



VIPS ROVER V6

VIPS-R-V6

User Guide

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1	01/12/2025	Carl Cook	First draft
1.1	19/01/2025	Carl Cook	Grammar, consistency and content improvements
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Introduction

The VIPS Rover v6, hereinafter referred to as "the rover," is essential to the VBOX Indoor Positioning System and AirPixel camera tracking solutions. The rover can be placed on any object, vehicle, or camera to be tracked, enabling accurate position and orientation calculations. In combination with the VIPS Processing Module v2, a VBOX Motion Pack, or a VBOX Control Unit (VCU), the rover forms the core tracking component, providing fully processed data ready for immediate use, recording for later analysis, or post-processing.

The rover communicates with VIPS Beacons to provide data anywhere within a VIPS volume. This enables wide-area tracking that can scale to volumes more than a kilometer in length, with only additional VIPS Beacons being required to expand the volume.

This document contains the following information:

1. Quick Start Guide
2. Glossary of Terms
3. Application Guide
4. Troubleshooting Guide
5. Hardware User Guide
6. Software User Guide
7. Maintenance and Care
8. Useful Information
9. FAQ

Quick Start Guide

This quick start guide is intended for users already familiar with VIPS systems. First-time users should follow the complete Application Guide.

Prerequisites

- VIPS Setup software installed
- Minimum 8 beacons installed and powered
- Rover and processing module connected
- Total Station available for beacon survey (TopCon LN150)

Configuration Steps (30-60 minutes)

1. **Open VIPS Setup** → Select "New" or load existing configuration
2. **Site Tab** → Configure system settings
3. **Add Rovers** → Enter rover ID(s) (optional: use download identifier button to read from device)
4. **Beacons Tab** → Add all beacons with their IDs
5. **Upload to Beacons** → Connect each beacon via serial and upload configuration
6. **Survey Beacons** → Use Total Station to measure all beacon positions
7. **Ping Table** → Click "Calculate" to generate proximity table
8. **Upload to Rovers** → Upload final configuration to all rovers
9. **Map Tab** → Connect and verify live tracking

Initialization (2-3 minutes)

1. Power on rover → Wait for "Static Initialization" (30 seconds)
2. When "Ready for Motion" appears:
 - **Vehicles:** Accelerate forward, brake, repeat, then figure-8s
 - **Cameras:** Smooth and fast forward then backwards motion
3. Status changes to "Running" → System ready

Troubleshooting

- **No beacon connection:** Check power and radio frequency settings
- **Poor initialization:** Reset unit and ensure first motion is straight forward
- **Position drift:** Run delay calibration procedure (see Step 6)

For detailed instructions, see the complete Application Guide.

Glossary of Terms

Term	Definition
AirPixel	Racelogic's camera tracking solution for virtual production and broadcast
Beacon	Fixed transmitter/receiver unit that communicates with the rover to enable position calculation
CAN	Controller Area Network - a vehicle bus standard for communication
FreeD	A camera tracking data protocol used in broadcast and virtual production
Geofence	A virtual perimeter that defines the boundaries of the VIPS coverage area
GNSS	Global Navigation Satellite System (includes GPS, GLONASS, Galileo, etc.)
IMU	Inertial Measurement Unit - sensors that measure acceleration and rotation
Kalman Filter	A mathematical algorithm that smooths position, velocity, and orientation data
Lat/Long	Latitude and Longitude - geographic coordinate system
PMv2	Processing Module v2 - performs position calculations and runs the Kalman filter
Rover	The mobile tracking unit that communicates with beacons to determine position
RTK	Real-Time Kinematic - high-precision GNSS positioning technique
Total Station	A surveying instrument used to accurately measure beacon positions
UWB	Ultra-Wideband - the radio technology used for ranging between rover and beacons
VCU	VBOX Control Unit - central processing unit for AirPixel systems
VIPS	VBOX Indoor Positioning System
ZUPT	Zero-velocity Update - a technique that eliminates drift when stationary

Application Guide

Step 1: Safety and Conformance Information

Safety Warnings

⚠ READ ALL SAFETY INFORMATION BEFORE INSTALLATION AND OPERATION

- Operate the system only in environments for which it is intended
- Do not attempt to disassemble or modify the device
- After exposure to water, ensure the device is completely dry before storage
- Avoid exposure to extreme temperatures
- Avoid exposure to corrosive liquids
- Use only the supplied power supply and cabling to ensure compliance with safety and FCC rules
- The antenna must be installed to provide a separation distance of at least 20 cm from all persons
- Do not co-locate or operate in conjunction with any other antenna or transmitter

Regulatory Compliance

For Customers in the United States

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: Changes and modifications not expressly approved by RACELOGIC can void your authority to operate this equipment under Federal Communications Commission rules.

FCC ID: 2AU5C-VIPSR06

For Customers in Canada

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radiation Exposure Statement

The device has been found to be compliant with the requirements set forth in CFR 47 Sections 2.1091 and Industry Canada RSS-102 for an uncontrolled environment. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Le dispositif a été jugé conforme aux exigences énoncées dans les articles 47 CFR 2.1091 et Industrie Canada RSS-102 pour un environnement non contrôlé. L'antenne(s) utilisée pour ce transmetteur doit être installée pour fournir une distance de séparation d'au moins 20 cm de toutes les personnes et ne doit pas être co-localisée ou fonctionner en conjonction avec une autre antenne ou transmetteur.

Additional Safety Information

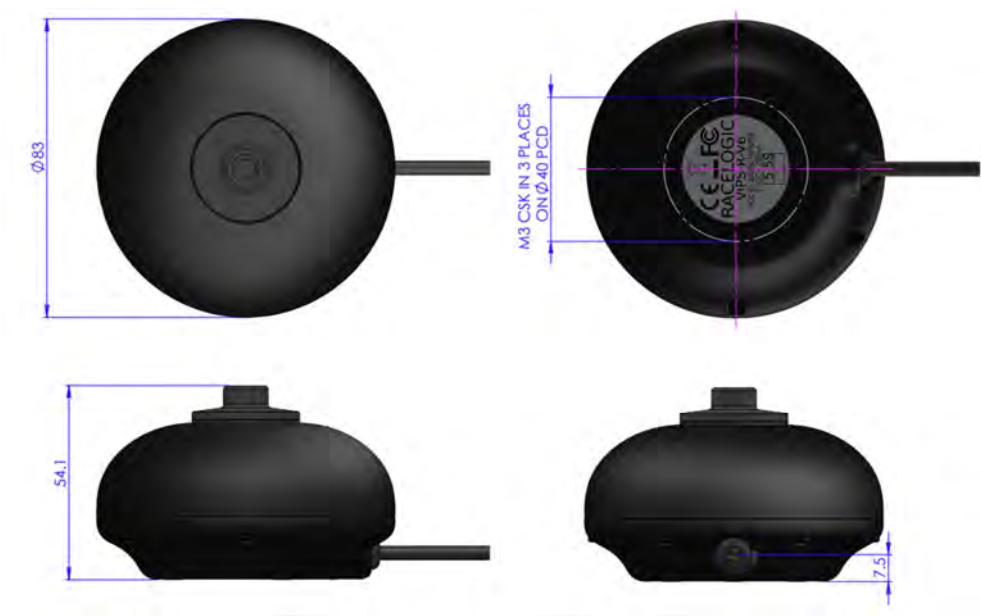
RF Interference: This device should not be used in medical facilities or near sensitive equipment without prior approval. Consult a qualified technician if interference occurs.

Disposal: This product contains electronic components. Dispose of according to local electronic waste regulations. Do not dispose of in household waste.

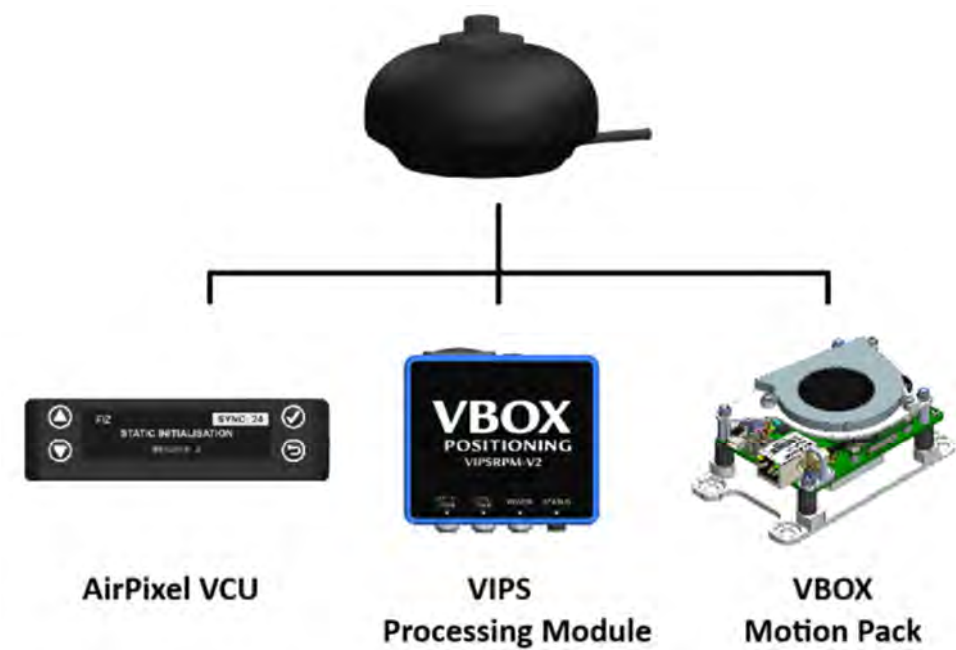
Further information can be found in Appendix 1.

Step 2: Hardware Overview

Dimensions (mm)



Connection Diagram



Quick reference table

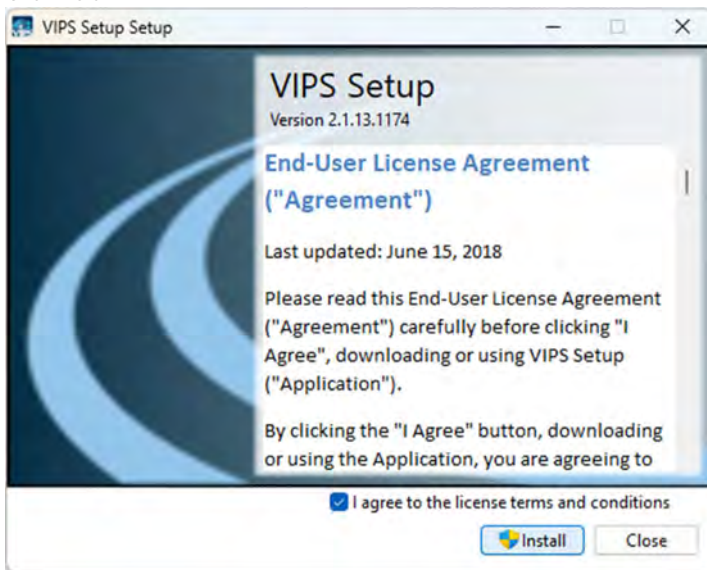
Specification	Value
Power Supply	5-12V DC (direct to rover – wider range available on connecting hardware)
Radio Frequency	3993.6 MHz (default), 4492.8 MHz, or 6489.6 MHz
Operating Temperature	-20 °C to +60 °C
Storage Temperature	-40°C to +85°C
Update Rate	Configurable 1-100 Hz
Horizontal Position Accuracy	<2 cm (after delay calibration)
Vertical Position Accuracy	<5 cm (after delay calibration)
Dimensions	83x54.1mm

Step 3: Software Overview

Setup, configuration, and monitoring of the rover is performed using VIPS Setup software. This can be downloaded from vboxpositioning.com or by contacting Racelogic customer support. The software is provided free of charge, including lifetime updates, with the purchase of any new rover hardware.

