目錄

EasyEDA 與電子零件認識

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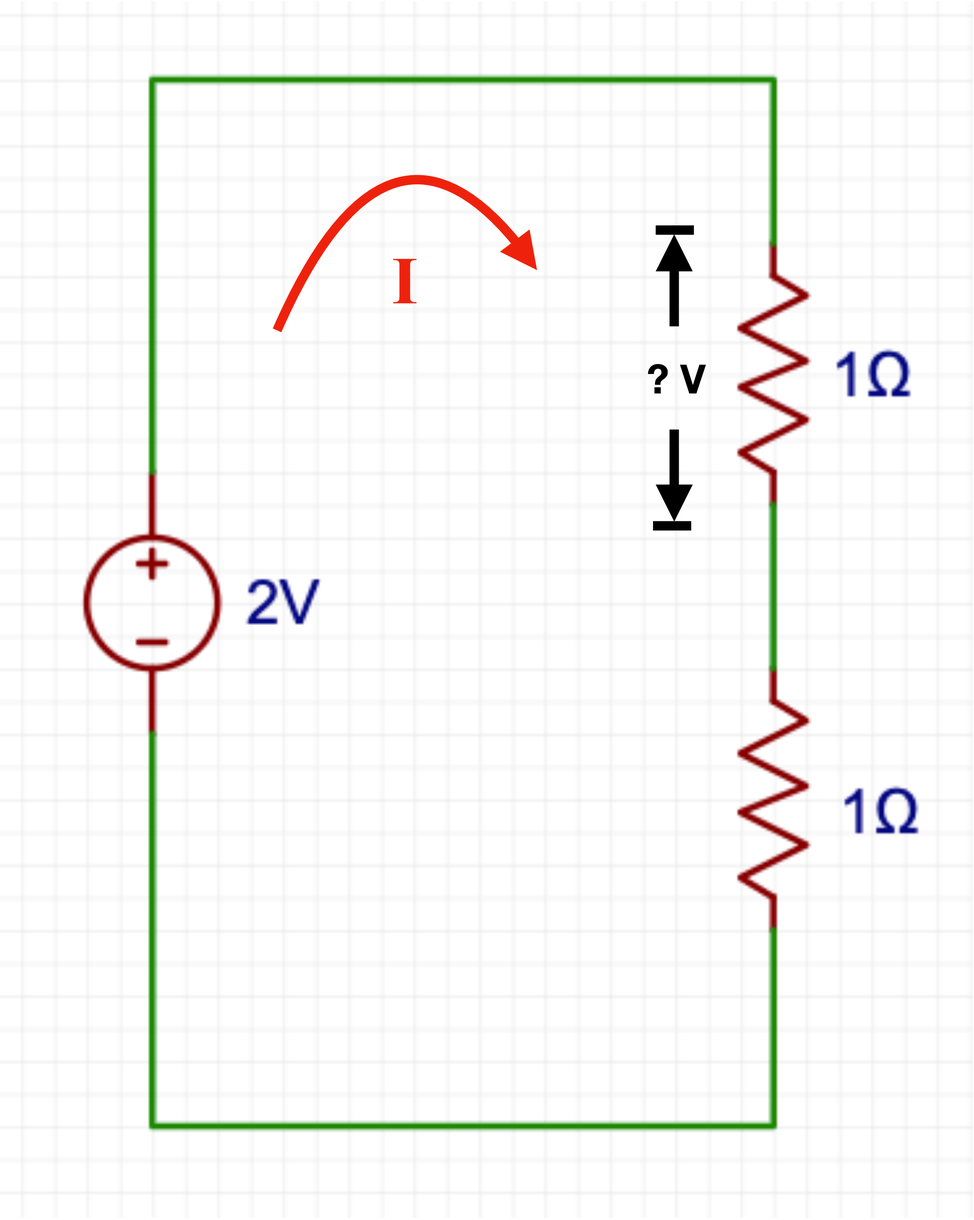

歐姆定理 $V = I \times R$

$I = 2V / 2\Omega \quad = 1A$

$? V = I \times R = 1A \times 1\Omega = 1V$

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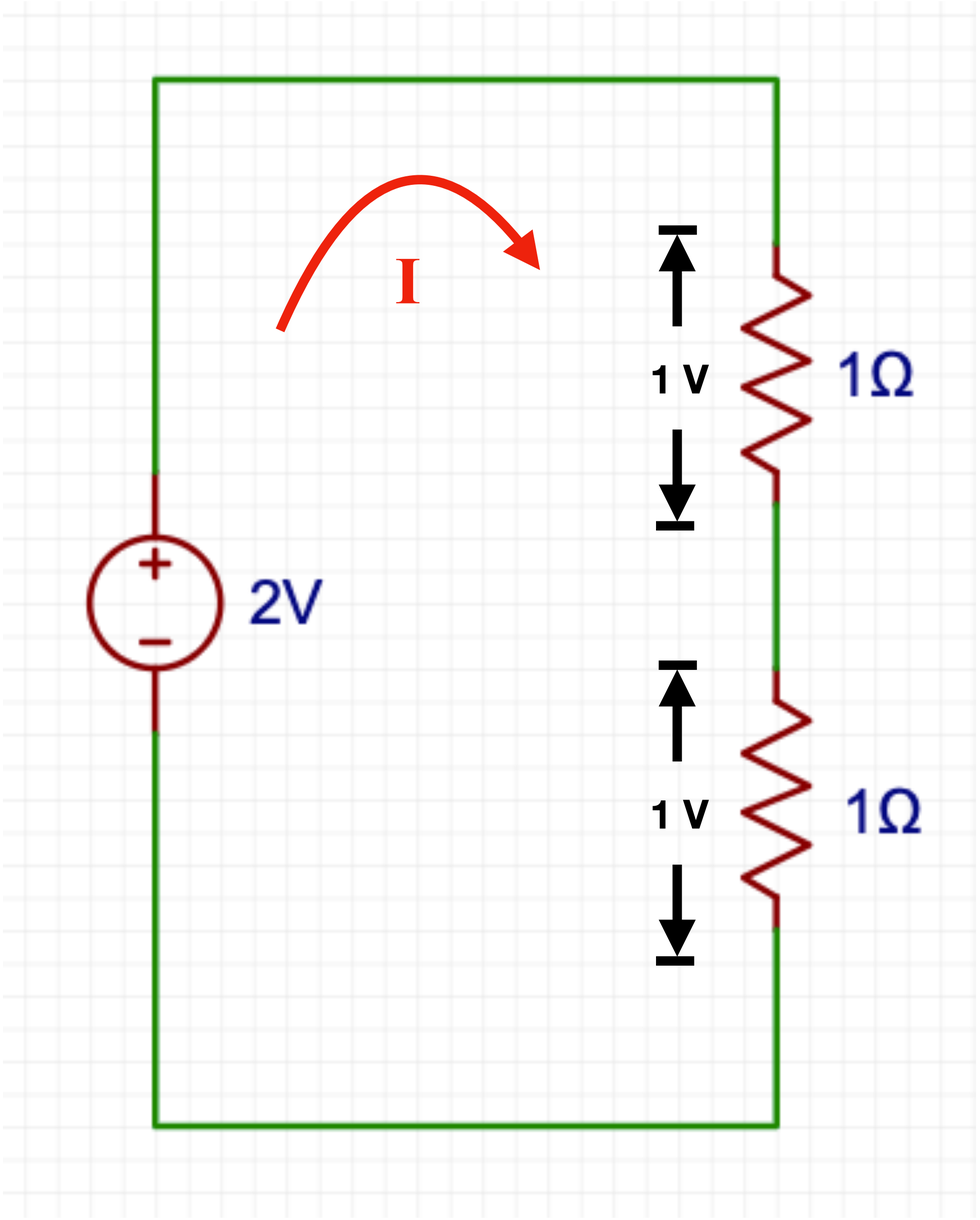

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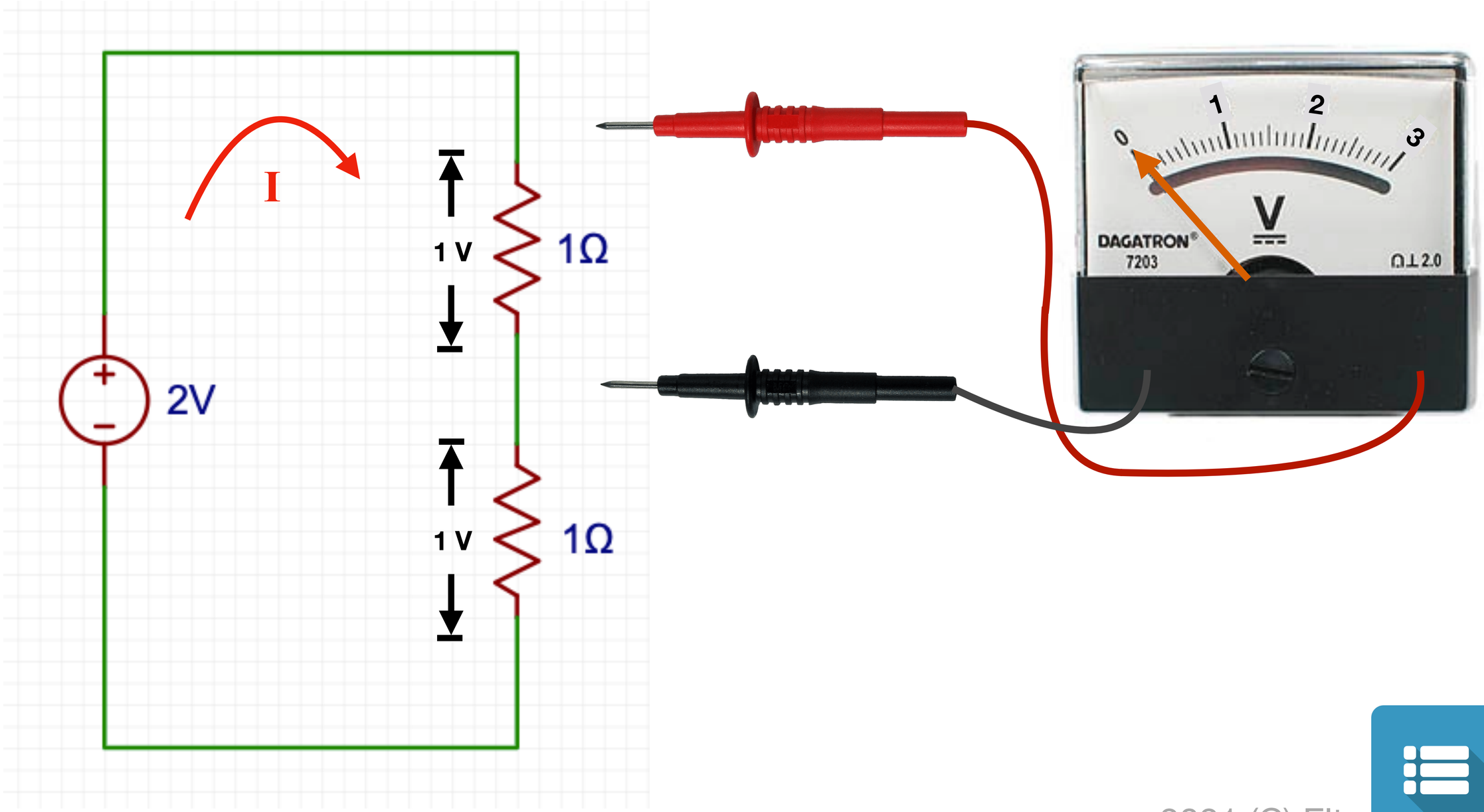

