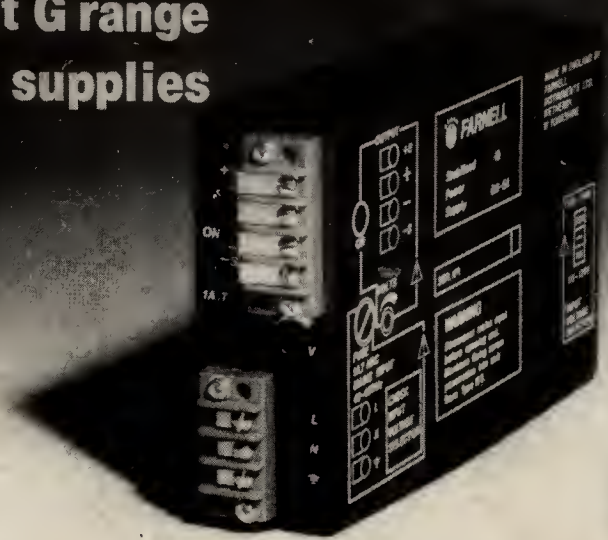
Instruction book for 30 Watt G range power supplies



Farnell

SCHEDULE OF EQUIPMENT

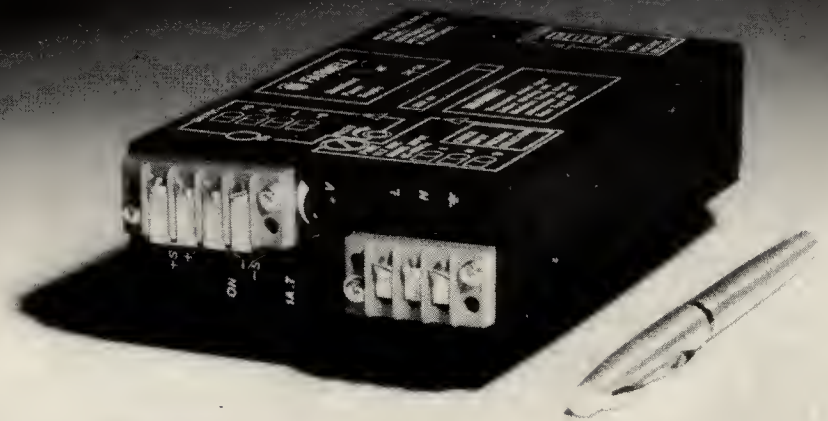
The unit has been carefully packed to prevent damage in transit. When removing the unit from the box ensure that all parts and accessories are removed from the packing material.

The complete equipment comprises:-

a) 1 off G range power supply of the type specified on order.
b) 1 off instruction book.
c) 1 off packet of accessories comprising:-
   1 off spare fuse.
   2 off flat washers.
   2 off spring washers.
   7 off terminal tags.
   2 off fixing screws 8mm long (see note in paragraph 'Mounting and ventilation' on page 8).
   1 off optional fixing bracket.

CONTENTS

The G6-5M power supply



INTRODUCTION

The Farnell 30 watt G range power supplies use a switching technique to provide stabilised d.c. from a.c. inputs. Use of these techniques has permitted the production of very compact lightweight, high efficiency power supplies which will work from a wide range of mains input voltages.

Four different units are available in the same mechanical package. These are based on combinations of output voltage and current which give a maximum output power of approximately 30 watts.

Each unit will operate from a nominal mains input voltage of either 220 to 240V or 115 to 120V, the range being set by a voltage selector switch on the rear panel.

The output voltage setting may be varied by screwdriver adjustment of the front panel potentiometer and the presence of output voltage is indicated by a front panel L.E.D.

Output current limiting and overvoltage protection are provided. The output voltage may be remotely sensed at the load to correct for voltage drop in the load connecting leads.

The units meet international specifications for conducted radio frequency interference and input to output isolation.

