

REFTEK

Miniature Seismic Recorder



Applications

- Active Source Crustal Studies Refraction
- Active Source Crustal Studies Reflection
- Exploration 3-D Noise Testing and Tomographic Arrays

Features

- Low power 24-bit ADC: powered from two "D" cell batteries
- Small, lightweight, and sealed aluminum case
- Solid-state data storage
- Time base stability 0.1 ppm: GPS synchronization



REFRACTION TECHNOLOGY, INC.

Miniature Seismic Recorder

Overview

The Miniature Seismic Recorder (Texan) is an important advancement in the seismology industry. The Texan's self-contained, compact design allows greater flexibility and the ability to easily integrate into system operations.

In *crustal scale refraction experiments*, hundreds of instruments are deployed over several hundred kilometers for two to four days duration. Recordings are made based on pre-set time windows at a rate of 100 samples per second (sps). Because explosions are typically being recorded, a maximum of 50 time windows of 120 second duration will be recorded. The Texan's data storage requirement for this application is about 2 MB. Timing accuracy for the four day period must be within +/- 5 msec relative to the shot time.

For *crustal scale reflection experiments*, instruments are deployed for three to five days with six to eight hour continuous recordings using a vibrator energy source. After each day's recording, data is downloaded and the Texan is initialized for the next day's recording. Because the data may be stacked, time accuracy must be within +/- 2 msec. The sample rate is typically 250 sps, thus the data storage requirement for each day is about 21 MB.

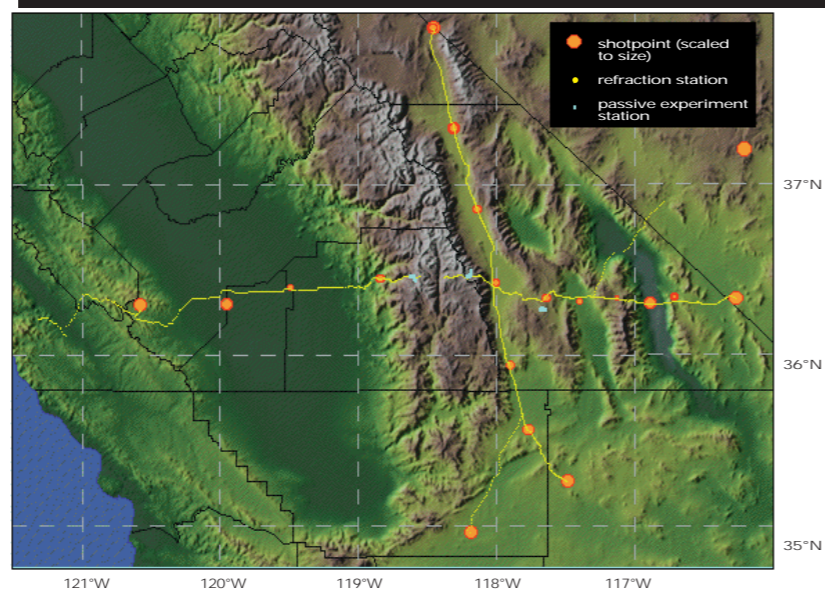


Drilling shot holes during Polonaise experiment, May 1997.

How The Name "Texan" Came About

The Miniature Seismic Recorder is a joint project between the Texas Universities Seismic Instrumentation Alliance¹ with funds from the State of Texas Advanced Technology Program, thus the name "Texan." In addition, support is provided by IRIS/PASSCAL² and several Texas-based energy companies.

1993 Southern Sierra Continental Dynamics Project deployment



This topographic map³ shows a typical active crustal studies experiment plan.

System Operation

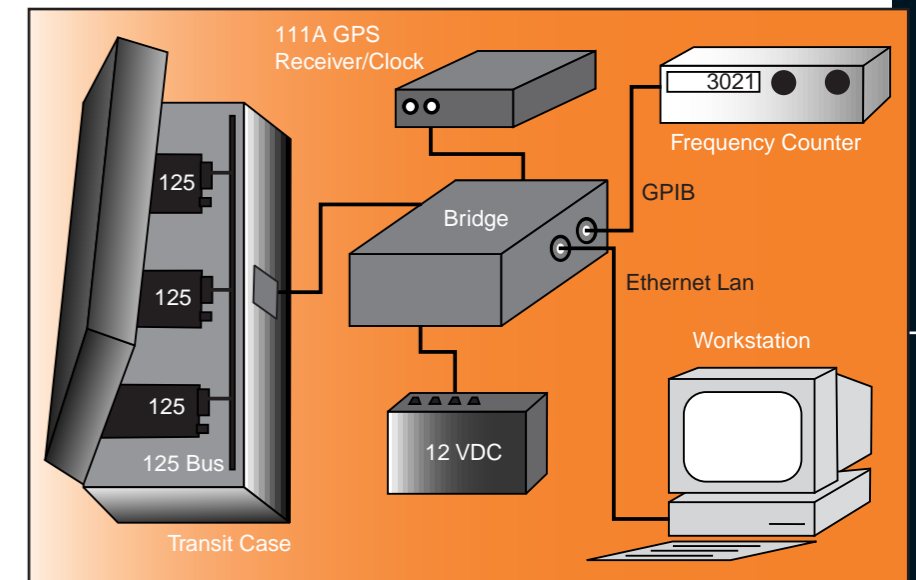
The self-contained Texan features a low-noise differential input amplifier, 24-bit analog-to-digital converter (ADC), solid-state data storage, and batteries, all in a sealed aluminum case. Up to 20 Texans are stored, transported and setup within a transit case. The transit case includes interconnect cabling (125 bus). This feature makes the system easy to connect to the external control device, also known as the Bridge.

