Custom Rugged Box OpenSCAD Documentation

What

This rugged box is loosely based off "https://www.printables.com/model/258431-rugged-box-parametric" but completely written from scratch in OpenSCAD. So, it can be customized either in the OpenSCAD software (downloadable here) or in the Bambu Labs customizer found "https://makerworld.com/en/models/788747" (I'm sorry Prusa, but the Bambu customizer is really nice!). I've also pre-rendered a bunch of versions so anyone can quickly download a version and print it, just to get started.

With this rugged box you can customize almost anything…

- Polygon Level (Extra Low Poly, Low Poly, or Curved corners and chamfers)
- Dimensions
- Add Stackable Feet
- Rim Size
- Rib Size
- Number of Ribs
- Hinge Size
- Number of Hinges
- Latch Size
- Number of Latches
- Gasket and Non-Gasket versions
- Dynamic Internal Separators
- Screw Size and Length
- Chamfer Radius
- And MORE… 62+ parameters of possibility

See the uploaded "CustomRuggedBoxSettingDocumentation.pdf" for a description and examples of ALL the settings.

When generating the STL files, you can generate 1 or all the object that make up the box via the setting (Box Bottom, Box Top, Latches, Feet, Water Resistant Gasket, Bottom Box TPU inert Template, and Top Box TPU insert Template). If you generate multiple objects at the same time, you can split them in the slicer via the "Split into Object" button in Prusa, Bambu, or your slicer of choice. This will separate the objects into independent items.

Prusa

Bambu
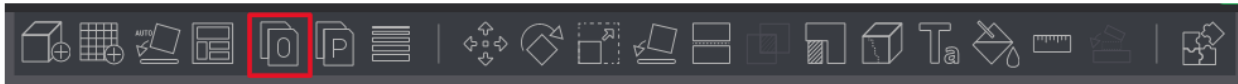
Quick NOTES:

NOTE 1:
You may need to update some of the tolerances depending on how good your printers are. I test printed these on my Ender 3 V2 and Sovol SV01, so it's likely your tolerances may need be tighter than that are for my pre-generated models. They should all still work well for most if not all printers, but you could tune them if you want to.

NOTE 2:

I did not pre-generate any modes with gaskets. If you want to use the gasket versions, I recommend first printing the gasket test objects to tune your gasket for your printer (see "Gasket Recommendations" section).

NOTE 3:

I have not added a lot of protections to the parameters. You can do almost anything, but that also means that if you make a parameter to big or too small in relation to the other parameters you may get something that doesn't even look like a box. Unfortunately, this is just one of the side affects of a very very dynamic model.

Why Another Rugged Box?

Well, I guess a couple of reasons…

1) I'm a control freak! I wanted a version of the rugged box where I could make any change that I wanted. Which is why there are LOTS of parameters (62 to be exact).
2) I wanted to be able to change ANYTHING by just changing the settings.

3) I wanted to publish something anyone could have access to and use. I assume most of us out here are 3D printing for a hobby and don't have thousands of dollars a year to spend on ridiculously expensive CAD software. So, I wanted to publish something **OPEN** to anyone. Hence OpenSCAD!
4) I just wanted to see if I could do it.
5) I have future plans for this model, so stat tuned!!! 😊

Quick OpenSCAD Code Apology :-/

Designing models with OpenSCAD is… well… let's say challenging, and sometimes really really frustrating. This is especially true when making parametric models that can have conflicting settings. This model (at the time of writing) has 62 user adjustable settings!! That's A LOT!!! So, I'm sure there are some settings that can be set in a way that conflict with other settings. I've done my best to validate that most reasonable settings will work together. If you find something that doesn't work that you feel should, feel free to let me know. I will try to prioritize fixing it along with all my other personal responsibilities. But I cannot make any promises (sorry, life gets in the way sometimes).

Also, some of this code (or a lot of it) was written really late at night and maybe after a few (many) beverages. Yeah, now you know why my grammar and spelling sux!! Plus, yes, I realize the code is not as organized/clean/etc. as it should be… But let's face it… no one is likely to actually read it 😊

Anyway, I will do my best to fix and update the model as I find issues.

Gasket Recommendations!

If you are going to print the gasket version of this model, I highly recommend that you print the test gasket rim and gasket via the **generateGasketTestObjects** option. This will allow you to print a sample gasket in TPU and a sample box rim to test the fit of your selected tolerances. Then you can adjust the tolerances and re-print until you find the gasket settings that you think will work best. This will minimize the waste (and time) if your tolerances are tighter or looser than mine.

Also, when using the gasket version you may need to loosen up the latches a bit by either of the following:

1) Make the latchScrewLargeRadiusMm larger
   OR
2) Make the latchClipCutoutAngle larger
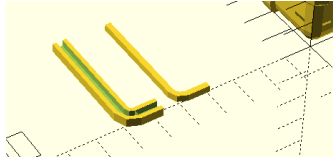
Pre-Generated STLs

I have pre-generates a set of STLs that I thought might be useful and **demonstrate the possibilities of this OpenSCAD model**.

