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Linear Circuits



An introduction to linear electric circuit elements and a study of circuits containing such devices.

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Introduction to Circuit Diagrams



- *Identify a collection of basic circuit elements*
- *Be able to identify nodes*
- *Identify short/open circuits*
- *Identify equivalent circuit diagrams*

Last Class

- ⦿ Showed how current and voltage specify electric power
- ⦿ Showed how basic physical constraints give equations to solve for unknown values

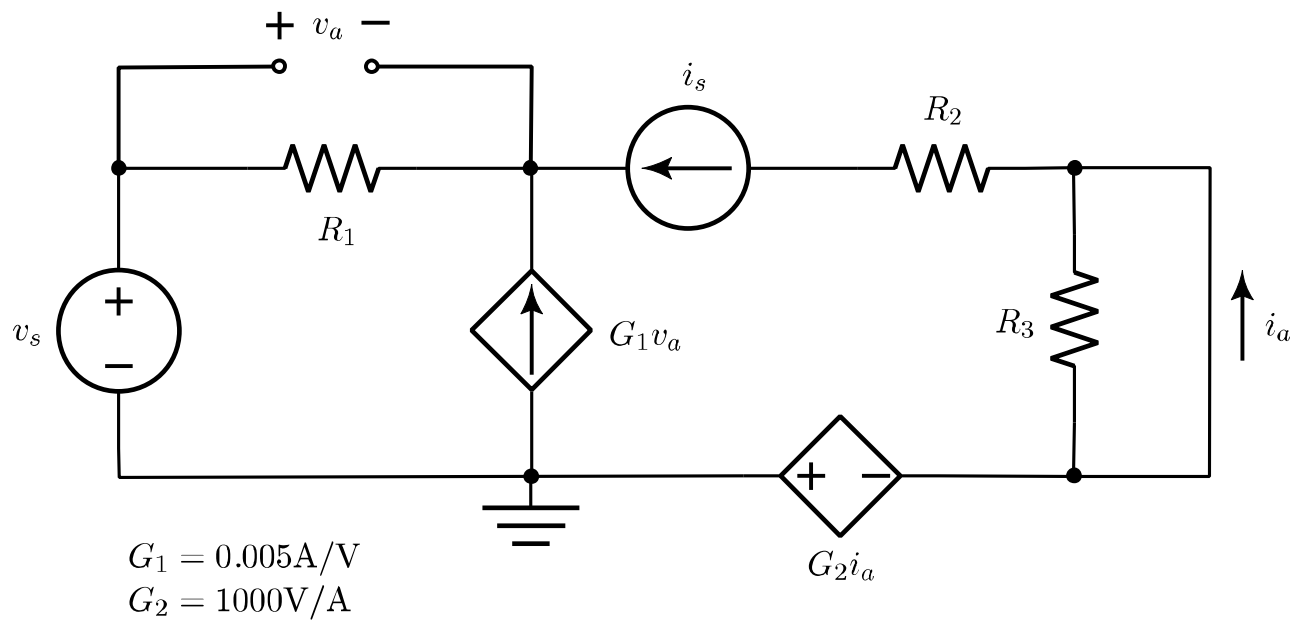
Module 1: Background

- ⦿ Charge
- ⦿ Current
- ⦿ Voltage
- ⦿ Power
- ⦿ Energy
- ⦿ Circuit Introduction

Lesson Objectives

- ◎ Identify a set of circuit elements
- ◎ Identify the nodes in a circuit diagram
- ◎ Recognize self-contradictory circuits
- ◎ Identify open/closed circuit
- ◎ Identify when two circuits are equivalent
- ◎ Modify a circuit to form an equivalent circuit

Circuit Diagrams

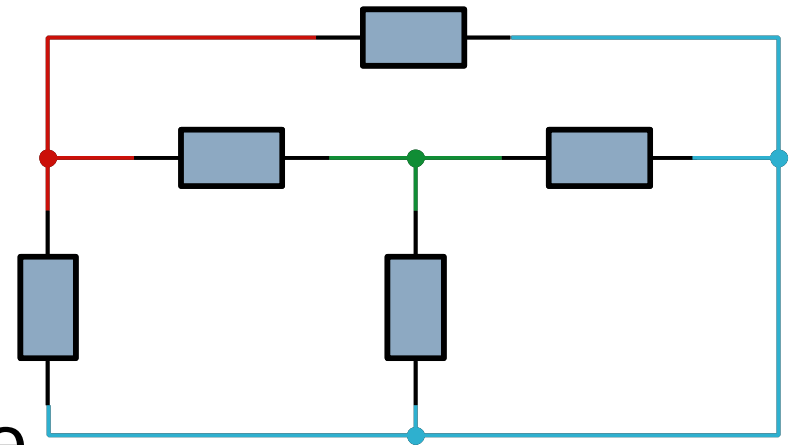


What is Circuit Analysis?

