

## Control amplifier

Transistors T1 and T2 form a voltage amplifier with a high input impedance and a low output impedance. When the slider of preset potentiometer P1 is set to give the full value of 1 k, the input sensitivity in combination with the 3-watt amplifier is about 150 mV for the 12-volt version working into a 4- $\Omega$  load, or 200 mV for the 17-volt version working into an 8- $\Omega$  load.

If a higher input sensitivity is required, P1 can be set to a value lower than 1 k.

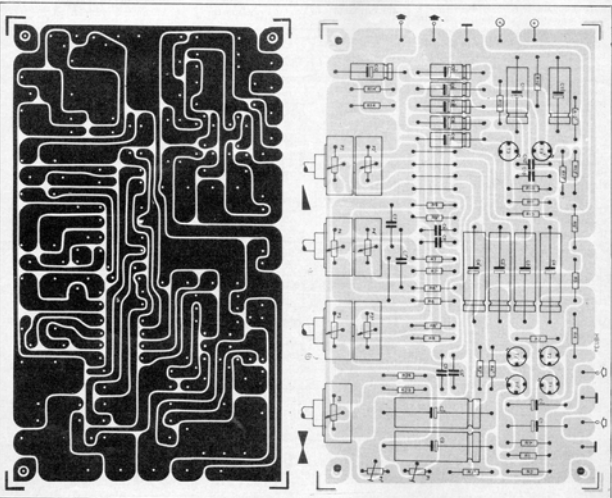
If switching to different values of input sensitivity is needed, fixed resistors can be used in place of P1, with values determined according to the formula:

$$R_x = \frac{500 \times V_{in}}{300 - V_{in}} \text{ (ohms)}$$

where  $V_{in}$  is the RMS input voltage in mV. The formula holds good for input voltages from 5 mV to 250 mV. T3 is used in a standard Baxandall tone control circuit. The 1 n capacitor between the collector and earth is to prevent oscillation.

# AUSTEREO

*Here is an interesting project for the audio enthusiast, who likes to play around with the circuit rather than just assemble a given project. The 'Austereo' has been split up into modules which can be combined to build a stereo amplifier of your own choice, or you can use any of the modules in a design of your own!*



## Resistors:

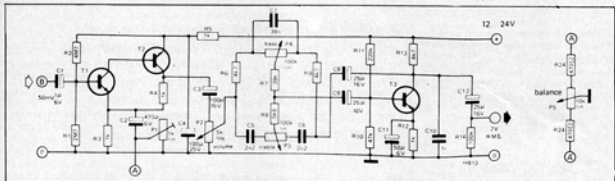
R1 = 2M7  
 R2 = 4M7  
 R3, R4, R5, R12 = 1 k  
 R6, R9, R13 = 4k7  
 R7 = 39 k  
 R8 = 5k6  
 R10 = 47 k  
 R11 = 220 k  
 R14 = 100 k

## Capacitors:

C1 = 1  $\mu$ , 6 V tantalum  
 C2 = 470  $\mu$ , 6 V electrolytic  
 C3 = 100  $\mu$ , 16 V  
 C4 = 100  $\mu$ , 25 V  
 C5, C6 = 2n2  
 C7 = 39 n  
 C8, C9, C12 = 25  $\mu$ , 16 V  
 C10 = 1 n  
 C11 = 50  $\mu$ , 6 V

## Sundries:

P1 = preset potentiometer  
 1 k lin.  
 P2 = potentiometer  
 4k7 log. stereo  
 P3, P4 = potentiometer  
 100 k lin. stereo  
 P5 = potentiometer 10 k lin.  
 Semiconductors:  
 T1, T3 = BC 148 B  
 T2 = BC 158 B

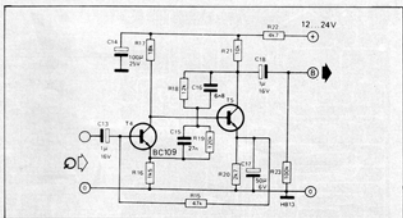


## Disc preamplifier

The disc preamplifier, of which only one channel is shown in the circuit, incorporates equalisation to correct the output of a magnetic cartridge according to the RIAA playback curve, and also amplifies the signal to a level sufficient to drive the control amplifier. It consists of a two-stage voltage amplifier, T4 and T5, with the RIAA feedback network R18, R19, C15 and C16 connected from the collector of T5 to the emitter of T4. DC feedback and biasing of T4 is provided by R15. The disc preamplifier board should preferably be mounted inside the turntable box as otherwise the capacitance of the screened lead between the cartridge and the disc preamplifier can form a resonant circuit with the self-inductance of the cartridge. If this resonance lies within the audio spectrum it may cause a peak in the frequency response. Of course some

cartridge manufacturers quote a recommended load capacitance and if this is so their recommendations should be adhered to. Another good reason for mounting the disc preamplifier inside the turntable is to keep it away from the

hum fields of the amplifier's mains transformer. Turntable motors usually have much less stray field than the average mains transformer! It can be seen that the layout for the two channels is symmetrical.



