

# Cubic Zirconia Round Brilliant Cut Faceting Instruction



- Faceting is a marvelous amalgamation of engineering and art. Through a mechanical process of cutting facets on a piece of crystal, marvelous gems are created.
- To the uninitiated, faceting appears to be the apex of complexity, but that is not the case. Faceting has its complex areas, like competition cutting and design, but one does not need to enter these areas. Learning the standard cuts is within the reach of almost everybody. The primary requirements are a desire to learn and the ability to follow instructions.
- To unravel the mysteries of faceting, we will describe

the actual cutting process. The material is not important; the procedures are the same for amethyst, emerald, or any other gem material. There are several steps, but none of them are particularly complicated. Once you see how simple it is, you will understand that it is something you can do!

---

## Basic Controls

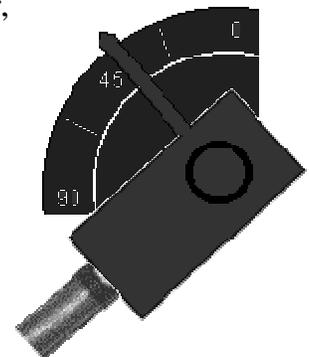
There are three basic elements to arranging the facets on a gemstone. They are: 1) the angle of the cut, 2) the rotation of the gem, and 3) the depth of cut. These three settings precisely locate every facet on a gem. How to make the adjustments varies slightly from one machine to another. However, all machines work on the same principles and there are only subtle variations on how to make the settings.

When cutting a gem, the design instructions tell you the index and angle for each facet. There is no guessing. The depth of the cut will be obvious when cutting. If your facets do not come together, you need to cut them deeper. If you cut them too deep - well, all beginners need to learn to use a light hand. Correcting over cut facets requires recutting the previous stages to the new depth. Hence the saying, "Cut a little, look a lot."

## Angle Setting



The angle of your cut is set on a protractor, or read off a digital display. How to set the angle varies slightly with the different machines. Sometimes it is a matter of loosening a setscrew, adjusting the angle, then retightening the screw. On other machines, it involves turning a handle until you reach the proper angle.

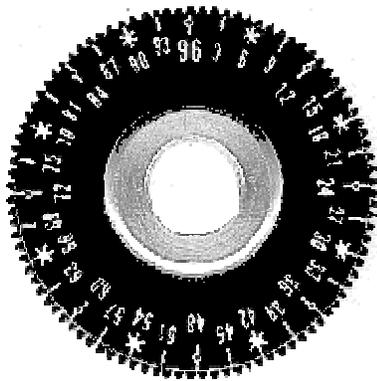


---

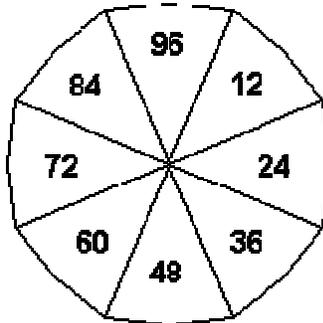
## Index Gears

The index gear controls the rotation of the gem. They are available in a variety of sizes, but 64 and 96 are the most common. To set the index; you release a pin, rotate the gear to the properly numbered slot, then let the pin return to its holding position.

**96 Tooth Index Gear**



**Index settings  
for these facets**



## Depth Control

This is actually called a "height setting," but it serves the purpose of determining how deep each facet is cut. While there are variations in how this is done on different machines, the principals remain the same. A coarse adjustment brings your setting in close, and then a fine control makes the final setting.

## Cheater

Due to subtle variations in your equipment, you will occasionally have a facet that will not lay flat on the polishing lap. A "cheater" control makes subtle, side-to-side adjustments. These are less than a full index number.

## Lubrication

Water, (often with additives,) is used as a lubricant. Each machine has a method of wetting the cutting laps. The most common is a simple drip tank. Its beauty lies in its simplicity. Simply open the valve to where you get a few drips per second. You want just enough to keep everything damp, without excessive splashing.