In this model I have mostly pre-generated a set of boxes that are mostly Low-Poly, stackable (with feet), and have a 4mm chamfer. Plus, a few other smaller boxes just to prove that almost any size/shape box can be generated.

As I mentioned above, the gasket's tolerances should be tested on your specific printer, so I did NOT pre-generate any gasket cases.

The settings for all the pre-generated models has been uploaded vis a "RuggedBoxV1.json" or "RuggedBoxV1.txt" depending on if you are on the Prusa or Bambu Site.
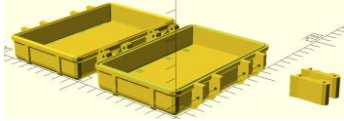
General file naming scheme:
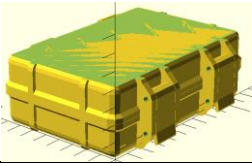
[Object(s)]_[PolyLevel]_[InternalWidthX]x[InternalLengthY]x[InternalBoxBottomZ]x[InternalBoxTopZ]_[ScrewLength]x[ScrewWidth]mmScrews_[OptionalXandYSectionCounts]_[IfitHasFeetOrNot].stl

Settings

View and Layout Options
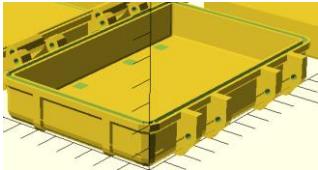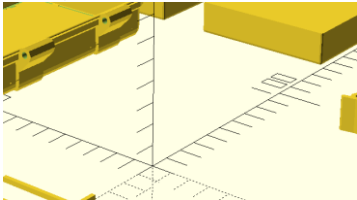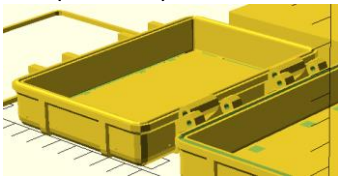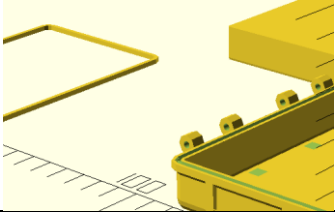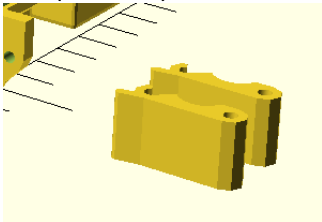
These settings control how the box is viewed
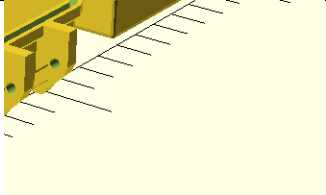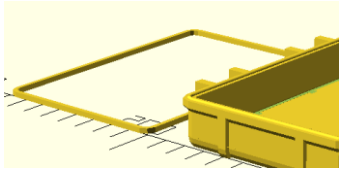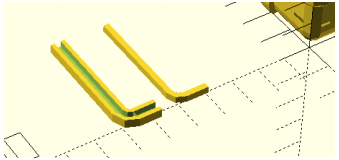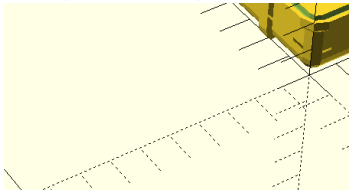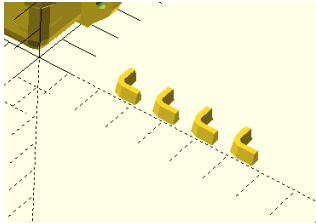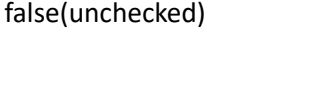
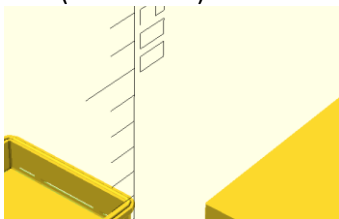| Setting	Default	Description	Example
viewBoxClosed	false	This option controls if you want to view the box closed or open. False = the box will be open, and everything will be on the build plate. True = view the box closed and latches in place (but the feet	false(unchecked)
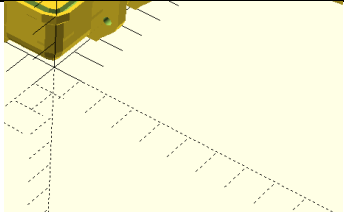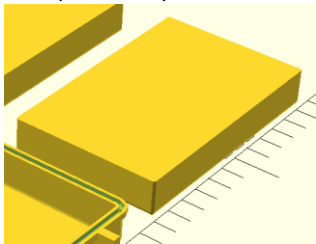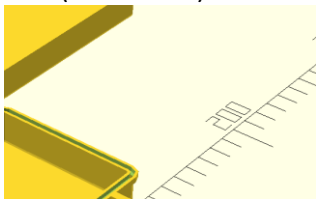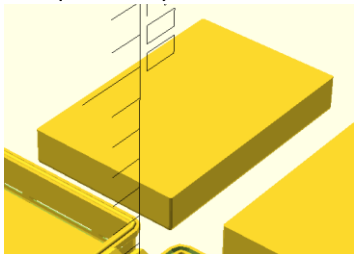
| | | and TPU inserts will remain separate). | true(checked) |

Objects To Generate

These settings indicate what components of the box you want to generate.

