

# VBOX 3i Dual Antenna

## Measures Slip and Pitch/Roll (RLVB3iSL-V5)

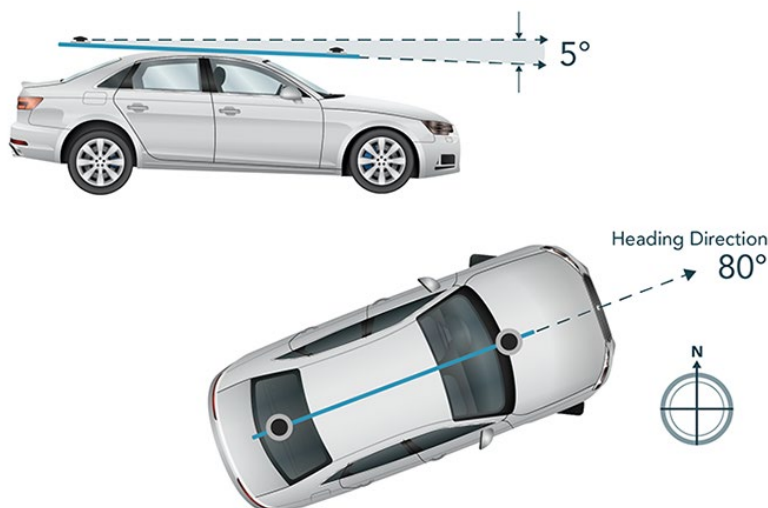


A VBOX 3i Dual Antenna (VB3iSL) uses a GPS/GLONASS receiver to achieve high level accuracy, as well as two antennas to measure slip and pitch/roll angles at 100 Hz.

The system is so accurate that it can even detect the difference a side wind makes to the slip angle measurement, a feat that even the very best inertial systems cannot currently replicate.

VB3iSL is ideal for ESC, Aquaplane, Centreline Deviation and Lane Change testing where slip angle is required.

The VBOX Test Suite software analysis package allows for a detailed examination of VBOX data, along with an intuitive interface that is accessible for all users from engineer to test driver.



VB3iSL is compatible with all existing peripherals, including the Inertial measurement unit which provides a highly accurate speed, distance, heading, and yaw rate measurement for use in ESC testing with a steering robot.

Included within the VB3iSL package is a configuration display, which enables you to change the dynamic modes and filter settings, set up slip angle data and define antenna locations.

An optional Dual Antenna Mounting Pole (max. width 2.5 m) ensures the most accurate attitude measurement.

## Features

- Simultaneous measurement of slip angle, pitch/roll Angle, yaw rate, true heading, and lat./long. velocity
- Very low latency:  $8.5 \pm 1$  ms
- 4 x analogue inputs / 2 x digital outputs
- 1x default CAN Bus port for input module expansion
- 1x configurable CAN Bus for vehicle CAN interface or VBOX data output
- Oversampled brake/event trigger
- Non-contact 100 Hz data acquisition using GPS and GLONASS
- Audio voice tagging
- Bluetooth, USB and RS-232 serial interface
- Data logged to Compact Flash Card
- 2 x 16-bit user configurable analogue outputs
- User configurable logging conditions