## Speed Control

Each machine has a method to control the speed of the laps. Many will also allow you to reverse the direction of rotation. As a rule, use higher speeds with coarse cutting, slower speeds when polishing.

## Laps

Laps are disks with abrasives on the surface. They are usually metal charged with diamond, but other materials and abrasives are used. They go on a revolving platform and are changed as needed.

The cutting and polishing procedure is done in stages. It begins by removing the excess material with a coarse lap. Next, the scratches are sanded out with a finer lap. Finally, a polishing lap is put on the machine for finishing.

## Procedures

Now that you know what the controls are, we will go through the procedures for a standard, round brilliant cut. First, inspect the gem to make there are no fractures that will cause problems. Then attach the gem to a dop stick and insert it in the faceting machine.

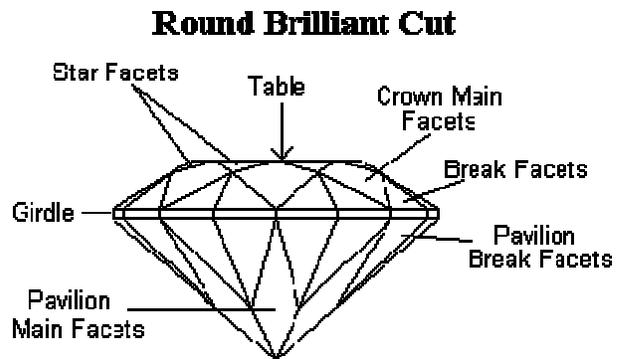
The dop is free to swing side to side during cutting, or lifted for inspection. It is the angle setting that limits the downward swing. It is important to understand this, because an under or over cut facet will not be at the proper angle. This is called a "hard stop" and is on almost all machines. The Facetron has no stop and you need to modify your technique to suit this machine.

### Cutting the Main Facets

Place a coarse cutting lap on the machine. Set the speed to medium and turn on the water. Get the lap thoroughly wet, spreading the water with your fingers if necessary, then turn everything off.

Look at the instructions to the right. We have eight pavilion main facets cut at 42 degrees. Set the angle on your machine to 42 degrees. They are cut at index settings 96, 12, 24, 36, 48, 60, 72, and 84. Set the index on your machine to 96 for the first facet.

Adjust the height so the stone will just meet the lap. This will not be deep enough, but it is the proper place to begin.



### Instructing for a Round Brilliant Cut

Facets	Angle	Pavilion Settings Index
Pavilion Mains	42°	36 12 24 36 48 60 72 84
Girdle	90°	36 94 86 82 74 70 62 58 50 46 38 34 26 22 14 10 2
Break Facets	43.7°	34 86 82 74 70 62 58 50 46 38 34 26 22 14 10 2
<b>Crown Settings</b>		
Crown Mains	35°	1 12 24 36 48 60 72 84
Break Facets	37.5°	2 10 14 22 26 34 38 46 50 58 62 70 74 82 86 94
Star Facets	16°	3 18 30 42 54 66 78 90
Table	0°	

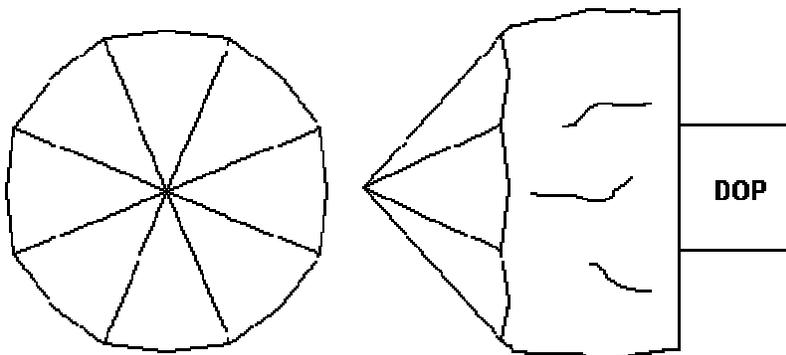
Now, turn the water and machine on again. Gently introduce the stone to the lap and sweep it back and forth across the surface. Do not use much force; apply just enough pressure to keep the stone in contact with the cutting surface. When you have cut all the way to your depth setting, the sound will change. It will go from a grinding noise to a 'shhh" sound. If you are using light enough pressure, it will be a clicking sound as just the largest particles of abrasive touch the gem. This technique is called "Cutting by sound." It is a valuable skill to develop, so pay attention to it right from the beginning.

