

Week 4 – ABB Robot Teaching Robot Jogging

Advanced Robotic Systems – MANU2453

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Content

- Introduction
- The ABB Robot at AMP
- Manual Mode
- The Teaching Pendant
- Jog the Robot – Joint
- Jog the Robot – Linear and Re-orient
- Change Jogging Speed or Step

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Introduction

- One common way to program the robot is by using the **teaching pendant**.
- We use the **joy stick** on the teaching pendant to move the robot to the **target points**.
- Then, **record** these positions.
- Finally, the robot will **playback** the taught positions.



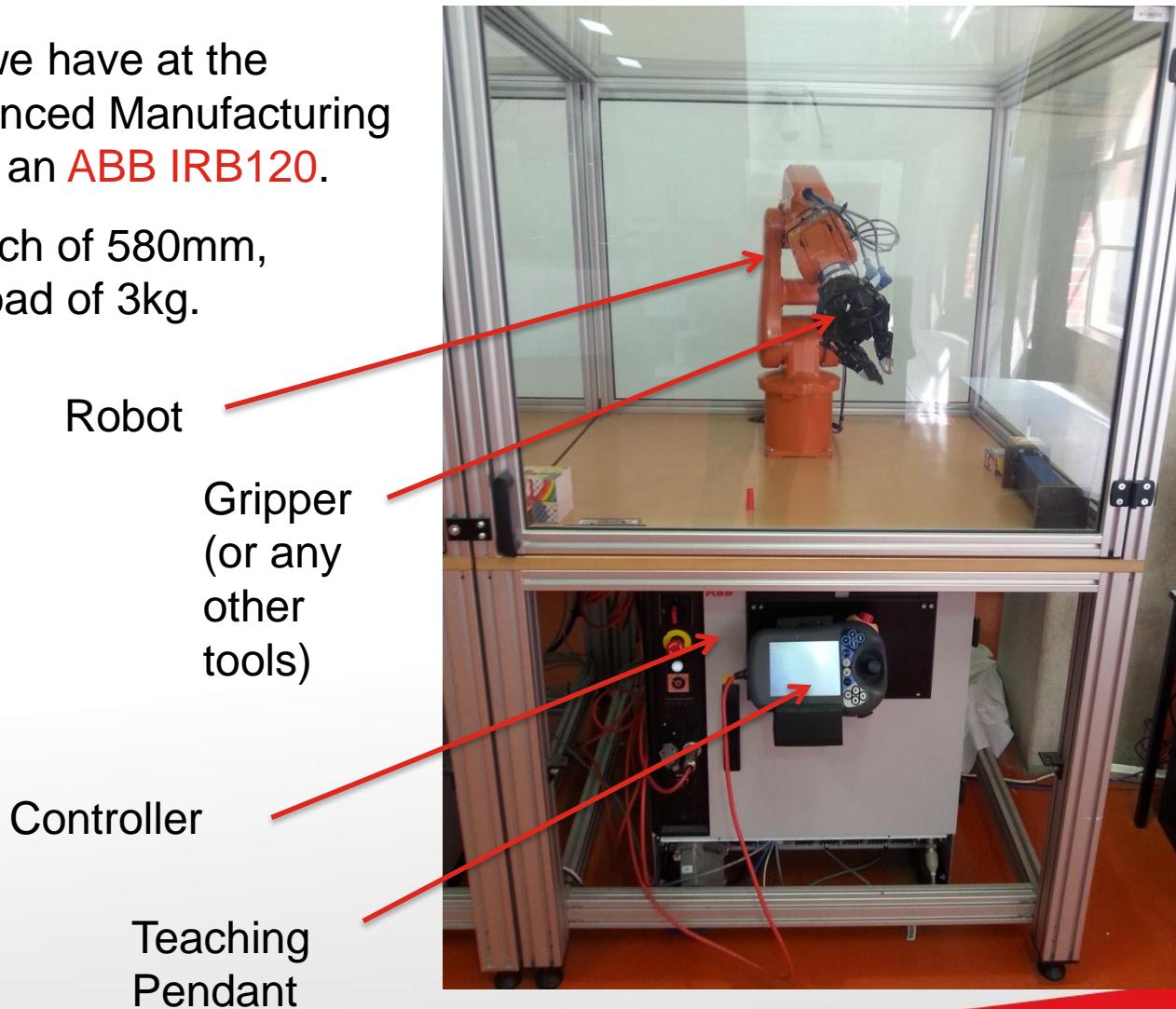
- We will first learn how to **jog** the ABB robot using its teaching pendant.

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The ABB Robot at AMP

- The robot we have at the AMP (Advanced Manufacturing Precinct) is an **ABB IRB120**.
- It has a reach of 580mm, and a payload of 3kg.



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Manual Mode

- There are three modes of operation for the ABB robot:
 - **Automatic mode** – Use this mode when the program is ready to be run in production.
 - **Manual mode** – For manual jogging, teaching, calibration etc.
 - Manual mode 100% speed
- For this lesson, we will only use the Manual mode.

Manual Mode

- To activate the **manual mode** of the robot, turn the key at the controller to the upright position:



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The Teaching Pendant

- Now let's look at the teaching pendant



The Teaching Pendant

- At the back of the teaching pendant, there is a “motor on” button.



It needs to be pressed “half-way” to turn on the robot motors.

Practise pressing this!

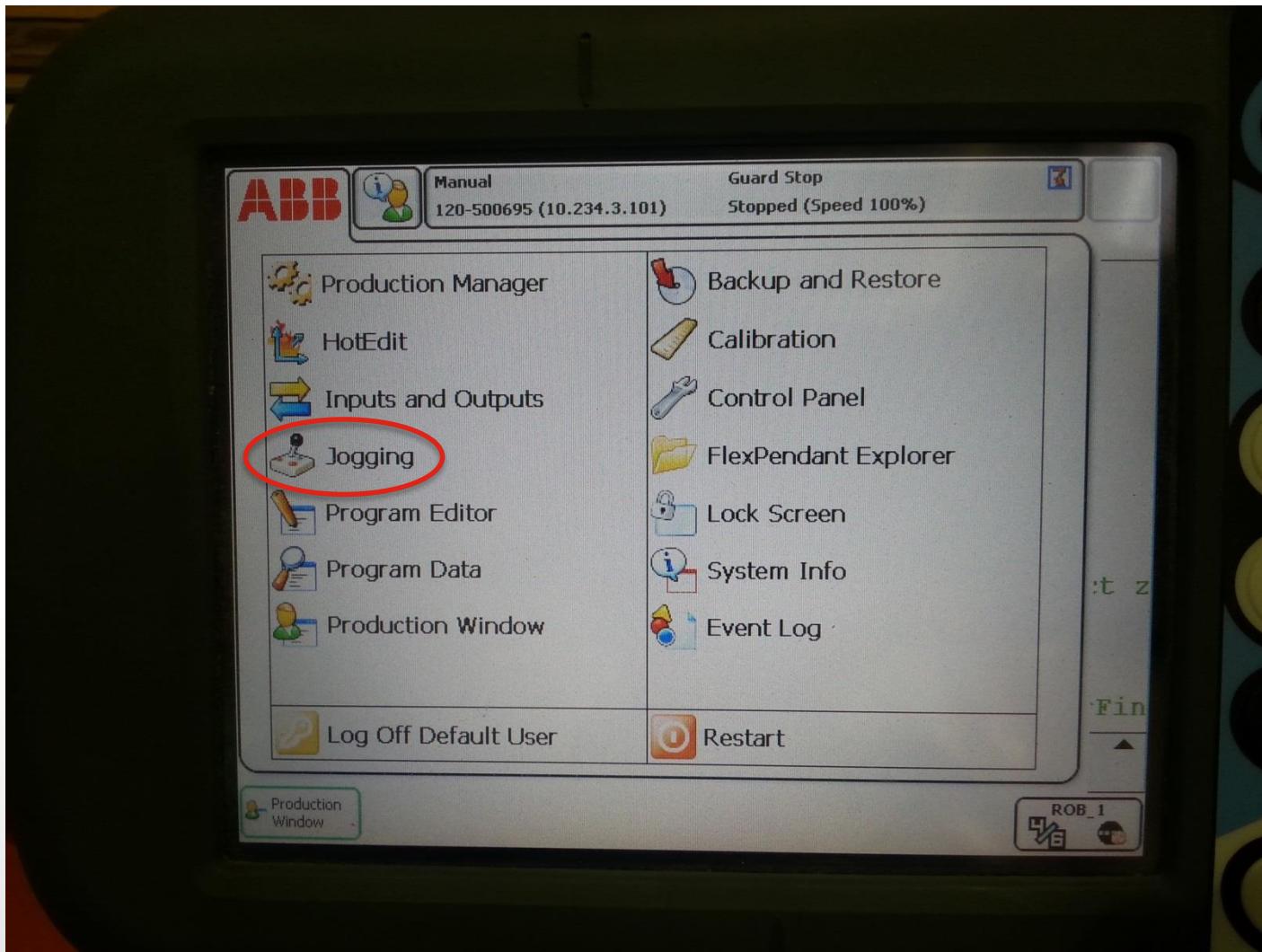
If pressed correctly, we will see “motor on” on top of the teaching pendant screen.

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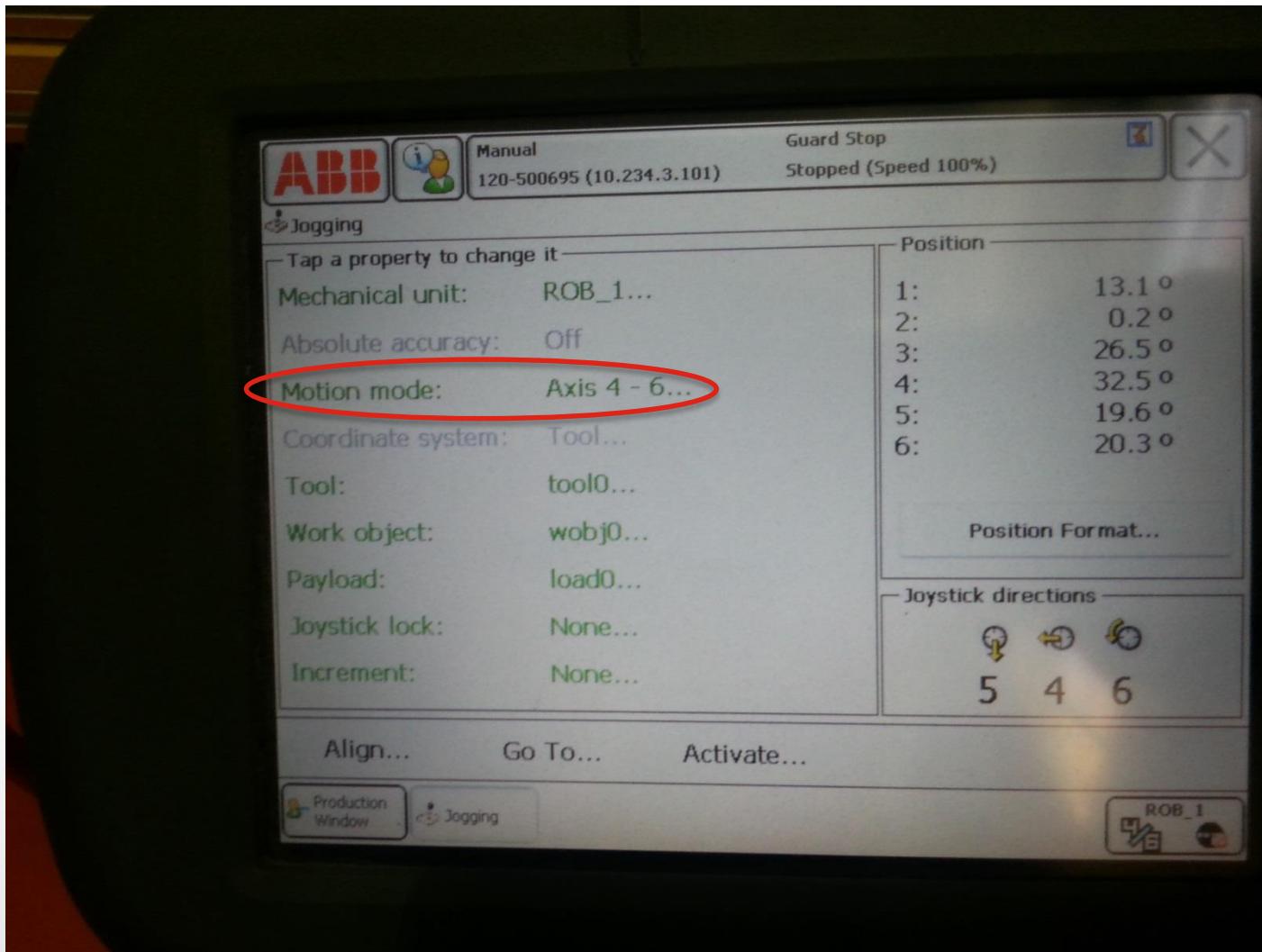
Jog the Robot - Joint

- Now let's learn how to **jog the robot**. On the pendant, press "Jogging"



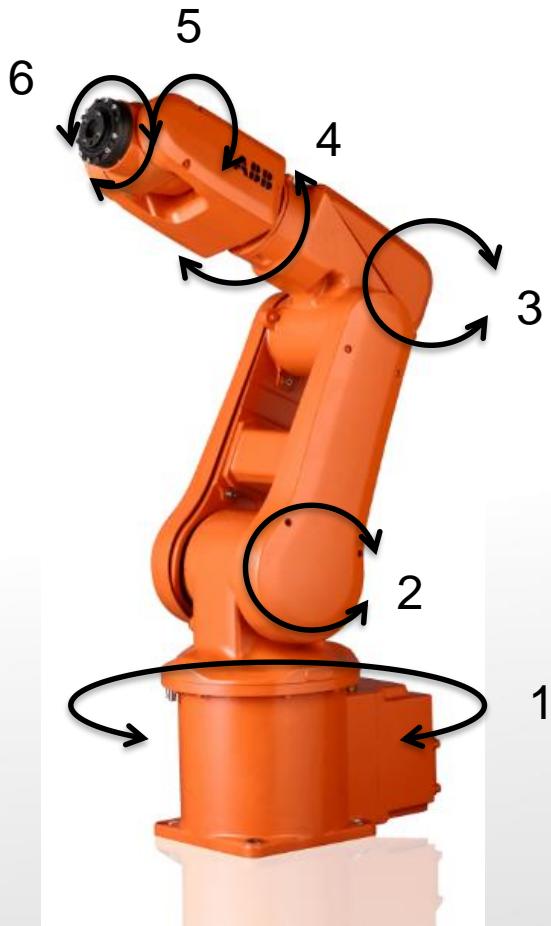
Jog the Robot - Joint

- We will reach the following screen. The **motion mode** is currently axis 4 – 6.



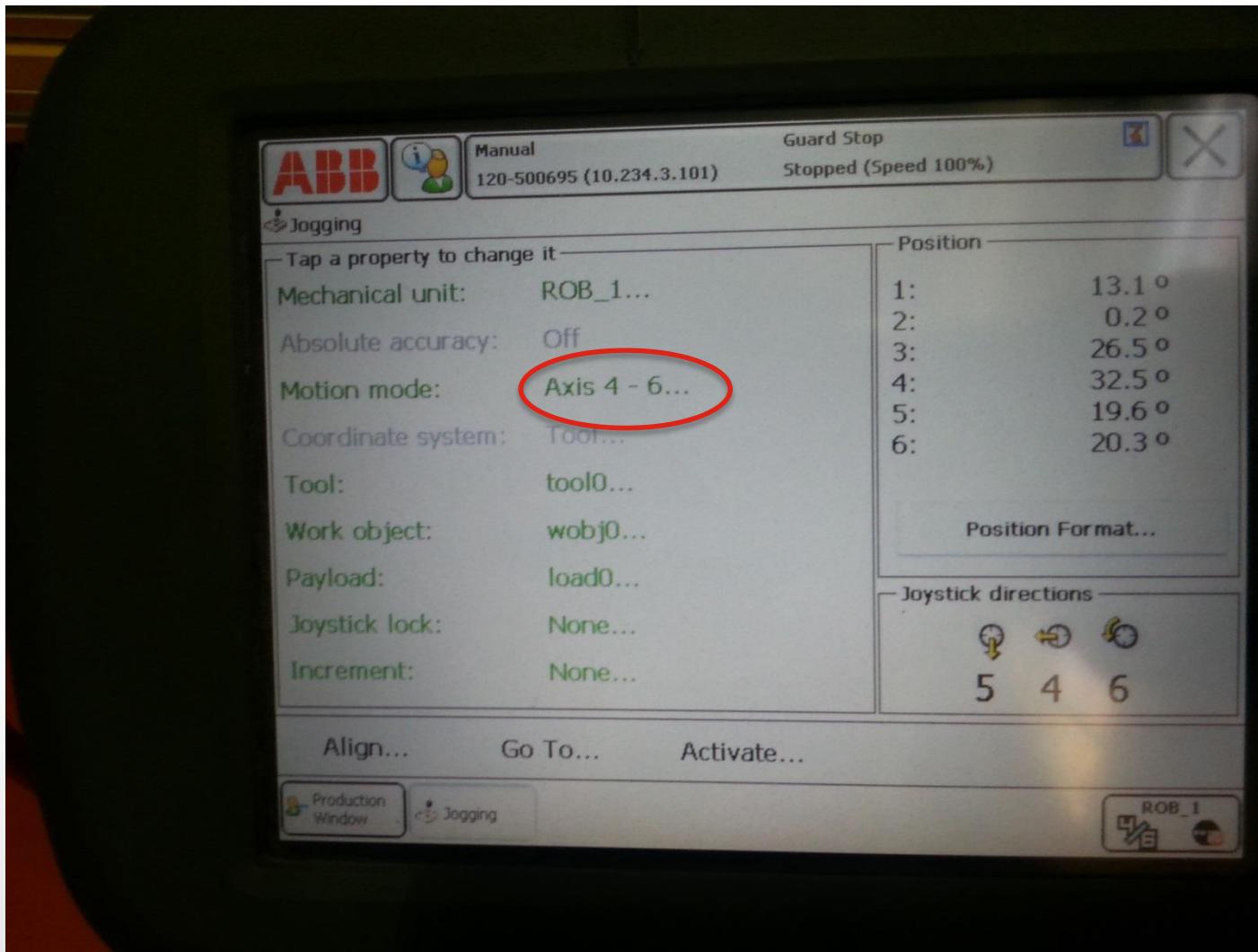
Jog the Robot - Joint

- These are the axis of the robot:



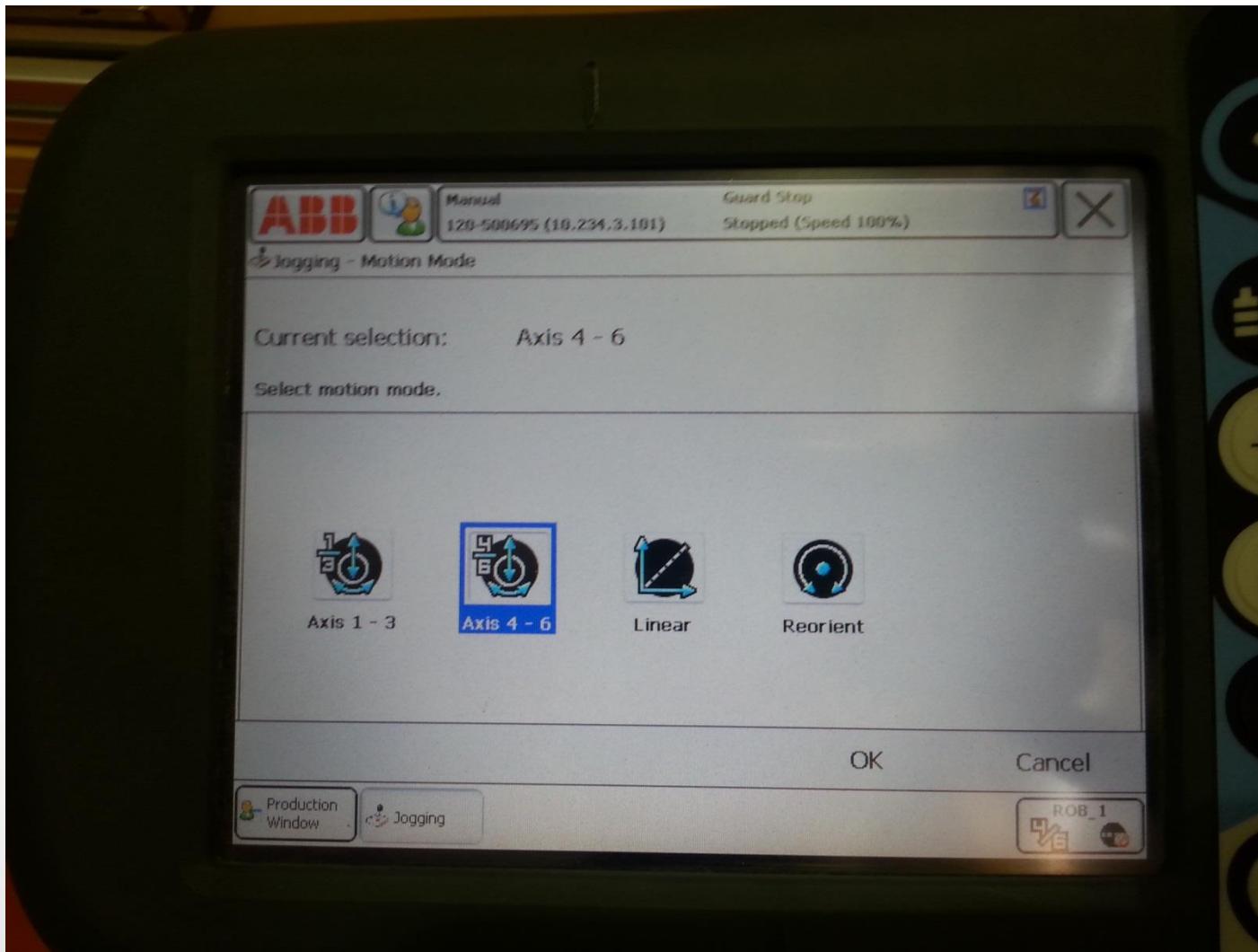
Jog the Robot - Joint

- Let's switch to axes 1-3 first. Press "Axis 4-6".



