Multiple-Exciter Waveform Replication

2580-9423

Technical Specifications
JAGUAR Systems

Control Methods

Control loop	Patented adaptive deconvolution control method with cross-coupling compensation. Matches the response of the control channels to corresponding user selected time histories.
Advanced features	See separate sheet for optional methods including I/O matrix transformations (standard & rotational), rectangular control and multiple variable control. Also see the optional MIMO Waveform Generator.

Outputs / Inputs

Output channels	1 to 12. Consult the factory if more are needed.
Input channels	Up to 98, depends on output channels and chassis.

Reference Types

Replication waveforms	User synthesized long-term time histories can be imported. These histories need to be consistent with the frequency range of interest as well as be within the acceleration, velocity, and displacement limits of the excitation system. See the optional MIMO Waveform Generator.
Import file format	Binary, UFF, or spreadsheet ASCII file formats.
Waveform units	Acceleration (m/s^2, g), velocity (m/s, in/s), displacement (mm, in), force (N, lbs) & user specified EU.
Waveform polarity	Select $\pm$ for individual control channels.
Segment selection	Allows selection of a subset of the imported file.
Scaling & offsets	Supports scaling factors and offset adjustment.

Control Parameters

Control channels	Any channel is selectable as control, equal to the number of installed output channels.
Modes of operation	Manual, semi-automatic and automatic.
Drive update	Off, on (drive waveforms are updated after every replication test iteration).
Drive update gain	Optimally selected by the system using a patented frequency dependent algorithm or user specified from 0.05 to1.0.
Impedance update	Off or on (impedance matrix is updated after every replication test iteration).
Impedance weighting	Specify the fraction of the error vector to use for updating the impedance: 0.05 to 1.0.
Impedance windowing	Select time domain, frequency domain or off.
Initial test level	Specify the test level after system identification.
Level increment	0.1 to 10 dB.

Control Strategy

Equalization method	Inverse frequency response matrix with long term deconvolution to implement cross-coupling compensation control.
Characterization signal	Reference waveform or random waveform with user specified spectral density matrix and time duration. The time duration must be selected to provide for at least 16 DOF for measuring the initial frequency response matrix.
System identification	System increases drive rms until one of the control channels has a peak amplitude equal to or greater than the specified level of -30 to 0 dB (relative to maximum reference waveform peak amplitude) before starting the system identification process. Charge amplifier sensitivities and levels need to be chosen such that the response voltage for the least responsive control channel is at least 50 mV peak.
Pre-stored drive	Retain and use previously equalized waveforms.
Buffering scheme	Memory-based for high frequency shorter duration waveforms or file-based for lower frequency longer duration waveforms.
Singularity threshold	Determines when a pseudo-inversion method will be used to compute the impedance matrix. If X is the maximum singular value of [H(f)] and N is the minimum singular value and S is the singularity threshold, then for $(X/N)^{-2} > S$, the [H(f)] is considered to be singular and pseudo-inversion is used.

Control Performance

Dynamic range	Up to 80 dB.
Equalization accuracy	Control performance depends on the physical feasibility of the selected waveform and the design of the excitation and measurement subsystems. Closed-loop on itself, control response waveforms are equalized to the corresponding reference waveforms within +/- 10% of the maximum reference.
Frequency range	Up to 2000 Hz for memory-based buffering with 12 drives and up to 5000 Hz with 8 drives.

Safety Parameters

Shaker limits	Pre-test verification that the selected waveform references are within the shaker operational limits (acceleration, velocity, displacement & voltage).
Loop check maximum	10 to 1000 mV RMS drive.
Alarm/abort tolerance	Alarm and abort values are specified by the user.
Abort lines	Specify the number of points allowed out before an abort will occur.
Active level	Specify the test level at which the alarm/abort features become active.
Control signal Loss	Continuous automatic detection.
Maximum reference	Specify the maximum positive and negative values.
Maximum drive	Specify the maximum allowed value up to 10V.

Channel Setup

Channel type	Specify one Control channel for each desired Drive channel. Specify as many Auxiliary channels as desired for on-line measurement analysis (file-based buffering).
Channel labels	Up to 45 characters (2 labels) for each channel.
Sensitivity	.01 to 10000 mV/EU, where EU are the engineering units of the reference waveforms.
Channel loop check	Enabled or disabled for each channel.
Import channel table	Channel setups imported from other applications.

On-line Test Control

Test controls	Start test, abort test and quit application.
Save data	Save current test data to disk. Save [Z(f)] for use in another test. Save the screen configuration.
Output control	Output, pause, resume, level control and number.
Remote communication	Supports remote operation via TTL signal levels.

On-line Displays & Analysis

Simultaneous displays	Up to 12 windows, each with up to 4 grids.
Waveforms per grid	Up to 4 (up to 196 on 48 grids).
Auxiliary monitor	Optional second monitor for test displays.
Block numbers	Select block number for long duration waveforms.
Real-time analysis	Spectrum, cross-spectrum and FRF waveforms for all selected channels.
Time functions	Control, error, and auxiliary waveforms.
Display units	Acceleration, velocity, displacement, force & EU.
Drive displays	Drive voltage history, drive spectrum, next drive voltage history, and next drive spectrum.
Cursors	X and Y value readout, peak search, trace tagging, multi-window locked positioning.
Scaling	Log or linear. Auto-scaled or fixed.
Plotting	Automatic and manual modes. Plots include annotation and labels from the test setup.

Data Storage & Review

Storage	Binary files may be saved after each output sequence.
Playback	Scan forward or backward through the data file (output sequence) with adjustable delay.
Plot annotation	Test name, test level and block number are included for each block displayed from the output sequence.
Test summary	Post-test summary may be recalled from data file. May be printed or incorporated into a document using standard word processing software.
Message log	Text files record the status messages from the tests.

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