



USER MANUAL

RF Steering Wheel Panel

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1. Device description

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

1.1. RF Steering Wheel Panel description

Made from lightweight carbon fiber for durability and style, this RF Steering Wheel Panel offers a convenient and cable-free way to control your car's features. It easily mounts to racing steering wheels with 6x70 mm bolt pattern and connects wirelessly to the RF Receiver, eliminating the unnecessary wires. The panel features 8 customizable buttons and 4 rotary switches, allowing you to use them for your preferred functions. Included stickers help you mark each button for quick identification. For even more control, two dedicated connectors enable the addition of paddle shifters (not included).



The RF Steering Wheel Panel integrates with other CAN-bus devices. This ensures enhanced connectivity and coordination between different components of the vehicle's control system.

The CR2450 battery of the RF Steering Wheel Panel, tested for durability, demonstrates efficient power consumption by withstanding over 1.5 million button presses at room temperature. Battery level is transmitted over the CAN-bus, providing real-time information.

1.2. RF Receiver description

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



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

Red LED: Blinks indicating low RF Steering Wheel Panel battery (approximately 20%). Change the battery as soon as possible.

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

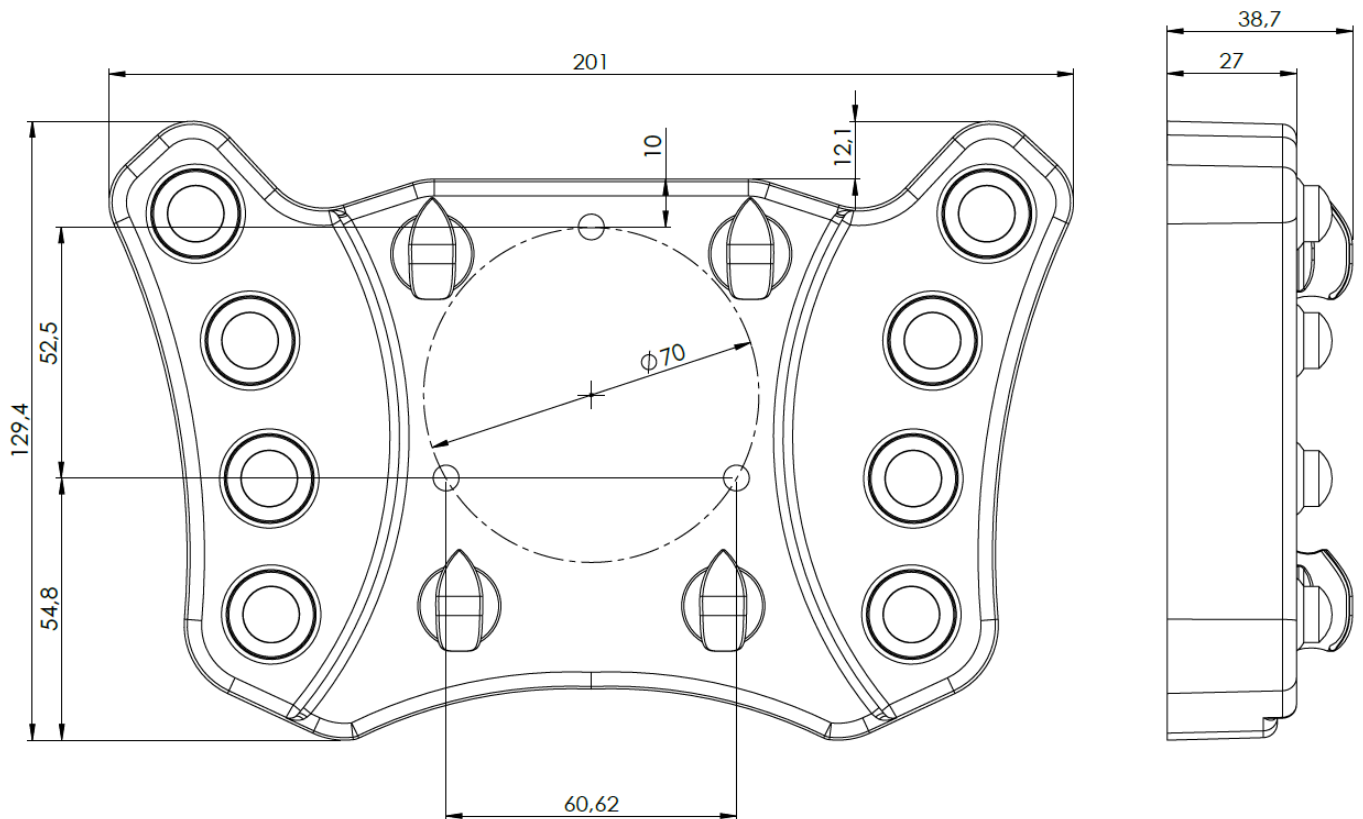
2. Specification

2.1. RF Steering Wheel Panel specification

Specification	
Temperature range	AECQ GRADE3 (-40°C to +85°C)
Battery type	CR2450 (included)
Wireless communication	Radio Frequency
Frequency range	2360 MHz to 2500 MHz
Estimated battery life	5 years at rest at room temperature or 1,500,000 switches

