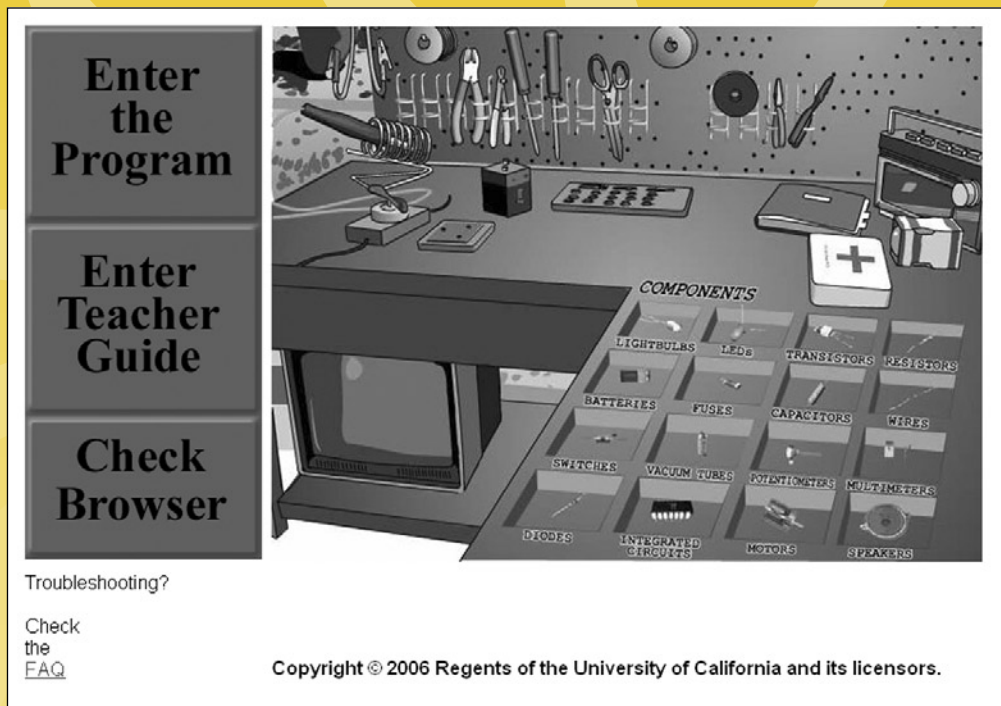


INTRODUCTION TO THE MULTIMEDIA (VERSION 2.0)



OVERVIEW

The *FOSS Electronics* CD-ROM is an important part of the **Electronics Course**. It provides students with an opportunity to access and interact with simulations, images, videos, and text that can enhance their understanding of physical science concepts and the application of these concepts to solve problems and to design new products. Different sections of the CD-ROM are incorporated in several investigations during the course. You will sometimes use the multimedia to make presentations to the entire class. At other times, individuals or small groups of students will work with the multimedia as a reference tool or to review and reinforce concepts.

This multimedia component is not optional. At a minimum, you should have one computer with either a CD-ROM drive or a local copy of the CD-ROM files, and a large-screen monitor available for use with the entire class. The following guide provides information to help you set up the simulation on your computers and provides a tour through the components of the multimedia.

SYSTEM REQUIREMENTS

MACINTOSH VERSION

A Power Macintosh G3 or higher, with at least 48 MB of RAM (64 MB recommended), OS 9.x or OS X 10.1 or later, 4X CD-ROM (faster recommended), 16-bit color minimum (thousands of colors) at a resolution of at least 800 × 600.

All of the multimedia is browser-based, so you will need to have a compatible Web browser installed on your system. Compatible browsers are Internet Explorer 5.1 for OS 9 users, Internet Explorer 5.2 for OS X users, and Netscape 7.0 or later for all Macintosh systems.

PC VERSION

Pentium-based (Pentium II or higher) or compatible computer with 48 MB of RAM (64 MB recommended), Windows 98, ME, 2000, or XP, 4X CD-ROM (faster recommended), 16-bit color video card minimum (thousands of colors) at a resolution of at least 800 × 600.

All of the multimedia is browser-based, so you will need to have a compatible Web browser installed on your system. Compatible browsers are Internet Explorer 5.0 or later for Windows 98 and 2000, Internet Explorer 5.5 for Windows ME, and Internet Explorer 6.0 or later for Windows XP. Netscape 7.0 or later is compatible on all PC systems.

GETTING STARTED

In all cases, your browser will need to have certain plug-ins installed, namely Flash 7 (or later), Shockwave 8.5 (or later), and QuickTime 6 (or later). If you don't already have these plug-ins on your system, they are available either from the CD-ROM or via the internet.

When you run the Electronics program, it provides an option to verify that your browser is configured properly. Choosing this option will take you step-by-step through all the important features that may require additional installation, including Flash 7, Shockwave 8.5, and QuickTime 6.

