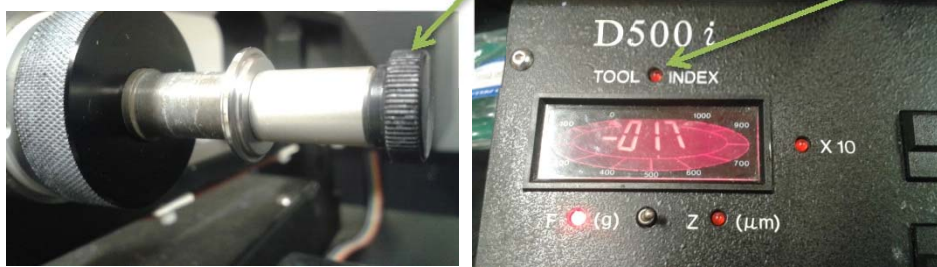


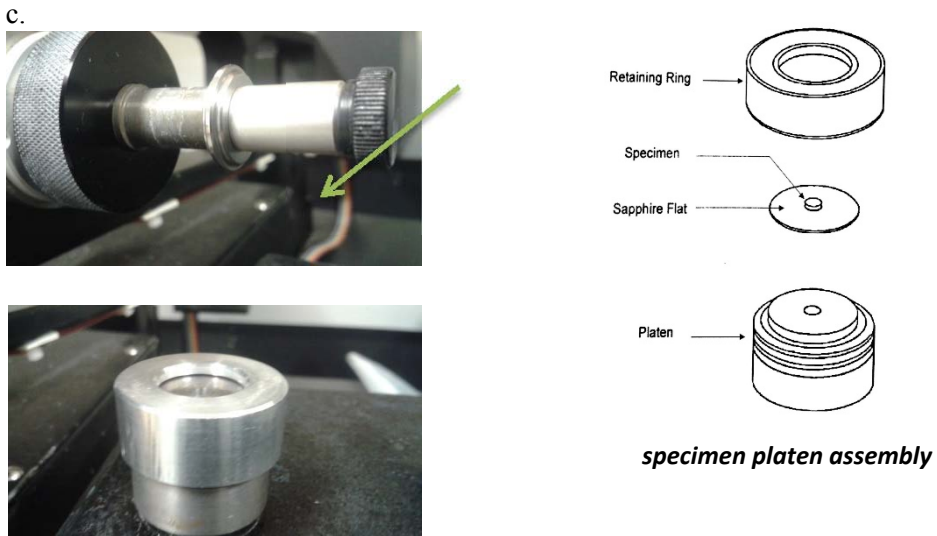
## OPERATION OF THE DIMPLER

After thinning your sample to  $\sim 80 \mu\text{m}$  you can now do a dimpling process to thin the center up to  $10 \mu\text{m}$ . When you walk in and use the DIMPLER® it should already be calibrated and balanced. Procedures on doing such calibrations will be provided if you'll be using it more often in the future.

1. Initial Z Measurement. Initial thickness measurement is made while the tool and specimen are stationary.
  - a. Mount Tool 3i and rotate the drive shaft/axle slowly until the red TOOL INDEX LED turns ON. The TOOL INDEX LED must be ON to make static Z measurements.



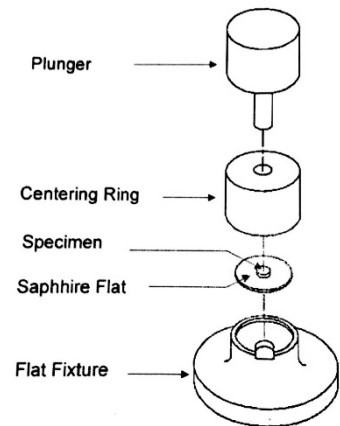
- b. Place the *specimen platen assembly* on the hex shaft. Make sure the sapphire ring is clean and mounted squarely under the retainer ring.



- d. Turn the FORCE SETPOINT knob to 20 g. This force is high enough to press the sample against the sapphire flat but not high enough to compress a specimen with a dimpled under layer.



- e. Toggle the F(g)/Z( $\mu\text{m}$ ) switch to Z( $\mu\text{m}$ )
  - f. Press ARM-DN to lower the tool onto the platen. The Z( $\mu\text{m}$ ) LED will turn ON and an arbitrary number will be displayed.
  - g. Zero the display with Z OFFSET knob.
  - h. Press ARM-UP and place your cleaned sample on the sapphire flat directly over the 3 mm hole in the platen.
  - i. Press ARM-DN to lower the tool onto the unmounted specimen surface. The Z( $\mu\text{m}$ ) LED will come on and the specimen thickness will be displayed in micrometers. This is your initial specimen thickness before dimpling. Measure 2 sides of your sample and use the smaller value as your initial thickness.
2. Mounting your sample onto the sapphire disc.
    - a. Place the sapphire disc on the *specimen mounting jig* and put them on top of a heating plate.
    - b. Heat the assembly to about 175 °C. Dab a small amount of wax at the center of the disc and wait for it to melt.
    - c. Position your sample at the center, using the center hole as guide.
    - d. Place the center ring on top of the disc and then insert the plunger into the center ring, pressing it gently while rotating slowly. This will flatten your sample into the sapphire disc.
    - e. Remove the Plunger and the center ring and take the fixture out of the hot plate and allow it to cool down.
  3. After it cools down, transfer the disc with your sample mounted onto the *specimen platen*, and place the *retainer ring* on top of it. Make sure that the disc is centered and the retainer ring is tight. Dimpling specimen to 15  $\mu\text{m}$ .



