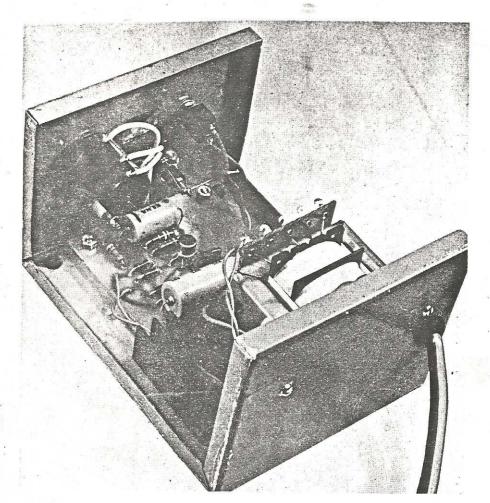
CPOWER



N our April 1972 issue we published constructional details of a dual power supply unit for the experimenter. Since then we have received a surprisingly large number of requests for a simple unit to power RTL and TTL logic circuitry.

Here then are details of a simple yet versatile power supply capable of delivering 1 amp up to 10 volts and ½ amp up to 15 volts.

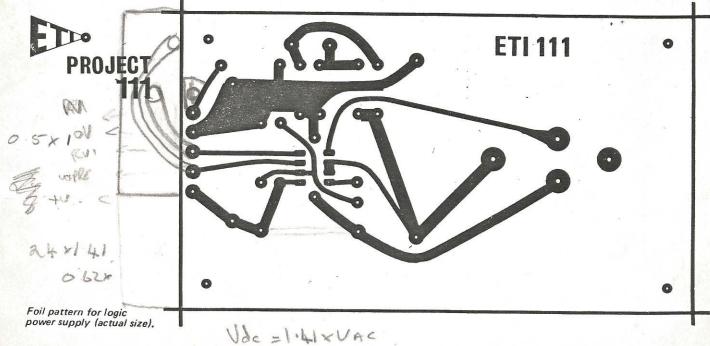
The unit may readily be adapted to operate over other voltage and current ranges.

If required, refinements such as output voltage and current metering, variable current limiting etc. may be added to the basic circuit.

VOLTAGE REGULATOR IC

The control circuit of this supply is formed by the integrated circuit precision voltage regulator — shown as IC1 in Fig. 1. This IC is now produced by a number of companies including SGS, Fairchild and Motorola (respective type numbers are included in the parts list for this project).

The integrated circuit is-a monolithic voltage regulator constructed on a single silicon chip using the planar expitaxial process. The device consists of a temperature compensated



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FOR 200 & R3 = 34K R2 = 2K, FORIOV R3 = 4705 R2 = 1.2KSZ

Simple, adjustable power source has

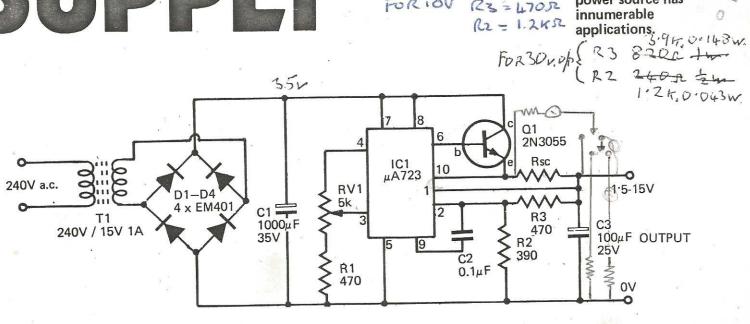
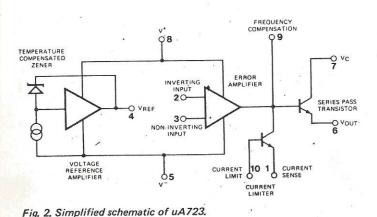


Fig. 1. Circuit diagram of regulated supply.



NON-INVERTING Circuit schematic of IC uA723.

reference amplifier, error amplifier, power series-pass transistor current limiting circuit. Additional external npn and pnp pass elements may be used when output currents exceeding 150mA (from the IC) are required. Provision is made for adjustable current limiting and remote shut-down. In addition to this the IC features low standby current drain, low temperature drift and high ripple rejection.

CONSTRUCTION

Our prototype unit was built on an epoxy glass board, however the constructional method is not critical and the unit may alternatively be built on matrix board, tag strips etc.

The power transistor is mounted on a 2" strip of extruded heatsink which in turn is located on the printed circuit board by the same screws that locate the transistor. One of these screws is

HOW IT WORKS

simplified Figure 2 shows a equivalent circuit of IC1. The voltage produces reference amplifier (typically) 7.15V at pin 4, this voltage has a maximum temperature coefficient of 0.015%/°C.

The V_{ref} voltage is taken to potentiometer RV1 which enables it to be varied between 0.7V and 7.15V. The error amplifier (within the IC) drives a power transistor (also within the chip), and this in turn drives the external series pass transistor Q1.

