

The CMG-5TD combines the CMG-5td three-axis strong motion accelerometer with the CMG-DM24/3 24-bit Digitiser Module in a single, sealed case. An internal dc-dc converter ensures a completely isolated sensor system and allows the system to operate from 10 to 36 Volts. The external GPS receiver/antenna can be placed up to 50 meters from the digital sensor.

The CMG-5TD sensor system has an extremely large dynamic range, combining the 140dB sensor with the 132dB noise-free resolution digitizer.

The CMG-5T transducers use low noise components, high feedback loop gain, and computer-aided design to produce a linear, wide dynamic range, precision transducer. Full-scale low-gain sensitivity can be specified as $\pm 0.1, 0.2, 0.4, 0.5, 1.0, 2.0$ or 4.0 g. The standard frequency pass band is flat to acceleration from dc to 100 Hz. Other low pass corners from 50 Hz to 100 Hz can be ordered.

The CMG-5TD Accelegraph has 2 separate RS232 outputs. While one RS232 port can be used for data transmission and configuration of the accelegraph parameters, the second RS-232 port (Monitor port) can be used locally to check system operation and additionally configure the system if so desired. Up to four simultaneous rates can be selected from 1 to 200 samples per second. (options from 1 to 1000 samples per second are available - please consult the factory).

Detailed system calibration information is provided with each CMG-5TD, including amplitude and phase responses, the transducer output in Volts/meter/second², the transfer function in poles/zeros notation, and the digitizer sensitivity in counts per microvolt.

The CMG-5TD has an internal flash memory with a capacity of up to 256 Mb. The digitiser program space is held in flash updateable memory allowing easy updating of the program either remotely or locally.



GÜRALP SYSTEMS LIMITED

3 Midas House, Calleva Park, Aldermaston,
Reading, Berks, RG7 8EA, United Kingdom.
Tel: +44 (0) 118 9819 056
Fax: +44 (0) 118 9819 943
e-mail: sales@guralp.com
Website: <http://www.guralp.com>

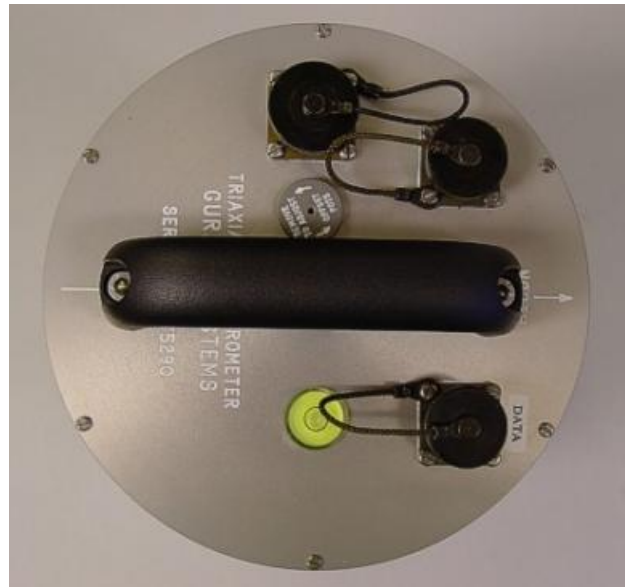


It is extremely simple to install the CMG-5TD system, as no sensor levelling is required.

The CMG-5TD output offsets can be reduced down to the sub millivolt range, they are adjusted electronically without exposing the insides of the accelerometer. The access to the offset adjustment is as simple as removing an 'O' ring sealed cap next to the sensor connector.

