

REFERENCE MANUAL
AO Model 935
Automatic Microtome Knife Sharpener

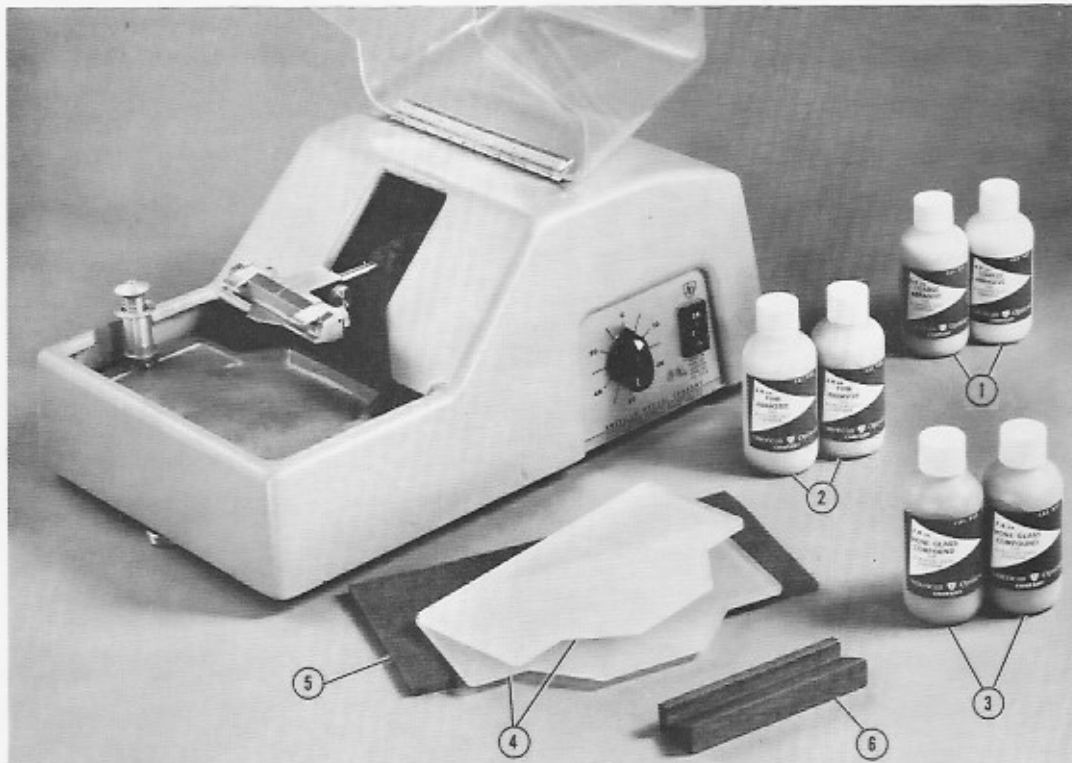


REGISTERED TRADE MARK AMERICAN OPTICAL COMPANY

 **AMERICAN OPTICAL COMPANY**
INSTRUMENT DIVISION • BUFFALO, NEW YORK 14215

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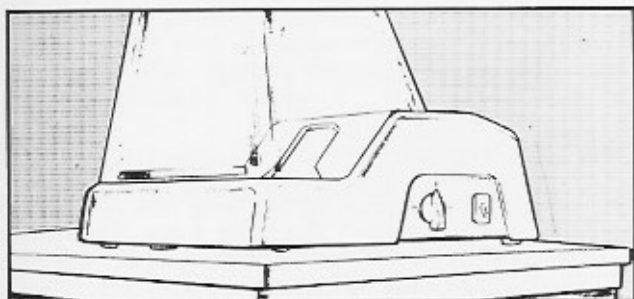
"Get Acquainted" with your AO 935 and its accessories

The 935 Knife Sharpener is shipped complete with all accessories required for coarse and fine knife honing and, when required, to dress glass hone plate surfaces. It employs the same sharpening principles designed into the elaborate, custom-built sharpening equipment used in the production of the Microtome Knives.

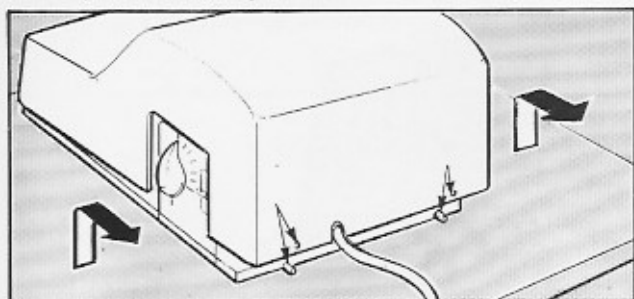
Because there are many demands on your time, take a few minutes now to get acquainted with your AO equipment to speed and simplify knife sharpening later. In addition to the plug adapter to permit use of a two-prong, grounded, electrical outlet, the following is included with Model 935.

- 1. COARSE ABRASIVE -- 2 BOTTLES:** Clearly labeled. Unbreakable plastic bottles for handy, safe application. Used in coarse honing procedure. (Shake well before using.)
- 2. FINE ABRASIVE -- 2 BOTTLES:** Clearly labeled. Used in the final sharpening (fine honing) procedure. Safe, unbreakable plastic bottles. (Shake well before using.)
- 3. HONE GLASS COMPOUND -- 2 BOTTLES:** Dry powder dressing compound which can be easily dispensed onto glass plates. Clearly labeled.
- 4. TWO GLASS HONE PLATES:** The 2 glass hone plates supplied with the 935 Sharpener are identical. Both sides of each plate are the same, giving you four usable honing surfaces.
- 5. REDRESSING PAD:** Washable, polyurethane pad on which glass hone plates are placed when plates are dressed (restored).
- 6. KNIFE INSPECTION BLOCK (WOOD):** Hardwood block used to hold knife blade at proper angle to inspect cutting facet with microscope.

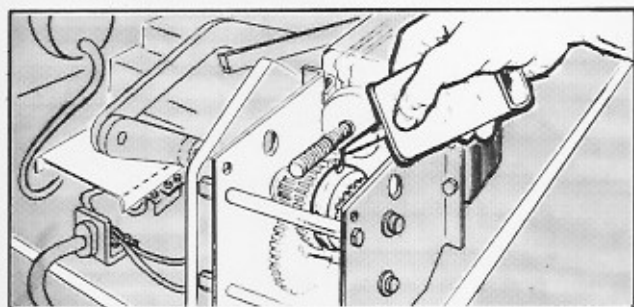
Just a few, fast preliminary steps and the AO 935 is "Ready to Use"



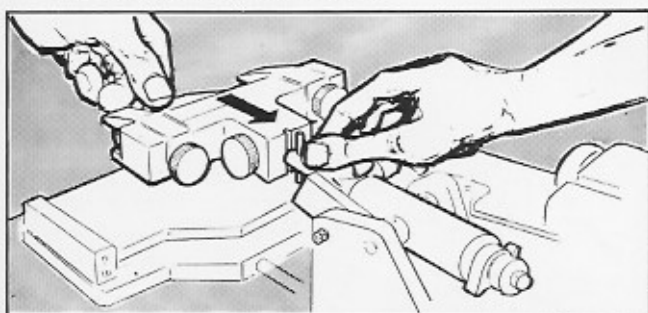
1. Place the instrument on a solid, level table or laboratory bench and remove tags and retaining tape used in shipment.



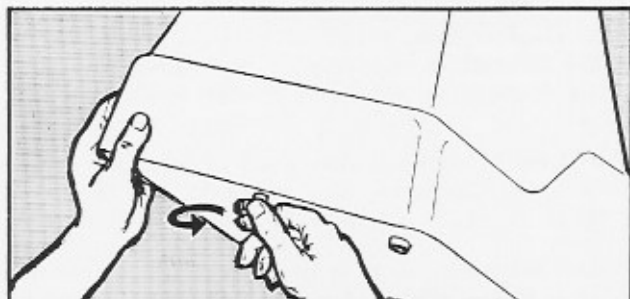
3. Lift the entire cover housing up and simultaneously move slightly toward the rear. This will free the housing from the two positioning pins at the back of the instrument base. Watch the position of the hone plate plunger to avoid damaging.



