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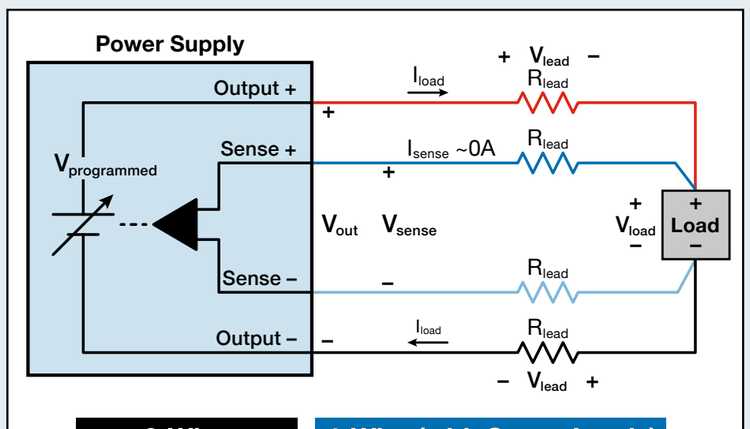
SIX TECHNIQUES FOR OPTIMAL PERFORMANCE FROM POWER SUPPLIES

Ensure that the Programmed Voltage is Accurately Delivered to the Load



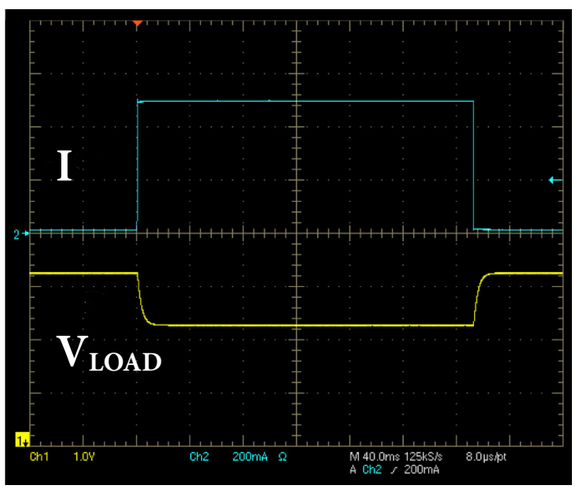
2-Wire	4-Wire (with Sense Leads)
$V_{out} = V_{programmed}$ $V_{load} < V_{programmed}$	$V_{load} = V_{sense}$ $V_{out} = V_{sense} + (2 \times V_{lead})$ $V_{load} = V_{programmed}$
Not Desired	Most Accurate

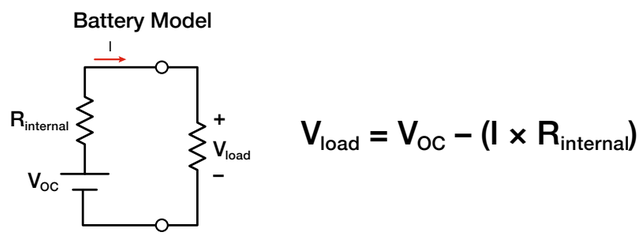
No matter how accurate your power supply output is, you cannot guarantee that the programmed voltage is the same as the voltage at the DUT's terminals. A power supply without sense leads regulates its voltage at its output terminals. However, the voltage you want regulated is at the DUT's power inputs. The power supply and the load are separated by lead wires that have a resistance, RLead; thus, the voltage at the load is:

$$V_{Load} = V_{Out} - 2 \times V_{Lead} = V_{Out} - 2 \times I_{Load} \times R_{Lead}$$

The remote sensing technique, using two sense lines, automatically compensates for the voltage drop in the leads by extending the power supply feedback loop to the load. The voltage at the load is fed back to the power supply by the sense leads and ensures that $V_{Load} = V_{Programmed}$.

