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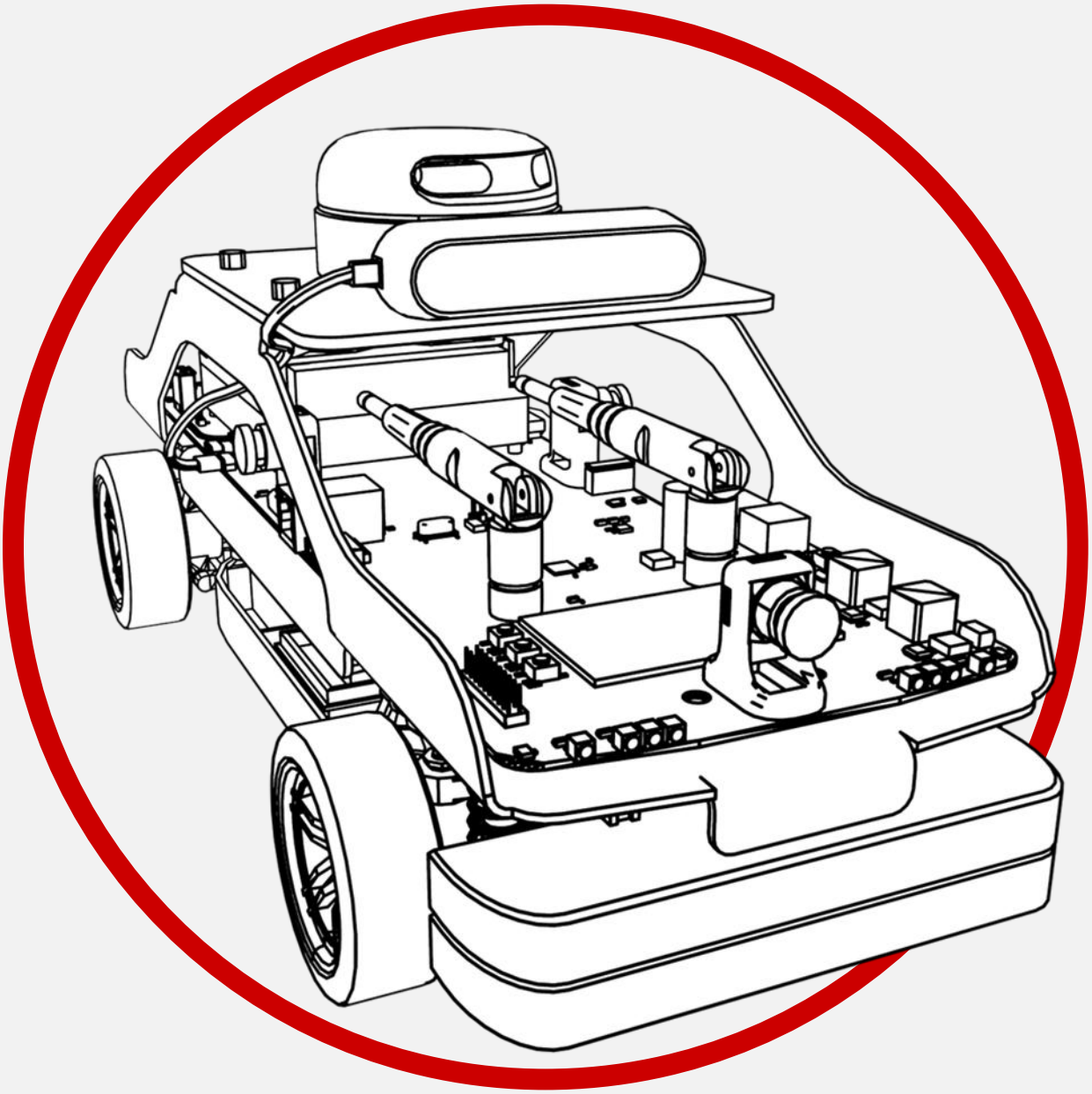

QCar 2

User Manual – Power

v 1.0 — 1st Oct 2024

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

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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. LiPo Battery Safety

Caution: Before using any batteries, chargers/balancers, or power supplies, users must first read the manuals packaged with their equipment. Quanser supplies these guidelines for charging batteries, but it is the users' responsibility to ensure they are operating their equipment safely and correctly. Quanser is not responsible for any damages resulting from use of batteries, power supplies, chargers, or balancers.

Caution: Charge and store LiPo batteries in a location where a battery fire or explosion (including smoke hazard) will not endanger life or property. Do not charge LiPo batteries near flammable materials, liquids or objects.

Caution: Prior to using the QCar 2, visually check the battery for bloating or damage. If the battery exhibits bloating **DO NOT USE** it. The visual bloating of the battery is dangerous - discard it in accordance with your country's relevant recycling and disposal laws.

Caution: A battery voltage below 10V increases the risk of uneven charge between the three cells. If you experience issues charging a battery that is consistently below 10V, discard it in accordance with your country's relevant recycling and disposal laws

Note: Use and store batteries in a dry environment.