We do not provide support for either Flash or QuickTime. For Flash/ Shockwave updates and support, go to Macromedia's player support homepage.

www.macromedia.com/support/players

For QuickTime updates and support, go to QuickTime's homepage.

www.apple.com/quicktime

or

www.apple.com/support/quicktime

MACINTOSH

Get your system ready to run the Electronics program.

- Turn on virtual memory (OS 9 only). Test the speed and stability of the Electronics program with different amounts of virtual RAM. Allocating too much will slow down your machine considerably. Apple recommends running 1 MB of virtual

RAM. You will have to restart your machine each time you change the virtual memory settings.

- Set your monitor to at least thousands of colors. The program runs best with millions of colors, but this setting is not required. You may have to set your monitor to a lower resolution in order to get more colors. For OS 9, use the Monitor Control Panel (accessible either from the Systems Folder or under the Apple on the menu bar) to set color and screen resolution. For OS X, use the Displays setting in the System Preferences (accessible either from the Dock or under the Apple on the menu bar).
- Make sure the sound is turned on and set to the desired level. For OS 9, adjust the sound through the Sound Control Panel. For OS X, use either the Sound System Preferences panel or the volume control buttons on your keyboard.

Insert the CD into your CD-ROM drive. Double-click on the FOSS_EL disk icon to open the FOSS_EL folder window, and then open the file named "Electronics.htm." This will launch your browser and load it with the program's start page.



1. **FOSS Electronics icon. Double-click to start the program.**

The first time you run the program, select the option to Check Browser, which will take you step-by-step through the verification and installation process. If you try to start the program without first going through this process, you could encounter program malfunctions.

PC

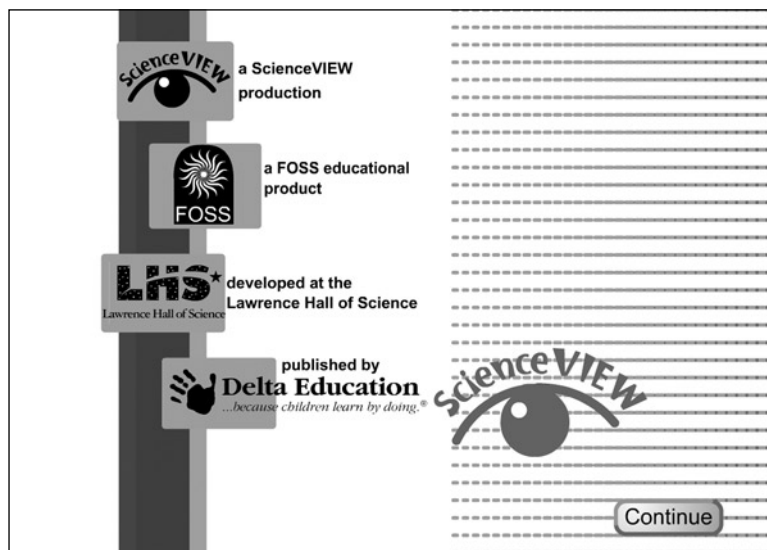
Get your system ready to run the Electronics program.

- Set your monitor to at least thousands of colors. The program runs best with millions of colors, but this setting is not required. You may have to set your monitor to a lower resolution to get more colors. Use the Display Control Panel to set color and monitor resolution under Settings, or right-click on the desktop and choose Properties.

- Make sure the sound is turned on and set to the desired level. Adjust the sound through the external speakers.

The Electronics program should launch automatically once the CD is inserted into your CD-ROM drive. If your autorun feature is not turned on or an error has occurred, open the FOSS_EL CD-ROM and double-click on the file Electronics.htm. Your browser will launch and load with the program's start page.

The first time you run the program on a new system, select the option to Check Browser, which will take you step-by-step through the verification and installation process. If you try to start the program without first going through this process, you could encounter program malfunctions.



Credits screen

PROGRAM BASICS

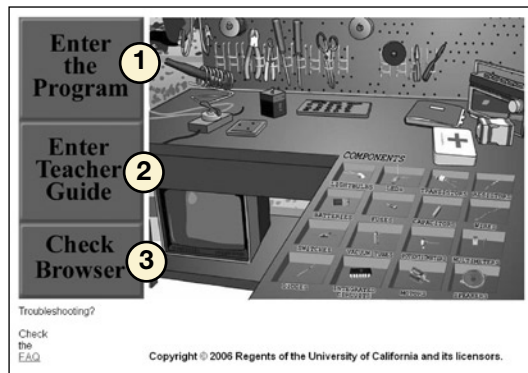
ENTERING THE PROGRAM

Upon launching the program, the user can either enter the CD-ROM or check the browser set up. There are two ways to enter the CD-ROM, either through the Electronics Lab by clicking Enter the Program, or through the Teacher Guide by clicking Enter Teacher Guide.

The Check Browser option verifies that the browser has all the required plug-ins installed and walks through any needed set-up procedure. To quit the program, just exit the browser.

