Simple and quick 5 or 10 amp power supply
By Lou Destefano, VK3AQZ

I recently had a need for an adjustable medium duty power supply. Most of the ones I had were either only a couple of amps, or an excessive 20 amps or so.

Also, I could not find a variable supply readily available from the electronic vendors which would do the job at a reasonable price.

There were a few switch mode power supplies available. However I needed this supply to drive a DC motor and I have found they don't work reliably when driving motors. The back EMF and brush spikes, despite lots of suppression, confuse the electronics in the supplies and they can go haywire.

Not to mention the hash generated which, unless they are dunked in molten metal, seems to get into all my sensitive radios.

However in my collection of lots of stuff, I had an Altronics M2175 transformer I had purchased on sale which had a 120 Watt core and 2 windings giving 12 and 15 volts each at 5 amps.

So I decided to use it in a dual 5 amp variable power supply.

I chose an LM317T, 3 terminal, 1.5 amp regulator driving a heavy duty TIP36C PNP transistor.

The result turned out to be quite good.

I built it into an old case and used a pair of VU meters from an old cassette deck to give an approximate voltage reading and current drawn for each supply.

The 2 supplies were kept isolated so that I could connect the 2 in series and obtain higher voltages.

The resulting supplies are variable from 1.25 volts up to around 20 volts using the 15 volt taps on the transformers. Current is around 4.5 amps before regulation starts to fall.

I found the short circuit current to peak at 18 amps for short periods!
(NOTE: after finishing the project I found that the PNP transistor can fail after several seconds so I now use a 5A circuit breaker at the output terminals).

The TIP36C transistor I used has a TO-3P case which rates the transistor at 25 amps continuous and 50 amps peak. The smaller TO220 style versions are rated at 15 amps. Note: a good heatsink is required for the higher current levels.

The filter capacitor for each supply was 10,000uF at 25vw, which seems to be enough for 5 amp loads up to around 13 volts.

As the circuit uses only a few components and works very well, I thought I might submit this design for others to use.

The actual circuit is basically a copy of the suggested circuits in the data sheets for 3 terminal regulators and is nothing really new. However, the use of a PNP transistor is often overlooked for the more common NPN type. However, the NPN version did not work as well due to the

base emitter voltage drop being part of the output section of the regulator. The NPN version requires the supply to be built essentially as a negative rail version for it to work without this problem.

The metering circuit uses a pair of VU meters with an internal resistance of around 1.5k ohm.

For the voltmeter function, a 100k resistor is put in series with the meter, whilst the ammeter function is obtained by using the 150 mm or so of PVC covered wire between the negative terminal of the bridge rectifiers, and the front panel terminal. This measured around 0.01 ohm.

5 amps give a deflection of around 1/3 of full scale. So an extra bit of wire is needed to give a somewhat higher deflection. However for my purposes, it is okay since the short circuit current is 18 amps, giving pretty much full scale deflection.

If you require a single 10 amp supply, the 2 transformer secondary windings can be connected in parallel as per the label on the transformer.

