FANTASY MACHINE

USER'S MANUAL

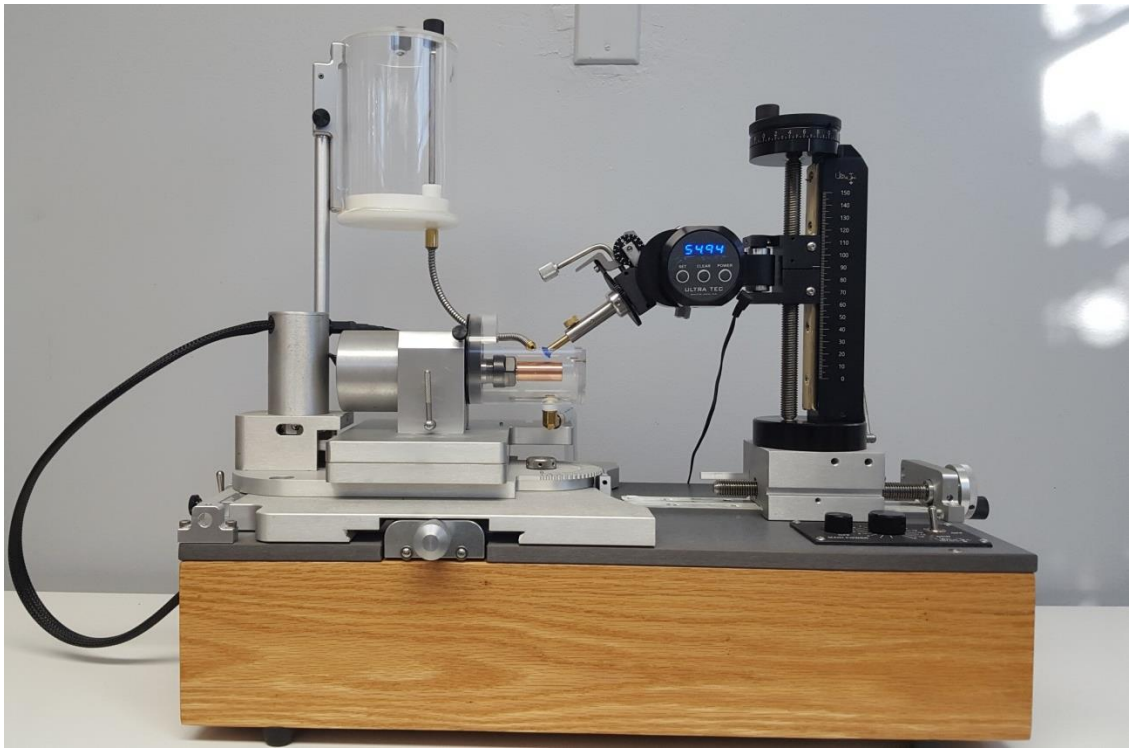


TABLE OF CONTENTS

INTRODUCTION

The Ultra Tec Faceting Machine has been manufactured since 1966. It displays Ultra Tec's approach to equipment design -- direct, simple, thorough and non-compromising – providing the user with the precision and repeatability that fine lapidary work requires.

The Fantasy machine was developed at the urging of professional gem cutters. It is based on their "wish list" – a list that included mechanisms and controls for almost every possible axis of positioning. It started out with a goal of making advanced positioning controls available for "concave cutting". When we were done, we found that the equipment could not only do the enhanced concave cutting originally intended but also something new - "Fantasy stones" – essentially, geometric carving – a lapidary art that gives free rein to the imagination of the user. So—the project became a goal exceeded.

The Fantasy Machine has gone through a period of extensive testing – tweaking – modifying – getting it right. That period included learning – a learning that continues – but clearly, it was time for the Fantasy machine to be introduced.

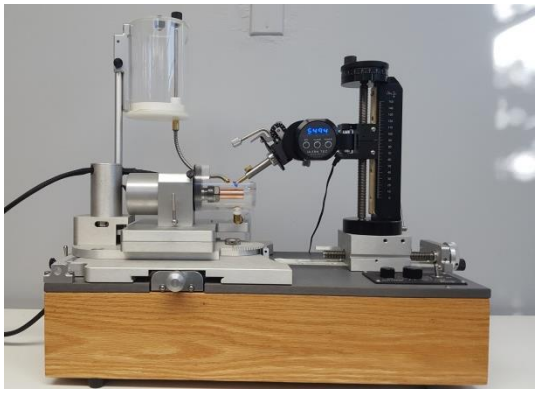
As Fantasy users gain experience – their work will turn increasingly complex. It's not for kids. It is for lovers of lapidary, perhaps better said – *imaginative* lovers of lapidary—it's an art form. Enjoy it.

ABOUT YOUR FANTASY MACHINE

The Fantasy Machiine is a precision device, but not a delicate device. For maintenance, it only needs normal "wipe-it-down" cleanliness and reasonable care.

Pay attention to safety -- there are tools in multiple motion. In general, these are not sharp cutting tools, but sometimes are, and are necessarily exposed. So -- treat them with respect.

As with any electro-mechanical device, there can be occasional problems--and if you experience one, re-read the Owner's manual for the function involved, to assure that you are performing the operation correctly. If you still experience a problem, communicate with your Ultra Tec representative or with the factory.



Shown with a Mast mounted – how it will look "in use".

ABOUT THIS MANUAL

Most Manuals start out by saying "Read this carefully before proceeding". Our advice is to do what you will probably do anyhow -- that is, "Browse through this Manual quickly, and then start trying things out – go back to the Manual if something puzzles you". Our reason: This is a complex, but very logical machine. As a faceter you'll figure out most of it by just looking at it. For many functions it takes longer to go through a verbal description than it does to just look at it—and try it. Obviously, if something feels "too tight", or is "jamming", go back to the Manual and read the section you need.

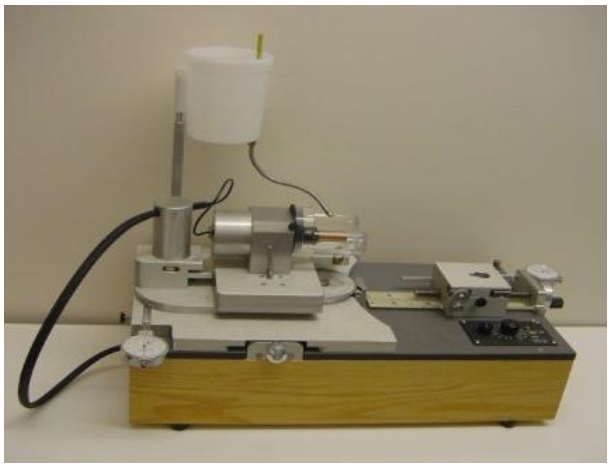
1.0 UNPACKAGING THE UNIT

The machine comes in protective packaging which you may want to save, along with its box, in the event that future shipment or storage is necessary. These are the included items:

Please note that the Fantasy Machine is heavy, so you may want someone to help you with lifting it out of its shipping box. Have a sturdy surface to set it onto.

There are not a lot of pieces.

The Base - the basic machine itself →



Two Dial Indicators

Mast Alignment Dops →

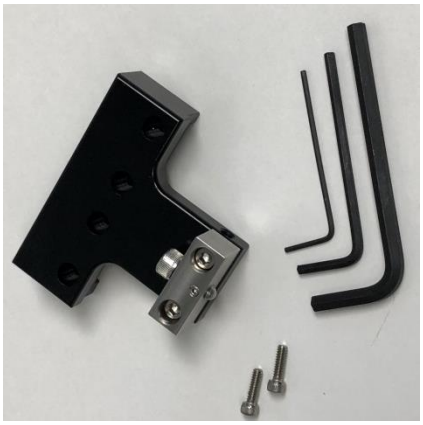
← Drip Tank

Position 2 Spacer

Position 2 Alignment Block

And, Tool Box that includes:

Cylindrical Tools:
Copper/Maple/Phenolic -**diameters 8mm 13 mm, 17 mm;**
Slitting Tools: Copper/Phenolic – 90º; and Adapter Shaft.
ER-16 Collet Set of 10
ER-16 Spanner Wrench.



