



Centreline Deviation Software User Guide



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Centreline Deviation Testing System

Manufactures need to test the ability of their vehicles to track in a straight line, to make sure that the vehicle does not "pull" to the left or right.

The ability to track in a straight line also needs to be verified under the influence of external conditions such as:

- Side winds.
- Suspension Geometry errors.
- Deviation under brake test.
- Deviation during lane change test.

The Racelogic Centreline Deviation Software helps measure this accurately.

In order to establish the vehicle heading to base the deviation calculation on data is sampled in the short time before the centreline deviation test. This means that the test engineer can drive in any direction across the test pad, as long as the vehicle is kept in a straight line before letting go of the steering wheel.

This is useful for different proving ground layouts, and means that tests can take place in a variety of locations. To maintain accuracy, any runs in which the heading before the start of the test was not within the user-defined tolerances during the averaging period are highlighted.

Test Procedure Example

- 1. The test driver sets the start or end line and centreline distance.*
- 2. Test driver proceeds to the start position, attempting to maintain a constant heading.
- 3. The centre line is calculated during the averaging period (if the deviation is too high the test is aborted)
- 4. The centre line and start speed are then updated on the screen, the status displays 'test started' and the software beeps.
- 5. During the test the centre line distance, centre line deviation, end speed, and average speed are updated every sample and shown in the live window.
- 6. The tests ends on a GPS end line or pre-defined centreline distance, and the final results are displayed.



*Note Speed Sensor Units can only use a digital Input for the Start condition and centreline distance for the end of the test



Software Overview

Racelogic Centreline Deviation Software is a stand-alone application specifically designed for Racelogic customers who are performing centreline deviation tests using a VB3i or VBSS100.

The software is able to process both live serial data and recorded VBO files in order to generate results from either brake trigger or distance tests. This allows customers to perform multiple tests and view the results in a visually clear manner.

The software is more configurable, clearer and visual than the Report Generator centreline deviation results in VBOX Tools.

How to setup your equipment for live testing

To generate results from live serial data the software must be toggled to be **Online** under the **Options** tab. -

	File Settin	igs	Opti	ons About	
1	Results	Ba	✓	Online	
	No. Tringe			COM Port	
	No. Trigge	r Spe		Configure Hardware	

File Settings	Opti	ons About		
Results Ba	✓	Online		
		COM Port	✓	COM1
INO. Trigger Spe		Configure Hardware	1	

Live data requires your software to be able to communicate with your VBOX. To do this a RLCAB001 serial cable must be connected to the serial port of your VBOX. This connection will be assigned a COM port by your computer. This relevant COM port must then be assigned under the **Options** tab.

Auto Configuration

To get the most accurate and representative test results, the VBOX3i (or equivalent RL unit) should be setup in its most dynamic state.

This can be configured automatically through connecting the unit up to the software.

With the VBOX unit connected up to the software go to the **Options** tab, select **Configure Hardware**.

File Settings Options About Results Ba Online No. Trigger Spe Configure Hardware n)	Configuring hardware Unit configured OK. Coldstarting GPS engine to enable settings.
You should see a confirmation window pop-up once your unit has been successfully configured.	



Live Data

When the software is in **online** mode the **Current Data** window on the right hand side of the screen can be used as a quick reference to see whether your setup is successful, and whether the system is ready to start performing brake stop tests.



If the window is green this indicates that the serial communication between the hardware and the software is successful, and that the VBOX has sufficient satellite lock.

Live data can also be monitored in the **Current Data** window, displaying Speed, satellite number, trigger status and up to four selected available CAN channels.



If the window is **pink** this means that either the connected VBOX has no satellite lock, or there has been a disruption in communication between the VBOX and software (**No Comms**).



CAN channels can be selected for viewing using the **CAN Set-up** option under the **Settings** tab. See below left. To be selectable in the Centreline Deviation Software, all CAN channels must be previously configured and set to log and 'send over serial' in the separate VBOX Tool Setup software.

Once enabled the selected channels appear in the "Current Data" display window, see below right.

