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GeoSIG
swiss made to measure

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 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-5PAD24 > 140 dB
Resolution	24 Bit
Sampling Rate (per 3 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
	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)	
Type		
	Polyethylene/ Aluminium	CR-5PHx (x: 2, 3, 4 or 6) stacking portable case, vibration protection optionally available
	Painted Steel	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	
Protection	IP65, EMI & Earthquake resistant 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

Triaxial	Biaxial	Uniaxial	Channels	A1	A2	A3	B1	B2	B3	C1	C2	C3
3			9	Triaxial			Triaxial			Triaxial		
			or									
	3	3	9	Biaxial	Uniaxial		Biaxial	Uniaxial		Biaxial	Uniaxial	
			or									
		9	9	Uniaxial	Uniaxial	Uniaxial	Uniaxial	Uniaxial	Uniaxial	Uniaxial	Uniaxial	Uniaxial
			or									
1	1	4	9	Uniaxial	Uniaxial	Uniaxial	Biaxial	Uniaxial		Triaxial		
			or									
	1	4	6	Biaxial	Uniaxial					Uniaxial	Uniaxial	Uniaxial

and many more…
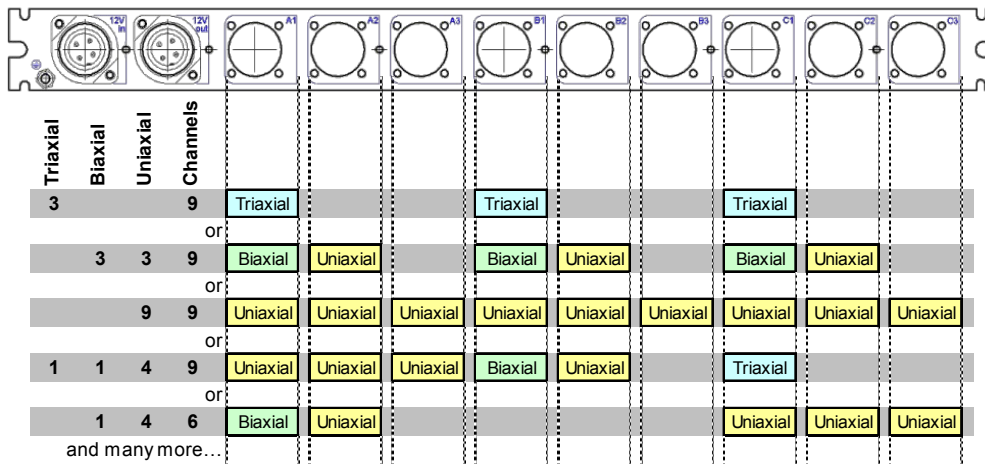
Figure 1. Some examples of possible sensor axes connectivity to a CR-5P system
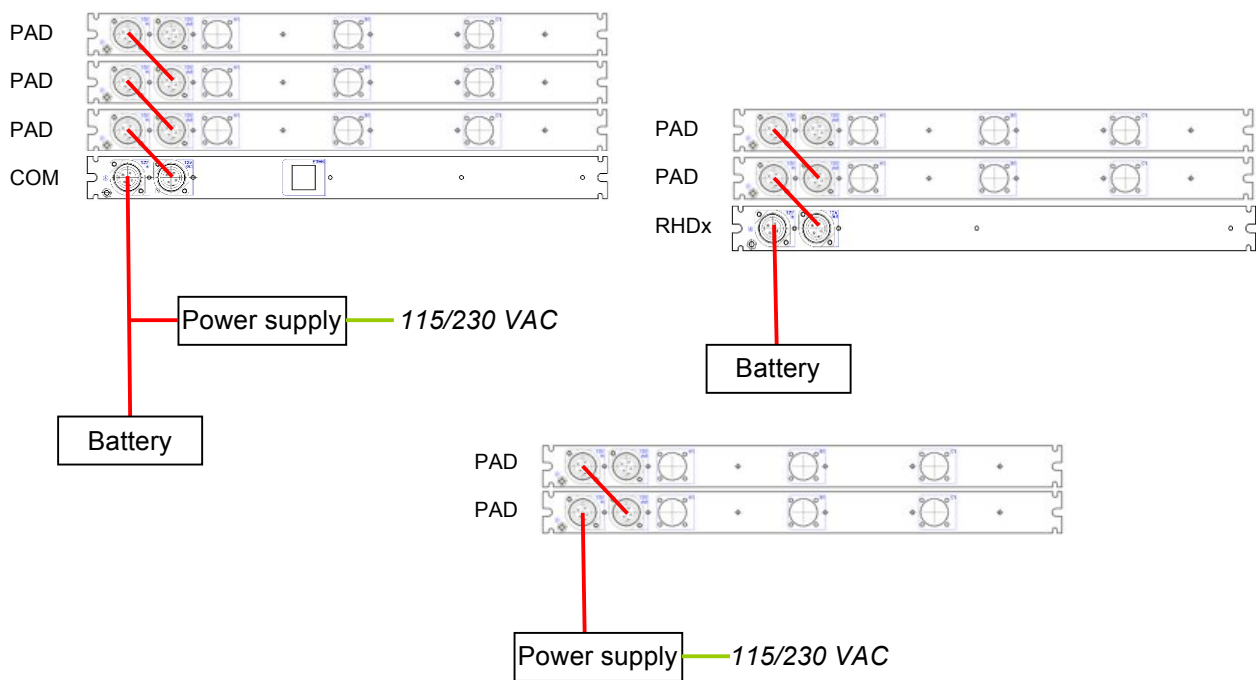
Figure 2. Example of powering a CR-5P system

