Chroma Systems Solutions, Inc.

Software Simplifies Testing to Military and Aerospace Standards

61500, 61600, 61700 AC Power Sources, 61500 & 61600 Soft Panel Software, and 7609-8205 Mil/Aero Soft Panel Software

Keywords: AC Power Sources, software, military and aerospace standards, MIL-STD-704, DO-160 and ABD0100

Title:

Software Simplifies Testing to Military and Aerospace Standards

Product Family: **61500, 61600, 61700 AC Power Sources, 61500 & 61600 Soft Panel Software, and 7609-8205 Mil/Aero Soft Panel Software**

Abstract

There are a wide variety of AC Sources on the market that provide variable voltage and frequency capabilities. Military and Aerospace standards, such as MIL-STD-704, DO-160 and ABD0100, and commercial standards such as IEC 61000-4, can require complex waveforms and test protocols that cannot be done with a simple AC Source with variable voltage and frequency. These standards can require an AC source with an arbitrary waveform or transient generator in order to create fast transients such as dips, drops and other profiles. While these profiles can be created on an AC source, it can be difficult and time consuming to replicate all of the required tests just from the front panel of an AC source.

Solution:

Chroma offers off the shelf software solutions such as a Military Aerospace Soft Panel, which includes a large number of the typical tests called out in the MIL-STD-704, DO-160, ADB0100 and IEC 61000-4, already predefined to simplify testing.

This application note will show some of the capabilities of Chroma's AC Sources in combination with the Military Aerospace Soft Panel and other Soft Panels.

61600 Series of AC/DC Sources and 61600 Soft Panel

Chroma manufactures a variety of AC Sources. Chroma's basic AC sources are the 61600 Single Phase Series and 61611/61612 3-Phase Series of AC Sources. These sources have the capability of providing a variety of output voltages from 0 to 300VAC, frequencies from 15 to 1500Hz, and advanced measurement capabilities including: voltage, current, crest factor, power factor, inrush current, total power, reactive power and real power.

The Chroma 61600 Single Phase Series features an external voltage input that can be used with an arbitrary waveform generator to create complex waveforms. This allows cost effective solution for requirements beyond a simple sinusoidal signal output.

The **61600 Soft Panel** is a Windows based software package designed for control of the 61600 Series Single Phase AC Source. The software allows for easy setup, and the ability to create a sequence of tests and reporting features to store measurements to a file. The timing on a sequence can be controlled down to 100ms. This allows for creation of test profiles such as powering a device at 115VAC/60Hz nominal and then varying voltage between +/- 10% and recording current, power consumption and power factor.

