

Week 4 – ABB Robot Teaching 4: Virtual Workcell in RobotStudio

Advanced Robotic Systems – MANU2453

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Content

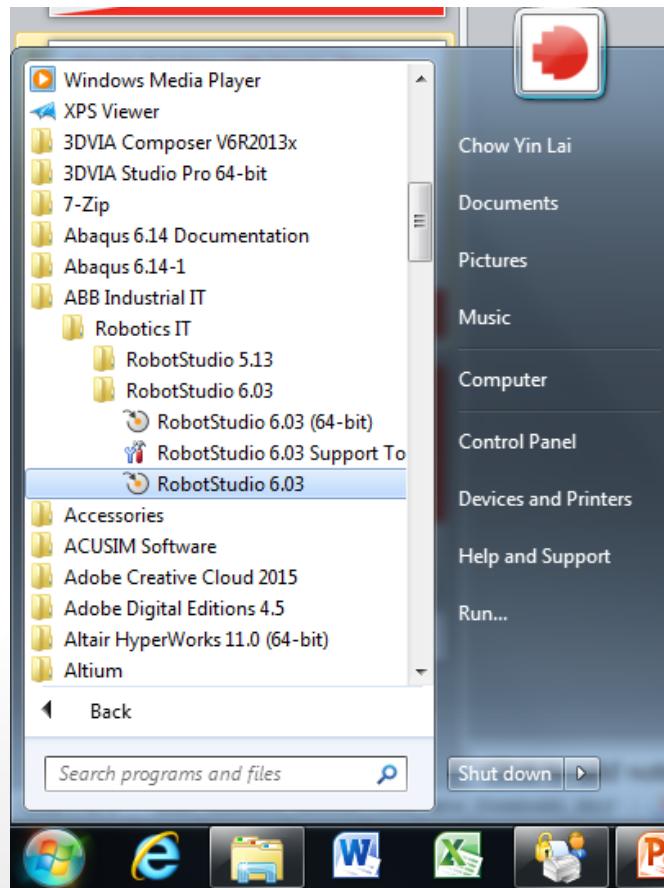
- Import Robot from ABB Library
- Navigation in 3D Window
- Create Robot System with Controller
- Jog Robot
- Import Tool
- Import Workpiece
- Save Solution

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- Import Robot from ABB Library
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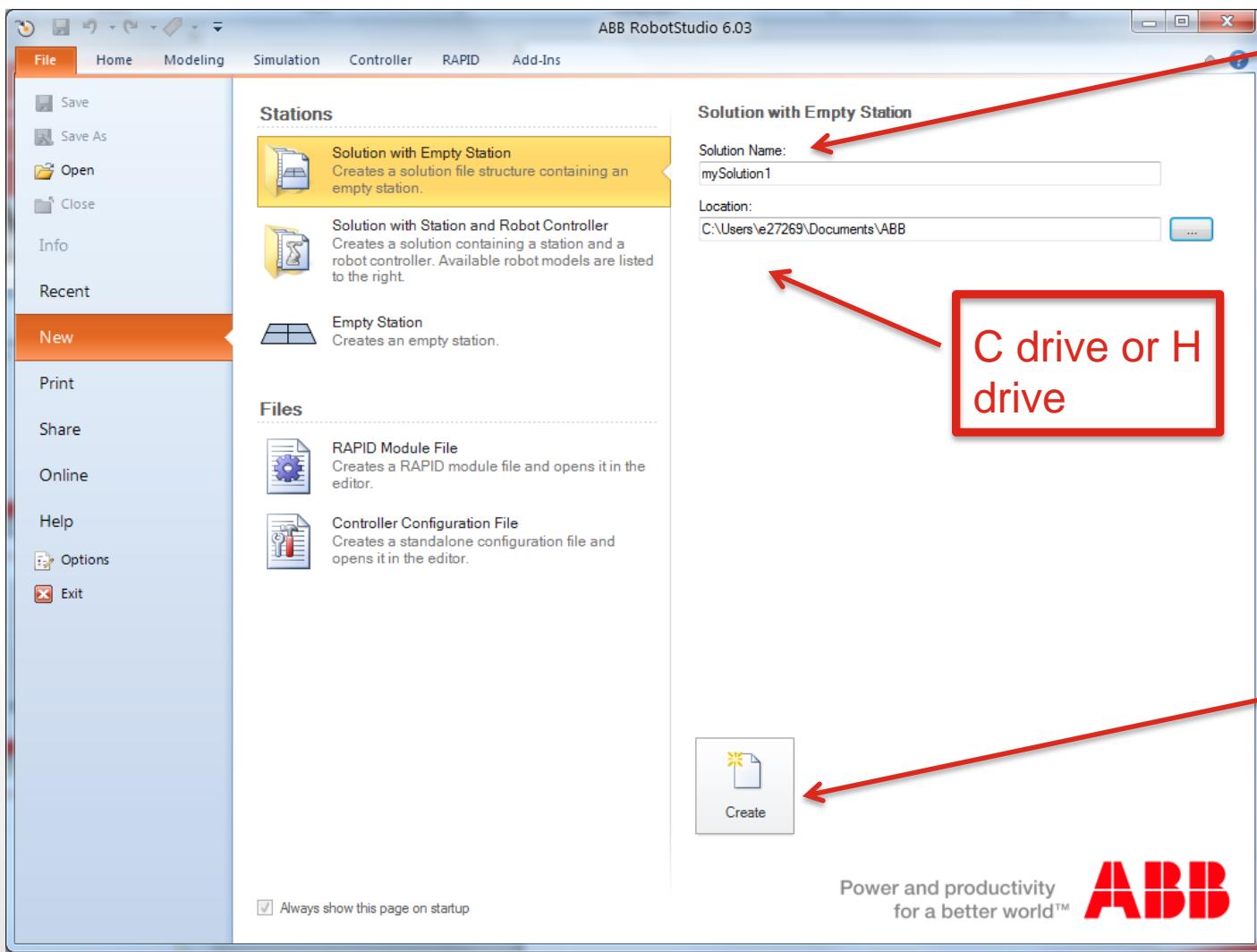
Create Solution with Empty Station

- Start RobotStudio 6.03



Create Solution with Empty Station

- In the next window, 1. Select “Solution with Empty Station”



2.
Change
name
and
location

C drive or H
drive

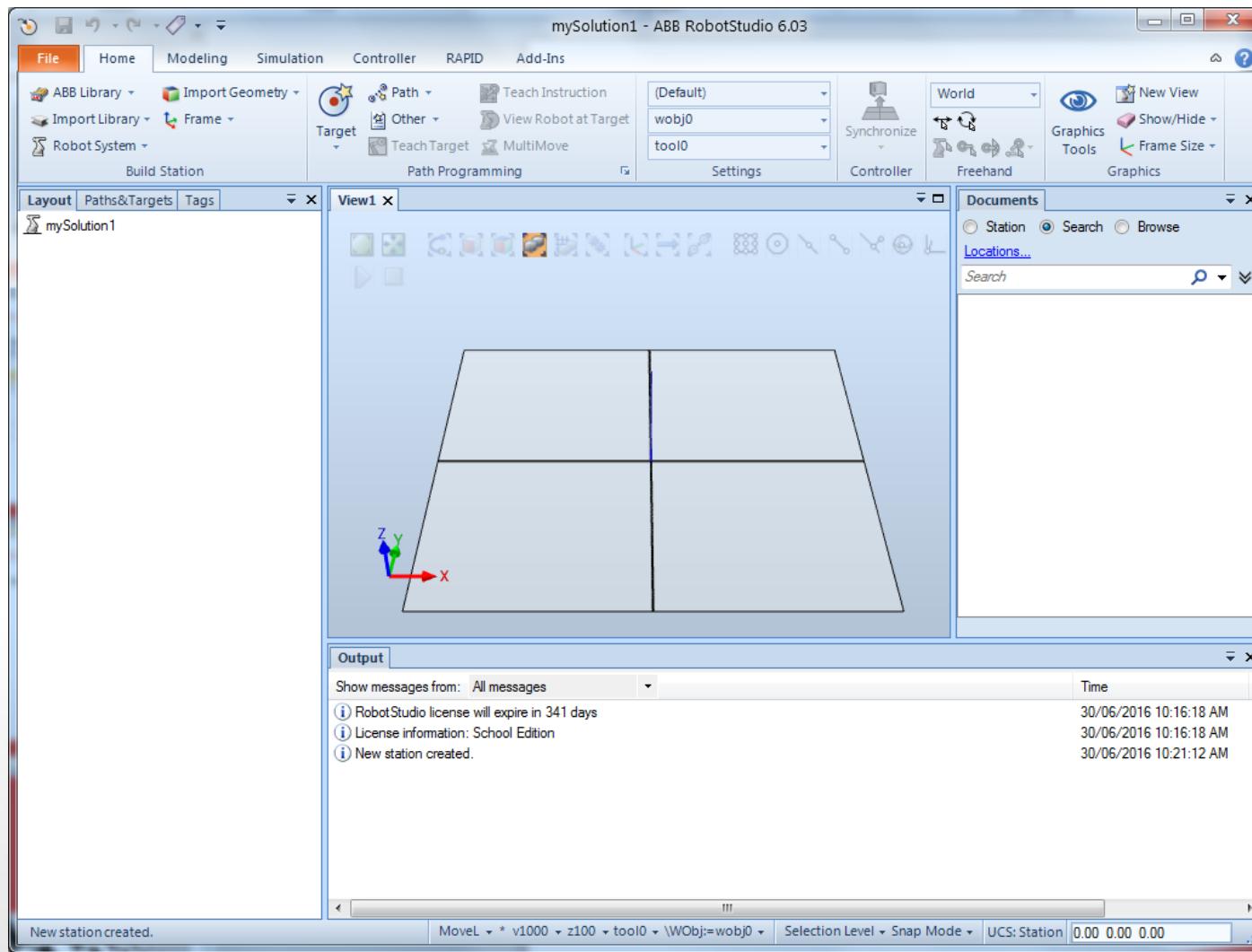
3. Click
Create

Power and productivity
for a better world™



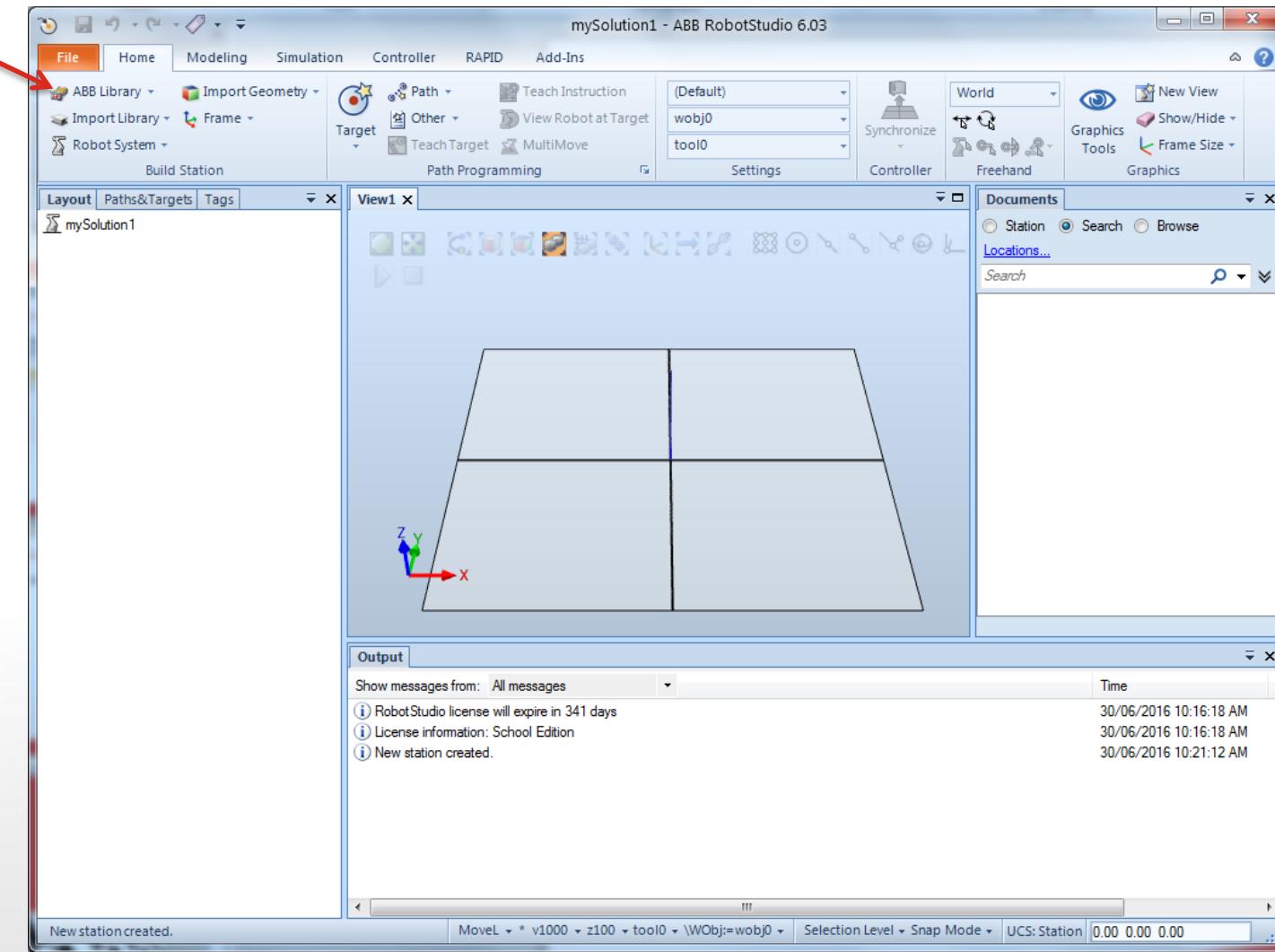
Create Solution with Empty Station

- The empty station will be shown.



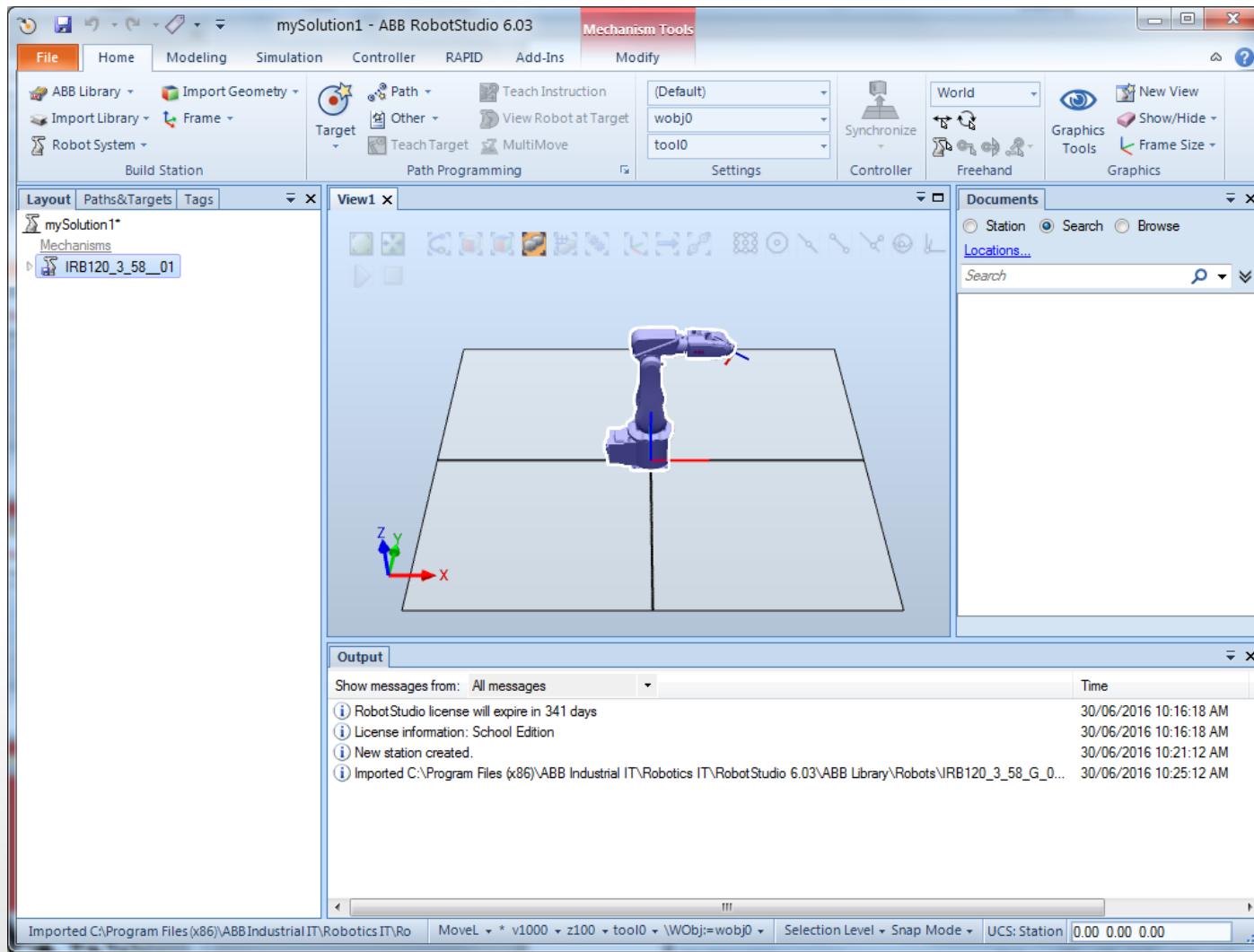
Import Robot from ABB Library

- On the home tab, click ABB Library → Choose your robot (e.g. IRB 120).



Import Robot from ABB Library

- The robot will then appear on the station.

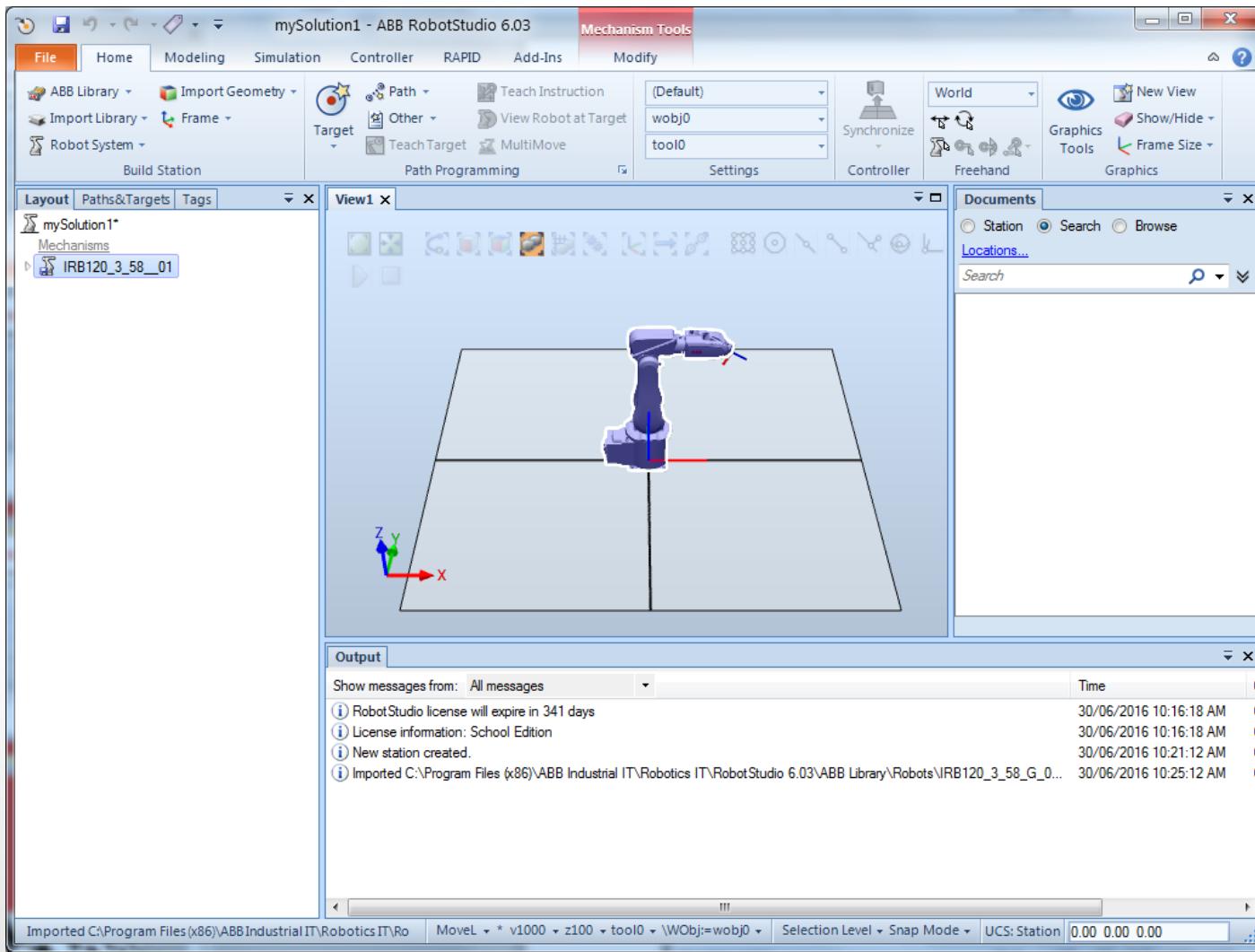


Content

- Import Robot from ABB Library
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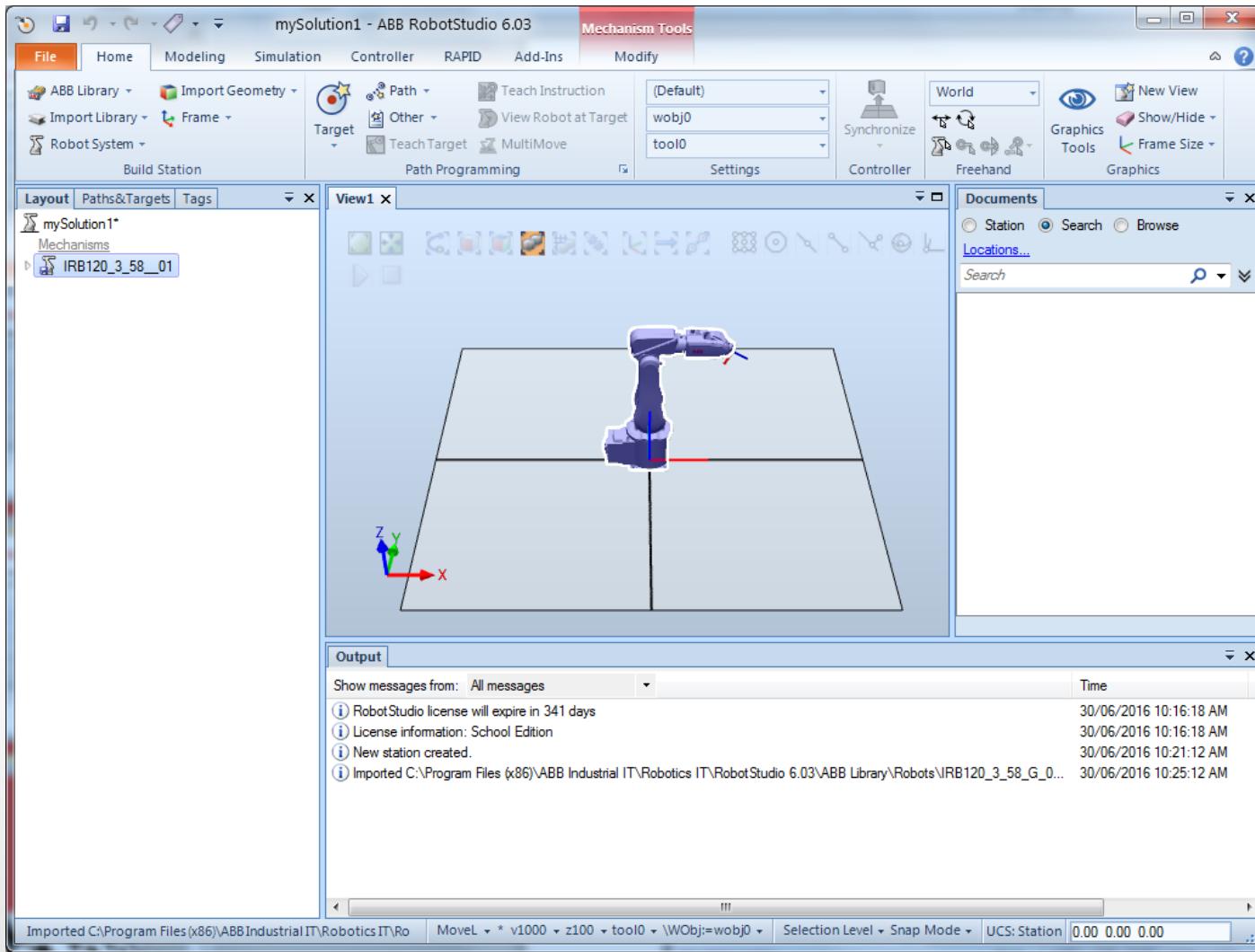
Navigate the 3D Window

- Zoom: Roll the mouse middle button, or hold the middle button and move.



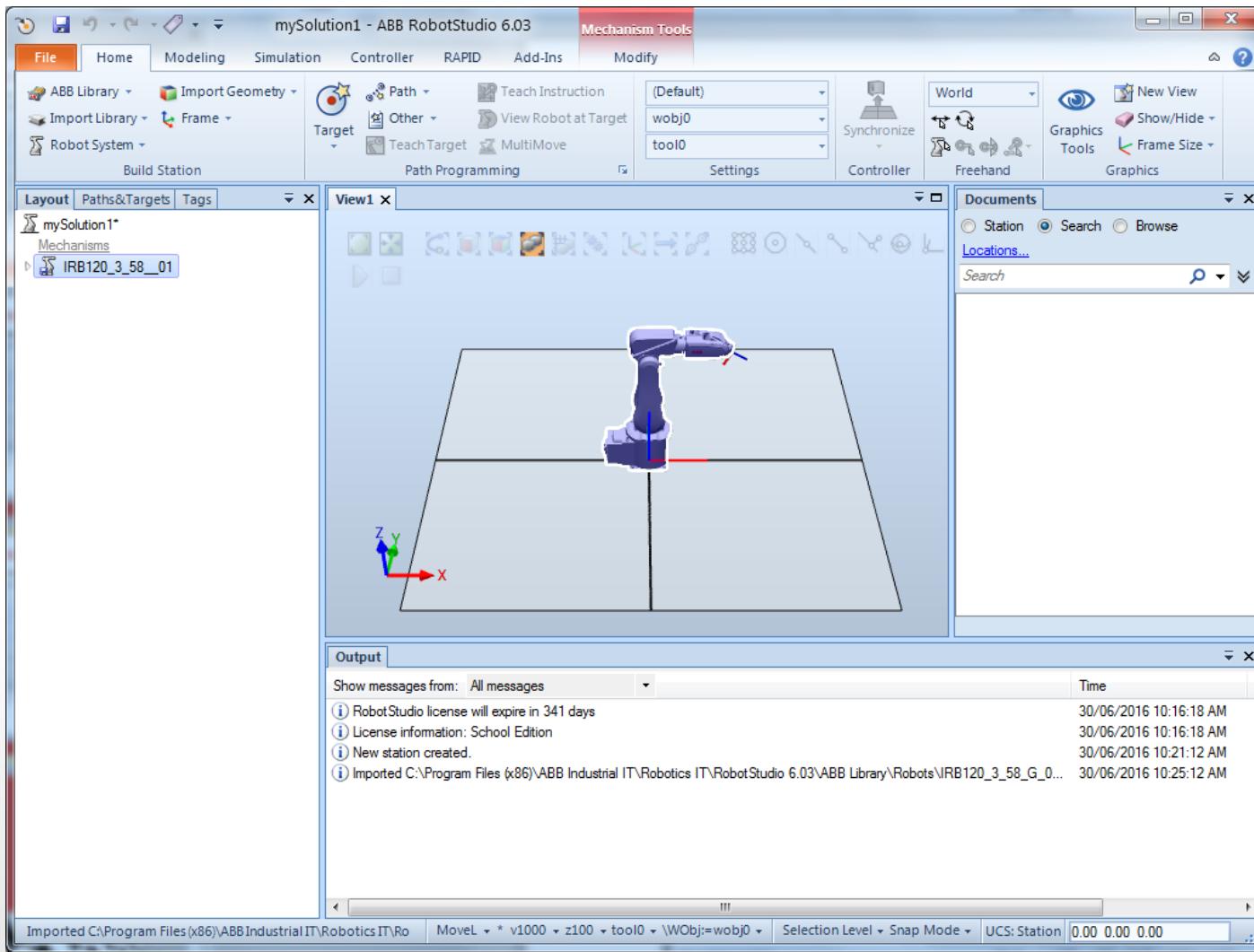
Navigate the 3D Window

- Rotate: Press mouse middle + right button, then move mouse.



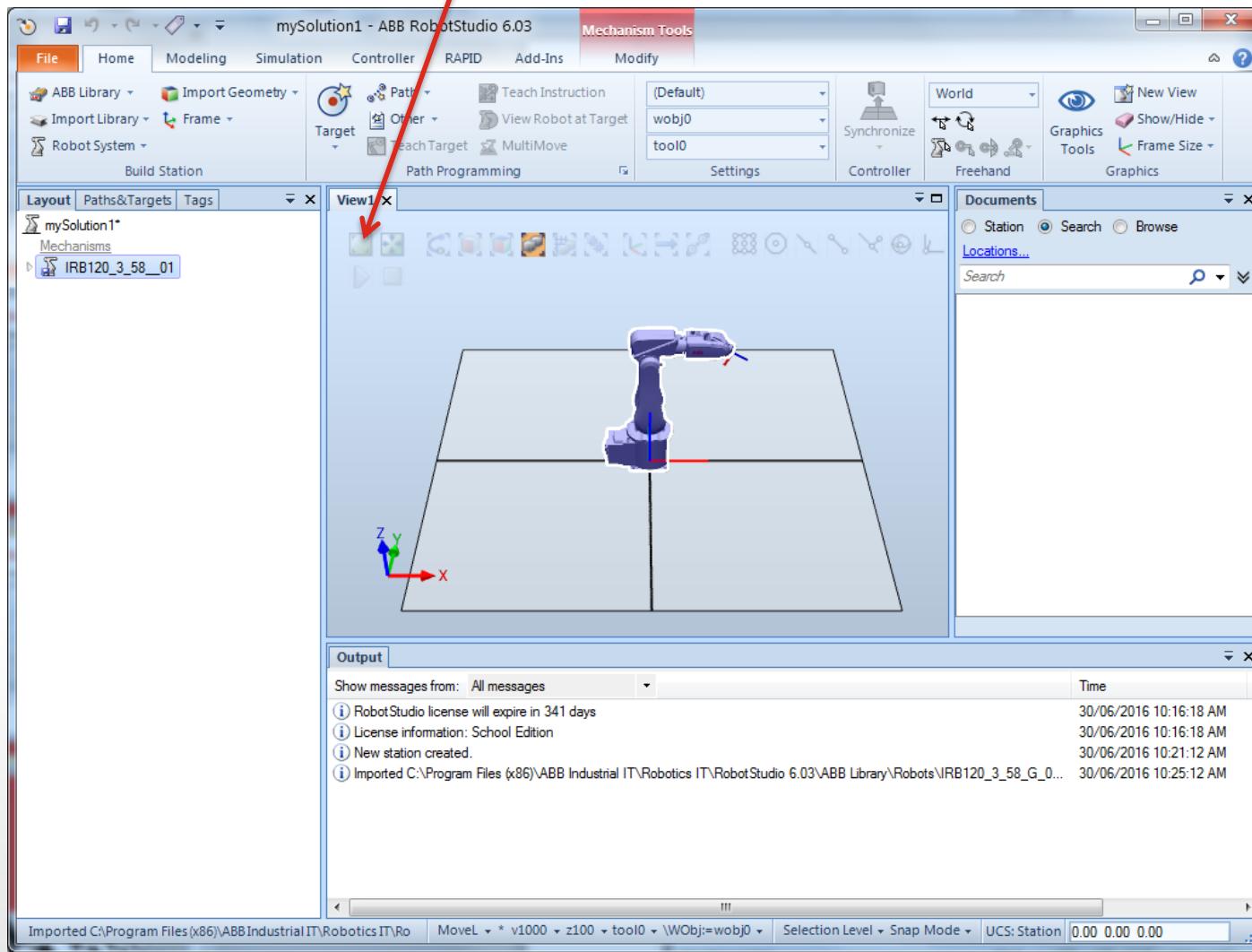
Navigate the 3D Window

- Pan: Ctrl + Press mouse left button, then move mouse.



Navigate the 3D Window

- View all: Click the “View all” button.



Content

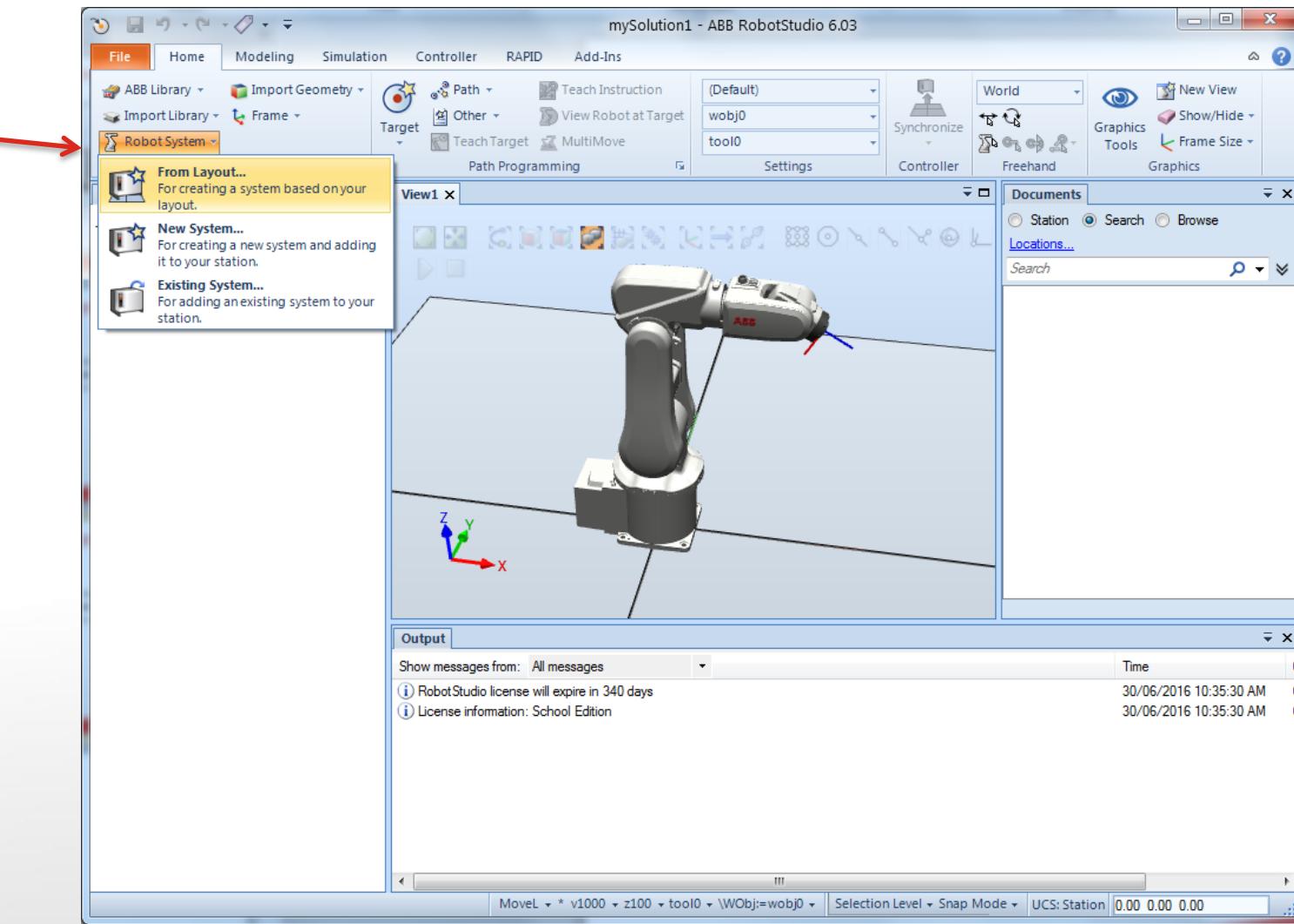
- Import Robot from ABB Library
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- **Create Robot System with Controller**
- Jog Robot
- Import Tool
- Import Workpiece
- Save Solution

Create Robot System from Layout

- A **robot system** consists of:
 - The **robot**.
 - A **virtual controller**.
 - The virtual controller is an exact replica of the actual controller.
 - This allows the simulated robot to act as in the real world.
 - If a task can be done in virtual environment, then it can also be done in the real world.