SPECIFICATION

MAINS INPUT

220 to 240V or 115 to 120V set by voltage selector switch 45 to 440Hz.

MAINS VARIATION TOLERATED

220V —20% to 240V + 10%.
115V —20% to 120V + 10%.

OUTPUTS

Unit	Nominal output voltage	Max. output current	Voltage adjust. range
G6-5M	6V	5A	4 to 6V
G12-2.5M	12V	2.5A	8 to 13.2V
G15-2M	15V	2A	10 to 16.5V
G24-1.4M	24V	1.4A	16 to 26.4V

OUTPUT VOLTAGE REGULATION

0.1% maximum variation for a worst case combination of 0 to 100% load change and 220V —10% to 240V + 10% or 115V —10% to 120V + 10% line change.

RIPPLE AND NOISE at full load (30MHz bandwidth)

Less than 10mV r.m.s.; 50mV pk to pk.

TEMPERATURE COEFFICIENT ±0.01% per °C typical.

TRANSIENT RECOVERY TIME

Typically 1mS for output to recover within 50mV following a 10% to 100% or 100% to 10% load change of 5µS risetime. Typical instantaneous output deviation 400mV.

OPERATING AMBIENT TEMPERATURE RANGE

—10 °C to +55 °C for full load output current. Convection cooled free air rating

MAXIMUM OPERATING AMBIENT TEMPERATURE

70 °C max. Output current should be derated linearly from full load at 55 °C to half load at 70 °C.

STORAGE TEMP. RANGE

—40 °C to +85 °C

HOLD-UP TIME

Output will be maintained for the duration of a missing mains cycle (28mS) at maximum output current and 220V —10% or 115V —10% mains input, when the output is at 6V for 6V nominal units or nominal +5% for other units.

See graphs on page 9 and 10

SWITCH ON SURGE	Less than 80A
SWITCH ON TIME	Output established within 30mS
INSULATION	Tested at 2.1kV peak for 1 minute between a.c. input and d.c. output, with output terminals and earth connected together. ±250V d.c. continuous rating between output and earth. Tested to 500V d.c. for 1 minute.
REMOTE SENSING	Up to 5V max. drop in each output lead permitted. However unit output terminal voltage must not exceed 6V for nominal 6V units, or nominal +5% for other units.
EFFICIENCY	Better than 70% at full load
PROTECTION	*Overload* Current limiting set at 110% ±5% of full load current with the short circuit current 100% – 130% of full load current.

	Overvoltage Set at nominal output voltage +20%. Disables control circuit and output falls to zero. Reset by interrupting the mains input supply. *Fuse* The a.c. input is fused (fuse type 1A.T.)
SERIES AND PARALLEL OPERATION	Any number of units with the same output voltage may be connected in parallel. Outputs of similar current rating may be connected in series up to a maximum total output voltage of 250V
RADIO FREQUENCY INTERFERENCE	Units will comply with the conducted interference requirements of VDE0875 curve N, CISPR (publication 2) curve N and BS800
DIMENSIONS (excluding terminals)	145 x 88 x 33mm
WEIGHT	750g

OPERATING INSTRUCTIONS

WARNING!
Hazardous voltages exist at many points within the unit. DISCONNECT THE MAINS INPUT SUPPLY BEFORE OPENING THE UNIT. If the unit requires servicing it is recommended that it be returned to the manufacturer.

MAINS INPUT
The mains input terminals are on the 3 way front panel terminal block and are marked L (live), N (neutral) and ⏚ (earth). The unit will operate from either a 115 to 120V supply or a 220 to 240V supply and this should be set by the voltage selector switch on the rear panel of the unit before connecting the mains input supply.
For 115 to 120V operation set the voltage selector to 115V.
For 220 to 240V operation set the voltage selector to 230V.

WARNING: INCORRECT SETTING OF THE INPUT VOLTAGE SELECTOR SWITCH MAY RESULT IN DAMAGE TO THE UNIT.