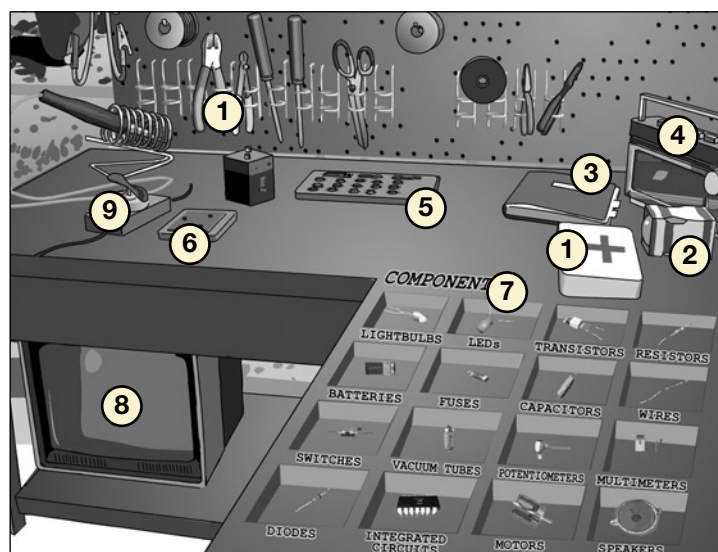
ELECTRONICS LAB WORKBENCH

When you click Enter the Program from the launch screen, the Electronics Lab Workbench appears. This serves as your portal to all the multimedia activities on the CD-ROM. Rolling the mouse over certain regions of the Workbench highlights a large text title or menu item, and clicking the mouse button takes you to activities associated with the current selection.



Launch screen

1. Click to enter Electronics Lab.
2. Click to enter Electronics Teacher Guide.
3. Click to check browser.



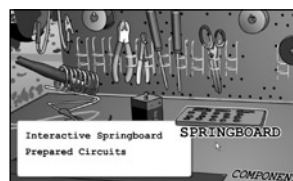
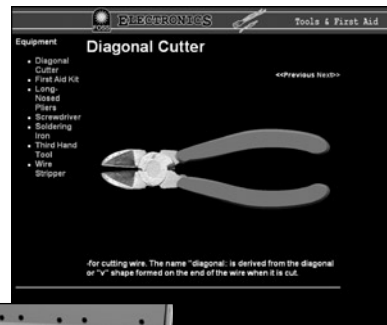
Electronics Lab Workbench

1. Equipment (tools and first aid)
2. Teacher Guide
3. Technical Manual
4. Device Dissections
5. Spring board
6. Wonder card
7. Components
8. Video Resources
9. Credits

The following areas of the Workbench will take you to specific activities as you roll the mouse over them.

- The soldering iron, hanging tools and first-aid kit bring up an index of common equipment and safety information.
- The packaged lightbulb in front of the radio leads to the Teacher Guide.
- The red book on the tabletop is the Technical Manual, a reference tool with simulations, diagrams, and explanations.
- The radio behind the Technical Manual takes you to the Device Dissections.
- The blue spring board reveals a menu for the Interactive Spring Board and the Prepared Circuits.
- The wonder card, in front of the lantern battery, brings up a game.
- The sixteen compartments in the frontmost tabletop panel provide detailed information about individual electronic components.
- The television on the shelf beneath the table takes you to an index of Video Resources.
- The propellor gizmo, just left of the wonder card, shows the full program Credits.

Each part of the *FOSS Electronics* CD-ROM is discussed in detail in the following sections.



GENERAL NAVIGATION AND PRINTING TOOLS

The *FOSS Electronics* CD-ROM uses your browser's standard navigational controls, including the Back button, the Refresh button, and opening links in new windows. Additional navigational features specific to the program are described in the remainder of this guide.

To print a page from the CD-ROM, you can use **⌘-P** on the Macintosh or **Control-P** on the PC to print the active window. The window's contents will be printed out and scaled to fill a single page.

QUICKTIME MOVIES

The movies that appear in this program are in QuickTime format. When a control bar appears at the bottom of the movie, click the single right-hand arrow button on the left-hand side of the control bar to run the movie. Click this button a second time to stop the movie. Click and drag the slider on the control bar to move at your own pace through the movie. If the movie has sound, a button with a speaker icon will appear on the far left side of the control bar. Click it and drag to adjust the sound level of the current movie.

On some screens only a play button will appear.

QUITTING THE PROGRAM

To exit the program, just quit your browser. You can also accomplish this by using **⌘-Q** on the Macintosh or **Alt-F4** on the PC. If you wish to use your Web browser for other purposes, there's actually no need to quit out of it. In that case, just go to another Web page and the browser will handle everything.



1. *Forward play arrow. Click once to play the movie. Click again to stop the movie. If present, use the slider to adjust sound levels.*
2. *Fast forward/reverse arrows. Click and hold to fast forward or reverse the movie. Some movies will not run smoothly in fast forward or reverse.*

TROUBLESHOOTING

If you encounter any trouble using this CD-ROM, the first place to look is on the Frequently Asked Questions page, accessible both directly from the program's start page and from within the Check Browser section of the program.

