Agilent Power Products Catalog 2002-2003

Application Information and Technical Data for:

dc Power Supplies

dc Electronic Loads

ac Power Solutions

Application-Specific Power Solutions
- Mobile Communications dc Sources
- Solar Array Simulators
- Component Test dc Source
- Multi-Cell Charger/Discharger

Power Products Modification Service

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solutions

to match your new test and measurement challenges. From Power Supplies to Power Solutions

One quick browse through this catalog will convince you that Agilent power products offer so much more than simple power generation. In each product category, we've integrated the capabilities you need for a complete power solution, including extensive measurement and analysis capabilities.

The cost and performance benefits of the one-box approach

The central theme in all our power products is one-box integration–giving you a complete test solution for the price of a single instrument. The one-box approach improves test results while cutting costs, complexity and rack size. These solutions are much easier to integrate, program and maintain in ATE systems. Another major benefit is that we specify and guarantee performance for the entire integrated system, so you know what you're really dealing with–unlike the typical "rack-and-stack" setup.

Power you can count on year after year

We've been a leader in the power products business for more than four decades because engineers like you know they can count on Agilent performance and reliability. Even our least-expensive dc supplies offer low ripple and noise with tight load and line regulation. Our high-precision products give you exacting control over power output levels, with accurate readback measurements to match. Plus, every Agilent power product in this catalog is covered by a three-year warranty (except where noted).

We know you have more important things to do than shop around for power supplies. That's why we've made such a wide range of products available through Agilent. The experienced engineers at Agilent can help you select just the right solutions for your application and your budget, then arrange fast shipping so you can get to work in a hurry.

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Selecting a System Power Supply

12 Factors to Consider when Selecting a System Power Supply

1

Does the power supply performance meet your requirements?
Agilent 6600, 6800, and 66000 Series offer low output noise – among the best in their power ranges – allowing you to make even the most critical measurements. Active circuits ensure fast up and down programming, regardless of the load.

2

How complete are the specifications?
Agilent specifications cover the total power supply system, including programmers, current shunt, and DVM. Agilent specifications and supplemental characteristics are very complete and cover a broad range of real operating conditions.

3

How much will the power supply cost you now and after it is purchased?
The competitive initial cost of the Agilent 6600, 6800, and 66000 Series power supplies is an important part of Agilent's lower total cost. However, there are other components in the total cost of ownership. Agilent power supplies cost less time, money, and expertise to integrate into your system, and their renowned reliability results in less downtime cost.

4

How long does it take to integrate the power supplies into your system?
With the Agilent "One-Box" Solution, current and voltage programmers, current shunt, and DVM are all part of the single power supply package. This not only takes less rack space, but eliminates external cabling and interconnections between units, greatly increasing ease of integration and reliability.

5

How long will it take to write a program?
With Agilent power supplies, you both program and read back in volts and amps; not binary, percent of full scale, or some other indirect representation. Most Agilent power supplies use the industry standard programming language, SCPI (Standard Commands for Programmable Instruments). Once these commands are learned for one instrument, programming any instrument is easy.

6

Can you find the information you need in the manual?
Complete programming, operating, and service documentation is available for each Agilent power supply.

7

Is the power supply flexible enough to meet your changing needs?
Agilent offers many choices for system configuration. These include a mainframe with easily removable modules, full-featured single-output power supplies, and preconfigured multiple-output power supplies. Power supply outputs can be connected in series and parallel to further increase product flexibility. These GPIB power supplies can also be controlled without a computer connected for easy system testing and troubleshooting.

8

Will you need additional GPIB interfaces?
Agilent multiple-output power supplies and modular power systems both use one GPIB address per mainframe. Most Agilent power supplies also are equipped with Agilent's serial link. This allows up to 16 power supply outputs to be programmed from one GPIB address.

Selecting a System Power Supply (Continued)

9

How well is your load protected from potential failure?
In addition to overvoltage, overcurrent and overtemperature protection, Agilent power supplies offer hard-wired remote shutdown of the system independent of the GPIB. A user-defined fault condition anywhere in the system can trigger an alarm or shut down the power supply via the DFI/RI port.

10

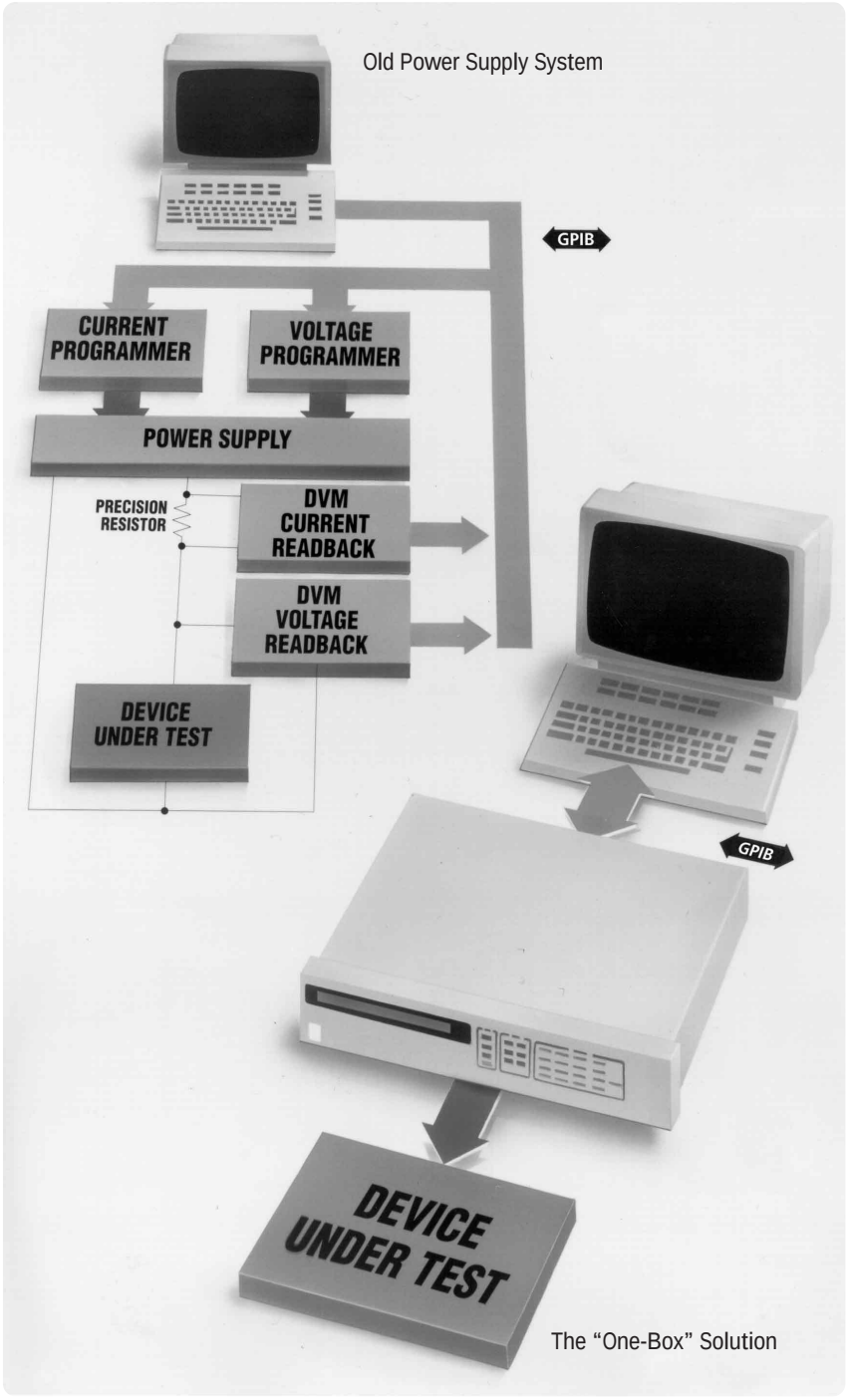
How easy is it to verify proper operation?
Agilent power supplies perform self-test at turn-on, with additional diagnostics available on program command. Some can even be calibrated without removing them from the rack.

11

How dependable is the power supply?
Agilent power supplies are subjected to extensive testing in grueling environmental conditions. This means that they will perform consistently and reliably in your most demanding application.

12

Where is the nearest sales and service office?
With hundreds of sales and service offices worldwide, Agilent provides extensive support when and where you need it. Please refer to the back cover of this catalog for the location nearest you.



Application Index

The models indicated for each application area in the table below are particularly suitable for that application. However, other Agilent models might also be useful for a given requirement.

Aerospace / defense	Automotive	Battery-powered products testing	Burn-in	Communications systems	Component testing	Computer systems	Consumer products testing	Electronic assembly testing	ac Mains Disturbance Testing	Opto-electronic	Power supply testing	Battery forming	Simulate electrical characteristics of solar arrays	UPS Testing	Wireless communications testing	Agilent Model No.	Page No.
●																6010A-6015A	52
●			●													6030A-6038A	53
	●			●												6541A-6545A	31
	●			●												6551A-6555A	36
	●			●												6571A-6575A	45
		●		●	●		●									6611C-6614C	25
				●			●									6621A-6624A, 6627A	55
				●				●								6625A, 6626A, 6628A, 6629A	57
		●		●			●									6631B-6634B	27
●	●		●		●		●									6641A-6645A	29
●	●		●		●		●									6651A-6655A	33
●	●		●		●		●									6671A-6675A	39
●		●														6680A-6684A	48
●		●														6690A- 6692A	50
●				●	●	●	●	●		●			●			6811B-6813B	86
●	●		●		●		●									66000A	59
		●												●		66309B/D, 66311B/D, 66332A 66319B/D, 66321B/D	63
				●			●									E3610A-E3617	16
				●			●									E3620A, E3630A	18
				●			●									E3631A	19
	●	●		●	●		●									E3632A-E3634A	20
		●		●	●		●								●	E3640A-E3645A	22
		●		●	●		●									E3646A-E3649A	23
													●			E4350B, E4351B	69
			●												●	E4356A	43
												●				E4370A-E4375A	74
		●	●		●					●						N3300A-N3307A	76
					●				●							N3280A	71

Selection Index

Maximum Volts	Maximum Amps	Maximum Watts	Number of Outputs	GPIB	Model Number	Type	Page Number
3.3	1000	3300	1	*	**6680A-J04**	Performance	48
5	875	4400	1	*	**6680A**	Performance	48
5.7	20	100	up to 8	*	**66101A-J03**	Performance	60
6	2.5	15	3		**E3630A**	Basic	18
6	5	30	3	*	**E3631A**	Basic	19
6	60	360	1		**6551A-J03**	Performance	37
6	60	360	1		**6651A-J03**	Performance	34
6.7	30	200	1	*	**6033A**	Autoranging	53
7	0.015	0.11	2	*	**6625A**	Performance	57
7	0.015	0.11	4	*	**6626A**	Performance	57
7	5	35	3	*	**6623A**	Performance	55
7	5	35	4	*	**6624A**	Performance	55
7	10	70	2	*	**6621A**	Performance	55
7	10	70	3	*	**6623A**	Performance	55
7	120	840	1		**6011A**	Autoranging	52
7	120	1000	1	*	**6031A**	Autoranging	53
8	3	24	1	*	**E3640A**	Basic	22
8	3	24	2	*	**E3646A**	Basic	23
8	3	30	1		**E3610A**	Basic	16
8	5	40	1	*	**6611C**	Performance	25
8	5	40	1	*	**E3642A**	Basic	22
8	5	40	2	*	**E3648A**	Basic	23
8	6	48	1		**E3614A**	Basic	16
8	10	80	1	*	**6631B**	Performance	27
8	8	80	1	*	**E3644A**	Basic	22
8	16	128	up to 8	*	**66101A**	Performance	59
8	20	160	1		**6541A**	Performance	26
8	20	160	1	*	**6641A**	Performance	29
8	20	160	1	*	**E3633A**	Basic	20
8	50	400	1		**6551A**	Performance	36
8	50	400	1	*	**6651A**	Performance	33
8	220	1760	1		**6571A**	Performance	45

Selection Index (Continued)

Maximum Volts	Maximum Amps	Maximum Watts	Number of Outputs	GPIB	Model Number	Type	Page Number
8	220	1760	1	*	**6671A**	Performance	39
8	580	4600	1	*	**6681A**	Performance	48
10	5	50	1	*	**6611C-J05**	Performance	25
10	50	500	1		**6551A-J01**	Performance	37
10	50	500	1	*	**6651A-J01**	Performance	33
10	200	2000	1		**6571A-J04**	Performance	46
10	200	2000	1	*	**6671A-J04**	Performance	40
+/-10.25	+/-0.5125	5.5	4	*	**N3280A**	Component Test	71
12	1.5	18	2	*	**66309B**	Mobile Communications	63
12	1.5	18	2	*	**66309D**	Mobile Communications	63
12	1.5	18	2	*	**66319B**	Mobile Communications	63
12	1.5	18	2	*	**66319D**	Mobile Communications	63
12	12	150	up to 8	*	**66101A-J05**	Performance	60
13	15.3	200	1		**6541A-J04**	Performance	32
13	15.3	200	1	*	**6641A-J04**	Performance	30
14	150	2000	1		**6571A-J03**	Performance	45
14	150	2000	1	*	**6671A-J03**	Performance	40
15	2	30	1		**E3610A**	Basic	16
15	3	45	2	*	**66309B**	Mobile Communications	63
15	3	45	2	*	**66309D**	Mobile Communications	63
15	3	45	1	*	**66311B**	Mobile Communications	63
15	3	45	1	*	**66311D**	Mobile Communications	63
15	3	45	2	*	**66319B**	Mobile Communications	63
15	3	45	2	*	**66319D**	Mobile Communications	63
15	3	45	2	*	**66321B**	Mobile Communications	63
15	3	45	2	*	**66321D**	Mobile Communications	63
15	7	105	1	*	**E3632A**	Basic	20
15	10	150	up to 8	*	**66102A-J05**	Performance	60
15	120	1800	1		**6571A-J17**	Performance	46
15	120	1800	1	*	**6671A-J17**	Performance	40
15	440	6600	1	*	**6690A**	Performance	50
16	0.2	3.2	2	*	**6625A**	Performance	57
16	0.2	3.2	4	*	**6626A**	Performance	57
16	0.2	3.2	2	*	**6628A**	Performance	57

Selection Index (Continued)

Maximum Volts	Maximum Amps	Maximum Watts	Number of Outputs	GPIB	Model Number	Type	Page Number
16	0.2	3.2	4	*	**6629A**	Performance	57
17	30	510	1	*	**6651A-J09**	Performance	34
20	0.5	10	3		**E3630A**	Basic	18
20	1.5	30	1		**E3611A**	Basic	16
20	1.5	30	1	*	**E3640A**	Basic	22
20	1.5	30	2	*	**E3646A**	Basic	23
20	2	40	1	*	**6612C**	Performance	25
20	2	40	3	*	**6623A**	Performance	55
20	2	40	4	*	**6624A**	Performance	55
20	2	40	4	*	**6627A**	Performance	55
20	2.5	50	1	*	**E3642A**	Basic	22
20	2.5	50	2	*	**E3648A**	Basic	23
20	3	60	1		**E3615A**	Basic	17
20	4	80	2	*	**6621A**	Performance	55
20	4	80	2	*	**6622A**	Performance	55
20	4	80	3	*	**6623A**	Performance	55
20	4	80	1	*	**E3644A**	Basic	22
20	5	100	1	*	**6632B**	Performance	27
20	5	100	1	*	**66332A**	Mobile Communications	63
20	7.5	150	up to 8	*	**66102A**	Performance	59
20	10	200	1	*	**6033A**	Autoranging	53
20	10	200	1	*	**6038A**	Autoranging	53
20	10	200	1		**6542A**	Performance	31
20	10	200	1	*	**6642A**	Performance	29
20	10	200	1	*	**E3633A**	Basic	20
20	15	300	1	*	**6651A-J09**	Performance	34
20	25	500	1		**6552A**	Performance	36
20	25	500	1	*	**6652A**	Performance	33
20	50	1000	1		**6011A**	Autoranging	52
20	50	1000	1		**6012B**	Autoranging	52
20	50	1000	1	*	**6031A**	Autoranging	53
20	50	1000	1	*	**6032A**	Autoranging	53
20	100	2000	1		**6572A**	Performance	45
20	100	2000	1	*	**6672A**	Performance	39
21	240	5000	1	*	**6682A**	Performance	48
24	6	100	up to 8	*	**66103A-J12**	Performance	61
24	85	2000	1	*	**6672A-J04**	Performance	40
25	1	25	2		**E3620A**	Basic	18
25	1	25	3	*	**E3631A**	Basic	19
25	7	160	1	*	**E3634A**	Basic	20
25	7	175	1	*	**E3634A**	Basic	20
27	20	540	1	*	**6652A-J03**	Performance	34

Selection Index (Continued)

Maximum Volts	Maximum Amps	Maximum Watts	Number of Outputs	GPIB	Model Number	Type	Page Number
28	5	140	up to 8	*	**66103A-J09**	Performance	61
30	3.3	100	1	*	**66332A-J01**	Mobile Communications	63
30	4	120	1	*	**E3632A**	Basic	20
30	17.5	500	1	*	**6653A-J17**	Performance	34
30	17.5	525	1		**6553A-J17**	Performance	37
30	220	6600	1	*	**6691A**	Performance	50
32	160	5100	1	*	**6683A**	Performance	48
35	0.8	28	2	*	**E3647A**	Basic	23
35	0.85	30	1		**E3611A**	Basic	16
35	0.8	30	1	*	**E3641A**	Basic	22
35	1.25	40	up to 8	*	**66105A-J01**	Performance	61
35	1.4	49	2	*	**E3649A**	Basic	23
35	1.4	50	1	*	**E3643A**	Basic	22
35	1.7	60	1		**E3616A**	Basic	17
35	3	80	3	*	**6623A-J03**	Performance	55
35	2.2	80	1	*	**E3645A**	Basic	23
35	4.5	150	up to 8	*	**66103A**	Performance	59
35	6	210	1		**6543A**	Performance	31
35	6	210	1	*	**6643A**	Performance	29
35	15	525	1		**6553A**	Performance	36
35	15	525	1	*	**6653A**	Performance	33
35	60	2100	1		**6573A**	Performance	45
35	60	2100	1	*	**6673A**	Performance	39
37	4	150	up to 8	*	**66103A-J01**	Performance	60
37.5	45	1690	1		**6573A-J03**	Performance	46
37.5	45	1690	1	*	**6673A-J03**	Performance	40
40	3.6	100	up to 8	*	**66103A-J02**	Performance	60
40	5	200	1	*	**6643A-J11**	Performance	30
40	12.5	500	1		**6553A-J04**	Performance	37
40	12.5	500	1	*	**6653A-J04**	Performance	34
40	30	1200	1		**6012B**	Autoranging	52
40	50	2000	1		**6573A-J08**	Performance	46
40	50	2000	1	*	**6673A-J08**	Performance	41
40	128	5100	1	*	**6684A**	Performance	48
43.5	11	480	1	*	**E4350B-J04**	Performance	70
50	0.5	25	2	*	**6625A**	Performance	57
50	0.5	25	4	*	**6626A**	Performance	57
50	0.8	40	3	*	**6623A**	Performance	55
50	0.8	40	4	*	**6624A**	Performance	55
50	0.8	40	4	*	**6627A**	Performance	55
50	1	50	1	*	**6613C**	Performance	25
50	1	50	2	*	**6625A**	Performance	57

Selection Index (Continued)

Maximum Volts	Maximum Amps	Maximum Watts	Number of Outputs	GPIB	Model Number	Type	Page Number
50	1	50	4	*	**6626A**	Performance	57
50	1	50	2	*	**6628A**	Performance	57
50	1	50	4	*	**6629A**	Performance	57
50	2	80	2	*	**6622A**	Performance	55
50	2	100	1	*	**6633B**	Performance	27
50	4	200	1	*	**E3634A**	Basic	20
50	4	200	1		**E3634A**	Basic	20
50	10	500	1	*	**6554A-J05**	Performance	38
50	10	500	1		**6654A-J05**	Performance	35
50	42	2000	1	*	**6574A-J07**	Performance	46
50	42	2000	1	*	**6674A-J07**	Performance	41
51.8	10	518	1	*	**E4350B-J03**	Solar Array Simulator	70
54	9.6	480	1	*	**E4350B-J01**	Solar Array Simulator	69
55	3	165	1	*	**66104A-J09**	Performance	61
56	38	2000	1		**6574A-J03**	Performance	46
56	38	2000	1	*	**6674A-J03**	Performance	41
60	0.5	30	1		**E3612A**	Basic	16
60	0.5	30	1	*	**E3641A**	Basic	22
60	0.5	30	2	*	**E3647A**	Basic	23
60	0.8	48	2	*	**E3649A**	Basic	23
60	0.8	50	1	*	**E3643A**	Basic	22
60	1	60	1		**E3617A**	Basic	17
60	1.3	80	1	*	**E3645A**	Basic	23
60	2.5	150	up to 8	*	**66104A**	Performance	59
60	3.3	200	1	*	**6038A**	Autoranging	53
60	3.5	210	1		**6544A**	Performance	31
60	3.5	210	1	*	**6644A**	Performance	29
60	9	540	1		**6554A**	Performance	36
60	9	540	1	*	**6654A**	Performance	33
60	17	1020	1		**6010A**	Autoranging	52
60	17.5	1050	1		**6012B**	Autoranging	52
60	17	1200	1	*	**6030A**	Autoranging	53
60	17.5	1200	1	*	**6032A**	Autoranging	53
60	35	2100	1		**6574A**	Performance	45
60	35	2100	1	*	**6674A**	Performance	39
60	110	6600	1	*	**6692A**	Performance	50
65	8	480	1	*	**E4350B**	Solar Array Simulator	69
68	7	480	1	*	**E4350B-J06**	Solar Array Simulator	70
70	3	200	1	*	**6644A-J09**	Performance	30
70	3	200	1	*	**6544A-J09**	Performance	32

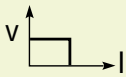
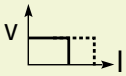
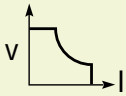
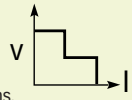
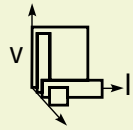
Selection Index (Continued)

Maximum Volts	Maximum Amps	Maximum Watts	Number of Outputs	GPIB	Model Number	Type	Page Number
70	7.5	500	1		**6554A-J04**	Performance	38
70	7.5	500	1	*	**6654A-J04**	Performance	35
80	6	480	1		**6554A-J12**	Performance	38
80	6	500	1	*	**6654A-J12**	Performance	35
86	6	516	1	*	**E4350B-J02**	Solar Array Simulator	69
100	0.5	50	1	*	**6614C**	Performance	25
100	1	100	1	*	**6634B**	Performance	27
100	22	2000	1		**6575A-J08**	Performance	47
100	22	2000	1	*	**6675A-J08**	Performance	42
110	20	2000	1		**6575A-J09**	Performance	47
110	20	2000	1	*	**6675A-J09**	Performance	42
120	0.25	30	1		**E3612A**	Performance	16
120	1.25	150	up to 8	*	**66105A**	Performance	59
120	1.5	180	1		**6545A**	Performance	31
120	1.5	180	1	*	**6645A**	Performance	29
120	4.5	540	1		**6555A**	Performance	36
120	4	540	1	*	**6655A**	Performance	33
120	18	2160	1		**6575A**	Performance	45
120	18	2160	1	*	**6675A**	Performance	39
130	4	480	1	*	**E4351B**	Solar Array Simulator	69
135	16	2000	1		**6575A-J06**	Performance	47
135	16	2000	1	*	**6675A-J06**	Performance	41
150	1.2	150	1		**6545A-J05**	Performance	32
150	1.2	150	1	*	**6645A-J05**	Performance	30
150	3.2	500	1	*	**6655A-J05**	Performance	35
150	15	2000	1	*	**6675A-J11**	Performance	42
150	15	2250	1		**6575A-J11**	Performance	47
156	3	500	1		**6555A-J10**	Performance	38
156	3	500	1	*	**6655A-J10**	Performance	35
160	13	2000	1		**6575A-J04**	Performance	47
160	13	2000	1	*	**6675A-J04**	Performance	41
170	1	170	1	*	**6645A-J06**	Performance	30
200	0.75	150	up to 8	*	**66106A**	Performance	59
200	5	1000	1		**6010A**	Autoranging	52
200	2	1000	1		**6015A**	Autoranging	52
200	5	1000	1	*	**6035A**	Autoranging	53
200	5	1200	1	*	**6030A**	Autoranging	53
200	11	2000	1		**6575A-J07**	Performance	47
200	11	2000	1	*	**6675A-J07**	Performance	42
500	2	1000	1		**6015A**	Autoranging	52
500	2	1000	1	*	**6035A**	Autoranging	53

Feature Description Index

		6030 Series Autorangers	6610 & 6630 Series Single-Output	6620 Series Multiple-Output	6620 Series Precision Multiple-Output	6640 & 6650 Series Single-Output	6670-6690 Series Single-Output	66000 Modular Power Systems	66300 Series Mobile Communications	E3630 & E3640 Series Single & Multiple-Output	N3280A Precision Multiple-Output
dc Range	Max Power	200 W - 1000 W	40 W - 100 W	40 W & 80 W	25 W & 50 W	200 W - 500 W	2000 W - 6600 W	1200 W	40 W- 100 W	30 W - 200 W	5 W
	Max Voltage	500 V	100 V	50 V	50 V	120 V	120 V	200 V	20 V	60 V	10 V
	Max Current	120 A	10 A	10 A	2 A	50 A	875 A	16 A	5 A	20 A	0.5 A
	Page	53	25, 27	55	57	29, 33	39, 48, 50	59	63	18, 22	71
Configuration Features											
"One-box" solution To preserve rack space and interconnections, the voltage and current programmers, current shunt, and DVM are built-in to one package.		●	●	●	●	●	●	●	●	●	●
Modular power system (multiple reconfigurable outputs) Up to 8 modules can be installed into a mainframe, and configuration can be changed at any time.								●			
Multiple non-reconfigurable outputs Up to four outputs are included in one package, and they share one GPIB address.				●	●				66309 B/D 66319 B/D	●	●
Serial link Up to 16 power supply outputs can share one GPIB address when connected with a telephone style cable.		●				●	●	●			
Relay connect, disconnect, & polarity reversal Optionally integrated with the power supply								●	● 66332A Only		
Auto-parallel, auto-series, parallel, and series operation When connected in auto-parallel or auto-series, only one unit has to be programmed to take advantage of the full power from all. **AP**=auto-parallel **AS**=auto-series **S**=series **P**=parallel		S AP		S P up to 2 identical outputs	S P up to 2 identical outputs	S AP	S AP	S, P		S, P	
Analog programming and monitoring ports Analog programming ports allow the power supply to be used as a power amplifier, responding to an external voltage signal. Monitoring ports allow an external DMM to monitor the power-supply outputs.		●				●	●				

Feature Description Index (Continued)

		6030 Series Autorangers	6610 & 6630 Series Single-Output	6620 Series Multiple-Output	6620 Series Precision Multiple-Output	6640 & 6650 Series Single-Output	6670-6690 Series Single-Output	66000 Modular Power Systems	66300 Series Mobile Communications	E3630 & E3640 Series Single & Multiple-Output	N3280A Precision Multiple-Output
dc Range	**Max Power**	200 W - 1000 W	40 W - 100 W	40 W & 80 W	25 W & 50 W	200 W - 500 W	2000 W - 6600 W	1200 W	40 W-100 W	30 W - 200 W	5 W
	Max Voltage	500 V	100 V	50 V	50 V	120 V	120 V	200 V	20 V	60 V	10 V
	Max Current	120 A	10 A	10 A	2 A	50 A	875 A	16 A	5 A	20 A	0.5 A
	Page	53	25, 27	55	57	29, 33	39, 48, 50	59	63	18, 22	71
Output Voltage and Current Range Changing											
Single Range The output voltage is limited by a single maximum value. The output current is limited by a single maximum value. 			•			•	•	•			
Single Range + Peak Current Pulse A limited amplitude and limited width current pulse can be sourced beyond the maximum static current limit. 									•		
Autoranging A wide, continuous range of voltage and current combinations are available automatically at the maximum power level. 		•									
Multiple-output range changing Automatic range changing gives maximum power to two different voltage and current combinations. 				•	•					•	
Precision multiple-output range changing Voltage and current ranges can be chosen independently to provide greater resolution. 					•						
Performance Characteristics											
Output ripple and noise (Peak-to-peak, 20 Hz to 20 MHz)		30 - 160 mV	3 mV (10 mV to 25 mV in fast mode)	3 mV	3 mV	3 mV-7 mV	7 mV-25 mV	5-50 mV	3-10 mV	2-8 mV	4 mV
Output programming response time Rise and fall time with full resistive load (10 to 90% and 90 to 10%) Does not include command processing time.		200 W: (100 ms - 200 ms) 1000 W: (300 ms - 2000 ms)	2 ms (0.4 ms in fast mode)	2-6 ms	6 ms	15 ms	9 ms-195 ms	20 ms-50 ms	0.4 ms-2 ms	60 ms	150 µs
Programming resolution (percent of full scale)		0.025%	0.025%	0.03%	0.007%	0.025%	0.025%	0.03%	0.025%	0.025%/ 0.007%	0.003%

Feature Description Index (Continued)

		6030 Series Autorangers	6610 & 6630 Series Single-Output	6620 Series Multiple-Output	6620 Series Precision Multiple-Output	6640 & 6650 Series Single-Output	6670-6690 Series Single-Output	66000 Modular Power Systems	66300 Series Mobile Communications	E3630 & E3640 Series Single & Multiple-Output	N3280A Precision Multiple-Output
dc Range	Max Power	200 W - 1000 W	40 W - 100 W	40 W & 80 W	25 W & 50 W	200 W - 500 W	2000 W - 6600 W	1200 W	40 W- 100 W	30 W - 200 W	5 W
	Max Voltage	500 V	100 V	50 V	50 V	120 V	120 V	200 V	20 V	60 V	10 V
	Max Current	120 A	10 A	10 A	2 A	50 A	875 A	16 A	5 A	20 A	0.5 A
	Page	53	25, 27	55	57	29, 33	39, 48, 50	59	63	18, 22	71
GPIB Programming Features											
GPIB programming of voltage and current Self-documenting programming commands mean that programming is done in units of volts and amps, not in percentages or binary representations.		●	●	●	●	●	●	●	●	●	●
Measured voltage and current read-back over the GPIB The output is read back in units of volts and amps.		●	●	●	●	●	●	●	●	●	●
Store-recall states Complete operating states can be stored in nonvolatile memory. Each state specifies not only the output voltage and current, but also many of the programmable protection features.											
	Number nonvolatile states (One of these states is automatically accessed on turn-on)	0	4	0	4	5	6670-5 6680-4 6690-4	5	4	5	0
	Number volatile states	16/5	0	10	7	0	0	5	0	0	0
Standard Commands for Programmable Instruments (SCPI) SCPI is the standard language for test and measurement equipment. Standard codes make a software writing and maintenance more efficient. For example, using this standard, the output voltage of the power supply is measured with the same command (MEASURE: VOLTAGE?) by either a DMM or a power supply.		●	●			●	●	●	●	●	●
Protection Features											
GPIB programmable overvoltage protection Can be enabled to quickly down-program the output and set SRQ and/or DFI/RI. **T** = Can generate trigger. **M** = Overvoltage, the level is set manually with a front-panel control.		M	●	T	T	●	●	T	●	●	●
GPIB programmable overcurrent protection Can be enabled to quickly down-program the output and set SRQ and/or DFI/RI. **T** = Can generate trigger.		●	●	●	●	●	●	T	●	E3630 only	●
Overtemperature protection Will down-program the output and can be enabled to set SRQ and/or DFI. **T** = Can generate trigger.		●	●	●	●	●	●	T	●		●

Feature Description Index (Continued)

		6030 Series Autorangers	6610 & 6630 Series Single-Output	6620 Series Multiple-Output	6620 Series Precision Multiple-Output	6640 & 6650 Series Single-Output	6670-6690 Series Single-Output	66000 Modular Power Systems	66300 Series Mobile Communications	E3630 & E3640 Series Single & Multiple-Output	N3280A Precision Multiple-Output
dc Range	Max Power	200 W - 1000 W	40 W - 100 W	40 W & 80 W	25 W & 50 W	200 W - 500 W	2000 W - 6600 W	1200 W	40 W- 100 W	30 W - 200 W	5 W
	Max Voltage	500 V	100 V	50 V	50 V	120 V	120 V	200 V	20 V	60 V	10 V
	Max Current	120 A	10 A	10 A	2 A	50 A	875 A	16 A	5 A	20 A	0.5 A
	Page	53	25, 27	55	57	29, 33	39, 48, 50	59	63	18, 22	71
Protection Features (Continued)											
Discrete fault indicator / remote inhibit (DFI / RI) Using these digital ports, power supplies can be connected independently of the GPIB. If any one experiences an error condition (overvoltage, for example), it can signal the other units to also downprogram their outputs. **O** = Optional		●	●	O	O	●	●	●	●		
SRQ Almost any fault condition or change of state of the power supply can be enabled to generate an SRQ. This signals the computer to take the appropriate action.		●	●	●	●	●	●	●	●		●
Local lockout Front-panel or keyboard control can be disabled. This keepsunauthorized operators from changing the programmed states.		●	●	●	●	●	●	●	●	●	
Fan-speed control Controls the fan-speed to provide only the required cooling, reducing unnecessary acoustic noise. **O** = Optional			●			●	●	●	●	●	
Active down-programming Active circuits quickly drain the energy from the output when unit is programmed to a lower voltage. This means that a unit under test can be safely removed from its test fixture without danger of arcing. **F** = Full-rated output current **P** = Less than 100% rated output current		P	6610-P 6630-F	F	F	P	P	P	P		
Maintenance Features											
Electronic calibration in the rack Calibration requires no internal adjustments.			●	●	●	●	●	●	●	●	●
Calibration security Units can be protected from accidental access to calibration routines by either a password (P) or an internal jumper (J) or switch (s).			P, S	J	J	P, J	P, J	P, S	P, S	P, J	P
Self-test Extensive self-test is triggered automatically on power-up. Additional tests can be initialed by user programming or front-panel control.		●	●	●	●	●	●	●	●	●	●

*A nonvolatile status in SCPI mode only.

Basic dc Power Supplies...essential features for a tight budget

Performance dc Power Supplies...speed and accuracy for test optimization

Application Specific dc Power Supplies... Tailored solutions for specific needs

dc Electronic Loads...maximize throughput with real life loading conditions

ac Power Source / Analyzers...an integrated ac power solution

Basic dc Power Supplies

Agilent Basic dc Power Supplies are the right choice for many applications. They provide quiet, stable dc power for both manual and automatic testing, in R&D and in manufacturing environments. At their price level, they have a surprising level of capability. If you do not need the performance level and features of Agilent Performance dc Power Supplies, then choose Agilent Basic dc Power Supplies. This summary table will help you decide which family of dc power supplies best meets your needs.

Comparison Summary	Agilent Basic dc Power Supplies	Agilent Performance dc Power Supplies
Output Power	30 W-200 W	40 W-6,600 W
Number of outputs	1-3	1-8
GPIB programming and measurement speed	Moderate	Fast
Output rise / fall time	Moderate	Fast
Convenient 1/2 rack-size for bench-top use	Yes	No
Active Downprogrammer for enhanced test throughput	No	Yes
Stored wake-up state	No	Yes
Programmable Capabilities	Moderate	Extensive
Protection for the DUT	Moderate	Extensive

Single-Output: 30-60 W

E3610A-E3617A

Convenient size for bench use

Low noise and excellent regulation

Easy to use

These linear-regulated dc power supplies provide reliable and convenient dc power on a lab bench. The 10-turn pots and clear voltage and current meters allow fine adjustments to be made easily. These models are CV/CC, so they can serve as either voltage or current sources. The "CC Set" button allows the current setting to be viewed, allowing easy adjustment of a current limit. Either the positive or negative terminal may be connected to ground, creating a positive or negative voltage, or floated up to 240 V from ground.

E3610A, E3611A, E3612A
These flexible 30 watt dc power supplies have 2 ranges, providing more current at lower voltage levels.

E3614A, E3615A, E3616A, E3617A
These dc power supplies have many features normally available only in performance power supplies. Remote sensing eliminates the errors in voltage regulation due to voltage drops in the load leads. Delicate loads are protected by the overvoltage protection feature. Remote voltage signals can be used to control the power supply's output voltage and current levels.

Specifications (at 0° to 55°C unless otherwise specified)		E3610A ☎	E3611A ☎	E3612A ☎	E3614A ☎
Number of output ranges		2	2	2	1
GPIB		No	No	No	No
Output ratings[1]					
Range 1		0 to 8 V, 0 to 3 A[1]	0 to 20 V, 0 to 1.5 A[1]	0 to 60 V, 0 to 0.5 A[1]	0 to 8 V, 0 to 6 A
Range 2		0 to 15 V, 0 to 2 A[1]	0 to 35 V, 0 to 0.85 A[1]	0 to 120 V, 0 to 0.25 A[1]	—
Power (max)		30 W	30 W	30 W	48 W
Load and line regulation		0.01% + 2 mV	0.01% + 2 mV	0.01% + 2 mV	0.01% + 2 mV
Ripple and noise					
from 20 Hz to 20 MHz					
Voltage rms		200 µV	200 µV	200 µV	200 µV
peak-peak		2 mV	2 mV	2 mV	1 mV
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)			
Control mode		CV/CC	CV/CC	CV/CC	CV/CC
Meter resolution	Voltage	10 mV	100 mV	100 mV	10 mV
(minimum change using front-panel controls)	Current	10 mA	10 mA	1 mA	10 mA

☎ For 0ff-the-shelf shipment
[1]Maximum current is derated 1% per °C between 40° to 55°C.

Single-Output: 30-60 W (Continued)

Supplemental Characteristics for all model numbers

Size: E3610A-E3612A: 91 mm H x 213 mm W x 319 mm D (3.6 in x 8.4 in x 12.6 in); E3614A-E3617A: 91 mm H x 213 mm W x 373 mm D (3.6 in x 8.4 in x 14.7 in)

Weight: E3610A-E3612A: 3.8 kg (8.4 lb) net, 5.1 kg (11.3 lb) shipping; E3614A-E3617A: 5.5 kg (12.1 lb) net, 6.75 kg (14.9 lb) shipping

Warranty: Three years.

Ordering Information

Opt 0E9 90 to 110 Vac, 47 to 63 Hz (Japan only)
Opt 0EM 104 to 126 Vac, 47 to 63 Hz
Opt 0E3 207 to 253 Vac, 47 to 63 Hz
Opt 1CM rack mount kit (E3614A-E3617A only)
Opt 0L2 extra documentation package

Specifications (at 0° to 55°C unless otherwise specified)		E3615A ☎	E3616A ☎	E3617A ☎
Number of output ranges		1	1	1
GPIB		No	No	No
Output ratings[1]				
Range 1		0 to 20 V, 0 to 3 A	0 to 35 V, 0 to 1.7 A	0 to 60 V, 0 to 1 A
Range 2		—	—	—
Power (max)		60 W	60 W	60 W
Load and line regulation		0.01% + 2 mV	0.01% + 2 mV	0.01% + 2 mV
Ripple and noise				
from 20 Hz to 20 MHz				
Voltage rms		200 µV	200 µV	200 µV
peak-peak		1 mV	1 mV	1 mV
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)		
Control mode		CV/CC	CV/CC	CV/CC
Meter resolution	Voltage	10 mV (0-20 V), 100 mV (>20 V)	10 mV (0-20 V), 100 mV (>20 V)	10 mV (0-20 V), 100 mV (>20 V)
(minimum change using front-panel controls)	Current	10 mA	1 mA	1 mA

☎ For 0ff-the-shelf shipment
[1]Maximum current is derated 1% per °C between 40° to 55°C.

Multiple-Output: 35 W and 50 W

E3620A, E3630A

Convenient size for bench use

Low noise and excellent regulation

Easy to use

These linear-regulated dc power supplies provide reliable and convenient dc power on a lab bench. Voltage and current can be monitored simultaneously on the front panel meters. There is also an overload indicator for each output.

E3620A
The E3620A has two isolated, independent, CV/CL 25 volt outputs. It is easy to make precise adjustments using the 10-turn pots.

E3630A
The E3630A triple output power supply has two 20 volt outputs and one 6 volt output. The +6V output is an isolated constant-voltage/current-foldback output, and both the +20 volt output and the -20 volt output are constant-voltage/current-limit. An autotracking feature lets you use one voltage control to adjust both 20 volt outputs. These outputs track each other to within one percent, making it easy to adjust the power supply for circuits requiring balance voltages. The ±20 volt outputs are referenced together to a floating common.

Specifications (at 0° to 55°C unless otherwise specified)	E3620A ☎	E3630A ☎
Number of Outputs	2	3
GPIB	No	No
Output ratings*		
Output 1	0 to 25 V, 0 to 1 A	0 to 6 V, 0 to 2.5 A*
Output 2	0 to 25 V, 0 to 1 A	0 to +20 V, 0 to 0.5 A
Output 3	—	0 to -20 V, 0 to 0.5 A
Power (max)	50 W	35 W
Load regulation	0.01% + 2mV	0.01% + 2mV
Ripple and noise from 20 Hz to 20 MHz		
Normal mode voltage rms	350 µV	350 µV
peak-to-peak	1.5 mV	1.5 mV
Common mode current	1 µArms	1 µArms
Control mode	CV/CL	CV/CL (±20 V), CV/CL (6 V)
Meter resolution (Minimum change using front-panel controls)		
Voltage	10 mV (0-20 V), 100 mV, (>20 V)	10 mV
Current	1 mA	10 mA
Input power	115 Vac ± 10%, 47 to 63 Hz	115 Vac, ± 10%, 47 to 63 Hz

*Maximum current is derated 3.3% per °C from 40°C to 55°C
☎ For off-the-shelf shipment

Supplemental Characteristics

Size: E3620A:
213 mm W x 91 mm H x 401 mm D
(8.4 in x 3.6 in x 15.8 in)
E3630A:
213 mm W x 92 mm H x 320 mm D
(8.4 in x 3.6 in x 12.6 in)

Weight: E3620A: 5.5 kg (12.1 lbs)
E3630A: 3.8 kg (8.4 lbs)

Warranty: Three years

Ordering Information

Opt 0E9 90 to 110 Vac, 47 to 63 Hz (Japan only)
Opt 0EM 104 to 126 Vac, 47 to 63 Hz
Opt 0E3 207 to 253 Vac, 47 to 63 Hz
Opt 1CM rack mount kit
Opt 0L2 extra documentation package

Triple-Output: 80 W GPIB

E3631A

Convenient size for the R&D bench

Triple output

GPIB and RS232 for automated testing

This is the dc power supply for every engineer's or electronic technician's lab bench. It has two tracking 25 V outputs, which are together referenced to a floating common, and an isolated 6 volt output. It is easy to control from the front panel, or with industry standard SCPI commands via the GPIB or RS232. VXI*Plug&Play* drivers are available to further simplify computer control. Up to 3 complete states can be stored for later recall. The low noise, excellent regulation, and built-in voltmeter/ammeter make this reliable power supply well suited for the exacting needs of the R&D lab.

Supplemental Characteristics for all model numbers

Product Regulation: Designed to comply with UL1244, IEC 1010-1; certified with CSA 22.2
Meets requirements for CE regulation

Warranty: Three years

Size: E3631A
213 mm W x 132 mm H x 360 mm D
(8.4 in. x 5.2 in. x 14.2 in.)

Weight: E3631A
8.2 kg (18 lbs)

Specifications

(at 0° to 55°C unless otherwise specified)

	E3631A		
dc outputs			
Voltage	0 to +25 V	0 to -25 V	0 to 6 V
Current	0 to 1 A	0 to 1 A	0 to 5 A
Load regulation			
Voltage	<0.01% + 2 mV	<0.01% + 2 mV	<0.01% + 2 mV
Current	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA
Line regulation			
Voltage	<0.01% + 2 mV	<0.01% + 2 mV	<0.01% + 2 mV
Current	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA
Ripple and noise from 20 Hz to 20 MHz			
Normal-mode voltage	<350 µV rms / 2 mV p-p	<350 µV rms / 2 mV p-p	<350 µV rms / 2 mV p-p
Normal-mode current	<500 µA rms	<500 µA rms	<2 mA rms
Common-mode current	<1.5 µA rms	<1.5 µA rms	<1.5 µA rms
Programming accuracy at 25°C ±5°C			
Voltage	0.05% + 20 mV	0.05% + 20 mV	0.1% + 5 mV
Current	0.15% + 4 mA	0.15% + 4 mA	0.2% + 10 mA
Readback accuracy at 25°C ±5°C			
Voltage	0.05% + 10 mV	0.05% + 10 mV	0.1% + 5 mV
Current	0.15% + 4 mA	0.15% + 4 mA	0.2% + 10 mA
Resolution			
Program / readback	1.5 mV, 0.1 mA	1.5 mV, 0.1 mA	0.5 mV, 0.5 mA
Meter	10 mV, 1 mA	10 mV, 1 mA	1 mV, 1 mA
Transient response	50 µsec for output to recover to within 15 mV following a change in output current from full load to half load or vice versa		

☎ For off-the-shelf shipment

Ordering Information

Opt 0E9 90 to 110 Vac, 47 to 63 Hz (Japan only)
Opt 0EM 104 to 126 Vac, 47 to 63 Hz
Opt 0E3 207 to 253 Vac, 47 to 63 Hz
Opt 1CM rack mount kit
Opt 0L2 extra documentation package

Single-Output: 120 W to 200 W GPIB

E3632A-E3634A

- Convenient size for the R&D bench
- Flexibility of dual range
- GPIB and RS232 to easily automate tests
- Accurate programming and measurement

These dual range dc power supplies provide the stable, accurate, and reliable dc power that the R&D engineer needs. Like Agilent performance dc power supplies, these models are CV/CC, so they can serve as either voltage or current sources. They can be used either for manual or automated testing, and have VXI*Plug&Play* drivers to further simplify computer control.

These dc power supplies have many features to help the R&D engineer to quickly and easily bias and monitor prototype circuitry. Remote sensing eliminates the errors in voltage regulation due to voltage drops in the load leads. Delicate prototypes are protected by overvoltage and overcurrent protection features. Up to 3 frequently used operating states may be stored for later recall. The output is isolated from chassis ground.

For applications where even higher accuracy is needed, or speed must be optimized, see the Agilent 6600 Series of performance dc power supplies.

