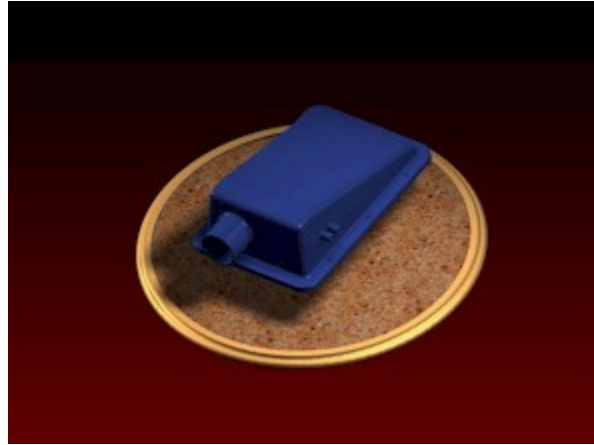


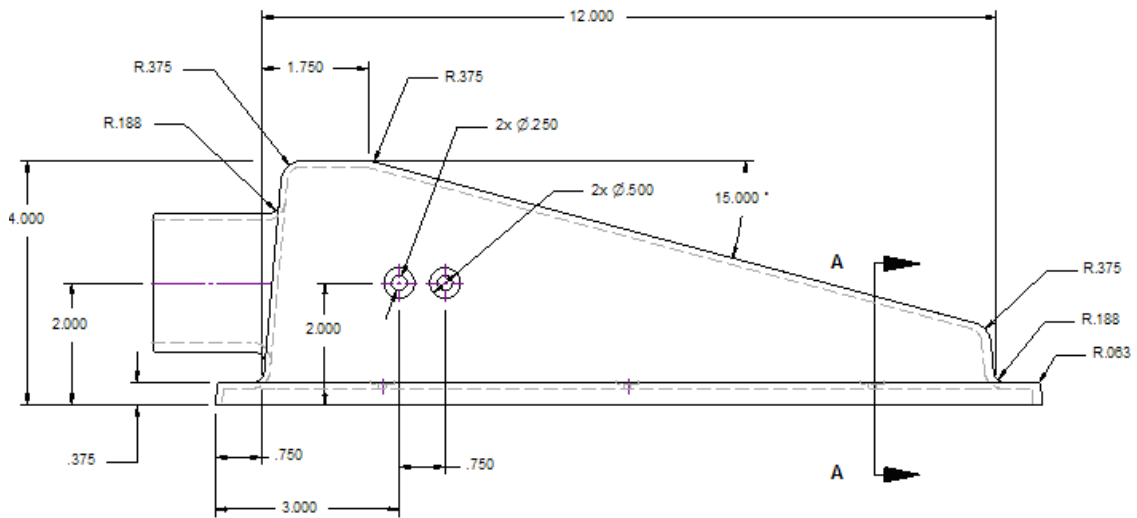
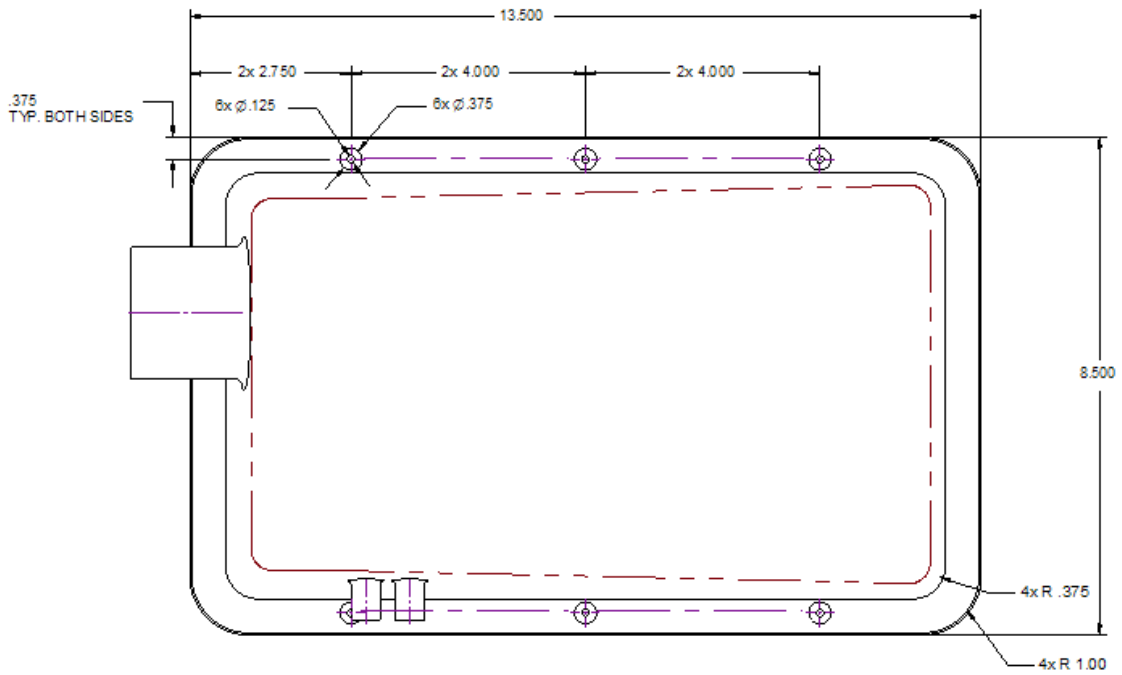
Filter Box
An Alibre Design Tutorial
By
CDS

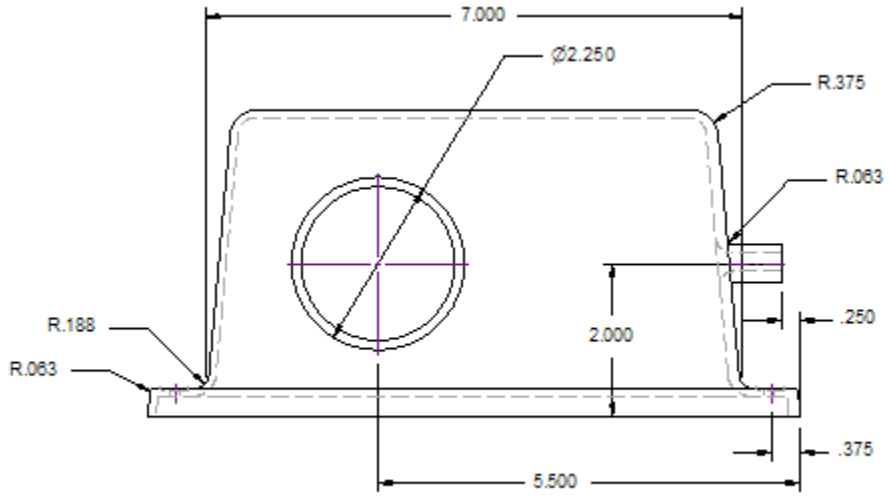


Written by Steve Carr
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@by CDS 05-29-06

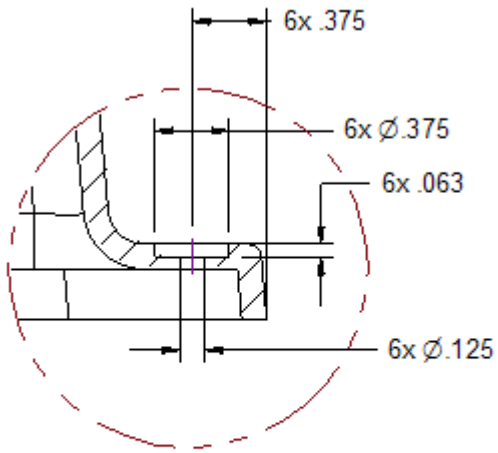
This tutorial will introduce you to many of the tools, workbenches, and methods you will use in your daily work. The part you'll create is an injection molded filter box. It should take less than two hours to complete. Many aspects of basic design work are touched on in this exercise, but no single tutorial can showcase all of the capabilities of Alibre. Please feel free to contact me with any corrections, or suggestions on ways to improve the material.

The following drawings will give you all the information required to create the Filter Box and serve as a reference in the part design process.