OUTPUT CONNECTIONS
The output connections are taken from the terminals marked '+' and '—' on the 4 way front panel terminal block. Ensure that the '+s' terminal is linked to the '+' terminal and the '—s' terminal linked to the '—' terminal unless remote sensing is being used. The presence of output voltage is indicated by the front panel L.E.D. adjacent to the terminal block.

REMOTE SENSING
In order to correct for voltage drop in the load connecting leads, the voltage at the load may be remotely sensed. To do this remove the metal links supplied from the '+s', '+', '—', and '—s' terminals, connect the load leads to the '+' and '—' terminals in the normal way and connect the '+s' and '—s' terminals to the point at which regulated voltage is required, observing polarity.

When using remote sensing the unit terminal voltage (i.e. load voltage + total lead drop) should not exceed 6V for 6V nominal units and nominal output voltage +5% for other units in order that full output specification be maintained. Additionally there is a limitation of 5V maximum drop in each output lead.

OUTPUT VOLTAGE ADJUSTMENT
The output voltage may be set (without derating max. output current) anywhere within the range shown in the unit specification, by screwdriver adjustment of the front panel 'VOLTS' potentiometer.

SERIES AND PARALLEL OPERATION
Any number of units with the same nominal output voltage may be connected directly in parallel.

Units with the same output current rating may be connected directly in series up to a maximum total output voltage of 250V.

