Purpose:

To explain how the STOCK MODEL OPERATION, under TOOLPATHS, functions and how to move a stock model around a 4-Axis Horizontal Tombstone. Grasping this will help you apply this theory to other stock model transformations.

Why:

Using the STOCK MODEL OPERATION allows you to keep track of your machining operations as you move around.

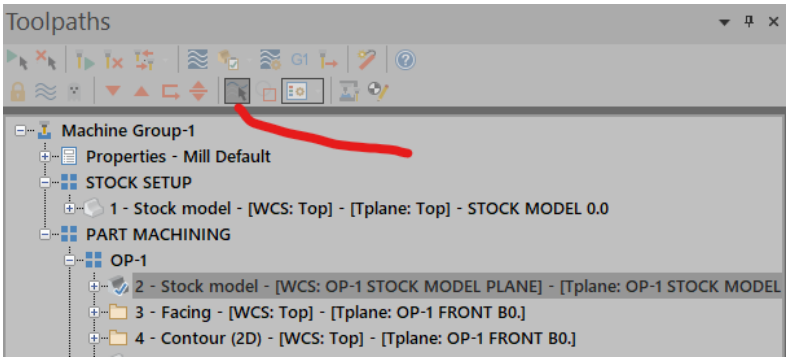
Using this method makes your operations dependent upon one another. Changes made upstream will alter your stock model downstream. If your STOCK MODEL is used for rest-roughing or stock collision detection, these also will be dependent.

How:

Hopefully, this document, along with the sample Mastercam file, will help users to understand how it worked for me. You can use the sample file as a starting point for your application. It's a Mcam 2026 content file that just contains the base machine installed with your application, nothing crazy or custom.

Special Notes:

The sample file contains actual Solid Models that have been placed around the environment that are "STOCK". Every effort has been made to differentiate between these "STOCK SOLID MODELS" and the "STOCK MODEL OPERATION" function in the toolpaths tab. If your turn on a LEVEL containing a "STOCK SOLID MODEL" and select a "STOCK MODEL OPERATION" in the TOOLPATHS MANAGER, they should perfectly overlap on the screen. It helps if you turn on "only display selected toolpaths".

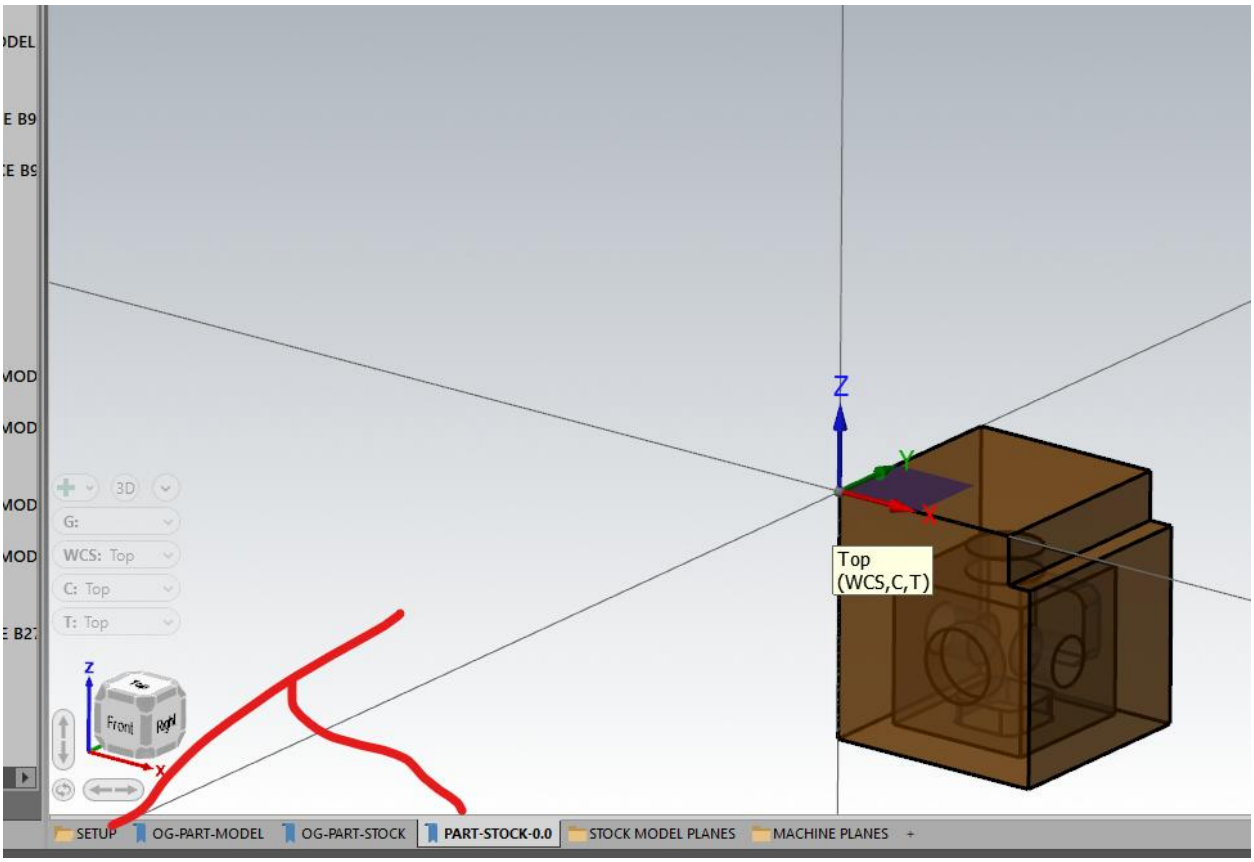


The huge benefit here is the difference. The solid models that were created and repositioned around the tombstone are what you would typically work with, in the old days… They are static. They do not change or update unless you spend the time to hand edit each model as you machine it.

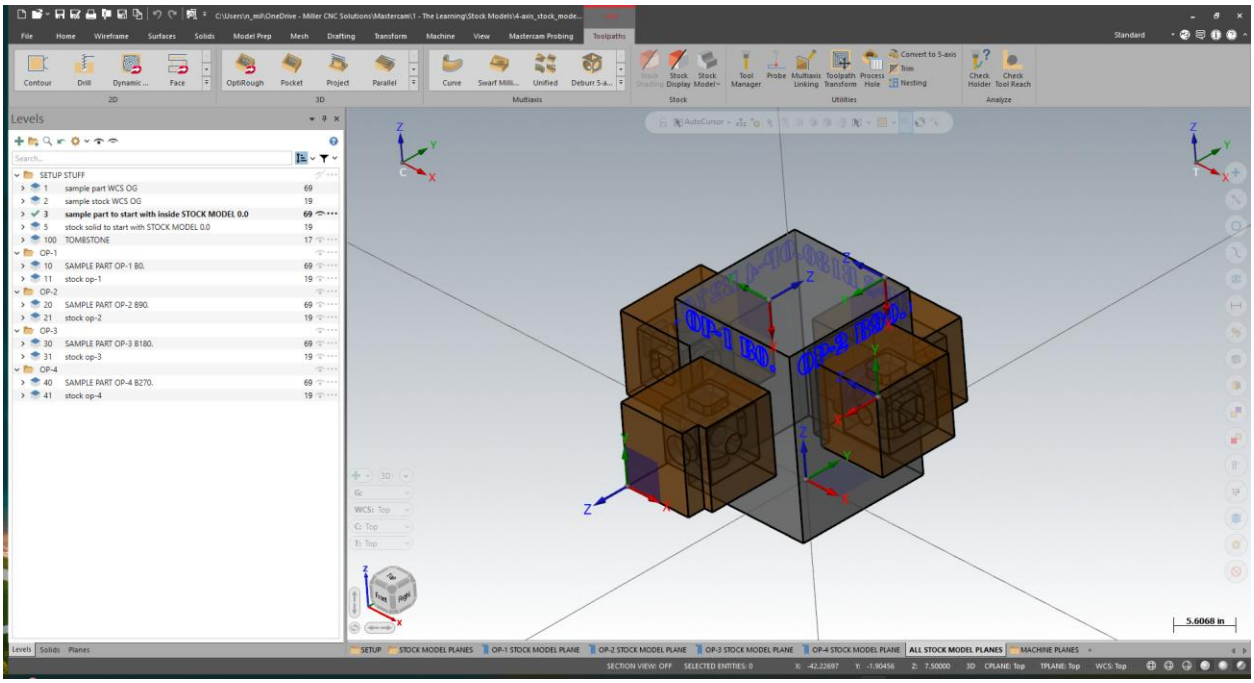
The STOCK MODEL OPERATION is live. Anything that is tied to it that gets modified will make it go dirty and need regeneration. Any toolpath that depends on it will go dirty and need regeneration. Now, everything you do is live and updated after you regen it.

If you turn on Translucency, you can see the Part Model inside the Stock Model.

There are Viewsheet folders with preset views to help you see what items belong to what categories. I have to credit Chris Kozell here (Mastercam expert of Okuma America Corporation). I refused to use Viewsheets until he showed me how useful they are.



THE PLANES, THE PLANES, THE PLANES, ALL OF THE TIME, THE PLANES



Well, this looks confusing, right?!?!?!

You have to start at the beginning. Then, it's not so bad.

When I first attempted to reposition stock models around a tombstone, I wanted to punch my screen in its face. But, my screen didn't do anything wrong. I did. I just didn't know what I was doing and I didn't know what Mastercam wanted.

CNC machining and programming can be frustrating sometimes. Always remember though, the machine does what you tell it to do. Mastercam also does what you tell it to do. If something doesn't react the way you want it to, slow down and figure out what it (the machine or the software) needs from you.

Mastercam releases a lot of new features. When your full-time job is producing code so machines can make parts to be shipped at unreasonable due dates, it's pretty difficult to master new features. There is no time.

I've tried to make a simple Mastercam file and this document to go with it in the hope that this will help explain what I've found and give you a sample file to start with. You could literally use this file and swap your models into it and edit the planes to match what you need and be up and running.

I'm definitely not saying this is "sponsored" by Mastercam or exactly what they intended. BUT, this is what makes sense to me, and this is how it works for me.

If you do have time (let's be honest, you don't), here are some helpful links to The Youtube for some videos on things. They are pretty good, and they touched on THE PLANES. I've found that THE PLANES are the key to the whole thing and I needed to understand this better.

