

Circuit Tools software guide

Overview

Circuit Tools software is a track focused, data-analysis package designed for all Racelogic GPS data-loggers, including VBOX, Video VBOX, DriftBox and Performance Box.

Quick start

If the software has just been started, then click on the **Open File** button, otherwise press **F3** to display the open File dialogue.

Now select the data file you wish to load.

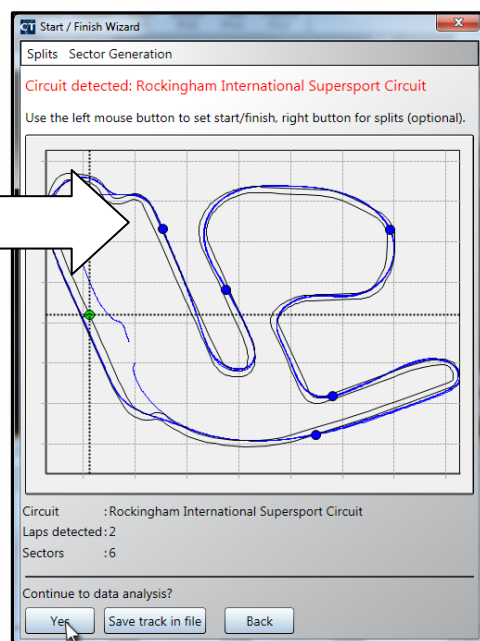
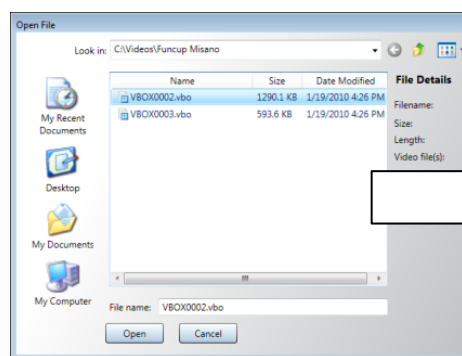
When the file is opened, it is automatically scanned to detect the Country, Circuit and Track configuration that you have driven and then appropriate circuit overlay and start/finish points are selected.



Program start menu

These are obtained from a large database which is loaded during the software installation procedure.

The database has many circuits from around the World, including multiple track configurations from the same location.



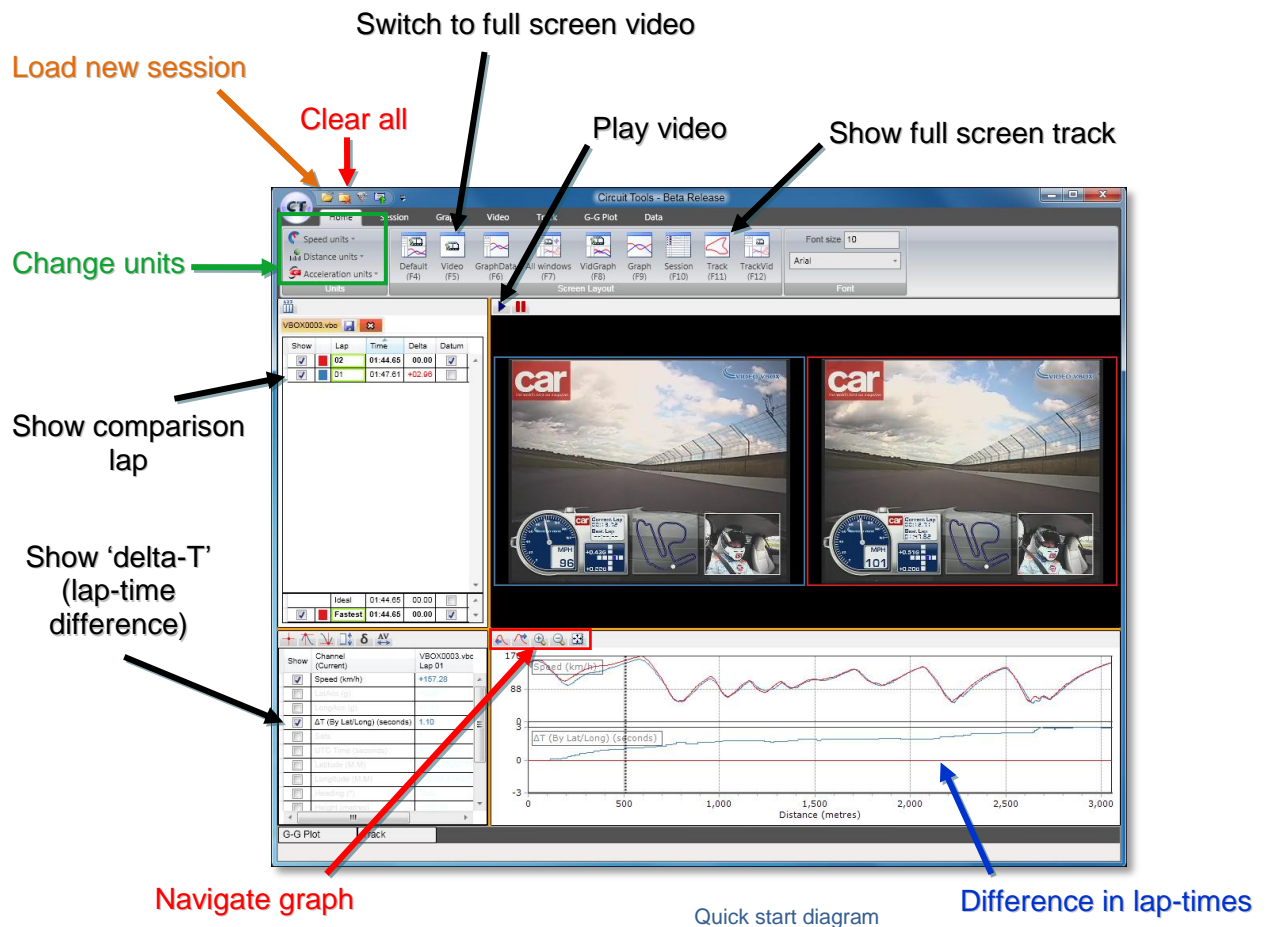
If the circuit does not exist in the database, then you simply select the Start/finish line by clicking on the chosen point on the track using the mouse.