Specifications (at 0° to 55°C unless otherwise specified)	**E3632A** ☎	**E3633A** ☎	**E3634A** ☎
Number of Outputs	1	1	1
GPIB	Yes	Yes	Yes
Output ratings			
Voltage	0 to 15 V, 7 A	0 to 8 V, 20 A	0 to 25 V, 7 A
Current*	0 to 30 V, 4 A	0 to 20 V, 10 A	0 to 50 V, 4 A
Load regulation			
Voltage	<0.01% + 2 mV	<0.01% + 2 mV	<0.01% + 2 mV
Current	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA
Line regulation			
Voltage	<0.01% + 2 mV	<0.01% + 2 mV	<0.01% + 2 mV
Current	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA
Ripple and noise from 20 Hz to 20 MHz			
Normal-mode voltage	<350 µVrms / 2 mVpp	<350 µVrms / 3 mVpp	<500 µVrms / 3 mVp-p
Normal-mode current	<2 mA rms	<2 mA rms	<2 mA rms
Common-mode current	<1.5 µA rms	<1.5 µA rms	<1.5 µA rms
Programming accuracy at 25°C ±5°C			
Voltage	0.05% + 10 mV	0.05% + 10 mV	0.05% + 10 mV
Current	0.2% +10 mA	0.2% +10 mA	0.2% +10 mA
Readback accuracy at 25°C ±5°C			
Voltage	0.05% + 5 mV	0.05% + 5 mV	0.05% + 5 mV
Current	0.15% + 5 mA	0.15% + 5 mA	0.15% + 5 mA
Resolution			
Program	1 mV, 0.5 mA	1 mV, 1 mA	3 mV, 0.5 mA
Readback	0.5 mV, 0.1 mA	0.5 mV, 1 mA	1.5 mV, 0.5 mA
Meter	1 mV, 1 mA	1 mV, 1 mA (<10 A / 10 mA (≥10 A)	1 mV, 1 mA (<10 A / 10 mA (≥10 A)
Transient response	50 µsec for output to recover to within 15 mV following a change in output current from full load to half load or vice versa		

*Maximum current is derated 1% per °C from 40°C to 55°C %

☎ For off-the-shelf shipment

Single-Output: 120 W to 200 W (Continued)

Supplemental Characteristics for all model numbers

Product Regulation: Designed to comply with UL1244, IEC 61010-1; certified with CSA 22.2
Meets requirements for CE regulation

Warranty: Three years

Size: 213 mm W x 132 mm H x 348 mm D (8.4 in. x 5.2 in. x 13.7 in.)

Weight: 9.5 kg (21 lbs)

Ordering Information

Opt 0E9 90 to 110 Vac, 47 to 63 Hz (Japan only)
Opt 0EM 104 to 126 Vac, 47 to 63 Hz
Opt 0E3 207 to 253 Vac, 47 to 63 Hz
Opt 1CM rack mount kit
Opt 0L2 extra documentation package

Single & Dual Output: 30-100 W GPIB


E3640A-E3645A


E3646A-E3649A

- Convenient system wiring with front and rear panel terminals
- Flexibility of dual range
- Single or dual output
- Easy system interface with GPIB and RS232

These isolated dual range dc power supplies provide the stable and reliable dc power that the manufacturing test system designer needs. These models offer constant-voltage/constant-current outputs, so they can serve as either voltage or current sources. They can be used either for manual or automated testing, and have VXI*Plug&Play* drivers to further simplify computer control.

The E3640A Series dc power supplies can be quickly integrated into a test system. Both front and rear panel terminals are provided for easy wiring. Remote sensing eliminates the errors in voltage regulation due to voltage drops in the load leads. Delicate DUTs are protected by overvoltage protection. Up to 5 operating states can be stored for later recall.

The E3640A Series dc power supplies are intended for manufacturing test systems where moderate speed and accuracy are required. For systems which require even higher accuracy for programming or measurement, or where test throughput must be optimized, consider the Agilent 6600A Series of Performance dc Power Supplies.

Specifications (at 0° to 55°C unless otherwise specified)	**E3640A**	**E3641A**	**E3642A**	**E3643A**	**E3644A**
Number of outputs	1	1	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes
dc outputs					
Voltage Current	0 to 8 V 3 A	0 to 35 V 0.8 A	0 to 8 V 5 A	0 to 35 V 1.4 A	0 to 8 V 8 A
Voltage Current	0 to 20 V 1.5 A	0 to 60 V 0.5 A	0 to 20 V 2.5 A	0 to 60 V 0.8 A	0 to 20 V 4 A
Power (max)	30 W	30 W	50 W	50 W	80 W
Load and line regulation					
Voltage	<0.01% + 3 mV	<0.01% + 3 mV	<0.01% + 3 mV	<0.01% + 3 mV	<0.01% + 3 mV
Current	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA	<0.01% + 250 µA
Ripple and noise from 20 Hz to 20 MHz					
Normal-Mode Voltage	<500 µVrms 5 mVp-p	<1 mVrms 8 mVp-p	<500 µVrms 5 mVp-p	<1 mVrms 8 mVp-p	<500 µVrms 5 mVp-p
Normal-Mode Current	<4.0 mArms	<4.0 mArms	<4.0 mArms	<4.0 mArms	<4.0 mArms
Common-Mode Current	<1.5 µArms	<1.5 µArms	<1.5 µArms	<1.5 µArms	<1.5 µArms
Programming accuracy at 25°C ±5°C					
Voltage <0.05% +	10 mV	10 mV	10 mV	10 mV	10 mV
Current <0.2% +	10 mA	10 mA	10 mA	10 mA	10 mA
Readback accuracy at 25°C ±5°C					
Voltage <0.05% +	5 mV	5 mV	5 mV	5 mV	5 mV
Current <0.15% +	5 mA	5 mA	5 mA	5 mA	5 mA
Program resolution					
Voltage	5 mV	5 mV	5 mV	5 mV	5 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA
Readback resolution					
Voltage	2 mV	2 mV	2 mV	2 mV	2 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA
Meter resolution					
Voltage	10 mV	10 mV	10 mV	10 mV	10 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA
Transient response	<50 µsec for output to recover to within 15 mV following a change in output current from full load to half load or vice versa.				

*Maximum current is derated 1% per °C from 40°C to 55°C

Single & Dual Output: 30-100 W GPIB (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to 1 V can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Settling Time: Less than 90msec for the output voltage to change from 1% to 99% or vice versa following the receipt of VOLTage or APPLy command via direct GPIB or RS-232 interface.

Product Regulation:
Designed to comply with UL3111-1; certified to CSA 22.2 No. 1010.1; conforms to IEC 1010-1; complies with EMC directive 89/336/EEC(Group1, Class A)

OVP Accuracy: 0.5% + 0.5 V, activation time: ≥3 V, <1.5 ms, and <3 V, <10 ms

Isolation: ±240 Vdc

Stability: Voltage <0.02% + 2 mV; Current <0.1% + 1 mA

Temperature Coefficient: <0.01% + 3 mV, <0.02% + 3 mA change per °C over operating range 0-40 °C after 30 minute warm-up

Warranty Period: Three years

Size: (E3640A-E3645A)
254.4 mm W x 104 mm H x 374 mm D
(10 in. x 4.1 in. x 14.8 in.)
(E3646A-E3649A)
213 mm W x 133 mm H x 348 mm D
(8.4 in. x 5.2 in. x 13.7 in.)

Weight: E3640A, E3641A: 5.3 kg (11.7 lbs)
E3642A, E3643A: 6.2 kg (13.7 lbs)
E3644A, E3645A: 6 kg (13.2 lbs)
E3646A, E3647A: 7.4 kg (16.3 lbs)
E3648A, E3649A: 9.5 kg (20.9 lbs)

Specifications (at 0° to 55°C unless otherwise specified)	E3645A	E3646A	E3647A	E3648A	E3649A
Number of outputs	1	2	2	2	2
GPIB	Yes	Yes	Yes	Yes	Yes
dc outputs					
Voltage Current	0 to 35 V 2.2 A	0 to 8 V 3 A	0 to 35 V 0.8 A	0 to 8 V 5 A	0 to 35 V 1.4 A
Voltage Current	0 to 60 V 1.3 A	0 to 20 V 1.5 A	0 to 60 V 0.5 A	0 to 20 V 2.5 A	0 to 60 V 0.8 A
Power (max)	80 W	60 W	60 W	100 W	100 W
Load and line regulation					
Voltage <0.01% +	3 mV	3 mV	3 mV	3 mV	3 mV
Current <0.01% +	250 µA	250 µA	250 µA	250 µA	250 µA
Ripple and noise from 20 Hz to 20 MHz					
Normal-Mode Voltage	<1 mVrms 8 mVp-p	<500 µVrms 5 mVp-p	<1 mVrms 8 mVp-p	<500 µVrms 5 mVp-p	<1 mVrms 8 mVp-p
Normal-Mode Current	<4.0 mArms	<4.0 mArms	<4.0 mArms	<4.0 mArms	<4.0 mArms
Common-Mode Current	<1.5 µArms	<1.5 µArms	<1.5 µArms	<1.5 µArms	<1.5 µArms
Programming accuracy at 25°C ±5°C					
Voltage <0.05% + (<0.1% + 25 mA for output 2)	10 mV	10 mV	10 mV	10 mV	10 mV
Current <0.2% +	10 mA	10 mA	10 mA	10 mA	10 mA
Readback accuracy at 25°C ±5°C					
Voltage <0.05% + (<0.1% + 25 mV for output 2)	5 mV	5 mV	5 mV	5 mV	5 mV
Current <0.15% + (<0.15% + 10 mA for output 2)	5 mA	5 mA	5 mA	5 mA	5 mA
Program resolution					
Voltage	5 mV	5 mV	5 mV	5 mV	5 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA
Readback resolution					
Voltage	2 mV	2 mV	2 mV	2 mV	2 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA
Meter resolution					
Voltage	10 mV	10 mV	10 mV	10 mV	10 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA
Transient response	<50 µsec for output to recover to within 15 mV following a change in output current from full load to half load or vice versa.				

*Maximum current is derated 1% per °C from 40°C to 55°C

Ordering Information

Opt 0E3 207 to 253 Vac, 47 to 63 Hz
Opt 0E9 90 to 110 Vac, 47 to 63 Hz (Japan only)
Opt 0EM 104 to 126 Vac, 47 to 63 Hz
Opt 1CM Rack mount kit (E3640A-E3645A p/n5063-9240; E3646A-E3649A p/n 5063-9243)
Opt 0L2 Extra documentation package
Opt 0B0 Delete documentation

Basic dc Power Supplies...essential features for a tight budget

Performance dc Power Supplies...speed and accuracy for test optimization

Application Specific dc Power Supplies... Tailored solutions for specific needs

dc Electronic Loads...maximize throughput with real life loading conditions

ac Power Source / Analyzers...an integrated ac power solution

Performance dc Power Supplies

Agilent Performance dc Power Supplies provide the features and performance necessary to satisfy the most demanding requirements. For system designers who are striving to shorten test time and maximize production throughput, these dc power supplies will help them achieve their goals. Multiple output power supplies (up to 8 outputs in one package) reduce rack space. The advanced programmable capabilities allow for efficient system design and maintenance. Also their programming and measurement accuracy, and their DUT protection features, make them an excellent value for the R&D lab.

Comparison Summary	Agilent Basic dc Power Supplies	Agilent Performance dc Power Supplies
Output Power	30 W-200 W	40 W-6600 W
Number of outputs	1-3	1-8
GPIB programming and measurement speed	Moderate	Fast
Output rise / fall time	Moderate	Fast
Convenient 1 / 2 rack-size for bench-top use	Yes	No
Active Downprogrammer for enhanced test throughput	No	Yes
Stored wake-up state	No	Yes
Programmable Capabilities	Moderate	Extensive
Protection for the DUT	Moderate	Extensive

Single-Output: 40-50 W GPIB

6611C - 6614C

Increase production throughput with fast programming speed and fast downprogramming time

Protect valuable prototypes with fast protection features

Accurate and fast built-in measurement system

This series of linear-regulated 40-50 W dc power supplies is designed to maximize the throughput of DUTs through the manufacturing test process with fast programming and measurement, and also active downprogramming. It offers many advanced programmable features including stored states and status reporting. Programming is done using industry standard SCPI commands via the GPIB or RS-232. Test system integration is further simplified by using the VXI*Plug&Play* drivers. The optional relays simplify system design and troubleshooting.

The half-rack size of the 6610A series makes it a convenient dc power supply for the R&D lab bench. The built-in microamp measurement system helps the engineer to easily and accurately monitor the output voltage and current without a complicated test setup.

Specifications (at 0° to 55°C unless otherwise specified)		6611C	6612C	6613C	6614C	6611C-J05 Special Order Option
Number of outputs		1	1	1	1	1
GPIB		Yes	Yes	Yes	Yes	Yes
Output Ratings						
Voltage		0 to 8 V	0 to 20 V	0 to 50 V	0 to 100 V	0 to 10 V
Current		0 to 5 A	0 to 2 A	0 to 1 A	0 to 0.5 A	0 to 5 A
Programming accuracy (at 25°C ±5°C)						
Voltage		5 m V	10 m V	20 m V	50 m V	5 m V
+Current	0.05% +	2 m A	1 m A	0.75 m A	0.5 m A	2 m A
Ripple and noise 20 Hz to 20 MHz, with outputs ungrounded or with either terminal grounded						
Voltage	rms	0.5 mV	0.5 mV	0.5 mV	0.5 mV	0.5 mV
	peak -to-peak	3 mV	3 mV	4 mV	5 mV	3 mV
Normal mode	rms	2 mA	1 mA	1 mA	1 mA	2 mA
dc measurement accuracy via GPIB or front-panel meters respect to actual outputat 25°C ±5°C						
Voltage	0.03% +	2 mV	3 mV	6 mV	12 mV	2 mV
Low current range	-20 mA to + 20 mA 0.1% +	2.5 µA	2.5 µA	2.5 µA	2.5 µA	2.5 µA
High current range	+20 mA to + rated 1 0.2% +	0.5 mA	0.25 mA	0.2 mA	0.1 mA	0.5 mA
	-20 mA to - rated 1 0.2% +	1.1 mA	0.85 mA	0.8 mA	0.7 mA	1.1 mA
Load regulation						
Voltage		2 mV	2 mV	4 mV	5 mV	2 mV
Current		1 mA	0.5 mA	0.5 mA	0.5 mA	1 mA
Line regulation						
Voltage		0.5 mV	0.5 mV	1 mV	1 mV	0.5 mV
Current		0.5 mA	0.5 mA	0.25 mA	0.25 mA	0.5 mA
Transient response time Less than 100 µs for the output to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of the output current rating of the supply						
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)				
Average programming resolution						
Voltage		2 mV	5 mV	12.5 mV	25 mV	3 mV
Current		1.25 mA	0.5 mA	0.25 mA	0.125 mA	1.25 mA
Sink current		3 A	1.2 A	0.6 A	0.3 A	3 A

Single-Output: 40-50 W GPIB (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc maximum from chassis ground

Remote Sensing: Up to two volts dropped in each load lead. Add 2 mV to the voltage load regulation specification for each one volt change in the postive output lead due to load current change.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital date is 4 ms for the power supplies connected directly to the GPIB.

Output Programming Response Time: The rise and fall time (10/90% and 90/10%) of the output voltage is less than 2 ms. The output voltage change settles within 1 LSB (0.025% x rated voltage) of final value in less than 6 ms.

GPIB Interface Capabilities: IEEE-488.2, SCPI command set, and 6630A Series programming compatability

Input Power: (full load): 1.6 A, 100 W (6611C: 2.2 A, 120 W)

Regulatory Compliance: Complies with EMC directive 89/336/EEC (ISM 1B).

Warranty Period: Three years

Size: 212.8 mm W x 88.1 mm H x 368.3 mm D (8.4 in x 3.5 in x 14.5 in)
See page 102 for more details

Weight: 8.2 kg (18.16 lb) net; 10.6 kg (23.5 lb) shipping

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz

Opt 120 104 to 127 Vac, 47 to 63 Hz

Opt 220 191 to 233 Vac, 47 to 63 Hz

Opt 230 207 to 253 Vac, 47 to 63 Hz

Opt 760 Isolation and Reversal relays

* **Opt ICM** Rack-mount Kit (p/n 5063-9240)

* **Opt AXS** Rack-mount Kit side-by-side mounting of two units, Lock-link Kit p/n 5061-9694; Flange Kit p/n 5062-3974

Opt 0L2 Additional standard documentation package

Opt 0B3 Service Manual

*Support rails required

Accessories

Rack-mount and slide for two side-by-side units of different lengths p/n 1494-0015, 5063-9255 and filler panel 5002-3999

Rack-mount slide and support for one instrument p/n 1494-0015, 5063-9255 and filler panel 5002-3999

E3663AC Support rails for Agilent rack cabinets

Single-Output: 80-100 W GPIB

6631B - 6634B

Increase production throughput with fast programming speed

Active downprogrammer sinks the full rated current

Protect valuable prototypes with fast protection features

Accurate and fast built-in measurement system

This series of linear-regulated 80-100 W dc power supplies is designed to maximize the throughput of DUTs through the manufacturing test process. Both programming and measurement are optimized for speed. The active downprogrammer can sink up to the full rated current of the power supply, which quickly brings the power supply output to zero volts. The 6630B Series offers many advanced programmable features including stored states and status reporting. Programming is done using industry standard SCPI commands via the GPIB or RS-232. Test system integration is further simplified by using the VXI*Plug&Play* drivers. The optional relays simplify system design and troubleshooting.

The optional front panel binding posts make the 6630B Series convenient on the R&D lab bench. The built-in microamp measurement system helps the engineer to easily and accurately monitor the output voltage and current without a complicated test setup.

Specifications

(at 0° to 55°C unless otherwise specified)

			6631B	6632B	6633B	6634B
Number of outputs			1	1	1	1
GPIB			Yes	Yes	Yes	Yes
Output ratings						
Voltage			0 to 8 V	0 to 20 V	0 to 50 V	0 to 100 V
Current			0 to 10 A	0 to 5 A	0 to 2 A	0 to 1 A
Programming accuracy at 25°C ±5°C						
Voltage			5 mV	10 mV	20 mV	50 mV
+ Current		0.05% +	4 mA	2 mA	1 mA	0.5 mA
Ripple and noise (20 Hz to 20 MHz, with outputs ungrounded or with either terminal grounded)						
Voltage Normal mode		rms	0.3 mV	0.3 mV	0.5 mV	0.5 mV
		peak-to-peak	3 mV	3 mV	3 mV	3 mV
Fast mode		rms	1 mV	1 mV	1 mV	2 mV
		peak-to-peak	10 mV	10 mV	15 mV	25 mV
Current		rms	3 mA	2 mA	2 mA	2 mA
dc measurement accuracy via GPIB or front panel meters with respect to actual output at 25°C ±5°C						
Voltage		0.03% +	2 mV	3 mV	6 mV	12 mV
Low current range	–20 mA to +20 mA	0.1% +	2.5 µA	2.5 µA	2.5 µA	2.5 µA
High current range	+20 mA to + rated I	0.2% +	1 mA	0.5 mA	0.25 mA	0.25 mA
	–20 mA to –rated I	0.2% +	1.6 mA	1.1 mA	0.85 mA	0.85 mA
Load regulation						
Voltage			2 mV	2 mV	4 mV	5 mV
Current			2 mA	1 mA	1 mA	1 mA
Line regulation						
Voltage			0.5 mV	0.5 mV	1 mV	1 mV
Current			1 mA	0.5 mA	0.25 mA	0.25 mA

Transient response time Less than 100 µs (50 µs in the fast mode) for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV) following any step change in load current of up to 50% of the output current rating of the supply.

Single-Output: 80-100 W GPIB (Continued)

Specifications

(at 0° to 55°C unless otherwise specified)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc maximum from chassis ground

Remote Sensing: Up to two volts dropped in each load lead. Add 2 mV to the voltage load regulation specification for each one volt change in the positive output lead due to load current change.

Command-Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 4 ms for the power supplies connected directly to the GPIB. (Display disabled).

Output-Programming Response Time: The rise and fall time (10/90% and 90/10%) of the output voltage is less than 2 ms (400 µs in fast mode). The output voltage change settles within 1 LSB (0.025% x rated voltage) of final value in less than 6 ms (2 ms in the fast mode).

GPIB Interface Capabilities: IEEE-488.2, SCPI command set and 6630A Series programming compatability

Measurement Time: Average time to make a voltage or current measurement is 50 ms.

Input Power (full load): 3.5 A, 250 W

Regulatory Compliance: Complies with EMC directive 89/336/EEC (ISM 1B).

Warranty Period: Three years

Size: 425.5 mm W x 88.1 mm H x 364.4 mm D (16.8 in x 3.5 in x 14.3 in). See page 103 for more information

Weight: Net, 12.7 kg (28 lb) net; 15.0 kg (33 lb) shipping

Supplemental Characteristics

(Non-warranted characteristics determined by design and useful in applying the product)

	6631B	6632B	6633B	6634B
Average programming resolution				
Voltage	2 mV	5 mV	12.5 mV	25 mV
Current	2.5 mA	1.25 mA	0.5 mA	0.25 mA
Sink current	10 A	5 A	2 A	1 A
Sink current tracking				
SCPI mode	0.4% + 4 mA	0.4% + 2 mA	0.4% + 1 mA	0.4% + 0.5 mA
Compatability mode	-500 mA	-250 mA	-100 mA	-50 mA
Minimum current in constant current mode*	40 mA	20 mA	8 mA	4 mA

*When programming in the 6630A Series language compatibility mode.

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz

Opt 120 104 to 127 Vac, 47 to 63 Hz

Opt 220 191 to 233 Vac, 47 to 63 Hz

Opt 230 207 to 253 Vac, 47 to 63 Hz

Opt 020 Front-panel Binding Posts

Opt 760 Isolation and Reversal Relays (N/A on 6631B)

* **Opt 1CM** Rack-mount Kit, p/n 5063-9212

* **Opt 1CP** Rack-mount Kit with Handles, p/n 5063-9219

Opt 0L2 Additional standard documentation package

Opt 0B3 Service Manual

* Support rails required

Accessories

p/n 1494-0060 Rack Slide Kit

E3663AC Support rails for Agilent rack cabinets

Single-Output: 200 W GPIB

6641A - 6645A

- Increase test throughput with fast up and down programming time
- Protect valuable assemblies with fast protection features
- Proven reliability
- Low ripple and noise

This series of 200 W linear-regulated dc power supplies is designed to maximize the throughput of DUTs through the manufacturing test process with fast up and down programming time.

Valuable assemblies can be destroyed by a minor component failure that can allow a surge of voltage or current to flow to the DUT. Fast protection features, including fast crowbar, mode crossover protection, and the ability to connect the protection circuitry of multiple power supplies can increase production yield.

Programming of the dc output and the protection features can be done either from the front panel or using industry standard SCPI commands, via the GPIB. Using the serial link, up to 16 power supplies can be connected through one GPIB address. Test system integration can be further simplified be using the VXI*Plug&Play* drivers. The output voltage and current can also be controlled with analog signals. This is helpful for certain types of noisy environments, and also immediate reactions to process changes.

Lab bench use is enhanced by the fan speed control, which helps to minimize the acoustic noise.

Specifications (at 0° to 55°C unless otherwise specified)		6641A	6642A	6643A	6644A	6645A
Number of outputs		1	1	1	1	1
GPIB		Yes	Yes	Yes	Yes	Yes
Output ratings						
Output voltage		0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V
Output current (40° C)		0 to 20 A	0 to 10 A	0 to 6 A	0 to 3.5 A	0 to 1.5 A
Maximum current (50° C/55° C)		18 A/17 A	9 A/8.5 A	5.4 A/5.1 A	3.2 A/3 A	1.4 A/1.3 A
Programming accuracy at 25°C ±5°C						
Voltage	0.06% +	5 mV	10 mV	15 mV	26 mV	51 mV
Current	0.15% +	26 mA	13 mA	6.7 mA	4.1 mA	1.7 mA
Ripple and noise from 20 Hz to 20 MHz						
Voltage	rms	300 µV	300 µV	400 µV	500 µV	700 µV
	peak-peak	3 mV	3 mV	4 mV	5 mV	7 mV
Current	rms	10 mA	5 mA	3 mA	1.5 mA	1 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed)						
Voltage	0.07% +	6 mV	15 mV	25 mV	40 mV	80 mV
+Current	0.15% +	18 mA	9.1 mA	5 mA	3 mA	1.3 mA
-Current	0.35% +	40 mA	20 mA	12 mA	6.8 mA	2.9 mA
Load regulation						
Voltage		1 mV	2 mV	3 mV	4 mV	5 mV
Current		1 mA	0.5 mA	0.25 mA	0.25 mA	0.25 mA
Line regualtion						
Voltage		0.5 mV	0.5 mV	1 mV	1mV	2 mV
Current		1 mA	0.5 mA	0.25 mA	0.25 mA	0.25 mA

Transient response time Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current

Supplemental Characteristics	(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution					
Voltage	2 mV	5 mV	10 mV	15 mV	30 mV
Current	6 mA	3 mA	2 mA	1.2 mA	0.5 mA
OVP	13 mV	30 mV	54 mV	93 mV	190 mV
OVP accuracy	160 mV	400 mV	700 mV	1.2 V	2.4 V

Single-Output: 200 W GPIB (Continued)

Specifications

(at 0° to 55°C unless otherwise specified)

	6641A-J04 Special Order Option	6643A-J11 Special Order Option	6644A-J09 Special Order Option	6645A-J05 Special Order Option	6645A-J06 Special Order Option
Number of Outputs	1	1	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes
Output ratings					
Output voltage	13 V	40 V	70 V	150 V	170 V
Output current (40°C)	15.3 A	5 A	3 A	1.2 A	1 A
Maximum current (50°C/55°C)	13.77 A/13 A	4.5 A/4.25 A	2.7 A/2.55 A	1.08 A/1.02 A	0.9 A/0.85 A
Programming accuracy at 25°C ±5°C					
Voltage 0.06% +	8.5 mV	17.5 mV	31 mV	65 mV	74 mV
Current 0.15% +	21 mA	6.7 mA	4.1 mA	1.7 mA	1.7 mA
Ripple and noise					
from 20 Hz to 20 MHz					
Voltage rms	300 µV	450 µV	600 µV	900 µV	1 mV
peak-peak	3 mV	3.5 mV	6 mV	9 mV	10 mV
Current rms	8 mA	3 mA	1.5 mA	1 mA	1 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed)					
Voltage 0.07% +	10 mV	30 mV	47 mV	100 mV	140 mV
+Current 0.15% +	15 mA	5 mA	3 mA	1.3 mA	1.3 mA
–Current 0.35% +	40 mA	12 mA	6.8 mA	2.9 mA	2.9 mA
Load regulation					
Voltage	1 mV	3 mV	4.5 mV	7 mV	8 mV
Current	1 mA	0.25 mA	0.25 mA	0.25 mA	0.25 mA
Line regulation					
Voltage	0.5 mV	1 mV	1.5 mV	2.5 mV	3 mV
Current	1 mA	0.25 mA	0.25 mA	0.25 mA	0.25 mA

Transient response time Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current

Supplemental Characteristics

(Non-warranted characteristics determined by design and useful in applying the product)

Average resolution					
Voltage	3.5 mV	12 mV	1.4 mV	37.5 mV	42.5 mV
Current	5 mA	2 mA	1.2 mA	0.5 mA	0.5 mA
OVP	23 mV	62 mV	110 mV	250 mV	285 mV
OVP accuracy	260 mV	800 mV	1.5 mV	3 V	3.4 V

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 20 ms for the power supplies connected directly to the GPIB

Output Programming Response Time: The rise and fall time (10/90% and 90/10%) of the output voltage is less than 15 ms. The output voltage change settles within 1 LSB (0.025% x rated voltage) of final value in less than 60 ms.

Down Programming: An active down programmer sinks approximately 20% of the rated output current

Modulation: (Analog programming of output voltage and current)
Input Signal: 0 to –5 V
Input Impedance: 10 k Ohm nominal

ac Input: (ac input frequency 47 to 63 Hz)

Voltage	100 Vac	120 Vac	220 Vac	240 Vac
Current	4.4 A	3.8 A	2.2 A	2.0 A

Input Power 480 VA, 400 W at full load; 60 W at no load

GPIB Interface Capabilities SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, E1, and C0. IEEE-488.2 and SCPI-compatible command set

Regulatory Compliance: Complies with UL 3111-1, IEC 61010-1.

Size: 425.5 mm W x 88.1 mm H x 439 mm D (16.75 in x 3.5 in x 17.3 in) See page 101 for more details.

Weight: Net, 14.2 kg (31.4 lb); shipping, 16.3 kg (36 lb)

Warranty Period: Three years

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 63 Hz
Opt 240 209 to 250 Vac, 47 to 63 Hz
* **Opt 908** Rack-mount Kit (p/n 5063-9212)
* **Opt 909** Rack-mount Kit w/ Handles (p/n 5063-9219)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No Documentation Package
* Support rails required

Accessories

p/n 1494-0060 Accessory Slide Kit
p/n 1252-3698 7-pin Analog Plug
p/n 1252-1488 4-pin Digital Plug
p/n 5080-2148 Serial Link Cable 2 m (6.6 ft)
E3663AC Support rails for Agilent rack cabinets

Single-Output: 200 W

6541A-6545A

Protect valuable assemblies with fast protection features

Proven reliability

Low ripple and noise

This reliable series of 200 W dc power supplies can be controlled either from the front panel or via an analog programming voltage. When used in a test system, the fast up and down programming helps decrease test time. Quickly reacting protection features, including fast crowbar, CV/CC mode crossover and over-voltage protection help protect your valuable assemblies from damage. The linear topology produces very low ripple and noise, which allows you to make extremely accurate measurements of the devices which you are testing.

Lab bench use is enhanced by the fan speed control, which helps to minimize the acoustic noise.

Specifications (at 0° to 55°C unless otherwise specified)		6541A	6542A	6543A	6544A	6545A
Number of outputs		1	1	1	1	1
GPIB		No	No	No	No	No
Output ratings						
Output voltage		0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V
Output current (40° C)		0 to 20 A	0 to 10 A	0 to 6 A	0 to 3.5 A	0 to 1.5 A
Maximum current (50° C/55° C)		18 A/17 A	9 A/8.5 A	5.4 A/5.1 A	3.2 A/3 A	1.4 A/1.3 A
Programming accuracy	at 25°C ±5°C					
Voltage	0.06% +	5 mV	10 mV	15 mV	26 mV	51 mV
Current	0.14% +	26 mA	13 mA	6.7 mA	4.1 mA	1.7 mA
Ripple and noise						
from 20 Hz to 20 MHz						
Voltage rms		300 µV	300 µV	400 µV	500 µV	700 µV
peak-peak		3 mV	3 mV	4 mV	5 mV	7 mV
Current rms		10 mA	5 mA	3 mA	1.5 mA	1 mA
Load regulation						
Voltage		1 mV	2 mV	3 mV	4 mV	5 mV
Current		1 mA	0.5 mA	0.25 mA	0.25 mA	0.25 mA
Line regulation						
Voltage		0.5 mV	0.5 mV	1 mV	1mV	2 mV
Current		1 mA	0.5 mA	0.25 mA	0.25 mA	0.25 mA
Transient response time		Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current				
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution						
Voltage		2 mV	5 mV	10 mV	15 mV	30 mV
Current		6 mA	3 mA	2 mA	1.2 mA	0.5 mA
OVP		13 mV	30 mV	54 mV	93 mV	190 mV
OVP accuracy		160 mV	400 mV	700 mV	1.2 V	2.4 V

Single-Output: 200 W (Continued)

Specifications

(at 0° to 55°C unless otherwise specified)

	6541A-J04 Special Order Option	6544A-J09 Special Order Option	6545A-J05 Special Order Option
Number of outputs	1	1	1
GPIB	No	No	No
Output ratings			
Output voltage	13 V	70 V	150 V
Output current (40° C)	15.3 A	3 A	1.2 A
Maximum current (50° C/55° C)	13.77 A/13 A	2.7 A/2.55 A	1.08 A/1.02 A
Programming accuracy at 25°C ±5°C			
Voltage 0.06% +	8.5 mV	31 mV	65 mV
Current 0.15% +	21 mA	4.1 mA	1.7 mA
Ripple and noise			
from 20 Hz to 20 MHz			
Voltage rms	300 µV	600 µV	900 µV
peak-peak	3 mV	6 mV	9 mV
Current rms	8 mA	1.5 mA	1 mA
Load regulation			
Voltage	1 mV	4.5 mV	7 mV
Current	1 mA	0.25 mA	0.25 mA
Line regulation			
Voltage	0.5 mV	1.5 mV	2.5 mV
Current	1 mA	0.25 mA	0.25 mA
Transient response time	Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current		
Supplemental Characteristics	(Non-warranted characteristics determined by design and useful in applying the product)		
Average resolution			
Voltage	3.5 mV	1.4 mV	37.5 mV
Current	5 mA	1.2 mA	0.5 mA
OVP	23 mV	110 mV	250 mV
OVP accuracy	260 mV	1.5 mV	3 V

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Output Programming Response Time: The rise and fall time (10/90% and 90/10%) of the output voltage is less than 15 ms. The output voltage change settles within 1 LSB (0.025% x rated voltage) of final value in less than 60 ms.

Down Programming: An active down programmer sinks approximately 20% of the rated output current

Modulation: (Analog programming of output voltage and current)
Input Signal: 0 to –5 V
Input Impedance: 10 k Ohm nominal

ac Input: (ac input frequency 47 to 63 Hz)

Voltage	100 Vac	120 Vac	220 Vac	240 Vac
Current	4.4 A	3.8 A	2.2 A	2.0 A

Input Power: 480 VA, 400 W at full load; 60 W at no load
Regulatory Compliance: Conforms to UL1244 and IEC 61010-1.

Size: 425.5 mm W x 88.1 mm H x 439 mm D (16.75 in x 3.5 in x 17.3 in)
See page 101 for more details

Weight: Net, 14.2 kg (31.4 lb); shipping, 16.3 kg (36 lb)

Warranty Period: Three years

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 63 Hz
Opt 240 209 to 250 Vac, 47 to 63 Hz
* **Opt 908** Rack-mount Kit (p/n 5063-9212)
* **Opt 909** Rack-mount Kit w/ Handles (p/n 5063-9219)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
* Support rails required

Accessories
p/n 1494-0060 Accessory Slide Kit
E3663AC Support rails for Agilent rack cabinets

Single-Output: 500 W GPIB

6651A-6655A

Increase test throughput with fast up and down programming time

Protect valuable assemblies with fast protection features

Proven reliability

Low ripple and noise

This series of 500 W linear-regulated dc power supplies is designed to maximize the throughput of DUTs through the manufacturing test process with fast up and down programming time.

Valuable assemblies can be destroyed by a minor component failure that causes a surge of current to flow into the DUT. Fast protection features, including fast crowbar, mode crossover protection, and the ability to connect the protection circuitry of multiple power supplies can increase production yield.

Programming of the dc output and the protection features can be done either from the front panel or using industry standard SCPI commands, via the GPIB. Using the serial link, up to 16 power supplies can be connected through one GPIB address. Test system integration can be further simplified be using the VXI*Plug&Play* drivers. The output voltage and current can also be controlled with analog signals. This is helpful for certain types of noisy environments, and also immediate reactions to process changes.

Lab bench use is enhanced by the fan speed control, which helps to minimize the acoustic noise.

Specifications (at 0° to 55°C unless otherwise specified)	**6651A**	**6652A**	**6653A**	**6654A**	**6655A**	**6651A-J01** Special Order Option
Number of outputs	1	1	1	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes	Yes
Output ratings						
Output voltage	0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V	10 V
Output current (40°C)	0 to 50 A	0 to 25 A	0 to 15 A	0 to 9 A	0 to 4 A	50 A
Maximum current (50°C/55°C)	45 A/42.5 A	22.5 A/21.3 A	13.5 A/12.8 A	8.1 A/7.7 A	3.6 A/3.4 A	45 A/42.5 A
Programming accuracy at 25°C ±5°C						
Voltage 0.06% +	5 mV	10 mV	15 mV	26 mV	51 mV	6 mV
Current 0.15% +	60 mA	25 mA	13 mA	8 mA	4 mA	60 mA
Ripple and noise						
from 20 Hz to 20 MHz						
Voltage rms	300 µV	300 µV	400 µV	500 µV	700 µV	300 µV
peak-peak	3 mV	3 mV	4 mV	5 mV	7 mV	3 mV
Current rms	25 mA	10 mA	5 mA	3 mA	2 mA	25 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed) System models only						
Voltage 0.07% +	6 mV	15 mV	25 mV	40 mV	80 mV	7.5 mV
+Current 0.15% +	67 mA	26 mA	15 mA	7 mA	3 mA	67 mA
–Current 0.35% +	100 mA	44 mA	24 mA	15 mA	7 mA	100 mA
Load regulation						
Voltage	1 mV	2 mV	3 mV	4 mV	5 mV	1 mV
Current	2 mA	1 mA	0.5 mA	0.5 mA	0.5 mA	2 mA
Line regulation						
Voltage	0.5 mV	0.5 mV	1 mV	1mV	2 mV	0.5 mV
Current	2 mA	1 mA	0.75 mA	0.5 mA	0.5 mA	2 mA
Transient response time	Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current					
Supplemental Characteristics	(Non-warranted characteristics determined by design and useful in applying the product)					
Average resolution						
Voltage	2 mV	5 mV	10 mV	15 mV	30 mV	2.5 mV
Current	15 mA	7 mA	4 mA	2.5 mA	1.25 mA	15 mA
OVP	12 mV	30 mV	54 mV	93 mV	190 mV	16 mV
OVP accuracy	160 mV	400 mV	700 mV	1.2 V	2.4 V	200 mV

Single-Output: 500 W GPIB (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 20 ms for the power supplies connected directly to the GPIB

Output Programming Response Time: The rise and fall time (10/90% and 90/10%) of the output voltage is less than 15 ms. The output voltage change settles within 1 LSB (0.025% x rated voltage) of final value in less than 60 ms.

Down Programming: An active down programmer sinks approximately 20% of the rated output current

Modulation: (Analog programming of output voltage and current)
Input signal: 0 to –5 V
Input impedance: 10 k Ohm nominal

ac Input: (ac input frequency 47 to 63 Hz)

Voltage	100 Vac	120 Vac	220 Vac	240 Vac
Current	12 A	10 A	5.7 A	5.3 A

Input Power: 1,380 VA, 1,100 W at full load; 120 W at no load

GPIB Interface Capabilities: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, E1, and C0. IEEE-488.2 and SCPI-compatible command set.

Regulatory Compliance: Listed to UL 1244; conforms to IEC 61010-1.

Size: 425.5 mm W x 132.6 mm H x 497.8 mm D (16.75 in x 5.22 in x 19.6 in)
See page 101 for more details

Weight: Net, 25 kg (54 lb); shipping, 28 kg (61 lb)

Warranty Period: Three years

Specifications (at 0° to 55°C unless otherwise specified)	6651A-J03 Special Order Option	6651A-J09 Special Order Option	6652A-J03 Special Order Option	6653A-J04 Special Order Option	6653A-J17 Special Order Option
Number of outputs	1	1	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes
Output ratings					
Output voltage	6 V	17V / 20 V	27 V	40 V	30 V
Output current (40°C)	60 A	30 A / 15 A	18.5 A	12.5 A	17.5 A
Maximum current (50°C / 55°C)	54 A / 51A	27 A / 25.5 A 13.5 A / 12.75 A	16.65 A / 15.72 A	11.25 A / 10.6 A	15.75 A / 14.87 A
Programming accuracy at 25°C ±5°C					
Voltage 0.06% +	5 mV	10 mV	13.5 mV	17.5 mV	15 mV
Current 0.15% +	75 mA	36 mA	25 mA	13 mA	16 mA
Ripple and noise					
from 20 Hz to 20 MHz					
Voltage rms	300 µV	300 µV	450 µV	1.6 mV	400 µV
peak-peak	3 mV	4 mV	4.5 mV	5 mV	4 mV
Current rms	30 mA	13 mA	10 mA	5 mA	6 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed) System models only					
Voltage 0.07% +	6 mV	15 mV	20.5 mV	30 mV	25 mV
+Current 0.15% +	80 mA	40 mA	26 mA	15 mA	18 mA
–Current 0.35% +	150 mA	55 mA	44 mA	24 mA	28 mA
Load regulation					
Voltage	1 mV	2 mV	2 mV	3.5 mV	3 mV
Current	6.5 mA	2 mA	1 mA	1 mA	0.5 mA
Line regulation					
Voltage	0.5 mV	0.5 mV	0.5 mV	1 mV	1 mV
Current	2 mA	2 mA	2 mA	0.75 mA	0.75 mA
Transient response time	Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current				
Supplemental Characteristics	(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution					
Voltage	2 mV	5 mV	6.75 mV	12mV	10 mV
Current	18 mA	9 mA	7 mA	4 mA	5 mA
OVP	12 mV	30 mV	30 mV	65 mV	54 mV
OVP accuracy	160 mV	500 mV	400 mV	750 mV	700 mV

Single-Output: 500 W GPIB (Continued)

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 63 Hz
Opt 240 209 to 250 Vac, 47 to 63 Hz
***Opt 908** Rack-mount Kit (p/n 5062-3977)
***Opt 909** Rack-mount Kit w/ Handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
*Support rails required

Accessories

p/n 1494-0059 Accessory Slide Kit
p/n 1252-3698 7-pin Analog Plug
p/n 1252-1488 4-pin Digital Plug
p/n 5080-2148 Serial Link Cable 2 m (6.6 ft)
E3663AC Support rails for Agilent rack cabinets

Specifications (at 0° to 55°C unless otherwise specified)		6654A-J04 Special Order Option	6654A-J05 Special Order Option	6654A-J12 Special Order Option	6655A-J05 Special Order Option	6655A-J10 Special Order Option
Number of outputs		1	1	1	1	1
GPIB		Yes	Yes	Yes	Yes	Yes
Output ratings						
Output voltage		70 V	50 V	80 V	150 V	156 V
Output current (40°C)		7.5 A	10 A	6 A	3.2 A	3 A
Maximum current (50°C/55°C)		6.75 A/6.37 A	9 A/8.5 A	5.4 A/5.1 A	2.88 A/2.72 A	2.7 A/2.55 A
Programming accuracy at 25°C ±5°C						
Voltage	0.06% +	30 mV	26 mV	35 mV	64 mV	71 mV
Current	0.15% +	7 mA	9 mA	7 mA	3.5 mA	4 mA
Ripple and noise from 20 Hz to 20 MHz						
Voltage rms		600 µV	500 µV	700 µV	800 µV	900 µV
peak-peak		6 mV	5 mV	7 mV	8 mV	8 mV
Current rms		5 mA	4 mA	3 mA	2 mA	3 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed) System models only						
Voltage	0.07% +	50 mV	40 mV	58 mV	100 mV	110 mV
+Current	0.15% +	6 mA	8 mA	6 mA	2.5 mA	3 mA
–Current	0.35% +	13 mA	17 mA	16 mA	6.5 mA	7.5 mA
Load regulation						
Voltage		4 mV	4 mV	4 mV	6 mV	7 mV
Current		0.5 mA	0.5 mA	0.5 mA	0.5 mA	1 mA
Line regulation						
Voltage		1 mV	1 mV	4.5 mV	2 mV	2 mV
Current		0.5 mA	0.5 mA	0.5 mA	0.5 mA	1 mA
Transient response time		Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current				
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution						
Voltage		17.5 mV	15 mV	20 mV	37.5 mV	39.5 mV
Current		1.9 mA	2.75 mA	1.7 mA	8 mA	8 mA
OVP		110 mV	93 mV	130 mV	240 mV	250 mV
OVP accuracy		1.4 V	1.2 V	1.6 V	3 V	3.3 V

Single-Output: 500 W

6551A-6555A

Protect valuable assemblies with fast protection features

Proven reliability

Low ripple and noise

This reliable series of 500 W dc power supplies can be controlled either from the front panel or via an analog programming voltage. When used in a test system, the fast up and down programming helps decrease test time. Quickly reacting protection features, including fast crowbar, CV/CC mode crossover and over-voltage protection help protect your valuable assemblies from damage. The linear topology produces very low ripple and noise, which allows you to make extremely accurate measurements of the devices which you are testing.

Lab bench use is enhanced by the fan speed control, which helps to minimize the acoustic noise.

Specifications (at 0° to 55°C unless otherwise specified)		6551A	6552A	6553A	6554A	6555A
Number of outputs		1	1	1	1	1
GPIB		No	No	No	No	No
Output ratings						
Output voltage		0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V
Output current (40° C)		0 to 50 A	0 to 25 A	0 to 15 A	0 to 9 A	0 to 4 A
Maximum current (50° C/55° C)		45 A/42.5 A	22.5 A/21.3 A	13.5 A/12.8 A	8.1 A/7.7 A	3.6 A/3.4 A
Programming accuracy at 25°C ±5°C						
Voltage	0.06% +	5 mV	10 mV	15 mV	26 mV	51 mV
Current	0.15% +	60 mA	25 mA	13 mA	8 mA	4 mA
Ripple and noise from 20 Hz to 20 MHz						
Voltage rms		300 µV	300 µV	400 µV	500 µV	700 µV
peak-peak		3 mV	3 mV	4 mV	5 mV	7 mV
Current rms		25 mA	10 mA	5 mA	3 mA	2 mA
Load regulation						
Voltage		1 mV	2 mV	3 mV	4 mV	5 mV
Current		2 mA	1 mA	0.5 mA	0.5 mA	0.5 mA
Line regulation						
Voltage		0.5 mV	0.5 mV	1 mV	1mV	2 mV
Current		2 mA	1 mA	0.75 mA	0.5 mA	0.5 mA
Transient response time		Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current				
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution						
Voltage		2 mV	5 mV	10 mV	15 mV	30 mV
Current		15 mA	7 mA	4 mA	2.5 mA	1.25 mA
OVP		12 mV	30 mV	54 mV	93 mV	190 mV
OVP accuracy		160 mV	400 mV	700 mV	1.2 V	2.4 V

Single-Output: 500 W (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Output Programming Response Time: The rise and fall time (10/90% and 90/10%) of the output voltage is less than 15 ms. The output voltage change settles within 1 LSB (0.025% x rated voltage) of final value in less than 60 ms.

Down Programming: An active down programmer sinks approximately 20% of the rated output current

Modulation: (Analog programming of output voltage and current)
Input signal: 0 to –5 V
Input impedance: 10 k Ohm nominal

ac Input: (ac input frequency 47 to 63 Hz)

Voltage	100 Vac	120 Vac	220 Vac	240 Vac
Current	12 A	10 A	5.7 A	5.3 A

Input Power: 1,380 VA, 1,100 W at full load; 120 W at no load

Regulatory Compliance: Listed to UL 1244; certified to CSA556B; conforms to IEC 61010-1.

