Congratulations on purchasing your new GemCutStudio!

How to set up GCS for designing gems. Part 1.

First – you need to do three things -

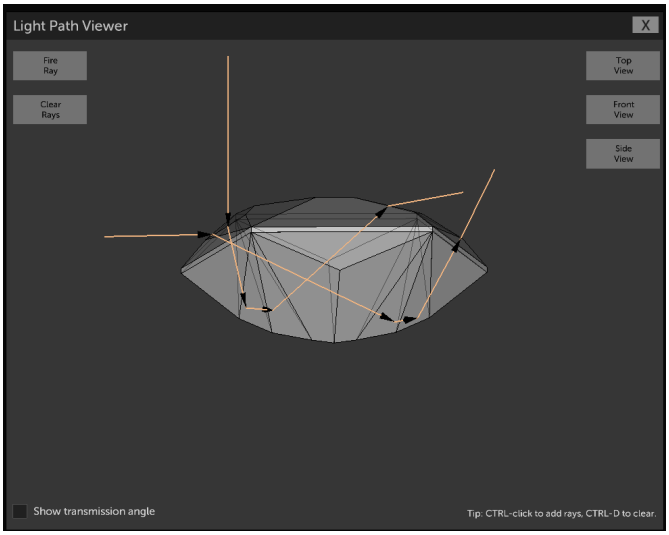
1/ Read the Manual!!!!! – yes, I know it's boring and hard to remember, but it helps.

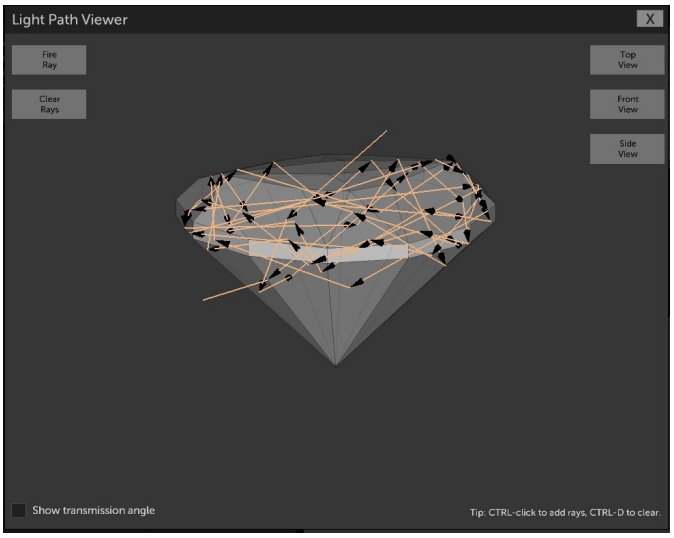
2/ Understand Critical Angle and Refractive Index – These are important to know as you will need to understand how light works, going in, bouncing around, and coming out. Good information can be found at -
https://www.physicsclassroom.com/class/refrn/Lesson-3/The-Critical-Angle
Just read the first and third paragraphs. Don't worry about the maths, just the concept is what you have to grasp. Light either bends or bounces according to the angle it hits at, going in, through, or out a gem.

Below the Critical Angle it will bend. It then either exits causing Window, or skip along the facet face (sometimes called Extinction) and disappears. Crown Facets need to do this but Pavilion Facets shouldn't.

Inside, if it hits a facet at above the Critical Angle it will reflect (bounce) inside the gem. The angle it hits internally at is called Total internal reflection (TIR) or Angle of Incidence.

GCS determines the Critical Angle (CA) from the Refractive Index (RI) of the materiel. Simply put, RI is used to calculate the CA, but you don't have to calculate it as it is done automatically. (Well, until your favorite mad scientist makes up a new one, then you add the new material and it's RI and GCS will calculate the CA). You just need to grasp the idea to know why the facets work. RI and CA just give you a idea of maybe what angles your facets need to be.





Left – Two rays going in and out. Right – An extreme example of one light ray going in and exiting out the pavilion, not what we want. See Light Path Viewer on P31 of manual.

3/ Bookmark the USFG – https://usfacetersguild.org/usfg-faceting-dictionary/
this will describe the meanings of words and terms that will be unfamiliar to you.