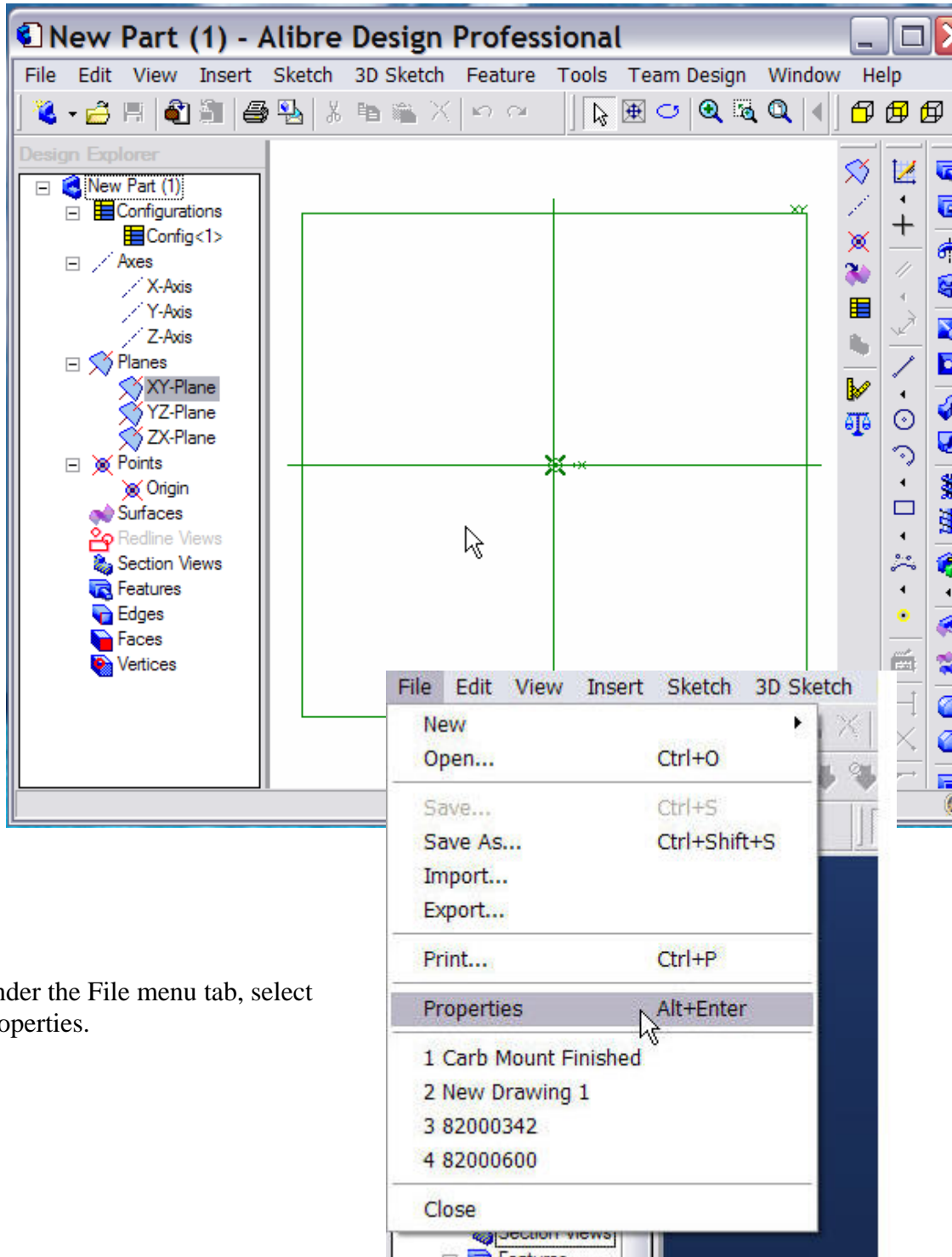
All Draft angles are 5°



SECTION A-A
SCALE 1:1

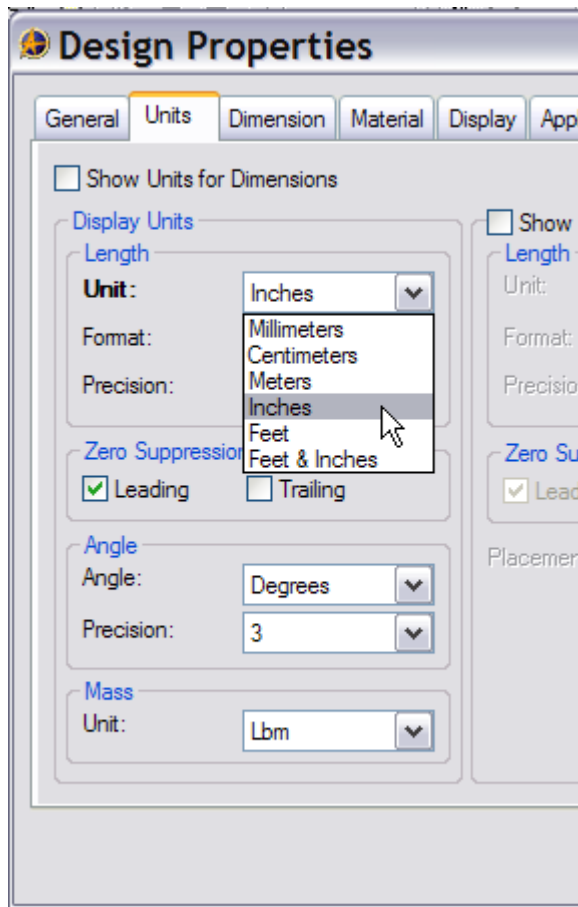
We need to set a few basic parameters in Alibre before we start the actual design process. In the Alibre Design Main panel, click on File>New>Part.

The New Part window opens.

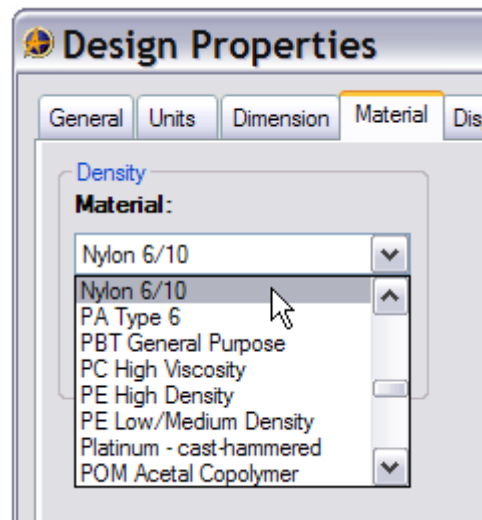


Under the File menu tab, select Properties.

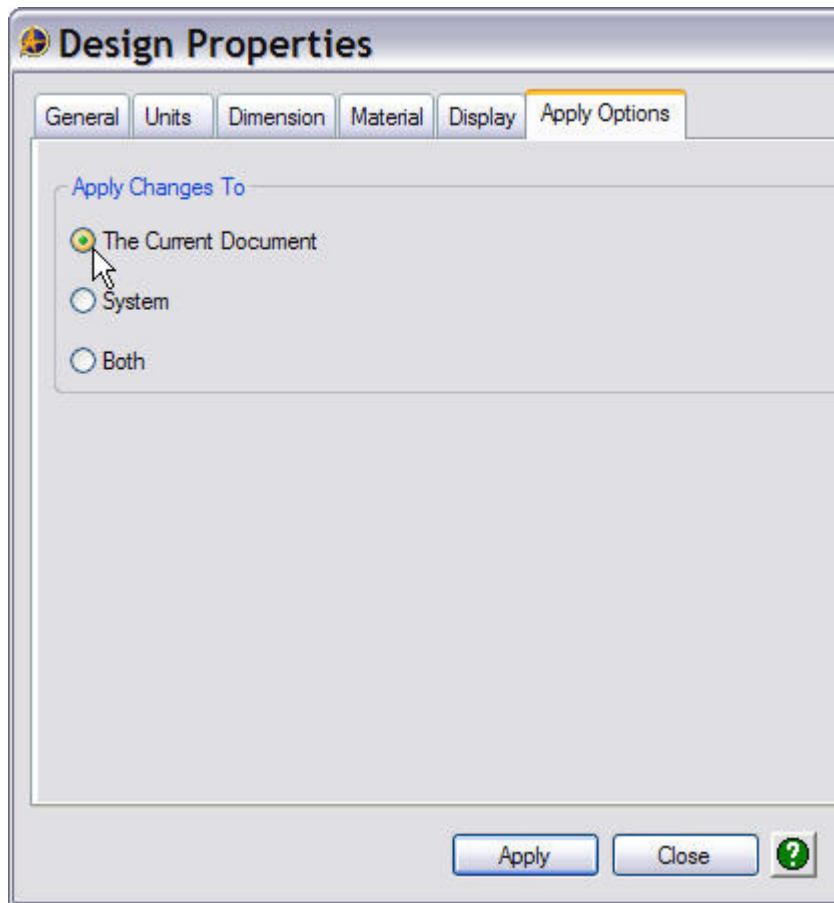
The Design Properties panel will open. Click on the 'Units' tab and select Inches.



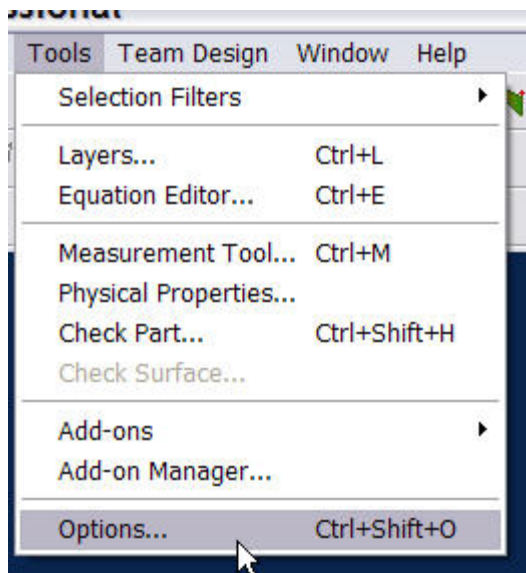
Under the 'Material' tab, scroll down in the selection window and click on 'Nylon 6/10'. This will set the material properties for our model, allowing us to determine the mass, and volume of the part as well as the center of mass, surface area, and moments of inertia.



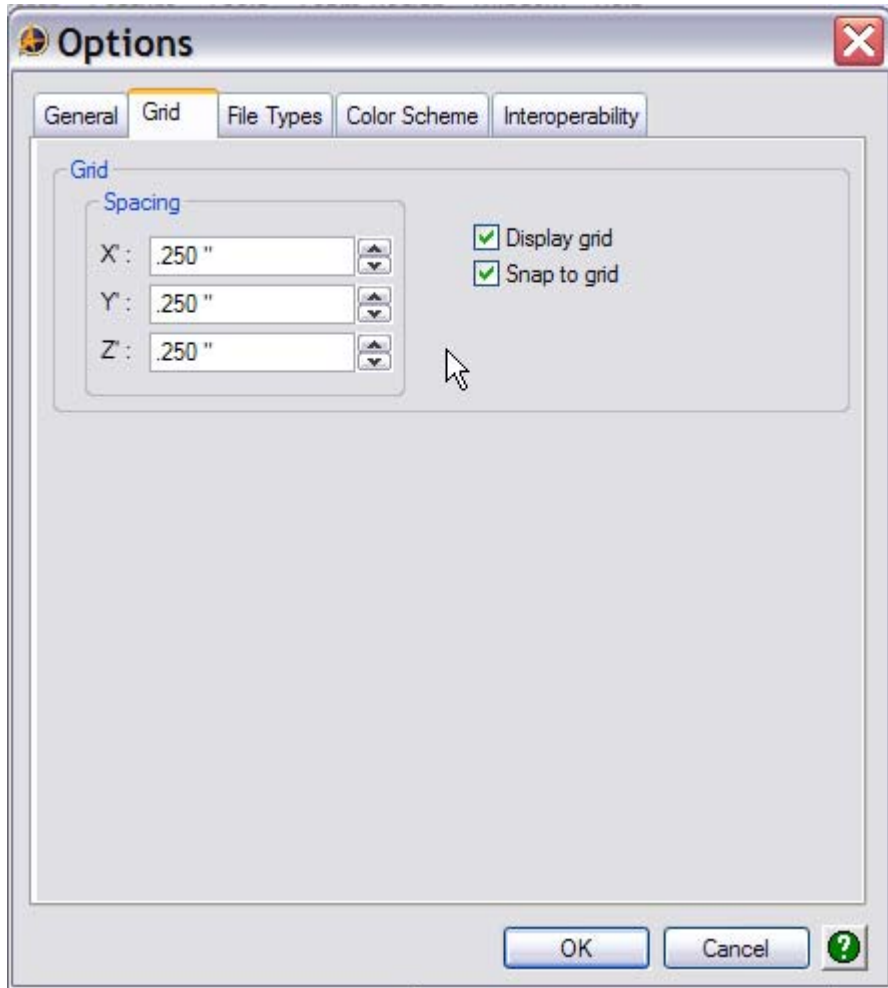
Under the Apply Options tab, check the radio button for 'The Current Document', click Apply, and then click Close.



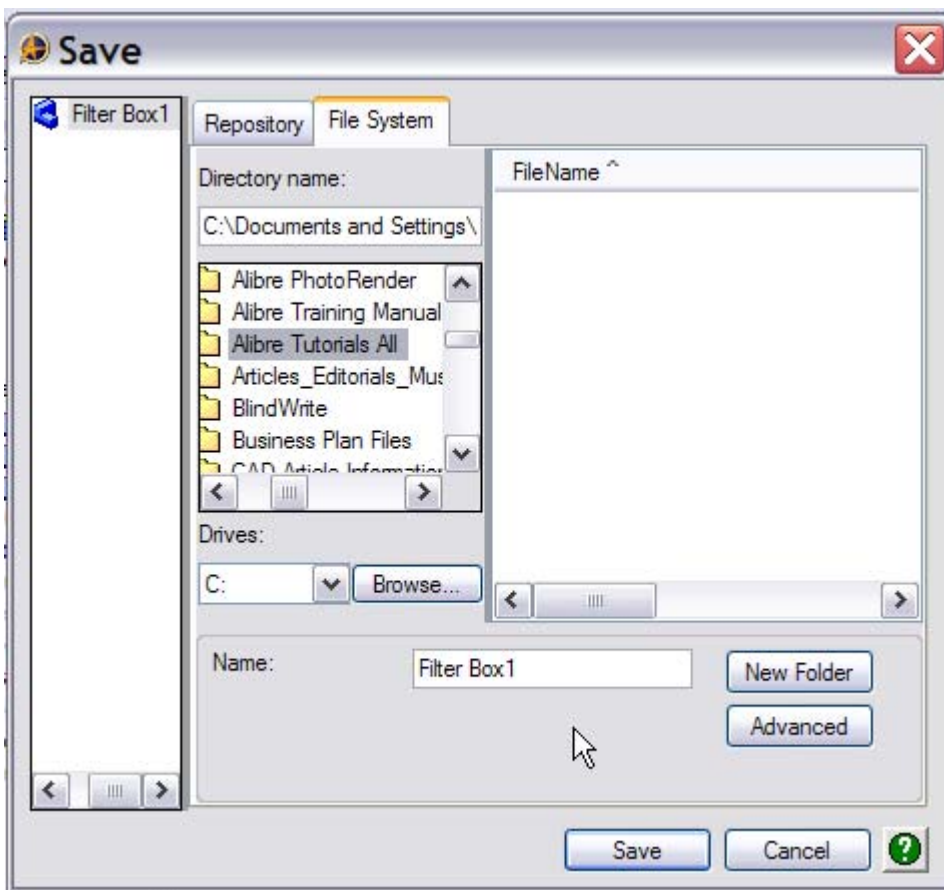
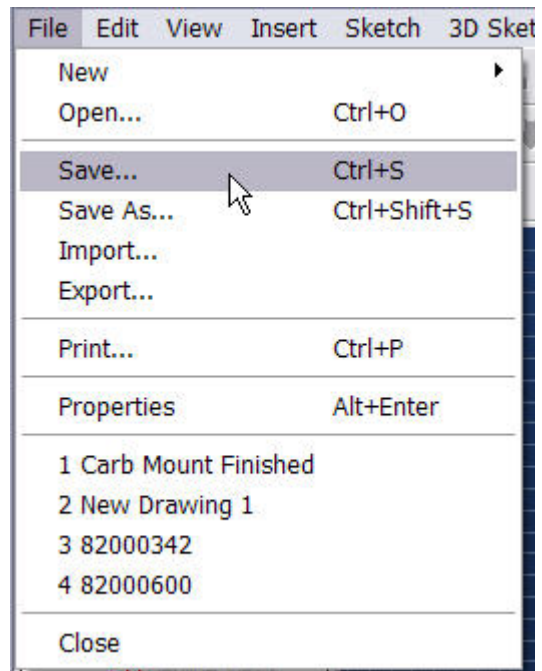
Go back to the main panel toolbar and locate 'Tools'. Under the 'Tools' menu tab, select 'Options'.



