

# DIRC Water System Checklist

(for experts only)

## **1. What to do to start the system after the SOB was opened.**

### **1.1. SOB leak checking** (details are in DIRC note #120)

- 1.1.1. Make sure that HV on PM's is off
- 1.1.2. Remove "bird house" from SOB
- 1.1.3. Close all ports with blank flanges
- 1.1.4. Setup argon bottle, regulator, Oxisorb filter and rotameter
- 1.1.5. Use portable DAQ system to monitor SOB pressure
- 1.1.6. Connect the plumbing hardware with barometers
- 1.1.7. Set 100mb pressure in SOB relative to atmosphere
- 1.1.8. Monitor the pressure (2 days is a minimum)
- 1.1.9. The average pressure drop should be less than 1mb/hr
- 1.1.10. Leak check with the portable argon detector
- 1.1.11. Compare data with the previous leak check operations (see Fig.1).

### **1.2. SOB plumbing**

- 1.2.1. Make sure that HV on PM's is off.
- 1.2.2. Connect the "bird house" to SOB.
- 1.2.3. Install HEPA filter into the "bird house."
- 1.2.4. Connect all water pipes (4" dia., 2" dia., and two 1" dia.).
- 1.2.5. Visually check all connections.
- 1.2.6. Connect N<sub>2</sub> purge to "bird house" and the drain line.
- 1.2.7. Make sure that black cloth is properly installed over the "bird house."

## **2. What to do when starting water flow through the system**

### **2.1. Initial checks of the water system**

- 2.1.1. The system is described in Fig.2.
- 2.1.2. Check that "inlet" filters (three 10 $\mu$ , two 5 $\mu$ , one 1 $\mu$ ) are new.
- 2.1.3. Use this procedure to change the filters (recommended by the company):
  - 2.1.3.1. Turn of water supply to filter.
  - 2.1.3.2. Unscrew housing using spanner wrench.
  - 2.1.3.3. Remove used cartridge and discard. Rinse out housing and fill about 1/3 full with water. Add about 2 to 3 tablespoons of bleach and scrub thoroughly with brush or sponge. Rinse thoroughly.
  - 2.1.3.4. Remove O-ring/Gasket from sump and wipe groove and O-ring/Gasket back in place and press O-ring down into the groove with two fingers.
  - 2.1.3.5. Insert a new cartridge into the sump making sure that it slips down over the sump standpipe.
  - 2.1.3.6. Screw the sump onto the cap and hand tighten. DO NOT OVER-TIGHTEN. Make sure cartridge slips over the cap standpipe.
  - 2.1.3.7. Turn on the water supply slowly to allow housing to fill with water.
  - 2.1.3.8. Check for leaks before leaving installation.
- 2.1.4. Purge the "inlet" filters with water..
- 2.1.5. Check the system's filters (two 0.2 $\mu$ , two 1 $\mu$ , charcoal and RO filters).
- 2.1.6. Visually check all plumbing connections.

- 2.1.6. Check the vacuum pump status.
- 2.1.7. Check the status of the water dump system.

## **2.2. Actual procedure to start the water flow**

- 2.2.1. Shut off water flow meters.
- 2.2.2. Open the “inlet” valve and set the regulator.
- 2.2.3. Pressurize filter housing.
- 2.2.4. Pressurize charcoal filter.
- 2.2.5. Back flush charcoal filter.
- 2.2.6. Open valve leading to the Reverse Osmosis (RO) system.
- 2.2.7. Switch power to RO system. Set the RO unit to manual mode.
- 2.2.8. Adjust RO flow and RO membrane pressure as tank fills.
- 2.2.9. Start vacuum pump.
- 2.2.10. Adjust water flow to allow water into SOB at the rate of RO production.
- 2.2.11. Set the RO unit to auto mode.
- 2.2.12. When SOB is full, increase water flow to SOB.
- 2.2.13. System is now automatic.
- 2.2.14. Replace the “inlet” filters (see chapter 2.1.3.)
- 2.2.15. Flush the “inlet” filters with water.
- 2.2.16. Back flush charcoal filter.

## **2.3. Water quality test** (the test is done in trailer #233; see also DIRC note #55).

- 2.3.1. Use a 1 gal. glass container to take samples.
- 2.3.2. Rinse the container twice using the best water in the system.
- 2.3.3. Take sample and verify a good transmission at 442, 325 and 266nm.
- 2.3.3 Compare data with the previous measurements (see Fig.3).

# **3. What to do during the running the system**

## **3.1. Water system**

- 3.1.1. Monitor flows.
- 3.1.2. Monitor N<sub>2</sub> flow from gas rack to “bird house.”
- 3.1.3. Change “inlet” filters per hour meter on the RO (see chapter 2.1.3).
- 3.1.4. Monitor vacuum system.
- 3.1.5. Monitor water conductivity (MΩ/cm).