The splits will be automatically generated.

To continue press 'Y' or click **Yes**.

Start/finish configuration

The screen will default to the following layout:



Hotkeys

- | | |
|-----|----------------------------------|
| F2 | – File transfer Wizard |
| F3 | – Load new session |
| F4 | – Default 4 window layout |
| F5 | – Full screen Video |
| F6 | – Graph + Data |
| F7 | – All windows |
| F8 | – Video + Graph |
| F9 | – Full screen Graph |
| F10 | – Full screen session window |
| F11 | – Full screen track window |
| F12 | – Session + Track + Video + Data |

Graph keys

- | | |
|----------------|--------------------------|
| Zoom in | – Up arrow |
| Zoom out | – Down arrow |
| Pan left/right | – Right Mouse click/drag |
| Cursor left | - Left arrow |
| Cursor right | - Right arrow |

R – Toggle ribbon

H – Switch to Home tab for quick function key reference

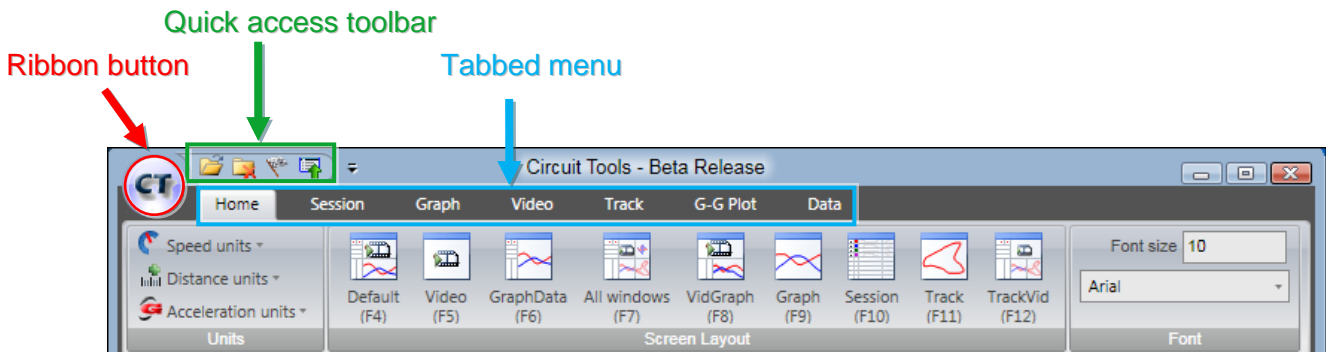
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Ribbon menu

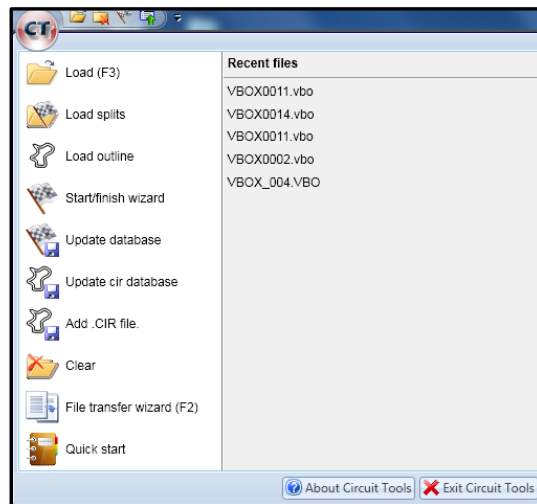
The main Circuit Tools interface is a 'Ribbon' style interface and consists of a main Ribbon button, a Quick access toolbar, and the Tabbed menu items. The visibility of the Ribbon menu can be toggled using the **R** key or the corresponding Quick access button on the toolbar.



