VBOX Micro
RLVBMIC01

Instruction Manual

Contents

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. VBMicro 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, 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.

Rear View showing connectors

What can you do with the VBOX Micro?

- Measure your speed, distance and acceleration
- Analyse your driving line
- Compare your driving style with others
- See if you are making the most of your tyres during braking and cornering
- Plot your route on Google Earth
- Measure you acceleration figures, top speed, ¼ mile etc.
- Take it anywhere – IP66 sealed against water, mud, dust etc.

What can you customise on the VBOX Micro?

- Choose the sample rate from 10 times a second to once per minute
- Attach input modules to log additional channels.
- Connect to CAN bus of your vehicle* to log useful data (RLVBMIC01C only)
- 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 : www.racelogic.co.uk/vbox/can

VBOX Micro Inputs and Outputs
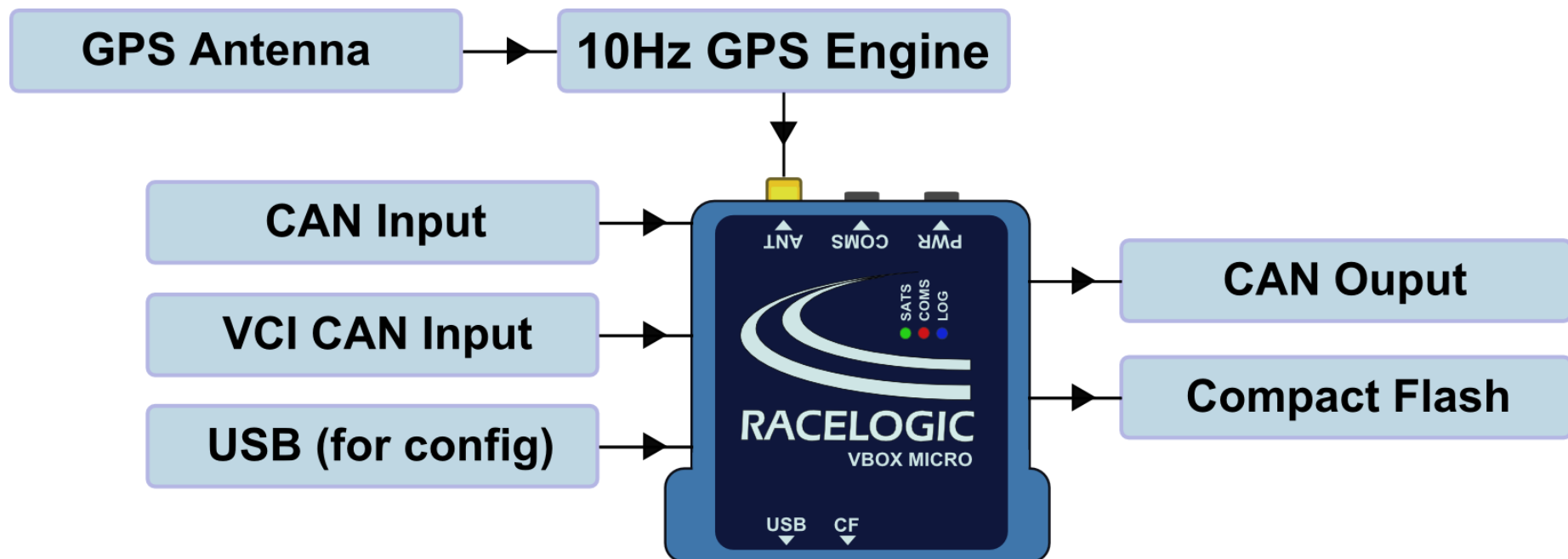
Parts Supplied with RLVBMIC01/RLVBMIC01C

1 x VBMIC01   10Hz datalogger
1 x RLVBACS001   GPS antenna
1 x RLVBACS048   512Mb Compact Flash card
1 x RLCAB060   2-way Fischer to cigar lighter plug – 1m (power cable)

Optional Accessories
Note: The VBOXMicro uses Fischer waterproof connectors, so care must be taken when choosing cables for connecting to other equipment.

Cables:
RLCAB062   5-way Fischer to 9 way 'D' connector (female) – 1m (CAN cable)
RLVBCAB20   9-way 'D' connector (male) to OBDII connector – 1.2m (for use with VCI products)
RLCAB063   VBOX Micro to VBOX module cable
RLCAB065   VBOX Micro to IMU02/YAW03 cable

Input Modules:
RLVBMIM01   VBOX Mini Input Module
RLVBFIM03   4 channel frequency and Pulse Counter Input Module
RLVBTC8   8 Channel Thermocouple Interface
RLVBADC03   8 Channel (16bit) Analogue Interface
RLVBYAW03   Yaw Rate sensor +2 Axis G sensor (IP65)
RLVBIMU02   Inertial Measurement Unit (IP65)

Antennas:
RLVBACS103   Low Profile 'Ground Plane' Antenna
RLVBACS065   Mushroom type 'Ground Plane' Antenna

Getting Started

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

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

3. Connect a power supply to the VBMicro

2.Connect the GPS antenna mounted in a suitable position

4.Wait for the SATS LED to show a solid green light

Connecting power to the VBMicro

The VBMicro 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)

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.

