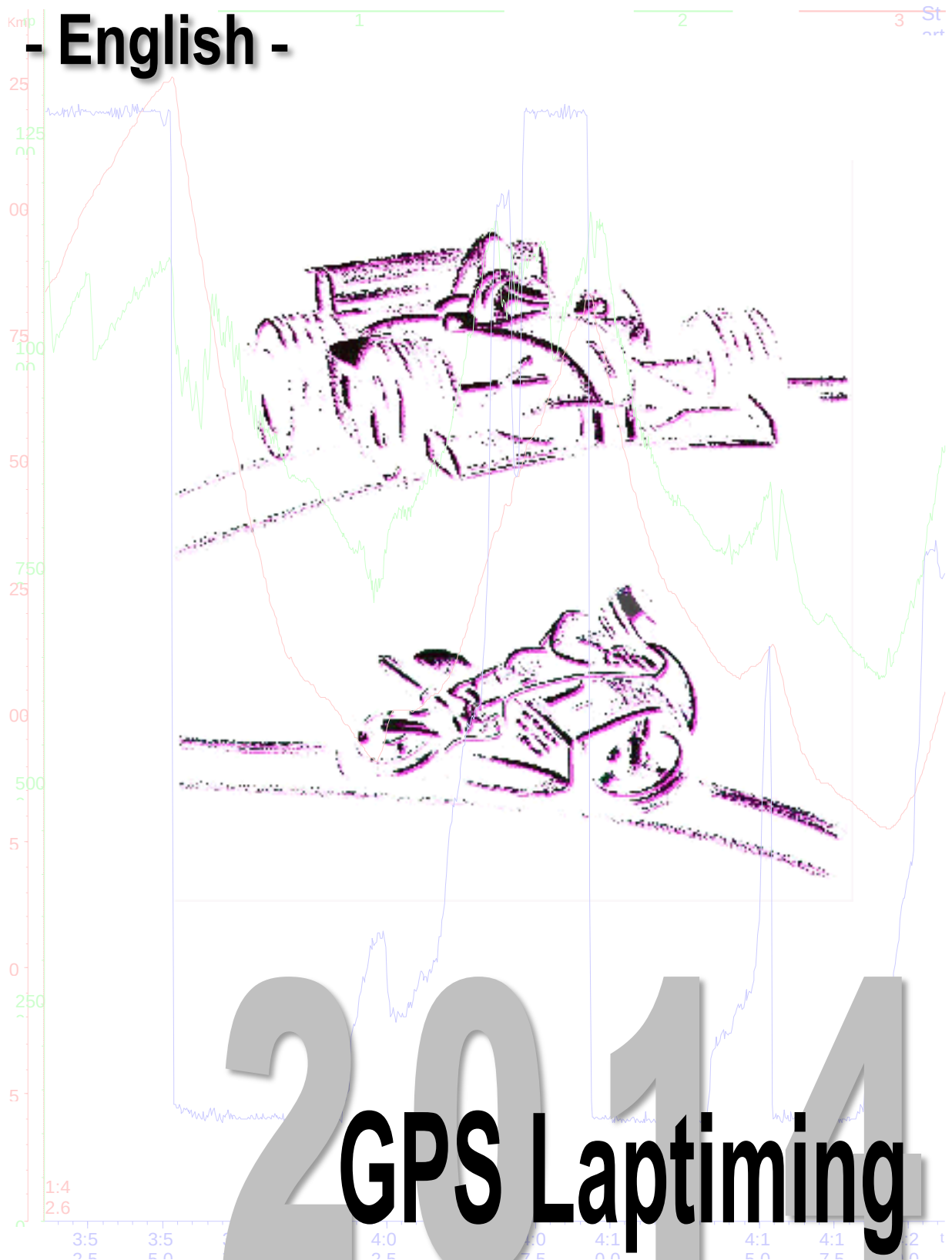




Preface

This documentation contains the necessary information to setup and to work with the 2D GPS system.

In order to achieve the optimum result when working with the 2D System, we recommend you read the instructions carefully and follow them step by step.

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Symbols used in the text



These paragraphs contain tips and practical advice for working with the 2D system.



In the paragraphs highlighted with this symbol, you will find additional information and it is very important that you follow the instructions given.

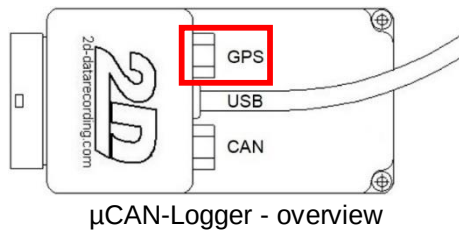
1 Mounting the GPS mouse

For optimal signal quality the GPS mouse must have a **free visibility towards the GPS satellites**. Therefore it should not be covered by any shielding parts. Mounting the antenna on the roof of the car or the pillion of the bike would be the best solution. To get better signal use aluminum foil as ground plane underneath the GPS mouse.



Double-sided "scratch tape" or Velcro® works very well to fix the GPS module. It keeps the GPS receiver fixed on its place but can be removed easily as well. The GPS mouse also has an integrated magnet on the lower surface. This allows simple and fast mounting of the receiver on all magnetic surfaces (e.g. body parts of the vehicle).

1.1 Connecting the GPS mouse



GPS mouse



The power supply of the complete system must be switched on before testing the GPS mouse. Incoming GPS data can be displayed online in the 2D software *WinIt*.

1.2 GPS channels

Connecting the 2D GPS module to the 4 pin connector of the logger activates additional 15 GPS channels to be recorded in the logging system.



It is important that the mounting instructions previously explained for the GPS module are followed exactly which will maximize the GPS signal quality.

