## Assemble a Subsystem Model

In this section we'll make the robot detailed design by assembling subsystems and then bringing them together in the Robot System assembly.

These instructions create a chassis subsystem using FTC Tetrix parts. The steps are the same for FRC, although the specific components and placements may be different. The detailed design process starts by creating an assembly file to represent the overall robot system and copying our envelope models into the new assembly's skeleton model.

1. With the Robot System model open, click **Create** 🖳 from the Model tab.

2. Select **Subassembly** for Type.

3. Name the new assembly file. The example uses the name "Chassis". Click **OK**.
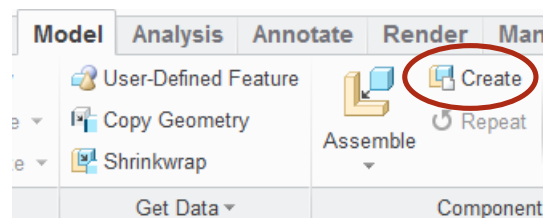
4. Leave the default settings for Creation Method and Copy From. Check the box next to **Leave component unplaced**.

   Your chassis subassembly appears in the model tree, but doesn't appear in the graphical area because it was left unplaced. We will place it after assembling the parts.

5. From the model tree, right-click on CHASSIS.ASM to open the chassis in a new Creo window.

6. The first part we will create is a skeleton model.

7. From the Model tab, click **Create**.

8. Select **Skeleton Model** for type.

9. A name will be automatically generated. Click **OK**.

10. Leave the default Creation Options. Click **OK**.

    The skeleton model appears in the model tree and a new set of data planes appears in the graphical area.

11. Right-click on the chassis skeleton model in the model tree. Select **Open**.

    The skeleton model opens in its own window.

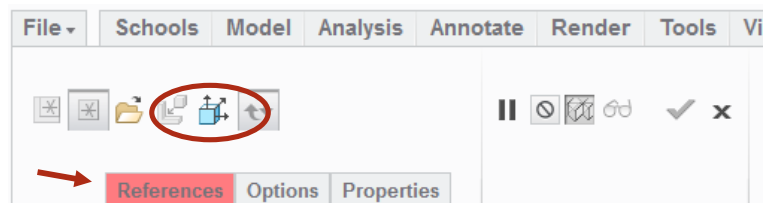   *Copy the drivetrain envelopes into your chassis skeleton model.*

12. From the Model tab, select **Copy Geometry**.
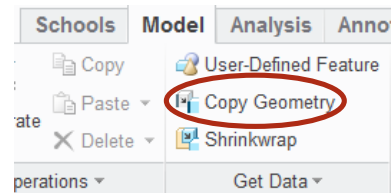
13. Click **Published Geometry Only** to disable it.
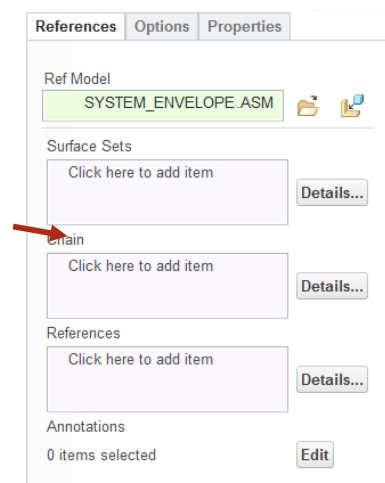
14. Click to open the References tab (appears red).

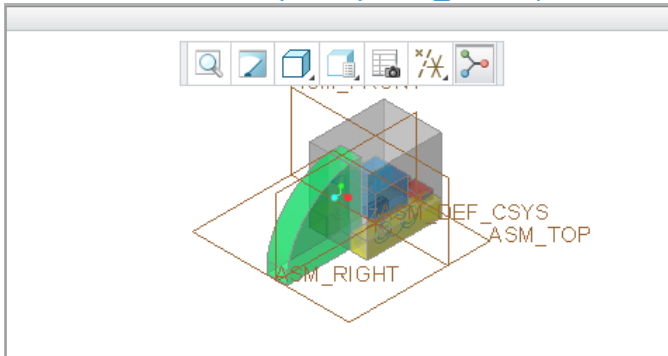15. Click next to the Ref Model field to choose a reference model.

16. Select **robot_system.asm**. Click **Open**.

17. Keep the default placement option. Click **OK**.

18. Click in the **References** field.

A second model tree, Model Tree(2), appears on the left of the Creo window containing the Robot System model.

The drivetrain envelopes models that we want to reference are part of the Robot System skeleton model.

19. In Model Tree(2), expand ROBOT_SYSTEM_SKEL.PRT so the geometric references are visible.

20. Our drivetrain envelopes are the second and third **extern copy geom** features. Hold Ctrl and click both drivetrain envelopes.

21. They will appear in the References field and the drivetrain envelopes will be highlighted in the model displayed in the small window. Click ✔ to copy them into the Chassis skeleton model.

The drivetrain envelopes are now visible in your chassis skeleton model. You will be able to use them to place the parts of your chassis subsystem.

