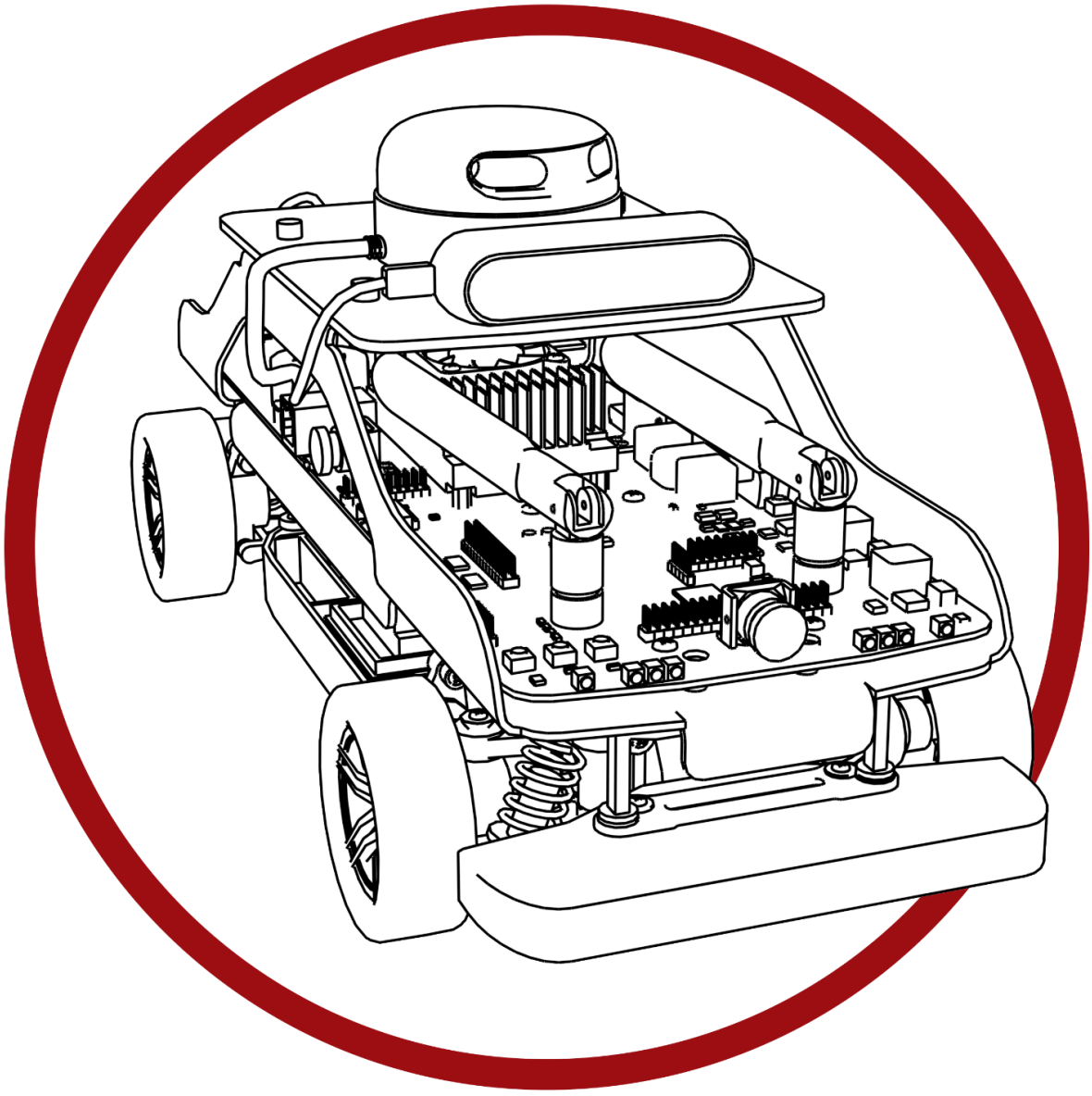
QUANSER
INNOVATE·EDUCATE

Self-Driving Car Research Studio



Hardware Tests - ROS

V 1.1 (November 2020)

Intel RealSense, RPLidar A2, CSI cameras and I/O

The following steps are meant to allow you to test the hardware available on the QCar via the ROS development environment. Please refer to the **User Guide** to ensure all necessary setup steps are completed before proceeding.