The GPS channels are as follows:

- **V_Sat** – vehicle speed according to changing of its GPS coordinates
- **ValidSat** – number of valid satellites signals being received
- **HHMM** – time of day in hours and minutes
- **Course** – the direction the vehicle is currently travelling
- **Lat_dez** – lateral GPS coordinates for vehicle position
- **Lon_dez** – longitudinal GPS coordinates for vehicle position
- **Altitude** – estimated altitude
- **MMDD** – the current date in month and day format
- **SSHH** – the current time in seconds and hundredth of a second format
- **A_Lat** – lateral acceleration of vehicle according to changing of its GPS coordinates
- **A_Lon** – longitudinal acceleration of vehicle according to changing of its GPS coordinates
- **Banking** – estimated banking angle of the vehicle when cornering
- **YawRate** – the rate at which the vehicle is changing its cornering radius
- **SpAccu** – the estimated accuracy of the GPS speed measurement
- **LapGps** – to enable lap time generation when no official circuit timing is available

1.3 GPS module operation mode



Ensure the data logger's "operation mode" is set according to the type of GPS module you are using. The data logger operation mode is changed by:

- selecting your interface/data logger from the system tree
- selecting the tab "Operation modes" choosing the correct option from the dropdown menu

The physical appearances of each GPS module are very similar, they have a similar plastic housing and so the table below should be used when choosing the operation mode.

		
		
Black housing Yellow label with serial number Green LED <u>Operation mode:</u> 3D_1G (FW version 86 or higher)	Black housing Serial number on backside Red LED <u>Operation mode:</u> NMEA	Blue, transparent housing No serial number <u>Operation mode:</u> 3D_1G
For use with: LG-uc11_Eng-000@12.5 Hz LG-uc11_Pro-000@12.5 Hz LG-uc11_Moto2-211@12.5 Hz LG-uc09_Eng-000@12.5 Hz LG-uc09_Moto2-200@12.5 Hz LG-uc09_Pro-000@12.5 Hz LG-uc08_Eng-000@12.5 Hz LG-uc08_Pro-000@12.5 Hz	For use with: LG-uc11_Eng-000@10 Hz LG-uc11_Pro-000@10 Hz LG-uc11_Moto2-211@10 Hz LG-uc09_Eng-000@10 Hz LG-uc09_Pro-000@10 Hz LG-uc09_Moto2-200@10 Hz LG-uc09_M2-000@10 Hz LG-KITTrackday09@6.25 Hz LG-KITBike09@6.25 Hz LG-KITTrackday11@6.25 Hz LG-KITBike11@6.25 Hz SY-KITGPS-000/001@6.25 Hz	For use with: LG-uc09_Eng-000@12.5 Hz LG-uc08_Eng-000@12.5 Hz LG-uc09_Pro-000@12.5 Hz LG-uc08_Pro-000@12.5 Hz LG-KITTrackday08@6.25 Hz LG-KITBike08@6.25 Hz <u>no longer available</u>
<u>FW Version 108 or higher has an "Autodetect" mode which is switched on by default</u>		

2 Creating GPS lap times

2.1 LapTime (Event channels)

LAPTIME – This is a measurement of the time taken to complete each lap of your race circuit.

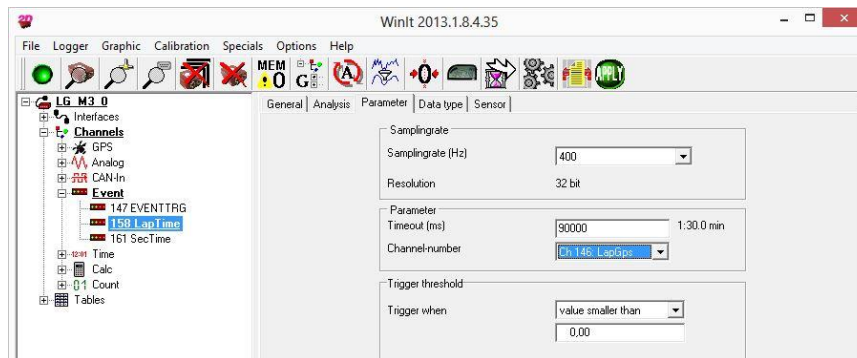


You must select the trigger channel that will activate the LAPTIME event inside the logger.

2.1.1 Selecting the trigger channel for LAPTIME

There is only one valid channel that can be used for the trigger channel via GPS signal: **LapGps**. See section 2.2 Creating lap times with GPS for information on configuration of LapGps for further information.

To define the trigger channel, start *WinIt*, select your logger in the system tree, go to *Channels* ⇒ *Event* ⇒ *LapTime* and open the tab <Parameter>. Choose the channel “LapGps” from the drop down menu of “Channel-number”. Confirm your changes with <Apply>.



2.1.2 Defining the “Timeout” parameter for LAPTIME

You must also define the “Timeout” parameter to be less than the expected lap time. This setting defines the minimum lap time that will be accepted as valid by the data logger.



The timeout setting helps prevent “false” lap times being generated, if the radius is set too big. For example, if you expect lap times of 1 min 32 s, set “Timeout” as 90000= 90 seconds = 1 min 30 s!

2.2 Creating lap times with GPS

Lap times can be generated by the channel ‘LapGps’ using your 2D GPS module. LapGps provides an alternative lap trigger signal that can be used when it is not possible to generate lap times with other modules (e.g. the 2D infrared receiver).



LapGps does not make lap times by itself, but simply generates a **lap trigger signal** when the GPS location of the vehicle is matching the GPS location of the defined lap trigger coordinates (start line).

