VBOX MOTORSPORT

VBOX LapTimer Manual

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Contents

EC declaration of conformity

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

EC directive 2004/108/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."

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Buckingham,
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MK18 1TB
United Kingdom.

Introduction

VBOX LapTimer is a 20Hz GPS data logger and predictive lap timer display in one. It provides instant driver feedback, helping to find valuable improvements in lap times. It features two RGB LED indicators, audible signals and a three button keypad. VBOX LapTimer has a built in screen orientation accelerometer, so it can be mounted either way up.

A logged data file (.VBO) containing all GPS derived information such as speed, time and position will be stored on the SD card for the user to examine later. This data file can be loaded into circuit tools software for lap time comparisons and driving line analysis.

VBOX LapTimer is also compatible with **Video VBOX (firmware 3.00.77 or later), VB3i and 100Hz Speed Sensor units to** offer full OLED functionality (cable not included). In OLED mode, GPS data will be logged to Video VBOX media but lap data (start/finish, split files and Reference laps) will be logged to the LapTimer SD Card.

Features

- 20Hz GPS data logger.
- Live delta-t on screen display.
- Delta-V LED indicators.
- Live / max speed display.
- Static / rolling lap times and lap counter.
- Can be used as an OLED display

Standard inventory

Description	Qty	RL Part #	Description	Qty	RL Part #
VBOX LapTimer unit	1	VBLAP01-V1	4GB SD card	1	RLACS137
Cigar lighter power cable	1	RLCAB010L	External Antenna	1	RLACS070-R
VBOX Suction mount	1	RLACS125			

Quick Start Guide

Connect a 12v power source and GPS antenna to the VBOX LapTimer.

Place the GPS antenna in the middle of the vehicles roof.

When satellites have been acquired, the VBOX LapTimer will check the GPS location against Racelogic's track map database and load the layouts available.

The user must select the layout they are driving through the main menu.

When the correct layout is selected, exit the menu and move to the 'Predictive Lap Timing' screen using the arrow keys.

Start driving! When the start line is crossed for the first time, a reference lap will be created.

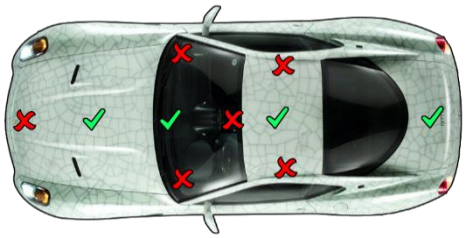
When the start line is crossed again, a live delta-t display will be shown, comparing the current lap time to the reference lap time.

The two front LEDs will indicate if the vehicles speed is currently faster (green) or slower (red) in comparison to reference lap speed.

If a faster lap time is achieved, this will automatically replace the reference lap, so VBOX LapTimer is always comparing to the best time.

Antenna setup

Obtaining the best GPS quality

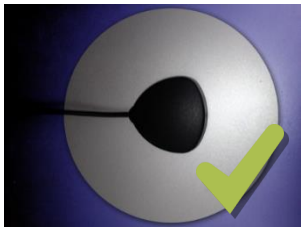


Placement of the GPS antenna is crucial to the quality of the data recorded by VBOX LapTimer. Any metal close to a GPS antenna can disturb the signal in an unpredictable way due to interference from reflections of weak GPS signals.

For the best results, use the antenna in the **centre** of a metal roof away from any roof bars or radio antennas. Do not mount the antenna close to the edge of the roof as reflections from the ground may interfere with the signals. Avoid the edges as reflections from the A-pillars will cause problems.

Mount the antenna as high up as possible and keep above any roll bars. Pieces of metal close to and above an antenna will badly disrupt the GPS signal.

If the vehicle being used does not have a metal roof, then place the GPS antenna on a flat piece of metal **at least 10cm in diameter**. If this is not possible, copper or aluminium foil can be used to create a shaped ground plane underneath the antenna. For example, on a fibreglass roof, mount the antenna on top of the roof, and place some adhesive backed metal foil underneath, on the inside of the roof.



Acquiring Satellite Lock

Tall buildings or trees can block GPS signals, causing a reduction in the number and quality of satellites being tracked, leading to inaccurate position measurements and a noisy velocity signal.

