ULTRAPOL

Advance

(3250.1)

Lapping and Polishing Machine

User Manual
(3255.1)

Issue 2.3
(Updated June, 2017)

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***Note: System shown above is complete with the Ultracollimator system.*

The information in this document is subject to change without notice. The authors assume no responsibility for any error that may appear.

Regulatory Agency Certification

The Ultrapol Advance (Part Number) has been tested and certified to meet the guidelines of 21 CFR 1040.10 and 1040.11 for CDRH Compliance.

The Ultrapol Advance is a Class IIIa laser autocollimator assisted device that incorporates a number of CDRH mandated safety features, including but not limited to an emission indicator and chassis interlocks to bring the manufacturer into compliance with U.S. government regulations.

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I. INTRODUCTION

A. Scope of Use

ULTRAPOL advance is a self-contained lapping and polishing machine capable of preparing wide range of materials and sample types for subsequent use in various forms of microscopy, production and R&D.

B. Parts List – What's included

	Part #	Description	
Main Hardware	3250.1	Ultrapol Advance Unit (110-240V)	
	3255.1	User Manual	
	5259.1	Power Cord	
Accessories (Included)	2239.1	8" Aluminum platen	
	3230.1	Slurry tray	
	3275.1	Accessories case includes below	
		3260.1	Mechanical alignment indicator
		3281.1	Set of loading weights 100g, 200g (2), 500g
		3278.1	Squeegee
		6170.1	Quick release plate 1mm hole
		6170.2	Quick release plate 2mm hole
		6377.U	Allen wrench set 7/64" w/ handle, 7/64" and 9/64"
**Optional Features			
Ultracollimator System	6183.UL	Ultracollimator unit	
	5259.1	Power Cord	
	6135.1	Metal optical flat	
	6158.AD	Recirculating Pump	

C. Power Supply

The Ultrapol Advance has one power supply:

Input	110-220VAC	10A	50/60Hz
Output	120VAC	1A	

D. Specifications

Part Number: 3250.1
Dimensions: 22 x 22x 15.5 in^3
Weight: Approximately 90 lbs.

The Ultrapol Advance is used for flat lapping/polishing of materials and/or semiconductor devices.

One laser at 660nm adjustable power output up to 5mW internally.

CDRH Class IIIa with interlocks.

E. Labels and Warnings

Center for Devices and Radiological Health (CDRH) –

The United States Food and Drug Administration's Center for Devices and Radiological Health (CDRH) is the agency responsible for enforcing federal regulations regarding radiation-emitting devices in the U.S. Because laser light is a form of radiation, it is monitored by CDRH, and we at Ultra Tec Manufacturing, Inc. have an obligation to the government, to ourselves and most importantly, to our customers to ensure that our products adhere to these regulations. Protecting consumers and complying with federal guidelines are our top priorities.

The code of the Federal Regulations (CFR) is the set of government guidelines set forth by CDRH that manufacturers of various products must follow. Specifically, guidelines 21 CFR 1040.10 and 1040.11 detail the standards that all laser products must meet. To comply with Federal regulations, all laser system manufacturers must ensure that their products contain mandated safety features, register their products with CDRH, and properly label each device with its respective warning data.

Laser products are regulated by CDRH based on the level of radiation emitted at a particular wavelength. They are grouped into specific classes according to their maximum emission level.

Per requirements of various federal and multinational regulatory agencies all labels and warnings displayed on or in the ASAP-1 are documented herein.

Certification and Identification:
Located on the rear panel

MODEL: Ultrapol Advance
SERIAL: 39945

LOCATION/DATE OF MFG:
Santa Ana, CA
October 2008

CERTIFICATION: This product complies with 21 CFR 1040.10 AND 1040.11

Ultra Tec Mfg., Inc.
1025 E. Chestnut Ave.
Santa Ana, CA 92701

Class IIIa Laser:
Located on the face of the Ultracollimator LCD box just below the Beam On/Off switch.

Aperture Warning:
Located on the front of the Ultracollimator LCD Box just below the monitor and perpendicular to the aperture.

AVOID EXPOSURE
Laser radiation is emitted from this aperture 

Access Panel and Safety Interlock Warning:
Located on rear panel of the Ultracollimator LCD box.

DANGER
Laser radiation when open.
AVOID DIRECT EYE EXPOSURE.

Located on the Ultracollimator unit housing.

DANGER
Laser radiation when open and interlock defeated.
AVOID DIRECT EYE EXPOSURE

F. Suggested Services / supplies

Strong flat workbench (with 1m x 1m available)
Hot and Cold water available
Lint-free wipes
Acetone
Isopropyl alcohol
Double sided tape
D.I. Water
Q-tips / cotton buds

G. Optional Services / supplies

Ultrasonic Cleaner (with heater)
INFRATEC Infrared microscope
UV Lamp (if using curable epoxies for wafer reinforcement)

II. INSTALLATION AND OVERVIEW

A. Installing Ultrapol Advance

i. Mechanical

The main hardware is shipped as two items; the Base Unit and the Mast Head assembly.

The Base Unit should be placed on a flat, sturdy bench.

The Mast Head assembly may then be installed on the Base Unit, by use of the 'base lock lever' positioned at the rear bottom of the head assembly. The protruding nut and bolt should be inserted into the wide radius section of the 'keyhole' on the top right rear of the base. The head may then be slid to its 'zero' position (the position where Mast head assembly cannot go further forward towards the front and is parallel with the base plate). At this point the base lock lever may be turned to lock the head into position.

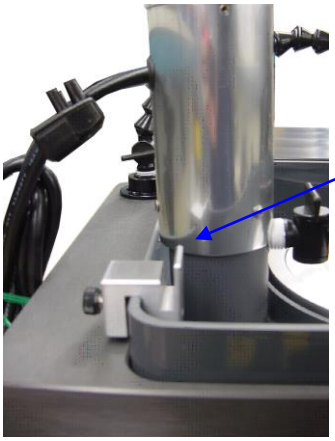
ii. Coolant

Coolant is an important part of the polishing process. The Solenoid Water Actuation system is generally used. Feed your water source into the back of the polisher, using the supplied nose piece and switch the Coolant Switch to the on position on the front panel. Water will begin to pump onto the polishing surface. Adjust the water pressure with the valve on the side of the faucet.

iii. Drain

The Base needs to be placed for convenient drainage. The drain exits from the rear panel through a fitting onto which the supplied drain hose is pressed. This drain can be fed into a container (a gallon plastic container is usually convenient). Alternatively, the feed may be directed into the facility drain, if faucets are used.

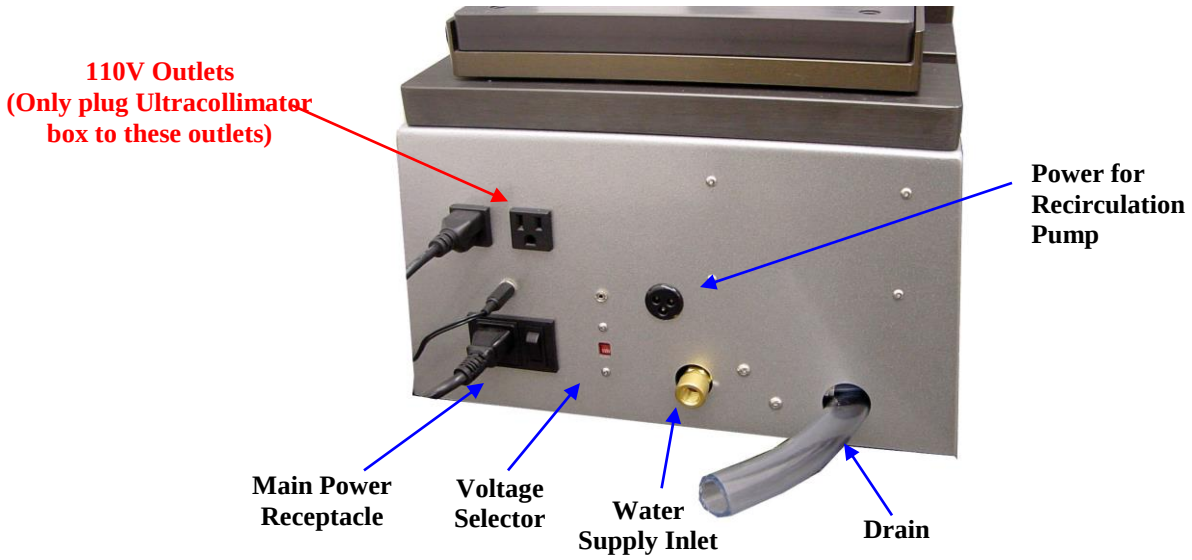
Pump bracket ensures pump remains securely in position.



