Pintar *V*irtuaLab™ Electricity

Preface

What is Pintar *V*irtualab™

The Pintar ***V*irtuaLab**™ is;

- a simulation tool which enables a science lab in your computer.
- designed to allow you to conduct experiments with only your imagination as your boundary.

What this manual contains

The Getting Started Pintar ***V*irtuaLab**™ Manual will

- guide you through the process of setting up the Pintar *V*irtuaLab™ in your computer.
- show you on how to use the features of the Virtualab.
- guide you on how to conduct an experiment.

Structure

This manual contains all the modules in the Pintar ***V*irtuaLab**™. Each module is divided into two parts;

- the components of the Pintar ***V*irtuaLab**™ interface, and
- the experiments

How to use getting started

This manual will help you by

- providing information for you to be familiar with all the different features and functions of Pintar ***V*irtuaLab**™ interface and
- guiding you to set-up your own experiments step-by-step instructions.

Functions

Familiarity with the MS-Windows system, should help you to use the Pintar ***V*irtuaLab**™.

But if you are not familiar with the system, here are some terms used to describe some of the main operating functions:

Terms	Function
Click	Press once on the mouse over a specified object
Select	Click once on a specified object
Drag	Click on an object while holding the button, to move object to the desired place and let go
Type	Press specified keys on the keyboard
Place	To drag object from the component box to the work windows
Choose	Click on a menu item in a menu

Chapter One

Installing Pintar ***Virtua*Lab**™

How to install

Introduction

This chapter will help you to install the Pintar ***Virtua*Lab**™ on your computer.

System requirements

To install the Pintar ***Virtua*Lab**™ successfully, you need to fulfill these system requirements:

- IBM or 100% compatible
- Minimum 66 MHz , 486 DX or faster
- 8 MB RAM
- Minimum 4 MB free hard disk
- Windows 95/98/200/ Windows NT
- Super VGA (640 x 480), set at 256 colors
- Sound card according to MPC
- A mouse and a keyboard
- Printer (optional)

Installation

Warning!

You are only authorized to install the Pintar ***Virtua*Lab**™ onto one computer only, unless you obtain the ***Pintar Site License***

Installation procedures

Follow these steps to install this program into your hard disk.

Step	Action
1	Start Microsoft Windows 95/98/2000/ Windows NT
2	Insert Pintar ***Virtua*Lab**™ Electricity CD inthe CD-ROM drive
3	From the CD-ROM drive:, double click on SETUP.EXE file
4	Follow each instruction in the installing panel

Note:
*After the installation process is complete,you will see a group of Pintar **Virtua*Lab**™ programs appear on your screen.*

Chapter Two
Electricity

Overview

Introduction

The Pintar ***V*irtuaLab**™ Electricity module has certain features that are different from any other Pintar ***V*irtuaLab**™ modules.

- If you are new to Pintar ***V*irtuaLab**™ you might want to familiarize yourself with the components which are found in the interface.
- Next, the fastest way of using the Pintar ***V*irtuaLab**™ is by doing an experiment. This manual will give you step-by-step instructions on conducting an experiment.

In this chapter

This chapter covers the following sections;

Section A

Components of the Interface

Overview

Introduction

In order, to use the Pintar ***V*irtuaLab**TM, you need to be familiar with the different components that you will be using in conducting your experiment.

In this section

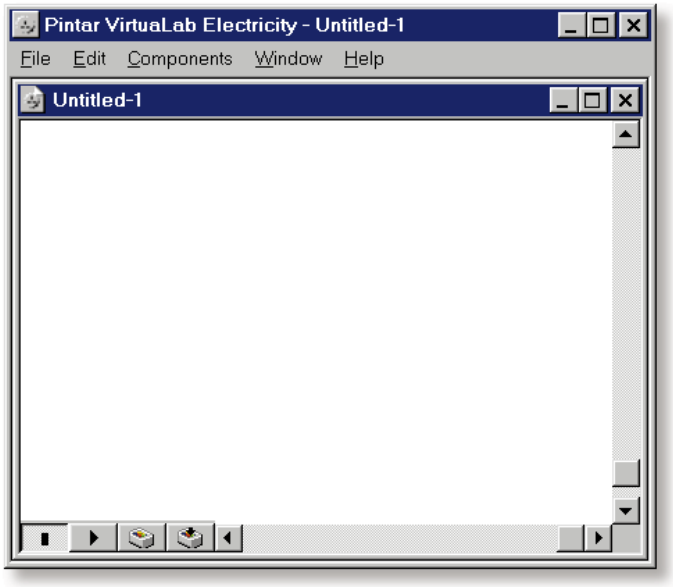
This section covers the following topics;

The Work Window

Introduction

The Work Window is

- A simulation of the real lab, so, you can create and conduct your experiments freely.
- The space where your electrical components are connected together to create an experiment.



