

# Seven Features You Didn't Expect from Your Bench DC Power Supply

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# Introduction

One of the most important tools on an engineer's bench is the power supply. This is typically a versatile basic benchtop DC power supply that you count on time and time again to do everything from powering up an LED to providing bias voltage to power up a circuit board. The power supply isn't the fanciest piece of equipment—in fact, the functions of bench DC power supplies are typically limited. But you still need your power supply to work accurately each time. And as technology evolves and DC increasingly becomes the primary power source for everyday devices, the bench DC power supply must evolve too.



Figure 1. Keysight's new E36300 Series triple output bench power supplies

# Accurate Low-Current Measurement

Measurement accuracy has always been the shortcoming of bench DC power supplies. Whether measuring voltage or current, bench DC power supplies often don't provide an accuracy level satisfactory for your task. This is even more true if you're making low-current measurements. Very few bench DC power supplies on the market can accurately measure at the mA level.

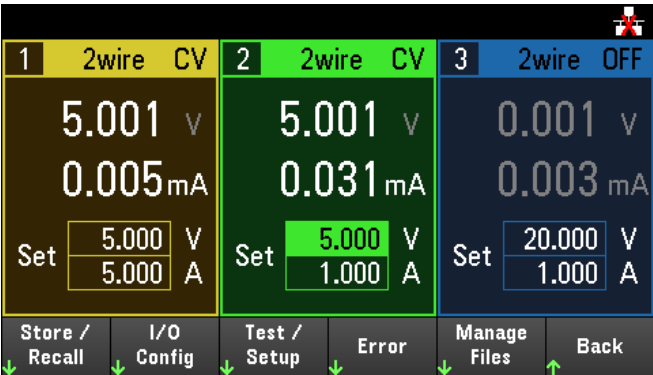


Figure 2. The E36300 Series can accurately measure down to 100 s of uAs of current.

Keysight introduced the E36300 Series of programmable bench DC power supplies to provide a current measurement accuracy level that's groundbreaking in this instrument category. The E36300 Series can accurately measure down to 100s of uAs of current. In fact, in the low-current measurement range, E36300 Series instruments can provide current measurement readings with an unprecedented accuracy of 0.25% +80 uA. Most bench DC power supplies do not come close to measuring at this level. The ability to accurately measure low currents internally reduces the need for an external multimeter and simplifies the setup.

# Easy Setup for Auto Parallel and Series Connection

Bench power supplies tend to be limited in terms of voltage and current output capabilities. Power supplies with a larger footprint can source more power, but those with a smaller footprint, such as the typical benchtop DC power supply, tend to be more limited in terms of output power. With more power-hungry devices on the market today, engineers find they may require a voltage, current, or power higher than what a single output on a bench power supply can source alone. Bench DC power supplies that you can set up in series or parallel will be able to meet the demand for higher voltage, current, or power. Connecting the power supply outputs in a series configuration doubles the voltage output of the overall power system. Connecting the power supply outputs in a parallel configuration doubles the current output of the overall power system.

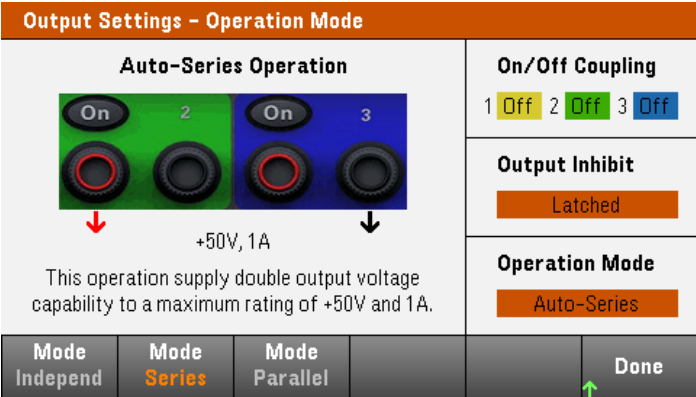


Figure 3. Output settings menu on the E36300 Series to configure Auto-series or -parallel operation

The Keysight E36300 Series of basic DC power supplies makes series and parallel setup easier than ever. With a single button setup, the E36312A and E36313A can be set to series or parallel mode to double the output voltage (up to 50 V) or current (up to 4 A), respectively. The setting is done through the front-panel display with graphical user interface instructions. Once set up, you can control the combined channels as a single output and use them to measure as a single channel. You save time by eliminating the need for external wiring between channels for the connection.

