PULSE
ROBOTIC ARM

PULSE DESK SOFTWARE.
OPERATOR MANUAL

ROZUM
ROBOTICS

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INTRODUCTION

The data, instructions, and recommendations in this manual are intended to assist operators of the PULSE robotic arm (hereinafter—arm, robotic arm, robot) in the following:

- understanding the operating principles of its hardware and software components
- using PULSE DESK to program and control motion of the PULSE robotic arm

WARNING SIGNS AND THEIR MEANINGS

Below, we list the warning symbols used throughout the manual and explain their meanings.

The sign denotes important information that is not directly related to safety, but that the user should be aware of.

The sign indicates important safety precautions the user should follow.

1. ABOUT THE PULSE ROBOTIC ARM

1.1. Overview

The PULSE robotic arm is a lightweight manipulator intended for collaborative operation in industrial and commercial applications, including:

- pick-and-place
- packing
- assembly
- machine tending
- screwing
- gluing
- welding, etc.

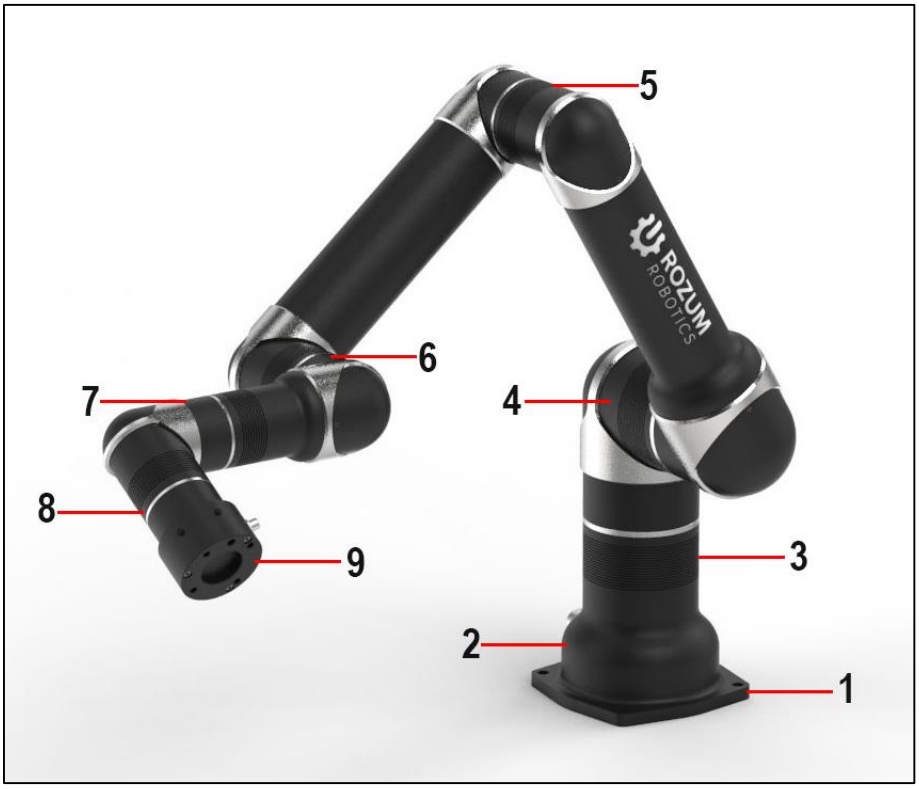


Figure 1-1: The PULSE robot (without an end effector)

Although the arm is designed to operate safely in close proximity to humans, the integrator should conduct a risk assessment for each particular installation to evaluate the need for additional safety devices (e.g., safeguards).

In its basic design, the PULSE arm comes in combination with the hardware and software components listed in Table 1-1.

Table 1-1: Hardware and software components supplied with the PULSE robotic arm

Component	Intended use
Hardware	
Control box	To control operation of the PULSE robotic arm.
Emergency stop button	To ensure Category 1 stop of the robotic arm in an emergency.
Software	
PULSE DESK	To program the PULSE robotic arm to move along a desired trajectory and perform different kinds of operations with a work tool.

Without an end effector, the PULSE robotic arm includes the following major structural sections (see Figure 1-1):

- a mounting plate **(1)**
- an arm base (**2**)
- six axes **(3-8)**, comprising Rozum Robotics self-designed servo motors
- a wrist with a LED indicator and a cable connector **(9)**

For detailed structural design and component-specific data, refer to "Pulse Robotic Arm. Hardware Installation Manual."

In addition, the arm includes linkage elements—aluminum alloy tubes and elbow fittings. On the elbow fitting above the wrist, there are ***four control buttons*** as shown below.

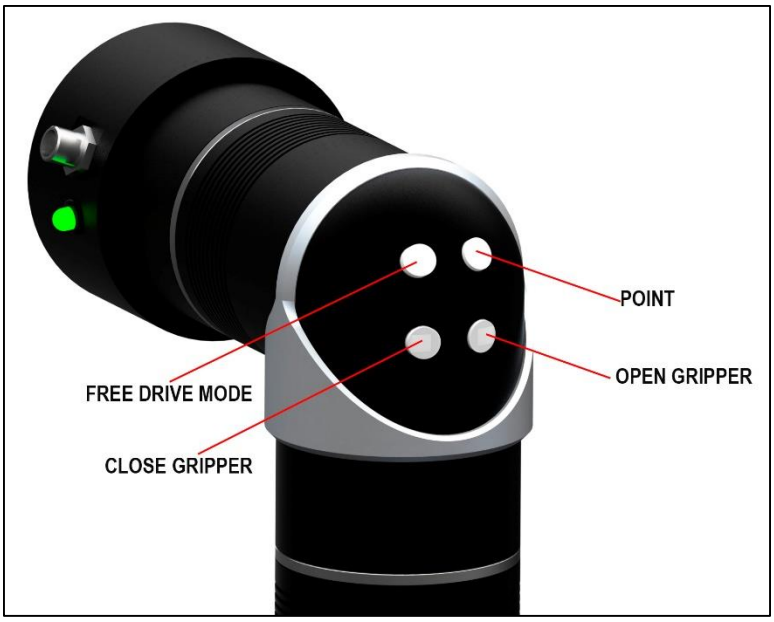


Figure 1-2: Control buttons of the PULSE robotic arm

1.2. The operating states of the PULSE robot

Table 1-2 describes the operating states and modes of the robotic arm. Transition from INITIALIZATION to READY is automatic, whereas from READY to WORK and back—enforced through the PULSE DESK software.

Table 1-2: The operating states of the PULSE robotic arm

Operating state	Details
INITIALIZATION	Power is supplied to the robotic arm via the cable that connects it to the control box. The arm is initializing, running self-tests to check the operational state of its components.  *In case any of the self-tests fails, the arm goes to the Error state. The red LED on the control box lights up, whereas the LED on the arm wrist remains off.*
READY	The robotic arm is on and ready for operation, but not in motion. The green LED on the control box is constantly on. Once you initialize the PULSE DESK software (see Section 3.1), the arm goes to the LEARN mode, enabling the control buttons. The wrist LED turns yellow. In the LEARN mode, two states are possible: • **Freeze**: The arm joints are locked in their current positions, and the user cannot move them by hand. The freeze state is on by default.  ***In the Freeze state, an attempt to move the robotic arm by hand guiding can cause damage to its components.*** • **Free Drive (Zero Gravity):** The arm retains its position, and the user can move the arm by hand guiding (e.g., to add points to a program created in PULSE DESK). To enable/ disable the state, press the FREE DRIVE MODE button (see Figure 1-2). Once the arm is in the Free Drive state, the wrist LED turns blue.

WORK	This is a state of active operation, when the robotic arm moves or performs any other programmed actions (e.g., closes/ opens the gripper). The green LED on the front panel of the control box is constantly on, and the wrist LED is blinking green. *If an error occurs during operation of the robotic arm, the wrist LED turns red. On the control box, the red LED lights up.*

1.3. Safe operation requirements

Make sure to read and meet the requirements before operating the robot.

To ensure safe operation of the PULSE robot, it is essential to comply with the following requirements:

- **Conduct a risk assessment** of your application to evaluate the need for additional safety devices (e.g., safety cages, fencing, etc.) or any other risk-mitigating measures.
- **Provide continuous power supply** to the robotic arm (e.g., installing an uninterruptible power supply, a redundancy circuit, etc.). Otherwise, we cannot guarantee that the robotic arm will maintain its position during a power outage, which may result in serious damage.
- **Keep away from the workspace** of the arm when it is in the WORK state.

2. SWITCHING THE ROBOTIC ARM

To switch the PULSE robotic arm, follow the instructions below:

Before powering the control box, make sure all cables are correctly connected and properly secured. Always use original cables from the Rozum Robotics supply package!

1. Plug the power cord of the control box into the mains socket.
2. Flip the external mains switch (if any) to the ON position.
3. Flip the power switch (see Figure 2-1) on the back panel of the control box to the ON position. The control box starts receiving power and initializing. Once the bootup of the control box is over, the robotic arm starts initializing, too.

Figure 2-1: The back panel of the control box

4. Wait until the arm is fully initialized. As soon as the arm is ready for operation, it will go to the READY state (see Table 1-2).

3. THE PULSE DESK USER INTERFACE

PULSE DESK is a software program that enables operating the PULSE robotic arm together with an attached work tool. The program is pre-installed on the PC module integrated into the control box and boots in the course of the control box initialization. Its functionality allows for the following:

- creating programs to set up a motion trajectory of the robotic arm
- debugging created programs to adjust the motion trajectory
- executing created programs to operate the arm
- saving and deleting created programs
- adjusting the motion speed of the arm
- operating an attached work tool
- setting parameters for communication between the arm and external equipment (e.g., conveyor belts, safety devices)
- enabling/disabling control of the robotic arm via the Application Programming Interface (API)
- saving data on program execution to a production log (available to service personnel only)

3.1. Accessing the PULSE DESK software

You can start working with PULSE DESK as soon as the PULSE robotic arm is on and in the READY state (see Table 1-2).

