

L 24182 / L 24183

Doppel

'LM' & 'LQ' Range

Continuously Variable Power Supplies

Instruction Manual

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Introduction

LM & LQ Series Power Supplies provide a continuously variable, highly stable output in both constant current and constant voltage modes.

Voltage and current levels are accurately set by separate single turn concentric potentiometers allowing coarse and fine adjustment and metered on a single dual scale moving coil meter.

Units may be worked in series in the constant voltage mode and in parallel in the constant current mode and into any type of load.

Specification

Constant Voltage Mode

Line Regulation:
± 0.01% + 1mV for a
± 10% mains change.

Load Regulation:
0.03% + 3mV zero to full load.

Output Impedance:
Less than 200mΩ at 100KHz.
Less than 500mΩ at 500 KHz.

Ripple Voltage:
0.005% + 0.5mV peak – peak.

Transient Response:

Temperature Range:

Temperature Coefficient:

Meter Accuracy:

Constant Current Mode

Line Regulation:
± 0.01% + 1mA for a
± 10% mains change.

Load Regulation:
0.03% + 3mA full load to short circuit.

Ripple Current:
0.01% + 1mA peak – peak.

Less than 10μS for recovery to
within 10mV of steady state voltage
after application of full load.

+ 10°C to +45°C.

Less than 0.02%/°C.

±3%

Specification continued

Input Voltage: 105 – 125 or 200 – 240 at 45 to 65Hz by transformer tap changes. Maximum permissible input supply deviation from nominal ± 10%.

Input Termination: 3 – core flying lead.

Unit Type	Voltage Range	Max Current	Height	Width	Depth	Weight
LM50/30	0–30V	0.5 AMP	5¼"	3 ^{3/16} "	8¼"	6 lbs
LM100/15	0–15V	1 AMP	133mm	86mm	210mm	2.7Kg
LQ 50/50	0–50V	0.5 AMP	5¼"	3 ^{3/16} "	11 ^{1/8} "	7 lbs
LQ 100/30	0–30V	1 AMP	133mm	86mm	282mm	3.2Kg
LQ200/15	0–15V	2 AMP				

Operating Instructions

Before switching input power to the unit check that:–

1. The A.C. fuse is 1 amp and is an anti-surge device.
2. The transformer primary taps are set to within ± 10% of the nominal. The unit is set to 240 volts for the British Isles, 220 volts for Export to Europe and 115V for Canada and USA before despatch unless otherwise specified by the customer.

Access is gained to the transformer by removing the four feet of the unit, loosening the four front panel retaining screws and removing the cover.

Fig. 1. Transformer Primary Tap Connections

The primary is arranged as three windings:–

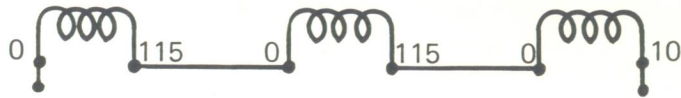


The 115V windings are connected in series for input voltages of 220 – 240V and in parallel for voltages of 105 – 125V.

The 10 volt winding is connected in series in phase or anti-phase to add or subtract 10 volts.

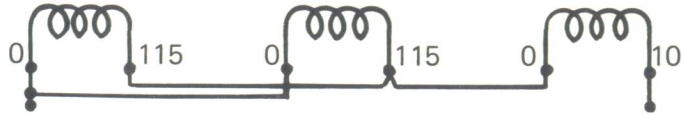
Examples:

10 volts connected in phase

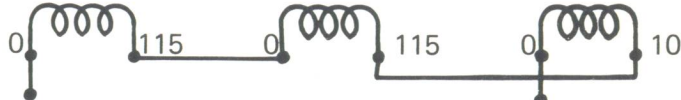


240V A.C.
input

125V A.C.
input

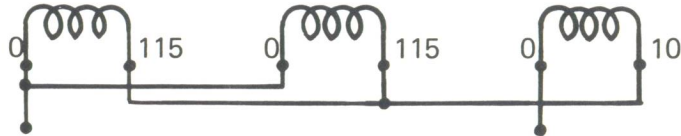


10 volts connected in anti-phase



220V A.C.
input

105V A.C.
input



IMPORTANT

A DIAL is provided on the rear panel to indicate the voltage at which the unit is set. Be sure to re-set the dial if it becomes necessary to alter the input voltage taps.

Input Connections

Connect the flying input lead to a suitable 3 pin plug using the colour code, green/yellow – earth, brown – line and blue – neutral.

Controls

Four main controls are provided.

