

In the first part of the article, we address the theoretical aspects of the design, and in the second part we turn our attention to its construction. Since this is a DIY project, rather than a kit, certain parts of the construction are described in fairly extensive detail.

Schematic diagram

Figure 1 shows the complete schematic diagram of a single channel of the Valve Final Amplifier. There are three supply voltages: a positive high voltage of +440 V, a negative grid voltage of -55 V and a filament voltage of 6.3 V. Separate filament circuits are used for the pre-amplifier/phase splitter (Fil1 & Fil2) and the output valves (Fil3 & Fil4). The filaments are symmetrically connected to circuit ground via R28 and R29.

The output valves are operated in the 'ultralinear' mode by connecting their screen grids to taps on the anode windings of the output transformer via 1k Ω resistors. Due to the internal negative feedback via the screen grids, the pentodes exhibit characteristics lying between those of a triode and those of a normal pentode. Their internal impedance is reduced to practically the same level as that of a triode, and distortion is reduced to the triode level. However, the output power also drops to around 65 percent of that provided by a pure pentode output stage.

Instead of obtaining the negative grid voltage for the output valves from a voltage drop across the cathode resistors, we use a separate grid voltage supply. This prevents the operating point of the valves from shifting during operation. The magnitude of the negative grid voltage

for the output valves can be adjusted using P2 ('DC current'), while the DC balance can be adjusted using P3.

The output stage operates in Class A for small signals, but it shifts increasingly towards Class B as the signal level increases. The current consumption also increases with larger signals. The operating point can be set within certain limits by adjusting the magnitude of the negative grid voltage. Since a separate supply is used for the negative grid voltage, the full anode supply voltage is present across the output valves.

The cathodes are connected to signal ground via 10 Ω resistors (R24 and R25). The voltages across these resistors are proportional to the currents through the valves (10 mV/mA).

Three test points are provided for aligning the circuit. TP0 is circuit ground, while TPV3 and TPV4 are the alignment test points for valves V3 and V4, respectively.

The EL34s provide maximum output power when the voltage on the control grid is

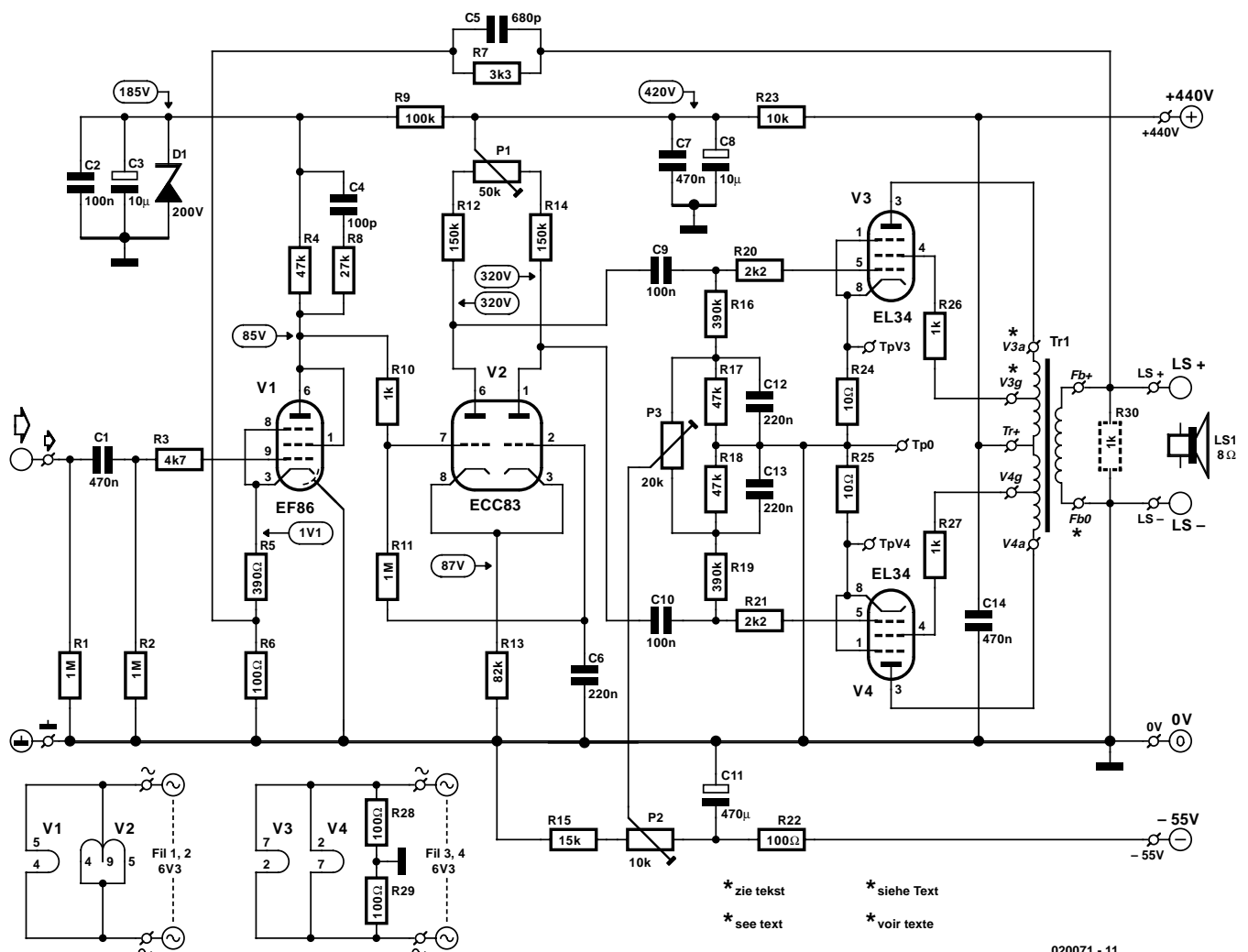


Figure 1. Schematic diagram of the Valve Final Amp.