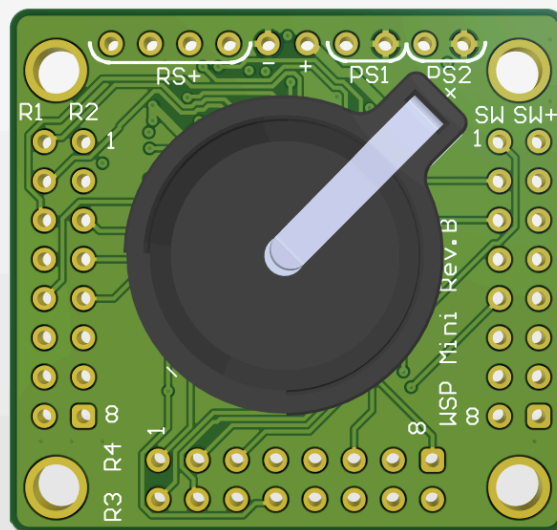




USER MANUAL

Wireless Racing Kit

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Contents

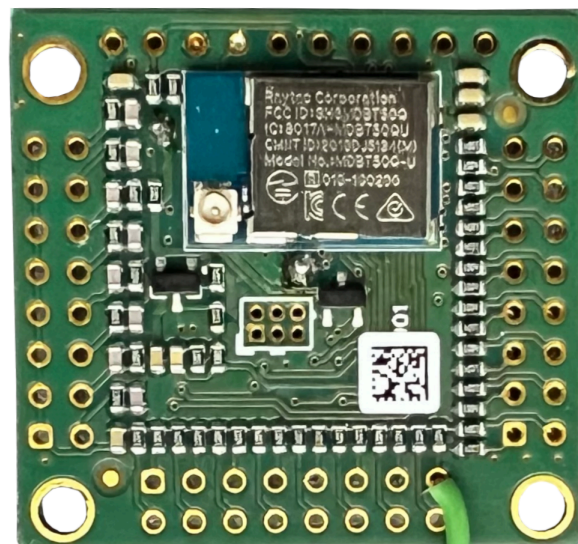
1. Device description.....	3
1.1. Wireless Racing Kit description.....	3
1.2. Wireless Receiver description.....	4
2. Specification.....	4
2.1. Wireless Racing Kit specification.....	4
2.2. Wireless Receiver specification.....	6
2.3. Wireless Receiver pinout.....	6
2.4. Included in set.....	7
3. Installation.....	7
3.1. Wireless Racing Kit Assembly.....	7
3.2. Wireless Receiver installation.....	11
3.3. Pairing Wireless Racing Kit with the Wireless Receiver.....	12
4. Wireless Receiver configuration and upgrade.....	13
4.1. Using Light Client.....	14
4.2. Wireless Receiver upgrade.....	17
4.2.1. CAN module upgrade.....	18
4.2.2. RF module upgrade.....	19
5. Wireless Racing Kit configuration and upgrade.....	22
5.1. Wireless Racing Kit upgrade.....	22
5.2. Power level.....	25
6. Communication details.....	26
7. Troubleshooting.....	26
8. CAN Stream.....	29
9. Document history.....	31

1. Device description

The Wireless Racing Kit offers a convenient and versatile control interface for your vehicle. Equipped with eight inputs for push buttons and four inputs for rotary switches, it integrates with the Wireless Receiver. Utilizing advanced wireless Radio Frequency (RF) technology, the Kit transmits data over the CAN bus, enabling diverse applications within your car. Additionally, the Kit supports connection to paddle shifters for expanded functionality.

1.1. Wireless Racing Kit description

Wireless Racing Kit offers a convenient and cable-free way to control your car's features. It connects wirelessly to the Wireless Receiver, eliminating the unnecessary wires. The panel features 8 inputs for customizable buttons and 4 inputs for rotary switches, allowing you to use them for your preferred functions. For even more control, two dedicated connectors enable the addition of paddle shifters.



The Wireless Racing Kit integrates with other CAN-bus devices. This ensures enhanced connectivity and coordination between different components of the vehicle's control system.

The CR1620 battery of the Wireless Racing Kit, tested for durability, demonstrates efficient power consumption by withstanding approximately 150 000 button presses at room temperature when four rotary switches are used. Reducing the number of rotary switches extends the battery life. Battery level is transmitted over the CAN-bus, providing real-time information.

1.2. Wireless Receiver description

The Wireless Receiver unit processes the signal received from the Wireless Racing Kit and transmits it via the Controller Area Network (CAN) bus, the vehicle's primary communication system. Additionally, the Wireless Receiver incorporates three status indicator LEDs, providing visual feedback on critical system parameters.



Green LED: Glows indicating the Wireless Receiver is powered. If properly powered, the diode should glow constantly.

Red LED: Blinks indicating low Wireless Racing Kit battery (approximately 20%). Change the battery as soon as possible.

Blue LED: Blinks each time the Kit successfully transmits data to the Wireless Receiver. This signifies active communication.

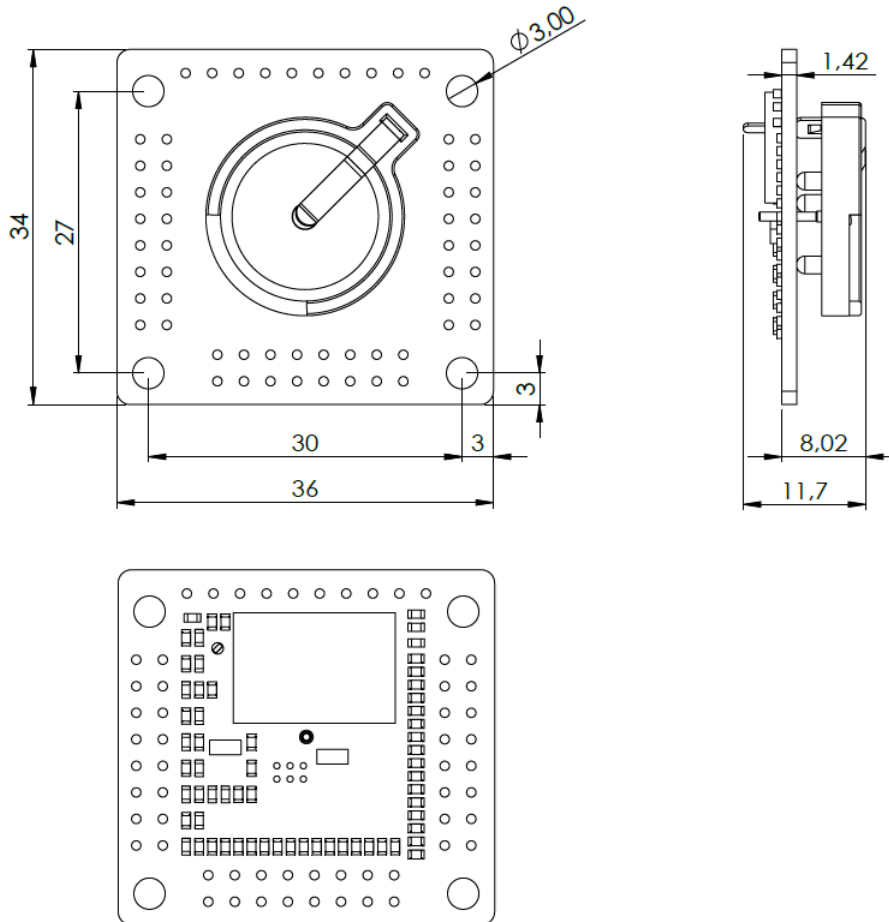
2. Specification

2.1. Wireless Racing Kit specification

Specification	
Temperature range	AECQ GRADE3 (-40°C to +85°C)
Battery type	CR1620 (included)
Wireless communication	Radio Frequency
Frequency range	2360 MHz to 2500 MHz
Estimated battery life	260 days at rest at room temperature or 150,000 switches

