

# VBOX3i – Dual Antenna with RTK

High positional accuracy with pitch/slip and roll (VB3iSL-RTK)



VBOX3i SL-RTK is Racelogic's most powerful GPS data logging system. The VB3iSL-RTK combines high level accuracy and test repeatability with the ability to measure slip and pitch/roll angles at 100Hz with high positional accuracy at 2cm 95% CEP.

The VB3iSL-RTK is ideal for testing the following applications:

- Braking
- Dynamics and handling
- Performance tests and benchmarking
- Tyre testing



VBOX 3iSL-RTK has the added capability of detecting signal from both GLONASS and GPS satellites, making the 2cm RTK lock robust, resilient and quicker to access. When connected to the optional BaseStation, a wide range of ADAS tests can be completed, including:

- Accurate track mapping
- Adaptive cruise control
- Auto parking systems development
- Blind spot detection
- Collision/pedestrian mitigation
- Lane departure



As with previous VBOX models, VB3iSL-RTK is compatible with all existing peripherals including Multifunction Display, 16bit Analogue Input, 4 Channel Frequency and Pulse Counter Input Module, 8 Channel Thermocouple Interface and Yaw rate sensor. Included within the VBOX3iSL package is VBOX Manager.

## Features

- Non-contact 100Hz speed and distance measurement using GPS + GLONASS
- 100Hz RTK and GLONASS options
- Positional accuracy up to 2cm with (optional) RTK BaseStation
- Simultaneous measurement of Slip Angle, Pitch/Roll Angle, Yaw rate, True Heading, Lateral Velocity and Longitudinal Velocity
- Very low latency: 6.75ms
- 4 x 24bit differential analogue input channels with  $\pm 50v$  input range and synchronous capture
- Brake/Event Trigger input 10ns resolution
- RS232 serial, USB & Bluetooth Interface
- Audio voice tagging with microphone included
- Data logged to compact flash memory card
- 2 x 16bit User configurable analogue outputs
- 2 x Digital outputs
- User configurable logging conditions
- Logging rate selectable to 100Hz, 50Hz, 20Hz, 10Hz, 5Hz, 1Hz
- Wide 7V to 30V operating range
- Low current consumption
- 2 x CAN Bus interface for data input & output

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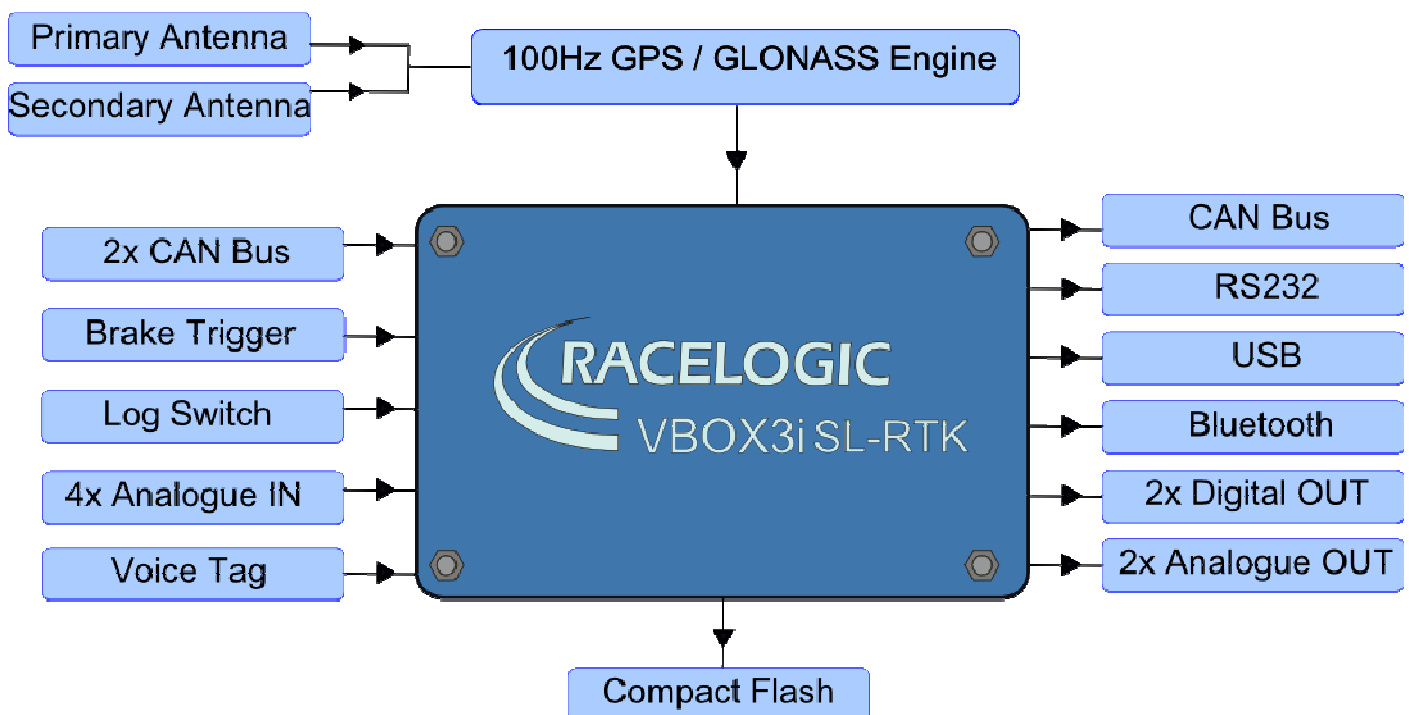
## System

