VIBbox

32, 48, or 64-Channel Sound & Vibration Solution – Expansion to 256 Channels

Overview

VIBbox is a high-accuracy, high-channel-count, dynamic signal analyzer system for sound and vibration applications. Each VIBbox packages up to four DT9857E modules in a rugged enclosure to provide up to 64 IEPE 24-bit Delta-Sigma sensor inputs, 8 D/A stimulus outputs, 4 tachometers, 4 32-bit counter/timers, 8 measure counters, and 32 DIO lines. If additional channels are required, users can connect multiple VIBboxes together to achieve up to 256 IEPE inputs, 32 D/A stimulus outputs, 16 tachometers, 16 32-bit counter/timers, 32 measure counters, and 128 DIO lines.
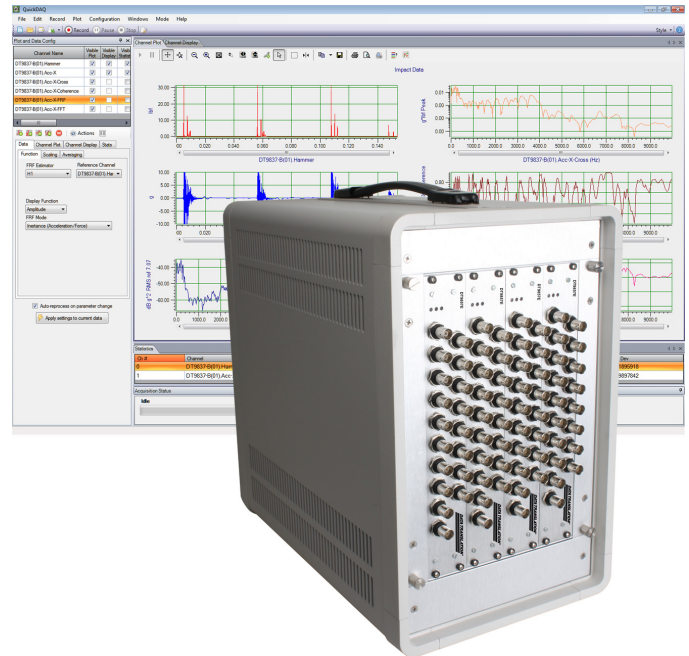
Key Features

- Up to four DT9857E modules in a rugged enclosure providing up to 64 IEPE analog input channels
- Input sample rate up to 105.4 kS/s/channel (system dependent)
- 24-bit Delta-Sigma ADC per channel eliminates aliasing for extremely accurate measurement
- Up to 8, 32-bit stimulus waveform output channels with output rates up to 216 kS/s/channel
- Programmable input range up to ±10 V
- Up to 32 digital input lines and up to 32 digital output lines
- Up to 4, 32-bit counter/timers, up to 4 tachometers, and up to 8 measure counters
- External power supply included (+7.5 VDC to +24 VDC)
- Up to four STP25 Screw Terminal Panels and Cables included with each VIBbox for connecting DIO, counter/timers, and tachometers
- Free QuickDAQ with Advanced FFT Analysis application and Signal Processing Component Library for .NET included

Supported Operating Systems

- Windows® 10/8/7/Vista® 32/64-bit

The DT9862 high-speed USB data acquisition module features SMA connectors to ensure signal integrity at a maximum sample rate of 10 MS/s per channel.

Analog Input Channels

VIBbox-64 provides 64 analog IEPE input channels, VIBbox-48 provides 48 IEPE inputs, and VIBbox-32 provides 32 IEPE inputs. Software-selectable gains of 1 and 10 provide effective input ranges of ±10 V and ±1 V. Each analog input channel uses a 24-bit Delta-Sigma analog-to-digital converter (ADC) that provides anti-aliasing filtering based on the clock rate. In addition to acquiring data from the analog input channels, VIBbox supports the ability to simultaneously acquire the value of the tachometers, measure counter/timers, measure counters, and digital input ports in the analog input stream, allowing precise correlation of all input signals.