## Resistors:

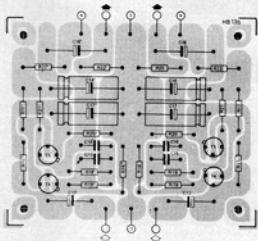
R15 = 47 k  
 R16 = 1k5  
 R17 = 18 k  
 R18 = 12 k  
 R19 = 120 k  
 R20 = 2k7  
 R21 = 10 k  
 R22 = 4k7  
 R23 = 100 k

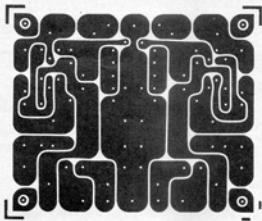
## Capacitors:

C13, C18 = 1  $\mu$  (16 V)  
 C14 = 100  $\mu$ /25 V  
 C15 = 27 n  
 C16 = 6n8  
 C17 = 47 ... 50  $\mu$ /6 V

## Semiconductors:

T4 = BC 109 C  
 T5 = BC 148 B





### 3-Watt output

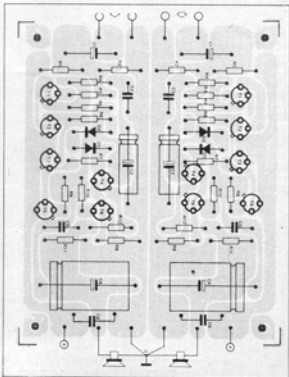
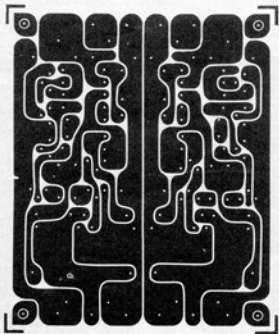
Transistors T1 and T2 form a direct-coupled voltage amplifier. Resistor R6 and diodes D1/D2 determine the quiescent current of the quasi-complementary driver stage T3/T4 and the output stage T5/T6. The values of resistors R7 and R8 are chosen so that the output transistors are either just biased on or just cut off depending on the gain of the transistors used. C3, C5, C6 and R3 help to maintain stability. The input sensitivity of the amplifier is about 400 mV for 12-volt operation with a 4- $\Omega$  load,

and 600 mV for 17-volt operation with an 8- $\Omega$  load. The gain may be increased by reducing R4 but this is not recommended as instability may occur and distortion is increased.

The following layout precautions should be noted when assembling the completed board onto a chassis:

	12 V	17 V
R12	680 $\Omega$	1 k
C4	4700 $\mu$	2200 $\mu$
LS	4 $\Omega$	8 $\Omega$

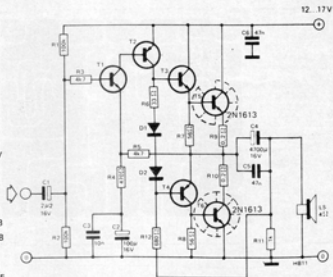
1. Loudspeaker common must be connected directly to the power supply common and should be kept well away from the boards.
2. Separate leads must be run from the supply to the supply points on each board.
3. Outputs of any board should be kept well away from inputs of other boards (except of course where the output of a stage is connected to the input of the succeeding stage).
4. Care should be taken to avoid earth loops. Each section of the amplifier should have only one connection to supply common.



Resistors:  
 R1, R2 = 100 k  
 R3, R5 = 4k7  
 R4 = 470 Ω  
 R6 = 33 Ω  
 R7, R8 = 56 Ω  
 R9, R10 = 0,2 Ω  
 R11 = 1 k  
 R12 = see table

Capacitors:  
 C1 = 2,2 μ, 16 V  
 C2 = 100 μ, 16 V  
 C3 = 10 n  
 C4 = see table  
 C5, C6 = 47 n

Semiconductors:  
 T1, T3 = BC 148 B  
 T2, T4 = BC 158 B  
 T5, T6 = 2N1613  
 D1, D2 = IN 4001  
 heatsinks for TO-5



## Power supply for 3 watt output

Transistors T1 and T2 form a Darlington pair acting as a compound emitter-follower with a reference voltage provided by Z1. Z1 is chosen as a 13 or 18 volt zener for a 12 or 17 volt supply respectively. Since T2 dissipates only a small amount of power a heatsink is not required.

