

Spec Name: IR-PP500MC	Revision: 044	ECN Number: 24106018
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Module : Implant  
Specification Name : IR-PP500MC  
Description : E500HP PM Procedures

## 1. PURPOSE

- 1.1. Provide specific instructions/procedures for the execution of scheduled maintenance. Of equipment listed in section 2.1 on an as required basis.

## 2. SCOPE

- 2.1. Applicable to all the medium current implanter listed in [IM-EQ500MC](#)

## 3. INDEX:

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## 4. REFERENCES

- 4.1. [IR-LO500MC](#) LOCKOUT/TAGOUT
- 4.2. [IR-PC500MC](#) PREVENTIVE MAINTENANCE CHECKSHEET
- 4.3. [IR-SQVARMC](#) VARIAN MC PITCREW PM PROCEDURE
- 4.4. [IR-PS500MC](#) PREVENTATIVE MAINTENANCE SCHEDULE
- 4.5. [IR-SS500MC](#) STARTUP AND SHUTDOWN PROCEDURES
- 4.6. [IR-SF500MC](#) SAFETY SPECIFICATION
- 4.7. [IR-CO500MC](#) E500HP CONFIGURATION
- 4.8. [IR-PPMCDIF](#) BKM MAINTENANCE GUIDE FOR DIFF SEALS
- 4.9. Varian Maintenance Manual [Volume 1](#) & [Volume 2](#)
- 4.10. [Varian Customer Drawing Manual](#)

## 5. DEFINITIONS

POU	Point Of Use
PS	Power Supply
KV	Kilovolt
A	Amperage
CB	Circuit Breaker
MSDS	Material Safety Data Sheets

EMO	Emergency Machine Off
CW	Clockwise
CCW	Counter Clockwise
PSI	Pound Per Square Inch
PSIG	Pounds Per Square Inch Gauge
CM^2	Centimeters squared
RP1	Roughing Pump
N2	Nitrogen
K	Kelvin
MT/MIN	Millitorr Per Minute
CCIG	Cold Cathode Ionization Gauge
LL	Load Lock
TVL	Traveling
ISO	Isolation
CHMBER	Chamber
TGT	Target
VMM	Varian Maintenance Manual
GUI	Graphical User Interface
Ω	Ohm

## 6. SAFETY

- 6.1. All preventative maintenance is to be performed by Equipment Engineering, AMAT service personnel or manufacturing specialists.
- 6.2. Before turning on control power, make sure there are no personnel working on Machine and all doors are closed.
- 6.3. Observe all warning signs on power supplies, and use grounding bar before entering and touching the terminal or source areas.
- 6.4. Note the Location of the Emergency Shut Off buttons, High Voltage disable, the nearest telephone, Emergency Phone Number 214-429-2222, locations of Scott Air Packs, the nearest fire extinguisher, and exits from the area.
- 6.5. For any questions concerning chemicals used in process, consult MSDS on the web page.  
<http://msds.ti.com/>
- 6.6. Periodically update yourself on chemicals used in your area.
- 6.7. Before performing maintenance to the implanter, you must read the safety specification [IR-SF500MC](#)

## 7. Procedures, Scheduled Preventative Maintenance

Refer to Varian Maintenance Manual for detailed procedures on removal of parts and cleaning. Detailed drawings and component part numbers can be found in the Varian customer drawing book. For brevity, Varian Maintenance Manual may be found abbreviated VMM throughout this specification.

NOTE: 'Q' indicates item for odd numbered PM's only.

### 7.1. Perform the following pre-checks before starting the SMM

- 7.1.1. Check XID of tool for anything that needs addressed during the SMM and complete those items.
  - 7.1.1.1. For example, XID for IM101 can be found as XIM101
  - 7.1.1.2. If parts or other resources are identified as not available for resolution of the XID, escalate the issue to shift lead and/or tool owner for resolution while SMM is active.
- 7.1.2. Verify no wafers or cassettes are loaded onto the tool.
  - 7.1.2.1. Check both load locks and SMIF load ports for cassettes and wafers.

- 7.1.3. All wafers should be unloaded and removed from the tool before beginning the SMM. Any wafers found on the tool should be identified as dummy or product. If possible, any production wafers loaded should be completed. If tool is not in the condition to run the product, unload the product lots, input proper information for disposition into SMS and create a Problot for the lot(s).
- 7.1.4. Verify that all parts and assemblies required to perform the SMM are available and ready.

7.2. Initiate Lock-out Tag-out Procedures. Refer to [IR-LO500MC](#).

### 7.3. Tilter Burst Test

- 7.3.1. Rotate the Tilter to 20°, 30°, and 7° angles
- 7.3.2. Press Esc on keyboard and select yes to get to the background screen.
- 7.3.3. Type "X <TILT !" Press 'Enter' sets the tilt angle (X = the angle in degrees)
- 7.3.4. Type "IMPLANT" Press 'Enter' moves the tilter to the set tilt angle
- 7.3.5. Type "RUN" Press 'Enter' to return to the E500 GUI
- 7.3.6. Go to Vacuum Page to check the chamber vacuum for changes
- 7.3.7. ALTERNATELY, use the recipe TILT VACUUM in Vac Cycle mode and cycle 5 getter wafers, watching the chamber vacuum reading for any changes.
- 7.3.8. Verify that the TGT chamber pressure does not change by more than 4e-7 Ex: base pressure is 2.0e-6 rises to 2.5e-6 would warrant investigation.
- 7.3.9. If a change is seen, resolve the issue and retest the Tilter at the end of the SMM.

### 7.4. Put tool in vac safe state and moor the Yscan.

- 7.4.1. Isolate the Cryo's.
- 7.4.2. Spin down the Turbos.
- 7.4.3. On the Vac screen press Moor on Yscan.

### 7.5. Verify vent pressures are set to 20 psi.

- 7.5.1. Open doors behind swing out rack and the vent pressure is the "Dry Nitrogen".

