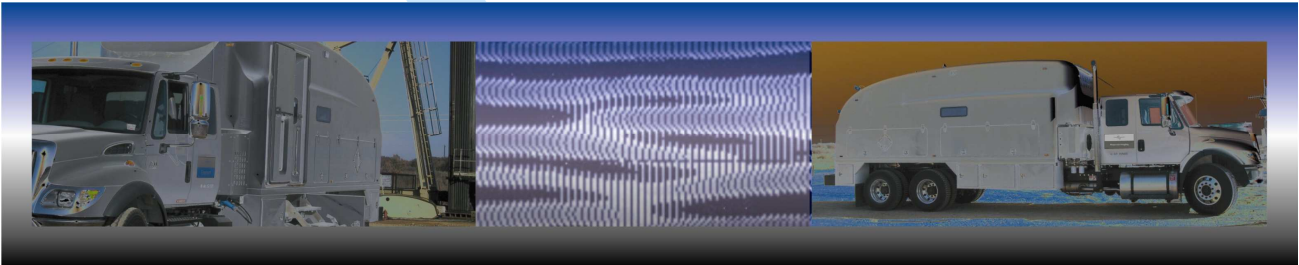


Reservoir Imaging, Inc.



Advanced Downhole Seismic Data Acquisition Services

EQUIPMENT SPECIFICATIONS

CONFIDENTIAL

The following documents are the sole property of Reservoir Imaging, Inc. and Enertech Ltd. and are not be copied or distributed without written consent of Reservoir Imaging, Inc. or Enertech Ltd.

Advanced Downhole Seismic Data Acquisition Services

The following are the standard operating specifications of the Downhole Seismic System. The standard configuration consists of the following basic components:

- Optional Installation Methods by “Conventional Wireline” or “Surface-to-Depth”
- Typical Downhole Vertical Seismic Array (VSA) 80 to 120 3C Levels
- Standard 15 meter (49.2 ft) and 7.7 meter (25.25 ft) spacing
- Centralized Operator Control Instrumentation
- Built-in Simultaneous Surface Channel Digitization
- SeisNet Workstation for real-time data display & QC
- Optional ProMax or VISTA VSP field data processing software
- High Speed (1GB) Ethernet Networked Data Management System
- Electro-Fiber Optic Armored Wireline
- Truck mounted and Skid mounted Wireline Deployment Unit

The Downhole Seismic System is based on the latest “state-of-the-art seismic instrumentation technology.

Features of the system include:

- Distributed telemetry downhole array with 24-bit digitization in each level
- “Double Loop-Back Technology” provides redundant path for telemetry and power
- Selectable sampling rates including $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4ms
- GPS timing for ultra precision system clock (measured to be better than 1 part per 5 million)
- Multiple recording modes including conventional time break and continuous recording (see details in document)

Downhole Vertical Seismic Array Specifications

Array Capacity:	Selectable depending on sample rate																		
	<table border="0"> <thead> <tr> <th>SR</th> <th>Max. Level</th> <th>Interleave Mode</th> </tr> </thead> <tbody> <tr> <td>@ 4 ms</td> <td>1024</td> <td>3C levels</td> </tr> <tr> <td>@ 2 ms</td> <td>592</td> <td>3C levels</td> </tr> <tr> <td>@ 1 ms</td> <td>256</td> <td>3C levels</td> </tr> <tr> <td>@ ½ ms</td> <td>128</td> <td>3C levels</td> </tr> <tr> <td>@ ¼ ms</td> <td>64</td> <td>3C levels</td> </tr> </tbody> </table>	SR	Max. Level	Interleave Mode	@ 4 ms	1024	3C levels	@ 2 ms	592	3C levels	@ 1 ms	256	3C levels	@ ½ ms	128	3C levels	@ ¼ ms	64	3C levels
SR	Max. Level	Interleave Mode																	
@ 4 ms	1024	3C levels																	
@ 2 ms	592	3C levels																	
@ 1 ms	256	3C levels																	
@ ½ ms	128	3C levels																	
@ ¼ ms	64	3C levels																	
Level Spacing:	15 M (49.2 ft) & 7.7 M (25.25 ft) Other spacing available on request																		
Data Sampling Rates:	¼, ½, 1, 2, 4 ms																		
Digitization:	24-Bit Delta Sigma																		
Sensor Type:	Single-Element Orthogonal OMNI-2400 (15 Hz Natural Frequency)																		
Sensor Sensitivity:	1.32 V/in/sec																		
Recording Modes:	(see GeoRes Surface Instrumentation for details) Conventional Time Break Continuous and Real-Time																		
Maximum Record Length:	@ ¼ ms 20 sec @ 1 ms 40 sec @ 2 ms 80 sec																		
System Timing:	GPS, Internal Clock (better than 1pp5m)																		
Recorded Data Format	SEG-2 or SEG-D Rev 2.0																		
System Temperature Rating	150 °C 302 °F																		
System Pressure Rating:	20,000 psi																		