Ethernet Cable (max 100 m)
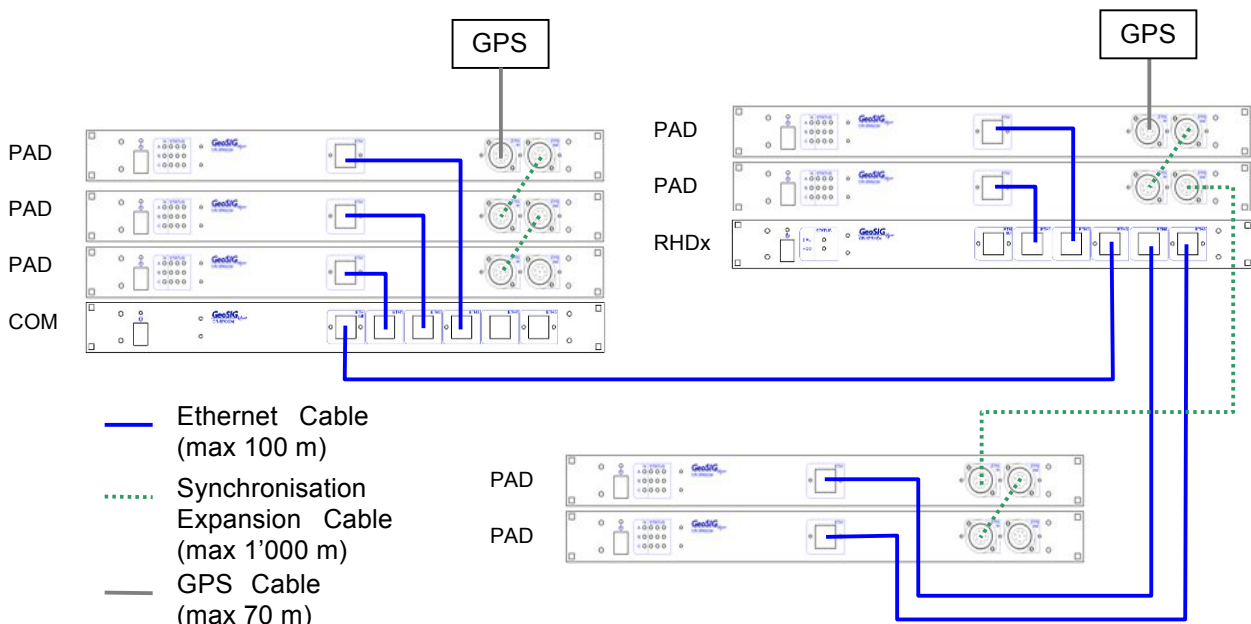
Synchronisation Expansion Cable (max 1'000 m)

GPS Cable (max 70 m)

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