Place bracket over basin and tighten screw to fix position. Place pump directly over the bracket as shown in the image to the right.

iv. Electrical

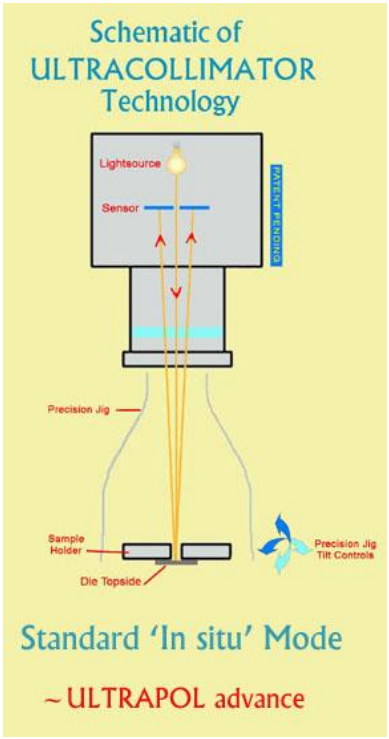
The voltage of the Ultrapol Advance unit is switch able 110/220V unless otherwise stated by means of a label on the machine. Select the proper input voltage via the selector switch on the back of the base unit. The electrical power cord should be attached to the machine, and then the opposite end connected to the 110/220V wall socket. Power for the Mast head assembly is achieved by connection of the black wire / connector extending from the tool head into the labeled socket on the back of the Base Unit. Place the black switch, which is right next to the power cord socket on the back of the Base Unit, to the ON position.



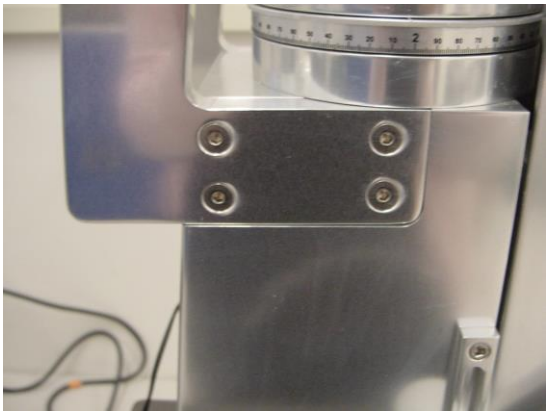
v. Ultracollimator Installation**

**If equipped

The Ultracollimator may be shipped in 2 pieces, the Ultracollimator box and "L" bracket, or in one piece, "L" bracket already secured to the Ultracollimator box.



1. Attach "L" bracket onto the back of the ULTRAPOL advance mast using the 4 screws provided for each side.



2. Plug the power of the Ultracollimator box ONLY to the back of the Base labeled 110V.

B. Operating the Ultrapol Advance Safely

The Ultrapol Advance contains a Class IIIa autocollimator device that incorporates a number of CDRH mandated safety features, including an emission indicator, aperture stop, and chassis interlocks to bring the manufacturer into compliance with U.S. government regulations

i. Safety Precautions

All persons who use the Ultrapol Advance or will be in the area where the Ultrapol Advance is in use should be aware of the potential hazards associated with the equipment.

Observe the following precautions when operating this equipment:

- This device produces visible laser radiation. To prevent injury to your eyes, never look directly into the laser.
- Intended for use with a work sample in place.

No maintenance is required. Servicing of the Ultrapol Advance must be done by trained personnel only.

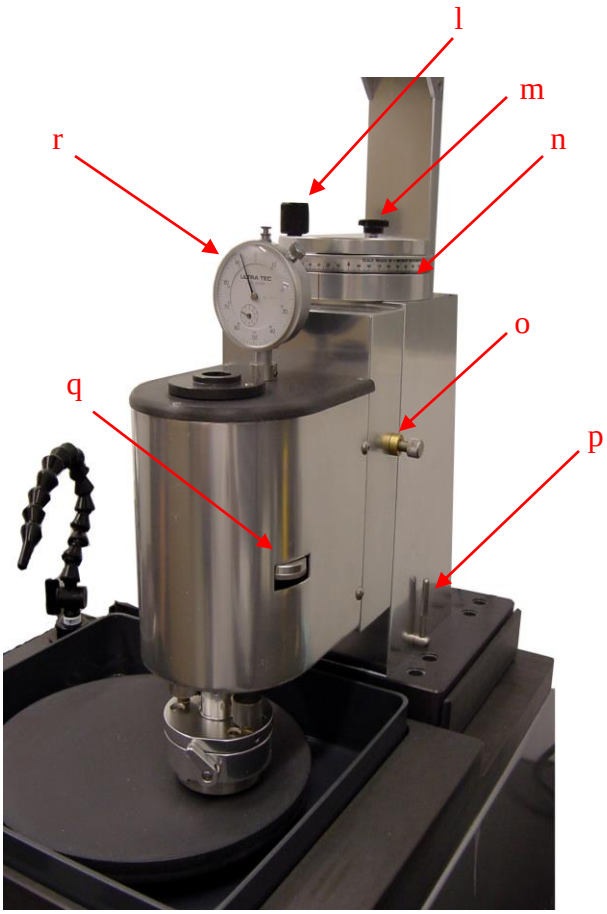
***Note: System shown above is complete with the Ultracollimator system.*

C. Overview of Functions

It's a good idea to familiarize yourself with the Ultrapol Advance for future reference in the instructional part of this manual.

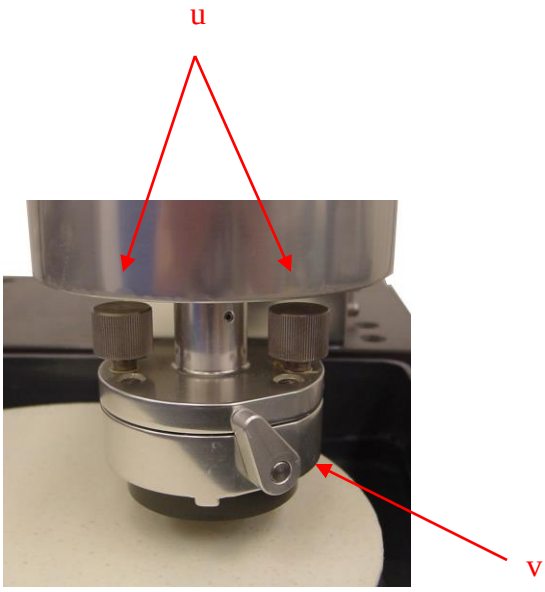
Baser Unit

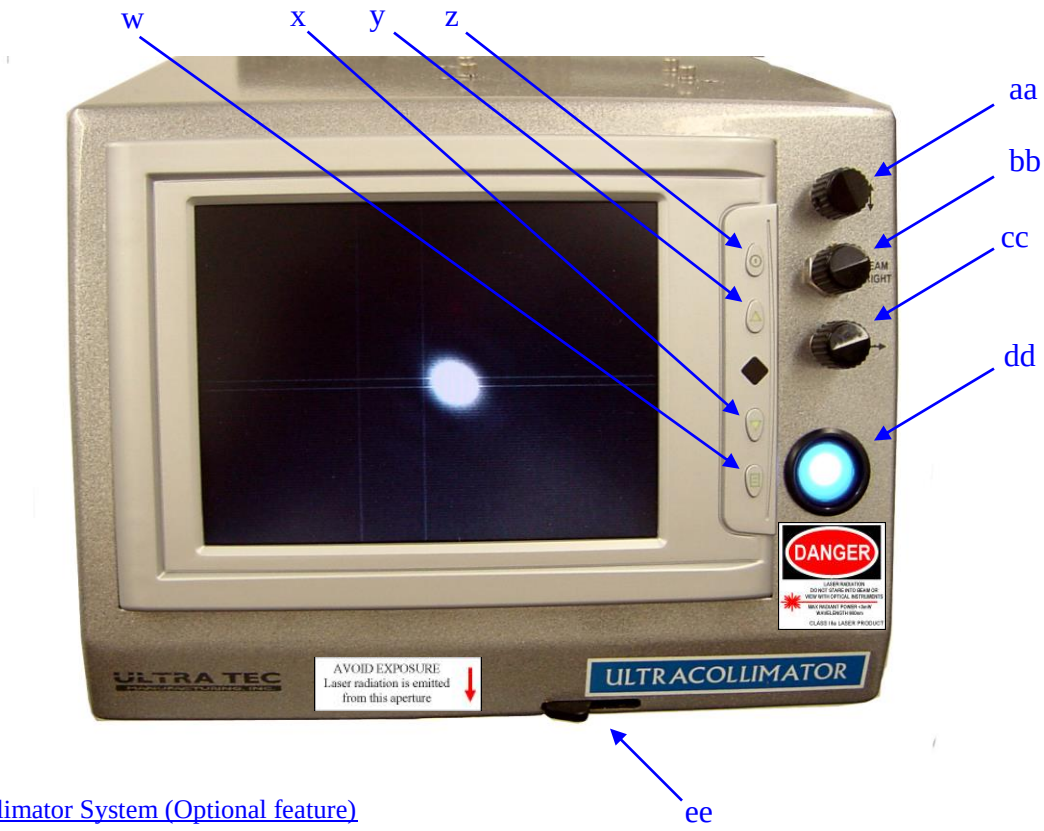
a. Main Power switch
b. Sample rotation On/Off switch and speed knob
c. Sample oscillation On/Off switch and speed knob
d. Timer (Timer Manual Appendix A)
e. Tachometer (Lap RPM)
f. Coolant (water) switch
g. Lap speed knob
h. Pump On/Off switch
i. Lap direction FWD/Off/REV
j. Stop process switch
k. Start/reset process time switch