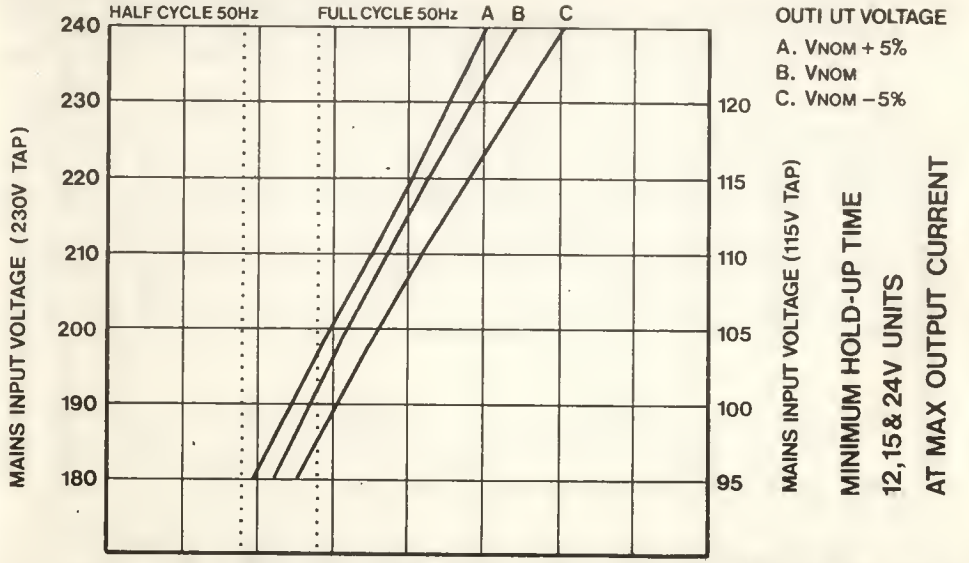
MOUNTING AND VENTILATION

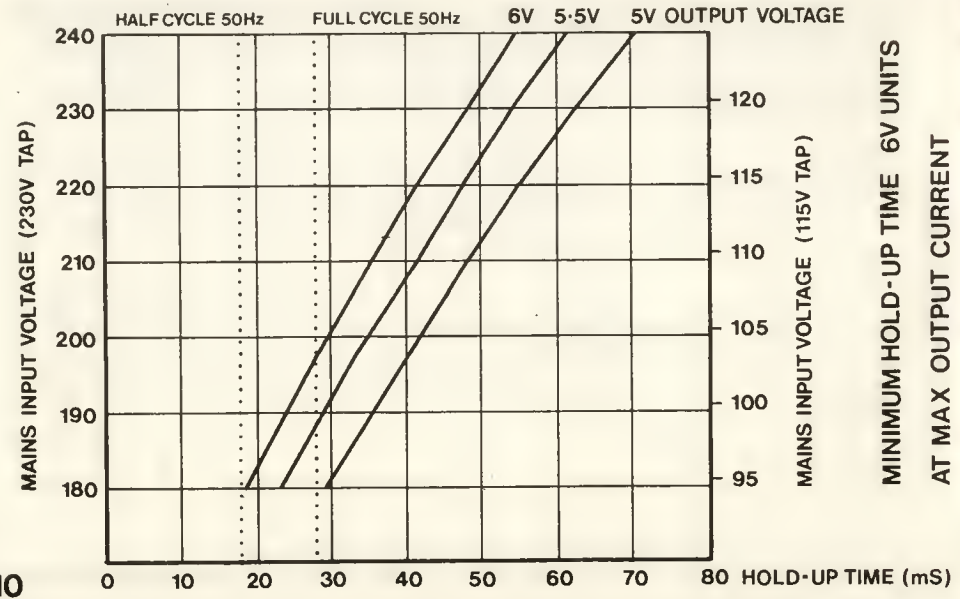
The unit may be operated in any position but provision should be made to allow free air circulation around the unit, since cooling is by natural convection. The unit is provided with M3 threaded fixing holes in the base and left-hand side. NOTE: fixing screws must not penetrate the unit by more than 6mm (8mm long fixing screws are supplied).

An additional angle bracket is supplied to give extended fixing centres on the side of the unit. If required, this bracket may be fixed to the unit using the screw in the top left-hand corner of the front panel.

OUTPUT HOLD-UP TIME

The output characteristics are shown by the graphs below and it will be seen that there is a trade off between mains failure hold-up time, output voltage (including lead drop) and minimum mains input.





CIRCUIT DESCRIPTION

The following is a simplified description of the G30 watt circuit operation and should be read with reference to the schematic diagram on page 14.

POWER CIRCUITS

The mains input supply is connected through the input filter and bridge rectifier MR101 to reservoir capacitors C105, C106 (for 115V operation MR101, C105 and C106 are connected as a voltage doubler circuit). The resulting d.c. rail of about 340V supplies power via current transformer TX101 to a single transistor forward converter, formed by transformer TX102 and switch transistor VT106. The transformer secondary voltage is rectified by D4 and D5 and then filtered by L1, L2, C9, C14, C15 to produce a d.c. voltage at the output terminals. This d.c. voltage is proportional to the average d.c. level of the pulse waveform on the transformer secondary.

VOLTAGE CONTROL CIRCUIT

A proportion of the output voltage is compared with the reference voltage at Z3 by the voltage control amplifier IC4. Any difference between these two voltages is amplified to produce a d.c. control signal which is coupled by opto isolator IC3 to VT105. This transistor compares the control signal with a voltage ramp developed across C111.

When the ramp voltage exceeds the control signal then VT105 triggers SCR101 which pulls off switch transistor VT106.

Conduction of VT106 is initiated by clock pulses generated at a frequency of 30kHz by PUT101 and VT102. VT106 is maintained in conduction by regenerative feedback from current transformer TX101, until SCR101 conducts. At this point VT106 ceases to conduct until driven by the next clock pulse.

In this way, the conduction time of VT106, and hence the average secondary voltage from transformer TX102, can be varied by the d.c. control signal to stabilise the power supply output voltage.

