

Integrated Stereo Amplifier

PART TWO

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In last month's issue, the first part of this article described the features of the circuit that provide a high performance compatible with the neat and clean appearance, both externally and internally. Component assembly and wiring of the two main channel amplifiers (except the output transistors) were shown on perforated board.

In Fig. 2 (last month) the wiper leads of VR3a and VR3b should be screened, and screens connected to C'11 and C11 on the board. The junctions of C19a and VR3a, and C19b and VR3b, should be connected to these screens. This is shown in Fig. 9. Also in Fig. 2, C29b (between VR1b and VR2b) should read R29b. Diodes D1 and D2 (a and b) should be OA95.

It is intended in this part to show how the two channels are combined with the tone controls, inter-channel circuitry, and power supply unit.

One particularly important point to remember is that "earth return" wiring is carried out in thick wire, 12 s.w.g., to avoid mismatching impedances (see last month's article). Good mechanical joints are essential prior to soldering. The constructor should follow all the diagrams given to ensure the best results.

MECHANICAL CONSTRUCTION

As previously indicated the mechanical structure has been fabricated from two main component parts, in order to ease the problem of having to make difficult bends that would stem from the use of one piece of material (Figs. 6 and 7).

Prior to the assembly of sections 1 and 2 (Figs. 6 to 9) it would be advisable to mount upon Section 1 the mains transformer T1, the output transistors TR8a, TR8b, TR9a and TR9b, the controls, the rectifier and the electrolytic capacitors, as shown in Fig. 9. These should then be wired up as far as possible.

Tackled in this manner it will prove a comparatively easy assembly. However should the two sections be married together before any wiring procedure takes

place then it will be difficult to delve into the interior of the U-shaped chassis.

Once this initial operation has been completed then all the components should be mounted on Section 2 (Fig. 9) including the completed amplifier board (Fig. 5). Sections 1 and 2 should now be bolted together and the final wiring operations completed as shown.

When mounting the output transistors it will be necessary to smear both sides of the mica insulating washers with silicon grease before fitting them between the transistors and the metal chassis. This will ensure that the best possible heat transference will be effected between transistor and heatsink.

It is also essential to fit the isolating bushes or nylon screws so that the transistors are electrically insulated from the heatsink otherwise all the transistors in the output configuration could be irreparably damaged because their collectors are connected to the case. At best the amplifier will just refuse to function.

You will notice from the final assembly photograph that small feet have been fitted on the underside of the chassis. This is necessary to allow a free passage of air over the output transistors, thus helping to maintain the temperature stability of the amplifier as well as to obviate the damage that might occur if stood on a polished surface.

The small pillars that hold the component board away from the chassis of Section 2 were made from a length of tubing cut to the required size. When finally wiring the board to the output transistors care must be taken to ensure that the bottom of the board is clear of the main chassis so that no short circuit can take place.

The fixing holes for the smoothing capacitors have been deliberately omitted so that the constructor can use capacitors of his own choice, but the voltage and capacitance values must be adhered to.

Although it was not necessary on the prototype to screen the input circuitry, it may be advisable in