To access the software, complete the following two steps:

1. Start a web browser on your device (a tablet, a laptop, a PC).

2. Specify the arm's IP address and the port number (:8080) in the browser line.

*The IP address is dynamically assigned to the PULSE robotic arm by the DHCP server. To get the address, you can either **(a)** look up the last assigned IP address on the DHCP server or **(b)** check the IP addresses of the devices on ports 22 8080 and 8081.*

If you have successfully completed the first two steps, PULSE DESK loads the **Edit** stage screen (see Figure 3-1). The arm goes to the LEARN mode, while the control buttons on the robotic arm switch to the enabled state.

At the start, the software also informs you about available updates (if any) (for details, refer to Section 4.6).

3.2. Edit stage screen

When you start PULSE DESK for the first time, the **Edit** stage screen is displayed empty, with no program body or **Service** and **Stepper** panels. As soon as you begin creating a new program (see Section 4.1.1), PULSE DESK loads the rest of screen elements as shown in Figure 3.1. Subsequently, the **Edit** stage screen loads, displaying the last executed program.

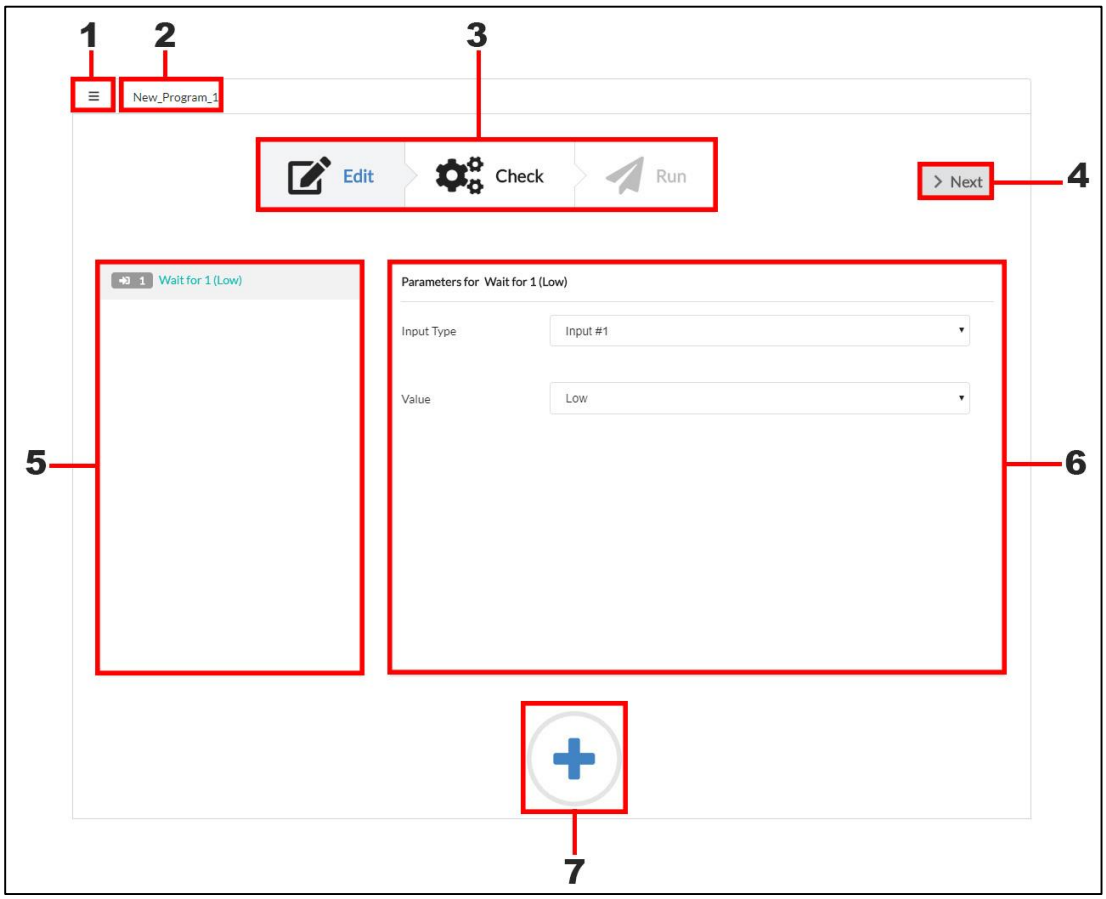


Figure 3-1: The Edit stage screen

Table 3-1 describes the interface elements of the **Edit stage** screen and their purposes.

Table 3-1: The elements of the Edit stage screen

No.	Description
1	**The Main Menu button** opens the Main menu of the PULSE DESK software (for details, see Section 3.3).
2	The **Program Name field** displays either the name of the currently executed program or the default "*Program_Name_N*" name. *The Program Name field cannot be empty. If you remove the program name from the field, it will display the "Program name here..." background prompt.*
3	**The Stepper** indicates the current stage of working with the PULSE DESK software: • creating a program **(Edit)** • debugging **(Check)** • production **(Run)** In the **Stepper**, you can see the currently active stage selected (as shown for the **Edit** stage in Figure 3-1) and the completed stage(s) (if any)—marked with a checkmark. Once you reach the **Run** stage, you can switch between the stages by clicking appropriate stage names in the **Stepper**. *Before switching back from the **Run stage** to any other, make sure to stop program execution.*
4	The **Next button** enables switching from programming to debugging and then to production. At the **Run stage**, PULSE DESK replaces the **Next button** with the **Save&Run** one.
5	The **Program Body** panel displays the sequence of commands contained in a program. PULSE DESK indicates the currently executed command by selecting it. If you have just started PULSE DESK and chosen to create a new program, the **Program Body** contains only the **Wait for** command. *When in the LEARN mode, the **Wait for** command disappears as soon as you start adding new commands using the control buttons.*
6	The **Service panel** displays the parameters of the command selected in the **Program Body**. You can set the parameters by changing the values in appropriate fields (for details, see Section 4.1.4). *For the **Open gripper** and **Close gripper** commands, the **Service panel** is displayed empty.*
7	The **Add Commands control** opens a list of commands for creating a program (for details, see Section 4.1.2).

3.3. The Main Menu of PULSE DESK

Clicking the **Main Menu** button opens a sliding menu with the following commands**:**

- **Load program**—for choosing a program to work with from a list of previously created and saved programs
- **New program**—for creating a new program
- **Save program as**—for saving the program under a specified name
- **Delete program**—for permanently removing a program
- **Configure**—for enabling/ disabling remote control of the robotic arm via the API

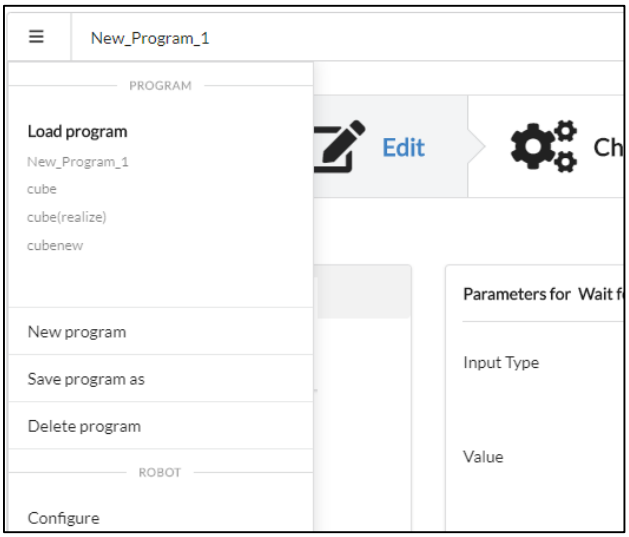


Figure 3-2: The Main menu of PULSE DESK

3.4. Accessing the API

The application programming interface (REST API) implemented for the PULSE robotic arm is another way to command it to perform different actions, for more advanced users. For detailed information on available commands and their use, refer to the document "PULSE robotic arm. API reference guide."

By default, access to API functions is disabled. Enabling access to the functionality is via the PULSE DESK user interface. Proceed as below:

1. Start PULSE DESK in accordance with the instructions in Section 3.1.
2. Click the **Main Menu** button and select **Configure.** PULSE DESK opens the **Configure screen** as shown in Figure 3-3.

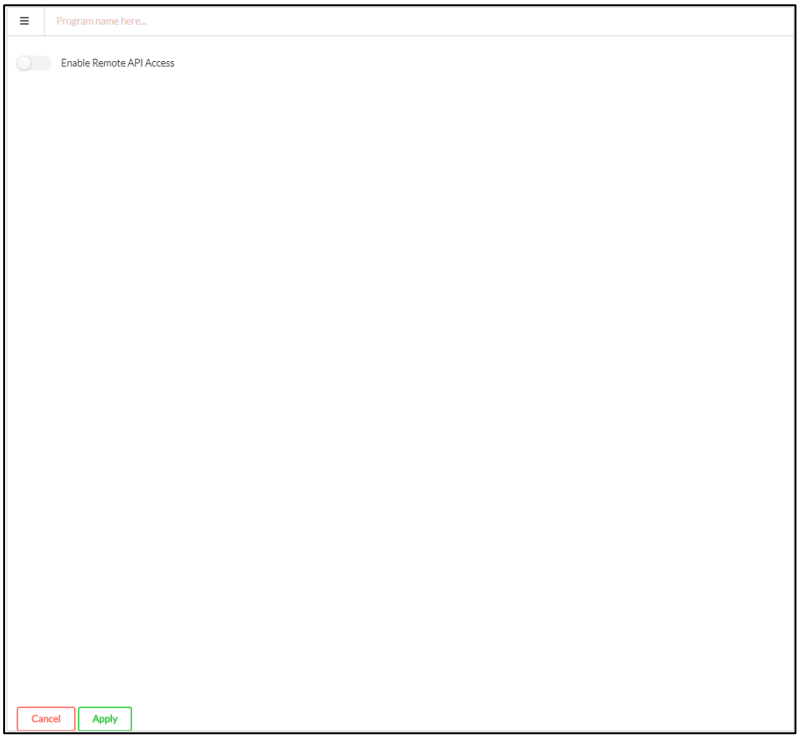
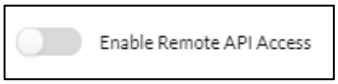


Figure 3-3: Configure screen (with the API toggle in the disabled state)

3. On the displayed screen, switch the **Enable Remote API access** toggle to the enabled state and click **Apply** to confirm.

