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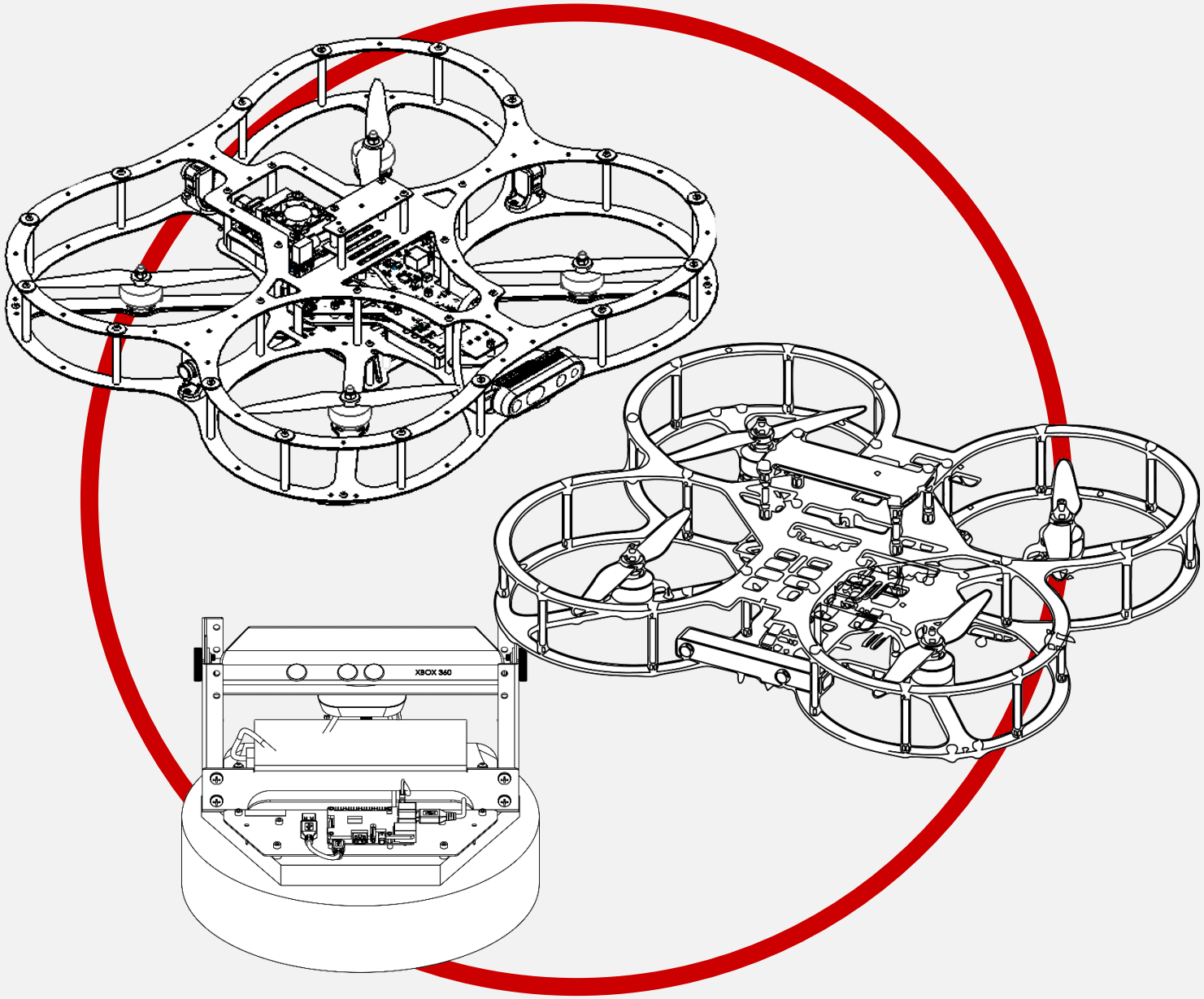

Autonomous Vehicles Research Studio

Setup Guide – FrSky Joystick Setup

v 2.0 – 18*th April* 2023

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Note: If you have a different joystick (Spektrum) make sure to instead read the Spektrum_joystick_setup file located in the same folder as this file.

