Basic Types of Feedback Amplifiers

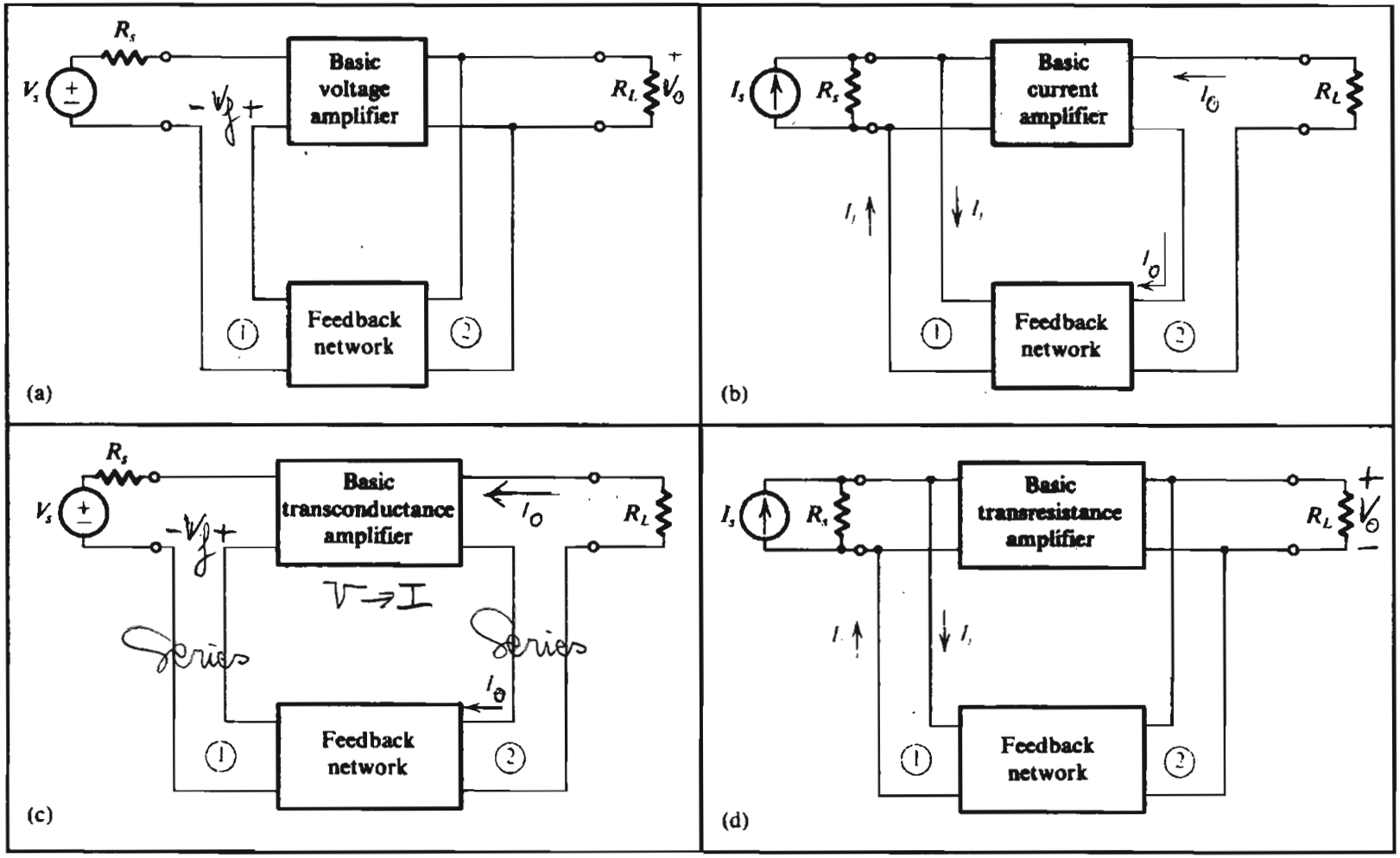
