



Chapter [2.2]

Msink2 Metal contaminated PR Strip Sink***(msink2)******(382)*****1.0 Equipment Purpose**

- 1.1 Msink2 provides heated 1165 photoresist strip baths and a SVC-14 pre-furnace metal clean bath for cleaning metal layers. There is also one DI water quick dump rinse (QDR) available in this sink, a limited amount of space for beaker work, and an automatic glove wash.
- 1.2 Msink2 is considered a metal-contaminated sink, and is used for samples with gold or other highly mobile ions which may not be processed at many other sinks. Once samples are processed at this sink, they may not continue to processing at msink1, msink6, msink7, msink8, or many other tools in the NanoLab.

2.0 Material Controls & Compatibility

- 2.1 This sink is considered a metal-processing sink for gold (Au), silver (Ag), sodium (Na), potassium (K), and highly mobile ions.
 - 2.1.1 Once wafers are processed here, there are many restrictions to where they may proceed to. Msinks 1, 6, 7, 8, 14 and most furnaces are strictly prohibited. Please consult with process staff if you have any questions.
- 2.2 This sink is for solvent and developer work.
 - 2.2.1 Developers with a low concentration (2-3%) of TMAH are allowed at this sink.
 - 2.2.2 Highly concentrated (25%) TMAH (Tetramethylammonium hydroxide) is strictly prohibited at msink1, 2, and 3. TMAH work should only be used at msink4.
 - 2.2.3 Please consult process staff before doing any beaker-scale work at this sink to discuss disposal procedures.
- 2.3 Acids, including etchants and hydrogen peroxide (H_2O_2), are strictly prohibited at msink2.
- 2.4 Liftoff processes, electroplating, cool grease, and crystal bond are not permitted at this sink including in any of the heated baths.
- 2.5 No photoresist stripping is permitted in the SVC-14 bath.
- 2.6 Only the cassettes and handles intended for this sink are allowed here. They are all scribed, and described in later sections. If you cannot find your cassette, you may not borrow from another sink. There should be both 4" and 6" cassettes for this sink.

3.0 Training Procedure & Applicable Documents

- 3.1 Exam Tool
 - 3.1.1 This tool requires an online exam before qualification.
 - 3.1.2 Timeline (estimated time to completion: 1 week)
 - 3.1.2.1 Get trained by any qualified member.

- 3.1.2.2 Take the online test in the Nanolab office (open 8A-12P, 1P-5P). The msink1, 2, and 3 tests are combined together.
- 3.1.2.3 Arrange a qualification session with a superuser to show competency on the tool. The msinks 1, 2, and 3 tests are combined together for qualification - please be familiar with all the sinks when you arrange a qualification session.
- 3.1.2.4 Note that sinkclass is a prerequisite for qualification on all sinks.
- 3.1.3 Superusers and staff qualify members on this tool.
- 3.1.4 [Chapter 2.01](#) - Sink Summary
- 3.1.5 [Process Chapter 2.1](#) - Chemical/Labwear Guidelines
- 3.1.6 [Process Chapter 2.5](#) - Photoresist Stripping

4.0 **Definitions & Process Terminology**

- 4.1 Quick dump rinse (QDR): DI water fills the sink followed by a quick dump to get rid of excess acid and/or contaminants. Resistivity must be >10 Mega ohm-cm for this step to be complete. [Chemical/Labware Guidelines](#)
- 4.2 Spin Rinse Dryer (SRD): DI rinse followed by dry cycle.
- 4.3 Tank: These are available to do large batches of chemical processing but cannot be heated up; available for room temperature only.
- 4.4 Bath: These are available for heated batch chemical work.
- 4.5 Exhaust alarm: This alarm shuts off power to the sink when the sink exhaust falls level falls below a certain limit (currently set at 0.8 inches of water; full scale is 1).
- 4.6 DI: De-ionized water used for clean processes with a resistivity of ~18 Mega Ohm-cm.
- 4.7 IPA: 2-propanol, or isopropyl alcohol. Available at certain sinks and around the lab in yellow-topped squeeze bottles.

