

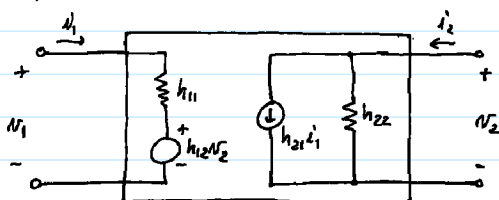
Loading From the FB Network

Ex: Series-Shunt FB (now including loading from the FB network)

Series Connection: resistors & voltage sources add when in series \rightarrow so represent amplifier & FB network by R_i & V_i to make the math simpler

Shunt Connection: conductances & current sources add when in parallel \rightarrow so represent amplifier & FB network by G_i & I_i to make the math simpler

For these representations, use h-parameter networks for a & f.



Port Equations:

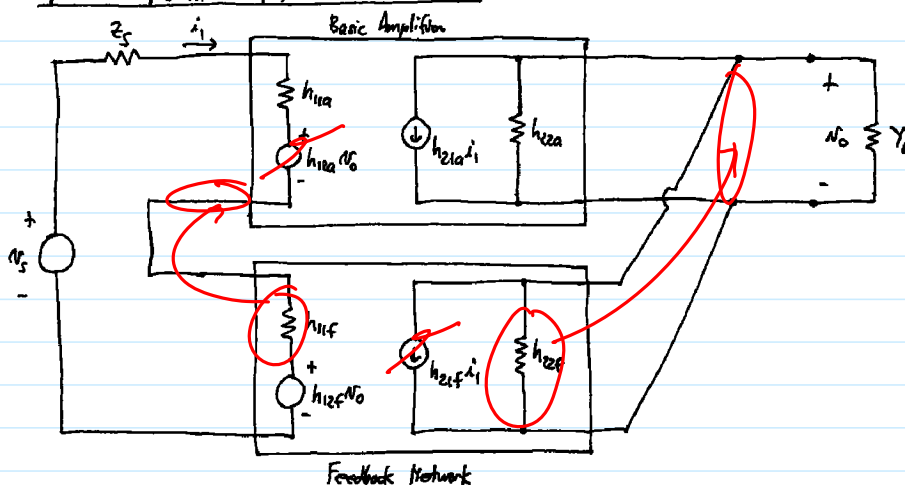
$$V_1 = h_{11}i_1 + h_{12}V_2$$

$$i_2 = h_{21}i_1 + h_{22}V_2$$

Elements: $h_{11} = \frac{V_1}{i_1} \Big|_{V_2=0}$ $h_{12} = \frac{V_1}{V_2} \Big|_{i_1=0}$

Fixed this $h_{21} = \frac{i_2}{i_1} \Big|_{V_2=0}$ $h_{22} = \frac{i_2}{V_2} \Big|_{i_1=0}$

h-parameter representation of the series-shunt FB ckt:



In general, transfer amplifiers & FB networks are uni-directional \rightarrow they have large gains in the forward direction, but very small gains in the reverse:

$$|h_{12a}| \ll |h_{12f}| \rightarrow \text{neglect } h_{12a} \text{ (set to 0)}$$

$$|h_{21a}| \gg |h_{21f}| \rightarrow \text{neglect } h_{21f} \text{ (set to 0)}$$

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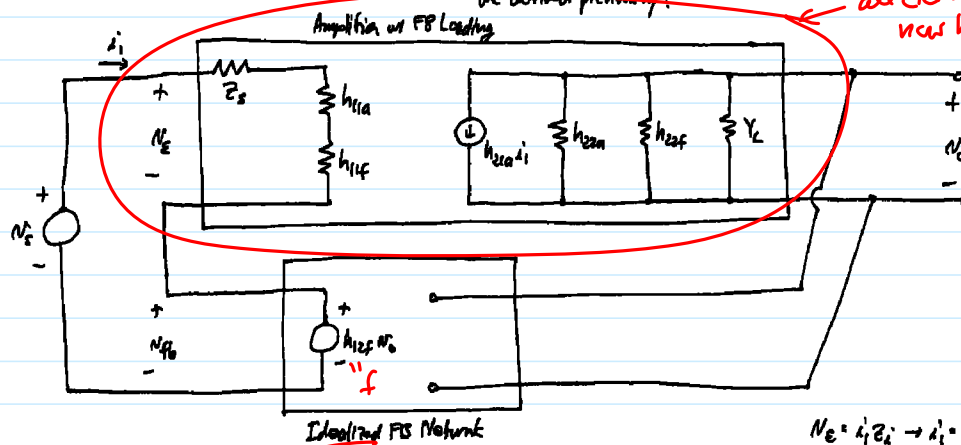
Loading f/ the FB Network

CTN

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⇒ move impedances to idealize the FB network → once ideal, we can use the general equations we derived previously!

all def. complexity
 near box



$$Z_i = Z_s + h_{11a} + h_{11f}$$

$$Y_o = Y_L + h_{22a} + h_{22f}$$

$$\frac{N_o}{N_s} = A = \frac{a}{1+af}$$

$$a = -\frac{h_{21a}}{Z_i Y_o}$$

$$f = h_{22f} \left(= \frac{N_o}{N_s} \right)$$

$$N_o = h_{21a} i_i / Y_o$$

$$\therefore \frac{N_o}{N_s} = a = \frac{-h_{21a} h_{22f}}{Y_o Z_i h_{11f}}$$

Thus, the key to inspection analysis of FB ckt: X for FB impedances to load the basic amplifier, then use our "inspection" formulas.