

Alternately a few simple changes can make the supply provide up to 40 volts at 1.25 amperes. The supply voltage is settable between zero and the maximum available, and current limiting is also adjustable over the full range. The mode of operation of the supply is indicated by two LEDs. The one beside the voltage control knob indicates when the unit is in normal voltage-regulation mode and the one beside the current limit control indicates when the unit is in current-limit mode. In addition a large meter indicates the current or voltage output as selected by a switch.

DESIGN FEATURES.

During our initial design stages we looked at various types of regulator and the advantages and disadvantages of each in order to choose the one which would give the best cost-effective performance. The respective methods and their characteristics may be summarized as follows.

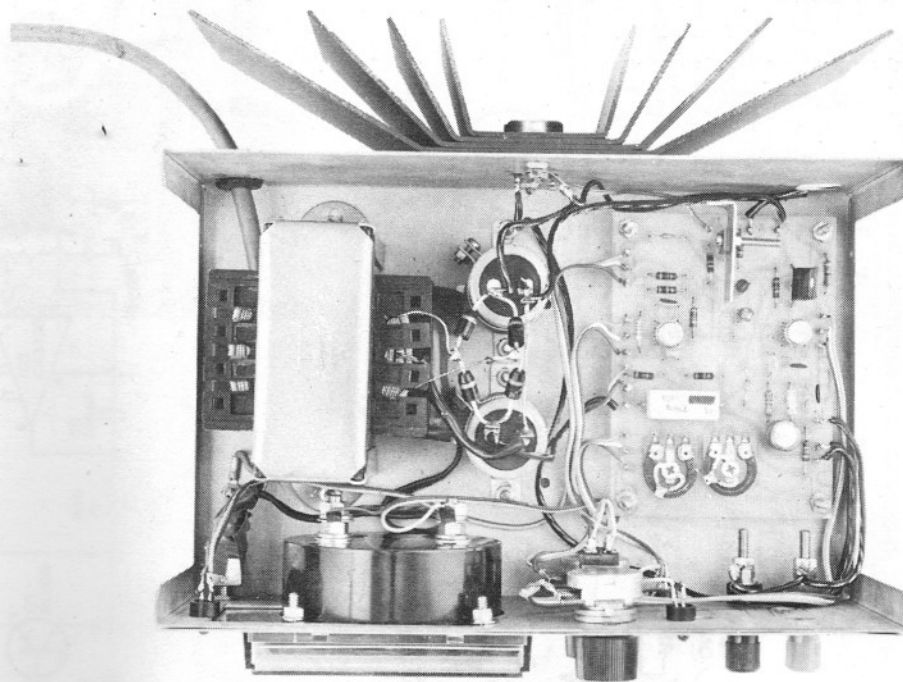
The shunt regulator. This design is suitable mainly for low-power supplies — up to 10 to 15 watts. It has good regulation and is inherently short-circuit proof but dissipates the full amount of power it is capable of handling under no-load conditions.

The series regulator. This regulator is suitable for medium-power supplies up to about 50 watts. It can and is used for higher power supplies, but heat dissipation can be a problem especially at very high current with low output voltages. Regulation is good, there is little output noise and the cost is relatively low.

SCR regulator. Suitable for medium to high power applications, this regulator has low power dissipation, but the output ripple and response time are not as good as those of a series regulator.

SCR preregulator and series regulator. The best characteristics of the SCR and series regulators are combined with this type of supply which is used for medium to high-power applications. An SCR pre-regulator is used to obtain a roughly regulated supply about five volts higher than required, followed by a suitable series regulator. This minimizes power loss in the series regulator. It is however more expensive to build.

Switching regulator. Also used for medium to high-power applications, this method gives reasonable regulation and low power dissipation in the regulator but is expensive to build and has a high frequency ripple on the output.



Inside view of the completed 40 volt power supply. Note how the heatsink is mounted to the rear of the unit.

Switched-mode power supply.

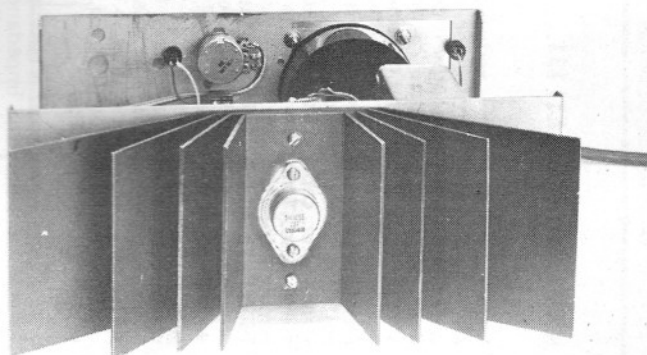
The most efficient method of all, this regulator rectifies the mains to run an inverter at 20 kHz or more. To reduce or increase the voltage an inexpensive ferrite transformer is used, the output of which is rectified and filtered to obtain the desired supply. Line regulation is good but it has the disadvantage that it cannot easily be used as a variable supply as it is only adjustable over a very small range.

OUR OWN DESIGN

Our original design concept was for

a supply of up to 20 volts at 5 to 10 amps output. However, in the light of the types of regulator available, and the costs, it was decided to limit the current to about 2.5 amps. This allowed us to use a series regulator — the most cost-effective design. Good regulation was required, together with variable-current limit, and it was also specified that the supply would be useable down to virtually zero volts. To obtain the last requirement a negative supply rail or a comparator that will operate with its inputs at zero volts is required.

Rather than use a negative supply



Rear view of the heatsink showing how it and the transistor are mounted.