Setting	Default	Description	Example
generateBoxBottom	true	Should the bottom of the main box be generated	true(checked) false(unchecked)
generateBoxTop	true	Should the top of the main box be generated	true(checked) false(unchecked)
generateLatches	true	Should the latches be generated	true(checked) false(unchecked)

generateGasket	true	Should the gasket be generated. **NOTE**: The gasket will still only be generated if the boxSealType is = 1 (Gasket)	true(checked) false(unchecked)
generateGasketTestObjects	false	Use this option to generate a test gasket and casket insert. This is so you can do a small print to test your tolerances before printing a full box. You will need to separate/split the in the slicer and print them one at a time. This "sample case rim(where the gasket will be inserted)" in your filament of choice, and the gasket itself in TPU.	true(checked) false(unchecked)
generateFeetIfSetInSettings	true	Should the feet be generated. This has NO effect on if the feet cutouts are added to the box top and bottom. Those settings are below... This just determines if the	true(checked) false(unchecked)
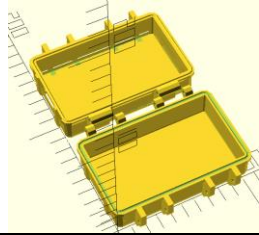
		feet themselves get generated.	
generateEmptyBottomBoxTPUInsert	false	For empty box bottoms (boxes with no divider/section) should we generate a blank insert for later customization.	true(checked) false(unchecked)
generateEmptyTopBoxTPUInsert	false	For empty box tops (boxes with no divider/section) should we generate a blank insert for later customization.	true(checked) false(unchecked)
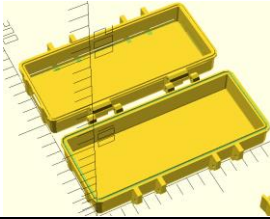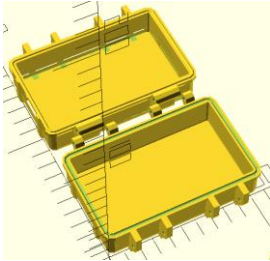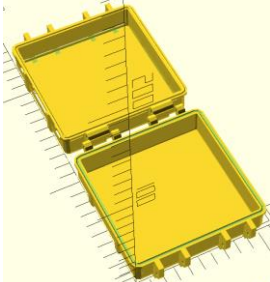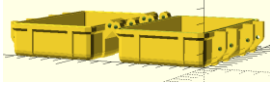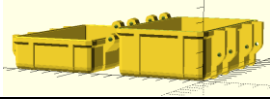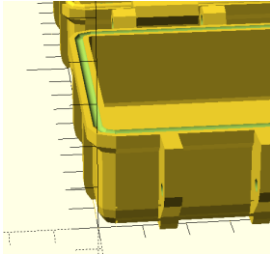
