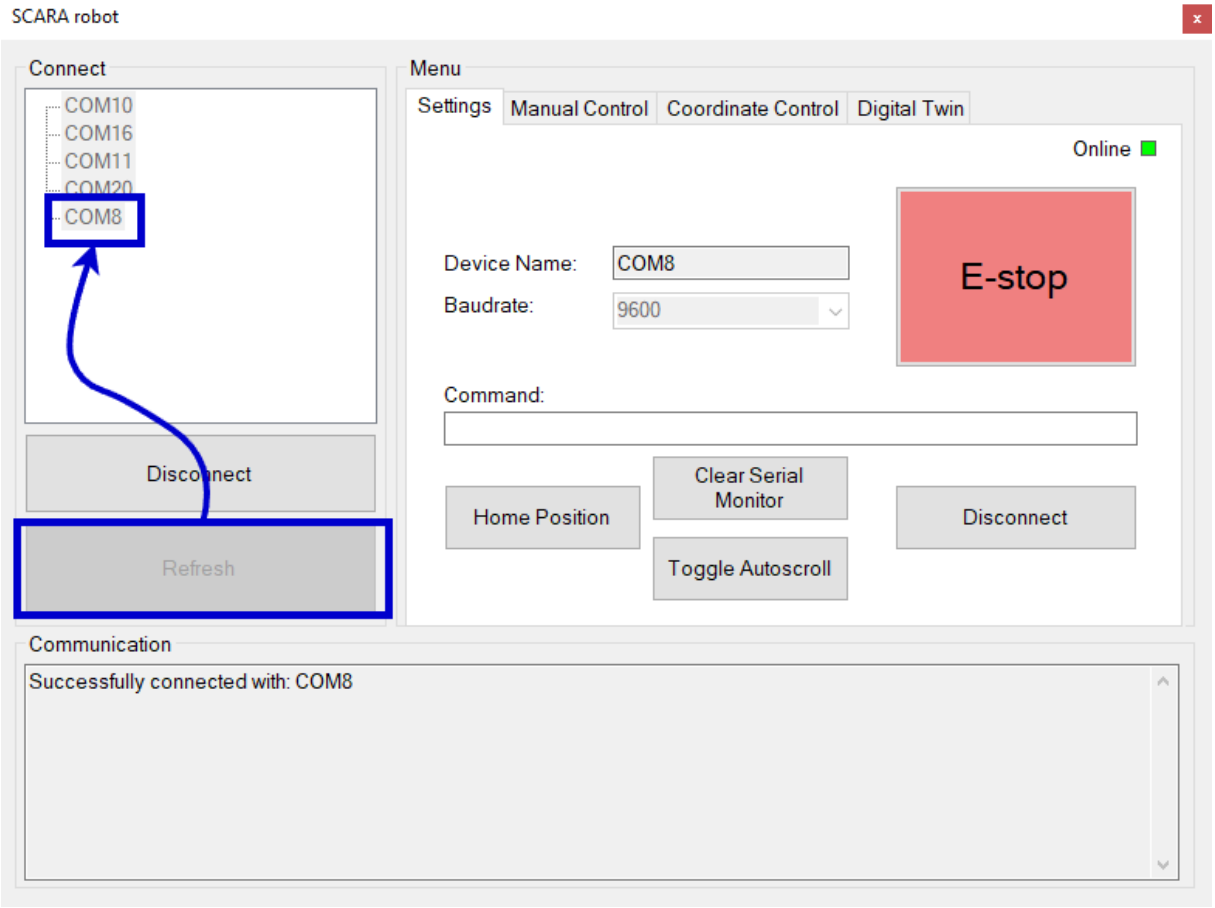
This manual will guide you through setting up, operating, and safely using your robot. Follow these steps carefully to ensure a smooth experience.

1. Connecting to the Robot

Before controlling the robot, you need to establish a connection with your computer.