Prior to starting the test please **connect** the **Logitech gamepad** onto the QCar. You can find the device ID by opening a command terminal and using the following command:

```
ls -l /dev/input/by-id
```

You will need to copy the content of **Core Modules/ROS-Python** to the ~**/ros1/src/** directory of the QCar. The copy the content of **Hardware Tests/ROS-Python** and merge with the ~**/ros1/src/** directory of the QCar.

Navigate to the following directory **~/ros1/src/qcar/src** and **modify** the following line in the **commandnode.py** script:

```
self.gpad = gamepadViaTarget(<LOGITECH_GAMEPAD_ID>)
```

You will also need to modify the file type of all the nodes which can be configured for the QCar. Within the same directory **~/ros1/src/qcar/src** run the following command:

```
sudo chmod +x <NAME OF FILE #1> <NAME OF FILE #2> <NAME OF FILE #3>
```

You will need to put the file names for all the qcar nodes:

- commandnode.py
- csinode.py
- lidarnode,py
- qcarnode.py
- rgbdnode.py

Open a new terminal and navigate to **~/ros1**.. Enable superuser authority with the following command **`sudo -s.`** You can start the hardware test by running the following launch file:

```
roslaunch qcar qcar.launch
```

In order to properly view the LiDAR and RGBD video streams you have to set the **fixed frame** under **Global Options** drop down menu at top right corner inside **Displays** section, for this test the **base** was used as the reference frame for the QCar.

To set up the **RGB image** feed from the RealSense RGBD camera on the QCar use the following steps:

- Under **Displays** click on **Add** and select **Image** under **By display type.**
- For the **Image Topic** option select **/qcar/rgbd_color**

This will show you a small window on the bottom left corner of the RViz session with the image feed from the RealSense RGBD camera.

To set up the **RPLiDAR** use the following steps:

- Under **Displays** click on **Add,** choose **By topic** and select **LaserScan.** By default, the LiDAR is broadcasting a topic called **/scan.**

To view the QCar model within RViz do the following step:

- Under **Displays** click on **Add**, choose **By display type** and select **RobotModel**. Then a QCar model will be shown in RViz

.

