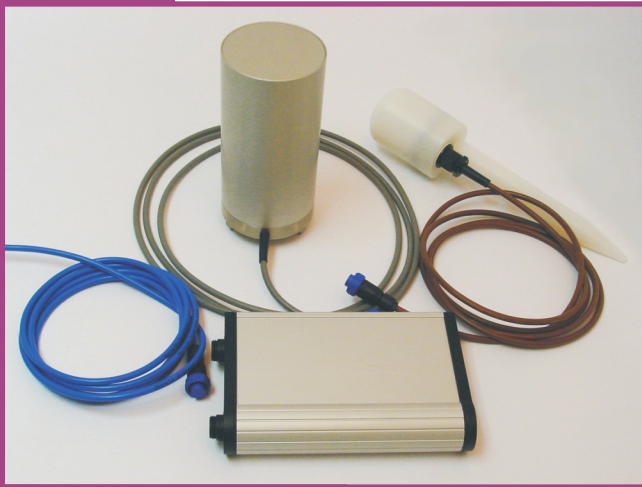




**GURALP  
SYSTEMS**

# CMG-EDU

**educational seismometer system**



The Guralp CMG-EDU is a complete seismology package for educational institutions, incorporating a broadband single-component vertical instrument and a compact digitizer with 24-bit resolution. Using the CMG-EDU system with Guralp Systems' free Scream! software for Windows, educators can demonstrate earth processes in a hands-on environment, and earth sciences students can investigate local and remote seismic events.

The CMG-EDU system was originally developed for the Princeton Earth Physics Project, and is suited for use at high-school or later levels.



## Features

Modern broadband force-feedback instrument

Output directly proportional to ground velocity from 30 s – 50 Hz

High sensitivity and dynamic range

Lightweight, waterproof and self-contained

Quick and easy installation

Easy access to electrical connections

No mass control required – plug in and go

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# The EDU-V seismometer



The seismometer component of the CMG-EDU system is based on Güralp Systems' CMG-6 broadband seismometer technology.

It is a true broadband feedback sensor which outputs voltages proportional to velocity in the 30 s – 100 Hz frequency range, with a standard output sensitivity of  $2 \times 1000$  V/m/s.

The high-gain feedback electronics eliminate mechanical non-linearity (the overall measured linearity exceeds 90 dB) and minimize resonances in the spring system.

The lowest spurious vibration mode of the EDU-V is a barely measurable resonance at 440 Hz: a comparable 1 second geophone would have spurious resonances around 14 – 20 Hz.

The stainless steel casing is fully "O"-ring sealed for water protection. No levelling is required as long as the sensor is placed on a surface within  $3^\circ$  of horizontal. A single cable to the digitizer is used for both signals and power.

Although sensitive seismic equipment should not be handled roughly, the casing is robust and can survive drops of up to 50 cm within its shipping case.

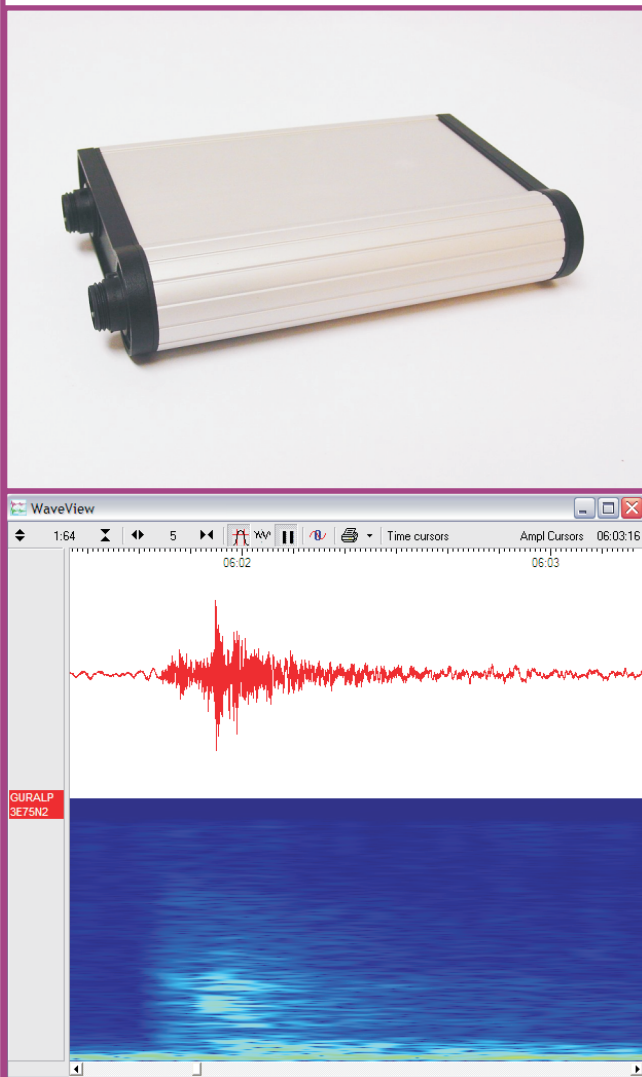


The Güralp Systems GPS receiver provided with the CMG-EDU is a rugged and 100% waterproof unit capable of providing accurate GPS time to a resolution better than 100 microseconds. It uses the standard NMEA protocol, and also provides longitude and latitude information.

Like the sensor, the GPS receiver is connected to the digitizer with a single cable which carries both data and power.

The GPS receiver is thoroughly tested in an environmental chamber and can operate at temperatures below  $-30^\circ$ .

# The CD24E1 digitizer



Based on a high-resolution sigma-delta ADC converter, the CD24E1 produces high-quality seismic data suitable for all kinds of investigations.

Data is output in the compact GCF format. Güralp Systems' free Scream! software can acquire, display, and record seismic data on a Windows or Linux PC.

Using Scream!, students can identify seismic events and investigate their frequency characteristics using filters and spectrograms.

Data can also be recorded for use in larger projects, or shared with other installations over your network or the Internet.

The CD24E1 has a minimum effective resolution of 20 bits at its standard output rate of 40 samples/s .

Data blocks are time-stamped within the digitizer using a real-time clock capable of synchronising to GPS time to better than 50 microseconds accuracy.

Full system characteristics for the CD24E1 are available, including decimation filter coefficients for deriving true ground motion. Calibration

information for the sensor and digitizer is provided both on paper and in a programmable information block, transmitted from the digitizer at every re-boot.

# Specifications

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Velocity output bandwidth	30 s – 100 Hz
Velocity output sensitivity	2 × 1000 V/m/s, 2 × 800 V/m/s or 2 × 400 V/m/s
Peak output	±10 V (20 V peak-to-peak)
<b>Optional</b> high gain sensitivity	2 × 10000 V/m/s (adjustable)
Lowest spurious resonance	440 Hz
Linearity	> 90 dB
Cross-axis rejection	> 65 dB
Electronics noise level	-172 dB relative (m/s <sup>2</sup> )/Hz @ 1 Hz
Operating temperature	-10 to +75 °C
Temperature sensitivity	< 0.6 V per 10 °C
Mass recentring range	±3 ° from horizontal
Materials	Hard anodised aluminium case Stainless steel base
Case diameter	82 mm
Case height	177 mm
Weight	1.2 kg
Power supply	10 – 36 V DC
Optional low power sensor	5 V DC supply (output ±4.5 V)
Current at 12 V DC	23 mA
Calibration controls	Common signal & enable lines exposed on sensor connector
Offset zeroing	Adjustable through case
<b>Optional</b> remote control	Offset zeroing with DC motors
Optional accessories	Handheld Control Unit

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