Steps to Connect:

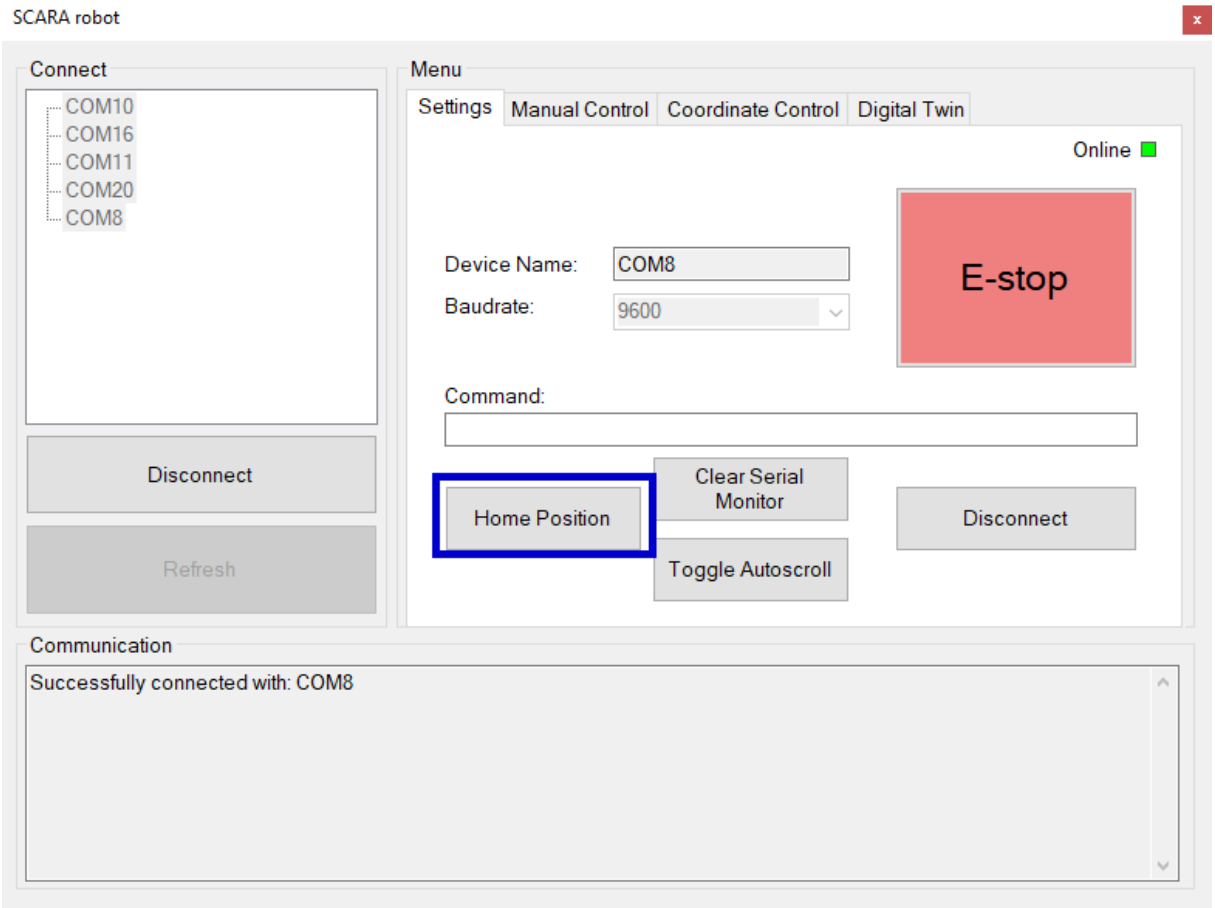
1. Plug in your Arduino – Connect it to your computer via USB.
2. Detect Devices – Press the "Refresh" button in the control interface to search for connected devices.
3. Select Your Arduino – It will appear as "com..." followed by a number.
4. Press "Connect" – A successful connection is confirmed by a message and a green LED in the interface.

Note: The interface remains disabled until the robot is connected!

