Farnell

'L' SERIES

BENCH POWER SUPPLIES

INSTRUCTION BOOK

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INSTRUCTION BOOK FOR

'L' SERIES

BENCH POWER SUPPLIES

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SCHEDULE OF EQUIPMENT

The instrument has been carefully packed to prevent damage in transit. When removing the unit from the box, be sure to remove all parts and accessories from the packing material.

The complete equipment comprises:-

a) 1 off L series power supply of the model specified

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 the carriers and Farnell Instruments Ltd., within three days of receipt of the 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.

INTRODUCTION

This instruction book covers the nine models which comprise the Farnell L series bench power supplies. The circuit diagram in the rear flap refers only to the particular model supplied.

The output voltage is regulated and the unit is protected against overloads and short circuits. Two models feature adjustable overvoltage ★ crowbar, this additional protection making them suitable for applications involving integrated circuits.

Output is continuously variable by coarse and fine potentiometers and is monitored by a meter which is switched to show either voltage or current. Separate switching of the mains input and d.c. output is provided.

The L12/10C and L30/5 models have facility for remote sensing of the load voltage, and separate meters for monitoring voltage and current. Some models are twin output units and these outputs may be connected in series or parallel to provide twice the voltage or current.

Units available

L50/05	L30/1	L10/3C★	L30/2	
0-50V at 500mA	0-30V at 1A	0-10V at 3A	0-30V at 2A	
L30/5	L12/10C★	LT50/05	LT30/1	LT30/2
0-30V at 5A	0-12V at 10A	2x0-50V at 500mA	2x0-30V at 1A	2x0-30V at 2A

SPECIFICATION

MAINS INPUT	A.C. mains 110, 130, 220, 240V by internal tap change 50-400Hz
MAINS VARIATION TOLERATED	± 10%
LINE REGULATION OUTPUT CHANGE FOR A ¼10% MAINS CHANGE	Constant voltage less than .01% +1mV short term Constant current less than .01% + 100µA short term
LOAD REGULATION OUTPUT CHANGE FOR A ZERO TO FULL LOAD CHANGE	Constant voltage less than .01% + 2mV short term Constant current less than .01% + 100µA short term
RIPPLE AND NOISE CONTENT AT FULL LOAD (Δf = 80kHz)	Constant voltage less than 1mV pk-pk Constant current less than 0.1% of max. output current
OUTPUT IMPEDANCE (C.V.) TYPICAL	0.1Ω measured at 100kHz and 20°C
TRANSIENT RECOVERY TIME TYPICAL	Less than 25µs for output to recover within 50mV following a 10%-100% load change of 1µs risetime
TEMPERATURE COEFFICIENT TYPICAL	0.01% per °C
OPERATING AMBIENT TEMPERATURE RANGE	0 to 45°C
STORAGE TEMPERATURE RANGE	-20°C to +50°C
OVERLOAD PROTECTION	Adjustable constant current limiting from 10% to maximum. Current limit indication by led mounted in the OUTPUT ON/OFF switch bezel. Automatically resets. L10/3 and L12/10 have over voltage crowbar adjustable 3.2V to 120% Vout max. Trip coefficient 0.02% per °C typical. Fuse protection input and output. Input fuse labelled 'TYPE T' (time-lag) plus value. Output fuse labelled 'TYPE F' (fast acting) plus value. Both are on the underside of the unit.

STABILITY

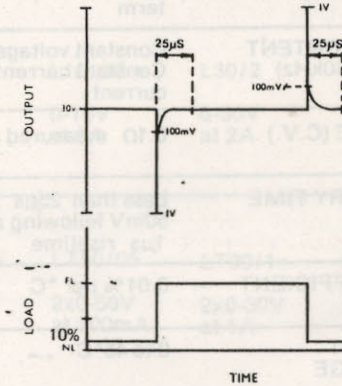
Output variations are due in the main to the following causes:-
a) Load change
b) Mains supply change
c) Component temperature change

a) Load change

i) STEADY LOAD — For a change in steady load from zero to full load the typical change in output is 1mV at full output voltage.

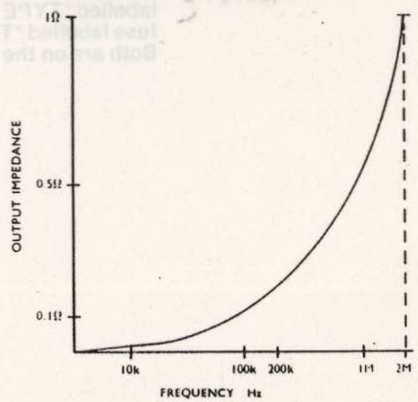
ii) TRANSIENT RESPONSE — The typical response to a pulsed load is shown in fig 1.

Fig. 1 Pulse response



iii) OUTPUT IMPEDANCE — For an alternating load superimposed on a steady load, the output impedance of the supply increases with frequency due to the fall off in gain of the amplifier until it is determined only by the output capacitor across the output terminals. A typical output impedance against frequency curve is shown in fig. 2.

Fig. 2 Output impedance



b) Mains supply change

Short term variations of up to 10% give corresponding variations of up to 0.01% on the output. Surges on the mains supply in the form of short rise time pulses can be fed on to the output by stray capacity. Where these conditions exist a suppressor filter should be connected to the mains lead.

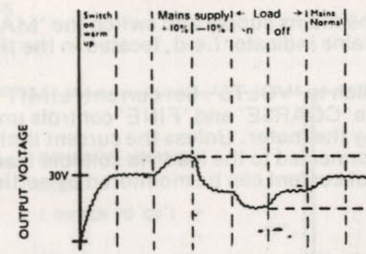
c) Component temperature change

Output variation is caused by component value changes due to temperature change. The temperature change can be i) as a result of ambient change or ii) as a result of internal temperature change, caused by changing internal dissipation from a change in load or supply to the unit.

i) Ambient change — The typical temperature coefficient of output voltage is 0.01% per °C of ambient change with constant load and line.

ii) Internal change — Fig. 3 shows typical output variations caused by mains change and load change plotted against time at constant ambient temperature.

Fig 3



OPERATING INSTRUCTIONS

Installation

Units are normally supplied for 240V operation. 220, 130 and 110 volts input units will have an appropriate label attached to the rear panel.

The fixed mains lead supplied is colour coded:-

Live ....Brown

Neutral ....Blue

Earth ....Green / yellow

Operating instructions

CONSTANT VOLTAGE MODE

Using a small screwdriver set the CV / CI switch on the underside of the unit near the front panel terminals to the CV position.

Before connection to the mains supply is made the 'OUTPUT ON / OFF' switch should be set to 'OFF' and the CV / CI switch set to CV.

Connect the unit to the mains supply and switch the 'MAINS ON / OFF' switch to the 'ON' position. The mains indicator l.e.d. located in the INPUT ON / OFF switch bezel should light.

Set the 'METER' switch to 'VOLTS'. Set current 'LIMIT' control to maximum (fully clockwise). Adjust the 'COARSE' and 'FINE' controls until the required output voltage is indicated by the meter. Unless the current limiting facility is to be used the supply may now be connected to the load via suitable leads by setting the 'OUTPUT' switch to 'ON'. Output current can be monitored by setting the 'METER' switch to 'CURRENT'.

Current limit setting

If a certain maximum current must not be exceeded then the setting-up procedure is as follows:-

With the mains supply connected to the unit, 'MAINS' and 'OUTPUT' switches set to 'ON', the 'METER' switch set to 'CURRENT' and the voltage controls set to the required value, connect a variable load to the output terminals and adjust it so that the required maximum current is indicated on the meter. The current 'LIMIT' control is then adjusted until the current just starts to fall. The current limiting circuitry will not allow higher currents to be drawn. It is normal practise to set the current ceiling approximately 10% in excess of the expected maximum, to prevent any modification to the voltage regulation characteristic. The variable load is now disconnected and the unit is ready for use.

When the unit is operating in its current limit mode, indication is provided by the 'I LIMIT' l.e.d. located in the OUTPUT ON / OFF switch bezel.

CONSTANT CURRENT MODE

Approximate

With the mains supply connected to the unit, 'MAINS' and 'OUTPUT' switches set to 'ON', the 'METER' switch set to 'CURRENT' and the output voltage controls set to maximum, link the positive output terminal to the negative output terminal and set the current 'LIMIT' control to indicate the required current. Remove the link across the output terminals and connect the supply to the load via suitable leads. The unit will give a roughly constant current if the load resistance falls within the range zero to $\frac{V_{max}}{I_{set}}$ where Vmax. is the unit maximum output voltage and set 1set is the current setting.

Accurate-(see table 1)

More accurate constant current than that provided by the current limit control can be obtained by using the constant voltage control system to maintain constant voltage across an external sensing resistor Rs which monitors load currnet.

