Robot Arm Quickstart

Congrats on getting your new X-Series Interbotix Arm on a Raspberry Pi!

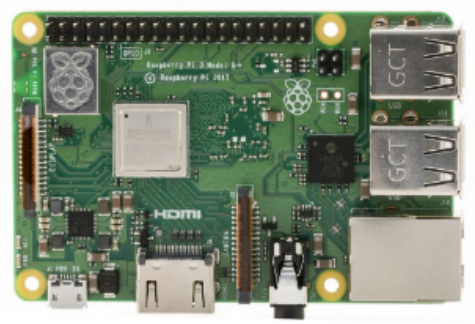
In just a matter of minutes, you will be ready to start your manipulation project. This quickstart will cover getting connected to your Arm as well as some troubleshooting steps if something goes wrong.

In Your Package...

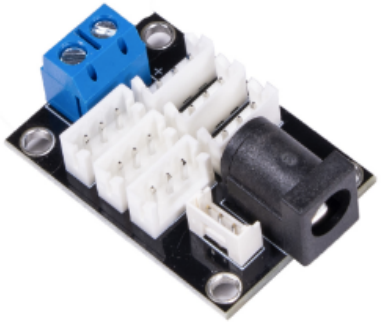
The Robot Arm package should come with the following components:

- 1 x X-Series Interbotix Robot Arm (including onboard U2D2 and X-Series power hub)
- 1 x 12V Robot Arm Power Supply
- 1 x Raspberry Pi 3B+ board (including a 32GB microSD card with preinstalled software)
- 1 x 5V Raspberry Pi Power Supply
- 1 x Raspberry Pi Clear Case
- 1 x Original Sony PS4 Controller
- 1 x microUSB cable

Robotis U2D2



Raspberry Pi 3B+



X-Series Power Hub

Hardware Setup

There is not much required to get the Robot Arm up and running as most of the setup is done for you. Just make sure to do the following steps:

- Remove the Arm from its packaging and place on a sturdy tabletop surface near an electrical outlet. To prevent it from potentially toppling during operation, secure it to a flat surface by placing the available thumb screws through the mounting holes around the base. At your own risk, you could instead place a small heavy bean-bag on top of the acrylic plate by the robot base. Finally, make sure that there are no obstacles within the workspace of the robot.
- Plug the 12V Arm Power Supply cable into an outlet and insert the barrel plug into the barrel jack on the X-Series power hub (located under the see-through acrylic on the robot base). You should briefly see the LEDs on the motors flash red.

- Plug the microUSB cable into the U2D2 (also located under the see-through acrylic on the robot base), and into a USB port on the Raspberry Pi.
- Finally, plug the 5V Raspberry Pi Power Supply cable into an outlet and insert the other side into the microUSB port on the Pi. If turning on the Pi for the first time, make sure to connect a keyboard, mouse, and HDMI monitor to it. Then, flick on the switch on the power cable

PS4 Controller Setup

Getting a PS4 controller connected via Bluetooth to the Raspberry Pi is pretty straightforward. Once the Pi boots, click the *Bluetooth* icon on the top right of your Desktop, followed by *Setup New Device...*. A window should pop up welcoming you to the 'Bluetooth device setup assistant.' Click the *Next* button. Then, press and hold the *Share* button on the PS4 controller. While holding the *Share* button, press and hold the *PS* button. After a few seconds, the triangular shaped LED located between the *L2* and *R2* buttons should start rapidly flashing white (about twice a second) at which point you can let go.

On the computer, click the 'magnifying glass' icon on the lower left of the 'Device' window. Wait until you see 'Wireless Controller' pop up, select it, and click *Next* on the bottom right of the window. A message should pop up asking if you would like to *Pair Device* or *Proceed Without Pairing*. Select *Pair Device* and click *Next* on the bottom right of the screen.

A new message should now display asking you to either connect to *Human Interface Device Service (HID)* or *Don't Connect*. Select the *Human Interface Device Service (HID)* option and click *Next*. In the following screen, you should see a message either saying that the *Device added successfully, but failed to connect* or that the *Device added and connected successfully*. This is typical and you should just click *Close* on the bottom right of the screen.

