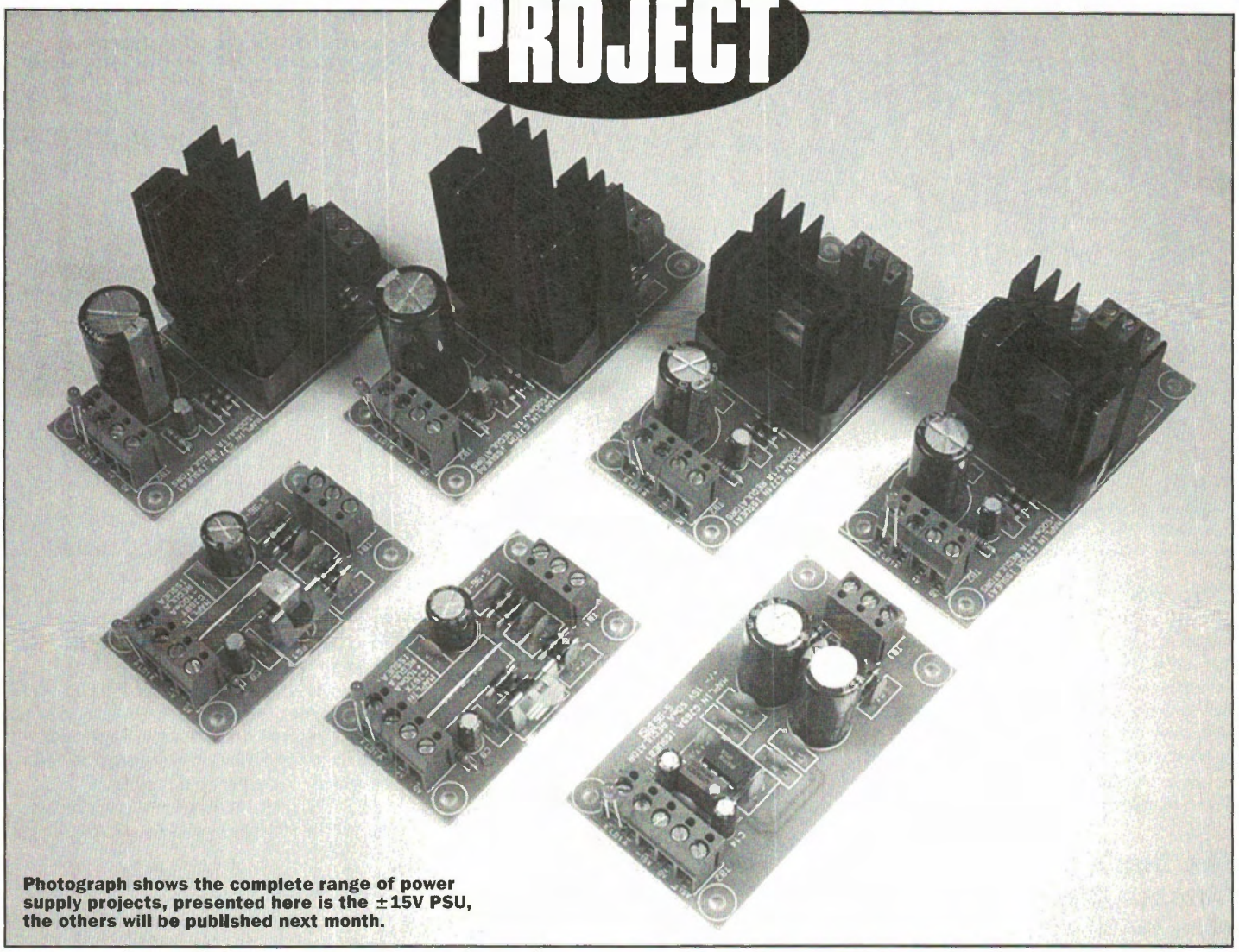
PROJECT



Photograph shows the complete range of power supply projects, presented here is the ±15V PSU, the others will be published next month.

