



SIMUCUBE

Simucube 2

Sport / Pro / Ultimate

User Guide

Version 3.0
July 31st, 2020

User Guide changelog

Version	Date	Changes
1.0	2019/06/06	Initial release
2.0	2019/08/14	SQR rev 2 update, external antenna
2.1	2019/09/04	Profile settings and templates explained, simple profiles mode (not released yet), additional troubleshooting tips
2.2	2019/09/23	Improved wireless wheel led information
2.3	2019/10/01	Added disclaimers about product appearance, note about exposure to direct sunlight
2.4	2019/10/30	Copied disclaimer from Accessory port user guide. Changed idle and standby behaviour, added title "Idle and standby"
2.5	2019/11/01	Moved standby chapter to better location.
2.6	2019/11/06	Added standby mode LED description.
2.7	2020/04/24	Text formatting fixes. Added warning that Ultimate version is for professional use only. Added a guide for assembling and disassembling the SQR wheel side. Changed pictures in SQR guide with correct bolts. Fixed incorrect SQR assembly option (2) Added: indoor use only.
2.8	2020/06/02	Changed Bumpstop functionality description. Changed Wireless Wheel disconnect descriptions. Updated UI images. Added note about discarding the product. Added warning about handling the Ultimate PSU. Added recycling. Added ultimate psu ip30 rating. Edited operating environment. Added warranty address.
2.9	2020/06/05	Add note about simulator/game updates.
2.10	2020/07/08	Changed company address. Style fixes. Spelling.
3.0	2020/07/31	Release publish

Previous published versions of the User Guide can be downloaded from here:

https://granitedevices.com/wiki/File:Simucube_2_User_Guide.pdf

Warnings and guidelines for safe operation

- Simucube 2 Ultimate is intended for professional use only. Usage under other conditions is under user's own responsibility.
- Do not grab, hold or insert fingers, etc objects to the rotating parts in a way where letting go immediately is not always possible.
- Do not operate Quick Release when the device is powered ON and connected to a PC.
 - Always disable torque by pressing Torque off button before removing or attaching wheel.
 - Do not release Torque off button unless Quick Release has been securely clamped with Quick Release pin.
- Do not set torque level higher than the level user can safely hold with a single hand grip
- If torque gets too high to control safely, let both hands off the wheel and press the Torque off button
- Preventing motion by the means of True Drive or simulator software are not reliable ways to prevent motion
- Device user must be an adult and physically and mentally fit person
- Usage of the device is allowed only by an instructed person who understands and follows the above safety instructions
- If the device becomes damaged in any way, stop using it immediately and contact the reseller
- Using the vibration and force feedback may cause damage to your health
- Do not open the casing of the device or the power supply. There are no user serviceable parts inside, and disassembling will void manufacturer's warranty.
- Do not use the device with a power source other than the power supply packaged with the Simucube 2 or received from an authorized reseller. Do not operate SC2 Pro model with only one power supply connected and powered.
- Do not use the device with any cables other than the cables packaged with the Simucube 2 or received from an authorized reseller
- The Simucube Accessory port is a female D15 connector on the back of the device. Its signal levels are from 0 to 5 Volts. Do not connect any unknown devices to this connector. The port is not a serial port connector although the mechanical connector is the same as a 15-pin serial port.
- This product has magnets which may interfere with pacemakers, defibrillators and programmable shunt valves or other medical devices. Do not put this product close to these medical devices and the person who use any of these medical devices. Consult your doctor before using this product if you have any concerns.
- Simucube 2 Ultimate power supply is not intended to withstand physical stress. Do not damage or mishandle the power supply.



Rotating shaft
Rotierenden Welle
Arbre rotatif
Eje de rotación



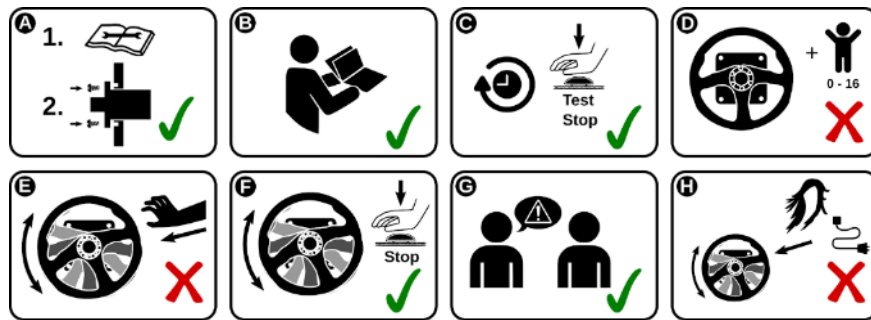
High torque
Hohes Drehmoment
Couple élevé
Alto par



Hot surface
Heisse Oberfläche
Surface chaude
Superficie caliente

- Operating environment:
 - 15°C – 30°C room temperature, non-condensing humidity
 - Do not expose the Simucube 2 device to direct sunlight.
 - Indoor use only.
 - Simucube 2 Ultimate power supply is IP30 rated.
- Rotating high torque parts:
 - Shaft torque up to 32 Nm
 - Shaft rotation speed up to 360 RPM
 - Shaft mechanical power up to 600W
- Hazard of entangling to rotating parts:
 - Pull force may exceed 130 kg / 270 lbs / 800 N when wire, rope, hair or similar object tangles on 5 cm / 2" spool diameter (such as output shaft of the device)
- Hot surface:
 - Device surface temperature may reach 70°C or 158°F.
 - Sudden rotation / vibration
- Device may start producing motion unexpectedly

Safe usage instructions



- A. Mount device securely to a rigid platform before use. Fix Simucube 2 to a proper table mount or a racing rig that is Simucube 2 compatible with all four fixings screws that are included. Do not use other types of fixings. Never operate the product without fixing it first as instructed in this User Guide.
- B. Read this user guide completely before installing or operating the device.
- C. Test functioning of the Torque off button before each usage session.
- D. Keep children away from the device.
- E. Do not attempt to stop freely rotating parts by grabbing.
- F. Always use the Torque off button or power off the device to stop and prevent motion.
- G. Instruct other users of the device about the safe usage.
- H. Keep hair, cables, clothing and other entangling items clear from the rotating parts.

Technical Datasheet

	SIMUCUBE 2 Sport	SIMUCUBE 2 Pro	SIMUCUBE 2 Ultimate
Motor	Direct Drive optimized ultra low torque ripple motor	High response speed Direct Drive optimized ultra low torque ripple motor	Maximum response speed, low inertia, Direct Drive optimized ultra low torque ripple motor
Simucube Wireless Wheel™ support	Included	Included	Included
Simucube Quick Release™	Included	Included	Included
Max torque *	17 Nm	25 Nm	32 Nm
Max torque slew rate	4.8 Nm/ms	8.0 Nm/ms	9.5 Nm/ms
Angle sensor	22 bit absolute	22 bit absolute	24 bit Hiperface
Torque Off button	Standard (Premium optional)	Standard (Premium optional)	Premium (with remote power switch)
Power supply	280 W	2 x 280 W	1000 W
Wheel base dimensions incl. SQR™	130 x 130 x 250 mm	130 x 130 x 270 mm	115 x 115 x 310 mm
Mounting holes	M8 x 4 pcs threaded hole	M8 x 4 pcs threaded hole	9 mm dia x 4 pcs through hole
Mounting hole pattern dia	145 mm	145 mm	130 mm
Flange centering hole dia	110 mm	110 mm	110 mm
Wheel base weight	8.0 kg	11.1 kg	11.3 kg
Standard warranty	24 months	24 months	60 months

3-D drawings of the Simucube 2 products can be found from the Simucube website at <http://www.simucu.be/>

What's included (Simucube 2 Sport and Pro models)

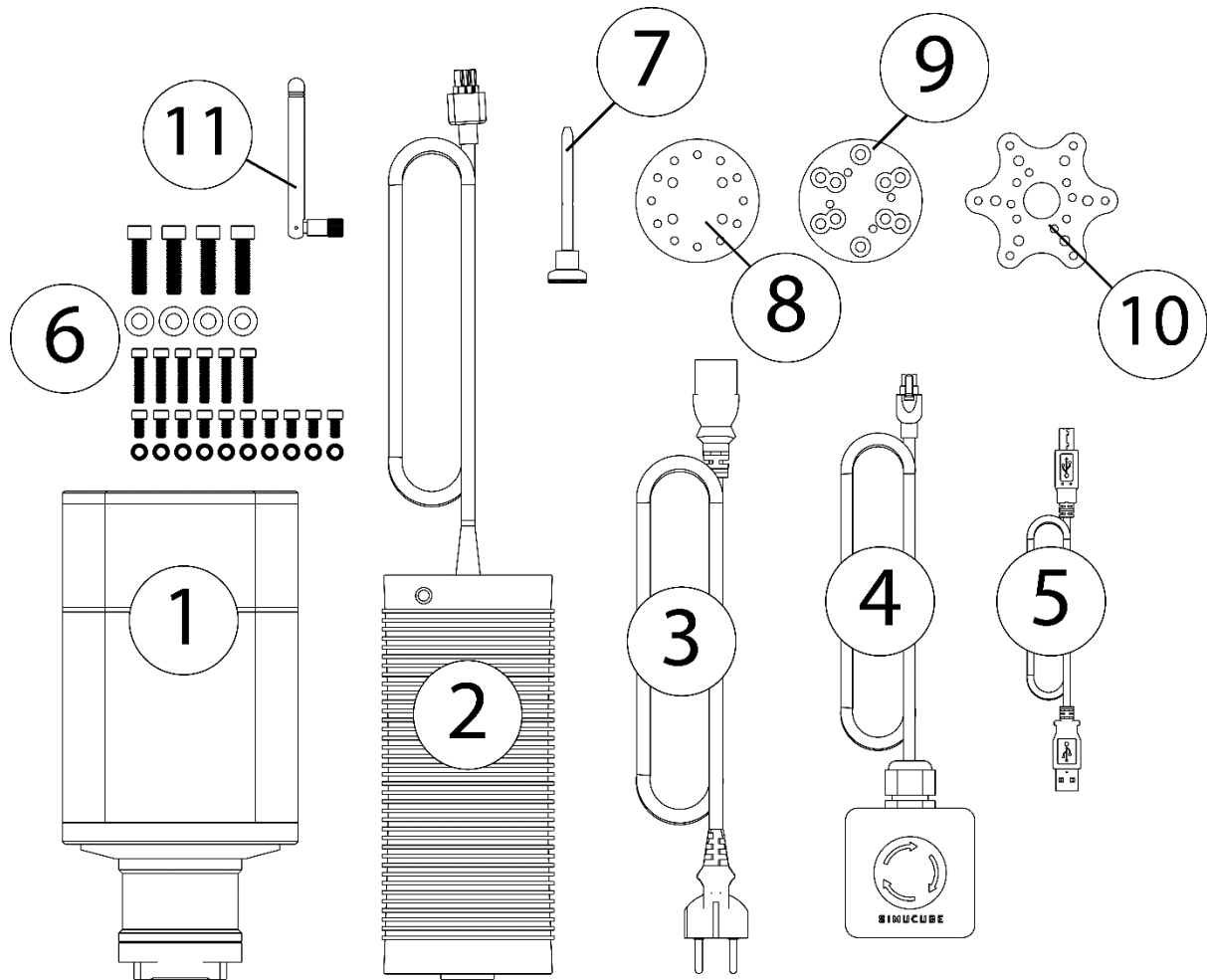


Figure 1 Simucube 2 Sport and Pro hardware

1. Simucube 2 wheel base
2. Power supply (1 pcs for Sport, 2 pcs for Pro)
3. Power supply AC-cable (EU) (1 pcs for Sport, 2 pcs for Pro)
4. Torque off button and cable (Sport and Pro)
5. USB cable
6. Fixing hardware for the wheel base and SQR
7. SQR pin
8. Wheel side SQR
9. 30mm Spacer
10. Adapter for 70mm wheels
11. External antenna for Simucube Wireless Wheel signal reception

Disclaimer:

Simucube 2 product appearance might differ from the illustrations on this User Guide and from the product pictures at the <http://www.simucu.be> website.