### 7.6. Q Delete logs beyond 90 days.

- 7.6.1. Navigate to the Utility Menu
- 7.6.2. Select range for past the 90 mark and press the bin next to the Archive logs button to delete.
  - 7.6.2.1. Archive will not delete the logs.

### 7.7. Q Verify door interlocks and drop rods function correctly.

- 7.7.1. Verify that all door interlocks shut off high voltage when the door is opened.
- 7.7.2. Verify all drop rods drop and touch the terminal when the doors are opened.

### 7.8. Q Inspect the Terminal.

- 7.8.1. Inspect red Terminal enclosure doors. Verify that all doors open and close properly.
- 7.8.2. Ensure the hinges are in good condition.
- 7.8.3. Verify any fans installed in the doors are functional.

### 7.9. Q Inspect the grounding sticks.

- 7.9.1. Look for fraying or broken connections.
- 7.9.2. Ohm from tip of grounding rod to ground and ensure it is less than 0.1  $\Omega$ 
  - 7.9.2.1. If greater than that fix the connection or replace grounding rod.

- 7.10. **Q** Check date on Cryo Adsorbers, if  $\geq 4$  Years replace.
- 7.10.1. Replace Adsorber steps below.
- 7.10.1.1. Ensure Cryo cold head is turned off.
  - 7.10.1.2. Turn off power to compressor with the breaker.
  - 7.10.1.3. Remove the Return then Supply from the Adsorber.
  - 7.10.1.4. Remove the Adsorber.
  - 7.10.1.5. Install the new Adsorber.
  - 7.10.1.6. Connect the Supply then Return to the Adsorber.
  - 7.10.1.7. Check for Helium leaks and correct if found.
- 7.11. Verify Poppet Valve covers are secured and the exhaust line is in operating condition without damage and it is safe to purge the Cryo.
- 7.12. **Q** Check Install for Cryo dates. If  $\geq 4$  years Replace the Cryo.
- 7.12.1. Steps to Replace Cryo below if needed. If not needed skip to 7.13.
- 7.12.1.1. Close Cryo Gate Valve.
  - 7.12.1.2. Turn off Cryo Cold Head.
  - 7.12.1.3. Disconnect Helium Return
  - 7.12.1.4. Disconnect Helium Supply
  - 7.12.1.5. Purge Cryo for a minimum of 30 minutes. Refer to [IR-SQVARMC](#) for how to purge the Cryo.
  - 7.12.1.6. After purge time is complete turn off the purge and isolate the RP from the Cryo.
  - 7.12.1.7. Remove the roughing line connection.
  - 7.12.1.8. Remove Poppet valve connection
  - 7.12.1.9. Remove electrical connections.
  - 7.12.1.10. Remove the  $\frac{3}{4}$ " claw clamps holding the Cryo onto the TGT Chamber.  
**\*Caution if you remove the claw clamps the Cryo will fall. Get additional help if needed. \***
  - 7.12.1.11. Clean Cryo Gate valve.
  - 7.12.1.12. Swap over the needed parts from the old Cryo to the new Cryo.
  - 7.12.1.13. Get the new Cryo placed against the TGT Chamber. **\*Caution it is recommended that you get help to install a Cryo as it is difficult to hold on the TGT Chamber and install the claw clamps at the same time. \***
  - 7.12.1.14. Install the claw clamps to hold the new Cryo in place.
  - 7.12.1.15. Install Roughing line.
  - 7.12.1.16. Install Poppet valve connection.
  - 7.12.1.17. Install electrical connections.
  - 7.12.1.18. Pump down and leak check. Correct any leaks if found.
  - 7.12.1.19. Install Helium Supply.
  - 7.12.1.20. Install Helium Return.
- 7.13. **Q** Check Helium pressure on compressors.
- 7.13.1. Add Helium if below 240 psig
  - 7.13.2. Remove Helium if above 250 psig
  - 7.13.3. Use leak checker to sniff for He leaks.
- 7.14. Start Full Cryo Regen, use automatic regen for On-Board.
- 7.15. After Cryo Regen is complete clean the Cryo pump Poppet Valves.

- 7.16. Disassemble & clean source area.
  - 7.16.1. Clean source housing to bare metal. For more information than below refer to [IR-SQVARMC](#)
  - 7.16.2. Close manual Gas Valve.
  - 7.16.3. Vent the Source.
  - 7.16.4. Remove Filament leads.
  - 7.16.5. Remove water lines.
  - 7.16.6. Remove gas line.
  - 7.16.7. Remove Source.
  - 7.16.8. Remove Electrode Assembly.
    - 7.16.8.1. Replace Electrode with clean/new Electrode.
  - 7.16.9. Remove Plastic Source Cover.
  - 7.16.10. Remove Source Flange.
  - 7.16.11. Remove Bushing.
  - 7.16.12. Remove Flange.
  - 7.16.13. Remove Inner Flange.
  - 7.16.14. Remove Standoff Graphite in back of source chamber.
  - 7.16.15. Remove V2 aperture.
  - 7.16.16. Using DI water and Scotchbrite scrub all of chamber to bare metal.
  - 7.16.17. Wipe out Chamber with IPA.
- 7.17. Assemble Source area.
  - 7.17.1. Ensure all parts going into the tool have the proper O-Rings installed.
  - 7.17.2. Install new V2 aperture.
  - 7.17.3. Install new Source rear graphite aperture.
  - 7.17.4. Install clean/new Inner Flange.
  - 7.17.5. Install clean/new Flange.
  - 7.17.6. Install clean/new Bushing
  - 7.17.7. Install clean/new Source Flange.
  - 7.17.8. Install Plastic Source Cover.
  - 7.17.9. Install Electrode Assembly.
    - 7.17.9.1. If SMM#19 replace Electrode Assembly with a unit that has new motors, potentiometers, and linear bearings.
  - 7.17.10. Install new Source.
    - 7.17.10.1. Before installing, attach water lines and inspect for leaks.
  - 7.17.11. Install gas line.
  - 7.17.12. Install water line
  - 7.17.13. Install Filament leads.
- 7.18. Verify Electrode Manipulator movement is smooth, and the assembly is free of debris.
- 7.19. Verify the water flow readbacks.
  - 7.19.1. Close valve to flow meters.
  - 7.19.2. Ensure the flow meter stops for the corresponding closed valve.
  - 7.19.3. Repeat for all meters.
  - 7.19.4. Double check to make sure all valves are opened.
- 7.20. Inspect for any water leaks and correct any leaks.
- 7.21. Verify that all cooling valves are open.