## Data Logging

Data logging has long been a feature missing on bench power supplies. In most applications with a bench power supply, you must use an external data acquisition instrument, such as a digital multimeter or data logger, to capture measurement data points. This is cumbersome, because you need an additional instrument. Also, you must take the time to synchronize the power supply and data logging equipment. Because of this additional setup, a simple task on the bench can quickly turn into a complex project.

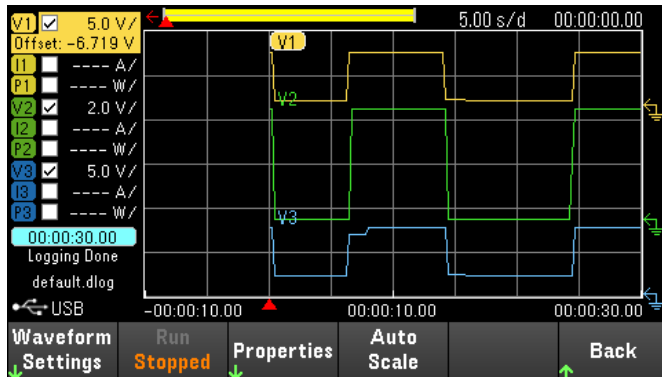


Figure 4. Data logging display on the E36300

The Keysight E36300 Series of basic DC power supplies has an integrated data-logging feature built into the instrument. Data can be simultaneously logged to the large color display and to a file on all three DC outputs. Measurements are spaced by the sample period, which is programmable from 200 milliseconds to 60 seconds. For each DC output, you can log voltage measurements, current measurements, or both, and each reading is an integrated voltage or current measurement. The maximum data log file size is ~7 Megabytes. An external USB memory device is required for data logging to start. The data logger display can be saved in PNG or BMP file formats for use in reports. You can also save logged data for viewing at a later time or export it to a CSV file.

The E36312A/E36313A includes a built-in battery backup real-time clock. This allows proper time stamping of logged data and tagging of files with correct creation dates. The built-in data-logging feature eliminates the additional setup complication and time investment associated with integrating a power source and an external data-logging device.

# Synchronization of Multiple Outputs through Easy Output Sequencing

Modern testing needs require power supplies to be much more than just a simple battery with an on/off switch. Some function testing requires power source outputs to turn on or off sequentially. For example, certain circuit board designs require a power startup sequence in which different power-bias points on the board power up at different times.

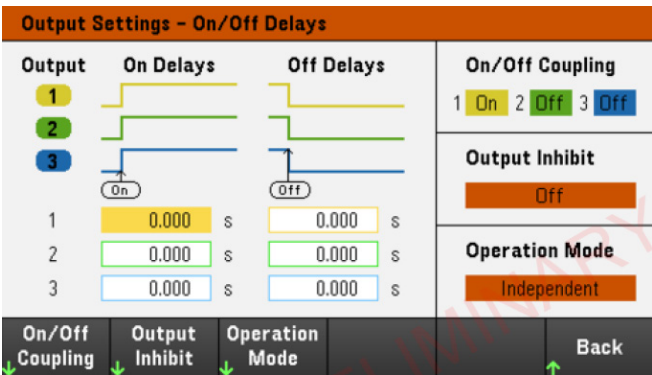


Figure 5. Output settings displays to configure sequencing on the E36300 Series

The Keysight E36300 Series of basic DC power supplies provides a built-in output sequencing function that lets you create complex output changes. Each channel on the E36312A/E36313A units can be individually set to turn on or turn off with a delay. By adjusting the delay times and then commanding the turn on, you can set the power supply to sequence in a particular order. The same sequencing capability is available to shut down the outputs in a particular order. Delay times can be set from 0 to 3600 seconds delay in 1 ms increments.

## Custom Output Waveform Creation

Some tests require complex sequences of output changes with rapid and precise timing. These complex test cases could range from power dropout emulation to stress tests with a fluctuating signal.