Simulate a Battery's Response for Testing Battery-Powered Circuitry

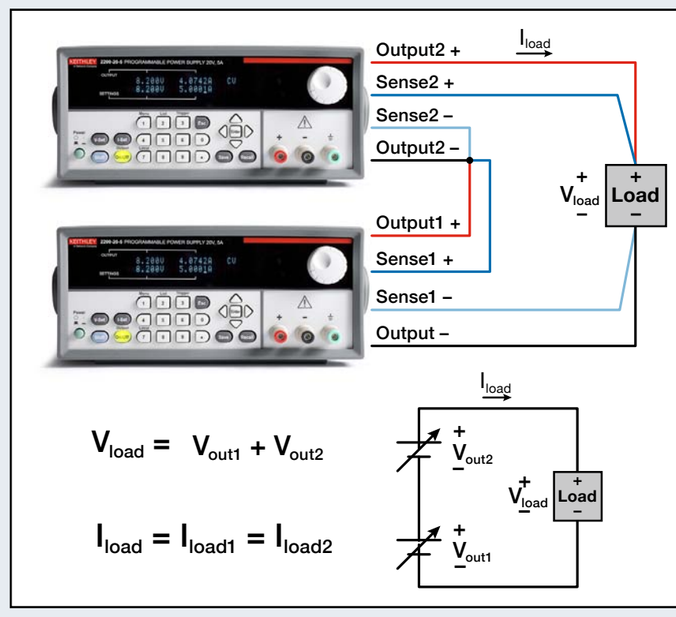




$$V_{load} = V_{OC} - (I \times R_{internal})$$

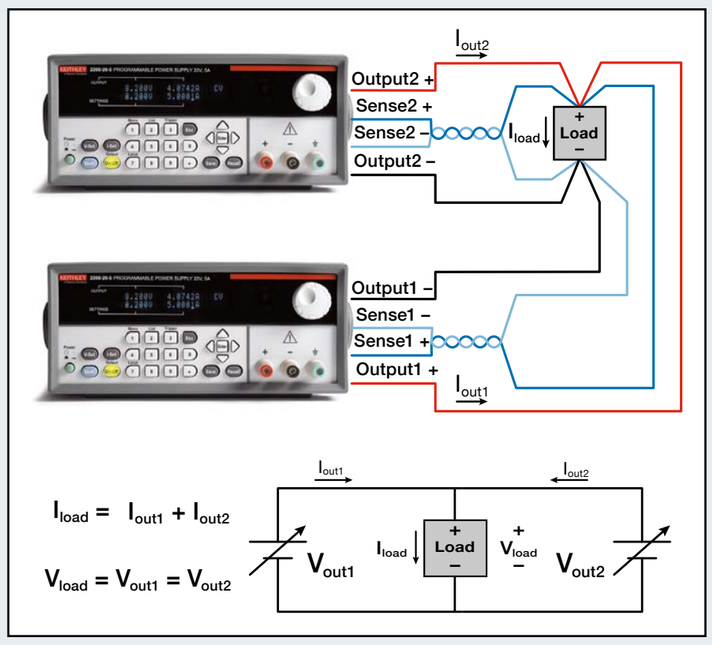
The most realistic way to test how a circuit or device will respond to a battery source is to simulate the output of a battery. A battery can be modeled as a voltage source in series with an internal resistance. When the load, such as an automotive motor starter circuit, draws a current inrush, the higher load current will create a large voltage drop across the internal resistance and the battery's output voltage will decrease. Power supplies that have a variable output resistance can simulate a battery's output response; thus, the circuit- or device-under test's performance can be tested to ensure proper performance under the varying output of the battery.

Series and Parallel Supplies with Proper Remote Sense Connections to Increase Voltage and Current Output



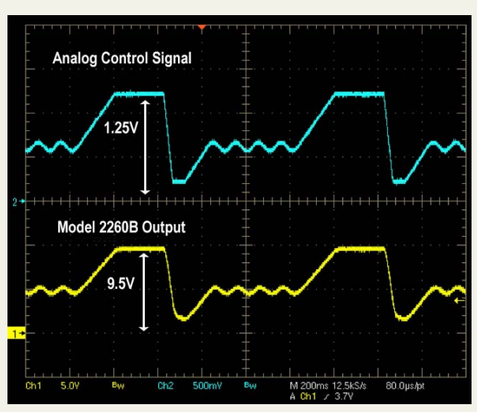
Use several supplies or combine the outputs in a multiple output supply to increase output voltage or current. For multiple output supplies, ensure that all the outputs are isolated; that enables the channels to be combined in either series or parallel. Keithley's multiple output power supplies provide features to simplify controlling and displaying the voltage and current when outputs are connected in series or parallel.

When using remote sensing, refer to the figures to ensure the sense leads are measuring at the appropriate locations for proper control of the output voltage.

