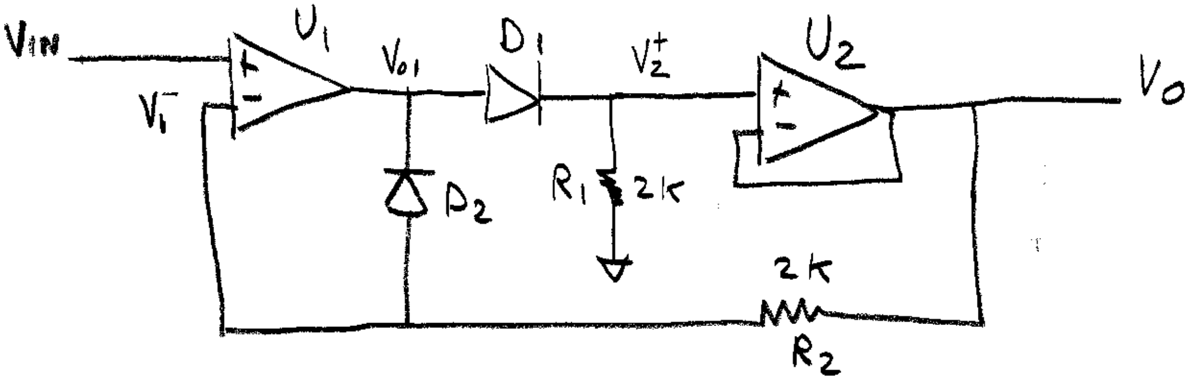
DIODE CIRCUITS

HALF WAVE RECTIFIER



ANALYSIS FOR $V_{IN} > 0$:

NOTE THAT $V_2^+ = V_o$ SINCE U2 HAS GAIN OF 1

$V_{O1} = V_2^+ + V_{D1}$

SINCE $V_1^- = V_o$ BECAUSE D_2 IS NOW REVERSE BIASED AND THERE IS NO CURRENT THROUGH R_2.

$\boxed{\text{SO} \quad V_o = V_{IN}}$

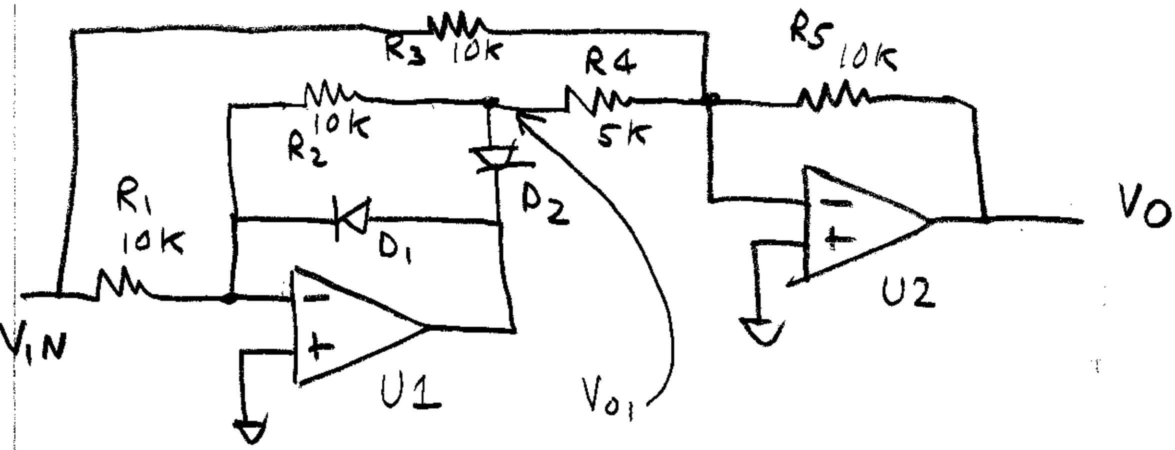
ANALYSIS FOR $V_{IN} < 0$;

NOW $V_{O1} = V_{IN} - V_{D2}$ SO $V_1^- = V_{IN}$

D_1 IS REVERSE BIASED SO $V_2^+ = 0$ AND $\underline{\underline{V_O = 0}}$

PURPOSE OF R_2 IS TO PROVIDE FEEDBACK PATH WHEN $V_{IN} > 0$ AND TO NOT BE TOO SMALL WHEN $V_{IN} < 0$. GENERALLY, R_1 + R_2 ARE AS SMALL AS POSSIBLE TO MINIMIZE TIME CONSTANTS THAT DEGRADE PERFORMANCE AT HIGH FREQUENCIES.

FULL WAVE RECTIFIER (ABSOLUTE VALUE CIRCUIT)



NOTE: $V_{O1} = -V_{IN}$ FOR $V_{IN} > 0$

$V_{O1} = 0$ FOR $V_{IN} < 0$

$$V_O = -V_{IN}\left(\frac{R5}{R3}\right) - V_{O1}\left(\frac{R5}{R4}\right)$$

$$= -V_{IN}(1) - V_{O1}(2)$$

$V_{IN} > 0$: $V_O = -V_{IN} - (-V_{IN})(2)$

$$\underline{\underline{V_O = V_{IN}}}$$

$V_{IN} < 0$: $V_O = -V_{IN} - (0)(2)$

$$\underline{\underline{V_O = -V_{IN}}}$$

THUS