Weight	270 g
Dimensions	200 x 130 x 40 mm
Mounting mechanism	3 standard steering wheel bolts
Steering Wheel Bolt Pattern	6 x 70 mm
Material	Carbon, with plastic back plate
Latency	Below 20 ms
Buttons	8 with customizable functions
Rotary switches	4 with eight positions and customizable functions
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

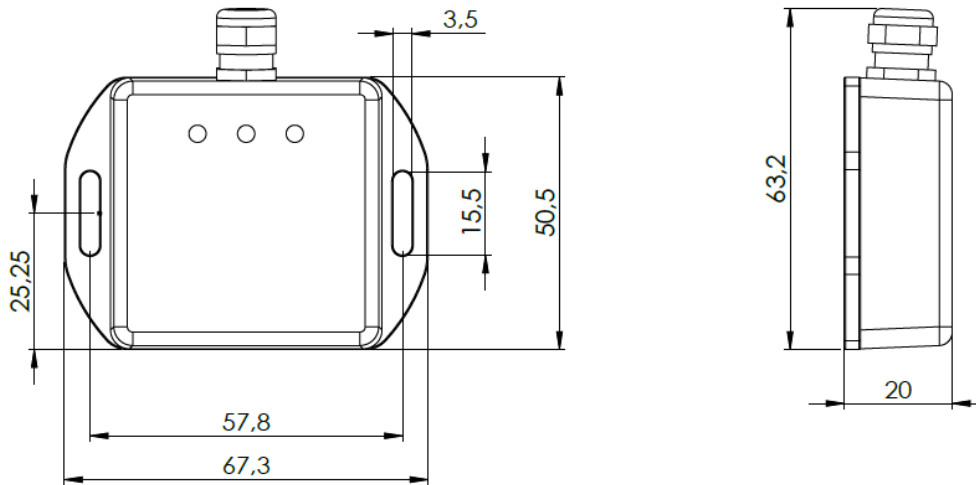
All dimensions in mm



2.2. RF 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 RF Steering Wheel Panels	Up to 8

All dimensions in mm



2.3. RF Receiver pinout



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

2.4. Included in set

The set includes:

1. RF Steering Wheel Panel
2. RF Receiver
3. Battery: CR2450
4. Receiver connector (Deutsch DTM04-4P) with terminals
5. Paddle shift connector (ZHR-2) with terminals (SZH-002T-P0.5)
6. Stick-on labels
7. Mounting bolts with different lengths: 3x30, 3x55, 3x65mm
8. Mounting screws: 3xM3

3. Installation

3.1. RF Receiver installation

Placement:

- **Surface:** Mount the RF 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 RF Receiver.
- **Surroundings:** Avoid placing any metal (or conductive) objects between the RF Receiver and the RF Panel's antenna. This can significantly weaken the signal strength and negatively impact communication range and performance.



Attention:

We discourage placing the RF 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 RF 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 RF 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.

3.2. Pairing RF Steering Wheel Panel with the RF Receiver

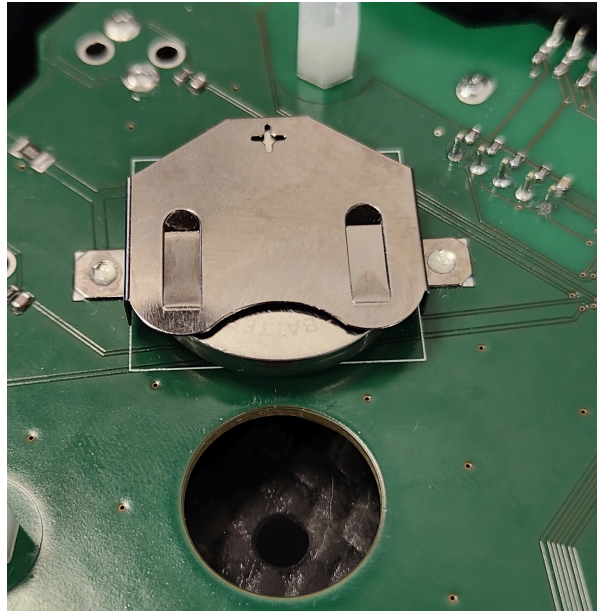
Pairing between the RF Steering Wheel Panel and RF Receiver is required before the first use and after every battery replacement. Please follow these steps for a smooth connection:

**Warning:**

RF Steering Wheel Panel 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:

- Unscrew the 4 bolts holding the back plate - 2 mm Allen (hex).
- Remove the back plate.
- Insert CR2450 battery into the panel as per the provided picture.
- Reposition the back plate onto the panel.
- Securely tighten the 4 bolts you removed earlier.
- Make sure to power on the RF Receiver. For detailed information, see chapter "[RF Receiver installation \(on page 7\)](#)".