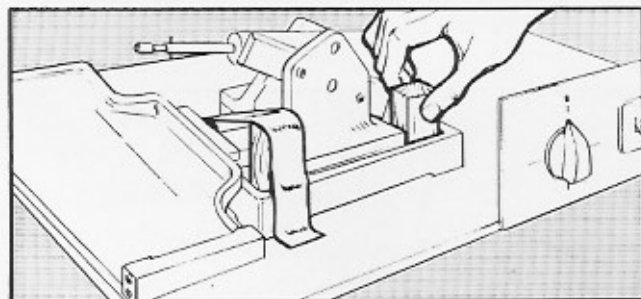
5. Place a drop or two of Pike oil on the felt pad beneath the motor worm gear. No other initial lubrication is required. Replace housing and tighten thumb screw firmly.



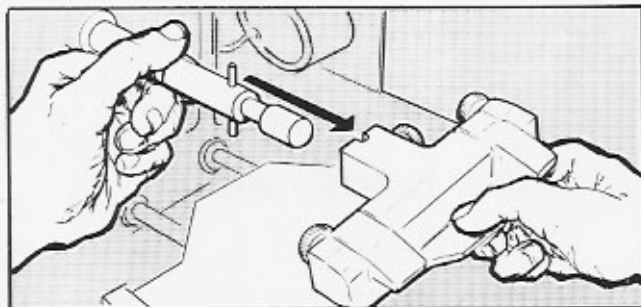
7. Slide the knife holder onto the shaft until the "slot" in the holder is seated firmly against the pin. Tighten locking screw securely.



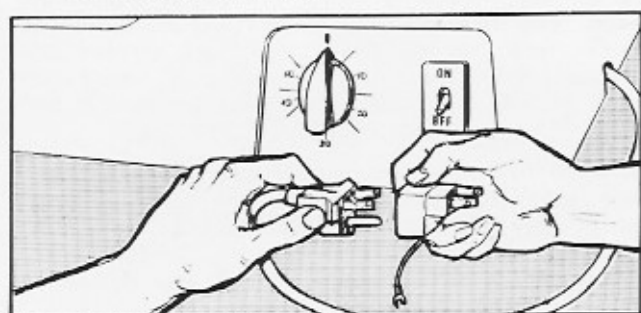
2. To remove the two, wood shipping blocks inside the instrument, first loosen the large thumbscrew directly under the front end of the 935.



4. Remove the two red blocks, as shown, by pulling the shipping tape free.

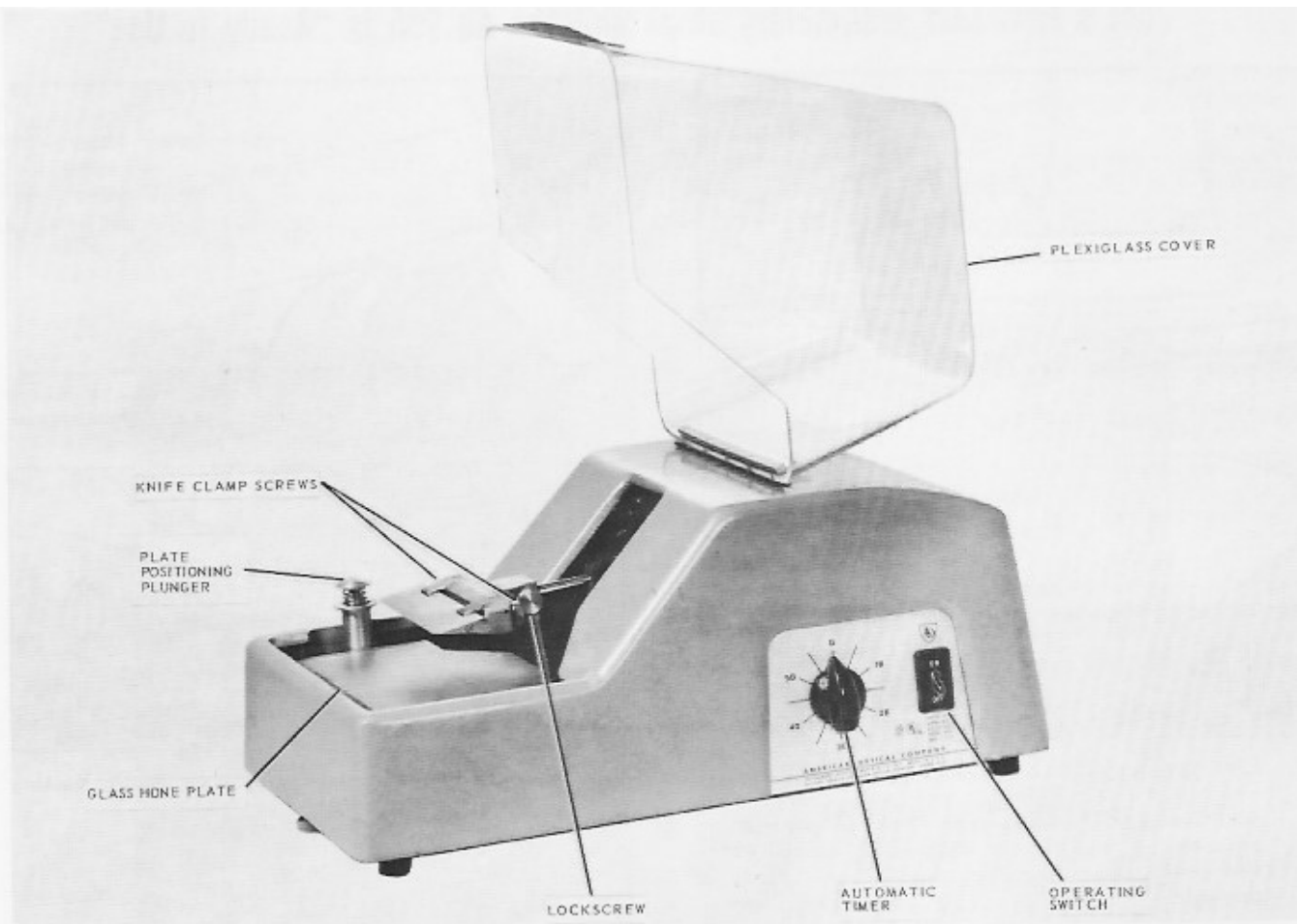


6. To attach the knife holder to the knife carrier arm, turn the arm, by hand, so that the pin is vertical. Position the knife holder so that the blade clamps are "up."



8. Attach plug adapter if required. Check to see that switch is "off" and plug in instrument.

CAUTION Do not operate instrument without knife in holder ... to do so may cause damage.



Your technical skill . . .

...is the key to the successful performance of any laboratory equipment. While the AO Microtome Knife Sharpener is a simple, compact instrument, your technical knowledge plays an important part in its operation.

To achieve results of which you can be justifiably proud, read these step-by-step instructions carefully. You'll find that the instructions are divided into several, main "sections" as well as into steps. Each easy-to-read section explains a specific part of the 935 operational procedure.

Save the manual for future reference. Even the most experienced technicians refer to the operating steps periodically to quickly "double check" that each procedure is accomplished properly in correct sequence. You will find the manual very helpful in training new personnel.

NOTE While under certain specific conditions competitive knives may be sharpened on the 935, optimum results cannot be assured.

IMPORTANT

Use only AO Knives either new or factory re-conditioned by the American Optical Company. Knives which have been sharpened previously by any other method cannot be satisfactorily sharpened on the 935 unless they are first factory reconditioned by American Optical. For comments on re-conditioning knives to restore proper facets, eliminate large nicks, etc., see page 13.



PLEASE READ OPERATING INSTRUCTIONS, BEGINNING ON PAGE 6 CAREFULLY BEFORE USING YOUR AO 935 SHARPENER.

I. MICROSCOPE EXAMINATION . . . KEY TO SHARPENING SUCCESS

The starting point of any successful sharpening technique is the careful examination of the condition of the knife edge using a microscope. Periodic re-examination during sharpening is equally important.

