
Description

Both the Agilent 66312A Dynamic Measurement DC Source and the Agilent 6611C, 6612C, 6613C and 6614C System DC Power Supplies combine two instruments in one unit. They include a dc source, which produces dc output with programmable voltage and current amplitude, and a highly accurate voltage and current meter, with the capability to measure very low-level currents. Additionally, the Agilent 66312A Dynamic Measurement DC Source has the ability to measure and characterize output voltage and current of pulse or ac waveforms.

Capabilities

- ◆ Output Voltage and Current control with 12-bit programming resolution
- ◆ Extensive measurement capability:
 - dc voltage and current.
 - rms and peak voltage and current (Agilent 66312A only).
 - 16-bit measurement resolution (low range accurate down to 2 microamperes).
 - Triggered acquisition of digitized current and voltage waveforms (Agilent 66312A only).
- ◆ Front panel control with 14-character vacuum fluorescent display, keypad, and rotary control for voltage and current settings.
- ◆ Built-in GPIB and RS-232 interface programming with SCPI command language.
- ◆ Non-volatile state storage and recall with SCPI command language.
- ◆ Over-voltage, over-current, over-temperature, and RI/DFI protection features.
- ◆ Extensive selftest, status reporting, and software calibration.

Front Panel Controls

The front panel has both rotary (RPG) and keypad controls for setting the output voltage and current. The panel display provides digital readouts of a number of output measurements. Annunciators display the operating status of the dc source. System keys let you perform system functions such as setting the GPIB address and recalling operating states. Front panel Function keys access the dc source function menus. Front panel Entry keys let you select and enter parameter values. Refer to chapter 5 for a complete description of the front panel controls.

Remote Programming

NOTE: When shipped, all units are set to the SCPI programming language. The language setting is saved in non-volatile memory.

To change the programming language from SCPI to Compatibility language, press the front panel **Address** key, use ▼ to scroll to the LANG command, press ↓ to select SCPI, then press **Enter**. Refer to the Programming Guide supplied with your dc source for further information about remote programming.

The dc source may be remotely programmed via the GPIB bus and/or from an RS-232 serial port. GPIB programming is with SCPI commands (Standard Commands for Programmable Instruments), which make the dc source programs compatible with those of other GPIB instruments. Compatibility commands are also included to make the dc source compatible with the Agilent 6632A, 6633A, and 6634A Series dc power supplies (refer to appendix D in the the Programming Guide). Dc source status registers allow remote monitoring of a wide variety of dc source operating conditions.

2 - General Information

Output Characteristic

The dc source's output characteristic is shown in the following figure. The output of the dc source may be adjusted to any value within the boundaries shown.