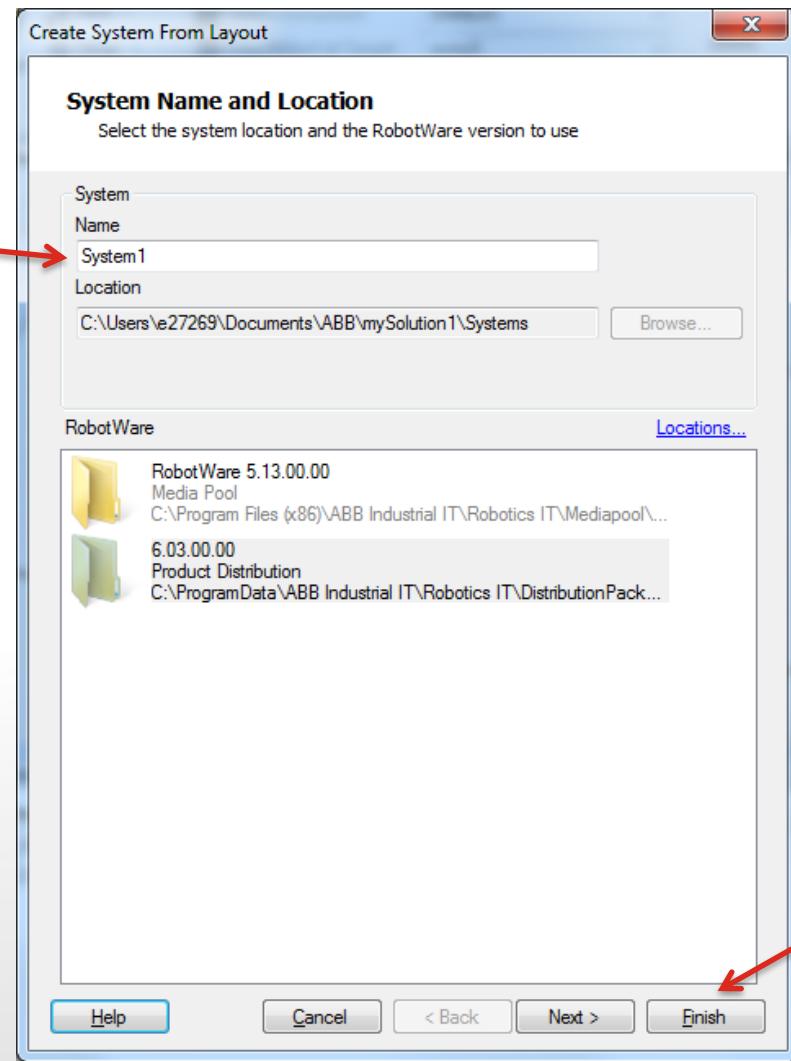
Create Robot System from Layout

- Click Robot System → From Layout.



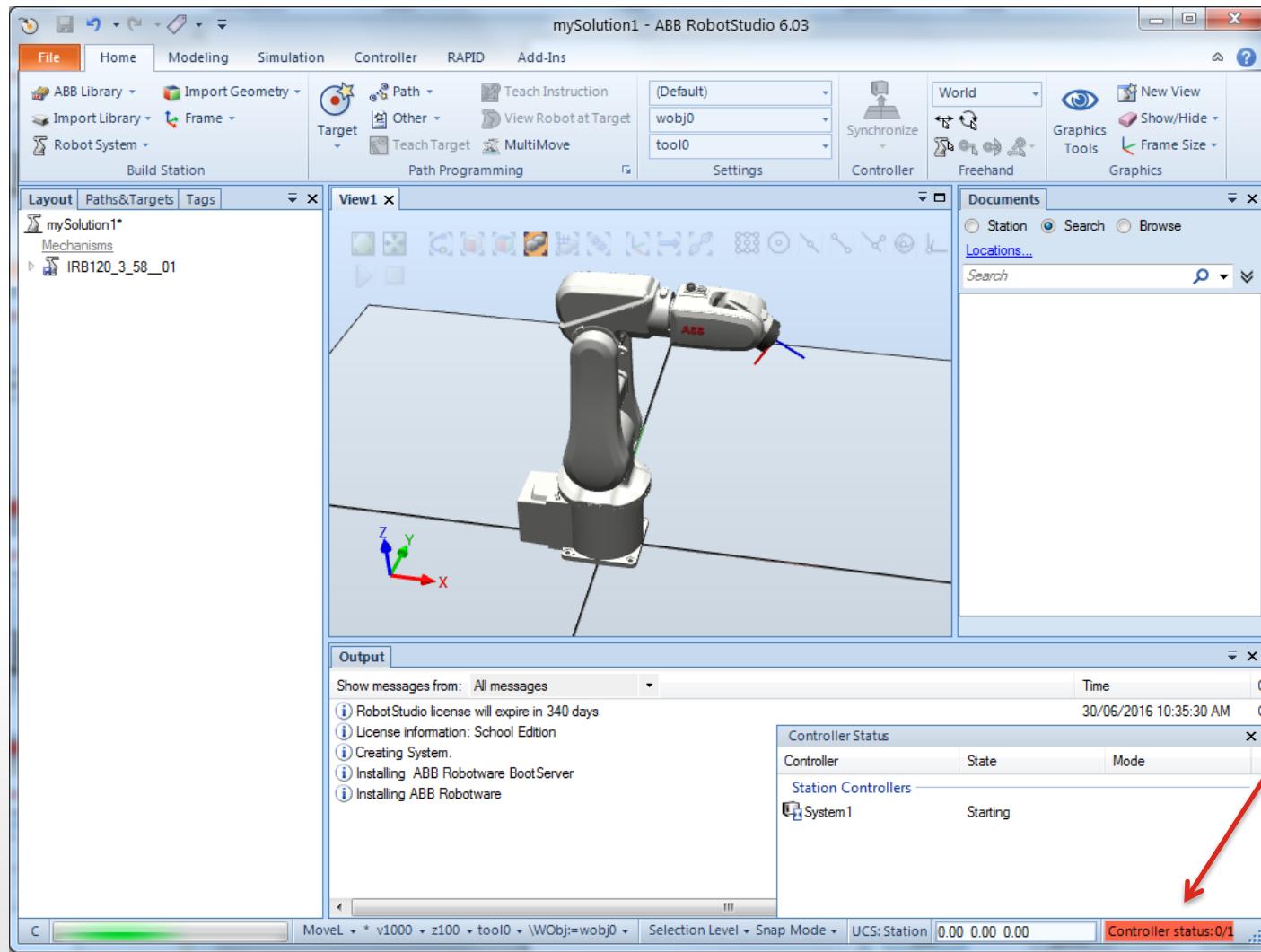
Create Robot System from Layout

- Rename the system if needed, then click Finish.



Create Robot System from Layout

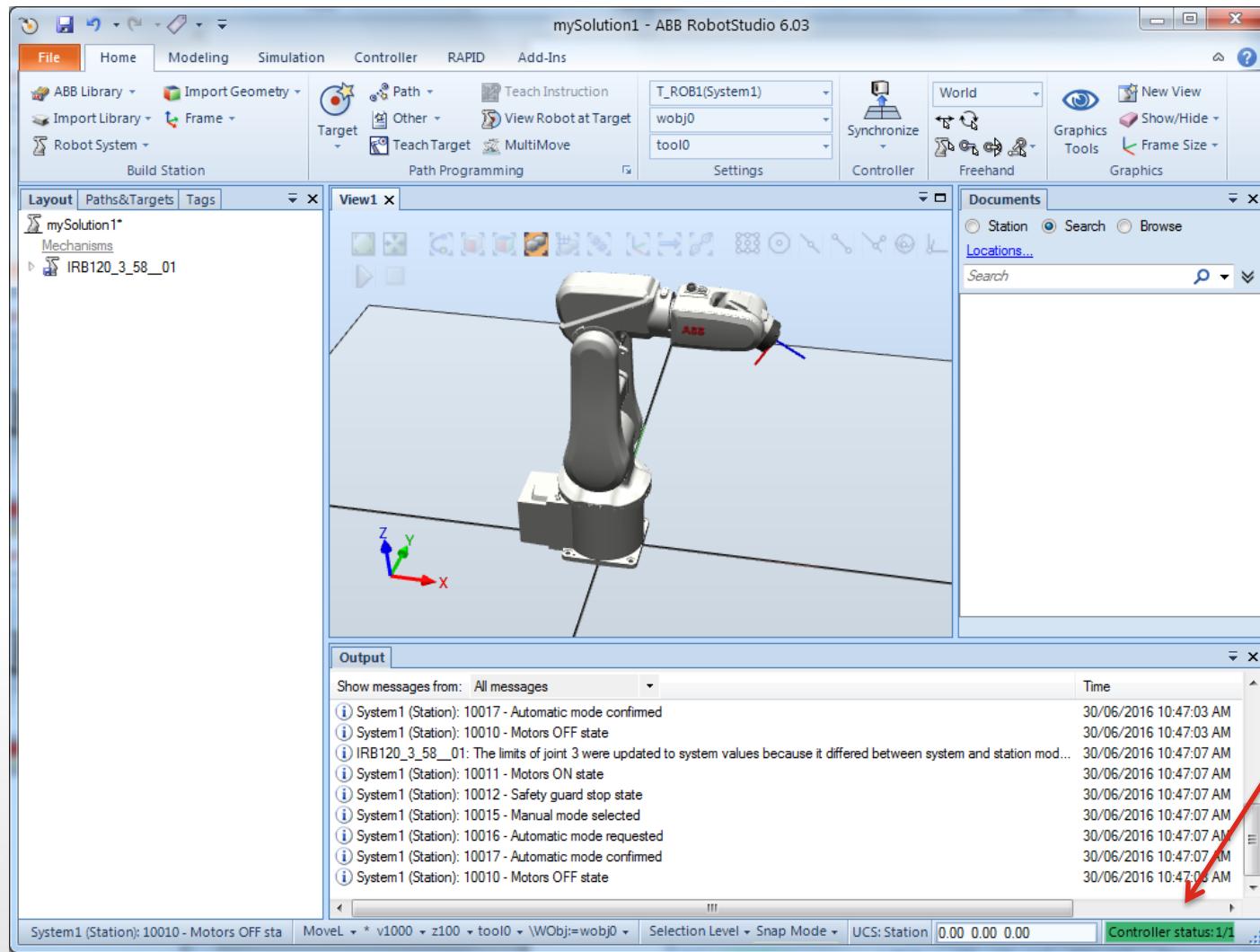
- The controller will start. (This will take a while).



Red
when
starting

Create Robot System from Layout

- When done, the controller status will become green.



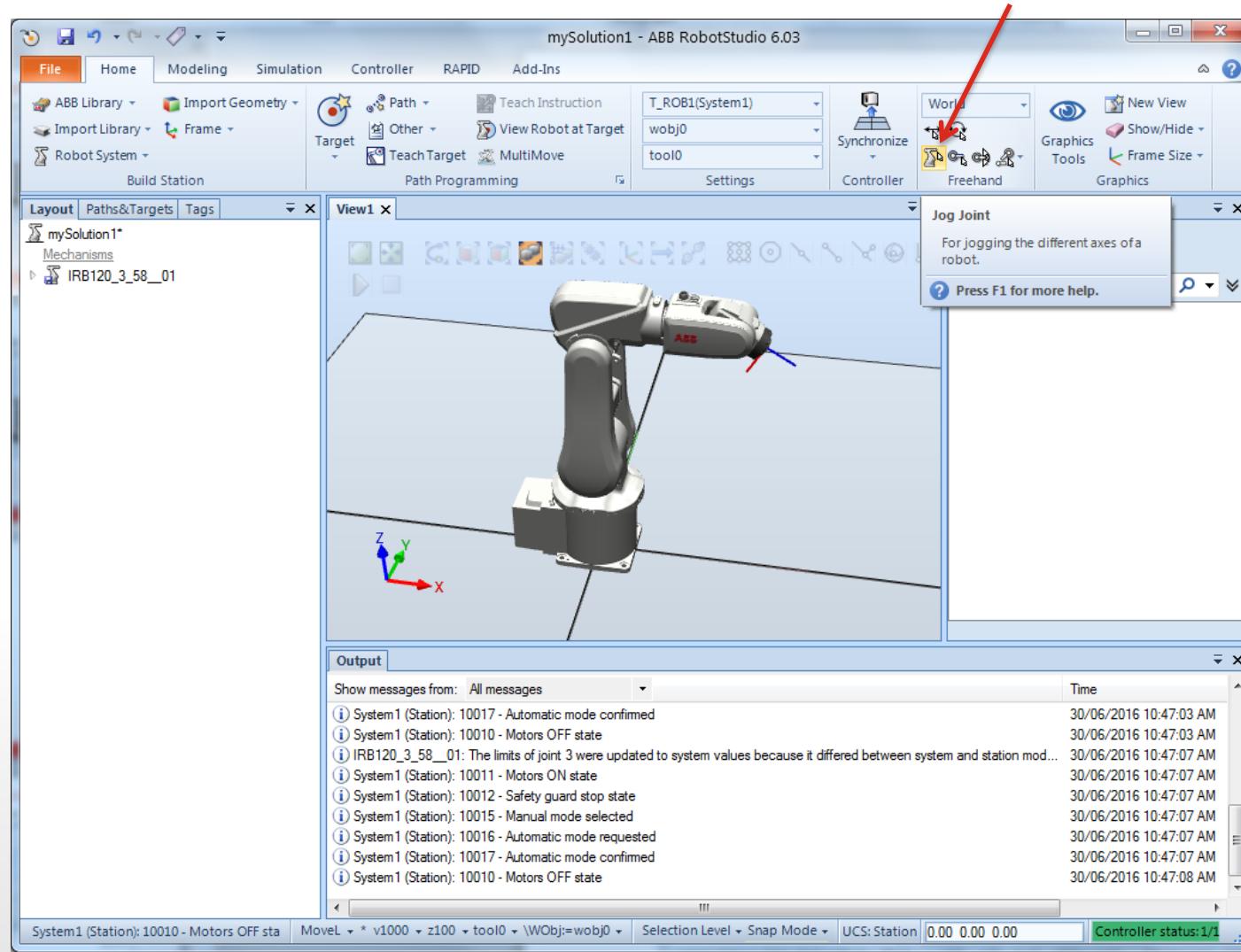
Green
when
done.

Content

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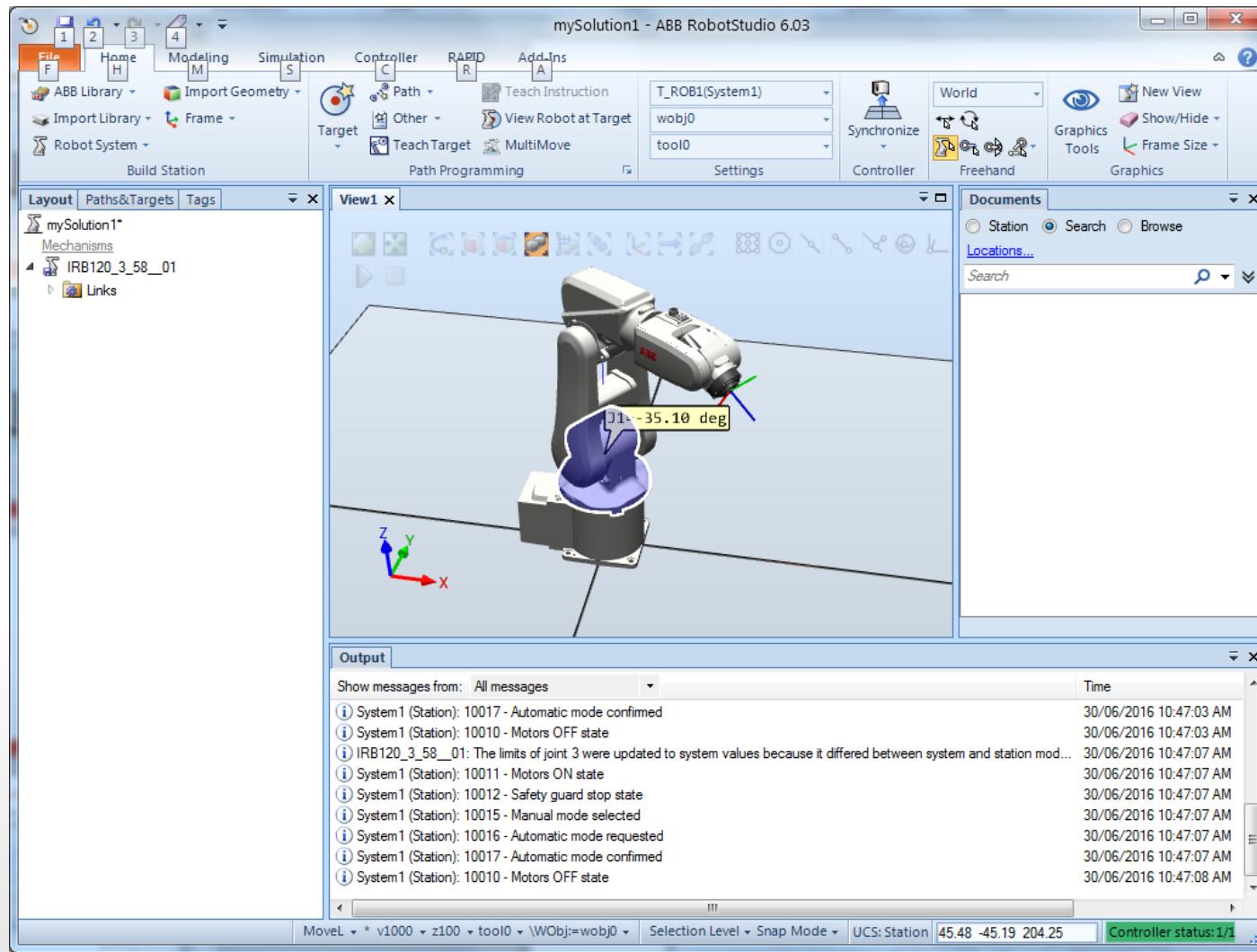
Jog the Robot (Joint Jog)

- Click the “Jog Joint” button on the top ribbon.



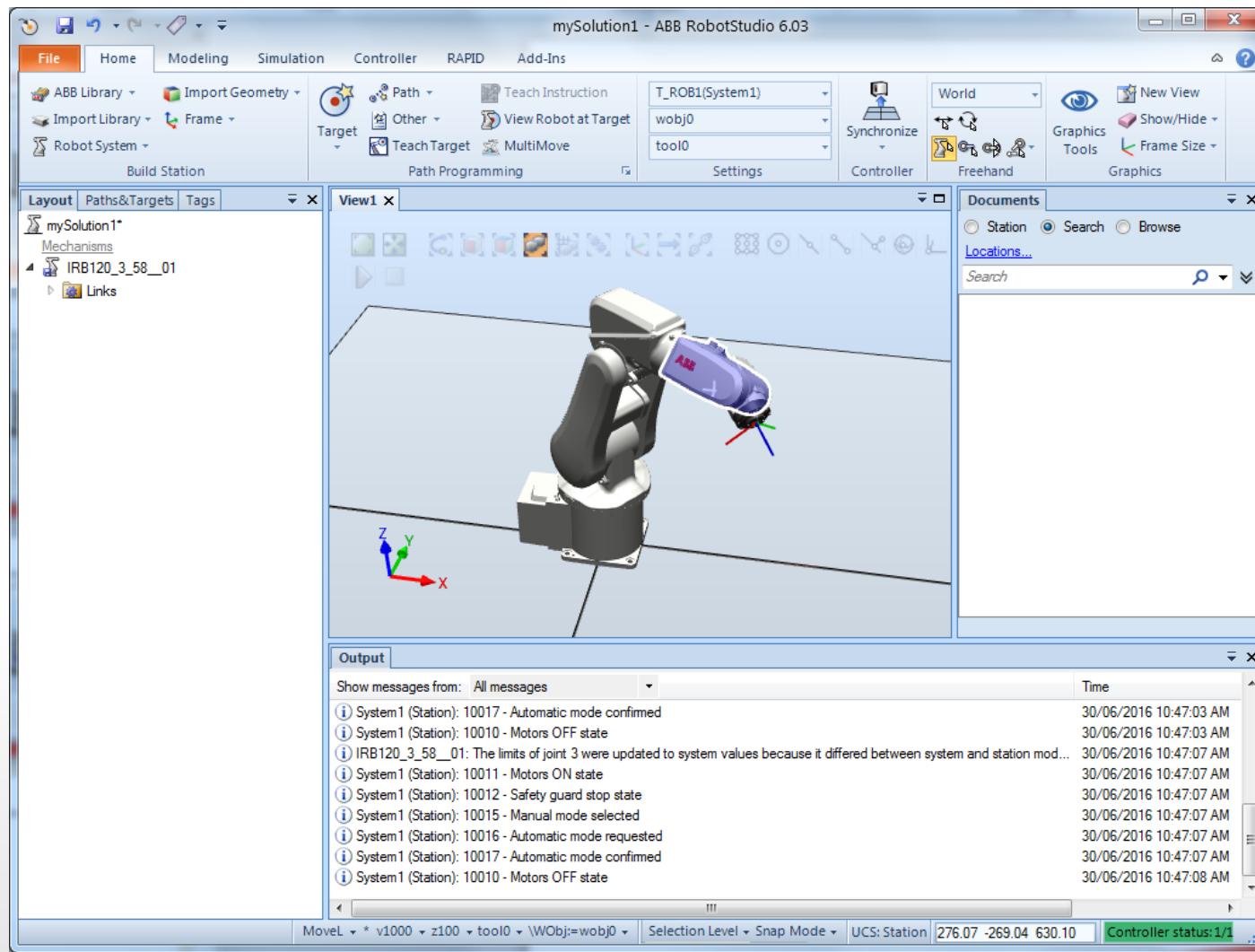
Jog the Robot (Joint Jog)

- Click (hold) and move the joints and the robot joints will move.



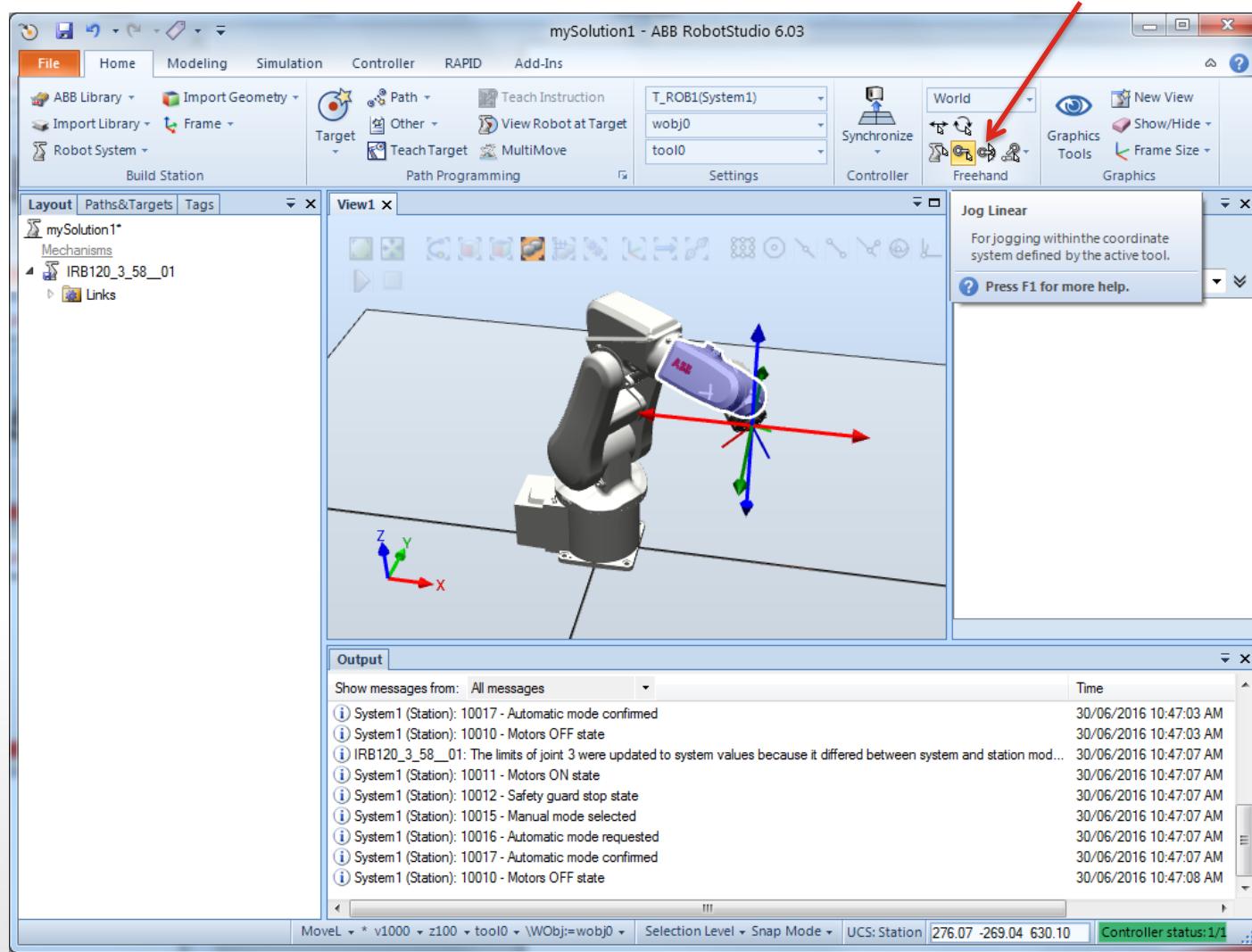
Jog the Robot (Joint Jog)

- Click (hold) and move the joints and the robot joints will move.



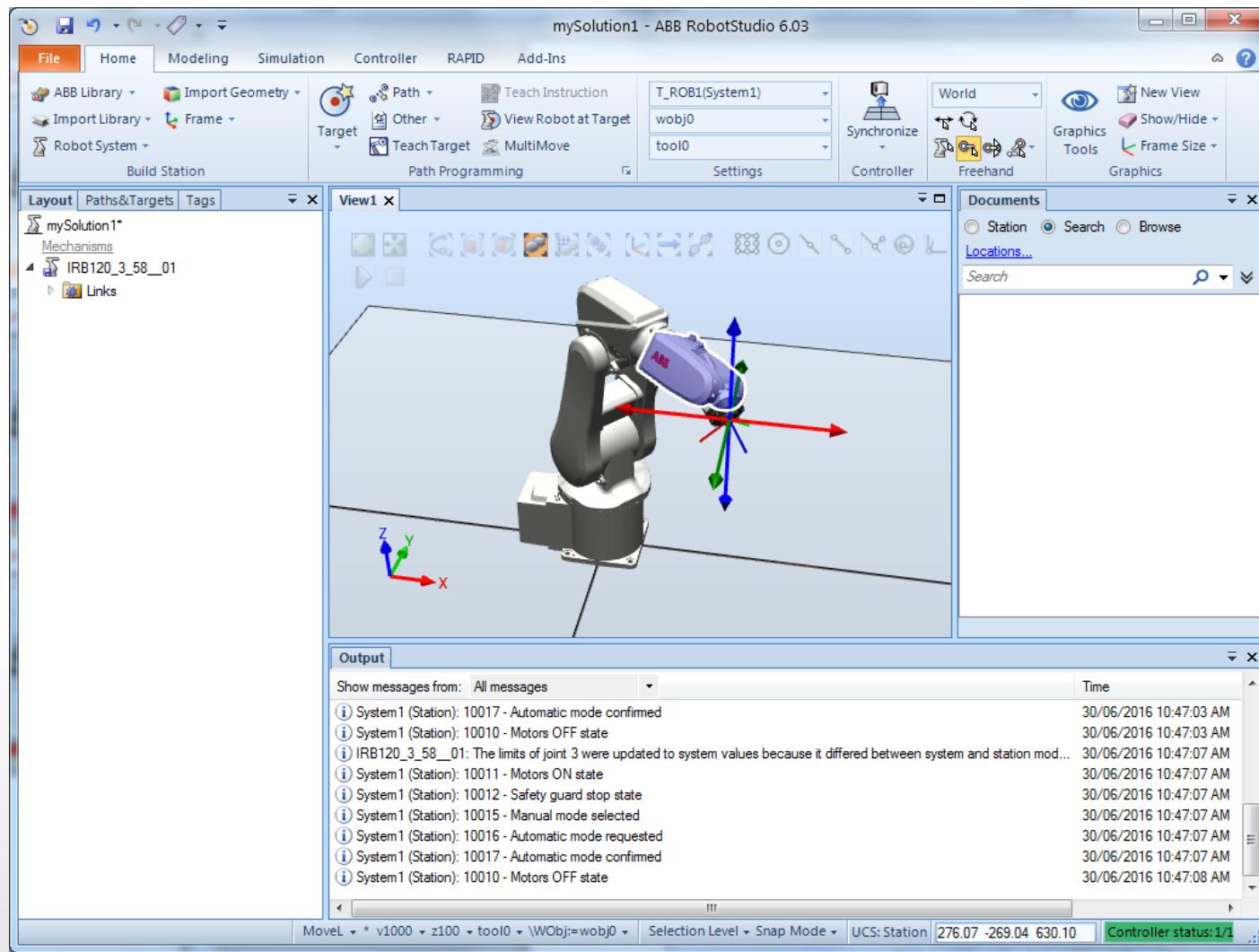
Jog the Robot (Jog Linear)

- We can also jog the robot in linear motion. Choose “Jog Linear”



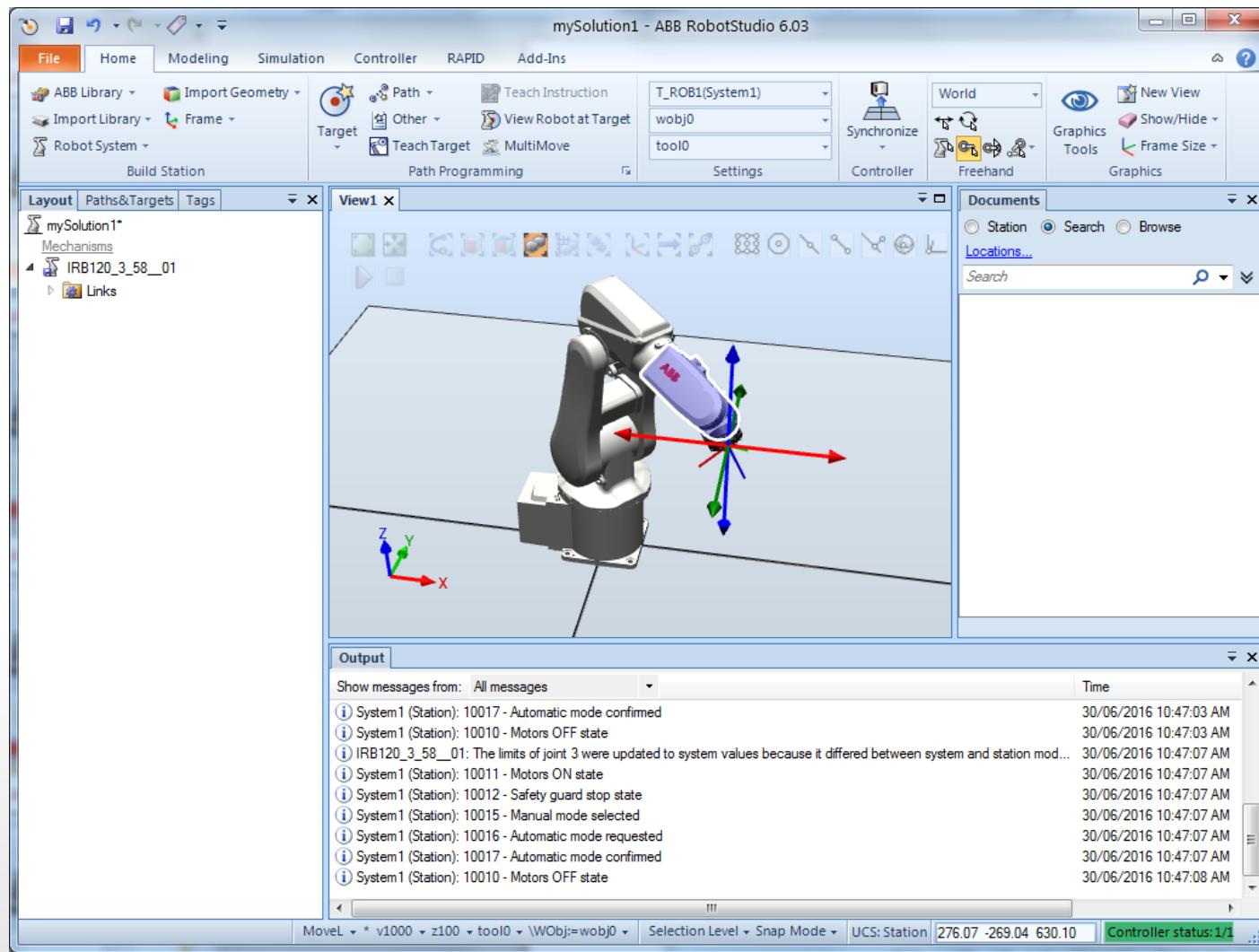
Jog the Robot (Jog Linear)

- Click (hold) the arrows and move around. Notice RGB colours = XYZ axes.



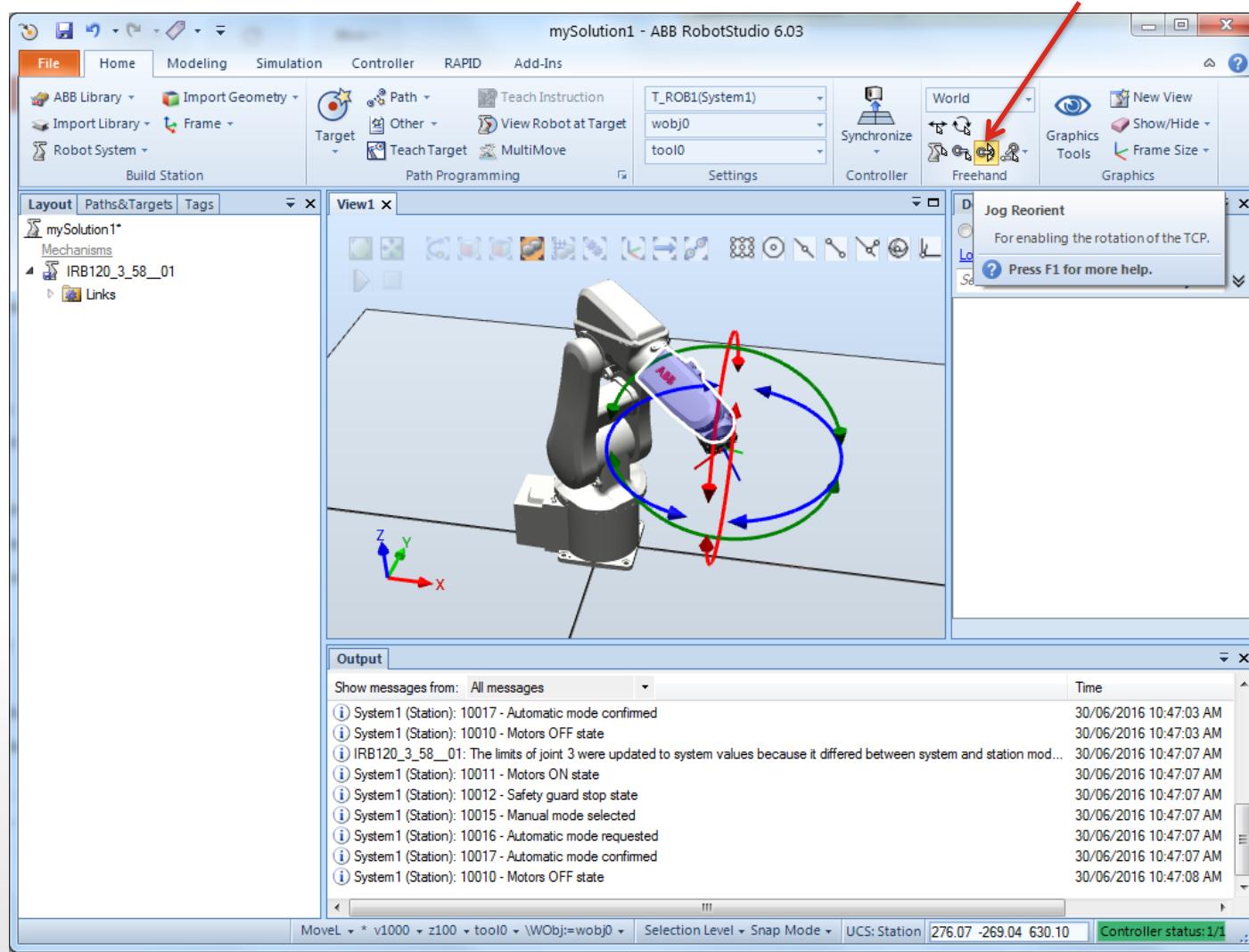
Jog the Robot (Jog Linear)

- Click (hold) the arrows and move around. Notice RGB colours = XYZ axes.