Mast/Head Assembly

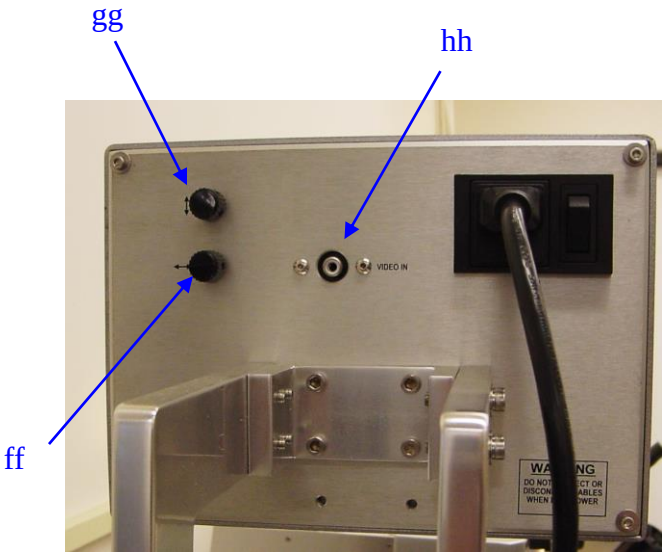
l. Handle for Z direction micro-adjust
m. Locking screw for slippable scale
n. Slippable scale
o. Floating head lock
p. Mast position lock
q. Load control knob
r. Analog dial height indicator
s. Lift lever
t. Tilt/quick release interface
u. Tilt knobs
v. Quick release lock





Ultracollimator System (Optional feature)

w. LCD Screen menu button
x. Input Video 2
y. Input Video 1
z. LCD Power ON/OFF
aa. Y-axis crosshair adjustment
bb. Beam Brightness
cc. X-axis crosshair adjustment
dd. Beam ON/OFF switch
ee. Ultracollimator shutter/attenuator
ff. Second X-axis crosshair adjustment
gg. Second Y-axis crosshair adjustment
hh. Video 2 Input



D. Operator Controls/Features

1. Power ON/OOF switch (a).
2. To stop/reset timer, pressing “Stop” during cycle will turn the lap, rotation and oscillation motion OFF.
3. To adjust cycle time, press the buttons under each digit of the timer to desired cycle time.
4. Pressing the Start button while the timer is Timing will reset the countdown.
5. Laser ON indicator (n) will be illuminated when laser is ON.*
6. Beam intensity can be adjusted with the rotating dial marked “Intensity”.*
7. The top button on the LCD monitor is the power button.*
8. The second button down on the monitor is Video 1 (Ultracollimator mode).*
9. The third button down Video 2 (Vision camera mode).*
10. The crosshairs (in Ultracollimator mode) can be adjusted using the knobs for either the vertical or horizontal lines.*

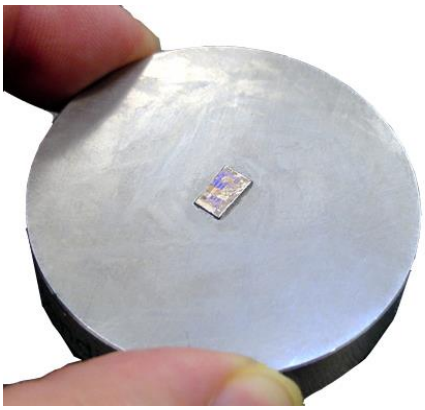
*If equipped with the Ultracollimator.

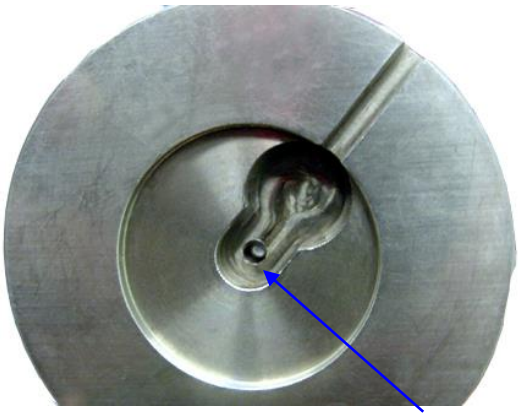
i. Adjusting the Amplitude of Oscillation

The sweep of the oscillation can be increased or decreased by a set screw in a cam on the left side of the base plate. Use the hex screwdriver provided to turn the set screw either CW to decrease amplitude or CCW to increase the amplitude. To visually see the set screw you first must turn the oscillation switch to ON and press the START button. You will notice the cam spin. Use the dial to decrease the speed of the cam. Once you see the set screw, turn the dial to 0 to stop the cam from spinning, then you can adjust the amplitude of the sweep.

E. Work holders and Accessories

i. Standard Quick Release Plate (6170.1)





Optical line of sight

The Standard QR Holder, allows for rapid transfer of sample between polisher and microscope. The plate is held in position on the machine by means of a cam lock. The alignment channel on the bottom of the holder means that the plate is mounted at the same rotational position.

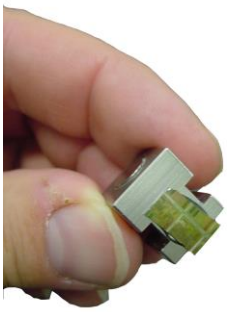
ii. SEM Stub Holder (See Order Codes Below)

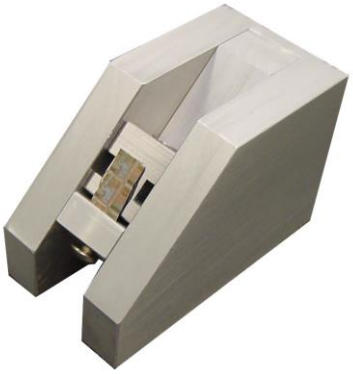
Hitachi Compatible Holder shown

The Quick Release SEM Stub Holder provides time saving for the user who will be inspecting resultant delayered or polished surfaces in the SEM. By mounting the sample directly on a compatible stub, several steps of remounting are avoided.

Order Code	SEM Style & Type
6172.H	Hitachi-compatible QR Holder & optical Stub
6175.H	Hitachi Stub only (stainless steel)
6178.H	Hitachi Stub only (aluminum)
6176.1	Hitachi X-sectioning Stub only (aluminum)
6172.P	Philips-compatible (XL30) QR Holder & optical Stub
6175.P	Philips Stub only (stainless steel)
6178.P	Philips Stub only (aluminum)
6172.J	JEOL-compatible (6400) QR Holder & optical Stub
6178.J	JEOL Stub only (aluminum)
6172.F	FEI FIB- compatible QR Holder & optical Stub
6178.F	FEI Stub only (aluminum)
	--- Other brand-compatible styles can be made on request

Single Die X-section Stub Holder & Mounting Fixture (6178.1)



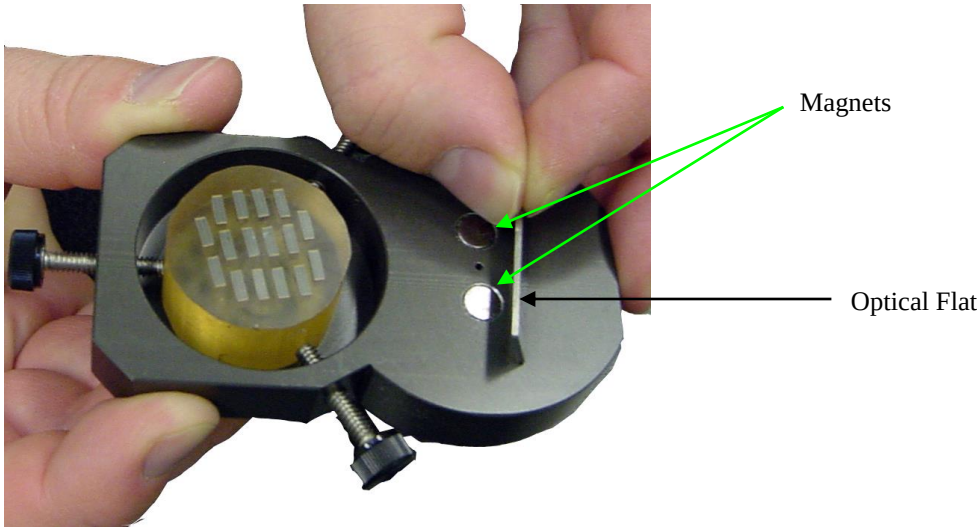


>> See section above for details of replacement stubs

X-section Quick Release Vise Holder (6150.1)

iii. Encapsulated Mount Holder

The encapsulated mount holder allows the polishing of samples that have been encapsulated. The three screws hold the potted samples in place. There are two magnets that hold an optical flat in place so that the holder can be used with the Ultracollimator. To do so, simply place the optical flat in place and mount the sample into the holder. Place the holder into the quick release and observe the dot on the LCD screen. (*Note: The reference dot on the screen is just that, a reference point from which to begin adjustment of the tilt. The sample that has been potted may not be parallel to the holder.) Adjust tilt accordingly.

