CR-5P Seismic, Earthquake and Structural Monitoring System

Features

- Multichannel modular central seismic / earthquake / structural monitoring and recording system
- Accessible from anywhere around the world through Internet
- Cable saving via distributed data acquisition nodes
- 3, 6 or 9 Channel Modules, 19" rack mountable and expandable to several hundred channels
- 24 Bit resolution
- Sampling rates 50, 100, 200, 500 SPS
- External 12 VDC Power Supply
- Rugged industrial portable or fixed 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
- Email messenger

Outline

The CR-5P was developed out of years of experience in seismic instrumentation as well as structural monitoring of civil engineered structures such as dams, nuclear power plants, pipelines, tunnels, bridges, tall buildings and unique structures all over the world. CR-5P provides scientists with a state of the art high dynamic seismic recorder and engineers with a valuable tool to fully understand and analyse the dynamics of structures in the operating environment. With CR-5P the seismic activity at a region or the dynamics affecting a 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 SPS can be provided. The system bases on synchronised multi-channel A/D converters. The signals are digitised using the over-sampling and decimation technique resulting in superior data quality.

The heart of the CR-5P 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-5P central recording monitoring system provides a richly configured set of user-friendly capabilities, displays and analytical tools running under Windows XP operating system.

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-5P 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 E-mail can be optionally provided.
Set-up and Configuration
All the necessary parameter and configuration settings are selectable using the CR-5P software interface. The configuration of the CR-5P stored in non volatile system memory to allow automatic restart in case of a system failure or manual hard reset.

Data Analysis
The GeoDAS program provides comprehensive time history data evaluation. Once a data file has been opened the analysis menu is available for functions like FFT, response and terzband spectras, etc. for determination of mode and natural frequencies of structures.

Sensor
The CR-5P offers the most flexible adaptation of sensors to meet the needs of structural measuring. Numerous channels may be configured. The sensors which can be used but not limited to are:

GeoSIG AC-xx accelerometer:
- AC-2x: 0.1 to 100 Hz, ±2 to ±0.1 g
- AC-4x: DC to 100 Hz, ±4 to ±0.625 g
- AC-6x: DC to 100 Hz, ±3.5 to ±0.5 g

GeoSIG VE-xx seismometers / velocity sensors:
- VE-1x: 1 to 100 Hz, ±100 to ±1 mm/s
- VE-2x: 4.5 to 100 Hz, ±100 to ±1 mm/s
- VE-3x: 4.5 to 315 Hz, 27.3 V/s/m
- VE-5x: 1 to 315 Hz, 100 to 1'000 V/s/m

Other sensors can be Strain Gage, Weather Station, Wind direction & speed, humidity, air pressure, temperature, etc.

Digitizer
Type: CR-5PDX (xx: 24)
- 9 channel modules
- 3 x Triaxial connectors or 9 x Uniaxial connectors

A/D Converter
24 Bit (synchronised)
der dynamic channel

A/D Sampling rate
250 kSPS / 9 channels (over sampling)

Dynamic Range
CR-5PAD24 > 140 dB

Resolution
24 Bit

Sampling Rate (per chn)
50, 100, 200, 500 SPS

Configurable input Voltages
differential ±2.5, 10 V
single ended ±2.5, 10 V
single ended 2.5 V ±2.5 V
other full scale settings on request

Recording Options
Internal Computer
CR-5PRHDx (x: 40 to 160 GByte)
Embedded board with storage on Hard Disk: 40 – 160 GByte or Compatible In-Rack Laptop

External or Remote Computer
Minimum performance:
Pentium IV 1.7 GHz
1 GByte RAM, 80 GByte HDD
Mouse*, Keyboard*
VGA display*
*not required for normal operation

Communication
via CR-5PCOM or CR-5PRHDx
Ethernet TCP/IP (see Figure 3)

Data Recording
Type: Continuous and/or Event Based

Triggering
Type: Level Trigger or STA/LTA
Pre-event-Time: 1 to 1800 seconds
Post-event-Time: 1 to 1800 seconds
Maximum Duration: 7200 seconds

Power
Supply: 12 VDC distributed within modules, see Figure 2. External power adapter / charger CR-5PPWR for 230 VAC / 50 Hz or 115 VAC / 60 Hz
Battery: Optional
- Rechargeable External, 12 VDC, 70 to 240 Ah Lead battery

Autonomy
Depends on the system and sensor configuration
Power consumption
Depends on the system and sensor configuration

Time Base
External Code Compatible: NMEA
Standard clock accuracy: 10 – 20 ppm (5-10 min/year)
External time interfaces:
- GPS System (< ± 1/2 sample)
- Synchronised cable (< ± 1/2 sample)

Power for GPS receiver: 12 VDC
Surge Protected

Environment / Housing
Operational temperature: -20 °C to +60 °C
Storage temperature: -40 °C to +90 °C
Humidity: 0 % to 100 % RH (non condensing)

Type: Polyethylene/Aluminium/Steel
- Polyethylene/Aluminium: stacking portable case, vibration protection optionally available
- Fixed wall mount cabinet

Size
Dimensions vary due to the size/protection
Width: 530 – 550 mm Polyethylene/Aluminium
600 mm Painted Steel

Depth: 330 – 350 mm Polyethylene/Aluminium
add 150 mm on depth for connectors
580 mm Painted Steel

Height: 160 – 340 mm Polyethylene/Aluminium
add height of multiple cases
370 mm Painted Steel

Weight: 20 kg typical for 9 channel recording unit
IP65, EMI & Earthquake resistant

Protection
Should be protected from direct environmental effects (sunlight, rain, etc).

Local PE connection recommended

Self Test
Sensor test: Square pulse
GPS: Signal lock
Visual Indicators: LED Indicators
System Status: Checked on the continuous basis through the data interrogation

Alarm Option
Method: Email messenger, activated in case of triggering. Other methods on request
Specifications CR-5P Seismic, Earthquake and Structural Monitoring System

Figure 1. Some examples of possible sensor axes connectivity to a CR-5P system

Figure 2. Example of powering a CR-5P system

Figure 3. Example of networking a CR-5P system