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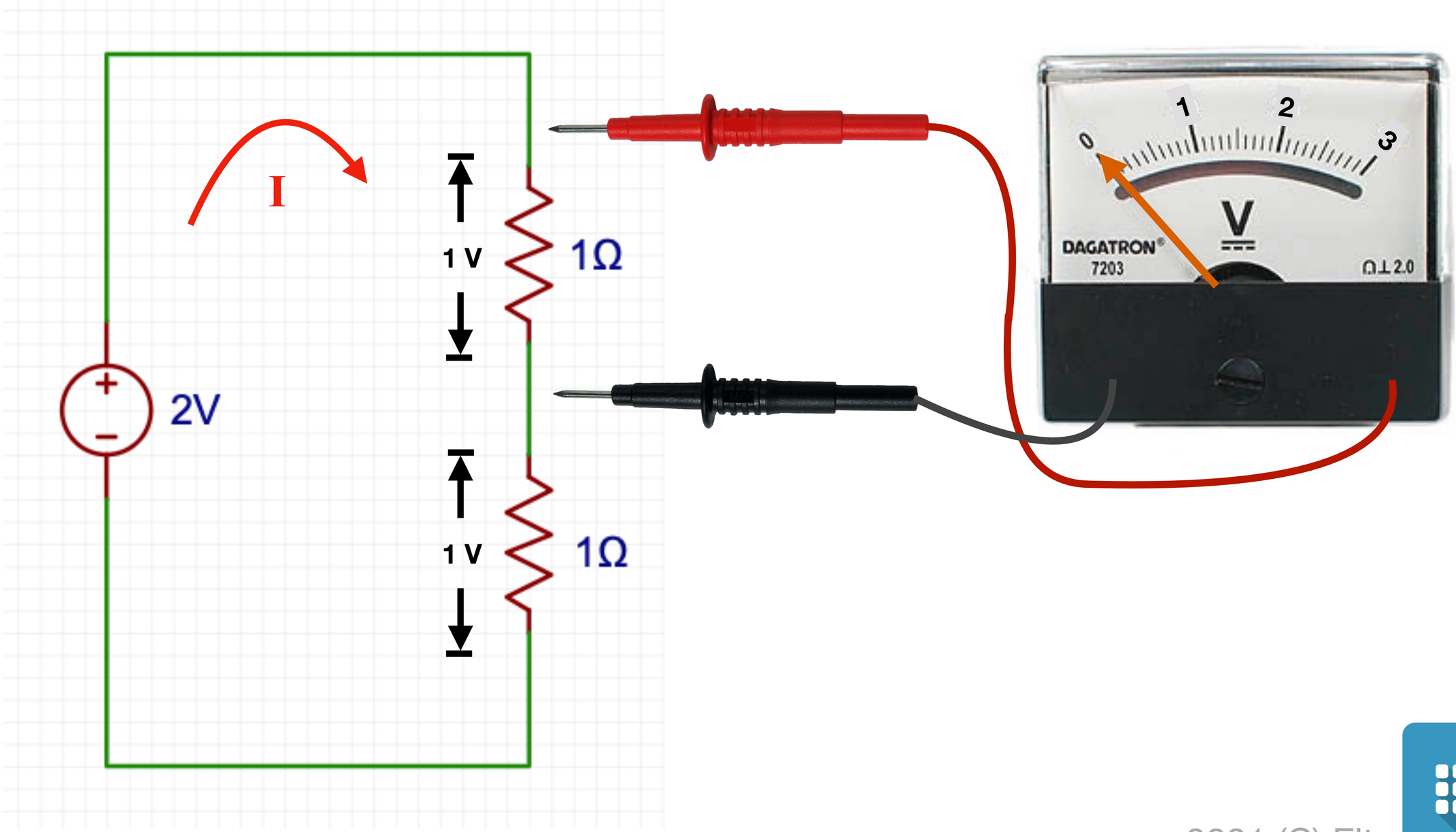

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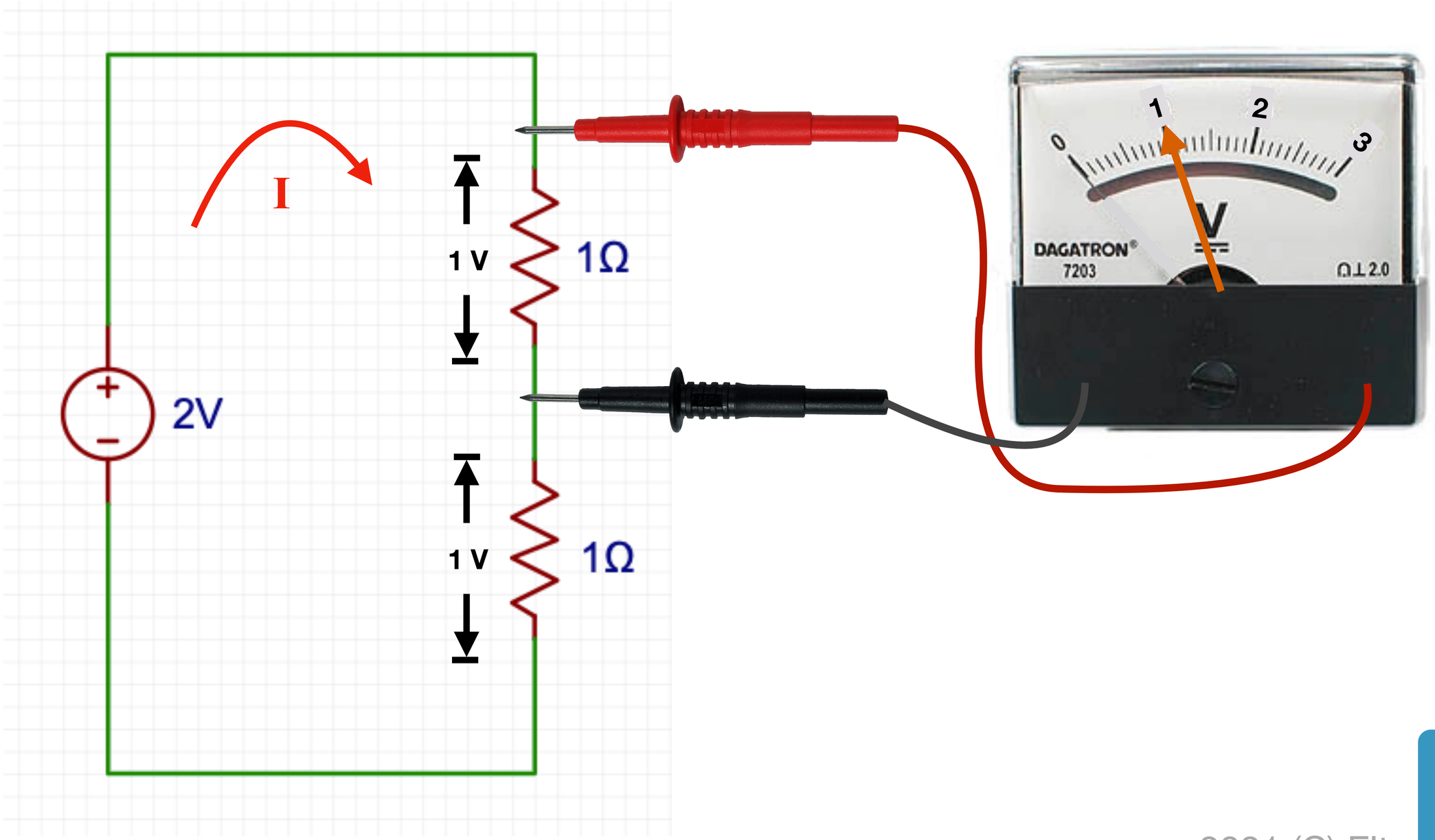

