

FACETRON ADJUSTMENT & ALIGNMENT

There are three basic adjustments or alignments that are reasonable for the cutter to do on most modern faceting instruments. Others may be more or less easy, but may require special processes. I'm going to cover the basic three using the Facetron as the example instrument. If you are cutting on a different mast-style instrument, the process is likely to be similar. See your owner's manual and/or contact your manufacturer before attempting these operations:

1. Cheater Alignment, or "Sighting the Rifle"
2. 45° Table Adapter Alignment
3. Protractor Calibration

Zeroing the Cheater "Sighting the Rifle"

Most high-quality modern instruments use a keyed dop system that maintains accurate rotational alignment between the dops during the transfer process, thus automatically aligning the second side of the stone.

Because index gears are not keyed to the quill (part of the instrument that holds the dop), and due to the availability of fine rotational adjustment, even a perfect transfer stand and technique does not guarantee accurate post-transfer alignment.

Faceting instruments that used keyed dops typically also have keyed transfer stands. These tools maintain rotational alignment between the pavilion and crown during transfer.

However, any imperfection in rotational alignment between the quill and the index gear during pavilion cutting will be preserved by the keying system. When reversed through transfer, that imperfection will express doubly. This is the most common source of stair-stepping girdles. (See the troubleshooting chapter for more on this.)

Achieving and maintaining rotational alignment between the quill and index gear will prevent the problem, saving lots of time and aggravation.

Three Methods to Zero the Cheater:

1. Using the instrument (table adapter and a dop)
2. Using a glass plate
3. Using a digital inclinometer

Method 1 requires the fewest tools, method 2 is the most accurate, and method 3 is the quickest and easiest. For each of these procedures, we're going to follow the LWRAPS order of instrument handling.

Using the Faceting Instrument to Zero the Cheater

This method for zeroing the cheater requires only the faceting instrument, the table adapter and a single 1/4 inch dop. It is the most basic, and builds good machine handling and operating skills.

Begin by setting up the instrument using LWRAPS order:

- L - Mount a master lap on the faceting instrument, taking care the lap and platen are clean and seating the lap securely.
- W - Move the drip tank out of the way, as you won't be using it.
- R - Set the index gear to the ID index and the cheater to the best known zero.
- A - SOFT stop the protractor at 45 degrees.
- AE - Mount the table adapter to the quill.
- P - Position the mast so the table adapter sits in the middle of the useful area, and between 4:00 and 5:00 o'clock.
- S - Snug all controls carefully.

Next, follow this sequence of steps:

1. Raise the table adapter to about 1/4 inch above the master lap.
2. Insert a clean and undamaged 1/4 inch dop between the near edge of the table adapter and adjust the micrometer height adjustment to achieve 45 degrees exactly.
3. Move the dop to the far edge of the table adapter.
4. If the indicator shows a different height or angle, use the cheater to adjust out one-half of the error.
5. Note the new reading, and move the dop back to the front edge of the table adapter.
6. The reading should now be equal whether the dop is under the front edge or the back.
7. If more adjustment is necessary, simply move the dop from front edge to back and adjust the cheater until the reading remains the same regardless of the dop location.
8. Once that's true, use a pencil to mark the cheater so you can return to that location.
9. Celebrate successful calibration of your faceting instrument.

Using a Glass Plate to Zero the Cheater

This is the most accurate method for zeroing the cheater. It requires you to build a cheater-zeroing tool as the first step. It also requires a sharpie pen.

Prepare extra items you will use:

1. Clean your transfer stand carefully.
2. Between two 1/4 inch dops, mount a scrap piece of glass (use CA or dop wax) with one flat edge of about an inch long - and oriented to be against the lap when one dop is in the quill.

Set up the instrument using LWRAPS order:

- L - Mount a 600 metal bond or equivalent lap on the faceting instrument, taking care the lap and platen are clean and seating the lap securely.
- W - Make sure the drip tank has water in it, and the swarf collection is prepared.
- R - Set the index gear to the ID index and the cheater to the best known zero.
- A - Stop the protractor at 90 degrees. You can use soft or hard stop for this.
- æ - Insert one of the dops prepared above into the quill, with the straight edge of the glass down so it will contact the lap.
- P - Position the mast so the glass sits inside the useful area of the lap near 3:00 o'clock. Position the head height so you can perfect the full length of the glass straight edge against the lap.
- S - Snug all controls carefully.

