

BARBIERI GROUP
MADE IN ITALY

BHV
Barbieri Hybrid Vehicle

GPS/RTK
GPS COMPASS SERVO DRIVE



XROT EVO - XFLAIL EVO - XCROSS - eROT EVO

Operator's Manual

GPS/RTK
GPS COMPASS SERVO DRIVE

This is a translation of the original version written in english

ENGLISH

BHV
Barbieri Hybrid Vehicle

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BARBIERI SRL – Power Product

Registered office: 00144 ROMA (RM) - PIAZZALE LUIGI STURZO N. 15
Production site & Factory: Via Seccalegno. 23 - 36040 SOSSANO (VI) Italy
Tel. +39 0444 885722

www.barbieri-group.com [mail info@barbieri-fb.com](mailto:info@barbieri-fb.com)

Parts code: OM - 6206 - 1 - V0 - IT
Publishing date: 12 January 2026
Printed in Italy

PART 1 - GPS Servo Drive Compass Manual

- **Introduction**
- **1.1 Initial Setup - Compass Servo Drive**
- **1.2 How to Operate the Remote Control**
 - o 1.2.1 LED and Labels
 - o 1.2.2 Control Buttons
- **1.3 Planning Your Work**
 - o 1.3.1 Cutting Width
 - o 1.3.2 Direction of Manoeuvre
 - o 1.3.3 Cutting Speed
- **1.4 Working Modes**
 - o 1.4.1 Mode 1 - Straight Line
 - o 1.4.2 Mode 2 - Curved Line
 - o 1.4.3 Mode 3 - Closed Line (Perimeter)
 - o 1.4.4 Mode 4 - Custom Path (RTK required)

PART 2 - BHV Web App

- **Introduction**
- **2.1 Connecting to the Web App**
- **2.2 Web App Menu Overview**
 - o 2DView
 - o Map
 - o Configuration
- **2.3 Advanced Properties**
 - o Vehicle Model
 - o Country
 - o Antenna Default Setup Mode
 - o Center Universe
 - o Software Update
- **2.4 Routes Management**

PART 3 - RTK Antenna

- **Introduction**
- **3.1 Antenna Installation and placement**
- **3.2 Antenna Activation**
- **3.3 Active and Passive Modes (Multi-Vehicle Setup)**
- **3.4 Antenna Initialization and Signal Status**
- **3.5 Recorded Path Association**
- **3.6 Managing Multiple Antennas**
- **3.7 Antenna Manager Application**

PART 1 - GPS Servo Drive Compass Manual

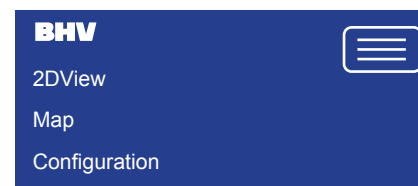
The GPS Servo Drive system significantly enhances the drivability, precision, and efficiency of the machine. By enabling autonomous operation through four configurable driving modes, the system reduces the need for constant manual control.

Important: Although the machine can operate autonomously, the operator must always remain present in the working area and monitor the machine continuously to ensure safe operation.

1.1 Initial Setup - Compass Servo Drive

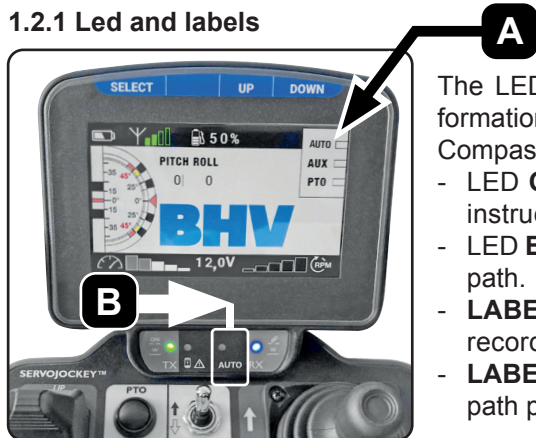
Follow the steps below to perform the first setup of the GPS Compass Servo Drive system:

1. Install the Compass Servo Drive kit on the machine, following the instructions provided in At-tachment A.
2. Power on the machine and connect the Remote Control.
3. From your WiFi-enabled device, connect to the machines WiFi network using the password: **12345678**.
4. Open a web browser and navigate to: <http://192.168.4.1:5000>.
5. Click on the menu icon (three horizontal lines) in the top right corner, then select Configu-ration.
6. Scroll to the bottom of the menu and select Advanced Properties.
7. Click on Center Universe (this step is required only during the first setup).
8. Select the country where the machine is operating.
9. Choose the correct machine model from the Vehicle Model section.
10. The machine will reboot automatically (this may take up to 60 seconds).
11. Once rebooted, the machine is ready to operate with the Compass Servo Drive system.