Disabled state



Enabled state

Once you have enabled control via the API, programming with the PULSE DESK software becomes impossible and the UI functionality—unavailable.

4. PROGRAMMING WITH PULSE DESK

The general workflow of the PULSE DESK program is as illustrated in Figure 4-1.

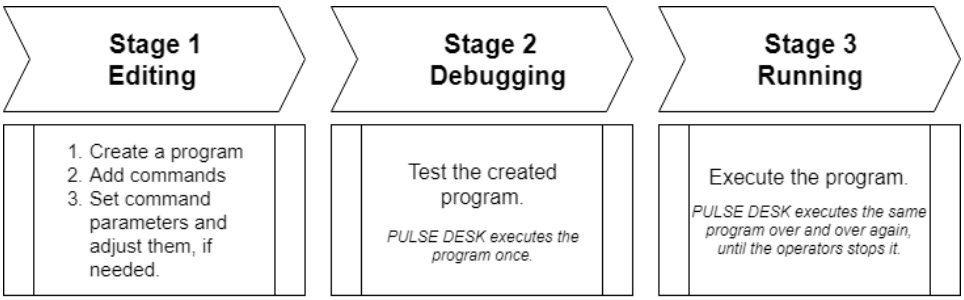


Figure 4-1: The PULSE DESK workflow

Until you complete the entire workflow up to the **Run** stage, switching from stage to stage is only possible in the forward direction by pressing the **Next** button. Once you are at the **Run** stage, you can go back to any previous stages or switch between the stages randomly by pressing the **Stepper** indications—**Edit**, **Check**, or **Run**.

Before switching back from the Running stage to any other, it is advisable to stop program execution.

4.1. Completing the Edit stage

4.1.1. Creating a program

To create a new program, follow the sequence of actions as below:

1. On the **Edit** stage screen, click the **Main menu button** to open the **Main menu**.
2. On the **Main menu**, select **New program**.
3. On the **Main menu**, select **Save program as**, specify a program name in the displayed dialog box and confirm the changes by clicking **Yes.**

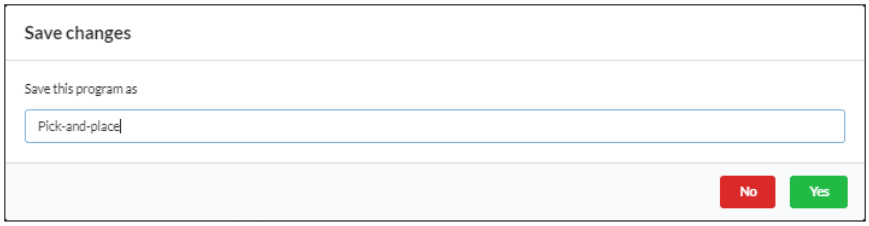


Figure 4-2: The "Save changes" dialog box

In PULSE DESK, every program should have a unique name. If you attempt to save a newly created program under a name that coincides with an already existing one, PULSE DESK displays an appropriate warning, preventing you from using the redundant name.

If there is a program already running in PULSE DESK when you select **New program** on the **Main menu**, PULSE DESK requests to stop execution of the program. Once you confirm the stop, the software clears the **Program Body** and the **Program Name** field. You can proceed to saving your new program (Step 3).

4.1.2. Adding commands to a program body

After you have created a program, the next step is to add commands to its body. The PULSE DESK software enables using the following seven commands:

- The **Wait for** command specifies the input port for receiving a signal from external equipment (e.g., a conveyor belt) and the type of the received signal (high/ low).
- The **Send to** command assigns the output port for sending a signal to external equipment (e.g., a conveyor belt) and the type of the sent signal (high/ low).
- The **Delay** command specifies how long (in seconds) PULSE DESK should wait before moving on to execute the next command in the program body.
- The **Point** command sets a waypoint in a motion trajectory of the arm.
- The **Open gripper** command opens the gripper.
- The **Close gripper** command closes the gripper.

 *Adding commands is possible only at the Edit stage.*

There are two ways to add commands to a program body:

A. Using the **Add Commands** button

B. Pressing the control buttons on the elbow fitting

A. To add a command using the **Add Commands** button, follow the instructions below.

1. On the **Edit Stage** screen, click  to open the **Add Commands** menu. The button  changes its appearance to  .

 *Use the*  *button to close the Add Commands menu when you no longer need it.*

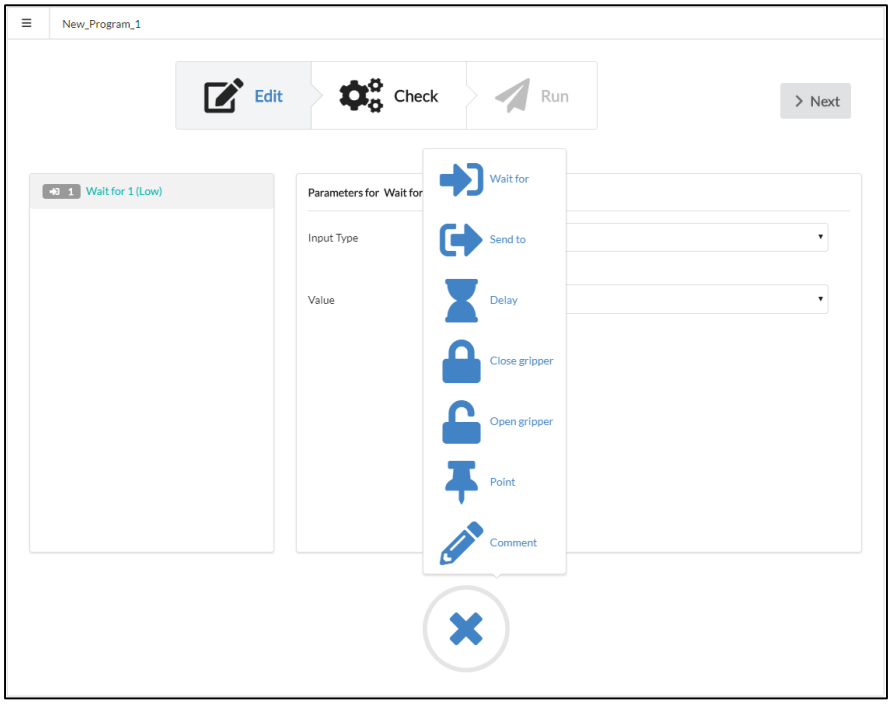


Figure 4-3: The Add Commands menu (opened)

2. On the **Add Commands menu**, click the required command. It appears in the **Program Body** below the currently selected command.

Now, you can proceed to set the command parameters (see Section 4.1.4) or to add another command.

B. To add a command by pressing the wrist buttons, keep to the following guidelines.

*The control buttons are enabled in the LEARN mode only. You can use them to add three of the six commands—**Point**, **Open gripper**, and **Close gripper.***

- To add the **Point** command:

  Step 1. Press the **Free Drive Mode** button on the elbow fitting**.**

  Step 2. Move the arm manually to the desired position.

  Step 3. Press the **Point** button on the elbow fitting. The point appears in the **Program Body** panel below the currently selected command. The **Service panel** displays the point parameters (the X, Y, Z coordinates and rotation angles).

If required, you can verify the point by clicking the "Move to the point" button and adjust the point parameters. For the adjustments, use the Joystick group of buttons (No. 2, Figure 4-8) or change the values in the parameter fields of the Service panel (No. 1, Figure 4-8).

- To add the **Open gripper** or **Close gripper** command**:**

  Step 1. Press the **Free Drive Mode** button on the elbow fitting.

  Step 1. Set a point (as described above for the **Point** command) where you want the gripper to open/close.

  Step 2. Press either the **Open gripper** or the **Close gripper** button on the elbow fitting. A command to open/close the gripper appears in the program body below the selected point.

4.1.3. Adding a comment to a program

You may need to add comments to a program to divide its body into subsections or to provide a more detailed description.

To do this, proceed as described below:

1. Choose a line within the program body where you want to add a comment by selecting an appropriate command.
2. On the **Edit Stage** screen, click  to open the **Add Commands** menu and click **Comment**. The **Commentary** line appears in the program body below the selected command (or you can drag-and-drop it to the top as shown in the figure below).

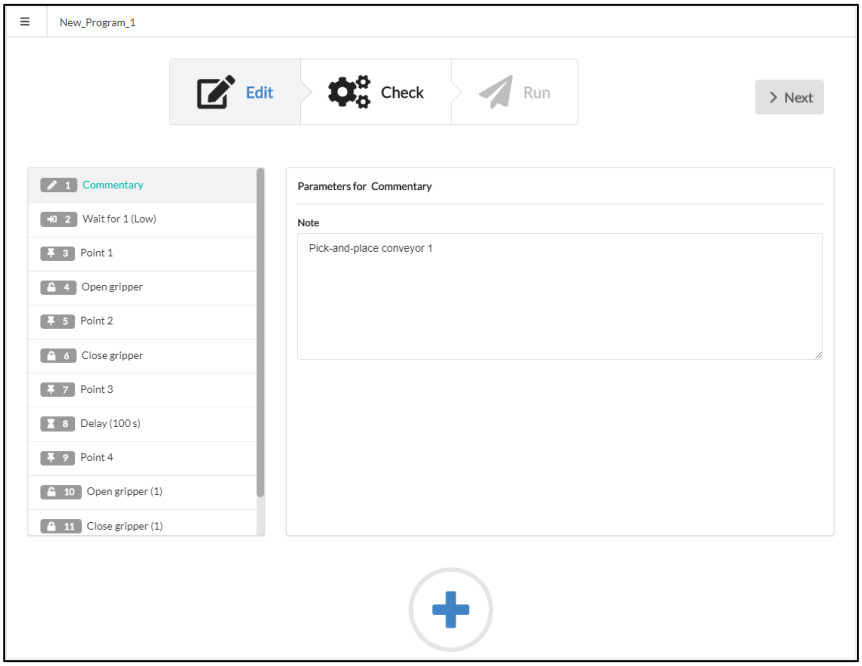


Figure 4-4: Adding a comment to a program

3. In the **Note** field in the **Service panel**, type in the contents of the comment. The program saves it in the field and, subsequently, displays it every time you select the **Comment** line in the program body.