Size: 425.5 mm W x 132.6 mm H x 497.8 mm D (16.75 in x 5.22 in x 19.6 in) See page 101 for more details

Weight: Net, 25 kg (54 lb); shipping, 28 kg (61 lb)

Warranty Period: Three years

Specifications (at 0° to 55°C unless otherwise specified)		6551A-J01 Special Order Option	6551A-J03 Special Order Option	6553A-J04 Special Order Option	6553A-J17 Special Order Option
Number of outputs		1	1	1	1
GPIB		No	No	No	No
Output ratings					
Output voltage		10 V	6 V	40 V	30 V
Output current (40° C)		50 A	60 A	12.5 A	17.5 A
Maximum current (50° C/55° C)		45 A/42.5 A	54 A/51 A	11.25 A/10.6 A	15.75 A/14.87 A
Programming accuracy at 25°C ±5°C					
Voltage	0.06% +	6 mV	5 mV	17.5 mV	15 mV
Current	0.15% +	60 mA	75 mA	13 mA	16 mA
Ripple and noise from 20 Hz to 20 MHz					
Voltage rms		300 µV	300 µV	1.6 mV	400 µV
peak-peak		3 mV	3 mV	5 mV	4 mV
Current rms		25 mA	30 mA	5 mA	6 mA
Load regulation					
Voltage		1 mV	1 mV	3.5 mV	3 mV
Current		2 mA	6.5 mA	1 mA	0.5 mA
Line regulation					
Voltage		0.5 mV	0.5 mV	1 mV	1 mV
Current		2 mA	2 mA	0.75 mA	0.75 mA
Transient response time		Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current			
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)			
Average resolution					
Voltage		2.5 mV	2 mV	12 mV	10 mV
Current		15 mA	18 mA	4 mA	5 mA
OVP		16 mV	12 mV	65 mV	54 mV
OVP accuracy		200 mV	160 mV	750 mV	700 mV

Single-Output: 500 W (Continued)

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 63 Hz
Opt 240 209 to 250 Vac, 47 to 63 Hz
* **Opt 908** Rack-mount Kit (p/n 5062-3977)
* **Opt 909** Rack-mount Kit w/ Handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
* Support rails required

Accessories

p/n 1494-0059 Accessory Slide Kit
E3663AC Support rails for Agilent rack cabinets

Specifications (at 0° to 55°C unless otherwise specified)		6554A-J04 Special Order Option	6554A-J05 Special Order Option	6554A-J12 Special Order Option	6555A-J10 Special Order Option
Number of outputs		1	1	1	1
GPIB		No	No	No	No
Output ratings					
Output voltage		70 V	50 V	80 V	156 V
Output current (40° C)		7.5 A	10 A	6 A	3 A
Maximum current (50° C/55° C)		6.75 A/6.37 A	9 A/8.5 A	5.4 A/5.1 A	2.7 A/2.55 A
Programming accuracy at 25°C ±5°C					
Voltage	0.06% +	38 mV	26 mV	35 mV	71 mV
Current	0.15% +	7 mA	9 mA	7 mA	4 mA
Ripple and noise from 20 Hz to 20 MHz					
Voltage rms		600 µV	500 µV	700 µV	900 µV
peak-peak		6 mV	5 mV	5 mV	8 mV
Current rms		5 mA	4 mA	3 mA	3 mA
Load regulation					
Voltage		4 mV	4 mV	4 mV	7 mV
Current		0.5 mA	0.5 mA	0.5 mA	1 mA
Line regulation					
Voltage		1 mV	1 mV	4.5 mV	2 mV
Current		0.5 mA	0.5 mA	0.5 mA	1 mA
Transient response time		Less than 100 µs for the output voltage to recover to its previous level (within 0.1% of the voltage rating of the supply or 20 mV, whichever is greater) following any step change in load current of up to 50% of rated current			
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)			
Average resolution					
Voltage		17.5 mV	15 mV	20 mV	39.5 mV
Current		1.9 mA	2.75 mA	1.7 mA	8 mA
OVP		110 mV	93 mV	130 mV	250 mV
OVP accuracy		1.4 V	1.2 V	1.6 V	3.3 V

Single-Output: 2000 W GPIB

6671A - 6675A

Proven reliability

Increase test throughput with fast up and down programming

High efficiency

Low ripple and noise

This series of 2000 watt dc power supplies has the exceptional, proven reliability that test system engineers look for. It also has the unusual combination of high efficiency and low noise operation.

Programming of the dc output and the extensive protection features can be done either from the front panel or using industry standard SCPI commands, via the GPIB. Using the serial link, up to 16 power supplies can be connected through one GPIB address. Test system integration can be further simplified be using the VXI*Plug&Play* drivers. The output voltage and current can also be controlled with analog signals. This is helpful for certain types of noisy environments, and also immediate reactions to process changes.

Lab-bench use is enhanced by the fan-speed control, which minimizes acoustic noise. The extremely low ripple and noise helps the built-in measurement system make extremely accurate current and voltage measurements.

Specifications (at 0° to 55°C unless otherwise specified)		**6671A**	**6672A**	**6673A**	**6674A**	**6675A**
Number of outputs		1	1	1	1	1
GPIB		Yes	Yes	Yes	Yes	Yes
Output ratings						
Output voltage		0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V
Output current		0 to 220 A	0 to 100 A	0 to 60 A	0 to 35 A	0 to 18 A
Programming accuracy at 25°C ±5°C						
Voltage	0.04% +	8 mV	20 mV	35 mV	60 mV	120 mV
Current	0.1% +	125 mA	60 mA	40 mA	25 mA	12 mA
Ripple and noise						
from 20 Hz to 20 MHz						
Voltage rms		650 µV	750 µV	800 µV	1.25 mV	1.9 mV
Voltage peak to peak		7 mV	9 mV	9 mV	11 mV	16 mV
Current rms		200 mA	100 mA	40 mA	25 mA	12 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed)						
Voltage	0.05% +	12 mV	30 mV	50 mV	90 mV	180 mV
±Current	0.1% +	150 mA	100 mA	60 mA	35 mA	18 mA
Load regulation						
Voltage	0.002%+	300 µV	650 µV	1.2 mV	2 mV	4 mV
Line regulation						
Current	0.005%+	10 mA	7 mA	4 mA	2 mA	1 mA
Transient response time		Less than 900 µs for the output voltage to recover 100 mV following a change in load from 100% to 50% or 50% to 100% of the output current rating of the supply				
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution						
Voltage		2 mV	5 mV	10 mV	15 mV	30 mV
Current		55 mA	25 mA	15 mA	8.75 mA	4.5 mA
OVP		15 mV	35 mV	65 mV	100 mV	215 mV
Output Voltage programming response time*						
(excluding command processing time)		30 ms	60 ms	130 ms	130 ms	195 ms

* Full load programming rise/fall time (10% to 90% or 90% to 10%) with full resistive load equal to rated output voltage/rated output current.

Single-Output: 2000 W GPIB (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Output Common-Mode Noise Current: (to signal ground binding post) 500 µA rms, 4 mA peak-to-peak

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 20 ms for the power supplies connected directly to the GPIB.

Modulation: (Analog programming of output voltage and current)
- **Input Signal:** 0 to –4 V for voltage, 0 to 7 V for current
- **Input Impedance:** 60 k Ohm or greater

Input Power: 3,800 VA, 2,600 W at full load; 170 W at no load

GPIB Interface Capabilities: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, E1, and C0. IEEE-488.2 and SCPI-compatible command set

Regulatory Compliance: Listed to UL1244; certified to CSA556B; conforms to IEC 61010-1.

Size: 425.5 mm W x 132.6 mm H x 640 mm D (16.75 in x 5.22 in x 25.2 in)
See page 102 for more details

Weight: Net, 28.2 kg (62 lbs); shipping, 31.8 kg (70 lbs)

Warranty Period: Three years

Specifications (at 0° to 55°C unless otherwise specified)	6671A-J03 Special Order Option	6671A-J04 Special Order Option	6671A-J17 Special Order Option	6672A-J04 Special Order Option	6673A-J03 Special Order Option
Number of outputs	1	1	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes
Output ratings					
Output voltage	14 V	10 V	15 V	24 V	37.5 V
Output current	150 A	200 A	120 A	85 A	45 A
Programming accuracy at 25°C ±5°C					
Voltage 0.04%+	14 mV	10 mV	15 mV	25 mV	37.5 mV
Current 0.1%+	90 mA	125 mA	90 mA	60 mA	40 mA
Ripple and noise					
from 20 Hz to 20 MHz					
Voltage rms	1.5 mV	750 µV	1.5 mV	1 mV	800 µV
Voltage peak to peak	15 mV	9 mV	15 mV	11 mV	9 mV
Current rms	150 mA	200 mA	150 mA	100 mA	40 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed) System models only					
Voltage 0.05% +	25 mV	15 mV	27 mV	40 mV	53.5 mV
±Current 0.1% +	110 mA	150 mA	110 mA	100 mA	60 mA
Load regulation					
Voltage 0.002%+	600 µV	300 µV	650 µV	650 µV	1.2 mV
Line regulation					
Current 0.005%+	7 mA	10 mA	7 mA	7 mA	4 mA
Transient response time	Less than 900 µs for the output voltage to recover 100 mV following a change in load from 100% to 50% or 50% to 100% of the output current rating of the supply				
Supplemental Characteristics	(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution					
Voltage	4 mV	2.5 mV	4 mV	6 mV	10 mV
Current	40 mA	55 mA	35 mA	22 mA	15 mA
OVP	28 mV	20 mV	30 mV	42 mV	65 mV
Output Voltage programming response time*					
(excluding command programming processing time)	30 ms	35 ms	35 ms	70 ms	130 ms

* Full load programming rise / fall time (10% to 90% or 90% to 10%) with full resistive load equal to rated output voltage / rated output current.

Single-Output: 2000 W GPIB (Continued)

Ordering Information

Opt 200 174 to 220 Vac, 47 to 63 Hz (Japan only)
Opt 230 191 to 250 Vac, 47 to 63 Hz
* **Opt 908** Rack-mount Kit (p/n 5062-3977)
* **Opt 909** Rack-mount Kit w/handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
* Support rails required

Accessories

p/n 1494-0059 Accessory Slide Kit
p/n 1252-3698 7-pin Analog Plug
p/n 1252-1488 4-pin Digital Plug
p/n 5080-2148 Serial Link Cable 2 m (6.6 ft)
E3663AC Support rails for Agilent rack cabinets

Specifications (at 0° to 55°C unless otherwise specified)		6673A-J08 Special Order Option	6674A-J03 Special Order Option	6674A-J07 Special Order Option	6675A-J04 Special Order Option	6675A-J06 Special Order Option
Number of outputs		1	1	1	1	1
GPIB		Yes	Yes	Yes	Yes	Yes
Output ratings						
Output voltage		40 V	56 V	50 V	160 V	135 V
Output current		50 A	38 A	42 A	13 A	16 A
Programming accuracy at 25°C ±5°C						
Voltage	0.04%+	40 mV	60 mV	60 mV	160 mV	125 mV
Current	0.1%+	35 mA	28 mA	30 mA	10 mA	12 mA
Ripple and noise						
from 20 Hz to 20 MHz						
Voltage rms		1 mV	1.25 mV	1.25 mV	2.8 mV	2 mV
Voltge peak to peak		10.5 mV	11 mV	11 mV	20 mV	18 mV
Current rms		40 mA	28 mA	25 mA	18 mA	12 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed) System models only						
Voltage	0.05%+	60 mV	90 mV	90 mV	240 mV	185 mV
±Current	0.1%+	60 mA	38 mA	42 mA	14 mA	18 mA
Load regulation						
Voltage	0.002%+	1.4 mV	2 mV	2 mV	6 mV	4 mV
Line regulation						
Current	0.005%+	4 mA	2 mA	2 mA	1 mA	4 mV
Transient response time		Less than 900 µs for the output voltage to recover 100 mV following a change in load from 100% to 50% or 50% to 100% of the output current rating of the supply				
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)				
Average resolution						
Voltage		10.5 mV	14 mV	12 mV	40 mV	34 mV
Current		12.5 mA	9.5 mA	11 mA	3.25 mA	4 mA
OVP		75 mV	100 mV	85 mV	300 mV	242 mV
Output Voltage programming response time*						
(excluding command programming processing time)		130 ms	130 ms	130 ms	280 ms	250 ms

* Full load programming rise/fall time (10% to 90% or 90% to 10%) with full resistive load equal to rated output voltage/rated output current.

Single-Output: 2000 W GPIB (Continued)

Specifications (at 0° to 55°C unless otherwise specified)	6675A-J07 Special Order Option	6675A-J08 Special Order Option	6675A-J09 Special Order Option	6675A J11 Special Order Option
Number of outputs	1	1	1	1
GPIB	Yes	Yes	Yes	Yes
Output ratings				
Output voltage	200 V	100 V	110 V	150 V
Output current	11 A	22 A	20 A	15 A
Programming accuracy at 25°C ±5°C				
Voltage 0.04%+	200 mV	120 mV	120 mV	150 mV
Current 0.1%+	8 mA	15 mA	13.5 mA	11 mA
Ripple and noise				
from 20 Hz to 20 MHz				
Voltage rms	3.5 mV	1.9 mV	1.9 mV	2.5 mV
Voltge peak to peak	25 mV	16 mV	16 mV	18 mV
Current rms	15 mA	15 mA	13.5 mA	12 mA
Readback accuracy at 25°C ±5°C (percent of reading plus fixed) System models only				
Voltage 0.05%+	300 mV	180 mV	180 mV	225 mV
±Current 0.1%+	12 mA	22 mA	20 mA	15 mA
Load regulation				
Voltage 0.002% +	7 mV	4 mV	4 mV	6 mV
Line regulation				
Current 0.005% +	1 mA	4 mV	4 mV	1 mA
Transient response time	Less than 900 µs for the output voltage to recover 100 mV following a change in load from 100% to 50% or 50% to 100% of the output current rating of the supply			
Supplemental Characteristics	(Non-warranted characteristics determined by design and useful in applying the product)			
Average resolution				
Voltage	50 mV	30 mV	30 mV	37.5 mV
Current	2.75 mA	4.5 mA	4.5 mA	3.75 mA
OVP	360 mV	215 mV	215 mV	270 mV
Output Voltage programming response time*				
(excluding command programming processing time)	350 ms	195 ms	195 ms	250 ms

* Full load programming rise / fall time (10% to 90% or 90% to 10%) with full resistive load equal to rated output voltage / rated output current.

Single-Output: 2000 W GPIB

E4356A

Flexibility of Dual Range

Increase test throughput with fast up and down programming

High efficiency

Low ripple and noise

This 2000 W dc power supply provides over 2000 watts at either 70 or 80 volts. This makes it particularly suitable for a variety of test scenarios for 48 volt systems. Telephone network equipment is one example of such a 48 volt bus application. It also has the unusual combination of high efficiency and low noise operation.

Programming of the dc output and the extensive protection features can be done either from the front panel or using industry standard SCPI commands, via the GPIB. Using the serial link, up to 16 power supplies can be connected through one GPIB address. Test system integration can be further simplified by using the VXI*Plug&Play* drivers. The output voltage and current can also be controlled with analog signals. This is helpful for certain types of noisy environments, and also immediate reactions to process changes.

Lab-bench use is enhanced by the fan-speed control, which minimizes acoustic noise. The extremely low ripple and noise helps the built-in measurement system make extremely accurate current and voltage measurements.

Specifications (at 0° to 55°C unless otherwise specified)	**E4356A**
Number of outputs	1
GPIB	Yes
Output ratings	
Voltage	0 to 70 V / 0 to 80 V
Current	0 to 30 A / 0 to 26 A
Programming accuracy at 25°C ±5°C (% of setting plus fixed)	
Voltage	0.04% + 80 mV
+Current	0.1% + 25 mA
Ripple and noise	
20 Hz to 20 MHz	
Voltage rms	2 mV
peak-peak	16 mV
Current rms	25 mA
dc measurement accuracy (via GPIB or front panel meters with respect to actual output at 25°C ±5°C	
Voltage	0.05% + 120 mV
Current	0.1% + 35 mA
Transient response time Time for the output voltage to recover to within 20 mV or 0.1% of the voltage rating of the unit following a change in load current of up to 50% of the output current rating.	<900 µs

Single-Output: 2000 W GPIB
(Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc maximum from chassis ground.

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 20 ms for the power supplies connected directly to the GPIB. (Display disabled.)

Output Voltage Rise Time / Fall Time: 100 ms/200 ms for output to change from 90% to 10% or from 10% to 90% of its total excursion with full resistive load (excludes command processing time).

Modulation: (Analog programming of output voltage and current)
Input Signal: 0 to -4 V for voltage and current
Input Impedance: 60 k Ohm nominal

Input Power: 3800 VA, 2600 W at full load; 100 W at no load

GPIB Interface Capabilities: SH1, AH1, TE6, LE4, SR1, RL1, PP0, DC1, DT1, E1 and C0. IEEE-488.2 and SCPI-compatible command set

Regulatory Compliance: Listed to UL1244; certified to CSA556B, conforms to EN61010.

Warranty Period: Three years

Size: 425.5 mm W x 132.6 mm H x 640 mm D
(16.75 in. x 5.22 in. x 25.2 in.)
See page 102 for more details

Weight: 27.7 kg (61 lbs) net, 31.4 kg (69 lbs) shipping.

Ordering Information

Opt 200 174 to 220 Vac, 47 to 63 Hz (Japan only)
Opt 230 191 to 250 Vac, 47 to 63 Hz
*** Opt 908** Rack-mount Kit (p/n 5062-3977)
*** Opt 909** Rack-mount Kit w/Handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No Documentation Package
See pages 93-98 for information on line cord options.
* Support rails required

Accessories

p/n 1494-0059 Accessory Slide Kit
p/n 1252-3698 7-pin Analog Plug
p/n 1252-1488 4-pin Digitial Plug
p/n 5080-2148 Serial Link Cable 2 m (6.6 ft)
E3663AC Support rails for Agilent rack cabinets

Single-Output: 2000 W

6571A-6575A

Proven reliability
High efficiency
Low ripple and noise

This series of 2000 watt dc power supplies has the exceptional, proven reliability that test system engineers look for. It also has the unusual combination of high efficiency and low noise operation.

These dc power supplies can be controlled either from the front panel or via an analog programming voltage. When used in a test system, the fast up and down programming helps decrease test time. Quickly reacting protection features, including CV/CC mode crossover and over-voltage protection help protect your valuable assemblies from damage.

Lab-bench use is enhanced by the fan-speed control, which minimizes acoustic noise. The extremely low ripple and noise helps the test engineer make extremely accurate current and voltage measurements.

Specifications (at 0° to 55°C unless otherwise specified)		6571A	6572A	6573A	6574A	6575A	6571A-J03 Special Order Option
Number of outputs		1	1	1	1	1	1
GPIB		No	No	No	No	No	No
Output ratings							
Output voltage		0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V	14 V
Output current		0 to 220 A	0 to 100 A	0 to 60 A	0 to 35 A	0 to 18 A	150 A
Programming accuracy at 25°C ±5°C							
Voltage	0.04% +	8 mV	20 mV	35 mV	60 mV	120 mV	14 mV
Current	0.1% +	125 mA	60 mA	40 mA	25 mA	12 mA	90 mA
Ripple and noise from 20 Hz to 20 MHz							
Voltage rms		650 µV	750 µV	800 µV	1.25 mV	1.9 mV	1.5 mV
peak-peak		7 mV	9 mV	9 mV	11 mV	16 mV	15 mV
Current rms		200 mA	100 mA	40 mA	25 mA	12 mA	150 mA
Load regulation and line regulation							
Voltage	0.002%+	300 µV	650 µV	1.2 mV	2 mV	4 mV	600 µV
Current	0.005%+	10 mA	7 mA	4 mA	2 mA	1 mA	7 mA
Transient response time		Less than 900 µs for the output voltage to recover 100 mV following a change in load from 100% to 50% or 50% to 100% of the output current rating of the supply					
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)					
Average resolution							
Voltage		2 mV	5 mV	9 mV	15 mV	30 mV	4 mV
Current		55 mA	25 mA	15 mA	8.75 mA	4.5 mA	40 mA
OVP		15 mV	35 mV	65 mV	100 mV	215 mV	28 mV
Output voltage programming response time*							
*Full load programming rise/fall time (10% to 90% or 90% to 10%) with full resistive load equal to rated output voltage/rated output current.		30 ms	60 ms	130 ms	130 ms	195 ms	30 ms

Single-Output: 2000 W (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Output Common-Mode Noise Current: (to signal ground binding post) 500 µA rms, 4 mA peak-to-peak

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Modulation: (Analog programming of output voltage and current)
Input Signal: 0 to –4 V for voltage, 0 to 7 V for current
Input Impedance: 30 k Ohm or greater

Input Power: 3,800 VA, 2,600 W at full load; 170 W at no load

Regulatory Compliance: Listed to UL1244; certified to CSA556B; conforms to IEC 61010-1.

Size: 425.5 mm W x 132.6 mm H x 640 mm D (16.75 in x 5.22 in x 25.2 in)
See page 102 for more details

Weight: Net, 28.2 kg (62 lb); shipping, 31.8 kg (70 lb)

Warranty Period: Three years

Specifications (at 0° to 55°C unless otherwise specified)		6571A-J04 Special Order Option	6571A-J17 Special Order Option	6573A-J03 Special Order Option	6573A-J08 Special Order Option	6574A-J03 Special Order Option	6574A-J07 Special Order Option
Number of outputs		1	1	1	1	1	1
GPIB		No	No	No	No	No	No
Output ratings							
Output voltage		10 V	15 V	37.5V	40 V	56 V	50 V
Output current		200 A	120 A	45 A	50 A	38 A	42 A
Programming accuracy at 25°C ±5°C							
Voltage	0.04% +	10 mV	15 mV	37.5 mV	40 mV	60 mV	60 mV
Current	0.1% +	125 mA	90 mA	40 mA	35 mA	28 mA	30 mA
Ripple and noise from 20 Hz to 20 MHz							
Voltage rms		750 µV	1.5 mV	800 µV	1 mV	1.25 mV	1.25 mV
peak-peak		9 mV	15 mV	9 mV	10.5 mV	11 mV	11 mV
Current rms		200 mA	150 mA	40 mA	40 mA	28 mA	25 mA
Load regulation and line regulation							
Voltage	0.002%+	300 uV	650 uV	1.2 mV	1.4 mV	2 mV	2 mV
Current	0.005%+	10 mA	7 mA	4 mA	4 mA	2 mA	2 mA
Transient response time		Less than 900 µs for the output voltage to recover 100 mV following a change in load from response time 100% to 50% or 50% to 100% of the output current rating of the supply					
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)					
Average resolution							
Voltage		2.5 mV	4 mV	10 mV	10.5 mV	14 mV	12 mV
Current		55 mA	35 mA	15 mA	12.5 mA	9.5 mA	11 mA
OVP		20 mV	30 mV	65 mV	75 mV	100 mV	85 mV
Output voltage programming response time*							
*Full load programming rise/fall time (10% to 90% or 90% to 10%) with full resistive load equal to rated output voltage/rated output current.		35 ms	35 ms	130 ms	130 ms	130 ms	130 ms

Single-Output: 2000 W (Continued)

Ordering Information

Opt 200 174 to 220 Vac, 47 to 63 Hz (Japan only)
Opt 230 191 to 250 Vac, 47 to 63 Hz
* **Opt 908** Rack-mount Kit (p/n 5062-3977)
* **Opt 909** Rack-mount Kit w/ Handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package

A line cord option must be specified.
See pages 93-98 for ordering information.

* Support rails required

Accessories

p/n 1494-0059 Accessory Slide Kit
E3663AC Support rails for Agilent rack cabinets

Specifications (at 0° to 55°C unless otherwise specified)		6575A-J04 Special Order Option	6575A-J06 Special Order Option	6575A-J07 Special Order Option	6575A-J08 Special Order Option	6575A-J09 Special Order Option	6575A-J11 Special Order Option
Number of outputs		1	1	1	1	1	1
GPIB		No	No	No	No	No	No
Output ratings							
Output voltage		160 V	135 V	200 V	100 V	110 V	150 V
Output current		13 A	16 A	11 A	22 A	20 A	15 A
Programming accuracy at 25°C ±5°C							
Voltage	0.04% +	160 mV	125 mV	200 mV	120 mV	120 mV	150 mV
Current	0.1% +	10 mA	12 mA	8 mA	15 mA	13.5 mA	11 mA
Ripple and noise from 20 Hz to 20 MHz							
Voltage rms		2.8 mV	2 mV	3.5 mV	1.9 mV	1.9 mV	2.5 mV
peak-peak		20 mV	18 mV	25 mV	16 mV	16 mV	18 mV
Current rms		18 mA	12 mA	15 mA	15 mA	13.5 mA	12 mA
Load regulation and line regulation							
Voltage	0.002%+	6 mV	4 mV	7 mV	4 mV	4 mV	6 mV
Current	0.005%+	1 mA	4 mV	1 mA	4 mV	4 mV	1 mA
Transient response time		Less than 900 µs for the output voltage to recover 100 mV following a change in load from response time 100% to 50% or 50% to 100% of the output current rating of the supply					
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)					
Average resolution							
Voltage		40 mV	34 mV	50 mV	30 mV	30 mV	37.5 mV
Current		3.25 mA	4 mA	2.75 mA	4.5 mA	4.5 mA	3.75 mA
OVP		300 mV	242 mV	360 mV	215 mV	215 mV	270 mV
Output voltage programming response time*							
*Full load programming rise/fall time (10% to 90% or 90%to 10%) with full resistive load equal to rated output voltage/rated output current.		280 ms	250 ms	350 ms	195 ms	195 ms	250 ms

Single-Output: 5000 W GPIB

6680A-6684A

Proven reliabilty

Increase test throughput with fast up and down programming

Fast reaction to analog programming signals

Reliable dc power for manufacturing test and long-term burn-in

This series of 5000 watt dc power supplies has the exceptional, proven reliability that test system engineers look for. It also has the features needed for easy test system integration.

Programming of the dc output and the extensive protection features can be done either from the front panel or using industry standard SCPI commands, via the GPIB. Using the serial link, up to 16 power supplies can be connected through one GPIB address. Test system integration can be further simplified by using the VXI*Plug&Play* drivers. The output voltage and current can also be controlled with analog signals. This is helpful for certain types of noisy environments, and also immediate reactions to process changes.

The 6680A Series has extremely low ripple and noise for a 5000 watt dc power supply. This helps the built-in measurement system make extremely accurate current and voltage measurements.

Selectable compensation is provided for problem-free powering of inductive loads.

Specifications (at 0° to 55°C unless otherwise specified)	6680A	6681A	6682A	6683A	6684A	6680A-J04 Special Order Option
Number of outputs	1	1	1	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes	Yes
Output ratings						
Voltage	0 to 5 V	0 to 8 V	0 to 21 V	0 to 32 V	0 to 40 V	0 to 3.3 V
Current (40°C then derate linearly 1%/°C from 40°C to 55°C)	0 to 875 A	0 to 580 A	0 to 240 A	0 to 160 A	0 to 128 A	0 to 1000 A
Programming accuracy at 25°C ±5°C						
Voltage 0.04% +	5 mV	8 mV	21 mV	32 mV	40 mV	5 mV
Current 0.1% +	450 mA	300 mA	125 mA	85 mA	65 mA	450 mV
Ripple and noise constant voltage mode from 20 Hz to 20 MHz						
rms	1.5 mV	1.5 mV	1.0 mV	1.0 mV	1.0 mV	3.4 mV
Peak to peak	10 mV	10 mV	10 mV	10 mV	10 mV	15 mV
Readback accuracy at 25°C ±5°C	(percent of reading plus fixed)					
Voltage 0.05% +	7.5 mV	12 mV	32 mV	48 mV	60 mV	7.5 mV
Current 0.1% +	600 mA	400 mA	165 mA	110 mA	90 mA	600 mA
Load and line regulation						
Voltage 0.002% +	0.19 mV	0.3 mV	0.65 mV	1.1 mV	1.5 mV	0.19 mV
Current 0.005% +	65 mA	40 mA	17 mA	12 mA	9 mA	77 mA
Transient response time	Less than 900 µs for the output voltage to recover within 150 mV following a change in load from 100% to 50%, or 50% to 100% of the output current rating of the supply					
Supplemental Characteristics	(Non-warranted characteristics determined by design that are useful in applying this product)					
Ripple and noise constant current mode from 20 Hz to 20 MHz						
rms	290 mA	190 mA	40 mA	28 mA	23 mA	—
Average programming resolution						
Voltage	1.35 mV	2.15 mV	5.7 mV	8.6 mV	10.8 mV	12 mV
Current	235 mA	155 mA	64 mA	43 mA	34 mA	260 mA
OVP	30 mV	45 mV	120 mV	180 mV	225 mV	25 mV
Output voltage programming response time	9 ms	12 ms	45 ms	60 ms	60 ms	9 ms
(excludes command-processing time)	Full-load progrmming rise or fall time (10 to 90% or 90 to 10%, resistive load)					
Output common-mode noise current (to signal-ground binding post) rms	1.5 mA	1.5 mA	3 mA	3 mA	3 mA	2.0 mA
peak-to-peak	10 mA	10 mA	20 mA	20 mA	20 mA	12.5 mA

Note 1: Option 6680A-JO4 is not available outside the USA because certification process is not complete.

Single-Output: 5000 W GPIB (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±60 Vdc maximum from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available for the load.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 20 ms for power supplies connected directly to the GPIB

Modulation: (analog programming of output voltage and current):
Input Signal: 0 to –5 V for voltage, 0 to +5 V for current
Input Impedance: 30 kΩ/or greater

ac Input (47 to 63 Hz): 180 to 235 Vac (line-to-line, 3 phase), 27.7 A rms maximum worst case, 21.4 A rms nominal; 360 to 440 Vac, 14.3 A rms maximum worst case, 10.7 A rms nominal (maximum line current includes 5% unbalanced phase voltage condition.) Output voltage derated 5% at 50 Hz and below 200 Vac.

Input Power: 7350 VA and 6000 W maximum; 160 W at no load

GPIB Interface Capabilities: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, E1, and C0. IEEE-488.2 and SCPI command set.

Size: 425.5 mm W x 221.5 mm H x 674.7 mm D (16.75 in x 8.75 in x 25.56 in)
See page 104 for more details

Weight: Net, 51.3 kg (113 lbs); shipping, 63.6 kg (140 lbs)

Warranty Period: Three years

Ordering Information

Opt 208 180 to 235 Vac, 3 phase, 47 to 63 Hz

Opt 400 360 to 440 Vac, 3 phase, 47 to 63 Hz

Opt 602 Two Bus Bar Spacers for paralleling power supplies (p/n 5060-3514)

* **Opt 908** Rack-mount Kit (p/n 5062-3977 and p/n 5063-9212)

* **Opt 909** Rack-mount Kit with Handles (p/n 5063-9221 and p/n 5063-9219).

Opt 0L2 Extra Standard Documentation Package

Opt 0B3 Service Manual

Opt 0B0 No Documentation Package

* Support rails required

Accessories

p/n 5060-3513 Three 30-A Replacement Fuses for 180 to 235 Vac line

p/n 5060-3512 Three 16-A Replacement Fuses for 360 to 440 Vac line

E3663AC Support rails for Agilent rack cabinets

p/n 5080-2148 Serial link cable 2m (6.6 ft.)

Single-Output: 6600 W GPIB

6690A-6692A

Proven reliabilty

Increase test throughput
with fast up and down programming

Fast reaction to analog programming signals

Reliable dc power for manufacturing test and long-term burn-in

This series of 6600 watt dc power supplies has the exceptional, proven reliability that test system engineers look for. It also has the features needed for easy test system integration.

Programming of the dc output and the extensive protection features can be done either from the front panel or using industry standard SCPI commands, via the GPIB. Using the serial link, up to 16 power supplies can be connected through one GPIB address. Test system integration can be further simplified by using the VXI*Plug&Play* drivers. The output voltage and current can also be controlled with analog signals. This is helpful for certain types of noisy environments, and also immediate reactions to process changes.

The 6690A Series has extremely low ripple and noise for a 6600 watt dc power supply. This helps the built-in measurement system make extremely accurate current and voltage measurements.

Specifications (at 0° to 55°C unless otherwise specified)		**6690A**	**6691A**	**6692A**
Number of outputs		1	1	1
GPIB		Yes	Yes	Yes
Output ratings				
Voltage		0 to 15 V	0 to 30 V	0 to 60 V
Current (derated linearly 1%/°C from 40°C to 55°C)		0 to 440 A	0 to 220 A	0 to 110 A
Programming accuracy at 25°C ±5°C				
Voltage	0.04% +	15 mV	30 mV	60 mV
Current	0.1% +	230 mA	125 mA	65 mA
Ripple and noise constant voltge mode from 20 Hz to 20 MHz				
	rms	2.5 mV	2.5 mV	2.5 mV
	Peak to peak	15 mV	25 mV	25 mV
Readback accuracy at 25°C ±5°C (percent of reading plus fixed offset) System models only				
Voltage	0.05% +	22.5 mV	45 mV	90 mV
Current	0.1% +	300 mA	165 mA	80 mA
Load regulation				
Voltage	0.002% +	0.65 mV	1.1 mV	2.2 mV
Current	0.005% +	40 mA	17 mA	9 mA
Line regulation				
Voltage	0.002% +	0.65 mV	0.65 mV	0.65 mV
Current	0.005% +	40.5 mA	17 mA	9 mA
Transient response time		Less than 900 µs for the output voltage to recover within 150 mV following a change in load from 100% to 50%, or 50% to 100% of the output current rating of the supply		

Single-Output: 6600 W GPIB (Continued)

Specifications (at 0° to 55°C unless otherwise specified)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminal can be floated up to ±60 Vdc from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped in each load lead. The drop in the load leads subtracts from the voltage available at the load.

Command Processing Time: Average time required for the output voltage to begin to change following receipt of digital data is 20 ms for power supplies connected directly to the GPIB.

Modulation: (analog programming of output voltage and current):
Input Signal: 0 to –5 V for voltage, and 0 to +5 V for current.
Input Impedance: 30 kΩ or greater.

ac Input (47 to 63 Hz): 180 to 235 Vac (line-to-line 3 phase) 36 A rms maximum worst case, 28 A rms nominal; 360 to 440 Vac, 18 A rms maximum worst case, 14 A rms nominal. (Maximum line current includes 5% unbalanced phase voltage condition).

Input Power: 9000 VA and 7950 W maximum; 175 W at no load.

Size: 425.5 mm W x 221.5 mm H x 674.7 mm D (16.75 in x 8.75 in x 25.56 in).
See page 104 for more details.

Warranty Period: Three years.

Supplemental Characteristics (Non-warranted characteristics determined by design that are useful in applying this product)

	6690A	6691A	6692A
Ripple and noise constant current mode from 20 Hz to 20 MHz			
rms	200 mA	50 mA	30 mA
Average programming resolution			
Voltage	4.1 mV	8.1 mV	16 mV
Current	118.5 mA	59 mA	30 mA
OVP	90 mV	170 mV	330 mV
Output voltage programming response time (excludes command-processing time) Full-load progrmming rise or fall time (10 to 90% or 90 to 10%, resistive load)	45 ms	60 ms	100 ms
Output common-mode noise current rms (to signal-ground peak-to-peak binding post)	3 mA 20 mA	3.5 mA 20 mA	4 mA 25 mA

Ordering Information

Opt 208 180 to 235 Vac, 3 phase, 47 to 63 Hz

Opt 400 360 to 440 Vac, 3 phase, 47 to 63 Hz

Opt 602 Two Bus Bar Spacers for paralleling power supplies (p/n 5060-3514)

* **Opt 908** Rack-mount Kit (p/n 5062-3977 and p/n 5063-9212)

* **Opt 909** Rack-mount Kit with Handles (p/n 5063-9221 and p/n 5063-9219).

Opt 0L2 Extra Standard Documentation Package

Opt 0B3 Service Manual

Opt 0B0 No Documentation Package

* Support rails required

Accessories

p/n 5065-6935 Replacement fuse kit for 360-440 Vac line.

p/n 5065-6934 Replacement fuse kit for 180-235 Vac line.

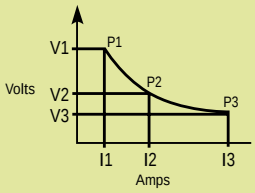
E3663AC Support rails for Agilent rack cabinets.

p/n 5080-2148 Serial link cable 2m (6.6 ft.)

Single-Output, Autoranging: 200 W and 1000 W

6010A, 6011A, 6012B, 6015A

Autoranging Output:



Save rack space by using fewer outputs

Reduce cost by using fewer power supplies

Control with external voltage

This series of dc power supplies take the place of multiple power supplies on your test bench by providing maximum power at a variety of operating points. They have ten-turn front panel pots to allow precise local control. These power supplies also may be connected in auto-parallel or auto-series with their corresponding GPIB unit (6030 Series), as part of a test system.

Supplemental Characteristics for all model numbers

Remote Sensing: Up to 2 V drop in each lead. Voltage regulation specification met with up to 0.5 V drop, but degrades for greater drops.

Modulation: (analog programming of output voltage and current)

Input signal: 0 to 5 V or 0 to 4 k Ohms

Regulatory Compliance: Certified to CSA556B; conforms to IEC 61010-1.

Size: 425.5 mm W x 132.6 mm H x 516.4 mm D (16.75 in x 5.25 in x 20.33 in).
See page 99 for more details

Warranty: One year

Ordering Information

Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 48 to 63 Hz
Opt 240 209 to 250 Vac, 48 to 63 Hz
* **Opt 908** Rack-mount Kit (p/n 5062-3977)
* **Opt 909** Rack-mount Kit with Handles. (p/n 5062-3983)
Opt 0L2 Extra Standard Documentation Package
Opt 0B0 No documentation package
Opt J01 Stabilization for loads up to 10 Henries

Specifications (at 0° to 55°C unless otherwise specified)		6010A	6011A	6012B	6015A
Number of outputs		1	1	1	1
GPIB		No	No	No	No
Output ratings					
Voltage		0 to 200 V	0 to 20 V	0 to 60 V	0 to 500 V
Current		0 to 17 A	0 to 120 A	0 to 50 A	0 to 5 A
Maximum power					
Watts		1,200 W	1,064 W	1,200 W	1,050 W
Autoranging output	V1, I_1	200 V, 5 A	20 V, 50 A	60 V, 17.5 A	500 V, 2 A
	V2, I_2	120 V, 10 A	14 V, 76 A	40 V, 30 A	350 V, 3 A
	V3, I_3	60 V, 17 A	7 V, 120 A	20 V, 50 A	200 V, 5 A
Ripple and noise, 20 Hz to 20 MHz					
Voltage rms		22 mV	8 mV	8 mV	50 mV
p-p		50 mV	50 mV	40 mV	160 mV
Current rms		15 mA	120 mA	25 mA	50 mA
Load regulation					
Voltage	0.01%+	5 mV	3 mV	5 mV	13 mV
Current	0.01%+	10 mA	15 mA	10 mA	35 mA
Transient response time 10% step change					
Time		2 ms	2 ms	2 ms	5 ms
Level		150 mV	100 mV	100 mV	200 mV
Supplemental Characteristics		(Non-warranted characteristics determined by design that are useful in applying the product)			
Programming resolution Voltage		50 mV	5 mV	15 mV	125 mV
Current		4.25 mA	30 mA	12.5 mA	1.25 mA
dc floating voltage either terminal can be grounded or floated from chassis ground		±550 V	±240 V	±240 V	±550 V
ac input current	100 Vac	24 A	24 A	24 A	24 A
	120 Vac	24 A	24 A	24 A	24 A
	220 Vac	15 A	15 A	15 A	15 A
	240 Vac	14 A	14 A	14 A	14 A
Weight	Net	16.3 kg (36 lb)	17.2 kg (38 lb)	16.3 kg (36 lb)	16.3 kg (36 lb)
	Shipping	21.8 kg (48 lb)	22.7 kg (50 lb)	21.8 kg (48 lb)	21.8 kg (48 lb)

A line cord option must be specified.
See pages 93-98 for ordering information.
* Support rails required

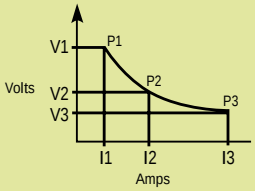
Accessories
1494-0060 Rack Slide Kit
E3663AC Support rails for Agilent rack cabinets

Single-Output, Autoranging:
200 W and 1000 W GPIB

6033A, 6038A

6030A, 6031A,
6032A, 6035A

Autoranging Output:



Save rack space by using fewer outputs

Reduce cost by using fewer power supplies

This series of 200 watt and 1000 watt dc power supplies take the place of multiple power supplies in your test system by providing maximum power at a variety of operating points.

Industry standard SCPI commands and VXI*Plug&Play* drivers make system integration easy. Using the serial link, up to 16 power supplies can be connected through one GPIB address. These power supplies have excellent electrical efficiency, making them a good choice for large systems.

Specifications (at 0° to 55°C unless otherwise specified)		6030A	6031A	6032A	6033A	6035A	6038A
Number of outputs		1	1	1	1	1	1
GPIB		Yes	Yes	Yes	Yes	Yes	Yes
Output ratings							
Output Voltage		0 to 200 V	0 to 20 V	0 to 60 V	0 to 20 V	0 to 500 V	0 to 60 V
Output Current		0 to 17 A	0 to 120 A	0 to 50 A	0 to 30 A	0 to 5 A	0 to 10 A
Maximum power watts		1,200 W	1,064 W	1,200 W	242 W	1,050 W	240 W
Autoranging output	V1, I_1	200 V, 5 A	20 V, 50 A	60 V, 17.5 A	20 V, 10 A	500 V, 2 A	60 V, 3.3 A
	V2, I_2	120 V, 10 A	14 V, 76 A	40 V, 30 A	14 V, 17.2 A	350 V, 3 A	40 V, 6 A
	V3, I_3	60 V, 17 A	7 V, 120 A	20 V, 50 A	6.7 V, 30 A	200 V, 5 A	20 V, 10 A
Programming accuracy at 25°C ±5°C	Voltage	0.035% +145 mV	0.035% +15 mV	0.035% +40 mV	0.035% +9 mV	0.25% +400 mV	0.035% +40 mV
	Current	0.2% +25 mA	0.25% +250 mA	0.2% +85 mA	0.15% +20 mA	0.3% +63 mA	0.09% +10 mA
Ripple and noise 20 Hz to 20 MHz	Voltage rms	22 mV	8 mV	8 mV	3 mV	50 mV	3 mV
	Voltage p-p	50 mV	50 mV	40 mV	30 mV	160 mV	30 mV
	Current rms	15 mA	120 mA	25 mA	30 mA	50 mA	5 mA
Readback accuracy at 25°C ±5°C	Voltage	0.08% +80 mV	0.08% +7 mV	0.08% +20 mV	0.07% +6 mV	0.5% +300 mV	0.07% +50 mV
	Current	0.36% +15 mA	0.4% +100 mA	0.36% +35 mA	0.3% +25 mA	0.5% +50 mA	0.2% +11 mA
Load regulation							
Voltage	0.01%+	5 mV	3 mV	5 mV	2 mV	13 mV	3 mV
Current	0.01%+	10 mA	15 mA	10 mA	9 mA	35 mA	5 mA
Line regulation							
Voltage	0.01%+	5 mV	2 mV	3 mV	1 mV	13 mV	2 mV
Current	0.01%+	5 mA	25 mA	10 mA	6 mA	18 mA	2 mA
Transient response time 10% step change	Time	2 ms	2 ms	2 ms	1 ms	5 ms	1 ms
	Level	150 mV	100 mV	100 mV	50 mV	200 mV 7	5 mV

Autoranging: 200 W and 1000 W GPIB (Continued)

Specifications

(at 0° to 55°C unless otherwise specified)

Supplemental Characteristics for all model numbers

Remote Sensing: Up to 2 V drop in each lead. Voltage regulation specification met with up to 0.5 V drop, but degrades for greater drops.

Modulation: (analog programming of output voltage and current)
Input signal: 0 to 5 V or 0 to 4 k Ohms

Size: 6030A–32A, 6035A:
425.5 mm W x 132.6 mm H x 503.7 mm D
(16.75 in x 5.25 in x 19.83 in).
6033A, 6038A:
212.3 mm W x 177.0 mm H x 516.4 mm D
(8.36 in x 6.97 in x 17.87 in).
See page 99 for more details.

Warranty: Three years

Supplemental Characteristics (Non-warranted characteristics determined by design and useful in applying the product)

		6030A	6031A	6032A	6033A	6035A	6038A
Programming resolution	Voltage	50 mV	5 mV	15 mV	5 mV	125 mV 1	5 mV
	Current	4.25 mA	30 mA	12.5 mA	7.5 mA	1.25 mA	2.5 mA
dc floating voltage either terminal can be grounded or floated from chassis ground		±550 V	±240 V	±240 V	±240 V	±550 V	±240 V
ac input current	100 Vac	24 A	24 A	24 A	6 A	24 A	6 A
	120 Vac	24 A	24 A	24 A	6.5 A	24 A	6.5 A
	220 Vac	15 A	15 A	15 A	3.8 A	15 A	3.8 A
	240 Vac	14 A	14 A	14 A	3.6 A	14 A	3.6 A
Weight	Net	16.3 kg (36 lb)	17.2 kg (38 lb)	16.3 kg (36 lb)	9.6 kg (21 lb)	16.3 kg (36 lb)	9.6 kg (21 lb)
	Shipping	21.8 kg (48 lb)	22.7 kg (50 lb)	21.8 kg (48 lb)	11.4 kg (25 lb)	21.8 kg (48 lb)	11.4 kg (25 lb)

Ordering Information

Opt 001 Front panel has only line switch, line indicator, and OVP adjust (6030A–33A and 6038A only)

Opt 100 87 to 106 Vac, 48 to 63 Hz (power supply output is derated to 75%)

Opt 120 104 to 127 Vac, 47 to 63 Hz

Opt 220 191 to 233 Vac, 48 to 63 Hz

Opt 240 209 to 250 Vac, 48 to 63 Hz

Opt 800 Rack-mount Kit for Two Half-rack Units Side by Side. Lock link Kit p/n 5061-9694 and 7 in Rack adapter Kit 5063-9215

* **Opt 908** Rack-mount Kit for a Single Half-rack Unit 6033A and 6038A (with blank filler panel); p/n 5062-3960, 6030A–32A and 6035A; p/n 5062-3977

* **Opt 909** Rack-mount Kit with Handles. For 6030A–32A, 6035A; p/n 5062-3983

Opt 0L2 Extra Standard Documentation Package

Opt 0B3 Service Manual

Opt 0B0 No documentation package

Opt J01 Stabilization for loads up to 10 Henries (not available on 6033A)

A line cord must be specified for 6030A-32A, 6035A. See pages 93-98 for ordering information.

* Support rails required

Accessories

5080-2148 Serial Link Cable, 2 m (6.6 ft)

1494-0060 Rack Slide Kit

E3663AC Support rails for Agilent rack cabinets

Multiple-Output: 40 W-105 W GPIB

6621A-6624A, 6627A

- Fast up and down programming
- Proven reliability keeps test systems running
- Easy to integrate into a system
- Extensive protection for DUTs

Two, three, or four isolated outputs are integrated into one package, conserving rack space and GPIB addresses. Most of the outputs also provide dual ranges, for more current at lower voltage levels. The outputs can be connected in parallel or series to further increase the flexibility that these products offer the system designer.