2. Homing Procedure

Homing ensures the robot knows it's starting position. This must be done after:

- Powering on the robot
- Resetting the system on Arduino
- Uploading new code



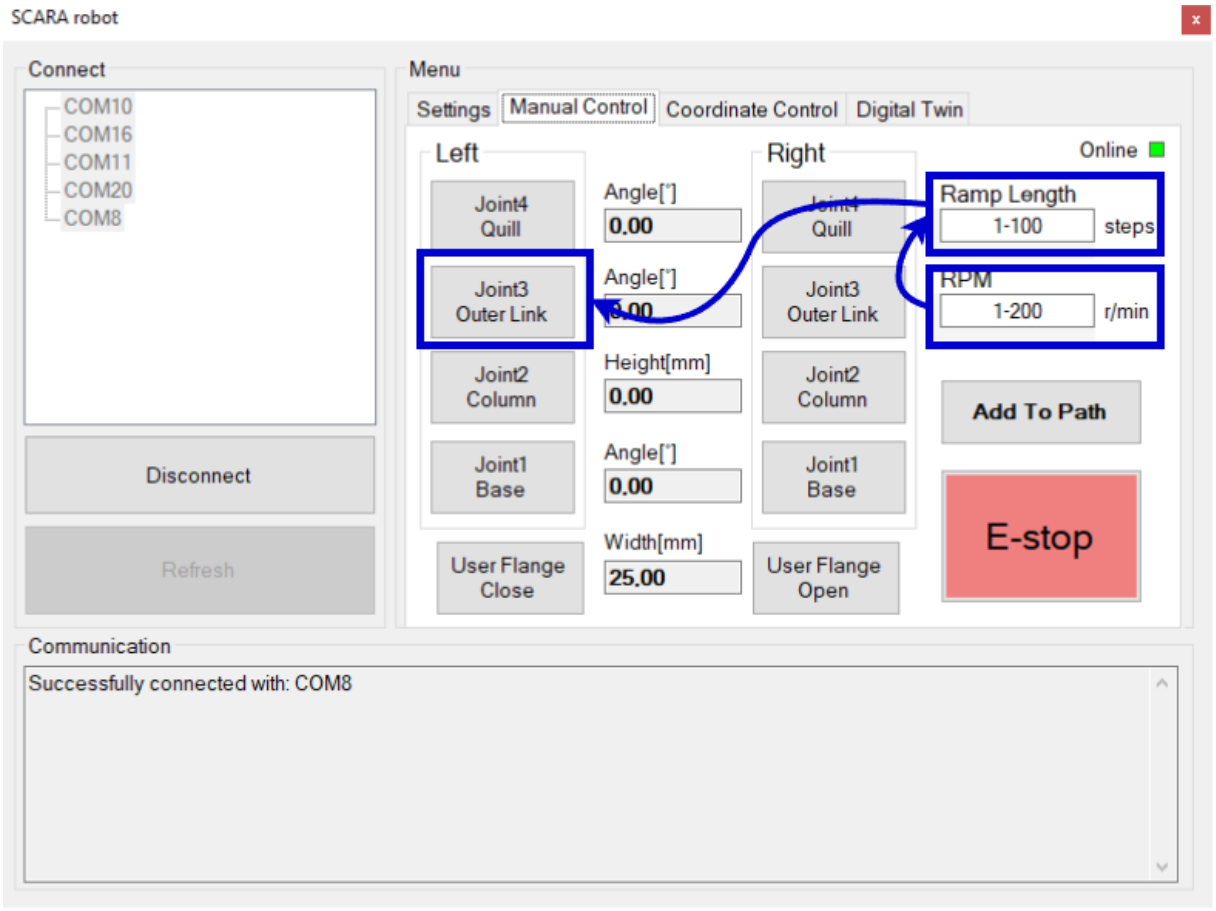
Homing Steps:

1. Ensure a clear workspace of at least 0.6m around the robot.
2. Start the homing procedure at the interface.
3. The robot will automatically calibrate the Z-axis using limit switches.
4. Once completed, the robot is ready for manual or coordinate control.

Important: Keep hands and objects away during homing to prevent collisions.

3. Manual Control

After homing, the robot's joints start at 0 degrees, and the Z-axis is centered.



