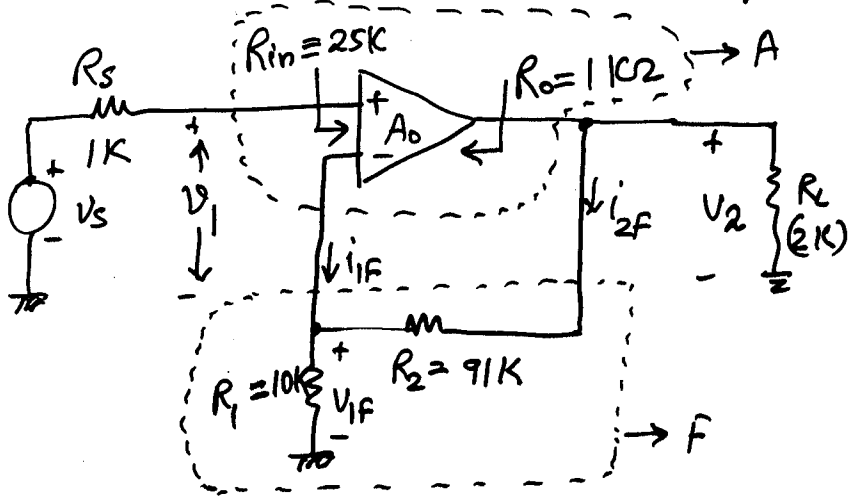
Example of series-shunt feedback



$A_0 = 10^4$ V/V

Find →

- A_v (open-loop gain) $= \left.\frac{V_2}{V_s}\right|_{\text{open-loop (without feedback)}}$
- F (feedback factor)
- A_{vF} (closed-loop gain) $= \left.\frac{V_2}{V_s}\right|_{\text{(with feedback)}}$

$$A = \frac{-h_{21A}}{(R_s + h_{11T})(G_L + h_{22T})} \quad ; \quad \boxed{F = h_{12F}}$$

$$h_{11T} = h_{11A} + h_{11F} = 25\text{K}\Omega + \left.\frac{V_{1F}}{i_{1F}}\right|_{V_2=0} = 25\text{K}\Omega + R_1 \| R_2 = 34.01\ \text{K}\Omega$$

$$h_{22T} = h_{22A} + h_{22f} \; ; \; h_{22F} = \left.\frac{i_{2F}}{V_2}\right|_{i_{1F}=0} = \frac{1}{R_1 + R_2} = \frac{1}{101\text{K}}$$

$$h_{12F} = \left.\frac{V_{1F}}{V_2}\right|_{i_{1F}=0} = \frac{R_1}{R_1 + R_2} = 0.099 = F = \beta$$

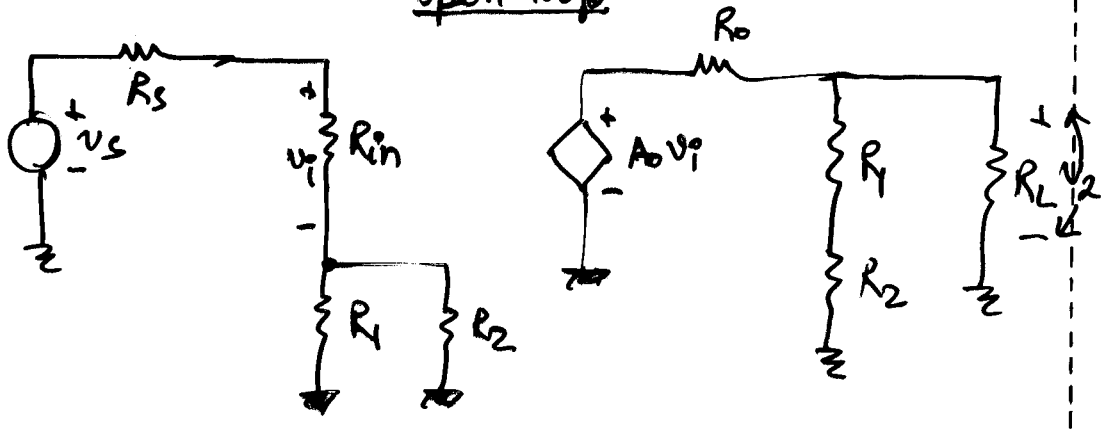
$$h_{21A} = \text{??} = \left.\frac{i_2}{i_1}\right|_{V_2=0}$$

$$A_{VF} = \frac{A_V}{1 + (A_V)F}$$

$F = h_{21F} = 0.099$

$A_V = \infty$

Open-loop



$$A_V = \frac{v_2}{v_S} = \left(\frac{R_{in}}{R_S + R_{in} + R_1 \| R_2}\right) A_o \cdot \left(\frac{(R_1 + R_2) \| R_L}{R_o + (R_1 + R_2) \| R_L}\right)$$

$$= 4730 \text{ V/V}$$

$$A_{VF} = \frac{A_V}{1 + F A_V} \approx 10.08 \text{ V/V}$$