VBOX 3i RTK

High positional accuracy for ADAS testing (VB3iDR-V5)

The VBOX 3i RTK is an RTK enabled version of the VBOX 3i Dual Antenna which can be used in conjunction with an RTK differential Base Station to obtain cm-level positional accuracy.

VBOX 3i RTK combines high level accuracy and test repeatability with the ability to measure slip and pitch/roll angles at 100 Hz. Its capability of detecting signals from both GLONASS and GPS satellites, makes the RTK lock robust, resilient, and quicker to access.

VBOX 3i RTK is compatible with all existing peripherals including Multifunction Display, 16-bit Analogue Input, 4 Channel Frequency and Pulse Counter Input Module, 8 Channel Thermocouple Interface and Yaw rate sensor.

In conjunction with an RTK DGPS Base Station, VBOX 3i RTK can be used in any number of vehicle tests where positional accuracy and repeatability are of the utmost importance, including ADAS tests like Adaptive cruise control, Auto parking systems development, Blind spot detection, Collision/pedestrian mitigation and Lane departure warning.

VBOX 3i RTK comes with a VBOX Manager, a display enabling you to change the dynamic modes and filter settings, set up slip angle data and define antenna locations.

A Dual Antenna Mounting Pole (needs to be ordered separately) ensures optimum antenna separation and the most accurate attitude measurement.

Features

- Centimetre-level positional accuracy with an RTK Base Station, ±5 cm vehicle separation accuracy when used in a Moving Base setup
- Resilient RTK lock using GPS + GLONASS
- Measures slip angle, pitch (or roll) angle and yaw rate at 100 Hz
- Very low latency
- 4 x 24-bit differential analogue input channels with ±50 V input range and synchronous capture
- Oversampled brake/event trigger input (25 ns)
- RS232 serial, USB & Bluetooth Interface
- Audio voice tagging (microphone included)
- Data logged to compact flash memory card
- 2 x 16-bit user configurable analogue outputs
- 2 x Digital outputs
- User configurable logging conditions
- Logging rate selectable to 100 Hz, 50 Hz, 20 Hz, 10 Hz, 5 Hz, 1 Hz
- Wide 7 V to 30 V operating range
- Low current consumption
- 2 x CAN Bus interface for data input & output
- Free lifetime support

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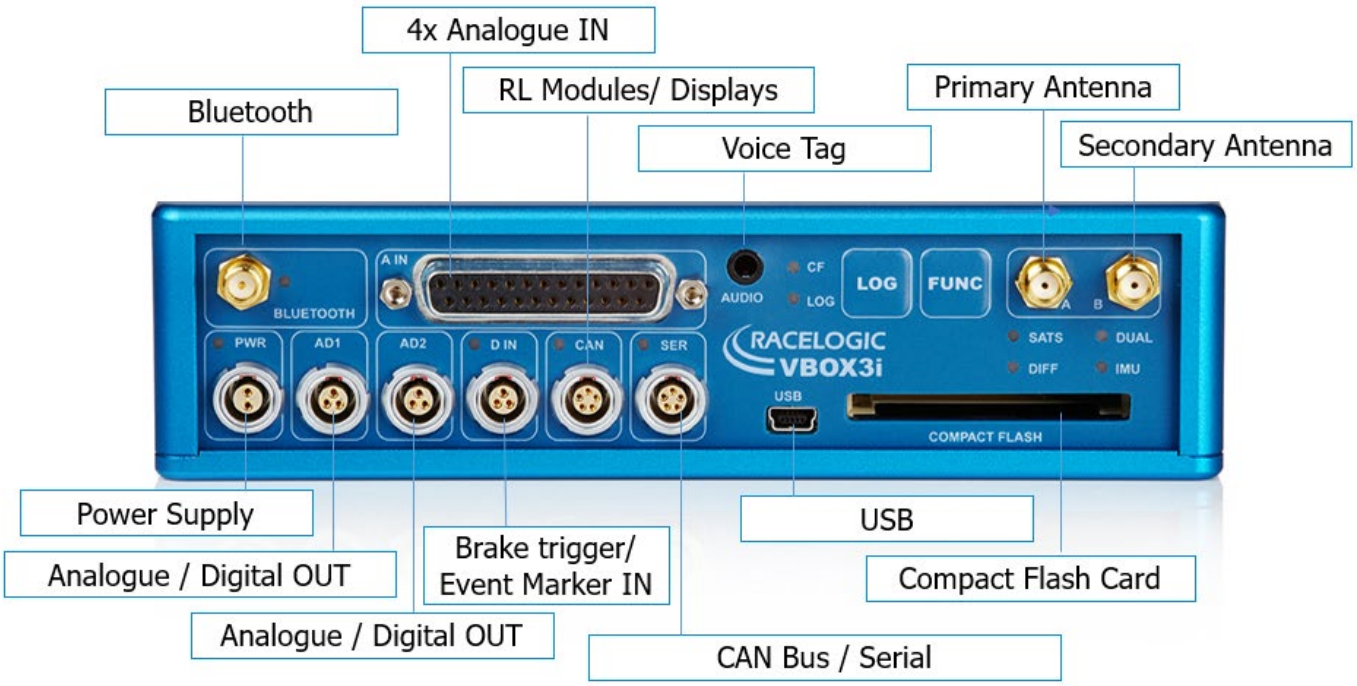
Interfaces



