

Monday, March 3, 2014

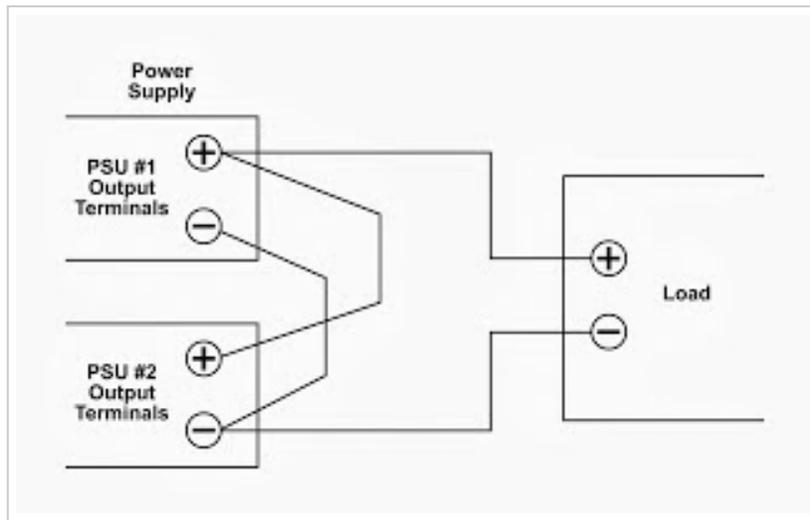
When should external diodes be used with a power supply?

I have written a few of articles over the years regarding the use of external diodes with power supplies (or FETS), one was back in 2007 concerning [fault tolerance](#), another was when [driving DC motors](#) and a third on [operating power supplies in series](#).

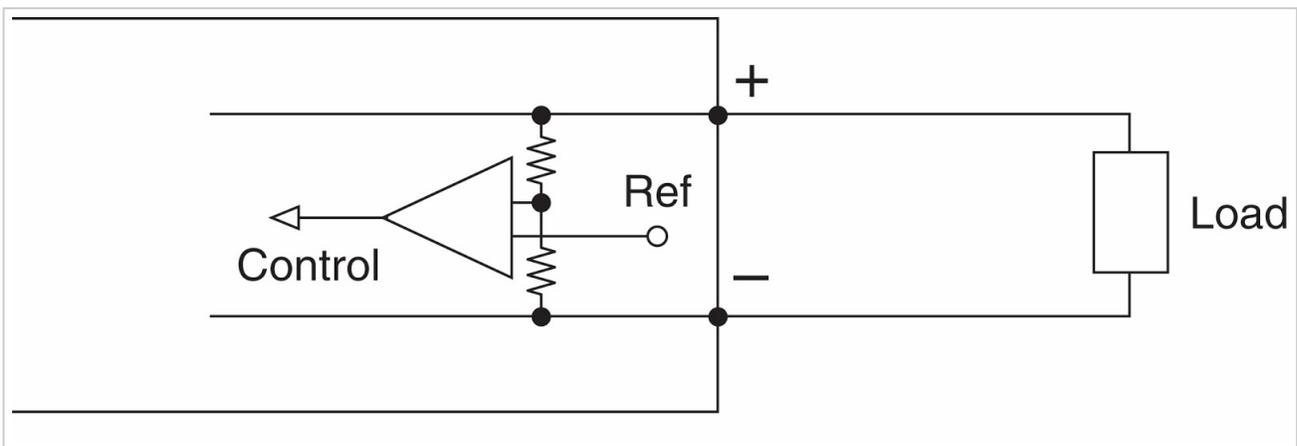
Recently two other applications came up, just when I thought I had the subject covered!