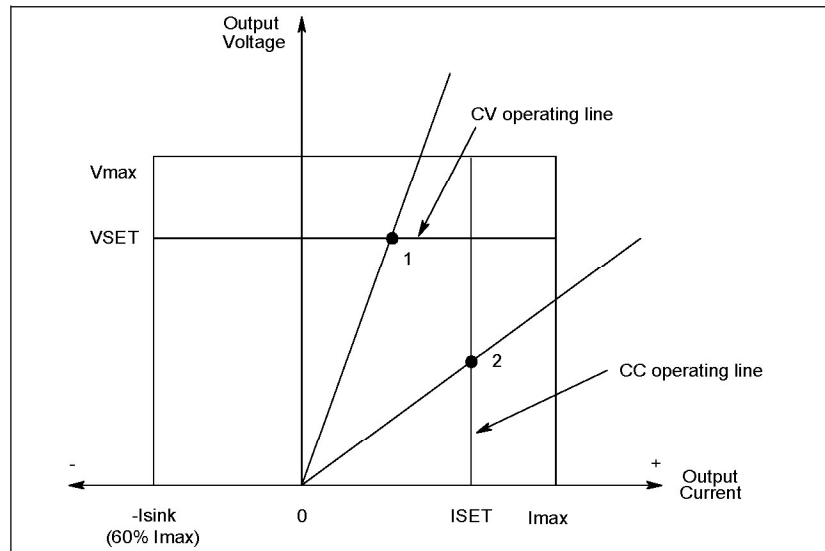


Figure 2-1. Dc Source Output Characteristic

The dc source can operate in either constant voltage (CV) or constant current (CC) over the rated output voltage and current. Although the dc source can operate in either mode, it is designed as a *constant voltage* source. This means that the unit turns on in constant voltage mode with the output voltage rising to its V_{set} value. There is no command for constant current operation. The only way to turn the unit on in constant current mode is by placing a short across the output and then enabling or turning the output on.

Note that the dc source cannot be programmed to operate in a specific mode. After initial turn-on, the operating mode of the unit will be determined by the voltage setting, the current setting, *and* the load resistance. In figure 2-1, operating point 1 is defined by the load line traversing the positive operating quadrant in the constant voltage region. Operating point 2 is defined by the load line traversing the positive operating quadrant in the constant current region.

Figure 2-1 also shows a single range – two quadrant capability. This means that the dc source is capable of sourcing as well as sinking current over the output voltage range from zero volts to the rated maximum. The negative current sinking capability of the dc source is not programmable, and is fixed at a maximum of approximately 60% of I_{max} .

NOTE: If you attempt to operate the dc source beyond its output ratings, the output of the unit will become unregulated. This is indicated by the UNR annunciator on the front panel. The output may also become unregulated if the ac input voltage drops below the minimum rating specified in Appendix A.

Appendix A documents the dc source's specifications and supplemental characteristics.

Specifications

Specifications

Table A-1 lists the specifications of the dc source. Specifications are warranted over the ambient temperature range of 0 to 55 °C. Unless otherwise noted, specifications apply when measured at the rear terminals after a 30-minute warm-up period.

Table A-1. Performance Specifications

Parameter		Agilent 6611C	Agilent 6612C Agilent 66312A	Agilent 6613C	Agilent 6614C
Output Ratings	Voltage: Current:	0 – 8 V 0-5 A	0 – 20 V 0 – 2 A	0 – 50 V 0 – 1 A	0 – 100 V 0 – 0.5 A
Programming Accuracy (@ 25°C ±5°C)	Voltage: 0.05% + +Current: 0.05% +	5 mV 2 mA ¹	10 mV 1 mA ¹	20 mV 0.75 mA ¹	50 mV 0.5 mA ¹
DC Measurement Accuracy (via GPIB or front panel meters with respect to actual output @ 25°C ±5°C)	Voltage: 0.03% + <u>Low Current range</u> –20 mA to +20 mA: 0.1% + <u>High Current range</u> +20 mA to +rated I: 0.2% + –20 mA to – rated I: 0.2% +	2 mV ² 2.5 µA ³ 0.5mA ⁴ 1.1mA	3 mV ² 2.5 µA ³ 0.25 mA ⁴ 0.85 mA	6 mV ² 2.5 uA ³ 0.2 mA ⁴ 0.8 mA	12 mV ² 2.5 µA ³ 0.1 mA ⁴ 0.7 mA
Ripple and Noise (in the range of 20 Hz to 20 MHz with outputs ungrounded or with either terminal grounded)	Voltage (rms/p-p): Current (rms):	0.5 mV/3 mV 2 mA	0.5 mV/3 mV ⁵ 1 mA	0.5 mV/4 mV 1 mA	0.6 mV/5 mV 1 mA
Load Regulation ⁶ (change in output voltage or current for any load change within ratings)	Voltage: Current:	2 mV 1 mA	2 mV 0.5 mA	4 mV 0.5 mA	5 mV 0.5 mA
Line Regulation (change in output voltage or current for any line change within ratings)	Voltage: Current:	0.5 mV 0.5 mA	0.5 mV 0.5 mA	1 mV 0.25 mA	1 mV 0.25 mA
Transient Response Time ⁶ (for the output voltage to recover to its previous level within 0.1% of the voltage rating of the unit or 20 millivolts following a change in load current of up to 50% of the output current rating)		< 100 µs			

¹0.05% + 3.32mA (Agilent 6611C), 1.53mA (Agilent 66312A/12C), 1.01mA (Agilent 6613C), 0.63mA (Agilent 6614C) when programming between zero and 0.03% of full scale current.