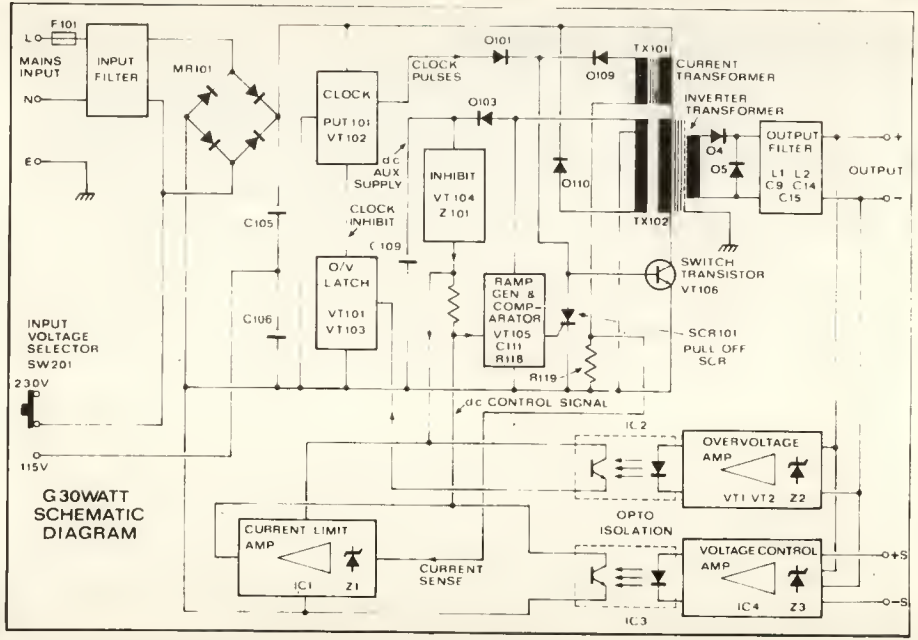
An overwind on transformer TX102 is used to generate the voltage ramp by charging C111 through R118, when VT106 conducts. Capacitor C111 is discharged when VT106 turns off and the voltage across TX102 drops. An auxiliary supply rail is also derived from the overwind on TX102 to power VT105 and the current limit amplifier. VT104 and Z101 act as an inhibit on this supply rail to prevent VT106 switching when the mains input is low.

CURRENT LIMIT CIRCUIT

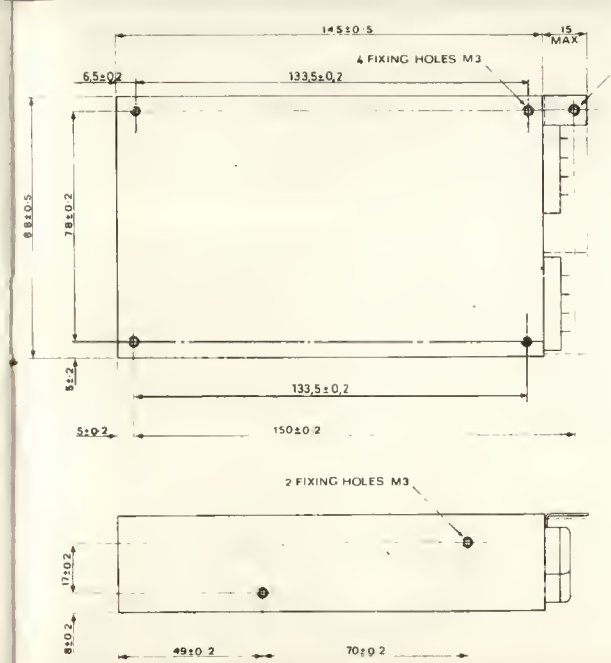
The peak current in transformer TX101, proportional to the power supply output current, is sensed across R119 by the current limit amplifier IC1. This compares the sense voltage with the reference voltage at Z1. If the peak voltage across R119 exceeds a pre-set level then the output of the current limit amplifier falls and overrides the d.c. control signal from the voltage amplifier. The conduction time of switch transistor VT106 is reduced and the output voltage of the unit falls sufficiently to limit the output current to a safe value.

