QCar 2

User Manual – Troubleshooting

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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 for ensuring that the equipment will be used by technically qualified personnel only. **NOTE:** While the GPIO, ethernet and USB ports provides connections for external user devices, users are responsible for certifying any modifications or additions they make to the default configuration.

Caution
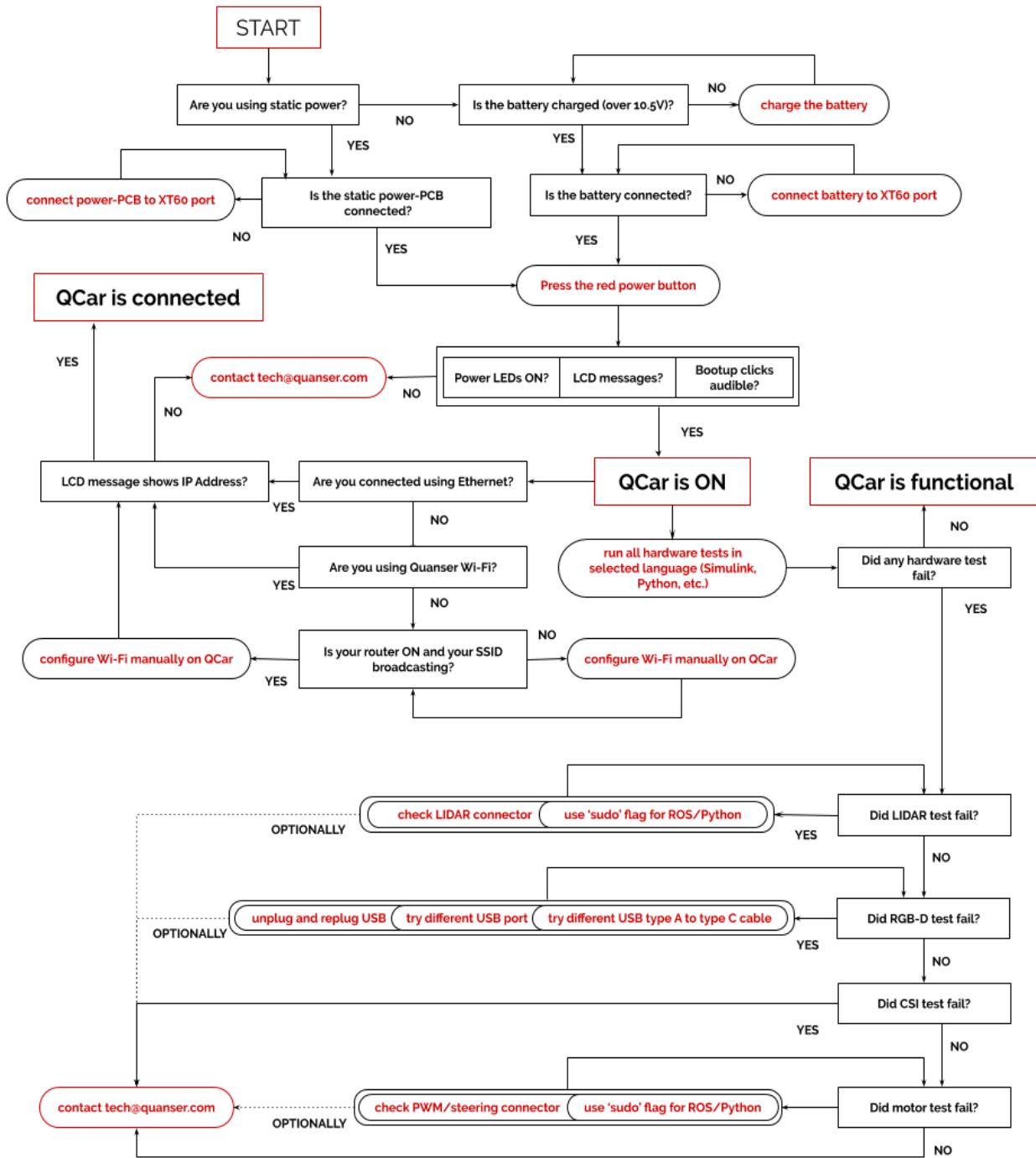
The Intel RealSense D435 RGB-D camera is classified as a Class 1 Laser Product under the IEC 60825-1, Edition 3 (2014) internationally and EN 60825-1:2014+A11:2021 in Europe. The camera complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed. 3 as described in Laser Notice No. 56, dated May 8, 2019. The RPLIDAR A2M12 reaches Class I laser safety standard and complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.
Do not power on the product if any external damage is observed. Do not open or modify any portion of any laser product as it may cause the emissions to exceed Class 1. Invisible laser radiation when opened. Do not look directly at the transmitting laser through optical instruments such as a magnifying glass or microscope. Do not update laser product firmware unless instructed by Quanser.