The Types of Menus

The File menu

It contains:

- Starting new experiment
- Opening saved experiments
- Closing current experiment
- Saving an experiment
- Playing and stopping the experiment
- Printing projects
- Setting preferences
- Ending work session

The Edit menu

It contains:

- Undoing changes
- Editing an experiment
- Cut
- Copy
- Paste
- Deleting one, more or all components from the Work Window
- Selecting all components on the Work Window
- Removing all connections between the components

The Types of Menus (continued)

The Components menu

It contains:

- Open Component Box
- Import component
- Show or hide resistance

The Window menu

The Window menu offers the following commands for arranging multiple views of multiple documents in the application window:

Function	Description
Cascade	Arranges windows in an overlapped fashion
Tile	Arranges windows in non-overlapped tiles
Arrange Icons	Arranges icons of closed windows.
Window 1, 2, ...	Goes to specified window

The Types of Menus (continued)

The Help menu

It contains:

- Get Help
- About ' Pintar ***Virtua*****Lab**™ Electricity'

The Control Panel

What is the Control Panel

The Control Panel contains controls that

- Run and stop an experiment,
- Open the Component Box and Import components into the Component Box.

Functions

The Control Panel consists of four buttons with different functions

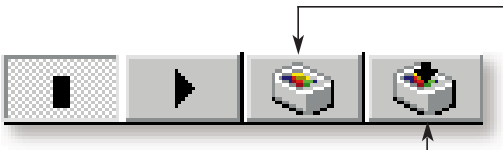
Button	Function
Construct or Stop 	Click on the 'Construct' or 'Stop' button to return to the edit mode. This mode allows components to be added or deleted
Play 	Click on this button to 'play' the experiment. In this mode, • an experiment will behave according to the parameters specified by the components. • when the experiment is playing, the experiment cannot be edited.
Components Box 	Click on this button to view the components in it Note : The Components Box holds the components that have been imported into an experiment.
Import Components 	Click on the 'Import Components' button to import components needed for your experiment into the Components Box.

The Components Box

What is the Components Box

The Components box holds the imported components for an experiment.

It deals with ;



Open Components
Transferring a component from the Components Box onto the Work Window

Import Components
Importing a component into the Components Box

The Components

The components refer to the instruments that you will be using in your experiments. All the components are placed in a directory called the Lab-Cage.

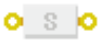
There are currently thirty- two components in the Lab-Cage and they are categorized in nine different categories.

Category	Components	Figures	Internal Resistance
Power source	Dry cell primary battery 1.5 V		None
	Wet cell secondary battery,2.0V		None
	car battery 12V		None
	fictitious dry cell battery, variable voltage		None

The Components Box (continued)

Category	Components	Figures	Internal Resistance
Connectors	3-arm linear		None
	3-arm transverse		None
	4-arm cross		None
Protection	Fuse		None
	Circuit breaker		None
Devices / Appliances	Lamp or bulb white, red, green, yellow and blue		20 ohms
	Signal		set-able
	Bell		set-able
	Radio		8 ohms
Meters	ammeter		None
	volmeter		None

The Components Box (continued)

Category	Components	Figures	Internal Resistance
	Ohmmeter		None
	Galvanometor		None
Resistor	Fixed		NA
	Rheostat		NA
	Resistor box		NA
	Shunt		NA
	Potentiometer		NA
	Wire		NA
Switches	Single-pole-single-throw (SPST), Type A		None
	Single-pole -single-throw (SPST), type B		None
	Settable single -pole-single -throw (SPST)		None
	Normally-open -push-button (NOPB)		None
	Normally-closed -push-button (NCPB)		None
	single-pole -double-throw (SPDT), type A		None

The Components Box (continued)

Category	Components	Figures	Internal Resistance
	Single-pole -single-throw (SPST), type B		None
	Double-pole -single-throw (DPST)		None
Timers	Standard clock		NA
	Count-down		None
	Multiple set-point		None
Others	Text component		NA

Section B
The Experiment

Overview

Introduction

Pintar ***V*irtuaLab**™ Electricity is a powerful simulation laboratory on the computer.