22. Save and close your chassis skeleton model.

23. The chassis assembly model includes the drivetrain envelopes. To place your first part model, click **Assemble** from the Model tab.

24. Find the part you want from your working directory. (Your kit of parts needs to be saved to your working directory to be available in that folder.) In the example, we choose the 416mm channel, **TETRIX_739069.PRT**.

25. Click in the graphical area between the two drivetrain envelopes to temporarily place the part.

26. Use the orientation sphere to position the part the way you would like it.

27. Click to select the right surface of the part and the left surf of the right drivetrain envelope.

28. A coincident constraint should automatically be created between the two surfaces. If a different type of constraint is created, use the drop-down menu from the Component Placement tab to set the constraint type to **Coincident** .

29. Create coincident constraints between the front surface of the channel part and the right drivetrain envelope and between the top surfaces of the two parts.

30. Your channel part is now fully constrained (it appears orange) and position correctly within the chassis subassembly. Click ✔ to complete the placement.

    The next parts will be positioned based on the first chassis part model. Since we no longer need the drivetrain envelopes to place components, we can hide them.

31. From the model tree, right-click on **CHASSIS_SKEL.PRT** and select **Hide** .

32. To place the second chassis part, click **Assemble** from the Model tab.

33. Select the part you need. In the example we choose the 288mm channel, **tetrix_739068.prt**.

34. Click to place the new part near the front of the assembly.

35. Use the orientation sphere to rotate the new part so it is perpendicular the other two parts and the open side is facing into the assembly.

36. From the display menu, open the Saved Orientations menu and select **TOP**. (You may need to scroll down on the view drop-down menu to find TOP.)

37. The inside surface of the small holes is useful for making constraints. The examples often use two small-hole constraints to connect and orient parts as they are placed.
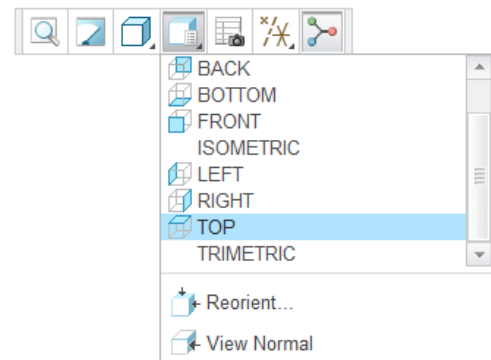
38. Click to select the small hole directly above the fifth large hole in from the right edge on the new part.

39. On the first channel placed in the assembly, click to select the small hole directly above the large hole ninth in from the front edge.

40. Click to select the small hole on the opposite side of the large hole from the one used in the previous constraint.

41. Click to select the bottom surface of the new part and the top surface of the first channel placed in the assembly.

42. The part is now fully constrained. Click ✔ to finish placing the new part.
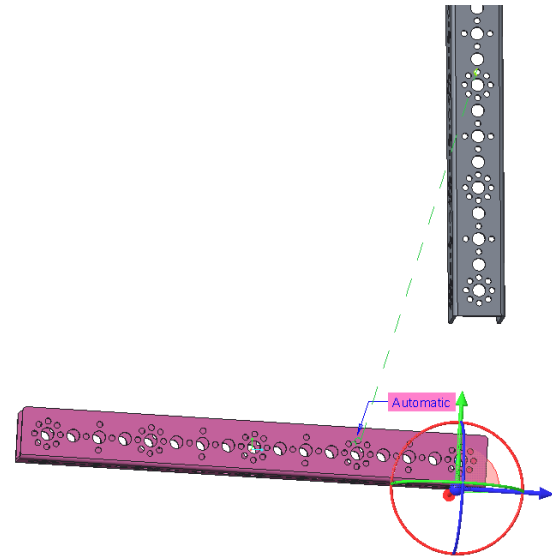
The part appears its natural color after it is placed in the assembly. If you need to change the placement of a part, right-click on the filename in the model tree and select Edit Definition 👆

43. Repeat the procedure used to place the 288mm channel in order to place a second 416mm channel part parallel to the first part placed and again to place a 160mm channel, **tetrix_739067.prt** aligned with the seventh large hole in from the back edge of the first channel piece placed in the assembly.

44. Your completed chassis model includes four channel pieces constrained using the screw holes and top and bottom surfaces.
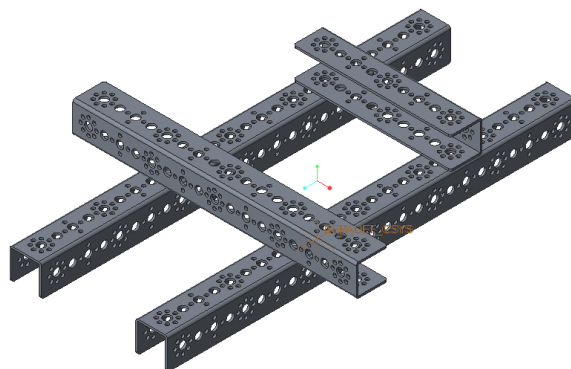
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