There are two ways of using the GPS lap trigger signal:

- **Automatically** - using the table ‘2DTrkPos’ (already loaded inside your module/μCAN data logger)
- **Manually** – you input the coordinates of your circuit start/finish line (read from line file)

2.3 Automatic setting of LapGps

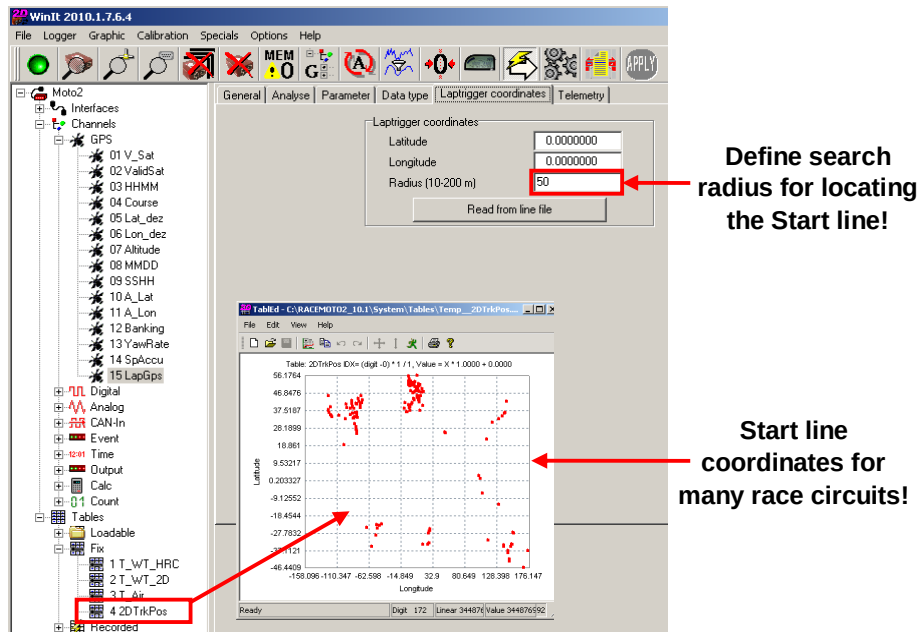
The table '2DTrkPos' contains the start line coordinates of many popular race tracks from around the world. The process is automatic, but you must define a 'radius' around the table-defined start line coordinates, where the LapGps trigger signal is made. Find recommended values for the radius in the table below for firmware-versions from 2012 onwards. For older firmware-versions choose the double radius.

To enter the radius, start *WinIt*, select your logger in the system tree, go to *Channels* ⇒ *GPS* ⇒ *LapGps* and select the tab **<Laptrigger coordinates>**. Confirm your changes with **<Apply>**.

Speed at lap trigger point	Recommended radius
<180 km/h	25 m
180 – 240 km/h	35 m
>240 km/h	45 m



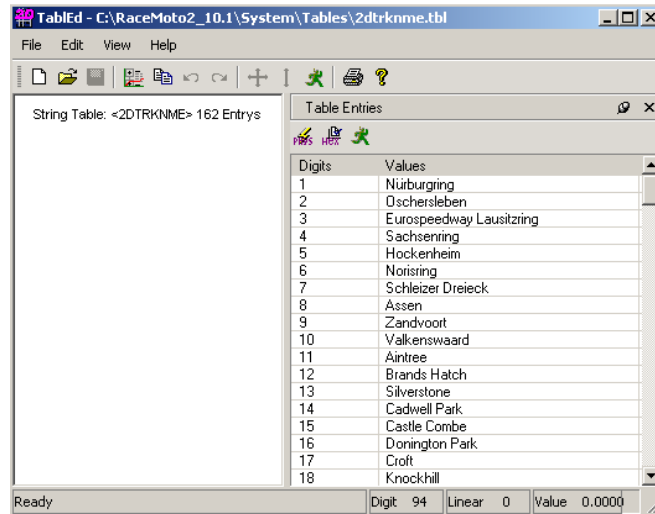
The GPS module compares its measured coordinates with those inside the table '2DTrkPos' and generates a lap trigger signal when the vehicle passes within the defined search radius of the start/finish coordinates defined in the table.



The defined search radius must be large enough to accommodate different driving lines and also GPS drift. However if the search radius is too large it may be possible to generate invalid lap times due to the lap signal occurring more than once in a lap, see figure below!



To check that your race track is inside the table '2DTrkPos', check in the [appendix](#) or go to your system directory <C:\ProgramData\Race20xx.y\System\Tables> (since 2014) or <C:\Race20xx.y\System\Tables> (older versions) and open the file '2Dtrkme'. Inside this table you can view all the race tracks currently accommodated by the automatic function for GPS lap trigger.



If your circuit is not inside the table '2DTrkPos', you should first check the 2D automatic updates to ensure you have the latest version of the table!