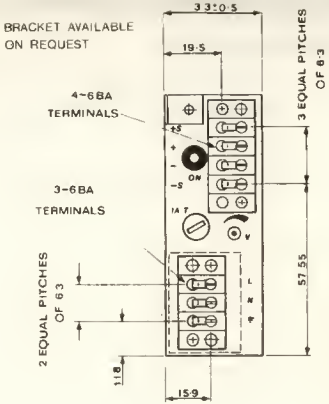
OVERVOLTAGE PROTECTION CIRCUIT

A proportion of the unit output voltage is compared with the voltage across Z2 by the overvoltage amplifier VT1, VT2. If the output voltage exceeds a pre-set level then the overvoltage amplifier provides a drive signal which is coupled through opto-isolator IC2 to a transistor latch formed by VT101, VT103. When this latch is triggered the clock is inhibited and VT106 ceases to switch, giving complete shut-down of the power supply. The latch stays in the triggered condition until the mains input supply is interrupted for a few seconds.



G30WATT SCHEMATIC DIAGRAM





G SERIES
OUTLINE DRAWING
30W PACKAGE

Drg. No.4SZU0027
Date 21-2-79
Iss. B

FARNELL INSTRUMENTS LTD WETHERBY W YORKS

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 the 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:-

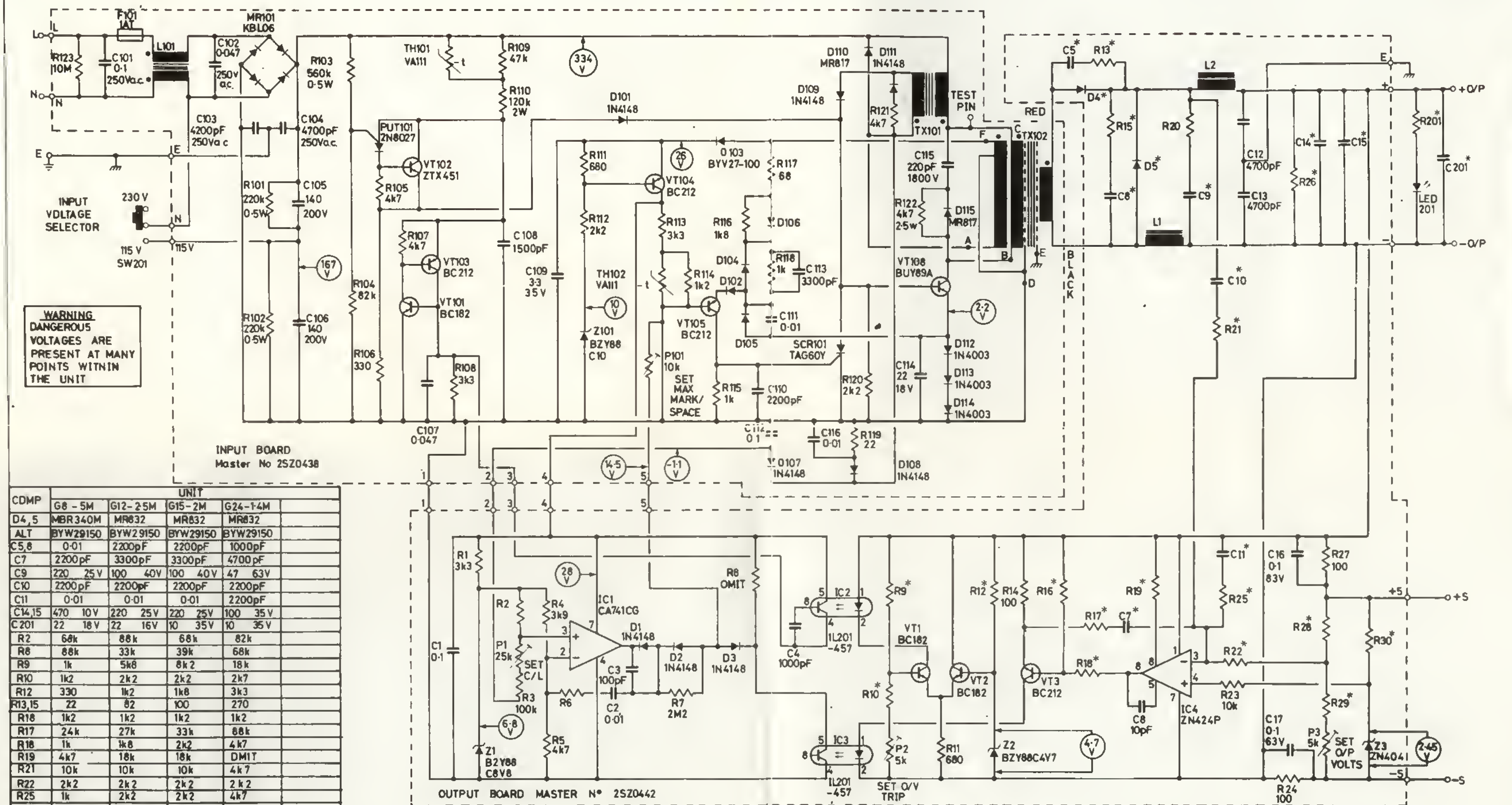
The Service Department,
Farnell Instruments Ltd.,
Sandbeck Way,
Wetherby, Yorkshire.
LS22 4DH.
Tel. 0937 61961. Telex 557294.

