# VBSS05 5Hz
# GPS Speed Sensor
## User Guide

# Contents

## EC Declaration of Conformity

We declare that this product has been tested to and meet the requirements of:

**EC Directive 2004/104/EC**
"Adapting to Technical Progress Council directive 72/245/EEC relating to the radio interference (Electromagnetic Compatibility) of vehicles and amending directive 70/156/EEC on the approximation of the laws of the member states relating to the type-approval of motor vehicles and their trailers."

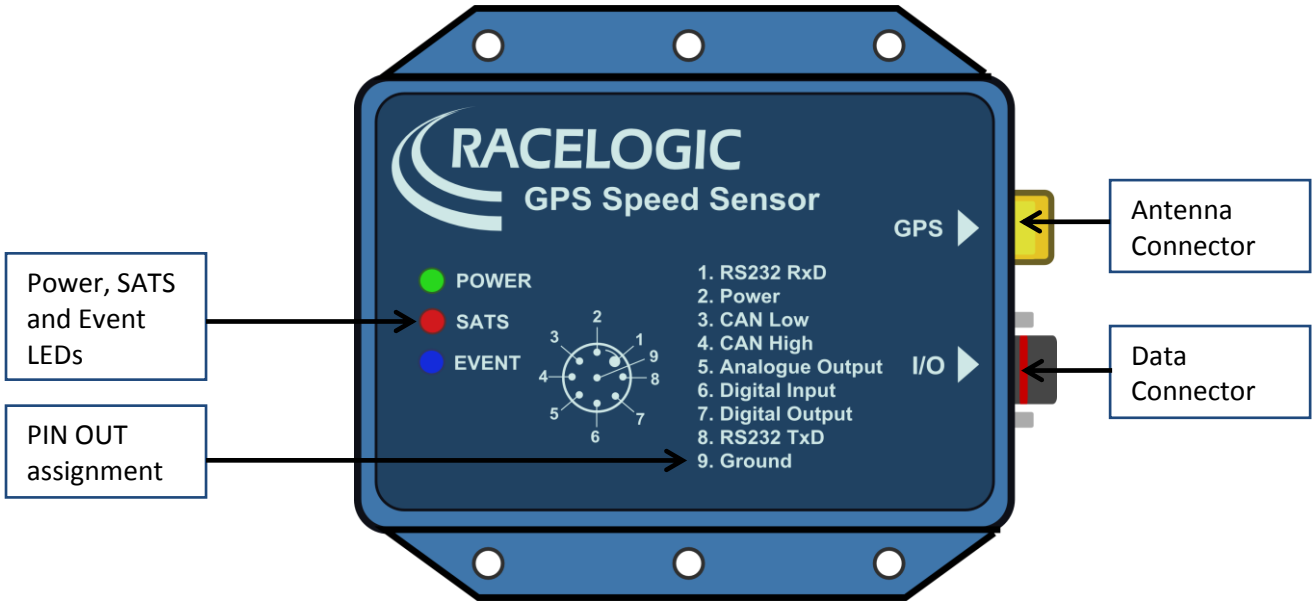
And has also been assessed, via Technical Construction File, by an independent DTI Competent Body and found to be in conformance with the essential requirements of:

**EC Directive 89/336/EEC** (and amending directives)
"Council Directive of 03 May 1989 on the approximation of the laws of the member states relating to electromagnetic compatibility."

DTI Competent Body responsible for issuing certificate of compliance:

3C Test Ltd,
Silverstone Technology Park,
Silverstone,
Northants.
NN12 8GX

## Hardware Overview



# VBSS05 User Guide

## 5 Hz Speed Sensor

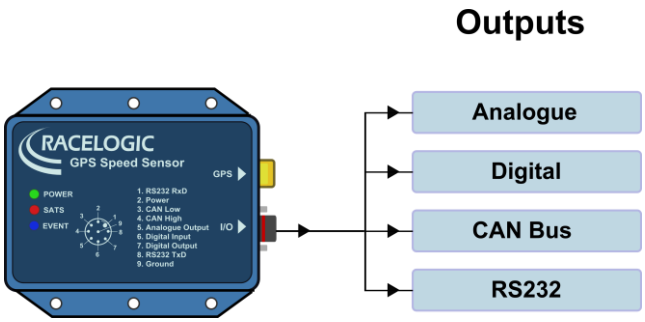
## Introduction

Based on a high accuracy 5Hz GPS engine, the VBSS05 Speed Sensor can be used for non-contact sensing of velocity providing signal output data on CAN, analogue and digital, allowing easy integration with data loggers and testing applications. The analogue output can be assigned to vehicle speed, lateral acceleration, longitudinal acceleration, or lap beacon marker with user selectable scaling. The digital output can be configured as either a digital speed pulse output or a lap beacon marker.

The unit has a small hardware footprint of only 9cm long, making mounting and transportation easy additionally making the Speed Sensor perfect for automotive testing, motorsport, marine, telematics, and data-logging applications and the IP66 rating means that each unit is water and dustproof, allowing them to be used in a variety of conditions.

## Features

- High Performance GPS Receiver: 5Hz
- CAN Bus Output includes: Speed, Heading, True Heading, Brake Stop Distance, Radius of Turn, Gyro Yaw Rate.
- RS232 Serial Output of NMEA*, position velocity and time
- User Configurable Analogue Output
- User Configurable Digital Output
- Virtual Lap Beacon Output
- Compatible with DGPS Basestation
- Rugged Deutsch ASDD Autosport connector
- High quality aluminium enclosure
- IP66 rated: water and dustproof
- Wide 6.5V – 30V operating range
- Low current consumption




***NMEA output is unavailable for units with a Serial Number of 31610 or higher.**

## Standard Inventory

| Description | Qty | Racelogic Part # |
|---|---|---|
| RLVBSS05 Speed Sensor | 1 | VBSS05 |
| GPS Magnetic Antenna for 5,10 & 20Hz version | 1 | RLVBACS018 |
| VBSS Speed Sensor User manual | 1 | VBSSMAN |
| CD ROM containing VBSS software | 1 | CDVBSS-SL |
| ***Supplied separately*** | | |
| VBSS Speed Sensor Interface Cable (Analogue / Digital / CAN / Serial / Power) | 1 | RLCAB093 |

# Operation

## Interfacing with the VBSS

If you have purchased a RLCAB093 interface cable, then connect this to the VBSS. The RLCAB093 features connections for power, input and all outputs of the VBSS.

