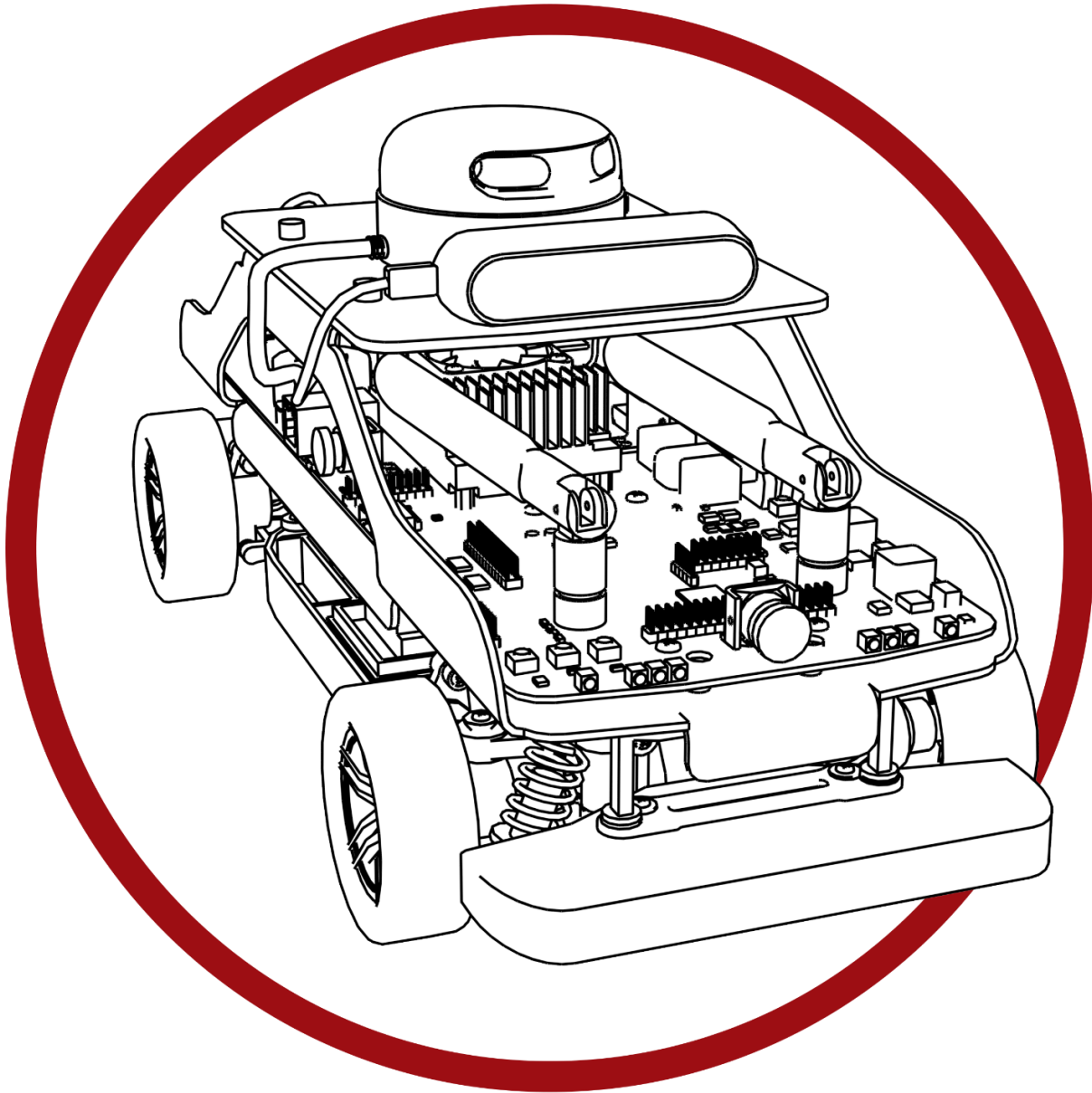


Self-Driving Car Research Studio



User Guide – Power

V 1.2 (January 2021)



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. 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).
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.



a. charger/balancer



b. Power cable



c. connections to charger

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

B. Connecting the battery

Once the LiPo battery is charged, place it in the QCar 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. 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's male XT-60 connector (4) in Figure 2.