What's included (Simucube 2 Ultimate)

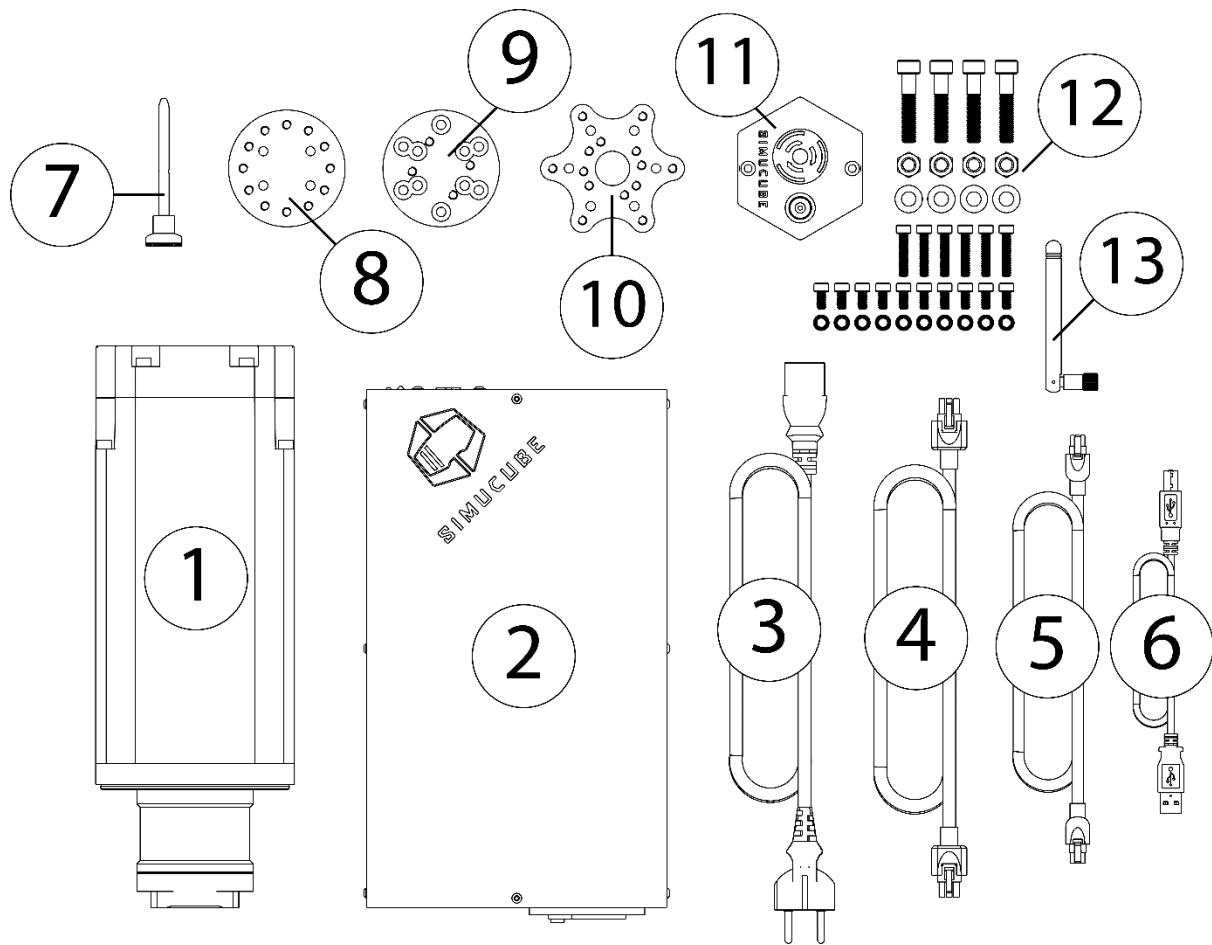


Figure 2 Simucube 2 Ultimate hardware

1. Simucube 2 wheel base
2. Power supply
3. Power supply AC-cable
4. Power supply DC-cable
5. Premium torque off button cable
6. USB cable
7. SQR pin
8. Wheel side SQR
9. 30mm Spacer
10. Adapter for 70mm wheels
11. Premium torque off button
12. Fixings for wheel base and SQR
13. External antenna for Simucube Wireless Wheel signal reception

Disclaimer:

Simucube 2 product appearance might differ from the illustrations on this User Guide and from the product pictures at the <http://www.simucu.be> website.

Getting started

Mounting the motor on the simulator

Simucube 2 must always be rigidly mounted on the simulator rig for user safety.

Mounting option 1

Simucube 2 can be mounted with separate bracket that can convert the front mount to a horizontal platform (table) mounting as in Figure 3. Mounting brackets be found from Simucube resellers listed on <https://www.simucu.be> website.

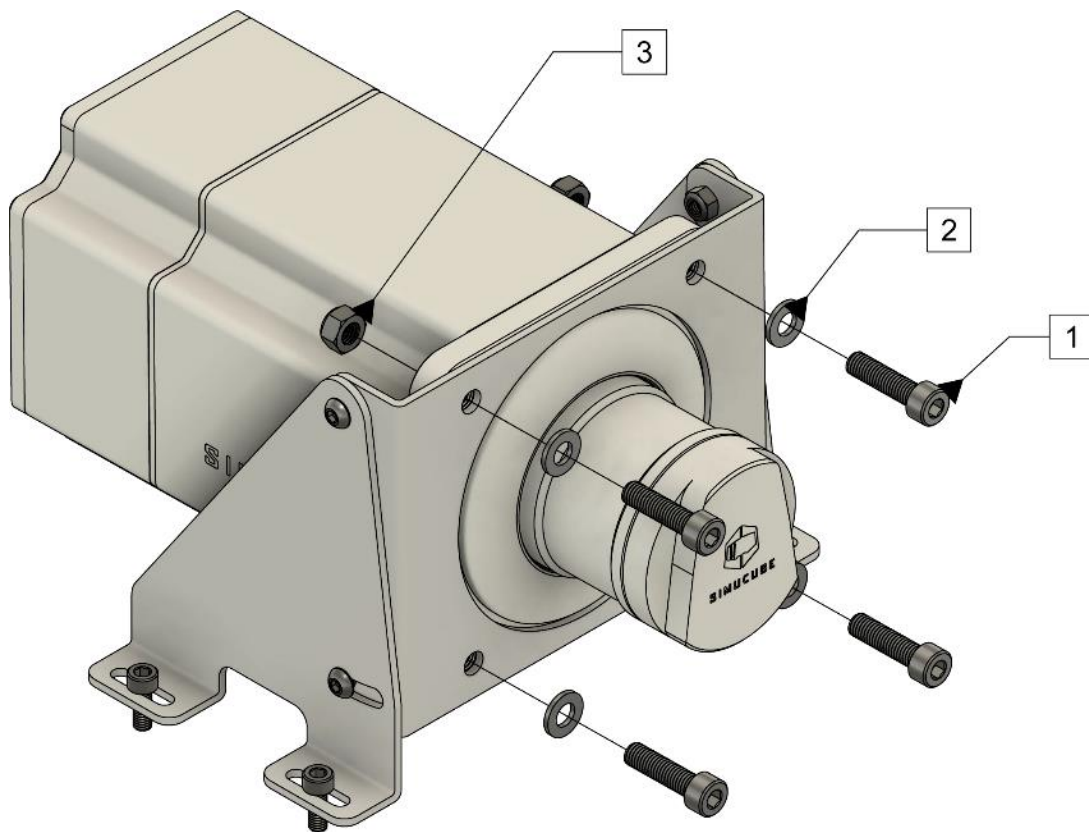


Figure 3 Mounting Simucube 2 using a mounting bracket.

Mount Simucube 2 as shown in Figure 3. Sport and Pro models are mounted with 30mm M8 bolts with 1.25mm thread pitch (1) and M8 flat washers (2). Simucube 2 Ultimate is mounted through the motor flange with 40mm M8 bolts (1), M8 flat washers (2) and M8 locking nuts (3).

Mounting option 2

Simucube 2 can be mounted by utilizing a front mount bracket found on many simulator rigs as shown in Figure 4.

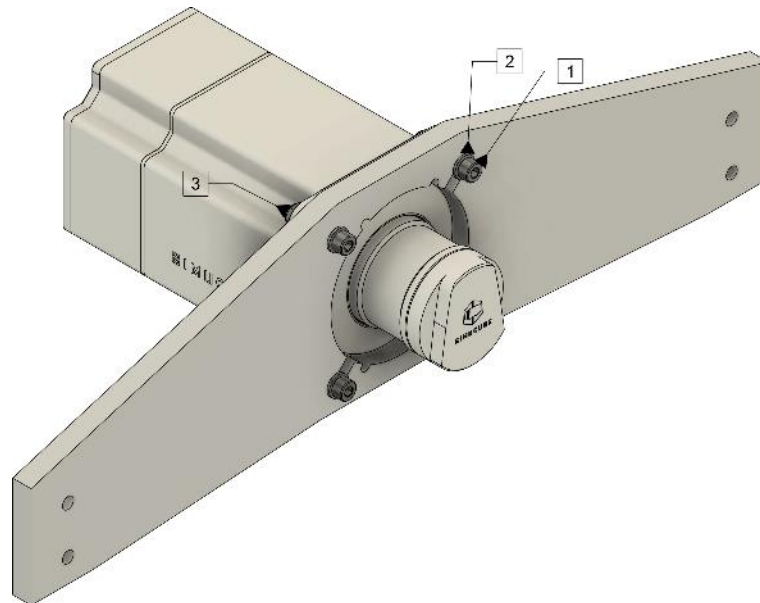


Figure 4 Mounting Simucube 2 on a simulator rig front mount bracket.

Mount Simucube 2 as shown in Figure 4. Sport and Pro models are mounted with 30mm M8 bolts with 1.25mm thread pitch (1) and M8 flat washers (2). Simucube 2 Ultimate is mounted through the motor flange with 40mm M8 bolts (1), M8 flat washers (2) and M8 locking nuts (3).

Wiring

Read and understand this chapter fully. Do not operate the product if you haven't fully read or understood this document. Check that main power switch at the back is off and all cables are unplugged before proceeding.

Connect the cables as indicated in figures 5 and 6. Important: always connect the AC power supplies first to Simucube (connection 3) and only then to AC mains socket (4).

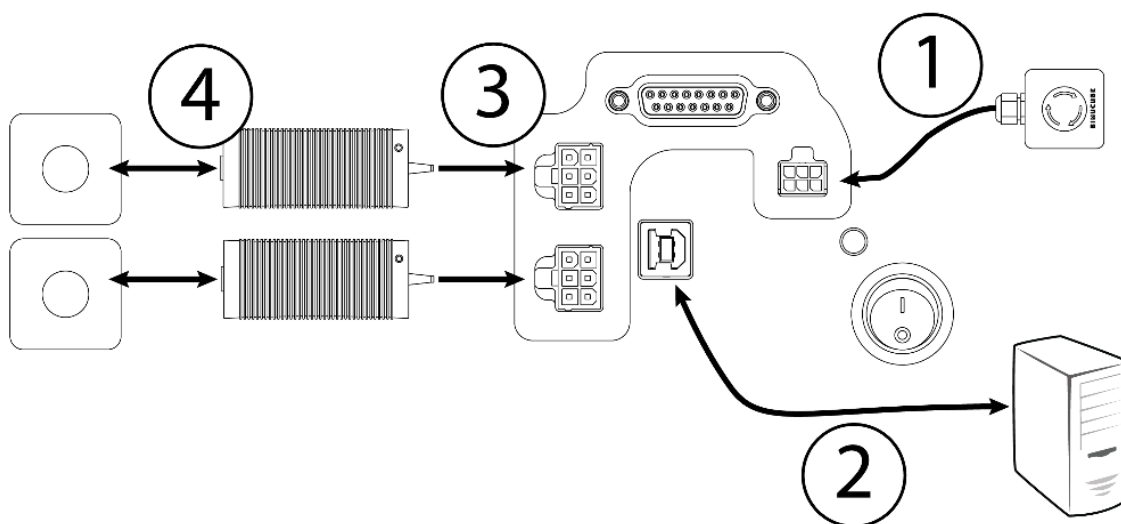


Figure 5 Simucube 2 Sport and Pro wiring diagram.

Note: Simucube 2 Sport has one power supply, and Simucube 2 Pro has two power supplies.