With Pintar ***V*irtuaLab**™ Electricity you can create experiments by connecting virtual electrical components on the computer screen. Properties can be altered as many times as desired.

The virtualab's powerful simulation engine will bring these experiments to life. accurately and immediately.

Section

This section covers the following topics;

Background

Experiment goal

In this tutorial, the goal is to put together a simple circuit that would verify Ohm's Law.

For a novice user, the quickest way to become familiar with Pintar ***V*irtuaLab**™ Electricity is to follow this step-by-step tutorial. Pintar ***V*irtuaLab**™ Electricity is designed to be very 'user-friendly.'

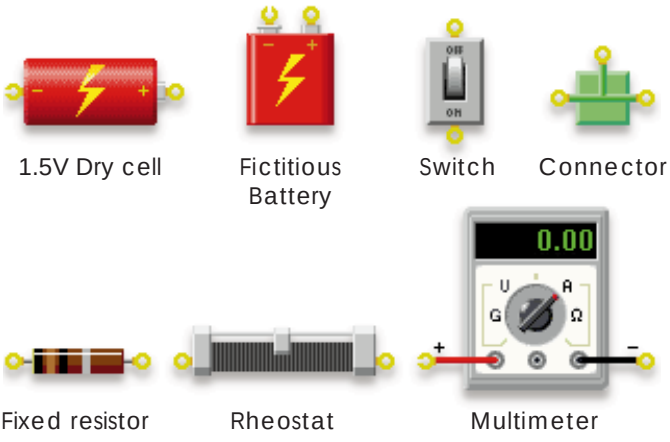
Throughout this tutorial, you will find frequent references to the on-line Help system, indicated by this symbol ? . You can access the Help documents from 'Help Topics....' in the 'Help' menu.

Objective

To determine the relationship between current, resistance, and voltage in a DC circuit

Components

For this experiment, you would need the following components



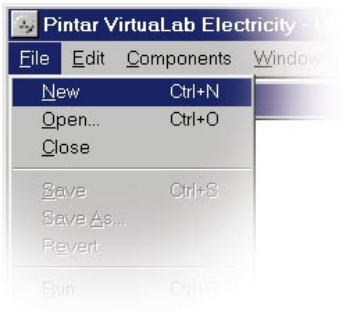
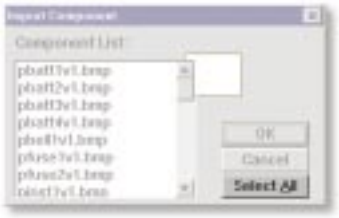
1.5V Dry cell | Fictitious Battery | Switch | Connector

Fixed resistor | Rheostat | Multimeter

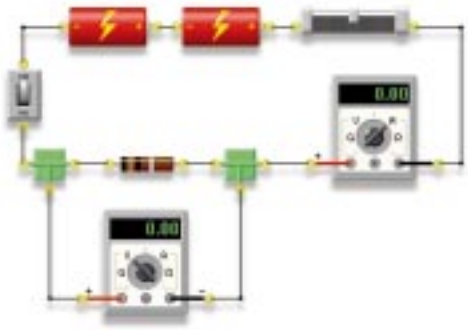
Experiment Set-Up

Method

Follow these procedures to start your experiment

Step	Action
1	**Starting up Pintar *V*irtuaLab™ Electricity**  Double-click on ELEC.EXE icon
2	**Start a new project**  Select 'New' from the File menu. You will see a blank VirtuaLab named 'Untitled 1'.
3	**Import the necessary components for your experiment** The next task is to acquire those components that you would need for the experiment (see 'Components Used' above); that is, importing the necessary components from the Lab-Cage into the Components Box. a. Open the Components Box by clicking on the Components Box icon at the bottom left of the VirtuaLab. It is currently empty b. Then click on the 'Import' icon, right of the Components Box window. You will see the 'Import' panel appear. c. Click the Select all option. You will see that the components has been imported into the Components Box. 

