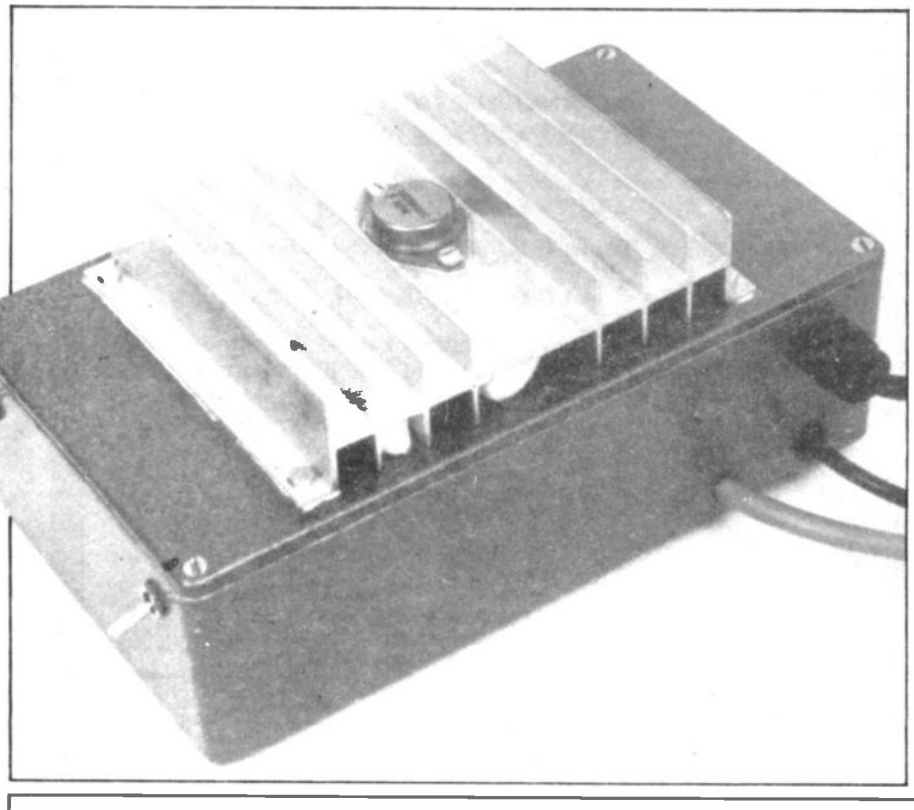
Power Pack for Portable Rigs

Many radio amateurs start by operating a small portable transceiver, such as the Trio 2300 or the Yaesu FT290. Whilst admirable for portable use, these suffer when used as a base station from the limitations of nicad rechargeable cells. The supply may become exhausted in the middle of a contact, and the need to recharge the cells for ten or so hours — for each couple of hours operating — can be very restrictive.

Got a new class B licence and a 2m portable rig? Find a soldering iron and build this project by P.M. Delaney, G8KZG, which will power the rig* plus *a small PA* and *recharge the nicads!

The solution to this problem is to build a mains power supply/nicad charger. In this design it is possible to operate the rig, and a small PA as well if you wish, whilst recharging the nicads from your latest /P expedition at the same time. Details are given as to how to adapt it for a variety of output voltages or charging currents.

The basic power supply consists of F1, T1, D1-4 and C1-3. A toroidal transformer is used for T1. This has the advantage of compactness and low radiated magnetic field. As the turn-on current with this type of transformer is large, F1 must be an anti-surge fuse of appropriate rating. The transformer windings are wired in parallel, and their output fed to a bridge rectifier and capacitance filter.



The operating power supply is built around IC1, an 78HG type regulator. The output voltage of this is set by R3 and R4, according to the formula.

$$V_{out} = \frac{5\,(R3 + R4)}{R4}$$

By altering R3 and R4 a variety of output voltages (from 5 to 15) can be obtained. Values of R3 and R4 for popular output voltages are given later. The output passes through RF chokes L1 and L2 (to prevent RF from the pa or rig passing back towards the mains) and output fuses F3 and F4.

To protect the rig and power amplifier from the possibility of too high a voltage being applied to them, an over-voltage circuit (R2, R5, Z1, C4 and Q1) is fitted. When the voltage across the zener diode is exceeded, the triac Q1 is turned on, and the fuse F2 connected to ground through the limiting resistor R2. This blows the main fuse F2. In practice, the zener voltage should be about 0.7V — 1V higher than the regulator output, to prevent false triggering. The correct zener voltage can be made by putting zener diodes in series (never in parallel!). Resistor R1 serves to discharge the main capacitor bank C1-3 when the fuse blows or the rig is turned off. Without this, the capacitors hold sufficient charge to give a sizeable spark after several hours.

The nicad charging circuit is build around IC2, a 7805 regulator. By Ohm's Law $V = I \times R$. By keeping the voltage across R6 constant (which the regulator does), the current through it is stable. This constant current then flows to ground through the nicads, so charging them, provided that the voltage at the input to the IC2 is at least 7V plus the nicad fully charged potential. The charging current will be (approximately) 5/R mA, where R is the resistance of R6 in kilohm. Typical valves are given later.