FEATURES

- Dual polarity tracking
- Short-circuit protected
- Over-temperature shutdown
- Power on indication
- Compact board dimensions

APPLICATIONS

- Dual-rail regulated DC PSUs
- Ideally suited to op-amp circuits

PROJECT RATING 3

Kit Available
Order as 95162
Price £7.99

±15V REGULATOR KIT

Design by Alan Williamson
Text by Alan Williamson and Maurice Hunt

This ±15V Regulator kit is based on the RC4195N, an 8-pin dual polarity tracking regulator integrated circuit, designed to provide balanced positive and negative ±15V DC outputs, at currents of up to 100mA (peak) per rail. The IC is fully protected against short-circuits, and shuts down if its internal temperature exceeds 175°C, making it the ideal choice for use in a general purpose regulated DC power supply, or for use with operational amplifier circuits.

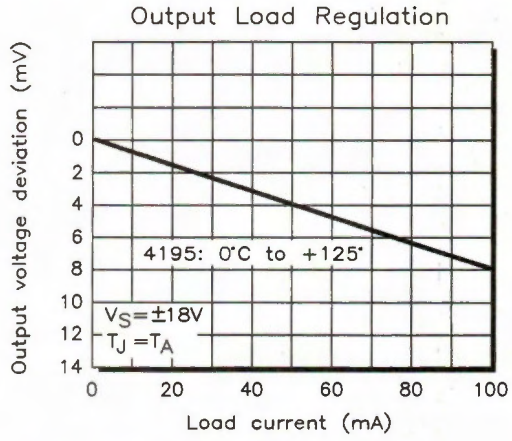


Figure 1. Output load regulation graph.

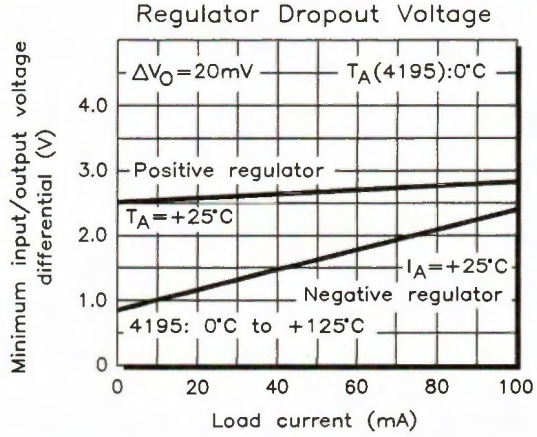


Figure 2. Regulator dropout voltage graph.

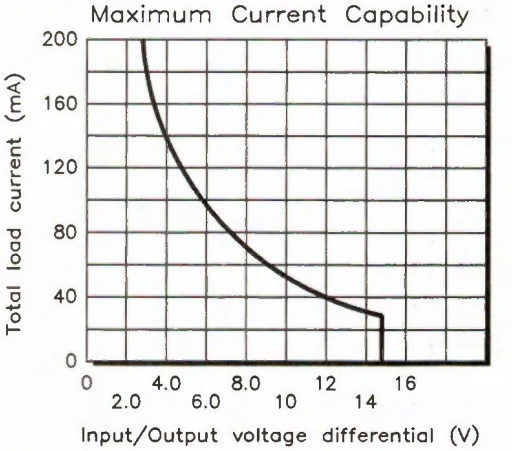


Figure 3. Maximum current capabilities graph.

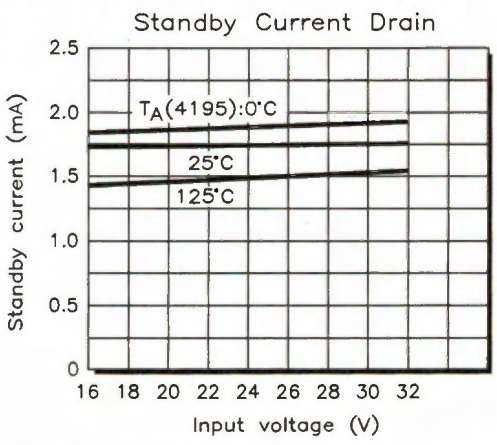


Figure 4. Input voltage graph.

The various performance aspects of the RC4195N regulator IC are detailed in the graph plots, see Figures 1 to 6. The ±15V Regulator Kit is built onto a compact, single-sided board, connections being made via onboard terminal blocks. Provision is made for accurate balancing of the output rails with a negative rail trimmer, and for optional power on indication.

