

Mini-Laser Spirograph

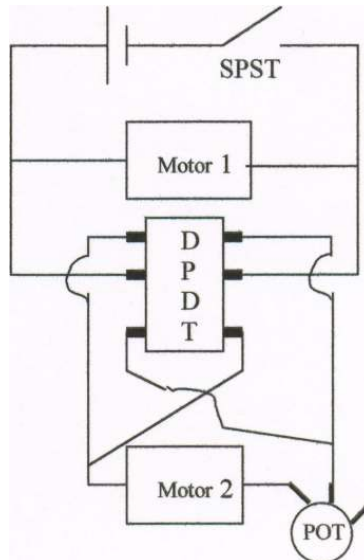
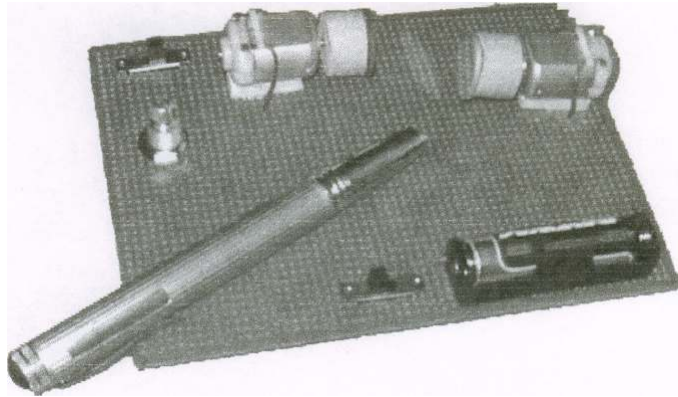
The essence of the mini-laser spirograph is two mirrors attached to small dc motors. A laser beam striking the rotating mirrors will produce a wide array of patterns. With one mirror rotating, the reflected beam “paints” an ellipse on a screen. When both mirrors are spinning, two elliptical patterns superimpose to produce more complex shapes. The pattern observed depends on the ratio of the speeds and direction of rotation of the mirrors. These parameters are controlled by a potentiometer connected to one mirror and a reversing switch connected to the second mirror.

The arrangement of the spirograph components is shown in Fig. 1. The placement of the switches, potentiometer, and battery is not critical. However, it is important to arrange the mirrors so that the laser beam forms a Z-shaped path. A schematic is given in Fig 2.

Two small mirrors are attached to 1.5 cm-long pieces of 2.5 cm dowel rod. If first surface mirrors are not available, pieces of ordinary mirror produce very acceptable results. The pieces of dowel rod need not be cut with particular care since the mirrors need to be mounted at a slight angle in order to produce elliptical images. The mirrors may be attached to the dowel rod with either Liquid Nails™ or other strong adhesive. (Note: We have never had a mirror detach. However, it is always prudent to have students stand behind you while the device is in operation.)

Friction will keep the dowel/mirror assemblies on the motor shafts if holes with slightly smaller diameters than the motor shafts are drilled in the center of the pieces of dowel rod.

Students are often surprised to learn that the patterns observed are all in their heads! Through the phenomenon of persistence of vision, the eye-brain system retains an image for a fraction of a second. Hence an entire pattern is observed even though at any instant there is only a point of light on the screen.



- Materials:** (Note: when components are from RadioShack, the part number and price are given)
- 2 - DC Motors 273-223 (\$1.99 ea)
 - 2 - Mirror Pieces
 - 2— 1 cm dowel (length) (width depends on size of mirror piece)
 - 1 - AA Battery Holder 270-401 (\$.99)
 - 1 - SPST switch 275-406 (\$2.29/2)
 - 1 - DPDT switch 275-403 (\$2.99/2)
 - 1 - 25-Ohm 3-Watt Rheostat 271-265 (\$3.99)
 - 1 - perfboard (size of your choice available from RadioShack)