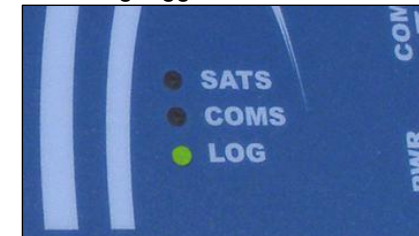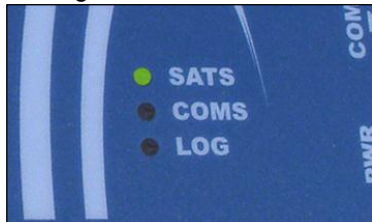| SATS:	COMS:	LOG:
Flashing RED to indicate that satellite lock has NOT been attained	Illuminates RED to indicate configuration communications via USB.	Illuminates GREEN to indicate that data is being logged to the CF card.

Solid GREEN light to indicate a valid satellite lock.	Illuminates YELLOW to indicate CAN communications

Logging

Logging control

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

- Opening the CF card door; this triggers a mirco 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 continuosly.
- Log only when moving (speed >0.5km/h).

Logging Rates

The VBOX Micro has an adjustable log rate set within the VBOX Micro setup software. 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. Dec07, Jan08.
- Each logged file will have a file name based on each date with the following format: Mon04Dec07_XXXX.VBO.
- A new file name is created for each new day, but if a file is being logged and the time crosses midnight in the local time then a new file is not created and logging continues in the currently open file.
- 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, unless settings are changed in which case a new file may be created.
- If you want to create a new file for the same day, you can do this by manually changing the file name of the file previously created, by accessing the CF card through a PC or laptop. The next file created will then have the standard VBOX Micro file name format
- 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 in order for the VBOX Micro to recognise the presence of the input module. This will then cause the VBOX Micro to open a new file as above.

The VBOX Micro will log 13 standard channels plus any additional channels from a connected input module or from the VCI connection on a VBMIC01C.

Logged Channels

The following channels are non-selectable (always logged):

- Satellite count.
- UTC time (ms since midnight).
- Latitude (0000.00000 minutes decimal minutes).
- Longitude (00000.00000 minutes decimal minutes).
- Speed (000.000km/h).
- Heading (000.00°).
- Height (0000.00m).

- Vertical velocity (0000.00km/h).
- Longitudinal Acceleration (0000.00G, smoothed over 4 samples).
- Lateral Acceleration (0000.00G, smoothed over 4 samples).
- Distance from power on (0000000.00m).
- Accumulated distance (permanent) (0000000.00m).
- Date from GPS (ddmmyy).

Logged File Format

VBOX Micro files are saved in a standard space delimited text format. This allows the data to easily be imported into third party applications such as word processors or spreadsheets. Each file contains a header section before the main data that describes the channel content and information about the VBOX Micro, such as serial number and firmware version.

The [column names] section specifies the data in each column of the data section.

An example of a VBOX .VBO file is shown on the right.

Note that the "File created" time and date is derived from GPS UTC time and date, so will not reflect your local time unless this has been set within the VBOX Micro setup software.

```
File created on 08/07/2008 @ 11:18

[header]
satellites
time
latitude
longitude
velocity kmh
heading
height
Vertical velocity kmh
Long accel g
Lat accel g
POR Distance m
Distance m
Date

[channel units]

[comments]
VBMicro V01.00 Bld. 0011
Serial Number : 00006999

[module Information]

[column names]
sats time lat long velocity heading height vert-vel Longacc Latacc POR_Distance Distance Date

[data]
008 111825.20 +3119.371150 -00059.479950 000.000 013.36 +0162.82 +0000.24 +0000.00 +0000.00 0000000.00 0000000.00 080708
```

008 111825.30 +3119.371150 -00059.479950 000.000 013.37 +0162.83 +0000.23 +0000.00 +0000.00 0000000.00 0000000.00 080708

Configuring the VBOX Micro

Configuration of any of the VBOX Micro settings is performed using the VBOX Micro Setup software supplied with the unit. You will need to power the VBOX Micro and make a connection from its USB socket to a USB socket on your computer.

When you connect to the VBOX Micro via USB for the first time you will be required to install USB drivers, please see the section 'Using USB' below.
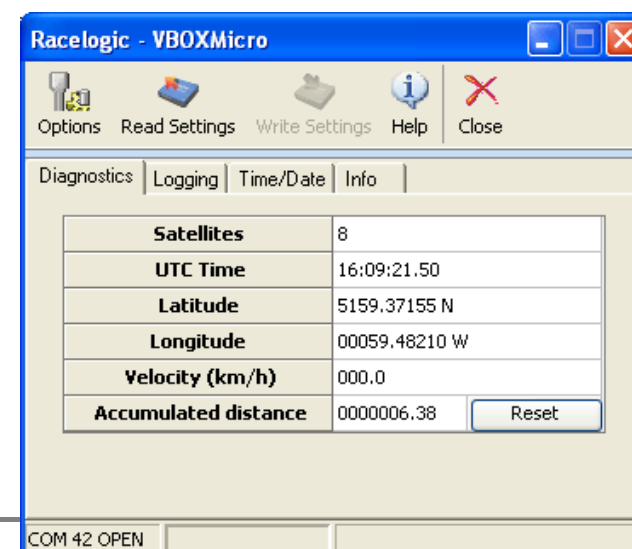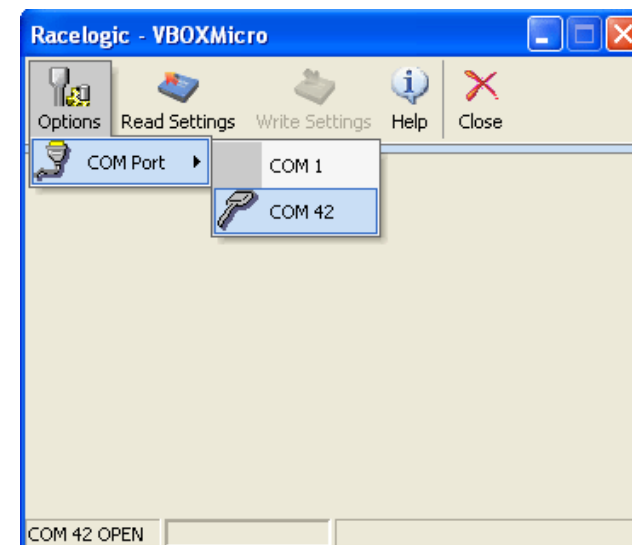
Installing the VBOX Micro Setup Software