Circuit Description

Refer to Figure 7, showing the circuit diagram. The stepped-down AC voltage from the transformer secondary windings are fed into the bridge rectifier formed from diodes D1 to 4. Capacitors C1 to 4 prevent noise/interference from the diodes. Capacitors C5 & C6 act as low-frequency decoupling, while C7 & C8 provide high frequency decoupling. The extremely large values of C5 & C6 (considering the current drawn) are required because IC1 has only 75dB ripple rejection, and the larger C5 & C6 are made, the lower the input ripple – the output ripple of the regulator will then be 75dB down from the (now) small input ripple.

IC1, the pinout, functional block diagram and internal circuit of which are shown in Figures 8, 9 and 11, achieves the regulation of the DC supply being fed into it. Capacitors C9 & C10 connect the compensation inputs of the IC to the negative side of the bridge rectifier and the 0V rail, respectively.

Potentiometer RV1 is used to balance the two output supply rails, so that they can be closely matched, but of opposite polarity.

Capacitor C11 provides common mode noise rejection of the output, while C12 and C13 provide differential mode rejection.

C14 & C15 achieve low-frequency decoupling of the output. Resistor R1 limits the current applied to the power on LED, LD1 (if fitted).

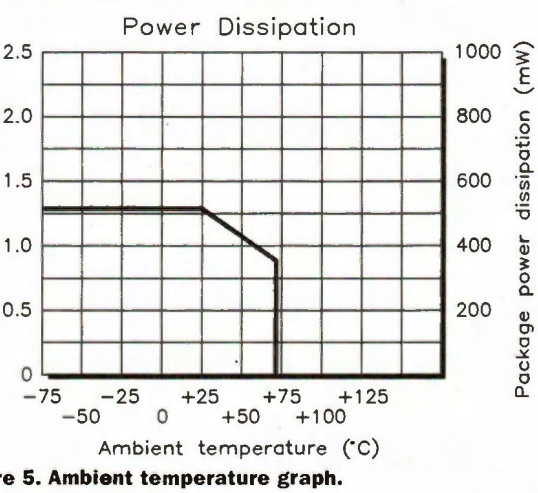


Figure 5. Ambient temperature graph.

SPECIFICATION

Operating voltage:	20-0-20V 50Hz AC
Output voltage:	±15V DC dual-rail, or 30V DC single-rail, regulated
Maximum output current:	50mA continuous (per rail), 100mA peak
Short Circuit current:	220mA @ 25°C
Maximum power dissipation:	600mW
Output voltage drift with temperature:	0·005%/°C (typ), 0·015%/°C (max)
Output voltage tracking:	±50mV (typ), ±300mV (max)
PCB dimensions:	78 × 42mm

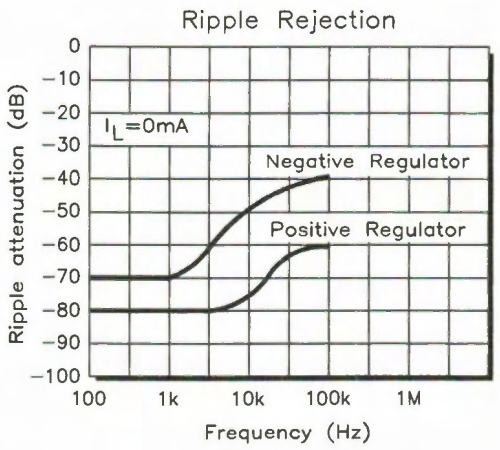
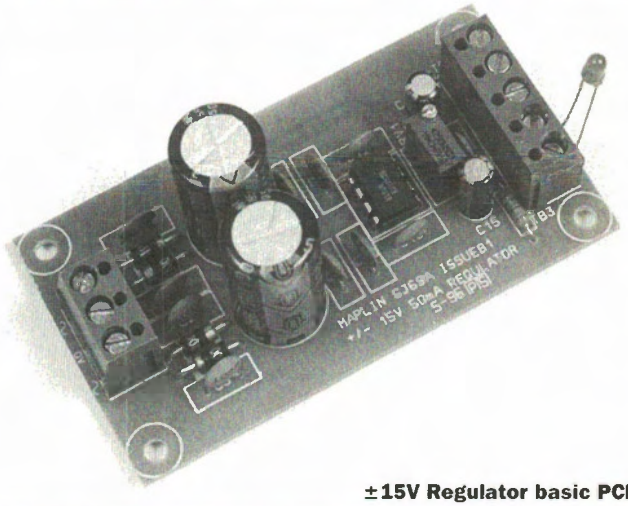


Figure 6. Frequency graph.



