

POWER SUPPLIES

Autoranging Power Supplies

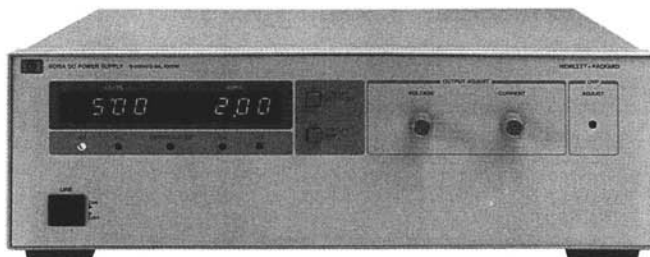
HP 6010A, 6011A, 6012B, 6015A, 6023A, and 6024A

- Complete front-panel control/display
- Constant voltage/constant current operation
- Remote programming and sensing

- Autoranging output
- High efficiency, compact, and light weight
- Ten-turn voltage and current controls



HP 6024A



HP 6010A, 6011A, 6012B, and 6015A



HP 6023A

Description

HP Models 6010A, 6011A, 6012B, 6015A, and 6023A

This versatile family of dc power supplies provides laboratory grade performance along with many features to meet both laboratory and system needs.

Ten-turn front panel controls provide the means to precisely adjust the output voltage and current. The settings of these controls can be observed on the front panel meters by pressing the Display Settings button. This allows the current limit to be set when operating in the CV mode without shorting the output terminals and the voltage limit to be set when operating in the CC mode without opening the load leads.

Three and one-half digit front-panel meters provide a convenient means for monitoring the output voltage and current. The accuracy of these meters allows them to replace external DVMs and monitor resistors in many applications that require monitoring of the power supply output.

The overvoltage protection (OVP) trip level can also be displayed on the front-panel meters, allowing the trip level to be accurately adjusted without actually activating the OVP circuitry or disconnecting loads. In addition to the protection provided to the power supply and load by the OVP, these supplies also have protection against operating under excessive ac line or thermal conditions.

As autoranging power supplies, these units can operate at their maximum rated power over a wide and continuous range of voltage and current combinations. This often allows both present and future requirements to be satisfied with fewer supplies.

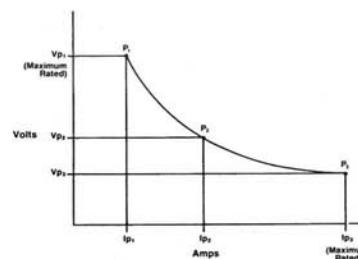
HP Model 6023A is stable when operating in the CC mode into inductive loads up to 1 henry. HP Models 6010A, 6011A, 6012B, and 6015A are stable when operating in the CC mode into inductive loads up to 100 mH, and a special modification is available for these three models to assure stability with loads up to 10 henries.

System Features

The output voltage and current of these supplies can be remotely controlled with either 0 to 5 volt or 0 to 4000 ohm analog programming signals. The actual output levels can be monitored without complicated external circuitry by connecting DVMs to the buffered 0 to 5 volt monitor outputs. All programming and monitoring signals are referenced to the same common and are accessed through the rear panel barrier strip.

Either terminal may be grounded, or floated up to ± 240 volts from chassis ground for the HP 6011A, 6012B, and 6023A, and ± 550 volts for the HP 6010A and 6015A.

If more output voltage or current is needed than a single unit can provide, auto-series or auto-parallel configurations can be used. Up to four 1,000-watt units, or up to two 200-watt units can be connected in auto-parallel, and any combination can be used in auto-series providing up to 240 volts total (550 Vdc for HP 6010A and 6015A) from chassis ground including output voltage. Remote sensing can be used to maintain the CV load effect specification at the load with up to 0.5 volt drop per load lead and sense wires that are less than 0.2 ohm per lead. Operation is possible with up to 2.0 volts per lead; however, load effect specification may be degraded. For more system control and monitoring capabilities, see Option 002.**