Because the VBSS can be used in a number of ways, it is common for the end user to integrate the VBSS connector into their own wiring harness. A mating connector, Deutsch ASDD606-09PN, may be purchased from Racelogic for this purpose. Please see the section of this manual 'Building an interface cable for the VBSS'.

Before connecting power to the VBSS you should connect the GPS antenna, this is because the VBSS will look for a connected GPS antenna and automatically adjust its gain for optimum performance from the connected antenna. For more information about the GPS antenna and antenna placement see the section 'GPS Antenna'.

## Power

The VBSS can be powered from a wide range of voltage sources including a Vehicle Cigar adapter, a Racelogic Li-ion battery pack or other source provided by the user. The supplied power cable is un-terminated. The maximum operating voltage input must not exceed 30V DC. Failure to observe this could result in damage to the VBSS.
**NB:** That during extended use, the VBSS case may become hot. This is normal; however it is good practice to mount the VBSS in a position where it has sufficient airflow around the case.

## LED indicators

There are 3 LED indicators on the top of the VBSS to show the status of operation.
**PWR**: Indicates that the VBSS is powered correctly.

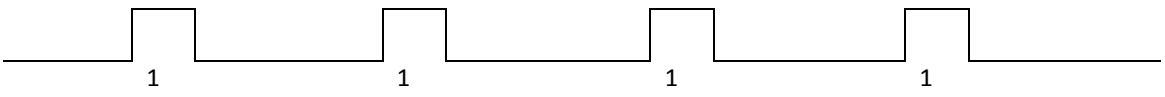
GREEN LED = OK RED LED = power on, but box not working correctly.

**SAT**: Indicates the number of GPS satellites that the VBSS has in lock. When no satellites are in lock, the SAT LED flashes slowly to indicate that the VBSS is searching for satellites. When one or more satellites are in lock, the LED will pulse the satellite count repeatedly with a short delay.

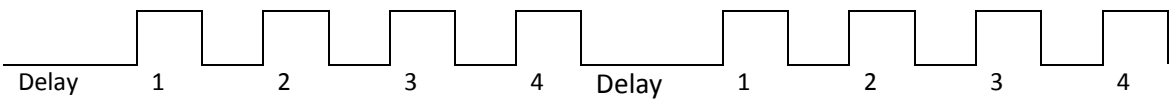
- Short RED LED = NO Sats - GREEN LED = GPS sat count

The following diagram shows an example of SAT LED pulse sequence.

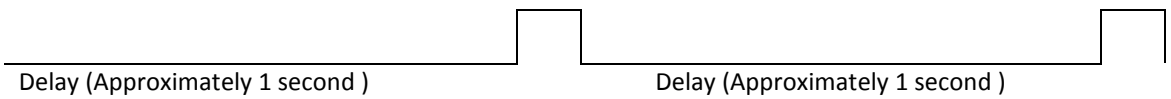
Sequence showing 1 Satellite




Sequence showing 4 Satellites




Sequence showing 0 Satellites



## LED Indicators – Continued

**EVENT:** Flashes in time with the digital pulse output.

- Digital Output set to 'Speed':

If the digital output is set to speed then the GREEN LED will flash in time with speed at a rate of 1/10th of the digital output.

- Digital Output set to 'Lap Pulse':

If the digital output is configured for the Lap Pulse, then the GREEN LED pulses for 1s when the start line is triggered and the EVENT GREEN LED and SATS GREEN LED both light up for 1s if the finish line is triggered.

**NB**: The EVENT LED and the GPS LED will be constantly lit RED for the duration of a coldstart.

## Locking onto Satellites

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

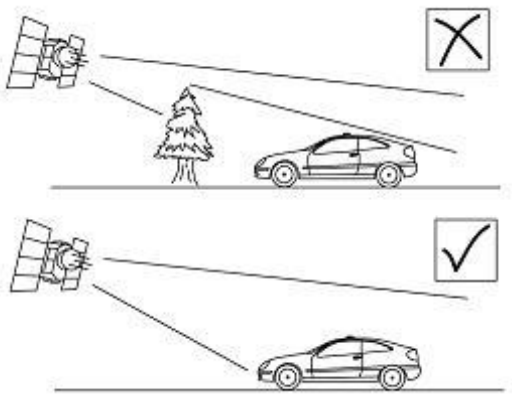
1) Confirm that the antenna is placed in a position where it has an unobstructed view of the sky.
2) Check the antenna connection with the VBSS; only small amounts of dirt in the socket can cause a significant reduction in signal strength. Also check the cable at the plug and along its length for any damage.
3) Check that the power supply is OK.
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'.

Once the VBSS has locked onto 5 or more satellites then it will be ready for use and will output data on CAN, RS232 and the analogue and digital outputs in accordance with the default settings.

The default settings of the CAN bus is shown in the CAN format table at the end of this manual. A CAN '.dbc' data file of this default CAN format is present on the CD, this file can be loaded directly into many CAN based data acquisition systems. The default setting of the Analogue output is Velocity configured to 5V output representing 400Kph. The default setting for the Digital output is Velocity configured to 90 pulses per metre.