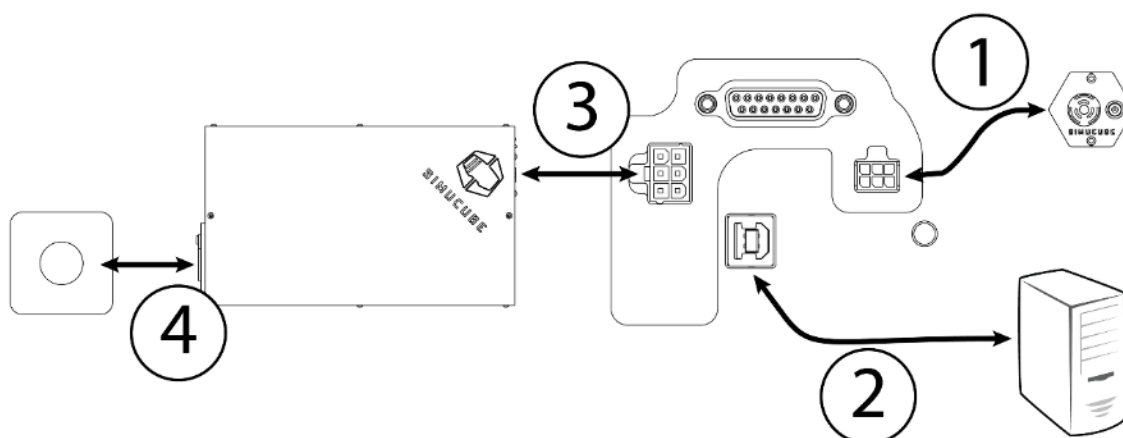
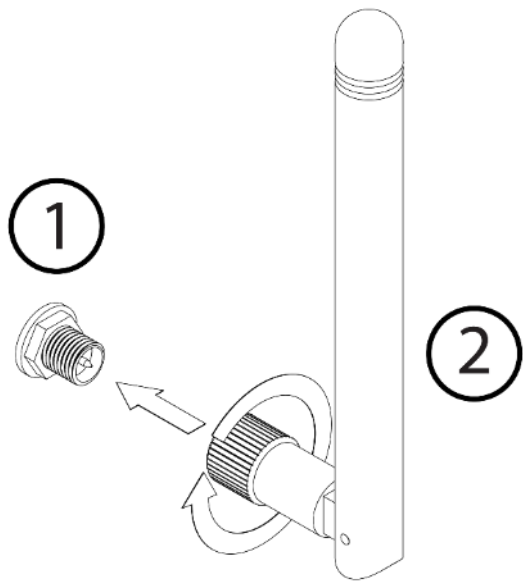


Figure 6 Simucube 2 Ultimate wiring diagram. Use Simucube 2 Ultimate only in a professional environment.

Antenna installation



(1) Locate the antenna connector at the back of your Simucube 2 wheel base.

(2) Take the supplied antenna (**Disclaimer:** use ONLY the supplied antenna) and insert it into the antenna connector. Make sure you are inserting it in a straight orientation. Gently twist the knurled surface at the end of the antenna in clockwise direction approximately 3 turns. **DO NOT** use any tools in the installation, only screw the antenna in place with your fingers.

You can now use the joint in the antenna to adjust antenna so that it is not in the way of other connectors/obstacles. In normal usage the orientation has little effect to received signal strength. The signal strength can be checked in the True Drive software.

Checklist for the first use

1. Connect remote Torque off button box to Simucube 2's TORQUE OFF connector.
2. Connect USB cable from Simucube 2 to PC.
3. Connect power supply/supplies to Simucube 2 POWER IN connectors.

Important:



- 1. Always connect POWER IN connector(s) on Simucube 2 first before connecting power supply to the AC outlet.**
- 2. Both power supplies must be used for Simucube 2 Pro.**
- 3. Simucube 2 Ultimate is to be used only in a professional environment.**

4. Connect power supply/supplies to 110 - 240 V AC outlet with protective earth (PE).
5. Fix steering wheel (not included) to Simucube Quick Release™ (SQR™). If required, install Spacer and/or 70 mm Adapter between the SQR wheel side part and the wheel.
6. Download and install True Drive software from <https://simucu.be> website. This product will not fully operate without installing the software for safety reasons.

Simucube Quick Release (SQR) User Guide

SQR – Wheel side assembly

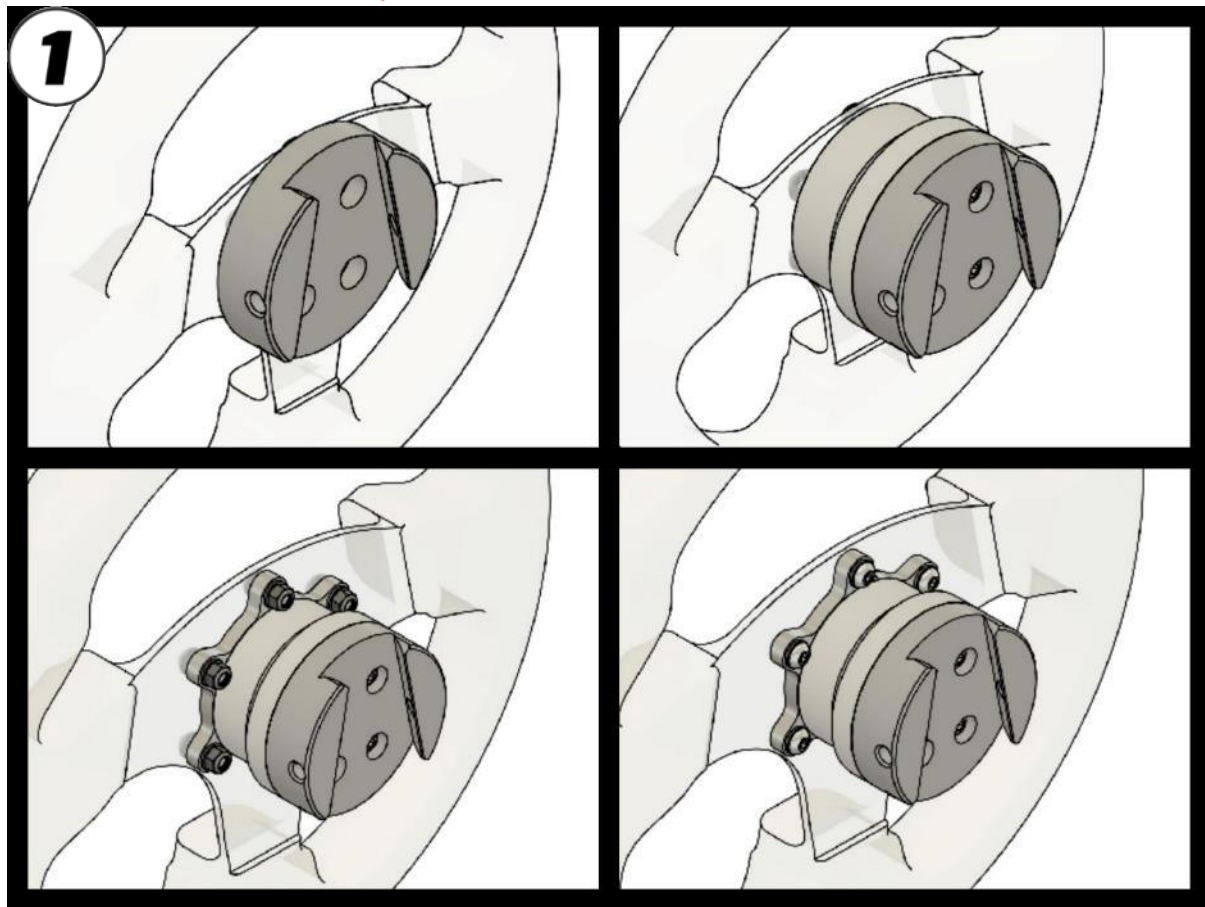
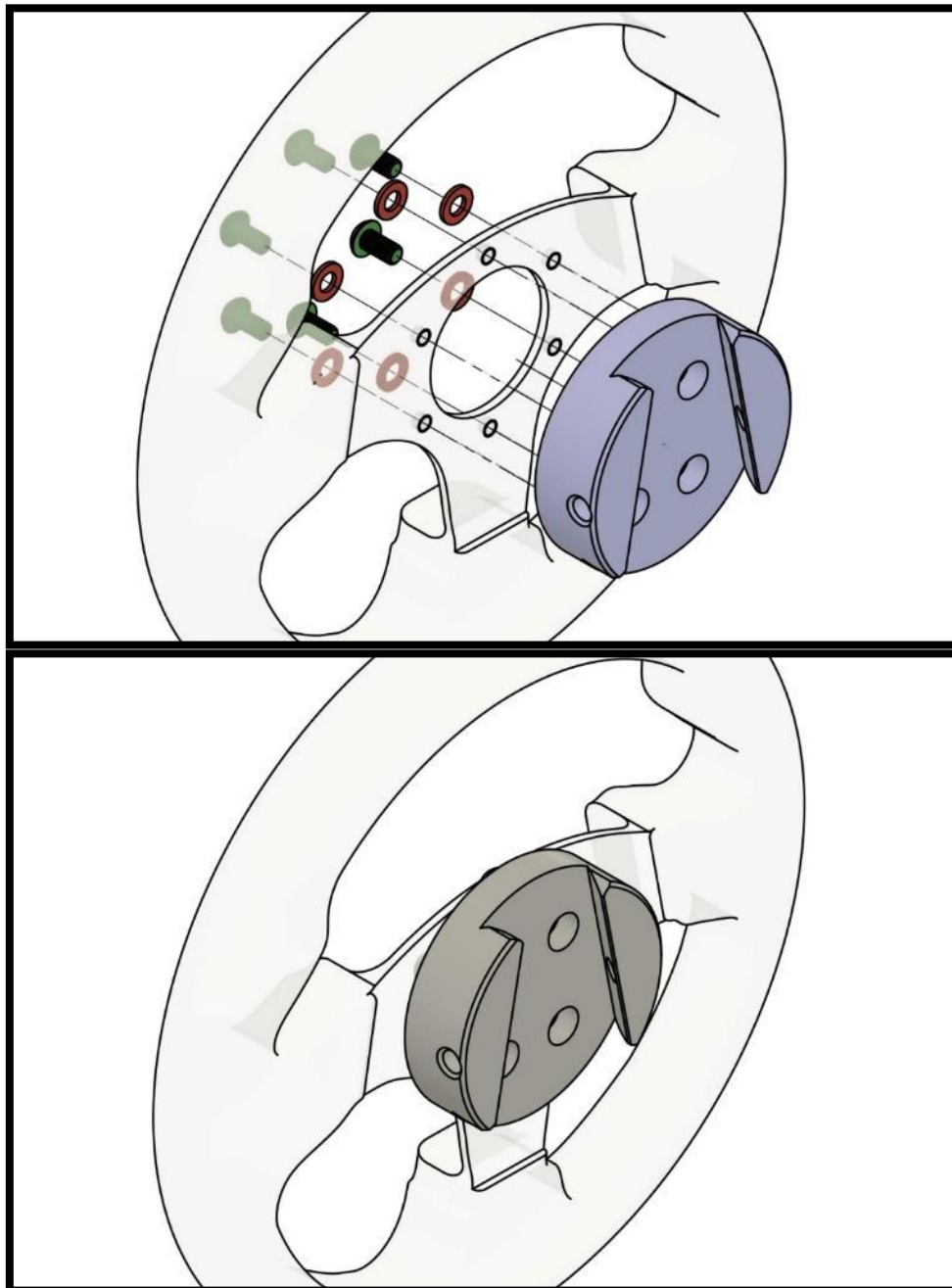


Figure 7 SQR assembly options

The included wheel side SQR (Simucube Quick Release) system can be assembled in multiple configurations to best suit your wheel and button box combination.

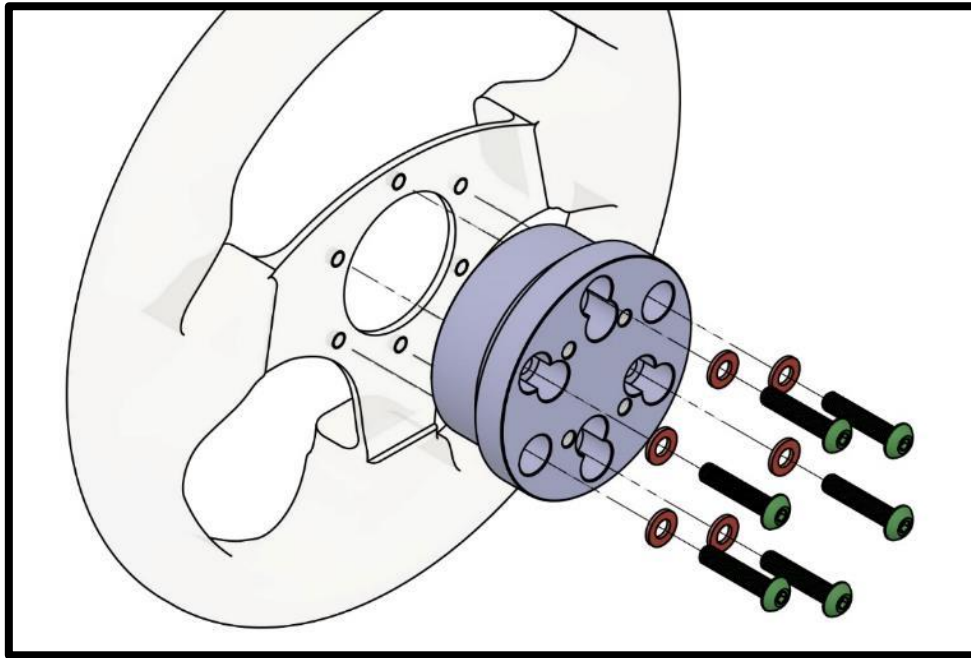
Standard configurations (Figure 7) include (1) 50.8 mm PCD (pitch circle diameter) front mounting without the spacer, (2) 50.8 mm PCD front and back mounting with the spacer and (3+4) 70 mm PCD front and back mounting.