***specimen mounting jig***

- a. Place the assembly on the hex shaft and press the ARM-DN button. When the tool touches the specimen, set the Z OFFSET to a value that will leave ~15  $\mu\text{m}$  thickness of your sample. Refer to your initial thickness measurement for this value. Press ARM-UP.
- b. Place 3-5 drops of 1  $\mu\text{m}$  diamond slurry on the sapphire disc.
- c. Press CLR to zero the timer. Operate the timer in Elapsed Time Mode to monitor the time used to perform this step.



- d. Press start to begin tool and platen rotation.

- e. Press ARM-DN to begin dimpling process. The amount of material removed can be monitored from the LCD display. The process automatically stops when the readout reaches zero. The sample thickness at the dimpled area will be 15  $\mu\text{m}$ .
  - f. Clean the specimen and inspect under the microscope.
4. Removing additional 5  $\mu\text{m}$  thickness using dimple polishing tool.
  - a. Mount the dimple polishing tool, 4i, on the drive shaft. It should have been presoaked for more than 10 minutes in extender fluid before use.
  - b. Turn the Z OFFSET with 3 full rotations CW to add an offset to the thickness measurement.
  - c. Place 3 – 5 drops of extender fluid on the sapphire disc.
  - d. Press the ARM-DN button to engage the dimpler. Wait for the Z measurement to stabilize. It should give you a reading with  $\pm 2$   $\mu\text{m}$  deviation.
  - e. Set the Z OFFSET to 5  $\mu\text{m}$ , the amount of material to be removed. Do this slowly so as not to trigger auto-termination (auto-termination occurs when the reading hits “0”).
  - f. Add 3 drops of 0.05  $\mu\text{m}$  alumina suspension directly on top of the dimpling tool and wait for the process to finish.
  - g. Wash your sample and remove it from the sapphire disc.

## OPERATION OF PRECISION ION POLISHING SYSTEM

1. Once your sample has been dimpled to ~10 micron thickness, the Precision Ion Polishing System (PIPS) will be used to further thin it down to ~100 nm.
2. Checking the condition of the PIPS.
  - a. The Ar gas flow and the voltage settings should have been already set up when you walk in the lab. The PIPS is currently set up for a maximum current of 65  $\mu\text{A}$  on both guns and beam energy of 5.0 keV.
  - b. Other initial standby settings are as follows:
    - i. Ar gas valve shut off (wall connection)
    - ii. Instrument power ON
    - iii. Sputter Chamber under vacuum
    - iv. Left and right ion gun switches OFF
    - v. Specimen holder raised (airlock control switch toggled UP)
    - vi. Rotation switch OFF
3. Turn ON the Ar gas valve on the wall
4. Purge the sputter chamber.
  - a. If the PIPS has not been used for more than 24 hrs. It is essential to purge the sputter chamber to remove ambient gas from it.
  - b. If the yellow **VENT** LED is on press the **VAC** button until the green LED turns ON

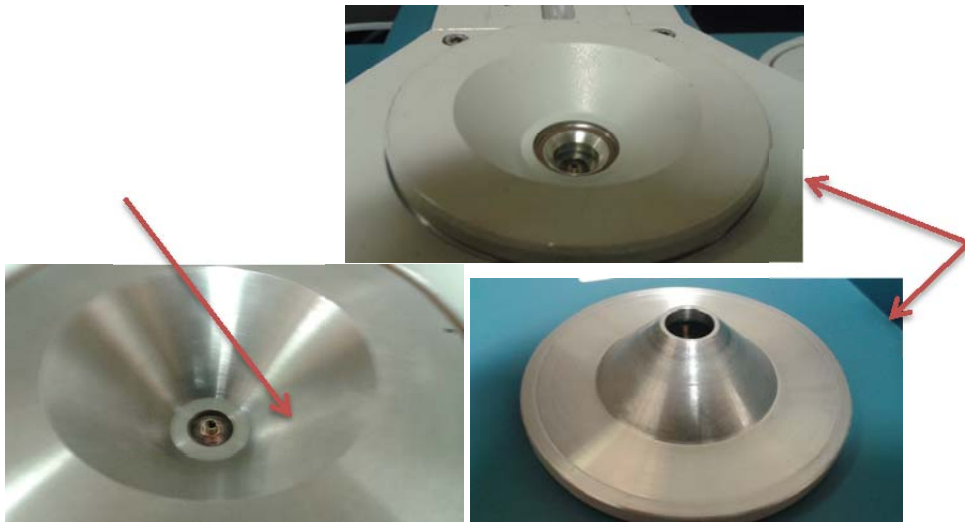


- c. Turn the **ROTATION** switch CW until it clicks.
- d. Toggle the **AIRLOCK CONTROL** switch to the **LOWER** position.
- e. Turn the **ION GUN** switches **ON**. The green LED indicator should light up.



- f. Set purging time of 15 minutes by pressing the arrow up/down in the LED display panel.
- g. Press Start and wait until purging is done.

- h.
5. Loading the Sample.
- a. Before loading your sample into the PIPS you need to mount them on special sample holders. Your instructor could show you how to mount the sample on those holders.
  - b. Once the sample is mounted you can load it on the PIPS. Toggle the **AIRLOCK CONTROL** valve UP. This will raise the stage and seal the sputter chamber.
  - c. Press the **VENT** button and wait for the load lock to be vented.
  - d. Open the load lock by lifting the cover.



- e. Load your sample mount using the specialized tweezers. Make sure that the mount is seated well on the stage.
- f. Place the cover back and press the **VAC** button until the green LED turns on.
- g. Lower the stage.
- h. Set an initial sputtering time of 30 minutes. (This may take longer depending on the initial thickness of your sample, and the type of material.)



- i. Place the Auto-terminator on the viewing port/door and press Start.



- j. Sputtering will stop automatically when the sample is thin enough that a beam of light can pass through that can be detected by the auto-terminator.
6. Unload your sample, remove it from the mount and check it under an optical microscope.