Weight	10 g
Dimensions	36 x 34 x 12 mm
Mounting mechanism	4 screws with a diameter of 3 mm
Latency	Below 20 ms
Button inputs	8 with customizable functions (not included)
Rotary switch inputs	4 with eight positions and customizable functions (not included)
Paddle shifters	2 connectors, paddle shifters (not included)
Range (line of sight)	100 m at highest power setting
Power levels	7
Power range	from -20 dBm to 4 dBm depending on power level selected

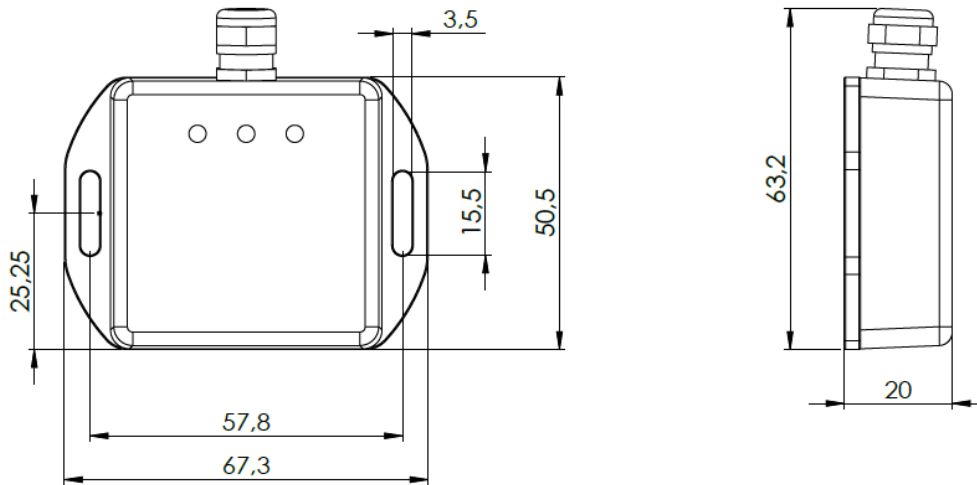
All dimensions in mm



2.2. Wireless Receiver specification

Specification	
Temperature Range	AECQ GRADE3 (-40°C to +85°C)
Operating Voltage	6-22 V, immunity to transients according to ISO 7637
CAN	CAN 2.0 A/B – 125, 250, 500, 1000 kbps
Dimensions	68 x 50 x 20 mm
Weight	50 g
Connector	Deutsch DTM04-4P (terminal included)
Cable length	20 cm
Mounting mechanism	2 x M3 bolts
Number of supported Wireless Racing Kits	Up to 8

All dimensions in mm



2.3. Wireless Receiver pinout



Pin	Description
1	Ground
2	CAN high
3	CAN low
4	+12V

2.4. Included in set

The set includes:

1. Wireless Racing Kit
2. Battery: CR1620
3. Antenna

If you purchased the "Wireless Racing Kit with Receiver" set, it additionally includes:

1. Wireless Receiver
2. Receiver connector (Deutsch DTM04-4P) with terminals

3. Installation

3.1. Wireless Racing Kit Assembly

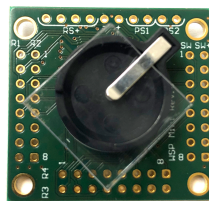
Wireless Racing Kit allows you to connect four eight-position rotary switches, eight buttons, and features two inputs for connecting paddle shifters. The board is powered by an internal battery but can also be powered by an external battery. To ensure safe usage, it is recommended to securely mount the board using screws in a non-conductive housing, such as plastic, to avoid signal interference.



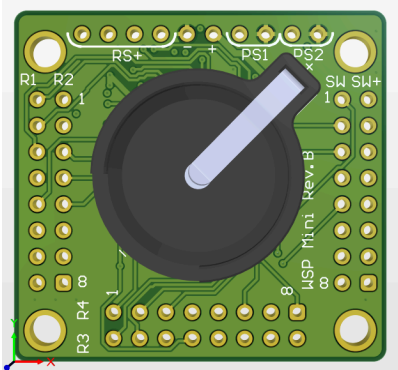
Attention:

External Power Supply Guidelines:

- The external power supply voltage must be in the range of 1.8V to 4.2V, with the recommended voltage between **3.0V to 3.3V**.
- It is allowed to connect a Li-Ion external battery.
- When using a battery, do not connect an external power supply.
- When using an external power supply, do not insert the battery; instead, place an insulator between holder terminals as shown in the picture below:

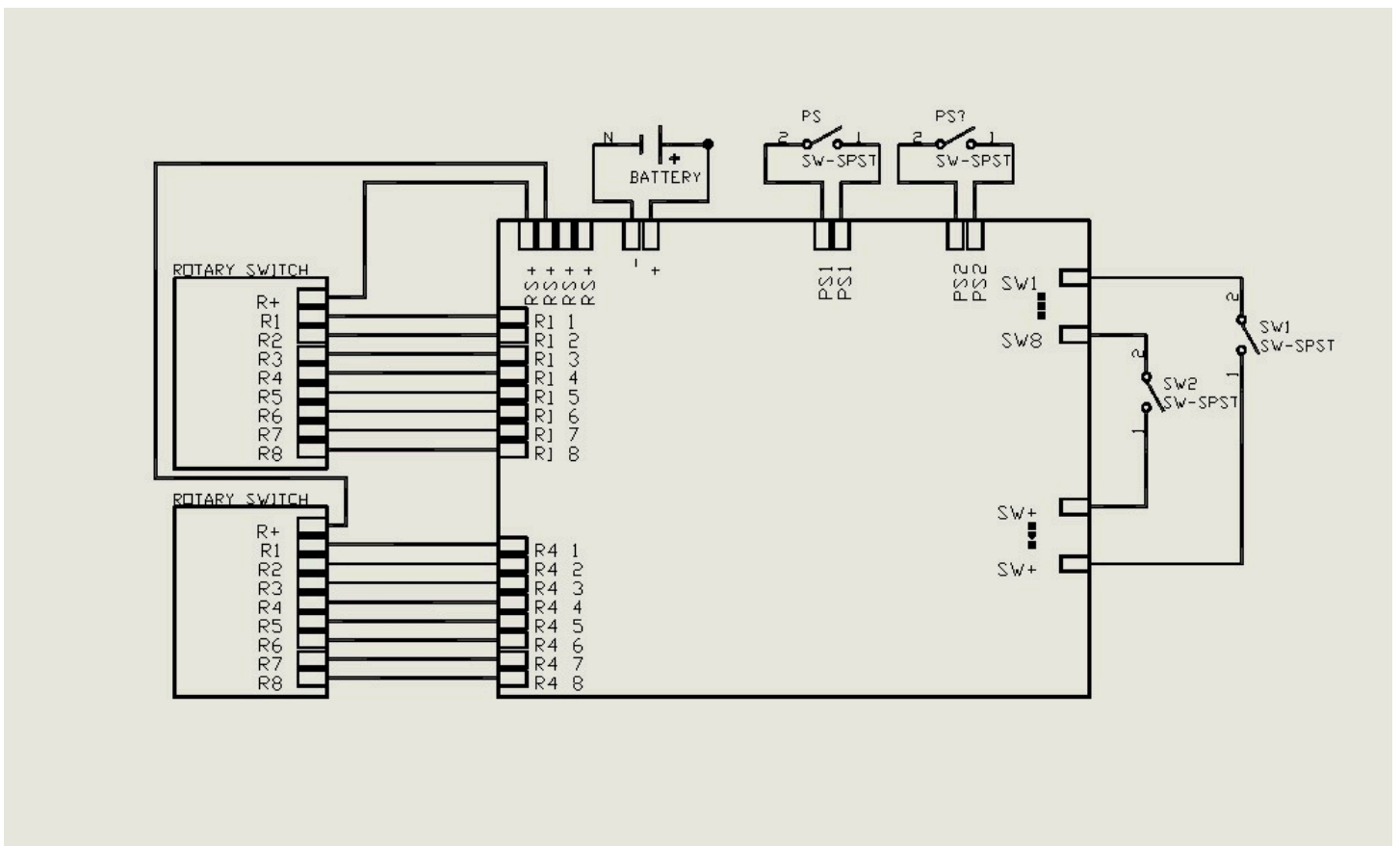


- There is no possibility to recharge the battery by connecting both external supply and placing the battery in a holder.



