PULSE
ROBOTIC ARM

QUICK-START GUIDE

ROZUM
ROBOTICS

GETTING STARTED WITH THE PULSE ARM

It takes the **SIX STEPS** to get started with the PULSE ARM:

STEP 1. Mount the arm.

STEP 2. Connect the arm with the control box, the local network, and the peripheries

STEP 3. Switch the arm

STEP 4. Set communication with the arm

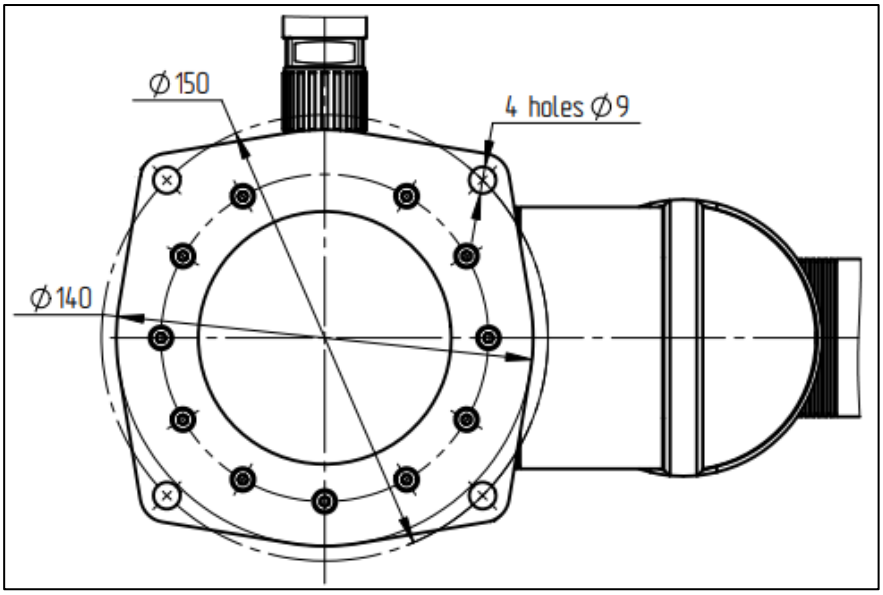
STEP 5. Start the PULSE DESK

STEP 6. Run a sample program

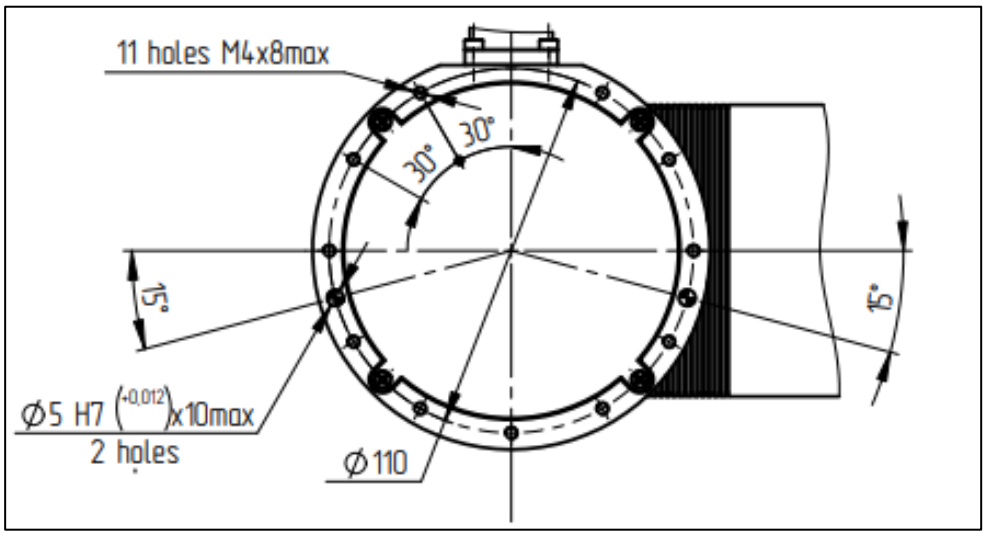
STEP 1. Mount the arm.

1. Unpack and position the arm vertically.
2. Holding the arm tight on the body, bolt it down onto a mounting surface using one of the following methods:

   Method 1. Insert four M8 bolts into the 9-mm dia. holes on the edges of the transition plate pre-assembled with the arm and tighten the bolts up.



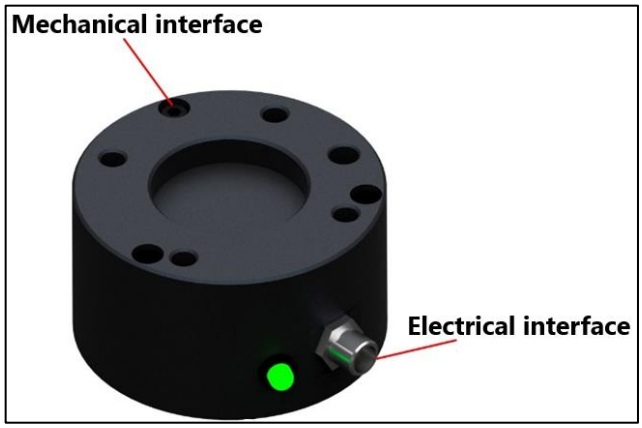
   Method 2. Dismantle the transition plate pre-assembled with the arm by removing the 2 pins and 11 bolts that hold together the arm base and the plate. Then, use the same 2 pins and 11 bolts to bolt down the arm base to the mounting surface.



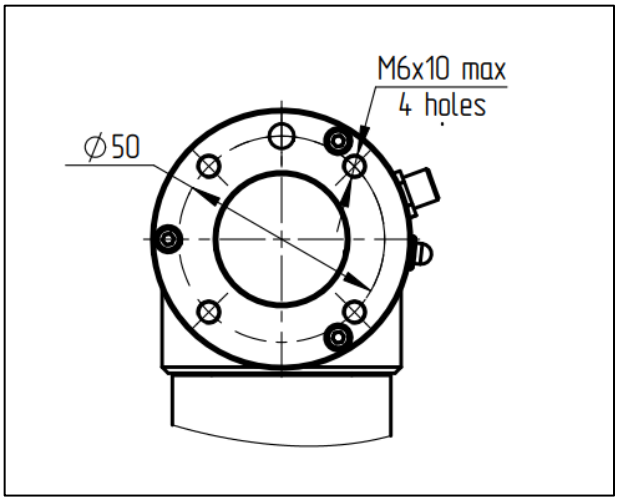
This is it! The arm is now ready for STEP 2.

STEP 2. Connect the arm with the control box, the local network, and the peripheries

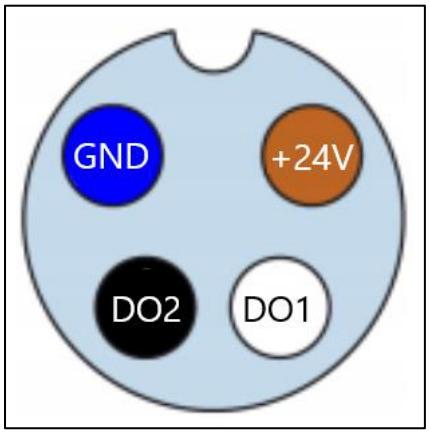
1. Attach your selected end effector, using the **mechanical** and **electrical interfaces** on the wrist of the robotic arm as illustrated below:



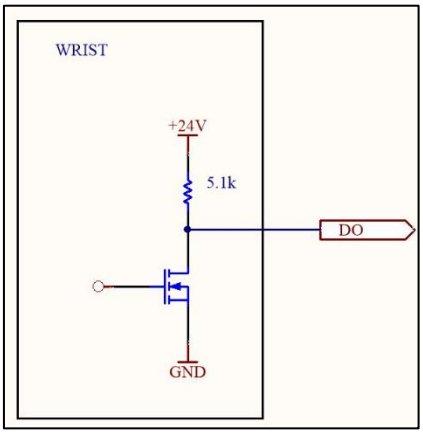
Mechanical interface



Electrical interface



*DO = digital output



*DO = digital output

2. Connect the arm with the control box, using the 48V hybrid cable from the supply package. The cable should run from the connector at the bottom of the robotic arm to the 48V connector on the back panel of the control box.

