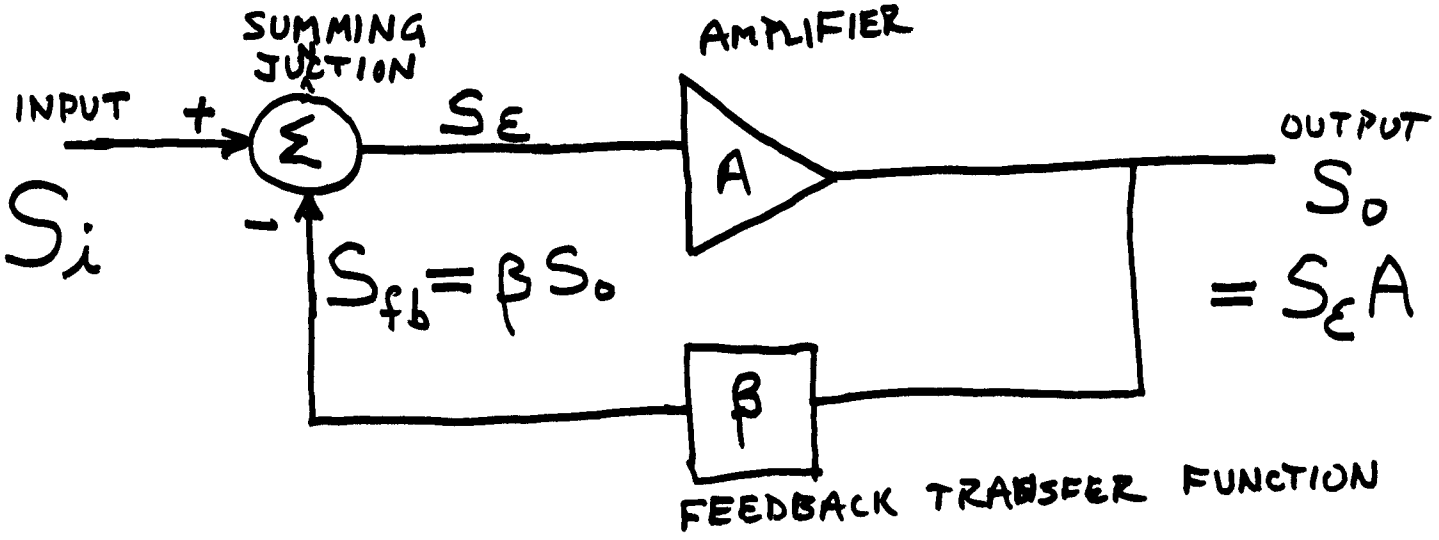
FEEDBACK



S_ε = ERROR SIGNAL $= S_i - S_{fb}$

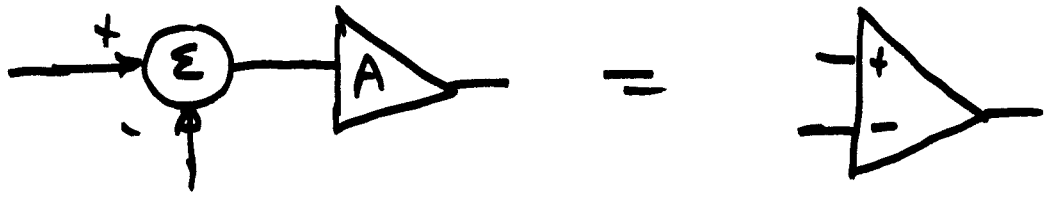
$$S_o = S_\varepsilon A = (S_i - S_{fb})A = (S_i - \beta S_o)A$$

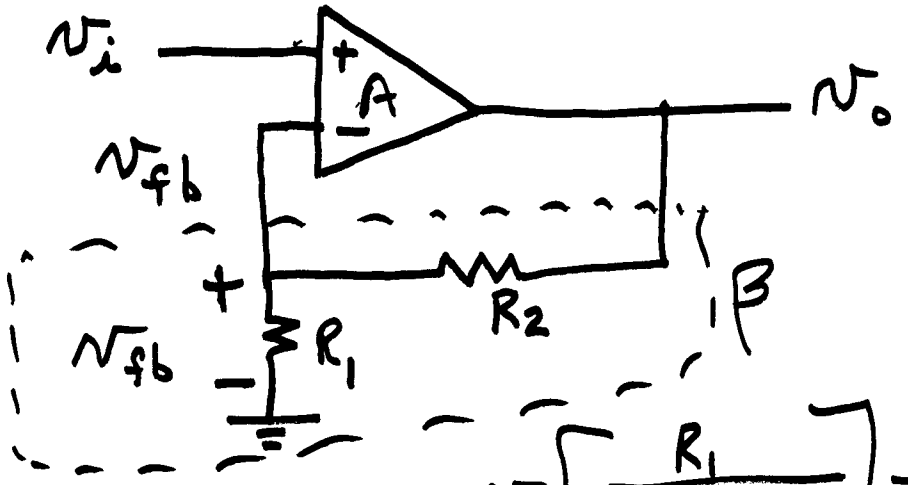
$$S_o = A S_i - \beta A S_o$$

$$\frac{S_o}{S_i} = \frac{A}{1 + \underbrace{\beta A}_{\text{LOOP GAIN}}} = \frac{1}{\frac{1}{A} + \beta} \approx \frac{1}{\beta}$$

