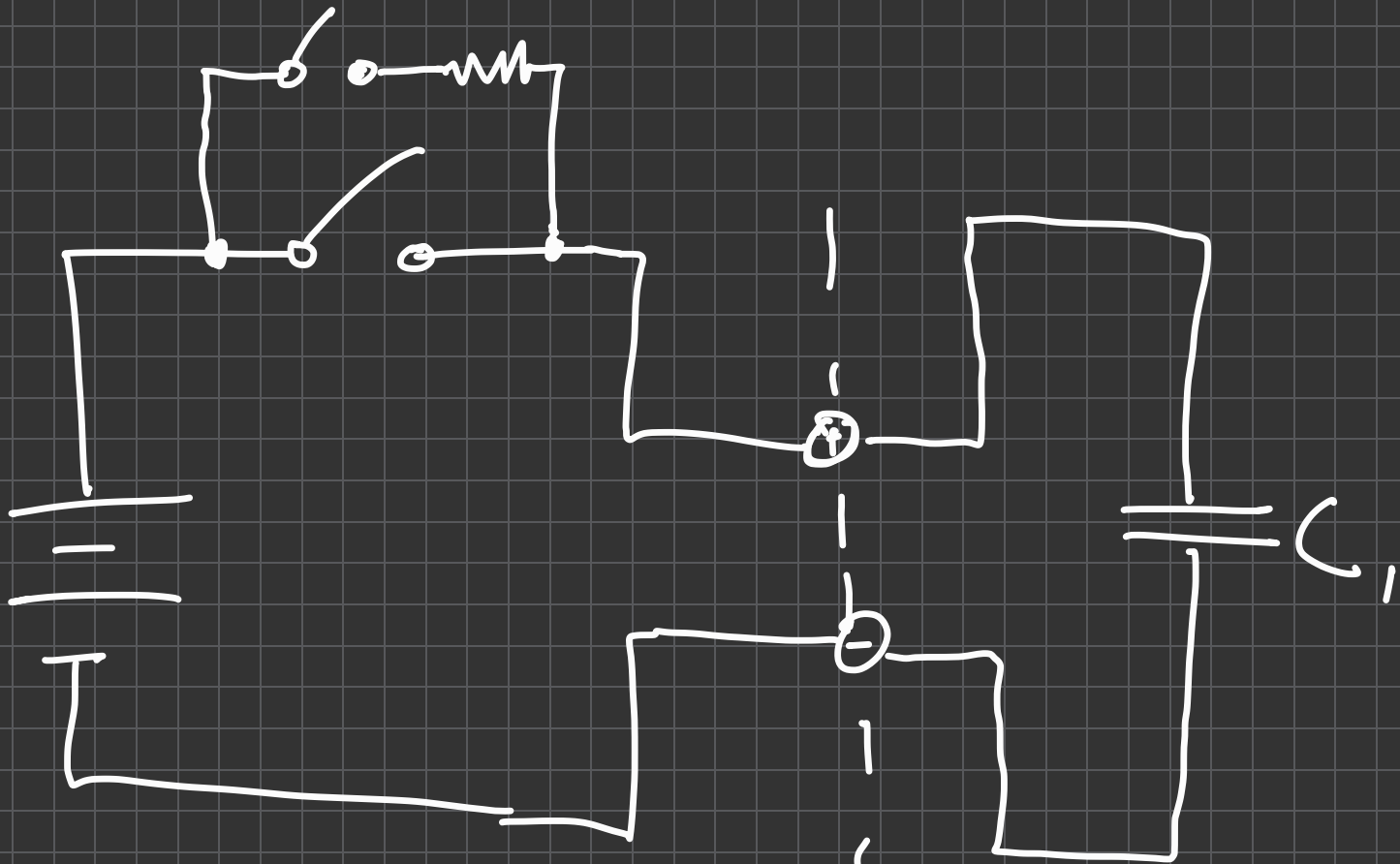


Pre-Charge

very important to have PL circuit for
any high voltage system