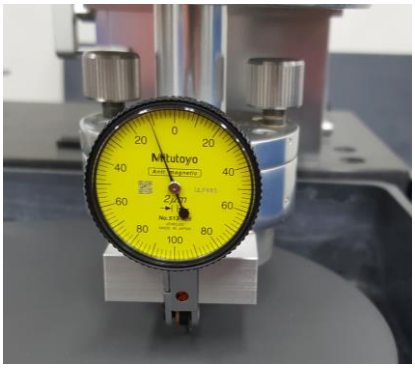


III. CALIBRATION

A. Mechanical Alignment

i. Aligning the base plate to the Aluminum platen.

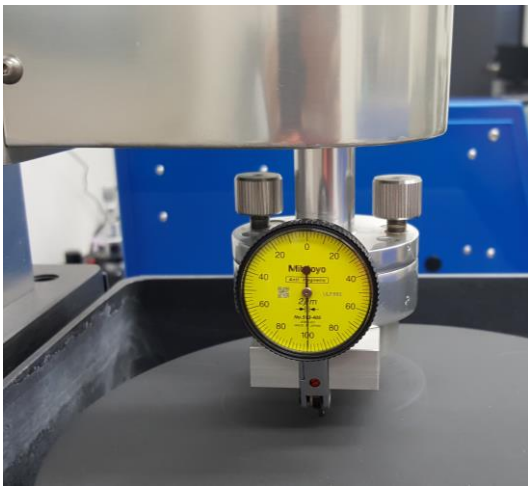
1. Place a desired lap onto the Advance. Preferably one that does not have any film attached to it.
2. Place the micrometer into the hole on the side of the work holder and tighten the set screw so that micrometer is fixed in its position.
3. Place the work holder with micrometer attached on the quick release.



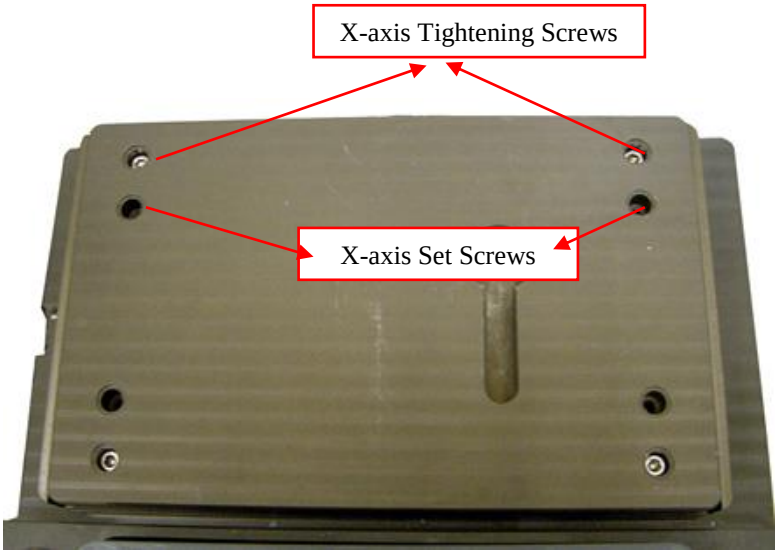
4. Turn pump, coolant, oscillation and lap switches to the OFF position.
5. Be sure that the oscillation sweep is closed off all the way so there is no sweep (turning the set screw CW)

<u>X-plane alignment (3 o'clock and 9 o'clock positions)</u>

6. Turn the rotation switch to ON and dial speed to 1. Press START. Stop the Rotation at the 3 o'clock position
7. Turn the Z-micro adjust dial on top of the head to bring the head down so that the deflection on the Micrometer reads '100.'



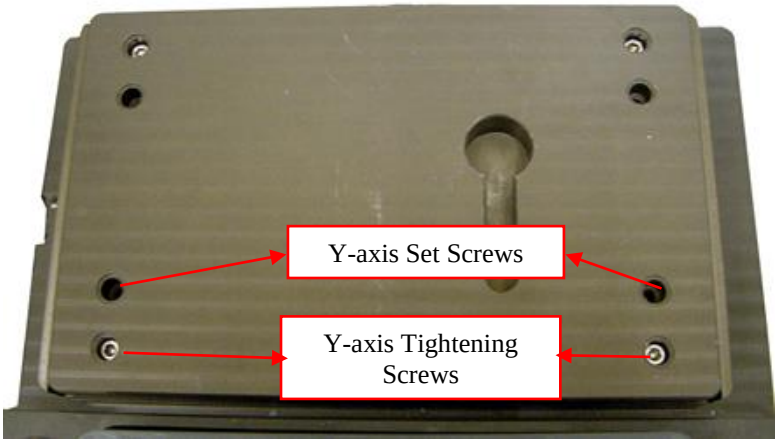
8. Rotate the head to the 9 o'clock position and observe the deflection at the two positions for the x-axis (left and right).
9. If there is a height difference at the 9 o'clock position, adjust with the back screws on the base plate until there is no difference in height between the two X-axis positions. To adjust, loosen the tightening screws first, then adjust the set screws to bring the deflection on the micrometer to read '100.'



10. Rotate back to the 3 o'clock position. If the deflection is not at '100' adjust the Z micro-adjust on top of the head to bring the deflection to '100'
11. Repeat steps 8-10 until both positions have no height difference.

Y-plane alignment (12 o'clock and 6 o'clock positions)

12. Turn the rotation switch to ON and dial speed to 1. Press START. Stop the Rotation at the 12 o'clock position.
13. Turn the Z-micro adjust dial on top of the head to bring the head down so that the deflection on the Micrometer reads '100.'



14. Rotate the head to the 6 o'clock position and observe the deflection at the two positions for the y-axis (front and back).
15. If there is a height difference at the 6 o'clock position, adjust with the back screws on the base plate until there is no difference in height between the two y-axis positions. To adjust, loosen the

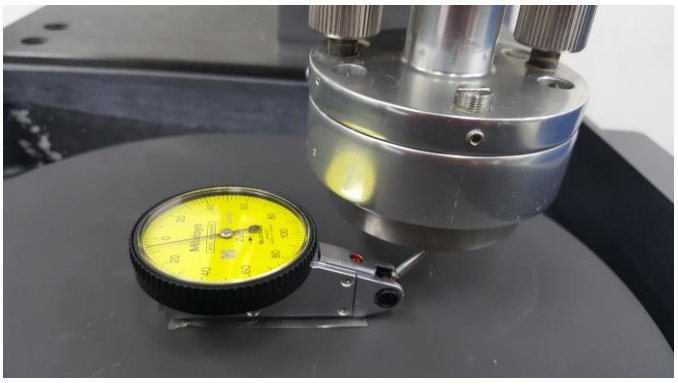
tightening screws first, then adjust the set screws to bring the deflection on the micrometer to read '100.'

16. Rotate back to the 12 o'clock position. If the deflection is not at '100' adjust the Z micro-adjust on top of the head to bring the deflection to '100'
17. Repeat steps 14-16 until both positions have no height difference.

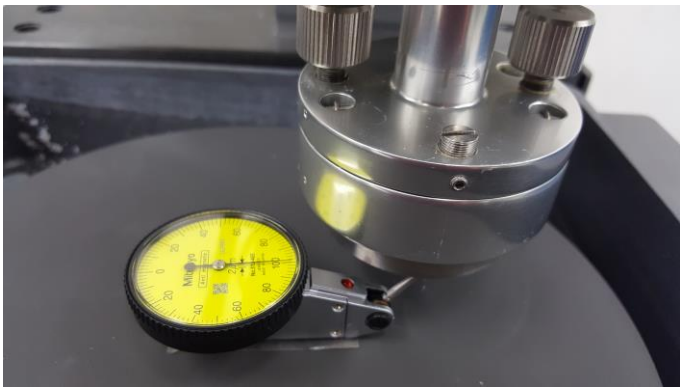
ii. <u>Aligning the sample head to the platen.</u>

1. Place a desired lap onto the Advance. Preferably one that does not have any film attached to it.
2. Turn pump, coolant, oscillation and lap switches to the OFF position.
3. Mount the sample holder into the quick release and lock into position.
4. Place a piece of double sided stick tape to the back of the micrometer.

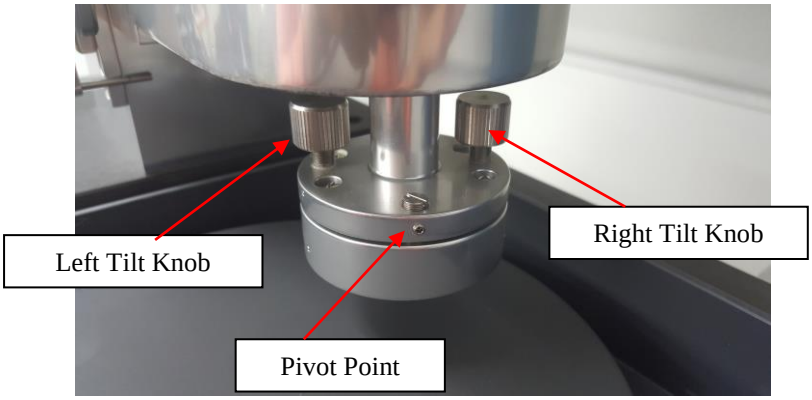
5. Then place the micrometer right under the quick release interface so that the indicator ball pin of the micrometer is touching the sample holder right under the pivot point of the quick release interface.