When your first facet is cut, turn the gem over to the opposite index setting, 48. Repeat the cutting procedure until the facet is fully cut to the selected depth.

Now look at your stone. Do the two facets you have cut come together in the center? If they do, you set your machine too deep. Bear this in mind for the next stone, as you do not want to remove too much material in the initial stages.

You should see two flat surfaces on an otherwise rough shaped piece of material that do not come together. Lower the head a bit and cut both facets again. Repeat this process of lowering the head and recutting the facets until they meet in the center. With practice you will get quicker, but you need to start on the conservative side so you learn not to waste material.

Once you have your depth set properly. Cut the remainder of the pavilion main facets at index settings 12, 24, 36, 60, 72, and 84. If you find that one of these facets does not reach the center, or has an uncut shallow area in it, lower the stone again. Recut all the main facets at this new depth setting.



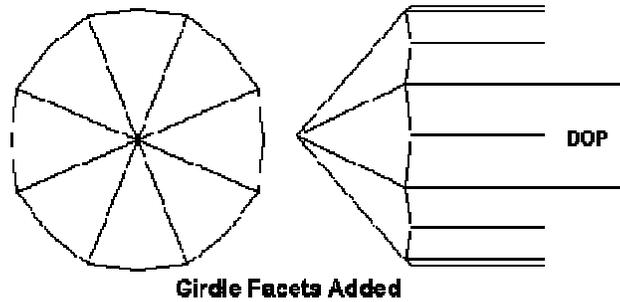
**Main Facets Cut**

## **Cutting the Girdle**

For the next step, you will cut the girdle. Adjust the angle setting to 90 degrees. This puts the gem parallel to the lap. Your machine will have an opening in the splashguard, or a means to hold it out of the way while cutting the girdle. Do this now. Set the index to your first setting, which is 2. Now, carefully lower the gem until it just touches the lap.

Turn the machine and water on. Cut the first three facets at indexes 2, 10, and 14. They are small and will not need nearly as much cutting as the main facets did. When finished, inspect your gem to see if these facets come together. If they do not, then you will have to lower the head. When the depth is set, continue cutting at the other index settings. You will probably come to an area that is shallower than the rest of the stone. Lower the gem until you can cut the girdle

facets at this section. You have now found the minimum distance you need to cut. Go back and cut all the girdle facets to this depth.



## Prepolishing

You have now shaped the pavilion of the gem. However, the coarse lap has left a very rough surface. You cannot see it, but there are tiny, subsurface fractures as well. You need to smooth the surface before you can polish the gem.

Remove the coarse lap from the machine. Clean the gem and all the controls with a damp cloth. This will remove any coarse particles that could contaminate your prepolish lap. You do not want to learn this lesson the hard way! Contamination is a very serious problem, but one that is easily avoided.

