

BASS

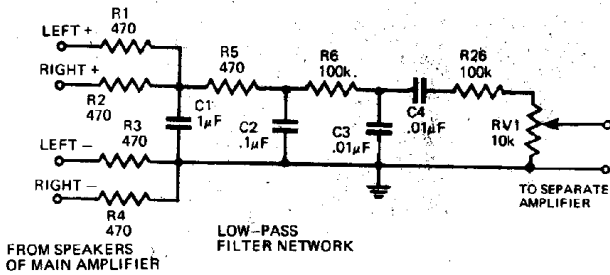


Fig. 1. This filter circuit can be used with an external amplifier.

Many economy hi-fi systems have adequate mid-range and treble response — but sound as if the bottom has fallen out of the amplifier when they come to some good solid bass.

And when you calculate the amplifier and speaker capacity required for realistic bass response you begin to appreciate why.

But all is not lost — for here is a modification that will reproduce the very deepest of bass, at levels practically guaranteed to infuriate your neighbours for life!

Unlike the higher audio frequencies, bass is largely non-directional, and, because of this, the positioning of a bass speaker is not at all critical.

The bass booster described in this project exploits this principle. Whilst

in no way affecting the normal output or stereo separation of the existing system the booster effectively combines the bass signals from the left and right hand stereo channels and, following amplification, reproduces them through a common bass speaker.

The system may be used in several different ways.

In its simplest form, the combining filter shown in Fig. 1 is connected to any spare mono or stereo amplifier (rated at 20 Watts or more) and played through a single speaker enclosure that has a good bass response.

In another form the same arrangement is used together with the speaker system specifically designed for bass reproduction (shown in Figs. 6 & 7).

But as few of us have spare

high-powered amplifiers lying around waiting for a project like this — we have designed a very simple yet effective amplifier especially for this project. Note, that for this latter arrangement the design of the filter has been changed slightly.

CONSTRUCTION

If the booster is used in its simplest form — using a separate amplifier — the filter should be constructed on a small piece of perforated board or tag strips. The circuit is shown in Fig. 1. The layout is not at all critical.

In the form shown in Fig. 2, the amplifier and filter are constructed as one unit. This complete unit may be mounted within the new bass speaker enclosure (as we did with our