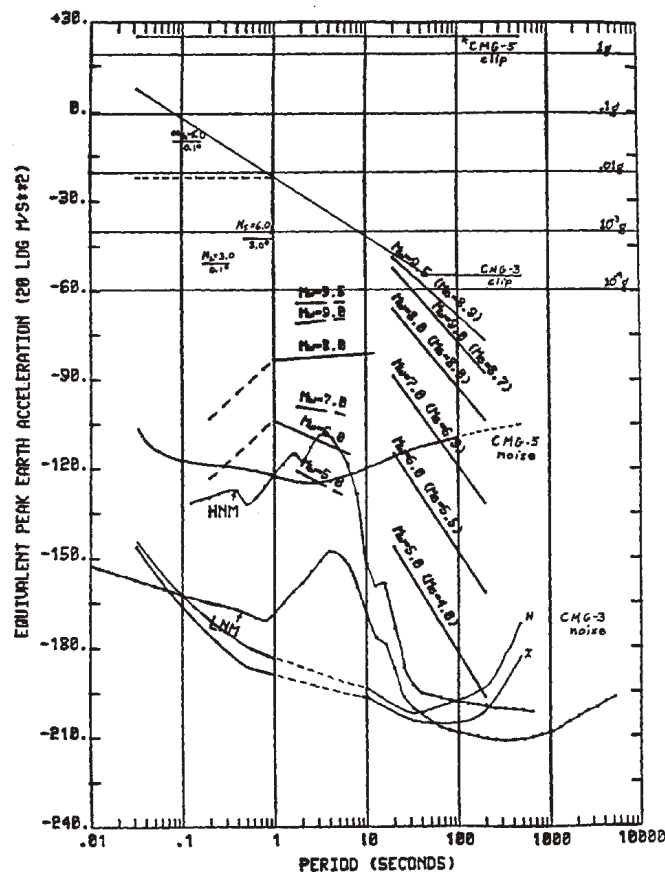
It is possible to adjust the sensor offsets remotely when the optional remote centering is specified.

The top cover of the CMG-5TD shows the sensor connectors, these being Analogue output, high and low gain outputs, RS-232 for Data, GPS port and Monitor Port.

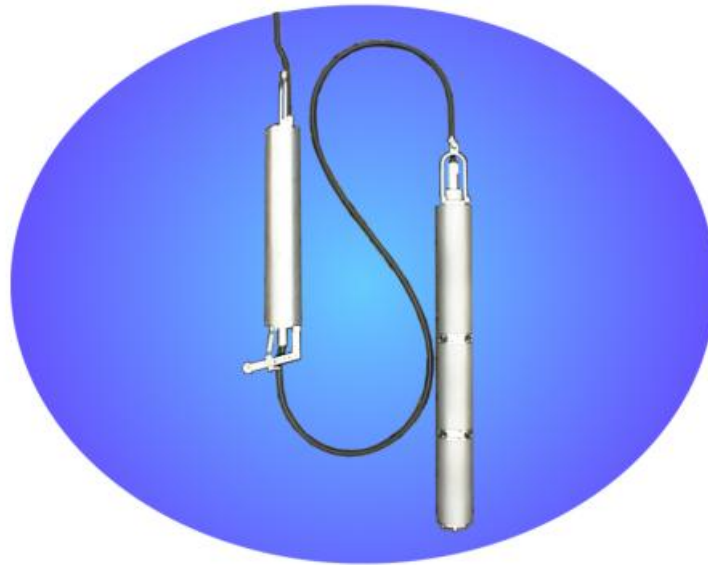


SIGNAL AND NOISE LEVELS

The figure below contains a typical estimate of CMG-5TD transducer noise power plotted as (thick line) non-coherent power for the vertical and horizontal sensors. The USGS Low Noise Model, together with CMG-3T noise, is also plotted as a reference.



DOWNHOLE CMG-5TD ACCELEROMETER WITH DOWNHOLE CMG-DM24



The CMG-5TDB is available as a posthole or downhole package with the downhole version of the CMG-DM24.

The CMG-5TDB sensor can be installed to depths of 100meters (other options are available).

The CMG-5TDB is supplied with remote mass centering mechanism which ensures that the dc-coupled outputs of the accelerometer offset can be reduced to below the micovolt level.

The mass centering mechanism is operated remotely from the CMG-DM24.