Next, follow this sequence of steps:

1. Cut enough of the glass to perfect the straight edge.
2. Lift the glass and inspect the edge to insure it's smooth and true.
3. Dry, then darken the edge of the glass with the Sharpie pen.
4. Simulate a transfer by removing the dop from the quill and inserting the opposing dop.
5. Lightly drag the straight edge of the glass across the lap and notice if one end of the glass contacts first.
6. Adjust the cheater to remove about one-half of the error.
7. Return to step 1, and repeat the process until after simulated transfer the sharpie mark is removed uniformly.
8. Use a pencil to mark the cheater so you can return to that location.
9. Celebrate successful calibration of your faceting instrument by the most accurate method available.

Using a Digital Inclinometer to Zero the Cheater

This is the fastest and easiest method, though it requires a digital inclinometer.

Begin by setting up the instrument using LWRAPS order:

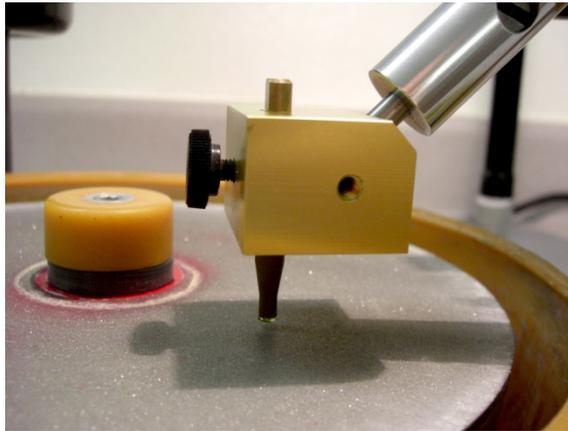
- L - Mount a master lap on the faceting instrument, taking care the lap and platen are clean and seating the lap securely.
- W - Move the drip tank out of the way, as you won't be using it.
- R - Set the index gear to the ID index and the cheater to the best known zero.
- A - HARD stop the protractor at 45 degrees.
- ae - Mount a large flat dop (or bulls eye dop) upside-down in the table adapter.
- ae - Mount the table adapter with the flat dop in the quill.
- P - Position the mast so the table adapter sits in the middle of the useful area, and between 4:00 and 5:00 o'clock.
- S - Snug all controls carefully.

Next, follow this sequence of steps:

1. Note the position of the table adapter and the axis of the quill across the lap.
2. Swing the quill out of the way and place the digital inclinometer on the lap. Orient the inclinometer perpendicular to the axis of the quill you noted in the previous step.
3. Zero the inclinometer.
4. Lift the inclinometer out of the way and swing the quill back into position.
5. Place the inclinometer on top of the flat dop. (Use a machinist's parallel or piece of plate glass to insure a proper footing/reading.)
6. Steady the quill carefully and adjust the cheater left and right to determine how much travel is available between tenths of a degree of rotation. (Take note how fine your cheater adjustment really is, and appreciate owning such a precision tool.)
7. Move the cheater to the center of the zero zone between the 0.1 or 0.01 readings.
8. Use a pencil to mark the cheater so you can return to that location.
9. Celebrate successful calibration of your faceting instrument by the easiest and fastest method available.

Table Adapter Alignment

Mast-style faceting instruments usually require a 45° adapter in order to cut tables. Here, the adapter is set to cut the table on a small Peridot:

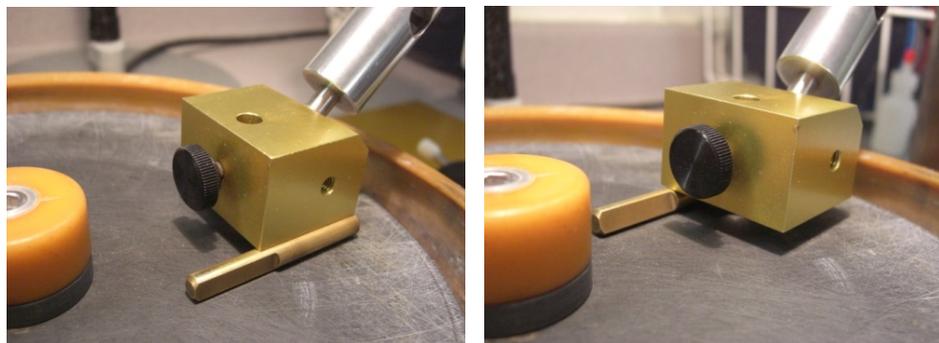


The 45° adapter may not be perfect with regard to rotation of the shaft that enters the quill. So, it may be necessary to use the cheater when cutting tables. Rather than finding this exact position every time, you can test the alignment and mark your cheater - or make a note of where it is relative to a "rifle-sighted" point on the cheater.

