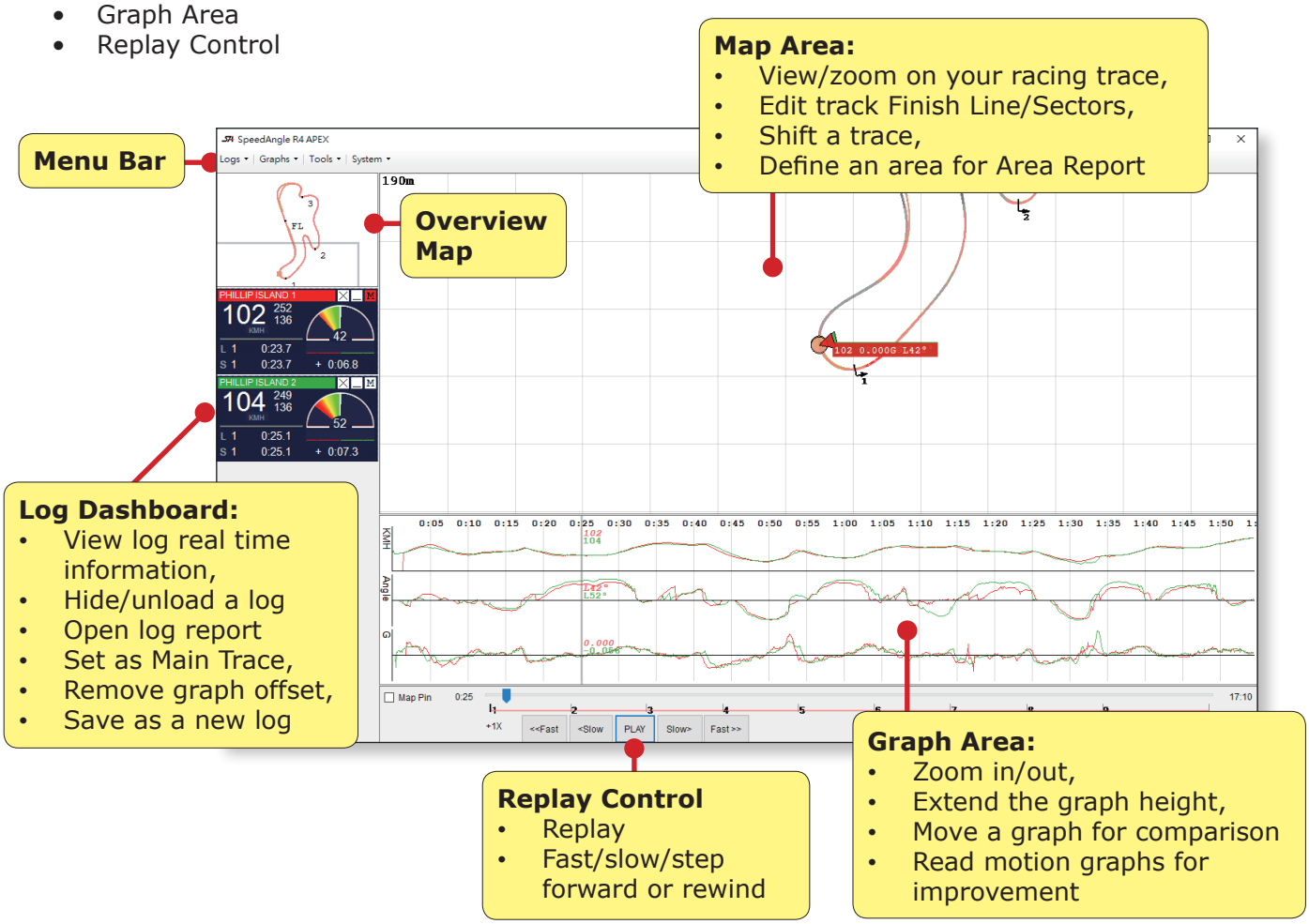
SpeedAngle R4 APEX User Manual

Contents

Overview

The SpeedAngle R4 interface consists of several components:

- Menu Bar
- Overview Map
- Log Dashboard
- Map Area
- Graph Area
- Replay Control



Connect APEX to Computer

Download Driver and Software

If this is the first time you connect your SA timer to a computer, please download the driver and the companion software SpeedAngle R4 first:

Driver: https://www.ftdichip.com/Drivers/CDM/CDM21228_Setup.zip
Please download the file, unzip it, and double-click on the icon to install the driver.

SpeedAngle R4: http://www.speedangle.com/downloadfile/1250/
Please download the file, unzip it, and double-click on the icon to launch it.

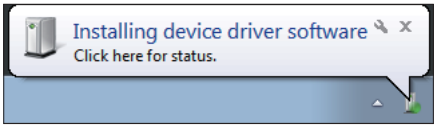
Connect Your APEX to a Computer

Please plug the APEX cable to a USB port of your computer. Once the cable is plugged in, APEX will power on automatically, and prompt "USB CONNECTED" on the screen.

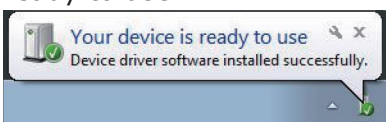
Your Windows will then start installing the driver and assigning a COM port for this APEX.

If you are running Windos 7,

you will see a prompt saying "Installing device driver software":



Please wait till it says "Your device is ready to use":



If you are running Windows 10,

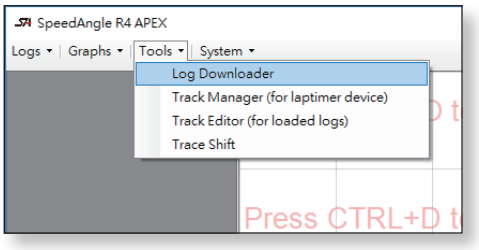
the system may install the driver without prompting any messages.

Depending on your system performance, this process may take from a few seconds to a couple of minutes.