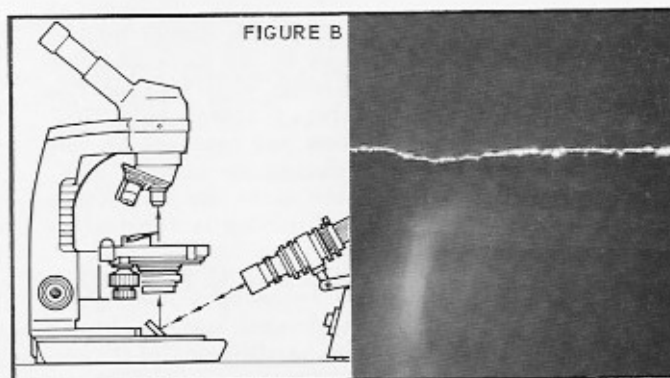
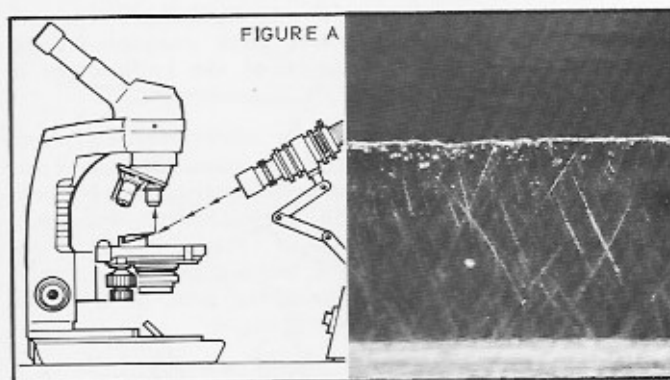
Please remember! The width of the entire cutting facet is only from 0.1 to 0.6mm, and nicks in the edge due to normal use are just a few microns deep. Therefore, there simply is no satisfactory substitute for the use of a good microscope in knife inspection. The microscope should be equipped with a measuring device such as an eyepiece reticle.

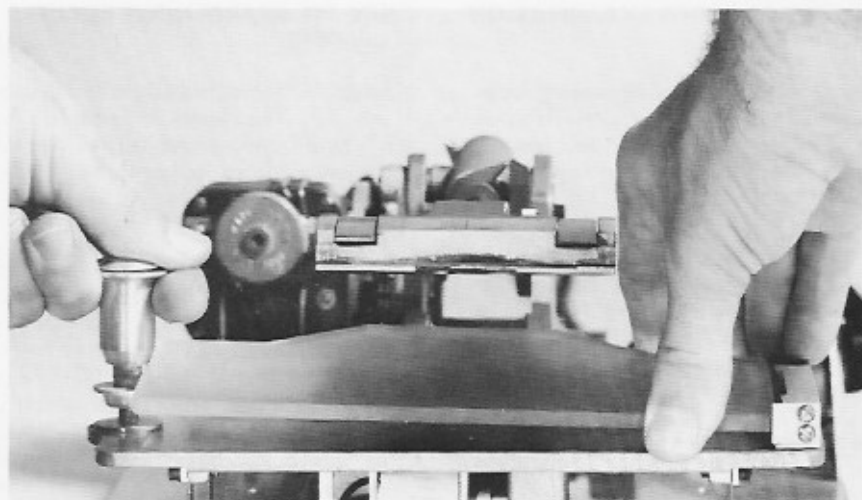
There are two basic methods of illuminating the knife for examination: When studying the surface of the cutting facet to check for smoothness and uniformity of

bevel, "reflected light" is used as shown in figure A. The lamp is located above the knife, about 6" to 8" away, and is positioned so that the light is directed down toward the knife at approximately a 45° angle.

When you wish to study only the edge of the knife to observe for presence and measurement of nicks, "transmitted light" is used as shown in figure B.

In both instances above, it is recommended that you examine the knife at 100X resultant magnification. Use the wood inspection block provided to hold the knife at the proper angle under the microscope and to avoid damage to knife edge. Always wipe the edge with a clean cloth moistened with solvent such as xylene before examining.





II. COARSE HONING OPERATION

The sharpening process begins with coarse honing. As a general rule, when nicks in the knife edge exceed 3-4 microns, coarse honing must precede fine honing. When in doubt, always coarse hone first. So little metal is removed that you need not be concerned about appreciably reducing the usable "life" of the knife. In cases where nicks are larger than 10-12 microns, factory reconditioning is required as discussed on page 13.

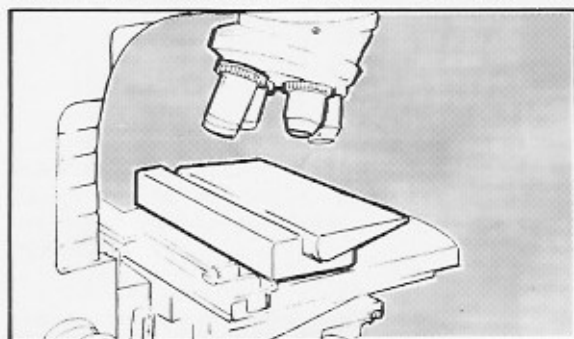
Make certain that you begin by using a hone glass plate with a uniformly even, frosted surface, free of any "shiny" area. Either use different plate surfaces for each length knife to be sharpened or always begin with longest knives and work down to smallest. See "Dressing Hone Glass Plates" page 11.

In coarse honing, the sharpening process begins at the back of the cutting facet and gradually proceeds to the front edge of the knife. Bear this "back-to-

front" honing action in mind when examining the knife. It is your best guide in recognizing the degree to which coarse honing has been completed each time you study the condition of the knife under a microscope.

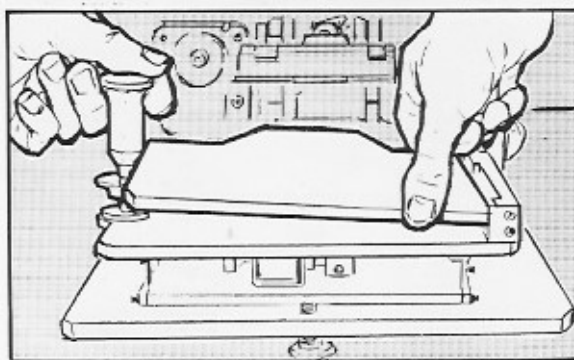
The length of time required for correct and complete coarse honing depends entirely upon the condition and characteristics of each individual knife. No two are identical; however, as experience is acquired, some insight is gained as to "timing." Still, as even the most experienced technicians agree, only microscopic examination provides proof-positive of satisfactory coarse honing procedure.

IMPORTANT: The first time a new AO Knife or a knife just factory reconditioned by American Optical is sharpened on the 935, the sharpening process must begin with coarse honing. Initial coarse honing of a new or reconditioned knife will be appreciably longer than during subsequent sharpenings. Complete removal of factory edge and nicks may require as long as 3-4 hours



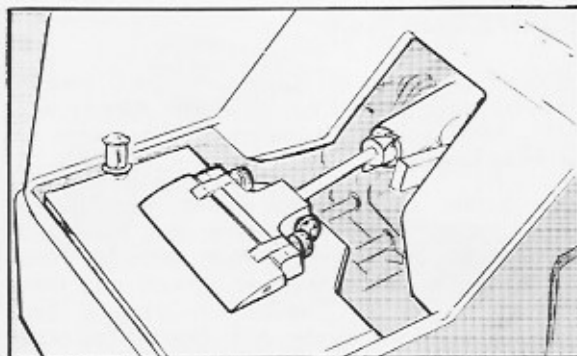
I. INSPECT FOR PRESENCE AND SIZE OF NICKS

Clean knife edge with solvent such as xylene. Place the wood inspection block on the microscope stage first; then set the knife on the block (a good safety precaution). Inspect knife edge for presence and size of nicks. Also note the other surface characteristics of the cutting facet to more easily recognize the "changes" that will take place during coarse honing.



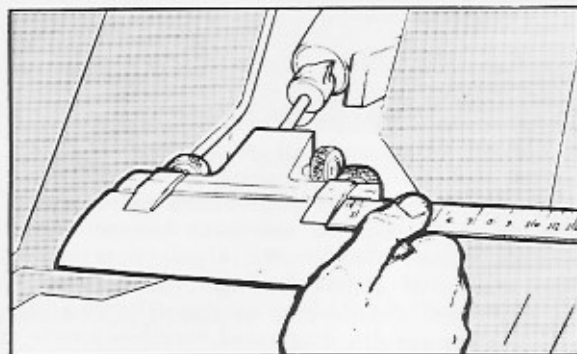
2. PUT GLASS HONE PLATE IN UPPER POSITION

Proper positioning of the glass plate is essential for correct coarse honing. Squeeze plunger to "lift." Set the left end of the plate on the upper pad of the plunger unit. Next insert the right end into the upper "V" of the plate support block. Release plunger and slide plate slightly from front to back to assure proper plate alignment in "V".



3. ATTACH KNIFE WITH AO TRADE MARK TO YOUR RIGHT (HANDLE SLOT TO LEFT)

Check to see that the knife holder is correctly and securely fastened to shaft (as shown on page 3). With the two clamps facing "up" and clamp screws loosened, install knife so that the end with the AO trade mark is to your right. This places the slotted end of the knife to your left as you face the front of the 935. Tighten the two clamp screws until the knife is safely, but temporarily, fastened. Note: Always sharpen longest knives first.