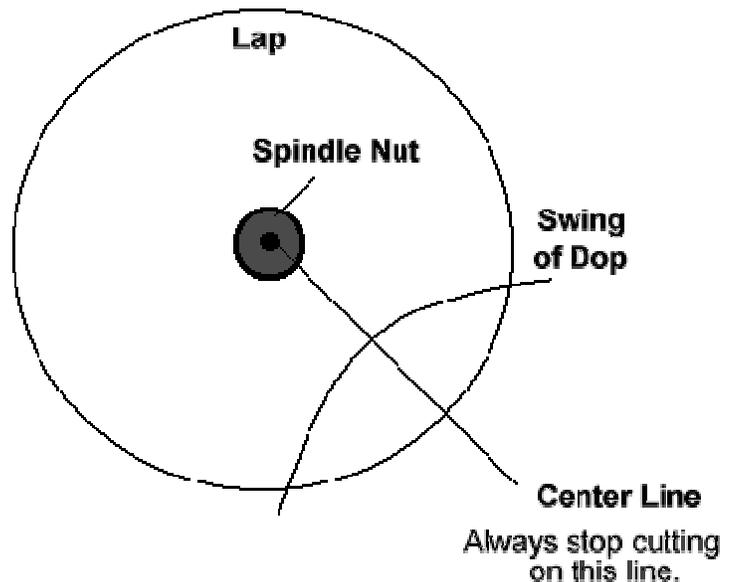
Place the prepolish lap on your machine and wet it. You ended your last sequence by cutting the girdle. Since your machine is already set at 90 degrees, it makes sense to prepolish the girdle first. Set the index to 2.

Setting the height accurately is very important, as you are only removing a tiny amount of material in this step.

Begin by setting the height so the stone just barely touches the lap. Many, (if not most machines,) will not have the lap perfectly level to the swing of the dop. If this is the case, adjust your height so the gem first touches the lap in line with the center. For accuracy, always stop cutting at this line.

Using the fine adjustment, lower the gem just one tiny increment. Prepolish the first facet, being careful to stop on your centerline. Now inspect the facet. It should have a smooth, frosted surface, with no visible pitting. If not, lower the gem just a tiny bit more and cut it again. Once you have the depth set correctly, prepolish the remainder of the girdle facets. Listen carefully and you can hear when the cutting stops.

The next step is to prepolish the main facets. Set your angle to 42 degrees and the index to 96.



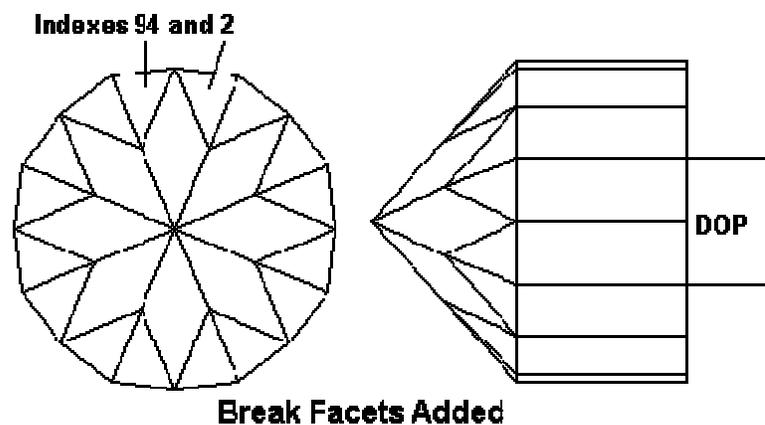
Adjust the height so the gem barely touches the lap on the centerline. Lower it one more tiny increment. Now proceed with prepolishing the mains, just as you did with the girdle facets.

Now it is time to cut the break facets. They were not cut in the coarse stage, because they are so small. Your main facets are cut at 42 degrees and the break facets are cut at 43.7. That is just a tiny sliver!

To cut the break facets, set the angle to 43.7 degrees and the index to 2. Adjust the height so the gem barely touches the prepolishing lap. Very gently, cut two facets at index 2 and 10. The technique is to introduce the gem to the lap with a very light hand and bring it towards the centerline. It should only take a couple swings of the dop to cut the facets.

When fully cut, they will create a level girdle and come together in the center. However, they should not come together yet. Lower the head just a bit and cut them again. Repeat this process until the facets come together properly. When the height is set correctly, cut the remainder of the facets.

Inspect your progress frequently. One of the most difficult aspects of faceting is learning hand control. Even though your machine is properly set, you can under or over cut small facets. From the beginning, pay attention to the hand pressure you are using. Learning to use consistent pressure is the key to getting uniform facets.



