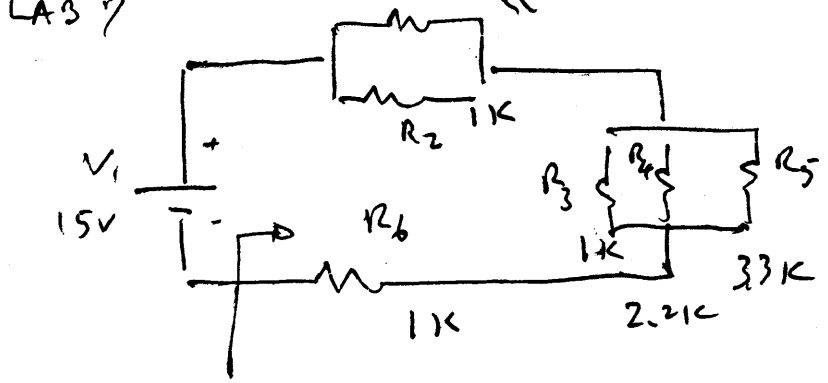
2012/12/27 ①

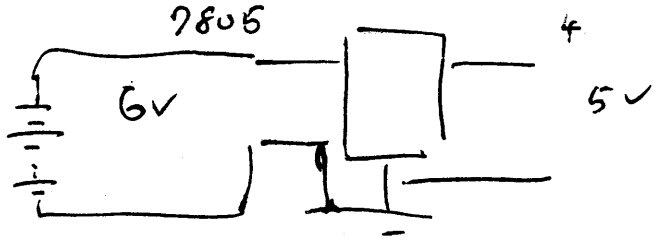
LAB 7

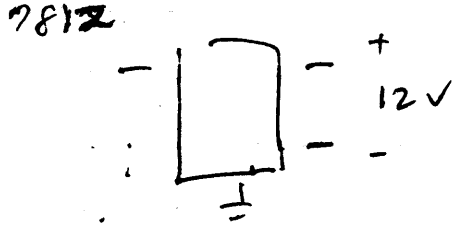
R_1 2.2K $(R_1 \parallel R_2) = R_{12} < 1K$



