Class One Sound Amplifier Part2

Constructional details for last month's audio amp.

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Last month we discussed the problems associated with amplifier design and looked at the circuit stages in detail. This month we conclude by setting out the construction procedure and final testing.

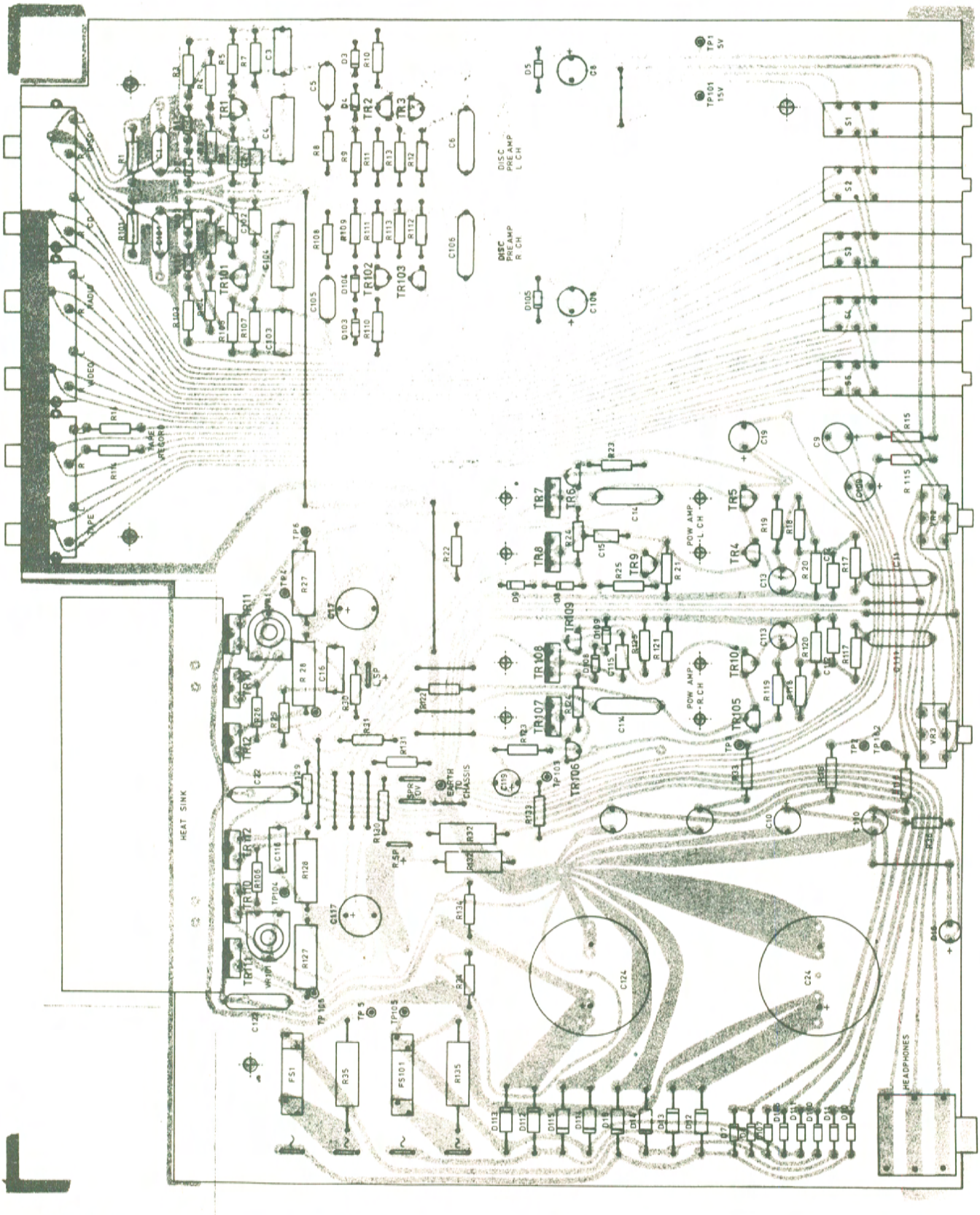
Grounding

In audio amplifiers the grounding circuits are a very important part of the design. Ideally, every single ground return should be taken separately to a central "star" ground. In practice, some grouping is permissible, but poor grounding techniques in an amplifier will result in hum, instability and degradation of the sound. In this amplifier, all the ground returns have been looked at in far more detail than I can write about here, and the result can be seen in the way in which they have been connected in the printed circuit board (PCB) layout.

