

AN-44

Connecting Multiple Power Supplies

Synopsis: Power supplies at voltages higher than 60V are becoming scarce. Learn how to connect multiple power supplies to achieve higher voltages or bipolar power supplies for power op amp circuits.

With today's focus on lower voltages, finding higher voltage power supplies for high power op amp circuits is becoming increasingly difficult. Lab type power supplies with higher voltages and adjustable outputs are not hard to find but they are very expensive, many times the cost of the power op amp they would provide power for. A much more economical approach is to use multiple fixed voltage power supplies to produce higher voltage power supplies or bipolar power supplies for power op amp circuits.

As an example let's first take a look at powering a Power Amp Design model PAD128 with maximum power supplies of $\pm 50V$. Fortunately, finding 48V power supplies is still easy to do and many low cost options are available. Figure 1 shows how to connect two of these 48V power supplies to make a bipolar $\pm 48V$ power supply to power the PAD128. This connection assumes the output voltage of the power supplies is floating and isolated from the wall power socket, as most AC/DC power supplies are today.

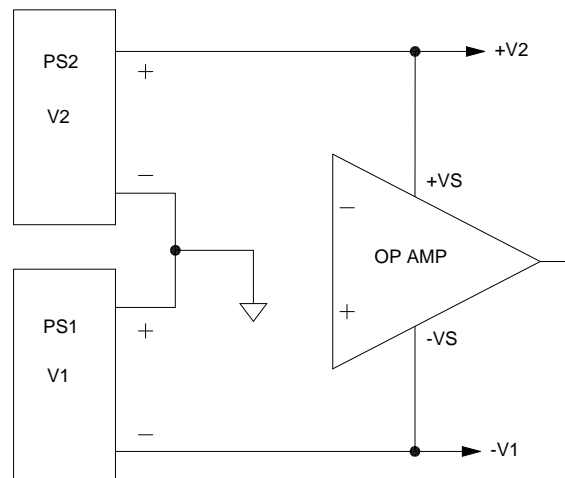


Figure 1.
Two Power Supplies in Bipolar Application

Let's now turn our attention to the model PAD129 with its maximum power supply rating of $\pm 100\text{V}$. The first task is to take two 48V power supplies and connect them in series (stacking) to increase the total voltage. In figure 2, two such 48V power supplies are connected in series to produce a total of 96V. D1 and D2 protect each power supply from damage to internal components with variations in power-up and power-down times. These diodes should be rated for the output voltage capability of the power supply and at least their current rating.

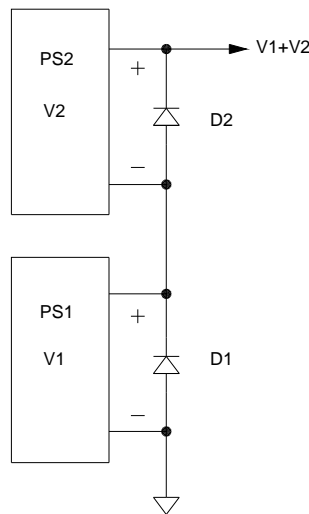


Figure 2.
Two Power Supplies Stacked for Increased Voltage

In figure 3, we combine the ideas of figures 1 and 2, and produce a bipolar high voltage power supply. The individual power supplies need not be rated for the same voltage, but the output current cannot be expected to be more than the least rated power supply current. With various power supply voltages and the ability to adjust the output voltages somewhat many voltages are available to power the op amp circuit. More than two power supplies can be stacked but the total voltage needs to be less than the isolation voltage rating of the power supply from the output to earth ground.

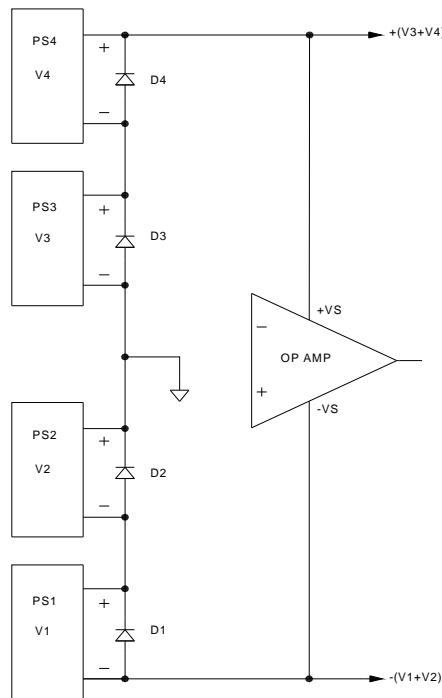


Figure 3.
Stacked Power Supplies in Bipolar Application

This application article does not cover paralleling power supplies for increased current capability. The power supplies for such connections must have that feature built-in to their designs. The most economical single voltage power supplies do not have that feature available and the power supplies currently sold by Power Amp Design do not have a paralleling feature so we are not covering that application. It is generally easier to obtain a power supply with an increased output current rather than paralleling smaller power supplies.