

# BJT Bias Base Bias (H.6)

20170123

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# References

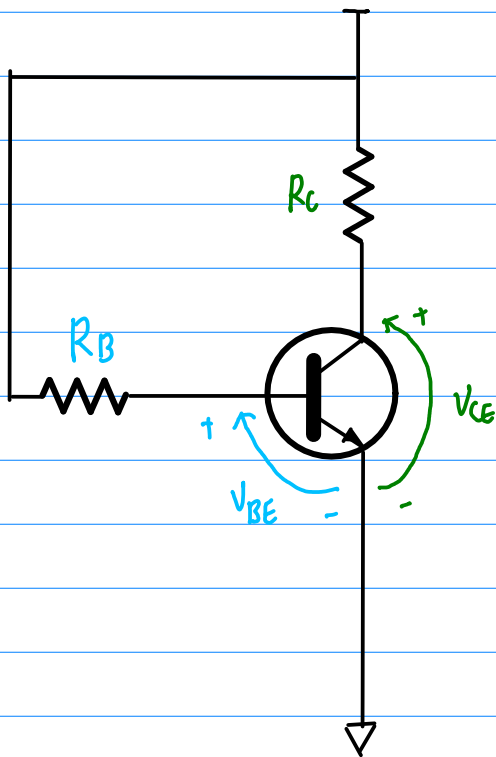
Based

[1] Floyd, Electronic Devices 7th ed

[2] Cook,

[2] [en.wikipedia.org](http://en.wikipedia.org)

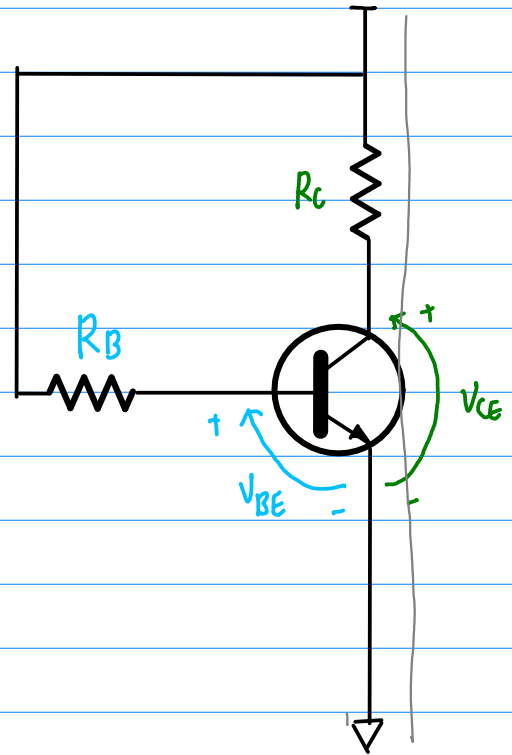
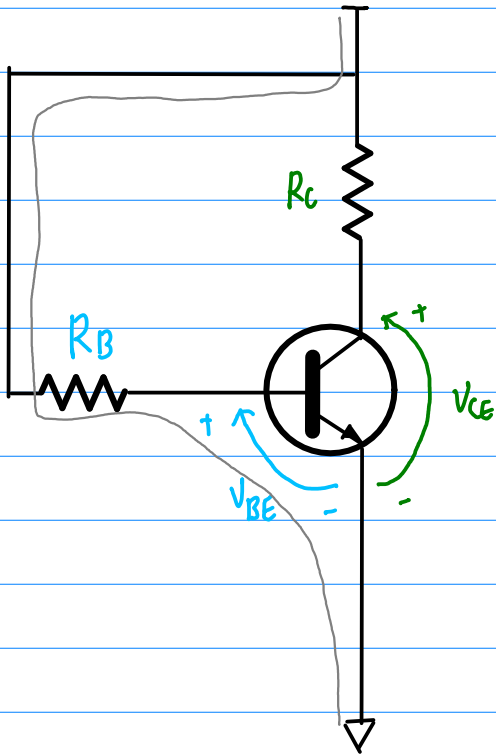
# Base Bias



