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CR-5 Computer Based Structural Monitoring System

Features

- ❒ **Computer based central recording system**
- ❒ **Upto 120 dynamic & > 500 static channels**
- ❒ **16 Bit resolution**
- ❒ **Sampling rate 20 - 1000 SPS**
- ❒ **Alarm Relays, SMS / Email messenger**
- ❒ **Power autonomy >24 hours**
- ❒ **Rugged industrial packaged housing**
- ❒ **Galvanic isolation and over voltage protection**
- ❒ **GPS synchronised recording available**
- ❒ **Real-time display of dynamic channels**
- ❒ **Large capacity data storage options**
- ❒ **On-line surveillance, diagnostics, self checking and reporting system**

Outline

The CR-5 was developed out of years of experience in monitoring civil engineered structures such as dams, nuclear power plants, pipelines, tunnels, bridges, tall buildings and unique structures all over the world. This modern multichannel central recording monitoring system provides engineers with a valuable tool to fully understand and analyse the dynamics of structures in the operating environment. With a CR-5 system the dynamics affecting the structure including but not limited to acceleration, velocity, displacement, temperature, current, wind speed, wind direction, stress and pressure may be monitored and recorded.

Dynamic channel sample rates of 50, 100, 200, 500 and 1000 SPS is provided. The system bases on synchronised multi-channel A/D converters. After hardware anti-aliasing filtering the signals are digitised using the over-sampling and decimation technique resulting in superior data quality.

The heart of the CR-5 software is GeoDAS, a proven data logger and data analysis package developed by GeoSIG Ltd. GeoDAS is frequently used in large seismic networks. GeoDAS integrated into the CR-5 central recording monitoring system provides a richly configured set of user-friendly capabilities, displays and analytical tools running under Windows XP operating system. Optionally, SEISLOG can also be used.

In addition to the near real-time display of the dynamic channels the system provides static data like mean, max, min, and peak values. The CR-5 monitors the real-time data generated by each of the sensors attached to the system and compares the measured data to five fully independent alarm trigger criteria. The ring buffer size, the post event time, trigger thresholds and relay alarm on/off times may be selected by the customer.

A comprehensive surveillance, diagnostics reporting system through alarm relays, SMS and Email is provided.

Set-up and Configuration

All the necessary parameter and configuration settings are selectable using the CR-5 software interface. The configuration of the CR-5 stored in non volatile system memory to allow automatic restart in case of a system failure, watchdog **5 minutes timeout** or manual hard reset.

Data Analysis

The **GeoDAS** program provides extended time history data evaluation. Once an event file has been opened the analysis menu is available for analysis functions like FFT, response and terzband spectras, etc. for determination of mode and natural frequencies of structures. Any customary in trade evaluation software package can of course be used as well using the available ASCII files.

Sensor

The CR-5 offers the most flexible adaptation of sensors to meet the needs of structural measuring. More than 120 dynamic and 500 static channels may be logically configured. The sensors offered but not limited to are:

GeoSIG AC-xx accelerometers:

AC-2x frequency response:	0.1 to 100 Hz, ± 2 to ± 0.25 g
AC-6x frequency response:	DC to 100 Hz, ± 2 to ± 0.25 g

GeoSIG VE-xx seismometers / velocity sensors:

VE-1x frequency response:	1 to 100 Hz, ± 100 to ± 1 mm/s
VE-2x frequency response:	4.5 to 100 Hz, ± 100 to ± 1 mm/s
VE-5x frequency response:	1 to 100 Hz, ± 800 to ± 1200 Vs/m
Weather Station	Wind direction & speed, humidity, air pressure, temperature
Strain Gauge	±1500 μStrain
Temperature	-40°C to +70°C

Digitizer

A/D Converter:	16 Bit (synchronised) per dynamic channel
A/D Sampling rate:	250 kSPS / 16 channels (over sampling)
Noise:	<1 LSB (Peak) <0.4 LSB (RMS)
Effective Bits:	16
Sampling Rate	50, 100, 200, 500, 1000 sps standard

Selectable Gain each Channel: 1, 2, 4 ,8, 16, 32, 64 ,128x

Bandwidth:	DC to 52 Hz (200 sps) or DC to 264Hz (1000 sps)

PC Based Recording

Computer (min. performance):	Pentium IV 1.7 GHz 512 MByte RAM, 80 GByte HD 650 MByte writeable CD USB, COM and LPT ports PS/2 Mouse*, PS/2 Keyboard* VGA display* *not required for normal operation
Laptop (Optional)	Pentium IV, 1.4 GHz, 512 Mbyte RAM, 60 GByte Hard Drive, CD COM, USB, PCMCIA, LPT
Communication	Modem: 56 kBaud external Ethernet TCP/IP
Data Logger Software	GeoDAS (optionally SEISLOG)

Remote Acquisition System:

Remote enclosure with A/D converter

Communications with CR-5:	RS-422
Baud rate:	9'600 bps (static), 19'200 bps dynamic 100 sps, 38'400 bps dynamic 200 sps

Data Recording

Pre-event-Time:	1 to 100 seconds
Post-event-Time:	1 to 100 seconds

Triggering

Level Triggering

Lower band limit:	0.2 Hz (20 dB / decade)
Upper band limit:	100 Hz @ 200sps (20 dB / decade)
Range:	0.003 to 100 % of full scale

STA/LTA Triggering

STA-Base:	0.1 to 5 seconds
LTA-Base:	5 to 100 seconds
STA/LTA-Ratio:	1 to 60 dB

Power Supply

AC Power:	230VAC/50Hz or 115VAC/60Hz std.
Solar Panels:	Optional
Internal battery:	1 Rechargeable, 12 VDC, 100 Ah Lead battery std. 2nd optional
Autonomy:	1 day
DC voltage:	12 VDC
Power consumption:	40 W with full rack without sensors

Time Base

External Code Compatible:	NMEA
Standard clock accuracy:	100 ppm (50 min/year)
External time interfaces:	GPS System accuracy 0.02 sec.
Power for GPS receiver:	12 VDC (power cycled every 15 min) Surge Protected

Environment / Housing

Operational temperature:	- 20 °C to + 60 °C
Storage temperature:	- 40 °C to + 90 °C
Humidity:	0 % to 100 % (non condensing)
Type:	Aluminium cabinet

Size up to:

15 channels	175 x 230 x 300 or 350 Portable ½ rack
33 Channels	175 x 530 x 300 or 350 Portable rack
33 channels	1000 x 600 x 620
120 channels	1600 x 600 x 620 all sizes in mm

Weight:

Portable ½ rack	8 kg typical
Portable rack	12 kg typical
1000 x 600 x 620	110 kg typical as shown on page 1
1000 x 600 x 620	150 kg typical
Protection:	IP65, EMI & Earthquake resistant

Self Test

Sensor test:	Square pulse
GPS:	Signal lock
DSP:	LED indicators of communication with PC
System Status:	Checked every 6 hrs & reported to central AC power, battery voltage & # of events

Seismic Switch / Warning Unit Option

The CR-5 alarm/warning option provides 5 independent outputs (relay contacts) based on user selectable criteria & 1 global alarm

Alarms:	6 relay
Alarm levels:	0.003 to 100 % of full scale (User programmable per axis)
Relay Hold-On:	Typical 5s. Time of writing event file to disk (User Programmable) Consult GeoSIG Ltd. for details

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