TPPS (%)
Steer (degrees)
RPM (RPM)
MAP (mBar)
🔲 GearPos (Gear)
🔲 BrakeSw (On)
RPM (RPM)
🔲 TPS (%)
BARO (mBar)
MAP (mBar)
MAPNumber ()
MAPNumber ()
📃 Lambda ()

Current Data					
Speed (km/h)					
50					
Satellites Trigger 5					
XAccel (g) YAccel (g)					
1 +0.41 ₂ -0.22					
ZAccel (g)	Temp (?C)				
₃ +1.00	4 +29.70				

Please note, the Centreline Deviation software configures your VBOX to 100Hz RS232 output. However, at this rate only certain channels are sent on the RS232 bus. If you choose to use RS232 rather than USB connection, you won't be able to see all channels unless the user configures the VBOX to output serial data at 50Hz or less. This can be done in VBOX Setup via VBOX Tools software.



How to view Post Processed Data

To generate deviation results from previously recorded data, the software must be set to Offline. This can be done by clicking on the **Options** tab and ensuring that the **Online** option is unchecked.

File Settir	ngs	Options	About	L
Results Ba		Onl	ine	t
rtesures		CO	M Port	 а
		Con	ifigure Hardware	

Load a VBO file in to the software by clicking on the **File** header tab at the top of the menu bar, and then clicking on Load.

File	Settings	Options
	Load	
	Rescan	
	Exit	

The loaded file will then automatically be scanned and the results displayed.

Racelogic - Centreline Deviation Software									
File Settings Options About									
Registered to : Racelogic									
Resu	ults Current (Graph Map \	/iew						
No.	Start speed (km/h)	End Speed (km/h)	Average Speed (km/h)	Distance (m)	Centreline (°)	CL Dev (m)			
1	51.08	41.45	12.98	40.00	126.71	-0.12			
2	53.47	45.03	16.49	40.00	126.42	-0.09			
3	52.19	46.44	14.01	40.00	0.00	+0.00			
4	48.53	16.77	12.14	40.00	127.19	-1.62			
5	54.57	43.58	16.13	40.00	0.00	+0.00			
6	52.98	49.84	14.30	40.00	306.18	-0.45			
7	51.46	45.54	14.26	40.00	306.75	+0.38			
8	42.76	21.36	10.79	40.00	306.49	-3.79			
9	54.84	45.99	15.78	40.00	126.64	-0.38			
10	55.37	43.46	15.42	40.00	126.91	+0.57			
11	55.81	32.48	14.09	40.00	126.74	-0.57			

Re-scanning Data

Under the **File** tab there is a **Rescan** button that can be used at any time once a file has been loaded in.

As it suggests, this button will re-scan the last loaded in data file and re-generate the results from it. This can be particularly useful if a number of runs from the test had been removed (deleted) from the analysis window previously.



Test Procedure & Setup

Configuration of the setup criteria can be done using the **Test Set-Up** option, found under the settings toolbar.

	Racelogic - Centreline Deviation Software							
	File	Settings Options About						
	Rec	>	Test	: Set-up				
	Dee		Cun	rent Graph Set-up				
Res		CAN	l Set-up					
	No. Start speed (km/n) End Speed (km/n) AV							

Adjust Units – The units for speed, distance and acceleration can all be changed. These changes are reflected in all other windows in the software.

Speed km/h 🔻	Distance m	Acceleration m/s ²



Start/Finish Lines – Load and save start/finish lines if testing in a specified location on different occasions. Gate width is the length of the start/finish line and can be adjusted to prevent accidental triggering.

Start/Finish Lin Start line : Finish line :	nes	
Gate Width :	25 m Save Clear	

Start Condition – Choose between using a start line or trigger event to begin the test.*



End Condition – Choose between a finish line or determine the distance that the test finishes and results are reported from.*

End Condition							
Finish line							
40	m						
	40						

Line Condition – Select this option if you wish to see the deviation at intervals on each run, the interval can be adjusted for a given distance depending on how many results are desired.

Line Conditions								
	Every	10	m					

Centreline Deviation – Adjust settings for centre line deviation computation.