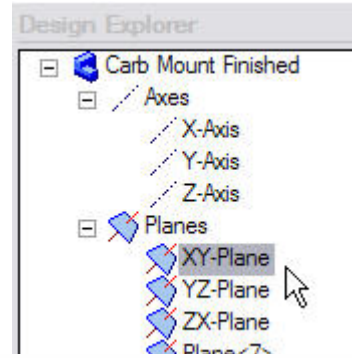
The 'Options' panel will open. Under the 'Grid' tab change the spacing settings to .250" for X, Y, and Z. Make sure the 'Display grid', and 'Snap to grid' boxes are checked. Click OK to return to the New Part window.



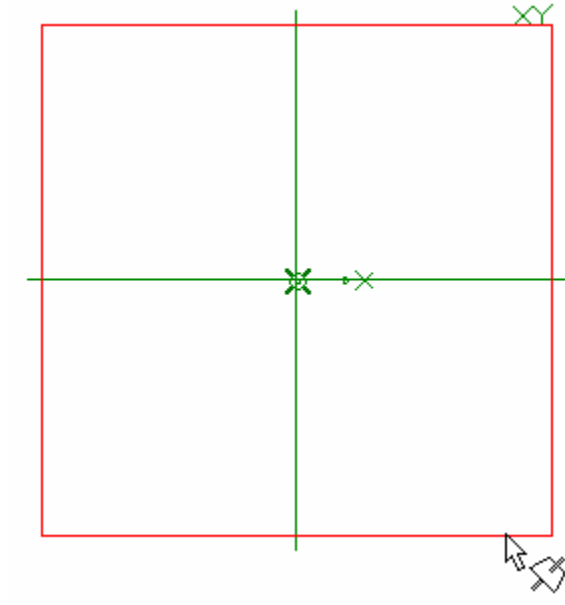
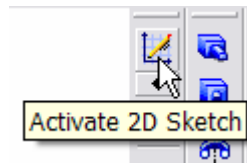
In the New Part window under the File menu tab, select 'Save'. Select a location to save the file, either in the Windows File System or in your local repository. Give the part a logical name, and click Save.



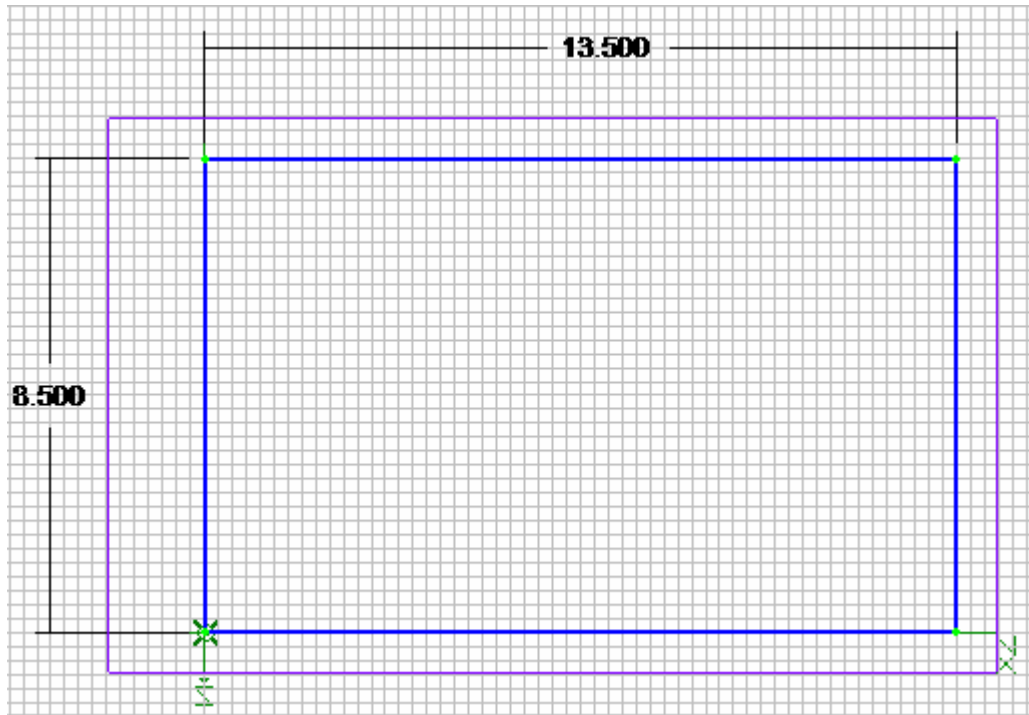
Click on the XY plane in the Design Explorer panel, or the XY plane in the Part workspace, and then click the 'Activate 2D Sketch' icon.



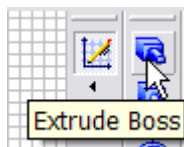
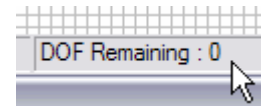
Now you're in 'Sketch' mode.



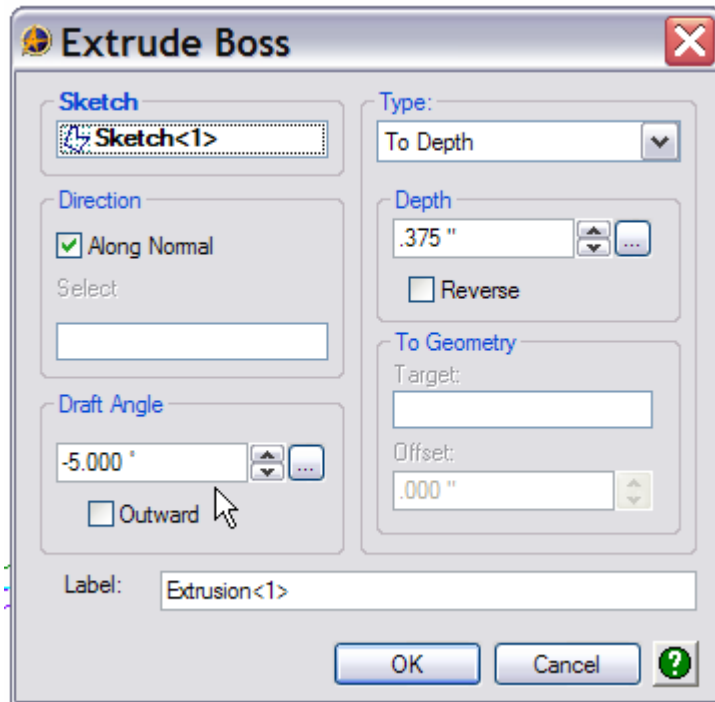
Start your design by drawing the sketch below. Sketch it off the axis system and then apply collinear constraints to place the lines on the axis system as shown.



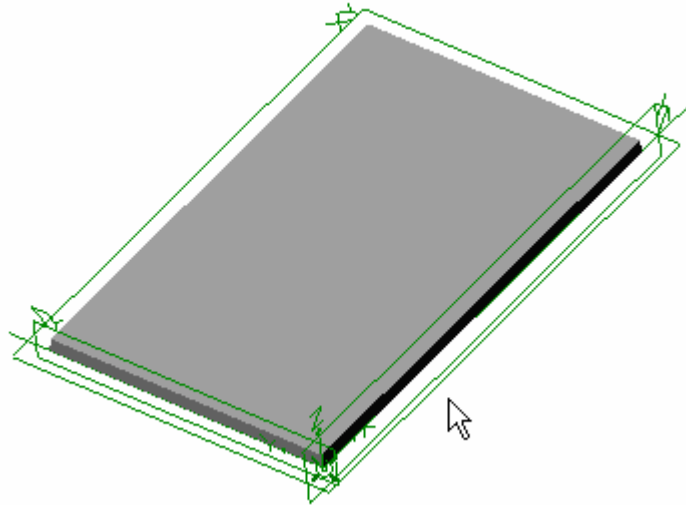
Dimensioning and constraining sketches is one of the most important aspects of good design work. You'll notice in the lower right hand corner of the Alibre main panel screen a running script labeled DOF (Degrees of Freedom). Reducing the DOF's to zero, through dimensional or geometric constraints, although not always necessary, is good design practice.



Click on the Extrude Boss icon in the toolbar, enter the values shown at the left, and then click OK.

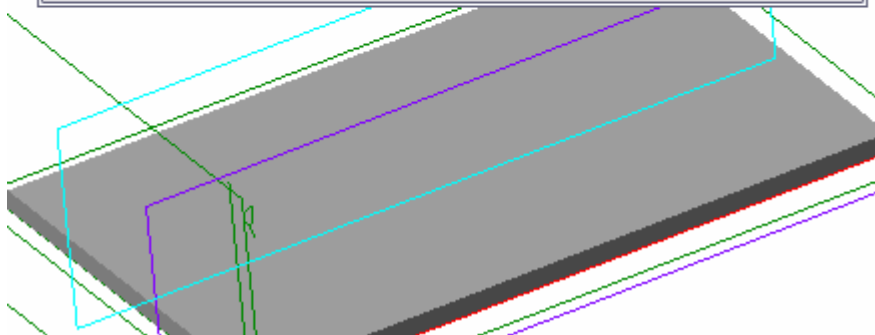
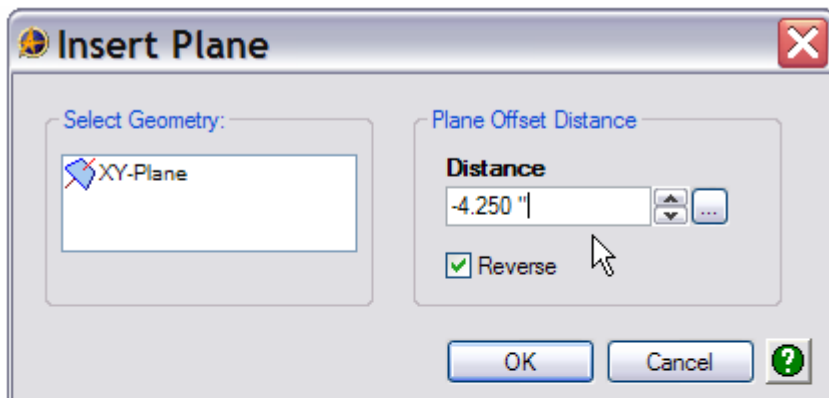
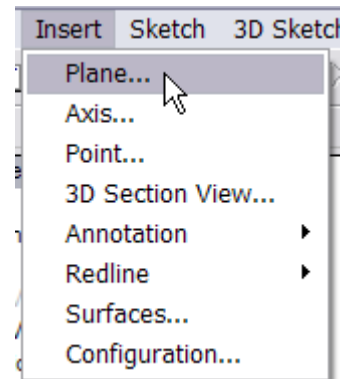


This is the base of your Filter Box.

