Machinery Chain Tutorial

This tutorial teaches you how to create roller chain system using the 2D links modeling method. The Adams/Machinery Chain module supports multiple combinations of chain system type and modeling methodology options.

This chapter includes the following sections:

What You Will Create

During this tutorial, you will model a roller chain system consisting of 2 sprockets and one guide with a tensioning device. Both sprockets will be constrained via revolute joints. One of the sprockets will be actuated with a motion. Contact forces including friction between the discrete chain segments and the sprockets convey the motion.

The figure shows the roller chain system using 2D links method that you are going to create.

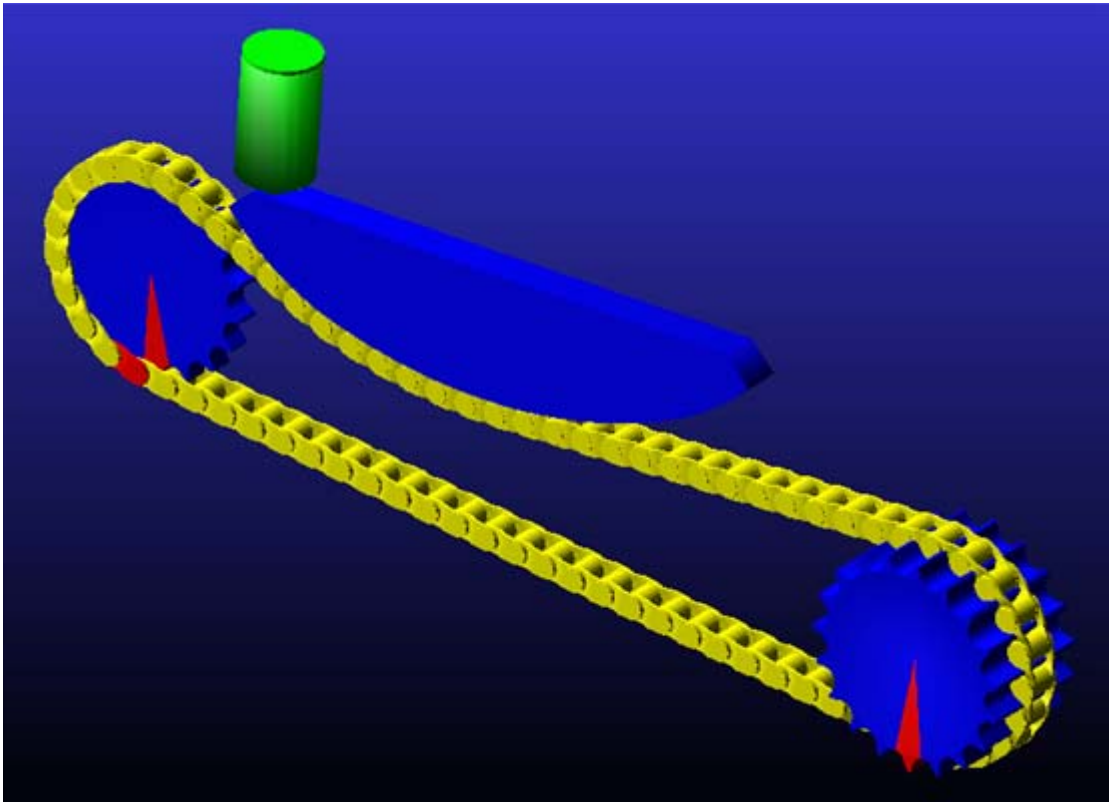


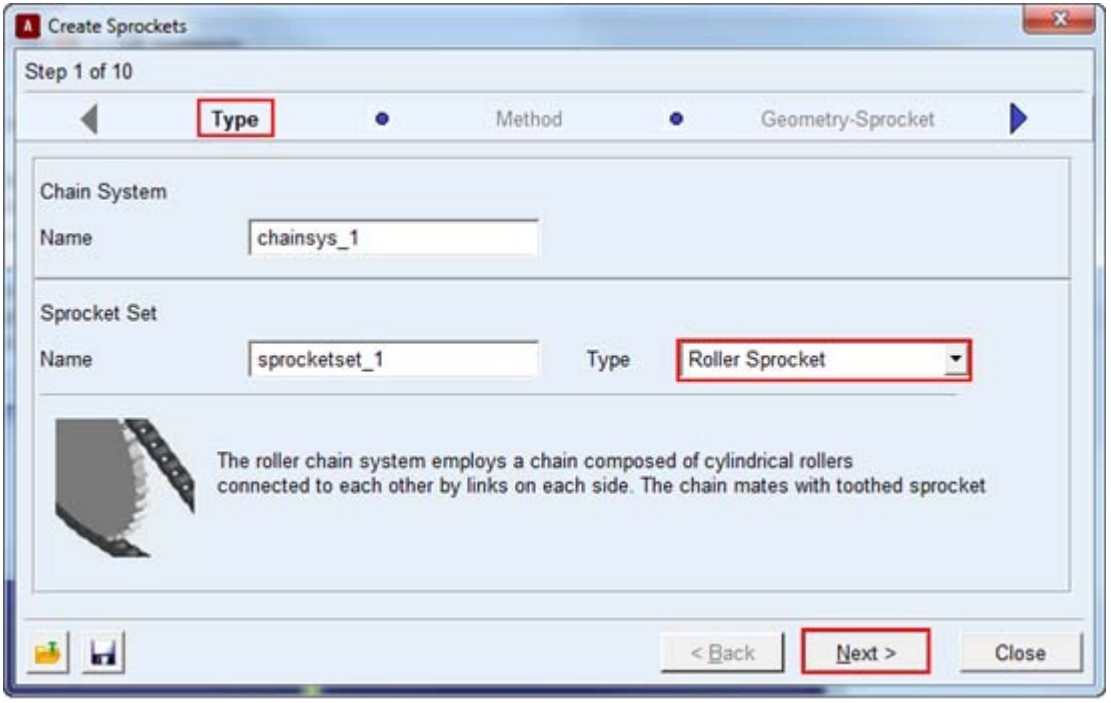
Figure 1 Roller Chain System

Creating Roller Chain System

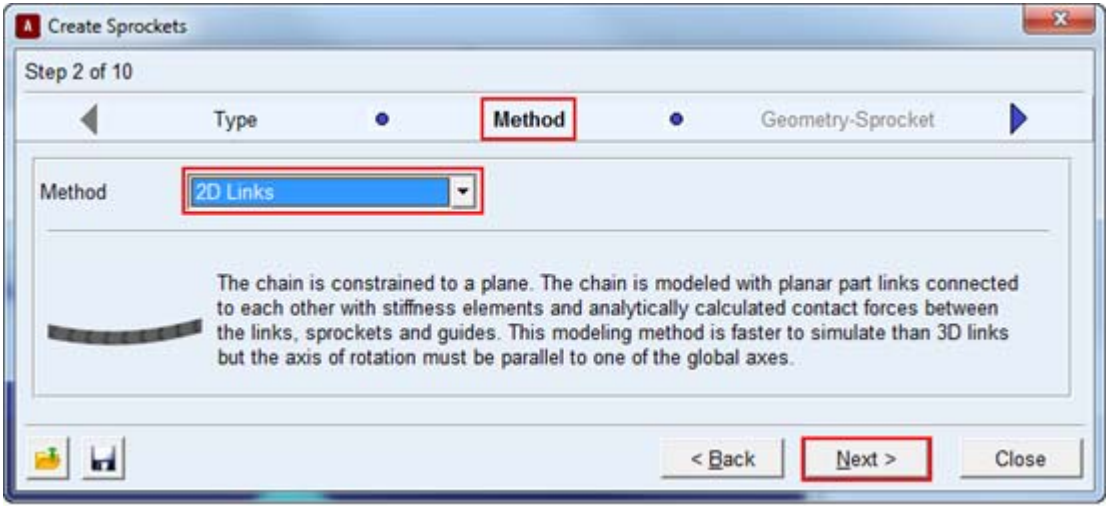
In this section, you will create a chain system.

1. Click the **Machinery** tab on the Adams/View ribbon.
2. From the **Chain** container, click the icon for **Create Sprockets.**

3. The sprocket creation wizard will launch. On the first page (**Type**) select **Roller Sprocket** from the **Type** option menu and click **Next.**