If the message said that the device connected successfully, you will need to disconnect and reconnect the controller for the next step. To do that, hold down the *PS* button for about 10 seconds until the blue LED at the front of the controller turns off. Then, tap the *PS* button on the controller (no need to hold it down), and after waiting a few seconds, you should see the LED at the front turn blue. At this point, you should see a small popup on the top right of the screen titled 'Bluetooth Authentication'. Make sure to click the *Always Accept* option. This means that the computer will always pair with your PS4 controller when you tap the *PS* button.

Specify Robot Arm Type

By default, the arm controller program does not know which of the robot arm configurations to load, so the program will error out the first time the Pi is booted. To fix this, click on the *armbot's Home* shortcut on the Desktop. Then navigate to the *interbotix_ws -> src -> interbotix_ros_arms_pi -> armbot -> interbotix_joy_control -> launch* directory. Open up the *joy_control.launch* file and you should see a line towards the top that says:

<arg name="robot_name" default=""/>

Replace *default=""* with the robot name abbreviation as described in the table below. For example, the line for the *PincherX 100 Robot Arm* should read…

<arg name="robot_name" default="px100"/>

After editing the file, make sure to save it and restart the Raspberry Pi.

Robot Type	Abbreviation
PincherX 100 Robot Arm	px100
PincherX 150 Robot Arm	px150
ReactorX 150 Robot Arm	rx150
ReactorX 200 Robot Arm	rx200
WidowX 200 Robot Arm	wx200
WidowX 250 Robot Arm	wx250
ViperX 250 Robot Arm	vx250
ViperX 300 Robot Arm	vx300

Connecting to the Robot Arm

After turning on the Pi, wait until you see the red LEDs on the U2D2 flash white. At this point, tap the PS button on the controller. Then wait until the white LED on the front of the controller turns to a solid blue (a few seconds). This means that the controller has successfully connected to the Pi over Bluetooth. Now go and have fun! Make sure to take a look at the guide below to get familiar with the button mappings.

Troubleshooting

If your PS4 controller isn't working…

- Verify that the controller is paired with the Pi by confirming that the LED on the front of the controller is blue. If it's flashing white or not on, try repeating the **PS4 Controller Setup**. If the LED is a different color like red, green, or pink, that means your controller is paired with the Pi but connected to the wrong port. Most likely, this is because another controller is already paired with the Pi.

- Make sure that your controller is charged
- Restart the Pi and try again

PS3 & PS4 Button Mappings

Button	Action
START / OPTIONS	move the robot to its Home pose
SELECT/SHARE	move the robot to its Sleep pose
R2	rotate the 'waist' joint clockwise
L2	rotate the 'waist' joint counterclockwise
△	increase gripper PWM in 25 step increments (max is 350)
X	decrease gripper PWM in 25 step increments (min is 150)
O	open gripper
□	close gripper
D-pad Up	increase arm speed in 0.25 step increments (max is 3.00)
D-pad Down	decrease arm speed in 0.25 step increments (min is 1.00)
D-pad Left	'Coarse' control - sets arm speed to a user-preset 'fast' speed
D-pad Right	'Fine' control - sets arm speed to a user-preset 'slow' speed
Right stick Up/Down	Increase/Decrease pitch of the end-effector
Right stick Left/Right	Increase/Decrease roll of the end-effector
R3	reverses the Right stick Left/Right control
Left stick Up/Down	move the end-effector (defined at 'ee_gripper_link') vertically in Cartesian space
Left stick Left/Right	move the end-effector (defined at 'ee_gripper_link') horizontally in Cartesian space
L3	reverses the Left stick Left/Right control

Other Info

Please note that the password to login to the computer is ‘armbot’ without the single quotes. Also, the Pi has its own Hotspot called ‘armbot-hotspot’. The password to get connected to the hotspot is ‘armbot-hotspot’ as well.

To review the software and/or look at other questions customers have asked, please take a look at our GitHub page: https://github.com/Interbotix/interbotix_ros_arms_pi. If you need assistance, feel free to contact us at trsupport@trossenrobotics.com. For other robotic kits, check out our website at https://www.trossenrobotics.com.

That’s all! Have fun and good luck!

- From the InterbotiX Team