A. FrSky Binding/Pairing

The provided FrSky Taranis X9 Lite S joystick (Figure 1a) communicates wirelessly to the FrSky USB dongle (Figure 1b), which is plugged into a USB port on the ground control station PC. The dongle and joystick have been pre-configured to bind/pair with each other prior to shipping. When the FrSky USB is connected to a powered PC, the RED status LED will be blinking waiting for a paired connection. Turn on the joystick by holding the power button in the middle for 4 seconds and releasing, the LCD screen will change to show the Quanser logo. Once the FrSky joystick is turned on the FrSky USB dongle will have a solid green LED indicating a successful connection to the FrSky joystick. To power off the FrSky joystick, hold the power button for 4 seconds and release.

a. FrSky Taranis X9 Lite S joystick

b. FrSky USB dongle

Figure 1: FrSky transmitter and USB dongle bound

Note: If the USB dongle is connected for long periods of time, then the joystick may stop receiving data. If so, try to disconnect and then reconnect the USB dongle to renew the connection.

i. Pair Joystick to USB Dongle

This section is only important if your joystick and dongle are no longer paired. If you do not have this problem, you can continue to the next section.

If the binding/pairing is lost (RED LEDs on dongle keep flashing), see FrSky USB Dongle Manual (located in supplementary_material/FrSky Dongle Manual.pdf).

To bind/pair the FrSky Taranis joystick transmitter to the FrSky USB dongle, follow these steps:

1. Ensure that the joystick transmitter is OFF. Disconnect the USB dongle from the PC if it was previously plugged in.
2. While pressing the pair button (Figure 2), connect the USB dongle to the PC. The red and green status LED on the will turn on indicating the dongle is ready for binding.

Figure 2: Bind button FrSky USB dongle

3. Press and hold the power button on the FrSky Taranis joystick for 4 seconds to turn on the joystick.
4. Press the MENU button followed by the PAGE button to navigate to page 2 of the main menu (the top right corner should say 2/12).
5. Use the right scroll wheel on the FrSky Taranis joystick to go to the INTERNAL RF option (Scrolling to the left (going back) is the fastest way to do it).
6. Use the scroll wheel to verify the following options:

```
MODE: ACCST D16
Ch Range: Ch1-16
RxNum : 01[Bnd][Rng]
Failsafe: Custom [set]
```

7. Once the settings in step 6 have been set use the scroll wheel to highlight the [Bnd] option and click the scroll wheel. Select mode Ch9-16 Telem ON and the FrSky Taranis joystick will start beeping and the FrSky USB dongle's RED LED will start flashing. Once the joystick has done a complete beeping cycle click the [Bnd] button again to finish the binding process.
8. Disconnect and reconnect the FrSky USB dongle from the PC.
9. Click the EXIT button twice on the FrSky Taranis joystick to exit the main menu.

B. FrSky Joystick Channels

The FrSky Taranis joystick has numerous buttons, toggles and sticks. However, only a subset relay information to the USB dongle receiver.

Currently the Autonomous Vehicles Research Studio supports three different models from FrSky:

- FrSky x9 Lite S (Quanser V2)
- FrSky x9 Lite (Quanser V3)
- FrSky X7 (Quanser V4)

Please review the joystick mapping below to become familiar with the button mapping across the three supported joysticks

Common functions across the different joysticks:

- Emergency Stop Button
- Takeoff/Land
- Arm/Disarm
- Throttle
- Yaw
- Pitch
- Roll

These functions are divided between Toggles and Joysticks. Toggles read TRUE when at position labelled 1 or 2 (middle or front position, moved towards the user), and FALSE at position 0 (back position/away from user).
Joysticks are spring loaded except for Throttle which holds the position for which the joystick is left on.