Insert the supplied CD-ROM into the CD drive of your computer. An installation dialog will automatically appear; follow the onscreen instructions to complete the installation of the setup software.

After installation the CD-ROM can be removed and two icons should have appeared on your desktop that will allow you to start the VBOX Micro Setup software and the VBOXTools software for post-processing data.

Running the VBOX Micro Setup Software

First, click on the Options button to select the correct COM port on your computer.
Now click the "Read Settings" button to enter the VBOX Micro setup screen.

Note: After changing any settings in the setup software you will need to press the " Write Settings" button to confirm the changes in the datalogger.

Log Settings

To adjust the logging mode and the log rate of the VBOX Micro, click the 'Logging' tab in the VBOX Micro Setup software.

Once the logging mode and rate has 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 changed the other setting will automatically reflect the change.
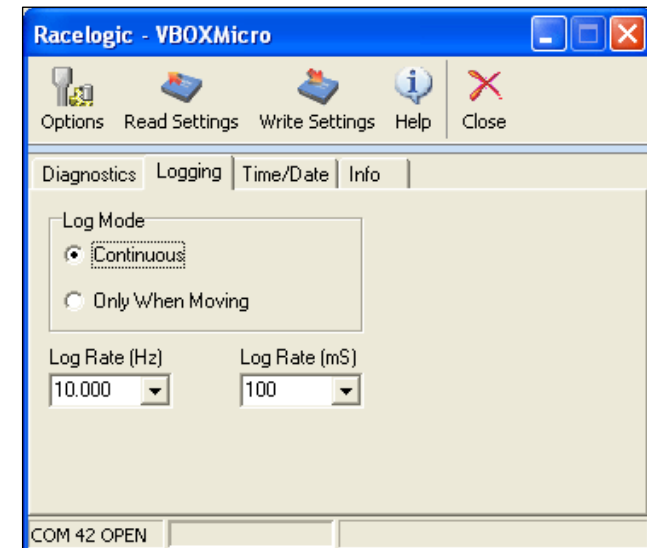
Time/Date

The VBOX Micro uses time and date information available from the 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 Time/Date page of the VBOX Micro Setup software 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.
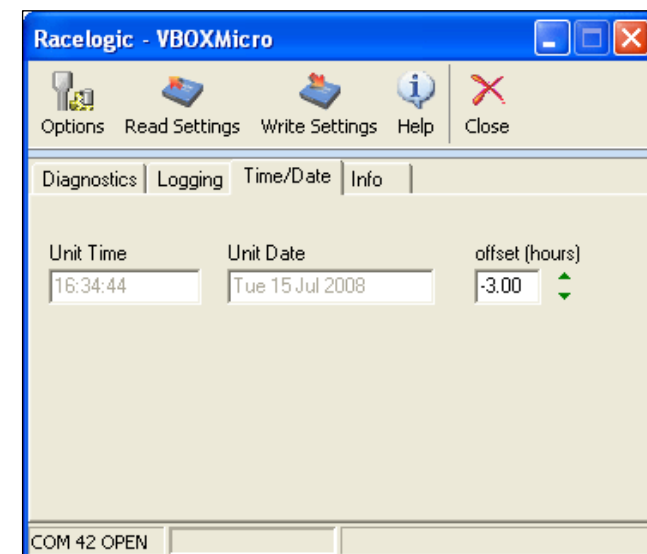
Connecting an Input Module to the VBOX Micro

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
RLVBIMU02	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, you cannot setup the channels via the USB port on the VBOX Micro. The software which is required is the Stand Alone Module Setup software which is included in the VBOX Micro installation. The module can take power from the VBOX Micro both during operation and during configuration.
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Once the module is powered and connected to the computer, run the Stand Alone Module Setup software. Under 'Options' select the appropriate COM port, then click 'Read Module Setup'.