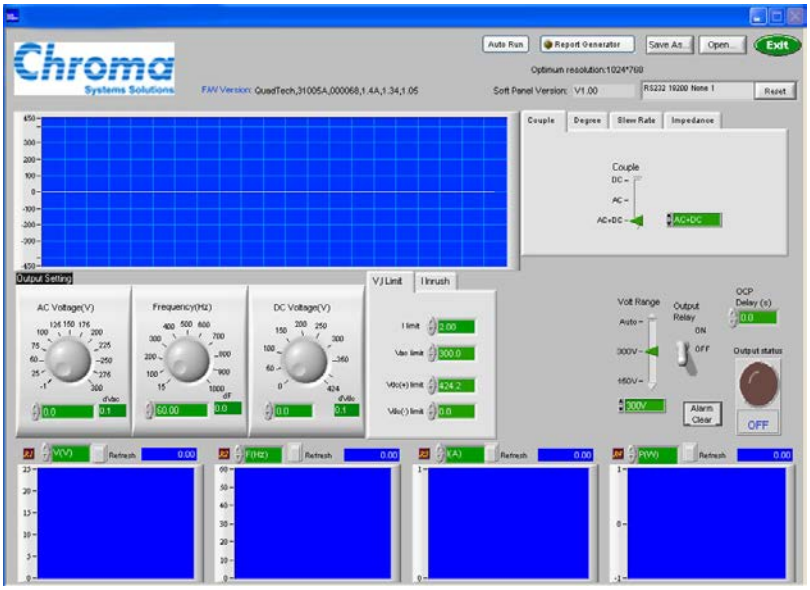

Figure 1. AC Soft Panel

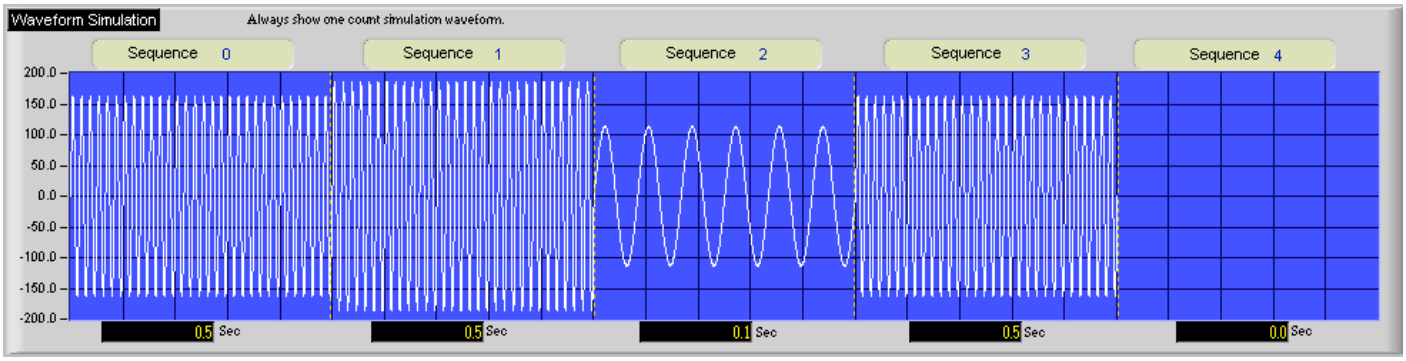

Figure 2. List Mode showing 4 Sequence Test using 61600Soft Panel

61500, 61511 and 61512 Series of AC/DC Sources and 61500 Soft Panel

Chroma also offers the 61500 and 61511/61512 AC/DC Sources, which have all the same capabilities as the basic 61600 Series of AC/DC Sources, with the addition of a transient generator. This transient generator allows for user defined waveforms, harmonics, and square wave output using built in modes such as list, step, harmonics and pulse.

61500 Soft Panel is a windows based software package for control of Chroma's 61500 and 61511/61512 AC/DC Single and 3 phase source with transient generator. The transient generator feature allows for quicker dips, drops and user defined waveforms.

The basic modes of operation allow a user to create an unlimited variety of outputs to simulate both normal and abnormal conditions that a product might see during use. These modes can be programmed from the front panel of the AC sources. Chroma's 61500Soft Panel Software allows for easier setup and data collection during testing. The software has a reporting feature that allows all measured parameters to be logged during testing for future analysis and report generation.

The next sections show the use of the 61500Soft Panel software in creating a variety of test sequences and waveforms.

List Mode

List mode allows for the creation of a sequence of up to 100 steps up that varies ACV, DCV, or frequency with timing down to 0.1ms or 0.1 of a cycle. This allows for creation of quick dips, drops, and transients. Voltages and frequencies can also be ramped up or down at various rates or combinations.