The Bridge provides several important functions:

1. Translates data between the 125 bus and the TCP/IP ethernet bus, which enables the User Interface Program (UIP) to run on either a Windows or Unix workstation.
2. Routes the 111A GPS Receiver/Clock signals to each Texan for synchronizing internal time to UTC.
3. Routes the Texan time base signals to the frequency counter to allow the UIP to calibrate the internal oscillator in each Texan.
4. Supplies power to the Texans for setup and data retrieval.

After setup, the Texans are deployed for recording. A state LED displays the operating condition of the Texan. This feature clearly informs the user that the battery voltage is sufficient, time is set, the acquisition program loaded, and the unit is either ready to acquire or is acquiring data. During the recording session, the Texan can be retimed or data may be downloaded to a laptop PC. At the conclusion of the experiment, the Texans are returned to the setup facility, retimed, and the data downloaded to the workstation for processing.

The relationship between the components during setup/data retrieval.



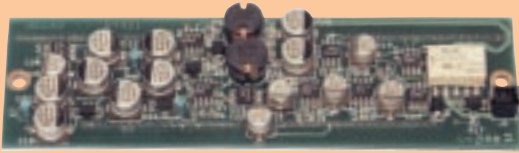
Demonstrating the installation of a 125 station.



Water geyser from under water explosion during CTBT tests in Wyoming, summer 1997.

¹The Texas Universities Seismic Instrumentation Alliance includes the University of Texas at El Paso, Rice University, and the University of Texas at Dallas.
²Program for the Array Seismic Studies of the Continental Lithosphere under the Incorporated Research Institutions for Seismology, an international consortium with 100 member institutions.
³Courtesy of C.H. Jones, University of Colorado

Specifications



MODEL NUMBER: 125-01

PHYSICAL:

Size: 3.0" (76mm) diameter x 7.7" (196mm)
Weight: <2.5 lb (1.1 Kg) including 2 D cell alkaline batteries.
Operating Temperature: -40° C to +60° C
Watertight Integrity: Water immersion without leaking in 2 meters water (48 hours), air tight to 2.5 psi.
Shock: Survives 1m drop on any axis

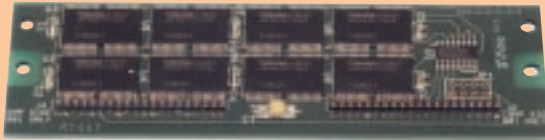


POWER (Internal):

Batteries: "D": cell alkaline, two required
Voltage: 1.6 VDC-3.0 VDC
Current: 50 micro-amp – sleep
25 mA – standby
125 mA operating

POWER (External):

Voltage: 5.0 VDC
Current: 50 mA



A/D CONVERTER:

Input Impedance: 2 megohms, 0.2 uFd, differential
Common Mode Rejection: Greater than 70 dB
Gain Selection: Fixed Gain
Full Scale Input: 0.625 Vpp
Bit Weight: 59.6 nV
Type: Delta-sigma modulation, 256 KHz base rate
Sample Rate: 1000, 500, 250, 200, 125, 100, 50, 25 sps

DATA STORAGE:

Word size: 24-bit two's-complement (3 bytes per sample)
Storage type: Flash EEPROM
Capacity: 32,760,000 bytes (32 MB) of data storage expandable to 64 MB



TRIGGER FOR CRUSTAL STUDIES:

Description: Recording windows are programmed by the host PC as a start and stop time.
Time trigger: 1000 trigger times may be programmed
Record length: A minimum of 1 second to a maximum time that will fill the data storage.

TIME BASE:

Frequency: 2.048 MHz, electronic control
Stability: +/- 0.1 ppm from 0 to 50° C;
+/- 0.3 ppm from -20 to 0° C

CONNECTORS:

Seismometer: U229/U
Power/I/O: U77/U



Related Subsystems

- Continuous Telemetry
- Event Oriented Telemetry
- Portable Seismic Recorders

Please see our brochures on these advanced systems.



Refraction Technology, Inc.
2626 Lombardy Lane, Suite 105
Dallas, Texas 75220
(214) 353-0609 (voice)
(214) 353-9659 (fax)
info@reftek.com (email)
www.reftek.com