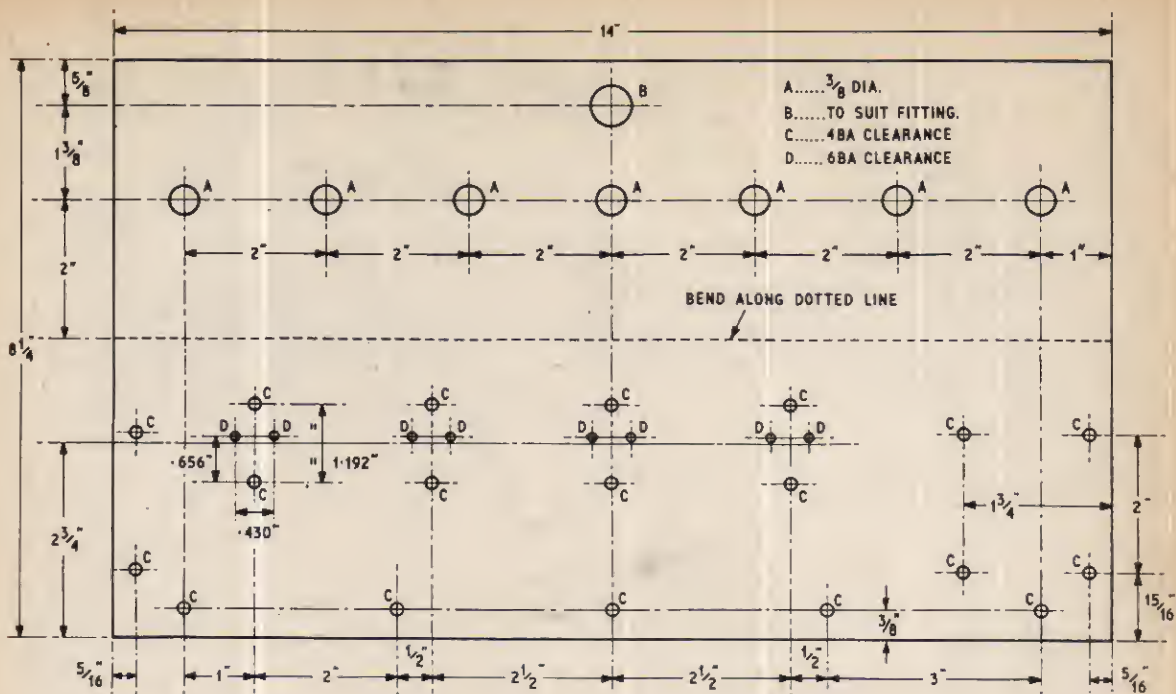


Fig. 6. Drilling details of Section I, the base and front panel. Bend away on the dotted line to look like the model shown in photograph below. Material 18 s.w.g. aluminium

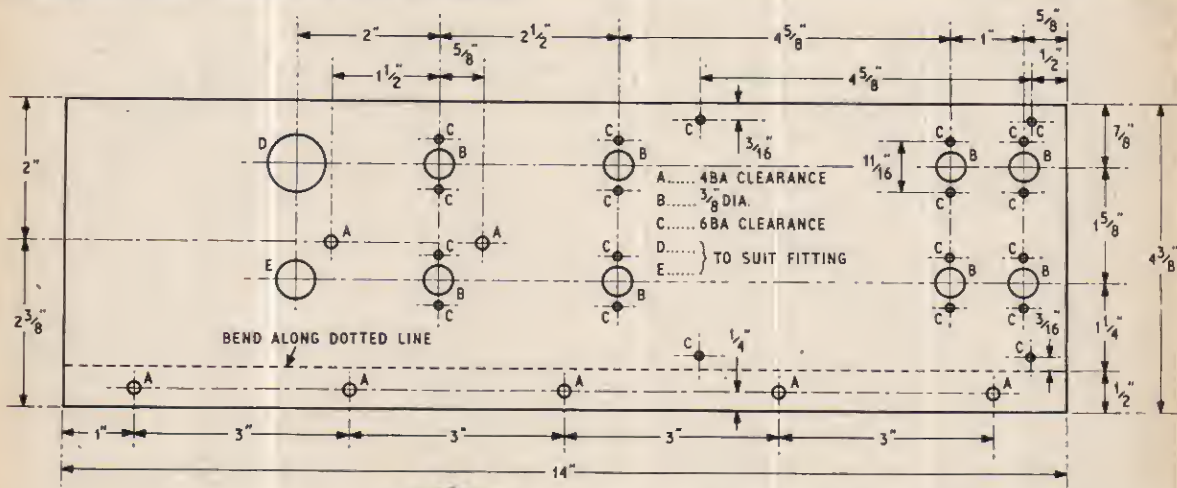


Fig. 7. Rear panel drilling details. Bend away on the dotted line (see photograph on next page). Material 18 s.w.g. aluminium

