

7104 – 7854 SMPS DUMMY LOAD

Without an adequate load, or with too great a load, a Tektronix 7000 series Switching Mode Power Supply (SMPS) will protect itself from damage. Removing an SMPS from a main frame to troubleshoot it requires that it be hooked up to a dummy load or else it will making a characteristic ticking noise several times per second to indicate that it is not regulating.

In order to troubleshoot several 7104 and 7854 SMPS I have, I built a dummy load from \$15 worth of power resistors and an old CPU cooling fan / heatsink I had in my parts box. A few members of TekScopes suggested the following current values for each supply that would bring the SMPS out of tick mode and into regulation so I could troubleshoot it further:

| | | | |
|----------------------|--------------|------|---------|
| +50VDC Power Supply: | 150 Ω | 0.3A | 15Watts |
| -50VDC Power Supply: | 150 Ω | 0.3A | 15Watts |
| +15VDC Power Supply: | 15 Ω | 1.0A | 15Watts |
| -15VDC Power Supply: | 15 Ω | 1.0A | 15Watts |
| +5VDC Power Supply: | 5 Ω | 1.0A | 5Watts |
| +5VDC Lamp Supply: | 5 Ω | 1.0A | 5Watts |

The total power drain of the dummy load when the SMPS is regulating will be 70 Watts. Eliminating that much heat can present a problem so I quickly realized I would need to build this dummy load on a heat sink and provide it with steady air flow to keep the heat sink cool. I am in the habit of keeping heat sinks and cooling fans every time I upgrade to a new PC and I found a set in my parts box that seemed almost ideal for this particular purpose.

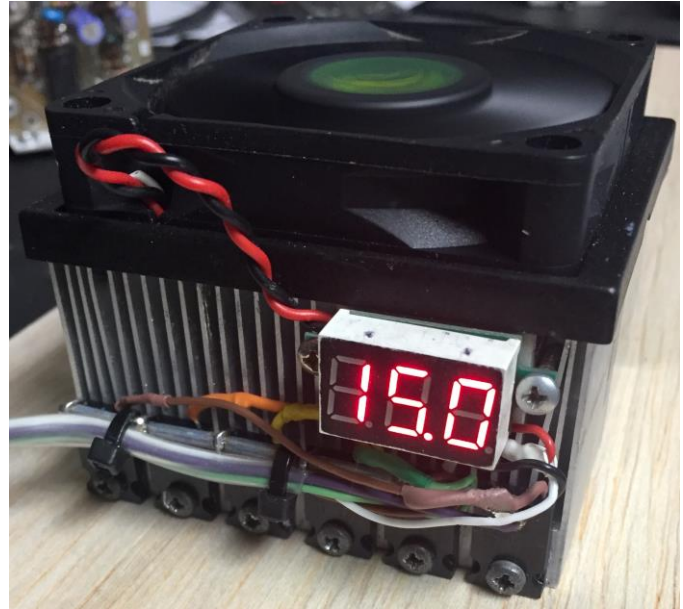


Figure 1 7104 / 7854 SMPS Dummy Load

For an earlier attempt at making a Tektronix 7000 series dummy load I chose wire wound resistors but they were large and there was no way to mount them onto a heat sink. This time I decided to try thick film alumina ceramic resistors instead. They are much smaller than wire wound resistors and mount conveniently with a single screw like TO-220 power transistors do.

To prepare the heatsink I drilled and tapped six 4-40 holes in one side of the heat sink. I applied a thin layer of heat sink compound to that area and screwed the six resistors onto the heatsink.

After wiring each resistor up to the Molex connector with #24 gauge wire, and #20 gauge wire for the common ground I realized there was no visible way to know when the SMPS was regulating so I added a simple Digital Panel Meter (DPM) I had in my parts box across the +15VDC load resistor. Now I could tell at a glance how well the SMPS was regulating by what voltage was displayed on the DPM..

