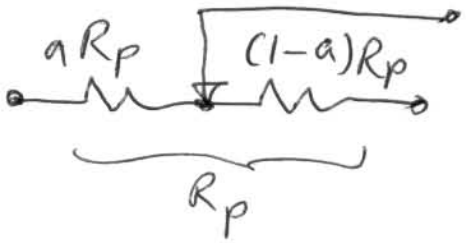
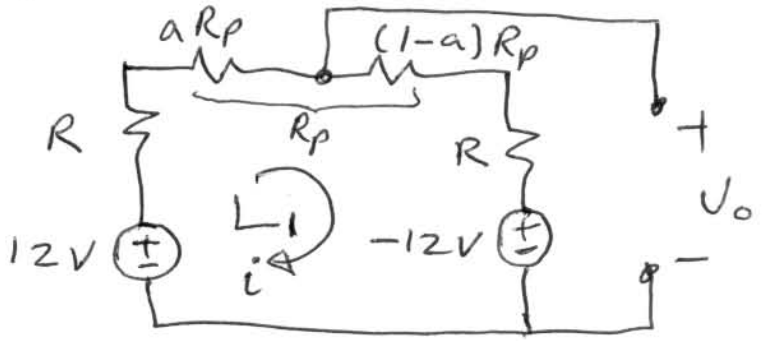
Key to the project

The potentiometer can be drawn as shown.



One possible solution can be



KVL for L_1

$$-12+[R+aR_p+(1-a)R_p+R]\,i-12=0$$

$$i=\frac{24}{2R+R_p}$$

To reduce power consumption in the circuit, we must reduce the current by selecting R_p as large as possible (i.e. 50kΩ)

$$\therefore\ i=\frac{24}{2R+50}$$

But $v_o = 12-[R+aR_p]\,i$

So $v_o = 12-\dfrac{24[R+aR_p]}{2R+50}$, for $0\le a\le 1$, $-5\le v_o\le 5$

For $a=0$, v_o must be 5 V

$$\therefore\ 5=12-\frac{24R}{2R+50}\Rightarrow\frac{24R}{2R+50}=7\Rightarrow \boxed{R=35\,k\Omega}$$

Check: For $a=1$, v_o must be -5V

$$v_o=12-\frac{24[35+50]}{2(35)+50}=-5\,V\quad\checkmark$$

To obtain $R=35k\Omega$ use 15k+20k resistors in series for example.

$$P=i^2(2R+R_p)=\left[\frac{24}{2R+R_p}\right]^2(2R+R_p)=4.8\,mW$$