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### System

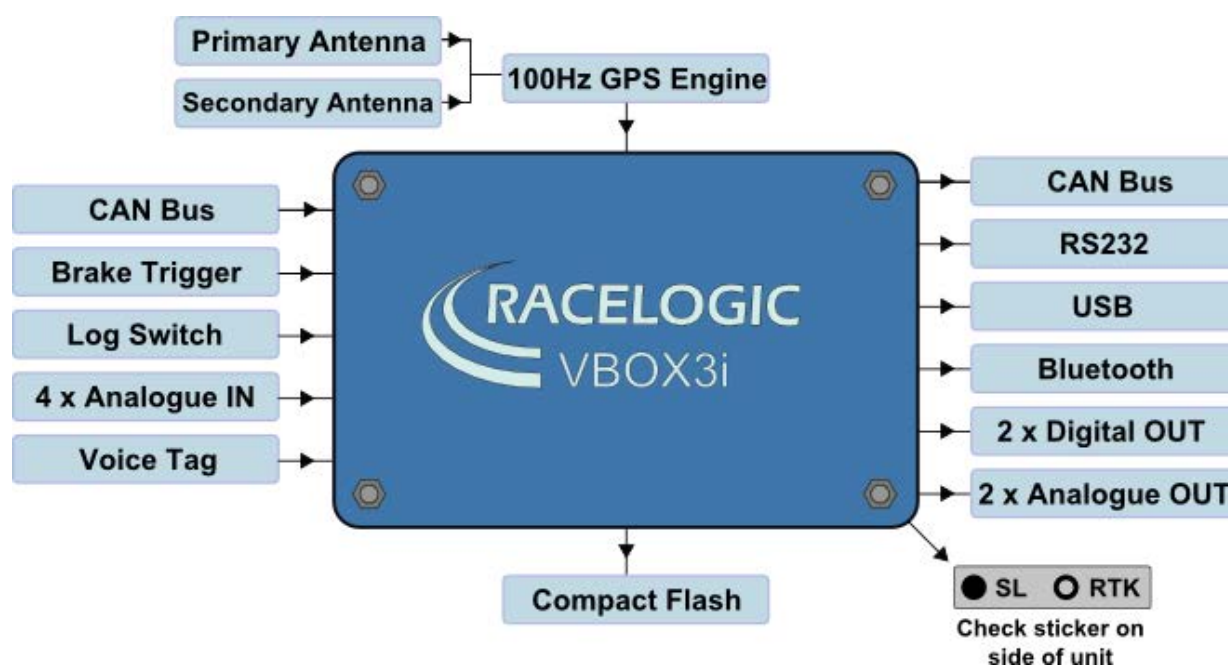
#### 100 Hz GNSS Engine

VB3iSL features a powerful GNSS engine embracing two antennas capable of providing 100 Hz signal update rate for all GPS / GLONASS parameters (i.e. velocity, heading & position). Velocity and heading are calculated via Doppler Shift in the GPS carrier signal, providing you with unparalleled data accuracy.

In addition to GPS, the VB3iSL tracks the Russian GLONASS range of satellites. The advantage of using both satellite constellations is that there are almost twice as many satellites in view: this helps to maintain a robust satellite lock in areas where 'GPS only' reception can cause data interruption.

#### Slip and Pitch/Roll measurement using two antennas

Utilising two GPS/GLONASS antennas, the VB3iSL measures all the normal VBOX GPS parameters, plus the azimuth and elevation between the antennas, i.e. the direction the antennas are pointing, and the angle between them measured from the horizontal. This allows the unit to measure slip angle, and pitch angle (or roll angle depending on how the antennas are mounted), all at 100 Hz. This system is ideal for vehicle dynamics testing.



**Note:** On a VBOX 3i Dual Antenna the 'SL' feature is ticked on the silver serial label. All units with the 'IMU04 ready' sticker can be used for GPS/INS integration using the IMU04.

#### Compact Flash

VB3iSL can accept Type I compact flash cards to log data. Data is stored in a standard PC format allowing fast transfer of data to a PC equipped with a compact flash card reader. The file format is an ASCII text file that can be loaded directly into VBOX Test Suite software or imported into Excel and other third-party software.