On Macintosh OS 9, restarting your computer with minimal extensions (the Base Set for your system) may increase the stability of the program. You can change your extensions through the Extension Manager Control Panel. See the *Macintosh User's Guide* (print) or Macintosh OS Help (located under Help on the menu bar) for more information.

On the PC, restarting your computer before you use the Electronics program may increase the stability of the program.

If you start experiencing problems while running the program, quit and restart the computer. If problems persist, you may be experiencing systemwide problems on your PC, such as driver conflicts or other errors.

Technical Support. If you have problems running the *FOSS Electronics* CD-ROM and your technical assistants cannot help, please send an email to foss@berkeley.edu.

RUNNING THE PROGRAM FROM YOUR HARD DRIVE

You may find that the limited speed of your system's CD-ROM drive causes the program to delay when loading media. To improve performance in this situation, or simply as a matter of convenience, it is possible to copy all of the program files from the CD-ROM onto your hard drive (see the CD-ROM license agreement). The following instructions apply to both Macintosh and PC users.

Create a new folder on your hard drive, and give it the name FOSS Electronics. With the *FOSS Electronics* CD-ROM in your CD-ROM drive, copy the entire top-level folder named "Content" from the CD-ROM into the new folder on your hard drive. Then, copy the Electronics.htm file from the CD-ROM into this folder.

You should now be able to launch and run the program directly from your hard drive, by double clicking on the Electronics.htm file.

THE TEACHER GUIDE

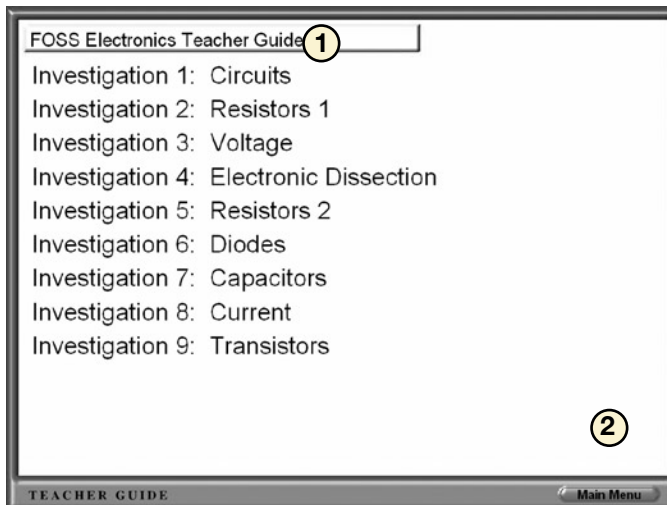
You can enter the Teacher Guide at startup from the launch screen or any other time by clicking on the Teacher Guide button in the Electronics Lab. The Teacher Guide portion of the CD relates the multimedia components of the course to the *FOSS Electronics Teacher Guide*.

The first screen of the Teacher Guide is a list of all the investigations in the course. Click an investigation to retrieve information about it.

Each investigation screen shows

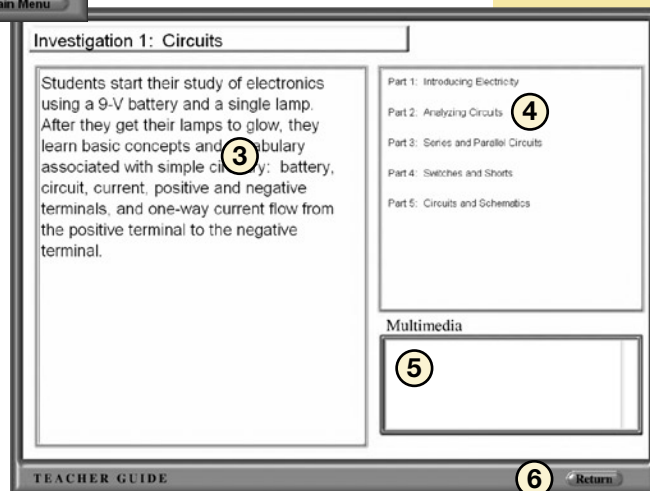
- A list of the parts in the investigation. Click the part title to bring up a brief description of the part and a list of multimedia components associated with it.
- The goals of the investigation.
- A list of multimedia associated with a part. To go to a multimedia component, click its title in the box. (When you leave the multimedia component, you will return to the Electronics Lab, not the Teacher Guide.)

1. Click a title to learn more about an investigation.
2. Click to go to Main menu.
3. Part description or goals.
4. A list of parts. Click a title to learn about the part.
5. Multimedia components for a part. Click a title to go to the multimedia component.
6. Click to return to investigation list.



Teacher Guide investigation list

Clicking the Return button on an investigation screen returns you to the investigation list. Clicking the Main Menu button on the Teacher Guide investigation list takes you to the Electronics Lab.



Investigation screen

TECHNICAL MANUAL



The Technical Manual contains information

about electricity as well as curriculum resources. When you enter the Technical Manual from the Workbench, a Table of Contents appears, listing the individual chapters.