- 7.22. Check DI water resistivity.
  - 7.22.1. Replace filters if below 1.5 MΩ
  - 7.22.2. Mixed Bed Filter PN 1031164-1050 (E30000213)
  - 7.22.3. Ultrapure filter PN 4182644-0001 (E30000214)
- 7.23. Fill the Terminal cooling tank with DI water.
- 7.24. Fill Ground cooling tank with 40% Dowfrost 60% DI water
  - 7.24.1. TI PN 4205040-0002 (via chemical request form)
- 7.25. Replace Exhaust Tube.
  - 7.25.1. Shutdown Terminal Roughing Pump.
  - 7.25.2. Remove bottom flange on Exhaust Tube.
  - 7.25.3. Unscrew Exhaust Tube from facilities exhaust.
  - 7.25.4. Screw in new/clean Exhaust Tube to facilities exhaust.
  - 7.25.5. Install bottom flange on Exhaust tube to Silencer/Muffler.
- 7.26. For IM107/8 & IMV02/5 perform at every SMM (heavy As75+) for all other tools perform at every odd SMM.
  - 7.26.1. Q Clean Analyzer Magnet area through Accel area.
    - 7.26.1.1. Using the arsenic vacuum, clean out the flakes from the Analyzer Magnet area, Beam Dump and Accel column.
    - 7.26.1.2. Using a flashlight inspect the entire post analysis beam path to ensure no debris can be seen.
  - 7.26.2. Q Wipe down all surfaces to ensure loose debris is removed from these locations. ([Reference 3.12 of VMM](#))
    - 7.26.2.1. Clean all graphite from the neutral dump forward excluding Accel column graphite liners.
- 7.27. Q Inspect platen assembly. Ensure platen is not excessively dirty or worn, and shows no sign of visible damage or scratches.
  - 7.27.1. Inspect the Ropins lifter and ensure it is moving smoothly through its travel.
  - 7.27.2. Using torque wrench, ensure the shoulder bolts for the Ropins lifter bracket are secure at 11 in\*lb. Record the serial number of the torque wrench used.
  - 7.27.3. Check the EClamp holding current and verify it is stable. Using an O-Scope, verify the 6 HV phases are all correct.
- 7.28. Wipe out TGT Chamber.
  - 7.28.1. Verify that all process debris is wiped out, and there is no trace of broken wafer or other silicon debris in the chamber. If any bubbling or flaking is present on the walls, use Scotchbrite, IPA and DI water to remove.
- 7.29. Replace any HCIG's that are on the 2<sup>nd</sup> filament.
  - 7.29.1. Check the software and it should display a 1 or a 2. If it is on 2 replace the gauge.
- 7.30. Q Replace the Mirror Assembly. Align mirror using [Varian PSB 1719](#)
- 7.31. Check Diff Seals Gauge Pressure
  - 7.31.1. If the diff seals gauge is over 2 Torr, close all the valves in the tree except the inlet. If the gauge doesn't drop below 1 Torr then leak check the pumping line and

repair. If no leaks are found ensure the pump/booster is running and submit a pump work order as needed to achieve 1 Torr or lower.

7.32. Individual Diff Seal Pressure Check

7.32.1. Close all diff seals ¼ turn valves

7.32.2. Open each diff seal valve 1 at a time if the gauge goes over 1.2 Torr replace the seals and bearings to achieve 1.2 Torr or lower for the item the valve is plumbed to. Seals/bearings replacement requires a trained technician.

7.32.3. If any component fails please refer to [IR-PPMCDIF](#)

7.33. Complete all wafer handling alignments impacted by any work performed in the previous items.

7.33.1. Impacted items will be any of the parts fixed for Diff leaking.

**PM Items to be performed during PM #1**

7.34. Replace the low beam aperture.

7.34.1. [Reference 3.14 of VMM.](#)

7.35. Replace the Setup Cup Faraday.

7.35.1. [Reference 3.13 of VMM.](#)

**PM Items to be performed during PM #3**

7.36. Clean the cassette elevator to handler vacuum valves

7.36.1. Remove and clean elevator isolation valves.

7.36.2. With the beamline and elevators vented.

7.36.3. Remove the 2, 10-32 screws and the access flange.

7.36.4. Locate and remove the 8-32 screw on the hinge block. Remove the hinge plate and clean/replace the o-ring, seal surfaces, and valve chamber. Reinstall valve plate.

7.36.5. [Reference 3.31 of VMM.](#)

7.37. Replace analyzer magnet exit aperture.

7.37.1. [Reference 3.12 of VMM.](#)

7.38. Inspect the post scan aperture for flaking. Replace if flaking. See FTA

7.38.1. [Reference 3.12 of VMM.](#)

**PM Items to be performed during PM #5**

7.39. Replace the Accel Suppression insulators.

7.40. Clean or replace the target chamber graphite.

7.40.1. [Reference 3.25 & 3.26 of VMM.](#)

7.40.2. Replace if needed.

7.41. Replace the Setup Cup Faraday.

7.41.1. [Reference 3.13 of VMM.](#)

7.42. Replace handler and orienter pads on both sides.

**PM Items to be performed during PM #7**

7.43. Perform Traveling Faraday maintenance and checks.

7.43.1. Replace Faraday Entrance aperture graphite.

7.43.2. Replace Cup and rebuild traveling faraday cup.

7.43.3. Setup the home sensor.



7.43.4. Inspect TVL faraday bearings/seals and clean/replace as needed.

**Note: When installing the TVL use the guide pins to not damage the TVL.**

7.43.5. Inspect the TVL cables and BNC connectors.

7.43.6. Perform continuity checks on the cables while moving the faraday to ensure no breaks exist during travel.

7.43.7. If any wear, fraying, burn spots are found, replace the cables with new. Similarly inspect the BNC connectors and replace if they are loose or otherwise compromised.