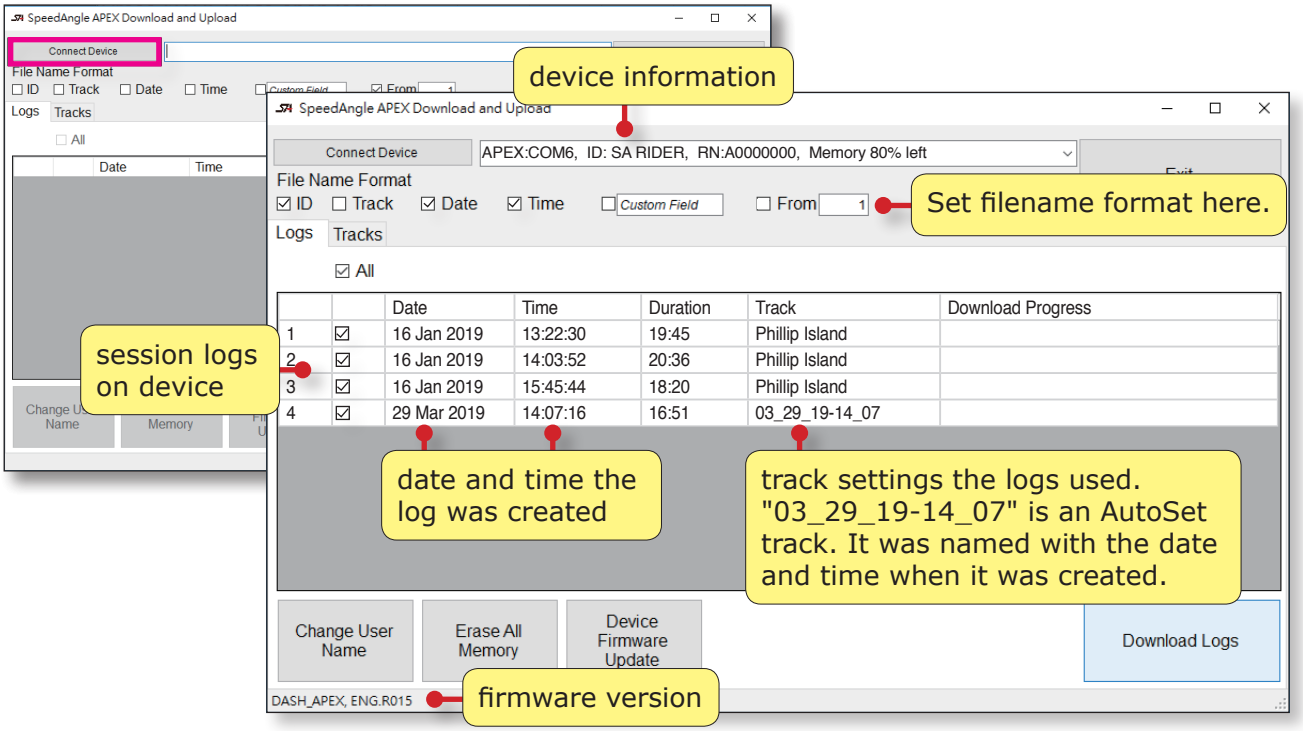
Download Logs/Manage APEX

Open Download Dialog and Connect Device

Please double-click on the SpeedAngle R4 icon to launch it. Go to MENU > TOOLS > LOG DOWNLOADER (or press CTRL + D) to open the Download and Upload dialog.

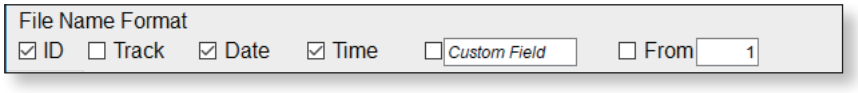


Click on the "CONNECT DEVICE" button to connect your APEX.



Set Filename Format

You can choose from below what information is to appear in the download file names. Check those you want before starting downloading the files.



- **ID**: Your User ID
- **Track**: The name of the Track
- **Date**: The month-day-year when the log was created
- **Time**: The hour-minute-second when the log was created
- **Custom Field**: Input a text you like (Only English alphabets and numbers are allowed)
- **From**: Number the downloaded files from the number designated

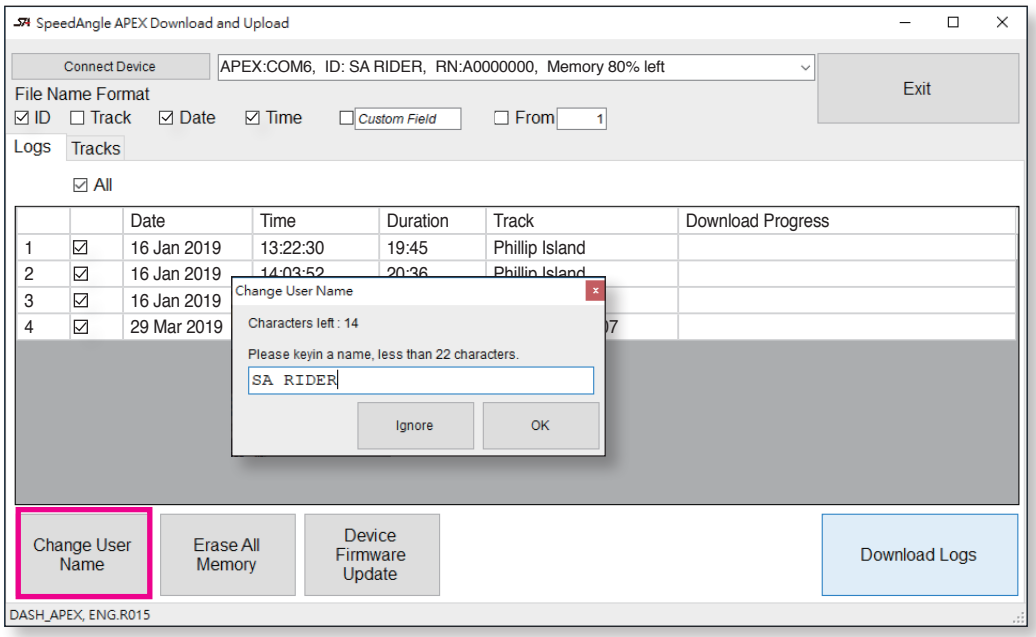
The default filename format is "ID DATE TIME.sa". E.g.: RIDER 032519 123013.sa
If none has been checked, the system will name the files as: SpeedAngle Log.sa

Change User ID

Connect APEX if you have not. Click on the "CHANGE USER NAME" button and enter an ID in the box. The new ID will be updated in the device information box.

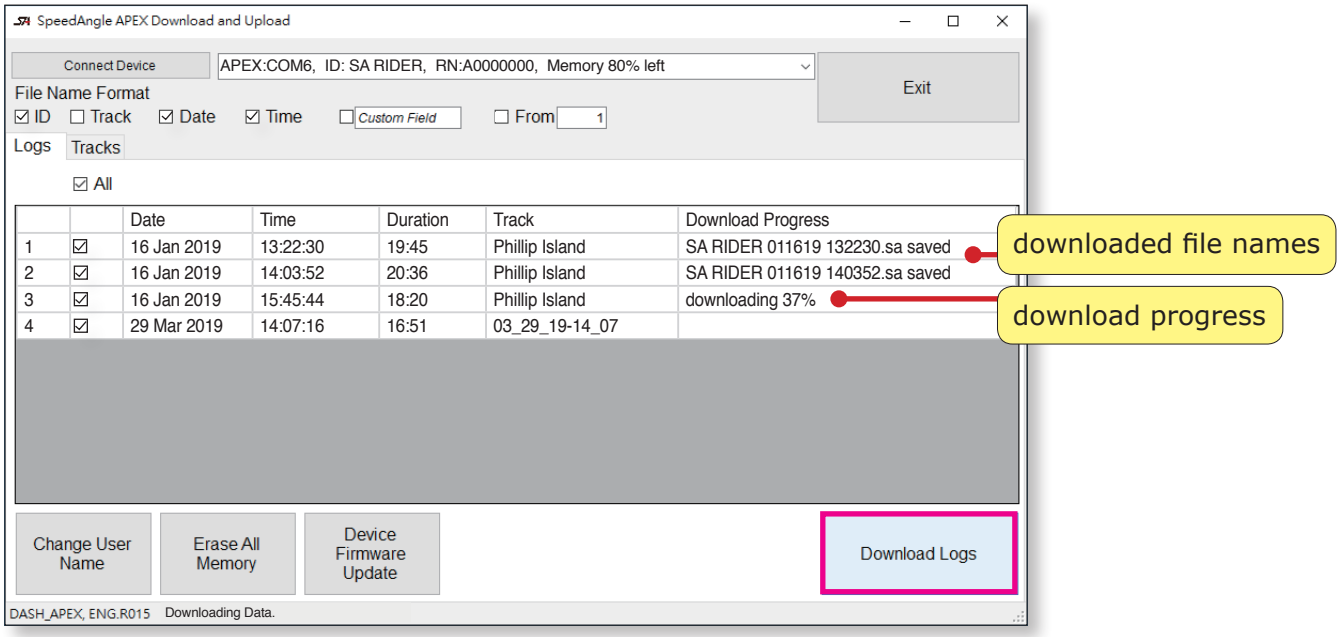
Please note:

- The max length of ID is 22 characters.
- Only English alphabets and numbers are allowed. Other characters will cause problems during log download.



