

Specialized supplies target battery-powered products

Solution-focused programmable supplies make measurements that general-purpose supplies can't

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Selecting the appropriate power supply for design characterization or automated test of many high-tech products no longer means just choosing the correct voltage, current, and a GPIB interface. The profusion of battery-powered portable products has spawned special test requirements that may preclude using a general-purpose benchtop supply.

These battery-powered products often promise long battery-operating time as a prominent competitive advantage. Keeping this promise requires a few critical tests that the general-purpose supply may not be able to handle.

Alternative solutions

One alternative is a custom power supply, but fast product development cycles present a scheduling problem. Unless the volume is high, either the non-recurring-engineering cost or a high unit price may make this approach prohibitively expensive.

A more practical solution for today's complex test requirements lies in the solution-focused power source. While application-specific fixed-output power supplies have always been manufactured for various industries, today's high-volume manufacturers are accelerating this trend toward solution-focused system power products.

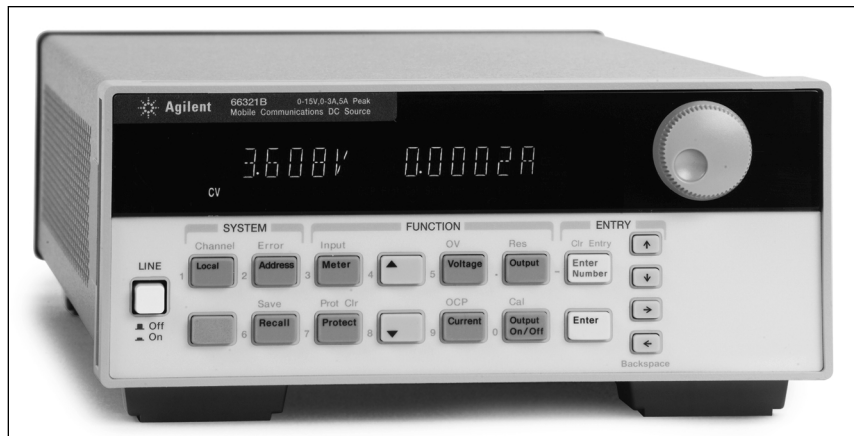


Fig. 1. Solution-focused programmable supplies, such as the 66321D dc source from Agilent Technologies, meet the increasingly specialized testing needs of many production test laboratory applications.

For example, companies such as Bertan and Spellman make power sources for x-ray applications. ALE Systems makes laser power and capacitor-charging supplies. Moreover, "one-box" power supply and battery test instruments are available from Chroma and Kikusui. For the wireless appliance test market, Agilent Technologies and Keithley Instruments offer an integrated solution-focused power source.

Other examples include regulatory test systems and multicell charge/discharge units for battery forming and test. A typical solution-focused supply is the Agilent Technologies 66321D mobile communications dc source (see Fig. 1).

While the price of a solution-focused power source is somewhat higher, the cost of the final test system can be considerably lower, when savings in time and overall equipment

are considered. While the power supply still represents a small part of the total system cost, the real benefit is in being able to perform quicker, more accurate, more sophisticated, and more meaningful measurements. This translates into the ability to guarantee longer battery life, and also translates into lower test time, resulting in higher throughput.

Extended range

One area where this solution-focused supply shines is in its extended current measurement range, not always present in a general-purpose supply. Guaranteeing that the current draw of a product is within its design target requires a measurement range from several amperes to as low as 1.0 μ A to characterize operating, standby, and sleep modes.

The solution-focused supply also excels in its ability to handle narrow

Solution-focused supplies

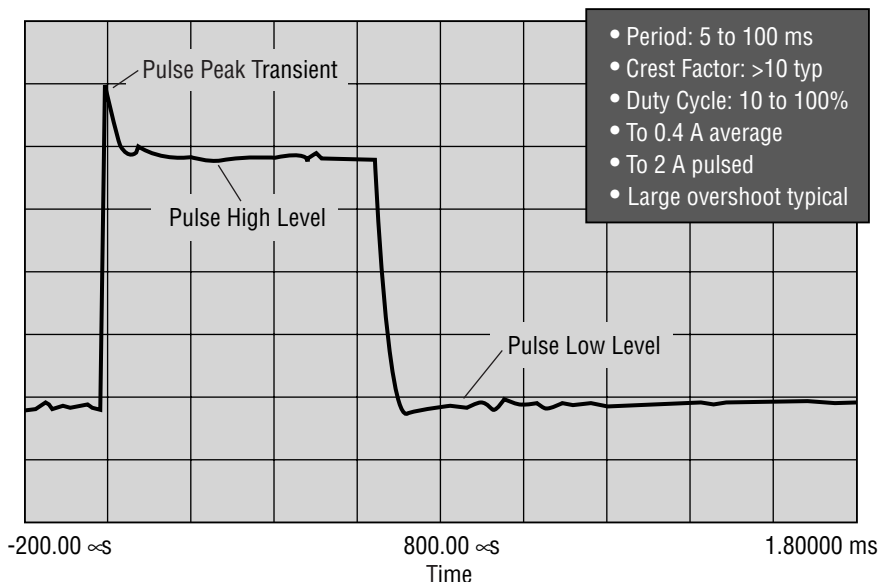


Fig. 2. Portable devices like cell phones draw high-peak current pulses that require measurement capabilities beyond what is available in a general-purpose benchtop power supply.

current pulses. Devices such as digital cell phones have operating modes that demand high-peak pulses of current from the battery (see Fig. 2). In R&D environments, these peak pulses can be handled because of the short leads involved in bench testing.

However, production test environments use remote sensing to overcome the appreciable resistance and inductance in a test fixture arising from the long leads and relay contacts. Thus, a general-purpose power supply cannot source such a narrow current pulse with fast rise and fall times without significant voltage undershoot and overshoot. This undershoot can cause a cell phone's internal low-battery-voltage-monitoring circuit to falsely shut down the phone, aborting the test.

Moreover, solution-focused supplies with advanced measurement capabilities can also accurately and quickly measure the peak or average value of the resultant current due to a peak pulse. The general-purpose supply generally provides only a fixed range and window for the average responding meter.

Another challenge in extracting the maximum operating time is testing and calibrating the device's voltage-monitoring and battery-charging circuitry. This involves calibrating two A/D circuits that measure two setpoints: the low-battery-voltage cut-

off, where the device must be shut down; and the high-voltage shutoff for the charger when the battery has been fully charged. This test requires a special power supply that can source and sink the battery current during discharge and charge cycles.

Selecting a supply

The modified power supply may not perform as well on a lab bench where leads are short and resistance is low. When selecting a solution-focused supply, the user should make sure the supply has multiple modes, which can easily be switched, so that the same product can be optimized for both R&D and production applications.

In addition to an extended low-current measurement capability, a solution-focused supply should have the same measurement capability (although not the full bandwidth) of a good digital sampling scope. With these features built in, it is easy to take a 4,096-point sampled measurement that allows quick and accurate measurements of complex current (or voltage) waveforms. This allows calculating average or rms values in addition to peak values from the measurement.

Having two outputs is also desirable. This way, one output can act as a battery charger, and the other as a battery to absorb the charging current. That flexibility is suited for applications such as testing and calibrating the voltage monitor circuits of a battery management subsystem. **P**

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