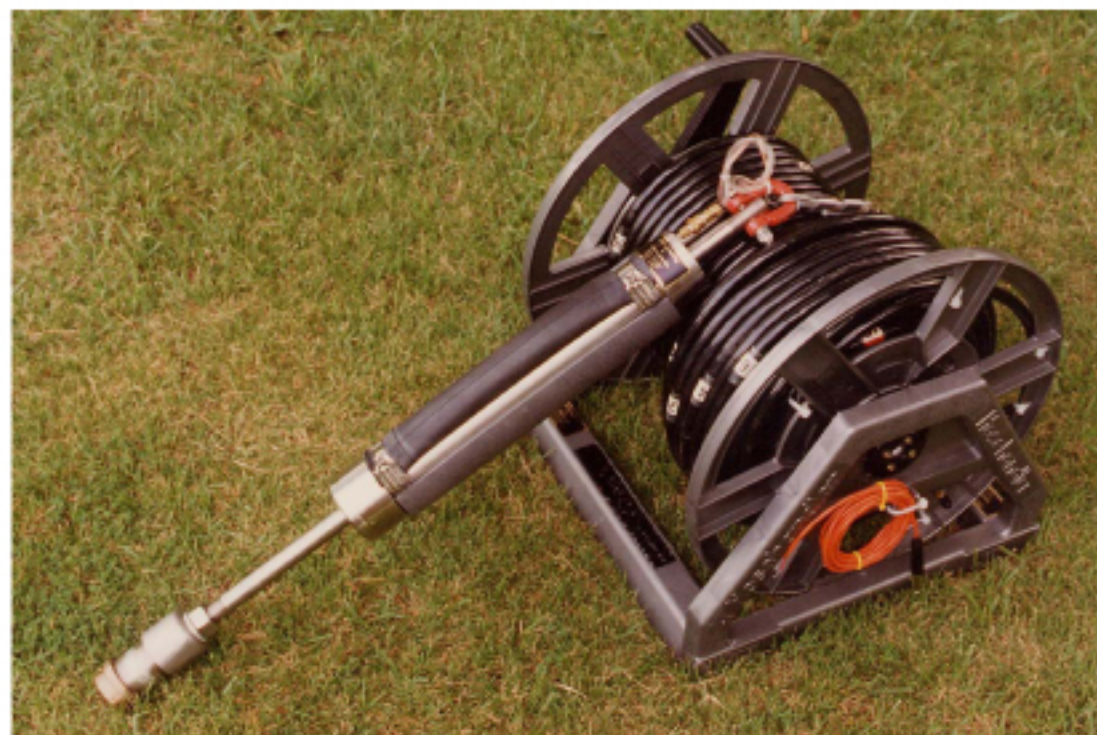


# **BALLARD BOREHOLE SEISMIC SOURCE**

**S-WAVE ENHANCED**

(Patent No. 5992559)

**Only U\$S 9,400.00**



**REVERSIBLE SPRING LOADED HAMMER, 100 FOOT SINGLE THREE-IN-ONE CABLE ,  
ZERO-TIME TRIGGER SOURCE INPUT TO SEISMOGRAPH, CABLE REEL,  
AIR PUMP AND GAUGE, ALUMINUM SHIPPING CASE, SPARE PARTS KIT**

The Ballard Borehole Seismic Source is a tool designed to enable engineering geophysicists and geotechnical engineers to conduct high quality P- and S-wave crosshole tests in accordance with ASTM standards.

Unlike P-wave energy which appears first on a seismic record, S-wave energy must be enhanced to be positively recognized within existing wave trains. This can be best accomplished by a reverse polarity seismic source rich in S-wave energy. Since the polarity of an S-wave can be controlled (unlike the P-wave) the seismic source can provide a positive identification if it is capable of S-wave phase reversal.

The Ballard Borehole Seismic Source is designed to offer S-wave enhancement, S-wave phase reversal, suppressed (but adequate) P-wave energy, light weight, signal repeatability, high frequency (fast rise time), maximum reliability, and low cost. An inflatable sidewall anchor system provides positive borehole clamping. A single three-in-one, 0.5 inch diameter cable houses the controls for reversible spring loaded hammer activation, zero-time geophone and air for the clamping mechanism.

In the early days of Crosshole testing, lack of uniform test practices in the engineering arena led to inconsistent and erroneous data. Recognizing that such practices could yield dangerous or undesirable results, the American Society for Testing and Materials (ASTM) formed a task group to study the problem. After nearly five years, "Standard Test Methods for Crosshole Seismic Testing" designation: D 4428/D4428 m-84 was published in the 1985 annual book of ASTM Standards, Volume 04.08, pp. 885-898. The standard was renewed and published with only minor changes in the 1991 annual book of ASTM Standards, Volume 04.08, pp. 691-700.

In the course of implementing a standard test procedure, it became apparent that a need existed for a simple, repeatable, borehole, S-wave seismic source.

## **THE BALLARD BOREHOLE SEISMIC SOURCE**

This compact tool enables a one or two person field crew to perform tests to depths of more than 150 feet without tripods or special purpose handling equipment. Extensive field tests have shown that the design concepts are sound. Repeatability is excellent, so signal stacking serves to enhance the P- and S-wave trains while repressing background noise.

Note: Even though this tool is waterproof, the design is optimized for use in a dry cased borehole. In a borehole water column, turbulence caused by the hammer's activation can create undesirable noise and loss of point source (the entire water column becomes the source).

### **TECHNICAL SPECIFICATIONS**

**Dimensions:**    **Basic Tool Length - 24 in.**  
                         **Body Diameter - 2.75 in.**  
                         **Body Length - 15 in.**  
                         **Cable - 0.5 in. dia. (length to suit)**

**Approx. Wt.:**    **Basic Tool 2.75 in. dia. - 12 lbs.**  
                         **Cable - 0.25lbs. per foot**

**Center Frequency:**    **Approx. 400 Hz**

**Trigger:**            **Miniature, 5,000g shock-rated geophone**  
                         **120 db dynamic range**  
                         **Waterproof (fully encapsulated in stainless steel housing)**  
                         **Bolted to upper anvil**

**Sidewall Anchor System:**  
                         **Inflatable double-walled bladder, field replaceable**  
                         **Normal locking pressure, in an air-filled borehole-30 psi.**  
                         **Manual air pump & gauge**

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