### 100Hz GPS Engine

VB3iSL-RTK features a powerful GPS engine embracing twin antennas capable of providing 100Hz 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.

### Dual Antenna

Utilising two GPS antennas additional parameters can be measured. Slip and pitch/roll angles can now be more accurately defined, making this system ideal for vehicle dynamics testing.



### Compact Flash

VB3iSL-RTK 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 Tools software, or imported into Excel and other third party software.

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| Inputs   | Outputs   |
|--|---|
| <p><b>CAN Bus</b></p> <p>Two CAN Bus interfaces are available on VB3iSL-RTK. 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 Tools can load signal data from an industry standard CAN database file (.DBC).</p>   | <p><b>CAN Bus</b></p> <p>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.</p>   |
| <p><b>Brake Trigger</b></p> <p>By using a physical pressure switch on the brake pedal, a precise 'start of braking event' can be captured.</p>   | <p><b>RS232</b></p> <p>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 - 20Hz (Full 100hz serial is available via USB / Bluetooth).</p>   |
| <p><b>Log Switch</b></p> <p>A start/stop logging switch allows users to manually choose when they wish to record data.</p>   | <p><b>USB</b></p> <p>VB3iSL-RTK USB connector can be used for VBOX Configuration to output real-time data at 100Hz.</p>   |
| <p><b>4x Analogue Input</b></p> <p>Each of the four Analogue Input channels on a VB3iSL-RTK has a dedicated 24bit 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 Tools software to allow sensor calibration and therefore logging of data in standard SI units.</p> <p>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.</p> | <p><b>2x Analogue Outputs</b></p> <p>2x 16bit 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 5v DC with a resolution of 76 <math>\mu</math>V per bit.</p> <p><b>2x Digital Outputs</b></p> <p>Two digital outputs are available on VBOX3i SL. 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.</p> |
| <p><b>Voice Tagging</b></p> <p>VB3iSL-RTK 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.</p>  | <p><b>Bluetooth</b></p> <p>VB3iSL-RTK 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 is capable of sending data at the full 100Hz rate.</p>   |
| <p><b>Power Supply</b></p> <p>VB3iSL-RTK can accept a supply voltage between 7 to 30V DC. Low current consumption results in extended battery life.</p>  |   |

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## GPS Specifications

| Velocity         |                                    | Distance                  |                       |
|------------------|------------------------------------|---------------------------|-----------------------|
| Accuracy         | 0.1 Km/h (averaged over 4 samples) | Accuracy                  | 0.05 % (<50cm per Km) |
| Units            | Km/h or Mph                        | Units                     | Metres / Feet         |
| Update rate      | 100 Hz                             | Update rate               | 100 Hz                |
| Maximum velocity | 1000 Mph                           | Resolution                | 1 cm                  |
| Minimum velocity | 0.1 Km/h                           | Height accuracy           | 6 Metres 95% CEP*     |
| Resolution       | 0.01 Km/h                          | Height accuracy with DGPS | 2 metres 95% CEP*     |
| Latency          | 6.75 ms                            |                           |                       |

| Absolute Positioning     |                  | Time                                     |          |
|--------------------------|------------------|--|----------|
| Accuracy                 | 2m 95% CEP*      | <i>Accel/Brake Test (MFD/VBOX Tools)</i> |          |
| Accuracy with SBAS DGPS  | <1m 95% CEP*     | Resolution                               | 0.01 s   |
| Accuracy with EGNOS DGPS | 70cm 95% CEP*    | Accuracy                                 | 0.01 s   |
| Accuracy with WAAS DGPS  | 1.5m*** 95% CEP* | <i>Lap Timing (OLED/VBOX Tools)</i>      |          |
| Accuracy with RTCM DGPS  | 40cm*** 95% CEP* | Resolution                               | 0.01 s   |
| Accuracy with RTK DGPS   | 2cm 95% CEP*     | Accuracy                                 | 0.01 s** |
| Update rate              | 100 Hz           |  |          |
| Resolution               | 1.8 mm           |  |          |

