

# VISIBLE EFFECTS OF THE INVISIBLE

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## MAINTENANCE INSTRUCTIONS

### GENERAL INFORMATION:

Visible Effects of the Invisible graphically demonstrates resonant frequencies. A horizontal, glass tube is half-filled with kerosene. A speaker at one end causes the air in the tube to vibrate. The frequency of the speaker can be adjusted and when it is tuned to one of the resonant frequencies of the tube, the surface of the liquid adjusts to the pressure differentials and geysers of kerosene appear over those sections where the motion of air is greatest.

### Initial Set-up:

First place the exhibit in its final display position. (Moving the exhibit when it is full of fluid can damage the speaker.)

To remove the speaker, first remove the ring of screws holding the Plexiglas bubble to the speaker case. Then disconnect the wires and remove the speaker.

Remove the splash guard, taking notice of how it was positioned.

Fill the horizontal section of the glass tube half-way with pure, clear, "Odorless" kerosene.

Replace the splash guard. It should rest in a horizontal position, and be pushed down just low enough in the tube to seal around its perimeter.

The speaker can now be mounted. The wire connection goes toward the bottom with the cord passing through the closest mounting hole. The bolts can then be passed through the speaker and acrylic, taking care that the wire is not pinched. Do not over-tighten these bolts as the acrylic may crack.

Replace the plastic bubble, again taking care not to over-tighten the screws.

Check that the kerosene is level in the tube. (Refer to the section: "Leveling the Tube".)

Check that the knob settings on the amplifier, located inside the exhibit, are in accordance with the amplifier settings listed in the "Electronic Maintenance" section.

#### General Cleaning:

The glass may be cleaned with glass cleaner. The finished surfaces of the exhibit may be cleaned with a mild soap solution or general purpose cleaner. The acrylic panel should be cleaned with a plastic cleaner and a soft wipe that will not leave scratches, (we suggest Wype-All™).

#### Potentiometer & encoder replacement:

Be sure the power is off. The potentiometer is accessed from underneath by loosening the two white nylon thumb-nuts and pulling on the potentiometer firmly but slowly until it releases. To reassemble, first turn both the pot shaft and the knob 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 and reinstall into the exhibit.

#### Speaker removal:

To access the speaker, first remove the ring of screws holding the Plexiglas bubble to the speaker case. Then disconnect the wires and remove the speaker. The speaker will need to be re-coned about once a year, when the material breaks down from the liquid. The original speaker cone was coated with silicone rubber to lengthen its life.

### Tube filling:

Removing the speaker allows access to the inside of the tube. The horizontal section of the tube should be kept half way full of kerosene. (If this level is lower the power required to drive the tube increases.) Removing the Splash-guard will facilitate filling although kerosene may be slowly added while the guard is in place. Be sure the screen is properly positioned before re-attaching the speaker. See photo.

### Leveling the Tube:

The kerosene should be level in the glass tube. To adjust the tilt, loosen the two socket head screws in the split clamp that hold the speaker brace. The pipe can be moved up and down enough to effect the kerosene level. Be careful that the pipe does not drop when loosening the clamp or else the electrical cord to the speaker might be cut.

### Electronic Maintenance:

Access to the electronics is gained through the back by unlocking the rear panel. The amp and circuit board must be carefully set to avoid overdriving the electronics and speaker. (10 Volt RMS at the speaker at 50 Hz to avoid splashing kerosene on the speaker, gradually increasing to 14 Volt RMS at 550 Hz.) Any adjustments should be made by qualified personnel only.

Refer to the schematics for location of components and trim pots on the circuit boards. Periodically the electronics should have any dust blown out of it to keep any heat sinks from overheating.