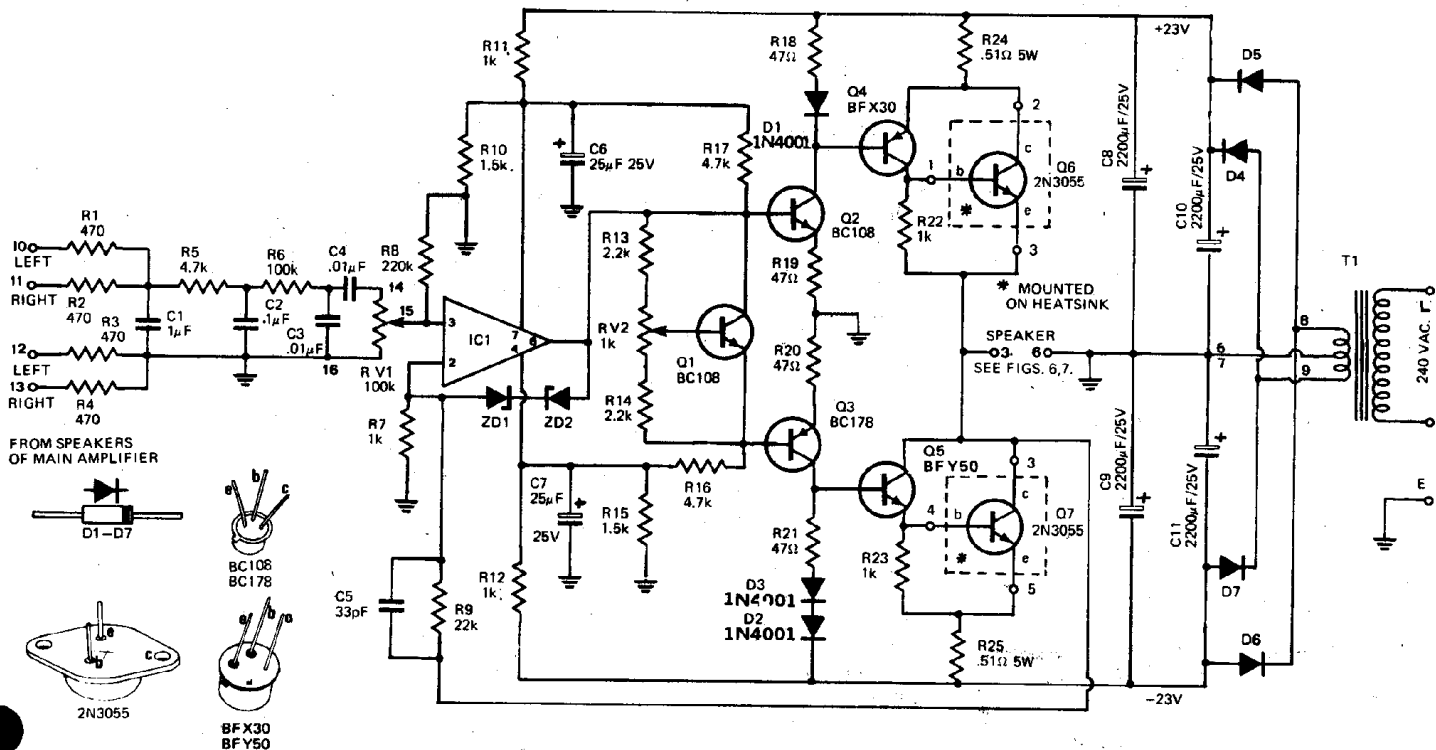


Fig. 2. In this circuit the filter and amplifier are combined as one unit.

BOOSTER

Modify your hi-fi system to provide some real bass performance.

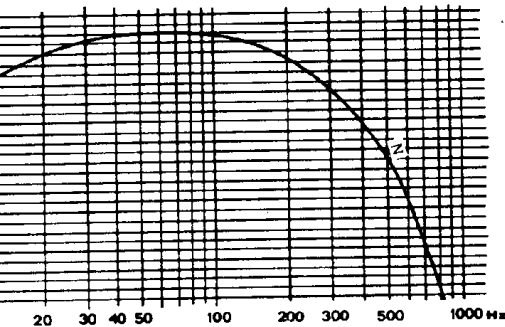
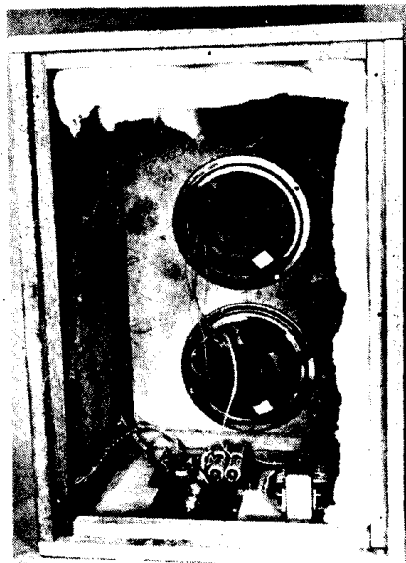


Fig. 3. This curve shows the frequency response of the filter.



All components can be mounted within the speaker enclosure.

prototype unit) or located in any readily accessible place.

Construction of the one-piece unit is quite simple as most components are mounted directly on the printed circuit board — shown full size in Fig. 2.

The main power transformer, output transistors and control potentiometer are mounted externally — and connections to and from these components are made via the points numbered on both the component layout diagram (Fig. 5) and the main circuit diagram (Fig. 2).

Make sure that all components are orientated correctly before soldering them into the circuit.

Transistors Q6 and Q7 are mounted on the heatsink — using insulating washers — and connected to pins 1, 2, 3, 4 and 5 as shown in Figs. 2 and 5.

If the amplifier is to be located within the speaker enclosure, the power transformer should be mounted on rubber.

The connections to the inputs and to the volume control should be made using screened cable.