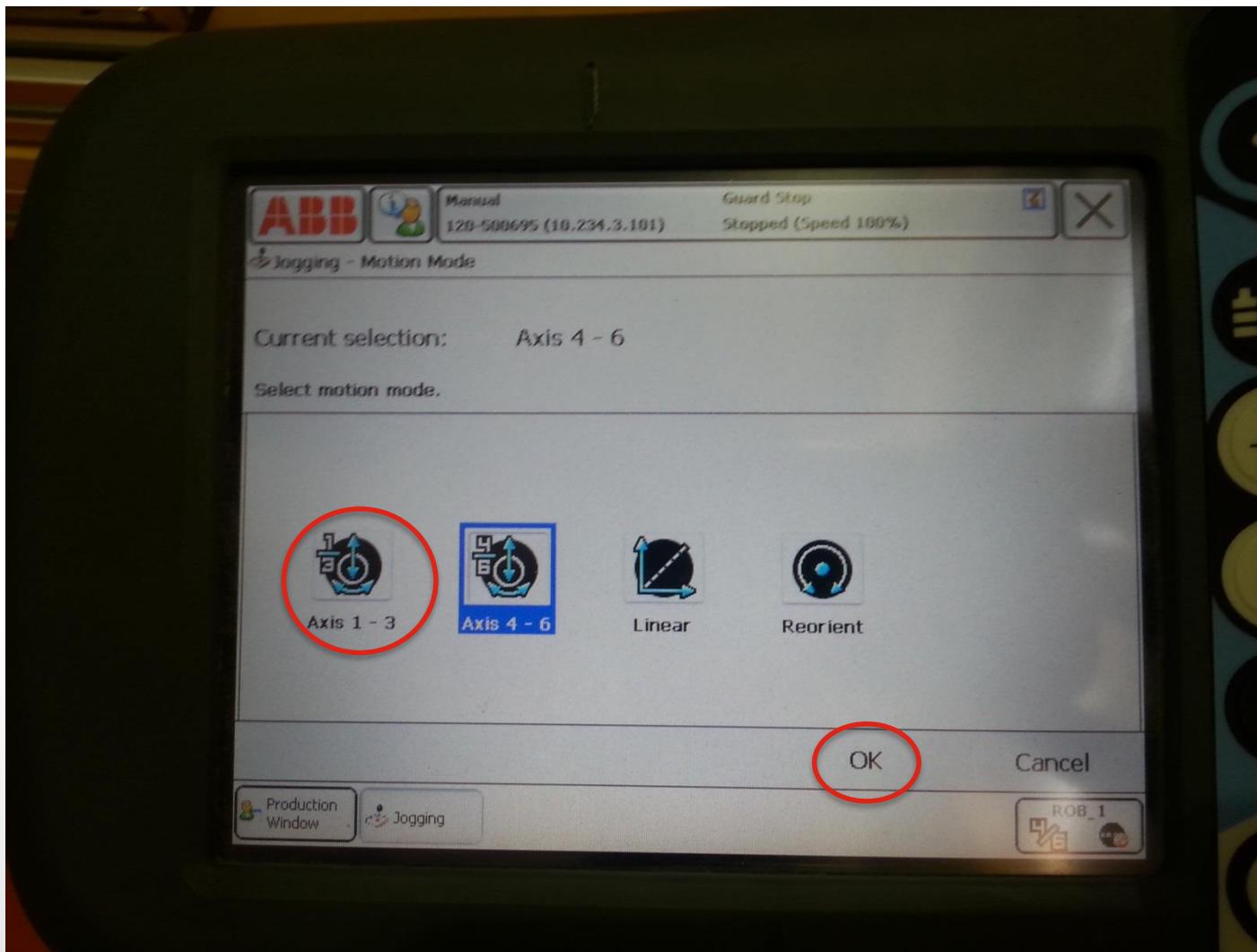
Jog the Robot - Joint

- We will reach the next screen:



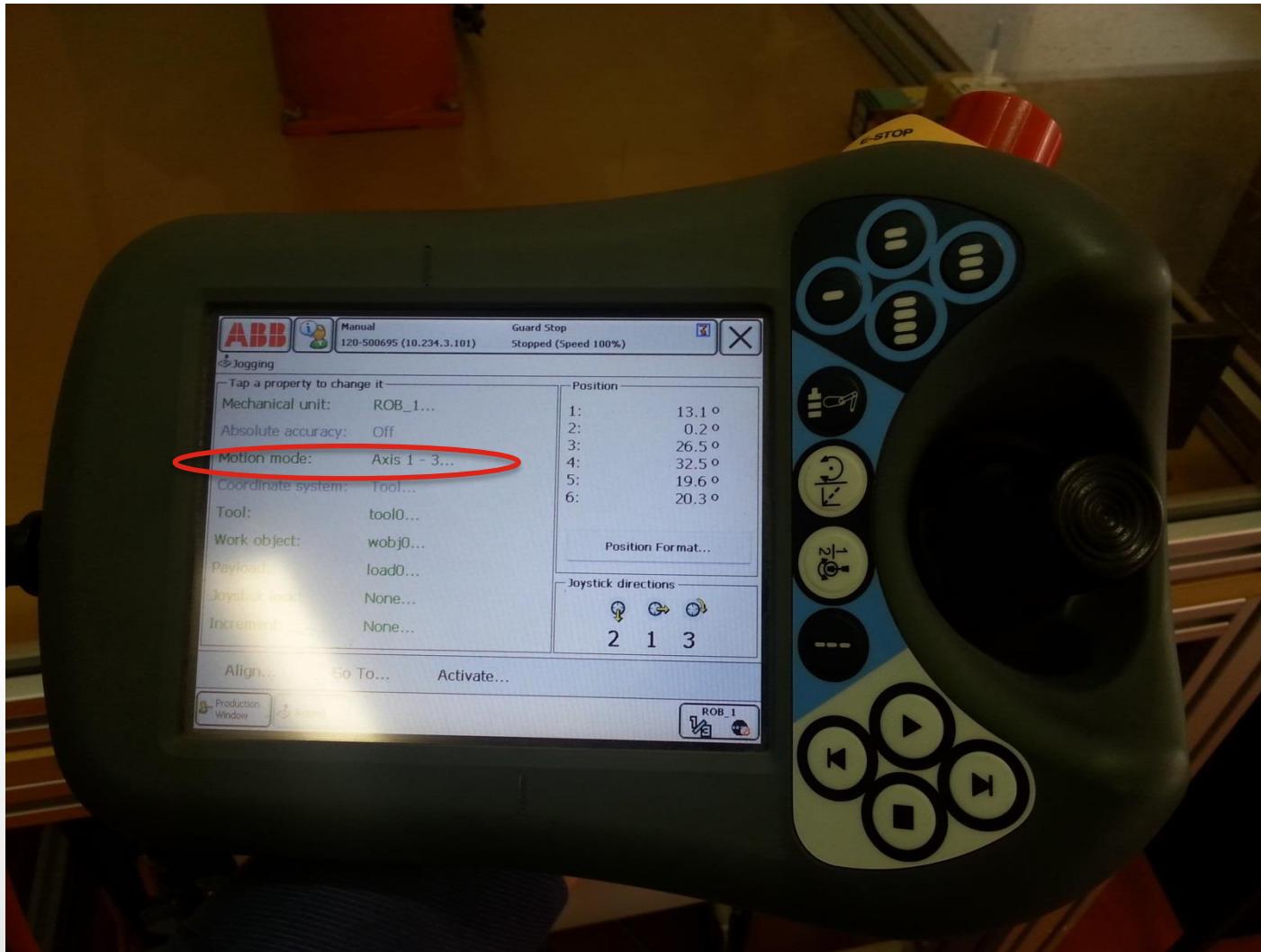
Jog the Robot - Joint

- Choose Axis 1-3, then click OK.



Jog the Robot - Joint

- The motion mode is now changed to axis 1-3.



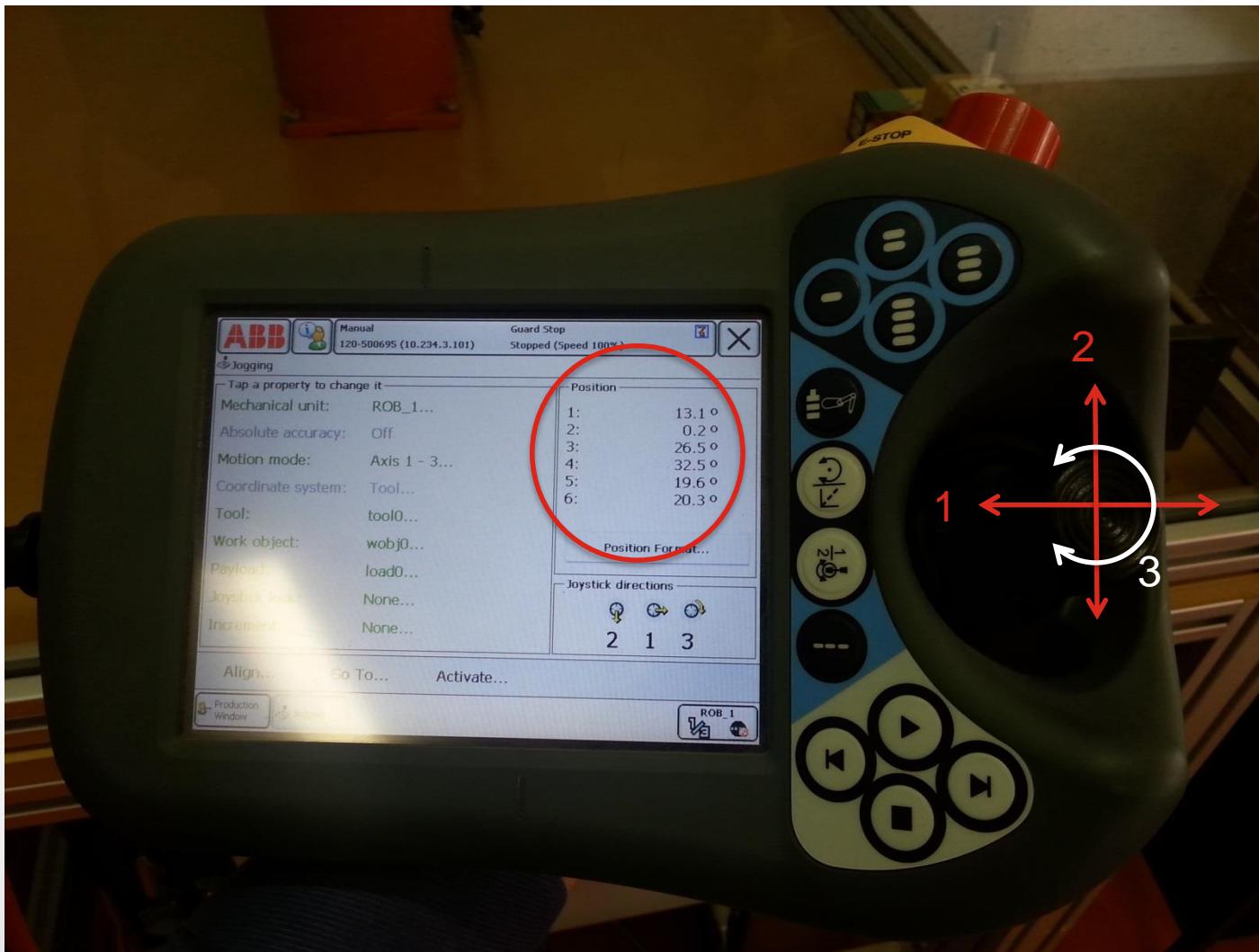
Jog the Robot - Joint

- Now we can jog the robot. Press the motor on button “half-way” and move the joy stick.



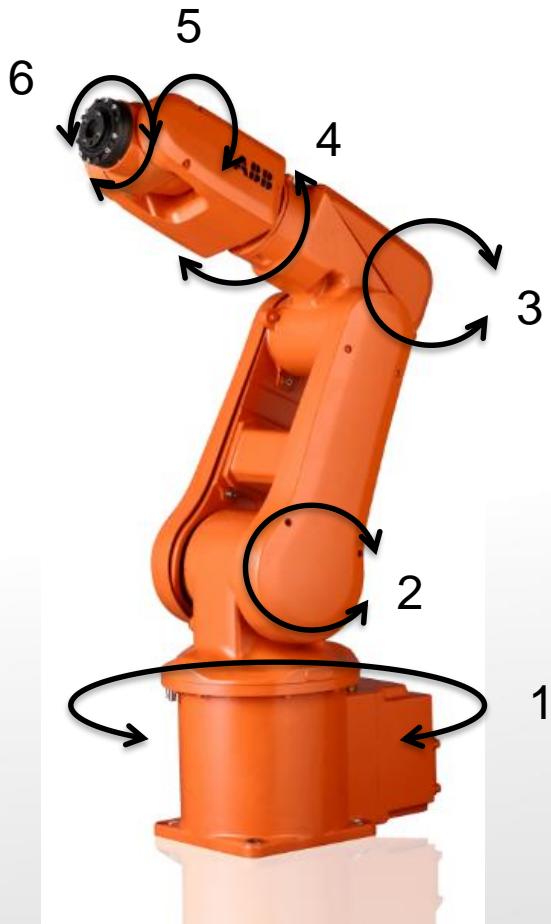
Jog the Robot - Joint

- The joint angles are shown on the right.



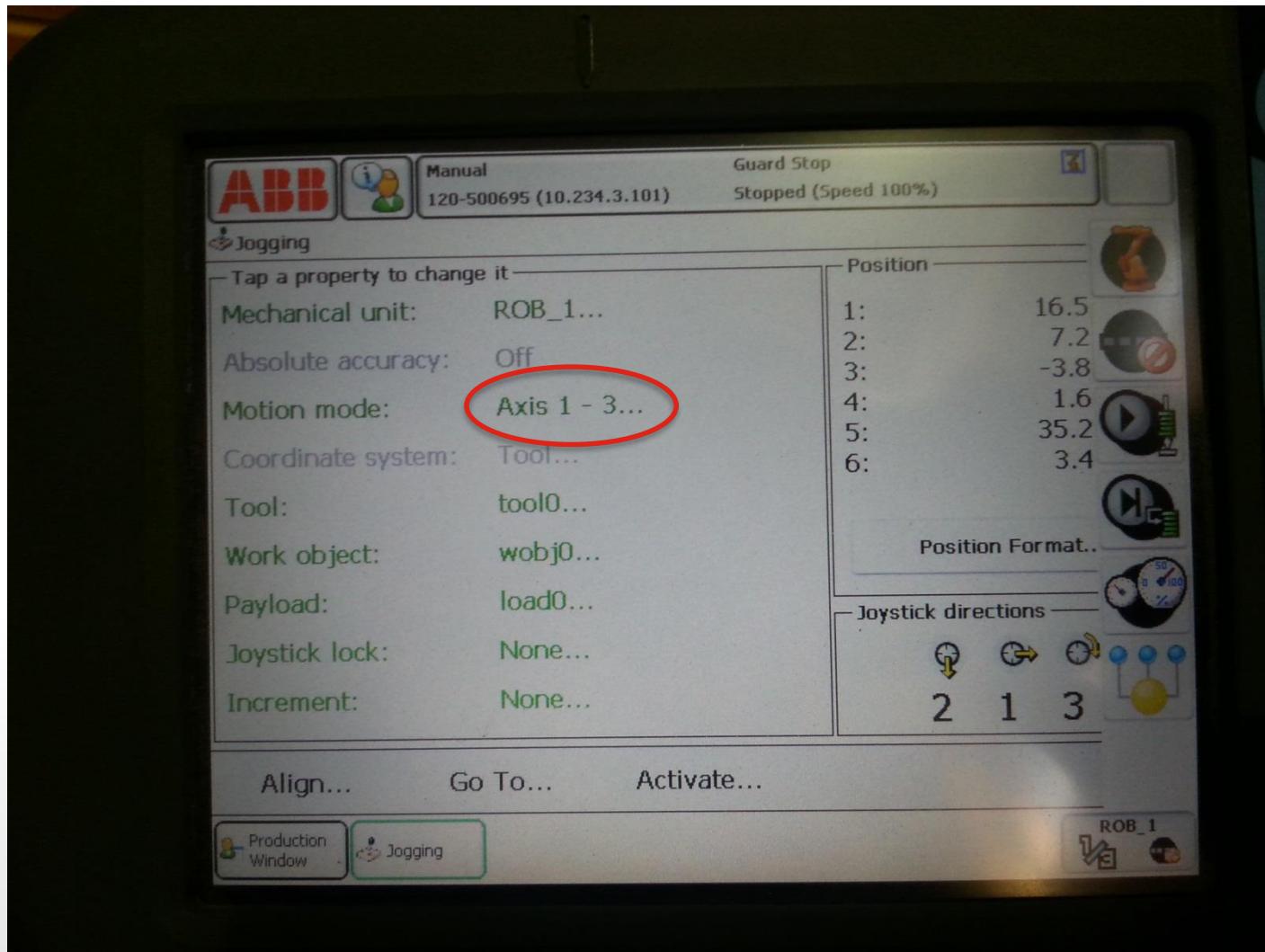
Jog the Robot - Joint

- Observe how the robot joints 1-3 rotates.



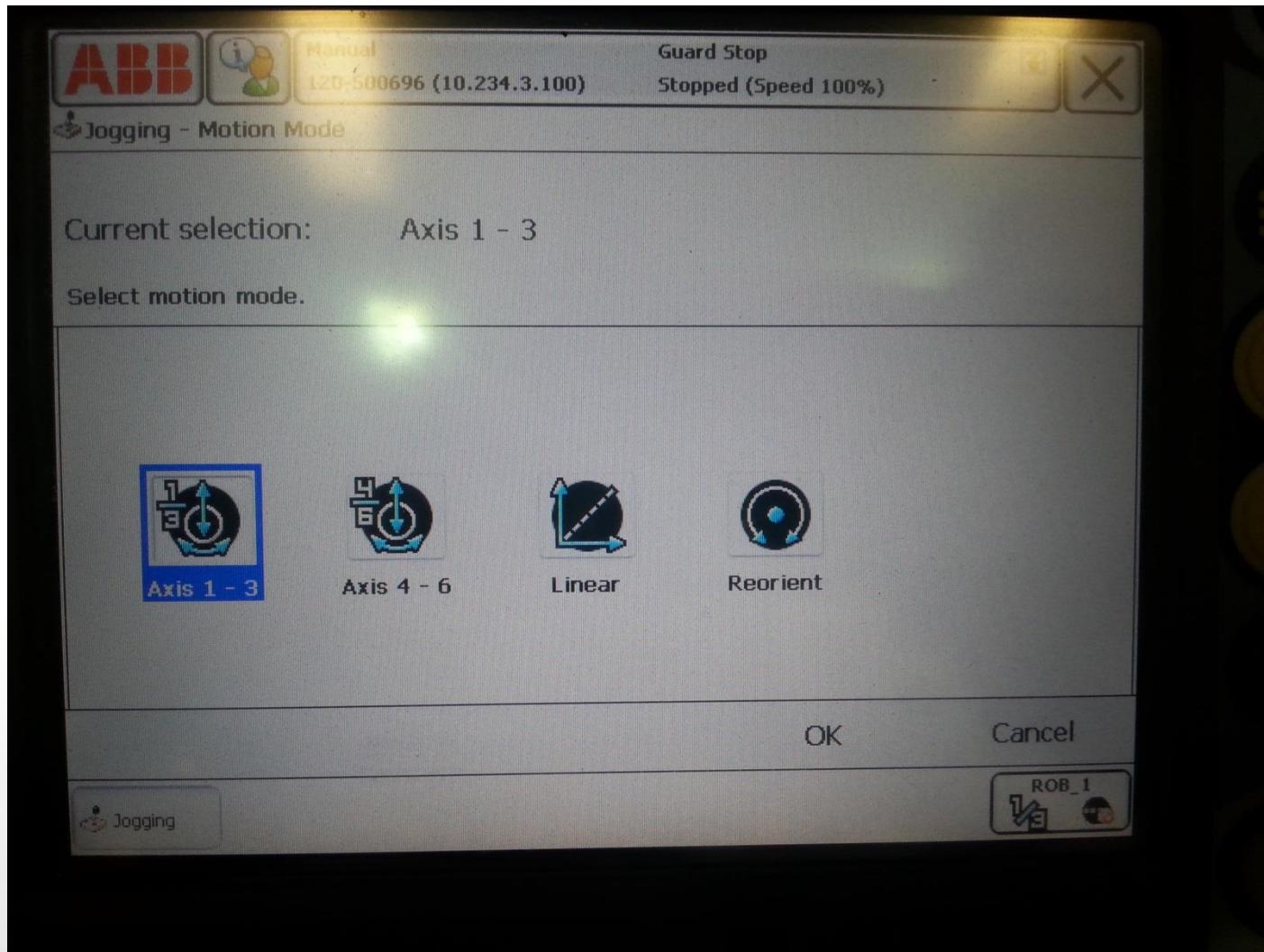
Jog the Robot - Joint

- Let's jog axes 4-6 next. Press "Axis 1-3".



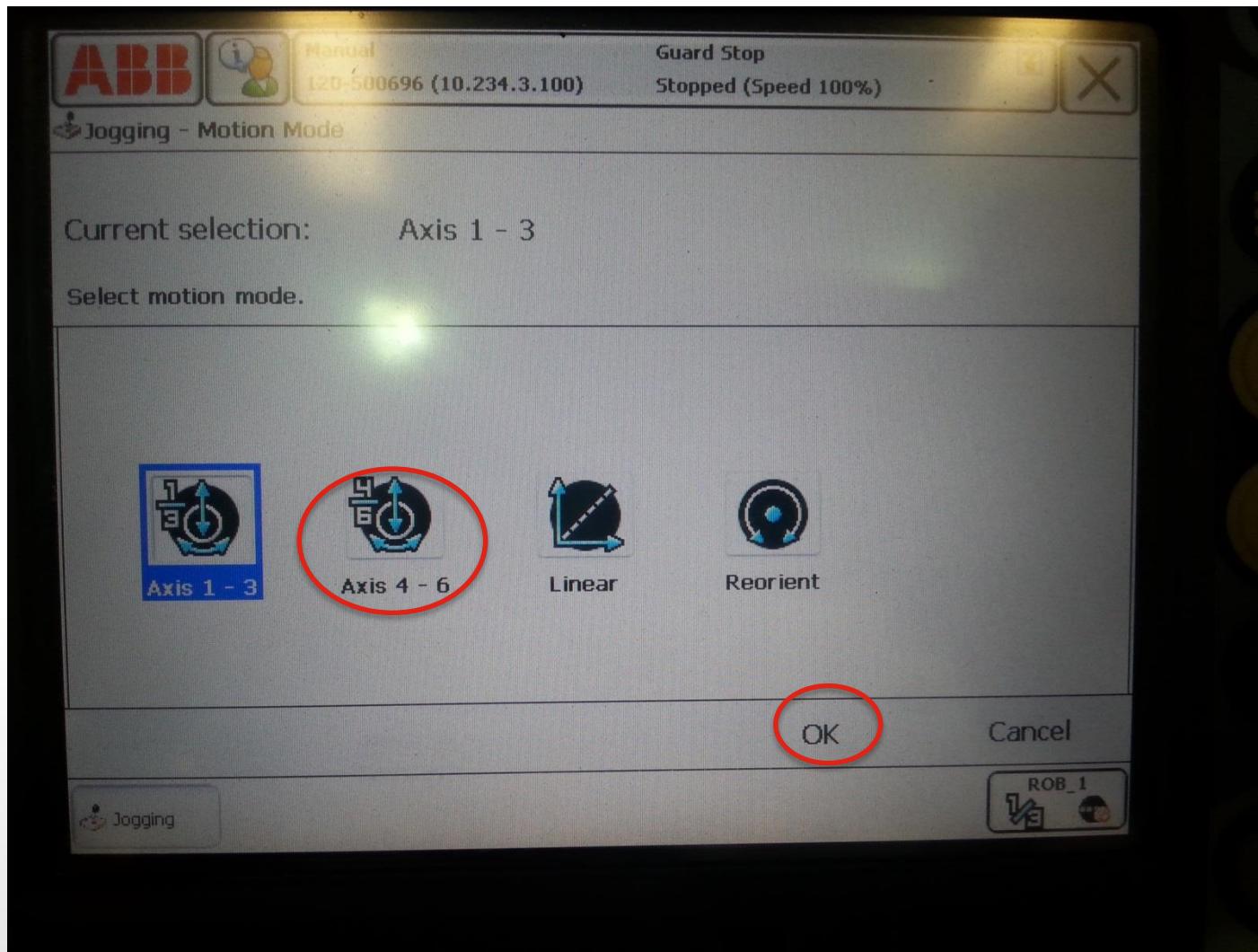
Jog the Robot - Joint

- We will reach the next screen:



Jog the Robot - Joint

- Choose Axis 4-6, then click OK.



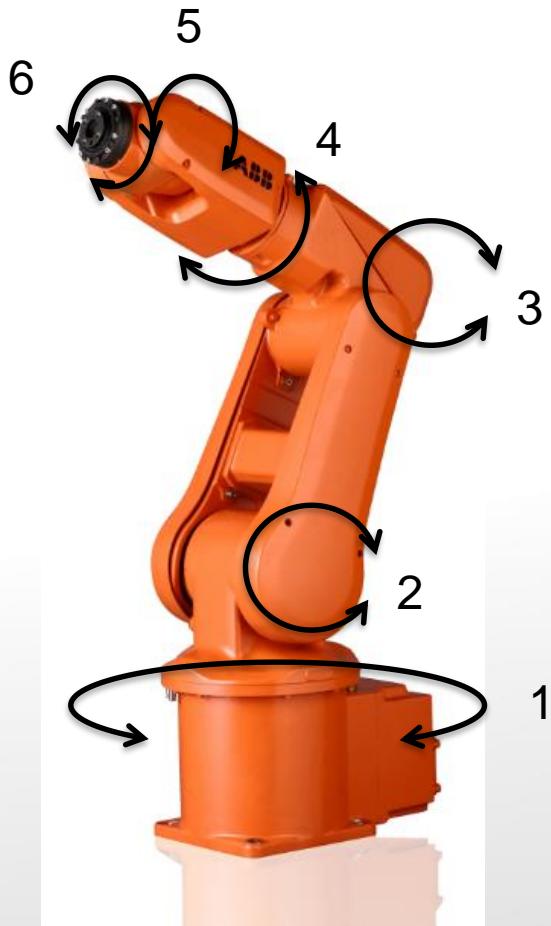
Jog the Robot - Joint

- Now we can jog the robot. Press the motor on button “half-way” and move the joy stick.



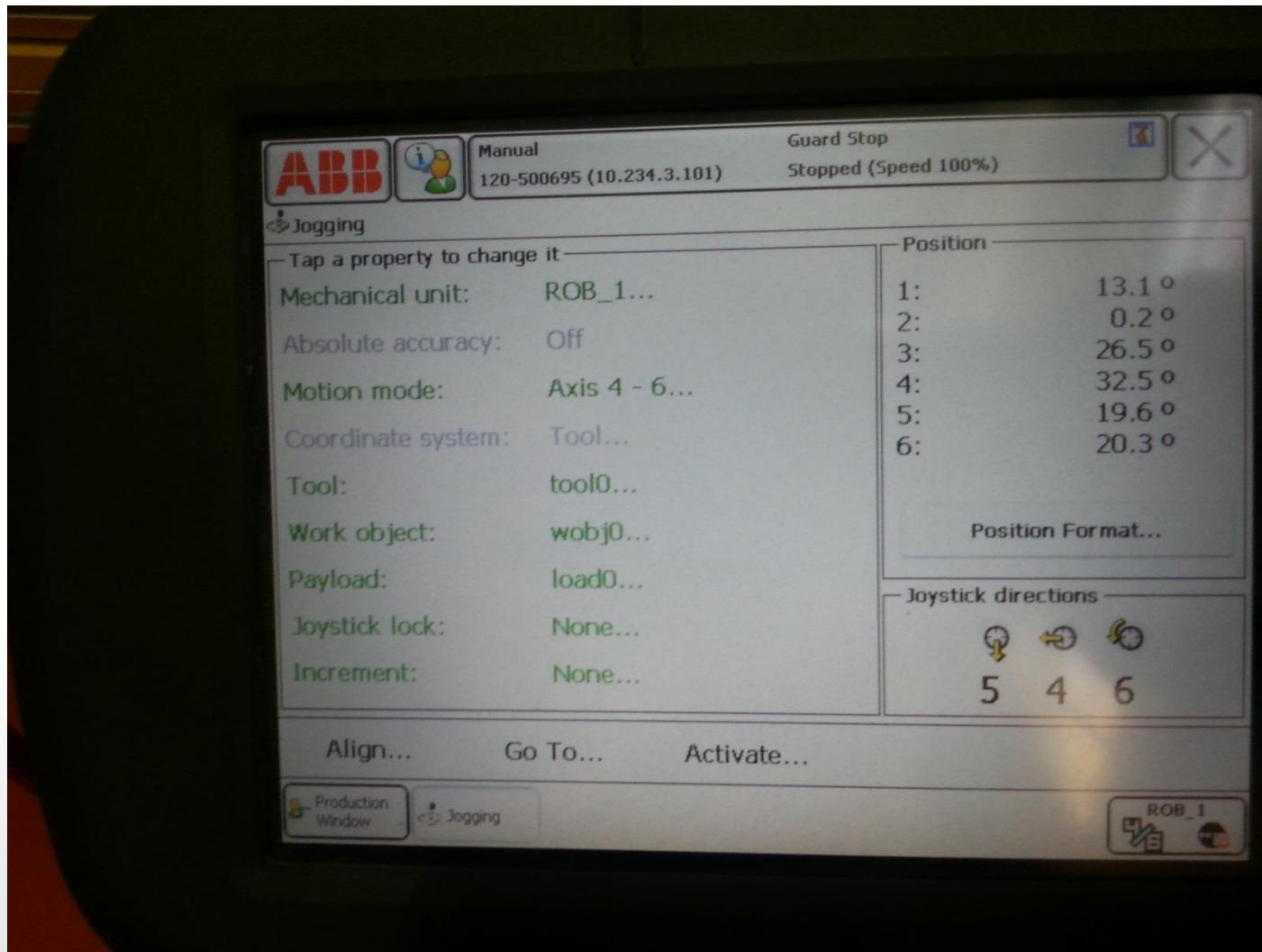
Jog the Robot - Joint

- Observe how the robot joints 4-6 rotates.