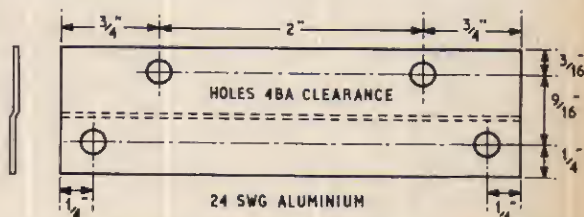
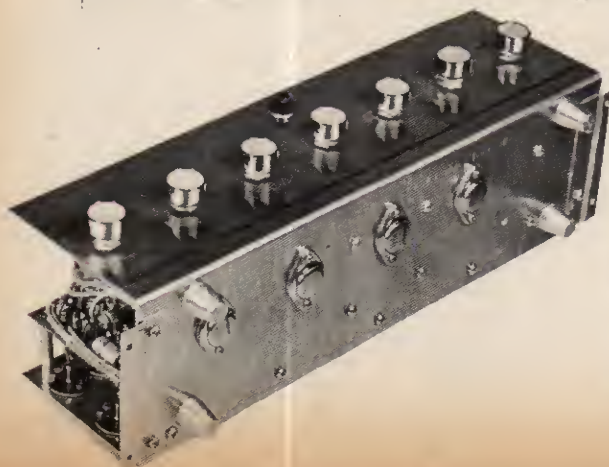
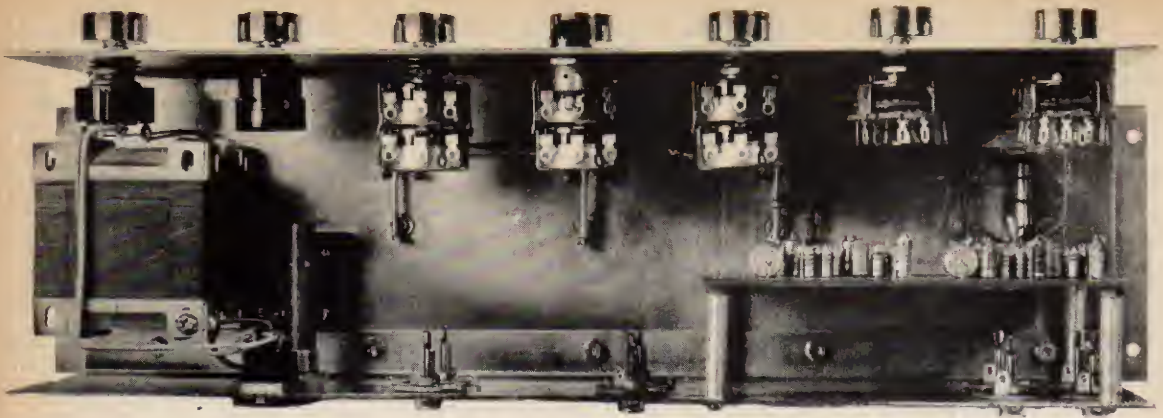


Fig. 8. The fixing brackets to hold the wooden case (see photograph on left)



The half-way stage. Most of the chassis mounted components are assembled. Before adding the capacitors wire up the output transistors in a cable form as shown, ready for connection to the board