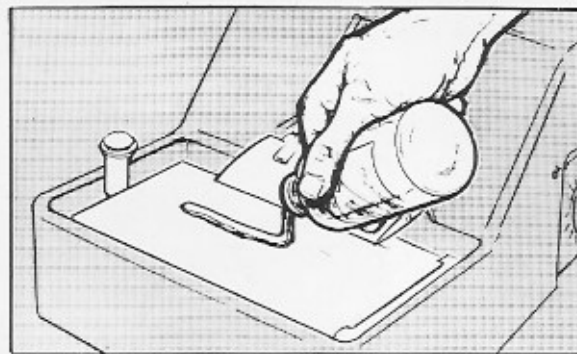
4. CENTER THE KNIFE USING A RULER

Carefully center the knife for proper balance during honing. Use a ruler and adjust knife position until you can measure exactly the same distance from the outside edge of each clamp to each end of the knife. Keep the knife evenly snug against the back of the holder. Gradually tighten the two clamp screws -- alternating from one to the other -- until the knife is held in place.



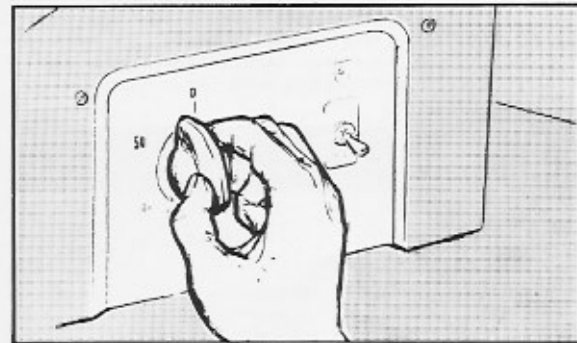
5. THOROUGHLY SHAKE COARSE ABRASIVE

Check label on plastic bottle to make certain that you are using the Coarse Abrasive, No. 937. Use of the correct abrasive is imperative. Shake very thoroughly (until all particles are in suspension) to get the proper proportions of oil and abrasive required for coarse honing. If necessary, remove the dispenser top from bottle and stir to mix contents.



6. APPLY COARSE ABRASIVE TO PLATE

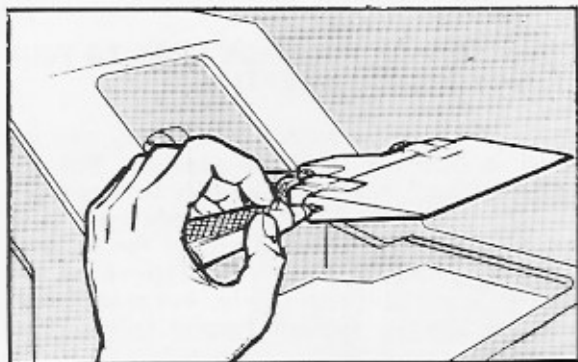
Squeeze a narrow "ribbon" (about the width of a pencil) of the coarse abrasive on the glass plate. The "ribbon" should be approximately equal in length to the knife being sharpened. Apply coarse abrasive at least an inch inside the front edge of the plate. Do not permit plate to run dry; add abrasive if needed. Avoid using excess or abrasive will "pile up" on plate and may necessitate cleaning of knife holder.



7. FIRST TIMER SETTING IS 60 MINUTES

When beginning coarse honing operation, set the automatic timer for 60 minutes. This initial setting of an hour holds true both for knives being sharpened for the first time on the 935 as well as those previously sharpened on this instrument. Close Plexiglass cover and turn on switch. The knife is automatically stroked against the high-frequency vibrating glass plate. After the equivalent of three full strokes on one side, a cam follower automatically turns knife and hones the other cutting facet, again using three strokes. Cycle is repeated continuously until time has run out.

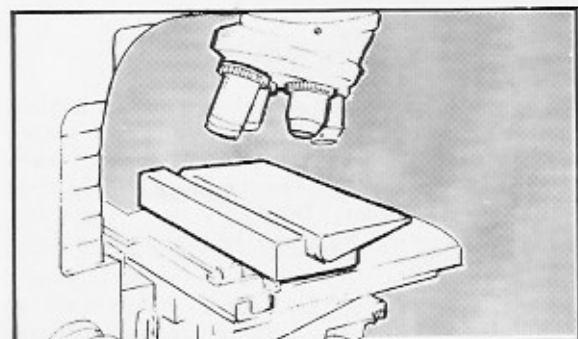
KNIVES UP TO AND INCLUDING 185 MM IN LENGTH CAN BE SHARPENED ON THE AO 935



8. REMOVE KNIFE CAREFULLY

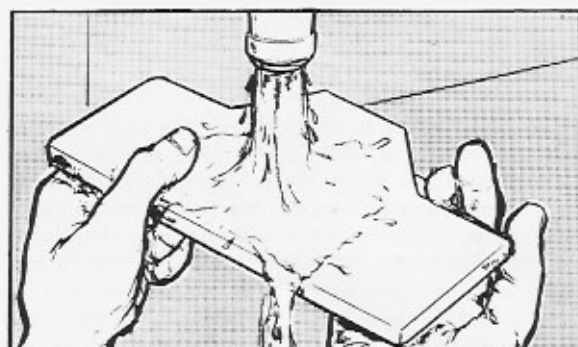
At the end of the time cycle, the knife holder will stop in raised, horizontal position. Loosen clamp screws and remove knife. As a safety precaution and for ease of handling, use knife handle.

NOTE If the holder should stop upside down (knife clamps facing downward), turn the automatic time knob beyond the 10 minute setting. Wait until the knife starts to move upward and then turn timer to "zero". The knife holder will then go through a half cycle and stop in correct, raised position.



9. CLEAN KNIFE -- INSPECT CONDITION

Wipe knife with clean cloth moistened with solvent and inspect the cutting facet under a microscope (100X). Keeping in mind that the coarse honing action proceeds from the back of the facet to the edge of the knife, check to see how much of the surface has been honed. As a guide, refer to the actual photographs, shown here, taken during various stages of coarse honing. Because each knife and its condition is different, no specific time can be given to achieve the results illustrated.



10. CLEAN GLASS PLATE -- CONTINUE COARSE HONING

Wash the glass hone plate with a detergent under hot running tap water to remove abrasive and fine metal particles. Wipe dry. Apply fresh, coarse abrasive and continue honing as required. Inspect periodically to check progress. Add abrasive as needed. Wash hone plate when abrasive becomes a dirty, grayish color.

With experience you'll soon be able to determine when you have a good, even coarse facet, uniform in appearance and have completely removed the single, factory facet - or - the fine, second, cutting facet produced by the 935 Sharpener.

NOTE: When a "shiny" surface is worn on the face of the hone plate, see instructions for dressing plate to restore even, frosted surface, page 11.

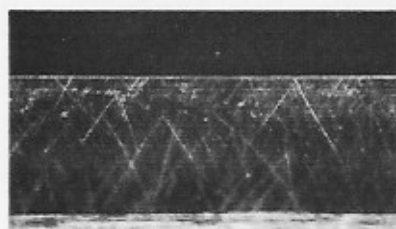


FIGURE C: Appearance of a new AO knife or knife factory reconditioned by American Optical before use. Note that there is just a single cutting facet.

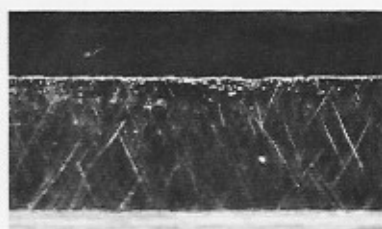


FIGURE D: Shown here is a new or reconditioned AO knife after normal use. Close inspection reveals nicks in the edge of sufficient size (over 3-4 microns) to require coarse honing.

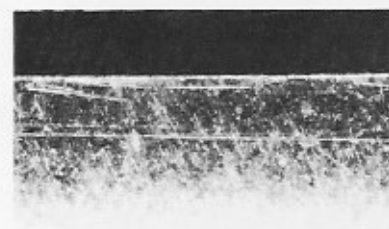


FIGURE E: Illustrated above is an "intermediate" stage in the coarse honing cycle. Notice the relatively large area near the knife edge which still remains to be coarse honed.