SQR - 50.8 mm PCD front mounting, no spacer

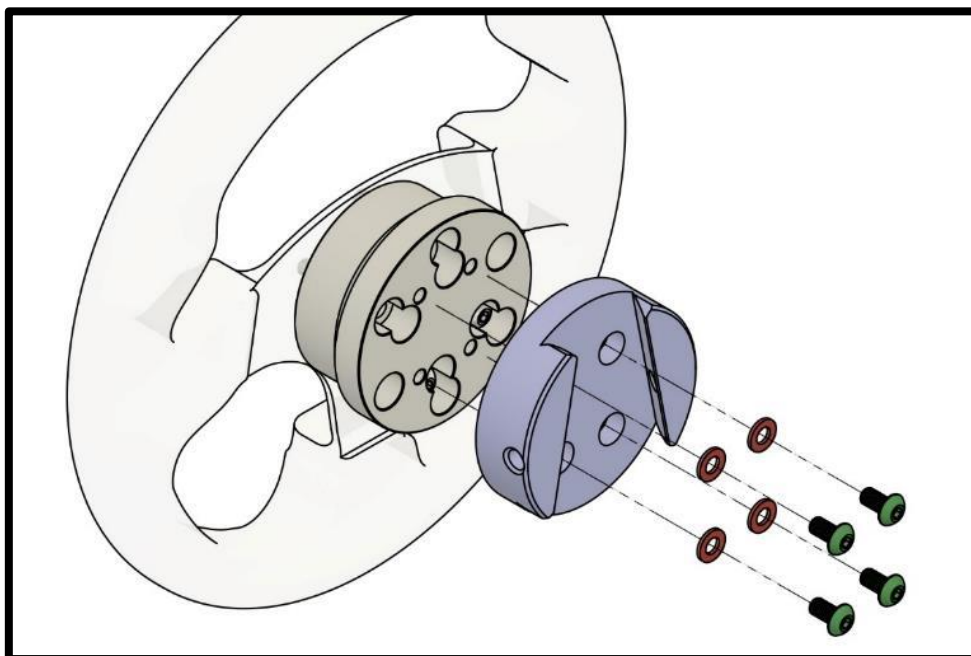


It is possible to use the SQR without a spacer, but the use of the spacer is recommended as it gives the user more space to use the locking pin. To attach the wheel side plate to your wheel, use suitable M5 screws and washers (3 or 6 screws depending on your wheel type) from the included ones or use your own if suitable length is not found. In case you have a need to find longer/shorter screws, the correct screw thread type is M5 size with 0.8 mm pitch.

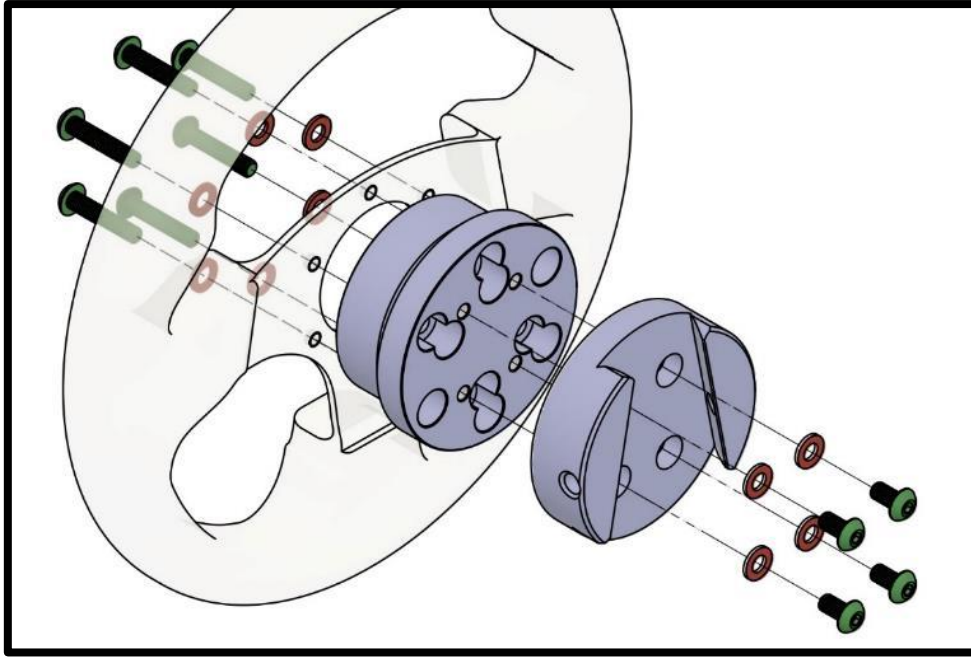
SQR – 50.8 mm PCD front and rear mounting, with spacer



To rear-mount your wheel (if you have threads in the rear of your wheel/button box), you will need 3 or 6 M5 screws with a length depending on your wheel and button box thickness and 1 washer per screw. Align the four middle threaded holes as in the image and attach the screws in the order as illustrated.

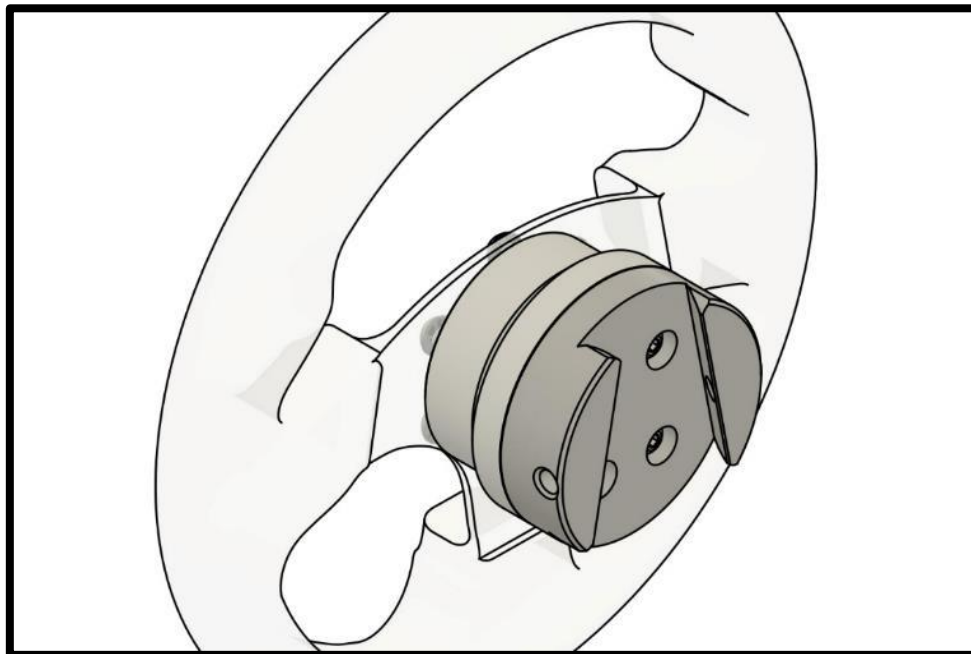


Use four of the included 10mm long M5 screws and 4 washers to attach the wheel side plate to the spacer as illustrated. Note: Do not use excessive torque to avoid damaging the threads in the SQR aluminum parts.



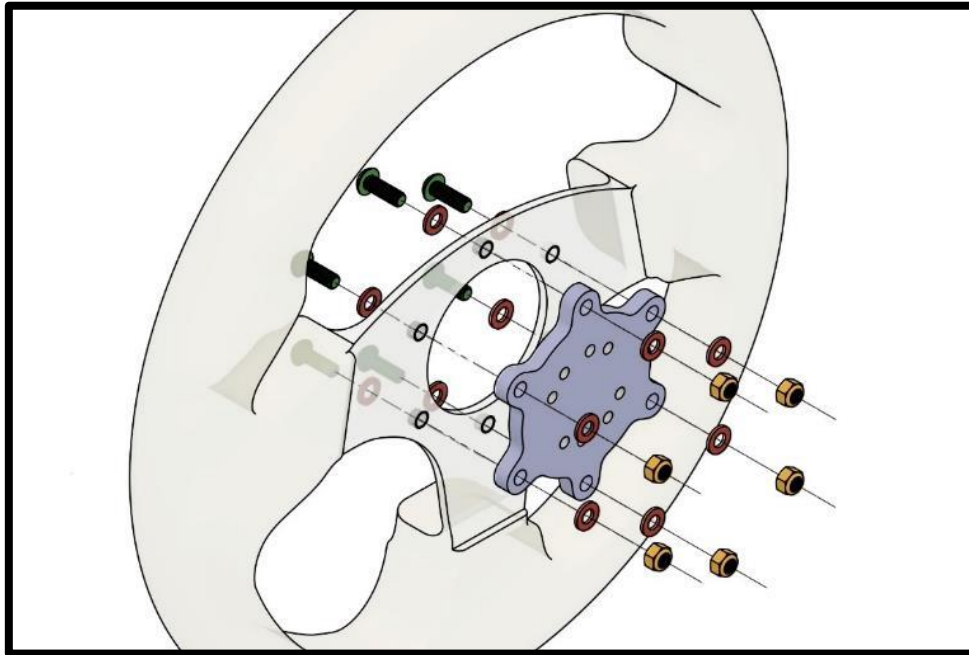
To front-mount your wheel, you will need 3 or 6 M5 screws and a washer per screw. The right length for these screws is approximately 35-39mm + the thickness of your wheel and button box since the screws attach to the threads in the wheel side plate.

Use four of the included 10mm long M5 screws and 4 washers to attach the wheel side plate to the spacer as illustrated. Align the four middle threaded holes as in the image and attach the rest of the screws as illustrated.

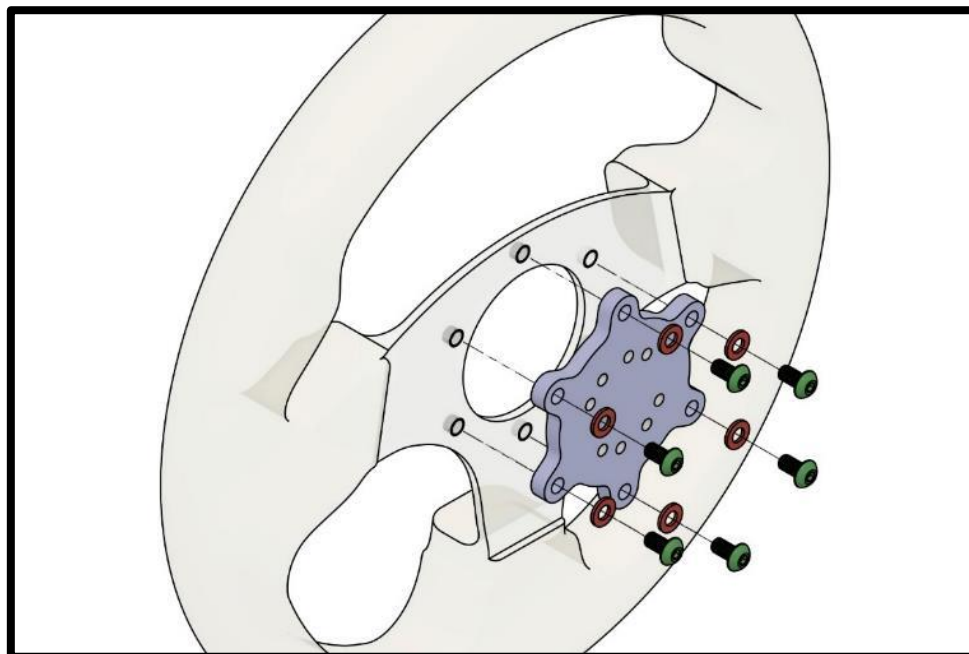


Completed SQR setup for 50.8 mm PCD wheel.