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 RF Receiver's LED indication. For detailed information, see chapter "[Using Light Client \(on page 12\)](#)".

3. Establish Proximity:

Position the RF Steering Wheel Panel within 10 centimeters (4 inches) of the RF 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 RF Receiver's "status" LED:

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

Unpairing the RF Steering Wheel Panel

If you need to unpair the RF Steering Wheel Panel from its current RF Receiver to connect it to a different one, follow these steps:

1. Unscrew the 4 bolts holding the back plate - 2 mm Allen (hex).
2. Remove the back plate.
3. Remove the battery from the RF Steering Wheel Panel.
4. Wait for a few seconds.
5. Reinsert the battery into the RF Steering Wheel Panel.
6. Reposition the back plate onto the panel.
7. Securely tighten the 4 bolts you removed earlier.

3.3. RF Steering Wheel Panel installation

**Note:**

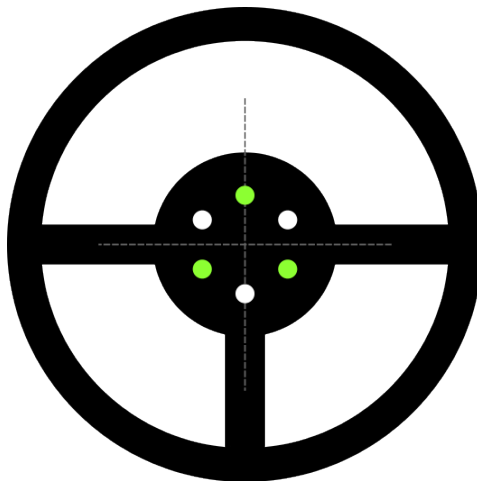
Before you mount your RF Steering Wheel Panel, pair it with the RF Receiver.

Before starting:

- **Safety first:** Always ensure your vehicle is parked safely and the ignition is off before beginning any modifications.
- **Compatibility check:** Verify your steering wheel hub utilizes the **6x70 mounting system**.

Steps:

1. **Identify top hub bolt:** Locate the top bolt securing your steering wheel to the hub. This will serve as your reference point. It has to be centered.
2. **Remove alternate bolts:** Starting from the top hub bolt, **unbolt every second bolt**, leaving three total removed.
3. **Install new bolts:** Replace the removed bolts with the **provided bolts of equal length**. Choose the appropriate length based on your steering wheel's geometry, opting for shorter bolts for flatter wheels.
4. **Mount panel:** Align the RF Steering Wheel Panel with the new bolts and carefully mount it onto the hub.
5. **Secure panel:** Using the provided **silver bolts**, gradually tighten them one at a time, starting from the top and working your way around in a circular pattern. This ensures even pressure and prevents warping the panel.