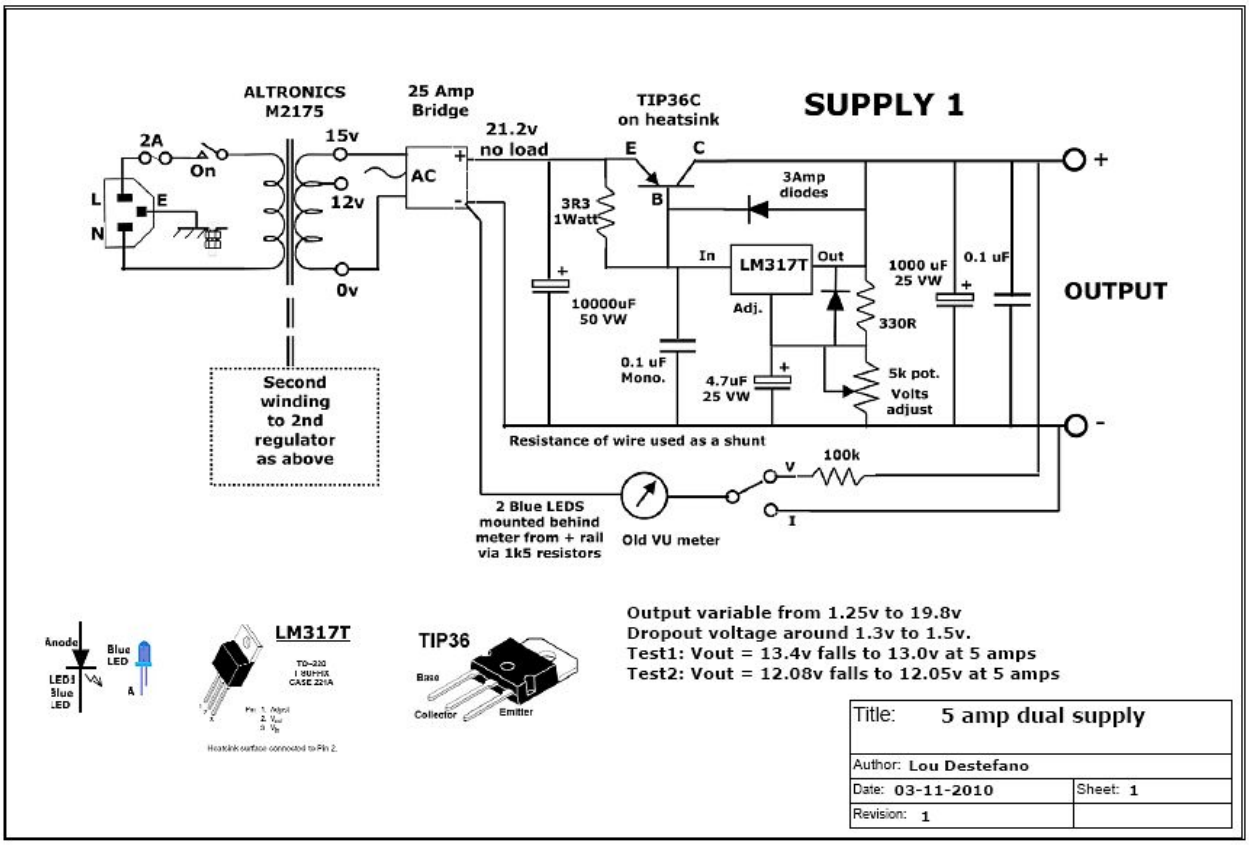
The rest of the electronics can easily handle the higher current.

Small scrap pieces of copper clad circuit board were used as terminals and for mounting some of the bits. The lands on the circuit board were made by scoring thin strips with a box knife then rubbing a flat bladed 60 W iron along the top of the resulting strips so as to lift the copper film clear of the board. This method is quick and easy for simple square or rectangular pad style layouts.
You can see the connections to the TIP36C were done this way as well as the board for the LM317T section.

The filter capacitors were salvaged from an old audio amplifier along with the circuit board.

Below are a few pictures of the supply and the circuit diagram.

The circuit diagram is pretty much self explanatory.

