

Preliminary Version

Working with the Blade of the Opus1 Gouger

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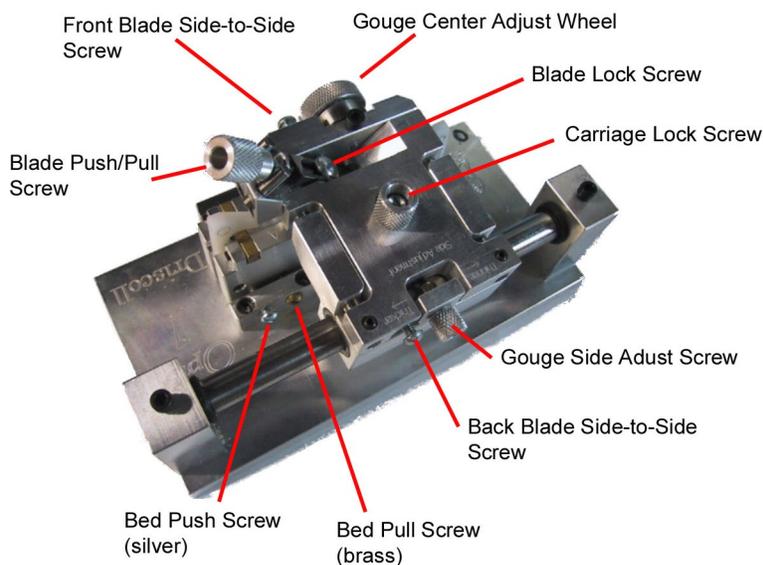
One of the most interesting aspects of the Opus1 Gouger is the multitude of adjustments that are now easily in your control. You can thin or thicken the sides of the gouge as well as center with equal ease. You regulate each the major adjustments by turning a single screw. Many conventional machines have you turning more than one screw to make any specific change of measurement. If you don't like your results, it is often difficult to return to the original position thus discouraging experimentation. You could be a single turn of a screw away from a great gouge and never know it.

This is not the case with the Opus1 since each measurement is adjusted by manipulating one screw. If you don't like a specific result from an experimental modification, just reverse the one screw you turned and easily return that machine to its original position.

Sharpening the blade is no longer the scary proposition that it used to be either. Upon close inspection, you will notice that the blade is NOT hollow ground behind the edge like many of the reed knives on the market today. If you look at the relief angle behind the edge of the blade, you will see that it is a straight line. It more closely resembles the relief angle of a beveled knife than a double hollow ground knife. Now, you will notice that when a blade gets dull from use, it tends to wear on the front surface of the blade or its leading edge. That is where most of the friction occurs for the blade. Since this recess angle is a straight line, if you grind the top flat surface down until it reaches the edge of the blade, you will have the original blade curve again. If the blade's recess was hollow ground instead of linear, as you ground the front flat surface down to meet the edge again, the blade curve would actually become flatter, resulting in a different gouge curve. If the blade has a hollow ground relieve, you will actually need to regrind the blade edge to get the original curve back.

BECOME FAMILIAR WITH THE NAMES AND THE FUNCTIONS OF THE DIFFERENT ADJUSTMENT SCREWS

At first glance, there will seem to be a lot of screws on this machine. It is actually easy to learn their names and locations if you refer to the illustration to the left. There are actually only two new screws on the carriage as compared to conventional machines. They are the **GOUGE SIDE ADJUST SCREW** and the **CARRIAGE LOCK SCREW**. I will be referring various screws in this paper, so please refer to this illustration if you need reminder.