Lateral Stop Bracket

2.0 An Overview

The Fantasy Machine provides multiple axis repeatable positioning for use of cylindrical tools ("mandrels") and Slitting tools (disc "grooving" tools).

These are the positioning features:

- Initial Alignment – the faceting Mast is set onto the Fantasy Machine and aligned to a "home position" – an initial retrievable 0 reference.

- X (in-out) directional positioning ("parallel stepping") of the grinding/polishing tool, relative to the workpiece is provided - Dial indicator readout.

- Y (side-to-side) directional positioning ("parallel stepping") of the grinding/polishing tool, relative to the workpiece is provided - Dial indicator readout.

- θ (theta – angular) 180º of angular positioning, of the grinding/polishing tool relative to the workpiece is provided. The Pivot axis is the 0-0 position

- Lateral Stop Bracket -- locks out lateral motion of the Quill and tweaks Quill-to-Mandrel alignment

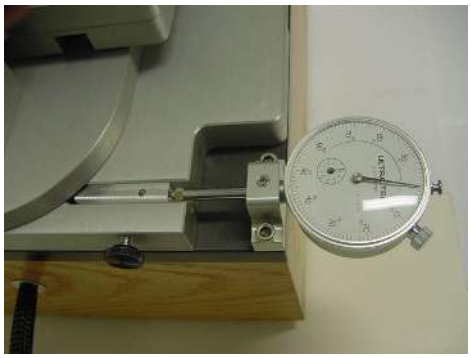
- There are two settable motor positions – Position 1, in line with a cylindrical tool axis - that axis intersecting the "pivot axis" (the axis of horizontal angular positioning) - and maintaining in-line reciprocation regardless of θ angular setting. Position 2 is at 90º, for use of grooving type of tool - it allows for setting the slitting tool so that it intersects the "pivot axis", and it also maintains in-line reciprocation regardless of θ angular setting.

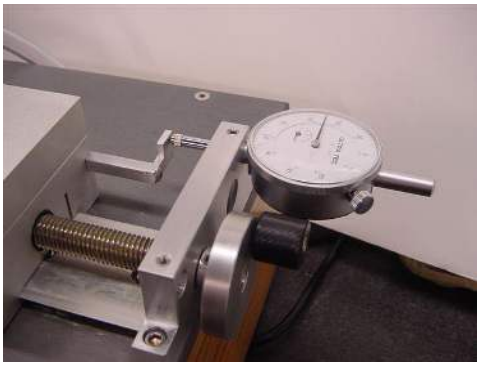
- Reciprocation of the mandrel amplitude is adjustable – from very little (including none) to over an inch and reciprocation rate is adjustable up to 140 CPM – a high reciprocation rate is valuable for polishing. The Reciprocation Motor is independent of other controls.

3.0 SETTING UP

3.1 The Machine – The machine should be placed on a workbench or desk surface. It is fairly heavy, about about 65 pounds, so be sure the work bench is sturdy and you may need assistance in lifting it to the surface. The machine will need a plug-in electrical supply and a container for draining, a gallon container is adequate.

3.2 Install Dial Indicators – There are two Dial Indicators (these are shipped unassembled to avoid damage). As you face the machine, the position at the close left corner is designated "X"; the position at the right side, toward the back, is designated "Y".





The two Indicators are identical. Inserted, each one into its bracket, (as shown in the photos) leaving a small gap of several millimeters between the round dial case and the bracket.

Each of these indicators has an Indicator Anvil to set the indicator reading.

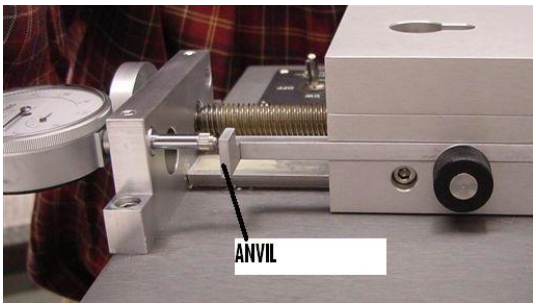
Note: The Indicator has an outer dial that the long needle tracks around – one full rotation being 1 mm (capable of very small incremental settings). There is a small inner dial that counts rotations of the outer dial – it reads 10 turns, and then 10 more –so you can read 20 mm in all (.800") [you *can* squeeze another millimeter at the end of the scale]. When the following paragraph says: set the indicator to 0-0 it means *set the Dial Indicator's long needle readout to 0 with the inner dial (rotation counter) at 0.*

3.2.1 The X Indicator Anvil (left) can be positioned by loosening the Black Knob at the left side of the plate, sliding the anvil to the desired position and then re-tightening the knob.

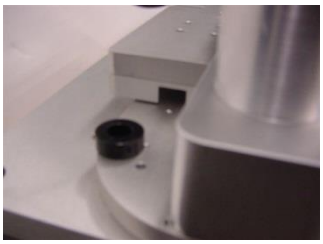
In setting up, set the X Indicator to 0-0 – there is some preloading, even at 0-0 (see the boxed note above). After initial mounting of the X Indicator, slide the Anvil against the indicator shaft to get that reading (you just have to get the 0 setting close, because you can "fine-tune" the alignment by turning the outer ring of the indicator until the outer 0 position is exact).

3.2.2 The Y Indicator Anvil (right) can be positioned by loosening the Black Knob at the rear of the Mast Mounting Block -- sliding the anvil to the desired position, and then retightening the knob.

At the time of initial setup, this Anvil is pulled away from the Dial Indicator – not activated, at least until the Y linear position of the Mast has been set. Later, when the Y setting *is* involved in the process, slide the Anvil into contact with the Indicator shaft then set it at 0-0.

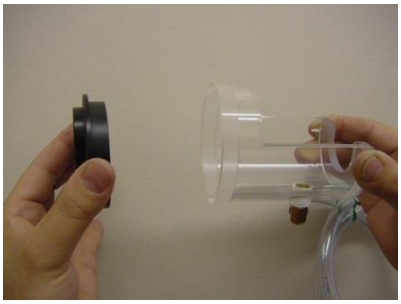


3.3 Install Drip Tank - The Drip Tank post slips into a black Bushing in the left rear of the Reciprocating Table (see the picture on right). Place the Drip Tank onto the post, position the Post into the Bushing, tighten the set screw, and it is ready. The flow rate is adjusted by turning the valve stem, and the water shuts off with an easy pressure. Avoid over tightening the valve. The tank will fit snugly, but loose enough for you to rotate its position.



3.4 Adjusting Splashguard Position

The machine is shipped with the Splashguard in place. You may want to later adjust its position (or you may not) no urgency about this. If you grip the Splashguard and pull, the entire Splashguard pulls out. Then you will find that the clear plastic piece can be pulled away from the Black Positioning Disc.



To reassemble and adjust the positioning, slip the black piece over the Spindle and set it into the hole – it's a "slip fit" (but fairly snug). Note that the hole through which the motor spindle passes is off center from the outside diameter of the black piece – it can be set with the hole downward (as in fig.2) or with the hole upward (as in fig 3), or at positions in-between. Those various positions allow you to set the amount of exposure of the Mandrel, providing more or less splash protection – it's a "judgment" setting that you will make (based on experience, starting out – leave it in its hole-**upward** starting point).

