

VOLTAGE SOURCES DC SOURCES-BATTERIES

Lesson 4
EET 150



Dc Voltage Sources Learning Objectives

- ▣ **In this lesson you will:**
- ▣ study a common dc voltage source, the battery.
- ▣ examine different types of batteries.
- ▣ review the parts that make up batteries.
- ▣ study the differences between batteries and electric cells.
- ▣ examine the electrical characteristics of batteries.
- ▣ define the capacity of a battery
- ▣ see how different batteries have different electrical characteristics



Dc Voltage Sources Batteries

Batteries produce potential difference (voltage) through electrochemical reactions

Types of Batteries

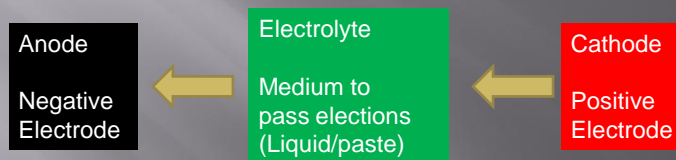
Primary Batteries – non-rechargeable
(e.g. “flashlight battery”)
Chemical reaction is not reversible

Secondary Batteries – rechargeable
(e.g. “car battery”)
Chemical reaction is reversible within limits

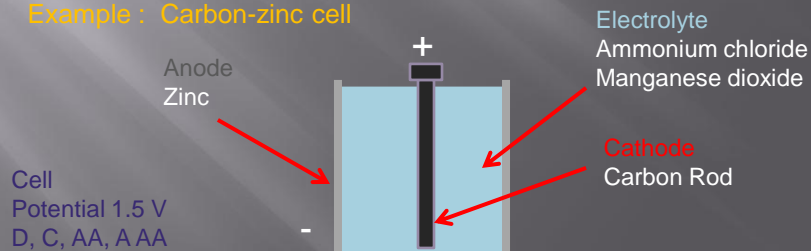


Batteries vs. Cells

Cell is single voltage producing element consisting of:

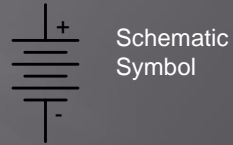


Example : Carbon-zinc cell



Batteries vs. Cells

Battery comprised of series cells

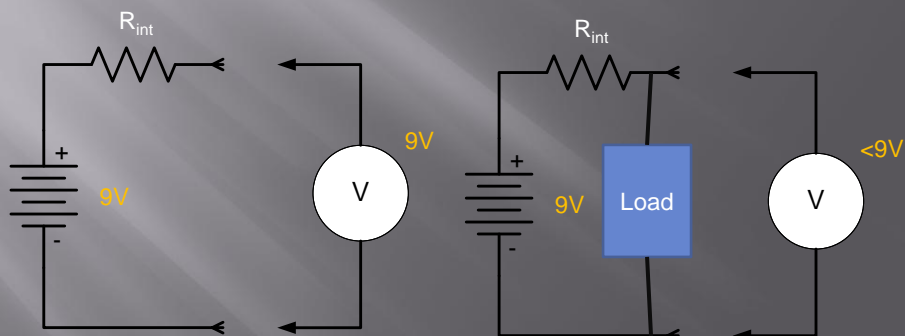


Example: 9 V battery $6 \times 1.5\text{V} = 9\text{V}$



Battery Ratings Open Circuit Voltage

Batteries have internal resistance that lowers terminal voltage when loaded.

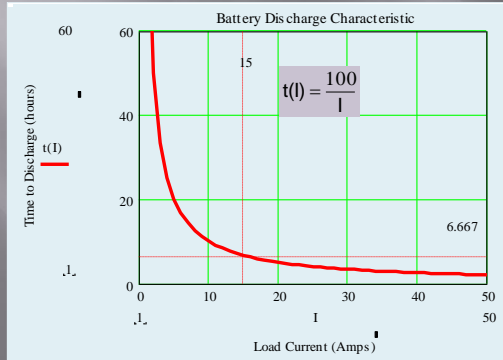


Battery Ratings Amp-Hour Capacity

The chemical reaction in batteries produces a limited amount of electrons

The time to discharge depends on the load current

Battery Amp-Hour rating and electric load determine discharge time



$$t = \frac{AH}{I}$$

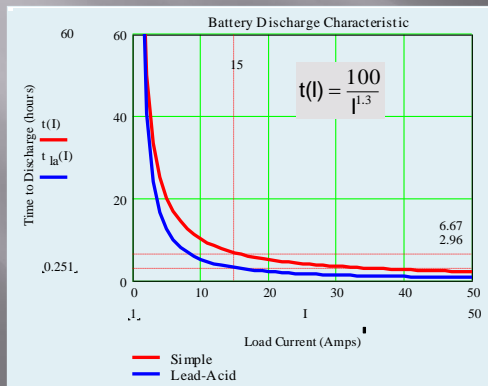
Where:

- t = discharge time (Hrs)
- AH = amp hour rating
- I = battery load current



Battery Ratings Amp-Hour Capacity

Lead-acid batteries use the following formula to find discharge time.



$$t = \frac{AH}{I^{1.3}}$$

Where:

- t = discharge time (Hrs)
- AH = amp hour rating
- I = battery load current



Dc Voltage Sources - Batteries

End Lesson 4 EET 150

Coming Next: Ac Voltage Sources

