

Standard Operating Manual

Ultra Fab Wet Station F –Non-standard Processing Station

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1. Picture and Location



This tool is located at NFF Room 2240 Cleanroom Class 1000.

2. Process Capabilities

- | | | |
|-----|-----------------------|--------------------|
| 2.1 | Cleanliness Standard: | Non-Standard |
| 2.2 | Substrate Size: | fragment, 2" or 4" |

3. Contact List and How to Become a Qualified User

3.1 Emergency Response and Communications

- Security Control Center: 2358-8999 (24hr) & 2358-6565 (24hr)
- Safety Officer: Mr. Wing Leong CHUNG 2358-7211 & 64406238
- Deputy Safety Officer: Mr. Man Wai LEE 2358-7900 & 9621-7708
- NFF Senior Technician: Mr. Henry YEUNG 2358-7896
- NFF Technician: Mr. Michael KWOK or Charles TANG
23587896

3.2 Training to Become a Qualified User

Please follow the procedure below to become a wet station qualified user.

1. Read through the on-line equipment operating manual of the equipment;

<http://www.nff.ust.hk/equipment-and-process/equipment-operation-manual.html>

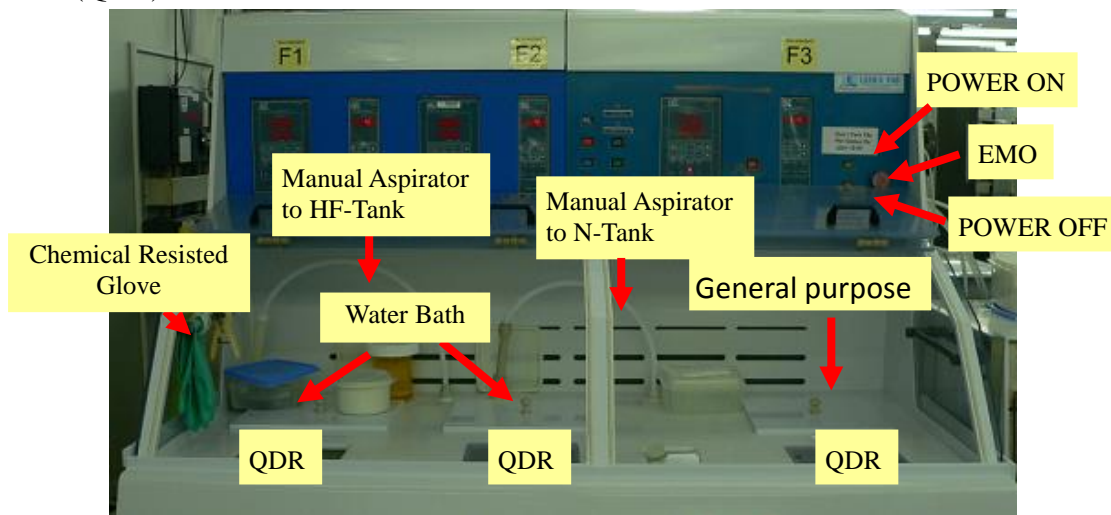
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2. Attend the equipment hand-on operation training either by peer or NFF staff.
3. If training is provided by NFF staff, user must log in NFF equipment reservation system, and register these trainings.
4. Send an e-mail to Mr. Henry YEUNG requesting wet station qualified exam.
5. Pass the examination for the equipment operation and security.

4. Operating Procedures

4.1 System Description

The Wet Station F is for Non-standard Processing. This Wet Station provides one set PCT heated quartz temperature controlled for general purpose (far right), two water heated baths for general purpose and three quick dump rinse baths (QDR).