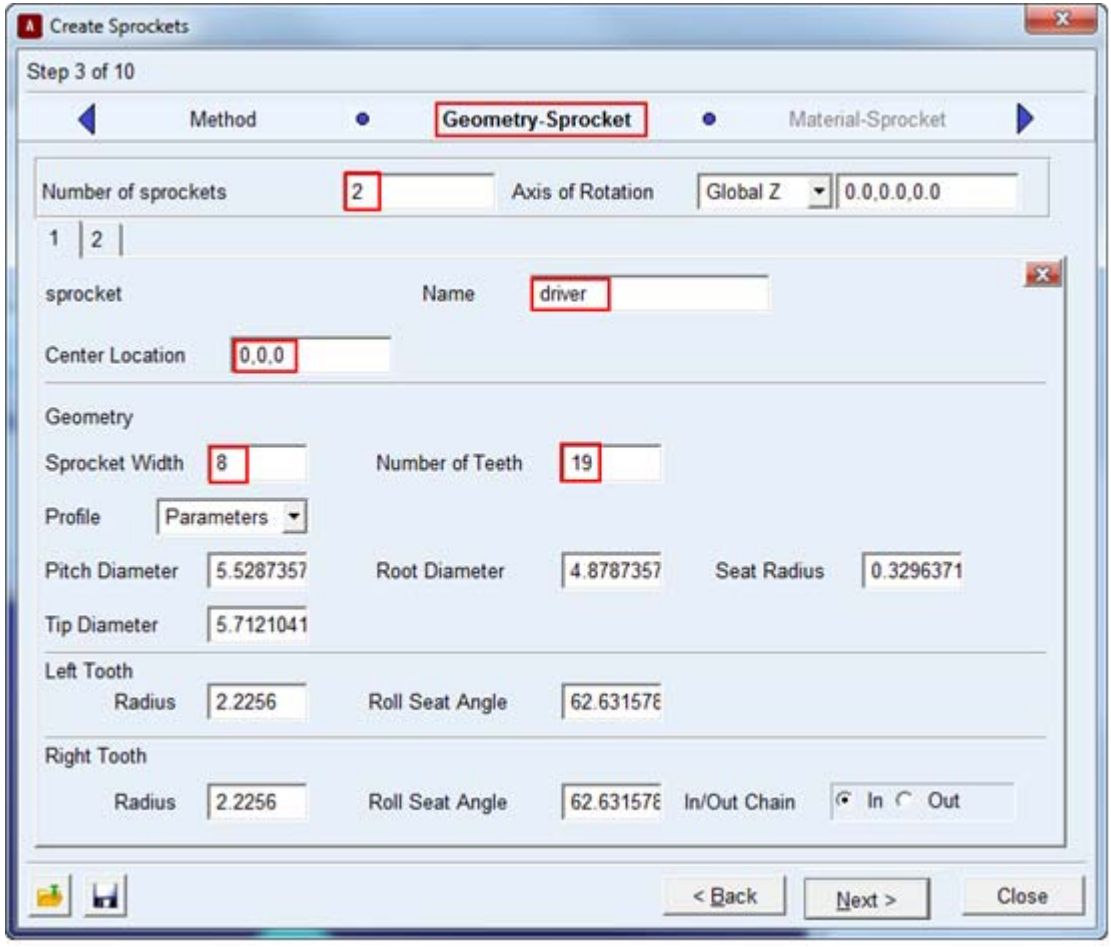


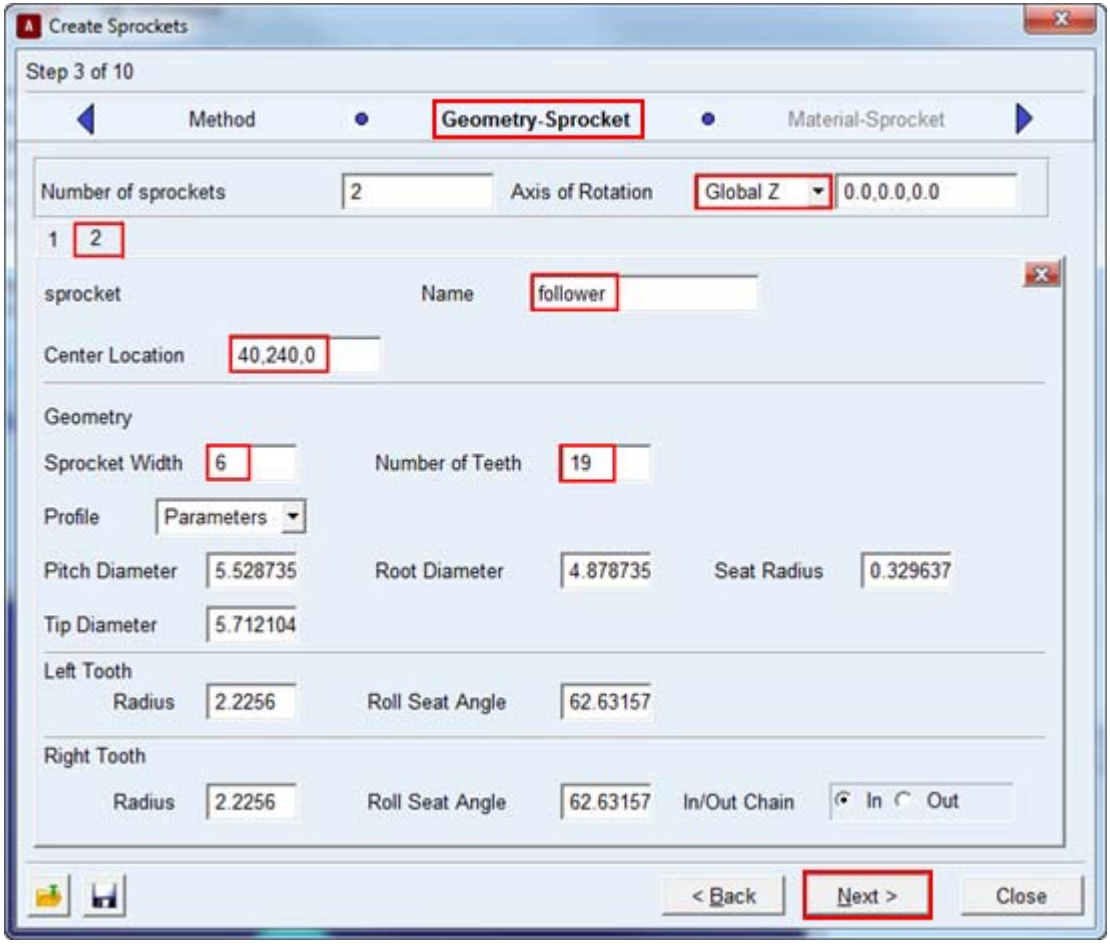
4. On the next page (**Method**) select **2D Links** from the **Method** option menu and click **Next**.