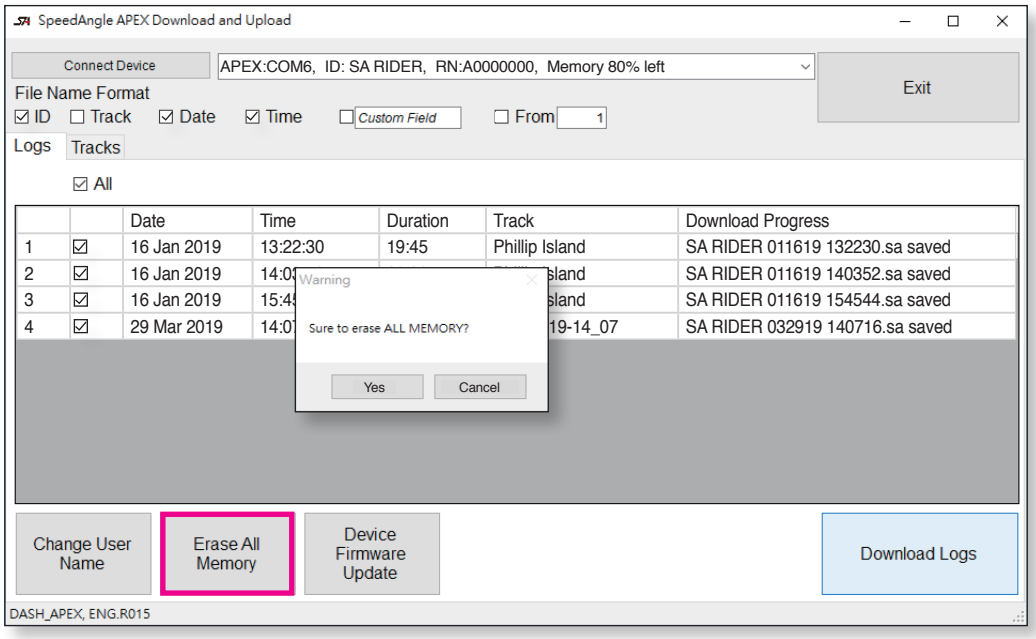
Start Download

Connect APEX if you have not. Click on the DOWNLOAD button and navigate for a folder to save the files. The download progress will be shown in the progress column.



Clear Memory

Connect APEX if you have not. Click on the "ERASE ALL MEMORY" button. When prompted, click "YES" to proceed. Please note that **ALL memory** will be erased and can not be retrieved.

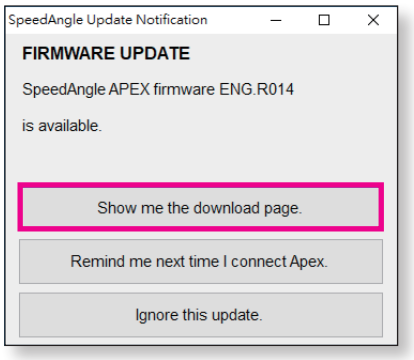


Reconnect APEX by clicking the "CONNECT DEVICE" button to update the memory usage status.

Update Device Firmware

Download New Firmware

If you are running SpeedAngle R4 009.exe (or above if available), once a new firmware has been released, R4 will show a prompt when your APEX is connected to the Download and Upload dialog:

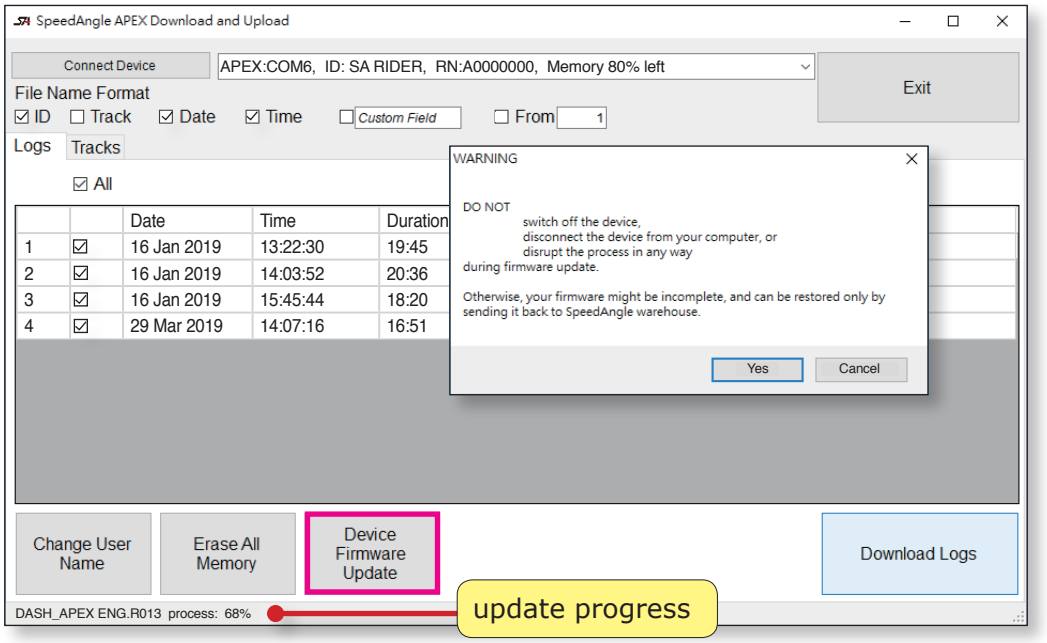


Click to go to the firmware download page to download the firmware.

Or you can visit www.SpeedAngle.com/download from time to time and look in the firmware section to see if a new firmware is available.

Perform Update

Click on the "DEVICE FIRMWARE UPDATE" button. A message reminding you not to disconnect device or interrupt the update procedure will be prompted. Read the message carefully. Click "YES" and then navigate to find the downloaded firmware file.



The update progress will be shown at dialog bottom. Wait till it says "APEX DFU COMPLETE". This may take up to one minute.

Once firmware update is complete, the APEX system will reboot automatically.

Connection Troubleshooting

If you experience trouble getting your APEX recognized by R4, it is mostly likely that the cable fails, or the USB port fails, or the driver has not been installed properly.

