



K I N E M E T R I C S

Basalt 4X/8X

High Dynamic Range, IP Aware, Communication Centric Multi-channel Recorder



Basalt 4X/8X represents the next evolution in Kinematics Multi-Channel Recorder Instrumentation. Offering exceptional high dynamic range, matched to Kinematics' outstanding *EpiSensor* accelerometer performance, and with exemplary timing accuracy, and spectral purity the **Basalt 4X/8X** again advances the standards of strong motion data recording. Complementing this outstanding data fidelity is a new suite of communication capabilities offering multiple real time data streams to multiple clients.

As a member of Kinematics' **Rock** platform, the **Basalt 4X/8X** is easy to integrate with other **Rock** and Quanterra instruments allowing users to develop highly flexible earthquake monitoring solutions.

The **Basalt 4X/8X** offers greatly enhanced ease of use over existing instruments as only a web browser is required to modify operation parameters, change recording and telemetry modes and formats, view or retrieve recorded files. Functions can be accessed worldwide via a WAN, or via a local wireless interface with the optional Bluetooth

Features

- ◆ 3 +1 sensor channels recorder (Basalt4X) or 2 (3 +1) sensor channels recorder (Basalt8X)
- ◆ 24-bit Delta Sigma converter per channel
- ◆ Built-in GPS
- ◆ Record and communicate multiple sample rates
- ◆ Multiple data formats and telemetry protocols
- ◆ Power Management for ultra-low power operation
- ◆ Rugged aluminum extruded case designed for 1m drop and 1m temporary immersion (IP67)
- ◆ Extensive state-of-health monitoring, including input and system voltages, internal temperature, humidity, communication link diagnostics
- ◆ Optional Terminal strips for easy sensor connection
- ◆ Transient and EMI/RFI protection on all connections
- ◆ System Status LEDs
- ◆ Designed for RoHS Compliance and easy re-cycling
- ◆ Designed for low total cost of ownership

Specifications subject to change without notice

Channels

Basalt: 3+1 sensor channels digital recorder
Also available with 2 (3 + 1) channels (Basalt8X)

Input level: 5Vpp, 10Vpp, 40Vpp Differential Input

Data Acquisition

Type: Individual 24-bit Delta Sigma converter per channel with Black Fin DSP

Anti-alias filter: Double Precision FIR Filter Causal/Acausal;
>140 dB attenuation at output Nyquist

Dynamic range: 200 sps ~127 dB (RMS noise to RMS clip - Typical)
100 sps ~130 dB (RMS noise to RMS clip - Typical)

Frequency response: DC to 80 Hz @ 200 sps

Sampling rates: 1, 10, 50, 100, 200, 250, 500, 1000, 2000 sps

Channel skew: None – simultaneous sampling of all channels

Acquisition modes: Continuous, triggered, time windows

Output data format: 24 bit signed (3 bytes) in user selectable format

Parameter calculations: Calculations of key parameters in real-time, including JMA intensity

Real time digital output: Ethernet or RS-232 output of digital stream (contact factory for available formats)

Trigger

Type: IIR bandpass filter (three types available)

Trigger selection: Independently selected for each channel

Threshold trigger: Selectable from 0.01% to 100% of full scale

Trigger voting: Internal, external and network trigger votes with arithmetic combination

Additional trigger: STA/LTA, Time Window

Storage

Primary slot: Internal Compact Flash Slot, standard 4 Gb up to 64 Gb

Secondary slot: Internal SD Card Slot

Storage Module: Additional User Accessible Compact Flash Slot
(Option) Accessible SD Card Slot (Replaces internal slot)
Hard Drive (Additional Option)

Recording capacity: Approximately 42 kB per channel per minute on Memory Card of 24-bit data @ 200 sps.