Table of Contents

A. Diagnostics Checklist

START

Are you using static power? — NO → Is the battery charged (over 10.5V)? — NO → charge the battery

Are you using static power? — YES → Is the static power-PCB connected?

Is the battery charged (over 10.5V)? — YES

Is the static power-PCB connected? — NO → connect power-PCB to XT60 port

Is the static power-PCB connected? — YES

Is the battery connected? — NO → connect battery to XT60 port

Is the battery connected? — YES

Press the red power button

QCar is connected

Power LEDs ON? | LCD messages? | Bootup clicks audible? — NO → contact tech@quanser.com

Power LEDs ON? | LCD messages? | Bootup clicks audible? — YES → QCar is ON

LCD message shows IP Address? — YES (up to QCar is connected, NO → contact tech@quanser.com)

Are you connected using Ethernet? — YES → LCD message shows IP Address?

Are you connected using Ethernet? — NO → Are you using Quanser Wi-Fi?

Are you using Quanser Wi-Fi? — YES → LCD message shows IP Address?

Are you using Quanser Wi-Fi? — NO → Is your router ON and your SSID broadcasting?

Is your router ON and your SSID broadcasting? — NO → configure Wi-Fi manually on QCar

Is your router ON and your SSID broadcasting? — YES → configure Wi-Fi manually on QCar

QCar is ON → run all hardware tests in selected language (Simulink, Python, etc.)

QCar is functional — NO → Did any hardware test fail?

Did any hardware test fail? — YES → Did LIDAR test fail?

Did LIDAR test fail? — YES → check LIDAR connector | use 'sudo' flag for ROS/Python

check LIDAR connector | use 'sudo' flag for ROS/Python — OPTIONALLY → contact tech@quanser.com

Did LIDAR test fail? — NO → Did RGB-D test fail?

Did RGB-D test fail? — YES → unplug and replug USB | try different USB port | try different USB type A to type C cable

unplug and replug USB | try different USB port | try different USB type A to type C cable — OPTIONALLY → contact tech@quanser.com

Did RGB-D test fail? — NO → Did CSI test fail?

Did CSI test fail? — YES

Did CSI test fail? — NO → Did motor test fail?

Did motor test fail? — YES → check PWM/steering connector | use 'sudo' flag for ROS/Python

check PWM/steering connector | use 'sudo' flag for ROS/Python — OPTIONALLY → contact tech@quanser.com

Did motor test fail? — NO

B. Boot up and Shutdown

a. **The QCar won't turn ON**

   i. Check that the battery/static power connector is plugged in correctly
   ii. If using a battery, ensure that it is fully charged
   iii. Ensure that you are pressing the red power button firmly
   Note: the 3 LEDs (VBAT, 5V, and 3.3V) next to the red power button light on.
   Note: the trim LEDs should be on while the car turns on.

b. **The QCar is stuck on boot with the display showing the 'Quanser Innovate Educate' message.**

   The 'Quanser Innovate Educate' message indicates that the hardware has powered up. If the system is stuck on this screen for more than 2 minutes, follow these steps.

   i. Turn OFF the QCar.
   ii. Connect a monitor, keyboard and mouse, using the HDMI and USB ports.
   iii. Turn ON the QCar and capture the output on the monitor when the QCar is stuck during boot.
   iv. Contact tech@quanser.com and send us the images/screenshots.

c. **When using a battery, the QCar turns ON, and shuts down immediately after.**

   The QCar has battery protection in place. If it detects a battery voltage under 10.0V, it automatically shuts the QCar 2 down. Ensure that you are using a fully charged battery or consider using static power for non-mobile development.

d. **The QCar is stuck on 'Button pressed, shutting down…'**

   The operating system shuts down multiple processes safely before turning the QCar OFF. It gives each service a couple of minutes to shut down before killing the process. As such, shutdown may take 20 seconds, up to 5 minutes.

   Beyond 5 minutes, you may force a shutdown by pressing the red power button for 4 seconds, although it is always recommended to let the system shutdown normally.

e. **The QCar unpredictably shutdown while driving with no display message.**

   Ensure your PWM duty cycle commands to the drive motor are saturated to a 30% magnitude (between -0.3 and 0.3) and that a rate limiter of 100% duty cycle per second is used. This negates the possibility of a brownout caused by sudden voltage drop.