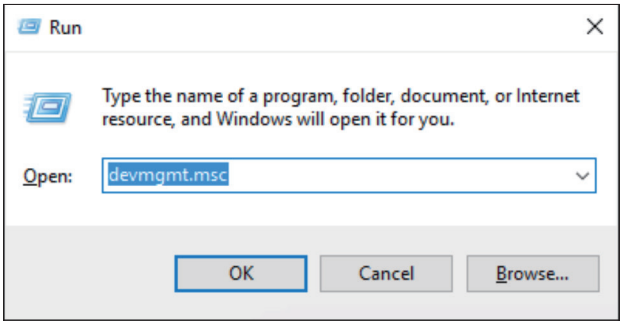
Check Cable and USB Port Connectivity

Check if there are foreign particles inside the cable connector. If yes, please remove it.

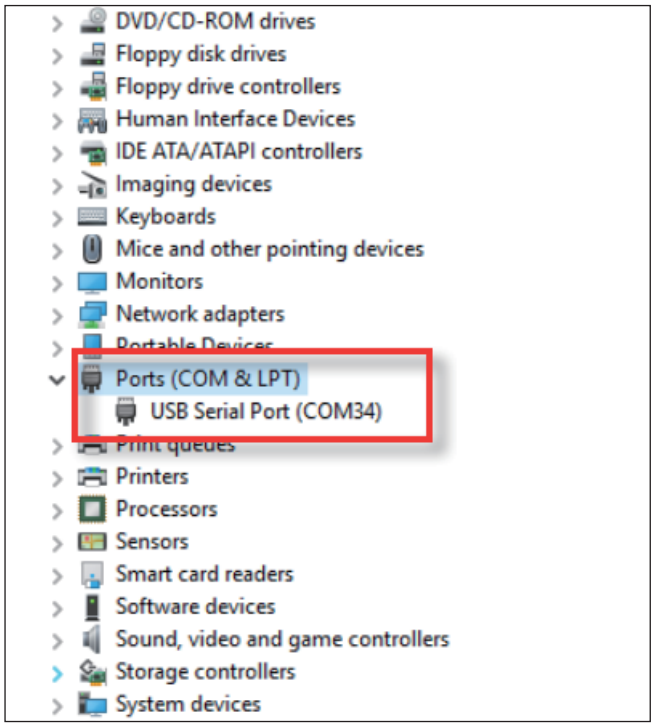
Connect your APEX to your computer. Check if APEX wakes up and shows "USB CONNECTED" on the screen. If not, try with another computer. If your APEX would not wake up anyhow, please contact your local distributor.

Check Driver Installation

If your APEX wakes up when connected to your computer and shows "USB CONNECTED", please check driver installation by pressing the Windows key and R key at the same time. Enter "devmgmt.msc" in the pop up window to call up Device Manager.

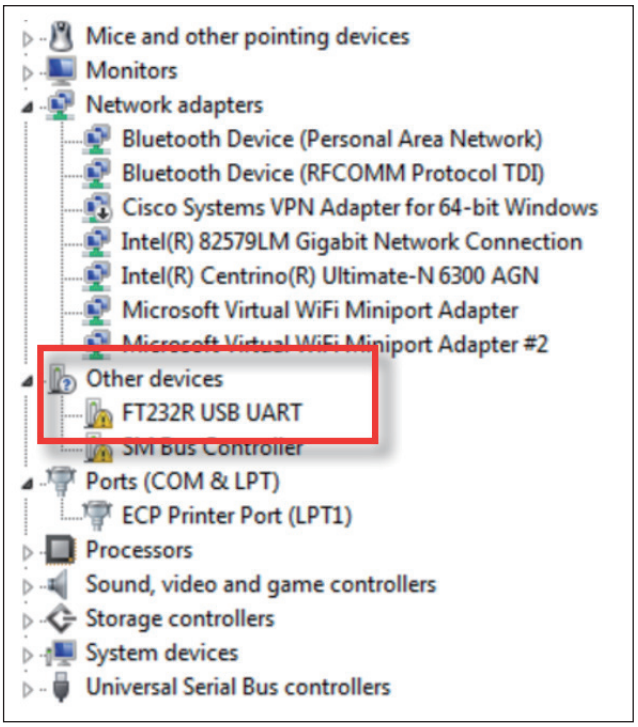


Check if you have "Ports (COM & LPT)" listed with a "USB Serial Port (COM#)" assigned as illustrated below.



If both are yes as shown above, your device driver has been properly installed. If your SA timer still can not be recognized, please contact your local distributor.

If instead, the device manager shows a "FT232R USB UART" in the list, Windows has failed to assign a serial port to your SA timer. please follow the steps below to uninstall and re-install the driver:



1. Right click on the FT232R device in the device manager, and select UNINSTALL in the menu to uninstall the device.
2. Remove and reconnect your APEX to the computer. Make sure to wait till the serial port assignment is complete.

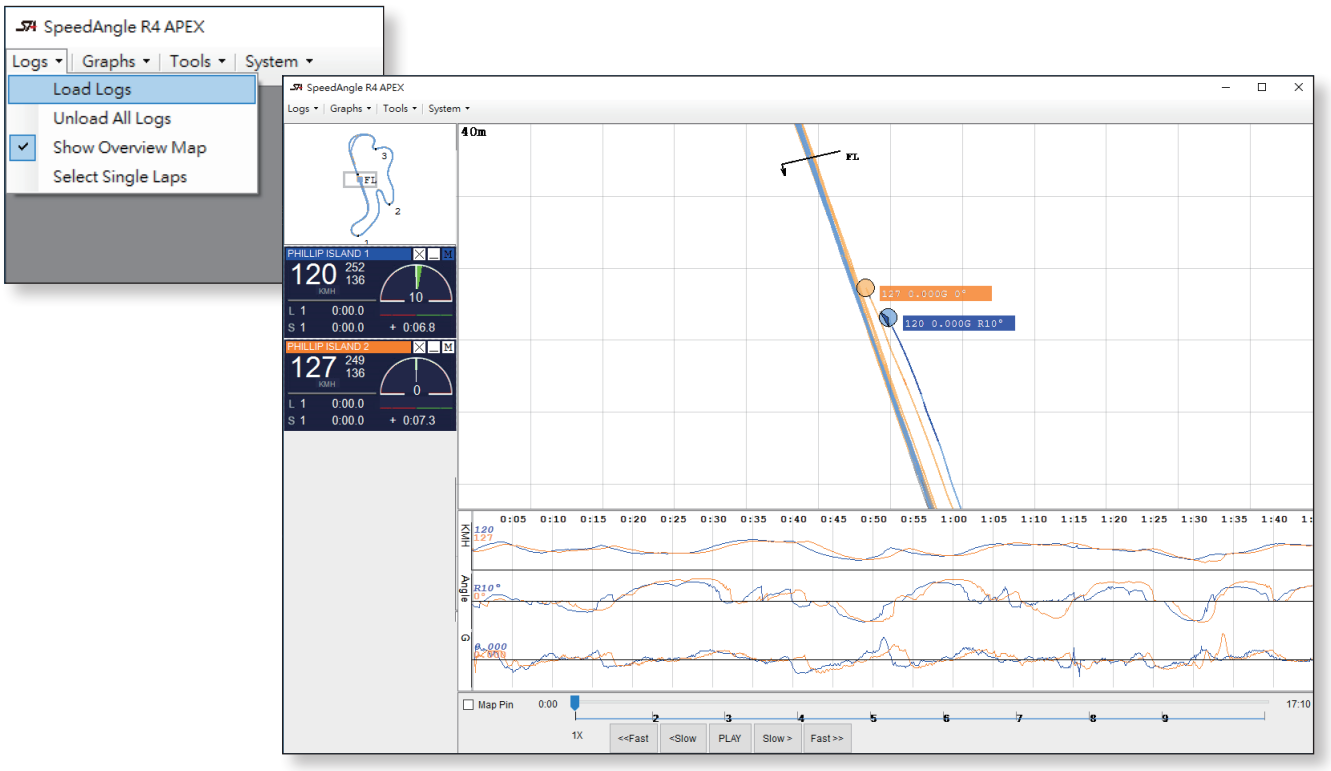
To monitor the process, it is recommended to keep the Device Manager on the screen during the installation. It will list "FT232R USB UART after the first procedure is complete (driver for this specific APEX associated), and then replace it with "COM & LPT", with a USB serial port listed below.