On – Off: A switch controlling the mains supply to the unit.

Meter: A switch to display either output voltage or current on the meter.

Volts: Two single turn potentiometers providing fine and coarse control to set the output voltage, the level of which is shown on the meter when the switch is set to V.

Amps: One single turn potentiometer to set the current level at which the unit will enter into constant current operation. The current level is indicated on the meter when the switch is set to A.

Operation: Constant Voltage Output

Turn the voltage to minimum (fully anti-clockwise) and the current control to maximum (fully clockwise). Connect the load to the output terminals and adjust the voltage to the required level. The unit will remain in constant voltage unless the load resistance is so reduced that the current demand exceeds the capacity of the unit. The output will then enter into the constant current mode and the voltage will fall to maintain a constant current output.

Operation: Constant Current

Turn the voltage control to maximum (fully clockwise) and the current control to minimum (fully anti-clockwise). Connect the load and adjust the current control until the required current level is indicated on the meter.

The unit will remain in the constant current mode until the load resistance is so increased that the current demand is less than the level set by the 'Amps' control, the unit will then change to constant voltage operation.

Circuit Description

The output of the 22 volt centre tapped secondary is rectified by MR1 and MR2 and the resulting D.C. passes to VT1 and associated circuitry which provides a constant current output fed into three Zener diodes MR3, MR9 and MR10. The most negative zener (MR3) forms the stabilised negative subsidiary rail. The two more positive zeners MR9 and MR10 form the positive subsidiary rail. The junction of MR3 and MR10 is taken to the common reference rail which is also the positive output line.

The output of the centre tapped main secondary winding is rectified by MR6 and MR7 and filtered by C52. The resulting D.C. is passed to the output terminals via the series transistor VT50, and resistors R50; R50 compensates for any possible variation in the base emitter voltages of the series transistors.

Constant Voltage Circuit

Zener diode MR11 is connected via R25 to the positive subsidiary rail to provide the reference voltage from which a reference current is derived by R12. This current is compared by long tailed pair comparator VT5 with the current required by RV3 across the output.

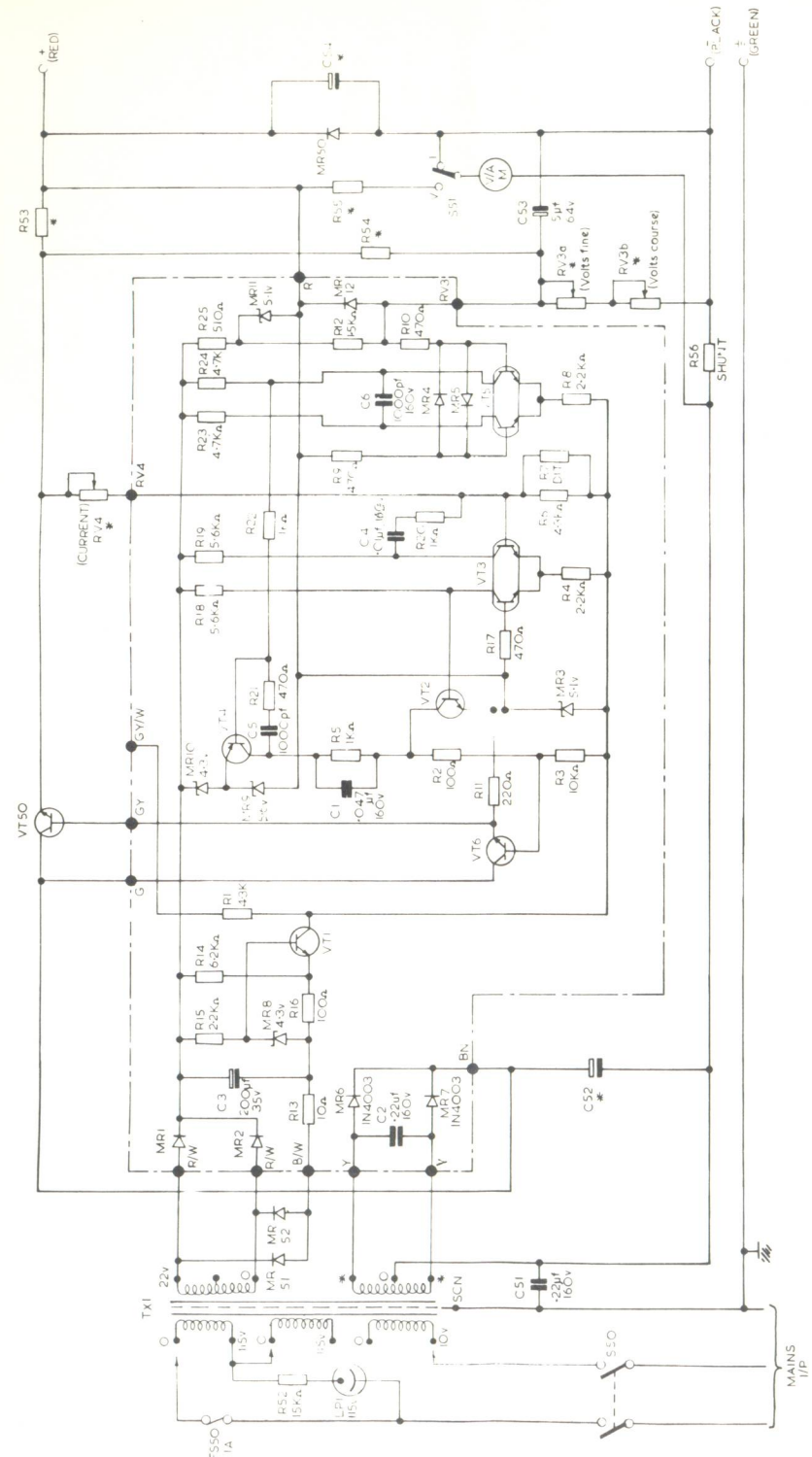
Since the current in RV3 is proportional to the output voltage, the setting of this resistor determines the output voltage of the unit. The single ended output from the comparator is taken to common emitter amplifier VT4 the emitter of which is connected to the junction of MR9 and MR10. An approximate constant voltage is applied across R24 which defines the current in VT5. The output of VT4 provides the drive to emitter follower chain VT50 and VT51 which in turn controls the drive current to the base of the series transistors.

