

Autonomous Vehicles Research Studio

Setup Guide – QDrone 2 I/O Test

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For more information on the solutions Quanser Inc. offers, please visit the web site at: <http://www.quanser.com>



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This symbol indicates that waste products must be disposed of separately from municipal household waste, according to Directive 2002/96/EC of the European Parliament and the Council on waste electrical and electronic equipment (WEEE). All products at the end of their life cycle must be sent to a WEEE collection and recycling center. Proper WEEE disposal reduces the environmental impact and the risk to human health due to potentially hazardous substances used in such equipment. Your cooperation in proper WEEE disposal will contribute to the effective usage of natural resources.

This product meets the essential requirements of applicable European Directives as follows:

CE Compliance 

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Warning: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.



Caution

This equipment is designed to be used for educational and research purposes and is not intended for use by the public. The user is responsible to ensure that the equipment will be used by technically qualified personnel only. While the end-effector board provides connections for external user devices, users are responsible for certifying any modifications or additions they make to the default configuration.

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A. QDrone 2 I/O Check

1. From the same folder containing this file, open the folder QDrone2 IO Check, and open QD2_IOCheck_2021b.slx.
2. In the model that loads, from the **HARDWARE** tab on top of your Simulink model, click on **Hardware Settings** (Gear Icon). (If using an older version, click on **Model Configuration Properties** under the **Simulation** drop menu.)
3. Expand **Code Generation** on the left side of the window, click on **interface** and set the **MEX-file arguments** (Figure 1) as follows

`'-w -d %d -uri %u','tcpip://192.168.2.x:17001'`

where 192.168.2.d refers to the IP address of the QDrone 2 you are using (found on the LCD screen). Press OK.

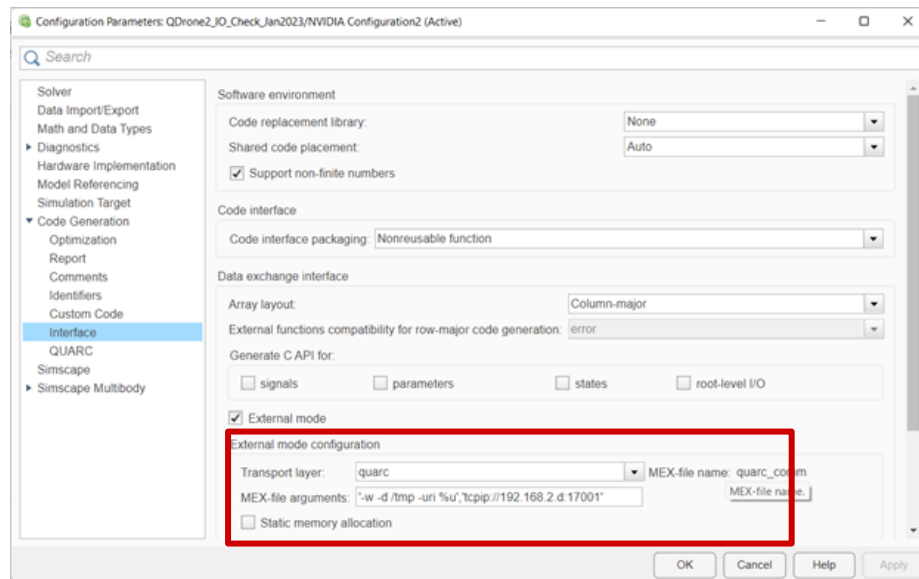


Figure 1. Setting up the MEX-file arguments

4. Plug in a battery and turn ON the QDrone 2 using the red on button. Place the drone at the center of the workspace ensuring the ESC disable switch has a green light (which means the ESC is enabled), as shown in figure 2.

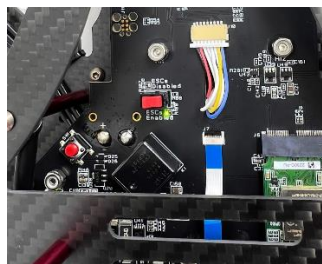


Figure 2. ESCs enabled (motors can spin)

5. Ensure that a connection to the drone is established by pinging to it. See the vehicle communication document for more information.
6. Ensure that the **Arm/Disarm Switch** in the model (Figure 3) is set to 0.