2.4 Creating or modifying a start-line

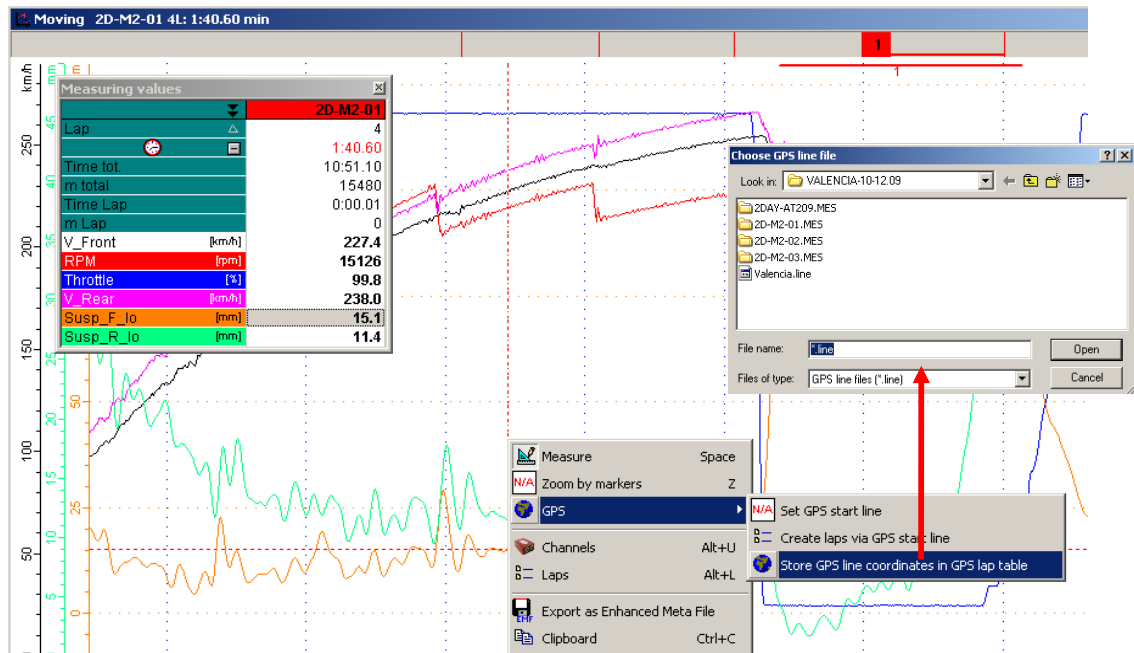
You can manually define the start-line coordinates of your circuit. This is required where your circuit is not in the table '2Dtrkme' or you wish to modify the position on the circuit at which you are generating lap times by GPS.



If the track on which you are racing is not inside the table '2Dtrkme', the automatic GPS lap trigger will not work!

To manually define the coordinates of your circuit start line, you must:

1. Obtain an accurate GPS measurement of the circuit layout and start line position.
Make an installation lap to measure the circuit start line coordinates.
2. Use the program 2D Analyzer to select your preferred start line position.
Open your measurement in Analyzer, press <space> to enter measure-mode and put the cursor on your preferred start-line position

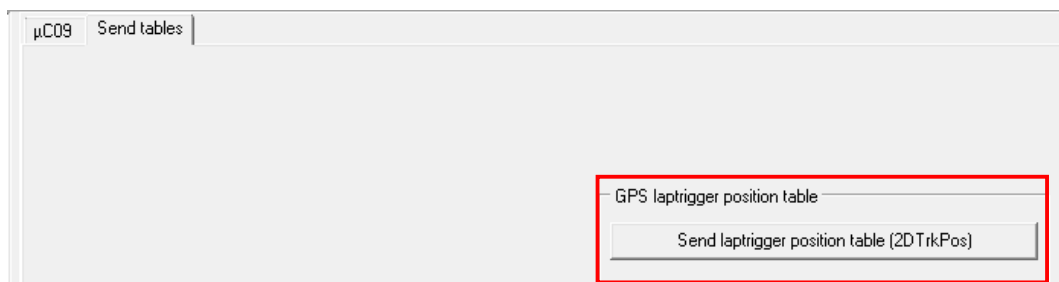


3. Use Analyzer to save your start line position to a table.
Right-click with mouse on your preferred start line position, select <GPS> + <Store GPS line coordinates in GPS lap table>. The table will be stored at <C:\Race20xx.y\System\Tables>.
4. Load your GPS table into the data logger to trigger lap times by GPS.
Connect to the logger and load the updated table into WinIt.

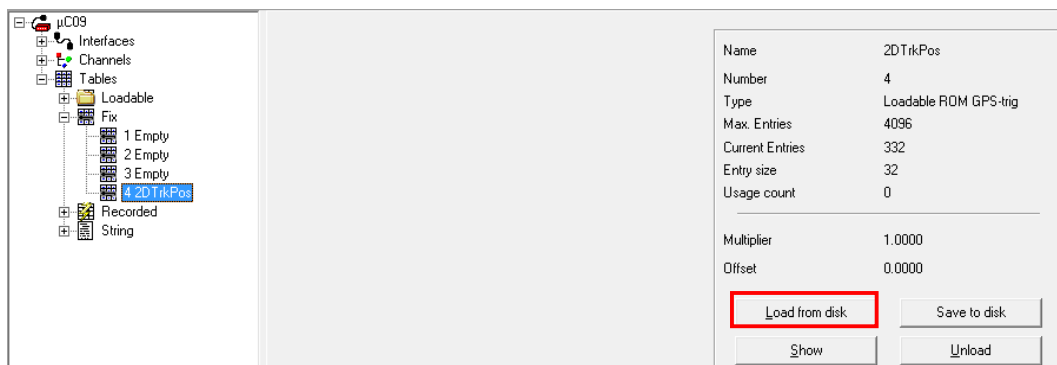


The updated '2DTrkPos' is loaded by clicking onto the buttons shown below depending on the license level you are working on. In the **standard version** the file 2DTrkPos.TBL has to be chosen whereas in the **KIT version** it works automatically. Send all changes to the logger with <Apply>