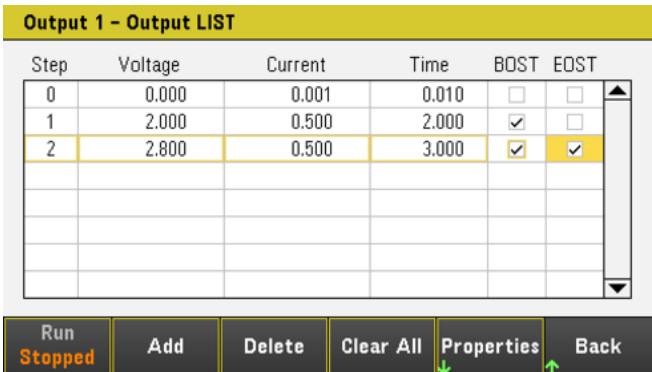


Figure 6. Output LIST menu to configure output waveforms on the E36300 Series

The Keysight E36300 Series of basic DC power supplies provides a way to create such waveforms using the built-in LIST function. This function lets you generate complex sequences of output changes with rapid and precise timing. This is a simple way for you to create a user-defined waveform using a basic DC power supply.

## Intuitive User Experience

Most engineers designing and testing on the bench will operate instruments using the front panel. A typical engineering bench might have five instruments. To maximize efficiency, an engineer must be able to operate each instrument to perform tasks quickly and accurately. This means bench instruments must provide an intuitive and easy-to-use user experience. Subtle instrument features, such as color coding and clear displays, can make huge differences in the ease with which engineers can effectively conduct bench testing.



Figure 7. Intuitive front panel and display on the E36300 Series creates a user-friendly experience

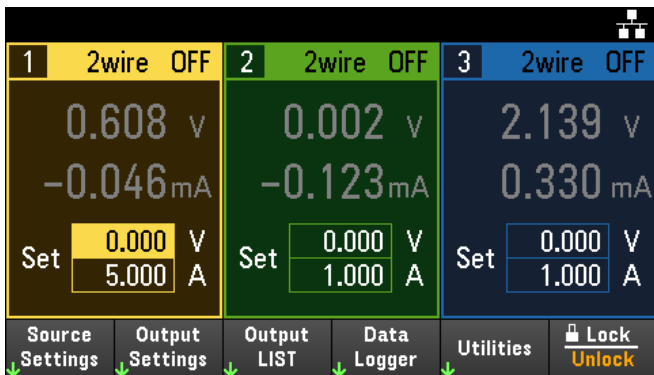


Figure 8. Three channels simultaneously displayed on the E36300 Series

When we asked our current E3631A users about the features they most wanted to see in a replacement, they unanimously stated they wanted the ability to see all channels simultaneously. Having a large 4.3-inch LCD color display allows more information to be communicated at a glance. In addition, we added large color buttons to show and toggle each channel on/off state. The Keysight E36300 Series also includes two individual knobs for voltage and current with rotary encoder control for precise setting and keypad for quick adjustment and configuration. The user interface is intuitive, making operation easy and improving bench productivity.

## Digital I/O Control

We sometimes think of the engineering bench as an assortment of various standalone instruments. While this approach works for certain types of testing, at times you may require more complex interactions between bench instruments. During this type of testing, you need a common interface among the instruments for those complex interactions to occur. One example is the need to disable all instruments associated with a test when any one instrument goes into a certain fault mode.

The screenshot shows a menu titled "I/O Config - Digital I/O". It contains three columns for Pin 1, Pin 2, and Pin 3. Each column has settings for Function, Polarity, In, and Out. Pin 1 is highlighted with an orange border. Below the columns is a navigation bar with buttons for Pin 1, Pin 2, Pin 3, Function, Polarity (Pos, Neg), Out (0, 1), and Back. A green arrow points down from the Function button, and another green arrow points up from the Back button.

Pin 1	Pin 2	Pin 3
Function: Trigger In	Function: Digital In	Function: Digital In
Polarity: Positive	Polarity: Positive	Polarity: Positive
In: 1	In: 1	In: 1
Out: 0	Out: 0	Out: 0

Pin 1 Pin 2 Pin 3

Function Polarity Pos Neg Out 0 1 Back

Figure 9. Digital I/O menu to configure input and output triggering functions

The E36300 Series of power supplies provides digital I/O ports in the rear panel that allow for these complex interactions. The digital port consists of four I/O pins to access various control functions. For example, one function might be fault inhibit system protection, which we described above. In addition, the digital pin could also be used to send or receive a trigger signal to or from other connected instruments. A received trigger signal could start the data logger or the LIST function. This flexibility is critical as technology evolves and requires more connected interactions between bench instruments.

After reading these about these seven unexpected things, you should never look at a bench power supply the same way again. The Keysight E36300 triple output bench power supply offers a level of performance unprecedented in its class.

Learn more at: [www.keysight.com](http://www.keysight.com)

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