

Polishing at 0 Degrees on the Gem Master

By
Wayne Emery

This is a short tutorial discussion for owners of Fac-ette's Gem Master and perhaps other machines that are capable of setting the quill of the machine to 0 degrees for cutting and polishing the table of a stone without resorting to a 45 degree dop fixture. Most of us are accustomed to machines that require the use of the 45 degree fixture to finish the table. At first, it seems that bringing a vertically oriented quill straight down on a spinning lap is asking for serious trouble. I thought so, too, until I tried it!

Before we talk about the actual final polishing of the table at 0 degrees, there are some issues that should be discussed.

One of the easiest and fastest ways to complete a table on most stones is to cut and polish it by hand. It requires a little bit of practice, but is not that difficult to master. The result may or may not be competition quality but it is in fact suitable for most purposes and a great time-saver, if that is important.

Most of us are in the habit of cutting the pavilion first. We have probably placed a temporary table for dop attachment, but the final table position will be placed when we finish the crown.. Many cutters will polish the table before final placement of the star facets, thus assuring very sharp table/star intersections. This is easy to accomplish when using the Gem Master at 0 degrees, but quite a bit more problematic when using a 45 degree jig.

On the Fac-ette Gem Master, the 45 degree fixture is not necessary. Elimination of this fixture increases machine accuracy because any time an additional fixture is added to the machine, the chance for inaccuracy rises dramatically. The farther the stone is placed from the pivot point of the quill, the greater the position error, and there is ALWAYS position error to begin with. Adding that 45 degree fixture just assures that the error will be greater, and the job of placing or polishing in that table becomes more difficult.

Aside from machine accuracy, one of the greatest problems that needs to be overcome is the difference in flatness or slope of successive lap surfaces. In any case, working as close as possible to the lap nut during pre-polishing and polishing can be very helpful in minimizing differences between laps.

With a brand new Gem Master, I would advise you to be very careful about lowering the mast with the quill in the vertical position. There is a sealing gasket in the base of the mast tube that may tend to stick a little on a newer machine; at least mine did. The "fix" is to make sure the gasket is well lubricated with the provided lubricant and to apply firm downward pressure on the mast as you lower it. It does not take long for the seal to break in and become smooth as glass, but I am in the good habit of applying downward pressure as I lower the mast.

When lowering the pre-polished table to the polishing lap, I'd suggest a lap speed of about "15" or so on the dial. Be absolutely certain you are spinning the lap in the "Reverse" (counter-clockwise direction). The stone should make contact with the lap close to the 3 or 4 o'clock position. Once contact is made, you can increase or decrease the speed to your liking or polishing method, but if your initial stone contact is with a very slowly moving lap, you may find the lap unpleasantly "grabbing" the stone. A faster moving lap will not allow this to happen, as long as you are lowering the stone very slowly and carefully.

Here is how I adjust my stone in relation to the lap when I first make contact:

I start with my index gear set to 96 (assuming I am using a 96-tooth gear) and carefully lower the quill, set to 0 degrees, to make solid contact, giving the stone a couple of short, 1 inch sweeps, close to the center nut. Note the depth marking on the mast.

I then raise the mast a half-turn or so and inspect the table. Usually, the contact is very close to perfect, but occasionally it is not. Let's assume a serious error, as illustrated in Illustration 1. The gray area is pre-polished, the clear or white area represents the area where polish is proceeding. We can see that our table is not parallel to the polishing lap. We can also see that the error is NOT parallel to the 96-48 direction either, meaning that an angle change of the quill will not give us the needed correction by itself.

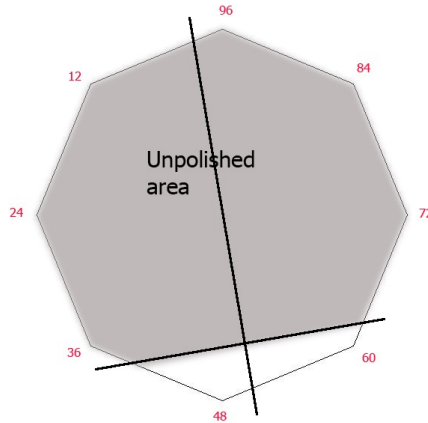


Illustration 1

If the error were very close to the 96-48 axis, we might be able to use the cheater to move the stone in the proper direction, but even a cursory glance tells us that won't help much. If we look at the line described by the leading edge of the polish, we can see that a line drawn perpendicular to it, and passing through the center of the stone intersects the edge of the table at a location that is approximately 2 teeth away from the 96-48 axis (approximately). If we then adjust our index setting to "2" we will see that the polishing line is now perpendicular to the 96-48 axis. Of course, some additional use of the cheater may be necessary.