## **3.2. Water quality test** (once a week)

- 3.2.1. Use the Baker 1 gal. glass container to take samples.
- 3.2.2. Rinse the container twice using the best water in the system.
- 3.2.3. Take the “best water in the system” sample.
- 3.2.4. Measure transmission at 442, 325 and 266nm.
- 3.2.5. Compare data with the previous measurements.
- 3.2.6. Take a water sample from the SOB return.
- 3.2.7. Measure transmission at 442, 325 and 266nm.
- 3.2.8. Compare data with the previous measurements (see Fig.3).

# **4. What to do after the water dump**

## **4.1. Water system**

- 4.1.1. Find the reason for the dump.
- 4.1.1. Call LBL pager to consults about their electronics.

- 4.1.2. Pump water from the dump tank into the sanitary water drain.
- 4.1.5. Reset and arm the system.
- 4.1.6. If the dump is caused by a human error, proceed with the filling procedure.
- 4.1.7. If the dump is caused by valid fault condition, search for leaks around SOB.
- 4.1.8. If the SOB is not filled within 8 hours, start the drying process.

## **5. What to do during power outage**

### **5.1. Water system**

- 5.1.1. Check the status of dump electronics.
- 5.1.2. Check that N<sub>2</sub> gas flows.
- 5.1.3. Check the status of all valves.
- 5.1.4. Check the air pressure on air tank (we need at least 50psi pressure).
- 5.1.5. Reset water pump.
- 5.1.6. Check that vacuum pump is running.

## **6. What to do during the planned normal shutdown**

### **6.1. Water system**

- 6.1.1. Make sure that HV on PM's is off
- 6.1.2. Open bypass.
- 6.1.3. Close flow meters.
- 6.1.4. Leave the water system running in a local loop.

### **6.2. SOB**

- 6.2.1. Make sure that HV on PM's is off
- 6.2.2. Start air dryer, open to air.
- 6.2.3. Drain/dump SOB water.
- 6.2.4. Drain 4" dia. pipe via a 1/2" valve.
- 6.2.5. Remove pipe downstream of 4" dump valve.
- 6.2.6. Open 1" dia. valves.
- 6.2.7. Drain the last water from SOB.
- 6.2.8. Connect air dryer to the dump valve.
- 6.2.9. Remove 1" dia. hoses at water system end.
- 6.2.10. Make sure that air flows out of these hoses.

## **6A. What to do if a shutdown lasts only 1-4 weeks**

### **6A.1. Water system**

- 6A.1.1. Keep the system running through the SOB loop.
- 6A.1.2. Make daily checks (Control room might be deserted!).

### **6A.2. SOB**

- 6A.2.1. SOB is full of water at this point.
- 6A.2.2. Get access to the tunnel and check for leaks.

## **6B. What to do if a shutdown lasts 1-6 months**

### **6B.1. Water system**

- 6B.1.1. Keep the system running in a local loop.

6B.1.2. Make daily checks (Control room might be deserted!).

### **6B.2. SOB**

6B.2.1. Drain the water slowly and follow the procedure in 6.

6B.2.1. Dry SOB and all pipes.

## **6C. What to do during a shutdown lasting > 6 months**

### **6C.1. Water system**

6C.1.1. Dry the system according to the company's recommendation:

6C.1.1.1. Close feed water valve on the inlet of the carbon filter.

6C.1.1.2. Install a drain hose to, and then open, the 3/4" brass sample port valve located on the pipe downstream of the carbon filter and just before the FEED WATER port on the reverse osmosis system. Pressurized water will flow to drain. When the carbon filter is depressurized, continue to the next step.

6C.1.1.3. Compressed air or nitrogen can be used to remove the rest of the water from the carbon tank. Adapt the pressurized gas line to either the NPT female port just upstream of the carbon filter (located on the copper manifold behind the filter tank). Application of 10 - 15 psi Nitrogen or air will push the remaining water out of the carbon filter and through the open sample valve just upstream of the reverse osmosis system.

6C.1.1.4. Excess water can be removed from the reverse osmosis system by unscrewing (ccw) the blue filter housing visible through the front of the reverse osmosis unit. Dump the water from the filter housing and replace housing.

6C.1.1.5. Water can be removed from the booster pump by unscrewing the hose connector from the suction side (bottom) of the pump. Allow the water to drain from the pump housing. Reconnect the hose fitting hand-tight. This fitting should not be over-tightened. Finger tight is adequate.

6C.1.1.6. Water should not be removed from the membrane housings as the membranes need to remain moist.

6C.1.1.7. Using circulation pump included with system, pump water out of the system until the pump cuts off. Shut power off at disconnect switch on Deionized Water Distribution panel.

6C.1.1.8. Open Valve on bottom of 55-gallon tank to allow remaining water in tank to drain.