When you are sure that all components have been wired correctly, set the wiper RV2 centre of its travel. Do not connect the speakers at this stage of the operation.

This project is intended primarily to increase the bass response of economy hi-fi systems. There is little to be gained by using this system where adequate bass already exists.

Switch on the main 240 Volt supply and check the voltage across the speaker terminals. This should be less than 200 mV. If it is substantially higher than this, switch off and recheck all connections. (If a voltmeter is not available, connect one side of the speaker to one side of the amplifier and momentarily touch the second amplifier lead to the remaining side of the speaker. If all is well the speaker should remain practically silent or at most produce a slight 'click'. (If the speaker cone tries to fly across the room — then switch off at once and recheck all connections).

Next, if a milliammeter is available, disconnect the lead to pin 2 and measure the current in this lead. Adjust RV2 until the current is approx. 40 mA. If no milliammeter is available, leave RV2 in mid-position.

Connect the leads from the existing speakers to the filter input and connect the bass speaker to the booster amplifier. The power may now be switched on and the complete system checked out. Remember that the sound from the bass booster will be grossly distorted if this unit is used

PARTS LIST ET 407

(combined filter/amplifier)

R1	— resistor	470	Ω	1/4W	5%	
R2	— " "	"	"	"	"	
R3	— " "	"	"	"	"	
R4	— " "	"	"	"	"	
R5	— " "	4.7k	"	"	"	
R6	— " "	100k	"	"	"	
R7	— " "	1k	"	"	"	
R8	— " "	220k	"	"	"	
R9	— " "	22k	"	"	"	
R10	— " "	1.5k	"	"	"	
R11	— " "	1k	"	"	"	
R12	— " "	1k	"	"	"	
R13	— " "	2.2k	"	"	"	
R14	— " "	2.2k	"	"	"	
R15	— " "	1.5k	"	"	"	
R16	— " "	4.7k	"	"	"	
R17	— " "	4.7k	"	"	"	
R18	— " "	47	"	"	"	
R19	— " "	47	"	"	"	
R20	— " "	47	"	"	"	
R21	— " "	47	"	"	"	
R22	— " "	1k	"	"	"	
R23	— " "	1k	"	"	"	
R24	— " "	0.51	"	5W	"	
R25	— " "	0.51	"	"	"	
RV1	— potentiometer	100k	log			
RV2	— preset potentiometer	1k	linear			
C1	— capacitor	1	μ F	200V		
C2	— " "	0.1	"	100V		
C3	— " "	0.01	"	"		
C4	— " "	0.01	"	"		
C5	— " "	33pF				
C6	— " "	25 μ F	25V electro-			
C7	— " "	25 μ F	25V lytic			
C8	— " "	2200 μ F	25V "			
C9	— " "	"	"			
C10	— " "	"	"			
C11	— " "	"	"			
Q1	— transistor	BC108				
Q2	— " "	BC108				
Q3	— " "	BC178				
Q4	— " "	BFX30				
Q5	— " "	BFY50				
Q6	— " "	2N3055				
Q7	— " "	2N3055				
IC1	— integrated circuit	μ A 741C—				
		TBA 221				
D1-D3	— silicon diodes type	1N4001				
D4-D7	— diodes	100 PIV, 1.6A;				
		(PL4002 — Henry's Radio)				
ZD1	— zener diode	BZY88 C3V9				
ZD2	— " "	"				
Transformer	220-250V Primary;					
	15-0-15V 1-5A Secondary;					
	(MT3AT, Henry's Radio)					
PC	— printed circuit board	ET018				
Heatsink	— type	H11, Henry's Radio				
Insulating kits for 2N3055s						
Three core flex and plug						
Terminals						
Shielded wire etc						
Note: C1-C4	— single-ended Polyester,					
	Mullard type C280 or equivalent					
PARTS LIST FOR SEPARATE FILTER						
R1-R4	— resistor	470	Ω	1/4W	5%	
R5	— " "	4.7k	"	"	"	
R6	— " "	100k	"	"	"	
R26	— " "	100k	"	"	"	
RV1	— potentiometer	10k	log			
C1	— capacitor	1	μ F	200V		
C2	— " "	0.1	"	100V		
C3	— " "	0.01	"	"		
C4	— " "	0.01	"	"		
Tag strips	— terminals etc					
(C1-C4)	: See Note above)					

