POWER SUPPLY

This kit is available from:

Talking Electronics

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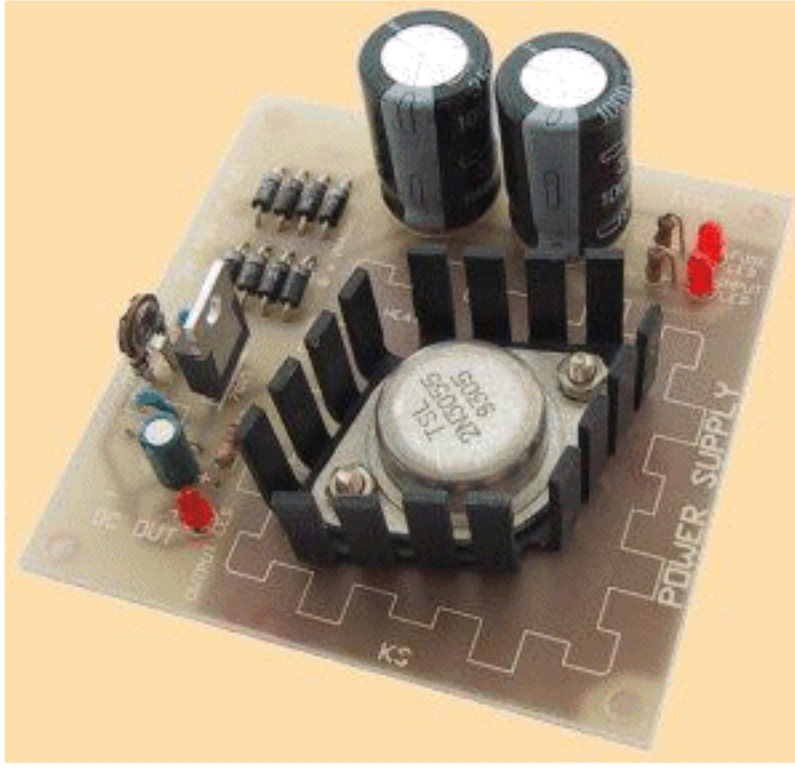
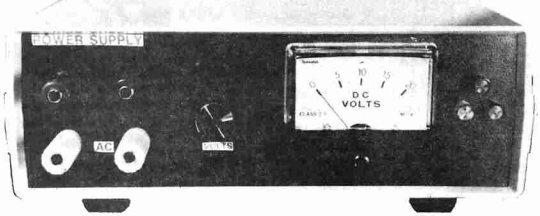
for pricing and postage.



POWER SUPPLY



OUR 5 - 15v 2 AMP PROTOTYPE.

Now that you have constructed several of the projects in this book, you will find it necessary to build a power supply.

Train controllers often have an output labelled "Uncontrolled DC". This means the output is not controlled by a rheostat. It is un-smoothed and is quite useless for powering electronic circuits.

The power supply described in this project is ideal for powering the circuits in this book. It has a very low output ripple and maintains a constant voltage over a wide range of current.

It is capable of delivering up to two amps depending on the type of transformer you use. It is variable between 5 and 15 volts and uses readily available components.

The overload protection device is a simple fuse. This has been chosen as it is the only really successful way of protecting a supply. Automatic trips usually operate too fast and give a false indication of a malfunction.

The project can be used as a bench supply as shown in the photograph, or mounted along with other circuitry on your layout.

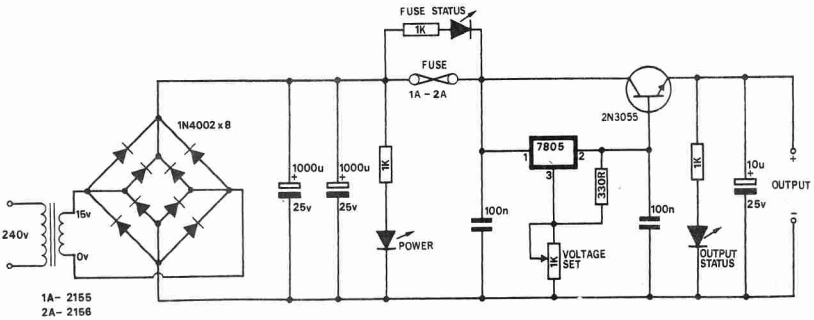
It would be advantageous to power all 'grain of wheat' lamps from an adjustable supply to give them a brightness comparable with those on a street. Invariably they are too bright when supplied with 12 to 15v. Dimming them adds to the realism of the layout as well as allowing them to last a lot longer.

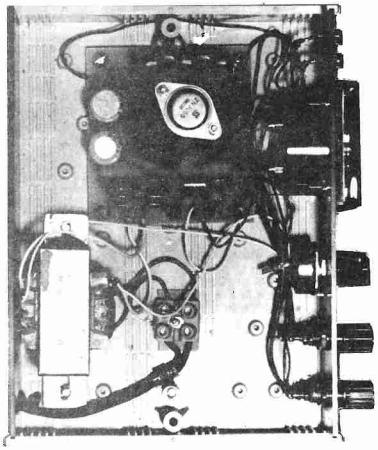
HOW THE POWER SUPPLY WORKS

The AC is rectified by a full-wave rectifier consisting of 8-1N4002 diodes. These are 1 amp diodes and have been paralleled to form a 2-amp bridge. These could be replaced by a set of diodes with a higher current rating if desired.