Virender Singh tutorials | Mastercam Multi-setup Webinar | Mastercam Tutorial

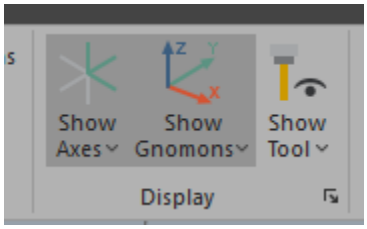
Mistake #1:

- When I tried to create my first stock model at my first operation (part on the tombstone for OP-1 at B0.) fail fail fail fail fail……
- Maybe there is a way to do it. I gave up and found a way that works and just doesn't fight me, so I use it.

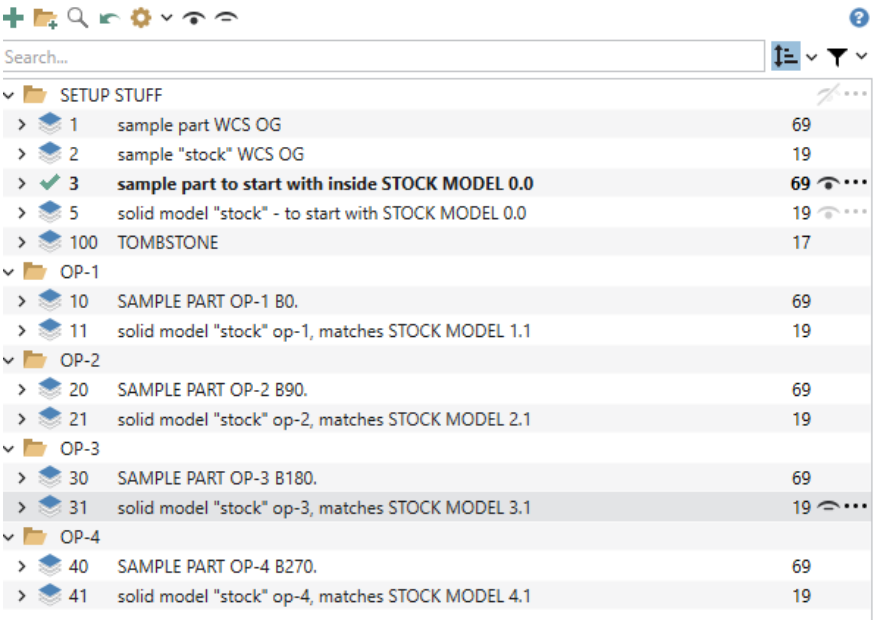
Basic theory:

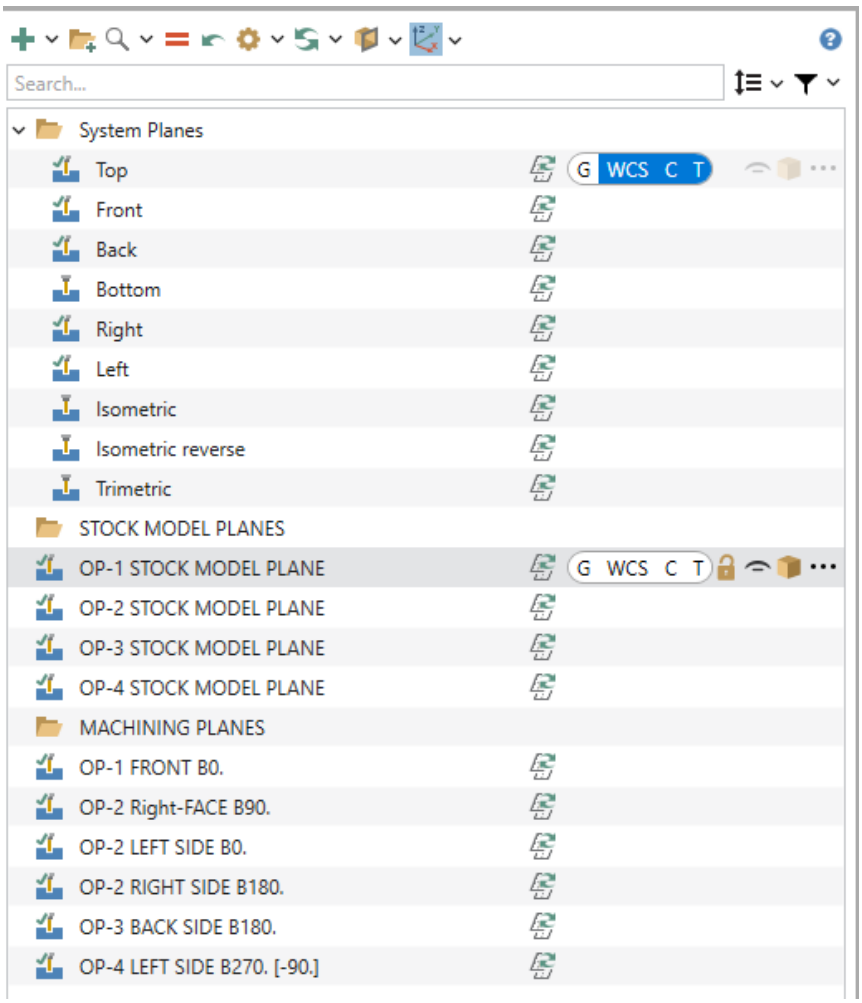
- You will have SEPARATE PLANES for your stock model operations.
- They appear to be INCREMENTAL as you move around.
- If you start at TOP – TOP – TOP, it makes everything easier.
- Start with your PART MODEL and STOCK MODEL (an actual solid model) at WCS zero. Everything zero, no extra stuff changed or selected, just zero.
- Take that combination and move it together so that it's located at WCS zero in a good base position to start your transformation to your first machining operation. This is totally up to the user, however you want to do it.
    - BUT, the key is that this point is now your START position for all STOCK MODEL PLANES that come afterwards. It is NOT your TOOL PLANE. It is NOT related to your TOOL PLANE.

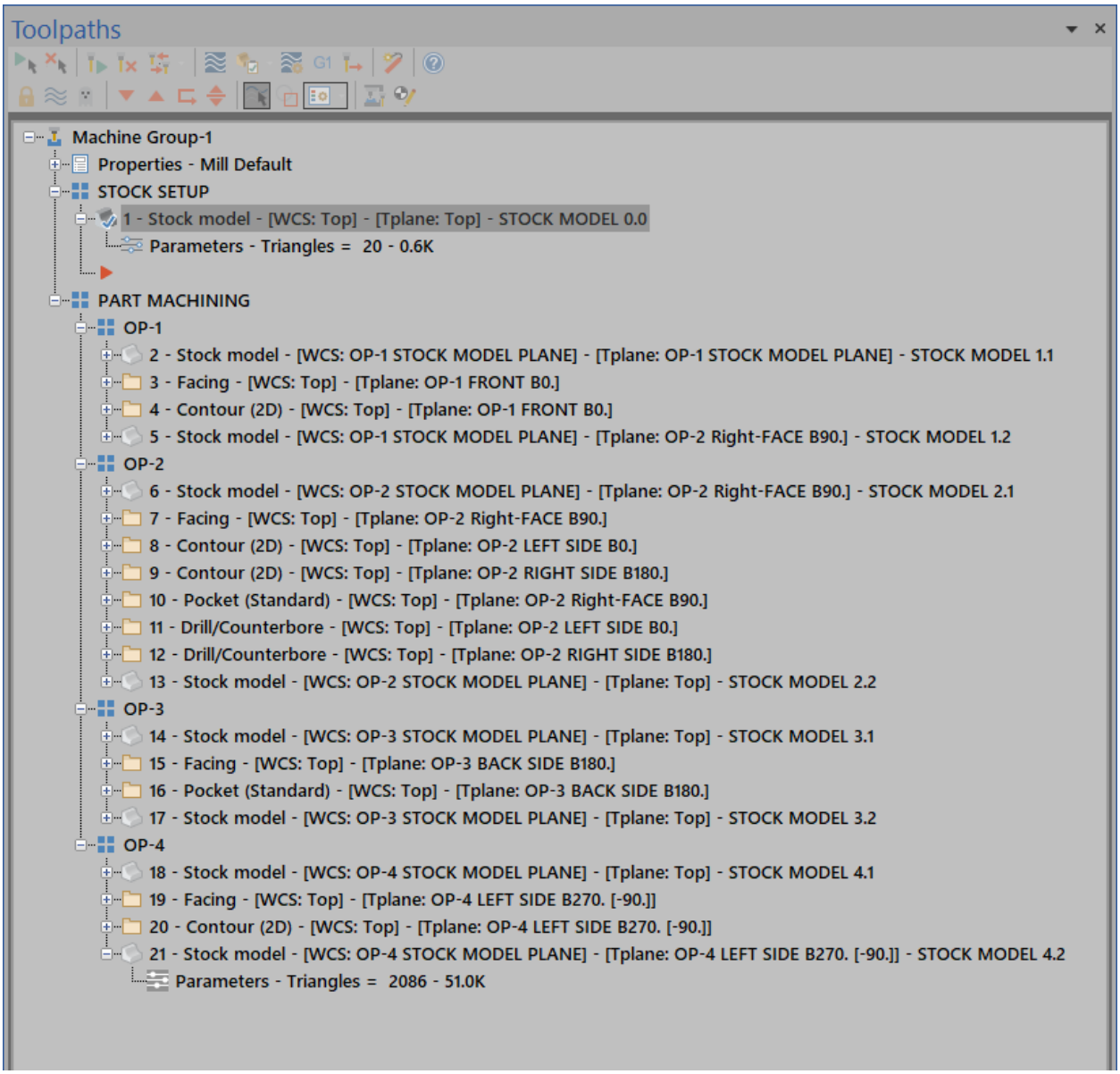
Tips:

- Use the new "FOLDERS" for your planes and levels.
- Turn on your "show axes" and "show gnomons" options.
- Pay attention to active PLANES. When working with STOCK MODEL operations, my WCS/C/T planes like to automatically switch to the plane on the stock model and make it active. Watch out for this.
    - 

MASTERCAM | STOCK MODEL TRANSFORM







Make your operations and groups make sense.

These operations are on the sides of the tombstone.