100 Hz GNSS Engine

VBOX 3i RTK features a powerful GPS engine embracing two antennas capable of providing 100 Hz signal update rate for all GPS / GLONASS parameters (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.

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

VBOX 3i 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 Test Suite software or imported into Excel and other third-party software.

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Inputs / Outputs

Inputs	Outputs
CAN Bus Two CAN Bus interfaces are available on VB3iSLR. By utilising separate CAN Bus connections, it allows data to be logged from external modules (e.g., TC8, FIM03). 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).	**CAN Bus** 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.
Brake Trigger By using a physical pressure switch on the brake pedal, a precise 'start of braking event' can be captured.	**RS232** 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).
Log Switch A start/stop logging switch allows users to manually choose when they wish to record data.	**USB** VB3iDR USB connector can be used for VBOX Configuration to output real-time data at 100 Hz.
4x Analogue Input Each of the four Analogue Input channels on a VB3iDR 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.	**2x Analogue Outputs** 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. **2x Digital Outputs** 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.
Voice Tagging VB3iDR 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.	**Bluetooth** VB3iDR 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.
Power Supply VB3iDR 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	
Accuracy	0.1 km/h (averaged over 4 samples)	**Accuracy**	0.05 % (<50 cm per km)
Units	km/h or mph	**Units**	m / ft
Update rate	100 Hz	**Update rate**	100 Hz
Maximum velocity	1000 mph	**Resolution**	1 cm
Minimum velocity	0.1 km/h		
Resolution	0.01 km/h		
Latency			
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	
Accuracy* (Standalone)	V: 1.8 m; H: 1.2 m	***Accel/Brake Test (MFD/VBOX Test Suite)***	
Accuracy* with SBAS	V: 1.2 m; H: 0.8 m	**Resolution**	0.01 s
Accuracy* with DGPS	V: 0.5 m; H: 0.3 m	**Accuracy**	0.01 s
Accuracy* with RTK	V: 10 mm; H: 5 mm		
		Lap Timing (OLED/VBOX Test Suite	
Update rate	100 Hz	**Resolution**	0.01 s
Resolution	1.8 mm	**Accuracy**	0.01 s**

Acceleration		Environmental and physical	
Accuracy	0.50 %	**Weight**	Approx. 900 g
Maximum	20 g	**Size**	170 x 121 x 41 mm
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**	+/- 1.8 cm
Accuracy	0.1°		

Memory		Power	
Compact Flash	Type I	**Input Voltage Range**	7 – 30 V DC
Recording time	Dependent on flash card capacity***	**Power**	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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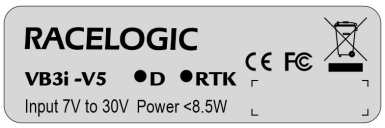
Package Contents

Description	Product Code
1x VBOX 3i RTK unit	VB3iDR-V5
1x VBOX Manager	VBFMAN
1x Mains Power Supply	RLVBACS020
2x GPS/GLONASS Low profile antenna (4 m removable cable)	RLACS156RTK
1x Spare Antenna Cable	RLCAB080-4
1x 4 GB 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
1x USB multi card reader	RLACS163
1x 5-Way Lemo to 5-Way Lemo cable – 2m	RLCAB005-C
1x VBOX Tape Measure	RLACS091
1x VBOX Padded carry case	RLVBACS013

Optional:
RTK Base Station (RLVBBS6) and telemetry radios, NTRIP Modem (RLVBNTRIPMDM), Dual Antenna Roof Mounting Pole (RLACS171)



Please note: On a VBOX 3i RTK, the dual antenna feature '**D**' and the '**RTK**' feature are ticked on the silver serial label. All units with the '**IMU04 ready**' sticker can be used for GPS/INS integration using the IMU04.

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