SOFTWARE:

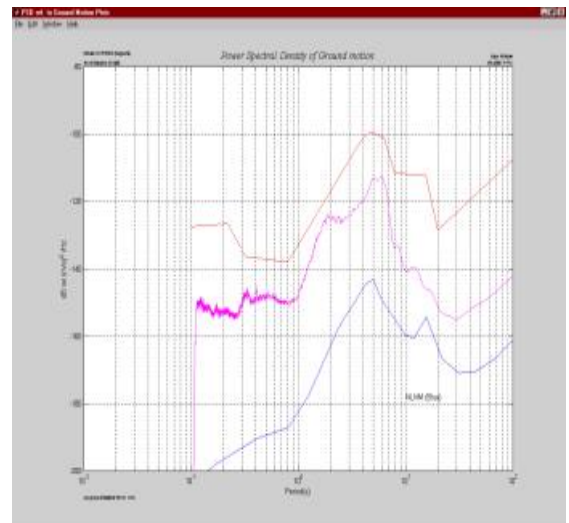
SCREAM

Guralp Systems Ltd SCREAM! software is a real-time packetised software application, which allows the user to acquire, configure, control, monitor and record data from all Guralp systems sensors and digitisers. SCREAM! is the perfect partner for GSL digitisers and digital output broadband sensors. Developed in parallel, they work as a team to provide an intuitive graphical interface to control the digitiser configuration, digitiser parameters and broadband seismometer commands. Sample rates, baud rates, triggering parameters, trigger band-pass filtering, storage and many other parameters are controllable using the mouse. Broadband sensor locking, unlocking and centering are achieved using point-and-click operations, which is particularly useful for borehole and cabled ocean bottom digital broadband seismometers, and duplex telemetered networks where the instrument is at a remote site. Sensor calibration, with adjustable amplitude and duration of the sinewave or squarewave signal can be initiated from the interactive display.

It provides information about the complete broadband system in a convenient way. The data port of the digitiser allows the user to monitor the data without any loss to the data storage process. If the user has Matlab installed INSTANT sensor PSD, Self-Noise and coherence information can be calculated giving immense confidence regarding the status of the Instrument. Further details about this functionality are printed in the SCREAM datasheet.

By simply typing in the instrument gains and digitiser scaling, the user can quickly plot the digitizers Power Spectral Density with ideal digitizer noise curves, Total Harmonic Distortion and Crosstalk between the two selected channels. It will also run system tests and plot the Coherence and PSD of both channels; or the self noise of either channel, in velocity or acceleration, referenced to ground motion, with the NLNM as a reference.

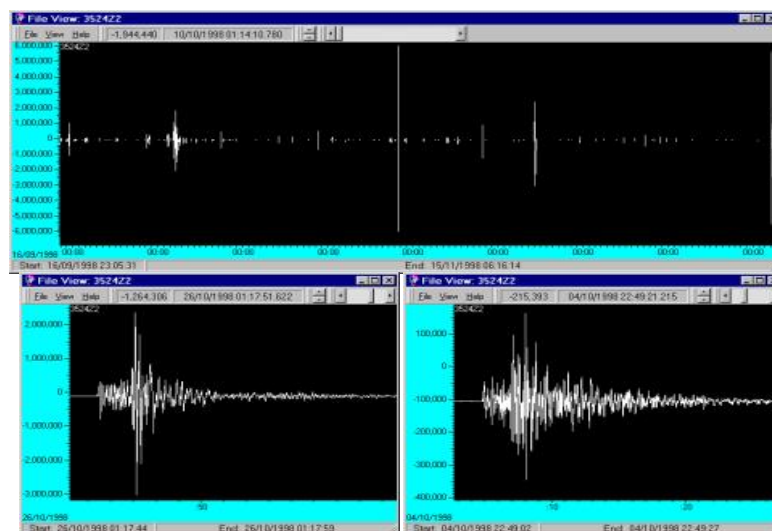
The plot shows the power spectral density of Ground motion of data highlighted in SCREAM to give instant idea of quality of signal.



TRIGGERING

In its standard configuration the digitiser outputs continuous data at a user-selectable sample rate. An additional powerful feature of the digitiser is the ability to simultaneously run a STA/LTA event triggering algorithm in parallel with the continuous acquisition. This permits the system to record continuously at a relatively low sample rate, and record at a much higher sample rate during short periods when triggered. Parameters controlling the triggering algorithm, and controlling the data output once the system is triggered, are all selectable by the user, permitting the maximum flexibility of operation and the most efficient use of available storage space.