4. RF Receiver configuration and upgrade

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

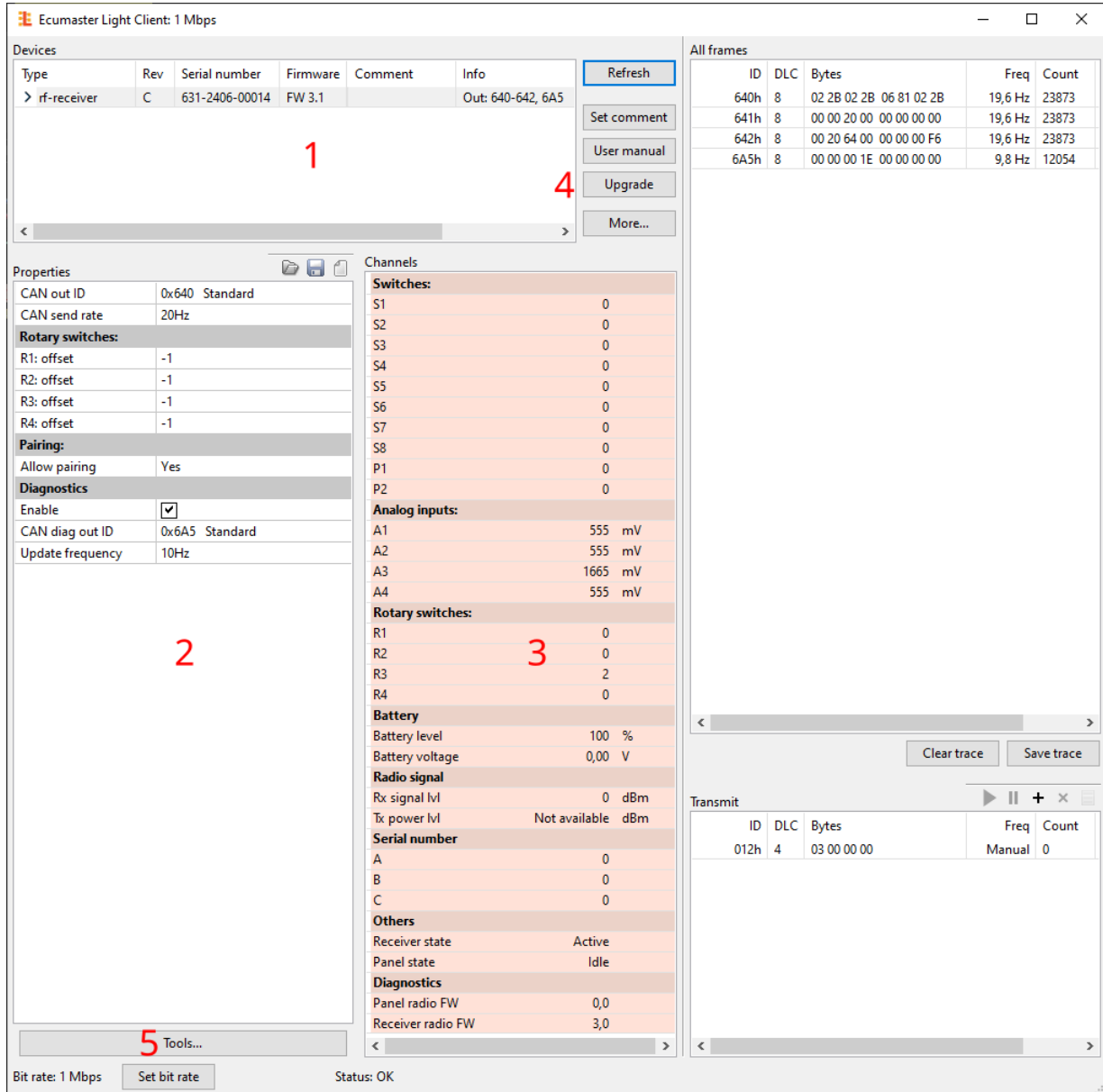
- Ecumaster USBtoCAN: <http://www.ecumaster.com/products/usb-to-can/>
- Peak Systems PCAN-USB and PCAN-LAN: <http://www.peak-system.com>
- Kvaser USBcan: <http://www.kvaser.com>

Use the Ecumaster Light Client to view real-time data from your RF Receiver, including the current RF Steering Wheel Panel state. You can also configure key settings like CAN send rate and CAN ID to fine-tune the RF Receiver's behavior to your setup. Additionally, Light Client is used to update the RF 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 RF Receiver comes configured with a default CAN speed of 500 kbps.

Once you've successfully connected the Ecumaster Light Client application to your RF 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 RF Receiver, double-click its entry in the "Devices" section.

2. Properties

The following table provides descriptions for all adjustable parameters of your RF 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	The offset for rotary switch position
Allow pairing	Indicates whether the RF Receiver allows pairing with a RF Steering Wheel Panel. 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 RF Receiver and connected RF Steering Wheel Panel(s) Think of it as a central dashboard for monitoring key parameters.

Parameter	Description
S1-S8	The status of RF Steering Wheel Panel switches: 0 - button not pressed, 1 - button pressed
P1-P2	The status of RF Steering Wheel Panel 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.
Battery level	Estimated battery level of the RF Steering Wheel Panel (0-100%).
Battery voltage	Measured voltage of the RF Steering Wheel Panel battery (in V). The value is 0 when the RF Steering Wheel Panel has not communicated