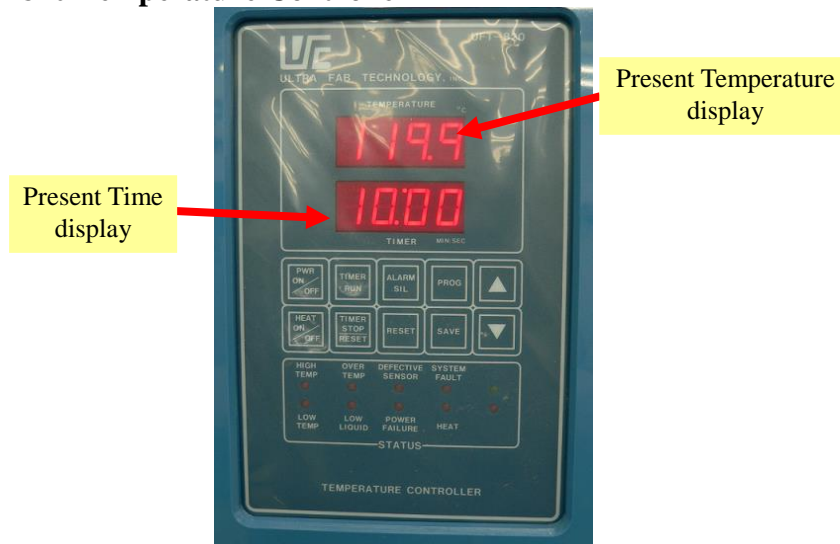


EMO	Red button for emergency stop of the wet station
Power On	Main power on for wet station
Power Off	Main power off for wet station
SILENCE	Silence any alarm at this wet station
RESET	Resets alarm system to this wet station
Drain On/Off	Dispose chemical to Neutralization Tank
Manual Aspirator	Aspirates HF to HF Collection Tank.
LOW PURGE	Red indicator light will flash when no enough air to purge the electronics for this wet station
PLENUM L/L	Red indicator light will flash when the plenum liquid level is too high

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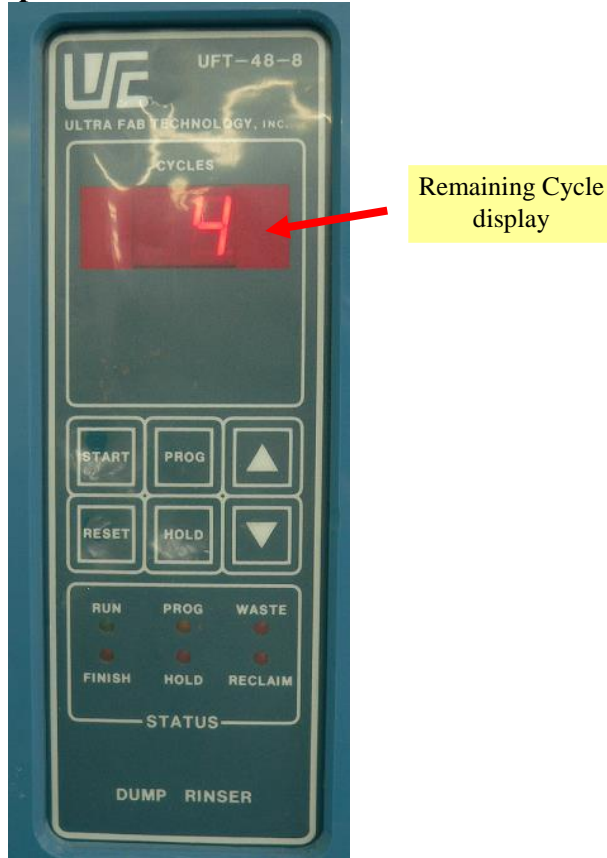
There are six controllers at this wet station. The UFT-820 Temperature Controller is PCT Tiger TT4 Heated bath and water heated bath. The UFT 48-9 Quick Dump Rinser is for quick dump rinse (QDR) bath.

4.1.1 UFT-820 Temperature Controller



PWR ON/OFF	Turn on/off the power of temperature controller
Heat On/Off	Activate and deactivate the heater output.
Timer Run	Start or Restart the timer
Timer Stop/Reset	Stop and Reset the timer
Alarm Sil	Silence the audio for both the timer and any alarm conditions.
	Cancel flashing alpha code in the process display
Reset	Examine the process set point and this Timer Preset.
PROG	Exit the program mode.
Save	Adjust parameters into program mode
△	Permanently save the system setup parameters.
▽	Up key, active in the program mode to increment the display
	Down key, active in the program mode to decrement the display

4.1.2 UFT 48-8 Quick Dump Rinsers



START	Activate the dump rinsers
RESET	Deactivate the dump rinsers, automatically reset itself in preparation for another run, and exit the program mode
PROG	Adjust parameters into program mode
HOLD	Halt the operation temporarily

4.2 Safety Warnings

1. Follow NFF Health and Safety Manual.
2. Some chemicals are dangerous when mixed with other chemicals or heated while others are dangerous on their own.
3. Do not allow to heat HF or BOE chemical.
4. Mixing hot piranha with organic compounds may cause an explosion. This includes acetone and IPA.
5. When preparing the piranha solution, always add the peroxide to the acid. The H₂O₂ is added immediately before the etching process because it immediately produces an exothermic reaction with gas (pressure) release.
6. All chemicals used in NFF are controlled items. No chemicals can be brought

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in or taken out without permission.

