

Pressure Inverted Echo Sounder (PIES) is an oceanographic instrument for measuring average sound speed in the water column. The instrument has been developed for marine seismic and ocean science applications to gather valuable physical oceanography data. PIES can be configured for autonomous monitoring over periods of several months or years. One key operational advantage for users is that minimal conductivity and temperature profiling is needed over the seismic survey period.

PIES uses an up chirp to accurately measure two-way travel-time through the water column. It simultaneously measures pressure at the seabed. Pressure measurements are converted to depth to find the acoustic distance travelled from the seabed to the surface and back again. By combining the depth and travel time the average sound speed in the water column can be calculated.

The user can retrieve two-way travel-time in seconds and pressure in kilo Pascals via an embedded acoustic modem. Alternatively the PIES unit can be retrieved to the surface. The SD Card Extractor software gives the user access to the raw data gathered by the instrument. Accurate conversion from pressure to depth can be achieved by allowing the user to include local barometric pressure, sea water density and gravity with the PIES data. The PIES unit is user configurable to capture at a programmable ping rate ranging from one minute to many minutes or even hours. The choice of ping rate enables the user to balance the conflicting demands of battery life with the need to average out effects from the instantaneous sea state at the time of acoustic measurement.

Logged data is typically retrieved once the survey is completed and PIES unit recovered. The PIES data is retrieved using the SD Card Extractor software and the raw measurements are post processed with geophysical data. The set-up for the SD Card Extractor is partially automatic and guides the user through the process. It can detect the current baud rate and minimise the time spent completing the extraction process.

PIES at a glance

- Monitors two-way acoustic travel time from seabed to surface
- Monitors the pressure at the seabed for conversion to depth
- Embedded arrival detection on the echo signal
- Acoustic retrieval of pressure and travel time
- Raw measurement data can be extracted using the SD Card Extractor
- No need for repeated temperature and conductivity profiling
- Sea state metrics available from raw data
- Depth rated to 3,000 metres

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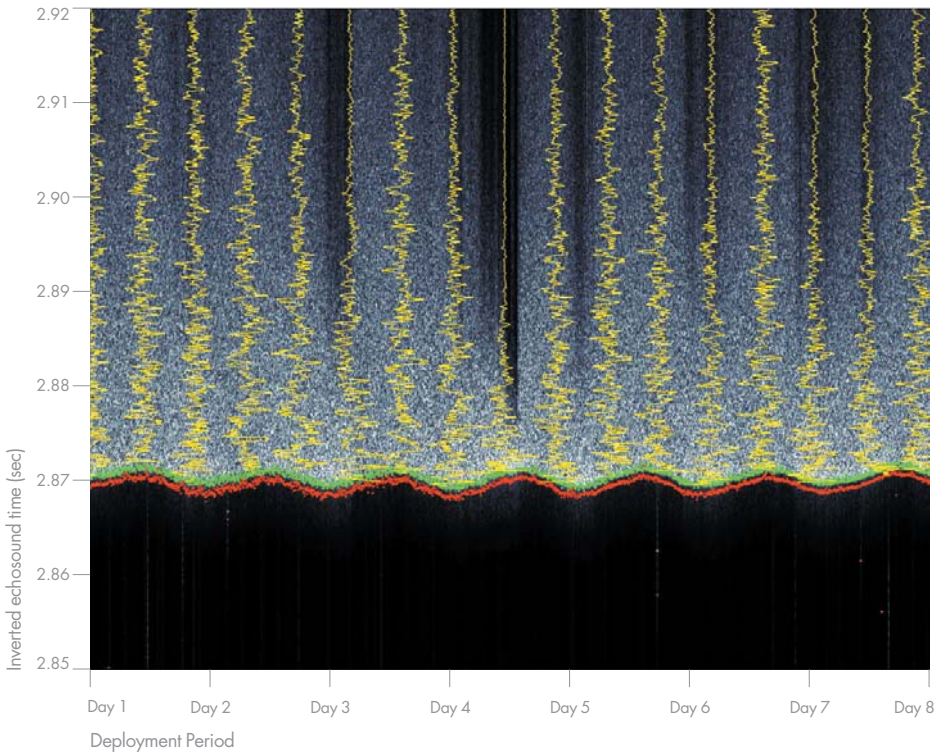
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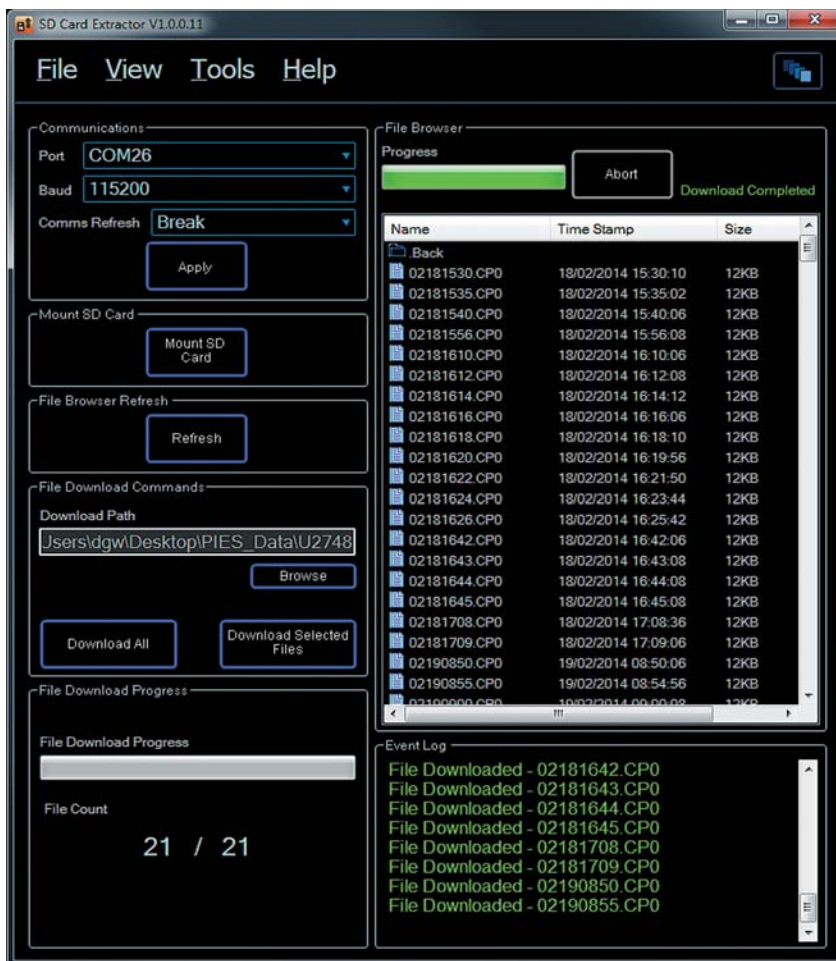
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**Figure 1**

The effect of a 24 hour tide cycle in a deep water deployment shows the arrival time in red and green. The acoustic wave scattering at the sea surface is dependent on sea state. Particularly calm sea states lead to more rapid decay in the echo, seen here in the time trace at the start of day 3 and the middle of day 4.

**Figure 2**

The SD Card Extractor software. Data files can be selected and downloaded using a file browser.

- Supports serial link for baud rates between 9600 and 115200
- Compatible with Windows XP, Windows 7 and Windows 8
- Average time taken to download 12 KB file over 115200 Baud = 3 seconds
- Overall file count displayed to inform the user of download status