±15V Regulator basic PCB.

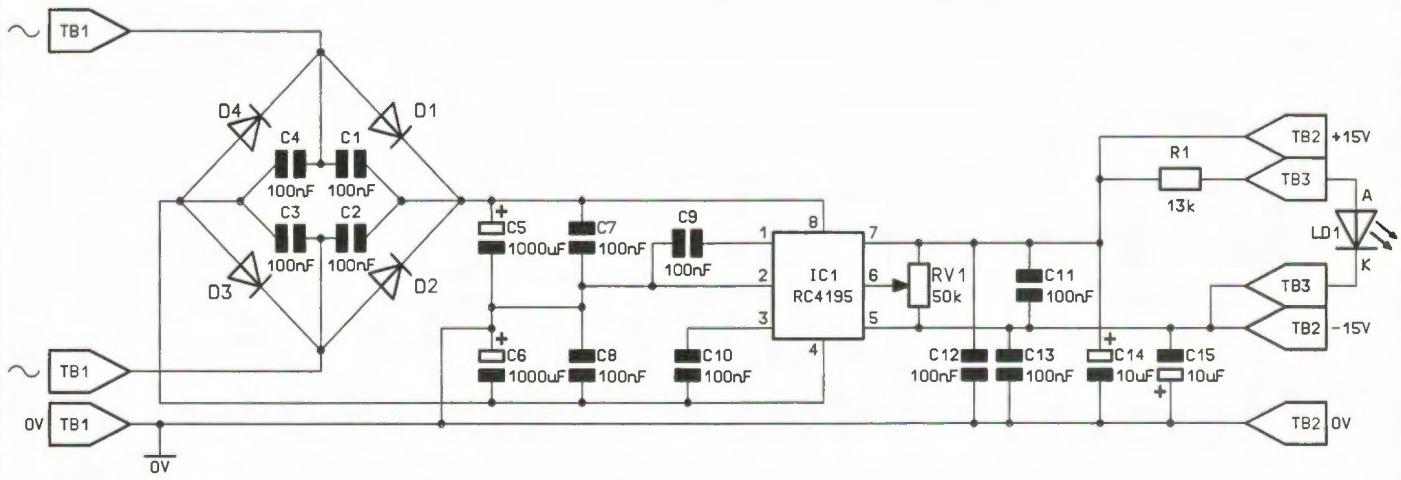


Figure 7. Circuit diagram.

PCB Assembly

Refer to Figure 12, showing the PCB legend and track, and to the Constructors' Guide if you are a newcomer to project building. Assemble the board in order of ascending component size/height, taking care to install the polarised components (electrolytic capacitors and diodes) with the correct orientation, as indicated by the legend. Install IC1 so that its end notch aligns with that of the legend, and fit the terminal blocks so that their access holes face outwards. Note that an IC holder should NOT be fitted, as the PCB tracks are used as a heatsink for IC1.

Having assembled the board, CAREFULLY check your work for misplaced components, solder bridges, whiskers or dry joints, then clean excess flux off the board using a suitable solvent.

Testing and Use

Connect the optional transformer to the board at terminal block TB1, and the LED, LD1, to TB3, as shown in Figure 13 (note orientation). The mains wiring to the transformer primary winding is shown in Figure 14. Once everything is connected to the board, check the continuity for short circuits, etc. With the unit installed in a suitable box and with the lid closed, turn the power on. If fitted, the LED LD1 should illuminate, indicating that power is presenting at the output terminals. Now, using a multimeter, measure the voltage between the 0V and +15V & −15V terminals of TB2. The reading should be +15V and −15V DC ±0·5V, respectively.

If fitted, adjust the optional potentiometer RV1 as necessary (see Figure 10), to obtain equally matched, but of opposite potential readings (i.e., balanced) at the two output terminals. The ±15V Regulator is now ready for use. Note, if RV1 is omitted, the output rail voltages may differ by up to 300mV.