Ribbon menu

Ribbon button

By clicking on the Ribbon button, a list of file operations will appear:

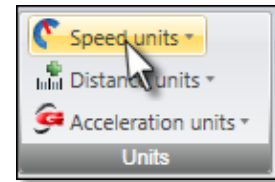


Ribbon file operations

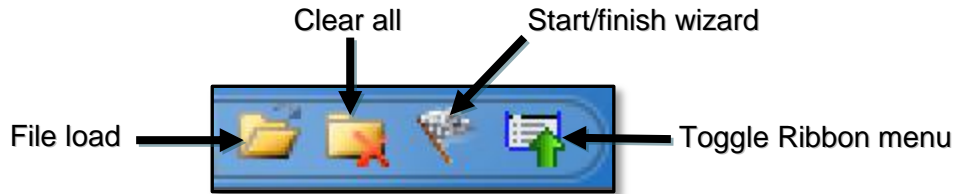
Load	Load in a new session of data (F3 is the hotkey)
Load splits	Load in a split file
Load outline	Load in a circuit overlay file
Start/finish wizard	Manually set the Start/finish line
Update database	Update the circuit database using the latest file from website
Update .CIR database	Load in a updated zip file containing all of the latest overlays
Add .CIR file	Add an individual circuit overlay to the database
Clear	Clear all current files and start/finish points
File transfer wizard	Copy all files from an SD card and rename them automatically
Quick start	Opens the Quick start guide video
Recent files	Links to the last files used

Changing Units

To change the units of speed, distance or acceleration, use the Units section in the **Home** tab:



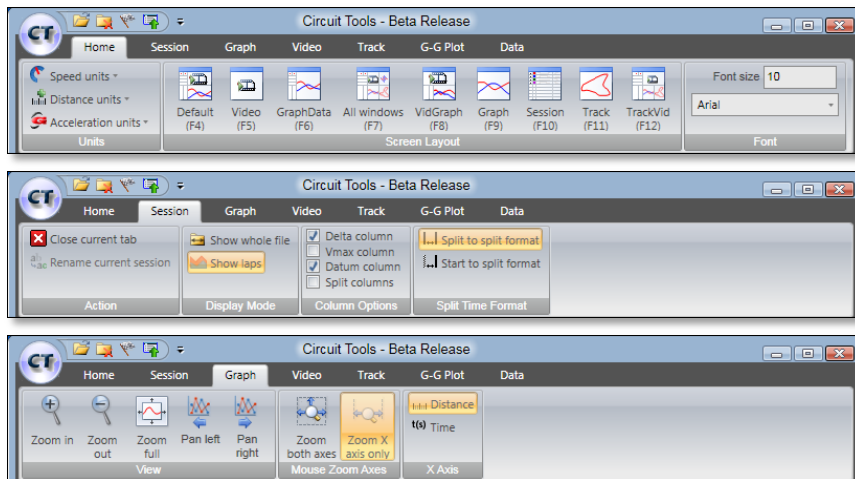
Quick access toolbar



Quick access toolbar

Tabbed menus

There are different menu tabs for each of the different main windows, which change automatically when you click on the top of one of the windows, or by simply clicking on the relevant tab.

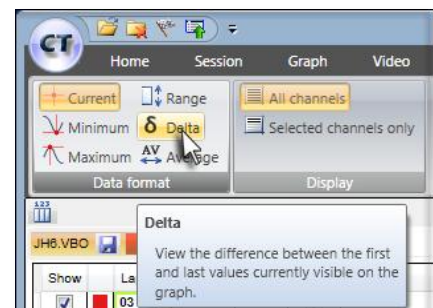


Tabbed menus

You can hide/show this menu by pressing **R** or using the Toggle ribbon bar button in the Quick access toolbar.



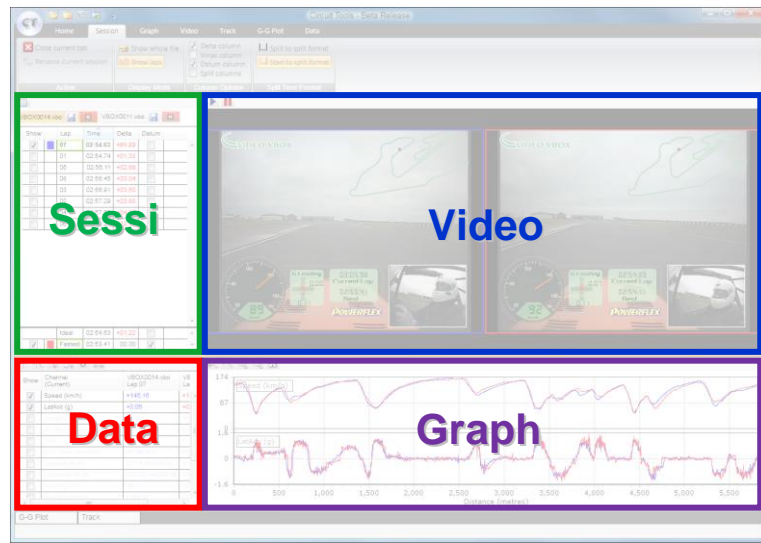
Note: If you hover the mouse over any buttons, a help hint will appear giving more explanation about the function of that button.