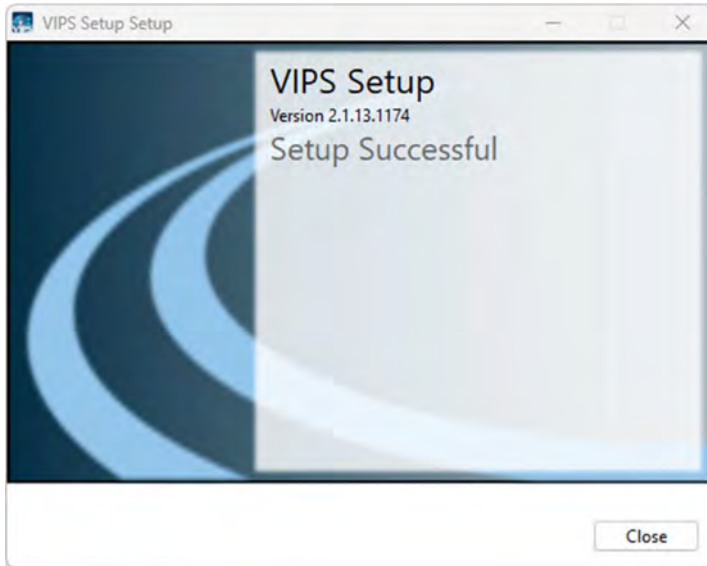
Installing the Software

1. Download the latest **VIPS Setup Installer.exe**
2. Run the installer
3. Check the box to accept the license terms
4. Click **Install**



5. Click **Yes** to allow changes to be made to your device.

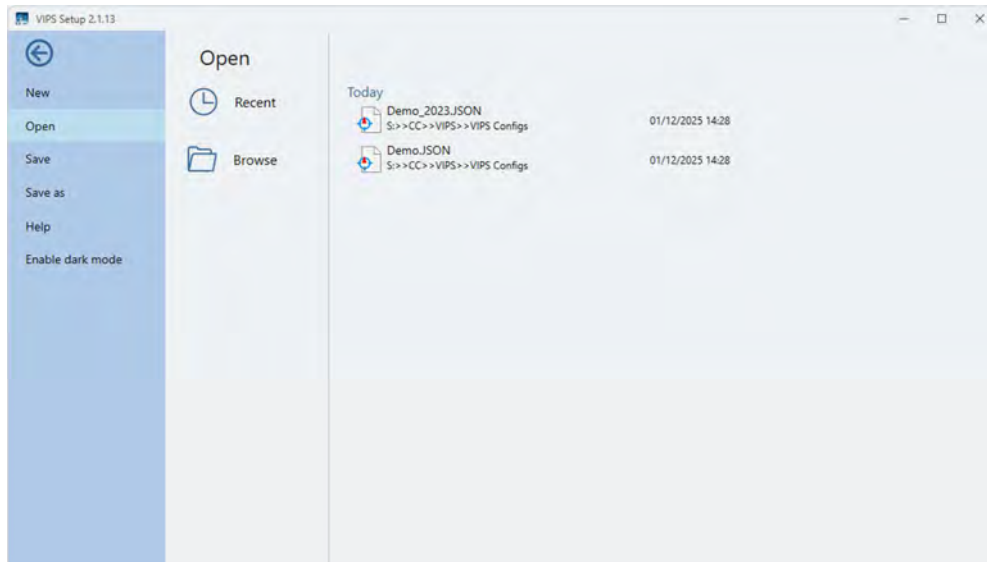
6. Once the Setup is finished, you can click **Close**.



Getting Started

When you open VIPS Setup, you are presented with the **Files** menu, which gives you the option to:

- Load a previously saved site configuration (.JSON file)
- Create a new configuration
- Save the current settings



By selecting **New** or loading a previously saved configuration file, you will be presented with the options necessary for correct VIPS configuration and operation.

Saving Configurations:



- Press the **Save** button on the right-hand side to save a .JSON configuration file
- If you have previously opened a site configuration, pressing Save will overwrite the current file
- Use the dropdown menu beneath the Save button and select **Save as** to save with a different filename

Tip: Save your configuration frequently during setup to avoid losing work.

Menu Sidebar

- **Files** - Load, save, and manage configurations
- **Site** - Configure system settings, rovers, and radio parameters
- **Beacons** - Manage beacon locations and settings
- **Ping Table** - View and edit beacon selection logic
- **Map** - Monitor live tracking and log data
- **Upload** - Upload configurations to rovers and beacons
- **Diagnostics** - Advanced troubleshooting tools (Beta)
- **Help** - Access documentation and support



Site Setup



The Site tab is where you configure how the system operates, including radio settings, rover registration, and output formats.

Connection Type

This section manages the communication link between your PC running VIPS Setup and the rover.

Setting	Description
---------	-------------

Serial/ UDP Port	Selects the physical connection type. Serial means a USB/ RS-232 connection to the device; UDP is used for network-based connections (Ethernet).
COM Port	(Active when Serial is selected) A dropdown menu to select the specific COM port (e.g., COM3, COM7) your Rover or Beacon is plugged into.
Refresh	Refreshes the list of available Serial COM ports.
Save	Saves the current configuration as a .JSON file in a chosen location on your desktop.
IP Address	Shown when UDP is selected. This is where the IP address for the device you are configuring should be entered, such as that of the VCU.
Port	This is where the UDP/TCP port you can communicate with your device being configured on can be set.

System Settings

System settings

Mode

Stand alone

Position output

Local x/y

Accuracy mode

Dynamics

Elevation correction

Off

Kalman filter

Enabled

Block beacon detection

Disabled

Studio LED mode

Disabled

Mode

This setting defines the system’s operating mode:

Setting	Description	Use Case
Stand alone	The rover uses its internal clock for all synchronisation and runs independent of any other device.	For all independent VIPS systems, AirPixel system or situations where not being synced with an external device.
VBOX	Syncs the system when connected to a VBOX 3i or VBOX 4	For use when integrating with VBOX 3i or VBOX 4 systems.
External Sync	Syncs the system to an external 100 Hz pulse and time source.	When a high-precision external clock (like a dedicated GPS receiver) is available.
ADMA	Syncs the system for use with the Genesys ADMA system	For integrating with Genesys ADMA systems.

Position Output

This setting determines the format of the outputted position data.

- Local x/y:** Outputs the position as a distance (in metres) on an X and Y plane, measured from an origin point set at 0,0. This should be chosen for all AirPixel deployments.
- Lat/Long:** Outputs Longitude and Latitude measurements. This allows the system to align with a global coordinate system, requiring you to set a valid Latitude, Longitude, and Altitude as the Origin.

Accuracy Mode

This setting adjusts the solution engine based on your specific requirements and hardware count.

- **Position:** Uses up to a maximum of 12 beacons in the solution and supports a maximum of 3 rovers in the system.
- **Auto:** The accuracy mode is automatically chosen based on other configured system options.
- **Dynamics:** Uses up to a maximum of 8 beacons in the solution and supports a maximum of 5 rovers in the system.

Elevation Correction

This feature corrects the position errors that can occur when a rover passes close to or directly underneath a beacon.

- **Off:** No elevation correction is applied. Use this if the rover will not be passing underneath beacons.
- **Small Room:** Tuned for smaller enclosed areas, such as offices or virtual production studios.
- **Large Area:** Tuned for large areas, such as automotive test halls or sound stages.
- **Very Large Area:** Turned for large-scale deployments.

Kalman Filter

The Kalman Filter provides a smoothed output of position, velocity, and attitude (roll, pitch, and yaw). We recommend this is enabled to get the best quality data.

Block Beacon Detection

This feature helps maintain accuracy in difficult environments. When enabled, beacons that are temporarily blocked or providing bad readings will be excluded from the position calculation.

Note: in some situations, this option can result in a deterioration in accuracy due to the detection of false positives.

Studio LED Mode

This is designed for environments where visual stealth is required. When enabled, the beacons LEDs will turn off 30 seconds after successfully connecting to the rover.

Note: The rover LED behaviour is unaffected by this setting.

Rovers

The Rovers configuration table is used to register each tracking unit and assign a non-colliding time slot for communication.

The table defines which rovers are active in the system and when they are allowed to communicate.

Rovers

Rover ID	Delay (metres)	Timeslot
894	-0.045	1 of 4
132	-0.042	2 of 4
896	0.000	3 of 4
135	-0.045	4 of 4

Rover ID	Delay (metres)	Timeslot
This is the unique identifier for the Rover. You can manually enter the ID or use the upload button next to the input field upload a unique ID from a respective COM port.	This value is a fine-tuning control used to compensate known latency in the system. The delay is expressed in metres. A negative value means the system expects the Rover's transmission to arrive slightly earlier.	The assigned communication slot for the Rover within the system's cycle. The format [N of X] shows the current slot (N) out of the total available slot (X). In this example, Rover 894 is in Slot 1 of 4.

The tools on the right side of the table allow you to add and remove Rovers from the configuration. Clicking the **'X'** button on the far right of a row will remove that rover from the list and free up its assigned Timeslot. The **'+'** button on the bottom row allows you to add a new entry to the table, registering a new Rover and consuming the next available Timeslot.

Serial Settings

This section allows you to customise the data output format, frequency, and specific content transmitted via the rover serial connection.

Select Output Format

Navigate to the **Serial settings** section within the **Site** tab.

- Click the **Output** dropdown menu.
- Select the required data protocol:
 - **Standard:** The default VIPS/AirPixel output format.
 - **GNSS NMEA:** Standard NMEA formatted strings for compatibility with third-party GPS/GNSS receivers.

Set Output Rate

Determine how frequently the system should transmit data.

- Click the **Output rate** dropdown menu.
- Select a frequency ranging from **1 Hz** (1 update per second) up to **100 Hz** (100 updates per second).

Select Output Messages

Customise the specific data included in the telemetry stream by checking the boxes under **Output Messages**.

Note: if a combination of messages are selected that would cause the serial connection to exceed capacity the output rate will be automatically limited. By unticking some messages you will be able to increase the output rate back to 100Hz.

Radio Settings

It is possible to change the radio frequency between 4492.8 MHz, 3993.6 MHz (default) and 6489.6 MHz.

Advanced

Advanced radio settings are also available, including **Tx power level**, **Leading edge time threshold**, **Preamble number** and **Sensitivity tuning**.

Tx Power Level

The radio transmit power level can be altered by either typing in a new number or by using the up and down arrows. Changing the radio frequency will change the power level, if 4492.8 or 3993.6 MHz is chosen as the radio frequency, 18.5 dB will be selected by default. If 6489.6 MHz is chosen, 8 dB will be selected.

Leading Edge Time Threshold

This option can be used to filter out long lived reflections that can occur in certain buildings and cause false range measurements. For most applications, the default setting of Normal will suffice, other levels of filter trade off effectiveness against false rejection rate. Selectable as None, Minimum, Normal (default), Aggressive and Maximum.

Preamble Number

This option can be changed if systems are working in relatively close proximity to each other (e.g. another building). Ensuring the systems have differing numbers prevents accidentally picking up signals from another system. Selectable as 18 (default), 19 or 20 for 3993.6 MHz and 6489.6 MHz, or 10, 11 or 12 for 4492.8 MHz.

Sensitivity Tuning

Adjust this setting if you experience radio instability or connectivity issues. It balances the system's ability to pick up weak signals (Range) against its ability to ignore background radio interference (Noise Immunity).