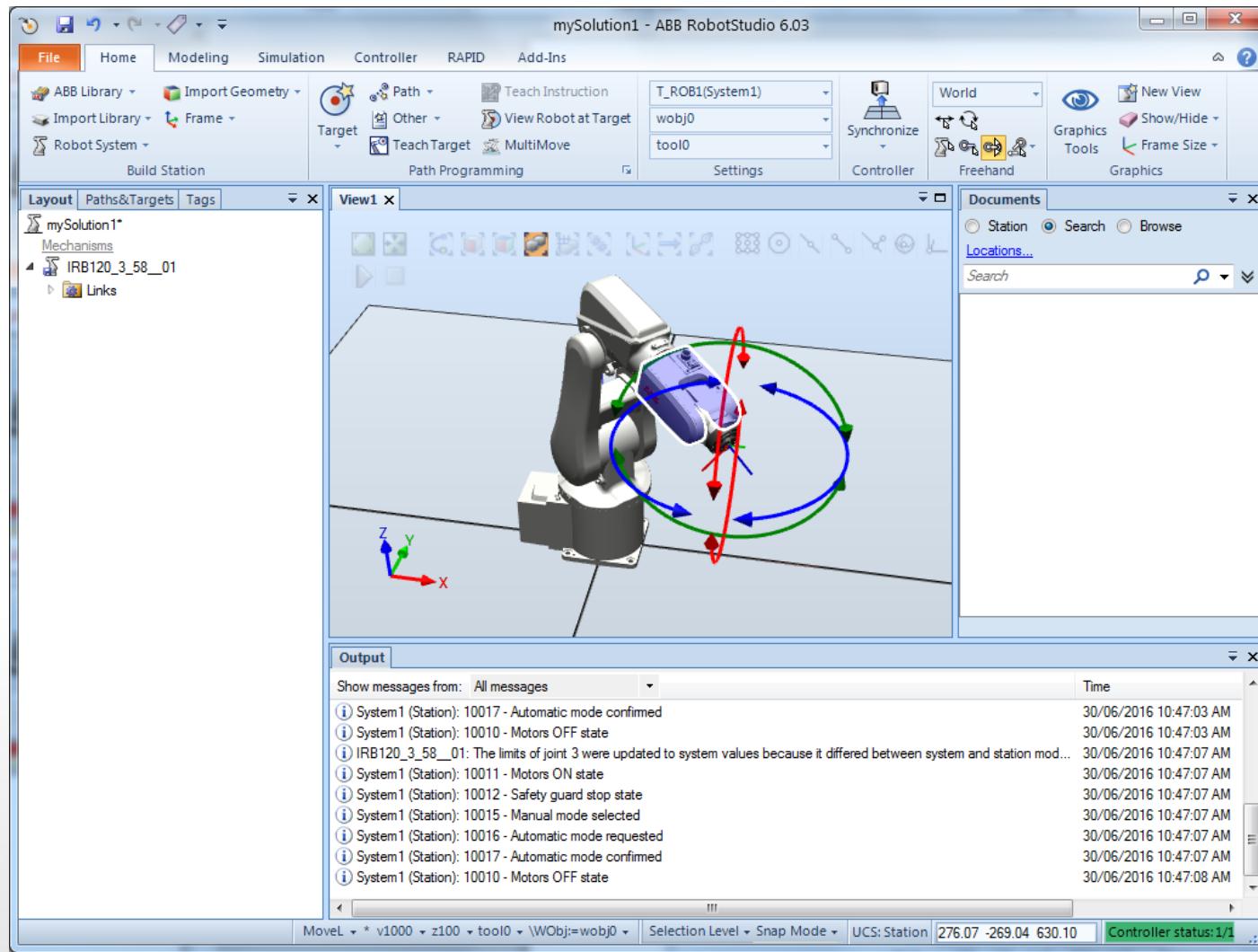
Jog the Robot (Jog Reorient)

- Next, we can also reorient the robot. Choose “Jog Reorient”



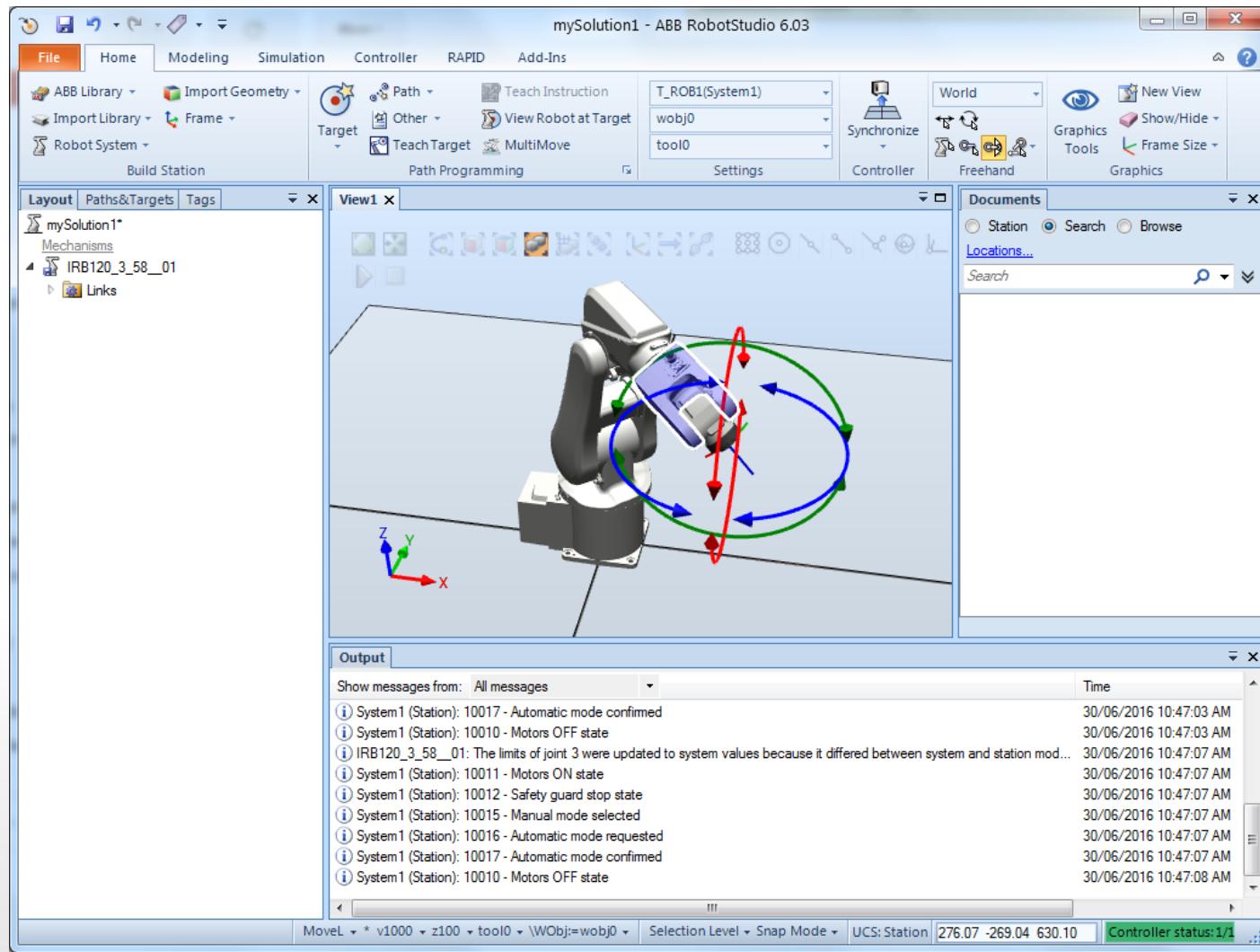
Jog the Robot (Jog Reorient)

- Click (hold) the arrows and move around. Notice RGB colours = XYZ axes.



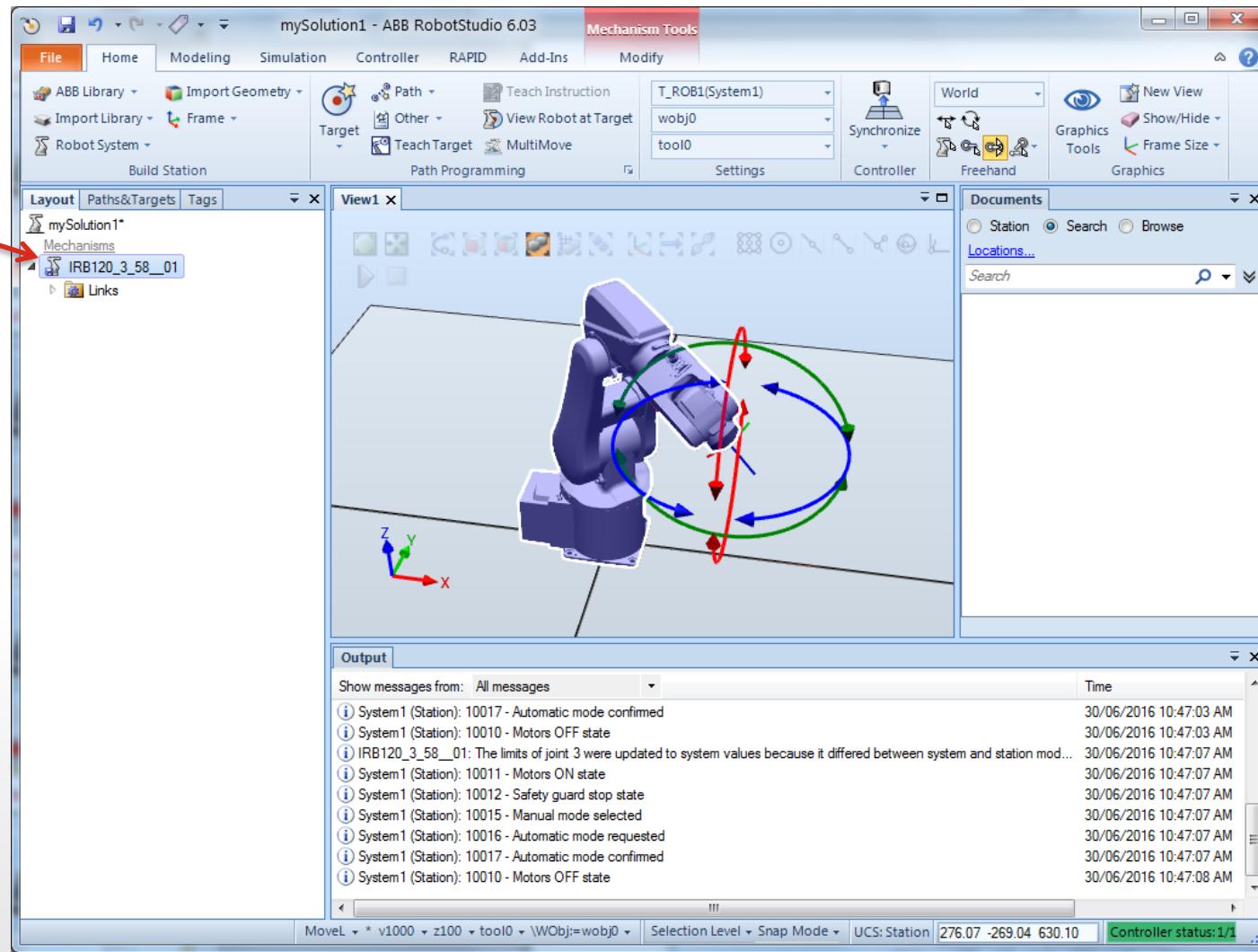
Jog the Robot (Jog Reorient)

- Click (hold) the arrows and move around. Notice RGB colours = XYZ axes.



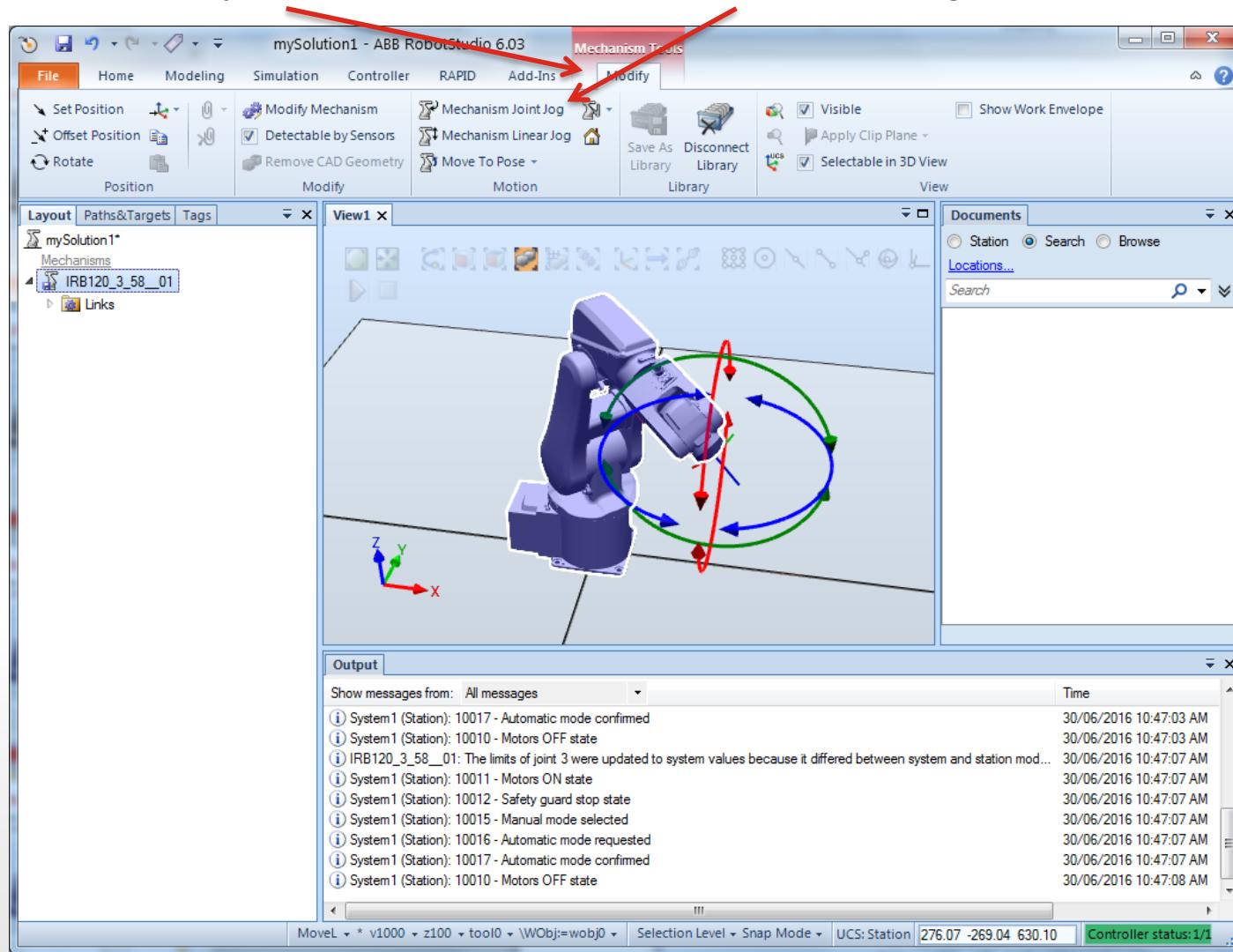
Jog the Robot by Numerical Values

- We can also jog the robot using numerical values. Mark the robot on tree.



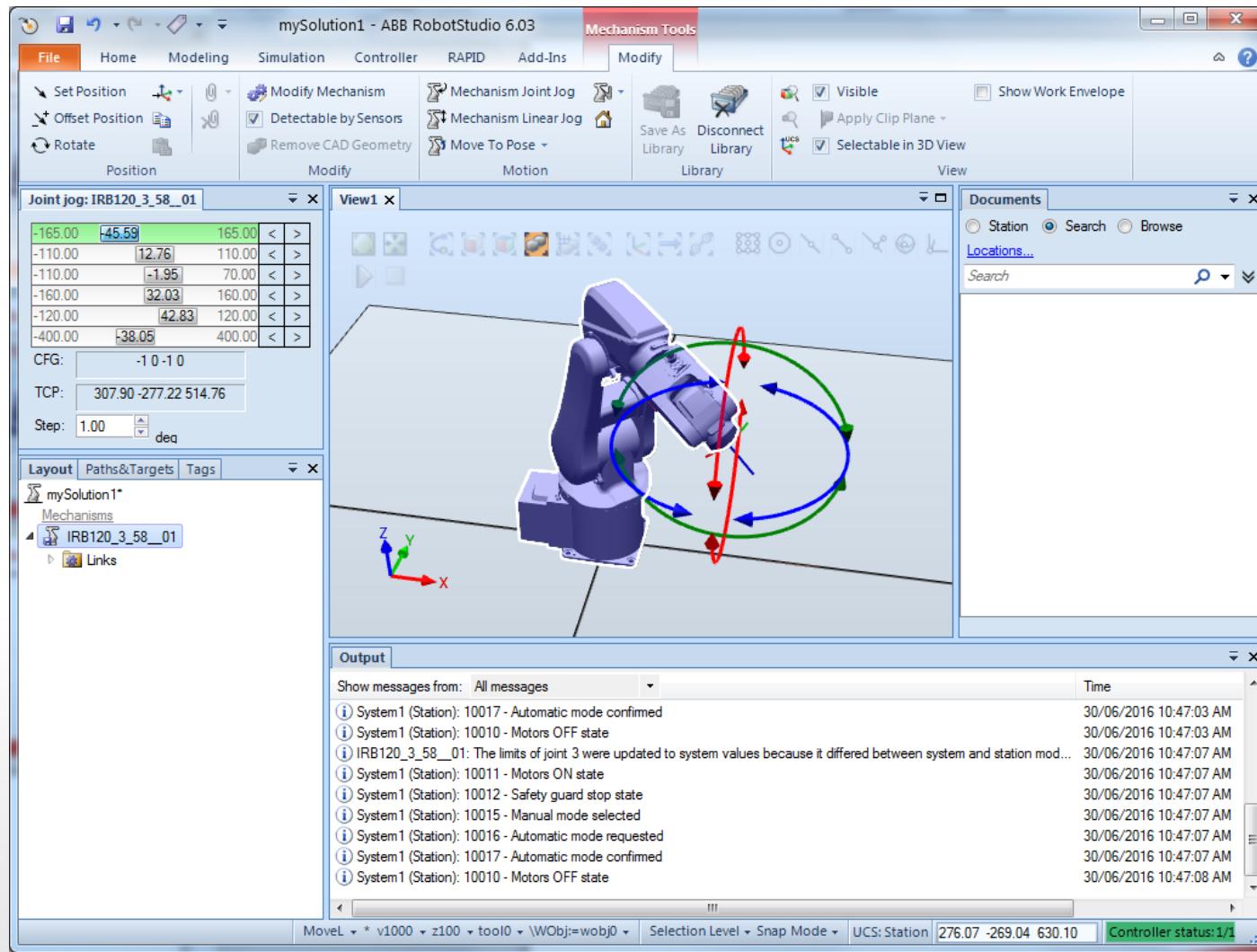
Jog the Robot by Numerical Values

- Go to “Modify” tab, and select “Mechanism Joint Jog”.



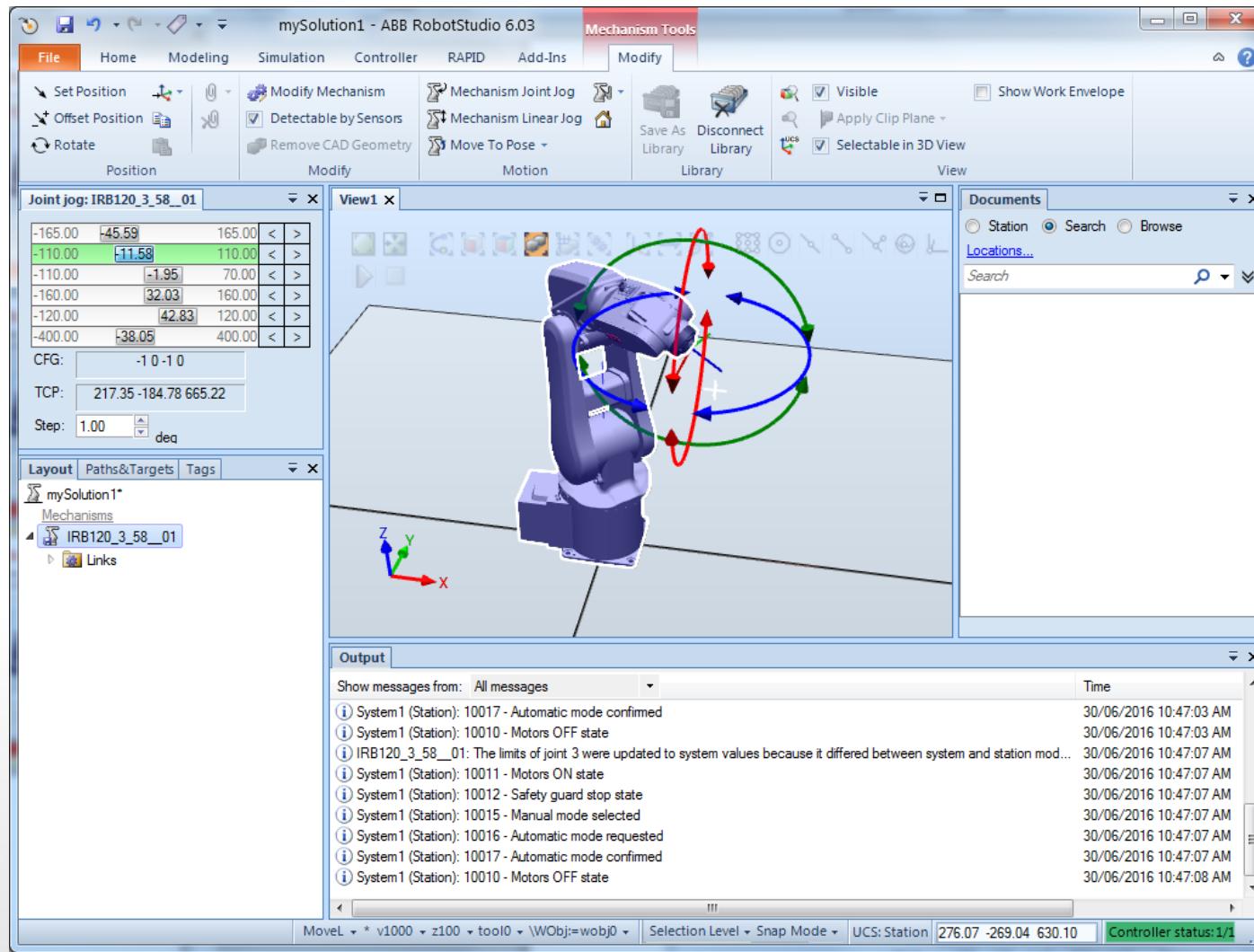
Jog the Robot by Numerical Values

- Slider bars will appear on the left.



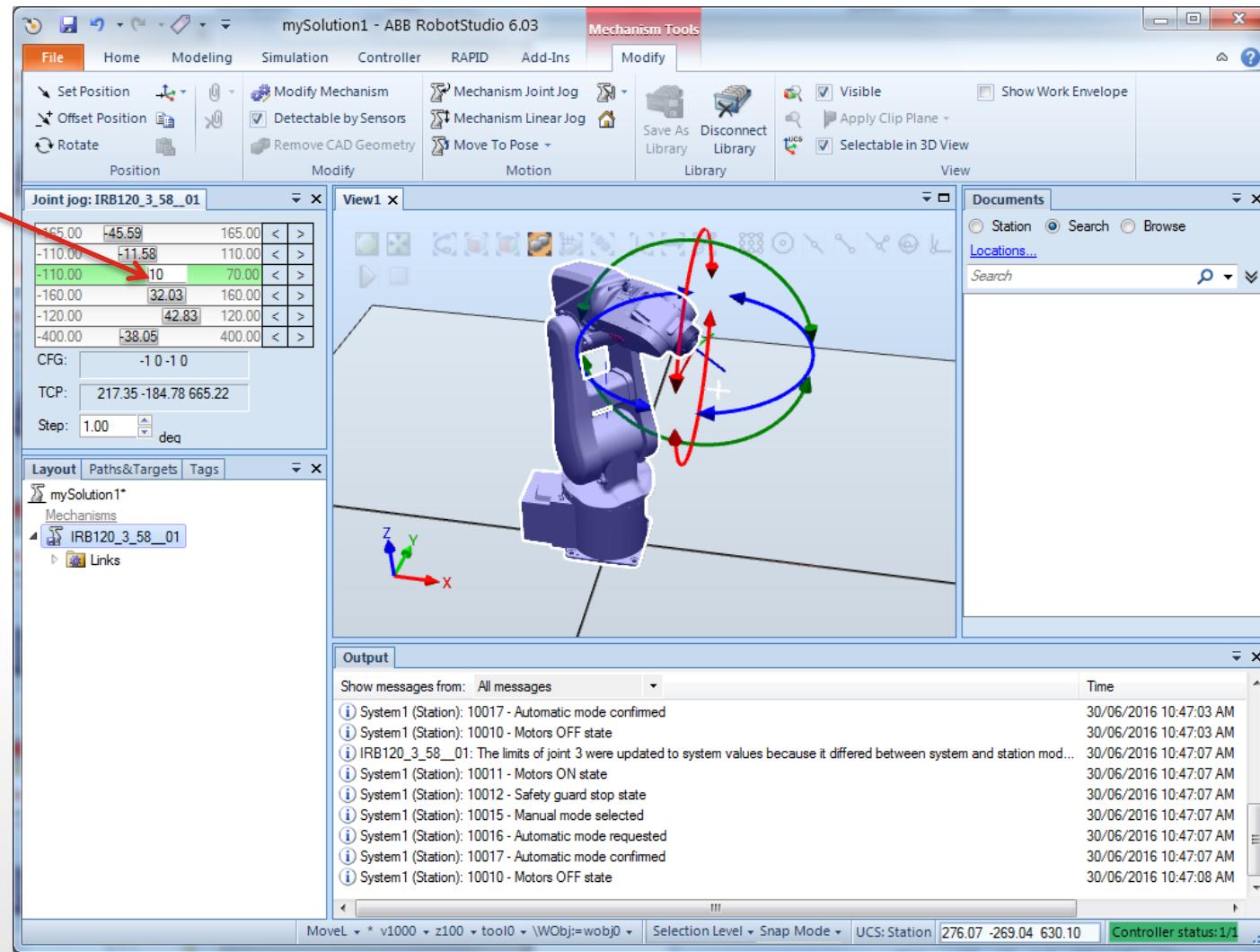
Jog the Robot by Numerical Values

- Move the slider bar and the robot joints will move.



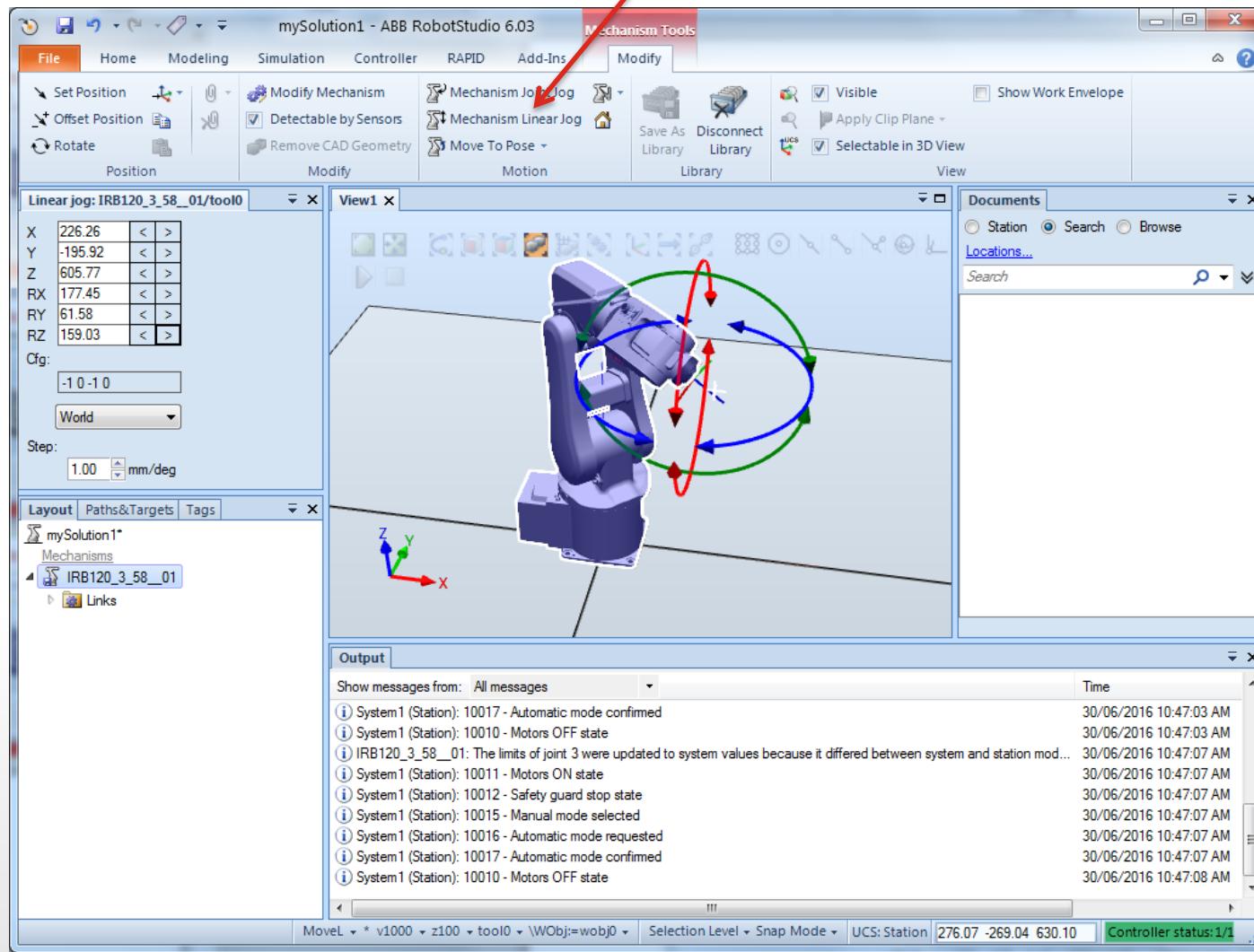
Jog the Robot by Numerical Values

- You can also key in the values.



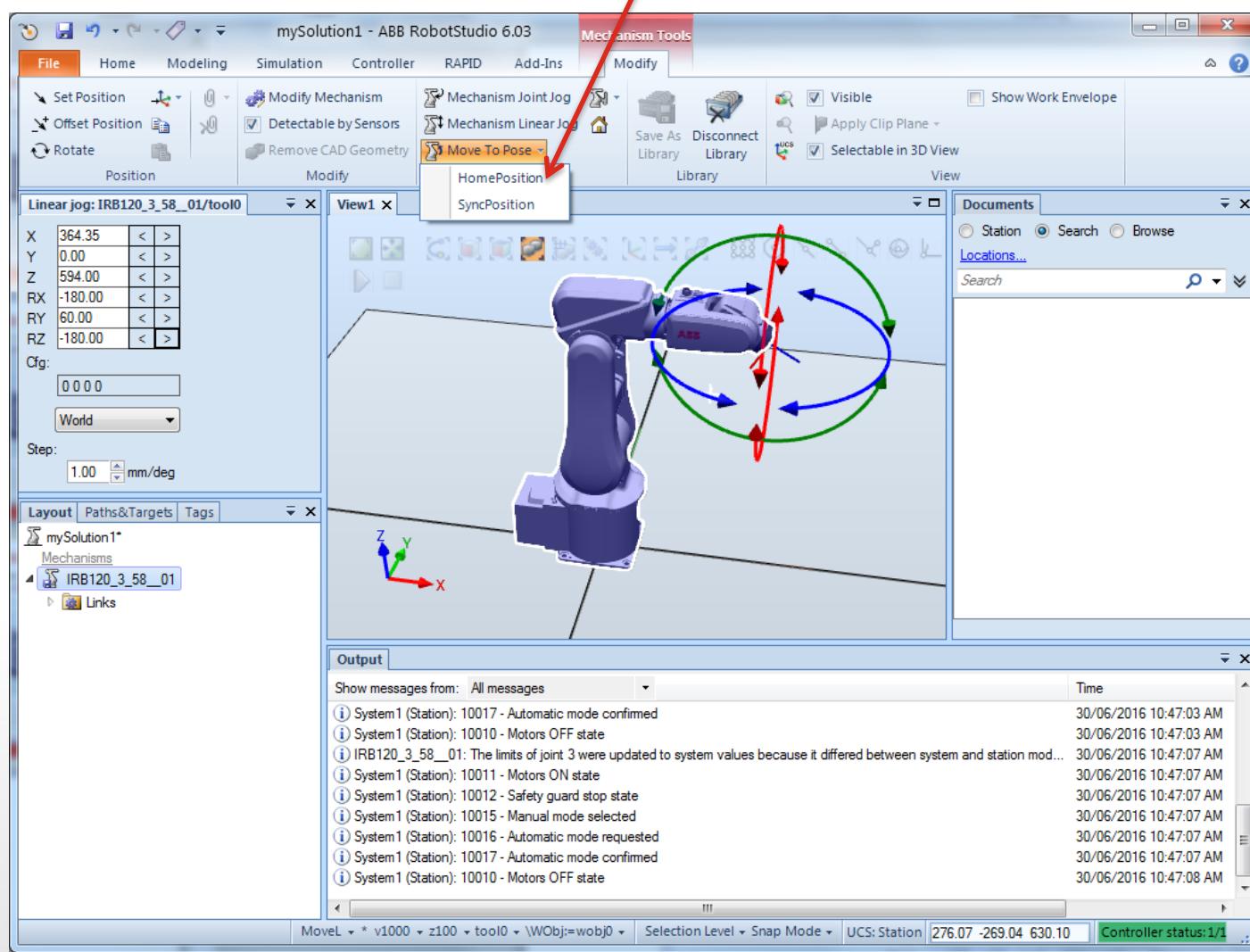
Jog the Robot by Numerical Values

- Now, do the same for “Modify” → Mechanism Linear Jog.



Move Back to Home Position

- Click “Modify” → Move to Pose → Home Position

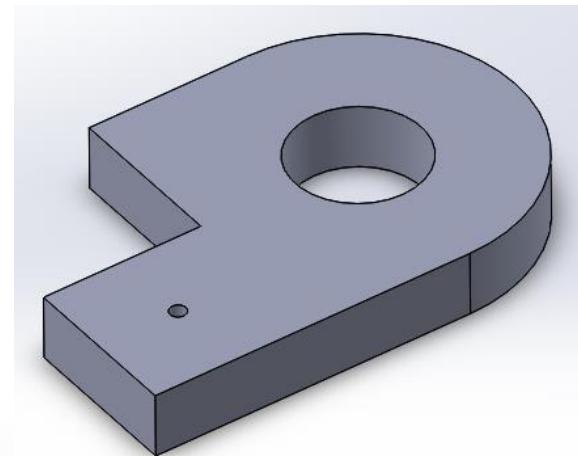
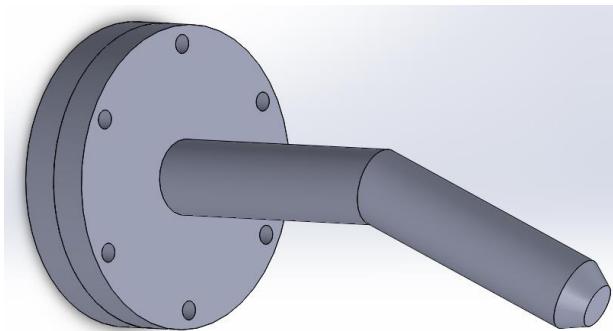


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Import Tool and Workpiece

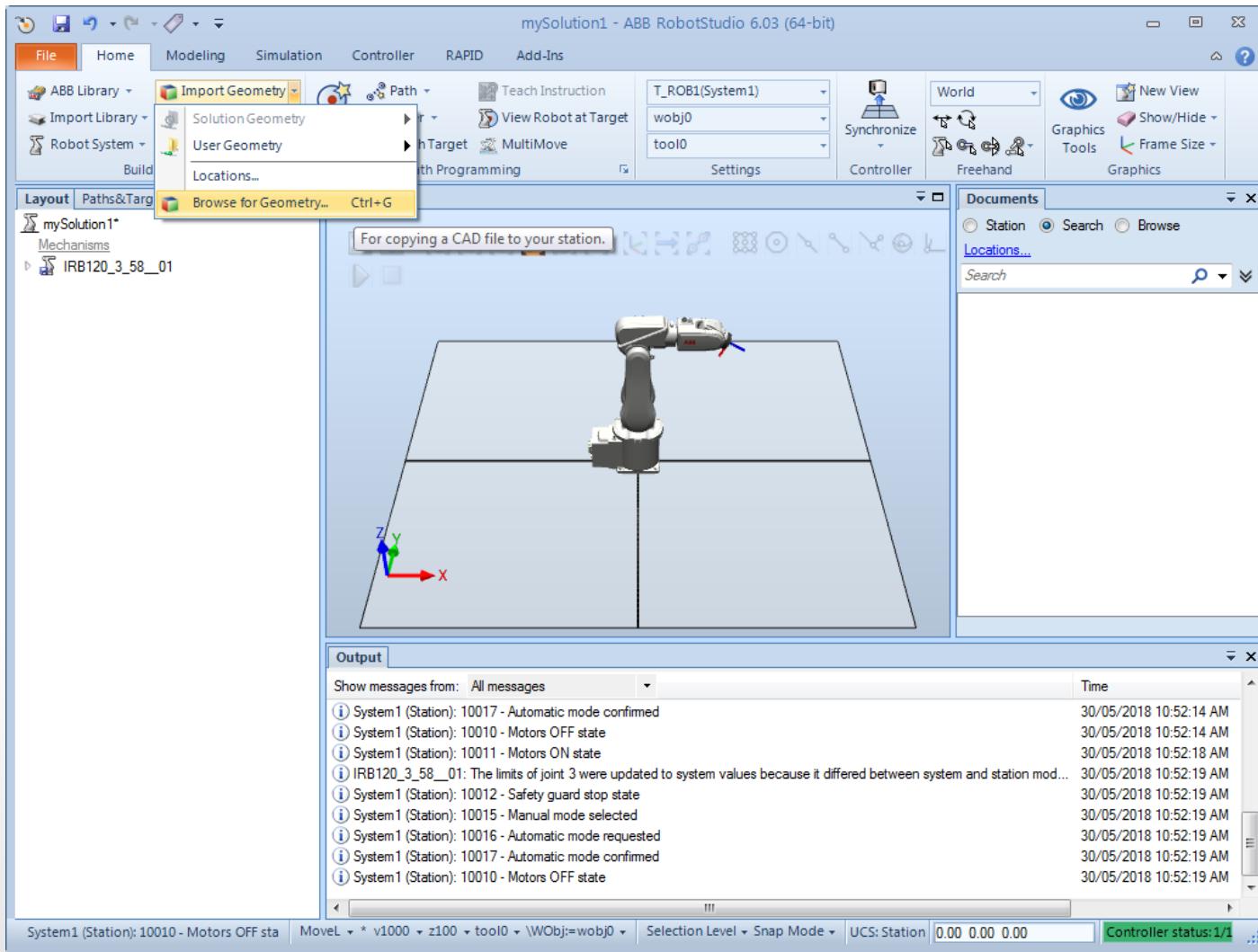
- We will now **import the CAD models** of the tool and workpiece into the virtual workcell.