7.44. Complete Centerline setup for the traveling faraday.

7.45. Clean & lubricate Orientor/Elevator/TVL shafts with Braycote 600

7.46. Clean and lubricate Orientor/Elevator/TLV lead screws with Superlube (Synthetic Grease w/Teflon) E70000014.

7.46.1. Switch both Orientor motors off on the swing out rack during maintenance.  
[Reference 3.28 of VMM.](#)

7.46.2. Switch both Elevator motors off on the swing out rack during maintenance.  
[Reference 3.33 of VMM.](#)

7.47. Clean and lube SMIF lead screw, slide and worm gear.

7.47.1. Use NSK#2

7.47.2. Note Newer SMIF models have a grease free lead screw. Verify that SMIF sensor will detect protrusions. Check for signs of excessive wear on SMIF belts and replace if needed. Refer to [web link](#) for detail on SMIF PM items.

7.47.3. Clean and oil SMIF drive nuts (2) and pivot points (4) w/ GPL-105.

#### **PM Items to be performed during PM #9**

7.48. Replace the Setup Cup Faraday.

7.48.1. [Reference 3.13 of VMM.](#)

7.49. Remove and clean the Scanner Deflector assembly & align.

7.49.1. Start by turning CB19 (Scanner PSU) off.

7.49.2. Use ground stick to verify the scanner feedthrough is at ground potential.

7.49.3. Remove the 7/16 nut and disconnect the cable.

7.49.4. Remove the 8 1/4-20 socket head screws.

7.49.5. Remove and clean the scanner top plate and the scanner assembly (Ref 3.16 of VMM).

7.49.6. Reassemble and reinstall when complete.

7.50. Perform Scan Amplifier Waveform Verification Procedure.

7.50.1. Follow the steps as [outlined here](#)

7.50.2. Check at 5 kV and 15 kV

7.51. Replace Analyzer Magnet exit aperture.

7.51.1. [Reference 3.12 of VMM.](#)

7.52. Replace the Post Scan aperture.

7.52.1. [Reference 3.12 of VMM.](#)

7.53. Check Accel resistor chain

7.53.1. Wipe off the outside of the column and vacuum out the inside.

7.53.2. Ohm the resistors and ensure they are within spec.



7.54. Replace wafer handler linear bearings

7.54.1. [Reference 3.30 of VMM.](#)

**PM Items to be performed during PM #11**

7.55. Clean the terminal and ground level water filter screens.

7.55.1. Clean as needed.

7.55.2. [Reference 3.40 of VMM.](#)

7.56. Replace Handler and Orientor pads on both sides.

**PM Items to be performed during PM #13**

7.57. Replace the source/analyzer hivac valve.

7.58. Maintain RP1 Foreline

7.58.1. Purge rough pump prior to removing lines.

7.58.2. Cap rough pump inlet & turn on pump to prevent seizing after line removal.

Note: Use safety precautions working with phos coated parts to prevent and suppress fire. Cap or insert rags wet with water immediately after disconnecting lines. **\*NO IPA\*** Have water bottles, wet rags and dunk tank near. Secure parts during transport so they will not fall off cart. Dropping Phos coated parts can cause them to ignite.

Links to safety concerns

<https://sps16.itg.ti.com/sites/cmpimpee/Safety/DunkTank.pptx>

<https://sps16.itg.ti.com/sites/cmpimpee/Safety/ForeLine.pptx>

7.58.3. Rinse RP1 foreline with water.

7.58.4. Clean the foreline vacuum valves.

7.58.5. Check RP1 exhaust lines back to the header or the down turn to the sub fab.

7.58.6. Oven dry for 1 hour.

7.59. Clean RP1 muffler/Silencer.

7.59.1. [Reference to Section 18](#)

7.60. Inspect the exhaust pipe going back to the large acid duct for any liquid accumulation or clogs, contact facilities and decon for assistance if exhaust has liquid or clogs.

7.61. Replace low beam aperture.

7.61.1. [Reference 3.14 of VMM.](#)

7.62. Replace the Setup Cup Faraday.

7.62.1. [Reference 3.13 of VMM.](#)

**PM Items to be performed during PM #15**

7.63. Clean & lubricate Orientor/Elevator/TVL shafts

7.63.1. Use Braycote 600

7.64. Clean and lubricate Orientor/Elevator/TVL lead screws

7.64.1. Use Superlube (Synthetic Grease w/Teflon) E70000014.

7.64.2. Switch both Orientor motors off on the swing out rack during maintenance.  
[Reference 3.30 of VMM.](#)

7.64.3. Switch both Elevator motors off on the swing out rack during maintenance.  
[Reference 3.35 of VMM.](#)

- 7.65. Clean and lube SMIF lead screw, slide and worm gear.
  - 7.65.1. Use NSK#2
  - 7.65.2. Note Newer SMIF models have a grease free lead screw. Verify that SMIF sensor will detect protrusions. Check for signs of excessive wear on SMIF belts and replace if needed. Refer to [web link](#) for detail on SMIF PM items.
  - 7.65.3. Please observe any “do not grease” tags on the newer SMIF drive nuts.
- 7.66. Clean and oil SMIF drive nuts (2) and pivot points (4)
  - 7.66.1. Use GPL-105.
- 7.67. Replace Analyzer Magnet exit aperture.
  - 7.67.1. [Reference 3.12 of VMM.](#)
- 7.68. Inspect the Post Scan aperture for flaking.
  - 7.68.1. Replace if flaking.
  - 7.68.2. [Reference 3.12 of VMM.](#)

**PM Items to be performed during PM #17**

- 7.69. Replace the Setup Cup Faraday.
  - 7.69.1. [Reference 3.13 of VMM.](#)
- 7.70. Replace the focus faraday cup.
  - 7.70.1. [Reference 3.26 of VMM](#)
- 7.71. Replace the Accel Suppression insulators.
- 7.72. Replace the handler and Orientor pads on both sides.

