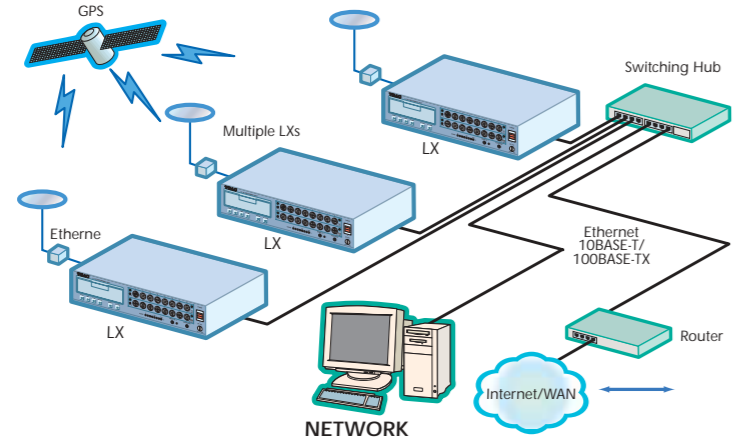
Connecting to Existing Analysis Systems

Some existing data recorders have the ability to perform analog playback and change the playback speed (matching the analysis system bandwidth and playing back fast phenomena at a slower speed, or playing back slow phenomena at a faster speed, within the same sampling rate series) The LX Series can replace a traditional data recorder even in an analysis system that requires existing analog data to be played back. At a PC with the optional LX View program, you can extract only a necessary portion from an originally recorded file to create a new data file. Then you can copy the new data file to another media to perform analog playback in the LX main unit. This enables data to be investigated more efficiently.

Connecting to Data Processing Software

The format for recorded data is TAFFmat, the file format now used by TEAC digital Data Recorders. Data files in the TAFFmat format can be read by the LX View and by other companies' analytical software that supports TAFFmat. Also, in a configuration in which a PC is connected and a LX Series recorder is used as the front-end, the TAFFmat format files can be used with software providing real-time recording and analysis functions. We also pro-vide the file converter software from TAFFmat to the popular analyzing data file formats, such as ASCII, UFF, ATI, and so on. TEAC provides system integrators with a Windows DLL for direct control of LX Series recorders. Contact TEAC for details.

Specifications

Main Units

LX-10

I/O Amp Slots	2 (Eight channels per slot)
Recording Devices	Choice of Memory only, Memory + MO disk, or Memory + PC card drive (Specify one when you order.)
Interface	Choice of IEEE 1394 or 10BASE-T/100BASE-TX Ethernet (Specify when you order.)
Front Panel Control Keys	REC, FWD, STOP, PAUSE, EVENT, P.LOCK
Digital Control Connector	Contact input: REC, FWD, REC, FWD, STOP, PAUSE, EVENT,P.LOCK, and ± 30-second internal clock adjustment Status output: REC, FWD, STOP, PAUSE, EVENT, and P.LOCK Input: L level: 0.4 V or less, H level: Open or 2 V or more, Pulse width: 100 ms or more Output: Open drain, maximum sync current: 8 mA Connector: Angled half pitch 36- pin (DHA-RC36-R1xxx series)
Monitor Channel	1 (analog output)
Microphone Jack	1
Speaker and Earphone Jack	1 each
Sampling Frequencies	96, 48, 24, 12, 6, 3, 1.5 kHz (Common to each channel)
Frequency Bandwidths	DC to 40, 20, 10, 5, 2.5, 1.25, 0.625 kHz
Max. Recording Rate	With real-time transfer to memory or PC: 1.536 MB/s (by IEEE1394)/0.768MB/s (by 100BASE-TX) (Example: 40 kHz bandwidth= 8 channels in 1.536 MB/s) With an MO disk/a PC card: 0.768 MB/s (Example: 20 kHz bandwidth= 8 channels)
Time Precision	± 1 ppm (at 25°C)
Internal Clock Correction	± 30 seconds' adjustment
Power Supply/Consumption	11 to 30 V DC, approx. 40 W for an 8-channel I/O configuration (AR-LXPA1 and AR-LXAO) with media recording. DC power supply cable and AC adapter are supplied.
Safety Standards	CE, VCCI
Vibration	Conforms to MIL-STD-810E Figure 514.4-1,2,3 for the models with memory only, memory + PC card drive, Memory with an MO drive only when an MO disk is not inserted.
Shock	Conforms to MIL-STD-810E Method 516.3 20 G 11 ms Half Sine (using PC Memory Card).
External Dimensions	Approx. 300W× 65H× 200D mm Approx. 12W× 2.5H× 8D in (excluding protruding parts)
Weight	Approx. 3.8 kg Approx. 8.5 lb (for an 8-channel I/O configuration using an MO disk/a PC card)
Temperature and Humidity	PC card model and Memory model: 0 to 40°C 32 to 104°F at 10 to 85 % RH (operation) MO model: 5 to 35°C 40 to 95°F at 10 to 85 % RH (operation)
Software	The LX Navi software, provided as standard, can set the measurement parameters, monitor, and record data to the PC. It has the following system requirements. OS: Windows 98SE/Me/2000/XP CPU: Pentium III 600 MHz or faster RAM: 128 MB or more Free Hard Disk Space: 2 GB or more