Table Adapter Alignment Procedure

Test the alignment of your 45° adapter by installing it in the quill; setting the protractor at 45°; and lowering the adapter gently close to a master lap. **DO NOT** use a cutting or polishing lap for this procedure.

Place a clean dop under one side of the adapter and lower the head until the dial indicator reads 0. Then move the dop to the other side as shown in these photos, and note the dial indicator reading:



If the adapter is rotationally aligned (as it should come from the factory), the readings will be identical.

If it is not, the dial indicator will show different readings with the dop under the left and right sides.

You have two options for dealing with this:

1. Note and adjust every time.
2. Adjust your 45° adapter.

The second option may not be available for every manufacturer's 45° adapter, but if it is a really fine-alignment of this will excuse you from future "rifle-sighting" procedures. I'll cover that later.

The "note and adjust" procedure is as follows:

Discover and note the offset from "rifle-sighted" position of your quill; note that offset; and make the adjustment whenever cutting a table.

To do that, gently adjust the cheater, taking repeated readings with the dop under alternating sides of the adapter and adjusting until the dial indicator reads the same for both sides. Once this location is found, note the offset from your "rifle-sighted" cheater mark. Adjust by that offset whenever cutting a table and your table will be parallel to your girdle.

Adjust the 45° Adapter

Make sure your manufacturer's 45° adapter is constructed to allow this procedure! On the Facetron, there is a set screw inside the hole on the near side of the adapter block (see photo above). Loosening that screw frees the block from the stainless steel shaft.

Make sure you have very precisely completed the cheater alignment procedure before doing this!

1. Check to make sure the adapter is not already perfect (most will be).
2. Only if it isn't already aligned, lower the head of your instrument until the 45° adapter is flat on the master lap and the dial indicator reads "0".
3. Loosen the set screw until the block of the adapter turns freely on the shaft.
4. Pressing the flat of the adapter firmly against the master lap, retighten the set screw firmly to lock it into place.
5. Re-check the rotational alignment of the 45° using the procedure above. Sometimes the set-screw leaves a dent in the shaft, and re-tightening imposes some rotation. So, don't worry if you have to do this a time or two to get it perfect.

Once the alignment is perfect, you can use your "sighted rifle" position to cut tables precisely parallel to the girdle. Even more conveniently, you can now use the 45 adapter to find that position again any time you remove an index gear to clean or change gears (detailed procedure on previous pages).

Protractor Calibration

The 45° is also useful for checking and setting protractor calibration, which may periodically become necessary, especially if the head has undergone some trauma such as slipping off the edge of the lap while cutting.

Protractor Calibration Test:

1. Install your 45° adapter in the quill
2. Set the protractor at 45°
3. Lower the adapter gently to within 1/4 inch of a master lap. DO NOT use a cutting or polishing lap for this procedure.
4. Using the micrometer height adjustment, lower the head until the 45° adapter comes to rest with the front edge on a clean dop as shown in the left photo. Then, adjust the micrometer until the dial indicator reads 0.
5. Move the dop to the back side of the 45° adapter as shown in the right photo:



6. If the dial indicator still reads 0, then the indicator is calibrated. If not, then follow the dial calibration procedure that follows to set it. The procedure given uses the Facetron as an example. Details will vary from instrument to instrument. Consult your owner's manual or your manufacturer before adjusting your instrument!

Facetron Protractor Calibration

1. Begin from the above Protractor Calibration Test.
2. Use the micrometer height adjustment to move the head of the instrument up or down until the dial indicator reads the same number with the dop under the front and back of the 45° adapter as in the two photos above. When both front and back locations of the dop read exactly the same on the indicator, go to the next step.
3. Loosen the scale-locking thumbscrew on the dial indicator (the silver one offset to the left in the photo below).
4. Holding the 45° table adapter against the dop on the master lap, rotate the scale until the Zero on the dial aligns with the long needle.
5. Re-tighten the scale-locking thumbscrew on the dial indicator.
6. Double-check by repeating step #2 to insure you still have identical (now zero) readings whether the dop is under the front or the back of the 45° table adapter.



For further reading on instrument alignment, I specifically recommend a great article titled “Faceting Instrument Alignment” by Paul A. Head, Old Pueblo Lapidary Club Faceting Guild, originally presented in the United States Faceters Guild Newsletter and preserved on the web at the following URL:

http://www.usfacetersguild.org/articles/paul_head/machine_alignment/