The scale / multiplier and offset of each channel can be set to suit the connected sensor. **No other settings should be changed.** After setting the scale and offset of each channel, click the button 'Write Setup to Module'. The screenshot to the right shows the Stand Alone Module Setup software whilst connected to an ADC03 module.
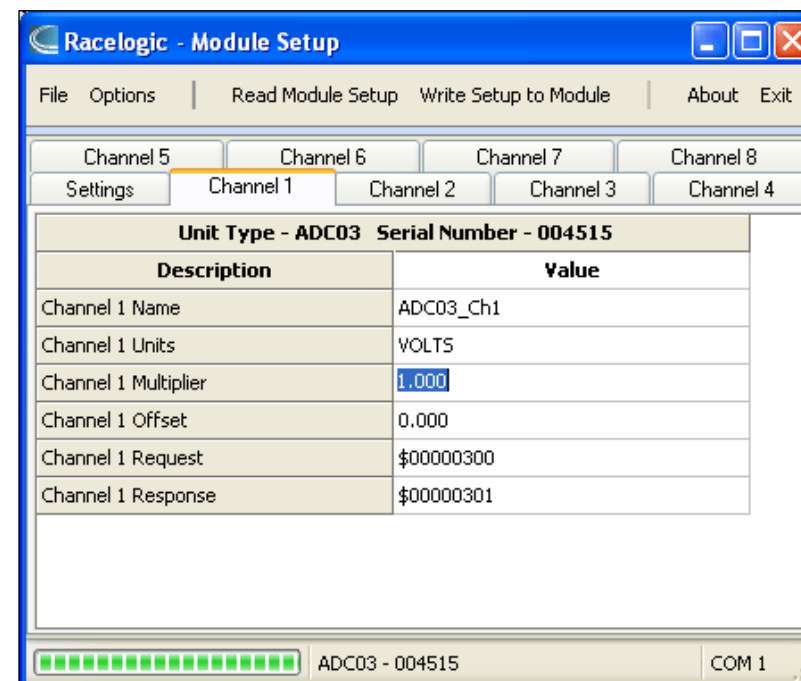
Configuring and using the VCI input (VBMIC01C only)

The VBMIC01C version of the VBMicro has the ability for its CAN port to be used as a 16channel vehicle CAN interface.
NOTE: When the VBMicro is configured in VCI mode it is not possible to connect and log data from Racelogic input modules.

Cables required

RLCAB062	5-way Fischer to 9 way 'D' connector (female) – 1m (CAN cable)
RLVBCAB20	9-way 'D' connector (male) to OBDII connector – 1.2m

When the VBMIC01C is connected to VBMicro setup software an extra Tab labelled CAN will be displayed.

Enabling VCI Mode

- Connect the VBMIC01C to the computer via the USB cable
- Run the VBMicro Setup software.
- Click the 'Read settings' button to read the current configuration out of the connected VBMIC01C
- Click on the CAN tab to display the CAN page.
- Select the 'Enable VCI' option.(shown in screen shot, right)

The screen shot to the right displays the CAN page when the VCI is enabled. You can see 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, right.
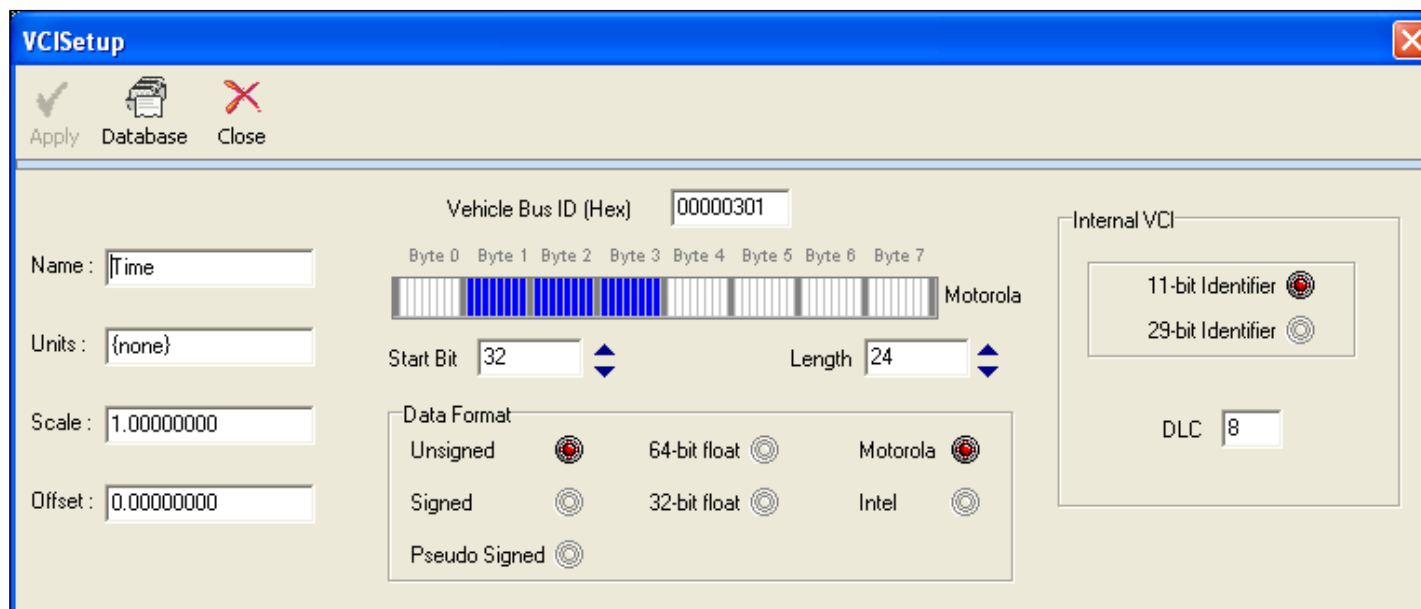
Baud Rate