1.2. How to operate the remote control

1.2.1 Led and labels



The LED '**AUTO**' on the remote control gives information about the status of the GPS Servo Drive Compass.

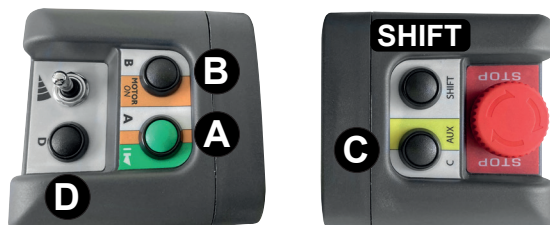
- LED **ON**: the machine is working with the GPS instructions or according to a saved path.
- LED **BLINKING**: The machine is recording a new path.
- LABEL '**A**' **BLINKING**: The machine is currently recording a work path.
- LABEL '**AUTO**' **APPEARS**: the machine is on a path previously saved.

The '**AUTO**' label appears in the **top-right** corner of the remote control screen, **above** '**AUX**', **only** when the machine is following a stored path.

1.2.2 Control Buttons

Essential Compass Servo Drive operations are handled through the **SHIFT**, **A**, **B**, **C**, and **D** buttons, located on both sides of the radio control.

Refer to the machine's main operational manual for detailed button positions and general control usage.



1.3 Planning your work

Before and during GPS-guided operation, you can configure the following parameters:

1.3.1 Cutting width

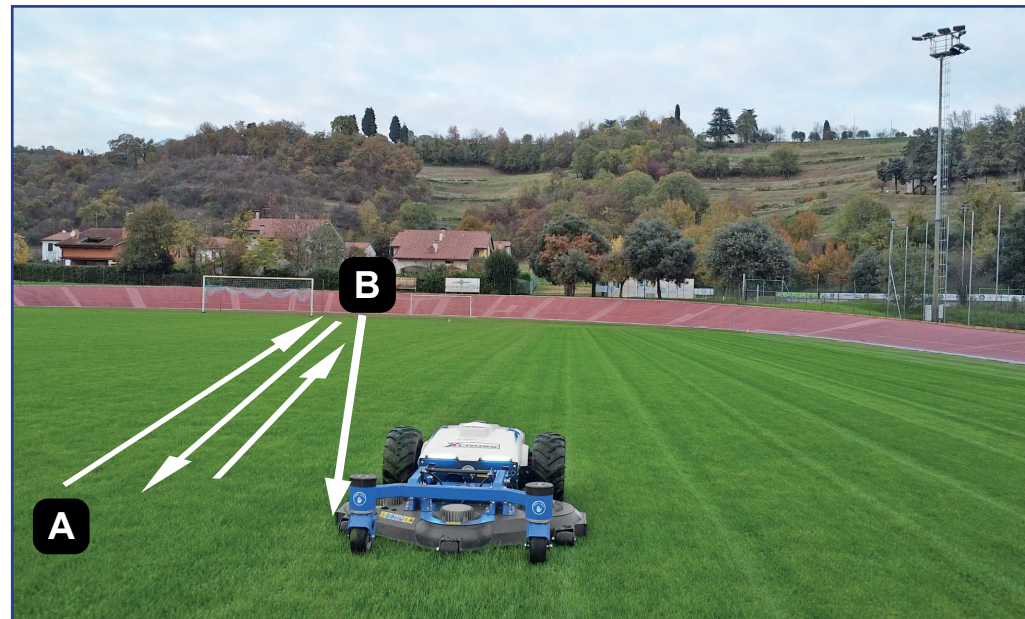
- Adjust via **SHIFT + Speed Lever** on the remote control (increases/decreases by 5 cm per press).
- You can also modify the width via the **Web App**.
- The new setting is automatically saved for future sessions.

