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 100 and 200 SPS, Optionally 8, 20, 125, 250 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
- Alarm Relays, SMS / 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 100 and 200 SPS, optionally 8, 20, 125, 250 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.
Specifications CR-5P Seismic, Earthquake and Structural Monitoring System

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 accelerometers:
- 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 Vs/m
- VE-5x: 1 to 315 Hz, 100 to 1'000 Vs/m

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

Digitizer
- Type: CR-5PADxx (xx: 24)
- 9 channel modules
- 3 x Triaxial connectors or 9 x Uniaxial connectors
- A/D Converter: 24 Bit (synchronised)
- per dynamic channel
- A/D Sampling rate: 250 kSPS / 9 channels (over sampling)
- Dynamic Range: CR-5PAD18 > 110 dB
- CR-5PAD24 > 130 dB
- Resolution:
  - CR-5PAD18 > 120 dB
  - CR-5PAD24 > 140 dB
- Sampling Rate (per 3 chn): 50, 100, 200 SPS
- Optionally 8, 20, 125, 250 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
  - Synch 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)

Other sensor types:
- Strain Gage
- Weather Station
- Wind direction & speed
- Humidity
- Air pressure
- Temperature

Specifications subject to change without notice
Copyright © GeoSIG Ltd, 16.03.2010/ GS_CR-5P_Leaflet_V05.doc
### Specifications CR-5P Seismic, Earthquake and Structural Monitoring System

<table>
<thead>
<tr>
<th>Triaxial</th>
<th>Biaxial</th>
<th>Uniaxial</th>
<th>Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>9</td>
<td>Triaxial</td>
<td>Triaxial</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Biaxial</td>
<td>Uniaxial</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>Uniaxial</td>
<td>Uniaxial</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>Uniaxial</td>
<td>Uniaxial</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>Biaxial</td>
<td>Uniaxial</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>Biaxial</td>
<td>Triaxial</td>
</tr>
</tbody>
</table>

and many more...

**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

Specifications subject to change without notice

Copyright © GeoSIG Ltd, 16.03.2010/ GS_CR-5P_Leaflet_V05.doc