Programming is done using industry standard SCPI commands. Test system integration can be further simplified be using the VXI*Plug&Play* drivers. These power supplies help reduce test time with fast up and down programming, which is enhanced by an active downprogrammer which can sink the full rated current.

Specifications

(at 0° to 55°C unless otherwise specified)

		40 W output	40 W output	80 W output	80 W output	105 W output
Output power	Low-range volts, amps	0 to 7 V, 0 to 5 A	0 to 20 V, 0 to 2 A	0 to 7 V, 0 to 10 A	0 to 20 V, 0 to 4 A	0-35 V, 0-3 A
	High range volts, amps	0 to 20 V, 0 to 2 A	0 to 50 V, 0 to 0.8 A	0 to 20 V, 0 to 4 A	0 to 50 V, 0 to 2 A	— —
Output combinations for each model (total number of outputs)	**6621A (2)**	—	—	2	—	—
	6622A (2)	—	—	—	2	—
	6623A (3)	1	1	1	—	—
	6624A (4)	2	2	—	—	—
	6627A (4)	—	4	—	—	—
	6623A(3) Special Order Option J03	—	2	—	—	1
Programming accuracy	Voltage	19 mV + 0.06%	50 mV + 0.06%	19 mV + 0.06%	50 mV + 0.06%	35 mV + 0.06%
	Current	50 mA + 0.16%	20 mA + 0.16%	100 mA + 0.16%	40 mA + 0.16%	30 mA + 0.16%
Readback accuracy (at 25°C ±5°C)	Voltage	20 mV + 0.05%	50 mV + 0.05%	20 mV + 0.05%	50 mV + 0.05%	35 mV + 0.05%
	+Current	10 mA + 0.1%	4 mA + 0.1%	20 mA + 0.1%	8 mA + 0.1%	6 mA + 0.1%
	-Current	25 mA + 0.2%	8 mA + 0.2%	50 mA + 0.2%	20 mA + 0.2%	15 mA + 0.2%
Ripple and noise (peak-to-peak, 20 Hz to 20 MHz; rms, 20 Hz to 10 MHz)						
	Constant voltage rms	500 µV	500 µV	500 µV	500 µV	500 µV
	peak-to-peak	3 mV	3 mV	3 mV	3 mV	3 mV
	Constant current rms	1 mA	1 mA	1 mA	1 mA	1 mA
Load regulation	Voltage	2 mV	2 mV	2 mV	2 mV	2 mV
	Current	1 mA	0.5 mA	2 mA	1 mA	2 mA
Load cross regulation	Voltage	1 mV	2.5 mV	1 mV	2.5 mV	N/A
	Current	1 mA	0.5 mA	2 mA	1 mA	N/A
Line regulation	Voltage	0.01% + 1 mV	0.01% + 1 mV	0.01% + 1 mV	0.01% + 1 mV	0.01% + 1 mV
	Current	0.06% + 1 mA	0.06% + 1 mA	0.06% + 1 mA	0.06% + 1 mA	0.06% + 1 mA

Transient response time Less than 75 µs for the output to recover to within 75 mV of nominal value following a load change within specfications

Multiple-Output: 40 W-105 W GPIB (Continued)

Specifications
(at 0° to 55°C unless otherwise specified)

Supplemental Characteristics for all model numbers

dc Floating Voltage: All outputs can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to 1 V drop per load lead. The drop in the load leads is subtracted from the voltage available for the load.

Command Processing Time: 7 ms typical with front-panel display disabled

Down Programming: Current sink limits are fixed approximately 10% higher than source limits for a given operating voltage above 2.5 V

Input Power: 550 W max., 720 VA max.

GPIB Interface Capabilities: SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT0.

Regulatory Compliance: Listed to UL1244; conforms to IEC 61010-1; carries the CE mark.

Size: 425.5 mm W x 132.6 mm H x 497.8 mm D (16.75 in x 5.22 in x 19.6 in) See page 103 for more details

Weight: Net, 17.4 kg (38 lb); shipping, 22.7 kg (50 lb)

Warranty Period: Three years

Supplemental Characteristics

(Non-warranted characteristics determined by design and useful in applying the product)

		40 W output	40 W output	80 W output	80 W output	105 W output
Average programming resolution	Voltage	6 mV	15 mV	6 mV 20 mV (high)	6 mV 20 mV (high)	10.5 mV
	Current	25 mA	10 mA	50 mA 20 mA (high)	50 mA 20 mA (high)	15 mA
OVP		100 mV	250 mV	100 mV 2	50 mV	175 mV
Output programming response time (time to settle within 0.1% of full scale output, after Vset command has been processed)		2 ms	6 ms	2 ms	6 ms	6 ms

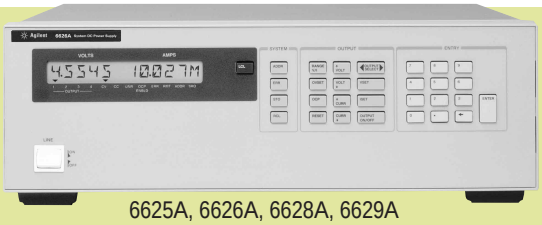
Ordering Information

Opt 100 87 to 106 Vac, 47 to 66 Hz Input, 6.3 A (Japan only)
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 66 Hz, 3.0 A
Opt 240 209 to 250 Vac, 47 to 66 Hz, 3.0 A
Opt 750 Relay Control and DFI/RI
Opt S50 similar to option 750, however the remote inhibit does not latch
* **Opt 908** Rack-mount Kit (p/n 5062-3977)
* **Opt 909** Rack-mount Kit w/Handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
* Support rails required

Accessories

p/n 1494-0059 Rack Slide Kit
E3663A Support rails for Agilent rack cabinets

Precision Multiple-Output: 25 W-50 W GPIB



6625A, 6626A, 6628A, 6629A

- Precise V & I programming and readback
- Fast up and down programming
- Extensive protection for DUTs
- Easy to integrate into a system

Two or four isolated outputs are integrated into one package, conserving rack space and GPIB addresses. Dual ranges allow for more current at lower voltage levels. The outputs can be connected in parallel or series to further increase the flexibility that these products offer the system designer. Programming is done using industry standard SCPI commands and test system integration can be further simplified be using the VXI*Plug&Play* drivers. These power supplies help reduce test time with fast up and down programming, which is enhanced by the active down-programmer which can sink the full rated current.

These power supplies are very useful on the R&D bench. The accuracy of both the programming and the measurement systems allow precise control and monitoring of prototype bias power. The extensive protection features protect valuable prototypes, including very fast CV/CC crossover. The power supply can be controlled from either the front panel keypad or, for automated testing, from the GPIB.

Specifications (at 0° to 55°C unless otherwise specified)		25 W output	50 W output
Output power	Low-range volts, amps	0 to 7 V, 0 to 15 mA	0 to 16 V, 0 to 200 mA
	High range volts, amps	0 to 50 V, 0 to 500 mA	0 to 50 V, 0 to 1 A or 0 to 16 V, 0 to 2 A
Output combinations for each model (total number of outputs)	**6625A (2) Precision**	1	1
	6626A (4) Precision	2	2
	6628A (2) Precision	—	2
	6629A (4) Precision	—	4
Programming accuracy (at 25°C ±5°C)	Voltage	1.5 mV + 0.016% (low) 10 mV + 0.016% (high)	3 mV + 0.016% (low) 10 mV + 0.016% (high)
	Current	15 µA + 0.04% (low) 100 µA + 0.04% (high)	185 µA + 0.04% (low) 500 µA + 0.04% (high)
Readback accuracy (at 25°C ±5°C)	Voltage	0.016% + 2 mV (low) 0.016% + 10 mV (high)	0.016% + 3.5 mV (low) 0.016% + 10 mV (high)
	+/-Current	0.03% + 15 µA (low) 0.03% + 130 µA (high)	0.04% + 250 µA (low) 0.04% + 550 µA (high)
Ripple and noise	Constant voltage rms	500 µV	500 µV
(peak-to-peak, 20 Hz to 20 MHz; rms, 20 Hz to 10 MHz)	peak-to-peak	3 mV	3 mV
	Constant current rms	0.1 mA	0.1 mA
Load regulation	Voltage	0.5 mV	0.5 mV
	Current	0.005 mA	0.01 mA
Load cross regulation	Voltage	0.25 mV	0.25 mV
	Current	0.005 mA	0.01 mA
Line regulation	Voltage	0.5 mV	0.5 mV
	Current	0.005 mA	0.01 mA
Transient response time change within specfications		Less than 75 µs for the output to recover to within 75 mV of nominal value following a load	
Supplemental Characteristics		(Non-warranted characteristics determined by design and useful in applying the product)	
		25-watt output	**50-watt output**
Average programming resolution	Voltage	460 µV (low)	1 mV (low)
		3.2 mV (high)	3.2 mV (high)
	Current	1 µA (low)	13 µA (low)
		33 µA (high)	131 µA (high)
	OVP	230 mV	230 mV
Output programming response time		6 ms	6 ms
(time to settle within 0.1% of full scale output, after Vset command has been processed)			

Precision Multiple-Output: 25 W-50 W GPIB (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: All outputs can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to 10 V drop per load lead. The drop in the load leads is subtracted from the voltage available for the load.

Command Processing Time: 7 ms typical with front-panel display disabled

Input Power: 550 W max., 720 VA max.

GPIB Interface Capabilities: SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT0, C0, E1.

Regulatory Compliance: Listed to UL 1244; conforms to IEC 61010-1.

Size: 425.5 mm W x 132.6 mm H x 497.8 mm D (16.75 in x 5.22 in x 19.6 in) See page 103 for more details

Weight: 6626A, 6629A: Net, 17.4 kg (38 lb); shipping, 22.7 kg (50 lb) 6625A, 6628A: Net, 15.5 kg (34 lb); shipping, 20.8 kg (46 lb)

Warranty Period: Three years

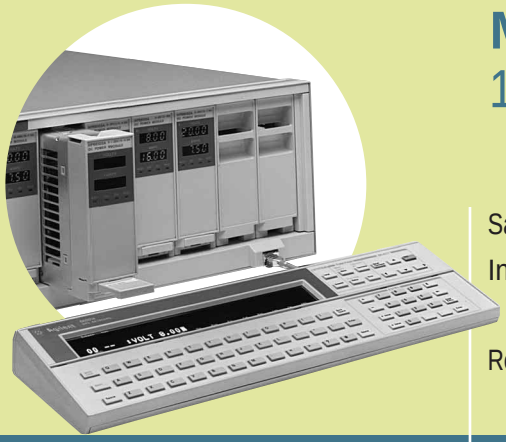
Ordering Information

Opt 100 87 to 106 Vac, 47 to 66 Hz Input, 6.3 A (Japan only)
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 66 Hz, 3.0 A
Opt 240 209 to 250 Vac, 47 to 66 Hz, 3.0 A
Opt 750 Relay Control and DFI/RI
Opt S50 Similar to option 750, however the remote inhibit does not latch
* **Opt 908** Rack-mount Kit (p/n 5062-3977)
* **Opt 909** Rack-mount Kit w/Handles (p/n 5063-9221)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package

* Support rails required

Accessories

p/n 1494-0059 Rack Slide Kit
E3663AC Support rails for Agilent rack cabinets



Modular Power System:
1200 W per mainframe GPIB

Save rack space with 8 power supply outputs in one mainframe

Increase test throughput with advanced triggering system and down-loadable LIST mode

Reconfigure fast with easily swappable modules

66000A (mainframe)
66001A (keyboard)

66000 Modular Power System

The Agilent 66000 modular power system simplifies test-system assembly, cabling, programming, debugging and operation. It is ideal for ATE and production test environments, where it can supply bias power and stimulus to sub-assemblies and final products. The modular power system saves rack space, the 7-inch-high (4-EIA units) mainframe can accommodate up to eight dc power modules.

Key Features

- GPIB-programmable voltage and current
- Programmable over-voltage and over-current protection
- Self-test initiated at power-up or from GPIB command
- Electronic calibration over GPIB or from keyboard
- Over-temperature protection
- Discrete fault indicator/remote inhibit (DFI/RI)
- Five nonvolatile store-recall states per output
- User-definable power-on state

Multiple Mainframes at One GPIB Address

The Agilent serial link feature will allow you to control up to 16 outputs at one GPIB address by connecting an auxiliary mainframe. The serial link cable comes standard with the

Specifications (at 0° to 55°C unless otherwise specified)		66101A	66102A	66103A	66104A	66105A	66106A
Output ratings at 40°C							
Output voltage		0 to 8 V	0 to 20 V	0 to 35 V	0 to 60 V	0 to 120 V	0 to 200 V
Output current		0 to 16 A	0 to 7.5 A	0 to 4.5 A	0 to 2.5 A	0 to 1.25 A	0 to 0.75 A
Maximum power		128 W	150 W	150 W	150 W	150 W	150 W
Programming accuracy at 25°C ±5°C							
Voltage	0.03% +	3 mV	8 mV	13 mV	27 mV	54 mV	90 mV
Current	0.03% +	6 mA	3 mA	2 mA	1.2 mA	0.6 mA	0.4 mA
Readback accuracy (via GPIB or keyboard display at 25°C ±5°C)							
Voltage	0.02%+	2 mV	5 mV	8 mV	16 mV	32 mV	54 mV
Current	0.02%+	6 mA	3 mA	2 mA	1 mA	0.6 mA	0.3 mA
Ripple and noise (20 Hz to 20 MHz)							
Constant Voltage rms		2 mV	3 mV	5 mV	9 mV	18 mV	30 mV
peak-peak		5 mV	7 mV	10 mV	15 mV	25 mV	50 mV
Constant Current rms		8 mA	4 mA	2 mA	1 mA	1 mA	1 mA
Line regulation							
Voltage		0.5 mV	0.5 mV	1 mV	2 mV	3 mV	5 mV
Current		0.75 mA	0.5 mA	0.3 mA	0.1 mA	50 µA	30 µA
Load regulation							
Voltage		1 mV	1 mV	1 mV	2 mV	4 mV	7 mV
Current		0.5 mA	0.2 mA	0.2 mA	0.1 mA	50 µA	30 µA
Transient response time		Less than 1 ms for the output voltage to recover within 100 mV of its previous level following any step change in load current up to 10 percent of rated current					
Supplemental Characteristics		(Non-warranted characteristics determined by design that are useful in applying the product)					
Average resolution							
Voltage		2.4 mV	5.9 mV	10.4 mV	18.0 mV	36.0 mV	60.0 mV
Current		4.6 mA	2.3 mA	1.4 mA	0.75 mA	0.39 mA	0.23 mA
Output voltage programming (OVP)		50 mV	120 mV	200 mV	375 mV	750 mV	1.25 mV
OVP accuracy		250 mV	500 mV	800 mV	1 V	1.5 V	2.5 V

Modular Power System:
1200 W per mainframe GPIB (Continued)

66000 MPS mainframe. For applications with a broader range of power requirements, one 66000 mainframe can be connected with up to eight of the 6640, 6650, 6670, 6680, 6690 or 6030 series of system power supplies. This solution provides power ranges from 150 watts to 5000 watts at one primary GPIB address.

Output Connections

System assembly is simplified thanks to a quick-disconnect connector assembly on each module. Once your wires are connected to the load, the connector design permits the modules to be removed from the front of the mainframe without disconnecting cabling or removing the mainframe from the rack. One connector assembly is shipped with each module.

Output Sequencing

Increase test throughput by using the output sequencing feature of the 66000 MPS. This powerful feature allows you to download up to 20 voltage, current, and dwell-time parameter sets per output. This sequence can be paced by the programmed dwell times. As an alternative, triggers can be used to step through the output list. The output sequences can be executed without controller intervention, thereby increasing overall test system throughput. More detailed information on the triggering and output sequencing capabilities can be obtained by ordering the 66000 Modular Power System Product Note (p/n 5091-2497E) described below.

Key Literature

66000 Modular Power System Product Note
p/n 5091-2497E

Specifications (at 0° to 55°C unless otherwise specified)	66101A-J03 Special Order Option	66101A-J05 Special Order Option	66102A-J05 Special Order Option	66103A-J01 Special Order Option	66103A-J02 Special Order Option
Output ratings at 40°C					
Output voltage	5.7 V	12 V	15 V	37 V	40 V
Output current	20 A	12 A	10 A	4.5 A	3.6 A
Maximum power	114 W	144 W	150 W	167 W	144 W
Programming accuracy at 25°C ±5°C					
Voltage 0.03% +	2.5 mV	5 mV	8 mV	13 mV	15 mV
Current 0.03% +	8 mA	6 mA	4 mA	2 mA	2 mA
Readback accuracy (via GPIB keyboard display at 25°C ±5°C)					
Voltage 0.02% +	2 mV	3 mV	5 mV	8 mV	9.2 mV
Current 0.02% +	8 mA	6 mA	4 mA	2 mA	2 mA
Ripple and noise (20 Hz to 20 MHz)					
Constant Voltage rms	2 mV	3 mV	3 mV	5.3 mV	6 mV
peak-peak	5 mV	7 mV	7 mV	10.6 mV	11.5 mV
Constant Current rms	10 mA	8 mA	6 mA	2 mA	2 mA
Line regulation					
Voltage	0.5 mV	0.5 mV	0.5 mV	1 mV	1 mV
Current	0.5 mA	0.75 mA	0.5 mA	0.3 mA	0.3 mA
Load regulation					
Voltage	1 mV	1 mV	1 mV	1 mV	1 mV
Current	1 mA	0.5 mA	0.3 mA	0.2 mA	0.2 mA
Transient response time	Less than 1 ms for the output voltage to recover within 100 mV of its previous level following any step change in load current up to 10 percent of rated current				
Supplemental Characteristics	(Non-warranted characteristics determined by design that are useful in applying the product)				
Average resolution					
Voltage	2 mV	3.6 mV	4.5 mV	11 mV	12 mV
Current	6 mA	4.6 mA	3.1 mA	1.4 mA	1.2 mA
OVP	45 mV	75 mV	90 mV	200 mV	230 mV
OVP accuracy	250 mV	375 mV	375 mV	850 mV	920 mV

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±240 Vdc from chassis ground

Remote Sensing: Up to half the rated output voltage can be dropped across each load lead. Add 2 mV to the voltage load regulation specification for each 1–V change in the negative output lead caused by a load current change.

Command Processing Time: The average time for the output voltage to change after getting an GPIB command is 20 ms

Output Programming Response Time (with full resistive load): The rise and fall time (10% to 90% and 90% to 10%) of the output voltage is less than 20 ms. The output voltage change settles within 0.1% of the final value in less than 120 ms.

Modular Power System:
1200 W per mainframe GPIB (Continued)

Down Programming: An active down-programmer sinks approximately 10% of the rated output current

Calibration Interval: One year

ac Input of System Mainframe

Voltage	100 Vac	120 Vac	200 Vac	220 Vac	230 Vac	240 Vac
Max. Current	29 A	25 A	16 A	16 A	15 A	15 A

Input Power of System Mainframe: 3200 VA (max.), 1800 W (max.), 1600 W (typ.)

GPIB Capabilities: SH1, AH1, TE6, LE4, SR1, RL1, PP0, DC1, DT1, E1, and C0, and a command set compatible with IEEE-488.2 and SCPI

Regulatory Compliance: Listed to UL 1244; certified to CSA 22.2 No. 231; conforms to IEC 61010-1.

Weight: Net, 66000A, 15 kg (33 lb); 66001A, 1.05 kg (2.3 lb); 66101-66106A, 2.8 kg (6 lb). Shipping, 66000A, 19 kg (42 lb); 66001A, 1.34 kg (2.95 lb); 66101–66106A, 4.1 kg (9 lb).

Size: 66000A: 425.7 mm W x 192 mm H x 677.93 mm D (16.76 in x 7.28 in x 26.69 in), including feet and rear connectors (See Page 104 for more details.)

Warranty Period: Three years

Ordering Information

66000A MPS Mainframe
Opt 120 for operation at 100 Vac or 120 Vac nominal
Opt 240 for operation at 200 Vac or 220-240 Vac nominal
* **Opt 908** Rack-mount Kit (p/n 5063-9215)
* **Opt 909** Rack-mount Kit with Handles (p/n 5063-9222)
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
* **Note:** Options 908 and 909 require cabinet rails (E3663AC) or a slide kit (p/n 1494-0059) to support the loaded mainframe's weight.
A line cord option must be specified.
See pages 93-98.
66001A MPS Keyboard includes 2m (6 ft) cables
66002A Rack kit for 66001A keyboard

Specifications (at 0° to 55°C unless otherwise specified)		**66103A-J09** Special Order Option	**66103A-J12** Special Order Option	**66104A-J09** Special Order Option	**66105A-J01** Special Order Option
Output ratings at 40°C					
Output voltage		28.5 V	24 V	55 V	35 V
Output current		5.5 A	6 A	3 A	1.25 A
Maximum power		157 W	144 W	165 W	44 W
Programming accuracy at 25°C ±5°C					
Voltage	0.03% +	13 mV	13 mV	25 mV	15 mV
Current	0.03% +	3 mA	3 mA	1.5 mA	0.6 mA
Readback accuracy (via GPIB or keyboard display at 25°C ±5°C)					
Voltage	0.02% +	8 mV	8 mV	15 mV	9 mV
Current	0.02% +	3 mA	3 mA	1.2 mA	0.6 mA
Ripple and noise (20 Hz to 20 MHz)					
Constant Voltage rms		5 mV	5 mV	9 mV	6 mV
peak-peak		10 mV	10 mV	15 mV	11.5 mV
Constant Current rms		4 mA	4 mA	1.2 mA	1 mA
Line regulation					
Voltage		1 mV	1 mV	2 mV	1 mV
Current		0.3 mA	0.3 mA	0.1 mA	50 µA
Load regulation					
Voltage		1 mV	1 mV	2 mV	1 mV
Current		0.2 mA	0.2 mA	0.1 mA	50 µA
Transient response time		Less than 1 ms for the output voltage to recover within 100 mV of its previous level following any step change in load current up to 10 percent of rated current			
Supplemental Characteristics		(Non-warranted characteristics determined by design that are useful in applying the product)			
Average resolution					
Voltage		10.4 mV	8 mV	16.5 mV	2 mV
Current		2 mA	2 mA	0.9 mA	1.2 mA
OVP		200 mV	150 mV	350 mV	230 mV
OVP accuracy		800 mV	600 mV	950 mV	920 mV

Module Options

Opt 760 Open/Close and Polarity Reversal Relays
Opt J17 External Imon
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package

Accessories

p/n 5060-3351 Field-Installable Relay Kit
p/n 5060-3386 Standard Connector Assembly
p/n 5060-3387 Standard Connector Assembly with installed relays (Option 760)
p/n 66000-90001 Mainframe Installation Guide
p/n 5959-3360 dc Power Module User's Guide
p/n 5959-3362 dc Power Module Programming Guide
p/n 66000-90003 Mainframe Service Manual
p/n 5959-3364 dc Power Module Service Manual
p/n 1252-1488 4-Pin FLT/Inhibit Connector
E3663AC Support rails for Agilent rack cabinets

Application Specific dc Power Supplies

Some applications require specialized dc power supplies. This section contains dc power supplies that provide the solutions needed to solve some very specific applications problems.

Mobile Communication dc Sources

Page 63-68

Battery life is a critical parameter for battery powered digital mobile communications devices such as cell phones and Bluetooth™ enabled appliances. The pulsed characteristics of battery drain create unique powering and measuring requirements. With fast transient response, to react to pulsed current draw, and a flexible and fast measurement system, these dc sources are optimized for the needs of digital mobile communications devices.

Solar Array Simulators

Page 69-70

Solar panels, consisting of multiple solar arrays, provide power to satellites. They have unique V-I characteristics. Since the output power of a solar array varies with environmental conditions (i.e. temperature, darkness, light intensity), a specialized power supply must be used for accurate simulation.

Component Test dc Source

Page 71-73

Mixed signal IC testing requires speed, accuracy, and multiple dc outputs. This quad output dc source provides cost effective and compact biasing and measurement for semiconductor test systems.

Multi-Cell Charger / Discharger (MCCD)

Page 74

This family of products is optimized for battery forming applications. It charges, discharges and monitors 100's of channels simultaneously.

Mobile Communications dc Sources: 40-100 W

66319B/D, 66321B/D

- Ideal for testing wireless and battery powered devices
- 20 to 30 times improvement in test throughput over general purpose dc sources
- Superior output transient performance with short or long load leads (up to 6 meters)
- Dynamic measurement system for accurate battery current drain measurement
- Easy-to-use Graphical User Interface and analysis tools for bench top use

Overcome Battery Powered Device Testing Challenges

Digital communications devices and digital battery powered devices present a unique testing challenge: they draw rapid pulses of current. By offering superior transient performance, unmatched in the marketplace, the Agilent Mobile Communications dc Sources dramatically reduce the transient voltage drop due to pulse loading characteristics of digital communications devices. The Agilent Mobile Communications dc Sources enable you to maximize test throughput by minimizing test interruption due to false trigger of device low voltage shutdown.

Dynamic Measurement Capabilities

The Agilent Mobile Communications dc Sources offer a built-in advanced measurement system to accurately measure battery current drains when the device operates in different modes (such as talk mode, active mode, standby mode, and off/sleep mode). Measurements made during these modes are critical for ensuring that your devices are operating properly and that you are getting the most out of the battery.

Simulate both Main Battery and Charger

Single output models are recommended when you need to provide power as a replacement to your

Specifications

(at 0° to 55°C unless otherwise specified)

	66309B/D	66311B/D	66319B/D	66321B/D	66332A	66332A-J01 Special Order Option
Number of outputs	2	1	2	1	1	1
GPIB	Yes	Yes	Yes	Yes	Yes	Yes
Output ratings						
Voltage	0 to 15 V	0 to 15 V	0 to 15 V	0 to 15 V	0 to 20 V	0 to 30 V
Current	0 to 3 A	0 to 3 A	0 to 3 A	0 to 3 A	0 to 5 A	0 to 3.3 A
Peak current for up to 7 ms	5 A	5 A	5 A	5 A	5 A	3.3 A
Programming accuracy at 25°C ±5°C (% of setting plus fixed)						
Voltage 0.05%+	10 mV	10 mV	10 mV	10 mV	10 mV	15 mV
+Current 0.05%+	1.33 mA	1.33 mA	1.33 mA	1.33 mA	2 mA	2 mA
Ripple and Noise (20 Hz to 20 MHz)						
Voltage rms	1 mV	1 mV	1 mV	1 mV	0.3 mV	0.5 mV
peak-to-peak	6 mV	6 mV	6 mV	6 mV	3 mV	5 mV
Current rms	2 mA	2 mA	2 mA	2 mA	2 mA	2 mA
dc measurement accuracy						
Voltage 0.03%+	5 mV	5 mV	5 mV	5 mV	3 mV	5 mV
+20 mA to + rated current 0.2%+	0.5 mA[2]	0.5 mA[2]	—	—	0.5 mA	0.5 mA
-20 mA to - rated current 0.2%+	1.1 mA	1.1 mA	—	—	1.1 mA	1.1 mA
-3 A to + 5 A 0.2%	—	—	0.5 mA[2]	0.5 mA[2]	—	—
-1 A to + 1 A 0.1%	—	—	0.2 mA	0.2 mA	—	—
-20 mA to + 20 mA range 0.1%+	2.5 µA	2.5 µA	2.5 µA	2.5 µA	2.5 µA	2.5 µA
Dynamic measurement system						
Buffer size	4096 points	4096 points	4096 points	4096 points	4096 points	4096 points
Sampling interval	15 µs - 31,200 s	15 µs - 31,200 s	15 µs - 31,200 s	15 µs - 31,200 s	15 µs - 31,200 s	15 µs - 31,200 s
Transient response time	<35 µs[3]	<35 µs[3]	<20 µs[3]	<20 µs	<100 µs[4]	<100 µs[4]
Transient voltage dip (typical with up to 15 feet 22 AWG wiring)	70 mV	70 mV	40 mV	40 mV	500 mV	650 mV
Programmable output resistance						
Range	—-	—	-40 mΩ to +1 Ω	-40 mΩ to +1 Ω	—	—
Programming accuracy	—	—	0.5% + 2 mΩ	0.5% + 2 mΩ	—	—
Resolution	—	—	1 mΩ	1 mΩ	—	—

Mobile Communications dc Sources: 40-100 W (Continued)

device's main battery during testing. Dual output models are recommended when you need to provide power as a replacement to your device's main battery and when you need to simulate the battery charger power; Use one output to supply current to the battery charger input port and the second output to connect in place of the main battery (which sinks current to simulate the main battery being charged).

Performs Like a Battery

With their battery emulation features, the Agilent 66319B/D and 66321B/D allow you to test your devices under the same power conditions that exist in actual use. Emulating the battery is key when characterizing battery operating life and detecting early product failures. These dc sources simulate the effects of internal resistance of the battery, enabling them to emulate the operation of various battery types or batteries in different charge states. Plus, these dc sources can simulate negative resistance so that you can compensate for voltage drop due to wiring in a fixture.

Feature Summary

Agilent has designed in the capability and flexibility that is required for accurately testing today's communications devices as well as your next generation designs for cell phones (formats include: 3G, cdma2000, WCDMA, CDMA, TDMA, GSM, PCS, DECT, TETRA, PHS, NADC), PDAs, *Bluetooth*™ enabled devices, and Wireless LAN access devices.

Specifications

(at 0° to 55°C unless otherwise specified)

		66309B/D	66311B/D	66319B/D	66321B/D	66332A	66332A-J01 Special Order Option
Voltmeter input (66309D, 66319D, 66311D and 66321D only)							
Input range		-25 to +25 Vdc	-25 to +25 Vdc	-25 to +25 Vdc	-25 to +25 Vdc	— —	— —
dc readback accuracy (at 25°C ±5°C)		0.04% + 5 mV	0.04% + 5 mV	0.04% + 5 mV	0.04% + 5 mV	— —	— —
ac + dc readback accuracy (at 25°C ±5°C) with dc plus a sinewave input > 25 mV rms		1% + 5 mV (60 Hz to 10 kHz)	1% + 5 mV (60 Hz to 10 kHz)	1% + 5 mV (60 Hz to 10 kHz)	1% + 5 mV (60 Hz to 10 kHz)	— — — —	— — — —
Auxilary output (66309B/D and 66319B/D)							
Output ratings	Voltage	0 to 12V	—	0 to 12V	—	—	—
	Current	0 to 1.5 A	—	0 to 1.5 A	—	—	—
Programming accuracy	Voltage	0.2% + 40 mV	—	0.2% + 40 mV	—	—	—
	+Current	0.2% + 4.5 mA	—	0.2% + 4.5 mA	—	—	—
dc measurement accuracy	Voltage	0.2% + 15 mV	—	0.2% + 15 mV	—	—	—
	+Current	0.2% + 3 mA	—	0.2% + 3 mA	—	—	—
Ripple and Noise (20 Hz to 20 MHz)							
Voltage	rms	1 mV	—	1 mV	—	—	—
	peak-to-peak	6 mV		6 mV			
Current	rms	2 mA	—	2 mA	—	—	—

Notes:

1. 66332A also has RS-232 interface.
2. Applies with current detector set to dc.
3. Time for the output voltage to recover to within 20 mV of final value after 0.1 to 1.5 A load change in high capacitance compensation range.
4. Time for the output voltage to recover to within 20 mV or 0.1% of the voltage rating of the unit following a change in load current of up to 50% of the output current rating.

Supplemental Characteristics

(Non-warranted characteristics determined by design and useful in applying the product)

dc Floating Voltage
Output terminals can be floated up to +/- 50 Vdc maximum from chassis ground (+/- 240 Vdc for 66332A)

Remote Sensing Voltage Drop
For 66332A: Up to 2 V can be dropped in each load lead. Add 2 mV to the load regulation specification for each 1 V drop in the positive output lead. For 66309B/D, 66311B/D: Up to 4 V can be dropped in each load lead. Add 2 mV to the load regulation specification for each 1 V drop in the positive output lead. For 66319B/D main output, 66321B/D main output: Up to 3 V total can be dropped in both load leads. For 66319B/D auxiliary output, 66321B/D auxiliary output: Up to 4 V total can be dropped in both load leads.

Command Processing Time
Average time required for the output voltage to begin to change following receipt of GPIB data is 4 ms (with display disabled).

Mobile Communications dc Sources: 40-100 W (Continued)

All models offer:

- Fast output response technology
- Programmable output response compensation
- Advanced DSP-based dynamic measurements
- Current sinking for testing and calibrating charger circuitry
- Extensive protection features (including broken sense lead detection)
- GPIB Interface, SCPI (Standard Commands for Programmable Instruments), VXI*plug&play* drivers

In addition, the 66319B/D and 66321B/D high performance models offer:

- Output resistance programming (positive and negative)
- Superior output stability with up to 6 meters of load leads
- Excellent transient voltage drop (typically < 30 mV)
- Three current measurement ranges
- NEW! Additional advanced battery drain measurements (CCDF, long term battery drain)

The new and improved 66319B/D and 66321B/D high performance models are recommended for new automated test system platforms and for R&D applications. The 66309B/D and the 66311B/D are available for those customers who need to replicate existing test platforms and who do not want to re-engineer existing automated test system designs.

Supplemental Characteristics

(Non-warranted characteristics determined by design and useful in applying the product)

(Continued)

Output Programming Response Time
For 66332A: The rise and fall time (10/90% and 90/10%) of the output voltage is < 2 ms (400 µs in fast mode). The output voltage change settles within 1 LSB (0.025% x full scale voltage) of final value in < 6 ms (2 ms in fast mode). For 66311B/D, 66321B/D, 66309B/D output 1, 66319B/D output 1: The rise and fall time (10/90% and 90/10%) of the output voltage is < 200 µs.

Measurement Time
Average time to process query, calculate measurement parameter and return data is 50 ms (includes the default time of 30 ms for acquiring data and 20 ms data processing overhead).

GPIB Interface Capabilities
IEEE-488.2, SCPI command set, 6630A series programming capability (not supported in 66309B/D, 66319B/D, 66321B/D)

Input power
(at worst case conditions: full load, 100 Vac mains)
For 66311B/D, 66321B/D: 1.7 A, 125 W.
For 66309B/D, 66319B/D: 2 A, 170 W.
For 66332A: 3.5 A, 250 W.

Regulatory Compliance
Complies with EMC directive 89/336/EEC (ISM 1B).

Warranty Period Three years

Size
For 66309B/D, 66311B/D, 66319B/D, 66321B/D: 212.8 mm W x 88.1 mm H x 435 mm D (8.4 in x 3.5 in x 17.13 in).
For 66332A: 425.5 mm W x 88.1 mm H x 364.4 mm D (16.8 in x 3.5 in x 14.3 in).
See page 102 for more details.

Weight
For 66309B/D, 66311B/D, 66319B/D, 66321B/D: 9.07 kg (20 lb) net, 11.1 kg (24.5 lb) shipping. For 66332A: 12.7 kg (28 lb) net, 15.0 kg (33 lb) shipping.

Mobile Communications dc Sources: 40-100 W (Continued)

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz

Opt 120 104 to 127 Vac, 47 to 63 Hz

Opt 220 191 to 233 Vac, 47 to 63 Hz

Opt 230 207 to 253 Vac, 47 to 63 Hz

Opt 004 Make "Hi Compensation Mode" as default setting

Opt 020 Front-panel Binding Posts (66332A only)

Opt UJ0 No front panel binding posts (66332A only)

Opt 053 Add 14565A Device Characterization Software with Battery Drain Analysis (66319B/D, 66321B/D)

Opt 521 Solid State Relays (66309B/D, 66319B/D)

Opt AYK No Solid State Relays (66309B/D,66319B/D)

Opt 760 Isolation and Reversal Relays (66332A only)

Opt 8ZJ Delete feet

Opt 8ZL Include feet

* **Opt 1CM** Rack-mount kit 66309B/D, 66311B/D, 66319B/D, 66321B/D: p/n 5062-3975; 66332A: p/n 5062-3974

* **Opt 1CP** Rack-mount Kit with Handles, p/n 5062-3975 (66332A only)

* **Opt AXS** Rack-mount Kit for side-by-side mounting, (N/A for 66332A) Locking Kit p/n 5061-9694; Flange Kit p/n 5062-3974

Opt 0B0 Delete standard documentation package

Opt 0L1 Include standard documentation package

Opt 0L2 Include extra standard documentation package

Opt 0B3 Include service manual

*Support rails required

Accessories

p/n 1494-0060 Rack Slide Kit (66332A only)

E3663AC Support rails for Agilent rack cabinets

14565A Device Characterization Software with Battery Drain Analysis

Note: Battery Drain Analysis means Data Logging and CCDF measurements. These capabilities require models 66319B, 66319D, 66321B or 66321D with version A.03.00 firmware or higher and 14565A software version 3.01 or higher.

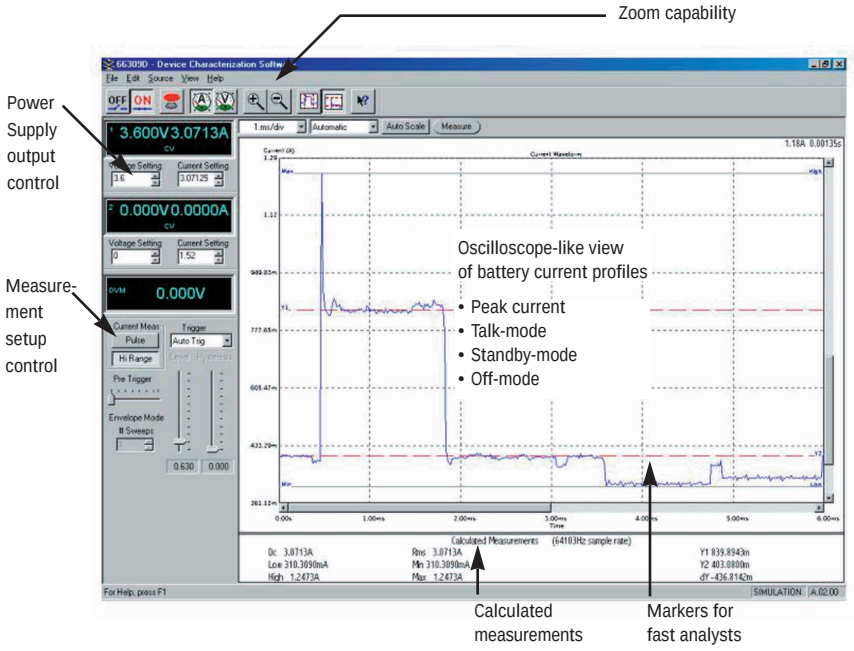
Mobile Communications dc Sources:
Device Characterization Software

- Ideal for testing wireless and battery powered devices
- Converts Mobile Communications dc Source into a powerful bench top tool for R&D and Repair
- Easy-to-use Graphical User Interface and analysis tools
- No programming required

Simplify test and analysis in R&D or on the repair bench

With the Agilent 14565A Device Characterization Software, testing, analyzing, and troubleshooting wireless and battery powered devices is made simple. The 14565A provides a graphical user interface that lets you easily control the Mobile Communications dc Sources. It gives you access to the Mobile Communications dc Source's high-powered measurement system and provides an oscilloscope-like view of the voltage or current waveforms of the device under test. The 14565A provides reference waveform save/recall, and provides oscilloscope-like measurement and analysis including voltage and current waveform parameter measurements, triggering, markers, zoom control, and more. By using the advanced capabilities built into the power supply, you can spend more time testing and analyzing instead of configuring and reconfiguring multiple pieces of test equipment, such as a current shunt, oscilloscope, current probe, DMM, and datalogger.

(Continued)



Mobile Communications dc Sources: Device Characterization Software (Continued)

When coupled with the 66319B/D or the 66321B/D, the 14565A also provides Battery Drain Analysis capabilities. More than just measuring battery run time, Battery Drain Analysis allows you to characterize current out of the battery and make tradeoffs in design that impact the current drain and battery life. This new version of the 14565A includes the measurement and data reduction tools needed to analyze and visualize the current being drained from your battery. By providing CCDF measurements and long-term battery drain data logging, the 14565A and 66319/21 provide a complete solution for analyzing complex current waveforms so that you can optimize your device designs to achieve maximum battery run time.

Key features

For R&D

- Fast and easy test setup
- Digitize current waveforms
- Accurately log battery current drain measurements from 10 seconds to 1000 hours at 64,000 measurements per second
- Test designs simulating different battery states (charged, aged, elevated temperatures, etc.) and chemistries (Ni-Cad to Lithium Polymer)
- Zoom capability for analyzing waveform anomalies
- Adjust markers for fast measurements on digitized waveforms
- Easily document your test results
- Record test data to files for archive or analysis by other software packages

For Repair

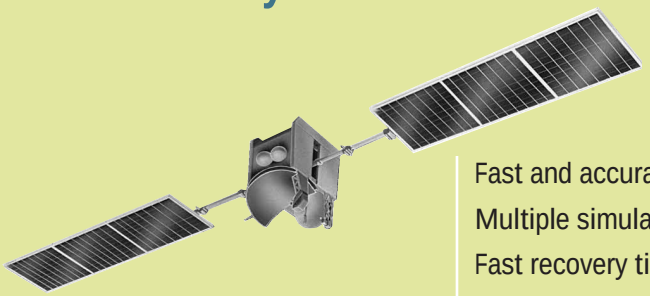
- Compact design with multiple instrument functionality
- Fast and easy test setup
- Graphical user software, no programming required
- Dual dc outputs for replacing the main battery and the power adapter/charger power source
- Electronic load for testing the battery charger circuitry
- Programmable soft limits to protect against incorrect voltage settings

Ordering Information

14565A Device Characterization Software with Battery Drain Analysis

Note: Battery Drain Analysis means Data Logging and CCDF measurements. These capabilities require models 66319B, 66319D, 66321B or 66321D with version A.03.00 firmware or higher and 14565A software version 3.01 or higher.

Solar Array Simulators



E4350B, E4351B

- Fast and accurate simulation of any type of solar array
- Multiple simulation modes
- Fast recovery time
- Easy to simulate environmental conditions

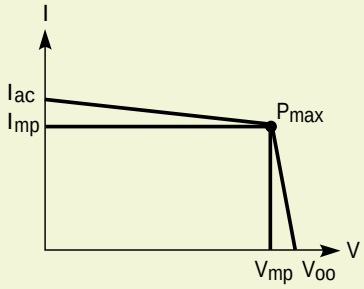
The Agilent one-box Solar Array Simulator (SAS) is a dc power source that simulates the output characteristics of a solar array. The SAS is primarily a current source with very low output capacitance and is capable of simulating the I-V curve of different arrays under different conditions (i.e., temperature, age etc.). The I-V curve is programmable over the IEEE-488.2 bus and is conveniently generated within the SAS. The SAS provides three current operating modes:

1. Simulator Mode: An internal algorithm is used to approximate a SAS I-V curve. Four input parameters: Voc (open circuit voltage), Isc (short circuit current), Imp and Vmp (current and voltage at the peak power point on the curve) are needed to establish a curve in this mode.

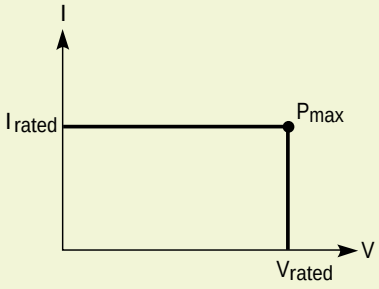
2. Table Mode: For a fast and accurate I-V simulation, the SAS provides a table mode. The I-V curve is set by a user-defined table of points. A table can have any length up to 4000 points (a point corresponds to a specific value of I and V). As many as 30 tables may be stored in each of the SAS built-in volatile and non-volatile memory.

Specifications (at 0° to 55°C unless otherwise specified)	E4350B	E4351B	E4350B-J01 Special Order Option	E4350B-J02 Special Order Option
Number of outputs	1	1	1	1
GPIB	Yes	Yes	Yes	Yes
Output ratings (Simulator and Table Modes)				
Max. Power	480 W	480 W	480 W	480 W
Voc. Max.	65 V	130 V	54 V	86.6 V
Isc. Max.	8 A	4A	9.6 A	6 A
Output ratings (for mixed mode)				
Max Power	480 W	480 W	480 W	480 W
V rated	0-60 V	0-120 V	0-50 V	0-80 V
I rated	0-8 A	0-4 A	0-9.6 A	0-6 A
Programming accuracy at 25°C ±5°C				
Voltage (Fixed Mode)	0.075% + 10 mV	0.075% + 20 mV	0.075% + 8.5 mV	0.075% + 13.5 mV
Current (Simulator and Fixed Mode)	0.2% + 20 mA	0.2% + 10 mA	0.2% + 25 mA	0.2% + 15 mA
Ripple and noise				
from 20 Hz to 20 MHz				
Voltage rms	16 mV	24 mV	16 mV	21 mV
Voltage p-p	125 mV	195 mV	125 mV	175 mV
Current rms	4 mA	4 mA	4 mA	4 mA

Simulator Mode



Fixed Mode



Solar Array Simulators (Continued)

Non-volatile memory can store a maximum of 3500 points. The tables (I-V curves) are easily stored and recalled with an IEEE-488.2 command. The table(s) stored in this memory will be retained when the power is turned off. Volatile memory greatly increases the flexibility by saving up to 30,000 points. Multiple tables are easily accessed with IEEE-488.2 command. These tables will be erased after power is removed.

In Table Mode, current and voltage offsets can be applied to the selected table to simulate a change in the operating conditions of the solar array.

3. Fixed Mode: This is the default mode when the unit is powered on. The unit has the rectangular I-V characteristics of a standard power supply, when an output capacitor is added in this mode.

Specifications (at 0° to 55°C unless otherwise specified)	E4350B-J03 Special Order Option	E4350B-J04 Special Order Option	E4350B-J06 Special Order Option
Number of outputs	1	1	1
GPIB	Yes	Yes	Yes
Output ratings (Simulator and Table Modes)			
Max. Power	480 W	480 W	480 W
Voc. Max.	52 V	47 V	74 V
Isc. Max.	10 A	11 A	7 A
Output ratings (for mixed mode)			
Max Power	480 W	480 W	480 W
V rated	0 - 48 V	0 - 43.5 V	0 - 68 V
I rated	0.10 A	0 - 10 A	0 - 7 A
Programming accuracy at 25°C ±5°C			
Voltage (Fixed Mode)	0.075% + 8 mV	0.075% + 8 mV	0.075% + 11.5 mV
Current (Simulator and Fixed Mode)	0.2% + 27.5 mA	0.2% + 30.5 mA	0.2% + 17.5 mA
Ripple and noise			
from 20 Hz to 20 MHz			
Voltage rms	16 mV	16 mV	19 mV
Voltage p-p	125 mV	125 mV	150 mV
Current rms	5.5 mA	6.5 mA	4 mA

Supplemental Characteristics for all model numbers

Load Switching Recovery Time: < 5 µs when switched from short circuit to variable load, to within 1.5 A of an operating point on the I-V curve.