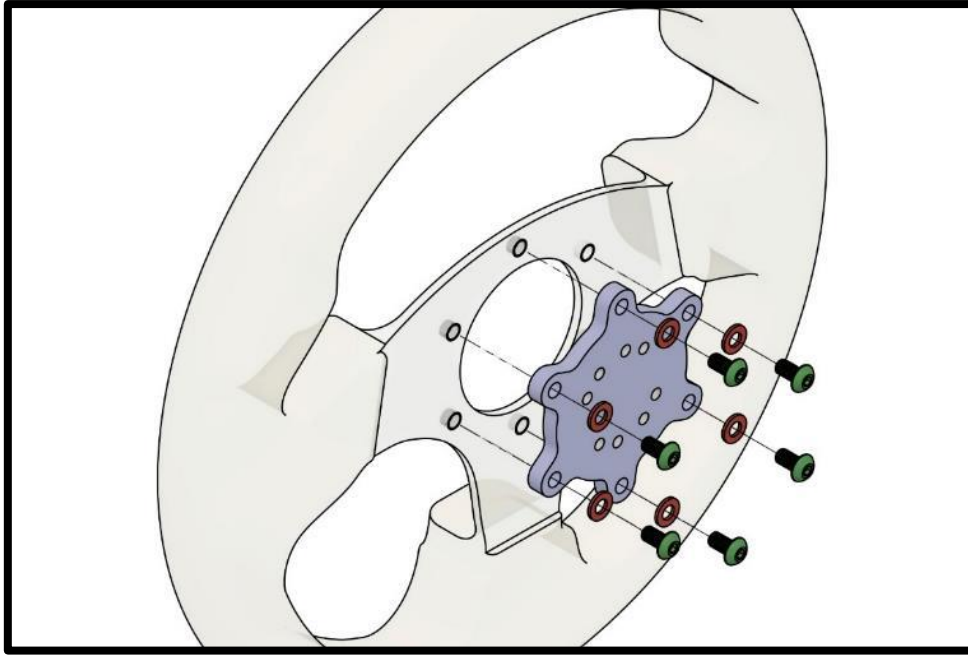
SQR – 70 mm PCD front and rear mounting, with spacer



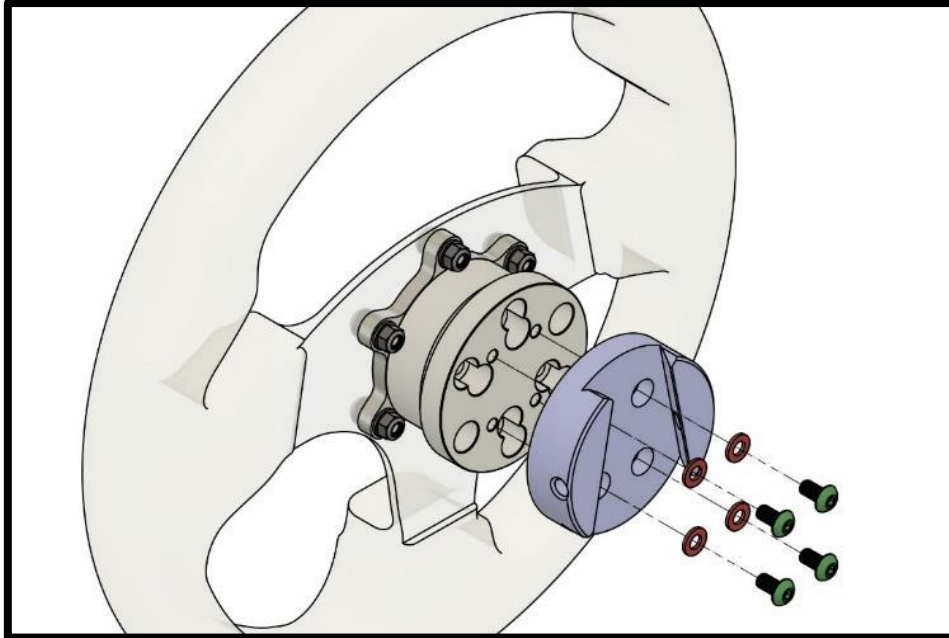
To front-mount your wheel, you need 6 M5 screws with a length depending on your wheel and button box thickness, 2 washers per screw and 1 locking nut per screw. Align the eight middle threaded holes as in the image and attach the screws in the order as illustrated.



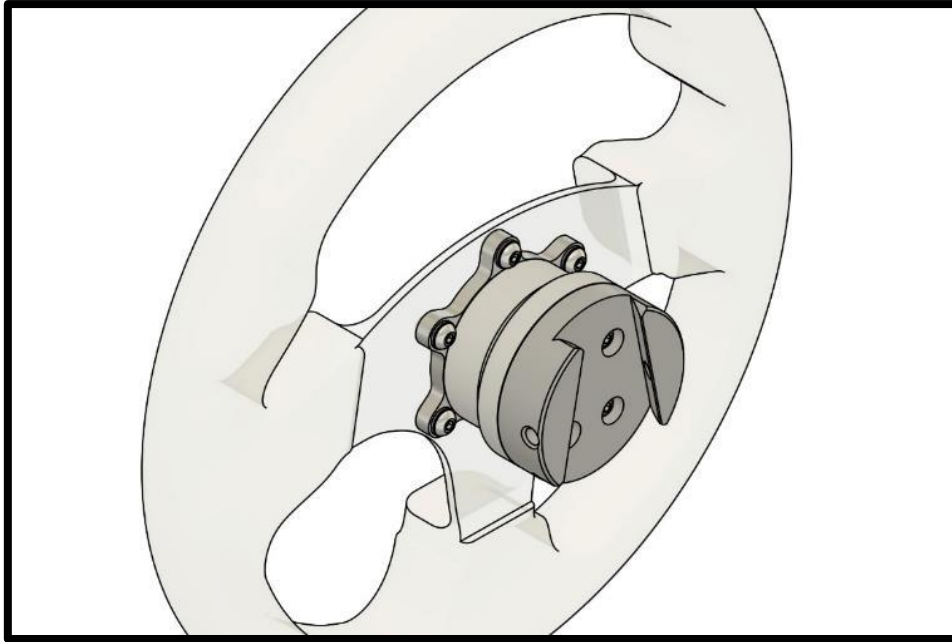
To rear-mount your wheel (if you have threads in the rear of your wheel/button box), you will need 6 M5 screws with a length depending on your wheel and button box thickness and 1 washer per screw. Align the eight middle threaded holes as in the image and attach the screws in the order as illustrated.



In both cases use four of the included 25 mm long M5 screws and 4 washers to attach the wheel side plate to the spacer as illustrated. Note: Do not use excessive torque to avoid damaging the threads in the SQR aluminum parts.



In both cases use four of the included 10 mm long M5 screws and 4 washers to attach the wheel side plate to the spacer as illustrated. Note: Do not use excessive torque to avoid damaging the threads in the SQR aluminum parts.



Completed SQR setup for 70 mm PCD wheel.

SQR – 70 mm PCD with no spacer

Due to the diameter of the wheel side SQR plate, use of the 70 mm adapter without the spacer is not possible with the included hardware.

SQR – Motor side assembly

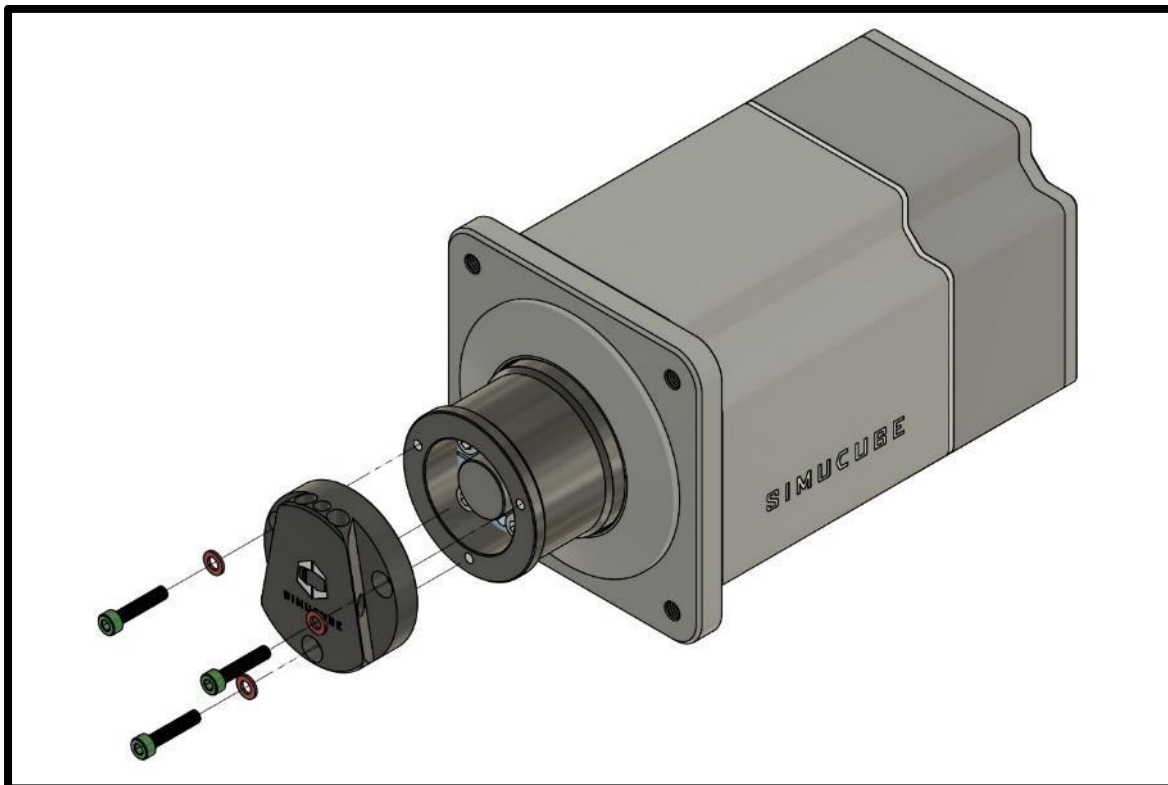
When installing the SQR (Simucube Quick Release) system ensure that the motor shaft diameter is compatible with the SQR.

The SQR motor side can be disassembled and re-installed in case of slipping or other problems relating to tightness, or if for some reason the black hub has slipped too close to the motor and appears to be touching it.

SQR – Quick Release Pin adjustment

The tightness of release pin can be adjusted. Video guide: [youtube.com/watch?v=YYKkb5Ioadg](https://www.youtube.com/watch?v=YYKkb5Ioadg)

Motor side disassembly

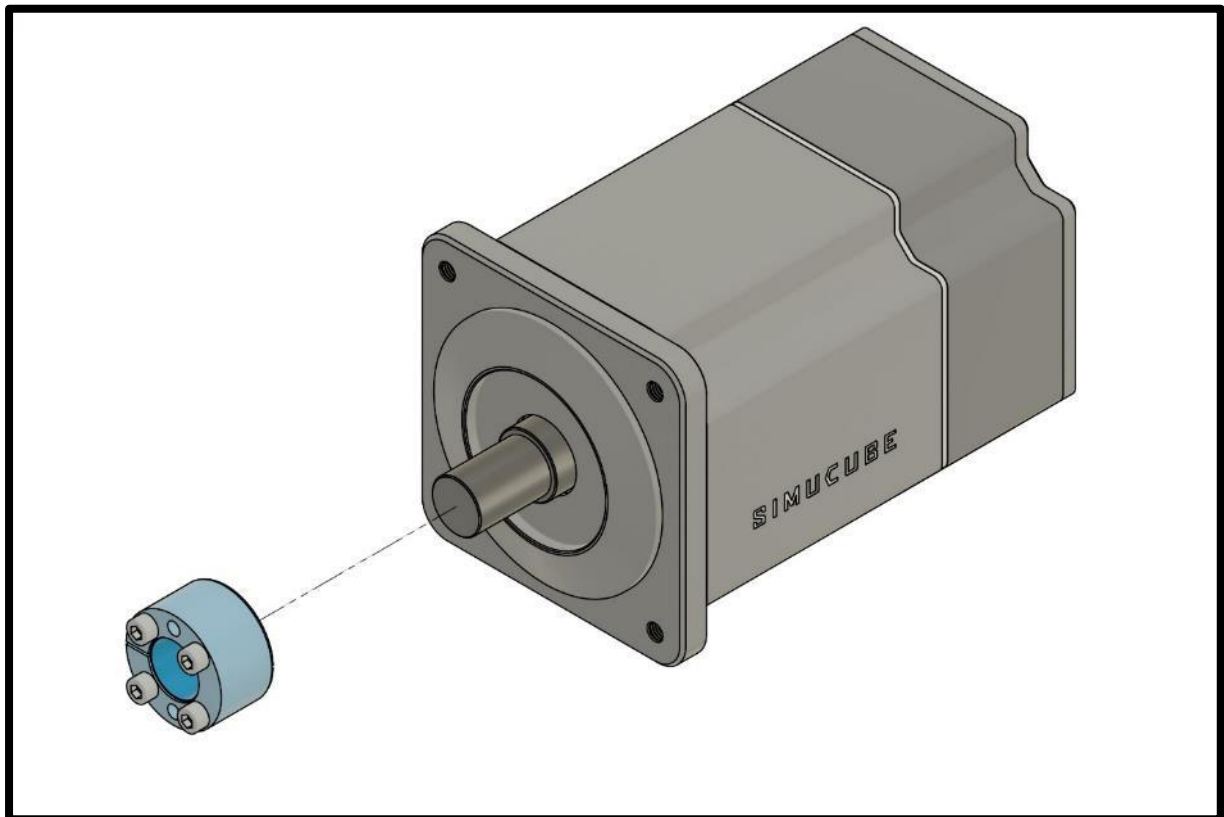


Open the three bolts on the top of SQR and remove the motor side plate.

