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Gravity Probe B Relativity Mission

SPHERICAL SUBSTRATE

CLEANING SYSTEM PROCEDURE

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PROCEDURE

1.0 SCOPE: This procedure describes the basic operation of the INTERLAB Model MRS/1351 Spherical Substrate Cleaning system used for bare quartz rotor cleaning and other critical cleaning applications. This procedure provides instructions on system turn on, basic system operation and system shutdown. For cleaning of specific parts, additional specific cleaning procedures are required.

2.0 SAFETY PRECAUTIONS: This system is intended for use with aqueous detergent solutions and DI water only. No flammable or non-flammable solvents should be used. This bench does not provide fume exhaust, all air flow is returned to the room, the exhaust flow interlock has been bypassed. No regulated hazardous materials are to be used at this bench.

This bench contains a number of high power heaters, including 2 x 7 KW DI water heaters and a 5.2 KW air heater. There is a risk of fire associated with these heaters, if any unusual conditions occur, such as over temperature conditions, the system must be shutdown until complete repair and safety checkout has been performed.

CAUTION: There are a number of hot surfaces and liquids associated with this bench, use caution to prevent burns.

When working at this bench, safety glasses or a face shield is required.

3.0 EQUIPMENT: INTERLAB MRS/1351 Spherical Substrate Cleaning System.

4.0 MATERIALS: MICRO@ Detergent.

5.0 START UP:

5.1 Bench START UP;

1. Check for leaks and/or water in drip pan. Seal any leaks and dry drip pan.
2. Turn on DI water source valve, located next to General Purpose Solvent Hood.
3. Verify that high pressure air is turned on and set for 60 psi.
4. Verify that nitrogen is turned on and set for 45 psi.
5. Turn on SAFETY circuit breaker, located in electrical control box overhead in the laminar flow enclosure. Use 1" diameter Plexiglas rod to actuate breaker. CM-87E exhaust monitor alarm should sound and the FAULT led illuminate. Press alarm reset to clear alarm, the NORMAL led should illuminate. Exhaust monitor CM-87E is located in overhead control panel at far left hand end.
6. Turn on MAIN breaker in overhead electrical control box, using Plexiglas rod. If breaker trips or will not reset, check SAFETY breaker. If SAFETY breaker is OK, and MAIN breaker still will not reset, have system checked out by engineer, qualified electrician, or manufacturer.
7. Turn on SUB breaker in overhead electrical control box, using Plexiglas rod.
8. Turn on HOOD breaker in overhead electrical control box, using Plexiglas rod. HEPA blower and lights should come on.
9. Turn on MISC. breaker in overhead electrical control box, using Plexiglas rod.

5.2 DI Circulation System

1. Check to see that DI reservoir is full.
2. Turn on DI circulation pump, verify flow rate of 1.75-2.00 gpm on behind left hand lower sliding panel.
3. Turn on MM-13 Resistivity Monitor to CHECK and verify that meter reads 15 Megohm. Set meter to BLACK scale and read resistivity. Resistivity should be above 1 Megohm and slowly rise above 7 Megohm.

5.3 Setup Ultrasonic

1. Fill ultrasonic tank with DI water. Be sure yellow handled drain ball valve is closed. Open manual inlet valve and observe tank level. When water level rises to within 1/2" of weir, close inlet valve. Add 150 ml of MICRO@ detergent to tank.
2. Turn on Ultrasonic Tank temperature controller, CM-64 located second from left in overhead control panel. Press SETPOINT to verify setpoint of 50 C. Release SETPOINT and observe display, CYCLE led should come on and temperature should begin rising. Tank and solution will take about 20 minutes to reach temperature.
3. Turn on Ultrasonic Tank recirculation pump, located in CM-94C. Make sure tank level is within 1/2" of top of weir.

5.4 Dump Rinser Setup

1. Turn on Dump Rinser Controller, single digit display should light and show 0.
2. Verify settings of toggle switches

Thumbwheel Switch	2 Cycles
Cycle-End Switch	Full
Spray Switch	OFF
Flush Switch	OFF
Resistivity	OFF

5.5 Hot Air Dryer Setup

1. Turn on Dryer breaker located in overhead electrical control box.
2. Turn on Hot Air Dryer, MD-14, SAFETY breaker, located on dryer electrical box behind right hand lower sliding panel. Then turn on dryer main breaker. Press reset. After a few seconds the AIR FLOW NORMAL led will light. Verify that WALL TEMPERATURE is set to 100 C.
3. Press POWER switch in CM-64 Digital Readout and Temperature Control at right hand end of overhead control panel. Alarm will sound, press reset.
4. Press SETPOINT and verify setpoint of 100 C. Release SETPOINT switch. Cycle led should illuminate and temperature should begin rising.

Allow system to come to operating temperatures and resistivity of DI water. Approximately 30 minutes will be enough time. The system is now ready for parts cleaning.

5.6 DI water heater START UP;

The DI water heater should be on only while cleaning is actually being done.