- **Important Note:** The CAD files need to be in **.SAT format**.
 - In common CAD software such as Solidworks or CATIA, we can save / export the parts or assemblies as .SAT files.

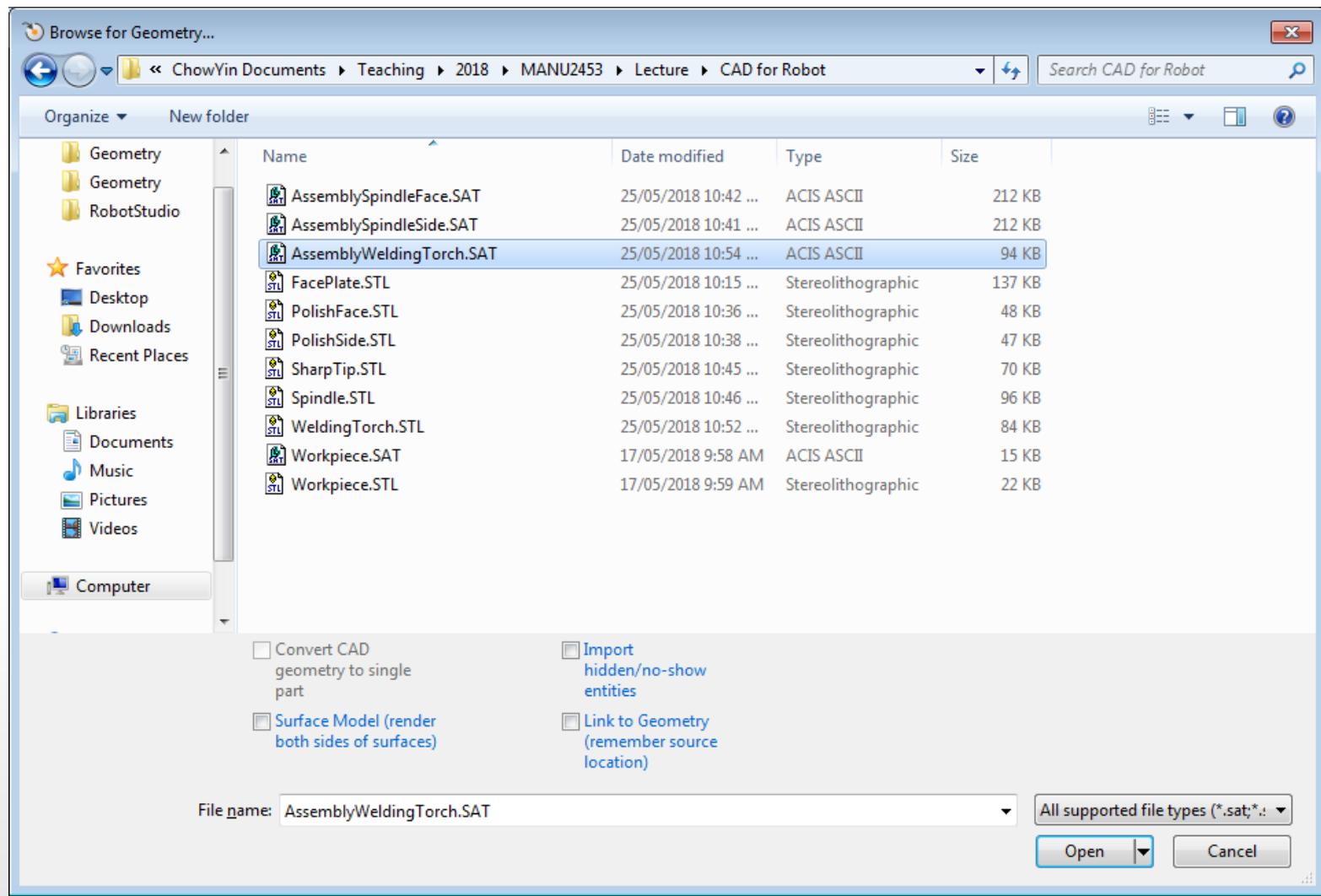
Import Tool

- Click “Import Geometry” → Browse for Geometry.



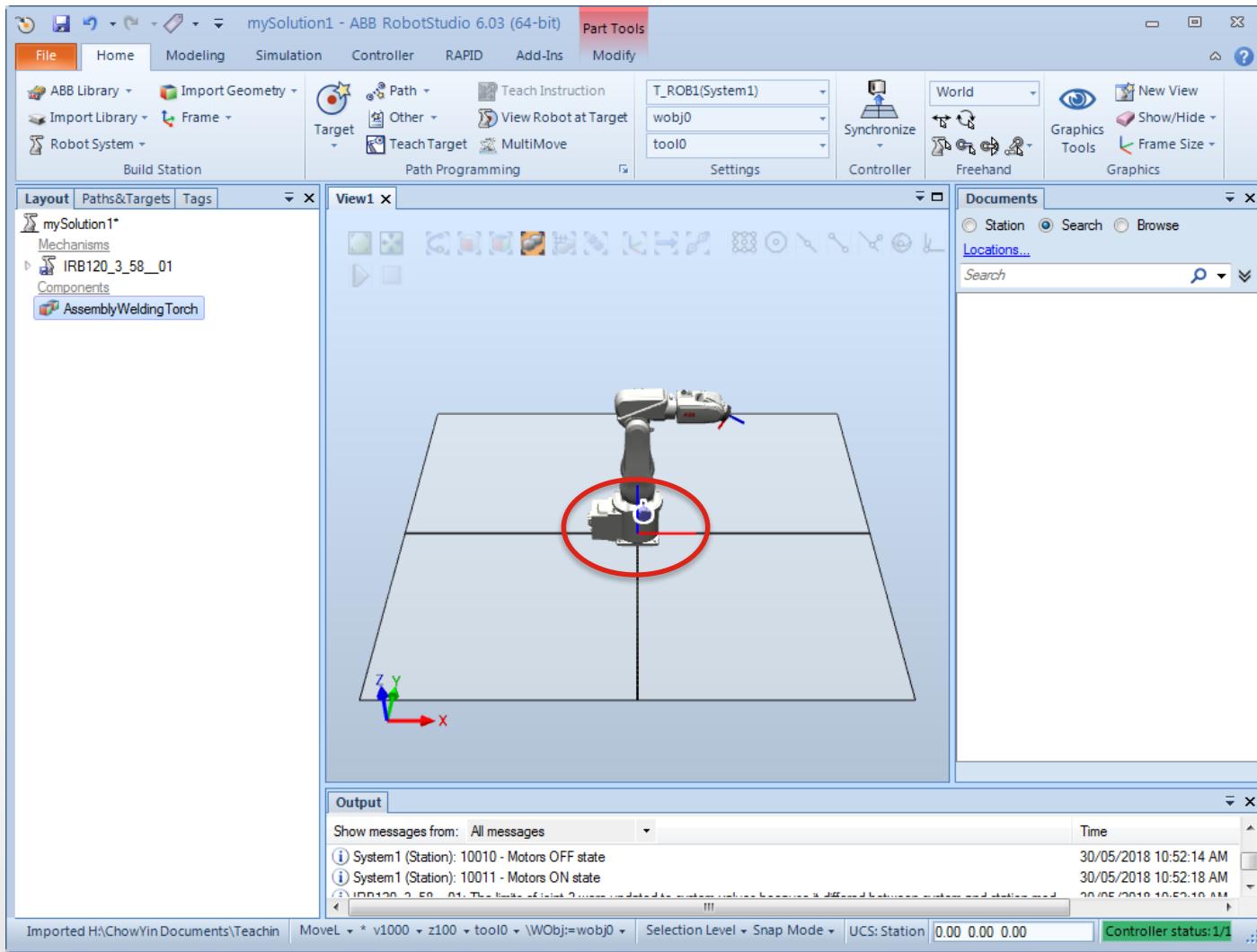
Import Tool

- Select the .SAT file for the tool, then click Open.



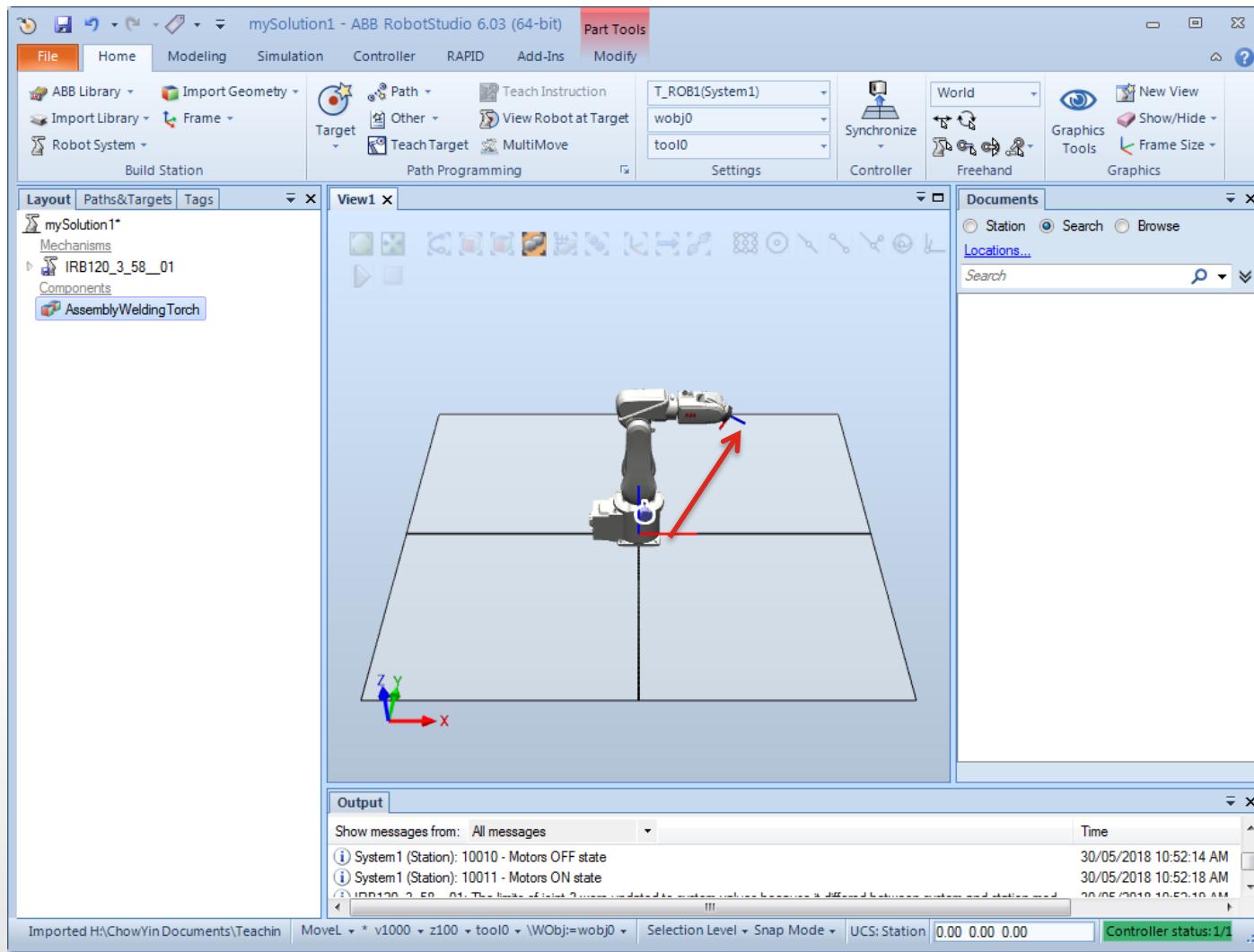
Import Tool

- The tool is now imported, but it is at the base of the robot.



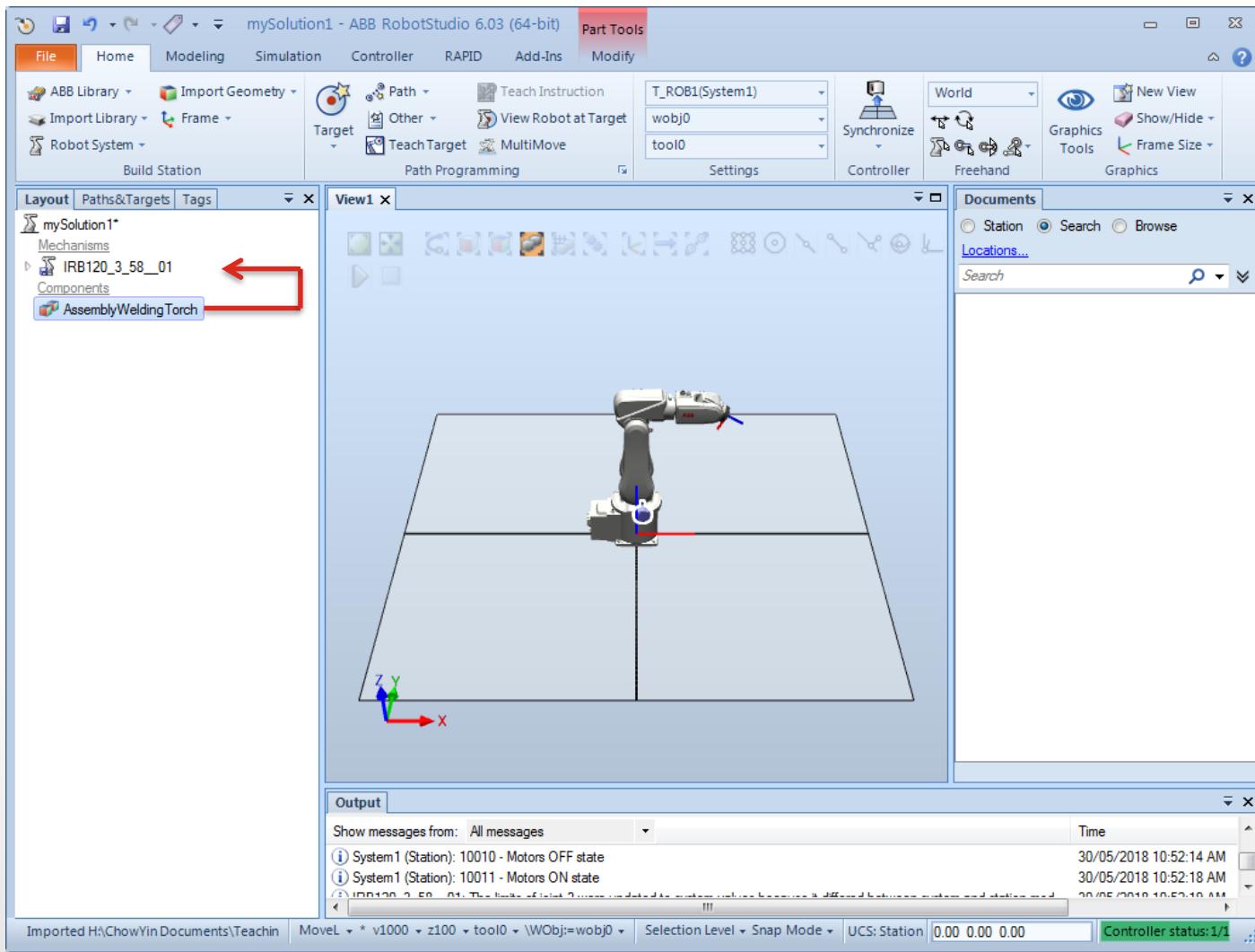
Import Tool

- We need to attach it to the robot.



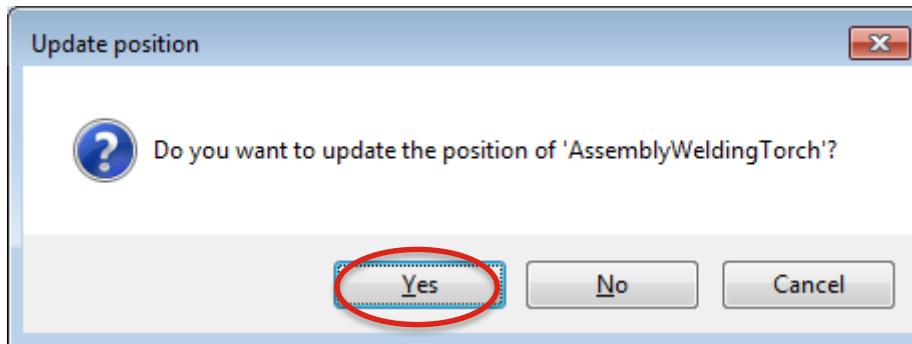
Import Tool

- Drag “AssemblyWeldingTorch” and drop at “IRB120...”.



Import Tool

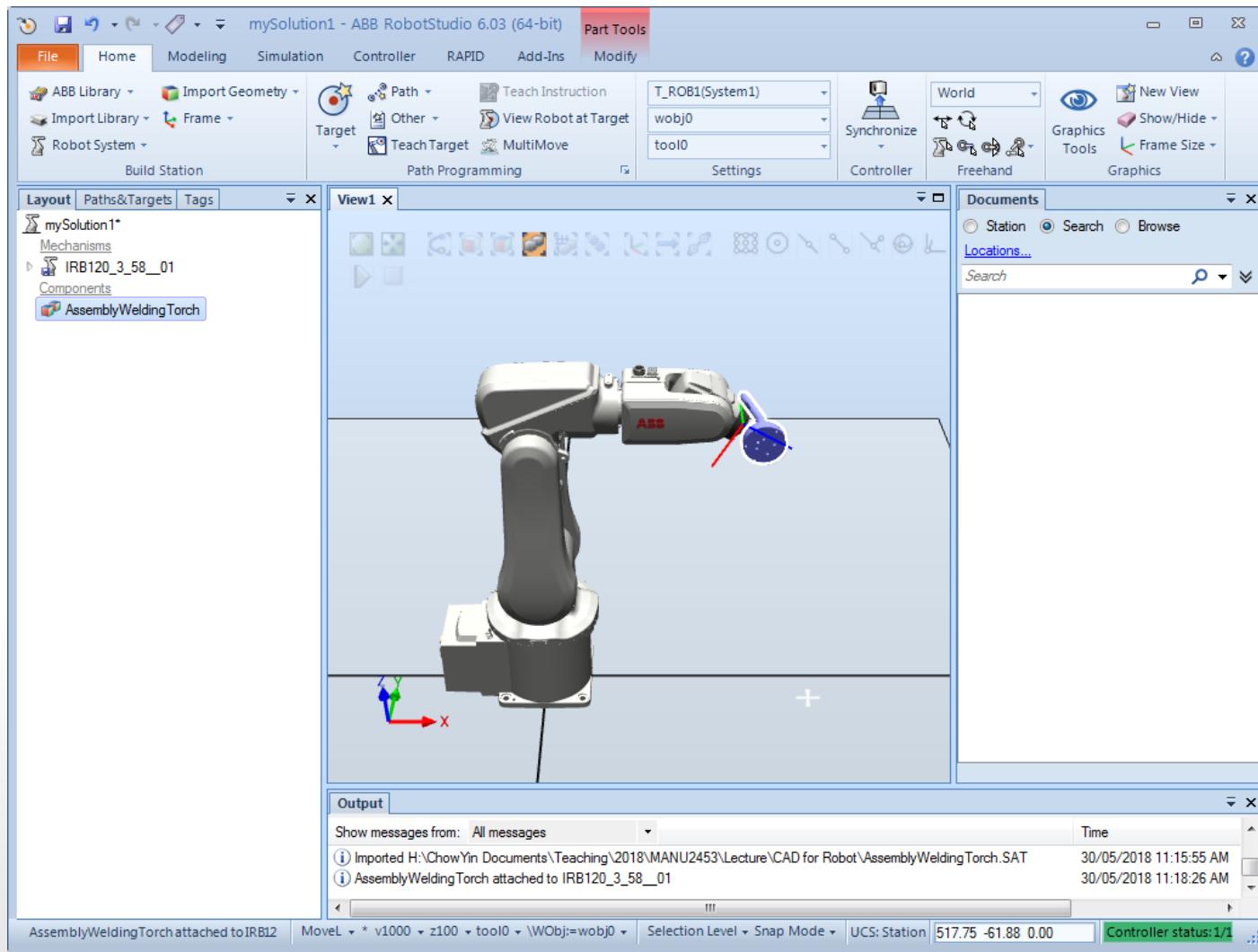
- The following question will appear.



- Click Yes.

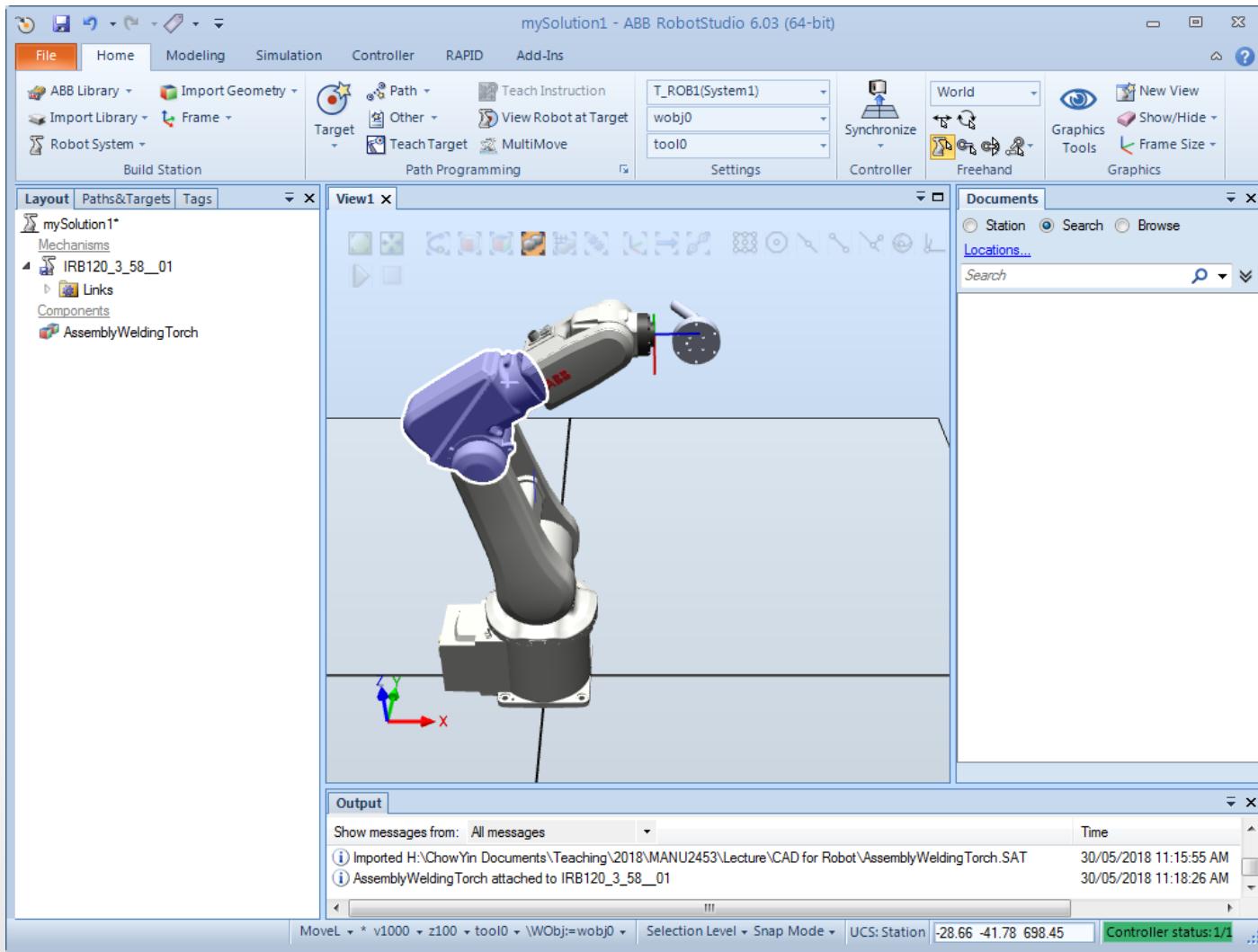
Import Tool

- The tool is now attached to the robot.



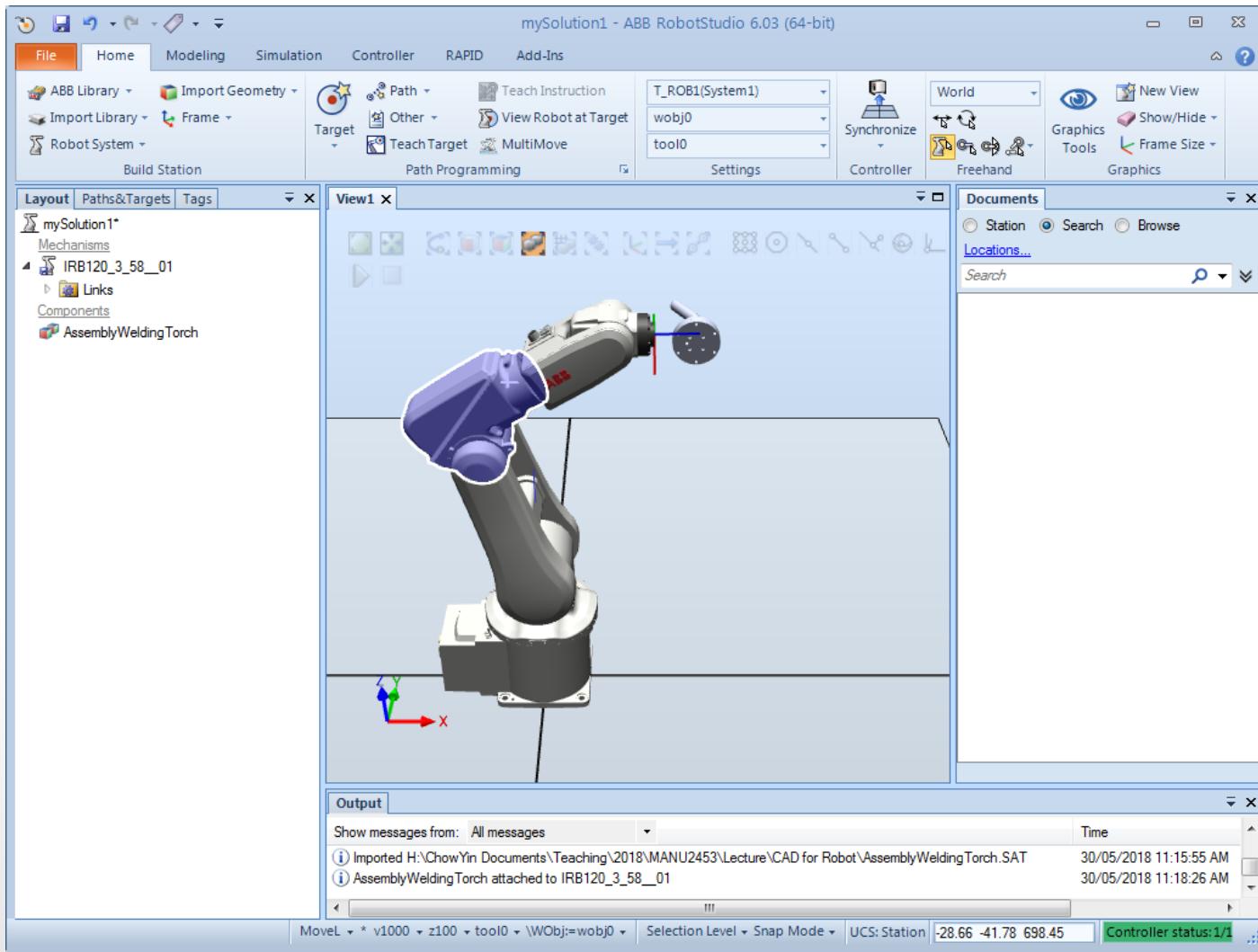
Import Tool

- If we jog the robot, the tool moves together.



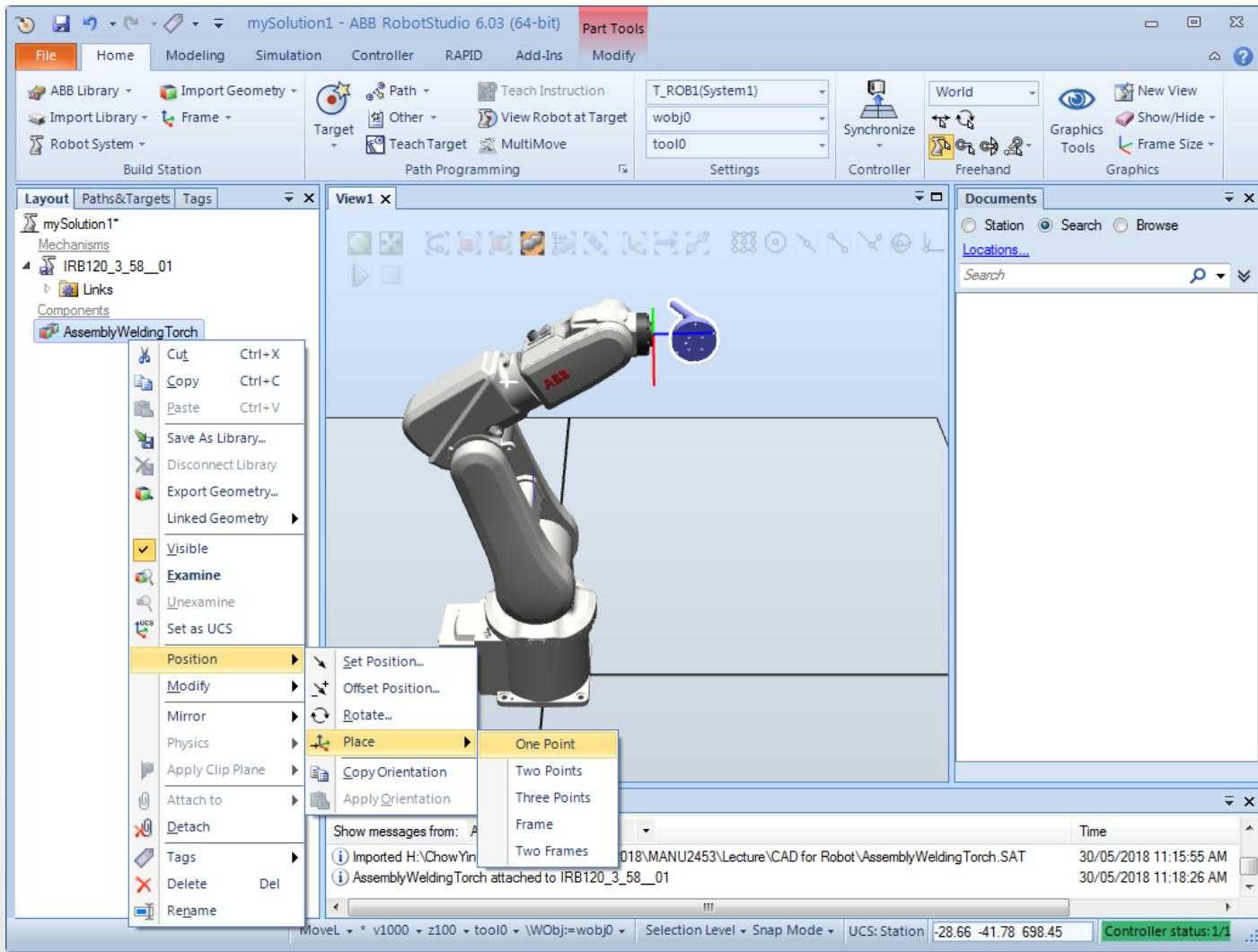
Import Tool

- However, the position and orientation are incorrect.



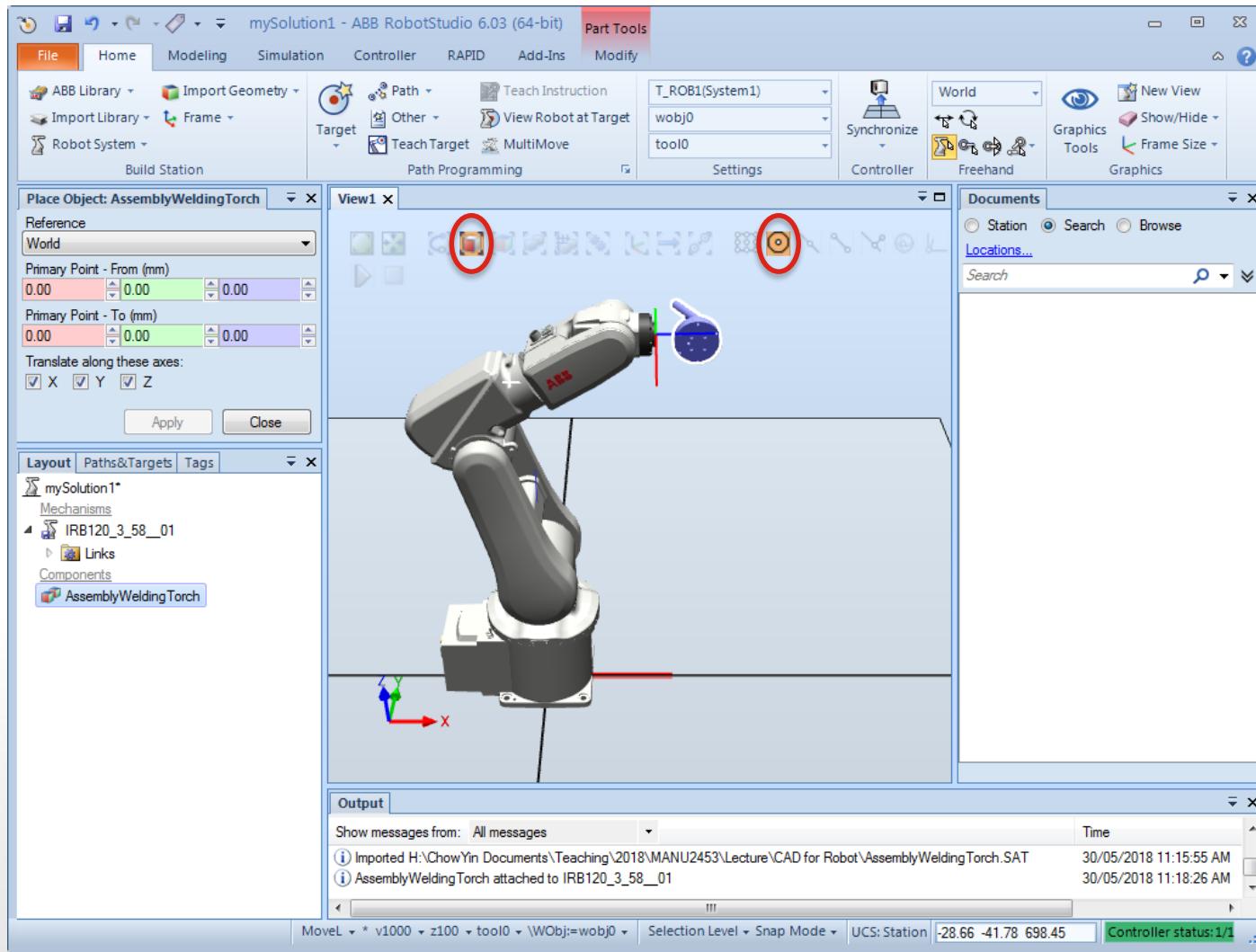
Import Tool

- To bring the centre of the tool base to the centre of robot end-point, follow the steps shown in the figure.