If you do not want to lose the SQR position, draw some markings to remember the SQR position related to the motor shaft.

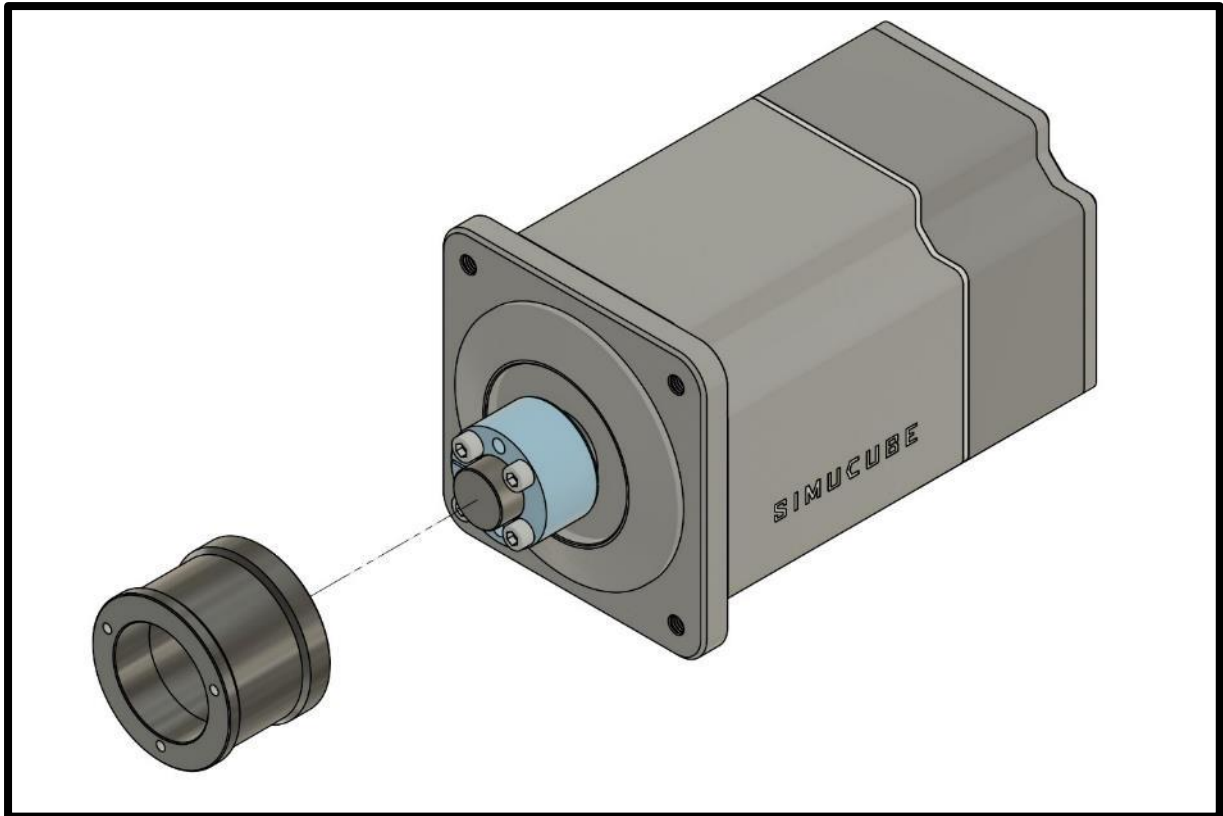
Open the four cone clamp bolts and remove the cone clamp and the SQR outer tube. If the cone clamp can't be removed after opening the four bolts, it can be opened by screwing one or two cone clamp bolts to the two empty threaded holes.

Motor side assembly



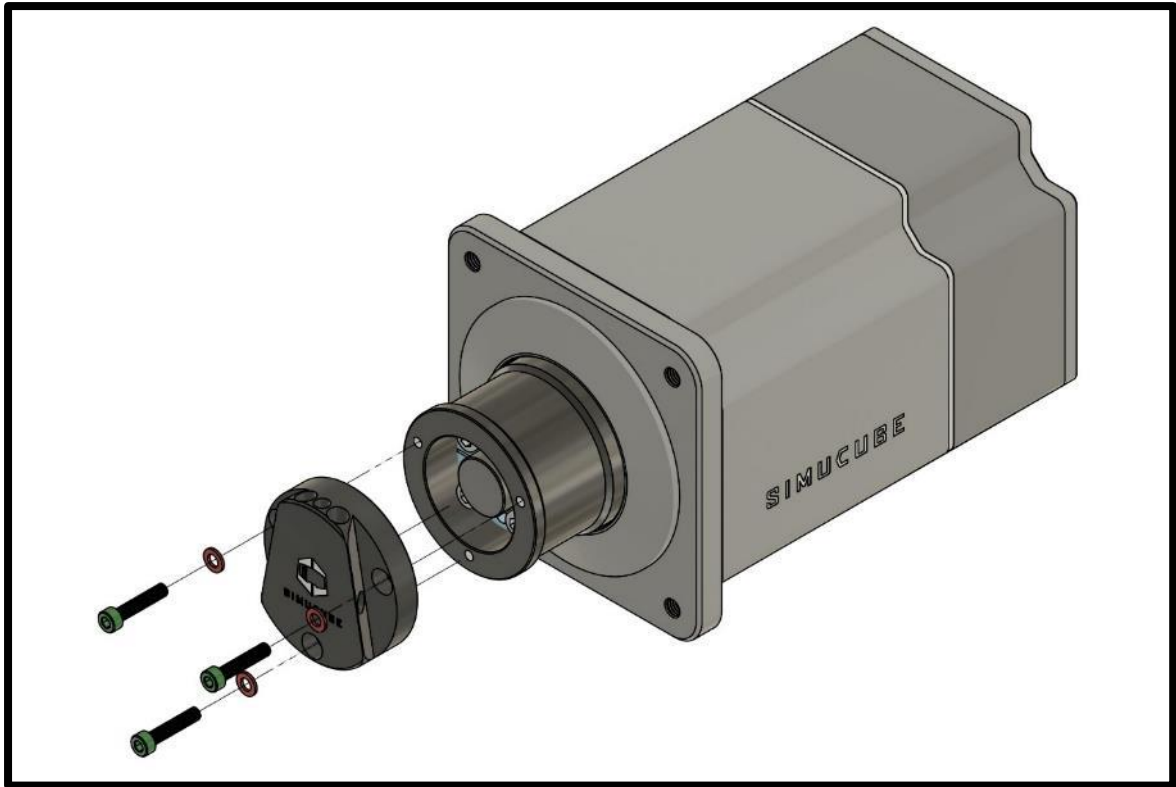
Clean the motor shaft and the cone clamp from possible grease with a dry paper towel.

Insert the cone clamp to the motor shaft. If installing to anything else than the Simucube 2 wheelbase, ensure that the clamp is in the middle of the shaft.



Insert a paper towel or any suitable thin and soft sheet to prevent the SQR outer tube touching the front plate of the motor.

Insert the adapter around the cone clamp and the motor shaft. Tighten the four cone clamp bolts evenly, starting from opposite sides. Go over the bolts multiple times to ensure tightness. Recommended tightening torque for these four bolts is 5-10 Nm.



Remove the paper towel, insert the motor side plate and tighten its three bolts.

Simucube 2 True Drive Software download instructions

The software is available as a zip file from <https://www.simucu.be> website.

Unzip the file and start the Simucube 2 True Drive application. It is important to unzip the file – do not launch the application from inside the zip file.

True Drive Software

Simucube 2 True Drive software is a powerful tool to set up and use the Simucube device.

First start

On first startup, it is likely that the True drive software will show a firmware update prompt. Update the firmware using the wizard. True Drive will close upon successful finish of update, and relaunching will give user normal access to software.

Note: Take care that the torque off button (e-stop) is not pressed in on first power up when going to firmware update.

General

The user interface of the True Drive software is tabbed and the middle area shows the tab content.



Figure 8 True Drive software main screen

1: Status area shows the current status of the device and shows if the High Torque Mode is activated.

2: Left hand side of the software is the tab bar. Tabs from top to bottom: Overview (currently viewed), Simucube Wireless Wheels Management, Profiles and tuning settings, Hardware settings, Hardware debug information and status.

3: The bottom area of the window shows a clickable slowly blinking button if the current settings are not saved permanently to Simucube. Upon clicking it, the settings are saved to the Simucube. This area also shows a notification if settings could not be applied to Simucube.

Status area and High Torque Mode functionality

Status area shows the general status of the Simucube device. In general, the operating mode should indicate "Operational". Only other typical status is "Waiting for drive to get ready" which is shown, when the device is powered on, and the device waits for the user to release the Torque Off (E-stop) button.

After every power-on, the Simucube device is in safe torque mode. In this mode, the torque is limited to approximately 4.4 Nm and the wheel has additional friction and damping applied.

High Torque Mode, where high torque level is unlocked, must be enabled manually via pressing the "Enable High Torque Mode" button. A dialog is opened. The Driver must read the disclaimer about the mode carefully before enabling the High Torque Mode. Notification beep will also indicate the wheel changing into High Torque Mode, and the Simucube 2 LED will remain blue with two quick red blinks in this mode.

In High Torque Mode, the damping and friction values in the settings will take effect over the forced high values in safe torque mode. This will result in the wheel becoming much easier to turn.

High Torque Mode can also be automatically activated. A checkbox to achieve this activate in the High Torque Mode activation dialog a few seconds after scrolling the disclaimer text down. If selected for use, the True Drive software will always enable the High Torque Mode when it sees a Simucube in Safe Torque Mode.

Idle and standby modes

To enforce drivers to practice operational safety, the Simucube 2 wheelbase will beep at user when it is unused. Safe operating practice is to use the physical safe torque off button to turn off torque, or to power off the device completely, when device is not used.

Simucube will enter a standby mode as follows:

- 1) Simucube will beep after 7 minutes when idle and torque production has been off.
- 2) After one additional minute another short beep is sound.
- 3) One minute after 2), Simucube will go to standby mode with a long beep.

In standby mode Simucube can be activated by toggling the e-stop or via a separate button in True Drive software. Standby mode can be avoided by turning the wheel left/right fast or if Simucube receives torque commands from games.

In standby mode, the LED blinks with blue colour at a low frequency.

In automatically activated High Torque Mode, the device will not go to any standby mode.

Taking the first test drive

This short section is a introduction to the features of the Simucube system. The first test drive can be done with any simulator, but we recommend Assetto Corsa, Assetto Corsa Competizione, iRacing, or Project Cars.

1. Place the Safe Torque Off button (E-stop) in a solid place where remains quickly reachable to the Driver and where it cannot drop on the floor.
2. Power on the system and verify wheel rotation with the True Drive software. You can already create a profile and adjust some of the settings if you so wish.
3. Star the simulator. Configure the wheel to be used by assigning controls. This step differs from simulator to simulator.
4. Take a test drive and verify wheel operation.
5. Also verify the rigidity of the Simucube 2 installation and the wheel installation.



At any point, if the rigidity of the installation is insufficient, press the Safe Torque Off button and stop driving immediately. Solve the issue before attempting further testing.

Simucube 2 motor becoming loose or the simulator rig suffering mechanical failure is potentially hazardous to the Driver, other people near the simulator, and materials.

6. On successful test drive, the Driver can enable the High Torque Mode by using the True Drive software. Wheel will become much more powerful and reactive.
7. Repeat steps 4 and 5 with High Torque Mode enabled.

Useful information for the first test drives:

Driver might hear **audible beeps** already on the first drive. These are the potential causes for these notifications:

- A) Torque saturation / clipping is detected.** The game is giving maximum torque and no additional signal details can be felt. Tune game FFB level to lower value to solve this. You can turn this feature on/off on the Hardware settings tab in True Drive.
- B) On rally- and drifting type games or other aggressive driving, Simucube 2 might beep many times.** This is due to automatic hands-off safety mode kicking in momentarily, which results in these beeps. The normal operating mode is automatically resumed when the Driver is detected to be using the wheel again (additional beeps are played by the device). You can tune this feature on the Hardware settings tab on True Drive and it can be turned off.