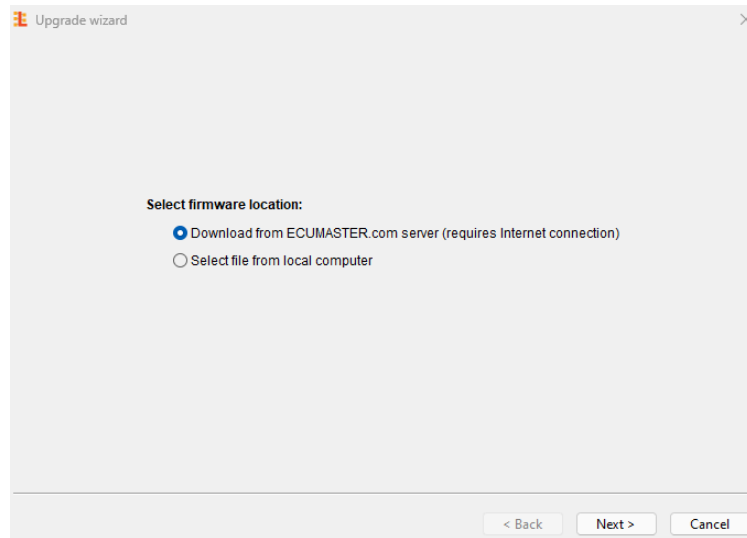
Parameter	Description
	with the RF Receiver yet. After pressing a button on the paired RF Steering Wheel Panel, the voltage value will be updated.
Rx signal lvl	Received radio signal strength from (in dBm) the RF Steering Wheel Panel measured by the RF Receiver.
Tx power lvl	Transmit power set in the RF Steering Wheel Panel. 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 RF Steering Wheel Panel has not sent any data to the RF Receiver yet. After pressing a button on the paired Panel, the value will be updated.
A, B, C	Serial number of the RF Steering Wheel Panel 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 RF Receiver status: Active - the radio part of the RF Receiver is working correctly, Bootloader - the radio part of the RF Receiver is in bootloader mode, Error - no communication with the radio part of the RF Receiver.
Panel state	RF Steering Wheel Panel status: Idle - the RF Steering Wheel Panel is in a sleep state, Active - the RF Steering Wheel Panel is active, Bootloader - the RF Steering Wheel Panel is in bootloader mode.
Panel radio FW	RF Steering Wheel Panel firmware version. Value is 0.0 when the RF Steering Wheel Panel has not communicated with the RF Receiver yet. Symbol '?' indicates the diagnostic frame not being transmitted.
Receiver radio FW	Firmware version of the radio part of the RF 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 [RF Receiver upgrade \(on page 15\)](#).

5. Tools button

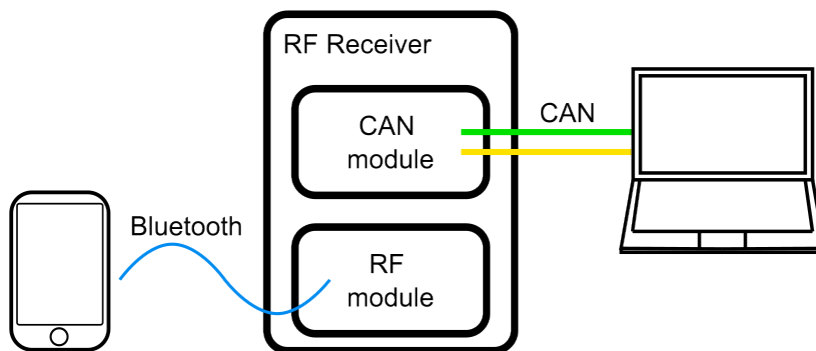
This button is used to enter the bootloader mode, necessary for an update. The upgrade process is described in chapter [RF Receiver upgrade \(on page 15\)](#).



4.2. RF Receiver upgrade

Your RF 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 RF Receiver's performance.

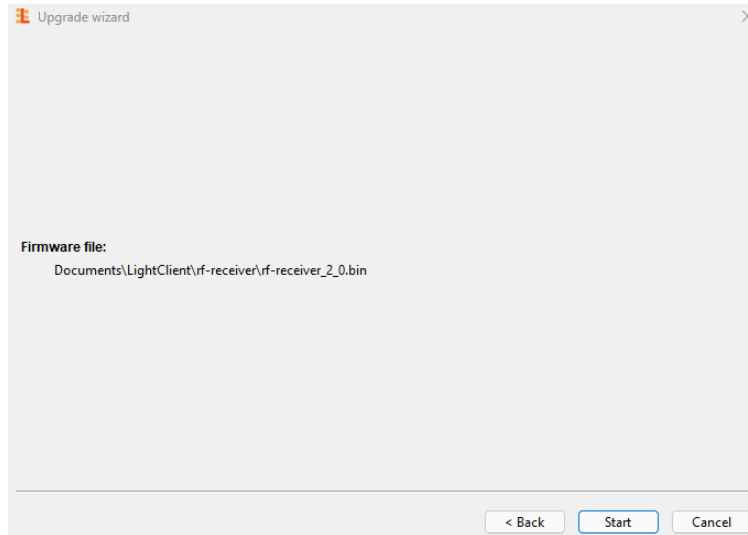
Both the RF and CAN modules display their firmware versions in the format "X.Y," where X represents the major version and Y the minor version. **For optimal functionality, ensure both modules share the same major version (X).**