Hover hints

Screen Layouts

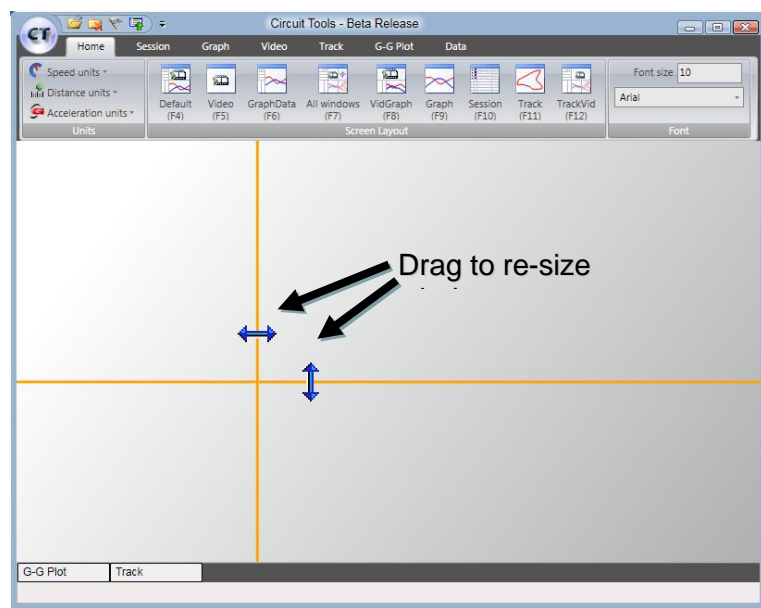
The main analysis screen can be used in a number of different layouts, the default layout is:



Default layout

Changing the sizes of the windows

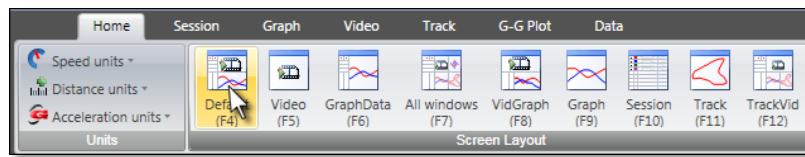
To change the size of the different windows, click and drag the yellow borders:



Re-sizing the windows

Changing the layout using hotkeys


The layouts can be changed by using the buttons in the **Home** tab, or by pressing the corresponding function key:



Layout hotkeys

To restore the original layout, double click the Hotkey layout button. You can quickly change to the Home tab by pressing **H** from any screen.

Using a popup window

Any windows not shown in the main layout appear on the window bar at the bottom of the screen and can be accessed using the mouse. They are closed by clicking away from the popup. To fix the window in place, use the pin button  in the top right hand corner.



Popup window

Push pin to fix in place

Session window

The session window contains all of the complete laps from a single file sorted using the Start/finish line, which was either contained in the file, or has been defined using the **Start/finish wizard**.

The **Start/finish wizard** can be accessed using the Quick access button, or from the Ribbon button.

You can toggle the visibility of laps (up to a maximum of four) using the **Show** tick boxes in the column on the left hand side.

The fastest lap of all sessions is picked as the reference or 'Datum lap', this can be changed using the tick boxes in the **Datum** column. All splits and lap-time comparisons are made relative to the Datum lap.

Show	Lap	Time	Delta	Datum
<input checked="" type="checkbox"/>	07	02:54.63	00.00	<input checked="" type="checkbox"/>
<input type="checkbox"/>	01	02:54.74	+00.10	<input type="checkbox"/>
<input type="checkbox"/>	05	02:56.11	+01.47	<input type="checkbox"/>
<input type="checkbox"/>	08	02:56.45	+01.81	<input type="checkbox"/>
<input type="checkbox"/>	03	02:56.91	+02.27	<input type="checkbox"/>
<input type="checkbox"/>	02	02:57.29	+02.65	<input type="checkbox"/>
<input type="checkbox"/>	04	02:57.68	+03.04	<input type="checkbox"/>
<input type="checkbox"/>	06	03:06.21	+11.57	<input type="checkbox"/>
Ideal		02:52.92	-01.70	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Fastest	02:54.63	00.00	<input checked="" type="checkbox"/>

Session window

When a session is loaded, the fastest lap of that session is highlighted in bold type and displayed in the graph window:

Show	Lap	Time	Delta	Datum
<input checked="" type="checkbox"/>	03	01:02.97	00.00	<input checked="" type="checkbox"/>
<input type="checkbox"/>	02	01:04.14	+01.17	<input type="checkbox"/>
<input type="checkbox"/>	01	01:06.22	+03.25	<input type="checkbox"/>
<input type="checkbox"/>	04	01:08.01	+05.04	<input type="checkbox"/>
Ideal		01:02.82	-00.15	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Fastest	01:02.97	00.00	<input checked="" type="checkbox"/>

Fastest lap automatically displayed

In the bottom of the session window, the Fastest lap is displayed and also the 'Ideal' lap. The Ideal lap is made up of the fastest sectors in any of the loaded sessions, note that splits have to be defined for this function to give meaningful data.

Changing the order of laps

In the Session tab the laps are listed (by default) in lap-time order with the fastest lap at the top. You can change the display order that by clicking on the column headers, by clicking on the Lap column they are arranged in lap order, for example.