The procedure is as follows:-

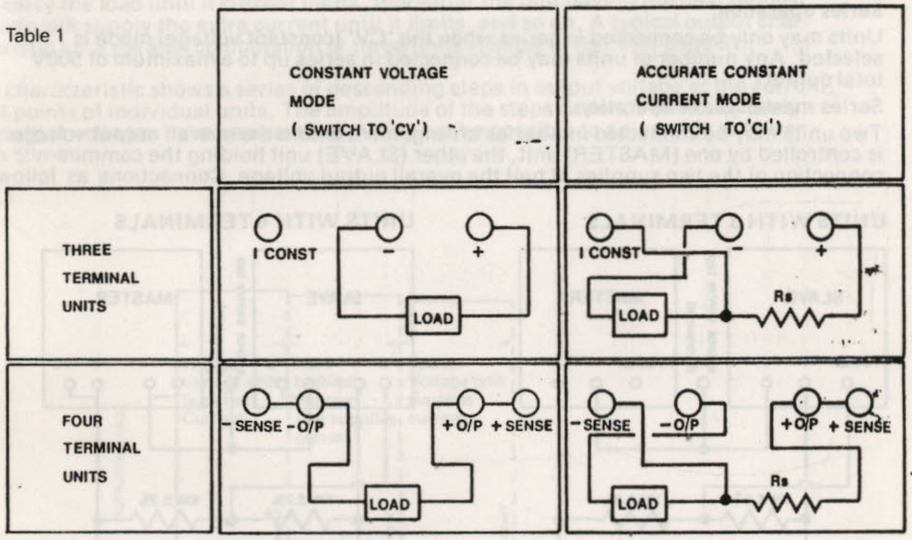
1. Set the CV / CI switch on the underside of the unit near the front panel terminals to the CI position using a small screwdriver and remove -o / p to -'SENSE' link on four terminal units.

WARNING! If the CV / CI switch is in the CI position when the unit is connected for CV operation, the voltage sensing circuit is inoperative and the unit output voltage is only restricted to the internal d.c. unregulated line. It is possible for damage to occur to the load under these conditions. The switch should always be returned to the CV position when the accurate constant current is no longer required.

2. Select a sensing resistor (Rs in table 1) such that at the maximum load current (IL max) required, the voltage drop across the resistor is 1 volt.

i.e. $RS = \frac{1}{IL\ max}$ ohms

Table 1



3. Connect the sensing resistor and load as shown in table 1.
4. Set the supply front panel voltage controls to minimum and the current limit control to maximum.
5. Switch on the supply and, using the front panel fine VOLTAGE control, set the output CURRENT to the required value.

NOTE: a) The stability of the set current is determined by the stability of the chosen sensing resistor as well as unit internal parameters. It is necessary therefore that this resistor is a wire wound type. In order to reduce the effects of self heating it is advisable to use a resistor of higher dissipation rating than that given by $(IL\ max)^2$ Rs. As a general guide the sense resistors should have a rating at least five times the operational dissipation figure.

b) For correct operation the sum of voltage drops across the sensing and load resistors should be less than the unit maximum quoted output voltage rating.

GENERAL

Remote sensing

The higher current models in the range have been provided with four terminal output, two marked 'OUTPUT' and two marked 'SENSE'. The terminals are colour coded red and black in both cases to indicate positive and negative terminals respectively.

The 'sense' terminals are used to sense the voltage at the load itself. The signal obtained is used to correct fo voltage drop due to the resistance of the load connecting leads. Maximum lead drop should not exceed 10V per lead.

For general use this facility may not be necessary and the links between + 'sense' and + 'O/P' and between -'sense' and -'O/P' may be left in place.

When the correction is required the links should be removed. The load is connected to the output terminals as usual and the ' +'sense' and -'sense' terminals are connected to the positive and negative sides of the load via separate wires. It may be necessary to decouple at the load with an electrolytic capacitor.

Overvoltage protection

On units fitted with overvoltage protection the overvoltage trip level adjustment is on the base plate of the unit.

To set a given trip level, set the output voltage to this level and adjust the 'OVERVOLTAGE' control until the output falls to a low level.

Set the 'COARSE' and 'FINE' controls fully anti-clockwise. Switch the 'OUTPUT' or 'MAINS' switch to 'OFF' and then 'ON'. This resets the overvoltage trip. Re-adjust the output voltage controls to give the required operating voltage.

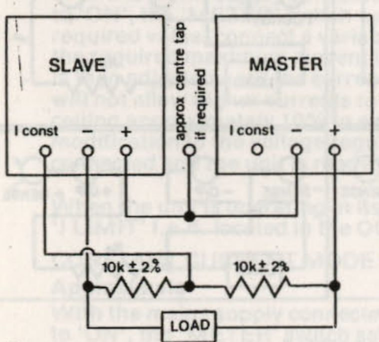
Series operation

Units may only be connected in series when the 'CV' (constant voltage) mode is selected. Any number of units may be connected in series up to a maximum of 500V total output.

Series master/slave operation.

Two units may be connected in a series arrangement where the overall output voltage is controlled by one (MASTER) unit, the other (SLAVE) unit holding the common connection of the two supplies at half the overall output voltage. Connections as follows:

UNITS WITH 3 TERMINALS



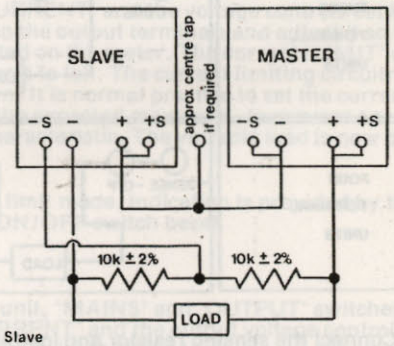
Slave

1. Set CV/CI switch to CI
2. Set voltage controls to zero

Master

1. Set for normal constant voltage operation
2. Voltage controls adjust overall voltage

UNITS WITH 4 TERMINALS



Slave

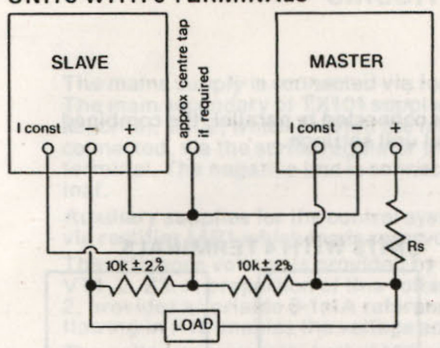
1. Remove llink between -sense and-output terminals
2. Set CV/CI switch to CI
3. Set voltage controls to zero

Master

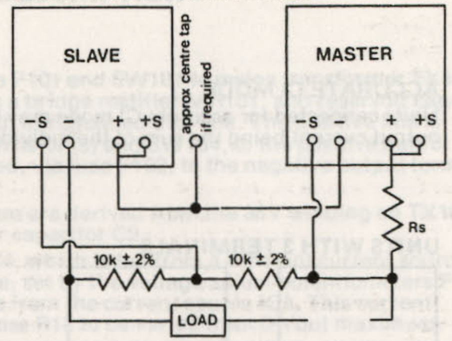
1. Set for normal constant voltage operation
2. Voltage controls adjust overall voltage

As an alternative, in the above configuration, the master unit can set for accurate constant current mode to provide a constant current system with twice the voltage compliance of one unit, the master voltage controls providing adjustment of overall current.

UNITS WITH 3 TERMINALS



UNITS WITH 4 TERMINALS



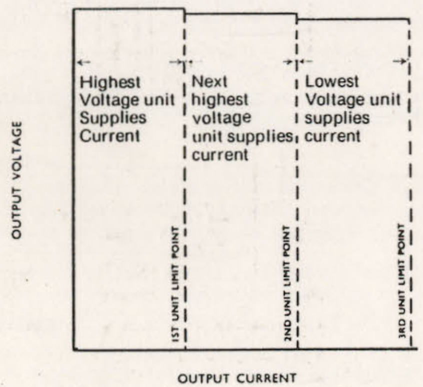
Parallel operation

C.V. MODE

Units which are set to approximately the same output voltage may be connected directly in parallel.On increasing load, the unit having the highest output voltage will carry the load until it current limits, thereafter the unit having the next highest voltage will supply the extra current until it limits, and so on. A typical output characteristic for a parallel combination of three units is show in fig. 1 on page 9.

The characteristic shows a series of descending steps in output voltage at the current limit points of individual units. The amplitude of the steps depends on how closely the output voltages have been set and it may not be possible to adjust this to better than 50mV.

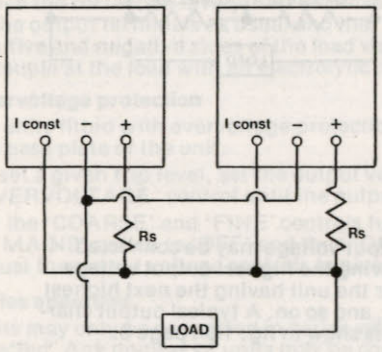
Fig.1.