Pin	Description
R1 1-8	Rotary Switch Input
R2 1-8	Rotary Switch Input
R3 1-8	Rotary Switch Input
R4 1-8	Rotary Switch Input
RS+	Positive terminals for Rotary Switches
SW 1-8	Switch inputs, switched to SW+
SW+	Positive terminals for switches
PS1	Paddle shift input 1
PS2	Paddle shift input 2
+	Positive connection for external battery (optional)
-	Negative connection for external battery (optional)

Connect the external components to the board as shown in the diagram below:

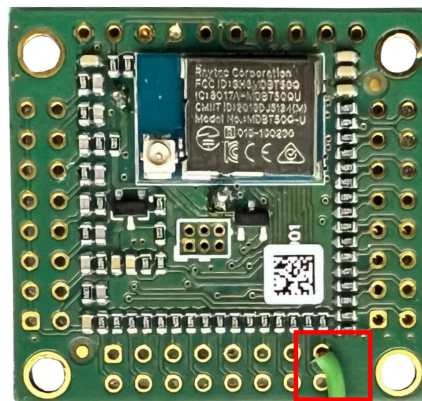


**Attention:**

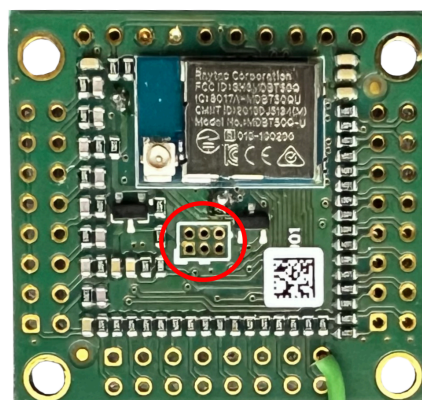
The Kit works only with rotary switches that have digital output; there is no possibility to connect rotary switches with analog output.

Assembly recommendations:

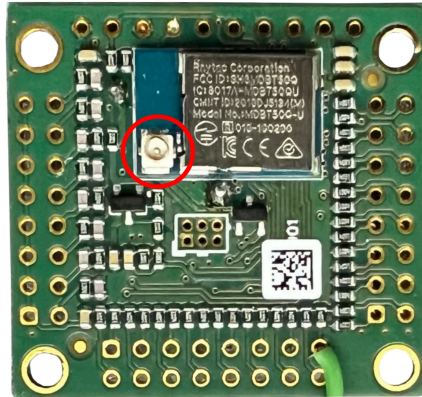
- Before soldering, remove the battery from the battery holder.
- Use wire size AWG 22 or smaller. Thicker wires can make harness difficult to manage in case of using a lot of inputs.
- Insert wires into the board from the component side and solder them on the battery side as shown in the picture below. This approach prevents unintentional damage to components during soldering.



- After soldering, it is recommended to cover the connections with epoxy resin or glue to protect them from potential damage.
- The pads shown on the picture below are used for factory programming; they are not dedicated to user usage. Do not connect anything to them.



- Connect the external antenna to the antenna connector (marked on the picture below); without an antenna, the range of the Kit is greatly decreased.



- Paddle shifts input has two pads; when they are shorted to each other, the signal is read as “high.”
- Place a CR1620 battery into the holder or connect an external power supply.
- To maintain signal integrity, it is crucial to mount the board within a non-conductive housing, preferably made of plastic. Use screws for a secure and stable attachment.
- An example of housing may look like the photo below:

**Note:**

In the subsequent sections of the document, the configuration will be described using the notation shown in the above picture.

3.2. Wireless Receiver installation

Placement:

- **Surface:** Mount the Wireless Receiver on a **flat, level surface** to avoid stress on the back cover.
- **Temperature:** Ensure the installation area maintains a **stable temperature below 85°C (185°F)** and avoids sudden temperature fluctuations.
- **Vibration:** We highly recommend using **isolation/rubber dampers** to minimize vehicle vibrations transmitted to the Wireless Receiver.
- **Surroundings:** Avoid placing any metal (or conductive) objects between the Wireless Receiver and the Wireless Racing Kit's antenna. This can significantly weaken the signal strength and negatively impact communication range and performance.



Attention:

We discourage placing the Wireless Receiver in the engine bay. This area exposes it to extreme heat, moisture, and vibrations, all of which can shorten its lifespan and impact performance. Choose a cooler, protected location for optimal performance and longevity. Placing the Wireless Receiver in the engine bay can block the RF signal, further hindering its ability to communicate effectively.

Mounting:

- **Screw holes:** The device features **two M3 screw holes** for secure mounting.
- **Screw selection:** Choose M3 screws with an appropriate length based on your mounting surface and dampers (if used).

To power and communicate, connect the Wireless Receiver to:

- **Power:** A stable +12V source.
- **Ground:** A reliable vehicle ground.
- **Communication:** The vehicle's CAN bus (High and Low).

Default CAN bus speed: 500 kbps, adjustable through the Light Client application if needed.

3.3. Pairing Wireless Racing Kit with the Wireless Receiver

Pairing between the Wireless Racing Kit and Wireless Receiver is required before the first use and after every battery replacement. Please follow these steps for a smooth connection:

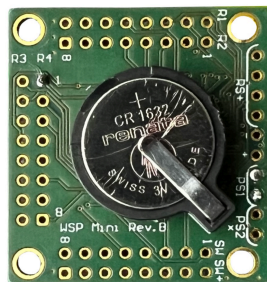


Warning:

Wireless Racing Kit is sensitive to ESD (Electrostatic Discharge). During the battery replacement process, caution must be exercised to avoid damaging the device. Please follow the recommendations to prevent device damage due to electrostatic discharge: Do not touch the device PCB or the battery if you are electrified or it is dry and warm. Touch something metal and grounded, such as a radiator, pipe, or car body, before and after changing the battery. Use a metal screwdriver, not a plastic or rubber one.

1. Power Up:

- Insert CR2450 battery into the panel as per the provided picture.
- Make sure to power on the Wireless Receiver. For detailed information, see chapter "[Wireless Receiver installation \(on page 11\)](#)".



2. Open the Light Client application on the PC

While not required, you can verify proper panel operation by checking its status in the Light Client application. This offers an additional confirmation beyond the Wireless Receiver's LED indication. For detailed information, see chapter "[Using Light Client \(on page 14\)](#)".

3. Establish Proximity:

Position the Wireless Racing Kit within 10 centimeters (4 inches) of the Wireless Receiver.



Note:

Avoid covering the antenna situated at the top-left corner of the panel's rear during pairing, marked in purple on the picture below.



4. Initiate Pairing:

Simultaneously press and hold the two buttons located on the panel's right side for at least 3 seconds, marked in orange on the picture above. Observe the Wireless Receiver's "status" LED:

- **Blinking:** Pairing is complete.
- **Data displayed in Light Client:** Pairing is complete.