Load/Unload Logs

Load Logs

Click on MENU > LOGS > LOAD LOGS or press CTRL + O, and browse for the logs that you would like to load. A third way is to drag the logs from their folder and drop them in the Map Area directly.

You can load up to six of them.



Unload Logs

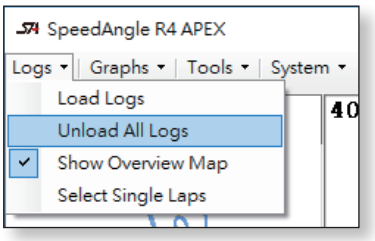
You can choose to unload a particular log or unload all the logs at once.

Unload Single Log

Please **double-click** on the "X" on the log dashboard.

Unload All Logs

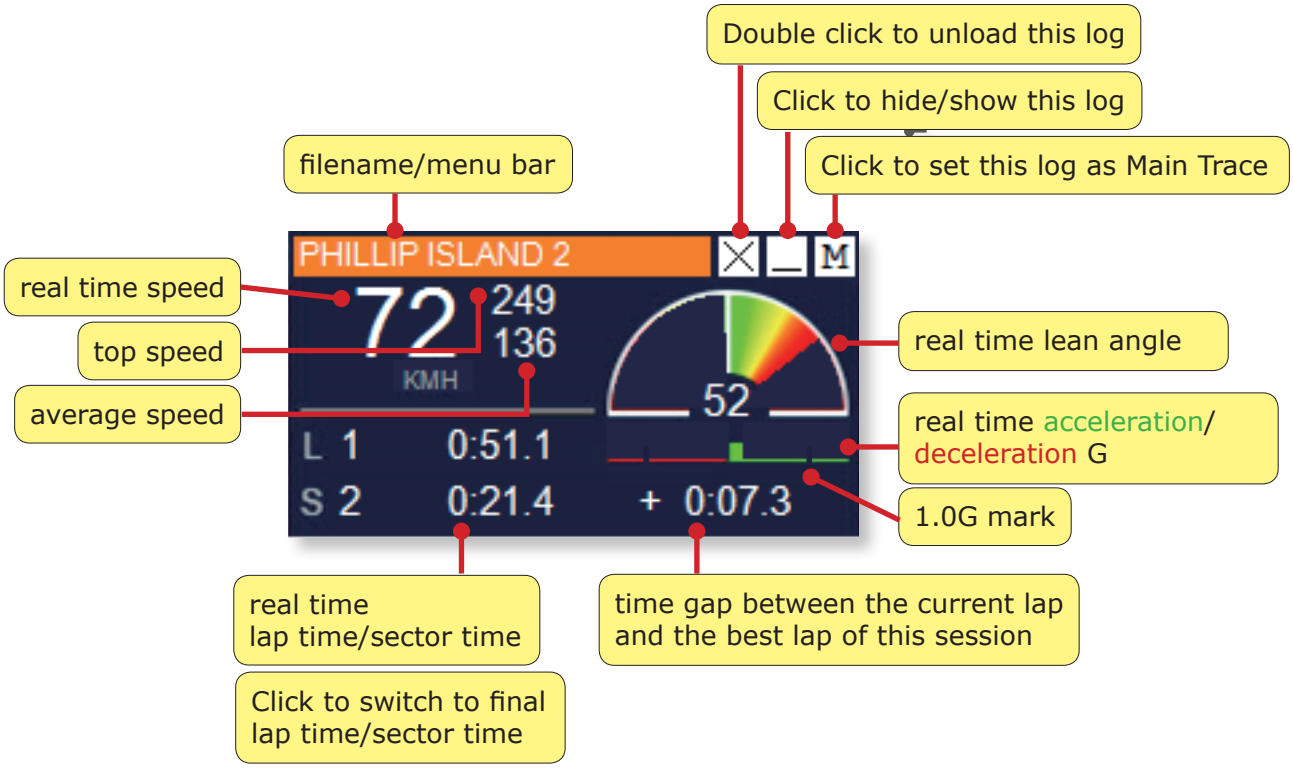
Please click on LOGS > UNLOAD ALL LOGS.



Log Dashboard

Overview

The log dashboard shows a lot of motion and lap time information of the log.

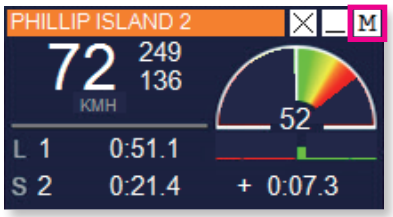


Main Trace

Setting a log as a Main Trace means that

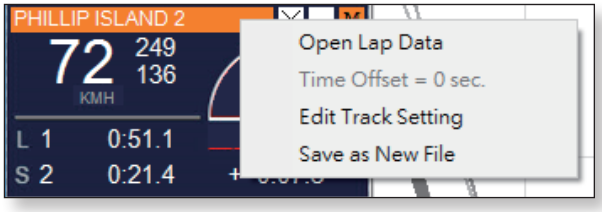
- its bike marker will be used as the focus of log replay in the Map Area,
- only its Finish Line and Sectors (if any) will be shown in the Map Area, and
- only its Finish Line and Sectors will be the object of Track Editor.

To set a log as Main Trace, simply click on the "M" square of its dashboard.



Filename Menu Bar

Click on the Filename Menu Bar, you will see a drop-down menu:



Open Lap Data

This will open the report of this log, which lists its basic information like the date, time, track setting, etc., lap times, sector times (if available), ideal lap time, and the motion data of them. For more information, please see: *"Lap Report"*.

Time Offset

When you move a graph for comparison (please see: *"Drag on a Graph and Move It for Comparison"*), a time offset is created. You can check how much the offset is here. To remove the offset, simply click on the offset item.

