

Seattle Sound and Vibration, inc.

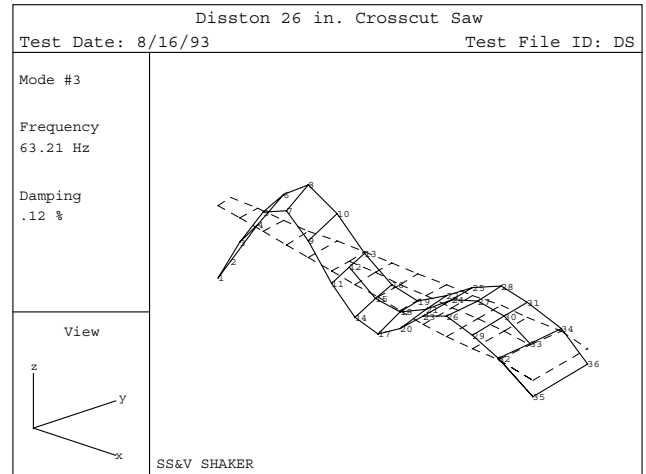
HAMMER-3D and SHAKER-3D

Modal Test, Analysis, and Animation Software
for the Hewlett-Packard 35670A Dynamic Signal Analyzer

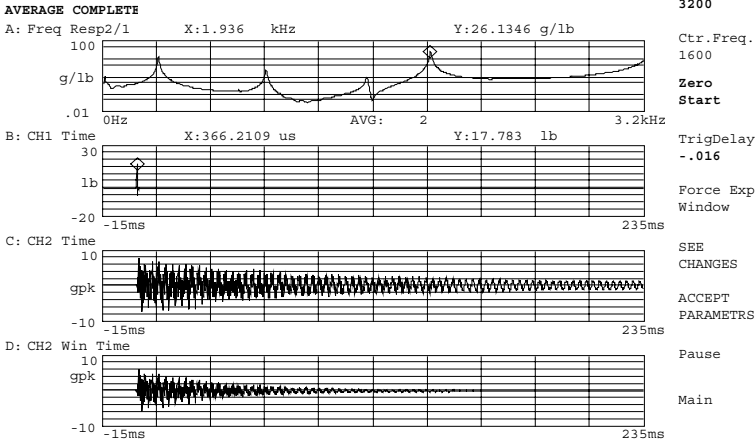
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Identify Noise and Vibration Problems On-Site

Track down noise and vibration problems quickly and easily using HAMMER-3D and SHAKER-3D software. Be guided through modal test, analysis, and animation without the burden of file management or data compatibility. Animate your structure's mode shapes on the HP 35670A screen. Generate a modal analysis report. Send mode shapes to a plotter, printer, or file. HAMMER-3D and SHAKER-3D are the solutions you need for vibration and noise troubleshooting.



Change settings. Select SEE CHANGES or ACCEPT PARAMTRS.



Analyze and Animate

Curve fitting and animation take just minutes. Select the proven, reliable HP 5423A polynomial curve fitter, identify modes of interest, and in a short time you will see an animated mode shape on your screen. Analyze and animate 40 measurement points with five modes in less than three minutes!

Modal Measurements Have Never Been Easier

HAMMER-3D and SHAKER-3D make *you* the measurement expert. HAMMER-3D has self-paced routines to help you with modal measurements using an impact hammer. High quality data is assured because HAMMER-3D coordinates all aspects of your measurements: range, trigger delay, exponential window time constant and overload protection.

SHAKER-3D uses the powerful capability of the HP 35670A source to automatically measure frequency response with electrodynamic shakers. Hands-off measurements are accomplished via software-controlled algorithms to set force level, autorange, average, and finally store FRF results. All you need to do is move the accelerometer when prompted!

No PC Required!

Run HP Instrument BASIC within the HP 35670A and no external PC controller is required. No file management headaches. No IRQ crashes. No data transfer problems. You don't need an expensive, portable PC to get the results you need. All you need are the basic tools: HP 35670A with HP Instrument BASIC, an accelerometer, a modal impact hammer (or a shaker excitation system - shaker, force transducer, and stinger), and HAMMER-3D or SHAKER-3D software.