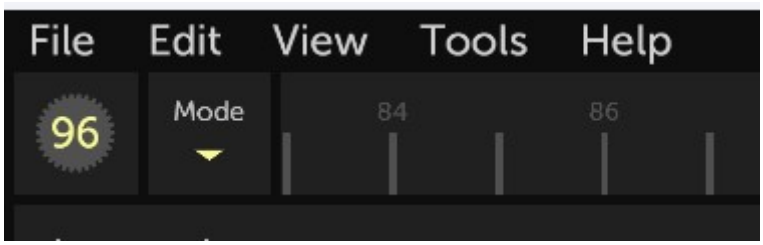
Now, after you have installed the file and registered it with Gem Cuts Studio, you will be ready to start designing -NO!

Just a few things first to set it up.
First a hint. Where ever you see a slider or number in a setting, usually you can change the setting by sliding and/or entering a number in the box. (usually, but not always).

Start the program.

Up in the top left of the program is this menu. Here is where you navigate through the various functions and tools. The most important one is the Help, click on that you have three choices, User's Manual, Tutorials and About. Click on the User's Manual and a PDF of the manual will pop up. You can also download that from the Gem Cuts Studio website.

The Tutorials is a quick link to the GCS videos on YouTube – watch them.



In the manual you will see on Page 4 the layout of the separate Windows on the screen.

Next Click On Edit and then on Preferences.
See page 25 in manual.

Leave these as default as in the manual.

Unless you want Classic instead of Modern versions of the printouts. Play with these and see which your prefer. When you use Print in GCS, it doesn't come out of your printer, but instead creates a PDF and you save it to where you want on your computer. Then you can print it out!

Then, unless you want your work saved to another place rather than the default local folder "Designs" under where GCS is installed to. In that case you can set a location where your designs live..

If you dislike the way GCS handles files, eg. save or loading a file, you can tick the "Use system Open dialogue", this will use your operating systems normal file/folder/directory handling method..

The rest, leave as default. But you can play and see want you like. If you do something you dislike you can always press "Restore to Defaults".

Next – Render – Gem Properties
Click on the little box in top right hand corner of the Render window, it will fill the screen.
On right had side there is the Gem Properties. This is where set the properties of the render system and gemstone you are designing for. See page 13 in manual.

The program comes with a default set of gemstone properties cover most of the basic materials, click on and scroll down list for the material you want. Once it is picked you change to colors to suit the gem. There is an expanded list of materials available, which I will link to and describe how to install in the next part.

Apart from Color you should leave the rest of the Gem Properties alone. When you save the file, it save the color and material into the gem's design file, so it will travel with the file.

Below the Properties is Render Options. Page 16 in manual
Leave the settings as is. ie -
Low Resolution = 200
High Resolution = 400
Bounces = 8 (I use 10)
These seem to be a good balance between effect and speed for most computers. The manual explains what they do well. These are not saved with the file but are the default set for your machine by you.

Lighting Model – set to Random
Lightning Models is used to set up the light going into the gem in a render. Random is the best general purpose one and is reasonable at showing realistic renders. The other fancy colors are used to show where the light is coming from and is being bounced back. It is an Advanced subject.

The Colors, however you can change to what ever you like.

The Background is what it says, the back ground against which the gem will be seen. The three sliders are Hue (color), Saturation and Light. Adjust to you own preferences. I tend to set it grey of various tones, depending on the color of the stone. By setting Hue to anything, Saturation to black (left hand side), and Light to set the tone, this sets the grey.

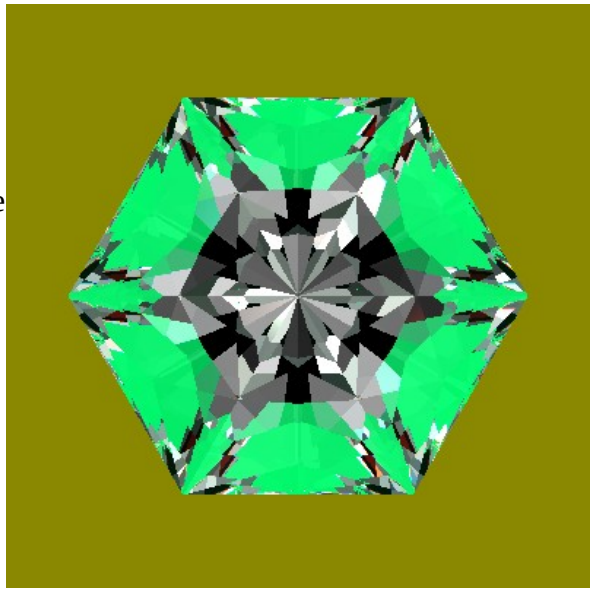
Pale color stones I set background to a darker tone, for dark colors I set it to a light tone. Or vice versa sometimes, if it shows the render better. Which color or tone is up to you, what you prefer.