5.0 **Safety**

- 5.1 Follow general safety guidelines for the lab; the safety rules outlined in [Chapter 1.01 - Marvell NanoLab Chemical Hygiene Plan](#) and the following:
- 5.2 The following **Personal Protective Equipment (PPE)** must be worn at all times while operating this sink:
 - 5.2.1 Chemical-resistant apron, face shield, and chemical-resistant gloves (either tan triopolymer multi-use or green single use ones) (chem) gloves.
 - 5.2.2 Tan chem gloves can be purchased at the Nanolab Office (open 8A-12P, 1P-5P). During off hours, you may checkout gloves from the plastic box in the gowning room. Please only do this if the office is closed, or the supply may not last through the weekend. Green gloves are available near sinks throughout the lab.

- 5.2.3 Chem gloves must always be the last thing on, and first thing off, so you do not accidentally leave residue chemical anywhere that another lab member may touch without proper safety gear (i.e. phones, doorknobs, table tops, etc.).
- 5.2.4 Chem gloves should be inspected for holes before each use, and multi-use gloves replaced regularly even if they appear to be in acceptable condition.
- 5.2.5 Lab members may purchase their own chemical aprons and faceshields. These can be stored in ziploc bags on the designated storage areas of the gowning room (shelves 12-4 and 12-5) or the metal rack in 391.
- 5.3 Closest Safety Showers are located in bays 383 and 385 near the windows.
- 5.4 This sink contains heated 1165 and SVC-14 PR strippers with flash points specified in the material data sheet. Do not adjust the heater controllers as they have been preset to produce proper temperatures for these chemical solutions currently at 80 °C.
 - 5.4.1 Changing the temperature is potentially a fire hazard due to the flash point of these chemicals.
- 5.5 Do not drain the heated baths. This is a staff-only job, and these chemicals must not go down the drain. Instead, they are collected in carboys and sent to EH&S for safe processing.
 - 5.5.1 If issues arise with one of these baths, ask staff to evaluate and replenish the chemicals if deemed necessary.
- 5.6 Only use the white Teflon® 25-slot chemically resistant cassettes with locking handles or special metal baskets provided at this sink. Please do a “shake test” after loading your wafers to make sure that you attached the handle correctly. Do not use these at any other sink.
- 5.7 **EPO** red button: Cuts power to the sink in emergencies. Report promptly on as problem on Mercury Client.
- 5.8 The de-ionized (DI) water deck hose for the sinks is **ALWAYS** available for emergencies; it provides a good safety backup in the event of exposure to chemicals.
- 5.9 **No hot plates** to heat any solvent or soft baking photoresist and/or curing of polymers are allowed at this sink. Use bake oven/hot plates in this bay for such purposes.
- 5.10 **No acid** allowed at this sink.
- 5.11 Use of 25% TMAH is prohibited at msink1/2/3. The only NanoLab sink where this is allowed is msink4.
- 5.12 Dwyer Photohelic Exhaust Flow Meter: Monitors the sink exhaust flow and will shut down all electricity and water to the sink if there is too much or too little flow. An alarm will sound; press the “silence” button and attempt to power back on. If continued alarm, promptly report as a Fault on Mercury.
- 5.13 Msink2 has an integrated fire suppression system which is tied to the lab and building-wide fire alarm system. Activation of the fire suppression system releases large volumes of CO₂ directly at the heated baths and deck area of the sink. Activation of the fire suppression system will also initiate the lab and building-wide fire alarm system. Immediately evacuate the lab after activation of the Msink2 integrated fire suppression system and notify others around you to do so as well.
- 5.14 Always leave a process ID tag on on-going work indicating your name, membername, date, time, and chemical (even if it's water).

