

# Voltage-regulated power supply delivers constant current

by Thomas E. Skopal  
Acopian Corp., Easton, Pa.

Obtaining a power supply that has constant-current operation or is susceptible to adjustable current-limiting can often be a problem because such power supplies are not as readily available as constant-voltage supplies. However, if a voltage-regulated supply has provision for remote sensing and a voltage-adjustment range equal to the required compliance, it can provide a constant current. Most power-supply engineers know how to do this, but judging from the number of calls we receive from power-supply users, many of them are not familiar with the technique.

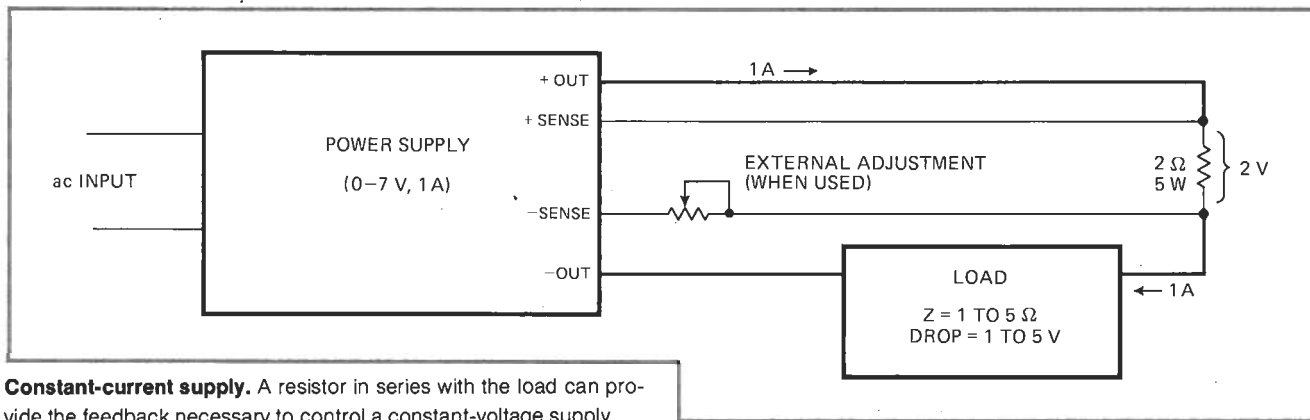
Normally, the remote-sensing terminals of a voltage-regulated supply are connected to the load separately from the output-current leads. The regulator senses the load voltage and varies the output voltage of the supply. By this means, it compensates for the voltage drops in the load lines, which vary with output current; thus, it maintains a constant voltage across the load. If the sensed load has a constant impedance, the supply's output current remains constant, even when compensation for impedance variations outside the sensing loop causes the supply's output voltage to vary.

Therefore, a constant current can be maintained through a circuit by sensing the voltage across a resistor and connecting the circuit requiring the constant current in series with the resistor, but outside the sensing loop. The current may be set to any desired amplitude within the rating of the supply by adjusting the supply's output voltage setting.

The power supply must have range of output-voltage adjustment at least as great as the required voltage-compliance range (the range of voltages needed to sustain a given value of constant current over a range of load resistances). In addition, the voltage across the resistor must be set no greater than the difference between the supply's maximum output voltage rating minus the compliance range. For example, a 1-ampere constant current with a compliance range of 1 to 5 volts may be obtained from a 0-to-7-v supply and a resistor no greater than 2 ohms. A "slot" adjust supply—one not adjustable down to 0 v—may also be used if its slot range equals or exceeds the necessary voltage compliance, and if the voltage maintained across the resistor equals or exceeds the minimum limit of the slot range.

Most power supplies provide for external voltage adjustment by means of a potentiometer wired in series with one of the sense lines. The load is connected between this sense line and its respective output terminal. On some supplies, the other set of output/sense terminals has a smaller compliance. □

Engineer's Notebook is a regular feature in Electronics. We invite readers to submit original design shortcuts, calculation aids, measurement and test techniques, and other ideas for saving engineering time or cost. We'll pay \$50 for each item published.



**Constant-current supply.** A resistor in series with the load can provide the feedback necessary to control a constant-voltage supply.