A few added components make a self-contained controller for 100A load

Steve Hageman, AnalogHome.com, Windsor, CA

The late Jim Williams' last project was a 100A active load (**Reference 1**). That design needed a separate signal generator and other components. This Design Idea makes the load self-contained. It adds potentiometers to control the stepped load levels, a chopper oscillator to switch between the set load levels, and a dual-readout DPM (digital-panel meter) to allow for direct voltage and current readout. In tribute to Williams, it uses three Linear Technology chips.

The heart of the load controller is two potentiometers, Set A and Set B (**Figure 1**). These devices allow you to set A and B load levels anywhere in the 0 to 100A-load-range capability of Williams' design. For instance, assume that Set A is at –0.5V and Set B is at –0.75V. Switching the load between these two levels changes it from 50 to 75A. Timer chip IC_1 controls the stepping rate and duty cycle between the Set A and the Set B levels. This timer IC allows you to control frequency over a decade range. It also allows you to set the duty cycle between 0 and 100%.

The full 0 to 100% duty-cycle control comes in handy when you set up the load. At 100% duty cycle, the voltage between the potentiometers does not switch, and the Set A control is active alone. This situation allows you to adjust Set A and watch the actual dc level on the dual-readout panel meter. Likewise, setting the duty-cycle control to 0% switches to the Set B potentiometer and allows you to adjust its static or dc level.

THE FULL 0 TO 100% DUTY-CYCLE CONTROL COMES IN HANDY WHEN YOU SET UP THE LOAD.

Setting any duty cycle other than 0 or 100% causes the Set A and Set B levels to alternate. You control the chopping frequency by adjusting the fre-

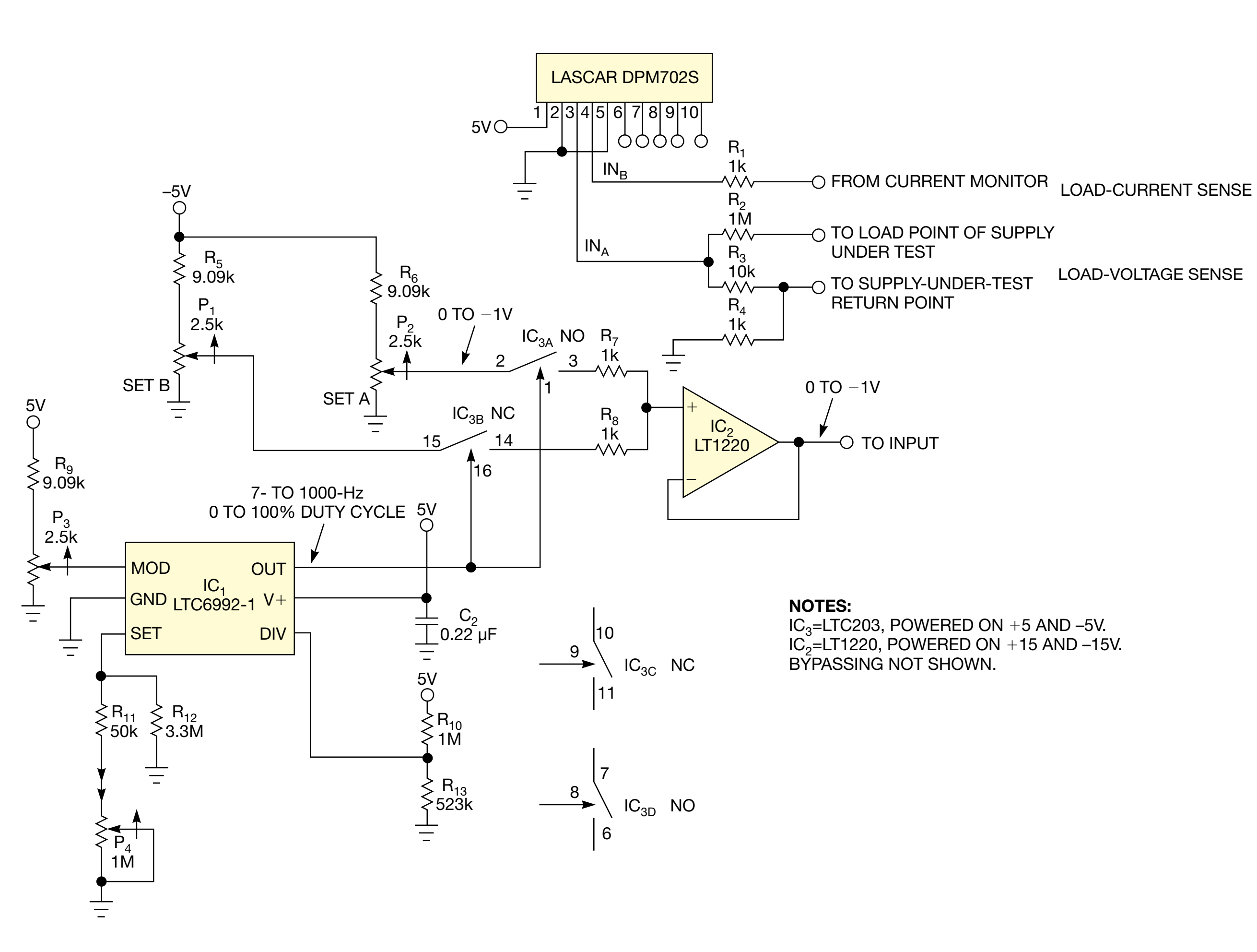

Figure 1 Adding this circuit to a 100A active load makes a stand-alone piece of test equipment.

quency potentiometer, P_4. A frequency of 60 to 1000 Hz best suits use in large power supplies. You can adjust the values of the resistors to get chopping frequencies of 4 Hz to 1 MHz.

Take care with the physical mounting of potentiometer P_4. Any stray capacitance on the Set pin of IC_1 is detrimental to its proper operation. Resistors R_{11} and R_{12} should be placed next to IC_1. You can wire potentiometer P_3 a few inches away for panel mounting.

Connect the labeled points in **Figure 1** directly to the labeled points in Williams' original schematic. You should change the 51Ω resistor at the earlier circuit's Input pin to something on the order of 1 kΩ. IC_2 should be close to the previous design's A_1 amplifier. You can slightly optimize the pulse's shape if necessary by adjusting the 300-pF capacitor at the input to A_1 on the original design.

The dual-readout DPM from Lascar Electronics is handy in active-load applications (**Reference 2**). The dual 3½-digit voltmeter has a ±1.999V input and has built-in annunciations for amperes and volts. Set the decimal place to the proper location by soldering jumper pads on the back of the unit.

This design connects the voltmeter across the load terminals but doesn't compensate for voltage drop on the leads connecting the load to the power supply. At the 100A level, the voltmeter doesn't provide the kind of accuracy that load-regulation testing requires. The voltage indication at the load is useful, however. It provides adequate indication that the power supply under test is still regulating and that the test leads connect properly to the load. If you need a more accurate reading, it is a simple matter to connect a 6½-digit bench DMM (digital multimeter) directly to the power supply under test. EDN

REFERENCES

1 Williams, Jim, "Design a 100A active load to test power supplies," *EDN*, Sept 22, 2011, pg 28, http://bit.ly/sGqlY5.
2 Lascar Electronics, www.lascarelectronics.com.