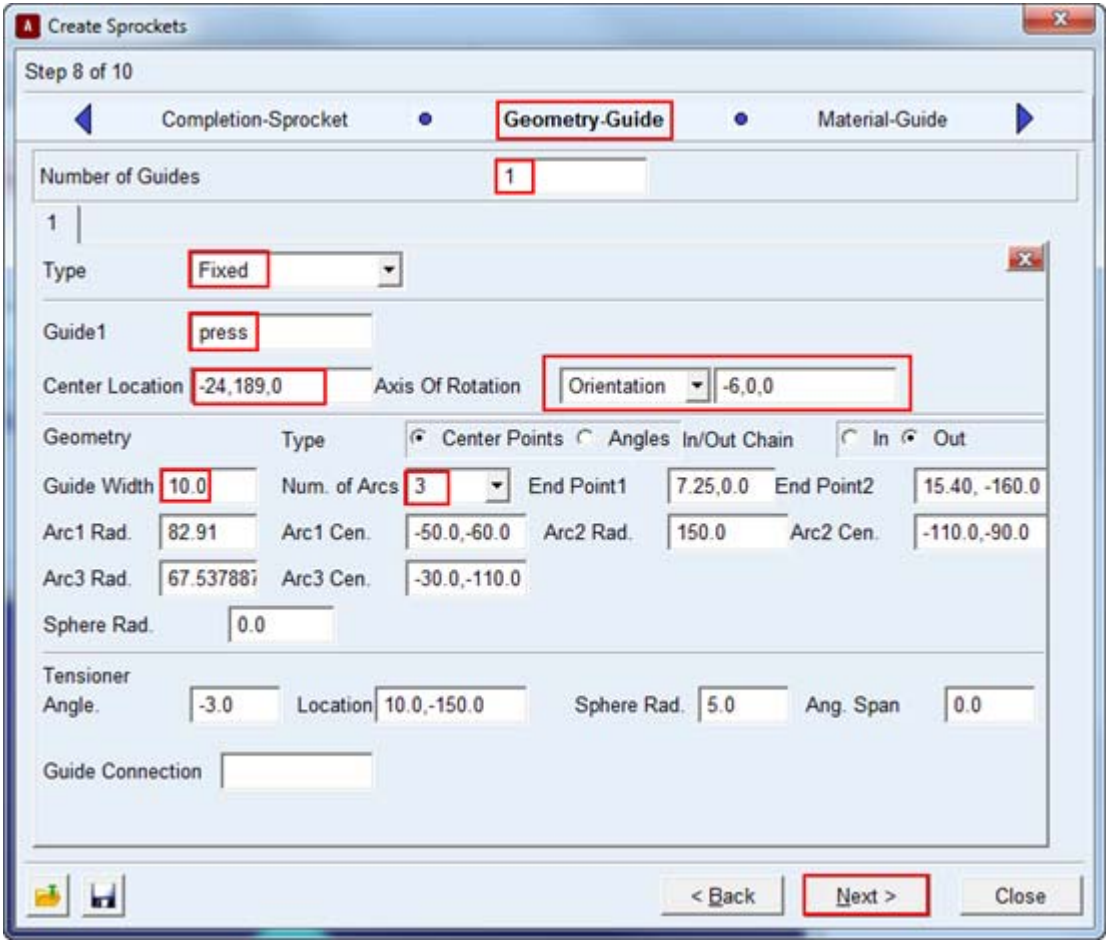
5. On the next page (**Geometry-Sprocket**) enter "**2**" in the **Number of Pulley** field and fill out the two tabs defining each pulley's geometry as shown below and then click **Next**:

Note: After you enter the number of teeth = 19, default values for the Profile will appear.

