VBOX Micro

User Guide

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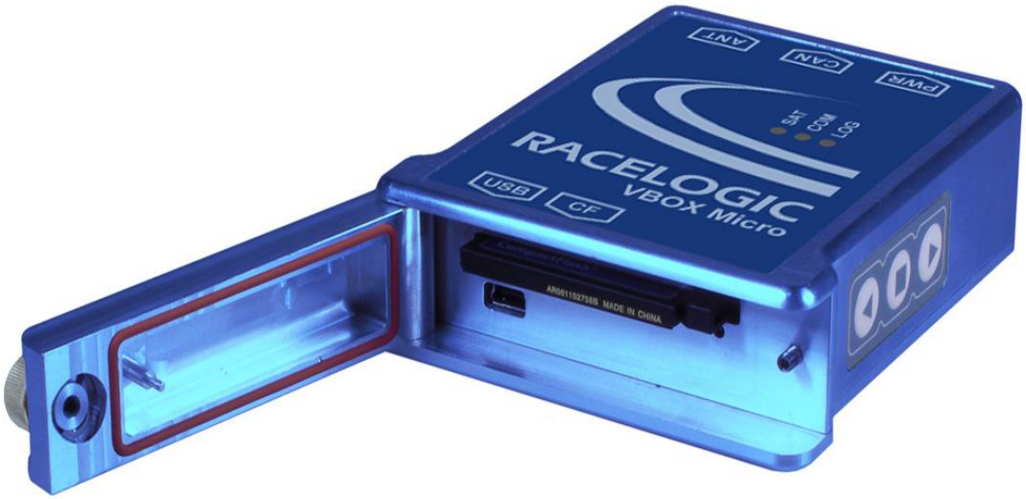
Introduction

The VBOX Micro is a small, waterproof (IP66) GPS data-logging device, which records your speed, position, acceleration and many other parameters. This data is stored on a removable compact flash card. Software provided with the unit allows you to view and analyse all of the parameters, which have been recorded, allowing you to see how fast you were going at any time, your maximum g-force, where you went on Google Earth and many other interesting and useful parameters.

The fastest recording rate is 10 samples per second, which is good for capturing fast events like a sports car on a circuit, a downhill skier or even a mountain biker. The slowest recording rate is 1 sample per minute, which is useful for more long term testing such as vehicle endurance testing, mileage/route analysis or even the movement of a ship. VBOX Micro logs 116 bytes/sample (default standard channels), at a log rate of 10Hz this equates to 4.2Mbytes/hour. Using a 512Mbyte compact flash card, at a log rate of 10 Hz, you get around 120 hours recording, and at 1 sample per minute you get over 3000 days recording!

The VBOX Micro records the following parameters as standard: Time, Position, Velocity, Heading, Height, Vertical Velocity, and Accumulated Distance. You can also record other parameters, either by connecting directly to your vehicle's CAN bus (RLVBMIC01C), or by connecting a suitable external input module.



What Can The VBOX Micro Do?

- Measure speed, distance and acceleration
- Analyse driving line
- Compare driving style with others
- See if the most is being made of tyres during braking and cornering
- Plot routes on Google Earth
- Measure acceleration figures, top speed, ¼ mile etc.
- Take it anywhere – IP66 sealed against water, mud, dust etc.
- Choose a sample rate from 10 times a second to once per minute
- Attach input modules to log additional channels
- Connect to CAN bus of vehicle
- Connect via CAN to a third party data-logger

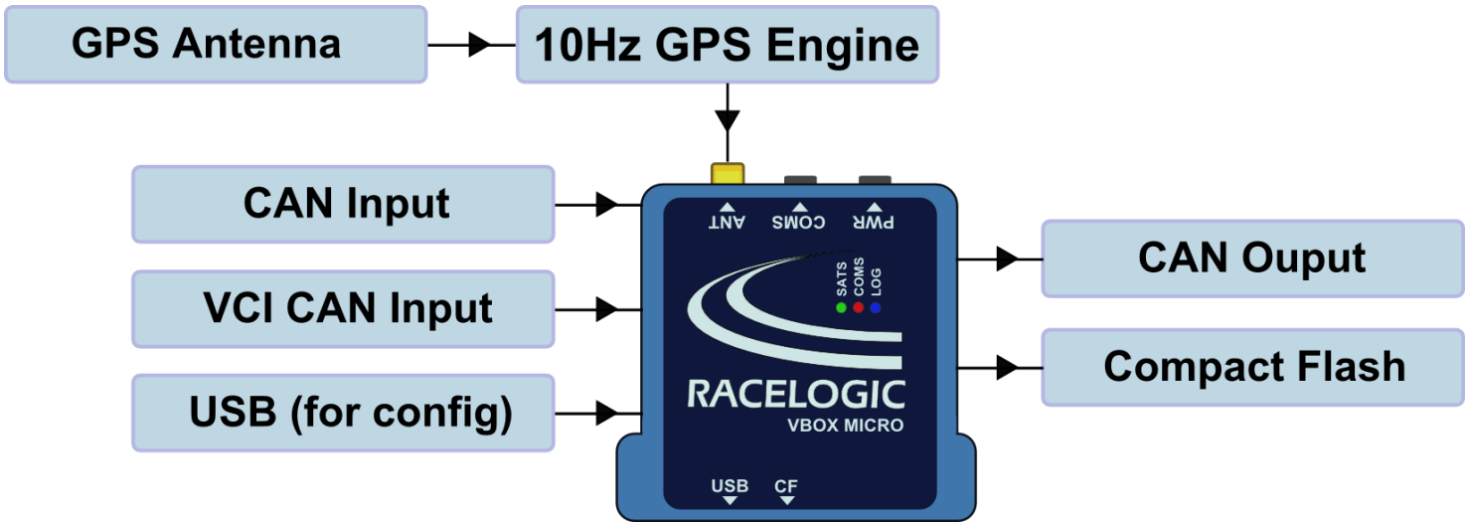
Additional Features

- USB interface for setup
- 13 GPS channels logged + 16 external channels
- LED operational status indication