6C.1.1.9. Close ball valve on suction side of pump (located under water storage tank).

6C.1.1.10 We typically use compressed air or nitrogen from a regulated pressure source to expel as much water as possible from the piping and components as possible. A convenient gas injection location on your system is the by-pass tubing off of the pump discharge port. The 1/2" OD tubing can be removed at the tank lid compression fitting. You can then adapt your pressurized nitrogen line to the tubing. Alternatively, you may adapt to the 1/2" NPT female port for this by-pass tubing at the lower end of the 1/2" OD tube.

6C.1.1.11. Application of 10 - 15 psi nitrogen will push the water through the system and into the 55 gallon water storage tank.

6C.1.1.12. This water can be removed through the bottom tank drain. Additionally, any water that can not be removed from the tank through the drain can be vacuumed off of the bottom of the tank.

6C.1.1.13. In order to remove the water from the pump's suction piping, it is most convenient to remove the suction side ball valve by unscrewing the

union ends from the valve. Allow the water to drain. The pump housing can be drained by loosening the sanitary band clamp at the pump housing.

6C.1.1.14. Any additional water trapped in the piping system can be removed by venting at any of the sanitary flange joints or ball valve union connections. This should remove the majority of water from the system and leave the system suitable for temporary storage.

6C.1.2. Remove filters.

6C.1.3. Keep the system under purge with dry filtered air.

### **6C.2. SOB**

6C.2.1. Keep SOB under purge with dry filtered air.

## **10. List of experts**

<b>Name</b>	<b>SLAC ext.</b>	<b>Pager</b>	<b>Home number</b>
Bob Reif	2386	9-849-9499	9-949-0550
Matt McCulloch	3288	9-849-9626	9-1-494-8752
Don McShurley	2883	9-849-9576	9-1-(408)-252-8560
Tom Weber	4146	***	9-1-(408)-252-4674
Al Lu	2554	***	9-712-9227
Jerry Va'vra	2658, 2052	9-846-0631	9-846-0631
Blair Ratcliff	2722		9-851-8900
LBL page		510-448-4621	

