

# CALIBRATION PROCEDURE

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**Credit:** Based on Allied High Tech manual v.7.3 ([www.alliedhightech.com](http://www.alliedhightech.com)) and WVU Webpage

*If you encounter any problems with this piece of equipment, please contact the staff member listed above immediately.*

*If the equipment is not behaving exactly the way it should, please contact a staff member.*

## ALIGNMENT

The alignment is a process that takes only a few minutes to accomplish, and it is highly recommended prior to starting any procedure. The alignment process involves three (3) steps:

- 1) Verification of platen run-out.
  - 2) Perpendicular alignment of spindle (sample rotation axis) to platen. This alignment is done in two phases.
  - 3) Alignment of micro-hub assembly to platen.
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1. If the MultiPrep System isn't ON, you can turn it ON using the switch in the back (right above the power cable connection).
  2. Adjust sample load to FULL.
  3. Remove the cover and splash ring. Keep it carefully stored in the cabinet's first drawer below the instrument.

4. From the same drawer, remove the non-magnetic platen from its box.
5. Find where the platen base in the instrument has a pin where it is stamped the letter A. That will be your platen position reference. You will match this A with the A marked under the platen.
4. Matching both "A"s, place the platen (without abrasive/disc/cloth) onto the base.

**Warning:** DO NOT DROP the platen onto the platen base or any other place!! Repeated abuse will affect precision!

**Warning:** Keep the surfaces between the platen and base clean and dry always so the platen run-out remains within specification!

### PLATEN RUN-OUT Calibration

The platen and base are precision lapped surfaces, and their tolerances may vary up to 2-3 microns each. The platen orientation, as it rests on the base, can affect the overall run-out. Find the platen position that matches the base with the minimum run-out.

1. Remove the dial indicator and its adapter (Figure 1) from the MultiPrep accessory case.
2. Slide the long edge of the dial indicator onto the dovetail on the silver pin of the adapter (circled in Figure 2).
3. Lock the indicator approximately one-quarter (1/4) inch from its rounded edge by rotating the threaded ring/collar.
4. Position the dial indicator tip at an angle, just below the adapter body (circled in Figure 3).

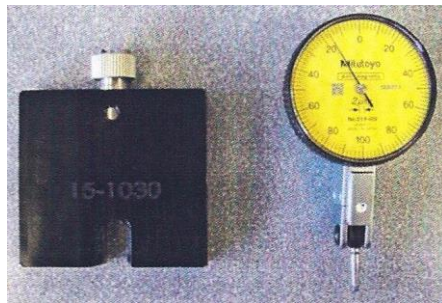


Figure 1: Adapter and dial indicator.



Figure 2: Dial indicator connected to the adapter.

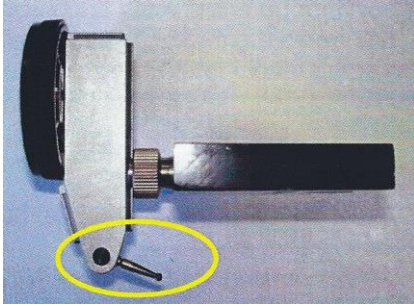


Figure 3: Dial indicator tip positioned at an angle below the adapter.

5. Attach the adapter plate/indicator to the MultiPrep using the cam-lock, and then lower the cam-riser.
6. Rotate the indicator bezel so 100 is at the six o'clock position (Figure 4).
7. Adjust the oscillator linkage to position the dial indicator tip approximately one (1) inch from the edge of the platen.
8. The dial should be facing the front of the machine (Figure 4).

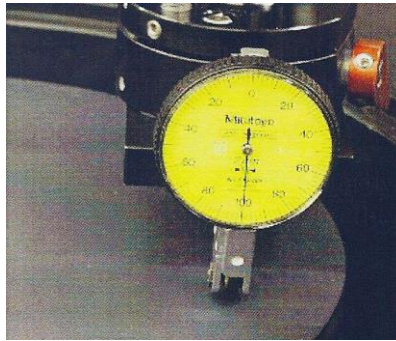

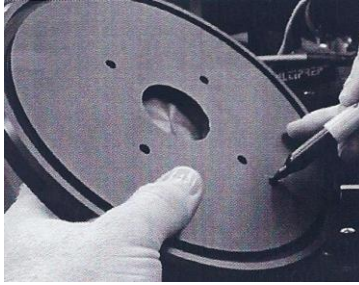


Figure 4: Dial indicator marking the number 100 and facing the front of the machine.

