Farnell

E30 BENCH POWER SUPPLIES

INSTRUCTION BOOK

THE QUALITY OF
THIS MANUAL IS
THE BEST THAT
IS AVAILABLE

CONTENTS

SCHEDULE OF EQUIPMENT

The unit has been carefully packed to prevent damage in transit. When removing the unit from the box be sure that all parts and accessories (if applicable) are removed from the packing material.

The complete equipment comprises:-

a) 1 off E30 power supply of specified model

b) 1 off Instruction book

Note:- In the event of damage in transit or shortage in delivery, separate notices in writing should be given to both carriers and Farnell Instruments Ltd., within five days of receipt of the goods, followed by a complete claim within ten days. All goods which are the subject of any claim for damage in transit or shortage in delivery should be preserved intact as delivered, for a period of 14 days after making the claim, pending inspection or instructions from Farnell Instruments Ltd. or an agent of this Company.

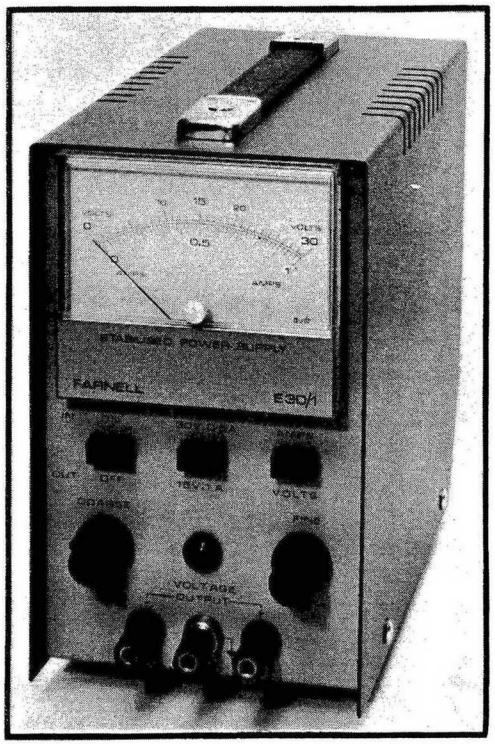
INTRODUCTION

An E30 laboratory bench power supply offers a choice of voltage and current ranges, selected by means of a push button switch. Model E30/1 provides a stabilised d.c. voltage variable 0 to 30 volts at 0.5 amps or 0 to 15 volts at 1 amp whereas model E30/2 provides 0 to 30 volts at 1 amp or 0 to 15 volts, 2 amps. The ET30/2 is a twin version of the E30/2

A push button switch selects the required meter scale to display either voltage or current. A similar push button switches mains input to the unit on or off. Coarse and fine potentiometers provide precise control over the continuously variable output.

The units are protected against progressive and sudden overloads by electronic current limiting preset at approximately 110% of the maximum current on the range employed. In operation this circuit limits the current that may be drawn from the unit. With progressive overload the voltage output falls while the current remains approximately constant. On removal of overload the output will reset to its original voltage.

The E30 power supplies will operate from mains supplies of 220V or 240V a.c. 50/60Hz in ambient temperatures of up to 45°C.



Model E30/2 is similar with appropriate range markings

SPECIFICATION

MAINS INPUT	110, 220 or 240V a.c. ±10%, 50/60Hz
OUTPUT E30/1 E30/2 ET30/2	0-30V, 0.5A or 0-15V, 1A selected by switch 0-30V, 1A or 0-15V, 2A selected by switch 2 x 0-30V, 1A or 0-15V, 2A selected by switch.
LINE REGULATION Output change for a ±10% mains change	Less than 0.02% or 2mV whichever is greater
LOAD REGULATION Output change for a zero to full load change	Less than 0.03% or 3mV whichever is greater
RIPPLE AND NOISE CONTENT at full load (Δf = 80kHz)	Less than 1mV r.m.s.
OUTPUT IMPEDANCE, typical	0.04Ω at 10kHz
TRANSIENT RECOVERY TIME, typical	Less than 20μS for output to recover within 50mV following a zero to full load change of 1μS risetime
TEMPERATURE COEFFICIENT, typical	0.02% per °C
OPERATING TEMPERATURE RANGE	0 to 45°C
STORAGE TEMPERATURE RANGE	-20°C to +50°C
PROTECTION	Constant current limiting preset to approx. 110% of maximum output current. Fuses for mains input and d.c. output
OVERALL DIMENSIONS approx.	E30/1 and E30/2 / ET30/2 Height 187 mm (7⅜") / 181 mm (7.13") Width 106 mm (4⅛") / 214 mm (8.43") Depth 221 mm (8¾") / 240 mm (9.45")
WEIGHT approx.	3.4 kg (7½ lbs) / 6.2 kg (13.64 lbs)