Unpairing the Wireless Racing Kit

If you need to unpair the Wireless Racing Kit from its current Wireless Receiver to connect it to a different one, follow these steps:

1. Remove the battery from the Wireless Racing Kit.
2. Wait for a few seconds.
3. Reinsert the battery into the Wireless Racing Kit.

4. Wireless Receiver configuration and upgrade

For communication with the Wireless Receiver, a USB-to-CAN interface is required. Connect this interface to your PC and then to the Wireless Receiver via the CAN bus. Compatible Interfaces:

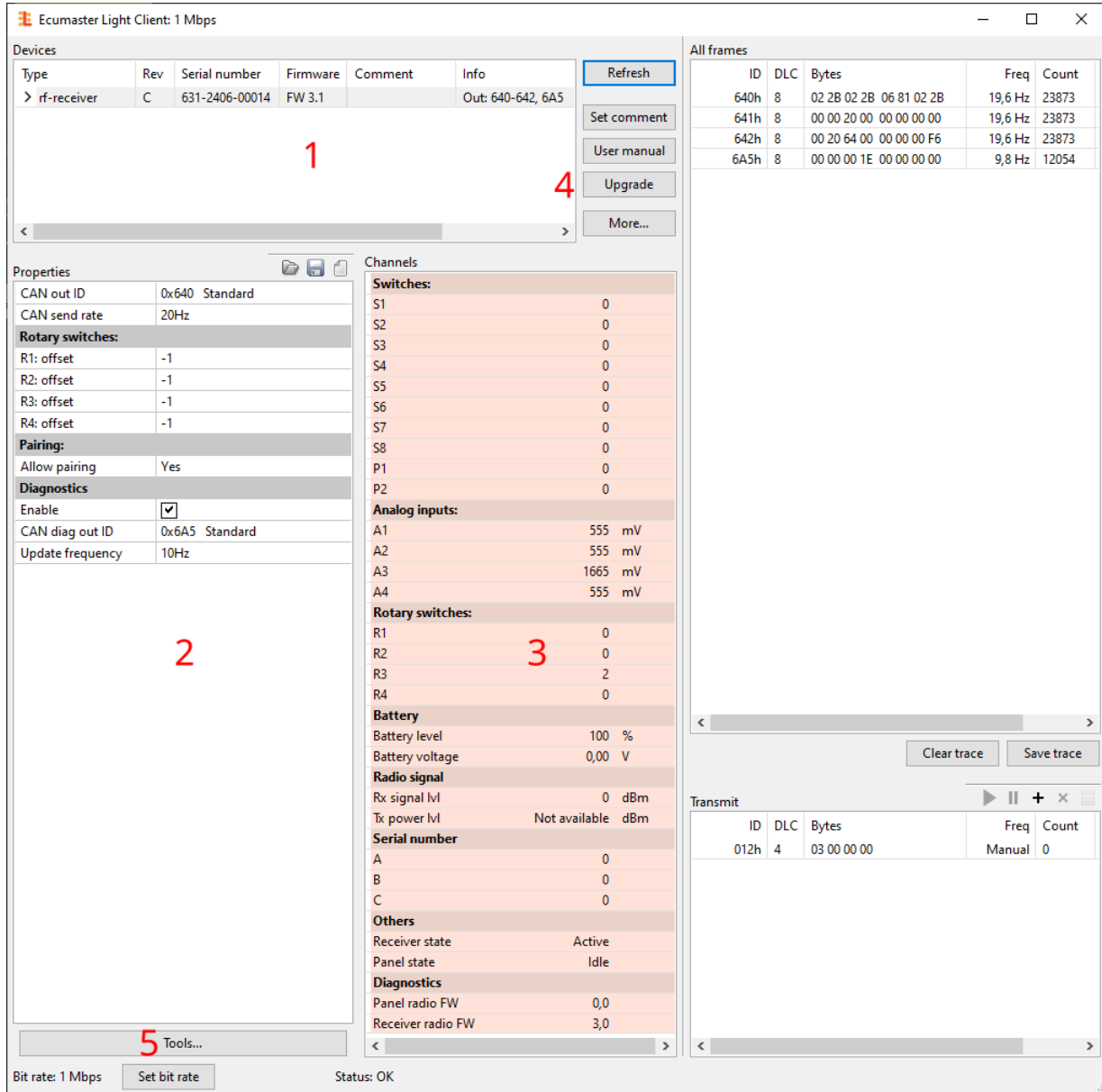
- Ecumaster USBtoCAN: <http://www.ecumaster.com/products/usb-to-can/>
- Peak Systems PCAN-USB and PCAN-LAN: <http://www.peak-system.com>
- Kvaser USBcan: <http://www.kvaser.com>

Use the Ecumaster Light Client to view real-time data from your Wireless Receiver, including the current Wireless Racing Kit state. You can also configure key settings like CAN send rate and CAN ID to fine-tune the Wireless Receiver's behavior to your setup. Additionally, Light Client is used to update the Wireless Receiver's firmware.

4.1. Using Light Client

Upon launching the Light Client application, you'll be prompted to choose the CAN bus bit rate. Your Wireless Receiver comes configured with a default CAN speed of 500 kbps.

Once you've successfully connected the Ecumaster Light Client application to your Wireless Receiver, you should see the following screen:



1. Devices

The Devices section within the Light Client application lists all compatible devices connected to your CAN bus. Upon connecting, Light Client will display a list of all compatible devices it detects on the CAN bus. Look for an entry named "rf-receiver" in this list. You will find the name, hardware revision, serial number, firmware version and additional information about used CAN IDs. To configure your Wireless Receiver, double-click its entry in the "Devices" section.

2. Properties

The following table provides descriptions for all adjustable parameters of your Wireless Receiver.

Parameter	Description
CAN out ID	The Base ID of the device. By default the Base ID is equal to 0x640.
CAN send rate	This parameter defines how often the device sends information to the CAN bus.
R#: offset	This parameter is added to the physical position of a rotary switch. When a value is transmitted via the CAN channel, it is the sum of the rotary switch's position and the offset.
Allow pairing	Indicates whether the Wireless Receiver allows pairing with a Wireless Racing Kit. Possible values: Yes or No.
Enable	Field enabling the activation of the diagnostic CAN frame (default: 0x6A5).
CAN diag out ID	Base ID of the diagnostic frame. This field allows for the modification of the diagnostic frame address.
Update Frequency	This parameter defines how often the device sends diagnostic frame to the CAN bus.

3. Channels

This section provides valuable insights into various aspects of your Wireless Receiver and connected Wireless Racing Kit(s) Think of it as a central dashboard for monitoring key parameters.

Parameter	Description
S1-S8	The status of Wireless Racing Kit switches: 0 - button not pressed, 1 - button pressed
P1-P2	The status of Wireless Racing Kit paddle shifts switches: 0 - paddle shift not engaged, 1 - paddle shift engaged
A1-A4	Calculated voltage value (in mV) based on the position of the rotary switches.
R1-R4	The position of rotary switches.