The rectified AC is then smoothed by the electrolytic. Provision has been made on the board for mounting two 1,000mfd electrolytics or one 2,200mfd electrolytic.

The smoothed DC then passes through a fuse to the regulation circuit. This consists of a 7805 voltage regulator which is a positive 5 volt type. These regulators can have their output voltage increased by a simple voltage divider network which 'jacks up' the common line and consequently increases the output voltage.
A 2N3055 transistor is wired as an emitter follower to supply the current to the output.





The upper voltage limit of the power supply will be set by the output voltage of the transformer and should not be above 15v for any of our circuits.

The regulator does not have to be heat-sinked because it is only supplying the base current for the emitter-follower transistor. All the output current flows through the emitter follower transistor and it will need to be heat-sinked adequately via a fin. Space is provided on the PC board for mounting a small TO-3 minifin heatsink and this will be suitable for currents up to 1 amp. If you intend to draw currents above 1 amp, it will be necessary to mount the 2N 3055 on an larger heatsink which is external to the board.

There are three LEDs in the circuit. The first is connected across the unregulated DC voltage. This indicates the power is ON. The second LED is connected across the fuse. It will light when the fuse blows. This is a handy indication to show that the supply has been overloaded. Before replacing the fuse, you should look for the cause of the overload and prevent if from occurring again.

The third LED is across the output and functions as a very simple voltage indicator. Its brightness will give an indication of the output voltage and you will need to have some comparison with another LED to determine the voltage value. This can be done with the power LED.

A 0-20v meter can be connected across the output to give a more accurate indication. This will be worthwhile in a bench-top model but for a model with a pre-set output voltage, it will be wasted.

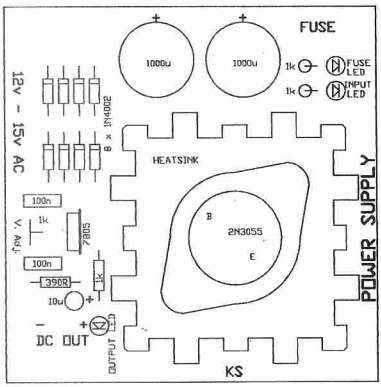
If your system uses several pre-set supplies, one meter could be connected to a rotary switch and the switch turned to monitor each of the supplies. This will keep costs to a minimum while providing accurate monitoring.

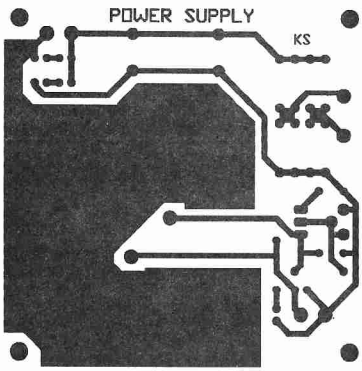
CONSTRUCTION

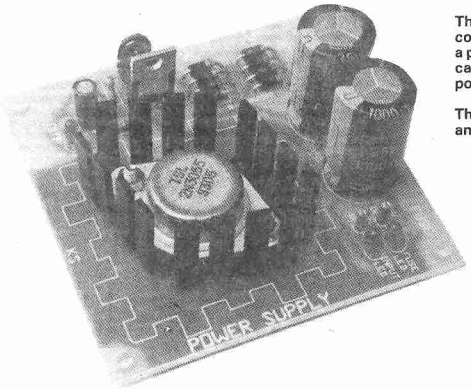
Firstly mount all resistors and diodes on the PC board. If you are making a pre-set unit, the LEDs and trim pots should also be mounted at this stage.

Cut two pieces of insulating sleeving, each 2mm long, and slip them onto the base and emitter leads of the 2N 3055 power transistor. These pieces of sleeving are to prevent the transistor from shorting against the heat-sink.

Bolt the transistor and heatsink onto the PC board. No insulating kit is needed but care should be taken when mounting the completed unit so that the heatsink does not come into contact with anything metal because it is at full unregulated DC voltage.







The final mounting of the PC board and front panel controls is up to you. Our prototype was mounted in a plastic instrument case. It is important to choose a case which has vents, to allow proper cooling of the power transistor.

The fuse is mounted in a panel-mount fuse holder and the fuse should be a 1 amp or 2 amp type.

Power Supply Parts List

1 - 330R
3 - 1K
1 - 1K Mini-trim pot

2 - 100n greencap
1 - 10 mfd 25v pc electro
2 - 1000 mfd 25v pc electro

8 - 1N4002
3 - 5mm LEDs
1 - 7805 regulator
1 - 2N3055

2 - Nuts & bolts
1 - TO3 Heatsink
1 - Power Supply PCB

Extras
Fuse & fuse holder
transformer. 15v@2A
1K lin pot

Next solder the 7805 regulator. The input pin (pin 1) is marked on the PC board and it is important to connected the regulator the correct way around. It must not touch the 2N 3055 or its heatsink as these are at different voltage potentials.

Next solder in the two 100n greencaps and the electrolytics.