OPERATING INSTRUCTION

Installation

The units are normally supplied set for use with a.c. mains supplies of 240V nominal. On request at the time of ordering, units can be set for 220V or 110V nominal operation. Units are set to 110, 220 or 240V input by means of a simple tap change on the transformer, which is labelled to indicate the appropriate connections.

Check that the unit supplied is set to the correct nominal input. Unless a label on the unit states 220 or 110V it may be assumed that the unit is set for 240V a.c. input.

The mains lead is wired as follows:-

Brown	-	Mains live
Blue	-	Mains neutral
Green/yellow	-	Earth

Operating instructions

Observing the correct colour coding and supply requirements connect the mains lead to the supply.

Depress the button 'INPUT ON/OFF'. The mains neon on the front panel will illuminate.

Select the required VA range using the centre push button marked 'RANGE'. Depress (in) for 0-30V and release (out) for 0-15V.

Select 'VOLTS' on the 'METER' push button and adjust the coarse and fine controls until the required output is shown on the upper scale (volts) of the meter.

Connections to the load are taken from the front panel screw terminals which will accept 4mm plugs, spade terminals or the bared ends of the connecting wires.

By depressing the 'METER' button it is possible to read the amount of current being supplied to the load.

Overload protection

The current limiting facility provides automatic protection in the event of accidental short circuits or overloads. This occurs at approximately 110% of the maximum current on each range. The circuit limits the current that may be drawn from the unit. With progressive overload the voltage at the output falls while the current remains approximately constant.

On removal of overload the output will reset automatically to its original voltage.

Fuses

The mains input and regulated output circuits are each protected by fuses accessible on the back panel of the unit.

Note: Before removing either fuse ensure the unit is disconnected from the mains supply

CIRCUIT DESCRIPTION

General

The output from the two main secondaries of the mains transformer MT1 are switched by SW2a and SW2b in series or parallel for 0-30 or 0-15 volt operation respectively. This a.c. voltage is rectified by a bridge and smoothed by a reservoir capacitor to provide an unstabilised d.c. supply. The positive of the unstabilised supply is fed to the collector of VT6 (and VT7) through R16 (and R18) to the positive output terminal. The negative of the unstabilised supply is fed through F2 to the negative output. An auxiliary supply for the stabilising circuit is obtained from the other secondary winding, which is rectified by D1 and D2 and smoothed by C1.

Stabilisation circuit

Current is taken from the auxiliary supply across C1 and fed through R1 to Z1 which is the first zener diode and provides rough stabilisation. The voltage across Z1 is further stabilised by Z2, D3 and Z3 which are fed by R2. These provide the stabilised voltages for the amplifier, namely +10V (nominal) -0.7V (nominal) and -5.8V (nominal), which are referred to the positive output terminal via the feedback connection. Current from the +10V line is passed through R3 to Z4 which provides a stable reference voltage.

The reference voltage passes current down the potential divider formed by R4 and T1 and P1 and P2. (R7 and T2 shunt P1 and P2 through SW2c only in the 0-15V mode). The other end of the potential divider is connected via the negative feedback lead to the negative output. The differential amplifier formed by VT1 and VT3 senses any voltage difference between the junction of T1 and P1, and the positive output.