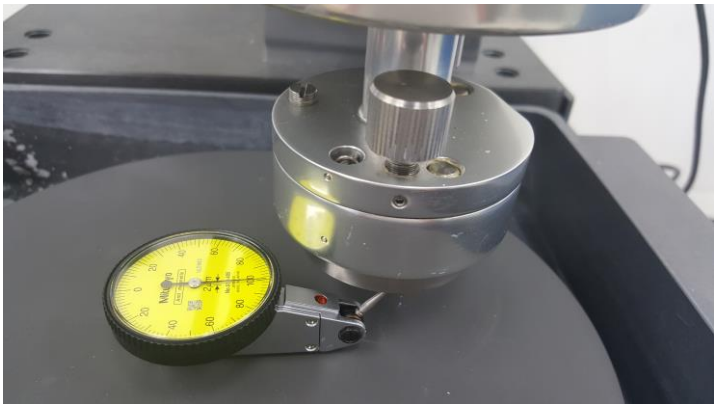


6. Turn the Z-micro adjust dial on top of the head to bring the head down so that the deflection on the Micrometer reads '100.'

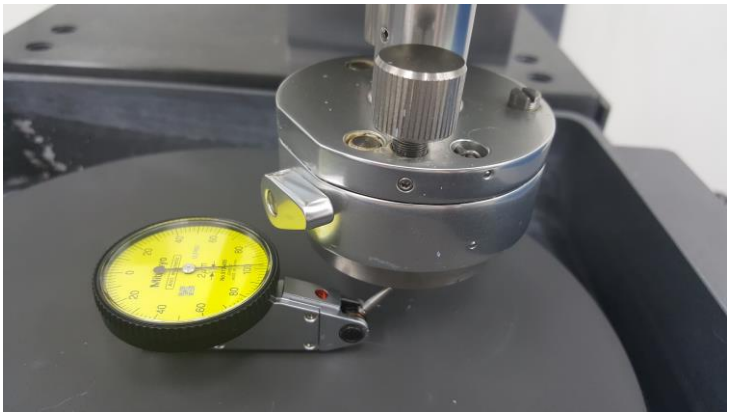


7. Turn the rotation switch to ON and dial speed to 1. Press START. Stop at the first (right) tilt knob location. If the readout on the micrometer is not at '100' adjust the tilt knob to bring the micrometer needle to '100.'





8. Rotate the head again to the second (left) tilt knob location. If the readout on the micrometer is not at '100' adjust the tilt knob to bring the micrometer needle to '100.'



9. Rotate back to the pivot point. If the readout on the micrometer is not at '100,' turn the Z-micro adjust dial on top of the head to bring the head down so that the deflection on the Micrometer reads '100.
10. Continue steps 7-9; adjusting the corresponding tilt knobs until there is no difference in height between the three positions.

Note: IF ULTRACOLLIMATOR is available, its use (detailed in Section 5 below) offers much higher accuracy for many applications.

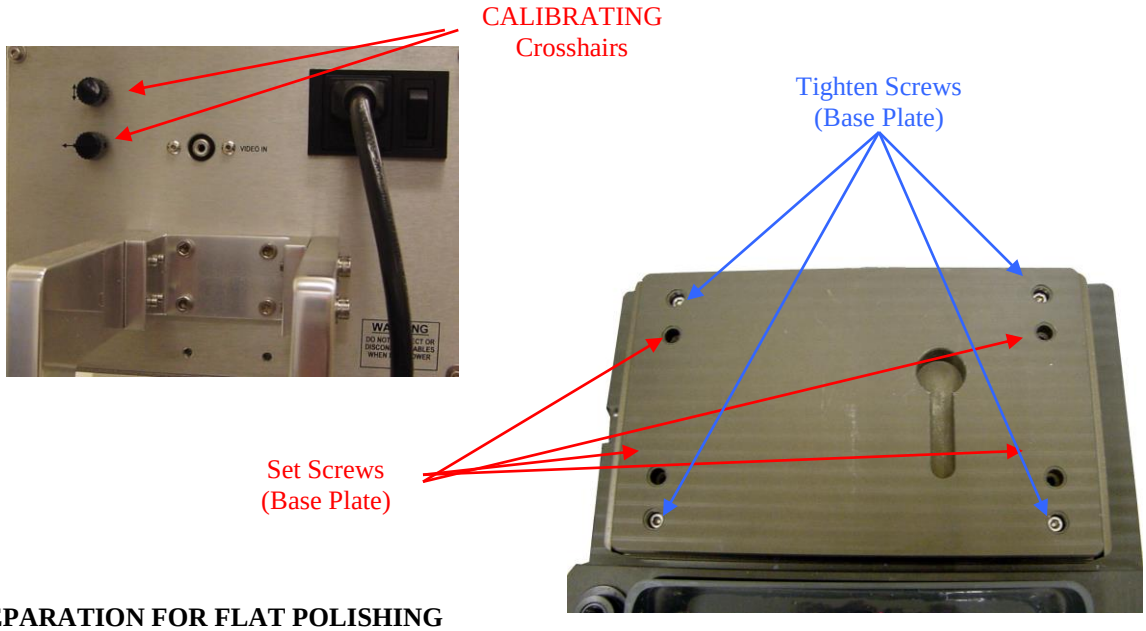
B. Optical Alignment (Ultracollimator)

When the ULTRACOLLIMATOR is installed or after the ULTRAPOL advance system has been moved or reseated, the following procedure should be followed:

1. Mount a sample with a reflective surface onto work holder (puck).
2. Mount work holder into quick release holder.
3. Turn machine ON, turn monitor ON.
4. Flip the switch to the lap and table to OFF position.
5. Flip the switch to the rotation to ON position.
6. Use the set screws on the top of the monitor to adjust get a reflection dot if not already visible.
7. Press the START button and allow the spindle to rotate.
8. Observe the DOT on the screen moving in an orbit.
9. Adjust the TILT KNOBS until the dot is stationary when the spindle is rotating.
10. Use the set screws on the top of the monitor to adjust the location of the DOT to the center.
11. Once DOT is in the center, tighten the screws on the back of the monitor.
12. Place CALIBRATING crosshairs (adjusted on the back with a flat head screwdriver) directly over the DOT.

Note: Do not move the CALIBRATING crosshairs from this point forward; otherwise the machine will be removed from calibration.

13. Remove the sample and work holder from the quick release holder.
14. Place optical flat on the lap. Observe location of DOT on screen.
15. If no DOT appears, tilt the flat until a reflection is observed. Note the position of the tilt.
16. Loosen the tightening screws on the back base plate.
17. Use the base plate set screws to adjust for tilt on the mast. Adjust until the DOT is at the center of the CALIBRATING crosshairs.
18. Once centered, tighten the back base plate screws.
19. System is now calibrated.



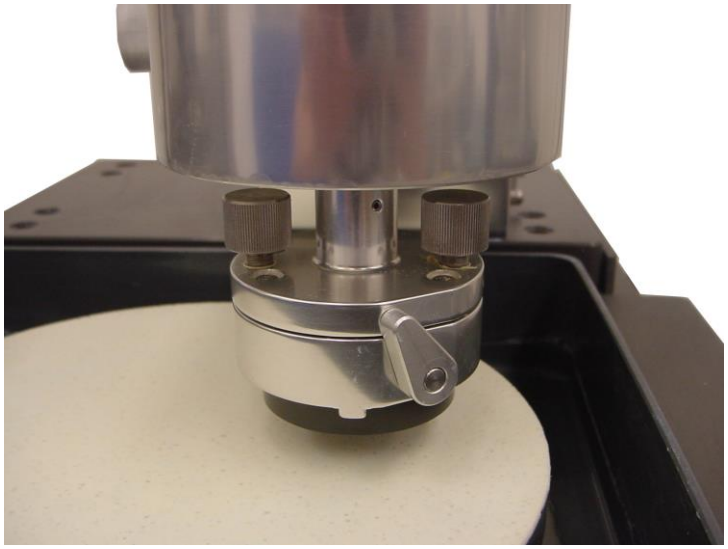
IV. PREPARATION FOR FLAT POLISHING

A. Mounting a Bare Die Sample

When mounting a bare die to the sample holder (puck), make sure that the sample has a reflective backside. If it is not reflective, the Ultracollimator will not be able to detect the reflected light. A quick hand polish on a 3µm film will achieve the shiny surface needed. Mount sample directly above the center hole of the sample holder. Ensure that nothing is covering the hole except the backside of the die, for example no wax, tape, or any such things that would obscure the direct line of sight that the Ultracollimator has to the backside of the sample. When using wax, make sure to surround the hole with wax so that once the sample is placed on the holder, that no fluid can seep into the hole (when polishing, liquids can easily find their way into the hole thus obscuring the line of sight of the ULTRACOLLIMATOR).