$(R_3 \parallel R_4 \parallel R_5) = R_{345} < 1K$

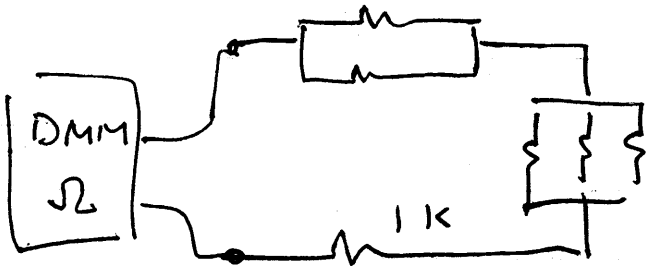
Mouser / Digikey





$\frac{2.2 \times 1.1K}{2.2 + 1K} = \frac{2.2}{3.2}$ K

0.75K



$\left(\frac{1K \cdot 2.2K}{1K+2.2K}\right)$

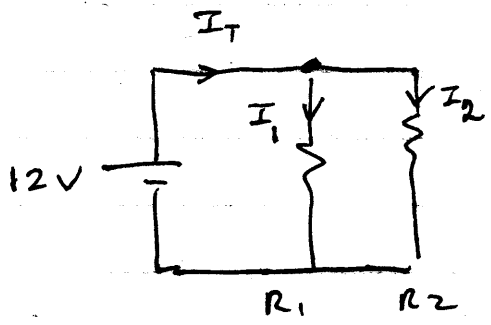
0.7K // 3.3K

$R_T = R_{12} + R_{345} + R_6 \approx 3K$

$\frac{0.7 \times 3.3}{0.7+3.3} = \frac{2K}{4K}$

$\approx 0.5K$

Current Divider Rule



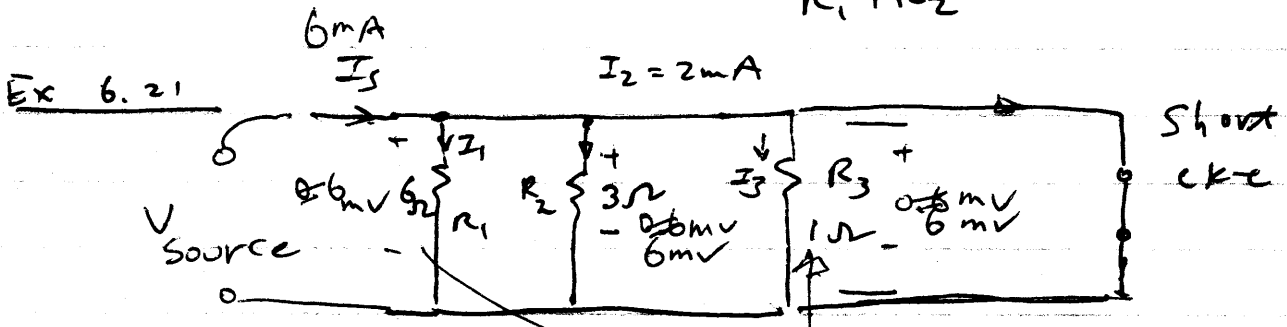
$= \frac{12V}{R_1} = \frac{12V}{R_2}$

R_1	R_2	I_1	I_2
1K	1K	12mA	12mA
1K	2K	12mA	6mA

Given I_T Find $I_1 = I \cdot \frac{R_2}{R_1 + R_2}$

$$I_2 = I \cdot \frac{R_1}{R_1 + R_2}$$

Ex 6.21



Step 1) Find $V_{R_2} = I_2 R_2 = 2mA \cdot 3\Omega = 6\,mV$

Step 2) Apply $V_{R_2} = V_{R_3} = V_{R_1}$

Step 3) Compute $I_1 = \frac{V_{R_1}}{R_1} = 6mV/6 = 1\,mA$

Compute $I_3 = \frac{V_{R_3}}{R_3} = \frac{6mV}{1\Omega} = 6mA$

Step 4) $I_S = I_1 + I_2 + I_3$

$= 1mA + 2mA + 6mA$

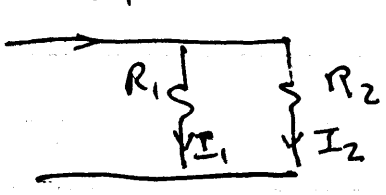
$= 9mA$

$V_{Source} = V_{R_1} = V_{R_2} = V_{R_3} = 6\,mV$

N Resistors

$$I_x = \frac{(R_T \cdot I_T)}{R_x} = \frac{E}{R_x} \quad \leftarrow \text{Ohm's Law}$$

CDR for two resistors in parallel



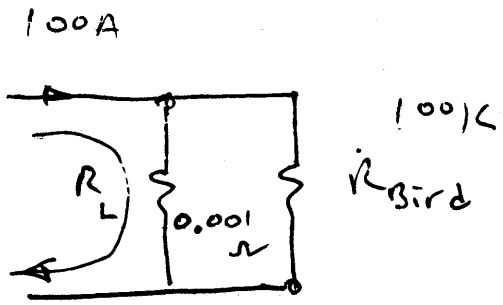
$$R_T = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

Find

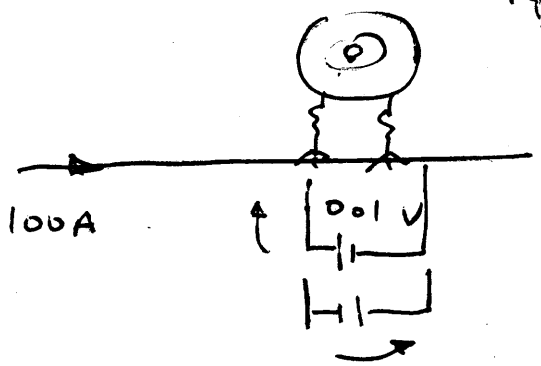
$$I_1 = \frac{R_T \cdot I_T}{R_1} = \left(\frac{\left(\frac{R_1 \cdot R_2}{R_1 + R_2} \right) / R_1}{R_1 / R_1} \right) \cdot I_T$$