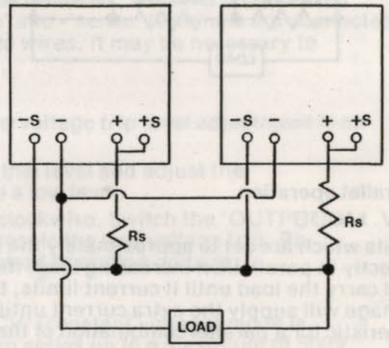
ACCURATE CI MODE

Units connected for accurate CI mode may be connected in parallel, the combined output current being the sum of the individual unit settings.

UNITS WITH 3 TERMINALS



UNITS WITH 4 TERMINALS



CIRCUIT DESCRIPTION

The mains supply is connected via fuse F101 and SW101 to mains transformer TX101. The main secondary of TX101 supplies a bridge rectifier MR101, and reservoir capacitor (s), C102, which provide the main unregulated d.c. line. The positive line is connected, via the series regulator transistor (s) and SW104, to the positive output terminal. The negative line is connected, via fuse F102, to the negative output terminal.

Auxiliary supplies for the control system are derived from the 36V winding on TX101 via rectifier MR1 which feeds reservoir capacitor C2.

The reference voltage is provided by Z4, which is fed from a constant current source, VT1, 2, Z3. A proportion of this voltage, set by the voltage adjust potentiometers P101, 2, provides a variable 0-1mA reference from the current source IC1. This current flowing in R12 enables the voltage across R12 to be varied from 0-Vout maximum.

The voltage comparator half of IC2 compares the voltage across R12 with the output terminal voltage of the unit. The voltage comparator controls VT3 and the regulator transistor (s) to stabilize the voltage at the output terminals.

A proportion of the reference voltage, set by the current limit potentiometer P103, is compared with the voltage across the output current sense resistor(s) by the current limit comparator half of IC2. If the output current exceeds the set level, this amplifier takes over control and holds the output current constant for increasing overload.

Operation of the current limit is shown by the overload indicator, LED 102, driven from the current limit comparator via VT4.

Overvoltage protection (L10/ 3C and L12/10C only)

A reference voltage is provided by Z302, R304 and R305, driven from the main unregulated d.c. line by the constant current source Z301, VT301 and associated resistors. A proportion of the unit output voltage set by P301, 2 is compared with the reference voltage by voltage comparator VT302, 3.

If the proportion of output voltage at VT303 base exceeds the reference voltage at VT302 base, VT303 and 304 conduct and SCR101 is gated on. This effectively short circuits the output terminal of the unit.

MAINTENANCE

Guarantee

The equipment supplies 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 by 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 to 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 lilmited 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 and recalibration it is recommended that the complete instrument be returned to:-

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

The Service Department,
Farnell Instruments Ltd.,
Davenport House,
Bowers Way,
Harpenden, Herts.
AL5 4HX.
Tel: 05827 69071 Telex: 826307

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

For those who operate their own comprehensive service departments and wish to repair and maintain the equipment themselves, a section on 'Recalibration/test procedure' follows.

RECALIBRATION/TEST PROCEDURE

Meter zero

In the event of it being necessary to set meter zero, the adjustment is on the rear of the meter which is accessible through a hole in the control printed circuit board after first removing the top cover of the unit.

Following repair action it may be necessary to check the unit to the specification.

The following procedure is recommended.

Remove units cover (side screws and handles)
Check mains input tapping setting
Set CV/CI switch to CV
Set coarse output control to fully c.w.
Set fine output control to fully c.c.w.
Set current limit control fully c.w.
Set meter switch to volts
Ensure the meter is zeroed (if necessary adjust as per para 1)
Connect the unit to a suitable mains supply and switch on
Check that the input led is on
Turn coarse voltage control anticlockwise and check that meter needle responds
Switch on the output switch
Connect a differential voltmeter to the output terminals of the unit and check that the output is 101% + 200mV of the rated output.
Adjust to this figure by P2 preset, if necessary
Check operation of both coarse and fine output controls for smoothness over all their range.
Reset the output controls to give the maximum rated output voltage (± 0.1V)
Check that the meter indicates the correct maximum rated figure, adjust by P1 if necessary.
Connect a variable load in series with an accurate ammeter of suitable range, to the output terminal.
Adjust the load to draw the maximum rated current plus 15% from the unit.
The voltage should begin dropping off at this point.
If it does not, adjust P3 until current just begins to fall.
The limit led should now begin to light.
Turn the current limit control anticlockwise and check that the current falls smoothly over the whole range.
Using an oscilloscope check that the output of the unit is not oscillating.
Reset the current limit control fully c.w.
Reduce the load resistance to zero and check that the unit gives a rough constant current.
Reset the load to give the maximum rated current (± 1%) on the external meter.
Switch the meter switch to 'amps'
Adjust P4 for fsd on the current scale
Seal adjusting presets with suitable paint.

Load regulation

Reconnect the differential voltmeter across the output terminals
Connect the load resistance and adjust for maximum rated current from the unit
Disconnect load and note change occurring in output voltage
This should be less than .01% + 2mV
Adjust the output voltage of the unit to 50% and 20% of maximum and repeat checks under maximum rated current output conditions.

Line regulation

Connect the unit to the mains supply via a variac or similar equipment
Set the load resistance to draw the maximum rated current from the unit at the maximum rated voltage
Connect the differential voltmeter to the output terminals.
Vary the mains supply ± 10% of nominal and note corresponding change in output voltage.
This should be less than .01% + 2mV

Output ripple

With the unit set up as for line regulation checks measure the output ripple and noise across the output terminals, using an oscilloscope - 80kHz band width.
The ripple amplitude should not exceed 1mV pk-pk.

Line ripple

Connect the oscilloscope across the terminals of capacitor C2 aND MEASURE THE ripple occurring.
The amplitude should not exceed 5V pk-pk - 100Hz.
If any components in the overvoltage circuitry have been replaced it may be necessary to reset the overvoltage trip point.

Overvoltage control setting

Ensure CV/CI switch is set to CV.
Set P301 (accessible through the chassis) fully c.w.
Set P302 (on circuit board) fully c.w.
Remove the units output fuse
Connect a suitable current limited power supply to the output terminals in the correct polarity.
Set the external supply to give an output of 20% above units rated maximum
Switch on the unit and the external supply
Monitor the voltage at the output terminals and adjust 'P302 until the output voltage falls off.
Switch off the unit and remove the external supply
Replace the output fuse
Turn the units voltage controls to zero (anticlockwise)
Switch on the unit
Turn P301 (chassis) fully anticlockwise
Monitor the output voltage
Increase the output voltage from zero using the controls; the voltage should fall off at approximately 3V or less
Turn P301 (chassis) fully clockwise
Interupt the mains supply and adjust output controls to maximum.

Current

Connect an accurate ammeter, (one which has an f.s.d. compatible with the maximum current available from the unit) in series with a variable load, between the 'O/P +' and 'O/P-' terminals.

Connect unit to mains supply. Switch on both the 'MAINS' and 'OUTPUT' switches. Set the current 'LIMIT' control fully clockwise. Adjust the load until an output current 10% in excess of the maximum specified for the unit is indicated by the external ammeter. Adjust P3 until the current just starts to fall.

Set the 'METER' switch to 'CURRENT'. Re-adjust load to indicate maximum specified output current on the external ammeter. Adjust P4 until the front panel meter indicates full scale deflection.