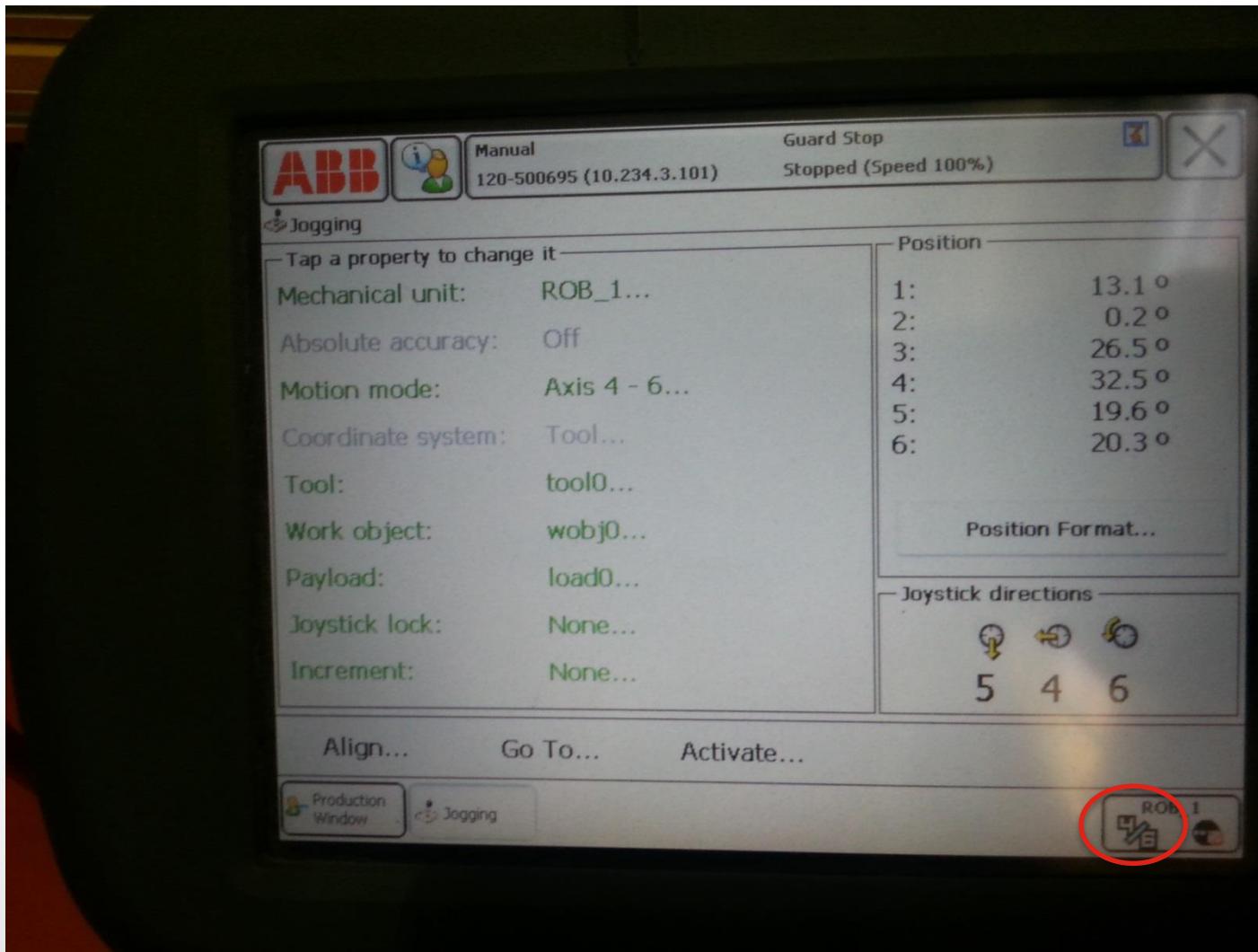
Jog the Robot - Joint

- There is an **alternative method** to change the motion mode.



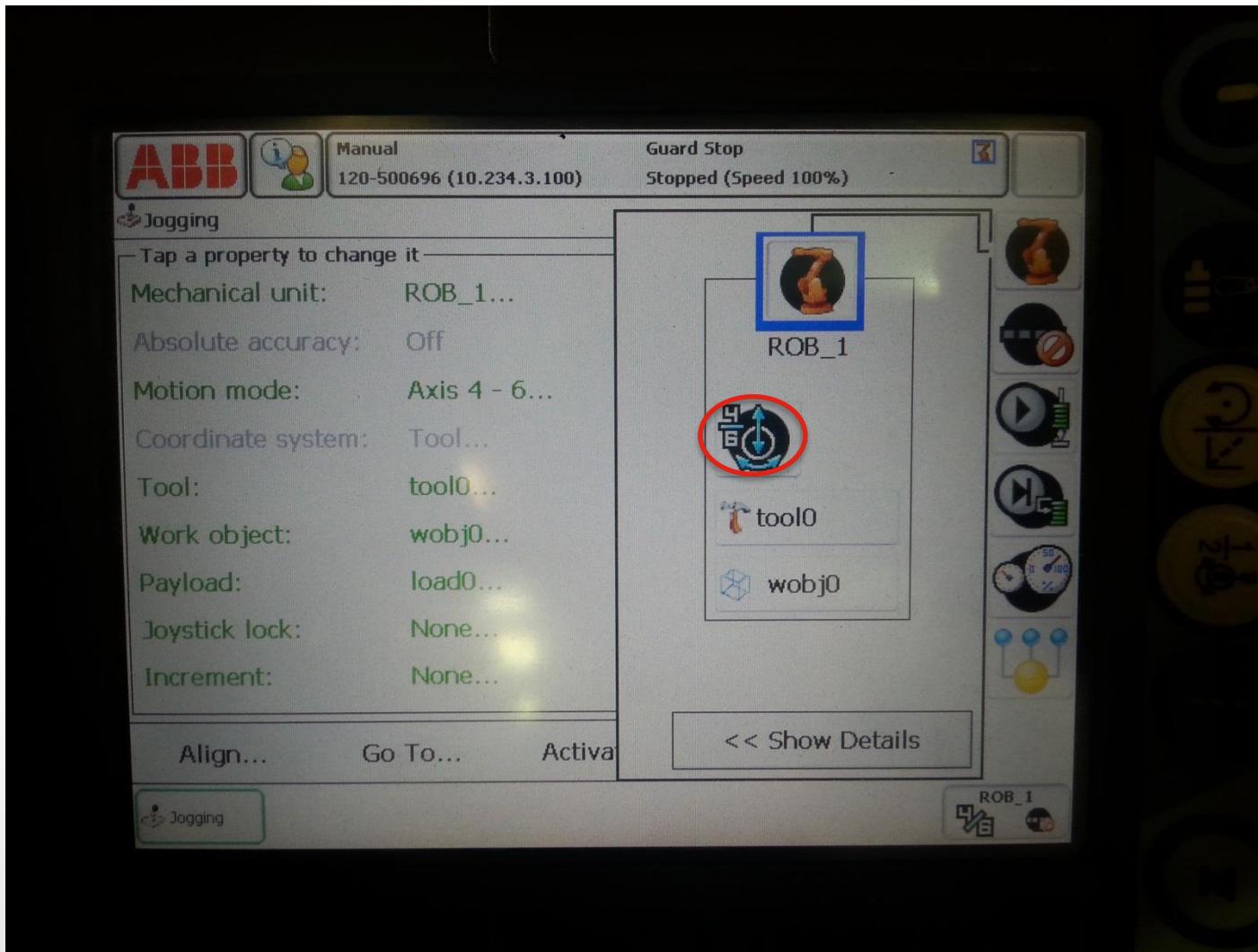
Jog the Robot - Joint

- Press the button on the bottom right which states “4/6”



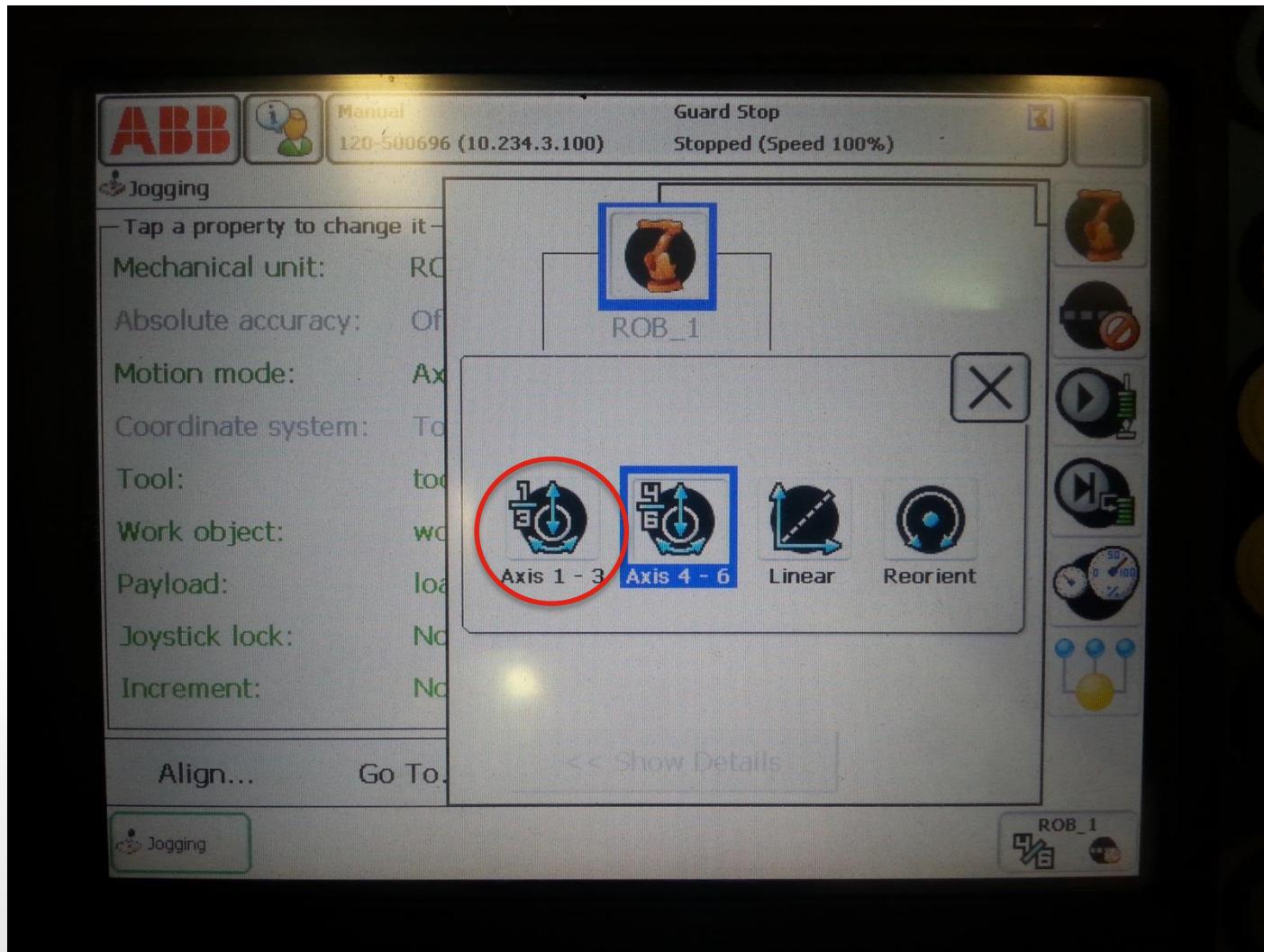
Jog the Robot - Joint

- A pop-up will appear. Press on the “4/6” button.



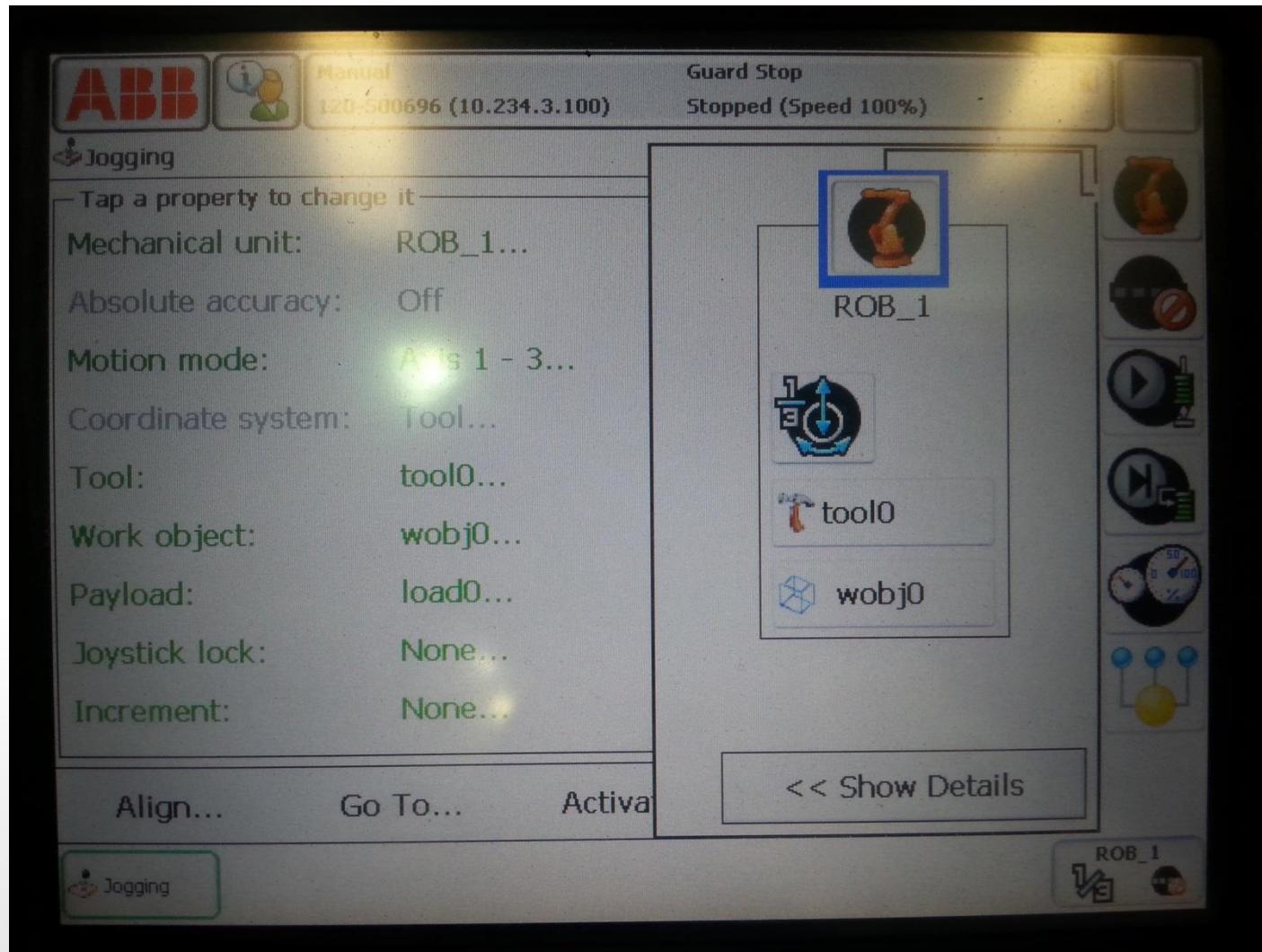
Jog the Robot - Joint

- More selections will appear. Choose 1/3.



Jog the Robot - Joint

- Axis 1-3 are active now.



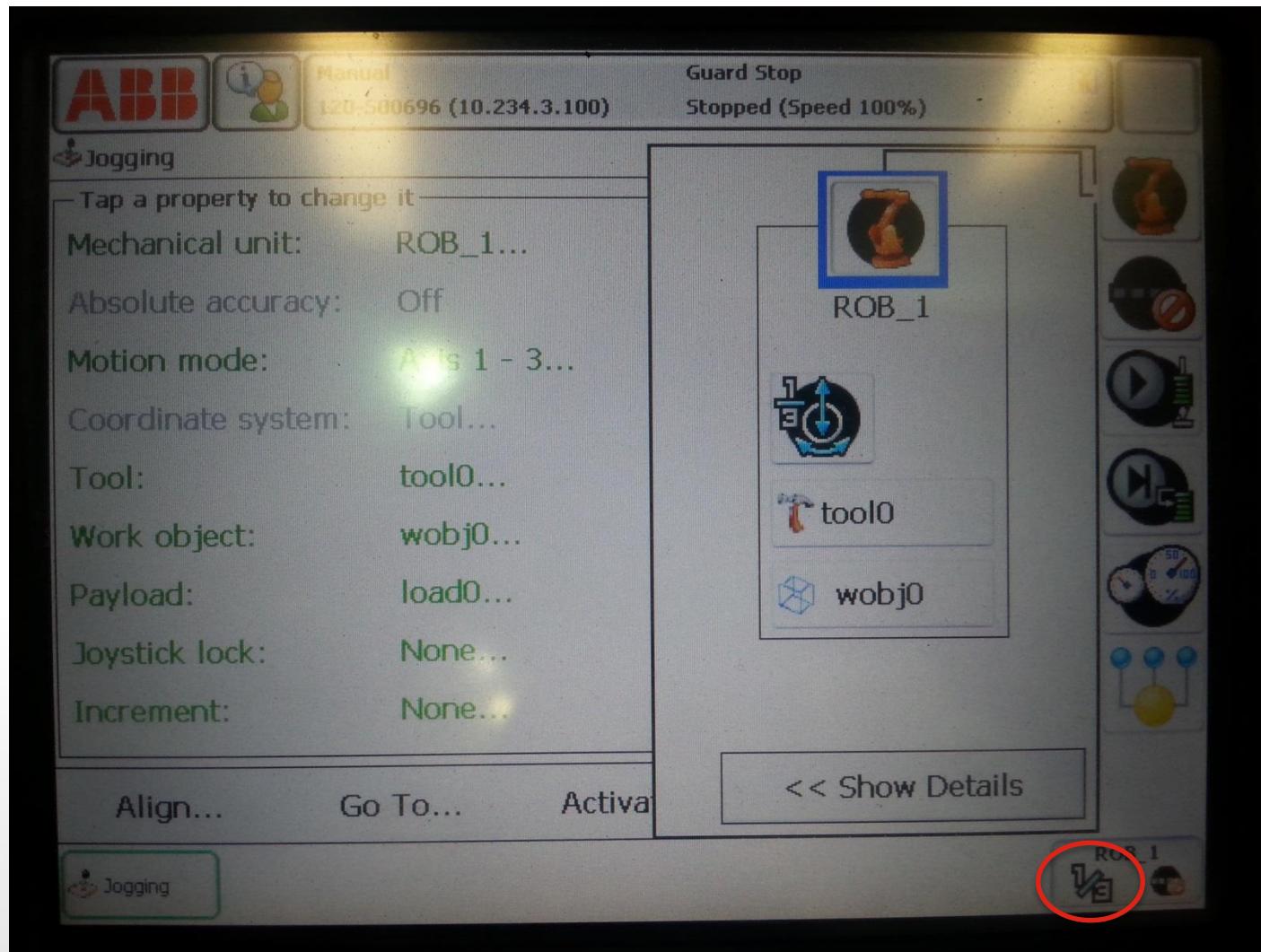
Jog the Robot - Joint

- Now we can jog the robot. Press the motor on button “half-way” and move the joy stick.



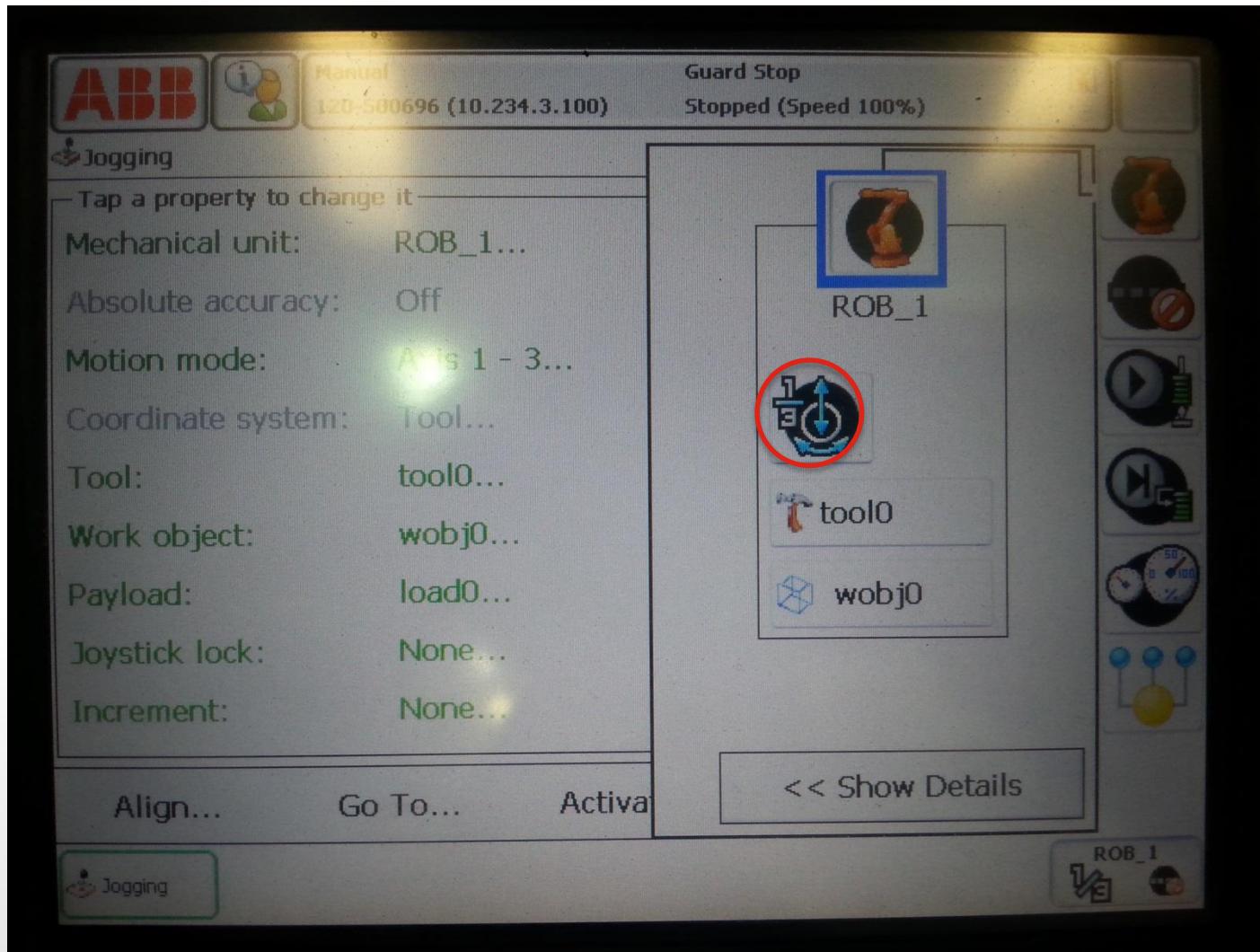
Jog the Robot - Joint

- To switch to axis 4-6, press the button on the bottom right which states “1/3”



Jog the Robot - Joint

- A pop-up will appear. Press on the “1/3” button.



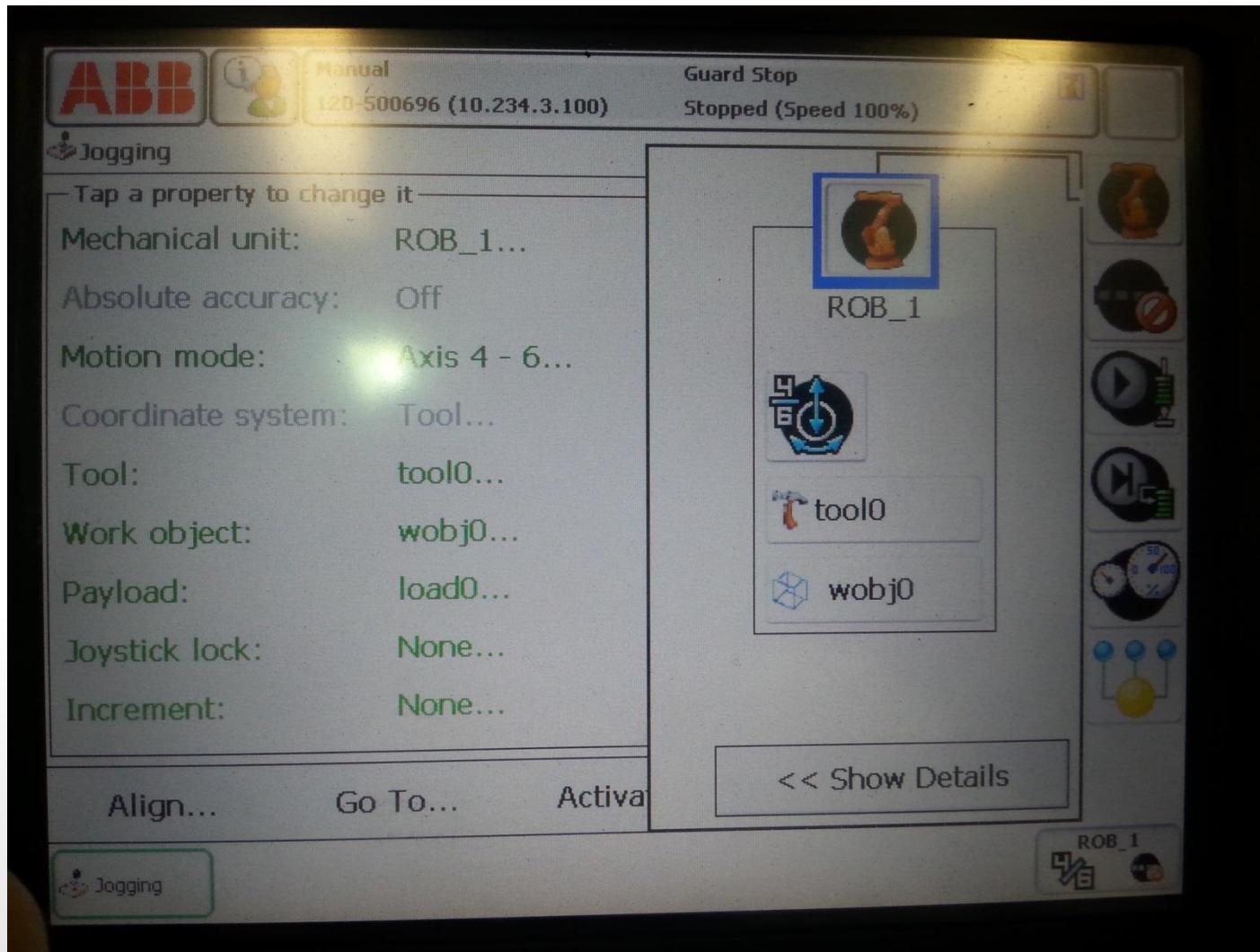
Jog the Robot - Joint

- More selections will appear. Choose 4/6.