C_1 can be any motor inverter or high freq.
switching

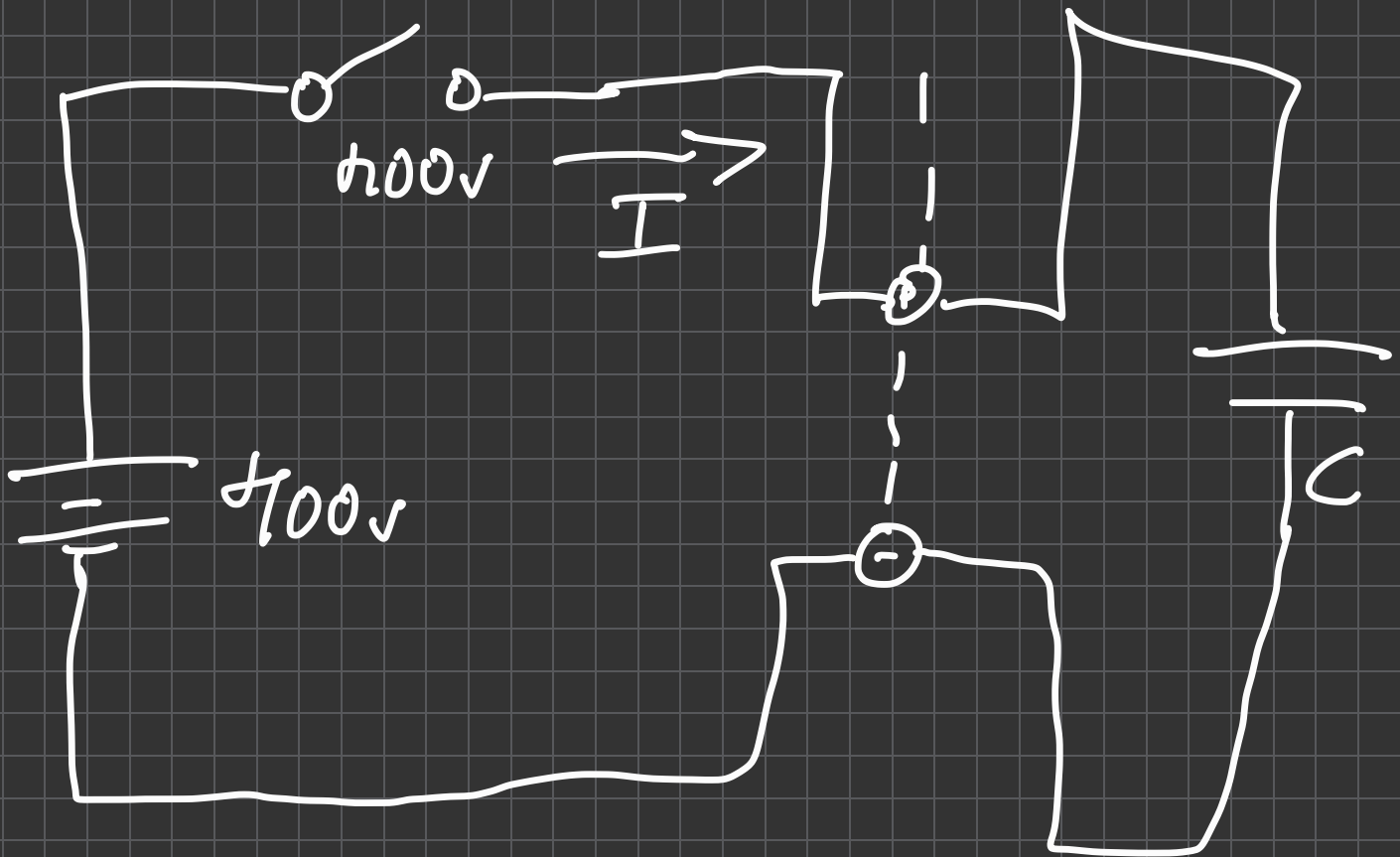
Capacitance : ability of a component or circuit to store energy.