DRAWING No | ASSEMBLY No STANDARD CONTROL BD | USED ON L SERIES COMMON TO ALL UNITS

CCT. DIA. REF.	VALUE	RATING	TOL±%	MANUFACTURER	MANF. REF.	TYPE	FARNELL REF.	LOCATION
R1	470	6W	5%	WELWYN	W22	WW	RW3470R22	
R3	1k8	400mW	2%	MULLARD	MR25	MF	RM41k8025	
R5	18k	"	2%	MULLARD	MR25	MF	RM518k025	
R6	470	"	2%	MULLARD	MR25	MF	RM3470R25	
R7	22k	"	2%	MULLARD	MR25	MF	RM522k025	
R8	22k	"	2%	MULLARD	MR30	MF	RM522k030	
R10	22k	"	2%	MULLARD	MR25	MF	RM522k025	
R11	22k	"	2%	MULLARD	MR25	MF	RM522k025	
R13	10k	"	2%	MULLARD	MR25	MF	RM510k025	
R14	10k	"	2%	MULLARD	MR25	MF	RM510k025	
R15	1k0	"	2%	MULLARD	MR30	MF	RM41k0030	
R16	680k	"	5%	MULLARD	CR25	CF	RC6680k25	
R17	6k8	"	2%	MULLARD	MR25	MF	RM46k8025	
R18	330	"	2%	MULLARD	MR25	MF	RM3330R25	
R19	330		2%	MULLARD	MR25	MF	RM3330R25	
R20	270	"	2%	MULLARD	MR25	MF	RM3330R25	
R21	1k5	"	2%	MULLARD	MR25	MF	RM41k5025	
R22	4k7	"	2%	MULLARD	MR25	MF	RM44k7025	
R23	4k7	"	2%	MULLARD	MR25	MF	RM44k7025	
R24	220k	"	2%	MULLARD	MR25	MF	RM6220k25	
R25	10k	"	2%	MULLARD	MR25	MF	RM510k025	
R26	82k	"	2%	MULLARD	MR25	MF	RM582k025	
R27	82k	"	2%	MULLARD	MR25	MF	RM582k025	
R28	10k	"	2%	MULLARD	MR25	MF	RM510k025	
R30	5k6	"	2%	MULLARD	MR25	MF	RM45k6025	
C1	0.1µF	250	10%	MULLARD			CPOU100R325	
C2	47µF	63V		MULLARD		E	CE247UOLM	
C3	1µF	100V	10%	MULLARD	344	PM	CF11U00N344	
C4	1k0pF	250		ERIE	831	CE	CC41k00831H	
C5	100pF	250		ERIE	831	CE	CC3100P831	
D1				TEXAS	1N4148		DG4148	
D2				TEXAS	1N4148		DG4148	
D3				TEXAS	1N4148		DG4148	
D4				TEXAS	1N4003		DG4003	
Z1	15Volt	1.3W	5%	MULLARD	BZX61C15		DZ61C15	
Z2	5.1V	1.3W	5%	MULLARD	BZV85C5V1		DZ85C5V1	
Z3	5.1V	400mW	5%	MULLARD	BZY88C5V1		DZ88C5V1	
Z4	6.2	400mW	5%	MULLARD	1N823		DZ823	
P1	5k0		10%	SPECTROL	63X	CM	PM45k0063X	
P2	2k0		10%	SPECTROL	63X	CM	PM42k0063X	

CCT. DIA. REF.	VALUE	RATING	TOL±%	MANUFACTURER	MANF. REF.	TYPE	FARNELL REF.	LOCATION
P3	5k0		10%	SPECTROL	63X	CM	PM45k0063X	
P4	200		10%	SPECTROL	63X	CM	PM3200R63X	
VT1				FERRANTI	BC212PL		VT212PL	
VT2				FERRANTI	BC212PL		VT212PL	
VT4				FERRANTI	BC182PL		VT182PL	
IC1				RCA	CA741CG	P	VA741CG	
IC2				MOTOROLA	TY30294	P	VA30294	
MR1				GEN INST	WO2M		DBWO2M	
F1		160mA		BESWICK	TDC123		FT160M123	

ISS	DATE	Q.C No	CHECKED	ISS	DATE	Q.C No.	CHECKED

COMPONENT TYPE ABBREVIATIONS

CAPACITORS: CE CERAMIC; E ELECTROLYTIC; PC POLYCARBONATE; PF POLYESTER FILM; PM POLYESTER METALIZED; PP POLYPROPELENE; PS POLYSTYRENE; SM SILVER MICA; T TANTALUM

RESISTORS: C CARBON; CF CARBON FILM; CM CERMET; MF METAL FILM; MG METAL GLAZE; MO METAL OXIDE; P PLASTIC; WW WIRE WOUND

POTENTIOMETERS: C CARBON; CM CERMET; P PLASTIC; WW WIRE WOUND

INTEGRATED CIRCUITS: CE CERAMIC; MC METAL CAN; P PLASTIC

FARNELL INSTRUMENTS Ltd.
WETHERBY W YORKSHIRE LS22 4DH ENGLAND

TITLE REFERENCE SHEET FOR
L series control bd
see other sheets for
non-common items

DRAWING No

SHEET OF SHEETS

DRAWN

DRAWING No L30/1 - LT30/1 | ASSEMBLY No | USED ON L30/2 - LT30/2

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R4	27k	400mW	2%	MULLARD	MR25	MF	RM527k025	CONTROL
R9	560k	400mW	2%	MULLARD	MR30	MF	RM6560k30	CONTROL
R12	33k	400mW	2%	MULLARD	MR30	MF	RM533k030	CONTROL
R102	3k3	1W	5%	ELECTROSIL	TR6	MF	RX43k30T6	CHASSIS
R201	1k8	400mW	2%	MULLARD	MR30	MF	RM41k8030	OUTPUT BD
R107	120	400mW	2%	MULLARD	MR30	MF	RM3120R30	CHASSIS
R108	0R5	6W	5%	ERG	58ES	WW	RW0R50058ES	HEATSINK
R109	0R5	6W	5%	ERG	58ES	"	"	"
R204	0R5	2.5W	10%	WELWYN	W21	W	RW0R50021	OUTPUT BD
R206	1k2	1W	5%	ELECTROSIL	TR6	MF	RX41k20T6	OUTPUT BD
C101	0.22μF	160V	10%	WIMA	TFM	PM	CP0U220PTFM	CHASSIS
C102	4,800μF	63V		SPRAGUE	W36D	E	CE44k80LSW	CHASSIS
C204	100μF	63V		WIMA	PRINTLYT	E	CE3100ULW	OUTPUT BD
D201					1N4148		DG4148	OUTPUT BD
D202					1N4003		DG4003	OUTPUT BD
D203					1N4003		DG4003	OUTPUT BD
MR101				GEN INST	B80/5000/3300		DBB80	CHASSIS
LED101				BOSS	BIM556R		LD556R	FRONT PANEL
LED102				BOSS	BIM556R		LD556R	FRONT PANEL
VT3				RCA	2N3053		VT3053	CONTROL BD
VT101				RCA	2N5294		VT5294	CHASSIS
VT102				RCA	2N3055H		VT3055	HEATSINK
VT103				RCA	2N3055H			
P101	5k		10%	SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
P102	5k		10%	SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
P103	5k		10%	SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
SW101				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW102				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW104				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW203				CANADIAN SP	SLSB129		SS129P	OUTPUT BD
	1A	L30/1	slow	BESWICK	TDC123		FT1A00123	CHASSIS
F101	2A	L30/1	slow	BESWICK	TDC123		FT2A00123	CHASSIS
F102	1A			BESWICK	TDC13		FF1A0013	CHASSIS
TX101				FARNELL	3SR0127/0		ZR0127	CHASSIS
M101				FARNELL	3Z00782/100A		EM0782100	FRONT PANEL

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R4	27k	400mW	2%	MULLARD	MR25	MF	RM527k025	CONTROL BD
R9	560k	400mW	2%	MULLARD	MR30	MF	RM6560k30	CONTROL BD
R12	33k	400mW	2%	MULLARD	MR30	MF	RM533k030	CONTROL BD
R102	3k3	1W	5%	ELECTROSIL	TR6	MF	RX43k30T6	CHASSIS
R201	1k8	400mW	2%	MULLARD	MR30	MF	RM41k8030	OUTPUT BD
R107	120	400mW	2%	MULLARD	MR30	MF	RM3120R30	CHASSIS
R108-111	0R5	6W	10%	ERG	58ES	WW	RW0R50058ES	HEATSINK
R204	0R25	6W	5%	CGS	C3A	WW	RW0R2503A	OUTPUT BD
R206	1k2	1W	5%	ELECTROSIL	TR6	MF	RX41k20T6	OUTPUT BD
C101	0.22	160V	10%	WIMA	TFM	PM	CP0U220PTFM	CHASSIS
C102	4,800μF	63V		SPRAGUE	W36D	E	CE44k80WW	CHASSIS
C204	470μF	63V		WIMA	PRINTLYT	E	CE3470ULK	OUTPUT BD
D201					1N4148		DG4148	OUTPUT BD
D202				MOTOROLA	MR752		DG752	OUTPUT BD
D203				MOTOROLA	MR752		DG752	OUTPUT BD
MR101				GEN INST	B80/5000/3300		DB880	CHASSIS
LED101				BOSS	BIM556R		LD556R	FRONT PANEL
LED102				BOSS	BIM556R		LD556R	FRONT PANEL
VT3				RCA	ZN3053		VT3053	CONTROL BD
VT101				RCA	ZN5294		VT5294	CHASSIS
VT102-105				RCA	ZN3055H		VT3055	HEATSINK
P101	5K		10%	SPECTROL	MW9/0/502	WW	RW45k00MW	FRONT PANEL
P102	5K		10%	SPECTROL	MW9/0/502	WW	RW45k00MW	FRONT PANEL
P103	5K		10%	SPECTROL	MW9/0/502	WW	RW45k00MW	FRONT PANEL
SW101				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW102				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW4				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW203				CANADIAN SP	SSB129P		SS129P	OUTPUT BD
F101	2A	L30/2		BESWICK	TDC134		FT2A00123	
F101	4A	LT30/2			S503		FT4A005503	CHASSIS
F102	2A			BESWICK	TDC13		FF2A0013	CHASSIS
TX101				FARNELL	3SR0128		ZR0128	CHASSIS
M101				FARNELL	3Z0074810014		EM0784100	FRONT PANEL