LX-20

Sampling Frequencies	- 96, 48, 24, 12, 6, 3, 1.5 kHz- 102.4, 51.2, 25.6, 12.8, 5.12, 2.56, 1.28 kHz -65.536, 32.768, 16.384, 8.192, 4.096, 2.048, 1.024 kHz - 100, 50, 20, 10, 5, 2, 1 kHz (Common to each channel)
Frequency Bandwidths	DC to the sampling frequency (listed above) / 2.4
Tachometer Pulse Inputs	
Num. of Input Channels	2× 16-bit channels (ON/OFF in 2-channel units), or 1× 32-bit channel Both use the lower 1 bit for tachometer pulse timing.
Input Format	Threshold level switched over among +0.5, 1, 2.5, 5, 10, and 20 V Max. allowable input voltage is ± 50 V
Input Connector	2× BNCs
Sampling Frequency	Depends on the main unit setting.
Frequency Division Ratio Setting	1 to 255
Moving Average Measurement	1 to 16 (Cannot be used simultaneously with generator output.)
Measurement Modes	Pulse count mode (Count of number of pulses within the gate time: count of the total number from the start to the stop.) Cycle count mode Frequency measurement mode (Cannot be used simultaneously with generator output.) RPM mode (Cannot be used simultaneously with generator output.)
Generator Output	
Num. of Output Channel	1 channel
Output Level	± 1 to 5 Vp (variable in 0.1 V steps, same as monitor output)
Output Connector	BNC (Monitor output)
Output Mode	Sine wave 1 to Fs/2.4 (to 1 digit below the decimal point) Sweep Sine wave, start/stop frequency, linear and log settings. Pulse, pulse width, and interval time settings (There are restrictions depending on the sampling frequency.) Pink noise White noise
Power Supply/Consumption	11 to 30 V DC, approx. 45 W for an 8-channel I/O configuration (AR-LXPA1 and AR-LXAO) with media recording DC power supply cable and AC adapter are supplied.
Weight	Approx. 4.1 kg Approx.9 lb (for an 8-channel I/O configuration using an MO disk/a PC card)

* Other specifications follow the LX-10 specifications.

Battery Enclosure(BU-80)

Num. of Internal Battery Packs	3 (A battery pack is described below)
External Dimensions	Approx. 300W× 27.5H× 200D mm Approx. 12W× 1H× 8D in (excluding protruding parts)
Weight	Approx. 1.5 kg Approx. 3 lb (excluding the battery pack and mounting brackets)

Battery Pack (HP-30L)

Supplied Voltage	13.2 V
Capacity	3.3 Ah
Weight	Approx. 700 g Approx. 1.5 lb
Size	NP1 type
Battery Type	Ni-MH

Remote Control Unit (ER-LXRC)

LCD	Reflective type, 320× 160 pixels
Functions	Bar meter display, main/unit control (setting, recording, reproducing) Event, Microphone input
External Dimensions	Approx. 170W× 30H× 100D mm Approx. 6.5W× 1.2H× 4D in (excluding protruding parts) Cable length 5 m 16 ft
Weight	Approx. 0.65 kg Approx. 1.4 lb(excluding cable)

Extension I/O Unit for DC Input Amp (AU-LXEPIO)

I/O Amp Slots	2 (Specify the combination of amp cards to be built in when you order.)
External Dimensions	Approx. 300W× 30H× 200D mm Approx. 12W× 1.2H× 8D in (excluding protruding parts)
Weight	Approx. 1.2 kg Approx. 2.5 lb (excluding the amp card)