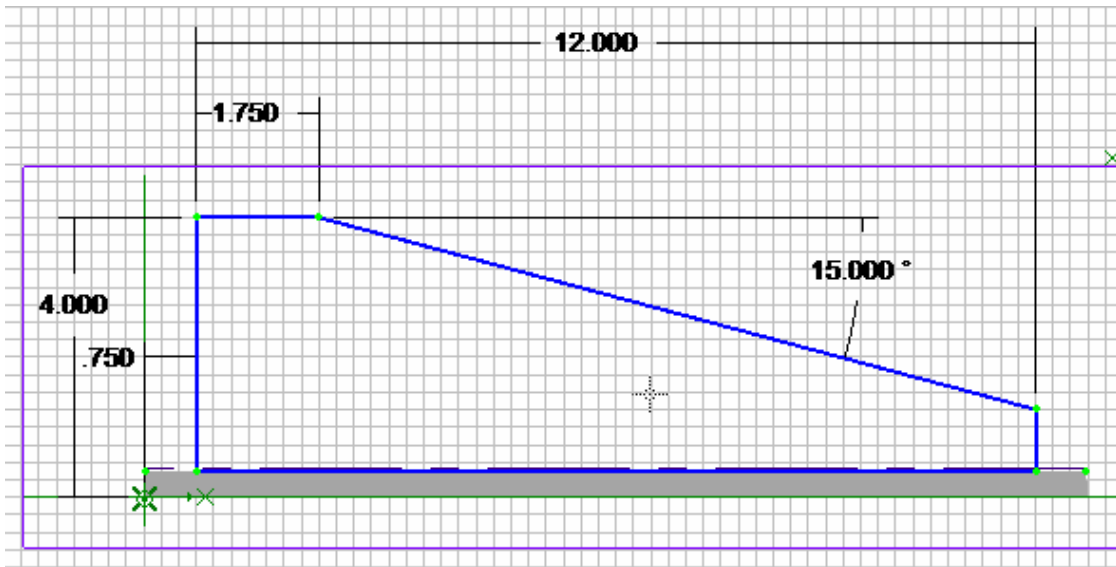


If you haven't moved the sketch to the axis systems of the workspace, do so now.

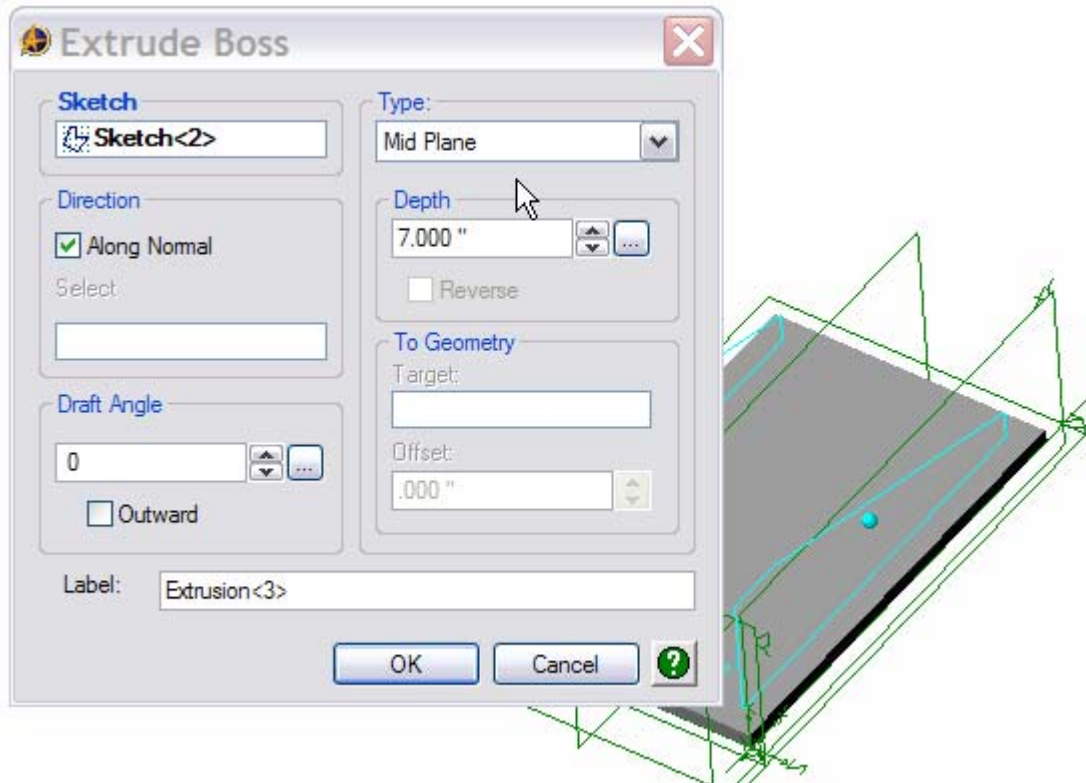
The next thing you need to do is insert a new Plane. Select the Insert>Plane command from the top menu bar. Using the XY plane as reference plane for the Select Geometry panel, offset the new plane by -4.250" as shown below.



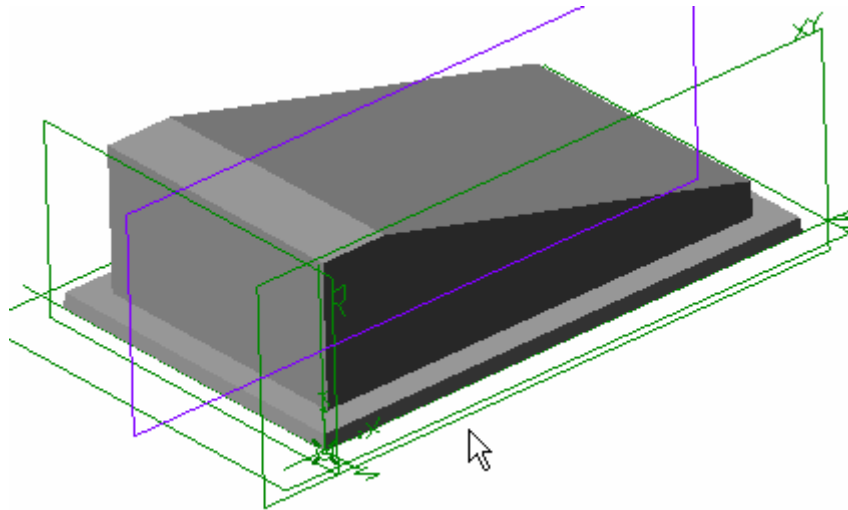
Select the new plane, click on the Activate 2D Sketch icon, and create the sketch shown below.



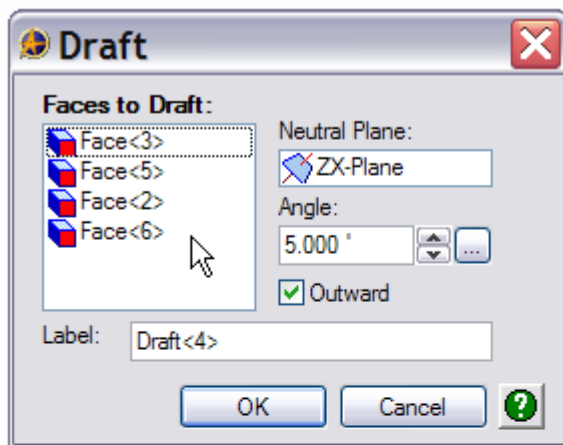
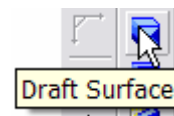
When finished, click the Extrude Boss icon in the toolbar, and extrude the new sketch with the values shown below.



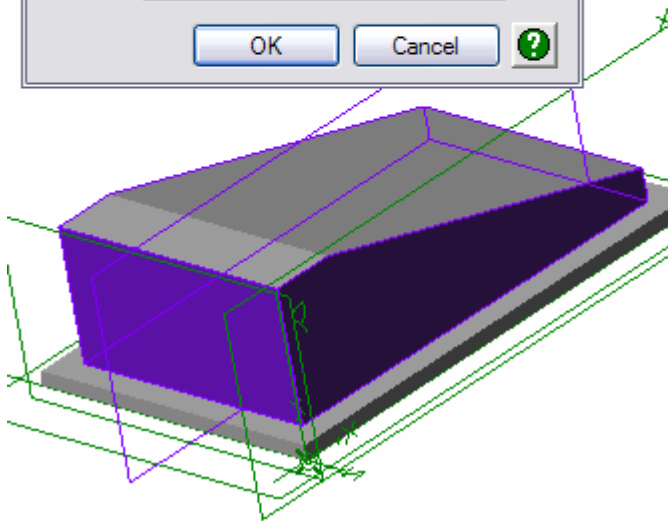
Your model should look like this.



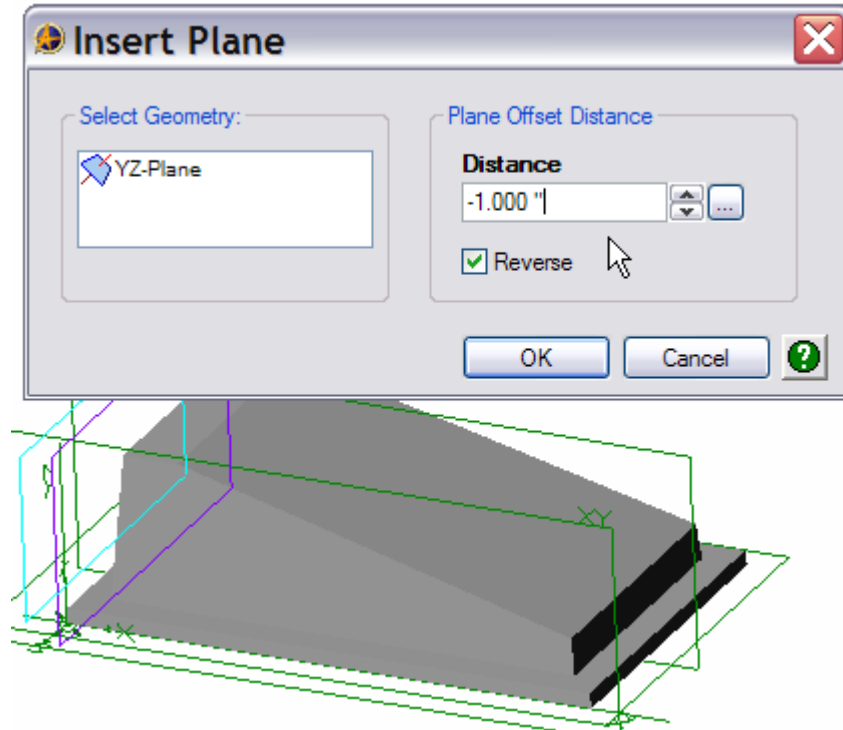
Now we'll add the draft angles to our newly created Filter Box 'Top'. Click on the Draft Surface icon in the toolbar.