GPS works best in open areas

Avoid tree lined roads

GPS Coldstart

If VBOX LapTimer is struggling to acquire satellite lock, a GPS coldstart may be required. This may be necessary when the unit hasn't been used for a number of days or has dramatically moved location since its last use. To perform a cold-start, select MENU > GPS OPTIONS > COLDSTART.

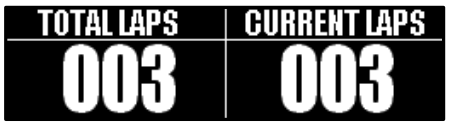
Note: The GPS Options menu cannot be accessed when the LapTimer is being used in OLED mode. In this instance, the coldstart must be done on the connected unit.

Display modes

VBOX LapTimer has different display modes, which can be accessed using the Up and Down buttons. The data on each screen is calculated at all times, even if it is not displayed.

Live Speed

Lap Count



Max. Speed

Predictive Lap Timing

Lap Timing

Speed

In this mode the screen will display a large clear speed value to 2 decimal places. The speed can be set to display in kph, mph or knots. The number of decimal places displayed can be adjusted through the VBOX LAPTIMER menu.

Logging control

To start or stop the VBOX LapTimer logging data, press the ■ button when in Speed Display mode.

Max speed

In this mode the screen will show the highest achieved speed value to 0, 1 or 2 decimal places.

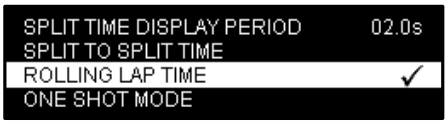
Max speed reset

If the ■ button is pressed then the unit will reset the displayed maximum speed value.

Lap timing

All lap times and split times are interpolated to 0.01 second resolution.

In this mode the screen can display either a live rolling lap time or a static last lap time and the lap count. This is set from within the menu screen.



Fastest lap

The difference between the new lap time and the best lap time will be shown with a + or – sign. A '–' is shown when a faster than best is achieved and a '+' is shown for a slower than best.

Split line display

If split lines have been set via the VBOX LapTimer main menu, then split times will be shown for between 2 and 20 seconds when the split line is crossed. See 'split time display period' section for setup info.

Setting a start/finish line

In the lap timing screen a new start/finish line can be set by pressing the ■ button. If this is selected by mistake, it can be cancelled by pressing the ▼ button within 5 seconds.
If split lines or a separate finish are also required, then use the 'set start finish and splits' option in the main menu.

Note: The vehicle must be moving >0.5km/h to set a Start/Finish Line.

Predictive lap timing

For this mode to work, a start/finish line is required. Make sure that a track layout is selected through the main menu, or set a start line manually.

Until the start line is crossed, the screen will show 'Waiting for start line' and the distance from current location to this point.

When the line is first crossed and during the first lap, VBOX LapTimer will create a reference lap.

The second crossover of the start line will allow VBOX LapTimer to start predicting.

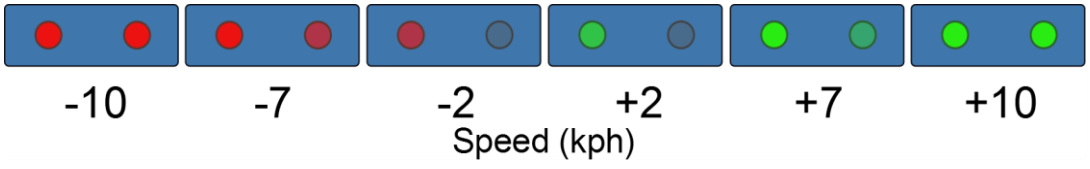
The reference lap will be replaced with any subsequent quicker lap time.
To fix this comparison lap time at any point, press the ■ button.

Delta-V LEDs

The two front panel LEDs are used in predictive lap timing mode. They indicate if the current vehicle speed is faster or slower than the speed was at the same position in the reference file.

The LEDs will show RED if the current speed is slower than the reference, or GREEN if the current speed is faster.

If 'Delta-V range' is set to 10kph, the LEDs will illuminate as shown below. Note that the brightness of each LED will increase/decrease as the difference to the reference speed becomes greater.