B. Aligning Sample for Parallel Polishing with the Ultracollimator

1. Once the system is calibrated and your sample mounted, mount the sample holder into the quick release and lock into position.
2. Lower the head by pulling the lock pin out. **Do not** allow the micro-positioning head to drop, guide the head down slowly.
3. Turn the rotating shaft that holds the sample so that the tilt knobs are facing West(to the left) and East(to the right) This allows you to remember the orientation of your sample should you need to correct for tilt.
4. Observe the reflected dot on the monitor; it may not be in the center of the CALIBRATING crosshairs, which tells you that the sample is not aligned properly to the lap.
5. To align the sample to the lap, use the tilt knobs to bring the reflected dot on the monitor to the center of the crosshairs.
6. Once that is achieved, sample has been aligned and parallel polishing may commence.



C. Load Control

(With no work holder in place)

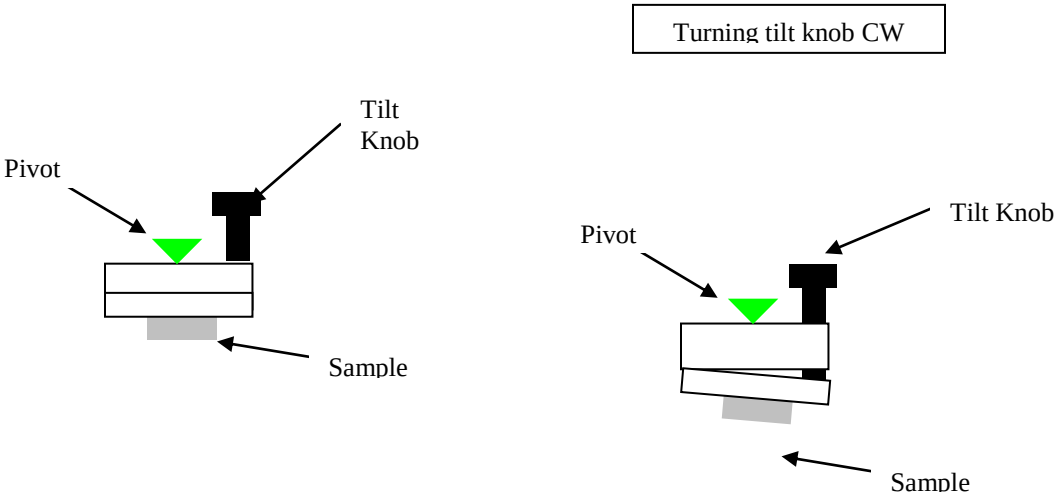
1. Release the up lock on the right side of the head so that the head is in the
2. down position (do not allow the head to fall to lowest position, but lower it gradually).
3. Turn pressure control knob clockwise(CW) until the center-shaft reaches the bottom stop and thus becomes heavy.
4. Adjust dial indicator face so that the needle is pointing towards 0.
5. Turn pressure control knob counterclockwise (CCW) until the need lifts off of the stop slightly. This can be monitored on the dial indicator. When the dial indicator moves, the center-shaft is no longer on the bottom stop.
6. Now slightly turn pressure control knob CW so that the center-shaft returns to the bottom most position.
7. Using your hand, lift the center-shaft slightly then lower the center-shaft down to the bottom most position.
8. Repeat step 6 multiple times to ensure that the center-shaft consistently falls back to the stop (when the dial indicator needle is at 0).
9. If the center-shaft does not return back to 0, turn pressure control knob slightly CW then repeat step 6 until the center-shaft consistently returns to 0.
10. Complete.

This adjustment can be done every time the pressure control knob has been changed from each sample.

**Note: Turning the pressure control knob CW effectively increase the downward pressure of the center-shaft and vise versa.

D. Correcting for Observed Tilt during polishing

If you notice a tilt on the die, simply align the tilt knobs to west and east as you previously did in aligning your sample. Turning the tilt knob clockwise (CW), you are pushing the sample holder forward which translates to the side of the sample on the same side as the knob to DESCEND. Turning the tilt knob counterclockwise (CCW) is vice versa, the same side elevates (effectively lowering the opposite side). Both tilt knobs work with this same principle. Adjust your sample according to the tilt seen on the die. Then proceed with the process. The pivot point is a third point not parallel to either tilt knobs, which allows you to adjust for side to side and front to back tilt.



V. APPLICATIONS

A. Topside Delayering of Single Die IC's

i. Parallel Delayering Techniques

The standard lap for delayering used on the Advance is the 8 inch polyurethane lap. This is used with 0.05μm colloidal silica slurry. Make sure to have the drain plugged in the gray basin using the rubber plug, otherwise fluid will drain. Use the recirculation pump to circulate the slurry back on to the lap.

With the system calibrated, sample mounted and aligned, lap, slurry and pump in place, you are now ready to polish.

1. Using the Z-micro adjust knob located at the top of the mast, lower the sample until you see a deflection on the dial indicator of 20μm (each division on the dial indicator represents 10μm).
2. Set pressure control to the lightest possible (turn pressure control knob CCW until the center-shaft begins to lift and then back off a bit).
3. Set the timer for desired length of time.
4. Turn oscillation switch to ON and turn dial to desired speed.
5. Turn rotation switch to ON and turn dial to desired speed.
6. Pick lap direction.
7. Turn pump on (point nozzle towards the area directly in front of the sample).
8. Press START.

The amount of lap time varies from each sample type to sample type, driven by density of device, composition and size of the die. A good starting point would be a one minute cycle to observe the removal rate.

ii. Tips for Delayering

- Mounting the die, do not cover center hole with any thing, this includes wax, tape, and etc.
- When first starting, remember orientation of die on puck, this will help you to correct for tilt later.
- Start with a one minute lap time. This allows you to observe removal rate and tilt so that you may adjust for them accordingly.
- A slow rotation speed of the sample minimizes edge rounding effects.
- You can adjust pressure by turning the pressure control knob (lightest pressure tends to work best).
- Smaller sweep amplitude ensures planarity.
- Use the SECOND set of crosshairs as a reference to "OFFSET" for any tilt that arises from the difference in planarity from topside to backside.

B. Backside Preparation

i. Package Level (e.g. Flip chip)

Mounting

First, decap a small window on topside so that Ultracollimator has a direct line of sight to a shiny surface. This will be used to adjust for tilt. If not possible, just make sure to press down on the center of the package to ensure that the thin wax layer has been minimized (this assumes that you are using Crystal wax to hold sample to holder.)

Zeroing the scale on the Z-micro adjust

With sample mounted to work holder and in the quick release holder with a lapping plate in place. Zero out the dial indicator while the head has not touched the lap. This is your zero point where the sample has not touched the lap. Bring down the head using the Z-micro adjust knob. Observe the first moment the dial indicator reads a deflection. Turn the Z-micro adjust until the dial reads 10μm. Now loosen the locking screw for the slippable scale and turn the slippable scale until it reads 10μm. Tighten screw for the slippable scale. From this point on, it is possible to keep track of how much material is removed by observing the turns when using the Z-micro adjust.

ii. Lapping

For backside, you could use various grit size films to remove material. The typical steps for material removal are various size diamond films in successive order as follows: 30μm, 15μm, 6μ, 3μm, and 1μm. Use the desired films for removal.

Once all steps of diamond films have been completed use the polyurethane pad and colloidal silica (much like in the delayering process) for about 2 minutes to get the final mirror finish. Lap speed, rotation speed, and oscillation speed can be changed to get faster results.

iii. Die Level

For die level backside thinning, you can use the Ultracollimator to align the sample. Mount the sample much like in the delayering process except that the topside will be facing the hole. The topside is reflective enough to use with the Ultracollimator. After alignment, same procedure for backside thinning is utilized, i.e. using decreasing different film grit sizes.

C. Cross-sectioning of Die / Packages

Cross-sections are much like backside thinning process, except the package is on its side. Follow the same setup procedure as the backside thinning process. Mounting the sample would be done either with the SEM stub holder that is correct for the user's SEM, or the clamp work holder. The SEM stub holder would work best with bare die, and the clamp work holder would work best with packaged and larger devices.

D. Other Lapping & Polishing Applications

The need to produce surfaces by precision sawing, lapping and polishing operations is widespread throughout manufacturing industry and research. ULTRA TEC designs, manufactures and provides advanced surface preparation equipment and consumables for both routine and custom applications.

ULTRAPOL advance can be used for a wide range of lapping & polishing applications including:

TEM and pre-FIB Thinning
Waveguide Polishing
Wafer Polishing
Fiber Optic Component and connector polishing

For details of our 'best-known' techniques for any specific application, please contact ULTRA TEC directly.

VI. PREVENTATIVE MAINTENANCE

A. Clean Up

At the end of each day, the user should clean the machine to ensure proper machine function.

