

FET constant current source as its emitter load. The design of the tone control stage allows a lift and cut of the bass and treble of about 12 dB. The overall distortion through the circuit is negligible. Switches S1A, S1B and S1C are included to allow a 'tone control cancel' facility. The complete circuit—for one channel—is shown in fig. 2.

Power supply

Many otherwise excellent amplifier designs are let down by unexpected and unsuspected breakthrough from the HT lines to the signal circuit inputs. This has been a factor which has been very much in mind in this design, and FET constant-current sources have been used where supply line isolation has been desirable. The need for supply line isolation is also greatly assisted at relatively low cost by the use of a pair of integrated voltage stabilisers, chosen to give a ± 12 volt supply, having a very low output impedance and very low noise and ripple. The operating current of the output stages is automatically held to about 110 mA, giving a total current demand of about 250 mA for the two channels. At this load the use of 'T03' style voltage regulators is preferred. The circuit diagram is shown in fig. 3.

Performance

As indicated above, the aim of this circuit was to take advantage of the design freedom conferred by the relatively low load demands of the normal headphone, and to design a system free from the constraints and compromises inherent in normal power amplifier circuits. It is hoped, therefore, that this will be regarded not as a poor man's substitute for a power amplifier, but rather as a reference standard against which existing higher power units can be judged.

A matching RIAA pre-amp designed to feed the input of the headphone amp. will be following shortly. **Ed.**

Performance data

T.H.D.

(Exclusively 2nd harmonic) (Includes noise)

100 Hz	0.014%
300 Hz	0.007%
1 kHz	0.008%
3 kHz	0.017%
10 kHz	0.044%

Measured at 1 V RMS across headphones having 100 ohms (nominal) impedance.

Turn-off time and turn-on time. Less than 0.5 μ s

Rise-time. 4 μ s. Fall time. 4 μ s.

Settling time. (To within 1%) 6 μ s—not affected by load reactance up to 0.22 μ F.

Recommended Load Minimum 8 ohms; ideal 35 ohms to infinity.

Headphone amplifier parts list (1 channel)

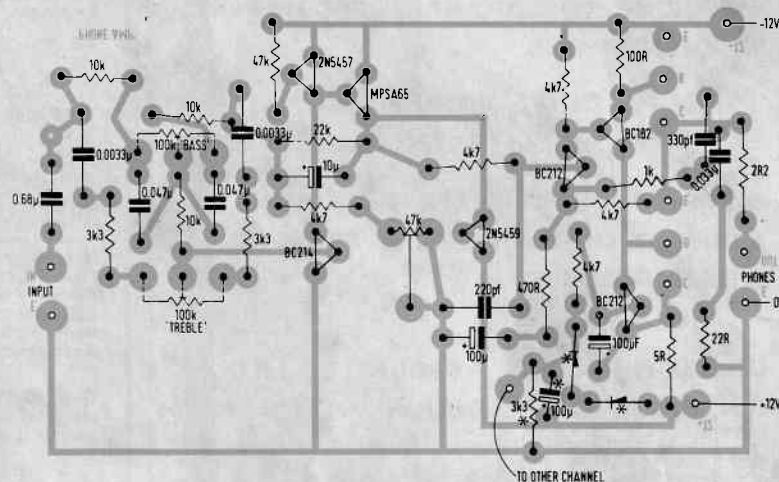
Resistors	Capacitors	Semiconductors
2.2 Ω	220 pF	BC182
5 Ω	330 pF	BC212 2 off
22 Ω	0.0033 μ F 2 off	BC214
100 Ω	0.038 μ F	2N 4922 2 off
470 Ω	0.047 μ F 2 off	2N 5457
1 k	0.68 μ F	2N 5459
3k3 3 off	10 μ F tant	MPSA 65
4k7 5 off	100 μ F 3V tant	IN914 diodes
10k 2 off		2 off (or equivalent)
22k		
47k		

Potentiometers: 5k log, 100k lin 2 off, 47k preset

Power Supply parts

Semiconductors	Capacitors
MC7812 CK	47 μ F 15 V Elec. 2 off
MC7912 CK	1000 μ F 25 V Elec. 2 off
Bridge rectifier (IA 50 PIV)	0.1 μ F 2 off
(or 4 \times IN4001)	Transformer 15.0-15 V 500 mA
	Mains Switch 240 V 2 pole 1 way

FIG. 4 HEADPHONE AMPLIFIER (One channel only shown - Other channel identical)



COMPONENTS MARKED * ON ONE CHANNEL ONLY

COMPONENT LAYOUT (Component side)

HEADPHONE AMPLIFIER

P.C. BOARD LAYOUT (One channel only shown)