ISS	DATE	Q.C. No.	CHECKED	ISS	DATE	Q.C. No.	CHECKED

DRAWN

COMPONENT TYPE ABBREVIATIONS

CAPACITORS: CE CERAMIC; E ELECTROLYTIC; PC POLYCARBONATE; PF POLYESTER FILM; PM POLYESTER METALIZED; PP POLYPROPELENE; PS POLYSTYRENE; SM SILVER MICA; T TANTALUM

RESISTORS: C CARBON; CF CARBON FILM; CM CERMET; MF METAL FILM; MG METAL GLAZE; MO METAL OXIDE; P PLASTIC; WW WIRE WOUND

POTENTIOMETERS: C CARBON; CM CERMET; P PLASTIC; WW WIRE WOUND

INTEGRATED CIRCUITS: CE CERAMIC; MC METAL CAN; P PLASTIC

FARNELL INSTRUMENTS Ltd.
WETHERBY W. YORKSHIRE LS22 4DH ENGLAND

TITLE REFERENCE SHEET FOR L30/1 LT30/1 L30/2 LT30/2 | DRAWING No | SHEET OF SHEETS

DRAWING No. L50/05 - LT50/05 | ASSEMBLY No. | USED ON L30/5

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R4	47k	400mW	2%	MULLARD	MR25	MF	RM547k025	CONTROL BD
R9	1M	400mW	2%	MULLARD	MR30	MF	RM71M0030	"
R12	51k	400mW	2%	MULLARD	MR30	MF	RM551k030	"
R102	5k6	1W	5%	ELECTROSIL	TR6	MO	RX45k60T6	"
R201	1k8	400mW	2%	MULLARD	MR30	MF	RM41k8030	OUTPUT BD
R204	1R0	2.5W	5%	WELWYN	W21	WW	RW11R0021	"
R206	3k3	1W	5%	ELECTROSIL	TR6	MO	RX43k30T6	"
R107	120	400mW	2%	MULLARD	MR30	MF	RM3120R30	CHASSIS
C101	0.22μF	160V	10%	WIMA	TFM	PM	CP0U220PTFM	"
C102	850μF	100V		SPRAGUE	36D	E	CE3850UNS	"
C204	100μF	63V		WIMA	PRINTLYT	E	CE3100ULW	OUTPUT BD
D201					1N4148		DG4148	OUTPUT BD
D202					1N4003		DG4003	"
D203					1N4003		DG4003	"
MR101				GEN INST	KBP02		DBP02	
LED101				BOSS	BIM556R		LD556R	FRONT PANEL
LED102				BOSS	BIMTT6R		LD556R	
VT3				TEXAS	2N1893		VT1893	CONTROL BD
VT101				RCA	2N5294		VT5294	CHASSIS
VT102				RCA	2N3055H		VT3055	HEATSINK
P101	5k0			SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
P102	5k0			SPECTROL	MW9/0/502	WW	PW45k00MW	"
P103	5k0			SPECTROL	MW9/0/502	WW	PW45k00MW	"
SW101				C & K	7201/J60/ZO		ST7201J	FRONT PANEL
SW102				C & K	7201/J60/ZC		ST7201J	"
SW104				C & K	7201/J60/ZC		ST7201J	"
SW203					SLSB129P		SS129P	OUTPUT BD
F101	1A L50/05			BESWICK	TDC123		FT1A00123	
	2A LT51/05	Slow		"	"		FT2A00123	CHASSIS
F102	0.5A			BESWICK	TDC13		FF500M13	"
TX101				FARNELL	3SR0126		ZR0126	CHASSIS
M101				FARNELL	3ZW0781100		EM0781100	FRONT PANEL

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R4	27k	400mW	2%	MULLARD	MR25	MF	RM527k025	CONTROL BD
R9	560k	400mW	2%	MULLARD	MR30	MF	RM6560k30	"
R12	33k	400mW	2%	MULLARD	MR30	MF	RM533k030	"
R101	1k8	400mW	2%	MULLARD	MR30	MF	RM41k8030	OUTPUT BD
R102	3k3	400mW	2%	ELECTROSIL	TR6	MO	RX43k30T6	"
R103	470	400mW	2%	MULLARD	MR30	MF	RM3470R30	"
R104	0.1	6W	5%	ELECTROSIL	C7	WW	RW0R10007	OUTPUT BD
R106	820	6W	10%	WELWYN	W22	WW	RW3820R22	OUTPUT BD
R107	120	400mW	2%	MULLARD	MR30	MF	RM3120R30	BACK PANEL
R108 to 115	0R5	6W	10%	ERG	58ES	WW	RW0R50058ES	HEATSINK
C101	1μF	160V		WIMA	TFM	PM	CP11U00PTFM	CHASSIS
C102	2x4800μF	63V		SPRAGUE	W360	E	CE44k30WW	"
C103	0.1μF	250V		MULLARD	PME271M	PK	CP0U100R271M	"
C104	2,200	40V		MULLARD	071	E	CE42k205M	OUTPUT BD
D101					1N4148		DG4148	
D102				MOTOROLA	MR752		DG752	
D103				MOTOROLA	MR1122		DT1122	CHASSIS
MR101				GEN INST	KBPC2506		DBC2506	"
LED101				BOSS	BIM556R		LD556R	FRONT PANEL
LED102				BOSS	BIM556R		LD556R	"
VT3				RCA	2N3053		VT3053	
VT101				RCA	2N3055H		VT3055	
VT102/109				RCA	2N3055H		VT3055	
P101	5k0			SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
P102	5k0			SPECTROL	MW9/0/502	WW	PW45k00MW	"
P103	5k0			SPECTROL	MW9/0/502	WW	PW45k00MW	"
SW101					8370/B3/CHP		ST8370B	FRONT PANEL
SW102					SLSC124		55124	CHASSIS
SW104					93A 402CHP13		ST93A	"
F101	5A	Slow		BESWICK	TDC11		FT5A0011	CHASSIS
F102	5A	Quick		BELLING LEE	L1055		FF5A01055	"
M101	Volts			FARNELL	3Z00785101/A		EM0785101	FRONT PANEL
M102	Amps			FARNELL	3Z00785100/A		EM0785100	"
TX101				FARNELL	2Z00248120/G		ZR034120	CHASSIS

ISS	DATE	Q.C. No.	CHECKED	ISS	DATE	Q.C. No.	CHECKED

DRAWN

COMPONENT TYPE ABBREVIATIONS

CAPACITORS: CE CERAMIC; E ELECTROLYTIC; PC POLYCARBONATE; PF POLYESTER FILM; PM POLYESTER METALIZED; PP POLYPROPELENE; PS POLYSTYRENE; SM SILVER MICA; T TANTALUM