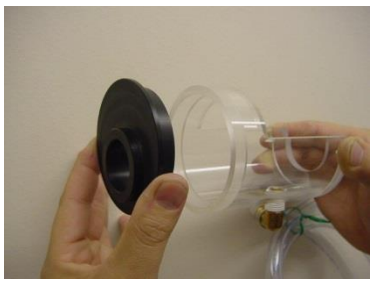


Figure 1

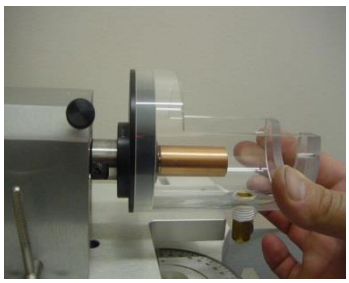


Figure 2

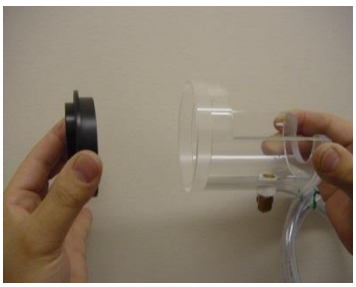
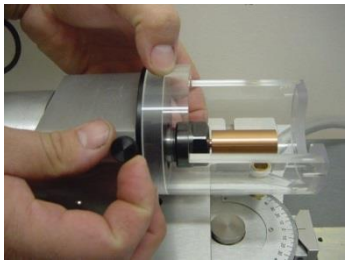


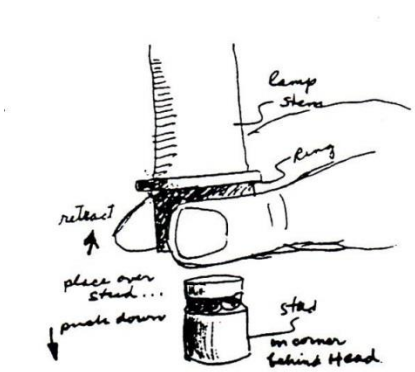
Figure 3



Set the clear Splashguard in place, and use the Black Knob to secure it. Note that there is a pre-installed drain and draintube that extends from the bottom of the clear Splashguard – lead it to an appropriate drain container.

3.5 Install Lamp

The Lamp mounts onto the pre-assembled stud located in the right rear corner of the Baseplate. The Lamp Mounting Lock has a Snap-On design. Pull back the nylon ring, place the Lamp onto the stud, and push down the ring. You will feel the ring snap into the down position, where it holds the lap securely.



4.0 OPERATION

4.1 The Control Panel

The Electronic Control converts AC current to DC, which the motors require. It contains controls for both motors that are part of the unit, the Tool-drive Motor and the Reciprocation Motor. Note that the motor controls are independent – modifying the running characteristics of one of the motors does not affect the other one.

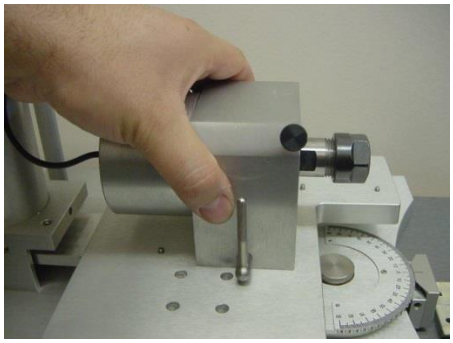
4.1.1 Control of Tool-drive Motor-The right-side Switch is a two-way ON-OFF toggle for the Tool-drive Motor. It has a choice for motor direction – UP for clockwise (CW) rotation of the tool, and DOWN for counter clockwise (CCW) rotation of the tool. The central position of the switch is OFF.

The Central Knob is a speed selector for the Tool-drive Motor. Most frequently, the Tool-drive Motor is operated at full or close-to full speed.

4.1.2 Control of Reciprocation Motor-The left Knob combines both power and rate control for the Reciprocation Motor. The extreme CCW position of the Knob is power OFF. Rotation starts and increases rate as the Knob is rotated CW.

4.1.2.1 Setting the Amplitude of the Reciprocation Motor-The amplitude (the in-line stroke) of the Reciprocation Motor is variably adjustable, from the maximum stroke of 30 mm – over an inch to a minimal stroke approaching 0. Commonly, a full stroke is used (and the unit is shipped that way), but often, because of the length of the particular tool that is being used less than full stroke is appropriate.

The setting is performed by engaging a screw that is visible in the side "window", as shown. The adjusting screw rotates with the rotation of the motor – and to perform the adjustment, obviously, the head of the screw must be visible (and so, reachable) in the window. A slow jogging of the motor can bring the head into view, or**…**

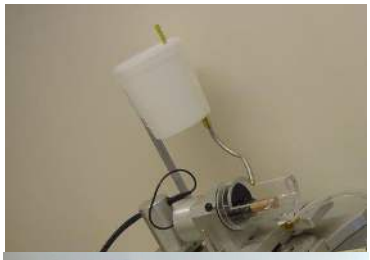


…it can be positioned by pushing or pulling the Tool-drive Motor Plate (it's OK to grip the Motor housing to do this as shown). This method will not work if the head is located, by chance, in a straight line with the reciprocation action (at an extreme of the reciprocation). If that happens, jog the motor so that the reciprocation stroke moves to About the half-way point, and try again.

In making the adjustment, CW rotation decreases the amplitude. CCW rotation increases the amplitude. The Reciprocation Motor is independent from the Tool Drive Motor—and none of these adjustments have an effect on the Tool Drive, and, the Reciprocation motor can be left in a power OFF condition, that is, with 0 reciprocation.

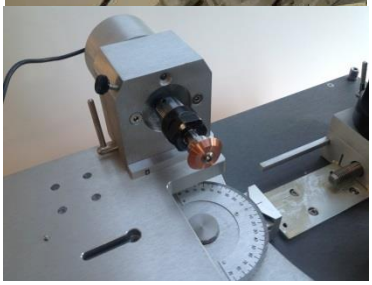
4.2 Tool-drive Motor position.

There are two optional positions for the Tool-drive Motor. Position 1, shown in figure 1, is the position in which the unit is shipped, and the position in which the initial setup alignment of the Mast to the machine is made.



Position 1 is the "main setup position" – and is the position for using cylindrical mandrels. When the Drive Motor is set into position 1, the centerline of the mandrel intersects the pivot axis of the θ motion, and remains in that relationship even if the θ angle position is changed, or, if the X or Y linear position is changed.

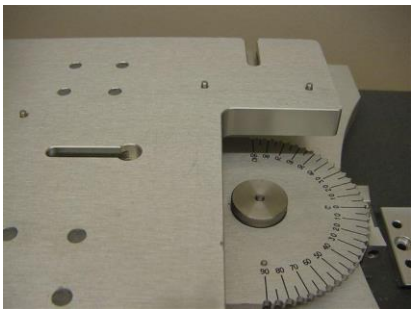
With the motor in Position 1, reciprocation is always in line with the axis of the Tool-drive Motor shaft – in line with the axis of the mandrel.



Position 2 is the position for using slitting and grooving tools. In Position 2, reciprocation is always in line with the cutting plane of the grooving tool, and remains in that relationship even if the θ angle position is changed, or if the X or Y linear position is changed. .

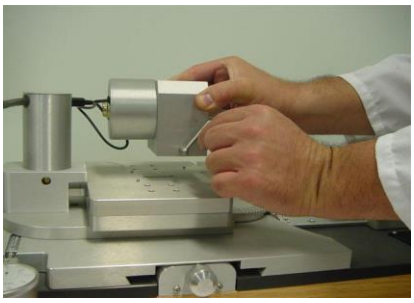
In setting up Position 2, there is a procedure for aligning the cutting plane so that it intersects pivot axis of the θ motion. It is usually a good idea to do this alignment since it establishes a 0 Home position for that tool. Once that alignment is made, the cutting plane intersects the pivot axis even if the θ angle index position is changed, or if the X or Y linear position is changed.