A robotic arm from a specific supply package is compatible only with the control box from the same package!

3. Plug the emergency stop button cable (attached to the button) into the appropriate connector on the back panel of the control box as shown below

4. Connect the 220V power cable included in the supply package to the power supply connector on the back panel of the control box.

5. Connect the arm directly to a personal computer (PC), using the Ethernet cable.

6. *(Optional)* To connect any required additional equipment (e.g., a sensor, a safeguard, a PLC) to the robotic arm, use the digital inputs and outputs on the back panel of the control box.

Note: *For detailed connection requirements and parameters, refer to the* ***HARDWARE INSTALLATION MANUAL.***

The arm is now ready for switching at STEP 3!

STEP 3. Switch the arm

Do not move the arm manually until the initialization is over and the wrist LED on the arm is steady green!

1. Plug the power cable connector into the mains socket.
2. Flip the power switch on the back panel of the control box to the ON position.

The control box starts receiving power and initializing. During the initialization, the LED on the arm wrist is off, while the green LED on the control box is blinking.

Once the initialization of the control box is over, the green LED goes from blinking to steady green. Then, the arm starts initializing, too.

After the arm initialization is over, the wrist LED turns steady green.

Now, you can go to Step 4!

STEP 4. Set communication with the arm

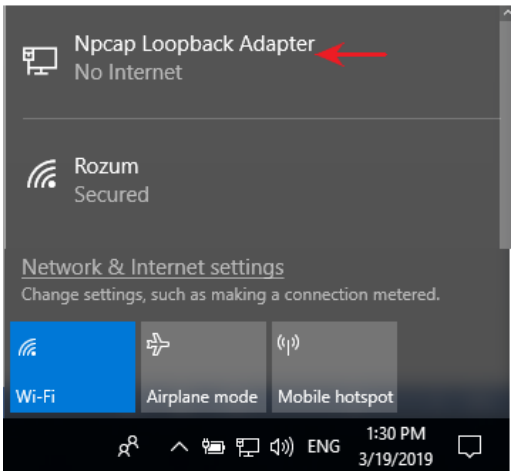
For the quick start, the robotic arm is connected directly to a PC. Therefore, to set communication with the arm, use a **static IP**. For the arm, the static IP is **10.10.10.20 by default**.

Below, you will find the instructions how to set communication via a static IP, depending on the operating system in use.

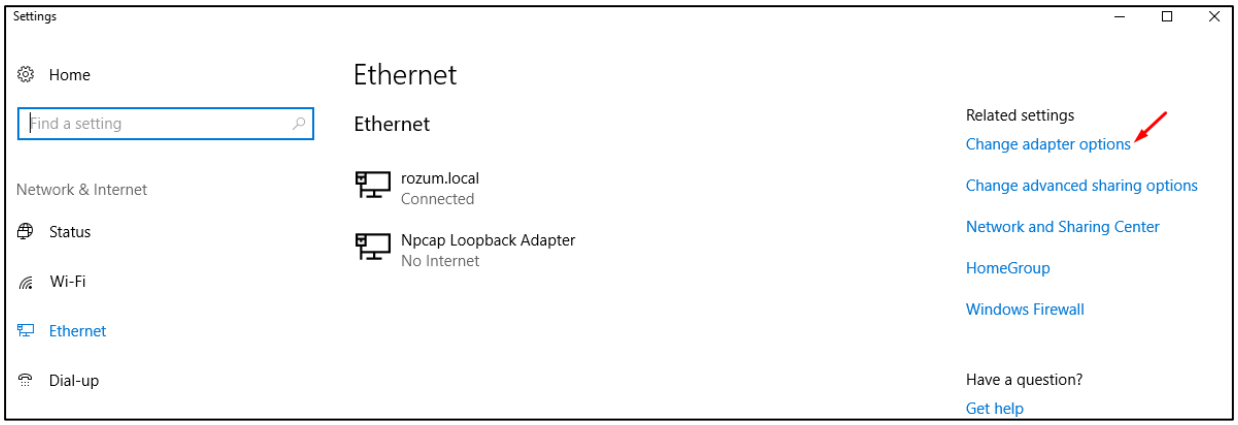
Windows OS

1. Switch on your PC.
2. In the right-hand corner of the Taskbar, left-click the network connection indicator.

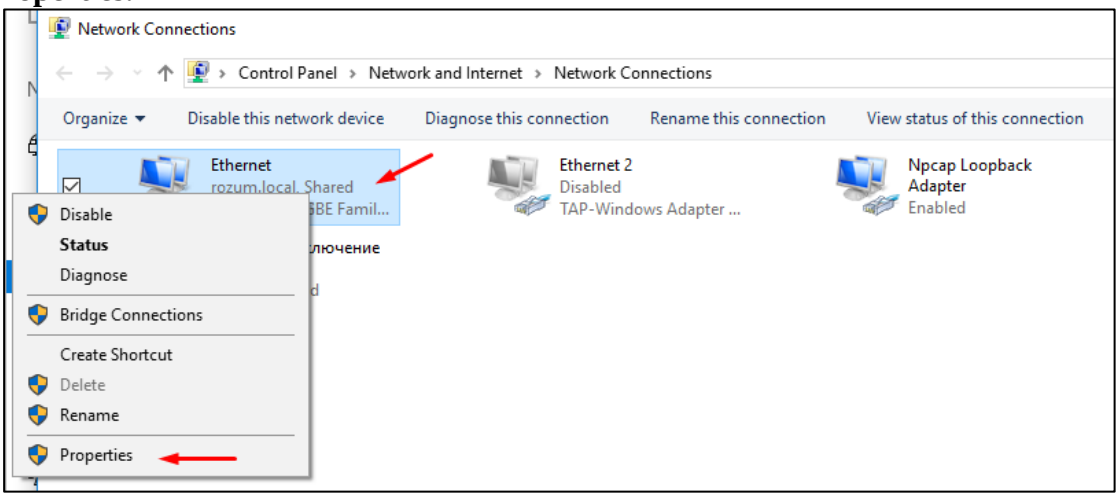
3. Among the displayed connection options, select **Npcap Loopback Adapter**.



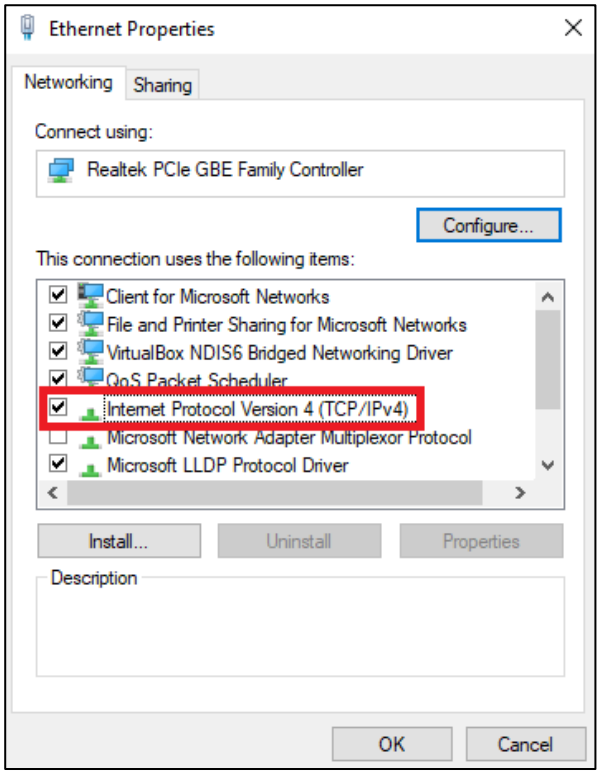
4. In the displayed Ethernet settings window, click **Change adapter options.**