Edit Track Setting

This option is available only to the Main Trace log. Click to launch Track Editor to edit the Finish Line/Sector of this log directly on Map Area. For detail on Track Editor, please see: *"Track Editor"*.

Save as New Log

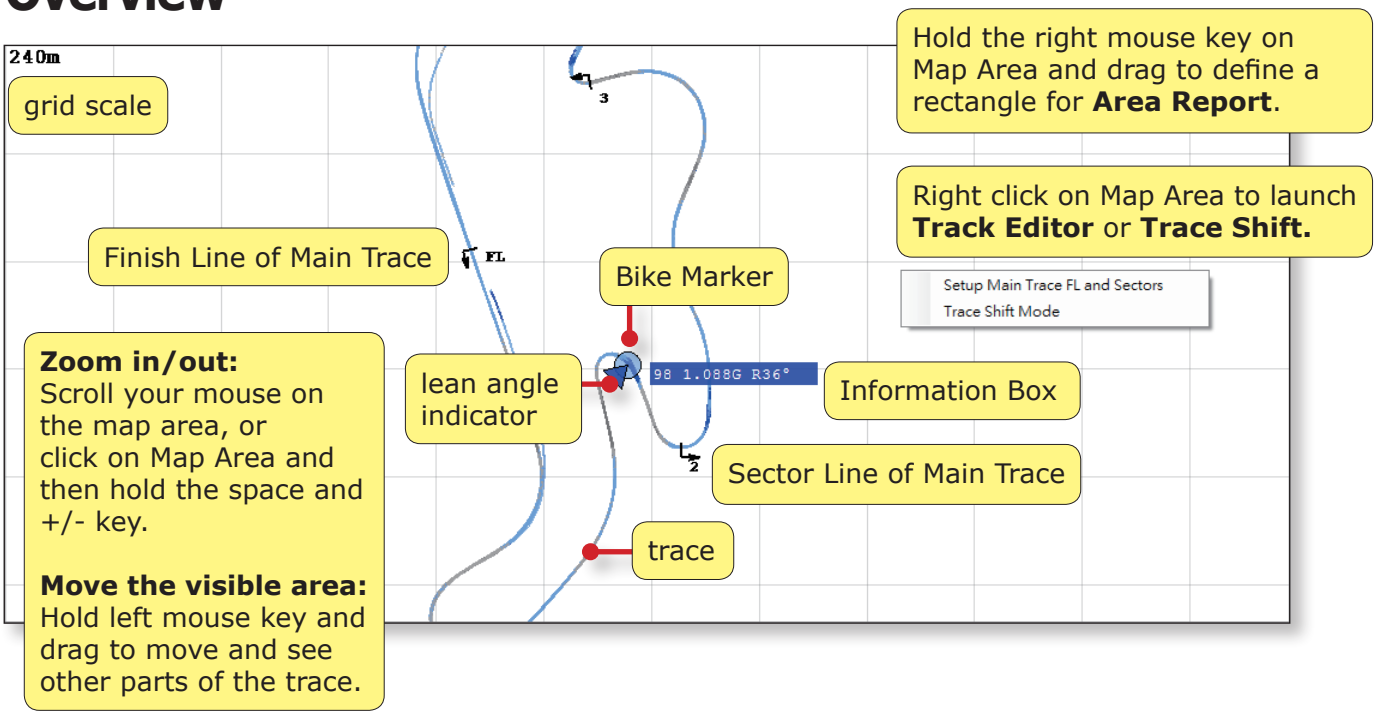
After finishing editing the Main Trace Finish Line/Sector with Track Editor, you may select to apply the modification to the Main Trace or to all the logs loaded. To save the modification of a certain log, please click on "SAVE AS NEW LOG" to save it as a new file.

The default new filename is "original filename R.sa".

Map Area

At Map Area, you can view the traces of the logs loaded and edit their track settings.

Overview



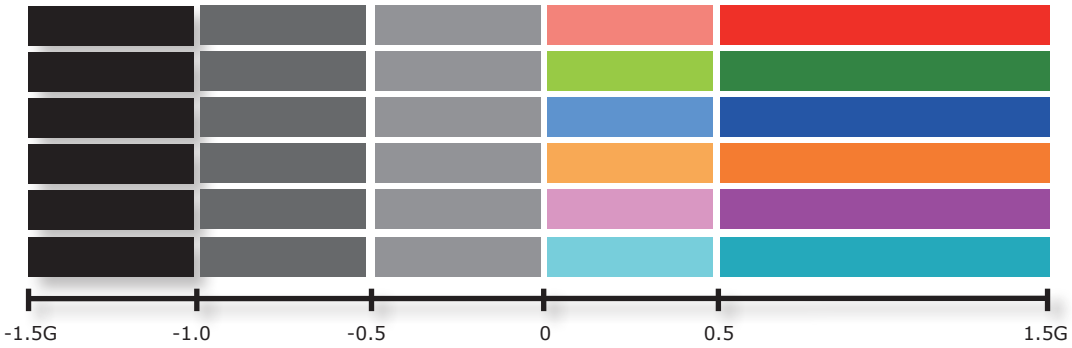
Bike Marker and Information Box

During replay,

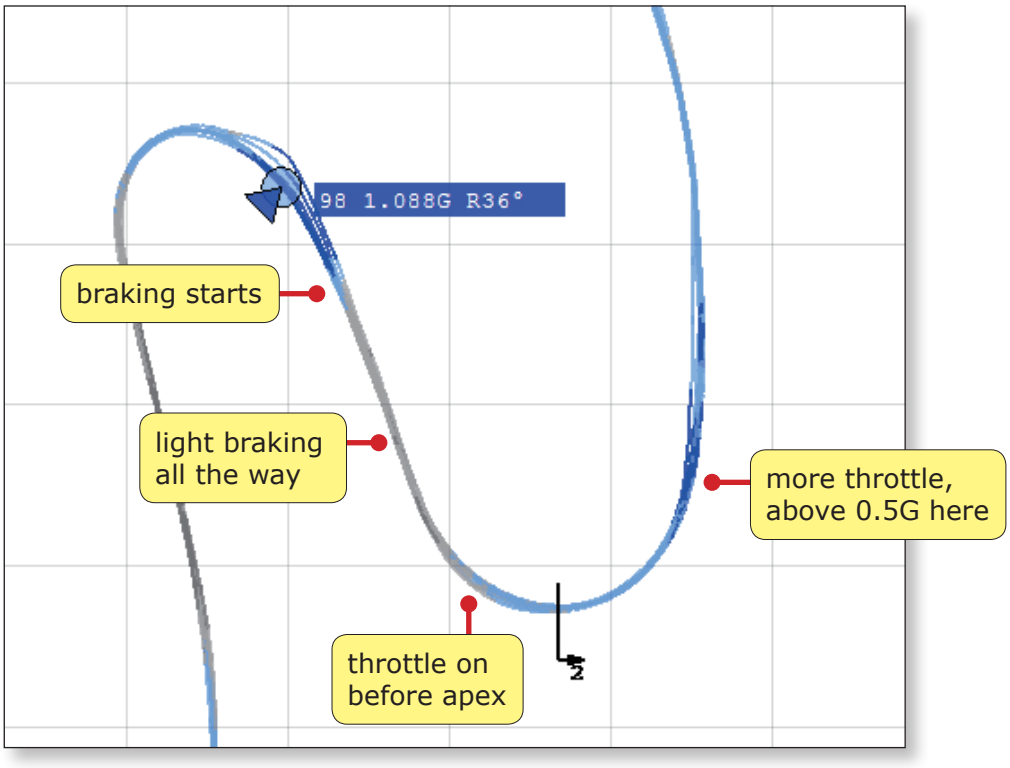
- the Bike Marker marks the position of the bike,
- the triangular Lean Angle Indicator extends to the left or right indicating how far the bike is leaning, and
- the Information Box shows the real time speed, G, and angle of the bike.