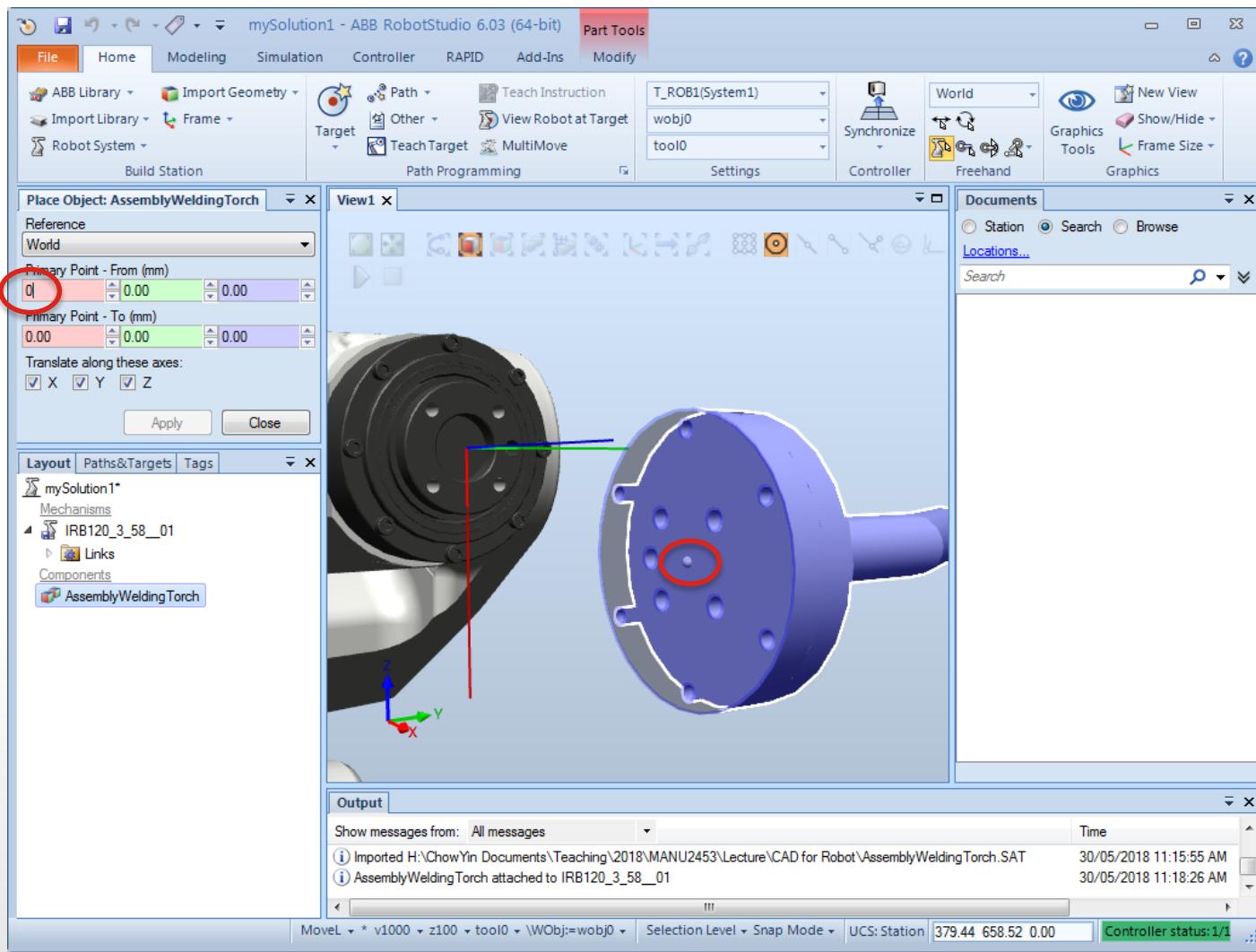
Import Tool

- Activate the “Surface Selection” and “Snap Center” options.



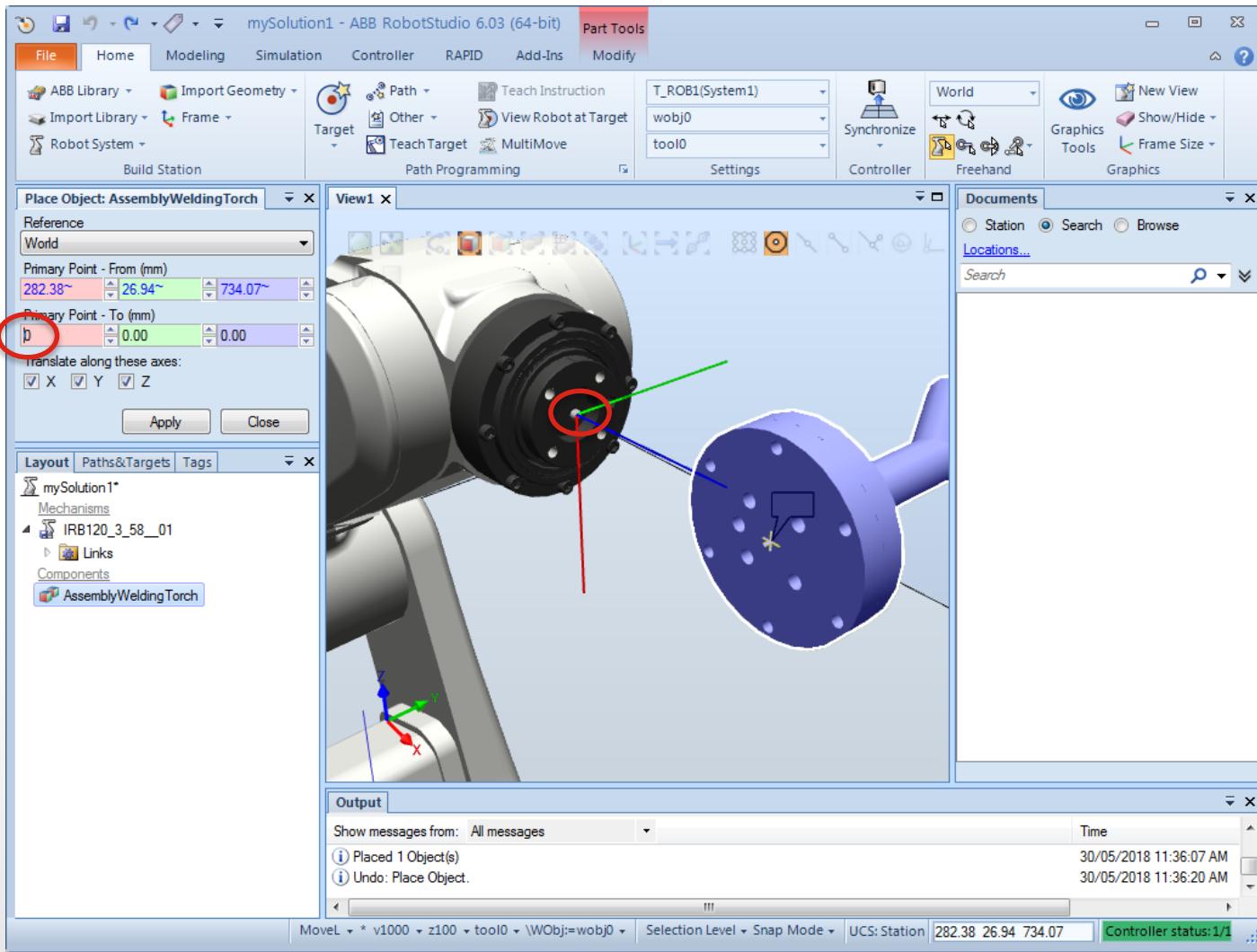
Import Tool

- Click “Primary Point – From” then click on the centre of tool base.



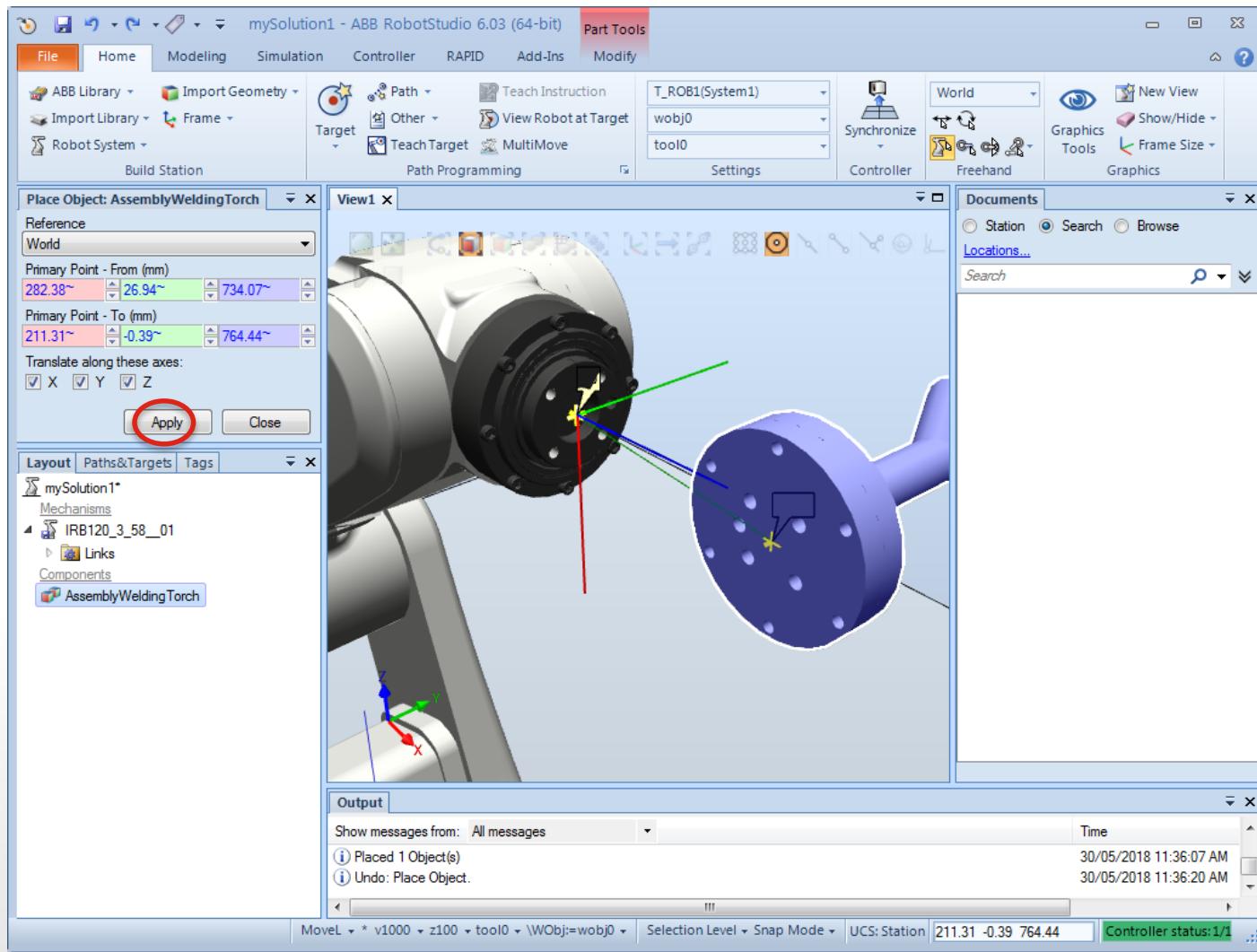
Import Tool

- Click “Primary Point – To” then click on the origin of Tool0.



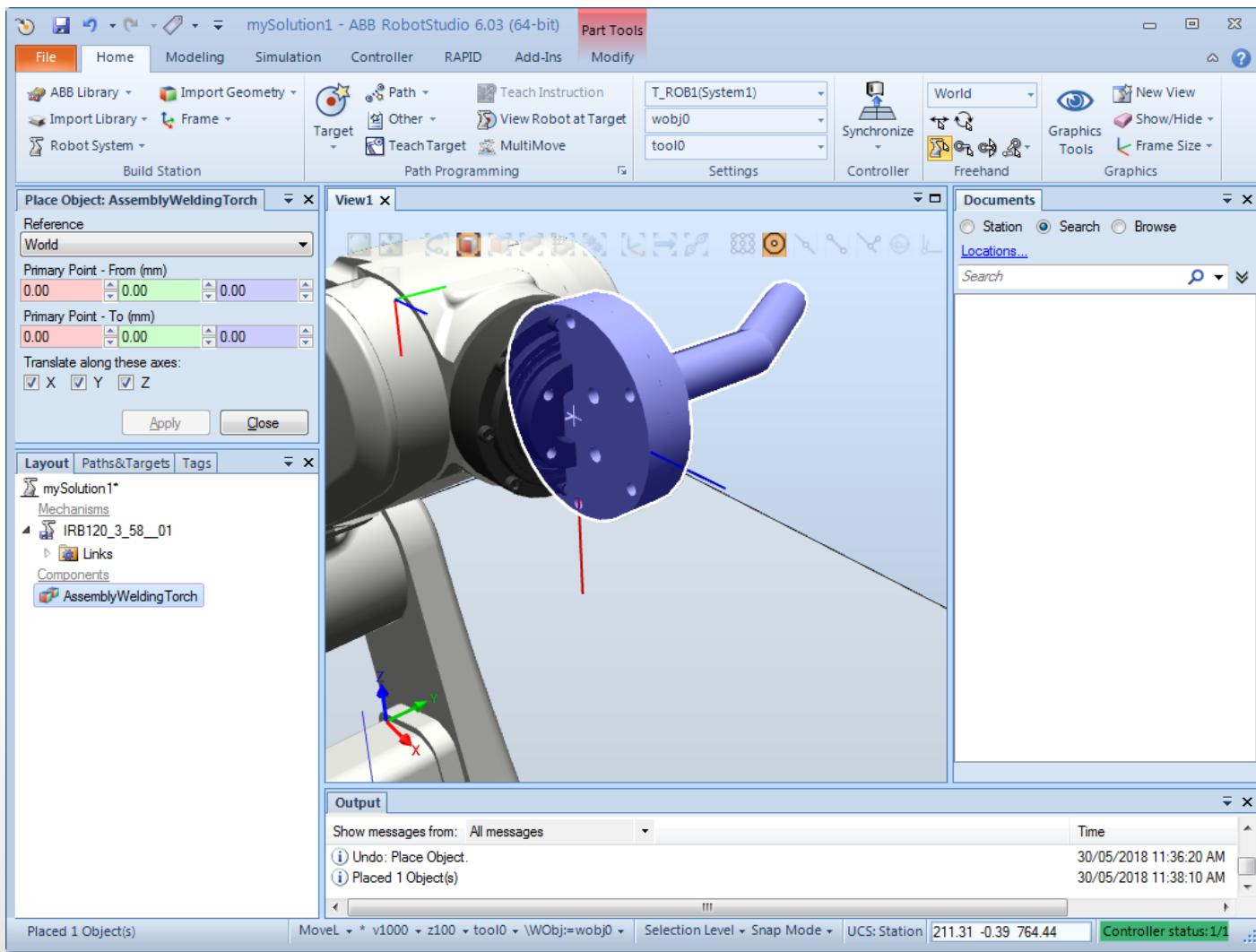
Import Tool

- Click “Apply”.



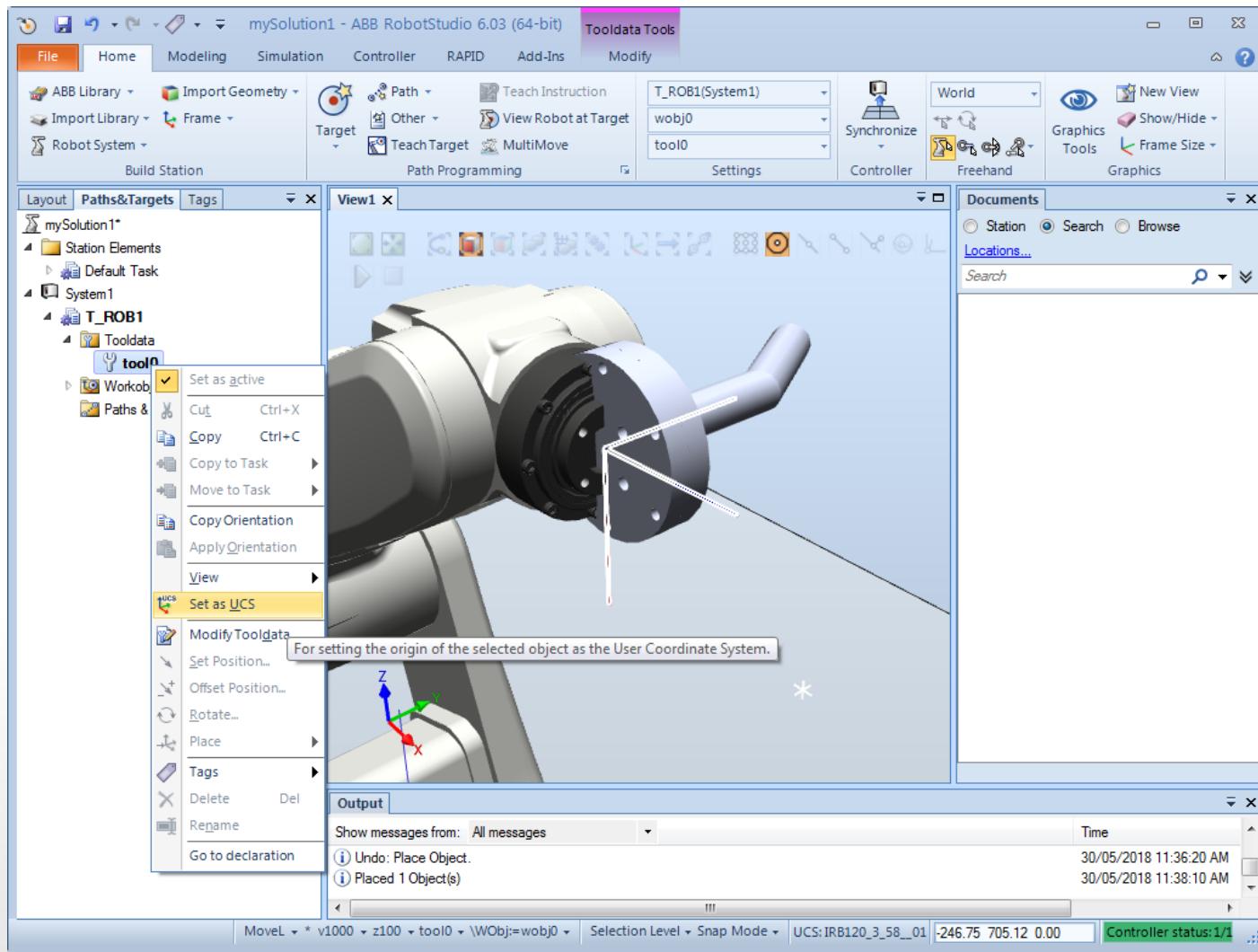
Import Tool

- Now the tool is **centred** at the origin of Tool0. However, the **orientation** is still **incorrect**.



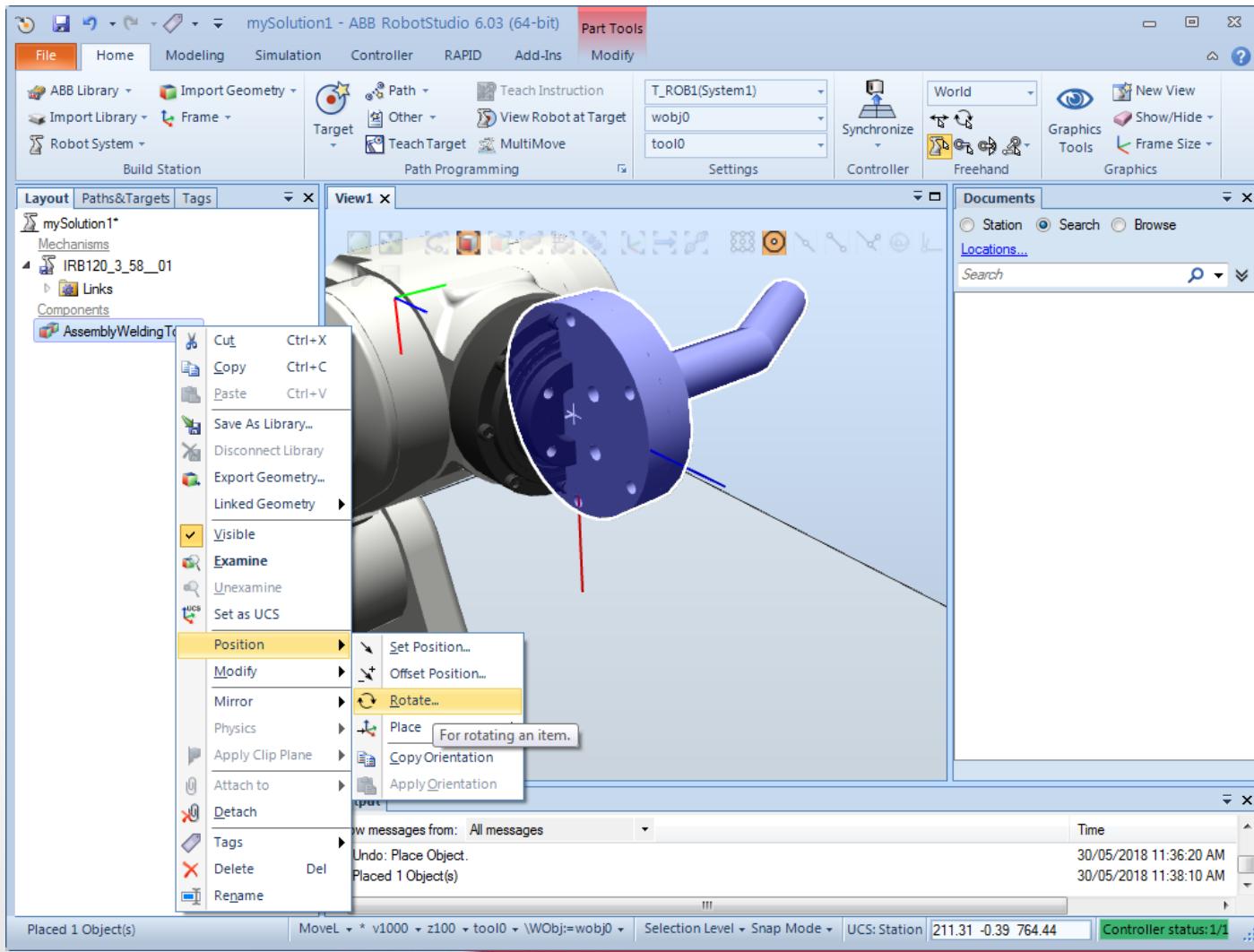
Import Tool

- To rotate the tool, first of all, set Tool0 as the UCS (User Coordinate System).



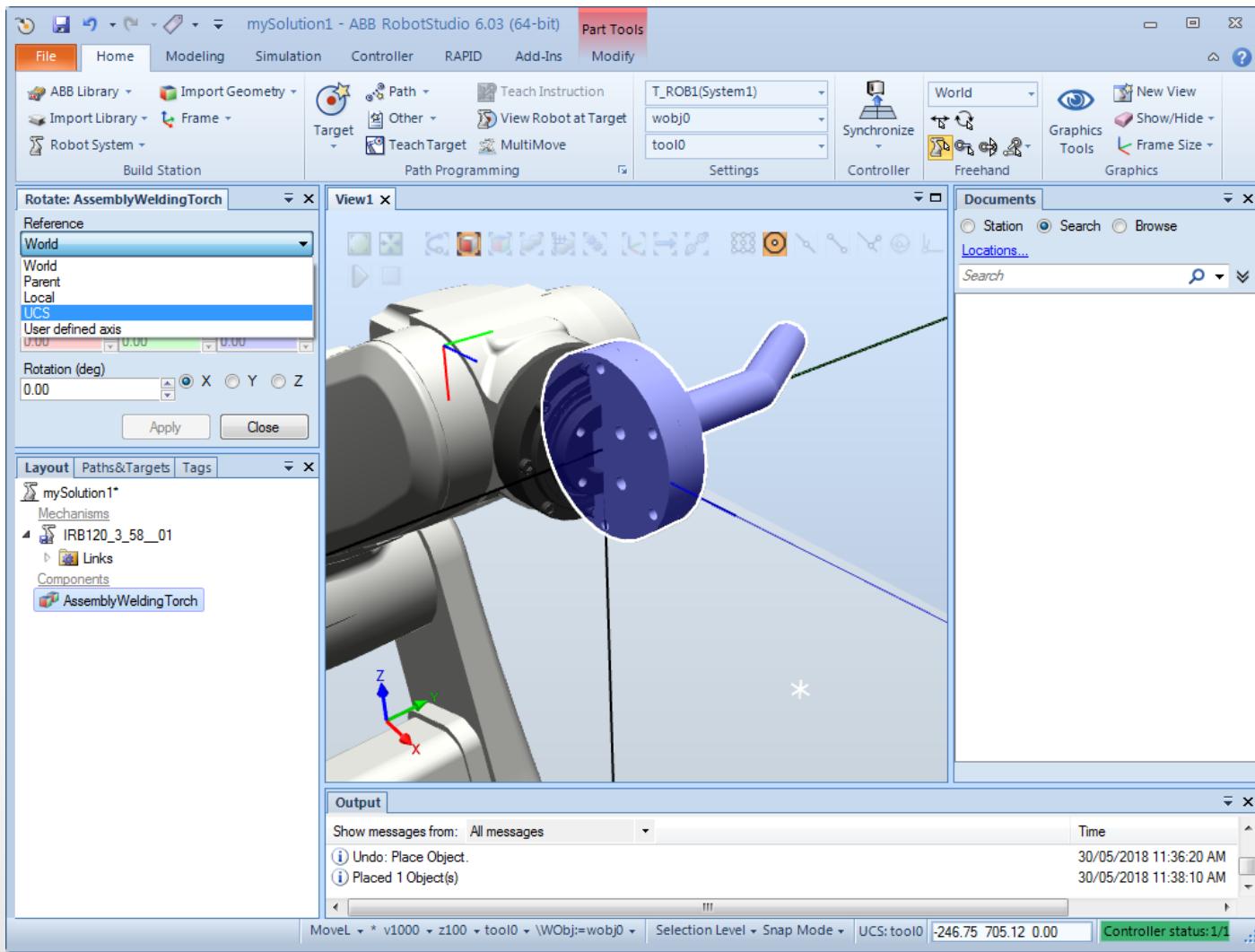
Import Tool

- Next, follow the steps in the figure.



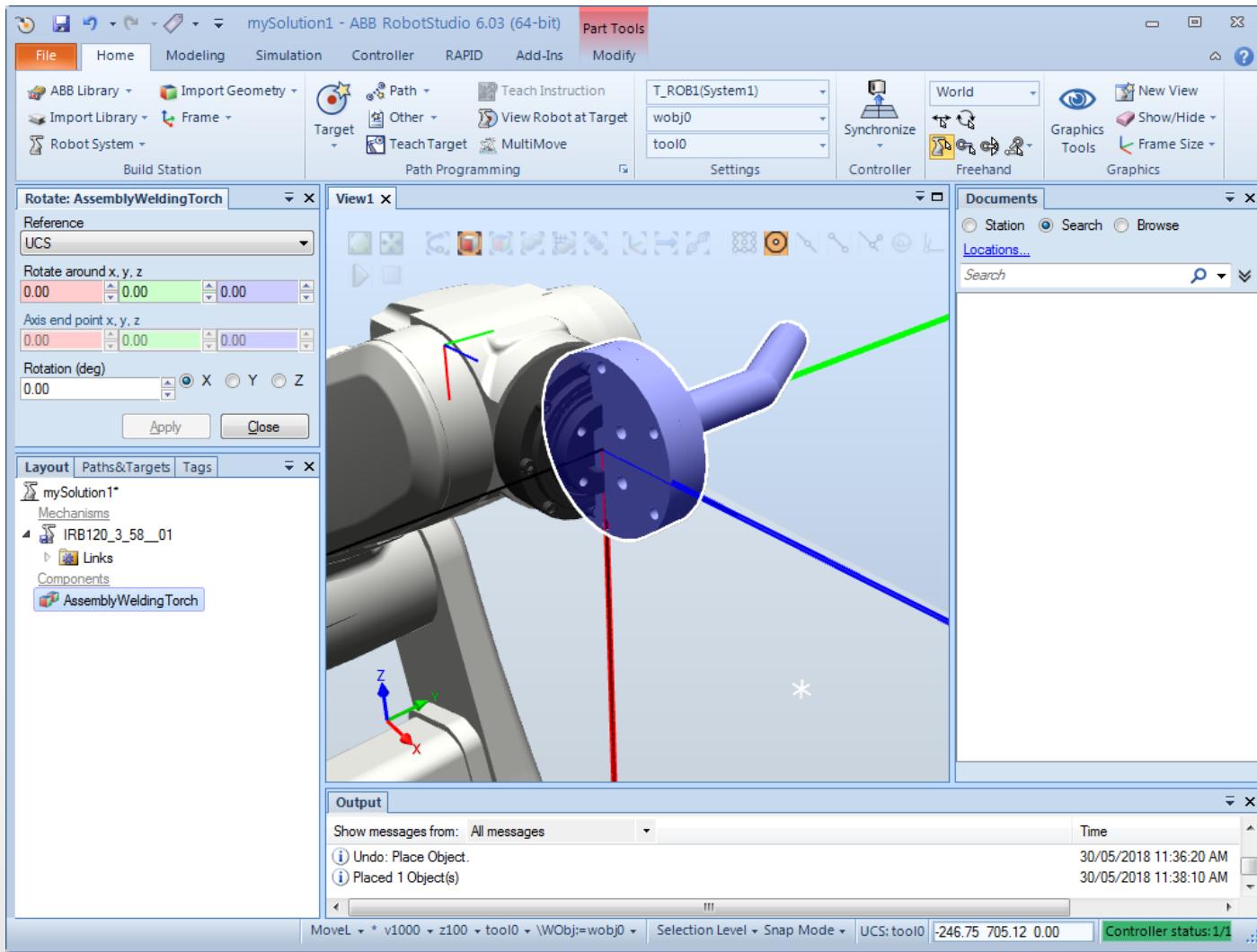
Import Tool

- In the “Reference” selection, choose “UCS”.



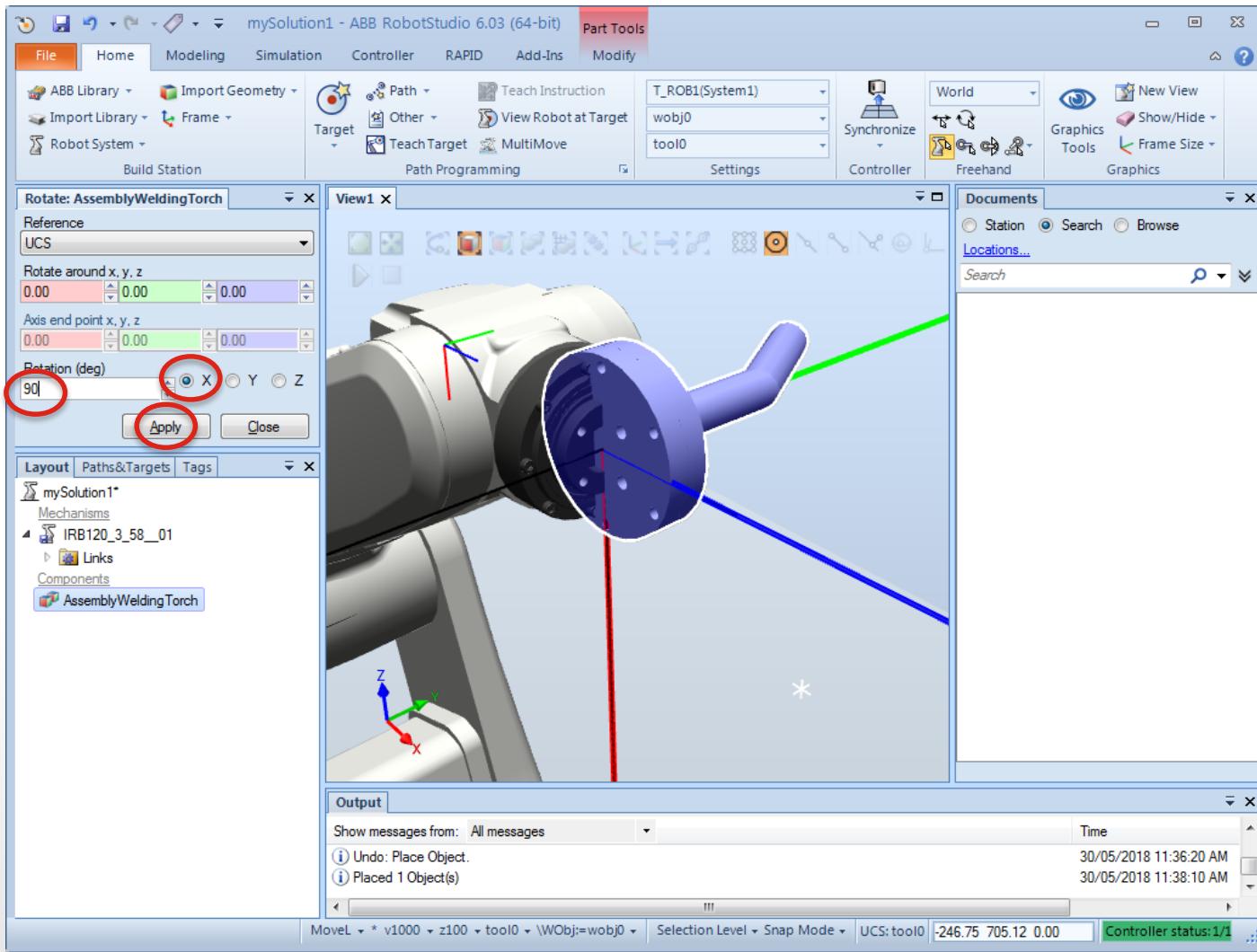
Import Tool

- Notice that **Tool0** is now highlighted.



Import Tool

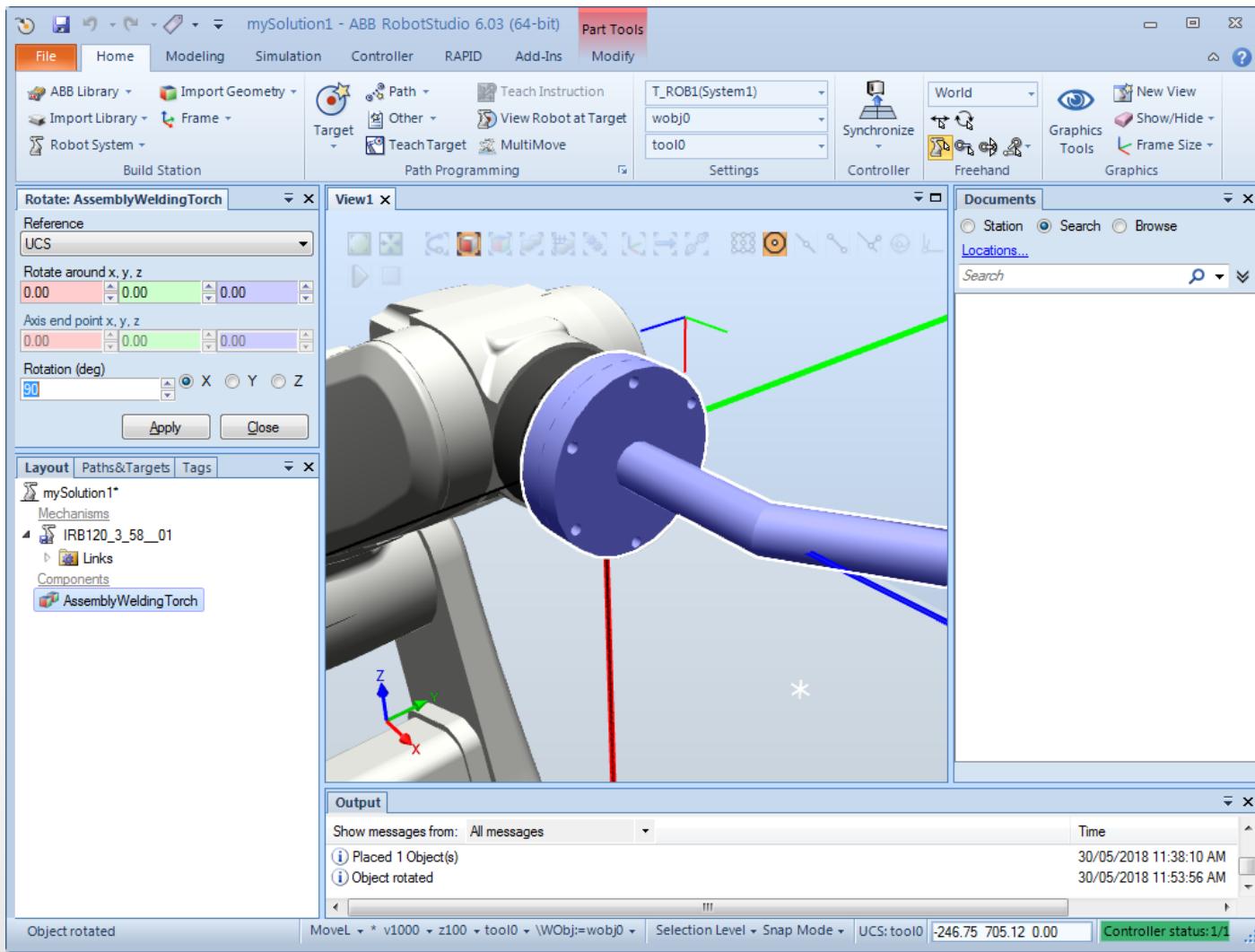
- Key in values for “Rotation (deg)”, choose X/Y/Z-axis and click “Apply”.



Note that:
Red = X
Green = Y
Blue = Z.
The sense
of
direction
follows
right hand
rule.