5. In the displayed **Network Connections** window, right-click the **Ethernet** icon and select **Properties.**

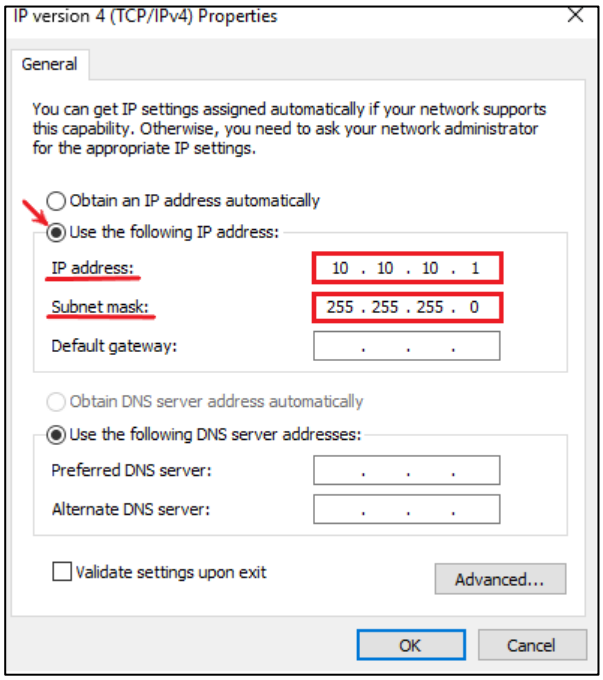


6. On the **Networking** tab in the displayed **Ethernet properties** window, double-click **Internet Protocol Version 4 (TCP/IPv4).**



7. In the **IP Version 4 (TCP/IPv4) Properties** window, select **Use the following IP address** and set the **IP address** and the S**ubnet Mask** fields to the values as shown below.

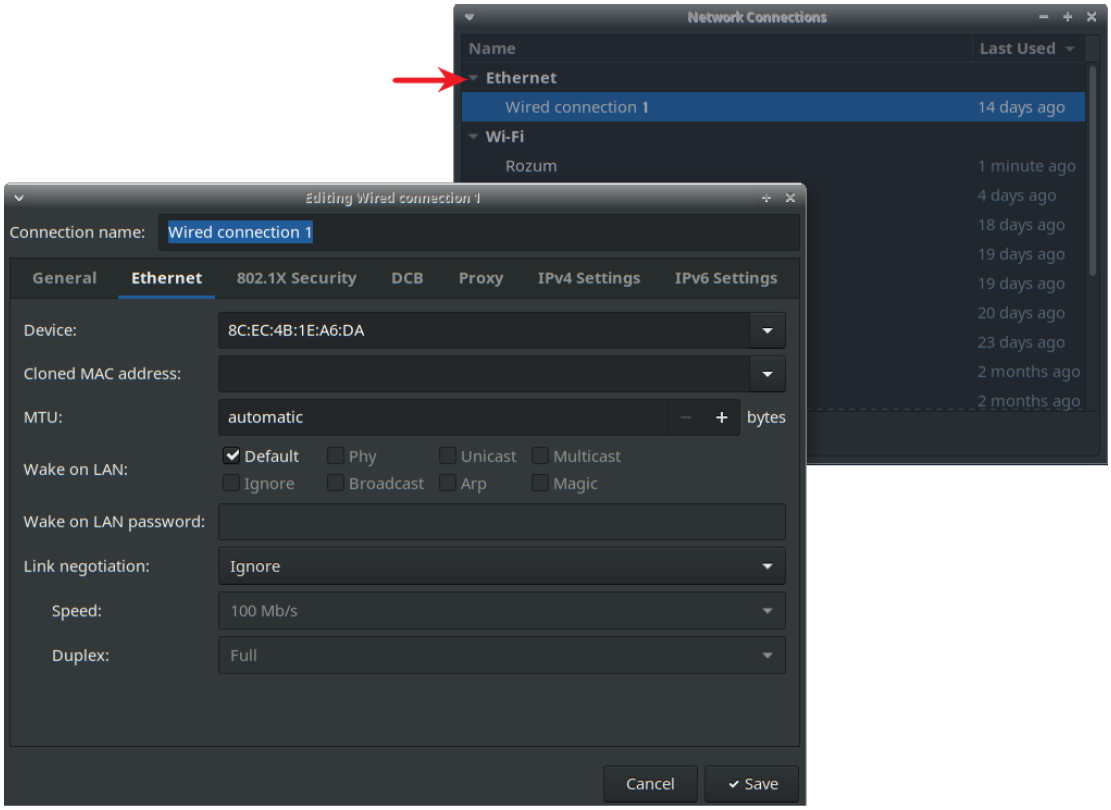
For the last digit in the IP address field, you can use any value from 1 to 255, except for 20, since 10.10.10.20 is the default static IP address of the arm.



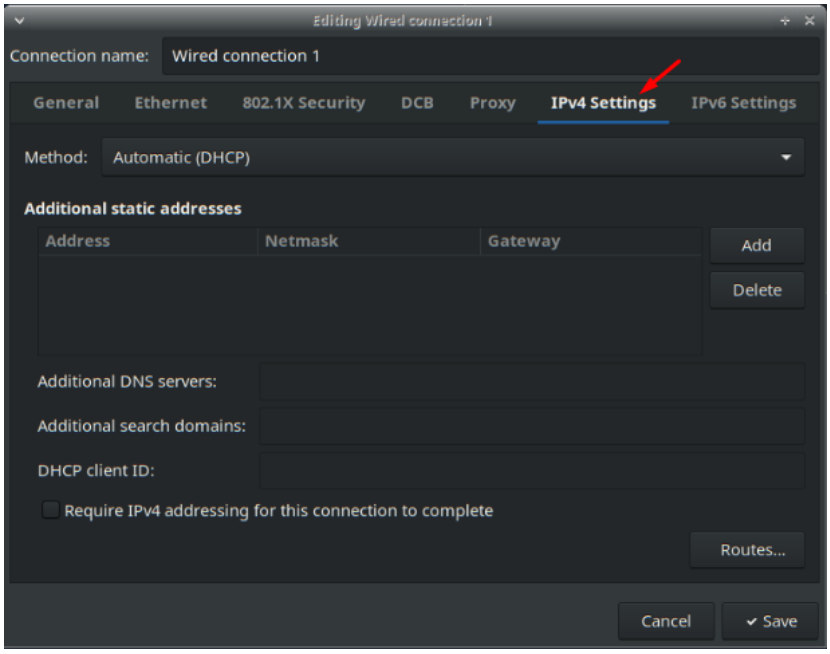
8. Click **OK** to confirm the settings.

Linux OS

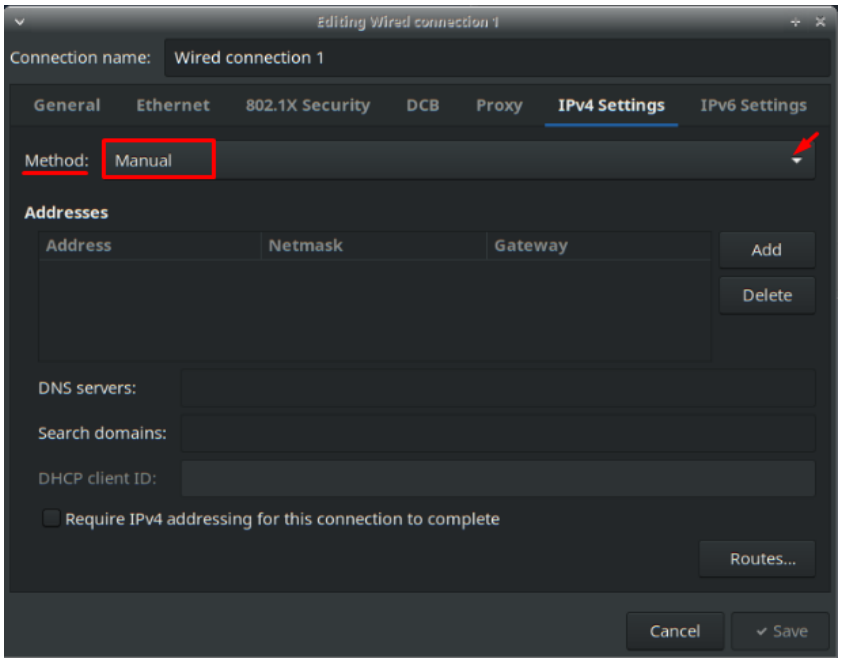
1. Switch on your PC.
2. Open **Network Connections** and double-click **Ethernet** to open the editing window as shown below.