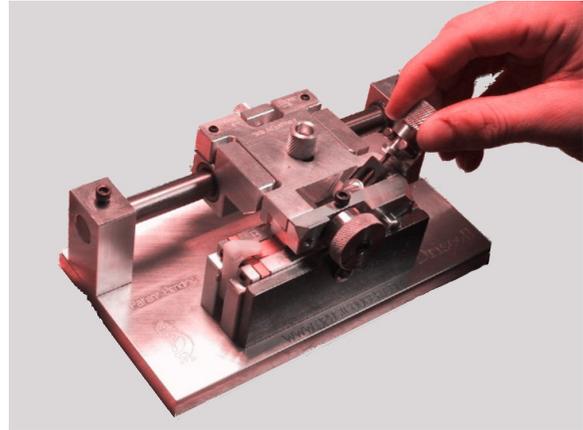
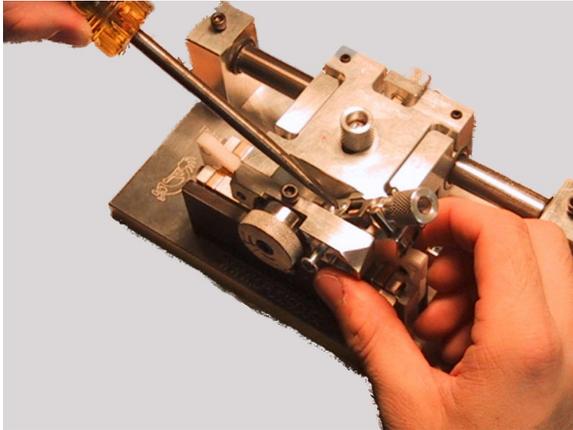
CHECKING THE BLADE EXPOSURE

Before we start, let's first make sure that the blade actually does need to be sharpened. I am assuming that since you are attempting this fix, you feel that the cane is not cutting well or the gouger seems to be rubbing instead of cutting. Understand that the gouger should have a slight rubbing feel to it. This is a result of the balance between the blades cutting and the guides rubbing to produce a desirable cut from the machine. The chip that comes out of the machine should measure about 0.05mm. If the measurement is thicker than that, there is too much blade exposed. If it is less than 0.04mm, then there is not enough blade showing and this could explain the feeling of the blade being dull even though it still might be sharp.

ADJUSTING THE BLADE EXPOSURE

It is very simple to adjust the blade exposure on this machine because of the Blade Grip System. There are two cylinders, one on each side of the blade, which regulates the side-to-side alignment of the blade. The **Front Side-to-Side Screw** and the **Back Side-to-Side Screw** push these cylinders against the blade. The ends of the cylinders are each faced to be parallel to the blade. For this reason, when the blade is manipulated with the Side-to-Side Screws, the blades shifts in a parallel fashion, it doesn't rotate radially around the **Blade Lock Screw**, as is the case in other conventional gouging machine designs.

These cylinders provide an addition benefit to the machine when adjusting the exposure of the blade. Since the cylinders ends are faced and are touching the blade on both sides, the blade feels like it is in a slot that is exactly as wide as the blade.



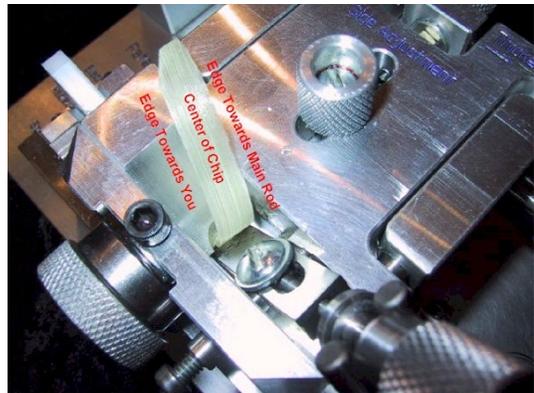
If you loosen the **Blade Lock Screw** slightly and turn the **Blade Push/Pull Screw** to move the blade, the blade will retain its side-to-side location and just move either up or down. To do very slight manipulations of the blade exposure, keep the **Blade Lock Screw** tight while you turn the **Blade Push/Pull Screw** to either expose more blade or retract the blade. The **Blade Push/Pull Screw** will now be putting a pressure on the blade to move. Now, quickly loosen and then retighten the **Blade Lock Screw**. If you measure your chip again, you will notice that there will only be a slight change. This is very helpful if you only want a slight change in the chip and don't want to completely loosen the whole setup. This is a feature that is unique to this gouger due to the Blade Grip System.