Recording format: Main CF Card Linux EXT3
Removable Media DOS File System

Firmware

Type: Multi-tasking operating system supports simultaneous acquisition and interrogation; boot loader allows remote and optionally automatic firmware upgrades

System control: Configure sample rate, filter type, trigger type and voting, maintains communications and event storage

Supported File Formats: Kinematics EVT, MiniSEED, SAC, COSMOS, MATLAB, SUDS, SEISAN, ASCII

User interface: 1 10BaseT Ethernet Port; 3 RS-232
1 USB 1.1 Device
2 USB 2.0 Ports (1 OTG/1 Host) (optional in Storage Module)
1 Bluetooth Interface (optional)

Intelligent alerting: System can be configured to initiate communications when an event is detected or if an auto-diagnostic failure occurs

Auto-diagnostics: System can be configured to continuously check system voltages, temperature, humidity, and timing system integrity

Rapid setup: Unit can be configured from parameter file stored on Compact Flash

Timing

Type: Oscillator digitally locked to GPS or *RockNet*

GPS: Integrates completely with system, providing timing, internal oscillator correction and position information.

RockNet: Shared timing for two units over CAT-5 cable

Timing: Accuracy: <1 microseconds of UTC with GPS

Power: Power consumption: <100mW (active)

I/O and Display

Power input: Mil-style connector for DC power input, external battery connection, 1-W power LAN

RS-232/USB input: Mil-style connector with full RS-232C interface with modem control, USB 1.1 Device connection, RS232 Console connector

Ethernet Connection: 10 Base-T Ethernet Interface

EMI/RFI protection: All I/O lines EMI/RFI and transient protected

LEDS: System, power and event status, Ethernet Link & Data

Power Supply

Type: Internal high efficiency switched power supply and battery charger system

Input: 8-18 VDC

Int. Charger Operation: 15.5VDC Required

Ext. Power Module: Input 100-250 VAC 50/60 Hz Output 15.5 VDC

Internal Battery Charger: Digitally temperature compensated output for VRLA battery with reverse protection and deep discharge recovery.

Fuses: None uses resettable Polyswitch protection

Batteries: External Valve Regulated Lead Acid (VRLA) Battery Optional battery housing.

Current drain: ~145ma @12V for 4X (w/o sensors)
~230 ma@12V for 8X (w/o sensors)

Communications

Ethernet interface: Real Time Telemetry (Multiple destinations TCP/IP Protocol), Parameter set up, and event retrieval (FTP/SFTP)

RS-232 interface: Real Time Telemetry (over modem, radio, etc.), Parameter set up, and event retrieval

Modem: Built in modem, Remote access, initiated by user or by the Basalt

Support Software

*Altus File Viewer**: Multiplatform program for rapid review of waveforms and event information.

Antelope: Comprehensive commercial network operational and mgmt system for medium and large networks

Earthworm: Comprehensive public domain network operational and management system for medium and large networks

NMS: Commercial PC-based network management system for small to medium sized networks via modem or real-time data

*RockTalk**: Multiplatform program for command and control

Rockhound: Commercial open architecture user-extensible real-time data collection and processing software that runs on a variety of computers

PSD: Commercial Pseudo Spectral Density software for earthquake data analysis

SMA: Commercial Strong Motion Analyst software for earthquake data analysis and processing

*K2COSMOS**: Conversion software from Altus EVT file format to COSMOS v1.20 format (COSMOS format can also be produced natively from the Granite)

Miscellaneous: Format converters to ASCII other formats. Web Server for command and control, Optional Software Development Kit and Compilers. Contact Kinematics for other options.

*No charge

Environment

Operating temperature: -20° to 70°C Operation

Humidity: 0-100% RH (Non-condensing)

Physical

Size & Weight: Basalt4X: 14" (L) x 5.5" (D) x 6.8" (H), 10 lbs
Basalt8X: 19" (L) x 7.5" (D) x 13.6" (H), 16 lbs

Enclosure Rating: IP67 Equivalent

Environmental: RoHS Compliant Unit