6.0 **Process Datad**

6.1 This tool has not been characterized by staff

7.0 **Available Processes, Gases, Materials. Process Notes**

7.1 This sink contains 3 heated baths (two 1165 baths and a SVC-14 metal clean). Additionally, there is an automated glove wash and a very limited amount of space for beaker-scale work.

Bath	Chemical	Time	Temperature
Right Heated Bath	Pre-Furnace Clean	10 min.	80°C
Center Heated Bath	1165 (msink2 wafers and cassettes)	<8 hours	80°C
Left Heated Bath	1165 (empty oven cassettes)	10-30 min	80°C

7.2 <http://microchem.com/products/images/uploads/Remover-1165-DataSheet-RH.pdf>

7.2.1 There are two 1165 remover baths. The LEFT side is for cleaning photoresist off empty oven cassettes, which should generally take 10-30 min. The center bath (right side 1165) is for stripping photoresist off wafers in msink2 cassettes and should be used for 8 hours or less. Please do NOT mix up these baths.

7.2.2 Use the white Teflon cassettes and handles in the yellow bin on top of the sink. They can be scribed any of the following: "Msink2 metals", or "Au 2 contaminated". These teflon cassettes can be used for the RIGHT side 1165 or SVC-14 at msink2. You may never use the msink1 cassettes at this sink (or vice versa).

7.2.3 1165 remover is an NMP-based remover, excellent for removing many kinds of photoresists.

7.2.4 Due to infrequent usage, the baths are often left at room temperature to prevent evaporation when not in use. Lab members may press "Hold" to turn on the heater to set it to it's preset temperature of 80°C. Lab members may never change the temperature setpoint. When you are done processing your wafers, please press "hold" to turn off the heater to prevent evaporation.

7.2.5 After placing your wafers in the 1165 for the desired amount of time, they should then go in the QDR followed by the SRD (section 8). They can remain in the same cassette the entire time, though the handle gets removed after the QDR step.

7.2.6 Wafers that have gone through a UV Bake step (such as axcelis) are not allowed in these baths. These have been shown to cause photoresist "stringers" in the bath. To remove photoresist that has gone through a UV bake step, you may either use a beaker of 1165 or matrix.

7.3 **SVC-14 metal clean:**

7.3.1 This is a pre-furnace metal clean step. Please note that there are strict limitations to furnaces after msink2 processing. Please consult with process staff for any questions.

7.3.2 Since this is a pre-furnace clean, you also must wear polyethylene ("poly") gloves during this process, in addition to all safety gear.

7.3.3 The bath is set to 80°C. Lab members may never change the temperature.

7.3.4 Use the white Teflon cassettes and handles in the yellow bin on top of the sink. They can be scribed any of the following: "Msink2 metals", or "Au 2 contaminated". These teflon cassettes can be used for either 1165 or SVC-14 at msink2. You may never use the msink1 cassettes at this sink (or vice versa).

7.3.5

7.4 Beaker work:

7.4.1 The chemicals stored under the sink are available for beaker level work. If you cannot find your chemical under msink2, you may look under msink1 and msink3 - all chemicals at these sinks are available for use at any sink.

7.4.1.1 The following chemicals are kept under msink1/2/3: SVC-14, 1165 remover, acetone, IPA, methanol, n-amyl acetate, PCS 605, PRS-3000, SU-8 developer, AZ 400K (1:4), MIBK/IPA, OCG 934, OPD 4262, and MF-26A

7.4.2 You must always finish a bottle before starting a new one, and you must always wash a finished bottles (Section 8.3).

7.4.2.1 NEVER leave empty bottles or multiple started bottles at the sink.

7.4.3 If all bottles of your chemical are used up under msink1/2/3, please see the following locations for backup stock. Use a bottle carrier to carry the bottle to the sinks, and store partially used bottles under the sink.

7.4.3.1 381-C2: This cabinet has SVC-14, 1165 remover, acetone, PRS-3000, SU-8 developer, AZ 400K (1:4), MIBK/IPA, OCG 934, OPD 4262, and MF-26A.