The output of Q1 is divided by R2 and R3 (÷2.2) and this voltage provides the feedback signal for the error amplifier. Hence the output voltage will be approximately 2.2 times the voltage on RV1.

Current limiting is determined by the voltage drop across, RSC. If this exceeds 0.6V, the current limit

transistor within the IC becomes forward biased and bypasses any further increase in drive current from

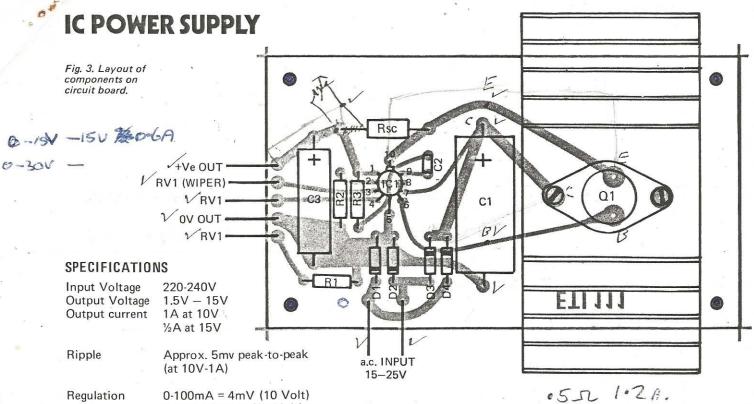
the output stage.

The max. output voltage and current of this unit is a function of the transformer, filter capacitor, and the heatsinking of Q1. The prototype unit used a 15V centre tapped 1A transformer (AR 2155) and this provided 1A up to 10V and 1/2A at 15V. The drop in output current is due to rectified dc voltage decreasing on load. If a higher voltage transformer is used - or one with a higher current rating, thus providing better regulation - then higher output currents may be expected.

The maximum output voltage may be altered by changing the ratio of R2 and R3. Note that the maximum no-load voltage across C1 should not exceed 35V.

O COMPENSATION

Sharring November to to Hair



also used for the electrical connection for the collector of the transistor.

0-100mA = 4mV (10 Volt)0-1.0A = 20mV (10 Volt)

Regulation

The IC may be soldered directly into the circuit - ensure that the device is correctly orientated - and avoid excess heat. Recommended maximum lead temperature during soldering is 300°C.

A load sensing resistor (RSC) is used to provide overload protection. In our prototype we used a short length of the current to the desired value. An in series interesting alternative is to substitute a warmen ohms 5 Watt wire-wound potentiometer for RSC. This enables the current limiting facility to be steplessly varied. With this feature the user can start experimenting with a very low current limit and then increase the current when the circuit is operating correctly.

The basic circuit described in this article can be modified to provide other ranges of voltage and current. The main design limitations are that the voltage across the IC must not exceed 40V and that the output current from the IC must not exceed 150mA, or 800mW of power.

Transistor Q1 (2N 3055) is capable of dissipating up to 115 watts but if power levels of this magnitude are envisaged then a second transistor should be added, in a Darlington pair configuration, to transistor Q1. This will reduce the loading on IC1. A larger heat sink will also be required.

INCREASED RIPPLE REJECTION

The integrated circuit chosen for this project has a typical ripple rejection of 74 dB. This is more than adequate for most applications. However by additional filtering at the non-inverting input (pin 3), the ripple can be even further reduced. A typical performance, using a 4.7µF capacitor across the non-inverting input and Vref is approximately 86 dB.

652 - 100 mA

100s 2001

RSC - TYPICAL VALUES

Value of RSC Current Limiting

65mA 10 ohms 650mA 1 ohm 0.5 ohms 1.4A 3.2A 0.2 ohms

1N4005 - 1A 6001. 0.62A 2004

1-24AMAY

2442A WT18AT 1330

PARTS LIST ETI 111

100 JE BUSHT WIRE WOUND RI OP 1.24 0.043 W R2 08 R3 08 see text 0.5 okm. RSCOP 27 P RV1 potentiometer 5k linear diodes EM401, 1N4005 or similar 199.25 D1-D4320 transistor 2N3055 65P integrated circuit uA723 55P. Q1 hof DIECTOR ZOPP (or SGS L123, or MC1723CG) (2) (2) (metal can types) capacitor 1000 uF 35V electrolytic C1 18P 186. KWE C2 OP. capacitor 0.1 uF 100V capacitor 100 uF 25V electrolytic T1/3-92 transformer 240V primary \$200 MARSHILLS

PC board ETI 111 250 00 on-off switch, terminals, knob, 3 core flex and plug, metal box approximately 4½ x 3½ x 6 etc.

15-20V sec @ 1A

WELL \$1.00

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SPECIFICATION

INPUT VOLTAGE 240U.

OUTPUT VOLTAGE, TWO RANGES.

4V-15V. 0

4 V -30 V. @

OUTPUT CURRENT, O GLOMA at 12U 70MA at 15V.

@ 1.2A at 20V HOOMA of 30V.

CURRENT LIMIT 0:006 A - 1.2 A.