Jog the Robot - Joint

- Axis 4-6 are active now.



Jog the Robot - Joint

- Now we can jog the robot. Press the motor on button “half-way” and move the joy stick.

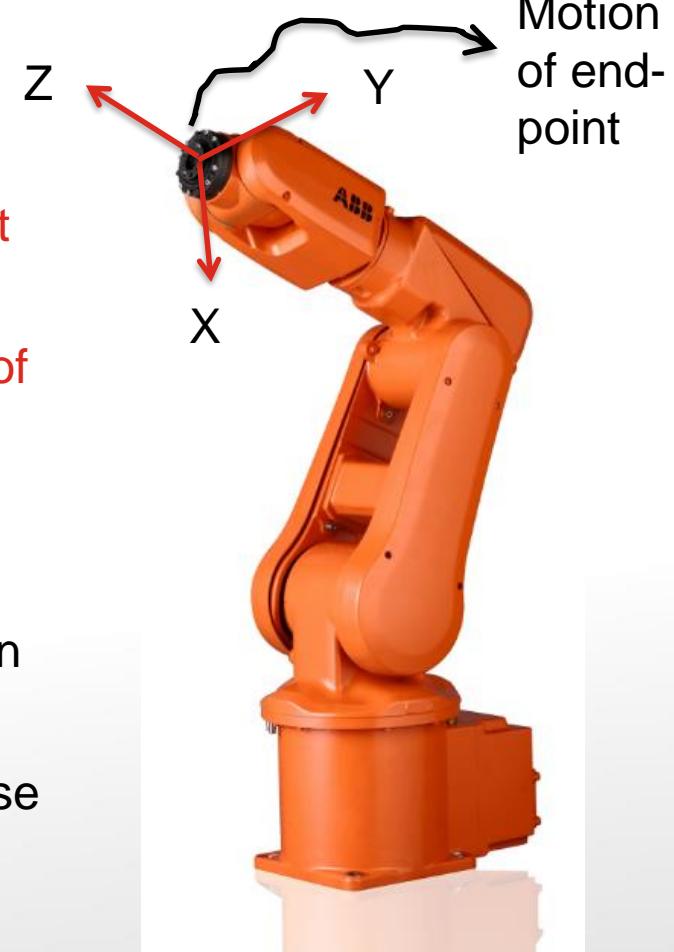


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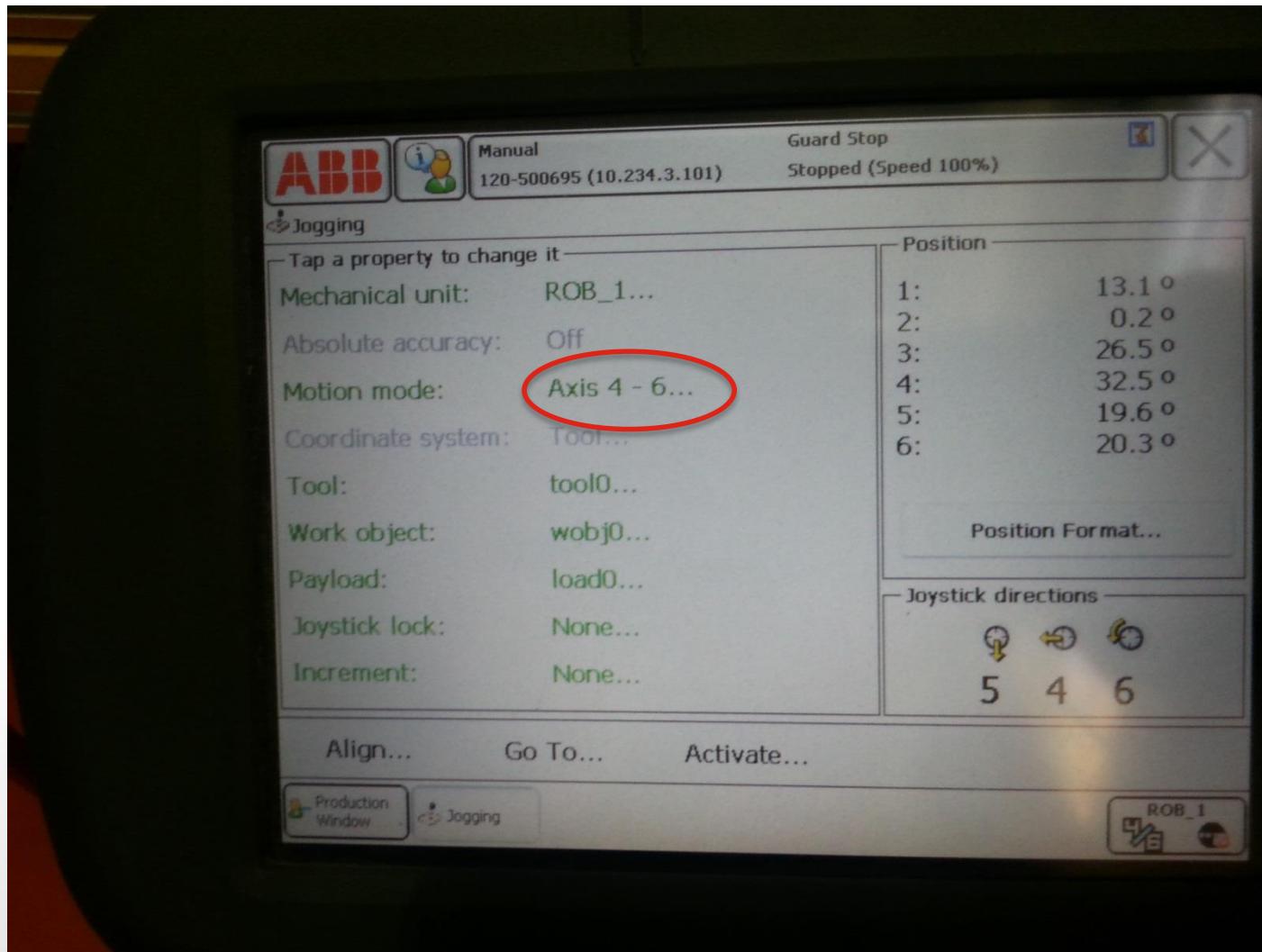
Jog the Robot – Linear / Re-orient

- So far, we have jogged the robot in the joint mode.
- The robot can also be jogged in **linear / re-orient mode**.
 - This means, we are interested of the **motion of the robot end-point or tools**.
- This however **depends on the frame** which we use.
- For example, it can be the Tool0 frame as shown in the diagram on the right.
- Or, it can be another tool frame, or the robot base frame etc.
 - Will be discussed shortly.



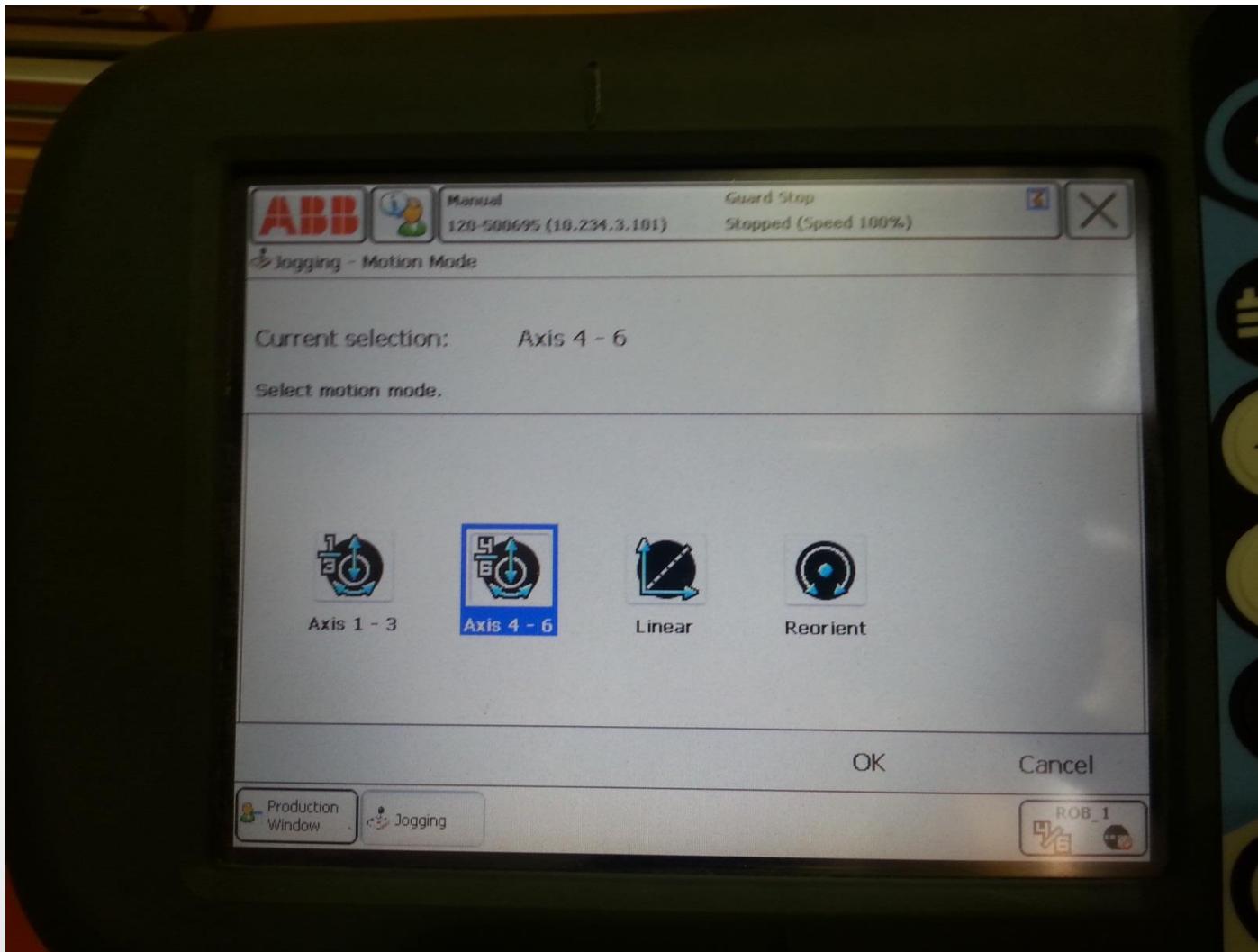
Jog the Robot – Linear / Re-orient

- Let's jog the robot in **linear mode**. Press “Axis 4-6”.



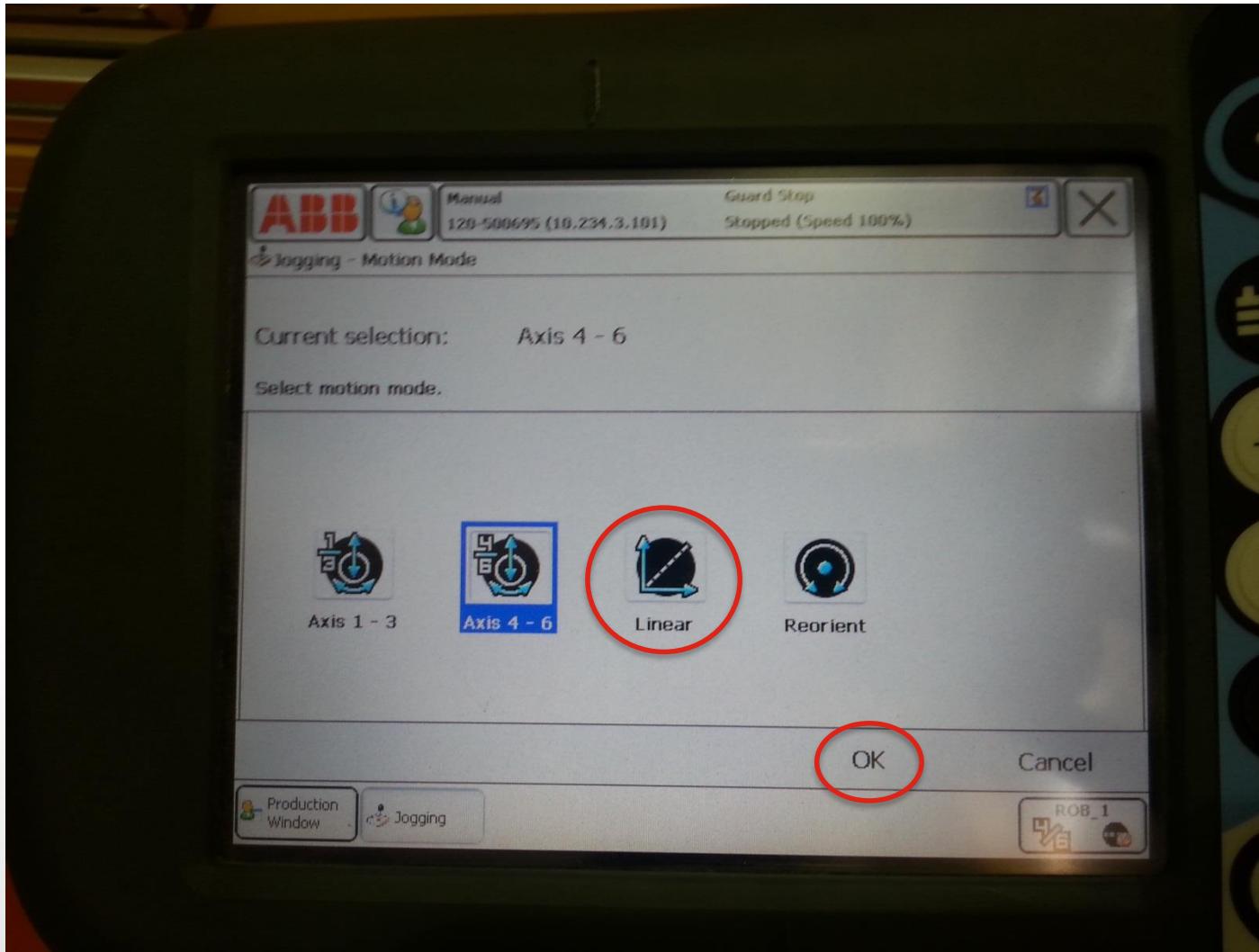
Jog the Robot – Linear / Re-orient

- We will reach the next screen:



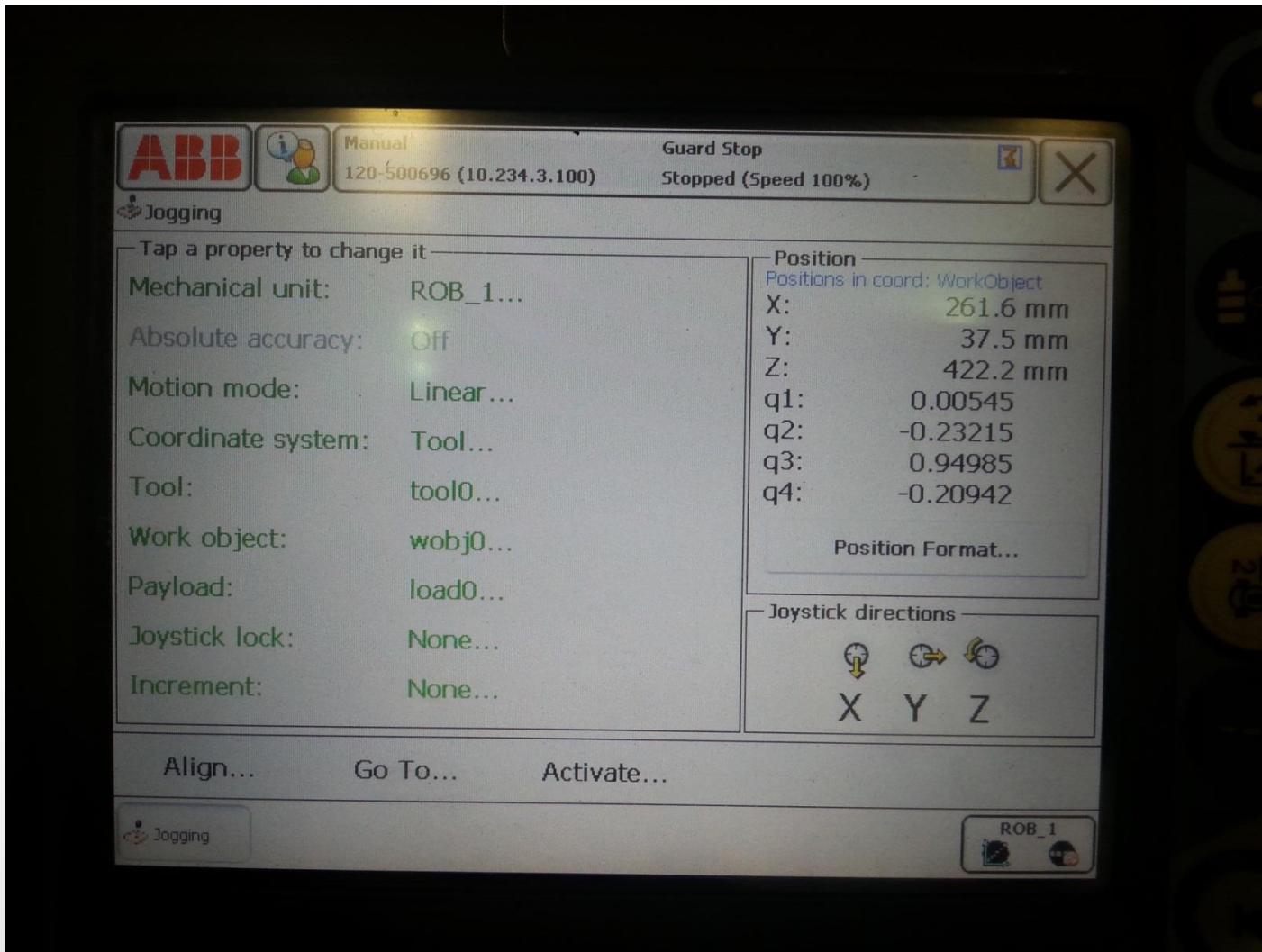
Jog the Robot – Linear / Re-orient

- Choose **Linear**, then click **OK**. The motion mode is now changed to Linear.



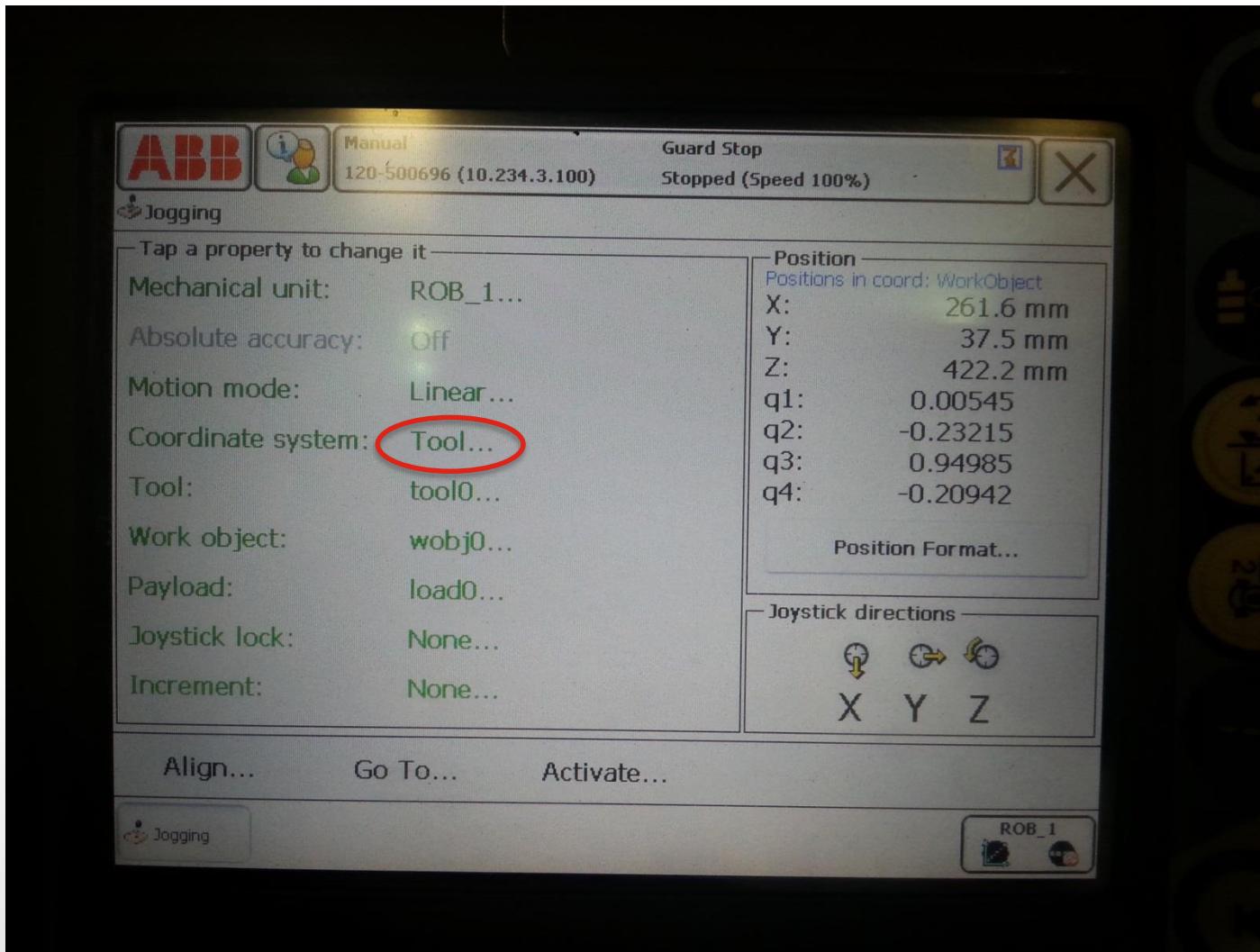
Jog the Robot – Linear / Re-orient

- As mentioned, the **axis** in the linear mode depends on the **chosen frame**.



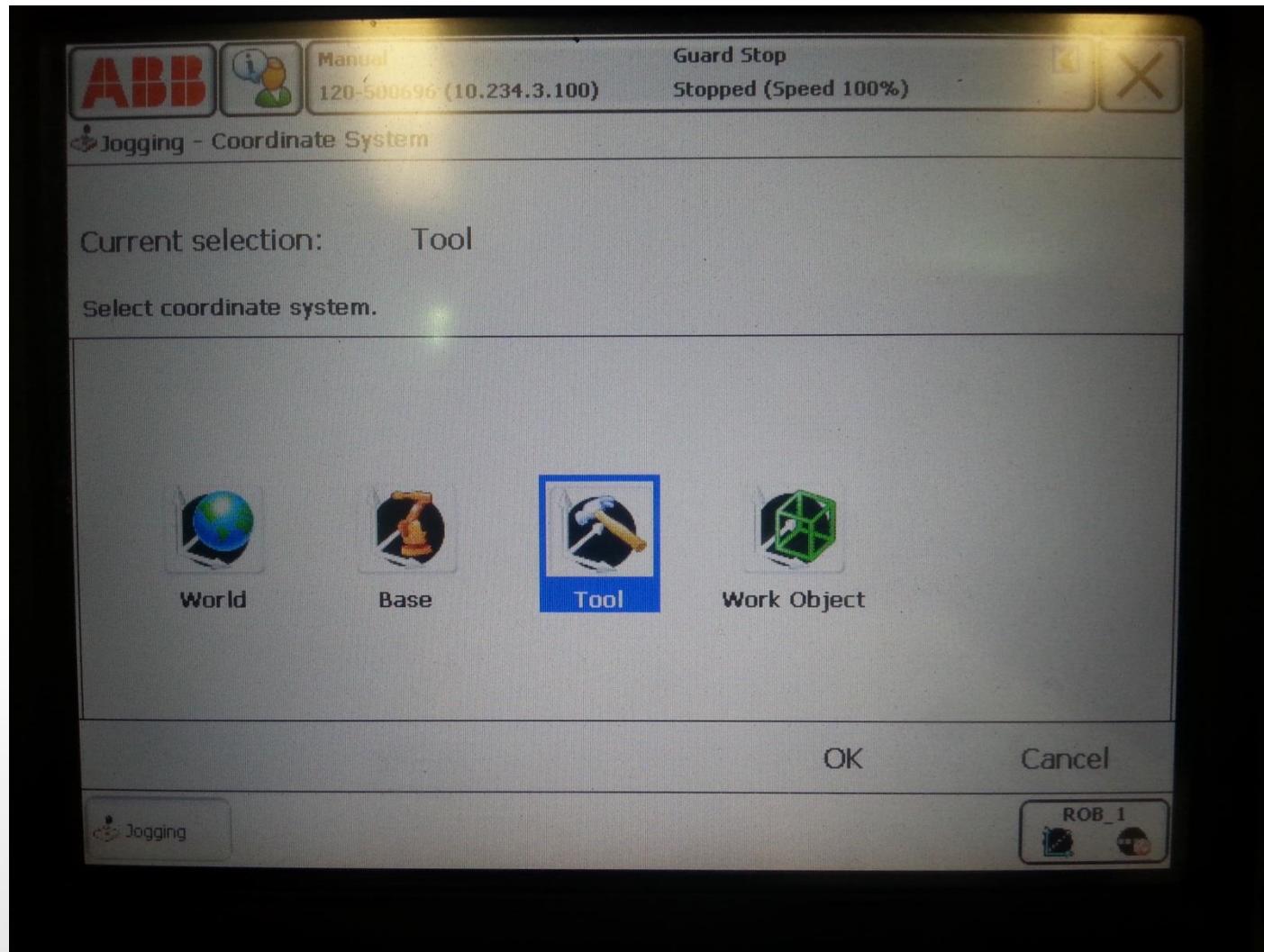
Jog the Robot – Linear / Re-orient

- To choose the frame, click “tool” beside “Coordinate system”.