Remote Sensing: Up to 2 V+ (Voc-Vmp). Add 3 mV to the voltage load regulation specification for each 1 volt change in the positive output lead due to load current change.

Analog Programming of Output Current
Input Signal: 0 to -4.0 V
Input Impedance: 20 k Ohms nominal

Shunt Regulation: Switching frequency up to 50 kHz

Series Regulation: Switching frequency up to 50 kHz

OVP and OCP: Overvoltage and overcurrent protection triggers in ≤100 us

Capacitive Load: In fixed mode, the maximum load capacitance (without causing instability) is 2000 uF. In simulator and table mode, it is unconditionally stable at all capacitive loads.

Inductive Load: The maximum load inductance (without causing instability) is 200 µH

Regulatory Compliance: Listed to UL3101, certified to CSA 22.2 No. 1010.1, complies with EN 61010-1.

RFI Suppression: Complies with CISPR-11, Group 1, Class A

Size: 425.5 mm W x 132.6 mm H x 497.8 mm D (16.75 in x 5.25 in x 19.6 in)
See page 102 for more details.

Weight: Net, 25 kg (54 lb); shipping, 28 kg (61 lb)

Warranty: Three years

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 63 Hz
Opt 240 209 to 250 Vac, 47 to 63 Hz
* **Opt 908** Rackmount Kit, p/n 5062-3977
* **Opt 909** Rackmount Kit with Handles, p/n 5063-9221
Opt 0L2 Extra Standard Documentation Package
Opt 0B3 Service Manual
Opt 0B0 No documentation package
* Support rails required

Accessories

p/n 1252-3698 7-pin Analog Plug
p/n 1252-1488 4-pin Digital Plug
p/n 5080-2148 Serial Link Cable 2 m (6.6 ft)
p/n 1494-0059 Accessory Slide Kit

N3280A Component Test dc Source

N3280A

Save valuable rack space with 4 outputs in a one-half rack box

Increase system throughput with fast command processing time

Accurately measure low level (nA) currents with its 16-bit measurement system

Synchronize measurements to an external event using the trigger system

The new N3280A dc source offers semiconductor ATE manufacturers a reduction in test time, integration time and rack space. It is a fast, low-power four-output (±10 V/±0.5 A) bipolar power supply optimized for testing RF and mixed signal semiconductors.

Valuable rack space is saved, by providing four bipolar outputs that eliminates the need for four separate sources and an external polarity reversal relay.

The N3280A helps maximize test system throughput with at least 5 times faster performance than any previous Agilent dc source. It provides reduced command processing time both for setting output levels and for acquiring measurements. Plus, any combination of outputs can be grouped in one programming command, further reducing test time.

Device current consumption can easily be measured and characterized with the digitizing measurement system. Each output has its own 16-bit precision voltmeter and ammeter. Additionally, three current

Specifications Applies to each of the four identical outputs (at 25° ± 5°C)	**Voltage Priority Mode**	**Current Priority Mode**
Number of Outputs	4	
GPIB	Yes	Yes
Output ratings[1]		
Voltage	-10.25 V to +10.25 V	-8 V to +8 V (full load) -11.25 V to +11.25 V (no load)
Current	-0.5125 A to +0.5125 A	-0.5125 mA to +0.5125 mA
Programming accuracy at 25°C ±5°C		
Voltage	0.1% ±2 mV	N/A
+Current	0.1% ±50 µA	N/A
-Current limit	0.1% ±50 µA	N/A
Current	N/A	0.1% ±1 µA
Measurement Accuracy[2]		
Voltage	0.1% ±2 mV	0.1% ±2 mV
0.5 A current range	0.1% ±200 µA	0.1% ±200 nA
15 mA current range	0.1% ±5 µA	0.1% ±200 nA
0.5 mA current range	0.1% ±200 nA	0.1% ±200 nA
Ripple and noise from 20 Hz to 20 MHz		
Voltage rms	0.380 mV	N/A
Peak-to-peak	4 mV	N/A
±Current limit rms	40 µA	N/A
Current rms	N/A	1.5 µA
Load regulation (A change from no load to full load or full load to no load by varying a resistive load)		
Voltage	±400 µV	N/A
+Current limit	±30 µA	N/A
-Current limit	±30 µA	N/A
Current	N/A	±25 nA

Notes:

[1] Full current at 40°C. Linearly derated to 50% of full current at 55°C.

[2] Measurement default is 5 measurement samples 30.4 microseconds apart. 0.5 mA range measured with the number of samples equivalent to one power line cycle.

N3280A Component Test dc Source (Continued)

measurement ranges allows you to accurately measure low-level (nA) currents.

This quad–output source is easy to integrate into a test system. The hardware connections are intended for quick configuration and the software is built on the straight-forward standard SCPI command set.

Specifications Applies to each of the four identical outputs (at 25°± 5°C)	Voltage Priority Mode	Current Priority Mode
Line regulation (A change in output voltage or current for any line change within ratings)		
Voltage	±200 µV	N/A
+Current limit	±10 µA	N/A
-Current limit	±10 µA	N/A
Current	N/A	±10 nA
Output transient response		
Voltage[3]: BW = 10 kHz	60 µs	N/A
BW = 20 kHz	45 µs	N/A
BW = 30 kHz	35 µs	N/A
Current[4]	N/A	90 µs
Supplemental Characteristics	(Non-warranted characteristics determined by design that are useful in applying this product)	
Programming resolution		
Voltage	312 µV	N/A
Current	N/A	16 nA
Measurement resolution		
Voltage	312 µV	312 µV
Current: 0.5 mA current range	16 nA	16 nA
15 mA current range	460 nA	16 nA
0.5 A current range	18 µA	16 nA
Programming output rise/fall time		
Voltage (10% to 90% or 90% to 10%)	150 µsec	N/A
Current (-80% to +80%)	N/A	160 µs
Measurement speed[5] (with 5 examples)		
Voltage/current	1.3 ms (2.1 ms for all outputs simultaneously)	1.3 ms (2.1 ms for all outputs simultaneously)

Notes:

[3] Time for output voltage to recover to within 40 mV of former value after a change from 0.25 A to 0.5 A or 0.5 A to 0.25 A

[4] Time for output current to recover to within 1 mA of former value after a change from -1 V to +1 V or +1 V to -1 V.

[5] Time from start of bus communication to final byte returned on bus. Assumes the default of 5 points 30.4 µs apart.

N3280A Component Test dc Source (Continued)

Supplemental Characteristics for all model numbers

dc Floating Voltage: Output terminals can be floated up to ±50 Vdc maximum from chassis ground and ±100 Vdc from output to output.

Remote Sensing: Up to 1/2 the maximum output voltage may be dropped across each load lead. Add 1/2 mV to the load regulation for each 1 V change in the HI output lead.

Command Processing Time: The time to set an output parameter is 0.6 ms for a single output (0.7 ms for all outputs simultaneously). Time to query a setting is 1.0 ms (1.5 ms for all outputs simultaneously)

Dynamic Measurement System
Buffer Size = 4096 points
Sampling rate increments = 30.4 µs

Input Power (full load):

Voltage	100 Vac	120 Vac	220 Vac	230 Vac
Current (max)	1.85 A	1.55 A	0.90 A	0.80 A
Power (max)	140 W	140 W	140 W	140 W

Regulatory Compliance: Complies with EMC directive 89/336/EEC (ISM group 1 Class A)

Warranty Period: 18 months

Size: 212.7 mm W x 88.9 mm H x 497.8 mm D (8.4 in x 3.5 in x 19.6 in)
See page 105 for more details.

Weight: 10 kg (22 lbs) net; 11.8 kg (26 lbs) shipping

Ordering Information

Opt 100 87 to 106 Vac, 47 to 63 Hz
Opt 120 104 to 127 Vac, 47 to 63 Hz
Opt 220 191 to 233 Vac, 47 to 63 Hz
Opt 230 207 to 253 Vac, 47 to 63 Hz
Opt 0B0 Delete manual set
Opt 0L1 Standard documentation package
Opt 0L2 Extra standard documentation package
Opt 8ZL Add feet – for bench use, p/n 5041-9167
Opt 1CM Rackmount kit, p/n 5063-9240
Opt AXS Rackmount kit for side-by-side mounting, Lock-link kit p/n 5061-9694; Flange Kit p/n 5063-9212; Tie Bracket Kit p/n 5965-6947

Accessories

p/n N3280A-10001 Virtual Front Panel Software

Key Literature

Agilent N3280A Component Test dc Source Datasheet p/n 5988-7080EN

Agilent Application-Specific dc Power Supplies: Multi-Cell Charger/Discharger (MCCD)

E4370A

- Easy system integration
- Integrated safety and protection features
- Accurate measurements
- Grouping capability
- Fully programmable

The Multi-Cell Charger/Discharger (MCCD) is a cost effective solution specifically designed for manufacturers to charge and discharge secondary lithium-ion and lithium-polymer cells. It has 256 charging and discharging channels each rated at up to 5 V and 3 A.

The E4371A Powerbus Load is used for discharging purposes within a formation system and can dissipate power from two fully loaded MCCD mainframes. For the discharging cycle, it is required to dissipate excess power from discharging cells. Additional electricity savings are realized because energy removed from discharging cells is automatically used to simultaneously charge other cells. This energy recycling contributes to cooling and ventilation savings because all of the energy removed from cells is not dissipated in unwanted heat.

Specifications (at 0° to 40°C)	Condition	Value for E4370A with E4374A	Value for E4370A with E4375A
Maximum programmable output voltage	charging	5 V	5 V
Maximum compliance voltage (cell voltage + fixture/wiring voltage drops)	charging	5.5 V	6 V
Maximum programmable output current	charging or discharging, per channel	2 A	3 A
Minimum output current[1]	constant voltage charging and discharging	0 A	0 A
Maximum output leakage current	disabled, per channel, with an external voltage of -5 V to +5 V	±25 µA	±25 µA
Maximum power	charging, per channel discharging, per channel	11 W 9 W	18 W 13.5 W
Maximum input voltage	discharging	4.5 V	4.5 V
Voltage programming and readback accuracy	measured at sense connector input with remote sensing	±1 mV	±1 mV
Current programming and readback accuracy	% of reading + offset ≤1 A 1 A to ≤2 A >2 A	±(0.05% + 1 mA) ±(0.1% + 1 mA)	±(0.05% + 1.5 mA) ±(0.1% + 1.5 mA) ±(0.15% + 1.5 mA)
dc and ac resistance measurement accuracy	% of reading + offset	±(1% + 1 mΩ)	±(1% + 1 mΩ)
Minimum programmable constant current limit	constant current charging and discharging	25 mA	25 mA

Notes:

[1] There is a minimum programmable current limit when operating in constant current (CC) mode. In CC, the output cannot be set to run below the minimum programmable constant current limit specified in the minimum programmable consant current limit. In constant voltage (CV) charge or discharge, the MCCD will regulate current down to 0 A.

dc Electronic Loads

Agilent dc Electronic Loads provide solutions for the problems of testing dc power sources.

Multiple Input Electronic Loads

76-81

The Agilent N3300A series of dc electronic loads has been optimized for the needs of high volume manufacturing test. Test throughput is maximized with both faster speed and specialized programming and measurement capabilities. The accuracy is enhanced over previous Agilent electronic loads, to meet the needs of testing today's smaller power supplies.

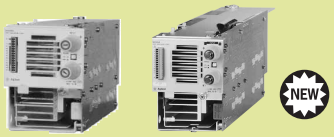
Single Input Electronic Loads

82-84

The 6060B and 6063B are single input dc electronic loads. They are convenient for testing of one single output dc power supply. They provide a total solution, with built-in measurement functions. However, to maximize either speed or accuracy, the N3300A Series electronic loads are recommended.

Multiple-Input: 150 W to 600 W

N3300A-N3307A



Standard dc connectors

Option UJ1 8 mm screw connectors

- Decrease system development time
- Increase system reliability
- Increase system flexibility
- dc connection terminal for ATE applications
- Lower cost of ownership
- Increase test system throughput
- Stable operation down to zero volts

Increase Test Throughput

Today's high volume manufacturing requires optimization of test system throughput, to maximize production volume without increasing floor-space. The N3300A Series electronic loads can help you in a number of ways to achieve this goal.

Reduced command processing time: Commands are processed more than 10 times faster than previous electronic loads.

Automatically execute stored command sequences: "Lists" of downloaded command sequences can execute independent of the computer, greatly reducing the electronic load command processing time and computer interaction time during product testing.

Programmable delay allows for either simultaneous or sequential load changes: This is the most efficient way to conduct testing of multiple output dc power supplies, simulating real-life loading patterns, with a minimum of programming commands.

Buffer measurement data: Voltage, current, and power measurements can be buffered for later readback to the computer, reducing computer interaction.

Control measurement speed vs. accuracy: Decrease the number of measurement samples to achieve greater measurement speed, or increase the number of samples to achieve higher measurement accuracy. You can optimize your measurements for each test.

Control rising and falling slew rates separately: Reduce rate of loading change when necessary for DUT stability or to simulate real life conditions, but otherwise change load values at maximum rate.

Increase System Flexibility... for both present and future requirements

Most power supply and battery charger test systems designed today need to test a variety of products and/or assemblies. In the future, additional products or assemblies may be needed. A flexible family of electronic loads makes present system design and future growth much easier.

Test low voltage power supplies: The N3300A series electronic loads operate with full stability down to zero volts. Many other electronic loads available today have been found to become unstable in the operating region below one volt. When designing power supply test platforms, the trend towards lower voltage requirements should be taken into account. Refer to the specification and supplemental characteristic tables for details of lower voltage operating characteristics.

Choose dc load connection method: Automatic test systems need consistency and reliability. Option UJ1 8 mm screw connectors provide a simple screw onto which your wires, terminated with insulated ring terminals, may be securely mounted. This optional connector is specifically designed for test systems. Wires may exit the plastic cover in any direction, and multiple wires may be placed on each screw terminal for easy parallel load connections. Up to AWG 4 wire may be used.

Applications which require repeated connections/disconections are better suited to the standard connector. The standard connector accepts an unterminated wire, and may be hand-tightened. This connector is specifically designed for bench applications and short-term automated tests.

Multiple-Input: 150 W to 600 W (Continued)

Design a system to test a variety of products: This series consists of 2 mainframes and 5 modules. The N3300A mainframe is full rack width. It has 6 slots. The N3301A mainframe is half rack width. It has 2 slots. Any assortment of the 5 different modules can be configured into these mainframes, up to the slot capacity. The N3302A (150 watts), N3303A (250 watts), N3307A (250 watts) and N3304A (300 watts) each require one slot. The N3305A (500 watts) and the N3306A (600 watts) each require 2 slots. The electronic load can be configured to supply exactly what you need now, and this modular design also allows for easy future reconfiguration.

Test high current power supplies: Electronic load modules can be operated in parallel to provide addition current sinking capability.

Control the electronic load how you want to: GPIB, RS232, and manual use of the front panel all provide complete control of these electronic loads. There are also analog programming and monitoring ports for those applications that utilize non-standard interfaces, require custom waveforms, or utilize process control signals. Custom waveforms can also be created by downloading a "List" of load parameters. In addition, there is a built-in transient generator, which operates in all modes.

Quickly create powerful and consistent software: All Agilent Technologies electronic loads use the SCPI (Standard Commands for Programmable Instruments) command set. This makes learning the commands easy, because they are the same format as all other SCPI instruments. The resulting code is virtually self-documenting, and therefore easier to troubleshoot and modify in the future. *Plug-n-Play* drivers are also available to help you to integrate the loads into your standard software packages.

Make Measurements Easily and Accurately

The 16-bit voltage, current and power measurement system provides both accuracy and convenience. The alternative is using a dmm (digital multimeter) and MUX (multiplexer) along with a precision current shunt and a lot of extra wiring. Avoiding this complexity increases system reliability and makes the system easier to design and support. Current measurements in particular are more consistently accurate using the electronic load's internal system, because the wiring associated with an external precision current shunt may pick up noise.

Measure with all load modules simultaneously: Testing multiple-output dc power supplies and dc-dc converters can be very time consuming if each output must be tested sequentially. If measurements are being made through a MUX using one DMM, this is what will happen. Using the built-in measurement capabilities of the N3300A electronic loads, all outputs can be measured simultaneously. Alternatively, multiple single output power sources can be tested simultaneously.

Measure voltage and current simultaneously: The N3300A measurement system has individual but linked current and voltage measurement systems. This means that voltage and current measurements are taken exactly simultaneously, which gives a true picture of the power supply under test's output at a particular moment in time. Some other electronic loads which feature internal measurement systems actually take current and voltage measurements sequentially, and therefore do not give as accurate a picture of momentary power.

Observe transient behavior using waveform digitization: Transient response and other dynamic tests often require an oscilloscope. The N3300A has a flexible waveform digitizer with a 4096 data point buffer for voltage and a 4096 data point buffer for current. Under many circumstances, this internal digitizer will be adequate for power supply test needs. Current and voltage are digitized simultaneously, and the sampling rate and sample window are programmable. Some analysis functions are provided, including RMS, max and min.

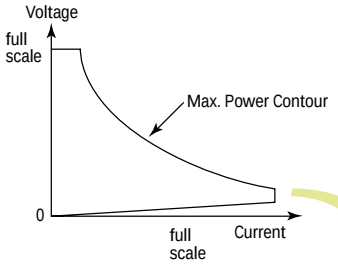
Multiple-Input: 150 W to 600 W (Continued)

Table A-1 Specifications

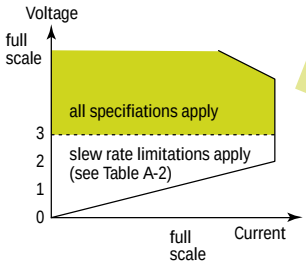
Table A-1 lists the specifications for the different load models. Specifications indicate warranted performance in the 25°C ±5°C region of the operating temperature range. Specifications apply to normal and transient modes unless otherwise noted.

Input Characteristic

Operating Contour



Derated Current Detail



Notes

1 Maximum continuous power available is derated linearly from 100% of maximum at 40°C, to 75% of maximum at 55°C.

2 Specification is ± (% of reading + fixed offset). Measurement is 1000 samples. Specification may degrade when the unit is subject to an RF field of 3 V/meter, the unit is subject to line spikes of 500 V, or an 8 kV electrostatic discharge.

3 dc current accuracy specifications apply 30 seconds after input current is applied.

	N3302A	N3303A	N3304A	N3305A	N3306A	N3307A (NEW)
Input ratings						
Current	0 - 30 A	0 - 10 A	0 - 60 A	0 - 60 A	0 - 120 A	0 - 30 A
Voltage	0 - 60 V	0 - 240 V	0 - 60 V	0 - 150 V	0 - 60 V	0 - 150 V
Maximum Power @ 40°C[1]	150 W	250 W	300 W	500 W	600 W	250 W
Specified current @ low voltage operation						
2.0 V	30 A	10 A	60 A	60 A	120 A	30 A
1.5 V	22.5 A	7.5 A	45 A	45 A	90 A	22.5 A
1.0 V	15 A	5 A	30 A	30 A	60 A	15 A
0.5 V	7.5 A	2.5 A	15 A	15 A	30 A	7.5 A
0 V	0 A	0 A	0 A	0 A	0 A	0 A
Typical minimum operating voltage @ full scale current	Table A-1 states that maximum current is available down to 2 volts. Typically, however under normal operating conditions, the load can sink the maximum current down to the following voltages:					
	1.2 V	1.2 V	1.2 V	1.4 V	1.4 V	1.4 V
Constant current mode[2]						
Low Range / High Range	3 A / 30 A	1 A / 10 A	6 A / 60 A	6 A / 60 A	12 A / 120 A	3 A / 30 A
Regulation	10 mA	8 mA	10 mA	10 mA	10 mA	10 mA
Low Range Accuracy 0.1% +	5 mA	4 mA	7.5 mA	7.5 mA	15 mA	7.5 mA
High Range Accuracy 0.1% +	10 mA	7.5 mA	15 mA	15 mA	37.5 mA	15 mA
Constant voltage mode[2]						
Low Range / High Range	6 V / 60 V	24 V / 240 V	6 V / 60 V	15 V / 150 V	6 V / 60 V	15 V / 150 V
Regulation	5 mV	10 mV	10 mV	10 mV	20 mV	10 mV
Low Range Accuracy 0.1% +	3 mV	10 mV	3 mV	10 mV	3 mV	10 mV
High Range Accuracy 0.1% +	8 mV	40 mV	8 mV	20 mV	8 mV	20 mV
Constant resistance mode[2]						
Range 1 (I >10% of current rating)	0.067-4 Ω	0.2-48 Ω	0.033-2 Ω	0.033-5 Ω	0.017-1 Ω	0.067-10 Ω
Range 2 (I >1% of current rating)	3.6-40 Ω	44-480 Ω	1.8-20 Ω	4.5-50 Ω	0.9-10 Ω	9-100 Ω
Range 3 (I >0.1% of current rating)	36-400 Ω	440-4800 Ω	18-200 Ω	45-500 Ω	9-100 Ω	90-1000 Ω
Range 4 (I >0.01% of current rating)	360-2000 Ω	4400-12000 Ω	180-2000 Ω	450-2500 Ω	90-1000 Ω	900-2500 Ω
Transient generator						
Frequency Range	0.25 Hz-10 kHz	0.25 Hz-10 kHz	0.25 Hz-10 kHz	0.25 Hz-10 kHz	0.25 Hz 10 kHz	0.25 Hz-10 kHz
Pulse Width	50 µs ±1% to 4 seconds ±1%	50 µs ±1% to 4 seconds ±1%	50 µs ±1% to 4 seconds ±1%	50 µs ±1% to 4 seconds ±1%	50 µs ±1% to 4 seconds ±1%	50 µs ±1% to 4 seconds ±1%
Current measurement[2]						
Low Range / High Range	3 A / 30 A	1 A / 10 A	6 A / 60 A	6 A / 60 A	12 A / 120 A	3 A / 30 A
Low Range Accuracy[3] 0.05% +	3 mA	2.5 mA	5 mA	5 mA	10 mA	3 mA
High Range Accuracy[3] 0.05% +	6 mA	5 mA	10 mA	10 mA	20 mA	6 mA
Voltage measurement[2]						
Low Range / High Range	6 V / 60 V	24 V / 240 V	6 V / 60 V	15 V / 150 V	6 V / 60 V	15 V / 150 V
Low Range Accuracy 0.05% +	3 mV	10 mV	3 mV	8 mV	3 mV	8 mV
High Range Accuracy 0.05% +	8 mV	20 mV	8 mV	16 mV	8 mV	16 mV
Power measurement[2]						
Accuracy 0.1% +	0.5 W	1.2 W	0.5 W	1.5 W	1.2 W	0.5 W

Multiple-Input: 150 W to 600 W (Continued)

Table A-2 Supplemental Characteristics

Table A-2 lists the supplemental characteristics, which are not warranted but are descriptions of typical performance determined either by design or type testing.

Notes

1 Slew rate bands are the ranges of programmable slew rates available. When you program a slew rate value outside the indicated bands, the electronic load will automatically adjust the slew rate to fit within the band that is closest to the programmed value. It is not necessary to specify the band, only the slew rate itself.

Below 3 volts, the maximum bandwidth of the electronic load is reduced by a factor of ten to one. For example, in the current range for Model N3302A, the maximum slew rate is specified as 2.5 MA/s, below 3 volts the maximum slew rate would be 250 kA/s. Any slew rate programmed between 2.5 MA/s and 250 kA/s would produce a slew rate of 250 k/s. Slew rates programmed slower than 250 kA/s would still correctly reflect their programmed value. Note that if you are using transient mode to generate a high frequency pulse train, a reduced slew rate might cause the load to never reach the upper programmed value before beginning the transition to the lower programmed value. So even though the transient mode is still operational at lower voltages, a fast pulse train with large transitions may not be achievable.

		N3302A	N3303A	N3304A	N3305A	N3306A	N3307A
Programming Resolution							
Constant current mode		0.05 mA/ 0.5 mA	0.02 mA/ 0.2 mA	0.1 mA/ 1 mA	0.1 mA/ 1 mA	0.2 mA/ 2 mA	0.05 mA/ 0.5 mA
Constant voltage mode		0.1 mV/1 mV	0.4 mV/4 mV	0.1 mV/1 mV	0.25 mV/2.5 mV	0.1 mV/1 mV	0.25 mV/2.5 mV
Constant resistance mode		0.07/0.7/ 7/70 mΩ	0.82/8.2/ 82 mΩ	0.035/0.35/ 3.5/35 mΩ	0.085/0.85/ 8.5/85 mΩ	0.0175/0.175/ 1.75/17.5 mΩ	0.17/1.7/ 17/170 mΩ
Readback resolution							
Current		0.05 mA/ 0.5 mA	0.02 mA/ 0.2 mA	0.1 mA/ 1 mA	0.1 mA/ 1 mA	0.2 mA/ 2 mA	0.05 mA/ 0.5 mA
Voltage		0.1 mV/ 1 mV	0.4 mV/ 4 mV	0.1 mV/ 1 mV	0.25 mV/ 2.5 mV	0.1 mV/ 1 mV	0.25 mV/ 2.5 mV
Programmable slew rate[1]							
Current Ranges	Slow band	500 A/s - 25 kA/s	167 A/s - 8330 A/s	1 kA/s - 50 kA/s	1 kA/s - 50 kA/s	2 kA/s - 100 kA/s	500 A/s - 25 kA/s
	Fast band ≥3 V	50 kA/s - 2.5 MA/s	16.7 kA/s - 833 kA/s	100 kA/s - 5 MA/s	100 kA/s - 5 MA/s	200 kA/s - 10 MA/s	50 kA/s - 2.5 MA/s
	Fast band <3 V	50 kA/s - 250 kA/s	16.7 kA/s - 83.3 kA/s	100 kA/s - 500 kA/s	100 kA/s - 500 kA/s	200 kA/s - 1 MA/s	50 kA/s - 250 kA/s
Voltage Ranges	Slow band	1 kV/s - 50 kV/s	4 kV/s - 200 kV/s	1 kV/s - 50 kV/s	2.5 kV/s - 125 kV/s	1 kV/s - 50 kV/s	2.5 kV/s - 125 kV/s
	Fast band ≥3 V	100 kV/s - 500 kV/s	400 kV/s - 2 MV/s	100 kV/s - 500 kV/s	250 kV/s - 1.25 MV/s	100 kV/s - 500 kV/s	250 kV/s - 1.25 MV/s
	Fast band <3 V	100 kV/s - 50 kV/s	400 kV/s - 200 kV/s	100 kV/s - 50 kV/s	250 kV/s - 125 kV/s	100 kV/s - 50 kV/s	250 kV/s - 125 kV/s
Resistance Range 1	Slow band	44 Ω/s - 1125 Ω/s	540 Ω/s - 13.5 kΩ/s	22 Ω/s - 560 Ω/s	55 Ω/s - 1400 Ω/s	11 Ω/s - 280 Ω/s	110 Ω/s - 2800 Ω/s
	Fast band ≥3 V	2250 Ω/s - 34 kΩ/s	27 kΩ/s - 408 kΩ/s	1120 Ω/s - 17 kΩ/s	2800 Ω/s - 42.5 kΩ/s	560 Ω/s - 8.5 kΩ/s	5600 Ω/s - 85 kΩ/s
	Fast band <3 V	2250 Ω/s - 3.4 kΩ/s	27 kΩ/s - 40.8 kΩ/s	1120 Ω/s - 1.7 kΩ/s	2800 Ω/s - 4.25 kΩ/s	560 Ω/s - 850 Ω/s	5600 Ω/s - 8.5 kΩ/s
Resistance Range 2	Slow band	440 Ω/s - 11.25 kΩ/s	5.4 kΩ/s - 135 kΩ/s	220 Ω/s - 5600 Ω/s	550 Ω/s - 14 kΩ/s	110 Ω/s - 2800 Ω/s	1.1 kΩ/s - 28 kΩ/s
	Fast band ≥3 V	22.5 kΩ/s - 340 kΩ/s	270 kΩ/s - 4.08 MΩ/s	11.2 kΩ/s - 170 kΩ/s	28 kΩ/s - 425 kΩ/s	5600 Ω/s - 85 kΩ/s	56 kΩ/s - 850 kΩ/s
	Fast band <3 V	22.5 kΩ/s - 34 kΩ/s	270 kΩ/s - 408 kΩ/s	11.2 kΩ/s - 17 kΩ/s	28 kΩ/s - 42.5 kΩ/s	5600 Ω/s - 8.5 kΩ/s	56 kΩ/s - 85 kΩ/s
Resistance Range 3	Slow band	4.4 kΩ/s - 112.5 kΩ/s	54 kΩ/s - 1.35 MΩ/s	2.2 kΩ/s - 56 kΩ/s	5.5 kΩ/s - 140 kΩ/s	1.1 kΩ/s - 28 kΩ/s	11 kΩ/s - 280 kΩ/s
	Fast band ≥3 V	225 kΩ/s - 3.4 MΩ/s	2.7 MΩ/s - 40.8 MΩ/s	112 kΩ/s - 1.7 MΩ/s	280 kΩ/s - 4.25 MΩ/s	56 kΩ/s - 850 kΩ/s	560 kΩ/s - 8.5 MΩ/s
	Fast band <3 V	225 kΩ/s - 340 kΩ/s	2.7 MΩ/s - 4.08 MΩ/s	112 kΩ/s - 170 kΩ/s	280 kΩ/s - 425 kΩ/s	56 kΩ/s - 85 kΩ/s	560 kΩ/s - 850 kΩ/s
Resistance Range 4	Slow band	44 kΩ/s - 1.125 MΩ/s	540 kΩ/s - 13.5 MΩ/s	22 kΩ/s - 560 kΩ/s	55 kΩ/s - 1.4 MΩ/s	11 kΩ/s - 280 kΩ/s	110 kΩ/s - 2.8 MΩ/s
	Fast band ≥3 V	2.25 MΩ/s - 34 MΩ/s	27 MΩ/s - 408 MΩ/s	1.12 MΩ/s - 17 MΩ/s	2.8 MΩ/s - 42.5 MΩ/s	560 kΩ/s - 8.5 MΩ/s	5.6 MΩ/s - 85 MΩ/s
	Fast band <3 V	2.25 MΩ/s - 3.4 MΩ/s	27 MΩ/s - 40.8 MΩ/s	1.12 MΩ/s - 1.7 MΩ/s	2.8 MΩ/s - 4.25 MΩ/s	560 kΩ/s - 850 kΩ/s	5.6 MΩ/s - 8.5 MΩ/s

Multiple-Input: 150 W to 600 W (Continued)

Table A-2 (Continued) Supplemental Characteristics

Table A-2 lists the supplemental characteristics, which are not warranted but are descriptions of typical performance determined either by design or type testing.

Notes
2 Applies to all ranges.

	N3302A	N3303A	N3304A	N3305A	N3306A	N3307A (NEW)
Programmable short	66 mΩ max.	200 mΩ max.	33 mΩ max.	33 mΩ max.	17 mΩ max.	33 mΩ max.
	40 mΩ typical	100 mΩ typical	20 mΩ typical	25 mΩ typical	12 mΩ typical	20 mΩ typical
Programmable open	≥20 kΩ	≥80 kΩ	≥20 kΩ	≥20 kΩ	≥20 kΩ	≥80 kΩ
Command processing time						
Using discrete commands	3 ms	3 ms	3 ms	3 ms	3 ms	3 ms
Using List commands	1 ms	1 ms	1 ms	1 ms	1 ms	1 ms
List dwell characteristics						
Range	0 - 10 s	0 - 10 s	0 - 10 s	0 - 10 s	0 - 10 s	0 - 10 s
Resolution	1 ms	1 ms	1 ms	1 ms	1 ms	1 ms
Accuracy	5 ms	5 ms	5 ms	5 ms	5 ms	5 ms
Measurement time						
1000 samples (default)	20 ms (with specified measurement accuracy)	20 ms (with specified measurement accuracy)	20 ms (with specified measurement accuracy)	20 ms (with specified measurement accuracy)	20 ms (with specified measurement accuracy)	20 ms (with specified measurement accuracy)
200 samples	10 ms (with <6% additional fixed offset)	10 ms (with <6% additional fixed offset)	10 ms (with <6% additional fixed offset)	10 ms (with <6% additional fixed offset)	10 ms (with <6% additional fixed offset)	10 ms (with <6% additional fixed offset)
100 samples	9 ms (with <10% additional fixed offset)	9 ms (with <10% additional fixed offset)	9 ms (with <10% additional fixed offset)	9 ms (with <10% additional fixed offset)	9 ms (with <10% additional fixed offset)	9 ms (with <10% additional fixed offset)
20 points	7 ms (with <30% additional fixed offset)	7 ms (with <30% additional fixed offset)	7 ms (with <30% additional fixed offset)	7 ms (with <30% additional fixed offset)	7 ms (with <30% additional fixed offset)	7 ms (with <30% additional fixed offset)
<20 points	7 ms (with >30% additional fixed offset)	7 ms (with >30% additional fixed offset)	7 ms (with >30% additional fixed offset)	7 ms (with >30% additional fixed offset)	7 ms (with >30% additional fixed offset)	7 ms (with >30% additional fixed offset)
Ripple and noise (20 Hz - 10 MHz)						
Current (rms/peak to peak)	2 mA/20 mA	1 mA/10 mA	4 mA/40 mA	4 mA/40 mA	6 mA/60 mA	2 mA/20 mA
Voltage (rms)	5 mV_{rms}	12 mV_{rms}	6 mV_{rms}	10 mV_{rms}	8 mV_{rms}	10 mV_{rms}
External analog programming						
Voltage Programming Accuracy[2]	0.5% + 12 mV	0.5% + 48 mV	0.5% + 12 mV	0.5% + 30 mV	0.5% + 12 mV	0.5% + 30 mV
Current Programming Accuracy[2]	0.25% + 4.5 mA	0.25% + 1.5 mA	0.25% + 9 mA	0.25% + 9 mA	0.25% + 18 mA	0.25% + 4.5 mA
External monitor ports						
Voltage Monitor Accuracy	0.25% + 12 mV	0.25% + 48 mV	0.25% + 12 mV	0.25% + 30 mV	0.25% + 12 mV	0.25% + 30 mV
Current Monitor Accuracy	0.1% + 4.5 mA	0.1% + 1.5 mA	0.1% + 9 mA	0.1% + 9 mA	0.1% + 18 mA	0.1% + 4.5 mA

Multiple-Input: 150 W to 600 W (Continued)

Table A-3 Supplemental Characteristics

	N3300A	N3301A
Operating temperature range	0°C to 55°C	0°C to 55°C
Input ratings		
Operating range	100 - 250 Vac 48 - 63 Hz	100 - 250 Vac 48 - 63 Hz
Input Current	4.2 A @ 100 - 127 Vac 2.2 A @ 200 - 250 Vac	2.3 A @ 100 - 250 Vac
Input VA	440 VA	230 VA
Inrush Current	38 A	18 A @ 115 Vac 36 A @ 230 Vac

Supplemental Characteristics for all model numbers

Analog Programming Bandwidth:
10 kHz (-3 db frequency)

Analog Programming Voltage:
Voltage: 0 - 10 V
Current: 0 - 10 V

Analog Monitor Ports:
Voltage: 0 - 10 V
Current: 0 - 10 V

Remote Sensing:
5 V dc between sense and load input

Digital / Trigger Inputs
Vil = 0.9 V max at Iil = -1 mA
Vih - 3.15 V min
(pull-up resistor on input)

Digital / Trigger Outputs
Vol = 0.72 V max at Iol = 1 mA
Voh = 4.4 V min at Ioh = -20 µA

Size:
See page 106 for more details.

Net Weight:
N3300A: 13.2 kg (29 lb); N3301A: 7.3 kg (16 lb); N3302A, N3303A or N3304A: 2.7 kg (6 lb); N3305A or N3306A: 4.6 kg (10 lb), N3307A 2.7 kg (6 lb)

Shipping Weight:
N3300A: 17 kg (38 lb); N3301A: 9.1 kg (20 lb)
N3302A, N3303A, or N3304A: 4.1 kg (9 lb)
N3305A or N3306A: 6.8 kg (15 lb), N3307A 4.1 kg (9 lb)

Ordering Information

Opt. UJ1: 8 mm screw terminal connector (available on all load modules N3302A-N3307A)

Opt. 800: Rack-mount kit for two N3301A Mainframes mounted side-by-side (p/n 5061-9694 and 5062-3978).

Opt. 908: Rack-mount kit (Two p/n 5062-3974 for a N3300A, or p/n 5062-3960 for one N3301A). For the N3301A, the kit includes a blank filler panel.

Opt. 909: Rack-mount kit with handles for N3300A (Two p/n 5062-3975)

Opt. 0B0: no manuals included (available with N3300A and N3301A)

Opt. 0L2: additional set of manuals

Single-Input: 250 W to 300 W

6060B and 6063B

Cost-effective for single input applications

Convenient optional front panel input connection

The 6060B and 6063B each provides one load input. This is more convenient for single input applications than a mainframe product.

These electronic loads are particularly suited for the lab bench. Entering commands manually using the front panel keypad is simpler because the channel does not need to be specified, as in a mainframe configuration. The keypad entry is further simplified because these products do not have the downloadable LIST feature of the N3300A Series, which helps to maximize production throughput. Extensive protection is included to help protect your valuable prototypes under test. This includes overvoltage, overcurrent, overtemperature, overpower, and reverse polarity.

These loads are suitable for manufacturing test systems where maximizing speed is not critical. They use industry standard SCPI instructions, and also have VXI*Plug&Play* drivers to simplify system design. For the greatest speed and accuracy in programming and measurement, see the N3300A Series of dc electronic loads.

Specifications	6060B	6063B
Amperes	0 to 60 A	0 to 10 A
Volts	3 to 60 V	3 to 240 V
Maximum power (at 40° C)	300 W	250 W
Constant current mode		
Ranges	0 to 6 A, 0 to 60 A	0 to 1 A, 0 to 10 A
Accuracy	0.1% ±75 mA	0.15% ±10 mA
Regulation	10 mA	8 mA
Constant voltage mode		
Accuracy	0.1% ±50 mV	0.12% ±120 mV
Regulation (w/remote sense)	10 mV	10 mV
Constant resistance mode	0.033 to 1.0 Ω	0.20 to 24.0 Ω
Ranges	1 to 1,000 Ω 10 to 10,000 Ω	24 to 10,000 Ω 240 to 50,000 Ω
Accuracy	1 Ω: 0.8% ±8 mΩ (with ≥6 A at input) 1 KΩ: 0.3% ±8 mS (with ≥6 V at input) 10 KΩ: 0.3% ±8 mS (with ≥6 V at input)	24 Ω: 0.8% ±200 mΩ (with ≥1 A at input) 10 KΩ/: 0.3% ±0.3 mS (with ≥24 V at input) 50 KΩ: 0.3% ±0.3 mS (with ≥24 V at input)
Transient generator		
Frequency range Accuracy	0.25 Hz to 10 kHz 3%	0.25 Hz to 10 kHz 3%
Duty cycle range Accuracy	3 to 97% (0.25 Hz to 1 kHz) 6 to 94% (1 to 10 kHz) 6% of setting ±2%	3 to 97% (0.25 Hz to 1 kHz) 6 to 94% (1 to 10 kHz) 6% of setting ±2%
Current level high range Accuracy	60-A range: 0.1% ±350 mA	10-A range: 0.18% ±50 mA
Current level low range Accuracy	6-A range: 0.1% ±80 mA	1-A range: 0.18% ±13 mA
Voltage level Voltage level accuracy	3 to 60 V 0.1% ±300 mV	3 to 240 V 0.15% ±1.1 V
Readback specifications		
Current readback accuracy Voltage readback accuracy	0.05% ±65 mA ±(0.05% + 45 mV)	0.12% ±10 mA ±(0.1% + 150 mV)
Ripple and noise (20-Hz to 10-MHz noise) Current Voltage	 4 mA rms 40 mA peak-to-peak 6 mV rms	 1 mA rms 10 mA peak-to-peak 6 mV rms

Single-Input: 250 W to 300 W (Continued)

Notes:

1. Operating temperature range is 0° to 55°C. All specifications apply for 25°C ±5°C, except as noted.
2. Maximum continuous power available is derated linearly from 40°C to 75% of maximum at 55°C.
3. dc current accuracy specifications apply 30 seconds after input is applied.

Specifications	6060B	6063B
Supplemental Characteristics	(Non-warranted characteristics determined by design that are useful in applying the product)	
Constant current mode	60-A range: 16 mA	10-A range: 2.6 mA
Resolution	6-A range: 1.6 mA	1-A range: 0.26 mA
Temperature coefficient	100 ppm/°C ±5 mA/°C	150 ppm/°C ±1 mA/°C
Constant voltage mode		
Resolution	16 mV	64 mV
Temperature coefficient	100 ppm/°C ±5 mV/°C	120 ppm/°C ±10 mV/°C
Constant resistance mode Resolution	1 Ω : 0.27 mΩ 1 KΩ: 0.27 mS 10 KΩ: 0.027 mS	24 Ω: 6 mΩ 10 KΩ: 0.011 mS 50 KΩ: 0.001 mS
Temperature coefficient	1 Ω: 800 ppm/°C ±0.4 mΩ/°C 1 KΩ: 300 ppm/°C ±0.6 mS/°C 10 KΩ: 300 ppm/°C ±0.6 mS/°C	24 Ω: 800 ppm/°C ±10 mΩ/°C 10 KΩ: 300 ppm/°C ±0.03 mS/°C 50 KΩ: 300 ppm/°C ±0.03 mS/°C
Transient generator		
Frequency range Resolution	0.25 Hz to 10 kHz 4% or less	0.25 Hz to 10 kHz 4% or less
Duty cycle range Resolution	3 to 97% (0.25 Hz to 1 kHz) 6 to 94% (1 to 10 kHz) 4%	3 to 97% (0.25 Hz to 1 kHz) 6 to 94% (1 to 10 kHz) 4%
Current level high range Resolution	60-A range: 260 mA	10-A range: 43 mA
Current level low range Resolution	6-A range: 26 mA	1-A range: 4 mA
Current temperature coefficient	100 ppm/°C ±7 mA/°C	180 ppm/°C ±1.2 mA/°C
Voltage level resolution	260 mV	1 V
Voltage temperature coefficient	150 ppm/°C ±5 mV/°C	120 ppm/°C ±10 mV/°C
Programmable slew rate	60-A range: 1 A/ms to 5 A/µs 6-A range: 0.1 A/ms to 0.5 A/µs	10-A range: 0.17 A/ms to 0.83 A/µs 1-A range: 17 A/ms to 83 A/ms
Rise/fall time	12 µs to 8 ms	16 µs to 8 ms
Analog programming bandwidth	10 kHz (–3 dB frequency)	10 kHz (–3 dB frequency)
Analog programming accuracy		
Current (low range)	4.5% ±75 mA	3% ±8 mA
Current (high range)	4.5% ±250 mA	3% ±20 mA
Temperature coefficient	100 ppm/°C ±6 mA/°C	150 ppm/°C ±1 mA/°C
Voltage	0.8% ±200 mV	0.5% ±150 mV
Temperature coefficient	100 ppm/°C ±1 mV/°C	120 ppm/°C ±10 mV/°C
Analog programming voltage	0 to 10 V	0 to 10 V
Readback specifications	17 mA (via GPIB)	2.7 mA (via GPIB)
Current readback resolution	20 mA (front panel)	10 mA (front panel)
Temperature coefficient	50 ppm/°C ±5 mA/°C	100 ppm/°C ±1 mA/°C
Voltage readback resolution	17 mV (via GPIB) 20 mV (front panel)	67 mV (via GPIB) 100 mV (front panel)
Temperature coefficient	50 ppm/°C ±1.2 mV/°C	100 ppm/°C ±8 mV/°C

Single-Input: 250 W to 300 W (Continued)

Specifications

Notes:

1. Operating temperature range is 0° to 55°C. All specifications apply for 25°C ±5°C, except as noted.
2. Maximum continuous power available is derated linearly from 40°C to 75% of maximum at 55°C.
3. dc current accuracy specifications apply 30 seconds after input is applied.

Supplemental Characteristics for all model numbers

Weight: 6.12 kg (13.5 lb) net; 8.16 kg (18 lb) shipping

Size: 425.5 mm W x 88.1 mm H x 396 mm D (16.75 in x 3.5 in x 13.7 in)

See page 100 for more details.

Ordering Information

Opt 020 Front Panel dc Input Connectors
Opt 100 87 to 106 Vac, 47 to 66 Hz input (for Japan only)
Opt 120 104-127 Vac, 47 to 66 Hz
Opt 220 191 to 233 Vac, 47 to 66 Hz input
Opt 240 209 to 250 Vac, 47 to 66 Hz input
* **Opt 908** Rack-mount Kit (p/n 5063-9212)
* **Opt 909** Rack-mount Kit with Handles (p/n 5063-9219)
Opt 0B0 no manuals included
Opt 0L2 additional set of standard documentation
Opt 0B3 Service Manual
* Support rails required

Accessories

E3663AC Support rails for Agilent rack cabinets

Supplemental Characteristics (Continued)	(Non-warranted characteristics determined by design that are useful in applying the product)	
Analog monitor accuracy		
Current monitor (0 to 10 V out)	4% ±85 mA	3% ±10 mA
Temperature coefficient	50 ppm/°C ±6 mA/°C	100 ppm/°C ±1 mA/°C
Voltage monitor (0 to 10 V out)	0.25% ±40 mV	0.4% ±240 mV
Temperature coefficient	50 ppm/°C ±0.2 mV/°C	70 ppm/°C ±1.2 mV/°C
Remote sensing	5-Vdc maximum between sense and load input	5-Vdc maximum between sense and load input
Minimum operating voltage (at full rated current)	2 volts (1.2 V typical)	2 volts (1.2 V typical)
Programmable short	0.033 Ω (0.020 Ω typical)	0.20 Ω (0.10 Ω typical)
Programmable open (typical)	20 kΩ	80 kΩ
Drift (over 8-hour interval)		
Current	0.03% ±10 mA	0.03% ±15 mA
Voltage	0.01% ±10 mV	0.01% ±20 mV
dc isolation voltage	±240 Vdc, between any input and chassis ground	±240 Vdc, between any input and chassis ground
Digital inputs	V_{IL} = 0.9 V max at I_{IL} = –1 mA / V_{IH} = 3.15 V min (pull-up resistor on input)	V_{IL} = 0.9 V max at I_{IL} = –1 mA / V_{IH} = 3.15 V min (pull-up resistor on input)
Digital outputs	V_{OL} = 0.72 V max at I_{OL} = 1 mA / V_{OH} = 4.4 V min at I_{OH} = –20 µA	V_{OL} = 0.72 V max at I_{OL} = 1 mA / V_{OH} = 4.4 V min at I_{OH} = –20 µA
Net weight (approx.)	6.12 kg (13.5 lb)	6.12 kg (13.5 lb)
Shipping weight	8.16 kg (18 lb)	8.16 kg (18 lb)

ac Power Source / Analyzers

Agilent ac Power Source/ Analyzers provide a complete ac test solution. As ac sources, they combine the capabilities of a power amplifier and an arbitrary waveform generator. This allows you to simulate normal waveforms and many types of distorted power waveforms. The built-in power analyzer combines the capabilities of a multimeter, oscilloscope, harmonic analyzer and power analyzer. These instruments may also be used to produce dc power, either alone or as a dc offset to an ac waveform.

ac Power Source / Analyzers: 375-1750 VA

6811B, 6812B, 6813B

Provides a complete ac and dc power and measurement solution

Protect valuable DUTs with extensive protection features

Easy to use Graphical User Interface (GUI)

The Complete ac Power Test Solution

Since your product will have to operate in the real world of unpredictable ac power, you need to design and verify its correct operation under a wide range of ac power inputs. Brownouts, dropouts, sags, and other irregularities are not unusual in many communities today. Agilent ac sources have the features needed to easily accomplish this test goal either in an R&D environment or on the manufacturing test floor. If you plan to sell your products in a worldwide market, you will also need to test them at the line voltages and frequencies that they will eventually operate at. There is also additional testing needed to meet regulatory requirements for sale into some countries.