Click on Time column Click on Lap column

Lap-time fastest first Lap-times slowest first Lap order Reverse Lap order

Re-organising session order

Renaming a session

Renaming sessions is a useful way of keeping track of the files that you are using, because they are all created with very similar names such as VBOX0001.vbo etc.



By clicking on the rename button, or by using the button in the ribbon menu, the file containing the data and the video file are both renamed from their default name to something more relevant. Note : as the system has to copy a large video file, this can sometimes take some time to complete.

Multiple sessions

When a new session is loaded, this appears as a new tab alongside any original sessions.

The fastest overall lap of the currently loaded sessions is shown in the bottom entry in the table, and the Ideal lap is also displayed, but this refers only to the currently displayed session.

1st session 2nd session

Multiple session tabs

Toggle splits

Splits

Splits are displayed using the splits button on the session window, or the button on the Session Tab menu.

The split points are defined in the **Start/finish wizard** and can be automatically or manually assigned.

Show	Lap	Time	Delta	Datum	S1	S2	S3	S4	S5	S6	S7
<input checked="" type="checkbox"/>	05	01:03.03	+01.28		+00.39	+00.02	+00.02	+00.14	-00.08	+00.45	+00.32
<input type="checkbox"/>	03	01:03.41	+01.67		+00.45	+00.33	+00.10	+00.05	+00.03	+00.44	+00.20
<input type="checkbox"/>	04	01:04.18	+02.43		+00.31	+00.13	+00.14	+00.04	-00.10	+01.41	+00.49
<input type="checkbox"/>	06	01:04.36	+02.62		+00.38	-00.06	+00.05	+00.12	+00.00	+00.42	+01.70
<input type="checkbox"/>	02	01:04.44	+02.70		+00.75	+00.56	+00.17	+00.23	+00.22	+00.48	+00.27
<input type="checkbox"/>	01	01:09.11	+07.37		+01.50	+01.10	+01.54	+01.03	+00.79	+00.80	+00.58
<input checked="" type="checkbox"/>	Ideal	01:02.58	+00.84		+00.31	-00.06	+00.02	+00.04	-00.10	+00.42	+00.20
<input checked="" type="checkbox"/>	Fastest	01:01.74	00.00		00.00	00.00	00.00	00.00	00.00	00.00	00.00

Assigning Splits

By using the **Start/finish wizard** (available in the Quick access toolbar or the Ribbon button menu), the location of the split points can be assigned.

There are four options:

Equal sectors

Sectors are set equally in distance around the lap

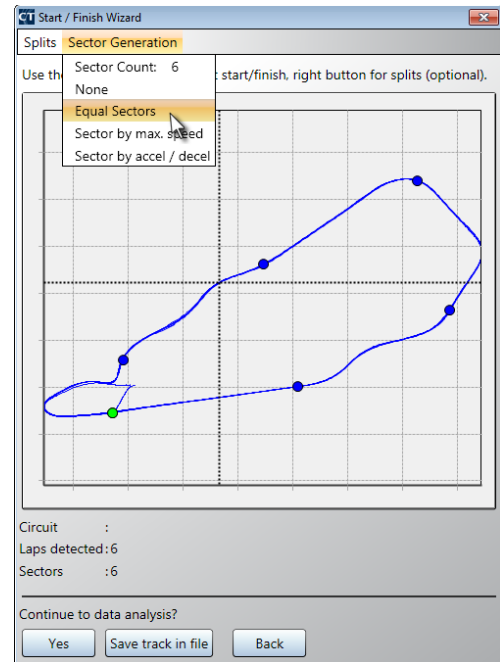
Sectors by max speed

Sectors start at the peak speed points around the lap, which effectively breaks each corner down into a sector.

Sectors by accel / decel

Sectors start at the peak speed points and finish at the minimum speed points, effectively breaking the corner down into corner entry and corner exit.

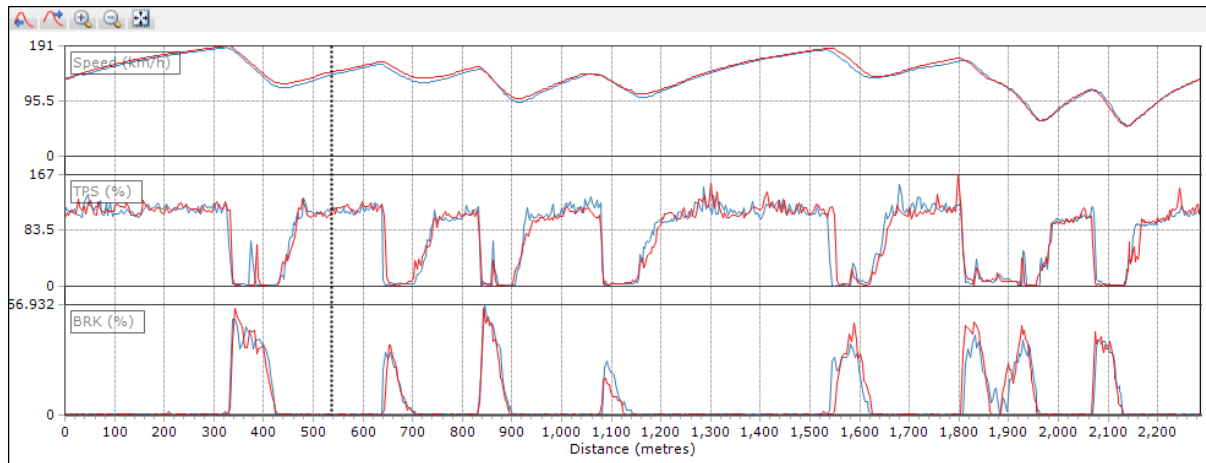
To clear splits, use the Splits menu in the Start/finish wizard.