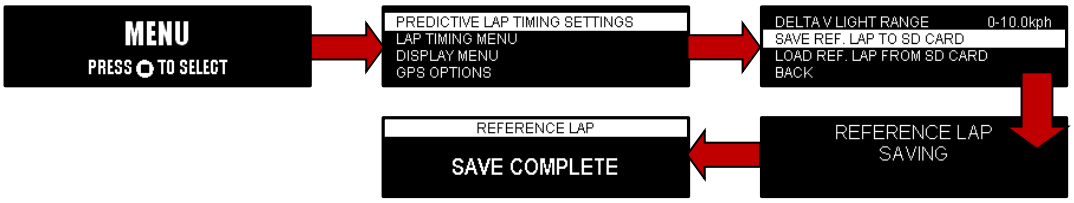


The left LED represents 0-50% of the positive or negative range and will illuminate first.
The right LED represents 50-100% of the positive or negative range and illuminates second.

Save reference lap

This feature allows the user to save a reference lap for future use, insert an SD card into VBOX LapTimer and use the menu options shown below. Note that the vehicle must be stationary to make this transfer.

Once this is selected, the following messages show saving has been successful. This will be stored on the SD card as LAP.REF in the 'Data' folder.



Load reference lap

To load a reference lap file stored from a previous session, put the desired file onto an SD card and load the card into VBOX LapTimer. The file can have any name, however it must be saved in the Data folder and only one .REF file should be present. Select the menu options as shown above – but select LOAD REF LAP instead of SAVE. Note that the vehicle must be stationary to make this transfer. Reference laps will be reset when either a new start/finish is set, or if the 'reset lap timing data' option is selected from the lap timing menu within main menu.

Live timing

The main predictive screen shows a continuously updated bar graph with the +/ - to previous. When a lap is completed, it will give a final lap time and total time difference to reference lap. If a faster time is achieved than the reference, a negative time will be shown.
The amount of time shown on the bar graph can be altered in the main menu to 2, 5, 10 or 30 seconds.

Additionally the LEDs on the front of the VBOX LapTimer indicate Delta-V. Red indicates that velocity is slower than the reference point and green faster. The brightness indicates how much slower or faster velocity is relative to the same point in the reference lap. The range over which this brightness will change can be defined in the menu over

Lap count display

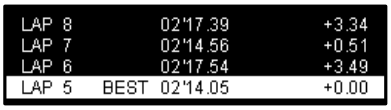
The lap count screen will display two lap counts. On the left hand side of the screen the total lap count is displayed – this counter will only be reset by a power cycle of the VBOX LapTimer. The right hand side of the screen displays the current laps and will be reset by removal of the logging media from VBOX LapTimer.

Menu options

The VBOX LAPTIMER display menu is accessed by pressing the ■ button when the 'Menu' screen is shown. The menu can be navigated with the ▲and ▼ buttons.

View lap times

VBOX LapTimer will store all the lap times from the current session (maximum of 99 lap times). The lap times will be cleared when a new start line is set or the lap timing data is reset.



Clear lap times

Selecting this option will wipe all stored lap times from the unit's memory.

Logging options

Within this sub menu the user is able to configure how VBOX LapTimer's logging is triggered. There are three logging options. **Note:** Logging mode cannot be configured when LapTimer is used as an OLED. This should be configured in the connected unit's software e.g. Video VBOX Setup or VBOX Tools.

Log when moving

The user can define at what speed the logging should start and stop and what the stop logging delay is (in seconds). To change these values use the arrow buttons to highlight the row and press the square button to select. A symbol will appear next to the field that is selected – as shown above.
The user can then use the arrow buttons to change the values and square again to set.

Manual

Manual logging mode must be toggled on and off by the user – it will never automatically start or stop. The square button when speed mode is selected must be used to control logging.

Continuous

When this mode is selected, VBOX LapTimer will log as soon as power and media are present. The user should press the square button when in speed mode to stop logging before removing the card.

Logging status

If the VBOX LapTimer is logging then a scrolling bar will be shown across the bottom of the screen, except in Predictive Lap timing mode.

Logging control

To start or stop the VBOX LapTimer logging data, press the ■ button when in Speed Display mode.