Click a chapter to see a list of pages in that chapter. Click the page you want to view.

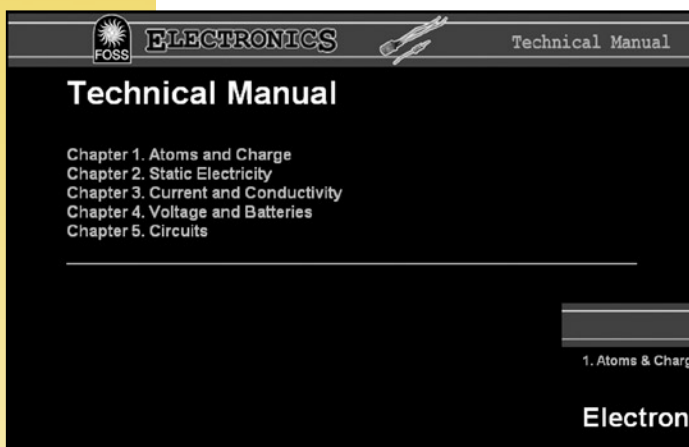
When present on a Technical Manual page, click on the small speaker icon next to the main page heading to play or stop the audio narration.

Navigation links are found at the bottom of each Technical Manual page. Click the Next link to bring up the next page in the chapter, the Previous link to bring up the previous page, and the Contents link to go back to the main Table of Contents page for the Technical Manual.

Additional links found at the top and bottom of the page provide you with further navigation throughout the Technical Manual.

Use the browser's Back button to go back to previously visited pages.

Other buttons on pages in the Technical Manual control animations. In the example shown below, clicking the Close Circuit button closes the switch in the animation.



Technical Manual Table of Contents



Technical Manual page with an animation

DEVICE DISSECTIONS



The Device Dissections are reached by clicking the radio on the far right side of the Workbench.

These photographs show electronic equipment that has been systematically taken apart. Some components have labels. Click the device you want to dissect to see the first photograph.

NOTE: The chattering skull is a novelty item for Halloween consisting of a toy skull that makes noise, has glowing eyes, and chatters when it senses noise. The novelty ball is a small white ball that chirps and glows when held in the hand. A functional novelty ball is included in the Electronics kit.

Click the Next button to see the next dissection layer. Click the Back button to see the previous dissection layer.

If visible, click and hold the Label button for a menu of components that are labeled on the layer. Slide the cursor to a component name and release.



Dissecting a calculator, first page



Dissected calculator with labels

SPRING BOARD



The blue spring board has a menu of two items: the Interactive

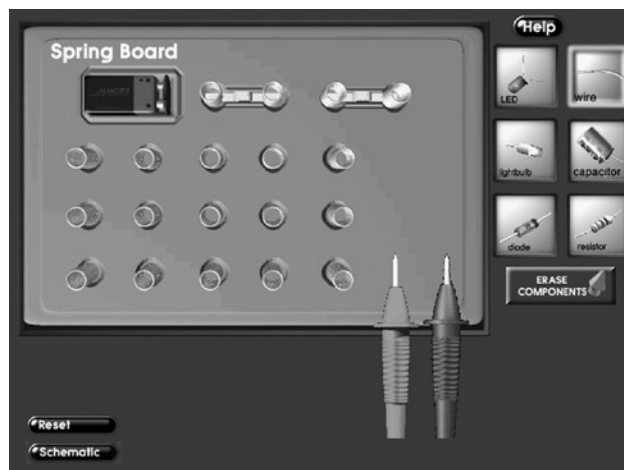
Spring Board and the Prepared Circuits.

INTERACTIVE SPRING BOARD

The virtual Spring Board simulates some of the workings of the FOSS Spring Board, but it is not a fully functioning spring board used to gather information. The two main purposes of the virtual Spring Board are to display circuits for whole-class viewing and to generate a schematic of a circuit that is constructed on it.

At the virtual Spring Board you will find a spring board display, a components display, multimeter probes you can drag, and various buttons.

Building a Circuit. Place a component on the spring board by clicking on the picture of the desired component in the component display. Next, click on



Spring board screen

the spring that will hold the positive connection of the component. The spring will highlight with a red circle, and a red arrow will follow your cursor. Click on the spring where the negative connection should be made. You can place up to twelve components onto the virtual Spring Board.

For wires, resistors, lightbulbs, and capacitors, the orientation of the positive and negative connections is not important. For diode and LED components, however, the positive and negative orientation is important. One way to keep your circuit-building tidy is to start with your first click on the positive terminal of the battery.