Redundant Operation

Connecting two power supplies together for redundancy is widely used. (Not to be confused with brute mode current sharing)



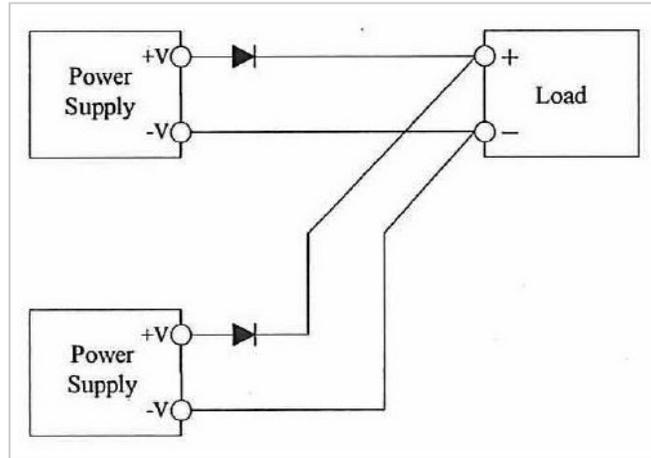
If PSU #1 fails, theoretically PSU #2 takes over, right? Not quite....



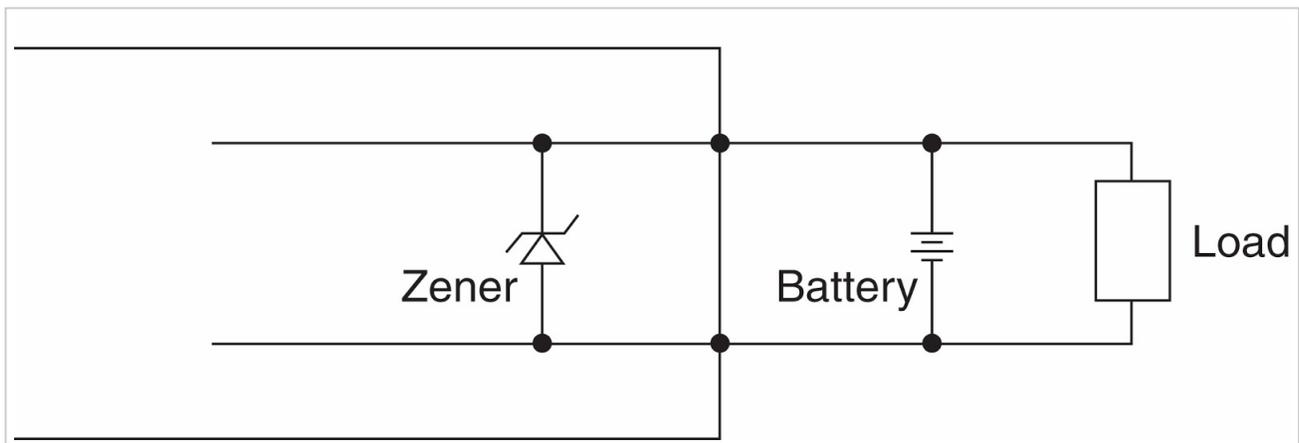
Looking inside the power supply, the output voltage is usually monitored by an op amp and is then compared to an internal reference. If the output voltage is too high, then the comparator will make the control circuit lower the output voltage by reducing the switching converter pulse width. Likewise, if the output voltage is too low, the switching pulse width will increase to make the output voltage rise.

Let's say PSU #1 is at 24.0V and PSU #2 is set at a slightly higher voltage, say 24.1V. PSU #1's control circuit now "sees" 24.1V as an output voltage and will turn the switching converter off believing that its output voltage is too high.

In the event of PSU #2 failing, the load demand will fall on PSU #1, which will have to turn the switching converter back on and may cause a temporary loss of voltage provided to the load.



Adding a diode in series with each power supply output will stop the power supplies from "seeing" the other's output voltage, and although PSU #2 may provide the entire load, if it fails PSU#1 will be active, ready to provide power, and be able to keep a voltage available to the load.



Battery Back-Up

On many low cost, low wattage power supplies, overvoltage protection is provided by a Zener diode connected across the output terminals of the power supply. In the event of a control circuit malfunction causing the output to rise, the Zener will fail short circuit, forcing the power supply into overcurrent protection ("hiccup" type current limit mode must be used by the power supply designer).

If battery back-up is being used (or another power supply), then current will flow into the faulty power supply and cause overheating of the Zener and surrounding circuitry.

Again, a diode in series with the power supply will prevent this.

Posted by [Power Guy](#)