Poly Level Option
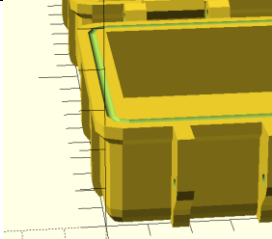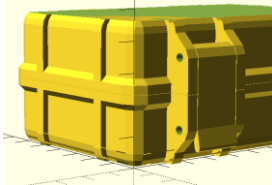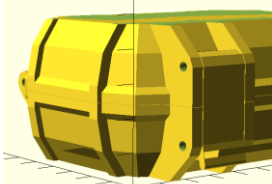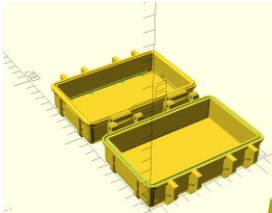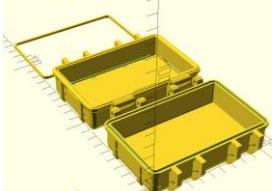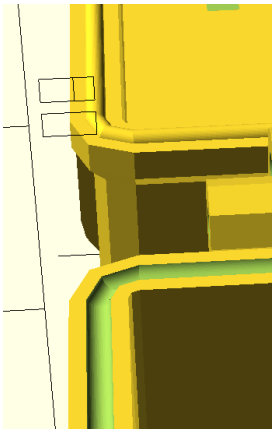
Setting	Default	Description	Example
BoxPolygonStyle	2	1 = Extra Low Poly 2 = Low Poly 3 = Curved	1 = Extra Low Poly
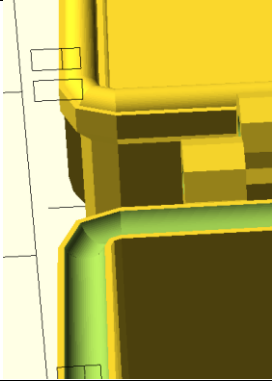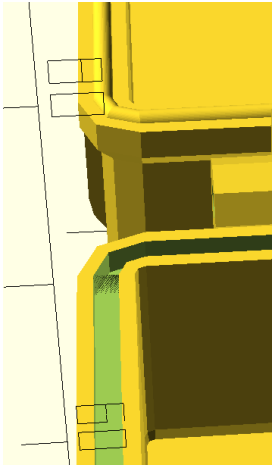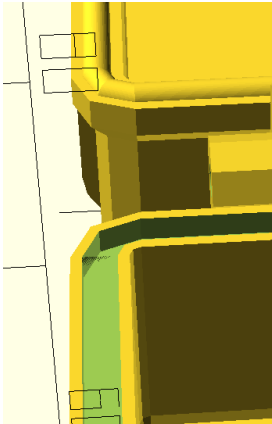
			2 = Low Poly
			3 = Curved
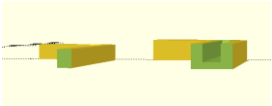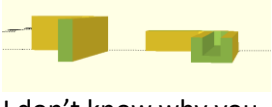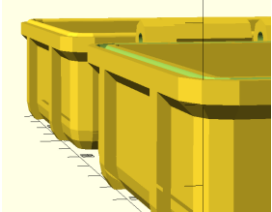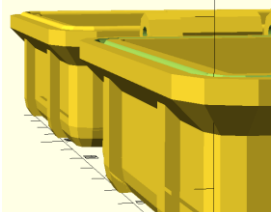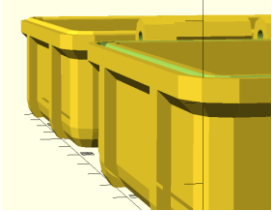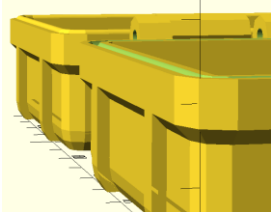
Main Box Settings
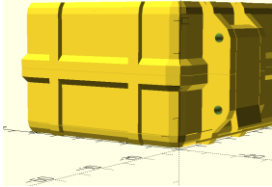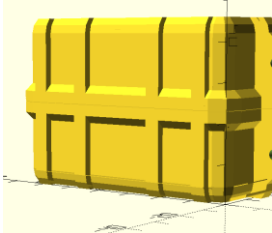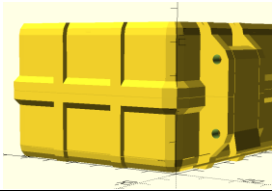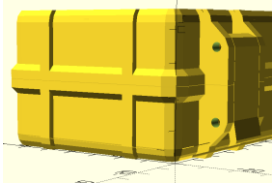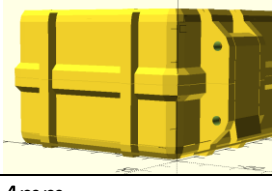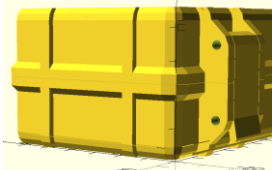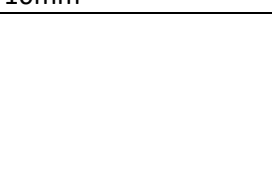
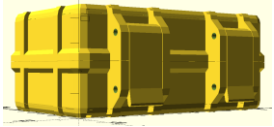| Setting	Default	Description	Example
internalBoxWidthXMm	100 mm	The width(X) of the inside box wall in MM	100 mm
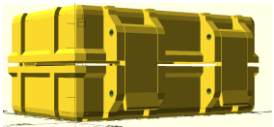
			150 mm
internalboxLengthYMm	60 mm	The length(Y) of the inside box wall in MM	60 mm 100 mm
internalBoxTopHeightZMm	20 mm	The internal height on the box top	20 mm 30 mm
internalboxBottomHeightZMm	20 mm	The internal height on the box bottom	20 mm 30 mm
boxWallWidthMm	3 mm	The width on the box wall and floor. **NOTE:** If you want square inside corners, the boxWallWidthMm must be > the boxChamferRadiusMm.	3 mm 6 mm

