LETTERS

Dear Sir

I note your "Lab Notes" in October ETI concerning the LM 723-derived Power Supply. Over the years since its publication in Nov 1972, I have seen it copied (and as I am about to say, I do mean copied) into circuits in other magazines and numerous club journals. I soon built not one, but two power supplies using the circuit, with and without modifications, and so did many of my friends. For all who built it as well as myself, the circuit performed terribly. How? Most people "blew" at least one IC, and after the second, threw the thing away, probably replacing it with discrete components. Current limit resistors, even 2N3055s and power diodes went west. I must confess - I have three dead 723s. Even if one was careful enough to preserve the power supply by never shorting it out, regulation was poor - sudden disconnection of a load would cause a one volt positive spike at the output, visible on a voltmeter. And it hummed!

I have since been amazed at the design notes in many articles, referring to a device with specs of ripple rejection at 50 Hz, of 74 dB with no output capacitor or Vref capacitor (the latter I always incorporated into the design). I seem to recall your magazine's original article as stating that a 50μF capacitor had to be added to the output to hold down hum. (Note: suggested value for 7812 = nil to 50 nF).

My sincere apologies for not writing this six years earlier when I realised the designed-in fault. I have until now assumed that some obscure errata column carried the answer, but realise from the current article that this must not be so.

Now I have met some people who have made, as in the present article, many of these units, usually for someone else's use, and report only occasional "by the way" failures - usually a "burn up" involving IC, power transistor and especially Rsc in the circuit as shown; or no trouble at all. I should point out that the applications referred to in the article are quite non-critical of regulation, and that the original circuit will withstand short-circuits 90% of the time, and indefinitely if not occuring rapidly.

So what is the fault?

Very simple. The compensation capacitor is specified at 1000 times the correct value! i.e.: 100 nf instead of 100 pf. All the other designs have slavishly followed this value, even though they may have changed its configuration.. Assuming shunt configuration - i.e.: C comp from Pin 13 (DIL) to earth, this sets the slew rate at about 7.5 V/ms. In feedback configuration i.e: C comp between Pins 13 and 4 (DIL) this figure becomes so much worse - thus the failure of ac regulation. As a second consequence, the current limit transistor on the IC is obliged to "pull down" this capacity in the event of an instantaneous short circuit (the most common sort) while the full output voltage appears across its base-emitter junction. From experience, it rapidly tires of this, suffering lead burnout (within the package) and either emitter or base "goes open". Not surprisingly, an external, discrete transistor substituted in the position fares likewise soon after. Without current limit action the resistor soon burns, unless it is rugged, in which case it passes the load to the 2N3055, power diodes and transformer, whichever is weakest. This immediately precedes user dissatisfaction.

The cure is obvious - use a 100 pf capacitor. Although the manual shows values ranging from 100 pf to 500 pf (depending on pass transistor gain) in feedback configuration and 1 nf in shunt configuration (5 nf in a shunt regulator - which uses higher gain of the loop). I have used lower values with complete success in a tightly-designed pc board. Regulation is now excellent, and the 50μF output capacitor may be dispensed with, in favour of about a 1μF (to pass frequencies above about 10 kHz). The 5μF bypass on the wiper of the pot now is functional, adding the "cream on the cake".

Now far less stressed, the current limit transistor performs without complaint, and on a 50 mA or so limit, and with little output capacitance, the supply can be shorted across an emitter-base junction without damage.

Just in case, a resistor of at least 100 Ω can be inserted in the "current limit" line - Pin 2 (DIL) and this could easily be added to your ETI 111 board.

A further warning about switching of the feedback resistors R2 and R3 in your circuit. It is possible to produce, for example 7V and 15V ranges switchable, but this must be done by opening R2, never by shorting R3 as this can put a 15V transient on the comparator, again resulting in instant destruction due to the output capacitance.

Hoping you make some use of this.

Paul B Webster
Earlwood, NSW

Dear Sir

I am writing to you in the hope you can give me some further information on an article in October's ETI.

We collect quite a lot of gem stones in our area and occasionally an aquamarine "Beryl".

In the October issue, there is an article "Beryllium, how dangerous?"

Could you find out for me if the Beryl we collect and cut and polish is the same Beryllium as in the article?

I enjoy reading your magazine,

Ray Taylor
Innisfail, Qld

Beryllium is found in nature in two forms; known as Beryl and Chrysoberyl, they have chemical compositions as follows:

Beryl: $Be_3Al_2(SiO_3)_6$

An ore of Beryllium, translucent to light green in colour (aquamarine). It is a metal, prized as a gemstone.

Chrysoberyl: $BeO.Al_2O_3$

It contains Beryllium Oxide with an oxide of Aluminium in the crystal structure. It is potentially carcinogenic. Alexandrite is another form - dark green in colour, red in transmitted light. Chrystoberyl is green in colour, possibly due to Chromium present in trace amounts. It is very hard (8.5).

I trust this answers your question.
Roger Harrison

Dear Sir

In recent New Scientist magazine (12 July, p.129) it was claimed that liquid crystal displays only have a life span of five years. In view of the widespread use of these devices in watches, calculators, etc., it would be interesting to know if this claim is true and if so why the secret has been so well kept.

J A Fisher
Lake Albert, NSW

It's not that well kept a secret. See ETI December 1975, page 90.