## GPS Antenna

The GPS Antenna supplied with the VBSS is a 5v active antenna. For the best possible signal quality, it is important to maintain a clean connection between the antenna and the VBSS. Before fixing the antenna to the VBSS, ensure that there are no dust particles in either connector. Replacement antennas are available by contacting your VBSS 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. (e.g. The Vehicle roof)

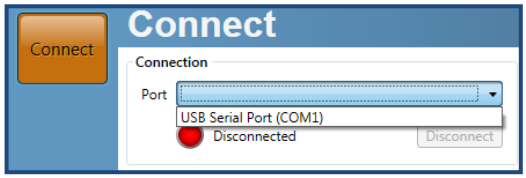
Please also note that when using any GPS equipment, an unobstructed sky view is important. Objects in the surrounding area such and tall buildings or trees can block the GPS signal causing a reduction or loss in the number of satellites being tracked.

# Configuring the Speed Sensor

## Hardware Connection

Configuration of the VBSS is performed using Racelogic Config software. Using the supplied RLCAB093 loom, connect the serial plug to the computers serial port – this can be done via a serial > USB convertor if required.

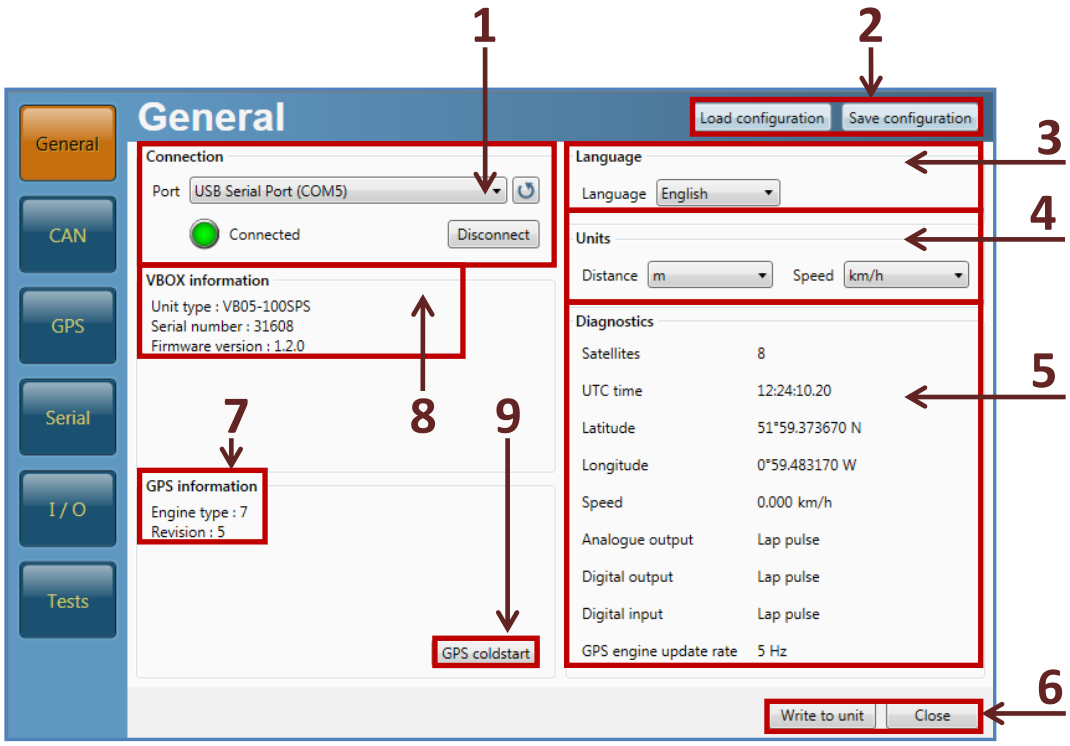
## Software Connection




Use the drop down list to select the correct COM port that the speed sensor is connected to. Click the connect button to enter the VBSS setup screen. **Note:** An auto detect message may appear if the baud rate has been changed from the default value– select 'Yes' to allow the different baud rates to be scanned.

# Setup Options

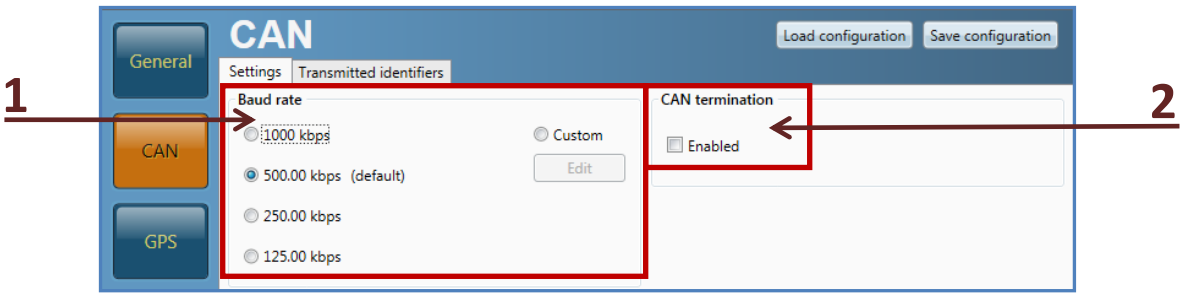
## General




1. **Connection** - Selected com port, refresh and disconnect buttons.
2. **Load/Save** - Load/Save settings from/into an .sscfg file. This allows setups to be kept for future use.
3. **Language** - Select an operating language.
4. **Units** - Select Distance units (m, ft, km, mi, nmi) and Speed units (kmh, mph, kts, m/s, fts).
5. **Diagnostics** - Displays live GPS data and basic current setup. GPS Info shows details on fitted GPS engine.
6. **Write to unit** - After making changes to setup, the write to unit button must be selected to upload settings.
7. **GPS Information** – Technical details about the GPS engine installed in the connected unit.
8. **VBOX Information** – Serial number and installed firmware version of connected unit.
9. **GPS Coldstart** - Clears almanac stored in the GPS engine. Only to be used when struggling to gain SAT lock.