Predictive lap timing settings

Delta T bar range

This setting alters the amount of +/- time shown on the bar graph during lap prediction. Either 2, 5, 10 or 30 seconds can be chosen.
Press ■ to when bar range is highlighted to scroll through different time options.

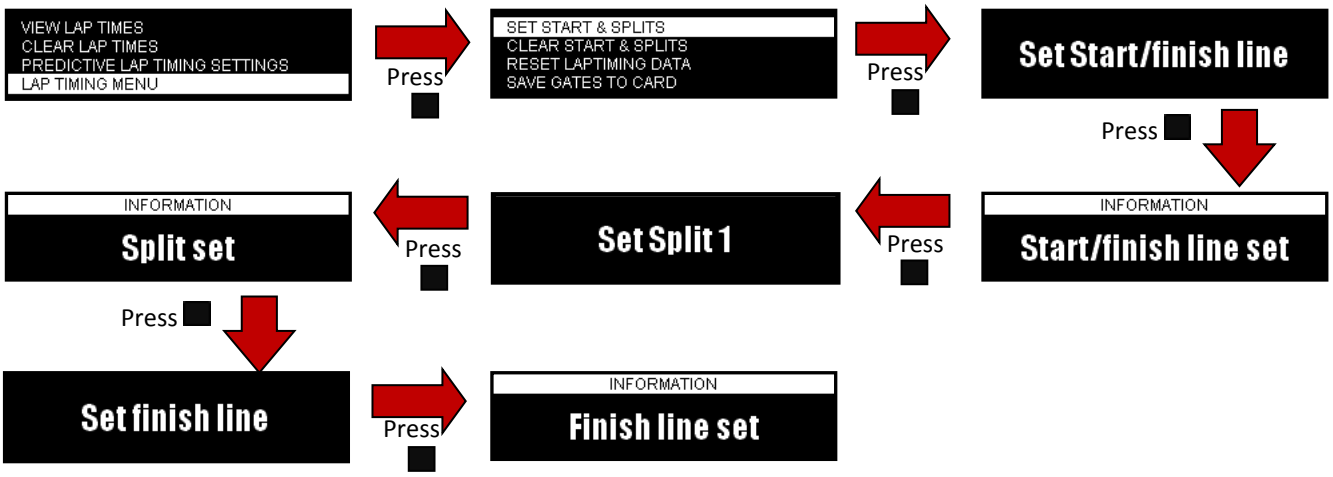
Delta V light range

This range setting affects the sensitivity of the Delta-V LEDs. Settings of 2kph, 5kph and 10kph are available – the default setting is 5kph.
Note that if the VBOX LapTimer is set to show speed in mph or knots, then these values will be the direct equivalent of the three values.
For more information on how this range affects the LEDs, see the 'Delta-V LEDs' section.
NB: See predictive lap timing section for info on saving and loading reference laps.

Lap timing menu

Set Start & Splits

After the ■ button is pressed a new start/finish point is set. After this the VBOX LapTimer will display "Set split 1". Press ■ to set the split, ▼to skip to additional split points, Finish line and back. If a new start/finish or split line is set then the lap count, best lap and all the best split time values automatically reset.

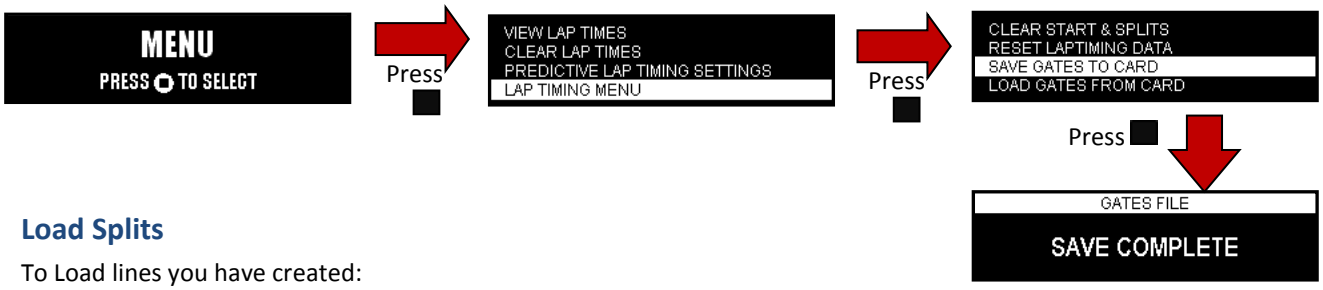


Save Splits

Start/Finish, split or finish lines can be loaded into or saved out from VBOX LapTimer. These files can be used in or created by the Circuit Tools software package.