7. Users should have a good understanding of all the chemicals they intend to use and know what to do when accidents of the materials with which they are working.
8. HF is potentially lethal. If HF is spilled on a person,
FOR SKIN CONTACT:
 1. Move victim immediately under safety shower and flush affected area with large amounts of cool running water.
 2. Remove all contaminated clothing while flushing with water.
 3. The rinsing may be limited to 5 minutes, with 2.5% calcium GLUCONATE GEL (available in first aid kit) applied as soon as the rinsing is stopped.
 4. While the victim is being rinse with water, someone should alert first aid or medical personnel, arrange for subsequent treatment and inform NFF staff.
 5. Apply the gel every 15 minutes and massaged into the tissue continuously until pain and/or redness disappear. It is advisable for the individual applying the gel to wear rubber gloves to prevent a possible secondary HF burn.
 6. After treatment of burned area is begun, the victim should be examined to ensure there are no other burned areas that have overlooked.
 7. Arrange to have the victim seen by a physician. During transportation to hospital or waiting for a physician to see the victim, continue massaging calcium gluconate gel.

FOR EYE CONTACT:

- i. Immediately flush the eyes for at least 15 minutes with large amount of gently flow water under eye washer.
- ii. While the victim is being rinse with water, someone should alert first aid or

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medical personnel and arrange for subsequent treatment.

- iii. Take the victim to a doctor, preferably an eye specialist, as soon as possible.
- iv. Rubbing of eyes is to be avoided.
9. If other chemical is spilled, remove clothing and rinse affected area in safety shower for 15 minutes and inform NFF staff. Seek urgent medical advice.
10. Chemical Spill Control, in the event of small spill, it can usually be cleaned up safely by NFF staffs only, but the spill is too large to clean up safely or if someone has been injured or contaminated, immediately call the SCC. Report all spills of hazardous chemicals to SEPO.
11. The Emergency Off – Button (EMO Button) shuts down the machine immediately. Only use the EMO in emergency situations. Emergency situations are where injury of personnel or serious damages of the system impends immediately.
12. According to the general fire emergency procedure of HKUST, please report the accident to the Security Control Center first. The nature of other emergencies will determine whether you will call police, staff, or both. If someone is injured, the 9-999 emergency number should be called before calling staff. If there is a facilities problem, such as a flood or a utility problem that does not present a danger to lab users but may result in damage to equipment, the staff or EMO need to be called. The 9-999 emergency should not be called for facility or equipment problem. Always call 9-999 when a potentially life threatening situation might exist (injury, fire, gas leak, etc.)
13. All spills on the wet bench during process should be cleaned up immediately.
14. When working at the wet station, always use appropriate personal protective equipment (PPE) – apron, face shield, chemical resisted gloves. After complete the process, rinse the PPE and fully dry it and return it back.
15. The apron must fully cover your shoulders at all times, make sure it is tied around the neck and do not let it slip off while you work.
16. Even you wearing PPE, never put your hands or fingers into a chemical bath.
17. Do not walk away from wet station while wearing PPE. If you need to step away from the wet station at any time, rinse off gloves at the rinse bath, dry with wiper and put it back.

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18. Never touch any surface while wearing chemical-resistant gloves that other lab users may come into contact with, such as table tops, door handles, phone, computer keyboards, face shield, apron, etc. Gloves shall be removed before touching other surfaces.
19. Check the leakage of chemical-resistant gloves by N₂ Gun every time.
20. Tanks are breakable, carefully place wafers in them, never bang a cassette on the side.
21. Keep the cassette handle with cassette throughout the etching or cleaning process.
22. No Solvent allowed at this wet station.
23. Never operate the heated tanks without the proper fluid level.
24. Read and understand the MSDS for the chemical being used.
25. Always add acid into water, never reverse!
26. Don't pour BOE, HF into the quartz or glass container. Use a PP, HDPE or Teflon container instead.
27. Use separate containers for KI or Iodine. Neutralize them with Sodium Thiosulfate before disposal.
28. Don't pour chemical into the water bath, which only used for water.
29. Know the location of the nearest safety shower and eyewash station.
30. Make sure the wet station having sufficient exhaust.
31. Improper disposal of waste could result in explosion and injury. Take time to consider how to dispose in your process or contact NFF staff.
32. Don't dispose hot chemicals. The temperature should be below 30°C before disposing.
33. If the machine failure while being used, never try to fix the problem by yourself. Please contact NFF staff.
34. When Neutralization system has the problem, the buzzer (there is one over between Wet Station D and E) will audible. If this happens, none of the wet station may be used.