Extension I/O Unit for the Constant Current Excitation Type Accelerometer Input Amp (AU-LXEPIOP)

I/O Amp Slots	2 (Eight channels per slot) (Specify the combination of amp cards to be built in when you order.)
Power Supply	11 to 30 V DC, DC power supply cable and AC adapter are supplied.
External Dimensions	Approx. 300W× 50H× 200D mm Approx. 12W× 2H× 8D in (excluding protruding parts)
Weight	Approx. 2 kg Approx. 1 lb (excluding the amp card)

Amp Cards

DC Input Amp (AR-LXDC2)

Num. of Channels	8
Input Format	Unbalanced
Input Coupling	DC
Low-speed Sampling	Fixes the sampling at 2 kHz, with DSP-based down sampling.
Input Impedance	100 k
Input Range	± 0.5, 1, 2, 5, 10, 20, 50 Vp (overrange ± 127%)
Absolute Max. Input Voltage	± 100 V
Filter	Joint use of both a digital filter (Decimation LPF) and an analog filter (2nd Order Butterworth)

Sampling Frequency	Frequency Bandwidth	1/2 fs Attenuation
1kHz	DC to 400Hz	80dB
500Hz	DC to 200Hz	80dB
200Hz	DC to 80Hz	80dB
100Hz	DC to 40Hz	80dB
50Hz	DC to 20Hz	80dB
20Hz	DC to 8Hz	60dB
10Hz	DC to 4Hz	60dB
5Hz	DC to 2Hz	40dB
1Hz	DC to 0.4Hz	No filter
1/30Hz	DC to 0.013Hz	No filter
1/60Hz	DC to 0.006Hz	No filter

Note : Analog voltage output is not supported.

Frequency Characteristics
Tolerance of ± 0.5 dB for DC to each bandwidth of the main unit.

Num. of Quantizing Bits / Conversion Method
24 bits, MSB16 bits used for data out of 24 bits Simultaneous sampling, 128-times oversampling ΔΣ (delta sigma) method: 64-times oversampling at 96 kHz sampling

Sampling Frequencies	See the sampling frequencies of the main unit.
Power Consumption	Approx. 5 W

Constant Current Excitation Type Accelerometer Input Amp (AR-LXPA1)

Num. of Channels	8 differential inputs
Input Format	Balanced and unbalanced
Input Coupling	Balanced AC coupling, balanced DC coupling, unbalanced DC coupling
Input Impedance	100 k
Input Range	± 0.01, 0.0316, 0.1, 0.316, 1.0, 3.16, 10 Vp (overrange to ± 127%)
Absolute Max. Input Voltage	± 50 V
Filter	Joint use of both a digital filter and an analog filter (2nd Order Butterworth)
Frequency Characteristics	± 0.5dB. In AC mode: 1 Hz to the bandwidth of the main unit (-3 dB at 0.1 Hz). In DC mode: DC to the bandwidth of the main unit.
Num. of Quantizing Bits / Conversion Method	24 bits, MSB16 bits used for data out of 24 bits Simultaneous sampling, 128-times oversampling ΔΣ method: 64-times oversampling at 96 kHz sampling
Sampling Frequencies	See the sampling frequencies of the main unit.
Power Supply to Sensors	28V DC, 4 mA
Power Consumption	Approx. 7 W

Constant Current Excitation Type Accelerometer Input Amp (AR-LXPA2)

Input Range	± 0.0316, 0.1, 0.316, 1.0, 3.16, 10, 50 Vp (overrange to ± 127%)
Absolute Max. Input Voltage	± 50 V in the ± 10 Vp range, ± 100 V in the ± 50 Vp range
Weighting	A, C, Flat
High Pass Filter	10 Hz, 20 Hz switchable
Power Supply to Sensors	28V DC/4 mA or 24V DC/4 mA switchable at hardware

* Other specifications follow the AR-LXPA1 specifications.