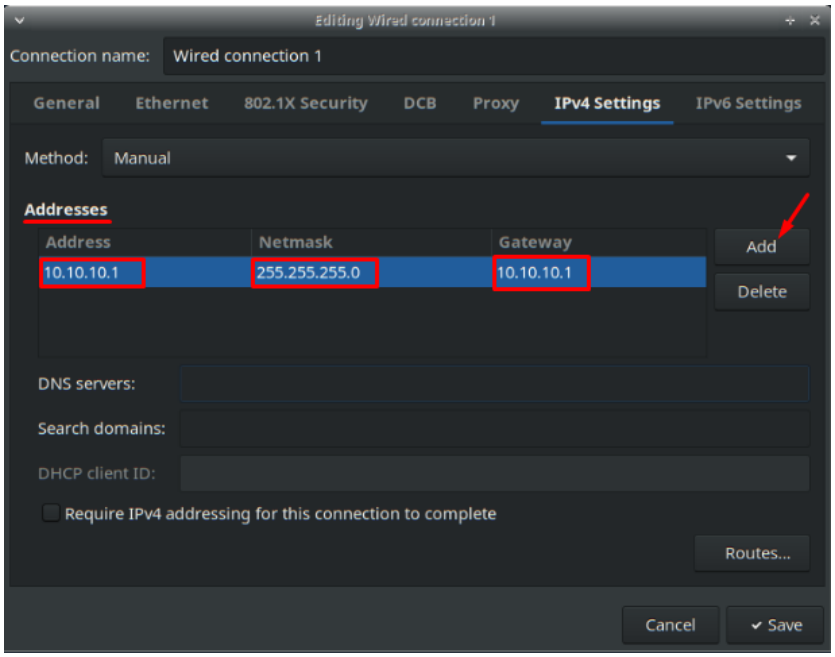
3. In the displayed window, select the **IPv4 Settings** tab.



4. In the **Method** dropdown box on the **IPv4 Settings** tab, select **Manual.**



5. In the **Addresses** area on the same tab, click **Add** and specify the **Address, Netmask**, and **Gateway** as shown in the figure below.



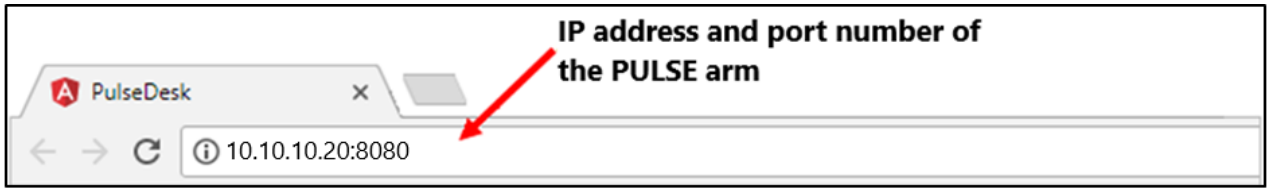
Specifying the last digits in the Gateway and the Address fields, it is possible to use any value from 1 to 255, except for 20, since 10.10.10.20 is the default static IP address of the arm.

6. Click the **Save** button to confirm the settings.

Now, you have all you need to start working with it via the PULSE DESK user interface!

STEP 5. Start the PULSE DESK user interface

1. Open a browser.
2. In the browser line, type in either the default static IP address 10.10.10.20 and the port number 8080.



The browser page displays the starting screen of the PULSE DESK user interface.

Now, you can start programming the PULSE arm using the interface. To help you make your first steps, we provide a sample PULSE DESK program in Step 6.

*For a more detailed program, refer to the **PULSE DESK USER MANUAL.***

STEP 6. Run a sample program

Task: To perform a pick-and-place operation, moving an object (e.g., a nut) from one location to another.

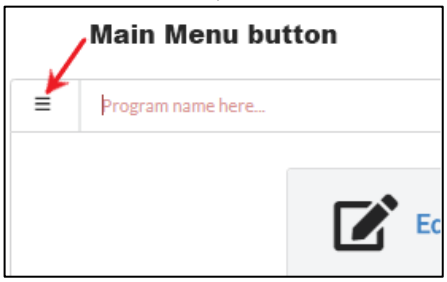
All parameter values are for reference only. To create a program for your purpose, use your own values specific to your application and operating conditions.

The general recommendation is to observe the following sequence:

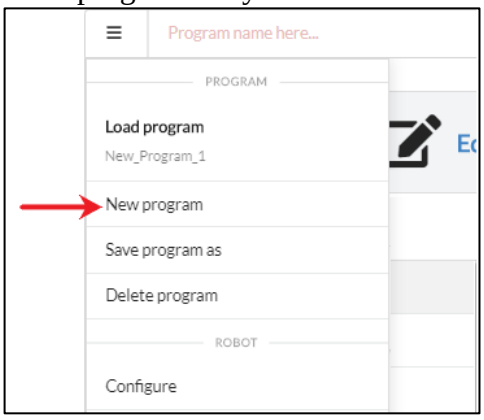
1. **Creating a new program**
2. **Setting a basic trajectory by hand guiding**
3. **Setting intermediary waypoints**
4. **Verifying and editing the trajectory**
5. **Conducting a test run**
6. **Executing and stopping the program**

Creating a new program

1. On the screen displayed at PULSE DESK start, click the **Main Menu button**.



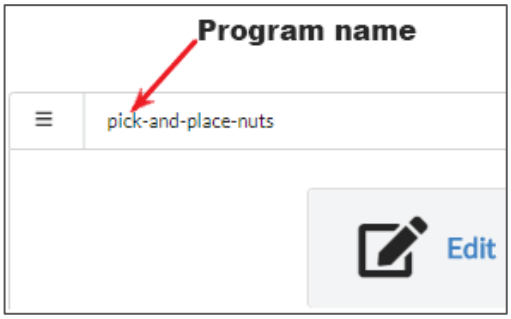
2. On the **Main menu**, select **New program**. PULSE DESK loads the **Edit** screen with the **Wait for** command already in the program body.



Simultaneously, you will see the wrist LED turn yellow. This means the LEARN mode is now on, and the control buttons on the arm elbow are enabled.

3. On the **Main Menu**, select **Save program as** and type in a name for your program (e.g., *pick-and-place-nuts*) in the displayed dialog box.

4. Click **Yes** to confirm saving the program under the name and close the dialog box. The specified name appears in the **Program Name** field.

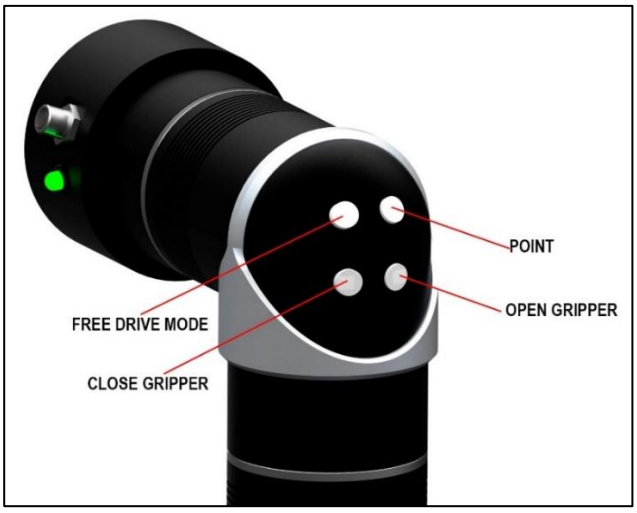


Setting a basic trajectory by hand guiding

For the particular trajectory, we will use the buttons on the arm elbow (see the figure below) to set **three basic waypoints**:

- **Point 1**—start position
- **Point 2**—to pick up the object from its initial location
- **Point 3**—to move the object from its initial location to another spot

In addition, we will **add commands to open/close the gripper** at the waypoints.



