

83. (a) Since  $P = \mathcal{E}^2/R_{\text{eq}}$ , the higher the power rating the smaller the value of  $R_{\text{eq}}$ . To achieve this, we can let the low position connect to the larger resistance ( $R_1$ ), middle position connect to the smaller resistance ( $R_2$ ), and the high position connect to both of them in parallel.
- (b) For  $P = 100 \text{ W}$ ,  $R_{\text{eq}} = R_1 = \mathcal{E}^2/P = (120 \text{ V})^2/100 \text{ W} = 144 \Omega$ ; for  $P = 300 \text{ W}$ ,  $R_{\text{eq}} = R_1 R_2/(R_1 + R_2) = (144 \Omega) R_2/(144 \Omega + R_2) = (120 \text{ V})^2/300 \text{ W}$ . We obtain  $R_2 = 72 \Omega$ .