## Polishing

Before polishing, remove the prepolishing lap; thoroughly clean your hands, the gem, (especially the area it where it attaches to the dop,) and the machine. Again, contamination is a serious problem, but one that is easily avoided.

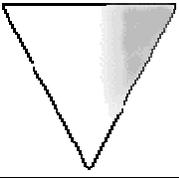
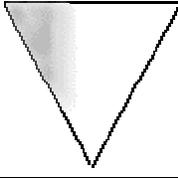
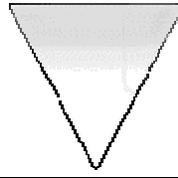
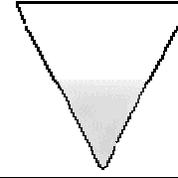
Now put your polishing lap on the machine. The techniques for preparing the laps vary with the materials used. However, once set up, the process remains essentially the same.

You finished the prepolish step with the break facets. Since your angle is already set for them, it makes sense to polish them first. Set your index to 2. Adjust the height so your facet just barely touches the lap on the center line. Turn on the water, (if used,) and set the speed to slow.

Introduce your facet to the lap very gently and polish it for about three seconds. Now, pick up the stone and inspect your polish. It may be incomplete, which simply requires a few more seconds on the lap. However, you may find that the polish is not completely covering the facet. In that case, you will have to make some subtle adjustments to get a perfect alignment. The

cheater control adjusts the alignment from side to side. The angle controls the facets up and down alignment.

There is a simple rule to making these adjustments. When you lift a stone to inspect it, make your adjustment to the direction opposite of where it needs polishing. To test your alignment, paint the facet with a felt tip marker. Give it a second to dry and then rub the facet on your polishing lap. If the ink is removed across the entire facet, your adjustment is correct. If not, make the necessary correction.

<b>Problem</b>	No polish to right	No polish to left.	No polish to top.	No polish to bottom
				
<b>Solution</b>	Turn cheater to left.	Turn cheater to right.	Adjust angle down.	Adjust angle up.

When you have your facet properly aligned, repeat the polishing process. Check your progress every three to five seconds. You can over cut small facets in the polishing stage, so be conservative and do not hurry. Repeat this process on the other break facets.

After your break facets are polished, move on to the pavilion mains. The procedures remain the same, but they will take a little longer to polish. Make your inspections every five to ten seconds.

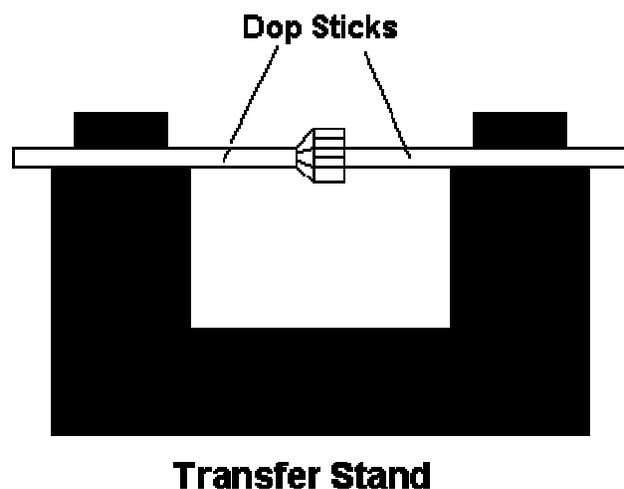
To polish the girdle facets, set your machine to 92 or 93 degrees. This purposely sets the machine so only the edge polishes. There is no need to polish the entire surface, as most of it will be cut away in the next step. When polishing, inspect the facets every couple seconds. They are tiny and polish rapidly.

## Cutting the Crown, Initial Steps

The procedures for cutting the crown are nearly identical to cutting the pavilion. However, there are two additional steps. Before cutting the crown, the gem needs to be turned over, to be dopped on the other side. Every faceting machine comes with a transfer fixture, so this can be done accurately.