Default Cutting Widths by Model:

- **XRot 70evo** - **XRot 80evo**: 75 cm - **XRot 95evo**: 90 cm
- **ERot 70**: 65 cm - **XCross**: 110-125-135 cm

1.3.2 Direction of Manoeuvre

To change the turning direction at the end of a line:



1. Press and hold **SHIFT**.
2. Move the **motion lever** in the desired direction (**left or right**).
3. The machine will continue recording and start working in the new direction.

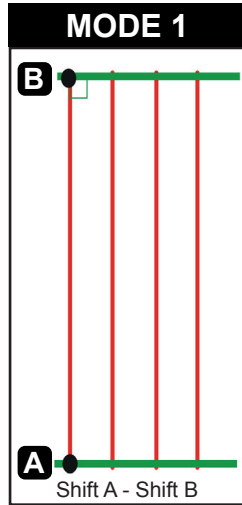
1.3.3 Cutting Speed

- Set using the **speed lever** on the **left side** of the remote control.
- The **maximum speed** is defined in the **Web App** (default limit: 6 km/h).

1.4 Working Modes

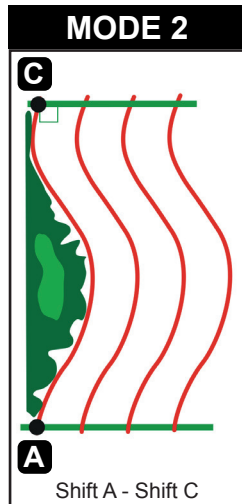
The machine can operate in four different GPS-assisted modes:

1.4.1 MODE 1 (STRAIGHT LINE)



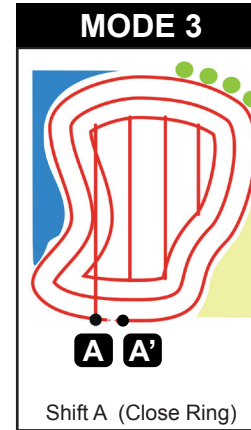
- Drive to **point A** (start of field).
- While stationary, press **SHIFT + A**.
- Move in a straight line toward **point B**. The **AUTO LED** starts blinking (path is being record-ed).
- At point B, press **SHIFT + B**. The LED stops blinking and the label '**AUTO**' appears.
- Reverse the machine by 1 meter.
- Press and hold **SHIFT for 3 seconds** to activate Compass Servo Drive.
- The **smart lamp** will blink lime, and the machine will begin repeating the A-B line, shifting right automatically.
- ✓ **To stop the machine**, simply move the **motion lever**.

1.4.2 MODE 2 (CURVED LINE)



- Start from point A, press **SHIFT + A** while stationary.
- Drive along a curved path (e.g., around an obstacle) toward point C.
- Press **SHIFT + C** to finish recording.
- Reverse 1 meter and press **SHIFT** for 3 seconds.
- The machine will now follow the curved path from A to C, shifting to the right automatically.
- ✓ **To stop the machine**, simply move the **motion lever**.

1.4.3 MODE 3 (CLOSED LINE - PERIMETER)



Ideal for **irregular or non-rectangular areas**.

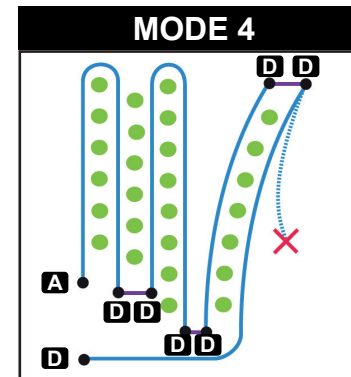
- From **point A**, press **SHIFT + A**.
- Drive around the entire **perimeter**, closing the loop back near point A. The **AUTO LED** blinks during recording.
- Once the perimeter is closed, wait up to 30 seconds. The label '**AUTO**' will appear.
- Press **SHIFT for 3 seconds** to start automatic operation.

- ✓ The machine will calculate the most efficient internal path-typically repeating perimeter passes, then moving into straight central lines. You can preview the planned path in the **Web App**.
- ✓ Remember to select the cutting width before mapping the area.