The elbow buttons are active in the LEARN mode only. When you switch to the PULSE DESK interface to perform any actions (e.g., to edit a point, add a command via the Commands menu), the mode is off. To switch back into the LEARN mode, you will have to create a new program.

5. Press the **Free Drive** button on the elbow of the robotic arm to set the arm into the **Free Drive mode**.

   The LED turns blue and you can now drive the arm to any position manually.

In the Free Drive mode, the arm joints are not locked. Make sure to hold the arm tightly, providing proper support, to avoid damages due to the robot falling.

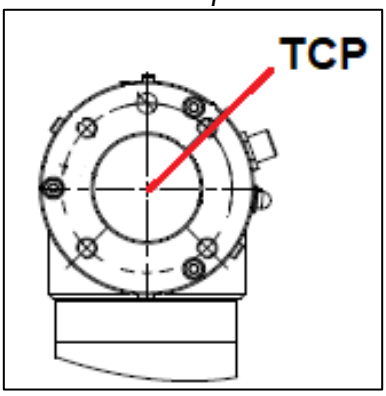
6. Set the arm into a starting pose by hand guiding. The recommended starting pose is as illustrated below.

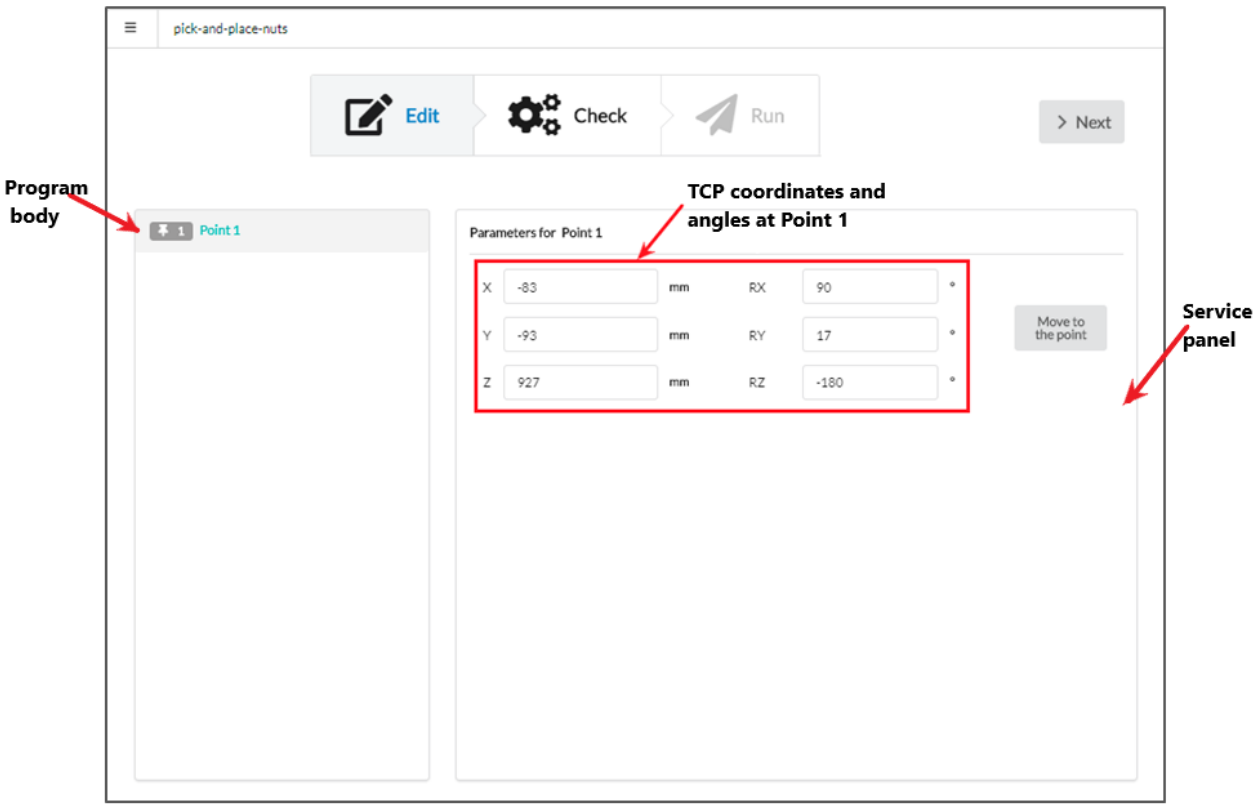
7. Once you are in the required starting pose, press the **Free Drive** button again. The arm goes to the **Freeze mode**, which means its joints are locked in their current positions.
8. Press the **Point** control button to remember the arm pose as the first waypoint in the required trajectory.

   Now, if you look at the screen of your PC, you will see the following:

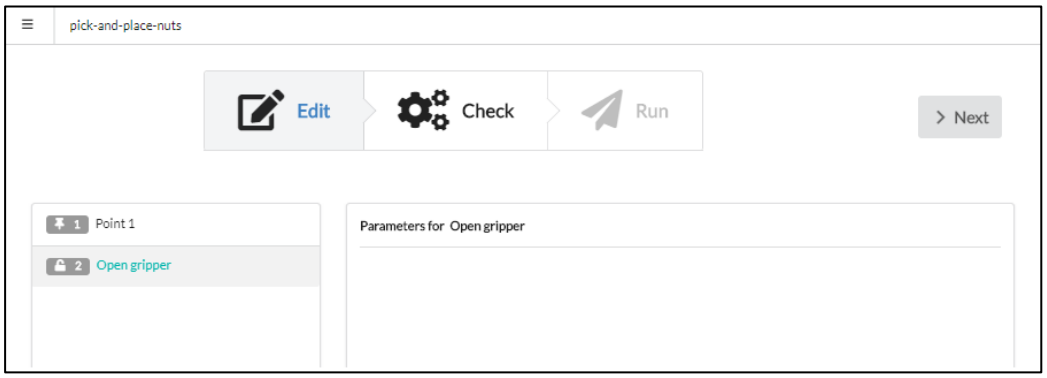
- PULSE DESK adds the point to the program body (default name **Point 1),** clearing the **Wait for** command.
- The **Service panel** displays **Point 1** parameters—the coordinates and rotation angles of the tool center point (TCP) in the position.

Physically, the TCP is located at the centre of the arm wrist as shown below.





9. With the arm in the same pose, press the **Open gripper** button. The **Open gripper** command appears below **Point 1** in the program body.

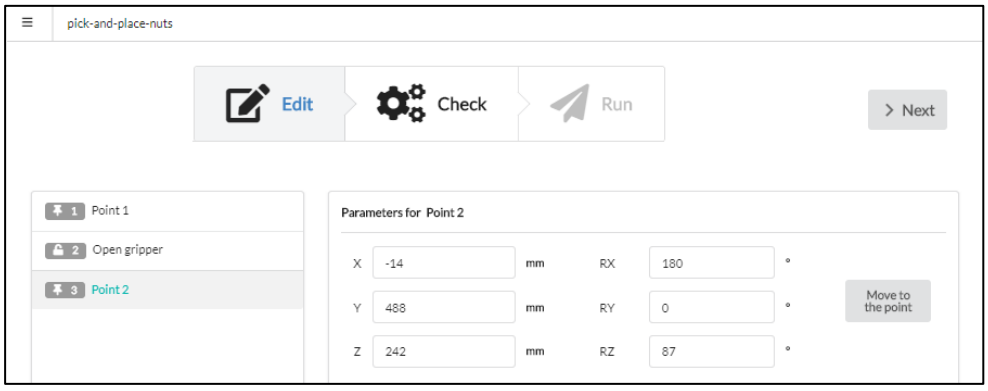


10. Press the **Free Drive** button to switch the arm back into the **Free Drive** mode. Drive the arm by hand guiding towards the nut so as to pick it up from its original location.