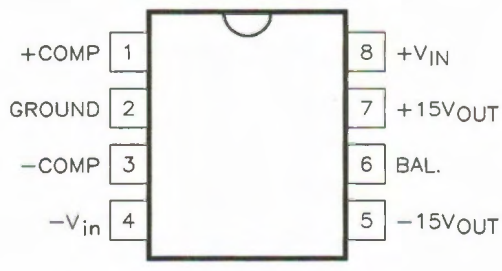


Figure 8. RC4195 pinout.

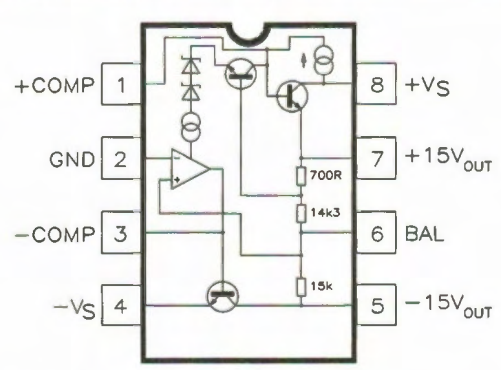


Figure 9. RC4195 functional block diagram.

Important Safety Note

It is important to note that mains voltage is potentially lethal. Full details of mains wiring connections are shown in this article, and every possible precaution must be taken to avoid the risk of electric shock during maintenance and use of the final unit, which should never be operated with the box lid removed. Safe construction of the unit is entirely dependent on the skill of the constructor, and adherence to the instructions given in this article. If you are in any doubt as to the correct way to proceed, consult a suitably qualified electrician or engineer.

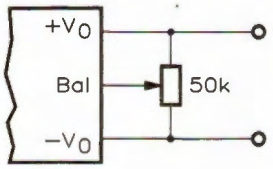


Figure 10. Balancing the output rails.

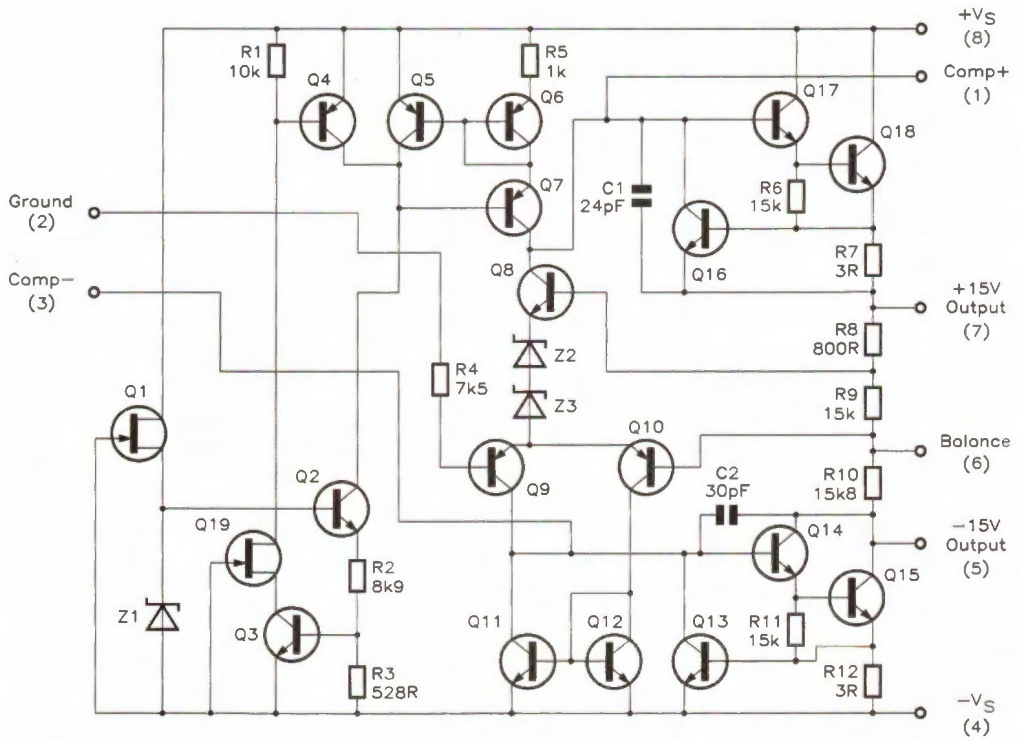


Figure 11. RC1495 circuit diagram.