Adding a wire to the spring board

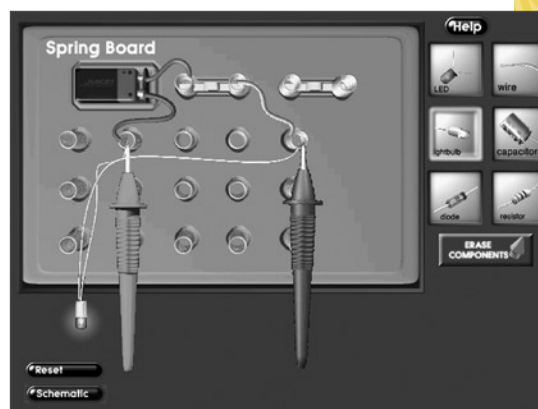
Continue around the circuit placing your other components. Finally, click to select the wire component, and place it from the last spring you used to the negative terminal of the battery.

If you create a circuit with a short, the word *Short* will flash on the screen. This feature determines *if* there is a short but not *where* the short is located.

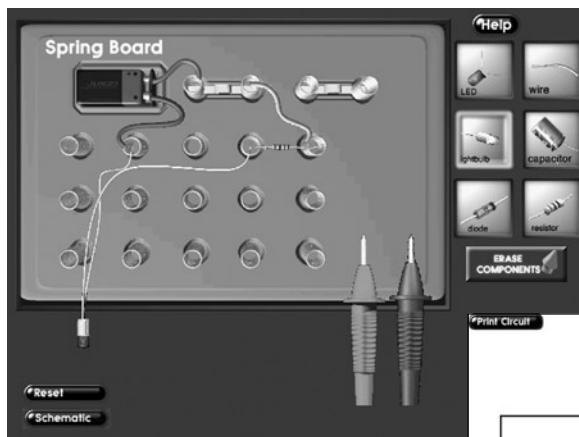
Changing the Components on the Spring Board. To remove a component from the spring board, click on the Erase button, then move the cursor over the component. Clicking will remove the highlighted component. Remove all components at once by clicking the Reset button.

Viewing a Schematic of the Circuit. To view a schematic of the circuit you are working with, click the Schematic button.

Using the Multimeter Probes. Click and hold to drag one of the multimeter probes to one of the springs on the spring board. When a circuit is constructed on the virtual Spring Board for display to a class, use this feature to indicate where the multimeter probes should be placed on the actual spring board in order to measure various electrical properties in the circuit.



Using the multimeter probes on spring board



View schematic of circuit on spring board


Lightbulbs in Parallel and Series. If the components in your circuit are only the battery, lightbulb(s) and wire(s), any lightbulb will respond to the electricity in the circuit. A lightbulb can only light up brightly

or not light up at all. It will not light up dimly to indicate the current it would be receiving in the circuit you have built. Any resistances

placed in series with the lightbulb will prevent it from lighting up.

Help Button. Click on the Help button to see a version of these instructions while working with the virtual Spring Board.


A new window will appear showing the schematic diagram. The window can be resized and repositioned, allowing you to construct or modify your circuit and watch the schematic develop. In some cases, the schematic will not appear correctly if a complete circuit is not formed.

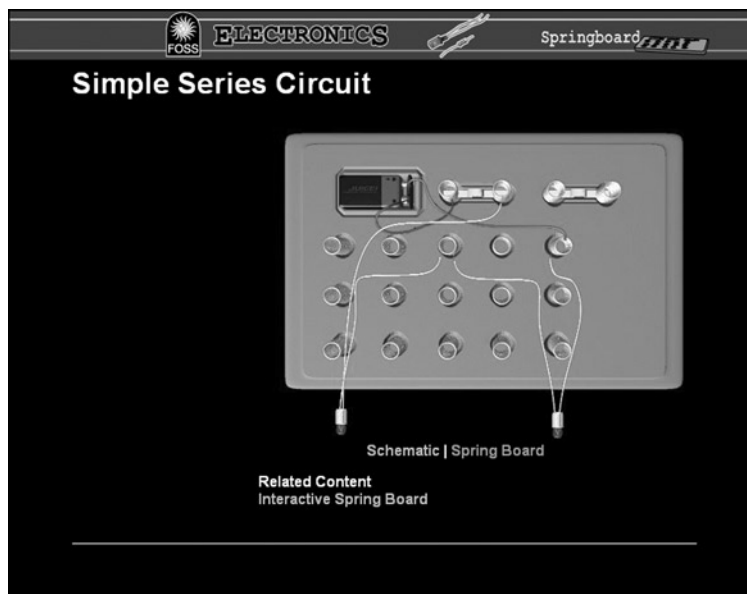
Printing. If you have a printer connected to your computer, you can print the schematic diagrams. The print icon will be visible in the left-hand corner of the screen. You can also use -P on the Macintosh or Control-P on the PC to print the schematic.

PREPARED CIRCUITS

There are eight prepared circuits.

- Simple Series Circuit
- Simple Parallel Circuit
- Simple Mixed Circuit
- Resistor Investigation Circuit
- Touch Switch
- Momon Switch
- Charge/Discharge Device
- Sunrise/sunset Device

Printing. If you have a printer connected to your computer, you can print the prepared circuits or the schematic. Use -P on the Macintosh or Control-P on the PC to print the screen.