The VCI CAN bus Baud rate is set by clicking the 'Baud Rate' button in this screen, then selecting the desired BAUD rate.
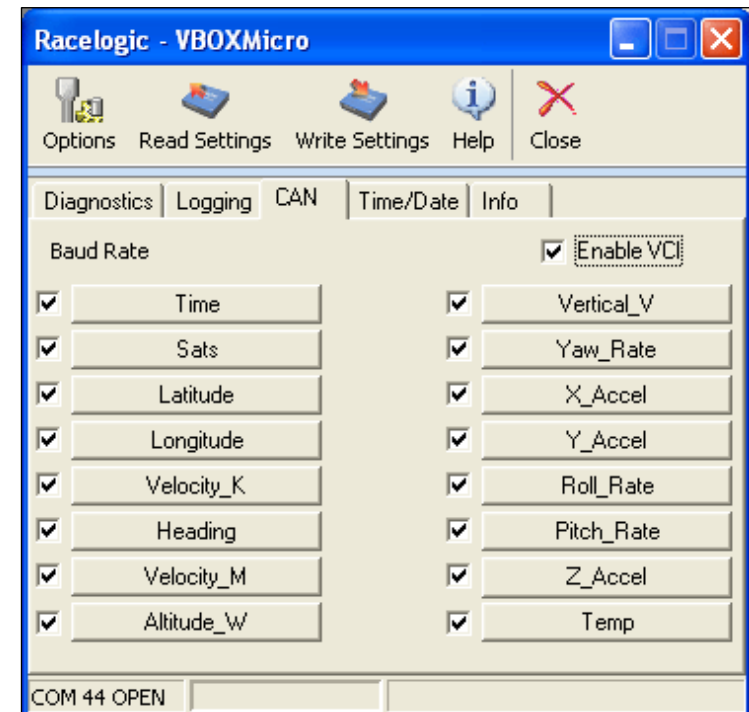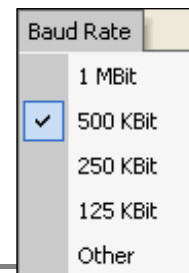
Configuring a VCI channel.

To configure a VCI channel click on the channel button of that channel, which 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 form 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   .DBC   Database file
.REF   Racelogic Encrypted database file   .RDF   Racelogic Encrypted database file

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 VBOXMicro 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.

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 (upto 2Gb)
- FAT16 (upto 2Gb)
- FAT32 (upto 128Gb)

Racelogic strongly recommends the following media card brands:

- SanDisk
- Kingston
- Lexar
- Ultra
- PQi

GPS 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).
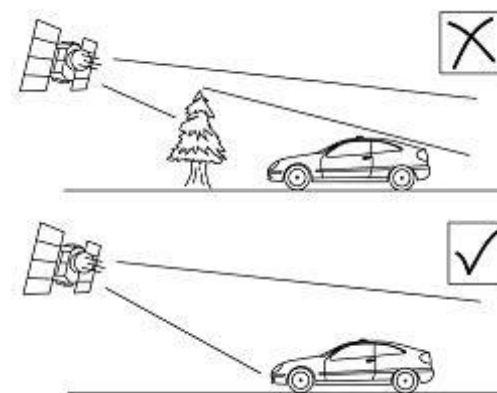
RLVBACS065 – Ground plane antenna

GPS 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.

After performing a GPS coldstart leave the VBOX Micro powered up in a static location where the antenna has an unobstructed view of the skies, for at least fifteen minutes.

Once the VBOX Micro has downloaded the new almanac it will reacquire satellites in noisy situations (such as near trees, buildings and under bridges) much more quickly. It will also acquire satellite much more quickly on power-up.

There are two ways to perform a GPS coldstart on the VBOX Micro, one with and one without the use of a computer.

Without a computer:
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.

With a computer:
To coldstart the GPS engine in the VBOX Micro using a computer, connect the VBOX Micro to the computer via USB cable and run the VBOX Micro set up software, is supplied with the unit. Press 'Read Settings' to start communications, then open the 'Options' menu and select the 'ColdStart' option. The unit will beep to confirm that the cold start is being performed.
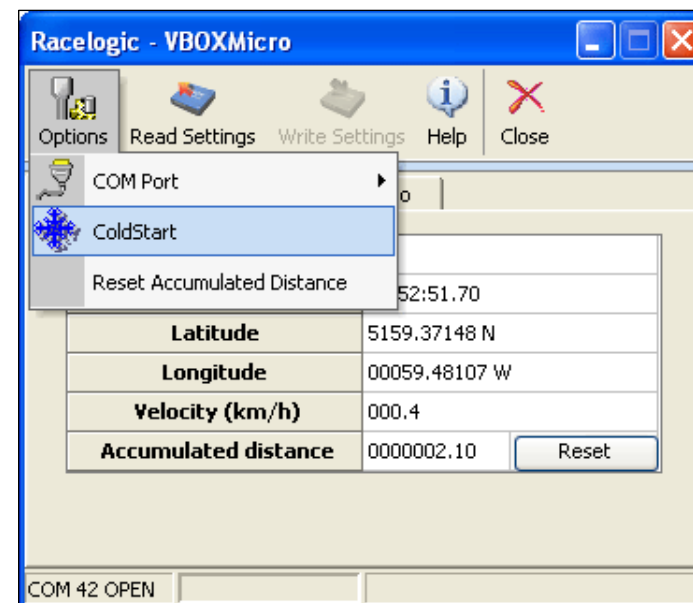
CAN Output

The VBOX Micro has a CAN output which is present on the 5-way connector output.