*Not all vehicles have a CAN bus, and each manufacturer uses a different protocol. However, we can supply CAN sets for various manufacturers, see website for details:

http://www.velocitybox.co.uk/can-database

VBOX Micro Inputs and Outputs



Parts Supplied with RLVBMIC01C

Description	Product Code
10Hz Data logger	VBMIC01C
GPS Magnetic Antenna	RLVBACS018
4GB Compact Flash Card	RLACS098
Power Cable – 2W Fischer – Cigar Plug (VBOX MICRO power lead)	RLCAB010F
VBOX Carry Case	RLACS106
USB A - USB Mini B – 2m	RLCAB066-2

Optional Accessories

Cables

Description	Product Code
5-way Fischer to 9 way 'D' connector (female) – 1m (CAN cable)	RLCAB19F
9-way 'D' connector (male) to OBDII connector – 1.2m (VCI products)	RLCAB020
VBOX Micro to VBOX module cable	RLCAB063
VBOX Micro to IMU04/YAW03 cable	RLCAB065-C

Input Modules

Description	Product Code
VBOX Mini Input Module	RLVBMIM01
4 channel Frequency and Pulse Counter Input Module	RLVBFIM03
8 Channel Thermocouple Interface	RLVBTC8
8 Channel (16bit) Analogue Interface	RLVBADC03
Yaw Rate sensor +2 Axis G sensor (IP65)	RLVBYAW03
Inertial Measurement Unit (IP65)	RLVBIMU04

Antennas

Description	Product Code
Low Profile 'Ground Plane' Antenna	RLACS103
Mushroom type 'Ground Plane' Antenna	RLVBACS065

Getting Started

The VBOX Micro can be used to log data once the following simple steps have been followed.

1. Insert a suitable CF card and close the door.

2. Connect the GPS antenna; ensure it is mounted in a suitable position.

3. Connect a power supply to the VBOX Micro.

Connecting Power To The VBOX Micro

The VBOX Micro can be powered from two different types of power source, via the 2way PWR input socket.

1) Vehicle power outlet socket (via a supplied cigar lighter power cable RLCAB060)
2) Battery power, (Racelogic 2Ah Battery pack RLACS110)

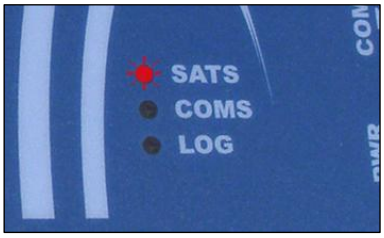
You must connect the GPS antenna before connecting power to the VBOX Micro. This is necessary because on power-up the VBOX Micro will look for a connected GPS antenna and automatically adjust its gain for optimum performance.

LED Indicators

There are three LED indicators on the top panel of the VBOX Micro: SATS, COMS and LOG.

SATS

Flashing RED to indicate that satellite lock has NOT been attained, Solid GREEN light to indicate a valid satellite lock.



COMS

Illuminates RED to indicate configuration communications via USB, Illuminates YELLOW to indicate CAN communications.

LOG

Illuminates GREEN indicating data is being logged to the CF card.

Logging

Logging Control

Logging of data to the CF card can be controlled in two ways:

- Opening the CF card door; this triggers a micro switch that stops the logging and closes the file. Closing the door will restart the logging to a new file.
- Pressing the '■'' button, this will stop the logging and close the current file. Pressing the '■'' button again will then re-start the logging to a new file.

Logging Modes

The VBOX Micro supports two logging modes that are set using the VBOX Micro Setup software:

- Log continuously.
- Log only when moving (speed >0.5km/h)

Logging Rates

The VBOX Micro has an adjustable log rate set within Racelogic Config. This allows the log rate to be set in the range between 1 sample per minute and 10 samples per second (10Hz).

File Management

VBOX Micro data files are stored in Month folders on the CF card, i.e. Jan14. Each logged file will have a name based on date with the following format: Mon04Dec07_XXXX.VBO.

A new file name is created for each new day, if a file is being logged when the time crosses midnight a new file is not created. If the system is switched off and then on again in the same day then it will append new data to the existing file for that day. If one file is closed and another created on the same day they can be distinguished by an increment to the file number, i.e. Mon04Dec07_0001.VBO, Mon04Dec07_0002.VBO. When a module is connected the unit must be power cycled, once the unit is recognised this will then cause the VBOX Micro to open a new file as above.

Memory Cards

The VBOX Micro stores logged data on Compact Flash (CF) cards. The supplied CF cards are already optimised for use on the VBOX Micro and as such do not need formatting before use.