- **Higher Sensitivity:** Improves signal detection at a distance but may pick up more background noise.
- **Lower Sensitivity:** Increases immunity to local interference but may reduce the system's maximum range.

CAN Settings

When used with select hardware such as the VIPS Processing Module v2, the rover can output data using a CAN bus protocol.

Note: if using the system with a VBOX 3i or 4, CAN output is configured via VBOX Setup and is otherwise outside the scope of this document.

Mode: CAN data can be output using the standard VIPS channels or on channels for robot integration.

- **No transmission:** CAN output is disabled
- **Standard:** All standard CAN channels are output as defined in 'VIPS CAN output v2' documentation, this can also be viewed in Appendix 2.
- **Robot:** All robot CAN channels are output as defined in 'VIPS CAN output v2' documentation, this can also be viewed in Appendix 2.
- **Standard & robot:** All standard and all robot channels are output.

Baud rate: Configurable between 125 Kbits/sec and 1 Mbits/sec.

Termination: Allows CAN termination to be enabled or disabled.

ID Range (hex): Sets the start range of the standard CAN output. Default options of 6F1 or 501 can be set with the option to set a custom value. Extended ranges can also be used by clicking the 'Is extended' box.

Export to DBC: Allows the current CAN options to be exported to a DBC file for use in other compatible software.

Advanced

Site Identifier: A unique ID assigned to the specific site configuration. Default is 0.

Sub-timeslot sync: This should remain enabled by default. It is only disabled for specific multi-rover configurations under the guidance of Racelogic Support.

Filter latency (10 mS): Sets a system-wide configuration option common to all rovers (beacons will ignore this). Default is 5 (50 ms). Lower values will result in more position noise.

Single sided ranging: When enabled, this allows for a higher number of rovers. Disabling this feature will limit the total usable rovers to 5. Double-sided ranging will always be used, regardless of if this is enabled. Enabling this allows the system to use single sided measurements that would otherwise be discarded.

Geofence buffer (m): Defines the size of the buffer zone for the Geofence in meters. Default is **10 m**. This is only used when the system is configured for use in indoor/outdoor mode and with compatible hardware such as a VBOX 3i or 4. The buffer distance determines how near to the beacons it will attempt to switch from GNSS.

Uncertainty multiplier: When enabled, this applies a multiplier to UWB position uncertainty values if the position residual exceeds a set threshold. This should only be used when specified by Racelogic or a 3rd party integrator.

Beacon Setup

Each installation will contain a number of beacons. A minimum of 8 beacons are required for stable operation.

In the **Beacons** menu  it is possible to set the Beacon IDs that will be used, as well as the **x, y, z** distances to the origin.

Beacons

Load

Add

Delete

Clear all

Rotate & Translate

Survey Beacons

Delay calibration

Save

Beacons

Time master Beacons

Friendly ID	Beacon ID	East (X)	North (Y)	Up (Z)	Delay (metres)	Use for ranging	Always used
1	45	0.048	-0.608	2.514	0	☒	☐
2	210	0.048	1.176	2.52	0	☒	☐
3	48	0.032	0.987	2.512	0	☒	☐
4	49	-0.04	4.791	2.515	0	☒	☐
5	234	0.044	6.174	1.968	0	☒	☐
6	231	4.044	0.956	1.708	0	☒	☐
7	209	4.805	4.822	2.517	0	☒	☐
8	18	4.814	0.021	2.511	0	☒	☐
9	140	4.84	1.222	2.511	0	☒	☐
10	406	4.849	-0.576	2.511	0	☒	☐
11	106	1.486	1.207	2.501	0	☒	☐
12	388	0.627	-1.247	2.513	0	☒	☐

Load

The **Load Button** allows you to load a text file containing beacon details from previously surveyed installations.

Add

The **Add Button** allows you to add a new beacon into the system. Adding a new beacon will automatically increment the “Friendly ID” by 1.

Delete

The **Delete Button** allows you to remove the selected beacon from the installation.

Clear all

The **Clear all Button** will remove all beacons in the list.

Rotate & Translate

The **Rotate & Translate** feature is used to shift or reorient your entire beacon network to align with a specific local coordinate system or map.

- Rotation angle:** Enter a value in degrees to rotate the entire beacon map around the origin point (0,0).

- **East (X) offset:** Shift the entire network horizontally along the East/West axis by a set distance in meters.
- **North (Y) offset:** Shift the entire network vertically along the North/South axis by a set distance in meters.
- **Up (Z) offset:** Adjust the height of the entire network by a set distance in meters.
- **Apply / Cancel:** Click **Apply** to update the coordinates for all beacons in the main table, or **Cancel** to discard your changes.

Survey Beacons

Initiates the **Beacon Survey** software which will allow you to survey the beacons accurately using a **TopCon LN150 Total Station**.

*Note: Detailed walkthroughs for **Survey Beacons** can be found in the Configure Your System section of the documentation.*

Delay Calibrations

Fine-tunes the internal timing delays of the hardware to ensure maximum accuracy.

*Note: Detailed walkthroughs for **Delay Calibration** can be found in the Configure Your System section of the documentation.*

Friendly ID

The **Friendly ID** is a user-friendly ID that is set for each beacon. The Friendly ID cannot be changed and will be a consecutive count from 1. It is essential if the Beacon ID assigned to a Friendly ID changes, then the configuration is reuploaded to all impacted beacons.

Beacon ID

The **Beacon ID** is a unique identifier that is hard coded into the beacon, like a serial number. This ID number can be changed to match the Friendly ID as needed, allowing for replacement beacons to be easily swapped in and out. It is essential if the Beacon ID assigned to a Friendly ID changes, then the configuration is reuploaded to all impacted beacons.

East (x), North (y), Up (z)

This is the area where you enter the locations of the beacons. It is very important that the locations are measured accurately to ensure that the system works correctly.

The **Offset** is the distance between the beacon and the nominated origin location, with East, North and Up being positive values, West, South and Down being negative values (assuming a rotation angle of 0).

*Note: It is **essential** these values are millimetre accurate, therefore all these values should be calculated using the 'Survey beacons' option and a TopCon LN150 Total Station. Manual calculations will not give the accuracy necessary for the positioning system to perform to specification.*

Delay (metres)

The **Delay** column is for further calibrations to the beacons if needed. This is calculated within the **Delay Calibration** section.

Use for Ranging

Use the check boxes to choose whether a particular beacon will be used for ranging. Pressing the spacebar when a beacon is selected will also toggle the ranging use.

Always Used

Use the check boxes to force the system to prioritise the Beacon selected regardless of signal geometry or proximity.

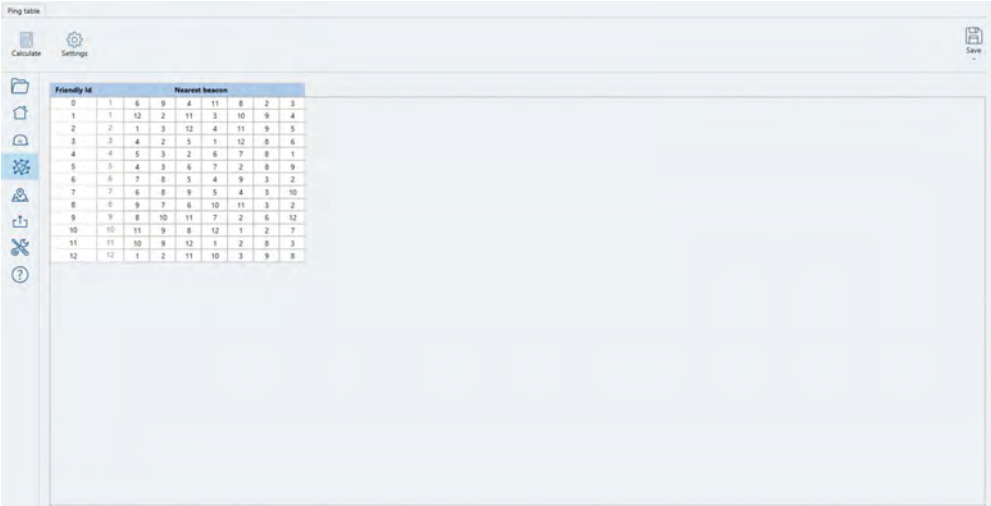
Ping Table

As the rover moves through the volume, it must determine which beacons to use. It does this by identifying the closest beacon, then using the remaining beacons in that row of the ping table to take measurements and calculate its position. This process is repeated continuously; as the rover moves closer to other beacons, it automatically switches to the corresponding row in the ping table. This enables seamless movement throughout the volume with dynamic beacon selection.

Pressing the **Calculate** button at the top of the **Ping Table**  menu will update the table. The software will also prompt 'Recalculate ping table?' after certain actions such as updating the beacon locations. To proceed and recalculate the table based on beacon proximity click 'Yes'.

For sites with unusual layouts it may be necessary to manually edit this table to ensure only visible beacons are used, however for most sites the automatic calculation will be correct.

It is important that the Ping table correctly matches the expected number of beacons, with the addition of 'Beacon 0' which is always present. Beacon 0 is used on start-up by the rover to seek it's closest beacon.



Priority Id	Nearest beacon										
0	1	6	9	4	11	8	2	3			
1	1	12	2	11	3	10	9	4			
2	2	1	3	12	4	11	9	5			
3	3	4	2	5	1	12	8	6			
4	4	5	3	2	6	7	8	1			
5	5	4	3	6	7	2	8	9			
6	6	7	8	5	4	9	3	2			
7	7	6	8	9	5	4	3	10			
8	8	9	7	6	10	11	3	2			
9	9	8	10	11	7	2	6	12			
10	10	11	9	8	12	1	2	7			
11	11	10	9	12	1	2	8	3			
12	12	1	2	11	10	3	9	8			

Settings: The settings menu contains options that change the automatic ping table calculation. Currently the only option is to limit the maximum distance between beacons in the ping table. The default is 100m.

Map

The map is the main area used for monitoring the system. When you first select the map tab you will be shown a 2D view of the configured beacon locations. You can use the on-screen controls or the scroll bars to pan and zoom the map.

Along the top menu you will be able to configure the map options:

Connection type: Here you can select how you will monitor live data, this can be via a serial connection or UDP data streamed from a compatible device such as the AirPixel VCU.

- **Serial:** When serial is selected you will have options to select the COM Port, Refresh the COM port list and Connect to the selected Port.
- **UDP:** When UDP is selected you will have the option to enter the UDP port on which data can be received and a Connect option to open this port.

Live date can be in VIPS/AirPixel format or FreeD format.

Background: A background image can be added and aligned to the map. This can be helpful in overlaying your beacon map on a building or studio layout blueprint, helping you visualise the physical layout.

Beacons: Here you can select to show all beacons on the map, hide beacons which are not being used for ranging, or hide all beacons.

Coverage: This will show you a theoretical maximum coverage based on your current beacon locations. High and Low resolution coverage can be selected.

Note: real world results will be limited by your environment and coverage is only applicable within the beacon perimeter.