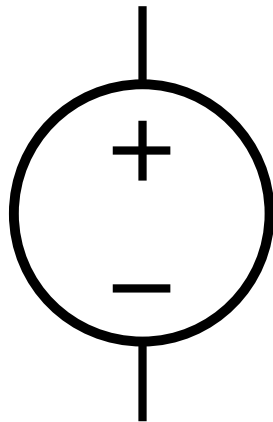
- ⦿ Devices are presented with some known parameters
- ⦿ We wish to identify the behavior of the device
- ⦿ Identify behavior based on the circuit using calculation

Wires

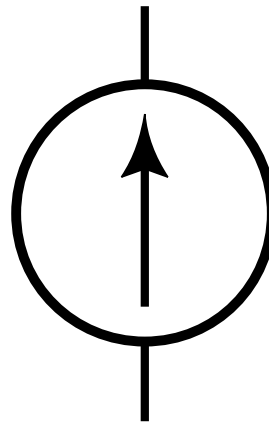
- ⦿ Zero internal resistance
- ⦿ Nodes and junctions
- ⦿ Zero voltage drop on node
- ⦿ Arbitrary current possible



Independent Sources

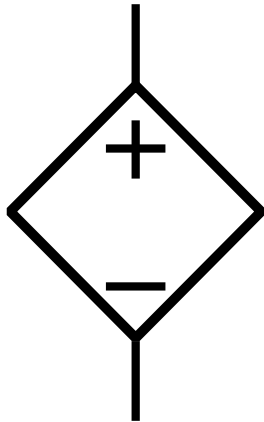


Independent Voltage
Source

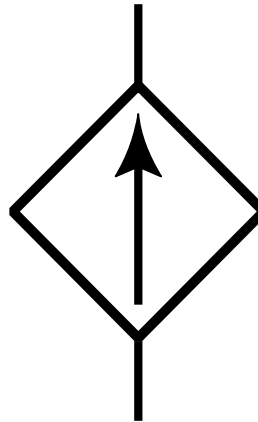


Independent Current
Source

Dependent Sources



Dependent Voltage
Source



Dependent Current
Source

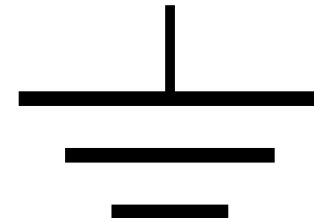
Resistors

- ⦿ Devices for resisting current
- ⦿ Drawn as zig-zag lines
- ⦿ Number of zigs and zags can vary
- ⦿ Other similar devices will be introduced as they are encountered

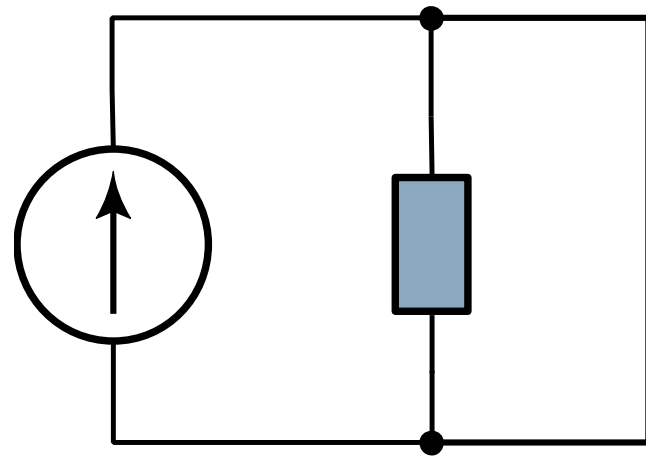
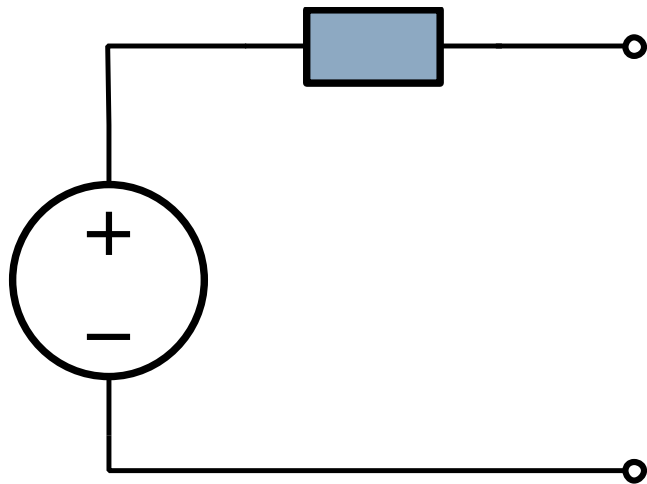