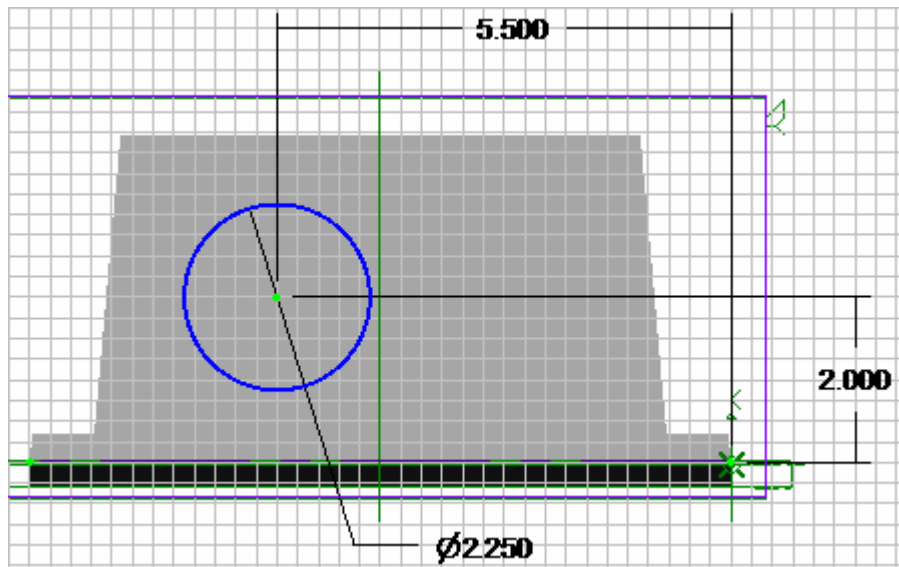
The Draft panel will open. Click on the four vertical faces of the 'Top', select the ZX Plane as the Neutral Plane, enter 5.000° in the Angle window, check Outward, and then click OK.



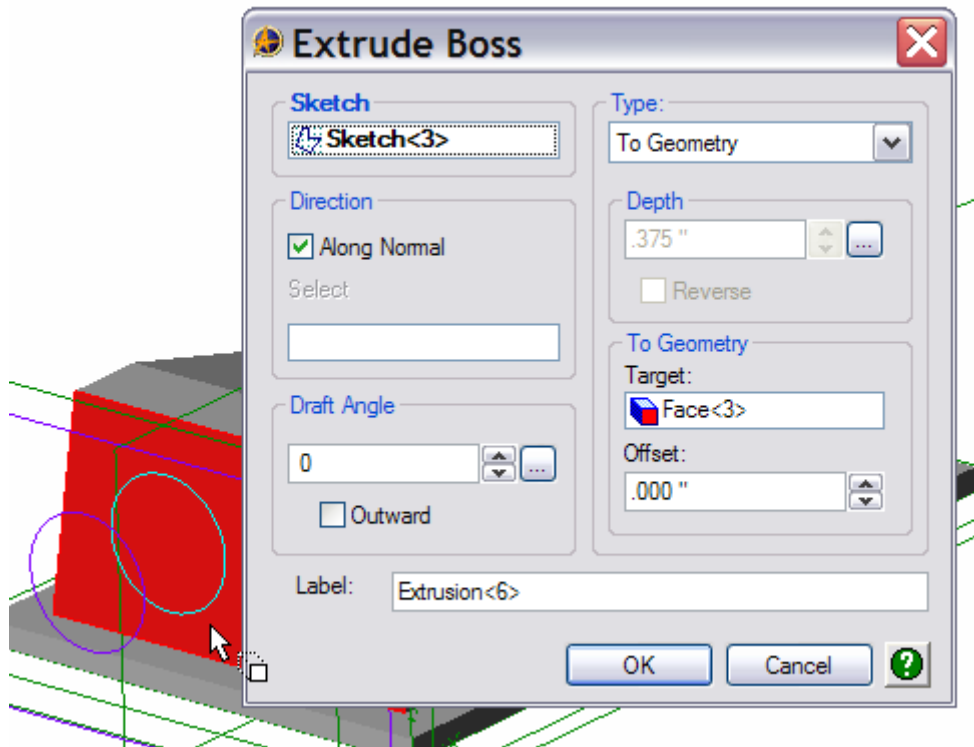
Now we need to create another plane for the inlet manifold. Again select the Insert>Plane command from the top menu bar. Select the YX Plane as the reference plane, and offset the new plane by -1.000", check the Reverse box, and click OK.



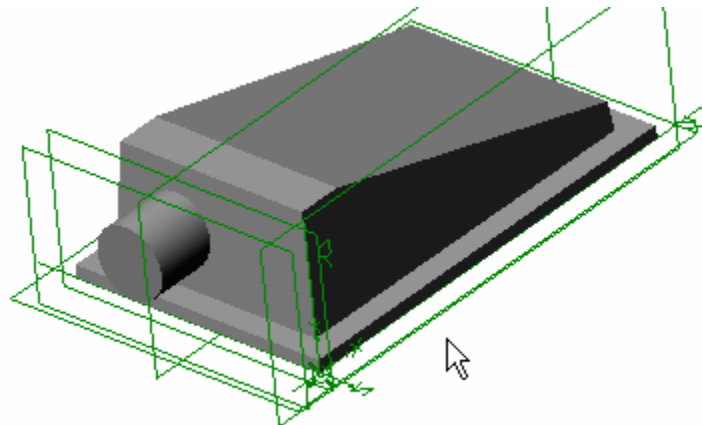
Select the new plane by clicking on it, and then click the Activate 2D Sketch icon to enter sketch mode. Create and dimension the sketch shown below.



Next, extrude the sketch using the To Geometry as the type, and select the front face of the Top as the To Geometry.



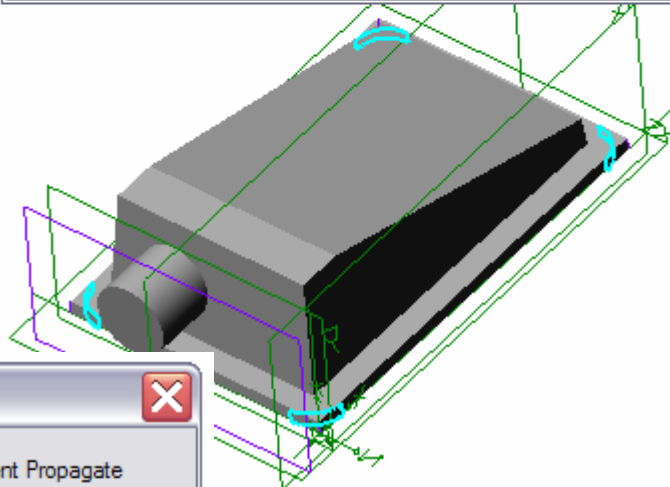
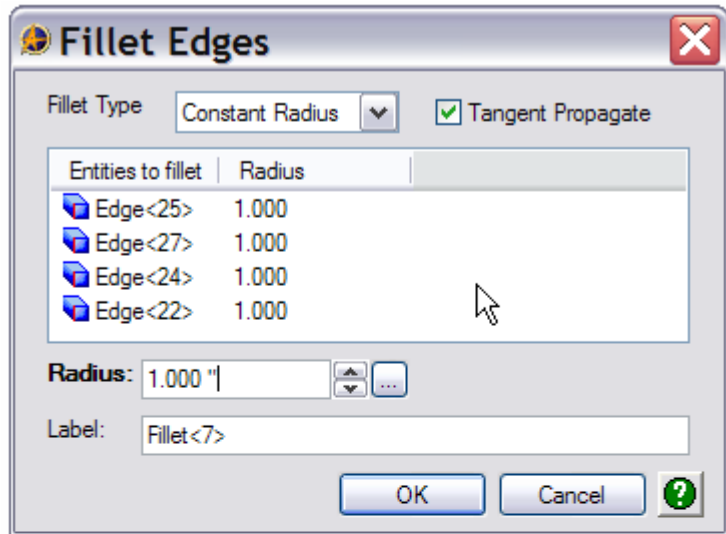
The Filter Box should now look like this.



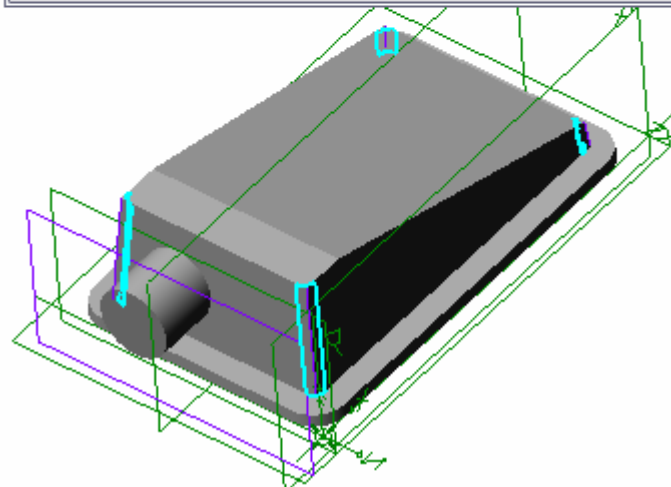
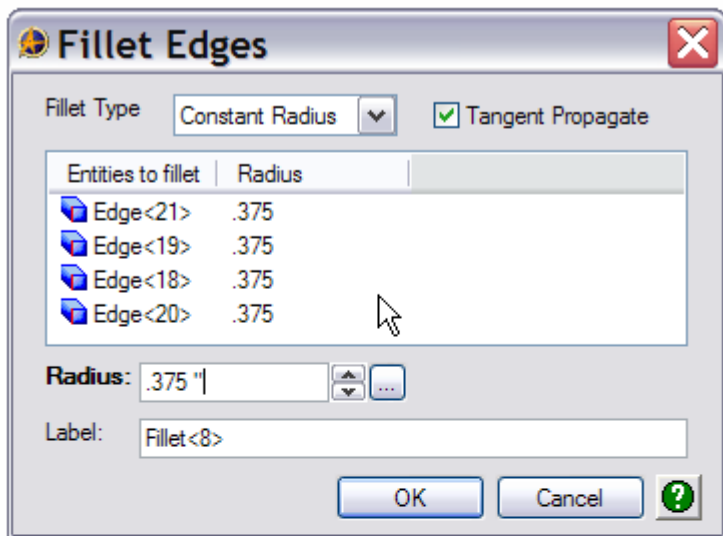
The next thing we need to do is add all the fillets to the Filter Box. Usually the best time to add fillets is as close to the end of the design process as possible in order to avoid building up any inter-related dependencies between the fillets and other part elements. In this case, we're going to Shell the Filter Box, and to make our design work a little simpler, we'll add the outer fillets, and let the shell operation create the inner fillets.

