CIRCLING WAVE UMBRELLA
by Ned Kahn

MAINTENANCE INSTRUCTIONS

General Description:

A spinning disc of fabric undulates in complex ways and organizes itself into a pattern of circling waves. The pattern of waves is influenced by the surrounding air currents as well as by viewers who can change the speed of rotation by adjusting a knob.

Initial Set-up:

The mast and umbrella assembly is shipped as a separate unit. It bolts to the base with three socket head fasteners. The motor connects to the shaft via a shaft coupling which is left attached to the mast assembly for shipment. To assemble the exhibit, first check that the set screw backed out clear of the coupling bore, unless in is a clamping type, in which case the clamping screws just needs to be loosened. Then lift the mast assembly into position so that the motor shaft flat aligns with the set screw in the coupling. Next, secure the mast into position on top of the base unit with the three socket head fasteners. The set screw(s) can then be tightened, checking that it aligns with the middle of the motor shaft flat. Before powering the exhibit, check that the shaft rotates freely.

Replacing the Fabric:

The fabric is a vinyl-coated Spandex™. The disc is approximately 55 inches in diameter. The upper hemisphere of the copper sphere on top that holds the fabric can be removed by removing the upper set of button head fasteners along its seam. This will expose the PVC plates that clamp the fabric. After cutting out a new disc, you will need to make some holes to line up with the bolts in the clamping plate. Use the old piece as a template if possible. You will also need to put a 1 1/2 inch hole near the outside edge so that viewers can see how fast the fabric is spinning.

Potentiometer replacement:

Be sure the power is off. The knob assembly can be accessed by removing the 8 button head screws that hold the perforated cylinder onto the front bezel. Slightly spread the perforated metal apart and slide it up and around the upright pipe. The potentiometer is removed by loosening the two white nylon thumb-nuts and pulling on the potentiometer firmly but slowly until it releases. To reassemble, first turn the pot shaft and the knob both completely clockwise. This will avoid a 'spongy' feel at the knob stops. Then align the plate with the threaded studs and push the pot shaft into the rubber coupling. Replace the nylon thumb-nuts hand tight.

Servicing the Motor and Speed Controller:

The motor and controller can be accessed by removing the 8 button head screws that hold the perforated cylinder onto the front bezel. Slightly spread the perforated metal apart and slide it up and around the upright pipe. A direct drive DC permanent magnet motor is used to drive the exhibit. The motor is a relatively high torque unit which is being run at very low speeds. The motor controller switches the line power at varying conduction angles to change the amount of power delivered to the load. To run at its maximum setting of 200 RPM, the motor requires around 15 Vdc. The trimpot settings on the unit become quite sensitive in this range, and prone to surges or oscillations if improperly adjusted.

The controller should be adjusted so that at the lowest setting of the user control, the umbrella just stops spinning, and at the highest speed it should unfurl and form into a 3 or 4 wave pattern. The dials on the controller trim-pots are recommended to be set as follows:

MIN	(Minimum speed)	10 - 11 O'clock
MAX	(Maximum speed)	1 - 2 O'clock
ACCEL	(Acceleration)	7 O'clock minimum
IR COMP	(Voltage drop compensation)	7 O'clock minimum
CUR LIM	(Current Limit)	9 O'clock

Lighting:

Side lighting is the optimal configuration for illuminating the umbrella and this throws an interesting shadow on the wall.