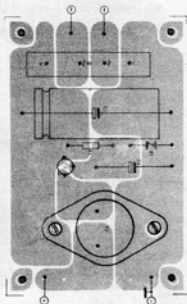
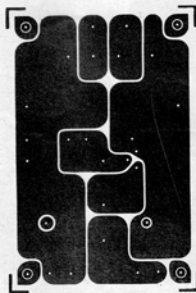
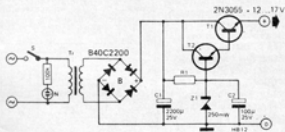
Resistor:  
 R1 = see table

Capacitors:  
 C1 = 2200 μ, 25 V  
 C2 = 100 μ, 25 V

Trafo:  
 Tr = 2 A sec., see table

Sundries:  
 B = B40C2200  
 Z1 = zenerdiode, 250 mW, see table  
 N = neon  
 S = on/off switch

Semiconductors:  
 T1 = 2N3055  
 T2 = see table



	12 V	17 V
R1	270 Ω	680 Ω
Z1	13 V	18 V
T2	BC 148 B	BC 147
Tr	12 V~	18 V~

## 15-30 Watt output

The 'austereo' 3-watt amplifier is used as a drive amplifier for the 2N3055 output transistors, and very few changes in the circuit or the component values are needed. Capacitor C7 is introduced to compensate for the phase shift due to the output transistors. The value of R1 is reduced to 56 k, and additional decoupling, in the form of a 47-k resistor and a 10- $\mu$  capacitor, is inserted between the high-potential end of R1 and supply positive. The output impedance is very low, as T5/T7 and T6/T8 form power darlings. The 'austereo' control amplifier is well capable of supplying the 1-V RMS input voltage needed.

Because of the low input sensitivity, the amplifier has good stability and its sensitivity to hum is low. Substantial negative feedback via R4 and R5 ensures low distortion.

Maximum permissible supply voltage is 42 V. The power supply circuit is developed from the stabilised power supply unit for the 'austereo' amplifier, with circuit modifications and also changes of component ratings to suit the higher working voltages.

In addition to the heat sinks shown in the amplifier and power supply circuits, the three 2N3055 transistors should be cooled by mounting them on the amplifier or power supply boxes (as applicable) using mica insulating washers. The power supply table is worked out for stereo. Power for the control amplifier is drawn from a 2N1613 with its base potential held at half the main supply voltage.

### Parts list for 15-30 W amplifier

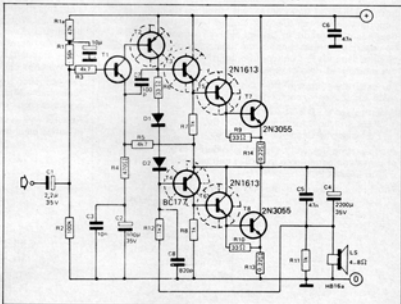
Resistors:  
R1 = 56 k  
R1a = 47 k  
R2 = 100 k  
R3, R5 = 4k7  
R6, R9, R10 = 33  $\Omega$   
R7, R8, R11 = 1 k  
R12 = 1k2  
R13, R14 = 0.22  $\Omega$ , 5 W

Capacitors:  
C1 = 2.2  $\mu$ , 35 V  
C2 = 100  $\mu$ , 35 V  
C3 = 10 n  
C4 = see table  
C5, C6 = 47 n  
C7 = 100 p  
C8 = 10  $\mu$ , 35 V

### Power output (wl with:

	8 $\Omega$	4 $\Omega$	2 $\Omega$ (R13, R14 = 0.1 $\Omega$ )	
power	30	9.5	19	35
supply	36	15	30	55
voltage (V)	42	20	40	70
	2200	4700	10,000	
	C4 capacity ( $\mu$ F)			

Semiconductors:  
T1, T3 = BC107  
T2, T4 = BC177  
T5, T6 = 2N1613  
T7, T8 = 2N3055  
D1, D2 = DUS  
5 heatsinks for TOS



## Power supply for 15-30 watt output

### Parts list for 15-30 W power supply

Resistors:  
R1 = see table  
R2 = 1k8  
R3 = 100  $\Omega$   
R4, R5 = 10 k  
R6 = 100 k

Capacitors:  
C1 = see table  
C2 = 47  $\mu$ , 50 V  
C3 = 47  $\mu$ , 25 V  
C4 = 47 n

Transformer:  
see table

Sundries:  
B = Bridge rectifier; see table  
Z = Zener diode, see table  
N = Neon lamp  
S = On/off switch  
Heat sink for TOS

Output power	Transformer secondary		B B40C...	C1 x 100 $\mu$ F	Z	R1 $\Omega$ 1 watt
	V	A				
9.5 - 19 - 35	30	1.2 - 4	1000 - 2200 - 5000	22 - 47 - 100 50 V	ZD 33	680
15 - 30 - 55	36	1.2 - 2.4 - 4.8	2200 - 3200 - 5000	22 - 47 - 100 60 V	ZD 39	820
20 - 40 - 70	42	1.2 - 2.5 - 5	2200 - 3200 - 5000	22 - 47 - 100 70 V	ZD 43	1 k