Should the CF Card need formatting due to card errors it can be done through Windows, as the VBOX Micro supports the following format type:

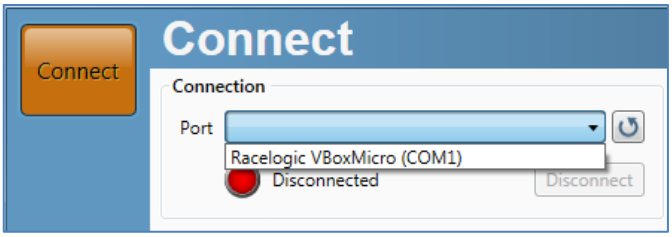
- FAT (up to 2GB)
- FAT32 (up to 128GB)

Racelogic strongly recommends the following media card brands:

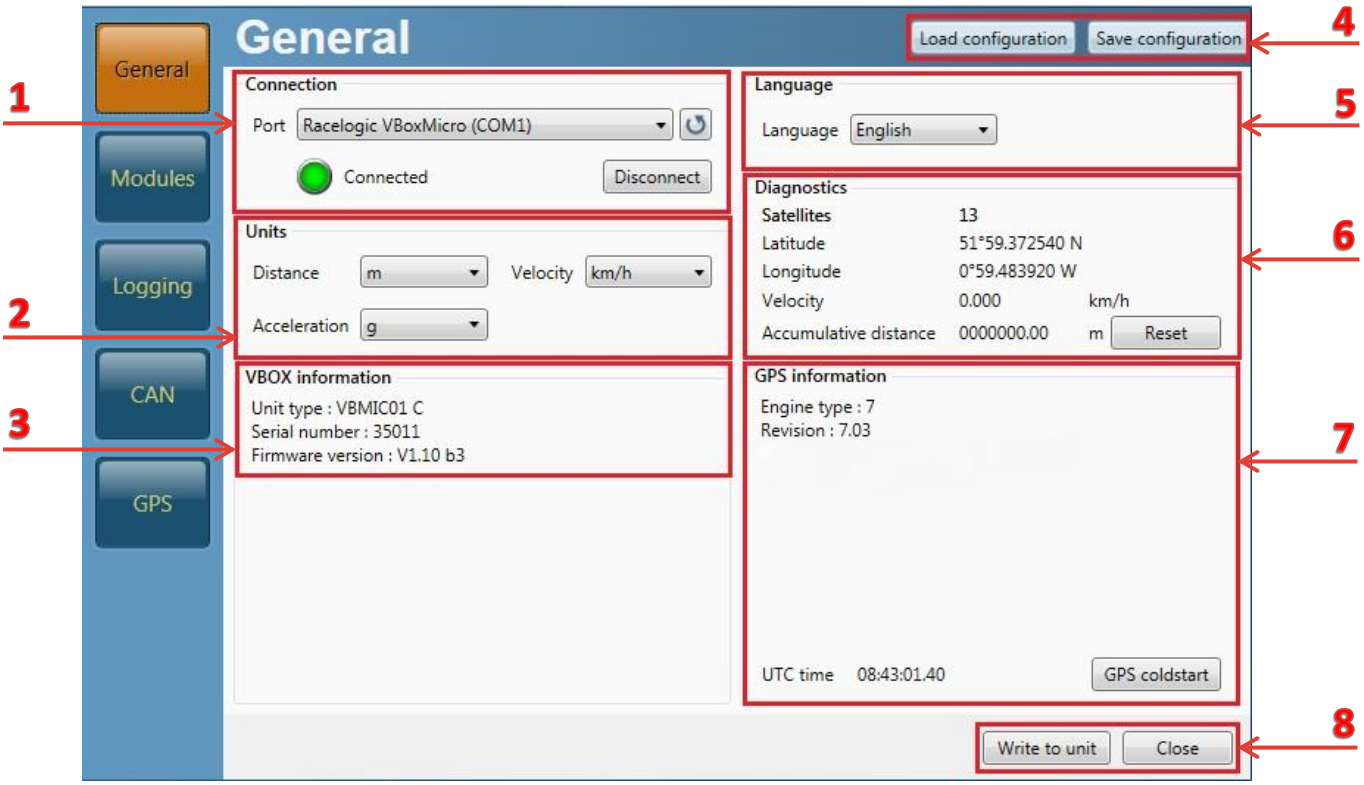
- SanDisk
- Kingston
- Lexar
- Ultra

Configuring the VBOX Micro

Configuration of the VBOX Micro is performed using Racelogic Config software. With the supplied USB cable, connect the USB port on the VBOX Micro to one of the computers USB ports. When connecting to Racelogic config use the drop down list to select the COM port assigned to the VBOX Micro. Once this is selected Racelogic Config will connect to the unit automatically.