9. Rotate the vertical adjustment knob counterclockwise until the indicator tip makes contact with the platen and reads 100.
10. Click the power button  to turn ON the control panel in the front of the instrument.
11. Use the arrows to increase or decrease the platen speed to 20 RPM (or enter the number directly in the keyboard).
12. Activate the counterclockwise rotation of the platen, to observe the motion of the indicator needle.
13. Repeat this process until the platen position that matches the base with the minimum run-out (minimum variation of the indicator needle) is found.
14. At the minimum position or run-out, remove and mark with a marker pen the corresponding platen drive hole that engages the pin in the base where it is stamped the letter A (Figure 5).



*Figure 5: Mark the platen drive hole with that gave the minimum run-out.*

15. If more than 5 microns of vertical run-out is observed, check the platen and platen base contact surfaces for debris, corrosion, etc, and clean as needed.
16. If the run-out is still more than 5 microns after cleaning, please contact SRF staff immediately. Using the tool with more than 5 microns of run-out will affect the precision of the instrument, thus affecting your sample preparation. This error is more than enough to ruin your final result. Platen base and platen may also be damaged if used under these conditions.

#### **PERPENDICULAR ALIGNMENT OF SPINDLE (SAMPLE ROTATION AXIS) TO PLATEN**

This alignment is done through two different adjustments.

1. With the dial indicator still attached from the verification of the platen run-out, move the arm to re-position the indicator closer to the center of the platen (Figure 6).
2. Activate FULL rotation at the lowest speed (1) and make sure the tip of the dial indicator makes continuous contact with the platen for a complete rotation.
3. If over the full rotation, the need on the indicator varies more than 4 microns (2 divisions), alignment is necessary.
4. Perpendicular alignment is accomplished by adjusting the screws on the leveling plate (Figure 7).
5. The dashed red lines in Figure 7 indicate the axes of alignment of the 3-point leveling plate, which are illustrated as a clock in Diagram 1.

##### *First adjustment*

This adjustment involves positioning the dial indicator at the 3 and 9 o'clock positions and adjusting the screw on the right side of the leveling plate until the readings are equal.

6. Rotate the bezel on the dial indicator so the number 100 is at the 6 o'clock position on the face.

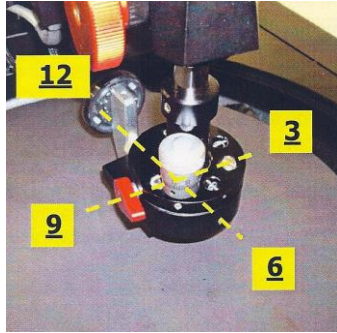


Figure 6: Indicator moved closer to the center and capable of a full rotation without getting out of the platen.

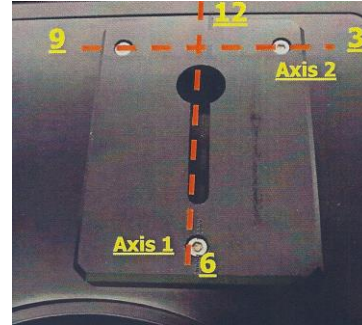


Figure 7: The clock reference of the leveling plate.

7. Activate sample rotation and position the dial indicator at the 3 o'clock position on the platen (Figure 6).
8. Set the indicator needle to 100 (Figure 8) on the dial by rotating the vertical adjustment knob.
9. Activate sample rotation and stop the indicator at the 9 o'clock position (180 degree rotation).
10. If the variation is greater than 2 divisions (4 microns), alignment is necessary. If the variation is smaller, go to the second adjustment.
11. If at the 9 o'clock position the needle has rotated clockwise, tighten the screw at the right rear corner of the leveling plate until the needle returns to 100.
12. If it has rotated counterclockwise, loosen the screw at the right rear corner of the plate until the needle returns to 100.
13. Repeat steps 7 to 12 until the variation is 2 divisions or less on the indicator.

### Second adjustment

This adjustment involves positioning the indicator at the 6 and 12 o'clock positions and adjusting the screw on the left side of the leveling plate until the values at each position are equal.

14. Activate sample rotation and stop at the 12 o'clock position. Rotate the vertical adjustment knob until the needle reads 100.
15. A mirror is supplied in the accessory kit to help see the indicator face when it is at the 12 o'clock position facing away (Figure 9)
16. Activate sample rotation and stop at the 6 o'clock position.
17. Adjust the screw on the front side of the leveling plate to return the needle to 100.
18. Repeat steps 14 to 17 until the variation is 2 divisions or less on the indicator.
19. Observe one full rotation to verify that the total variation of movement of the needle is less than 4 microns.