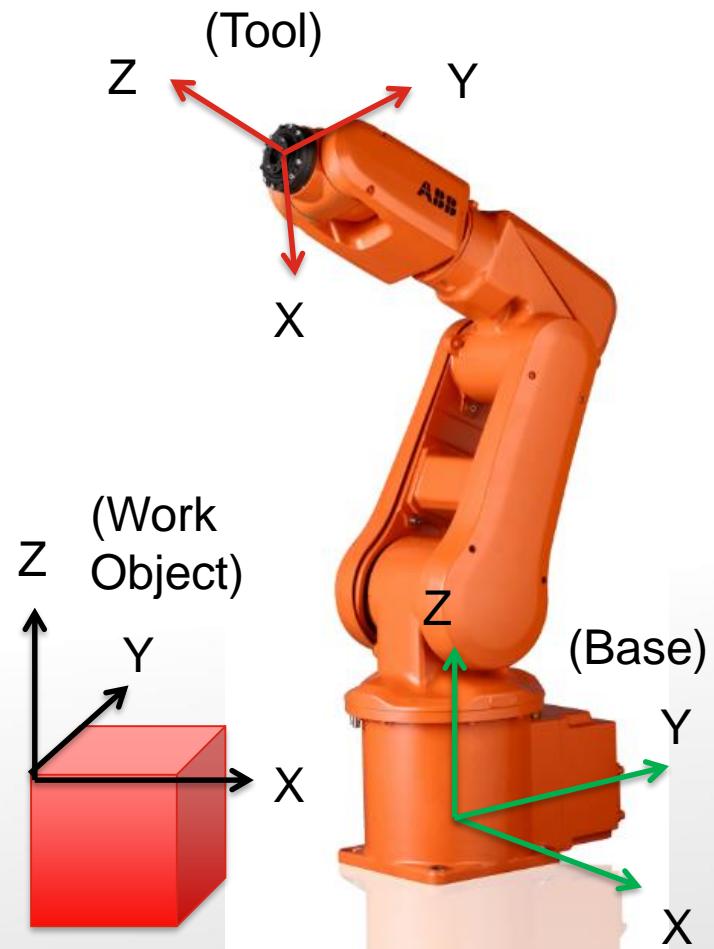
Jog the Robot – Linear / Re-orient

- We will see the following options:



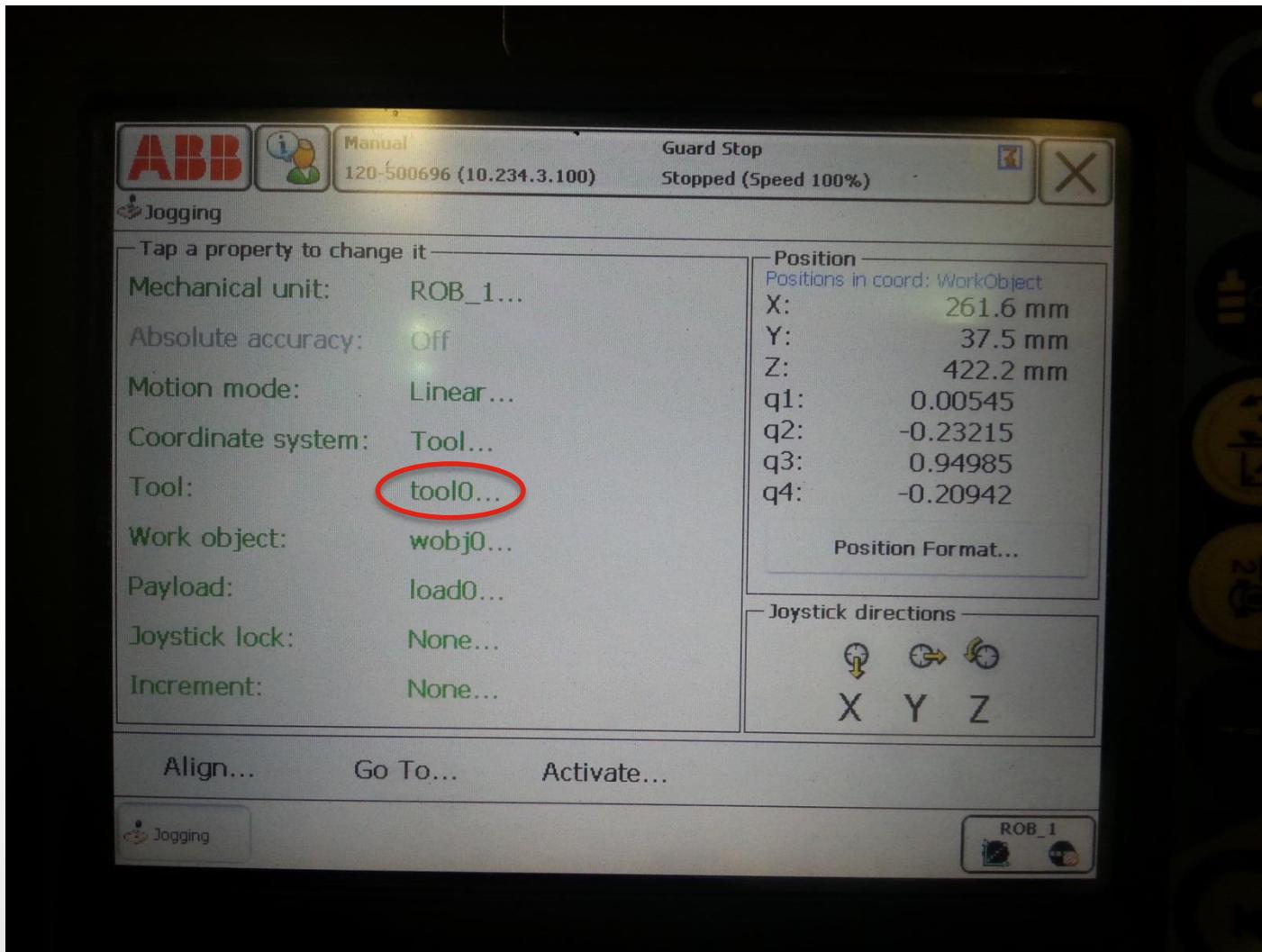
Jog the Robot – Linear / Re-orient

- The options on the previous slides are:
 - Base**: Frame at the base of robot.
 - Tool**: Frame attached with the tool, at the end of the robot.
 - Work Object**: Frame attached to the work piece.
- In this example, we stick with “Tool”, thus click “**Tool**” on the screen.



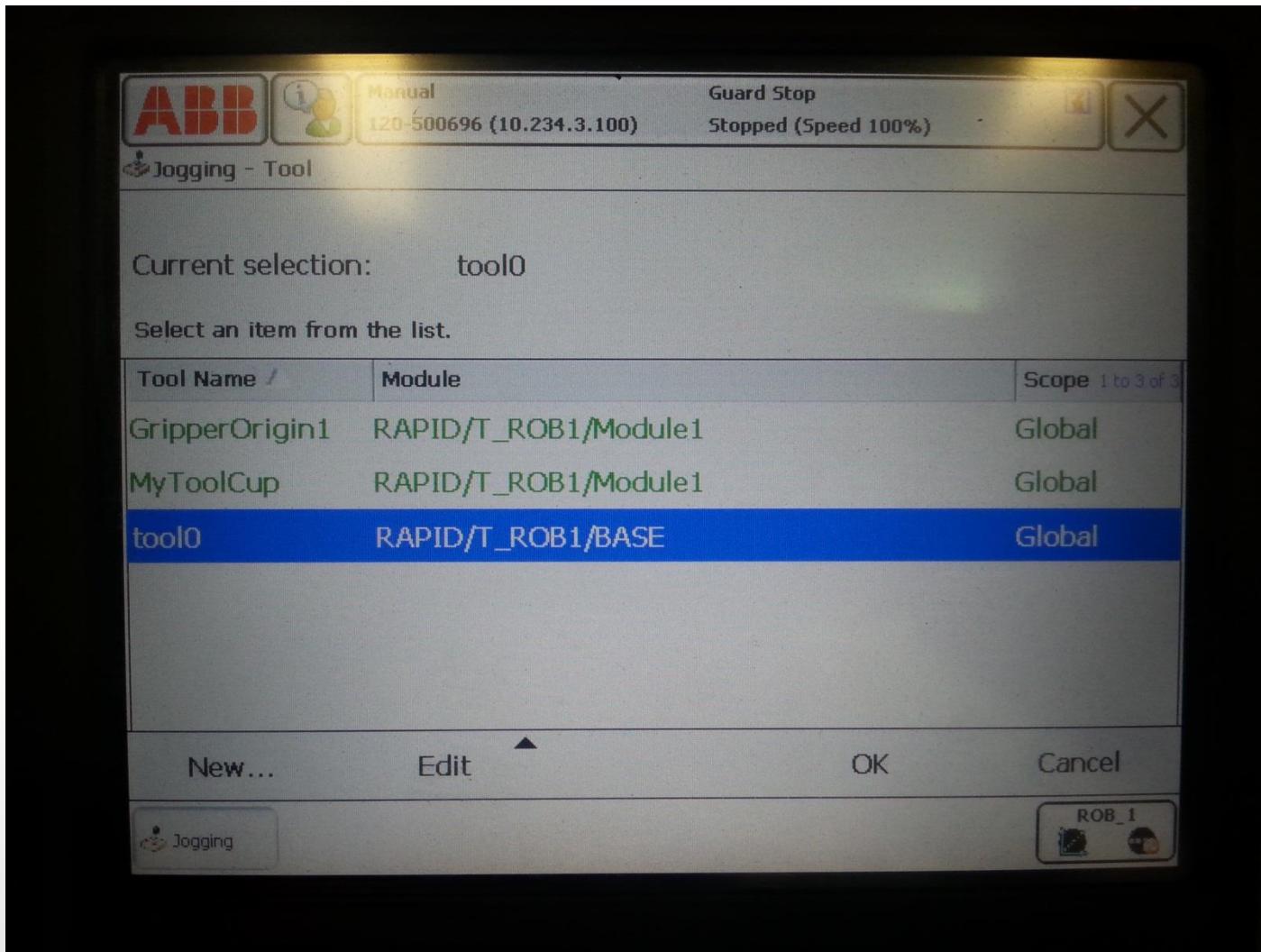
Jog the Robot – Linear / Re-orient

- Next, to choose the tool, click “tool0” beside “Tool”.



Jog the Robot – Linear / Re-orient

- We will see the following options:

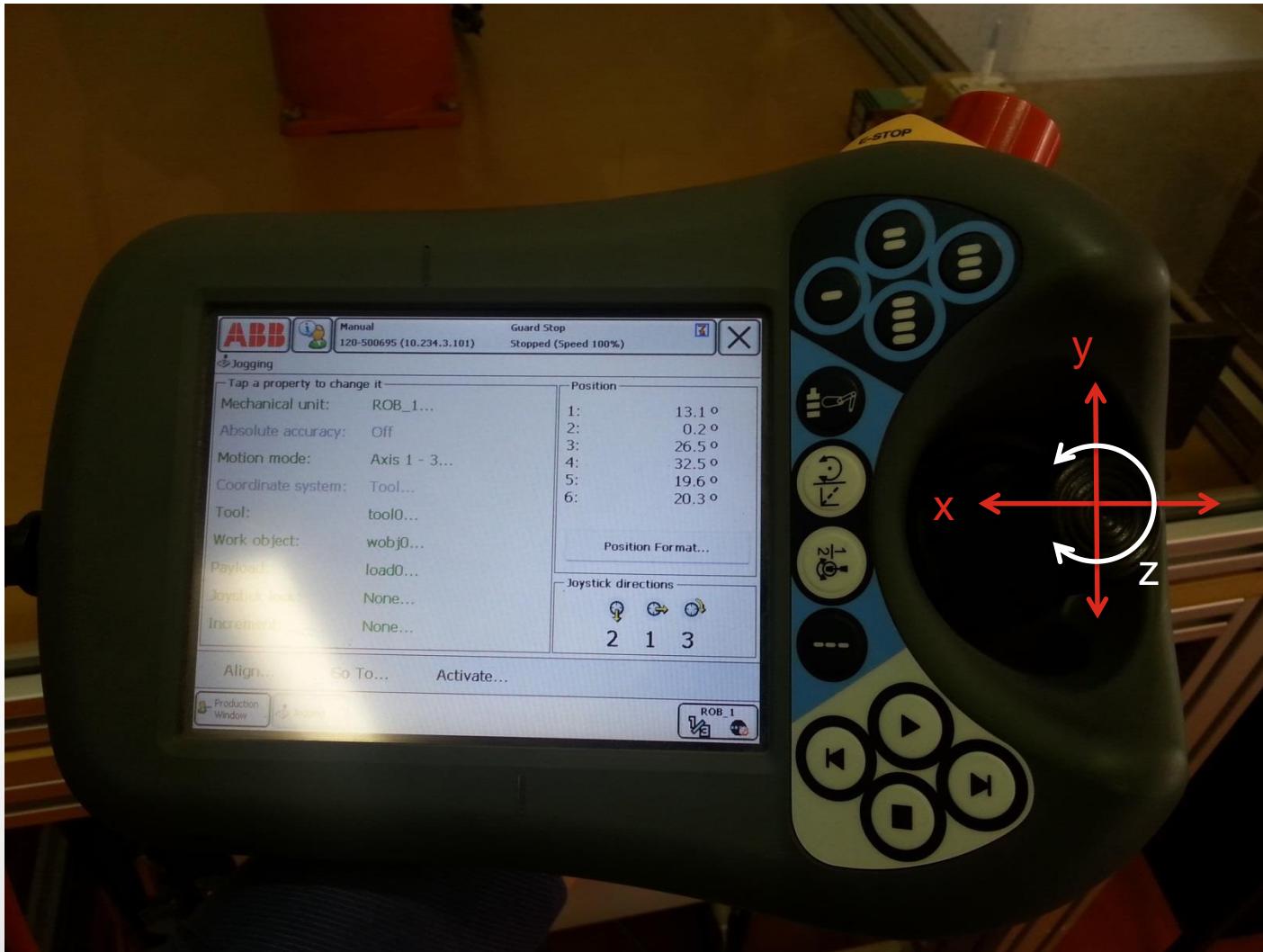


Jog the Robot – Linear / Re-orient

- The options on the previous slide are:
 - GripperOrigin1
 - MyToolCup
 - Tool0 – The original tool frame at the end of robot.
- In this example, we use “Tool0”, thus click “Tool0” on the screen.

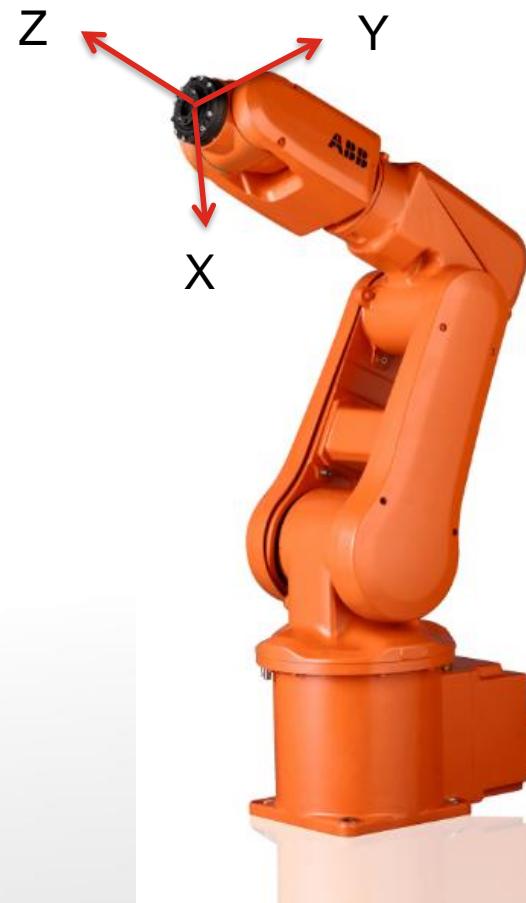
Jog the Robot – Linear / Re-orient

- Now you can jog the robot. Press the motor on button “half-way” and move the joy stick.



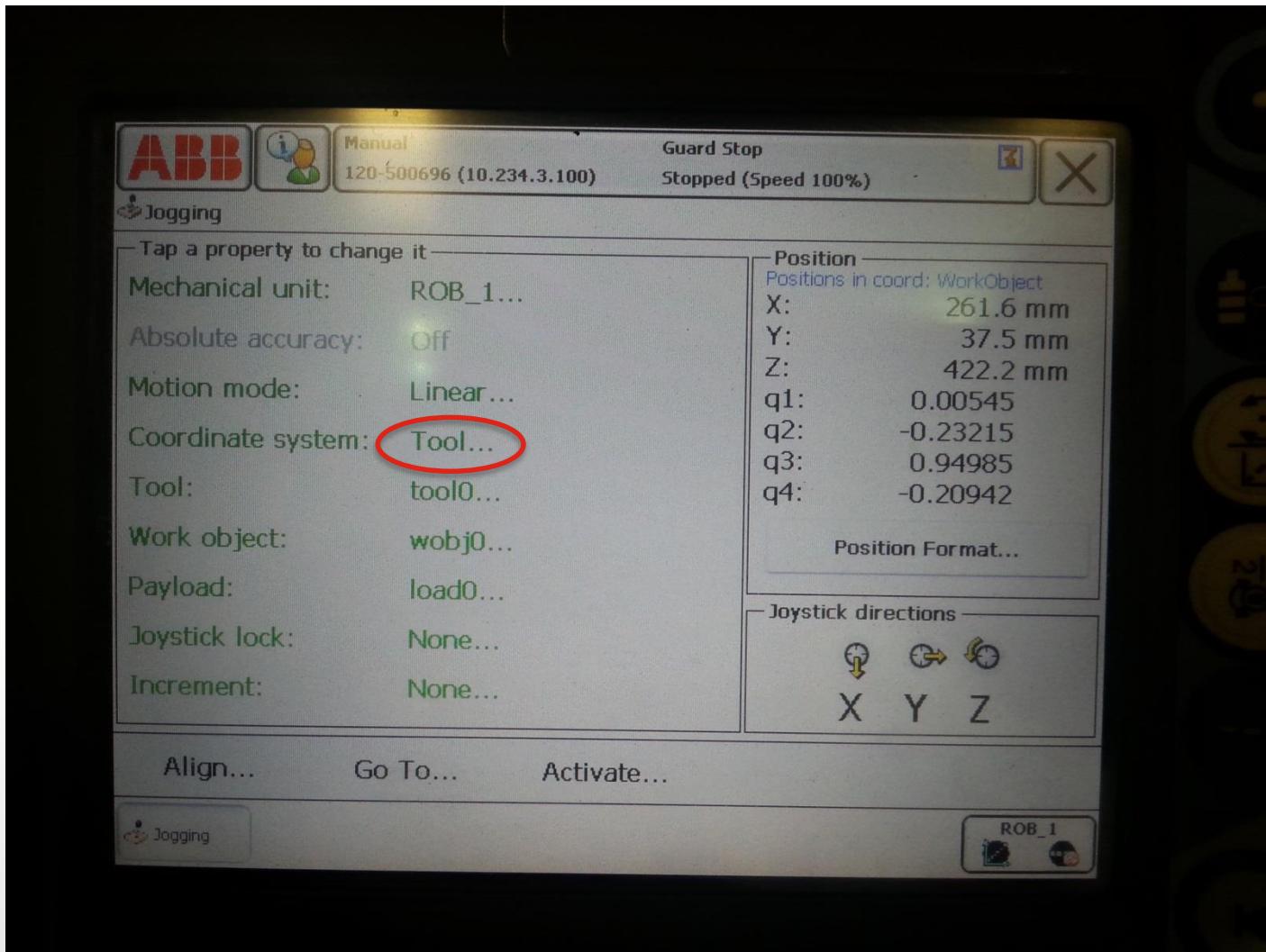
Jog the Robot – Linear / Re-orient

- In the current case of :
 - Coordinate System – Tool
 - Tool – Tool0,
 - The axes are as shown:
- Observe the motion of the robot, especially with regards to the end-point of the robot.



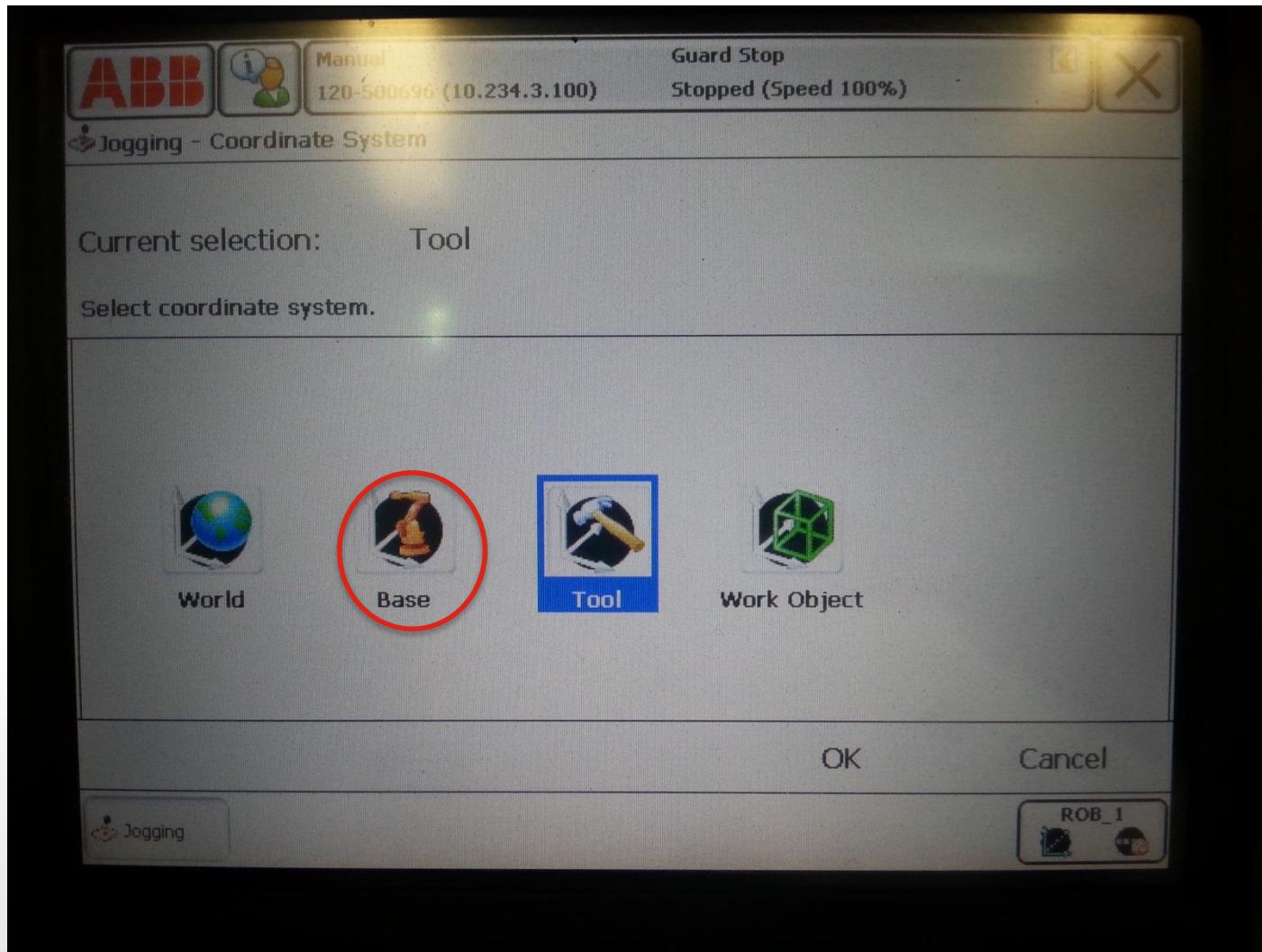
Jog the Robot – Linear / Re-orient

- Try changing the frame to “Base frame”. Click “tool” beside “Coordinate sys”.