(How well it can hold electrical charges)

$$C = \frac{Q}{V}$$

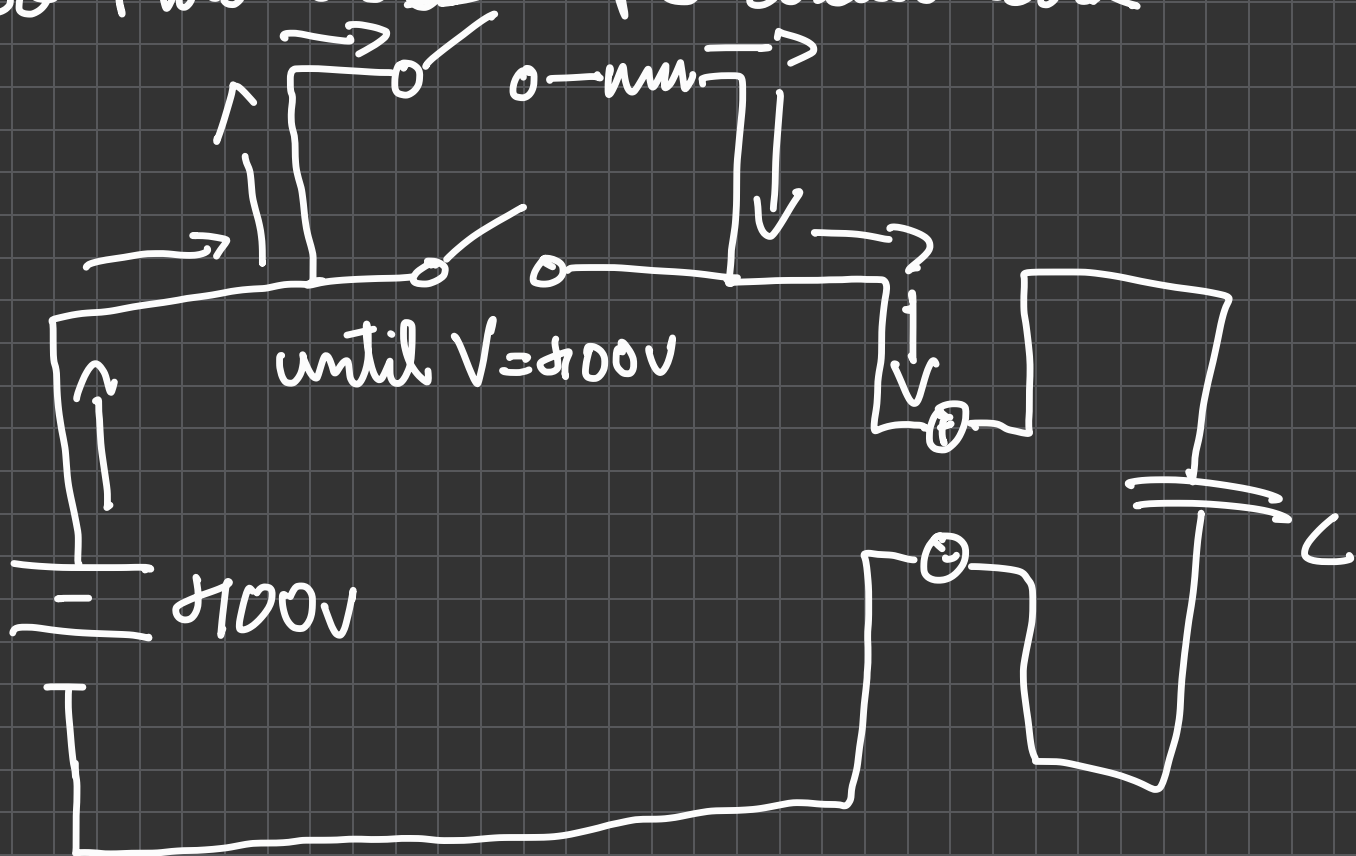
Capacitance ← voltage

as voltage ↑ capacitance ↓



W/o a PC circuit the 100V would rush to the capacitor and the switch would weld shut and damage capacitor

so How does a PC circuit work



- current is limited by resistance of resistor
- when the V flowing through PC circuit starts to get closer to V_{batt} , the main relay closes