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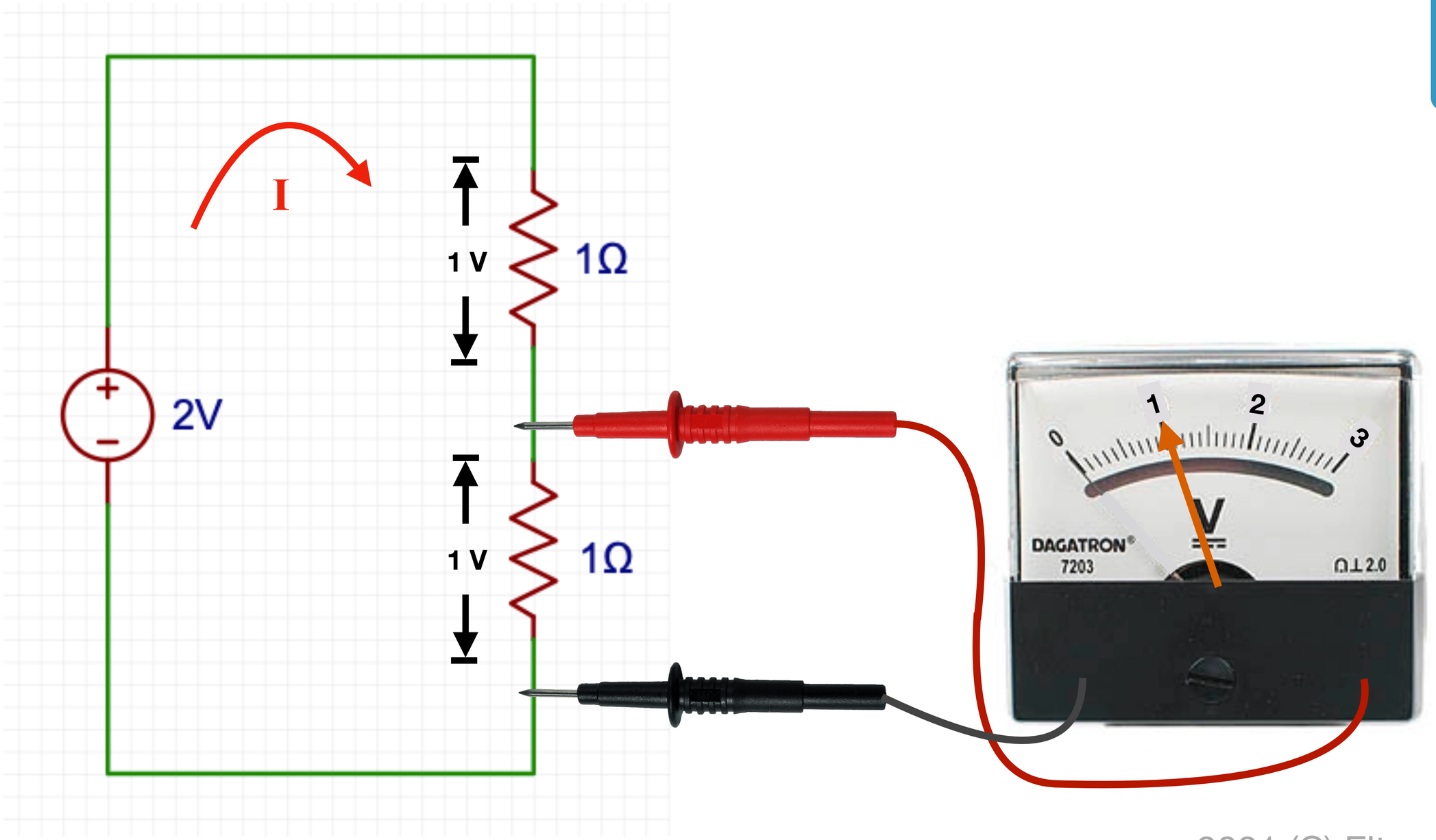

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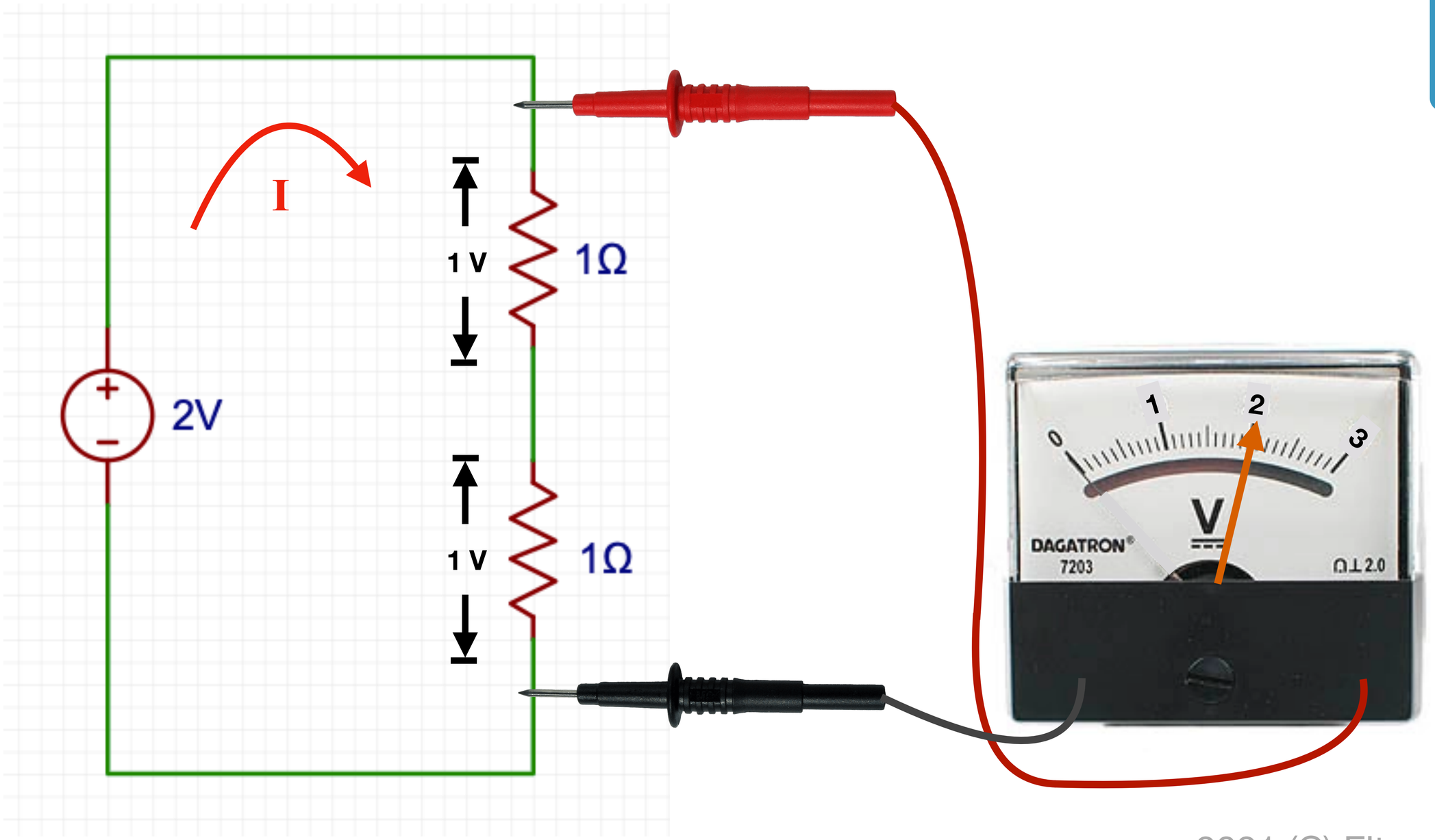

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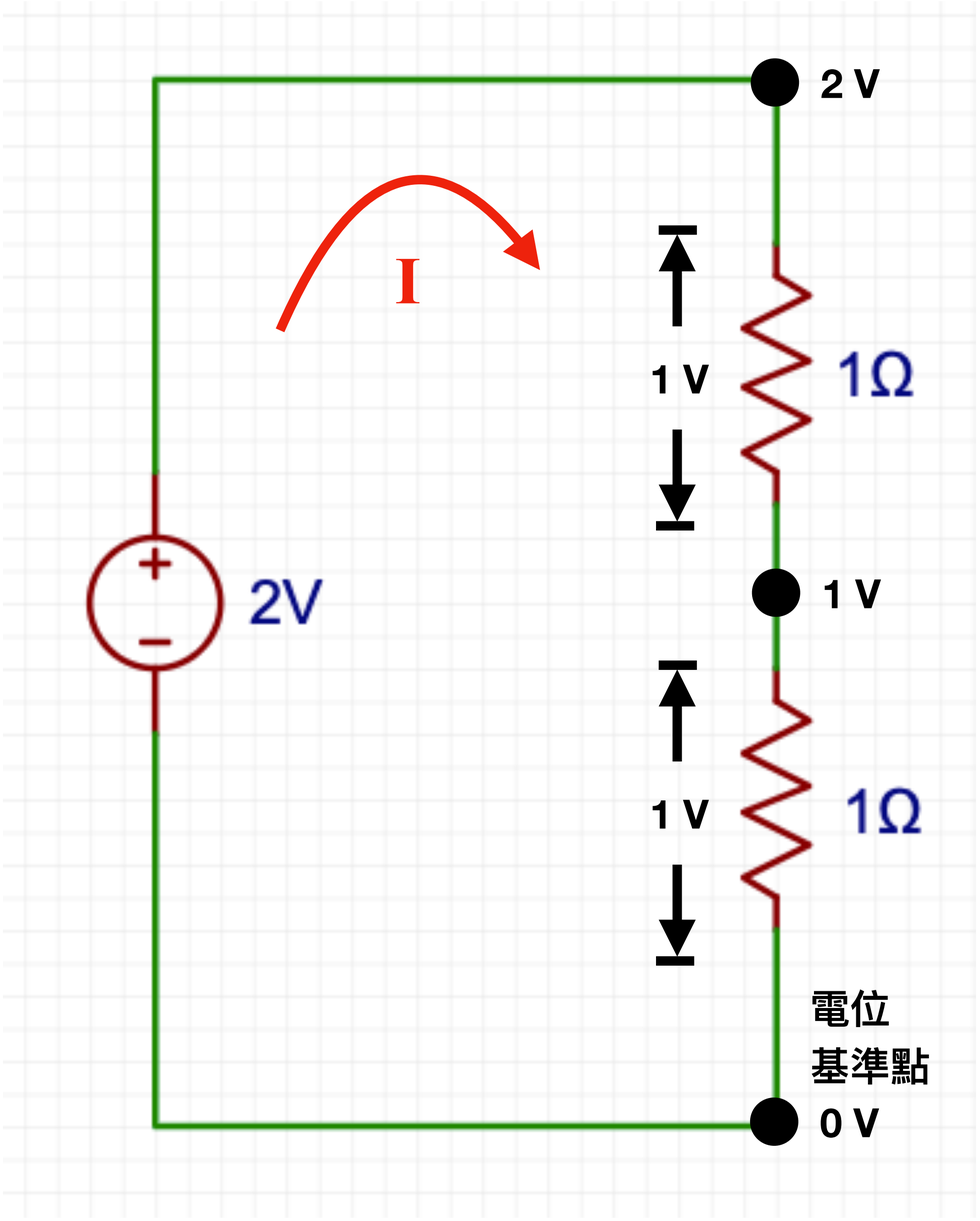