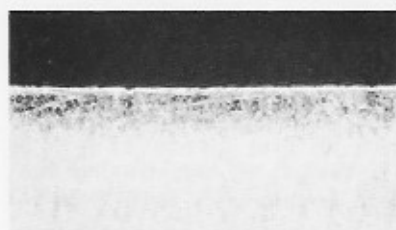
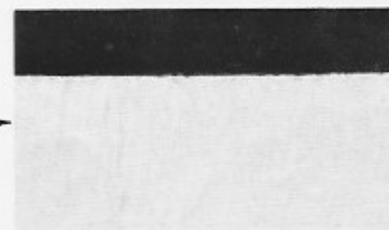
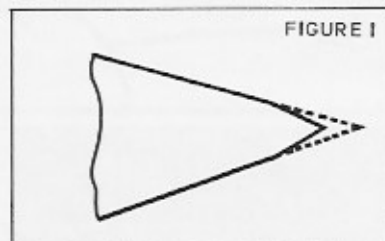
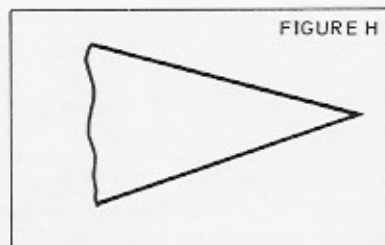
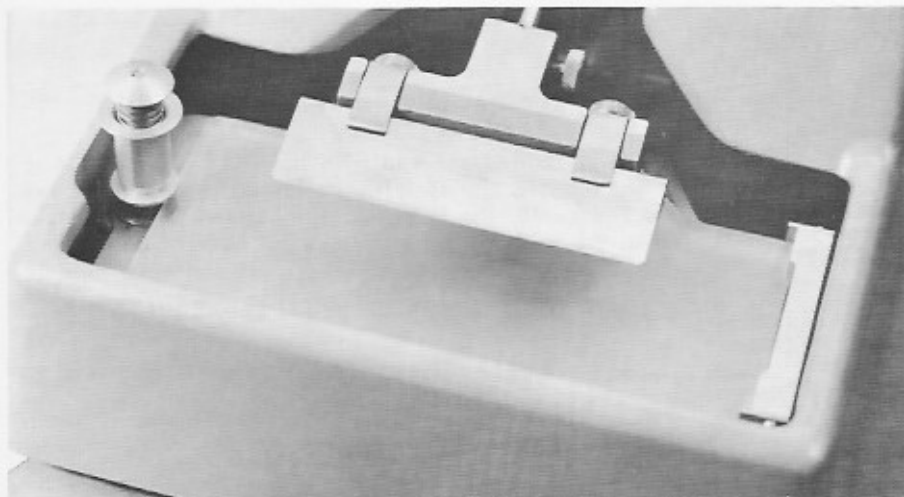


FIGURE F: An "advanced" stage in the coarse honing cycle is pictured here. Honing has progressed close to the edge of the knife, leaving only a small surface area still to be honed.

FIGURE G: Coarse honing complete. Note the even width and uniform appearance of the entire cutting facet, without any trace of original surface characteristics. Knife is now ready for fine honing.



SMALL NICKS OF 3-4 MICRONS OR LESS WILL BE REMOVED DURING FINE HONING.



III. FINE HONING OPERATION

Coarse honing must be followed by a final honing process using fine abrasive. As illustrated in figure H, the coarse honing action produces a single facet. In proceeding with the fine honing operation, a second cutting facet is ground on the knife at the cutting edge as shown in figure I.

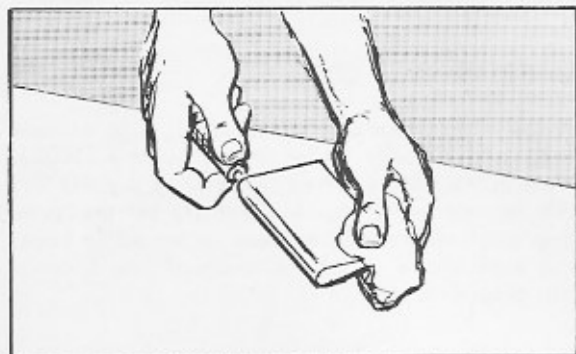
The width of the fine facet is not of significance. This will vary from one knife to the next. Also, this width often varies from one side of a particular knife to the other; however, this fine facet should be approximately the same width from one end of the knife to the other end. (See page 14 for comments on typical sharpening problems.)

While the above should be kept in mind, the most critical factor in judging the success of fine honing is the degree to which the small, remaining nicks are removed. Nothing exceeds this in importance! Exactly how microscopically free of nicks the knife edge

must be depends, of course, on the thickness of the tissue sections being cut. For example, with a four-micron nick in the knife, you cannot obtain a satisfactory section 5 microns thick because of a "tearing" action. However, with a 10 micron section, results may be acceptable although not uniformly even.

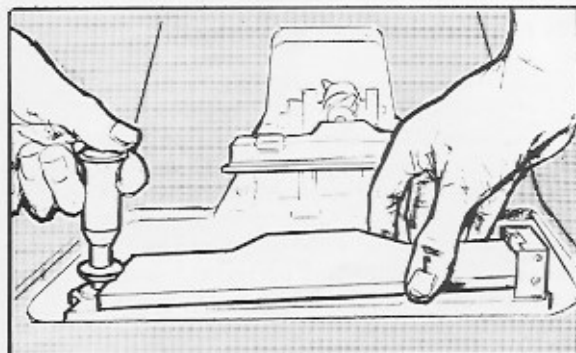
Your AO 935 Sharpener, with proper fine honing procedure, is capable of producing an edge so near to perfection that subsequent hand stropping will only result in "turning over" the edge. Do not stop!

NOTE Follow fine honing procedure carefully. While some steps are similar to those performed during coarse honing, and are therefore abbreviated, watch closely for the "differences" in technique. Nicks should not be more than 3-4 microns deep if the fine honing operation is to be properly accomplished. Inspect condition using a microscope.



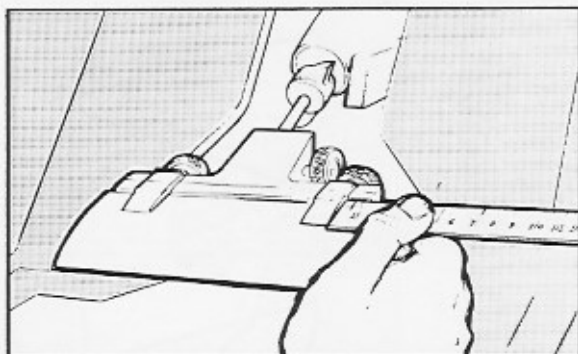
1. CHECK FOR CLEANLINESS

It is extremely essential that all traces of coarse abrasive are removed from the knife, knife holder and glass hone plate before beginning fine honing. Check and clean thoroughly. If the same glass hone plate is to be used, remove and wash under hot running tap water using ordinary detergent and carefully wipe dry.



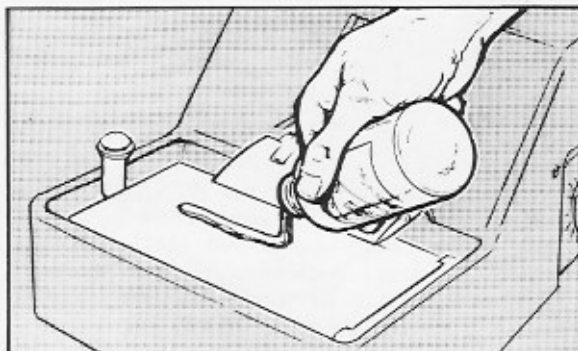
2. PUT GLASS HONE PLATE IN LOWER POSITION

After making sure that the frosted hone plate surface does not have a "shiny" worn area, put the plate in the lower hone table position. Squeeze to raise plunger. Place left end of plate on the lower pad of the plunger unit and insert right end into the lower "V" of the plate support block. Release plunger and slide plate slightly from front to back to assure proper plate alignment in "V".



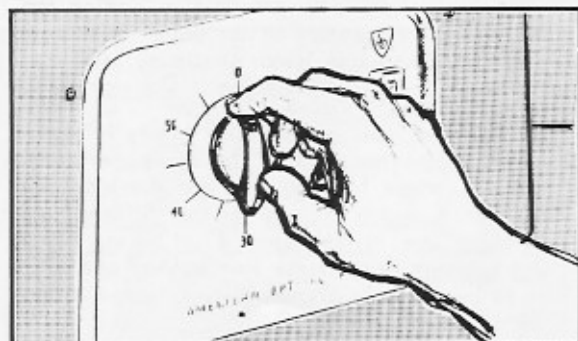
3. ATTACH AND CENTER KNIFE

Install knife so that the end with the AO trade mark is to your right (handle slot to left). Temporarily tighten the two screws and center the knife carefully using a ruler. Make sure that the knife is snug against the back of holder and, alternately, tighten clamp screws until knife is held in place. Note: Always sharpen longest knives first.