Updates to simulators and games

The game developers can update their games at any time via automatic software deployment platforms such as Steam. They can also change their Force Feedback and game controller detection codes.



Always perform a test drive after simulator/game update with the system in Safe Torque Mode (High Torque Mode not activated) to avoid unexpected behavior, such as full torque left/right.

Overview

Overview tab (Figure 8) shows the general status information of the wheel, analog inputs and digital buttons. Reset center -button allows the Driver to change the center point of the wheel either temporarily or permanently. If a Simucube Wireless Wheel is connected, its name, connection quality and battery status is shown on under the wheel image. For some Simucube Wireless Wheels, a customized image of the wheel is shown in place of the generic wheel.

Simucube Wireless Wheels

The Simucube Wireless Wheel system enables users to connect sim wheels wirelessly to the Simucube 2. The sim wheel buttons and incremental encoders are connected to a wireless button plate logic module, which wirelessly communicates with Simucube 2. The Simucube controller in turn communicates these button and encoder state changes to the user's PC via USB connection.

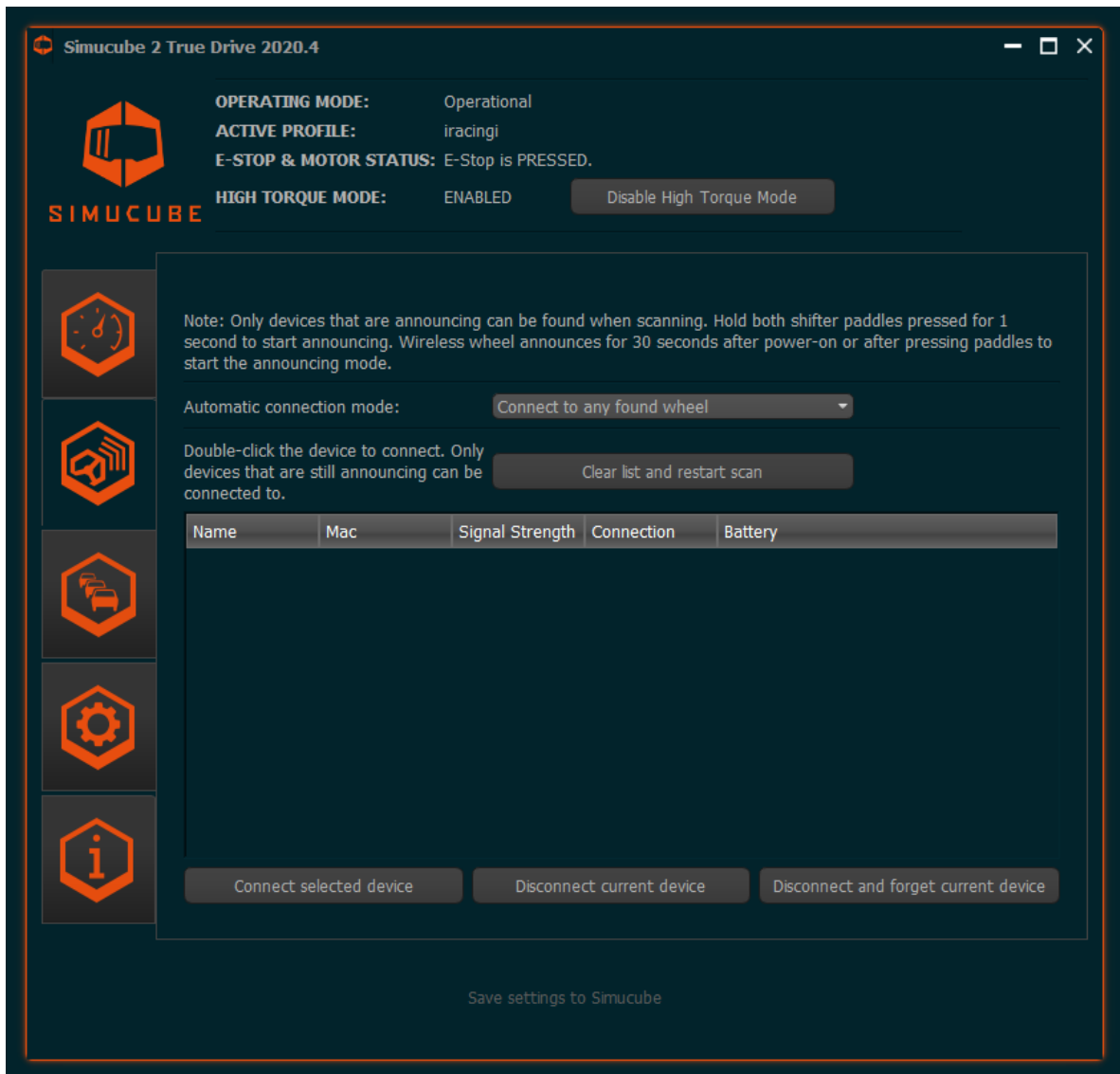


Figure 9 Simucube Wireless Wheel Management

The user interface of Simucube Wireless Wheels is shown in the above figure. Scanning of new devices is an ongoing process, and the list of found devices is shown. It is possible to manually disconnect from the currently connected wireless wheel and to forget the currently connected wheel. Connecting automatically to any found Simucube Wireless Wheel is the default connection mode. This can be changed to connect to only previously connected wheel. This is useful and recommended if it is expected that there are other users with Simucube systems in the same physical location. This is the case in LAN gaming events or simulator lounges. The automatic connection can also be completely turned off via the dropdown menu.

Connecting a wheel

For connecting a Simucube wireless wheel to a Simucube, the wireless wheel must be in the discovery mode. The discovery mode can be started by switching the wireless wheel power on, or by pressing both of its paddle shifters simultaneously for 2 seconds. The wheel will then stay in the discovery mode for 30 seconds, or while the paddles are pressed.

LED: Status led blinks rapidly in the discovery mode if the wheel has a status led.

If a wireless wheel and a Simucube have previously been connected, they will remember each other, and connect automatically if the option to do so is enabled. If a wireless wheel and a Simucube 2 do not know each other, they can be connected by double clicking the wheel name from the True Drive software, or by the separate button below the list of found devices.

LED: The status led blinks 3 times in moderate frequency after connecting, and the Simucube Wireless Wheel is ready to use.

Disconnecting a wheel

When connected, the Wireless Wheel can be disconnected by pressing both paddle shifters simultaneously for over 5 seconds, or by pressing the “Disconnect current device” button on the Simucube Wireless Wheels tab.

LED: After disconnecting, the status led blinks 10 times slowly. Powering off the Simucube Wireless Wheel will also cause a disconnection and led blinking.

Simucube 2 remembers 8 Simucube Wireless Wheels and will forget the one that has not been seen for the longest time.

Simucube Wireless wheel safety features

Wireless wheel disconnection and other events can cause torque to be disabled. There will be a slowly blinking button for manually re-enabling the torque shown on the status area (see Figure 8). Torque will be disabled in following cases:

- (I) If Simucube Wireless Wheel with a torque-off switch is connected, and the torque switch is in the torque off -position, torque will be disabled. This will be also indicated in the status area, and a separate manual torque enable button is not shown.
- (II) Simucube wireless wheel with a torque-off button is disconnected.

Additional notes about Simucube Wireless Wheel status led

Simucube wireless wheel status led (on the wireless wheel itself) blinks when the device is in advertising mode where it can be connected to. **Note:** The status led on a Simucube Wireless Wheel stops blinking if the discovery mode is continued over 50 seconds by pressing the paddle shifters. The Simucube Wireless Wheel stays normally in the discovery mode, but the led does not blink anymore. The status led continues working normally after leaving the discovery mode.

Low battery warning

After connecting to a Simucube Wireless wheel that has too low battery voltage level, there is a notification in True Drive software and the Wireless Wheel Connected audible status notification will be followed by a separate notification (two low-pitched beep sequences). The low voltage limit is set so that after the first time this happens, there is still more than one week’s worth of battery charge remaining if the wheel uses an AA battery.

Simucube will try to draw current from the battery at connection to analyse battery health, and the battery warning might be sounded only after a few seconds after connection.

Profile management

Simucube 2 has powerful profile management system that allows the driver to set up multiple profiles for use.

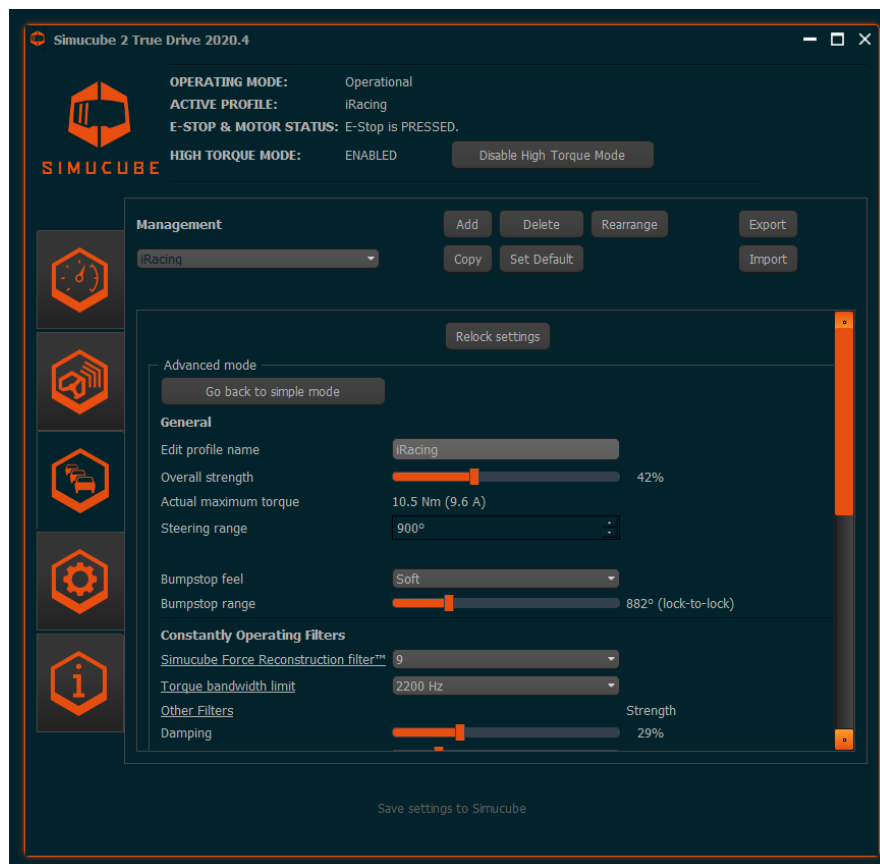


Figure 10 Profile management tab

Main functions of the profile settings:

- Profile can be switched from the dropdown selector
- The "Read-only safe profile" serves as a fallback profile, and is the default profile. It can't be deleted.
- **Add** -button creates a new profile. A dialog to select a profile based on a selection of pre-tested profile settings is shown, and a OK button creates the profile.
- **Delete** button deletes current profile. If current profile is the default profile, then the Read-only safe profile is set as default profile.
- **Copy** -button copies current profile.
- **Set as default**- button sets the currently selected profile as default, and it will be activated at Simucube power on.
- Profiles can be exported to a file and imported from file via the Export and Import buttons. Imported profiles are added to the list of profiles and will not delete existing profiles.
- Profiles can also be rearranged via the Rearrange button.

Profile name, steering angle and a variety of other settings can be adjusted via the other functions of the Profiles tab. In-depth descriptions of the multitude of filters will be added in this user guide later.

Simple and Advanced Profile Settings



Figure 11 Simple Profiles mode

Starting from version 1.0.10, True Drive software allows users to adjust just a few settings in a Simple mode (Figure 11) by default. There are settings that affect Reconstruction Filter and Slew Rate Limit together as a Smoothness setting, and a setting that affects Damping, Friction, and Inertia filters together as Damping setting. To unlock all settings, there is a Go to Advanced Mode button which unlocks all available settings for fine tuning (Figure 12).

True Drive versions before 1.0.10 do not have the Simple mode implemented and default to the Advanced Profile mode (Figure 12).