7.4.3.2 CPD sink: Under the CPD sink in 382 is backup IPA and methanol

7.5 Special Chemicals: While the NanoLab supplies many chemicals for lab members to use, there may be some for your project that are not stocked. In this case, you may bring in these special chemicals by following the procedure outlined in the Chemical Hygiene Plan, section 5.1, namely the following steps:

7.5.1 Before bringing in a special chemical, you must have approval from the NanoLab safety officer or process staff.

7.5.2 All special chemicals must have a label printed in the NanoLab that defines where the chemical is stored and how it is disposed of.

7.6 The use of acids, acid etchants, hydrogen peroxide (H₂O₂), and plating baths is strictly prohibited at msink2.

7.7 Use of 25% TMAH is prohibited at msink1/2/3, and should only be used at msink4.

7.8 Soft baking of photoresist and other use of hot plates are not allowed at this sink.

7.9 Liftoff processes are not allowed at this sinks in any of the heated baths (SVC-14 metal clean and the 1165 photoresist strippers). These should be done in the ASAP Liftoff tool or in msink16 or Msink18 instead.

7.10 If your wafer box has seen wafers with gold or highly mobile ions, you may use the msink2 QDR to rinse it out to clean it from particulates. Note that you would then be restricted from using this wafer box for wafers to go to other areas of the lab that are generally restricted with msink2 usage.

8.0 Equipment Operation

8.1 Waste Disposal

8.1.1 Water miscible solvents and bases may be aspirated. This includes the following:

8.1.1.1 Acetone and IPA without photoresist mixed in

8.1.2 Water immiscible solvents and organic waste must be disposed of in the organic waste bottle, including the following:

8.1.2.1 Any form of photoresist, including acetone or IPA mixed with photoresist

8.1.2.2 Water immiscible solvents such as 1165 remover and PRS-3000

8.1.2.3 Certain developers, including SU-8 developer and MIBK.

8.1.2.4 Please contact process staff if you will be doing beaker-level work with any of these chemicals at msink2.

8.2 To rinse empty bottle in bottle wash: Carry the empty bottle to the bottlewash in 397 using a secondary containment carrier. Wear the safety gear supplied there. Take off the cap to the empty bottle, and place the bottle upside down on the water spout. Close the lid. Press the green button which cycles water for one minute. Draw an X on the label, and place in the blue recycle bin (either glass or plastic).

8.3 Control Panel

8.3.1 The buttons along the front panel are used to control the EPO, power on, power off, alarm silence and alarm reset functions of the sink (see [Figure 3](#)). The following describes their use.

8.3.2 SILENCE: press to silence an alarm.

8.3.3 STATIC BATH DRAIN 1 and 2: switch to drain for manual developer tanks 1 or 2.

8.3.4 Timers are available for both ambient tanks ([Figure 5](#)). Use the up/down arrows to set time, press START to run, or STOP/RESET to clear display.

8.3.5 To drain a bath into a carboy, the toggle switch on the right must be pushed DOWN to "plenum" (not up to "spigot").

8.4 Quick Dump Rinse and Spin Rinse Dry (QDR/SRD) Operation

8.4.1 Slowly lift the wafers, letting the residual acid drip into the bath. Place into the QDR and run until the resistivity is >10 Mega ohm-cm (about four cycles).

8.4.1.1 If the QDR is empty, hit "stop/reset", then "start"

8.4.1.2 If the QDR is full, hit "open", then "stop/reset", then "start"

8.4.2 Remove the wafers from the QDR. Remove the handle. Place the cassette into the SRD (either 4" or 6") until resistivity is > 12 Mega ohm -cm. The H-Bar should face in.

8.4.3 Wafers may only go into the msink2 SRD. If this is not working, you may NOT use the msink1 or any other SRDs.

8.5 Hot Bath Controller Operation

8.5.1 Draining Chemicals in MSINK2 is handled by process staff only. Control Panel Programs are shown in the Appendix. The parameter codes for the programs on the MPC-100 temperature controllers are listed in Tables [1](#) and [2](#). The parameter codes are not to be altered by labmembers; please only use them as your reference check.