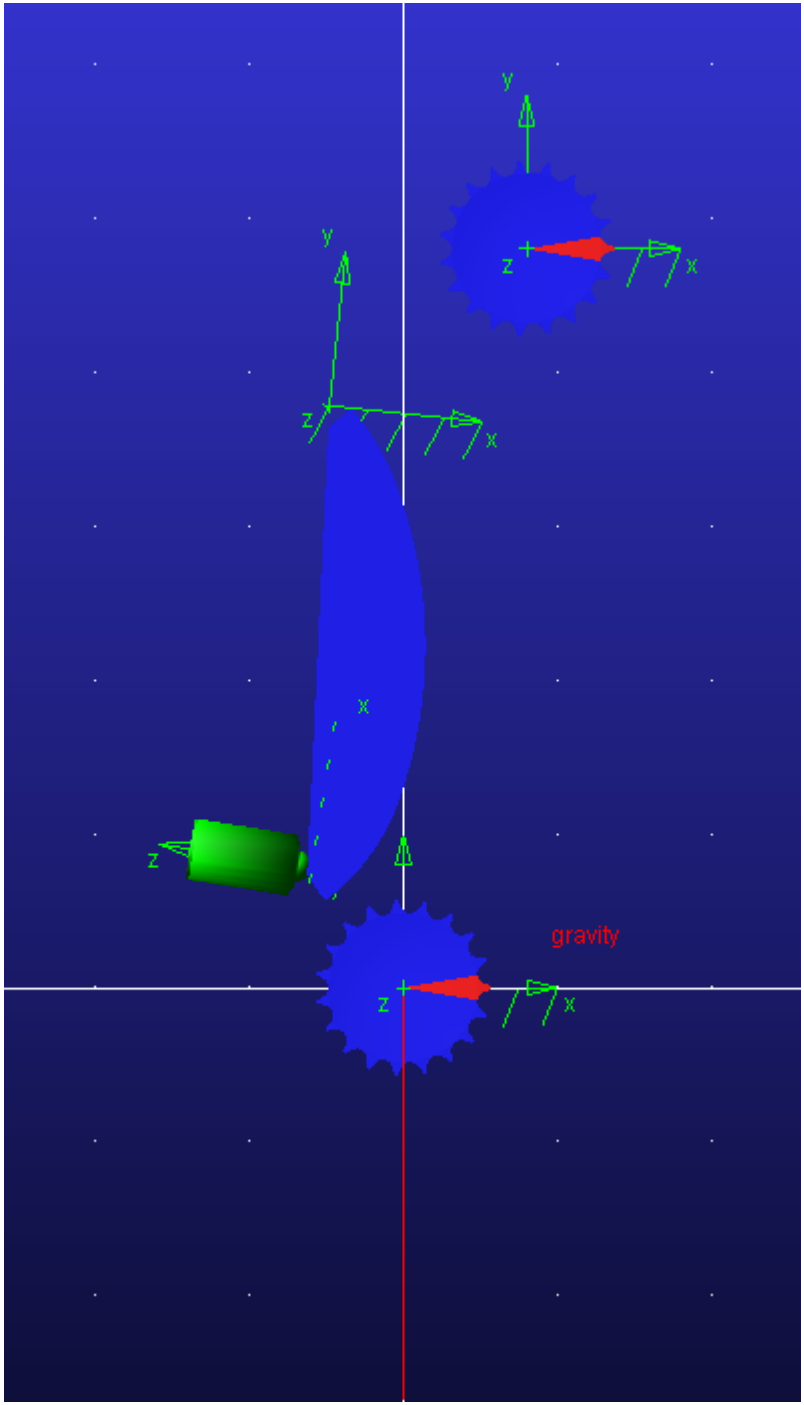

Create Sprockets
Step 3 of 10
Method
Geometry-Sprocket
Material-Sprocket
Number of sprockets
2
Axis of Rotation
Global Z
0.0,0.0,0.0
1
2
sprocket
Name
driver
Center Location
0,0,0
Geometry
Sprocket Width
8
Number of Teeth
19
Profile
Parameters
Pitch Diameter
5.5287357
Root Diameter
4.8787357
Seat Radius
0.3296371
Tip Diameter
5.7121041
Left Tooth
Radius
2.2256
Roll Seat Angle
62.631578
Right Tooth
Radius
2.2256
Roll Seat Angle
62.631578
In/Out Chain
In
Out
< Back
Next >
Close



6. The next page (**Material-Sprocket**) defines the material properties to be used for the mass property calculations for each sprocket. Accept the defaults and move on by clicking **Next**.
7. On the next page (**Connection-Sprocket**) you define how each sprocket is to be connected to the rest of the model. For this example, accept the defaults which mount each pulley to ground via revolute joints and click **Next**.
8. On the next page (**Output-Sprocket**) you can optionally reduce the amount of post-processing information about the sprockets to be made available as Adams Requests. For this example, accept the defaults (to get all information) and click **Next**.
9. The next page (**Completion-Sprocket**) informs you that all the information required for the roller sprockets has been entered. Click **Next** to proceed to the guide definition.
10. On this page (**Geometry - Guide**) enter "**1**" in the **Number of Guides** field and fill out the tab defining the guide as shown below and then click **Next**:



