

## Add Variable Voltage Control to your Fixed Voltage Power Supply

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As you know, regulated, fixed output power supplies are both common and relatively inexpensive. This is especially true of the lower current surplus laptop power supplies available (eg, see the All Electronics PS-1231 12-volt 3.5-amp power supply for \$15.85 at [www.allelectronics.com](http://www.allelectronics.com)). However, a variable voltage power supply is frequently much more desirable for your workbench projects. As an example, I have an MFJ-4225 on my workbench. And while this power supply does have a variable voltage output adjustable from 8-15 volts, I often need lower output voltages for many of my projects. Therefore, this project consists of an inexpensive add-on to your fixed-output power supply that will give you a wide variable voltage output.

The circuit, shown in Figure 1, is based on the STM LD1085V low drop-out adjustable voltage regulator. This regulator is packaged in a TO-220 case and is rated at 3-amps. Since the LD1085V regulator is fully current limited and thermally protected, no fuse is used. And at the full 3-amp current limit, this device only needs a 1.2-volt input/output differential voltage, meaning that the highest adjustable voltage is just 1.2-volts below the power supply source voltage you have available. The LD1085V has a minimum output voltage of about 2-volts. So if you want a lower output voltage, you can put one or two 3-amp diodes in series with the adjustable output.

I built everything into a small Bud aluminum box, which also serves as a heat-sink for the LD1085V regulator. Figure 2 shows the dimensions I used for drilling the aluminum box. I used an inexpensive nibbling tool to cut out the two 0.5"x0.8" rectangular holes for the Powerpole connectors.

It is important to note that the LD1085V regulator tab must be electrically insulated from ground, so you need to use the TO-220 mica insulator kit and heat-sink grease called out in the parts list. Just to be sure, verify that the LD1085V mounting tab is insulated from ground with an ohmmeter after you've mounted the regulator to the aluminum box. Note that I also provided tip jacks for monitoring both the fixed and variable voltage outputs.

Photo A is an internal view of the wiring. I used Powerpole mounting brackets for the two output connectors, and a Powerpole terminated pendant cable for the DC input from the power supply. For the DC input and high current output wiring, I used 12-gauge wire since I wanted to carry the full 25-amp capability of my MFJ-4225 through the variable voltage box. 16-gauge wire is used for the 3-amp variable voltage output circuitry and wiring. Photo B shows the variable voltage unit mounted on the side of my MFJ-4225 power supply, using double-sided tape available from Home Depot.

If you elect to use pendant cables for the outputs and therefore don't need the mounting brackets, then you can order Powerpole-compatible AMP connectors from Mouser as noted in the parts list. I couldn't find any means of mounting these connectors with hardware on the Mouser site, so that's why the outputs need to be on pendant cables if you use the AMP connectors.

That's it. With this simple project, you can add a variable output to any fixed output power supply. And as an added benefit, you now even have a pair of front-facing Powerpole connectors!

Table 1 - Parts List

| <u>QTY</u> | <u>Description</u>       | <u>Source</u>           | <u>Price ea.</u> |
|------------|--------------------------|-------------------------|------------------|
| 1          | STM voltage regulator    | Mouser PN 511-LD1085V   | \$1.85           |
| 2          | 22uf 16V elec. Capacitor | Mouser 140-HTRL16V22-TB | \$0.03           |
| 2          | 0.01uf 50V capacitor     | Mouser 80-C315C153K5R   | \$0.16           |
| *1         | 1K $\Omega$ linear pot   | Mouser 31JN301-F        | \$1.27           |
| 1          | Knob                     | Mouser 506-PKG50B1/4    | \$1.52           |
| 1          | 2.75"x2.13"x1.63" box    | Mouser 563-CU-3000A     | \$4.20           |
| 1          | TO-220 mica mtg kit      | Mouser 534-4724         | \$1.13           |
| 2          | Red tip jacks            | Mouser 530-105-0802-1   | \$0.60           |
| 1          | Black tip jack           | Mouser 530-105-0803-1   | \$0.60           |
| 1          | Terminal strip           | Mouser 158-1005         | \$0.54           |
| 1          | Heatsink grease          | Radio Shack 276-1372    | \$1.99           |
| **3 pr     | Anderson Powerpoles      | Powerwerx PP-RB-30-10   | 10 sets/\$10     |
| **2 pr     | Powerpole clamp set      | Powerwerx 1462G1        | \$2.49           |

\*Note: You may wish to substitute a 10-turn potentiometer for easier adjustment. A good substitute is the Mouser 882-MW2287-10-1K potentiometer (\$9.48).