8.5.2 Place your wafers in the desired bath. If you are cleaning photoresist off empty oven

cassettes, use the LEFT side 1165 bath. If you are cleaning wafers in msink2 cassettes, use the RIGHT side 1165 bath, or the metal cleaning bath.

- 8.5.3** Press time/start button to start the strip process cycle with the preset time and temperature (optional).
- 8.5.4** When your strip/clean cycle is completed after the preset time, hit the TIME STOP/RESET button to reset the timer alarm.
- 8.5.5** Remove your wafers and rinse in the quick dump rinse station.
- 8.5.6** Adding Chemicals in MSINK2: lab members are allowed to add more 1165 to the baths when the **L Level** warning indicator light is on. Bottles are located under the sink.

9.0 Troubleshooting Guidelines

- 9.1** Rinse cycle stopped in the middle QDR cycles: press open to dump the water out. Press stop/reset key followed by restart the dump rinse cycle from the start.
- 9.2** Power to system is off: Press power ON if no issues have been reported on the Mercury or if the system is not under technician's control.
- 9.3** Photohelic Differential Pressure Reading ([Figure 7](#)) is outside defined limits (two red bars): Consult with staff to check house exhaust pressure.
- 9.4** I can't find the cassette I want. Can I use a cassette for a different bath or sink?
 - 9.4.1** NO! Never. Report the problem.
- 9.5** I am all out of the chemical that I need. What should I do?
 - 9.5.1** First: Pull out the storage bin. Check if there is another bottle of your chemical in it.
 - 9.5.2** Second: Check the bins under msink2 and msink3 as well. Even if you are only qualified on msink1, you can get a chemical from any of these sinks.
 - 9.5.3** Third: If that chemical is out from all sinks, you may bring a bottle over from the following locations:
 - 9.5.3.1** 381-C2: This cabinet has SVC-14, 1165 remover, acetone, PRS-3000, SU-8 developer, AZ 400K (1:4), MIBK/IPA, OCG 934, OPD 4262, and MF-26A
 - 9.5.3.2** CPD sink: Under the CPD sink in 382 is backup IPA and methanol
 - 9.5.4** Fourth: If all of those locations are out of the chemical as well, report the problem on Mercury.
- 9.6** My labware is wet. Where should I dry it?
 - 9.6.1** **Drystation1:** lab glassware drying station. Place your washed/wet glassware on the tray directly underneath the **"STA-HOT"** infrared lamp. Toggle the **"ON"** switch to the **UP** position. Turn the timer clockwise to 60, then back to the desired time for drying your glassware. When the time is up, wait for 5 minutes for the glassware to cool down. A **"hot hand"** is provided for your safety. Remove your dry glassware and store it away. Make sure your glassware is labeled with your name and/or login.

10.0 Study Guide

- 10.1** To be updated

11.0 Appendices, Figures & Schematics

1. Glassware (and teflon beakers) can be stored in the communal glassware cabinets. On the third floor, this is at the window area between bays 380 and 382, and on the 5th floor it is in 591 near 591-C1. Cabinets must never overflow- the doors must always be able to fully close. Glassware must have a current member's name on it - not a former member or a group name. Otherwise, it may be purged.