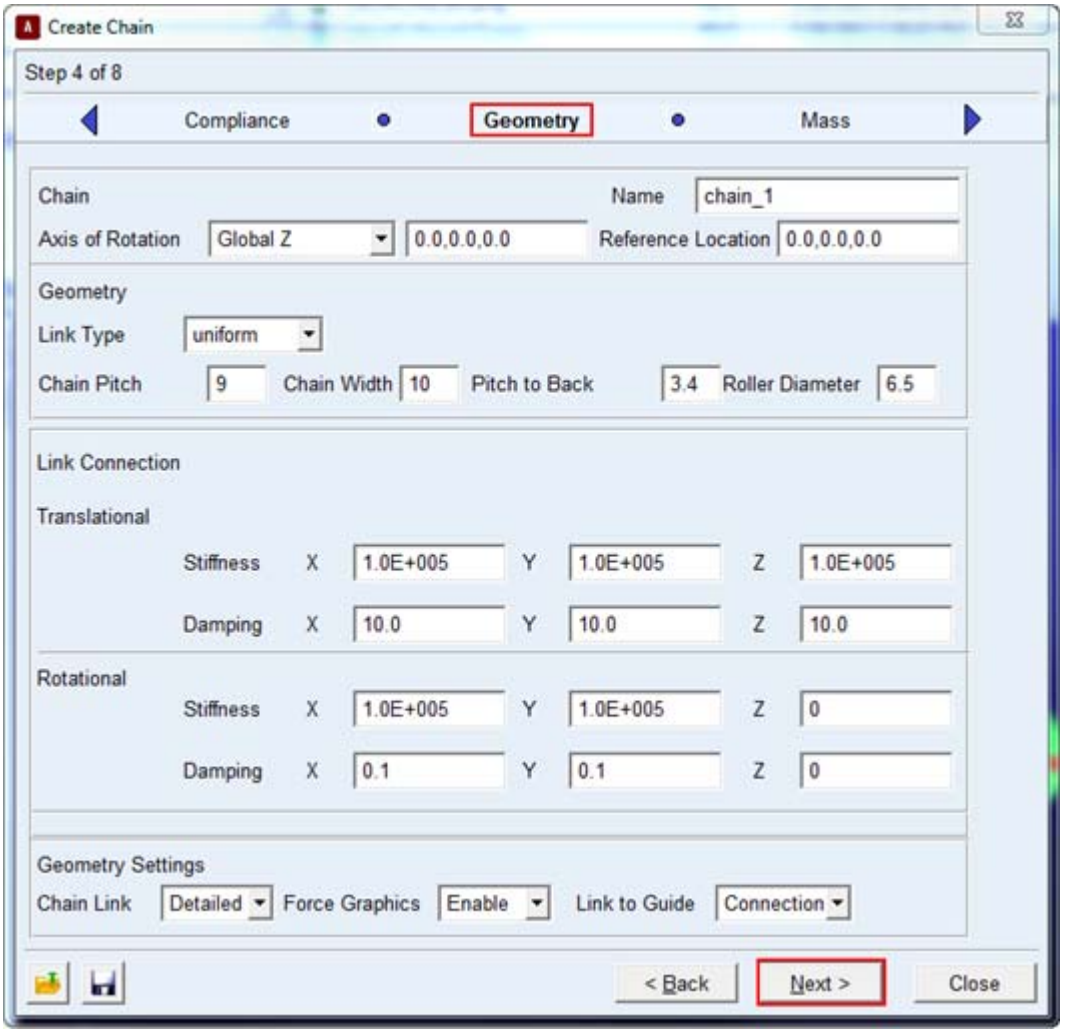
11. The next page (**Material-Guide**) defines the material properties to be used for the mass property calculations for the guide. Accept the defaults and move on by clicking **Next.**
12. On the next page (**Output-Guide**) you can optionally reduce the amount of post-processing information about the guide to be made available as Adams Requests. For this example, accept the defaults (to get all information) and click **Next**.
13. The next page (**Completion**) informs you that all the information required for the sprocket set has been entered. Optionally save the content of the entire wizard to a file for re-use later by clicking the **Save** icon. Click **Finish** to create the sprocket set.


y
z
x
y
z
x
x
z
gravity
z
x

14. From the Ribbon go to the **Machinery** tab's **Chain** container and click the icon for **Create Chain**.

15. The Chain Creation wizard is launched. In the **Name** field enter the name of the sprocket set you just created (right-mouse-click in the field and use **Pick** or **Guesses** to quickly select) and then click **Next**.
16. The next page (**Method**) defaults to the method you chose when creating the sprocket set. Accept zthis default by clicking **Next**.
17. The next page (**Compliance**) defines the model to be used for the chain's link-to-link compliance. Accept the default, **Linear**, and click **Next**.