To save the lines you have created:

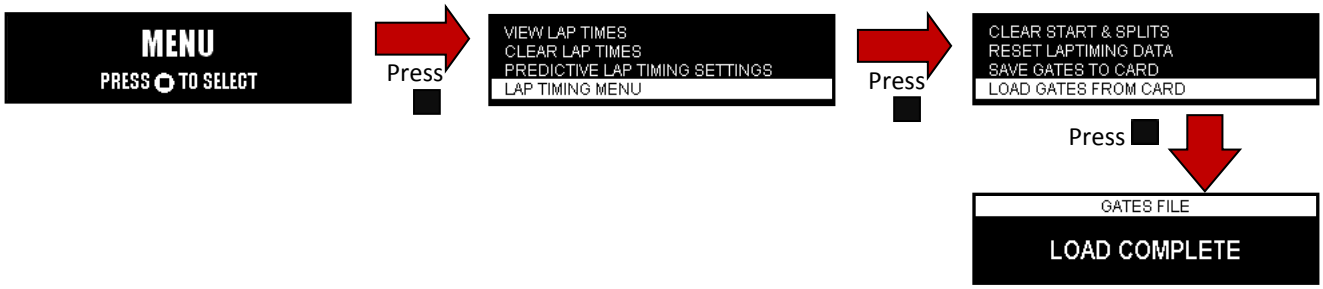
1. Ensure the SD card is inserted and vehicle is stationary.
2. Press the **MENU** button to enter the Lap timing menu.
3. Highlight the SAVE GATES TO CARD option and press **OK –** a *file will be saved as GATES.SPL in the Data folder.*



Load Splits

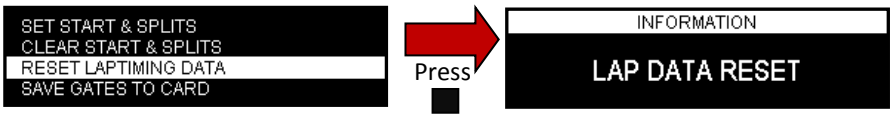
To Load lines you have created:

1. Ensure the SD card is inserted with the Splits file saved as GATES.SPL in the data folder and that the vehicle is stationary.
2. Press the **MENU** button to enter the Lap timing menu.
3. Highlight the LOAD GATES FROM CARD option and press **OK.**



Reset lap timing data

When this option is highlighted, pressing the ■ button causes the stored reference lap, lap count and all lap times to be reset. Using this option fully resets predictive lap timing mode.



Load tracks database

If an updated track database file for VBOX LapTimer is released, this option will load it from the SD card.

Split time display period

This function allows you to set how long the split time is shown for on the VBOX LAPTIMER display when a split line or the start/finish line is crossed. There is a choice of: 2s, 5s, 10s, 15s or 20s, to select these options navigate to Main Menu - Lap timing Menu then highlight Split Time Display Period and use the ■ button to cycle through each option.

Split to split time

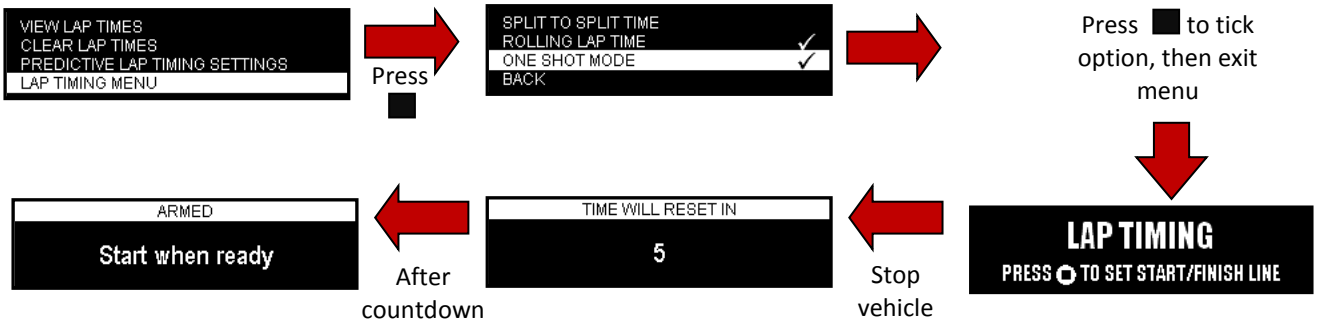
When this option is selected then the calculated split times will be split to split and not accumulative from the start of the lap.