4.2.1 MOVING MOTOR POSITION.



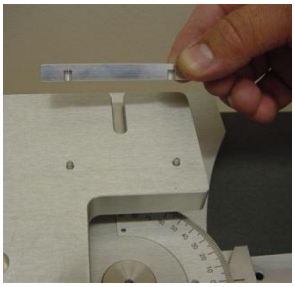
This view of the Motor mount Plate tells the story. Central in the photo is the Position 1 Mounting provision. At the upper part of the photo is the Position 2 Mounting provision.

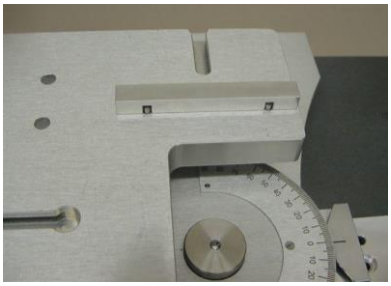
Position 1 has the familiar Ultra Tec "keyhole" mount cutout – and the Motor Housing has the familiar cam gripping mechanism.



In removing the Motor from Position 1, loosen the cam lever, pull the Motor Housing forward and up (see the photo).

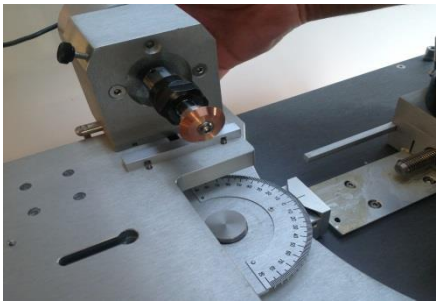
Insertion is the reverse of that action – insert – side back firmly against the two dowel pins (note that there are two notches in the Motor Housing that the pins fit into) – and tighten the lever to lock.





For Position 2

Before setting the Drive Motor into position 2, set the Position 2 Spacer Bar in place, engaging the two dowel pins.

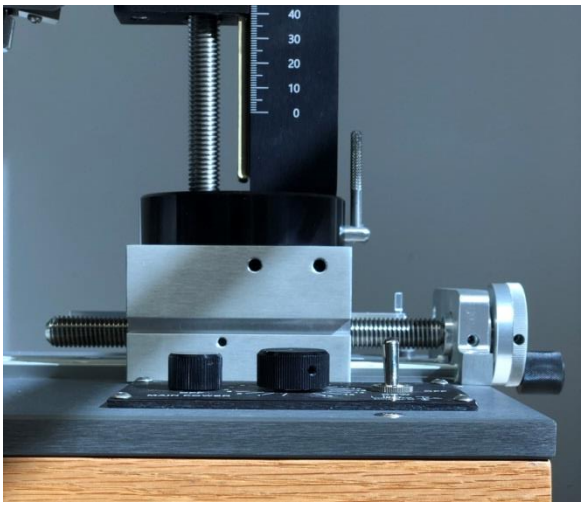


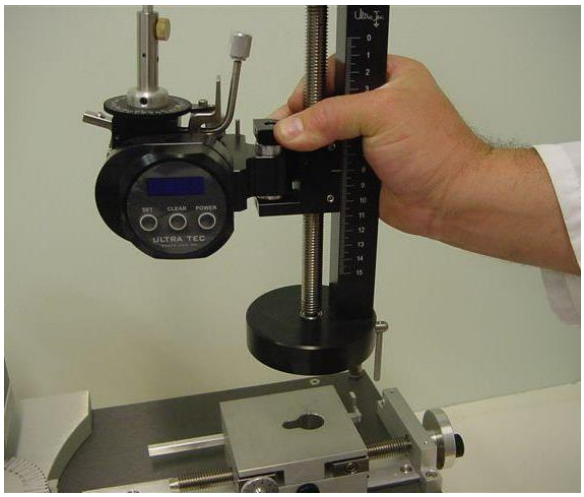
Position 2 continued:

Slide the Motor into position – push the Drive Motor firmly against the rear of the Spacer Bar - the rear pins on the Bar will engage the notches on the face of the Motor Housing. Lock the Drive Motor there.

4.3 Positioning and Aligning the Mast on the Fantasy Machine. Most commonly, preparation of the workpiece is done on the standard flat Faceting Machine, and after the preparation is complete, the Mast, holding the stone, is moved to the Fantasy unit for further work. It is set onto the **Mounting Block** which includes the familiar keyhole cutout that accepts the cam-lock mechanism of the Mast.

The Mast is moved to the Fantasy, where it is positioned and aligned in order to proceed with the addition of concave features.





4.3.1 Mounting the Mast.

The Mast is mounted onto the Mounting Block, fitting into the “keyhole slot” in the Block. Perform a visual alignment—just sort of point things in the right direction (no precision required yet - there will be an careful alignment of the “Home” position later. Tighten the cam, locking the Mast in place.

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MOUNTING THE MAST ONTO THE FANTASY, AND ALIGNING IT…

Moving the Mast from the flat-faceting machine to its position on the Fantasy and aligning it is not “difficult” to do, but it takes time. Let’s say, after you’ve done it once or twice, it may take you 20 or 25 minutes – for many people, a “bother”. There are two solutions – one is no-time-at-all fast (but expensive), the other solution reduces the time to perhaps 5 minutes. Read about them:

● NO TIME AT ALL. Some people have chosen to purchase a Mast specifically for the Fantasy. Yes, that’s expensive (although there’s a special price for a V5 Mast purchased with a Fantasy machine). Who might do that? Well, people who are impatient and want things to move forward quickly. These people are mostly professionals who can manage to keep their classic faceting machine and their Fantasy both working at the same time. And yes, that’s a “trick” that must consider the size and complexity of the stone being worked.

With a dedicated Mast, the alignment procedure is done just once – and the Mast remains in position on the Fantasy permanently. When it is time to transfer the stone from classic faceting to the Fantasy it’s just the dopped stone. on its keyed Dop, that makes the trip. Less than a minute.

● 5 MINUTES. Here’s a fast way. When you complete an initial setup – and the positon of the Base of the mast is set - you can mark the Base and the Mounting Plate. Below is an instruction on how to do that marking.

The marking allows you to remove the Mast and go back to doing flat faceting, and, completing that, return the Mast to the Fantasy Mounting Plate – and line up the marks. Fast. If you work slowly, it will take you 5 minutes

In regard to mounting the Lateral Stop Bracket – since you left it set from your initial setup, it's the same. Just mounting needed – no adjustment – a couple of minutes.

Marking: Use a square block – set it onto the Plate and push it against the side of the Base. Use a pencil – plain old wood kind, sharpened. Pressing the pencil tip onto the side of the Block, draw a line down, on the Base,. You've drawn a line down – when you hit the surface of the Plate, continuing to use the block as a guide, draw the pencil toward yourself. Do that in two places. Those markings will allow setting the Mast into the same position as the initial setting. (to remove those marks from the anodized surfaces, use a steel wool dishwasher pad – rub lightly – works like magic.