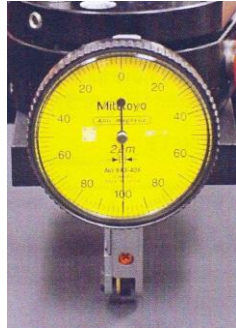


Figure 8: Indicator marking the number 100.

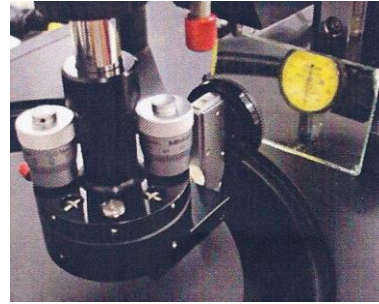


Figure 9: Mirror positioned at the 12 o'clock equivalent position.

### ALIGNMENT OF MICRO-HUB ASSEMBLY TO PLATEN

The micrometer heads on the micro-hub assembly are used to adjust/tilt a sample, by changing its angle relative to the platen. Changing its angle should be performed to correct variations caused by mounting wax, uneven encapsulation of potted and packaged samples, tape, etc. This alignment is required to establish a parallel surface to which the sample is secured and referenced.

1. Remove the adapter plate and the dial indicator, and separate the two components so the dial indicator can be used by itself (Figure 1).
2. Manually position the indicator tip to about a 25-degree forward angle, and secure the indicator to the platen using double sided adhesive tape.
3. Rotate the indicator bezel so the zero is rear-facing (Figure 10).

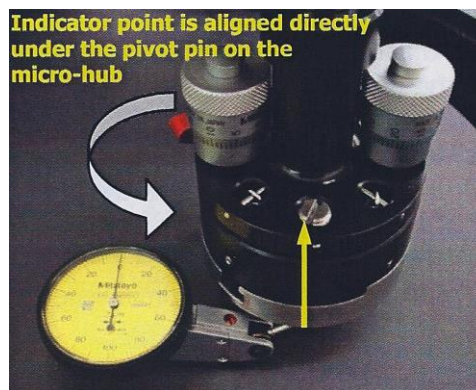


Figure 10: Indicator point aligned under the pivot pin (yellow arrow) and marking zero.

4. Attach a parallel polishing fixture (Figure 11) to the MultiPrep head and lower the spindle using the spindle riser (Figure 14).



5. Activate sample rotation and stop when the pivot pin is over the contact point of the indicator tip (the pivot pin is indicated by the yellow arrow in Figure 10).
6. Lower the arm using the vertical adjustment knob until the bottom of the fixture makes contact with the indicator tip and the needle of the dial indicator is aligned with the zero.
7. Activate the full sample rotation and stop it when the indicator tip is directly beneath the first micrometer head (Figure 12).
8. Adjust the micrometer head to return the dial indicator needle back to zero, in the opposite rotational direction of its movement during the previous step (step 7).
9. Activate full rotation and stop it when the indicator tip is directly beneath the second micrometer head (Figure 13).
10. Adjust the micrometer head to return the needle to zero.

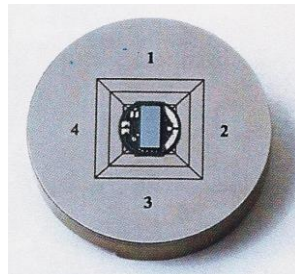


Figure 11: Parallel polishing fixture, showed here with a sample attached.



Figure 12: Indicator point aligned with the 1<sup>st</sup> micrometer.

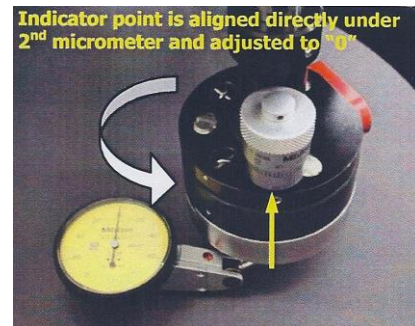


Figure 13: Indicator pin aligned with the 2<sup>nd</sup> micrometer.

11. Activate full rotation until the fixed pivot pin is located over the tip of the dial indicator (Figure 10)
12. Adjust the vertical adjustment knob until the needle on the dial equals zero.
13. Repeat steps 7 to 12 until less than 4 microns of variation is noted on the dial indicator over a full 360-degree rotation.

## PREPARING THE PROCESS

1. Select the proper 8-inch diameter abrasive surface or diamond lapping film.
2. Place a film of water on the platen surface and the underside (smooth/ shiny side) of the 8-inch paper. Surface tension should hold the paper to the platen.
3. Select the proper fixture to hold your sample.

