

## 615-4635 (10-145) Ampere's Rule Apparatus

### Warranty and Parts:

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.

### How to Teach with Ampere's Rule Apparatus:

**Concepts Taught:** Ampere's Rule, right hand rule, magnetic field, magnet, conductor, and compass.

**Curriculum Fit:** Magnetic Field and Magnetism.

### Additional Materials Needed:

- 6 Volt Battery or low voltage power supply
- Two each conducting wire with alligator clips on both ends

### Theory:

**What is Ampere's Rule?** It can be defined as: *around a wire carrying a current towards the observer, the magnetic field curls in the anticlockwise direction.*

**What is a magnetic field?** It can be defined as: *the lines of force around a permanently charged magnet or a moving charged particle.*

**What is a magnet?** It can be defined as: *a piece of equipment that can attract pieces of iron or steel.*

**What is a compass?** It can be defined as: *a magnetized needle, mounted on a pivot, which points in a north direction.*

**Caution:** Always make sure the power supply is turned off before connecting leads to it or making any adjustments to the leads. Do not touch the current-carrying conductor while the power is on.

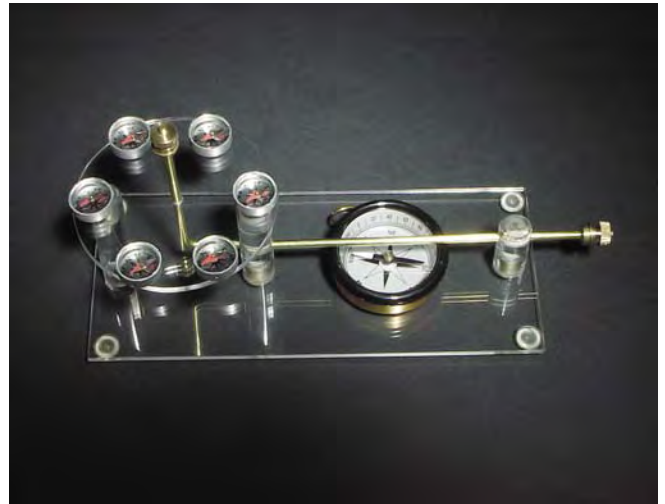
### Demonstration 1: Magnetic Field about a Conductor

**Kit Components Needed:** Ampere's Rule Apparatus

**Additional Items Needed:** DC power supply

#### Procedure Part A.:

1. Put the demonstrator on a flat surface such as a lab bench.
2. Align the unit so that the horizontal wire is pointing roughly north and south.
3. Place the large compass beneath the horizontal wire.
4. Position your 6 Volt battery in back of the apparatus. Open the alligator clip on one wire and place it on the positive terminal of the battery. Repeat using a second wire with alligator clip and place it on the negative terminal of the battery.
5. Loosen the screw caps on the horizontal and vertical sides of the instrument.
6. Open the free end of the alligator clip of the positive wire and put it on the horizontal side of the apparatus.
7. Open the alligator clip on the free end of the negative wire and put it on the vertical side of the instrument.
8. Without changing the overall north to south alignment, move the large compass to the 9:00 or 3:00 o'clock position, alongside the vertical conductor. See diagram below.





9. With current flowing, there will be little noticeable effect on the compass needle.
10. Now, move the large compass to the 12:00 or 6:00 o'clock position. You should observe an immediate and large deflection of the needle. See diagram on page three.



11. Turn off the power supply and remove the large compass and set it aside.

#### Procedure Part B.:

1. Arrange the six small diameter compasses in a circle on the apparatus' plastic circle with the vertical rod protruding through the center.
2. Turn on the current and observe the needle directions of each of the six smaller compasses.

#### Discussion Points:

1. This demonstration shows that:
  - a. A magnetic field surrounds a conductor of electric current.
  - b. The direction of the magnetic field is determined by the direction of the electric current.
  - c. The strength of the magnetic field decreases with increasing distance from the electrical conductor.

Ampere devised a rule to predict the direction of a magnetic field around a straight conductor. It is called the "right hand rule". If the conductor is grasped with the right hand in such a way that the right thumb points in the direction of the current, the fingers wrap around the conductor in the direction of the magnetic field.

#### Related Products:

**Science First<sup>®</sup>** manufactures many low-cost items that can be ordered from most science education distributors. For more information, please contact us.

**615-0270 Magnetic Field Demonstrator** - Wow your students with this handy magnetic field demonstration! Shake the unit so that the iron filings are distributed throughout the unit. This transparent acrylic case holds iron filings in such a way as to maximize the visible lines of force from a magnet placed either on top of or underneath the case. Note: Magnets not included.

**615-0250 Magnetic Field Viewer, 3D** - Explore the mysteries of magnets in three dimensions! Iron filings mixed with oil inside and acrylic plastic cube will react in fascinating ways to a magnetic field or electric current.