Agilent ac sources offer a complete solution for ac power testing, helping you to simplify this important task. These instruments combine the features of a power amplifier and arbitrary waveform generator to give you the ability to do all of the tests that you need. There are many standard preprogrammed waveforms, or you can use the transient generation system to simulate sophisticated and repeatable ac line disturbances. dc power can also be generated, either as a dc offset or as a pure dc signal.

Powerful Built-in Measurement Capabilities

Agilent ac sources have extensive 16-bit precision measurement capabilities which would normally require a number of complex measurement instruments, including a DMM (digital multimeter), oscilloscope, power analyzer, and harmonic analyzer. The precision measurements include:

- rms, dc, ac + dc voltage and current
- peak voltage and current
- real, apparent, and reactive power
- harmonic analysis of voltage and current waveforms providing amplitude and phase up to the 50th harmonic
- THD (total harmonic distortion)
- Triggered acquisition of digitized voltage and current

Using the measurement capabilities of an Agilent ac source simplifies your test setups and helps you obtain accurate data quickly.

Dual Power Analyzer Option 020

The powerful built-in power meter/analyzer in Agilent ac sources provides everything that you need to make ac measurements at the ac input to your DUT. For many test scenarios, this is the extent of the ac analysis required.

Some test scenarios, however, require ac measurements to be made at both the ac input and the ac output of the DUT. Option 020 provides an additional power analyzer, complete with a precision current shunt, which can be connected anywhere you need it. This second analyzer can even be used for tests where the ac source is not providing power, thus expanding the usefulness of this instrument to many more test configurations. The additional analyzer is equivalent in specifications and capabilities to the standard analyzer.

ac Power Source / Analyzers: 375-1750 VA (Continued)

Using the dual power analyzer option instead of an additional power analyzer instrument externally is more than just convenient. Measurements on all four measurement channels (ac source output voltage and current, and dual power analyzer voltage and current inputs) are inherently synchronized with the ac source output waveform. This precision would be difficult to achieve using separate measurement instruments.

Examples Dual Power Analyzer Applications

- Complete testing of uninterruptible power sources (UPS)
- Efficiency testing of dc power supplies
- Efficiency testing of ac power sources
- Efficiency testing of transformers
- Safety testing of transformers
- Line disturbance and brownout testing of dc power supplies
- Line disturbance and brownout testing of ac power sources
- Sleep mode current monitoring
- Independent power analyzer

Sleep Mode Current Monitoring

Many electronic products have power-saving or sleep modes. In this mode, the device draws only enough power to be able to recognize a "wake-up" signal, and then execute a smooth "wake-up". The power drawn in this mode is a critical parameter, and the ability to accurately monitor it is important.

The accessory precision current shunt that is supplied with option 020 is mounted in such a way to make it easy for you to replace it with a precision resistor of your choice. By doing this, you can configure the system to accurately monitor extremely low currents. This provides an easy way for you to profile the current draw in all modes of your product's operation. Since Agilent 6811B-6813B ac sources produce dc power as well as ac power, portable battery operated products can also be tested with this configuration.

UPS (uninterruptible power source) Testing

The Dual Power Analyzer Option provides many important benefits for UPS testing. Since the key to correct UPS operation is having the output react properly to changes on the input, being able to monitor the output relative to the input simplifies testing. For example, commands are available to enable calculation of UPS transfer time, and the phase difference between the UPS input and output voltage. Agilent ac sources also have programmable output impedance, enabling the UPS designer to verify product stability over a wide range of ac line impedance.

Free Graphical User Interface (GUI)

When you need to run a variety of tests, study the results carefully, and then run more tests with slightly varied conditions, writing computer programs using the extensive SCPI command set may seem burdensome. This is when you should download the latest copy of the Free Agilent ac Source Graphical User Interface from www.agilent.com.

The Agilent ac source GUI makes it quick and easy to set the output of your Agilent ac source, be it from a stored waveform or with a waveform that you create using your mouse. The GUI also allows you to see the output of the ac source in graphical form, save the results, or dump them directly into a Microsoft Excel file.

Microsoft Excel Link

The direct Excel link feature was recently added to meet the current needs of R&D engineers. It makes it easy to keep the results of many tests, and makes them easily retrievable. With it, the test records resulting from changing conditions can be kept in one place and easily compared.

Access to raw data often helps in fully understanding test results. For example, small local peaks may not be evident in processed data. V, I and phase results from harmonic measurements are particularly susceptible to not showing the complete story in a graphical representation.

ac Power Source / Analyzers: 375-1750 VA (Continued)

Microsoft Excel offers a wide variety of data manipulation and graphical capabilities that can help an engineer gain the fullest understanding from the test data.

Test Suite for Avionics Equipment
Agilent ac sources are well suited for testing equipment intended for use in the avionics industry which operate at nominally 400 Hz. One of the special requirements that many manufacturers in this industry must concern themselves with is testing to meet RTCA DO-160 standards. These standards involve both ac and dc immunity tests. The Agilent ac source GUI includes a section devoted to these tests. By using this tool, you can quickly step through the required set-ups with confidence.

Extensive protection to prevent load damage

In addition to overcurrent, overvoltage, overpower and overtemperature protection, the 6800 series offers output disconnect relays and remote inhibit capability (quickly disabling the output of the ac source via a TTL signal) to protect the device under test.

The 6800 series is backed by a three-year warranty and Agilent's worldwide network of support and service centers.

Application info

The 6800 series can help you test and improve your products. You can easily perform:

1. Static testing–generating and measuring voltage, frequency, and line current for meeting worldwide specifications.
2. Dynamic testing–generating ac line transients for limit testing and design verification.
3. Specialty testing–measuring current harmonic content and creating custom ac power waveforms (such as a combined ac + dc signal to simulate a telephone ring).
4. Precompliance regulatory testing–measuring current harmonics, voltage fluctuations and flicker emissions and generating voltage and frequency disturbances and interharmonics to determine product immunity.

Development engineers and test professionals in a wide variety of industries use ac power source/analyzers. Here are a few examples:

Avionics
Instrumentation, ATE test stations

Computer Products
Computers, Monitors, Peripherals

Consumer Products
Home appliances, Audio and video equipment, Heating/cooling controls

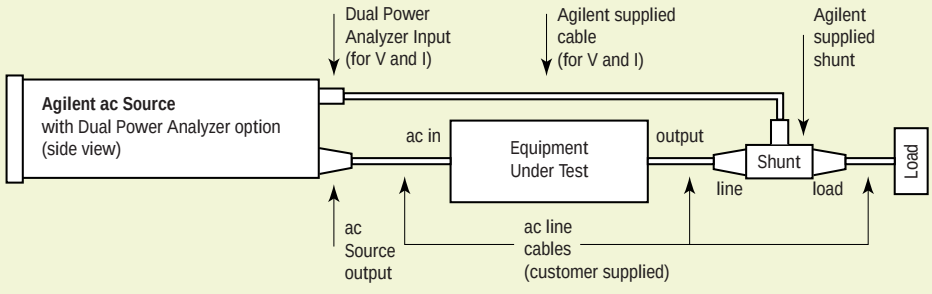
Electrical Products
Relays, Transformers, Power components, Fire alarms

Lighting Products
Electronic ballasts, Compact flourescent bulbs, Timers

Motors
ac motors, Electronic controllers

Power Products
ac/dc adapters, ac/dc power supplies, PBX power supplies, Uninterruptible power supplies

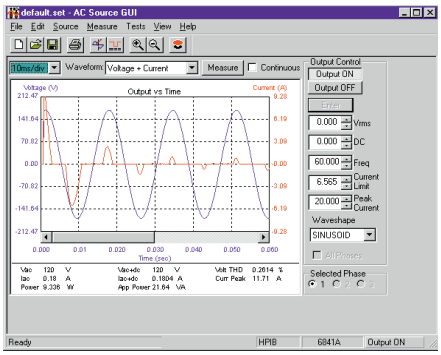
Telecom Products
RF amplifiers, CATV devices, MUX's, routers, switches



Test configuration of efficiency measurement using an Agilent ac source with the 020 Dual Power Analyzer Option.

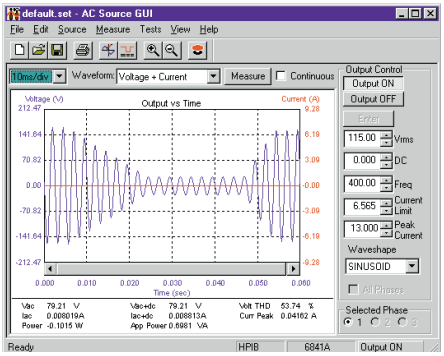
ac Power Source / Analyzers: 375-1750 VA (Continued)

ac Source Graphical User Interface

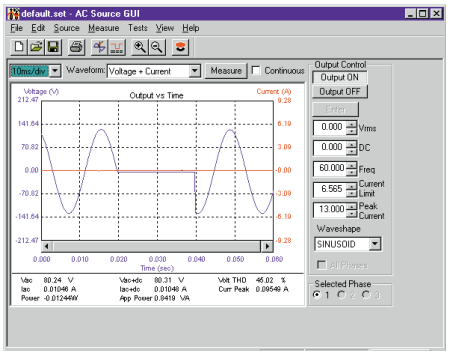


Inrush Current Measurement

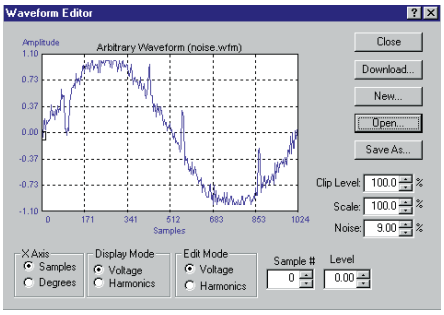
Ringer Voltage (dc + ac) Generation



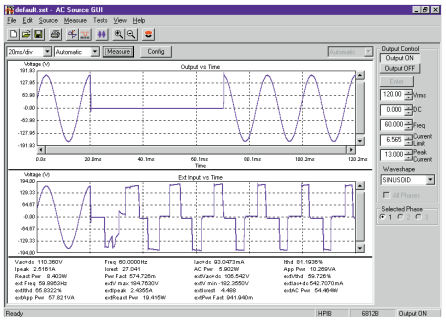
Voltage Slew Control (Brownout)



One cycle ac Mains Dropout



User Defined Waveform: Noise with Spikes



Testing of UPS Input and Output using Dual Power Analyzer Option 020

ac Power Source / Analyzers: 375-1750 VA (Continued)

For a sine wave with a resistive load at 0° to 40° C, within an output frequency range of 45 Hz to 1000 Hz, and in ac coupled mode after a 30 minute warm-up unless otherwise noted.

Notes:

1 Product may be operated between dc and 45 Hz subject to certain deratings. Measurements may be extended to 4.5 Hz at full accuracy only by selecting a digitization rate of 250 µ seconds per point. Frequency content of the measured signal must be limited to 4 k Hz or less to avoid aliasing effects.

Specifications (at 0° to 55°C unless otherwise specified)	6811B	6812B	6813B
Number of phases	1	1	1
Output ratings (Maximum)			
Power	375 VA	750 VA	1750 VA
rms voltage	300 V	300 V	300 V
rms current	3.25 A	6.5 A	13 A
Repetitive & non-repetitive peak current	40 A	40 A	80 A
Crest factor	12	6	6
Load Power factor capability	0 to 1	0 to 1	0 to 1
dc power	285 W	575 W	1350 W
dc voltage	±425 V	±425 V	±425 V
dc current	2.5 A	5.0 A	10.0 A
Output frequency range[1]	dc; 45 Hz to 1 kHz	dc; 45 Hz to 1 kHz	dc; 45 Hz to 1 kHz
Constant voltage ripple and noise (20 kHz to 10 MHz)	-60 dB (relative to full scale)	-60 dB (relative to full scale)	-60 dB (relative to full scale)
Line regulation (% of full scale)	0.1%	0.1%	0.1%
Load regulation (% of full scale)	0.5%	0.5%	0.5%
Maximum total harmonic distortion	0.25% at 50/60 Hz 1% worst case 45 to 1 kHz	0.25% at 50/60 Hz 1% worst case 45 to 1 kHz	0.25% at 50/60 Hz 1% worst case 45 to 1 kHz
Programming accuracy	(25° ± 5°C)		
RMS voltage (% of output + offset)	0.15% + 0.3 V (45 - 100Hz) 0.5% + 0.3 V (>100 - 500 Hz) 1% + 0.3 V (> 500 - 1000 Hz)	0.15% + 0.3 V (45 - 100Hz) 0.5% + 0.3 V (>100 - 500 Hz) 1% + 0.3 V (> 500 - 1000 Hz)	0.15% + 0.3 V (45 - 100Hz) 0.5% + 0.3 V (>100 - 500 Hz) 1% + 0.3 V (> 500 - 1000 Hz)
dc voltage	0.1% + 0.5 V	0.1% + 0.5 V	0.5% + 0.3 V
Frequency	0.01% + 10µHz	0.01% + 10µHz	0.01% + 10µHz

ac Power Source / Analyzers: 375-1750 VA (Continued)

For a sine wave with a resistive load at 0° to 40° C, within an output frequency range of 45 Hz to 1000 Hz, and in ac coupled mode after a 30 minute warm-up unless otherwise noted.

Notes:

1 Product may be operated between dc and 45 Hz subject to certain deratings. Measurements may be extended to 4.5 Hz at full accuracy only by selecting a digitization rate of 250 µ seconds per point. Frequency content of the measured signal must be limited to 4 k Hz or less to avoid aliasing effects.

2 Select low measurement range for improved accuracy (10:1) for lower power measurements.

Specifications (at 0° to 55°C unless otherwise specified)	6811B	6812B	6813B
Measurement Accuracy	(25°C ±55°C)		
Rms. voltage (45 - 100 Hz)	0.03% + 100 mV[1]	0.03% + 100 mV[1]	0.03% + 100 mV[1]
dc voltage	0.05% + 150 mV[1]	0.05% + 150 mV[1]	0.05% + 150 mV[1]
RMS current (45 - 100 Hz)[2]			
high range	0.05% + 10 mA	0.05% + 10 mA	0.05% + 10 mA
low range	0.05% + 1.5 mA	0.05% + 1.5 mA	0.05% + 1.5 mA
Power (VA) (45-100 Hz)[2]			
high range	0.1% + 1.5 VA + 12 mVA/V	0.1% + 1.5 VA + 12 mVA/V	0.1% + 1.5 VA + 12 mVA/V
low range	0.1% + 1.5 VA + 1.2 mVA/V	0.1 % + 1.5 VA + 1.2 mVA/V	0.1% + 1.5 VA + 1.2 mVA/V
Power (watts) (45-100 Hz)[2]			
high range	0.1% + 0.3 W + 12 mW/V	0.1% + 0.3 W + 12 mW/V	0.1% + 0.3 W + 12 mW/V
low range	0.1% + 0.3 W + 1.2 mW/V	0.1% + 0.3 W + 1.2 mW/V	0.1% + 0.3 W + 1.2 mW/V
Frequency	0.01% + 0.01 Hz	0.01% + 0.01 Hz	0.01% + 0.01 Hz
Power factor	0.01	0.01	0.01
Current magnitude Fundamental	0.03% + 1.5 mA	0.03% + 1.5 mA	0.03% + 1.5 mA
Low range Harmonics 2-49	0.03% + 1 mA + 0.2%/kHz	0.03% + 1 mA + 0.2%/kHz	0.03% + 1 mA + 0.2%/kHz
Current magnitude Fundamental	0.05% + 5 mA	0.05% + 5 mA	0.05% + 5 mA
High range Harmonics 2-49	0.05% + 3 mA + 0.2%/kHz	0.05% + 3 mA + 0.2%/kHz	0.05% + 3 mA + 0.2%/kHz
Supplemental Characteristics	(Non-warranted characteristics determined by design that are useful in applying the product)		
Average programming accuracy (% of output + offset) rms current	1.2% + 50 mA	1.2% + 50 mA	1.2% + 50 mA
Average programming resolution			
rms voltage	125 mV	125 mV	125 mV
dc voltage	250 mV	250 mV	250 mV
Overvoltage programming (OVP)	2 V peak	2 V peak	2 V peak
rms current	2 mA	4 mA	4 mA
peak current	12.5 mA	25 mA	25 mA
output frequency	10 µHz	10 µHz	10 µHz
phase	N/A	N/A	N/A

ac Power Source / Analyzers: 375-1750 VA (Continued)

Specifications

(at 0° to 55°C unless otherwise specified)

	6811B	6812B	6813B

For a sine wave with a resistive load at 0° to 40° C, within an output frequency range of 45 Hz to 1000 Hz, and in ac coupled mode after a 30 minute warm-up unless otherwise noted.

ac Input Ratings notes:

1 Measured at low line

2 Measured at high line

Supplemental Characteristics

(Continued)

(Non-warranted characteristics determined by design that are useful in applying the product)

	6811B	6812B	6813B
Average measurement resolution			
rms voltage	10 mV	10 mV	10 mV
rms current	2 mA	2 mA	2 mA
Programmable output impedance			
resistance	0-1 Ω	0-1 Ω	0-1 Ω
inductance	20 µh - 1 mh	20 µh - 1 mh	20 µh - 1 mh
Remote sense capability	Up to 1 Vrms can be dropped across each load lead.	Up to 1 Vrms can be dropped across each load lead.	Up to 1 Vrms can be dropped across each load lead.
Isolation to ground	300 Vrms / 425 Vdc	300 Vrms / 425 Vdc	300 Vrms / 425 Vdc
Net weight	28.2 kg (62 lb)	28.2 kg (62 lb)	32.7 kg (72 lb)
Shipping weight	31.8 kg (70 lb)	31.8 kg (70 lb)	36.4 kg (80 lb)
Dimensions	See drawings on page 105		

ac Input Ratings

Voltage range (Vac) *default factory setting	87 to 106 Vac *104 to 127 Vac 174 to 220 Vac 191 to 254 Vac	87 to 106 Vac *104 to 127 Vac 174 to 220 Vac 191 to 254 Vac	174 to 220 Vac *191 to 254 Vac
Maximum input current (rms)[1]	12 A (100 Vac) 10 A (120 Vac) 7.5 A (200/208 Vac) 6.5 A (230 Vac)	28 A (100 Vac) 24 A (120 Vac) 15 A (200/208 Vac) 13 A (230 Vac)	22 A (200/208 Vac) 20 A (230 Vac)
Input power (max)[2]	1000 VA / 700 W	2500 VA / 1400 W	3800 VA / 2600 W
Input frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz

Ordering Information

Opt 019 2000 VA ac Power source/ analyzer (6813B only)

Opt 020 Dual power analyzer option

Opt 026 26 Volt, 0.1A auxiliary reference output (6812B only)

Opt 0BN Service Manual, extra Operating Guide, and ProgrammingGuide

Opt 1CM Rack-mount Kit, p/n 5062-3977 (quantity 2) (support rails required)

Opt 1CP Rack-mount Kit with Handles, p/n 5062-3983 (support rails required) 6811B, 6812B, 6813B only

Support rails, p/n 12679B, required when rack mounting the 6811B, 6812B, and 6813B Opt 1CM and Opt 1CP

Opt 100 (6811B and 6812B only) 87 to 106 Vac (100 Vac nominal), 47-63 Hz, Japan only

Opt 120 104-127 Vac (120 Vac nominal), 47-63 Hz

Opt 200 (6813B only) 174-220 Vac (200 Vac nominal), 47-63 Hz, Japan only

Opt 208 (6811B and 6812B only) 174 to 220 Vac (208 Vac nominal), 47-63 Hz

Opt 230 191 to 254 Vac (230 Vac nominal), 24-63 Hz

Opt 831 12 AWG, 200 to 240 Vac, unterminated (6812B, 6813B only)

Opt 832 4 mm^2 wire size, unterminated (6813B only)

Opt 833 1.5 mm^2 wire size, 200 to 240 Vac, unterminated (6812B only)

Opt 834 10 AWG, 100 to 120 Vac, unterminated (6812B only)

Opt 841 Line Cord with NEMA L6-20P; 20 A 250 V Plug (6812B only)

Opt 842 Line Cord with IEC 309; 32 A 220 V plug (6813B only)

Opt 844 Line Cord with NEMA L6-30P; 30 A 250 V Locking Plug (6813B only)

Opt 845 Line Cord with IEC 309; 16 A 220 V Plug (6812B only)

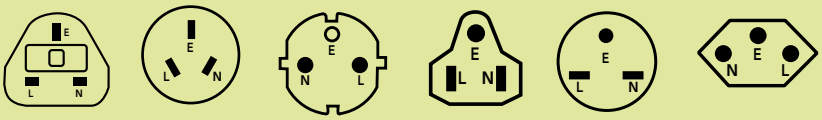
Opt 846 Line Cord with NEMA L6-30P; 30 A 120 V Plug (6812B only)

Opt 847 Line Cord with CEE 7/7; 16 A 220 V Plug (6812B only)

Opt 848 Line Cord with BS 546; 15 A 240 V Plug (6812B only)

For ac Line Cord and Cord Options information see pages 93-98.

Choosing ac Line Voltage and Cord Options for your Agilent Power Products



A sample of our many line cord options

7 Easy Steps for Choosing Line Cord Options

Determine the voltage option

Step 1

Go to table 1a. Find the model number of the product you are ordering. Note the standard line voltage. If it is correct you do not need to specify a line voltage option. Go to step 4

Step 2

If the standard line voltage is not correct, use table 1b to determine which of the available options best matches the available line voltage.

Step 3

Add the line voltage option to your purchase order.

Line cords for low power products

Step 4

Go to table 1a. Find the correct line cord option series for the product you are ordering. If your model # requires an 800 series, go to step 6.

Step 5

If your model # requires a 900 series line cord, the correct one will automatically be shipped for the destination country on the purchase order. DONE!

Line cords for high power products

Step 6

If your model number requires an 800 series line cord, determine if there is a line cord with plug that matches your outlet receptacle in tables 3a and b. If not, choose the appropriate unterminated line cord.

Step 7

Add the option number for the appropriate line cord to your purchase order. DONE!

Note

If no line cord option is specified for products which require 800 series line cords, an unterminated line cord will be shipped automatucally for the destination country on your purchase order.

Choosing ac Line Voltage and Cord Options for your Agilent Power Products (Continued)

Table 1A– ac Line Voltage / Frequency Options

Model Number	Standard Line Voltage	Line Voltage Options	50 HZ Operation	Field Changeable; Method	Line Cord Series
6010A, 6011A, 6012A, 6015A	120	220, 240	Yes	Yes; internal board mounted switch and quick connect jumpers	800
6030A, 6031A, 6032A, 6035A	120	100*, 220, 240	Yes	Yes; internal board mounted switch and quick connect jumpers	800
6033A, 6038A	120	100*, 220, 240	Yes	Yes; internal board mounted switch and quick connect jumpers	900
6060B, 6063B	120	100*, 220, 240	Yes	Yes; internal switches	900
654XA	120	100, 220, 240	Yes	Yes; internal board mounted switches	900
655XA	120	100, 220, 240	Yes	Yes; internal quick connect jumpers	900
657XA	230	200*	Yes	Yes; internal board mounted switch	800
66000A	100-240	none	Yes	Not necessary; automatic wide ranging input	800
6610XA	100-120, 200-240	none	Yes	Yes; bottom panel switch	n.a.
661XC	120	100, 220, 230	Yes	Yes; internal quick connect jumpers	900
662XA	120	100, 220, 240	Yes	Yes; moveable insert on rear panel mounted line cord module	900
663XXA	120	100, 220, 230	Yes	Yes; internal quick connect jumpers	900
663XB	120	100, 220, 230	Yes	Yes; internal quick connect jumpers	900
664XA	120	100, 220, 240	Yes	Yes; internal board mounted switch	900
665XA	120	100, 220, 240	Yes	Yes; internal quick connect jumpers	900
667XA, E4356A	230	200	Yes	Yes; internal board mounted switch	800
668XA, 669XA	220 3Ø	400 3Ø	Yes	Yes; internal connector mounted jumpers	3Ø; unterminated only
6811B	120	100, 230	Yes	Yes; internal connector mounted jumpers	900
6812B	120	100, 230	Yes	Yes; internal connector mounted jumpers	800
6813B	230	200	Yes	Yes; internal connector mounted jumpers	800
E3610A, E3611A, E3612A	ØEM (115)	ØE3 (230 V), ØE9 (100 V)	Yes	**NO! Transformer change required; return to factory**	line cord hardwired
E3614A, E3615A, E3616A, E3617A, E3620A, E3630A	ØEM (115)	ØE3 (230 V), ØE9 (100 V)	Yes	Yes; internal board mounted switch	
E3631A, E3632A, E3633A, E3634A	ØEM (115)	ØE3 (230 V), ØE9 (100 V)	Yes	Yes: moveable insert on rear panel mounted ac receptacle	
E364XA	ØEM (115)	ØE3 (230 V), ØE9 (100 V)	Yes	Yes, internal board mounted switch	
N3300A, N3301A	100-240	None	Yes	Not necessary; automatic wide ranging input	900

Notes: 100*, 200*: for Japan only; derating required, product see specifications

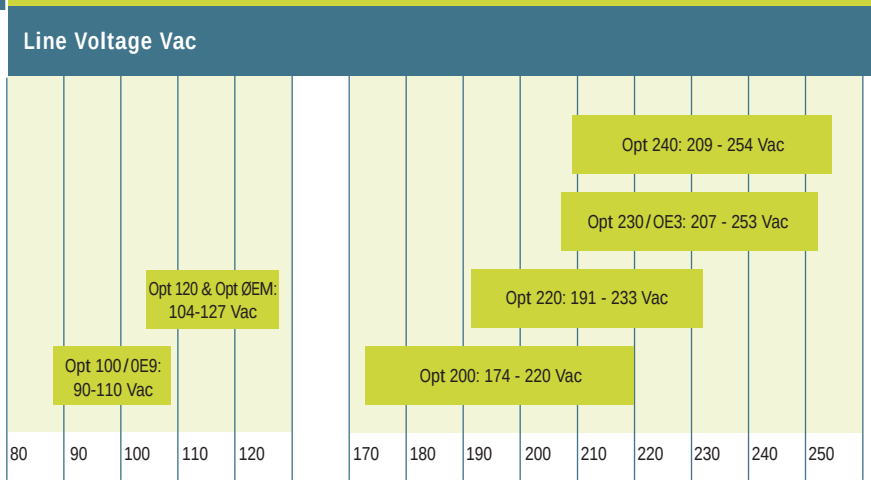
Choosing ac Line Voltage and Cord Options for your Power Product

Power distribution systems, regulations, and connection techniques vary greatly among geographic regions as a result of local ac electrical standards. Most Agilent products, including power products which draw less than 500 watts of power from the ac line, can be readily adjusted to accept different line voltages or frequencies.

Line voltage and frequency for certain Power Products may not be field changeable. Choosing the correct voltage option for these products requires care. This is especially true for higher power products. Line voltage/frequency options and method of change are summarized in Table 1a below. Voltages for Europe and Asia Pacific vary widely from country to country. Europe is moving toward harmonization, with countries standardizing on 230 Vac instead of 220 or 240 Vac. Some older products don't offer a 230 Vac option. For countries operating on 230 Vac, option 240 with a range of +6%/-13% (a range of 208 to 254 Vac) generally offers the best match. See table 1b for further information. The specifications listed for each product indicate the range of voltage and frequency that each option accomodates. If in doubt, contact your local Agilent Field Engineer for assistance.

Choosing ac Line Voltage and Cord Options for your Agilent Power Products (Continued)

Table 1B - Line Voltage Coverage of Various Single Phase Options



Note: Consult specific product listing above for options availablity

Low Power Products

For lower power products, a universal receptacle on the rear panel accepts a wide range of line cords to meet local regulatory requirements. Table 2 shows a range of standard line cords that Agilent offers, with option numbers and part numbers.

Part numbers are needed to order a line cord separately.

For products which use the 900 series line cords, the appropriate type is automatically selected at time of shipment, based on the country to which the product is being shipped. If you plan to use your power products in a different country or region than the country to which the product is being shipped, you will need to specify the appropriate line voltage and line cord options on your order, so that we can provide the appropriate configuration. Contact your local Agilent Field Engineer for assistance.

High Power Products

There are several factors which limit the amount of power which can be readily drawn from a normal branch circuit. For example, in the U.S., the typical 115/120 Vac branch circuit has a circuit breaker rated for 15 A. For industrial applications, 20 A service is commonly available. Current draw for an appliance is further restricted to 80% of the breaker rating unless the circuit is dedicated to only one appliance. The line cord can also represent a limiting factor based on the wire gauge used. Finally, the power supply with a rectifier and capacitive input filter represents a non-sinusoidal current load. Thus, the maximum input current drawn by the power supply is higher than if the input were a resistive load.

The practical result of this is that linear power supplies with outputs over 500 watts and switching supplies rated over 750 watts will generally exceed the capability of a 15 A branch circuit. Connecting power products above these power levels will require installing either a higher voltage or higher current service. Some practical examples are:

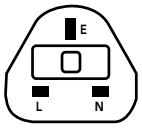
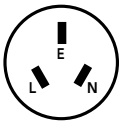
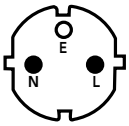
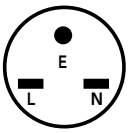
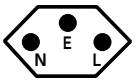
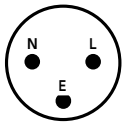
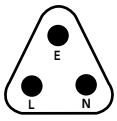
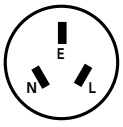
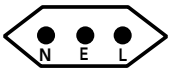
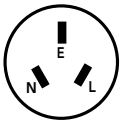
- standard line voltage for 2KW products such as the 667XA is 230 Vac; they can not be powered off a 120 Vac line
- the 1KW 601XA and 603XA products cannot be powered off a standard 15 A/120 Vac circuit; they can operate off a 30 A/ 120 Vac service, or they can be configured for 230 Vac operation
- the 66000A mainframe requires a 30 A/120 Vac service or 230 Vac operation; although each module is 150 watts, the maximum input current is based on the total requirement of 8 modules.

Choosing ac Line Voltage and Cord Options for your Agilent Power Products (Continued)

Table 2 - 900 Series Line Cord Options (Available for low power products)

Agilent offers a range of line cords for many higher power products to mate with the wall receptacles commonly specified for these higher power services. Refer to tables 3a, 3b and 3c to determine if there is a line cord for your product with a plug that meets the local requirements. If not, you must order an unterminated line cord. For the products in table 3a, you must specify a line cord option at the time you order your power product, or an unterminated line cord will be shipped.

Often, higher power products (over 1 kW) are hardwired, i.e. connected directly to a breaker panel or distribution box. The line cord may also be hard wired to the back of the power supply where a universal receptacle is impractical. Typically, a local electrician should be consulted to determine the best alternative to connect a high power product to the ac line. Consider the most appropriate option for your application based on local electrical codes.

Option #	Part No.	Option #	Part No.	Option #	Part No.
900	8120 - 1351C (8120 - 8605 for 6811B)  **United Kingdom**	901	8120 - 1369C (8120 - 5412 for 655xA/665xA, 8120 - 8606 for 6811B)  **Australia, New Zealand**	902	8120 - 1689C (8120 - 5413 for 655xA/665xA, 8120 - 8607 for 6811B)  **Europe**
903	8120 - 4383 (8120 - 4383 for 655xA/665xA, 8120 - 8609 for 6811B)  **United States, Canada**	904	8120 - 0698C (8120 - 5421 for 665xA/665xA, 8120 - 8610 for 6811B)  **United States, Canada**	906	8120 - 2104C  **Switzerland**
912	8120 - 2956C (8120 - 8608 for 6811B)  **Denmark**	917	8120 - 4211 (8120 - 5414 for 655xA, 665xA, 8120 - 8611 for 6811B)  **South Africa, India**	918	8120 - 4753C (8120 - 4383 for 655xA/665xA 8120 - 8609 for 6811B)  **Japan**
919	8120 - 6800  **Israel**	920	8120 - 6869  **Argentina**	921	8120 - 6980  **Chile**
922	8120 - 8376 (8120 - 8800 for 6611B)  **China**	927	8120 - 8871  **Brazil, Thailand**		L = Line or Active Conductor (also called "live" or "hot") N = Neutral or identified Conductor E = Earth or Safety Ground

Choosing ac Line Voltage and Cord Options for your Agilent Power Products (Continued)

Products with 3-Phase Inputs

Some of the higher power products exceed the capability of a single phase line. Agilent offers several power products which require 3-phase inputs, including the 5kW 668XA and 6.6 kW 669XA dc source family. For 3-phase power distribution up to the building, there are two different distribution systems in wide use: delta, predominantly used in the US; and wye predominantly used in Europe. However, for service inside the building, the 5 wire wye is the predominant configuration. Products which are delta loads, are compatible with either delta or wye.

As shown in table 4, the delta has only three current carrying conductors; there is no neutral. The wye configuration has four current carrying conductors. In general, the neutral should carry no significant current. None of the Agilent power products use the neutral connection found on wye systems. Do not connect the neutral to ground.

In selecting the correct operating voltage for 3-phase products you need to distinguish between the line-to-line and the line-to-neutral voltages. The line-to-line voltage is the square root of 3 x the line-to-neutral voltage. It is the line-to-line voltage that is used to specify the input voltage to be applied to Agilent power products. For example, common 3-phase voltages and available options are shown in table 4.

Table 3A - 800 Series Line Cord Options (Available for high power products)

Power supply series	Option Number	601XA 603XA(1kW) 66000A, 6812B	657XA 667XA E4356A	6813B
Unterminated: line cords without plugs	831	8120-5573	8120-5488	8120-5573
	832	n.a.	8120-5490	8120-6502
	833	8120-5568	n.a.	n.a.
	834	8120-5566	8120-5545	8120-5566
Terminated: line cords with plugs	841	8120-5572	8120-5491	8120-5572
	842	n.a.	8120-5489	8120-6506
	844	n.a.	8120-5546	8120-6507
	845	8120-5570	n.a.	n.a.
	846	8120-5565	n.a.	n.a.
	847	8120-5567	n.a.	n.a.
	848	8120-5569	n.a.	n.a.

NOTE: If no line cord option is specified on the purchase order, an unterminated line cord will be shipped.

Table 3B - Unterminated Line Cords (Line cords without plugs)

Option Number	Description
Option 831	12 AWG, 3 wire; UL-Listed, CSA-certified, 8 ft, unterminated. Use for connection to 200-240 Vac mains. Note for 657XA or 667XA series, E4356A and 6813B: not acceptable for use in Canada or Japan. Choose either -834 or -844 10 AWG power cord option.
Option 832	4-mm^2 wire size, 3 wire, 2.5 m; harmonized cordage; unterminated. Suggested for use in Europe and other areas not listed.
Option 833	1.5-mm^2 wire size, 3 wire, 2.5 m; harmonized cordage; unterminated. Suggested for use in Europe and other areas not listed. Note for 603XA and 66000 series: intended for connection to 200-240 Vac service.
Option 834	10 AWG, 3 wire; UL-listed, CSA-certified; 8 ft, unterminated. Note for 601XA or 603XA series, 66000A or 6812B: required for connection to 100-120 Vac mains. For 657XA or 667XA series, E4356A and 6813B: required for connection to 200-230 Vac mains in Canada or Japan.

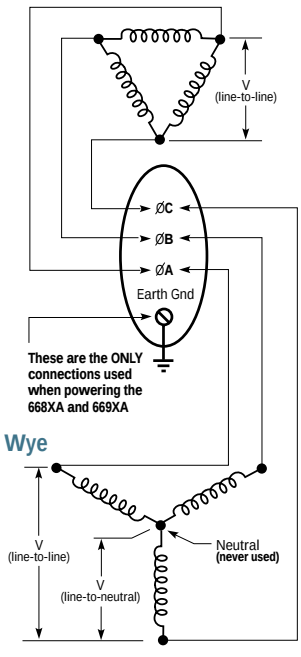
Choosing ac Line Voltage and Cord Options for your Agilent Power Products (Continued)

All Agilent 3-phase power products are shipped with either a North American or harmonized unterminated line cord based on the destination country on the purchase order.

Table 3C - Terminated Line Cords (Line cords with plugs)

Option Number		Description
Option 841		12 AWG, 3 wire; UL-Listed, CSA-certified; NEMA 6-20P, 20-A, 250-V plug; 8 ft. Use for connection to 200-240 Vac mains. Note for 657XA or 667XA series, E4356A and 6813B: not acceptable for use in Canada or Japan. Choose either -834 or -844 10 AWG power cord option.
Option 842		4-mm^2 wire size; harmonized cordage with IEC 309, 32-A, 220-V plug. Suggested for use in Europe and other areas not listed.
Option 844		10 AWG, 3 wire; UL-Listed, CSA-certified; with NEMA L6-30P, 30-A, 250-V locking plug; 8 ft. Suggested for use in North and South America. Note for 657XA or 667XA series, E4356A and 6813B: not acceptable for use in Canada or Japan. Choose either -834 or -844 10 AWG power cord option.
Option 845		1.5-mm^2 wire size; harmonized cordage with IEC 309, 16-A, 220-V plug. Suggested for use in Denmark, Switzerland, Austria, China and other countries not listed.
Option 846		10 AWG, 3 wire; UL-Listed, CSA-certified; with NEMA L5-30P, 30-A, 120-V locking plug; 8 ft. Suggested for use in North America. Note for 601XA or 603XA series, 66000A or 6812B: required for connection to 100-120 Vac mains.
Option 847		1.5-mm^2 wire size; harmonized cordage with CEE 7/7, 16-A, 220-V plug. Suggested for use in continental Europe.
Option 848		1.5-mm^2 wire size; harmonized cordage with BS 546, 15-A, 240-V plug. Suggested for use in India and South Africa.

Delta



Wye

Table 4 - Three Phase ac Input Systems

668XA and 669XA	Delta	Wye	
Standard 180-235 volts (line-to-line)	180-235 volts (line-to-line)	180-235 volts (line-to-line)	104-136 volts (line-to-neutral)*
Option 400 360-440 volts (line-to-line)	360-440 volts (line-to-line)	360-440 volts (line-to-line)	208-254 volts (line-to-neutral)*

***Note**: Never connect to the Neutral line connection when powering an Agilent 3 ϕ Product. Included as information ONLY. **Standard:** p/n 8120 -6203 **Opt 400:** p/n 8120 -6204

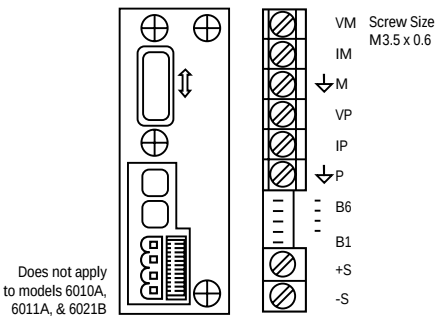
For information on single-phase operation, see page 107 question 2.