Features Summary							
Model	IEPE Inputs	Analog Outputs	DIO Lines		Counter/ Timer	Measure Counters	Tachometer
			In	Out			
VIBbox-64	64	8	32	32	4	8	4
VIBbox-48	48	6	24	24	3	6	3
VIBbox-32	32	4	16	16	2	4	2
Extending VIBbox to 256 Channels (up to 4 units)							
4 units, VIBbox-64	256	32	128	128	16	32	16

Any combination of VIBbox models can be connected together for a maximum of 256 analog input channels.

IEPE Support

Applications that require accelerometer, vibration, noise, or sonar measurements often use IEPE sensors. IEPE conditioning is built-in to the analog input circuitry of the VIBbox. Each analog input channel provides the following capabilities for IEPE support:

- Excitation current source — Internal excitation current source of 4 mA.
- Coupling type — Software-programmable AC coupling or DC coupling.
- Compliance voltage — +24 V

Analog Input Clock

VIBbox supports an internal clock, which is derived from the 48 MHz crystal oscillator, for pacing analog input operations. The sampling frequency can be programmed to a value between 195.3 Hz and 105.4 kHz.

Input Triggers

VIBbox supports both a start trigger and a reference trigger. Users can specify a start trigger to acquire post-trigger data when the specified start trigger event occurs. To acquire pre- and post-trigger data, users can specify both a start trigger and a reference trigger. In this case, pre-trigger data is acquired when the start trigger occurs and post-trigger data is acquired when the reference trigger occurs. Post-trigger acquisition stops when a user-specified number of samples have been acquired. The following trigger sources are supported:

- software trigger source (start trigger only)
- external digital (TTL) positive or negative trigger
- threshold trigger

Analog Output Channels

VIBbox-64 supports eight 32-bit analog output channels, VIBbox-48 supports six analog outputs, and VIBbox-32 supports four analog outputs, all with an output range of ±10 V. A two-pole Butterworth filter and quiet start circuitry prevents noise from interfering with the output signal. VIBbox supports single-value, waveform, and continuous analog output operations. In addition, the digital output ports can be updated simultaneously with the analog output channels for simultaneous stimulus and control applications.

Analog Output Clock

VIBbox supports an internal D/A clock, which is derived from the 48 MHz crystal oscillator. The clock frequency of the D/A output clock can be programmed to a value between 30 kHz and 216 kHz for pacing output operations.

Output Triggers

To start an output operation, the following output triggers are supported: software trigger or external digital (TTL) positive or negative trigger.

Tachometer Inputs

VIBbox-64 supports four tachometer input signals, VIBbox-48 supports three tachometers, and VIBbox-32 supports two tachometers, all with a range of ±30 V. The frequency or period between two edges of the tachometer input signal can be measured to calculate the rotational speed of the high level tachometer input. The values can then be returned in the analog input data stream. The starting edge (either rising or falling) of each tachometer signal is programmable. An internal 12 MHz counter is used for the measurement.

General-Purpose Counter/Timers

VIBbox-64 supports four 32-bit, general-purpose counter/timers, VIBbox-48 supports three counter/timers, and VIBbox-32 supports two counter/timers. The value of the counter/timers can be returned in the analog input data stream, if desired. The following counter/timer functions are supported: event counting, edge-to-edge measurement, continuous edge-to-edge measurement (for determining the frequency and period width of a signal), continuous pulse output, one-shot, repetitive one-shot, and up/down counting operations. Programmable gates, clocks, and output signals are also supported.

Measure Counters

VIBbox-64 supports eight measure counters, VIBbox-48 supports six measure counters, and VIBbox-32 supports four measure counters. Each counter can measure the frequency or period between two signals or two edges of the same signal and return the value in the analog input data stream. This is useful for correlating analog input and digital positional data.

A variety of programmable signals and edges are supported for the measurement, including the A/D conversion complete, tachometer signal, measure counter/timer, and digital input signals. An internal 48 MHz counter is used for the measurement.

Digital I/O Lines

VIBbox-64 supports four digital input ports and four digital output ports, the VIBbox-48 supports three digital inputs ports and three digital output ports, and the VIBbox-32 supports two of each.

Each digital input port consists of 8 digital input lines and each digital output port consists of 8 digital output lines. Users can read all digital input lines or write to all digital output lines with a single-value digital I/O operation.