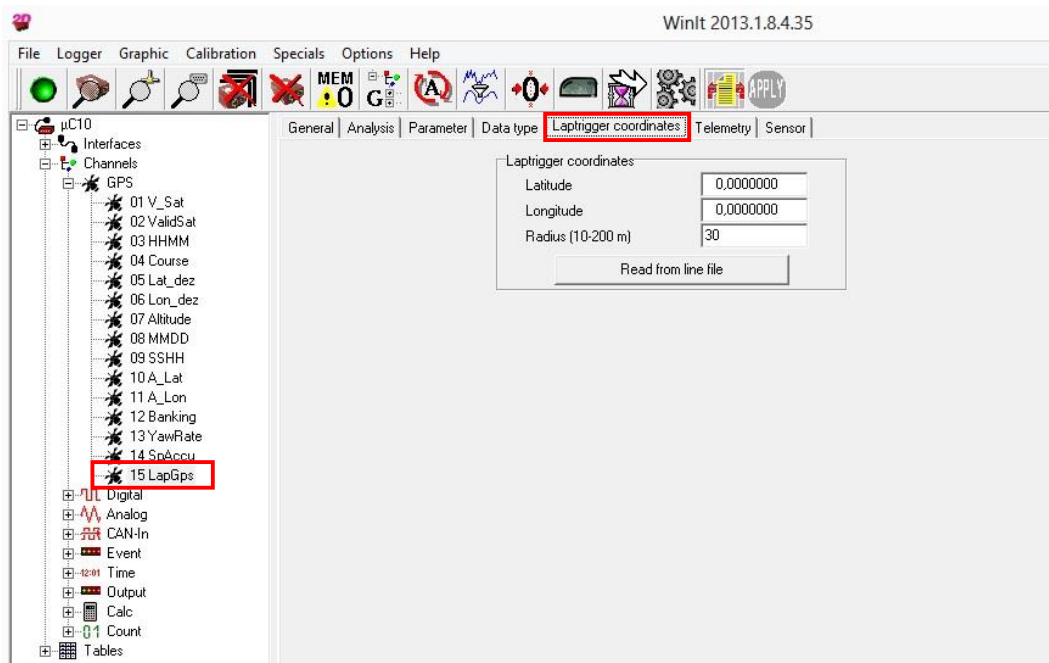
KIT version



Standard version



5. Usually the logger chooses the start-line which is closest to its current position when the logger is powered. If there is a need to force the logger to use a certain start-line or manually enter GPS coordinates, there is the possibility to do this in the channel **LapGps**. Choose the previously created start-line or enter the coordinates and send all changes to the logger with **<Apply>**.

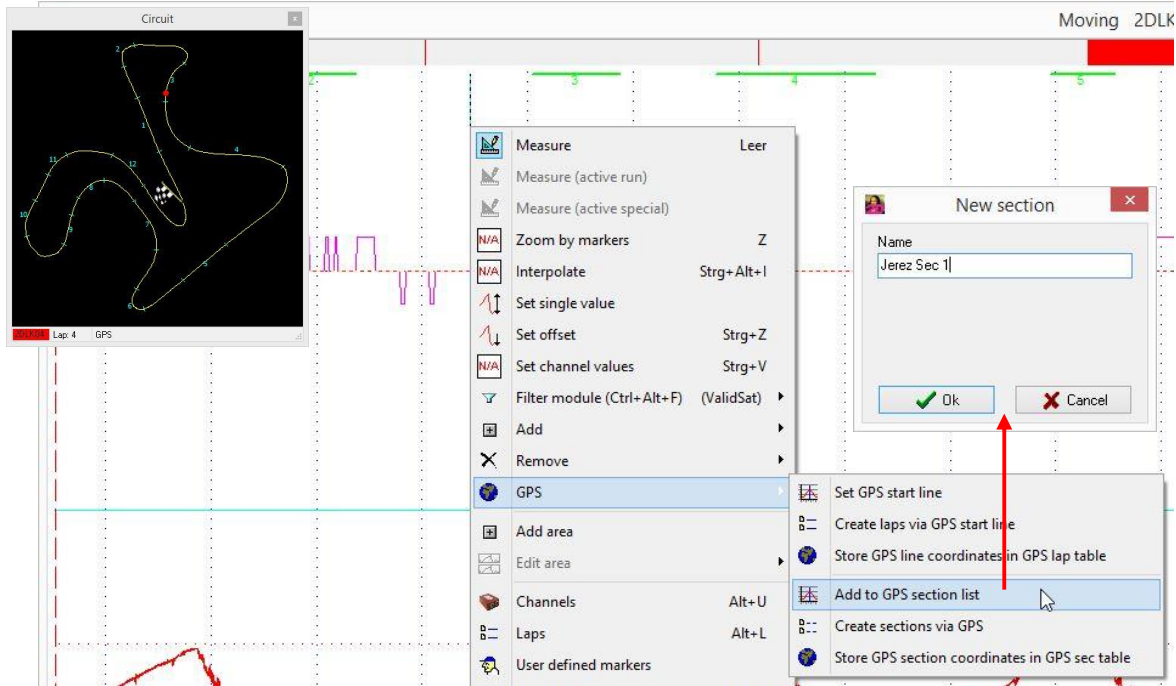


3 Creating GPS section times

To create section times via GPS you have to create the GPS section triggers first. Therefore you need GPS data of a full lap of that circuit.