Full period duration - Time before trigger activation, this is what is used to calculate the centre line reference heading.

Full Period std. dev. max - The maximum allowed heading deviation during test.

Std. dev. Warning threshold - Heading deviation threshold before results displayed with red warning text.

*Note Speed Sensor Units can only use a digital Input for the Start condition and centreline distance for the end of the test



Centreline Deviation						
Full period duration	2	seconds				
Full period std. dev. max.	0.5	•				
Std. dev. warning threshold	0.2	•				

Note: Centreline Deviation results in Red and Yellow:

Centreline (°)	CL Dev (m)
126.71	-0.12
126.42	-0.09
0.00	+0.00
127.19	-1.62
0.00	+0.00
306.18	-0.45

Centre line deviation results shown in Red indicates that the vehicle was not driven straight enough during the immediate time before the test start condition was met, exceeding the configured Full Period Standard Deviation threshold. Results shown in yellow indicate the standard deviation warning threshold has been exceeded.

Obtaining Results

Centreline Deviation test results can be achieved by using either a trigger or a GPS start line. Once the software has detected one of these inputs it will calculate results for distance, centreline and other parameters relative to the user configured **Test Setup**.

Testing environments

Due to the dynamic nature of a centreline deviation test a VB3i (or equivalent RL unit) should be set to its highest dynamic, most sensitive settings. To obtain good results from this it is essential that such a test is performed in an area of good, clear satellite reception (no high buildings, trees) with the antenna receiving a clear view to the sky with no obstructions (roof racks, etc).

Analysing Results

Results can be viewed and analysed in several forms using the Centreline Deviation Software package, and any graphs and tables can be adapted to suit the customers' specific requirement for any given test.

Results Current Test
Start speed (km/h)
48.53
End Speed (km/h)
16.//
Average Speed (km/h)
12.14
Distance (m)
40.00
Centreline Deviation (m)
-1.62



Results from Last Recorded Test

Results of the last performed brake stop test will be shown in numerical form in the **Results Current Test** tab, or in a more visual representation in the **Current Graph** window. The Current Graph shows the live plot of user configured channels for the current test run.

The **Current Graph** window can be altered by making changes to the **Current Graph Set-up** page under the **Settings** option. In the setup, both axis can be altered, different data channels be selected and a reset value determined.





Collective Results

Figurative results are clearly laid out in a tabular form in the **Results** window. The test results by default will be shown in numerical order. The table can be toggled though by clicking on a desired column to order the test results by highest to lowest (or reverse).

Res	sults Current Graph Map View							ults Current (Graph Map \	/iew			
No.	Start speed (km/h)	End Speed (Km/h)	Average Speed (km/h)	Distance (m)	Centreline (°)	CL Dev (m)	No.	Start speed (km/h)	End Speed (km/h)	Average Speed (km/h)	Distance (m)	Centreline (°)	CL Dev (m)
1	45.65	45.22	45.38	100.00	271.30	+0.29	1	45.65	45.22	45.38	100.00	271.30	+0.29
2	45.62	45.52	45.47	100.00	271.32	+2.31	2	45.62	45.52	45.47	100.00	271.32	+2.31
3	29.91	30.06	30.10	100.00	91.41	+0.63	3	29.91	30.06	30.10	100.00	91.41	+0.63
4	30.86	30.46	30.55	100.00	90.63	-1.12	4	30.86	30.46	30.55	100.00	90.63	-1.12
5	93.05	93.50	93.14	100.00	270.86	-0.25	5	93.05	93.50	93.14	100.00	270.86	-0.25
6	43.08	38.75	40.65	100.00	91.59	+2.26	6	43.08	38.75	40.65	100.00	91.59	+2.26
7	40.35	43.62	41.88	100.00	91.66	+0.30	7	40.35	43.62	41.88	100.00	91.66	+0.30
8	46.15	45.26	45.62	100.00	270.86	-0.41	8	46.15	45.26	45.62	100.00	270.86	-0.41
9	45.68	45.59	45.48	100.00	271.07	-0.29	9	45.68	45.59	45.48	100.00	271.07	-0.29
10	88.11	88.17	88.19	100.00	91.04	-0.44	10	88.11	88.17	88.19	100.00	91.04	-0.44
11	62.12	62.74	62.52	100.00	271.22	+0.71	11	62.12	62.74	62.52	100.00	271.22	+0.71
12	30.20	29.81	29.91	100.00	91.95	+1.05	12	30.20	29.81	29.91	100.00	91.95	+1.05
13	30.08	29.52	29.71	100.00	91.39	+0.93	13	30.08	29.52	29.71	100.00	91.39	+0.93