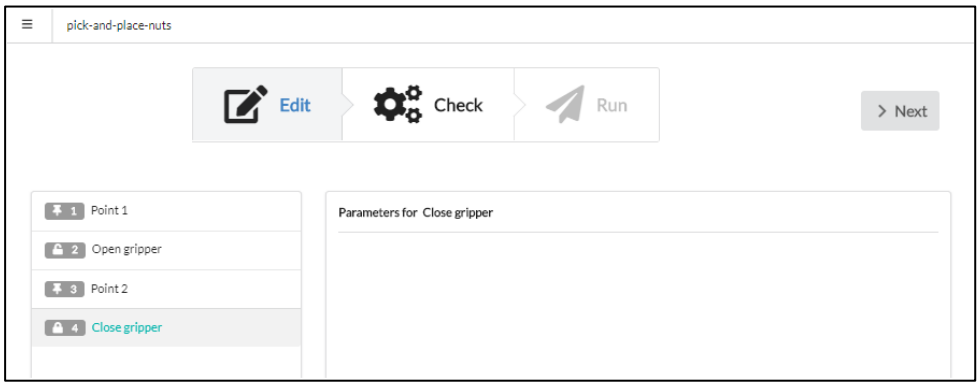
11. Once the gripper is in the right position and orientation to pick up the nut, press the **Free Drive** button again to freeze the arm in the pose.

12. Press the **Point** button to remember the pose as **Point 2** of the required trajectory.

    A corresponding command line (default name **Point 2**) appears in the program body. On the **Service panel**, you can see the TCP coordinates and rotation angles specifying the arm position at the point.



13. To grab the nut at **Point 2**, press the **Close gripper** button on the arm elbow. The corresponding command appears below **Point 2** in the program body.

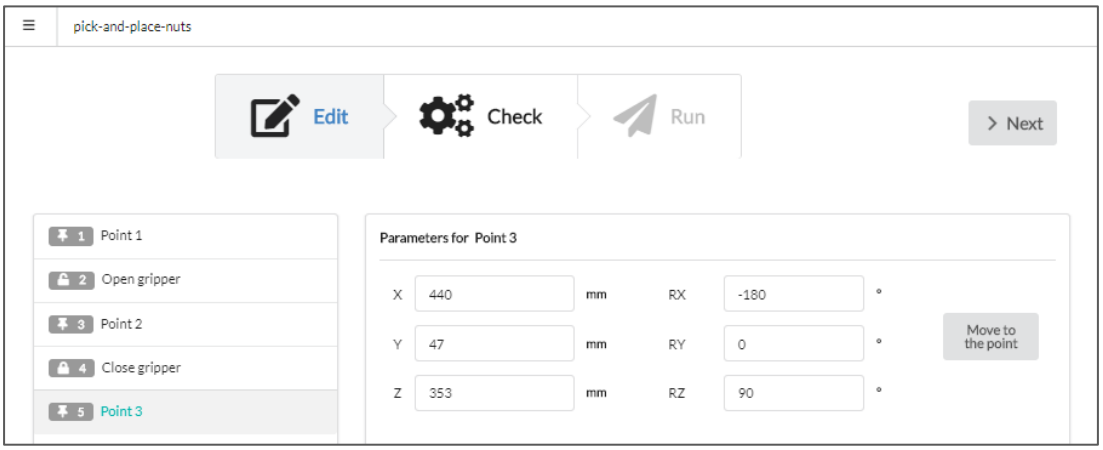


14. Press the **Free Drive** button to switch the arm back into the **Free Drive** mode. Drive the arm by hand guiding to move the nut from its original location to another spot**.**

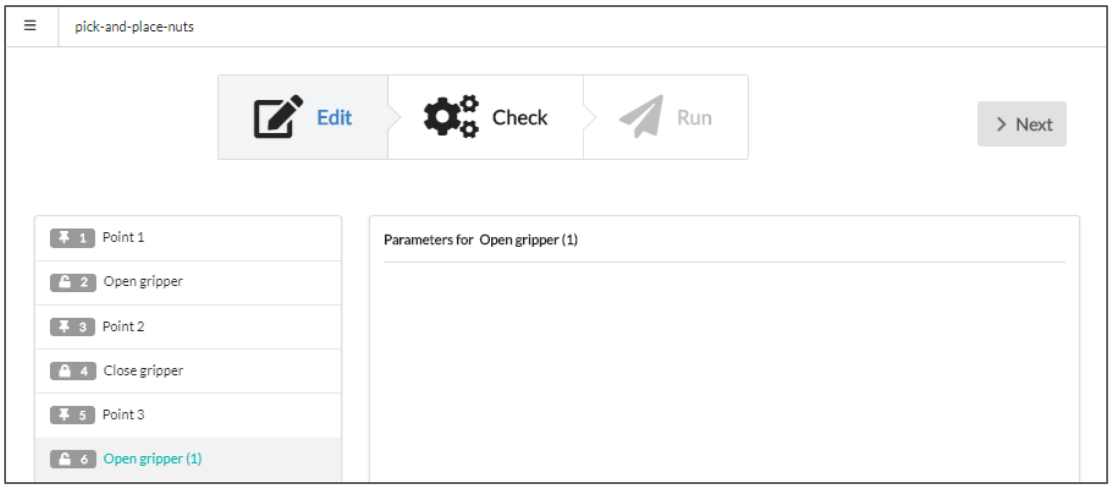
15. Once the gripper is at the required spot, press the **Free Drive** button again to freeze the arm in the pose.

16. Press the **Point** button to remember the pose as **Point 2** of the required trajectory.

    A corresponding command line (default name **Point 3**) appears in the program body. On the **Service panel**, you can see the TCP coordinates and rotation angles specifying the arm position at the point.



17. To open the gripper and release the nut at the spot, press the **Open gripper** button. The **Open gripper (1)** command appears below **Point 3** in the program body.