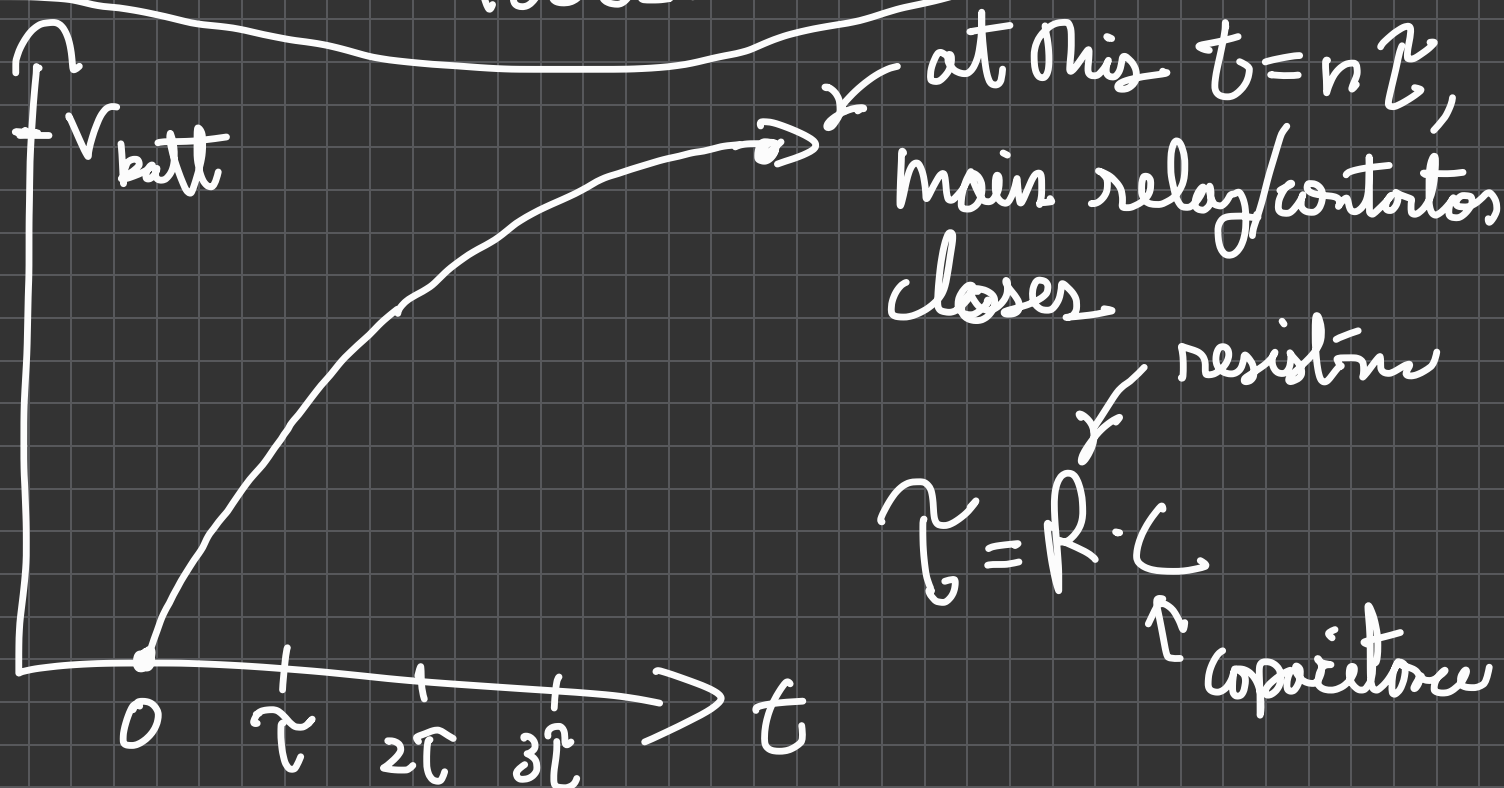
Eg.

$$V = 100V$$

more generous

$$R = 1000\Omega$$

$$I = \frac{100V}{1000\Omega} = 100mA$$



τ is an RC time constant

$$1\tau \approx 0.63 V_{batt}$$

$$2\tau \approx 0.87 V_{batt}$$

$$3\tau \approx 0.95 V_{batt}$$

Eg. $V = 2100V$
 $R = 1000\Omega$
 $C = 400\mu F$

$$\tau = 1000 \cdot 400\mu F = 400ms$$

95% of V_{batt} is enough to close main relay (3 τ)

Why not choose a really small resistor val?

$$P = \frac{V^2}{R} = \frac{(2100V)^2}{1000\Omega} = \boxed{160W} \leftarrow \text{very high power dissipation}$$

↑
power
dissipation
of resistor

best practice: use pre-charge
rated resistor, or
high pulse rated resistor
or chassis mount resistor

the power dissipation is maximized at $t=0$, and then it starts decaying

Note: want to enable a fault checking system in BMS