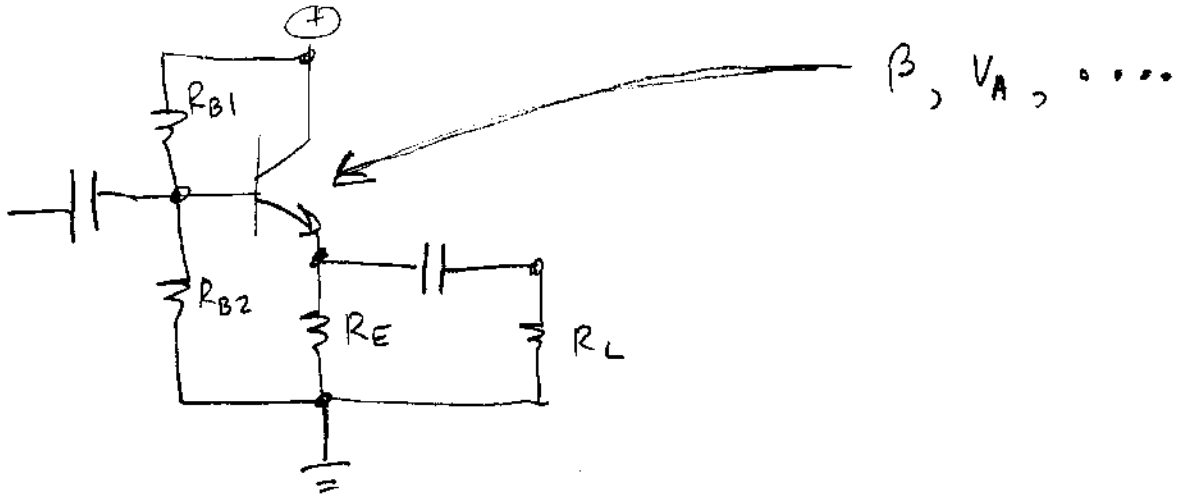
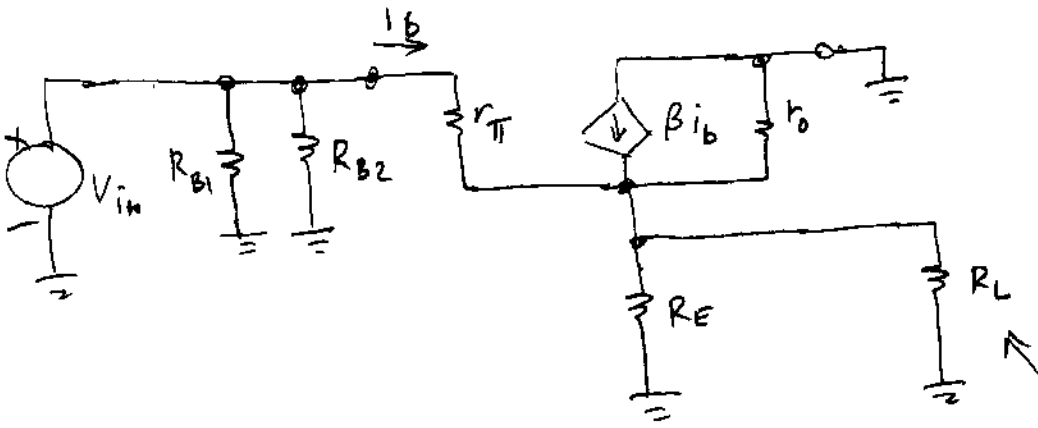
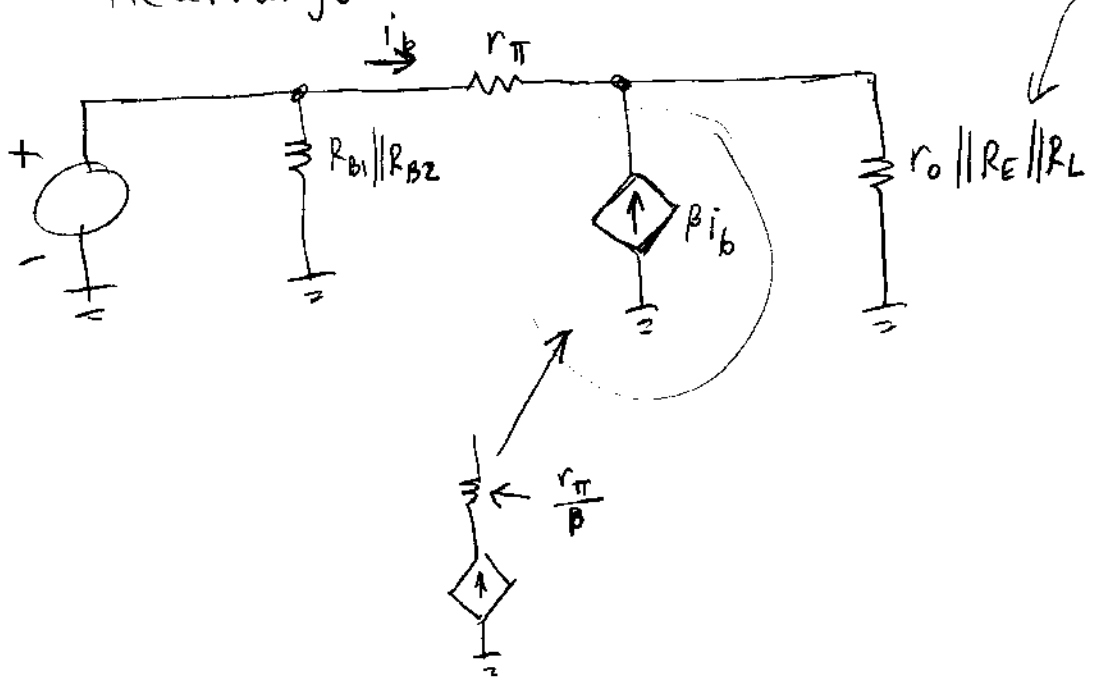
Analysis of the emitter follower