Next – Headshadow. It is just what it sounds like: a shadow of your head, blocking light as you stare into a gem, it is the effect of the a head looking at the gem. Or a camera when trying to take photos of it. A gem reflects light and dark. Having your big noggin above the stone is reflected back at you, so there is shadows that you will see in the stone. BTW you can't use it to shave, it is shadows only. Headshadow is more a issue when photographing gems, but you can see it in real gems in your hand. Really good photo setups can remove or minimise Headshadow and can give a non-real-life image, just be aware of this. (ie. "my gem doesn't look like that!"). This Headshadow approximates it into the render.

The head shadow angle is explained in manual but keep it to either default or 10 degrees or close to that, I use 8 degrees.

Now the Use Separate Window Color tick box.
When this is unticked. The gem will let light through the render if the design Windows, ie you see through the stone. See right, this is in quartz, the centre is reflecting well, but the facets around the centre is allowing light to go straight through. So you can see the background.

Now if you tick Use Separate Window Color, a new set of color sliders will appear. You set the color you want to represent Window in the render. This is useful when it's hard to see if it Windows because of colors and sparkle, but by making it oblivious shows them up. In the case here, there is my normal Window color, neon green. (for green stones I use neon blue).



You can see the windows now!

You can add new materials to the stored ones, see Page 57 – Adding and modifying Materials
The same page has instructions on how to Adding lightning models. I will link and explain a expanded set of Light Models in the next Part.

Next – Design a gem!

How to design? Well that is a much longer and complicated book.
First, as I said before, watch the Tutorials, the first three.
And maybe for homework , watch videos from my YouTube
https://www.youtube.com/@TonysGemDesignswithGCS
or the designing videos at Bopies -
https://www.youtube.com/@BOPIESDiamondsFineJewelry

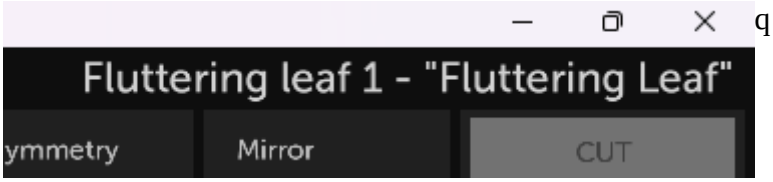
Have fun!

Then, at some stage you will have to save the design file.
File – Save will do that. You will be asked to put in a file name if this is completely new, call it what you will. But think about using a naming system. I will talk about that later below.

Then either before you do that or after that, you need to fill in the Edit-Comments, as on Page 25 of manual. Here is where you put the design name (which can be different from file name). Put your name, a date and any other information you want there. Then Save again.

Clicking on Name/Author gives an option of a plain comment line replacing the Name and Date. This is a holdover from much older programs which didn't have these fields.

Now if the File name (on your computer) is different from the Design name (prints on your print out) you get this -