When the demand for current from the unit is increased, the output voltage tends to fall, increasing the voltage at the base of VT5. VT5 passes more current and hence VT4 allows more current to pass to the base of the emitter follower chain. The output current thus increases until the correct voltage is maintained at the output terminals.

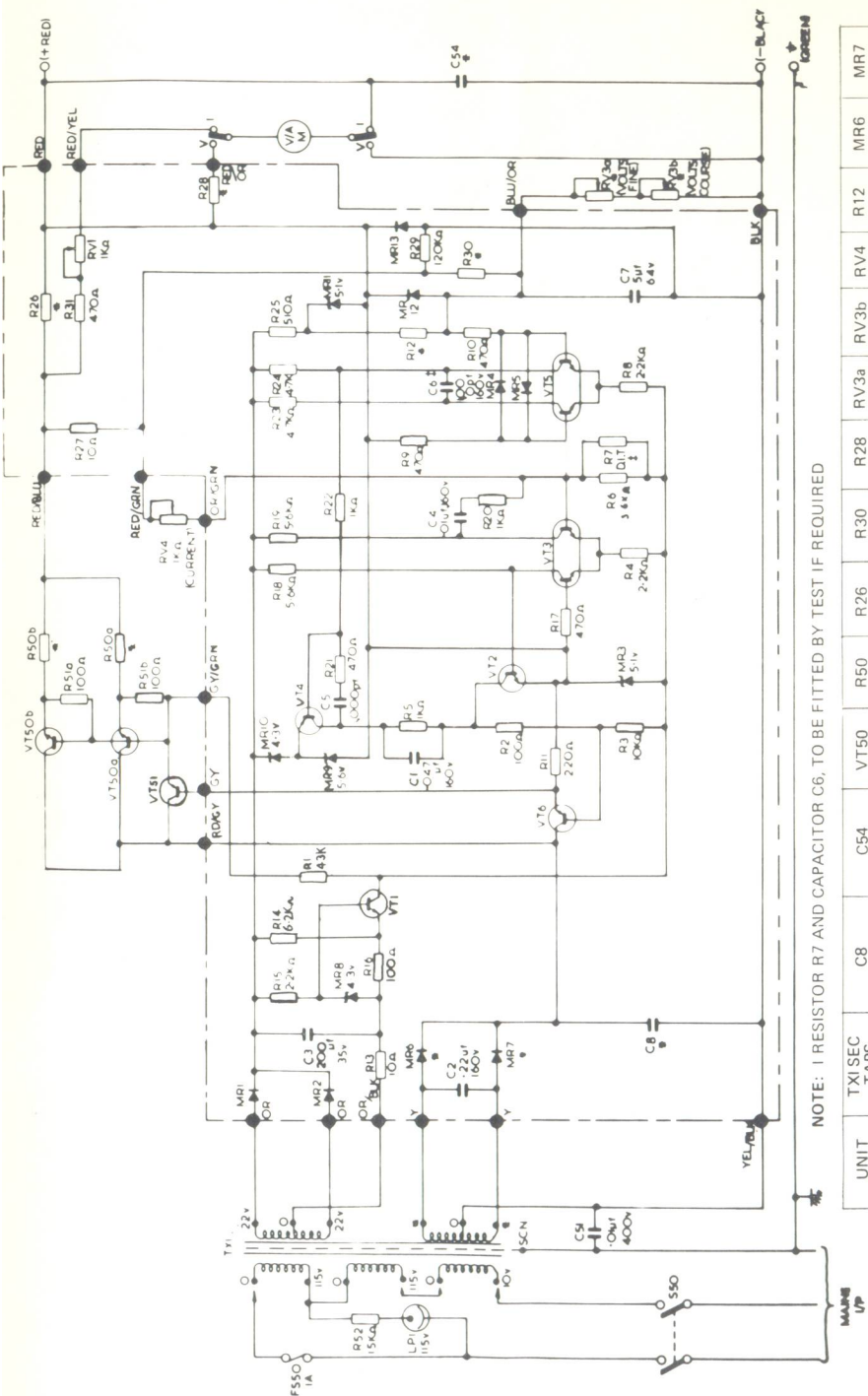
Lag networks C4, R20, R21 and C5 ensure high frequency stability of the closed loop. C53 provides a degree of ripple attenuation.