Downhole Sensor Module (DS-150) Specifications

Tool Diameter:	1.625 inches (41.3 mm)	
<i>(Note: with bow spring and magnet brackets minimum recommended casing diameter is 3.625 inches)</i>		
Tool Length:	15 inches (38.1 cm)	
Tool Weight:	4.1 lbs (with out bracket assembly)	
	9.0 lbs (with one (1) bow spring shoe)	
Tool Material:	Stainless Steel	
Clamp Mechanism	Passive Bow Spring Magnetic	
Clamping OD Ranges	5-Point Anchor	4-Point Anchor
	3 5/8 – 6 inches (92 - 152 mm)	6 – 9 5/8 inch (152 – 244 mm)

Digitization Specifications

Digitization:	24 Bit Sigma-Delta
Sampling Rates:	¼, ½, 1, 2, 4ms (Operator Selectable)
Pre-amplification:	0, 8, 19, 31, 42 dB (Operator selectable)
Equivalent Input Noise (EIN)	

@ 2 ms 0.264 μ V rms @ 19 dB

@ 1 ms 0.275 μ V rms @ 19 dB

@ ¼ ms 0.351 μ V rms @ 42 dB

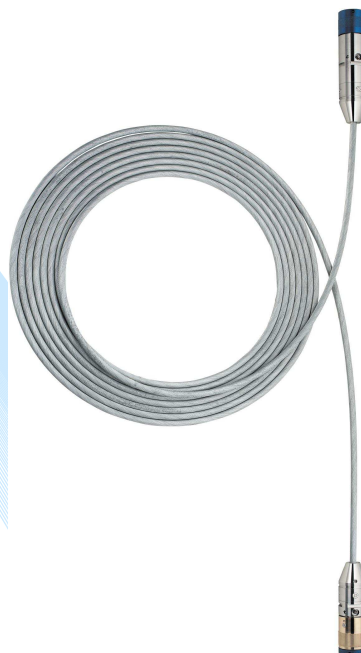
Anti Alias filter	80% Nyquist
Frequency Response	3 to 1600 Hz (1/4 ms)
Instantaneous DR	Greater than 120 dB
THD	.0018%
Cross-feed Isolation	>100dB
System Timing Accuracy	Better than 1 PP5M



DS-150 with Magnetic Clamps



DS-150 with Bow Spring Clamps



3-Component Geophone Sensor Package

Three (3) fixed axis orthogonal oriented OMNI-2400 geophone configured with Z-component (vertical component in a vertical well) aligned inline to downhole tool and interconnect cable.

X-Line 1 geophone (H1)

Inline (Z) geophone aligned long axis of tool

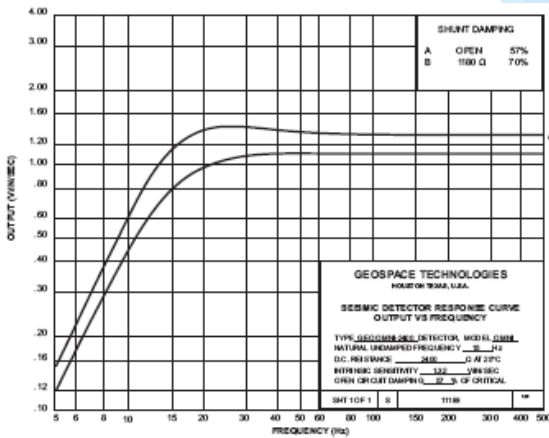


X-Line 2 geophone (H2)