General

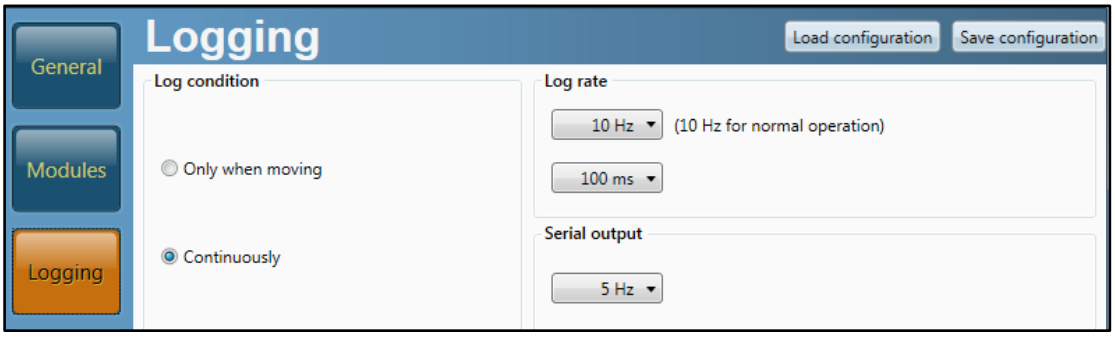


1. **Connection** - Selected COM port, refresh and disconnect buttons.
2. **Units** - specify the distance, acceleration & velocity units.
3. **VBOX Information** - Serial number and installed firmware version of connected unit.
4. **Load/Save Configuration** - Load/Save settings from/into a Racelogic setting file (.RSF).
5. **Language** - Select an operating language.
6. **Diagnostics -** Live preview of satellites, latitude, longitude, velocity & accumulative distance.
7. **GPS Information -** reports the internal GPS engine type and allows user to coldstart the unit.
8. **Write to unit** - After making changes to setup, the write to unit button must be selected to upload settings.

Log settings

To adjust the logging mode and the log rate of the VBOX Micro, open the 'Logging' tab in Racelogic Config.

Once the logging mode and rate have been set, click the 'Write Settings' button to program the new configuration into the VBOX Micro.



The log rate is shown as a frequency (in Hz) and also as a time period (in ms). Both options are linked so if one is altered the other setting will automatically reflect the change.

Time/Date

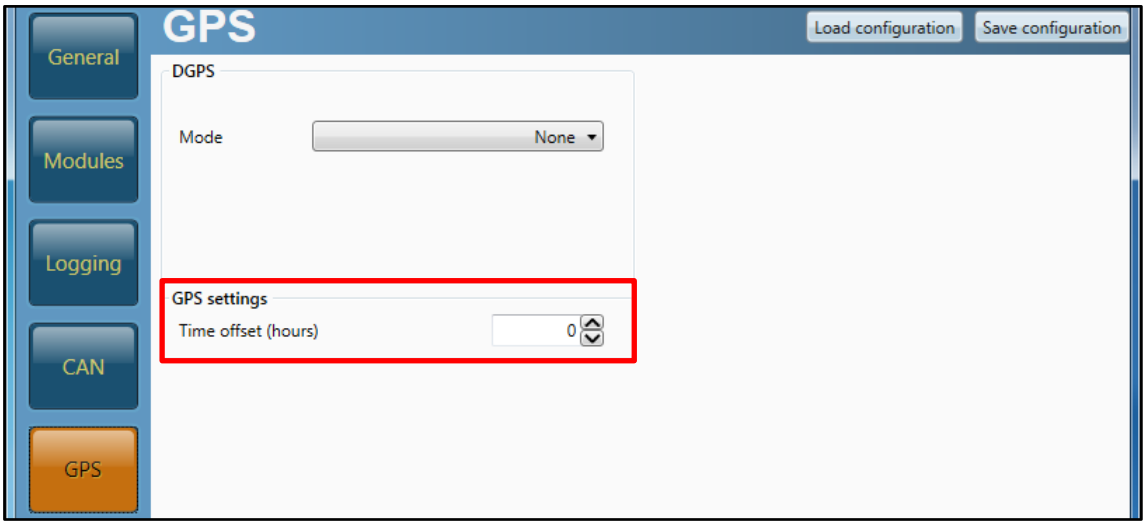
The VBOX Micro uses time and date information available from GPS satellites. This time is based around UTC (approximately equal to GMT) so if the VBOX Micro is used in a different time zone the local time should be set inside the VBOX Micro for ease of use.

As the time and date are critical to the creation of file names in the VBOX Micro, it is recommended that the local time is correctly set.

Adding or subtracting an offset on the GPS page of Racelogic Config adjusts the local time.

Once the offset has been set click the 'Write Settings' button to program the new time and date into the VBOX Micro.

NOTE: In order to obtain UTC time, the VBOX Micro must have attained satellite lock.



Connecting an Input Module to the VBOX Micro

The VBOX Micro can connect to any one of the following Racelogic input modules and then include the data from each channel in the logged VBO file. The VBOX Micro will automatically log all channels from a connected Input Module providing that the module is connected before the power is switched on.

Part Numbers	Descriptions	Connection Cable
RLVBTC8	8 Channel Thermocouple Interface	RLCAB063
RLVBADC02	8 Channel (10bit) Analogue Interface	
RLVBADC03	8 Channel (16bit) Analogue Interface	
RLVBFIM03	4 Channel Frequency and Pulse Counter Input Module	
RLVBMIM01	Mini Input Module	
RLVBYAW03	Yaw Rate Sensor + 2-Axis G Sensor	RLCAB065
RLVBIMU04	Inertial Measurement Unit	

Configuring the Input Modules

To configure an input module you must connect the module directly to the computer via a serial cable, the channels cannot be setup via the USB port on the VBOX Micro. The software required will be Stand Alone Module Setup software or Racelogic Config depending on the module being configured. The module can take power from the VBOX Micro both during operation and during configuration.

Connecting a Display to the VBOX Micro

A Multi-Function Display (MFD, part number RLVBDSP03) can be connected to the CAN output of the VBOX Micro using an RLCAB063 cable. This then provides the user with a live display of the VBOX Micro data parameters, plus the ability to show live results of acceleration and deceleration runs and also display Lap times.