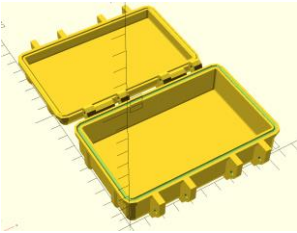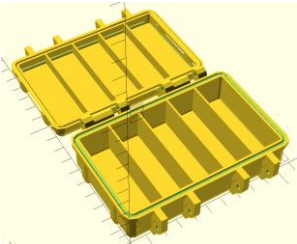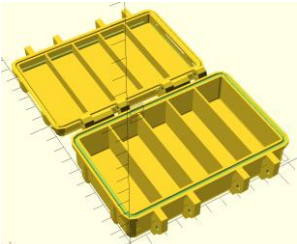|			
boxChamferRadiusMm	4 mm	The chamfer radius of the boxes corners. **NOTE1**: the floor/top radius is slightly differentthan the sides to eliminate the need for supports. **NOTE2**: If you want square inside corners, the boxWallWidthMm must be >= the boxChamferRadiusMm.	4 mm 18 mm
boxSealType	1:Circular Non-Gasket	The type of seal for the case. 1 = Circular Non-Gasket (less water resistant) 2 = Gasket type seal (more water resistant)	1: Non-Gasket 2:Gasket
boxCircularSealRadius	1.1mm	The radius of the seal **NOTE**: 2*boxCircularSealRadius MUST be < the (boxWallWidthMm+rimWidthMm)	1.1 mm 2 mm

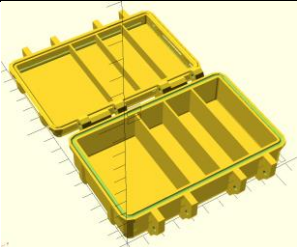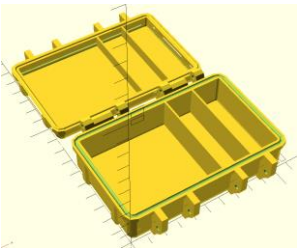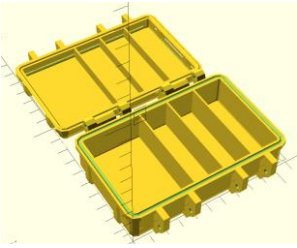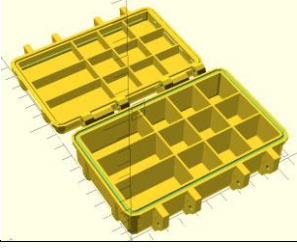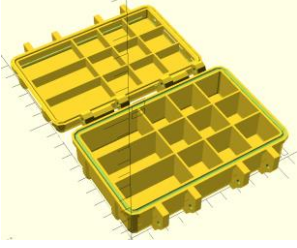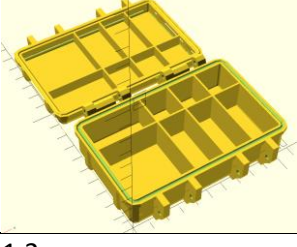|			
gasketSlotWidth	2.2 mm	The with of the slot that holds the gasket for a water resistant seal. Only used if boxSealType = 1(Gasket) **NOTE**: The gasketSlotWidth MUST be >= 2* boxCircularSealRadius	2.2 mm 3 mm
gasketSlotDepth	2.2 mm	The depth of the slot that holds the gasket for a water resistant seal. Only used if boxSealType = 1(Gasket)	
gasketTolerance	0.2 mm	The tolerance subtracted from the actual gasket size do it will fit into the slot. Only used if boxSealType = 1(Gasket)	

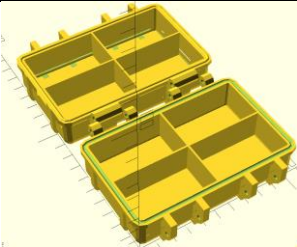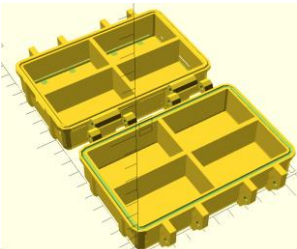| additionalGasketHeight	0.1 mm	If you feel like you need to add some additional height to your gasket (so it protrudes out of the gasket slot) to make sure you get a good seal, you can add that here. By default, I have set this to the same value as the opening tolerance	0.1 mm 3 mm I don't know why you would ever set this to anything more that 0.2. This is just an example to see what it would do to the gasket.
rimWidthMm	2 mm	The width of the rim that goes around the case opening	2mm 4mm
rimHeightMm	3 mm	The height of the top/bottom rim that goes around the case opening (This excludes the rim chamfer which is just a 45 degree angle)	3mm 6mm
numSideSupportRibs	2	Number of side ribs on the side	2

			4
ribCenterOffsetMm	5 mm	The offset from the center for the side ribs (moves the ribs away from the center)	5mm 0mm
supportRibThickness	2 mm	The thickness of the side ribs, you probably want this to match the rimWidthMm. This is the thickness of the rib from the box wall.	2mm 4mm
supportRibWidth	4 mm	The width of the side rib along the wall	4mm 10mm

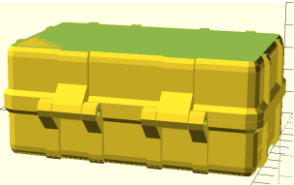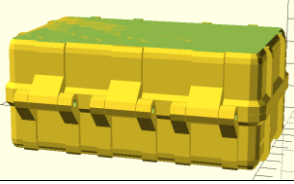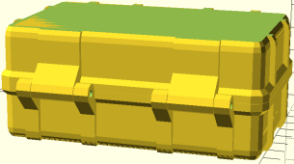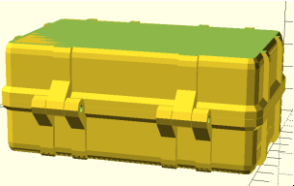|			
openingTolerance	0.1 mm	The tolerance/separation between the top and bottom box sections	0.1mm 2mm Again, why you would do this I have no idea, but it's just the example.