IMPORTANT: The three previous working modes can also be used without the RTK. However, in this configuration, the path cannot be saved in the WebApp, thus preventing its replication when the operator wishes to return to the same area. With the RTK, on the other hand, paths for all modes can be stored in memory and therefore replicated without the need to retrace the route.

1.4.4. MODE 4 (CUSTOM PATH) - ONLY AVAILABLE FOR MACHINE EQUIPPED WITH RTK ANTENNA



Shift A-Shift D (Shift C to cancel last wrong path)

Use this mode for specialized applications such as **vineyard row mowing**:

- At **point A**, press **SHIFT + A** to begin recording.
- Drive along the first row, **exiting 1.5 m past the last obstacle**, then press **SHIFT + D**.
- Move to the start of the **next row**, at **least 1.5 m from the edge**, and aim the machine straight.
- Press **SHIFT + D** again to mark the new start point.
- Drive to the end of the second row and press **SHIFT + D** again.
- Repeat steps 3-5 for all remaining rows.

Error Handling:

- To cancel an incorrect line:
 1. Press **SHIFT + D** to complete it.
 2. Then press **SHIFT + C** to delete it.
 3. Reposition at the correct start point and press **SHIFT + D** again.
- If **RTK signal is lost** during recording, the current line is **automatically discarded**. Restart from the **last saved D point**.

Part 2 - BHV Web App

The **BARBIERI GROUP Web App** is a powerful digital interface designed to simplify the **configuration, monitor-ing**, and management of the machine system. It offers a clean, intuitive user experience and can be accessed from any device with WiFi connectivity-such as a tablet, PC, or smartphone.

Through the Web App, users can access real-time data, monitor GPS signal status, adjust key op-erational parameters, and manage saved routes. While the Web App is not strictly necessary for daily operation-since essential controls are available via the remote control-it is **crucial for ini-tial setup and advanced configuration**, particularly when working with **RTK antennas**.

The sections below will guide you through connecting to the Web App, using its main features, and navigating each available function.

2.1 Connecting to the Web App

To begin using the Web App, follow these steps:

1. **Power on the machine** and connect the **remote control**.
2. Wait approximately one minute for the internal computer of the Compass Servo Drive to finish booting.
3. On your WiFi-enabled device, **disable mobile data**, and search for the WiFi network named **BHV-xxx** (where "xxx" is the serial number of your machine Compass Servo Drive).
4. Connect to this network using the password: 12345678.
5. Open your preferred web browser (Chrome, Safari, Firefox, etc.) and enter: <http://192.168.4.1:5000>



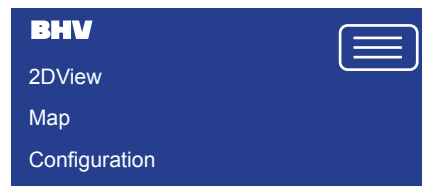
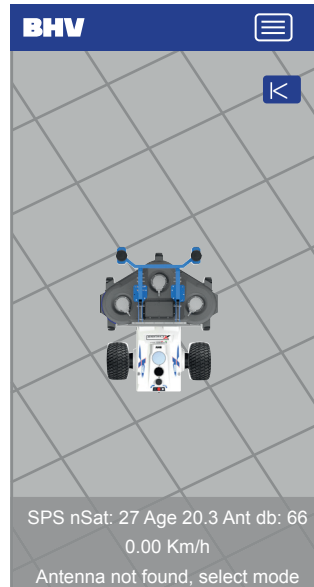
Note: If the page does not load, verify that:

- You are connected to the BHV-xxx WiFi network.
- Your mobile data is turned **off**.
- You typed the address correctly.

2.2 Web App Menu Overview

Once connected, tap the **menu icon (three horizontal lines)** in the top-right corner. The dropdown menu provides access to three main sections:

- **2DView**
- **Map**
- **Configuration**

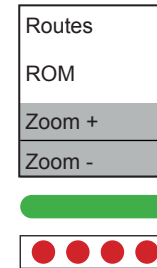


Each is described below.