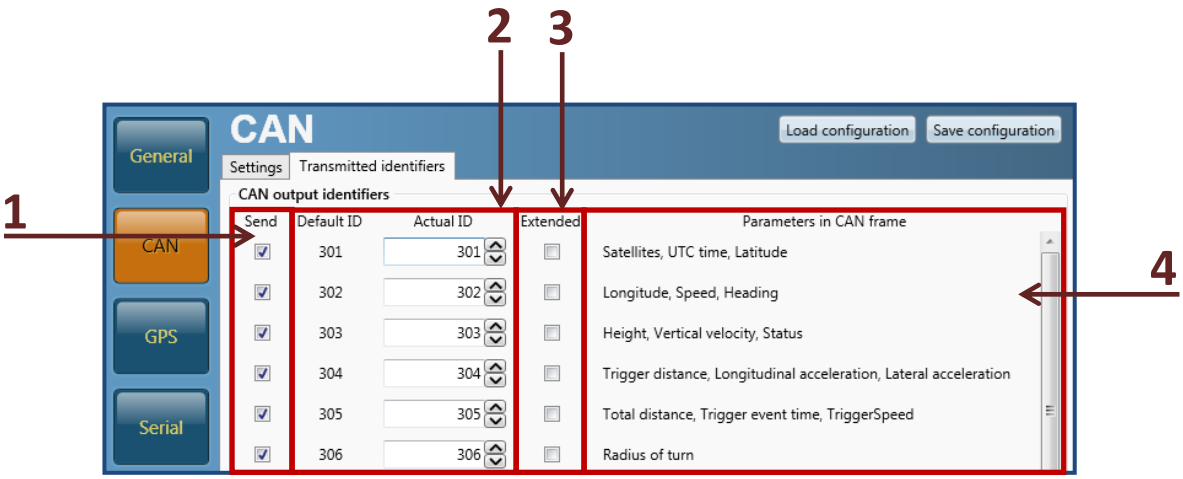
## CAN

The CAN output consists of 10 CAN messages. To see details of the default CAN output of the VBSS, go to the CAN format section at the end of this manual.




1. **Baud Rate -** The software has four common baud rate values: 1000 kbps, 500 kbps, 250 kbps or 125 kbps. The user also has the option to select a custom baud rate.

2. **CAN termination Resistance -** The internal CAN termination resistance can be enabled or disabled here.



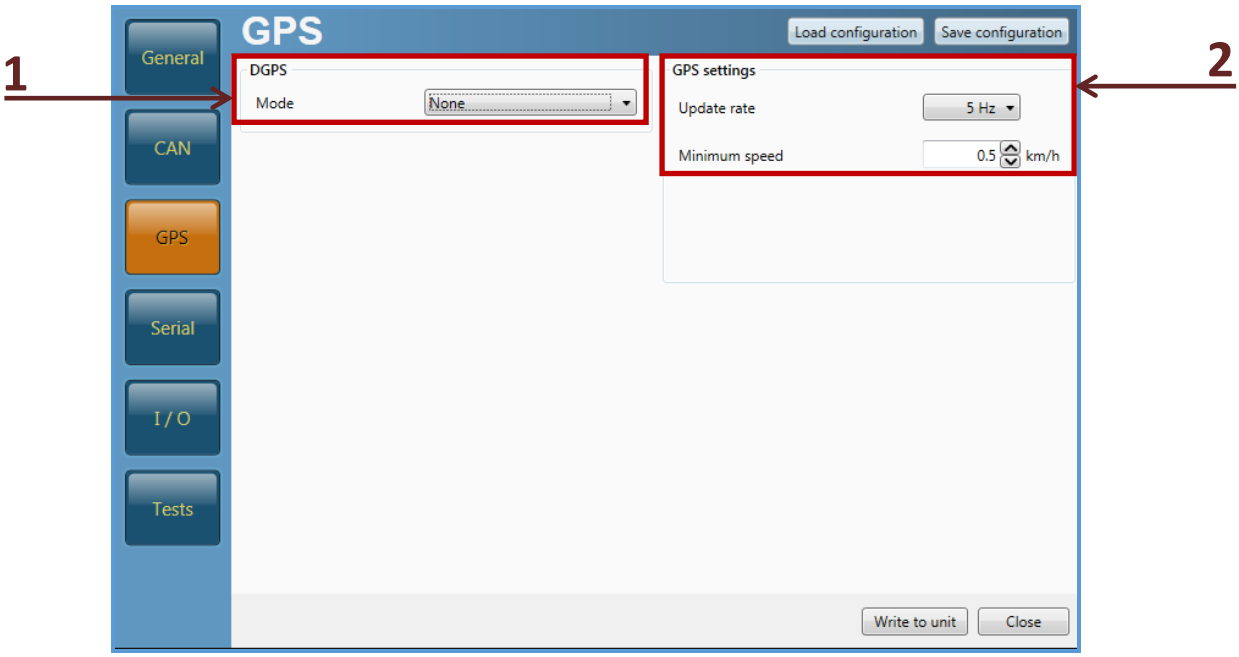

1. **Send -** To switch a CAN message on/off, tick or un-tick the box for the corresponding message.

2. **Default / Actual ID –** This allows the user to modify the CAN IDs transmitted by the Speed Sensor. Default values are the Racelogic standard ID's of 0x301, 0x302 …. 0x307.

3. **Standard/Extended -** To change the identifier format from standard 11bit to extended 29bit tick the 'Extended' box in the corresponding column.

4. **Parameters –** shows which parameters will be sent out in each message.