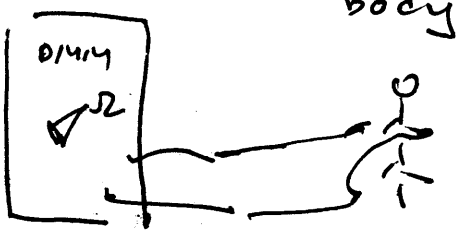
$$= \left(\frac{\frac{1 \cdot R_2}{R_1 + R_2}}{1} \right) I_T = \left(\frac{R_2}{R_1 + R_2} \right) \cdot I_T$$

$$I_2 = \left(\frac{R_1}{R_1 + R_2} \right) I_T$$



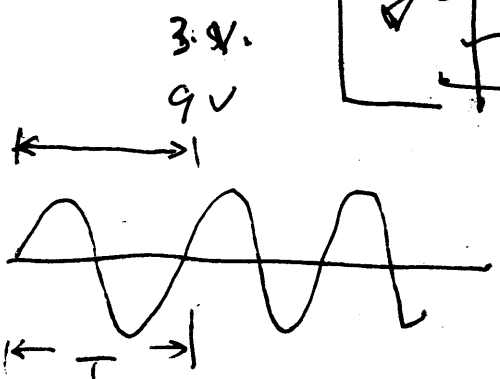
$R_{Bird} \approx 100K\Omega$

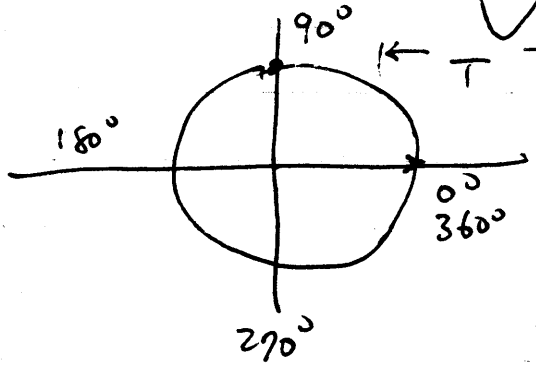




$V_{R_L} = 100A \cdot R_L$

$= 0.1\ V$





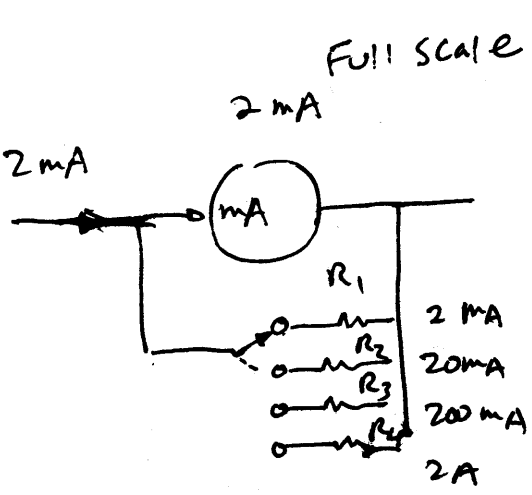
$f = 60Hz$

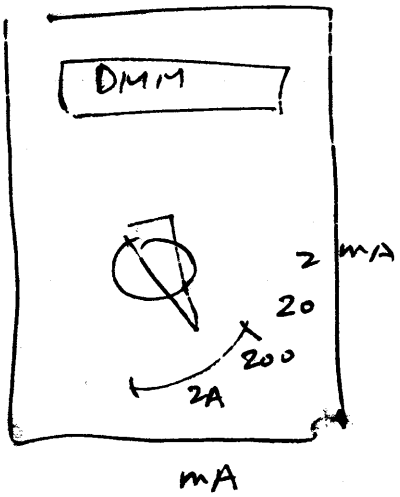
$T = \frac{1}{f} = \frac{1}{60} = 16.67ms$