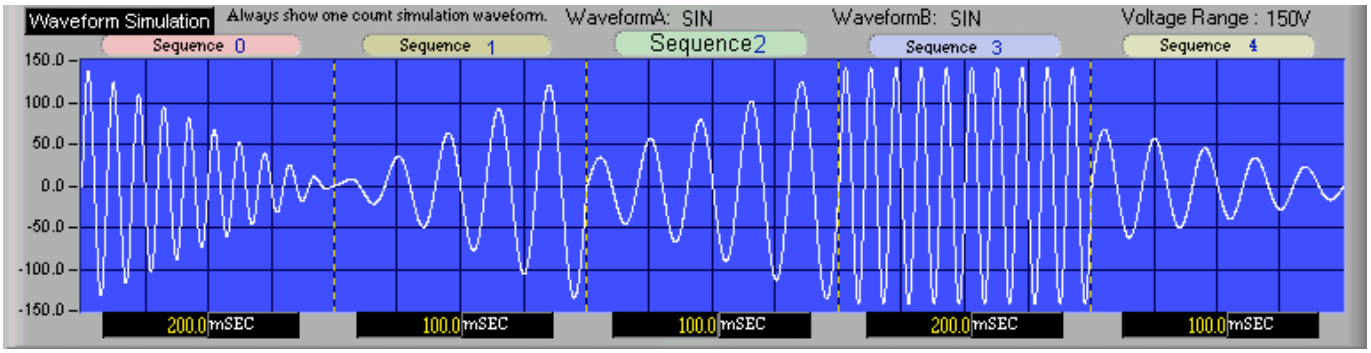

Figure 3. Sequence Test showing various combinations

Pulse Mode

Pulse mode is used to create a pulse in a specific duty cycle in the normal signal output. The normal signal output can be controlled for both amplitude and frequency, and the pulse for amplitude, frequency, duty cycle and starting phase.

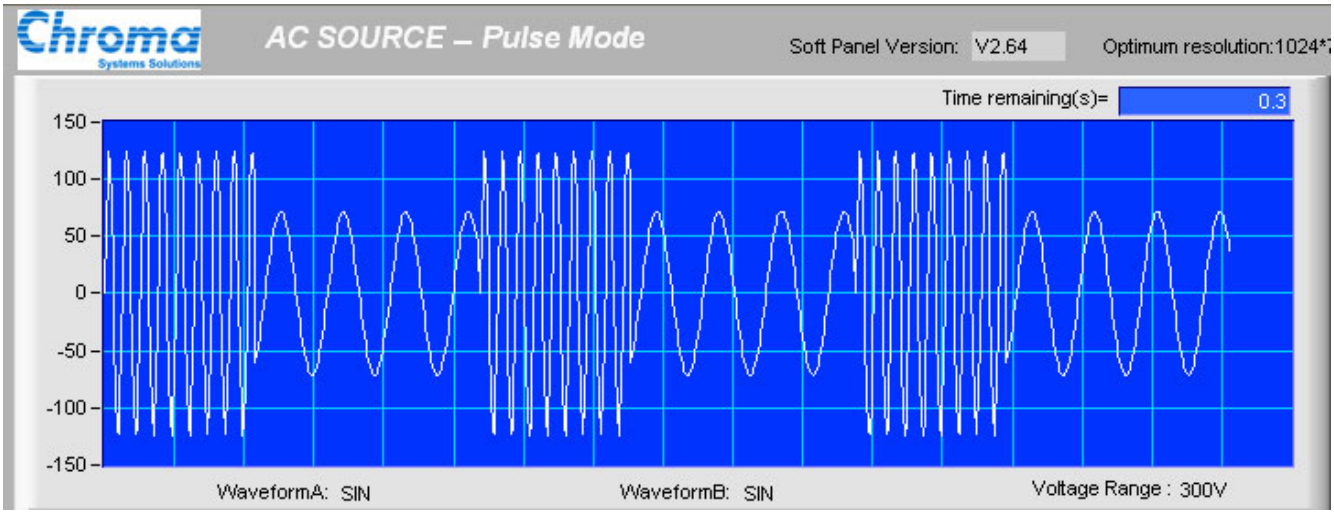

Figure 4. Pulse Mode

Step Mode

Step mode allows the voltage and/or frequency to be varied at a programmable rate of change over a specific time interval. One example of this would be to program the voltage to start 50V and vary in steps to 300V.