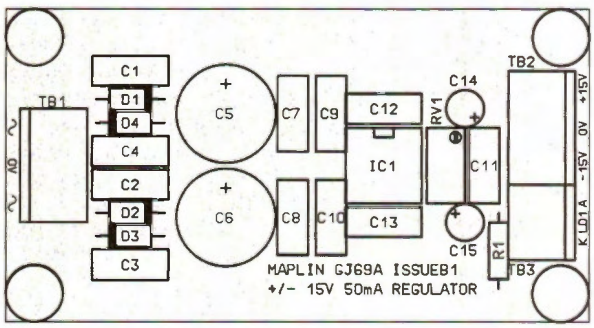


Figure 12. PCB legend and track.

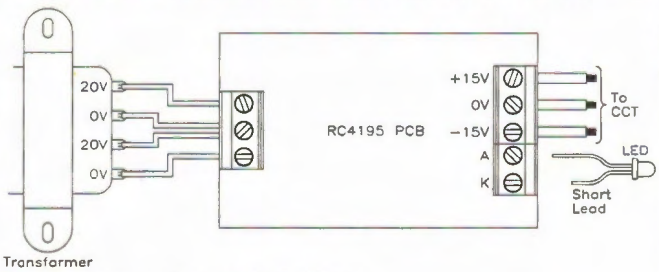


Figure 13. Transformer/PCB wiring.

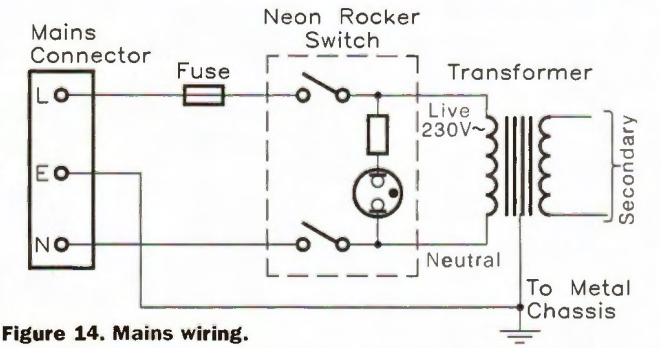


Figure 14. Mains wiring.

PROJECT PARTS LIST

RESISTORS: All 0·6W 1% Metal Film (Unless stated)			
R1	13k	1	(M13K)
CAPACITORS			
C1-4,7-13	100nF 50V Ceramic Disc	11	(BX03D)
C5,6	1,000µF 35V Radial Electrolytic	2	(AT63T)
C14,15	10µF 63V Radial Electrolytic	2	(YR75S)
SEMICONDUCTORS			
D1-4	1N4001	4	(QL73Q)
LD1	3mm Red LED	1	(CZ28F)
IC1	RC4195	1	(XX02C)
MISCELLANEOUS			
TB1,2	3-way 5mm PCB-mounting Terminal Block Type 300	2	(JY94C)
TB3	2-way 5mm PCB-mounting Terminal block Type 300	1	(JY92A)
	PCB	1	(GJ69A)
	Instruction Leaflet	1	(XZ33L)
	Constructors' Guide	1	(XH79L)
OPTIONAL (Not in Kit)			
RV1	50k 22-tum Cermet Potentiometer	1	(UH26D)
T1	6VA 230V to 20-0-20V Transformer	1	(WB16S)
FS1	50mA Time Delay Glass Fuse	1	(CZ85G)

The Maplin 'Get-You-Working' Service is available for this project, see Constructors' Guide or current Maplin Catalogue for details.

The above items (excluding optional) are available as a kit, which offers a saving over buying the parts separately.

Order As 95162 (±15V Regulator Kit) Price £7.99

Please Note: Where 'package' quantities are stated in the Parts List (e.g., packet, strip, reel, etc.), the exact quantity required to build the project will be supplied in the kit.

The following new item (which is included in the kit) is also available separately, but is not shown in the 1996 Maplin Catalogue.

±15V Regulator Kit PCB **Order As 95182 Price £2.49**