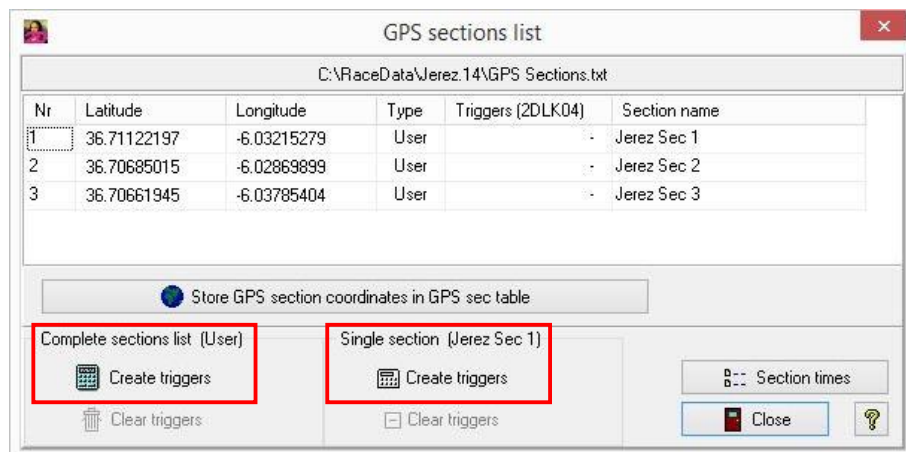
3.1 How to create GPS section trigger

1. Open your measurement in 2D Analyzer, press **<space>** to enter measure-mode and put the cursor on your preferred section trigger position

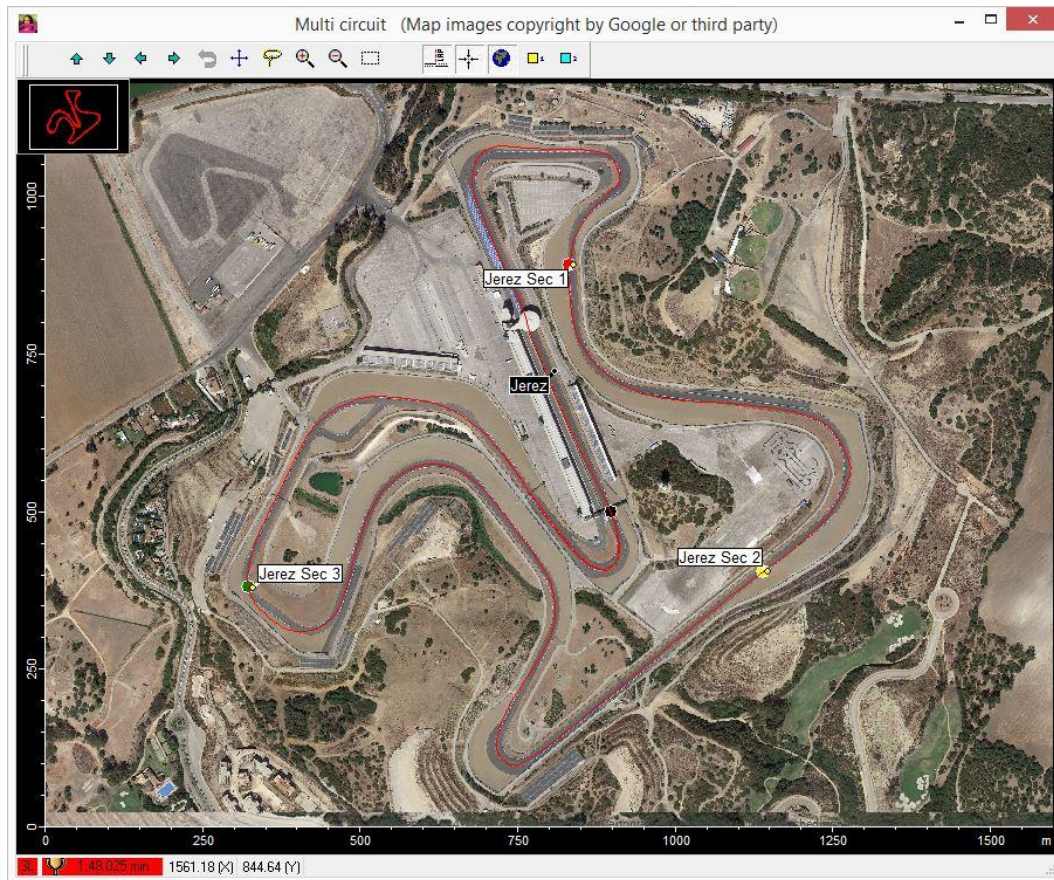


2. Right-mouse click on your preferred section trigger position (have a look at the circuit window to see where on the track you are), select **<GPS>** ⇒ **<Add to GPS section list>** and name your section trigger.
3. The window “GPS sections list” shows all available GPS section triggers of that event. 2D Analyzer checks which trigger coordinates match the current measurement and fades out other section triggers (they appear grey instead of black).

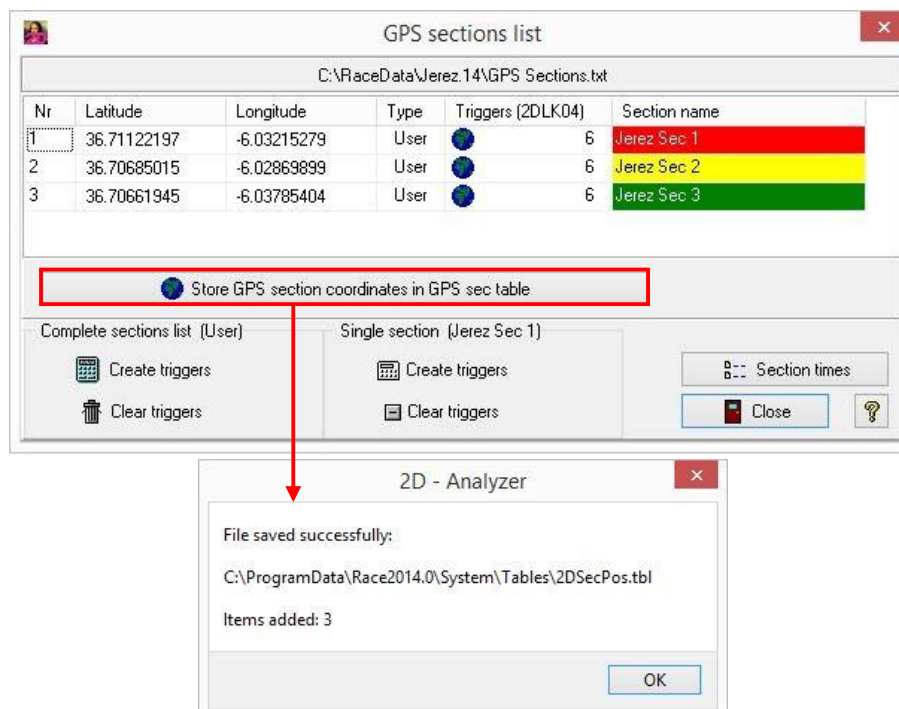
To create the section triggers for the analyzing select **<Create triggers>**. You can choose between “Single section” (creates only one selected trigger) or “Complete sections list” (creates all valid section triggers).