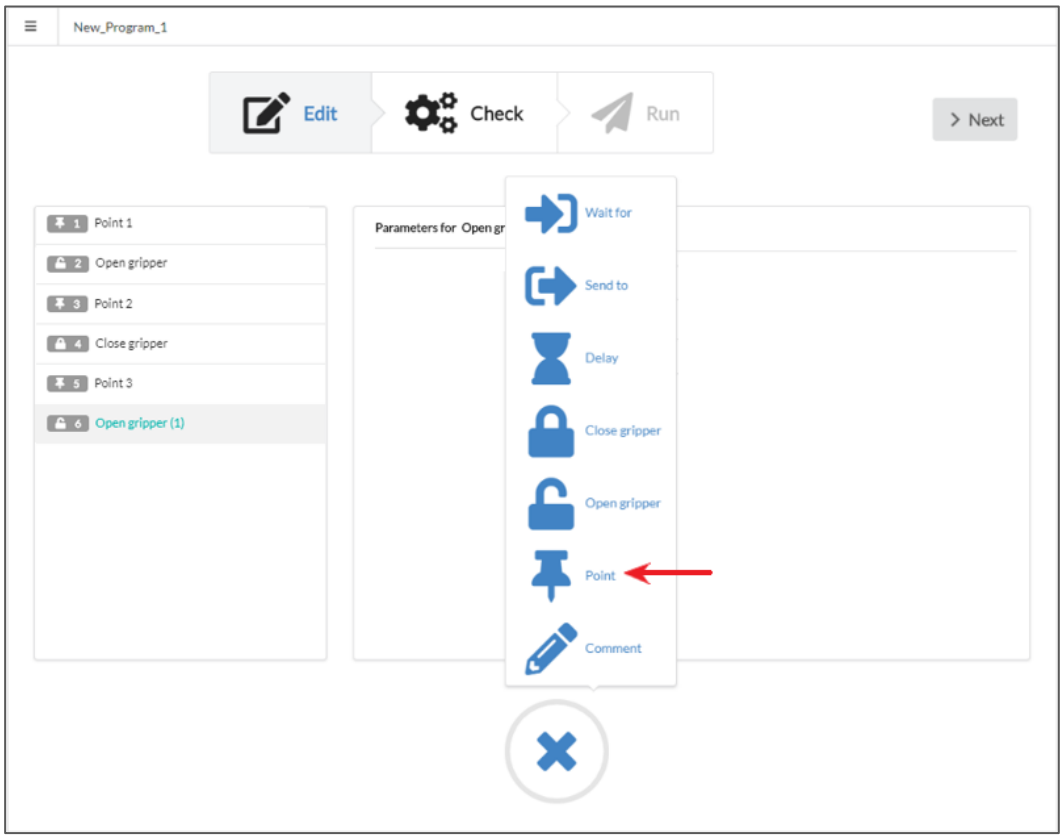


Now that a basic pick-and-place trajectory is set, you can start working with **Add commands menu**. Your next task is to add intermediary points to make the arm trajectory smoother.

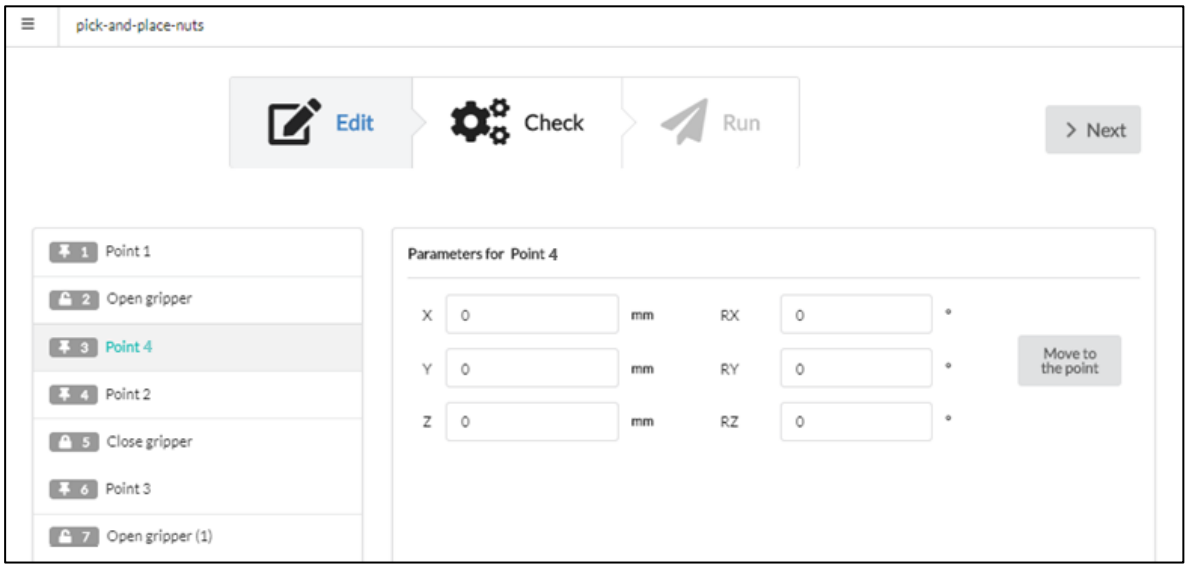
Setting intermediary waypoints

In this particular case, we set up **two intermediary waypoints** for each of the already preset points in the basic trajectory—**Point 2** and **Point 3**. One of the intermediary waypoints is to approach a preset point before lowering the gripper and the other—to lift the gripper before moving on to another waypoint. In addition, we will set **an end pose** to finish the program.

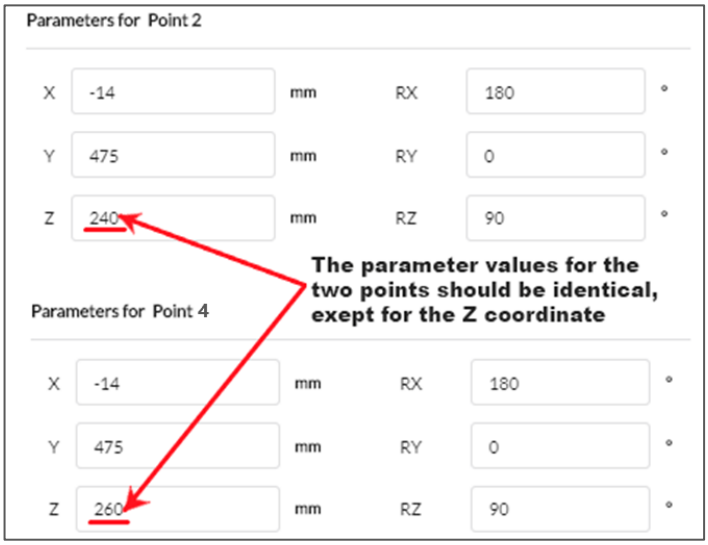
18. Add an intermediary waypoint to approach **Point 2**. To do this, select the command preceding the point in the program body. Click ⊕. In the displayed menu, select **Point.**



A new command line (default name **Point 4**) appears in the program body preceding **Point 2**. The parameter fields on the **Service panel** for the new command contain default zeros.



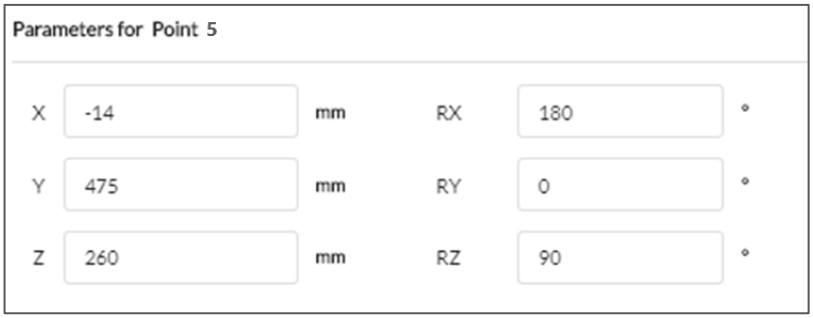
19. In the parameter fields on the **Service panel** for **Point 4**, type in the same coordinates and rotation angles as for **Point 2**. The **only change** you need to make is to adjust the Z coordinate to a higher value so that the gripper at **Point 4** would be slightly above **Point 2**.



20. Set an intermediary waypoint to lift the gripper at **Point 2**. To do this, select **Close gripper** in the program body and click ⊕**.** In the displayed menu, select **Point**.

    A new command line (default name **Point 5)** appears in the program body below **Close gripper**. The parameter fields on the **Service panel** for **Point 5** contain default zeros.

21. In the parameter fields on the **Service panel**, specify the same coordinates and rotation angles as for **Point 4**.



22. To set an intermediary waypoint to approach **Point 3,** select the command preceding the point in the program body. Click ⊕. In the displayed menu, select **Point.**

    A new command line (default name **Point 6**) appears in the program body preceding **Point 3**.

23. Instead of the default zeros on the **Service panel** for **Point 6**, specify the same coordinates and rotation angles as for **Point 3.** The only change you need to make is to adjust the Z coordinate to a higher value so that the gripper at **Point 6** would be slightly above **Point 3**.

24. To set an intermediary waypoint to lift the gripper at **Point 3**, select **Open gripper (1)** in the program body and click ⊕. In the displayed menu, select **Point**.

    A new command line (default name **Point 7)** appears in the program body below **Open gripper (1)**.

