

REFRACTION

Portable Seismic Recorders



Applications

- Local/Regional Seismic Networks
- Broadband Array Studies
- Aftershock Studies
- Active-Source Crustal Studies
- Micro-zonation Surveys
- Site Noise Surveys

Features

- PASSCAL industry standard seismic recorder
- Flexible operating modes
- High capacity disk recording
- UTC time synchronized using GPS
- Lightweight, low power, rugged, modular construction



REFRACTION TECHNOLOGY, INC.

Portable Seismic Recorders

Overview

The REF TEK 72A series of portable seismic recorders was developed under contract for IRIS PASSCAL¹. Production of the first 16-bit data acquisition systems (DAS) began in 1989, with the development of a 24-bit DAS in 1992.

The PASSCAL Instrument Committee required the DAS to be modular and upgradable to avert early obsolescence. As a result, most of the 16-bit DASs have been upgraded to 24-bit with >1 gigabyte recording capacity. This is possible because of REF TEK's modular and upgradable design, which set new standards for the seismological community.

The benefit for the scientist is an instrument which is flexible and can be used for multiple types of experiments. Furthermore, upgrades allow the instrument to remain current with the state-of-the-art.

Today REF TEK has delivered more than 1500 24-bit DASs throughout the world. REF TEK DASs are used in field experiments on every continent and in extreme environmental regions including the Antarctic, the Tibetan Plateau, Tanzania and the Mojave Desert.

This PASSCAL field computer is used to read, archive, and pre-process data recorded from a 72A-05 Disk in Antarctica. (1994-96)



A technician inspects one of 11 stations in the Fiji, Tonga, and Niue islands. (1993-95)



Being programmed prior to deployment, a group of REF TEK DASs are prepared for an active-source experiment in Tanzania, Africa. (1994-95)



Twenty DASs like this recorder, were deployed on the Redoubt Volcano and surrounding glacier in Alaska. (1993-95)



One of 25 aftershock deployments following the Loma-Prieta earthquake (1989). Equipment: Omega timekeeping, 72A-02 DAS, 72A-05 disk, 72A-04 power source, and 5 second velocity seismometers.



System Operation

A portable seismic station consists of a sensor, hand terminal, clock, digitizer, data storage, and a power source. After data is recorded, it is retrieved from the data storage unit, archived, and field quality control (QC) is performed.

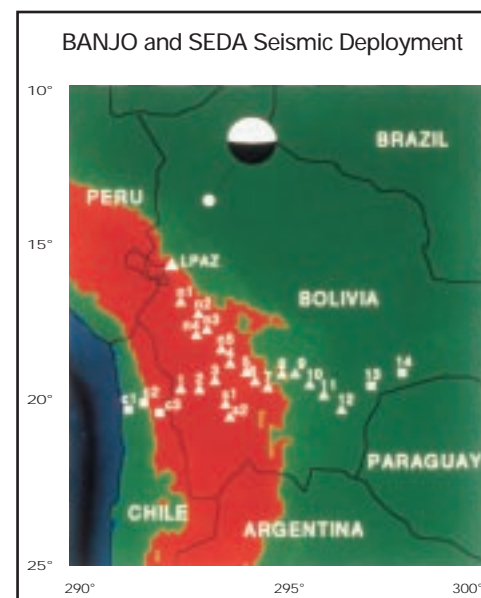
Sensor: For weak-motion recording, the sensor can be either a short-period or broadband seismometer. For strong-motion recording, a force-balanced accelerometer is used. For a 3-channel DAS, either a seismometer or an accelerometer is used. For a 6-channel DAS, both a seismometer and an accelerometer can be used simultaneously.

Hand Terminal:

The user sets acquisition parameters with the HPC2M palmtop computer and our Field Setup Controller (FSC) program. Up to eight active data streams may be specified. A data stream encompasses the included channels and preamplifier gain, sample rate, and one of seven recording modes, for example-continuous, event-triggered, or time-windowed recording.

Clock: At the time the recording parameters are downloaded, the analog-to-digital converter (ADC) is synchronized to Universal Coordinated Time using the REF TEK 111A-04 GPS Receiver/Clock as a time source. When the 111A-04 is ON and receiving GPS signals, time is within 100 microseconds. When operated in duty-cycle mode to reduce power consumption, time is accurate within 1 millisecond.