Caution: Do not charge the battery under direct sunlight.

Caution: Do not charge the battery when the battery feels hot. If it does, you should place it in a metal container and observe signs of swelling or heating for at least 30 minutes.

Ensure that the metal container doesn't short the leads of the battery, which may cause a fire!

Caution: If your LiPo battery is subjected to a shock (such as a crash) you should place it in a metal container and observe signs of swelling or heating for at least 30 minutes.

Ensure that the metal container doesn't short the leads of the battery, which may cause a fire!

Caution: Always be present when charging batteries and **do not leave batteries connected to the chargers or the QCar 2 overnight**.

Caution: Keep LiPo batteries away from children and animals.

Caution: Never charge a LiPo battery that has ballooned or swollen due to overcharging, undercharging or from a crash.

Caution: Never charge a LiPo battery that has been punctured or damaged in a crash. After a crash, inspect the battery pack for signs of damage. After a crash, inspect the battery pack for signs of damage.

Caution: Protect your LiPo batteries from accidental damage during storage and transportation. Do not put battery packs in pockets or bags where they can short circuit or can come into contact with sharp or metallic objects.

Note: If you require additional batteries, please contact Quanser. If you are using batteries not supplied by Quanser, ensure that the connection and polarity match.

Caution: Never charge the LiPo battery in a moving vehicle.

Caution: Never overcharge the LiPo battery.

Caution: Never leave the LiPo battery unattended during recharging.

Caution: Do not charge LiPo batteries near flammable materials, liquids or objects.

Caution: Ensure that charging leads are connected correctly. Reversing polarity charging can lead to battery damage, fire or explosion.

Caution: A LiPo battery fire is a chemical fire. Have a suitable fire extinguisher (class D/for electrical fires) or a large bucket of dry sand near the charging area. Do not try to extinguish electrical battery fires with water.

⚠ **Caution**: Reduce risks from fire/explosion by storing and charging LiPo batteries inside a suitable container: a LiPo storage sack/bag or metal/ceramic container is advised.

⚠ **Caution**: Do NOT attempt to disassemble, modify, or repair the LiPo battery.

⚠ **Caution**: Never use a battery that is warm from charging or charge a battery that is warm from usage.

Note: Consider how you would deal with a LiPo battery fire/explosion as part of your normal fire safety and evacuation planning.

Note: When discarding a LiPo battery, discard it in accordance with your country's relevant recycling and disposal laws.

Note: Monitor charging LiPo batteries for signs of overheating.

B. Charging the Battery

1. Power the battery charger (Figure 1a) with the supplied power cable (Figure 1b).
2. Connect the balancer cable on the battery to the charger's middle port (Figure 1c).

a. charger/balancer b. Power cable c. connections to charger

Figure 1. Wiring and using the RC battery charger/balancer

3. Charging will start automatically. Charging is complete when the fourth LED is illuminated. A full charge takes approximately 40 minutes.

4. After charging is complete, unplug AC power first. Then disconnect the battery from the charger.

Note: When the status on the charger stops flashing at 100%, the battery is fully charged.

Caution: A battery voltage below 10V increases the risk of uneven charge between the three cells. If you experience issues charging a battery that is consistently below 10V, discard it in accordance with your country's relevant recycling and disposal laws

C. Connecting the Battery

Once the LiPo battery is charged, place it in the QCar 2 by following these steps.

1. As shown in Figure 2, press down on the locking arm (1) and pull outward on the latch (2).

2. Place the LiPo battery (3) in the compartment with the battery cables towards the front of the QCar 2. Do not connect the battery cables yet.

3. Push the latch (2) back in over the battery and its cables, and into the lock until the locking arm (1) clicks.

4. Connect the battery's female XT-60 connector into the QCar 2's male XT-60 connector (4) in Figure 2.

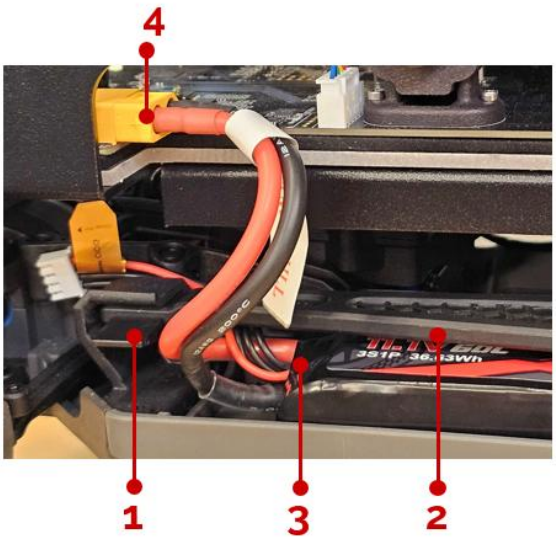


Figure 2. Battery compartment and connectors

D. Using External Power

For applications where the QCar 2 will not need to drive, it may be powered using a power supply instead of the provided batteries, this is typically used while doing development directly on the QCar 2. To use this power supply, connect the male 6-pin connector of the power supply (Figure 3a) to the female 6-pin connector on the supplied adapter in Figure 3b. Connect the adapter as you would connect a battery using the yellow XT-60 connector in the QCar 2 to the one in the adapter.

a. Power supply

b. XT-60 adapter PCB

Figure 3. Static power supply and adapter

E. Turning ON the QCar 2

After the battery is connected, turn on the QCar 2 by firmly pressing only once, on the red power button shown in Figure 4.