Split selection

Graph window

The graph window shows any of the logged channels in the form of a plot against distance or time:



Graph window

The channels to be displayed are chosen by ticking the appropriate **Show** box in the Data window.

Show	Channel (Delta)	VBOX0011.vbo Lap 04	VBOX0011.vbo Lap 05
<input checked="" type="checkbox"/>	Speed (km/h)	+016.68	+000.45
<input checked="" type="checkbox"/>	LatAcc (g)	+0.16	-0.15

Displaying channels in the Graph window

Each graph can have up to 4 lines of the same parameter from different sessions and up to 8 graphs can be shown at once.

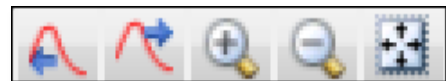
You can move the cursor around by pointing and clicking with the mouse, or by using the left and right arrow keys. As the cursor moves in the Graph window, the values are updated in the Data window and the videos jump to their synchronised position.

Zooming and panning the Graph window

You can use the functions in the Graph tab menu, the quick buttons on the Graph window itself, or a combination of the keyboard and mouse to zoom and pan around in the Graph window.

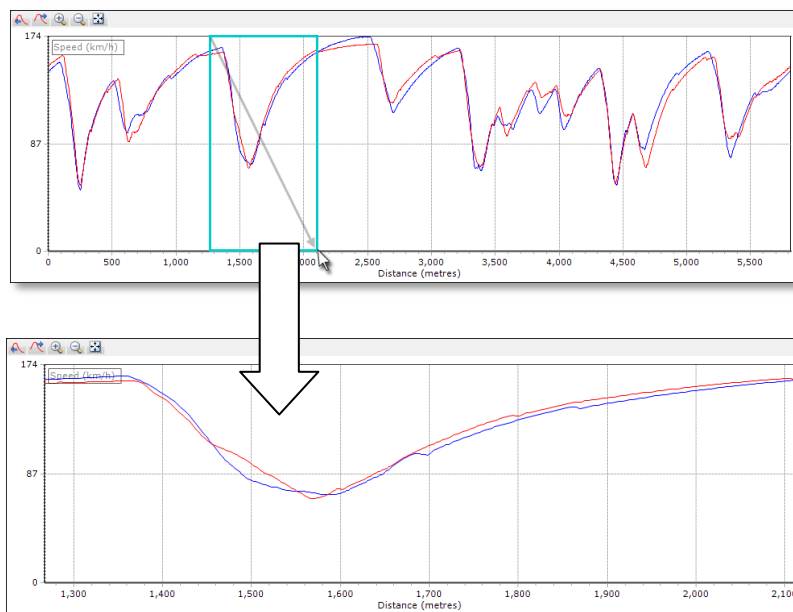


Tab menu Graph navigation buttons



Graph navigation Quick buttons

Using the mouse: you can zoom into the graph by clicking and dragging a zoom window from left to right:

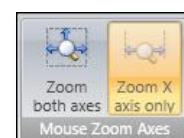


Using the cursor to zoom into the Graph

You can also use the up and down arrow keys to zoom in and out and pan by right clicking and dragging the mouse.

Changing the zoom mode in the Graph window

By default the zoom only affects the X-axis, this can be changed by using the buttons in the Graph Ribbon menu:



Data window

The Data window displays the values of the channels which have been logged at the position of the graph cursor. The visibility of each parameter can be toggled using the tick box in the **Show** column.

By default the current values of the channels are displayed, but these can be changed to Minimum, Maximum, Range, Delta or Average, using the Quick buttons or the Data menu tab:



Quick buttons

Show	Channel (Current)	VBOX0011.vbo Lap 04	VBOX0011.vbo Lap 05
<input checked="" type="checkbox"/>	Speed (km/h)	+099.03	+103.55
<input type="checkbox"/>	LatAcc (g)	-0.94	-0.96
<input type="checkbox"/>	LongAcc (g)	+0.23	+0.22
<input type="checkbox"/>	ΔT (By Lat/Long) (seconds)	2.80	0.00
<input type="checkbox"/>	Sats	8	8
<input type="checkbox"/>	UTC Time (seconds)	54829.42	54801.29
<input type="checkbox"/>	Latitude (M.M)	52°14.052991 N	52°14.055028 N
<input type="checkbox"/>	Longitude (M.M)	000°27.802584 W	000°27.804171 W
<input type="checkbox"/>	Heading (°)	327.7	328.9
<input type="checkbox"/>	Height (metres)	+128.43	+128.81
<input type="checkbox"/>	Vertical Velocity (km/h)	+000.71	+000.90
<input type="checkbox"/>	Distance Travelled (metres)	+3630.62	+3630.62
<input type="checkbox"/>	Elapsed Time (seconds)	107.52	104.89

Data window

For example, if **Minimum**  is chosen:



Minimum function enabled in Data window

The values now show the minimum values displayed in the current graph window.