➤ 2DView

The **2DView** page displays live operating data from the Xmachine system, including:

X

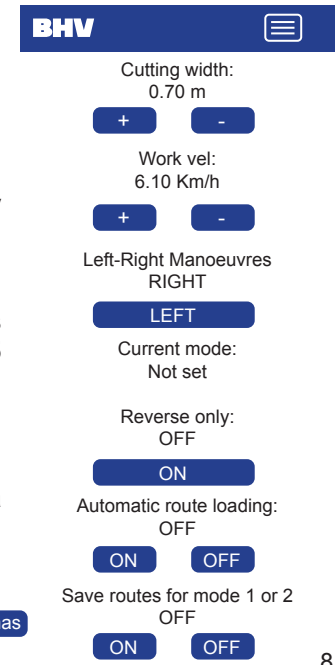


- GPS signal quality and number of connected satellites
 - RTK correction latency (in seconds; shows "0" if inactive)
 - RTK antenna radio signal strength
 - Real-time vehicle speed
 - RTK antenna name (if corrections are active)
- By clicking the **blue arrow button (←)** on the left, a side menu opens with these functions:
- **Routes** - Displays a list of previously saved routes
 - **ROM** - Starts direction calibration. Press the button, then drive the machine straight for 10 meters until the orientation on screen aligns correctly.

- **Zoom + / Zoom -** - Adjust the view scale
 - **Status Dots** - Four status indicators (dots); all should be green when the Compass Servo Drive has started successfully. Red indicates incomplete startup-wait a few seconds.
- **Map.** If your machine is equipped with a SIM card and mobile data connection, this section allows you to view the machine's real-time location on a satellite map.
- **Configuration.** This section allows you to adjust machine settings:
- Cutting Width - Adjust with + / - (increments of 5 cm)
 - Work Velocity - Set the maximum working speed

Left/Right Manoeuvres - Toggle the end-of-

- line turn direction
- Current Mode - Displays the currently selected working mode
- Reverse Only (Mode 4) - Enables reverse movement only (useful for specific accessories)
- Automatic Route Loading - If ON, machine will auto-load saved routes when RTK is active and the location matches a stored path
- Save Modes 1 & 2 - If ON, allows saving routes for modes 1 and 2 when RTK is active. If OFF, only modes 3 and 5 are saved
- Mobile SIM - Edit APN settings for mobile data access
- Ntrip - Access antenna settings and switch between antenna and SIM-based correction
- Manage Antennas - View and delete saved antenna positions



2.3 Advanced Properties

Clicking Advanced Properties reveals the following options:

- **Vehicle Model** - Select the correct machine model in use.



Make sure the displayed model matches your machine, or update it accordingly.

- Country - Set the country where the machine is currently operating.
- Antenna Default Setup Mode - For multi-vehicle RTK antenna setups:
 - o Use ACTIVE if only one machine is using the antenna
 - o Use PASSIVE for secondary machines
- Center Universe - Used only during initial setup. It resets machine alignment and may delete existing routes. Use only if calibration issues arise.
- Software Update - Allows firmware upgrades when available



Note: The features above apply primarily to Barbieri machines **equipped with GPS and RTK Antenna**. Using RTK enables full route memory functionality and allows path replication without needing to drive it manually again.

Advanced Properties

Vehicle model:
machine electric power

Select Model ▼

Country:

Select Country ▼

Antenna default setup mode:
Active

Select Mode ▼

ATTENTION!

“Center universe” will break all the previously recorded routes. Use it only for a first-time setup to adjust the coordinates.

Center universe

Software update

2.4 Routes Management

In the **Routes** section, you can view and manage all previously recorded paths (RTK must be active during route creation):

- **#** - Sequential number of each saved route
- **Name** - User-assigned name (click a route → **RENAME**)
- **Geo Ref** - Antenna position used during recording. If marked **TEMP**, the route will be deleted upon reboot
- **Mode** - Indicates which working mode was used (e.g., 1, 2, 3, 4)
- **LOAD** - Select a saved route and press **LOAD** to activate it
- **DELETE** - Remove unwanted saved routes
- **RENAME** - Modify the route name for easier identification

Routes X

Tap or click on route to see its details and load, rename or delete it.