Generalized autoranging output characteristic curve

Specifications (at 0° C to 50° C unless otherwise specified)

| Ratings* | | Autoranging Output* | | | | Regulation | | | | 10% Change Transient Recovery | | | |
|----------|----------|---------------------|----------------|----------------|----------------|----------------|----------------|---------------|---------------|-------------------------------|---------------|---------------|---------------|
| | | | | | | Load Effect | | Source Effect | | | | | |
| Volts | Amperes | V ₁ | P ₁ | V ₂ | P ₂ | V ₃ | P ₃ | HP Model | Voltage | Current | Voltage | Current | Time Level |
| 0 to 20 | 0 to 30 | 20 V | 200 W | 14 V | 242 W | 6.7 V | 200 W | 6023A | 0.01% + 2 mV | 0.01% + 9 mA | 0.01% + 1 mV | 0.01% + 6 mA | 1 ms / 50 mV |
| 0 to 20 | 0 to 120 | 20 V | 1000 W | 14 V | 1064 W | 7 V | 840 W | 6011A | 0.01% + 3 mV | 0.01% + 15 mA | 0.01% + 2 mV | 0.01% + 25 mA | 2 ms / 100 mV |
| 0 to 60 | 0 to 10 | 60 V | 200 W | 40 V | 240 W | 20 V | 200 W | 6024A | 0.01% + 3 mV | 0.01% + 3 mA | 0.01% + 5 mV | 0.01% + 5 mA | 1 ms / 75 mV |
| 0 to 60 | 0 to 50 | 60 V | 1000 W | 40 V | 1200 W | 20 V | 1000 W | 6012B | 0.01% + 5 mV | 0.01% + 10 mA | 0.01% + 3 mV | 0.01% + 10 mA | 2 ms / 100 mV |
| 0 to 200 | 0 to 17 | 200 V | 1000 W | 120 V | 1200 W | 60 V | 1020 W | 6010A | 0.01% + 5 mV | 0.01% + 10 mA | 0.01% + 5 mV | 0.01% + 5 mA | 2 ms / 150 mV |
| 0 to 500 | 0 to 5 | 500 V | 1000 W | 350 V | 1050 W | 200 V | 1000 W | 6015A | 0.01% + 13 mV | 0.03% + 34 mA | 0.01% + 13 mV | 0.03% + 17 mA | 5 ms / 200 mV |

*See the generalized autoranging output characteristic curve.

**Option 002 not available with HP model 6015A.

HP Model 6024A

As an autoringing dc power supply, the HP 6024A can provide 200 watts over a wide and continuous range of voltage and current combinations, with maximums of 60 volts and 10 amperes. This provides greater flexibility than traditional power supplies that have only one maximum power point.

Ten-turn potentiometers provide precise control of the output voltage and current. The output levels can be observed on the separate front-panel voltage and current meters. Terminals are available on both the front and rear panel for load connections.

The built-in OVP is adjustable from the front panel. Other protection features include over-temperature and high ac line detection.

The HP 6024A has many system-oriented features. It can be remotely programmed with 0 to 5 volt or 0 to 2500 ohm analog signals. The output current can be easily monitored without an external shunt with the proportional 0 to 5 volt buffered monitor output. Remote sensing can be used to eliminate the effects of voltage drops in the load leads, and either terminal may be floated up to ± 240 volts from chassis ground. Several units can be combined in auto-series, auto-parallel, and auto-tracking configurations, further increasing the HP 6024A's flexibility.

For more system features, see Option 002.

General Specifications

Dimensions

HP 6010A, 6011A, 6012B and 6015A: 132.6 mm H \times 425.5 mm W \times 516.4 mm D (5.2 in \times 16.75 in \times 20.33 in)

HP 6023A: 177.0 mm H \times 212.3 mm W \times 443.6 mm D (6.97 in \times 8.36 in \times 17.872 in)

HP 6024A: 133.4 mm H \times 212.3 mm W \times 415.33 mm D (5.25 in \times 8.36 in \times 16.35 in)

Ordering Information

Option Descriptions

Opt 002 provides extra programming and monitoring capabilities for system use. A card inserted into the power supply is accessible through a 37-pin connector on the rear panel. It provides easy access to the control and monitor signals available on standard units, as well as these additional features:

- OVP trip and reset
- power supply inhibit
- status bits indicating CV mode, CC mode, unregulated output, OVP tripped, overtemperature condition, and ac line drop-out
- remote programming via a 0 to 2 mA current sink
- bias supplies for your circuitry: +5 volts at 100 mA, +15 volts at 75 mA, and -15 volts at 75 mA
- buffered 0 to 5 volt outputs representing both the output voltage and the output current. (HP 6010A, 6011A, 6012B, 6015A, and 6023A provide this feature standard, but HP 6024A provides only a scaled 0 to 5 volt output to represent output current, not output voltage.)
- programmable remote/local for use when programming with a current sink

These features can all be taken advantage of with an HP 6942A, 6944A, or 6954A Multiprogrammer instrument subsystem configured with an HP 69709A Power Supply Programming Card. The Multiprogrammer provides a cost-effective solution for controlling a

group of power supplies, and it also can provide many other digital and analog monitoring and control functions, all on the HP-IB. The voltage and current programming resolution available with this card is 1/1000th of full scale.