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### Inputs / Outputs

Inputs	Outputs
<b>CAN Bus</b> Two CAN Bus interfaces are available. By utilising separate CAN Bus connections, it allows data to be logged from external modules (e.g. TC8, FIM02). Up to 16 CAN signals can also be logged from a different CAN source (e.g. Vehicle CAN Bus). When logging data from another source, VBOX Test Suite can load signal data from an industry standard CAN database file (.DBC).	<b>CAN Bus</b> One of the two VBOX CAN ports can be used to output VBOX GPS parameters plus any 12 channels from connected input modules or internal AD channels. The baud rate and CAN ID's for these outputs are user configurable.
<b>Brake Trigger</b> By using a physical pressure switch on the brake pedal, a precise 'start of braking event' can be captured.	<b>RS232</b> RS232 connector is used for VBOX configuration and output of real-time GPS data. Serial data sent to the software is limited by the bandwidth of the PC serial port - 20 Hz (Full 100 Hz serial is available via USB / Bluetooth).
<b>Log Switch</b> A start/stop logging switch allows users to manually choose when they wish to record data.	<b>USB</b> VB3iSL USB connector can be used for VBOX Configuration to output real-time data at 100 Hz.
<b>4x Analogue Input</b> Each of the four Analogue Input channels on a VB3iSL has a dedicated analogue converter. Data is recorded from each channel simultaneously to avoid latency between analogue channel data. The name, scale and offset of each Analogue Input channel can be adjusted using VBOX Test Suite software to allow sensor calibration and therefore logging of data in standard SI units.  The Analogue Input connector also provides two power outputs that may be used for driving sensors. These are in the form of a 5v DC isolated supply and an output equal to the VBOX power supply voltage.	<b>2x Analogue Outputs</b> 2x 16-bit analogue outputs can be configured to output velocity (or other GPS parameters) for use by additional data logging equipment. The voltage output range is from 0 to 5 V DC with a resolution of 76 µV per bit.
	<b>2x Digital Outputs</b> Two digital outputs are available. One Digital output is assigned to Speed/Distance – configurable via Pulses per Meter. While the second is a level switch output enabling users to select any one of the logged channels and assign it a threshold value.
<b>Voice Tagging</b> VB3iSL can record a GPS synchronised WAV audio tag up to 30 seconds long to a time accuracy of 0.5 sec. The recorded WAV file is then logged to the CF card.	<b>Bluetooth</b> VB3iSL comes equipped with an internal Bluetooth Radio allowing remote configuration and remote output of real-time GPS data to any Bluetooth capable PC or Data logger. The Bluetooth connection can send data at the full 100 Hz rate.
<b>Power Supply</b> VB3iSL can accept a supply voltage between 7 to 30 V DC. Low current consumption results in extended battery life.	

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### GPS Specifications

Velocity		Distance	
<b>Accuracy</b>	0.1 km/h (averaged over 4 samples)	<b>Accuracy</b>	0.05% (<50 cm per Km)
<b>Units</b>	km/h or mph	<b>Units</b>	metres / feet
<b>Update rate</b>	100 Hz	<b>Update rate</b>	100 Hz
<b>Maximum velocity</b>	1000 mph	<b>Resolution</b>	1 cm
<b>Minimum velocity</b>	0.1 km/h		
<b>Resolution</b>	0.01 km/h		
<b>Latency</b>			
Minimum	8.5 ±1 ms		
Fixed CAN delay, no IMU integration	15.5 ms		
Fixed CAN delay, with IMU integration	20 ms		

Absolute Positioning (RMS)		Time	
<b>Accuracy* (Standalone)</b>	V: 1.8 m; H: 1.2 m	<b>Accel/Brake Test (MFD/VBOX Test Suite)</b>	
<b>Accuracy* with SBAS</b>	V: 1.2 m; H: 0.8 m	<b>Resolution</b>	0.01 s
<b>Accuracy* with DGPS</b>	V: 0.5 m; H: 0.3 m	<b>Accuracy</b>	0.01 s
		<b>Lap Timing (OLED/VBOX Test Suite)</b>	
<b>Update rate</b>	100 Hz	<b>Resolution</b>	0.01 s
<b>Resolution</b>	1.8 mm	<b>Accuracy</b>	0.01 s**

Acceleration		Environmental & Physical	
<b>Accuracy</b>	0.50%	<b>Weight</b>	Approx. 900 g
<b>Maximum</b>	20 g	<b>Size</b>	170 x 121 x 41mm
<b>Resolution</b>	0.01 g	<b>Operating temperature</b>	-20°C to +70°C
<b>Update rate</b>	100 Hz	<b>Storage temperature</b>	-30°C to +80°C

Heading		Brake Stop Accuracy	
<b>Resolution</b>	0.01°	<b>Accuracy</b>	+/- 1.8 cm
<b>Accuracy</b>	0.1°		

Memory		Power	
<b>Compact Flash</b>	Type I	<b>Input Voltage Range</b>	7 – 30 V DC
<b>Recording time</b>	Dependent on flash card capacity***	<b>Power</b>	Max. 5.5 Watts

\* Specifications will vary depending on the number of satellites used, obstructions, satellite geometry (PDOP), multipath effects, and atmospheric conditions. For maximum system accuracy, always follow best practices for GNSS data collection.