Thus, assuming the voltage on the output tries to rise, the base of VT1 will become negative and VT1 will tend to turn off. This reduces the current through R5 and the base/emitter junction of VT2 decreasing the current through VT2 collector. This decreases the current drive into VT5 base through R8, and hence the current drive into VT6 base. Therefore the current into the output load and the voltage across it decreases. Alternatively if the voltage on the output tends to go down, the reverse process increases the output current and therefore the output voltage.

The sum effect is to keep the voltage at a value fixed by the value of P1 and P2 against all load variations. Z4 provides a stable reference against mains supply variations.

Overload protection

The current through R16 gives a voltage proportional to output current. This is sensed by R9, T3 and R10. R10 provides a negative bias on the base of VT4 which is turned off in normal use. As the output current rises the voltage at the base of VT4 rises until it is positive enough with respect to VT4 emitter, which is set at -0.7V, to turn VT4 on. Drive current to the base of VT5 is then shunted through VT4 collector. This limits the maximum current available at the output. The value of current available is preset by T3. On removal of the overload VT4 is switched off and the output voltage returns to its previous level. R11 is switched to

shunt R10 in the 0-15V mode, increasing the bias on VT4 base and allowing the voltage across R16, (and therefore the current through it) to rise to a higher value before VT4 is turned on.

Metering

A one milliamp f.s.d. meter is used to monitor the output voltage or current. SW3 in the volts position connects the meter in series with R13 and T5, (between positive and negative output terminals). T5 is set to give f.s.d. on the meter at 30 volts. With SW3 in the current position the meter (with T4 in series) senses the voltage across R16. T4 is set to give f.s.d. on the meter with an output current of 1 amp on model E30/1 and 2 amps on models E30/2 and ET30/2.

MAINTENANCE

Guarantee

The equipment supplied by Farnell Instruments Ltd., is guaranteed against defective material and faulty manufacture for a period of twelve months from the date of despatch. In case of material or components employed in the equipment but not manufactured by us, we allow the customer the period of any guarantee extended to us.

The equipment has been carefully inspected and submitted to comprehensive tests at the factory prior to despatch. If, within the guarantee period, any defect is discovered in the equipment in respect of material or workmanship and reasonably within our control, we undertake to make good the defect at our own expense subject to our standard conditions of sale. In exceptional circumstances and at the discretion of the Service Manager, a charge for labour and carriage costs incurred may be made.

Our responsibility is in all cases limited to the cost of making good the defect in the equipment itself. The guarantee does not extend to third parties, nor does it apply to defects caused by abnormal conditions of working, accident, misuse, neglect or wear and tear.

Maintenance

In the event of difficulty, or apparent circuit malfunction, it is advisable to telephone (or telex) the Service Department or your local Sales Engineer or Agent (if overseas) for advice before attempting repairs.

For repairs it is recommended that the complete unit be returned to:-

The Service Department,
Farnell Instruments Ltd.,
Sandbeck Way,
Wetherby, Yorkshire.
LS22 4DH

Tel: 0937 63541 Telex: 557294

or

London Office,
Farnell Instruments Ltd.,
2 Orley Court,
Greenford Road,
HARROW, Middlesex.
HA1 3QD.

