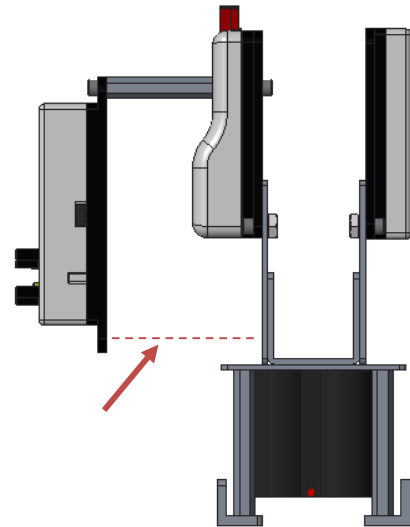





## Creating a Custom Part

CAD models can be used to fabricate custom parts. Some robotics teams use their Creo models to 3D print parts, some share their 3D models with partners who can make the part for them.


After reviewing your robot system model, you may find needed improvements that require custom part fabrication. In our example, the original design has the power distribution module secured by only two screws along its top flange. This is not an optimal design because the module will experience vibration while the robot operates and would be vulnerable to breaking in a collision. There is not a standard piece in the Tetrix kit of parts that fits the distance between the bottom flange of the module and the mounting plate in the electronics subsystem, so we will need to make a custom part to hold the module more securely.

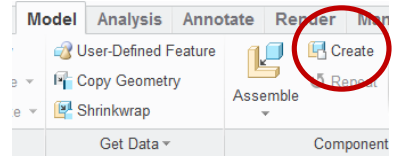


### Task A: Reference the electronics subsystem components

1. Open your robot system model.
2. To add a new part to the electronics subsystem, right-click on the electronics subsystem assembly file in the model tree and select **Open** .


*The electronics subsystem opens in a new Creo window.*

3. From the Model tab, click **Create** . Choose **Part** for the type. Leave the default Sub-type.




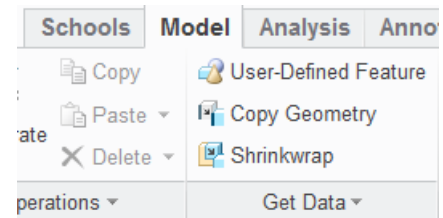
4. Name your new part. The example part is named **Custom\_bracket**.


5. Leave the default Creation Method and Copy From filename in the Creation Options window. Check the **Leave component unplaced** box.

6. Your new part appears in the model tree. Right-click the new part and select **Open** .

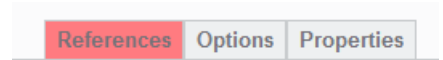
*The part opens in a new Creo window.*

7. From the Model toolbar, click **Copy Geometry** .




8. From the Copy Geometry toolbar, click **Published geometry**  to turn it off.

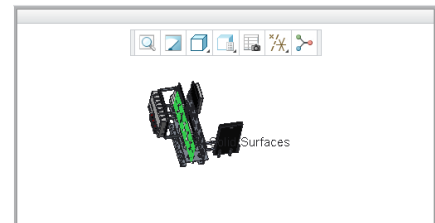
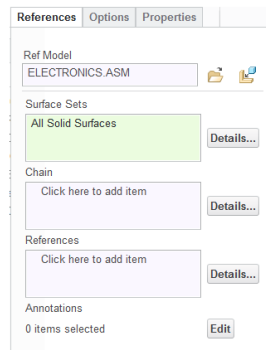
9. Select the References tab (it may be red).



10. Open **electronics.asm** to set it as the reference model. Use the default placement method. Click **OK**.

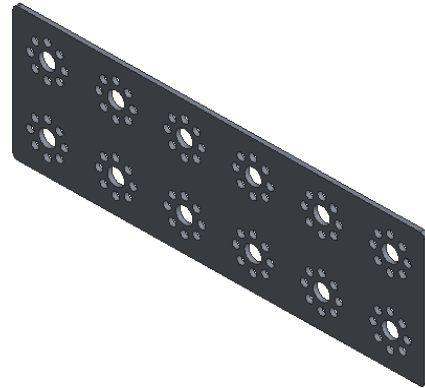
*The electronics subsystem model appears in a small window in the top-right of the screen. A second model tree appears in the bottom-left.*

11. Click in the Surface Sets field to activate it. From Model Tree(2), click the **TETRIX\_739073.PRT** file that represents the left vertical mounting plate. In the example it is the third TETRIX\_739073.PRT from the top. Click .





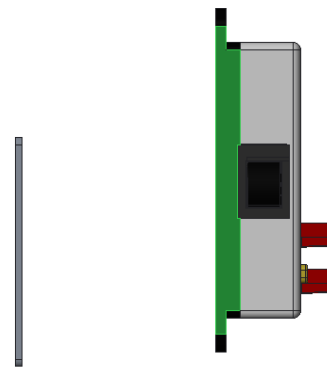
The mounting plate appears in the graphical area.  
The Extern Copy Geom id XX feature that represents the plate appears in the model tree.

