PhET Tips for Teachers   Circuit Construction Kit (All versions)
Written by Trish Loeblein, Sam Reid, Kathy Perkins, last updated July 19, 2010
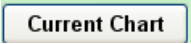
Tips for controls:

- Components are dragged from the toolbox to make circuits with the exception of the voltmeter and stopwatch.
- Use the **Save** button to save a configuration for lecture or homework.
- In order to open a saved circuit, download the file. To open a file, Circuit Construction Kit simulation must be running, press the **LOAD** button, if the file was not saved with the .cck extension, then in the **FILE TYPES** box, select **ALL FILES**.
- **Right Click** helps explore many situations. For example, you can break a junction, remove a component, or change values like resistance.
- The current charts have a movable sensor that can be dragged to different locations, If you want more than one chart, click again on the button . The voltage charts work similarly, but requires that both sensors are connected across a component
- You can **Pause** the sim and then use **Step** to incrementally analyze.
- If you are doing a lecture demonstration, set your screen resolution to 1024x768 so the simulation will fill the screen and be seen easily.
- The "Reset Dynamics" will discharge any capacitors or inductors
- Under **Options,** you can change the colors if it is helpful for viewing.

Important modeling notes / simplifications:

- The model is computed with Modified Nodal Analysis. Capacitors and inductors are linearized at each time step, and dynamic timestep subdivisions are used to trade off accuracy and speed.
- There are 4 versions of **Circuit Construction Kit**. The DC version is the simplest and is a good spot to start students. The AC version includes AC voltage sources, capacitors, and inductors.
- The "Virtual Lab" versions do not have the ammeter that can be moved onto components to determine the current. This was a request of teachers who use ammeters that must be incorporated into the circuit.
- Fire denotes a short circuit or very high current
- If the current is high and the blue dots for the electrons cannot be drawn fast enough, the sim changes speed and this displays : **Animation speed limit reached! Simulation speed reduced to 75% normal!** .
- When you change the Wire Resistivity, the amount of resistance will vary with the length of the wire. So to find the resistance value for any wire, read both the current and voltage and use Ohm's Law $R = V/I$

Insights into student use / thinking:

- Students sometimes have difficulty recognizing if a switch is completely closed or not.
- Our studies show that complex concepts and lab skills about circuits may be made easier for students who use this simulation. To read more, see these articles (names have been shortened for simplification). "Assessing..Environments" "Assessing..Tutorials"

Suggestions for sim use:

- For tips on using PhET sims with your students see: **Guidelines for Inquiry Contributions** and **Using PhET Sims**
- The simulations have been used successfully with homework, lectures, in-class activities, or lab activities. Use them for introduction to concepts, learning new concepts, reinforcement of concepts, as visual aids for interactive demonstrations, or with in-class clicker questions. To read more, see **Teaching Physics using PhET Simulations**
- For activities and lesson plans written by the PhET team and other teachers, see: **Teacher Ideas & Activities**

Authors: Loeblein, Reid, Perkins