One of the prepared circuits on the spring board

WONDER CARD

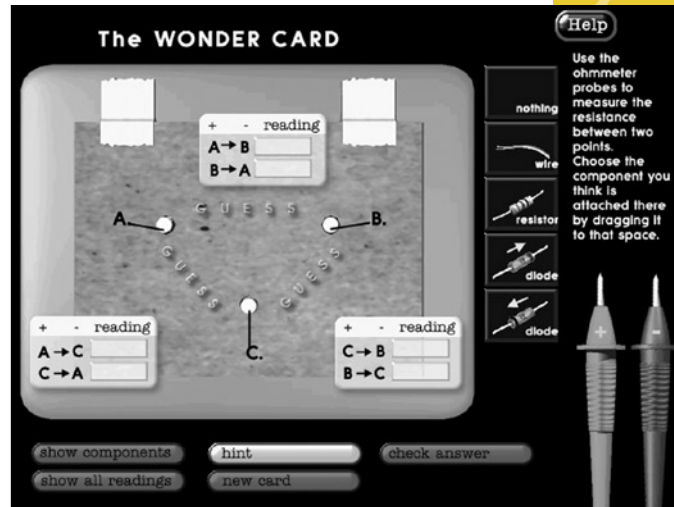


This activity simulates the FOSS Wonder Cards that are constructed in the course. A wonder card

is a puzzle. It has three contacts, labeled A, B, and C. Components may connect any two contacts, but they are hidden behind cardboard. A component may be a diode, a resistor, or a wire. The challenge is to figure out what component, if any, is between each of the pairs of contacts.

In this virtual version, virtual multimeter probes are used to collect ohmmeter readings that then allow you to deduce which type of component, if any, is virtually attached between each pair of contacts underneath the cardboard. Wonder card configurations from the course are presented randomly. A virtual wonder card can have 0, 1, or 2 components, but not 3.

The virtual wonder card has a wonder card display with three contacts and room for your ohmmeter readings; multimeter probes; a display of possible components for the puzzle; and various buttons.



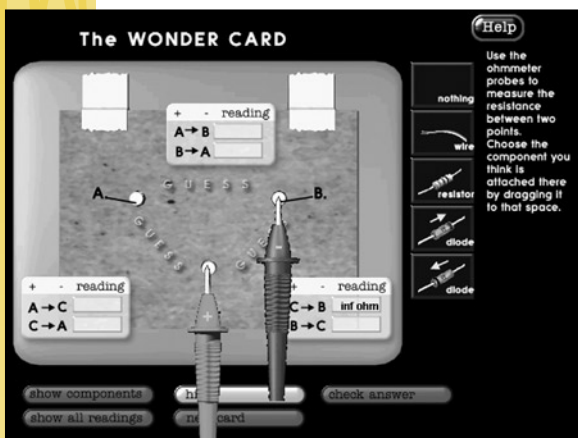
Wonder Card opening screen

Ohmmeter Readings. Use the red (plus) and black (minus) ohmmeter probes to check the resistance between each pair of contacts. The resistance will help you figure out what components are between the contacts. The resistances of the components are:

Wire	0 Ω
Resistor	150 Ω
Diode (conducting direction)	700 Ω
Diode (nonconducting direction)	Inf Ω (infinite resistance)
Nothing (no component)	Inf Ω (infinite resistance)

To Solve a Puzzle

1. Drag the probes to test the resistance between the three contacts in both directions. There are six possibilities. The ohmmeter reading will appear in the appropriate reading box. For example, if the red probe is on contact C and the black probe is on contact B, the ohmmeter reading will appear in the box marked "C → B."


Using probes on the wonder card

The orientation of the probes designates contact C as the positive side of the component, while contact B is the negative side. Reversing the locations of the two probes will reverse the polarity of the reading and the reading will appear in the next box below, labeled "B → C."

2. Place your answer for what is between each pair of contacts by dragging a component (or the word nothing) into position. To do this, go to the components display to the right of the wonder card. Click and hold the mouse button down on the type you would like to use as your answer.

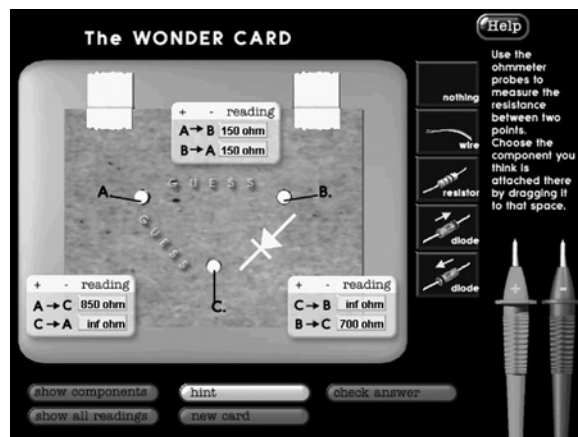
A symbol for that type of component will appear under your cursor. Drag it over to the wonder card. When two contact points light up in green, releasing the mouse button will place your answer between those two contact points.