Technical Data

Measurement Set-up

Portable, Fast, and Easy

HAMMER-3D and SHAKER-3D will identify vibration motion problems on-site quickly. Specify measurement points and transducer data, then let HAMMER-3D and SHAKER-3D automatically sequence through modal test, analysis, and animation. All results are stored on disk for later examination. Reports and mode shape plots complete the process.

Specify Structure, Transducers

Represent a structure with up to 99 points connected by up to 400 line segments. Each measurement point is allowed up to three axes, each in any specifiable direction.

Enter measurement point coordinates and accelerometer direction using the X,Y,Z rectangular coordinate system. Points may be added, moved, and deleted. Line segments may be added or deleted. Structure is displayed during construction.

Specify hammer's model number, serial number, EU in mV/g, and ICP?. Specify accelerometers' model number, serial number, EU, sensitivity, and ICP?. All transducer data is stored with test results. All structure and transducer data is stored on a PC-compatible SETUP file.

HAMMER Measurement Features

Measure Impact FRFs

Measure FRFs by roving the hammer or the response transducers. Use a triaxial accelerometer with HP 35670A option AY6 to easily measure 3-axis motion.

Measurement Setup

Attach transducers, then use the Default Settings routine to interactively select span, input range, and trigger delay. Force and exponential windows are set to optimize measurement quality. Display format shows hammer impact in time domain to reveal double hits, and FRF and coherence to show measurement quality.

Trigger delay, force window, and exponential window are set relative to chosen span. HAMMER-3D automatically stores exponential window parameters for damping correction during curve fitting.

Measurement Sequencing

Automatically sequence through the modal test, with accept/reject prompts after each hit or after the ensemble average. Pause a test to change the range or other measurement state, then continue at last point.

SHAKER Measurement Features

Specify SHAKER-3D Transducers

Specify model number, serial number, EU, sensitivity, and ICP? for accelerometers and the force transducer. All data is stored with test results.

Measure Highest Quality FRFs

Measure FRFs between accelerometers and the force transducer at up to three shaker locations. With option AY6 measure three axes simultaneously with a triaxial accelerometer or measure one axis three times faster.

Measurement Setup

Attach transducers, then use DEFAULT ROUTINE to interactively select shaker force level, span and center frequency, burst percentage and number of averages. Measurement parameters are stored in a file, and can be recalled using RECALL SETUP for quick, easy re-starts after lunch or coffee break.

Measurement Sequencing

Automatically sequence through the modal test, with automatic file storage and prompting for location of the next measurement points. Starting point and shaker location are softkey selectable.

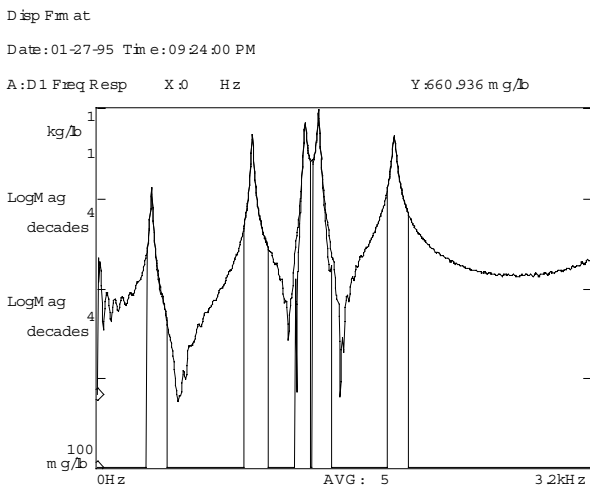
Measurement Storage

FRFs are automatically stored in a unique directory. Filenames are tagged with the roving measurement point number and axis (where the accelerometer was located) and stationary point number and axis (where the shaker was attached). No file management is required to complete the analysis.