4.1.4. Setting command parameters

You can set and adjust command parameters **only at the Edit stage.** PULSE DESK enables you to set parameters for the following commands:

- Wait for
- Send to
- Point
- Delay

*The **Open gripper** and **Close gripper** commands have no parameters to set.*

Wait for command

1. In the **Program Body**, select **Wait for**. The **Service panel** displays the command parameters as shown in Figure 4-5 below.

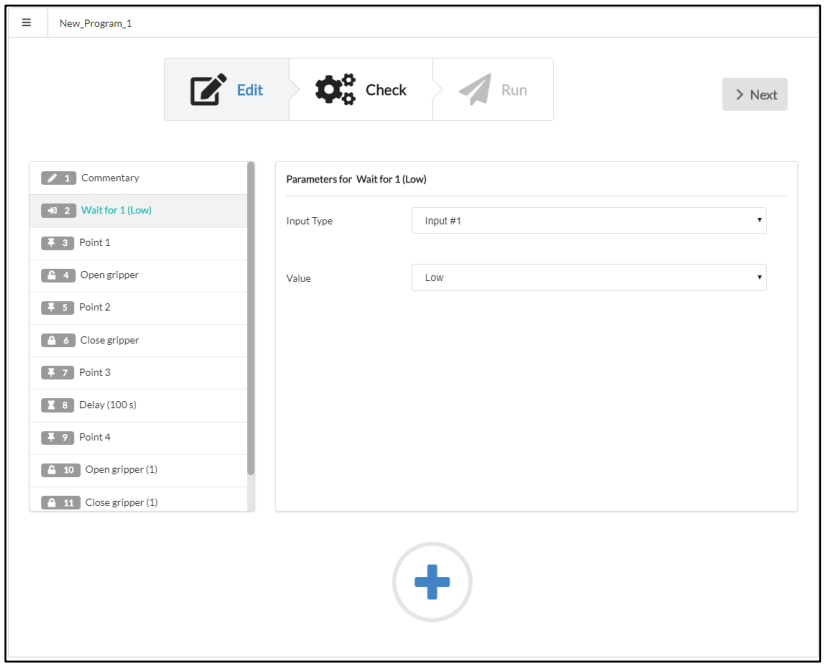


Figure 4-5: Setting parameters for the "Wait for" command

2. In the **Input Port** dropdown box, select an input port for receiving a signal from connected external equipment (e.g., a conveyor belt).

An input port is one of the digital inputs on the back panel of the control box.

3. In the **Value dropdown box**, select either **High** or **Low** to specify the type of the received signal.

Send to command

1. In the **Program Body**, select **Send to**. The **Service panel** displays the command parameters as shown in Figure 4-6 below.

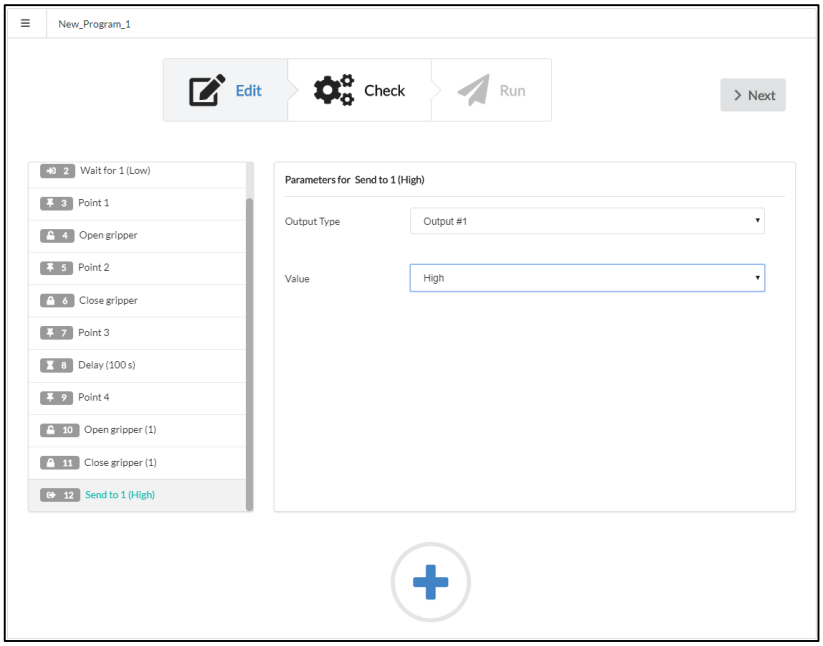


Figure 4-6: Setting parameters for the "Send to" command

2. In the **Output Port dropdown box**, select an output port for sending a signal to connected external equipment (e.g., a conveyor belt).

An output port is one of the digital outputs on the back panel of the control box.

3. In the **Value dropdown box**, select the output signal type—**High** or **Low**.

Delay command

1. In the **Program Body**, select **Delay**. The **Service panel** displays the command parameters as shown in Figure 4-7.

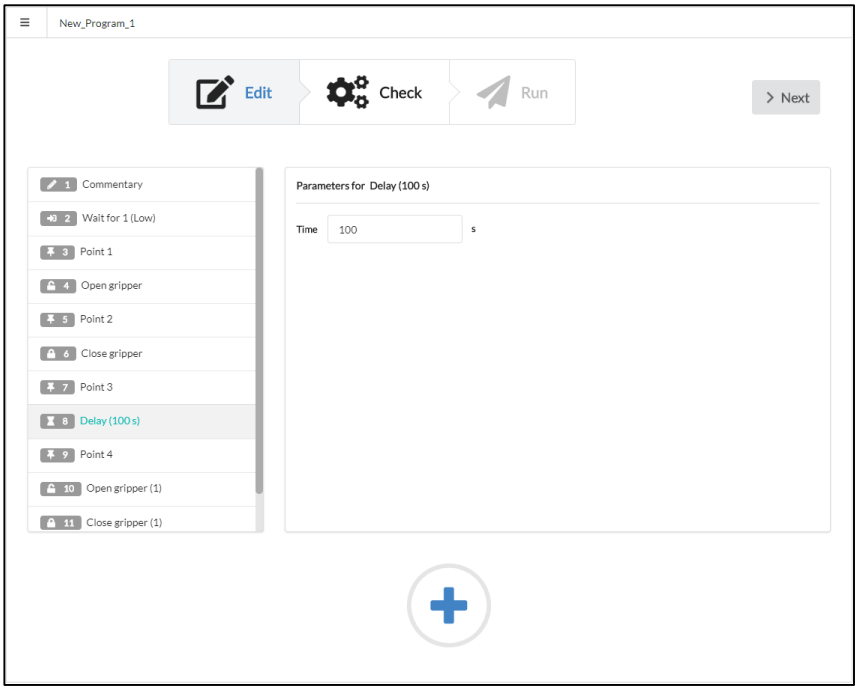


Figure 4-7: Setting the parameters for the Delay command

2. In the **Time field**, specify how long (s) PULSE DESK should wait before moving on to the command following the **Delay** one.

The default value displayed in the field is 100 s.

Point command

1. In the **Program Body**, select **Point**.

2. In the **Service panel,** set the coordinates and rotation angles (roll, pitch, yaw) for the point in the fields **(1)** as shown in Figure 4-8 below.

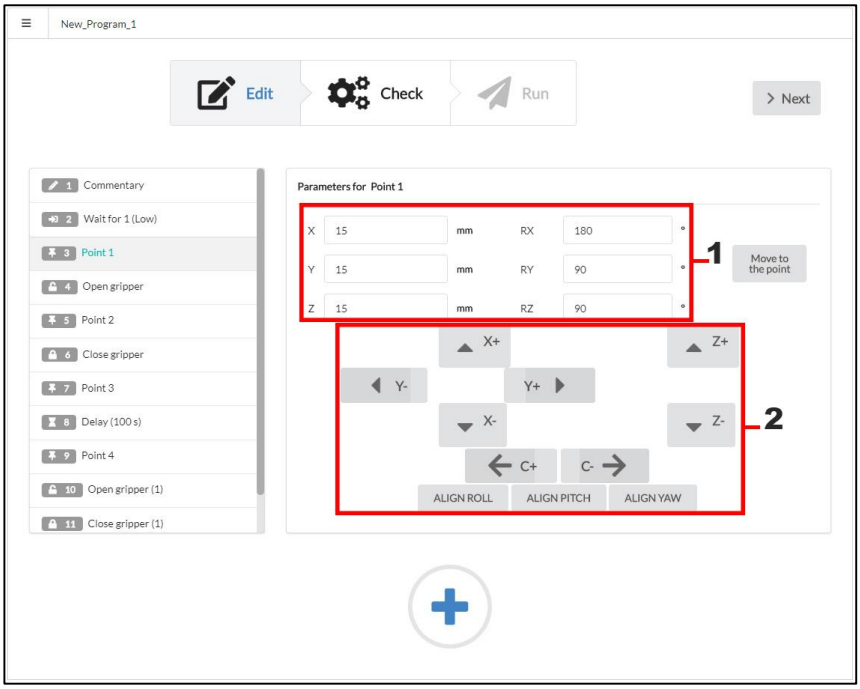


Figure 4-8: Setting parameters for the Point command

As you set the parameters in area **(1),** PULSE DESK prompts you about mandatory parameters and their admissible ranges as shown in Figure 4-9.