→ 8.87msec ⇒ 0.0089 sec

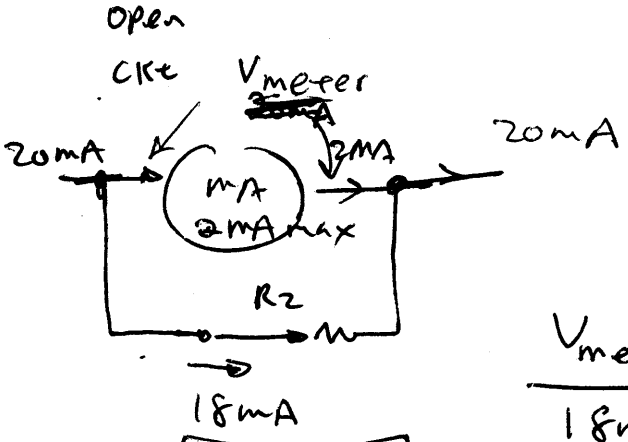
← 8.87msec

DMM MA meter





R_1 R_2 R_3 R_4



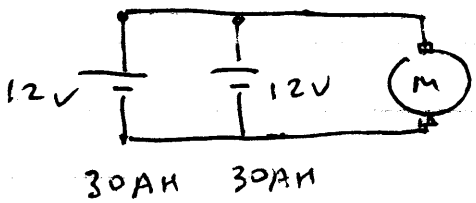
$$\frac{V_{meter}}{18mA} = R_2$$ design

Shunt

Shunt resistor

$R_2 << (mA)$ Resistance

Voltage Sources in parallel



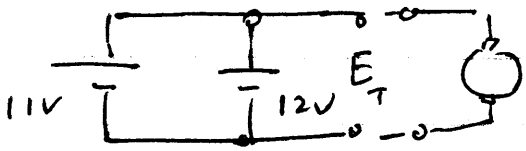
DC motor / Electric Bike

Use one BA — 20 miles

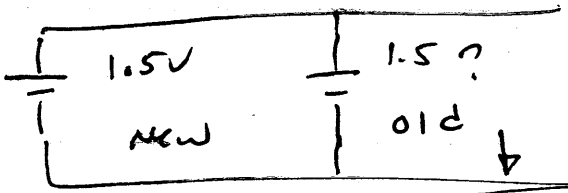
Use both $BA_1 + BA_2$

→ > 30 miles

? 40 miles ?



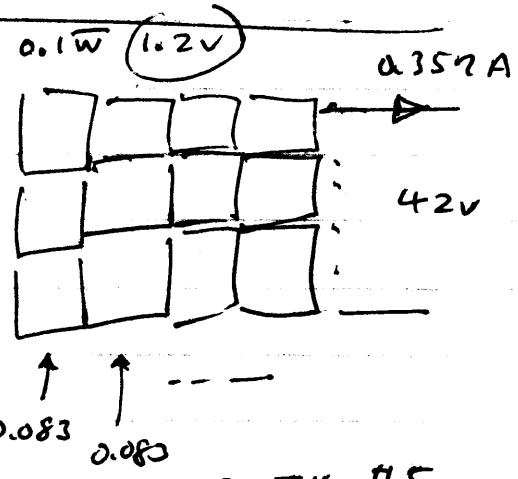
$E_T = 11V$



? 1.5V

42V Solar Cell 15W

- Each cell output 0.1W / 1.2V
- How many in parall / series would be needed.