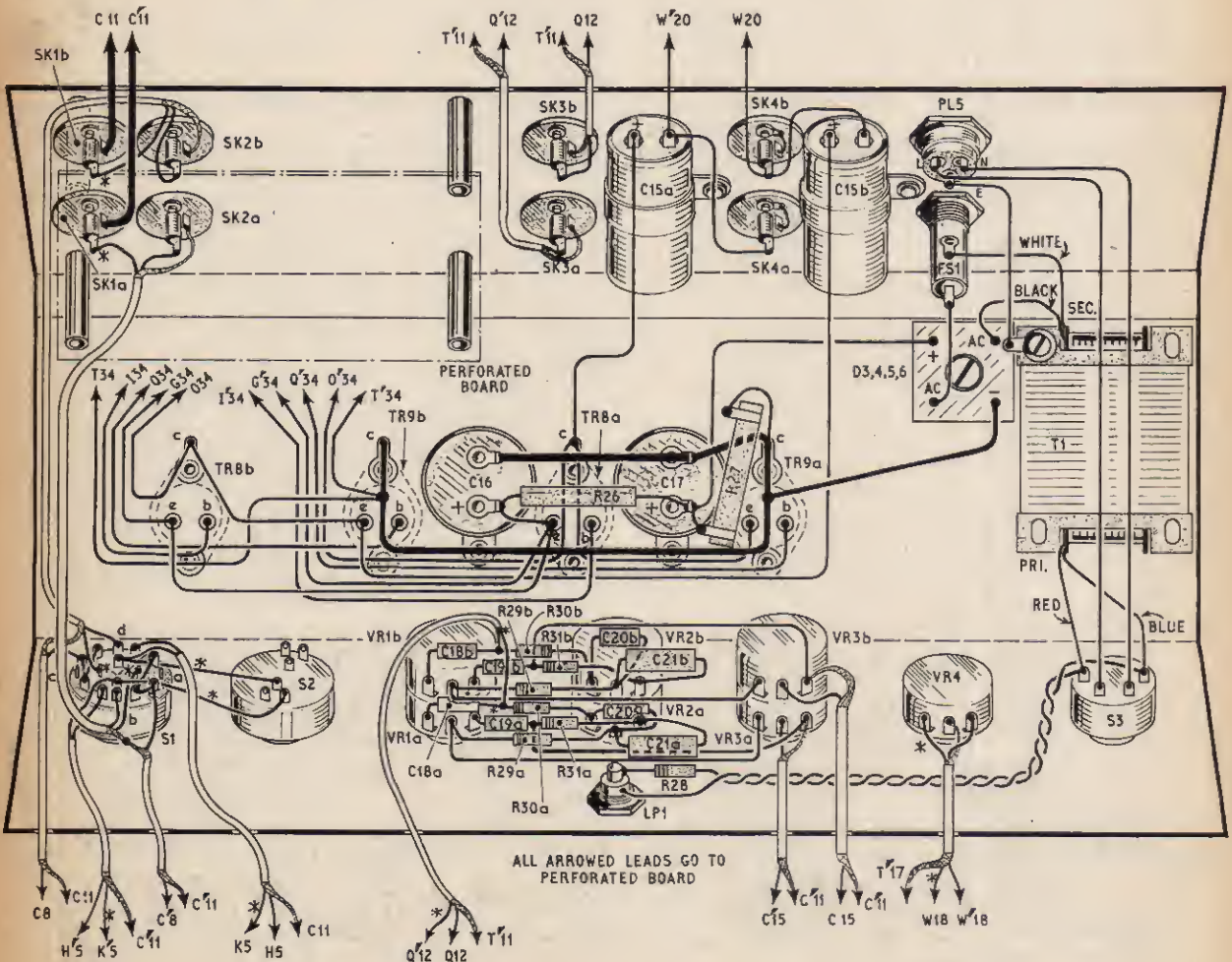


Fig. 9. The wiring of the base and front panel piece (Section 1) and that of the rear panel (Section 2), and assembled into one unit. Asterisks are shown to identify twin leads. Arrowed code numbers relate to perforated board locations (see Fig. 5 last month). For exact position of board see photographs. Observe thick 12 s.w.g. wires

certain instances to provide a simple screen to cover the appropriate part of the component board and the input sockets.

The cabinet was made from ordinary softwood and then finally finished with veneer. The cabinet just rests on the fixing brackets (Fig. 8) and then screwed in position from the underside. The front panel was satin finished by rubbing the surface of the material with steel wool coated with a silicon furniture polish.