CHECKING THE SIDE-TO-SIDE ALIGNMENT OF THE BLADE

As mentioned earlier, you want the chip to be 0.05mm in the center. You should also measure the sides of the chip. If the sides of the chip are different thicknesses, there is a chance that the blade is not positioned correctly from side-to-side. Notice how the chip comes out of the machine and measure the edge of the chip that is closest to the main rod and then the edge of the chip that is closest to you.

If it is thicker on the Edge Towards the main rod, then the blade is not centered correctly. It is exposed too much on the inside of the guide (closest to the main rod). Slightly tighten the **Back Side-to-Side Screw** located on the backside of the carriage next to the **Gouge Side Adjust Screw**. If you imagine the screw to be the face of a clock, the screw will only be rotated a few minutes.

If it is thicker on the Edge Towards You, then the blade is exposed too much on the outside of the guide (closest to the carriage wheel). Slightly tighten the **Front Side-to-Side screw** located on the front side of the carriage next to the **Gouge Center Adjust Wheel**. Again, image the screw as the face of a clock and only adjust it a few minutes at a time.



There can be a slight variance in these two measurements. You want the deviation to be less than 0.02mm when comparing the two edges of the chip. If either of these adjustment screws is too tight already, you can loosen the opposing screw instead. It is important, however, to maintain a slight amount a pressure from the cylinders on the sides of the blade.



You can see in this illustration that the chip is slightly too thick. It should read 0.05mm instead of 0.07mm. This machine needs to have the blade exposure adjusted as described above so that the chip thickness is 0.05mm.

If the blade exposure does not seem to be the problem, then there is a good chance that the blade needs to be sharpened. Let us make sure that we have the proper tools for the job before we get started.

TOOLS NEEDED TO SHARPEN THE BLADE



A standard screwdriver is needed to remove the blade from the gouger. **A diamond stone** makes the job very easy. If you don't have one, they can be purchased fairly cheaply at most hardware stores. I strongly recommend using one for this job since the blade is made of hardened steel.

400 grit wet and dry Sandpaper can be used as a substitute for a diamond stone but will require more elbow grease to get the job done.

A firm clean flat surface is helpful to work on, especially if you are using sandpaper to work on the flat surface of the blade.

A cloth towel will be used to help dress the burr once the blade edge is reached with the diamond stone.

Emery Polishing Paper 1/0 or 2/0 grit (desirable but not required) will be used to do the final dressing and sanding of the front flat surface of the blade and cleaning the recess behind the blade edge. This polishing paper is commonly used by glass blowers. It looks similar to a sheet of paper with dried mud on it. The color is grey-brown and has almost no

grit feel to the touch. It will put a mirror smooth finish on your blade. If you cannot find this Paper, you can use a sheet of 600 grit wet-dry paper that has been well used. The purpose of using this paper is to "polish" the blade only; it is not to remove metal.

REMOVE THE BLADE FROM THE GOUGER

Taking the blade out of the gouger is a rather simple operation.

- Remove the **Blade Lock Screw**. This screw is located down in the blade recess and is mounted at a 45-degree angle.
- Loosen the **Front Blade Side-To-Side Screw** that is located next the carriage wheel on the front surface of the carriage.
- Lift the blade out of the carriage by holding the **Blade Push/Pull Screw** that is screwed into the back end of the blade. This **Blade Push/Pull Screw** is located between two dowel pins mounted at a 45-degree angle.
- Unscrew the **Blade Push/Pull Screw** from the backside of the blade.