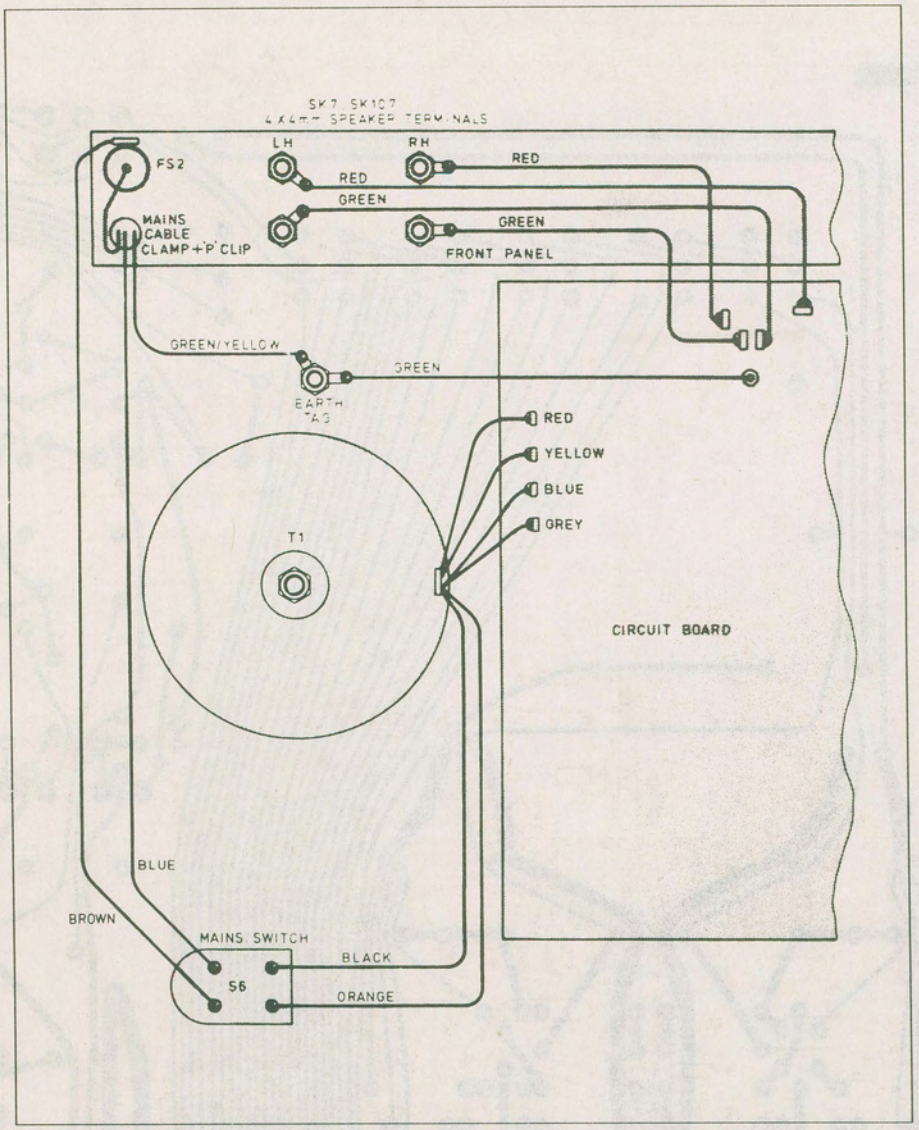
Building the Amplifier

1. Insert and solder all PCB pins.
2. All diodes except D16 (LED).
3. All 1/4 watt metal film resistors.
4. Insert all wire links using resistor lead offcuts, except for L1 and L10 which should be made from tinned copper wire.
5. All polystyrene capacitors.
6. Attach heat sink to PCB using 3/8 inch bolts and insulating washers.
7. Slot TR-10-TR-12, TR110-TR112 into the board and line up the holes in the tabs with the threaded holes in the heatsink.
8. Attach the transistors to the heatsink using a bolt, washer and nylon bushing, after placing a thermally conducting electrically insulating washer or silicone heatsink compound between transistor and heatsink.
9. Attach VR1, VR101, C22, C116, C122 to PCB
10. Attach R27, R28, R127, R128 to PCB
11. Attach all remaining semiconductors including D16.
12. Attach all polyester capacitors (NB, C7, C18, C20, C23, C107, C118, C120, C123 are optional).
13. Attach all 1/4 inch blade connectors, fuse and remaining resistors.
14. Attach all electrolytic capacitors.
15. Make certain that each and every electrolytic is connected in the right polarity. Check a second time because a wrongly connected capacitor can be damaged when the power is connected.
16. Attach phono sockets, switches, potentiometers and headphone socket.

Now that the board is complete, set



The printed circuit board component layout for the Class One amplifier, not full size.



Interwiring from case mounted components to the PCB.

VR1 and VR101 fully clockwise and remove fuses FS1 and FS101.

Case

Next assemble the case, leaving the rear panel off, and attach the mains transformer and all the parts shown in Fig. 11. The PCB can now be attached to the floor of the case using 3/4 inch threaded pillars with bolts at each end. Attach the rear panel to the case and make all the necessary connections to the PCB (Four 1/4 inch blade connections from the transformer, four 1/4 inch blade connections from the speaker terminals and the chassis ground connection, which is soldered to the 1mm dia. pin.

