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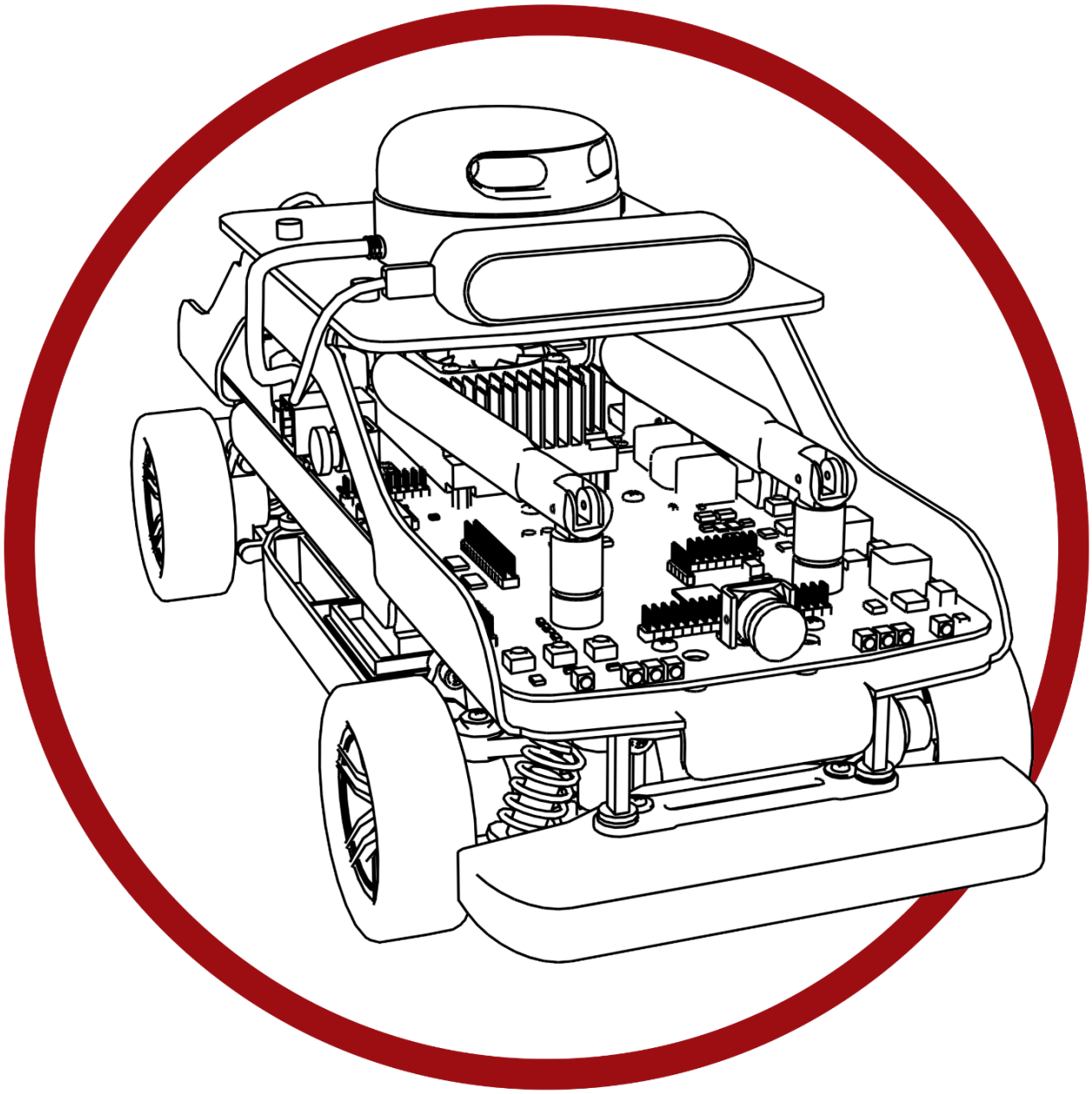
Self-Driving Car Research Studio



User Guide – Troubleshooting

V 1.1 (November 2020)

Caution **This equipment is designed to be used for educational and research purposes and is not intended for use by the general public.** The user is responsible to ensure that the equipment will be used by technically qualified personnel only.