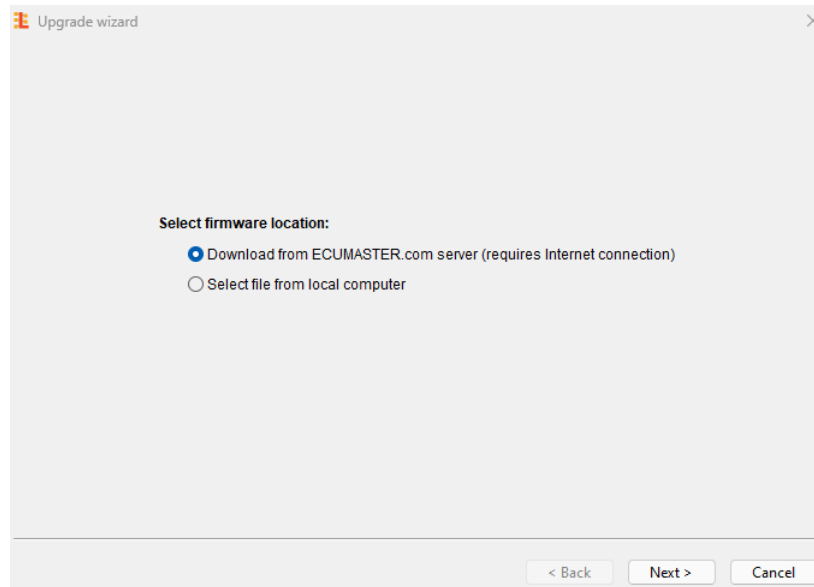
Parameter	Description
Battery level	Estimated battery level of the Wireless Racing Kit (0-100%).
Battery voltage	Measured voltage of the Wireless Racing Kit battery (in V). The value is 0 when the Wireless Racing Kit has not communicated with the Wireless Receiver yet. After pressing a button on the paired Wireless Racing Kit, the voltage value will be updated.
Rx signal lvl	Received radio signal strength from (in dBm) the Wireless Racing Kit measured by the Wireless Receiver.
Tx power lvl	Transmit power set in the Wireless Racing Kit. Lv 1: -20 dBm, indicates the lowest transmit power. Lv 7: 4 dBm indicates the highest transmit power (default setting). "Not available" means that the Wireless Racing Kit has not sent any data to the Wireless Receiver yet. After pressing a button on the paired Kit, the value will be updated.
A, B, C	Serial number of the Wireless Racing Kit divided into parts A, B, C. For example, the serial number 632-2350-00058 will be displayed as: A = 632, B = 2350, C = 58
Receiver state	Radio Wireless Receiver status: Active - the radio part of the Wireless Receiver is working correctly, Bootloader - the radio part of the Wireless Receiver is in bootloader mode, Error - no communication with the radio part of the Wireless Receiver.
Panel state	Wireless Racing Kit status: Idle - the Wireless Racing Kit is in a sleep state, Active - the Wireless Racing Kit is active, Bootloader - the Wireless Racing Kit is in bootloader mode.
Panel radio FW	Wireless Racing Kit firmware version. Value is 0.0 when the Wireless Racing Kit has not communicated with the Wireless Receiver yet. Symbol '?' indicates the diagnostic frame not being transmitted.
Receiver radio FW	Firmware version of the radio part of the Wireless Receiver. Symbol '?' indicates the diagnostic frame not being transmitted.

4. Upgrade button

The Light Client application allows you to upgrade the connected device's firmware to the latest version. To do this, press the *Upgrade button*. The upgrade process is described in chapter [Wireless Receiver upgrade \(on page 17\)](#).

5. Tools button

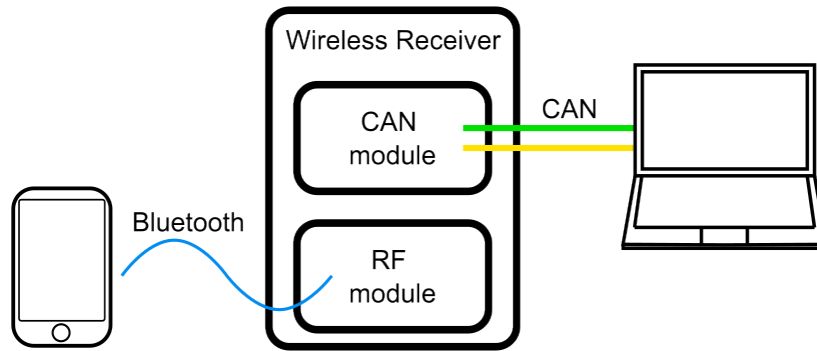
This button is used to enter the bootloader mode, necessary for an update. The upgrade process is described in chapter [Wireless Receiver upgrade \(on page 17\)](#).



4.2. Wireless Receiver upgrade

Your Wireless Receiver consists of two separate modules: a CAN module and an RF module. Each part requires a separate firmware upgrade process. However, **it's crucial to maintain compatibility between the two modules' versions**. Inconsistency can lead to communication issues affecting your Wireless Receiver's performance.

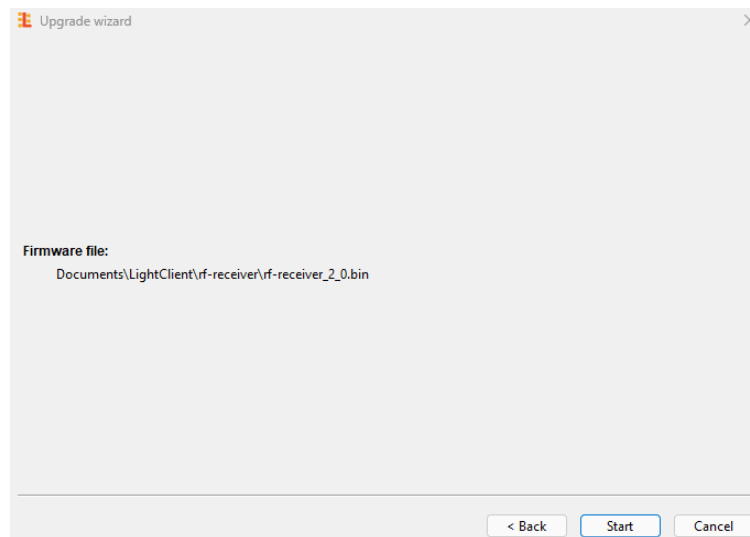
Both the RF and CAN modules display their firmware versions in the format "X.Y," where X represents the major version and Y the minor version. **For optimal functionality, ensure both modules share the same major version (X)**.



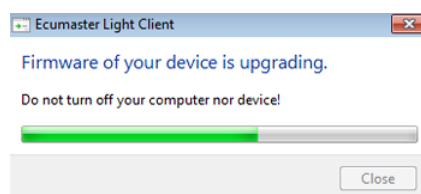
4.2.1. CAN module upgrade

To upgrade the CAN module, use the Light Client application. The detailed description of the application was supplied in the chapter [Using Light Client \(on page 14\)](#). After a successful connection via the CAN bus, select the rf-receiver and press the **Upgrade** button.

Select whether to upgrade from a file on your PC ("Select file from local computer") or download the latest version directly ("Download from internet").



Next, press the "Start" button to upgrade the firmware. **Crucially, avoid turning off your PC or interrupting power to the device during the upgrade.**



4.2.2. RF module upgrade

To upgrade the RF module of your Wireless Receiver, you'll need a smartphone with Bluetooth connectivity and the "nRF Device Firmware Update" application. Download it from the App Store (iOS) or Google Play (Android). The Light Client application on your PC is also necessary.

1. Download the "nRF Device Firmware Update" application

App Store: <https://apps.apple.com/us/app/nrf-device-firmware-update/id1624454660>

Google Play: <https://play.google.com/store/apps/details?id=no.nordicsemi.android.dfu>

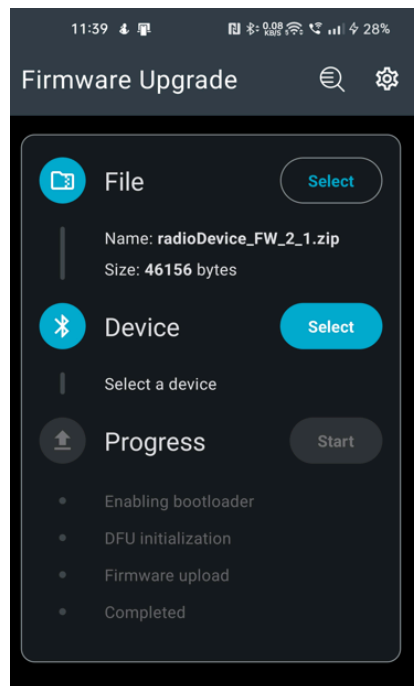
2. Enable Bluetooth on your phone

3. Download the firmware

Open the website <https://www.ecumaster.com/products/wireless-racing-panel/> on your mobile phone. Download the .zip file. It's location will be important in the next step.