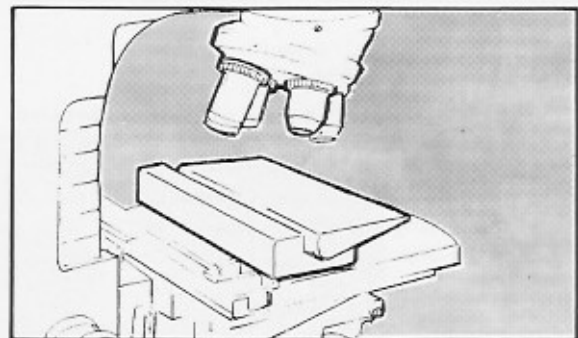
4. SHAKE AND APPLY FINE ABRASIVE

Check to make certain that you are using the Fine Abrasive, No. 938. Shake very thoroughly until all particles are in suspension. (Stir, if necessary.) Apply a narrow "ribbon" of fine abrasive on the glass plate the same length as the knife. Apply fine abrasive about an inch inside front edge of glass plate.



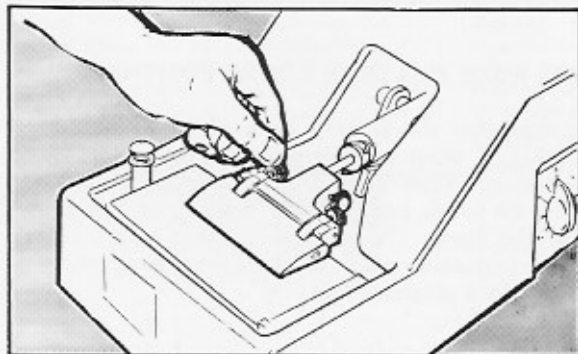
5. SET TIMER FOR THIRTY MINUTES

Use an initial time setting of at least 30 minutes when beginning fine honing operation. Keep Plexiglass cover closed when instrument is running. At the end of the time cycle, loosen clamp screws and remove knife. As a safety precaution, and for ease of handling, use knife handle.



6. CLEAN KNIFE, INSPECT CONDITION

Clean knife edge with clean cloth moistened with solvent such as xylene and inspect under a microscope (100X). The second, fine cutting facet, characteristic of the AO 935 Sharpener, will be apparent. Look carefully for presence and size of any small nicks still evident in the knife edge. The removal of such nicks -- not the width of fine facet -- determines your progress.



7. CONTINUE FINE HONING, AS REQUIRED

In proceeding with fine honing, "timing" is dependent entirely upon the condition of the knife. Experience with the 935 will soon enable you to gauge approximately how much more time is needed to achieve the desired results; however, please remember that microscopic examination is still the final determining factor. Add abrasive, as required. Should fine abrasive become "grayish" in color, this indicates the presence of excess metal particles. In this case, wash hone plate and apply fresh abrasive.

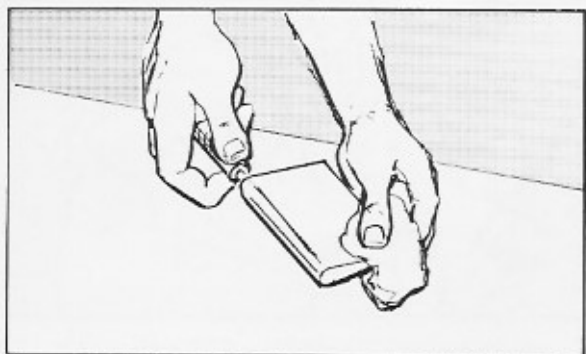


FIGURE J: Appearance of an AO knife edge after proper coarse honing. Note that there is just a single facet, the surface of which is evenly ground and uniform in appearance.

FIGURE K: Illustrated here is an "initial" stage in the fine honing cycle. The second cutting facet is beginning to become evident near the edge of the knife.

FIGURE L: The fine facet is now clearly apparent in this "advance" stage photograph. In contrast to coarse honing, the fine honing action proceeds from the front edge of the knife to the back.

FIGURE M: Fine honing complete. Note the even width of the fine facet (from end to end of knife). Small nicks have been satisfactorily removed. Microscopic "S-shaped" lines on fine facet are a normal result of polishing action and do not affect cutting qualities.

8. AFTER FINE HONING IS COMPLETE

Clean knife and wipe dry carefully. Where atmosphere is corrosive and the knife is to be stored for any length of time, lubricate with a good grade of light, neutral oil.

After the knife has been used, only a "touch up" of the edge using fine honing may be sufficient to restore cutting qualities. (Never stop.) Much will depend upon the type of tissue and desired thickness of the sections. Again, microscopic examination will assist you in determining what is necessary.

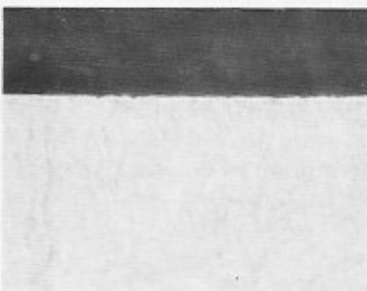


FIGURE J

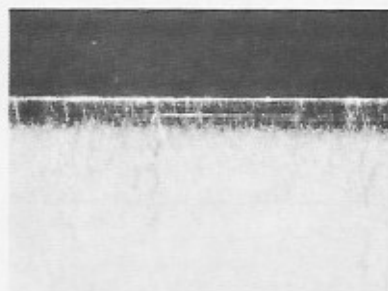


FIGURE K

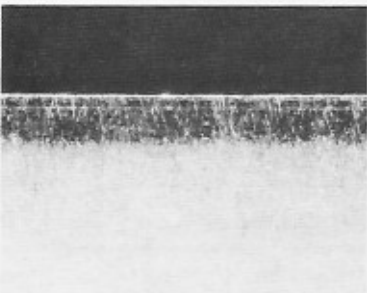


FIGURE L

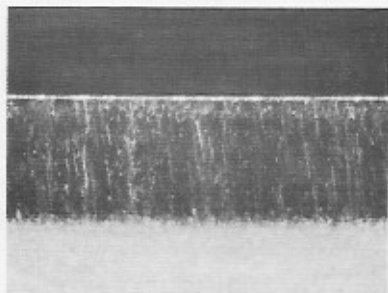


FIGURE M

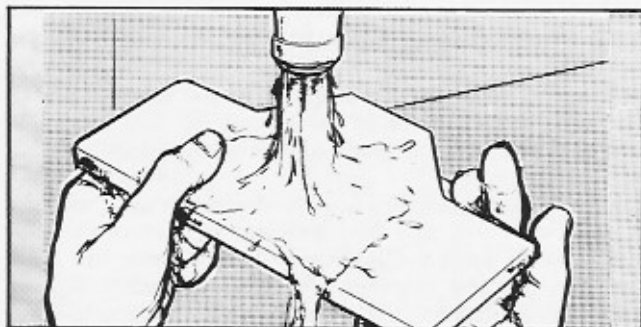


IV. DRESSING HONE GLASS PLATES

The honing action of the knife against the frosted surface of the glass plate will eventually cause a "shiny" path to be worn on the face of the plate as wide as the length of the knife. (The number of hours before the appearance of a shiny area depends upon the type of abrasive most frequently used.)

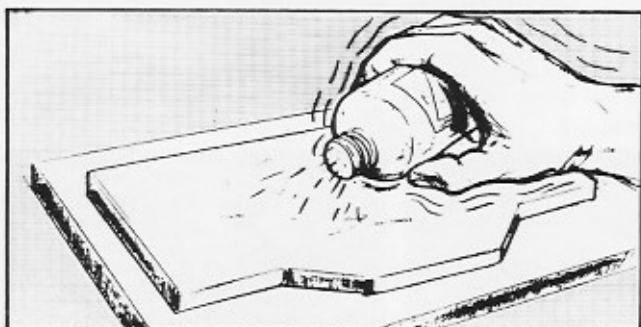
When such a rectangular-shaped, shiny surface exists, time required for proper honing increases substantially. Coarse honing, in particular, becomes very time consuming. Also, should one attempt to sharpen a knife that is longer than the worn part of the plate, correct honing becomes impossible. The ends of the longer knife will ride high on microscopic shoulders (areas still frosted) and the center will not make proper contact on the shiny, worn area.

To economize time, most technicians wait until both glass hone plates require dressing. In addition, if desired, each side of the two plates can be dressed during the same procedure thus restoring the frosted appearance to all four identical plate surfaces.