Results can be visualised in the current graph tab, this can be modified in current graph setup to display any selected parameter. Colours can be applied to these by clicking on the names and selecting an appropriate colour to make the graph stand out.





The graphs are also adjustable using the **Current Graph Set-Up** option, under the **Settings** menu bar.

sectorie - Centreline Denauon Sonware			الكريكي المحالي
aphara (1.20 coronada) 20 Porat Spaced (km/b) 2	Channel Set-up		
lebase (1-50 seconds) 50 Reset Speed (km/n) 2.	Available Channels	Left Axis Channels	
eft Axis	UTC Time	Heading	
Minimum Maximum Automatic Automatic	Long Acc.		
Manual B5 Manual 95	Latitude		
	Longitude		
ight Axis Minimum Maximum	Brake Trigger		
Automatic Automatic	Height		
C Manual 0 C Manual 100	Lat Acc.		
	Satellites		
	_latitude ()		
	_longitude ()		
	_velocity kmh (km/h)		
	_heading (degrees)		
	_height (metres)		
	_Vertical velocity m/s (m/s)		
	True_Head (Degrees)		
	Slip_Angle (Degrees)	-	
	Pitch_Ang. (Degrees)	Right Axis Channels	
	LatVel. (km/h)	Speed	
	Yaw_Rate (Degrees/s)		
	Roll Angle (Degrees)		
	Lng, Vel. (km/h)		
	Slin COG (Degrees)		
	Slip El (Degrees)		
	Slip FR (Degrees)		
	Slip_I (Degrees)		
	Siip_RC (Degrees)		
	Slip_rk (Degrees)		
	YawKate (7s)		
	x_Accel (g)		
	Y_Accel (g)		
	Temp (°C)		
	PitchRate (°/s)		
	RollRate (*/s)	-	
	7 Accel (n)	•	
			Cancel



Removing Test Lines

A practical tool within the software application is the ability to delete selected runs from the data output. This enables any erroneous or unwanted results to be quickly removed from the data, making analysis clearer and more representable.

Res	ults Current (Graph Map \	/iew				-		
No.	Start speed (km/h)	End Speed (km/h)	Average Speed (km/h)	Distance (m)	Centreline (°)	CL Dev (m)		1	
1	45.65	45.22	45.38	100.00	271.30	+0.29			Delete selected run
2	45.62	45.52	45.47	100.00	271.32	+2.31		7 "	
3	29.91	30.06	30.10	100.00	91.41	+0.63			
4	30.86	30.46	30.55	100.00	90.63	-1.12	-		
5	93.05	93.50	93.14	100.00	270.86	-0.25			
6	43.08	38.75	40.65	100.00	91.59	+2.26			
7	40.35	43.62	41.88	100.00	91.66	+0.30			
8	46.15	45.26	45.62	100.00	270.86	-0.41			
9	45.68	45.59	45.48	100.00	271.07	-0.29			

If you wish to remove all of the current data, then the **Reset** button can be used to do this quickly.

