

Each part of the circuit contained within dashed lines—see Fig. 7.3—is built on a separate board. Thus, there are four boards: one for the voltage amplifier, one for the current amplifier, one for the protection circuits, and one for the power supply.

The only capacitor in the signal path is  $C_1$  at the input. From there the signal is applied to the differential amplifier via low-pass filter  $R_2$ - $C_2$ , which has a cutoff frequency of about 200 kHz. This limits the input bandwidth and thus the slew rate before any amplification takes place. Dual FET  $T_1$ - $T_2$  forms the differential input amplifier; the feedback is applied to the gate of  $T_2$ . Transistors  $T_3$  and  $T_4$  and the dual FET form a cascode circuit which holds the direct voltage at about 20 V via  $R_{12}$ - $R_{13}$ - $R_{14}$ - $D_1$ - $D_2$ . Resistors  $R_9$  and  $R_{10}$  limit the amplification to about  $\times 3.5$ . So as to keep the bandwidth as large as feasible, the value of the collector resistors,  $R_7$  and  $R_8$ / $P_1$ , has been kept as low as practicable. Small variations in the d.c. setting can be negated with preset  $P_1$ . Frequency (lag) compensation is provided by  $R_5$ - $C_3$ ; the capacitor determines the open-loop cutoff point, while the resistor improves the phase behavior which enhances the stability at this large bandwidth. The d.c. setting for the input differential amplifier is provided by constant current source  $T_5$ .

The second differential amplifier,  $T_6$ - $T_7$ , together with  $T_8$  and  $T_9$ , forms a cascode circuit to achieve the maximum possible bandwidth. The output signal of  $T_8$  appears at B via current mirror  $T_{10}$ - $T_{11}$ . Thus, the difference in direct voltage between the signals applied to the current amplifier from A and B is determined by the quiescent current setting of  $T_{10}$ . Lead compensation capacitors  $C_8$  and  $C_9$  ensure the maximum possible bandwidth of this stage.

The current amplifier consists of drivers  $T_{21}$  and  $T_{22}$ , and output transistors  $T_{23}$ - $T_{24}$  and  $T_{25}$ - $T_{26}$ , in the earlier mentioned compound arrangement. Because of resistors  $R_{55}$  and  $R_{62}$ , there is also some voltage amplification.

Heavy-duty diodes  $D_9$  and  $D_{10}$  protect the output transistors against any high-voltage peaks that may emanate from the loud-

speaker system.

Variable zener  $T_{20}$  sets the voltage drop across  $T_{21}$ .  $R_{50}$ ,  $R_{55}$  and  $T_{22}$ , and the across  $R_{49}$  and  $R_{56}$ , which determines the quiescent current through the output transistors. The zener is fitted on the heat sink for the drivers and output transistors thermal coupling to ensure that the quiescent current remains level even at rising temperatures. Since the quiescent current is 100 mA per transistor, the output amplifier easily process small signals in its Class-A operating area.

Boucherot network  $R_{64}$ - $C_{28}$  at the output of the amplifier ensures that the amplifier mains properly loaded even at high frequencies. Inductor  $L_1$  limits the output

