Comparing the N6700 Low-Profile and DC Power Analyzer Mainframes

Technical Overview

Agilent Technologies

Introduction

This technical overview describes the major differences between mainframes in the N6700 Agilent Technologies Modular Power System.

Description

The N6700 family is a Modular Power System (MPS) with up to four power outputs. It consists of two groups of mainframes intended for different use-models. The N6700B (400 W), N6701A (600 W), and N6702A (1200 W) are Low-Profile mainframes intended for system racks when rack space is critical. The N6705A (600 W) is the dc Power Analyzer mainframe intended for R&D use thanks to its bench-friendly package and robust user interface.

Both the low-profile and dc power analyzer mainframes use the same power modules grouped into three categories: basic performance, high-performance, and precision performance. It is important to note that most of the source and measurement capabilities of the system are built into the power modules. The two groups of mainframes, low-profile and dc power analyzer, provide access to these capabilities through their different user interfaces and programmability.

General Differences

There are a number of differences between the low-profile and dc power analyzer mainframes. The low-profile mainframe is flat and optimal for Automated Test Equipment (ATE) in manufacturing and design validation systems where instruments are rack mounted and space is at a premium. It has a robust command set and is typically controlled by a computer program that sends commands in SCPI (Standard Commands for Programmable Instruments). The dc power analyzer mainframe is a bench-top instrument and is optimal for R&D environments where engineers need quick answers to various tests on their bench. It has a robust user interface and is typically operated from the front panel.

At a quick glance, here are the major differences between the low-profile mainframes and the dc power analyzer:

Low-Profile Mainframes:

- Size and user interface are optimized for computer control
- Smaller, only 1 U high
- Small display and small keypad suitable for program troubleshooting and debugging
- Rear connectors
- Up to 1200 W per mainframe
- Less expensive

DC Power Analyzer Mainframe:

- Size and user interface are optimized for front panel control
- Larger, takes more rack space, but shallow for bench
- Large color display with excellent user interface for non-computer controlled DUT testing, program troubleshooting and debugging
- Front panel connectors
- Up to 600 W per mainframe
- More expensive

Table 1 and the following paragraphs compare form factor, user interface/programmability, and hardware in more detail. Items in the table that are bold indicate major differences.

Table 1. Comparison summary of Low-Profile vs. DC Power Analyzer mainframes

	Low-Profile Mainframes			DC Power Analyzer
	N6700B	**N6701A**	**N6702A**	**N6705A**
General				
Typical Environment	System rack			Bench
Total Module Output Power	400 W	600 W	1200 W	600 W
Form Factor				
Height	**44.45 mm / 1.75 in**			197.77 mm / 7.665 in
Width	432.5 mm / 17.03 in			425.6 mm / 16.756 in
Depth	585.66 mm / 23.06 in		633.9 mm / 24.96 in	313 mm / 12.319 in
Weight (w/ 4 power modules)	12.73 kg / 28 lbs	11.82 kg / 26 lbs	14.09 kg / 31 lbs	16 kg / 35 lbs

Table 1. Comparison summary of Low-Profile vs. DC Power Analyzer mainframes (Continued)