Exporting Test Results

Click the **Save Results** tab to save the results out in an excel file with added comments to help reference the test results in the future. In the save file you are able to detail

many conditions and vehicle variables from the set of results that have just been achieved. These comments are then amended to an excel document that includes the tabular results. Various inputs entered into this Save Data will be remembered by the software and be made available via a dropdown menu, for quick selection in any successive file saves. Disable trigger (Space) Save Results

File Home Inset Page Layout Formulas Data Review View Image Carteria and a constraints of the constraints of	X	- 1 · 1	[4 -] -		Test.xls - Microsoft Excel			
Al B I I A F E I I A F E I I I A I	F	ile Ho	ome Insert Page Lay	out Formulas Data	Review View			∧ (?) = ∂ ⊠
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3 20.24 30.46 30.55 100 90.63 6 5 93.05 93.5 93.14 100 270.86 7 6 43.08 38.75 40.65 100 91.59 8 7 40.35 44.85 100 91.66 9 8 46.15 45.62 100 270.86 10 9 45.68 45.59 45.48 100 271.07 11 10 88.11 88.17 88.19 100 91.64 12 11 62.12 62.74 62.52 100 271.07 13 12 30.2 29.81 29.91 100 91.39 14 13 30.08 29.52 29.71 100 91.39 16	3	2	43.62	45.52	45.47	100	91.41	
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8 7 40.35 43.62 41.88 100 91.66 9 8 46.15 45.62 100 270.86 10 9 45.68 45.59 45.48 100 271.07 11 10 88.11 88.17 88.19 100 91.04 12 11 62.12 62.74 62.52 100 271.22 13 12 30.2 29.81 29.91 100 91.39 14 13 30.08 29.52 29.71 100 91.39 15 10 10 91.39 100 10 10 16 10 10 10 10 10 10 18 10 10 10 10 10 10 19 10 10 10 10 10 10 10 20 10 10 10 10 10 10 10 10 21 10 10 100 100 100 100 100	7	6	43.08	38.75	40.65	5 100	91.59	
9 8 46.15 45.26 45.62 100 270.86 10 9 45.68 45.59 45.48 100 271.07 11 10 88.11 88.17 88.19 100 91.04 12 11 62.12 62.74 62.52 100 271.22 13 12 30.2 22.81 29.91 100 91.39 15	8	7	40.35	43.62	41.88	3 100	91.66	
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12 11 62.12 62.74 62.52 100 2/1.22 13 12 30.02 29.81 29.91 100 91.95 14 13 30.08 29.52 29.71 100 91.39 15 1	11	10	88.11	88.17	88.19	100	91.04	=
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16 17 18 19 19 19 19 19 19 19 19 19 19 19 19 19	15	13	50.00	23.32	25.73	100	51.35	
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20 21 22 24 25 26 27 27 27 27 27 27 27 27 27 27	19							
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	22	-						_
	Rea	dy Re	esuits / Sheet2 / Sheet3			<u></u>	III III 100%	• • <u>•</u>



Glossary of Terms

Centreline Deviation

Commonly used for applications such as measuring side wind susceptibility, and vehicle deviation during various manoeuvres; the centre line deviation function can be used to show the deviation of a vehicle from a specified centre line to an accuracy of between 1 and 2cm (over a 30 second time period).

The high accuracy, Doppler derived velocity channels are measured and used to determine the lateral deviation from a specified track heading at every sample using geometric theories. This calculated deviation (lateral displacement) is an accumulative distance measurement, so it is most accurate when measured over short periods of time.



The above diagram simply displays how the accumulative deviation from a given centre line (H) is calculated.

Once the centre line deviation value starts calculating (S1), it will initially take the heading value recorded by the Doppler shift, and create a heading difference value (h1), relative to the defined Centre line deviation heading. Knowing the velocity at which the vehicle was travelling between samples (v) allows a sample measured deviation distance to be accurately determined. Using trigonometric relationships, this deviation distance is calculated using the following equation.

(Sin (heading diff) * Speed (m/s))*sample time

For successive samples a heading difference is then determined by comparing the current heading sample to the one previous.

The sample measured deviations are then accumulated throughout the test to produce a final centre line deviation result.



Checking Software Version



You can check what version of Brake Test Software you are currently using by clicking on the **About** tab along the top menu bar.

Latest Software and Firmware versions are always available to download from our <u>website</u>. If you have any problems with Racelogic equipment please contact <u>support@racelogic.co.uk</u>.

Contact details

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