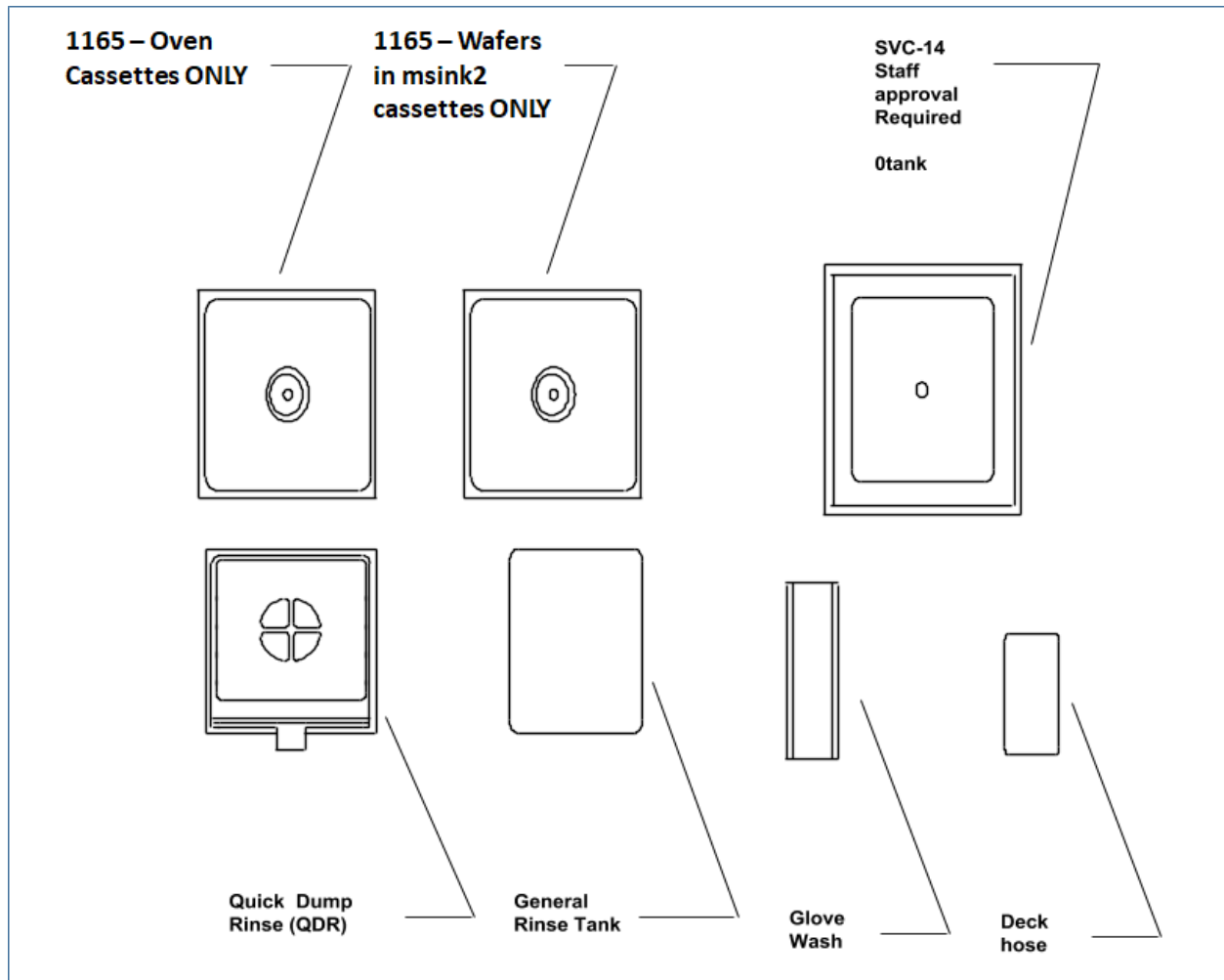


Figure 1 - Msink2 Top View Schematic

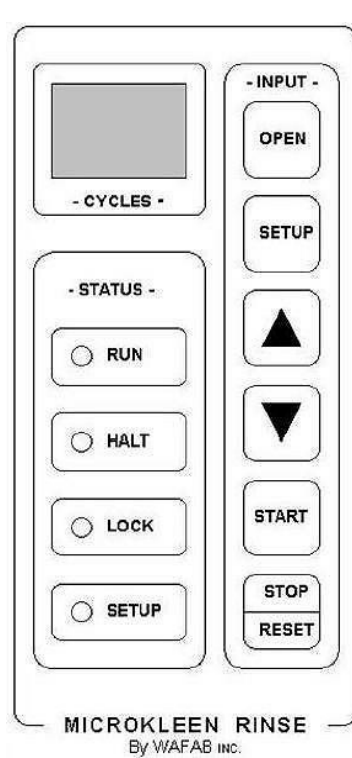


Figure 2 - Quick Dump Rinse (QDR) Controller

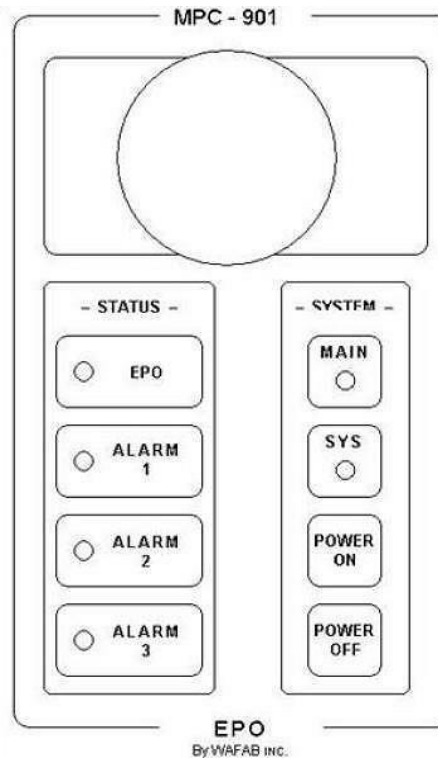


Figure 3 - MPC-901 Emergency Off and Alarm Controller

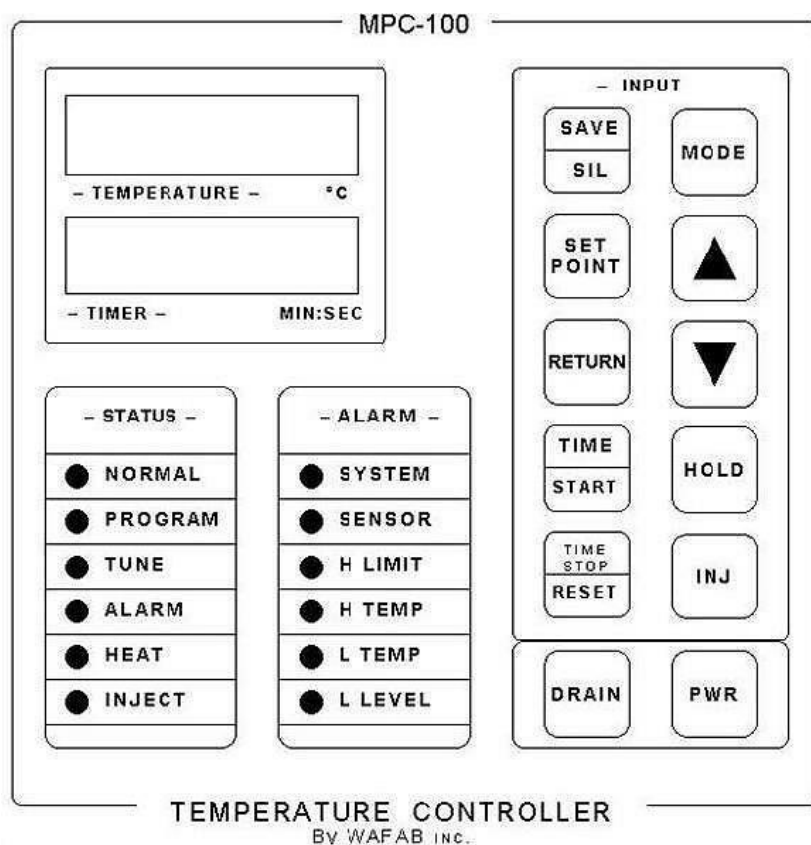


Figure 4 - MPC-100 Hot Bath Temperature Controller



Figure 5 - Ambient Tank Timer



Figure 6 - Resistivity Meter



Figure 7 - Photohelic Gauge



Figure 8 - Mskink2 Teflon® Dedicated Cassette

Temp.	Timer
Cr	10
Pb	1.0
rE	1.0
OF	0.0
AC1	0.0
AC2	0.0
PS	80.0
dr	40.0
dp	10:00
HI	10.0
LO	10.0
CS	30:00
PA	:30
IP	:00
Cd	d1

Table 1 - Msink2 MPC-100 Hot Bath Temperature Controller Codes

Note: Do not change these recipes. The factory set-up codes will be impacted.

Cycles	
CY	2
FP	45
dP	5
Sd	4
Ad	0
n2	n
Ac	0
PC	5
Pn	1
nb	10
SL	1

Table 2 - Msink2 Quick Dump Rinse Codes

SPIN RINSE/DRYER HELP MESSAGES

HELP-0 Power Failure	The power failed while the unit was operating. Check the electrical lines in the unit, and for a blown fuse. Press START to reset the microprocessor. The rinsers/dryer indexes the rotor and resets to the beginning of the interrupted cycle.
---------------------------------------	--