²Applies for output voltages greater than 10mV (Agilent 6611C/12C), 25mV (Agilent 6613C), and 50mV (Agilent 6614C).

³This specification may degrade slightly when the unit is subjected to an RF field ≥3 V/meter.

⁴For Agilent 66312A: applies in SCPI mode, with current detector set to DC. With current detector set to ACDC, accuracy is 0.2% + four times the fixed error value. In COMPatibility mode, accuracy is 0.2% + six times the fixed error value.

⁵For Agilent 66312A (from 1 MHz to 20 MHz) = 0.5mV/15mV.

⁶Applies at rear terminals with unit set to remote sensing and with sense terminals externally jumpered to their respective output terminals.

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.

Table A-2. Supplemental Characteristics

Parameter	Agilent 6611C	Agilent6612C Agilent 66312A	Agilent 6613C	Agilent 6614C	
Input Rating (at full load)	100 Vac mains: 120 Vac mains: 220 Vac mains: 230 Vac mains:	100 Vac nominal, 50/60 Hz, 2A, 200 VA max. 120 Vac nominal, 50/60 Hz, 1.7A, 200 VA max. 220 Vac nominal, 50/60 Hz, 0.95A, 200 VA max. 230 Vac nominal, 50/60 Hz, 0.85A, 200 VA max.			
Output Programming Range	Voltage: Current: OVP:	0 – 8.190 V 0 – 5.118 A 12 V	0 – 20.475 V 0 – 2.0475 A 0 – 22 V	0 – 51.188 V 0 – 1.0238 A 0-55 V	0 - 102.38 V 0 – 0.5118 A 0 – 110 V
Average Programming Resolution	Voltage: Current: OVP:	2 mV 1.25 mA 60 mV	5 mV 0.5 mA 100 mV	12.5 mV 0.25 mA 250 mV	25 mV 0.125 mA 500 mV
OVP Accuracy	2.4 % +	200 mV ¹	240 mV	600 mV	1.2 V
Maximum Current Measurement		7 A	2.43 A	1.28 A	0.7 A
Average Current Measurement Resolution	High Range: Low Range:	213 uA 0.6 uA	74 uA 0.6 uA	39 uA 0.6 uA	21 uA 0.6 uA
Sink Current²		- 3 A	- 1.2 A	- 0.6 A	- 0.3 A
Programming Accuracy Temperature Coefficient (change/ C ^o)	Voltage: 0.01% + Current: 0.01% + OVP: 0.015% +	0.15 mV 30 uA 2 mV	0.25 mV 12 uA 4 mV	0.5 mV 6 uA 10 mV	1 mV 3 uA 20 mV
Readback Accuracy Temperature Coefficient (change/C ^o)	Voltage: 0.01% + Current (DC): 0.02% + Current (ACDC): 0.05% + Current (Low Range): 0.01% +	60 uV 25 uA 160 uA 0.3 uA	150 uV 10 uA 80 uA 0.3 uA	500 uV 5 uA 40 uA 0.3 uA	700 uV 3 uA 20 uA 0.3 uA
Drift³	Voltage: 0.01% + Current: 0.01% +	0.25 mV 50 uA	0.5 mV 20 uA	1 mV 10 uA	1 mV 10 uA
Output Voltage Rise/Fall Time (for a change from 10% to 90% or 90% to 10% of the total excursion)		2 ms			
Output Voltage Settling Time (to settle within 1 LSB or 0.025% times the rated voltage of the final value)		6 ms			

¹ Agilent 6611C Option 760 = 2.4% + 500mV.

² The sink current does not track the programmed current.