   Even with the saturation and rate limits in place, a voltage drop under 10.0V when driving may occur if the voltage is under 10.5V to begin with, triggering an automatic shutdown. Always turn OFF the QCar and charge the battery when the voltage drops below 10.5V.

C. Connectivity

a. **The QCar LCD shows a 'No IPv4 address' message.**

    If the QCar cannot detect the Wi-Fi networks that it is configured to search for automatically on boot, and is not connected via the ethernet cable either, it will display this message on the LCD. Ensure that your network is up and running and configure the QCar 2 to connect to your network by following the steps outlined in the Wi-Fi section of the User Manual - Connectivity. Alternatively, consider using an ethernet connection for non-mobile development.

b. **The Wi-Fi antennas on the PCB are loose.**

    Please contact tech@quanser.com for support.

    Warning: Please do not attempt to tighten the antennas as it may damage the PCB resulting in unknown behaviour.

c. **The Ethernet port on the PCB is damaged**

    Please contact tech@quanser.com for support. In the meantime, consider using Wi-Fi.

D. Hardware

a. **The LCD display goes blank on boot, but the QCar is ON.**

Ensure that the battery is charged and that the QCar is powered on (3 power LEDs next to the red power switch must be ON). If the LCD display is still OFF on boot, contact tech@quanser.com.

b. **The provided LIDAR does not spin**

To reduce power consumption, the LIDAR has been configured to not spin unless being actively used by an application. If actively using the LIDAR,
   i. check the J17 LIDAR connector to ensure that it is plugged in completely.
   ii. check your software application for syntax/semantics. Always use the hardware tests applications provided for Simulink, Python or ROS for correct usage. If the provided hardware tests do not work, contact tech@quanser.com.

c. **The QCar's LiDAR won't stop spinning after a model stops**

   i. Turn the car off and on again.
   ii. Check your model, it usually is caused when the model has an error and stops unexpectedly.

d. **Intel RealSense RGBD camera not detected**

Run the provided hardware test application for the RGB-D camera for Simulink, Python or ROS. If the test does not display the expected output, connect to the QCar directly or remotely as described in the User Manual - Connectivity. In a terminal (or PuTTY terminal) type the following command,
   `>> ls -l /dev/video*`
Find the 3 `plugdev` output lines corresponding to the Intel RealSense camera (2 x depth sensors and 1x RGB sensors) as shown in Figure 1. If these lines of output are not present, try the following,
   i. unplug and replug the camera.
   ii. try connecting the camera to a different USB port.
   iii. try a separate USB 3.0 type-A to USB-C cable to connect the camera instead

If this does not resolve the issue, please contact tech@quanser.com.

Figure 1. Terminal output showing video devices connected to the QCar

e. **CSI cameras do not work**

Remove any additional USB webcams that may have been connected. Run the provided hardware test application for the CSI cameras for Simulink, Python or ROS. If the test does not display the expected output, connect to the QCar directly or remotely as described in the User Manual - Connectivity. In a terminal (or PuTTY terminal) type the following command,
>> ls -l /dev/video*

Find the 4 `video` output lines corresponding to the CSI cameras as shown in Figure 1. If there are less than 4 lines of output, one or more of the cameras may not be connected correctly or may have come loose. Please contact tech@quanser.com.

Warning: Do not attempt to reconnect a loose CSI connector as this may damage the QCar's PCB resulting in unknown behaviour.

f. **The drive motor does not function/respond to commands**

Check the LCD screen for an **Overcurrent** message. In this case, the motor is switched to the Neutral mode. Stop your application and restart it to resume normal operation.

If this is not the case, run the provided hardware test application for motor IO for Simulink, Python or ROS. If the test does not actuate the motor, please contact tech@quanser.com.

g. **PCB components or header pins are bent/damaged/missing**

If any component is damaged or missing, please contact tech@quanser.com.

Warning: Do not attempt to repair or replace any component as this may damage the QCar's PCB resulting in unknown behavior.

7

E. Software

For software related issues, always start with the software user manuals and hardware test examples, as well as task/application-level examples provided for Simulink, Python or ROS. As a benchmark, these examples help validate that the hardware is functional and serve as a reference point for syntax and semantics. Also check the QUARC and Quanser API documentation for additional information on general topics.

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