BASS BOOSTER

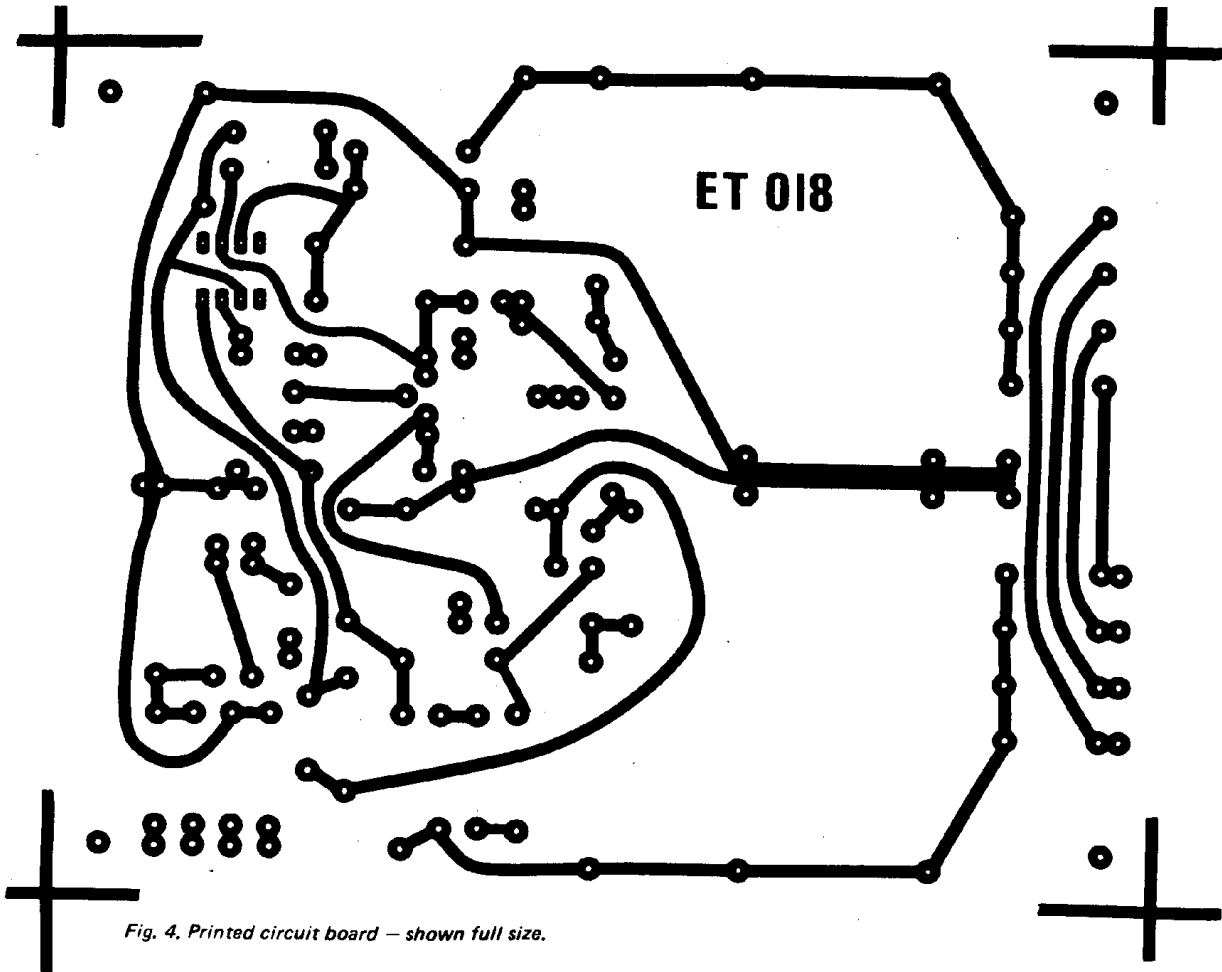


Fig. 4. Printed circuit board — shown full size.