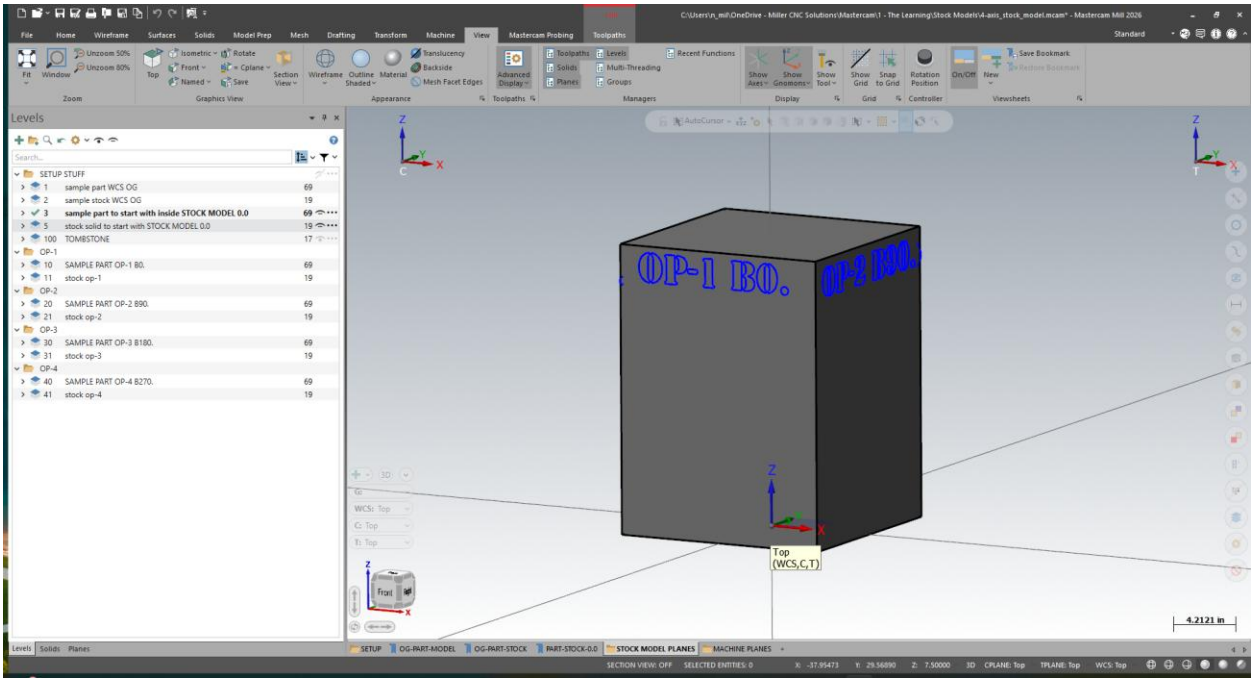
Each one starts with a stock model operation and ends with a stock model operation.

The START stock model operation is the prior stock model with the NEW STOCK MODEL PLANE.

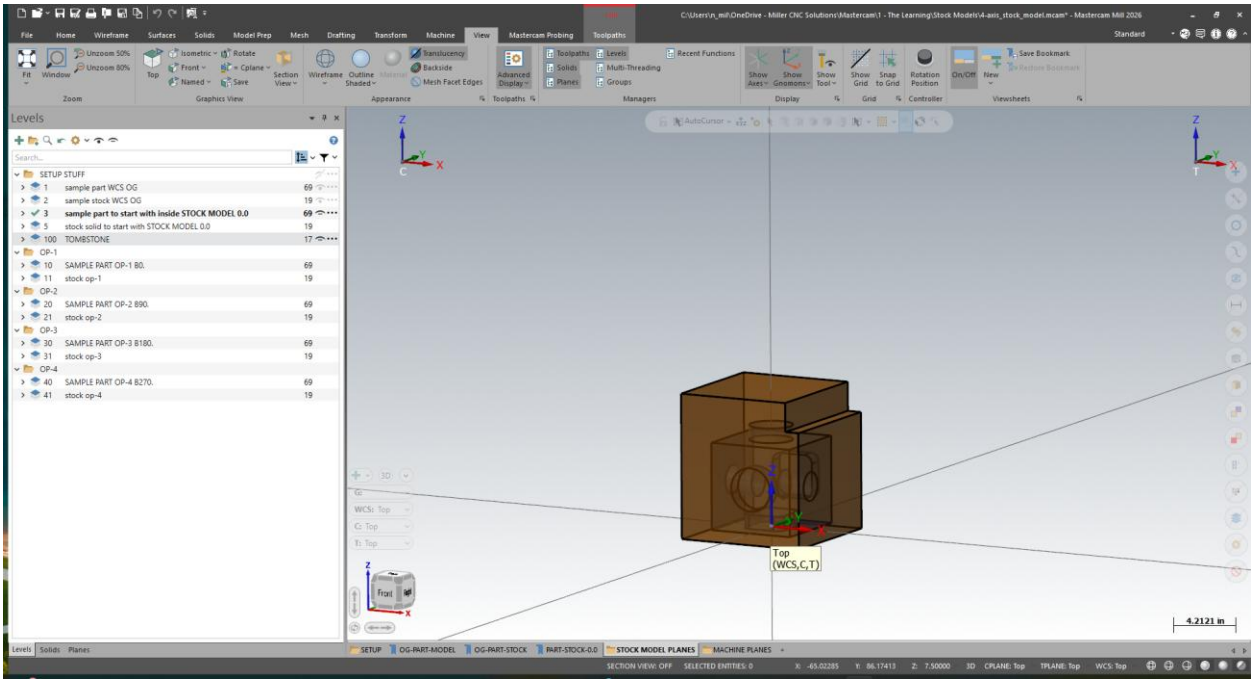
The END stock model operation is the START stock model with the machining operations applied to it.

I have found that you need to apply the machining operations first. Then, you transform that stock model result. You cannot do both at the same time. This is another important key.

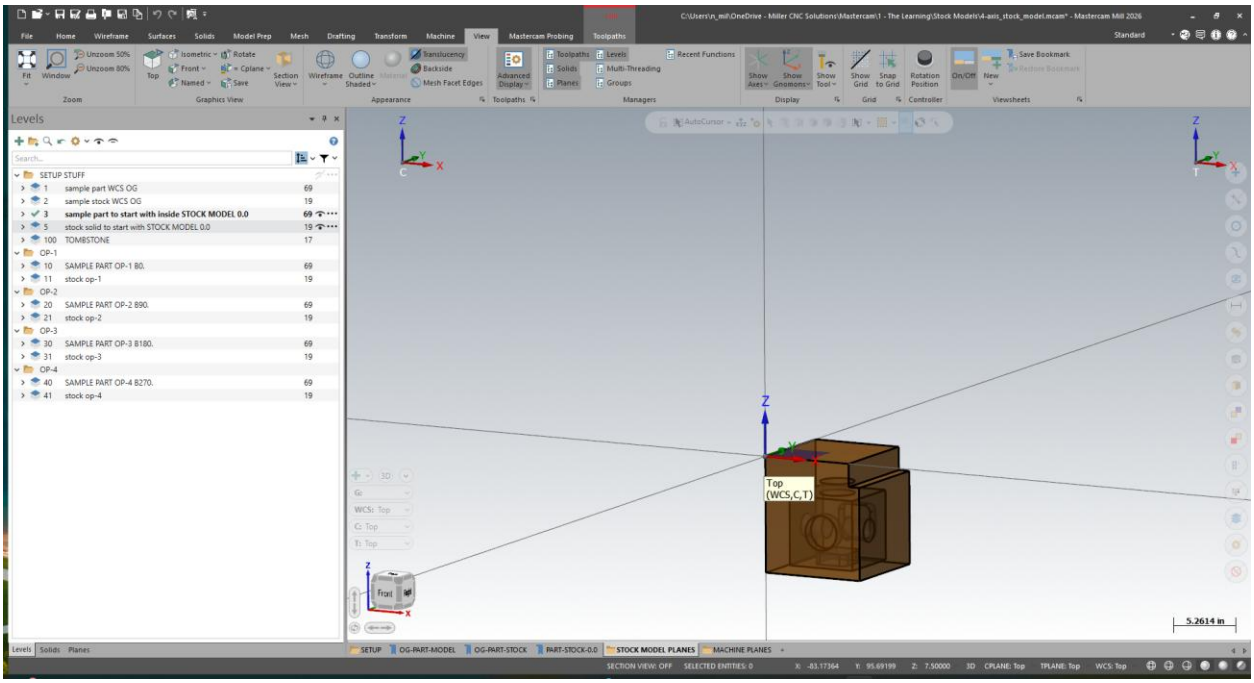
STEP 1: SETUP STUFF



1- Get your setup stuff done.
    a. Tombstone, fixtures, part model, part stock model (actual solid model, not the toolpath stock model.
    b. WCS zero zero zero zero, everything at zero, no plane changes.

