

S13B-1069 - Extension to High Frequencies of the Experiment Capability of SEIS-UK

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1. Abstract

The seismic equipment facility serving the UK academic community, SEIS-UK, has recently purchased 15 high frequency seismic recording systems capable of sampling at up to 24kHz. A suite of 3 component 30Hz geophones and piezoelectric accelerometers has also been acquired. The SAQS systems, designed and built by ISS International of South Africa, represent a significant extension in the capability of the SEIS-UK facility. The units record 24bit data from 6 channels, at sample rates of 50Hz to 24kHz, in continuous or triggered mode. An external GPS antenna and removable hard disk allow the systems to run autonomously. The 6 channels can be configured as any combination of tri-, bi- or uni-axial systems. The recording systems are also compatible with broadband seismometers and standard 4.5Hz geophones.



2. Modified SAQS Systems

Although originally designed for the purpose of hardrock mine monitoring, the SAQS system is a good solution for a range of high frequency seismic monitoring experiments, especially controlled source or high-resolution surveys. The SEIS-UK systems have been modified with disk-heaters to extend the environmental operating capability. The addition of an external GPS antenna means the units can be used in the same way as any other passive seismic field system. A 40GByte removable hard disk increases the length of recording to acceptable levels for long-term projects. The functionality of the recorder is significantly greater than that of many standard seismic systems. More information can be found at www.issi.co.za.



3. Features of the SAQS systems

- Up to 6 seismic sensor channels
- Software selectable sampling rates (50 to 24000 sps)
- 24bit digitizing
- Triggered and/or continuous modes
- Small, lightweight, low power consumption
- Logging to removable HDD and/or RS232 port
- Dialup via fixed or mobile telephone
- LCD status display
- Built-in power management and calibration functions
- Built-in or external GPS



4. Sensors

The SEIS-UK SAQS systems can be used with a combination of sensors, the most likely solutions being a tri-axial geophone with a tri-axial accelerometer, or 6 uni-axial geophones. The sensors available from SEIS-UK are:

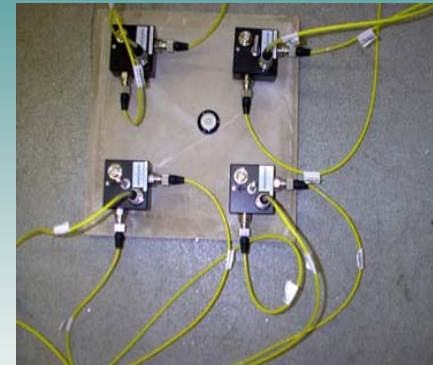
30Hz Geophones – 3G30_SUR

- 30Hz Natural Frequency
- 15-2000Hz Usable Frequency Range
- 11 V/m/s Undamped Sensitivity

Piezoelectric Accelerometers – 3A2.3K

- 0.2-2300Hz Usable Frequency Range
- 500mV/g Undamped Sensitivity
- 8µg Broadband Noise

The SEIS-UK SAQS systems can also be used with standard 4.5Hz 3-component geophones or broadband seismometers.



5. How many events fit on a disk?

A 40Gb disk can hold 260,467 'seismograms', but each seismogram represents one site i.e. one channel when recording uni-axial, or 3 channels when recording tri-axial. Assuming that each event in triggered mode is recorded on all channels a disk will hold the following number of events:

- 6 x Uni-axial triggered sites – 43,400 events
- 2 x Tri-axial triggered sites – 130,200 events

Assuming 300 events a day (at any sample rate):

- running 6 uni-axial triggered sites, a disk will last 144 days.
- running 2 tri-axial triggered sites, a disk will last 434 days.

Running on continuous with 2 tri-axial sensors:

- at 6000Hz a disk will last 4 days.
- at 3000Hz a disk will last 8 days.

6. Example SAQs control windows using ISSI proprietary software



7. British Antarctic Survey RABID experiment supported by GEF

The SEIS-UK High frequency equipment is currently loaned to the British Antarctic Survey for use as part of a large multi-disciplinary experiment on the Rutford Ice Stream in Antarctica - "RABID Basal conditions on Rutford Ice Stream, West Antarctica: drilling and down-hole instrumentation". The project involves drilling through the Rutford Ice Stream with a hot water drill, retrieving ice core samples from selected depths, and sampling the basal sediment. The aim of the project is to enhance understanding of the ice stream dynamics and stability. The SEIS-UK instruments will be deployed in an array centred on the main sub-glacial access hole. Instruments will detect events from the bed of the glacier and within the ice column.



Location map of B.A.S. RABID Experiment 2005 (Figure courtesy of B.A.S.)

8. Loans Procedure

Applications for all equipment should be submitted on our official application form, available on our website. New borrowers are encouraged to contact the Facility first to discuss requirements. Peer review is undertaken by the GEF steering committee which meets twice a year (next meeting Jan 12th 2005). Only in the most exceptional circumstances will applications be assessed outside these meetings, but applicants with urgent loan requirements should read our statement on Executive decisions.

Every successful bid for equipment will be subject to our Terms and Conditions, which are described in the application form.