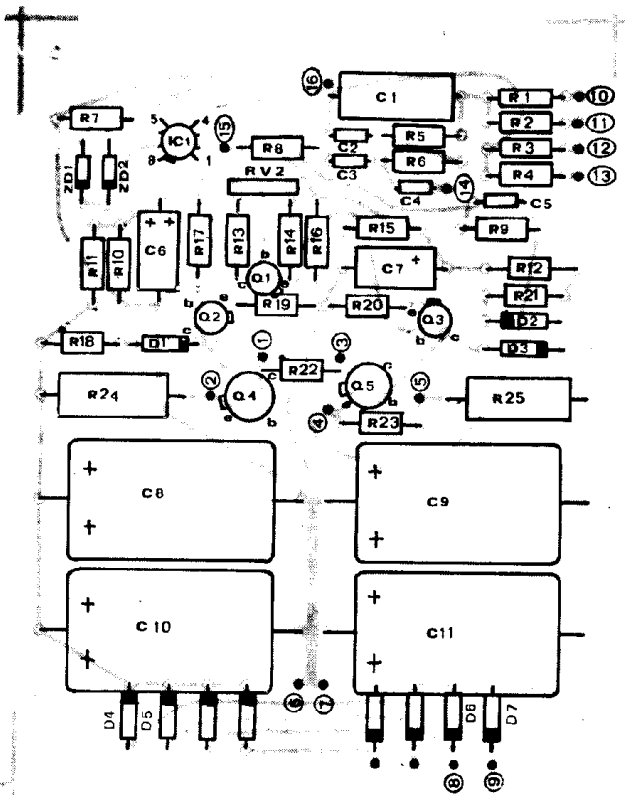


Fig. 5. How the components are located on the printed circuit board.

HOW IT WORKS

The output from each channel of the existing stereo amplifier is combined by resistors R1-R4. Resistors R5, R6 and RV1, together with capacitors C1, C2 and C3 form a low pass filter that has a cut-off frequency around 200 Hz and a final 18 dB per octave slope.

Capacitor C4 provides a high pass filter of approximately (30 Hz to protect the speakers from large transients and dc levels. (The filter shown in Fig. 1 — intended for use with separate amplifiers — has a 20 dB attenuator incorporated before the output potentiometer — this protects the following amplifier against overloads).

The amplifier shown in Fig. 2 has a voltage gain of 23 ($R9 + R7$), a power output of approx. 25 Watts into four ohms and a frequency response from 0Hz to approx. 50 kHz. How-

ever with the input filter incorporated, the frequency response of the amplifier is that of the filter — shown in Fig. 3.

The main voltage gain of the amplifier circuit is provided by IC1. Q2 and Q3, Q4 and Q5 provide the necessary current gain to drive the output transistors Q6 and Q7. Transistor Q1 stabilises Q2 and Q3 while D1 compensates Q4, D2 and D3 compensate Q5 and Q7.

Zener diodes ZD1 and ZD2 protect Q2 and Q3 by limiting the output voltage swing of the IC.

The amplifier described in this project may also be used — without the filter — as a straightforward 25 Watt mono amplifier — in this case diode D2 or D3 (but not both) should be removed from its location on the printed circuit board and relocated on heat sink.

