Basic Elec. Engr. Lab
ECS 204

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Practice Session for Midterm Exam

Midterm

- Work alone

- Circuit construction and measurement

- The TAs will not help you debug your circuit.
  - Debug your own circuit.

Exam Instructions (1/3)

- Four sessions
  - session a: 9:30 – 10:30 AM
  - session b: 10:40 – 11:40 AM
  - session c: 1:30 – 2:30 PM
  - session d: 2:40 – 3:40 PM
- Check your session.
- Arrive at least 10 minutes early
- **Do not enter the lab before your exam time**.
- Bench numbers for taking exam will be randomly assigned by the instructor.

Exam Instructions (2/3)

- Closed book. Closed notes.

- ***No calculator***.

- For the problems that ask for TA's signatures, lack of the signature(s) means **no credit for the whole part**.
  - Having the signatures mean that the values recorded are the same as the values measured.
  - These signatures do not guarantee that you have the correct answers.
  - You need a new TA signature if you change your answer.

- When possible, record *at least two decimal places* from the DMM. Do not write 12 mA when you see 12.00 mA on the DMM's display.

# Exam Instructions (3/3)

- **<u>Read</u> the instructions and the questions carefully**.

- Allocate your time wisely.

- Some easy questions give many points.

- Units are important.

- Do not forget to write your **first name and the <u>last three digits</u> of your ID** on each page of your examination paper, starting from page 2.

- Clean your desk/bench before you leave the exam room.

Tips

- Check the current-limit light warning on power supply
- Usually, connecting the circuit in the same way (components arranged in the same positions and orientation) that is drawn on the exam sheet will make debugging and modification easier.
- Review how to use "continuity test" on DMM
  - Useful for checking broken wires
- Battery indicator on DMM
- Look at what the signature is for.
- Actual exam is 1 hour.
  - You should be able to finish the practice problems in 45 minutes.
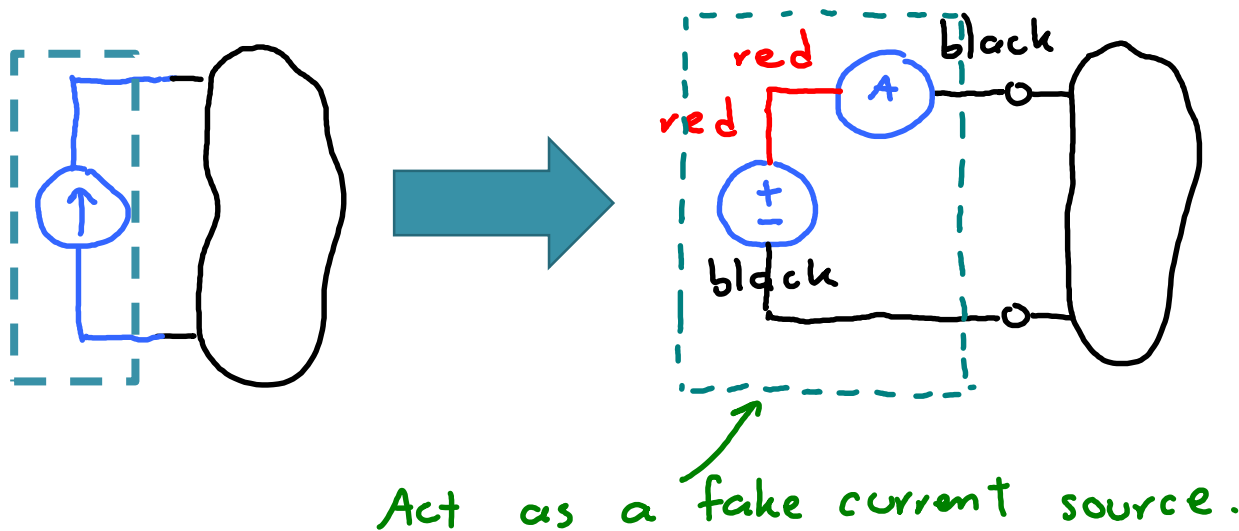
Voltage vs. Current Measurements

