A. Communicating with QDrone 2

The QDrone 2 is shipped pre-configured to connect to the wireless network created by the provided router: Quanser_UVS-5G. This happens automatically following a boot sequence when they are powered on. To ensure that the drone is connected, observe if there is an IP in the LCD screen on top of the drone and try to ping it from the command prompt in the ground control station, similar to ensuring that the ground control station PC - router connection has been established in the router to PC documentation step 7 – router pc connection.

To connect additional vehicles to the UVS network, the 5GHz and 2.4GHz bands on the router have been configured as follows:

5GHz:

SSID: Quanser_UVS-5G Password: UVS_wifi

2.4GHz:

SSID: Quanser_UVS Password: UVS_wifi

Router login credentials are as follows:

Username: admin Password: Quanser_123

The QDrone 2 does not have a preset IPV4. **If you would rather set a fixed IP, refer to the Setting Fixed IP Addresses document (supplementary_material > setting_fixed_ip).** For a successful connection, the DHCP server option on the router must be enabled. For the Netgear Nighthawk router provided with the AVRS system, the DHCP server can be found by going to Advanced/Setup/LAN Setup.

To ensure compatibility with the Self-Driving Car Research studio, the **5GHz band** for the Netgear Nighthawk router has been configured to **channel 44.** If you do notice intermittent issues with communication to any of the vehicles, it is recommended that you use a WiFi spectrum analyzer and check if there are networks which are broadcasting on the same channel but at a higher signal strength. Microsoft has a free WiFi analyzer: **(** https://www.microsoft.com/en-us/p/wifi-analyzer/9nblggh33n0n?activetab=pivot:overviewtab#)

You can change the Netgear Nighthawk's channel number by logging into the router and checking the channel number under the 5GHz wireless band.

B. Boot-Up for QDrone 2

i. Connecting the Battery

Insert a fully charged battery into the battery compartment on the QDrone 2 (Figure 1) all the way to the hard stop marked with a red circle at the bottom of the image. Make sure that the long cables that have the XT-60 connector go to the top left so that you can connect it plug it in, **Tighten the battery with the velcro**. It is generally good practice to hide the 5-pin connector under the battery, so it is not dangling while in flight.

> **Note:** Ensure that the velcro strap is tight and that the battery is secured in place.

Connect the XT-60 connector on the battery to the XT-60 connector on the tail at the bottom of the drone (Figure 1).

> ⚠ **Caution:** Leaving the QDrone 2 powered on with the battery connected will continue to drain power below the minimum voltage threshold of 13.3V **and may permanently damage the battery**.

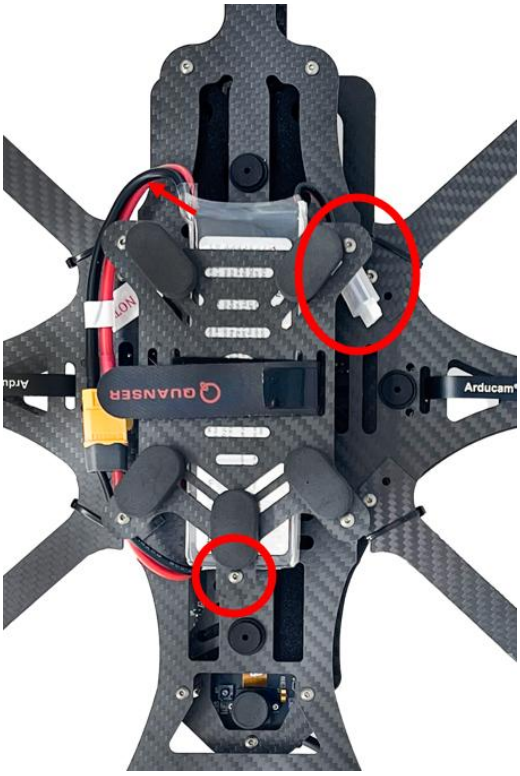

Figure 1. Battery setup

ii. Turning the QDrone 2 ON and OFF

Press and quickly release the red power button on the drone PCB to turn it on. It should be acknowledged by 3 beeps from the QDrone 2 as the drone's computer boots. The LCD on the QDrone 2 should turn on and it should show Figure 2a. Figure 2 shows the LCD display as the QDrone 2 is being turned on (2a), as it starts (2b) and gets an IP address (2c) and what happens after the button is pressed for power off (2d).