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

NOTES

Note:- In the event of damage in transit or shortage in delivery, separate notices in writing should be given to both the carriers and Farnell Instruments Ltd., within three days of receipt of goods, followed by a complete claim within five 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 seven days after making the claim, pending inspection or instructions from Farnell Instruments Ltd., or an agent of this Company.

R	123 · 101,102 · 103,104,105,106, 107,108,1 · 109,110,2,3,4,5,6,111,112 · 113,114,7, 115 · 116,8,117,118 · 119,120,121,9,10,122,11 · 12 · 14 · 16 · 13,15,17,18,19,20 · 21,25,22,23,24,26,27,28,29,30 · 201
C	101 · 102 · 103 · 104,105,106 · 107 · 1 · 108 · 109 · 2 · 3 · 110,111,112,113,4 · 116 · 114 · 115 · 5 · 6 · 7 · 8 · 9 · 10,11,12,13 · 17,14,16,15 · 201
VT	101,102,103 · 104 · 105 · 1 · 8 · 2 · 3
MISC	F101,SW201 · MR101 · PUT101 · TH101 · Z1 · Z101 · TH102 · D103,102,104,105 · D108,109,P2,D110,111,115,112,113 · Z2 · D4 · D5 · L1 · L2 · P3 · Z3 · LED 201
MISC	L101 · P1 · IC1 · D101 · P101,D1,2,3 · D106,107,SCR101, IC2, IC3, TX101,D114 · TX102 · IC4



WARNING
DANGEROUS VOLTAGES ARE PRESENT AT MANY POINTS WITHIN THE UNIT
INPUT VOLTAGE SELECTOR
230 V
115 V
SW201
F101 1AT
MR101 KBL06
L101
R123 10M
C101 0·1 250Va.c.
C102 0·047 250V a.c.
C103 4200pF 250Va c
C104 4700pF 250Va.c.
R103 560k 0·5W
TH101 VA111
PUT101 2N6027
VT102 ZTX451
R109 47k
R110 120k 2W
D101 1N4148
D103 BYV27-100
VT104 BC212
VT105 BC212
VT103 BC212
VT101 BC182
Z101 BZY88 C10
TH102 VA111
P101 10k SET MAX MARK/SPACE
SCR101 TAG60Y
D110 MR817
D111 1N4148
D109 1N4148
TEST PIN
TX101
TX102
RED
BLACK
C115 220pF 1800V
R122 4k7 2·5W
D115 MR817
VT108 BUY89A
D112 1N4003
D113 1N4003
D114 1N4003
D107 1N4148
D108 1N4148
INPUT BOARD
Master No 2SZ0438
+O/P
−O/P
+S
−S
IC1 CA741CG
D1 1N4148
D2 1N4148
D3 1N4148
R8 OMIT
P1 25k SET C/L
Z1 BZY88 C6V8
IC2 1L201 -457
IC3 1L201 -457
VT1 BC182
VT2 BC182
VT3 BC212
P2 5k SET O/V TRIP
Z2 BZY88C4V7
IC4 ZN424P
P3 5k SET O/P VOLTS
Z3 ZN4041
OUTPUT BOARD MASTER Nº 2SZ0442