HELP-1 Bladder Pressure	There is inadequate nitrogen pressure to inflate the door seal. Check the door bladder, the nitrogen pressure, and the pressure switch. Be sure there is 20-21 psi on RG2 and that the pressure switch turns off when the pressure reaches 17-18 psi.
HELP-2 Nitrogen Pres	There is insufficient pressure in the system nitrogen line. Check the nitrogen pressure switch (PSW1). It should be set to approximately 13 psi. Check the system line for leaks. Be sure that the pressure at RG1 is 23 psi dynamic. Check the Clean Coil thermostat and reset if necessary.
HELP-3 Door Open	The door is not completely closed. Check the door. If the door is properly aligned, check the micro-switch actuating arm.
HELP-4 Index Failure	The unit is not able to index the rotor. Check the rotor positioner.
HELP-5 Excessive Speed	The rotor speed has exceeded 3400 RPM. Retry the cycle a few minutes. If the problem persists, there is a hardware problem. Call maintenance or VERTEQ for assistance.

1165 or SVC-14 Photoresist Strip Bath draining (PROCESS STAFF ONLY)

- 1.0 Press the **HOLD** button once on the MPC-100 temperature controller panel, which turns the heater off. The bath temperature must cool down to 60°C before draining. Report the problem on Mercury, and put a sign on the control panel, so that members know the bath is being cooled.
- 2.0 These chemicals need to get captured through the drain hose at the back of the sink. Make sure the drain hose is securely placed in the designated carboy for 1165 or SVC-14 in the chase 381. Open the drain valve before starting to drain.
- 3.0 Verify that the toggle switch on the front panel is set down to "plenum" (not up to "spigot").
- 4.0 Once the chemical is at 60°C or below, you can start draining the bath by pressing the drain key twice on the MPC-100 controller ("drn" should appear without blinking)
- 5.0 Go to the chase to verify the chemical is being drained into the carboy. If not, stop the draining process immediately. Leave some room in the carboy, as you will also need to rinse out the empty bath.
- 6.0 Use the deck hose to rinse out the emptied bath; this also gets drained into the carboy. Be sure not to overfill the carboy!
- 7.0 Once done draining and rinsing the bath, close the drain valve in chase 381.
- 8.0 On the control panel, press "Drain" again to STOP the draining (it should read "HOLD"). Add new chemical to the desired level.
- 9.0 Press the HOLD button to restart the heater. The LED Heat light will turn on and bath temperature will eventually ramp up to 80°C.
- 10.0 Prepare the carboy for EHS pickup if you know how to do this. If not, label it with the chemical contents and contact process staff so it gets prepared for EHS pickup.