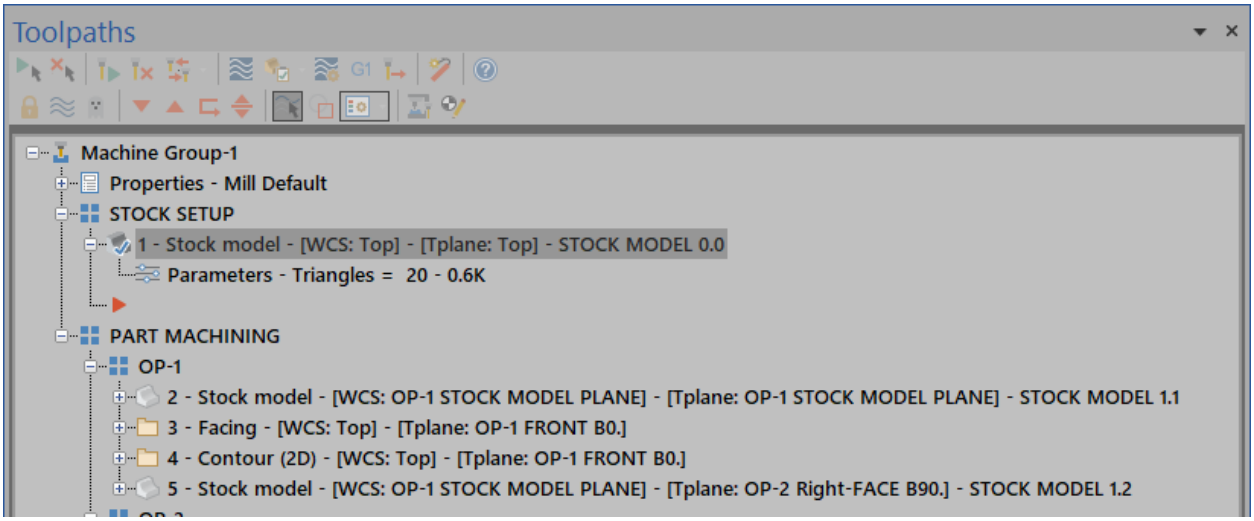


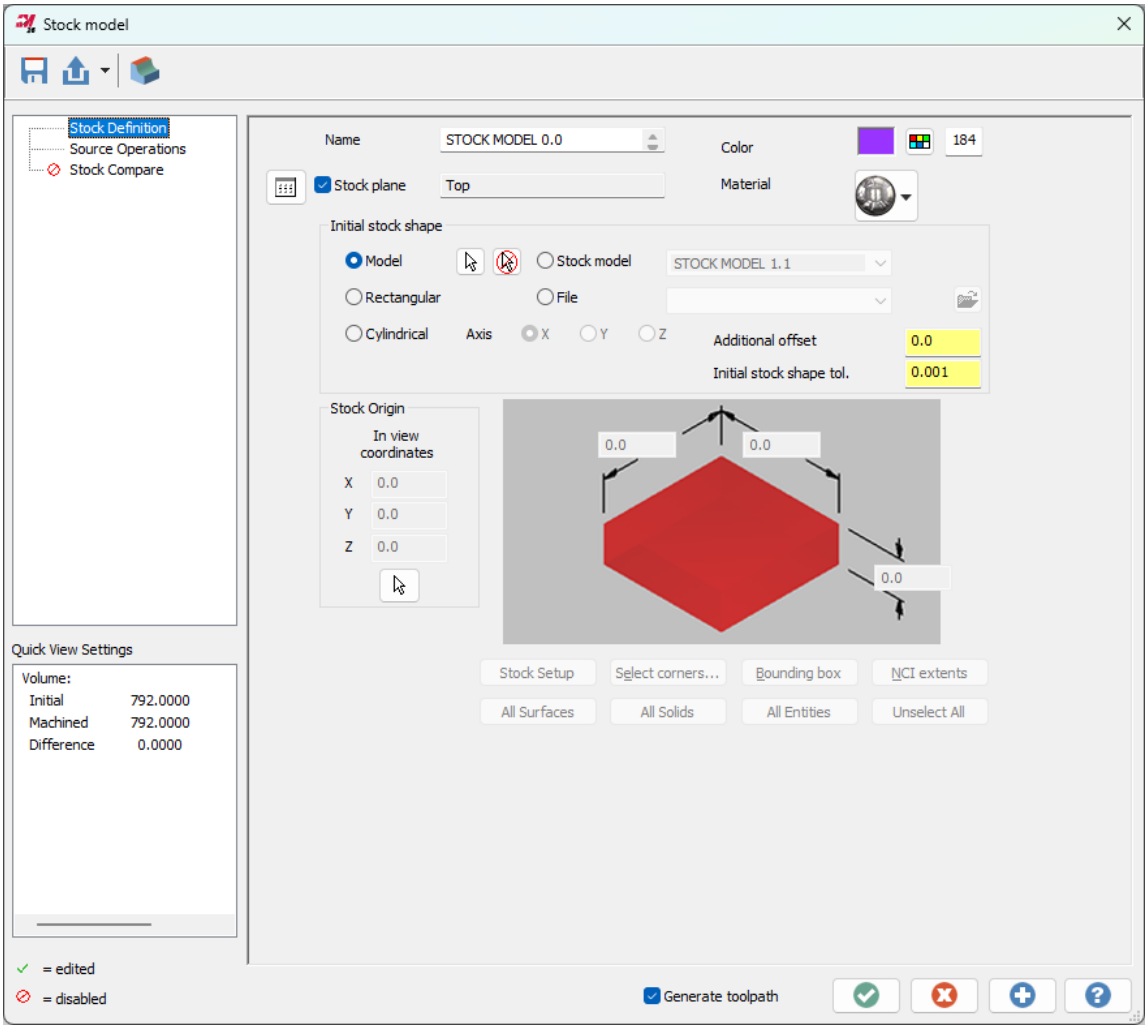
2- Orient your stock solid model how it will be with your finished part inside.



3- Make a copy of your part solid model and your stock solid model and move them together so that they are positioned however you want them to be, so it makes sense to you.

a. This is kind of arbitrary, but this START position is important because this is your base position for your first TOOLPATH STOCK MODEL. Every operation after this will be RELATIVE.





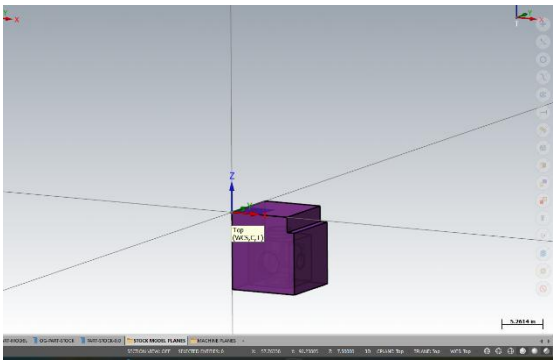
4- Create your first STOCK MODEL OPERATION.

a. Planes will be TOP.

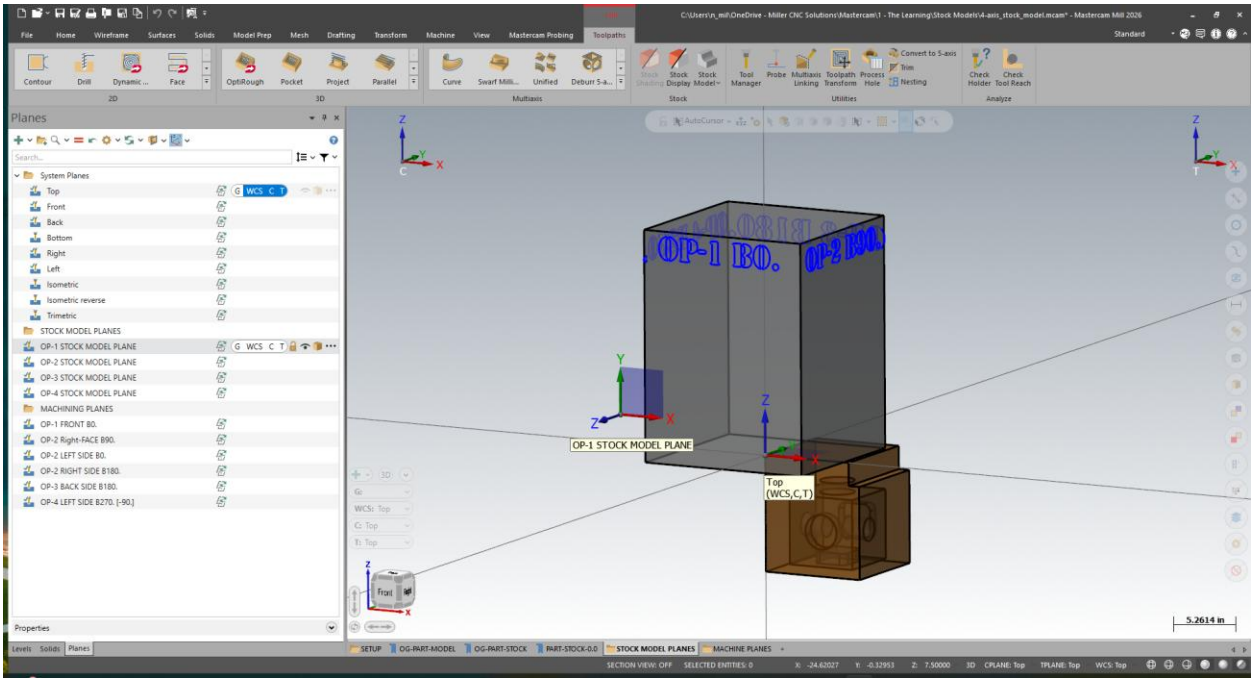
b. Initial stock shape, you will select solid model and pick the model you just moved to the origin.

c. Pay attention to how it is oriented because your OP-1 model will be transformed from here.

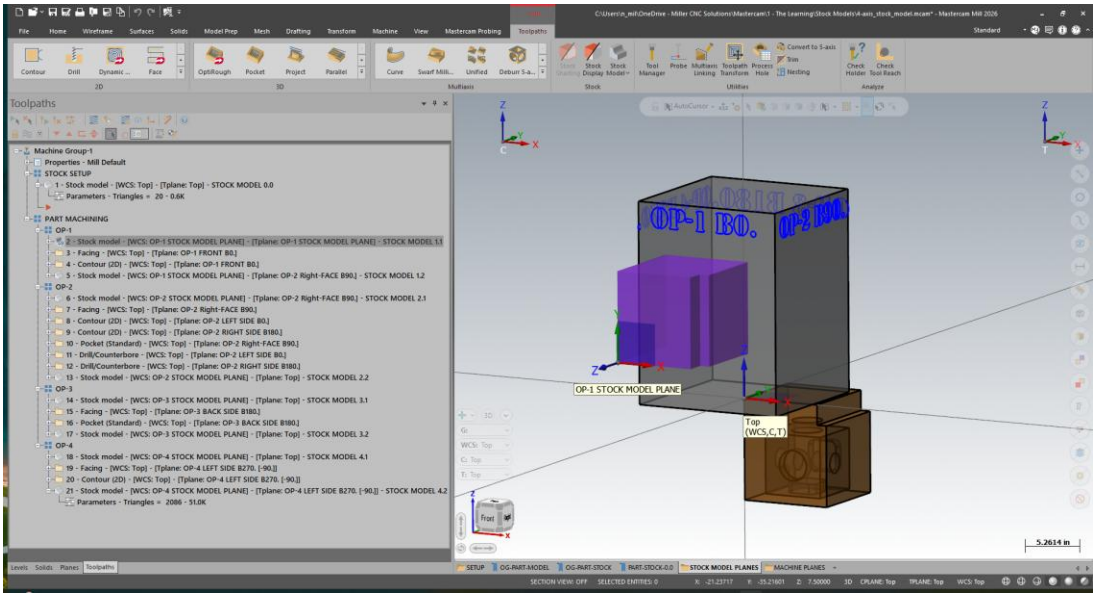
d. When you highlight this stock model operation, the stock that shows up on the screen should exactly overlay the stock solid model you copied and placed here. The purple shown here is the exact same as the brown above.