**PM Items to be performed during PM #19**

- 7.73. Perform Traveling Faraday maintenance and checks.
  - 7.73.1. Replace Faraday Entrance aperture graphite.
  - 7.73.2. Replace Cup and rebuild traveling faraday cup.
  - 7.73.3. Setup the home sensor.
  - 7.73.4. Inspect TVL faraday bearings/seals and clean/replace as needed.

**Note: When installing the TVL use the guide pins to not damage the TVL.**

- 7.73.5. Inspect the TVL cables and BNC connectors.
  - 7.73.6. Perform continuity checks on the cables while moving the faraday to ensure no breaks exist during travel.
  - 7.73.7. If any wear, fraying, burn spots are found, replace the cables with new. Similarly inspect the BNC connectors and replace if they are loose or otherwise compromised.
  - 7.73.8. [Reference IR-PP-MCDIF](#)
- 7.74. Complete Centerline setup for the traveling faraday.

**PM Items to be performed during PM #21**

- 7.75. Check Accel Resistor chain.
  - 7.75.1. Wipe off the outside of the column.
  - 7.75.2. Vacuum out the inside.
- 7.76. Replace/rebuild the Scanner Deflector assembly.
  - 7.76.1. Start by turning CB19 (Scanner PSU) off.
  - 7.76.2. Use ground stick to verify the scanner feedthrough is at ground potential.
  - 7.76.3. Remove the 7/16 nut and disconnect the cable.

- 7.76.4. Remove the 8 ¼-20 socket head screws.
- 7.76.5. Remove and clean the scanner top plate and the scanner assembly ([Reference 3.15 of VMM](#)).
- 7.76.6. Reassemble and reinstall when complete.
- 7.77. Perform Scan Amplifier Waveform Verification Procedure.
  - 7.77.1. Follow the steps as [outlined here](#)
  - 7.77.2. Check at 5 kV and 15 kV
- 7.78. Replace Analyzer Magnet exit aperture.
  - 7.78.1. [Reference 3.12 of VMM](#).
- 7.79. Replace Post Scan aperture.
  - 7.79.1. [Reference 3.12 of VMM](#).
- 7.80. Replace the Setup Cup Faraday.
  - 7.80.1. [Reference 3.13 of VMM](#)

**PM Items to be performed during PM #23**

- 7.81. Replace handler and orienter pads on both sides.
- 7.82. Clean & lubricate Orientor/Elevator/TVL shafts
  - 7.82.1. Use Braycote 600
- 7.83. Clean and lubricate Orientor/Elevator/TVL lead screws
  - 7.83.1. Use Superlube (Synthetic Grease w/Teflon) E70000014.
  - 7.83.2. Switch both Orientor motors off on the swing out rack during maintenance.  
[Reference 3.30 of VMM](#).
  - 7.83.3. Switch both Elevator motors off on the swing out rack during maintenance.  
[Reference 3.35 of VMM](#).
- 7.84. Perform Exhaust Leakage Conductivity test.
  - 7.84.1. Refer to [Section 19](#).

**PM Items to be performed after every Monthly PM:**

- 7.85. **Q** Verify all lights in the tool are working.
  - 7.85.1. Replace bulbs and/or ballast if necessary
- 7.86. **Q** Check the light tower bulbs.
  - 7.86.1. Replace if burnt out.
  - 7.86.2. if tool is IM108 or IM107 check remote light towers next to IM101. Replace bulbs (4094545-001) if necessary.
- 7.87. **Q** Check ground pin continuity.
  - 7.87.1. Using a meter check from pin to tool ground.
  - 7.87.2. Continuity must be < 0.5 Ω.
- 7.88. **Q** Wipe out load locks and handler chambers
  - 7.88.1. Using IPA and clean room wipes clean out the following.
    - 7.88.1.1. Left LL.
    - 7.88.1.2. Right LL.
    - 7.88.1.3. Left Handler Chamber.

7.88.1.4. Right Handler Chamber.

7.88.1.5. TGT Chamber.

7.89. Pump down Tool.

7.89.1. After you have ensured everything is closed and the beamline/source is back together use the autovac page to pump down the tool.

7.89.2. On the Vac screen pump down the tool.

7.90. Replace any CCIG's reading  $1.1\text{e-}7$

7.90.1. This means the gauge is broken/not reading.

7.91. Perform Helium Leak check

7.91.1. You must have the Cryo Iso valves closed during leak check.

7.91.2. Fix any leaks identified.

7.92. Test Tilter for pressure changes

7.92.1. Perform test as outlined previously in 7.3

7.92.2. Rotate the Roplat multiple times and verify the vacuum doesn't get worse during actuation.

7.93. Record Post-SMM Vacuum

7.93.1. Source ( $1.1\text{e-}7 < x < 4.0\text{e-}6$ ).

7.93.2. Beamline ( $1.1\text{e-}7 < x < 2.0\text{e-}6$ ).

7.93.3. Scanner ( $1.1\text{e-}7 < x < 2.0\text{e-}6$ ).

7.93.4. Chamber ( $1.1\text{e-}7 < x < 2.0\text{e-}6$ ).

7.93.5. Perform 7.89 – 7.91 While waiting for base pressure.

7.93.6. If the tool is struggling to reach base pressure ensure a vacuum of below  $1\text{e-}5$  before bringing up any beams. It is recommended that you outgas any graphite replaced. Slowly ramp the PSU for the desired outgas, about  $1\text{kV}/2\text{min}$  is a good pace for outgassing. If vac bursts or voltage drops reduce voltage and walk the voltage back up slowly.

7.94. Perform a System Startup.

7.94.1. Under the Mode Control Screen press System Startup.

7.94.2. The tool must be able to complete the startup without alarm or errors.

7.95. Cross slot detection test.

7.95.1. Using dummy wafer cross slot a wafer to sit in position 12 and 13 of the cassette.

7.95.2. Load cassette in the left LL and perform a wafer map.

7.95.3. Ensure the map shows a wafer cross slot error.

7.95.4. Move the cassette to the right LL and perform a wafer map.

7.95.5. Ensure the map shows a wafer cross slot error.

7.95.6. If tool does not detect the cross slotted wafer perform the wafer mapping sensor setup Reference [6.4.5 VMM](#) on the faulty Endstation.