$P = E \cdot I$ $\quad 15W = 42 \cdot I$

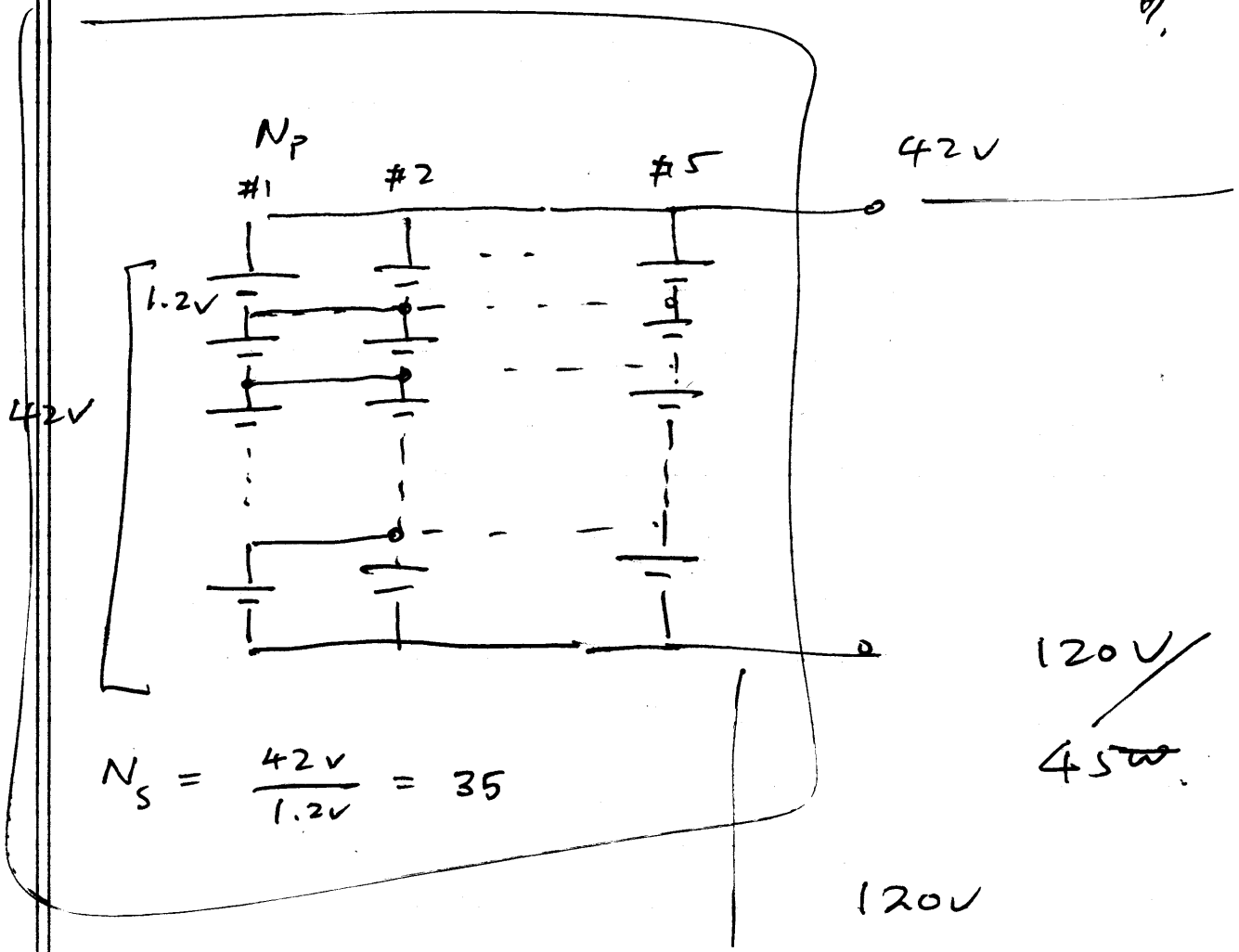
$I = 0.357A$

Each cell $\quad 0.1W = E \cdot I = 1.2 * I$

$I = \frac{0.1W}{1.2} = 0.083A$

$I_x = \frac{I}{N_{parallel}} = 0.083A = \frac{0.357A}{N_p}$

$N = \frac{0.357}{0.083} = 4.3 \simeq 5$



$$N_S = \frac{42V}{1.2V} = 35$$

120V