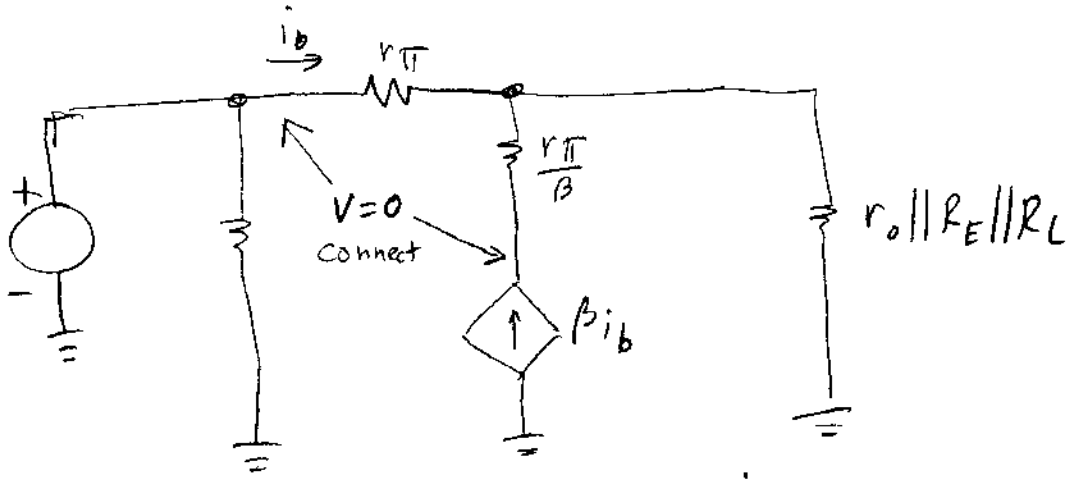
Substitute the model for the transistor:
(remember --- power is ground)

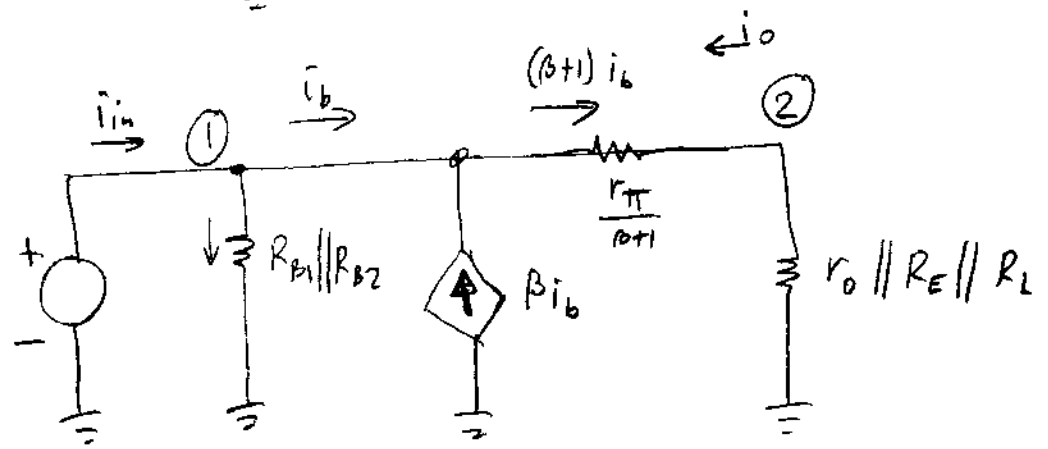


Rearrange:



To find output impedance, leave out R_L.





$$\frac{V_2}{V_1} = \frac{r_o \| R_E \| R_L}{\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L} \approx 1 \quad \text{(a little less)}$$

$$R_{in} = \frac{V_1}{i_{in}}$$

$$i_b + \beta i_b - \frac{V_1}{\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L} = 0$$

$$(\beta+1)\, i_b = \frac{V_1}{\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L}$$

$$i_b = \frac{\frac{V_1}{\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L}}{\beta+1}$$

$$i_b = \frac{i_{LOAD}}{\beta+1}$$

So -- ignoring R_{B1}, R_{B2}

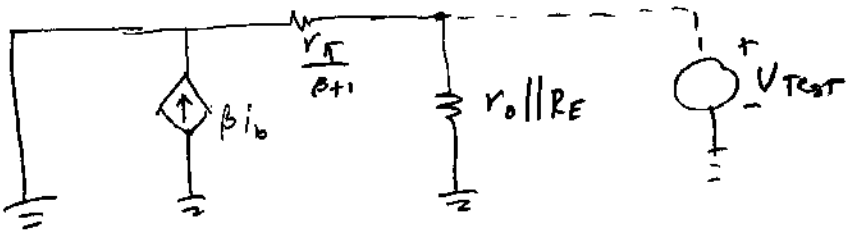
$$R_{in} = \frac{V_1}{\frac{V_1}{\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L}{\beta+1}} = \frac{\beta+1}{\frac{1}{\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L}}$$

$$= (\beta+1)\left(\frac{r_\pi}{\beta+1} + r_o \| R_E \| R_L\right)$$

$$Rin_{raw} = r_\pi + (\beta+1)\underbrace{(r_o \| R_E \| R_L)}_{\text{Effective load.}}$$

Real $R_{in} = R_{in_{raw}} \| R_{bias}$

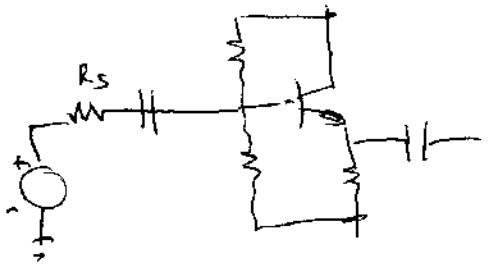
$$R_{out} = \left.\frac{V_2}{i_o}\right|_{V_{in}=0}$$

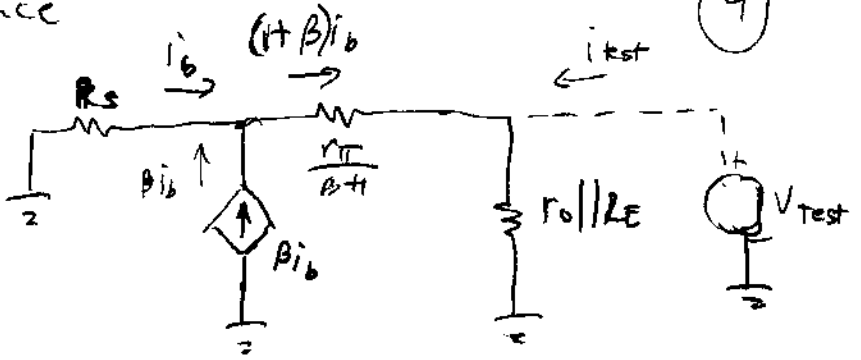


For shorted input -- $r_o \| R_E \| \frac{r_\pi}{\beta+1} \approx \frac{r_\pi}{\beta+1}$

But --- R_{out} depends on source resistance.

With Source resistance





HW —	p	#	p	#
Em. Follower	209	17, 18	235	33
	213 }	19, 20, 21	236	37
	214 }	22, 23	237	40
Common base	~~217~~	~~24~~	~~238~~	~~44, 47~~
	218	25, 26		
Multi-stage	225	27, 28, 29	239	50
	~~226~~	~~30~~	240	53
~~power~~	~~228~~	~~31, 32~~	~~241~~	~~56, 59~~

Power considerations (4, 10)

This section discusses "Class A" amplifiers.

You should be able to do quiescent power calculations and power gain, power delivered to load, etc.

Put off (for now) supply and dissipation calculations with signal. — (the integrals) it is less than quiescent.

Prepare to do it next fall (chapter 8)