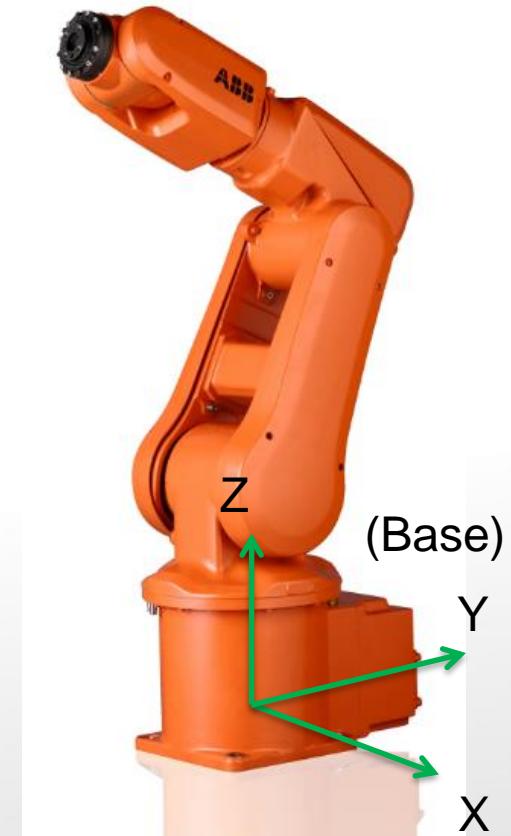
Jog the Robot – Linear / Re-orient

- In the new window, select “Base”



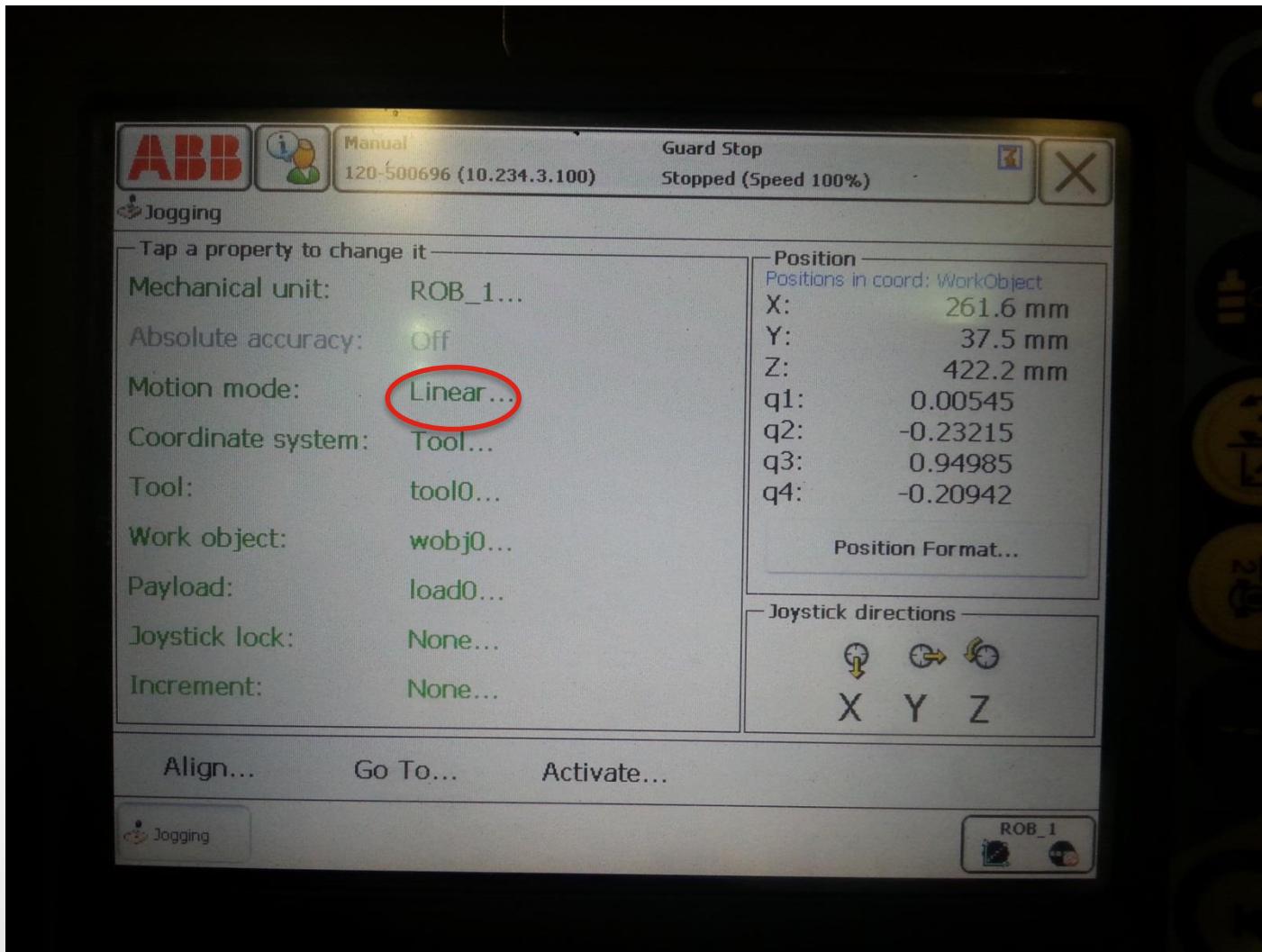
Jog the Robot – Linear / Re-orient

- Now jog the robot and observe the motion of the robot's end-point.
- The x, y, z directions are now according to the **robot base**.



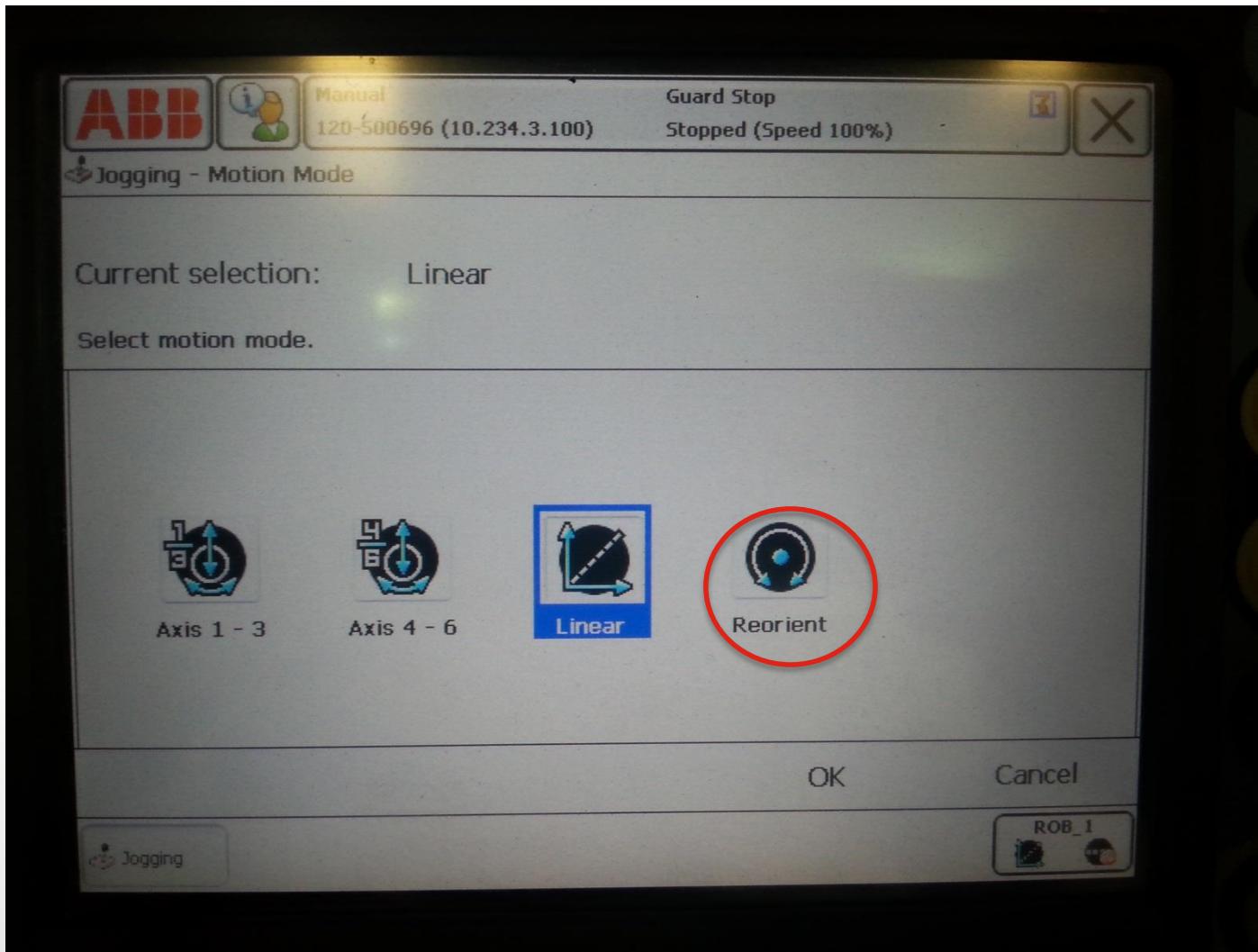
Jog the Robot – Linear / Re-orient

- Let's finally jog the robot in **reorient mode**. Press "Linear".



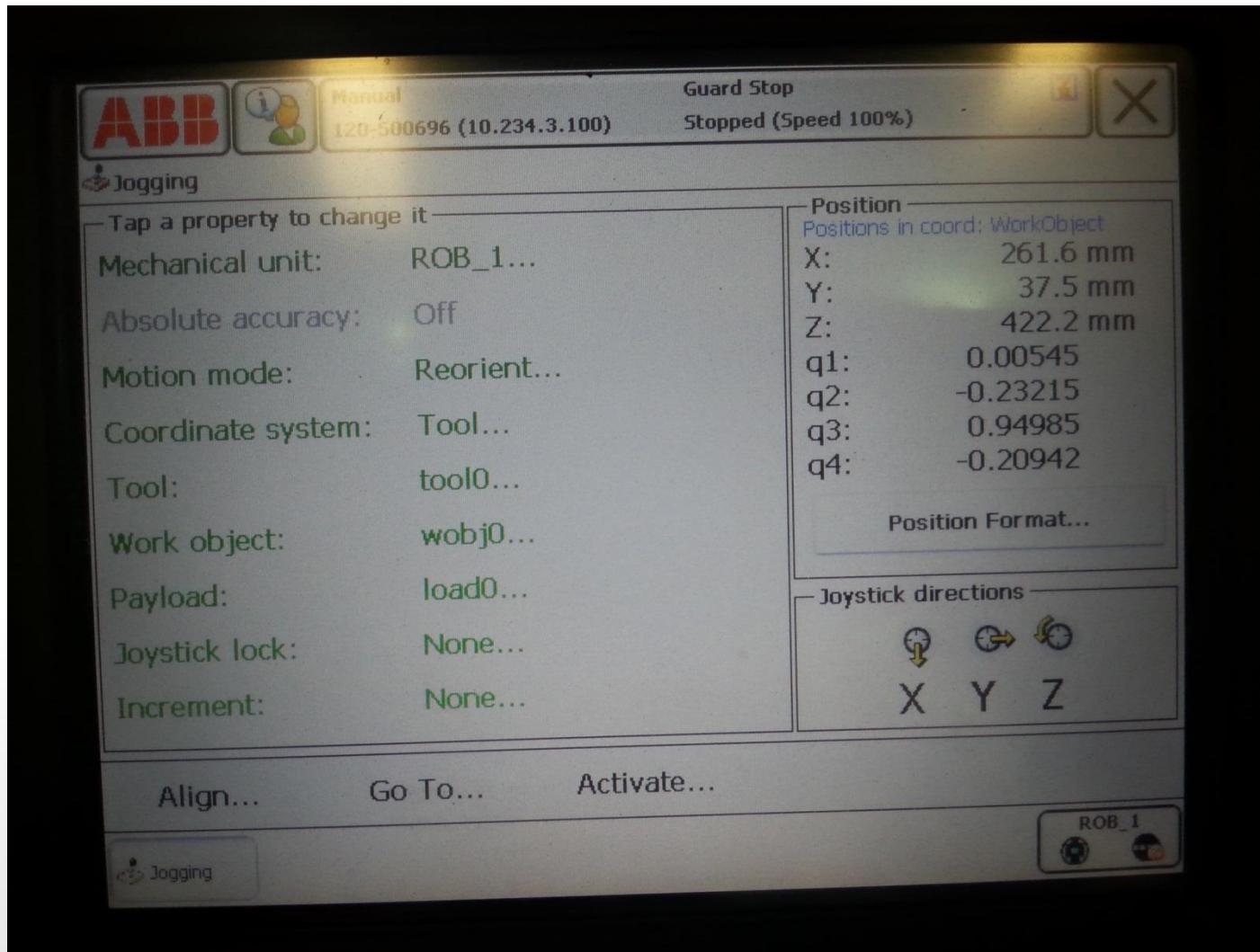
Jog the Robot – Linear / Re-orient

- In the new screen, select “Reorient” then click OK.



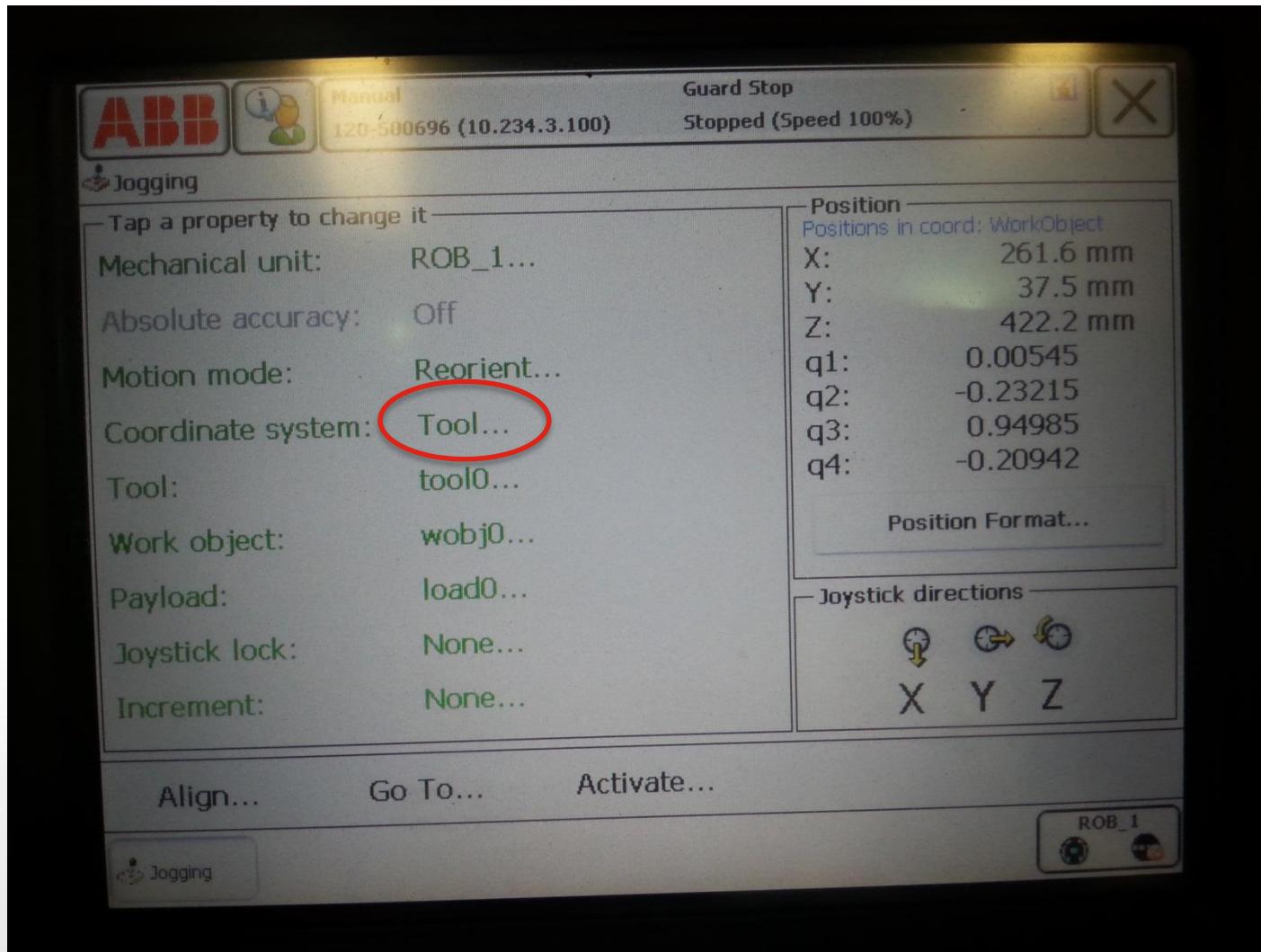
Jog the Robot – Linear / Re-orient

- Similar to linear mode, the reorient function depends on the chosen frame.



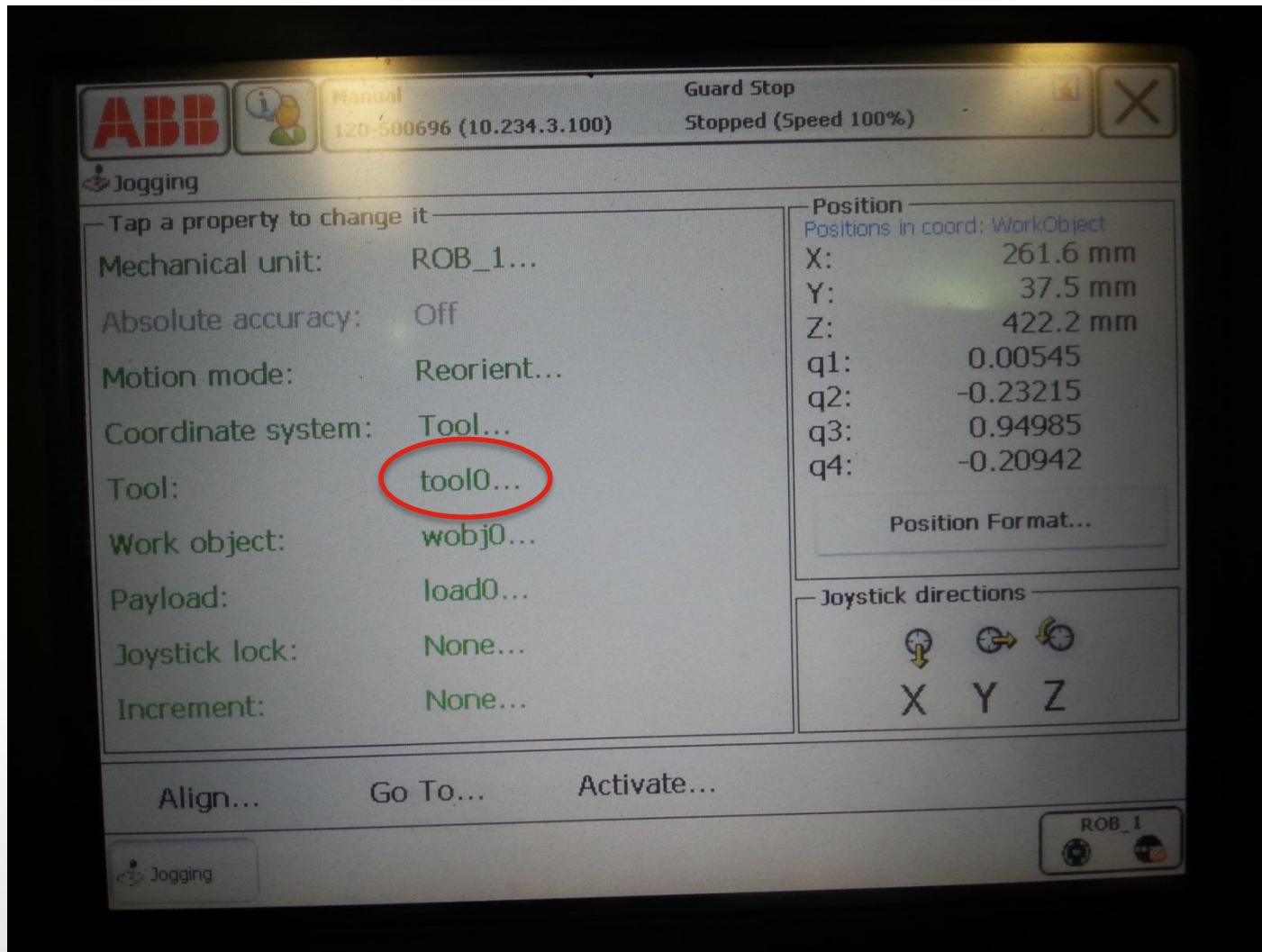
Jog the Robot – Linear / Re-orient

- Change coordinate system (from currently “Base”) to “Tool”, as shown.



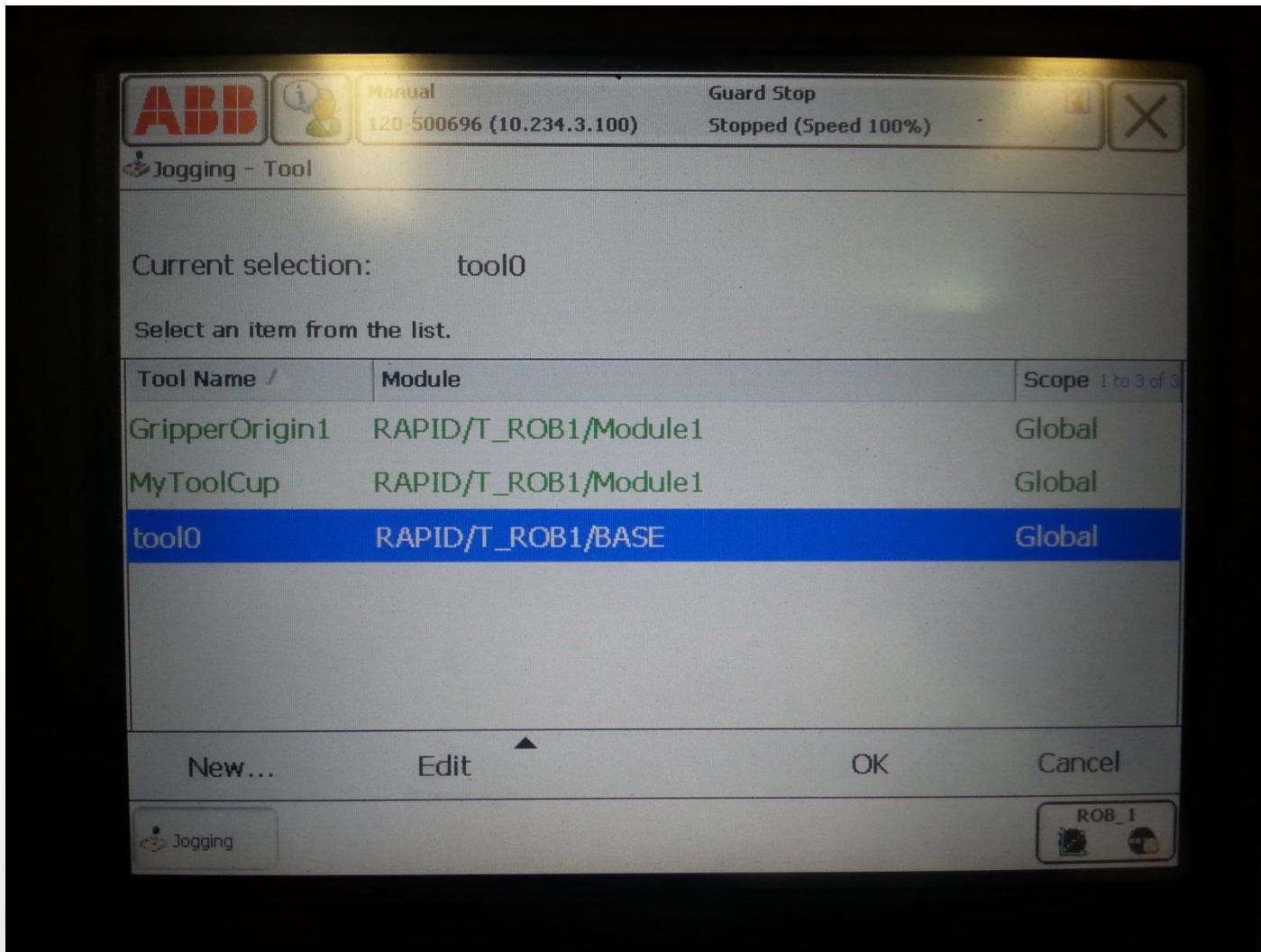
Jog the Robot – Linear / Re-orient

- Next, select the tool by pressing “tool0”.



Jog the Robot – Linear / Re-orient

- We will see the following options:



Jog the Robot – Linear / Re-orient

- The options on the previous slide are:
 - GripperOrigin1
 - MyToolCup
 - Tool0 – The original tool frame at the end of robot.
- In this example, we use “GripperOrigin1”, thus click “**GripperOrigin1**” on the screen.

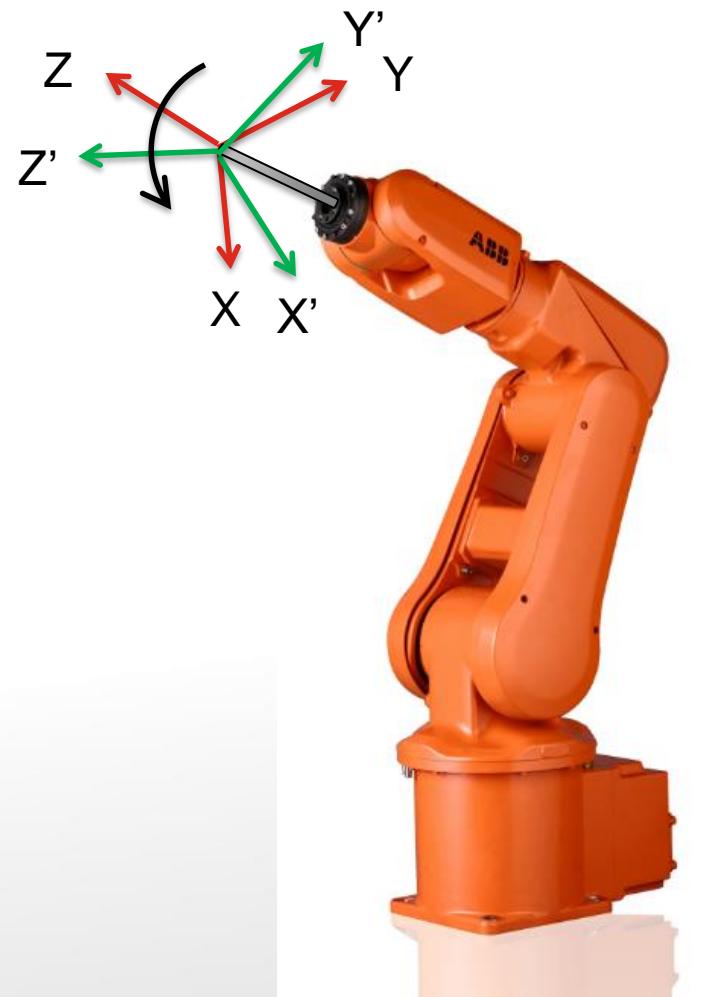
Jog the Robot – Linear / Re-orient

- Now you can jog the robot. Press the motor on button “half-way” and move the joy stick.