	Low-Profile Mainframes N6700B N6701A N6702A	DC Power Analyzer N6705A
Measurements		
DC Measurements	Average voltage and current shown on meter display or fetched over bus	Average voltage, current, and **power** shown on meter display or fetched over bus
Digitizer Basic Modules (N673xA, N674xA, N676xA)	None	**4096 points of voltage OR current measurements**
		Max measurement speed: 50 kHz
		Measurements shown in scope view or setup, triggered & fetched over bus
High-Performance Modules without Option 054 (N675xA)	None	**4096 points of voltage OR current measurements**
		Max measurement speed: 50 kHz
		Measurements shown in scope view or setup, triggered & fetched over bus
High-Performance Modules with Option 054 (N675xA)	4096 points of voltage OR current measurements	4096 points of voltage OR current measurements
	Max measurement speed: 50 kHz	Max measurement speed: 50 kHz
	Setup, triggered & fetched over bus	**Measurements shown in scope view** or setup, triggered & fetched over bus
Precision Modules (N676xA)	4096 points of voltage AND current measurements	4096 points of voltage AND current measurements
	Max measurement speed: 50 kHz	Max measurement speed: 50 kHz
	Setup, triggered & fetched over bus	**Measurements shown in scope view** or setup, triggered & fetched over bus
Datalogger	Not available	**Built-in**
User Interface/Programmability		
General	**Optimized for bus programming**	**Optimized for front panel use**
Arbitrary waveforms	Bus programming with "List" commands	**Dedicated "Arb" front panel controls**
		Bus programming with "Arb" or "List" commands
Extra SCPI commands		**Arbitrary waveforms**
		Predefined waveforms
		Data logger
		Screen capture
Additional features		**Arbitrary waveform preview screen**
		Output delay preview screen
		File system for managing data log and scope data
		Real-time clock

Table 1. Comparison summary of Low-Profile vs. DC Power Analyzer mainframes (Continued)

	Low-Profile Mainframes N6700B N6701A N6702A	DC Power Analyzer N6705A
Hardware		
Output and sense connectors	**Output connectors on rear**	**Binding posts on front**
Local sensing	External jumpers	Internal relays
LCD Screen	Black and white	Color
Additional features	Digital IO connector for trig in/out, fault, inhibit	Digital IO connector for trig in/out, fault, inhibit
		External BNC trigger IN and OUT
		Internal flash memory
		Front panel USB memory device input
		Firmware update via SCPI or front panel
		USB memory device
		Emergency stop
Other	None	Binding posts rated for up to 20 A
		N6753A module not supported

DC Measurements

All power modules have dc voltage and current read back capabilities. The Low-Profile mainframes display average dc voltage and current measurements on the front panel. Measurements can also be fetched over the bus. Similarly, the dc power analyzer displays average dc voltage and current measurements on the front panel or fetches the measurements over the bus.

Digitized Measurements

When installed in the low-profile mainframes, basic and high-performance modules without high-speed test extensions (option 054) can only make integrated dc voltage and current measurements. The high-performance power modules (N675x) with high-speed test extensions and precision power modules (N676x) have built-in digitizers of up to 50 kHz. These digitizers have adjustable sampling rates that are programmable from the front panel or over the bus. Digitized data is available in tabular form by reading back the data stored in the internal buffer of the low-profile mainframe.

When installed in the dc power analyzer, ALL power modules digitize up to 50 kHz regardless of the model number or options installed. The dc power analyzer graphically displays digitized measurements in an oscilloscope-like display or Scope View, as shown in Figure 1. Digitized data is also available in tabular form by reading back the data stored in the internal buffer of the dc power analyzer.

Data Logging

The dc power analyzer has a data logging feature. This feature allows users to configure and display data continuously captured for long periods of time from the front panel. The data logger logs the captured data directly to an internal flash memory device or to an external USB flash memory device. This feature is only available in the dc power analyzer mainframe.

