hum problems are experienced, extra decoupling via a 100 ohm resistor and 100μF capacitor on the +12V line to the filter would be needed. This extra decoupling would also be required if the power leads feeding the unit are very long.

If you are using the ready made PCB, the following order of construction is advised:

1. Insert 1mm PCB connection pins through all larger pads from the underside and solder into place.

2. Following the layout and parts list carefully, insert and solder all the resistors, making sure you use metal oxide 2% types where specified. The 9.1k resistor can be 8.2k and 1k in series (the PCB allows for this).

3. Insert and solder all the capacitors, keeping the bodies as close to the board as possible. Again several capacitors may be needed in some places to make up the value — these are designated 'a' and 'b' on the layout and values are given for each in the parts list. Make sure the polarity of the electrolytics is correct.

4. Finally insert and solder the 4 ICs, with the pin 1 identifier correctly placed. When soldering, be careful not to bridge the pads.

5. Carefully inspect the PCB for solder bridges etc, before applying power.

No alignment is required so it should work first time. If it doesn't, try to isolate the stage which isn't working first by trying each output in turn. Then have a look at the components to see if any values are wrong. The voltage check chart will be of help here, but allow for the fact that there will be some variations due to component tolerances.

Table 1 Component list

R1, 3	2k2 5%
R2, 4, 7, 8, 25, 26	27k 5%
R5, 12, 29, 40, 41, 42	56R 5%
R6	2k2 5%/ 15k 5% (see text)
R9, 28, 32, 35, 38	2k2 2%
R10	9k1 2% (8k2 + 1k)
R11	100k 2%
R13, 14, 16, 17, 18, 20, 21, 22, 24	10k 2%
R15, 19, 23	20k 2%
R27	68k 2%
R30, 33, 36, 39	180k 2%
R31, 34, 37	82k 2%

All resistors marked 2% should be 2% or 1% tolerance metal film types. Those marked 5% can be 5% tolerance or better carbon film.

C1, 2, 3, 4, 5, 10, 20, 21, 24 31, 32, 33	10μ/ 16V radial electrolytic
C6, 7, 9	27n (22n+4n7) mylar
C8, 12	12n (10n+2n2) mylar
C11	15n (10n+4n7) mylar
C13, 19	2n2 mylar
C14, 18	22n mylar
C15	18n (10n+6n8) mylar
C16	1n5 polystyrene
C17	33n mylar
C22, 23, 25, 26, 27, 28, 29, 30	10n mylar
IC1	741N (8 pin DIL)
IC2, 3, 4, 5	LF353N

Also required: 15 1mm PCB connection pins
Screened audio cable
PCB
1-pole 8-way switch (if all positions used)

The PCB and complete set of parts including a rotary switch is available from WPO Communications for £15.45 inc. VAT & p&p.

Table 2 Voltage check chart

All voltages measured with high impedance digital voltmeter, no AF input.

PIN	IC1	IC2/3/4	
1	nc	6.1	nc = no connection
2	6.1	6.1	
3	6.1	6.1	
4	0	0	
5	nc	6.1	
6	6.1	6.1	
7	11.9	6.1	
8	nc	12.0	

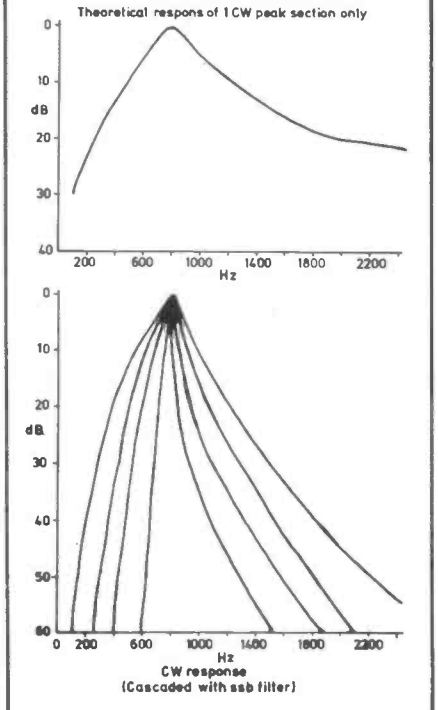

Fig. 4 Frequency response of CW filter sections