MEASUREMENT TIPS
Volume 4, Number 1

Create Complex Sequences with a DC Power Supply

DC power supplies are a fundamental component of almost every test system. Today's complex automatic test equipment (ATE) systems must perform a variety of tests quickly, either to increase test system throughput or to tweak and optimize design performance. Each step in the test may have different power requirements, and the setup time for each step can significantly affect test throughput. Devices that are powered by multiple DC power supplies may require the test system to turn power on in a particular order to prevent problems with the device, such as latch-up or excessive current flow. Power sequencing is used when you need to control sequences such as the shut down of devices either in normal testing or because of a fault condition.

Snapshot: Testing Product Reliability

During the design validation process, one liquid crystal display (LCD) manufacturer needed to ensure its inverter would perform as expected. Company engineers executed thousands of on/off tests precisely sequenced within 1 ms over a temperature range to ensure the inverter did not shorten the life of the cold cathode fluorescent lamp (CCFL) backlight, one of the key components of a LCD screen. The manufacturer was using multiple pieces of equipment in a costly, unreliable test system. To improve the reliability of the test, the manufacturer turned to the N6700 modular power system and modules to configure four synchronized outputs within a 1 U mainframe. Engineers used the delay feature to create precise power-on and power-off sequences and list mode to produce the pulse width modulation (PWM) for the digital dimming control signal. With the N6700, the manufacturer was able to reduce the test time and cost while improving reliability.

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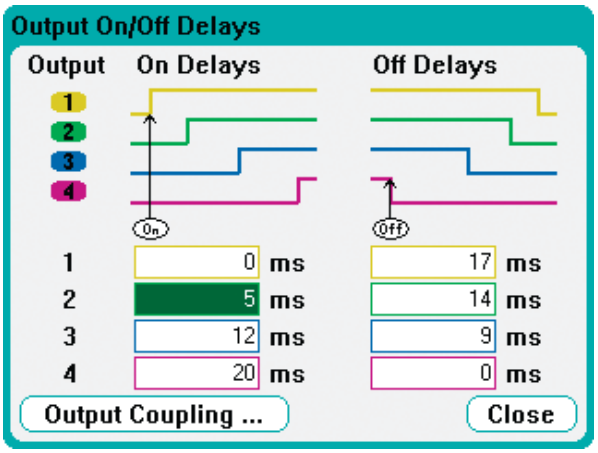
Power sequencing methods

You can use a number of methods to control the turn-on and shut-down sequence of multiple power sources. Using diodes between inputs or placing relays in series with the inputs introduces signal variations that interfere with the testing. Using software to control the sequence or relays in series with each input often results in imprecise timing.

Instruments such as Agilent's N6700 modular power system for ATE systems or the N6705A DC power analyzer for bench use makes it easy to set up sequences. Either of these mainframes can be configured with up to four power supply output modules out of more than 20 options to best fit your application needs

To create turn-on and shut-down sequences using multiple sources, the delay feature can be used to specify the amount of time between the start of the sequence and the transition of each source.



List mode

You can make transitions between the turn-on and shut-down portions of your test. If your test requires a series of changes to the output level or a low frequency signal, you may face similar instrumentation and cabling challenges to setting up sequences, as well as investing the time and effort to configure it. Some power supplies have analog inputs that add external signals, such as a signal from a function generator, to the power output.

To simplify your test, you can use a power product with list mode to create complex series of output changes or low-frequency waveforms with rapid and precise timing. If your application requires multiple sources, each output may be synchronized with your external signals.

The list capability of the N6700 provides up to 512 command steps that can be used to define the voltage or current and set the dwell time for each step. In addition, you can repeat each list a specified number of times or have it repeat continuously. Once you have created your list, it can be executed programmatically, manually, or using an external trigger. Since the list is stored within the instrument, the list can be run at maximum speed because the bus transfer and command processing for each step has been eliminated.

You can also store the complete instrument state within the power supply and later use a single command to recall the configuration, saving you time when you next run the sequence.

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Each step of a list can be run automatically or can be paced using an external trigger. Using an external trigger allows the power supply to wait until one phase of testing is complete before progressing to the next step. Trigger sources such as a voltmeter complete or a sync signal from a data acquisition or switch unit work seamlessly with list mode to reduce your test time.

Fault conditions

Outputs can be sequenced off in response to a power supply fault event using the delay time settings. The supply output experiencing a fault event, such as over-voltage, over-current, or over-temperature, will shut down as quickly as possible to avoid damage to the device or the power supply. The remaining outputs will use the programmed delays for a controlled shut-down sequence. When you configure it to do so, the sequenced shut-down can be synchronized across multiple mainframes.

For more information, refer to the Agilent application note, ***Avoid DUT Damage by Sequencing Multiple Power Inputs Off Upon a Fault Event*** (http://cp.literature.agilent.com/litweb/pdf/5989-7686EN.pdf).

Summary

Creating power sequences for applications requiring multiple power outputs can help you run your tests reliably and prevent damage to your device. Power supplies with list mode can further reduce your test time by storing the series of changes in the instrument and eliminating the overhead of using programming commands. We have reviewed the benefits of list mode and synchronizing multiple power outputs to improve your test routine, and showed how Agilent's N6700 and N6705A mainframes and modules makes it easy to include these features in your test.

N6705A

Helpful tools for power product users

Free DC Power Supply Hints and Tips

A series of useful tips to help you get the most out of your power supply

- ***Create Complex Sequences with a DC Power Supply***
- ***Improve Power Supply Performance and Safety Using Remote Sensing and Remote Inhibit***
- ***Achieve Cleaner Power Signals by Minimizing Common Sources of Noise***

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