For details of full functionality please refer to the Multi-Function Display user manual.

Whilst connected to the VBOX Micro, the MFD will have full functionality except for the ability to display trigger-activated brake test results.

Configuring and using the VCI input (VBMIC01C only)

The VBMIC01C version of the VBOX Micro has the ability for its CAN port to be used as a 16 channel vehicle CAN interface.

NOTE: When the VBOX Micro is configured in VCI mode it is not possible to connect and log data from Racelogic input modules.

Cables required

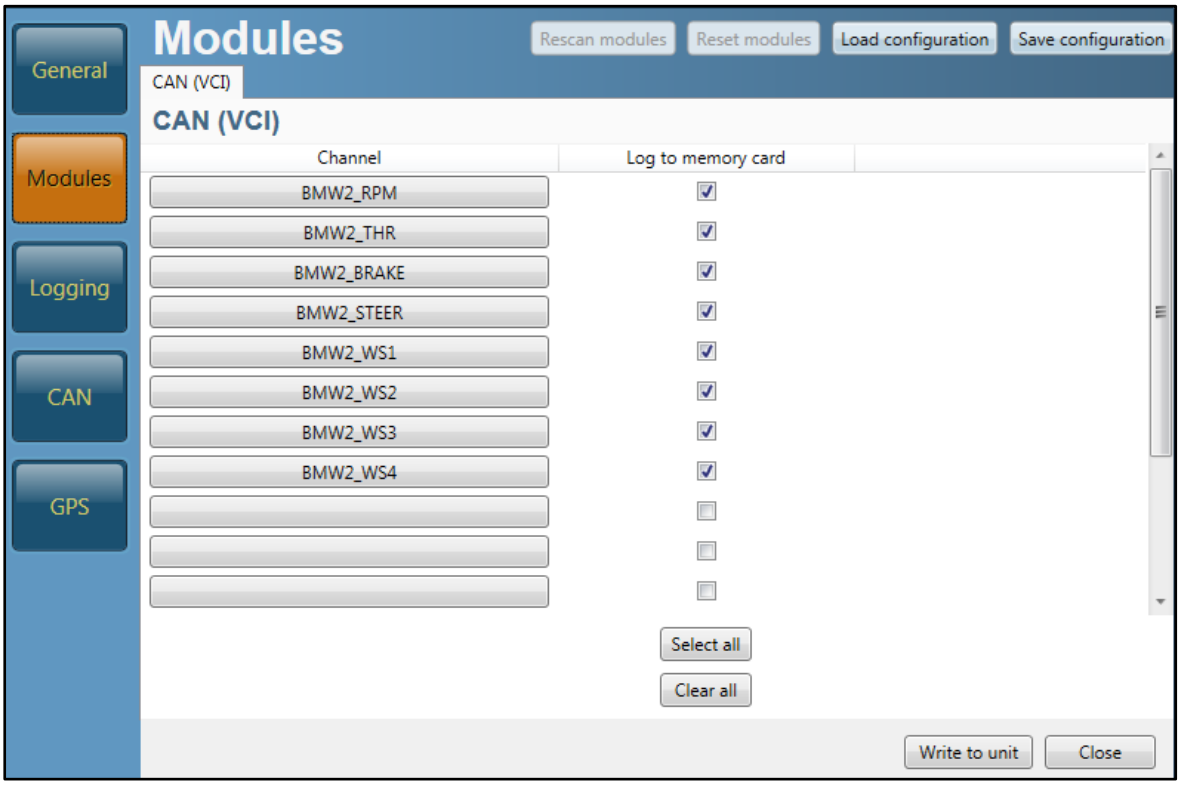
Description	Product Code
5-way Fischer to 9 way 'D' connector (female) – 1m (CAN cable)	RLCAB019F
9-way 'D' connector (male) to OBDII connector – 1.2m	RLVBCAB20

Enabling VCI Mode

- Connect the VBOX Micro to the computer via the USB cable
- Run Racelogic Config.
- Select the appropriate COM port.
- Click on the CAN tab to display the CAN page.
- Select the 'Enable VCI' option.

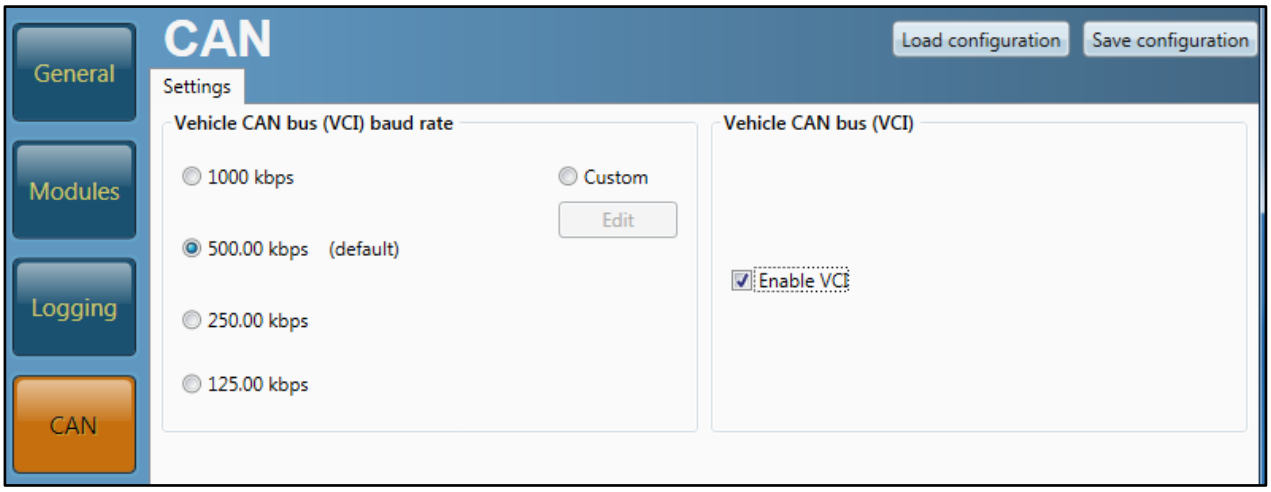
The screen shot below displays the CAN page when the VCI is enabled. Displayed are the 16 CAN channels, which in this case have all been configured to read CAN data from other Racelogic products.