電路中兩點之間的電壓差 →

電路中各點「電位」

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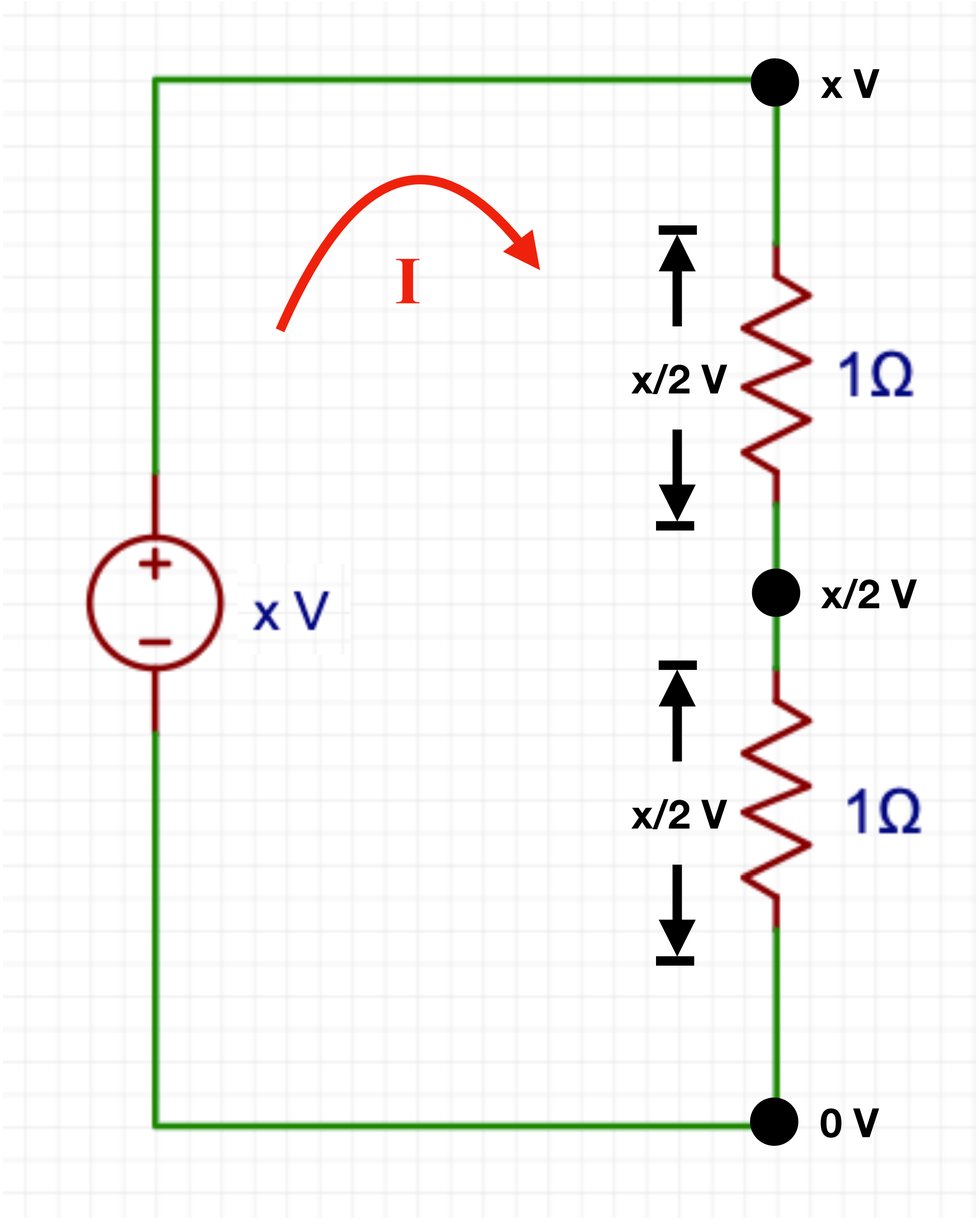

歐姆定理 $V = I \times R$

$I = xV / 2\Omega \quad = x/2\ A$

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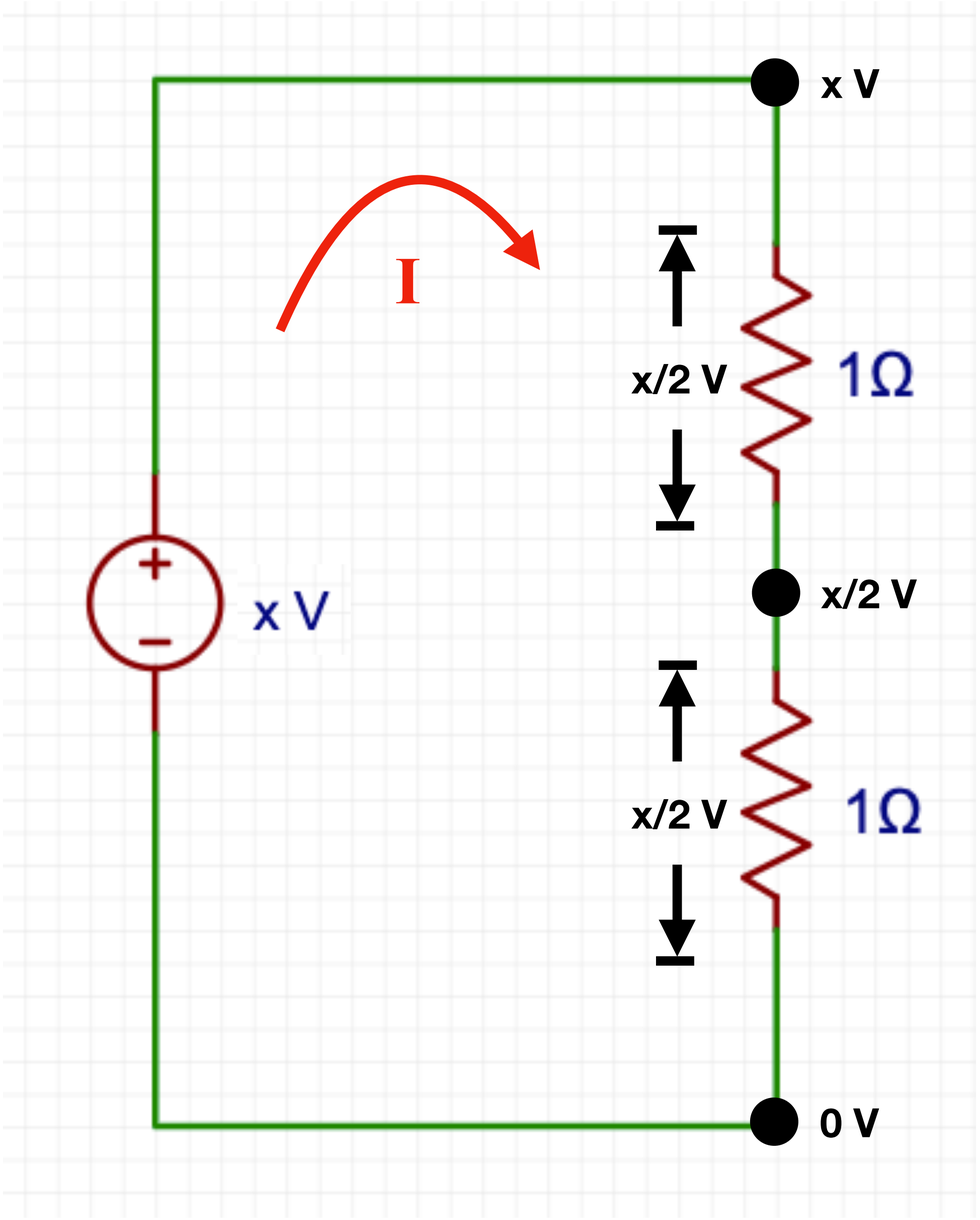

如果 x 是負的

I = x/2 A 也是負的

電路中的電流實際流動方向就

和圖示箭頭方向相反

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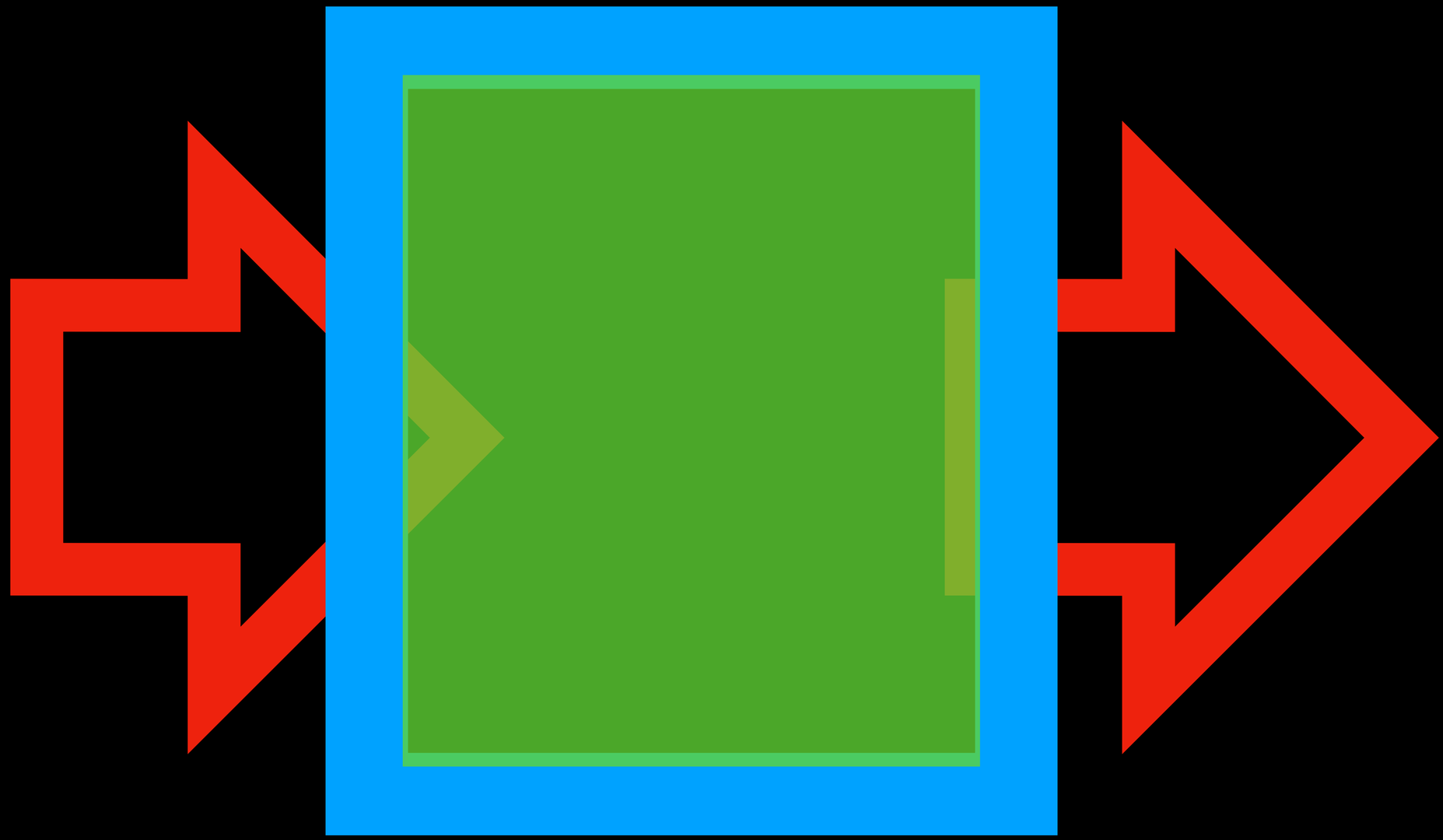