Users can also return the value of the digital input ports in the analog input stream for synchronous input measurements, or update the value of the digital output ports in the analog output stream for synchronous waveform stimulus and control.

VIBbox-64 packages four DT9857E modules in a rugged enclosure for field use. The user can take advantage of the full expandability of this module series in a self-contained enclosure. The use of a USB hub internal to the system allows easy connection to the host computer through one simple USB cable. An external power supply is included.
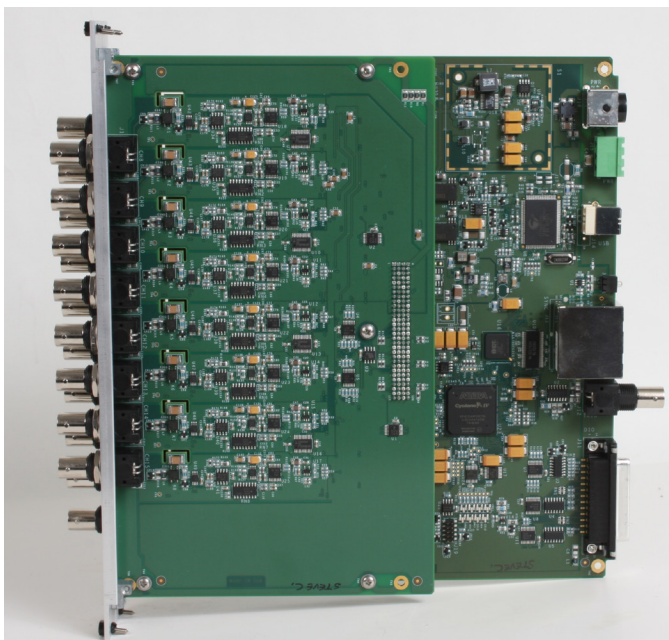
The DT9857E provides sixteen IEPE analog inputs, 2 analog outputs, 16 DIO, 1 counter/timer, 1 achometer, and 2 measure counters on each board set. VIBbox-64 packages four of these to bring the channel count to: 64 IEPE analog inputs, 8 analog outputs, 64 DIO, 4 counter/timer, 4 tachometers, and 8 measure counters. For more information on the DT9857E module, visit our web site: www.mccdaq. com/Products/Sound-Vibration-DAQ/DT9857E

Channel Expansion

If desired, you can connect up to four VIBboxes together to synchronize up to 256 analog inputs, 8 analog outputs, 128 digital input lines, 128 digital output lines, 16 counter/timers, 32 measure counters, and 16 tachometer inputs.

Any VIBbox model can be connected together for maximum flexibility. For example, if 80 analog input channels are required, users can connect one VIBbox-48 and one VIBbox-32 together.

A maximum of four VIBboxes, in any combination of VIBbox models, can be connected together to expand the number of channels.

All channel data is available at the same time due to the simultaneous operation and parallel configuration of the I/O circuitry. This parallel measurement capability assures that vibration data can be analyzed at the same instant in time without the time lapse and phase difference of multiplexed systems.

When multiple VIBboxes are connected together, users can achieve a maximum throughput rate of 51.2 kS/s on each channel. IEPE inputs from sensors such as microphones, accelerometers, and other transducers that have a large dynamic range can be connected directly and measured at this very fast throughput rate.

The DT Device Collection Manager, provided on the OMNI CD with the VIBbox, allows all the channels from each VIBbox to be combined into one collection, enabling the software to work seamlessly with all channels for maximum ease of use.


VIBboxes are connected together by attaching an EP377 Trigger Bus cable from the Sync Bus connector of one VIBbox to the Sync Bus connector of the next VIBbox. Each VIBbox must be powered using an external power supply and connected to a USB 3.0 port of a host computer.

QuickDAQ with Advanced FFT Analysis

QuickDAQ with Advanced FFT Analysis is a ready-to-measure application package that ships free with VIBbox. Combine QuickDAQ with VIBbox to acquire data, record data to disk, analyze the data, display the results in both a plot and digital display, and read a recorded data file. Data can be exported to other applications like Microsoft Excel® and The Mathworks MATLAB® for more advanced analysis.

