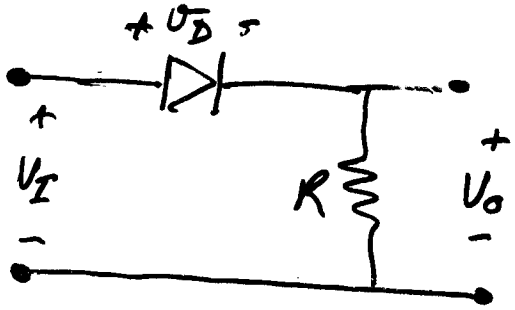
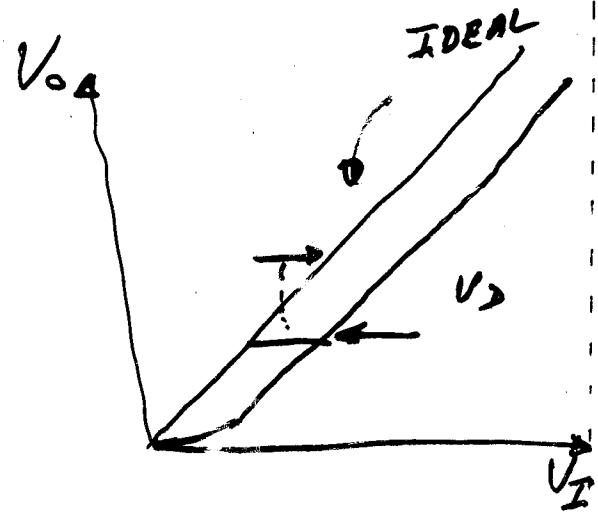
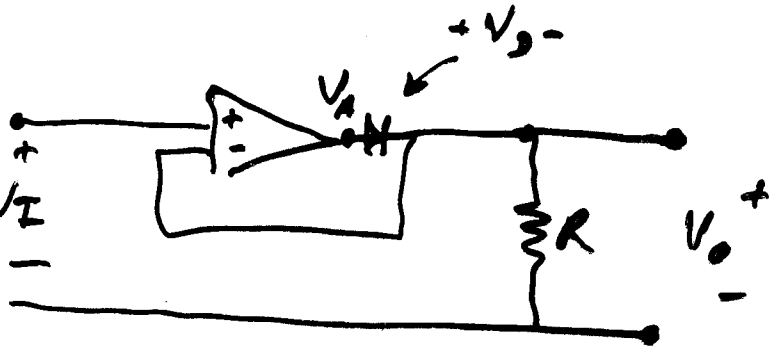
EFFECT OF THE DIODE FORWARD VOLTAGE DROP:



$$V_o = V_I - V_D$$



THE USE OF OP-AMPS FOR RECTIFICATION - "THE SUPER-DIODE"



