

# Borehole Seismic Tool String



## Scientific Application

The Borehole Seismic Tool String is composed of the Versatile Seismic Imager (VSI\*) and the Enhanced Digital Telemetry Cartridge (EDTC-B\*). The VSI is used for check shot surveys (to obtain a depth-traveltime relation) and zero-offset Vertical Seismic Profile (VSP) experiments (to obtain seismograms at the site). The depth-traveltime relation can also be derived from the sonic velocity log, which together with the density log and seismic source wavelet combine to make a synthetic seismogram. Thus, reflectors on the seismic section can be correlated with lithological or petrophysical changes in the borehole.

The primary function of the EDTC-B is to provide high-speed (>1 Mbps) communications between the wireline tools downhole and the acquisition system at surface. It also includes a scintillation gamma ray detector that provides depth matching to other logs.

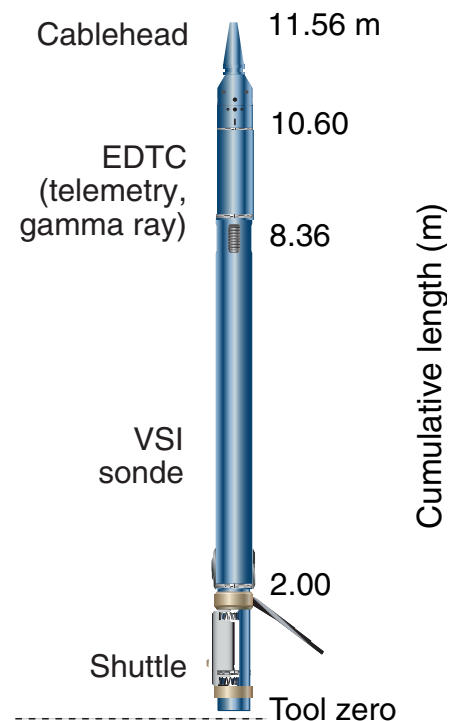
The Borehole Seismic Tool can be used for:

- Integrated processing for interpretation of borehole and surface seismic data
- Planning for well placement
- Simultaneous surface and borehole seismic recording for high-definition images
- Shear wave processing and analysis

## Additional Information

### VSI

The configuration of the tool (number of sensor packages, sensor spacing, and type of connection (stiff or flexible) varies to provide the maximum versatility of the array. A maximum of 20 shuttles can be used, though only one has been used so far in ODP and IODP. Regardless of configuration, the tool is used to collect seismic data by anchoring in the hole at the desired depth using a caliper arm. When anchored, the accelerometer package is pressed firmly against the formation while remaining decoupled acoustically from the body of the shuttle. Air guns deployed from the rig by crane then provide the necessary source pulse, and the resulting acoustic wave is recorded downhole on all three axes.



**Schematic of the VSI Tool String used during Exp 351.**

## Tool Specifications

Temperature rating:	350°F (175°C)
Pressure rating:	20 kpsi (13.8 kPa)
Diameter:	3.625 in. (9.21 cm)
Cartridge length:	20.9 ft (6.37 m)
Cartridge weight:	190.8 lb (86.5 kg)
Shuttle length:	6.4 ft (1.96 m)
Shuttle weight:	70.6 lb (32 kg)
Sensor length:	11.4 in. (29 cm)
Sensor weight:	6.4 lb (2.9 kg)
Sensor natural frequency:	25 Hz
Flat bandwidth in acceleration:	2-200 Hz
Length (multiple shuttles):	Up to 1,040 ft (317 m) for 20 shuttles
Weight (multiple shuttles):	Up to 2,200 lb (998 kg)
Maximum number of shuttles:	20
Logging speed:	Stationary
Sampling rate :	Seismic waveform recording: 1, 2, 4 msec
Combinability:	Bottom only



**Air gun being lifted by one of the ship's cranes.**