Key Features

- **QuickDAQ with Advanced FFT Analysis**
  - o Ready-to-measure application software
  - o Configure, acquire, log, display, and analyze data
  - o Customize many aspects of the acquisition, display, and recording functions to suit your needs
  - o Perform single-channel FFT operations including:
    - ◊ Auto Spectrum
    - ◊ Spectrum
    - ◊ Power Spectral Density
  - o Configure and view dynamic performance statistics
  - o Supports Hanning, Hamming, Bartlett, Blackman, Blackman Harris, and Flat Top response windows
  - o Perform 2-channel FFT operations including:
    - ◊ FRF
    - ◊ Cross-Spectrum
    - ◊ Cross Power Spectral Density
    - ◊ Coherence
    - ◊ Coherent Output Power
  - o Supports real, imaginary, and Nyquist display functions
  - o Additional FFT analysis functions supported: Exponential, Force, Cosiner Taper
  - o Save data to .uff file format
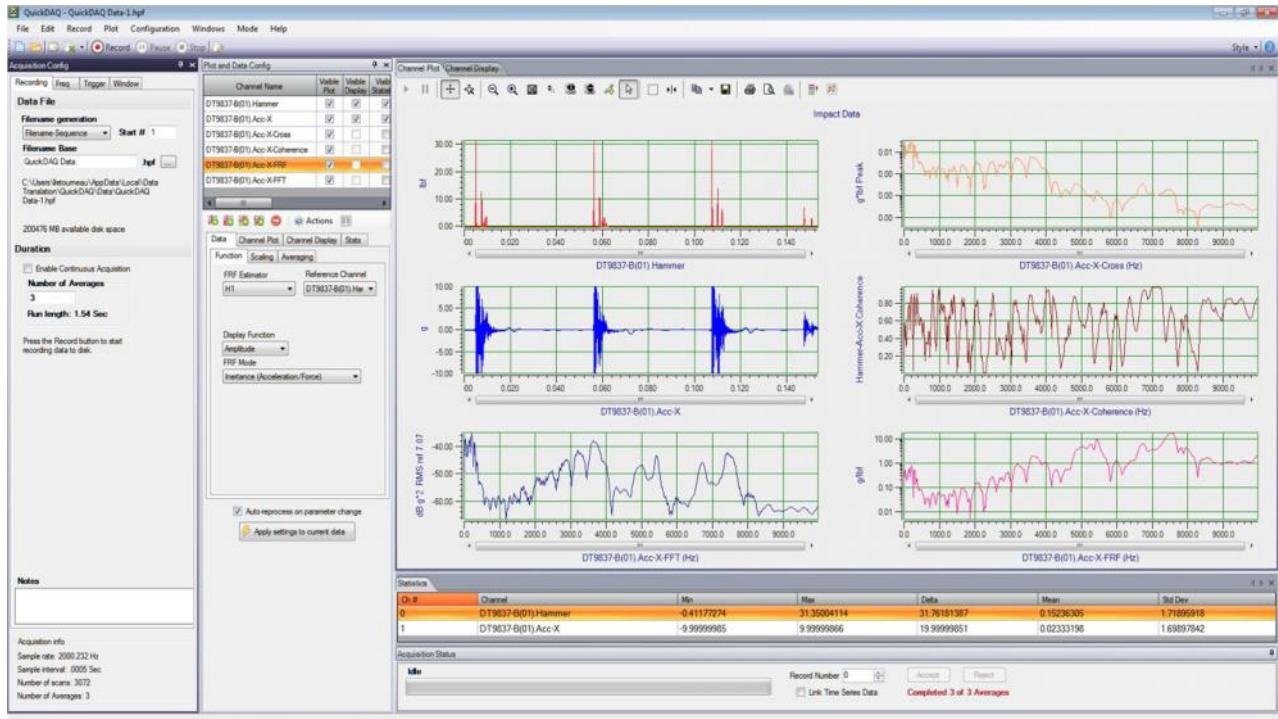
QuickDAQ with Advanced FFT Analysis ships free-of-charge and allows you to get up and running quickly.

Signal Processing Component Library for .NET

The Signal Processing Component Library for .NET is a rapid development environment for signal processing applications. Each component contains properties and methods that can be used to perform single-channel and two-channel FFT operations, and to calculate signal metrics on time-domain data.