1. Empty/drain basin of any slurries.
2. Clean and rinse basin.
3. Clean and rinse lapping plate.
4. If a Polyurethane lap (3208.8) has been used, it is often necessary to re-condition the lap (see 6.3)
5. Flush recirculation pump (see 6.2)

B. Flushing the recirculation pump

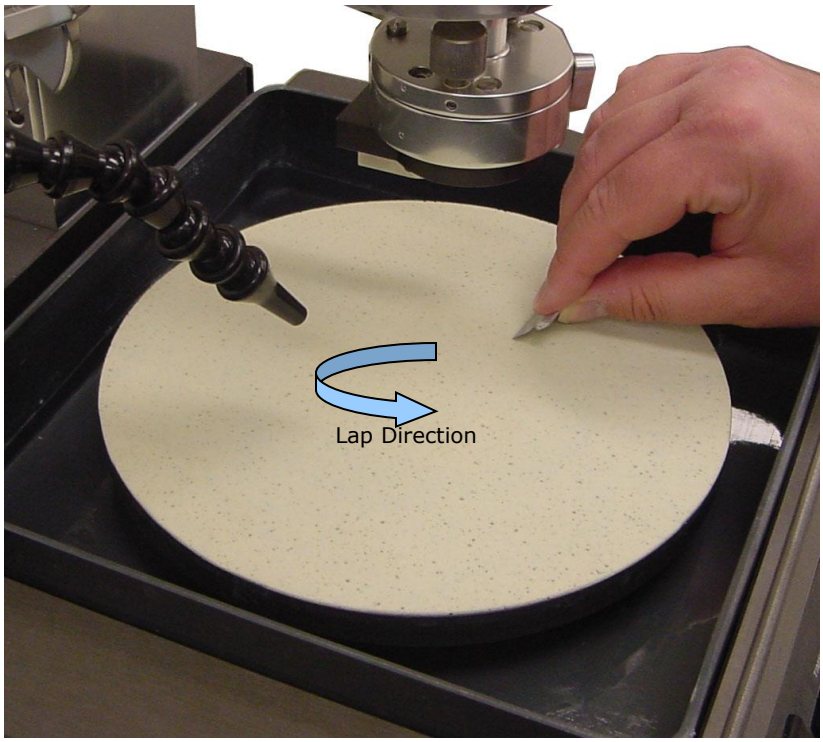
It is necessary to flush out the recirculation pump after use every day or if changing slurries to prevent cross contamination. Flushing the pump will also extend the life of the pump.

1. Turn pump off.
2. Fill a separate basin, such as a plastic container, with about an inch of water.
3. Place pump into the container.
4. Turn pump on and allow the pump to re-circulate the water for a few seconds.
5. Turn pump off.
6. Do this a few times to ensure pump is clean of any slurry.

C. Reconditioning the Polyurethane Lap (6208.9)

The lap should be reconditioned before the start of each day to ensure quality polishing.

1. Start Water coolant with Stopper out of the recirculation tray (running to drain) or Fill basin with water (if system not connected to water and drainage)
2. Place polyurethane padded lap into position.
3. Turn rotation and oscillation OFF.
4. Turn lap direction to CCW.
5. Turn pump/coolant ON.
6. Point the nozzle towards the center of the lap.
7. Press START.
8. Turn lap RPM to 100.
9. Use a single-sided razor blade to scrape surface of lap as shown in the image. Hold at
10. Scrape by holding the razorblade directly on top of the lap at approximately a 45° angle to the surface. Sweep the blade from inside to outside. Pay close attention to the heavily used areas of the lap.
11. Repeat scraping action from inner to outer about 4-5 times.
12. STOP the lap rotation.
13. Rinse lap and empty basin.
14. Poly lap is now reconditioned and ready for polishing.



VII. ACCESSORIES, CONSUMABLES & SPARES

Lapping & Polishing Films 8” diameter

Diamond Lapping and Polishing Films 8” (200mm) diameter

8” PSA Backed Discs		
Order No.	**Micron Size**	**Quantity**
M-8230-1	0.1	5
M-8231-1	0.5	5
M-8232-1	1	5
M-8233-1	3	5
M-8234-1	5	5
M-8237-1	6	5
M-8235-1	9	5
M-8236-1	15	5
M-8238-1	30	5

8” Plain Backed Discs		
Order No.	**Micron Size**	**Quantity**
M-8430-1	0.1	5
M-8431-1	0.5	5
M-8432-1	1	5
M-8433-1	3	5
M-8434-1	5	5
M-8437-1	6	5
M-8435-1	9	5
M-8436-1	15	5
M-8438-1	30	5

Silicon Carbide Polishing Film 8”

8” PSA Backed Discs		
Order No.	**Micron Size**	**Quantity**
M-8203-1	0.5	100
M-8221-1	1	100
M-8202-1	2	100
M-8222-1	3	100
M-8223-1	5	100
M-8224-1	9	100
M-8225-1	12	100
M-8226-1	15	100
M-8227-1	20	100
M-8228-1	30	100

8” Plain Backed Discs		
Order No.	**Micron Size**	**Quantity**
M-8403-1	0.5	100
M-8421-1	1	100
M-8402-1	2	100
M-8422-1	3	100
M-8423-1	5	100
M-8424-1	9	100
M-8425-1	12	100
M-8426-1	15	100
M-8427-1	20	100
M-8428-1	30	100

ULTRAFILM Polishing Film 8” (203mm) Plain & PSA backed

8” PSA Backed Discs		
Order No.	**Micron Size**	**Quantity**
M-8250-1	ULTRAFILM B	100

8” Plain Backed Discs		
Order No.	**Micron Size**	**Quantity**
M-8450-1	ULTRAFILM B	100

Order Codes for ULTRAPOL advance & Accessories

Part No.	Description
3250.1	ULTRAPOL advance system includes... Base unit with timer, oscillator, speed control (50 to 400rpm), 8” (200mm) Polishing plate Sample Z-direction control with 1µm precision Mechanical alignment indicator 2 circle tilt control (+/- 2 degrees) Sample Rotation control Quick release interface mounting system Sample Load Control – 0 to 3 kg (in 50 gram increments) Drip Tray / Slurry Containment Tray
Accessories	
6183.U	ULTRACOLLIMATOR upgrade includes... main ULTRACOLLIMATOR unit, incorporating light source and camera, cross-hair generator, and 6.5 inch LCD monitor, with Video Out (NTSC). Includes optical flat and mounting bracket for ULTRAPOL advance
3210.1	Trade-in Value against pre-return of MUTIPREP or older series ULTRAPOL unit (NOTE: To qualify, customer must purchase ULTRAPOL advance plus ULTRACOLLIMATOR)
6170.1	Standard QR Sample Holder for Microscopy preparations – optical
6178.1	Mounting Stand for X-SECTIONING stub samples
3377.1	Quick Release Vise - for cross-sectioning packages, waveguides etc.
6124.1	Encapsulated Mount Work holder (variable 1/2 to 1 1/2" diameter mounts)- Quick Release
3230.1	Plastic Drip Tray
6158.1	Recirculation Pump
Lapping Surfaces	
2239.1	Aluminum 200mm diameter plate (used with films & cloths)
3206.8	Polyurethane-faced 200mm diameter polishing plate
3209.8	Metal-faced 200mm diameter polishing plate
Consumables	
2297.1	Poly-facing 200mm diameter - with adhesive backing
1503.1	Disc Holding Band
Electro-metallic (Plated) Diamond 8" Plates	
2218-1	100 Mesh
2219-1	180 Mesh
2220-1	54 micron, 260 Mesh
2217-1	42 micron, 360 Mesh
2221-1	30 micron, 600 Mesh
2222-1	15 micron, 1200 Mesh
2223-1	6 micron, 3000 Mesh
Sintered Diamond 8" Plates	

2271-1	120 Mesh
2272-1	42 micron, 360 Mesh
2273-1	15 micron, 1200 Mesh
8" Polishing Plates	
2238-1	Tin Surface
2234-1	Steel Surface
2254-1	Tin-Lead Surface
2239-1	Aluminum, lapped and anodized (spare item for plate supplied with system)
Resilient Surface Pads	
2390-1	Resilient Surface Pad, 8 inch diameter (Each)
2390-5	Resilient Surface Pad, 8 inch Diameter (Pack of 3)
	NOTE: The resilient surface pad is used to achieve a PC polish on fiber optic connectors. It is placed onto an anodized aluminum plate (6-2239-1), and then covered by the Mylar film to be used.

Special Note:

ULTRA TEC is proud to operate a continuous product improvement policy. Items may vary in appearance or specification from those shown here.

Many of the items discussed are protected by PATENT or are PATENT PENDING.

APPENDICES

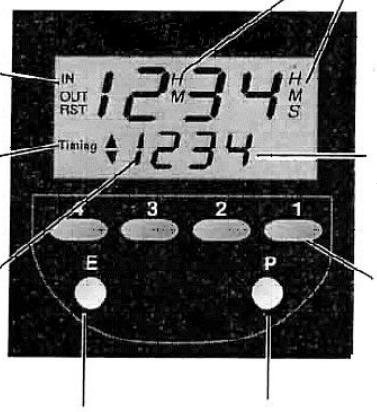
Appendix A – Timer Manual

Timer Manual

I/O Status Indicators
Illuminates to display when an input or output is active: "IN" for the start input, "OUT" for the timed output and "RST" for the External reset signal.

Time Indicators
The word "Timing" flashes when a timing function is taking place. The applicable arrow also lights to indicate if the display is set to time up or time down.

Time Value
Indicates the elapsed/remaining time to preset.



Time Range Indicator
Illuminates to show the time base: H for hours, M for minutes, and S for seconds. Multiple indicators will be illuminated when the time base is Hours:Minutes or Minutes:Seconds.

Set Value
Settable value used to trigger the timed output.

Numeric Keys
Each of the number keys is used to increment the value of the corresponding digit of the preset or a parameter value.