Place the new dop in the machine. If you do not have a keyed dop system, set the index to 2 and leave the angle at 90 degrees. Lower the head until you can lay a girdle facet flat on the polishing lap. Now tighten the dop.

Set the index to 96 and look at your stone. It is properly oriented if the peaks of the main facets are aligned straight up and down. If they are slightly cantered, set the index to 2 and place



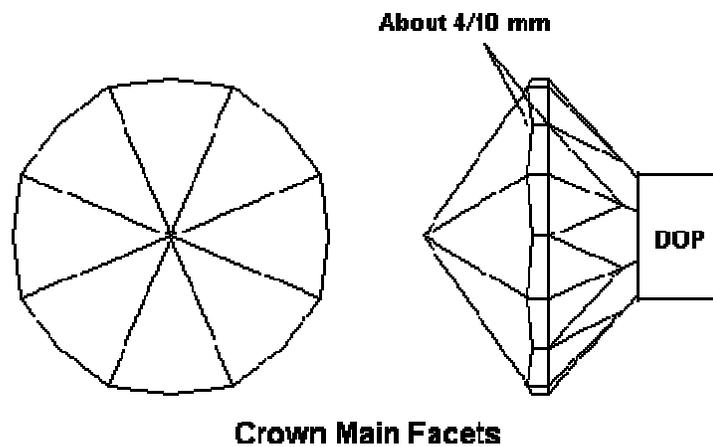
the stone on the lap again. Loosen the dop and rotate the stone to one of the adjoining facets. Tighten the dop again. There are only two ways of orienting the stone, so it has to be correct after this adjustment.

## Cutting the Crown Main Facets

Place the coarse lap on the machine and set the angle to 35 degrees. Set the index to 96 and adjust the height so the stone barely touches the lap.

This facet determines the thickness of the girdle. When the gem is finished, the girdle should be about 3% to 4% of the diameter of the gem. For example, if your stone measures 6 mm in diameter, the girdle should be between .18mm and .24 mm, or roughly 2/10 mm. After cutting this facet, you are going to have to prepolish and then polish it. Both of these steps will remove more material. For this stage, you want to stop cutting about twice the size of your finished facet, or about 4/10 mm.

Cut this facet and then lower the height. Keep adjusting the depth setting until you reach the proper depth. Then cut the remainder of the crown main facets.

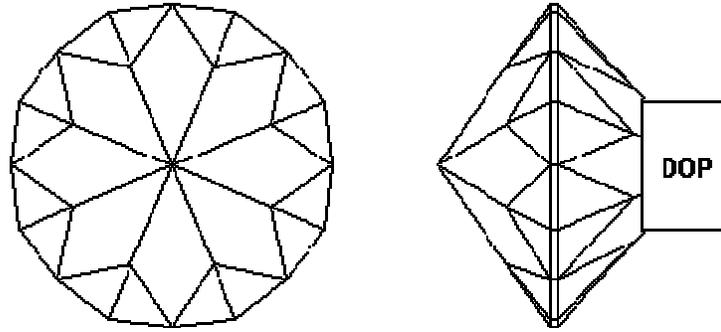


## Prepolishing

Clean the gem and the machine and put the prepolishing lap on the spindle. The angle is already set for the mains, so simply set the index to 96 and adjust the height so the gem barely touches the lap. Prepolish the first facet and inspect it to make sure you have removed all the coarse scratches.

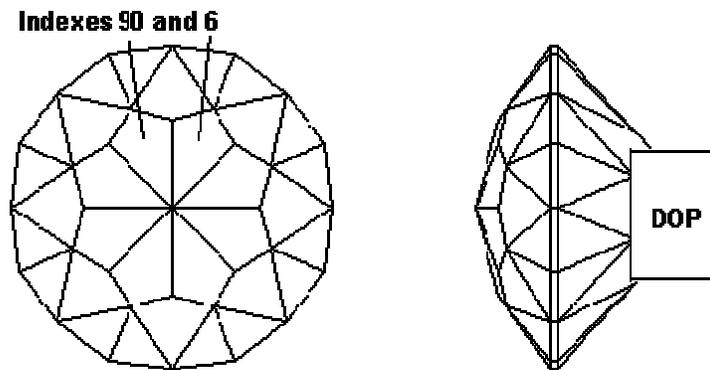
Now look at your girdle thickness. It has changed from the first cutting and will change very little when polished. Is it pretty close to the thickness you want? If not, you can cut it a little deeper. If you are not certain, then simply stop. It is better to have a girdle that is a bit too thick than too thin. (Thin girdles are prone to break when a goldsmith tightens the prongs against it.)

