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IA-2 Internet Accelerograph

Features

☐ **Cost efficient Earthquake Recorder**

☐ **All-in-one: Sensor, Digitiser, Recorder, Data Server, Memory, Communication, UTC Timing, Power, Autonomy**

☐ **Internet based communication and timing**

☐ **Continuous and Event Recording**

☐ **Event and Parameter Reporting**

☐ **Internal Triaxial Accelerometer AC-4x or AC-6x**

☐ **From > 90 to >120 dB**

Outline

The Internet Accelerograph IA-2 expands the era of its predecessor IA-1. It complements the GeoSIG instrument NetQuakes / GMS in the urban seismic research and engineering, which requires a high spatial density of seismic instruments. For major urban centres several hundred instruments are required. Thus unit costs as well as operating costs are of major concerns.

The state of the art, all-in-one IA-2 offers a substantially lower cost solution when compared to any other equipment doing the same job. Since the instrument and communication design takes advantage of the latest micro electronic technology in design and the existing Internet infrastructure for station management, data retrieval and event-reporting; network operating costs drop to a small fraction of conventional strong-motion seismograph networks.

IA-2 encompasses a three component acceleration sensor that can be selected from AC-6x or AC-4x series and stores more than 32 days (up to 500 days on request) of full-waveform acceleration data in a non-volatile ring-buffer, which is securely accessible over the Internet.

The instrument's software processes data in real time. If triggered by a seismic event, IA-2 calculates Peak Ground Acceleration (PGA), Peak Ground Velocity (PGV), Peak Ground Displacement (PGD) and Katayama Spectral Intensity (kSI) of the event.

IA-2 reports these parameters, which are related to the strength of shaking, to one or many data centres where a synopsis (such as a shakemap) 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 also securely accessible over the Internet.

IA-2 is self-contained and is equipped with an uninterruptible power-supply, which provides for more than 36 hours emergency operation without external power.

In lieu of an internal clock, NTP based on Internet UTC timing, provide for timing accuracy, typically better than 5 ms.

GeoDAS supports connecting, status checking, downloading and analysing files as well as updating all firmware's and configuring of the IA-2. Configuration of the IA-2 can be also be performed locally through a RS-232 connection or remotely through a SSH connection on a LAN or WAN (like Internet). This allows connecting to an IA-2 anywhere in the world from your computer.

Internet Accelerograph features a virtually maintenance free design, which makes this innovative equipment the best choice for numerous applications.

Specifications IA-2 Internet Accelerograph

Applications
- Urban Seismology
- High density monitoring networks
- Shake / Hazard mapping
- Disaster Management

Set-up and Configuration
Instrument setup is based on a configuration file in ASCII format. The configuration can be edited on site through the instrument console, exchanged by replacing the memory card or remotely from a server. The configuration files can be edited manually or through GeoDAS.

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.

Sensor

Type:	AC-4xi or AC-6xi
Dynamic range:	>96 dB with AC-4xi
	>120 dB with AC-6xi
Full Scale Range:	± 2g, ±5g with AC-4xi
	± 1g, ±2g, ±3g with AC-6xi

Digitiser

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

Recorder

Continuous Recording

Method:	Ringbuffer files with adjustable duration.

Event Recording

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 details

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

Event reporting

Method:	Syslog messages (2 per event)
Content:	1st message: event detected
	2nd message: PGA, PGV, PGD, kSI

Storage Memory

Size and Type:	2 GByte removable SD Card higher capacity upto 32 GByte on request FAT32 formatted
Recording format:	miniSEED
Memory:	Permanent and Event data are stored on the removable SD Card. 2 GByte are sufficient for more than 32 days worth of 3-component full-waveform data

CPU

Processor:	ARM9 series
SDRAM:	64 MByte
Operating System:	Linux, Kernel 2.6.x

Time Base

External time interfaces:	NTP, GPS (optional)
Accuracy:	±5 ms assuming reasonable access to NTP-servers
	±2 ms with optional GPS after learn

Power Supply

Input voltage:	90 - 260 VAC / 50 – 60 Hz
Type:	Switched external power supply
Internal battery:	Rechargeable, 12 VDC, 7.2 Ah Sealed Gel-cell Lead acid battery
Power consumption:	190 mA @ 12 VDC
Autonomy:	36 hours
Battery charger:	Temperature compensated with battery fault detection.

Indicators
- 🟢 Green: AC Power present LED,
- 🟢 Green: Run/Stop LED
- 🟡 Yellow: Event/Memory LED
- 🔵 Blue: Network link/Traffic LED
- 🔴 Red: Warning/Error LED

Communication

Data Retrieval:	Via SCP, FTP or TFTP or directly from removable memory card.
Network requirements:	Fixed or Dynamic IP on Ethernet LAN and/or Internet connection with Ethernet interface.
	Optional Relay Server service is available for operation behind remote private LANs or for special applications
Total Data Time Lag:	690 ±10 ms, due to FIR filter length
Internet security:	Password protection for FTP access, secure shell (SSH) access for maintenance
Connectors:	RS-232 (internal)
	Ethernet
	Power
	GPS (optional)

Environment

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

Housing

Type:	Cast aluminium housing
Size:	296 x 175 x 140 mm (W x D x H)
Size with base plate:	296 x 225 x 156 mm (W x D x H)
Weight:	7.3 kg (incl. 2.65 kg of 7.2 Ah battery) Base plate: 1.3 kg
Protection:	IP65 (NEMA 12)
Mounting:	Base plate with single bolt, surface mount. When base plate levelled and fixed, the instrument can be replaced without re-levelling.

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