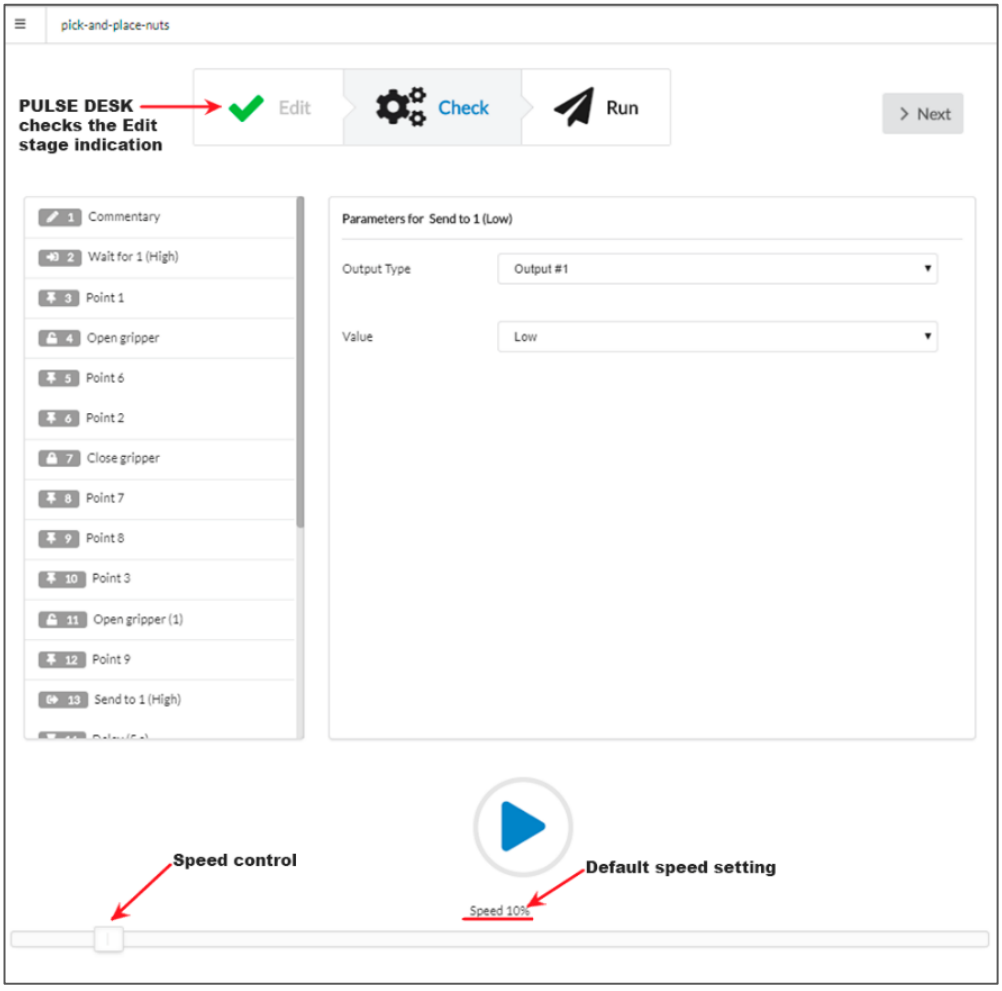
25. In the parameter fields on the **Service panel**, specify the same coordinates and rotation angles as for **Point 6**.
26. Set the end pose. To do this, click + and choose **Point**. In the parameter fields on the **Service panel**, set the same coordinates and rotation angles as for the starting position.

Verifying and editing the trajectory

27. To verify **Point 1**, select the point in the program body. On the **Service panel**, click the **Move to the point** button to see how the arm moves to the specified position.
28. Adjust the coordinates and rotation angles on the **Service panel**, changing manually the values in the parameter fields**.**
29. Repeat the same actions as described in **Step 27 to 28** to verify and adjust the rest of the points in the program body.

The Open gripper and Close gripper command have no parameters to edit.

30. Click **Next** or **Check** in the **Stepper** to move on to check the created program. PULSE DESK switches to the **Check** stage screen as shown below, where you can start a test run of the program.



Conducting a test run

For the first test run, it is advisable to set the arm to operate at the default 10% speed. Subsequently, you can increase the speed by dragging the speed control to the right.

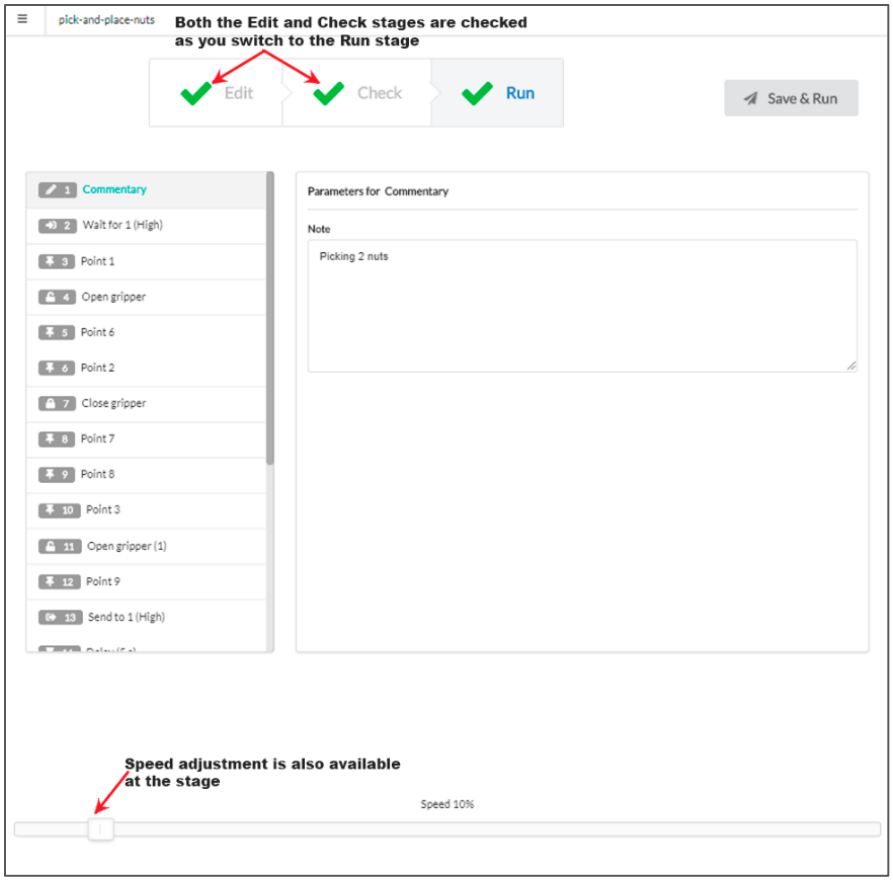
31. Click . PULSE DESK starts executing the specified sequence of commands from the first command in the program body and down.

    The button changes to .You can monitor the test run progress by the way PULSE DESK moves the selection from one command to another.

In case, during a test run, you find out some of the preset parameters need adjustment, click and switch to the Edit stage to make necessary adjustments.

32. When PULSE DESK executes the last command, it stops and displays an appropriate warning. Click **OK** to return to the **Check** screen.

33. Click **Next** to move on to execute the program. If you click **Next**, PULSE DESK displays the **Run** stage screen.



Executing and stopping the program

34. On the Run stage screen, click **Save&Run** to start execution of the program. PULSE DESK executes the sequence of commands in the **Program Body**. The **Save&Run** is replaced with the ■ Stop button.

Once PULSE DESK completes the sequence, it resumes execution of commands from the very beginning and keeps repeating it until you stop the execution.

35. Click ■ Stop to stop the program execution.

If you click the Save&Run button again after stopping the program, PULSE DESK starts executing the program from the very beginning.

36. Close the browser window to quit PULSE DESK.

If you close the browser without stopping the program, the robotic arm continues executing it.

37. To switch off the arm, set it into a safe position where it can remain stable after power supply is disconnected (e.g., see the figure in step 6). Then, toggle the power supply switch on the back panel of the control box to the OFF position.