Testing the Amplifier

Check that fuses FS1 and FS101 have been removed from the board and that VR1 and VR2 are turned fully clockwise.

Switch on and measure the voltages at test points TP1 to TP4 and TP101 to TP104. The slightly lower readings on the right channel (TP101 to PT104) are due to the effect of the LED drawing current from the right channel supply only.

The most difficult part of building the amplifier is setting the output stage quiescent current. This is achieved on the left channel by turning VR1 counterclockwise, and on the right channel by turning VR101 counterclockwise. If you have a digital meter or oscilloscope you can set the current by turning VR1 (VR101) until about 40mV is observed across R27/R28 and R127/R128. Alternatively, you can set the output stage quiescent current using only a moving coil meter on its AC voltage range. Connect the meter across R35 (left channel) and R135 (right channel) and adjust VR1(L) and VR101(R) until the reading across each register increases by one volt AC. This will give a quiescent current of 20mA through the output stages. If all the readings appear correct, switch off, replace fuses FS1 and FS101, switch on again and start listening.

Sound Quality

Readers who are interested in building the amplifier will be interested in how it sounds, so I borrowed a pair of Richard Allen CD5 loudspeakers to assess its performance with a high quality speaker of recent design. The results were very rewarding. Stereo imagery was really good compared with one of my earlier designs, which shared the same power supplies for each channel.