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SUPPLY 1
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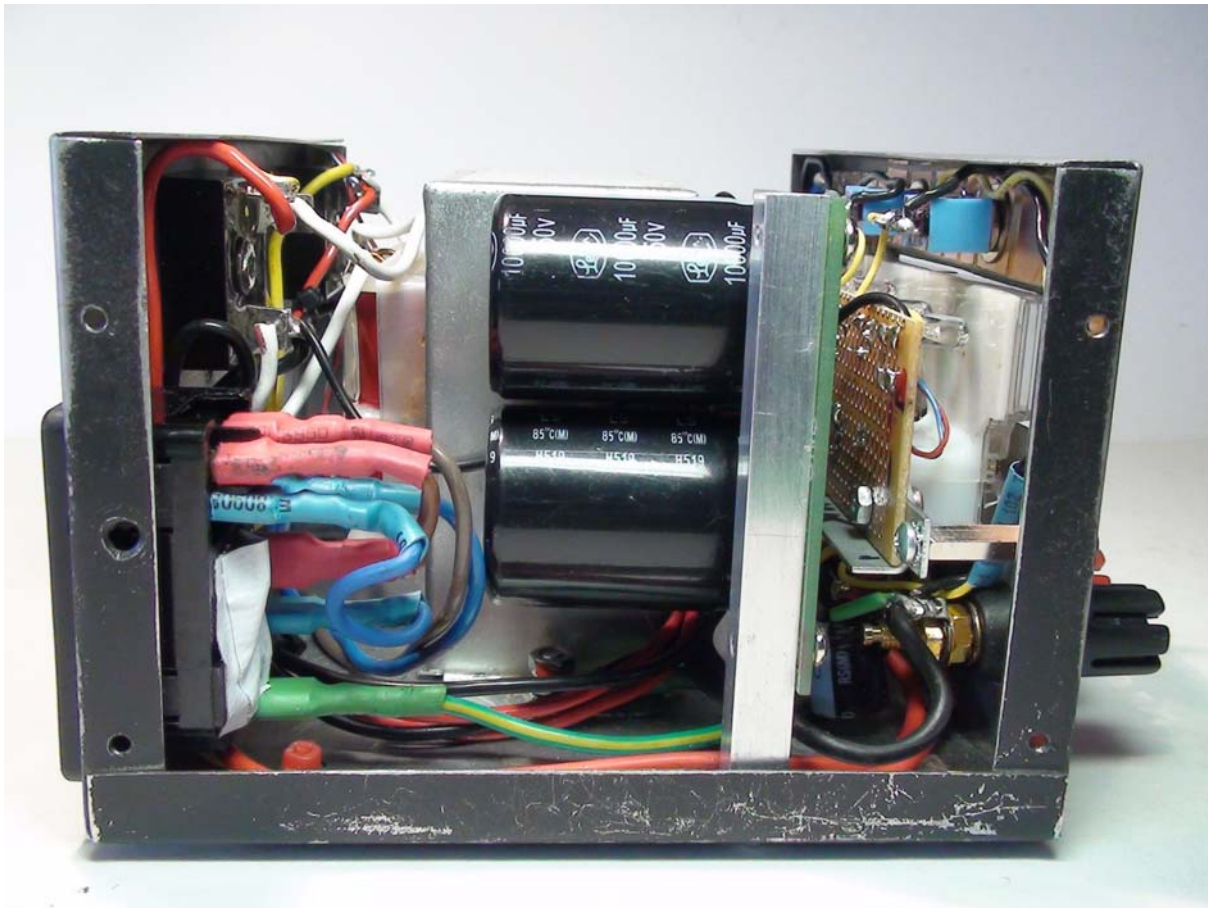
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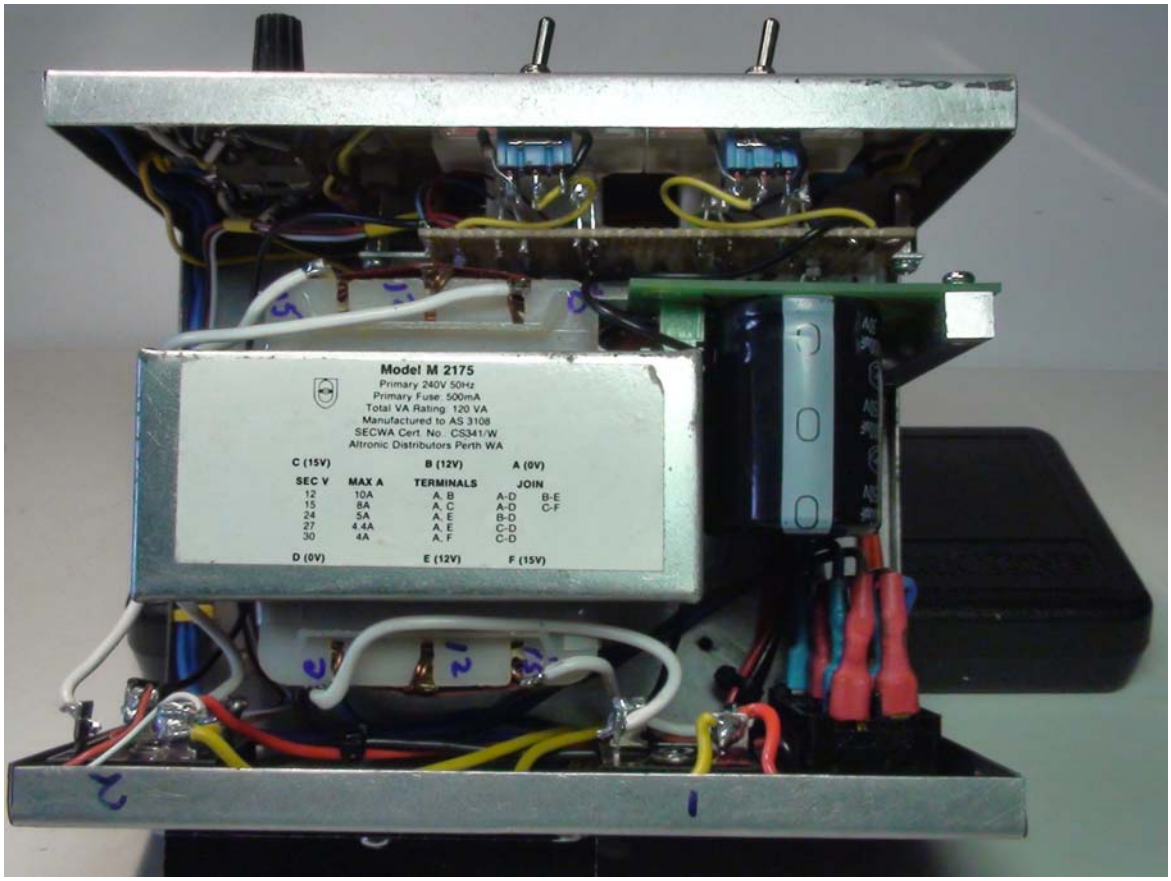
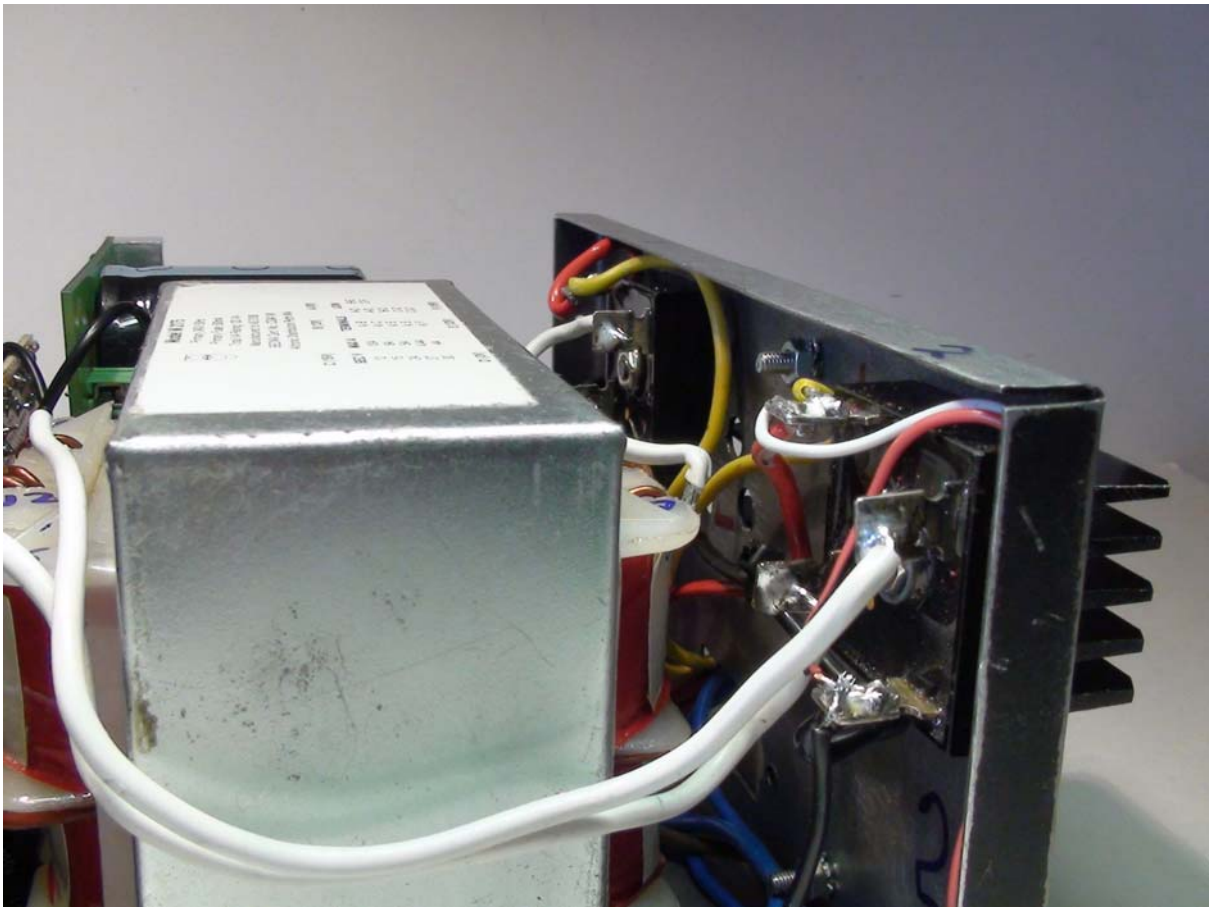

Model M 2175
Primary 240V 50Hz
Primary Fuse: 500mA
Total VA Rating: 120 VA
Manufactured to AS 3108
SECWA Cert. No.: CS341/W
Altronic Distributors Perth WA
C (15V)
B (12V)
A (0V)
SEC V
MAX A
TERMINALS
JOIN
12 10A A, B A-D B-E
15 8A A, C A-D C-F
24 5A A, E B-D
27 4.4A A, E C-D
30 4A A, F C-D
D (0V)
E (12V)
F (15V)

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