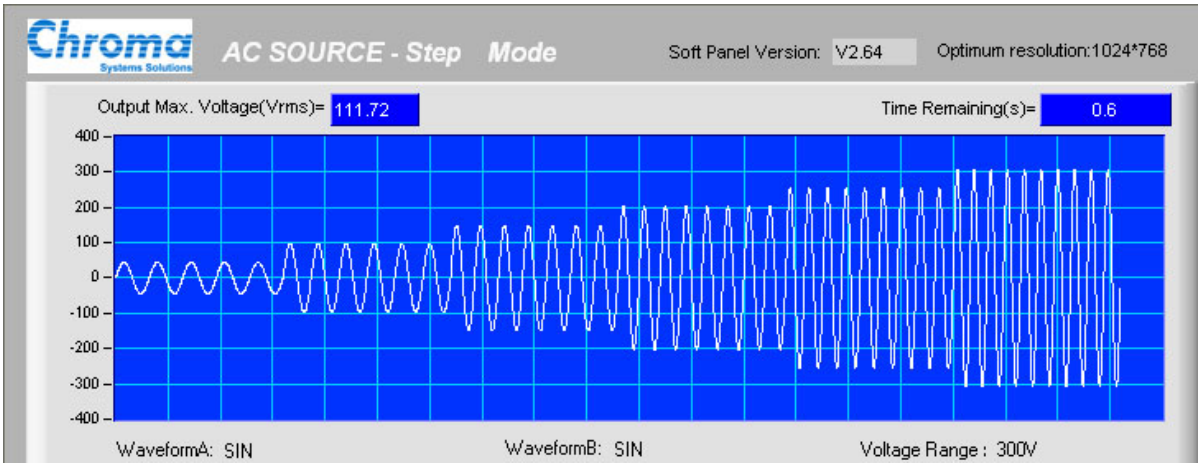

Figure 5. Step Mode showing voltage stepping up

Harmonic Synthesis Mode

The main waveform of fundamental frequency is Sine wave and the user can the edit the 2 to 40 steps of harmonic to create a wide variety of waveforms. These waveforms can be stored for later recall. The waveform is downloaded real-time into the source.

There is also a waveform editor function which is similar to this mode with the exception that the waveform editor allows the user to create the waveform, which is then stored into 1 of 6 user defined waveforms in the AC/DC programmable source. This user defined waveform can then be recalled using the front panel of the AC/DC programmable source.

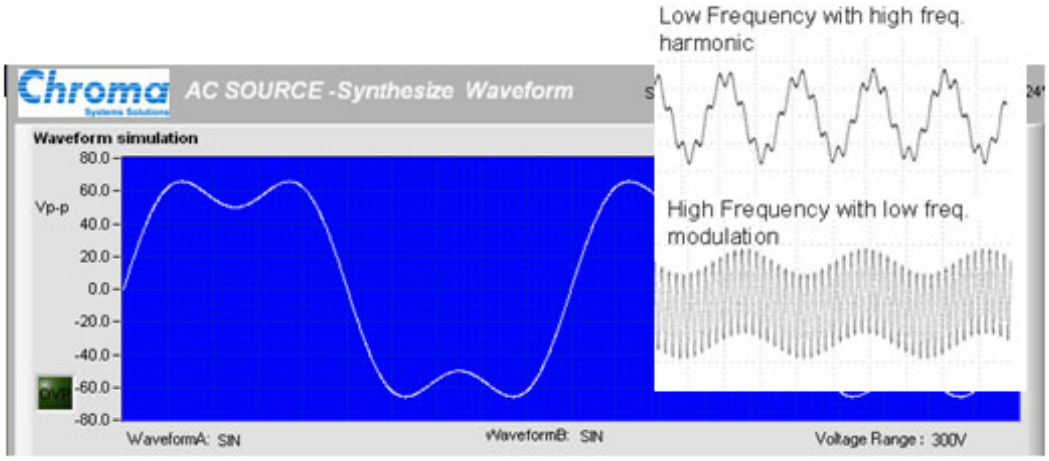

Figure 6. Harmonic Synthesis and User Defined Waveforms

Chroma 61500, 61511, 61512 and 61700 with TG Option and 7609-8205 Military Aerospace Soft Panel

The 7609-8205 Soft Panel features all of the basic modes of operation covered in the previous sections for the 61500Soft Panel such as list, step, pulse, harmonic synthesis, and waveform editor.

The Military Aerospace Software uses the basic modes of operation of the AC source with a transient generator to create the complex tests called out in MIL-STD-704, DO-160 and ABD0100. The user selects the appropriate standard from a pull-down list and then all the predefined tests for that standard are shown and can be selected for testing. The predefined tests can be modified and saved if required.