Pictures would be useful

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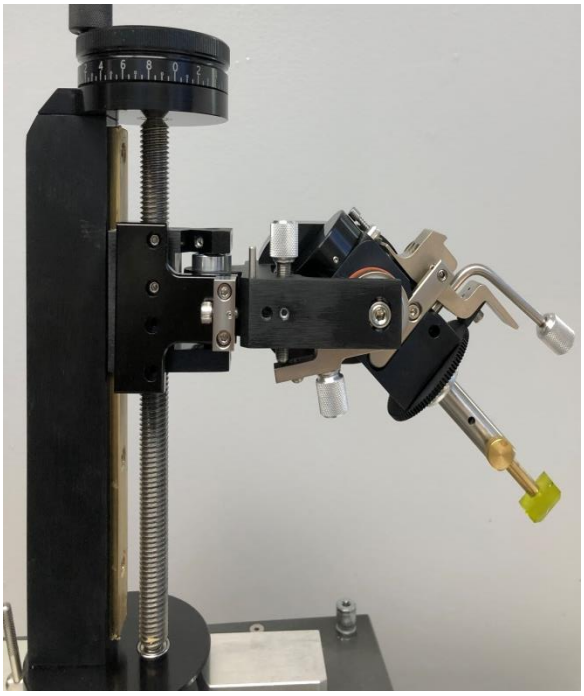
Back to the MAST Alignment – you have mounted the Mast onto the Mounting Block…moving on…

4.3.1.1 Affixing the Lateral Stop Bracket to the Mast. For fantasy cutting, **i**t is necessary to eliminate lateral swinging of the Yoke – the Quill of the Mast (and its dopped stone) must be aligned and held on the centerline of the various Grinding-Polishing tools. To set and hold that centerline position, the "**Lateral Stop Bracket**" is provided – it mounts onto the Mast and eliminates Yoke lateral swing beyond the central position – the adjustable Stopping Screw allows tweaking of the fixed lateral position.

Here are the mounting steps.

The Lateral Stop Bracket attaches to the Riser Block (the Block that rides up and down on the Leadscrew). In the Riser Block are two threaded holes to accept the two bracket-mounting screws - a forward-extending arm of the Bracket has a Stopping Screw that makes contact with the back of the Yoke – acting as a stop on the Yoke – preventing lateral movement. The Bracket is delivered with the Stop Screw at or near its final position The Stop Screw position can be adjusted – tweaking the lateral position of the Yoke, aligning the Quill with the centerline of the position 1 Motor



(If you have an old Ultra Tec Mast, you will see those two side tapped holes in the Riser Block are missing – in which case you will see that the Bracket Plate also works as a C-clamp gripper). Finish mounting that plate – snug the screws.

Set the position of the Stop Screw as part of aligning the Mast to the centerline of the Position 1 Mandrel. The Stop Screw can be "tweaked" in very small increments – you will see that there is a small set screw that bears upon the Stop Screw – holding it in its final set position – snug it.

Once the position of the Stop Screw is set, leave it there (held by its side locking screw that holds it from moving).

Later, upon removing the Bracket, don't change the settings - the next time the Bracket is used the settings will be the same.

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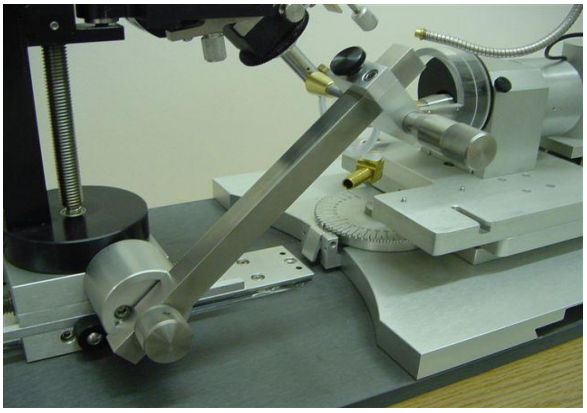
HD Lateral Stop Arm?

You may have ordered this as an optional accessory – its function is the same as the Lateral Stop Bracket (the Lateral Stop Bracket works only on Ultra Tec Masts) – Other Masts used on the Fantasy machine *must* have a Lateral Stop Arm).

One advantage of the Stop Arm is that once it is assembled it remains permanently in place. Some people are more comfortable with its use.

Installing the HD Lateral Stop Arm (If you have purchased this option)

HD Lateral Stop Arm is delivered as a sub-assembly that needs mounting onto the Base that holds the Mast. This is easily done (see the picture) the two screws that are part of the kit thread into two tapped holes in the Base, as shown. Completing the mounting is easy.



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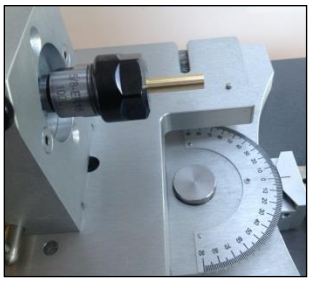
ON to final alignment of the Quill to the Drive Motor/Mandrel…

4.3.2 The Position 1 "Home" position. You have already mounted the Lateral Stop Bracket.



Aligning the Mast to the Drive Motor- Lateral alignment of the Mast in relation to the tools driven by the Drive Motor is important. It establishes a 0 reference that relates to the stepped positions of the work piece. Alignment, and repeated alignment, if that becomes necessary, typically takes a few minutes. Here it is, step by step:

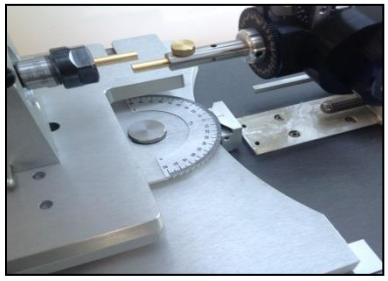
a) Ready the Drive Motor. Insert one of the nominal 6 mm Dops into the Collet, and lock it there.

b) Ready the Mast. Mount the Mast onto its Mounting Plate. Don't worry about the exact position – it will be adjusted later.

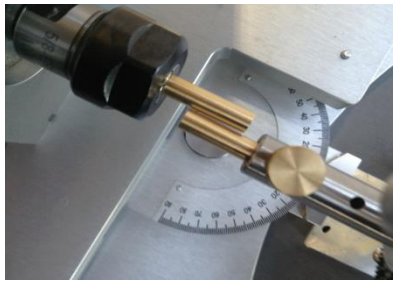
4.3.3 You have already mounted the Lateral Stop Bracket.

Insert one of the nominal 6 mm Dops into the Quill, and lock it there.

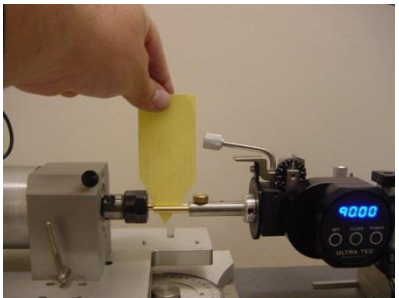
c) Offset the Y position In – away from the front edge – about 6.5 mm (reading on the indicator). Use the Adjustment Knob.



d) Then, set the quill at 90°, pointing forward, with the Mast height position set so that the dops are in the same horizontal plane. This level setting is not critical, it just needs to look ok by eye - it will look something like this photo (there has been nothing "critical" about the positioning, so far).



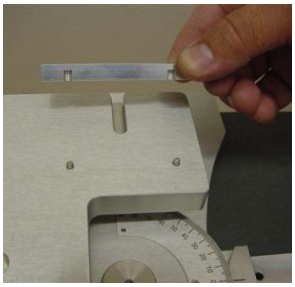
4.3.4 e) Watching the spacing of the Dops, manipulate the position of the Mast – making the gap between the Dops narrower and even, finally bringing the Dops in contact. Do that by adjusting the position of the Mast on its Mounting Plate. The final "tweaking" – reducing the gap to very little, and getting the sides parallel – can be assisted, if necessary, by tweaking (in tiny increments), the front adjusting screw on the already mounted Lateral Stop Bracket.