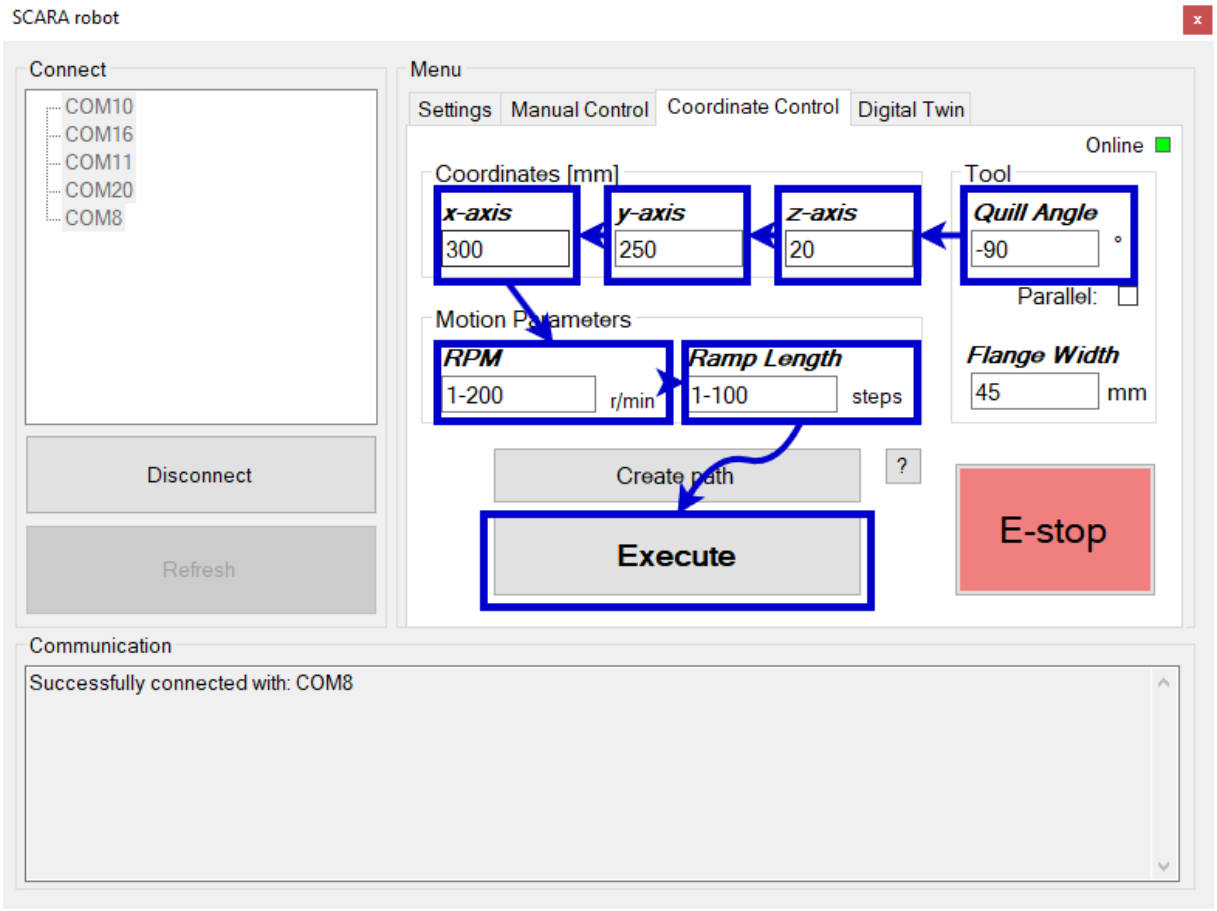
How to Move the Robot Manually:

1. Set the RPM (speed) and ramp length (smoothness of acceleration). Start with low values.
2. Press and hold a direction button to move a specific joint.
3. Release the button to stop movement.
4. View real-time angle updates in the interface.

Example: Pressing the right-hand button will move the Z-axis upwards.