Data format: Motorola
Baud rate: 500Kb/s

| ID*	Update Rate	Data Bytes							
		1	2	3	4	5	6	7	8
0x301	100ms	(1) Sats in view	(2) Time since midnight UTC			(3) Position – Latitude MMMM.MMMMM			
0x302	100ms	(4) Position – Longitude MMMM.MMMMM				(5) Velocity. (Knots)		(6) Heading (Degrees)	
0x303	100ms	(7) Altitude. WGS 84. (Metres)				(8) Vertical velocity. (M/S)	Unused	(9) Status	(10) Status
0x304	100ms	Unused				(11) Longitudinal Accel. (G)		(12) Lateral Accel. (G)	
0x305	100ms	(13) Distance travelled since VBOX reset (Metres)				Unused		Unused	

* Default Identifiers. The identifier values can be changed using the configuration software.

1) If Satellites in view < 3 then only Identifier 0x301 transmitted and bytes 2 to 8 are set to 0x00.
2) Time since midnight. This is a count of 10ms intervals since midnight UTC. (5383690 = 53836.90 seconds since midnight or 14 hours, 57 minutes and 16.90 seconds).
3) Position, Latitude * 100,000 (311924579 = 51 Degrees, 59.24579 Minutes North). This is a true 32bit signed integer, North being positive.
4) Position, Longitude * 100,000 (11882246 = 0 Degrees, 58.82246 Minutes West). This is a true 32bit signed integer, West being positive.
5) Velocity, 0.01 knots per bit.
6) Heading, 0.01° per bit.
7) Altitude, 0.01 meters per bit, signed.
8) Vertical Velocity, 0.01 m/s per bit, signed.
9) Status, unused.
10) Status, unused.
11) Longitudinal Acceleration, 0.01G per bit, signed.
12) Lateral Acceleration, 0.01G per bit, signed.
13) Distance travelled in meters since VBOX reset.

Using USB

The first time you use the USB connectivity of the VBOX Micro to configure the unit, you will need to follow the instructions below. You will also need to repeat this procedure the first time you upgrade the VBOX Micro's firmware.

- Connect the USB cable between the VBOX Micro and the computer.
- The computer should now recognise the presence of a new device; after a short period of time a 'Found New Hardware Wizard' window will appear (see image below).
- Click the option 'No, not this time' and click 'Next' (see image right and above).
- A new window will appear at this window click 'Next' (see image right and below).
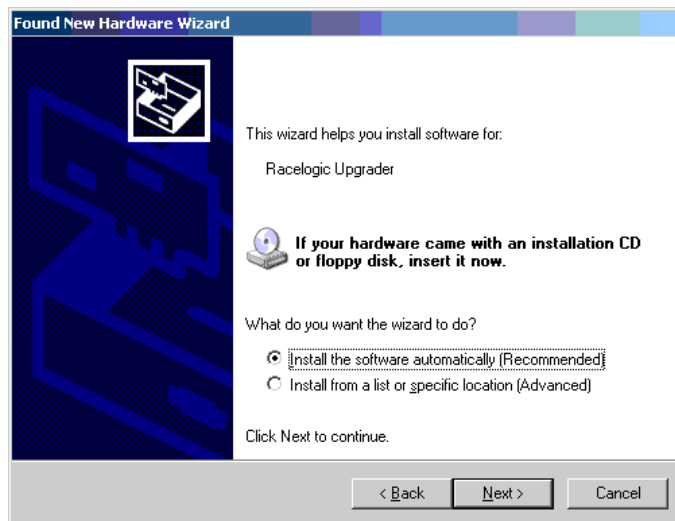
- A new 'Hardware Installation' window will appear. Click the button labelled 'Continue Anyway'.
- At the last window click 'Finish' to complete the installation.
- After a short period of time a window will ask you if you wish to reboot your computer; click 'No'.
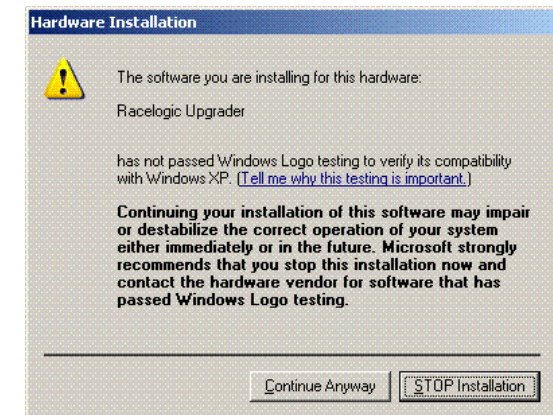
Now disconnect then reconnect the VBOX Micro from its power supply. Your computer should now recognise the unit. When you run the VBOX Micro Setup software it will recognise the USB connections.

