

'Goof-proofing' the '162 power supply

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The ETI-162 Power Supply has been a very popular project since we published it in the December 1982 edition. However, while current limit protection was provided, the supply isn't wholly 'goof-proof'. This little modification fixes that.

WHILE WE RECEIVED the 'usual' rash of calls and letters shortly after the project appeared — constructors using TIP31s instead of TIP32s for the series-pass transistor, shorting leads 2 and 3 of the 317 regulator, putting diodes in back to front, etc — few readers reported any unusual or common problems and the 'help' calls and letters trailed off as is the general pattern. However, towards the last quarter of 1983, we began to receive a 'run' of calls all reporting the same symptom — destruction of Q1 at switch-on or switch-off.

Now this puzzled us, as the original ETI-162 had been doing sterling service in the ETI lab since it was built and we could not reproduce the fault. Until, that is, a technical college lecturer and a reader independently gave us 'the clue'. With a short circuit on the output (or with the project operating in the current limit mode at or near maximum current out-

put), Q1 would be destroyed when the supply was switched off, or in some cases, when it was switched on in that condition.

After some investigation, we could reproduce the problem (fzzst went several TIP32s!). Delving further into the switch-off conditions, it seems that the -10 V rail may rapidly 'collapse' following switch-off. When this occurs, IC1 'lets go' of the 'adj.' terminal (pin 1) of the 317 regulator which is then free to draw more current through R3, turning Q1 on harder. Now, there's 5000 μ F of capacitance on the rectifier output and the charge held in C1-C2 will be 'dumped' through the emitter-collector junction of Q1 and the short (or low resistance load) on the output. This can cause the emitter-collector junction of Q1 to fuse. Exit Q1. If Q1 goes short circuit, next time you turn the power supply on you'll get peak current through the load, or, if you've removed the load, you'll get 36 V or so on the output. Gen-

The modification installed. About \$2 worth of bits is all it takes! Note where the 0 V and -10 V leads connect. (Pay no attention to the resistor paralleled across R2).

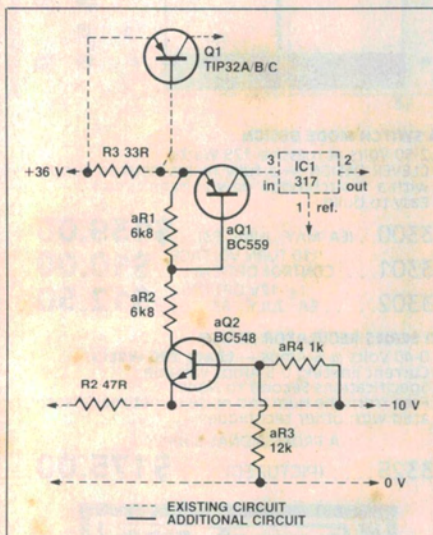


Figure 1. When the -10 V supply rail is present, aQ2 is biased on, which turns on aQ1 via aR1 and aR2. Thus, current can flow through IC1, the 317 regulator. When the -10 V rail drops below about 0.5 V, aQ2 turns off, turning off aQ1; preventing IC1 from drawing current and saving Q1 from destruction as described in the text.

erally, this causes R7 to smoke furiously! Tsk, Tsk.

If the -10 V rail rises more slowly than the main rectifier output after switch-on, then IC1's output may not control the adj. terminal of the 317 regulator, as before, with the same result: Exit Q1.

The modification

Providing current-limit protection during switch-on and switch-off is simple. Just ensure IC1 can draw no current when the -10 V rail is not present. The circuit in Figure 1 shows how it's done and was suggested by a reader.

Technical Editor, Geoff Nicholls, lashed up a trial run and tried it out. Problem cured. A pc board was laid out, etched up, constructed and installed. The result you see in the accompanying photograph. The component overlay for the pc board is shown in Figure 2. Assembling the board is straightforward — but watch the orientation of the transistors and note which is which or you might be back where you started! Attach the '0V' and ' -10 V line' flying leads. These should be about 100 mm long.

Installing it is simple. First, desolder the three tinned copper wire leads between the 317 pins and the pc board — at the 317 pins. Bend these wires forward slightly, so that they stand almost straight up from the board. Next, unbolt the 317. Solder it to the '162a pc board, at full lead length. Bend the 317 flat across the board and, holding it vertical, aQ2 uppermost, copper side toward the front panel, solder the three tinned copper wire leads to the appropriate holes in the little board.

Now bend the board back down so that it lies roughly parallel to the main board, bend the 317 back up and bolt it in place, taking care to correctly replace the insulating bush and mica washer. Use a multimeter to check there are not shorts between the 317 tag and chassis. Now solder the '0 V' and ' -10 V line' leads in place, as can be seen in the photograph.

That's it. Give the whole thing a final check, then switch on and check it out.

Your ETI-162 Bench Supply is now goof-proof!



Figure 2. Component overlay for the ETI-162a pc board.