Rolling lap time

Selecting this function will show a continuously counting lap time which briefly freezes as the start/finish line is crossed.

One shot mode

This mode is used for lap timing when the S/F line is not in the circuit database.
When one shot mode is enabled, when the user comes to a stop, after 2s, the screen counts down from 5 then shows ARMED – Start when ready.



If the user pulls away before 1 is shown on the screen, nothing changes. During or after 1 is shown, when the user pulls away the lap time measurement is started as if they had crossed a start/finish. If a lap had been running up to this point, the time is discarded. After correct movement has been detected and a one shot start has begun, a normal start/finish line cannot be triggered for 3 seconds.

Display menu

Speed units

Pressing the ■ button allows the user to select the units for speed to be displayed in - mph, kph or knots can be set.

Speed decimal places

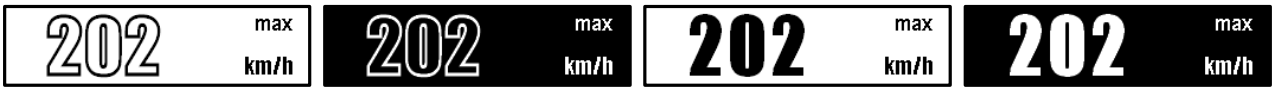
Pressing the ■ button will cycle through 0, 1, and 2 decimal places.

Brightness

Pressing the ■ button will cycle through five brightness settings labelled 1 – 5. The displays screen will change its brightness as each setting is cycled through. This setting also affects the two external LEDs.

Invert screen colour & use outline font

Pressing the ■ button when an option is highlighted allows it to be turned on or off. When an option is turned on, a tick will appear next to it. See images below for examples of the four different combinations.



Orientation

This setting allows the user to define the orientation of the VBOX LapTimer screen. When the default setting of auto is selected, the displays screen will automatically rotate when it is turned upside down.

If the VBOX LapTimer is being fitted in a permanent install or if it is expected to experience some heavy vibrations when in use, then the user may wish to fix the orientation as this can trigger the sensitive internal gyro to flip the screen.

GPS Options

Note: The GPS Options menu cannot be accessed when the LapTimer is being used in OLED mode. In this instance, the coldstart must be done on the connected unit.

Coldstart

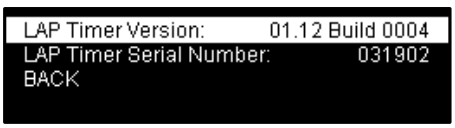
See 'Antenna setup' for cold start info.

Leap seconds

The number of leap seconds here sets the current offset between GPS and UTC time. This is set by official bodies to compensate for the slowing of the rotation of the earth. A new leap second is usually introduced every 4 to 7 years. The last leap second was added in June 2012.

About

In this section, the VBOX LapTimer serial number and installed firmware version is listed.

