VTI Instruments

DATA SHEET

EMX-1434

"SMART' PXI EXPRESS 4-CHANNEL 204.8 KSA/S ARBITRARY WAVEFORM GENERATOR

APPLICATIONS

Modal / GVT (Ground Vehicle Testing)
Acoustics
Shock / Vibration
Rotational Machinery
Electronic Test

FEATURES

Analog Performance

- 4-channel, 204.8 k Sa/s sample rate per channel
- Dual integrated tach input channels
- Synchronized DSA source
- Rotational measurement capability
- 4 channel DIO
- Advanced system-on-a-chip filtering and analysis
- Precision multi-channel synchronization
- End-to-end internal source self-calibration

System Level Functionality

- Corporate Wide Cloud Data Management / Access
- Comprehensive Runtime Health Monitoring
- Run-time Self-calibration / Embedded NIST Calibration
- Precision Distributed Measurement Synchronization
- Data Streaming at Full Acquisition Rates on all Channels across PXI Express backplane

Software

- X-Modal III
- EXLab
- SO Analyzer
- Open Source Drivers

AMETEK PROGRAMMABLE POWER

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OVERVIEW

High Performance Architecture

The EMX-1434 is an arbitrary source/tach high performance modular PXIe board which has four channels arbitrary sources and two channels tachometer inputs. It is uniquely designed for sound/vibration and DSA applications and can be easily synchronized with digitized data giving the capability to combine the required source and signal analysis into one single chassis to maximize flexibility. It supports various output modes such as Sine, Burst Sine, Chirp, Burst-random and continuous random. It also provides two 64-bit tachometer/counter input channels each of which has a 16k-word FIFO. The module functions as a high-performance arbitrary waveform generator that is also ideal for electronic test applications requiring standard function generator capability, or the need to generate custom-defined waveforms.

With its capability of providing stimulus to a shaker, loudspeaker and other electrical devices, it can be paired with the EMX-4250, EMX-4350, EMX-4380 and EMX-6010 products forming the basis for a versatile dynamic signal analysis system. With the most advanced PXIe and LXI architecture, it can stream numerous waveforms from the host computer to the module, with that ability to synchronize multiple channels in a distributed architecture through the use of IEEE-1588 precision time protocol.
Analog Performance

Analog Performance

Built-in Sine and Noise Waveforms

Sine waveform is one of the most common test waveforms. The EXM-1434 provides four independent channels of sine wave capability, each with its own frequency, phase, and amplitude. Sine waves can be generated in continuous and burst modes with frequencies from less than 1Hz to 93 kHz.
The EMX-1434's noise capabilities are specifically designed to provide periodic and pseudo random waveforms in either continuous or burst mode. Additionally, the EMX-1434 can band-translate the noise to have a non-zero start frequency. This allows the user to pinpoint the noise stimulus to frequencies of interest, avoiding troublesome resonances or frequencies that might damage the device under test.

Arbitrary Waveform

The EMX-1434 can generate arbitrary waveforms to provide simulate virtually any stimulus pattern with a bandwidth up to 80 kHz. Arbitrary waveforms can be downloaded from the host computer and then output a repeating loop. Or the host can continuously download new segments of a waveform to be concatenated with previous segments, allowing continuous, glitch-free playback of any length waveform.

24-bit Resolution for dynamic range

The EMX-1434 has a 24-bit DAC per channel and a very high -115dB spurious free dynamic range. The 24-bit DAC ensures superior accuracy and allows the EMX-1434 to output high-fidelity waveforms. The -115dB SFDR maximizes the dynamic performance of the EMX-1434 and is useful for applications where there is a need for smooth output levels over a wide amplitude range.