Please note that, due to the nature of USB communications, the above procedure may occasionally fail at various stages. Should this happen, please repeat the procedure three or four times, if necessary, prior to requesting technical support.

VBOXTools Software

The VBOXTools software is used for the analysis of the logged .VBO data files.

VBOXTools is included as part of the VBOX Micro software installation.

For further information on the VBOXTools software please refer to the VBOXTools Software Manual supplied with the VBOX Micro.
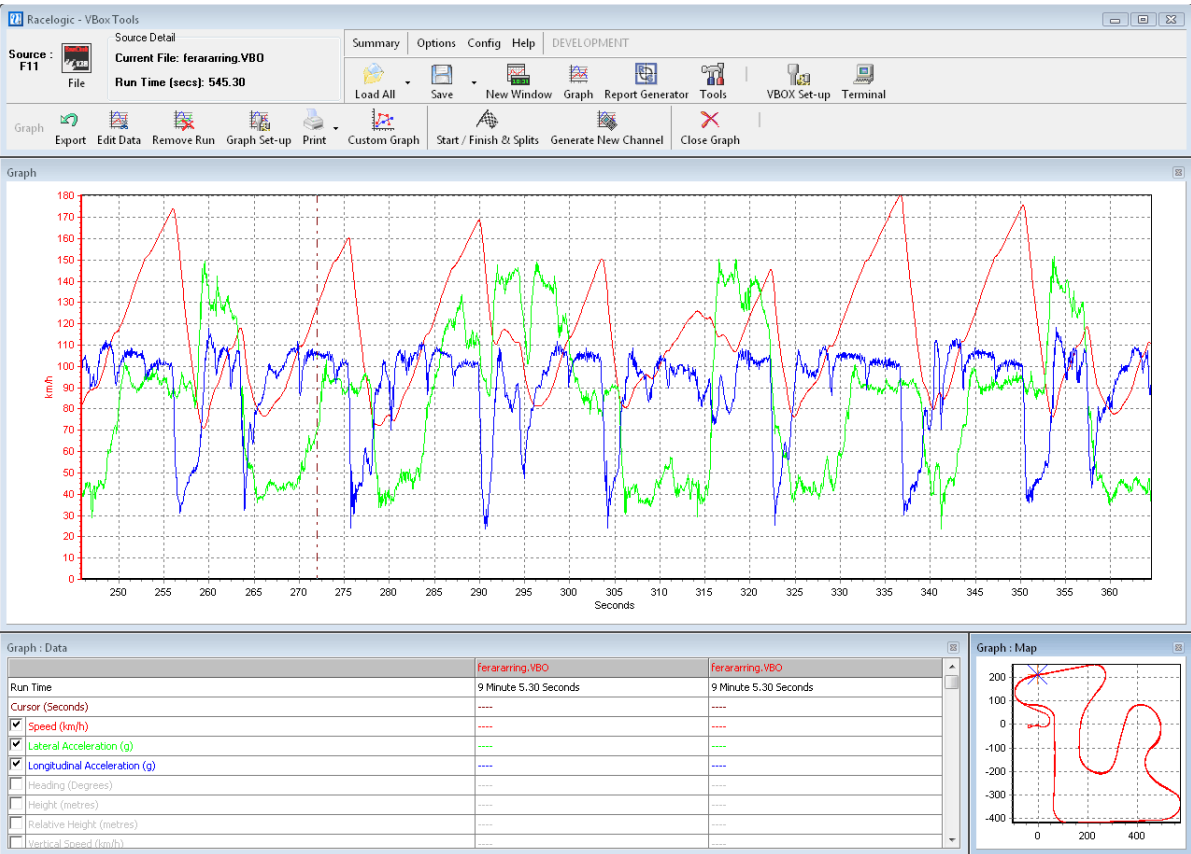
Trouble shooting

Failing to Lock onto Satellites

If the VBOX Micro is having trouble locking onto satellites then please follow the checklist below for typical solutions:

1) Ensure that the antenna is placed in a position were it has an unobstructed view of the sky.
2) Check the antenna connection with the VBOX Micro; only small amounts of dirt in the socket can cause a significant reduction in signal strength. Also check the cable at the plug and along its length for any damage.
3) Check that the power supply is connected and free from damage.
4) If possible try another known working antenna, to confirm antenna functionality.
5) Perform a GPS coldstart and then leave the unit powered up in an open static position for at least 15 minutes. See 'GPS Coldstart'.

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.racelogic.co.uk/?show=VBOX-Downloads-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

Connector Assignments

Connector 1 – Power (Dedicated 6V to 30V DC Power Connector)

Pin	I/O	Power
1	I	Power+
2	I	Ground
Chassis	I	Ground

Connector 2 – CAN (CAN Bus Connector, Serial Connection to GPS Engine)

Pin	I/O	Function
1	I/O	Power
2	O	RS232 Tx
3	I	RS232 Rx
4	I/O	CAN H
5	I/O	CAN L
Chassis	I	Ground

Connector 3 – GPS (GPS Antenna)

Pin	I/O	Function
1	I	Signal
Chassis	I	Ground

Specification

Velocity	
Accuracy	0.2 Km/h (averaged over 4 samples)
Units	Km/h or Mph
Maximum update rate	10 Hz
Maximum velocity	1000 Mph
Minimum velocity	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 performance results scanned in VBOXTools)

Acceleration	
Accuracy	1%
Maximum	4 G
Resolution	0.01 G
Maximum update rate	10 Hz

Memory	
External memory support	Compact Flash Card
Recording time	Dependant on CF capacity. Approximately 4.4MB per hour at 100ms per sample (10Hz) log rate, logging all standard GPS channels.