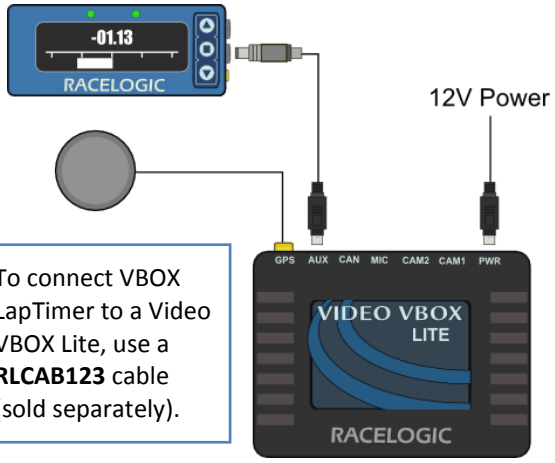


Using VBOX LapTimer as an OLED display

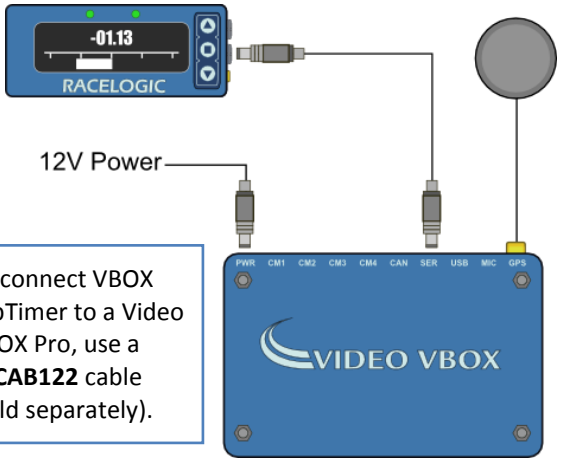
Using with Video VBOX

VBOX LapTimer can be used as an OLED display when connected to a Video VBOX unit. The LapTimer will check for the presence of a Video VBOX unit when it is powered up.

Connect the VBOX LapTimer to the Video VBOX as shown below, using the cables specified.



To connect VBOX LapTimer to a Video VBOX Lite, use a **RLCAB123** cable (sold separately).

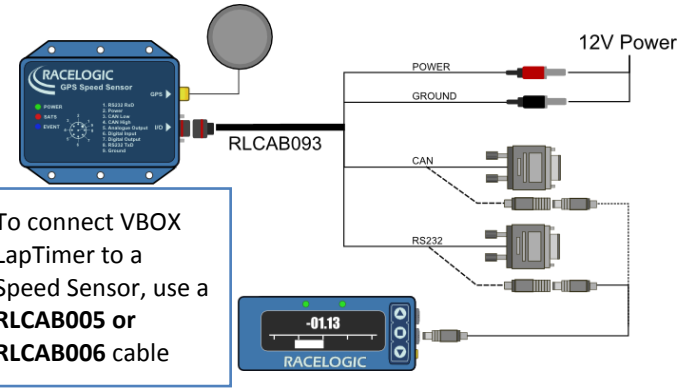


To connect VBOX LapTimer to a Video VBOX Pro, use a **RLCAB122** cable (sold separately).

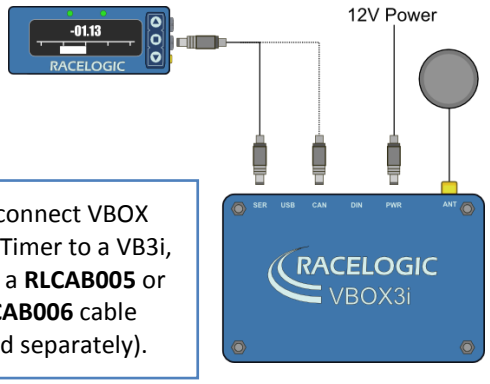
Using with VBOX or Speed Sensor

VBOX LapTimer can be used as an OLED display when connected to a VBOX or Speed Sensor unit. The LapTimer will check for the presence of a connected unit when it is powered up.

Connect the VBOX LapTimer as shown below, using the cables specified.



To connect VBOX LapTimer to a Speed Sensor, use a **RLCAB005 or RLCAB006** cable



To connect VBOX LapTimer to a VB3i, use a **RLCAB005** or **RLCAB006** cable (sold separately).

When using VBOX LapTimer as an OLED, it will use serial data sent from the connected unit. Power and GPS connections should be made only to the connected unit, as shown in the diagrams above

Important notes:
When the LapTimer is connected as an OLED, the user will not be able to access the 'Logging Options' and 'GPS Options' within the main LapTimer menu.

Logging settings must be altered using software for the connected unit, e.g. Video VBOX Setup or VBOX Tools.

If required, a GPS coldstart must also be carried out via the connected unit.

The VBOX LapTimer can also not have firmware upgrades performed through the Video VBOX like an OLED display can. Please see the 'upgrading firmware' section for details on how to do this.

Compatible recording media

VBOX LapTimer can record to MMC, SD, SDHC and SDXC media cards that are formatted in a FAT or FAT32 format.

