Placid Power Supply

User Manual

Revision 2.0a

For PCB Revision 2.0

Twisted Pear Audio

Overview

The Placid is a shunt regulated positive DC power supply designed for low noise and excellent line and load regulation. It is important your read the manual prior to trying to use this power supply. Make sure you understand how to adjust the output voltage and current before you do anything else. You could easily destroy something if you do not know what you are doing. So be careful, and read the schematic and this manual. This is not a difficult circuit to use, but it not trivial. You can learn a lot from the schematic. Take advantage of it. There is no shame in asking questions. Ask them before you do anything your might regret later.

Default Configuration

The supply is designed to be fed by a single secondary from a transformer. For the purposes of this manual we will assume you are aiming for 5.5VDC rail and ~350mA load current. The kit includes parts suitable for this setup. If you need more current you may need to change some parts (this is covered later). We will also assume you have a transformer with dual 7-15VAC secondaries with a suitable VA rating.

The 350mA supply current configuration should fit projects like powering the VD supply of a Buffalo II very well. It is very easy to configure the supply for other current demands by simply adjusting a few part values. As always you can ask us for help should you have a special need. If you need more or less current I will explain later how to achieve it.

First Steps

The simplest and most accurate way to setup the supply is by using the provided potentiometers. These potentiometers are actually used as variable resistors or rheostats. This manual assumes you are using them.

Populate the PCB as you normally would stuffing components from shorted to tallest. Mount the TO-220 transistors to the large heat sinks prior to soldering them. Note that R7 and C4 are not normally used nor recommended.

IMPORTANT!!! Prior to applying power or even wiring the transformers, adjust the CCS pots so that the resistance across the CCS R position (VR2) is about 100Ω. Then adjust the V_{OUT} pot (VR4) to its maximum resistance which should be ~10K. It is easy to check the resistance of the pots by placing your DMM probes on each the pads of the unpopulated R2 and R5. Do this with no power applied.

Once you have completed the above steps, leave the output of the supply **unconnected** to any load. Now connect it to the transformer secondary. The secondary connects to AC1. Power it up. You should see some pleasantly glowing LEDs and no smoke. You need to adjust the output voltage next. Adjust the V_{OUT} pot (VR4) until the voltage at the output terminals is as desired. For Buffalo II 5.5V will work nicely.

Now adjust the CCS pot until the measured voltage across R17 is ~ 0.35V.

You are now ready to connect the supply to your load. Connect it and re-check the output voltage. There should be no sag. If there is then you may need to increase the output current. The output current per rail is calculated as **V across RE divided by value of RE** where RE is R17. So a measured voltage of .35V is .35A or 350mA.

Some Helpful Facts

The voltage reference (V_{REF}) used to regulate the supply normally is ~4V. A little variation is normal because of variances in the LEDs and the CCS JFETs. You much measure the actual voltage at the output to be sure before you proceed to the use the supply. The more gain you use the more the V_{REF} variation will be apparent.

The formula for the output voltage is this: $V_{OUT} = V_{REF} * (1+(R_F/R_G))$ Where R_F is R10 and R_G is R5.

Based on that here are some possible configurations using a fixed resistor to set V_{OUT}. These assume R_F is 1K.

R_G	**V_{OUT}**
Open	~ 4V
4.02K	~5V
2K	~6V

Advanced Tips

Advanced users who want to do something other than the default configuration should understand the schematic. If you don't then please don't bother. If you do understand the circuit well enough to be confident in changing things around a bit, well then here are some tips. The rest I will leave to your imagination.

If you need to supply > 500mA per rail then I would adjust the JFET CCS (Q2/R6 and Q6/R15) and/or VR1/VR2. You will also likely want to add capacitance after the rectifier.

You can also substitute fixed Rs for the pots. Just do the calculations before hand or measure the resistance across the pots after your happy can remove them and substitute .25W metal film fixed resistors.