(a) Booting up

(b) Started

(c) Connected

(d) Powering off

Figure 2: QDrone 2 boot and power off

> **Note:** Turn off the QDrone 2 by using the red power button. Only press once quickly and release, LCD should show Figure 2d. Do not keep the red button pressed to turn it off as it could cause issues. Disconnect the XT-60 battery cable whenever the QDrone 2 is not in use.

iii. Testing the Connection

Open a command prompt on the ground control station PC (type `cmd` in the start menu). Type the following command: `ping 192.168.2.d -t` where 192.168.2.d represents the IP on the drone. It should be displayed in the LCD when the drone is powered on. It could take a couple of minutes to appear. A reply should be registered as in Figure 3, which indicates that a connection has been established. You can press CTRL+C to terminate the ping.

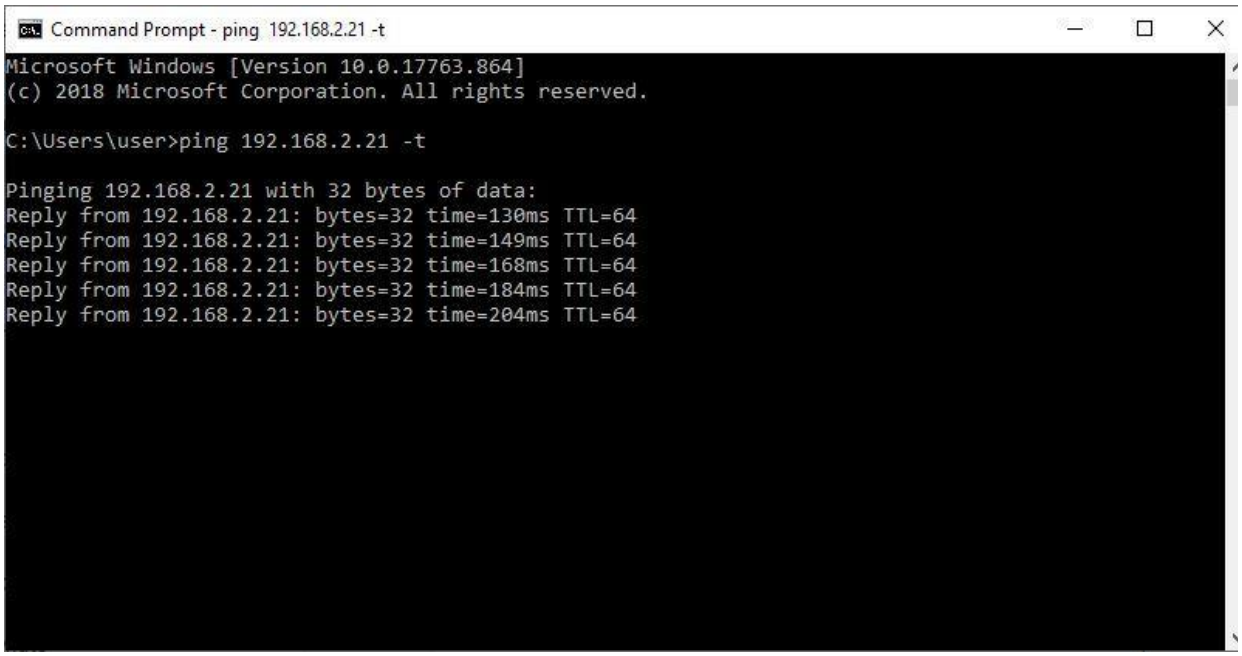

Figure 3: Checking the connection between the QDrone 2 and the ground control station PC

An alternative way of checking connectivity between the QDrone 2 and the router is to note if the router is seeing the QDrone 2 by connecting to the router. Router login credentials are in section A.

The QDrone 2 network information can be found by checking under the Connected/Attached Devices option.

If the QDrone does not have an IP address on its LCD after a few minutes and the router is turned on configured properly, contact Quanser's technical support.

> **Note:** If the ping test fails, double-check the network connection and try again. Also try power cycling the drone. If issues persist, contact Quanser technical support (tech@quanser.com).