4. Coordinate Control and Path Creation

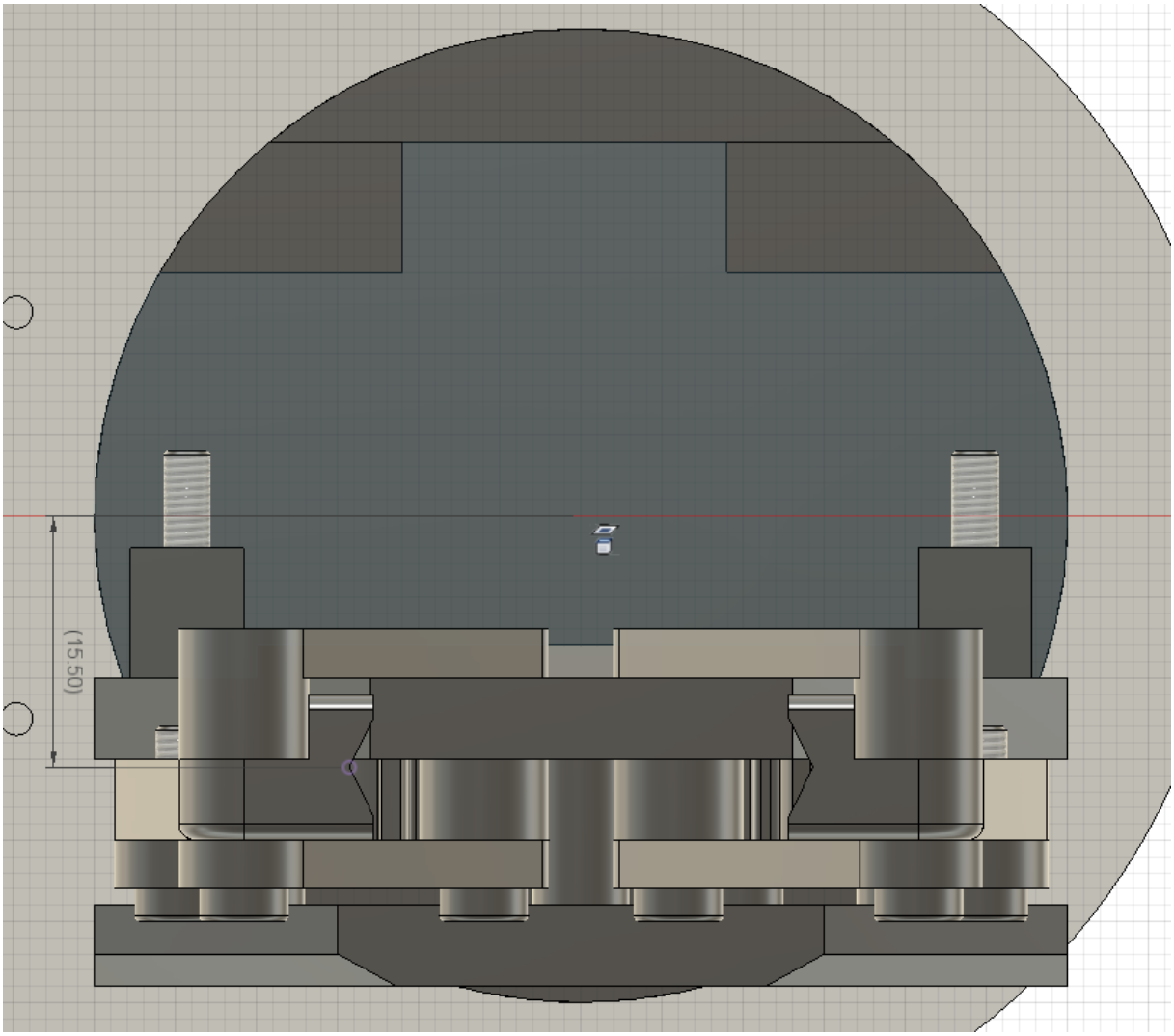
This mode allows precise movement to specific coordinates.