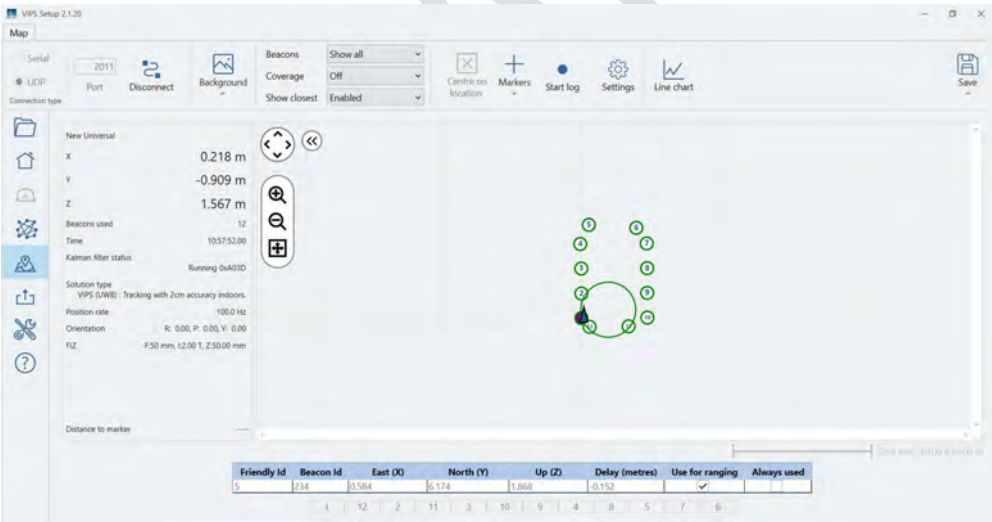
Show closest: When enabled, clicking on the map will cause the closest beacon to that point to be shown shaded in purple. This allows easy visualisation of which row of the ping table will be used in any given location, the entire area covered by that row of the ping table will also be shaded.

Edit Obstructions: Using these tools, it is possible to add 2D shapes to the map to represent physical obstructions such as walls in the environment. When these obstructions are added the automatic ping table calculation will then try to avoid using beacons that would be occluded by the obstruction.

Ping table: As an alternative to using the ping table tab to view and edit which beacons will be used, the ping table tools on the map allow you to select and change the ping table based on the visual beacon layout.

Live Map View

After clicking 'Connect' on a Serial or UDP Port the view will change and several new options will be available.



Disconnect: Will disconnect the current port and exit the live map view.

Centre on location: Available when zoomed in on the map. When enabled the current rover location will be kept in the viewing window of the map.

Markers: Markers can be dropped to show points you may wish to return to. The current history trace and markers can also be cleared from this menu.

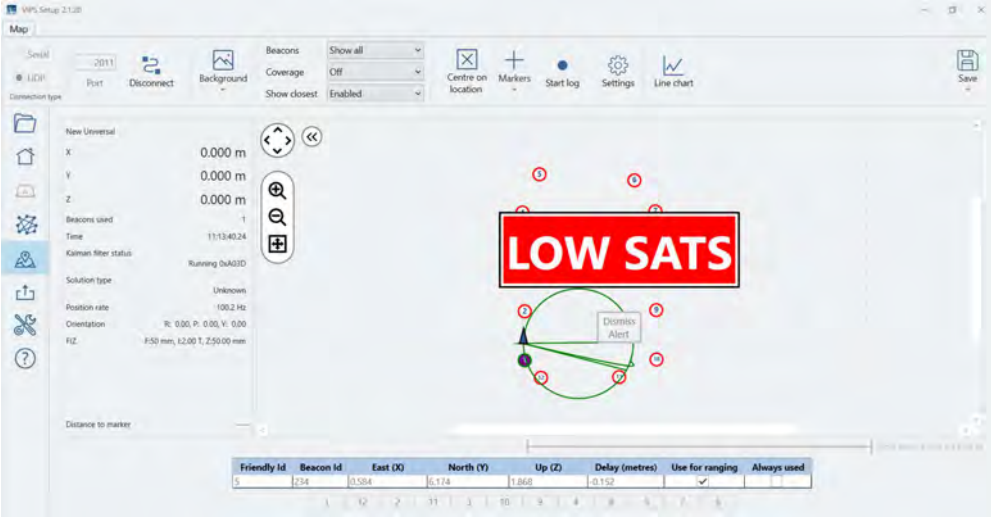
Start log: Enables the current live data to be logged to either a CSV file or Racelogic VBO file. When connected via Serial it is also possible to record a raw BIN file. This can be used by Racelogic to perform advanced troubleshooting on potential site issues.

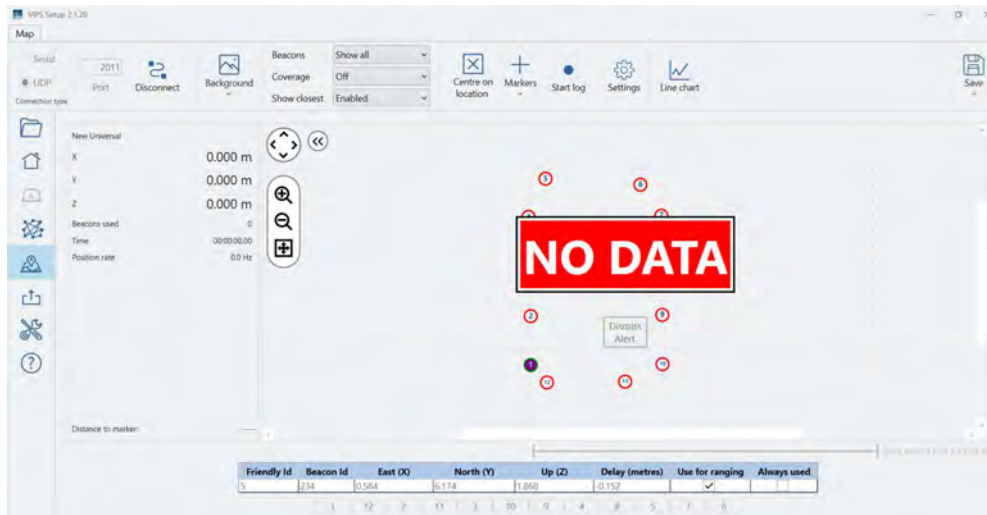
Note: when logging raw bin data, the live view will pause until the log is ended.

Settings: Map settings can be edited from here.

- **Show position history:** Value can be set from 1 to 300 seconds with a default of 60 seconds.
- **Show position heat trace:** This will colour code the position trace (Green, Amber, Red) based on either beacon count, or position quality.
- **Show heading:** This will change the position indicator to an arrow pointing in the direction of the yaw/pan value.
- **Show beacons used by rover:** If the beacons' used message is turned on, the beacons currently being used by the rover will be shown in green. Those not being used will be shown in red.
- **Line chart time period:** This value adjust how long data will be shown in the line chart display.
- **Alerts:** Turns on warnings for if Data is lost, or the beacon count drops too low.

Example alerts:





Line Chart: Clicking line chart will open the chart section of the map display. This will plot the selected value for the duration selected in settings.



Live Data display: On the left of the map when connected to a live data source you will have the output displayed. This will update in real time.

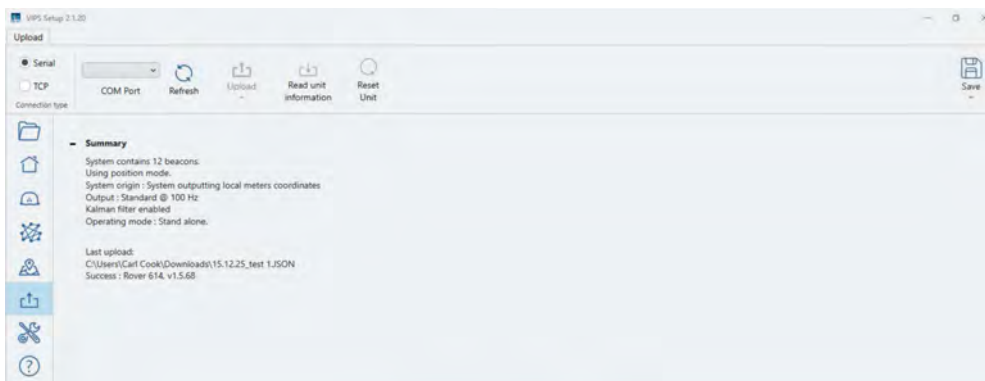
New Universal	
X	1.799 m
Y	1.990 m
Z	1.567 m
Beacons used	12
Time	11:35:46.09
Kalman filter status	Running 0xA03D
Solution type	
VIPS (UWB) : Tracking with 2cm accuracy indoors.	
Position rate	99.9 Hz
Orientation	R: 0.00, P: 0.00, Y:-97.85
FIZ	F:50 mm, I:2.00 T, Z:50.00 mm
Distance to marker	

- **New Universal:** This indicates the data format being received. New Universal is indicated for the VIPS/AirPixel protocol. If FreeD is being received, this will be shown instead.
- **X, Y, Z:** These values show the latest known position of the rover.
- **Beacons used:** Shows the current number of beacons being used to calculate the position. At least 8 beacons should always be visible for reliable tracking.
- **Time:** The current time being reported by the rover.
- **Kalman filter status:** Shows the current state of the Kalman Filter.
For further information on Kalman filter states and their impact, please refer to the 'System Operation' section.
- **Solution type:** Should always be 'VIPS (UWB)' when using the rover. Other states will be shown when using alternative systems such as AirPixel XT however that is outside the scope of this document.
- **Position rate:** Shows the current rate data is being received. This should closely match your rover output rate or if applicable VCU genlocked rate.

- **Orientation:** Shows current Roll, Pitch and Yaw values. These are equal to Roll, Tilt and Pan in the camera industry. These values will only be shown when the Kalman filter is initialised.
- **FIZ:** Shows current Focus, Iris and Zoom values when supported hardware is connected.
- **Distance to market:** When a marker is dropped, shows the current distance between the rover and the marker.

Upload

From this screen the current configuration can be uploaded to the rover and beacons. The configuration needs to be uploaded to beacons when the radio settings and/or the Beacon ID / Friendly ID relationships are changed. The configuration needs to be uploaded to the rover when any changes are made.



Serial / TCP: Select Serial or TCP depending on the upload connection you are using. If using a Serial connection, you can select the COM Port or refresh to update the list of COM ports. If using TCP, you will need to enter the IP address for the device you are connecting to, such as the VCU, and its settings port.

Upload: This button will attempt to upload the current configuration to the connected rover or beacon.

Read unit information: This will return the details for the currently connected unit.

Reset unit: This will reset the currently connected unit.

Note: resetting a rover will also reset the Kalman filter and require a new initialisation be completed.

Summary: This shows a summary of the current system configuration and can be used to verify your key settings before uploading. Confirmation of your last configuration upload and the status is also shown towards the end of this section.

Diagnostics (Beta)

Additional diagnostic tools have recently been added to the VIPS Setup software. It is preferable to use these with a direct serial connection either directly to the rover or the processing module v2. Where applicable the connection type can be selected and appropriate connection details configured. Currently 3 diagnostic tools are available, and they can be selected using the mode menu.

Mode:

- **Raw Data:** This will put the rover into raw mode. In this mode raw range measurements to each beacon can be shown. These are plotted on a graph and enable the user to see how stable the ranges are. Erratic or intermittent ranges indicate a problem with your configuration or environment. Raw intertial (IMU) measurements can also be viewed here.

- **Site Diagnostic:** This tool is best used connected to a beacon you have already surveyed into position. This will allow you to check the ranges to every other beacon. If a large delta is shown this can indicate an issue with your configuration or survey.
 - **CIR Data:** By viewing the CIR data after completing a site diagnostic you can see if the signal is a clean strong pulse or is being reflected around the environment. This can help diagnose environmental issues causing system performance degradation.
- **Broadcast Settings:** *Please note this tool is an early beta and will receive further updates in future software releases.* The tool allows you to update all beacons by broadcasting new settings from your rover or another beacon. This provides a quick mechanism for changing channel or power levels and broadcasting these new settings, rather than uploading individually to each beacon. The rover or beacon used will then need to be manually uploaded to with the new settings to complete the process.