5v entries per page

Search:

▼	Name	Geo Ref	Mode
TMP	Route 14	temp	2
GPS	Route 1	ntrip	1
GPS	Route 10	ntrip	3
GPS	Route 11	ntrip	3
GPS	Route 12	ntrip	5

Showing 1 to 5 of entries

< >

Part 3 - RTK Antenna

This section provides complete guidance on how to correctly install, activate, and manage the RTK antenna used with the machine system. Proper antenna setup is critical for achieving high-precision GNSS positioning, enabling the machine to execute automated tasks with exceptional accuracy.

You will learn how to position the antenna, configure different operational modes, verify signal status, manage multiple antennas, and monitor progress via the Antenna Manager interface.

Antenna placement

3.1 Antenna Installation and placement

3.1.2 RTK antenna kit - parts



- A. Case for RTK
- B. Radio Antenna
- C. RTK antenna
- D. Battery & battery charge

- E. Lower pole
- F. Upper pole
- G. Cover bag

3.1.3 RTK Installation

Correct antenna placement is essential for reliable RTK functionality. Improper or unstable positioning can result in poor signal reception, compromising the system's ability to complete RTK-based operations effectively.

- Choose a suitable working area and place the antenna in an elevated and stable position.
- Ensure the antenna has a clear line of sight to the sky and is visible to the machine.
- Avoid any obstacles (trees, buildings, machinery) between the antenna and the machine that could interfere with signal reception.

STEP 1. Insert the lower pole firmly into the ground. Then screw the upper pole onto the lower pole already secured in the ground.



At the top of the upper pole there is a level. Using the spirit level, make sure the pole is perfectly perpendicular to the ground before proceeding. Check the level periodically to ensure it remains correct during future uses.

STEP 2.

Screw the RTK antenna onto the pole already secured in the ground.



Then screw the radio antenna into its designated mounting point.

STEP 3.

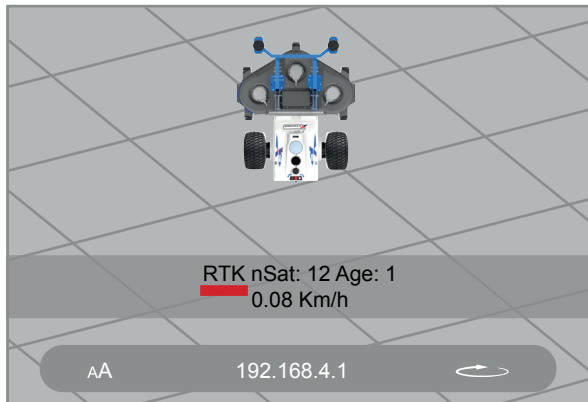
Insert the battery into the RTK antenna.



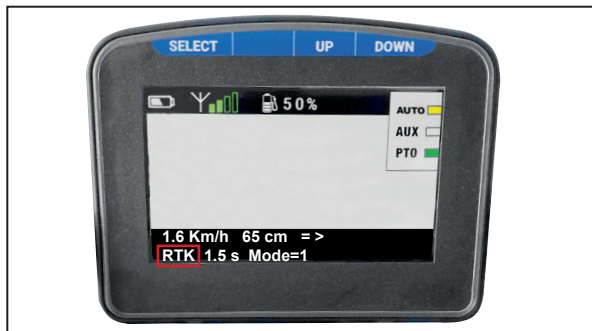
Note: the battery is the same type used for the radio control. Make sure that the RTK antenna emits a flashing blue light, indicating correct power-on.

STEP 4.

Once the portable RTK antenna setup is complete, no further operations are required.



If an machine unit is operating nearby and powered on, the antenna will automatically connect to it. The pairing process may take up to 3 minutes.



Once the connection between the RTK antenna and the machine is successfully established:

the RTK label will appear in the WebApp (highlighted in red in the first images below), or

if the operator is using the latest radio control with LCD display, it will also appear on the second page of the display (indicated by the red arrow in the second image).

3.2 Antenna Activation

To activate the RTK antenna:

Ntrip mode OFF

X

IP or address

Enter ip or address

Address to the ntrip server

Server port

Enter a port such as 2101

^

v

Status

Restart Ntrip

Restart W/O Ntrip
(autonomous or rtk radio)

Close

1. Connect to the configuration page at: <http://192.168.4.1:5000/config>
2. Go to:
Ntrip → **“Restart W/O Ntrip (autonomous or RTK radio)”**
3. Ignore the fields such as “IP or address” - these are not used for the antenna setup.