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- 週期波 (例如單音) 可以經過傅立葉轉換表示為特定不同震幅/頻率的正弦 (sine) 波與餘弦 (cosine) 波的組合。

- 非週期波 (例如講話、傳訊電波) 的極短瞬間可以視為某個週期波的一部分。

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如何「畫」聲音

- 改變電磁鐵的磁力、國九理化【觀念】電磁鐵的應用
- 感應電流
- How sound wave is converted into electrical signal
- Sound, Vibration, Wave Characteristics (mechanically)
- Frequency, Wave Shape and Pitch (3:50)

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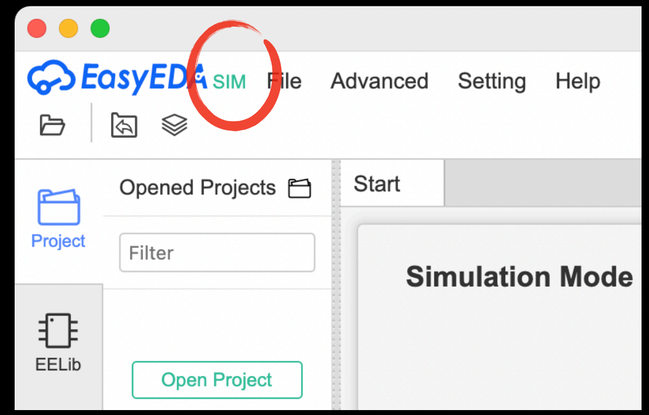
Unit 1: EasyEDA 操作要點

- 右上角 Login 用 Google 帳號登入將用雲端儲存空間操作
- 左上角 (藍色 EasyEDA logo 右邊的淡藍色) 點選 SIM 模式 (不要 STD 模式)，彈出視窗按 Confirm



操作：複習中 2 電阻的直流電路與示波器連接、使用、觀察

- 零件在最左欄點選 EELib。
  點選零件時上面命令列 (或 Format) 改變放置方向，右欄改變設定 (也可直接更改元件在設計同中的標示)
- 右鍵結束拉線
- 示波器 (Oscilloscope) 拉線到電路節點 (紅點) 必須在元件端點或綠線
  (邏輯分析儀 Logic Analyzer 同)

時間軸，電壓的變化：預測與觀察

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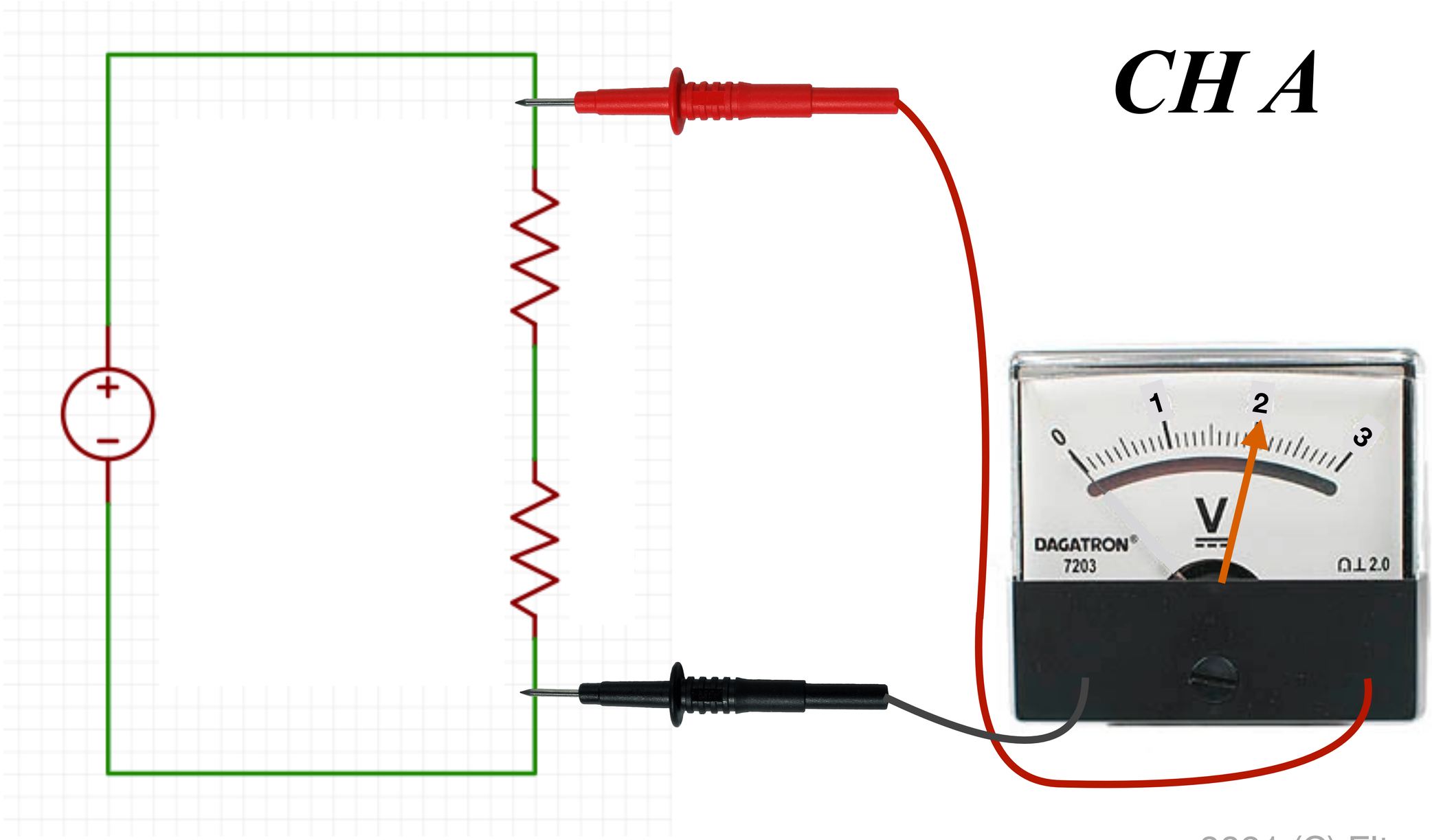
連接電路用示波器
頻道 (Channel) *A* 和 *B*
顯示電路中以下兩點的波形變化

CH A



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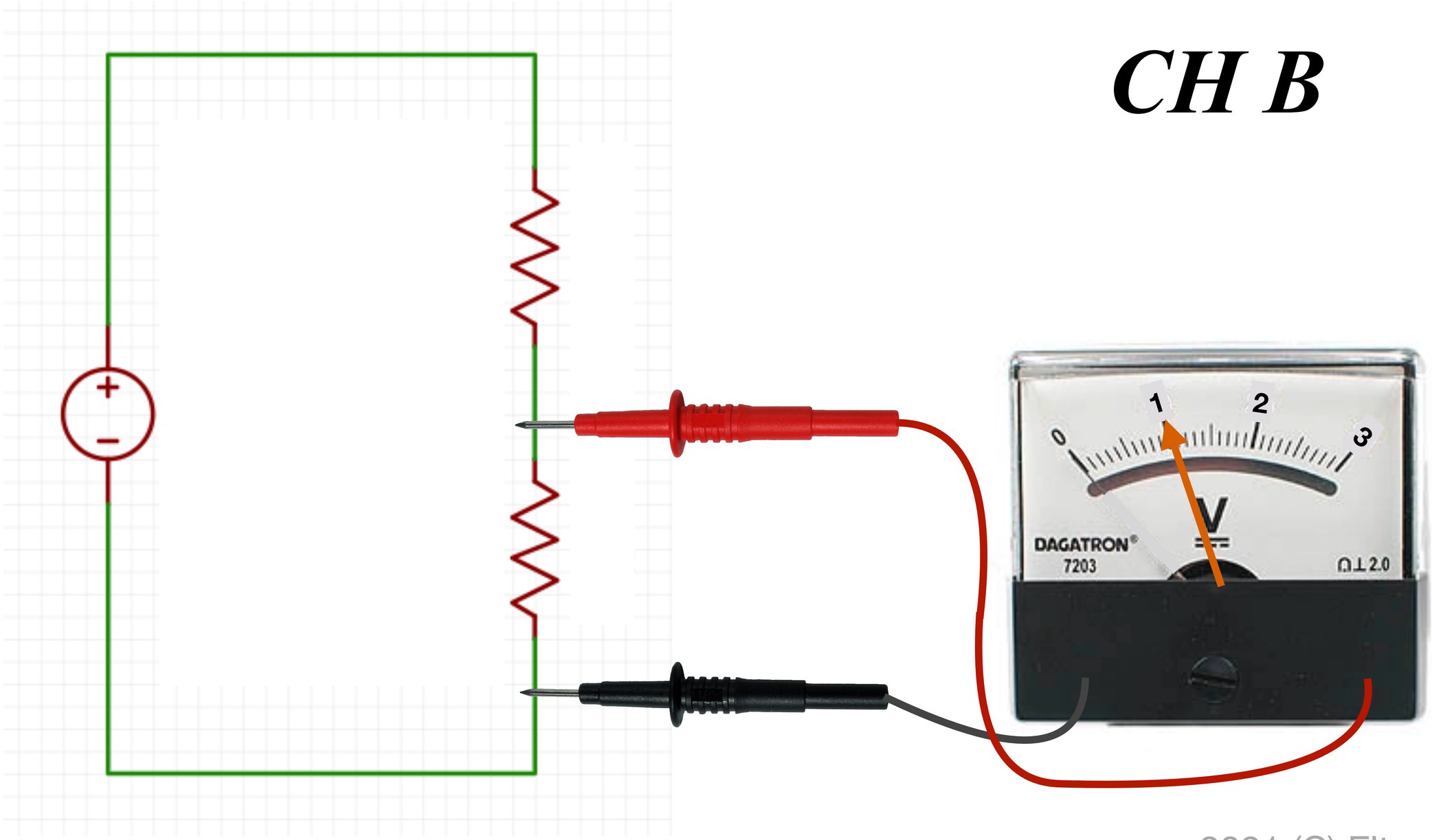
CH B