Step 4: Install and Connect Your System

Automotive and Positioning customers please follow Step 5.1

AirPixel customers please follow Step 5.2

Step 4.1: Automotive and Positioning

VBOX Motion Pack customers please refer to the VBOX Motion Pack user guide for instructions on installing and connecting your system. Use of the rover with VBOX Motion Pack is therefore outside the scope of this document.

Automotive and positioning customers – As part of the purchase of your rover for use with the VBOX Indoor Positioning System (VIPS) you will also have received a VIPS Processing Module v2 (PMv2). The PMv2 is required to do the VIPS position calculation and where applicable run the Kalman filter to ensure a smooth position output. This data can then be logged to the built in SD Card or output via serial or CAN to a PC, VBOX or other compatible data logger.

Rover setup

1. Ensure the rover is placed securely in a location with a clear line of site to your beacons. If doing automotive testing this should be on the top of the vehicle with no other equipment blocking the view of the rover. Raising the rover a short distance from the vehicle roof will improve the quality of the received signals. If using a robot platform or other nonstandard configuration look to mount your rover as high as possible, ensuring the radio signals can pass freely between the rover and beacons, with no metallic or dense materials obstructing the RF signal path.
2. With the rover mounted plug the flying lead in to the 'Rover' port on the PMv2.
3. To configure the rover and/or view data on a PC connect Racelogic cable RLCAB250 to the Data/Pwr port of the PMv2. Connect the 9 way D connector to an RS232 port on your PC or suitable USB adapter such as RLBACS035. Finally connect a suitable power source to the 2 way Lemo socket on the cable.
4. After configuring the system, if you are using a VBOX 3i or 4 you can connect RLCAB251 (VBOX 3i) or RLCAB252 (VBOX 4) between the PMv2 and your VBOX. If using the CAN output, you can connect a suitable CAN & Power cable to the 'CAN / PWR' port. If using a 3rd party system please check their guidance on integration or contact Racelogic for further support.

Please now go to Step 5.3 for details on setting up your beacons.

Step 4.2: AirPixel

AirPixel Customers - As part of the purchase of your rover for use in the AirPixel system you will also have received a VIPS Processing Module v2 (PMv2) and FIZBox or a VBOX Control Unit (VCU). The PMv2 is required to do the position and orientation calculation and runs the Kalman filter to ensure a smooth position output. This is then sent to the FIZBox where it is Genlocked, we optionally integrate lens FIZ data and can configure output

via serial or UDP in the AirPixel and/or FreeD protocols. As the VCU is currently unreleased this documentation will herein assume you are using a PMv2 and FIZBox.

Rover setup

1. Using the supplied V-lock kit ensure the rover is mounted securely to the camera with a clear view to the beacons. The rover needs to be mounted with the cable exiting towards the back of the camera and aligned along the same axis, this avoids errors in nodal offsets and enables good initialisations. No monitors, microphones, cabling or other accessories should be obstructing the view of the rover. If tracking an object other than a camera, ensure the rover is placed as high as possible with minimal obstructions surrounding it.
2. Connect the rover flying lead to the PMv2 'ROVER' port.
3. Connect the PMv2 'DATA / PWR' port to the FIZBox 'VIPS' port using an RLCAB253 cable.
4. On the FIZBox:
 - a. Connect a Genlock source to the 'Sync In' port. RLCAB191 provides a BNC connection for this purpose.
 - b. Optionally connect from the 'Sync Out' port to your camera to pass through the Genlock signal to your camera.
 - c. If using a compatible lens connect the appropriate cable from the 'Lens Ser' port to your camera lens. Fujinon lenses will use RLCAB185, Canon will use RLCAB193.
 - d. Connect a suitable Racelogic power cable to the 'Power' connector. By default systems are supplied with an RLCAB194 cable for powering from a D-Tap connector.
Note: care should be taken when powering the system via 3rd party cables as the polarity may not match other products.
 - e. If using Ethernet to output data and configure the system connect a suitable cable with an RJ45 connector to the 'LAN' port. This cable should in turn be connected to your tracking network or directly to your computer.
 - f. If using serial output, connect an appropriate cable to the 'PC SER' port. Cables can optionally be supplied by contacting Racelogic.
 - g. To configure the FIZBox connect a USB mini cable to the 'DEBUG' port, with the other end connected to a computer you will have a new USB storage drive called mbed. On this drive a file called settings.txt will be available and allow you to edit the FIZBox configuration including network and lens settings.

Please proceed to Step 5.3 for details on installing and connecting your beacons.

Step 4.3: Beacons

For your system to operate it requires a minimum of 8 beacons to be installed to create a tracking volume. Your system will have been supplied with enough beacons to provide coverage in your volume as agreed during the initial sales and consultation process.

Before installing your beacons, it is recommended to create your configuration and upload to each beacon as per Step 6: Configure your system - Parts 1-24 below.

The beacons need to be installed to create a 3D volume, therefore we recommend creating a perimeter of beacons with varying heights. In large installations it may also be necessary to install additional beacons in the middle and above the tracking area. Beacons should not be mounted within 1 metre of the ground and need at least 30cm clearance from any surrounding metalwork or RF reflective structures. Ideally beacons should be placed in locations where they will always have a clear view of the rover and will not be obstructed by people or objects.

Your beacons will have been supplied with a plate or adapter that allows mounting to standard rigging equipment use as clamps, brackets or articulating arms. If you require further guidance on rigging, please contact Racelogic.

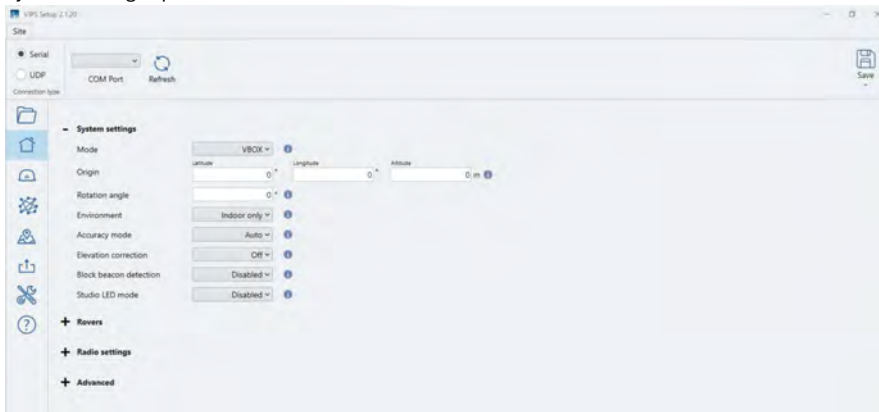
Beacons only require power and do not need to be networked together, all communication with the rover is handled by the Ultra-Wide Band (UWB) radio. Once the beacons are mounted ensure they are powered using appropriate mains adapters or batteries.

Step 5: Configure Your System

All configuration and monitoring of the system is done using the VIPS Setup software.

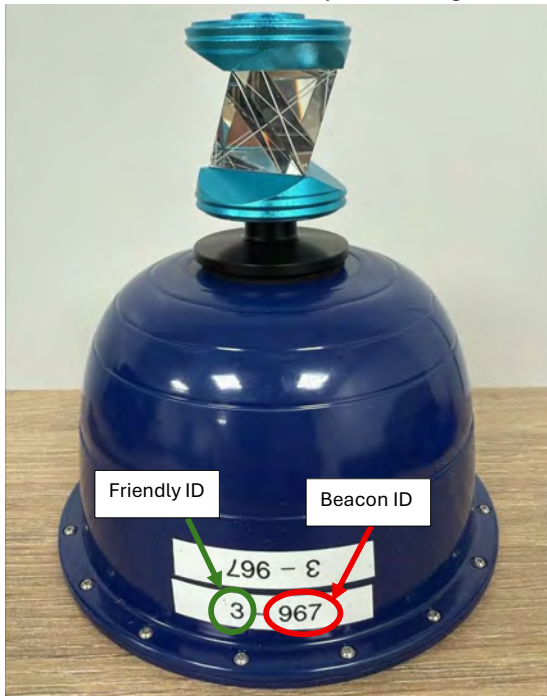
Initial Configuration

1. Start by opening VIPS Setup. If you have previously been provided a base configuration file for your system from Racelogic, open this now. If not click New to open a blank configuration.
2. On opening your configuration or starting a new one, you will be presented with the Site tab and the system settings options.



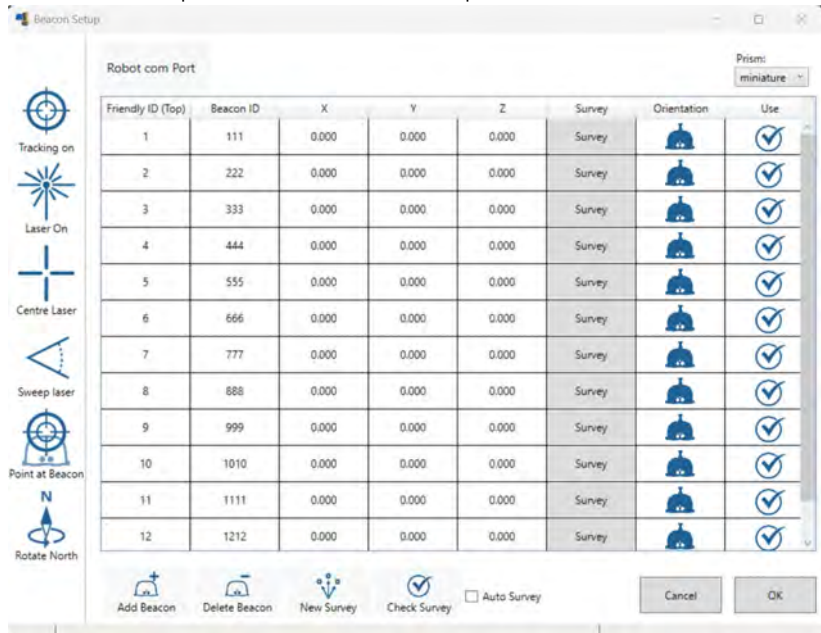
3. Firstly, select your Mode. All AirPixel systems will use 'stand alone' mode, for other customers you can proceed with stand alone for your initial setup and testing then change to another mode later when you are confident the system is performing to requirements.
4. Set position output to Local x/y
5. Accuracy mode to 'Auto'
6. Elevation correction should be set based on ceiling height and beacon placement. If your rover will never pass under or very near any of your beacons it can be left 'Off'.
7. Kalman filter will be enabled for stand alone use.
8. Block beacon detection should be disabled. This can later be enabled if you experience difficulties with people walking in front of beacons and other temporary occlusions. Your beacon mountings ideally avoid this situation from occurring alleviating the need for BBD.
9. Studio LED mode should be enabled if you anticipate the beacon LEDs causing a distraction to talent or cameras etc. When enabled the beacon LED will turn off 30 seconds after detecting a rover and will not turn on again until power cycled.
10. Next configure your rovers. At this stage you just need to add the unique ID for each of your rovers, if you need to add an additional rover click the + button on the right of the rover table. Leave the Delay 0.000 currently.
11. Automotive and positioning customers can leave the Serial settings at the default values. AirPixel customers may benefit from deselecting 'Speed/Heading' and selecting 'Beacons Used' instead.
12. Radio settings can be left at their default values unless you already know you will be operating on a different channel.
13. For your initial configuration it is not necessary to set CAN Settings or change the advanced options.
14. You can now proceed to the Beacons tab by selecting the beacon icon in the left menu.