3. To change your answer, drag and drop the new component into place. The new answer will replace the old one.

4. Press the check answer button after placing all three answers. If your configuration of components correctly reflects the virtual configuration, you will hear "Yeah!" and the virtual components will become visible. If your configuration is incorrect, you will hear "Oh No."

5. Revise your answers if they were incorrect, and click the check answer button again until you figure out the correct configuration.

6. Click the new card button for a new wonder card puzzle.

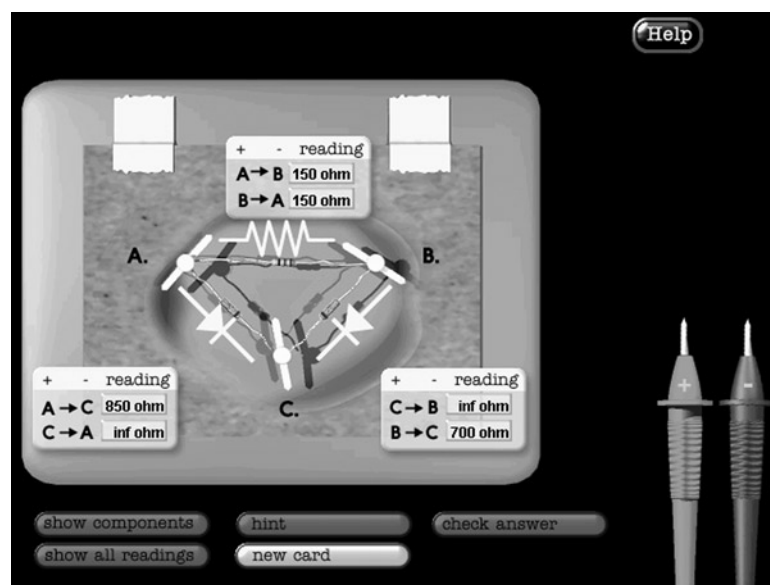

Answer by dragging a component into position on the wonder card

More Buttons. After completing your first wonder card, you can simply click the Show all Readings button to immediately see all of the resistances between the contacts on any new wonder card without having to position the probes between pairs of contact points.

After you have taken all six possible ohmmeter readings and provided guesses between all three of the contacts, you can see the solution to the puzzle by pressing the Show Components button.

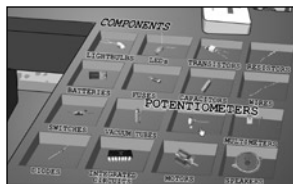
The hint button reminds you that no more than TWO components are included in any virtual wonder card.

Click on the Help button to see a version of these instructions while working with the virtual wonder card.



Show components screen

COMPONENTS

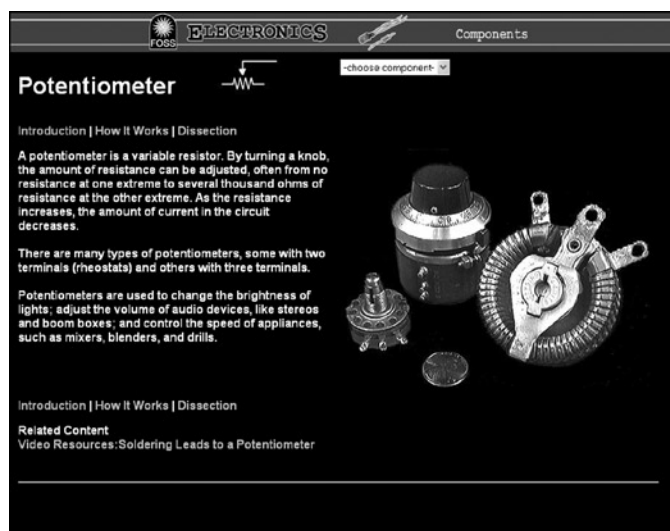


The individual Component compartments are the gateway to the component

information pages. From the Workbench, click on any of the components to learn more about it.

A component information page opens to an Introduction to the component. Click Dissection for a labeled diagram of the component and information on the separate parts. Click How It Works to see an animation or an illustration of the mechanisms of the component. If visible, click on Links to see a menu of closely related topics throughout the CD. Select a topic to go there.

From any component page, you can select another component from the pull-down menu that appears to the right of the current component's name on the page. Drag the cursor to the name of the new component and release.



Component information page

VIDEO RESOURCES



The Video Resources include two types of videos: Measuring Electrical Properties and Procedural Videos.

The first set of videos provide teachers and students with an introduction to the multimeter and how to use it to measure resistance, voltage, and current. There are four videos in this set.

The second set of videos demonstrates procedures for the teacher. These procedural videos could also be viewed by students if they are involved in preparing materials for class.

- Building a Wonder Card
- Placing a Guardian Resistor on the Spring Board
- Transistor into Socket
- Soldering Leads to a Potentiometer
- Stripping a Wire
- Repairing Leads
- Soldering Techniques
- Fuse and Battery Replacement



FOSS