\*\*\* To be confirmed

| Acceleration |        | Environmental and physical |                   |
|--------------|--------|----------------------------|-------------------|
| Accuracy     | 0.50%  | Weight                     | Approx. 900 grams |
| Maximum      | 20 G   | Size                       | 170 x 121 x 41mm  |
| Resolution   | 0.01 G | Operating temperature      | -20°C to +70°C    |
| Update rate  | 100 Hz | Storage temperature        | -30°C to +80°C    |

| Heading    |       | Brake stop accuracy |         |
|------------|-------|---------------------|---------|
| Resolution | 0.01° | Accuracy            | +/- 2cm |
| Accuracy   | 0.1°  |                     |         |

### Definitions

\* 95% CEP (Circle of Error Probable) means 95% of the time the position readings will fall within a circle of the stated Radius. 2cm accuracy requires an RTK option and RTK enabled Base Station

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

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| Slip Angle |  |
|------------|--|
| Accuracy   | <0.2° rms at 0.5m antenna separation   |
|            | <0.1° rms at 1.0m antenna separation   |
|            | <0.067° rms at 1.5m antenna separation |
|            | <0.05° rms at 2.0m antenna separation  |
|            | <0.04° rms at 2.5m antenna separation  |

| Pitch / Roll Angle |  |
|--------------------|--|
| Accuracy           | <0.14° rms at 0.5m antenna separation  |
|                    | <0.07° rms at 1.0m antenna separation  |
|                    | <0.047° rms at 1.5m antenna separation |
|                    | <0.035° rms at 2.0m antenna separation |
|                    | <0.028° rms at 2.5m antenna separation |

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

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

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## Outputs

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

| Analogue                 |   | Digital                  |  |
|--------------------------|---|--------------------------|--|
| <b>Voltage range</b>     | 0 to 5Volts DC                                    | <b>Frequency range</b>   | DC to 44.4Khz  |
| <b>Default setting *</b> | Velocity<br>0.0125Volts per Km/h<br>(0 - 400Km/h) | <b>Default setting *</b> | Velocity<br>25Hz per Km/h (0 - 400Km/h)<br>90 pulses per metre |
| <b>Accuracy</b>          | 0.1 Km/h  | <b>Accuracy</b>          | 0.1Km/h  |
| <b>Update rate</b>       | 100Hz   | <b>Update rate</b>       | 100Hz  |

### Definitions

\* The range settings can be adjusted by the user in VBOX Tools Software

## Inputs

| CAN Bus                  |   |
|--------------------------|---|
| <b>Racelogic modules</b> | Up to 32 channels from any combination of ADC02, ADC03, FIM02, TC8, Yaw sensor or CAN01   |
| <b>External CAN Bus</b>  | 16 Channels of user definable CAN signal from external bus, e.g. Vehicle CAN bus<br>Can load signal data from industry standard DBC database file |

| Analogue                    |             | Digital                       |  |
|-----------------------------|-------------|-------------------------------|--|
| <b>Number of channels</b>   | 4           | <b>Brake event trigger</b>    | 10ns resolution                          |
| <b>Input range</b>          | ±50v        | <b>On/Off logging control</b> | Remote log control from hand-held switch |
| <b>Channel sample order</b> | Synchronous |                               |  |
| <b>Resolution</b>           | 24 bit      |                               |  |
| <b>DC accuracy</b>          | 400 µV      |                               |  |

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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 VBOX3i SL-RTK unit  | VB3iSL-RTK   |
| 1x VBOX Manager  | RLVBFMAN     |
| 1x VBOX mains charger  | RLVBACS020   |
| 2x GPS/GLONASS ground plane antenna with 4m removable cable            | RLACS156     |
| 1x 4GB Compact Flash Card  | RLACS098     |
| 1x VBOX Serial PC cable (5-way LEMO to 9-way D-type serial cable - 2m) | RLCAB001     |
| 1x VBOX3i Bluetooth antenna  | RLACS119     |
| 1x VBOX3i Audio Headset  | RLACS120     |
| 1x 25-way D-type connector   | ADC25IPCON   |
| 1x USB A – Mini B Lead 2m  | RLCAB066-2   |
| 1x 2-way LEMO power lead to 12V cigar lighter – 2m                     | RLCAB010L    |
| 1x 5-way LEMO to 5-way LEMO- CAN only cable                            | RLCAB005-C   |
| 2x spare fuse 3.15A 250V   | 416-610      |
| 1x USB multi card reader   | RLACS163     |
| 1x VBOX Padded carry case  | RLVBACS013   |
| 1x VBOX User Manual  | VB3iMAN      |
| 1x VBOX Tools Software Manual  | VBTOOLSMANA5 |
| 1x VBOX Tools Software CD  | RLVBACS030   |
| 1x VBOX Tape Measure   | RLACS091     |
| 1x VBOX3i SL Cable identification                                      | VB3iSL-CABID |