Afterwards the surface was polished quite vigorously with a soft duster until all the polish was completely removed and the surface was reasonably shiny. The lettering was taken from a Letraset pack of electronic data and then sprayed or brushed with a clear varnish.

SETTING UP PROCEDURE

Having thoroughly checked out the wiring of the amplifier and set VR6a and VR6b at zero resistance, then VR5a and VR5b should be adjusted to about the mid-way point. **IT IS IMPERATIVE THAT THESE LATTER TWO INSTRUCTIONS BE CARRIED OUT PRIOR TO SWITCHING ON.**

The unit may now be switched on at the mains. At this stage it may be better not to connect in the speakers or any input while the d.c. conditions are set up. In the quiescent condition, that is to say when no input signal is being applied to the amplifier, the centre voltage measured at the emitter of TR9a or TR9b will not be half the rail voltage as expected. This is due to the reduction in the main rail voltage when the amplifier is functioning at full power output. When this happens then the centre voltage is indeed half of the rail voltage.

The voltage at this point should be set in the quiescent state by varying VR5a and VR5b until it reads exactly 35 volts on a 20 kilohm-per-volt meter. This should ensure that the amplifier should clip evenly when under full drive conditions.

Once this voltage has been set up it will be necessary to disconnect one of the amplifiers by breaking the positive supply to each amplifier in turn. It is essential to make sure that the whole of the amplifier section has been disconnected otherwise the current reading that follows from the setting of VR6a and VR6b will not be a true reading.

Having disconnected one of the positive supplies the volume control should be reduced to zero and an

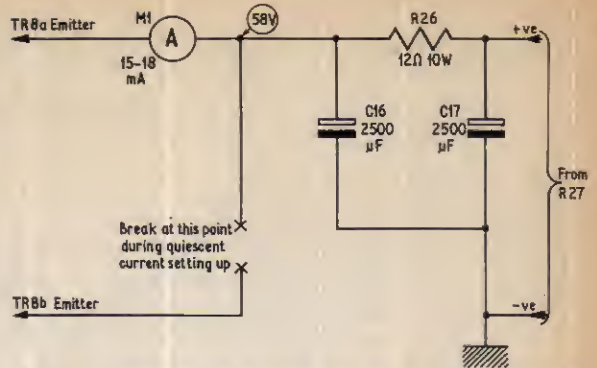


Fig. 10. Measure the supply quiescent current while adjusting VR6a and b. Break each channel h.t. line in turn while the other is being set up

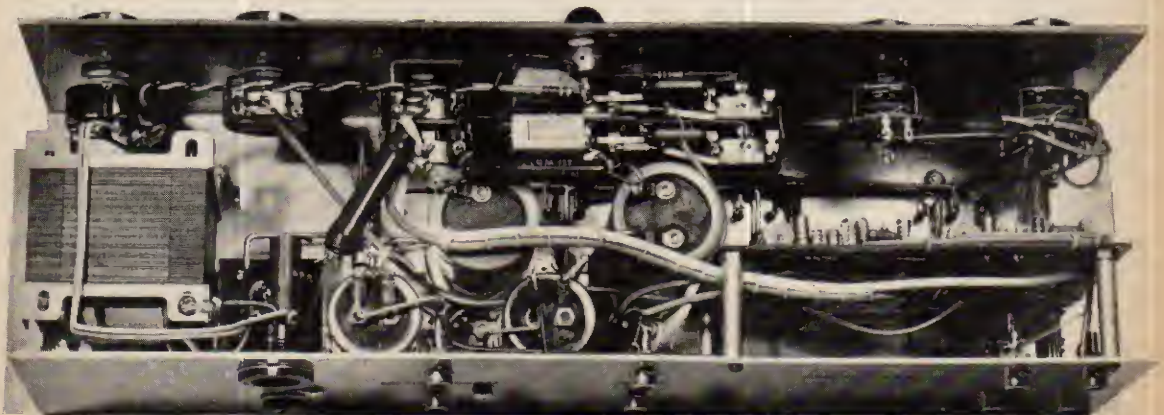
ammeter introduced into the positive rail between the junction of R26 and C16 and the amplifier positive rail as shown in Fig. 10. VR6a should now be advanced very slowly until the current measured lies between 15 and 18mA. Reversing the operation VR6b should be set up in the same manner.