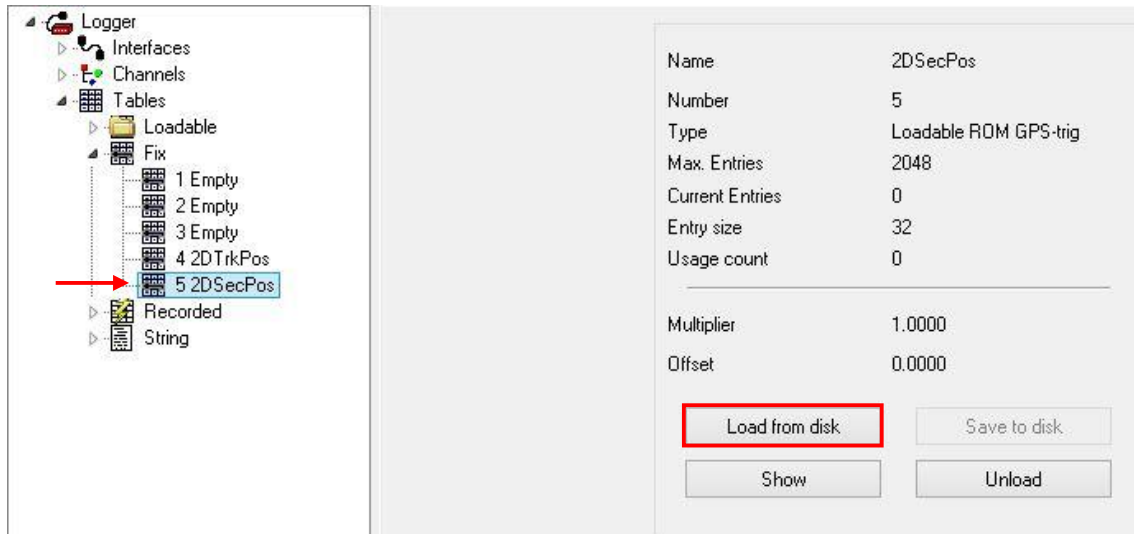
4. In the multi-circuit window (shortcut <M>) you can see your created section triggers:



5. To be able to use these section triggers online they need to be stored in the section trigger table (2DSecPos). Click on **<Store GPS section coordinates in GPS sec table>**. 2D Analyzer informs you about its action and where the table is stored.



6. Load this 2DSecPos table to your logger.
Connect your logger to your PC and start *WinIt*. Select *Tables, Fix* ⇒ *2DSecPos*. Click on **<Load from disk>** and select the section trigger table.



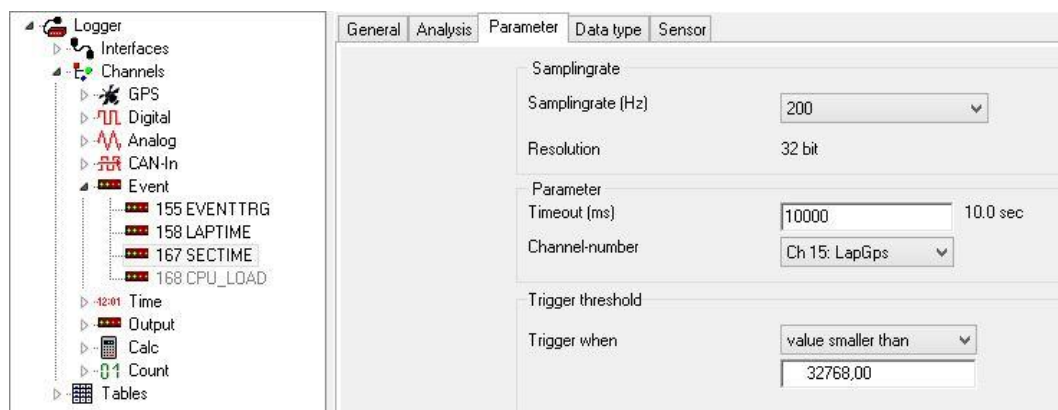
7. Confirm your changes in *WinIt* with **<Apply>**.

3.2 SecTime (Event channels)

There is only one valid channel that can be used for the trigger channel via GPS signal: **LapGps**. See section 2.2 Creating lap times with GPS for information on configuration of LapGps for further information.

If the lap time is generated with the “LapGps” channel, then normally the section times are also generated via GPS (provided that the table *2DSecPos* is available).

To define the trigger channel, start *WinIt*, select your logger in the system tree, go to *Channels* ⇒ *Event* ⇒ *SecTime* and open the tab **<Parameter>**. Choose the channel “*LapGps*” from the drop down menu of “Channel-number”. The timeout should be less than the fastest section time. Confirm your changes with **<Apply>**.