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模擬 Simulation

- 請拉一個 

到設計圖中任意一處，示波器模擬才能正常顯示。
- 模擬之前要先 File → Save
- *.tran* 後面的數字對應的是模擬呈現的 10 個格點對應的時間 (單位：秒)

操作：信號產生器 Signal Generator 對接示波器。習題：如何讓波形不那麼密集？

- 使用完登出
- KiCad (讀做 “開 Cad”) 為同類自由軟體但功能更為完整，我們電腦亦有安裝，歡迎同學自主學習探索。作業練習繳交使用也可使用 KiCad。

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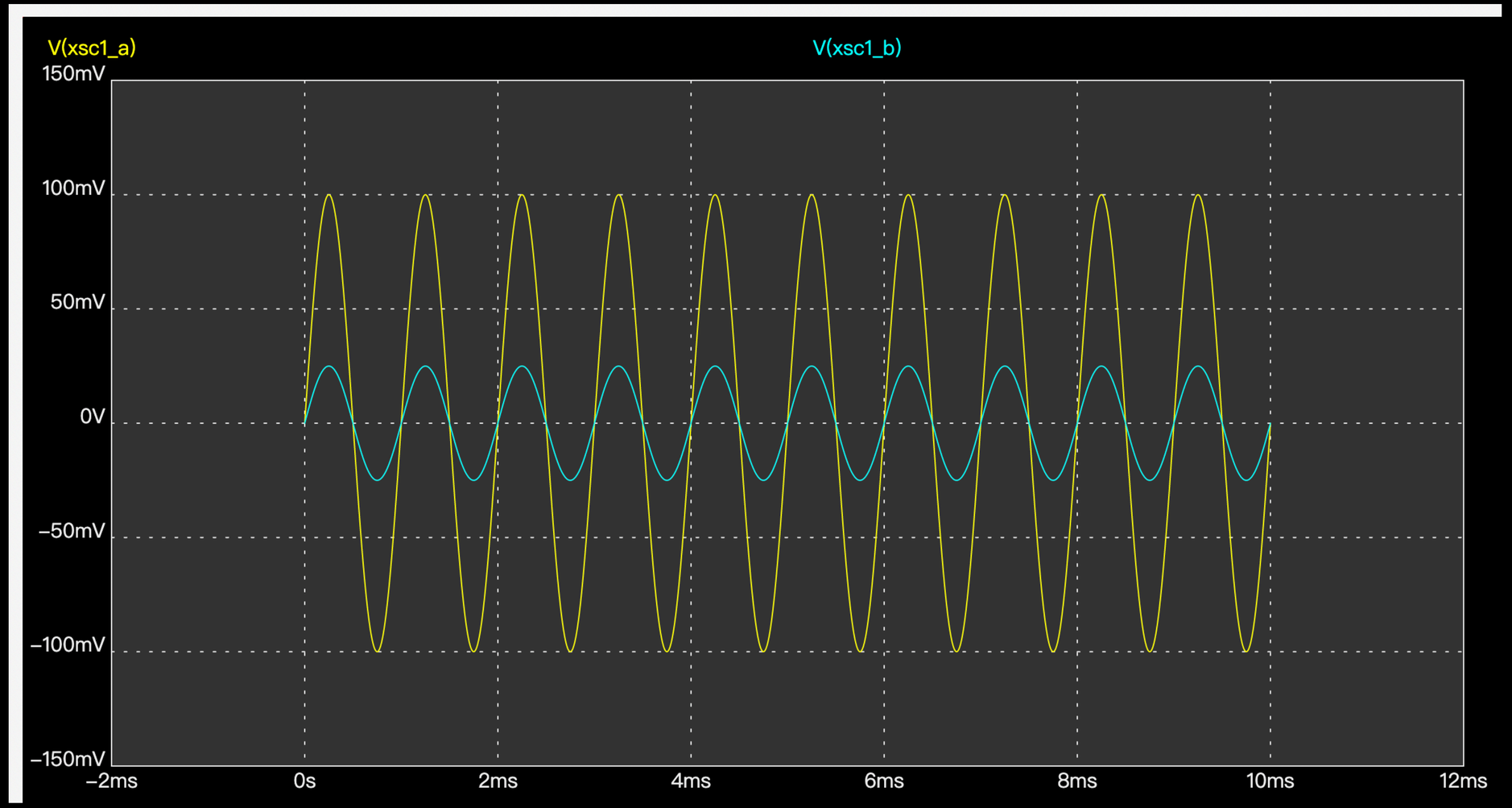
作業：EasyEDA 操作

請交可以產生以下波形的電路截圖 (數字要一樣)



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電容

- Capacitors and Capacitance: Capacitor physics and circuit operation
- 高中基本電學_電容與靜電_電容器的構造與原理_張書誠
- What is capacitance? The 3 Effects of Capacitance - The 2-Minute Guru
- 和電池充電一樣，前面充得快，越到後面越接近飽和就充得越來越慢

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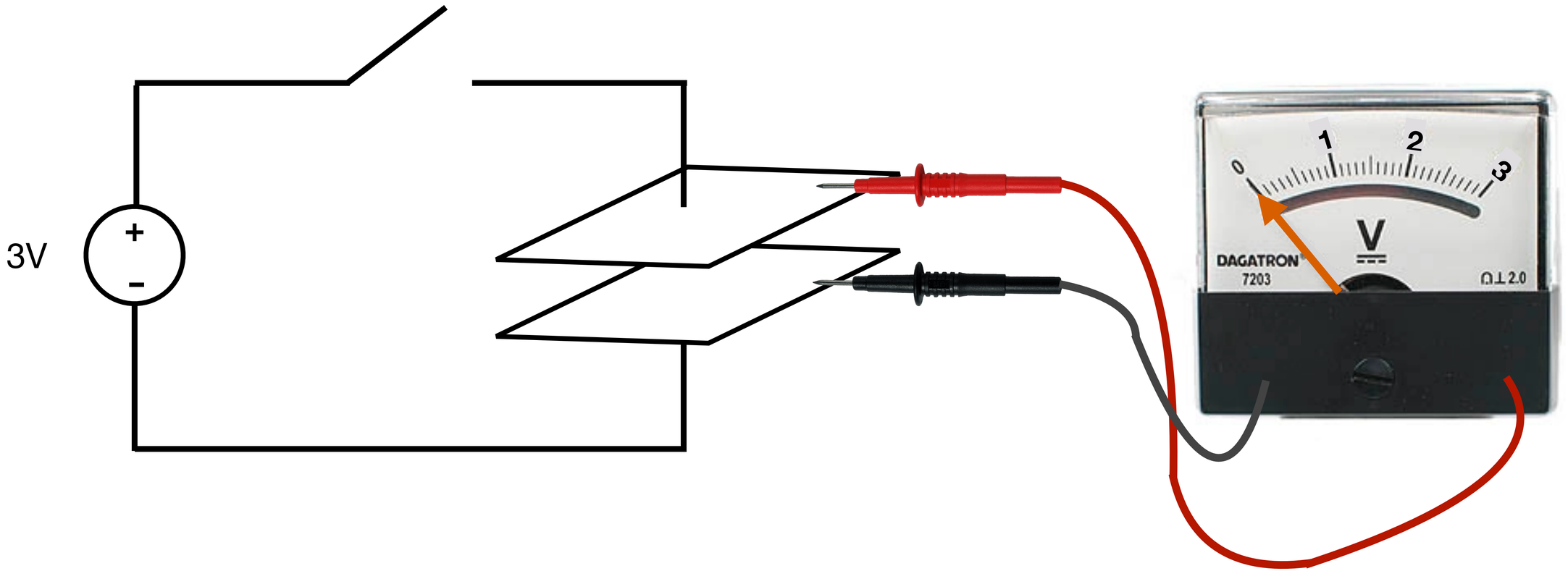

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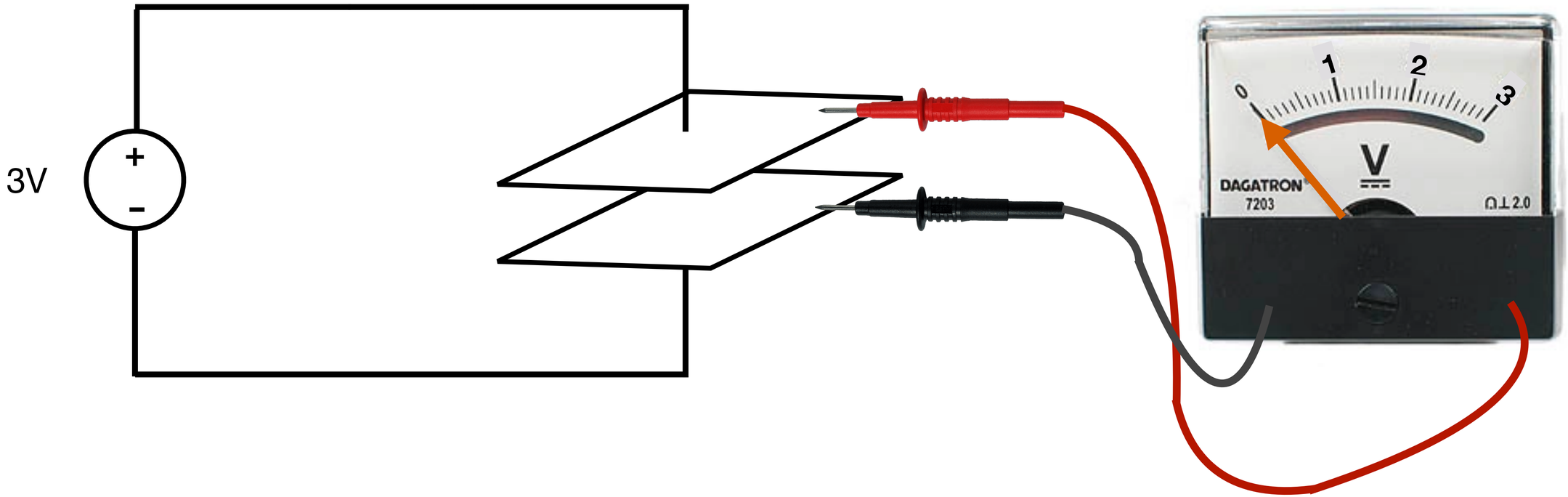