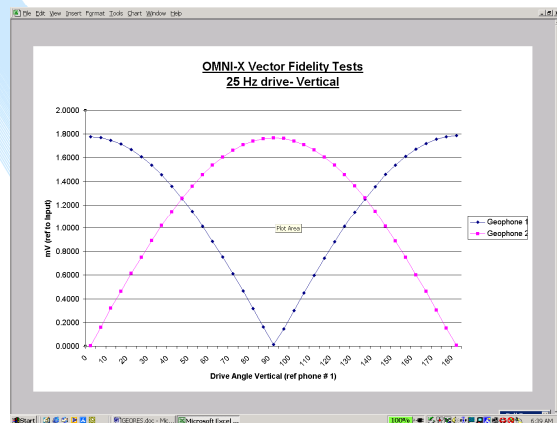
Geophone Specification

Single element per channel
 OMNI-2400 Geophone
 15Hz Natural Frequency
 Element Sensitivity: 1.32 V/in/sec

The OMNI-2400 geophone elements are designed to operate and output identical sensitivity regardless of the tilt in space. Each OMNI element has the same specification of sensitivity, impedance, phase, frequency response, and harmonic distortion.



OMNI-2400 Sensitivity - Frequency



Vector Fidelity of OMNI-2400

Surface Data Recording Instrumentation

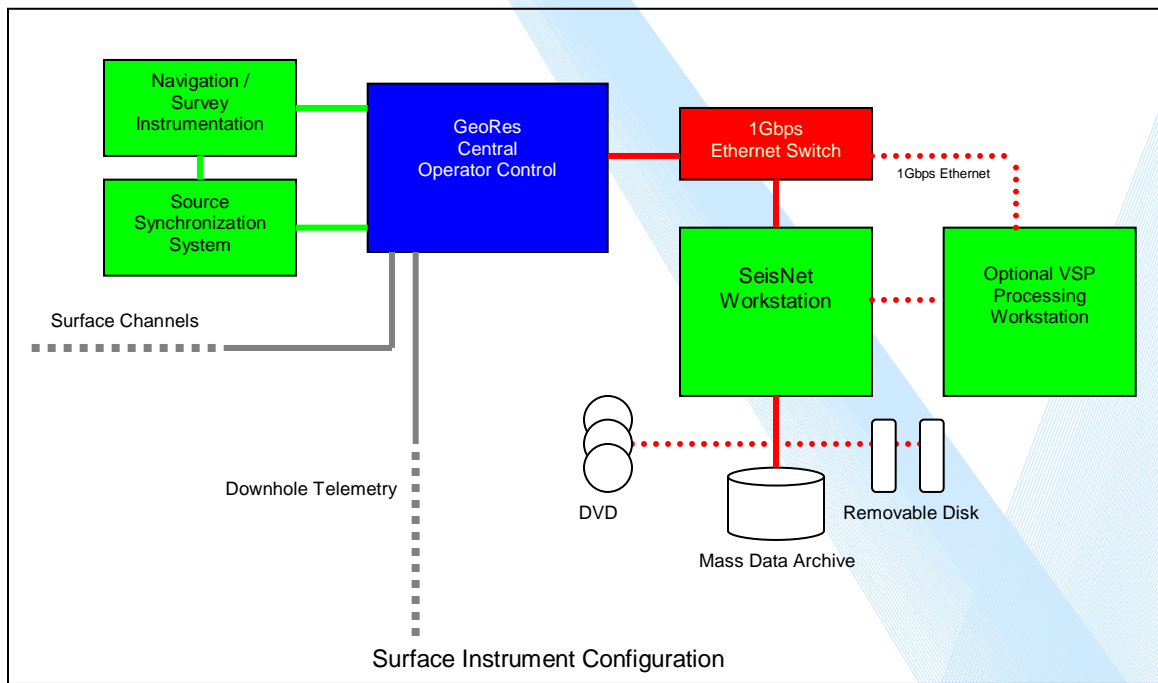
The GeoRes serves as the central control for the downhole recording system. The system is hosted by the Windows XP platform and is compliant with multi-networking systems and large storage media solutions.

Data format recorded on disc is SEG2 Rev2. Trace header information includes x, y, z coordinates, external header from navigation system and source synchronization systems.

The surface recorder has capacity for simultaneous surface seismic recording with downhole recording. Digitization for downhole and surface recording is identical and synchronous.

The operator control system has several types of hardware triggers, software fire-control mode, header-control mode and "pre-control" trigger enabling data recording before the receipt of a "fire-command". Select cases of controlled trigger options require operation using the GPS updated time-base mode.

