

THE ARL SHIPBORNE COMPUTER SYSTEM

by

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The system described is a rugged, portable, data-gathering and processing system based on the Ferranti FM 1600B "mini-computer". It will be used at sea for recording and partial processing of acoustic and environmental data and in the laboratory for further data processing. The system was conceived about two years ago, when it became apparent that unless future data could be collected in a computer-compatible form much of it would not be used. Since our sea trials are conducted from a number of different ships portability and ruggedness were considered of prime importance when selecting equipment. The computer selected has both these qualities. The FM 1600B uses a 24-bit word and contains floating point hardware, the core cycle time is 1 μ s. The machine code is very powerful, having over 330 instructions, and the use of a 3-address technique gives considerable savings in the core store required for programs. All input channels employ direct memory access and the priority of peripherals is determined by the channel to which they are attached. To complete the system there are two ATM-13 militarised digital tape decks, a 15-bit, 20-channel, multiplexer and ADC, a 14-in incremental plotter and teletype and paper tape peripherals. A CRT graphic display will be added in the next few months. Time information for the system is provided by a crystal oscillator unit within the computer which generates program and data interrupts at rates which can be independently varied between 4 and 2048 per second. 15-bit words from the ADC can be stored on magnetic tape at up to 22 kHz. The central processor, core store, interfaces and power supplies are mounted in one cabinet 2 m high weighing about 250 kg.

Since the computer was delivered towards the end of 1970 most of the available time has been spent writing and testing software to operate the peripherals, but work on data processing programs has now begun. A fast fourier transform program has been written and auto and cross-correlation programs using this routine. An FFT carried out on 2048 points will take 3 to 5 seconds. The complete system, excluding tape decks, has been taken to sea once and performed very well. Installation required about 2 man-days and all peripheral test programs were run successfully immediately after installation was completed. The first use of the system for data gathering and processing should be made later this year when acoustic data from explosive sound sources will be recorded and processed. Some of the preliminary processing, such as total energy calculations, will be carried out between shots. The necessary software will be developed in the future to enable background programs, such as ray tracing, to be run while the computer is gathering data, so using spare computer time to maximum advantage. A typical data logging program of this type will probably require about 8K of store, leaving 8K available for background programs.