HEWLETT PACKARD

Sonar System Testing

Quick interconnect

Array element coupling

Phase, gain, and noise measurement

General acoustic test

Acoustic Signature test

Applications
Defense electronics

Departments
Research and development
Production test
Test engineering
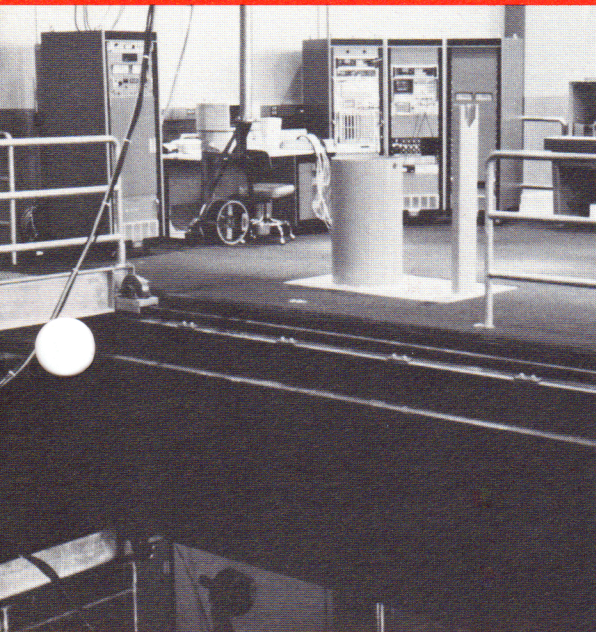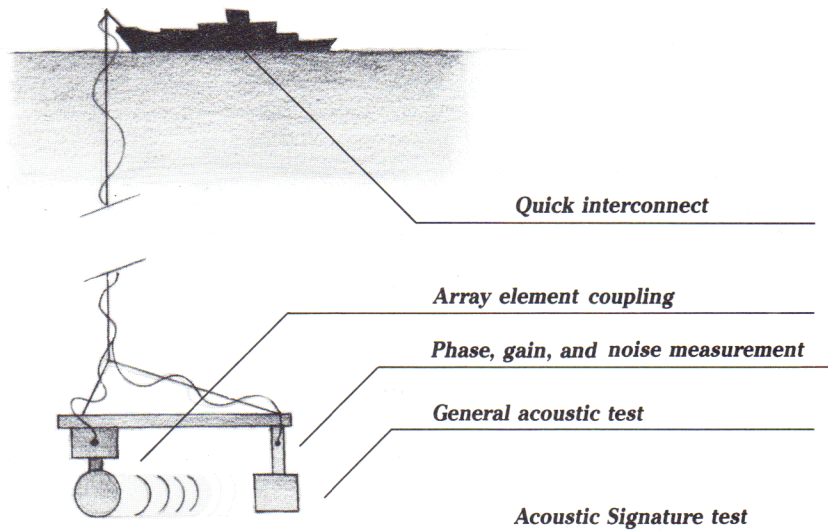
Description   The U.S. Department of Defense has a large number of sonar development programs underway. Each of these sonar systems must be thoroughly tested to insure functionality and reliability. Normally, the system configuration and specific test equipment required for engineering and development varies with the product and the type of test. Tests are often conducted at remote sites on board a vessel or at a vendor's facility. In the case of in-water acoustic tests, geometry, conditions and environment play a major role in the test constraints and accuracy.

Problem   Many inputs and loads must be simulated in order to accurately evaluate a sonar system. Test volumes are relatively low, changes are frequent and deadlines are very important. The test system must be easy to start up, easy to reconfigure, accurate, flexible and have control as well as measurement capabilities. The software design must be highly modular and flexible to permit changes and additions in test requirements. In addition, the same test system used for R&D must often be used at sea. For production testing, the ability to connect any signal and any of the measuring devices to any device-under-test is essential.

Solution   The ideal solution combines an HP 3235A Switch/Test Unit with a variety of other HP equipment including network, spectrum, and FFT analyzers and a digital pulse generator. The switch/test unit routes all signals between the HP equipment and DUTs, while measuring all voltages. Engineering development of the system causes constant changes and iterations making a flexible software package like HP FTM/300 essential. Using the modular capability of HP FTM/300 sections of the software can be leveraged to other tests with a minimum of time and cost. By using an automated test station for both stimulus and measurement test results are consistent, accurate, and repeatable.

IMPLEMENTATION

Phase, Gain, and Noise Measurement   Phase, gain and noise measurements must be made on all amplifiers, filters and other two-port devices with a continuous wave (CW) stimulus. A network analyzer is used for amplitude and phase measurement, while a spectrum analyzer measures the output spectrum.

Array Element Coupling   The mechanical element coupling effects within an acoustic array must be measured. A stimulus is applied to one or more elements while measuring the amount of coupling (amplitude and phase) with the tracking receiver. The switch/test unit does the stimulus and measurement multiplexing.

Acoustic Signature Test   The acoustic signature of a device or unit is usually acquired in real-time, stored and processed later. Results are displayed in third-octave bands, Hz, or other data presentations and on hard-copy printout. An FFT Analyzer is used for acquiring data over the frequency spectrum of interest.

General Acoustic Test   General acoustic tests usually performed by R&D are investigative in nature and may require additional parameters, test conditions or test instruments during any test. To have the necessary flexibility to run a wide variety of tests, a switch matrix is necessary. A matrix connects any instrument to any test point on the device-under-test.

Quick Interconnect   To accommodate testing several different sonar modules on the production-line and use the same test system for on-site testing, quick interconnect fixtures permit rapid changeovers between test configurations. Several fixtures are wired with terminal blocks for production-line testing, with others wired for on-site testing.

KEY SYSTEM FEATURES

- Data storage
- Quick Interconnect
- Modular

TYPICAL CONFIGURATION

Switch/Test Unit   Qty
HP 3235A 1
Quick Interconnect 1-10
Integrating DVM 1
Relay multiplexer channels 50-150
Relay matrix channels 50-100

Computer/Software

HP Series 300 technical computer
Disc drive (HP 9133L)
Software - HP BASIC and HP FTM/300
(data storage, graphics, reports,
statistics)
Printer (HP Thinkjet)
Plotter (HP 7475A)

Other Equipment

Spectrum analyzer (HP 3582A)
Network analyzer (HP 3562A)
FFT analyzer (HP 3562A)
Digital pulse generator (HP 8112A)

TYPICAL SYSTEM PRICE:
$51,000 to $78,000

INSTRUMENTATION

Network analyzer
Spectrum analyzer
Relay multiplexer

Network analyzer
Relay multiplexer

FFT analyzer
Relay multiplexer

Spectrum analyzer
Network analyzer
Integrating DVM
Digital pulse generator
Switch matrix

Quick Interconnect Fixture