Shown below in the upper window, is an example of a data stream recording over a two month period. Two seismic events are shown highlighted in the two lower windows which, given suitable triggering parameters, can be recorded in greater detail at a higher sampling rate of upto 200 samples per second. (Upto 1000sps available please consult factory)



Triggering of all three components from vertical channel 100Hz tap, filter from 5 to 45 Hz
 Sta = 1, Lta = 50, Sta/Lta = 10, pre-trigger = 40, post-trigger = 70

CMG-5TD TRANSDUCER SPECIFICATIONS

<p>Outputs and Response Output options (specify):</p> <p>Dynamic range for 2g full-scale: 0.005 to 0.05 Hz 3 to 30 Hz Standard frequency band: Optional low pass corner: Linearity: Cross axis rejection: Clip level and self noise:</p> <p>Calibration Controls</p> <p>Closed loop response:</p> <p>Calibration Signal</p> <p>DC offset adjustment (remote dc null):</p> <p>Physical</p> <p>Lowest spurious resonance:</p>	<p>4g 2g 1g 0.5g 0.4g 0.2g 0.1g</p> <p>>140dB >130dB dc to 100Hz (-3dB point) 50, 100 or 200 Hz 0.1% of full scale 0.001 g/g See plot on Page 3.</p> <p>Calibration signal is injected into the feedback network of the sensor</p> <p>Sine wave -0.001 Hz to 10 Hz (amplitude adjustable) Square wave or step response. (amplitude adjustable) The Calibration signal is injected through the CMG-DM24.</p> <p>Standard instrument manual operation. Optional Remote DC null (as in borehole system).</p> <p>450Hz</p>
--	--



Construction

The CMG-5TD employs solid body technology along with surface mount and discrete electronics for Robust and reliable design.



CMG-5TD DIGITIZER SPECIFICATION

Seismic channels		
Number of channels	:	3@ 24-bits
Inputs	:	Differential with transient protection
	:	+/- 10 Volts input range
Input Impedance	:	1 M Ohms, 10 nano Farad
Common Mode Rejection	:	120 dB at 10Hz
GPS		
	:	External GPS (CMG-GPS2)
GPS Power	:	GPS can be connected with 50 metres of cable
GPS Time Format	:	Supplied via the GPS connector on the digitizer NMNI
Sensor Control Functions		
	:	Calibration Enable - Vertical North/South, East/West
	:	(can be enabled individually)
Sensor Calibration Signal		
	:	Amplitude and frequency adjustable - sine or square wave
Digital Signal Processor		
Type and Speed	:	M56002, 20 MHz
Hardware Sampling Rate	:	2 kHz
Selectable Sample Output Rates available from the DSP	:	Up to four separate rates are available. User selects each in serial, beginning with 200 sps and dividing the prior rate by 2,3,4,5,8,10 or 20. Examples: 200, 100, 50, 10 sps or 100, 40, 20, 4, 1 sps. The sample rates must be even integers. (1 to 1000 sps available, consult factory for more details).
Anti-alias Filters	:	3 pole
Low Pass Filters	:	FIR
Out of Band Rejection	:	140dB
In band ripple	:	-140dB
Trigger Modes	:	STA/LTA (additional triggers available, contact factory).
Digitizer Performance		
Standard Output Format	:	24 bits
Noise-free Resolution, NPR	:	22.5-bits@20 sps, 21.5-bits@100 sps
Absolute Accuracy	:	Standard - 0.5%, Optional - 0.1%
Type	:	5th order single bit low pass noise shaper
Analogue Transducer Outputs	:	3-C signals
Clock		
Oscillator	:	Standard - 8×10^7 , Optional (oven-controlled) - 5×10^8
Interface for External Receiver	:	GPS
Sync for External Receiver	:	<100
Output Options		
RS232	:	100m
RS422	:	1 Km
Optical	:	10 Km
Short Haul modem	:	10Km (dependant upon baud rates and cable type).

Optional: Modem and UPS Power Supply Module

- 110-240 V AC input
- Supplies Filtered UPS DC supply to Instrument
- RS-232 Modem Connection
- Support for Sync/async or leased line connections
- ISDN version available
- Full Modem LED status display
- Supports all key ITU data communication protocols
- Remote FLASH capability for software upgrade
- Upto 56K Kbps downloads with ITU V.90 or X2
- ITU V.34 at 33.4 Kbps, V.32 at 19.2 Kbps
- Remote management capable
- 2 hour UPS standard, longer run times available
- Provides connectivity for compatible, reliable connections for all telephone networks
- Specifically designed for unattended remote operation.

