

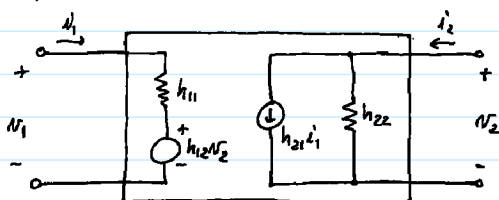
Loading from the FB Network

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 networks by R_i & V_i to make the math simpler

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

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



Port Equations:

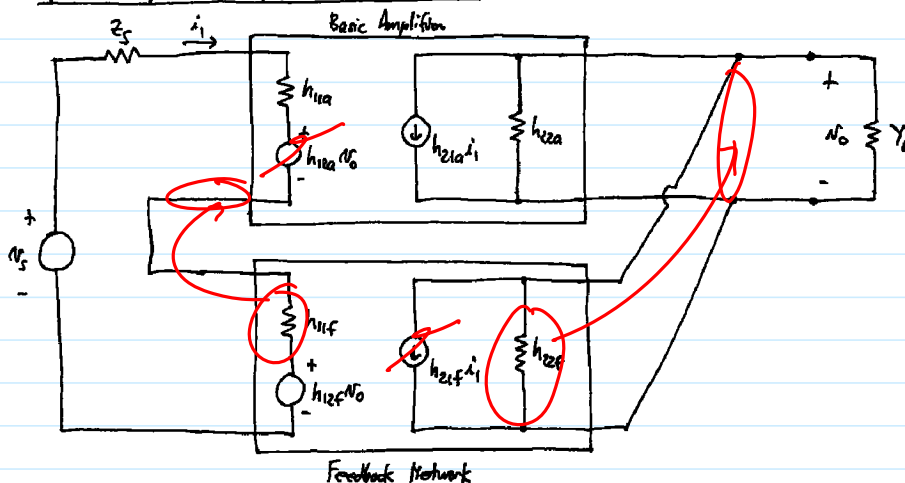
$$V_1 = h_{11}i_1 + h_{12}V_2$$

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

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

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

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:

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

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

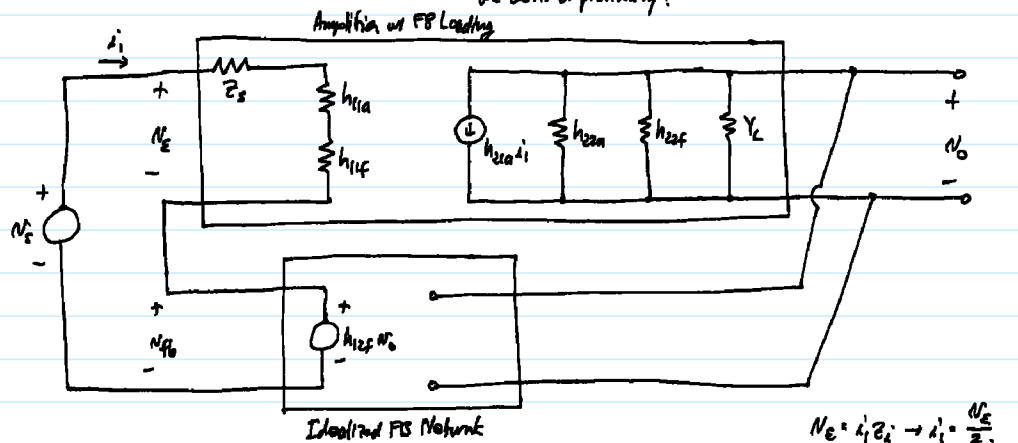
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Loading f/ the FB Network

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



$$Z_i = Z_s + h_{ie} + h_{if}$$

$$Y_o = Y_L + h_{oe} + h_{of}$$

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

where

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

$$f = h_{of} \left(= \frac{N_{of}}{Y_o} \right)$$

$N_s = i_i Z_i \rightarrow i_i = \frac{N_s}{Z_i}$
 $N_o = h_{oe} v_o$
 $\therefore \frac{N_o}{N_s} = a = \frac{-h_{oe} v_o}{Y_o Z_i i_i}$

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