### SOB leak checking in IR2, April 6-8, 1999

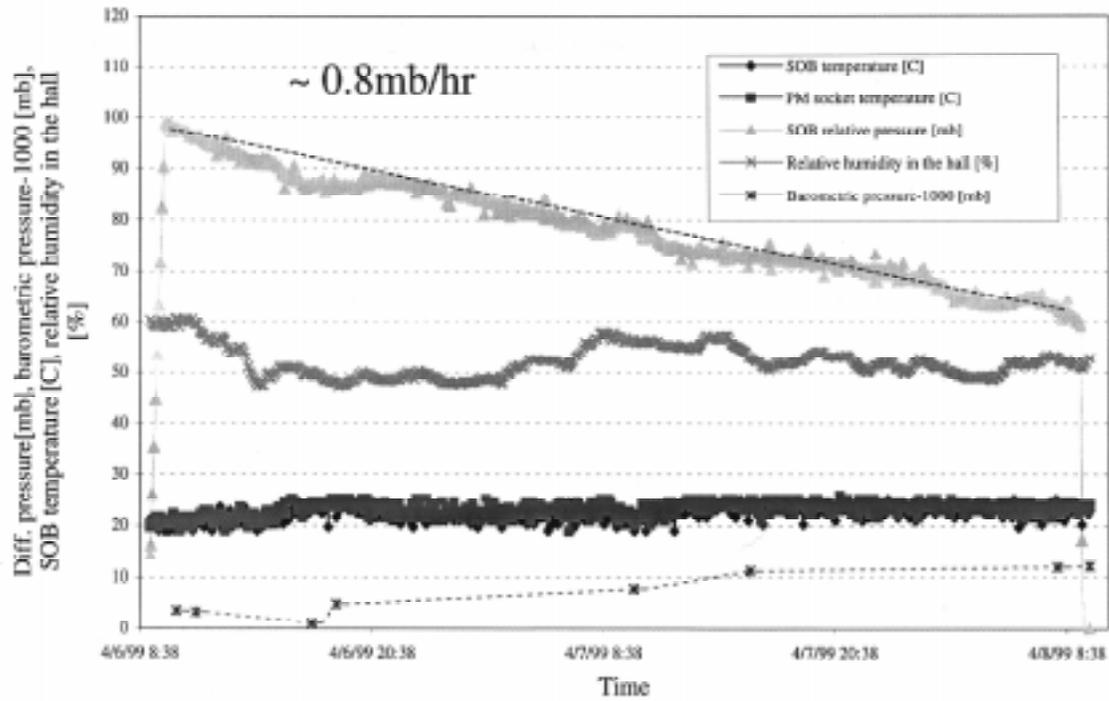


Fig.1

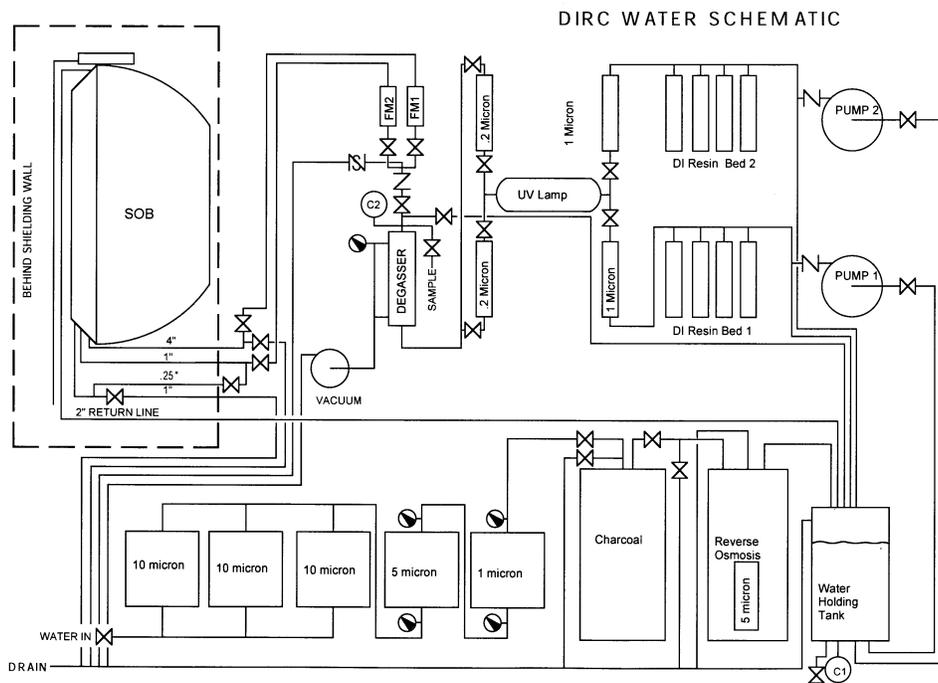


Fig.2

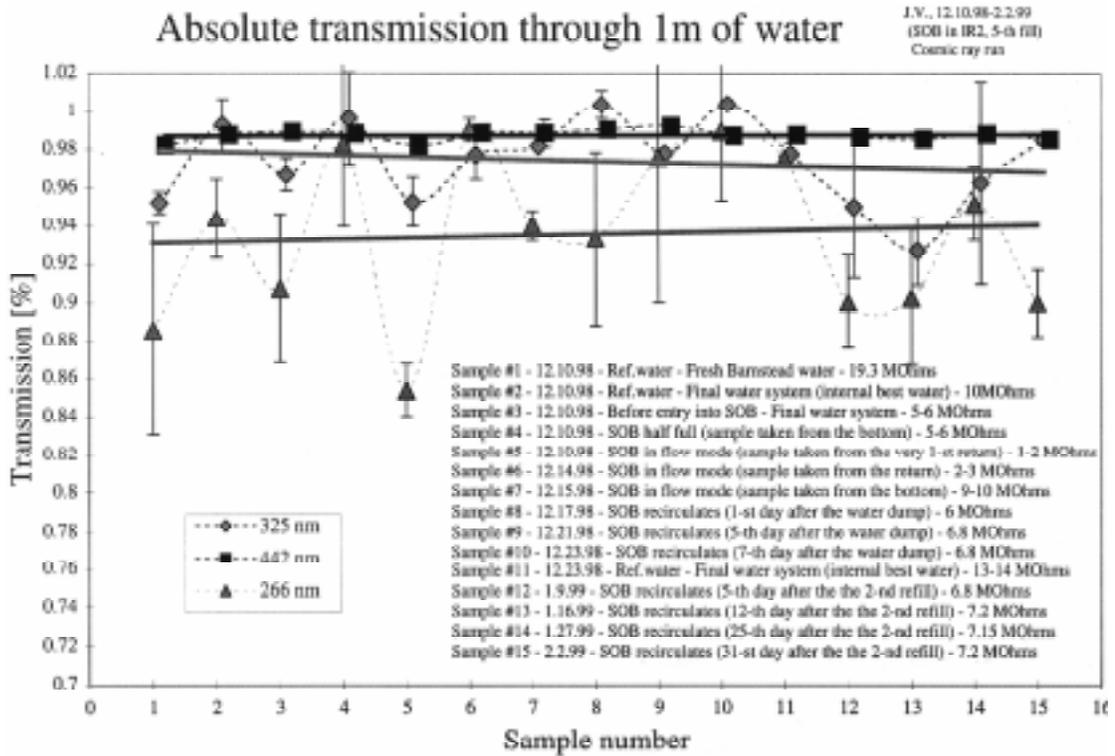


Fig.3