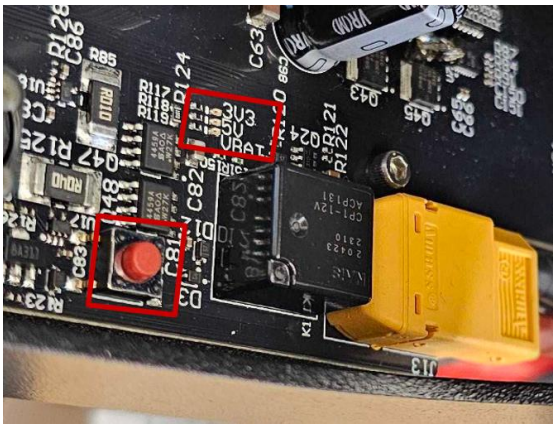


Figure 4. Red power button and green power LEDs on the QCar 2 PCB

The LCD, power LEDs (Figure 4, labelled VBAT, 5V and 3.3V on the PCB) should turn ON and the trim LEDs should turn green. Once the LCD is no longer displaying the Quanser logo (figure 5b), the trim LED will turn off. The speaker will emit a click sound once the system is up.

The LCD will display 'QUANSER INNOVATE EDUCATE' as shown in Figure 5a. After a few seconds, the LCD will change to 'QCar 2-xxxxx starting up . . . ' as shown in Figure 5b. Once the car boots up completely, it will switch to a default mode which shows important information of the QCar 2 including battery, disk/CPU usage, internet connection as well as QUARC version as shown in Figure 5c.

a. First bootup message b. Second bootup message c. Default display message

Figure 5. LCD startup and default messages

F. Turning OFF the QCar 2

To turn OFF the QCar 2, firmly press and let go of the red power button **once**. This will display "Button Pressed. Shutting down…" on the LCD as shown in Figure 6a. **This is the recommended process to initiate shutdown normally.** Please wait for the QCar 2 to fully shut down before disconnecting the battery.

If for some reason the QCar 2 will not shut down by clicking the power button, press and hold the red power button for approximately 4 seconds. The message in Figure 6b will then be displayed. Upon releasing the power button, the power to the QCar 2 computer will be cut off immediately and the LCD will go blank, equivalent to a hard shutdown. This is **not recommended** and should not be required during normal operation.

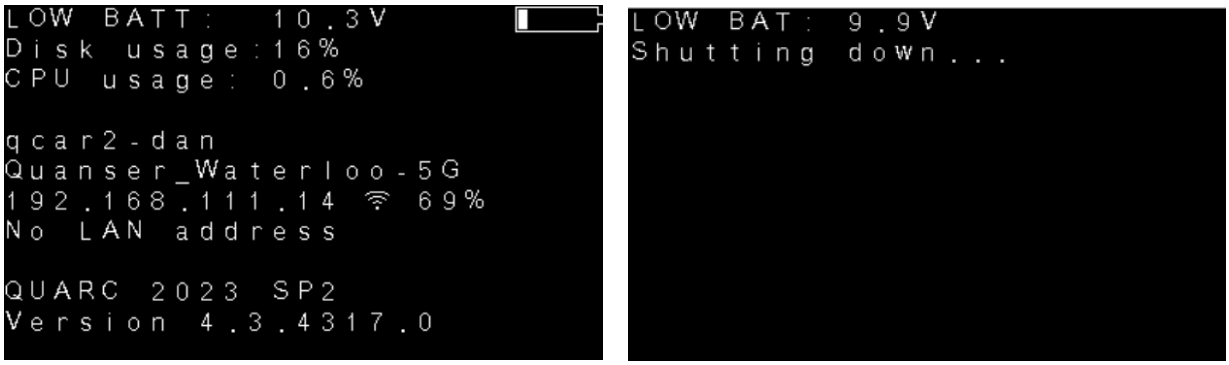
a. Normal shutdown message b. Forceful shutdown message

Figure 6. LCD shutdown message

G. Low-battery and Auto-shutdown

Lithium Polymer (LiPo) batteries can be damaged if discharged below a threshold voltage. A low battery warning will be displayed if the battery voltage is below **10.5 V**, as shown in Figure 7a. You should save your work and begin recharging the battery.

To prevent damage to the battery, the QCar 2 will shut down automatically if the battery voltage gets below **10.0 V**, displaying the message shown in Figure 7b. It will first attempt a normal shutdown, but if it is unable to do so, it will disconnect the power after a short period.



a. Low battery warning message

b. Automatic shutdown

Figure 7. Low voltage protection and automatic shutdown

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