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GMC Measuring Centre

Features

❑ **Internet Enabled, Multifunctional and Multichannel Measuring System**

❑ **> 130 dB, up to 72 channels, up to 500 SPS**

❑ **Linux Operating System with On Board Processing and Evaluation**

❑ **Timing via NTP (Network Time Protocol), Optional GPS or 433 MHz Wi-Synch**

❑ **Enhanced Connectivity Options for GSM, GPRS, Satellite, Radio Telemetry or Landline Modem, Wired/Wireless Network**

❑ **Ring Buffer Continuous Recording**

❑ **Data Stream Output, Network Triggering**

Outline

The instrument is based on the GMS / NetQuake technology and has 100% software compatibility with the GMS instruments. It is the new generation of the GeoSIG Measuring Systems with extended connectivity capability and flexibility..

It includes an Ethernet connection and optionally a 2.4 GHz Wi-Fi module to insure fast and reliable data transfer.

Its design and efficiency makes it the first choice for any application requiring seismic instruments. With its optimized installation, operation and maintenance philosophy, the GMC offers the real possibility to implement such as high density arrays with total operating costs at a small fraction of conventional strong-motion seismograph networks.

The instrument's software processes data in real time. If triggered by a seismic event, GMS calculates Peak Ground Acceleration (PGA), Peak Ground Velocity (PGV), Peak Ground Displacement (PGD) and Response Spectrum (RSA) at various frequencies of the event. GMC can report these parameters, which are related to the strength of shaking, to a data centre where a synopsis (such as a shake map) for disaster management facilities can be generated in almost real time over the Internet. An event file is also recorded in the memory, which is sent out from the instrument and also securely accessible over the Internet.

The GMC is self-contained and is equipped with an uninterruptible power-supply, which provides, excluding options, more than 3 hours emergency operation without external power with internall battery and more than 24 hours with additional external battery. Since the battery and power management are critical components in applications, excessive care has been taken in the charger design and the GMC is released as the first unit that can warn of a faulty battery before it is detected by a lack of communication during an AC power loss.

The GMC uses an intelligent "Real Time Clock" (RTC) with self-learning temperature compensation at a fraction of power and thus cost of a TCXO. The RTC is able to synchronize with GPS or NTP (Network Time Protocol based on Internet UTC timing) to provide high timing accuracy.

The instrument can be locally connected to a laptop through its ports for configuration, testing or data retrieval. The internal memory cards can also be simply exchanged to retrieve the data. Several advanced communication options exist such as for connection over the Internet; it can utilize a list of servers where the communication is based on a simple but highly secure file exchange.

Wired or Wireless Interconnected Network option enables the use of several units together in a time and trigger synchronised manner; wireless using the Wi-Fi and Wi-Synch options.

Applications - Seismic, Earthquake and Structural measuring and monitoring

Set-up and Configuration

Instrument setup is based on a configuration file in XML format. The configuration can be edited on site through the instrument console, exchanged by replacing the memory card or remotely from a server. Even if the configuration file can be manually edited at any time, a tool is provided to edit it securely.

Data Analysis

The GeoDAS program provides basic data evaluation in the field. The instrument supplies data in miniSEED format. The GeoDAS Data Analysis Package covers the requirements of detailed laboratory analysis for most earthquake and civil engineering applications. Any other software package reading miniSEED can as well be used.

Sensors

Various GeoSIG sensors as well as any other custom sensors can be connected externally to the unit.

Digitizer

Channels:	from 3 up to 72
A/D conversion:	24 bit delta-sigma converters running in parallel
Dynamic range:	>130 dB
Sampling rate:	500, 200, 100 or 50 SPS
Bandwidth:	40% of sampling rate
Anti Aliasing Filter	FIR (finite impulse response)

Triggering

Several "Trigger set"s can be defined in the instrument with each one freely defined regarding the source of trigger, trigger processing and selected channels for storage. For each trigger a "Minimum exceedance duration" can be defined to insure that the unit will not trigger on spikes.

Trigger filter

High pass filter:	None, 0.1, 0.2, 0.5, 1 or 2 Hz*
Low pass filter:	None, 2, 5, 10 or 20 Hz*
Band pass filter response:	2 poles on each side* (40 dB / decade)

*: Any other value is freely useable, as long as does not lead to data loss.

