OPERATING INSTRUCTIONS

Purpose:

To generate and investigate controllable uniform magnetic fields.

Contents:

One (1)	Assembled air core solenoid

Required Accessories:

One (1)	Ammeter (0 to 5 amperes)
One (1)	Rheostat (25 watt)
One (1)	Power supply (6 ampere) or Batteries
One (1)	Bar Magnet

Specifications:

The solenoid is wound on an air core in 5 layers with approximately 560 turns (570 turns #14835) of #16 Nyclad solid copper wire. The number of turns per unit length for each coil is 3720 turns/meter and results in a calculated field to current ratio of 0.00468 tesla/amp. The inside diameter of the coil is 3.2 cm (6 cm #14835). Each coil is designed to carry 5 amps continuously, and up to 10 amps for short durations.

Discussion:

A solenoid is a long wire wound in a closely packed helix. For points very close to a single turn of the solenoid, the magnetic properties of the current carrying wire are very similar to those of a long straight wire. The magnetic field lines close to individual wires are very nearly concentric with a direction given by the right hand rule. (With the thumb of your right hand pointing in the direction of the wire's current, your fingers will wrap around the wire in the direction of the magnetic field lines.) The solenoid field is the vector sum of the fields set up by all of the turns that make up the solenoid. Therefore, between the individual turns of the coil the magnetic fields tend to cancel out, while near the center the magnetic field becomes larger and more uniform.

Figure #1 illustrates a loosely wound solenoid showing the position and direction of the magnetic field lines. As the solenoid is more and more tightly packed, the magnetic field near the center becomes more and more uniform, and the magnetic field outside the solenoid windings approaches zero. To