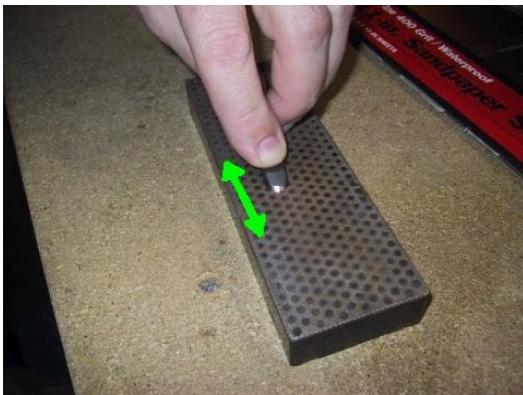
The blade should be out of the gouger now and ready to be inspected.

INSPECT THE GOUGER BLADE

Test the edge of the gouger blade against your thumbnail as you would a reed knife. Test it along its entire cutting edge. You will notice, if the blade is dull, that the edge is sharper at certain spots more than others. If you look at the flat top surface of the blade along the edge, you might notice that the edge is worn. Polish this front surface of the blade on some fine sandpaper on a flat surface and the worn edge will show up like a very small crescent moon-shaped area that is not being touched by the sandpaper. If you do indeed notice this, your blade is definitely dull and you are doing the correct thing now to remedy the problem.

GRIND THE TOP FLAT SURFACE OF THE BLADE

As I discussed earlier, the recess of the blade edge is linear. If you grind the top surface of the blade down below the worn part of the edge, you will have the original blade curve once again. I use a diamond stone for this operation.



Place your diamond stone on a flat surface and apply a little bit of water on it.

Place the blade top surface down on the diamond stone.

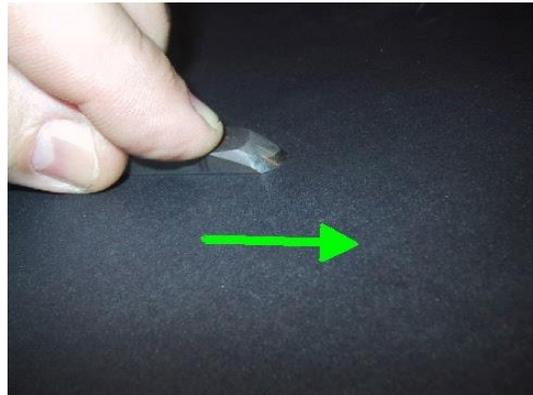
Grind the blade using a back and forth motion moving into the edge of the blade and back. It is helpful to think of applying more pressure to the blade as you move into the blade. The friction of the stone will pull the edge of the blade down into the stone during this pass so you want to maximize this effect by adding some pressure of your own.

Grind the blade in this fashion until there is a burr created along the entire edge of the blade.



Place a towel on your lap and draw the blade backwards across the towel. This will push the burr forward along the edge.

Once the burr is pushed forward, with a piece fine sandpaper of a very flat, clean surface, place the blade top side down on the paper and push into the edge of the blade to shear the burr off. I will go back and forth between these two steps several times to insure that the entire burr is removed and just the sharp edge of the blade is left. If you leave a burr, it will just rip the cane during the gouging process.



If you have emery polishing paper, place a piece on the flat surface you just used in the preceding step. Draw the blade backwards again through the towel and then polish the flat surface on the emery polishing paper. You can also slightly polish the curved side of the edge, if you care to, in order to remove any tarnish or buildup that might be present. Drawing the blade backwards in the towel will have burnished the curved side some already. If you do polish the curve edge, always finish by polishing the top flat side again.

If you don't have this polishing paper, a piece of "well-used" 600-grit wet and dry will serve as a good substitute.

TEST THE BLADES EDGE

Test the blade again as you did earlier. You will notice now that the blade grips the thumbnail along its complete edge. If this is indeed the case, you are ready to re-install the blade into the gouger.