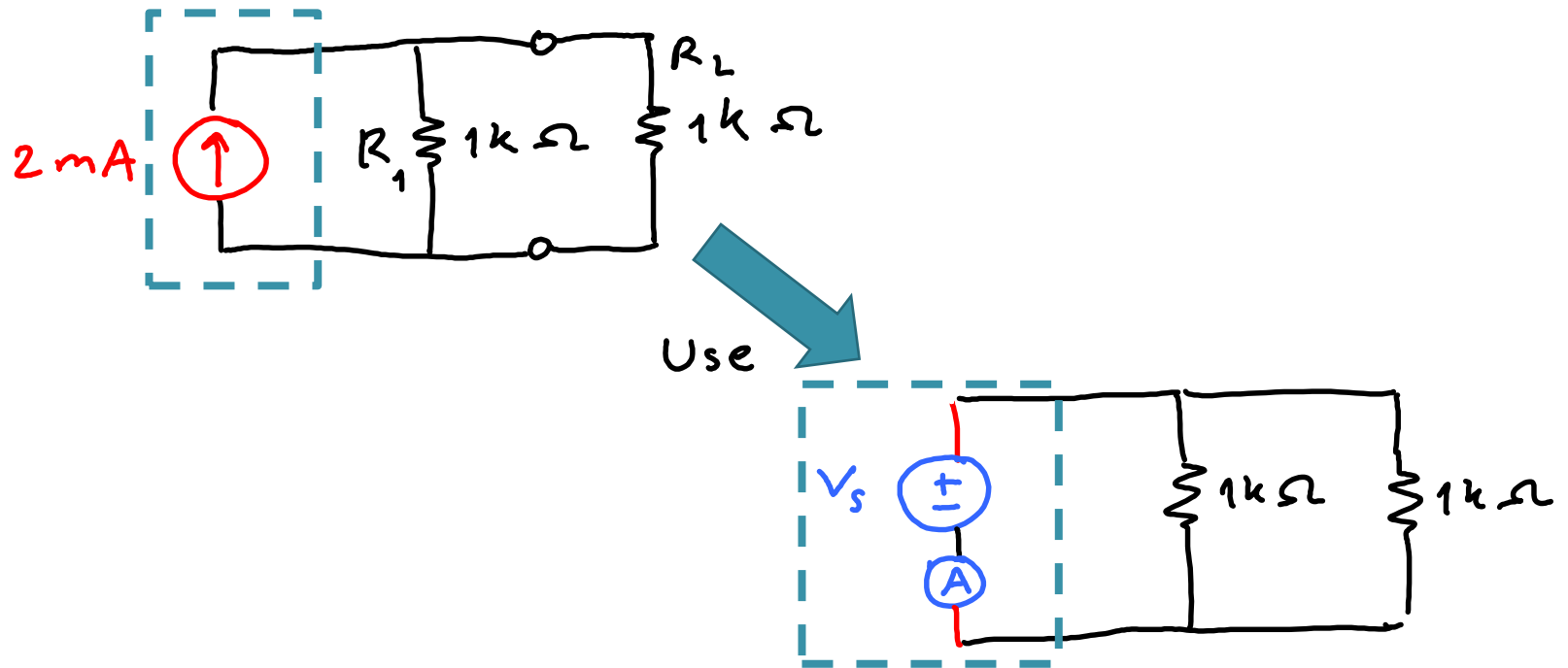Voltage Measurement

Curent Measurement

+
V
-

I

"Break the connection"

A

A
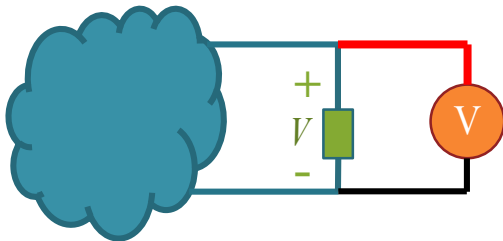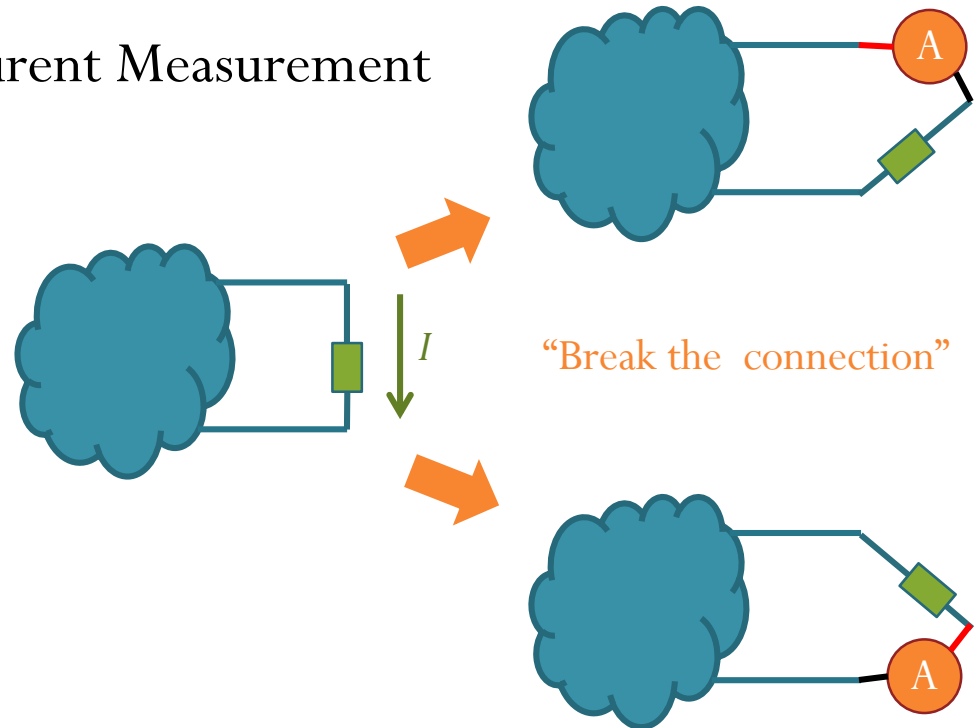
Constructing "fake" current source

Act as a fake current source.