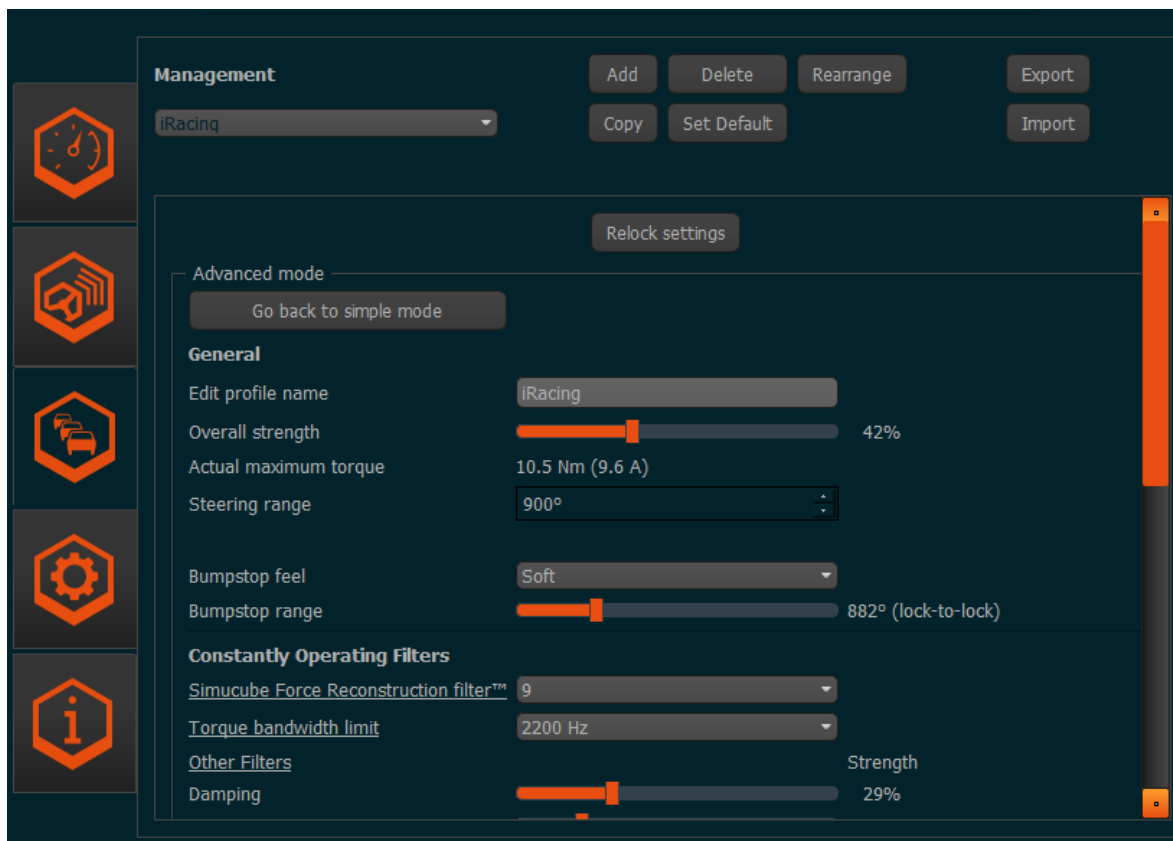


Figure 12 Advanced Profiles mode

By using Go back to simple mode -button, all advanced mode adjustments are discarded for the current profile, and settings that were last used in the Simple mode take effect again.

Profile settings (Simple Mode)

Edit profile name

Profile name can be changed. Press Enter after editing to apply the new name.

Steering range

Steering range can be adjusted via this setting. A number pre-selected options is available.

Smoothness

This setting affects the overall smoothness of the Force Feedback feel. Smoother feel will reduce small details, but will result in more quiet operation. Less smooth feel gives more details but makes the wheel more active and can show non-ideal FFB effects such as grainy feel and even audible sound from the wheel in various simulator titles.

Damping

This setting affects the overall effect intensity in games and also controls the overall weight of the steering. More damping results in less effects feel and can help to control oscillatory behaviors, whereas less damping results in more road feel but can make the wheel more active.

Profile settings (Advanced Mode)

Profile name

Profile name can be changed. Press Enter after editing to apply the new name.

Overall strength

This slider controls the overall force feedback strength.

Steering range

Steering range can be adjusted via this setting.

Bumpstop feel

Bumpstop is a software generated effect that prevents wheel from turning over a certain angle in any event. This setting controls how the bumpstop feels; there is option for soft/medium/hard setting.

Bumpstop range

This setting moves the bumpstops inside or outside the axis limits. The actual location of the bumpstops is shown next to the slider.

Constantly operating filters

These sliders and settings adjust the overall feel of the wheel base. They are being constantly applied when the device is turned on.

Reconstruction filter

This filter smooths out low update rate torque signal from the simulator to the maximum possible rate while making the changes between simulator torque updates smooth. The filter predicts torque behavior. Low filters values are reactive also when torque rate or direction changes quickly, but some of the original notchiness from the low frequency remains in the signal. Higher values are smoother, but the torque peaks might overshoot compared to the signal that the simulator produces. This due to the predictive algorithm. Typically, in constant torque modes or in typical driving conditions, there is no apparent lag, and the filter just makes the wheel feel rubberier towards the higher values.

Torque bandwidth limit

This is a low pass filter that filters out high frequency content vibrations in the force feedback signal. By setting lower values, the force feedback appear to be smoother but some details will be lost.

Damping

Damping is a torque effect which is relatively to the speed of the torque command change rate. It dampens fast torque effects that are the result of the FFB updates from the simulator. The faster torque effect changes, the more torque is generated to resist this motion. This effect is useful, as simulators do not always model tire deformations and car suspensions in a way that includes all dampening features, such as rubber bushings. This is realistic for some simulator&car combinations. Adding Damping and Friction is a good way to give realistic weight to the wheel and reduce oscillatory behavior.

Friction

Friction is a constant torque that adds resistance to the wheel movement. Wheel will become more difficult to turn with this effect. This is realistic for some simulator&car combinations. This

effect can be used combination with Damping to make the wheel more stable if there is a tendency for oscillation.

Inertia

Inertia effect is used to give the wheel more weight. The effect resists any attempts to change the current rotation speed of the wheel, and can get be helpful to make the wheel more realistic especially if very light steering wheel is used.

Static Force Reduction

This effect reduces force in long corners, while at the same time, letting the sharp details from kerbs and the road surface through to the wheel. This is useful when the Driver wants to feel every detail with full strength torque effects but does not want to fight against the wheel constantly.

Slew Rate Limit

This effect limits how fast the torque is being changed. "Off" (default setting) means, that the rate of change is unlimited and the rate will be as fast as the Simucube 2 servo drive and motor will be able to accomplish. Limiting the slew rate can be useful to soften the driving feel. If the Driver has experience of other DD wheel systems, limiting the slew rate can be useful to make Simucube 2 feel less active.

Ultra Low Latency Mode

This filter attempts to reduce latencies between the wheel base and the PC. Typically using higher filter setting can reduce the tendency of wheel oscillating in the simulator if driver lets go of the wheel. Using this filter, it may be possible to reduce Damping and Friction filter values and still get a relatively stable, non-oscillatory wheel.

DirectInput fine tuning

This section can be used for fine tuning effects that games can utilize. Not many simulator titles use any of these effects at all.

- If an effect is used and actively controlled by the simulator, a filled balloon ● is shown next to the effect slider. Changing the setting can result in a different force feedback feel in the game.
- If an effect is created but the value is not actively controlled by the simulator, an empty balloon ○ is shown.
- If the simulator has not activated this effect at all, then a dash (-) is shown, and the setting slider has no effect.
- Active DirectInput effects are also listed in the Advanced tab in textual form.
- It is recommended to keep the sliders at their default setting (100% for all expect somewhat less for Damping and Friction), as game developers expect these levels.

Simucube 2 Ultimate and early access filters

This section contains various filters that are only available for Simucube 2 Ultimate and those filters that are in development stage.

Hardware settings

The hardware tab can be used to set up those settings that typically remain constant.



Figure 13 Hardware settings tab

Hands-off safety feature

If the driver lets go of the wheel and the wheel accelerates to fast speed, Simucube by default goes automatically to safe torque mode. When driver's hands are detected again and produce force against the wheel, the High Torque Mode is smoothly reactivated (if it was active).

The sensitivity of this feature can be adjusted on the hardware tab, and it can also be turned completely off.

Audible status notifications

This setting controls the device status beeps but does not control any beep tones that are related to safety. This means that the idle beeps before going to standby mode and the beeps related to going in and out of the High Torque Mode cannot be turned off.

There is also a beep on torque saturation (clipping), which should be avoided as any additional torque is not felt when torque is clipping. This is useful for VR/HMD users or when the Driver drives a simulator where there is no Force Feedback meter or a clipping detector available. This torque saturation beep can be turned on/off via a checkbox on the Hardware tab.

Hardware tab also contains additional buttons and dialogs to set up analog inputs via the D15 connector, and other features. Later revisions of this guide will include documentation for those.

Information / Advanced tab

The last tab includes version information for product and the software.

- If, for whatever reason, a simulator has crashed but has left effects running on the PC, there is a button to reset the Force Feedback device state. This will clear all the device memory managed FFB effects.
- Some firmware status bits are shown in text form. This is useful in development and troubleshooting.
- A debug event log functionality is also available for troubleshooting purposes.

It is also possible to password protect profile settings so that users will only be able to change the profile, but not any of profile settings. Unlock and relock buttons appear on the Profile settings tab if the password protection is activated. Password protection can be disabled by checking the checkbox that appears in the Unlock dialog.

Troubleshooting and LED blink codes

LED colours and blink codes

Simucube 2 has an RGB led on the back of the device. Here are the possible led colours and blink cycles.

Normal operation

Led colour	Function
Blue	Normal operating mode
Blue slowly blinking	Standby mode
Blue with two RED blinks	High Torque Mode is activated
Red	Torque is clipping/saturated
Green	Wheel has turned over bumpstop.

Firmware update

Firmware update has special status LED cycles. They can be used for analysing firmware upgrade status and for troubleshooting reasons on failure.

Led colour	Function
Yellow	Flash erase failed before uploading new flash data.
Green blinking	Flash data is being received from PC.
Red blinking (after a firmware update attempt)	Received flash data was not compatible with this Simucube 2 product
Red	Received flash data was corrupt.
Green	Received flash data is compatible with this Simucube 2 product.
Blue	Firmware was valid and the device was told to go to firmware upgrade mode by the PC.
Blue blinking	Firmware was invalid/corrupt and the device stayed in firmware upgrade mode after power up.
Red blinking (at startup)	The device was forced to go to firmware upgrade mode by a special service dongle.

Troubleshooting instructions

Symptom	Reason	How to solve
Unexpected audible beep sound when driving in a corner.	Torque is being saturated / clipped. FFB settings are not optimal.	Recommended: Reduce FFB level in simulator and increase the Strength in Simucube to regain same overall level of FFB. Other solution: Turn off torque clipping notification on the Hardware tab.
Unexpected many beep sounds in decreasing loudness when driving. FFB goes very weak and wheel feels stiff. The sound is similar to the deactivation of High Torque Mode notification. Additional beeps with increasing loudness can be heard when Driver's hands are detected back on the wheel	Automatic hands-off detection triggered and Simucube went to the safe torque mode automatically. Very fast steering movements might trigger The feature is useful to limit the dangers of wildly oscillating wheel and in crash situations.	Reduce (or turn off) automatic hands off detection sensitivity on the Hardware settings tab
Firmware update in True Drive says 'Simucube was not found in Firmware upgrade mode' on first start	A firmware issue in first shipped production batches.	Allow the system to initialize properly with the Safe Torque Off (E-stop) button not pressed before launching True Drive software for the first firmware update.
True Drive software hangs at start	Firmware issue in currently released firmware version.	Power off and then power on the Simucube 2 wheelbase whenever you reboot the computer.

Warranty

This product has a 24-month limited warranty (Simucube 2 Sport and Pro) and 60 months (Simucube 2 Ultimate). Warranty terms are available on the Simucube website (<https://www.simucu.be/support>).

Recycling

Please discard the device via proper electrical equipment recycling operator. Do not discard Simucube 2, its power supplies or other peripherals via regular trash.

Manufacturer information

Granite Devices Oy

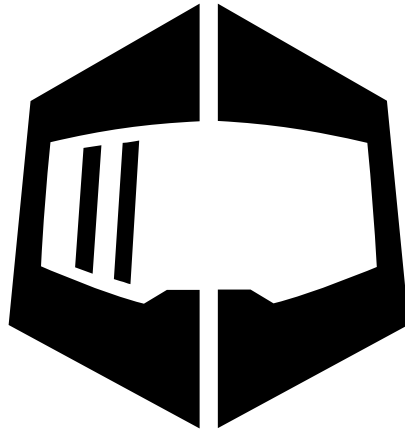
Sinitaival 6 0

FI-33720 Tampere

Finland

<https://www.simucu.be>

In support queries please contact your reseller as the first point of contact.



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