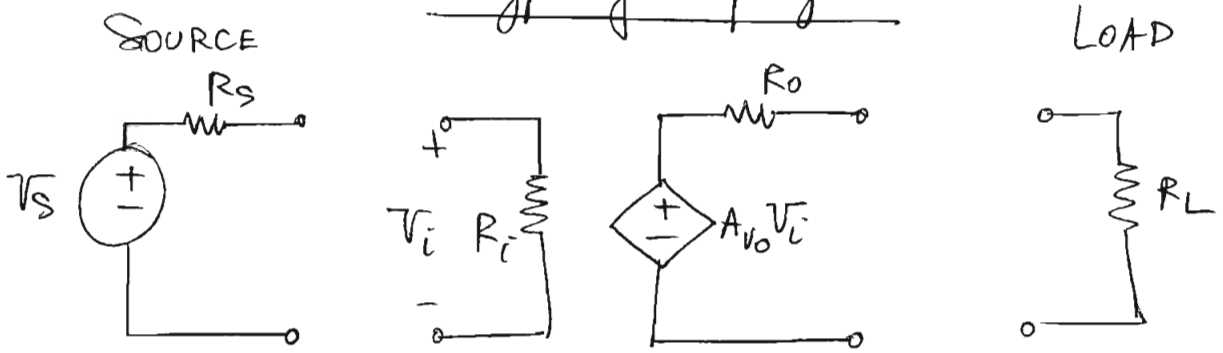
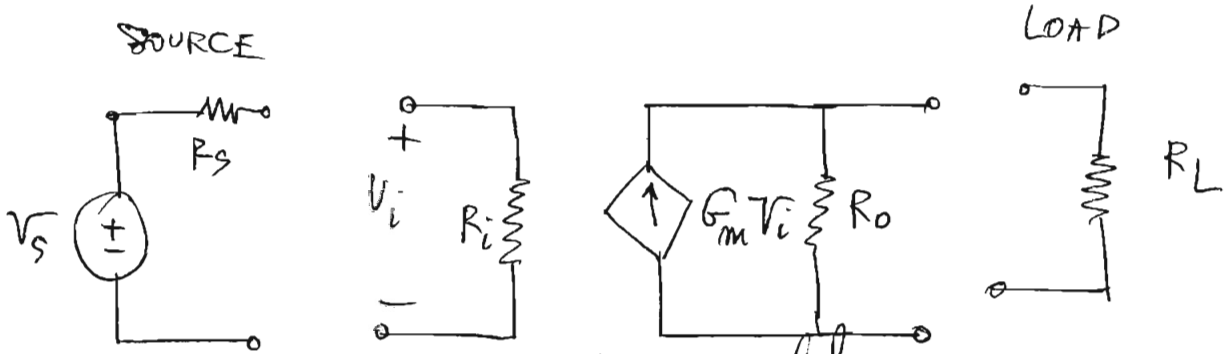


