Kirchhoff's Laws

TOPICS AND FILES

E&M Topic

Kirchhoff's Laws

DataStudio File

70 Kirchhoff.ds

EQUIPMENT LIST

Qty	Items	Part Numbers
1	PASCO Interface (for two sensors)	
1	Voltage Sensor	CI-6503
1	Current Sensor	CI-6556
1	AC/DC Electronics Laboratory	EM-8656
2	Banana Plug Patch Cord	SE-9750 or SE-9751
1	'D' cell 1.5 volt	

INTRODUCTION

The purpose of this activity is to explore Kirchhoff's two laws of electrical circuits. Use a voltage sensor, current sensor, and the *DataStudio* software to measure the voltage *across* and the current *through* parts of a complex circuit.

BACKGROUND

Ohm's Law describes the relationship between current, voltage, and resistance in simple circuits. Many circuits are more complex and cannot be solved with Ohm's Law. These circuits have many power sources and branches which would make the use of Ohm's Law impractical or impossible.

In 1857 the German physicist Gustav Kirchhoff developed methods to solve complex circuits. Kirchhoff produced two conclusions known today as Kirchhoff's Laws. Kirchhoff's two laws describe the unique relationship between current, voltage, and resistance in complex electrical circuits.

Kirchhoff's Current Law: The current arriving at any junction point in a circuit is equal to the current leaving that junction. Stated another way: No matter how many paths into and out of a single point, all the current leaving that point must equal the current arriving at that point. This law is sometimes called the *junction* rule.

Kirchhoff's Voltage Law: The algebraic sum of the voltages around any closed path is zero. Stated another way: The voltage drops around any closed loop must equal the applied voltages. This law is sometimes called the *loop* rule.

Kirchhoff's Laws can be related to conservation of energy and charge if we look at a circuit with one load and source. Since the load consumes all of the power provided from the source, energy and charge are conserved. Since voltage and current can be related to energy and charge, then Kirchhoff's Laws restate the laws governing energy and charge conservation.