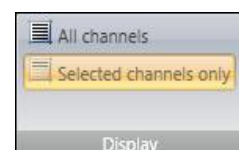
Data window options

- Current** Current value at the cursor
- Minimum** Lowest value displayed on graph
- Maximum** Highest value displayed on graph
- Delta** Difference between the first point and last point on the graph
- Range** Difference between the maximum and minimum on the graph
- Average** Average of all points on the graph

Hiding unwanted channels

All channels are shown in the grid by default, but the ones currently not displayed in the Graph window are shown in a light colour.

You can choose to show just the displayed channels, hiding the non-displayed items, using the **Selected channels only** button in the **Display** section of the Data tab:



Available channels

Speed (km/h)	GPS Speed over ground
LatAcc (g)	Lateral acceleration (cornering g-force)
LongAcc (g)	Longitudinal acceleration (accel/braking g-force)
Delta-T (s)	Lap-time difference between two laps
Sats	Number of satellites being tracked
UTC time (s)	Co-ordinated Universal Time
Latitude	Latitude position in degrees and minutes
Longitude	Longitude position in degrees and minutes
Heading (°)	Vehicle heading in degrees
Height (m)	Height
Vertical vel (km/h)	Vertical velocity
Distance (m)	Distance travelled since start of lap
Elapsed time (s)	Elapsed time since start of lap

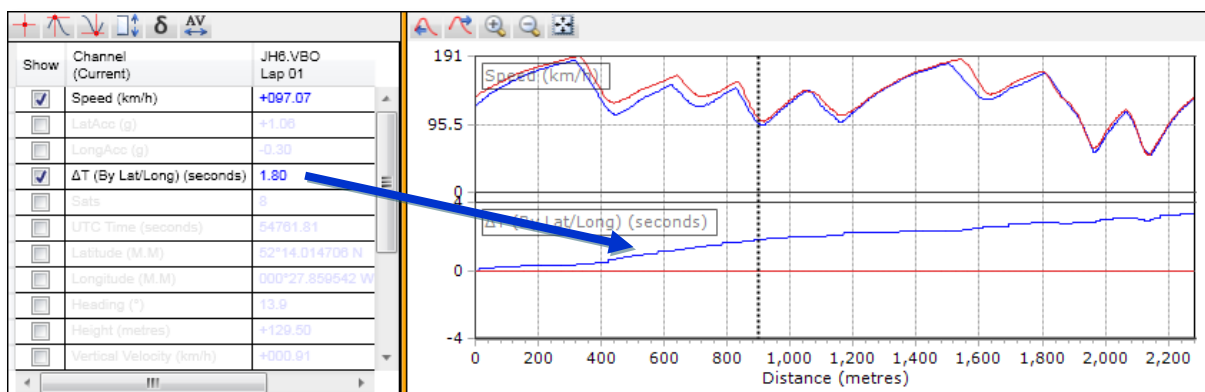
External inputs

Most VBOXs are capable of logging additional channels, there are a number of different ways of logging these, there is a Micro-input module (4 analogue 1 rpm), Mini-Input module (8 analogue, 2 digital, 1 rpm) or you can log native vehicle parameters directly via from CAN bus (depending on Make, Model and year).

If logged, these additional channels will then appear in the Data window automatically, and can be displayed on the graph as normal.

Lap-time difference values

A powerful and useful parameter is the Delta-T function. This is the running lap-time difference between two laps and it gives a very clear indication of where time is lost or gained around a lap. This channel appears in the Data window and can be displayed on the graph.



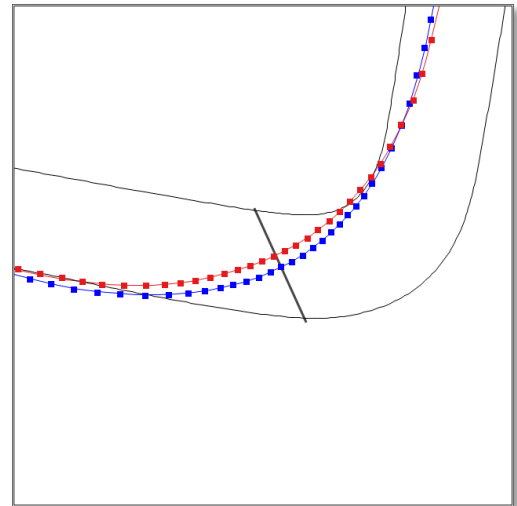
Lap-time difference plot

Using this channel gives an insight in exactly how much time a driver is losing or gaining in a particular section of track and is a great way of seeing instantly the differences between drivers.

Traditionally, this function would be carried out by comparing the time at each data point compared to the rolling distance around the lap, calculated from the start of the lap.

This can have problems, as often the difference in rolling lap distance can be quite large, which leads to significant errors in comparing laps of greater than 0.5s.

Circuit Tools uses the actual GPS position to make this calculation, and by using a line at 90 degrees to the reference lap, the potential error is greatly reduced to less than 0.1s.