When the mains are prepolished, set the angle to 37.5 degrees and the index to 94. Lower the head until the stone barely touches the lap. Cut the first two break facets at indexes 94 and 2. Lower the head as needed until the break facets create a level girdle and come together in the center. Then cut the remainder of the sequence, checking your progress regularly.



**Crown Break Facets**

With the prepolish lap still in place, set the angle to 16 degrees and then adjust your height setting until the stone barely touches the lap. Cut the first two star facets at index setting 90 and 6. Adjust your height setting until they almost touch the top of the break facets. (They will enlarge slightly when polished, so leave a wee bit of room.) Then cut the remainder of the star facets to that depth.



**Star Facets Added**

## Polishing

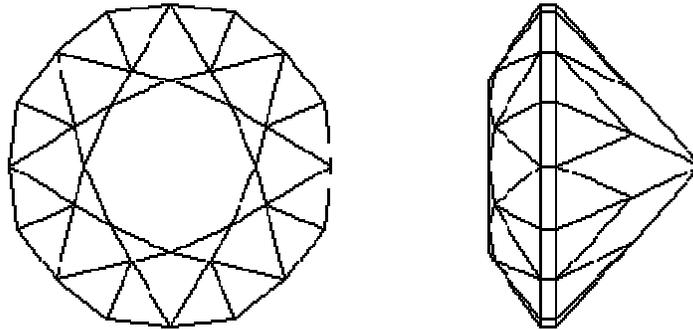
Now it is time to polish the crown facets. Clean the machine thoroughly and place a polishing lap on the spindle. The angle is set for the star facets, so polish them first. Polish the main facets next and finish with your break facets. You may find that your points do not come together as accurately as the diagrams. You can make fine adjustments with the polishing lap, but do not worry about it. This is your first faceted gem and your priorities are learning the sequence. Your technique will improve with experience.

## Table

The final step is to cut the table. For this, you need to use the table adapter that came with your faceting machine. Set the angle to 45 degrees and place the table adapter where the dop usually goes. The dop goes in the table adapter, which holds the gem perpendicular to the lap.

Put a coarse to medium cutting lap in the machine, depending on how much material you need to remove. Set the height to make a small cut. Gradually lower the height setting, cutting a progressively larger table. As the table grows, you may find that it is not level, that it is not approaching the top of the main facets equally. The procedure for aligning the table is much like aligning for polishing. If it needs to cut more towards the top, lower the angle a bit; if it needs to go to the right, turn the cheater control to the left; etc. This is simple, always adjust the to the opposite side. The more accurate your machine is, the less likely you will have to make any adjustments.

Cut the table until it nearly touches the juncture of the break and main facets. Switch to the prepolish lap and bring it in just as close as you can. Finish by polishing the table.



**Finished Gem**

Now, do you think you could do that? Of course you can! There are several steps to put 57 facets on a gem, but none of them are difficult. You will find that your first stone is the hardest, because you have to learn all the new controls and procedures. It will take you six to eight hours. With practice, the time will come down to an hour or two.

Once you are familiar with your faceting machine, you can move on to other shapes. Soon you will be faceting like a professional. In fact, your gems will be better cut than the majority of stones you see in the jewelry stores. Those are cut with methods that give emphasis to speed rather than accuracy. You can do better work than most full time lapidaries! Your gems will have higher value because of the precise cutting and you can take pride in work well done.