15. If you have not already got a base configuration you will need to add all of your beacons on the Beacons tab.
16. Start by clicking 'Add' from the top menu until you have a row in the table for each of your beacons. For example, if you have 12 beacons, you will need to click Add until you see rows for Friendly ID 1 to 12.
17. If your beacons have a single or two digit number on a sticker, in addition to a higher 3 or 4 digit number, the lower number will be the Friendly ID and the higher number the Beacon ID.

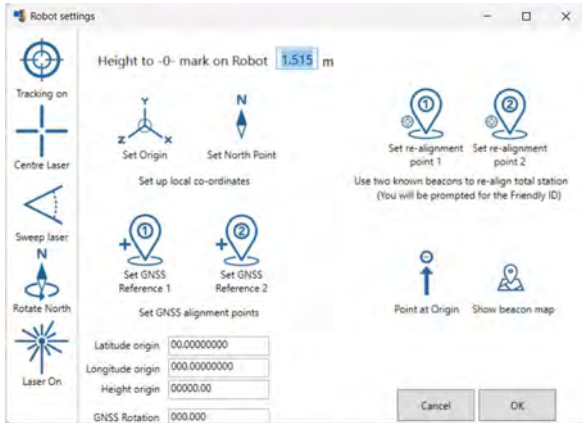


18. Complete the beacon table adding the Beacon ID that corresponds to each Friendly ID. If for any reason your beacons do not have stickers as above or you wish to change the pairings, you can add any Beacon ID to any Friendly ID, however it is essential you upload the configuration to the beacons after so when in operation they know their own Friendly ID.
19. At this point the beacons have all the information they need to operate. You **do not** need to survey the beacon locations before uploading to them as only the rover requires the beacon locations. This means all beacons can be configured before mounting to save time later.
20. Proceed to the upload tab, if asked if you wish to recalculate the ping table select yes.
21. Connect your beacons using either RLCAB151-L or RLCAB250, depending on your beacon model. Then select your Serial COM Port.
22. Click 'Save' to update the configuration, this is necessary before you can upload.
23. Now click 'Upload', the software will proceed to configure the beacon, and you will receive a successful dialogue when done.
24. Repeat for all remaining beacons.
25. Once all beacons have been configured, they should be installed in location as per the guidance in Step 5.3 above.
26. You can now return to the Beacon tab from the left menu and click 'Survey beacons'.
27. If prompted to save, click 'Yes'.

28. You should now be presented with the Beacon Setup screen.



29. The table should represent the same information as entered previously in the beacons tab, we will now use the Total Station to accurately measure the location of each beacon.
30. Ensure your total station is switched on and the Bluetooth / WiFi toggle located under the battery has already been set to Bluetooth.
31. Using the Windows Bluetooth device screen you will then need to search for and add the LN150 Total Station. On newer total stations 2 separate Bluetooth devices may need to be added.
32. If you are connecting to the Total Station for the first time you may need to exit the beacon setup screen and again click 'Survey beacons' before the Total Station is available.
33. Click Robot com Port and a COM port for the Total Station will be shown, click this to connect to the total station.
34. Once connected to the total station you should see live output in the bottom area of the beacon setup window and the current position normally shown in red at the top.
35. Click 'New Survey' from the bottom menu to bring up the new survey dialogue box.



36. Now using a laser measure the height from the ground to the -0- mark on either side of the total station. Enter this height in the first box.
Note: this will set your world floor, therefore if you wish your 0 height to be at a different level such as a stage or top of a ramp you will need to enter the height relative to that level.
37. Next place a prism where you wish your origin point to be. This will be the point from which your beacons are measured and from where the rover will report its location. IE a position of X 5m, Y 3m, Z 2m would be 5 metres East of the origin point, 3 metres North and 2 metres Up from the floor.
38. Rotate the top of the total station to point in the direction of the prism you just placed on your origin point. This does not need to be super precise, as the total station will automatically search for the prism.
39. Click 'Set Origin', the total station will then look for the prism and when locked on the 'Set Origin' button will turn green.
40. Next place a prism beyond the origin point, in the direction you wish to be North or Forward of your origin. This will work better with at least 10 metres separation from the origin.
41. Now point the total station at this prism and click 'Set North Point'
42. Once the total station has locked on to this prism the Set North Point button should turn green.
43. You can now click OK to exit the dialogue box.
44. We are now going to survey the beacon locations. Start by pointing the total station at the beacon with Friendly ID 1. Then on the Beacon Setup screen, on the row corresponding to Friendly ID 1, click 'Survey'. As before the total station will search for the prism, when it locks on it will highlight the row green and the X,Y,Z will be updated.
45. Repeat step 44 for all remaining beacons, moving to Friendly ID 2, then 3 and so forth.
46. Once all beacons have been surveyed and have X,Y,Z values click 'OK' to save and return to the Beacon tab in VIPs Setup.
47. From the left menu now select 'Ping table'. This will present your ping table, if not already prompted to do so click 'Calculate' to regenerate the table based on proximity.
48. Next click the Map tab from the left menu. The map will show a top down 2D view of your beacons, ensure they are laid out as expected. If not return to the Beacon screen and check your survey.
49. Finally click the 'Upload' tab from the left menu. Select your COM port or enter your TCP settings, click Save, then Upload to all of your rovers.
50. The system is now ready for initial operation. We advise following Step 7 to validate core performance before proceeding with improving accuracy via the Delay Calibration process.

Improving accuracy – Delay Calibration

By default, when first installed a system will be approximately 10cm accurate. To improve this, we complete a procedure called a delay calibration. This process can be completed by clicking ‘Delay calibration’ from the beacon tab of VIPS Setup and following the instructions in the onscreen wizard.

Configuring the system for use with VBOX 3i or VBOX 4

This section describes how to configure a VIPS Rover system for use with a **VBOX 3i or VBOX 4**, including correct GNSS alignment and indoor/outdoor transitions.

Correct configuration is critical to avoid position jumps when transitioning between GNSS and VIPS positioning.

Prerequisites

Before starting, ensure:

- The rover is connected to the processing module (PMv2)
- Beacons are installed and powered
- Beacons have been surveyed using a total station
- VIPS Setup software is installed
- A VBOX 3i or VBOX 4 is available and powered
- If Indoor / Outdoor operation is required, **your VBOX supports RTK GNSS.**

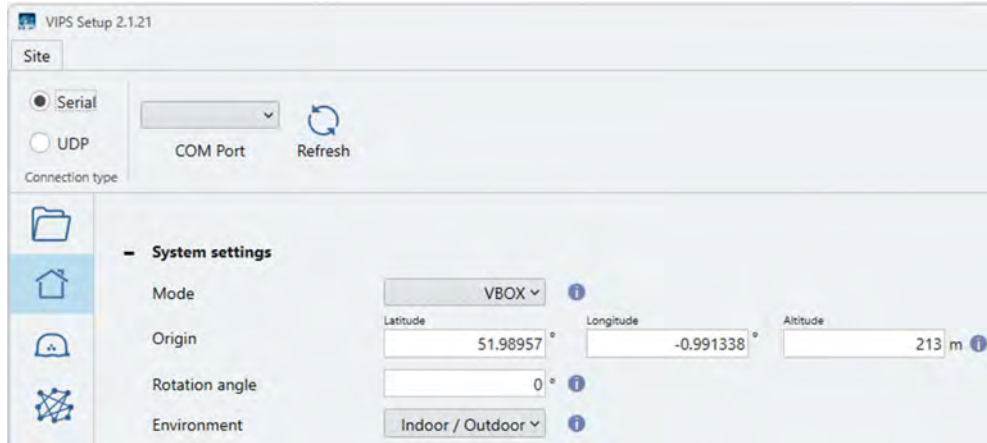
Step 1 – Open the Configuration

1. Launch **VIPS Setup**
2. Open your existing site configuration (.json)
 - If none exists, complete **Step 6: Configure Your System** before continuing

Step 2 – Select VBOX Operating Mode

1. Navigate to the **Site** tab
2. Under **System Settings**, set:
 - **Mode:** VBOX

This enables synchronisation and data alignment with VBOX hardware.



Step 3 – Set the VIPS Origin (Latitude, Longitude, Altitude)

The VIPS origin defines how the local VIPS coordinate system aligns with GNSS.

Option A – Indoor-Only Operation (No GNSS Transitions)

Use this option **only if the system will never transition to GNSS**.

1. Enter an **approximate**:
 - o Latitude
 - o Longitude
 - o Altitude

Accuracy is not critical for indoor-only use, as GNSS will never be used.

Option B – Indoor / Outdoor Operation

For seamless GNSS ↔ VIPS transitions, the origin **must be measured accurately**.

Choose **one** of the following methods:

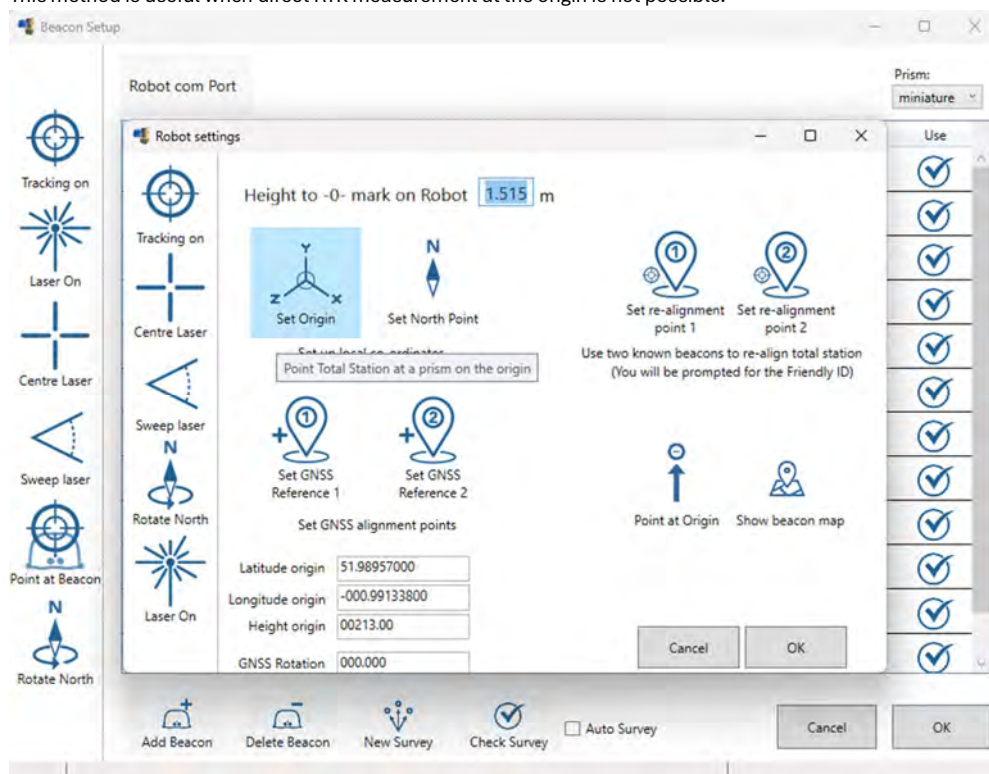
Method 1 – Direct GNSS Measurement at Origin

1. Place your GNSS antenna **exactly at the same physical point** used as the VIPS origin during beacon survey.
2. Ensure you have an RTK Fix then record:
 - o Latitude
 - o Longitude
 - o Altitude
3. Enter these values into the **Origin** fields

Method 2 – Total Station GNSS Reference Points

1. Open **Beacon Setup** from the beacon page of VIPS Setup.
2. Select **New Survey**
3. Use:
 - **Set GNSS Reference 1**
 - **Set GNSS Reference 2**
4. Survey two known points using the total station, providing the Latitude, Longitude and Altitude when prompted.
5. Allow the software to calculate:
 - Origin position
 - Rotation automatically

This method is useful when direct RTK measurement at the origin is not possible.