Experiment Set-Up (continued)

Step	Action
4	**Placing a component from the Components Box onto the VirtuaLab**. Click on a component in the Components Box and drag it onto the Virtualab.
5	**Connect the components to create a circuit** After transferring the required components onto the Virtualab, you may then proceed to connect the components, so that your circuit resembles the diagram below. 
6	**Set the properties for the components** • Multimeters Set one multimeter to an ammeter, and the other one to a volmeter. • Fixed resistor Set to 1 ohm
7	**Annotate your experiment** • Select and drag the Display text icon from the lab cage to its specified location • Double click the text box to start annotating your experiment.
8	**Save your experiment** Save the project by selecting 'Save As' from the Project menu. Name the project. You may want to save your project in the Examples folder.

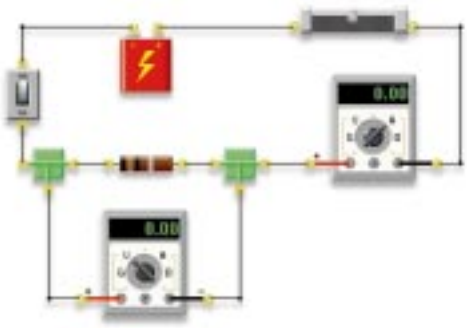
Experiment Set-Up (continued)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>9</td><td>Play your experiment
• Click on the ‘Play’ or ‘Run’ button at the bottom of the VirtuaLab.
• Then close the circuit by clicking on the ‘switch’ component.</td></tr>
<tr><td>10</td><td>Changing the resistance in the circuit.
Slide the saddle on the rheostat. Make a note of the new readings in the meters. Repeat the process for about ten different readings.

On a piece of paper, write down the readings in each of the multimeters, for example,

<table>
<tr><th>Step</th><th>Volmeter Reading</th><th>Ammeter Reading</th></tr>
<tr><td>1</td><td>0.00</td><td>0.00</td></tr>
<tr><td>2</td><td>0.04</td><td>0.04</td></tr>
<tr><td>3</td><td>0.06</td><td>0.06</td></tr>
<tr><td>4</td><td>0.12</td><td>0.13</td></tr>
<tr><td>5</td><td>0.30</td><td>0.30</td></tr>
<tr><td>6</td><td>0.50</td><td>0.50</td></tr>
<tr><td>7</td><td>0.70</td><td>0.70</td></tr>
<tr><td>8</td><td>1.50</td><td>1.50</td></tr>
<tr><td>9</td><td>2.20</td><td>2.20</td></tr>
<tr><td>10</td><td>3.00</td><td>3.00</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Stop your experiment
After obtaining the ten readings, stop the project by clicking on the ‘Stop’ button</td></tr>
</table>

Experiment Set-Up (continued)

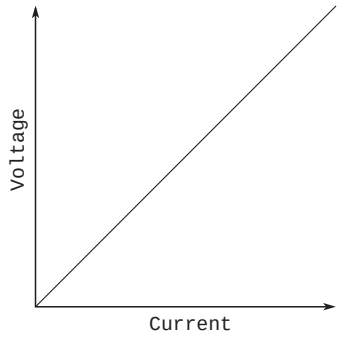
Step	Action
12	**Re-edit your project** Change the circuit (substitute the two 1.5V dry cell batteries to a single fictitious battery) to reflect the diagram below ;  · Change the parameters of the following components to: - Voltage (fictitious battery) : 6 volts - Fixed resistor : 30 ohms Repeat steps 9 to 11. · Once again, change the parameters of the following components to: - Voltage (fictitious battery) : 15volts - Fixed resistor : 10 ohms Repeat steps 9 to 11.
13	**Ending your work session** Finally, when you are ready to call it a day, select '*Quit*" from the File menu.

Observation

Findings

For the three sets of data that you have collected, draw a graph with each set of data, with the y-axis representing voltage and the x-axis for current.

The diagram below shows the plot for the set of data in the example in Section 10 above.



Inference

A 'straight line through the origin' graph conforms to the general equation,

$$y = mx$$

where, **m** is a constant

In this experiment, resistance (fixed resistor) has been kept constant, while the current is varied via the rheostat. The change in voltage in the circuit was noted. Therefore, it can be deduced by substitution into the equation below.

Voltage = current x resistance