

## Microelectronic Integrated Data Acquisition System

A Portable Vibration Data Collection and Analysis Tool

**INNOVATION FOR THE FLEET**



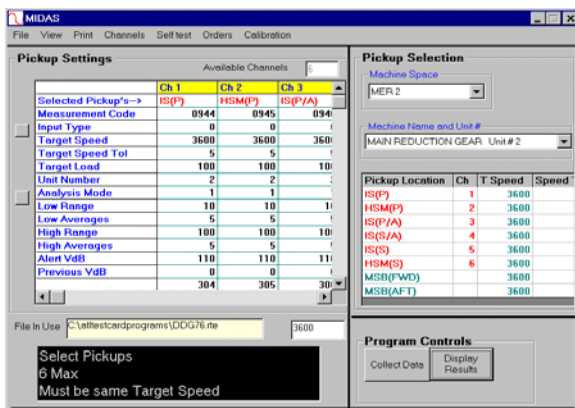
MIDAS Development Target: Naval Surface Ships



Machinery health monitoring aboard Navy surface ships is an important aspect of the Naval ship maintenance program. Portable data collectors are used to acquire, store and transfer machinery vibration data to a remote host computer for analysis. Data is also stored in a Navy database for retrieval and analysis using the Navy Assessment of Equipment Condition (AEC) VIBADS program. Decreasing budgets, more complex machinery and longer periods away from repair facilities have significantly increased the importance of the monitoring and diagnosis of machinery failure times and modes. Higher data collection efficiency, enhanced onboard diagnostics and a clear migration path to newer technologies have therefore become critical needs for the user.



MIDAS in Soft Case



Opening Screen Showing P/U Locations

Measuring 11 inches wide X 9 inches high X 3 inches deep, it collects and conditions up to 6 channels of vibration data at a time, and provides on-board analysis, high-resolution FFT displays, and data storage. The system features zero time skew for 2 sets of 3 channels when collecting data in an automatically synchronized, ordered tracking mode, and zero phase shift for all 6 channels when synchronized to an external tachometer pulse. Automatic calibration, gain setting, internal testing, over/under load detection and route file parameter parsing are all salient features of the system. Selectable hardware integration, analog channel gains, tracking filter band-pass, and AC/DC coupling provide a broad-based capability for a wide range of applications.

The route and FFT file structures are compatible with the vibration analysis database that is currently in use by the Navy under the AEC program. The system is also compatible with the Navy's VIBADS program for the review and analysis of both

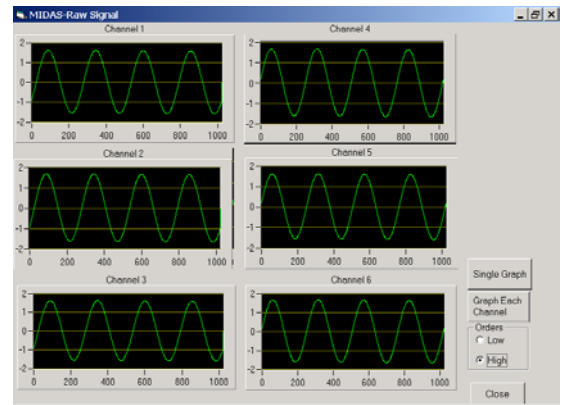
current and historical vibration data. The system is highly integrated with VIBADS, and allows the passing of collected spectrum data to the program for analysis right on the data collector. All functions that are currently available in the VIBADS program under desktop operation are now available on the portable system.



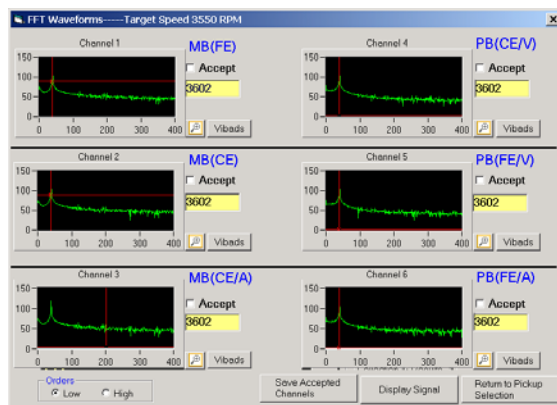
Typical Measurement Location

The 800 X 400 resolution screen allows the display of all 6 channels of FFT data for quick screening. Broad band spectra are also displayed for all 6 channels. A magnification function provides a single high resolution display for any selected channel. The zoomed transform window has a settable FFT-following cursor. Two data boxes indicate machine frequency/speed and vibration magnitude at the cursor position. Raw analog

waveform data can be viewed in a separate window. All 6 channels can be superimposed or individual channels selected for viewing. All waveforms are zoomable. Pre or post integrator real-time analog outputs are also available for viewing on an external oscilloscope through BNC connectors. The operator can select any combination of channel data to store to the hard drive before proceeding. A history file can be viewed at any time through a pull-down menu. The data list can be sorted according to date of data collection, pickup location, machine name, machinery space, etc. The pickup selection window is also marked after data is accepted to indicate completed locations. The channel assignments for accepted channels are automatically deleted when the user returns to the pick-up location screen. Data can be recollected at any time at any location. The new data can be stored, and the history file will accommodate multiple runs on a single location. System calibration can be performed internally or externally. An external calibrator can be connected to any channel and a calibration screen walks