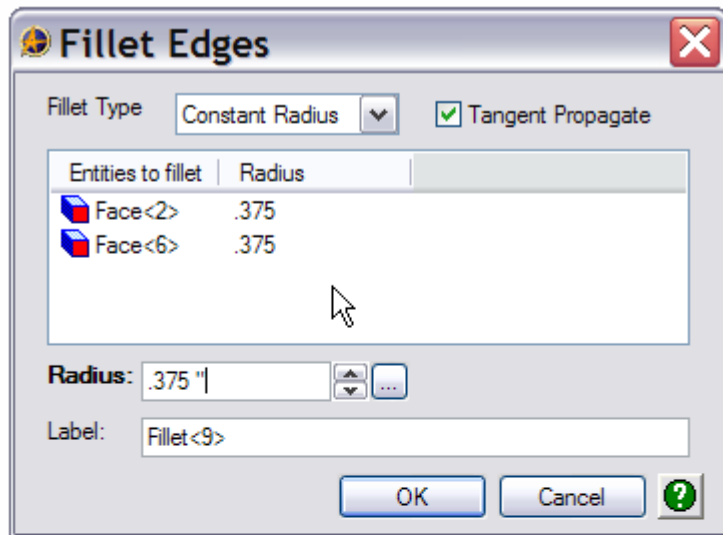
Add the fillets in the following order:

1.000" base corner fillets

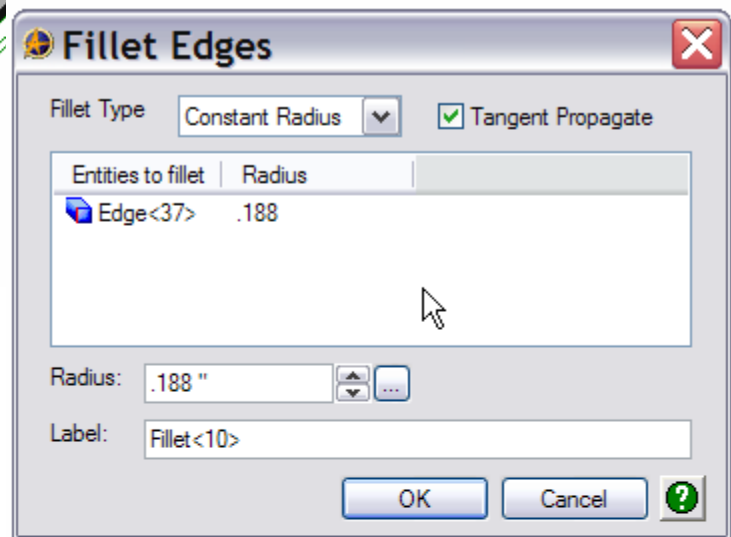
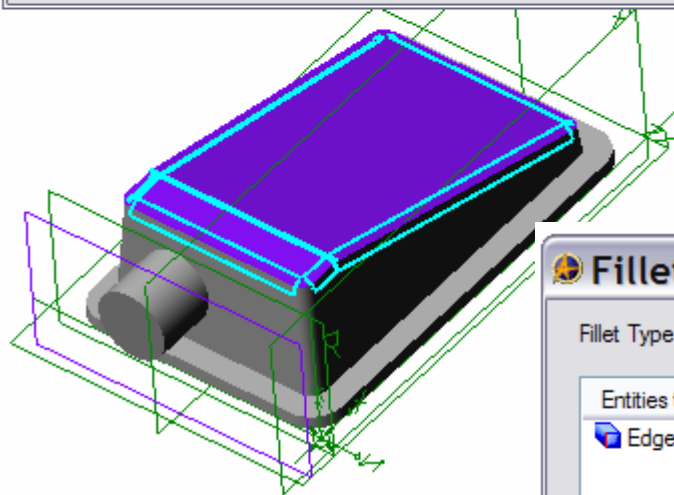


.375 Vertical Top corner fillets

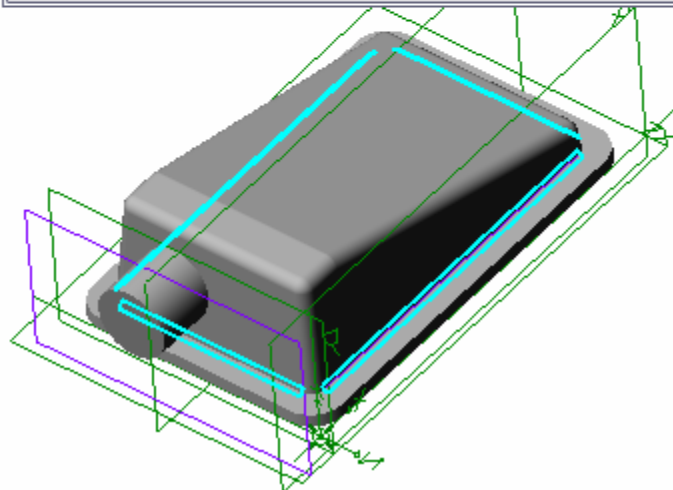


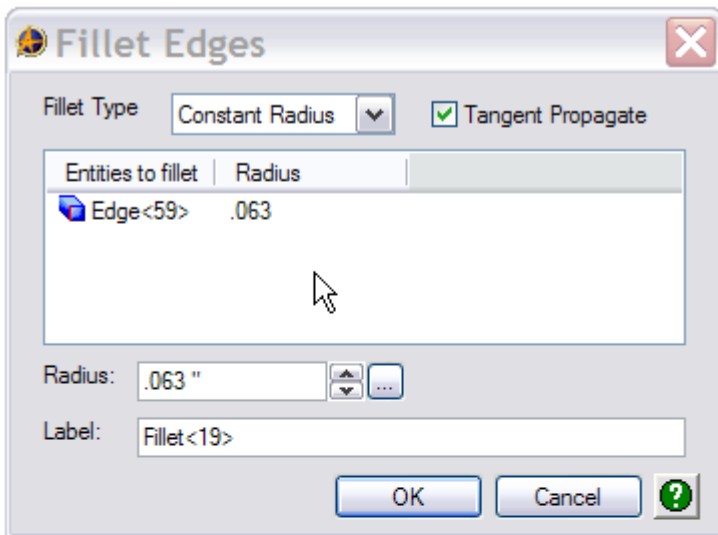


.375 Top corner fillets

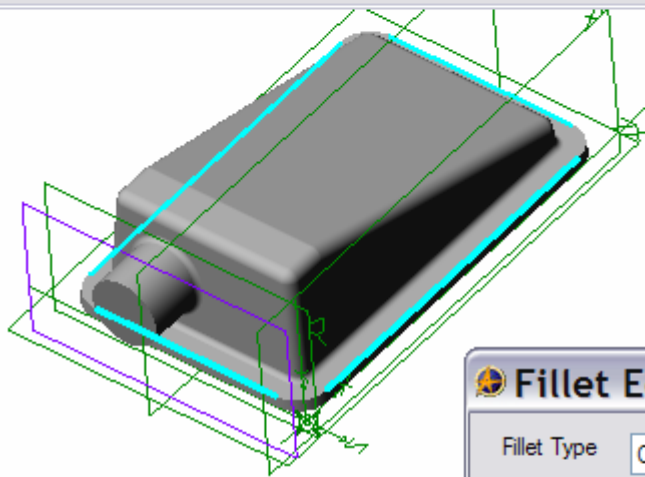


.1875" bottom edge fillets

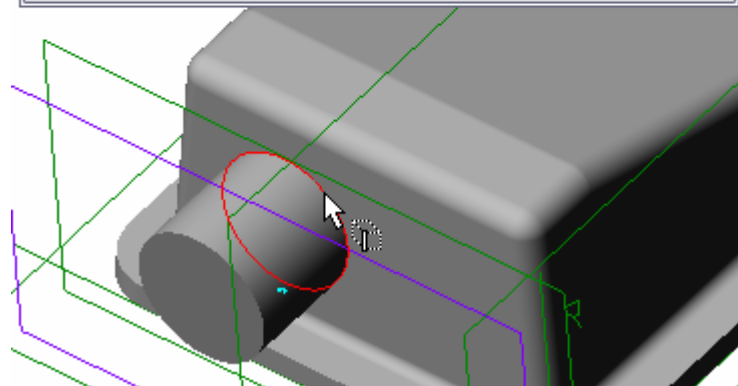
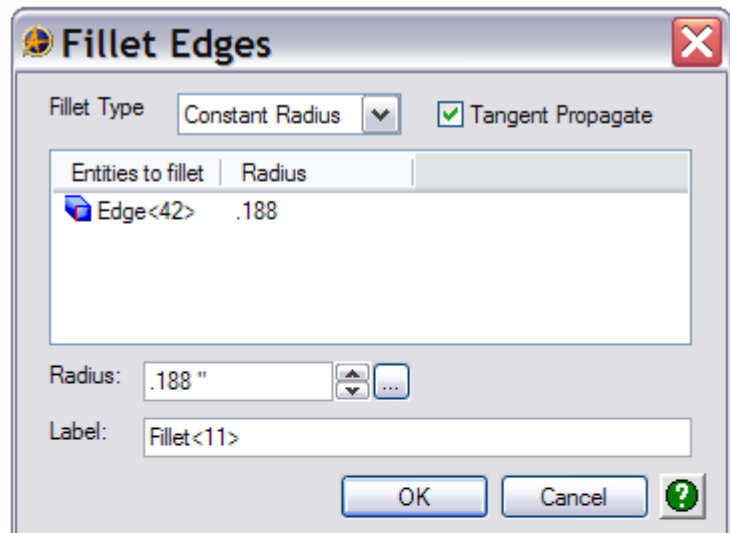




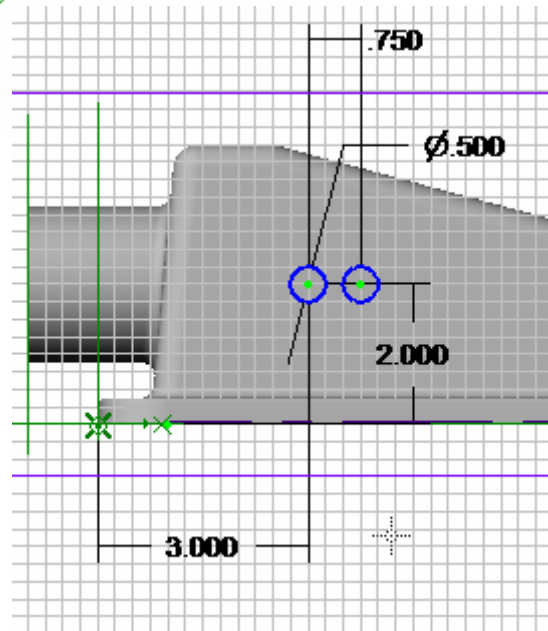
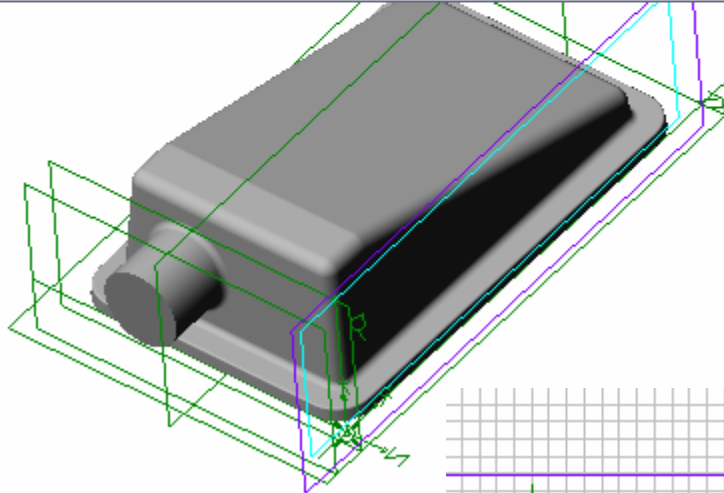
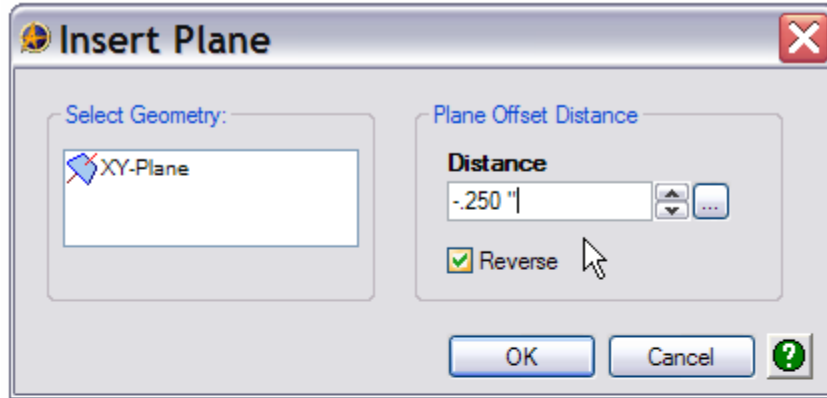
.0625" base edge fillets



.1875" manifold fillet.