**Warning:** DO NOT touch any part of the MultiPrep system head with wet hands!! Liquid is only allowed on the platen and below. No other part of the MultiPrep should be wet at any time! If the MultiPrep System head becomes wet, infiltration of liquids to the electronics can occur. Oxidation and corrosion may result if you do not follow this rule.

4. Properly attach sample to the fixture. Mounting of the sample onto the fixture is usually done with wax, double-sided tape, glue or set screws.
5. Raise the spindle either using the vertical adjustment knob or the spindle riser (Figure 14) so that the sample and fixture fit without contacting the platen and the abrasive surface.

**Note:** All fixtures are mounted to the bottom of the angle adjustment plate of the micro-hub assembly attached at the end/bottom of the spindle. Each fixture has a common U-shaped cutout. The flat edge of the fixture is referenced against the machine edge (lip) of the angle adjustment plate, which is located behind the cam-lock plunger (Figure 15).

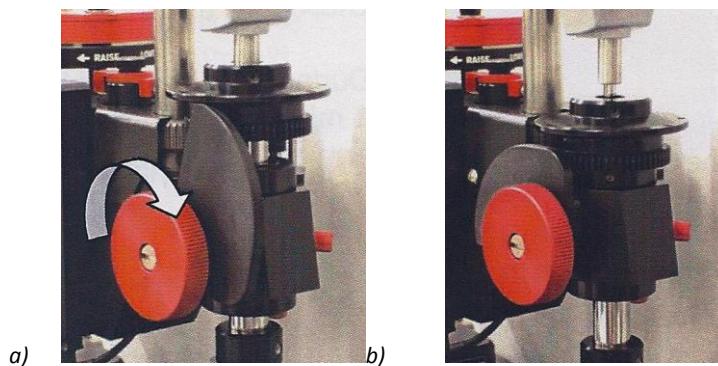


Figure 14: a) Spindle riser positioned UP; b) Spindle riser positioned DOWN.

6. Slide the prepared fixture onto the bottom of the angle adjustment plate until it makes full contact with the edge. Make sure it has engaged the cam-lock plunger.
7. Rotate the cam-lock lever clockwise until tight (no need to force it tight though!).
8. Remember to bring down the spindle riser before starting to run a sample! (Figure 14)
9. Follow your protocol of sample preparation.



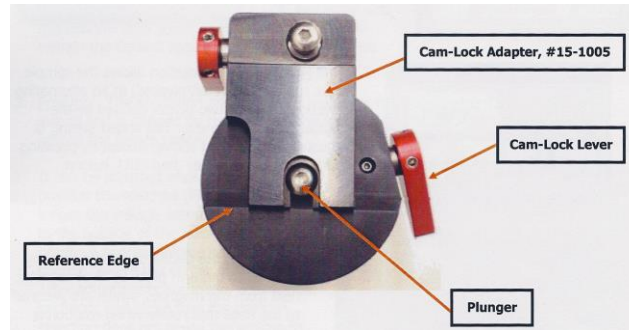


Figure 15: Bottom view of the Micro-Hub Assembly showing the reference edge.

## WORKING WITH CLOTH

10. Select the proper 8-inch diameter cloth.

**Note:** If working with adhesive cloths, continue working with the same platen. If working with magnetic cloths, change the platen to a magnetic platen. No new alignment is required for this part of the process. Swing the MultiPrep arm away from the platen before exchanging it for the magnetic one!

11. Attach the polishing cloth to the platen. If working with the adhesive one, make sure no wrinkles or bubbles are created in the surface during this process.
12. Dampen the cloth with water (get it wet; do not saturate in water!), and then turn the water OFF.
13. Swing the MultiPrep arm back to its original position and reattach the oscillator linkage.
14. Remove the cam-lock adapter
15. Attach the paddle fixture (with the sample already attached to it) directly to the underside of the micro-hub assembly, and then lower the spindle riser.
 

**Note:** This will allow for rotation during the final polishing step.
16. Adjust proper settings based on your protocol.
17. Once the settings are adjusted and you start running the machine, activate the water and position the flow at the edge of the platen to wash the colloidal suspension from the sides of the bowl.
18. Apply the proper colloidal suspension to the cloth.
19. Remember to bring down the spindle riser before starting to run a sample! (Figure 14)
20. Follow your protocol of sample preparation.

**Warning:** Always keep the surfaces between the platen and platen base clean and dry so the platen run-out remains within specification! Once you are done with each lapping film or cloth, clean then with water and save them for reuse.