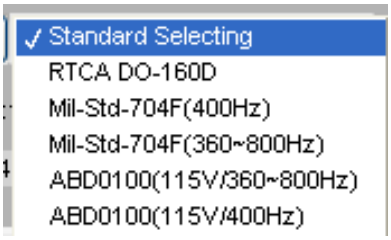

Figure 7. Pull-down box showing predefined standards

The next sections will illustrate the screens for each of the 5 standards that are covered in the software.

RTCA-DO-160 Test

In RTCA-DO-160 there are 3 categories available for selection: normal option, emergency and abnormal. Each category window will show respective test items for that category.

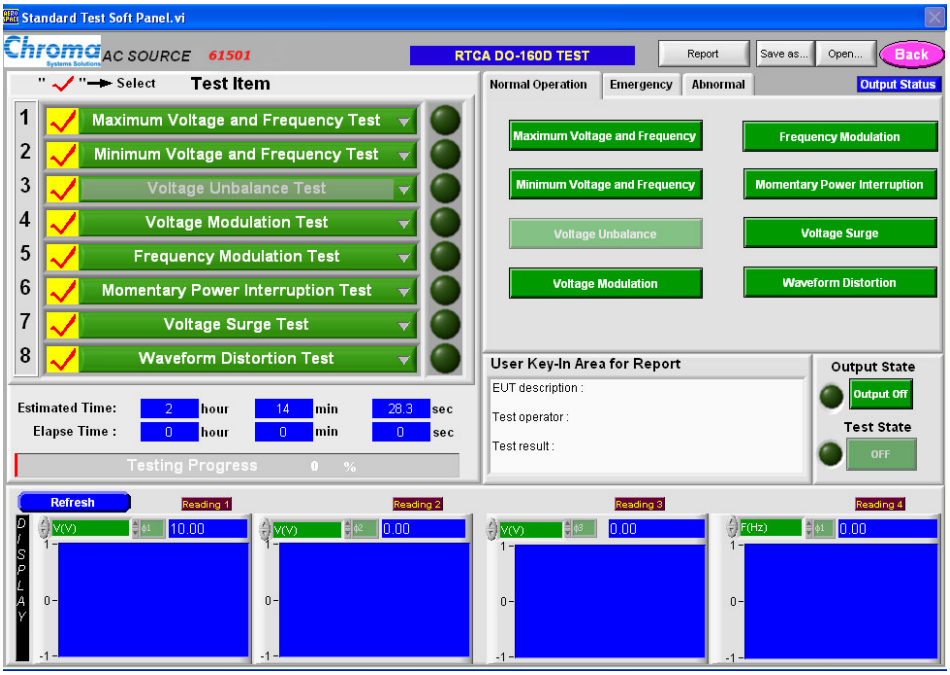

Figure 8. DO-160 Test Screen

MIL-STD-704F

If Mil-Std-704F standard is selected, there are 5 categories available for tests: normal, transfer, abnormal, emergency and power failure. Each category window will show the respective test items for that category. There are two selections for MIL-STD-704F one for 400Hz operation and the other for 360Hz - 800Hz operation.