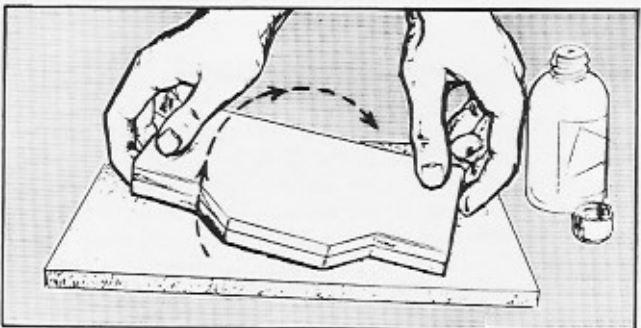
1. MAKE CERTAIN HONE PLATES ARE CLEAN

Check to see that hone plates are entirely free of any trace of either coarse or fine abrasive. Clean under running tap water, using detergent if necessary.



3. APPLY HONE GLASS DRESSING COMPOUND

Remove cap and use plastic bottle like a "salt shaker" to apply the No. 939 dressing powder. Apply in a fairly thin, even layer over the entire surface of the glass plate.



5. AFTER 6-8 CIRCULAR MOTIONS "FLIP" PLATES

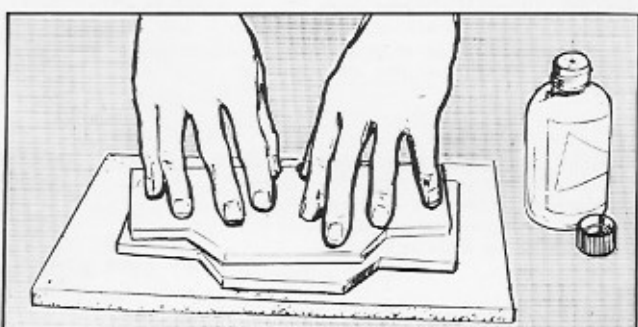
When you complete from six to eight full, circular motions, flip both plates over together (as a "sandwich") so that the bottom plate becomes the top plate. Repeat circular, stroking action and flipping procedure for about 5 minutes. Add honeglass powder and water as needed.

NOTE The appearance of large "bubbles" between the plates and the feeling of less friction "drag" are both indications that additional honeglass dressing compound and water are required.



2. PLACE "SHINY" SIDE UP -- SPRINKLE WITH WATER

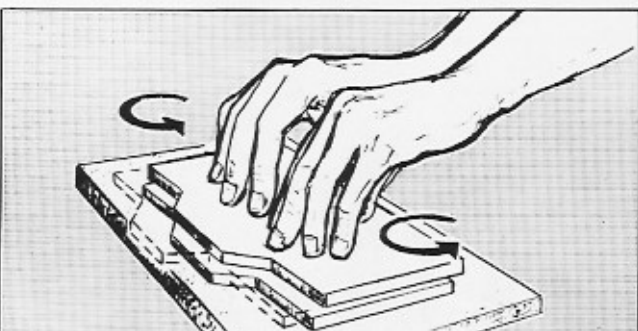
After rinsing, place the damp glass hone plate on the sponge-like, polyurethane pad. Position so that the side with the worn area faces "up" and liberally sprinkle droplets of water on the surface.



4. RUB TOGETHER USING A CIRCULAR MOTION

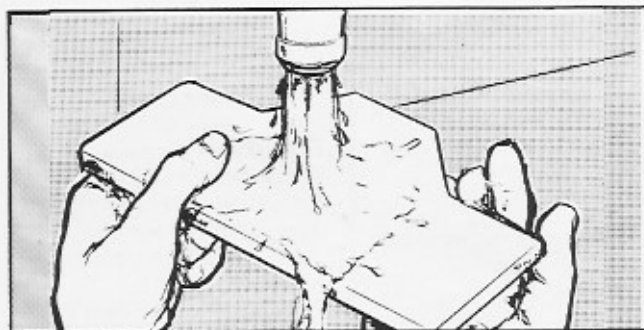
Place the second, clean glass plate ("shiny" side down) over the first plate. Rub one surface against the other with a circular or slightly elliptical motion. Use both hands and maintain steady, light pressure.

NOTE If plates tend to stick together stubbornly, an excess of honeglass compound may have been applied. Add more droplets of water and continue rubbing action. Any excess will quickly "work" off the edges of the plates.



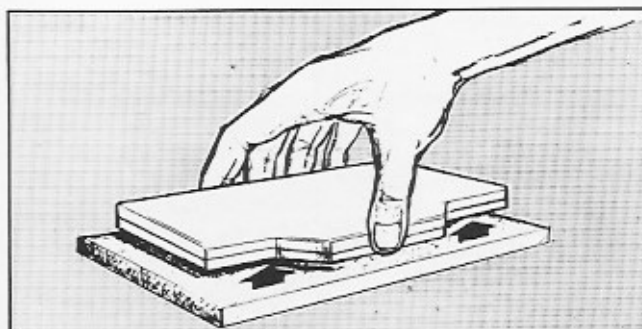
6. DO NOT OVERLAP PLATES BY MORE THAN ONE INCH

Watch carefully that you do not overlap the top plate more than an inch beyond the edge of the bottom plate during circular motion action. If plates are overlapped excessively during dressing, edges may be rounded slightly and microscopic concave areas will be rubbed into the top glass plate.



7. WASH PLATES — INSPECT CONDITION

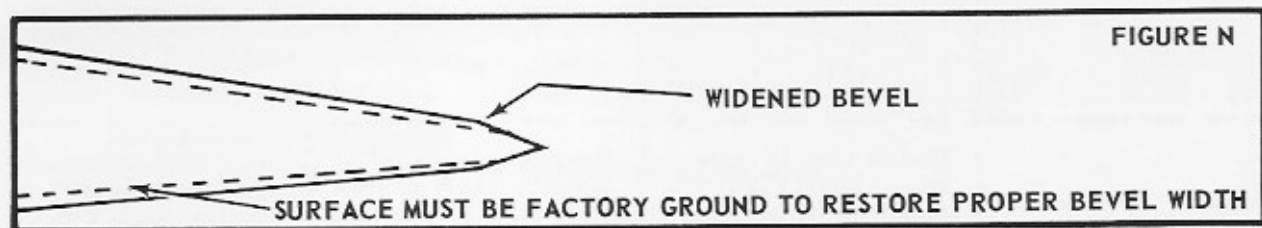
After dressing for approximately five minutes, wash each plate thoroughly under running water and dry completely. Inspect for uniform, frosted appearance over the entire surface of each plate. If there is a "shadowy" indication of the shiny area still present repeat the above procedure until a uniform surface is obtained.



8. TEST GLASS HONE PLATES FOR "FLATNESS"

After plates are properly dressed and dried, they can be tested for flatness in the following manner: Bring the plates into contact (dressed surfaces together) with a sliding, circular motion until edges match. Lift the top plate with your fingertips. If both plates are perfectly flat, the bottom plate will cling to the top plate and raise with it, about $\frac{1}{2}$ ", until its own weight finally pulls it free.

CAUTION All traces of hone glass dressing compound must be removed from glass plates before sharpening knives.



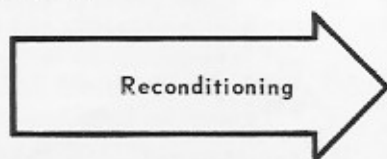
When ... Why AO Factory Reconditioning of Knives is Required

The new, or factory reconditioned, AO Knife has very precise wedge and cutting facet angles. These angles permit the knife to "meet" the glass hone plate in the correct manner for proper coarse and fine honing. For this reason, please remember:

- A. The use of only new or factory reconditioned AO Knives in good condition is recommended. In a very few instances (where angles and configuration are similar) competitive knives may be sharpened on the 935. Even in these cases, AO does not guarantee optimum results. Hollow ground knives of any type simply cannot be sharpened satisfactorily on the 935.
- B. If your AO Knives have been sharpened by any other method, they must be reconditioned by American Optical to restore proper angles prior to sharpening on the 935.

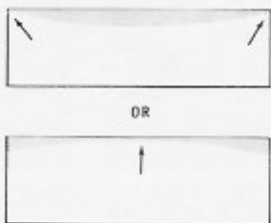
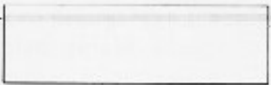

- C. AO Knives with nicks larger than 10-12 microns in the area of the knife used for sectioning should, as a general rule, be factory reconditioned.
- D. After many repeated sharpenings, the angles of coarse and fine honed cutting facets will widen excessively. At that time, the knife should be sent to the factory where the entire knife thickness will be ground down slightly to restore proper angle, as illustrated in figure N.