Dimension Drawings

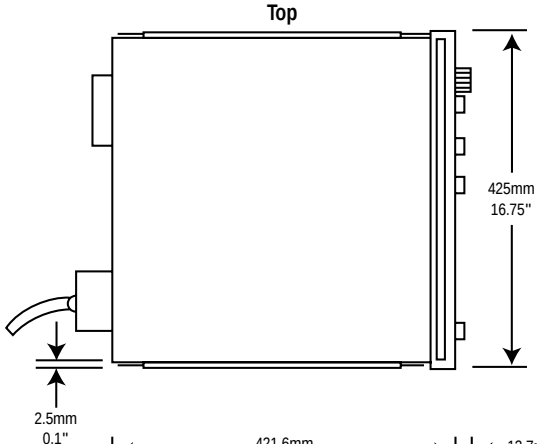
Agilent Models

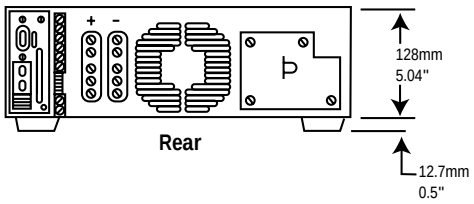
6010A, 6011A, 6012B, 6015A, 6030A, 6031A, 6032A, 6035A

Terminal Strip Detail



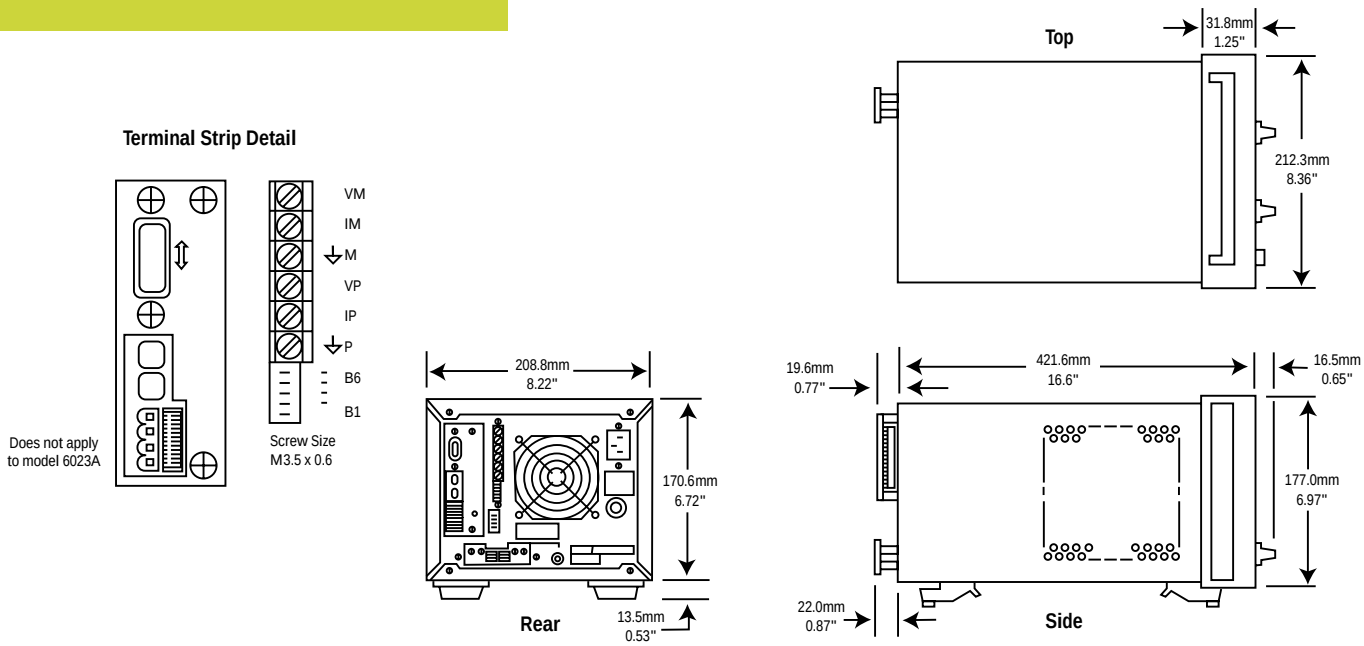
Top



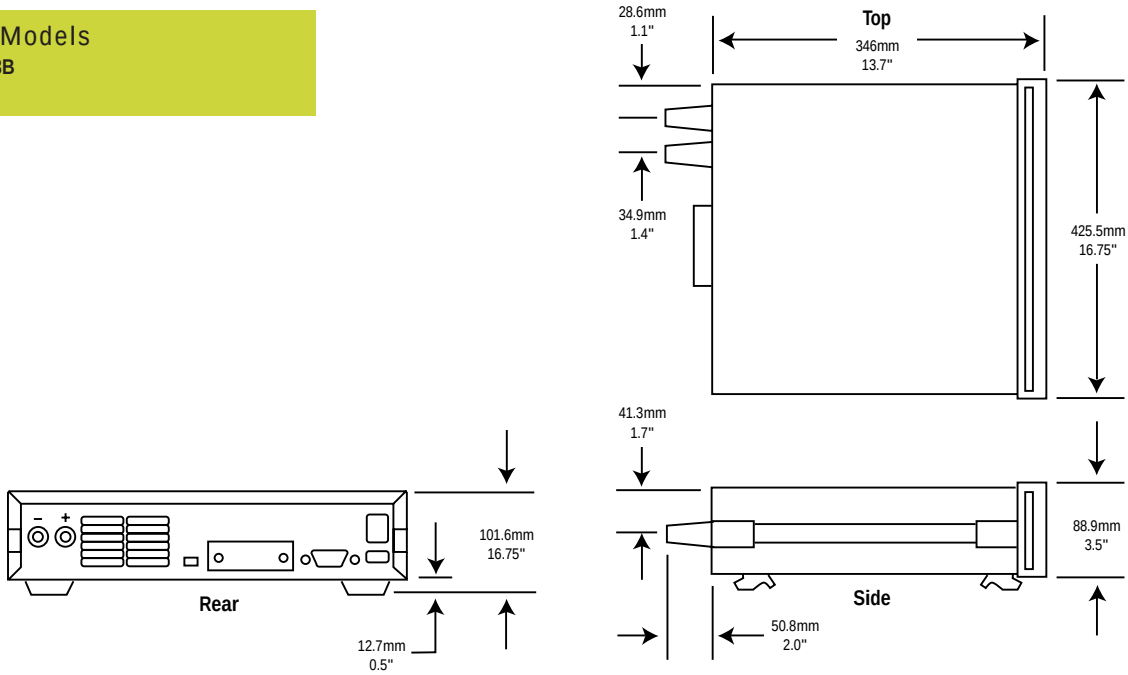


Dimension Drawings (Continued)

Agilent Models
6033A, 6038A

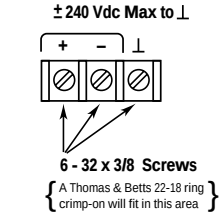


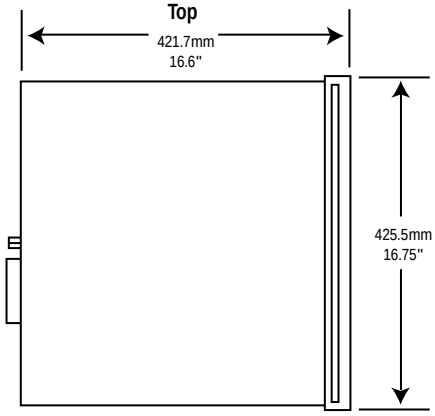
Agilent Models
6060B, 6063B



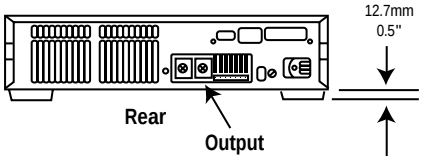
Dimension Drawings (Continued)

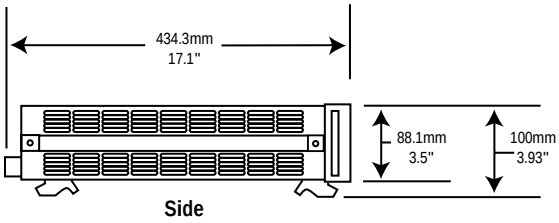
Agilent Models
6541A, 6542A, 6543A, 6544A, 6545A, 6641A, 6642A, 6643A, 6644A, 6645A





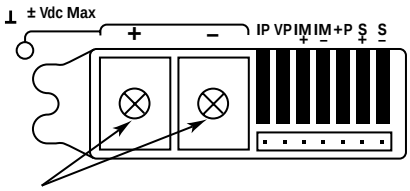
Terminal Screw Size: m4 x 0.7 x 8mm



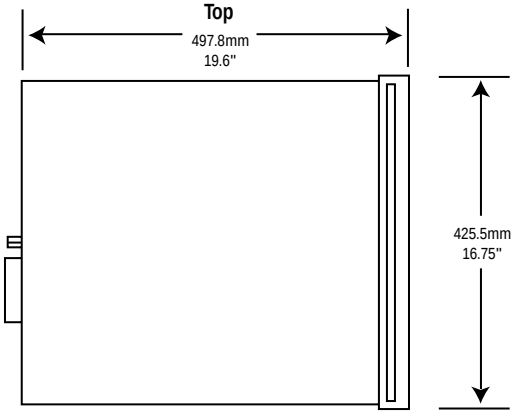


Agilent Models
6551A, 6552A, 6553A, 6554A, 6555A, 6651A, 6652A, 6653A, 6654A, 6655A, E4350B, E4351B

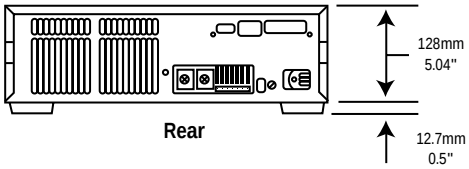
Rear Output

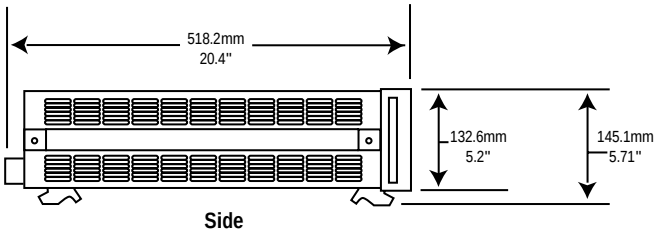


Metric Pan Head, M4 x 0.7 x 8 mm long
(center to center on these two screws is 20 mm, typ)



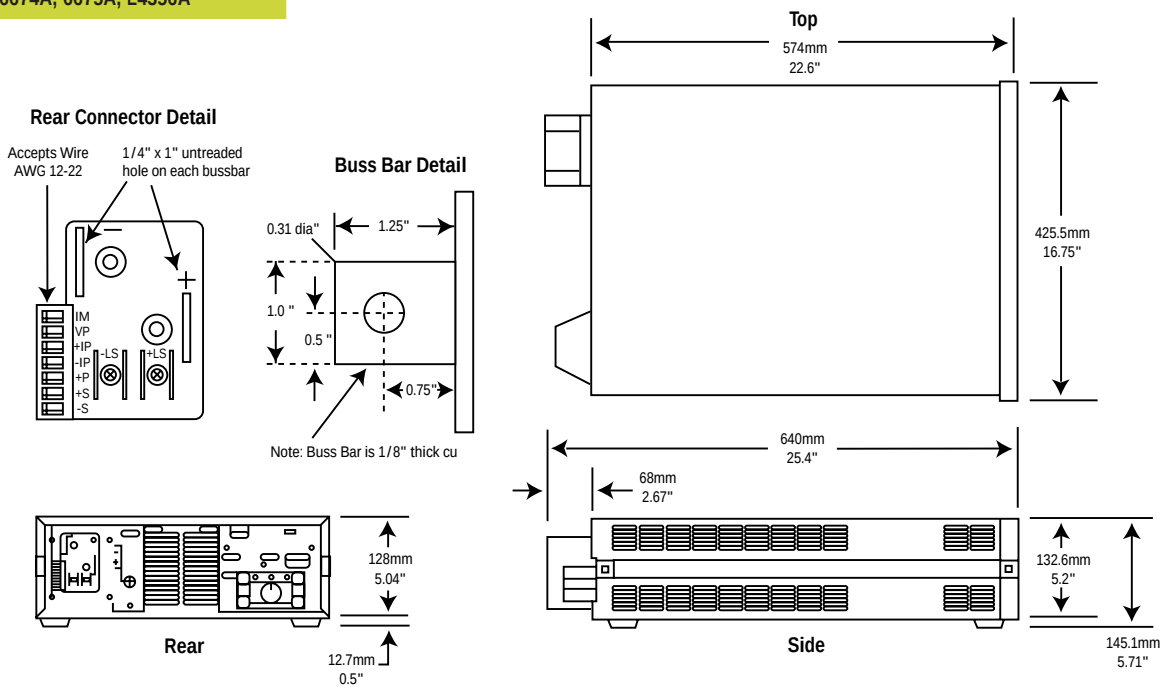
Terminal Screw Size: 6-32 x 5/16in



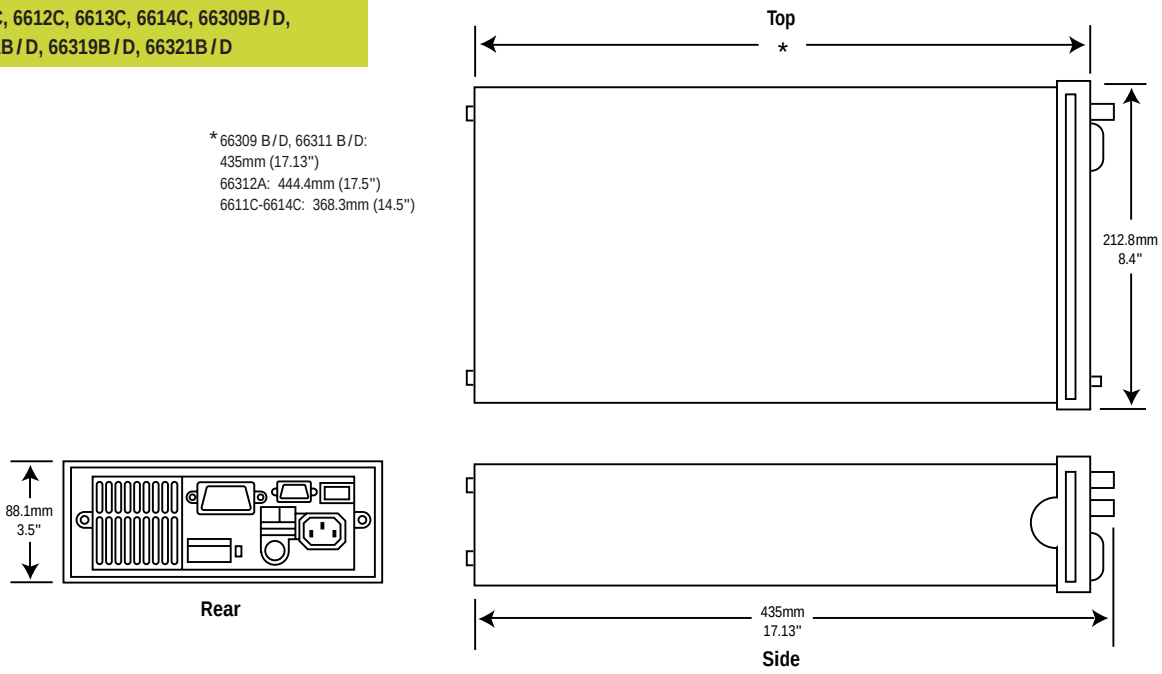


Dimension Drawings (Continued)

Agilent Models
6571A, 6572A, 6573A, 6574A, 6575A, 6671A, 6672A, 6673A, 6674A, 6675A, E4356A



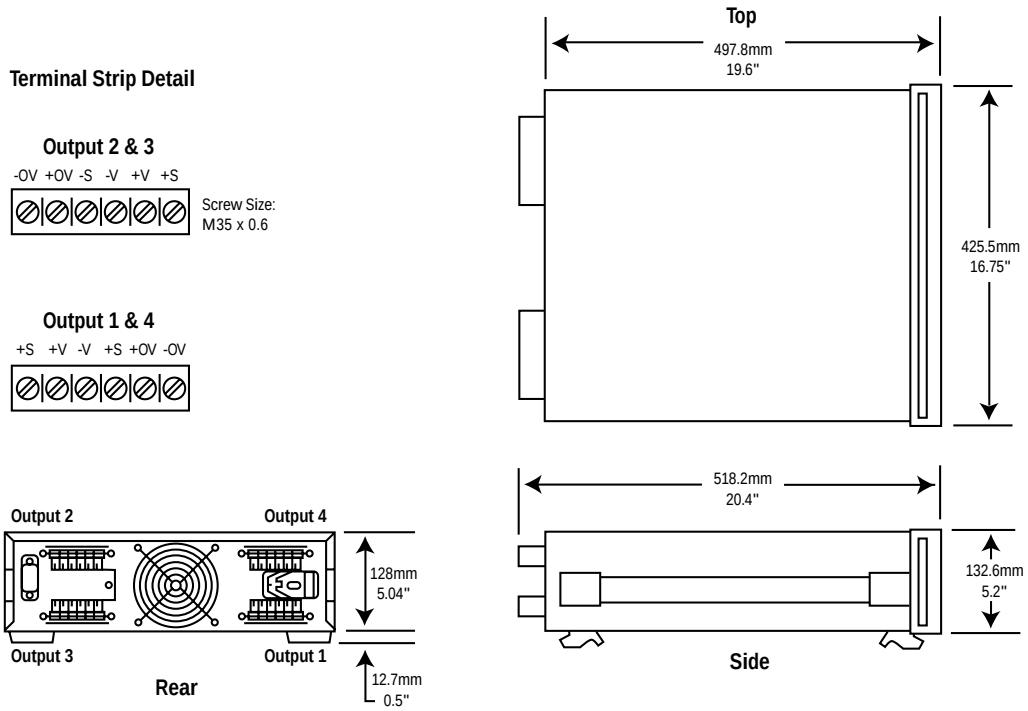
Agilent Models
6611C, 6612C, 6613C, 6614C, 66309B/D, 66311B/D, 66319B/D, 66321B/D



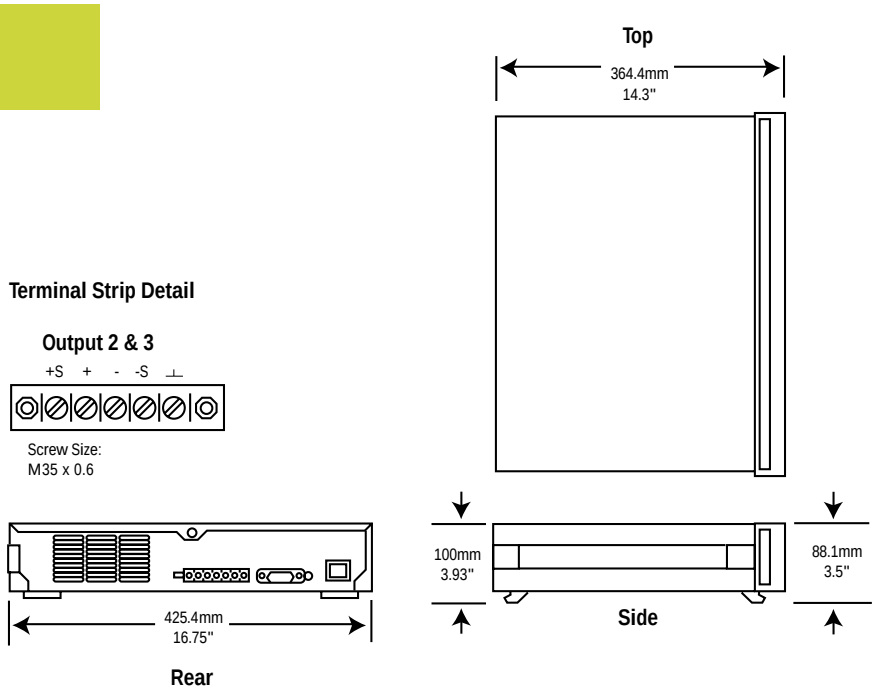
*66309 B/D, 66311 B/D:
435mm (17.13")
66312A: 444.4mm (17.5")
6611C-6614C: 368.3mm (14.5")

Dimension Drawings (Continued)

Agilent Models
6621A, 6622A, 6623A, 6624A, 6625A, 6626A, 6627A, 6628A, 6629A

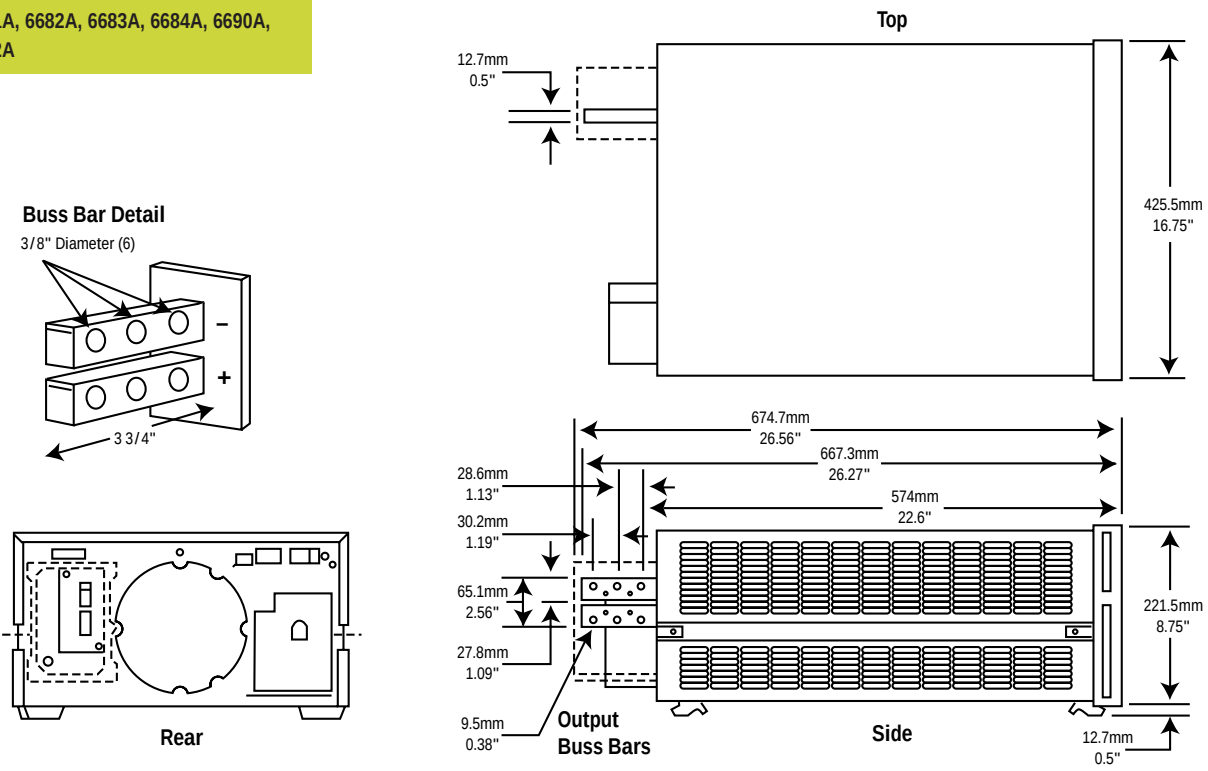


Agilent Models
6631B, 6632B, 6633B, 6634B, 66332A

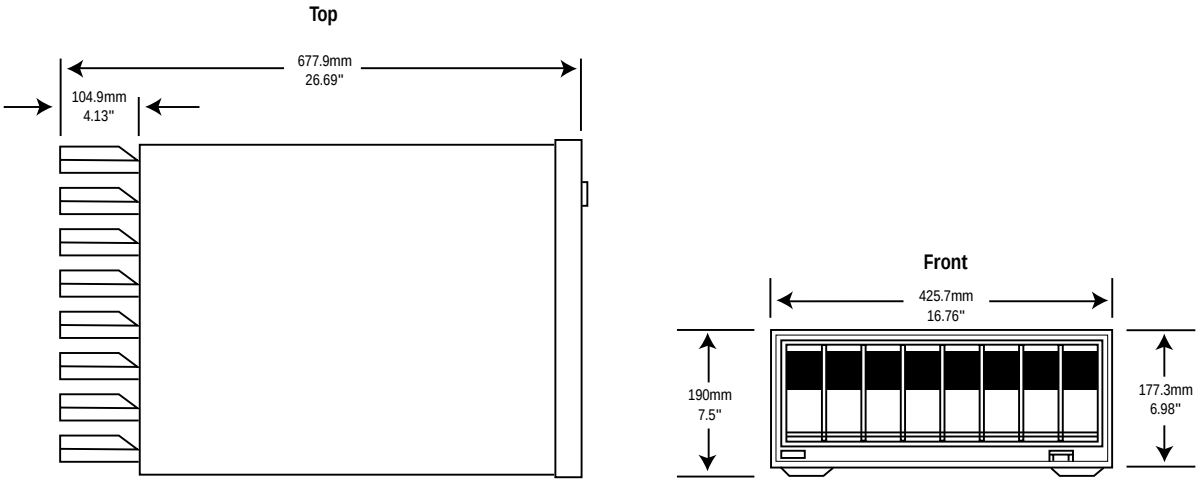


Dimension Drawings (Continued)

Agilent Models
6680A, 6681A, 6682A, 6683A, 6684A, 6690A, 6691A, 6692A

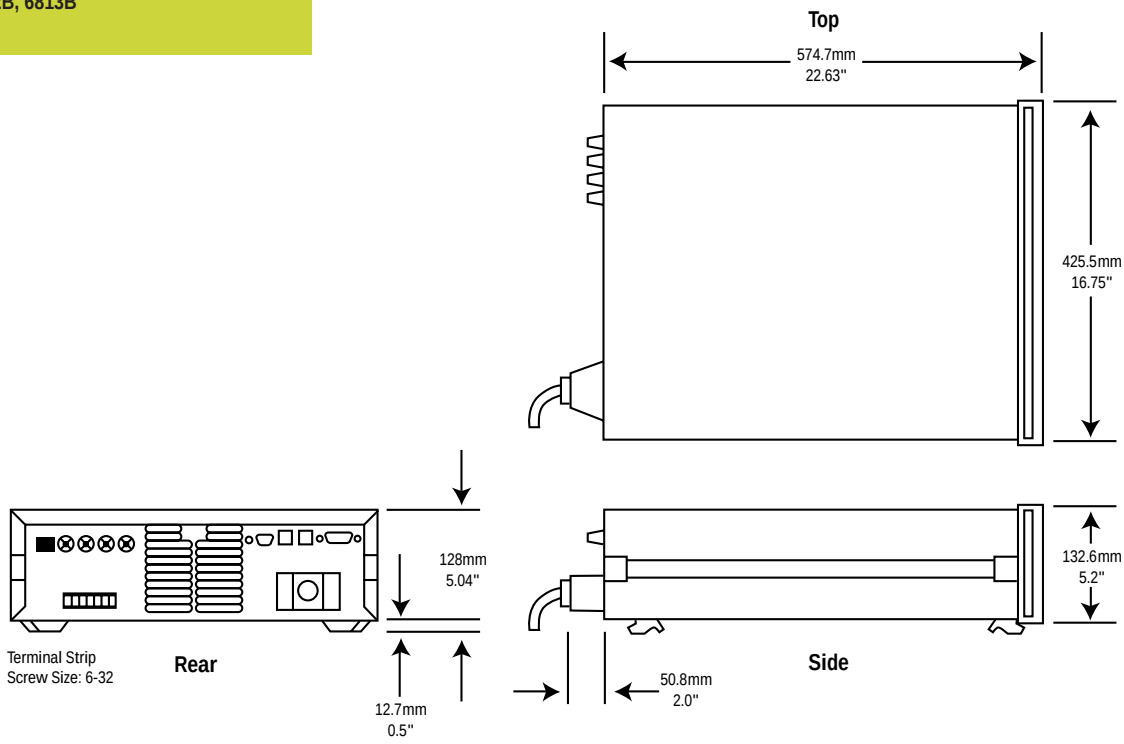


Agilent Models
66000A

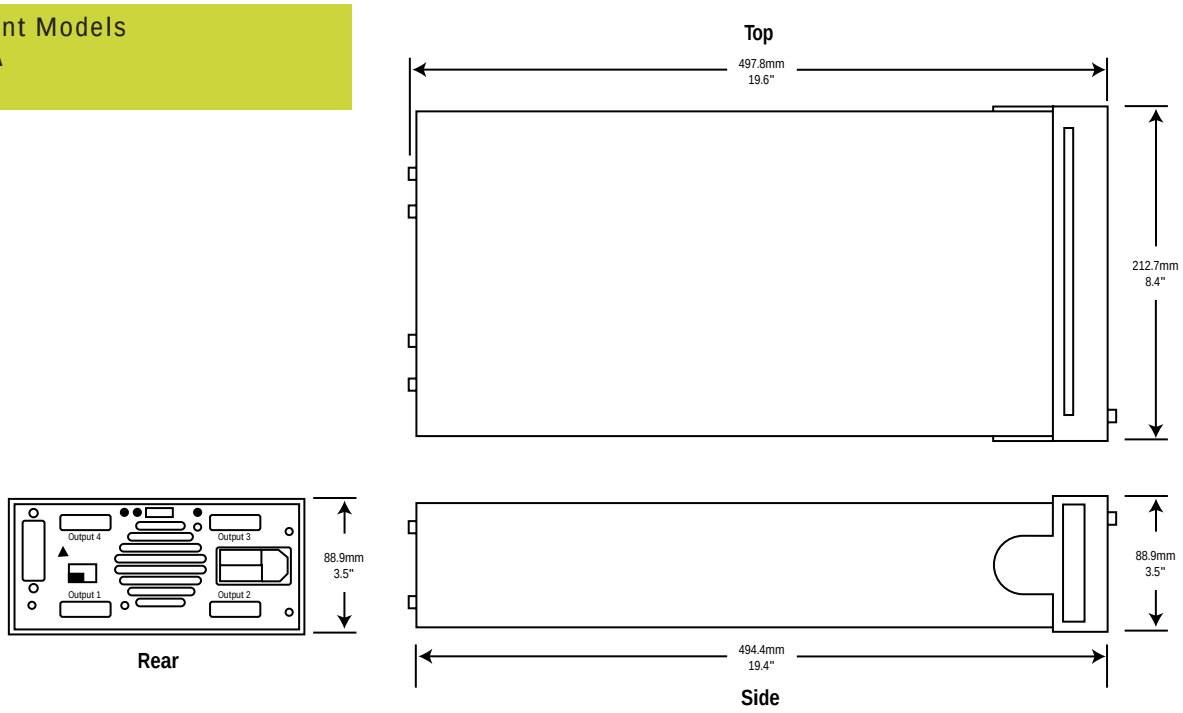


Dimension Drawings (Continued)

Agilent Models
6811B, 6812B, 6813B

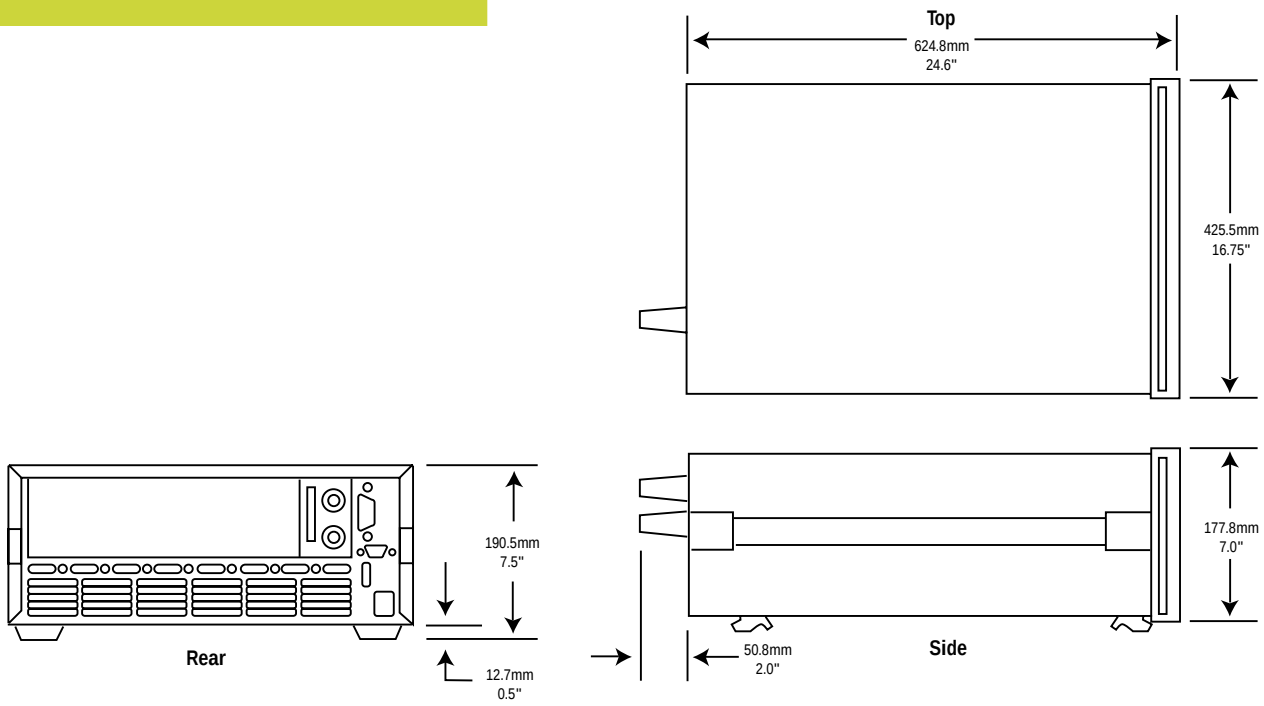


Agilent Models
N3280A

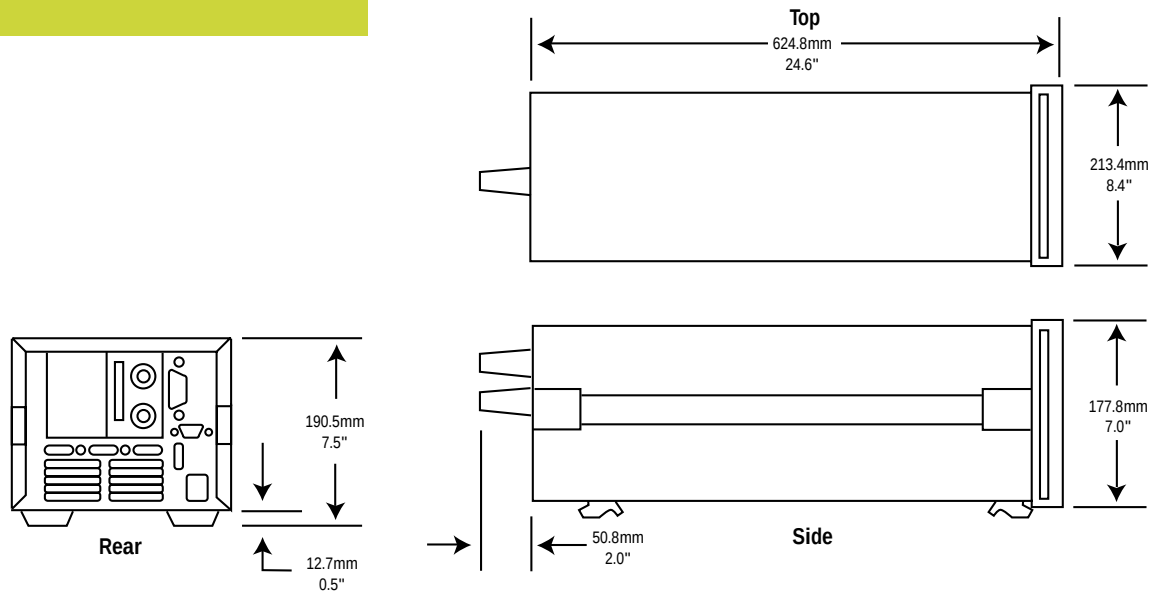


Dimension Drawings (Continued)

Agilent Models
N3300A



Agilent Models
N3301A



Applications Information

10 Most frequently asked questions about using dc power products

1

How do I put the power supply in the constant current mode?

The power supply cannot be "put" into the constant current mode. The output settings of the power supply combined with the ohmic value of the particular load determine whether or not the power supply is in constant current.

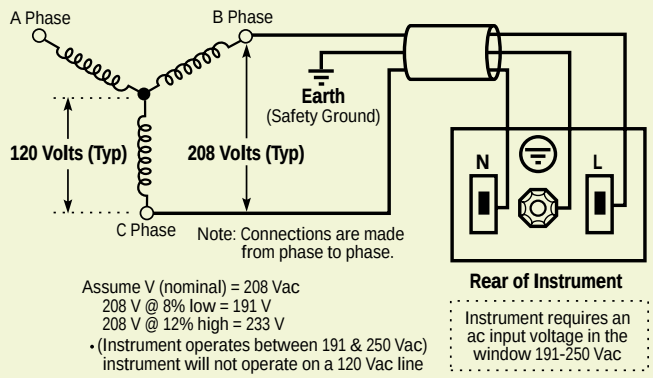
ie: The power supply inherently resides in the constant voltage mode. If the output voltage were set to 24 volts and a 6 Ω load were placed across the output terminals, Ohm's Law would require that 4 amps would flow (24 V/6 Ω). This presumes that the constant current setting of the power supply were set to a value greater than 4 amps; lets say 5 amps. Now, if the 6 Ω load were replaced by a 2 Ω load, Ohm's Law would suggest that 12 amps (24 V/ 2 Ω) would flow. However, the power supply is set to go into constant current at 5 amps. Therefore, the actual output voltage would be 10 volts (2 Ω x 5 A). The power supply will now remain in constant current for values of load = 0 Ω ≤ R < 4.8 Ω. Once the ohmic value of the load becomes greater than 4.8 Ω (24 V/5 A), the power supply will again revert to constant voltage operation at the value of 24 volts.

2

I have 208 vac, 3ϕ phase power; can it be used to operate a product requiring 208 V single phase?

Yes, see below.

657xA / 667xA Connection to a 3-phase line



3

Why are the required Watts and VA so different?

Watts is a scalar quantity which is frequently used to measure system efficiency. It is the energy supplied by the utility company over a given period of time and is commonly referred to as power. Except for heavy industrial users, the utility company only bills users for the watts consumed. Watts are directly convertible into mechanical work or BTUs (British Thermal Units) of heat. Wasted power is paid for a second time in terms of additional loading on the user's air-conditioning system. Mathematically, it is a scalar quantity resulting from the vector product of two vector quantities (volts and amps). It is NOT the simple algebraic product of the rms volts times rms current.

VA on the other hand IS the scalar quantity resulting from multiplying the magnitudes (rms) of the vector

quantities (volts and amps). This resulting quantity will never be smaller than the watts demanded by an instrument. Uninformed users incorrectly use VA to assess the device's over-all efficiency and power demands. VA is most frequently and correctly used by electricians to determine proper ac mains conductor gage and circuit breaker sizing.

4

How much cooling do I need for my power supply?

Users frequently rack power supplies into an enclosure to supply power to some remotely located external load. Under these conditions, to properly determine the cooling requirements, the systems integrator needs thermal data from the manufacturer for the specific enclosure in question. This data is generally in the form of a curve which relates the rise of the enclosure's internal air temperature to the amount of power (or BTU's) dissipated within the enclosure.

The difference between the maximum power demanded by the external load, and the ac power demanded by the power supply to support the load's needs, is the power dumped into the internal air of the enclosure. Using this number and data for the enclosure, the internal rise can be determined. The internal rise added to the external ambient temperature will determine the temperature of the environment for the power supply. This must be within the ratings of the product or premature failure will occur.

A valuable conversion factor between Watts and BTU's is listed below:

1 BTU/Hr = 0.293 Watt

5

Can Agilent power supplies sink current?

Yes! Sinking, or downprogramming, is the ability of a power supply to pull current into the positive power terminal. Sinking is necessary to discharge the power supply's own output capacitor, or the capacitors that are part of an external load.

Sinking is particularly important, for example, in printed circuit board test systems. The relays in test board systems typically must be switched only when the power supplies have discharged to zero volts, to avoid arcing and burn-out of the relay contacts. Sinking allows the power supply outputs to go to zero quickly, thus providing faster test times, an important factor for reducing overall test cost.

The value of the sink current is fixed and is not programmable, with the exception of the 6630 series, where sink current is set to the same value that is programmed for source current.

In general, sinking is provided to improve a power supply's transition time from a higher to a lower constant voltage operating level, and is not intended to be a steady-state operating condition.

Series	Current Sinking Capability
6620 Multiple Output	110% of source current rating
6620 Precision Output	110% of source current rating
6630 100 Watt	110% of source current rating
6030 Autorangers	50 W/actual output voltage in volts or actual output voltage volts/0.05 ohms, whichever is less
6640 200 Watt	25% of source current rating
6650 500 Watt	20% of source current rating
6670 2000 Watt	50 W/actual output voltage in volts or actual output voltage in volts/0.05 ohms, whichever is less
6680 5000 Watt	50 W/actual output voltage in volts or actual output voltage in volts/0.05 ohms, whichever is less
6690 6600 Watt	50 W/actual output voltage in volts or actual output voltage in volts/0.05 ohms, whichever is less

6

I want to put a microswitch on the safety cover over my UUT so that lifting the cover will program my ATE power supplies to zero volts and protect the operator from harm. Do Agilent power supplies have this capability?

Yes, all of the GPIB programmable supplies in the 6030, 6640, 6650, 6670 and 6680 series have this capability built-in at no extra cost. It's called "Remote Inhibit" (RI). RI is available as an option at extra cost on the 6620 and 6630 series. A contact closure or TTL low signal programs the output of the supply to zero volts. The power supply can also be programmed to generate a service request (SRQ) via the GPIB in the event that RI is pulled low.

7

Can I use Agilent Electronic Loads in series and in parallel?

Agilent electronic loads are designed to be operated in parallel for more current, but NOT in series for more voltage. Loads are fully protected against damage from current overloads, but will be damaged by voltage above the maximum voltage rating.

8

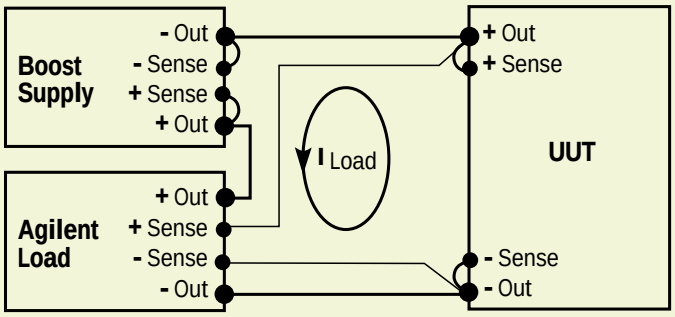
I must test a 1 volt power supply using a constant current load and I want to use Agilent Electronic Loads. But the Agilent load meets all of its dynamic specs with no derating on down to 3 volts. Below 2 volts, the Agilent load current must be linearly derated. What can I do?

Use a boost supply in series with the UUT. The load will now meet all its specs with no derating, because it always operates above 3 volts. (see the illustration below)

The boost supply can be a low-cost fixed output 3 V or 5 V supply with a current rating at least as high as the maximum peak load current needed. The 6641A (8 V, 20 A), 6651A (8 V, 50 A), 6671A (8 V, 220 A), or 6681A (8 V, 580 A) are all excellent choices.

The voltage setting of a programmable boost supply should be set to 3 volts, and the current limit set to full scale.

Select a boost power supply with low p-p ripple and noise. The constant current load will compensate for low-frequency p-p ripple and noise below a few kHz, but high frequency ripple and noise from the boost will appear across the UUT.



9

Why are Agilent's Electronic Loads constant resistance resolution speced in ohms on the low resistance range, but in mSiemens on the two higher ranges?

In general, Agilent's Electronic Loads are not a conventional "resistor". The loads consist of IC's, capacitors, resistors, FETs, etc. They were designed with two major circuits, a cv and cc circuit. These circuits are used to simulate resistance on the two upper ranges.

First, it is necessary to understand why there is a difference in the way in which the ranges are specified (mohms or mS). The constant resistance (CR) mode in the load actually operates using either the constant current (CC) or constant voltage (CV) circuits inside the load. The lowest CR range uses the CV regulating circuits, while the two higher ranges use the CC regulating circuits. It is because of these differences in the circuits used to regulate the load input that the specifications need to be different.

When the CV circuits are used, the load can be viewed as many resistors, all the same value (the resolution), in series to produce the desired resistance. Then, changing the resistance is like changing the number of discrete resistors in series. Therefore, the resolution is the value of one of these series resistors, and putting resistors in series changes the resistance measured in ohms. For the N3302A, the "discrete resistor" or resolution that can be programmed is 0.54 mohms in the 2 ohm range.

When the CC circuits are used, the load can be viewed as many resistors, all the same value (the resolution), in parallel to produce the desired resistance. Then, changing the resistance is like changing the number of discrete resistors in parallel. Therefore, the resolution is the value of one of these parallel resistors, and putting resistors in parallel changes the conductance measured in siemens. For the 60501B, the "discrete resistor" or resolution that can be programmed is 0.14 mS (=7.14 kohms).

For example, in the 2 kohm range, you can program the load input from 2 ohms to 2 kohms (0.5 S to 0.5 mS) with a resolution of 0.14 mS. This would be the equivalent of starting with about 3568 7.143 kohm resistors in parallel with each other, and in parallel with a 2 kohm resistor, and removing one at a time until you had only the 2 kohm resistor left.

Note that the resolution of the conductance is constant at 0.14 mS, however, the resolution of the total parallel resistance is not constant. It depends on how many resistors you have in parallel.

If you have two 7.143 kohm resistors in parallel and remove one, the resolution looks like 3571.5 ohms. If you have 3568 7.143 kohm resistors in parallel and remove one, the resolution looks like (7143/3567) - (7143/3568) = 0.561 mohms. But the conductance resolution is constant at 0.14 mS.

10

Can Agilent power supplies be programmed from 0 to full output voltage using a 0 to 10 V signal source?

Yes, many Agilent power supplies feature remote voltage programming or analog programming capability. However, there is a potential danger in analog programming any power supply, especially a high voltage supply. If the 0 to 10 V programming source is a typical, non-isolated, low-cost, digital-to-analog converter (DAC), it is probably grounded through its digital inputs and/or through the computer's internal power supplies, which are grounded through the computer's power cord. It's easy to overlook this, and the mistake can be very expensive.

If the DAC is non-isolated (or isolated only up to 42 V above ground) and one of the output terminals of the power supply is grounded, either directly or through the UUT, the output capacitor of the power supply can discharge through the computer backplane, motherboard, and the I/O common through the computer power cord ground. The resulting high current may even last long enough to vaporize the thin ground tracks on some or all of the printed circuit boards in the PC.

Be sure the programming source is electrically isolated, is operated from isolated power supplies, and is rated for floating voltages up to the full output voltage of the programmed supply. This is necessary so no one is hurt, and no equipment is damaged, no matter which output terminal of the power supply or UUT is grounded.

For additional questions and answers visit our web site at www.agilent.com/find/answers

Applications Information | ac Power and Load Connections

A modern stabilized dc power supply is a versatile high performance instrument capable of delivering a constant or controlled output reliably and with little attention. But to take full advantage of the performance characteristics designed into a supply, certain basic precautions must be observed when connecting it for use on the lab bench or installing it in a system. Factors such as wire ratings, system grounding techniques, and the particular way that ac input, dc output, and remote error sensing connections are made can contribute materially to obtaining the stable, low noise output expected by the user. Careful attention to the following guidelines can help to ensure the trouble free operation of your Agilent power supply.

ac Power Input Connections

Wire Rating

RULE 1. When connecting ac power to a power supply, always use a wire size rated to carry at least the maximum power supply input current.

If a long cable is involved, make an additional check to determine whether a still larger wire size might be required to retain a sufficiently low impedance from the service outlet to the power supply input terminals. As a general guideline, input cables should be of sufficient size to ensure that the voltage drop at maximum rated power supply input current will not exceed 1% of the nominal line voltage.

Continuity

RULE 2. Maintain the continuity of the ac, acc, and grounding wires from the ac power outlet to the power supply input terminals without an accidental interchange.

Interchanging the ac and grounding wires may result in the power supply chassis being elevated to an ac potential equal to the input line voltage. If the chassis is grounded elsewhere, the result may be no worse than some blown fuses. But if the chassis is not grounded, the result could be a potentially lethal shock hazard. Confirm that the chassis is grounded by the grounding wire.

Transformers

RULE 3. If an autotransformer or an isolation transformer is connected between the ac power source and the power supply input terminals, it should be rated for at least 200% of the maximum rms current required by the power supply.

The transformer must have a higher rating than would be suggested by the supply's rms input current because a power supply input circuit does not draw current continuously. Input current peaks can cause a smaller transformer to saturate, resulting in failure of the supply to meet its specifications at full output.

RULE 4. Be sure to connect the common terminal of an autotransformer to the acc (and not the ac) terminals of both the power supply and the input power line.

If acc is not connected to the common terminal of the autotransformer, the power supply's input acc terminal will have a higher than normal ac voltage connected to it, contributing to a shock hazard and, in some instances, a greater output ripple.

ac Line Regulator

RULE 5. Do not use an ac line regulator at the input to a regulated power supply without first checking with the power supply manufacturer.

Some regulators tend to increase the impedance of the line in a resonant fashion and can cause power supplies to malfunction, particularly if they use SCR or switching regulators or preregulators. Moreover, since the control action of many line voltage regulators is accompanied by a change in the output waveshape, their advantage in providing a constant rms input to a power supply is small. In fact these changes in waveshape are often just as disruptive in causing power supply output changes as the original line voltage amplitude changes would have been.

Load and Remote Error Sensing Connections

Making Load Connections to One Power Supply

The simplest and most common example of improper load wiring is shown in Figure 1. The voltage at each load depends on the current drawn by the other loads and the voltage drops they cause in some portion of the load leads. Since most load currents vary with time, an interaction among the loads results. This interaction can sometimes be ignored, but in most applications the resulting noise, pulse coupling, or tendency toward inter-load oscillation is unacceptable. The following thirteen steps describe a recommended procedure for connecting the load wiring, grounding the system in a manner that avoids troublesome ground loops, and making connections for remote error sensing.

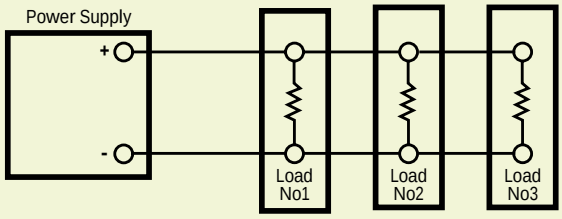


Figure 1
Improper load connections

STEP 1. Select a load wire size that, as an absolute minimum, is heavy enough to carry the power supply output current that would flow if the load terminals were short-circuited.

This is the minimum, however. Impedance and coupling considerations usually dictate the use of load wires larger than would be required just to satisfy current rating requirements. In general, the power supply performance degradation seen at the load terminals becomes significant when the wire size and length result in a load wire impedance comparable to or greater than the effective output impedance of the power supply. Refer to a copper wire resistance table to see if a larger wire size might have to be used to attain an impedance comparable to or smaller than the output impedance of the power supply.

If multiple loads are supplied from a pair of dc distribution terminals not located at the power supply terminals, it is necessary to consider separately the mutual impedance of the wires connecting the power supply to the distribution terminals and the additional impedance of the wires to each individual load. The mutual impedance presents an opportunity for a variation of one load current to cause a dc voltage variation at another load. Fortunately this mutual impedance can be effectively reduced at dc and at low frequencies by using remote error sensing, as will be described later.

Connect the Load Wiring

STEP 2. Designate a single pair of terminals as the positive and negative dc distribution terminals.

These two terminals might be the power supply output terminals, the load terminals, or a separate pair of terminals established expressly for distribution. If the power supply is a short distance from the load and remote sensing will not be used, locate the dc distribution terminals as near as possible to the power supply output terminals. Using the power supply output terminals themselves as the distribution terminals results in optimum performance.

If remote sensing is to be used, locate the dc distribution terminals as near as possible to the load terminals. Later in the procedure, sensing leads will be connected from the power supply sensing terminals to the dc distribution terminals as shown in Fig. 2.

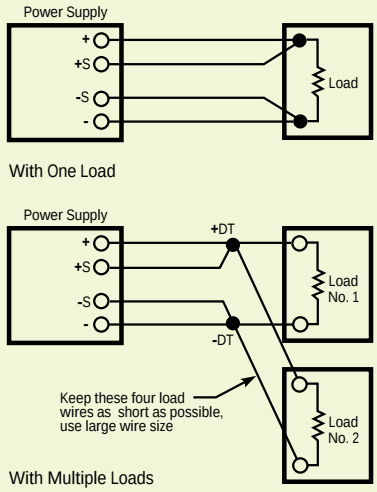


Figure 2
Location of dc Distribution Terminals with Remote Sensing (Distribution Terminals are Shown Solid)

STEP 3. Connect one pair of wires directly from the power supply output terminals to the dc distribution terminals, and connect a separate pair of wires from the distribution terminals to each load.

There should be no direct connection from one load to another except by way of the dc distribution terminals. (Although for clarity the diagrams show the load and sensing leads as straight lines, some immunity against pick-up from stray magnetic fields can be obtained by twisting each pair of load leads and shielding all sensing leads.)

Decouple Multiple Loads

STEP 4. If required, connect a local decoupling capacitor across each pair of distribution and load terminals.