- **Conventional Trigger Mode** - requires source synchronization hardware
- **Header Control Mode** –merge and matching of continuous recorded data (GPS time) and supported "navigation" header string (GPS time). Data concatenated into records.
- **Event Trigger Mode** - when user-defined conditions are met, data records are captured
- **Autonomous Signal Mode ("GeoWatch")** - collection of remote un-connected source control signal(s) on multi system with identical time-base
- **Continuous Mode** - allows recording of every data sample, parsed into user defined record lengths
- **Combined modes** – simultaneous recording of multiple sets of continuous or time break data



Operator Control and Instrument Status Monitor Display

GeoRes provides powerful instrument control and status monitoring. Typical real-time monitor is shown below.

Display Windows includes:

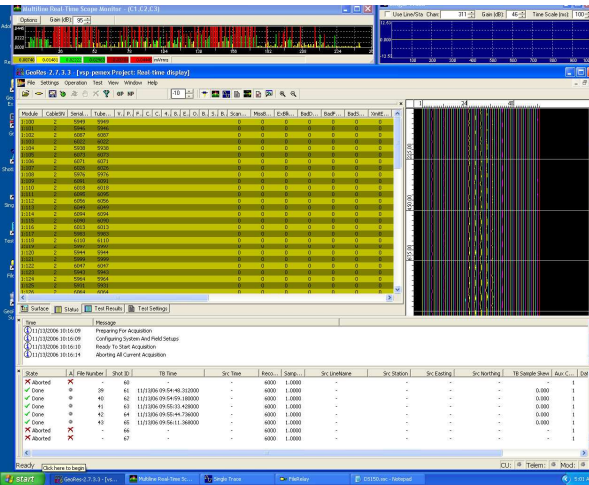
RMS Channel Display
(Continuous monitoring)

Single Channel Display

Downhole Tool Status
(Continuous monitoring)

Wiggle Trace Display
(Variable Density)

Instrument Status
Shot Log Window
(Each shot or file record)



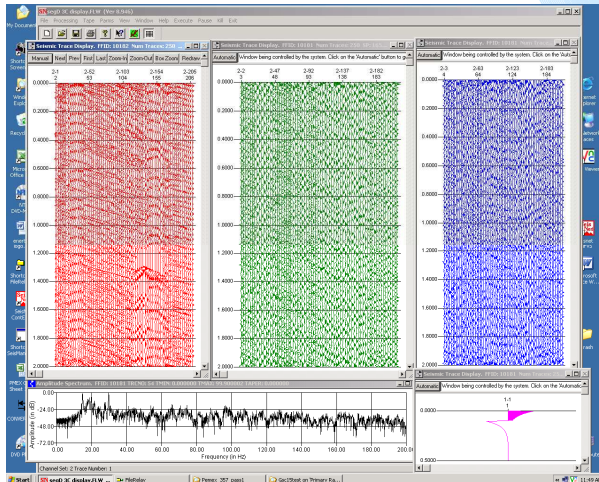
Built-in Instrument testing includes:

- Harmonic distortion
- Impulse response
- Dynamic range/resolution
- Noise tests: amplifier
- RMS noise, receiver RMS noise
- Gain Accuracy
- Leakage tests
- Cross-Feed isolation
- Full Geophone Sensor Test

SeisNet Data Display and QC

SeisNet™ provides the quality assurance of on-line seismic data display, attribute analysis, multi-path data

Real-time SeisNet data display. Typical real time raw data display window is shown below:

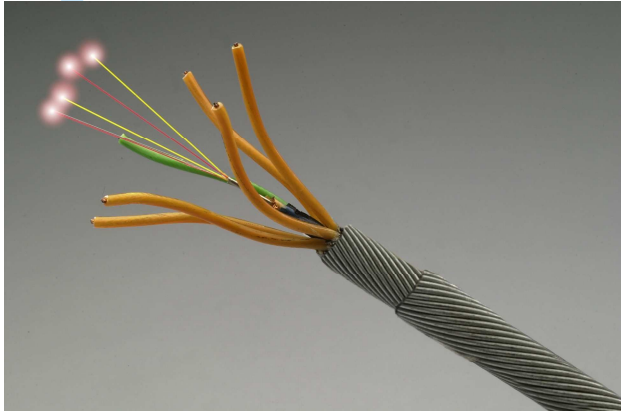


SeisNet Display

- RED – Inline (Vertical) component Channel
- GREEN – Xline 1 (Horizontal) Channel
- BLUE – Xline 2 (Horizontal) Channel
- Power Spectrum (bottom left window)
- Time Break Trace (bottom right window)

Electro-Fiber Optic Wire line

Electro-fiber optic wire line is extensively tested and field proven to set new standards of performance for high-resolution downhole seismic data recording.