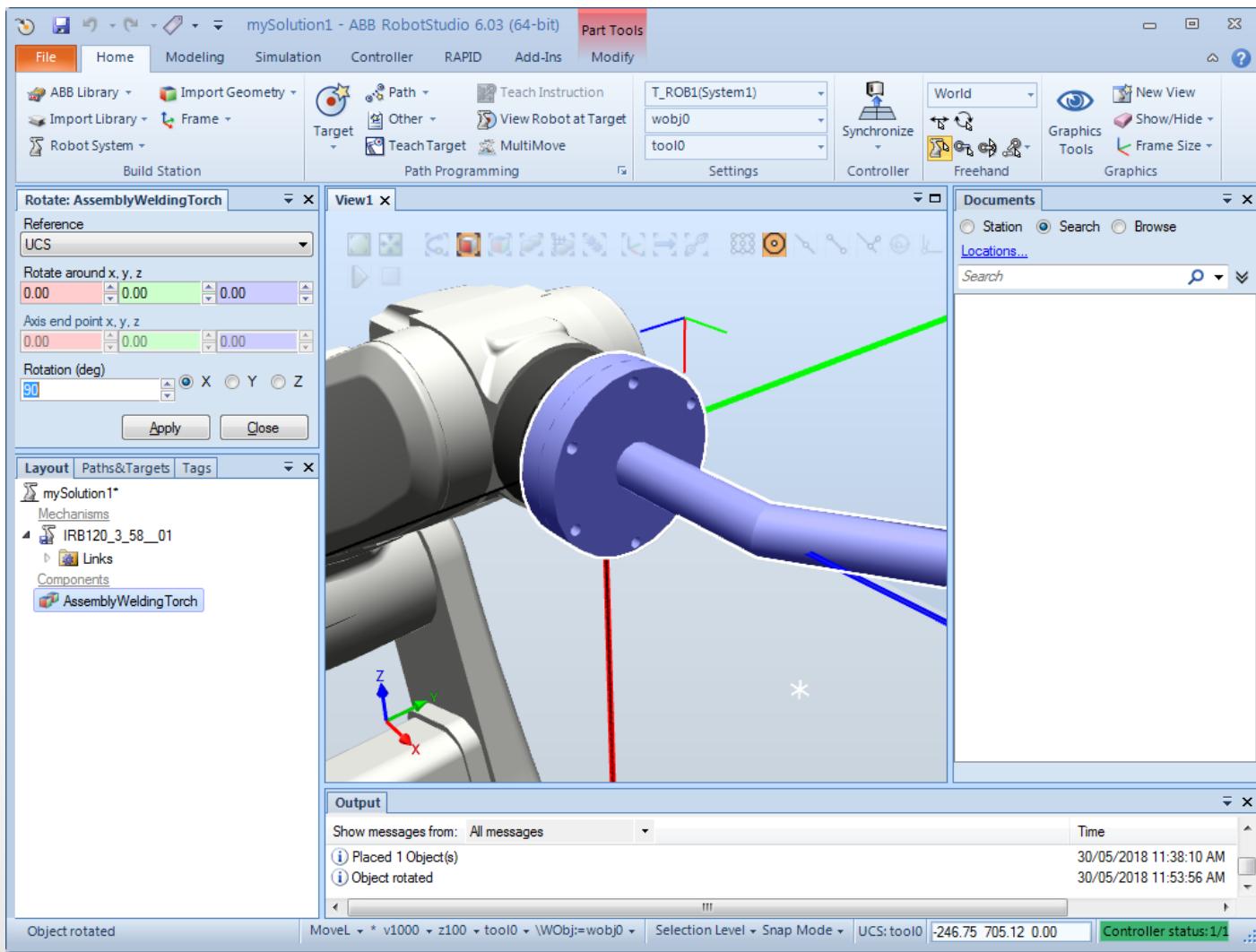
Import Tool

- The tool is now rotated about x-axis.



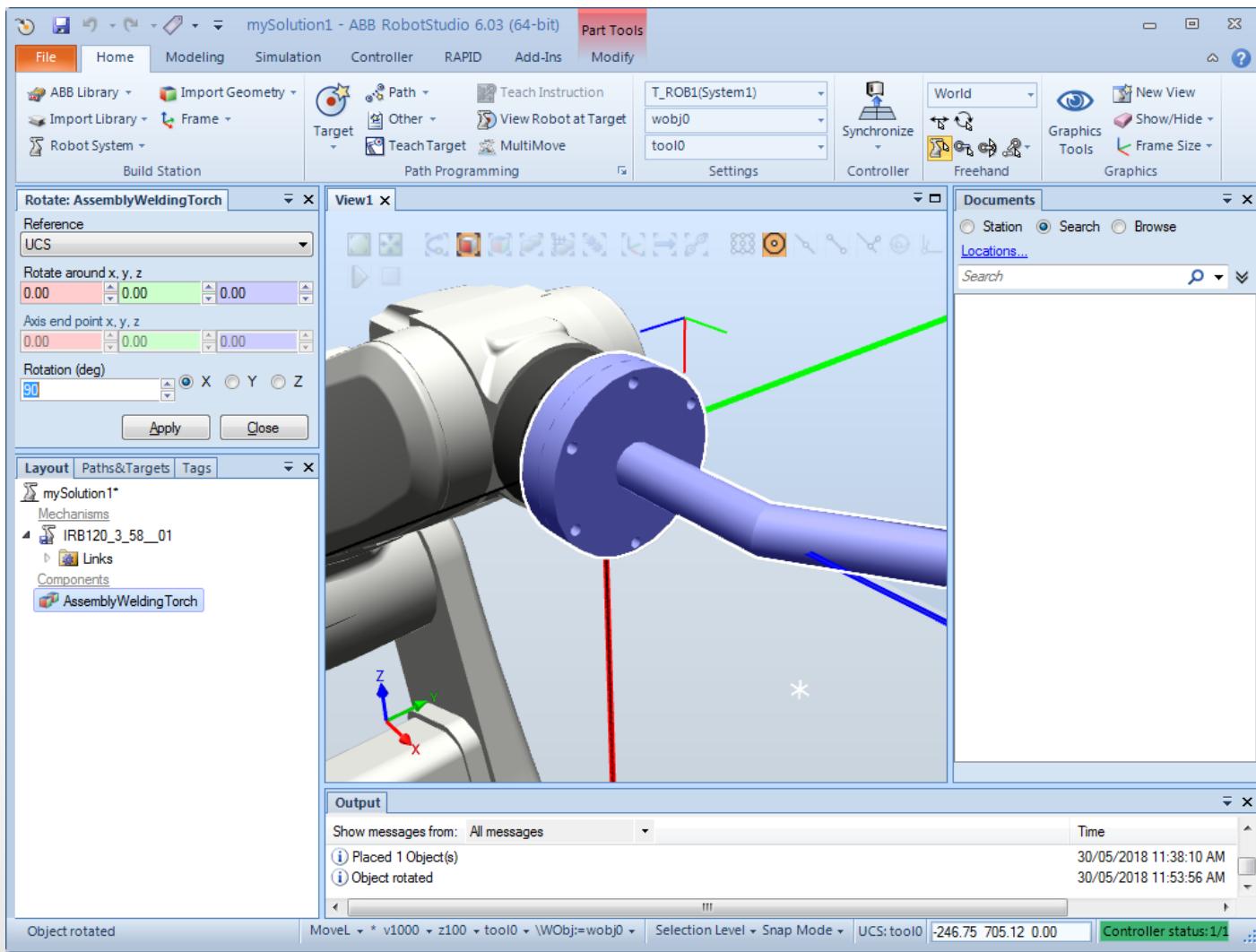
Import Tool

- Another rotation about Z-axis is required. However, we need to **know the angle required.**



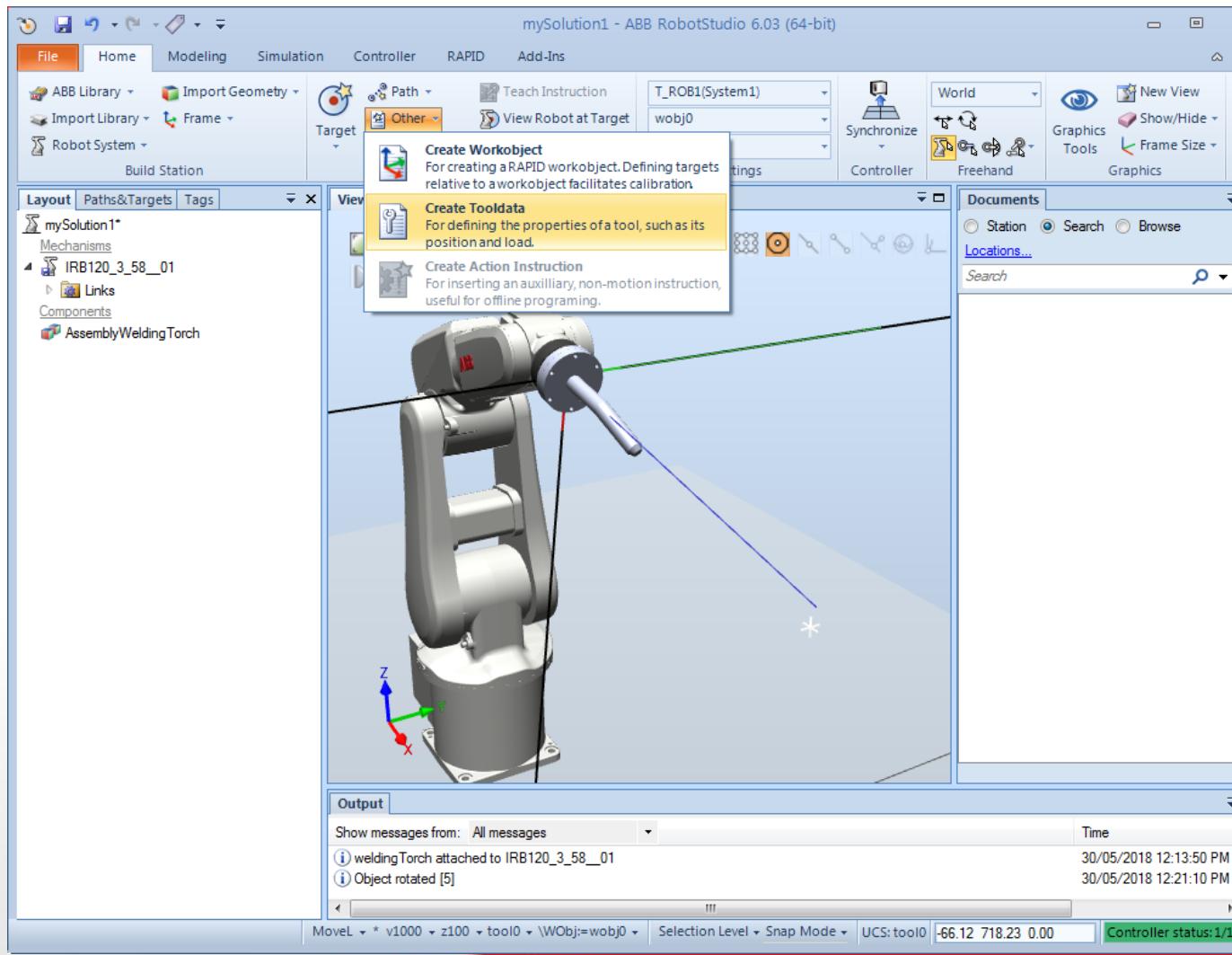
Import Tool

- To do this, we make use of the **tool frame** (weldingTorch) which we **calibrated** earlier.



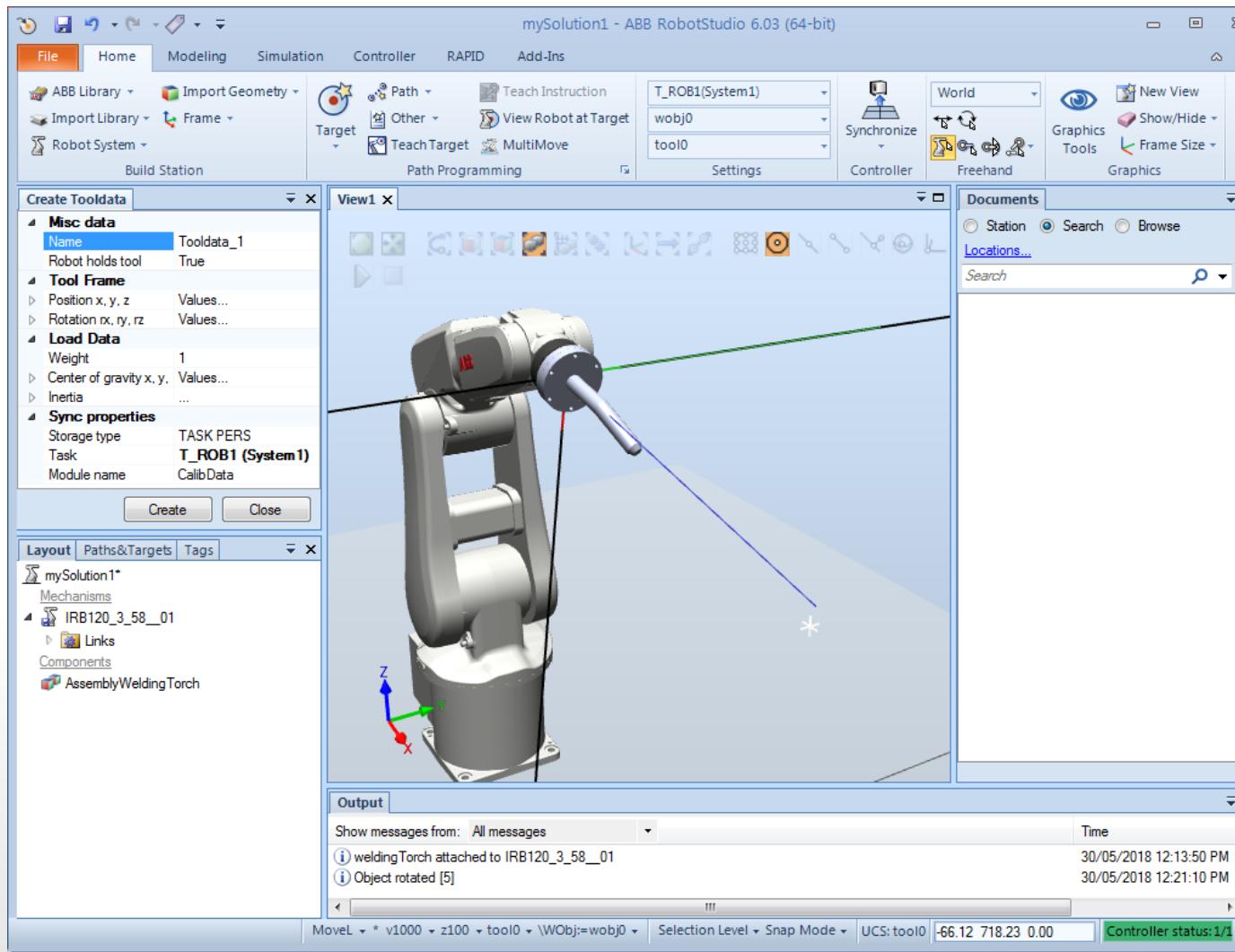
Import Tool

- We will now create the tool Frame. Click “Create Tooldata” as shown.



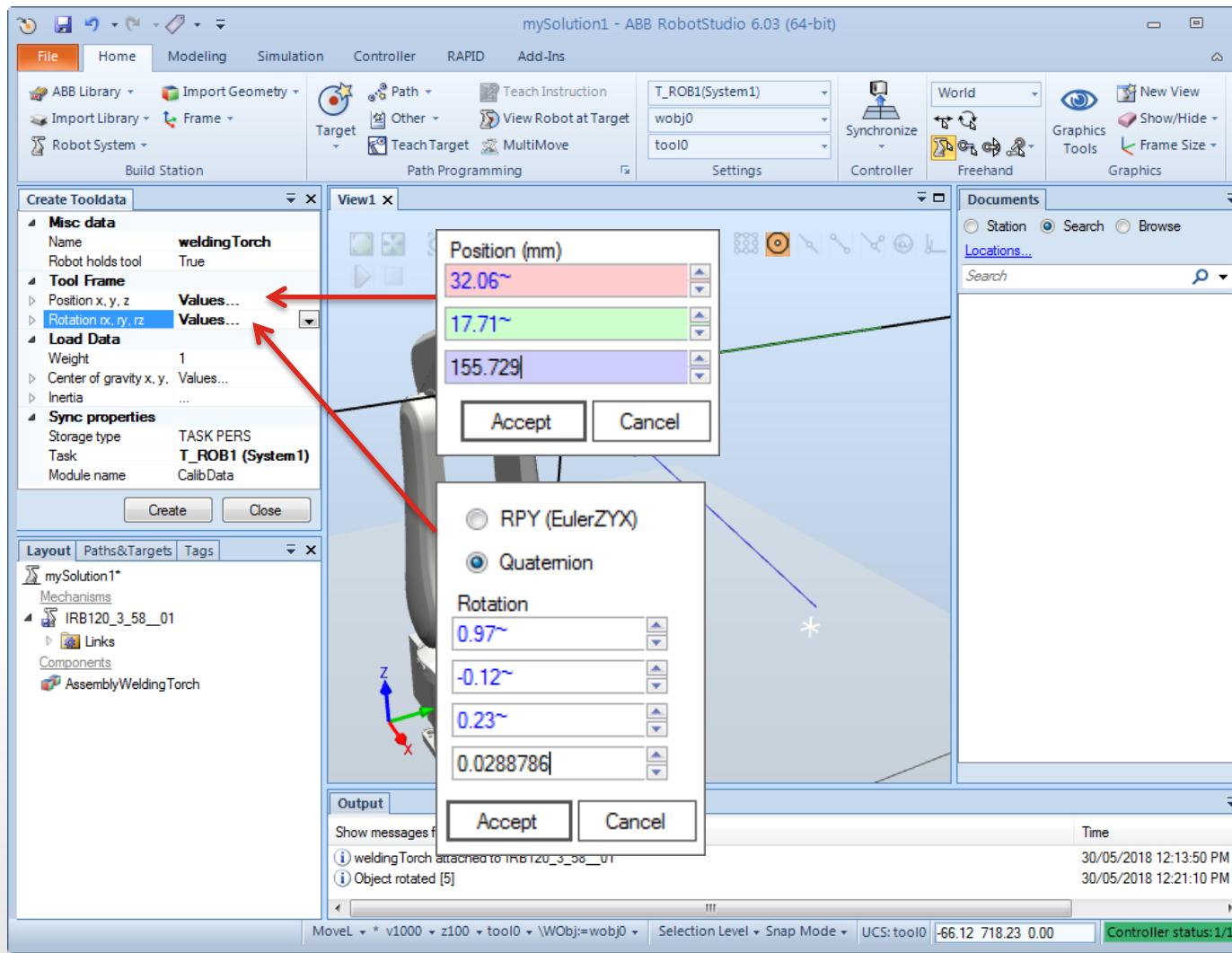
Import Tool

- On the left, key in name and values (as calibrated).



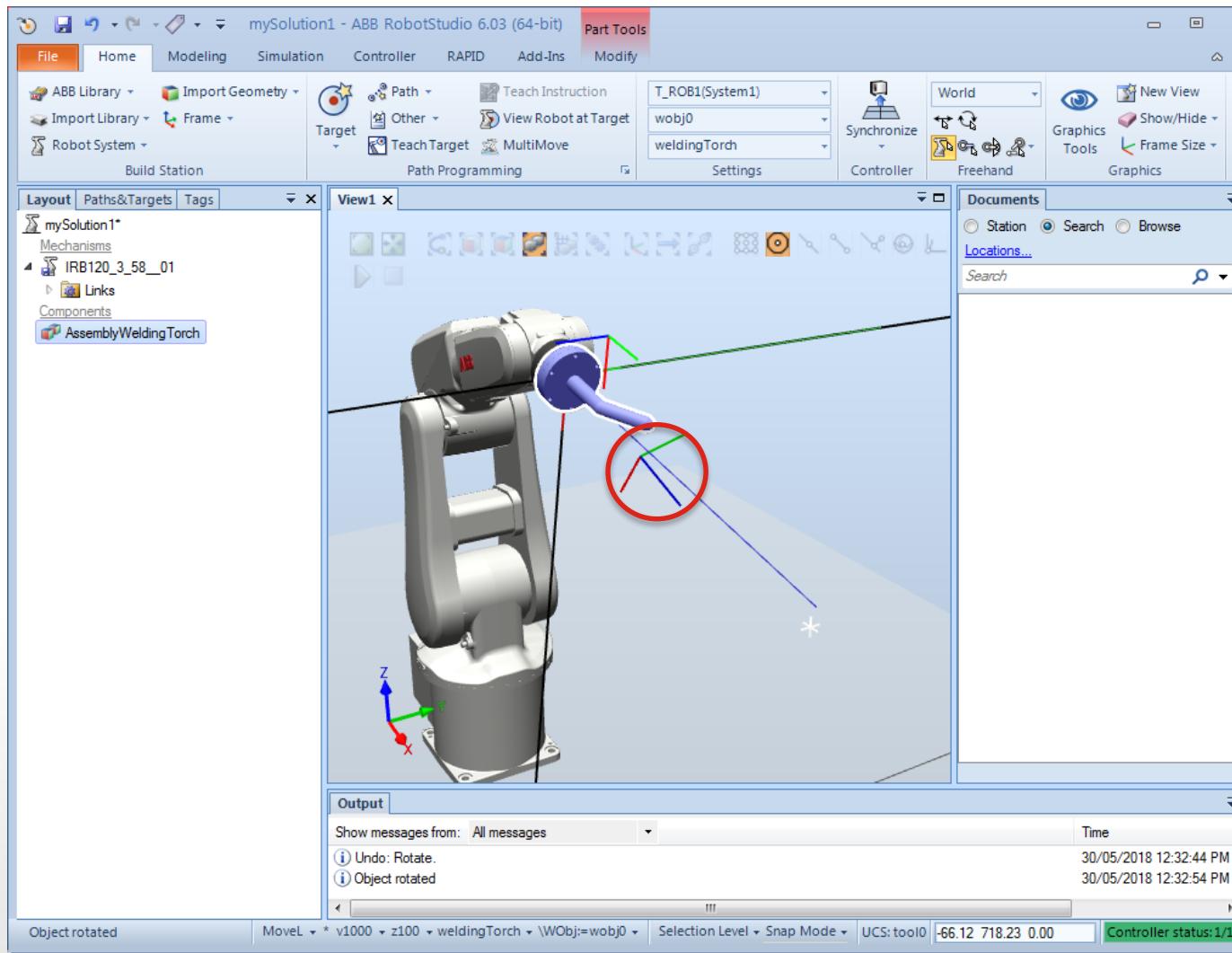
Import Tool

- On the left, key in name and values (as calibrated).



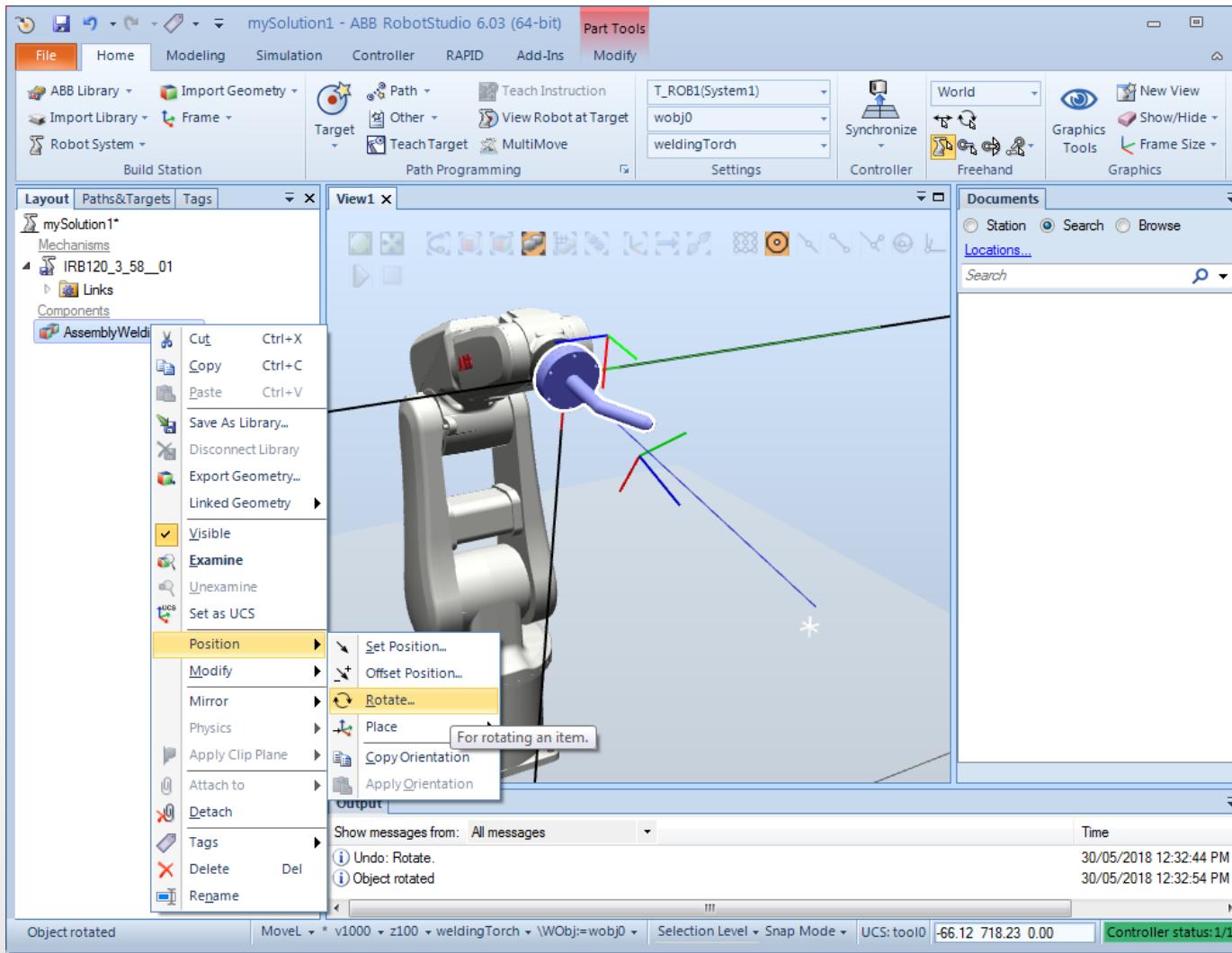
Import Tool

- The frame is now created.



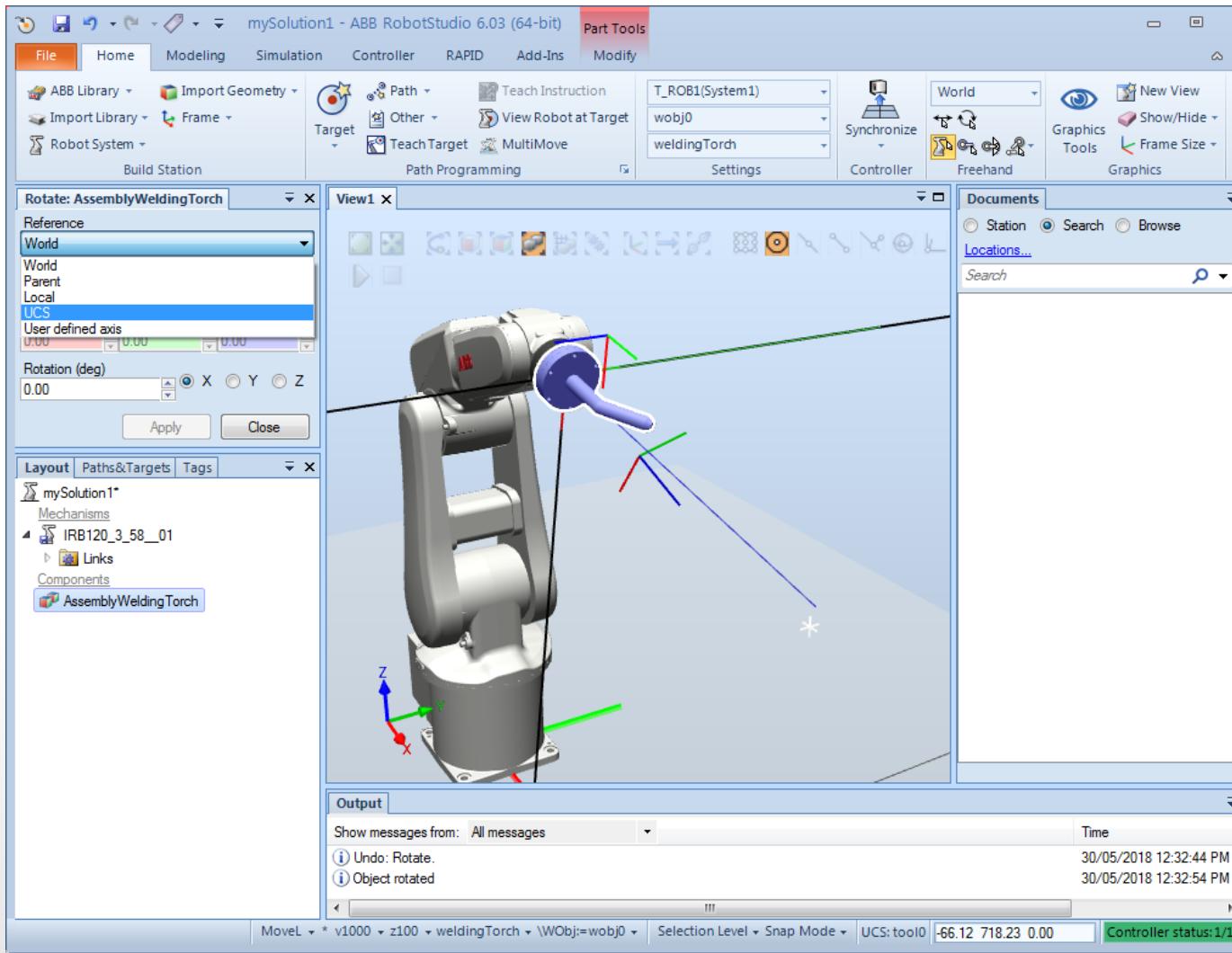
Import Tool

- We are now ready to **rotate the tool about z-axis**. Follow steps in figure below.



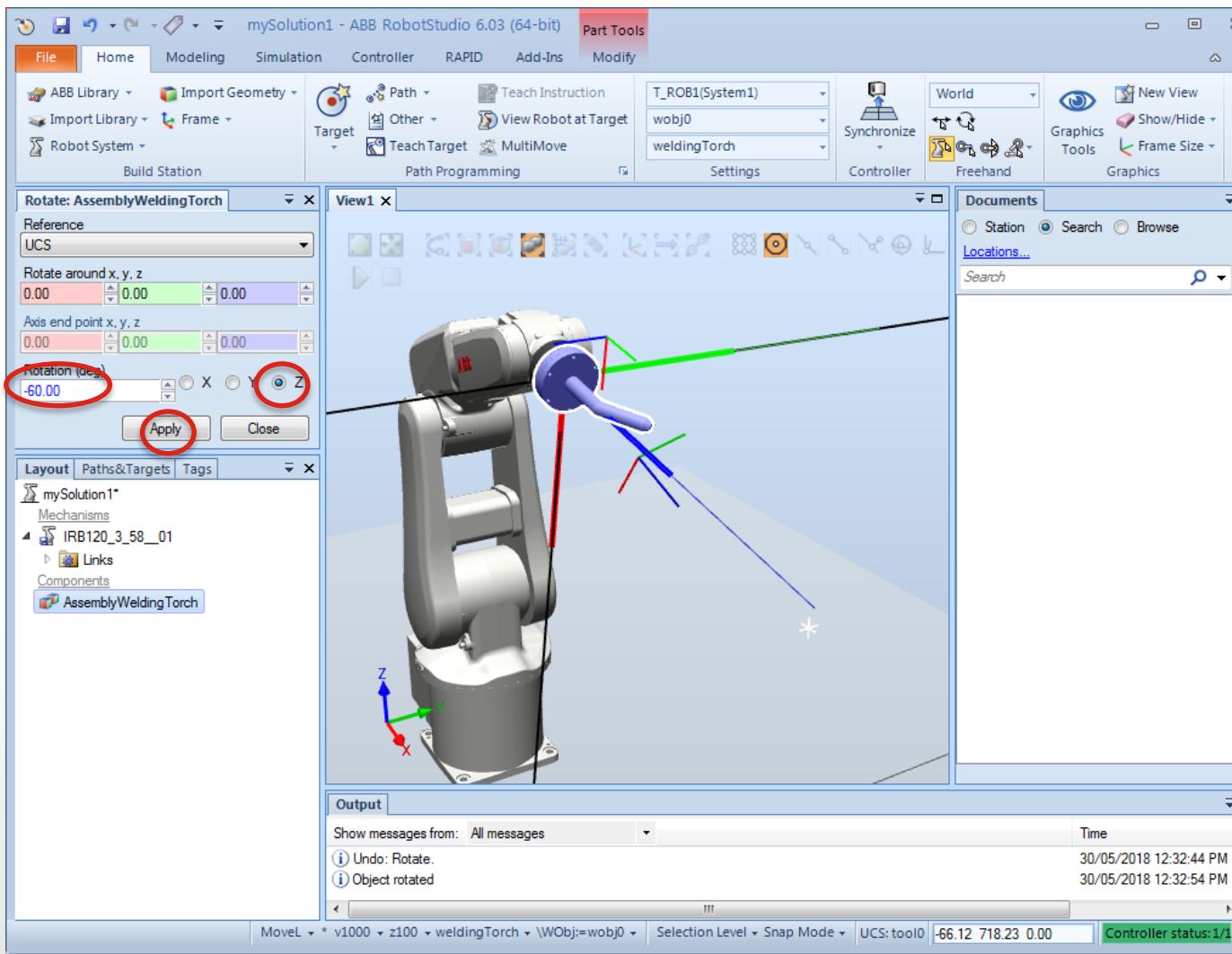
Import Tool

- Select **UCS** again as the reference.



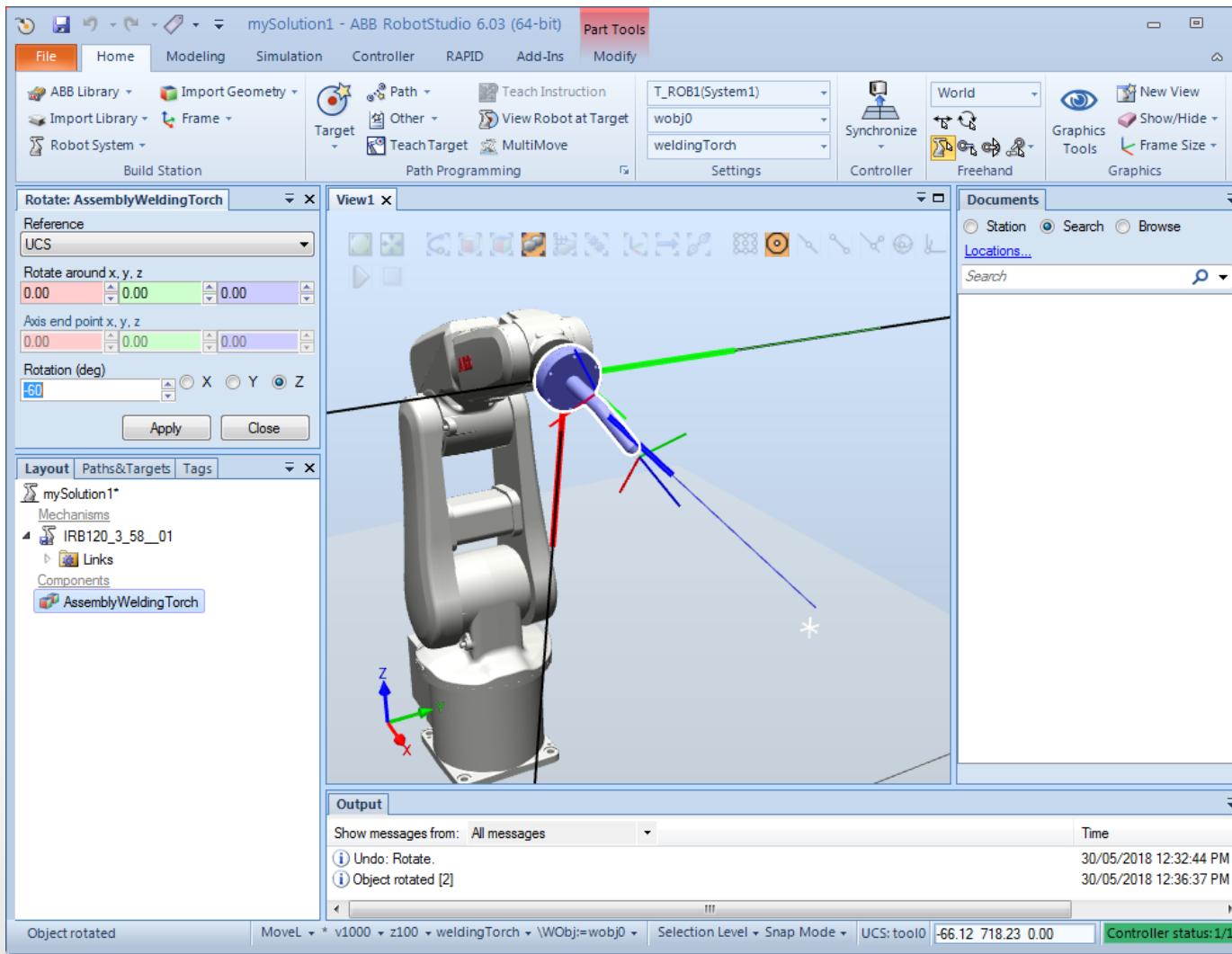
Import Tool

- Key in values in **Rotation (deg)** - here minus 60 degrees **about Z**, then click **Apply**.



Import Tool

- The tool is now having the **correct orientation**, as the actual tool.