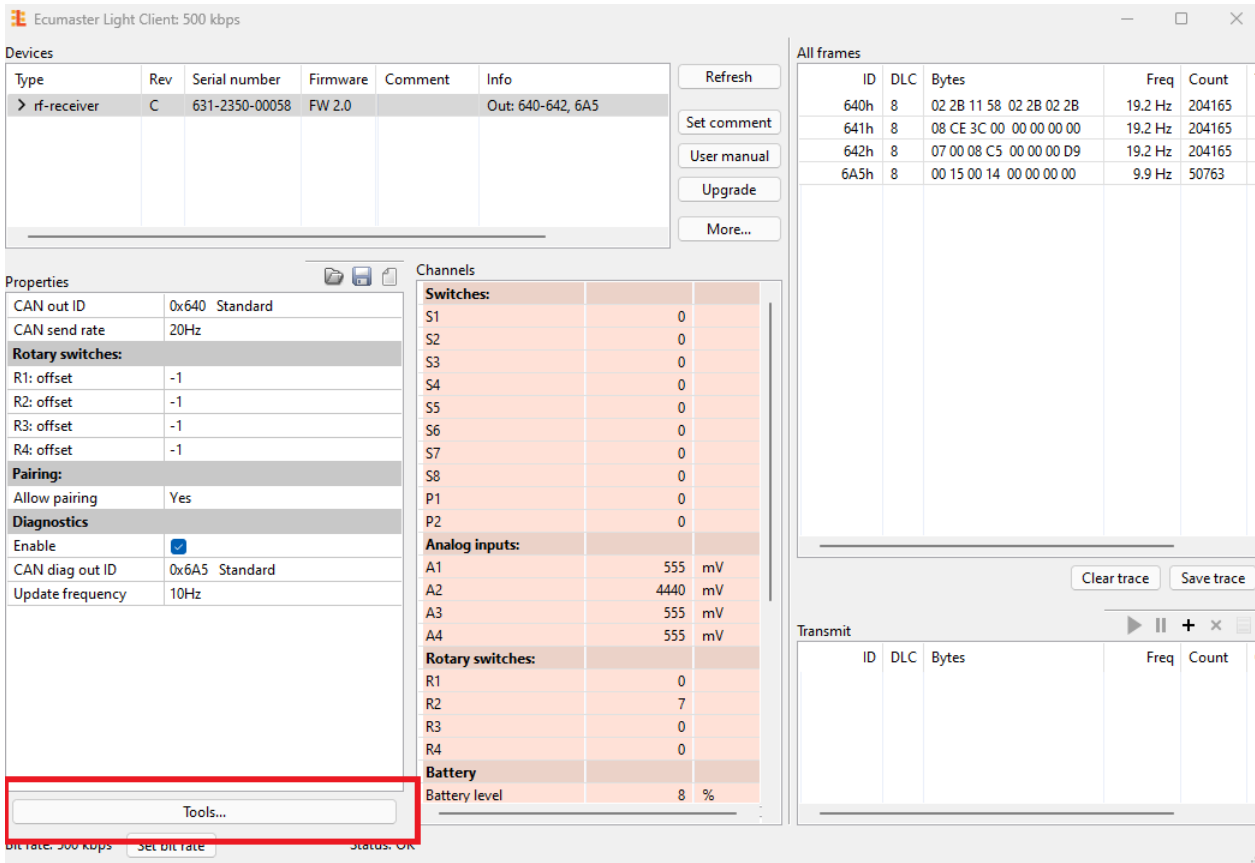
4. Select the file

In the nRF Device Firmware Update application, select the appropriate .zip file:



5. Enter bootloader mode

Before updating your Wireless Receiver firmware via smartphone, the device must enter bootloader mode. This process utilizes the Light Client PC application. Within the Light Client window, find the "Tools..." button and click it. From the presented options, select "Go to receiver bootloader."



Once you select "Go to receiver bootloader" in the Light Client application, the Wireless Receiver enters bootloader mode. To **confirm successful entry**, check the **Receiver state** channel within the application.

Others	
Receiver state	Bootloader
Panel state	Idle
Diagnostics	
Panel radio FW	2.1
Receiver radio FW	2.0



Note:

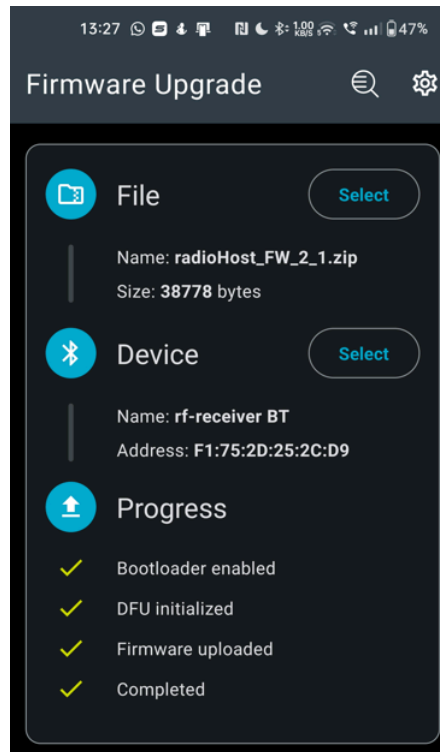
Bootloader mode on your Wireless Receiver is active for only 2 minutes. To ensure successful firmware update, initiate the process on your smartphone immediately after entering bootloader mode. Accidental entries pose no risk, as the mode automatically times out after 2 minutes. Please note that during bootloader mode, Wireless Racing Kit signal transmission to the CAN bus is suspended. This is normal behavior and will resume after the update or timeout. You can also exit bootloader mode by restarting the device.

6. Select the device

In the nRF Device Firmware Update application, select the appropriate device. The name of the Wireless Receiver is "rf-receiver BT".

7. Start the upgrade

Within the nRF Device Firmware Update application, locate and press the "Start" button. This action initiates the transfer and installation of the new firmware onto your Wireless Receiver.



Confirmation of the successful upgrade procedure will be the information about the firmware version in the Channels window *Receiver radio FW* of the Light Client and the change of the **Receiver State** parameter from **Bootloader** to **Active**. The CAN diagnostic frame must be enabled to see the *Receiver radio FW* channel.

Others	
Receiver state	Active
Panel state	Idle
Diagnostics	
Panel radio FW	0.0
Receiver radio FW	2.1

5. Wireless Racing Kit configuration and upgrade

5.1. Wireless Racing Kit upgrade

**Note:**

This process is similar to the Wireless Receiver upgrade, detailed in chapter [RF module upgrade \(on page 19\)](#). However, bootloader entry differs significantly here.

To upgrade the Wireless Racing Kit, you'll need a smartphone with Bluetooth connectivity and the "nRF Device Firmware Update" application. Download it from the App Store (iOS) or Google Play (Android). The Light Client application on your PC is recommended but not necessary.

