

# SEA OF CLOUDS

## by Ned Kahn

### MAINTENANCE INSTRUCTIONS

#### GENERAL INFORMATION:

A large pool of slowly undulating fog is alive with waves and complex convection currents. The exhibit uses a reverse osmosis water filter to supply clean water to the humidifier. The filtered water greatly increases the life of the humidifier, especially in locations that have hard water. About 1-1/2 to 2 gal/hr are used during operation. The exhibit is equipped with a sump and pump to drain condensation that collects inside the dish.

#### General Cleaning:

A drain screen is located in the center of the dish to catch foreign particles. The maintenance crew will need to clean this screen at regular intervals. The finished or painted surfaces of the exhibit may be cleaned with a mild soap solution or general purpose cleaner. The acrylic graphic panels should be cleaned with a plastic cleaner and a soft wipe that will not leave scratches, (we suggest Wype-All™).

#### Initial Set-up:

If a municipal drain cannot be located near the exhibit, a suggested Ø3/8" (10mm) I.D. hose will need to be routed from the exhibit to the drain. It will most likely be routed along side the feed line through a hole in, or a 'pancake' strip along, the floor. Choose tubing for the drain line that will not collapse in time. ABS or polyethylene are recommended. Vinyl will work if the wall thickness is at least 1/8". If a copper line is run, place a silicone phosphate cartridge between the reverse osmosis filter and the copper pipe. This will prevent the purified water from leaching copper. Be sure to change the pre-filter cartridge on a routine annual basis. This will insure that the life of the expensive membrane is optimized.

Connect the purified water source (we suggest a reverse osmosis filter) to the Ø 3/8" barbed fitting on the humidifier's inlet solenoid. If the purified water is at high pressure, switch the barbed fitting with a compression fitting (see humidifier drawing).

#### Humidifier Maintenance:

Periodically check the unit for proper operation by removing the hose connections at the tops of the output pipes. The unit should produce a steady stream of mist from each pipe.

**Every 12 weeks, the exhibit should be checked for any moisture accumulation inside the cabinet, and mineral deposits inside the humidifier.**

1. Disconnect the humidifier wiring cable (multi-connector plug) from the electrical box to prevent either accidental filling or powering of the transducers.
2. If the unit needs to be removed for servicing, disconnect the water supply from the solenoid valve.
3. If the unit needs to be inverted to access the transducers or circuit boards, remove the screws that secure the unit to the floor.
4. The PVC top cover lifts out of the fog machine to inspect the sump, transducers and float switches.
5. The fog machine (humidifier) has switches for level control and "low water". The unit will automatically shut down when low on water. The switches are in the reservoir and should be manually checked with each routine maintenance. (However be careful not to power the transducers without water over them, this overloads the electronics.)
6. Clean inside the fog machine by absorbing dirty water with paper towels or a cloth. Wash all of the interior surfaces down with a sterilizing solution consisting of a tablespoon of liquid bleach in 1/2 liter of water. This will sterilize any bacterium that can become air borne during operation. Give the solution a few minutes to soak then carefully wipe the inside and transducers on the bottom of the tank. It is recommended to sterilize the humidifier and water tank four times a year.
7. If the tube that connects the fog machine to the water tank appears dirty, remove and clean the tube.
8. **Fill the tank with filtered water.**
9. Replace the PVC cover on the fog machine.
10. If the humidifier has a difficult time starting, check for air bubbles in the fill tube that connects the tank to the fog machine. Topping off the water tank should push the bubble through the tube. Jiggling the tube or sliding it off of one of its hose barbs can vent the bubble out if topping off the tank is inconvenient.

11. If the humidifier has poor output, even after cleaning, than one or more of the transducers may be bad. Transducers and boards are replaceable. Unplug the humidifier and remove the drain line. Remove the inlet hose from the water tank and plug it with a suitable object. Lift the humidifier from the base of the exhibit and drain it. First test the unit in a place that you can fill it with enough water to lift the float switches, and plug it in while observing the disc shaped transducers in the bottom of the reservoir. They should produce a stream that spurts over the top of the humidifier. Keep track of the discs that are not operating and proceed to the next step.
12. Find a suitable location to work on the humidifier assembly and remove the top cover to access the transducers. The transducers are bolted to the stainless steel plate in the bottom of the tank. Remove the two bolts that retain the transducer to replace the unit. DO NOT remove the fasteners in the corners of the plate since these seal the plate to the bottom of the plastic sump. DO NOT power up the circuit board with the piezoelectric transducers disconnected from the circuit board. This will destroy the power transistor on that board. Replace the bad transducers and boards, and reconnect the plumbing for another test. Remember, running the unit without water over the transducers will overload the electronics, so don't override the float switches, or plug it in while upside down.

As of October, 2002 have made a couple of changes that will make it easier to service and maintain the Cloud Rings Exhibit.

1. The water cabinet now has casters and also serves as the door to the exhibit. To hook up the exhibit for the first time, connect the clear plastic line at the bottom of the cabinet to the inlet on the Sonic Misty unit. (see manual) Plug in the electrical cords into the outlet boxes and make sure that no cords or hoses will block the cabinet from attaching to the exhibit. To Close the exhibit, insert the aluminum catch on the left of the water cabinet into the exhibit base and line up the two holes on the right of the cabinet with the two blocks on the outside of the base. Insert the two flathead screws into the holes and secure.  
This does not apply to units hooked up to a civic water source.
2. The Sonic Misty unit and the sump are mounted on a slide out tray for easy servicing. Remove the bolt and shipping clamp from the front of the gray PVC tray. Disconnect the hoses from the Sonic Misty and unscrew the tailpipe from the bottom of the dish. The tray should now slide out. Reverse this procedure to re-install

If you have any questions, please call Exploratorium Exhibit Services at (415) 353-0432