Load decoupling capacitors are often needed when multiple loads draw pulse currents with short rise times. To reduce high frequency mutual coupling effects under these circumstances, capacitors must be connected directly across the load and distribution terminals. The capacitors used for decoupling must be selected to have a high frequency impedance that is lower than the impedance of the wires connected to the same load, and their connecting leads must be kept as short as possible to minimize impedance.

Grounding the System

Since no two ground points have exactly the same potential, the idealized concept of a single ground potential is a snare and a delusion. In many cases the potential difference is small, but a difference in two ground potentials of even a fraction of a volt could cause amperes of current to flow through a complete ground loop. (Ground loop is a term used to describe any conducting path formed by two separate connections to ground). Ground loops can cause serious interference problems when voltages developed by these currents are coupled into sensitive signal circuits.

To avoid ground loop problems, there must be only one ground return point in a power supply system. (A power supply system includes the power supply, all of its loads, and all other power supplies connected to the same loads). The selection of the best ground return point depends on the nature and complexity of the dc wiring. In large systems, practical problems frequently tend to force compromises with the ideal grounding concept. For example, a rack mounted system consisting of separately mounted power supplies and loads generally has multiple ground connections. Each instrument usually has its own chassis tied to the third grounding wire of its power cord, and the rack is often connected by a separate wire

to ground. With the instrument panels fastened to the rack frame, circulating ground currents are inevitable. However, as long as these ground currents are confined to the ground system and do not flow through any portion of the power supply dc distribution wiring, their effect on system performance is usually negligible. To repeat, separating the dc distribution circuits from any conductive paths in common with ground currents will in general reduce or eliminate ground loop problems. The only way to avoid such common paths is to connect the dc distribution system to ground with only one wire. Figure 3 illustrates this concept: dc and signal currents circulate within the dc system, while ground loop currents circulate within the ground system. Steps, 5, 6, and 7 make specific recommendations for avoiding ground loop problems.

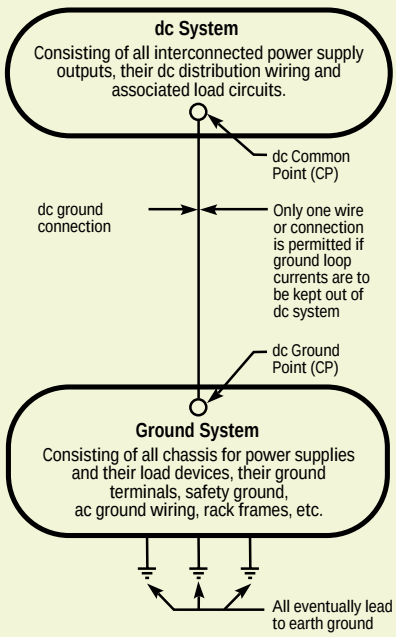


Figure 3
Isolating Ground Loop Paths from the dc system

Select the dc Common Point

STEP 5. Designate one of the dc distribution terminals as the dc common point. There should be only one dc common point in a dc system. If the supply is to be used as a positive source, then the negative dc distribution terminal is the dc common point. If it is to be a negative source, then the positive dc distribution terminal is the dc common point. Here are some additional suggestions for selecting the best dc common point for five different classes of loads:

a. Single Isolated Load.
A single isolated load exists when a power supply is connected to only one load and the load circuit has no internal connections to the chassis or ground. If the power supply output terminals are to be used as the dc distribution terminals, then the dc common point will be either the positive or negative power supply output terminal (Fig. 4A). If remote sensing is to be used and the load terminals will serve as the distribution terminals, then either the positive or negative load terminal will be the dc common point (Fig. 4B).

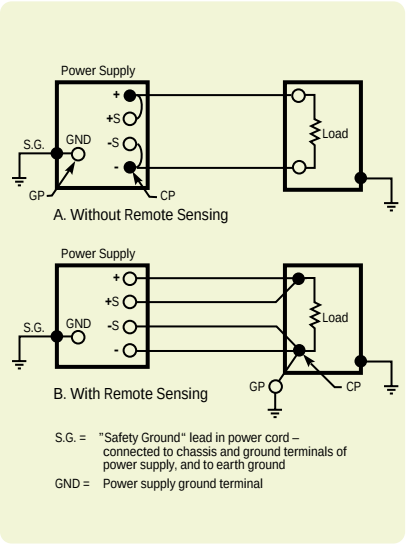


Figure 4
Preferred Ground Connections for a Single Isolated Load

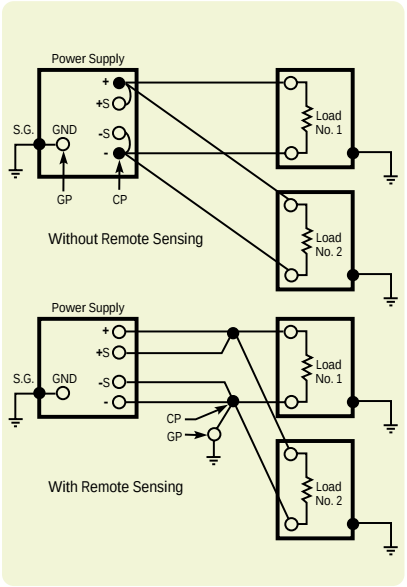


Figure 5
Preferred Ground Connections for Multiple Ungrounded Loads

b. Multiple Ungrounded Loads.
This alternative applies when separate pairs of load leads connect two or more loads and none of the load circuits has an internal connection to chassis or ground (Fig. 5). Use the positive or negative dc distribution terminal as the dc common point.

c. Single Grounded Load.
When a power supply is connected to a single load that has a necessary internal connection to chassis or ground as in Fig. 6, or when a supply is connected to multiple loads only one of which has a necessary internal connection to chassis or ground as in Fig. 7, the load terminals of the grounded load must be designated the dc distribution terminals, and the grounded load terminal is necessarily the dc common point.

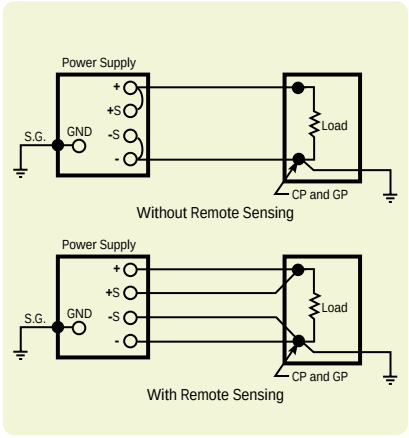


Figure 6
Preferred Ground Connections for a Single Grounded Load

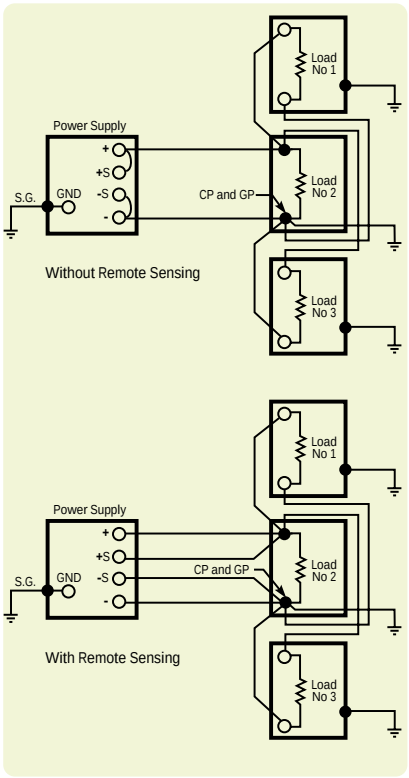


Figure 7
Preferred Ground Connections for Multiple Loads, Only One of Which is Grounded Internally

d. Multiple Loads, Two or More of Which are Individually Grounded.
This undesirable situation must be eliminated if at all possible. Ground loop currents circulating through the dc and load wiring cannot be avoided so long as separate loads connected to the same power supply or dc system have separate ground returns as shown in Fig. 8.

One possible solution is to break the ground connection in all of the loads and then select the dc common point using the multiple ungrounded load alternative as in (b) above. Another would be to break the ground connection in all but one of the loads and select the dc common point as in alternative (c). If there are two or more loads with ground connections that cannot be removed and the system is susceptible to ground loop problems, then the only satisfactory solution is to increase the number of power supplies and to operate each grounded load from a separate supply. Each combination of power supply and grounded load would be treated as in alternative (c).

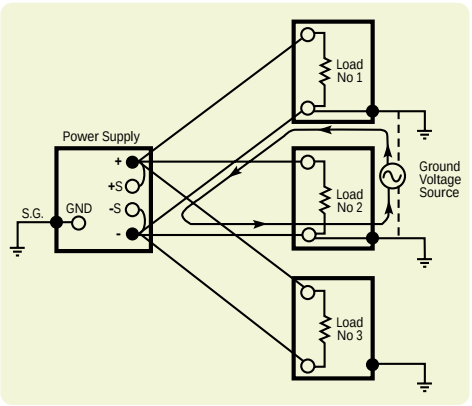


Figure 8
Improperly Connected dc Distribution System with Two Grounded Loads forming a Ground Loop

e. Load System Floated at a dc Potential Above Ground.
It is sometimes necessary to operate the power supply output at a fixed voltage above or below ground potential. The usual procedure in these circumstances is to designate a dc common point using whichever of the preceding four alternatives is appropriate, just as though conductive grounding were to be used. Then connect this dc common point to the dc ground point through a 1 microfarad capacitor as shown in Figure 9.

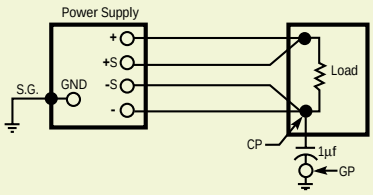


Figure 9
Floating a Load System at a dc Potential Above Ground

Select the dc Ground Point

STEP 6. Designate the terminal that is connected to ground as the dc ground point.

The dc ground point can be any single terminal, existing or added, that is conductively connected to the ground of the building wiring system and then eventually to earth ground.

STEP 7. Connect the dc common point to the dc ground point, making certain there is only one conductive path between these two points.

Make this connection as shown in Figures 4, 5, 6, or 7. Make the connection as short as possible and use a wire size such that the total impedance from the dc common point to the dc ground point is not large compared with the impedance from the ground point to earth ground. Flat braided leads are sometimes used to further reduce the high frequency component of the ground lead impedance.

Making Remote Error Sensing Connections

Normally a power supply operating in the constant voltage mode achieves its optimum line and load regulation, its lowest output impedance, drift, and PARD, and its fastest transient recovery performance at the power supply output terminals. If the load is separated from the output terminals by any lead length (as in Fig. 10), some of these performance characteristics will be degraded at the load terminals-usually by an amount proportional to the impedance of the load leads compared with the output impedance of the power supply.

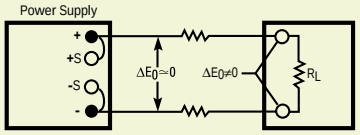


Figure 10
Load Voltage Variations Caused by Load Lead Voltage Drops when Remote Error Sensing is not Used

With remote error sensing, a feature included in nearly all Agilent power supplies, it is possible to connect the input of the voltage feedback amplifier directly to the load terminals so that the regulator performs its function with respect to the load terminals rather than with respect to the power supply output terminals. Thus, the voltage at the power supply output terminals shifts by whatever amount is necessary to compensate for the voltage drop in the load leads, thereby maintaining the voltage at the load terminals constant (Fig. 11).

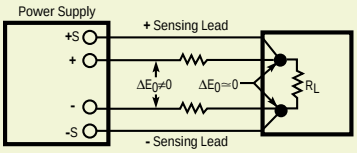


Figure 11
Regulated Power Supply with Remote Error Sensing.

Making the Sensing Connections

STEP 8. Remove the jumper connections between the power supply sensing and output terminals, and connect the power supply sensing terminals to the dc distribution terminals as shown in Fig. 12.

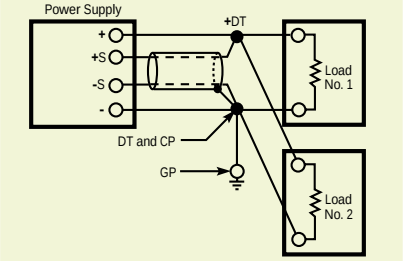


Figure 12
Properly Grounded Power Supply System with Remote Error Sensing

Use an insulated shielded pair for the sensing leads. Do not use the shield as one of the sensing conductors.

STEP 9. Connect one end of the sensing lead shield to the dc common point and leave the other end unconnected.

In nearly all cases this method of connecting the sensing shield minimizes ripple at the dc distribution terminals.

Protect Against Open Sensing Leads Step

STEP 10. Avoid the possibility of an open remote sensing path, either on a long-term or a transient basis.

Opening a sensing lead causes the power supply output voltage to increase. Protective circuits in the supply provide some load protection by limiting the amount of the increase, but eliminating all switch, relay, or connector contacts from the remote sensing path helps to minimize the possibility of any loss of regulation due to this cause.

Check the Load Wire Rating

STEP 11. Verify that the voltage drop in the load leads does not exceed the capabilities of the remote sensing circuit.

Most well regulated power supplies have an upper limit to the load lead voltage drop around which remote sensing can be connected without losing regulation. This maximum voltage drop is typically 0.5, 1, or 2 volts, and may apply to the positive, the negative, or both the positive and negative output leads. See the instruction manual for the exact load lead voltage drop limitations of a particular power supply.

Remember too, that any voltage drop lost in the load leads reduces the maximum voltage available for use at the load. Either of these limitations sometimes dictates the use of a larger wire size than would be required by wire current rating or impedance considerations.

Check for Power Supply Oscillation

STEP 12. Verify that the power supply does not oscillate when remote sensing is connected.

Although dc and low frequency performance are improved by remote sensing, phase shifts associated with long load and sensing leads can affect the stability of the feedback loop seriously enough to cause oscillation. This problem can frequently be corrected by readjusting a "transient recovery" or "loop stability" control inside the supply if the circuit includes one; follow the adjustment procedure in the manual. Another remedy that is often effective is to disconnect the output capacitor inside the power supply (some models have a rear panel jumper that can be removed for this purpose) and to connect a similar capacitor across the dc distribution terminals.

Check for Proper Current Limit Operation

STEP 13. Check that the operating point of the current limit circuit has not been affected by the remote sensing connections.

With some power supply designs, the resistance of one of the output conductors adds to the resistance used for current limit monitoring when remote sensing is used. This reduces the threshold value at which current limiting begins and makes readjustment of the current limit

circuit necessary. To determine whether connecting remote sensing has changed the current limit setting, turn off the supply, short terminal -S to -OUT and +S to +OUT at the power supply, and check whether the current limit value differs from the value without these terminals shorted. If it does differ significantly, the current limit control needs readjustment.

Making Load Connections to Two or More Power Supplies in the Same System

The following four rules must also be observed in extending the preceding techniques to systems containing two or more power supplies.

dc Distribution Terminals

RULE 1. There must be only one point of connection between the dc outputs of any two power supplies in the multiple power supply system. This point must be designated as one of the two dc distribution terminals for those two power supplies.

Thus there are always exactly (N+1) dc distribution terminals in any system, where N is the number of power supplies. (This is true unless parallel supplies share the same distribution terminals, or supplies are connected in series with no other connections to their intermediate terminals).

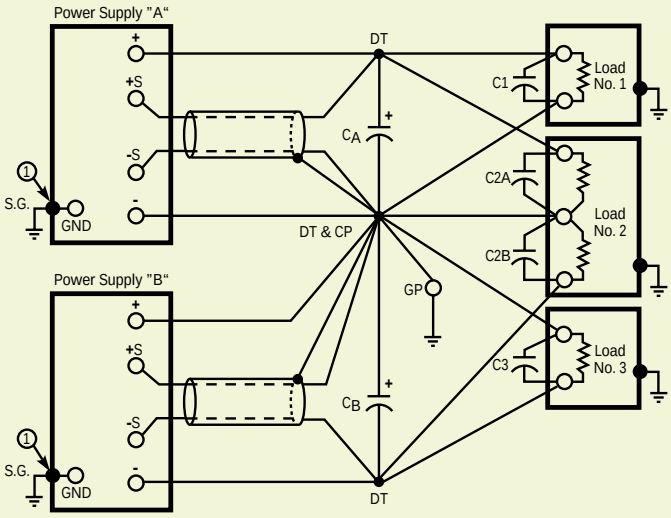


Figure 13
A Properly Connected Multiple Power Supply System

dc Common Point

RULE 2. One of the (N+1) dc distribution terminals must be designated as the dc common point for the system.

There can be only one dc common point allowed in a system.

dc Ground Point

RULE 3. There must be only one dc ground point in a multiple power supply system.

This rules out the possibility of connecting two grounded loads in the same system.

RULE 4. There must be only one conductive path between the system dc common point and the system dc ground point.

This rule is repeated from Step 7 above as a reminder because of the far greater number of possible paths to ground in a multiple power supply system. Figure 13 shows an example of a properly connected and grounded multiple power supply system.

Applications Information | Agilent Application Notes

These documents and other helpful applications information are available both on the Agilent Technologies Power Products website (www.agilent.com/find/power) and through any Agilent Sales Office.

AN 372-1
Power Supply Testing
An electronic load offers a broad range of operating modes, providing versatile loading configurations needed for characterizing and verifying dc power supply design specifications.

p/n 5952-4190

AN 372-2
Battery Testing
An electronic load can be used to discharge batteries of various chemistries to determine actual capacity, capacity retention, and impedance.

p/n 5952-4191

AN 1246
Pulsed Characterization of Power Semiconductors Using Electronic Loads
An electronic load eliminates the self-heating problems associated with measuring the on-state voltage drop and transconductance (or current gain) of power semiconductors.

p/n 5091-7636E

AN 1293
Sequential Shunt Regulation
This sequential shunt regulation is widely used for regulating the satellite bus voltage, powered by solar arrays. The E4350B/E4351B solar array simulators (SAS) are ideal for this type of application.

p/n 5965-7329E

AN 1310
Considerations when selecting a system power supply for mobile communication device testing
Pulsed battery drain currents, regulated charge currents, and remote DUT (Device Under Test) fixtures, dictate the need for specialized power sourcing, loading, and measurement capabilities for testing mobile communications devices. Many of these capabilities are not available in general-purpose system power supplies.

This guide will assist the test system designer in selecting a system power supply by properly evaluating test system and power supply needs that are unique to the application and not immediately obvious.

p/n 5968-2424E

AN 1396
Optimizing *Bluetooth*™ Device Battery Drain Measurements in Manufacturing
Battery operating time is a critical parameter for portable devices. This application note describes the procedures that can be used in manufacturing test to ensure a minimum operating time for portable *Bluetooth*™ devices.

p/n 5988-6064EN

Applications Information | Agilent Application Notes (Continued)

Product Note
Increasing dc Power Supply Test System Throughput with Agilent Technologies N3300A dc Electronic Loads

By using fast electronic loads, and a variety of programming techniques, production throughput can be greatly enhanced.

p/n 5980-0233E

Product Note
Agilent dc Power Supplies for Base Station Testing

By choosing the correct power supply for the application, and using the features appropriately, the manufacturer of base stations and base station components can reduce manufacturing cost, and produce a more robust product.

p/n 5988-2386EN

Product Note
Testing Uninterruptible Power Supplies using Agilent 6800 Series ac power source / analyzers

Agilent ac sources can be used to help test uninterruptible power supplies in many different environments, including research and development, manufacturing, and incoming inspection. Ensuring that the UPS is designed and operating properly is essential to guarantee that the UPS will satisfactorily protect sensitive equipment against ac mains voltage abnormalities.

p/n 5967-6056E

Product Note
Zero Volt Electronic Load

Increasing demand for lower voltage power supplies is pressuring test system designers to identify electronic load test equipment designed to adequately perform at these lower voltages. Read how to configure Agilent dc Electronic Loads, with option J04, to perform accurate dynamic loading completely down to zero volts.

p/n 5968-6360E

Product Note
Making Fuel Cell ac Impedance measurements utilizing Agilent N3300A Series Electronic Loads

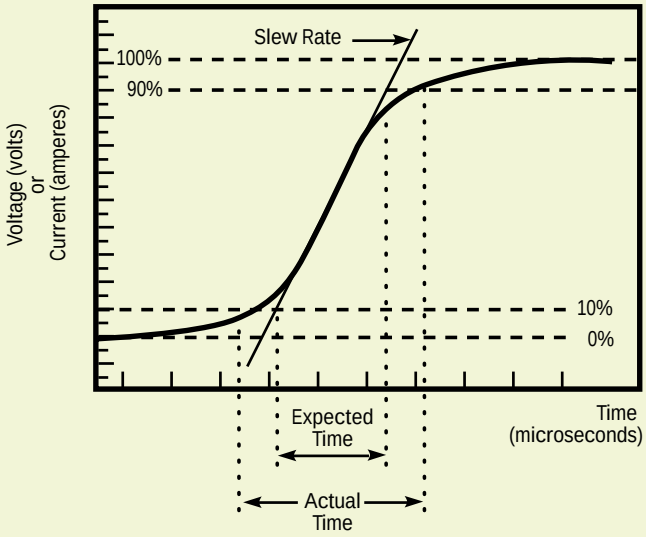
Making ac impedance measurements on fuel cells can help identify problems with the fuel cell components and help identify deviations in the fuel cell assembly process. This product note explains how an electronic load can be used to make Electrochemical Impedance Spectroscopy measurements.

p/n 5988-5358EN

Applications Information | Power Products Terms

ac input current: the maximum current into the power supply or electronic load. The current specified is worst case (low line voltage, full output).

Actual transition time: for an electronic load, either the total slew time (voltage or current change divided by slew rate - time) or the minimum transition time, whichever is longer.



Risetime Transition Limitation

Ambient temperature: the temperature of the air immediately surrounding the power supply or electronic load.

Analog programming: controlling the output voltage and/or current with an analog signal. This signal could be a voltage, current or resistance. This is similar to using the power supply as an amplifier.

Auto-parallel operation: a master-slave connection of the outputs of two or more supplies or the inputs of two or more electronic loads used for obtaining a current rating greater than can be obtained from a single load or supply. Only supplies that have the same voltage and current ratings should be paralleled.

Autoranging power supply: a power supply that can provide maximum rated power over a wide and continuous range of voltage and current settings.

Auto-series operation: a master-slave connection of the outputs of two or more supplies used for obtaining a voltage greater than can be obtained from one supply. Only supplies that have the same voltage and current ratings should be connected in series.

Auto-tracking operation: a master-slave connection of two or more supplies each of which has one of its output terminals in common with one of the output terminals of all of the other supplies.

Command processing time: the average time required for a power supply output voltage, or electronic load input voltage or current, to begin to change following receipt of a voltage or current set command over GPIB. This is effectively the time it takes for the power supply or electronic load to interpret the voltage set command and initiate a response.

Common mode noise: the current flowing from either output terminal (+ and –) through the power supply to chassis ground.

Compliance voltage: the output voltage of a power supply operating in the constant-current mode.

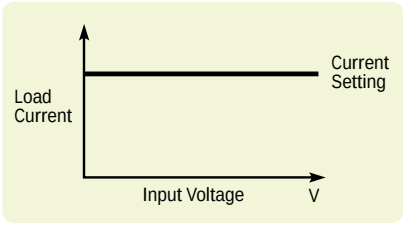
Constant-current (CC) mode: a power supply that stabilizes output current with respect to changes in load impedance. Thus, for a change in load resistance, the output current remains constant while the output voltage changes by whatever amount necessary to accomplish this.

Constant-current / voltage / resistance mode electronic load: an electronic load that can operate in one of the following ways:

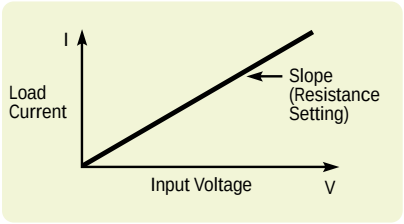
CC= ratio of voltage to current in accordance with the programmed value regardless of the input voltage

CV= ratio of voltage to current in accordance with the programmed value regardless of the input current

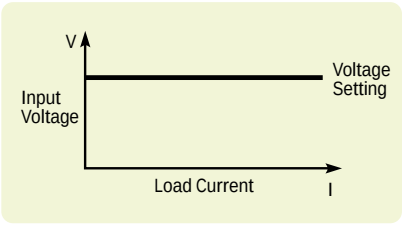
CR= ratio of voltage to current while maintaining the programmed resistance value



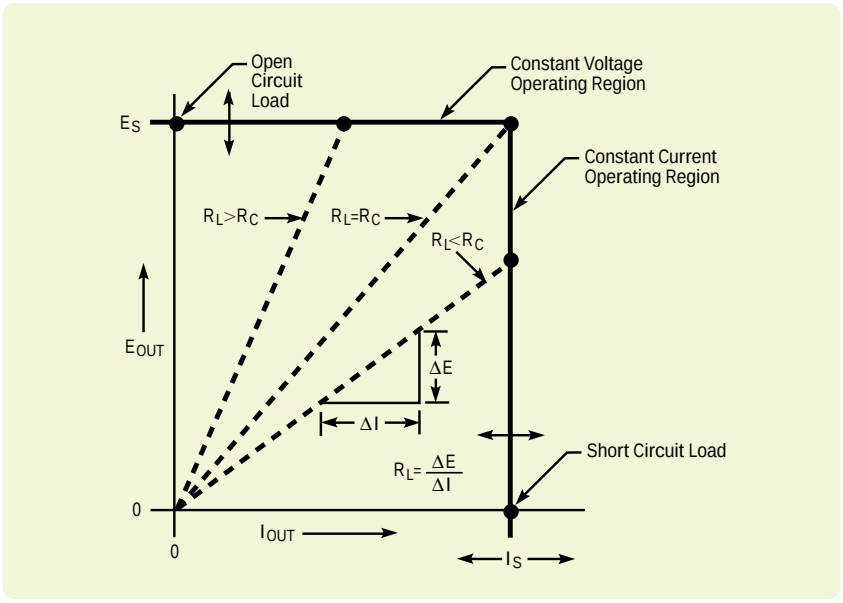
Constant-Current Mode



Constant-Resistance Mode



Constant-Voltage Mode



Constant-Voltage / Constant-Current Output Characteristics

Constant-current / voltage / resistance regulation: the change in the steady-state value of the stabilized electronic load input voltage, current, or resistance resulting from a full scale source change, with all other influence quantities held constant.

Constant-voltage (CV) mode: a power supply that stabilizes output voltage with respect to changes in influence quantities. Thus, for a change in load resistance, the output voltage remains constant while the output current changes by whatever amount necessary to accomplish this.

Constant-voltage / constant current (CV / CC) power supply: a power supply that operates as a constant-voltage power supply or a constant-current power supply, depending on load conditions. The supply acts as a constant-voltage source for comparatively large values of load resistance and as a constant-current source for comparatively small values of load resistance.

Applications Information | Power Products Terms (Continued)

Constant-voltage / current limiting (CV / CL) power supply: a power supply similar to a constant-voltage/constant-current supply except that at comparatively small values of load resistance, its output current is limited instead of being stabilized.

Crest factor: the ratio of the zero-to-peak value to the rms value of a waveform. This term is often used to specify the maximum peak amplitude that an ac power supply can source (relative to its maximum rms rating) without distortion.

Crowbar: see overvoltage protection.

Current limiting: the action, under overload or short-circuit conditions, of limiting the output current of a constant-voltage supply to some predetermined maximum value (fixed or adjustable) and automatically restoring the output voltage to its normal value when the overload or short circuit is removed. There are three types of current limiting:

- by constant-voltage/constant-current crossover
- by decreasing the output voltage as the current increases
- by decreasing both voltage and current as the load resistance decreases.

DFI: a TTL compatible output signal that can be used as an alarm and automatically initiates an action for multiple power supply or electronic load shutdown. The DFI signal is commonly connected to RI of the next supply. (See RI)

Downprogramming: the ability of a power supply to discharge its output capacitors independently of load. The use of an active down programming device can reduce the fall time of the output voltage.

Drift: the maximum change of a power supply output or load input voltage or current during an 8-hour period following a 30-minute warmup, with all influence and control quantities maintained constant during the warm-up time and the period of drift measurement. Drift includes both periodic and random deviations over the bandwidth from zero frequency (dc) to a specified upper frequency limit.

Efficiency: expressed in percent, efficiency is the total output power of the supply divided by the active input power. Unless otherwise specified, Agilent measures efficiency at maximum rated output power and at worst case conditions of the ac line voltage.

Electromagnetic interference (EMI): any type of electromagnetic energy that could degrade the performance of electrical equipment. The EMI generated by a power supply can be propagated either by conduction (via the input and output leads) or bt radiation from the units' case. The terms "noise" and "radio-frequency interference" (RFI) are sometimes used in the same context.

Electronic Load: an active device which absorbs power. Loads are used for the testing of the power producing products.

Foldback: immediate shutdown of the power supply output when a crossover between constant voltage and constant current mode occurs. Both the voltage and current levels are reduced (folded back).

Harmonics: the occurrence of this type of distortion is based upon the mathematical principle that all periodic waveforms are made up of a series of sine waves. As a result, harmonic distortion is produced at frequencies that are integer multiples of the fundamental or desired signal frequency. When viewed in the frequency domain, harmonics have an amplitude (often expressed in db), frequency, and phase characteristic relative to the fundamental.

Isolation: the maximum voltage (including output voltage) either output terminal may be floated from earth ground.

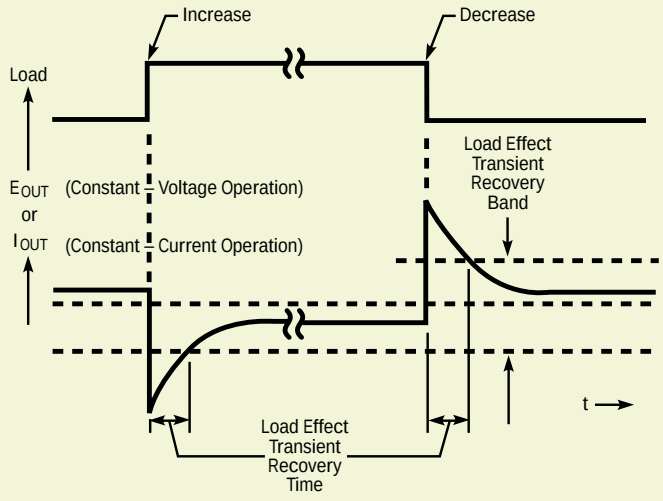
Load cross regulation: the affect on one output of a multiple output power supply when another output is programmed from zero to full rated current.

Applications Information | Power Products Terms (Continued)

Load Effect: also known as "load regulation". Load effect is the change in the steady-state value of the stabilized output voltage or current resulting from a full-load change in the load current of a constant-voltage supply or the load voltage of a constant-current supply, with all other influence quantities maintained constant.

Load effect transient recovery time: the time interval between a specified step change in the load current of a constant-voltage supply (usually a full-load or 5-amp change, whichever is smaller) or in the load voltage of a constant-current supply and the instant when the stabilized output quantity returns to and stays within a specified transient recovery band.

Master-slave operation: a method of interconnecting two or more supplies or electronic loads such that one of them (the master) serves to control the others (the slaves). The outputs of the slave supplies or inputs of the slave electronic loads always remain equal to or proportional to the output of the master. The outputs of the master supply and of one or more slaves may be connected in series, in parallel, or with just their negative or positive output terminals in common. (See also "complementary tracking"). The inputs of the master electronic load and one or more slaves may be connected in parallel only.



Load Effect Transient Recovery Waveforms

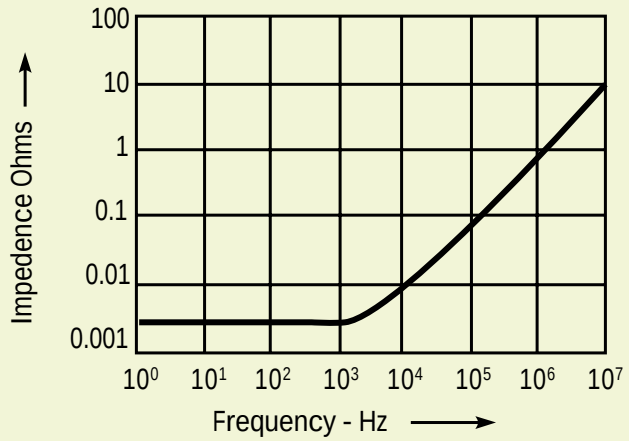
Minimum transition time: the shortest possible time in which an electronic load input can change from one level to another. This is determined by the small signal bandwidth of the load.

Modulation: analog programming of the output voltage and/or current. The output programming response time determines the maximum slew rate at which the power supplies output can be programmed.

Nominal value: the value that exists "in name only"; not the actual value. For example, in the case of a power supply with a calibrated output control, the nominal value is the value indicated by the control setting. For a supply with a fixed output, the nominal output is the output indicated on the nameplate. The nominal value of a 120-volt ±10% line voltage is 120 volts.

"One-Box": a power supply that can be controlled by direct connection to a computer (with no additional programmers) and that can provide measured data to a computer without external voltmeters or ammeters.

Applications Information | Power Products Terms (Continued)



Typical Output Impedence of a Constant Voltage Power Supply

Output Impedance: at any frequency of load change, ΔEout/ΔIout. Strictly speaking, the definition applies only for a sinusoidal load disturbance, unless the measurement is made at zero frequency (dc). The output impedance of an ideal constant voltage power supply would be zero at all frequencies, while the output impedance for an ideal constant current power supply would be infinite at all frequencies.

Overcurrent protection: protection of the power supply, electronic load and/or connected equipment against excessive output current.

Overvoltage protection: protection of the power supply, electronic load and/or connected equipment against excessive output voltage. Overvoltage protection is usually by means of a crowbar protection circuit, which rapidly places a low resistance shunt across the supply's output terminals to reduce output voltage to a low value if a predetermined voltage is exceeded. A supply equipped with an overvoltage crowbar must also be protected by a means for limiting or interrupting the output current.

Peak-to-peak noise: is the range between maximum and minimum noise level. Sometimes called noise "spikes." Peak-to-peak noise is typically low in energy and does not show up in a RMS measurement, 20-20 Mhz.

Phase angle: specifies the time domain phase relationship between two sine waves. The unit of phase angle is the degree, with one cycle corresponding to 360 degrees of phase.

Programming speed: the maximum time required for the programmed output voltage or current to change from a specified initial value (usually zero or maximum output) to a value within a specified tolerance band of a specified newly programmed value (for most models 99.9% or 0.1% of maximum output, respectively) following the onset of a step change in an analog programming signal, or the gating of a digital signal.

Readback: the ability of a power supply or electronic load to measure its actual output voltage and/or current, and provide the reading to a computer.

Remote sensing: remote sensing, or remote error sensing, is a means by which a power supply or electronic load monitors the stabilized voltage directly at the load or source respectively, using extra sensing leads. The resulting circuit action compensates for voltage drops up to a specified limit in the load leads.

Resolution: for a bench supply, the smallest change in output voltage or current that can be obtained using the front panel controls. For a system supply or electronic load, the smallest change that can be obtained using either the front panel controls, or a computer.

Reverse voltage protection: protection of the power supply or electronic load against reverse voltage applied at the outputor input terminals.

Applications Information | Power Products Terms (Continued)

RI (discrete fault indicator / remote inhibit): a rear-panel port that can be used to disable the power supply output independently of the GPIB. This port can also be used to chain multiple power supplies together such that an emergency shutdown of one output automatically signals the other supplies to disable their outputs.

Ripple and Noise (dB): a term often used to specify rms or peak ac source noise relative to the maximum rms or peak output rating. The specification is calculated as follows: dB = 20 Log (Vnoise/Vrating).

Rms (or effective) amplitude or noise: an average signal or noise level based on energy content. The root mean square (rms) content is often called the ac component.

SCPI (Standard Commands for Programmable Instruments): is a programming language for controlling instrument functions over the GPIB (IEEE 488) instrument bus. The same SCPI commands and parameters control the same functions in different classes of instruments.

Serial link: a means by which up to 16 power supplies with this feature can share one GPIB primary address. The power supplies can be connected with cables similar to U.S. modular telephone cables. They are independently controlled using GPIB secondary addressing.

Series regulation: power supplies designed with this topology have fast programming speeds and low noise. Also referred to as a "linear" topology.

Slave operation: see "master-slave operation".

Slew rate: for any given electronic load input transition, the change in current or voltage over time.

Source effect: also known as "line regulation", source effect is the change in the steady-state value of the stabilized output or input voltage or current resulting from any change in the ac source voltage within its specified range, with all other influence quantities maintained constant. Source effect may be measured at any output or input voltage and current within rating.

Specifications: describe the power supply or electronic load warranted performance.

Supplemental characteristics: give typical but nonwarranted performance parameters.

Switching regulation supplies: power supplies designed with this topology are efficient and can have laboratory-grade specifications.

Temperature effect coefficient: the maximum steady-state change in a power supply's output voltage or current or electronic load's input voltage or current per degree Celsius following a change in the ambient temperature within specified limits, with all other influence quantities maintained constant.

Total harmonic distortion: the ratio of the rms sum of the harmonic components to the rms value of a periodic waveform. This is typically expressed as a percent or in decibels (dB).

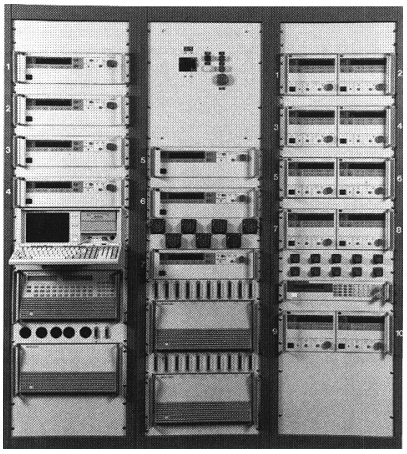
Voltage limiting: the action of limiting the output voltage of a constant-current supply to some predetermined maximum value (fixed or adjustable) and automatically restoring the output current to its normal value when the load conditions are restored to normal. There are two types of voltage limiting:

- by constant voltage/constant current crossover
- by decreasing the output current as the voltage increases

Warm-up time: the time interval from when a power supply or electronic load is turned on until its output complies with all performance specifications.

Customer Assistance

Modification Service



- Modification of maximum output voltage or current
- Improvement of a specific performance specification such as accuracy, resolution, programming speed, etc.
- Alteration of a control loop's compensation in order to accommodate a highly reactive load
- System hardware integration

Power Products Modification Service

While the products in this catalog are intended to satisfy a wide range of customer applications, Agilent recognizes that these products may not match all needs. To better meet your specific power supply and load requirements, Agilent offers a special modification service. This service entails the design and manufacture of modified versions of standard catalog models of dc power supplies and electronic loads.

The modified products are designed, manufactured, tested, to the same high quality and reliability standards as other HP products. Any necessary updates are provided for the operating and service documentation.

By taking advantage of Agilent's engineering expertise to address your special power supply needs, your engineering staff can focus on your main business. The associated engineering costs can be amortized over a number of units, contingent on volume commitment and other project specifics.

OEM customers may find this capability particularly valuable when integrating power supplies into their final product. While the scope of this service is usually limited to the modification of a standard product, our engineers welcome discussion to determine the feasibility of meeting particular requirements.

By providing completely integrated power systems that meet customer's requirements, our customers can concentrate on their main business. **If you have a special requirement for a system, power supply or electronic load that is not in the catalog, contact your local sales office with your specifications. Please see the back cover of this catalog for regional phone numbers.**

Agilent Model Number Index

Output Rating*

* Maximum volts and amps listed may not be available simultaneously. Refer to product description for details. More than one voltage value listed indicates multiple outputs. Maximum watts column indicates total power.

** Indicates electronic load.

Agilent Model Number	Maximum Watts	Maximum Volts	Maximum Amps	Page Number
6010A	1200	200	17	52
6011A	1064	20	120	52
6012B	1200	60	50	52
6015A	1050	500	5	52
6030A	1200	200	17	53
6031A	1064	20	120	53
6032A	1200	60	50	53
6033A	242	20	30	53
6035A	1050	500	5	53
6038A	240	60	10	53
6060B**	300	60	60	82
6063B**	250	240	10	82
6541A	200	8	20	31
6542A	200	20	10	31
6543A	200	35	6	31
6544A	200	60	3.5	31
6545A	200	120	1.5	31
6551A	500	8	50	36
6552A	500	20	25	36
6553A	500	35	15	36
6554A	500	60	9	36
6555A	500	120	4	36
6571A	2000	8	220	45
6572A	2000	20	100	45
6573A	2000	35	60	45
6574A	2000	60	35	45
6575A	2000	120	18	45
6611C	40	8	5	25
6612C	40	20	2	25
6613C	50	50	1	25
6614C	50	100	0.5	25
6621A	160	20/20	10/10	55
6622A	160	50/50	4/4	55
6623A	160	20/50/20	5/2/10	55
6624A	160	20/20/50/50	5/5/2/2	55
6625A	75	50/50	0.5/1	57
6626A	150	50/50/50/50	0.5/0.5/1/1	57
6627A	160	50/50/50/50	2/2/2/2	55
6628A	100	50/50	1/1	57
6629A	200	50/50/50/50	1/1/1/1	57
6631B	80	8	10	27
6632B	100	20	5	27
6633B	100	50	2	27

Agilent Model Number Index (Continued)

Output Rating*

* Maximum volts and amps listed may not be available simultaneously. Refer to product description for details. More than one voltage value listed indicates multiple outputs. Maximum watts column indicates total power.

** Indicates electronic load.

Agilent Model Number	Maximum Watts	Maximum Volts	Maximum Amps	Page Number
6634B	100	100	1	27
6641A	200	8	20	29
6642A	200	20	10	29
6643A	200	35	6	29
6644A	200	60	3.5	29
6645A	200	120	1.5	29
6651A	500	8	50	33
6652A	500	20	25	33
6653A	500	35	15	33
6654A	500	60	9	33
6655A	500	120	4	33
6671A	2000	8	220	39
6672A	2000	20	100	39
6673A	2000	35	60	39
6674A	2000	60	35	39
6675A	2000	120	18	39
6680A	5000	5	875	48
6681A	5000	8	580	48
6682A	5000	21	240	48
6683A	5000	32	160	48
6684A	5000	40	128	48
6690A	6600	15	440	50
6691A	6600	30	220	50
6692A	6600	60	110	50
6811B	375 VA	300 V_{rms}	3.25 A_{rms}	91
6812B	750 VA	300 V_{rms}	6.5 A_{rms}	91
6813B	1750 VA	300 V_{rms}	13 A_{rms}	91
66000A	—	—	—	59
60001A	—	—	—	59
66101A	128	8	16	59
66102A	150	20	7.5	59
66103A	150	35	4.5	59
66104A	150	60	2.5	59
66105A	150	120	1.25	59
66106A	150	200	0.75	59
66309B/D	40	15	3	63
66311B/D	40	15	3	63
66319B/D	40	15	3	63
66321B/D	40	15	3	63
66332A	100	20	5	63
E3610A	30	8/15	3/2	16
E3611A	30	20/35	1.5/0.85	16
E3612A	30	60/120	0.5/0.25	16

Agilent Model Number Index (Continued)

Output Rating*					
Agilent Model Number	Maximum Watts	Maximum Volts	Maximum Amps	Page Number	
E3614A	48	8	6	16	
E3615A	60	20	3	17	
E3616A	60	35	1.7	17	
E3617A	60	60	1	17	
E3620A	50	25/25	1/1	18	
E3630A	35	6/+20/-20	2.5/0.5/0.5	18	
E3631A	25	25/-25/6	1/1/5	19	
E3632A	120	15/30	7/4	20	
E3633A	200	8/20	20/10	20	
E3634A	200	25/50	7/4	20	
E3640A	30	8/20	3/1.5	22	
E3641A	30	35/60	0.8/0.5	22	
E3642A	50	8/20	5/2.5	22	
E3643A	50	35/60	1.4/0.8	22	
E3644A	80	8/20	8/4	22	
E3645A	80	35/60	2.2/1.3	23	
E3646A	60	two 8/20	two 3/1.5	23	
E3647A	60	two 35/60	two 0.8/0.5	23	
E3648A	100	two 8/20	two 5/2.5	23	
E3649A	100	two 35/60	two 1.4/0.8	23	
E4350B	480	60	8	69	
E4351B	480	120	4	69	
E4356A	2000	70/80	30/26	43	
E4370A	—	—	—	74	
E4371A**	—	—	—	74	
E4374A	10	(64) 5	(64) 2	74	
E4375A	15	(64) 5	(64) 3	74	
N3280A	5.5	four 10.25	four 0.5125	71	
N3300A**	1800	—	—	78	
N3301A**	600	—	—	78	
N3302A**	150	60	30	78	
N3303A**	250	240	10	78	
N3304A**	300	60	60	78	
N3305A**	500	150	60	78	
N3306A**	600	60	120	78	
N3307A**	250	150	30	78	

* Maximum volts and amps listed may not be available simultaneously. Refer to product description for details. More than one voltage value listed indicates multiple outputs. Maximum watts column indicates total power.

**Indicates electronic load.

Replacement Guide

Index for Obsolete Agilent Products

* These products are closest in ratings to the discontinued model, but are not identical. Refer to the catalog for the features and specifications of the suggested alternative.

Obsolete Model Number	Closest Alternatives*	Obsolete Model Number	Closest Alternatives*
6002A	664xA	6268B	6574A
6023A	6033A	6269B	6573A
6024A	6038A	6271B	6544A
6028A	6038A	6274B	6574A
6034A	6038A	6281A	E3614A
6050A	N3300A	6282A	6542A
6051A	N3301A	6284A	E3615A
6200B	E3616A	6286A	6542A
6201B	E3616A	6289A	E3616A
6202B	E3616A	6291A	6543A
6203B	E3614A	6294A	E3617A
6204B	E2617A	6296A	6544A
6205C	(2) E3611A	6299A	6634B or (2) E3617A
6206C	E3617A	6384A	6542A
6211A	E3612A	6427B	6552A
6212C	E3612A	6428B	6011A
6213A	E3610A	6433B	6012B
6214C	E3610A	6434B	6012B
6215A	E3611A	6438B	6544A, 6634B
6216C	E3611A	6439B	6012B
6217A	E3612A	6448B	6015A
6218C	E3612A	6453B	(2) 6572A
6220B	E3617A	6456B	(2) 6572A
6224B	6453A	6459A	(2) 6573A
6226B	6544A	6464C	(2) 6681A
6227B	(2) E3616A	6466C	(2) 6681A
6228B	(2) E3617A	6612B	6612C
6234A	E3620A	6632A	6632B
6235A	E3630A	6633A	6633B
6236B	E3630A	6634A	6634B
6237B	E3611A and E3620A	6814A / B	6813B
6253A	(2) E3615A	6834A / B	6813B
6255A	(2) E3616A	60501B	N3302A
6256B	E6552A	60502B	N3304A
6259B	6572A	60503B	N3303A
6260B	6572A	60504B	N3306A
6261B	6573A	60507B	N3305A
6263B	6542A	66111A	66311B
6264B	6552A	66311A	66311B
6265B	6554A	66312A	66311D or 66319D
6266B	6543A	E4350A	E4350B
6267B	6553A		

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