NOTE Knives which, by sharpening or reconditioning, have eventually been reduced in size (from back to cutting edge) to 27mm or less cannot be resharpened on the AO 935 Knife Sharpener nor can they be factory reconditioned.



American Optical Company
Instrument Division
Buffalo, N.Y. 14215
Attention: Repair Department

TYPICAL KNIFE SHARPENING PROBLEMS

Appearance	Problem	Cause	Correction
	<p>Fine facet fades out at ends of knife (opposite side of knife has even bevel).</p> <p style="text-align: center;">or</p> <p>Fine facet fades out at center of knife (opposite side of knife has even bevel).</p>	Microscopic curvature on one side of knife.	<p>Disconnect turning mechanism and coarse hone side of knife with uneven bevel for one hour. (Contact your AO representative for specific instructions to accomplish this step.)</p> <p><u>Caution:</u> Microswitch will not shut off when used in this manner.</p>
	Fine facet starts back of (away from) cutting edge.	<ol style="list-style-type: none"> 1. Facet angle too wide (see page 13, figure N). 2. Insufficient coarse honing. (Microscopic examination would have revealed this.) 3. Knife accidentally reversed (end for end) in holder. 	<ol style="list-style-type: none"> 1. Recondition at factory. 2. Coarse hone. 3. Repeat coarse honing cycle with knife in proper position.
	No fine facet in center area of knife. (This condition will occur on <u>both</u> sides of knife.)	Sharpening knives of different length on same glass plate in improper sequence.	Redress, or change, hone plate and start complete cycle with coarse honing. (Always sharpen longest knives first.)

NOTE: These are typical knife sharpening problems that may be encountered. Should you ever experience an unusual sharpening situation in which you cannot identify the problem, write the AO Sales Department at Buffalo for prompt assistance.

MAINTENANCE

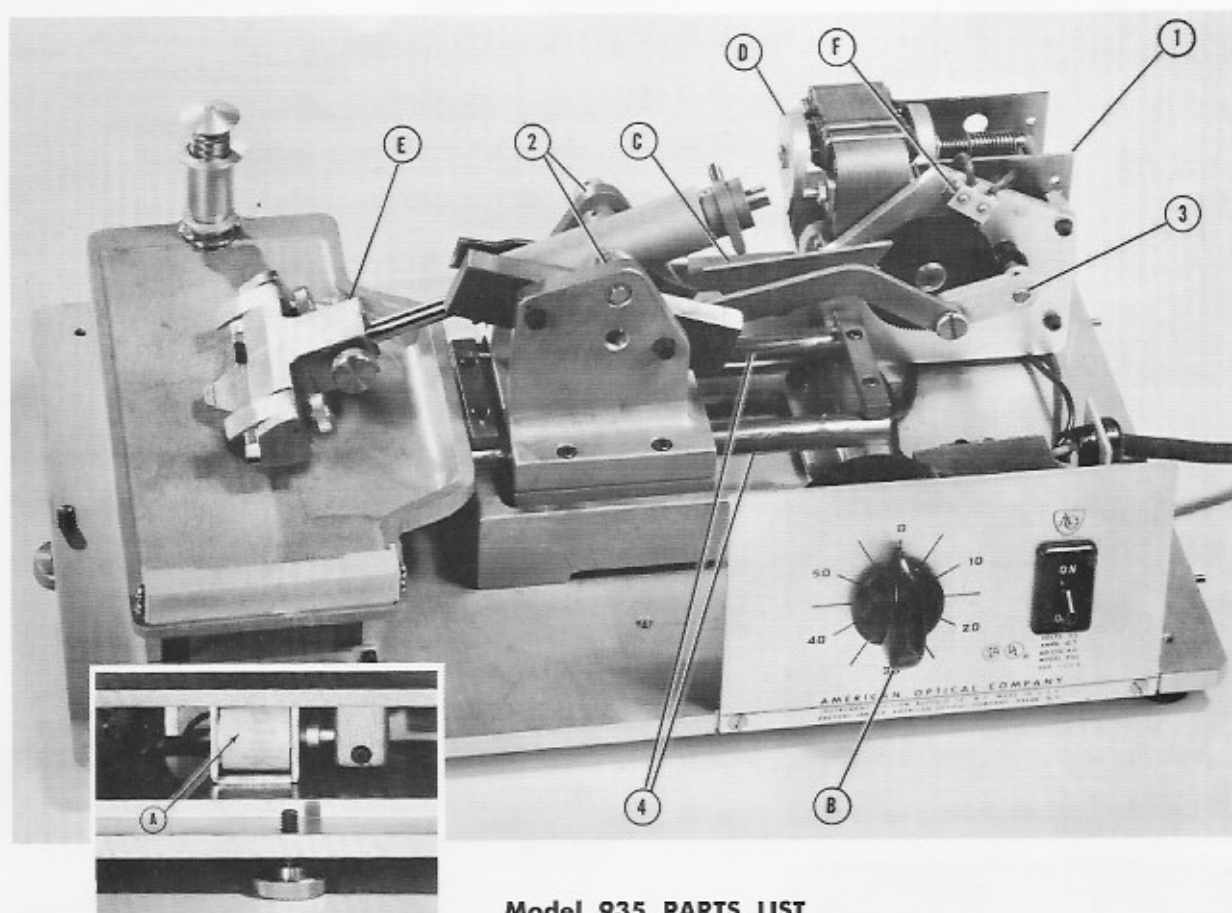
The AO Microtome Knife Sharpener is of durable construction with remarkable design simplicity. Except for routine cleaning and occasional lubrication, no other maintenance should be required. Even after years of use, only a few parts are likely to need replacement. These are listed on page 15.

Should the occasion ever arise, the AO 935 Sharpener can be reconditioned at the American Optical plant in Keene, New Hampshire. This is a customer service provided at a nominal charge.

1. CLEANING: Plexiglass cover and outside enameled surfaces should be kept clean. Use warm water and detergent. Sponge out and wipe dry the catch-basin on the hone table after each sharpening session. Knife holder, knife holder shaft and exposed fittings are non-corrosive and require no attention other than normal cleaning.

2. LUBRICATION: Lubricate instrument approximately once each month, depending on how extensively it is used. Lifetime Oilite bearings are used throughout the instrument; therefore, only a few points require lubrication. Lubricate sparingly. Place just a drop or two of Pike oil on:

- (1) round, felt pad beneath worm gear of motor.
- (2) two brass bearings at pivot points between carrier arm assembly and slide casting.
- (3) brass bearing at the end of the motor crank arm.
- (4) two slide rods (Use Molykote Spray Graphite Lubricant - available locally).



Model 935 PARTS LIST

Pic. Id.	Part No.	Description
(A)	935-147	Solenoid 115V, 60C
(B)	935-176	Timer
(C)	935-503	Knife Carrier Actuator Assembly (for instruments with Serial No. over 3,000). Order L5137 Knife Carrier Actuator Kit for instruments with Serial No. under 3,000.
(D)	935-860	Side Plate Assembly (includes motor)
(E)	935-863	Knife Holder (for instruments with Serial No. over 3,000)
(F)	935-868	Microswitch Kit

FOR
FACTORY SERVICE

NOTE: All parts are interchangeable with old style (Serial No. under 3,000)
AO Sharpener except as noted.

In the event that repair or reconditioning is ever required,
send instrument directly to:

**CUSTOMER SERVICE DEPARTMENT
AMERICAN OPTICAL COMPANY
KEENE, NEW HAMPSHIRE**

All correspondence related
to repairs and other matters
should be directed to:

Sales Department
AMERICAN OPTICAL COMPANY
Instrument Division
Sugar and Eggert Roads
Buffalo, New York 14215

**Model 935 Knife Sharpener
Accessories and AO Microtome Knives**



Number	Description
936	Glass Hone Plates (Set of 2)
937	Coarse Abrasive (package of 6 plastic bottles)
938	Fine Abrasive (package of 6 plastic bottles)
939	Honeglass Compound (package of 6 plastic bottles)
935-105	Redressing Pad
935-139	Knife Inspection block (wood)
940	110mm Knife in Case
942	120mm Knife in Case
945	185mm Knife in Case
955	Handle for 940, 942 and 945
969	Pike Oil (3 oz.)



AMERICAN OPTICAL COMPANY
INSTRUMENT DIVISION • BUFFALO, N. Y. 14215

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