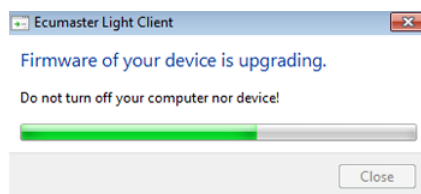
4.2.1. CAN module upgrade

To upgrade the CAN module, use the Light Client application. The detailed description of the application was supplied in the chapter [Using Light Client \(on page 12\)](#). 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 RF 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>

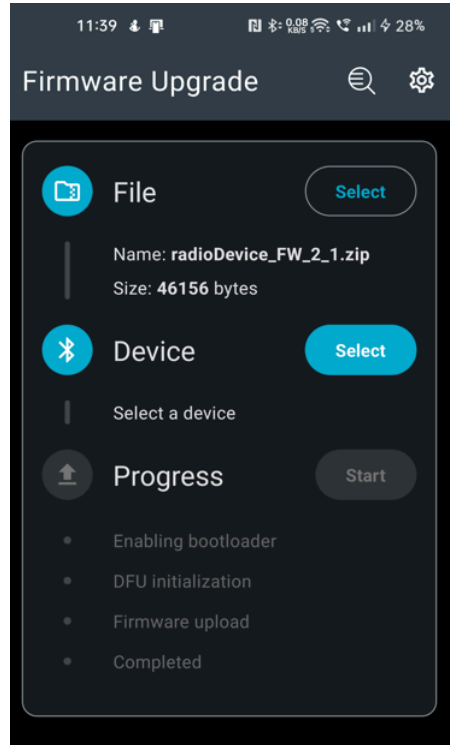
2. Enable Bluetooth on your phone

3. Download the firmware

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

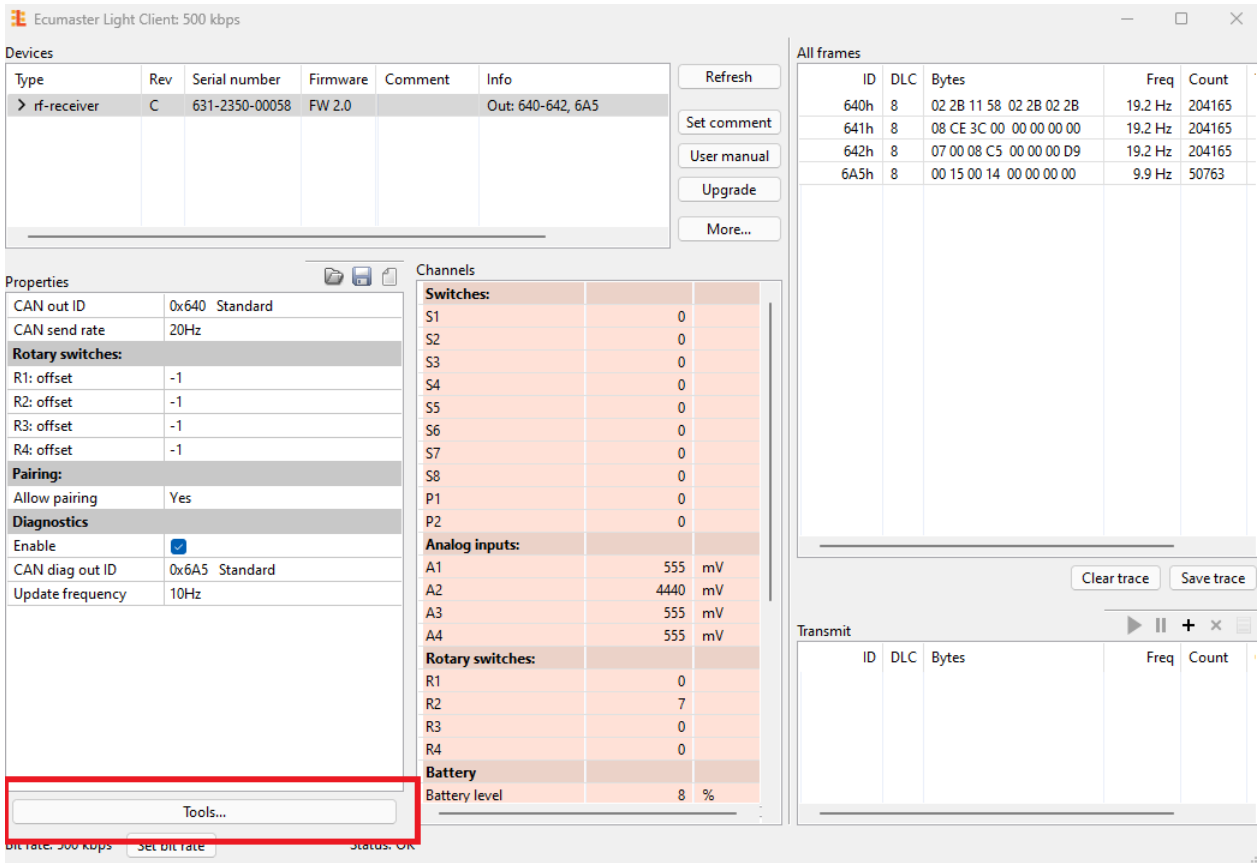
4. Select the file

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



5. Enter bootloader mode

Before updating your RF 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 RF 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:

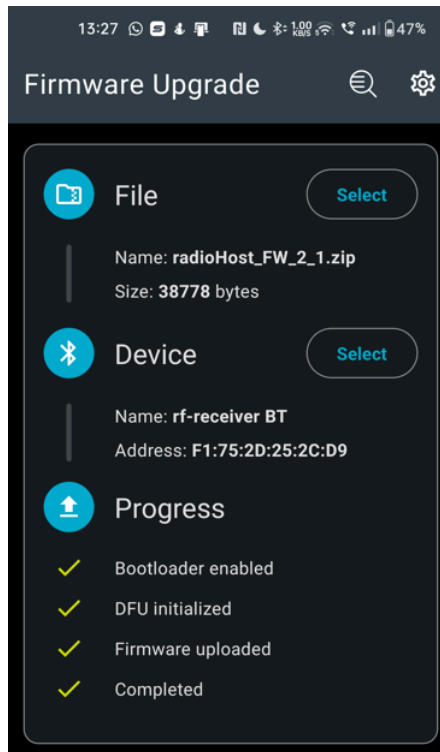
