



The eentec DR4000 is a *rugged, ultra low power, high-performance, versatile 24-bit resolution seismic recorder*. It is designed for the most demanding requirements in high performance seismic research.

This state-of-the art seismic recorder features 4 to 12 channels with high resolution ADC's on each channel that ensures no channel to channel skew, and a very low-power, high-performance DSP that controls the data acquisition, real-time digitization and filtration. Data streams can be split into virtual streams, applying different event detectors with different trigger bandpass filters and sampling rates while simultaneously recording.

The powerful, full featured single-board PC controls the data transfer to disk and communication functions. It is active only when the SRAM is full, typically a few times a day.

The proprietary Smart Time? system, controlled by the DSP, maintains extremely accurate time with only occasional calls to the GPS receiver.

The power hungry components such as the PC, disk, and GPS operate on an extremely low duty cycle, allowing the system to use *less than 3/4 Watt* of power. The presence of a powerful PC, however, opens a wide range of options to the user. The industry standard PC/104 allows the use of many peripherals in a modular, stackable format, such as Ethernet cards, wireless LAN cards, satellite communication hardware, *etc.*

## DR-400 Specifications

### DIGITIZER

Converter Type:	24-bit $\Delta\Sigma$ ; 320 kHz Base Rate
Dynamic Range:	>132 dB @ 100 sps (rms to FS)
Data Channels:	3opt. up to 12 (5 VIRTUAL)
Sampling Rates:	0.1, 1, 10, 20, 40, 80, 100, 200, 500, 1000, 2000, 4000 sps
CMR @ 50, 60 Hz	120dB
Analog Anti-Aliasing Filter:	>100 dB @ primary sampling rate
Digital Filter (@ output Nyquist):	>130 dB @ 200 sps (FIR)
Programmable Gains:	1,2,4,8,16,32,64
Differential Input Signal Range:	Programmable: $\pm 2.5$ , $\pm 20$ V
Input Impedance	$\pm 2.5$ V – 1M $\Omega$ ; $\pm 20$ V – 26k $\Omega$
Overvoltage Prot.	$\pm 40$ V
State-of-Health;	Internal 24-bit resolution
Static RAM Buffer:	Up to 16MB

### TIMING SYSTEM

Type:	True Real Time $\Delta\Sigma$ PLL controlled, GPS-referenced
Maximum Accuracy:	<1 $\mu$ sec (Software Selectable)
Crystal Frequency Correction Resolution	0.016 ppm
GPS Duty Cycle (User Selectable):	Once every 18 hrs to achieve <1msec accuracy

### EVENT DETECTORS

Type:	STA/LTA, up to 6 independent detectors in frequency domain
Pre-filter	Up to 6 trigger passbands
Pre-event data buffer	up to 90 seconds (@ 100 sps)
Trigger channels	May be controlled by one, several or all 6 detectors associated with any physical or virtual acquisition channel
Calibration	5V square wave
Calibration Duration	User selectable

### POWER

Voltage:	6 – 16 Vdc
Overvoltage protection:	$\pm 60$ V
Power consumption	$\sim 0.75$ W (4 channels, cycled)

### USER INTERFACE

Display Type:	Backlit VGA
Keypad:	12 (numerical + function) keys; optional PC keyboard
User Control:	Menu-driven; state-of-health messaging
Data display:	Up to 3 channels simultaneously
Master Computer	Fully PC Compatible, single-board
Remote PC:	RS232

### MASS STORAGE

Miniature Hard Disk	1 GB Flash card (optional 30 GB disk)
Disk Compatibility:	Any PC
Temperature Range:	-30 to +50 $^{\circ}$ C (w/ opt built-in auto heater)
Data Formats:	Mini-SEED w/Steim-2 compression or CSS 3.0: long integer; separate data description in ASCII

### COMMUNICATION

Continuous Data Retrieval:	via RS485 DSP port (up to 1km)
Dial-up Phone Access	RS232; optional internal modem
Ethernet	Optional LAN card

### ENVIRONMENTAL

Housing	Reinforced Plastic
Waterproofing	Fully Submersible to 1m depth
Operating T $^{\circ}$ Range	-30 to +50 $^{\circ}$ C (HD)
Humidity	100%
Storage T $^{\circ}$ Range	-40 to +60 $^{\circ}$ C
Size	L10xW9xD7" (250x225x175mm)
Weight	$\sim 4.5$ kg

### CONNECTORS: REAR PANEL, WATERPROOF

Power	CONXALL MINI-MIZER
Data Channels (3) and sensor power	10-pin Circular (MS3114)
Auxiliary Channels	10-pin Circular (MS3114)
RS485 port	Optional 6-pin Circular (MS3114)
GPS	6-pin Circular (MS3114)

### CONNECTORS: MAIN PANEL

To PC Keyboard	PS/2 Mini-DIN
To external PC	RS232 (DB9)