PUT THE BLADE BACK INTO THE GOUGER

Screw the **Blade Push/Pull Screw** back into the backside of the blade. You should thread it down about $\frac{3}{4}$ of the entire length. This will prevent the blade from sticking out too far and crashing into the bed when you close the carriage.

Place the tip of the blade down into the blade slot located on the top surface of the carriage. Take care not to hit the tip of the blade on any of the surfaces. Manipulate the blade so that the recess in the handle of the **Blade Push/Pull Screw** fits in between to two 45-degree dowel pins located on the right side of the carriage. Make sure that the blade is fully situated into this slot and is between the two Blade Grip Cylinders. Replace the **Blade Lock Screw** in the slit located on the top surface of the blade and turn it until it is fully in contact with the blade. To seat the blade will, it is often good to tighten this lock screw firmly and then back it off until it is just touching the blade. Now tighten the **Front Blade Side-to-Side Screw** next to the wheel until it is just touching the blade. At this point, the **Blade Lock Screw** and the **Front Blade Side-to-Side Screw** will not be tightened all the way. We need to adjust the position of the blade first.

POSITIONING THE BLADE BY EYE

Advancing/Retracting the Blade

Open the carriage so that the guide is facing up into the air. Look down the front guide in the same fashion you would if you were aiming a rifle. You will either see a lot of blade sticking up, a slight bit of blade sticking up, or no blade exposure at all.

The blade should be exposed over the front guide only as a slight crescent moon. This should be barely visible. It should also appear centered with the guide because the guide is contoured to this blade curve. It is not a cylinder.

If there is too much blade exposed, turn the Blade Push/Pull screw (the 45-degree knurled screw) until the blade backs off a little. If the blade doesn't move, either Blade Grip Cylinders or the Blade Lock screw is too tight for this stage. Loosen the screw that is too tight and continue adjusting the blade.

If there is too little blade exposed, do the same procedure but turn the Blade Push/Pull screw in the opposite direction until the blade advances over the front edge of the guide. Again, it should only be visible as a small crescent moon.

Vertical Alignment of the Blade

If the blade does not appear to be centered with the guide, you will need to align it vertically with respect to the guide. This is achieved by adjusting the Side-to-Side Adjustment Screws that push the Blade Grip Cylinders.

If the blade appears to be too close to the wheel of the gouger, you will tighten the Side-to-Side Adjustment screw located on the wheel side of the carriage. You can tighten this screw while you are looking down the guide surface. Stop tightening this screw once the blade appears centered.

If the blade appears to be too close to the Main Rod side of the carriage, you will tighten the opposing Side-to-Side Adjustment screw located on the backside of the carriage. This is located next to the knurled screw that adjusts the Side Measurement of the gouge. Unfortunately, you can't sight the blade while making this adjustment. The carriage needs to be closed to have access to this screw. Just turn it slightly and open the carriage to inspect the progress of your adjustment.

Once you have the blade "visually aligned", you should tighten the **Blade Lock Screw** fully.

REFINING THE POSITION OF THE BLADE

Now that the blade is visually positioned, it is time to gouge a piece of cane to fine-tune this adjustment. The piece of cane used should be 8.0mm across the flat side. If the cane is wider than this, it will not gouge correctly and you may not have satisfactory results.

Gouge a couple of passes until you have a complete chip of cane coming from the machine. Take this chip from the gouger and measure its thickness. It should be approximately 0.05mm thick. Refer to the sections above entitled ADJUSTING THE BLADE EXPOSURE and CHECKING THE SIDE-TO-SIDE ALIGNMENT OF THE BLADE to inspect this chip and obtain correct blade alignment.

FINAL THOUGHTS

At this point, your gouger should be cutting well and your cane should be coming out with a smooth gouge curve on the inside. If you are uncomfortable with any of these adjustments, please feel free to contact me. I can be reached through the information provided on my website, www.opus1gouger.com.