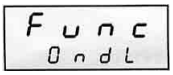
Edit Key
Many of the parameters in Program mode require selection of a specific choice as opposed to a numeric value. The Edit key is used to scroll through the available choices. In Operation mode the Edit key can be pressed simultaneously with the Program key to rest the timer.

Program Key
Pressing the key continuously for 3 seconds moves the unit in and out of Program mode. Once in Program mode, pressing and releasing the key will scroll the display from one parameter to the next.

Program Mode

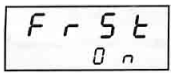
1. Enter the Program mode by holding down the "P" key for 3 seconds.
2. Press the "P" key to move the top display from one parameter to the next.
3. Press the "E" key to scroll the bottom display through the available choices for that parameter.
4. While in Program mode the unit will stop timing and the output will retain its last state. The new settings will only become effective after returning to Operation mode by holding down the "P" key for 3 seconds.
5. If there is no key activity for 60 seconds, the unit will automatically return to Operation mode and maintain the previous settings.

Operating Function: Determines how outputs will operate in relation to the set value.

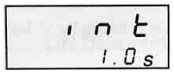


- On Delay (OndL)
- Off Delay (OFdL) ←Factory setting
- Interval (int)
- Repeat Cycle (CYCL)
- Delay/Interval (dint)

First Operation: Determines whether the Repeat Cycle will start with an ON or an OFF Operation. (This parameter will only appear if Repeat Cycle is chosen as the Operating Function.



Interval Time: Sets the amount of time the output will be active after the On Delay function has timed out. Use the 1 through 4 keys to set the value in a range from 0.1 to 999.9 seconds. (This parameter will only appear if Delay/Interval is chosen as the Operating function.)

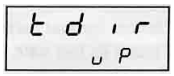


Time Range: Sets the unit of measure for the time values that will be shown on the display in Operation Mode. Choices are:

- Seconds
- Minutes
- Hours
- Minutes:Seconds ← Factory Setting
- Hours:Minutes

Decimal Position: Sets the decimal position for the time display. Choices are: no decimal point (0), 1/10ths position (0.0), or hundredths position (0.00). The time range selected in the previous parameter will remain illuminated for reference. (This parameter will not appear if Minutes:Seconds or Hours:Minutes is selected as the time range.)

Timing Direction: Determines whether the time value will increment from zero and change the state of the output at the set value (uP) or decrement from the set value and change the state of the output at zero (dn).



Power Reset Enable: After a loss of power the unit can be programmed to either reset upon reapplication of power (On) ← Factory Setting, or continues from the point of power interruption (Off).

Front Panel Reset Enable: When active (On), the timing operation can be reset in Operation Mode by simultaneously pressing the "E" and "P" keys. If inactive (Off), the timing operation can only be reset through the remote input.

Security Level: 4 different levels of security are available:

- 0 = Full Access
- 1 = SP locked out
- 2 = Access to Program Mode only by holding the "P" key for 10 seconds
- 3 = SP Locked Out and access to Program Mode only by holding the "P" key for 10 seconds

Appendix B – CE Certification

DECLARATION OF CONFORMITY

1025 E. Chestnut Ave.
Santa Ana, CA 92701
Toll Free (US): 1 (877) 542 0609
Tel: 1 (714) 542 0608 Fax: 1 (714) 542 0627
e-mail: info@ultratecusa.com
www.ultratecusa.com

MANUFACTURER'S NAME: ULTRA TEC MFG., INC.
MANUFACTURER'S ADDRESS: 1025 East Chestnut Ave.
Santa Ana, California 92701
USA

Declares that the product:

PRODUCT TYPE: Laboratory Sample Preparation Tool
MODEL: ULTRAPOL Advance (Order Code 3250.1)

Conforms to the following

Application of Council Directive:

LVD Directive EN61010-1
EMC Directive: 89/336/EEC
EN61326:1998 Product Specific Standard Laboratory, Measurement, and Process Control Equipment

Standards by which conformity has been established:

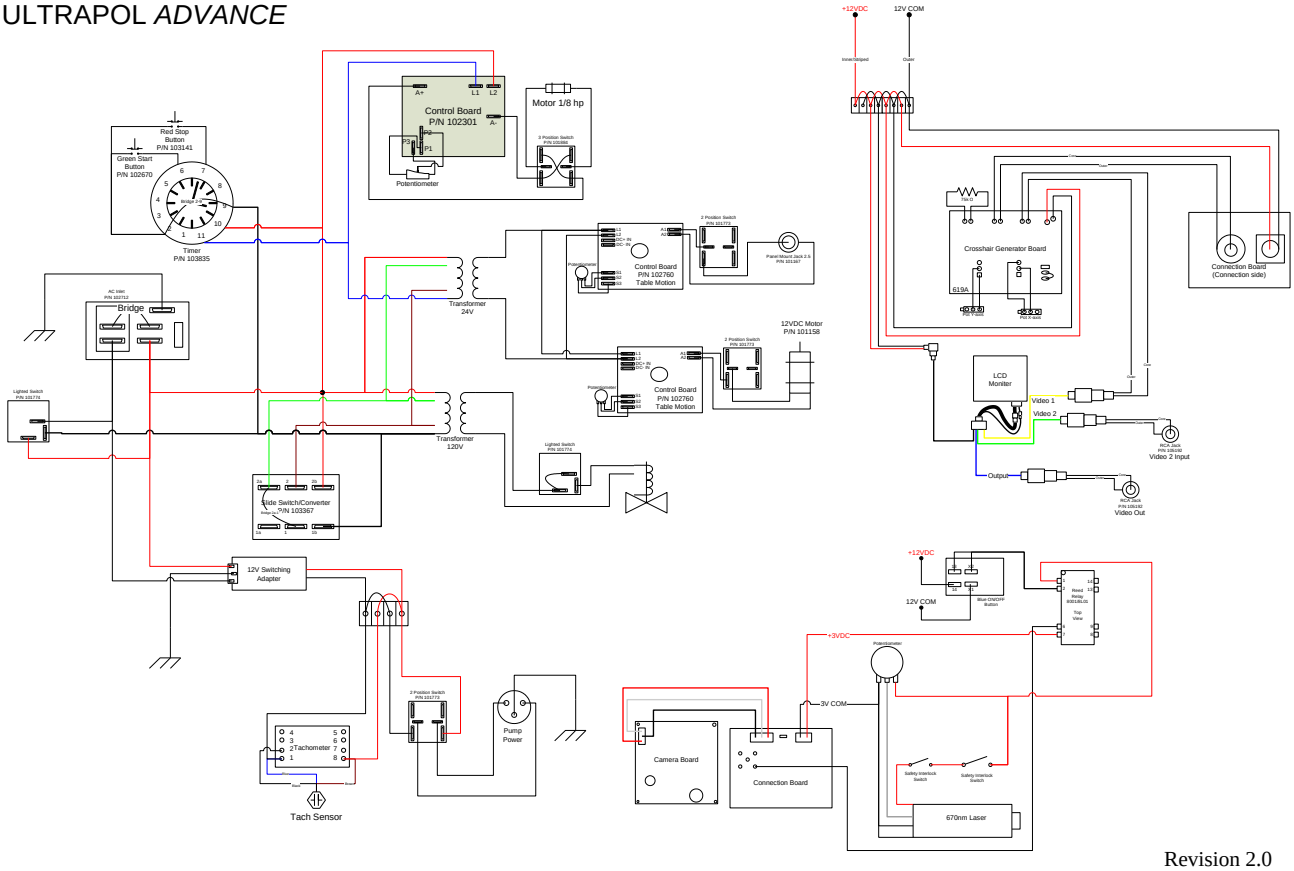
EN55011.98	LIMITS AND METHODS OF MEASUREMENT OF RADIO DISTURBANCE CHARACTERISTICS OF INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT.
EN61000-4-2:95	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART4: TESTING AND MEASUREMENT TECHNIQUES – SECTION 4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST-BASIC EMC PUBLICATION.
EN61000-4-3:97	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART 4: TESTING AND MEASUREMENT TECHNIQUIES – SECTION 3: RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST.
EN61000-4-4:95	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART 4: TESTING AND MEASUREMENT TECHNIQUES – SECTION 4: ELECTRAL FAST TRANSIENT/BURST IMMUNITY TEST – BASIC EMC PUBLICATION.
EN61000-4-5:95	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART 4: TESTING AND MEASUREMENT TECHNIQUES – SECTION 5: SURGE IMMUNITY TEST.
EN61000-4-6:96	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART 4: TESTING AND MEASUREMENT TECHNIQUES – SECTION 6: IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RADIO FREQUENCY FIELDS.
EN61000-4-8:94	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART 4: TESTING AND MEASUREMENT TECHNIQUES – SECTION 8: POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST – BASIC EMC PUBLICATION.
EN61000-4-11:94	ELECTROMAGNETIC COMPATIBILITY (EMC) – PART 4: TESTING AND MEASUREMENT TECHNIQUES – SECTION 11: VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATION IMMUNITY TESTS.

This product has been tested and is in conformity with the standards and specifications cited above.

Joseph Rubin
Manager, Quality Assurance
7 April 2008

Appendix C – Wiring Diagram

ULTRAPOL *ADVANCE*



Revision 2.0