Q point values  $I_C \cong I_E$

$$I_C = \beta_{DC} \left( \frac{V_{CC} - V_{BE}}{R_B} \right)$$

$$V_{CE} = V_{CC} - I_C R_C$$



$$V_{CC} - V_{R_B} - V_{BE} = 0$$

$$V_{CC} - I_C R_C - V_{CE} = 0$$

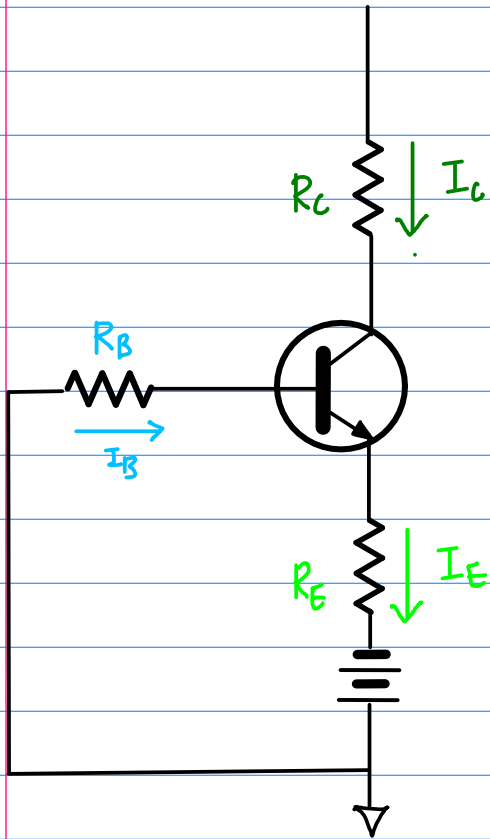
$$V_{CC} - I_B R_B - V_{BE} = 0$$

$$V_{CE} = V_{CC} - I_C R_C$$

$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = \beta_{DC} I_B = \beta_{DC} \left( \frac{V_{CC} - V_{BE}}{R_B} \right)$$

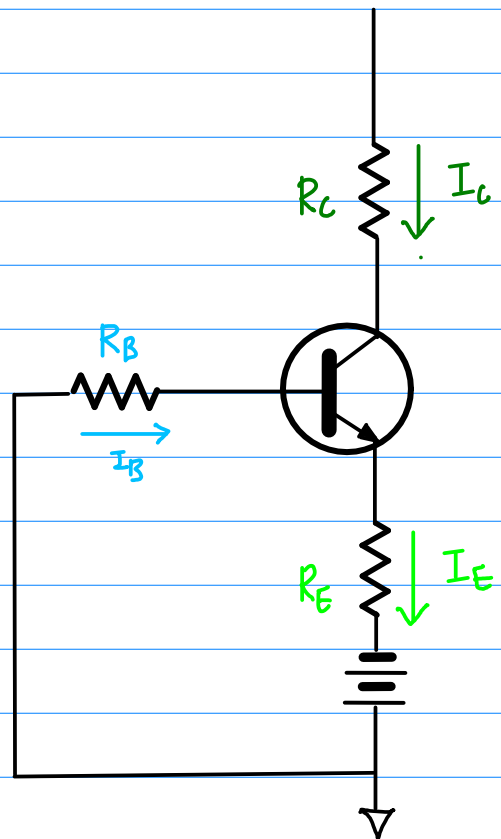
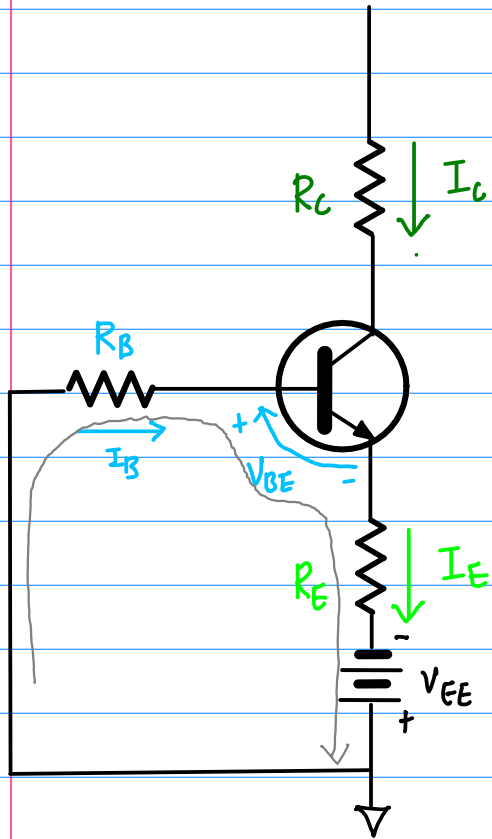
# Emitter Bias