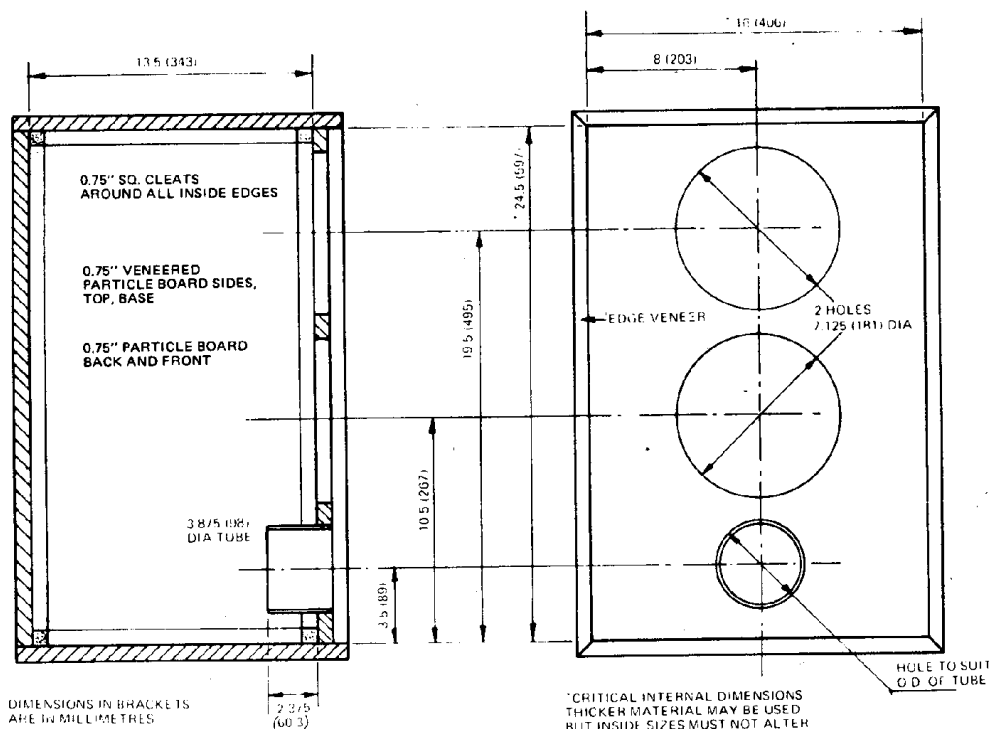


Fig. 6. Constructional details of recommended speaker enclosure.

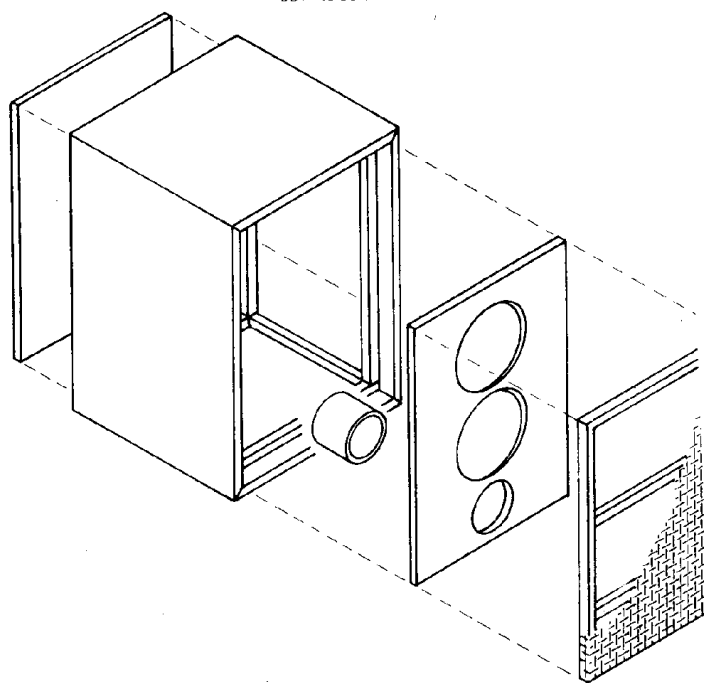


Fig. 7. Exploded view of speaker enclosure.

alone — but when mixed with the sound from the existing two speakers in your stereo system it sounds just great.

BASS SPEAKER ENCLOSURE

The enclosure tested for use with this system is shown in Figs 6 and 7. The speakers used were two 8 ohm Magnavox type 8W connected in parallel, thus having an effective impedance of 4 ohms.

The inside of the speaker enclosure was lined on at least three non-facing surfaces (eg side, top and rear) with absorptive material such as felt.

Fig. 8. How the speakers are interconnected.