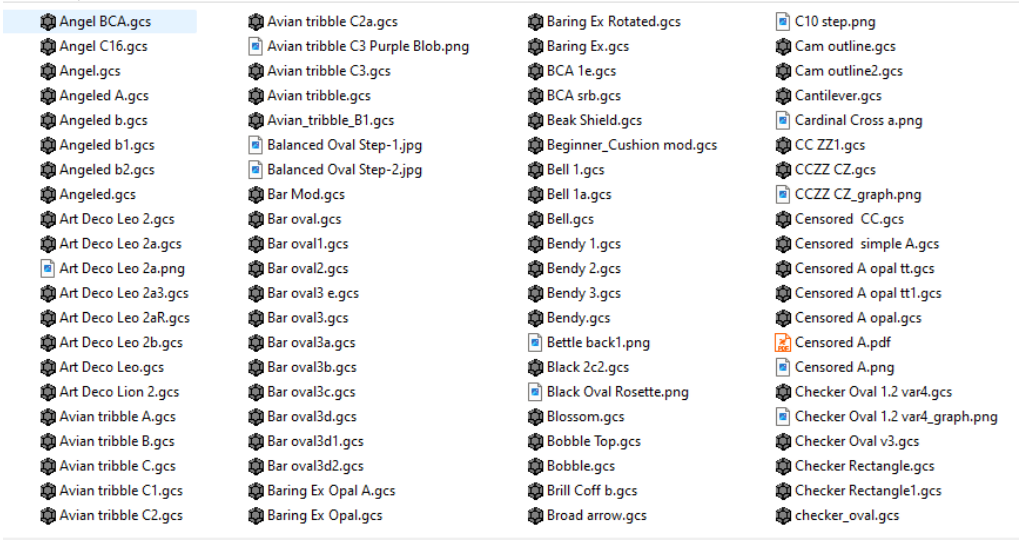


q

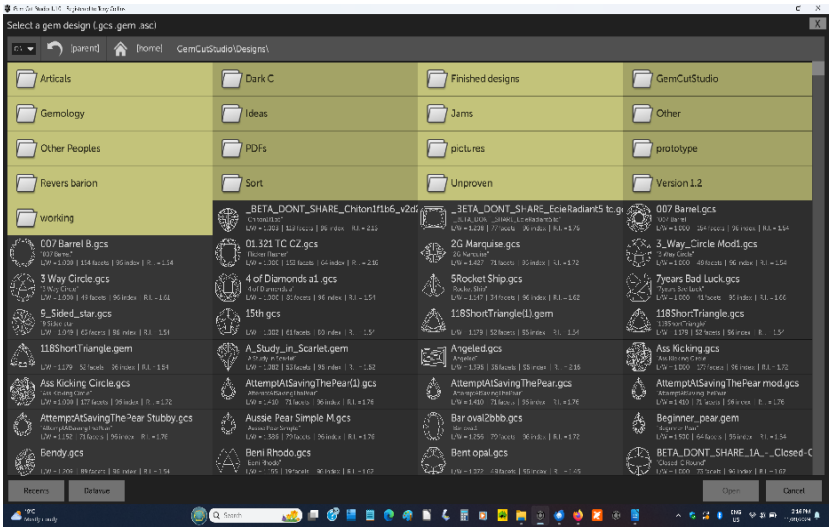
Left is file name, right is design name.
If they were the same you will see only one name there.

Now – naming systems. There are many and what you use is up to you. Make up your own system. The reason you need a system is when you are designing you will go through many variations before you do one you will settle on, or there are variations that look good as as well. Use “File – Save as” to save to a slightly different name as you go.

Some people use a system where individual File names are used with version number/date code in the name. I just use version numbers in mine, sometimes alphanumeric. I end up with lots of variations as I develop the design, so if I go down a track of different changes I can always go back and go down a different track if it doesn’t work out. Trouble is, what ever system you use, you will eventually end up with heaps of variations and failed designs.



Also use various directories to store different types of design. What they are, is up to you.



Once you have saved your design, now test it.

Testing – Tools – Tilt Performance.

Tilt Performance and Optimiser is where those settings in the Render are for. Page 27 in manual covers the settings well. I suggest untick COS Brightness and Table values on the Graph. At least until you understand what they show, I rarely use them.
Now the graph is only an indication of how well the design is bouncing light (ISO brightness), Windowing and having Headshadow. There are too many factors that can affect these for this to be absolutely accurate, but it is indicative where things are working or not.

Now on right hand side is the Tilt render. This pictures the gem as it tilts up and down and then side to side through a set angle. Which angle is determined by which material and the design, but as a suggestion low RI (below 1.7) use 20 or 30 degrees. Above RI 1.7 use 40 or 60 degrees. Note when you do this, it will change the range shown on the graph on the right hand side.
Again this is only indicative, and only gives you a rough idea of how the gem might actually look. The colors set in Render properties for Window and Headshadow will show where that is happening, at various angles, in the gem.

Tilt render snapshot, Window is neon green, Headshadow is black.

Next Tools – Manual Optimiser
This is related to Tilt Performance and Render as well. See Page 39 in manual.

This show a range of possible Renders for changes to the Crown and Pavilion angles.

You can change how more choices there are in Grid Divisions. Which RI in the Refractive Index on the right hand side, and on the left, what % ranges +/- for the Crown or Pavilion. Now depending on what your screen resolution is, you will either see both Graph and Preview in the top right. Or you will see a choice of either. These draw when you pick which render on the right you select. Click Apply if you to make the change, or Cancel. If you Apply and then change your mind, use Edit-Undo.

Next – Have fun!

Go for it, practise. Make mistakes. Check out YouTube and FB groups and other social media, there is someone out there who will give you advice when asked. Good advice or bad? You never know.

Next Part – Optional extras and more advanced.

https://www.youtube.com/@TonysGemDesignswithGCS