## GPS



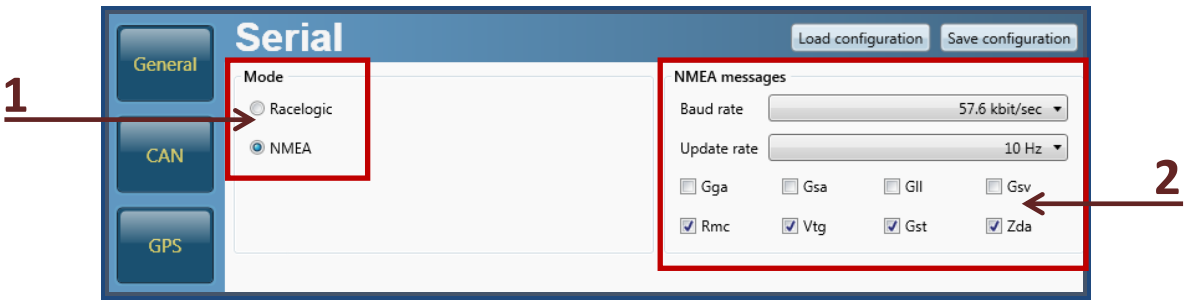

1. **DGPS Mode -** This gives the user the option to select whether the Speed Sensor uses differential GPS:

   None: Differential GPS is off.
   SBAS: SBAS differential corrections are received from the nearest Geo-stationary GPS-SBAS satellite.

2. **GPS Settings -** Change the update rate of the GPS engine and set a minimum speed output value and elevation mask, if required. For more information on elevation masking, see page 7.

## Serial

The serial output screen allows the user to configure the format, content and data rate of the serial stream transmitted by the Speed Sensor.



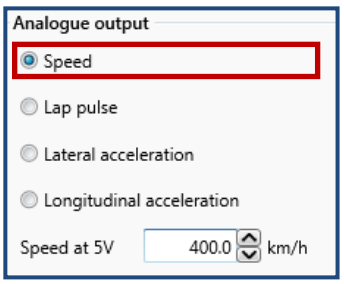

1. **Mode -** This selects whether the Speed Sensor outputs data in the Racelogic format or the NMEA message format*.

2. **NMEA Messages** - If the NMEA message format is selected, more options become available.
   **Baud Rate:** The required serial baud rate can be selected from this drop down menu.
   **Update Rate:** The update rate of the NMEA messages can be changed using this drop down list.
   **Message Selection:** NMEA messages can be selected and deselected for transmission by checking and un-checking the boxes next to each message type.

* **NMEA output is unavailable for units with a Serial Number of 31610 or higher.**

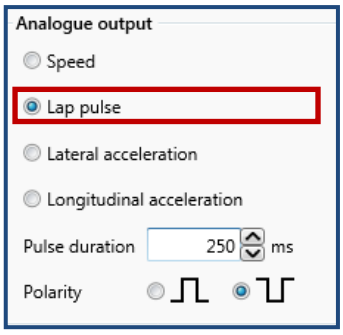
# I/O

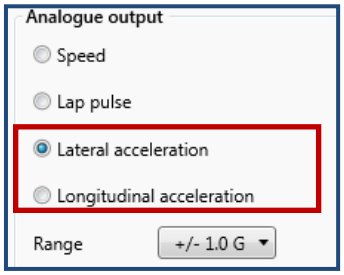
## Analogue Output




**Speed -** Enter the maximum for the speed range you wish to measure. Default speed is set to 400 kmh. The maximum speed at 5V can be in the range 10 – 1000 kmh.

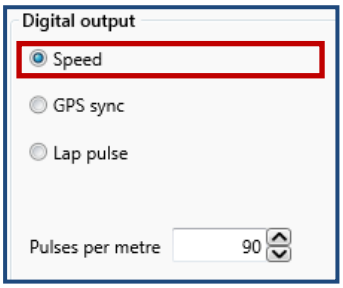
**Lap Pulse -** When this option is enabled the VBSS will output a 5V pulse when a Start/Finish line is crossed. The duration of the pulse in milli Seconds can be adjusted by entering a different value. The polarity of the pulse can be changed to either a rising or falling pulse by clicking the 'Polarity' button. The image of the pulse will change to indicate the current polarity configuration.



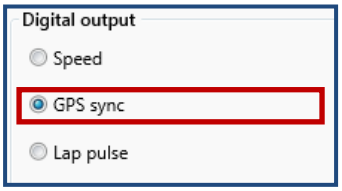




**Lateral / Longitudinal Acceleration** - Select the range you wish to use from the pull down list.

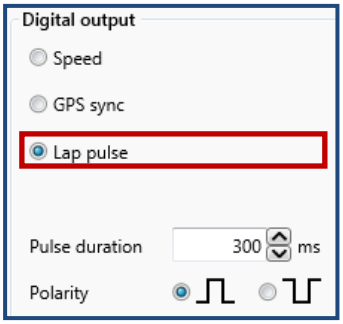
## Digital Output




**Speed** - The speed output is configured by changing the number of pulses per metre. Default = 90 pulse per metre => 25 Hz per km/h.



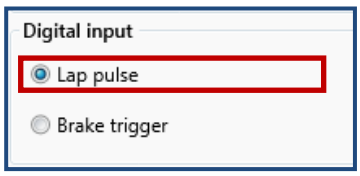

**GPS Sync** - Selecting this option outputs a pulse every second, which is synchronised to the GPS clock. **Note:** this feature is an optional extra which is not available by default. A GPS engine update is required to allow this to work correctly.
Contact support@racelogic.co.uk for more information.




**Lap Pulse** - When this option is enabled the VBSS will output a 5Vpulse for 300ms when a Start/Finish line is crossed. The duration of the pulse in milliseconds can be adjusted by entering a different value.
The polarity of the pulse can be changed to either a rising or falling pulse by selecting the marker next to the desired image.