Trace Color

There are six trace colors available. Each trace loaded is assigned a color. The shades of the color indicate the G range of that trace section:



This allows you to find where the acceleration or braking starts/ends, estimate how long that section is, and see how hard the acceleration or braking is.



These visual cues are especially helpful when you are comparing single laps or comparing with other riders. They show the differences of riding styles and techniques.

Enter Track Editor

Right click on Map Area, and then click on "SET UP MAIN TRACE FL AND SECTORS" to launch Track Editor. Track Editor allows you to edit the Finish Line and Sectors of the Main Trace, apply a track setting file to the traces, or save the Finish Line and Sectors as a track setting file. You can then save the edited logs as new logs. For more detail, please see: *"Track Editor"*.

Shift a Trace

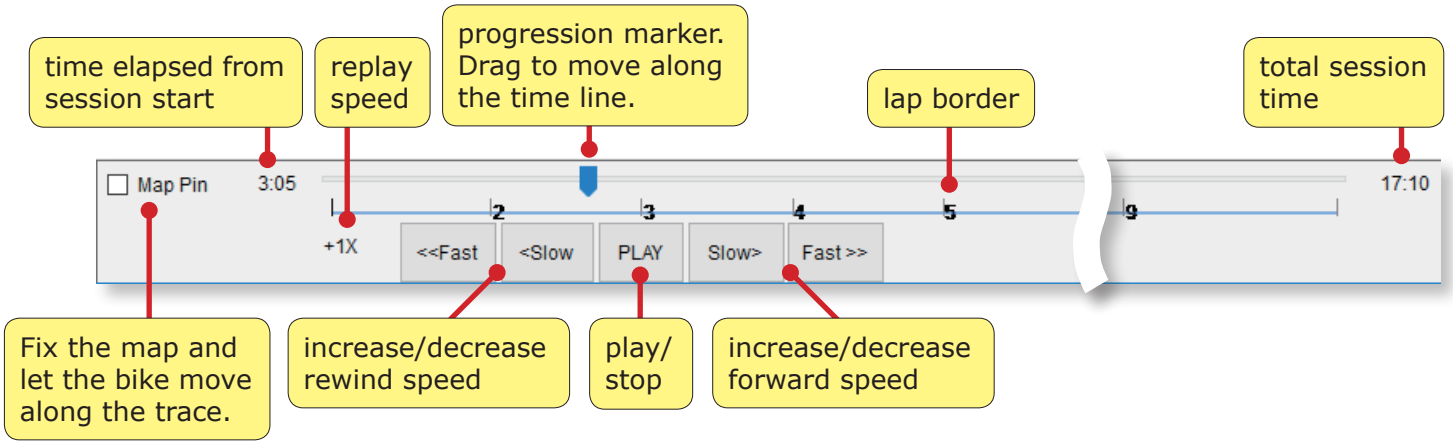
Right click on Map Area, and then click on TRACE SHIFT MODE to launch Trace Shift. This allows you to move a trace so that it matches with other logs location wise for ease of comparison in case of GPS offset. For more detail, please see: *"Trace Shift"*.

Define an Area for Area Report

Right click and hold the mouse key, and then drag to define a rectangle for area report. This is especially helpful when you want to see the duration, speed, distance, angles or G's of a certain segment of the trace for comparison. For more detail, please see: *"Area Report"*.

Replay

Overview



Fast/Slow/Step Forward or Rewind

Click on the "FAST" or "SLOW" buttons to increase or decrease replay speed among 20X, 10X, 5X, 2X, 1X, 1/2X, 1/3X replay speeds.

If you keep clicking on "SLOW" when the replay speed has been down to 1/3X, it will switch to STEP mode. In this mode,

- each click on the "STEP" button will move the Bike Marker to the next GPS fix logged, which is 1/10 second apart. This allows you to see the data 1/10 second by 1/10 second.
- "<STEP" will move the Bike Marker backward, while "STEP>" will move the Marker forward.
- To exit STEP mode, simply click on "FAST" to increase replay speed, or on "PLAY" to start replay.

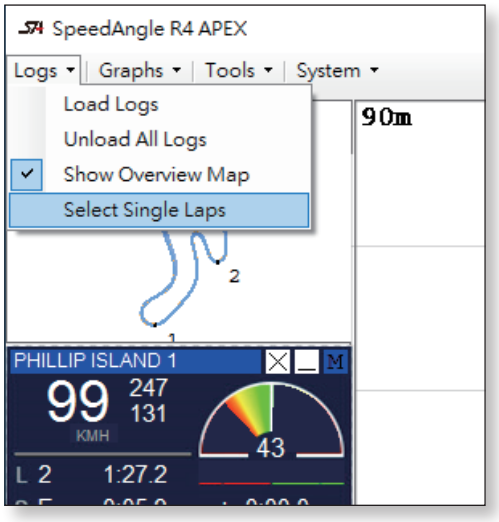
Select Single Laps

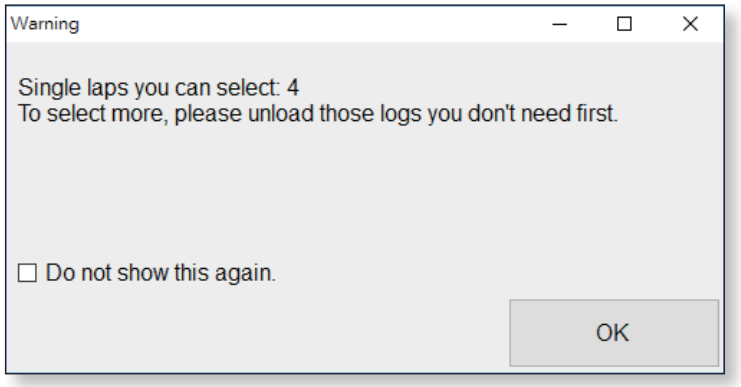
You can select single laps from the logs loaded for further comparison.

Start

Please go to LOGS > SELECT SINGLE LAPS.