Modal Analysis and Display

SDOF Polynomial Curve Fitter

HAMMER-3D and SHAKER-3D use the same algorithm as the HP 5423. Complex polynomial, least squares fitter with residual terms. Fit up to nine modes per test. Compare curve fit results vs. FRF. Curve fit speed: less than 4 seconds per FRF (5 modes) with delay off. A 40-point modal test requires 3 minutes to analyze. Damping is corrected for exponential window value used for hammer tests. Curve fit results are automatically stored in a PC-compatible text file.



Three-Axis Motion

Whether multiple axes are measured with a triaxial accelerometer or with one single-axis accelerometer measured one axis at a time, HAMMER-3D and SHAKER-3D's residue sorting algorithm will decompose the resulting residue from each measured axis and generate a resulting mode shape that contains true 3-D motion. Residues are scaled to maximum DOF and stored for animation.

Animate Modes of Vibration

See animated mode shape, frequency, and damping in one display. Select the following animation parameters:

- Mode number
- Animation speed
- Animation amplitude
- View direction

Plot and Print Mode Shapes

Send graphs of mode shapes directly to Microsoft Word using Insert Picture, or to an HP-IB plotter. Raster dumps can be sent to a serial or parallel printer. Plot a single mode or all modes on one graph. Send an animated modal cartoon to a serial or parallel printer.

Generate a Test Report

Generate a test report in PC text format containing:

- Test setup information
- Modal frequency, damping, and residues

Modal Test Report

Test item: Angle Bracket
Date tested: 3/4/97
Test technique: HAMMER-3D
Exponential window used? YES
Exponential time constant: .0625 S

Test File ID: AA

1. Transducer Information

Channel	Model#	S/N	EU	ICP?	Force Unit
1	PCB 086	3279	24.00	1	lb.
2	PCB 353	8769	10.50	1	

2. Measurement Locations and Hammer Strike Directions

MeasPt#	Location			Orientation		
	X	Y	Z	DX	DY	DZ
1	0.0	0.0	0.0	0.0	0.0	1.0
2	1.0	0.0	0.0	0.0	0.0	1.0
3	0.0	1.0	0.0	0.0	0.0	1.0

3. Location of Response Accelerometers

Channel	Pt.#
2	12

4. Modal Analysis Setup

Curve Fit Type: SDOF Polynomial

Mode#	Hz	Hz	# Modes/Band
1	320.0	436.0	1
2	944.0	1080.0	1

5. Modal Analysis Results

Number of modes analyzed: 5

Mode	Frequency-Hz	Damping-% of critical
1	349.1	.955

HAMMER-3D and SHAKER-3D

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Product Ordering Information

HP 35670A Analyzer Requirements

HP 35670A Dynamic Signal Analyzer
option 1C2 HP Instrument BASIC

Supported Options

option UFF add 1 Mbyte Non-Volatile RAM
option AY6 add 2 Input Channels
option AN2 add 4 Mbyte RAM or option UFC add 8 Mbyte RAM
option 1CL PC Style 101-Key Keyboard

HAMMER-3D Price and Ordering Instructions

HAMMER-3D Software: \$4500 (\$US)

Mail or FAX order to Seattle Sound and Vibration, inc. Please include the serial number for the HP 35670A in which the software is to be used. If the analyzer is being purchased concurrently, then write "New Analyzer" in the serial number field.

SHAKER-3D Ordering Instructions

SHAKER-3D Software: \$4500 (\$US)

Mail or FAX order to Seattle Sound and Vibration, inc. Please include the serial number for the HP 35670A in which the software is to be used. If the analyzer is being purchased concurrently, then write "New Analyzer" in the serial number field.

HAMMER-3D and SHAKER-3D for the same HP 35670A:

HAMMER-3D and SHAKER-3D software for the same HP 35670A: \$6300 (\$US)

Mail or FAX order to Seattle Sound and Vibration, inc. Please include the serial number for the HP 35670A in which the software is to be used. If the analyzer is being purchased concurrently, then write "New Analyzer" in the serial number field.

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