If an oscilloscope is available then the setting up of VR5a and VR5b is much more of a simple matter. The oscilloscope should be connected across the terminals of the output socket and a 15 ohm resistor should be inserted in place of the loudspeaker.

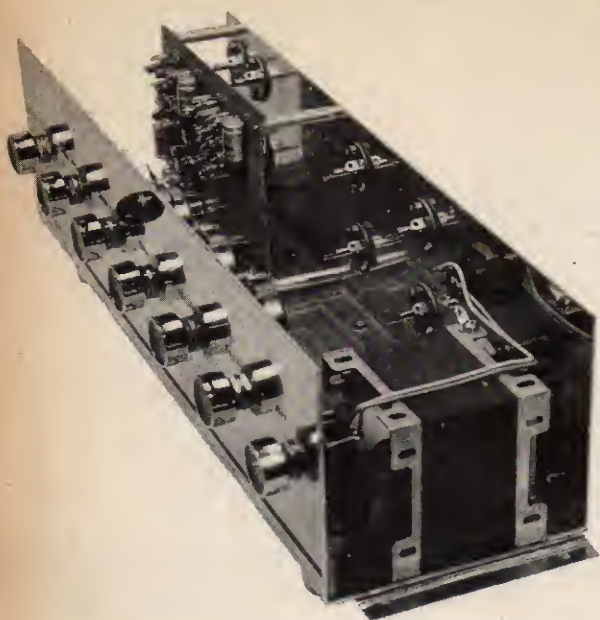
The volume control should then be advanced to about a half-way position and a signal of 1kc/s introduced into any one of the input sockets of the same channel. The signal should be increased until one side of the waveform shown on the oscilloscope starts to flatten off.

VR5a should now be varied until both halves of the waveform start to clip at the same time. The peak-to-peak voltage measured should be somewhere in the order of 43 volts. The voltage representing an output power of 10 watts is 35 volts peak-to-peak.

After the setting up of these four potentiometers there is no further setting up procedure required but it is advisable to check the input sensitivity and balancing operation to ensure that there is no great discrepancy between the channels.



The finished amplifier wired up and ready for testing and setting up



Half-way stage in construction of the amplifier

A.C. TEST PROCEDURE

The volume controls should be advanced to their maximum output condition and the tone and balance controls set to the mid-position. The stereo/mono switch should be set to MONO and the input selector set to TUNER. A 1kc/s signal should be introduced into the appropriate input socket and should not exceed 250mV r.m.s. (measured on an a.c. millivoltmeter) for an output of 35 volts peak-to-peak as indicated by an oscilloscope or 12.5 volts r.m.s. measured on an a.c. millivoltmeter.

Now the input signal should be reduced to zero and the "function" switch set to the MIC position. The input level may now be advanced once more until the output across the load reads 35 volts peak-to-peak; the input signal required to promote this output should not be more than 5mV r.m.s. After transferring the input to the "phono" socket the input signal should not exceed 250mV r.m.s.

By checking the performance of the amplifier in the MONO condition it is possible to transfer the output measuring instrument from one output socket to the other so that a quick comparison can be made between the opposite channels.

Having ascertained the input characteristics the balance control may then be checked by reducing the volume control until the output is below 4 volts peak-to-peak, then turning the balance control in the appropriate direction. The output signal should now increase by approximately two and a half times, in other words the output voltage should now read about 10 volts peak-to-peak.

The tone control characteristics may be easily confirmed by referring to the curves shown in Fig. 4 (last month). There is also an output provided to feed a tape recorder giving 300mV r.m.s.

Note: The mains transformer T1 delivers 58V at a load of 50mA. At full load the secondary winding is rated 43V at 2.5A.

