

# Keysight Technologies

## Comparing the N6700 Low-Profile and DC Power Analyzer Mainframes

### Technical Overview



## Introduction

This technical overview describes the major differences between mainframes in the N6700 Keysight Technologies, Inc. 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 benchtop 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			DC Power Analyzer
	N6700B	N6701A	N6702A	N6705A
Measurements				
DC Measurements	Average voltage and current shown on meter display or fetched over bus			Average voltage, current, and <b>power</b> 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)

Hardware	Low-Profile Mainframes			DC Power Analyzer
	N6700B	N6701A	N6702A	N6705A
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
Other	None			Emergency stop
				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.

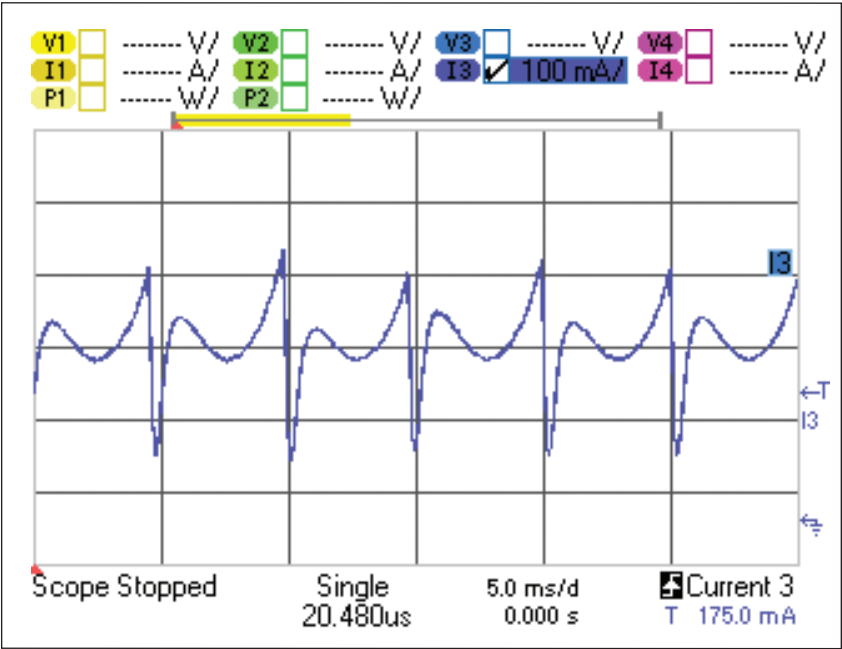


Figure 1. N6705A screen shot of Scope View

## 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.

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.



## myKeysight

### myKeysight

[www.keysight.com/find/mykeysight](http://www.keysight.com/find/mykeysight)

A personalized view into the information most relevant to you.



[www.axiestandard.org](http://www.axiestandard.org)

AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. Keysight is a founding member of the AXIe consortium. ATCA®, AdvancedTCA®, and the ATCA logo are registered US trademarks of the PCI Industrial Computer Manufacturers Group.



[www.lxistandard.org](http://www.lxistandard.org)

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.



[www.pxisa.org](http://www.pxisa.org)

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.



### Three-Year Warranty

[www.keysight.com/find/ThreeYearWarranty](http://www.keysight.com/find/ThreeYearWarranty)

Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.



### Keysight Assurance Plans

[www.keysight.com/find/AssurancePlans](http://www.keysight.com/find/AssurancePlans)

Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.



[www.keysight.com/go/quality](http://www.keysight.com/go/quality)

Keysight Technologies, Inc.  
DEKRA Certified ISO 9001:2008  
Quality Management System

### Keysight Channel Partners

[www.keysight.com/find/channelpartners](http://www.keysight.com/find/channelpartners)

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

For more information on Keysight

Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:

[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

## Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

## Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

## Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:

[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

(BP-09-23-14)