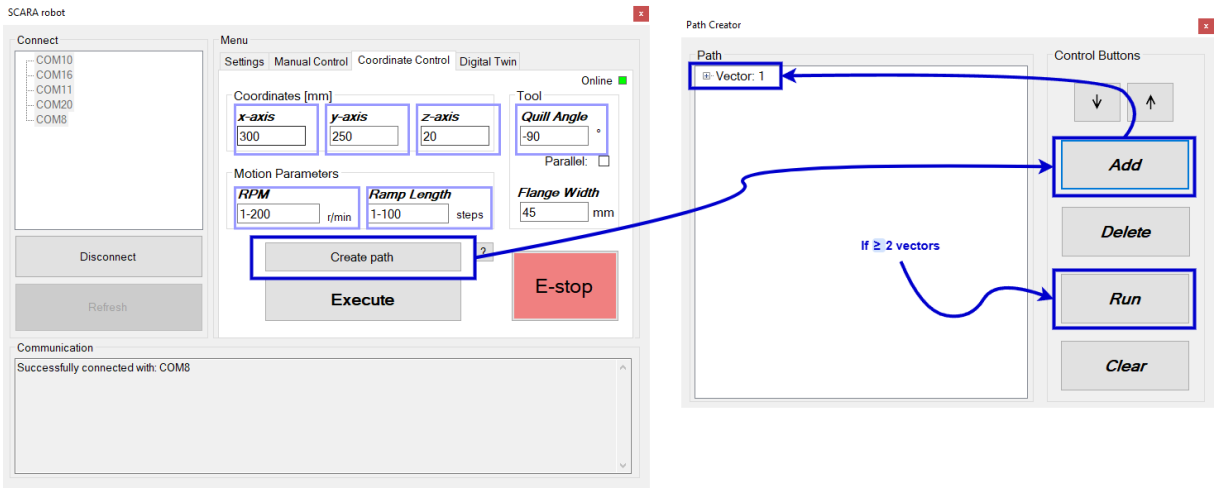


Moving to a Coordinate:

1. Open the possible workspace graph, by clicking on the question mark in “Coordinate Control” tab. It can help with understanding the robot’s coordinates.
2. Enter X, Y, Z coordinates and tool orientation (quill angle).
3. Set motion parameters (speed and acceleration).
4. Ensure the area is clear and there are no obstacles.
5. Press Execute to move the robot.

Note: The gripper is offset 15.5mm from the center of joint 4 center point.