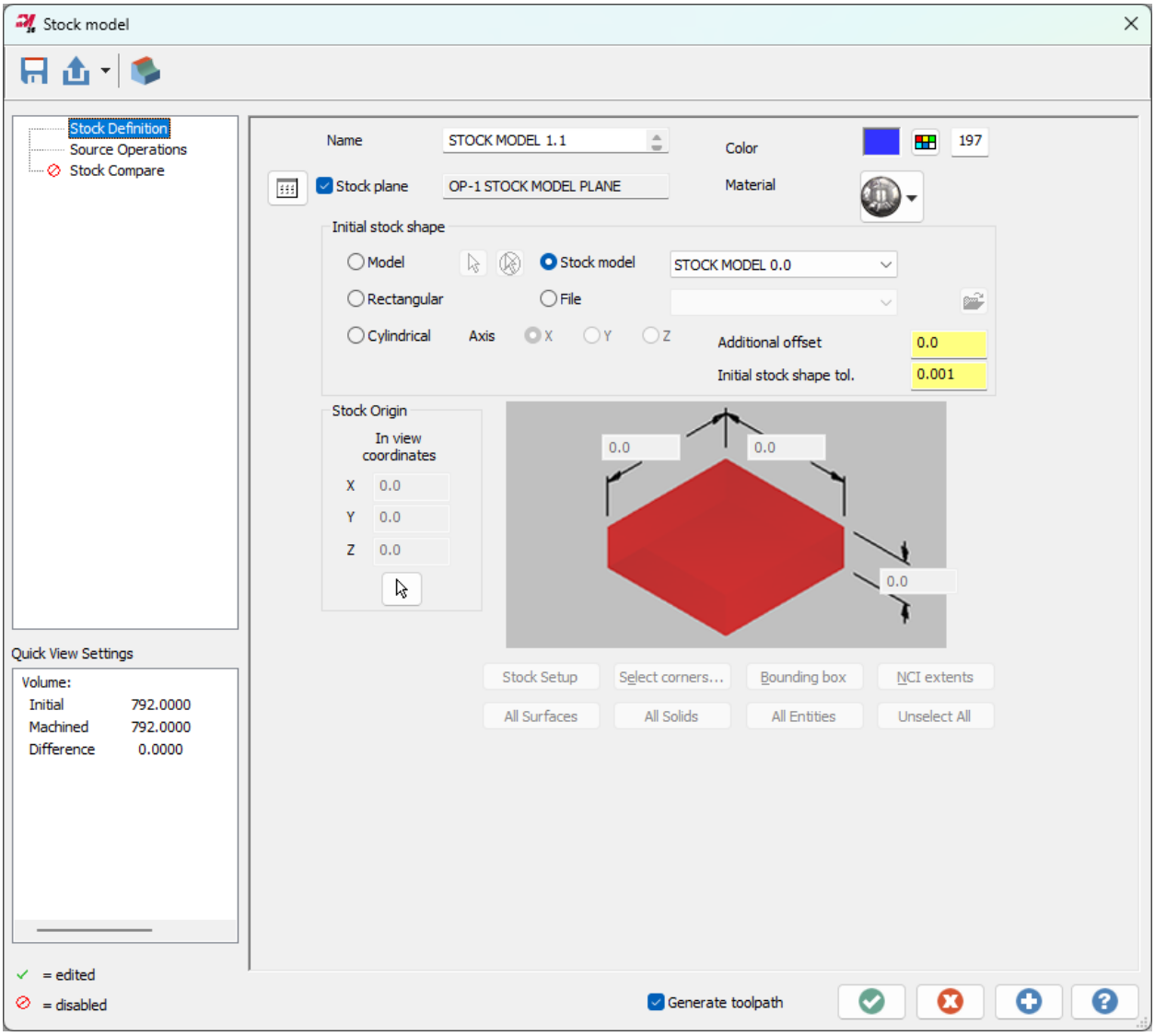


STEP 2: OP-1 STOCK MODEL, THE FIRST TRANSFORM



1- Create a new plane for how you want the stock model and part to be oriented on the tombstone.
   a. This is NOT YOUR TOOL PLANE.
   b. This is ONLY FOR STOCK MODEL TRANSFORM.
   c. See above and look at the new orientation. The axes have been rotated forward and moved up and left. That's how your STOCK MODEL is going to be teleported like magic. Watch… Poof, magic.





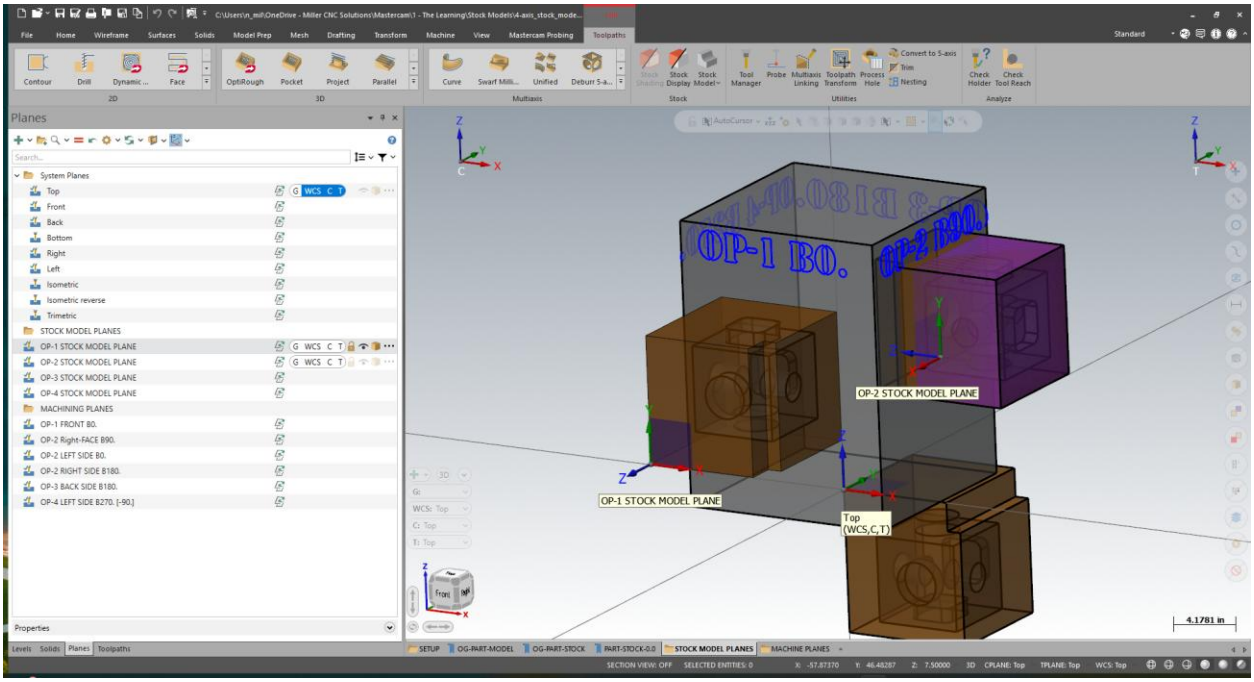
Ok, so what happened?

We just picked the INITIAL STOCK SHAPE as the first “setup stock model” and picked the new plane we created to reposition the stock model. No machining operations happened or were selected. This is just the teleport operation, magic…

Now, just program your machining operations like normal.

When you are done, we need to create the model that results from the machining.

STEP 3: OP-2 STOCK MODEL, THE SECOND TRANSFORM



Oh boy, this is going to look like a hot mess. Hold on…

Ok, remember, when you select a STOCK MODEL OPERATION, it shows up on the screen like a toolpath.

If I select Operation #6, the purple stock model shows up.

Follow the STOCK MODEL PLANES. I made copies of the PART MODEL and the STOCK SOLID MODEL and repositioned them on every side of the tombstone. This is how you would normally reposition your PART MODEL that you are machining and create the stock you are working with.

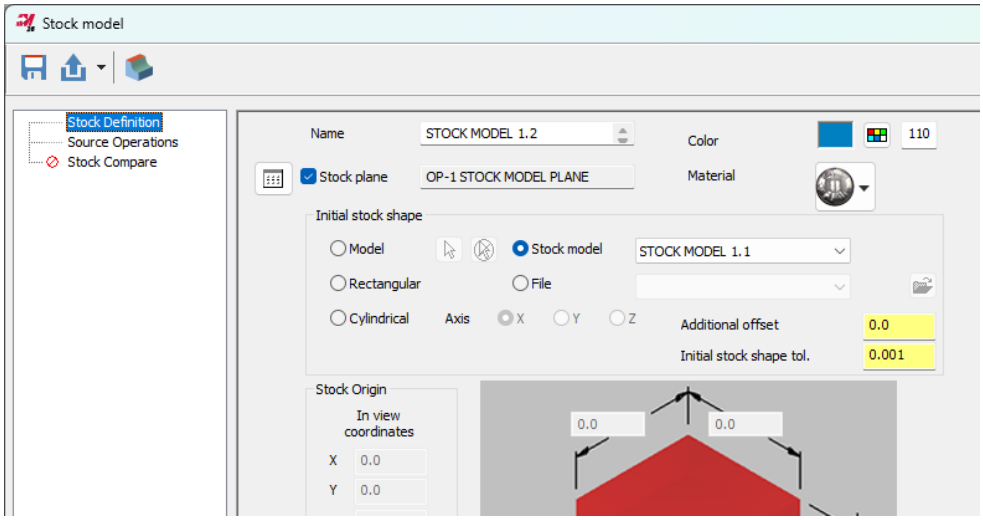
This is just how I decided to make this part. Each operation has a TOOL PLANE for the machining. This is just like you would normally do to machine a part.

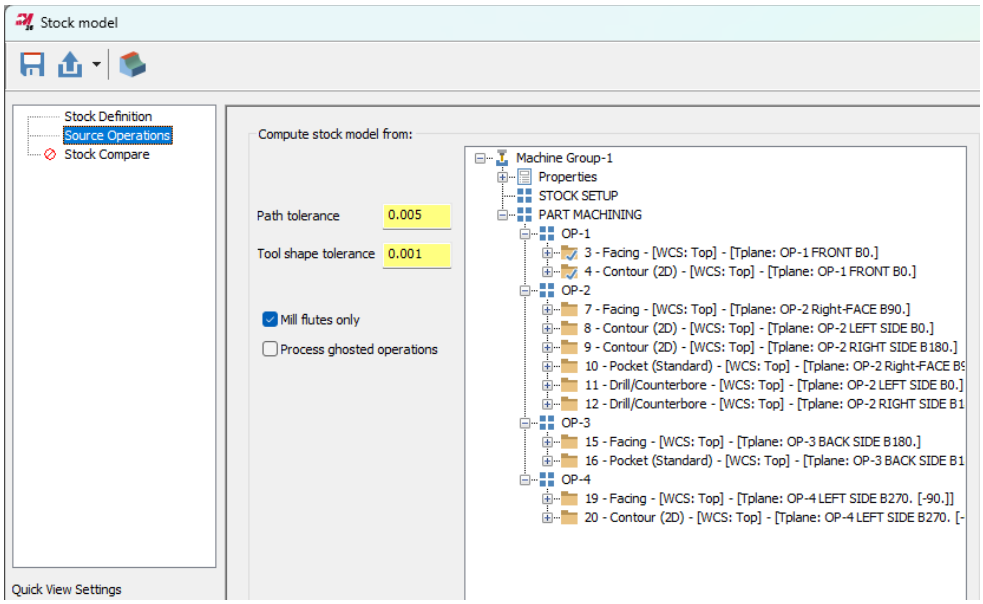
BUT, we need to pay attention to the STOCK MODEL PLANES. These are incremental from the previous one and are just for the STOCK MODEL OPERATIONS.