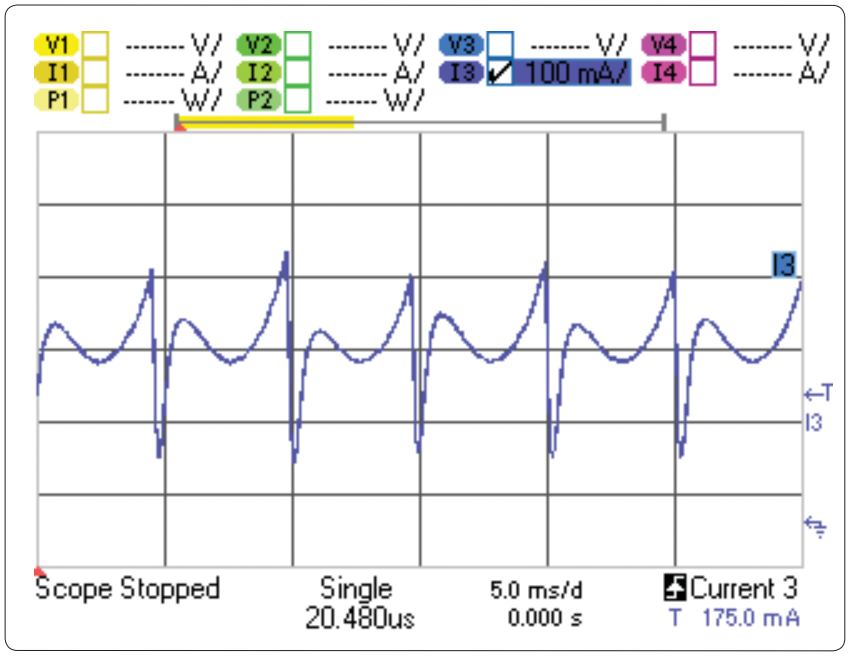

Figure 1. N6705A screen shot of Scope View

It is possible to perform a similar test with the low-profile mainframes by programming it over the bus, but to simulate the data logger requires a computer and a well-versed programmer. The data logger continuously measures average dc voltage and/or current measurements. The reading rate greatly depends on the user-written program speed. Typical maximum speeds are 50 readings per second, but the ability to reach this maximum depends on how fast the user-written program can sequence through the measurement loop. Also, timing and data management needs to be considered by the user-written control program.

Generating Waveforms

Both mainframes can create arbitrary waveforms. In the low-profile mainframes, the high-performance (N675x) with high-speed test extensions (option 054) and precision (N676x) power modules use “List” SCPI commands over the bus or the front panel to send up to 512 voltage or current waveform points and dwell times. The waveform data is stored inside the instrument and is executed with a single command.

The dc power analyzer has dedicated front panel controls for arbitrary waveforms. There are seven built-in waveforms (sine, step, pulse, ramp, trapezoid, staircase, and exponential) as well as user-defined voltage and user-defined current waveforms that are programmed by the user. These waveforms are configured from the front panel or by programming the instrument over the bus. When programmed over the bus, the capability of the dc power analyzer's user-defined waveforms is identical to the capabilities of the "List" SCPI commands in the low-profile mainframes.

Storing Data

The dc power analyzer writes data to internal non-volatile memory or to an external memory device. Scope waveforms and arbitrary waveforms are transferred to comma separated variable (.csv) files, and screen captures are transferred to graphics interchange format (.gif).

The low-profile mainframes do not have a file system for storing multiple readings or multiple digitized data buffers in internal memory. All data must be fetched manually over the bus each time a digitized buffer or dc measurement is made and saved to a PC. There is no non-volatile memory for storing readings.

Additional Capabilities

There are additional SCPI commands for the dc power analyzer mainframe to account for the extra features accessible from the front panel. Examples of this include SCPI for the Arb waveforms, data logger setup, and screen captures. These commands are useful for users who programmed the dc power analyzer from the front panel and want to automate their test over the bus. The low-profile mainframes do not have these additional SCPI commands since they do not support these features.

Hardware

Both mainframes use the same power modules, but use different power output connections. The low-profile mainframes use output connectors that are located on the rear panel. The dc power analyzer routes connections from the power modules to 20 A banana plugs on the front panel. Since the front outputs are rated for a maximum of 20 A, the N6753A autoranging high-performance power module (20 V, 50 A, 300 W) is not compatible with the dc power analyzer because the maximum current of the module exceeds the maximum current rating of the front banana plugs.

Summary

The N6700 family includes two distinct sets of mainframes tailored towards specific test environments. The low-profile mainframes are optimal for ATE and system applications while the dc power analyzer is optimal for R&D and bench applications. While both mainframes use the same power modules, there are differences between form factor, user interface/programmability, and hardware. Potential users should consider their work environments and how they plan to use it before choosing the best mainframe for their task.

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