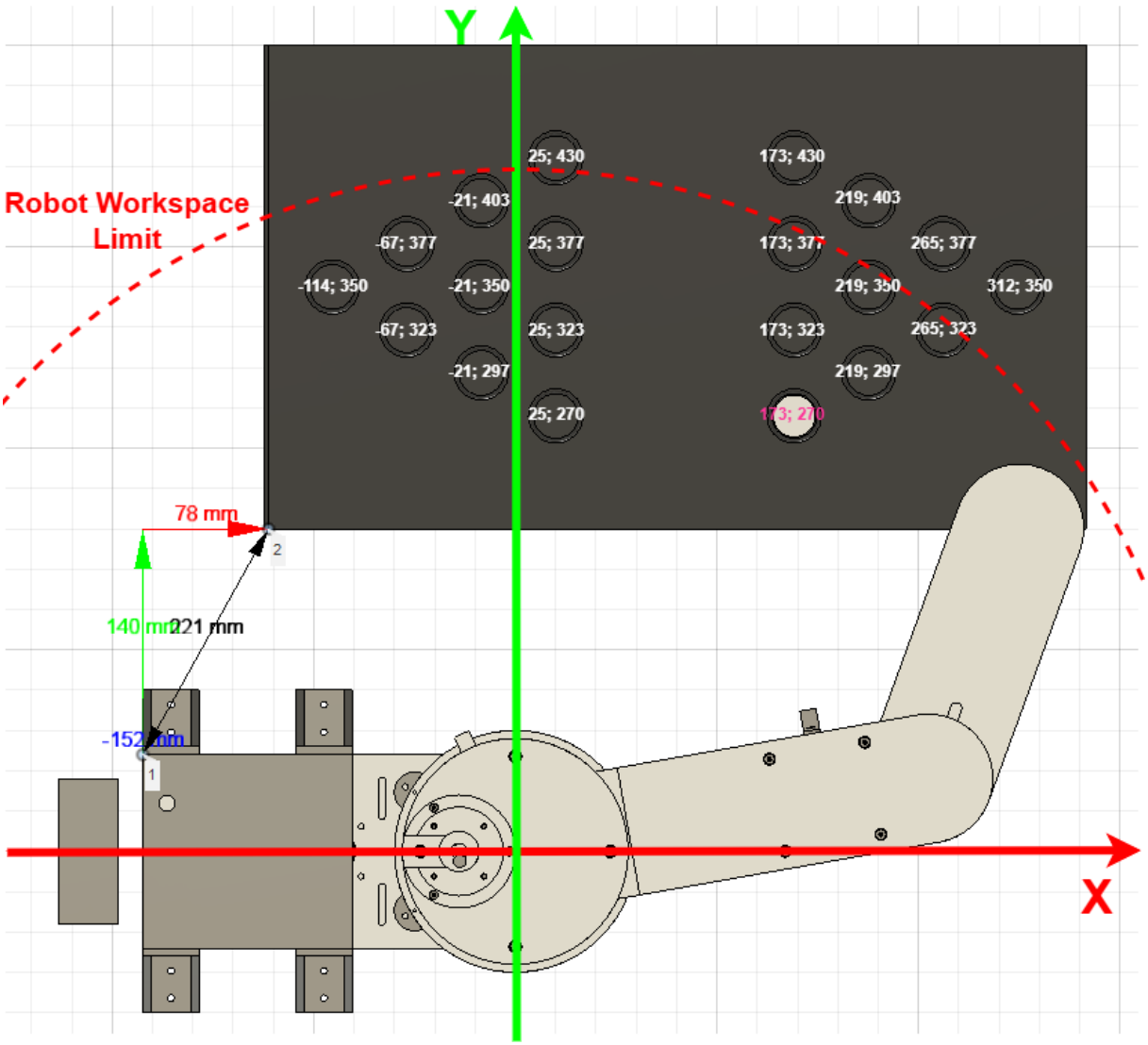




Creating a Path:

1. Click "Path Creator" to open the path planning window.
2. Add waypoints by selecting "Add" – at least 2 waypoints are required. It is always worth to check before, by executing, if the vector is in the range and satisfy our conditions.
3. Use the arrow buttons to reorder waypoints if needed.
4. Click "Run" to execute the sequence.
5. Use "Delete" to remove a waypoint or "Clear" to erase all waypoints.

Example**:** To draw a square, add waypoints at four different (X, Y) locations with the same Z height.


Y
X
Robot Workspace Limit
25; 430
173; 430
-21; 403
219; 403
-67; 377
25; 377
173; 377
265; 377
-114; 350
-21; 350
219; 350
312; 350
-67; 323
25; 323
173; 323
265; 323
-21; 297
219; 297
25; 270
173; 270
78 mm
140 mm
221 mm
-152 mm
1
2

5. Important Safety Precautions

Prevent Collisions: Keep the workspace free from obstacles.

Always pay attention: To robot movement especially the robot's electronic enclosure, if not on the collision path.

Adjust Z-axis limits: Prevent the tool from hitting the ground.

Start Slow: Use low speeds (50-100 RPM) while learning.

Check Limit Switches: If they don't respond, disconnect power and check wiring.

Supervise Operations: Always monitor the robot while it's running.

Be Cautious with the Gripper: It lacks a touch sensor, so avoid too tight gripping to prevent damage.

Restart if Needed: If the robot malfunctions, try resetting the Arduino by unplugging or restarting the software.

Troubleshooting Common Issues	
Issue	**Solution**
Robot not connecting.	Check the USB cable and port. Try restarting the software.
Homing is not complete.	Ensure limit switches are connected properly. Check wiring.
Robot moves inconsistently.	Start with lower RPMs and check the path sequence.
No response to controls.	Restart the Arduino and check the power supply.
Something doesn't work as it is supposed to.	Immediately cut the power supply on the left side of the robot and unplugged the Arduino!

Do not touch electronics or robots when robot is either connected to power supply or while working!

This is an open-source project, meaning parts are easy to replace at a low cost. If something goes wrong, don't panic! Most issues can be fixed with a simple reset or minor adjustments.

Enjoy using your SCARA Robot!-