Bootloader mode on your RF Receiver is active for only 2 minutes. To ensure successful firmware update, initiate the process on your smartphone immediately after entering bootloader mode. Accidental entries pose no risk, as the mode automatically times out after 2 minutes. Please note that during bootloader mode, RF Steering Wheel Panel 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 RF 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 RF 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. RF Steering Wheel Panel configuration and upgrade

5.1. RF Steering Wheel Panel upgrade

**Note:**

This process is similar to the RF Receiver upgrade, detailed in chapter [RF module upgrade \(on page 16\)](#). However, bootloader entry differs significantly here.

To upgrade the RF Steering Wheel Panel, 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>

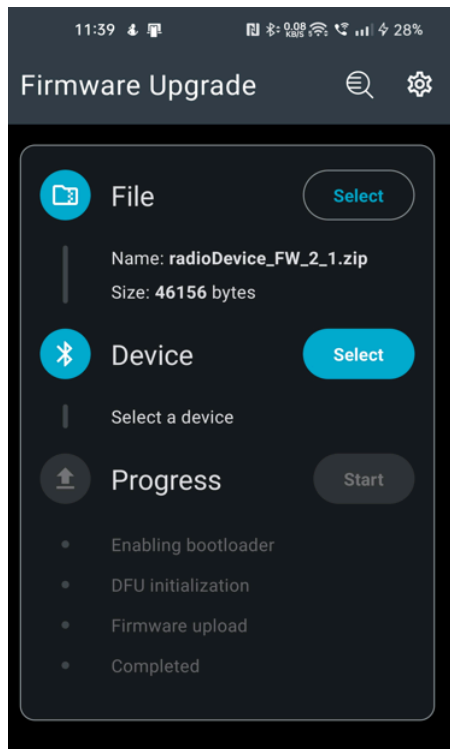
2. Enable Bluetooth on your phone

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 RF Steering Wheel Panel 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:**

