HOW IT WORKS – ETI 131.

The 240 volt mains is reduced to 40 Vac by the transformer and, depending on which supply is being built, rectified to either 25 or 50 Vdc. This voltage is only nominal as the actual voltage will vary between 29 volts (58 volts) on no-load to 21 volts (42 volts) at full load. The same filter capacitors are used in either case. They are connected in parallel for the 25 volt version (5000 μF) and in series for the 50 volt version (1250μF). In the 50 volt version the centre tap of the transformer is connected to the centre tap of the capacitors thus ensuring correct voltage sharing between the capacitors. This arrangement also provides a 25 volt supply for the regulator IC.

The voltage regulator is basically a series type where the impedance of the series transistor is controlled in such a way that the voltage across the load is maintained constant at the preset value. The transistor Q4 dissipates a lot of power especially at low output voltages and high current and is therefore mounted on the heatsink on the rear of the unit. Transistor Q3 adds current gain to Q4, the combination acting as a high-power, high-gain, PNP transistor.

The 25 volts is reduced to 12 volts by the integrated-circuit regulator IC1. This voltage is used as the supply voltage for the CA3130 ICs and is further reduced to 5.1 volts by zener diode ZD1 for use as the reference voltage. The voltage regulation is performed by IC3 which compares the voltage as selected by RV3 (0 to 5.1 volts) with the output voltage as divided by R12 and R13. The divider gives a division of 4.2 (0 to 21 volts) or eight (0 to 40 volts). However at the high end the available voltage is limited by the fact that the regulator loses control at high current, as the voltage across the filter capacitor approaches the output voltage and some 100 Hz ripple will also be present. The

output of IC3 controls transistor Q2 which in turn controls the output transistor such that the output voltage remains constant regardless of line and load variations. The 5.1 volt reference is supplied to the emitter of Q2 via Q1. This transistor is in effect a buffer stage to prevent the 5.1 volt line from being loaded.

Current control is performed by IC2 which compares the voltage selected by RV1 (0 to 0.55 volts) with the voltage generated across R5 by the load current. If say 0.25 volts is set on RV1 and the current drawn from the supply is low, the output of IC2 will be near 12 volts.

This causes LED 2 to be illuminated as the emitter of Q1 is at 5.7 volts. This LED therefore indicates that the supply is operating in the voltage-regulator mode. If however the current drawn is increased such that the voltage across R5 is just above 0.25 volts (in our example) the output of IC2 will fall. When the output of IC2 falls below about 4 volts Q2 starts to turn off via LED 3 and D5.

The effect of this is to reduce the output voltage so that the voltage across R7 cannot rise further. When this happens the voltage comparator IC3 tries to correct for the condition and its output rises to 12 volts. IC2 then takes more current to compensate and this current causes LED 3 to light, indicating that the supply is operating in the current-limit mode.

To ensure accurate regulation the voltage sensing leads are taken to the output terminals separately from those carrying the load current.

The meter has a one milliamp movement and measures the output voltage (directly across the output terminals) or current (by measuring the voltage across R5) as selected by the front panel switch SW2.
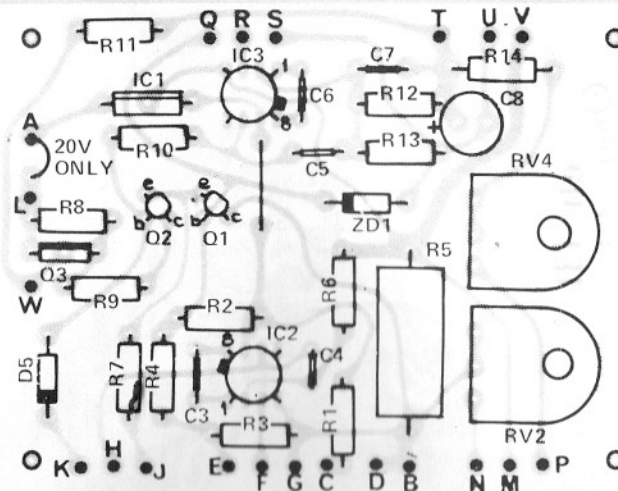

Fig. 3. Component overlay for the printed-circuit board assembly.

Fig. 4. How the supply is wired for the 20 volt 2.5 ampere version.