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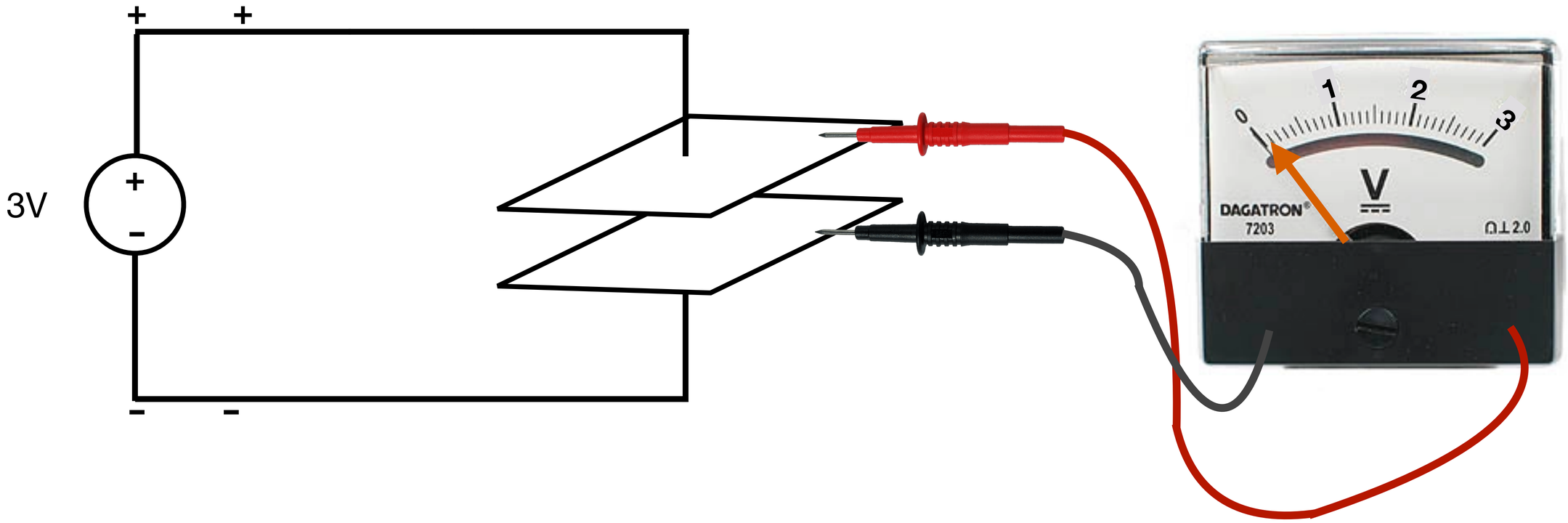

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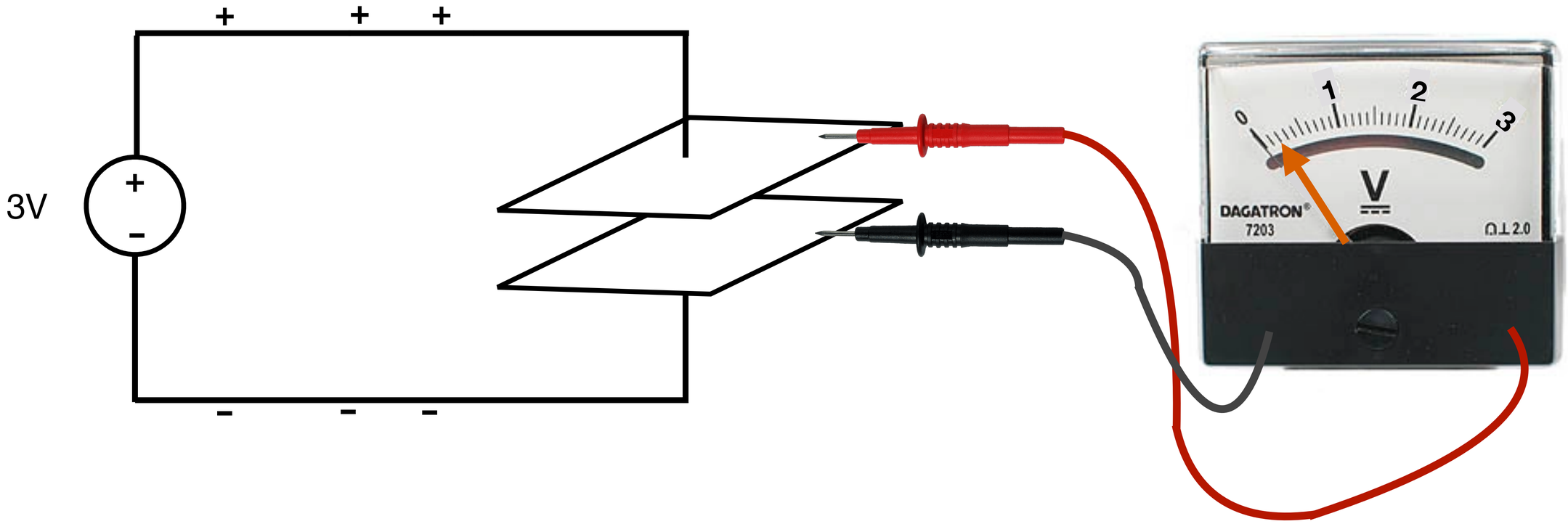

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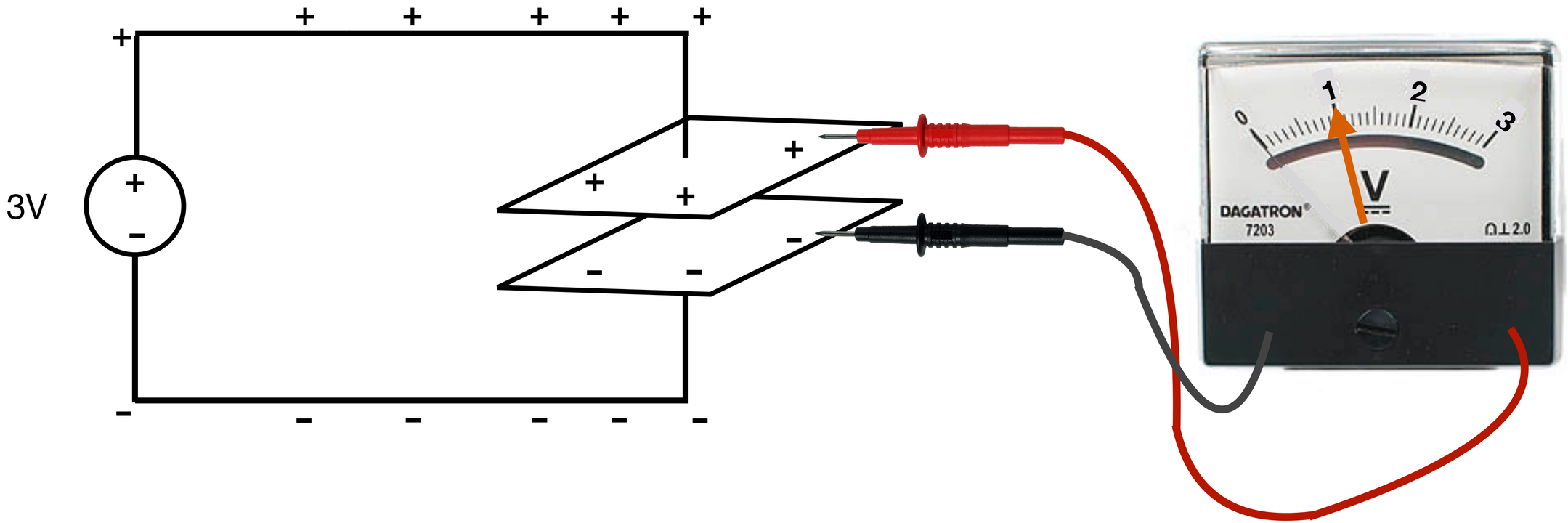

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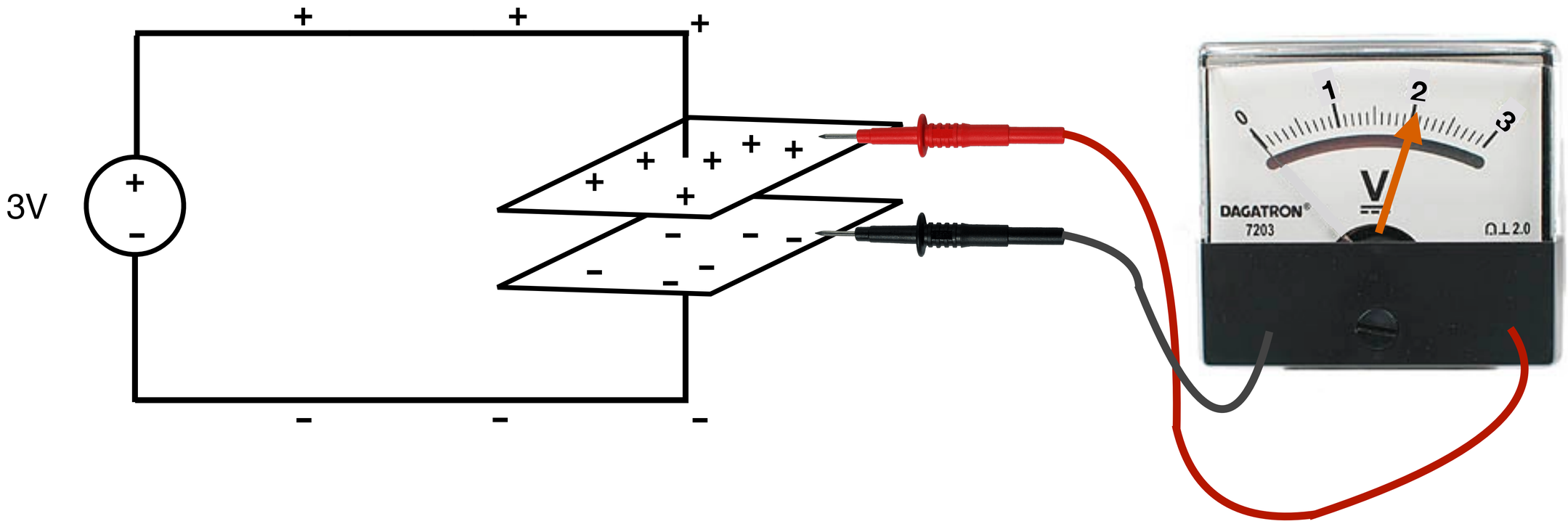