Settings for adding dividers
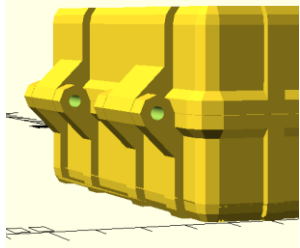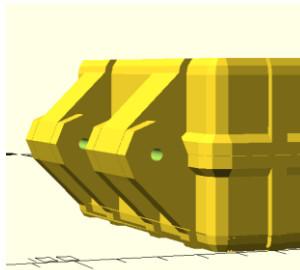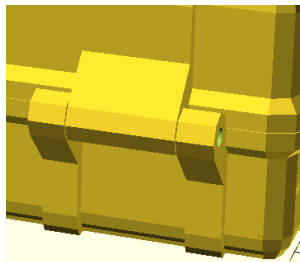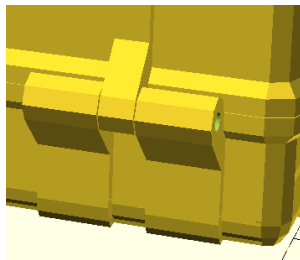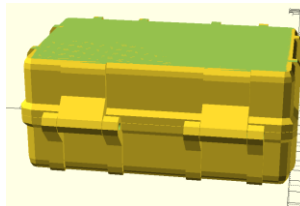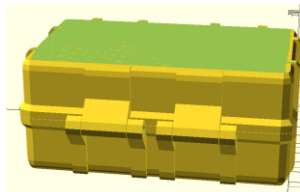
Setting	Default	Description	Example
countainerWidthXSections	1	The number of horixontal sections (the number of dividers = countainerWidthXSections - 1)	1 5
numCountainerWidthXSectionsToSkip	0	This is the number of horixontal dividers to skip, this will effectively make a larger section followed by smaller ones	0 1

			2
boxLengthYSections	1	The number of virtical sections (the number of dividers = boxLengthYSections - 1)	1 3
numBoxLengthYSectionsToSkip	0	This is the number of virtical dividers to skip, this will effectively make a larger section followed by smaller ones	0 1
boxSectionSeparatorWidth	1.2 mm	The width of the divider walls	1.2mm

			3mm

Hinge Settings
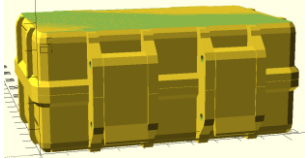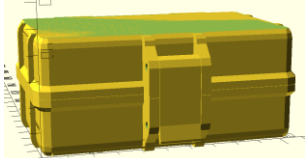
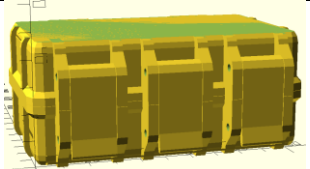| Setting	Default	Description	Example
numberOfHinges	2	The number of hinges	2 3
hingeTotalWidthMm	25 mm	AKA: Hinge Screw Length. The full hinge width. This is also the length of the screw you will need to assemble the case	30mm 20mm
hingeRadiusMm	4 mm	The radius of the hinge pivot	4mm
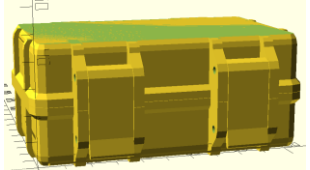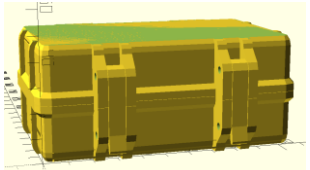
			8mm
			8mm
hingeOutsideWidth	6 mm	The width of the outside portion of the hinge connector	6mm 12mm
hingeCenterOffsetMm	5 mm	The number om MM you want to move each hinge away from center. If there is a middle hinge, that one won't move. **NOTE**: If you make this value too big, your hinge will no longer be connected to the box :-/	5mm -5mm