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. Note: Unit does not connect to other Racelogic CAN modules when VCI CAN input is active.

Outputs	
CAN Bus	
Bit rate	125 kbit/s, 250kbit/s, 500kbit/s & 1Mbit/s selectable baud rate
Identifier type	Standard 11bit and Extended 29bit 2.0A
Data available	Satellites in view, UTC time, Latitude, Longitude, Speed, Heading, Altitude, Vertical velocity, Longitudinal acceleration, Lateral acceleration, Distance since reset

Power	
Input Voltage range	6-30V DC
Current	Typically 70mA

Environmental and physical	
Weight	Approx 275 grammes
Size	105mm x 85 x 30mm
Operating temperature	-10°C to +60°C
Storage temperature	-40°C to +85°C

Definitions	
** 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.

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

Module Dimensions (mm)
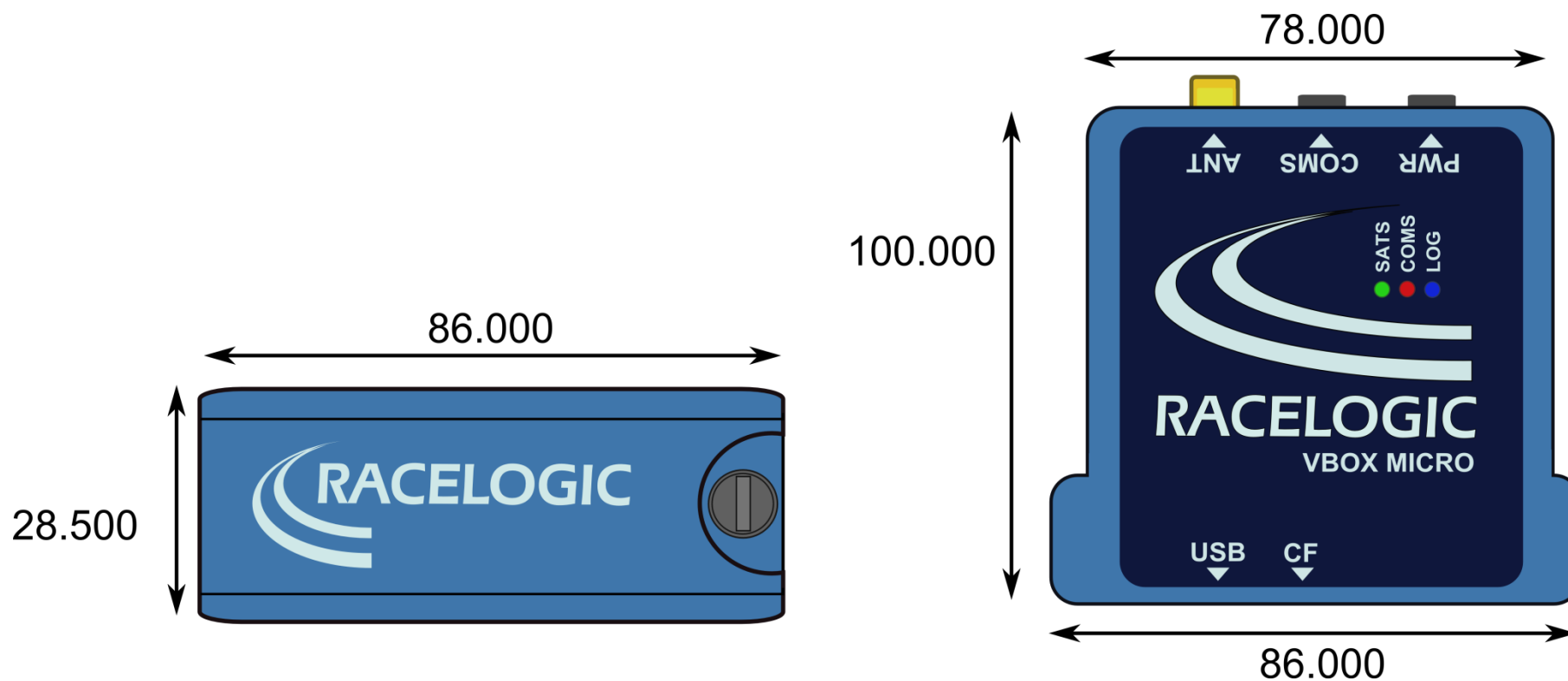
Contact Details

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

Tel +44 (1280) 823803

Fax +44 (1280) 823595

Email support@racelogic.co.uk

Web www.racelogic.co.uk

Document Updates

Revision	Description	Date
1	First Release. JH	31/07/08
2	Improved explanations KB	16/9/08
3	Added CAB063 and CAB065 to options on page 6	08/10/08
4	Added VCI mode operation for VBMIC01C versions. KB	9/10/08
5	Edited incorrect connector functions and pins information. TH	16/10/12
6	Added new images for dimension, connectors and inputs/outputs. LN	17/10/12
7	Amendment to page 21. LN.	01/02/13