7.96. Verify Elevator motion

7.96.1. Open both LL's and visually inspect the cassette nests.

7.96.2. Ensure the components are not loose / do not wobble.

7.96.3. Verify they extend and retract to the proper position.

7.96.4. Exercise the elevator from pivot position to slot 1 position and verify each elevator moves smoothly without vibration or rattling.

7.96.5. The handler should pick wafers easily from each slot.

- 7.97. Perform E-Alignment.
  - 7.97.1. Tune up E-ALIGNMENT-G.
  - 7.97.2. Refer to [Section 17](#) for Ext Electrode Beam Centering.
  - 7.97.3. Record X & Y screen count values.
- 7.98. Complete the Radiation survey.
  - 7.98.1. Readings should be less than 0.25mR/hr.
  - 7.98.2. Troubleshoot and fix if necessary.
  - 7.98.3. Complete the online form on our web page at the link below  
<http://dm5ee2.de.sc.ti.com/RadiationSurvey/asp/Query.asp>
- 7.99. Tune up Performance 1 & 2 to verify proper function.
  - 7.99.1. Tune both recipes and verify the tool has no arcing for 15 minutes.
- 7.100. Run 26 wafers on RS Qual Recipe.
  - 7.100.1. Check which species MFG is going to run the tool as and use that recipe.
  - 7.100.2. Recipe by species is in step 7.104.2-4
  - 7.100.3. Run 13 on left side
  - 7.100.4. Run 13 on right side
  - 7.100.5. All 26 wafers must run successfully with no alarms/errors. If it has errors troubleshoot and fix and retry.
- 7.101. **Q** Wafer notch alignment test.
  - 7.101.1. Using the wafers from previous step use the top 5.
  - 7.101.2. Tune up PCPR recipe for the tool.
  - 7.101.3. Run the top 5 wafers.
  - 7.101.4. Verify that the notches line up within  $\pm 2$  degrees.
  - 7.101.5. Verify the wafers are properly positioned in the cassette.
- 7.102. Run online PCPR test on 1 loadlock for the tool.
  - 7.102.1. Adders must be < upper zone b of the production qual chart.
    - 7.102.1.1. Refer to IM-CHARTS for chart name.
  - 7.102.2. If qual fails don't post it, abort it. Then fix the particle issue and retry.
- 7.103. Tune up the top 5 recipes found in the EE page link.
  - 7.103.1. Tune up the recipes found from the [EE page link](#).
  - 7.103.2. Ensure beams are stable and at least 10% away from alarm limits.
  - 7.103.3. For example if scan limit is 45 and it sets up at 42 tune to reduce the scans.
- 7.104. Tune up RS qual with species needed for production/qual.
  - 7.104.1. Ask a MFG operator what species they are going to run the tool on and tune up that RS recipe.
  - 7.104.2. Boron Qual Recipe NPOCKQUAL-65MA
  - 7.104.3. Phos Qual Recipe PPOCKM-65MA
  - 7.104.4. Arsenic Qual Recipe ASMON-70KQUAL
- 7.105. Clean around the tool and in the ES area.
- 7.106. Update tool XID.
  - 7.106.1. Insert comments into SMS identifying all work done to resolve XID's. If an XID cannot be completed, the tool owner must input comments on the XID status. Log the XID to PROD if all actions on the XID are completed.

- 7.107. Record the Misti ID's of the items replaced during PM in Checksheet.
- 7.108. Verify the area in and around the tool passes all 5S requirements for cleanliness and organization.

Return exchanged parts, recyclable materials, cleaning materials, discs, manuals, documentation, etc. to their proper locations.

Record comments for items needing correction/completion.

Record your name(s) and employee ID(s) on checksheet.

Update the PM tracking in the online web page

<http://pm-checksheets.sc.ti.com/ffwMenu/index.jsp>

## 8. Beam Shut Down

- 8.1. From the implant Screen select the manual menu.
- 8.2. Select the mode menu.
- 8.3. Select Auto Shutdown
- 8.4. When prompted for a diskette, select proceed.
- 8.5. Select yes when prompted to leave magnets on unless work will be in close proximity to the magnets.

## 9. Source Change [Reference 3.5 in VMM](#)

- 9.1. Turn off the source gas, arc and Filament.
- 9.2. Ensure the high voltage interlock is enabled or that the source cabinet is in bypass mode.  
The red lamp on right side of the enclosure will be flashing when the high voltage interlock is made.
- 9.3. Verify that the source has been shut down for at least 30 minutes.
- 9.4. Go to the auto vacuum screen and press the vent button located under the source section.
  - 9.4.1. To vent the source manually switch to the manual vacuum screen
  - 9.4.2. Turn off the source turbopump by pressing the source turbopump icon.
  - 9.4.3. Wait 10 minutes for the pump to stop spinning.
  - 9.4.4. Open the vent valve by pressing the vent valve icon.
- 9.5. Use the manual grounding rods to ground the terminal module and ensure that the source bypass switch is off.
- 9.6. Disconnect the following
  - 9.6.1. Both Thermocouples if installed
  - 9.6.2. Heater cable if installed
  - 9.6.3. Both Filament Leads
  - 9.6.4. Both 3/8" coolant lines
  - 9.6.5. Gas line to source.
- 9.7. Remove source.
- 9.8. Vacuum out the source housing and clean housing with DI water and clean wipes. Wipe housing with IPA and clean wipes to remove residual water.
- 9.9. Install rebuilt source.
- 9.10. Inspect gas feed O-Ring and seal surface. Connect gas line.
- 9.11. Connect the rest of the items disconnected in 9.6
- 9.12. Check for water leaks around the manifold and connections.
- 9.13. Go to auto vacuum screen and put Source region in high vacuum. Make sure source region goes to 5.0e-5 Torr within 5 minutes.
- 9.14. Outgas Filament Reference 10 below.
- 9.15. When all maintenance is completed release the system to manufacturing.