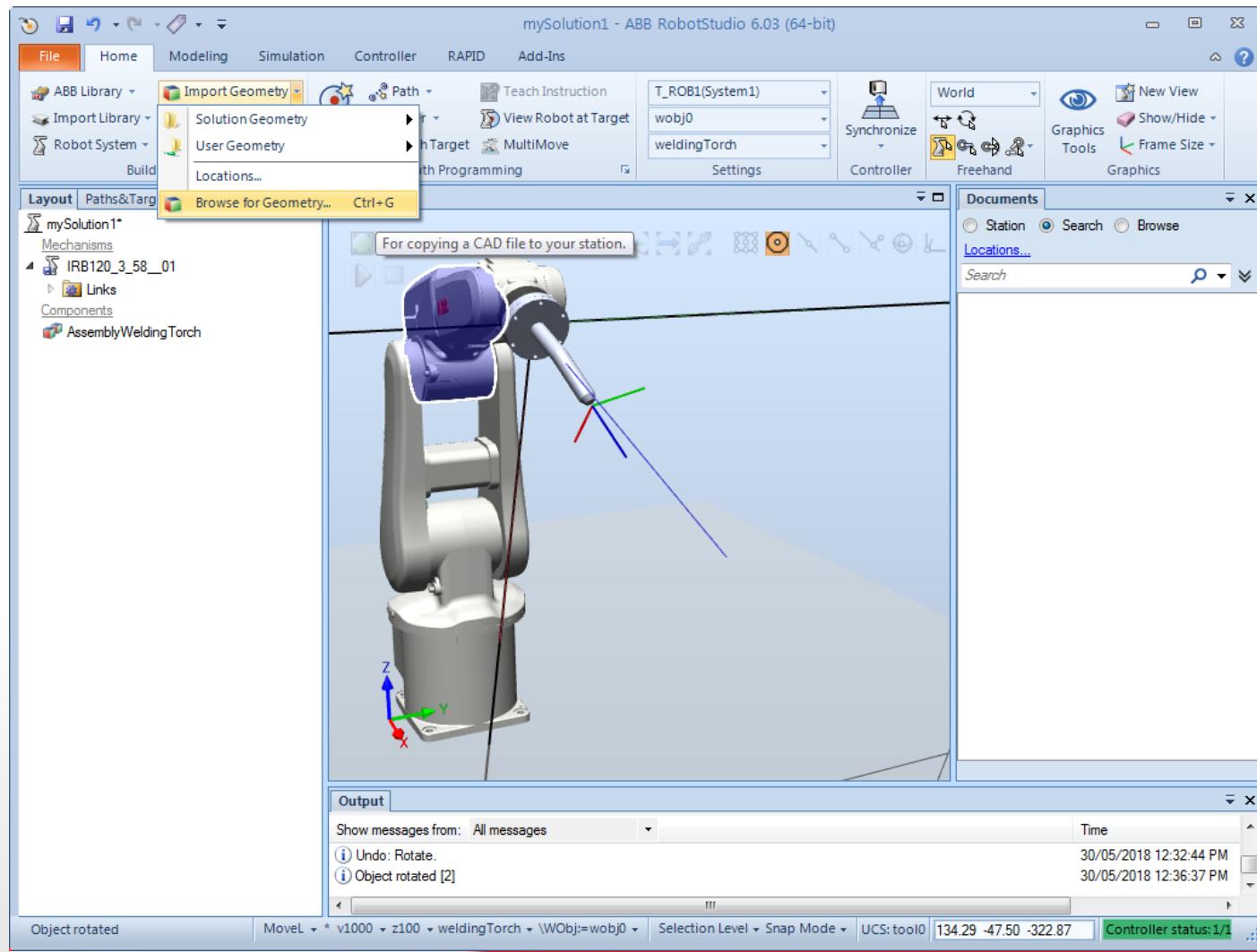


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- **Import Workpiece**
- Save Solution

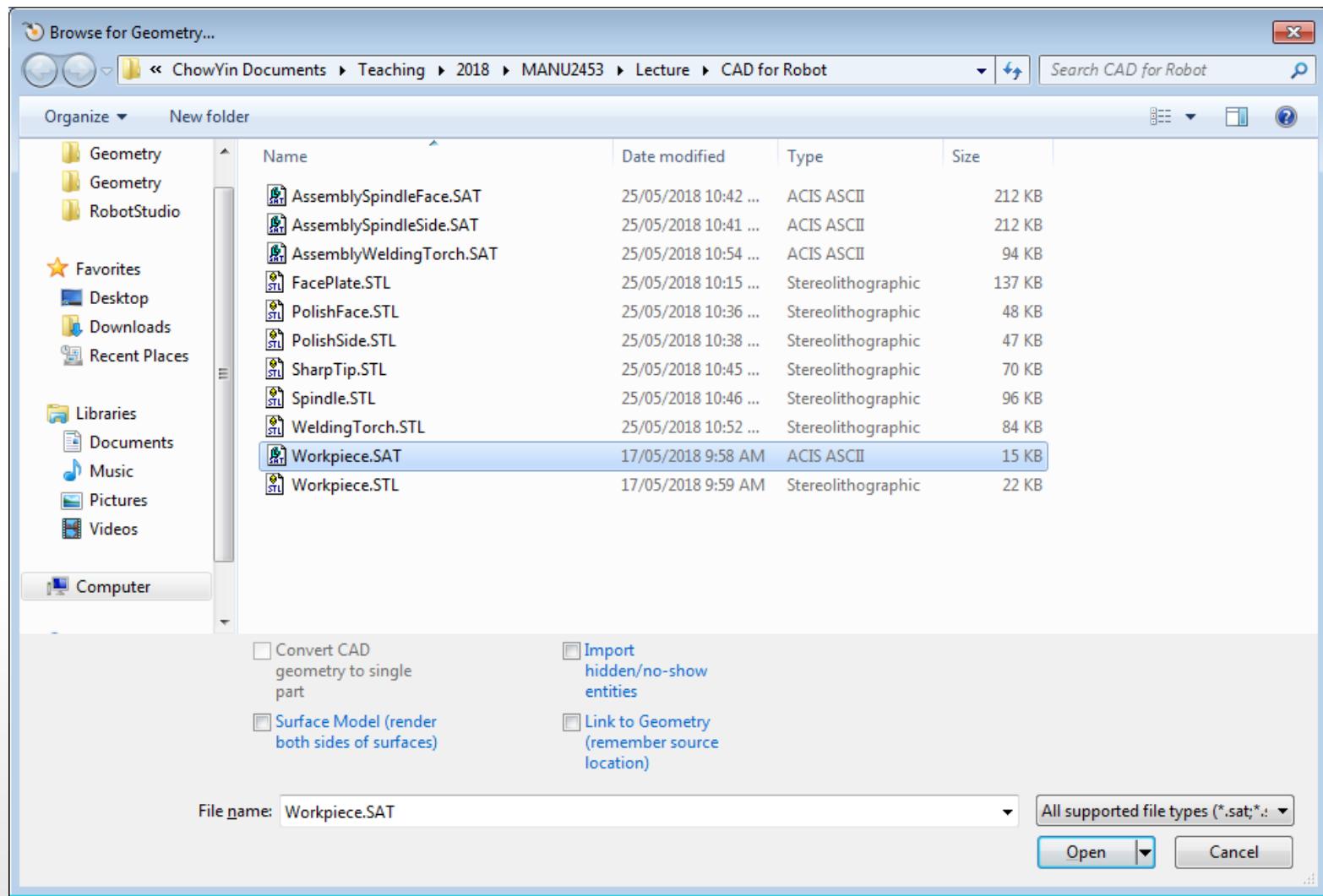
Import Workpiece

- Our next step is to import the workpiece. Click “Browse for Geometry” as shown



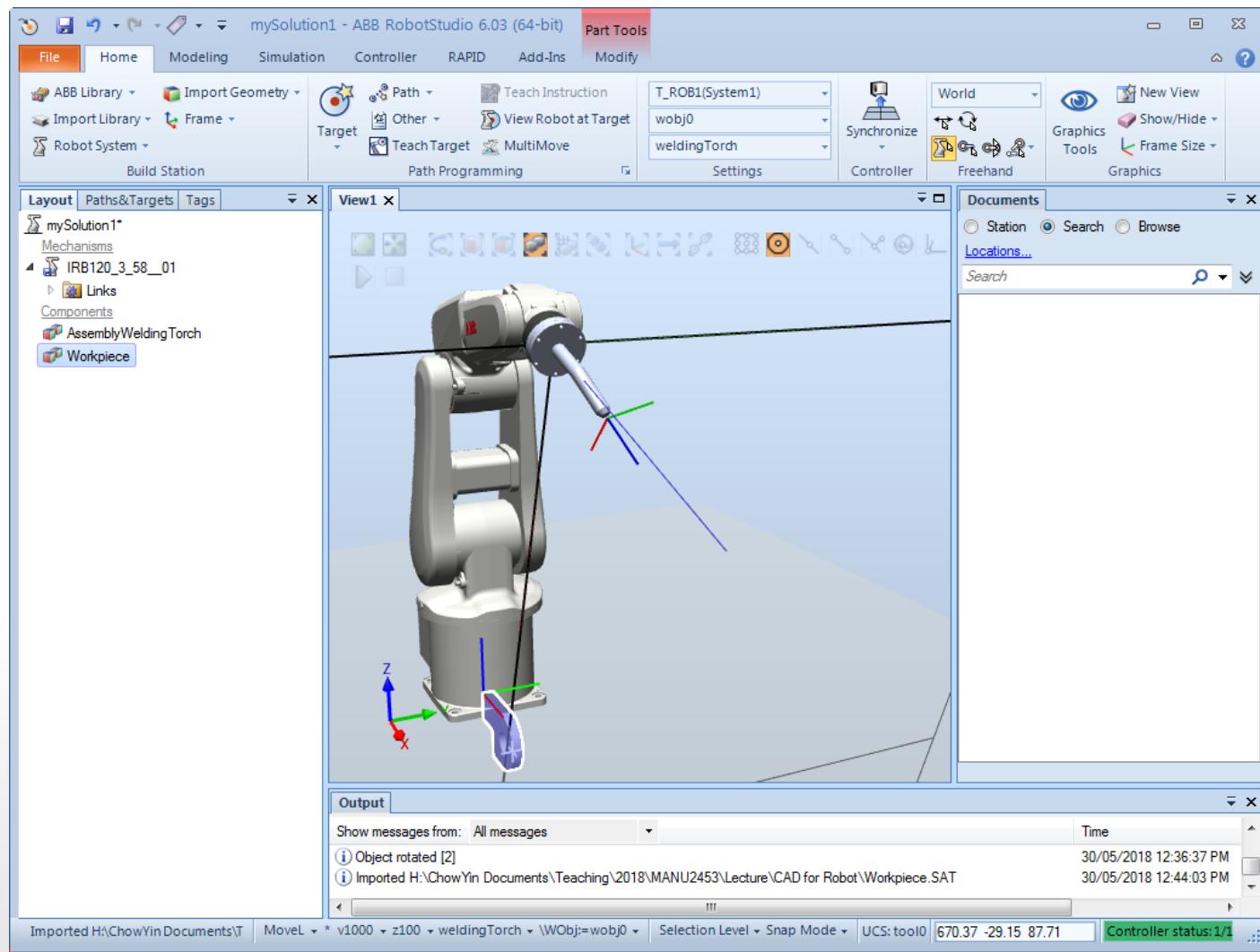
Import Workpiece

- Select the workpiece .SAT file.



Import Workpiece

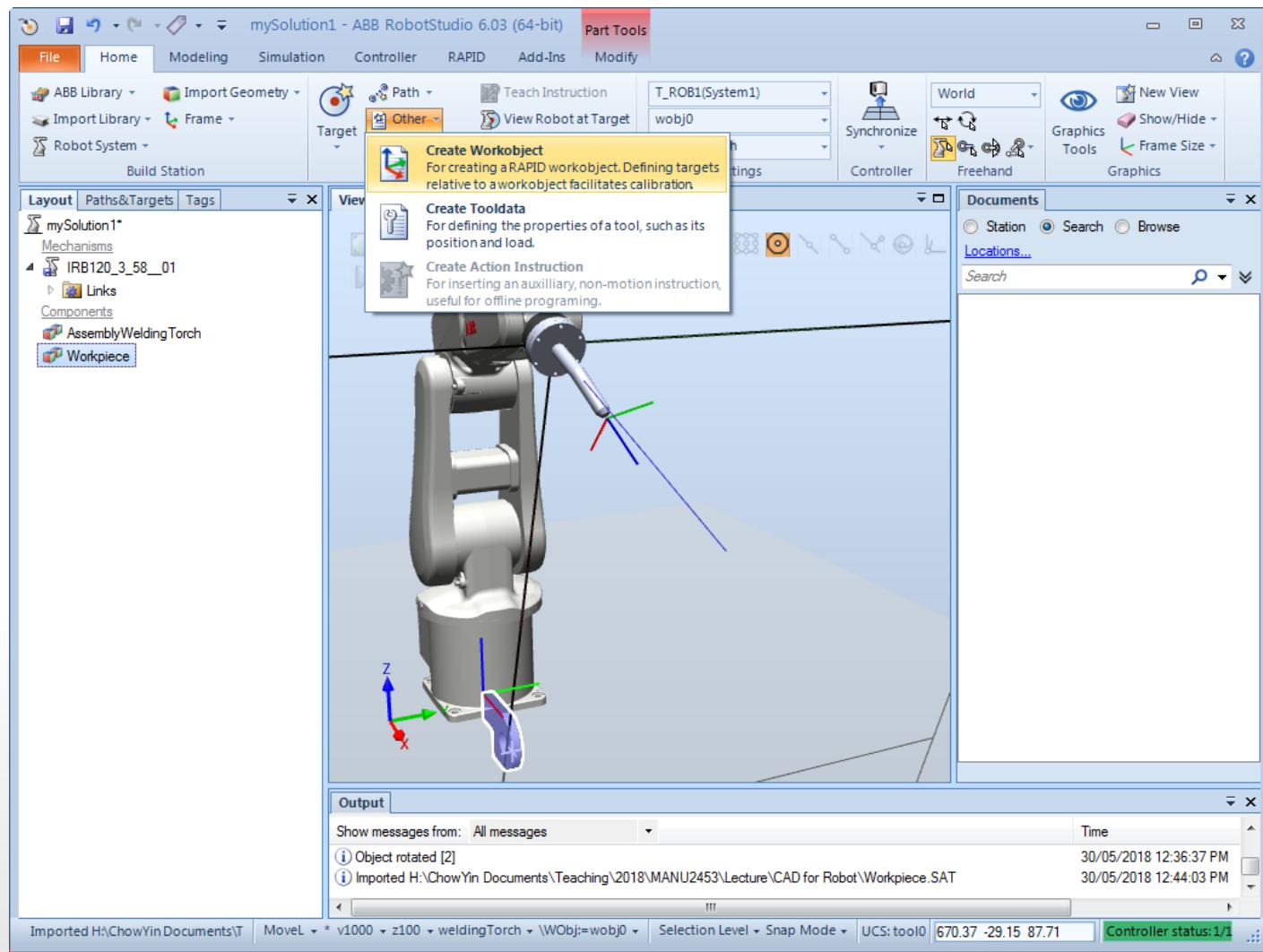
- The workpiece is in the work cell now. However, the **location and position** are incorrect.



Import Workpiece

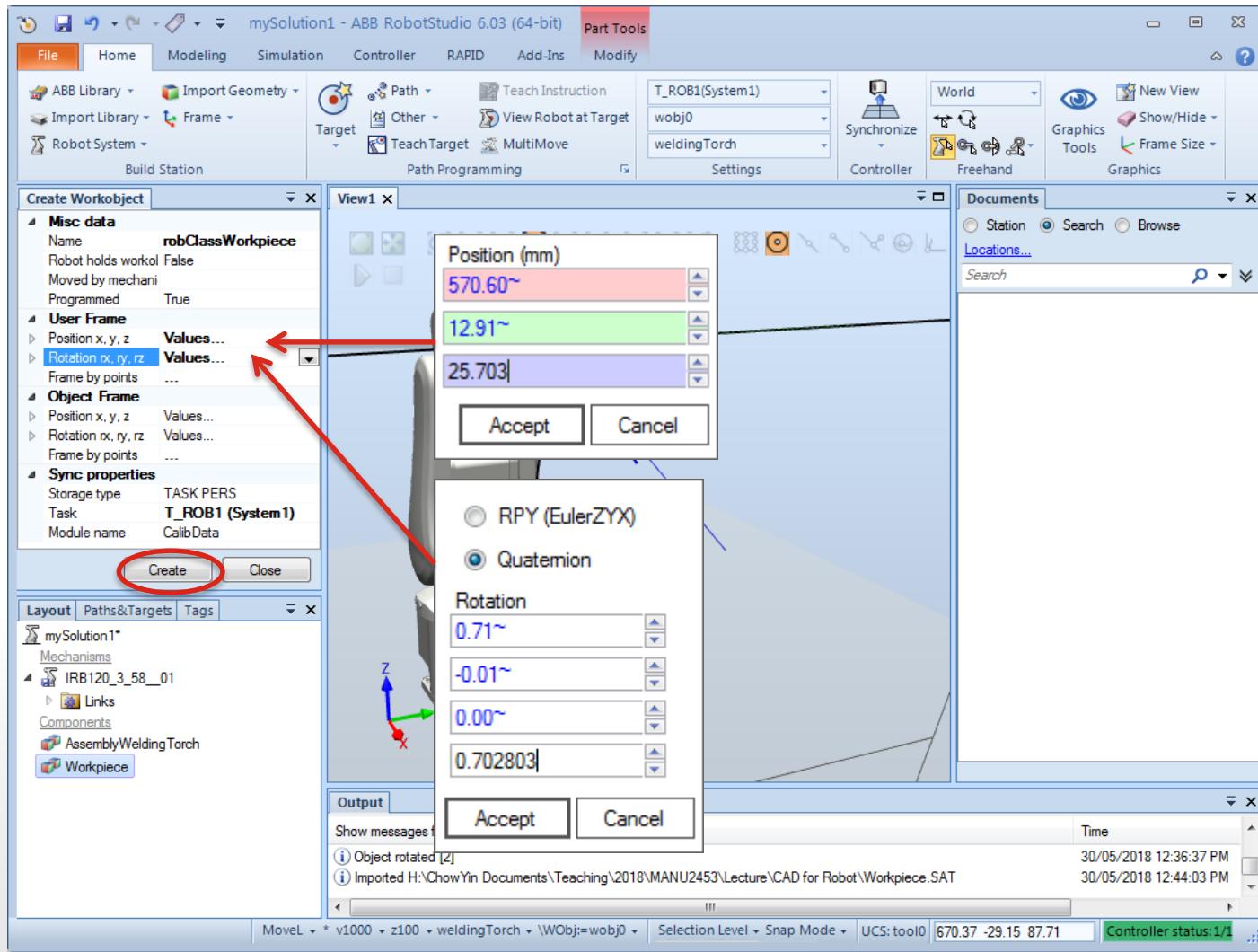
- To know the correct location, we again set up a **frame as calibrated** earlier. Click

Create Work-object.



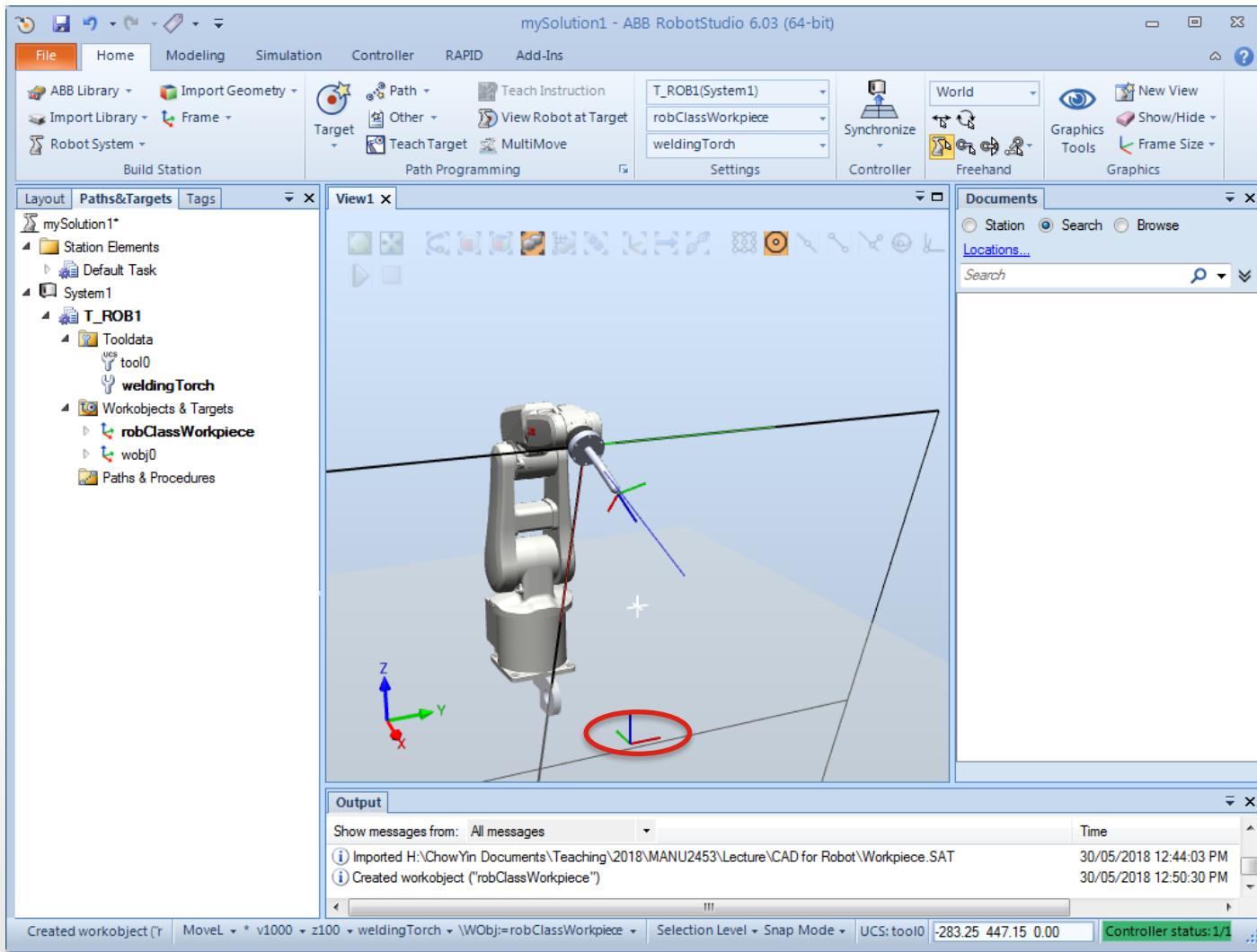
Import Workpiece

- Key in name and value as calibrated, then click “Create”.



Import Workpiece

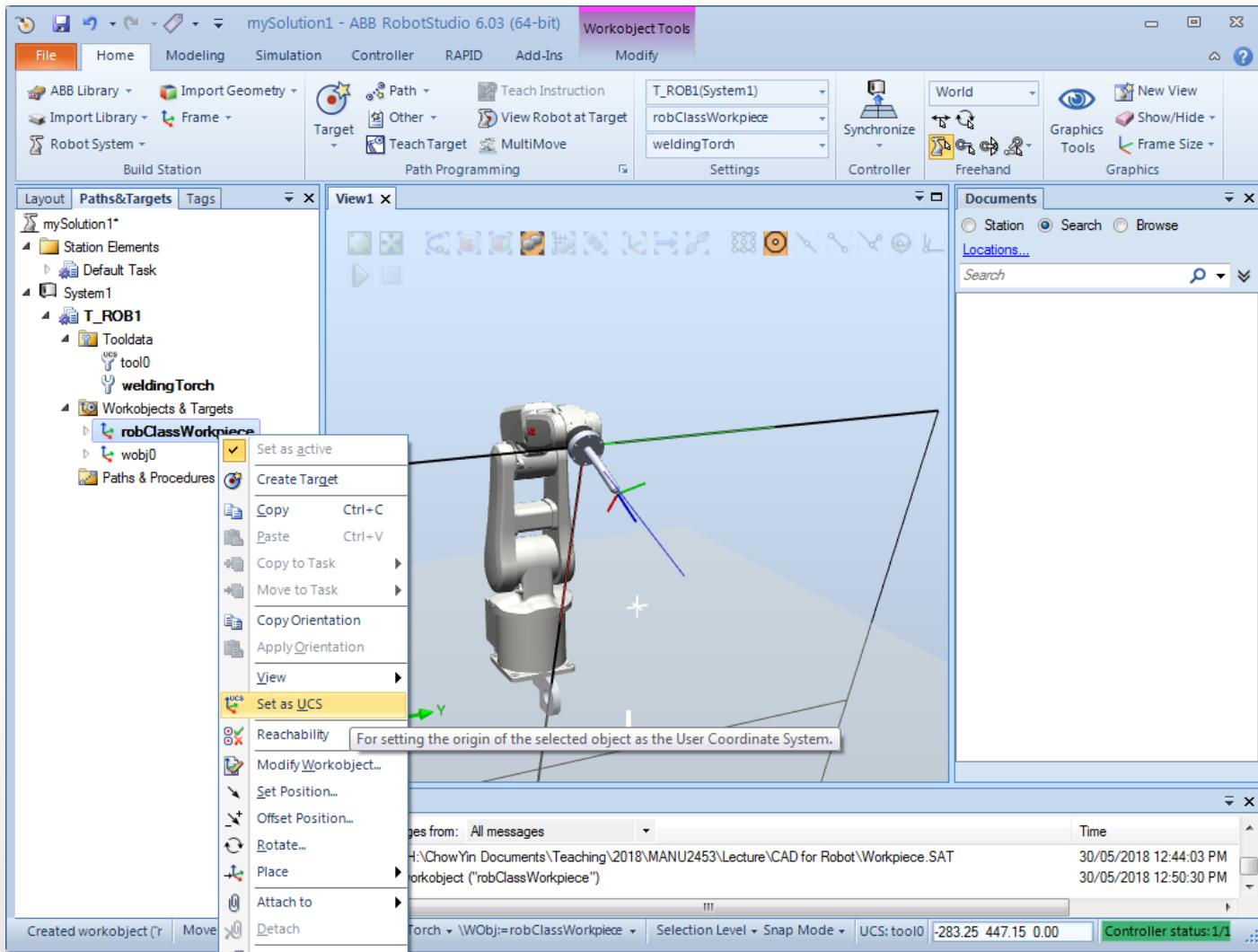
- The work object frame is now created.



Import Workpiece

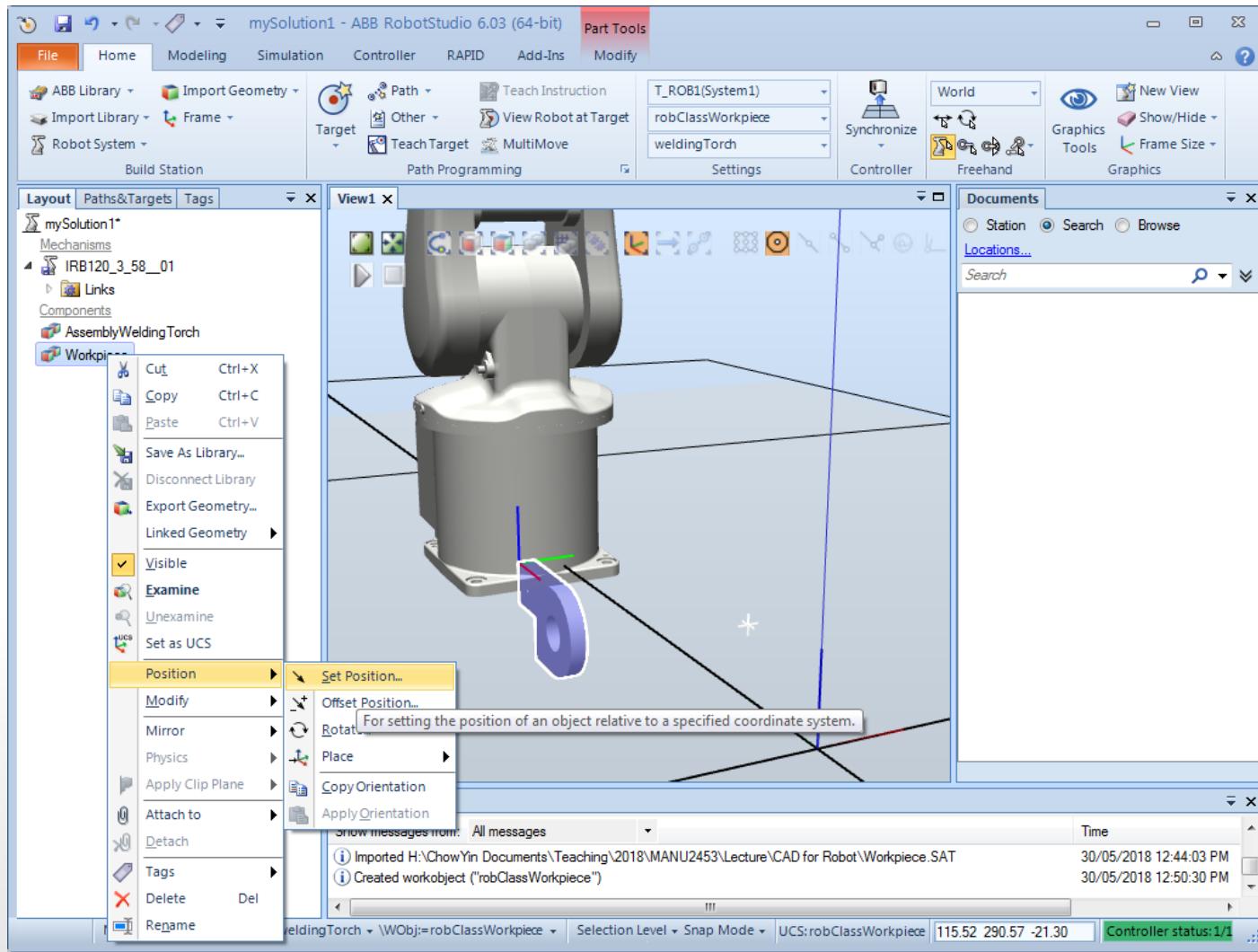
- We now wish to locate/rotate the workpiece so that it matches the frame. Set

robClass
Work
piece
as UCS.



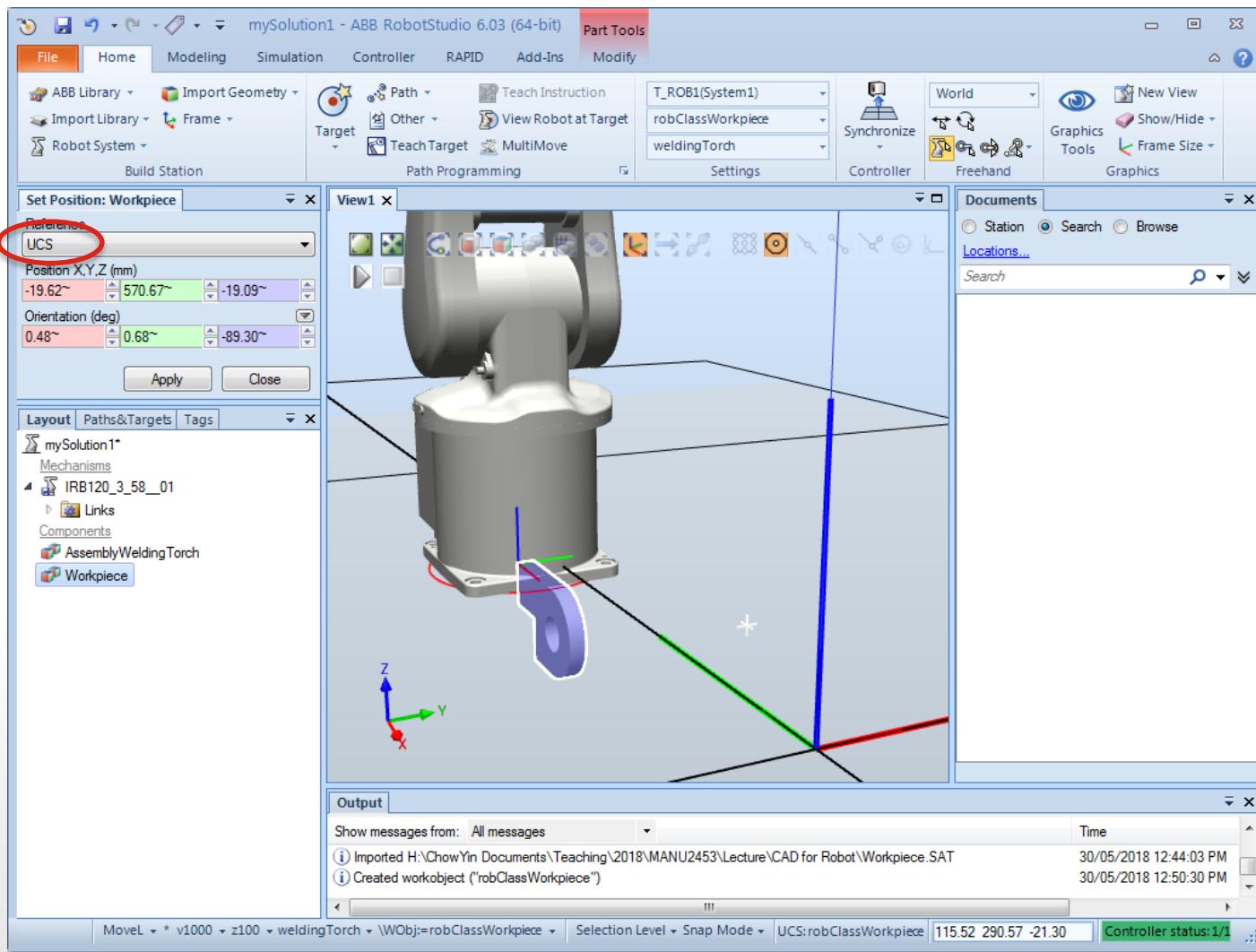
Import Workpiece

- Follow instructions on screen.



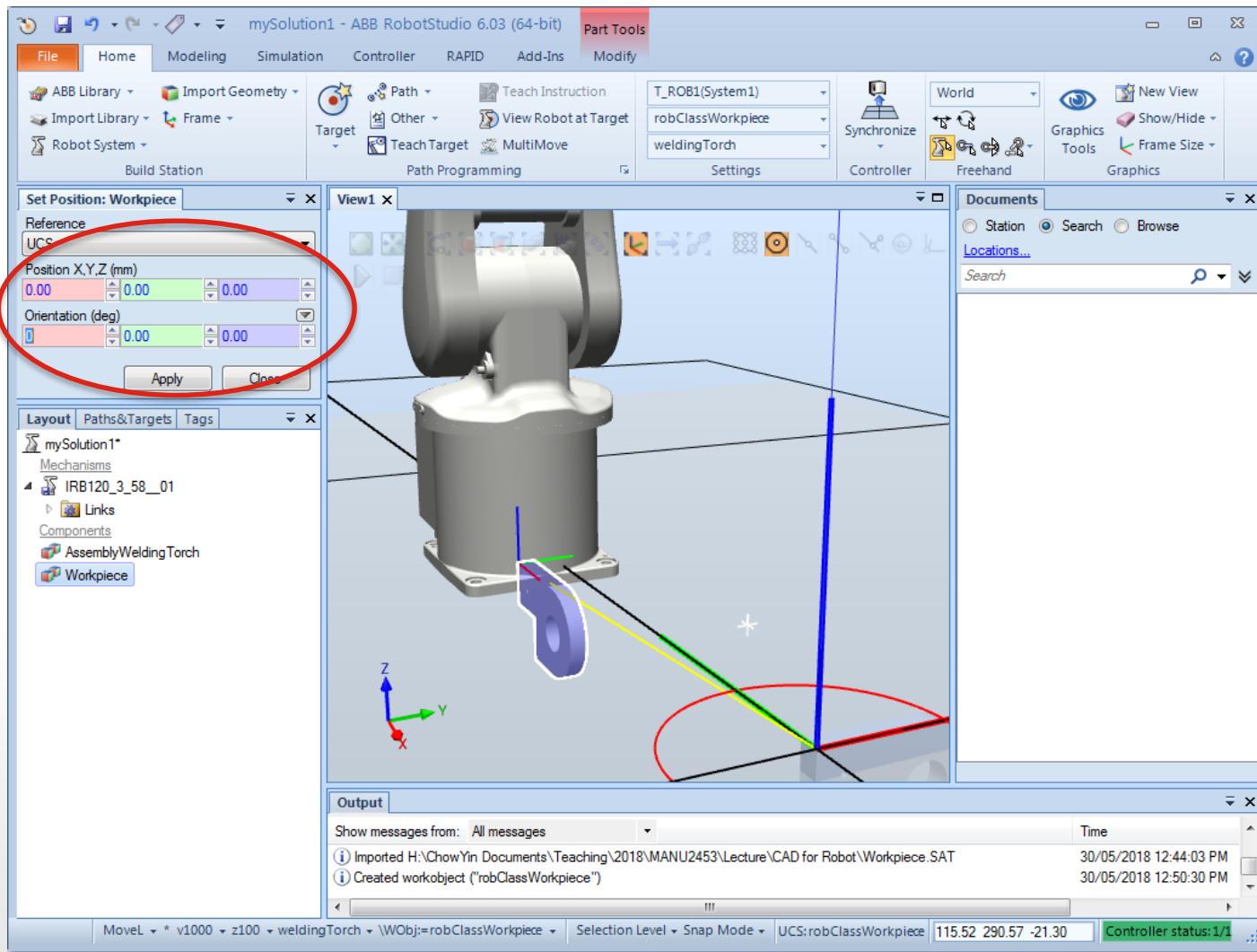
Import Workpiece

- Select **UCS** as Reference.