Use the same procedure to reference the power distribution module part from the custom bracket part model.





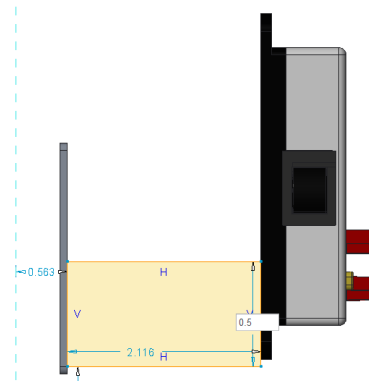
### Task B: Create a solid model of a custom part

1. Click to select the back surface of the black case of the power distribution module.
2. The surface appears green when selected.
3. From the Model toolbar, select **Sketch** .
4. The 2D sketch of the new part will be aligned with this surface.
5. From the *Sketch* toolbar, select **Corner Rectangle** .



You may need to expand the *More* menu to access the *Rectangle* menu.

6. Draw a rectangle that spans from the left edge of the plate to the right edge of the power distribution module. Don't worry about the exact height of the rectangle. That will be set in the next steps.
7. Middle-click to exit the corner rectangle tool.
8. Click the height dimension to of the rectangle. Set the height dimension to **0.5**. Click **OK**  to finish drawing the 2D sketch of the new part.
9. From the Analysis toolbar, select **Measure** .

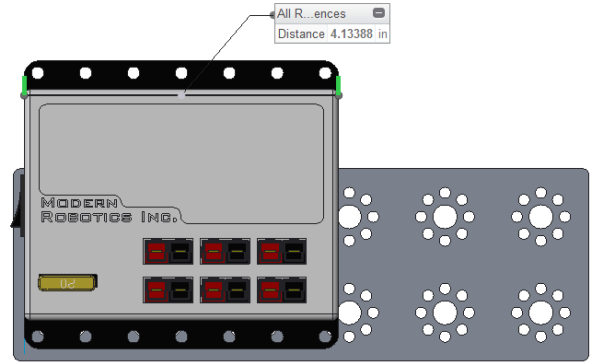


10. From the Measure menu, select

**Distance** .

11. Click the front edge of the power distribution module. Press **Ctrl** and click the back edge of the module.



*The length of module is shown in the window that appears. In the example, the distance is **4.13388in**.*

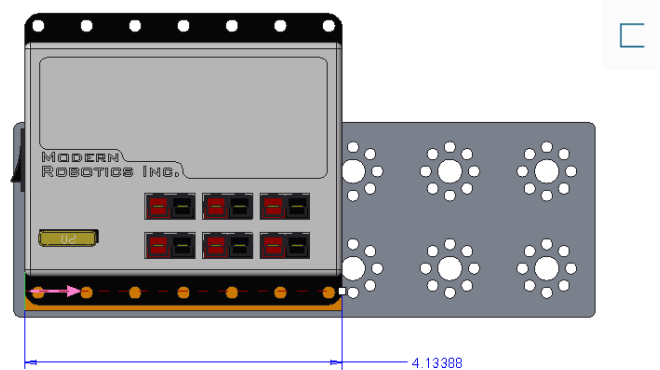



12. Exit the Measure  tool.

13. In the model tree, select **Sketch 1**. From the Model toolbar, select **Extrude** .

14. Set the depth value to the length of the power distribution module. In the example, the depth value is set to **4.13388**.


15. If the part has extruded in the wrong direction, click  to change the direction of the extrude to the other side of the surface. Click  to complete the extrude.




16. From the Saved Orientations menu, select **TOP** .

17. Click to select the top surface of the new part. The surface appears green when it is selected.

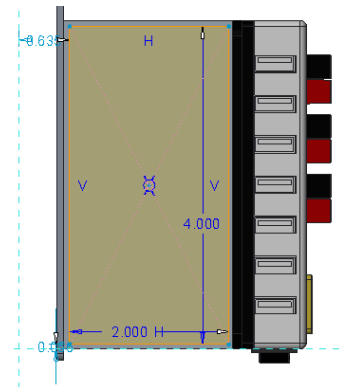
18. From the Model toolbar, select **Sketch** .

19. Draw a rectangle centered on the top surface of the new part that is **4in** long and **2in** wide. Click **OK**  to complete the sketch.

20. From the Model toolbar, select **Extrude** . Set the depth to a value greater than 0.5. In our example the depth value is set to **1**.

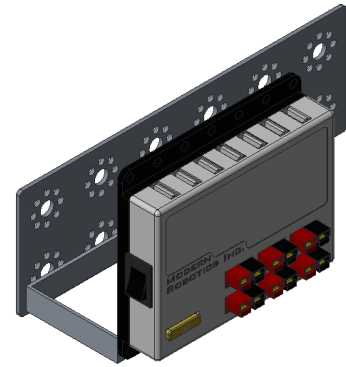
21. Click **Remove Material** .


