

DIGITAL ACOUSTICAL PROCESSING
AT WOODS HOLE OCEANOGRAPHIC INSTITUTION

by

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Hewlett Packard computers were first acquired at the Woods Hole Oceanographic Institution in 1967 for at sea processing of gravity and magnetic data. Since that time seven additional Hewlett Packard of various models and memory sizes have been acquired by various departments. These are used for various purposes from general purpose computing to data acquisition and control. Some of the non-acoustic applications of the Hewlett Packard have been:

- 1) On-line reduction of navigational satellite data.
- 2) On-line acquisition and reduction of gravity, magnetics and bathymetry.
- 3) Merging this geophysical data with navigational data and producing track charts.
- 4) On-line acquisition and reduction of conductivity, temperature, pressure, and sound velocity data.

The computer is also being heavily used for acoustic processing. The ability to acquire continuous seismic profiling (CSP) data on-line has been achieved and various digital processing techniques are being compared. One simple method which appears promising is the computation of running averages over six or so shots. This process tends to cancel noise which is

uncorrelated from shot to shot and enhances the sub-bottom layering. Another program for processing CSP which is under development involves the purchase and use of a Fourier analyser for pulse compression and removal of shallow water reverberation.

Ambient noise data is being processed on the Hewlett Packard. Up to sixteen channels of filtered data from one or more hydrophones are multiplexed and digitized. Data from each channel is continuously sampled at a 850 Hz rate, squared, and summed for thirty seconds. These sums are then punched onto paper tape. In a second pass this tape is read, the values are combined with calibration factors for each channel, and ambient noise levels for each frequency band are typed out. Under development is a processing program which will play back data recorded in a moored buoy to a noise analyser which computes rms noise levels for each of 15 filtered channels. The computer will then sample the analyser, draw plots, and compute statistics on the data.

Data from explosive sound transmission experiments is also being acquired and processed digitally. In an existing on-line program an operator initiates the data acquisition whenever a shot is heard over a loud-speaker connected to the hydrophone. The computer digitizes up to eight frequencies at a 500 Hz rate per channel, squares and sums this data over 20 to 50 points, and writes the sums onto digital magnetic tape for periods up to 30 seconds. In a second pass through the computer the magnetic tape is read, the points are displayed on an oscilloscope, the arrival is manually bracketed by a pair of cursors, and the transmission loss for each frequency band is computed. A third pass is used to plot the data. In a new version of this program an attempt will be made to eliminate pass two by automatically detecting and processing the arrivals on-line.

One of the limiting factors of Hewlett Packard computers at Woods Hole has been the lack of a high speed output device. This should be alleviated somewhat by nine track tape units now on order. However, our experience indicates that a disc storage unit is needed if the full capability of the computer is to be realized.