SDXC cards will be formatted as exFAT by default, a format type not supported by VBOX LapTimer. They can still be used, as long as they have been reformatted to FAT32. Various free third party applications are available online to format SDXC cards.

Memory usage

If the SD card used has less than 10 MB of space remaining a warning symbol flashes periodically to indicate the amount of memory remaining.

Power

VBOX LapTimer can accept a supply voltage in the range of 7 to 30V DC.

Upgrading firmware

It is recommended to check the web site periodically for updates. The latest firmware for VBOX LapTimer can be found here.

To perform an upgrade simply place the .upgrade file on the root directory of an SD card, insert the card into the VBOX LapTimer when it is turned off, hold down the top arrow and then apply power.
Doing so will put VBOX LapTimer into an upgrader mode, the progress of the upgrade is indicated on the screen. When this has completed remove and reapply power to complete the upgrade.

If you have any questions regarding upgrades, please do not hesitate to contact support@racelogic.co.uk

Troubleshooting

See below for possible error messages and causes.

Over 50KM away from selected SF line. Check you have the correct track selected, note that it may be necessary to first select clear start and splits from the Lap timing Menu.

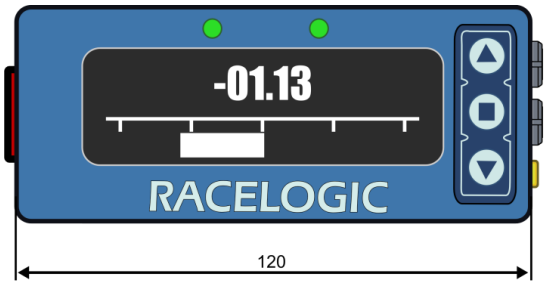
Make sure you are stationary before attempting to load/ save a reference lap.

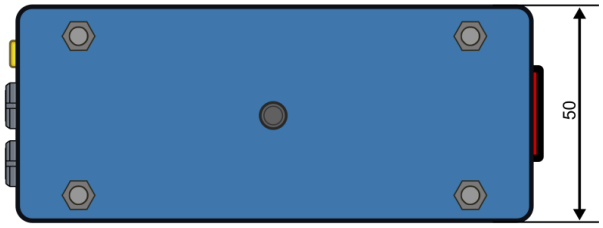
No reference lap file present on SD card to load into VBOX LAPTIMER. Make sure file is called 'LAP.REF'.

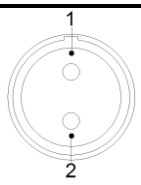
Predictive Lap Timing does not update, or lap time is fixed on screen. Check '**Split time display period**' in MENU is set to **5 seconds.** Also try clearing errors by using the **RESET LAP TIMING DATA** option.

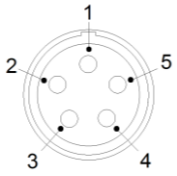
Unable to Set S/F, split or Finish point as the vehicle is not moving

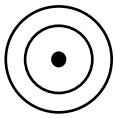
Connector assignments & specifications





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

RS232/CAN Connector			
Pin	I/O	Function	
1	O	RS232 Tx	
2	I	RS232 Rx	
3	I/O	CAN High	
4	I/O	CAN Low	
5	I	Power	

GPS Antenna Connector			
Pin	I/O	Function	
1	I	Signal	
Chassis	I	Ground	

General Specification

Environmental and Physical	
Unit Connection	1x Lemo 5w socket 1 x Lemo 2w socket
IP Rating	IP31 Rating
Operating Temp	-20 to +70°C
Power	1.5W
Input Voltage	7 – 30VDC
Dimensions	120 x 50 x 24.5mm (exc. connectors)
Weight	178g (exc. cable)

GPS Specification

Velocity		Position	
Accuracy	0.1 km/h	**2D Position**	5m 95% CEP *
Units	Km/h or MPH	**Height**	±5m
Update rate	20 Hz		
Maximum velocity	1800 km/h		
Minimum velocity	0.1 km/h		
Resolution	0.01 km/h		

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

Acceleration		Heading	
Accuracy	0.5%	**Resolution**	0.01°
Maximum	4g	**Accuracy**	±0.2°
Resolution	0.01g		

Contact details

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