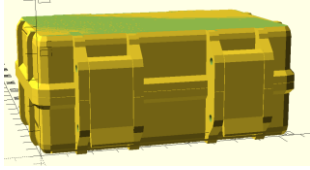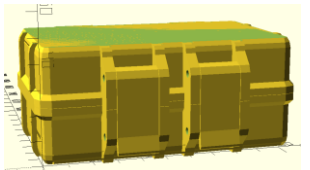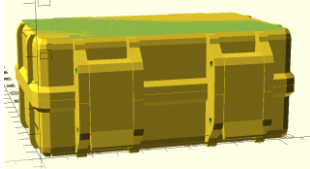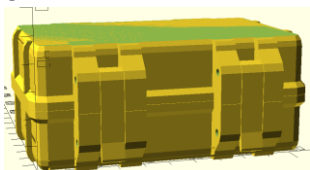|			
hingeScrewLargeRadiusMm	1.7 mm	The radius of hinge screw hole that does not get threaded and allows the hinge to pivot/rotate. These are screw size estimates. But your tolerances may be different. 2mm Screw=1.2 3mm Screw=1.7 4mm Screw=2.2	
hingeScrewSmallRadiusMm	1.45 mm	The radius of hinge screw hole gets threaded and holds the hinge together. These are screw size estimates. But your tolerances may be different. 2mm Screw= 0.95 3mm Screw=1.45 4mm Screw=1.95	
hingeToleranceMm	0.2 mm	The tolerance between all the hinge components. The small gap that allows the hinge to move.	

Latch Settings

NOTE: If you need to make the latch easier to open, first make the latchScrewLargeRadiusMm 0.1mm larger. This will give the latch a little more wiggle room around the screws. If that doesn't work, then adjust the latchClipCutoutAngle to something a little larger, something like 35-40. That will make it easier to clip and unclip.

Setting	Default	Description	Example
numberOfLatches	2	The number of latches to generate	2 1 3

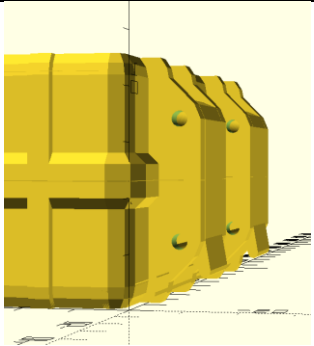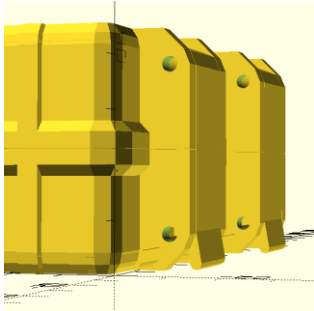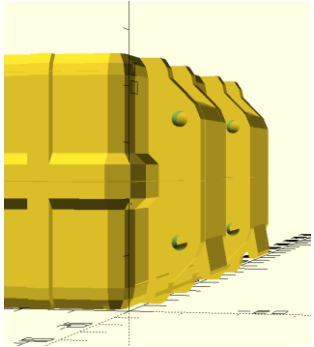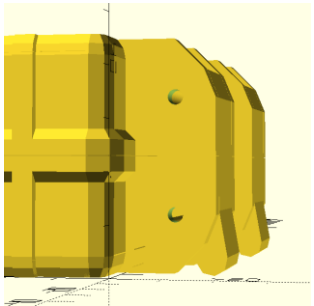|			
latchSupportTotalWidth	25 mm	AKA: Latch Screw Length. The total width of the latch. This is the length of the screws needed to assemble the latch.	25mm 15mm
latchCenterOffsetMm	5 mm	The number in MM you want to move each hinge away from center. If there is a middle hinge, that one won't move. NOTE: If you make this value too big, your hinge will no longer be connected to the box :-/	5mm -5mm
latchSupportWidth	4 mm	The width of the outside portions of the latch mount	4mm 8mm
latchScrewPositionPct	50%	The vertical position of the latch screw position. The position is calculated be the percentage of the top/bottom box heights.	50%

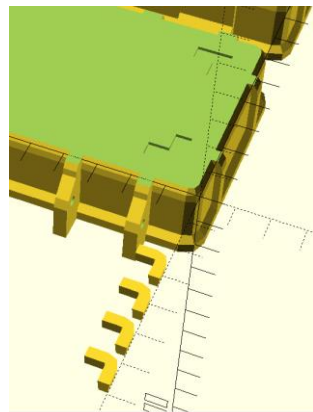|			
			70%
latchSupportRadius	4 mm	The radius of the latch pivot.	4mm 8mm
latchToloerance	0.2 mm	The tolerance of the gaps between the latch and the latch mount so the latch can move.	
latchScrewLargeRadiusMm	1.7 mm	The radius of hinge screw hole does not get threaded and	