RESISTORS: C CARBON; CF CARBON FILM; CM CERMET; MF METAL FILM; MG METAL GLAZE; MO METAL OXIDE; P PLASTIC; WW WIRE WOUND

POTENTIOMETERS: C CARBON; CM CERMET; P PLASTIC; WW WIRE WOUND

INTEGRATED CIRCUITS: CE CERAMIC; MC METAL CAN; P PLASTIC

FARNELL INSTRUMENTS Ltd.
WETHERBY W YORKSHIRE LS22 4DH ENGLAND

TITLE REFERENCE SHEET FOR L50/05 LT50/05 and L30/5 | DRAWING No | SHEET OF SHEETS

DRAWING No L10/3C | ASSEMBLY No | USED ON L10/3C

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R4	8k2	400mW	2%	MULLARD	MR25	MF	RM48k2025	CONTROL BD
R9	180k	400mW	2%	MULLARD	MR30	MF	RM6180k30	CONTROL BD
R12	10k	400mW	2%	MULLARD	MR30	MF	RM510k030	CONTROL BD
R102	3k3	1W	5%	WELWYN	TR6	MO	RX43K30T6	CHASSIS
R108	2x0R5	6W	5%	ERG	58ES	WW	RW0R50058ES	HEATSINK
R109	2x0R5	6W	5%	ERG	58ES	WW	RW0R50058ES	HEATSINK
R201	1k8		2%	MULLARD	MR30	MF	RM41k8030	OUTPUT BD
R107	120	400mW	2%	MULLARD	MR30	MF	RM3120R30	BACK PANEL
R204	0R25	2.5W	5%	CGS	C3A	WW	RW0R2503A	OUTPUT BD
R205	0R5	2.5	5%	WELWYN	W21	WW	RW0R5021	OUTPUT BD
R206	180	1	5%	WELWYN	TR6	MO	RX3180RT6	OUTPUT BD
C101	0.22uF	160V	10%	WIMA	TFM	PM	CPOU22OPTFM	CHASSIS
C102	10,000uF	25V		MULLARD	071	E	CE510K0GM	CHASSIS
C204	470uF	16V		WIMA	PRINTYLT	E	CE3470UFW	OUTPUT BD
D201				TEXAS	1N4148		DG4148	OUTPUT BD
D202				MOTOROLA	MR752		DG752	OUTPUT BD
D203				MOTOROLA	MR752		DG752	OUTPUT BD
MR101				GEN INST	KBPC606		DBC606	CHASSIS
VT3				RCA	2N3053		VT3053	CONTROL
VT101				RCA	2N5294		VT5294	BACK PANEL
VT102				RCA	2N3055H		VT3055	HEATSINK
VT103				RCA	2N3055H		VT3055	HEATSINK
P101	5k0		10%	SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
P102	5k0		10%	SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
P103	5k0		10%	SPECTROL	MW9/0/502	WW	PW45k00MW	FRONT PANEL
SCR101				MOTOROLA	2N6394		DS6394	CHASSIS
SW101					7201/J60/ZO		ST7201J	FRONT PANEL
SW102					7201/J60/ZO		ST7201J	FRONT PANEL
SW104					7201/J60/ZO		ST7201J	FRONT PANEL
SW203				CANADIAN SPEC	SLSB129		SS129P	OUTPUT BD
F101	1A	slow		BESWICK	TDC123		FT1A00123	CHASSIS
F102	3A			BESWICK	TDC13		FF3A0013	CHASSIS
TX101				FARNELL	2Z00846120/C		ZR0846120	CHASSIS
LED101				BOSS	BIM556R		LD556R	FRONT PANEL
LED102				BOSS	BIM556R		LD556R	FRONT PANEL
M101				FARNELL	3Z00783/100A		EM0783100	FRONT PANEL

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R301	3.3k	400mW	2%	MULLARD	MR25	MF	RM43k3025	O/V TRIP BD
R302	15k	400mW	2%	MULLARD	MR25	MF	RM515k025	O/V TRIP BD
R303	390	400mW	2%	MULLARD	MR25	MF	RM3990R25	O/V TRIP BD
R304	2.7k	400mW	2%	MULLARD	MR25	MF	RM42k7025	O/V TRIP BD
R305	3.3k	400mW	2%	MULLARD	MR25	MF	RM43k3025	O/V TRIP BD
R306	4.7k	400mW	2%	MULLARD	MR25	MF	RM44k7025	O/V TRIP BD
R307	2.2k	400mW	2%	MULLARD	MR25	MF	RM42k2025	O/V TRIP BD
R308	47k	400mW	2%	MULLARD	MR25	MF	RM44k7025	O/V TRIP BD
R309	1.5k	400mW	2%	MULLARD	MR25	MF	RM41k5025	O/V TRIP BD
R310	68k	400mW	2%	MULLARD	MR25	MF	RM568k025	O/V TRIP BD
R311	390	400mW	2%	MULLARD	MR25	MF	RM3390R30	O/V TRIP BD
R312	1k	400mW	2%	MULLARD	MR25	MF	RM41k0025	O/V TRIP BD
C301	2200pF	100V	10%	WIMA	FKS2	PF	CF42k20NFKS2	O/V TRIP BD
Z301	3V3	400mW	5%	MULLARD	BZY88C3V3		DZ88C3V3	O/V TRIP BD
Z302	5V1	400mW	5%	MULLARD	BZY88C5V1		DZ88C5V1	O/V TRIP BD
VT301				FERRANTI	BC212L		VT212PL	O/V TRIP BD
VT302				FERRANTI	BC182L		VT182PL	O/V TRIP BD
VT303				FERRANTI	BC182L		VT182PL	O/V TRIP BD
VT304				FERRANTI	BC212L		VT212PL	O/V TRIP BD
P301	10k		10%	SPECTROL	43P	WW	PM510k043P	O/V TRIP BD
P302	50k		10%	SPECTROL	63P	CM	PM550k063P	O/V TRIP BD

ISS	DATE	Q.C. No.	CHECKED	ISS	DATE	Q.C. No.	CHECKED

DRAWN

COMPONENT TYPE ABBREVIATIONS

CAPACITORS: CE CERAMIC; E ELECTROLYTIC; PC POLYCARBONATE; PF POLYESTER FILM; PM POLYESTER METALIZED; PP POLYPROPYLENE; PS POLYSTYRENE; SM SILVER MICA; T TANTALUM

RESISTORS: C CARBON; CF CARBON FILM; CM CERMET; MF METAL FILM; MG METAL GLAZE; MO METAL OXIDE; P PLASTIC; WW WIRE WOUND

POTENTIOMETERS: C CARBON; CM CERMET; P PLASTIC; WW WIRE WOUND

INTEGRATED CIRCUITS: CE CERAMIC; MC METAL CAN; P PLASTIC

FARNELL INSTRUMENTS Ltd.
WETHERBY W YORKSHIRE LS22 4DH ENGLAND

TITLE REFERENCE SHEET FOR: L10/3C including overvoltage cct use with standard sheet

DRAWING No 2ZX0846101

SHEET OF SHEETS

DRAWING No | ASSEMBLY No | USED ON L12/10C

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R4	10k	400mW	2%	MULLARD	MR25	MF	RM510k025	CONTROL BD
R9	220k	400mW	2%	MULLARD	MR30	MF	RM6220k30	CONTROL BD
R12	12k	400mW	2%	MULLARD	MR30	MF	RM512k030	CONTROL BD
R101	1k8	400mW	2%	MULLARD	MR30	MF	RM41k8030	OUTPUT BD
R102	330	6W	10%	WELWYN	W22	WW	RW3330R22	OUTPUT BD
R103	470	400mW	2%	MULLARD	MR30	MF	RM3470R30	OUTPUT BD
R104	OR1	6W	10%	ELECTROSIL	C7	WW	RW0R10007	OUTPUT BD
R105	OR1	6W	10%	ELECTROSIL	C7	WW	RW0R10007	OUTPUT BD
R106	180	6W	5%	WELWYN	W22	WW	RW3180R22	OUTPUT BD
R107	120	100mW	2%	MULLARD	MR30	MF	RM3120R30	BACK PANEL
R108-115	OR5	6W	10%	ERG	58ES	WW	RW0850058ES	HEATSINK
C101	2 x 1uF16CV		10%	WIMA	TFM	PM	CP11U00PTFM	CHASSIS
C102	2x10,000uF	25V		ADVANCE	EP333	E	CE510K0GA	CHASSIS
C103	0.1	250V		MULLARD	PME271M	PM	CPOU100R271M	CHASSIS
C104	2,200uF	40V		MULLARD	071	E	CE42k20JM	CHASSIS
D101				TEXAS	1N4148		DG4148	OUTPUT BD
D102				MOTOROLA	MR752		DG752	"
D103				MOTOROLA	MR1122		DT1122	CHASSIS
D104-107				MOTOROLA	MR1122		DT1122	CHASSIS
VT3					2N3053		VT3053	CONTROL BD
VT101				RCA	2N3055H		VT3055	BACK PANEL
VT102-109					2N3055H		VT3055	HEATSINK
P101	5k		10%	SPECTROL	MW9/0/502		PW45k00MW	FRONT PANEL
P102	5K		10%		MW9/0/502		PW45k00MW	FRONT PANEL
P103	5k		10%		MW9/0/502		PW45k00MW	FRONT PANEL
SCR101				MOTOΣOLA	MCR3918/3		DS39183	CHASSIS
SW101					8370/B3/CBP		ST8370B	FRONT PANEL
SW103					SLSC124		SS124	FRONT PANEL
SW104					93A/402CHP13		ST93A	FRONT PANEL
F101	5amp	slow		BESWICK	TDC11		FT5A0011	CHASSIS
F102	10amp	fast		BELLING LEE	L1055		FF10A01055	CHASSIS
TX101				FARNELL	2Z00849120F		ZR0849120	CHASSIS
LED101				BOSS	BIM556R		LD556R	FRONT PANEL
LED102				BOSS	BIM556R		LD556R	FRONT PANEL
M102	AMPS			FARNELL	3ZC078401A		EM0786101	FRONT PANEL
M101	VOLTS			FARNELL	3Z0078610CA		EM0786100	FRONT PANEL