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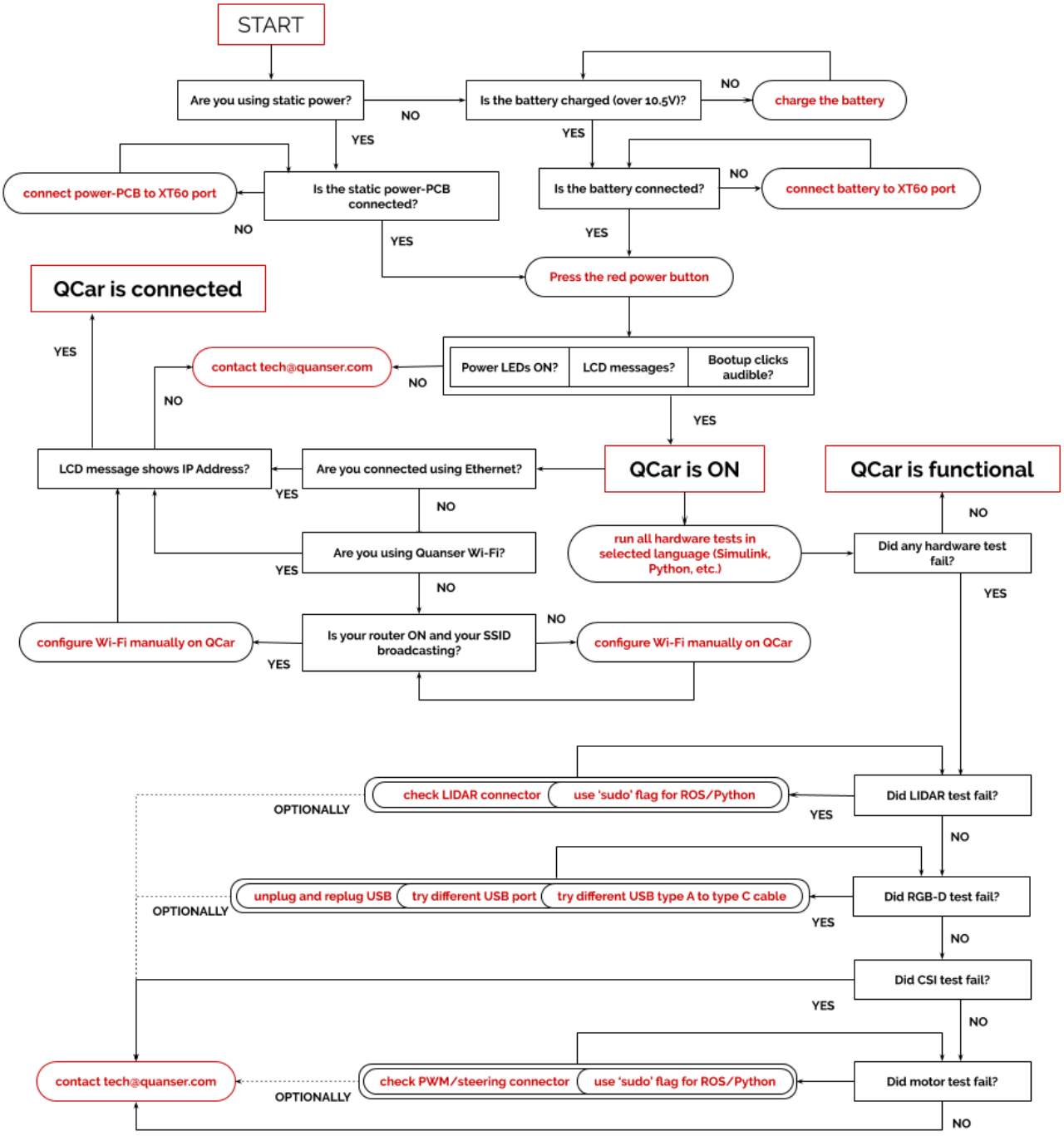
A. Diagnostics Checklist



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 headlamps, brake lamps, reverse lights and indicators should flash once on boot.

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.**

   A quarc_power_monitor service monitors the battery level to protect the system. If it detects a battery voltage under 10.0V, it automatically shuts the platform 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 platform OFF. It gives each such 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 and holding the red power button, 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 platform 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 platform to connect to your network by following the steps outlined in the Wi-Fi section of the Connectivity User Guide. Alternatively, consider using an ethernet connection for non-mobile development.

b. **My 5GHz network is available on other devices, but the QCar operating system's Wi-Fi list does not display/detect it.**

   The Jetson TX2 supports the lower end of the 5GHz bands. As such, ensure that your 5GHz network is broadcasted on the channels 36 to 60. This can be setup in your router.

c. **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 or onboard Jetson TX2 resulting in unknown behaviour.

d. **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 platform 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.

Note: If using Python or ROS, recall that a 'sudo' flag must be used when executing applications with the LIDAR

c. **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 Connectivity User Guide. 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.

```
quser@qcar-15:~$ ls -l /dev/video*
crw-rw----+ 1 root video   81,  0 Apr  7 10:51 /dev/video0
crw-rw----+ 1 root video   81,  3 Apr  7 10:51 /dev/video1
crw-rw----+ 1 root video   81,  6 Apr  7 10:51 /dev/video2
crw-rw----+ 1 root video   81,  9 Apr  7 10:51 /dev/video3
crw-rw-rw-+ 1 root plugdev 81, 12 Apr  7 10:51 /dev/video4
crw-rw-rw-+ 1 root plugdev 81, 13 Apr  7 10:51 /dev/video5
crw-rw-rw-+ 1 root plugdev 81, 14 Apr  7 10:51 /dev/video6
```

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

d. **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 Connectivity User Guide. 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 of 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.

e. **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.

Note: If using Python or ROS, recall that a 'sudo' flag must be used when executing applications with the LIDAR

f. **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 behaviour.

E. Software

For software related issues, always start with the software user guides and hardware test examples, as well as task/application level examples provided for Simulink, Python or ROS. As a benchmark, these help validate that the hardware is functional and also 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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