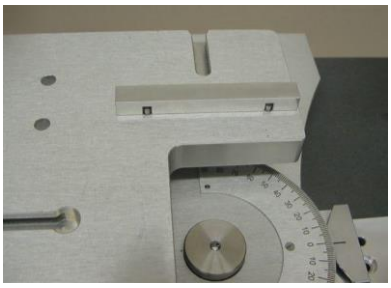


Visual observation of the gap is really ok, but if you wish, you can confirm the parallelism by using the "feeler" method, as shown (some slick paper from a magazine will do).

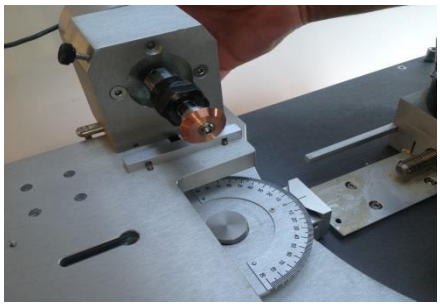
Draw back the position of the Mast, so the there is no overlap of Dops, return the main Y-Plate to its original position – alignment accomplished – the Dops will be in a straight line. The Drive Motor will be ready to accept a grinding or polishing tool and the Mast ready to accept the work piece.

4.4.2 Position 2 Alignment-The Position 2 "Home" setup is a matter of aligning the cutting plane of the tool so that it intersects with the pivot axis, providing a retrievable dimension starting point (¶ 4.2.1 showed mounting the Drive Motor in Position 2).





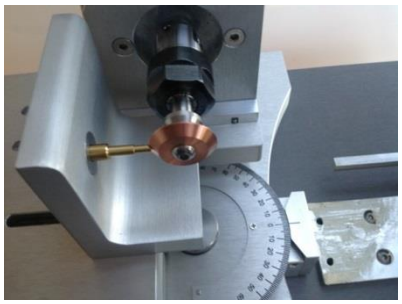
To do this alignment, before setting the Drive Motor onto position 2, set the "use the Position 2 Spacer Bar "in place, engaging the two dowel pins.



Slide the Motor into position – push the Drive Motor firmly against the rear of the Spacer Bar - the rear pins on the Bar will engage the notches on the face of the Motor Housing. Lock the Drive Motor there.

What you have done is to position the Drive Motor so that the Slitting Tool is close to the desired central position – ready for the final tweaking…

Insert the grooving tool with the Collet lightly tightened, so that the tool can slide in and out slightly, as part of the alignment procedure (that is, setting the cutting plane of the tool in line with the θ pivot axis - "on center").

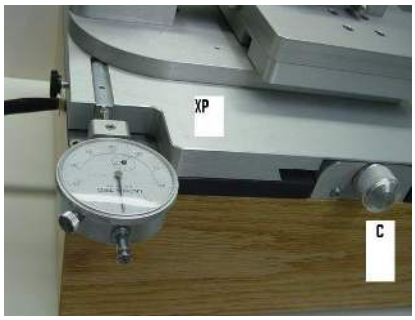


Set the right-angle Alignment Plate in place (down onto the plate) the back edge pushed against the face of the Drive Motor Spacer. Slide it toward the tool. The V groove in the Brass Rod will engage the tool - the Brass Rod moves in and out - longer or shorter - to manage engagement with the tool. The V groove of the Rod is on center - manipulate the tool in-out until it aligns in the V groove, you can see it and feel it. Lock the tool there - it is now on center of rotation.

This technique will work with ball-shaped or cylindrical tools as well.

4.5 Horizontal Work Positioning – X, Y, θ

4.5.1 X Positioning.



When you want to adjust the position of the workpiece relative to the tool in an X direction, you turn the nearby Knob [**C**] – CW rotation of the Knob brings the tool closer to the front edge, CCW rotation moves it away from the front edge. What you are actually doing is adjusting the position of the X Traveling Plate which carries the Tool Drive Motor. The X position is reflected on the X Dial Indicator.

At start out, when the Indicator was mounted, it was set to a readout of 0-0. If for some reason it is no longer 0-0 (you may have been fiddling with the machine—that's fine), reset it there. (Notice, by the way, that at this Home-0 setting, the close edge of the X Traveling Plate is pretty well aligned with the close edge of the Baseplate – that may become handy information later on).

The Traveling Plate has a range of +/- 25mm (1") from the Home-0 position – so, features as far apart as 50mm (2") can be put onto the workpiece.

The range of the Dial Indicator is 20mm (.8") so, from its initial setup position ("Home 0"), an X offset up to 20mm can be done. That allows for features with up to 40mm (1.6") of separation on the stone without resetting the indicator position.

For X offsets larger than 20mm, resetting of the Dial Indicator is needed. To do that—at the end of the 20mm stroke, with the Indicator reading 0 and the inner rotation counter at 20 (0-20), loosen the Knob that holds the Anvil in position and reset the Anvil so that the Indicator again reads 0-0, lock the Anvil. It is now ready for the setting of new additional offset positions. You can get back to the Home-0 by running the process backwards. An example: suppose you have performed the resetting and continued working on the stone, and you've put in your last feature with the Indicator reading, let's say, 4.5mm (that is, the inner dial now reads 4, and the main dial now reads 5) and, you'd like to reset to the Home-0 position. Turning the C Knob, return to the 0–0 Indicator reading, unlock the Anvil and reposition the Anvil so that the indicator reads 0-20; again turning the C Knob, return to the 0-0. That's it, you are back to Home-0.

All of this allows you to return to any particular offset feature position – for modification, polishing, whatever, if you kept track of the Indicator reading where you placed that particular feature.

4.5.1.1 If you get "lost" and need to reestablish the X Home-0?

Remember? You took note that when you did the original alignment of the Mast to the tool--the close edge of the X Traveling Plate was aligned with the close edge of the Baseplate. If you get "lost" (perhaps after going through a number of re-settings of the X position – and just losing track), it is helpful to know that edge-to-edge relationship exists – a sort of "macro" target.

You can precisely reset the X home 0 position with this procedure: Using C, move away from that edge-to-edge condition by perhaps a half inch, and, referring to Section 4.4, above, set the Alignment Plate in position, set the Quill of the Mast onto the top edge of the Alignment plate (as in 4.4, figure 4 – but keeping the Mast firmly locked to the Mounting Block), drag the Quill along the top of the Plate toward the notch by rotating C. When the Quill "pops" firmly into the notch, that's it. Reset the X Home-0.

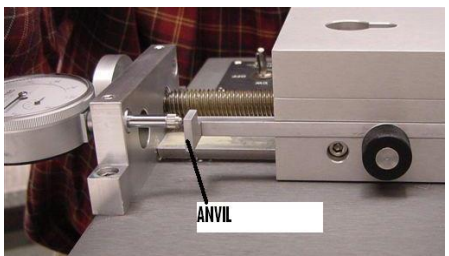
4.5.2 Y Positioning.

This is similar to the preceding section on X positioning – except, that in making adjustments, instead of moving the *tool's* position, you are moving the *Mast's* position. When you turn the Knob – CW rotation withdraws the Mast from the Tool Drive Motor, CCW rotation moves it closer to the Tool Drive Motor. What you are actually doing, of course, is adjusting the position of the Mounting Block which carries the Mast. At the end of the alignment process, the Y Indicator was left disengaged—and there are common conditions (described below) where engagement of the Y Indicator remains unnecessary – and so remains disengaged. When it is needed, however, the Y position is set on the Y Dial Indicator.

There is no strict Home-0 position for Y as there is for X. This is because Y positioning is a matter of user judgment – *until* a Y feature is added. Once a Y feature is added, *that* position can be used as a positioning reference – that is, when that position is selected, the indicator can be set so that subsequent positions are measured and resettable. (*An observation:* Usually, the workpiece stone is significantly narrower in the Y dimension than it is in the X dimension, making re-setting of the indicator a less likely requirement).