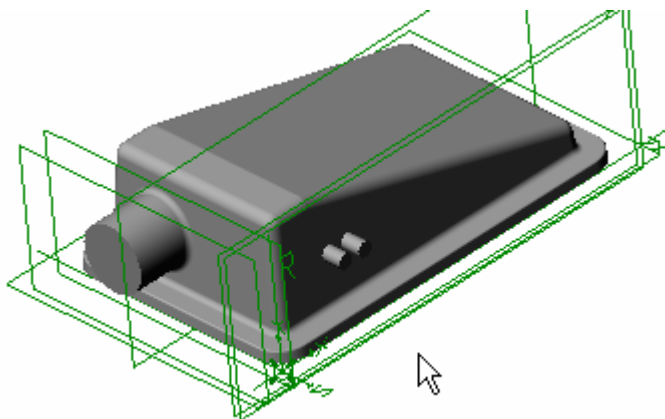
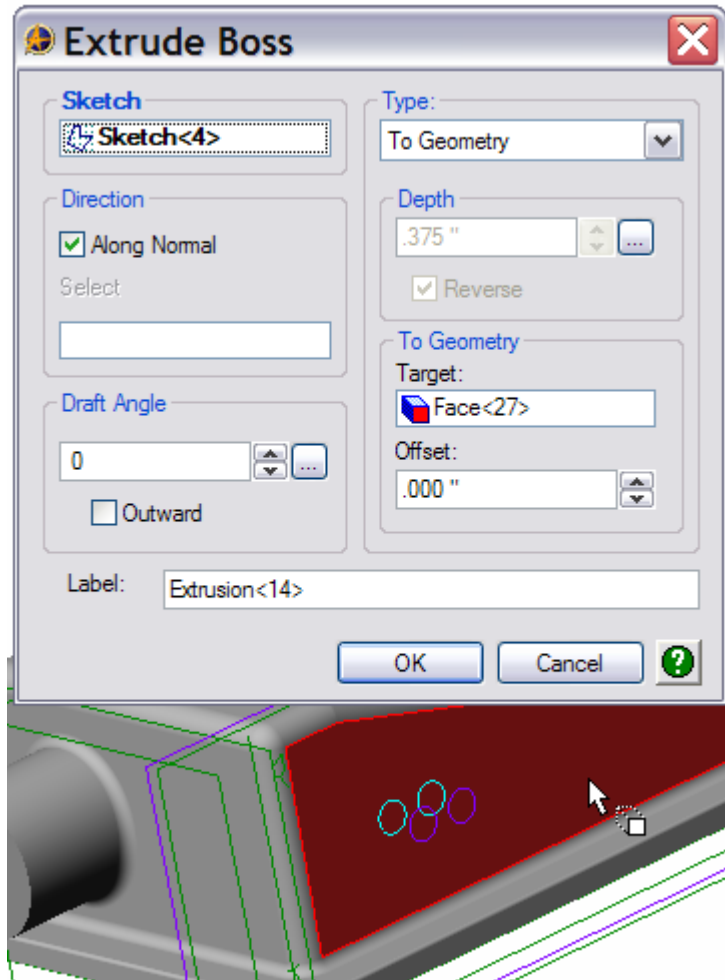


We need to insert one more plane in order to create the two small inlet bosses on the side of the Filter Box. Select the Insert>Plane command from the top menu bar. Select the XY plane for the Select Geometry panel, and offset the new plane by $-.250''$. Check the Reverse box, and click OK.



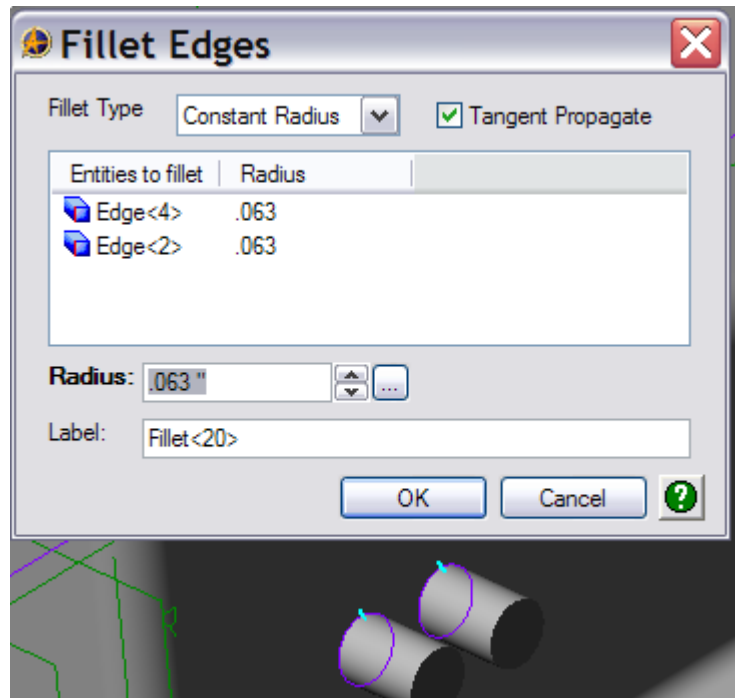
Create and dimension the sketch shown.

Extrude the twin inlet sketch using the values show.

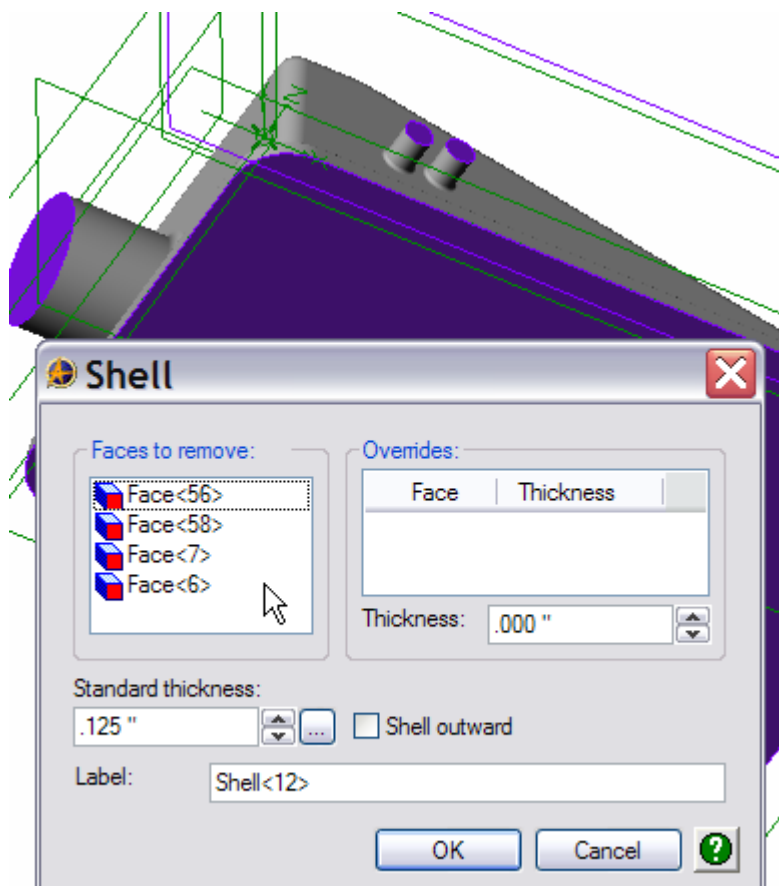
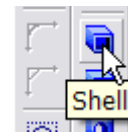


Your model should look like this.

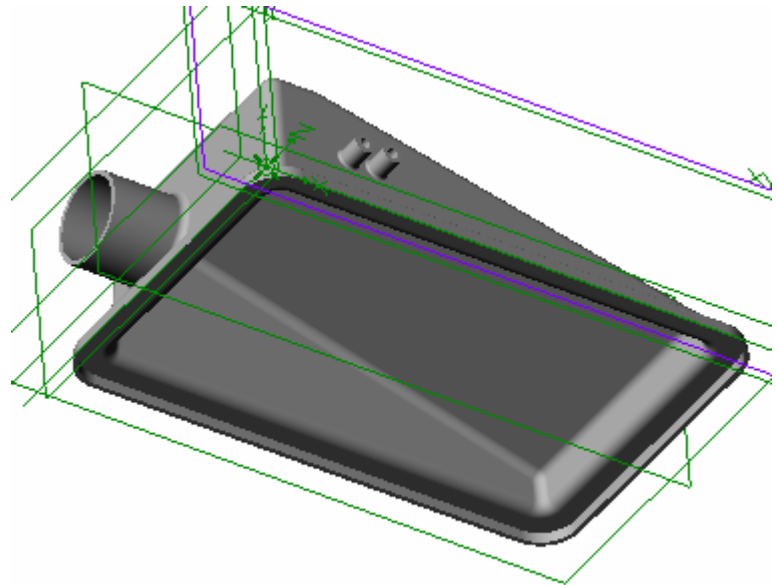
Fillet the inlets as shown.



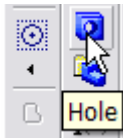
Now we'll Shell the Filter Box. Click on the Shell icon in the toolbar. Select the bottom face, the manifold face, and the two small inlet faces for removal. Enter .125" as the Standard thickness, and then click OK.



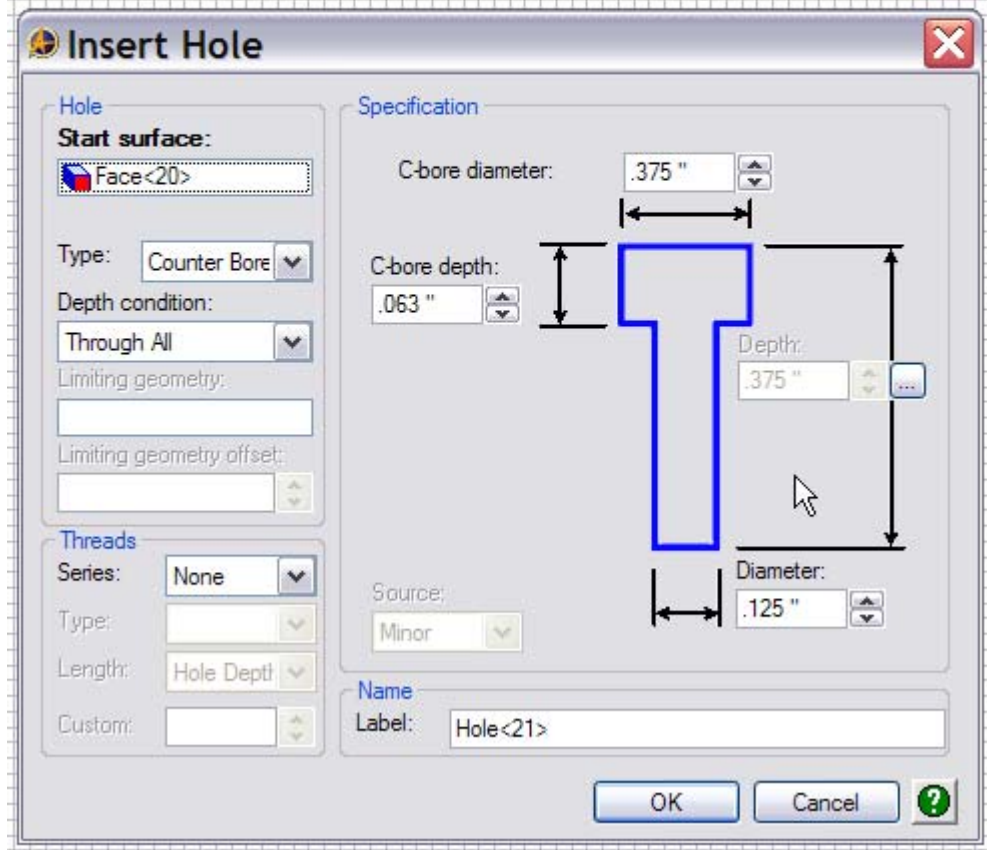
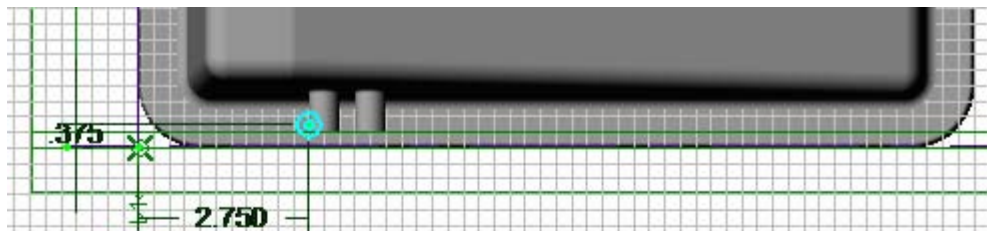
Your model should look like this after the Shell process is complete.