\*\* Not using DGPS and crossing the start/finish line at 100 km/h

\*\*\* Approximately 29 MB per hour used when logging GPS data at 100 Hz. Approx. 182 MB per hour total logging capacity



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### Slip, Pitch, Roll Angle Accuracies

Antenna Separation	Slip Angle (RMS)	Pitch / Roll Angle (RMS)
0.5 m	<0.2°	<0.14°
1.0 m	<0.1°	<0.07°
1.5 m	<0.067°	<0.047°
2.0 m	<0.05°	<0.035°
2.5 m	<0.04°	<0.028°

### Outputs

CAN Bus	
Bit rate	125 Kbits, 250 Kbits ,500 Kbits & 1 Mbit selectable baud rate
Identifier type	Standard 11-bit 2.0 A
Data available	Satellites in View, Latitude, Longitude, Velocity, Heading, Altitude, Vertical Velocity, Distance, Longitudinal Acceleration & Lateral Acceleration, Distance from Trigger, Trigger, Time, Trigger Velocity

Analogue		Digital	
Voltage range	0 – 5 V DC	Frequency range	DC to 44.4 KHz
Default setting (The range settings can be adjusted by the user in VBOX Test Suite Software.)	Velocity 0.0125 Volts per km/h (0 to 400 km/h)	Default setting (The range settings can be adjusted by the user in VBOX Test Suite Software.)	Velocity 25 Hz per km/h (0 to 400 km/h) 90 pulses per metre
Accuracy	0.1 km/h	Accuracy	0.1 km/h
Update rate	100 Hz	Update rate	100 Hz

### Inputs

CAN Bus	
RACELOGIC modules	Up to 32 channels from any combination of ADC02, ADC03, FIM02, TC8, YAW03 or CAN01
External CAN Bus	16 Channels of user definable CAN signal from external bus, e.g. Vehicle CAN bus Can load signal data from industry standard DBC database file

Analogue		Digital	
Number of channels	4	Brake event trigger	25 ns resolution
Input range	±50 V	On/Off logging control	Remote log control from hand-held switch
Channel sample order	Synchronous		
DC accuracy	± 2 mV (calibrated at 23°C)		

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### Hardware & Software Support

Support	
Hardware	One Year Support Contract
Software	Lifetime Support Contract: Valid for a minimum of 5 years from the date of purchase and limited to the original purchaser. Contract includes telephone/ email technical support provided by local VBOX Distributor and firmware/ software upgrades (where applicable).

### Package Contents

Description	Product Code
1x VBOX 3i SL unit	VB3iSL-V5
1x VBOX Manager	VBFMAN
1x VBOX Mains Charger	RLVBACS020
2x GPS/GLONASS Low profile antenna (4 m removable cable)	RLACS156
1x 4GB Compact Flash Card	RLACS098
1x VBOX Serial PC cable (5-way LEMO to 9-way D-type serial cable – 2 m)	RLCAB001
1x VBOX 3i Bluetooth antenna	RLACS119
1x VBOX 3i Audio Headset	RLACS120
1x 25-way D-type connector	ADC25IPCON
1x USB 'A' to Mini 'B' 2m cable (USB Configuration)	RLCAB066-2
1x 2-way LEMO power lead to 12V cigar lighter – 2m	RLCAB010LE
2x Spare fuse 3.15A 250 V	416-610
1x USB multi card reader	RLACS163
1x 5-Way Lemo to 5-Way Lemo cable – 2m	RLCAB005-C
1x VBOX Tape Measure	RLACS091
1x Spare Antenna Cable	RLCAB071-4
1x VBOX Padded carry case	RLVBACS013

Optional:

1x Dual Antenna Roof Mounting Pole (2.5m max.)	RLACS171
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