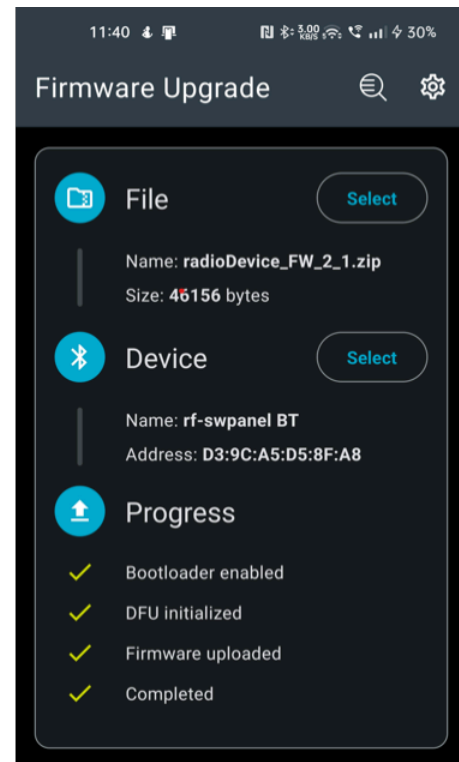
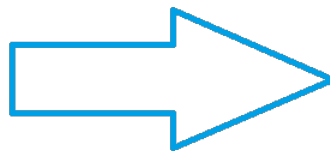
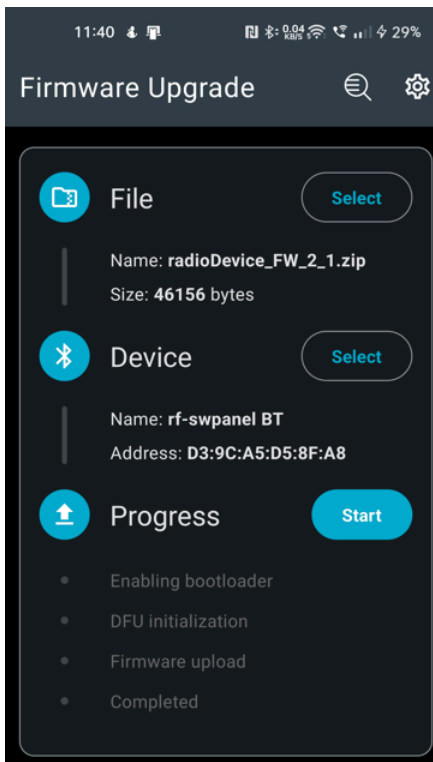
Bootloader mode on your RF Steering Wheel Panel is active for only 2 minutes. To ensure successful firmware update, initiate the process on your smartphone immediately after entering bootloader mode. Accidental entries pose no risk, as the mode automatically times out after 2 minutes. Please note that during bootloader mode, RF Steering Wheel Panel 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 RF 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 RF Steering Wheel Panel.



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 RF Steering Wheel Panel 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 RF Steering Wheel Panel:

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 RF Steering Wheel Panel may not be transmitted to the RF Receiver, the power level in the Light Client will not be updated.

6. Communication details

The RF Steering Wheel Panel prioritizes battery life by transmitting signals to the RF 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 RF 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 RF Receiver is crucial for ensuring reliable communication and control.

With multiple RF Steering Wheel Panels connected to a single RF 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 RF Steering Wheel Panel.

Driver 1 makes adjustments to their panel, and the updated state gets transmitted to the RF 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

RF Receiver not visible in Light Client application

- Check if the RF 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 RF 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 RF Receiver has green LED continuously glowing, indicating it's receiving power.
- Confirm that RF Steering Wheel Panel is powered. Please note it comes without the battery. For details, see [Pairing RF Steering Wheel Panel with the RF Receiver \(on page 8\)](#).
- Bring the Panel and RF 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 Panel's right side - top and bottom. Hold both buttons simultaneously for at least 3 seconds** until you see a blinking "Status" light on the RF Receiver

RF Steering Wheel Panel upgrade unsuccessful

1. Device not found in **nRF Device Firmware Update** application
 - Confirm that RF Steering Wheel Panel is powered. For details, see [Pairing RF Steering Wheel Panel with the RF Receiver \(on page 8\)](#).
 - Enter the bootloader by holding the outer 4 buttons for 5 seconds. Check if the RF Steering Wheel Panel 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. **RF Steering Wheel Panel and RF 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.

RF Receiver RF module upgrade unsuccessful

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

- Enter the bootloader through the Light Client application. See [RF Receiver - enter bootloader \(on page 17\)](#) for 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. **RF Steering Wheel Panel and RF 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.

RF Receiver malfunctioning after upgrade

- Your RF 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 RF Receiver's performance.

RF Steering Wheel Panel power level not changing in Light Client application

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

RF Steering Wheel Panel rotary switches and button states not displaying correct values in the Light Client application

- Check if the RF Steering Wheel Panel is paired with the RF Receiver. For details, see [Pairing RF Steering Wheel Panel with the RF Receiver \(on page 8\)](#).
- Confirm that RF Steering Wheel Panel is powered. For details, see [Pairing RF Steering Wheel Panel with the RF Receiver \(on page 8\)](#).
- If the set transmit power is too low for given distance and RF Receiver placement, data from the RF Steering Wheel Panel may not be transmitted to the RF Receiver. Try bringing the RF Receiver closer to the RF Steering Wheel Panel or increasing the signal power. For details, see [Power level \(on page 23\)](#).

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