Analog Output Amp (AR-LXAO)

Num. of Channels	8
Output Format	Unbalanced
Output Coupling	DC coupling
Output Level	± 1 to 5 V (variable in 0.1 V steps)
Frequency Bandwidths	DC to the frequency bandwidth of the main unit
Filter	Joint use of both a digital filter (Decimation LPF) and an analog filter(2nd Order Butterworth)
Num. of Quantizing Bits / Conversion Method	24 bits, MSB16 bits used for data out of 24 bits 128-times oversampling ΔΣ method: 64-times oversampling at 96 kHz sampling
Output Connector	BNC
Power Consumption	Approx. 5 W

Overall Accuracy

When Using AR-LXPA1 and AR-LXAO

Range accuracy	± 2% or less
Linearity	± 0.1% or less
Distortion factor	± 0.05% or less (for bandwidth of 20 kHz or more), ± 0.2% or less (for bandwidth of 10 kHz or less)
Drift	± 0.1% or less (from 10 minutes after the power has been turned on and when recording to one media)
Inter-channel phase difference	Typical 0.5° (in the same range and with a bandwidth of 20 kHz or less), or 1° or less (in the same range and with a bandwidth of 40 kHz)

S/N (Crosstalk), measured at the Analog Output:

Input Rage	At 20kHz or less	At 40 kHz
± 0.01V	64 dB (- 64 dB)	60 dB (- 60 dB)
± 0.0316V	74 dB (- 71 dB)	69 dB (- 69 dB)
± 0.1V	83 dB (- 77 dB)	76 dB (- 73 dB)
± 0.316V	87 dB (- 77 dB)	77 dB (- 73 dB)
± 1.0V	87 dB (- 77 dB)	77 dB (- 73 dB)
± 3.16V	87 dB (- 77 dB)	77 dB (- 73 dB)
± 10V	87 dB (- 77 dB)	77 dB (- 73 dB)

When Using AR-LXDC2 and AR-LXAO

S/N	78 dB (within the bandwidth)
Crosstalk	- 78 dB (below 20 kHz within the bandwidth) or 75 dB (40 kHz within the bandwidth) (except for low-sped sampling)

Note: The overall accuracy specified here is the accuracy of the analog output when using an input amp and a DC output amp, and may differ depending on the frequency characteristics and the input range of the input amp.
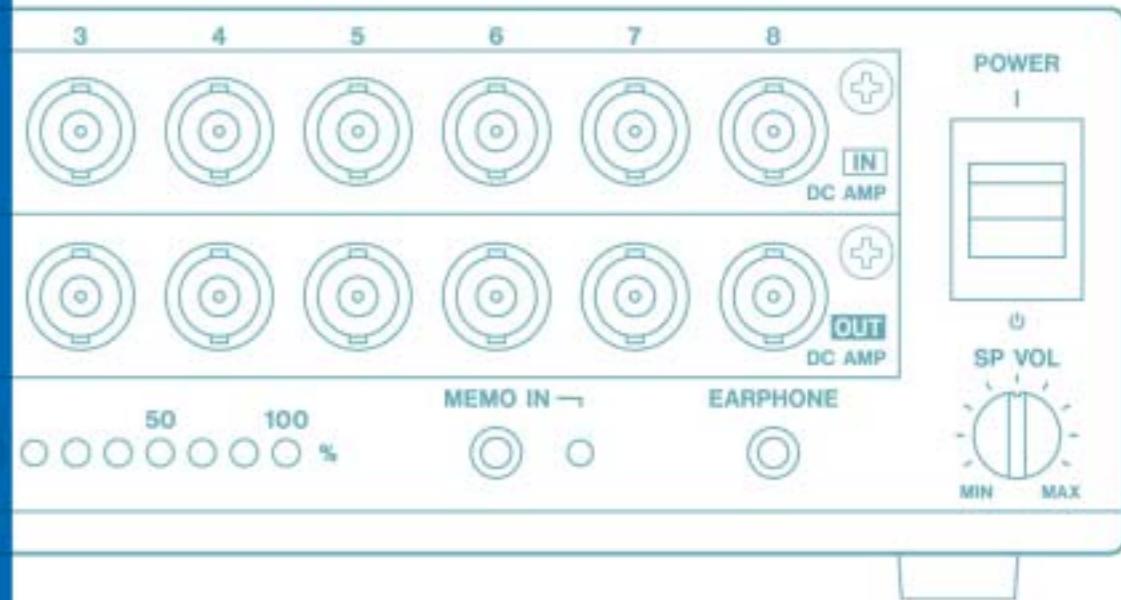
LX Series
Recording Unit

Recording and playback performance that exceeds DAT Data Recorders

The new LX Series data recording system from TEAC has been designed for fast set-up, reliable recording, and versatile playback in your data recording applications in the laboratory and in the field. Following-on from the convenience of DAT recorders, the LX Series en-ables recording in wider bandwidths. The series has strengthened connectivity with sensors, PCs and analysis applications: achieves fast data processing; and is designed to lower data recording costs.