Analog Performance

Built-in Tachometer inputs for Rotating Machinery/Order Analysis Tests

The EMX-1434 has integrated dual tachometer inputs with signal conditioning for a wide range of Tach input signals. These inputs allow tight integration of tachometer information from rotating machinery with acquired data from a digitizer card. This provides the information the floating point processor needs to do RPM triggering of order analysis measurements. Data accuracy can be increased by the fact that the measurement data can be re-sampled and synchronized based on the edge of the tachometer. With the build-in tachometer feature, the EMX-1434 works best with the EMX series DSA products, EMX-4250, EMX-4350, EMX-4380 and EMX-6010 in stimulus and response applications such as rotating machinery and order analysis tests.

Channel independence and pairing

The EMX-1434 four output channels are grouped in pairs. Both channels of a pair must output the same type of waveform - sine, random or arbitrary. But each pair of channels is completely independent from the other pair. For example, one channel pair can output two uncorrelated random noise signals while the other channel pair and produce two independent sine waves.

Graceful Shutdown/Safety Feature

Since arbitrary sources can drive very expensive devices under test, it is important to provide an orderly shutdown in case of emergency. In addition to programmable ramp-up and ramp-down rates, the arbitrary source has a smooth ramp-down from AC power failure, or in response to its emergency shutdown input. Furthermore, the EMX-1434 supports < 4 ms fast shutdown for failure conditions and < 5 sec slow shutdown which would be typically used for shaker applications.

Analog Performance

Built-in self calibration

Measurement accuracy is maximized utilizing a unique approach for run-time self-calibration eliminating the need to disconnect transducers or field connections. Complete end-to-end self-calibration is performed using a precise onboard voltage reference source permitting execution at test time, at current temperature. This approach not only delivers the most accurate measurements possible, but also validates the instrumentation signal path prior to test.

Complete embedded NIST traceable calibration eliminates the need to remove the instrument from service, resulting in maximum test equipment utilization, reduced need for spares, and reduced down time. The embedded web interface provides a fool-proof, easy to use interface to permit complete traceable calibration, in place, without removing the instrument from service.

System-level Functionality

Industry standard MATLAB® and Simulink® design tools simplify implementation, maximize re-usability, and provide access to hundreds of standard filters and analysis algorithms.

System-level Functionality

Corporate wide cloud data management delivers advanced data access, security and storage services throughout the organization, accessible from web browsers and other applications, on desktop and mobile devices.

- Simplified, next generation user data services
- Corporate wide data access and security
- Dynamically scalable data management services
- Accessible on a wide range of traditional and mobile devices
- Eliminates need for knowledge of the physical location or configuration of the system

Comprehensive runtime health monitoring (BIST: Built-in Self-test) provides test system confidence and peace of mind by ensuring that the complete instrumentation measurement path is functional and delivering the most accurate results possible.

- Ensures runtime instrument performance and accuracy
- Performed without disconnecting external transducer cabling
- Delivers exceptional run-time convenience and measurement confidence
- Instrument performance is verified utilizing precision internal voltage references

Precision distributed measurement synchronization ensures that all test data is time correlated whether the instrumentation is centrally located in the laboratory or distributed around a test article.

- Enables widely distributed system level performance
- Utilizes embedded IEEE 1588 precision time protocol
- Precise synchronization across multiple instrumentation modules and chassis
- Synchronization achieved over-the-wire (Ethernet), with complete user transparency

Software

Software

Open-source SDRL X-Modal III experimental modal analysis software features intuitive task oriented user interfaces, extensive modal parameter estimation algorithms, parallel display capabilities, flexible data management, and unparalleled channel expandability.

- MATLAB®-based open-source programming environment
- Multiple live parameter estimation windows displayed in parallel
- Task oriented, easy-to-use user interface always "one-click" away
- Simplified "cut & paste" data management and unit's unification tool

EXLab is an easy to use, turn-key, data acquisition solution featuring intelligent configuration capabilities, automatic device discovery, extensive time and frequency domain data visualization, and post-acquisition display and analysis tools.