For a VCI channel to be included in the logged file it must be 'Ticked' as shown on all the channels in the screen shot, below.



Baud Rate

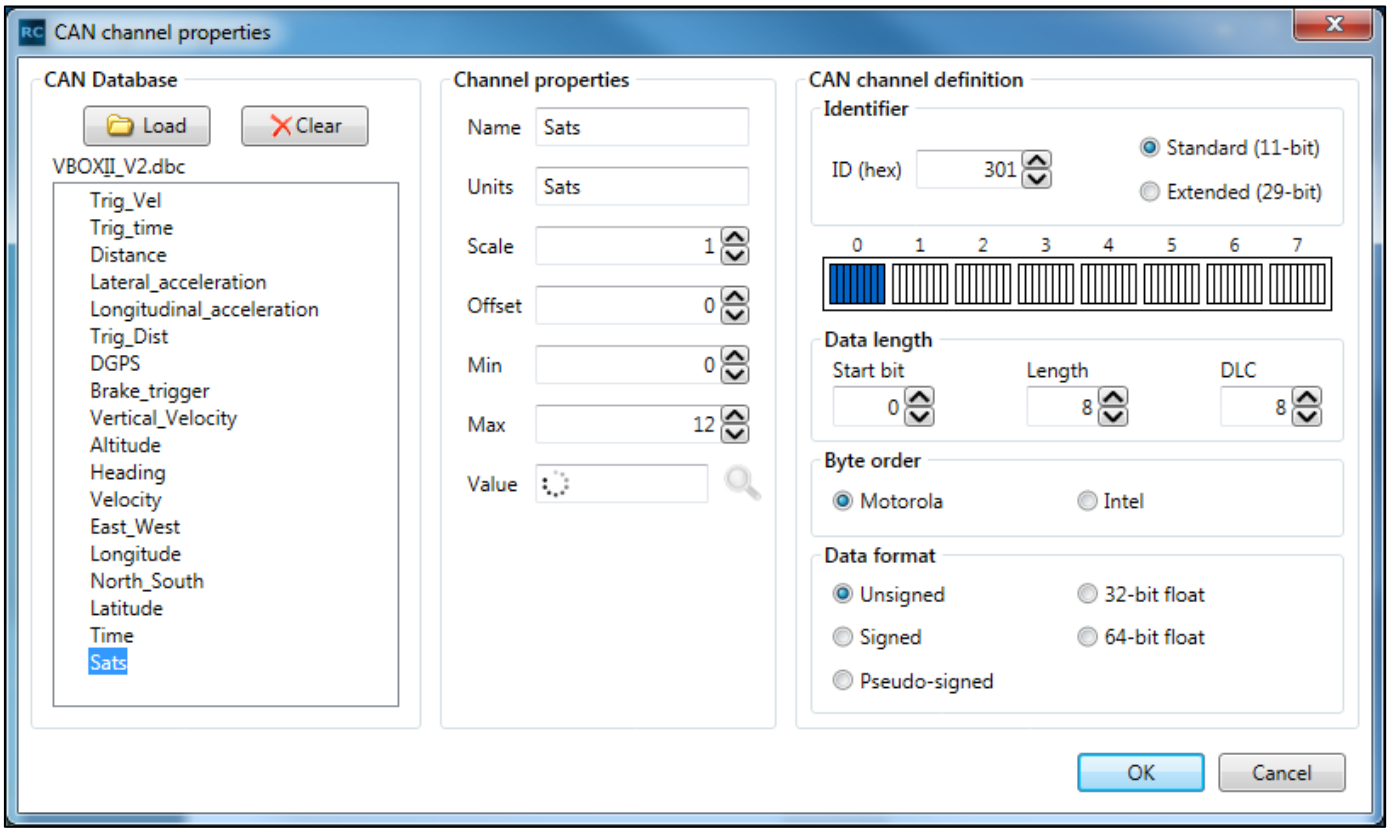
The VCI CAN bus' baud rate is configured by selecting the desired baud rate from the right hand side of the Racelogic Config CAN tab.



Configuring a VCI channel

To configure a VCI channel click on the channel box that needs to be setup, this will open a new configuration window.

All CAN attributes for channel configuration can be manually configured from within this window, shown below.



Loading a CAN database file

Each of the 16 CAN channels can be configured from a CAN database file. From each channels setup window a CAN database file can be loaded by clicking the 'Database' button. Clicking the 'Database' button allows a CAN database file to be opened and then a signal from the Database can be selected. This will then automatically configure the channel with the correct CAN settings.