Constant Current Circuit

Load current is monitored as the voltage drop across R53 which is in series with the regulator transistors. MR3 (which also defines the negative subsidiary rail voltage) provides the reference voltage for constant current operation. Potential divider R6 and RV4 derives a voltage from the voltage drop across R31 which is compared with the reference voltage by comparator VT3. When the voltage across R55 increases to a point determined by the setting of RV4, the comparator is unbalanced in a direction to cause VT2 to divert drive current from the emitter follower chain, allowing the output voltage to fall. This circuit now assumes over-riding control and the supply is in constant current operation.



UNIT	TX1:SEC TAPS	C52	C54	R53	R55	RV3b	RV4
LM 50/30	34v-O-34v	1000uf 63v	1M Ω	2 Ω , 3w	3.0K Ω	10K Ω	1K Ω
LM 100/15	20v-O-20v	2200uf 40v	470K Ω	1 Ω , 3w	15K Ω	500 Ω	5K Ω



NOTE: 1 RESISTOR R7 AND CAPACITOR C6, TO BE FITTED BY TEST IF REQUIRED

UNIT	TXI/SEC TAPS	C8	C54	VT50	R50	R26	R30	R28	RV3a	RV3b	R12	MR6	MR7
LO 50/50	51V-0-51V	1000uf, 100V	150uf, 70V	2N4347	1Ω, 3W	2Ω, 3W	2.2MΩ	51KΩ	2KΩ	20KΩ	2KΩ	IN4003	IN4003
LO 100/30	34V-0-34V	2200uf, 63V	200uf, 35V	2N3055	1Ω, 3W	1Ω, 3W	1MΩ	30KΩ	1KΩ	10KΩ	1-5KΩ	IN4003	IN4003
LO 200/15	20V-0-20V	4700uf, 40V	500uf, 35V	2N3055	15Ω, 3W	5Ω, 3W	470KΩ	15KΩ	500KΩ	5KΩ	1-5KΩ	IN5402	IN5402

LQ SERIES CIRCUIT DIAG

WARNING

When the mains supply is connected to the mains connector block on a power supply dangerous voltage will be present on some components within the unit.

HEALTH AND SAFETY AT WORK ACT 1974

We have reasonable grounds to believe that we have ensured, so far as is practicable, that our product has been so designed and constructed as to be safe and without risks to health, when properly installed and used in its intended environment by appropriate and trained personnel, and in accordance with our published instructions.

SPARES AND SERVICE

1. A full stock of tested spare parts is held at our Ilfracombe factory for customers who require to repair units themselves.
2. When returning units to our Service Department, please ensure they are adequately packed for the journey. The units must also be accompanied by information as to their origin and nature of defect. This information will greatly assist us in giving a speedy turn round, please supply too much information rather than too little.
3. Coutant Electronics Ltd., reserve the right to make design and component changes without notice. Equivalent components may be used in place of those listed.

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