Fig. 8.4 The four basic feedback topologies: **(a)** voltage-sampling series-mixing (series–shunt) topology; **(b)** current-sampling shunt-mixing (shunt–series) topology; **(c)** current-sampling series-mixing (series–series) topology; **(d)** voltage-sampling shunt-mixing (shunt–shunt) topology.

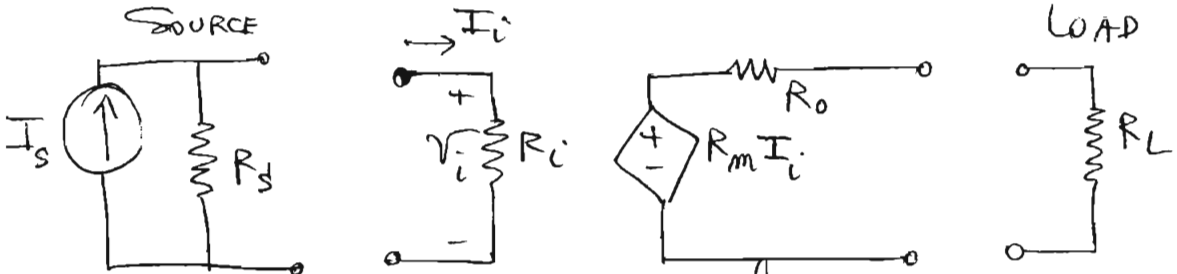
4 Types of amplifiers



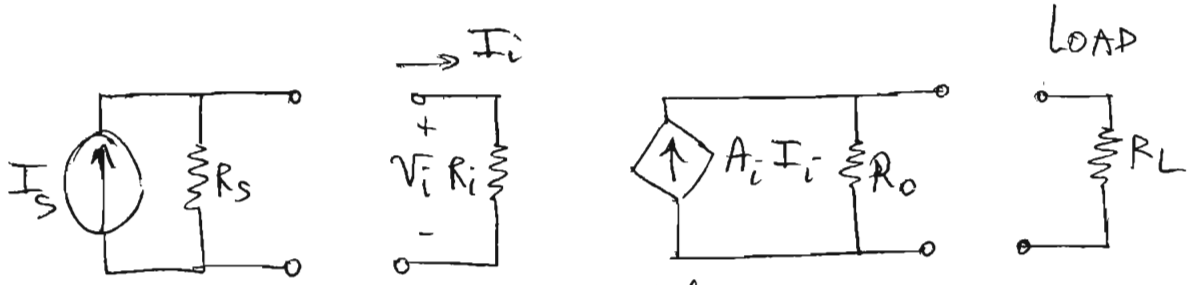
Basic Voltage amplifier



Basic Transconductance amplifier

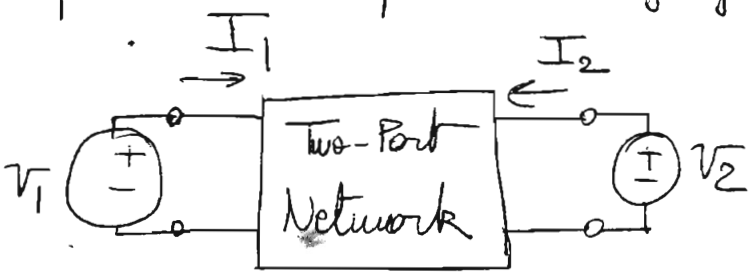


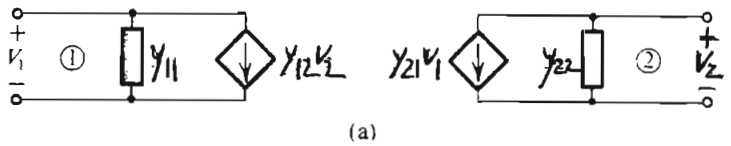
Basic Transresistance amplifier



Basic current amplifier

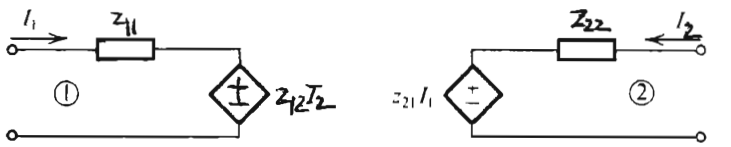
Equivalent Two-port Network for feedback circuits.





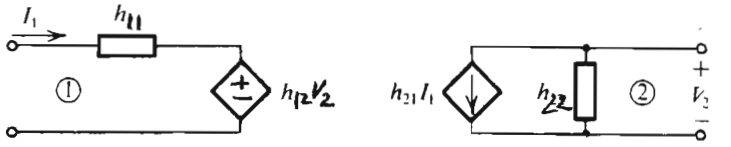
(a)

$$\begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix}$$



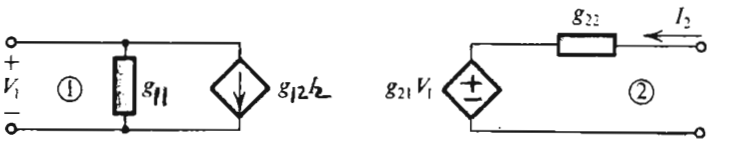
(b)

$$\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$



(c)

$$\begin{bmatrix} V_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} \begin{bmatrix} I_1 \\ V_2 \end{bmatrix}$$



(d)

$$\begin{bmatrix} I_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} g_{11} & g_{12} \\ g_{21} & g_{22} \end{bmatrix} \begin{bmatrix} V_1 \\ I_2 \end{bmatrix}$$

FIGURE B.6 Equivalent circuits for two-port networks in terms of (**a**) y, (**b**) z, (**c**) h, and (**d**) g parameters.

BJT- Fundamental relations for DC and AC analyses
ECE352 - Spring 2007.

DC analysis

$$I_E = I_B + I_C$$

$$I_C = \alpha I_E = \beta I_B$$

$$I_E = (\beta + 1) I_B$$

$$\beta = \frac{\alpha}{1-\alpha} \quad ; \quad \alpha = \frac{\beta}{\beta+1}$$

AC analysis

$V_T \simeq 26\ mV$

$V_A \sim [50 - 100\ V]$ ← Early voltage

$$r_\pi = \frac{V_T}{I_B} \qquad r_e = \frac{V_T}{I_E}$$

$$r_\pi = (\beta+1) r_e$$

$$g_m = I_C / V_T$$

$$r_\pi g_m = \beta \quad ; \quad r_e g_m = \alpha$$

$$r_o = V_A / I_C$$

Hybrid-π model