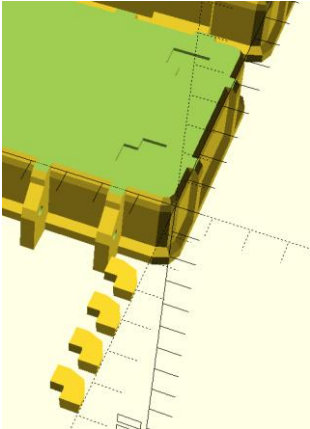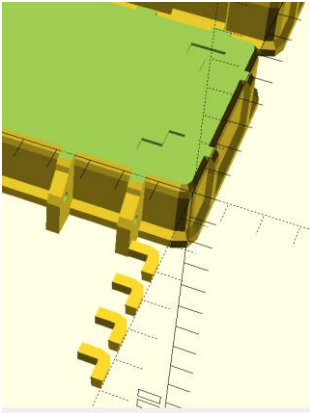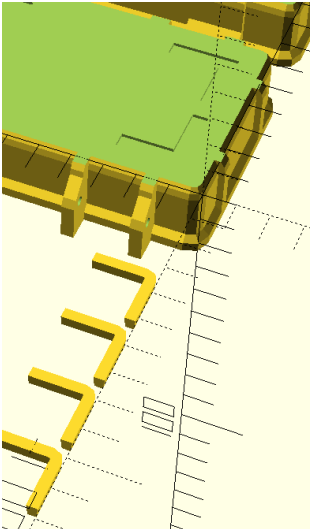|			
		allows the latch to pivot/rotate. 3mmScrew=1.7	
latchScrewSmallRadiusMm	1.5 mm	The radius of hinge screw hole gets threaded and holds the latch together. 3mmScrew=1.5	
latchOpenerLengthMultiplier	1.4	Controls the length of the tab that allows you to open the latch. 1 is pretty short, 2 is pretty long. It's easy to make this too short or too long... Somewhere between 1 and 2 seems like a good value.	1.4 3.0
latchOpenerAngle	10 degrees	This is the angle of the latch opener tab. The valid values are between 0 and 45 seem to be okay values.	10 degrees 40 degrees
latchClipCutoutAngle	25 degrees	Min: 10, Max: 50. The shallower the angle the Harder it will be to close, at 10 you probably won't be able to bend the latch	25 degrees

		enough to close it, as you approach 50, it may not hold very well.	
			40 degrees
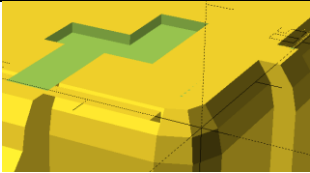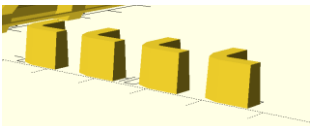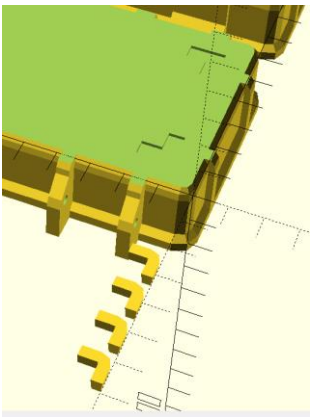
Settings for generating full case inserts
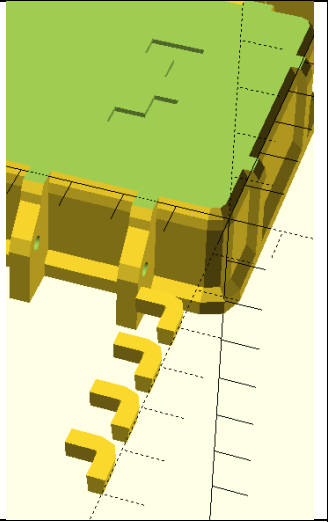
Setting	Default	Description	Example
insertTolerance	0.1 mm	The tolerance around the TPU insert that can be customized to hold random shapes	

Feet Settings

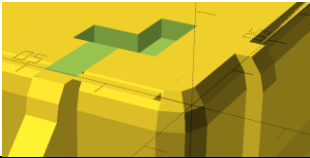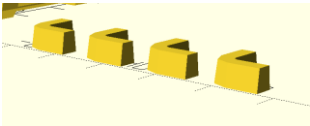| Setting	Default	Description	Example
isFeetAdded	False (unchecked)	Should feet be generated and the feet connections be cutout from the containet top and bottom. (NOTE: this will require some glue... sorry, no tome to create a snap-in connector)	
feetwidthMm	4 mm	The width of the feet	4mm

			6mm
feetLengthMm	10 mm	the length of the feet	10mm 20mm
feetInsertDepth	1 mm	the depth that the feet will insert into the top and bottom cases	1mm

			2.5mm
boxGapMm	1.5 mm	The gap size between the stacked top and bottom box. This will effectively increate the height of the feet.	1.5mm 4mm
additionaldistanceFrom WallAfterChamferMm	5 mm	The actual distance of the feet from the exterior wall(not including the rim) wall will be the boxChamferRadiusMm + additionaldistanceFromWallAfterCha mfer	5mm 15mm

footInsertToleranceMm	0.4 mm	The tolerance that allows the feet to be inserted into the box cutouts. This will depend on the quality of your printer, but 0.4mm should work for most without too much slop.	