\*\*Note: Available from [www.powerwerx.com](http://www.powerwerx.com). Anderson Powerpole compatible connectors (by AMP) are available from Mouser. Part numbers are: 571-14459572 (Black housing, \$0.39), 571-14459575 (Red housing, \$0.39), 571-16041132 (16-20 gauge contact, \$0.15), 571-16041122 (12-16 gauge contact, \$0.17).

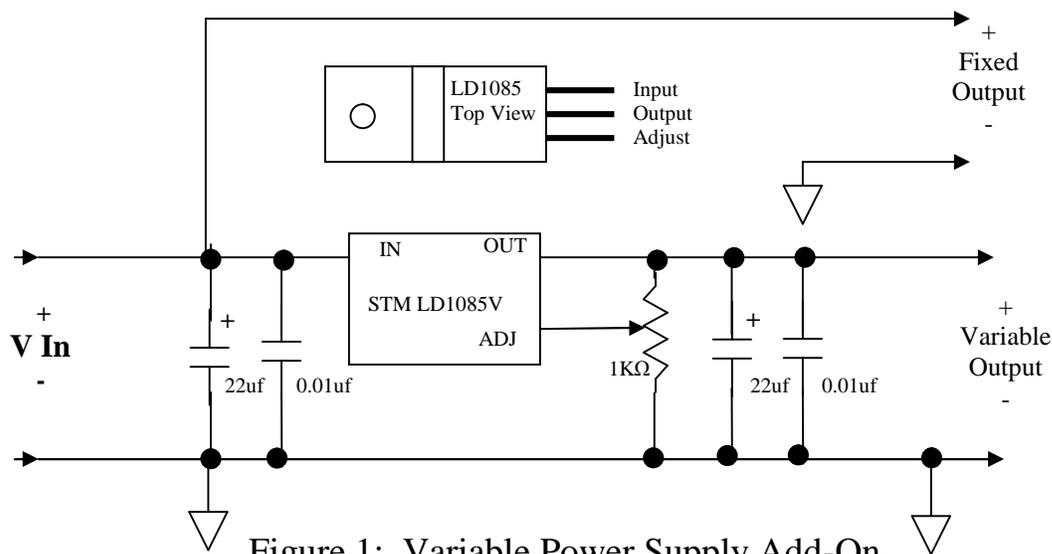


Figure 1: Variable Power Supply Add-On

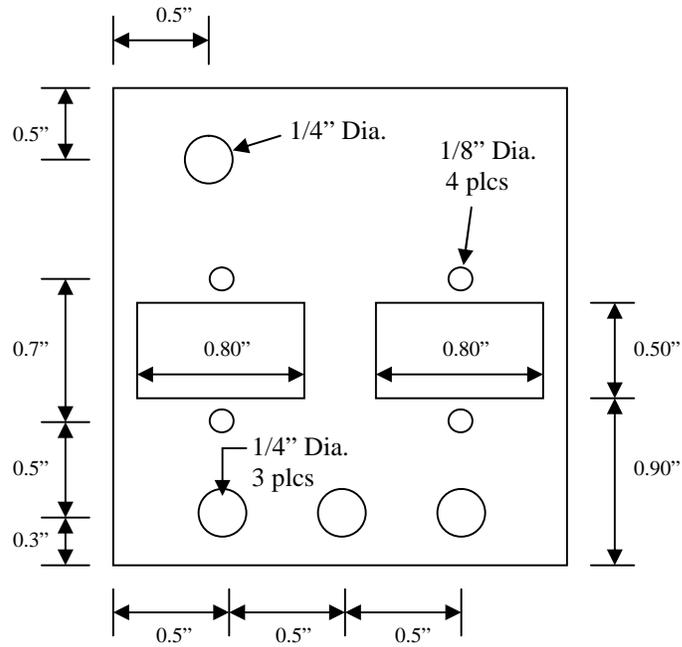


Figure 2 – Drilling/Cutout dimensions



Photo A – Internal wiring



Photo B – Final unit mounted on MFJ-4225