- **Caution**: When the circuit changes, need to readjust (the voltage on the voltage source and hence the current passing though it) back to the specified value.

Example 1 (1/2)

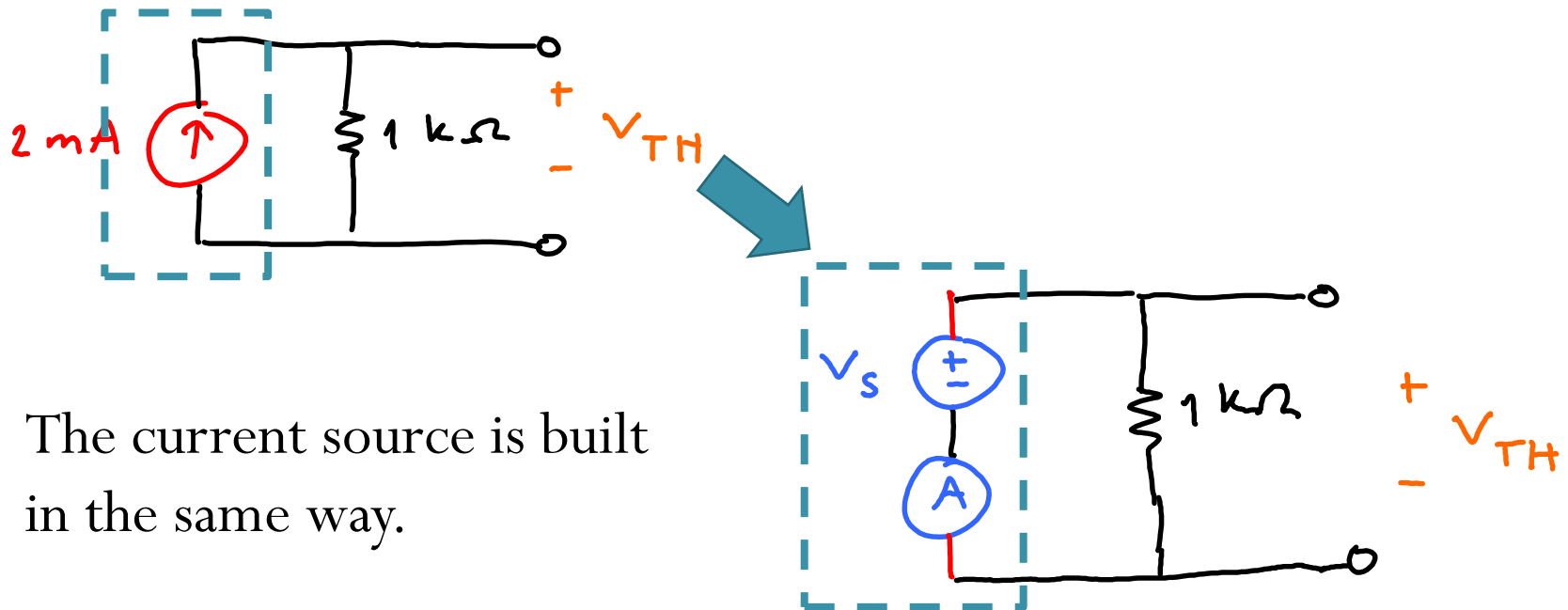Suppose you want to construct the following circuit

Adjust Vs to make 2mA shows up on the DMM.

Note that Vs = 1 V is required to make this happen.

Example 1 (2/2)

Suppose we want to find the Thevenin equivalent circuit at R_L (R_L is the load), then need to measure the open circuit voltage of

2 mA   1 kΩ   + V_{TH} −

V_S 1 kΩ   + V_{TH} −

The current source is built in the same way.

However, note that the original 1V for Vs will only give 1 mA. So, need to readjust Vs to 2V to get 2mA.
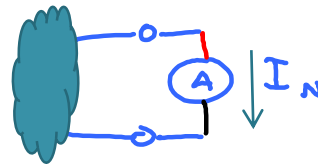
Source Deactivation

- In general, not the same as turning off the power supply.

- Definition: To deactivate a source means to set its output to be zero.

- For voltage source, having the value of $0\,V$ means "short" circuit.

- For current source, having the value of $0\,A$ means "open" circuit.

Thevenin's and Norton's Theorems
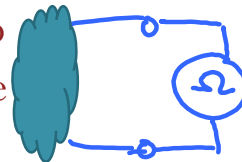
V_{TH} = open-circuit voltage
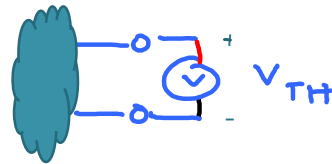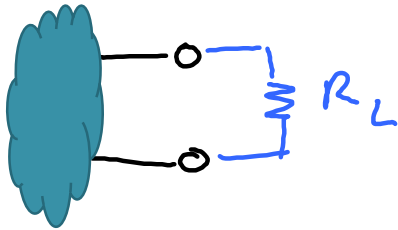
I_N = short-circuit current

$R_{TH} = R_N$ = equivalent resistance when all sources are deactivated.

For R_{TH}, need to deactivate all the sources in here

12