Power Supply Protection

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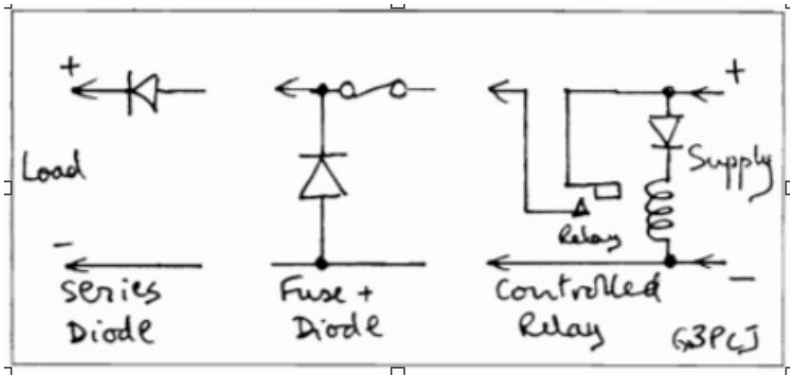
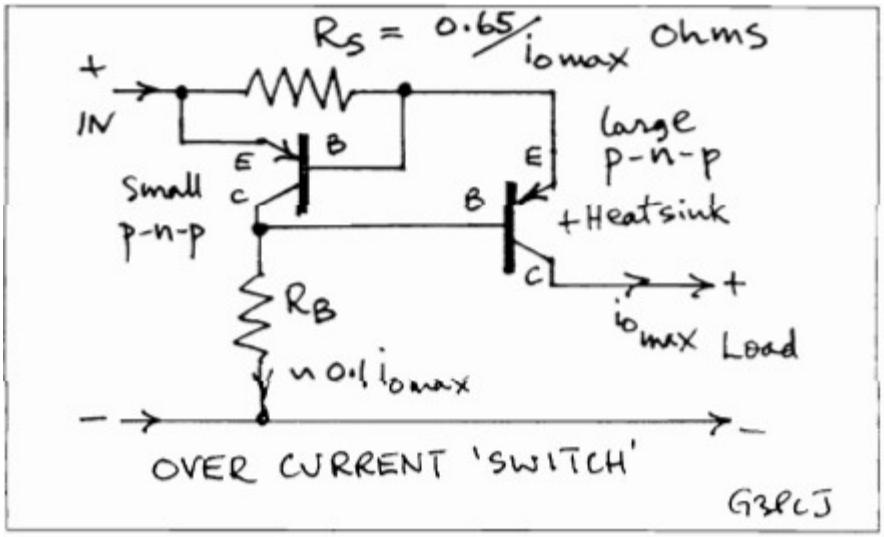
Adapted from the original Hot Iron #13 article

Reversed Polarity: One of our members recently had a cheap CB type commercial PSU fail, resulting in high DC volts on his Taunton plus counter, which burnt out some of the chips supplied direct from the 12 volt line. Hence these notes! These are not complete circuits since you may be able to use what is already in your junk box. It is necessary to keep protection circuits simple so that their reliability will be appreciably higher than the item which might fail, causing damage. However simple circuits often have poorly defined operating points so it is vital to try them out with care on dummy loads first! Reverse polarity - protects against operator failure! The easiest is a series watty diode, better is a series fuse followed by watty diode across the supply. Note that a correctly connected RF output stage FET such as an IRF510 acts just like this power diode (assuming its drain is always connected to the supply). This has saved my Yeovil once with the supply wires acting as fuse! Even better still is a relay with a diode in series with the coil - see below:



Over-current sensing: This protects against load failure! The load current is sensed and, when above some threshold, shuts down the regulator by removing the control voltage. Most schemes depend on the load current flowing through a resistor which turns on a transistor, hence there is nearly always a voltage drop of about 0.7 volts The 'switch' scheme outlined below can be added to an existing supply but will have a variable loss across it up to about 1 volt. This can be avoided if it is placed in the raw DC line feeding the regulator. The current through R needs to be about 10% of I max. - ałso consider R dissipation. The sense resistor should be about 0.65 volts divided bv I max. Use a watty transistor + heatsink for the output.



Over-voltage sensing: This protects against PSU failure! Here a fast acting circuit is needed to avoid damage to the load. Usually the excessive voltage triggers a 'crow-bar' across the supply - often done with an SCR which stays on till the PSU is shut down. The scheme below right is a compromise between simplicity and precise trip voltage. Again use a watty transistor with heatsink and also a relativelv watty zener. Don't forget the fuse or you may loose the protection devices as well! It is well worth trying this out first with a variable power supply to assess the actual voltage at which the transistor turns on hard.