



The collector emitter voltage of the RF-transistor can be adjusted with the aid of trimmer resistor R 2, and the collector current with the aid of R 3.

To calculate all four resistance values approximately, the following values are required:

- Operating voltage U_B *)
- Required collector voltage of the RF-transistor: U_{CE_2}
- Required collector current of the RF-transistor: I_{C_2}
- Current gain of control and RF-transistor: B_1 and B_2
- Base-emitter voltage of both transistors for the collector current: U_{BE_1} and U_{BE_2}

*) With some limitation, the following is valid for the operating voltage: It should not be higher than the maximum permissible collector-emitter voltage of the RF-transistor ($U_{CE\ max}$ of T 2).

It is then possible to use the four following equations:

$$R 1 = \frac{[U_B - (U_{CE_2} - U_{BE_1})] \times B_1 \times B_2}{110 \times I_{C_2}}$$

$$R 2 = \frac{(U_{CE_2} - U_{BE_2}) \times B_1 \times B_2}{121 \times I_{C_2}}$$

$$R 3 = \frac{U_B - U_{CE_2}}{I_{C_2} \times [1 + 11/B_2 (1/B_1 + 1)]}$$

$$R 4 = \frac{U_{BE_2} \times B_2}{10 \times I_{C_2}}$$

The values for a transistor HXTR-6101 (HP) are to be given as an example. This transistor is to be used as a low-noise preamplifier in a receiver for the 13 cm band.

The calculation is made from the following values obtained from the data sheet or estimated:

$$U_B = 15 \text{ V}, \quad U_{CE_2} = 10 \text{ V}, \quad I_{C_2} = 4 \text{ mA}, \\ B_1 = 100, \quad B_2 = 150, \quad U_{BE_{1,2}} = 0.7 \text{ V}.$$

This results in the following resistor values:

$$R 1 = 194 \text{ k}\Omega \quad R 2 = 287 \text{ k}\Omega \\ R 3 = 1.2 \text{ k}\Omega \quad R 4 = 2.6 \text{ k}\Omega \\ \text{and } P_{R3} = 22 \text{ mW}$$

Finally, attention must be paid, since the RF-transistor T 2 can be destroyed when disconnecting its base line !

It is, of course, clear that each RF-transistor requires its own stabilizer circuit.

REFERENCES

- (1) Hewlett-Packard Application Note 967
- (2) D.E.Schmitzer, DJ 4 BG:
Stabilizing the Operating Point of Transistors with Directly Grounded Emitter
VHF COMMUNICATIONS 9,
Edition 2/1977, pages 100-103