$$I_C \cong I_E$$

$$I_C = \frac{V_{BB} - V_{BE}}{R_E + R_B / \beta_{DC}}$$

$$V_{CE} = V_{CC} + V_{EE} - I_C(R_C + R_E)$$



$$V_{R_B} + V_{BE} + V_{R_E} + V_{EE} = 0$$

$$V_E = V_{EE} + I_E R_E$$

$$I_B R_B + V_{BE} + I_E R_E + V_{EE} = 0$$

$$V_B = V_E + V_{BE}$$

$$I_B R_B + V_{BE} + I_E R_E = -V_{EE}$$

$$V_C = V_{CC} - I_C R_C$$

$$I_E \cong I_C = \beta_{DC} I_B$$

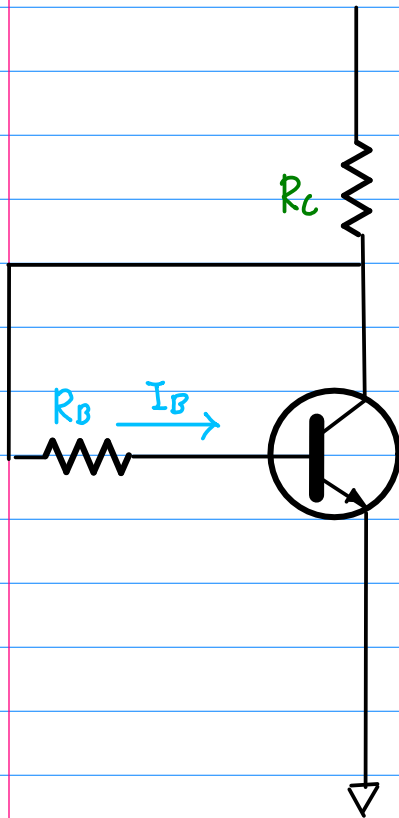
$$I_B \cong \frac{I_E}{\beta_{DC}}$$

$$\frac{I_E}{\beta_{DC}} R_B + V_{BE} + I_E R_E = -V_{EE}$$

$$I_E \left( \frac{R_B}{\beta_{DC}} + R_E \right) + V_{BE} = -V_{EE}$$

$$I_E = \frac{-V_{EE} - V_{BE}}{R_E + R_B/\beta_{DC}} \cong I_C$$

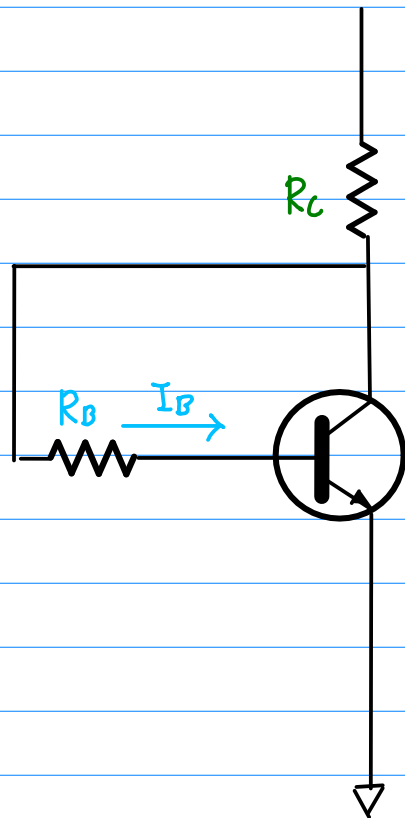
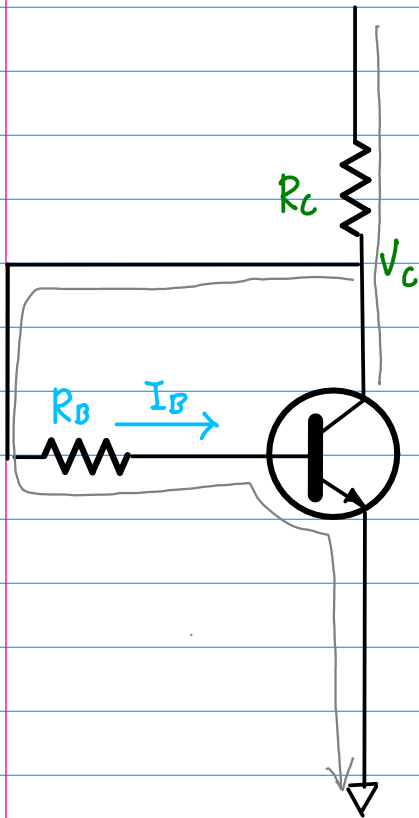
# Collector Feedback Bias



$$I_C \approx I_E$$

$$I_C = \frac{V_{CC} - V_{BE}}{R_C + R_B/\beta_{DC}}$$

$$V_{CE} = V_{CC} - I_C R_C$$



$$I_B = \frac{V_C - V_{BE}}{R_B}$$

$$V_{CE} = V_C$$

$$V_{CE} = V_{CC} - I_C R_C$$

$$I_C \gg I_B$$

$$V_C \cong V_{CC} - I_C R_C$$

$$I_B = \frac{I_C}{\beta_{DC}} = \frac{V_{CC} - I_C R_C - V_{BE}}{R_B}$$

$$\frac{R_B}{\beta_{DC}} I_C = V_{CC} - I_C R_C - V_{BE}$$

$$\left( \frac{R_B}{\beta_{DC}} + R_C \right) I_C = V_{CC} - V_{BE}$$

$$I_C = \frac{V_{CC} - V_{BE}}{R_C + R_B / \beta_{DC}}$$