DATA Base format types

- .VCI - Racelogic CAN database file
- .REF - Racelogic Encrypted database file
- .DBC - Database file

Memory Cards

The VBOX Micro stores logged data on Compact Flash (CF) cards. The supplied CF cards are already optimised for use on the VBOX Micro and as such do not need formatting before use.

Should the CF Card need formatting due to card errors it can be done through Windows, as the VBOX Micro supports the following format type:

- FAT (up to 2Gb)
- FAT16 (up to 2Gb)
- FAT32 (up to 128Gb)

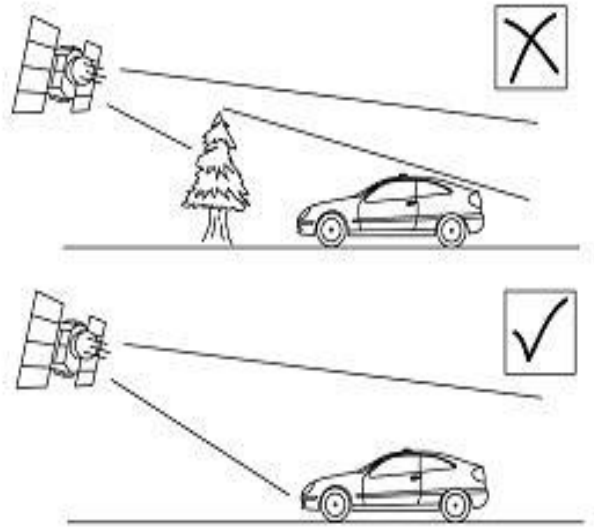
Racelogic strongly recommends the following media card brands:

- SanDisk
- Kingston
- Lexar
- Ultra
- PQi

Satellite lock

Antenna

The GPS antenna supplied with the VBOX Micro is a 3.5V active antenna. For the best possible signal quality, it is important to maintain a clean connection between the antenna and the VBOX Micro. Before fixing the antenna to the VBOX Micro, ensure that there are no dust particles in either connector. Replacement antennae are available by contacting your VBOX Micro distributor.



The antenna is a magnetic mounting type for quick and simple mounting to the vehicle roof. For optimum GPS signal reception, make sure that the antenna is fitted to the highest point of the vehicle away from any obstructions that may block satellite reception. The GPS antenna works best with a metal ground plane underneath (a metallic vehicle roof is perfect for this).

Please also note that when using any GPS equipment, a clear sky view is important. Objects in the surrounding area such as tall buildings or trees can block the GPS signal causing a reduction in the number of satellites being tracked, or introducing reflected signals that can decrease the accuracy of the system. Note that clouds and other atmospheric conditions do not affect the VBOX Micro's performance.

GPS antennas require a ground plane to operate correctly. This helps to reduce unwanted reflections of the GPS signal caused by nearby objects, and usually the metal roof of a vehicle performs this function. However, if a test requires an antenna to be placed either off the vehicle, or on a vehicle that does not have a metallic roof, a special ground plane antenna must be used. This has an internal ground plane and can operate perfectly without the need for mounting on a metal surface. Ground plane antennas are available from your VBOX distributor (part number RLVBACS065).

Coldstart

A GPS coldstart forces the GPS engine to reset its downloaded almanac of current satellite positions. This can be useful if the VBOX Micro is having trouble locking onto satellites, which typically occurs if the VBOX Micro has not been used for several weeks or if it was last used a long distance (over one thousand miles) away from the current location.

Manually

Press and hold the square button '■' on the side of the VBOX Micro for five seconds. The unit will then beep to indicate that the GPS coldstart is underway.

Via Software

Connect to Racelogic Config, select the 'Coldstart' option within the 'General' tab. The unit will then beep to indicate that the GPS coldstart is underway.

Upgrading the VBOX Micro's Firmware

Occasionally Racelogic releases new versions of firmware (internal code) for VBOX products, often to introduce new features. New firmware can be loaded into the VBOX Micro using a computer and the supplied USB cable.

The latest firmware upgrade (.RUF) file for the VBOX Micro is available from the Racelogic website in the 'Support' section.

http://www.velocitybox.co.uk/firmware

If you need the latest file, download it from the website and copy it to your computer.

If you are upgrading the VBOX Micro for the first time (or the first time on the computer being used for the upgrade), please follow the instructions in the section 'Using USB' earlier in this manual before following the instructions below.

How to Upgrade the Firmware

- Press and hold the '◀' button whilst the power is connected to the VBOX Micro.
- The VBOX Micro will enter 'Upgrader' mode, indicated by solid RED 'COM' and 'LOG' LEDs and a solid GREEN 'SAT' LED.
- Connect the USB cable to the computer.
- Double-click the .RUF firmware upgrade file that you have downloaded from the Racelogic website. This will automatically run the Upgrader software, in which you can see the progress of the upgrade.
- At the end of the process disconnect the USB cable and then disconnect and reconnect the power supply.

If you have any questions regarding the VBOX Micro upgrade procedure, please do not hesitate to contact support@racelogic.co.uk .

