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TITLE: STANDARD OPERATING PROCEDURE FOR THE HYDRO 'PICOSYSTEM PLUS' ULTRAPURE WATER SYSTEM

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HYDRO 'PICOSYSTEM PLUS' ULTRAPURE WATER SYSTEM

TABLE OF CONTENTS

1.0 INTRODUCTION

An ultrapure and readily available supply of water is one of the most important facilities in a trace metal laboratory. This important reagent must be available in large volumes as it is used in every step of the analytical procedures from sample preparation to final analysis. Most often analyses in trace metal laboratory involve the measurement of metals at levels at or below a part per billion, thus it is crucial to have high quality water with no background levels of analytes of interest.

2.0 SYSTEM DESCRIPTION

The HYDRO 'PICOSYSTEM® PLUS' ultrapure water system is designed for tap water feed. It is installed in Dreyfus 193 (service room). It consists of two pre-filters (0.5 μm and 0.2 μm), an activated carbon bed, two mixed bed ion exchange resin tanks, a pump, an UV irradiation unit, an indicator light, a digital resistivity monitor, and three faucets.

The system consists of four primary purification steps. The coarse pre-filter is designed to remove particles larger than 0.5 μm and the fine pre-filter is to remove particles larger than 0.2 μm. The activated carbon tank is incorporated to remove organics and chlorine from the feed water. Two ion exchange resin tanks remove dissolved solids and other ionic species. Finally, the UV sterilizer unit is designed to destroy most water-borne pathogens.

The system is designed to deliver 18 MΩ, bacteria free water with total organic content less than 10 ppb and background levels of metals at parts per trillion range. The system is fully recirculating and capable of supplying high quality water continuously at a rate of 0.5 gallons per minute.

3.0 INSTRUCTION MANUAL

A copy of the instruction manual, "Picosystem® Plus/Recirculating Picotech®" is kept near the system along with a copy of general operating instructions.

4.0 SYSTEM INSTALLATION AND OPERATION

4.1 The system was installed by the manufacturer and brought to the stated specifications (the total organic content <10 ppb and the resistivity of water ≥18 MΩ). After installation the system was checked for leaks and for proper operation.

4.2 The system is designed for continuous recirculation and is operated 24 hours a day. When drawing water from the system, it is recommended that the faucet be opened and the water run for 10 to 20 seconds before collection. This procedure will eliminate collection of any retrograde contaminated water that may result from the retained water (non-recirculated) in the faucet.

4.3 The UV irradiation unit is included in the system to carry out sterilization of the purified water to provide bacteria free, ultrapure water. Users who require bacteria free, sterilized, ultrapure water should draw water from the faucet connected to the UV unit.

5.0 GENERAL OPERATING INSTRUCTIONS

5.1 The system is continuously recirculated and is operated 24 hours a day.

5.2 Check the resistivity monitor (located on the wall next to the water system) and make sure that the green indicator light is ON and the display reads 17.00 or higher (i.e. resistivity is 17 MΩ or above). If the red indicator light is ON or the display reads less than 17.00, notify the system custodian and the usage of water is not recommended in such a situation.

5.3 Open any of the three system faucets and let the water run for 10-20 seconds before collection.

5.4 If bacteria free, sterilized water is required, the use of the faucet connected to the UV unit is recommended. If the UV unit is not ON, turn the switch next to the UV unit (on the wall) ON and wait 10 seconds before drawing water from the faucet.

6.0 ROUTINE MAINTENANCE

6.1 Daily Maintenance

6.1.1 The system must be checked on a daily basis by the custodian or by lab personnel to make sure that the pump is in operation and the water is flowing (recirculating) through the system. This can be easily done by checking either the pressure gauge (located on the front panel of the pump) reading or the resistivity reading. If the pressure is above 40 psi and the resistivity is higher than 17 MΩ the pump is in operation and water is recirculating. If the pressure reading is below 40 psi, the pump should be switched off to avoid any damage to the pump and the problem reported to the system custodian.

6.1.2 The resistivity of the water must be monitored by the custodian or by lab personnel each working day and the value recorded in the system log book (an example is given in Table 1). The system custodian must be notified if the resistivity falls below 17 MΩ. The custodian is responsible for taking appropriate action to reestablish the water quality to 17 MΩ.