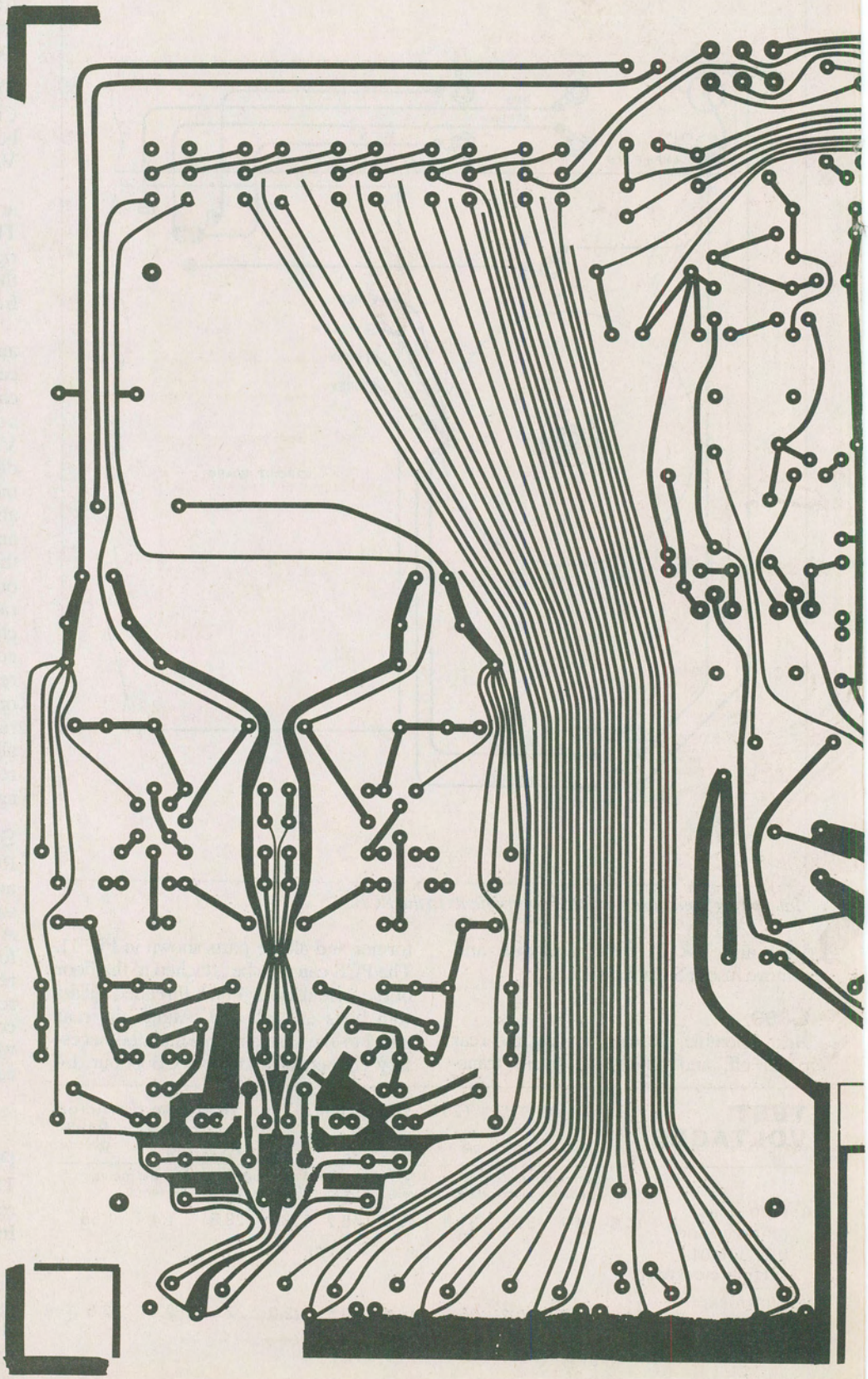
Parts Availability

The printed circuit diagram is enclosed for reference; it is copyrighted by Audiokits Inc.

Complete amplifier kits, plus individual components, special component packs and printed circuit boards are available from Audiokits, 6 Mill Close, Borrowash, Derby DE7 3G0, England. Send a large envelope plus three International Reply Coupons for details.

TEST VOLTAGES

	TP1 L	TP101 R	TP2 L	T201 R	TP3 L	TP103 R	TP4 L	TP104 R	Across R35 L	Across R135 R
* All measurements from TP1 to TP4, TP01 to TP104 are made using a digital meter. Measurements across R35, R135 with a moving coil meter on a.c. volts range.										
A With fuses removed and VR1, VR101 set fully clockwise	14.5	14.7	31.5	31.3	45.7	45.2	23.2	28.8	1.4	1.55
B With fuses removed and VR1, VR101 set to 20mA output stage current	14.6	14.7	30.2	30.1	42.9	42.8	22.0	22.0	2.4	2.5
C With fuses inserted and 20mA output stage current	14.6	14.7	33.5	33.5	49.5	49.5	24.9	24.7		



The main board for the Class One power amp; see text for availability.