Jog the Robot – Linear / Re-orient

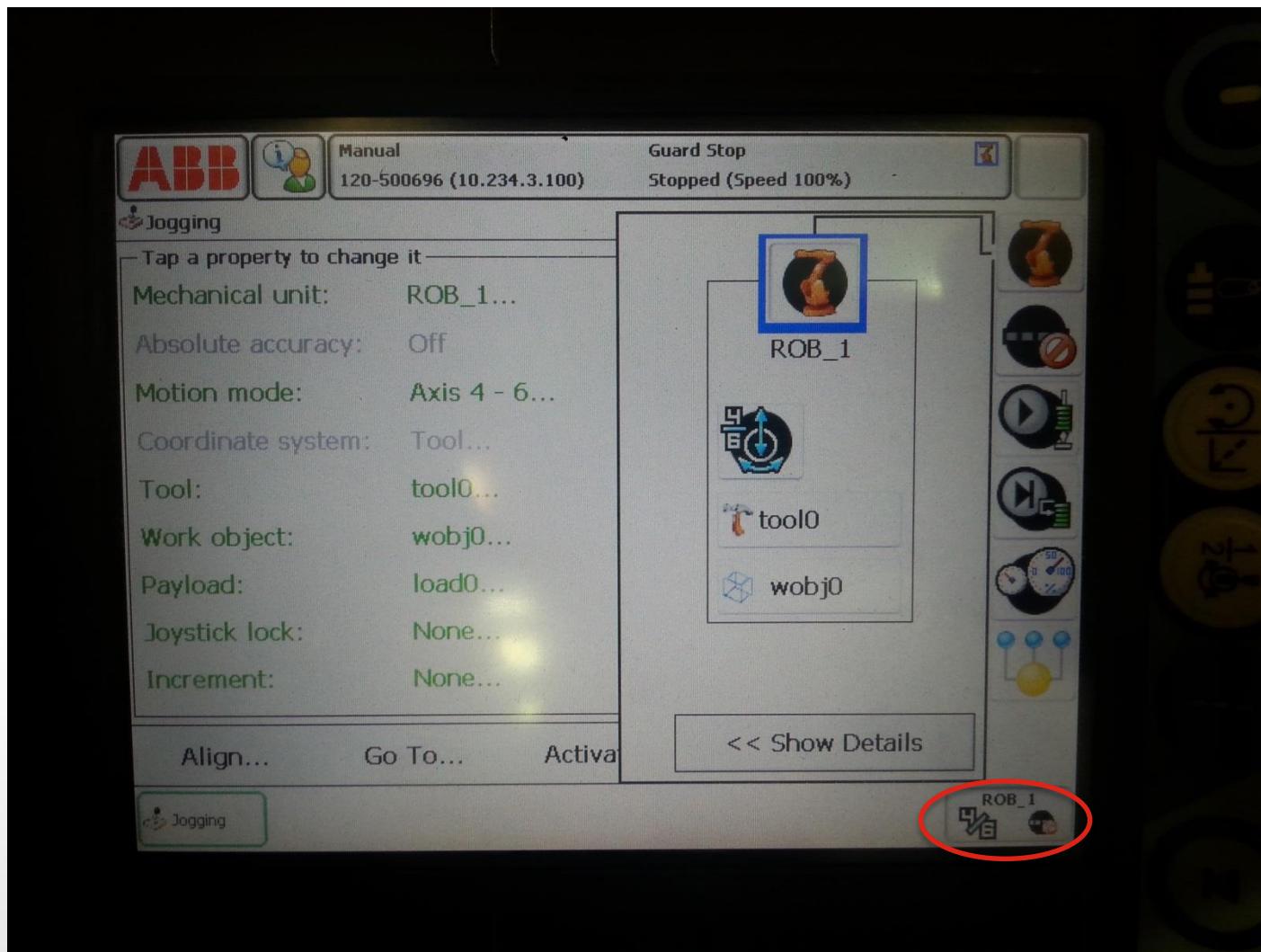
- In the current case of :
 - Coordinate System – Tool
 - Tool – GripperOrigin1
 - We see that the **end-point of the gripper** seems to be **stationary** when we re-orient the robot.
- This is because we are only re-orienting the frame at the end of the gripper. No linear motion is involved.
- In one of the later training, we will learn how to find the frame for tools and objects.



Jog the Robot – Linear / Re-orient

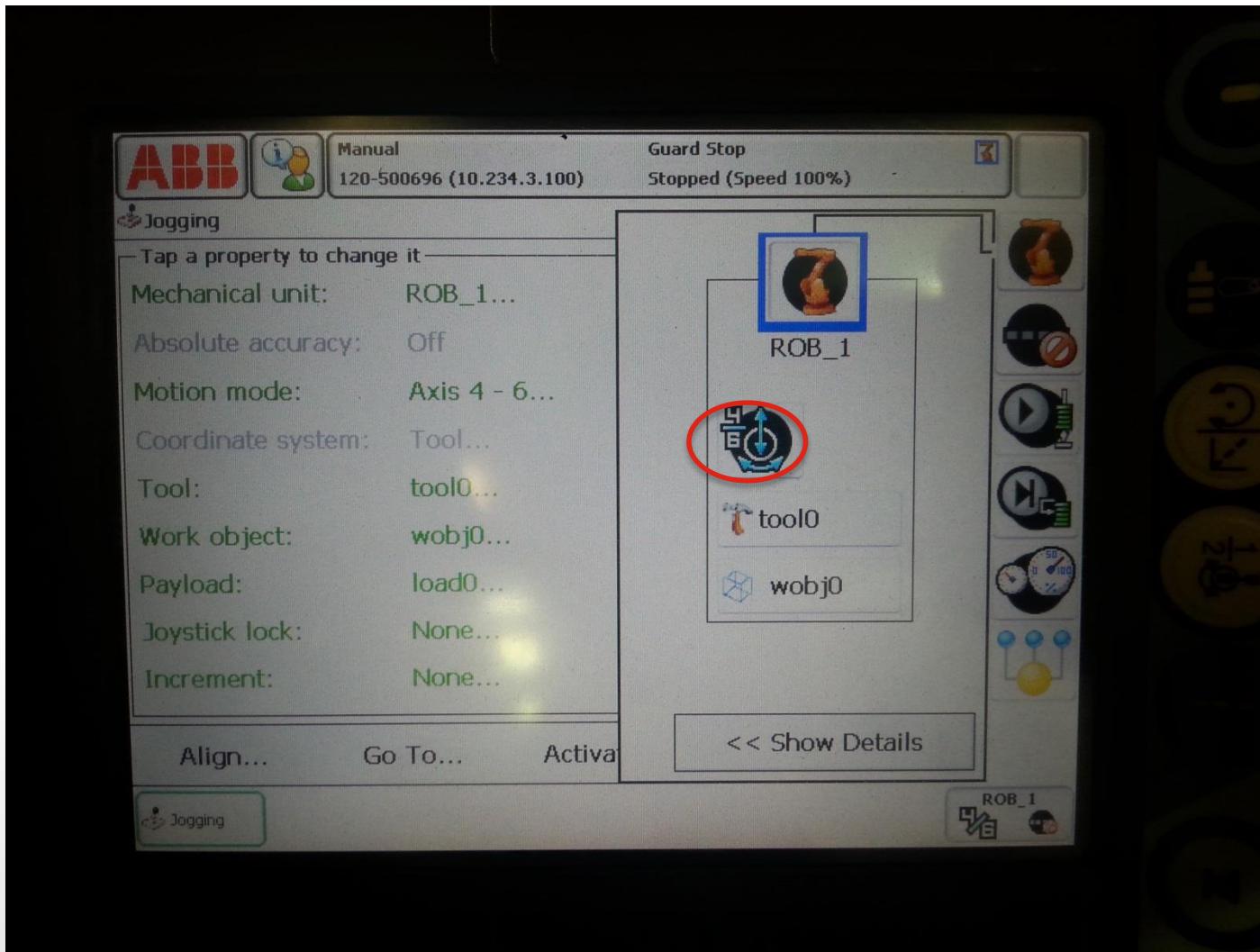
- All the mode selection can also be done through the **small symbol** at the

right bottom
of
the
window.



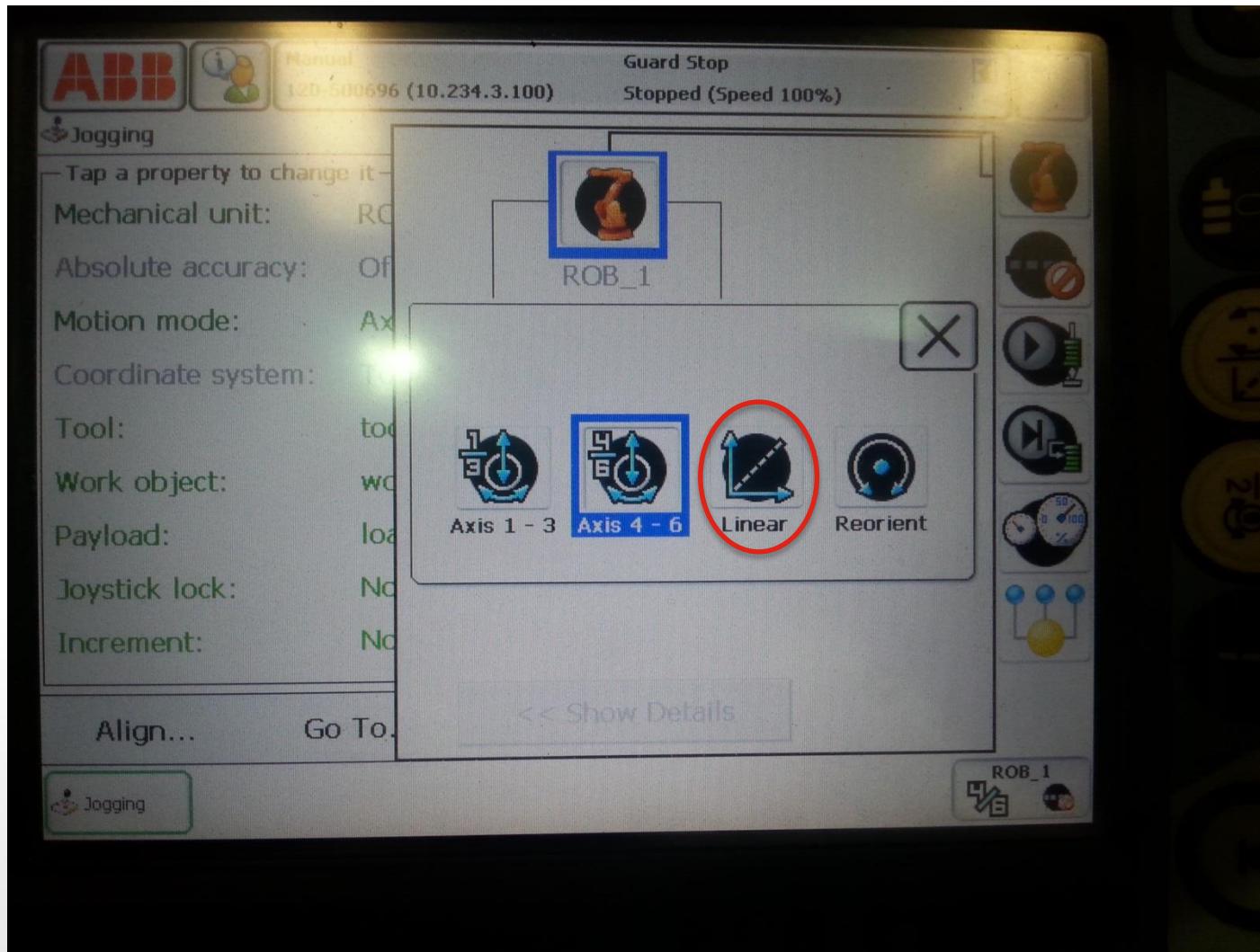
Jog the Robot – Linear / Re-orient

- On the pop-up window, click “4/6”.



Jog the Robot – Linear / Re-orient

- More selections will appear. Select “Linear”



Jog the Robot – Linear / Re-orient

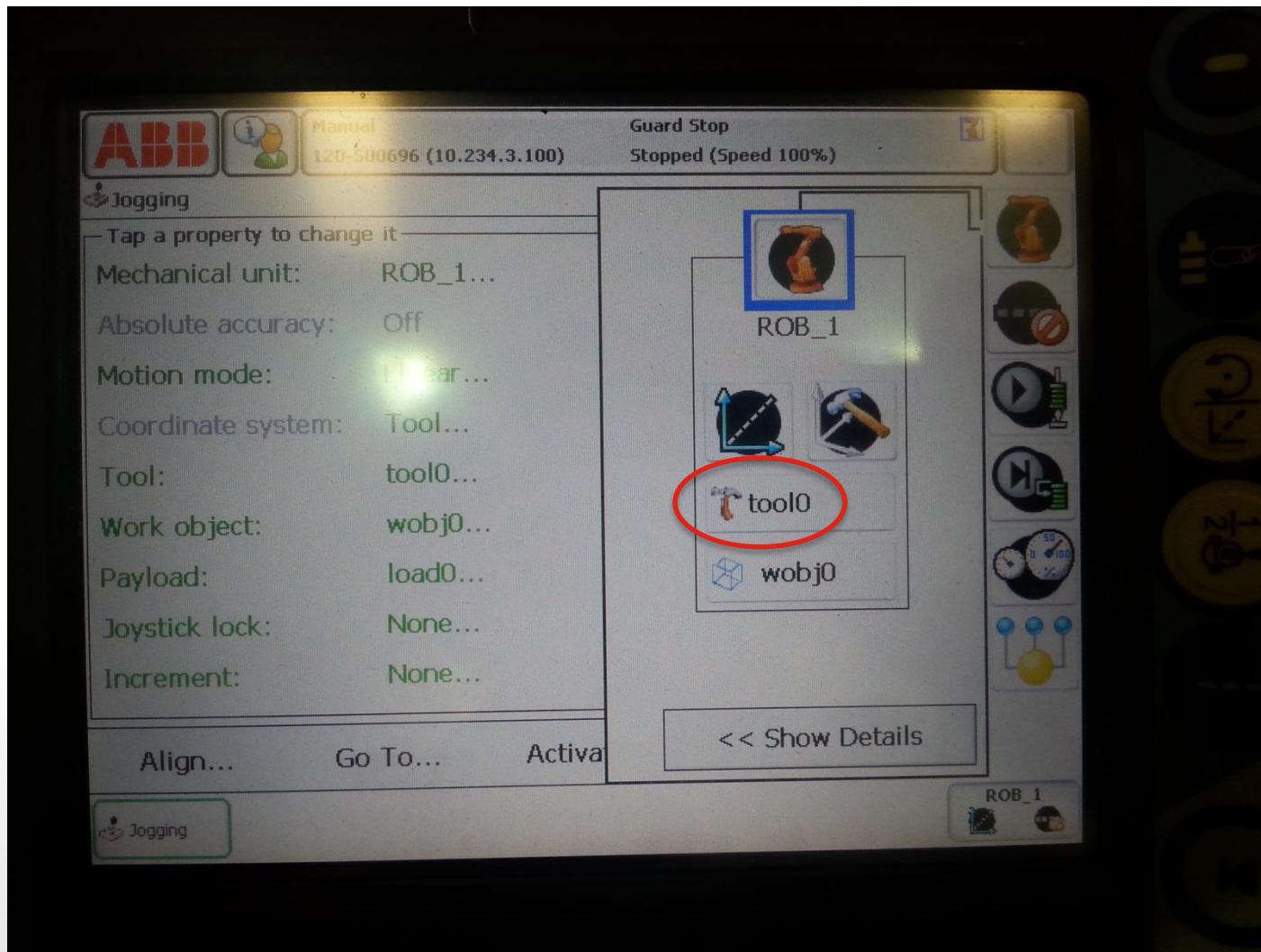
- The mode is now “Linear”. Use the symbol on the right to choose the frame

i.e.
either
tool,
base,
or
work
object.



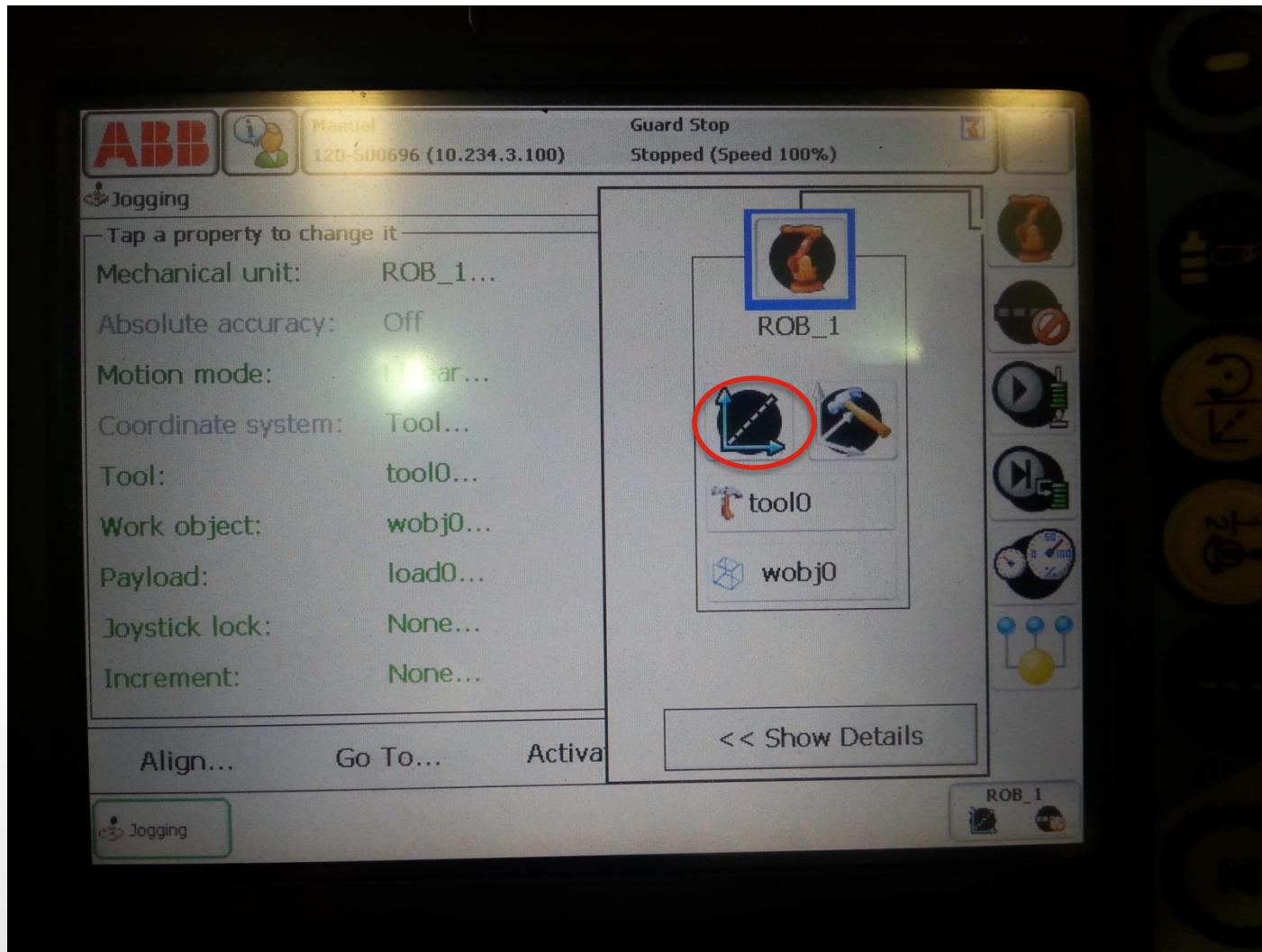
Jog the Robot – Linear / Re-orient

- Finally, click on the button below to choose the **correct tool** (for tool frame).



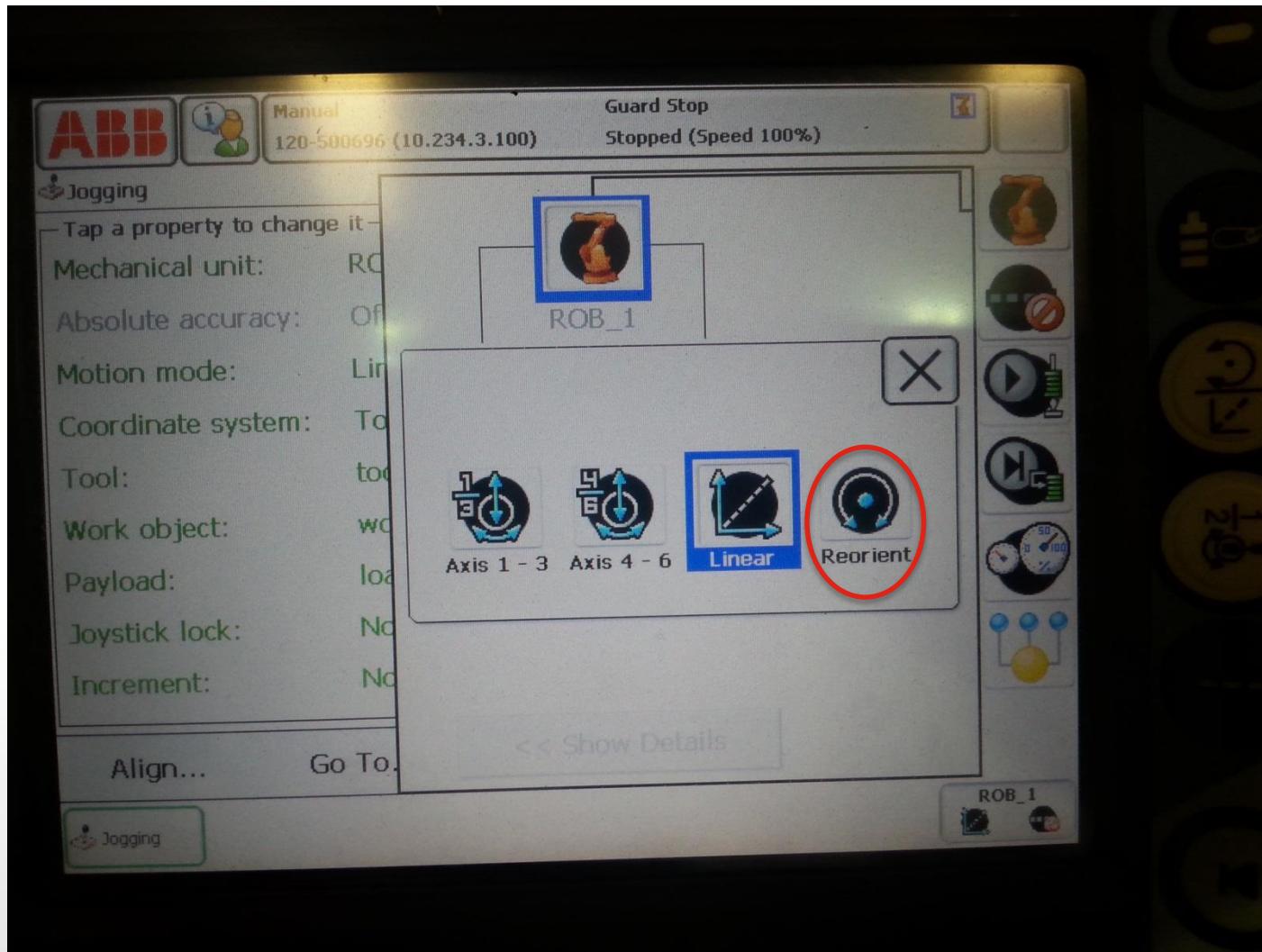
Jog the Robot – Linear / Re-orient

- To switch to reorient mode, click the “linear” symbol.