Digitizer: Acquisition parameters determine the preamplifier gain (x1 for active sensors and x32 for passive sensors) and the sample rate of the ADC, ranging from 1 to 1000 sps. Data samples are stored if the acquisition parameter's recording conditions are met.



Nineteen stations were deployed for a comprehensive passive-source, broadband seismic experiment in the central Andean Cordillera of Bolivia and northern Chile. (1994-1995)

Data Storage: When data is to be recorded, PASSCAL data packets are constructed and stored in CMOS static RAM. If a 72A-05 Disk Recording Subsystem is attached, the DAS copies the data from RAM to the disk. One to three months of data can be stored on a disk depending on sample rate and disk capacity.

Data Retrieval: If there is only RAM or if the disk is internal (in the case of the 72A-07/G/2000), the data can be copied to another disk (72A-01/2000), a DAT tape drive (72A-03/DAT), or to a portable PC for transporting to the central processing center. If the disk is external, it can be 'hot-swapped' with an empty disk, and the disk with data taken to the processing center for reading and archiving of the data.

Data Archiving/Field QC: REF TEK provides two group 'programs' for working with data in a Windows 95 environment. The first group is RTUTILS, programs for reading data from the field storage device and writing files or copies of the data to an attached peripheral such as a DAT drive. The second group is SUDSUTILS, allowing direct reading of the PASSCAL data from either the field storage device or a file, and outputting files in PCSUDS format for processing. Additional programs are included for displaying, filtering, phase picking, and plotting the data.

For a UNIX based computer, similar software can be obtained from the IRIS PASSCAL Instrument Center.



REFRACTION TECHNOLOGY, INC.

Refraction Technology: Providing Solutions That Work.

¹ Program for the Array Seismic Studies of the Continental Lithosphere under the Incorporated Research Institutions for Seismology, an international consortium with 100 member institutions.



Active Source Crustal Studies Site Noise Surveys

Sensor: Short Period Velocity Sensor
DAS: 72A-07/G/2000 High Resolution Digitizer, 3 channels 24-bit, internal GPS and >2 GB internal hard disk
Power: Rechargeable battery

Ancillary equipment:
72A-01/2000 Disk Recorder subsystem for copying data from DAS
HPC2M Hand Terminal with FSC

Available in 6-channel configuration model 72A-07/6/G/2000



Local/Regional Seismicity Surveys Aftershock Studies Micro-zonation Surveys

Sensor: Short Period or 20 second Velocity Sensor
DAS: 72A-07/G/ND High Resolution Digitizer, 3 channels 24-bit, internal GPS and 72A-05/2000 Disk Recording Subsystem >2 GB capacity
Power: Rechargeable battery and optional Solar Panels

Ancillary equipment:
HPC2M Palmtop PC with FSC
72A-05/2000 Disk Recording Subsystem >2 GB capacity "swap disk"

Available in 6-channel configuration model 72A-07/6/G/ND



Broadband Array Studies Regional Seismic Network

Sensor: Broadband Seismometer optional strong motion accelerometer
DAS: 72A-08 High Resolution Seismograph, 3 channels 24-bit and 3 channels 16-bit, 72A-05/2000 Disk Recording Subsystem >2 GB capacity, and 111A-04 GPS Receiver/Clock
Power: Rechargeable battery with Solar Panels

Ancillary equipment:
HPC2M Palmtop PC with FSC
72A-05/2000 Disk Recording Subsystem >2 GB capacity "swap disk"

Available in 3-channel 24-bit configuration model 72A-08/3



Observatory Seismograph

Sensor: Broadband Seismometer and strong motion accelerometer
DAS: 72A-08/6 High Resolution Seismograph, 6 channels 24-bit, 72A-05/2000 Disk Recording Subsystem >2 GB capacity, and 111A-04 GPS Receiver/Clock
Power: Rechargeable battery with AC mains charger

Ancillary equipment:
HPC2M Palmtop PC with FSC
72A-05/2000 Disk Recording Subsystem >2 GB capacity "swap disk"



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Related Subsystems

- Continuous Telemetry
- Active Source Recorders
- Event Oriented Telemetry

Please see our brochures on these advanced systems.