1. Download the "nRF Device Firmware Update" application

App Store: <https://apps.apple.com/us/app/nrf-device-firmware-update/id1624454660>

Google Play: <https://play.google.com/store/apps/details?id=no.nordicsemi.android.dfu>

2. Enable Bluetooth on your phone

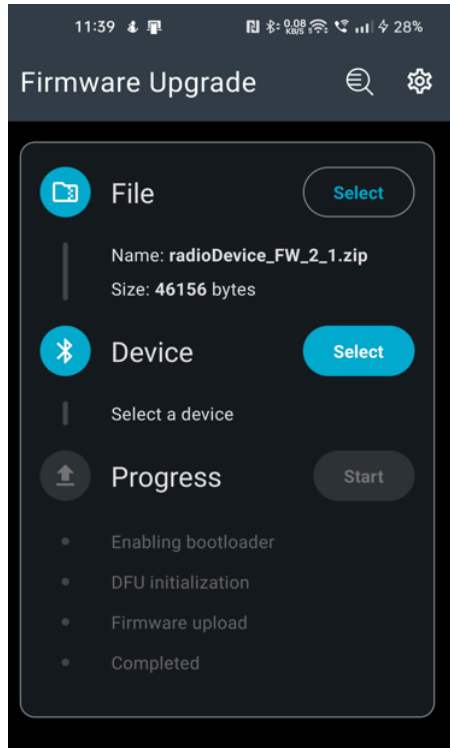
3. Download the firmware

Open the website <https://www.ecumaster.com/products/wheel-panel/> on your mobile phone.

Download the .zip file. It's location will be important in the next step.

4. Select the file

In the nRF Device Firmware Update application, select the appropriate .zip file:



5. Enter bootloader mode

Before updating your Wireless Racing Kit firmware via smartphone, the device must enter bootloader mode. To enter it, hold the outer 4 buttons (marked on the picture below) for 5 seconds.



To **confirm successful entry**, check the **Panel state** channel within the Light Client application.

Others	
Receiver state	Active
Panel state	Bootloader
Diagnostics	
Panel radio FW	2.0
Receiver radio FW	2.0

**Note:**

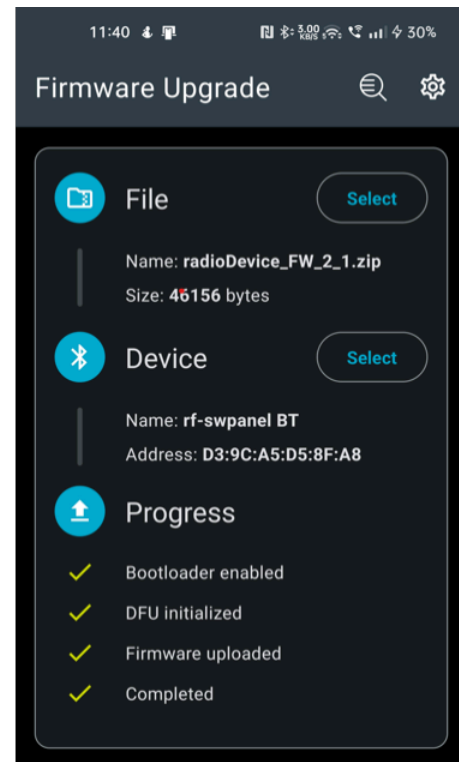
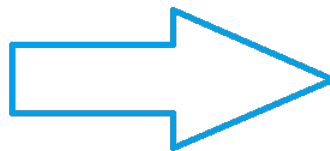
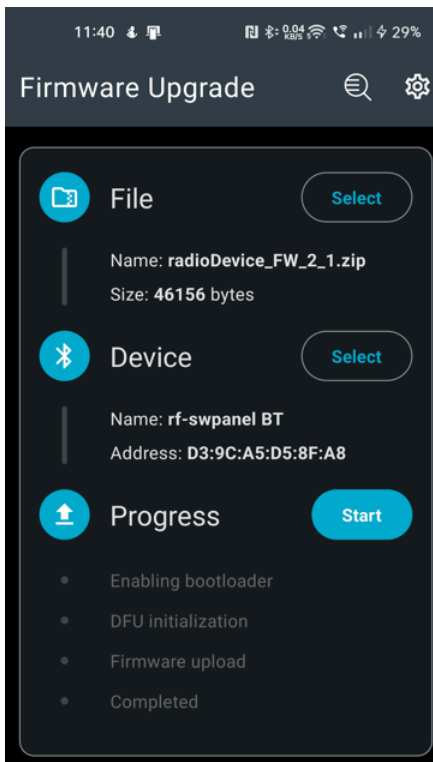
Bootloader mode on your Wireless Racing Kit is active for only 2 minutes. To ensure successful firmware update, initiate the process on your smartphone immediately after entering bootloader mode. Accidental entries pose no risk, as the mode automatically times out after 2 minutes. Please note that during bootloader mode, Wireless Racing Kit signal transmission to the CAN bus is suspended. This is normal behavior and will resume after the update or timeout.

6. Select the device

In the nRF Device Firmware Update application, select the appropriate device. The name of the Wireless Receiver is "rf-swpanel BT".

7. Start the upgrade

Within the nRF Device Firmware Update application, locate and press the "Start" button. This action initiates the transfer and installation of the new firmware onto your Wireless Racing Panel Kit.



Confirmation of the successful upgrade procedure will be the information about the firmware version in the Channels window *Receiver radio FW* of the Light Client and the change of the **Receiver State** parameter from **Bootloader** to **Active**. The CAN diagnostic frame must be enabled to see the *Panel radio FW* channel.

Others		
Receiver state		Active
Panel state		Idle
Diagnostics		
Panel radio FW		2.1
Receiver radio FW		2.0

5.2. Power level

Initially, the Wireless Racing Kit transmits at its highest power level (Lvl 7, 4 dBm). At this power level, the range in line of sight can be up to 100 meters. However, you can adjust this power level to optimize between battery life and effective radio range.

Lowering the power **increases battery life but reduces range** (down to approximately 1 meter, placement dependent).

To change the transmit power of the Wireless Racing Kit:

Set the desired power level using the rotary switch highlighted in **yellow**, where 1 is the lowest transmit power, 7 is the highest power. Position 8 is also treated as the highest power.



When the rotary switch indicates the desired power level, confirm the change by pressing the 4 buttons highlighted in **blue** for a **minimum of 3 seconds**. Confirmation of the power change will be reflected in the **Tx power lvl** channel in the channels window of the Light Client. An example of changing the power from the highest to the lowest is shown in the image below:

Radio signal			➔	Radio signal		
Rx signal lvl	-40	dBm		Rx signal lvl	-59	dBm
Tx power lvl	Lvl 7: 4	dBm	Tx power lvl	Lvl 1: -20	dBm	

**Warning:**

If the set transmit power is too low, data from the Wireless Racing Kit may not be transmitted to the Wireless Receiver, the power level in the Light Client will not be updated.

6. Communication details

The Wireless Racing Kit prioritizes battery life by transmitting signals to the Wireless Receiver **only when its state changes** (e.g., turning a rotary switch or pressing a button). This **eliminates redundant updates** and preserves battery power. However, it's essential to remember that if the Wireless Receiver misses a signal due to weak reception or insufficient power, the **panel's state won't be automatically refreshed on the CAN bus**. Therefore, **selecting the appropriate signal power level** based on the intended distance and placement of the Wireless Receiver is crucial for ensuring reliable communication and control.

With multiple Wireless Racing Kits connected to a single Wireless Receiver, a key aspect to understand is **transmission priority**. When a state change occurs on any panel, **only the state of the most recently changed panel is transmitted on the CAN bus**.

Example:

Imagine a two-driver endurance race, each with their own Wireless Racing Kit.

Driver 1 makes adjustments to their panel, and the updated state gets transmitted to the Wireless Receiver and subsequently the CAN bus.

Now, Driver 2 enters the car with their panel. **Crucially, until Driver 2 takes any action (even a simple button press), the CAN bus will continue transmitting the previous driver's settings**, potentially causing unexpected behavior if not aware of this prioritization system.