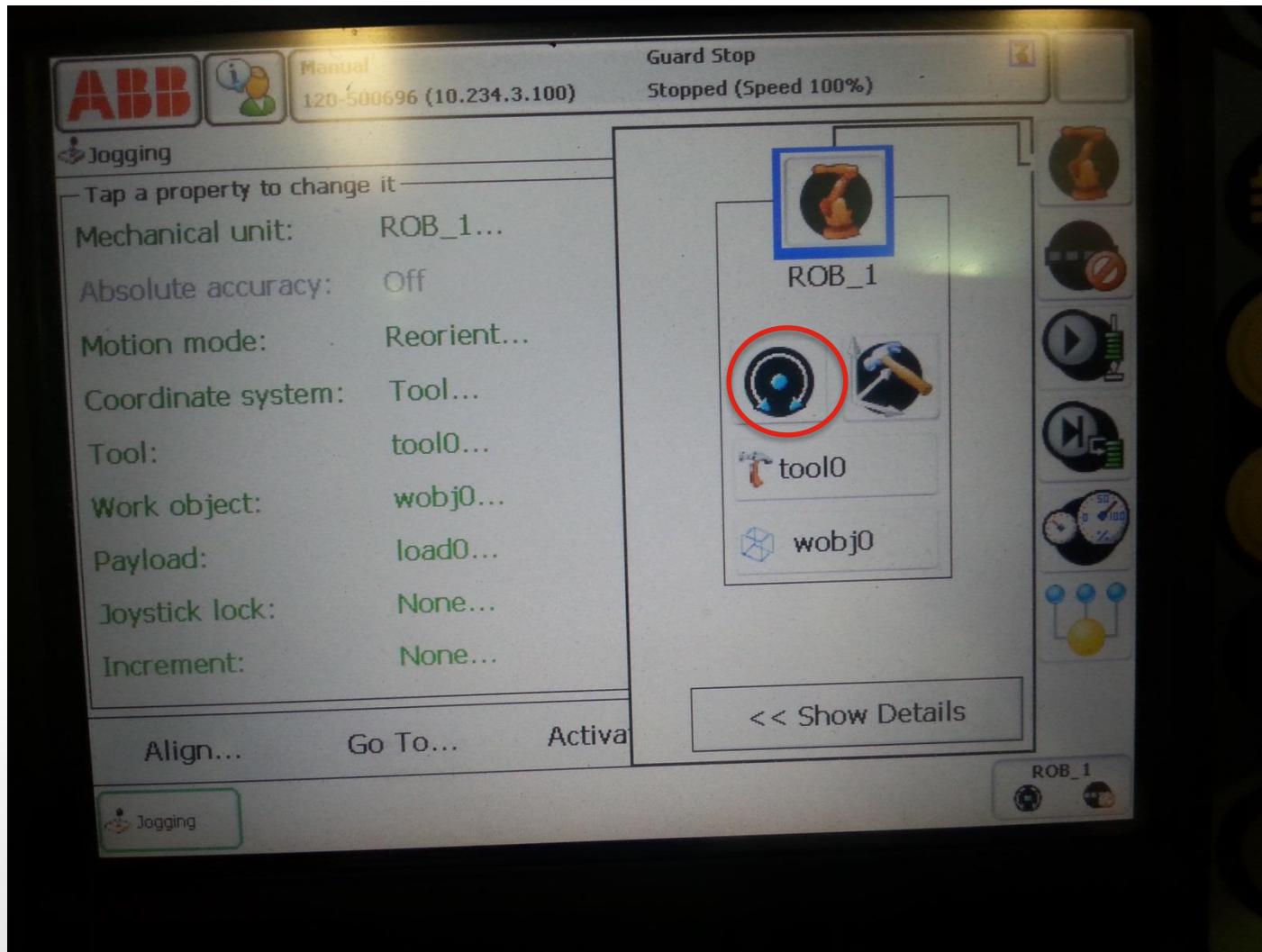
Jog the Robot – Linear / Re-orient

- More selections will appear. Select “Reorient”



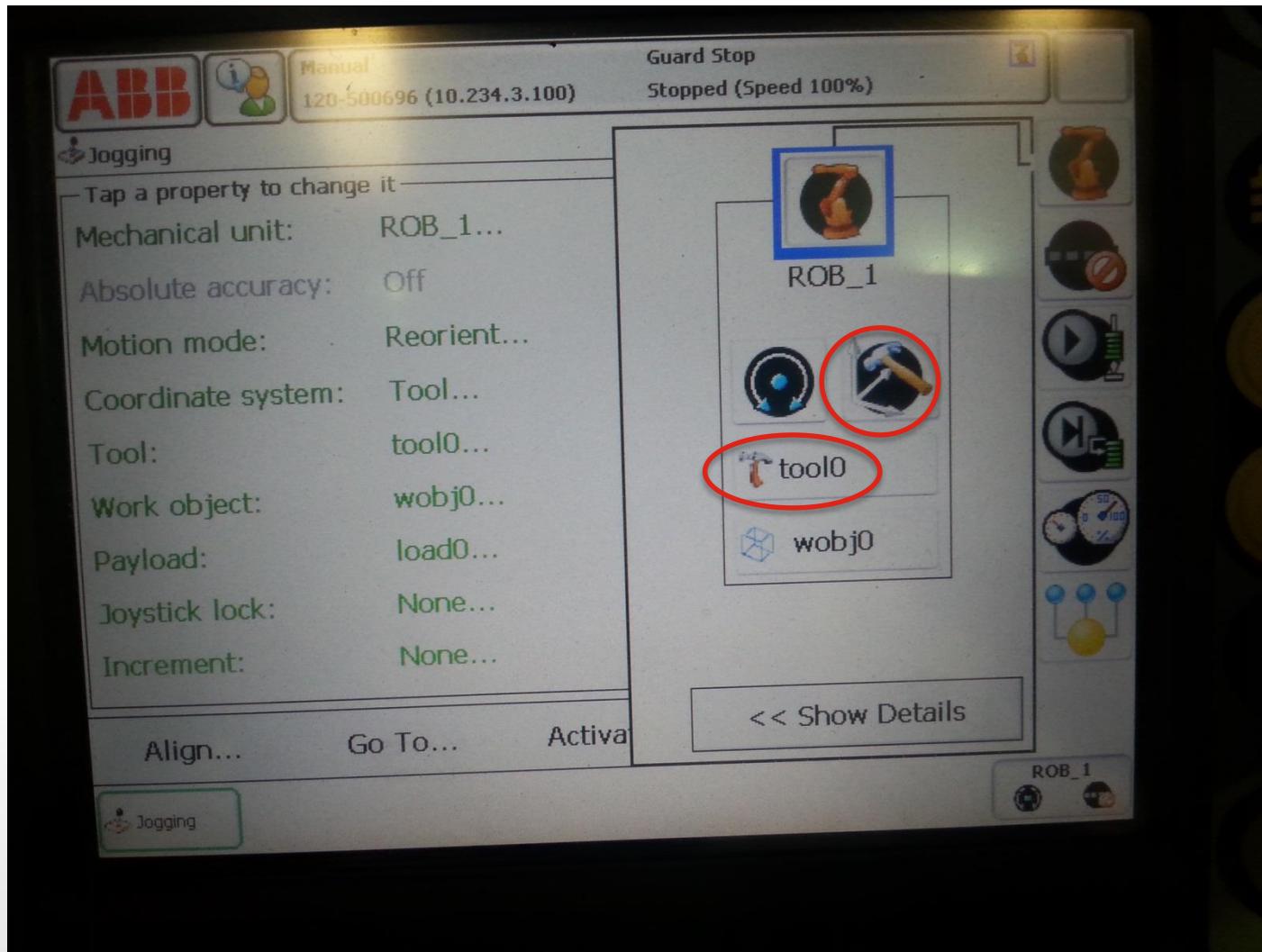
Jog the Robot – Linear / Re-orient

- The mode is now changed to “reorient”.



Jog the Robot – Linear / Re-orient

- Similar to the linear case, you can change the **frame** or the **tool**.



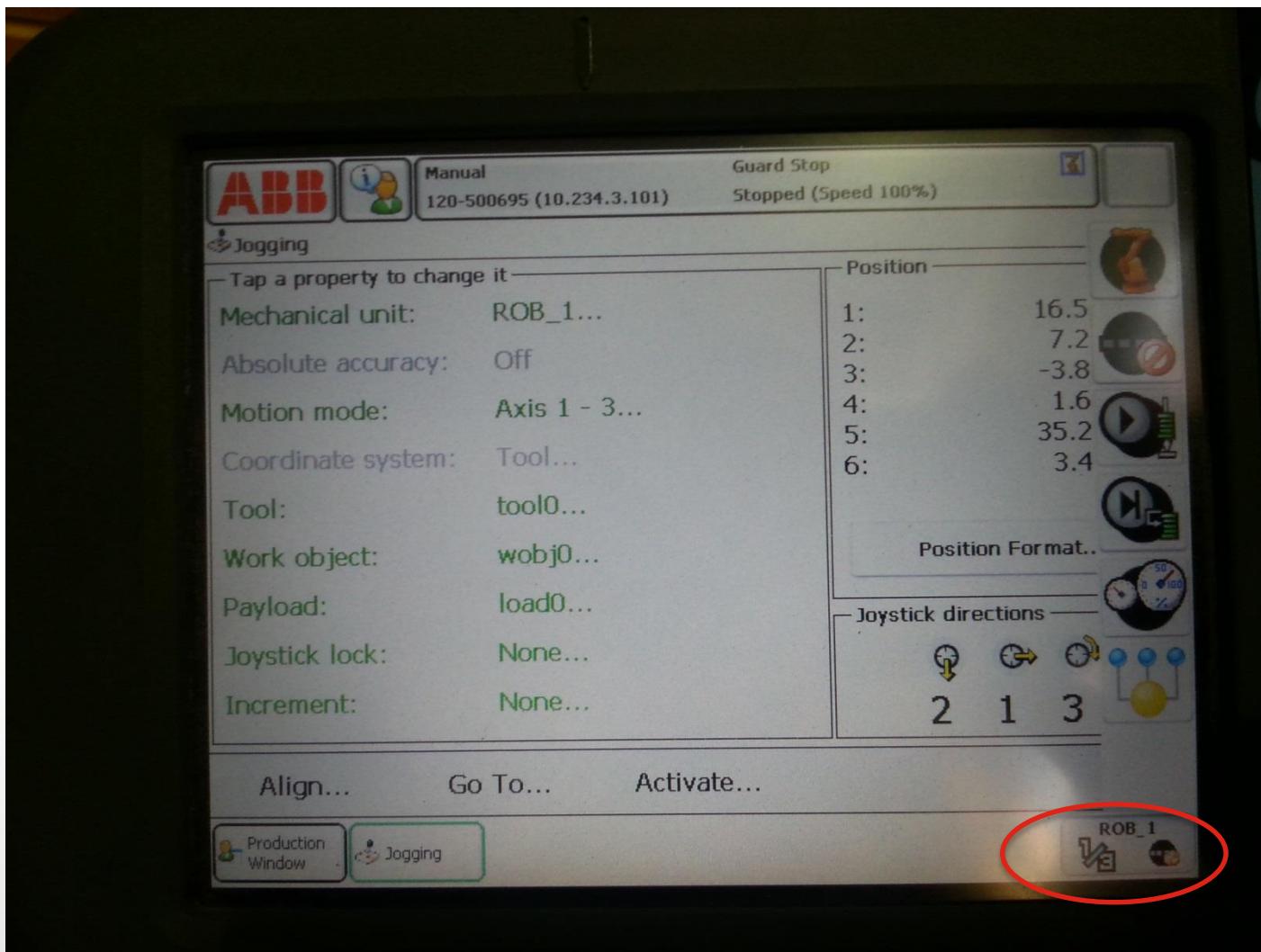
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Change Jogging Speed

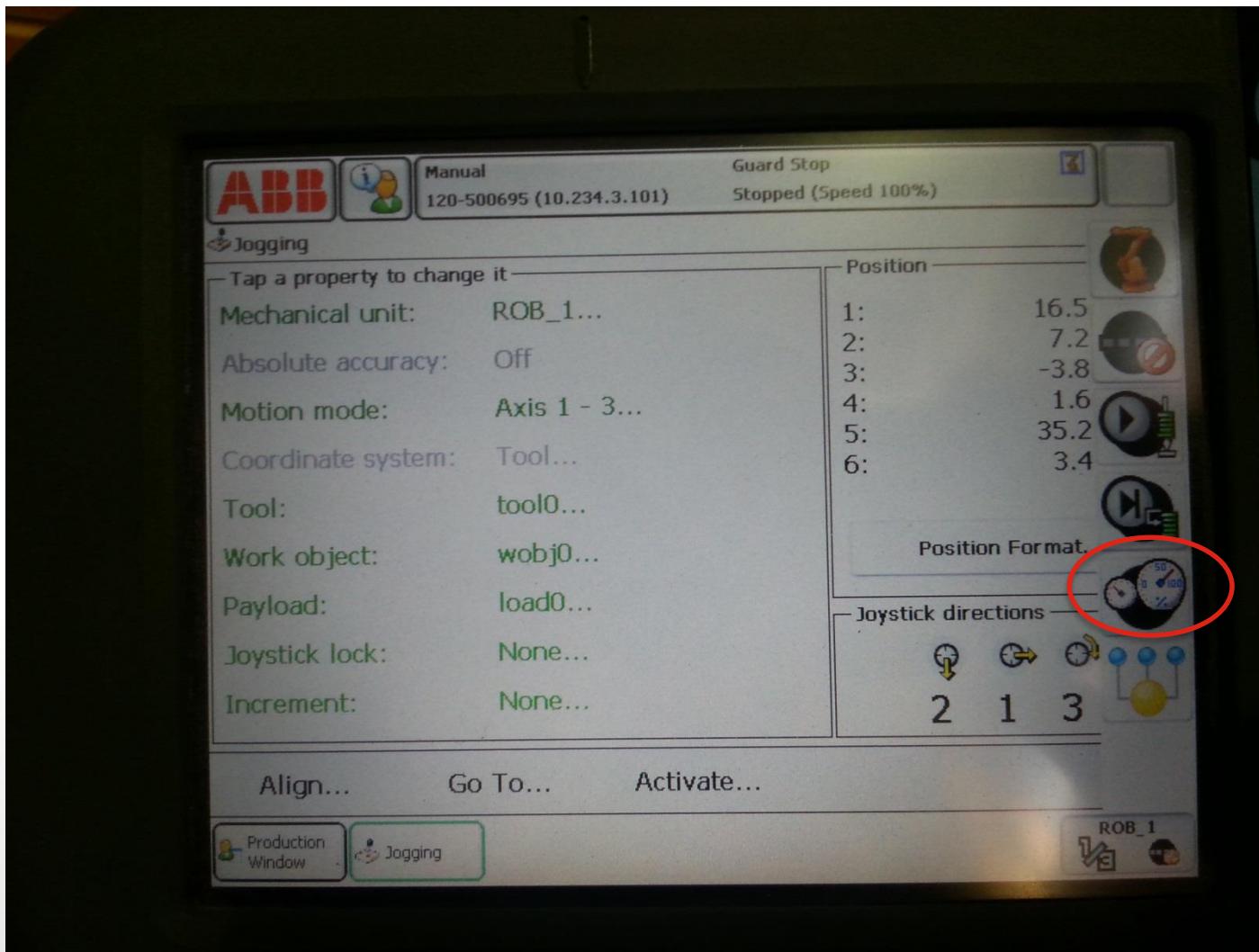
- Sometimes we wish to change the **speed of jogging**. Press the bottom button

and a column appears.



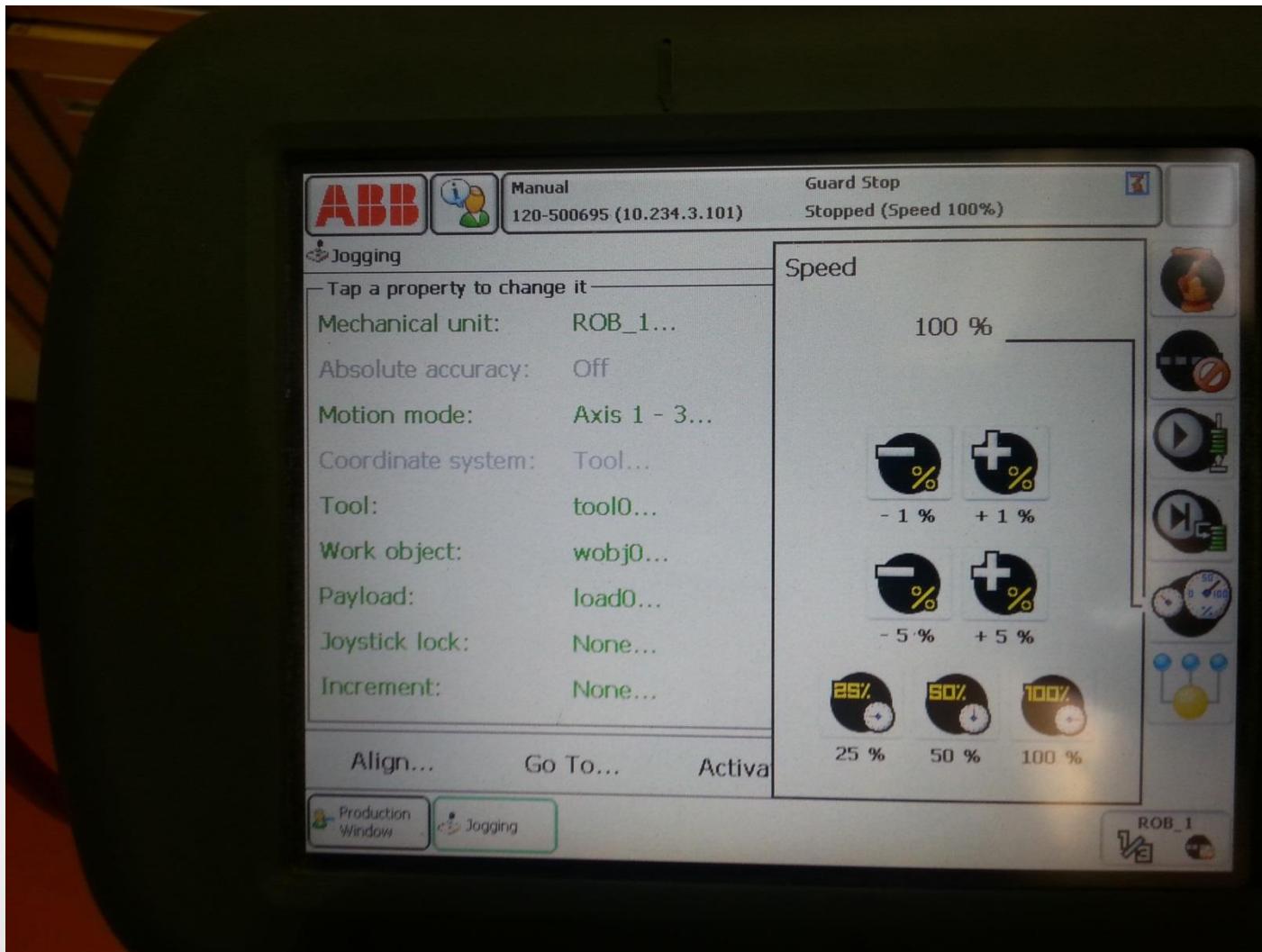
Change Jogging Speed

- Press the “speedometer”.



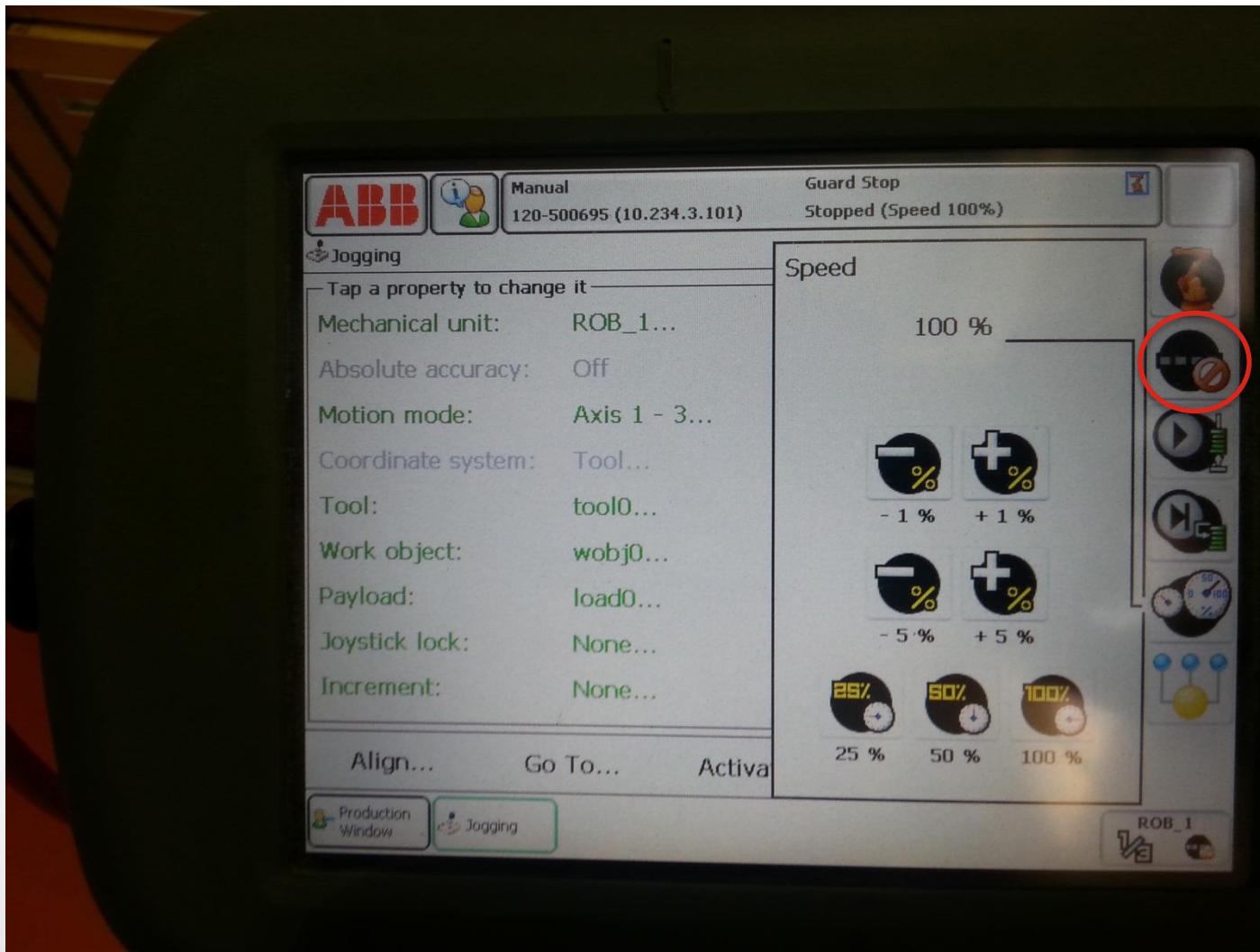
Change Jogging Speed

- You can choose the speed you want, or increment it by 1% or 5%.



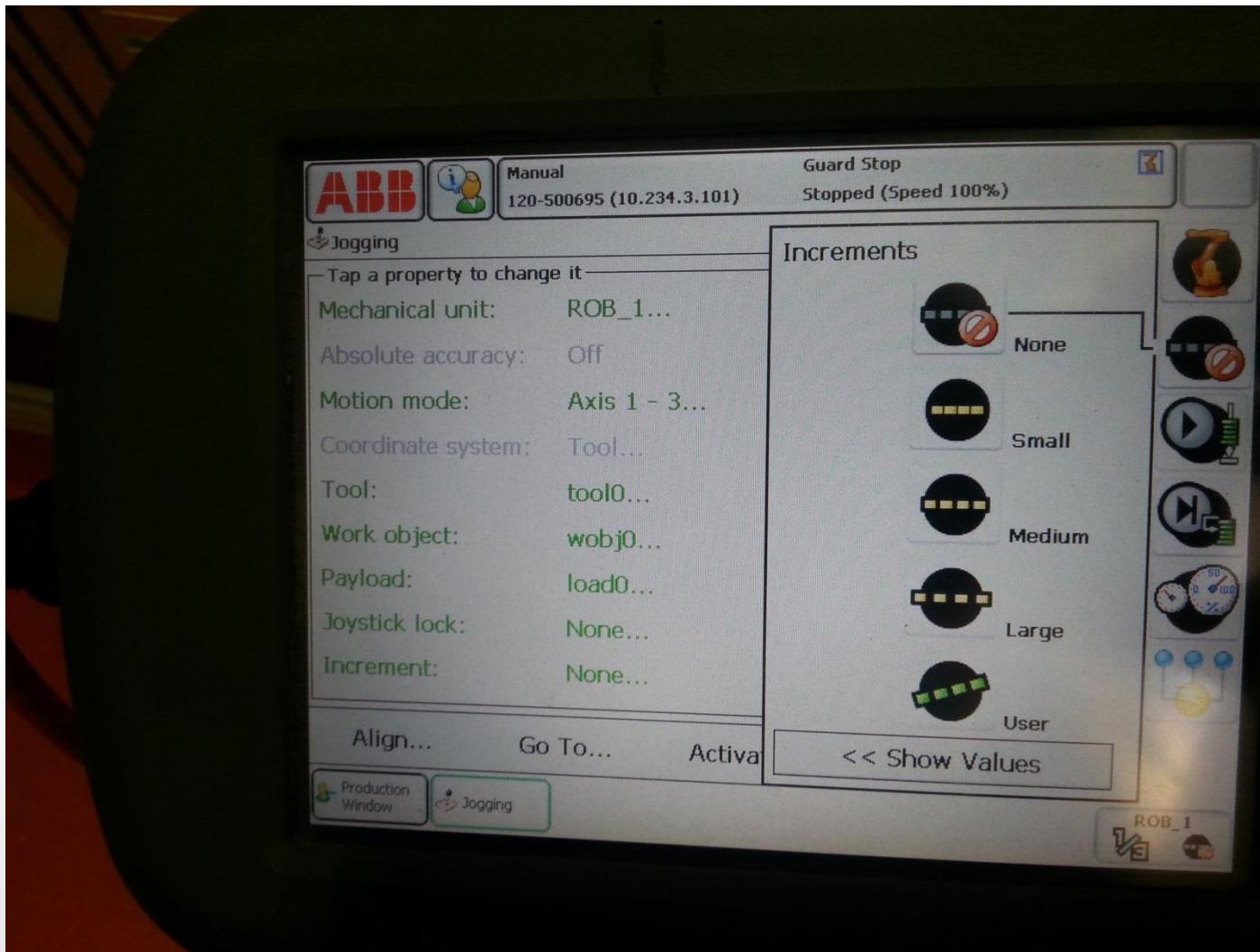
Change Jogging Steps

- We can also change the jogging steps. Press the “Steps” button.



Change Jogging Steps

- The steps can be chosen to be small, medium, large, or None (smooth).



Change Jogging Speed / Steps

- Practise changing the speed and steps, in conjunction with joint jogs or linear/re-orient jogs.
- This is very important when we perform tool or workpiece calibration later.

Thank you!

Have a good evening.