4.3 Operation Precautions and Rules

1. Do not operate the machine unless you are properly trained and approved by NFF staff.

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2. All wet-processing baths are designed and arranged according to their cleanliness levels and purpose; users are not allowed to use those solutions for different purpose.
3. Each Wet Station has its own Teflon wafer cassette and cassette handler and 2" dipper basket (chemically resistance). User doesn't mix it with other wet stations.
4. The Teflon cassette, cassette handle, 2" dipper basket without color button label is only allowed in this wet station.



5. Don't send the cassette boxes of this station to any places.
6. Do not store wafer(s) in wet station cassette. To store wafer(s) in your own plastic cassettes and boxes.
7. Don't dispose hot chemicals. The temperature should be below 30°C before disposing.
8. Don't leave any unnecessary things on top of the wet station.
9. Bubble generation on wafers with large-area photoresist coverage may cause wafers to float out of the cassette!
10. If a wafer falls out or breaks, do not attempt to retrieve it. Contact NFF staff.
11. Close the cover after each use.
12. Process Temperatures are set and should not be changed without NFF Staff approval.
13. Please fill all the details of the log sheet attached.

4.4 Initial Status Checks

1. Please check the status of shutdown notice posted in the NFF reservation website
2. Before operate the machine, please make sure you have read check list and

fill the log sheet.

3. Please check-in the equipment via Equipment Card Reader.

4.5 Initial System Checks

Before starting, verify the machine is in the correct idle state:

1. If system power is off, notify NFF staff to turn on power switch on the controller. Leave system ON, after your process.
2. Verify that the chemical you want to use is filled to the proper level.
3. Verify that the bath temperature is reached the set point.
4. Verify that the wet station has DI water and Nitrogen.
5. Verify that the exhaust level is normal ($>0.5''$ inch w. c.).
6. Check log sheet that last user had no problem.

4.6 Personal Protective Equipment (PPE)

Users are required to use additional Personal Protective Equipment (PPE) when working in the wet station.

4.6.1 Sequence for Wearing PPE

PPE consists of three items that should be worn in the following order: an apron, a face shield, and chemical resisted gloves. Check all items for damage before each use, inspect the apron and face shield for damage (e.g. cracks, scratches). Gloves are to be inspected for damage and contamination. Use Nitrogen Spray Gun injects the Nitrogen to the chemical resisted glove and immerse to the DI water Bath for leakage check. Face Shield places over face and eyes, and then adjust to fit.

4.6.2 Sequence for Removing PPE

PPE should be removed in the following order: chemical resisted gloves, a face shield and an apron. Rinse and dry the chemical resisted gloves, remove them and hang them up. Hang face shields and avoid damage it. Lastly remove the apron and be careful to hang it. If apron has any liquid, use a wipe to dry it. Do not leave inside out.



Apron

Face Shield



Chemical resisted Gloves

4.7 Quick Dump Rinse Operation

The purpose of QDR is to rapidly wash surface of the wafer and leave the wafer in a clean condition.

1. Place the wafer in the quick dump rinse (QDR) bath, initially should be full of DI water and close the lid.
2. Press the **START** button of UFT 48-8 quick dump rinser controller to activate the QDR. It will cycle down from 4 to 0 in the display window.
3. After completion of the cycle the warning sound will be audible until the **RESET** button are pressed.
4. Press **RESET** button to automatically reset itself in preparation for another run.
5. Press **HOLD** button to manually dump or fill the bath.

4.8 Aspirator Operation

1. The aspirator can be activated by pressing the **ASPIRATOR** button located on the front panel of the wet station. The aspirator timer is set by default to thirty seconds.
2. Use the aspirator to dispose the water-soluble acids to Neutralization Tank except HF and BOE. HF and BOE need to dispose to HF Collection Tank. Please notify to swap the valve if you need dispose HF and BOE.
3. Be careful not to mix solvents with acids when aspirating this is a potentially

explosive combination.