Other Software Options

The following software is available for use with the VIBbox and is provided on the Data Acquisition Omni CD:

- **DT9857E Device Driver** – The device driver allows you to use the DT9857E modules in the VIBbox with any of the supported software packages and utilities.
- **VIBbox Calibration Utility** – This utility allows you to calibrate the analog input and analog output circuitry of the VIBbox
- **DT-Open Layers® for .NET Class Library** — Use this class library if you want to use Visual C#® or Visual Basic® for .NET to develop application software for a DAQ module using Visual Studio® 2003-2012; the class library complies with the DT-Open Layers standard.

- **DataAcq SDK** — Use the DataAcq SDK to use Visual Studio 6.0 and Microsoft® C or C++ to develop application software for a DAQ module using Windows 10/8/7/Vista/XP 32/64-bit; the DataAcq SDK complies with the DT-Open Layers standard.
- **DAQ Adaptor for MATLAB** — Data Translation's DAQ Adaptor provides an interface between the MATLAB® Data Acquisition (DAQ) toolbox from The MathWorks™ and Data Translation's DT-Open Layers architecture.
- **LV-Link** — Data Translation's LV-Link is a library of VIs that enable LabVIEW™ programmers to access the data acquisition features of DT-Open Layers compliant USB and PCI devices.

The Signal Processing Component Library for .NET is a comprehensive library of object-oriented classes ideal for developing signal processing applications. Each class contains properties and methods that can be used to perform single-channel and two-channel FFT operations, and to calculate signal metrics on time domain data. This library is included free with VIBbox.
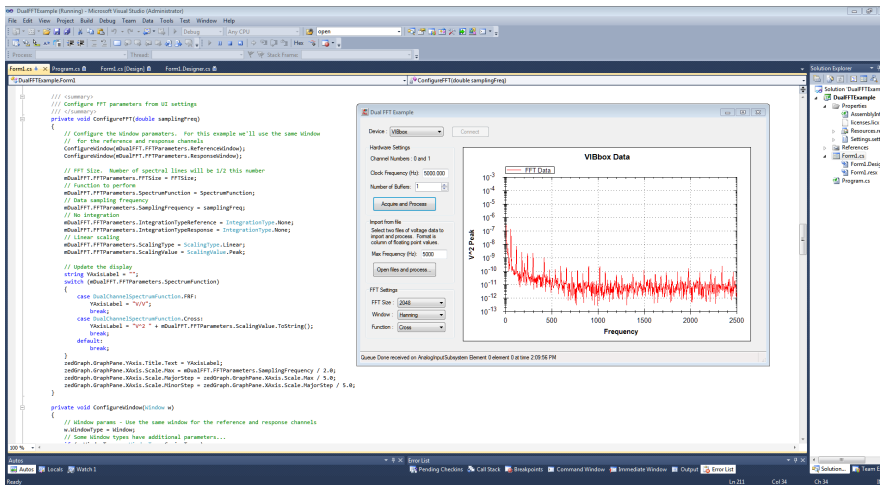
HARDWARE

- **VIBbox-64** – 64-channel Sound & Vibration System, includes 64 IEPE analog inputs, QuickDAQ with Advanced FFT Analysis, Signal Processing Component Library for .NET, four STP25 screw terminal panels w/ cables, and external power supply
- **VIBbox-48** – 48-channel Sound & Vibration System, includes 48 IEPE analog inputs, QuickDAQ with Advanced FFT Analysis, Signal Processing Component Library for .NET, three STP25 screw terminal panels w/ cables, and external power supply
- **VIBbox-32** – 32-channel Sound & Vibration System, includes 32 IEPE analog inputs, QuickDAQ with Advanced FFT Analysis, Signal Processing Component Library for .NET, two STP25 screw terminal panels w/ cables, and external power supply

ACCESSORIES

- **EP377 LXI Trigger Bus cable** – When connecting four VIBboxes together, three EP377 cables are required. When connecting three VIBboxes together, two EP377 cables are required. When connecting two VIBboxes together, one EP377 cable is required.

INCLUDED SOFTWARE

- **QuickDAQ with Advanced FFT Analysis**
- **Signal Processing Component Library for .NET**
- **Data Acquisition Omni CD**

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VIBbox-Datasheet

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