Ground

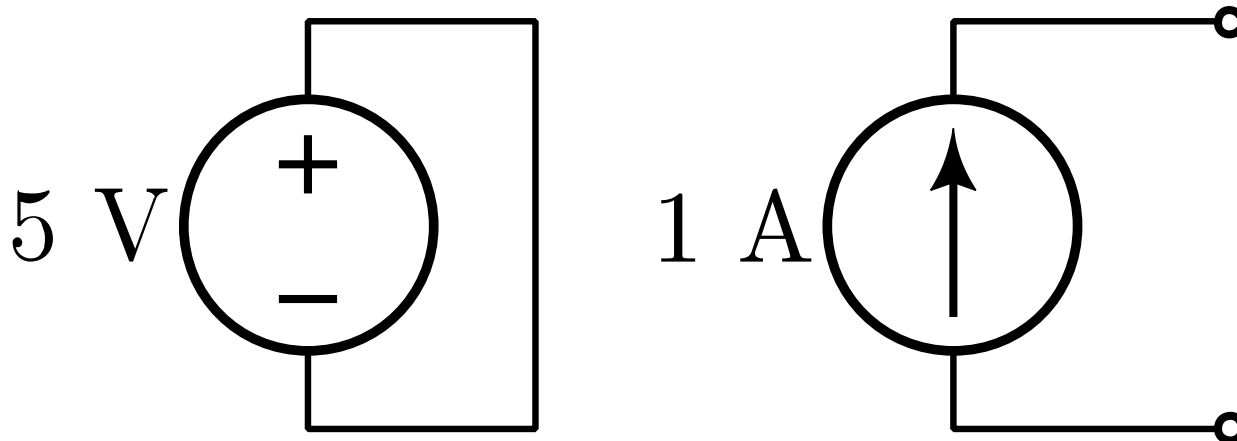
- ◎ Common Point of reference
- ◎ Path of electrons
 - Lightning rod (literal ground)
 - Prevent electrocution
 - Prevent damage to sensitive components