$\because A_V \neq \infty$

$$V_o = V_A - V_D$$

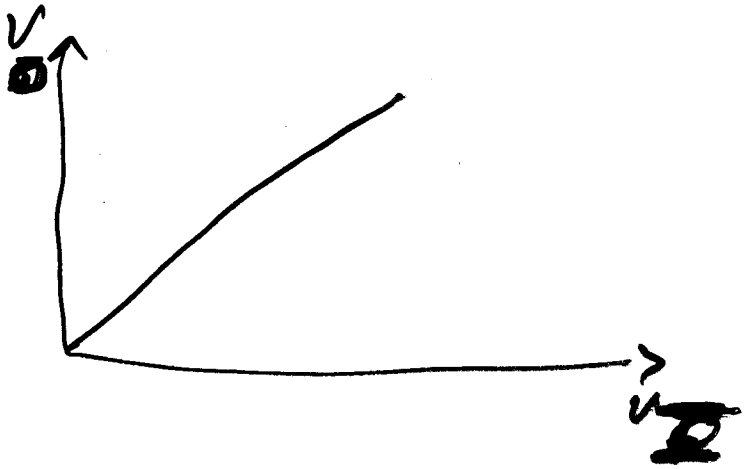
$$\because V_A = A_V (V_I - V_o)$$

$$V_o = A_V (V_I - V_o) - V_D$$

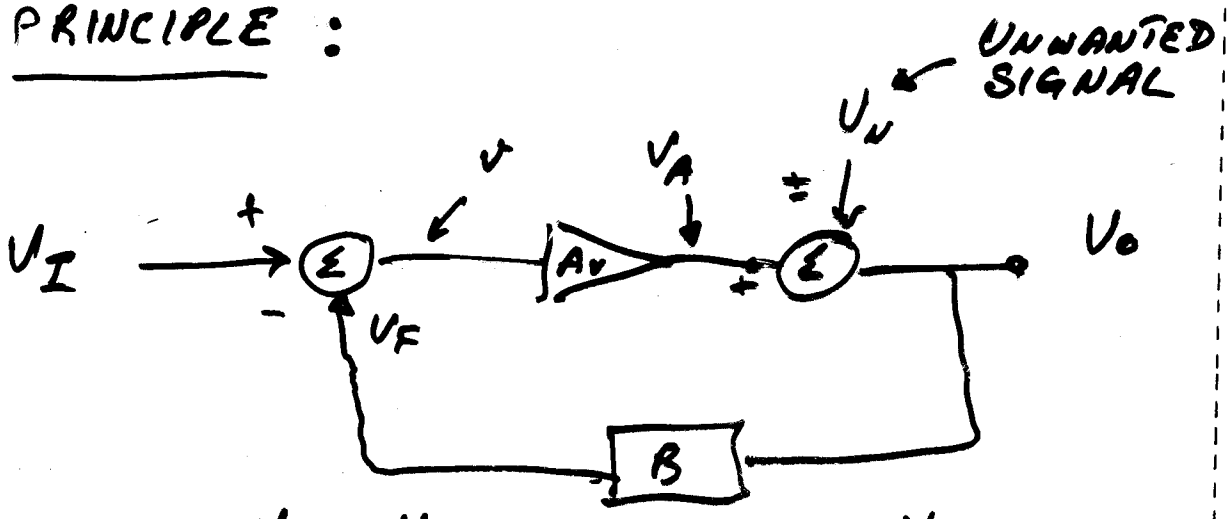
$$V_o(1+A_v) = A_v V_I - V_D$$

$$\Rightarrow V_o = \frac{A_v}{1+A_v} V_I - \frac{V_D}{1+A_v}$$

As $A_v \to \infty$, $V_o = V_I$



PRINCIPLE :



$$V_o = V_A \pm V_N = A_v V \pm V_N$$

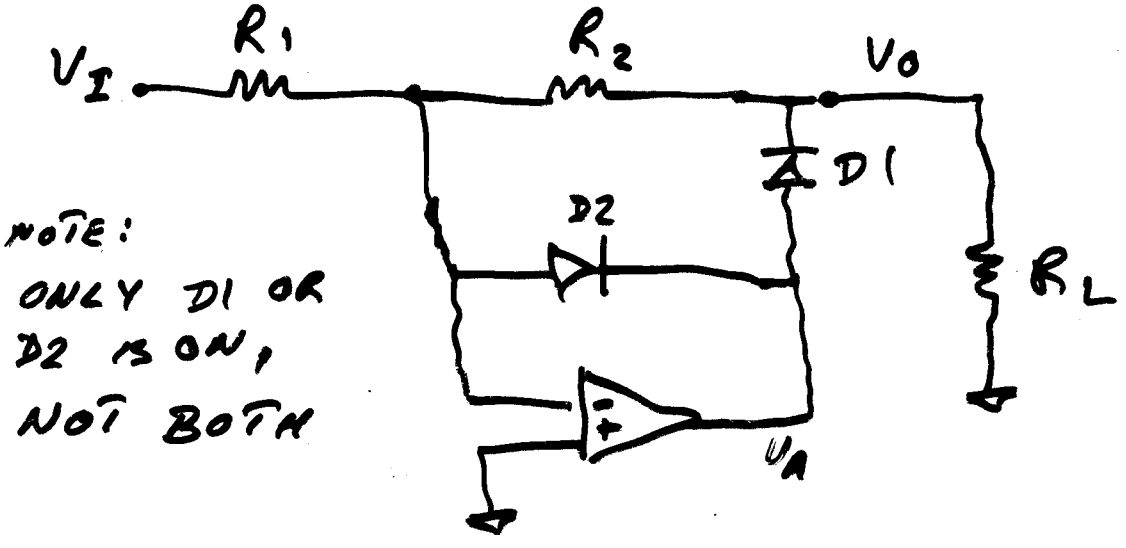
$$V_o = A_v (V_I - V_F) \pm V_N$$

$$V_o = A_v (V_I - B V_o) \pm V_N$$

$$V_o = \left(\frac{A_v}{1+BA_v}\right) V_I \pm \frac{V_N}{1+BA_v}$$

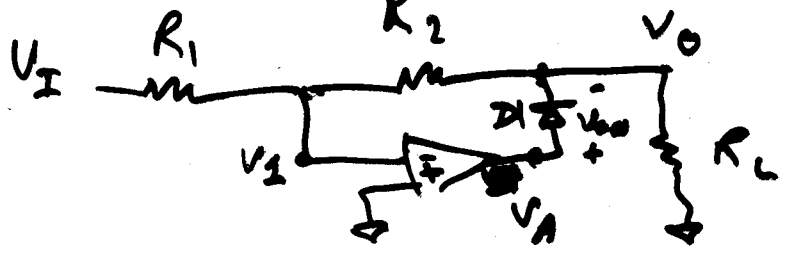
"PRECISION DIODE" - PRACTICAL OP-AMP RECTIFIER:

IN THE PREVIOUS CKT the loop is open for $V_I < 0$.



NOTE: ONLY D1 OR D2 IS ON, NOT BOTH

$V_I < 0$ $\quad V_A > 0 \Rightarrow$ D1 ON, D2 OFF



$$V_O = V_A - V_{ON} = -A_V V_1 - V_{ON}$$

$$\because \quad V_1 = \frac{R_2}{R_1 + R_2} V_I + \frac{R_1}{R_1 + R_2} V_O$$

$$V_O = -A_V\left(\frac{R_2}{R_1+R_2}V_I + \frac{R_1}{R_1+R_2}V_O\right) - V_{ON}$$

$$V_O\left\{1 + \frac{A_V R_1}{R_1+R_2}\right\} = -A_V\frac{R_2}{R_1+R_2}V_I - V_{ON}$$

$$V_O = \left(\frac{-A_V\frac{R_2}{R_1+R_2}}{1+A_V\frac{R_1}{R_1+R_2}}\right)V_I - \frac{V_{ON}}{1+A_V\frac{R_1}{R_1+R_2}}$$

$$\lim_{A_V\to\infty} V_O = -\frac{R_2}{R_1}V_I$$