VBOX Automotive
Indoor Positioning System

VIPS, the VBOX Indoor Positioning System employs ultra-wideband technology and an integrated IMU to accurately measure speed, position, and vehicle attitude (pitch/ roll/ yaw) in areas where GPS is not available.

The system consists of a minimum of eight beacons placed along the perimeter of the testing area that communicate with a receiver, called the rover, which is mounted on the vehicle's roof.

The accuracy of the system is optimized through a site survey, which ensures the exact location of each beacon is known and can be shared with the rover for location calculation to centimetre-level accuracy.

The VBOX 3i connects directly to the rover, allowing logging of additional parameters from the vehicle's CAN bus.

With seamless integration between indoor and outdoor environments, VIPS is perfectly suited for high dynamic applications.

VIPS Rover

VIPS Beacon

Features:

- Seamlessly transfers from outdoor GNSS to indoor VIPS and vice-versa.
- Centimetre-level accuracy in areas where GPS-based systems are unable to operate.
- Small, rugged, and low powered
- Connects directly to a VBOX 3i data logger using only one cable for simple configuration.
- A minimum of 8 and maximum of 250 beacons can be installed in each location allowing continuous coverage of tracks up to 3.5 km long.
- Simple one-time configuration either by Bluetooth or serial cable (RS232)
- 100 Hz update and low latency for high dynamic applications
- The rover automatically connects to the nearest beacon for optimum accuracy

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Specifications (Rover)

Velocity		Relative Positioning	
Accuracy (VB3i Kalman filtered)	0.1 km/h	Accuracy	X: ± 2 cm Y: ± 2 cm Z: ± 10 cm
Update rate	100 Hz	Update rate	100 Hz
Maximum velocity	270 km/h	Resolution	1 mm
Resolution	0.01 km/h	Latency with VBOX	85 ms

Accuracies are dependent on quality of installation and architecture of the location.

Distance		Acceleration	
Accuracy	0.05 % (<50 cm per km)	Accuracy	0.50 %
Update rate	100 Hz	Maximum	20 G
Resolution	1 cm	Resolution	0.01 G
		Update rate	100 Hz

Heading		Time	
Resolution	0.01°	Resolution	0.01 s
Update rate	100 Hz	Accuracy	30 ns
Accuracy	0.2° (rms)		

Brake Stop Accuracy (Trigger Activated)	
Accuracy	5 cm*

UWB Radio	
Frequency	Channel 4 – 3993.6 MHz ±450 MHz Channel 7 – 6489.6 MHz ±450 MHz
Transmit power	-41.3 dBm/MHz
FCC ID (Rover/Beacon)	2AU5C-VIPSR01 / 2AU5C-VIPSB01
IC (Rover/Beacon)	25649- VIPSR01 / 25649- VIPSB01

* Based on <50 m brake stop distance. All performance measurements are subject to accurate site survey and installation.

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Inputs (Rover)

Unit Power	
Input Voltage Range	7 – 30 V DC, 100 mA
Power Consumption	< 3 W
Digital Input	
Input Function	1 PPS*

Outputs (Rover)

RS232	
RS232 Port 1	Position and velocity
RS232 Port 2	IMU04 data
Output data rate	100 Hz
Digital Output	
Signal Levels	Low = 0 V, High = 5 V
Output Type	1 PPS*

Inputs (Beacon)

Unit Power	
Input Voltage Range	7 – 30 V DC, 100 mA
Power Consumption	< 3 W

Outputs (Beacon)

RS232	
RS232 Port 1	Configuration only

*PPS can be used as an input or output. When the rover is connected to a VBOX3i, it can only be used as an input.

Environmental and Physical

Environmental and physical	
IP rating	IP 67;
Operating temperature	-20˚C to +60˚C
Storage temperature	-40°C to +85°C
Size (of each beacon / rover)	124 mm (D) x 74.5 mm (H)
Weight beacon	302 g (0.67 lbs)
Weight rover	322 g (0.71 lbs)

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IMU Specifications

	Gyroscopes (Angular rate sensors)	Accelerometers
Dynamic range	± 450 °/s	± 20 g
Nonlinearity	0.01 % of full scale	Nonlinearity (± 1g)[1]: typical 0.03 % FS; max. 0.05 % FS
Resolution	20 bits (0.00085 °/s)[2]	20 bits (0.00004 g)[2]
Bandwidth	50 Hz	50 Hz
Noise density (Random walk)	0.01 °/s/√Hz (0.6 °/√hr)	90 µg/√Hz (0.055 m/s/√hr)
Bias stability	±0.0028 °/s	15 µg
Bias repeatability (1 year)	0.2 °/s	0.005 g

[1]For full scale range of ± 20g the nonlinearity is 0.1%.
[2]Effective resolution is after allowing for oversampling and averaging.

Please note: Inertial measurement sensors are highly sensitive mechanical systems. Their performance and life span can be impacted by severe vibration or heavy knocks, and we can only guarantee the gyroscope and accelerometer specifications for a maximum of 2 years from the date of purchase.

Package Contents

Description	Product Code
VIPS Vehicle Rover	
VIPS Rover unit (inc. IMU Module and Prism)	VIPS-R-V2
VIPS Rover/ Beacon serial configuration cable (2 m)	RLCAB151
VIPS Rover cable to VBOX 3i (7W Lemo to 5W Lemo + DB-25) (3 m)	RLCAB153
USB to Serial connector (10 cm)	RLVBACS035
VIPS Static Beacon*	
VIPS Beacon Unit*	VIPS-B-V1
Beacon Tripod VIPS adaptor plate*	MECH0422
VIPS Beacon power cable (3 m)*	RLCAB152

*A standard VIPS system requires a minimum of 8 Beacons and 1 Rover to operate.

Unit Dimensions