This is so you can track the machining of your part all the way through your four operations.

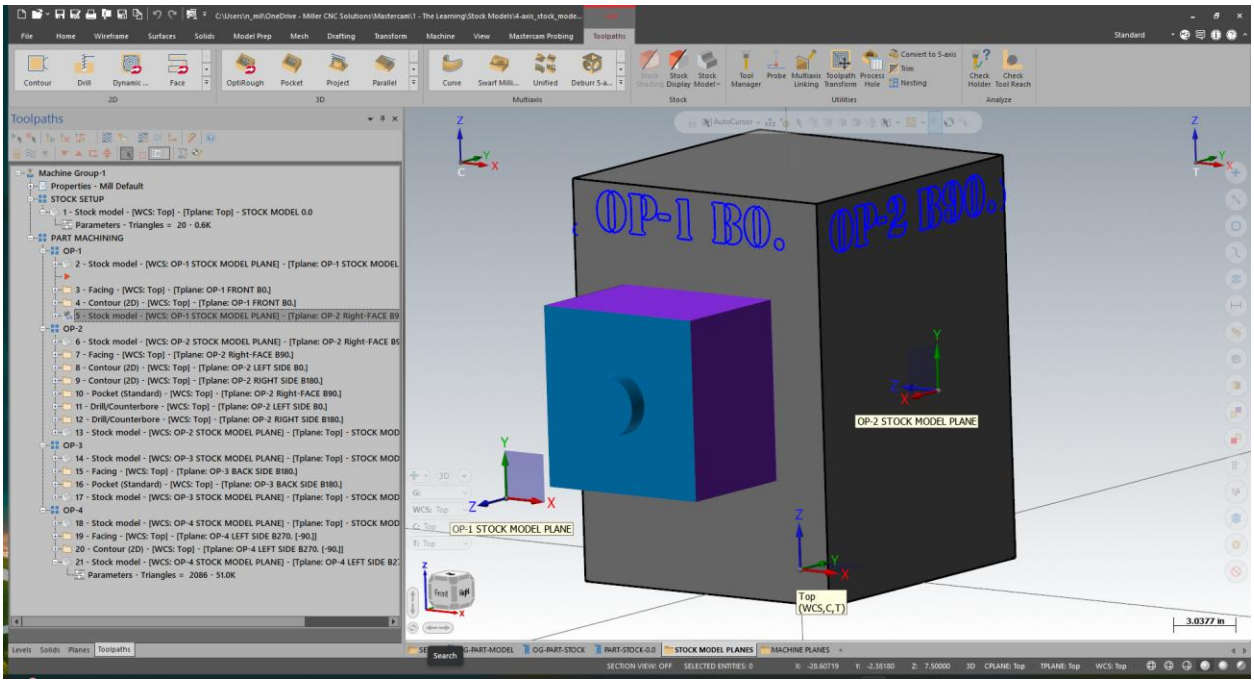
The beauty is that everything is now relational. If you change a feature or operation on OP-1 and you are rest-roughing on OP-3, those dependent operations will go dirty and you can regenerate them to update. Plus, if you mess something up on OP-1, it will show up on the following operations. A little flag that let's you know "hey, you messed up back there."

1- Ok, so look at how we moved the STOCK MODEL PLANE from TOP to OP-1.
2- Now, look at how we need to move OP-1 to OP-2. Rotate around Y and then move to the new position. It matches the PART MODEL and the SOLID STOCK MODEL. When we do our STOCK MODEL operation, it will follow this incremental move from OP-1.
3- Ok, first create your OP-1 finish STOCK MODEL operation.
4- Your INITITAL STOCK SHAPE is what you started with before machining (STOCK MODEL 1.1) in this case.
5- Your stock plane remains the same.
6- Your source operations are the machining operations that occur between this finished model and the INITIAL STOCK SHAPE.



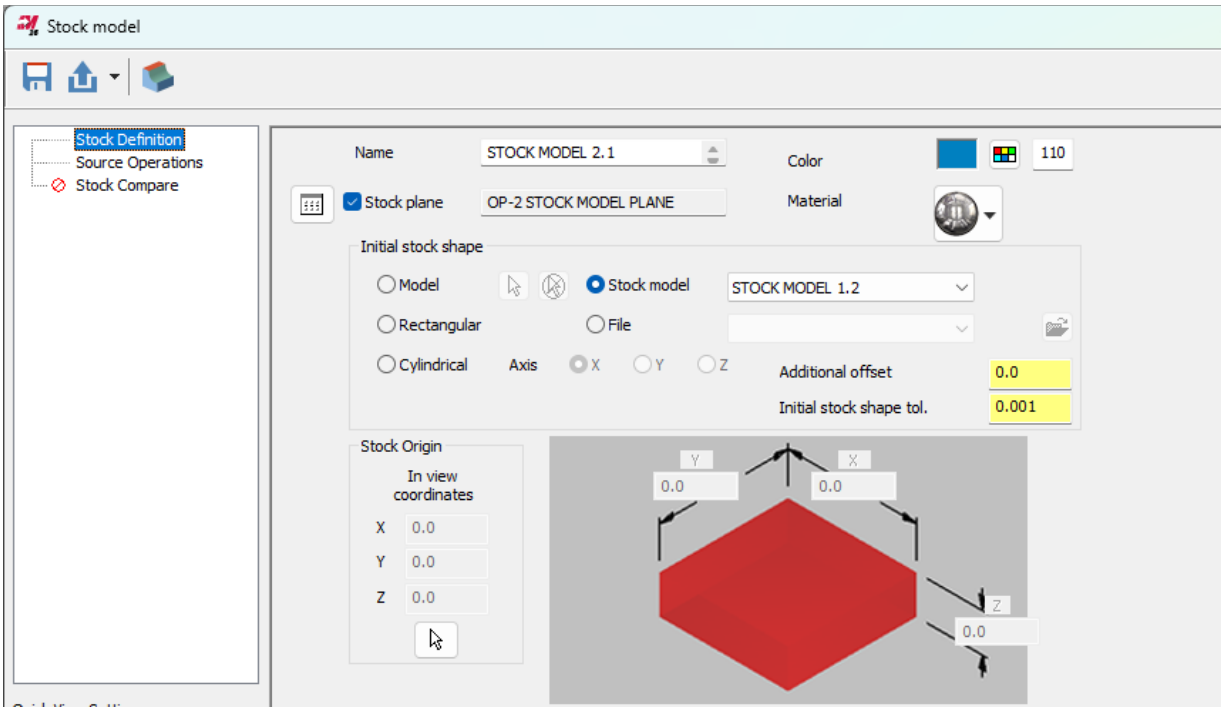


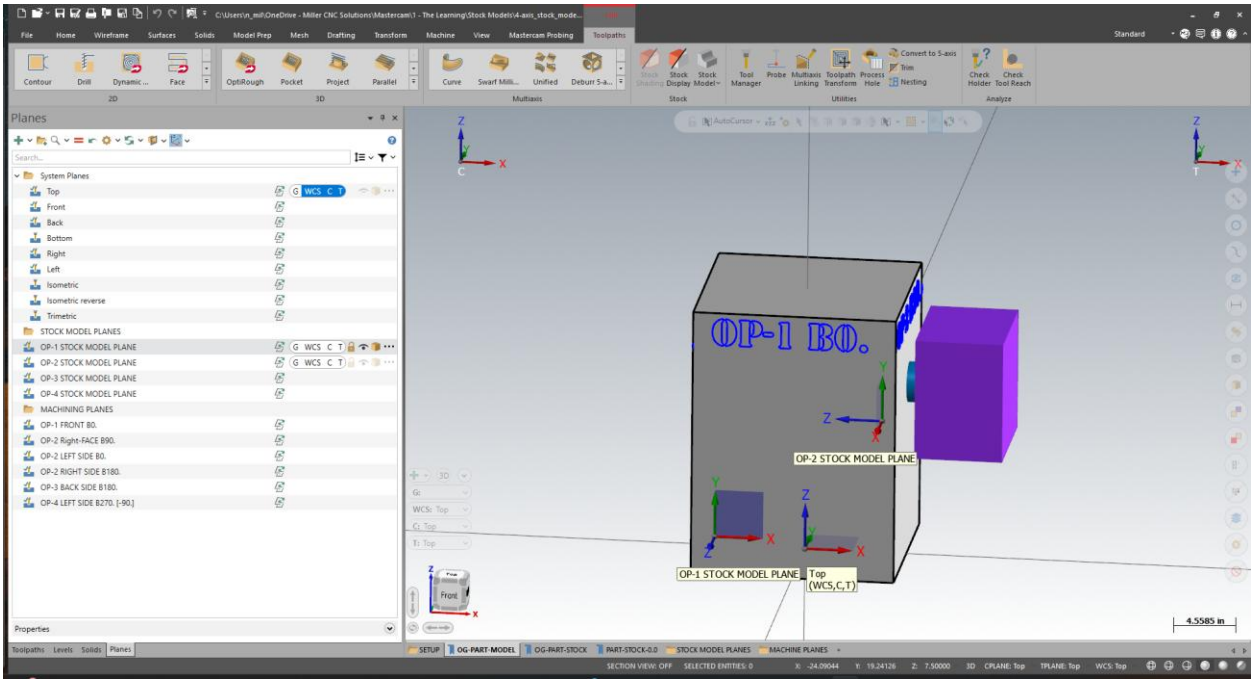
7- Here is what you should get. When selected, the stock model should show up.



Now, this STOCK MODEL shows what you started with and what is left after OP-1 machining is complete.