1. Verify that DI circulation pump is operating, the DI reservoir is full and that there are no air bubbles in the water.
2. Verify that the CM-68K Digital Temperature Readout and Heater ON/OFF is off.
3. Turn on both DI HEATER breakers located in the overhead electrical control box using the Plexiglas rod.
4. Verify that the DI circulation flow rate is between 1.75 and 2.00 gpm.
5. Turn on CM-68K Digital Temperature Readout and Heater ON/OFF. Temperature readout should illuminate and water temperature should begin to rise. Typical temperature range is 50 C to 60 C. If temperature rises above 60 C verify water flow rate of 1.75 - 2.00 gpm.

6.0 OPERATION:

6.1 Ultrasonics Operation;

1. Place part with and fixture on tray in ultrasonic tank. Center as best possible.
2. Start agitation. Speed should be set to about 35 on dial located in overhead electrical control box.
3. Start ultrasonics. Note, the circulation motor will stop while ultrasonics is operating.
4. Manually time ultrasonics operation. Typical cleaning times should not exceed 5 minutes. Be careful not to damage parts by cavitation due to excessive cleaning times. Follow specific part cleaning instructions where appropriate.
5. Remove part and fixture.

6.2 Dump Rinser Operation;

1. Place part in fixture on tray in bottom of dump rinser.
2. Press START on CM-78C dump rinser controller.
3. When CYCLE indicator has counted down to 0 the part is rinsed.
4. Press RESET to silence alarm and return dump rinser to ready status.
5. Remove part and fixture.

6.3 Hot Overflow Operation;

1. Be sure part and fixture have been thoroughly rinsed in dump rinser prior to hot overflow rinsing.
2. Note resistivity indication on resistivity monitor sensor #1. Reading should be $\geq$ 7 Megohm.
3. Place part and fixture in overflow rinse tank.
4. Rinse for 5 minutes.
5. Observe resistivity monitor sensor #1, reading should be $\geq$ 7 Megohm. If not, continue rinsing for another 5 minutes.
6. Slowly remove part and fixture from overflow tank allowing as much water as possible to drain off. Tilt slightly to drain water off horizontal surfaces.

6.4 Hot Air Drier Operation;

1. Remove cover from hot air drier tank.
2. Place part and fixture on screen at bottom of tank.
3. Replace cover on hot air drier tank.
4. Allow at least 5 minutes for part to dry. Follow specific part cleaning instructions where appropriate. Simple parts, with smooth surfaces should dry in about 5 minutes. Parts with cavities, horizontal surfaces or blind holes will take longer to dry. Critical surfaces should be oriented vertically if possible. Large parts, or parts with high thermal mass may take longer to dry.
5. When part and fixture are completely dry, remove slowly.
6. Replace cover on hot air drier tank.

7.0 SHUTDOWN:

7.1 DI water heater shutdown;

The DI water heaters should be shutdown whenever they are not actually being used for cleaning.

1. Turn Off CM-68K Digital Temperature Readout and Heater ON/OFF.
2. Turn Off both DI HEATER breakers in overhead electrical control box.

7.2 Standby Mode;

This mode is intended for periods of 1-8 hours when cleaning will not actually be performed, but use is planned for the same day.

1. Be sure all fixtures and parts have been removed from the tanks.
2. Be sure all tank covers are in place.
3. Turn OFF hot air drier CM-64 Temperature control and readout.
4. Turn OFF CM-68K Digital Temperature Readout and Heater ON/OFF for DI Water.
5. Adjust Ultrasonic Temperature SETPOINT to 40 C.
6. Turn OFF Ultrasonic recirculation pump.
7. Turn OFF DI circulation pump.

7.3 Overnight Shutdown;

This mode is intended for periods of less than 36 hours when cleaning is planned or likely.

1. Verify that system is in STANDBY mode.
2. Turn OFF hot air drier circuit breakers located in hot air drier control box behind lower right hand sliding panel.
3. Turn OFF Ultrasonic CM-64 Digital Temperature and Control Readout.
4. Turn OFF Dump Rinser Control CM-78K.
5. Verify that DI HEATER breakers in overhead electrical control box are OFF.
6. Turn OFF DI circulation pump.
7. Turn OFF Resistivity Monitor.
8. Close DI supply valve.
9. Close Nitrogen supply valve.
10. Close High Pressure Air supply valve.

7.4 Weekend Shutdown;

This mode is to be used at the end of each week, unless Saturday work will occur.

1. Verify that system is in STANDBY mode.
2. Turn OFF Ultrasonic CM-64 Digital Temperature Control and Readout.
3. Drain ultrasonic tank by opening yellow handled ball drain valve. Use cold DI spray to rinse tank.
4. Close ultrasonic drain valve and fill tank.
5. Turn ON ultrasonic CM-64 and run recirculation pump for 2 minutes, then turn off recirculation pump.
6. Repeat steps 2, 3, 4 and 5.
7. Repeat steps 2, 3, 4 and 5 again.
8. Turn OFF Ultrasonic CM-64 Digital Temperature Control and Readout. Leave tank full of clean DI water.
9. Verify that Overnight Shutdown has been completed.
10. Turn OFF the following overhead electrical control box breakers in the following order.
    a. Hot Air Drier.
    b. Misc.
    c. Hood.
    d. Sub. Breaker.