## Digital Input

**Lap Pulse input -** To program the position of a virtual line in the Speed Sensor you must first ensure that you have a connection to the Lap Input (pin 6). This pin should be connected to one side of a momentary switch and the other side of the switch connected to the Ground pin of the VBSS, so that when the switch is pressed the Lap Input pin will be shorted to Ground.



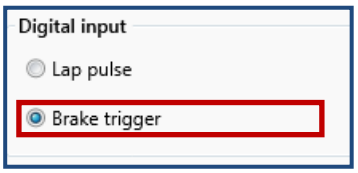

**Set a Start/finish line**: Press and immediately release the Lap input switch as you cross the start finish line. You must be moving >5km/h to do this and following the normal line along the track. The VBSS notes the point and direction of travel, then creates a virtual line perpendicular to your line of travel 25m wide.

**Set a separate Finish line:** press hold the switch for >1.5 seconds before releasing. After you have set a Start/Finish or Finish line you can view the Latitude and longitude of this line position in the 'Tests' page of the setup software. If the software was already connected then press 'Connect' again to refresh the settings.

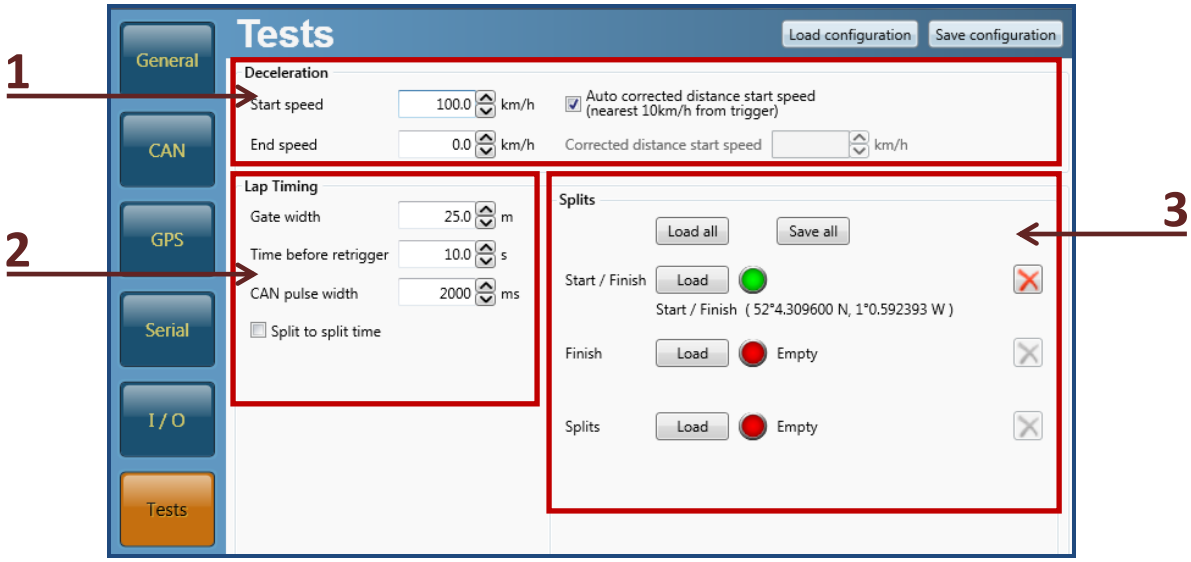
**Set a Split line -** Press the button twice for a very short period, when this has been marked, the 2nd LED flashes quickly 5 times. The output from the split line should be identical in all respects as the first.

**To clear all Virtual lines -** Press the button shortly once followed by a longer button press (longer than 1.5 seconds). In each case the VBSS will recognise the lead edge of the first pulse as the activation in order to set the associated virtual line at the exact point that the user first presses the switch.

**Brake Trigger Input** - Starts the brake stop distance measurement, where the VBSS will calculate a Time and Distance for a Brake Trigger to 0Km/h test.



## Tests




1. **Deceleration –** Here the start and end speed of non-trigger deceleration tests can be configured.

   **Auto Corrected Distance Start Speed** – This sets the speed sensor to use the nearest rounded 10km/h speed when the trigger is activated. For example, if the trigger speed was 104km/h then 100km/h would be the nominated start speed for the corrected brake stop distance.
   **Corrected Distance Start Speed** - If the auto option is not selected, the user is able to specify a speed value to correct all deceleration tests to.

2. **Lap Timing**

   **Gate Width –** This sets the width of any gates set in the software. This is a useful feature when two parts of a track run very close to each other, or the pit lane is next to the start/finish line, as lowering this value can stop the virtual line being triggered by the incorrect area of the circuit.

   **Time before retrigger –** This allows the user to set a number of seconds during which the brake trigger will not be reactive after having been pressed. This is to avoid trigger bounce during tests.

   **CAN Pulse Width –** This option controls the duration of the lap time and splits CAN pulse. Other lap timing CAN channels such as Lap Marker, SF crossing pulse or gate crossing pulse mare set to a 1000ms duration, or, the highest analogue or digital pulse duration setting, if greater.

   **Note:** For a Lap beacon pulse to be output by the VBSS ensure valid virtual gate(s) have been loaded.

3. **Splits –** Use the ‘Load all’ button to load a .SPL or .DSF file containing start/finish and split gates. Optionally, load split points, finish line or S/F line separately, using the separate ‘Load’ buttons.
   Files loaded via these buttons will have the selected information only loaded from them –i.e. a file containing a start/finish gate and 6 splits will only load the start/finish gate when loaded via the Start/Finish ‘Load’ button.

## Upgrading the VBSS Firmware

Firmware refers to the operating software inside the VBSS Speed Sensor. The firmware is responsible for all of the functions within the VBSS and from time to time, firmware updates will be released by Racelogic to improve or enhance the way that the VBSS works. The latest firmware will always be available on the Racelogic website:

www.firmware.racelogic.co.uk

It is recommended to check the web site periodically for updates. The VBSS upgrade files have a ".ruf" file extension. To upgrade the VBSS firmware, download the latest firmware file from the Racelogic web site and copy this file onto your PC. If you have done a full VBSS CD installation then you will have the upgrade programme automatically installed in the Utilities folder of VBSS folder. If not then this can also downloaded from the website.
Connect you pc to the VBSS via the VBSS serial lead and apply power to the VBSS.