Step 4 – Set the Rotation Angle (GNSS Alignment)

The rotation aligns the VIPS coordinate frame to **true GNSS North**. If using method 2 above, this will provide you an accurate rotation value.

1. Enter the **Rotation** value beneath the Origin fields
 - 0° assumes positive X = East and positive Y = North

2. If using Indoor / Outdoor mode:

- Rotation **must be extremely accurate**
- Even small errors will cause position jumps during transitions

When operating with a VBOX, this rotation is used to align VIPS data to GNSS heading.

Step 5 – Select Operating Mode (Indoor vs Indoor / Outdoor)

Still within **System Settings**:

1. Choose one:

- **Indoor Only**
 - VIPS free-runs
 - GNSS is never used
- **Indoor / Outdoor**
 - System acquires GNSS lock first
 - Automatically transitions between GNSS and VIPS

2. For Indoor / Outdoor operation:

- Default transition occurs within **10 m** of the VIPS perimeter
- This distance can be adjusted under **Advanced Settings → Geofence buffer**

Step 6 – Upload Configuration to the Rover

1. Navigate to the **Upload** tab
2. Select the correct **Serial or TCP connection**
3. Click **Save**
4. Click **Upload** to program the rover

Step 7 – Connect to the VBOX

1. Connect the Processing Module to the VBOX using:
 - **RLCAB251** for VBOX 3i
 - **RLCAB252** for VBOX 4
2. Power-cycle:
 - VBOX

Step 8 – Verify Synchronisation

1. Observe the **STAT LED** on the Processing Module:
 - **Solid green** = synchronised and ready
2. Confirm in VBOX:
 - Position data is valid
 - When using VIPS, Solution Type = 32
 - No jumps occur during transitions (if Indoor / Outdoor)

Important Accuracy Notes

⚠ Critical for Indoor / Outdoor Use

- Origin latitude, longitude, and altitude must be measured **at the same physical point** as the VIPS origin
- Rotation must correctly align VIPS North to GNSS North
- Errors will cause:
 - Sudden jumps in position
 - Heading discontinuities
 - Invalid GNSS ↔ VIPS transitions

Configuration Complete

The system is now configured for use with **VBOX 3i** or **VBOX 4**.

Proceed to **Step 7: System Operation** to initialise the Kalman filter and validate tracking performance.

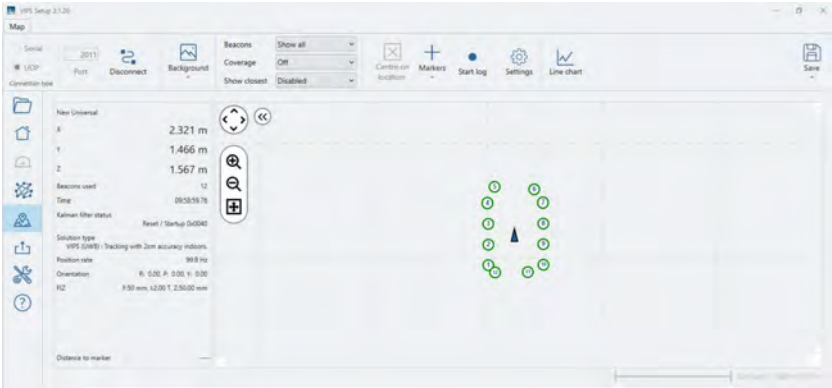
Configuring the system for use with 3rd party devices

When using the rover with a 3rd party device such as a data logger or INS from another manufacturer. Please follow your device manufacturers guidelines on integration with the Racelogic VIPS system.

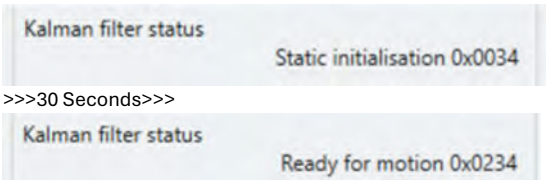
Step 6: System Operation

Once a system has been configured the process of operating and monitoring it is quick and repeatable. Monitoring can be done using the VIPS Setup map tab, accessed from the left menu.

1. With your rover connected open the map and connect via Serial or UDP.
2. Turn on your rover and observe the initial Kalman filter status will be Reset / Startup



3. After a short startup process the Kalman filter status will change to 'Static Initialisation'. During this 30 second period the rover will measure its static stability and set its initial biases. If the system is stable and configured correctly after this 30 second period, the Kalman filter status will change to 'Ready for motion'.



4. Kalman Filter Initialisation Procedure

When the Kalman Filter status changes to **Ready for Motion**, the system must be initialised before normal operation can begin.

⚠ Critical rule (applies to all installations)

Every initialisation must begin with a clean, fast, straight forward motion.

Any deviation from this (sideways, vertical, rotational, or hesitant movement) can result in incorrect yaw/pan alignment.

General Initialisation Requirements

- The rover must be mounted securely and correctly oriented.
- The first movement **must be forward, smooth, fast, and uninterrupted.**
- The camera or object must **not rotate or pan** during the initial forward motion.
- Further dynamic motion is required after the initial movement to complete initialisation.

Initialisation Examples by Mounting Type

a. Vehicle-mounted Rover

- Mount the rover with the **cable exiting towards the rear of the vehicle.**
 - When **Ready for Motion** is reported:
 1. Accelerate forwards in a straight line.
 2. Brake to a complete stop.
 3. Accelerate forwards again.
 4. Perform several **figure-of-eight manoeuvres.**
 5. Drive straight ahead and come to a complete stop.
- ✓ The system is now initialised and ready for operation.

b. Camera-mounted Rover (AirPixel)

- The exact procedure depends on the available range of motion.

Using a Camera Slider (recommended if straight motion is not possible)

- Use a slider with approximately **1 metre of travel.**
- Attach the rover to the slider using a v-lock adapter, ensuring there is enough free cable to allow the full range of movement for the initialisation.
- When **Ready for Motion** is reported:
 - i. Slide the rover forwards **quickly and smoothly.**
 - ii. Immediately return to the start position.
 - iii. Repeat the forwards and backwards motion **5 times.**

Using a Cable Camera System

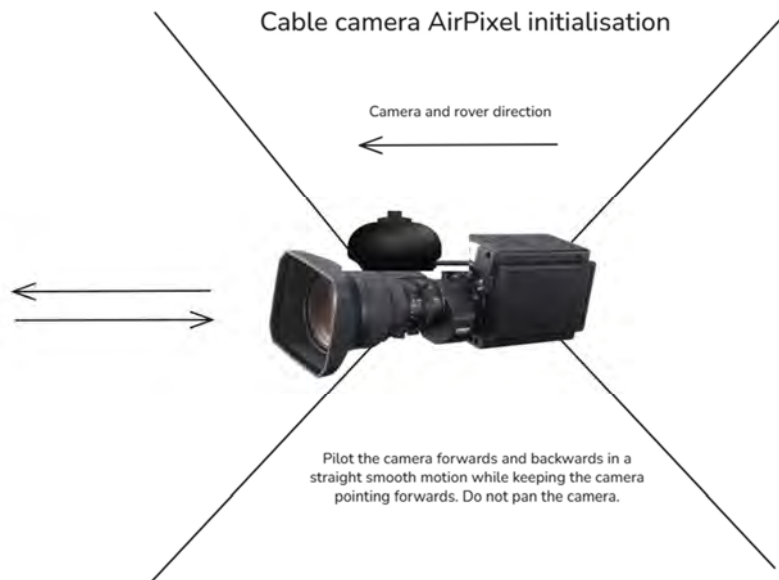
- Point the camera forwards.
- Once the camera is in position ready for the initialisation it may be necessary to reset the unit to complete a new static initialisation before 'Ready for motion' will again be shown. To do this



from the upload tab of VIPS Setup click 'Reset unit' .

- When ready for motion is shown in the Kalman filter status, pilot the camera forwards in a **long, straight, smooth motion**, keeping the camera facing the same direction.
- Pilot the camera backwards.
- Repeat several times.

✓ The system is now initialised and ready for operation.



c. Jib or Other Mounted Systems

- Align the camera to point **along the direction of motion**. E.g. the arc of a jib.
- Perform smooth forwards and backwards movement.
- Avoid vertical motion as the first movement.
- Continue dynamic motion until the system completes initialisation.

✓ Once initialised:

- Kalman Filter status changes to **Running**
- When stationary, **ZUPT becomes active**
- Yaw / pan drift should be minimal

Common Initialisation Errors

⚠ Do not perform these actions first

- Raising a rover before moving forwards
- Pulling a camera slider backwards before pushing forwards
- Introducing small sideways or rotational movement before the forward motion
- Panning or tilting the camera during initial movement

These errors can cause:

- Incorrect yaw/pan seeding
- Excessive pan drift during operation
- The need to reset and repeat initialisation

If excessive yaw/pan drift is observed:

- Reset the unit
- Repeat the initialisation process carefully following the steps above

5. **System Running**

Your system is now running and is ready for use.

Data can be recorded using a suitable data logger or sent to a PC for immediate analysis in VIPS Setup or use by other software such as render engines.

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Troubleshooting Guide

For information and guidance on troubleshooting please visit the Racelogic support centre.

<https://en.racelogic.support/>

Hardware User Guide

Registration

To activate your support service including software and firmware updates, please register your product by visiting <https://www.racelogic.co.uk/index.php/en/customer-area/register-your-product>

Safety

- Operate the system only in environments for which it is intended.
- Do not attempt to disassemble or modify the device.
- After exposure to water ensure device is completely dry before storage.
- Avoid exposure to extreme temperatures.
- Avoid exposure to corrosive liquids.
- Use only the supplied power supply and cabling to ensure compliance with safety and FCC rules.

Power

The rover has a variable power supply capable of running on 5-12V DC power. This can be directly from a compatible power supply via an RLCAB254, or using an RLACS368/RLACS374, a VIPS Processing Module, a VBOX Motion Pack or AirPixel VCU.

Kit Content

Racelogic offer a range of rover kits depending on your needs. When purchasing your sales invoice will confirm which rover kit you have purchased identifiable by the part number and description.