## 10. Filament Outgas Procedure

- 10.1. Reference Section [3.5.2 in VMM](#)
- 10.2. This procedure is performed following a source change or where water vapor may be present in the source area after being at atmosphere.
- 10.3. On the service menu screen select filament outgas.
- 10.4. Program the maximum filament current to 200 amps.
- 10.5. Start the outgas
- 10.6. If outgas finishes without error this is the end of the outgas procedure.

## 11. Cryopump Regeneration

- 11.1. Shutdown the beam.
- 11.2. To perform an auto regen, select the cryo regen button located on the auto vacuum screen.
- 11.3. Select yes on the dialog box to start the regeneration cycle.
- 11.4. During an auto regen no manual control of the vacuum system is allowed. The on-board controls are accessed from the vacuum control submenu.
- 11.5. A manual regen of On Board cryos will not turn on the coldhead heaters.
- 11.6. To perform a manual regen
  - 11.6.1. Select the non-auto symbol. The vacuum schematic will appear.
  - 11.6.2. Isolate the cryo's by closing their respective isolation valves. Also close the source isolation valve.
  - 11.6.3. From the vacuum screen turn off the compressor to the target chamber cryo.
  - 11.6.4. Open the Nitrogen purge to the cryo.
  - 11.6.5. Once the cryo reaches 305K turn off the Nitrogen purge.
  - 11.6.6. Rough out the cryo by opening the roughing valve to that cryo.
  - 11.6.7. When the pressure reading on the cryo reaches 50 microns close the roughing line.
  - 11.6.8. Watch the pressure for 5 minutes.
  - 11.6.9. If pressure rises more than 50 microns take appropriate action and repeat step 11.6.6 – 11.6.8
  - 11.6.10. With the cryo isolated from Nitrogen and roughing pump turn on the compressor. This will start cooling the head.
  - 11.6.11. When the cryo temp is below 20K the cryo iso valves can be opened.

## 12. Bottle Change Requirements.

- 12.1. Breathing air systems must be used when changing the Arsine, Phosphine and Boron Trifluoride bottles.
- 12.2. Scott-O-vista or ScottAV2000 supplied air respirators must be used with the breathing air system.
- 12.3. A person buddy system must be followed during bottle changes. A 5 minute egress bottle must also be used with the airline respirator.
- 12.4. There should be one assigned facepiece for each qualified individuals working on the implanters.
- 12.5. Each user is responsible for cleaning, maintenance and storage of the respirator.
- 12.6. The face piece must be disinfected after every use.
- 12.7. The face piece must be allowed to dry, stored in a plastic bag and properly stored. Respirator should be identified with the owner's name or employee number.
- 12.8. MISTI comments after bottle changes must include the names of people who worked on the bottle change procedure. Comments should also indicate if the respirator was inspected prior to use and disinfected after use.



- 12.9. Do not accept a gas cylinder from the Chemical Dock without a cylinder cap in place and a plug on the gas connection. Gas cylinders requested must be removed from the dumbwaiters promptly (within 4 hours).
- 12.10. Do not transport gas cylinders on a cart or mobile table without properly securing the cylinder using straps. Gas cylinders may be hand-carried. The gas connection plug and the cylinder cap must be in place during transport.
- 12.11. Use the proper gasket and torque wrench for making the gas fitting connection to the implanter.
- 12.12. Immediately upon removal from the implanters, gas cylinders must have the gas connection plugged, attach a cable tie to the valve wheel to secure the valve in the closed position and install a valve cap. If the cylinder being removed does not have a cap notify the Chemical Dock and they will provide one.
- 12.13. Mark empty cylinders as empty (MT), place in the dumbwaiter and notify the Chemical Dock.

### 13. Bottle Change Procedure ([Reference 4.13.8 VMM](#))

- 13.1. Shut down the beam.
- 13.2. Select the yellow change button on the gas screen.
  - 13.2.1. Touch yes when prompted.
- 13.3. Select the gas cylinder that needs to be changed.
- 13.4. Close the gas cylinder manual valve tightly when prompted.
- 13.5. Fully open the regulator after low side pressure drop to <0 psi when prompted (CW).
- 13.6. Close the regulator (CCW) after the system performs a leak check. Touch regulator symbol when prompted.
- 13.7. System will prompt bottle removal by indicating wrench size and turn direction on the screen. Remove bottle and cap off.
- 13.8. Touch button to confirm gas bottle is removed.
- 13.9. Select appropriate gas. This will normally be the same as the gas that is removed.
- 13.10. Install the new gas cylinder (DO NOT OPEN VALVE OR CAP YET). When gas cylinder is securely in place in the source cabinet, recheck the gas valve to make sure it is securely closed. Remove the seal cap and install a new Teflon gasket. Carefully inspect the gasket for nicks or cuts on the seal surface. Secure bottle fitting and touch the fitting symbol on the screen. Leave the bottle valve closed.
- 13.11. Open the regulator valve fully when prompted.
- 13.12. Barely open bottle valve. Visually check for white smoke indicating a leak. If no leak is indicated continue to open the valve. Touch the bottle valve symbol when complete.
- 13.13. Set regulator to -10 hg to -15 for BF3.
- 13.14. Touch the yes button when prompted to signal the completion of the gas change procedure.
- 13.15. When all maintenance is completed release the system to manufacturing.

### 14. Wafer Handling Rules

- 14.1. 500 wafers must be cycled after any wafer handling adjustments. 4 Rotations should be used for the setup.

### 15. Scan Amplifier Waveform Check Procedure.

- 15.1. Verify the tool is at spec base vacuum.
- 15.2. Connect a Ross Probe high voltage side to the top of the scan deflector feedthrough, and the low voltage side to channel A of an oscilloscope.
- 15.3. Ramp the scan amplifier to the voltages to be checked and set the mode to Linear Scan.
- 15.4. Set the O-Scope display to 2 V/div, and 200  $\mu$ s/div on the time scale.