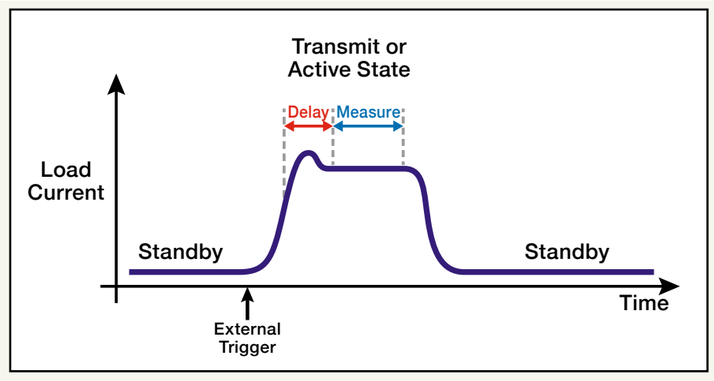


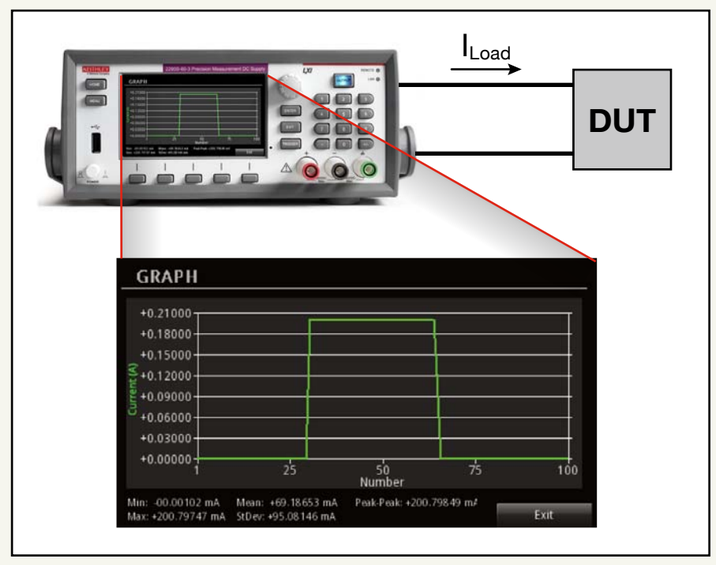
Stress Test Circuits by Creating Voltage Patterns and Simulating Noise on DC Supply Lines

More thoroughly characterize your circuits by subjecting them to operating at the extremes of their specified operating voltage range. Test tolerance to supply voltage transients and noise on the DC supply line. Many Keithley supplies have a list mode to automate steps through a range of voltages. They have variable slew rates to create rise and fall conditions. Some models have analog inputs to enable an AC waveform to be superimposed on the DC line for simulation of a noisy line. Many of these features minimize the test instrumentation needed to thoroughly test a DUT.



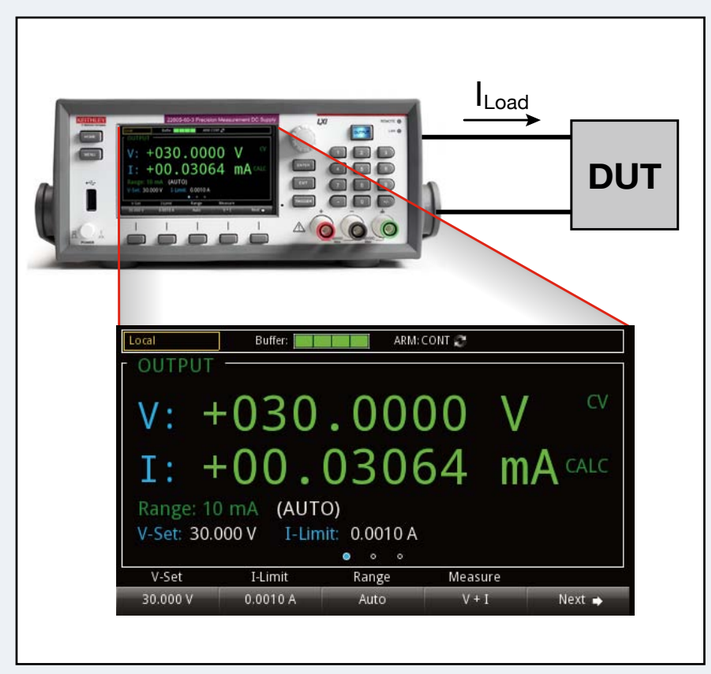
Measure Peaks of Narrow Load Current Bursts





Wireless devices and medical devices often have millisecond or shorter full power, transmit, or stimulate states. Measuring these active state load currents requires the ability to measure the peak of a narrow pulse. Capturing a load pulse can be a difficult measurement challenge but not for a precision measurement power supply. A precision measurement power supply can be reconfigured to make very short duration measurements. These measurements can be triggered by an external trigger source to capture load current pulses that are as narrow as 140µs.

Use a Precision Measurement Power Supply to Accurately Measure Portable Device Sleep Mode and Standby Mode Currents



Minimizing power consumption is critical to maximizing the time a portable device can operate before the battery must be recharged or replaced. Load currents, especially sleep and standby load currents must be as low as possible. Simplify the measurement of these low currents by using the load current measurement capability of a precision measurement power supply. Increase the measurement aperture to maximize resolution, and filter the measurement to further stabilize current readings down to µA levels.

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