CCT. DIA. REF.	VALUE	RATING	TOL %	MANUFACTURER	MANF REF	TYPE	FARNELL REF.	LOCATION
R301	3.3k	400mW	2%	MULLARD	MR25	MF	RM43k3025	O/V TRIP BD
R302	15k	400mW	2%	MULLARD	MR25	MF	RM515k025	O/V TRIP BD
R303	390	400mW	2%	MULLARD	MR25	MF	RM3990R25	O/V TRIP BD
R304	2.7k	400mW	2%	MULLARD	MR25	MF	RM42k7025	O/V TRIP BD
R305	3.3k	400mW	2%	MULLARD	MR25	MF	RM43k3025	O/V TRIP BD
R306	4.7k	400mW	2%	MULLARD	MR25	MF	RM44k7025	O/V TRIP BD
R307	2.2k	400mW	2%	MULLARD	MR25	MF	RM42k2025	O/V TRIP BD
R308	47k	400mW	2%	MULLARD	MR25	MF	RM44k7025	O/V TRIP BD
R309	1.5k	400mW	2%	MULLARD	MR25	MF	RM41k5025	O/V TRIP BD
R310	68k	400mW	2%	MULLARD	MR25	MF	RM568k025	O/V TRIP BD
R311	390	400mW	2%	MULLARD	MR25	MF	RM3390R30	O/V TRIP BD
R312	1k	400mW	2%	MULLARD	MR25	MF	RM41k0025	O/V TRIP BD
C301	2200pF	100V	10%	WIMA	FKS2	PF	CF42k20NFKS2	O/V TRIP BD
Z301	3V3	400mW	5%	MULLARD	BZY88C3V3		DZ88C3V3	O/V TRIP BD
Z302	5V1	400mW	5%	MULLARD	BZY88C5V1		DZ88C5V1	O/V TRIP BD
VT301				FERRANTI	BC212L		VT212PL	O/V TRIP BD
VT302				FERRANTI	BC182L		VT182PL	O/V TRIP BD
VT303				FERRANTI	BC182L		VT182PL	O/V TRIP BD
VT304				FERRANTI	BC212L		VT212PL	O/V TRIP BD
P301	10k		10%	SPECTROL	43P	WW	PM510k043P	O/V TRIP BD
P302	50k		10%	SPECTROL	63P	CM	PM550k063P	O/V TRIP BD

ISS	DATE	Q.C. No.	CHECKED	ISS	DATE	Q.C. No.	CHECKED

DRAWN

COMPONENT TYPE ABBREVIATIONS

CAPACITORS: CE CERAMIC; E ELECTROLYTIC; PC POLYCARBONATE; PF POLYESTER FILM; PM POLYESTER METALIZED; PP POLYPROPYLENE; PS POLYSTYRENE; SM SILVER MICA; T TANTALUM

RESISTORS: C CARBON; CF CARBON FILM; CM CERMET; MF METAL FILM; MG METAL GLAZE; MO METAL OXIDE; P PLASTIC; WW WIRE WOUND

POTENTIOMETERS: C CARBON; CM CERMET; P PLASTIC; WW WIRE WOUND

INTEGRATED CIRCUITS: CE CERAMIC; MC METAL CAN; P PLASTIC

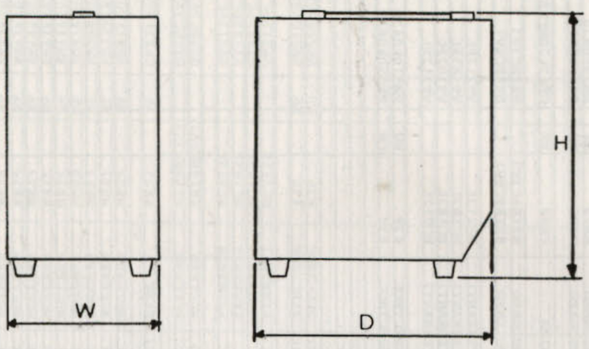
FARNELL INSTRUMENTS Ltd.
WETHERBY W YORKSHIRE LS22 4DH ENGLAND

TITLE REFERENCE SHEET FOR: L12/10C including overvoltage

DRAWING No

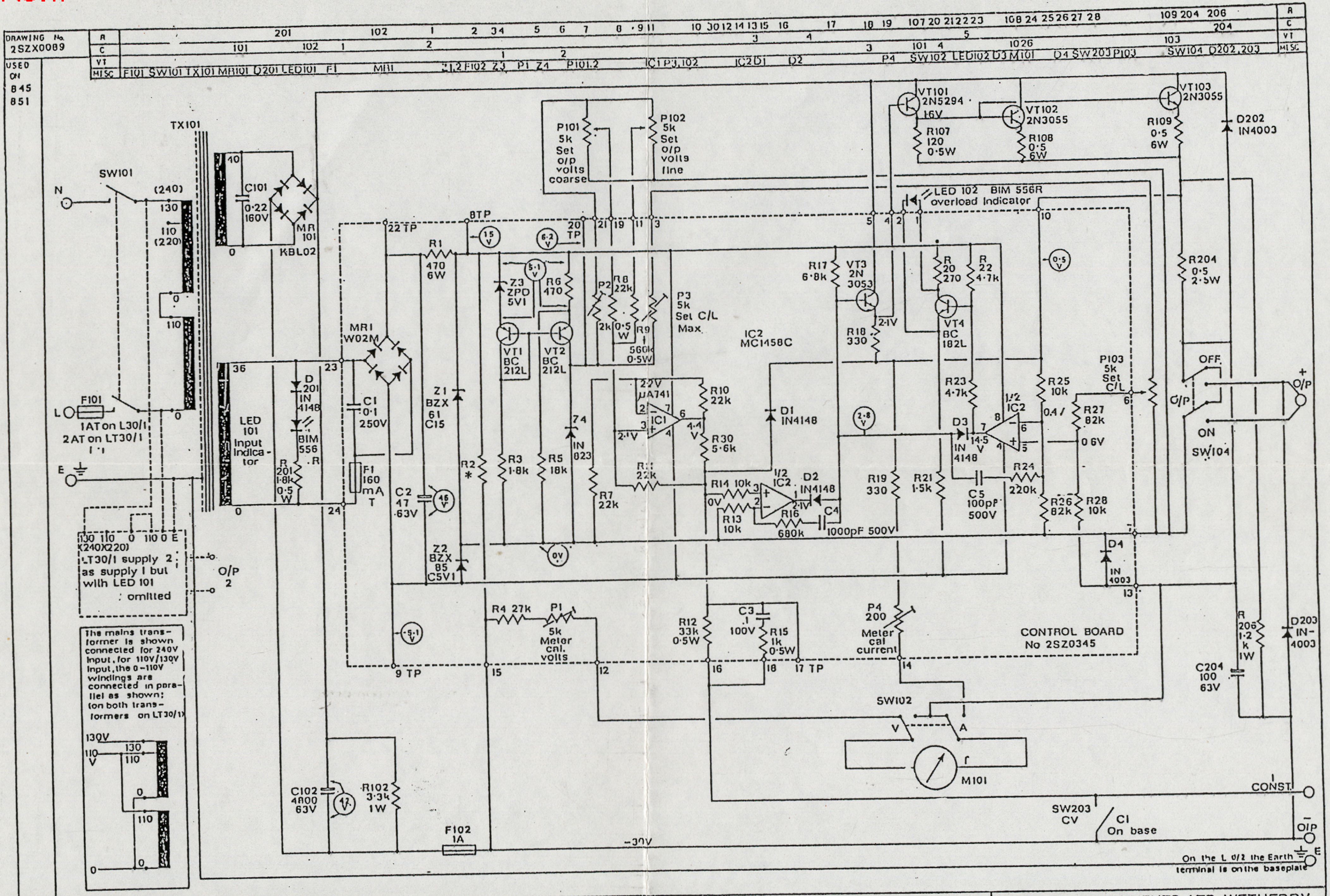
SHEET OF SHEETS

MECHANICAL DETAILS



SINGLE UNITS	H	W	D
L50/05 L30/1 L10/3C	226	133.5	225
L30/2	226	133.5	249
TWIN SIZE UNITS	H	W	D
LT50/05 LT30/1	226	254	225
LT30/2	226	254	249
L30/5 L12/10C	226	254	313