$$S_\varepsilon = S_i - S_{fb} = S_i - \beta S_o = S_i - \beta \left[\frac{1}{\frac{1}{A} + \beta}\right] S_i$$

$$S_\varepsilon = S_i \left[1 - \frac{1}{\frac{1}{\beta A} + 1}\right]$$





$$V_{fb} = V_o\left[\frac{R_1}{R_1+R_2}\right] = V_o\,\beta$$

$$\frac{V_o}{V_i} = \frac{1}{\frac{1}{A}+\beta} \approx \frac{1}{\beta} = \frac{R_1+R_2}{R_1} = 1+\frac{R_2}{R_1}$$

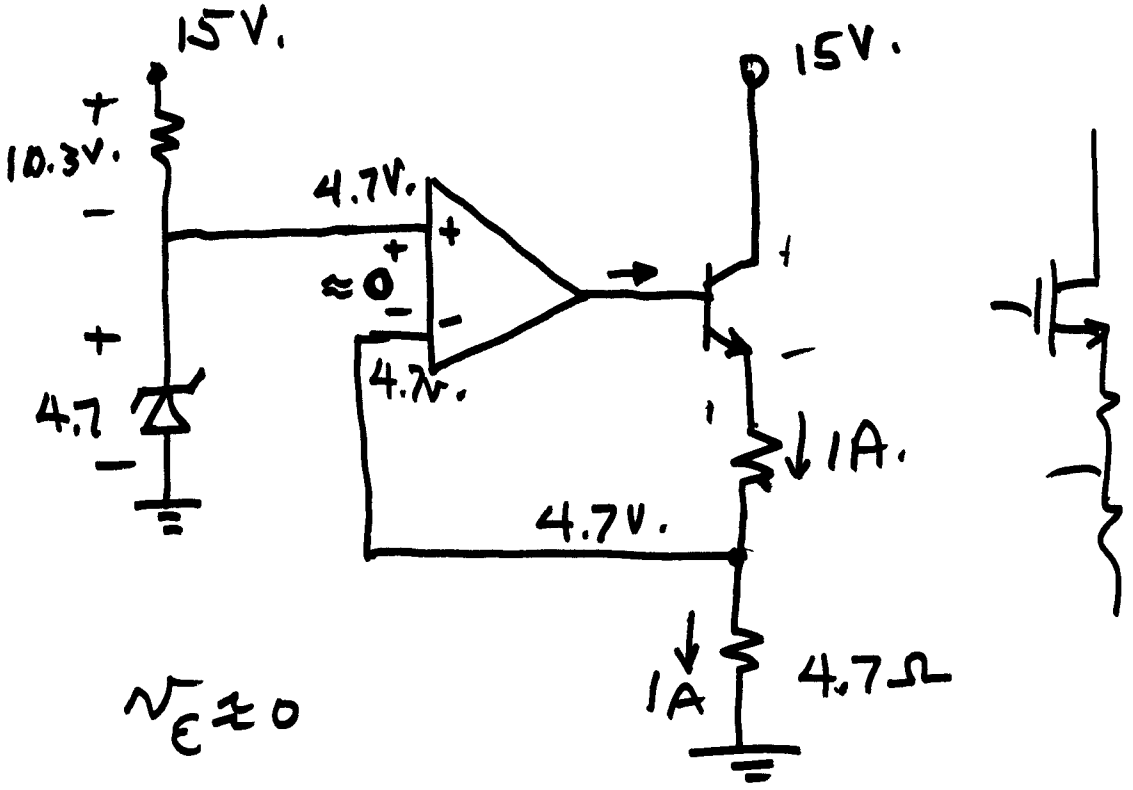
$\beta = 0.1$

$A = 100{,}000$

$$\frac{V_o}{V_i} = \frac{1}{10^{-5}+0.1} = \frac{1}{0.10001} = 9.999$$

$$V_i - V_{fb} = V_\varepsilon = V_i\left[1 - \frac{1}{\beta A+1}\right] = V_i\left[1-\frac{1}{10^{-4}+1}\right]$$

$$V_\varepsilon = V_i\left[1-\frac{1}{1.0001}\right] = V_i\left[9.999\,(10)^{-5}\right]$$



$V_\epsilon \approx 0$