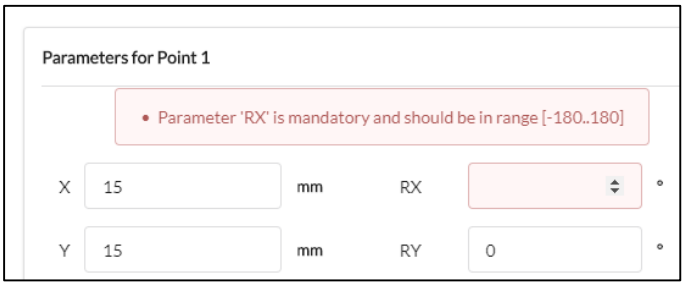


Figure 4-9: Prompt to set point parameters

3. Using the joystick buttons (**2)** in accordance with their purpose (Table 4-1), adjust the X, Y, Z coordinate values and rotation angles, if needed.

*Alternatively, you can adjust point parameters by changing the values directly in the parameter fields **(1)**.*

Table 4-1: The joystick buttons and their purpose

Button	Purpose
X+	To increase the X coordinate value

	To decrease the X coordinate value
	To increase the Y coordinate value
	To decrease the Y coordinate value
	To increase the Z coordinate value
	To decrease the Z coordinate value
	To set rotation in the clockwise direction
	To set rotation in the counterclockwise direction
	To adjust the roll angle (RX) (rotation around the X axis)
	To adjust the pitch angle (RY) (rotation around the Y axis)
	To adjust the yaw angle (RZ) (rotation around the Z axis)

To verify the resulting arm pose, click **Move to the point** and then make new adjustments, if needed.

4.1.4. Deleting one or more commands

To remove a command from the **Program Body**, follow the instructions below:

1. Select one or more commands in the **Program Body**.
2. Drag-and-drop the selected one or more commands outside the **Program Body** panel. PULSE DESK removes them permanently from the program body.

4.1.4. Relocating one or more commands

To relocate one or more commands within the **Program Body**, proceed as follows:

1. Select one or more commands.

2. Drag the selected one or more commands to any desired location within the **Program Body**. PULSE DESK displays them at the desired location.

4.1.5. Renaming commands

To give a command a new name, follow the instructions below:

1. Select the command you want to rename.

2. Click on the command name in the **Service panel** and type in a new name to replace the previous one. The new name appears in the program body where used to be the previous one.

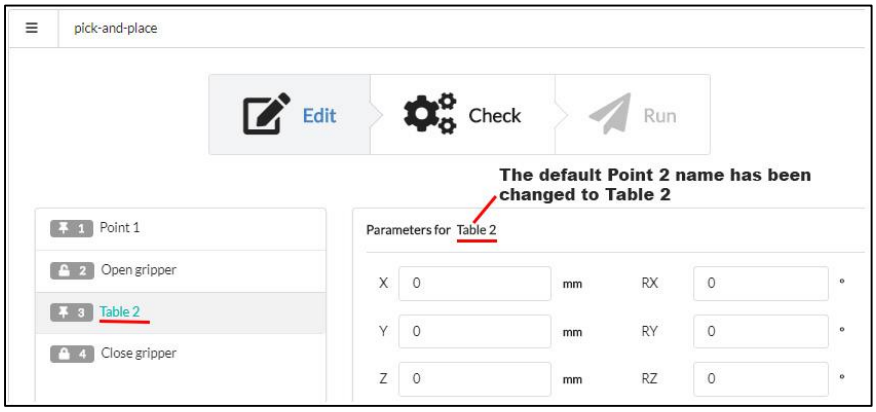


Figure 4-10: Renaming a command

4.2. Debugging a program

4.2.1. The Check stage screen

Once you have created a program, your next step is to check whether it can work properly with the robotic arm and debug it. For the purpose, you need to switch to the **Check** stage and conduct a test run of the program.

To switch to the **Check** stage, click **Next** on the **Edit screen**. In the **Stepper**, PULSE DESK checks the **Edit** stage indication and moves selection to the **Check** stage. The screen has the appearance as shown in Figure 4-11.

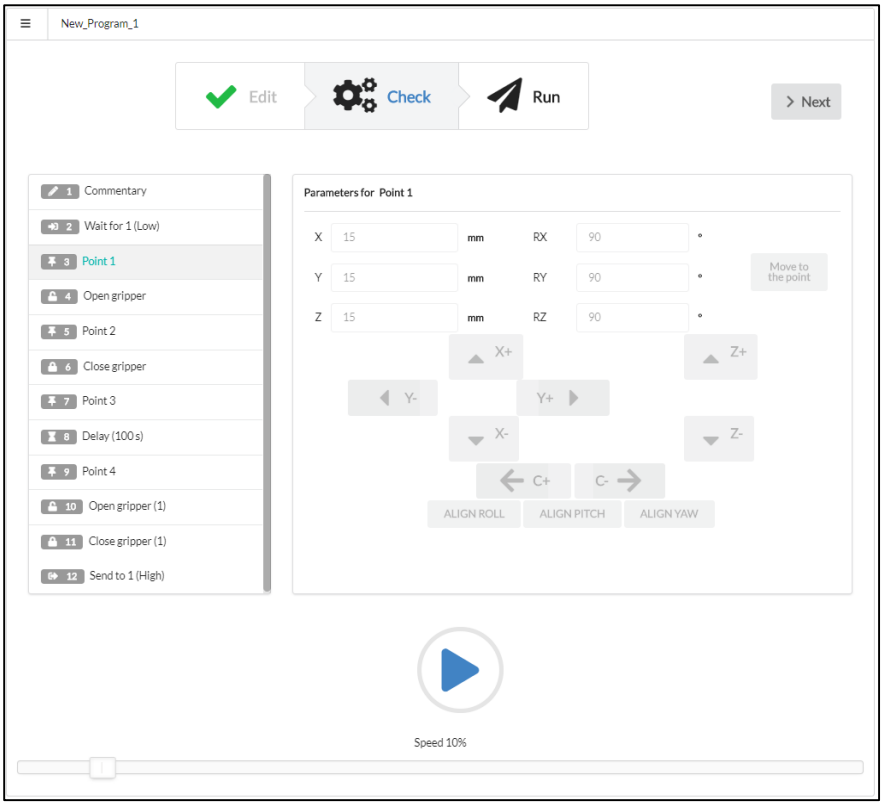


Figure 4-11: The Check stage screen

The **Add Commands button** is not available at the **Check stage**, and you cannot add commands in any other way.

The **Program Body** panel contains the program created at the **Edit stage**. The **Service** panel shows the parameters of the command selected in the Program Body. However, the parameters are not available for editing (greyed out).

To edit parameters, you need to switch back to the Edit stage. To do this, click Edit in the Stepper.

Table 4-2 contains a detailed description of the controls on the **Check stage** screen.

Table 4-2: The controls on the Check stage screen

Control	Purpose
Run	When you click the button, PULSE DESK starts executing the program in the **Program Body** panel, moving sequentially from one command to another until it reaches the last one. Once PULSE DESK starts a test run, the button changes to . Use the button to pause/ stop execution of the program. When the software executes the **Delay** and **Wait for** commands, the additional **Step Forward button** appears on the screen next to the **Run** one. The **Step Forward button** allows you to skips the current command and move on to execute the immediately following one.

Speed	The slider element enables adjusting the motion speed of the arm (% maximum speed). The default value is 10%. You can change it by dragging the slider to the right to accelerate the arm motion or to the left to slow the arm down.

4.2.2. Conducting a test run

To start a test run of the program displayed in the **Program Body**, click  . The robotic arm system and the PULSE DESK software react as described below:

1. The system goes to the WORK state, changing its LED indication accordingly (see Table 1-2). Simultaneously,  changes to  .

2. PULSE DESK begins to execute the commands in the **Program Body**—from the first one on the list down to the last one, while verifying reachability of trajectory points (i.e., whether the arm can actually execute them).

3. As the software goes from one command to another, the selection frame moves down the **Program Body.** The **Service panel** displays the parameters of the currently selected command.

4. After PULSE DESK executes the last command in the **Program Body**, it stops the test run and displays an appropriate message. The button  changes to  . The system goes to the READY state.

4.3. Running a program

Once you have checked and debugged a program, you can proceed to execute it at the next stage—**Run**. To switch to the **Run stage** from the **Check** one, click **Next**.

When PULSE DESK switches to the **Run stage** screen (Figure 4-12), it checks the Check indication in the **Stepper**, moving selection to the Run one.

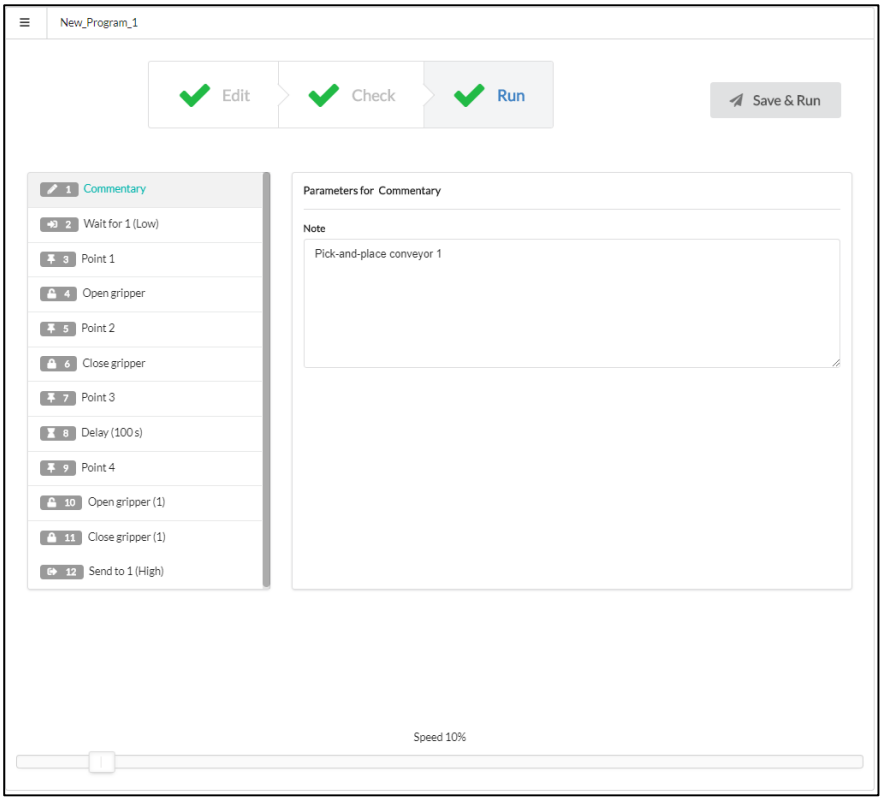


Figure 4-12: The Run stage screen

4.3.1. Program execution

To start execution of your program, click **Save&Run**. PULSE DESK saves changes to the program (if any) and starts executing the commands in the **Program Body**—from the first one down to the last one. Simultaneously, **Save&Run** changes to **Pause**.