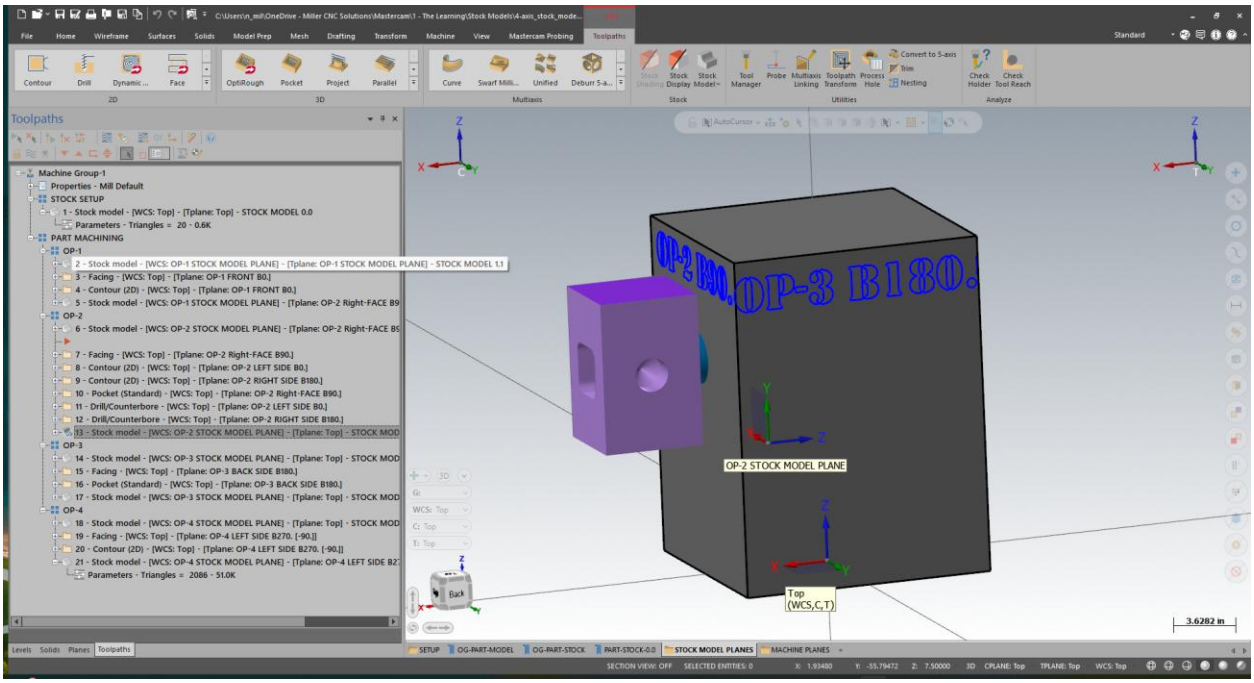
8 – Make your next STOCK MODEL operation, which will simply teleport this model into the position you defined in your STOCK MODEL PLANE for OP-2.



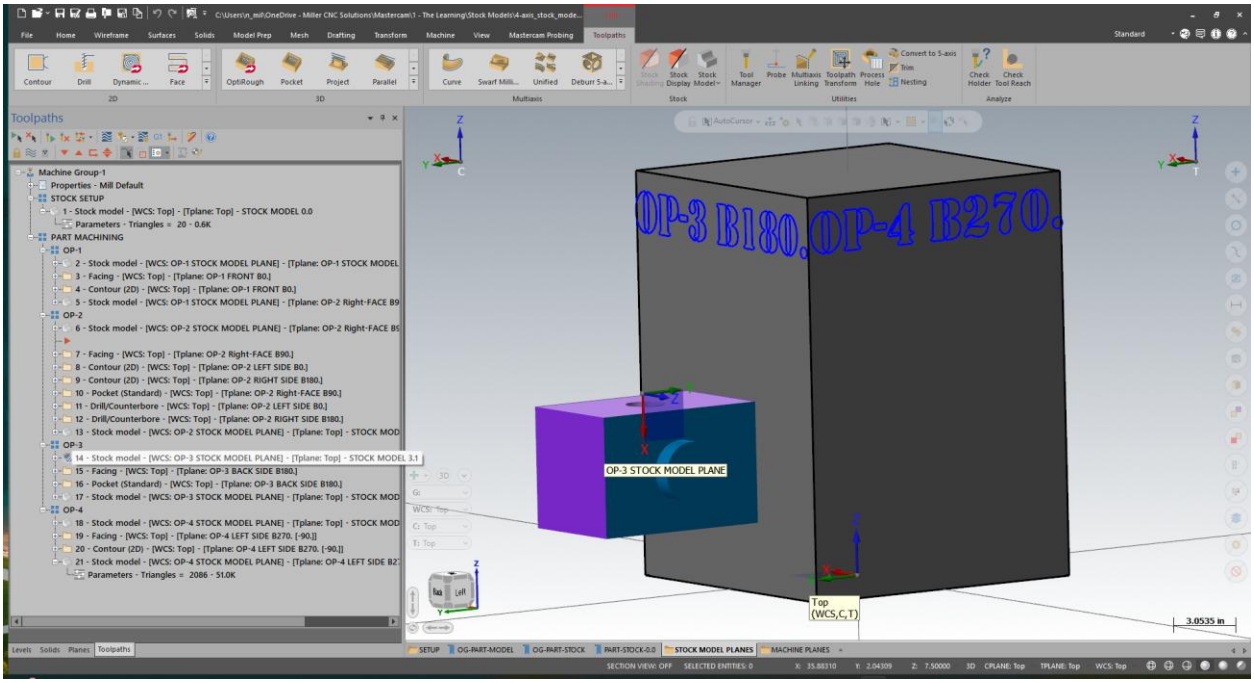


Now, your OP-2 stock model should have OP-1 features machined on it and be teleported according to the OP-2 STOCK MODEL PLANE you created.

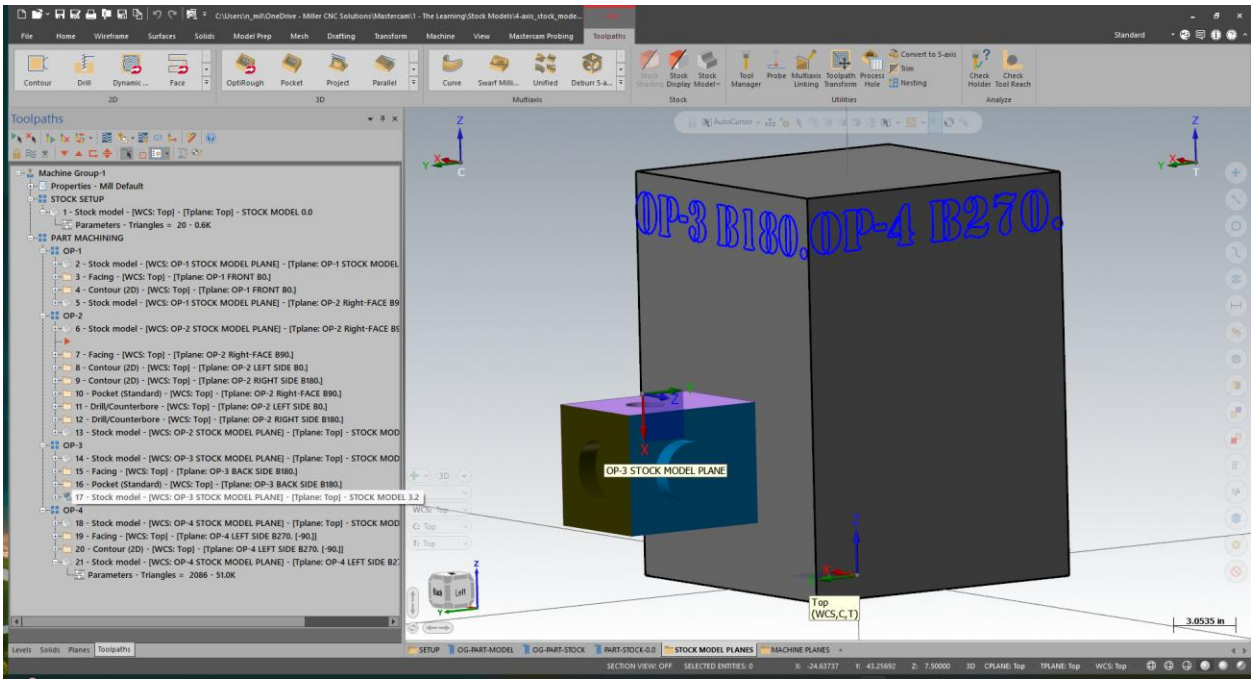
STEP 4: REPEAT



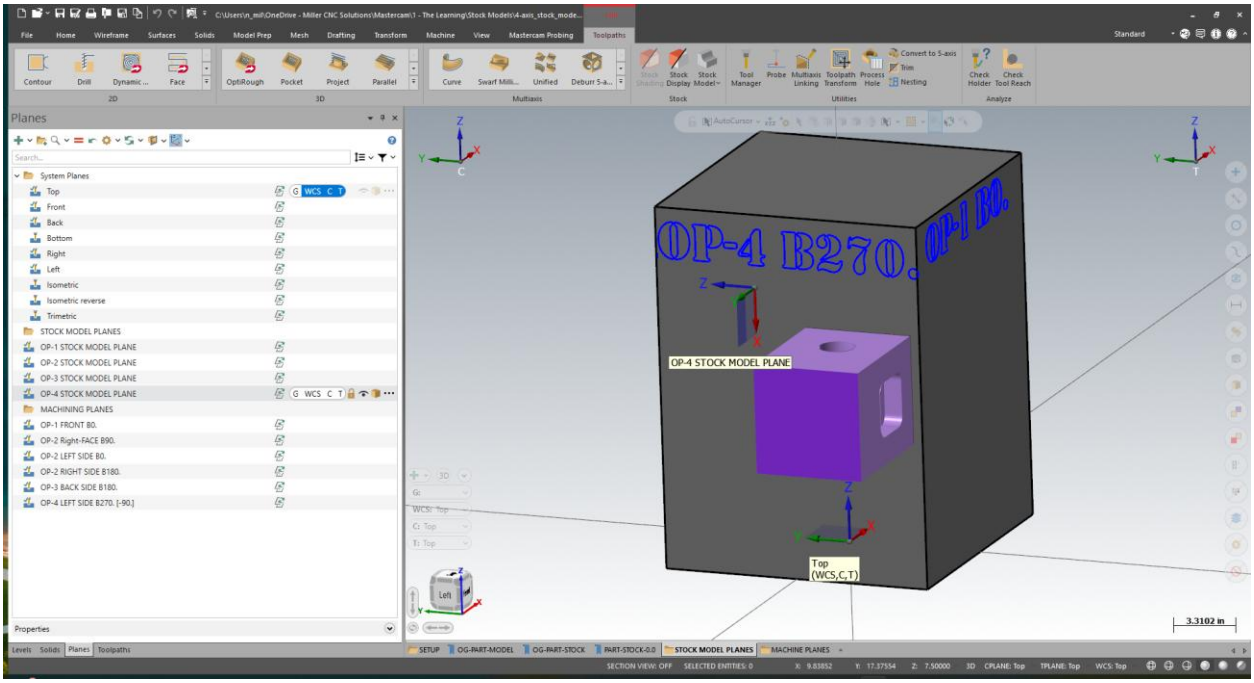
OP-2 finish machined STOCK MODEL.