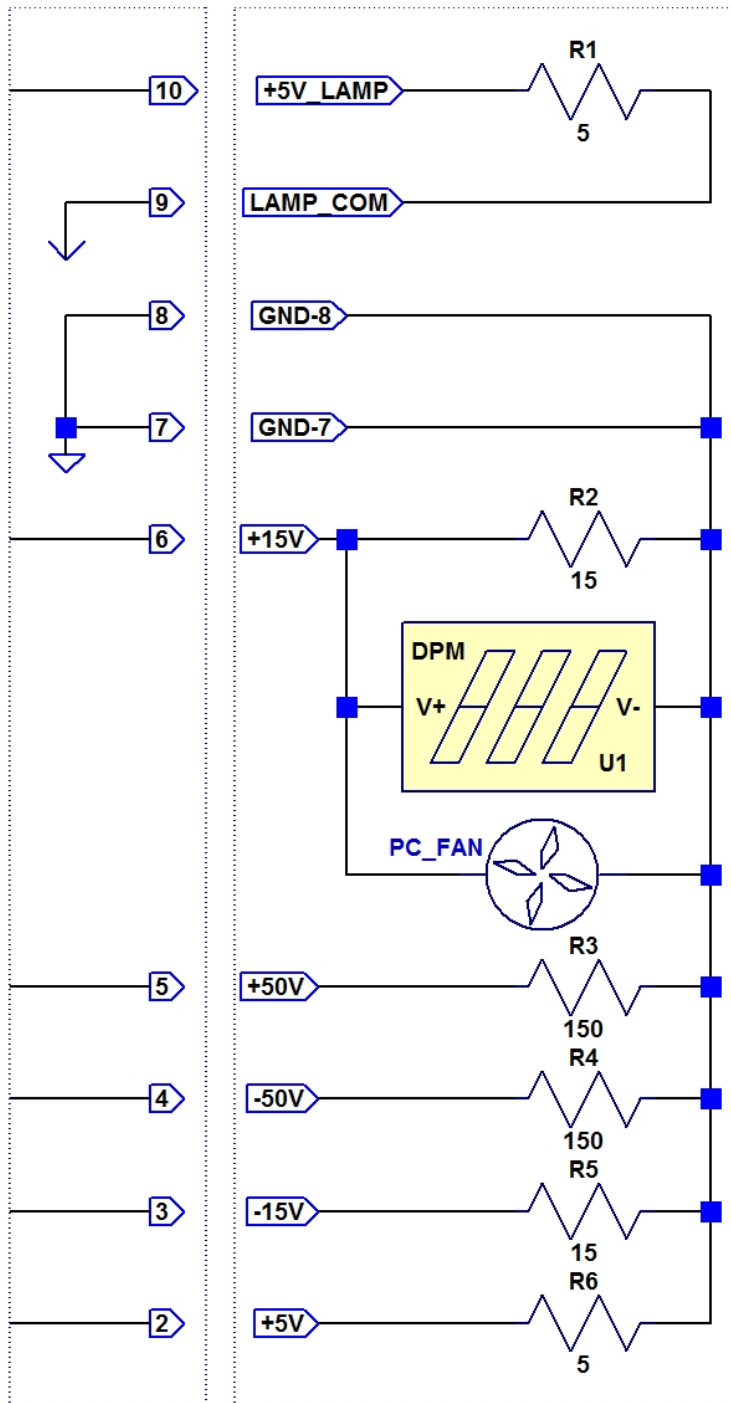
I wired the 12V PC cooling fan across the +15VDC load resistor. When the SMPS is regulating and dissipating 70 Watts the +15VDC supply powers the fan to cool the heat sink automatically. When the SMPS is not regulating there is no +15VDC to power the fan but the SMPS doesn't dissipate any power.

As the final step, I applied a piece of wide packing tape across the far side of the heat sink to block air from leaving that way. All the air now flows out the side of the heat sink with the power resistors.

The dummy load runs continuously with only a 20°C temperature increase when it is dissipating full power. It barely gets warm to the touch.

P82 SCOPE CONNECTOR

7104 - 7854 SMPS DUMMY LOAD



Mouser Order Information

R3, R4 PWR221T-30-1500F \$2.68 150Ω 1% 30W Thick Film Res.
 R2, R5 PWR221T-30-15R0J \$2.33 15Ω 5% 30W Thick Film Res.
 R1, R6 PWR221T-30-5R00J \$2.33 5Ω 5% 30 W Thick Film Res.
 P82 538-10-11-2103 \$0.48 KK 254 10 position Crimp Housing

Miscellaneous from my spare parts box
 30VDC Digital Panel Meter
 PC_FAN 2.75" (70mm) square, 12VDC
 Heat Sink