When the antenna mode is successfully activated, the message “Ntrip mode OFF” will be dis-played.

3.3 Active and Passive Modes (Multi-Vehicle Setup)

Antenna manager

X

Current Setup Mode:

passive

ID	Linked Routes	Action
66-		Rename
Antenna		Export
# 2		Delete

Close

Manage Antennas

The RTK antenna supports operation with one or multiple machine vehicles. Mode selection is managed from: **Advanced Properties** → **Antenna default setup mode Configuration Guidelines:**

- **Single vehicle:** Set the vehicle to **Active Mode**.
- **Multiple vehicles:**
 - o Designate **one vehicle as Active**.
 - o Set all others to **Passive Mode**.

Behavior:

- The **active vehicle** detects and initializes the antenna.
- **Passive vehicles** wait for the antenna to be prepared before connecting to it.

Steps:

1. Place and power on the antenna.
2. Set the **main vehicle** to Active Mode and power it on.
3. After setup completes (approx. **2-3 minutes**), switch on the **secondary vehicles** in Passive Mode.

3.4 Antenna Initialization and Signal Status

After completing the above steps:



1. Switch the machine ignition to ON, without starting the engine.
2. Insert the battery into the antenna. A blinking blue light will indicate that the antenna is powered.

On the remote control display (second window), monitor the signal status:

- **CALC:** Antenna survey in progress.
- **RTK:** Antenna is ready and fully connected.
- **FRTK or DGPS:** Signal is not correctly received by the antenna or machine.



In **FRTK** or **DGPS** conditions, path recording is disabled. Reposition the antenna and repeat the setup process.

Also, check that the **signal latency is below 5 seconds** for optimal performance.

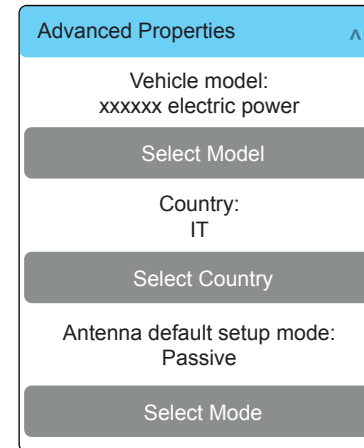
3.5 Recorded Path Association

When an RTK antenna is successfully connected (visible in the 2DView page) and RTK signal is active:

- Previously recorded paths linked to that antenna can be reloaded.
- Any new paths recorded will be automatically associated with the current antenna.

3.6 Managing Multiple Antennas

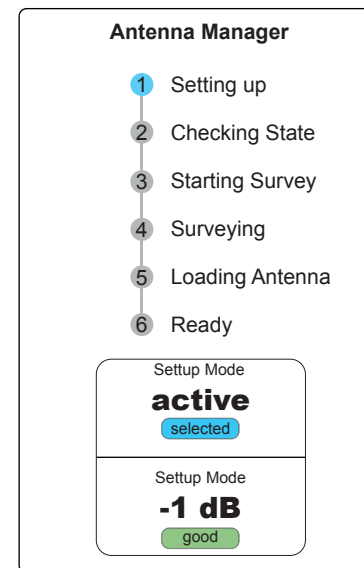
You can manage saved antennas directly from the configuration interface:



Access: <http://192.168.4.1:5000/config> → Manage Antennas

This section allows you to:

- View a list of stored antennas.
- Rename or delete individual antennas as needed.



3.7 Antenna Manager Application

An additional monitoring tool, **Antenna Manager**, is available at:
<http://192.168.4.1:7887>

This application provides **real-time status information** on:

- The **setup progress** of each antenna.
- Whether the machine is in **active or passive mode**.
- The current **step in the antenna preparation process**.

When setup is complete:

- Step 6 - "**Ready**" will turn green.
- The label "**RTK**" will appear on the remote control and in the WebApp, confirming that the system is ready for RTK-based operation.

The machine must be **powered ON** and **within range of the antenna**. The search for RTK signal starts automatically once the antenna battery is inserted.