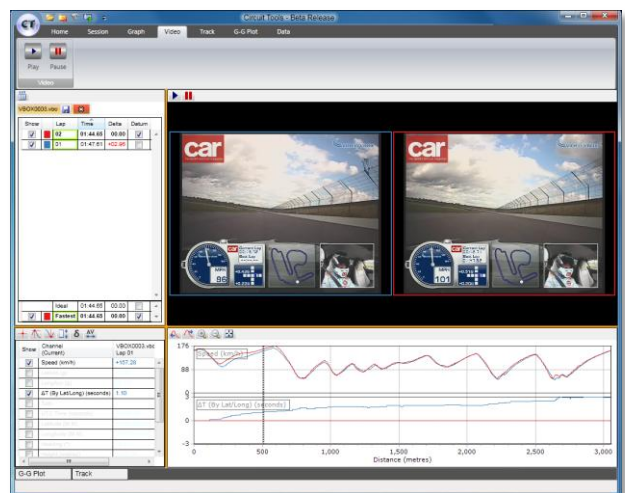


Lap-time difference using Lat/Long

Video window

There are two controls in the video window, **Play** and **Pause**. The video will synchronise with the data shown in the graph and data windows. By moving the cursor in the graph window, the video will move to the synchronised position.

Up to four videos can be displayed at one time and full screen video can be displayed using the **F5** Hotkey.



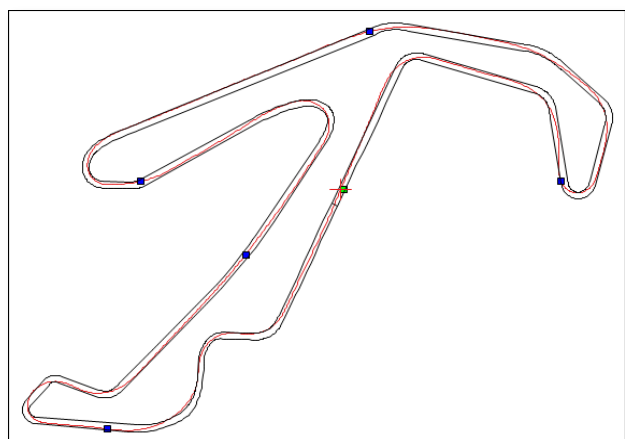
Multiple Video displays

Track window

The track window shows the path for each lap and if the circuit is in the Database, then a circuit overlay displaying the outside and inside of the track will be shown.

The Start/finish line is shown using a green marker and the Splits are shown using blue markers.

The current position of the cursor in the Graph window and the corresponding Video frame is shown as a cross in the same colour as the selected lap.

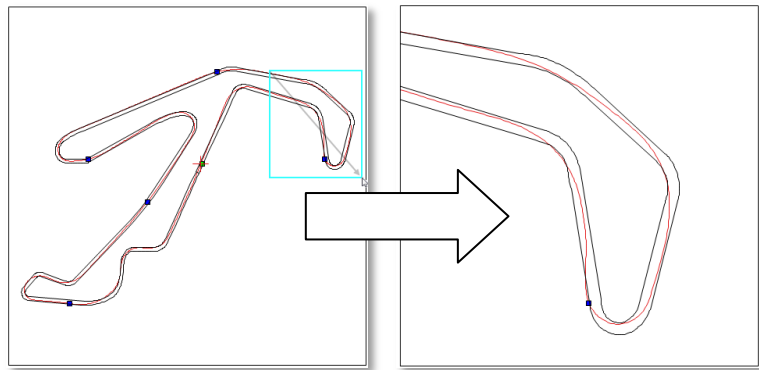


Track window

Zooming and panning in the track window

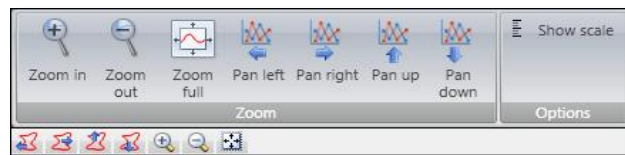
You can zoom into the track by clicking and dragging a zoom box from left to right.

To zoom out, click and drag from right to left. The track can be panned by holding the right hand mouse button down and dragging.



Zooming the track map

You can also use the Quick buttons and Tabbed Menu buttons:



Circuit overlays

A circuit overlay file contains the inside and outside edges of the track and is normally used to analyse the driving line. There are a large number of circuit overlays already held in the database which is supplied with the software and this database is regularly updated. You can download the latest 'CIR Zip file' from our website and you can also add your own overlay file using the **Update CIR database** button in the Ribbon button menu.

You can create your own overlay file by driving round the outside, then the inside of the circuit and then rename this file '.cir' from '.vbo'.

Overlays can also be created in Google Earth and then imported into the VBOX Tools (or Performance Tools) software to create a .cir file. See the relevant software manual for details.

G-G Plot window

The G-G Plot window is a plot of Longitudinal G against Lateral G.

The G-G plot gives a good indication of how the driver is using total the grip of the tyre which is available.

The same zoom and pan controls as the Track window can also be used in the G-G Plot window.