You can monitor the execution progress by following the way selection in the **Program Body** moves down the command sequence. The execution results are also saved to a production log (available to service personnel only).

As PULSE DESK reaches the last command in the **Program Body**, it starts running the same program anew and keeps repeating it cyclically until the user stops or pauses its execution (see Section 4.3.3).

4.3.2. Stopping a program

To stop a running program, click 

on the **Run stage** screen. After clicking, the **Stop button** changes to the **Save&Run** one.

In addition, PULSE DESK requests to stop program execution when the user selects **Load program** or **New program** on the **Main Menu** (see Section 3.2). As the request appears on the screen, click **Yes** to stop the program or **No** to continue its execution.

Emergency stop

When the user stops the system by pressing the emergency stop button (see Figure 4-13):

- The system performs a Category 1 Stop.
- PULSE DESK disables the user interface elements and shows a splash screen warning that the system is in the Error state.

Figure 4-13: The emergency stop button

To resume operation of the robotic arm after an emergency shutdown, reset the system as described below:

1. Wait for the arm to come to a full stop. The wrist LED on the arm should go off.
2. Unpress the emergency stop button.
3. Flip the power switch on the back panel of the control box to the off position or unplug the power cord from the mains socket. Wait for the LEDs on the control box to go off completely.
4. Switch the system on again as described in Section 3.

Before restarting the system after an emergency shutdown, make sure the emergency stop button is unpressed. Otherwise, the system will not start, causing the red LED on the control box to light up.

4.3.3. Saving a program

To save a program, follow the sequence of actions as below:

1. Open the **Main menu** and select **Save program as**.
2. In the displayed dialogue box (Figure 4-11), specify a name for the program and confirm the input by clicking **Yes.**

Figure 4-11: "Save program as" dialog box

PULSE DESK also saves programs automatically when you click the **Save&Run** button at the **Run** stage. After clicking the button, any unsaved changes are applied to the program.

4.3.4. Renaming a program

To change a program name, follow the instructions below:

1. Open the **Main menu** and select **Save program as**.
2. In the displayed dialogue box (Figure 4-11), specify a new name for the program and confirm the changes by clicking **Yes.**

*It is also possible to rename the program by changing its name in the **Program Name** field.*

4.4. Managing programs

PULSE DESK offers the following capabilities for managing programs:

- loading a created program into the **Program Body** panel
- deleting a created program

4.4.1. Loading a program

Instead of creating a new program, you can reuse any of the previously created ones. To do this, follow the instructions below:

1. Click the **Main menu button** to open the **Main menu**.

2. In the sub-menu below the **Load program** command, select the program you need. PULSE DESK loads the content of the selected program in the **Program Body** panel.

*If there is a program already running when you attempt to load another one, PULSE DESK requests to stop the currently running program. You need to confirm the stop by clicking **Yes**.*

4.4.2. Deleting a program

To delete a program, proceed as below:

1. Load the program you want to delete into the **Program Body** as described in Section 4.4.1.

If the program is already displayed in the Program Body, move on to Step 2.

2. Open the **Main menu** and select **Delete program.** PULSE DESK removes the program contents from the **Program Body** and deletes the program name from the **Load program** sub-menu.

4.5. Closing PULSE DESK

To quit PULSE DESK, the user needs to carry out the following actions:

1. Stop the currently running program (see Section 4.3.2).
2. Close the browser page.

The software stops execution of the program. The system goes to the READY state (Freeze mode). The control buttons are disabled.

If you quit PULSE DESK without stopping the currently running program, the software keeps executing the program cyclically even after you close the browser page.

In PULSE DESK, every program should have a unique name. If you attempt to save a newly created program under a name that coincides with an already existing one, PULSE DESK displays an appropriate warning, preventing you from using the redundant name.

4.6. Updating PULSE DESK

PULSE DESK features functionality for updating the software via Internet. As soon as a new PULSE DESK version becomes available for uploading, users see an appropriate popup notification during PULSE DESK initialization.

Figure 4-12: Update notification

To be able to use the update functionality, you need an active Internet connection.

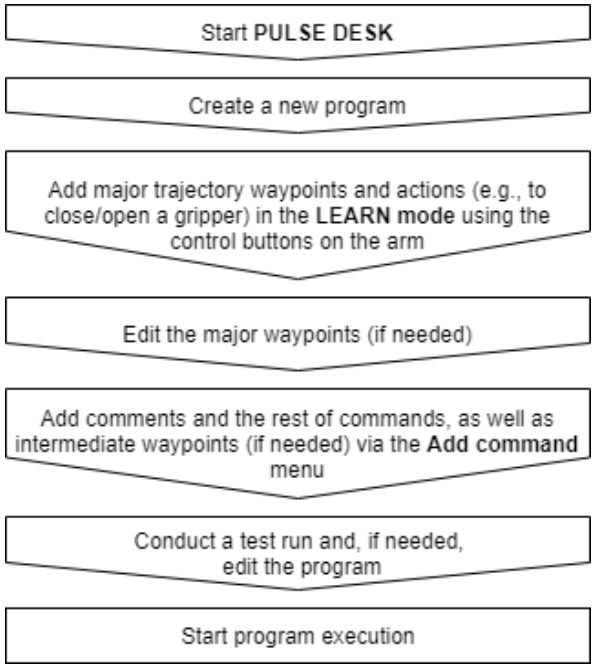
To update your PULSE DESK version:

- Click the notification.
- Confirm the update by clicking **Yes** in the displayed dialog. PULSE DESK completes the updating process automatically. You only have to wait for a couple of minutes until the updating is over.

ANNEX I. SAMPLE PULSE DESK PROGRAM

Below, we provide a detailed step-by-step instruction describing how to create, check, and execute a simple PULSE DESK program to perform a pick-and-place operation.

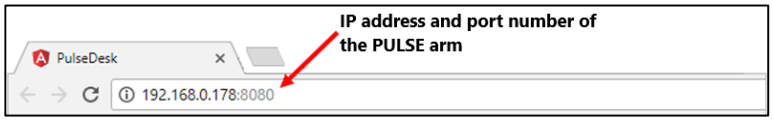
In general, our recommendation is to observe the following sequence of actions:



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

Starting PULSE DESK

1. Start PULSE DESK by typing in the *PULSE robot IP address* and *the port number (:8080)* in the browser line.

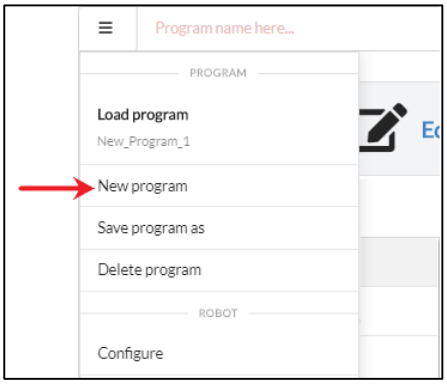


*The IP address is dynamically assigned to the PULSE robotic arm by the DHCP server. To get the address, you can either **(a)** look up the last assigned IP address on the DHCP server or **(b)** check the IP addresses of the devices on ports 22 8080 and 8081.*

Creating a new program

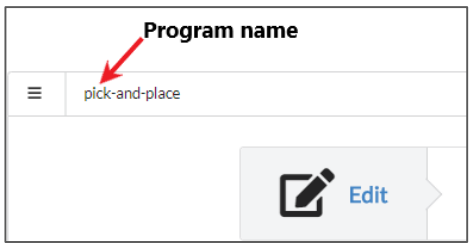
2. On the displayed **Edit stage** screen, click the **Main Menu button**.

3. On the Main menu, select **New program**.



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

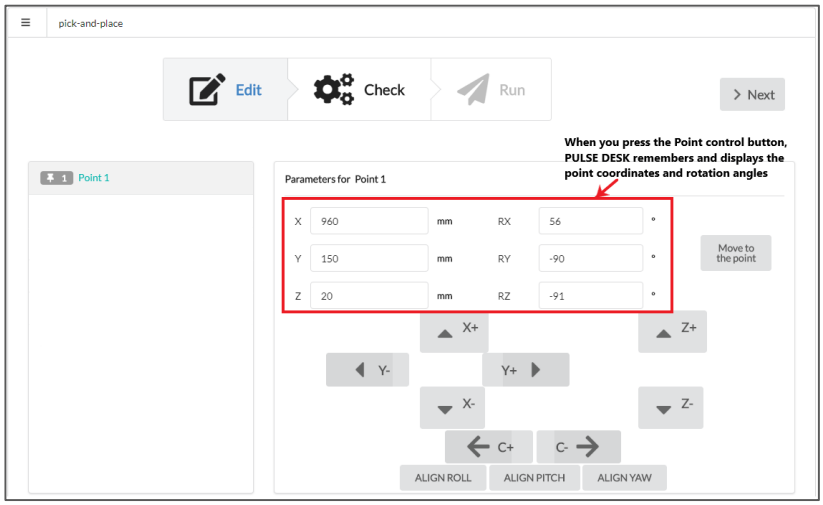
5. Click **Yes** to confirm saving the program under the name and close the dialog box. The specified name appears in the **Program Name** field. Simultaneously, PULSE DESK loads the **Edit stage** screen of the newly created program with the **Wait for** command already in the program body.