Click  to complete the extrude.




The bracket has been made to fit the space between the plate and the power distribution module in the electronics subsystem.

The holes of the two parts can also be used as a reference to place holes in the bracket at the correct locations.



22. From the Saved Orientations menu, select **RIGHT** . Click to select the right surface of the new part.

23. From the Model toolbar, select **Sketch** .

24. From the *Sketch* toolbar, click **Project** .


25. Select **Chain** from the Type pop-up menu.

26. Click to select the top edge of the second hole in from the front on the bottom flange of the power distribution module.

27. Click to select the bottom edge of the same hole.



28. Choose **Yes** to convert the chain to a loop.

29. Repeat the procedure to project the top and bottom edges of the second hole in from the back on the bottom flange of the power distribution module. Click **Ok**  to complete the sketch.

30. From the Model toolbar, select **Extrude** .

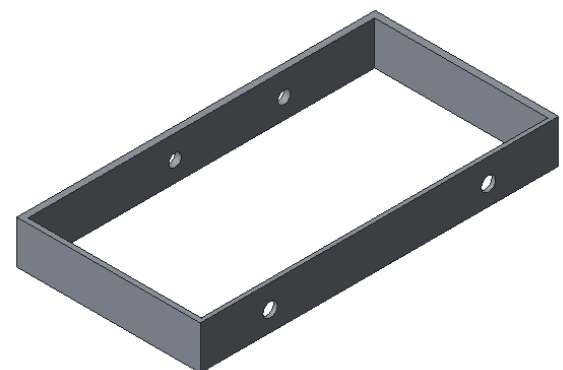
31. Set the depth to a value greater than the width of the bracket frame. In our example the depth value is set to **0.2**.




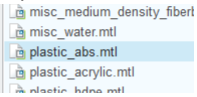
32. Click **Remove Material** .

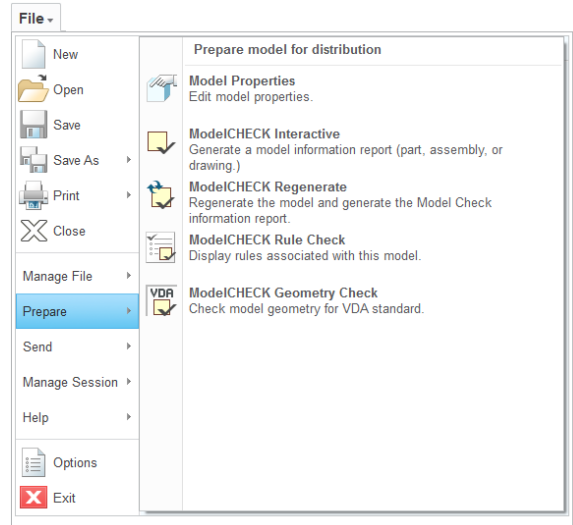
33. Repeat the procedure to create two holes on the left frame of the bracket. In the example, the bottom holes of the second and third hole sets in from the front are selected.

34. You have a completed custom model.



### Task C: Set the material of the custom part

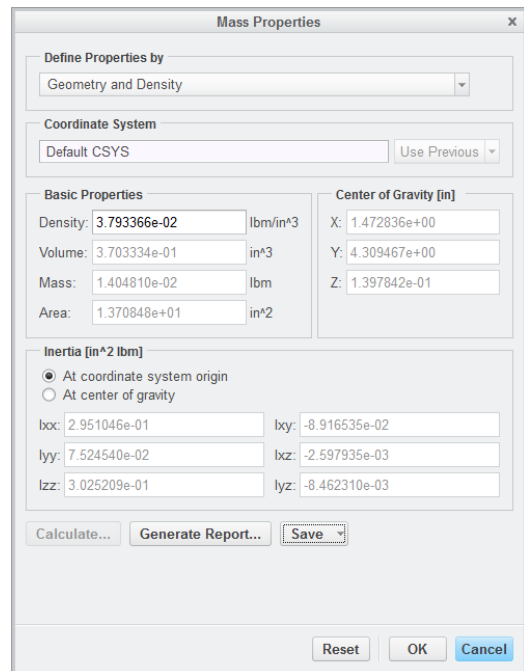
1. From the File menu, select **Prepare**. Select **Model Properties** .
2. In the Model Properties window, click on the **change** link across from Material.
3. Double-click on the correct material for the new part. In the example, **plastic\_abs.mtl** is selected. 
4. ABS is a common plastic for 3D printing. It has a density similar to other common 3D printing plastics.



5. In the Model Properties window, click on the **change** link across from Mass Properties.
6. In the Mass Properties window, click **Calculate**. Click **Save**. Click **Close** in the Model Properties window.

*Your custom part now has an accurate density and weight.*

*Save your new part. Return to your electronic subsystem model and place your new part.*



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