Level Triggering

Range:	0.01 to 100 % of full scale

STA/LTA Triggering

STA period:	0.01 to 100 seconds
LTA period:	1 to 1000 seconds
STA/LTA-Ratio:	1 to 100 ratio

Event recording

Pre-event memory:	1 to 100 seconds
Post-event duration:	1 to 1000 seconds

Event summary

Including:	PGA, PGV, PGD, RSA
Transmission delay:	User defined from trigger time

Ring Buffer

Usage:	User can request backward from console or remotely from server for portion of the buffer as start time/date and duration.
Method:	Ringbuffer files with configurable duration.

Data stream

Total Data Time Lag:	0 ms, full correction included
Protocol:	SeedLink, GSBU

Storage Memory

Size and Type:	2 GByte Removable Compact Flash Card per 3 Channels, higher capacity upto 32 GByte on request FAT32 formatted
Management:	Intelligent management of memory card capacity using policies as per file type and ring buffer capacity specification.
Recording format:	miniSEED
Estimated Capacity:	50 SPS: 18 Mb / day 100 SPS: 36 Mb / day 200 SPS: 72 Mb / day 500 SPS: 180 Mb / day since the data is compressed, capacity depends on the context of the data.

CPU

Processor:	Freescale ColdFire
RAM:	32 MByte
Flash:	16 MByte
Operating System:	uCLinux

Time Base

Standard accuracy:	20 ppm (10 min/year @ -10 to +50 °C), higher accuracy optional
Accuracy after learn:	0.5 ppm (16 s/year or 2 ms/h)
Accuracy with NTP:	±10 ms accuracy, assuming reasonable access to NTP-servers
External time interfaces:	GPS, Interconnection

Power Supply

Redundancy:	Two power supply plug-in modules can be used for duplication. Hot standby and Hot replacement are supported.
Input voltage:	90 - 260 VAC / 50 – 60 Hz
Type:	Switched internal power supply
Internal battery:	Rechargeable, 12 VDC, 12 Ah Sealed Gel-cell Lead acid battery
External Battery	Rechargeable, 12 VDC, charging current is 0.5A (single Power supply module is used) or 1 A (two Power supply modules is plugged-in). Float charging option is supported.
Power consumption:	4 A @ 12 VDC for 30 channels, incl. GPS
Autonomy:	3 hours with internal battery, 1 day with External battery 100 Ah or better.
Battery charger:	Temperature compensated with battery fault detection.

Indicators:

Each plug-in unit has sufficient Indicators' set on the front panel.

Communication

Configuration, Data Retrieval:	via ETHERNET, SERIAL or CONSOLE, or directly from removable memory card.
Network requirements:	Fixed or Dynamic IP on Ethernet LAN for each GMS plug-in module and/or Internet connection with Ethernet interface.
Security:	GeoDAS proprietary protocol Checksum and software handshaking
Serial ports:	2 ports, 3 ports optional
Baud rates:	Console: 19200 bauds Stream: 38400, 57600, 115200 bauds
RS-485 networks:	Triggering network, Time synchronisation network, Data network

Alarm / Seismic Switch / Warning Option

Alarms:	4 independent relay contacts for trigger alarm or error
Alarm levels:	Based on event triggers (NO or NC selectable during order)
Relay Hold-On:	1 to 60 seconds (User programmable)
Max. switching current:	2 A
Max. switching voltage:	150 VDC / 150 VAC
Max. switching capacity	60 W / 120 VA

Interconnected Network Option

Wired or Wireless (Wi-Synch) time synchronisation (Common Time) among several units is optional. Trigger synchronisation (Common Trigger) is handled over the Wired/Wireless Ethernet or RS-485 network.

Modem

Internal analogue line modem is available.

Electric protection

All external connections have over-voltage protection. Alarm and Interconnection RS-485 networks have also galvanic insulation (1000 VDC).

Self Test

Permanent self monitoring of hardware and software components without affecting their normal operation.

Periodical state of health report based on comprehensive test of instrument. Period can be set in minutes and/or hours and/or days.

Periodical sensor test. Period can be set in days.

Environment

Operational temperature:	-20 to +70 °C
Storage temperature:	-40 to +85 °C
Humidity:	0 to 100 % RH (non condensing)

Housing

Type:	Steel housing
Size (upto 30 Channels):	400x600x366 mm (W x D x H)
Weight:	Depends on the configuration
Protection:	IP55 (NEMA 12)
Mounting:	on the wall.