

## Control Performance

Control loop	Uses patented adaptive control method with cross-coupling compensation, frequency response matrix updating and coherence smoothing to accurately and quickly compensate for nonlinearities or time varying changes in the dynamic load. Control accuracy and performance may be limited by actuator and instrumentation characteristics.
Advanced features	See separate sheet for optional methods including I/O matrix transformations & multi-variable control.
Dynamic range	Up to 90 dB.

## Outputs/ Inputs

Output channels	1 to 16. Consult the factory if more are needed.
Input channels	8 to 96 (depends on outputs and chassis type).

## Reference Definitions

Classical types	Half-sine, initial peak sawtooth, terminal peak sawtooth, trapezoidal and rectangular.
Import reference	ASCII formatted data, including Seismic Synthesis.
Frame size	Automatic selection of 256, 512, 1024, 2048, 4096, 8192, 16384 or 32768 samples.
Buffer duration	2.5 ms to 256 sec.
Pulse duration	Minimum of 0.1 ms for classical waveforms.
Pulse amplitude	0.01 to 10,000 acceleration units.
Trapezoidal	0.01 ms minimum for rise, peak and fall times.
Units	g-in/s-in, g-m/s-mm or m/s <sup>2</sup> -m/s-mm.
Frequency range	From 10 Hz to 10 KHz; dependent on the pulse duration, oversample ratio and compensation.
Oversample ratio	Selectable as 5.12, 10.24 or 20.48 times the maximum control frequency.
Dynamic limits	Input voltage maximum, acceleration, velocity and displacement (maximum & minimum) calculated and displayed with sample rate and duration.

## Classical Pulse Compensation

Type	Pre- and post-pulse, pre- only and post- only.
Optimize displacement	Pre- and post-pulse: single sided or double sided.
Compensation method	Double sided: displacement, symmetrical acceleration or non-symmetrical acceleration.
Pre-pulse amplitude	1 to 100% of peak amplitude.
Post-pulse amplitude	1 to 100% of peak amplitude.

## Display Tolerances

Type	User specified or MIL-STD-810. Imported breakpoint SRS from Seismic Synthesis utility.
Specified segments	± pre-pulse, ± main pulse and ± post-pulse.
Specified tolerance	0 to 100%; independent for each segment.

## Control Parameters

Control channels	Up to the number of installed output channels.
Mode of operation	Manual, semi-automatic or automatic.
Repetitive pulses	1 to 1,000,000.
Delay between pulses	0 to 1,000,000 ms.

## Control Strategy

Pre-stored drive	Load previously saved drives and Impedance data.
Drive update	Equalization updated after every output; may override.
Output polarity	Positive or negative (±).
Output level	May output up to one level increment above full level for difficult nonlinear test conditions.
Adaptive update rate	Selectable from 0.05 to 1.
Feedback gain	Selectable from 0.05 to 1.
Characterization level	-30 to 0.0 dB (relative to maximum reference amplitude). System increases drive rms until one of the control channels has a peak amplitude equal to or greater than the specified level. Charge amplifier sensitivities and characterization levels need to be chosen such that the control response voltage for the least responsive control channel is at least 50 mV peak.

Equalization method	Inverse Frequency Response Matrix.
Characterization signal	Spatially and temporally uncorrelated random bursts with a flat spectral density.
Trend removal	Removes DC offset before integrating from acceleration to velocity or displacement.

## Start-up Parameters

Initial test level	Select from characterization level to 0.0 dB.
Level increment	0.1 to 10 dB.
Delay between pulses	0.0 to 1,000,000 ms.

## Safety Features

Shaker limits	Pretest verification that spectrum dynamic limits are within shaker operational limits (acceleration, velocity, displacement and voltage).
Loop check drive	Selectable, 10 to 1000 mVrms maximum drive.
Average alarm & abort	0.01 to 500% normalized to peak of reference.
Peak alarm & abort	0.01 to 1000% normalized to peak of reference.
Control signal loss	Continuous automatic detection.
Maximum drive signal	0.01 to 10 V peak.

## Test Automation

Automatic levels	Selectable initial level, level increment, delay between pulses; re-equalization between pulses.
Multiple pulses	Selectable number of full level pulses and delay between pulses.

## Channel Setup

Channel type	Control, auxiliary or inactive.
Sensitivity	0.01 to 10,000 mV/g or mV/(m/s <sup>2</sup> ).
Loop check	Enabled or disabled individually for each channel.
Channel labels	Two labels for each channel (30 & 15 characters).

## On-Line Displays

Simultaneous displays	Up to 12 windows with up to 4 grids per window.
Traces per grid	Up to 4 (192 traces total).
Auxiliary monitor	Optional second monitor for test displays.

## On-Line Analysis

Real-time analysis	Time histories, FFT spectra and SRS types simultaneously displayed for all available channels.
Time histories	Control, drive, reference, error and auxiliary.
Integration	Velocity and displacement from acceleration.
SRS displays	Maxi-max, Primary+ and Primary- with tolerance bands. Tabular lists of SRS frequencies and acceleration values.
Impedance matrix	Z(f) magnitude and phase for all matrix elements (diagonal and off-diagonal functions).
Drive displays	Voltage and spectra for most recent drives and for next output (each drive).
Cursors	X and Y value readout, peak search, trace tagging and multi-window locked positioning.
Scaling displays	Log or linear; auto-scaled or fixed.

## Data Storage & Review

Setup & format	Every pulse, every full level pulse, manual or off. Binary files, well-documented and published format, easily converted to UFF and easily transferred to PC via network or floppy disk.
Playback	Scan forward or backward through the test data file, with adjustable delay.
Record annotation	Test name, test time and test level for each record.

## Documentation

Test summary	Fully documented post-test summary, easily printed or incorporated into any document using standard word processing software.
Message log	Text file records system status messages displayed during the test.
Automatic plots	Automatic plot generation at test completion.
Batch plots	Plot modes for sending all displays to the printer with single or multiple grids per page.



S P E C T R A L  
D Y N A M I C S

**Spectral Dynamics Inc.**  
2730 Orchard Parkway  
San Jose, CA 95134-2012  
Tel 408 678-3500  
Fax 408 678-3580

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