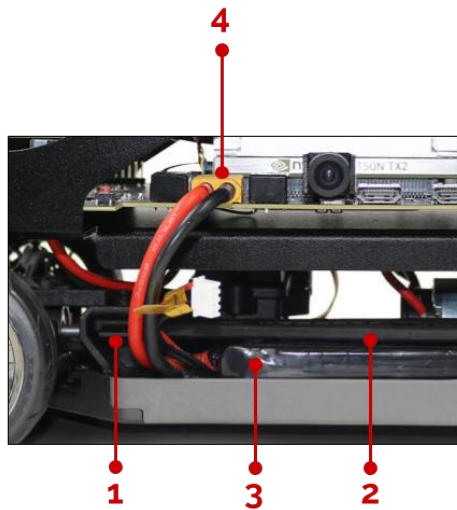


Figure 2. Battery compartment and connectors

C. Using Static Power

For applications where the QCar platform will remain static, it may be powered using a power supply instead of the provided batteries. To do this, connect the male 6-pin connector of the supplied power supply (Figure 3a) to the female 6-pin connector on the supplied adapter in Figure 3b. Connect the adapter's female XT-60 connector to the QCar's male XT-60 battery connector, and continue operation as normal.



a. Power supply



b. XT-60 adaptor PCB

Figure 3. Static power supply and adaptor

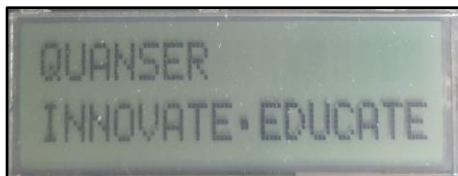
D. Turning ON the QCar

After the battery is connected, turn on the QCar platform by firmly but gently pressing on the red power button shown in Figure 4.



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

The power LEDs (Figure 4, labelled VBAT, 5V and 3.3V on the PCB) should turn ON. The headlamps, brake lamps, reverse lights and indicators should flash once and the speaker will emit a click sound. The LCD will display 'QUANSER INNOVATE EDUCATE' as shown in Figure 5a. After a few seconds, the LCD will change to 'qcar-xxxxx starting up ...' as shown in Figure 5b. Once the car boots up completely, it will switch to a default mode which shows the current battery level, Ethernet/WiFi status as well the IP address of the platform, an example of which is shown in Figure 5c.



a. First bootup message



b. Second bootup message



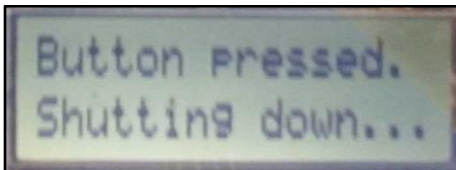
c. Default display message

Figure 5. LCD startup and default messages

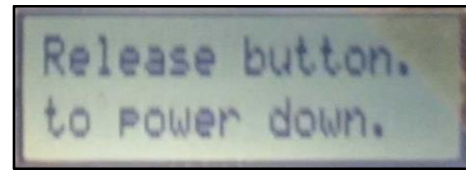
E. Turning OFF the QCar

To turn OFF the QCar, firmly but gently press on the red power button once. This will display the message shown in Figure 6a. **This is the recommended process to initiate shutdown normally.** Please wait for the QCar to fully shut down before disconnecting the battery.

If for some reason the QCar will not shut down by clicking the power button, press and hold the power button for approximately 1 second. The message in Figure 6b will then be displayed. Upon releasing the power button, the power to the QCar 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

F. 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 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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