6.1.3 The indicator light between the two ion exchange tanks must be monitored daily. In the event the indicator light is off, the custodian must be notified.

6.2 Periodic Maintenance

6.2.1 The system should be serviced every six months by the manufacturer or manufacturer's representative. The service includes the following:

(a) Replacement of the 0.2 μm pre-filter, one ion exchange resin tank, the activated carbon tank and the UV bulb in the UV unit.

(b) Replacement the first ion exchange resin tank with the second one and moving the new one (fresh) in place of the second one.

(c) On-line analysis of total organic content (TOC).

(d) After service an acceptable water quality must be demonstrated as described in Section 4.1.

The system custodian is responsible for making appropriate arrangements with the manufacturer for service so that the down time of the system does not interfere with the normal laboratory operation.

6.2.2 The quartz water jacket inside the UV unit must be replaced annually by the manufacturer or manufacturer's representative. The system custodian is responsible for making necessary arrangements with the manufacturer for service.

7.0 NON-ROUTINE MAINTENANCE

Any malfunction of the system should be reported to the system custodian. The custodian is responsible for taking necessary corrective action to bring the system to proper operation. All problems pertaining to the system should also be reported to the laboratory supervisor.

8.0 CORRECTIVE ACTIONS

In the event of any malfunction or deviation from the documented performance, the following corrective actions are recommended.

- Check whether the feed water ball valve located above the coarse filter is OPEN. If not OPEN it.
- Check the pressure gauge reading. It should read 20-40 psi when the pump is OFF and 40-60 psi when it is ON. If it reads below 20 psi the feed water pressure is too low. Do not switch ON the pump.
- If the pressure is above 20 psi, switch on the pump. If the pump is working (should feel the vibration), the pressure should read 40-60 psi.
- With the pump in operation the indicator light should come ON. If the indicator light is OFF, the system needs service. The resistivity should increase gradually and stabilize above 17 MΩ. The system may need service if the resistivity is below 17 MΩ.
- Dirt build up on the filter(s) may result in high pressure (>55 psi) at the pump and/or lower flow rate at the point of use. Replacement of the coarse filter may correct the problem. The 5 µm filter will be replaced by lab personnel. The 0.2 µm filter will be replaced by a Hydro Service Representative.

9.0 DOCUMENTATION

A log book must be maintained for records regarding the HYDRO 'PICOSYSTEM® PLUS' ultrapure water system and kept in the laboratory where it is easily accessible to users.

All users of the system who draw large quantities (more than 2L) of water must make the following entries in the log book:

(a) Date of use

(b) Name of the user

(c) Quantity of water drawn

All maintenance operations (routine and non-routine) must be recorded in the maintenance section of the log book.

10.0 REFERENCES

1. Hydro Picosystem® Plus/Recirculating Picotech® Manual.
2. Hydro HRPM Pump System Manual.
3. Myron L Resistivity Monitor User Manual.

TABLE 1. HYDRO 'PICOSYSTEM® PLUS' DEIONIZE SYSTEM
DAILY MAINTENANCE LOG

Date	Indicator light		Resistivity Reading (MΩ)	Initial
05/02/94	☐ ON	☐ OFF		
05/03/94	☐ ON	☐ OFF		
05/04/94	☐ ON	☐ OFF		
05/05/94	☐ ON	☐ OFF		
05/06/94	☐ ON	☐ OFF		
05/09/94	☐ ON	☐ OFF		
05/10/94	☐ ON	☐ OFF		
05/11/94	☐ ON	☐ OFF		
05/12/94	☐ ON	☐ OFF		
05/13/94	☐ ON	☐ OFF		
05/16/94	☐ ON	☐ OFF		
05/17/94	☐ ON	☐ OFF		
05/18/94	☐ ON	☐ OFF		
05/19/94	☐ ON	☐ OFF		
05/20/94	☐ ON	☐ OFF		
05/23/94	☐ ON	☐ OFF		
05/24/94	☐ ON	☐ OFF		
05/25/94	☐ ON	☐ OFF		
05/26/94	☐ ON	☐ OFF		
05/27/94	☐ ON	☐ OFF		
05/30/94	☐ ON	☐ OFF		
05/31/94	☐ ON	☐ OFF		