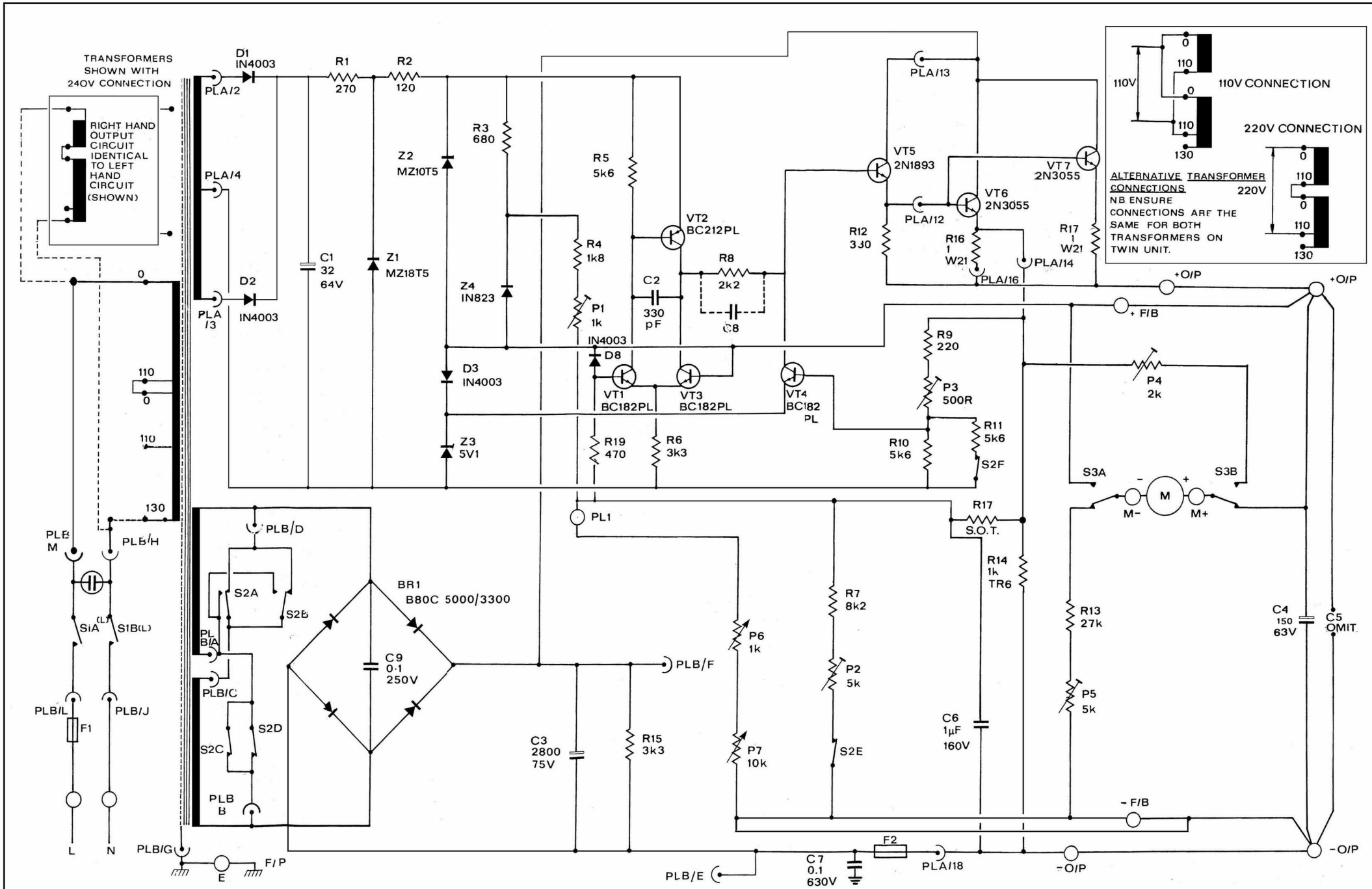
Tel: 01-864 7433 and 7434

Please ensure adequate care is taken with packing and arrange insurance cover against transit damage or loss.

ERRATA & ADDENDUM

Alternative components to those listed on the circuit diagram may be used in the event of supply difficulties.

Major design changes are listed below:-



H	21·4·80	Q6403	I	8-5-80	Q6435
G	23·01·80	Q6247	J	18·2·81	Q6847
F	8.8.78	Q4906	K	26·8·82	Q8028
E	2. 6.78	Q4705			
D	3·12·74	Q3257			
–	9·6·77	---			

All resistor values given in ohms unless ohterwise stated
"" capacitor "" "" "" μF

FARNELL INSTRUMENTS LTD. WETHERBY

TITLE
CIRCUIT DIAGRAM
E30/2 ET30/2

DRAWING No.
2SZX0095

SHEET 1 OF 1 SHEET