- Intuitive setup and control
- Remote client monitor and control
- Advanced filtering, analysis, and modeling
- Waterfall, video, images, scatter, 3D model and SRS diagrams

Open Source industry standard, drivers and programming interfaces provide the flexibility and freedom of choice to select the application programming environment best suited for the application and specific development requirements.

- Support for all major programming environments
- Software interoperability, maintainability, and reusability
- Common development environment and interface across all instrumentation types

General Specifications

SOURCE	
OUTPUT MODES	Sine, burst sine, pseudo random noise, and band translation. Arbitrary waveform with loop or continuous output and burst
DIGITAL-TO-ANALOG CONVERTER	Independent 24-bit per channel
OVERVOLTAGE PROTECTION	±40 V peak
DYNAMIC RANGE	115 dB, 0-51.2 k Hz spurious free
THD	-98 dB, to 20 kHz
CROSS CHANNEL PHASE MATCH	±0.01° per 1 kHz
CROSS CHANNEL AMP MATCH	±0.01 dB 10Hz to 20 kHz
SAMPLING RATE	204.8 kSa/s
FLATNESS	±0.01 dB to 35 kHz
	±0.06 dB 35 kHz to 93 kHz
PHASE LINEARITY	±0.005° DC to 10kHz
	±0.02° 10 kHz to 30 kHz
	±0.5° 30 kHz to 93 kHz
CROSSTALK	-100 dB to 10 kHz
	-95 dB 10 kHz to 93 kHz
MAXIMUM AMPLITUDE	±10 V
OUTPUT IMPEDANCE	<0.5 Ω
MAXIMUM OUTPUT CURRENT	±25 mA
MAXIMUM CAPACITIVE LOAD	Aberrations begin at 20nF
	Overshoot and ringing but no oscillation at 1µF
RESIDUAL DC OFFSET	<±1mV
AMPLITUDE CONTROL	
AMPLITUDE RANGE	-20 dB to 0 dB in 1dB steps
AMPLITUDE SCALE FACTOR	0 to 1
AMPLITUDE RAMP-DOWN TIME	4 ms
SINE OUTPUT MODE	
SHUTDOWN	yes
SINE FREQUENCY	0.01 Hz to 93 kHz
FREQUENCY RESOLUTION	71 uHz
AMPLITUDE ACCURACY	±0.05 dB
GENERATED FREQUENCY ACCURACY	Clock source dependent; internal clock 50ppm.
NOISE OUTPUT MODE	
FREQUENCY SPANS	80 KHz or 51.2 KHz Full Span – with/without Decimated by 5 and/or Decimated by 2 with maximum of 16 times
PASSBAND FLATNESS	< 1.2dBpp
CREST FACTOR	4:1 (Typical)
PERCENT IN-BAND ENERGY	> 90% (Typical)
MINIMUM SPAN	Full Span / $(5*2^{16})$
CENTER FREQUENCY RESOLUTION	71 uHz

FREQUENCY AND BAND TRANSLATION	MIN SPAN	MAX SPAN	MAX CENTER FREQUENCY
FS = 204.8 KHZ	0.244140625 Hz	80 KHz	80 KHz
FS = 131.072 KHZ	0.15625 Hz	51.2 KHz	51.2 KHz