Connectors Assignments

2 PIN LEMO socket

5 PIN LEMO socket

POWER - 2 PIN LEMO socket			
PIN	In/Out	Description	Range
1	I	Power +	6V to 30V
2	I	Ground	0V

COMS – 5 PIN LEMO socket		
PIN	In/Out	Description
1	I/O	Power
2	O	RS232 Tx
3	I	RS232 Rx
4	I/O	CAN H
5	I/O	CAN L

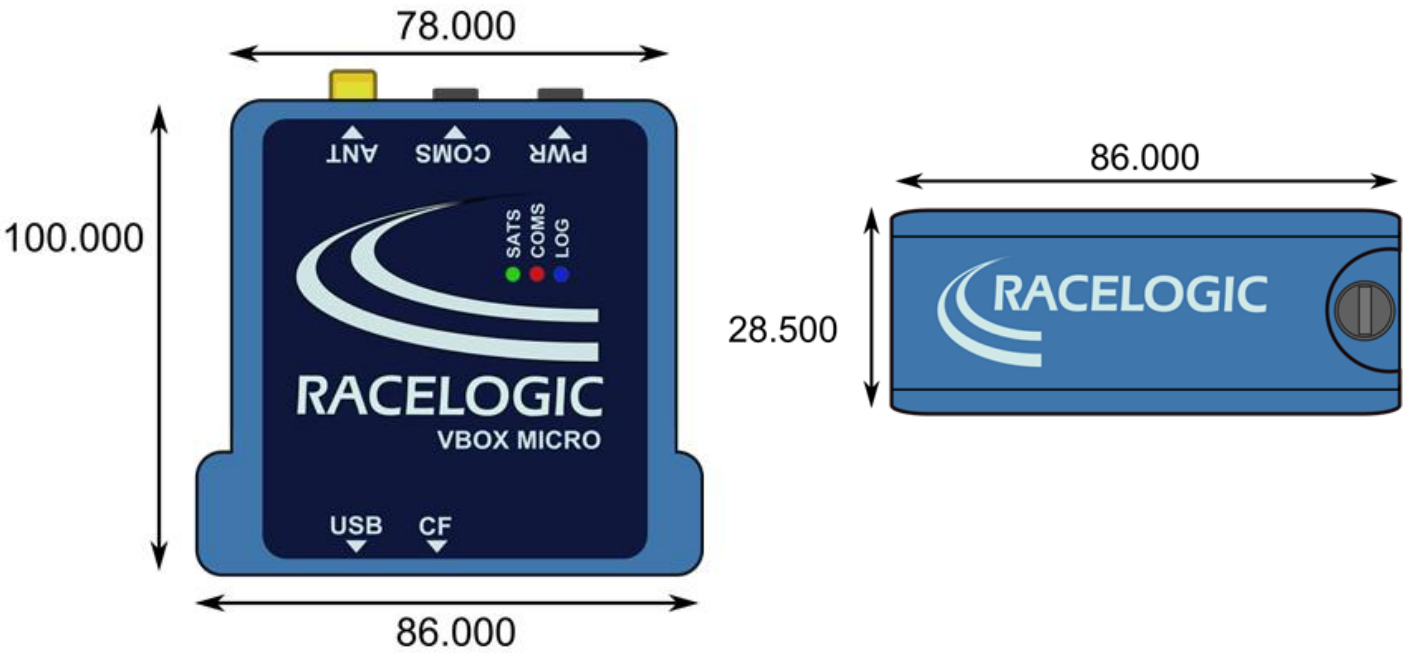
ANTENNA - SMA connector		
PIN	In/Out	Description
Centre	-	RF Signal / Power for active antenna
Chassis	-	Ground

Specification

Velocity	
Accuracy	0.2 Km/h (averaged over 4 samples)
Units	Km/h or Mph
Maximum update rate	10 Hz
Maximum velocity/ Minimum velocity	1000 Mph/0.1 Km/h
Resolution	0.01 Km/h
Latency	>160ms
Distance	
Accuracy	0.05% (<50cm per Km)
Units	Metres / Feet
Maximum update rate	10 Hz
Resolution	1cm
Absolute Positioning	
Accuracy	5m 95% CEP**
Height accuracy	10 Metres 95% CEP**
Maximum update rate	10 Hz
Resolution	1 cm
Heading	
Resolution	0.01°
Accuracy	0.2°
Time	
Resolution	0.01 s
Accuracy	0.1 s (0.01s for results scanned in VBOXTools)
Acceleration	
Accuracy	1%
Maximum	4 G
Resolution	0.01 G
Maximum update rate	10 Hz
Inputs	
CAN Bus – RLVBMIC01	CAN connection for Racelogic modules only
VCI CAN Input – RLVBMIC01C	Allows the user to log incoming CAN data from other systems
CAN Bus Outputs	
Bit rate	125, 250, 500kbit/s & 1Mbit/s selectable baud rate
Identifier type	Standard 11bit and Extended 29bit 2.0A
Data available	Satellites, UTC time, Latitude, Longitude, Speed, Heading, Altitude, Vertical velocity, Longitudinal & Lateral acceleration, Distance since reset
Power	
Input Voltage range	6-30V DC
Current	Typically 70mA
Environmental and physical	
Weight	Approx 275 grams
Size	105mm x 85 x 30mm
Operating temperature	-10˚C to +60˚C
Storage temperature	-40˚C to +85˚C

** CEP = Circle of Error Probable 95% CEP (Circle Error Probable) means 95% of the time the position readings will fall within a circle of the stated radius.

Module Dimensions



Contact details

Racelogic
Unit 10 Swan Business Centre
Osier Way
Buckingham
Bucks
MK18 1TB
United Kingdom

Email: support@racelogic.co.uk
Web: www.racelogic.co.uk