7. Troubleshooting

Wireless Receiver not visible in Light Client application

- Check if the Wireless Receiver has green LED continuously glowing, indicating it's receiving power
- Double-check that the wiring is connected correctly:
 - **Pin 2:** CAN High
 - **Pin 3:** CAN Low
- Ensure secure and firm connections with no loose wires or damage

- Verify that the Wireless Receiver's Base ID (0x640) is not already used by another device on the CAN bus. Conflicting IDs can impede communication.
- Ensure you have downloaded and installed the latest version of the Light Client application

Pairing unsuccessful

- Check if the Wireless Receiver has green LED continuously glowing, indicating it's receiving power.
- Confirm that Wireless Racing Kit is powered. Please note it comes without the battery. For details, see [Pairing Wireless Racing Kit with the Wireless Receiver \(on page 12\)](#).
- Bring the Kit and Wireless Receiver **within 10 cm (4 in)** of each other, ensuring a **clear line of sight** with no objects obstructing the antenna.
- In Light Client application, check if the **Allow pairing** option is set to "Yes"
- Locate the **two buttons on the Kit's right side - top and bottom. Hold both buttons simultaneously for at least 3 seconds** until you see a blinking "Status" light on the Wireless Receiver

Wireless Racing Kit upgrade unsuccessful

1. Device not found in **nRF Device Firmware Update** application
 - Confirm that Wireless Racing Kit is powered. For details, see [Pairing Wireless Racing Kit with the Wireless Receiver \(on page 12\)](#).
 - Enter the bootloader by holding the outer 4 buttons for 5 seconds. Check if the Wireless Racing Kit entered the bootloader in the Light Client application.
 - The bootloader is only active for two minutes, after that time the device will not be visible via the Bluetooth communication.
2. Failed firmware upload
 - The bootloader is only active for two minutes, the "Start" button has to be pressed within that time.
 - Check if the proper firmware file was selected. **Wireless Racing Kit and Wireless Receiver have different firmware files.**
 - If firmware upgrade stops, it's likely due to power loss or Bluetooth signal. Restart your device, ensure stable power/connection, and retry the upgrade.

Wireless Receiver RF module upgrade unsuccessful

1. Device not found in **nRF Device Firmware Update** application
 - Check if the Wireless Receiver has green LED continuously glowing, indicating it's receiving power.

- Enter the bootloader through the Light Client application. See [Wireless Receiver - enter bootloader \(on page 19\)](#) or details.
- The bootloader is only active for two minutes, after that time the device will not be visible via the Bluetooth communication.

2. Failed firmware upload

- The bootloader is only active for two minutes, the "Start" button has to be pressed within that time.
- Check if the proper firmware file was selected. **Wireless Racing Kit and Wireless Receiver have different firmware files.**
- If firmware upgrade stops, it's likely due to power loss or Bluetooth signal. Restart your device, ensure stable power/connection, and retry the upgrade.

Wireless Receiver malfunctioning after upgrade

- Your Wireless Receiver consists of two separate modules: a CAN module and an RF module. Each part requires a separate firmware upgrade process. However, **it's crucial to maintain compatibility between the two modules' versions.** Inconsistency can lead to communication issues affecting your Wireless Receiver's performance.

Wireless Racing Kit power level not changing in Light Client application

- If the set transmit power is too low for given distance and Wireless Receiver placement, data from the Wireless Racing Kit may not be transmitted to the Wireless Receiver and the power level in the Light Client will not be updated.

Wireless Racing Kit rotary switches and button states not displaying correct values in the Light Client application

- Check if the Wireless Racing Kit is paired with the Wireless Receiver. For details, see [Pairing Wireless Racing Kit with the Wireless Receiver \(on page 12\)](#).
- Confirm that Wireless Racing Kit is powered. For details, see [Pairing Wireless Racing Kit with the Wireless Receiver \(on page 12\)](#).
- If the set transmit power is too low for given distance and Wireless Receiver placement, data from the Wireless Racing Kit may not be transmitted to the Wireless Receiver. Try bringing the Wireless Receiver closer to the Wireless Racing Kit or increasing the signal power. For details, see [Power level \(on page 25\)](#).

8. CAN Stream



Byte	Bit	Channel	Data Type	Range	Multiplier/ Divider	Factor	Offset	Unit
CAN out ID+0 (default: 0x640)								
0..1		Analog 1	16-bit U	0 – 65535	1/1	1	0	mV
2..3		Analog 2	16-bit U	0 – 65535	1/1	1	0	mV
4..5		Analog 3	16-bit U	0 – 65535	1/1	1	0	mV
6..7		Analog 4	16-bit U	0 – 65535	1/1	1	0	mV
CAN out ID+1 (default: 0x641)								
0..1		Battery voltage	16-bit U	0.000 – 65.535	1/1000	0.001	0	V
2	5 (0xE0)	Receiver state ²	3-bit U	enumeration	1/1	1	0	
	2 (0x1C)	Tx power lvl ¹	3-bit U	enumeration	1/1	1	0	dBm
2..3	0 (0x03FF)	A	10-bit U	0 – 1023	1/1	1	0	
4	6 (0xC0)	Panel state ³	2-bit U	enumeration	1/1	1	0	
4..5	0 (0x3FFF)	B	14-bit U	0 – 16383	1/1	1	0	
6..7		C	16-bit U	0 – 65535	1/1	1	0	
CAN out ID+2 (default: 0x642)								
0	4 (0xF0)	Rotary 1	4-bit U	0 – 15	1/1	1	0	

Byte	Bit	Channel	Data Type	Range	Multiplier/Divider	Factor	Offset	Unit
	0 (0x0F)	Rotary 2	4-bit U	0 – 15	1/1	1	0	
1	4 (0xF0)	Rotary 3	4-bit U	0 – 15	1/1	1	0	
	0 (0x0F)	Rotary 4	4-bit U	0 – 15	1/1	1	0	
2		Battery level	8-bit U	0 – 255	1/1	1	0	%
3		Rx signal lvl	8-bit S	-128 – 127	1/1	1	0	dBm
4	7 (0x80)	Switch 8	1-bit	0 – 1	1/1	1	0	
	6 (0x40)	Switch 7	1-bit	0 – 1	1/1	1	0	
	5 (0x20)	Switch 6	1-bit	0 – 1	1/1	1	0	
	4 (0x10)	Switch 5	1-bit	0 – 1	1/1	1	0	
	3 (0x08)	Switch 4	1-bit	0 – 1	1/1	1	0	
	2 (0x04)	Switch 3	1-bit	0 – 1	1/1	1	0	
	1 (0x02)	Switch 2	1-bit	0 – 1	1/1	1	0	
	0 (0x01)	Switch 1	1-bit	0 – 1	1/1	1	0	
5	5 (0x20)	Paddle shift 2 (Left)	1-bit	0 – 1	1/1	1	0	
	4 (0x10)	Paddle shift 1 (Right)	1-bit	0 – 1	1/1	1	0	
CAN diag out ID+0 (default: 0x6A5)								
0..1		Panel radio FW	16-bit U	0.0 – 6553.5	1/10	0.1	0	
2..3		Receiver radio FW	16-bit U	0.0 – 6553.5	1/10	0.1	0	

¹ Values for channel: **Tx power lvl**

Value	Description
0	Not available
1	Lvl 1: -20
2	Lvl 2: -16
3	Lvl 3: -12
4	Lvl 4: -8
5	Lvl 5: -4

Value	Description
6	Lvl 6: 0
7	Lvl 7: 4

² Values for channel: **Receiver state**

Value	Description
0	Active
1	Bootloader
2	Error

³ Values for channel: **Panel state**

Value	Description
0	Idle
1	Active
2	Bootloader

9. Document history

Version	Date	Changes
1.0	2024.03.27	Initial release
1.1	2024.05.08	Name changed to Wireless Racing Kit and Wireless Receiver
1.2	2024.06.12	Improved <i>R#</i> : <i>offset</i> parameter description