Turret Quickstart

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

In just a matter of minutes, you will be ready to start controlling the Turret for your pan-and-tilt application. This quickstart will cover getting connected to your Turret as well as some troubleshooting steps if something goes wrong.

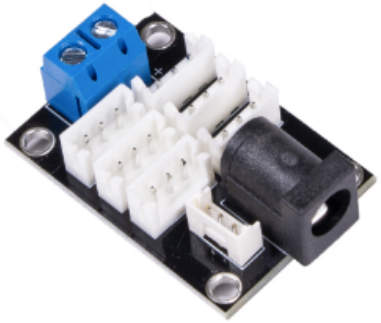
In Your Package...

The Turret package should come with the following components:

- 1 x X-Series Interbotix Turret (including onboard U2D2 and X-Series power hub)
- 1 x 12V Turret 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 Turret up and running as most of the setup is done for you. Just make sure to do the following steps:

- Remove the Turret 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 Turret base. Finally, make sure that there are no obstacles within the workspace of the Turret.
- Plug the 12V Turret 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 Turret 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 Turret 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 Turret Type

By default, the turret controller program does not know which of the five turret configurations to load, so the program will error out the first time the Pi is booted. To fix this, click on the *turretbot's Home* shortcut on the Desktop. Then navigate to the *interbotix_ws -> src -> interbotix_ros_arms_pi -> turretbot -> interbotix_turret_control -> launch* directory. Open up the *turret_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 *PhantomX XL430 Robot Turret* should read…

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

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

Robot Type	Abbreviation
PhantomX XL430 Robot Turret	pxxls
WidowX XM430 Robot Turret	wxxms
WidowX Dual XM430 Robot Turret	wxxmd
ViperX XM540 Robot Turret	vxxms
ViperX Dual XM540 Robot Turret	vxxmd

Connecting to the Turret

There are three ways to operate the Turret. They are:

- Using a PS4 controller only
- Interfacing with the Graphical User Interface tool directly on the Raspberry Pi
- Interfacing with the Graphical User Interface tool remotely on a Network

PS4 Control

This is the simplest way of controlling the Turret. 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 *Turret Control Tutorial* guide to get familiar with the button mappings.

Directly Interfacing with the GUI

In this mode, you must connect your own keyboard, mouse, and monitor to the Pi (which you should do before turning the Pi on). Please note that the Pi only has an HDMI port, and that an HDMI cable is not included in the package. When the monitor turns on, you should see a graphical user interface that can be used to control the Turret. Please take a look at the *Turret Control Tutorial* guide to get familiar with it. If you would like to control the Turret with the PS4

controller in addition to the GUI, just follow the directions specified in the ‘PS4 Control’ section above. As an FYI, it you ever close the GUI, you can always reopen it by pressing the ‘Interbotix Turret’ shortcut on the Desktop.

Remotely Interfacing with the GUI

In this mode, you will place the Raspberry Pi on your network and remote into it from whatever computer you want. The benefit of this approach is that you do not have to be physically near the Turret to control it. However, this will require some setup. Specifically, you will need to:

- Connect your Raspberry Pi to a network (via Wifi or Ethernet)
- Install software on your personal computer and on the Pi to allow remote control
- Remote into the Pi from your computer over the network

Step 1

To get started, hook up a mouse, monitor, and keyboard to your Raspberry Pi, and turn it on. If you plan on using an Ethernet cable to connect the Pi to your network, plug it in now, and skip to **Step 2**. Otherwise, mouse over to the top-right of your screen and hit the ‘Wifi’ icon. Scroll down to where it says ‘Disconnect’ (should be under ‘turretbot-hotspot’) and press it. After a couple seconds, you should be able to see other available networks. Click your desired network and type in the password (assuming there is one).

Next, click the ‘Wifi’ icon again, and scroll down to where is says ‘Edit Connections…’. Click it, then double click the ‘turretbot-hotspot’ name in the window that pops up. Navigate to the ‘General’ tab and uncheck ‘Automatically connect to this network when it is available.’ Then, click ‘Save’. Now, double click your network name and navigate to its ‘General’ tab. Make sure that the two checkboxes below are checked, then click ‘Save’.

- Automatically connect to this network when it is available
- All users may connect to this network

Step 2

In this step, you should install software on the Raspberry Pi and your own computer to allow remote control. While it is completely up to you what to install, we recommend installing TeamViewer. Look at the tutorial at https://pimylifeup.com/raspberry-pi-teamviewer/ to learn how to install it on the Pi and your computer.

Step 3

In this step, you should remote into the Raspberry Pi from your own computer. Regardless of which software you installed, make sure to write down any information you might need before removing your keyboard, mouse, and monitor from the Pi. For example, if using TeamViewer, you should write down the Pi’s TeamViewer ID and Password somewhere safe. Now, when you remotely access the Pi, you should see the Turret Control GUI! Make sure to look at the *Turret Control Tutorial* guide to get familiar with it. If you would like to control the Turret with the PS4 controller in addition to the GUI, just follow the directions specified in the ‘PS4 Control’ section

above. As an FYI, it you ever close the GUI, you can always reopen it by pressing the ‘Interbotix Turret’ shortcut on the Desktop.

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 the **External Joystick Checkbox** in the turret control GUI is checked

If the turret control GUI is not responding or seems to be frozen…

- Turn off the Pi, wait a few seconds, and turn it back on.

If the turret control GUI doesn’t pop up…

- Make sure that you have entered the right robot abbreviation in the **Specify Turret Type** section, then restart the Pi

If the GUI is responding but the Turret is not moving…

- This can happen if you unplugged a USB or power cable from the turret during operation. Just plug it back in and restart the Pi

Other Info

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