

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



**Basalt** represents the next evolution in Kinematics Strong Motion Instrumentation. Offering exceptional high dynamic range, matched to Kinematics outstanding **EpiSensor** accelerometer performance, and with exemplary timing accuracy, and spectral purity the **Basalt** 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 new **Rock** platform the **Basalt** is easy to integrate with other **Rock** and Quanterra instruments allowing users to develop highly flexible earthquake monitoring solutions.

The **Basalt** 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 interface.

- ◆ 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

### Features

- ◆ 4 sensor channels digital recorder w/internal or external Episensor Triaxial Deck
- ◆ 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)

Specifications subject to change without notice

## Channels

Basalt: 4 sensor channels digital recorder w/internal or external triaxial Episensor accelerometer  
Input level: 5Vpp, 10Vpp, 40Vpp Differential Input

## Data Acquisition

Type: Individual 24-bit Delta Sigma converter per channel with Black Fin DSP on each 4 Channel board  
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, 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  
Real time digital output: Ethernet or RS-232 output of digital stream (contact factory for available formats)

## Sensor

Type: Triaxial EpiSensor Force Balance Accelerometer, Orthogonally oriented, Internal or External  
Full scale range: User selectable at ±0.25g, ±0.5g, ±1g, ±2g or ±4g  
Bandwidth: DC to 200 Hz  
Dynamic range: 155 dB+  
Calibration & test: Calibr. Coil Functional Test; Calibr.Coil Response Test

## 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  
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 Ports  
1 RS232 (2<sup>nd</sup> Port/Modem Optional)  
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

GPS: Integrates completely with system, providing timing, internal oscillator correction and position information, optional power cycling.  
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 4W (typical) for 12 channels  
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: ~335ma @12V (12 Channel System)

## 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 (Multiple destinations TCP/IP Protocol), Parameter set up, and event retrieval  
Modem: Remote access, initiated by user or by the Granite. Optional

## 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: Basalt: 14" (L) x 5.5" (D) x 6.8" (H), 10 lbs without internal Episensor deck

Enclosure Rating: IP67 Equivalent  
Environmental: RoHS Compliant Unit