### Control Methods
- **Control loop**: Patented adaptive control with cross-coupling compensation, frequency response matrix updating and coherence smoothing to accurately and quickly compensate for non-linear or time varying changes in the dynamic load. Control response vector is controlled to user specified amplitude and relative phase profiles. Square control method is standard.
- **Advanced features**: See separate sheet for optional methods including rectangular control, I/O matrix transformations and multiple variable control.

### Outputs / Inputs
- **Output channels**: 2 to 16. Consult the factory if more are needed.
- **Input channels**: 6 to 96 (depends on outputs and chassis type).

### Control Performance
- **Dynamic range**: Up to 90 dB with .05 dB level step control over the full amplitude range. Amplitude adjustments are ramped between set-points.
- **Output**: Analog quality digital sine generation using a double precision integrated phase algorithm for low distortion and smooth relative phase control.
- **Level accuracy**: Control to within ±2 dB for 1 oct/min sweep through a 150 Hz resonance of a linear system with a Q of 50 using 4 control channels, each with an internal 80% proportional tracking filter. Control accuracy applies to both limit and control channels.
- **Phase accuracy**: Control to within ±2 degrees with a sweep rate of 1 oct/min wire-to-wire using 4 control channels, each with an internal 80% proportional tracking filter. Level and phase accuracy may be limited by exciter systems and instrumentation.
- **Sweep resolution**: ≥ 0.5% of the drive frequency.
- **Loop Time**: The greater of either 5 ms or one half-cycle of the fundamental amplitude with no more than 0.5 ms increase for each additional control channel.
- **Compression rate**: Up to 3500 dB/sec with unconditionally stable feedback control loop.
- **Harmonic distortion**: Less than -80 dB at full output.

### Reference Spectra
- **Definition**: Up to 100 frequency segments with amplitude and relative phase to other control channels.
- **Segment types**: Constant displacement, velocity & acceleration and straight line acceleration – linear or logarithmic.
- **Phase adjustment**: From -180 to +180 degrees.
- **Crossover frequencies**: Automatically calculated to avoid discontinuities.
- **Alarm and abort limits**: Independent positive and negative alarm and abort margins for both amplitude and phase.
- **Sweep range**: User defined between 0.5 Hz and 2000 Hz.
- **Sweep resolution**: User defined from 200 to 2000 points per sweep.
- **Dynamic limits**: Range (dB) and maximum/minimum for acceleration, velocity and displacement.
- **Limit profiles**: Defined using up to 40 frequency segments with amplitude; defaults to reference spectrum.

### Control Parameters
- **Mode of operation**: Manual or automatic with fixed parameters.
- **Measurement process**: Tracking filter processing for all channels in parallel.
- **Tracking filter types**: Proportional to drive frequency or fixed bandwidth.
- **Transducer types**: Control via acceleration or displacement transducer with programmable transition frequency band.
- **Control channels**: Up to the number of installed output channels for square control. May be greater than active Drives for optional rectangular control.
- **Limit profiles**: Limit profiles override defined control method on spectral line by line basis to prevent over-test. May select any/all available channels for limit.
- **Abort channels**: Abort test when specified level is exceeded.
- **Compression**: 1% to 100%.

### Technical Specifications
- **Strategy**: Import a measured Impedance matrix from MIMO Random or Identification for the initial sweep.
- **Adaptive Z(f) gain**: Update factor selectable from 0.05 to 1.
- **Singularity threshold**: Selectable from 0.0 to 0.1. Allows pseudo-inverse when "deep notches" are detected in [H(f)].
- **Equalization method**: Adaptive inverse frequency response matrix. Sinusoid during startup and continuously during test with swept-sine wave responses.
- **Start-up Parameters**: Characterization level -30 to 0 dB (relative to maximum reference). System increases drive rms until one of the control channels has an amplitude equal to or greater than specified characterization level. Charge amp sensitivities and characterization levels need to be chosen such that the control channel's response voltage, for the least responsive control channel, is at least 50 mV rms. Characterization level to 0 dB.
- **Sweep Parameters**: Linear: 0.001 to 300 Hz/s. Log: 0.1 to 100 oct/min. Sweep up or down in frequency.
- **Safety Features**: Pretest verification that dynamic limits are within shaker operational limits (acceleration, velocity, displacement and voltage).
- **Loop check drive**: Selectable maximum from 10 to 1000 mV RMS.
- **Limit profiles**: An independent profile for each limit channel.
- **Manual abort**: Graphical and keyboard abort buttons.
- **Manual control**: Hold, resume or reverse. Manual sweep start.

### Control Loop
- **Patented adaptive control**
- **Cross-coupling compensation**
- **Frequency response matrix updating and coherence smoothing**
- **Accuracy to ±2 dB**
- **80% proportional tracking filter**
- **Crossover frequencies**
- **Alarm and abort limits**
- **Sweep range**
- **Sweep resolution**
- **Dynamic limits**
- **Limit profiles**

### Control Signal Loss
- **Continuous automatic detection.**

### Safety Features
- **Pretest verification of dynamic limits**
- **Shaker limits**
- **Loop check drive**
- **Limit profiles**
- **Manual abort**
- **Manual control**

### Sweep Parameters
- **Sweep mode & rates**
- **Linear and logarithmic sweep modes**
- **Sweep range**
- **Sweep resolution**
- **Dynamic limits**
- **Limit profiles**

### Start-up Parameters
- **Characterization level**
- **Sweep parameters**
- **Safety features**
- **Manual control**

### Sweep Resolution
- **0.5% of the drive frequency**
- **Loop time**
- **Compress rate**
- **Harmonic distortion**

### Reference Spectra
- **Definition**
- **Segment types**
- **Phase adjustment**
- **Crossover frequencies**
- **Alarm and abort limits**
- **Sweep range**
- **Sweep resolution**
- **Dynamic limits**
- **Limit profiles**

### Control Parameters
- **Mode of operation**
- **Measurement process**
- **Tracking filter types**
- **Transducer types**
- **Control channels**
- **Limit channels**
- **Abort channels**
- **Compression**

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