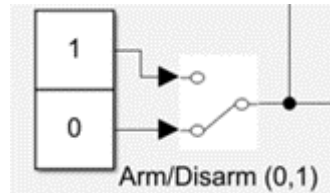


Figure 3. Motor Switch set to off in the QDrone 2 IO check model.

7. Ensure both the SAFETY GOGGLES and PROTECTIVE GLOVES are worn.
8. Click on the **HARDWARE** tab on the top menu, and then click the green play button (**Monitor & Tune**). It should build and start the model. If you have an older version of Simulink that does not have a Hardware tab, under the **QUARC** drop down menu, click **Build** and once it finishes click **Start**.
9. After you hear 3 or 5 beeps (which indicates that the ESCs are enabled and that the model is running on the drone), set the **Arm/Disarm switch** to 1. The four motors should start spinning at the same time. Use this to make sure all motors are spinning in the correct direction. **Switch the Cycle Motors switch** to 1, the motors will move sequentially (one at a time in clockwise order) which you should see in the **Motors (%) Scope**. Ensure that the motors are turning on and off in a clockwise cyclical order and each motor is spinning in expected directions: bottom right (motor 0, clockwise), bottom left (motor 2, counter-clockwise), top left (motor 3, clockwise) and then top right (motor 1, counter-clockwise). Shown in figure 4 where the front of the drone is where the real sense camera is mounted.

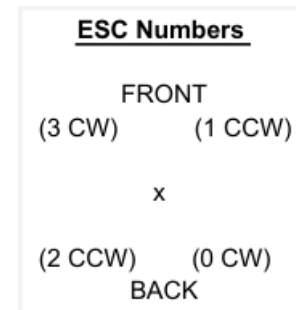


Figure 4. Motor numbers and spinning directions.

10. Set the **Arm/Disarm Switch** to 0.
11. Step into the workspace and set the **ESC Disable** switch on the QDrone to **ON** (that is, the ESCs are DISABLED, which is indicated by a **red LED lit next to the switch**). **This will trigger a warning sign on the LCD, it is okay and is there to show that the motors have been disabled through hardware. If you flip the switch again, you would not be able to Arm the motors. The icon will not disappear until the model is restarted with the Switch OFF (has a green LED).** The Scope at the bottom of the model connected to the HIL watchdog should change from 0 to 1 when the switch is flipped.

12. Move the drone around manually by holding it using the handle on the top frame of the QDrone. Check the attitude of the drone in the **Attitude Estimates (rad)** scope to ensure that the readings are reasonable. Use the picture of the drone axis in the model to make sure the movements in X, Y and Z are correct.
CAUTION: DO NOT handle the drone with spinning motors.
CAUTION: DO NOT handle the QDrone 2 with spinning motors (Make sure Arm/Disarm Switch is set to 0).
13. Hold the QDrone 2 and check the Height using the **BF_Height (m)** scope. The sensor is in the front bottom of the QDrone 2 next to the bottom facing camera. You can place the drone on the edge of a table and make sure it is working properly.
14. While holding the QDrone 2 by the handle, move it around and confirm that the **Optical Flow scope** measurements are changing when moving the QDrone 2 in X and Y directions. Use the drone image on the model as a reference for positive X and Y.
15. Ensure that the **Low Battery** display is 0 (i.e., battery is charged, low battery threshold is 14V).
16. Ensure that the **Sensor Failure** display is 0 (i.e., no sensor issue).

This completes the **QDrone 2 IO check** task and confirms that your QDrone is functioning correctly. The **QDrone 2 IO Check** model can be used to confirm basic functionalities whenever you run into unexpected behavior, to isolate software from hardware issues. If you have any errors, make sure that all the steps prior to this checkpoint have been followed. If further issues persist, please contact Quanser technical support (tech@quanser.com).

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