6 Channel Raw Data Display



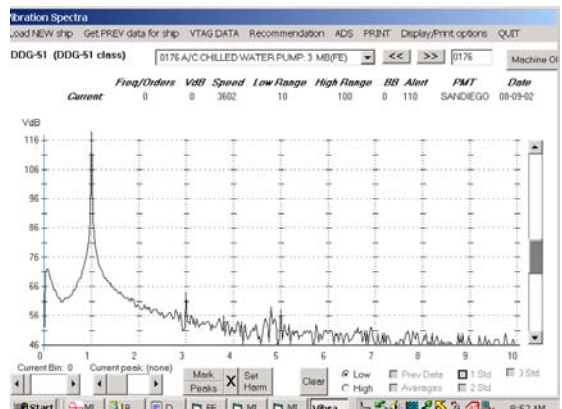
6-Channel FFT Display

the user through the procedure for each channel. An internal 120 VdB calibration source is available for automatic calibration of all channels, or selected ones. Automatic calibration provides amplitude accuracy to within +/- 0.5 VdB. Manual adjustment of channel gain values can be used to provide further enhancement.

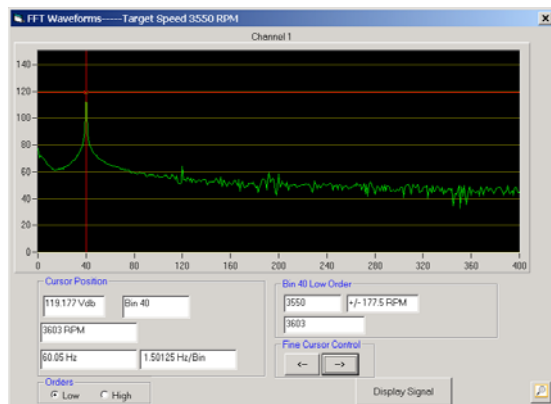
Tight integration of VIBADS within **MIDAS** allows the passing of any pickup-location data being viewed directly to VIBADS for screening and analysis. Alternatively, the user can launch vibads directly from the desktop and view all data that has been collected. Multiple route files are handled by both **MIDAS** and VIBADS, and can be stored and recalled at any time. A stand-alone mode of operation allows **MIDAS** to perform

functions similar to a standard spectrum analyzer. Continuous data monitoring can be accomplished in either fixed frequency or order normalized tracking modes. Operator inputs of bandwidth, operating mode, number of orders and the channel to be used for tracking are used to set up the initial conditions for data acquisition. 6 channels of spectral data are available for viewing in near real-time in the continuous monitoring mode.

similar to a standard spectrum analyzer. Continuous data monitoring can be accomplished in either fixed frequency or order normalized tracking modes. Operator inputs of bandwidth, operating mode, number of orders and the channel to be used for tracking are used to set up the initial conditions for data acquisition. 6 channels of spectral data are available for viewing in near real-time in the continuous monitoring mode.



VIBADS Data Handoff



Single Channel FFT Display

### MIDAS Advantages

- Lower maintenance and operating labor costs
- Compatibility with current databases
- Highly modularized
- Wide range of monitoring formats
- Wide-based technical support
- Less lost data
- VIBADS Integration
- COTS implementation



**MIDAS** was developed under a Phase II SBIR program in cooperation with Naval Sea Systems Command. Field testing has been performed by the Navy at the NAVSEA-Philadelphia, Ship Systems Engineering Station, and other bases around the world. The integration of VIBADS, the screening and analysis software, with **MIDAS** has been accomplished under a joint effort of NAVSEA and ATL. Initially targeting Naval surface ships, the system can also be used to satisfy submarine, aircraft or land-based requirements. The same technology can be applied to equipment in the Military Sea Lift

Command, Army, Air Force, Ready Reserve, DOT and Coast Guard, as well as a wide range of civilian applications.

## Specifications

### Screening/Analysis

- Route File generator: User-Definable P/U Locations
- Data File Generator: Built In
- Averaging Template Generator: Min. of 3 Averages Rq'd.
- Storage: Screening Templates: Up to 256

### Acquisition

- Size: 11 in. W X 9 in. H X 3 in. D
- Weight: 4.5 Lbs.
- Operating System: Win 2000 Pro.
- Storage: 16 GB Hard Drive
- Operator Input: Stylus, OS Keyboard
- Comm: USB, IR, 56K Modem
- No. of Inputs: 6
- Operational Modes: Route, Analyzer
- Operational Conditions: Auto, Manual
- Ordered Tracking Synch.: Any Channel
- No. of Orders: 2 to 100
- Data Resolution: 12 bits, 16 bits optional
- Tach. Modes: Tach. Synch, Tach. Track
- Analog Monitor: Continuous, All Channels

### Available Accessories

- Fitted Shipping Case
- Docking Station
- USB Zip, CD Drive
- Wireless Keyboard

- Broadband History Gen.: Min. of 19 Rq'd.
- FFT Viewing: Both Current and Historical
- View Scan: All stored FFTs
- Adv. Analyzer Functions: Sideband & Harmonic Marker Generation
- Bandwidth: 2 Hz to 10 KHz
- Filtering: Tracking AA, Digital
- FFT Display: 6 Chan, with Zoom
- Analog Display: All Captured Waveforms, with Zoom
- Max. PU Locations: Unlimited
- History File: Unlimited
- Calibration: Automatic External, Internal
- Gain Set: Automatic, Manual
- Gain Range: .5 to 100
- Integration: Selectable Hardware Integration
- Input Sensor: Voltage Mode Accelerometer
- Tach. Input: .05 to 4.5 V, RMS

- Soft Carrying Case
- USB Keychain Memory
- WLAN Node
- Offline Route File Generation