³ Following a 30 minute warm-up, the change in output over 8 hours, under constant ambient, load and line operating conditions.

Table A-2. Supplemental Characteristics (continued)

Parameter		Agilent 66312A	Agilent 6611C - 6614C
Dynamic Measurement Accuracy	Instantaneous Voltage: Instantaneous Current:	0.03% + 5 mV 0.6% + 1 mA ¹	not applicable
Dynamic Measurement System	Buffer Length: Sampling Rate Range:	4096 points 15.6µs–31,200s	not applicable
Measurement Time (voltage or current)		50 ms average (includes the default time of 30 ms ² for acquiring data, and a 20 ms data processing overhead)	
Command Processing Time		4 ms average (for output to begin to change following receipt of digital data)	
Remote Sense Capability		Up to 2 V can be dropped across each load lead. (add 2 mV to the voltage load regulation specification for each 1 V change in the positive output lead due to load current change.)	
Savable Instrument States (applies only in SCPI mode)		4 (in locations 0 to 3)	
RS-232 Interface Capabilities	Baud rates: Data formats: Language:	300 600 1200 2400 4800 9600 7 bits even or odd parity; 8 bits without parity SCPI or COMPatibility ³	
 GPIB Interface Capabilities	Language: Interface:	SCPI or COMPatibility ³ AH1, C0, DC1, DT1, E1, L4, PP0, RL1, SH1, SR1, T6	
INH/FLT Characteristics	Maximum ratings: FLT Terminals: INH Terminals:	16.5 Vdc between terminals 1 and 2; 3 and 4; and from terminals 1 or 2 to chassis ground Low-level output current = 1.25 mA max. Low-level output voltage = 0.5 V max. Low-level input voltage = 0.8 V max. High-level input voltage = 2 V min. Low-level input current = 1 mA Pulse width = 100 µs min. Time delay = 4 ms typical	
Digital I/O Characteristics	Maximum ratings: Digital OUT Port 0,1,2 (open collector)	same as INH/FLT Characteristics Output leakage @ 16V = 0.1 mA (ports 0,1) = 12.5 mA (port 2) Output leakage @ 5V = 0.1 mA (ports 0,1) = 0.25 mA (port 2) Low-level output sink current @ 0.5 V = 4 mA Low-level output sink current @ 1 V = 50 mA	

¹For full scale current changes with a risetime of 20 µs, an additional 0.5% error exists in the first data point in the buffer after the change. The error percentage increases proportionally with the decrease in risetime.

²This time may be reduced by changing the default conditions of 2048 data points, however, measurement accuracy will be reduced.

³COMPatibility language is used to program the Agilent 663xA Series power supplies.

Agilent 66312A

A - Specifications

Table A-2. Supplemental Characteristics (continued)

Parameter		Agilent 66312A	Agilent 6611C - 6614C
Digital I/O Characteristics (continued)	Digital IN Port 2: (internal pull-up)	Low-level input current @ 0.4 V = 1.25 mA High-level input current @ 5 V = 0.25 mA Low-level input voltage = 0.8 V max. High level input voltage = 2.0 V min.	
Isolation to Ground (Maximum from either output terminal to chassis)		50 Vdc	240 Vdc
Recommended Calibration Interval		1 year (from the date the unit is put into service)	
Regulatory Compliance	Listing pending: Certified to: Conforms to: Complies with:	UL 3111-1 CSA 22.2 No. 1010.1 IEC 1010-1 EMC directive 89/336/EEC (ISM Group1 Class B)	
Dimensions (see figure 3-1)	Height: Width: Depth:	88.1 mm (3.5in.) 212.8 mm (8.4in.) 444.4 mm (17.5 in.)	88.1 mm (3.5in.) 212.8 mm (8.4in.) 368.3 mm (14.5 in.)
Net weight		8.8 kg (19.5 lbs.)	8.2 kg (18.16 lbs.)
Shipping weight		11.1 kg (24.5 lbs.)	10.6 kg (23.5 lbs.)