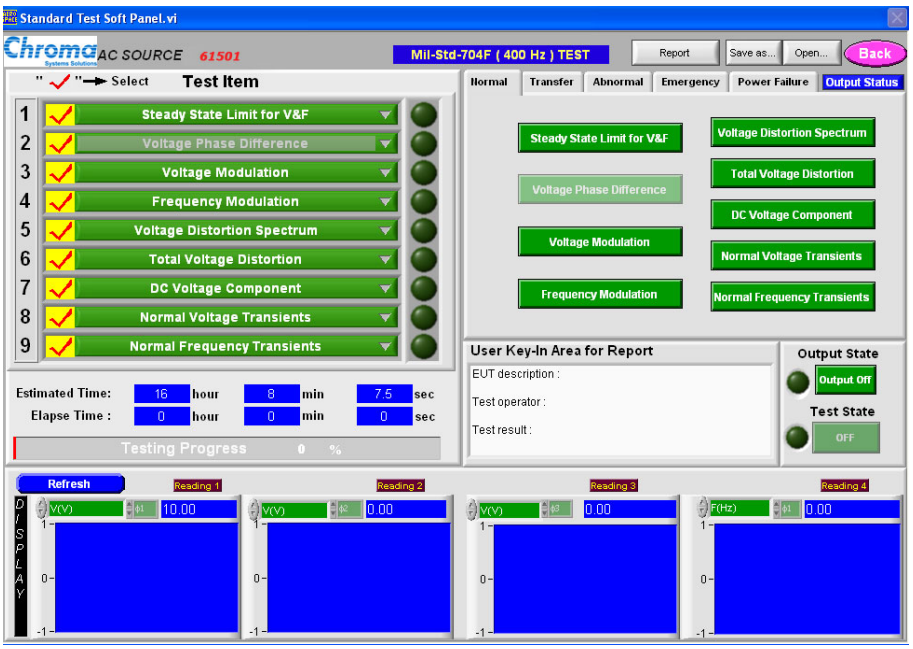

Figure 9. Mil-std-704 Test Screen for 400Hz Test

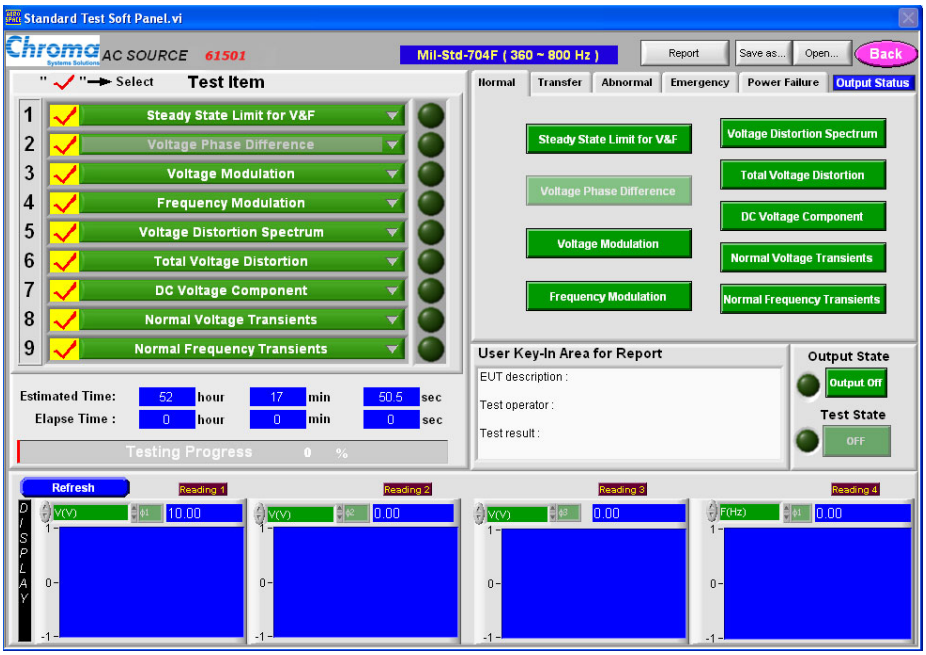

Figure 10. Mil-std-704 Test Screen for Variable Frequency Test

ABD0100 (AIRBUS – A350)

There are two predefined tests for the AIRBUS-A350. These are the standard test procedures used to verify equipment that utilizes variable frequency 115VAC single and 3-phase power.