General Specifications

ARBITRARY OUTPUT MODE	
MAXIMUM SIGNAL BANDWIDTH	80 KHz or 51.2KHz
BUFFER SIZE	64K Samples x 2 Buffers
CONTINUOUS ARB DATA RATE	User must supply data @ rate = $F/(5^m)*(2^n)$ Where Fs=204.8KHz or 131.072KHz m = 0 or 1 n = 0,1,2… 16
CONSTANT LEVEL OUTPUT	
OUTPUT LEVEL AT 1KHZ	±10V peak
RESIDUAL DC OFFSET	<±1mV
SUMMER INPUT	
MAXIMUM INPUT	±10V peak
GAIN, SUMMER INPUT TO SIGNAL OUTPUT	1
INPUT IMPEDANCE	2 kΩ
FLATNESS	±0.01 dB to 35 kHz ±0.06 dB 35 kHz to 93 kHz
TACHOMETER	
INPUTS	2
FREQUENCY INPUT RANGE	1 MHz
RANGES	±25 V ±250 V
INPUT TYPE	Differential
INPUT COUPLING	DC, AC 0.6 Hz
MINIMUM PULSE WIDTH	600 nS
THRESHOLD	Programmable ±95% of range
HYSTERESIS	Programmable ±1% of range
DIGITAL I/O	
CHANNELS	4
VIN HIGH	3.5 V min
VIN LOW	1.5V max
VOUT HIGH	4.9 V – Iout *100 Ω
VOUT LOW	+0.1 V + Iout *100 Ω
OVERVOLTAGE PROTECTION	±15 V peak
MAX SLEW RATE	50 V/µs
SHUTDOWN INPUT	A normally open contact between GND (SMB shell) and a 38 kΩ resistor pulled up to +5 V (SMB center).

Note: that this is not a safety rated shutdown and that if a safety rated shutdown is required then the user is responsible for such, not VTI Instruments.

Mechanical Specifications

IEEE 1588 CLOCK SPECIFICATIONS	
CLOCK OSCILLATOR ACCURACY	±50 ppm
SYNCHRONIZATION ACCURACY	Reports "synchronized" when < ±100 ns of the 1588 master clock
TIMESTAMP ACCURACY	As good as time synchronization down to 50 ns
RESOLUTION	25 ns
IEEE 1588-BASED TRIGGER TIMING	
ALARM	
TRIGGER TIME ACCURACY	As good as time synchronization down to 50 ns
TIME TO TRIGGER DELAY	50 ns
RECEIVE LAN [0-7] EVENT	
TRIGGER TIME ACCURACY	As good as time synchronization down to 50 ns
TIME TO TRIGGER DELAY	
Future timestamp	50 ns typical
Past/zero timestamp	1 ms maximum
HARDWARE TRIGGER TIMING	
DIO BUS	
TIME TO TRIGGER DELAY	57 ns typical

Environmental Specifications

TEMPERATURE	
OPERATING	0 °C to +50 °C
STORAGE	-40 °C to +70 °C
RELATIVE HUMIDITY	5% – 95% (non-condensing)
ALTITUDE	3000 m
SHOCK AND VIBRATION	Conforms to MIL-PRF-28800F
RANDOM VIBRATION	10 Min per Axis, MIL-PRF-28800F Class 3
SINUSOIDAL	5 to 55hz Resonance Search per MIL-PRF-28800F Class 3, each Axis
SHOCK	30g/Axis, 11mS half Sine pulse per MIL-PRF-28800F Class 3

Notes:

1) All specifications are typical unless otherwise stated as a minimum or maximum.

2) All specifications subject to change without notice.

3) All specifications assume within 24 hours and 5°C of self-calibration temperature unless otherwise specified.

Ordering Information

	PART NUMBER	
EMX-1434	70-0409-008R	4-Channel, 204.8 kSa/s Smart Arbitrary
SOFTWARE		
X-MODAL III		Modal Analysis Software
SO ANALYZER		Acoustics/Impact/Rotational/Shock Software
EXLAB*		General Purpose DAQ Software
*Multiple configurations available		
RELATED PRODUCTS		
EMX-4350	70-0409-002R	4-Channel, 625k Sa/s Smart Dynamic Signal Analyzer
EMX-4250	70-0409-004R	16-Channel, 204.8k Sa/s Smart Dynamic Signal
EMX-4251	70-0409-012R	Analyzer 8-Channel, 204.8k Sa/s DSA Digitizer
EMX-4008	70-0409-010R	8-Channel Break-out box for EMX-4250/4251
EMX-4016	70-0409-015R	16-Channel Break out box for EMX-4250/4251