At the start of the process (after completing alignment of the Mast to the Tool Drive Motor), set the first working angle on the Mast, set the working height of the Mast (the **Z** direction) and, using the Knob**,** position the stone in relation to the tool. Turn on the Reciprocation Motor so that you can observe the amplitude of the Tool's movement, and set the stone's Y position in relation to it – (a non-critical judgment call).

If you are working with a cylindrical tool, with the Motor in Position 1, there is no reason to engage the Y Indicator. If, however, you are working with the Motor in Position 2, you *would* engage the Y Indicator.



The Mounting Block has a range of 3". Similar to the X situation, the Indicator has a range of 20mm (8"). Read the part of paragraph 4.5.1 that deals with re-setting of the Indictor, if that becomes necessary—it works the same way as the X position (except that a specific Home position, as X has, is replaced in the

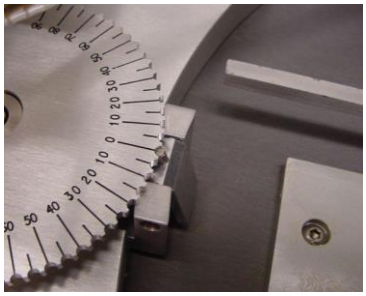
Y direction by a *selected* reference position (see the second paragraph of this section, above, for a description of this setting).

4.5.3 θ Positioning This controls the angular position of the tool, in the horizontal plane, relative to the workpiece.

Just as X, Y and Z are used to describe *linear* directions of positioning. **θ**, the Greek letter "theta" is used for *radial* positioning around an axis. We could have called it "indexing", as it is called on the faceting Mast, but here, the designation of θ avoids confusion between those two devices.

θ positioning is on the Y traveling Plate, and the entire plate moves to any new θ setting. The axis of θ rotation is the centerline of the Pivot Knob which intersects the centerlines of the Tool drive Motor in Position 1 and Position 2 – *and so, this axis is directly associated with the Home-0 alignment* – as the θ position is moved, the tool remains on the θ axis – allowing radial features to be centered around a settable point. θ can be set through a full 180º range - settings in 5º increments are standard (1º increments are available with the HD Protractor mod).

Note that when the Y traveling Plate is rotated to a new θ position, it carries with it the Reciprocation Mechanism – continuing the reciprocation in line with the cutting action.

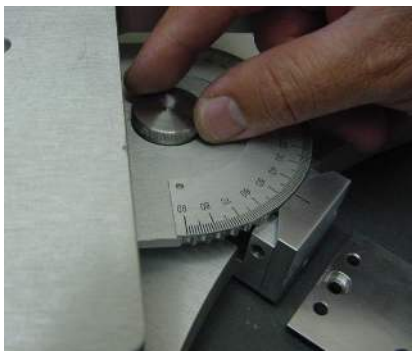


At time of alignment, θ is set at 0º (left photo).

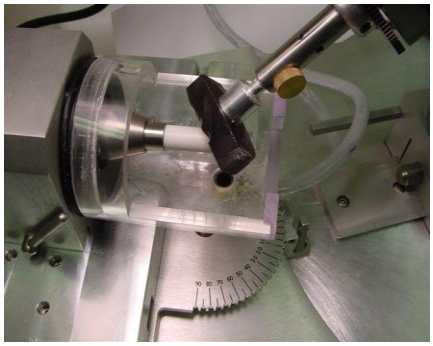
To change the θ position, loosen the Pivot Knob, push in the lever, as shown - that swings out the detent pin, and swivel the Y Traveling Plate to align the new angular position (to move the Plate, grip the housing of the Reciprocating Motor) - move to the new angular position.

(NOTE: with the 1º HD Protractor installed, see the pictures below, the detent pin is locked out and angular position is set visually, using the line on the indicator block, and locked with the Pivot Knob)

4.5.3.1 Locking the θ Position

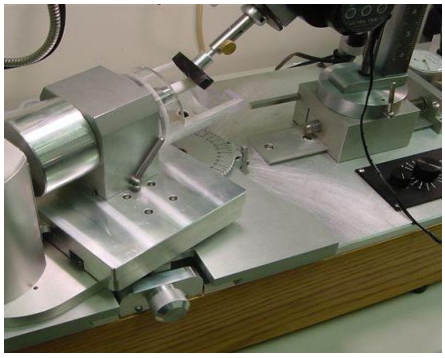


When the θ position is set, it can be locked by tightening the Pivot Knob. The standard 5º notches will usually have sufficient locking force without tightening the Knob, but, if the HD Protractor Mod is installed, tightening of the Knob is necessary. In general, finger tightening is sufficient, but, the Knob does have a side hole for added tightening or loosening, if desired.



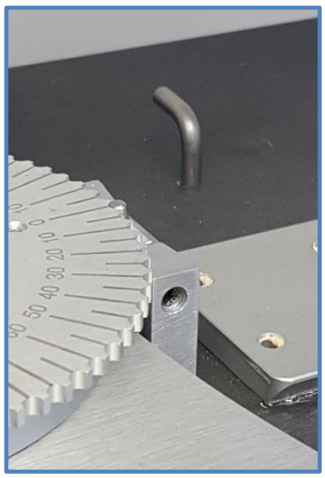
A CW angle setting is shown on the left,

A CCW angle setting is shown on the right.



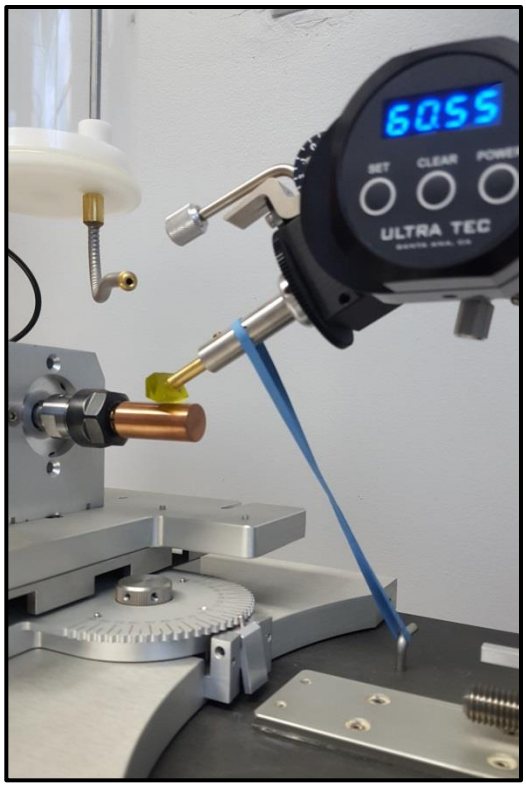
4.6 Applying pressure while the Fantasy faceting is being performed…

When everything is set, and the alignment is complete, it is time to do the work. As the work is performed there are two significant directions of pressure that are applied: 1) a pressure onto the stone, pressing it downward – against the top of the mandrel, for grinding or polishing, and 2) Pressure against the Lateral Stop, maintaining the central relationship between the workpiece and the Tool (the Lateral Stop mechanism keeps the workpiece from swinging back, but the forward swing remains possible). You can maintain those pressures with your hand, holding the Quill and pressing down, and at the same time, holding against the Lateral Stop. An advantage of the rubberband pressure is that the rubberband doesn't get impatient and *lean* on the pressure points (the way you might)



There is, however a high-tech method that will help – applying those operating pressures automatically (you can walk away from the machine during its operation). The high-tech method involves using a rubber band.