Features

- Dual 24x24 Contra Helical Armored
- 0.464 inch OD
- 7,250 lbs Working Strength
- 12,400 lbs Break Strength (Ends Free)
- 329 lb/Kft Cable weight in air
- Four (4) Multi-mode fibers 62.5/125/245 μm acrylate
- Six (6) 20 AWG electrical conductors

Advantages of Fiber optic Wire Line Data Transmission

1. 12 Mbits per second digital data transmission rates over long wire line lengths up to 30,000 feet compared to standard 7-conductor rates of < 1 Mbits per second
2. Optical telemetry is not susceptible to leakage improving downhole reliability
3. Provides ultra precision system timing and synchronization eliminating system and multi system timing skew
4. Fast data rate transmission enables real time high sample rate
5. Fast data rate transmission enables true continuous data recording
6. Fast data rate transmission enables recording of true 24-bit digitization
7. Provides real time downhole data recording without degradation of acquisition speed

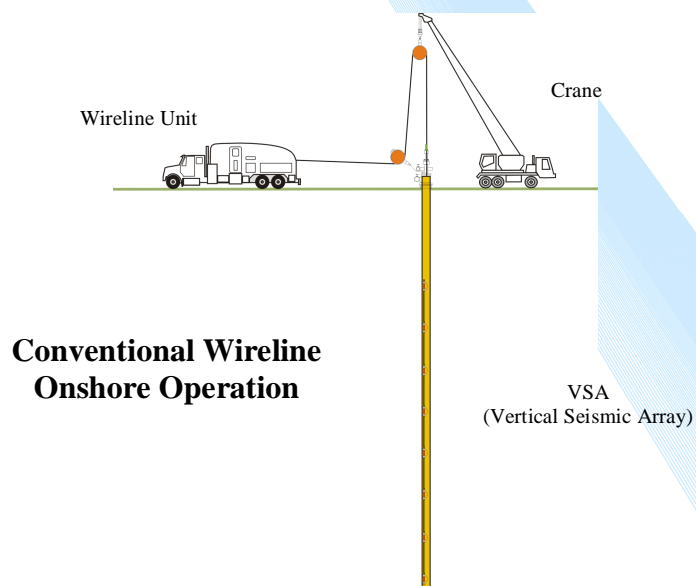
Truck-Mounted Wireline Unit

Wireline Truck with ~21,000 ft (6400 meter) armored wire line



Model	2006 International HT 570 FBA	6 X 6 Drive
GWV	50,000 lbs with ~21,000 ft of armored wireline	
	Front Axle	12,760 lbs
	Drive Axles	32,660 lbs
	Total Weight	45,420 lbs

(NOTE: Weights may vary depending on tool and interconnect storage onboard)



Skid-Mounted Wireline Unit

Remote (Offshore/Onshore) Skid Mounted Unit with ~21,000 ft (6400 meter) wireline



Self Powered Diesel-Power Pack

Hydraulic Wireline Winch

Air-Conditioned Recording Cabin

Specifications

Complete Unit
w/ ~20K Wireline

21,000 feet Wireline
(6E4FO 464)

Weight

13,800 kg

30,500 lbs

6909 lbs (3125 kg)

Dimension

6.058 m L x 2.438 m W x 2.336 m H

20' L x 8' W x 7' 7" H
Note: (8'6" H with /AC unit)

11.8 mm diameter
0.464 inch diameter
329 lb/Kft or 488 kg/km

Standard Features on all wire line units include:

- Full set of Data Recording Instrumentation
- SeisNet Data QC and Display Workstation
- Optional Vista VSP Processing Workstation
- Kerr AMS 5K Dual Wheel Depth and Tension Measurement System
- Casing Collar Locator (CCL)
- Fiber optic augmented Armored Wire line

Portable Recording Unit (PRU) for “Surface-to-Depth” Operations

Portable trailer mounted unit optimally suited for “Surface-to-Depth” operations where wireline conveyance is not required. Unit shown below is for onshore work. *Note: Offshore Unit available on request*



Standard Features on portable unit include:

- Full set of data recording instruments in air conditioned recorder cab
- SeisNet Data QC and Display Workstation
- Optional Vista VSP Processing Workstation
- Cabling and Auxiliary Equipment for single well or multiple well recording
- Work room for maintenance of tools and interconnects