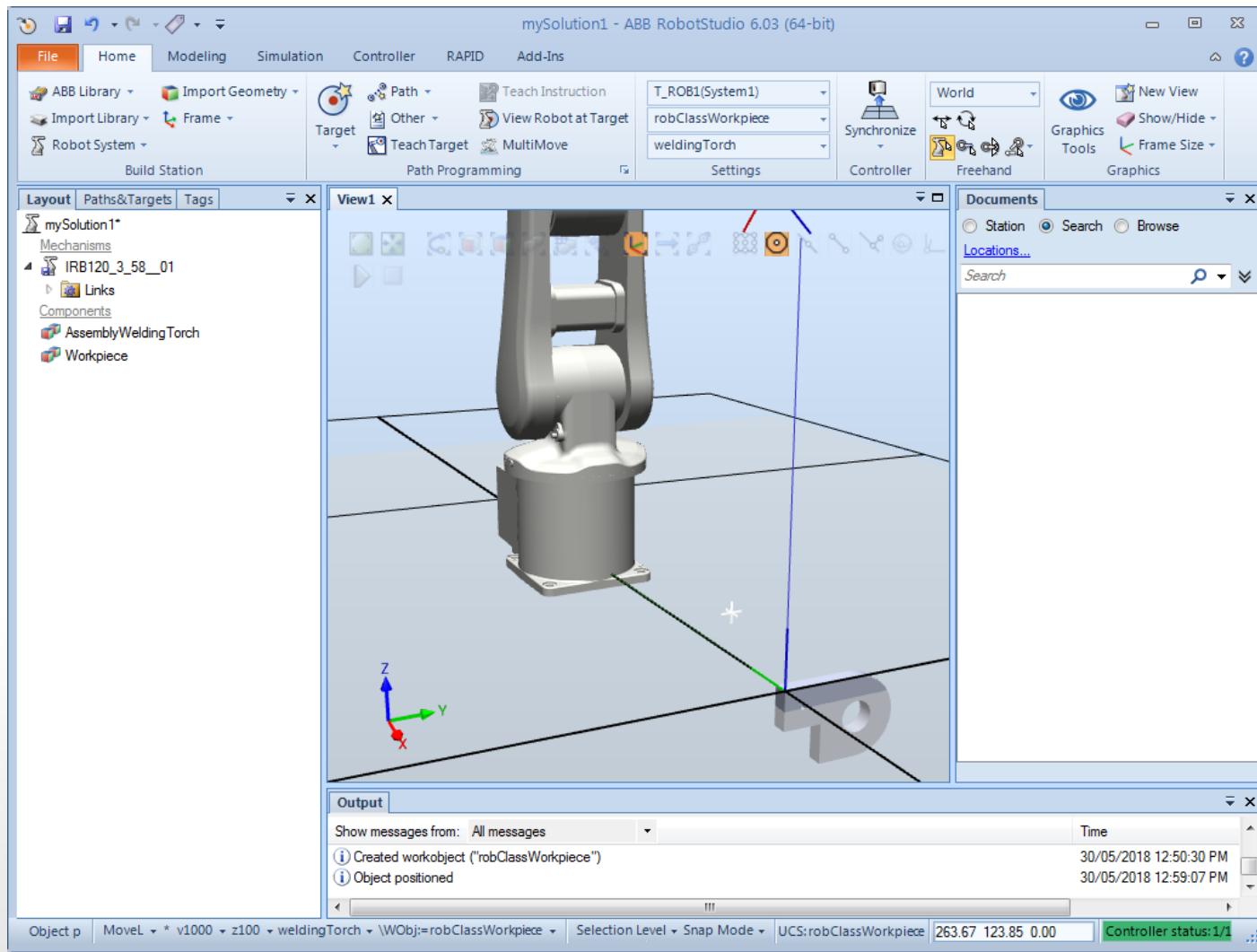
Import Workpiece

- Change all the values to 0. This means the relative location and angle are zero.



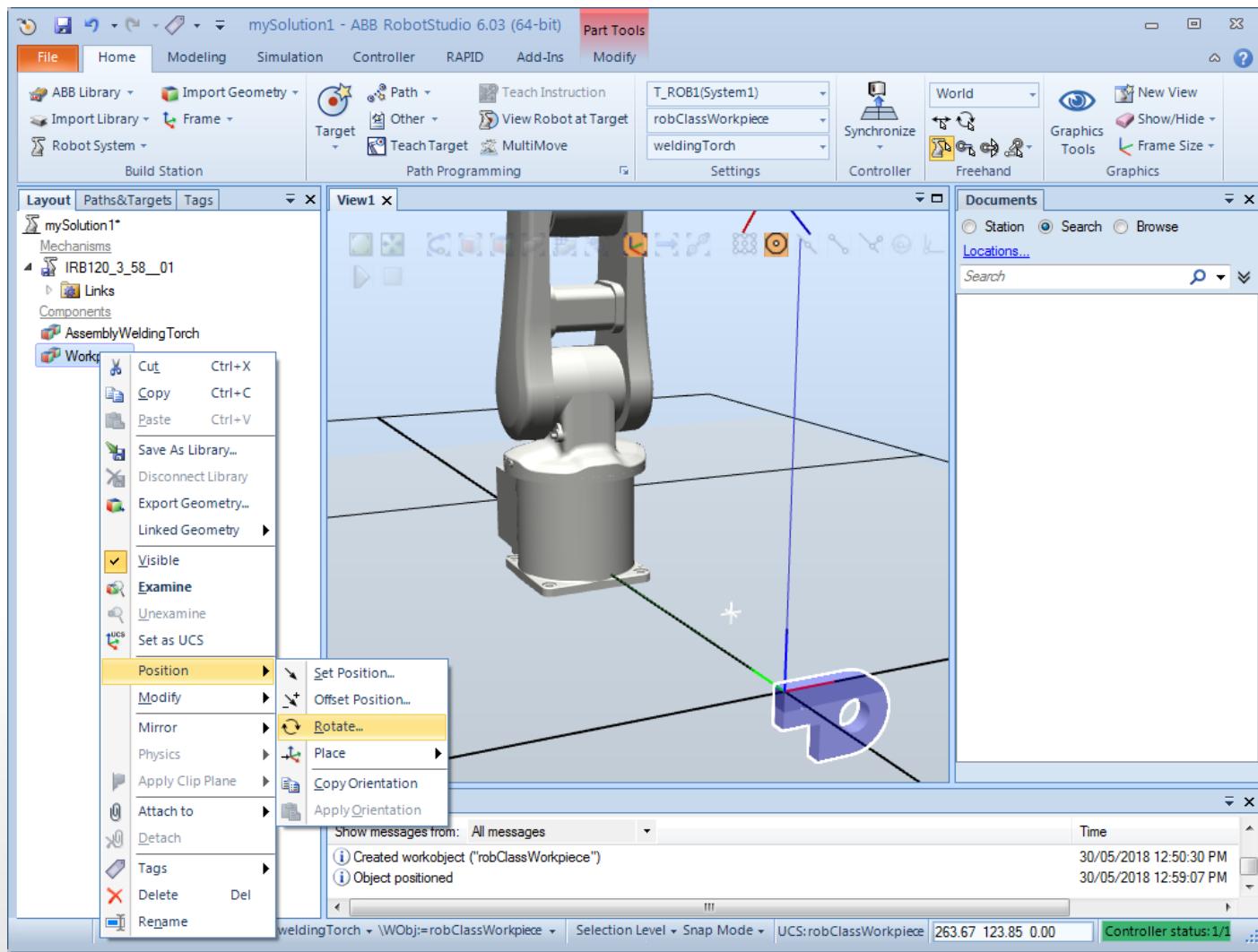
Import Workpiece

- Click “Apply” and the workpiece is shifted to the frame location.



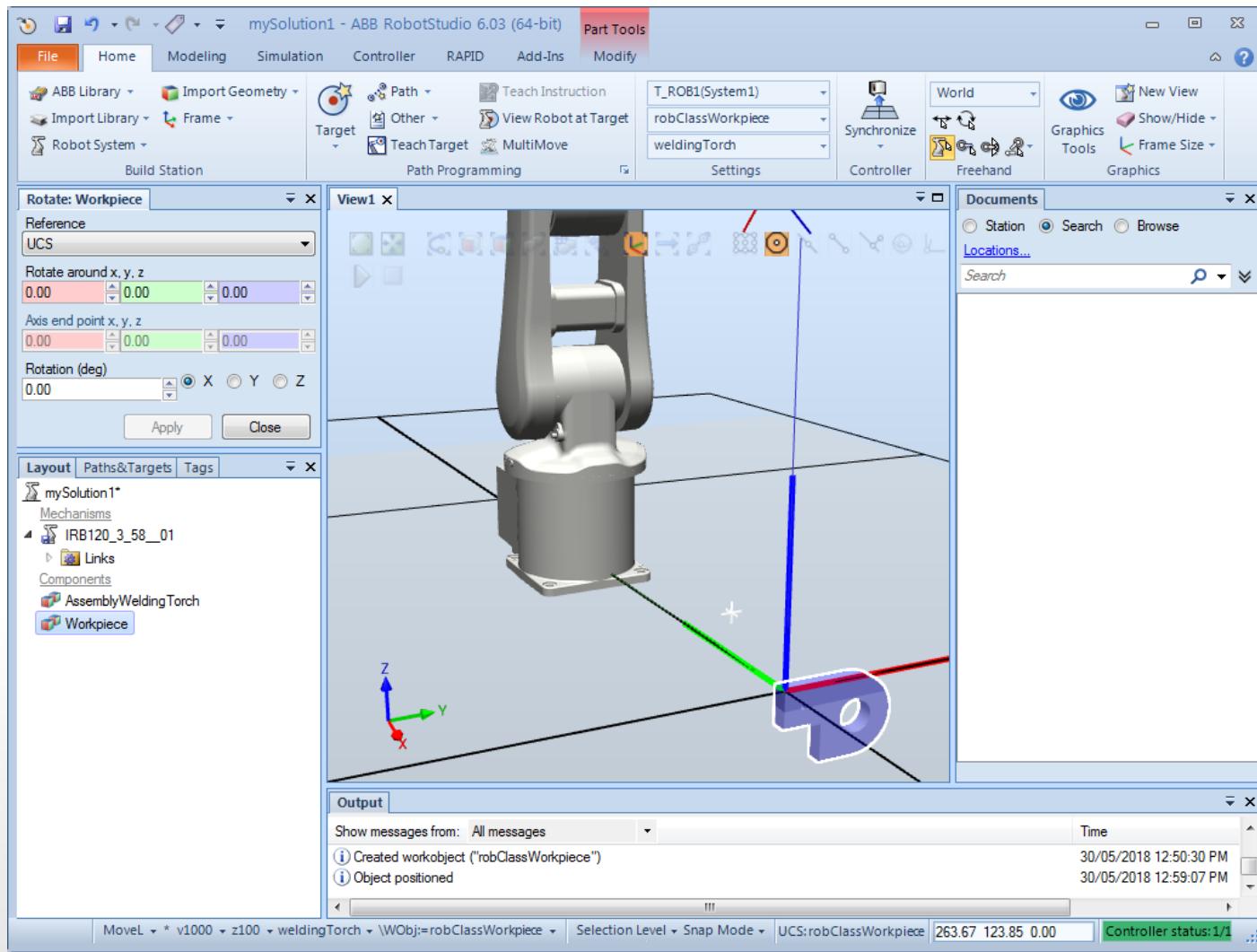
Import Workpiece

- We still need to perform the final **rotation** (and translation). Follow steps as shown.



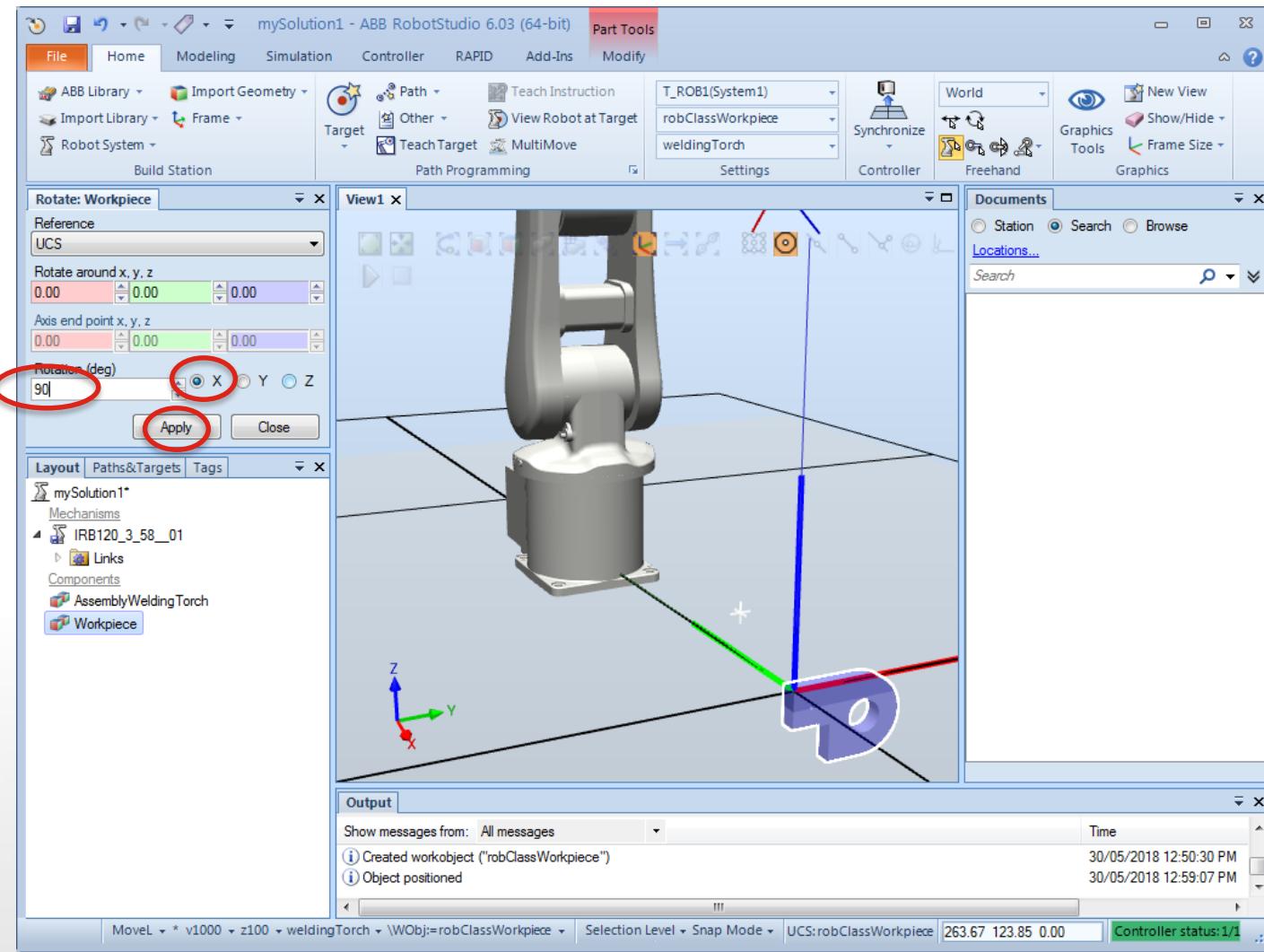
Import Workpiece

- Select **UCS** as Reference.



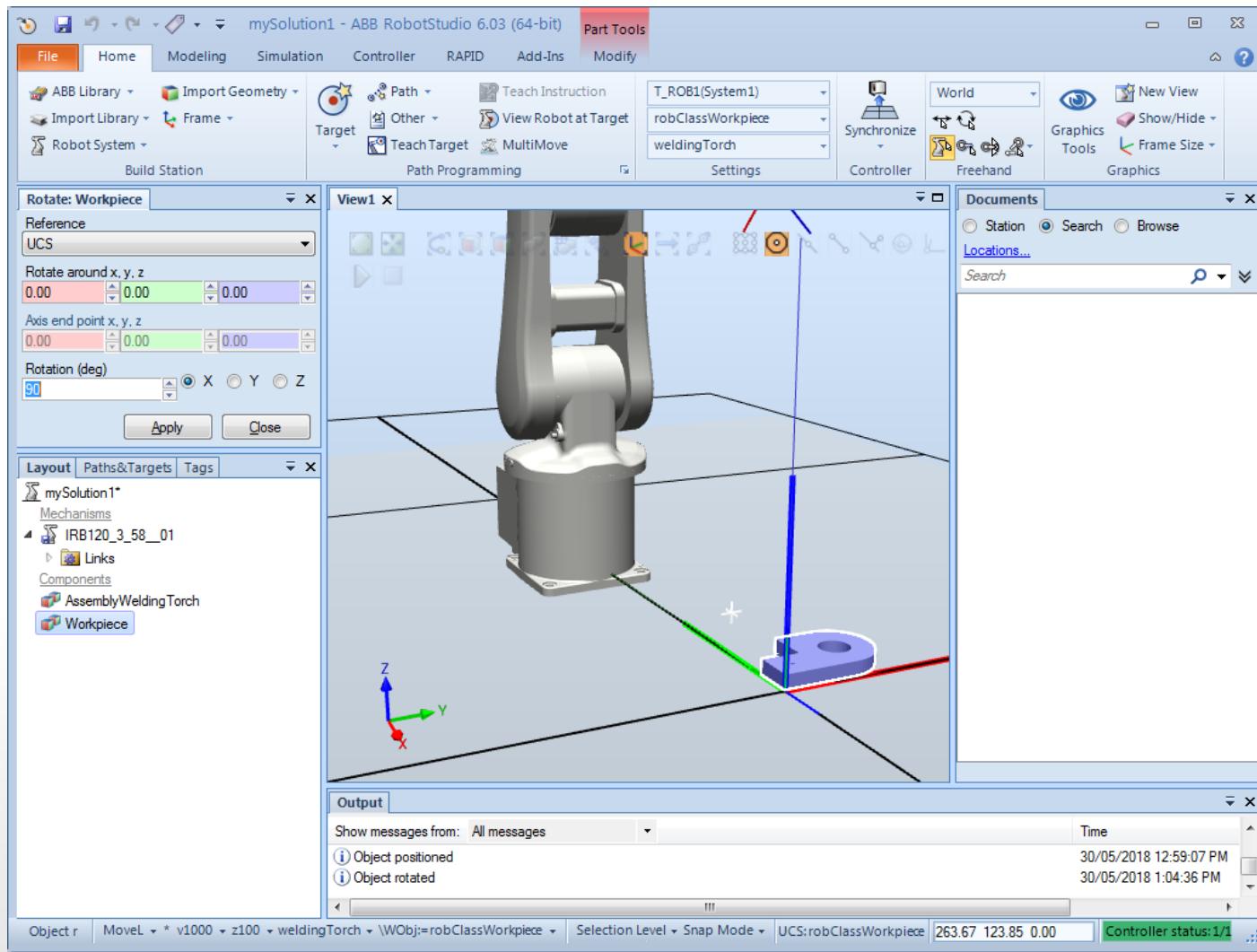
Import Workpiece

- Key in the rotation (deg) values, select the axis, and click Apply.



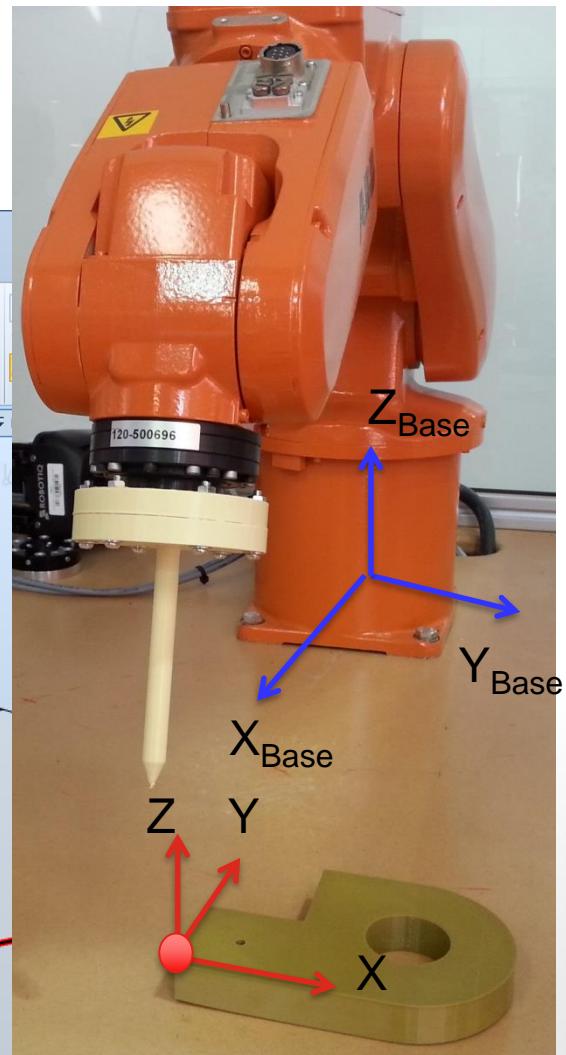
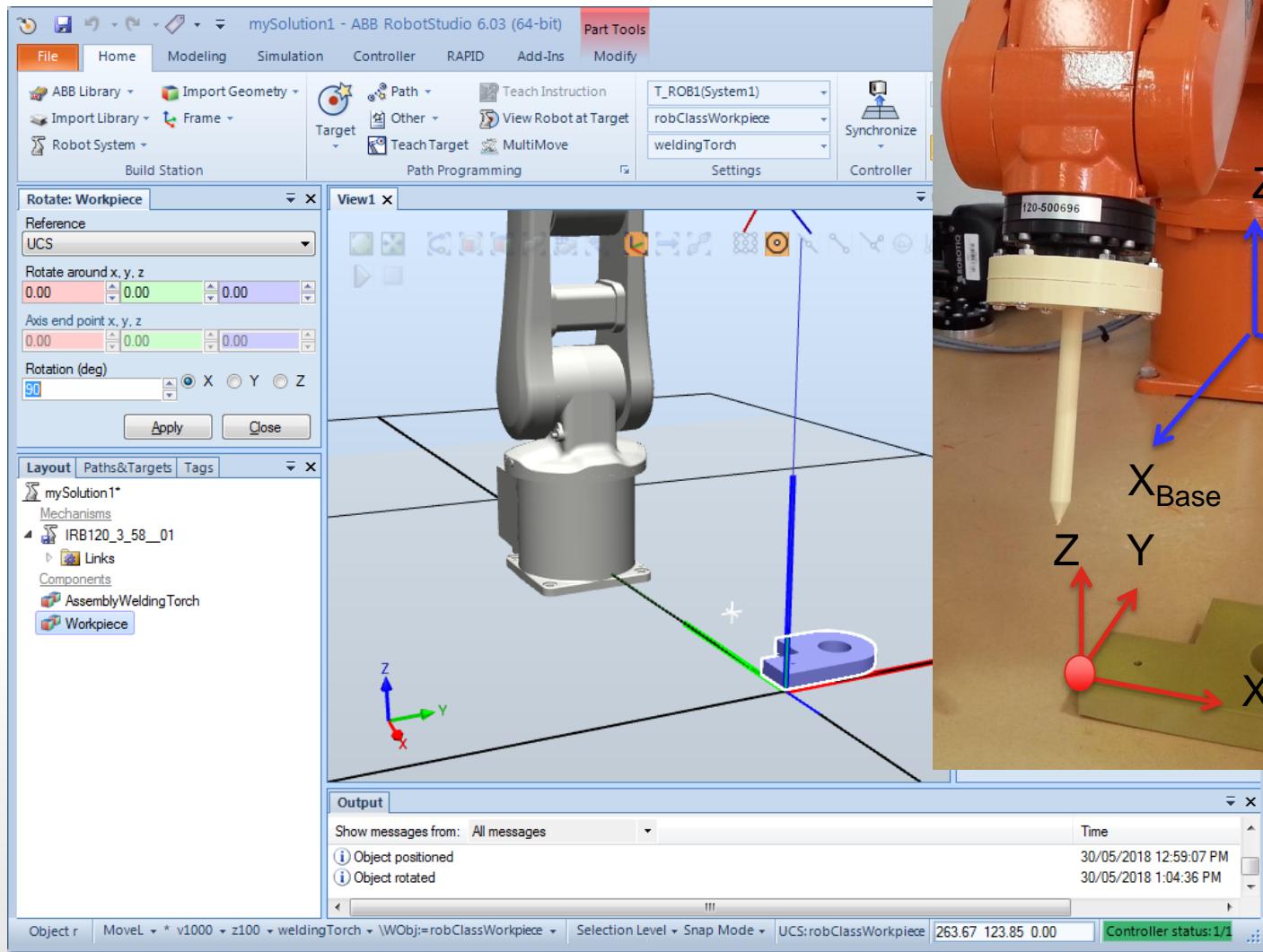
Import Workpiece

- The workpiece is now having the correct orientation.



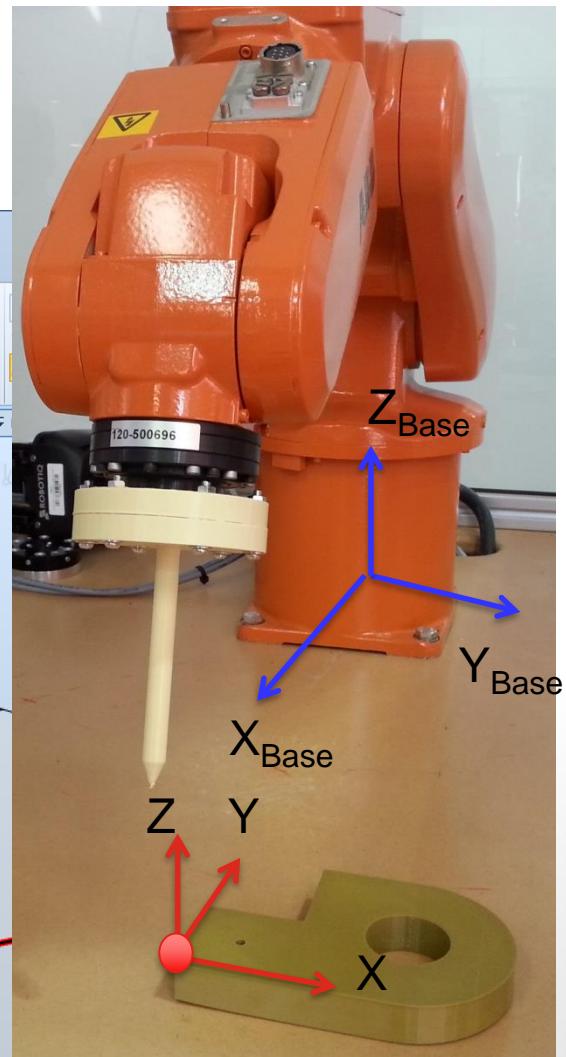
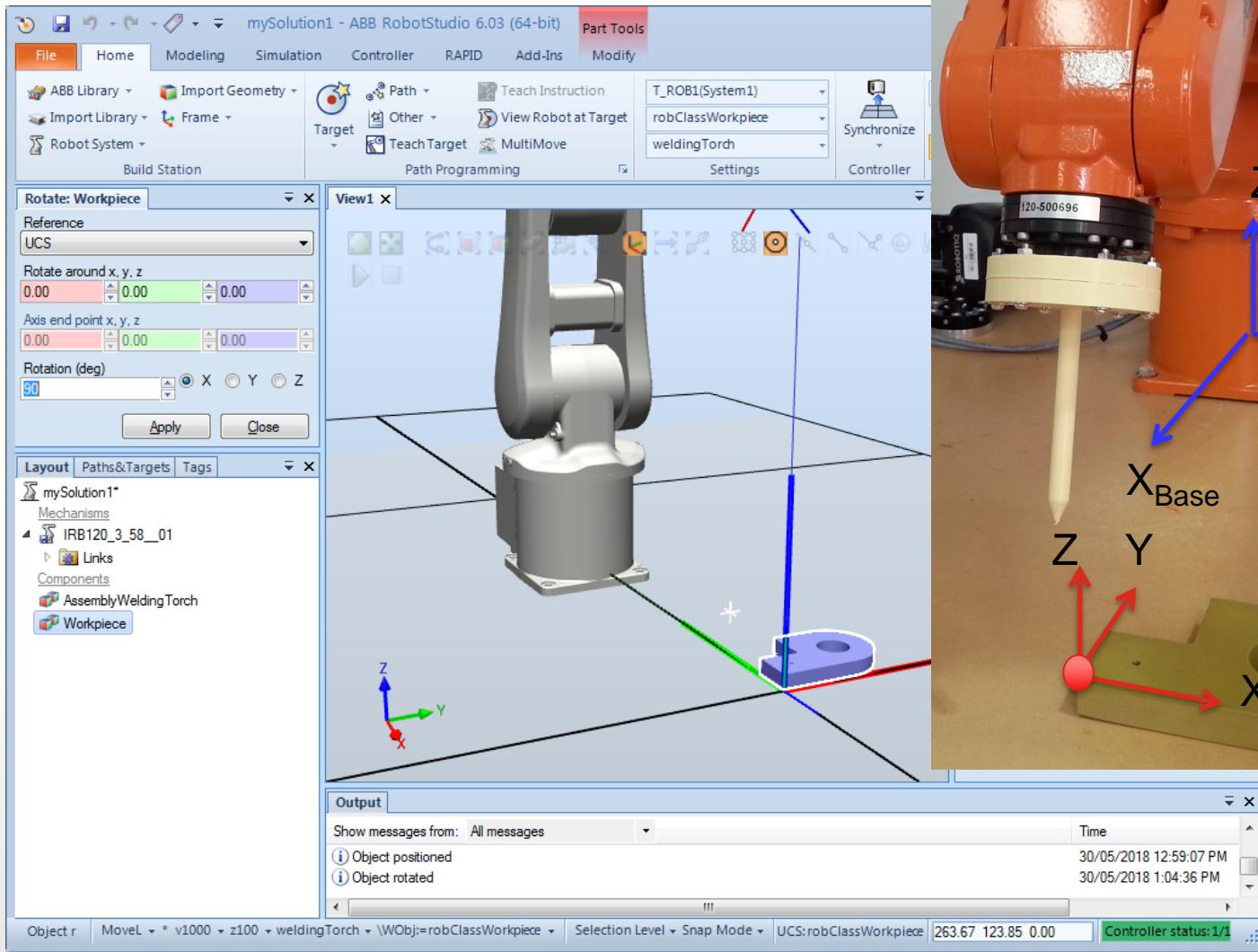
Import Workpiece

- However, the position is **incorrect**.



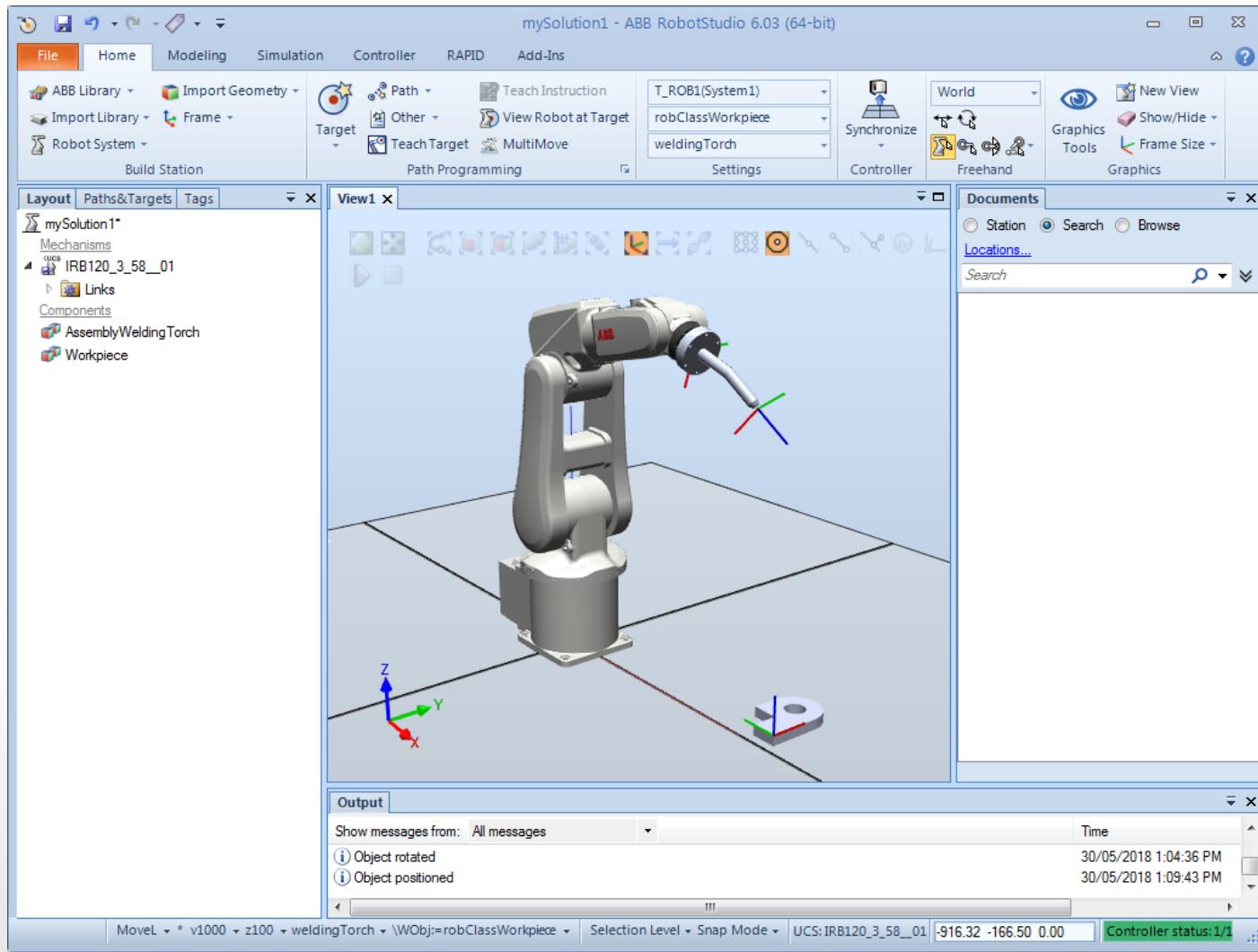
Import Workpiece

- We need to shift the workpiece **downwards**.



The Complete Work Cell

- The virtual work cell is now complete.

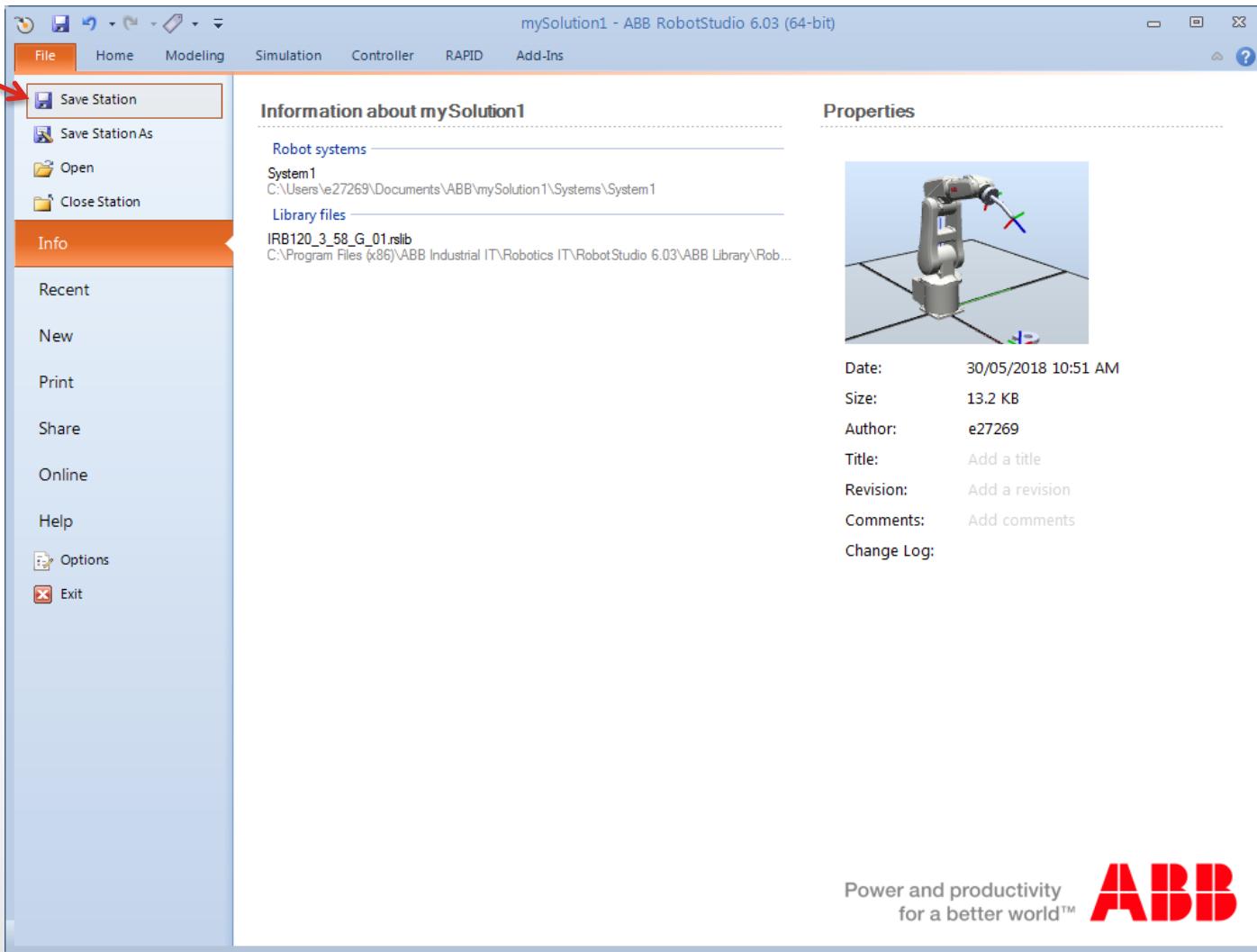


Content

- Import Robot from ABB Library
- Navigation in 3D Window
- Create Robot System with Controller
- Jog Robot
- Import Tool
- Import Workpiece
- Save Solution

Save Solution

- Go to File tab, and click Save Station.



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Thank you!

Have a good evening.