Creating a trajectory by hand guiding

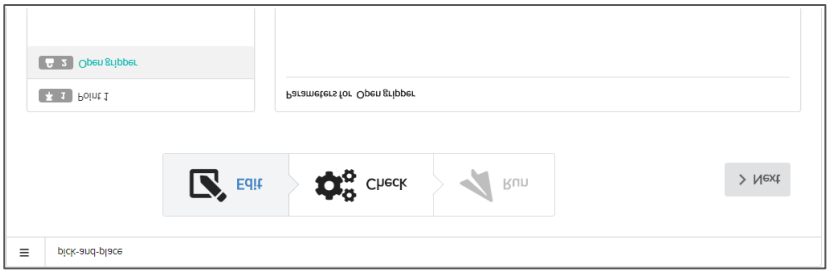
6. Press the **Free Drive** button on the elbow of the robotic arm and start moving the arm by hand guiding to set up the first waypoint in your trajectory. As you put the arm in the required position, press the **Point** control button. The software remembers the position and adds it to the **Program Body** as **Point 1**. The **Service panel** displays the parameters for the **Point 1** command specifying the TCP coordinates and rotation angles in the position.

Tool center point is the point, relative to which all arm positions and movements are defined. Its original physical location is at the center of the arm wrist.

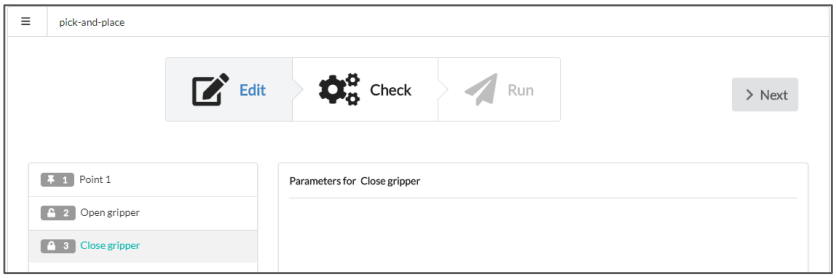


*When in the LEARN mode, the **Wait for** command disappears as soon as you start adding new commands using the control buttons.*

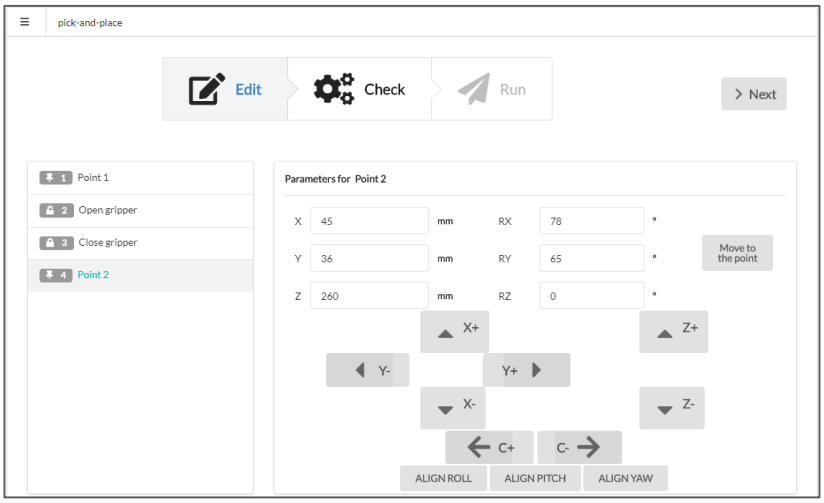
7. On the arm elbow, press the **Open gripper** button. The **Open gripper** command appears below **Point 1** in the **Program body**.



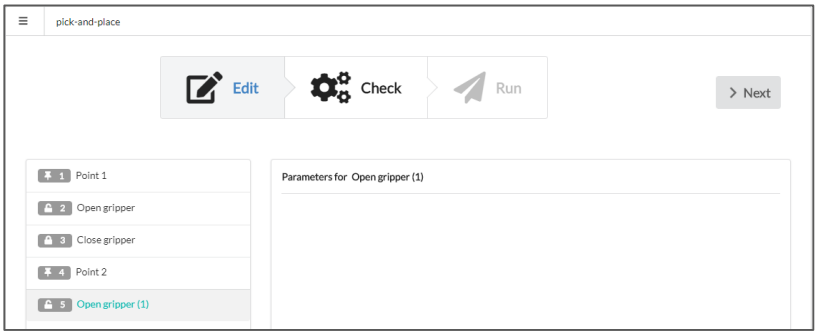
8. To grab the load and close the gripper, press the **Close gripper** button on the arm elbow. The corresponding command appears below **Open gripper** in the program body.



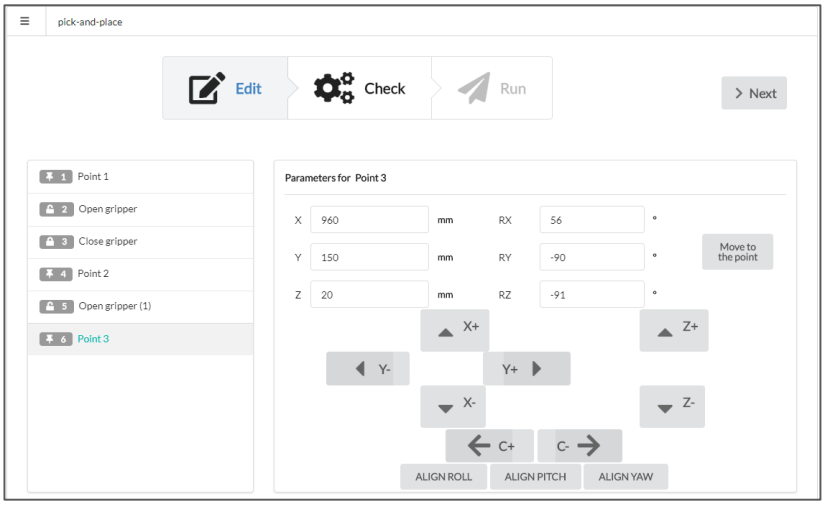
9. Repeat the same actions as described in **Item 6** to add Point 2. The newly created Point 2 appears below **Close gripper** in the program body.



10. To open the gripper and release the load, press the **Open gripper** button. The **Open gripper (1)** command appears below **Point 2** in the **Program body**.

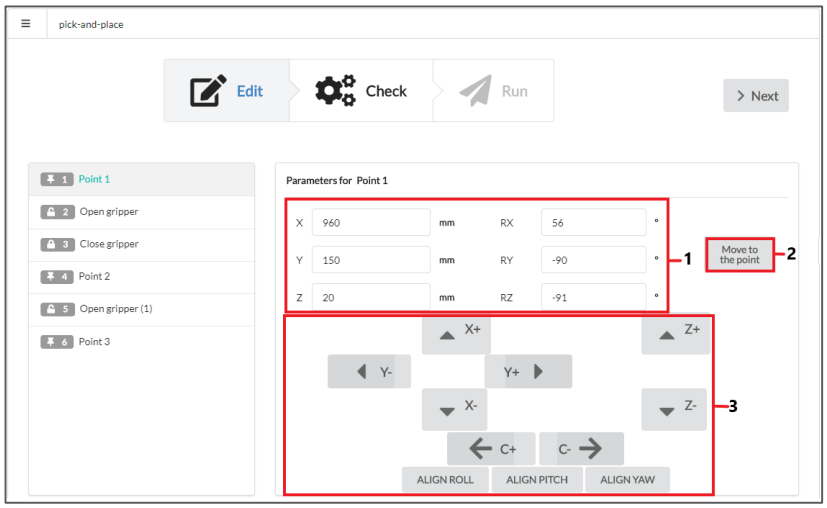


11. Repeat the same actions as described in **Item 6** to add **Point 3**. The newly created **Point 3** appears below **Open gripper(1)** in the program body.



Verifying and editing the trajectory

12. To verify **Point 1**, select the point in the program body. On the **Service** panel, click the **Move to the point** button **(2)** to see how the arm moves to the respective position. To adjust motion (if needed), change the coordinates and rotation angles on the **Service** panel. You can do this by correcting the values in the fields **(1)** or using the Joystick group of buttons **(3).**



13. Repeat the same actions as described in **Item 13** to verify Point 2 and Point 3.

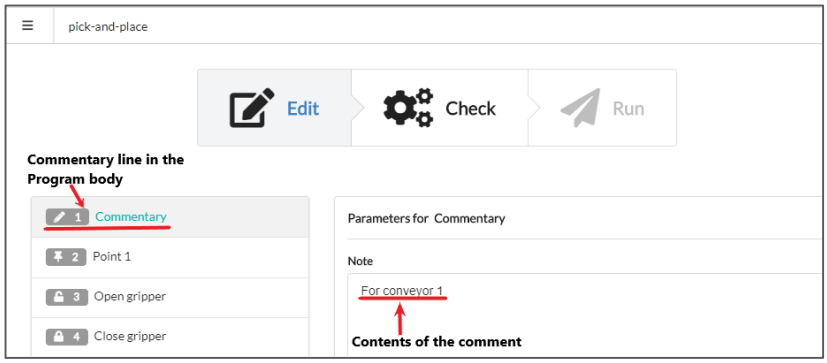
The Open gripper and Close gripper command have no parameters to edit.