Either 'double click' on the '.ruf' upgrade file, which auto runs the Upgrader software, or run the Upgrader software and load in the '.ruf' firmware upgrade file. Then follow the onscreen instructions and the VBSS firmware will be upgraded.

At the end of the process power down the VBSS when prompted, before further use During the upgrade process an upgrade log file will have been created. This log file can be emailed to the support address below should any problems arise.

If you have any questions regarding the upgrade of the VBSS, please do not hesitate to contact: support@racelogic.co.uk

## CAN output

The following details the default CAN output from a RLVBSS05.

Note, this is the Racelogic standard VBOX output, ie. Starting at 0x301

| **Format** | | **Motorola** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **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 MMMMM.MMMMM | | | | (5) Speed. (Knots) | | (6) Heading (Degrees) | |
| **0x303** | 100ms | (7) Altitude. WGS 84. (Metres) | | | (8) Vertical velocity. (M/S) | | Unused | (9) Status | (10) Status2 |
| **0x304** | 100ms | (11) Distance from Brake trigger (Meters) | | | | (12) Longitudinal Accel. (G) | | (13) Lateral Accel. (G) | |
| **0x305** | 100ms | (14) Distance travelled since VBOX reset (Metres) | | | | (15) Trigger Time (S) | | (16) Trigger Speed | |
| **0x306** | 100ms | Unused | | (17) Lean Angle (degrees) | | (18) Radius of Turn (meters) | | | |
| **0x307** | 100ms | (19) Position – Latitude DD.DDDDDDD | | | | (20) Position – Longitude DD.DDDDDDD | | | |
| **0x308** | 100ms | (21) Distance from Brake Trigger (corrected) (Meters) | | | | (22) Distance from start speed to end speed (Meters) | | | |
| **0x309** | 100ms | (23) Speed at start of test (kmh) | | (24) Speed at end of test (kmh) | | (25) Decel test time (s) | | unused | |
| **0x30A** | 100ms | (26) Lap time (s) | | (27) Split time (s) | | (28) Status | | unused | |

## CAN output – continued

(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 (mmmm.mmmmm) * 100,000 (311924579 = 51 Degrees, 59.24579 Minutes North). This is a true 32bit signed integer, North being positive.
(4) Position, Longitude (mmmmm.mmmmm)* 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.8 bit unsigned char. Bit 2 always set.
(10) Status2, 8 bit unsigned char. Bit 0 is always set, Bit 1 = Lapmarker, Bit 3=brake test started, Bit 4 = Brake trigger active, Bit 5 = DGPS active
(11) Distance, 0.000078125 meters per bit, unsigned. Corrected to trigger point
(12) Longitudinal Acceleration, 0.01G per bit, signed.
(13) Lateral Acceleration, 0.01G per bit, signed.
(14) Distance (since reset/powercycle), 0.000078125 meters per bit, unsigned.
(15) Time from last brake trigger event. 0.01 Seconds per bit
(16) Velocity at brake trigger instant, 0.01 knots per bit (window smoothed over previous 4 samples)
(17) Lean Angle, 16-bit signed integer * 100.
(18) Radius of Turn 32-bit signed * 100.
(19) Position, Latitude (DD.DDDDDDD) * 10,000,000 (519874298 = 51.9874298 Degrees, North). This is a true 32bit signed integer, North being positive.
(20) Position, Longitude (DD.DDDDDDD) * 10,000,000 (11882246 = 1.9803743 Degrees, West). This is a true 32bit signed integer, West being positive.
(21) Distance, 0.000078125 meters per bit, unsigned. Trigger distance corrected to nearest 10km/h speed
(22) Distance, 0.000078125 meters per bit, unsigned. From start speed to end speed –Decel test
(23) Speed at start of Decel test, 0.01 knots per bit
(24) Speed at end of Decel, test 0.01 knots per bit
(25) Time of Decel test . 0.01 Seconds per bit
(26) Lap time 0.01 Seconds per bit
(27) Split time 0.01 seconds per bit
(28) Status. Bit 0 = Start/finish crossing; Bit 1 = Split line crossing (includes start/finish crossing)

## RS232 / NMEA* output

The RS232 output is present to provide a connection to a computer for configuring the settings of the VBSS through the VBSS setup software. It also can output NMEA format messages. The VBSS can output 8 types of NMEA messages, the most commonly used are GPGGA and GPVTG, the contents of which are shown below.

`$GPGGA,hhmmss.ss,Latitude,N,Longitude,E,FS,NoSV,HDOP,msl,m,Altref,m,DiffAge,DiffStation*cs<CR><LF>`

| Name | ASCII String Format | ASCII String Example | Units | Description | |
|---|---|---|---|---|---|
| $GPGGA | string | $GPGGA | | Message ID | GGA protocol header |
| *hhmmss.ss* | hhmmss.sss | 092725.00161229.487 | | UTC Time | Current time |
| *Latitude* | dddmm.mmmm | 4717.113993723.2475 | | Latitude | Degrees + minutes |
| *N* | character | N | | N/S Indicator | N=north or S=south |
| *Longitude* | dddmm.mmmm | 00833.9159012158.3416 | | Longitude | Degrees + minutes |
| *E* | character | WE | | E/W indicator | E=east or W=west |
| FS | 1 digit | 1 | | Position Fix Indicator | See Table 41 |
| NoSV | numeric | 078 | | Satellites Used | Range 0 to 12 |
| HDOP | numeric | 1.001 | | HDOP | Horizontal Dilution of Precision |
| Msl | numeric | 499.69.0 | m | MSL Altitude | |
| M | character | M | | Units | Meters |
| Altref | blank | 48.0 | m | Geoid Separation | |
| M | blank | M | | Units | Meters |
| DiffAge | numeric | | second | Age of Differential Corrections | Blank (Null) fields when DGPS is not used |
| DiffStation | numeric | 0 | | Diff. Reference Station ID | |
| Cs | hexadecimal | *5B *18 | | Checksum | |
| <CR> <LF> | | | | | End of message |