Versatile data recording system can interface many applications and popular analysis software packages.
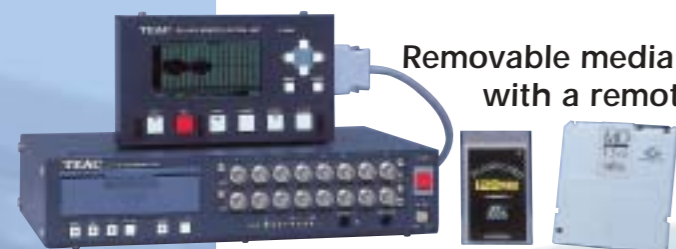
Versatile Recording System Configurations

Choose the recording media, the sampling frequency and control methods to meet your data acquisition and processing demands.

Stand-alone.....

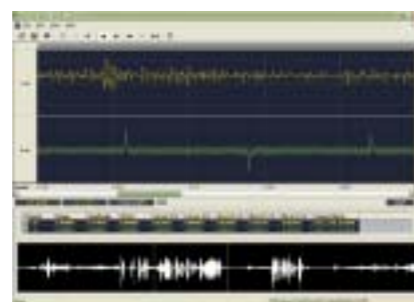**Removable media recording with a remote control unit.....**

With PC direct.....

Application Software

Many popular data analysis software packages support the data file format recorded by the LX series. In addition, TEAC LXView software is available for fast data file review and file format conversion.

Easy Setup and Secure Data Recording

TEDS sensor information display feature provides easy and accurate setting of measurement parameters.
Real time monitoring capability, along with simultaneous recording and data transfer to a PC make your critical data recording tasks more secure.

L X-10 Series - the LX-10 Series provides basic recording and playback performance with selections of recording media and input/output configurations.

Three Types of Recording Media
Memory (from the standard 64 MB to a maximum of 576 MB) achieves maximum recording rate: a PC card (Flash memory and IBM Microdrive™) enables data recording in environments where vibration occurs: or a 3.5 inch 1.3 GB MO disk is convenient for long-term media storage.

Recording Via a Maximum of 32 Channels
By combining channel selection and input amplifier cards, you can record via 2, 4, 8, or 16 channels, or use an expansion unit to record up to 32 data channels.

Simultaneous Recording to Media and PC with a Selection of Interfaces
Either an IEEE1394 interface or a 100BASE-TX interface can be selected to connect to the PC. While recording to a storage media, you can transfer data to a PC in real-time and display the data on the PC monitor, process the data, or record the data to hard disk on the PC. While using the PC for fast real-time recording and processing of data, you can back up the data onto a storage media. This achieves accurate data recording simultaneously with fast data analysis.
(Some information, such as events stored in a header file while recording to media, are not written to the header file while recording directly to PC.)

Higher Recording Bandwidth
The LX Series can record 8 channels at 20 kHz bandwidth with 48 kHz sampling frequency per channel, which is double the recording performance of DAT recorders. Using internal memory or transferring data to a PC in real-time, you can record 8 channels at 40 kHz bandwidth with 96 kHz sampling via the IEEE1394 interface, or 8 channels at 20 kHz bandwidth with 48 kHz sampling via the 100BASE-TX interface.
(Using an IEEE1394 interface in the PC, as specified by TEAC. The data transfer rate to the PC varies depending on the connected PC environment.)

I/O Amp Cards in 8 Channel Units
Two types of input amplifier cards are available: including a DC input amp card and a selectable DC / constant current excitation type accelerometer input amp card. The available output amplifier card can output the analog voltage during recording and can play back the analog voltage after recording for both types of input amp cards.
(The output amp card does not support low sampling below 1 kHz, and can only reproduce the analog voltage within the same sampling time base series.)

Lower Sampling Rate to Extend Recording Times
Using the DC input amp card that supports low sampling rates, you can select a sampling frequency from 1 kHz to a maximum length of 1/60 Hz.

Controlling the Main Unit from a Remote Controller Unit or a PC
The LX main unit provides LED indicators and operation keys that are required for recording. After you set the parameters, recording can proceed independently. Using a remote controll unit or a PC, you can perform a sequence of operations: system setup, recording, monitoring, and data playback. During recording, the remote controll unit can display a bar meter and the PC can display a bar meter, waveform display, or digital display by us-ing the standard LX Navi software. These display functions provide real-time data monitoring.