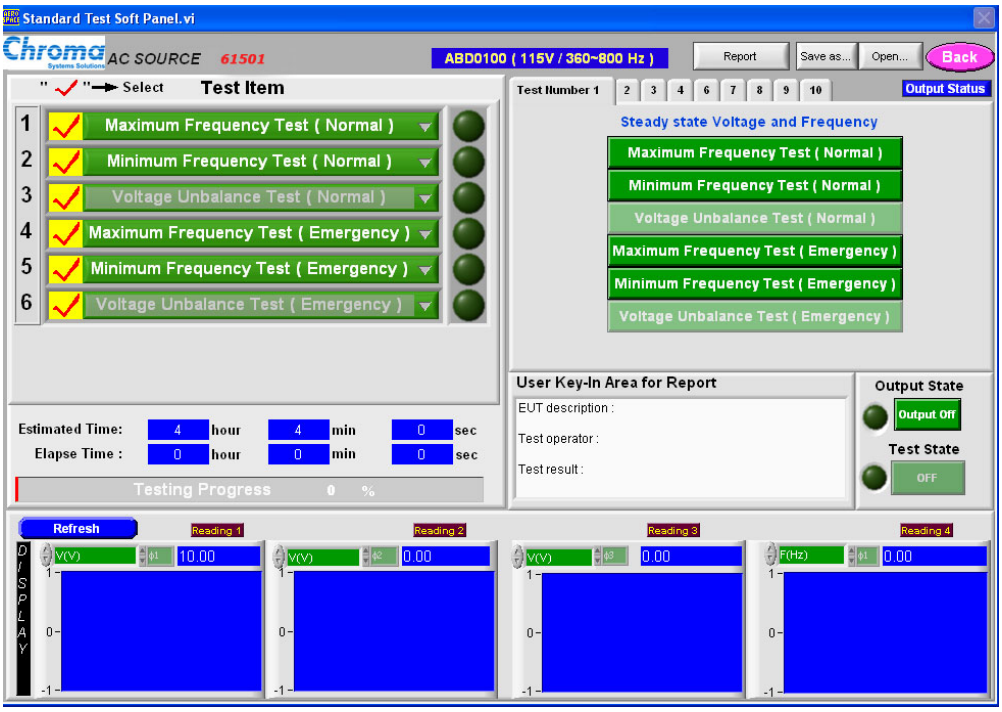

Figure 11. Air Bus 350 Test Screen for Variable Frequency Test

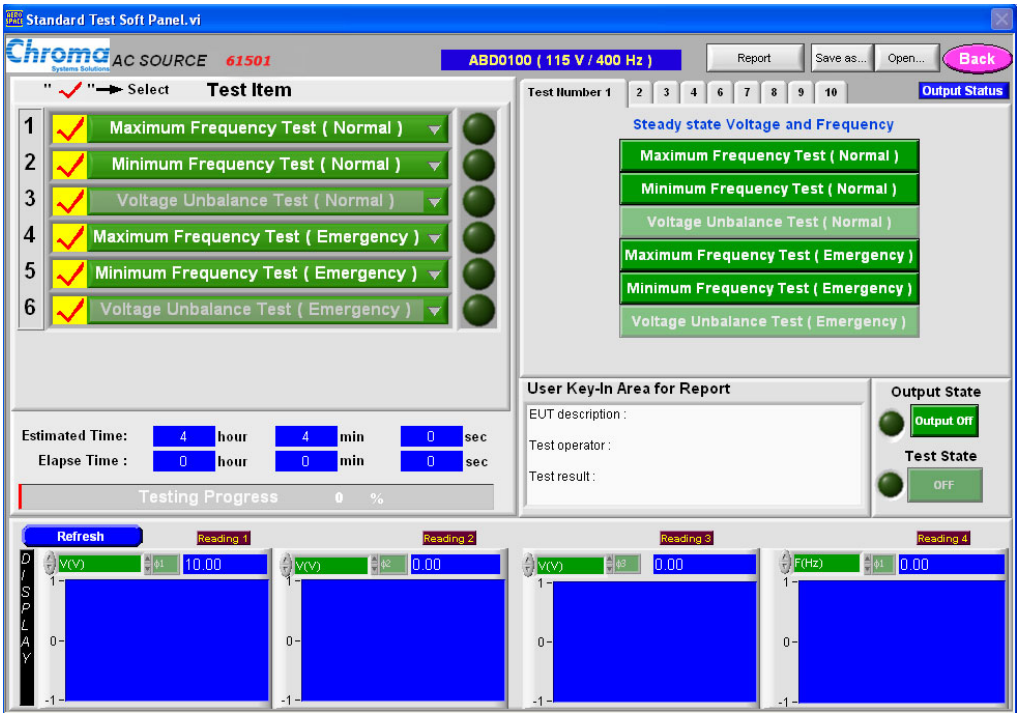

Figure 12. Air Bus 350 Test Screen for 115VAC/400Hz Test

DC Transient Testing

Chroma's sources also have the capability of outputting DC and can be used to perform dip and drop testing to DO-160 for systems operating at 28VDC as well as other voltages.

