## Overview

The JAGUAR supports a broad range of applications for multiple exciter testing. These MIMO (Multiple Input – Multiple Output) applications include:

- **MIMO Random** (2580-9420)
- **MIMO Swept Sine** (2580-9421)
- **MIMO Waveform Replication** (2580-9423)
- **MIMO Transient Waveform Control - Shock** (2580-9424)

Each of these control applications is capable of running with up to 12 DACs and 76 measurement channels simultaneously for real time adaptive control, phase control and cross coupling compensation. Separate technical specifications (data sheets) are available for each of these control applications.

MIMO control applications for **Swept Sine** and broadband **Random** environments generally synthesize the required drive signals within the control loop. For these test environments, the test Reference criteria are typically defined in the **frequency domain** (spectra) in terms of magnitude, phase and coherence. The control system can synthesize suitable time domain signals to cause the spectra at the control points to match the reference definitions within reasonable tolerance limits. MIMO control applications for **Waveform Replication** and **Shock** environments generally import the Reference waveforms that are defined in the **time domain**. Sometimes the references for shock may be defined in terms of relatively short duration classical waveforms such as half-sine, saw-tooth, rectangular or trapezoidal shapes. These classical waveforms are also typically synthesized within the control application.

## MIMO Waveform Generator

For many types of tests, you may be required to create sets of complex (mixed-mode) time domain waveforms that meet certain test criteria. Typically the desired waveforms have a relatively long duration and the same waveform may need to be used for multiple tests and/or for repetitive outputs within a test. These tests may require up to 12 references with user-specified dependence for phase, coherence and spectral shape. The MIMO **Waveform Generator** provides these synthesis and processing features.

Reference time domain waveforms are sometimes obtained from actual shock and vibration events. The data could be recorded (saved) by a specialized signal analyzer or by the general-purpose control system with signal analysis applications. This measured data may need additional processing before it can be used as suitable references for waveform replication and transient waveform (shock) applications. MIMO **Waveform Generator** provides this processing via waveform editing and digital re-sampling features.

## Waveform Synthesis

Waveforms are described in terms of simple waveforms and complex or mixed-mode waveforms. The types of simple waveforms supported by the program are defined as:

- MIMO Random (Broadband)
- Swept MIMO Random (Sweeping Narrowbands)
- MIMO Sine
- Imported Files

Note that MIMO Shock environments can be supported via waveforms from the Imported Files feature. Complex (mixed-mode) waveforms are combinations of the simple types of waveforms. You may combine these types in any desired way, such as:

- The waveforms may contain separate time slices of multiple simple types.
- The waveform types may overlap in time and may be summations of multiple types.

## Waveform Editor

The editor provides a table that summarizes the current editor selections for each of the Reference waveforms that have been imported. The features include:

- Change the scaling.
- Change the polarity.
- Apply tapering to the start, end or both sections.
- Select a time slice of arbitrary length using multiple cursors and Zoom In/Out buttons.
- Change the channel assignment (order of References).
- Change the channel labels.

## Digital Re-Sampling & Filtering

MIMO Waveform Replication and Shock test requirements are frequently specified as acceleration waveforms to be reproduced at control points on the test article.  The acceleration waveforms usually represent waveforms that were measured during the use of a similar test article in its intended service environment. These waveforms need to be imported and used as the test references for the various control channels. The equipment used to record this data may, or may not, be 100% compatible with the Jaguar system. One difference might be related to the sample rate used to acquire the data. The Jaguar system supports the following sample rates: 51200, 25600, 12800, 5120, 2560, 1280, 512, 256 and 128. If the recorded data does not match one of these sample rates, it may still be imported and digitally re-sampled to match one of the supported rates. The program also supports the following digital filters:

- High-Pass
- Low-Pass
- Band-Pass
- Band-Reject

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