A test polish now gives us a result that looks like Illustration 2, below.

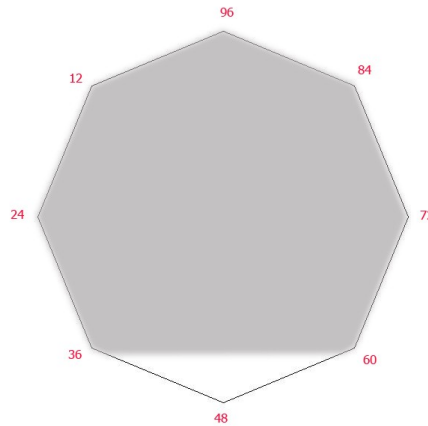


Illustration 2

Once that is accomplished, it is a simple trial-and-error operation to bring the table flat to the polishing lap. This is, of course, exactly what we do when we use a 45degree fixture, but we are able to accomplish it without adding more inaccuracies produced by that fixture.

Of course, there is always the question of how much angle change is needed on the quill to bring the polished surface completely across the stone, but no farther than necessary. Experience will be a guide, but if this is new to you then the answer is “More angle change than you think!”, especially if the stone is in the 5 to 8 mm range. I would suggest you make an angle change on the order of 0.5 degrees and make a couple of preliminary sweeps after carefully lowering your stone back to the noted mast height position. You may have to vary slightly higher or lower, so pay attention.

Let’s say you have made an angle change of 0.5 degrees and now your stone looks like Illustration 3, below.

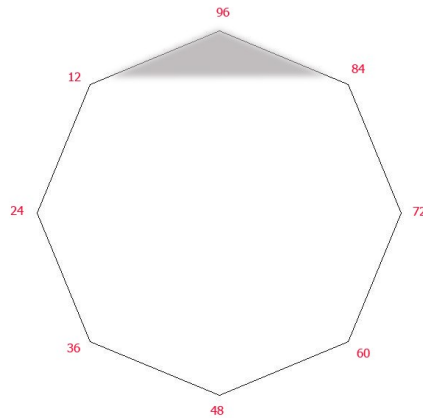


Illustration 3

The polished area has moved well across the stone, but if we lower the mast more, we may be cutting into the star area on the “48” side of the table. The first thought is that the angle just needs to be changed a little more. But exactly how much? At this point we really cannot afford to be fudging angles back and forth; we are running out of stone.

What I do (I can hear the shrieks already) is simply put the quill into freewheel position and manually turn it while the lap is in contact with the stone, at the same height that produced Illustration 3. Common sense will tell you that you are now cutting a low-angle cone for a table instead of the desired flat table, but I have NEVER been able to detect it in the finished stone. Try it, you might be surprised! In fact, if you do the math, you will learn that the variation from flatness produced by such a low angle is smaller than the human eye can detect in reasonably sized stones. I only recommend this when the polish is very close to covering the whole table, but not quite. If you try this when the polish is only slightly more than half the diameter of the table, you will, in all likelihood, create a noticeable “cone”. But maybe you’ll like it!

Again, most of the time, the accuracy gained by not using an additional fixture with all its attendant geometry problems allows us to polish a table at 0 degrees with very little, if any “fudging”. I find the worst situation to be when I have pre-polished a material on one lap and then must use a polishing lap whose surface varies greatly from the pre-polish lap. I try not to do that, but when I have no choice, I have every confidence that the problem can be solved easily and quickly. Thank you, Fac-ette!

I would like to thank Ernie Hawes, Roger Dery , Johnny Tew and my machinist brother, Brant Emery, for their knowledgeable review of this article. If you have comments, corrections or suggestions please feel free to contact me at wayne_emery@msn.com Copyright 2007, Wayne Emery