The features available with Option 002 can also be interfaced to your own external circuitry rather than an HP Multiprogrammer.

Price

Standard unit is configured to operate at 104 to 127 Vac, 48 to 63 Hz. To operate at other input voltages, order one of the following line voltage options.

Opt 100 87 to 106 Vac, 48 to 63 Hz. HP 6024A Only! \$0

This option is for use in Japan only. The power supply output power is 75% of the output power available with the other line voltage options. For HP 6024A only.

Opt 220 191 to 233 Vac, 48 to 63 Hz \$0

Opt 240 208 to 250 Vac, 48 to 63 Hz \$0

For HP models 6010A, 6011A, 6012B, and 6015A, one of the following line cord options must be specified when ordering. Order according to local electrical codes. All line cords are 2.5 meters long.

Opt 831 12 AWG wire size; UL listed, CSA certified; unterminated line cord (200-240 Vac connections) \$0

Opt 833 1.5 mm² wire size; Harmonized cordage; unterminated line cord (200-240 Vac connections) \$0

Opt 834 10 AWG wire size; UL listed, CSA certified; unterminated line cord (100-120 Vac connections) \$0

Opt 841 Line cord with NEMA 6-20P, 20A/250V plug (suggested for use in North and South America) \$15

Opt 843 Line cord with JIS C8303 appended fig 6(2), 20A/250V plug (suggested for use in Japan) \$35

Opt 845 Line cord with IEC 309, 16A/220V plug (suggested for use in Denmark, Switzerland, Austria, China and other countries not listed) \$35

Opt 846 Line cord with NEMA L5-30P, 30A/120V locking plug (suggested for use in North America) \$55

Opt 847 Line cord with CEE 7/7, 16A/220V plug (suggested for use in continental Europe) \$35

Opt 848 Line cord with BS 546, 15A/240V plug (suggested for use in India and South Africa) \$35

Opt 800 Rack Mount kit for two units side by side. For HP 6023A and 6024A only.

HP 6023A \$63
HP 6024A \$69

Opt 908 Rack Mount kit for a single unit. A blank filler panel is supplied when ordered for half rack width units.

HP 6010A, 6011A, 6012B, 6015A \$36
HP 6023A \$84
HP 6024A \$64

Opt 909 Rack Mount kit with handles for HP 6010A, 6011A, 6012B, and 6015A \$85

Opt 910 One extra operating and service manual shipped with each power supply.

HP 6024A \$10
HP 6010A, 6011A, 6012B, 6015A, 6023A \$21

| PARD (rms/p-p) 20H to 20MHz | | Programming Response Time | | | | | | General | | | | | | Price |
|--------------------------------|-------------|---------------------------|-----------|---------|-----------|------------|------------------|---------|---------|---------|-----------------|-----------|-----------|---------|
| | | Setting Band | UP | | DOWN | | AC Input Current | | | | Weight kg (lbs) | | | |
| | | | Full Load | No Load | Full Load | Light Load | 100 Vac | 120 Vac | 220 Vac | 240 Vac | Net | Shipping | | |
| Voltage | Current | | | | Time | Load | | | | | | | | |
| 3 mV 30 mV | 15 mA — | 5 mV | 100 ms | 100 ms | 200 ms | 500 ms | 50 Ω | — | 6.5 A | 3.8 A | 3.6 A | 8.6 (19) | 10.5 (23) | \$2,100 |
| 8 mV 50 mV | 120 mA — | 30 mV | 300 ms | 300 ms | 500 ms | 1.5 s | 50 Ω | — | 24 A | 15 A | 14 A | 16.8 (37) | 22.2 (49) | \$3,250 |
| 3 mV 30 mV | 5 mA — | 60 mV | 200 ms | 200 ms | 300 ms | 600 ms | Open | 5.3 A | 5.3 A | 2.9 A | 2.7 A | 5.4 (12) | 7.3 (16) | \$2,100 |
| 8 mV 40 mV | 25 mA — | 90 mV | 300 ms | 300 ms | 2.0 s | 3.0 s | 100 Ω | — | 24 A | 15 A | 14 A | 15.9 (35) | 21.3 (47) | \$3,250 |
| 22 mV 50 mV | 15 mA — | 300 mV | 300 ms | 300 ms | 600 ms | 3.5 s | Open | — | 24 A | 15 A | 14 A | 16.3 (36) | 21.7 (48) | \$3,250 |
| 50 mV 160 mV | 50 mA — | 750 mV | 350 ms | 250 ms | 600 ms | 7.0 s | Open | — | 24 A | 15 A | 14 A | 16.3 (36) | 21.7 (48) | \$3,500 |