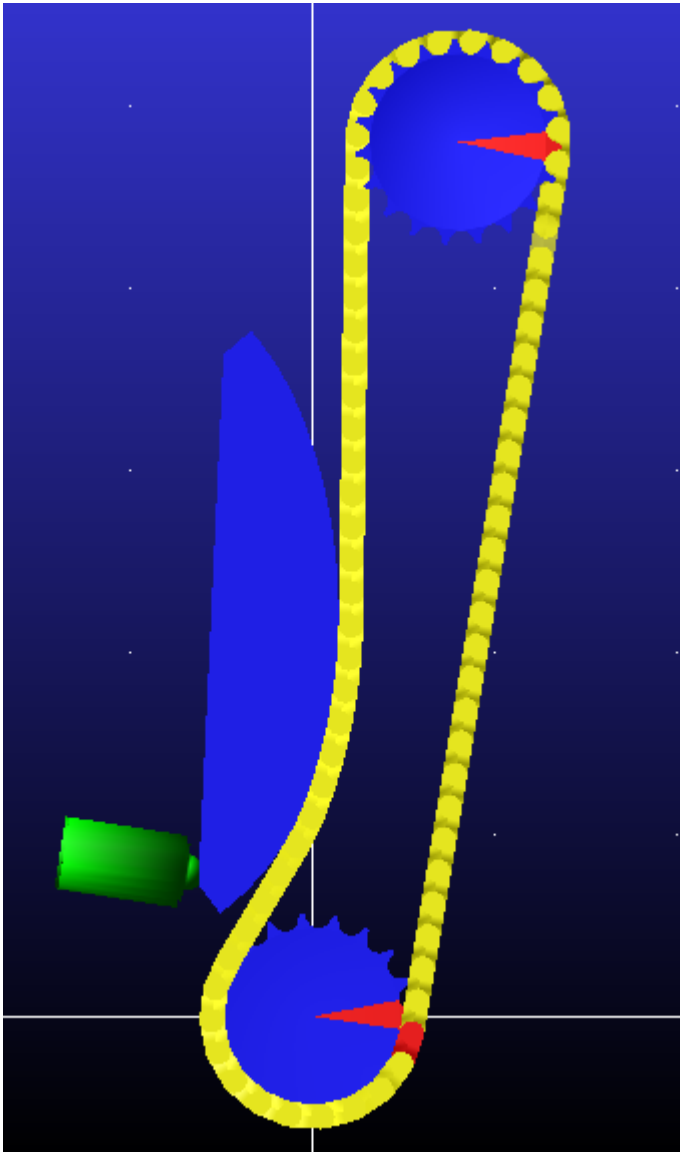
18. The next page (**Geometry**) is for specification of the Chain geometry. Accept the default values. In the Geometry Settings ensure that **Detailed** is selected from the **Chain Link** option menu and that **Enable** is selected from the **Force Graphics** menu; then click **OK**. Then click **Next** to move on.



19. The next page (Mass) defines the mass properties for the chain links. Accept the defaults and click **Next**.

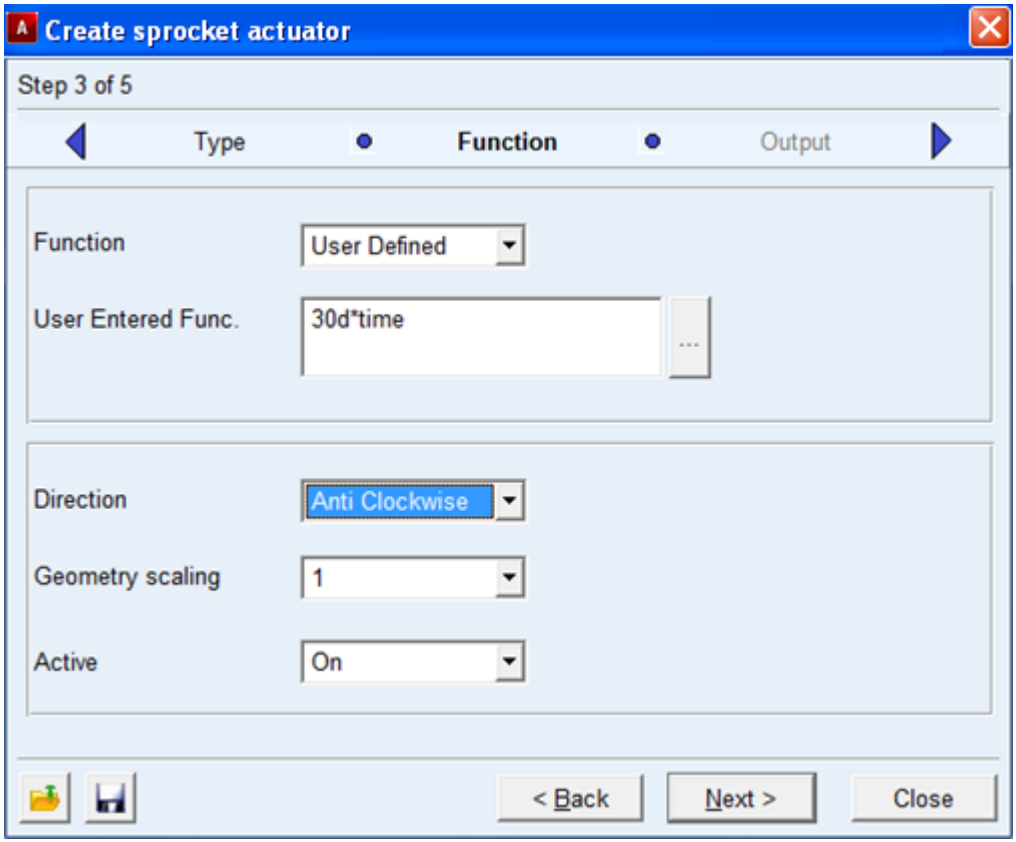
20. On the next page (Wrapping Order) the chain routing is defined. Right-click in the field and use the **Guesses** menu to first pick the driver, then the guide and finally the follower so that the field is populated as such: "**sprocketset_1_driver, sprocketset_1guide_press, sprocketset_1_follower**" …then click **Next.**