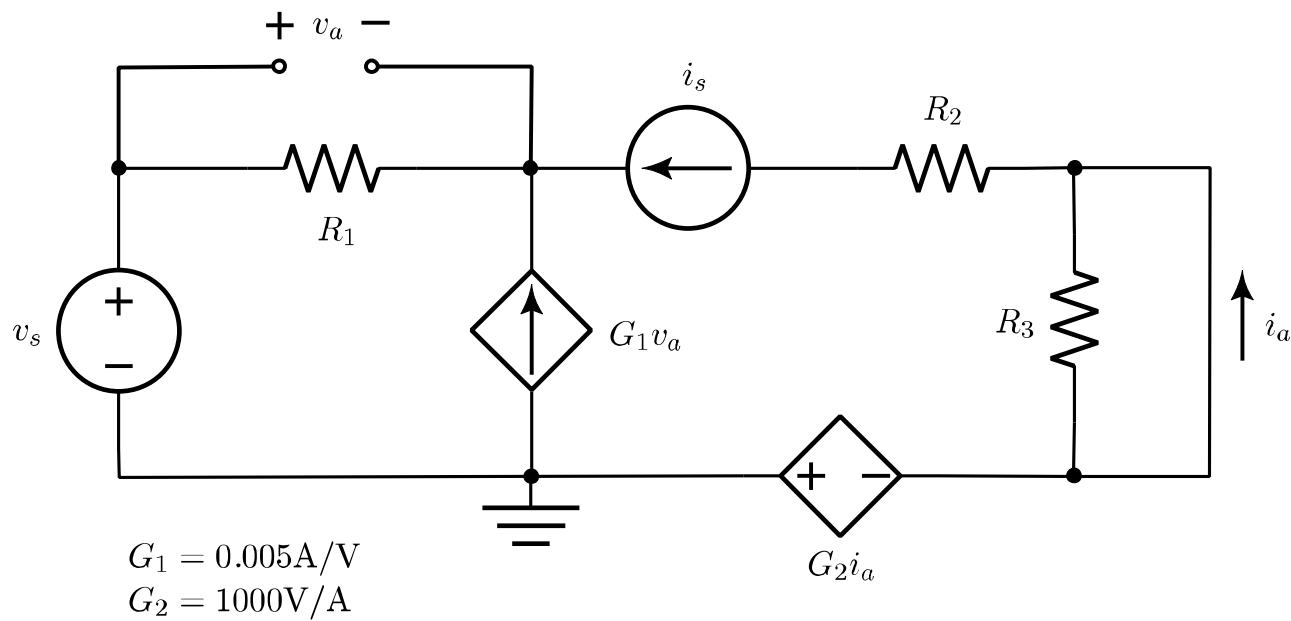
Open/Short Circuits



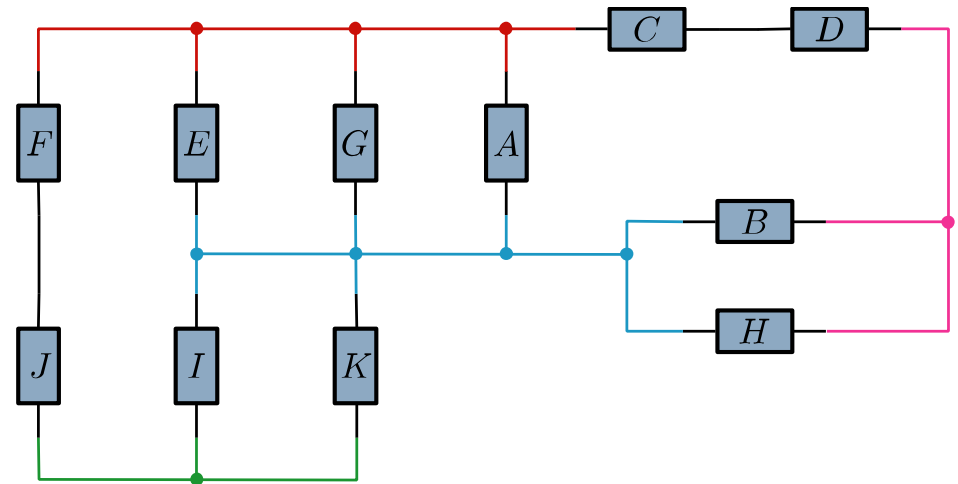
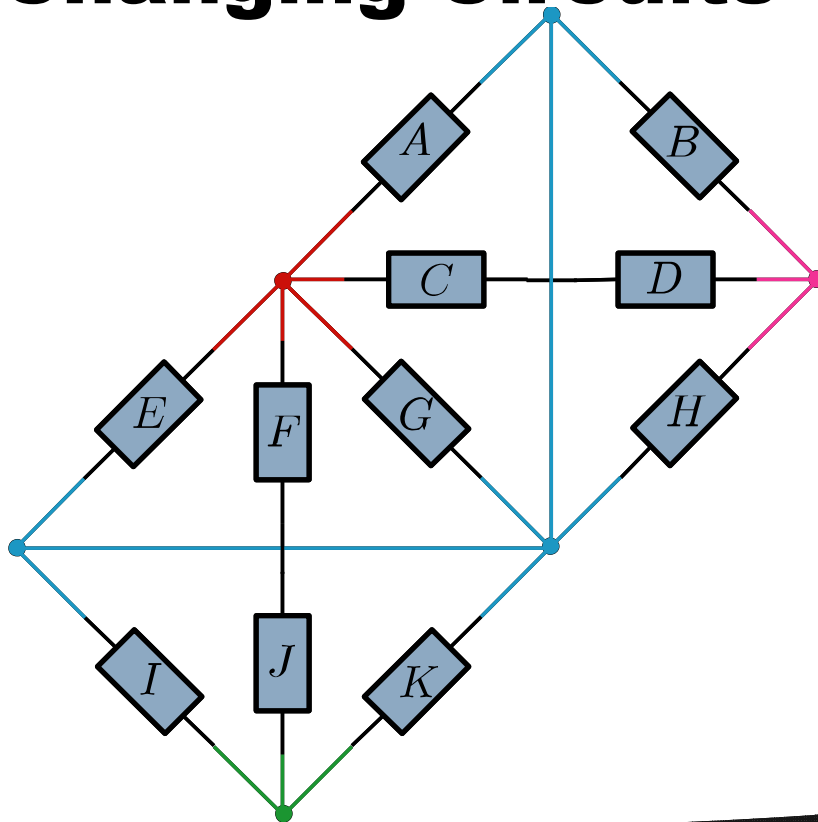
Self-Contradictory Circuits



Putting It Together



Changing Circuits



Summary

- ⦿ Described the concept of a node and how to identify one
- ⦿ Introduced independent and dependent voltage and current sources
- ⦿ Introduced a resistor – a device that will be discussed in more detail later
- ⦿ Presented the idea of a ground
- ⦿ Showed examples of self-contradictory circuits
- ⦿ Described how circuits can be equivalent

Next Class

- ◎ See another way voltage and current relate
- ◎ How charge moves through real materials