`$GPVTG,cogt,T,cogm,M,sog,N,kph,K*cs<CR><LF>`

| Name | ASCII String Format | ASCII String Example | Units | Description | |
|---|---|---|---|---|---|
| $GPVTG | string | $GPVTG | | Message ID | VTG protocol header |
| cogt | numeric | 77.52 | degrees | | Course over ground (true) |
| T | character | T | | fixed field | True |
| cogm | Blank | | | Course over ground (magnetic). | Not output (empty) |
| M | character | M | | fixed field | Magnetic |
| sog | numeric | 0.004 | knots | | Speed over ground |
| N | character | N | | | |
| kph | numeric | 0.008 | km/h | Speed | |
| K | character | K | | K | Kilometers per hour - fixed field |
| cs | hexadecimal | *0B | | Checksum | |
| <CR> <LF> | | | | | End of message |

*** NMEA output is unavailable for units with a Serial Number of 31610 or higher.**

# Technical Specifications

## 5Hz Speed Sensor (VBSS05): GPS Specifications

| | | | |
|---|---|---|---|
| **Velocity** | | **Distance** | |
| Accuracy | 0.2 Km/h | Accuracy | 0.05% (<50cm per Km) |
| Units | Km/h or Mph | Units | Metres / Feet |
| Update rate | 5 Hz | Update rate | 5Hz |
| Maximum velocity | 1000 Mph | Resolution | 1cm |
| Minimum velocity | 0.1 Km/h | Height accuracy | 10 Metres 95% CEP** |
| Resolution | 0.01 Km/h | | |
| Latency | >160ms | | |
| **Absolute Positioning** | | **Time** | |
| Accuracy | 5m 95% CEP** | *Accel/Brake Test (MFD):* | |
| Accuracy with SBAS DGPS | >1.8m 95% CEP** | Resolution | 0.01 s |
| Accuracy with BaseStation RTCM DGPS | 40cm 95% CEP** | Accuracy | 0.2 s |
| | | *Lap Timing (OLED):* | |
| Update rate | 5 Hz | Resolution | 0.01 s |
| Resolution | 1.8 cm | Accuracy | 0.01 s* |
| **Heading** | | **Acceleration** | |
| Resolution | 0.01° | Accuracy | 1.00% |
| Accuracy | 0.2° | Maximum | 4 G |
| | | Resolution | 0.01 G |
| | | Update rate | 5 Hz |
| **Brake Stop Accuracy (Trigger Activated)** | | | |
| Accuracy | N/A | | |

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

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

## Inputs

| **Power** | |
|---|---|
| Input Voltage range | 6.5v – 30v DC |
| Power | 2w Max |
| GPS Antenna | 3V Active Antenna (inc) |
| Digital Input | Cold Start Activate / Set Lap beacon Position |
| LED | Power, Satellite Count, Event Out |

## Outputs

| | |
|---|---|
| **CAN Bus** | |
| Output Data Rate | 125Kbit, 250Kbit, 500Kbit & 1Mbit selectable baud rate. Un-terminated CAN node. |
| Data available | Position, vehicle speed, heading, lateral acceleration, longitudinal acceleration, satellite count, time, radius of turn, altitude. |
| **RS232** | |
| Output Data Rate | 5Hz |
| Data Available | NMEA* $GPGGA and $GPVTG messages at 115200Baud |
| **Analogue** | |
| Output Data Rate | 0 to 5v DC |
| Data Available | Either Speed, Lateral Acceleration, Longitudinal Acceleration, or Lap Beacon |
| **Digital Output** | |
| Output Data Rate | Low = 0v, High = 5v, 10-1000 pulses per metre, Max frequency 4.4Khz |
| Data Available | Speed or Lap Beacon |

*** NMEA output is unavailable for units with a Serial Number of 31610 or higher.**

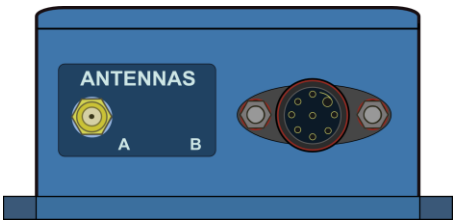
## Environmental and physical

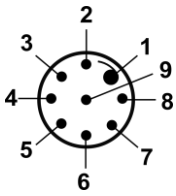
| | | | |
|---|---|---|---|
| Weight | Approx. 250g | Operating temp<br>Storage temp | -30˚C to +70˚C<br>-40°C to +85°C |
| Size | 140mm x 92mm x 31.85mm | Connectors | Deutsch ASDD Autosport<br>Rated IP66 |

## Hardware / Software 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 original purchaser. Contract includes telephone / email technical support provided by local VBOX distributor and firmware / software upgrades where applicable. |

## Connection Data




9-PIN Deutsch Connector

**Main Connector (Deutsch Autosport)**

| Pin | I/O | Function |
|---|---|---|
| 1 | I | RS232 Rx |
| 2 | I | +8V to +30V Power. Ignition switched feed |
| 3 | I/O | CAN Low |
| 4 | I/O | CAN High |
| 5 | O | Analogue Output |
| 6 | I | Lap Marker Input / Brake Trigger Input |
| 7 | O | Speed Pulse / Lap Beacon |
| 8 | O | RS232 Tx |
| 9 | I | Ground |

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