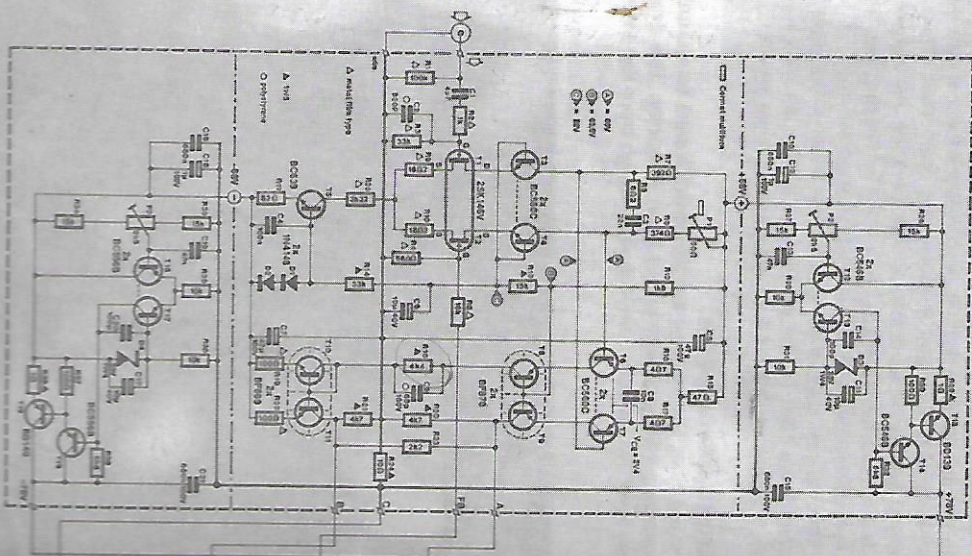
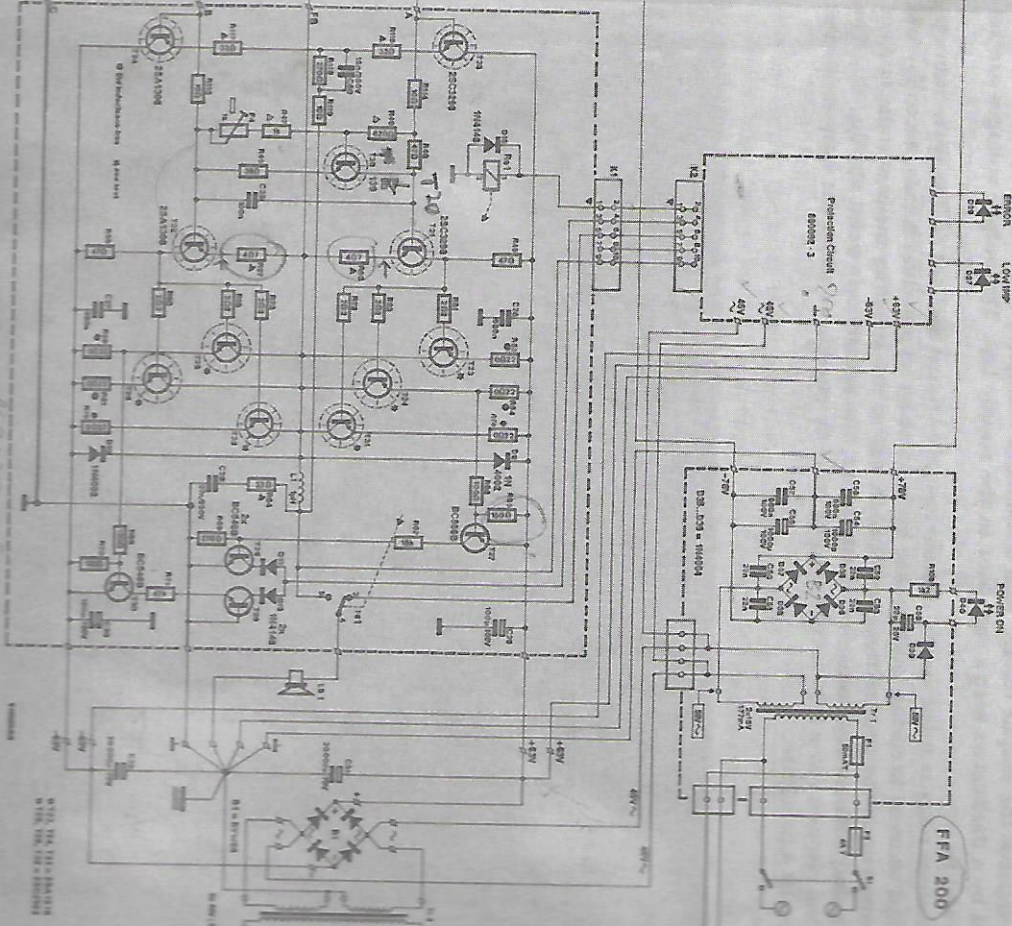


Fig. 7.3. Circuit diagram



of the 200 W power amplifier