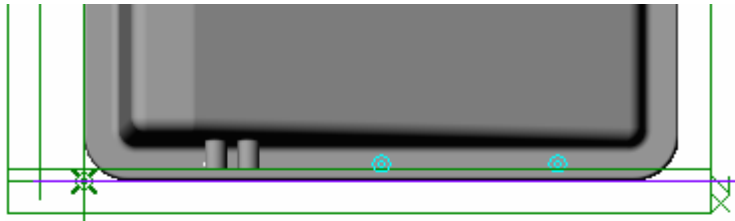


Click on the top face of the Filter Box base, and then click the Activate 2D Sketch icon to enter sketch mode.



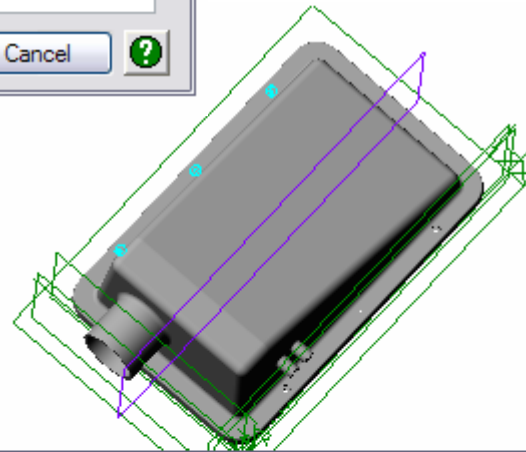
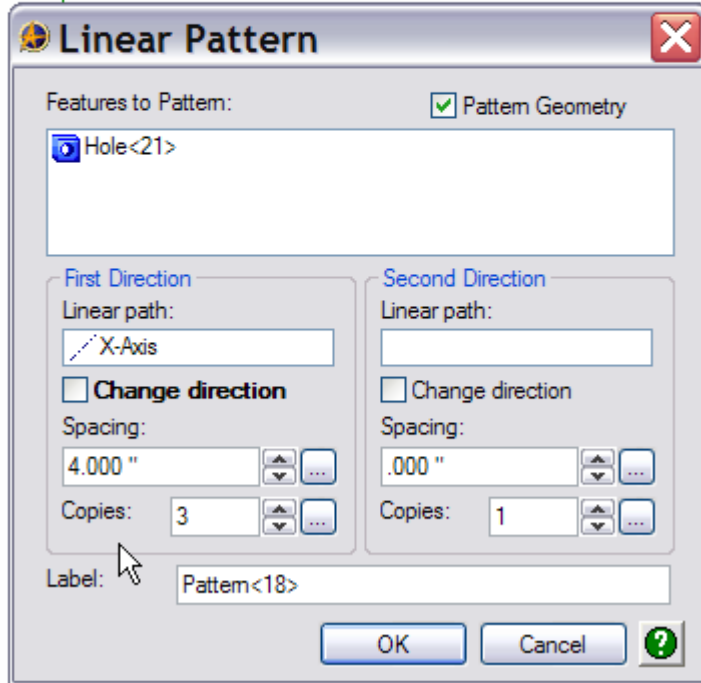
Click the Hole icon in the toolbar. Create and locate the first fastener hole as shown.





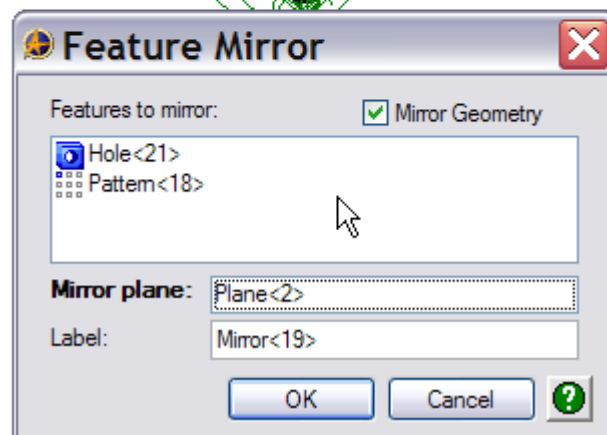
Now we'll use the Feature>Pattern>Linear command, found under the Feature tab in the top menu bar, to create the other two fastener holes on this side of the filter box base.

Enter the information shown at the left in the Linear Pattern panel, and then click OK.



To complete our design, we need to mirror the fastener holes to the other side of the Filter Box.

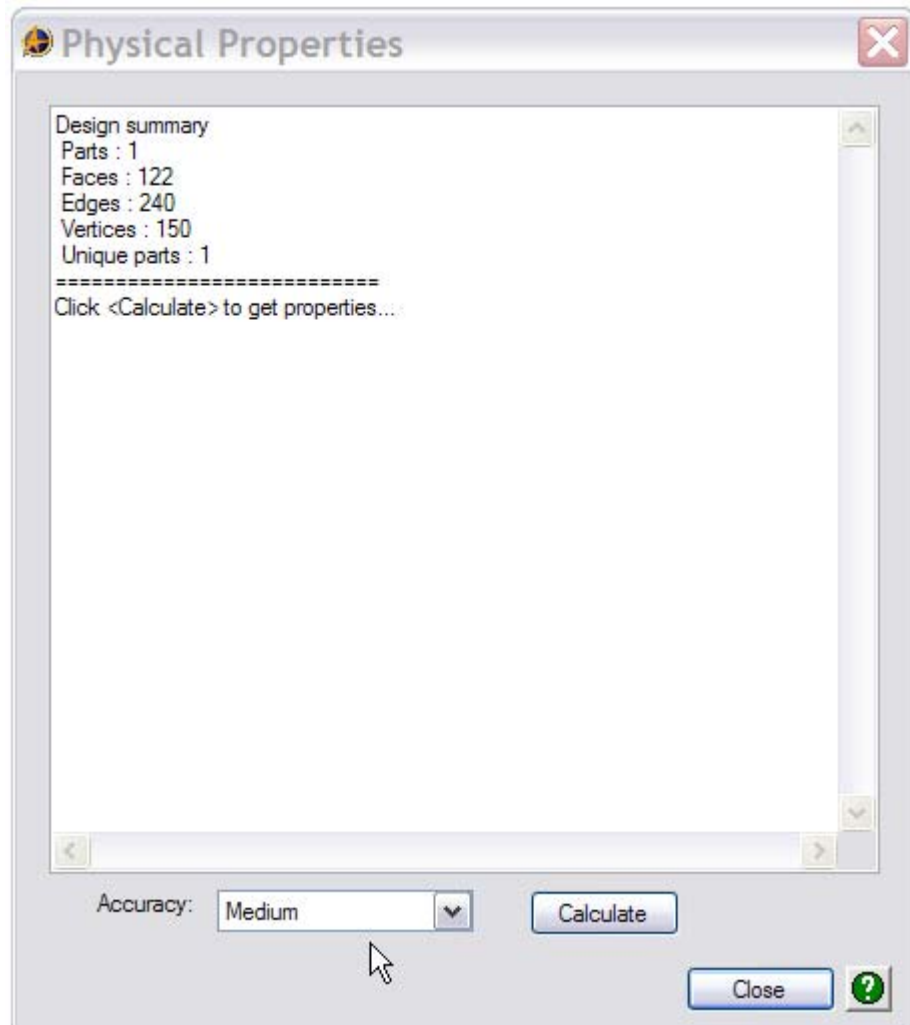
Click the Feature>Mirror command under the Features tab in the top menu bar, and select the Hole and Pattern features from the Design Explorer window. Click on the plane we inserted when we created the Filter Box Top sketch as the Mirror plane, and then click OK.



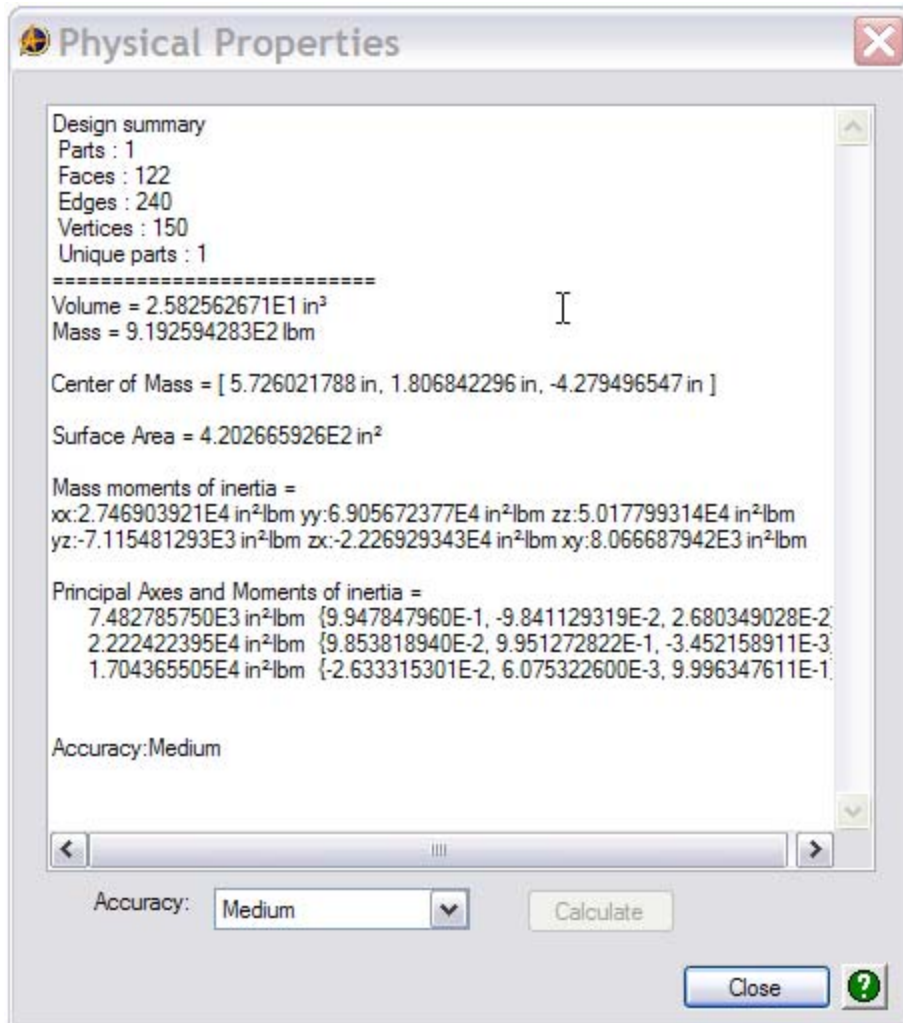
Your finished Filter Box should look like this.



Because we specified the type of material from which the filter box is fabricated, we can retrieve specific physical properties from our finished model. Click on Tools>Physical Properties. In the Physical Properties Panel, select the level of Accuracy desired, and then click Calculate.



The Physical Properties are returned.



This concludes the Filter Box Tutorial. I hope you've enjoyed creating the part, and hope you learned a few things along the way. Look for other tutorials in the future.