Rev.I



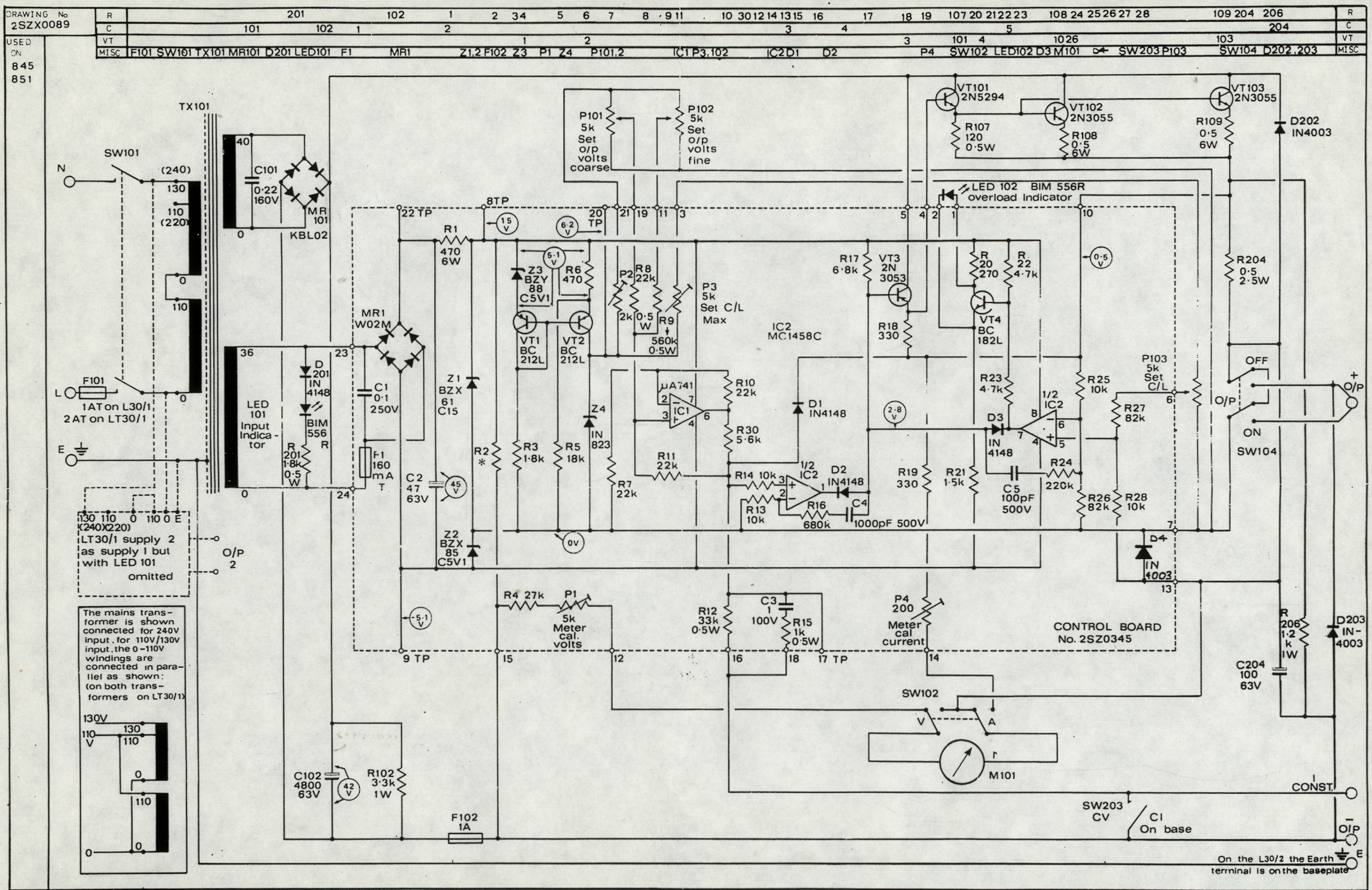
TRACED	E	18 Nov '78	5048			
	D	10.10.79	4960	I	25.8.82	Q8028
CHECKED J. S.	C	11.7.78	4915	H	30.4.81	07041
	B	7.7.78	4913			

Components numbered 2— are on the output circuit board
Resistors Values in ohms
Capacitor µF unless otherwise stated

* Not fitted
Note: voltages measured with respect to control board pin 7, unless otherwise shown, using a 20,000Ω/V meter at nominal input voltage
Output 30V 1A

Rev.I

FARNELL INSTRUMENTS LTD. WETHERBY
TITLE
L30/1 & LT30/1
CIRCUIT. DIAGRAM
FROM S/No L 2500 LT 2000
DRAWING No. 2SZX0089
SHEET OF SHEETS



TRACED	E	28 Nov '78	5048
	D	30·10·79	4960
CHECKED J. S.	C	11.7.79	4815
	B	7.7.79	4813
DRAWN J N	ISS	DATE	MOD. No.
	A	25.5.78	—
	G	28.7.79	5844
	F	4·1·79	5151

Components numbered 2__ are on the output circuit board
Resistors values in ohms
capacitor " " μF unless otherwise stated

* Not fitted
Note: voltages measured with respect to control board pin 7, unless otherwise shown, using a 20,000Ω/V meter, at nominal input voltage.
Output 30V 1A

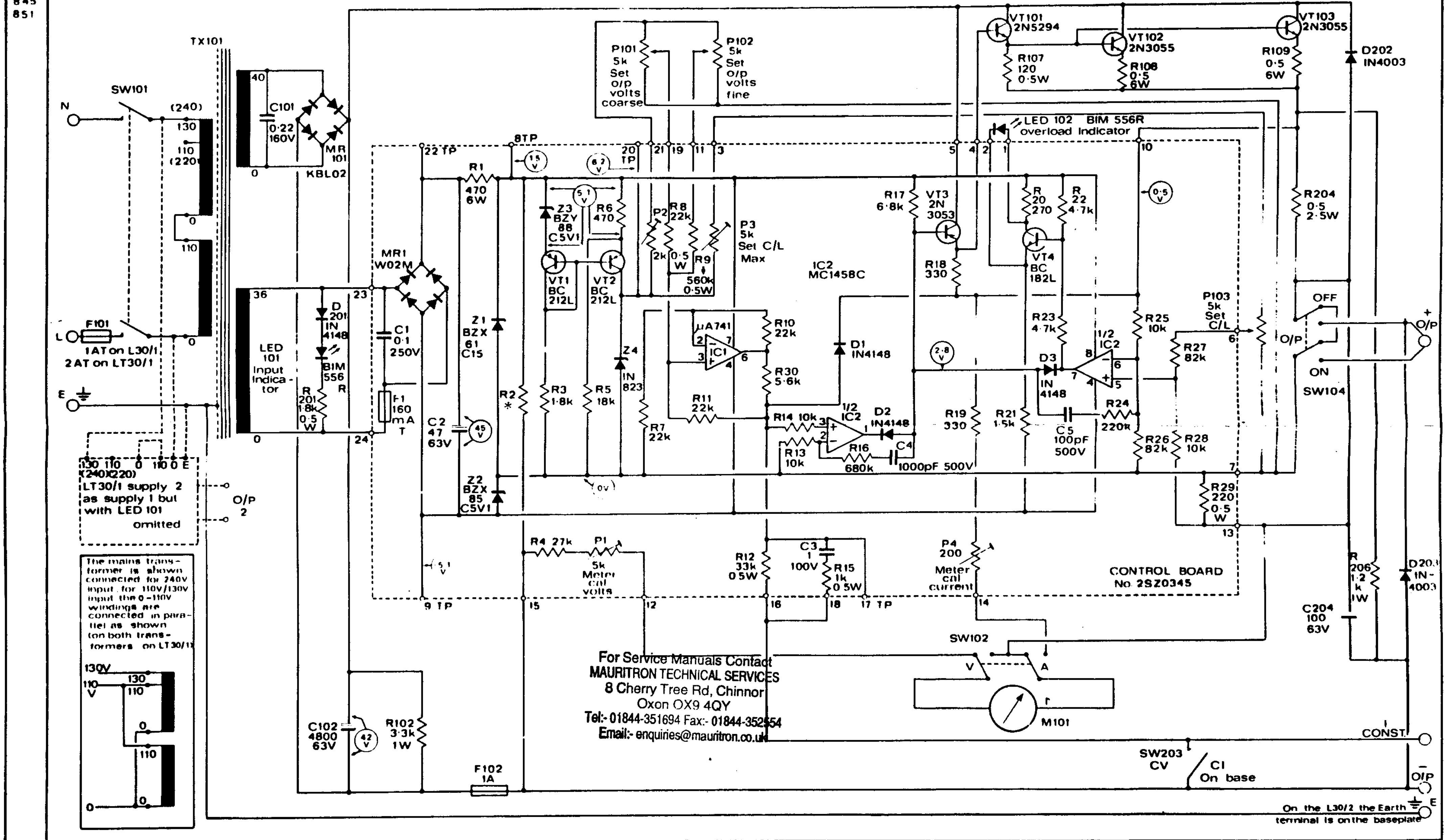
FARNELL INSTRUMENTS LTD. WETHERBY

TITLE
L30/1 & LT30/1
CIRCUIT DIAGRAM

DRAWING No 2SZX0089

SHEET OF SHEETS

Rev.G



Components numbered 2__ are on the output circuit board
Resistors values in ohms
capacitor " " µF unless otherwise stated

* Not fitted
Note: voltages measured with respect to control board pin 7, unless otherwise shown, using a 20,000Ω/V meter, at nominal input voltage.
Output 30V 1A

FARNELL INSTRUMENTS LTD. WETHERBY

TITLE
L30/1 & LT30/1
CIRCUIT DIAGRAM

DRAWING No
2SZX0089

FARNELL INSTRUMENTS LIMITED - SANDBECK WAY - WETHERBY - YORKSHIRE LS22 4DH - TELEPHONE 0937 61961