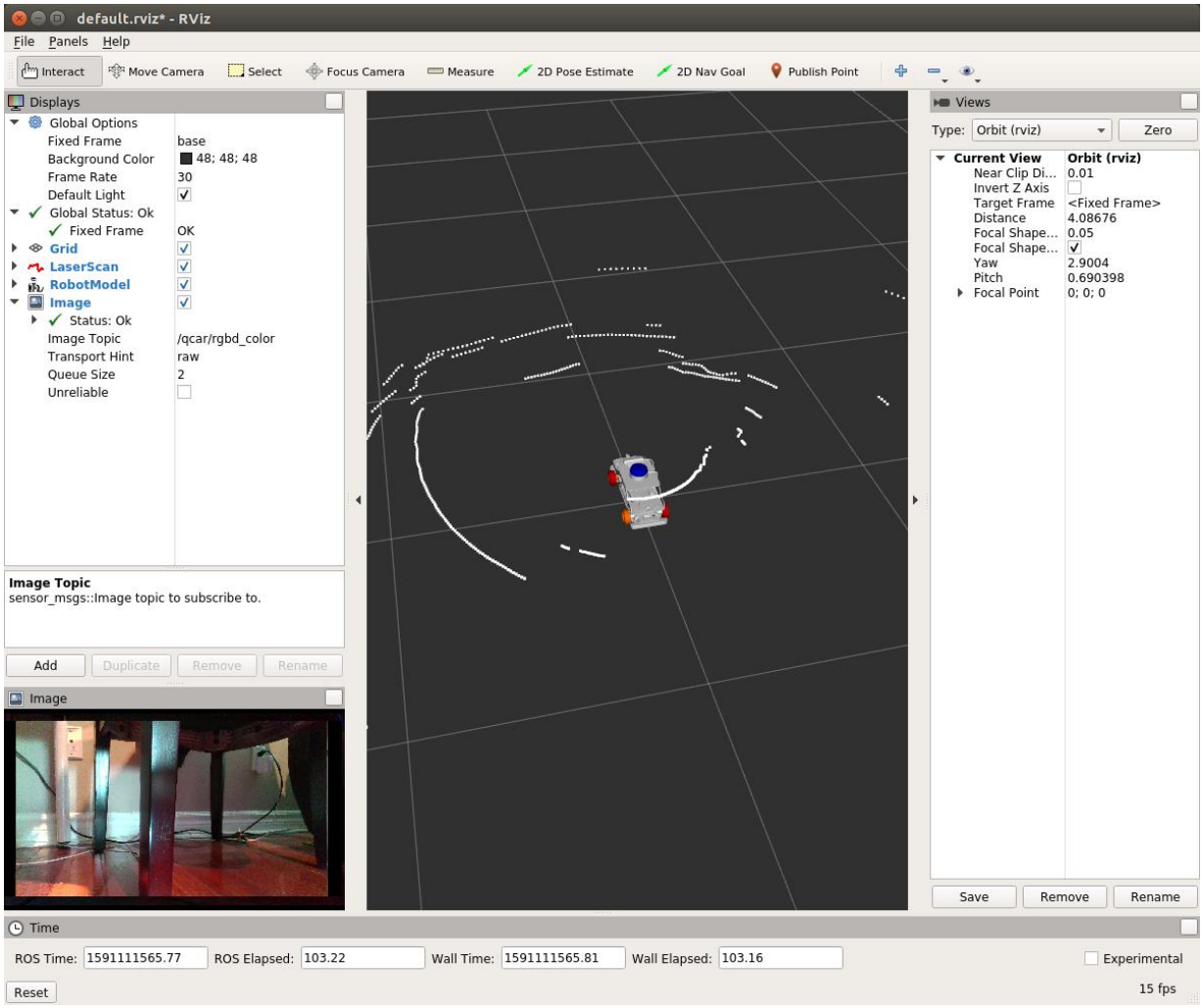


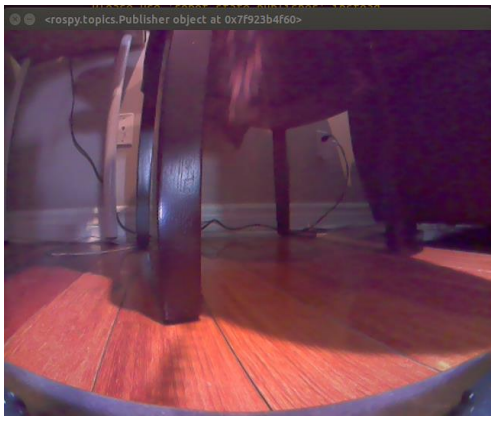
Figure 1: Sample image of configured RViZ window.

NOTE: The illustrated 3D data in RViz represents the raw LiDAR data from the RPLiDAR. The head reference of the raw data is pointed at 90˚ to the left of the QCar. These raw data will need to be rotated properly to align with the heading of the QCar.

You can use Figure 1 as reference for the topics which should be displayed. Please note that topics which have **not been set correctly** will have a **yellow exclamation mark** beside the name of the feature being displayed. If the topic is **not receiving** any data you will see a **red warning** beside the name of the display feature.

Running the QCar launch file will also start streaming the image feed from all 4 CSI cameras.

a. CSI front camera



b. CSI back camera

c. CSI left camera

d. CSI right camera

Figure 2: Video stream from all 4 CSI cameras on the QCar.

To **test** the **drive motor** and **steering servo** you will need to send commands with the **Logitech Gamepad.**

Controlling the QCar:

- Use the **LB** button on the Logitech gamepad to **enable** motor commands,
- Use the **RT** to **accelerate** forwards and use the **left joystick** to **steer**.
- To move in **reverse,** hold the **LB** and **A buttons** while using the **RT** to control acceleration.

Once you have verified that the QCar's sensors and actuators are working correctly you need to terminate RViz by using **Ctrl+C** on the terminal used to launch the qcar.launch file.