Below is a sample test and output of a 61501 AC/DC Programmable Source. The test was created using the list mode in the Military Aerospace Soft Panel. This is a 3 step test:

- Step 1 for 28VDC for 2ms
- Step 2 for 24VDC for 0.5ms
- Step 3 for 28VDC for 2ms

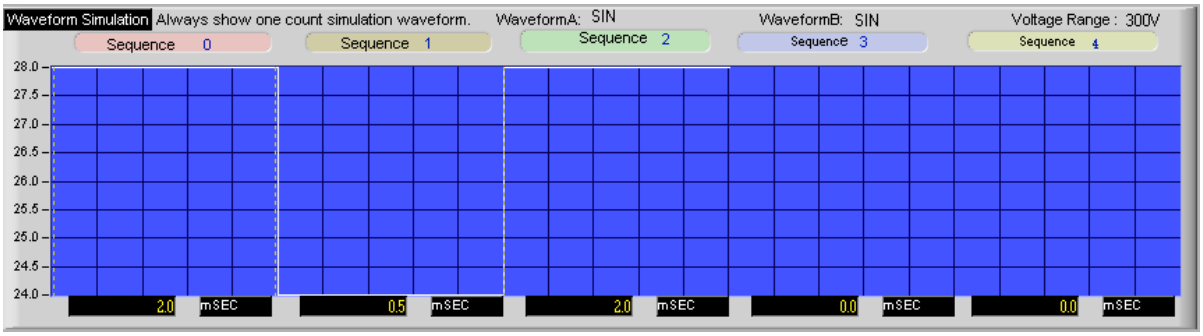

Figure 13. 28VDC Transient Test using List Mode

The test ran and a waveform was captured on a Tek TDS 210 Scope. The trace shows very good response with a 24VDC dip for 0.5ms in the 28VDC nominal voltage.

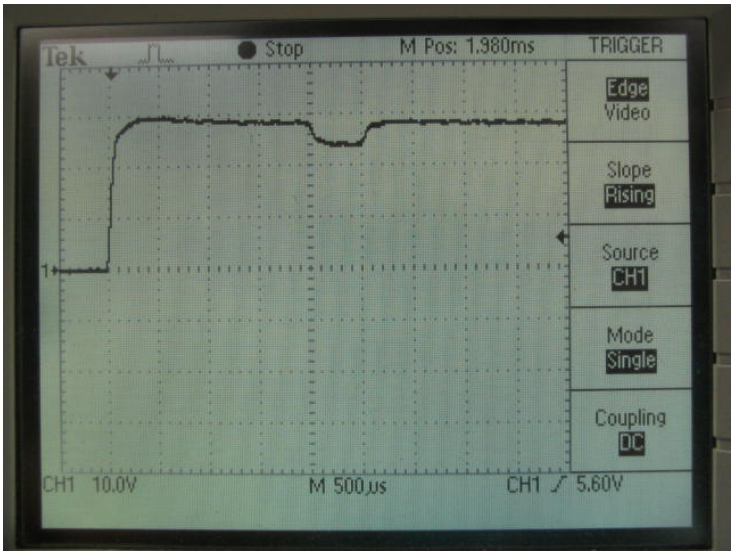

Figure 14. Scope trace showing output of the AC/DC source when transient test is run

Conclusion

Chroma's AC/DC Programmable Sources and software provide powerful solutions for commercial and aerospace product testing. The software allows for rapid testing to specific military and aerospace standards such as MIL-STD-704, DO-160 and ABD0100.