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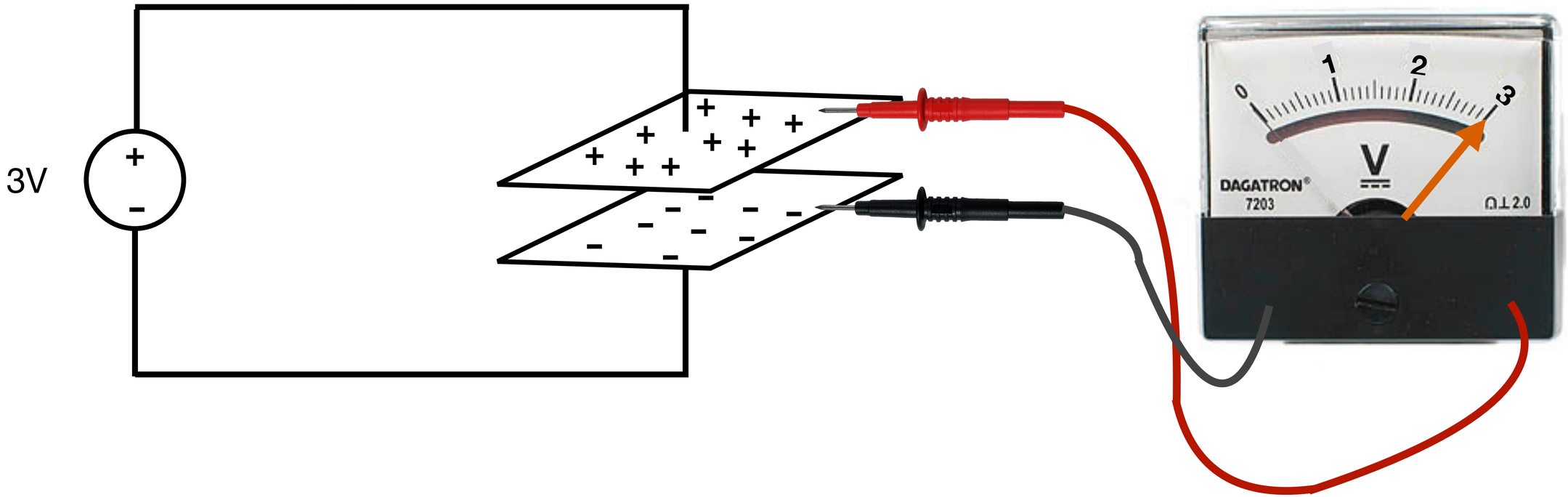

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作業

產生以下兩波形圖的電路截圖 (2 張圖，波形對即可，數字可以不一樣)

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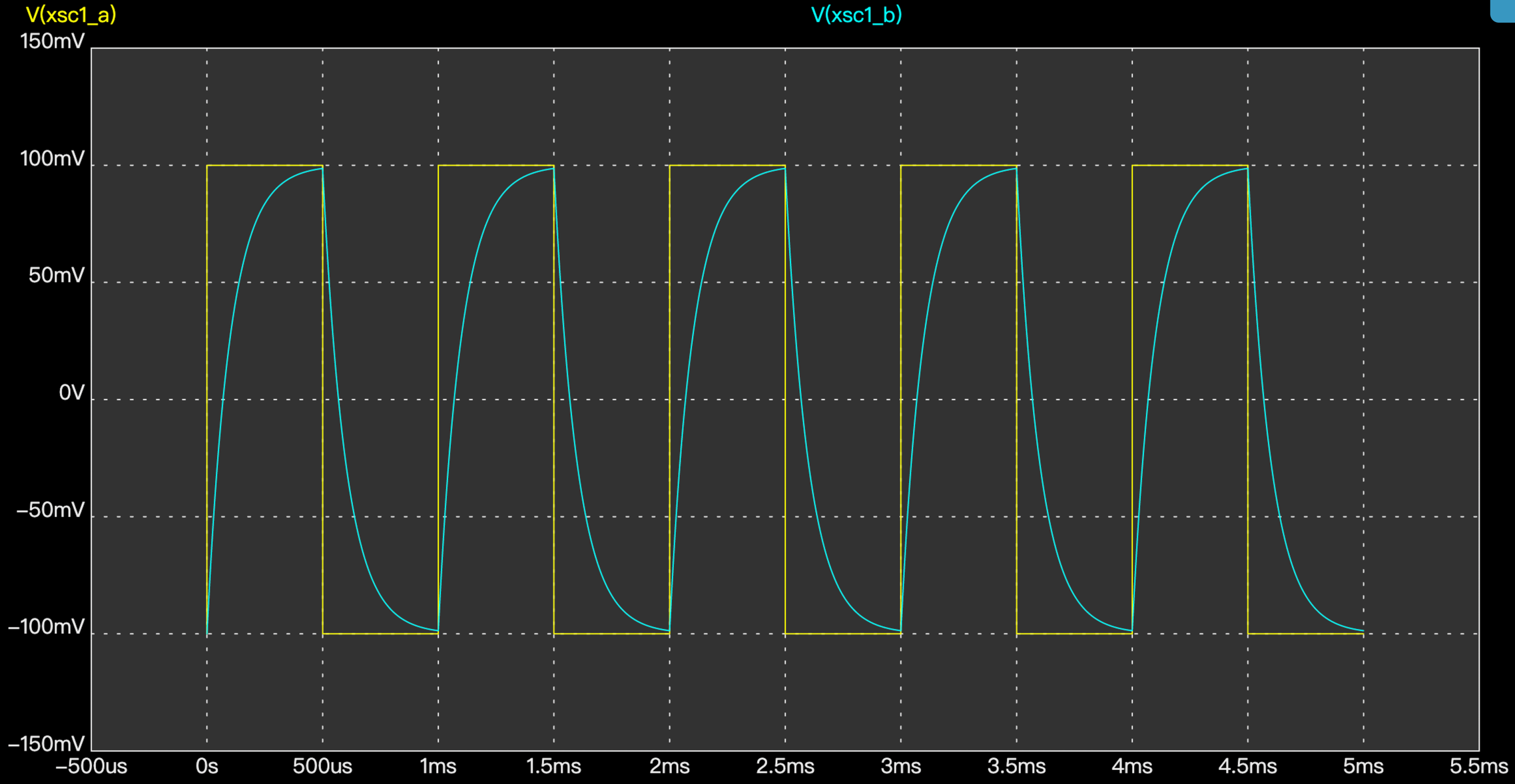

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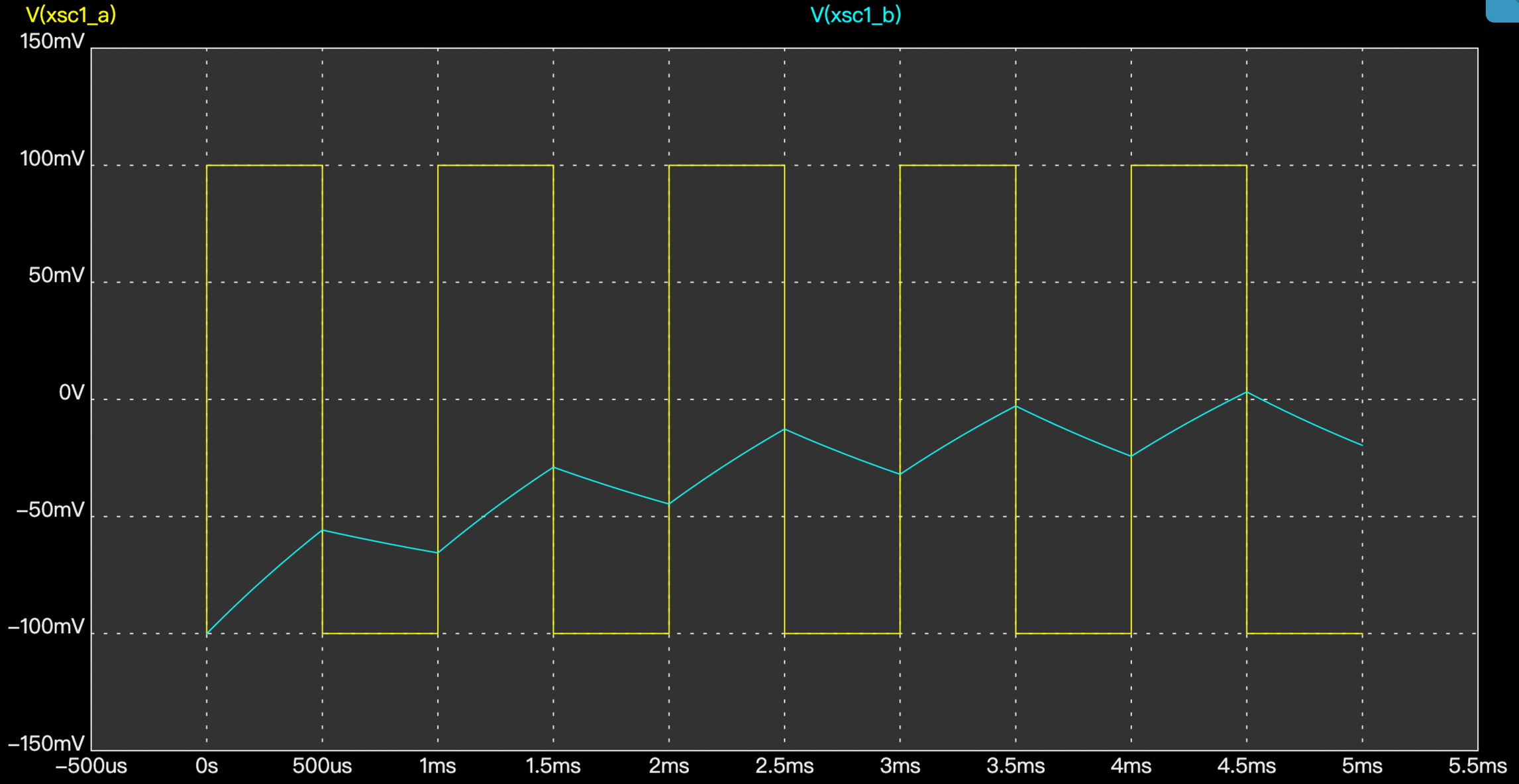

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二極體

- Characteristics of a P N Diode & Breakdown Mechanisms
- Zener diode & Zener breakdown

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電晶體

- Transistors, How do they work ?
- OpAmps Tutorial - What is an Operational Amplifier?

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電感

- Inductors and Inductance
- Resonance Circuits: LC Inductor-Capacitor Resonating Circuits
- The beauty of LC Oscillations!
- How does an Electric Motor work? (DC Motor)

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