Trigger Recording
To let you record data efficiently, various types of start and stop trigger modes are provided. You can control the starting or stopping of recording by using external control, level start/stop triggers, timer recording, interval recording, time-out start, start pre-trigger, stop post-trigger recording, or repeat recordings.
(Some restrictions might apply to the triggers that can be used when using a combination of triggers.)

Voice Memo Recording and Audio Playback
You can record convenient voice memos to describe recorded data, which simplifies later extraction. These voice memos are recorded as WAV files separate from the recorded data files. Data recorded from any one channel or the voice memo can be played over the built-in speaker.

Battery Enclosure
The battery enclosure BU-80 can be attached to the bottom of the main unit. In addition to battery-powered operation, battery-backup operation is possible using an external DC power source. Up to 3 battery packs in tandem for longer life can be stored in the BU-80, which enables 3 hours of recording when recording 8 channels to media via the constant current excitation type accelerometer input amp card.
(The BU-80 does not include the battery pack.)

L X-20 Series - In addition to all recording and playback features of the LX-10 Series, the LX-20 Series provides the selection of additional sampling rate series, Tachometer pulse inputs, and a signal generator feature.

Maximum Recording Rate
Record to the internal memory, or to the hard disk drive of the PC via IEEE1394 interface:1.536 MB/s (Example, 40 kHz bandwidth with 96 kHz sampling rate x 8 channels)
Record to the MO/PC card, or to the hard disk drive of the PC via 100BASE-TX (Pier-to-Pier connection): 0.768 MB/s (Example, 20 kHz bandwidth with 48 kHz sampling rate x 8 channels)
Note: Recording rate to the hard disk drive of the PC may vary depending on the connection and the PC specifications.

Versatile Sampling Rate Selections for Frequency Analysis
In the LX-20 series, 102.4 kHz, 65.536 kHz, and 100 kHz sampling rate series can be selected in addition to the 96 kHz sampling rate series, fitting for FFT analysis data recording by using the LX-20 as a PC front-end.

Direct Rotational Signal Inputs
The LX-20 provides dedicated 1 × / 2 × tachometer pulse input(s) without impacting the analog input channel count.
(Using the tachometer pulse input channels lowers the maximum sampling rate at some of the channel settings.)

Output to Vibration Simulators and Loudspeakers
A waveform generating function is provided at the LX-20 monitor output terminal. You can record data while outputting sine waves, white noise or pink noise to vibration simulators or loudspeakers.

Frequency Bandwidth vs. Recording Time

576 MB Memory (64 MB standard + 512 MB optional)

Numbers of Channels	Frequency Bandwidth	Recording Time
2	40 kHz (96 kHz sampling)	1,480 seconds (Approx. 24 minutes) / 1,450 seconds at Memo ON
4	40 kHz (96 kHz sampling)	740 seconds (Approx. 12 minutes) / 730 seconds at Memo ON
8	20 kHz (48 kHz sampling)	370 seconds (Approx. 6 minutes) / 360 seconds at Memo ON
16	10 kHz (24 kHz sampling)	370 seconds (Approx. 6 minutes) / 360 seconds at Memo ON
32	5 kHz (12 kHz sampling)	370 seconds (Approx. 6 minutes) / 360 seconds at Memo ON

Note: Turning ON the voice memo additionally consumes 64 kbps (8 bits x 8 kHz) data. Turn OFF the tachometer pulse input channels.

PC Card

Calculation based on using 950 MB capacity of 1 GB PC card

Numbers of Channels	Frequency Bandwidth	Recording Time
2	40 kHz (96 kHz sampling)	2,470 seconds (Approx. 41 minutes) / 2,420 seconds at Memo ON
4	40 kHz (96 kHz sampling)	1,230 seconds (Approx. 20 minutes) / 1,220 seconds at Memo ON
8	20 kHz (48 kHz sampling)	1,230 seconds (Approx. 20 minutes) / 1,220 seconds at Memo ON
16	10 kHz (24 kHz sampling)	1,230 seconds (Approx. 20 minutes) / 1,220 seconds at Memo ON
32	5 kHz (12 kHz sampling)	1,230 seconds (Approx. 20 minutes) / 1,220 seconds at Memo ON

Note: Turning ON the voice memo additionally consumes 64 kbps (8 bits x 8 kHz) data. Turn OFF the tachometer pulse input channels.

Optional Accessories

Battery Unit BU-80/ Battery Pack HR-30L   Vehicle Mount Adapters TZ-LXVM (16ch Unit)   Remote Control Unit ER-LXRC