FrSky X9 Lite S

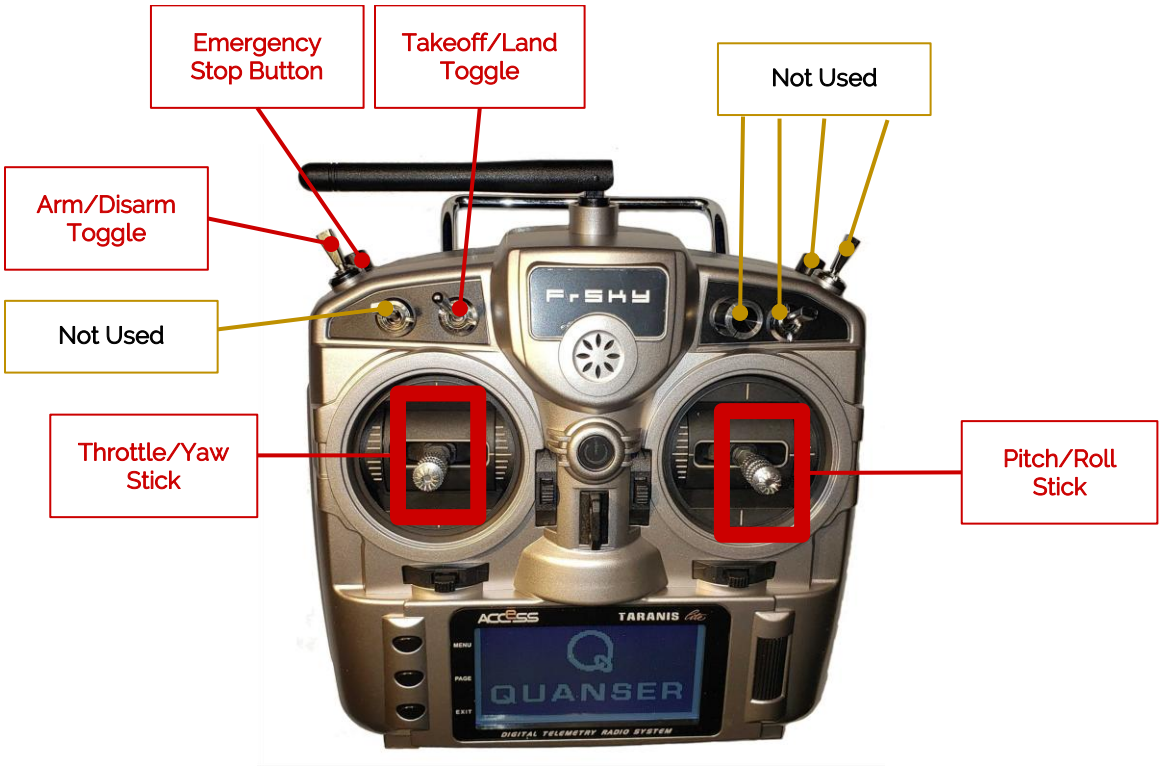


Figure 3: FrSky Taranis X9 Lite S joystick buttons, toggles, and sticks

Note: Some of the buttons/toggles relay information to the USB dongle but are currently not used. These are highlighted in Figure 3 in yellow. For proper operation of the Autonomous Vehicles Research Studio, ensure that these toggles are set to a position tilted away from the user holding the joystick, as illustrated in Figure 3.

FrSky X9 Lite

Figure 4: FrSky Taranis X9 Lite joystick buttons, toggles, and sticks

Note: Some of the buttons/toggles relay information to the USB dongle but are currently not used. These are highlighted in Figure 4 in yellow. For proper operation of the Autonomous Vehicles Research Studio, ensure that these toggles are set to a position tilted away from the user holding the joystick, as illustrated in Figure 4.

FrSky X7

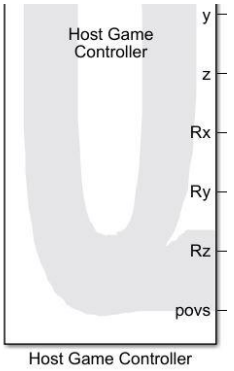
Figure 5: FrSky Taranis X7 joystick buttons, toggles, and sticks

Note: Some of the buttons/toggles relay information to the USB dongle but are currently not used. These are highlighted in Figure 5 in yellow. For proper operation of the Autonomous Vehicles Research Studio, ensure that these toggles are set to a position tilted away from the user holding the joystick, as illustrated in Figure 5.

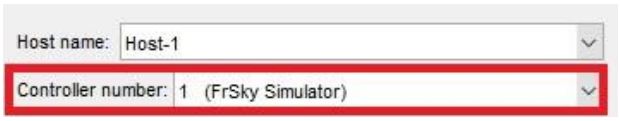
C. Checkpoint – Joystick Visualization Demo

1. From the same folder as this file, under Joystick Visualization Demo, open the Joystick_Visualization_2019a.slx model.
2. In the model that loads, double-click the **JOYSTICK_FRSKY** subsystem (Figure 4a) and double-click on the **Host Game Controller** block (Figure 4b). In the pop-up dialog window, ensure that the **Controller number** (Figure 4c) drop down menu has selected the item labelled **FrSky Simulator**.

a. Joystick subsystem



b. Host Game Controller



c. Controller number set to FrSky Simulator

Figure 4: Selecting the FrSky USB receiver in Simulink/QUARC

3. Ensure that the joystick is powered **ON** and that it is bound to the USB dongle plugged into the ground station PC.
4. Go back to the root level in the model, click on the **HARDWARE** tab on the top menu and click the green play button **(Monitor & Tune)**
5. Follow the instructions at the model's root level to move the drone around.
6. The drone should fly around in directions aligned with the user joystick commands.
   a. Pushing the throttle stick up/down should increase/decrease the drone's height.
   b. Pushing the yaw stick left/right should increase/decrease the drone's heading.
   c. Pushing the pitch stick up/down should move the drone forward/backward.
   d. Pushing the roll stick left/right should move the drone left/right.

This completes the checkpoint task and confirms that your Joystick has been configured successfully. If you encounter 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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