4 Appendix – predefined tracks in the 2DTrkPos - 18.06.2014

Abbeville	Chelsea Handling Track	Kartodromo Fatima
Achna Speedway	Chennai	Katar- Losail
Adelaide	Chenviers	Kemora
Adria	Chicago	Kentucky Speedway
Ahvenisto	Chicagoland	Kinnekulle
Aiginio	Chuckwalla Valley Raceway	KIP-Palmela
Aintree	Circuit of the Americas	Knockhill
Alastaro	Croft	Knutstorp
Albacete	Croix-en-Ternois	Korea Intertional Circuit
Albert Park	Curborough	Korfez
Alcarrás	Curitiba	Kyalami
Ales	Darlington Speedway	LaFerteGaucher
Almeria	Darwin	Laguna Seca
Anglesey	Daytona	Lakeside Queensland
Anhembi - Sao Paulo	Dijon	Las Vegas Motor Speedway
Anneau du Rhin	Donington Park	Ledenon
Ansan	Dover	LeMans
Artic Circle Raceway	Dreux	Lime Rock
Ascari	Dubai	Ljungbyhed Park
Aschheim	Dunsfold	Llandow
Assen	East London	Loheac
Atlanta Motor Speedway	Eastern Creek	Lonato
Autodromo da Salta	Ebisu South	Londrina
Autodromo Goianina	Elvington	Loudon
Autodromo Hermanos Rodrigues	Enna Pergusa	Lydden
Autopolis	Estoril	Magione
Bahrain	Eurospeedway Lausitzring	Magny Cours
Barbagallo	Eusebio	Mallala
Barber Motorsports Park	Fay de Bretagne	Mallorca-Rennarena
Baskerville	Fiorano	Mallory Park
Bathurst	Folembay	Manfeild
Bay Meadows	Fort Devens	Mantorp
Beave Run Motorsports Complex	Franciacorta	Martinsville Speedway
Bedford Autodrome	Fuente Alamo	Mas du Clos
Belle Isle	FujiSpeedWay	Maze
Bilster Berg	Gateway International	Megara
Blackhawk Farms	Gellerasen Circuit	Memphis
Blyton Park	Gingerman Raceway	Mendig
Bombarral	Goodwood	Miachkovo
Botniaring	Gotland Ring	Michelin Laurens Proving Grounds
Braga	Grattan	Mid America
Brainerd	Grobnik	Mid Ohio
Brands Hatch	Guadix	Midvaal
Brasilia	Guapore	Miller Motorsports Park
Bresse	Hampton Downs	Milwaukee
Bristol	Hastings Motorsport Park	Misano
Brno	Hawai Raceway	Mittsverigebanan
Broadford	Heartland Park of Topeka	Modena
Bruntingthorpe	High Plains Raceway	Mont Tremblant
Buddh International Circuit	Hockenheim	Montebianco
Bukernieki	Homebush	Montreal
Buttonwillow Raceway	Homestead	Monza
Cadwell Park	Honjo	Morgan Park
Calabogie	Hungaroring	Mornay
Calafat	Imola	Moroso
Calder	Inde Motorsports Ranch	Mosport
California Speedway	Indianapolis	Most
Campo Grande	Infineon Raceway	Motegi
Cape Town	Interlagos	Motopark
Carolina Motorsport Park	Istanbul Park	Motorland Aragon
Cartagena	Jacarepagua	Motorland Suzuka
Cascavel	Jarama	Mugello
Castelloli	Jennings	Myrtle Beach
Castle Combe	Jerez	Nakhonchaisri
Catalunya	Johor	Nardo
Charlotte	Jyllandsring	Nashville
Chayka	Kansas Speedway	Navarra

Nazareth	Rijeka	Symmons Plains
Nelson Ledges	Ring Djursland	Talladega Superspeedway
New Jersey Lightning	Rioveggio	Taruma
New Jersey Thunderbolt	Road Atlanta	Taupo
Nikko	Roberto Mulas Circuit	Teretonga
Nogaro	Rockingham	Texas Motor Speedway
Nola Motorsports Park	Ruapuna	Three Sisters
Norising	Rudskogen	Thruxton
Nürburgring	Sachsenring	Thunderhill Raceway Park
Okayama	Saellandsringen	Timaru
Oran Park	Salzburg	Tocancipa
Oschersleben	Samara-Ring	Tokachi
Oulton Park	San Luis Potosi	Track
Padborg Park	Sandia	Troronto Motorsports Park
Palm Beach	Sandown	Tsukuba
Pannoniarig	Santa Cruz do Sul	Valencia
Park Algar	Sauga Circuit Auduring	Valerbanen
Pau Arnos	Schleizer Dreieck	Valkenswaard
Paul Ricard	Sebring	Vallelunga
Paw	Seinajoki	Varano
Penbry International	Sendai Highland	Velo Citta - Mogi Guacu
Phillip Island	Sentul	Velopark
Pinarbasi	Sepang	Virginia International Raceway
Pittsburgh	Serres	Wakefield Park
Pocono Raceway	Shanghai	Waneroo
Pomposa	Siena	Waterford Hills
Port Elizabeth	Silverstone	Watkins Glen
Portland	Slovakia Ring	Welkom
Poznan	Snetterton	Wesbank Raceway
Prestwold Hall	Spa Francorchamps	Willow Springs
Pukekohe	Spa Nishiura Motor Park	Winton
Pukekohe Park Raceway	Spring Mountain	Yas Marina
Putnam Park	St Petersburg Street Circuit	Zandvoort
Quensland	Sturup	Zolder
Ramenskoe	Sugo	Zuhai
Red Bull Ring	Summit Point Motorsports Park	Zwartkops Raceway
Reno Fernley	Surfers Paradise	
Riberao Preto	Sviestad	