21. When prompted about the chain number of links, tension and strain; click **OK** to continue. A warning message will be displayed informing you that the 2D parts for the links are unique to the Adams/Solver C++ executable (the default mode).
22. Now you will be on the Output Request page. Create a **Link Request** and populate the **Link Parts** field (for example, via right-click **Pick**) with a link near the bottom of the follower sprocket. This will create output requests to track the forces on that link as the chain runs around the sprockets. You may want to toggle the icon display off to better see the chain (one way to do this is to click inside the graphics window and press the "**v**" key on your keyboard). Click **Next.**



23. From the Ribbon go to the **Machinery** tab's **Chain** container and click the icon for **Chain Actuation Input**.

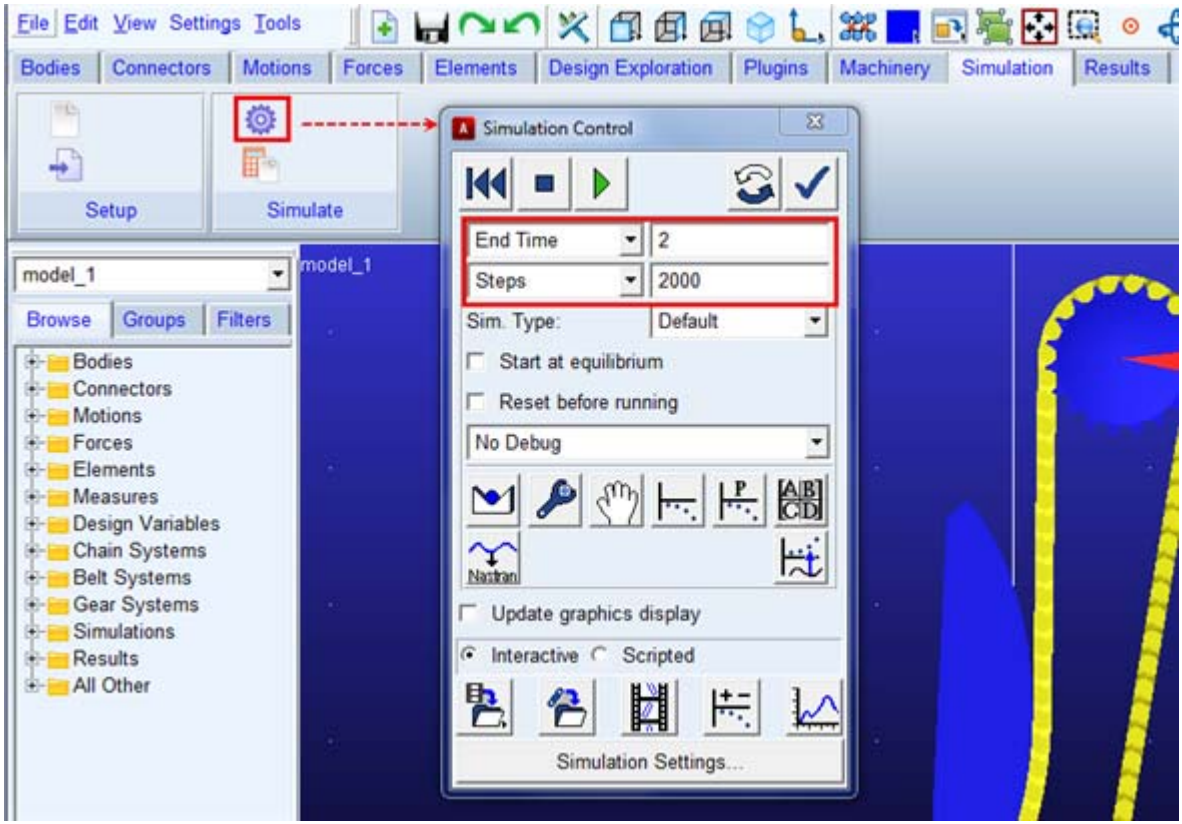
24. The **Actuate Chain** wizard is launched. In the Sprocket Set **Name** field enter the name of the sprocket set you just created (right-mouse-click in the field and use **Pick** or **Guesses** to quickly select). In the Actuator Sprocket field enter the name of the driver sprocket (right-mouse-click in the field and use **Pick** or **Guesses** to quickly select). Then click **Next**.
25. On the next page (**Type)** select **Motion** and click **Next**
26. Complete the next page (**Function**) as shown below:



27. On the next page (**Output**) you can optionally reduce the amount of post-processing information about the actuator to be made available as Adams Requests. For this example, accept the defaults (to get all information) and click **Next**.
28. The next page (**Completion**) informs you that all the information required for the actuation has been entered. Optionally save the content of the entire wizard to a file for re-use later by clicking the **Save** icon. Click **Finish** to create the actuator.
29. Now we are ready to simulate the model. The preferred integrator for such Chain systems is HHT. From the main text menu select: Settings-Solver-Dynamics and ensure that **HHT** is selected from the **Integrator** option menu.

Simulation

Simulate your model for 2 seconds at 2000 steps by clicking the **Interactive Simulation** icon from the **Simulate** container on the **Simulation** tab, entering the values shown below and clicking the **Start Simulation** button.



Adams/PostProcessor Results

Explore the results in Adams/PostProcessor.