RLVIPS-B-V6	VIPS Beacon v6 No IMU Package (Does not include FW/Config Module)
VIPS-R-V6	Rover v6 No IMU
RLACS379	Base plate adapter 5/8" x 11 UNC
RLCAB254	2W lemo to 6w Yamaichi socket adapter
RLACS376	Prism mount extension
VIPSPRISMBLK	Mini 360 Degree Black Prism

RLVIPS-R-V6-MP	VIPS Rover v6 Motion Pack
VIPS-R-V6	Rover v6 No IMU
RLCAB259	Yamaichi Socket <> Mag release connector
RLACS368	VIPS RMM-V6 FW Updating Module
RLACS376	Prism mount extension
VIPSPRISMBLK	Mini 360 Degree Black Prism
RLACS382	Travel Case

RLVIPS-R-V6-PM	VIPS Rover v6 No IMU & Processing Module Package (3rd Party integrators, external IMU)
VIPS-R-V6	Rover v6 No IMU
RLACS379	Base plate adapter 5/8" x 11 UNC
VIPSRPM-V2	VIPS Mini Rover Processing Module - V2
RLACS368	VIPS RMM-V6 FW Updating Module
RLCAB250	Yamaichi 7W Plug to 9W D-Sub Socket & 2W LEMO Socket 2m
RLVBACS035	USB to Serial Connector

RLACS376	Prism mount extension
VIPSPRISMBLK	Mini 360 Degree Black Prism
RLACS231	32GB SD Card CL10 UHS-1
RLACS382	Travel Case
	Data out cable may need adding based on connecting hardware VBOX 3i,4 or 3rd party

RLVIPS-R-V6-5	VIPS Rover v6 IMU05 & Processing Module Package
VIPS-R-V6-5	Rover v6 IMU05
RLACS379	Base plate adapter 5/8" x 11 UNC
VIPSRPM-V2	VIPS Mini Rover Processing Module - V2
RLACS368	VIPS RMM-V6 FW Updating Module
RLCAB250	Yamaichi 7W Plug to 9W D-Sub Socket & 2W LEMO Socket 2m
RLVBACS035	USB to Serial Connector
RLACS376	Prism mount extension
VIPSPRISMBLK	Mini 360 Degree Black Prism
RLACS231	32GB SD Card CL10 UHS-1
RLACS382	Travel Case
	Data out cable will need adding based on connecting hardware VB3i, VB4, etc

RLVIPS-R-V6-5S	VIPS Rover v6 IMU05S & Processing Module Package
VIPS-R-V6-5S	Rover v6 IMU05S
RLACS379	Base plate adapter 5/8" x 11 UNC
VIPSRPM-V2	VIPS Mini Rover Processing Module - V2
RLACS368	VIPS RMM-V6 FW Updating Module
RLCAB250	Yamaichi 7W Plug to 9W D-Sub Socket & 2W LEMO Socket 2m
RLVBACS035	USB to Serial Connector
RLACS376	Prism mount extension
VIPSPRISMBLK	Mini 360 Degree Black Prism
RLACS231	32GB SD Card CL10 UHS-1
RLACS382	Travel Case
	Data out cable will need adding based on connecting hardware VB3i, VB4, etc

RLVIPS-R-V6-5S-AP	AirPixel Rover v6 IMU05S Package (None VCU)
VIPS-R-V6-5S	Rover v6 IMU05S
RLACS375	V-lock base plate set including camera kit
VIPSRPM-V2	VIPS Mini Rover Processing Module - V2
RLACS368	VIPS RMM-V6 FW Updating Module
RLCAB250	Yamaichi 7W Plug to 9W D-Sub Socket & 2W LEMO Socket 2m
RLVBACS035	USB to Serial Connector
RLCAB253	7W YAMAICHI TO 6W LEMO - 0.5m
RLACS376	Prism mount extension
VIPSPRISMBLK	Mini 360 Degree Black Prism
RLACS231	32GB SD Card CL10 UHS-1
RLACS381	Travel Case

Rover Connectors

The rover contains a single flying lead terminating in a Yamaichi 6 way T-series plug.

Pinouts



Yamaichi Pin	Function
1	RS232-Tx
2	RS232-Rx
3	RS232 Sync
4	RS232 Return Sync
5	V In
6	Ground

Technical Specifications

Please refer to the datasheet for full technical specifications.

Software User Guide

See Application Guide – Step 3 Software Overview for software guidance.

Maintenance and Care

General Care Guidelines

- The VIPS Rover V6 contains sensitive electronic and RF components. Handle the unit with care at all times.
- Avoid impacts, excessive vibration, or dropping the unit.
- Do not attempt to open or disassemble the enclosure. There are no user-serviceable parts inside.
- Only use accessories, cables, and batteries approved or supplied by **Racelogic**.

Environmental Considerations

- Operate and store the Rover V6 within the specified temperature and humidity limits stated in the technical specifications.
- Do not expose the unit to corrosive substances, salt spray, or dust-heavy environments without appropriate protection.
- Always ensure all connectors are fully mated and locked before operation.

Cleaning

- Power down the Rover V6 and disconnect all cables before cleaning.
- Clean the enclosure using a soft cloth.
- If required, lightly dampen the cloth with water. Do not use solvents, alcohol, or abrasive cleaners.
- Ensure all connectors are dry before reconnecting cables or applying power.

Connectors and Cabling

- Inspect connectors regularly for signs of dirt, moisture, or mechanical damage.
- Ensure connectors are aligned correctly before mating; never force a connector into place.
- Keep protective caps fitted to unused connectors to prevent contamination.
- Periodically inspect cables for cuts, kinks, or strain damage and replace if necessary.

Firmware and Software

- Ensure the Rover V6 is running the latest approved firmware and software versions.
- Firmware updates should only be performed using Racelogic-approved tools and procedures.
- Do not interrupt power during firmware updates, as this may result in system malfunction.

Transportation and Storage

- When transporting the Rover V6, use appropriate protective cases to prevent mechanical shock.
- Secure the unit to prevent movement during transport.
- Store the unit in a dry environment away from direct sunlight and extreme temperatures.

Periodic Inspection

It is recommended to periodically:

- Check mounting points and brackets for security and wear.
- Verify connector integrity and cable strain relief.
- Confirm normal system operation prior to critical deployments.

Service and Support

If the Rover V6 shows signs of abnormal operation, physical damage, or fails to perform as expected:

- Discontinue use.
- Do not attempt repair.
- Contact Racelogic support or an authorised service representative.

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Useful Information

Product Documentation

Please note that product features and specifications may evolve. As a result, some information in this printed manual may become outdated or superseded by later updates.

For the most current version of this documentation, along with additional resources, please refer to our online Support Centre.

Warranty and Returns

Our products are rugged, versatile and designed for use in a wide range of conditions, so all Racelogic hardware comes with a minimum 1-year warranty.

If your device stops working or has been damaged accidentally and is out of warranty, our service technicians can still help you. In some instances, it might not be possible to source components for older products if they are no longer manufactured, however we will always do our best to offer a solution to get you up and running again.

Please contact Support to arrange a repair.

Certificate of Conformity

Please contact support for the latest CoC.

Technical Support

If you require further assistance with your system, please contact our Customer Support Department at **support@racelogic.co.uk**. When emailing, please include '**[Product Name and Customer Name]**' in the subject line to help us process your enquiry efficiently.

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Appendix 1 – FCC Compliance Statement

FCC Compliance and Safety Information

1. FCC Compliance Statement

This device complies with **Part 15 of the FCC Rules**. Operation is subject to the following two conditions:

1. This device may **not cause harmful interference**.
2. This device **must accept any interference received**, including interference that may cause undesired operation.

Note: Changes or modifications not expressly approved by Racelogic could void the user's authority to operate this equipment.

2. FCC Identification

This product contains a transmitter that has been authorized under FCC rules.

- **FCC ID:** 2AU5C-VIPSR06

The FCC ID can also be found on the product sticker on the base of the rover.

3. RF Exposure Safety Information

This equipment complies with FCC radiation exposure limits for an uncontrolled environment. To ensure compliance with RF exposure limits, the device must be used with a minimum separation distance of **20cm** from the user's body.

Avoid placing the device in direct contact with the body or operating it in a manner not intended by the manufacturer.

4. Interference Information

This device generates, uses, and can radiate radio frequency energy. If it is not installed and used according to these instructions, it may cause harmful interference to radio communications.

If interference occurs, users should try to correct it by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the device and the receiver.
- Connect the equipment into an outlet on a different circuit than the receiver.
- Consult a qualified technician for help.

5. Modifications Warning

Any modifications to this equipment **not expressly approved by Racelogic** could void the user's authority to operate the equipment under FCC rules.

6. Electromagnetic Compatibility (EMC) Declaration

This equipment has been tested and found to comply with the limits for a **Class B digital device**, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential or commercial environment.

7. Product Identification

- **Manufacturer:** Racelogic
- **Model:** VIPS-R-V6 / VIPS-R-V6-5 / VIPS-R-V6-5S

8. Installation and Use Instructions (Safety)

- Operate the system only in environments for which it is intended.
- Do not attempt to disassemble or modify the device.
- After exposure to water ensure device is completely dry before storage.
- Avoid exposure to extreme temperatures.
- Avoid exposure to corrosive liquids.
- Use only the supplied power supply and cabling to ensure compliance with safety and FCC rules.

Appendix 2 – VIPS CAN Output v2

VIPS CAN outputs

Users can select Standard CAN outputs, Robot CAN outputs or both.
All multi-byte values are sent as big endian values.

Standard CAN outputs

ID	Byte							
	1	2	3	4	5	6	7	8
501	Kalman filtered Latitude ¹							
502	Kalman filtered Longitude ²							
503	Altitude ³			Speed ⁴		Heading ⁵		Flags ⁶
504	Time ⁷			0		ID ⁸	KF status ⁹	
505	X acceleration ¹⁰				Y acceleration ¹⁰			
506	Z acceleration ¹⁰				Roll rate ¹¹			
507	Pitch Rate ¹¹				Yaw Rate ¹¹			
508	Raw UWB Latitude ¹							
509	Raw UWB Longitude ²							
50A	Raw UWB Altitude ³			Raw UWB Speed ⁴		Raw UWB Heading ⁵		0
50B	KF Heading ⁵		KF Roll angle ¹²		KF Pitch angle ¹²		0	0
50C	Location in meters on X axis ¹³				Location in meters on Y axis ¹³			

¹ Latitude in degrees as IEEE 64 bit double. If bit 7 of Flags is set this value is location as meters on the X axis

² Longitude in degrees as IEEE 64 bit double. If bit 7 of Flags is set this value is location as meters on the Y axis

³ Altitude in meters * 100 as a 24 signed integer

⁴ Speed in knots * 100 as 16 bit unsigned integer

⁵ Heading in degrees *100 as 16 bit unsigned integer

⁶ Flags value contains multiple fields

Bit	Meaning
0-3	Beacon count 0-15
4 (0x10)	Horizontal position good
5 (0x20)	Vertical position good
6 (0x40)	Velocity good
7 (0x80)	Position is in meters (No origin set)

⁷ Time since midnight in units of 10 ms as a 24 bit unsigned integer

⁸ Rover Device ID

⁹ Internal Kalman filter status indicators as 16 bit unsigned integer

¹⁰ Acceleration in g as IEEE 32 bit float

¹¹ Rate in degrees per second as IEEE 32 bit float

¹² Angle in degrees *100 as 16 bit signed integer

¹³ IEEE 32 bit float

50D	Velocity in X direction ¹⁴	Velocity in Y direction ¹⁴
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Robot CAN outputs

ID	Byte							
	1	2	3	4	5	6	7	8
308	Latitude ¹⁵						Pos Quality ¹⁶	Solution Type
309	Longitude						Speed ¹⁷	
314	Time ¹⁸			Beacons used	0		Heading ¹⁹	

¹⁴ Velocity in m/s as an IEEE 32 bit float

¹⁵ 48 bit signed integer of minutes*10E7

¹⁶ A numerical position confidence indicator used for VIPS robot path following applications.

10	Difference between VIPS and KF estimated position is better than 5 cm.
9	Difference between VIPS and KF estimated position is between 5–10 cm.
8	Difference between VIPS and KF estimated position is between 10 cm and 1 m.
7	Path following position confidence is between 1–2 m.
2	When the KF has been enabled and IMU has sync'd but is not yet initialised. Once initialised it should report as per the above values.
1	When the IMU has not sync'd or if the KF has not been enabled.

¹⁷ Speed in Knots*100 as 16 bit unsigned integer

¹⁸ Time since midnight in units of 10 ms as a 24 bit unsigned integer

¹⁹ Heading in degrees *100 as 16 bit unsigned integer



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Document Number and version



QR code to online
documentation