4.9 Available Chemicals

The standard chemicals used at Wet Station F are stored in the Standard chemicals Storage Cabinet located next to Wet Station F. Do not store unlisted chemicals to this cabinet.



The location of chemicals in the standard chemical storage cabinet is shown below.

HNO ₃	HF	Na ₂ S ₂ O ₅	KI
HCL	BOE	Iodine	KOH
Acetic Acid	CEP- Etch	TMAH	NH ₄ OH
H ₃ PO ₄	H ₂ SO ₄	777-Etch	Freckle-Etch

4.10 Chemical Mixing Operating Procedure

1. Wear **Personal Protective Equipment (PPE)** following the section 4.6.1.
2. Select and Rinse appropriate lab wares for your process.
3. Prepare a “Label” for your chemical solution you are using.
4. Take the key for the standard chemical storage cabinet from Staff and pick chemicals. (User may need to submit NFF Safety Assessment Form).
5. Place the acid bottle near the exhaust of the wet station to prevent fumes escaping into the lab.
6. Remove the bottle cap and place it topside down on the wet station, to prevent contamination.

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7. Avoid contamination of the bottle; do not touch the inside of the bottle cap or the mouth of the bottle with your gloves.
8. If the cap is contaminated, rinse thoroughly before replacing it on the bottle.
9. Using one hand around the neck and the other around the base of the bottle, gently pour slowly the acid into the container to avoid any splashing. When mixing the chemical, should use the safest ways to mix, and always add acid into water, never reverse!
10. If any acid drips onto the outside of the bottle, thoroughly rinse and dry the bottle before returning to the storage cabinet.
11. Return unused chemicals to the standard acid storage cabinet as soon as you are done pouring; never leave chemicals at the wet bench.
12. If need to heat up the chemicals, put container to the water bath to indirect heat up the chemical.
13. User should always be at the wet station when in use. If you need step away from wet station, the container must be covered but still allow vapor to escape.
14. When you are completed your processing with chemicals you need dispose them to neutralization tank. If chemicals are HF or BOE, please contact staff to dispose it or swap the valve for you.
15. Rinse and dry used appropriate lab wares, and return them to the original place.
16. Clean the wet station by rinsing it with DI water and dry it with N2 gun or clean room wipes.

4.11 Clean Up

1. Use Manual Aspirator to N-Tank tube to dispose unused acid (except HF and BOE) which is mixed in the container by user to NFF Neutralization Treatment System following the section 4.9. If you need dispose HF or BOE, contact staff.
2. Rinse and dry the container, and then return it to original location.
3. Clean up the wet station. Thoroughly rinse off any drips (assume they are acid) with DI spray gun, gently dry with the N2 gun. Ensure the bench top is clean and dry.
4. Leave the dump rinsers filled with water and the lid closed.

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5. Close wet station Cover.
6. Do not leave cleanroom wipers on the bench top.
7. Fill out the log sheet.

4.12 Check Out

Check out the equipment via Equipment Card Reader after use.

NFF Standard Chemical list

Item	Standard Acids	Applications and Characteristics
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A1	Acetic Acid	For aluminum etch
A2	HCl	For RCA2 and decontamination
A3	Phosphoric Acid	For nitride removal and aluminum etch
A4	Sulfuric Acid	For photoresist stripping, and piranha clean
A5	Nitric Acid	For aluminum etch
A6	777 Pad Etch	For etching silicon dioxide
A7	Freckle Etch	For silicon residue removal
A8	CEP-2000	For chrome etch
A9	Hydrofluoric Acid (HF)	For oxide etch, and piranha cleaning
A10	Buffered Oxide Etchant BOE	For oxide etch

Item	Standard Base	Applications and Characteristics
B1	Ammonium Hydroxide	For RCA1
B2	Sodium Thiosulphate	For neutralization of Potassium Iodide (KI) solution
SB-6	Tetramethyl ammonium Hydroxide 20% (TMAH)	For silicon etch (used at wet station G only)
B1	Ammonium Hydroxide	For RCA1

Item	Miscellaneous	Applications and Characteristics
M1	Hydrogen Peroxide (H2O2)	For cleaning and resist stripping
M2	Potassium Hydroxide (KOH) Pellet	For silicon etch (used at wet station J)
M3	Potassium Iodide	For gold etch etc.