COMP	UNIT G8 - 5M	G12 - 2·5M	G15 - 2M	G24 - 1·4M	
D4,5	MBR340M	MR832	MR832	MR832	
ALT	BYW29150	BYW29150	BYW29150	BYW29150	
C5,8	0·01	2200pF	2200pF	1000pF	
C7	2200pF	3300pF	3300pF	4700pF	
C9	220 25V	100 40V	100 40V	47 63V	
C10	2200pF	2200pF	2200pF	2200pF	
C11	0·01	0·01	0·01	2200pF	
C14,15	470 10V	220 25V	220 25V	100 35V	
C201	22 18V	22 16V	10 35V	10 35V	
R2	68k	88k	68k	82k	
R8	88k	33k	39k	68k	
R9	1k	5k8	8k2	18k	
R10	1k2	2k2	2k2	2k7	
R12	330	1k2	1k8	3k3	
R13,15	22	82	100	270	
R16	1k2	1k2	1k2	1k2	
R17	24k	27k	33k	68k	
R18	1k	1k8	2k2	4k7	
R19	4k7	18k	18k	OMIT	
R21	10k	10k	10k	4k7	
R22	2k2	2k2	2k2	2k2	
R25	1k	2k2	2k2	4k7	
R26	47 1W	270 1W	390 1W	1k 1W	
R28	3k8	15k	22k	43k	
R29	2k2	2k7	3k3	3k9	
R30	820	2k7	3k9	6k8	
R201	270	820	820	1k8	

	ISS	DATE	MOD No	ISS	DATE	MOD No
TRACED	E	5·12·79	Q8140	F	14·3·80	Q6328
CHECKED	D	1·11·79	8113	G	10·4·80	Q6336
	C	4·4·79	5388	N	11·4·80	Q6356
DRAWN	B	24·2·79	Q5231	I	25·6·80	Q6493
I. Kepple	A	1·12·78	———	J	5·1·82	Q7338
				K	23·6·82	Q7911
				L	14·9·63	Q8618

NOTE – Component numbers are prefixed according to location.

PREFIX	EXAMPLE	LOCATION
NONE	VT1	OUTPUT BOARD
1	C101	INPUT BOARD
2	R201	CHASSIS

NOTE – Voltages measured at 240V input and full output current with respect to the negative end of C108 (unless otherwise indicated.) Warning this common measuring point is at mains input potential.

NOTE – D102,104,105,108 – 1N4148

NOTE
CAPACITOR VALUES GIVEN IN μF
RESISTOR VALUES IN Ω
UNLESS OTHERWISE STATED

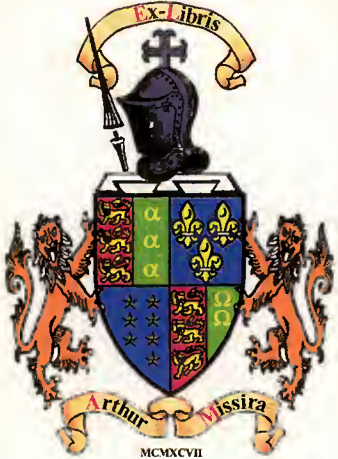
USED ON – 868, 869, 870, 871

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.

TITLE: 30W 'G' SERIES CIRCUIT DIAG.

DRAWING No: 2SZX0100.

SHEET 1 OF 1 SHEETS


Ex-Libris
α
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Arthur
Missira
MCMXCVII

Farnell

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