- 15.5. Verify on the O-Scope display the following attributes of the waveform:
  - 15.5.1. The signal is clean and free of noise (no arcing)
  - 15.5.2. The waveform should be triangular with a plateau at the top of the duration 40  $\mu$ s.
  - 15.5.3. The plateau should be straight and flat with no humps or slope.
- 15.6. If any doubts exist as to the waveform, take a picture of the O-Scope display and send to tool owner.

#### 16. Leak Checking ES Diff Rough Vac Lines

- 16.1. Connect leak checker to bearing outer seal rough line via leak check port.
- 16.2. Starting high and working your way down leak check diff line. If hit is detected repair line.
- 16.3. Connect leak checker to ES components diff rough vac and bearing inner seal line via leak check port. Starting high and working your way down leak check diff line. If hit is detected repair line.
- 16.4. In both cases, we are looking for a leak on the diff lines themselves. If a leak is detected at the motion seal (diff seal), it's burst rate and amplitude must be determined.
- 16.5. Throttle helium flow using IPA bottle to one or two bubbles per second. Leak check motion seal in question.
- 16.6. At the main vacuum page monitor ES vacuum gauge reading. Vacuum burst should be no greater than  $\frac{1}{2}$  a decade from baseline. Example if ES base vac is  $5e-7$  a burst vac of  $1e-6$  is considered a failure and will have to be addressed.
  - 16.6.1. [Reference PSB2621](#) for more information.

#### 17. Ext Electrode Beam Centering

- 17.1. Under no circumstance are recipe (s) E-Alignment-G or E-Alignment limits to be modified (Changed) and saved without notification and approval of tool owner.
- 17.2. Run recipe E-Alignment-G for gauss tools or E-Alignment for non-gauss tools for setup and verification of extraction electrode axis alignment to beam center. If recipe successfully completes setup without issue then this procedure is completed.
- 17.3. Else if recipe fails to setup due to X and Y axis out of range (not within defined recipe limits) error then the remainder of this procedure must be performed.
- 17.4. Optimize beam for max achievable stable beam with minimal suppression & extraction currents.
- 17.5. X axis should be optimized in reference to max setup cup beam current.
- 17.6. Y axis should be optimized in reference to max focus cup beam current.
- 17.7. Shut down beam for terminal entrance.
- 17.8. Access extraction electrode assembly and unplug X & Y motor power connectors.
- 17.9. Set X & Y screen command counts to 500 on both X & Y axis.
- 17.10. Using an Allen wrench loosen mechanical link between X & Y readback pots and extraction assembly.
- 17.11. Using needle nose pliers adjust X & Y mechanical pots so both screen readbacks read 500 plus or minus 5.
- 17.12. Tighten mechanical linkage set screws for X & Y read back pots.
- 17.13. Plug X & Y motor connectors back in. The motors for X & Y should not move. If one or the other move, causing the screen read back to differ from command set point with delta greater than 5 screen counts then re-perform beam centering alignment procedure from the beginning else proceed to next step.
- 17.14. Verify both X & Y axis has a movement range from 400 min to 600 max screen counts.
- 17.15. Re-run E-ALIGNMENT-G for gauss tools or E-ALIGNMENT for non-gauss tools.
- 17.16. Verify tool tunes alignment recipe without any X or Y errors.
- 17.17. If so, Extraction electrode beam centering is completed.

17.18. If tool is unable to achieve axis target setting after several attempts to complete this procedure contact tool owner for further instructions.

#### 18. RP1 Exhaust Muffler/Silencer Annual Clean

-Refer to Varian PSB 2616B if needed.

- 18.1. This procedure must be performed with source turbo spun down.
- 18.2. Make sure before servicing unit that it has cooled and can be safely handled by hand.  
This involves shutting down RP1. Please de-energize and lockout CB2.
- 18.3. Remove KF clamps from muffler unit.
- 18.4. Remove muffler mount bracket.
- 18.5. Move unit to hood.
- 18.6. Remove muffler grate from unit and place to the side.
- 18.7. Remove Top Muffler cover.
- 18.8. Remove bottom cover
- 18.9. Remove and discard KF, muffler top and bottom cover O-Rings.
- 18.10. Take unit to rebuild shop.
- 18.11. Tape off all O-Ring surfaces.
- 18.12. Clean top and bottom of cavities using DI water and brushes make sure to get inner pipes as well.
- 18.13. Once pipes are clean remove tape.
- 18.14. Rinse unit thoroughly.
- 18.15. Polish to remove any further debris.
- 18.16. Rinse unit thoroughly.
- 18.17. Dry unit with compressed air gun.
- 18.18. Take unit to fab toxic hood for reassembly.
- 18.19. Install all new O-Rings previously removed.
- 18.20. Install bottom cover.
- 18.21. Install grate along the top cover.
- 18.22. Install mount bracket.
- 18.23. Mount unit in terminal reconnecting exhaust line via KF clamps as well.
- 18.24. Remove Lockout Tagout device.
- 18.25. Reenergize RP1 circuit.
- 18.26. Perform Exhaust Leakage conductivity test 19

#### 19. Exhaust leakage Conductivity Test

Refer to [Varian PSB1679](#) if needed

Refer to [VMM 2.19.5 – 2.19.5.4](#)

- 19.1. Perform system shutdown
- 19.2. Open TVL faraday side outer enclosure door.
- 19.3. Engage door interlock switch.
- 19.4. Activate HV on keyswitch and green button.
- 19.5. Turn off exhaust leakage module.
- 19.6. Wait 10 seconds and turn exhaust leakage module back on.
- 19.7. Both Red and Green indicator light should be lit.
- 19.8. After 30 seconds the red light should go off leaving only the green light lit.
- 19.9. If red light remains on then Ref to Varian PSB 2616B. Contact tool owner.

#### 20. Data Retention

- 20.1. Refer to DM5 Specification:

QP016-1

- 20.2. PM tracking and data entry in online web page

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