← On the surface pf the main Baseplate you will see a high-tech hook, offset toward the rear of the machine



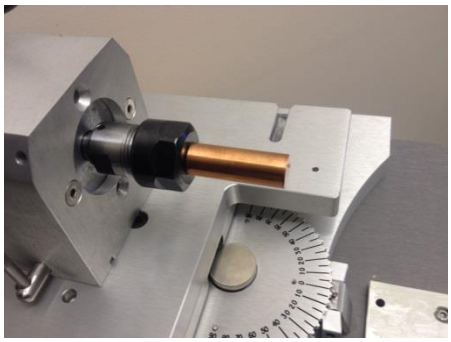
← A rubber band, stretched under the hook and over the Quill will pull the Quill back. against the Lateral Stop, and, at the same time, pull the workpiece down against the Mandrel.

Adjusting the amount of force? You can try different rubberbands (a rather strong one is shown in this photo), and you can adjust the force rather finely, even looping together two rubberbands. See what works best for you

5.0 TOOLS

5.1 Mounting Tools into the Tool-drive Motor

5.1.1– Cylindrical tools



Cylindrical tools (commonly referred to as “mandrels”) are used when the **Drive Motor is in Position 1.** In that position the reciprocation action is always in line with the axis of the tool. Regardless of the θ position, the reciprocation action remains in line with the axis of the tool and the tool’s rotational axis is aligned to the rotational axis of the θ settings.

5.1.2 Slitting Tools.

Slitting tools are used when the **Drive Motor is in Position 2,** in that position the reciprocation action is always in line with the peripheral edge of the tool. The reciprocation action remains in line with the peripheral edge of the tool regardless of the θ position,

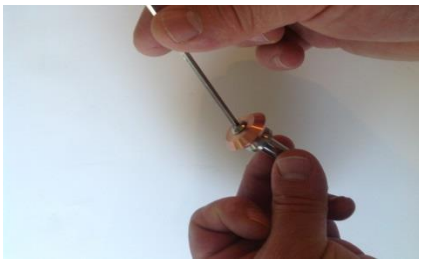
Ultra Tec supplies two 90° included angle Slitting Tools in the tool kit – Copper and Phenolic. Other slitting tools are available.

These mount onto a special Adapter Shaft:

The Slitting tools**…**

A slitting tool is selected**…**

Ready the Adapter Shaft and screw, and the wrench. Remove the screw and set it to the side for a moment…



Mount the tool to the Adapter Shaft – carefully and patiently – it's a close fit, to maintain good concentricity. Engage the screw and tighten it snugly.

The slitting tool is positioned over and in line with the axis of θ rotation (not always critical, but sometimes desirable).

5.1.2.1 Purchased Slitting Tools

For "off the shelf" slitting tools that come with attached shanks, ¼", 1/8", or 3/32", use the following procedure:

A) After moving the Motor to Position 2, insert the Tool Adapter (the same as used for the cylindrical tools) with a diameter appropriate for the tool you will be using – lock it.

B) Insert the tool. You will have some leeway in setting the linear position of the cutting tool. Lock it in position with the set screw.

5.2 CUTTING AND POLISHING TOOLS

We've learned that Concave faceting IS strongly related to flat faceting, and is properly called Concave *faceting*. A comparatively small number of cylindrical tools (mandrels) accomplish the task. Yes, of course, it can get pretty "fancy", and there is room for creativity, but still, within faceting design "discipline". A look for concave tools on Internet sites reveals the availability of a number of diameter sizes (sometimes in inches, sometimes metric) – in several materials.

Fantasy cutting, on the other hand is a craft much more closely related to *carving*. It is *Geometric Carving*, in which the symmetry (or purposeful non-symmetry) is craftsman controlled—craftsman "dreamed up". In Fantasy cutting, tools are a major consideration. The number of tools that might be useful becomes very many. A visit to the workshop of such a craftsman typically reveals a wall of tools with sizes ranging from very small to very large, of different materials – much of it the result of experimentation.

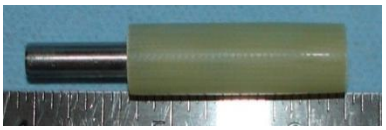
It is a situation in which the selections are many, and the choice is growing. It is also a situation in which we understand that many purchasers of a Fantasy Machine have already ventured into this sort of work and have a collection of favorite tools.

Our plan is that we will supply certain materials – in certain sizes – and include them in a "starter kit". The "standard" materials are Copper, Maple, and Phenolic. Right now, the sizes are limited – but if you need a certain size, contact us (email is best – info@ultratec-facet.com), we will try to accommodate your need. (and if it is not a completely "oddball" size, we may add it to the list of available sizes).

Technically, we *can* offer other materials – specifically, we've made and experimented with Zinc and Corian mandrels. Right now, there's no "plan" to proceed with standard tools in those materials, but if you have a strong wish to have a particular tool, again, talk to us about it – we have a desire to support your efforts in this relatively new field.

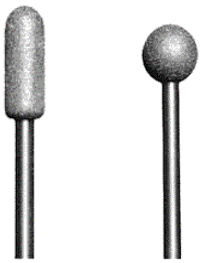
All in all – faced with the impossibility of offering and having in inventory hundreds of tools – it is better for us NOT to be a middle man. It is better for you, the user, to purchase directly from the tool suppliers – google them. Here are a few suggestions—

- Special materials—that have been very successful in flat faceting – “Lightning Laps” and “Batt Laps” have made mandrels available.



From the Lightning Lap page – “ The advantage of the LL-Mandrel is in the ability to have just one lap to do all your work, just by cleaning and changing the polishing medium. Your angle-integrity is preserved, as there are no lap changes” (www.lightninglap.com).

- Many companies offer a large array – shapes and sizes - of carving tools. The finest diamond mesh that is available is 3000.



Hard Felt Bobs. The emphasis is on the “hard” – the right type to use, there’s a rock-hard [too hard] and a soft [too soft] – double check when you order. Inexpensive (a little run-out won’t hurt at this point), the stone has been formed - let it bounce around with a slurry.

5.2.1 THE KIT:

Included are **Cylindrical Tools** of Copper, Phenolic, and Maple, in diameters of 8mm, 13mm, and 17mm

Included are Slitting Tools of nominal 24mm diameter of Copper and Phenolic with included angles of 90º and Adaptor Shafts.

6.0 CUTTING INFORMATION

- A very useful book – an interesting and informative read - confirming that “Fantasy” is close to carving – is ***Lapidary Carving for Creative Jewelry*** by Henry Hunt. It’s new at $25 – very worth it.

- This is, we hope, in the “coming soon” category –an instruction book by **Dalan Hargrave**. Very good news! Dalan is an extraordinary lapidary artist who is willing to share his expert techniques.

- The various tools would be used with Diamond Powder slurries – coarse diamond for cutting, and, for polishing, in addition to fine diamond (14K – commonly used by many professionals, 50K – used by “perfectionists”), Aluminum Oxide slurry or Cerium Oxide slurry can be used. Various oils are used as carriers – very commonly, olive oil (a carry-over [?] of the use of olive oil in diamond faceting).

Miscellaneous Minor notes:

- There are inexpensive contact holders available in drugstores – plastic, two compartment devices. These are very handy – one compartment is used for holding dry powder; the other holds the diamond/oil mix. The hinged lid closes nicely. Use a black marker to identify the mesh inside.

- When using a ball end cutter, straight forward plunging leads to swirl marks (the dead center isn’t moving much – it’s a dead center all right). Approaching the stone from the side at some angle or other provides the same cutting profile, but much swiping action.

- Setting a rapid reciprocation is generally advantageous. The side swiping action acts against the radial grooving that develops in the small contained areas.

- Through much of the process you will probably not be using water or thin slurry, at which times you may not want to use the Splashguard. The clear plastic part is easy to remove and set to the side. Leave the black part in place (it functions to protect the motor area).

Appendix

A. HD Protractor Mod. (1901.85) This modifies the theta positioning increments from the standard 5º to 1º. The Kit includes the items shown.

It is a self-installable Kit - only a small screwdriver is needed.