Adding and setting up comment(s) and other commands

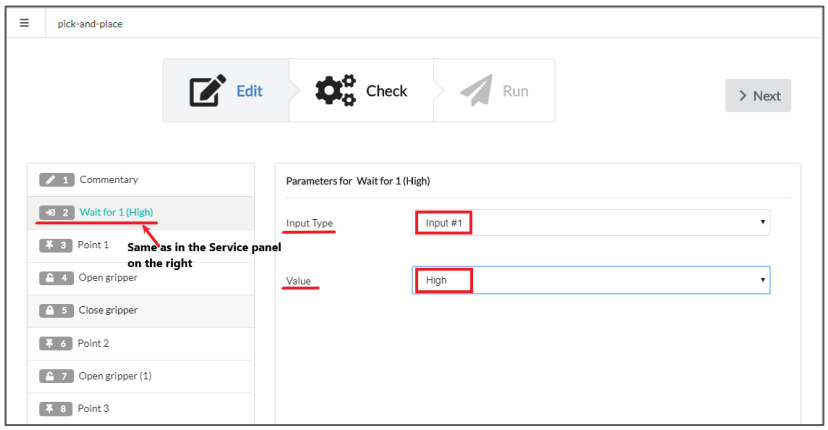
14. Click and select **Comment**. PULSE DESK adds the **Commentary** line to the program body below the selected command.

The button changes to once you click it.

15. Drag the command to the top (as shown in the figure below). In the **Note** field on the **Service panel**, type in any detailed description of the program as required.



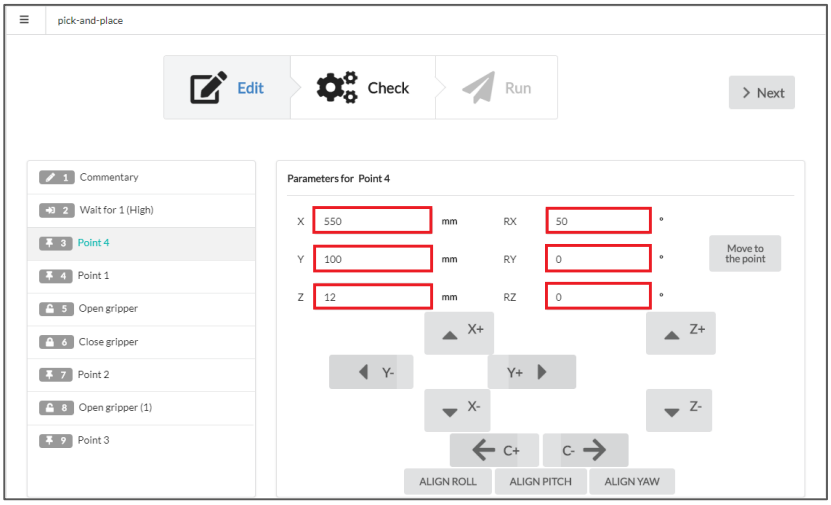
16. Select **Commentary** in the program body and click , then select **Wait for.** The command appears in the **Program body**, and the **Service panel** displays the fields to set up the command parameters.
17. To set up the parameters for the **Wait for** command, select **Input#1** in the **Input Type** dropdown box and **High** in the **Value** dropdown box. The same values appear next to the command name in the **Program Body** on the left.



In this way, you let PULSE DESK know that it can move on to the subsequent commands once it receives the **High** signal from an external device (e.g., a conveyor belt) connected to **Input#1** on the back panel of the control box.

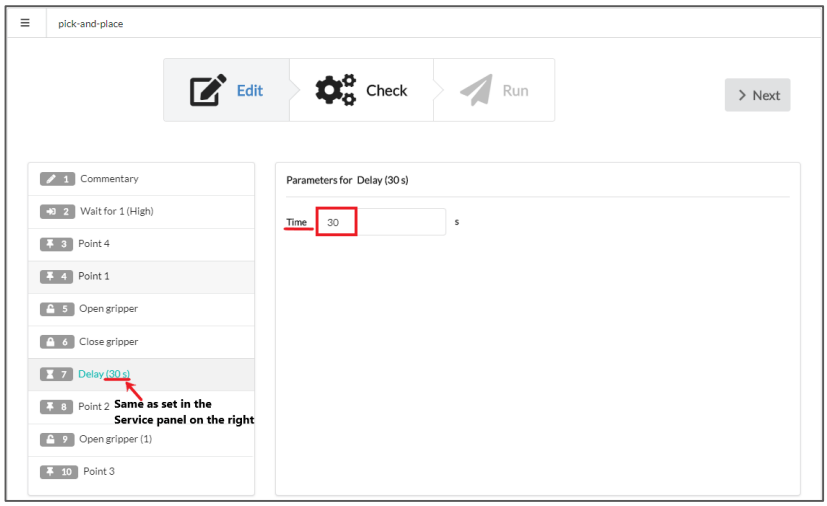
18. (*Optional*) Next, specify an intermediary point, if needed, to improve the previously created motion trajectory of the robotic arm. To do that, click and select **Point**. The **Point 4** command appears in the program body below **Wait for**.

19. To set up the **Point 4** parameters—coordinates and rotation angles (roll, pitch, yaw) of the tool center point, fill in the fields (in red frames) on the **Service** panel as shown in the figure.



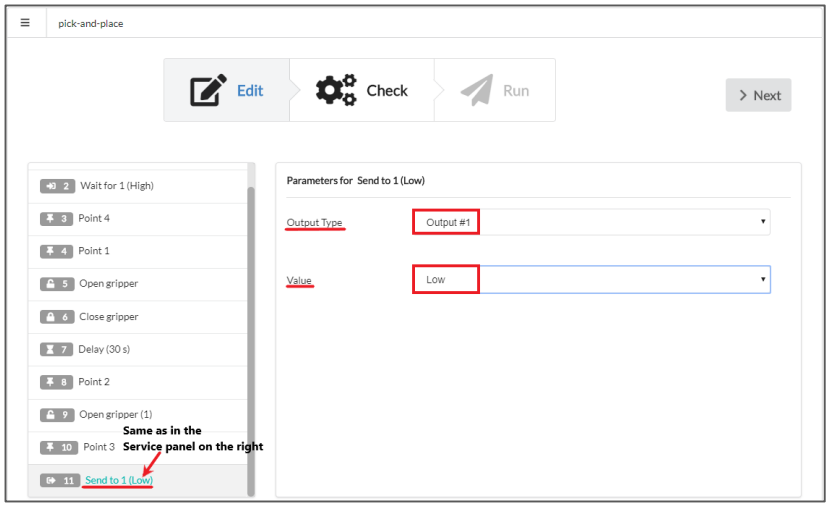
20. In the program body, select **Close gripper** and click  , then select **Delay**. PULSE DESK adds the **Delay** command to the **Program Body** below **Close gripper**. The Service panel for the command contains only the **Time** field with the default delay value of 100 s.

21. Set the delay value in the **Service panel** to 30 seconds. The value indicates for how long the robotic arm should wait before moving on to execute another command.

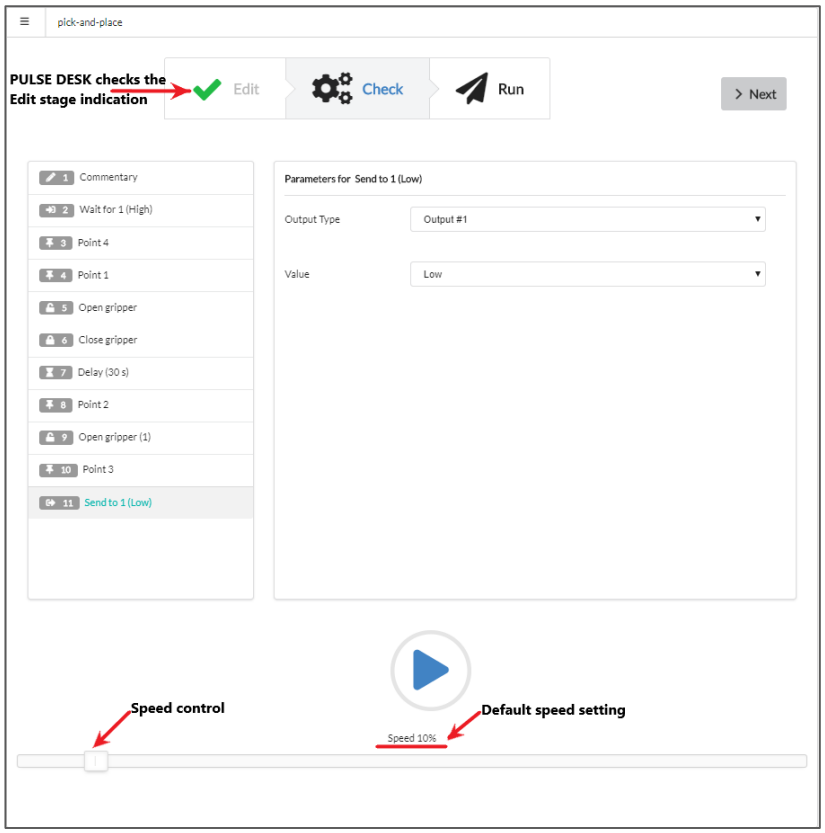


22. In the program body, select Point 3, click  . In the displayed menu, select **Send to**. PULSE DESK adds the **Send to** command to the program body below **Point 3**. The **Service panel** displays the fields to set up the command parameters.

23. Use the fields in the **Service** panel to set up the output and the signal that the arm should send to an external device (e.g., a conveyor belt) to warn about the pick-and-place operation completed. To do that, select **Output#1** in the **Output Type** dropdown box and **Low** in the **Value** dropdown box.



24. Click **Next** to move on to check the created program. PULSE DESK switches to the **Check** stage screen as shown below.



Conducting a test run

25. Adjust the speed control value to 20% by dragging the speed control to the right.

26. Click . PULSE DESK starts executing the specified sequence of commands from 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.

27. When selection reaches **Delay,** PULSE DESK displays next to . Click to skip the delay and move on to **Point 2**.

28. When PULSE DESK executes the last (**Send to**) command, it stops and displays the warning as shown in the figure below. Click **OK** to return to the **Check stage screen**.

29. Click **Next** to move on to execute the program or return to the **Edit** stage to make adjustments to the program. If you click **Next**, PULSE DESK displays the **Run** stage screen.

Executing the created program

30. To start execution of the program, click **Save&Run**. PULSE DESK executes the sequence of commands in the **Program Body**.

31. Click 

(replaces the **Save&Run** button) 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.

32. Close the browser window to quit PULSE DESK.

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