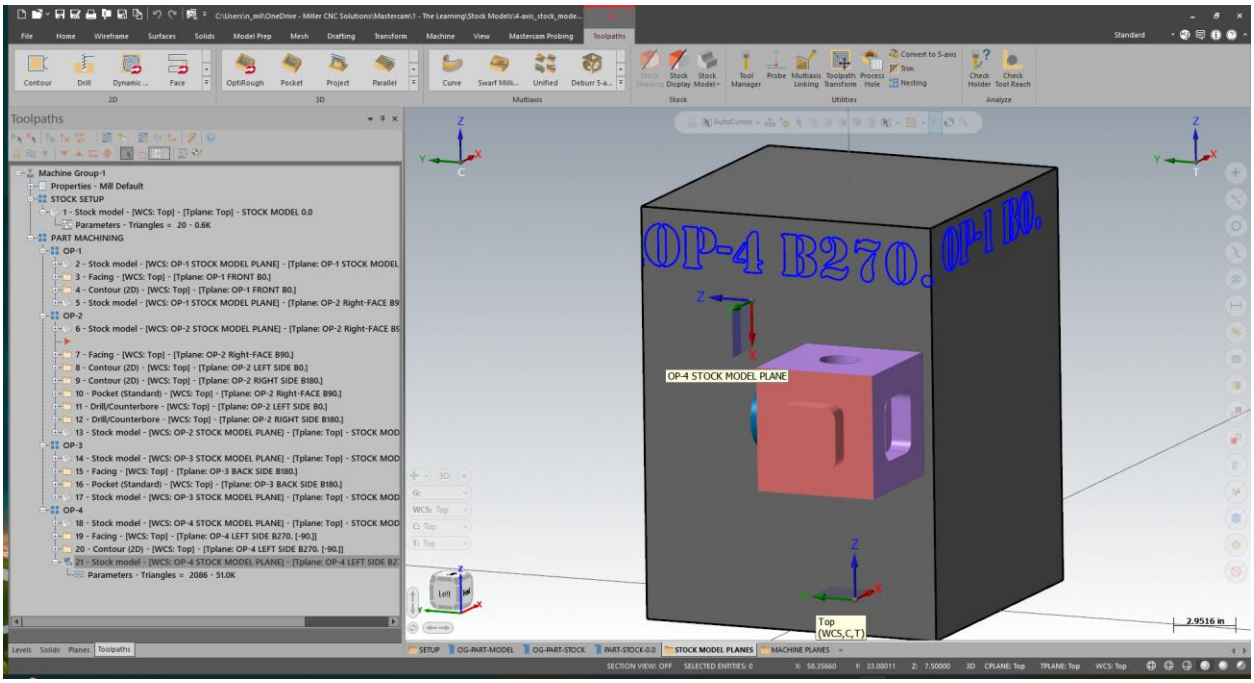
OP-3 starting STOCK MODEL (OP-2 STOCK MODEL teleported).



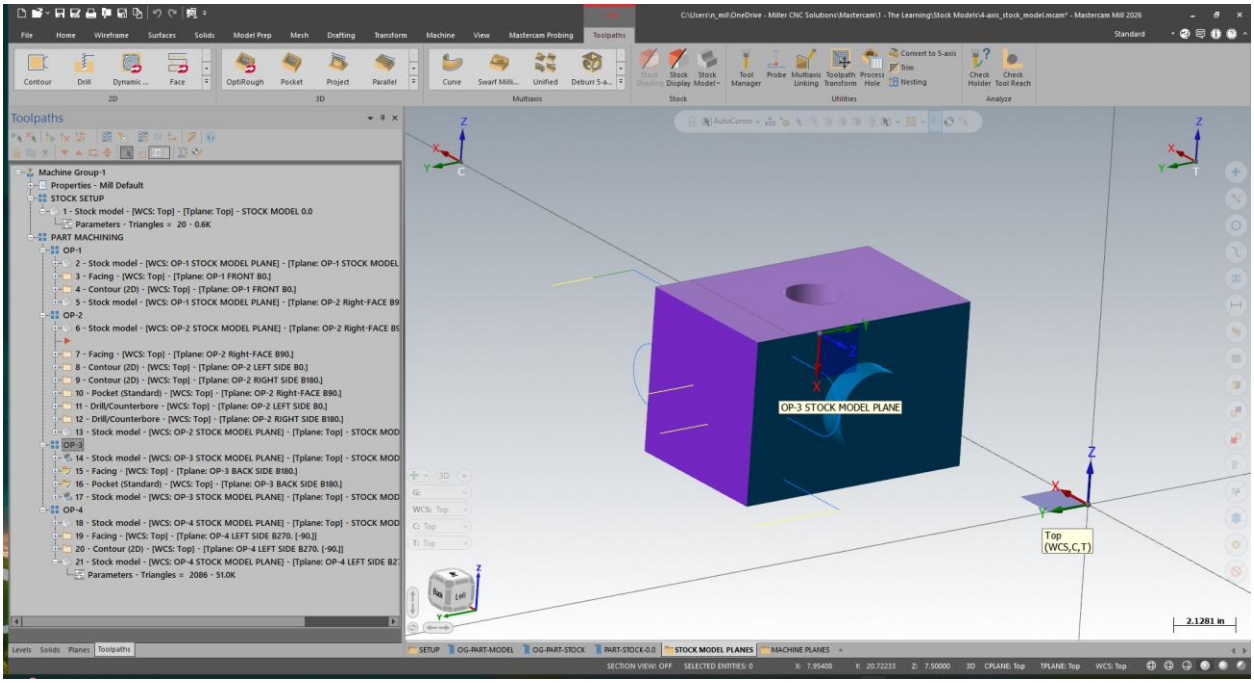
OP-3 finish machine STOCK MODEL.



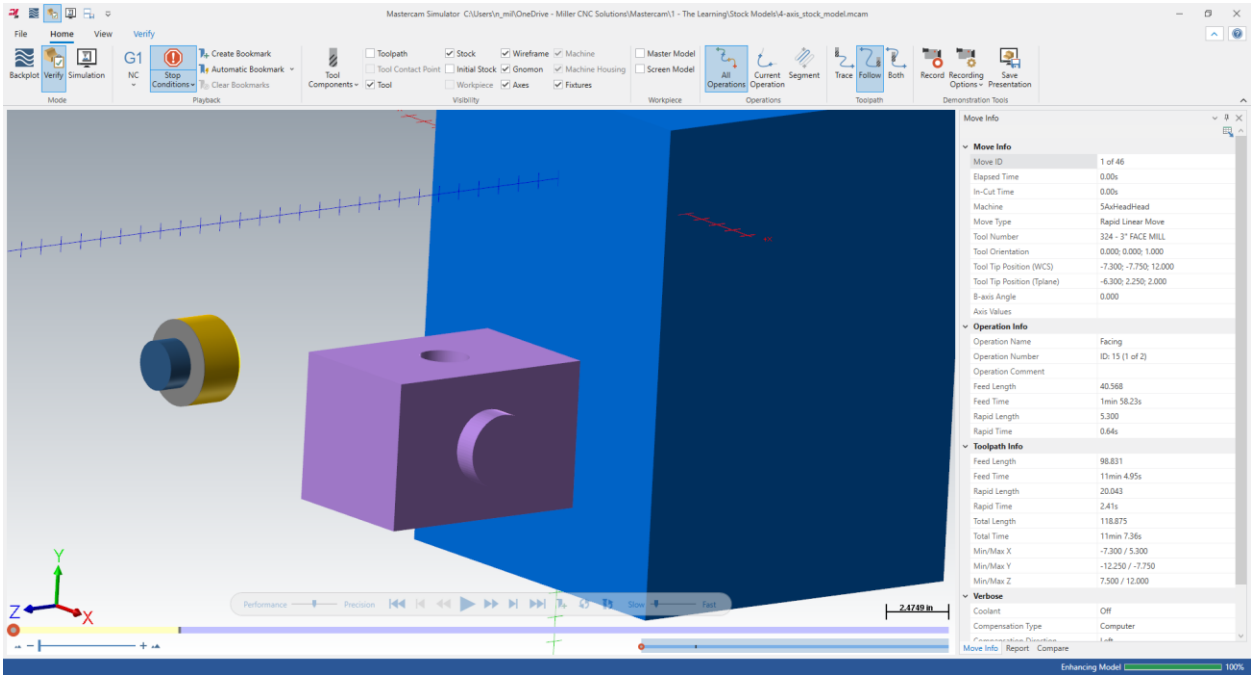
OP-4 starting STOCK MODEL (OP-3 finish STOCK MODEL teleported).



OP-4 finish machine STOCK MODEL.



Now, if you select all OP-3 operations, the STOCK MODEL comes in with your fixture, and you are up and running. If you modify something in OP-2 and **regen everything**, OP-3 and OP-4 will update. Now, all operations are linked.



Closing thoughts:

1- Organize your stuff.
    a. Folders and labels for your Levels, Planes, Solids, Toolpaths.
2- Separate STOCK MODEL PLANES.
    a. Used only for STOCK MODEL teleporting.
    b. These are NOT used as Tool Planes. I mean, I guess they could be, but don't.
3- Everything is INCREMENTAL.
    a. Start with some models at WCS zero, TOP-TOP-TOP.
    b. Make your moves from there.
    c. You can translate and rotate the STOCK MODEL in one shot. Wherever that new plane is, that's where it's going.
    d. Each set of operations or sides of the tombstone should have TWO STOCK MODEL operations.
        i. One at the beginning that is just the teleport operation.
        ii. One at the end that is the model after all previous machining operations are done.
        iii. You can have more STOCK MODEL operations, but you need at least the start and the end ones.

It's difficult to keep things straight when you have multiple setups and sides of a tombstone with a part that has 100 – 200 operations. When you change a roughing operation on OP-1 that changes your rest-roughing material on OP-4, it kinda matters. Doing it this way will make the STOCK MODEL operations and any dependent operations on OP-4 go dirty. It's a clear sign that something has changed and you need to check it and regen it.

Then, you can run it through verify and check for collisions. Maybe the tool shank hits now and it didn't before. Maybe your depths don't get all the stock anymore. Maybe they gouge into too much stock. This will show it.

Good luck. The end.

Credits: These guys helped me piece this all together, many thanks.

Chris Kozell (Okuma America Corporation)

Jamie Boyd (Mastercam)

These video channels have a lot of helpful information:

MLC CAD Systems, Virender Singh Bhati, Mastercam (The Youtube)