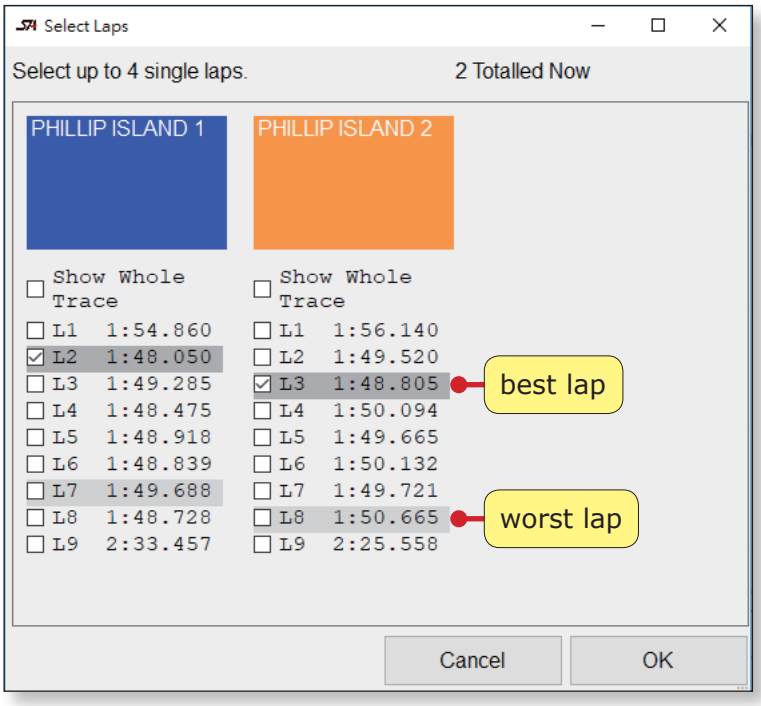
Please note that the max number of logs loaded plus single laps is 6. If you have had two logs loaded already, you can still select as many as 4 single laps. If you have three logs loaded, you can select up to 3 single laps, etc..





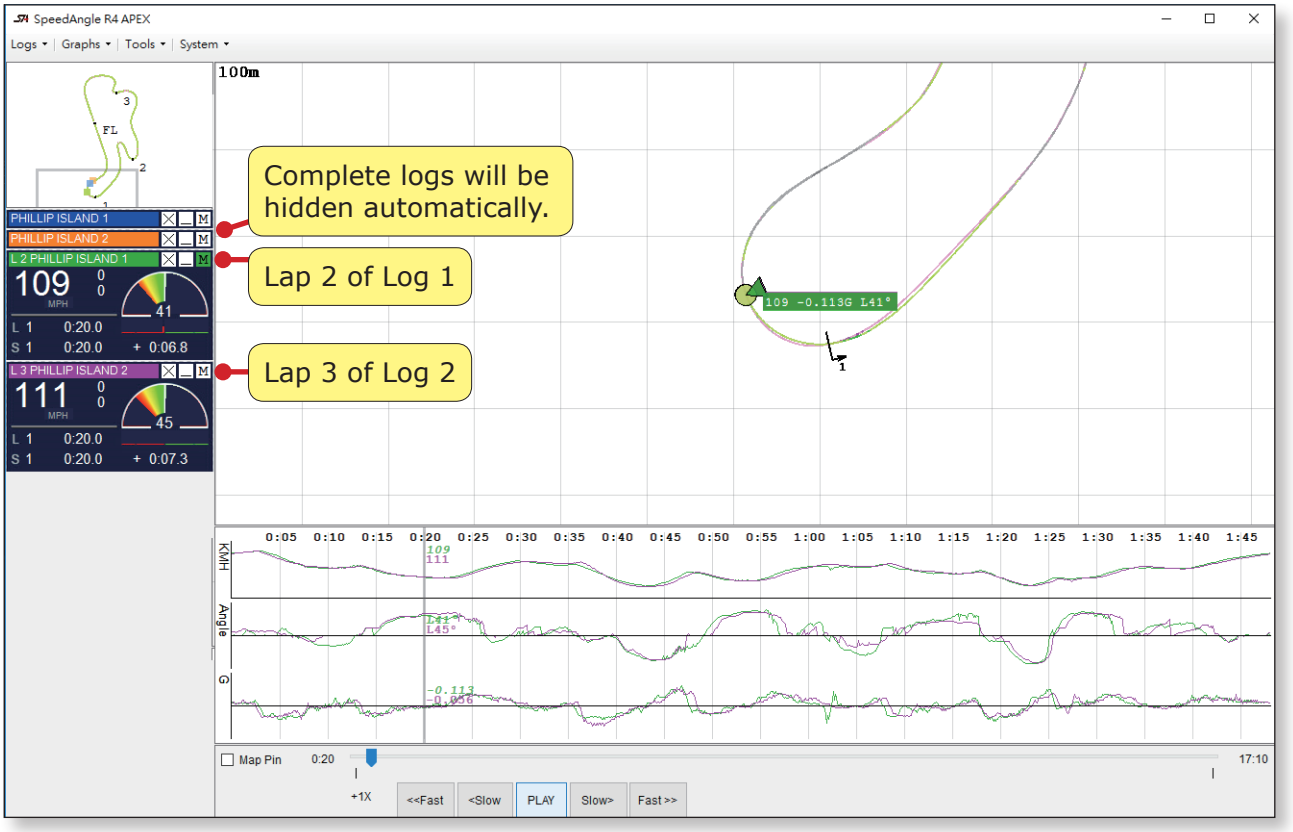
Lap List

The system will show a list of all laps of the logs loaded. The best laps are highlighted with dark gray, while worst laps with light gray. Check those you are interested in, and click OK.



Single Laps Loaded Like Full Logs

Single laps will be loaded in the Map Area as well as Graph Area and with Dashboards just like complete logs. You can perform Track Editor, Trace Shift or define for Area Report on them. To unload a single lap, just double-click on the "X" of the dashboard.



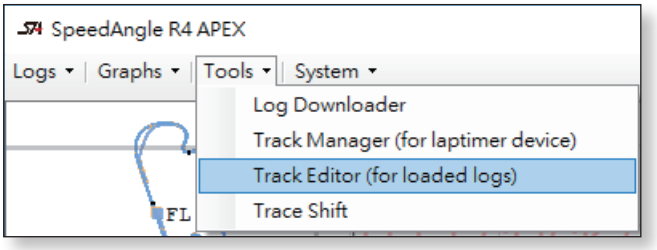
Track Editor

Track Editor allows you to edit the track settings of a loaded log directly in the Map Area. You can even create a track or load and apply a track setting file to a log.

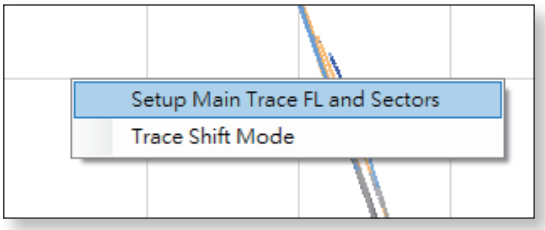
Enter Track Editor

There are three ways to enter Track Editor:

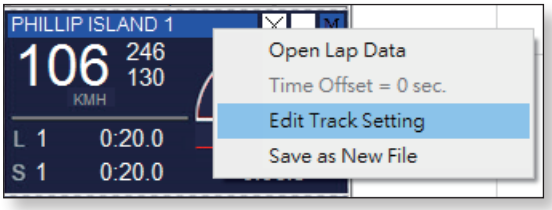
By going to MENU > TOOLS> TRACK EDITOR:



By right-clicking on Map Area and select "SETUP MAIN TRACE FL AND SECTOR":

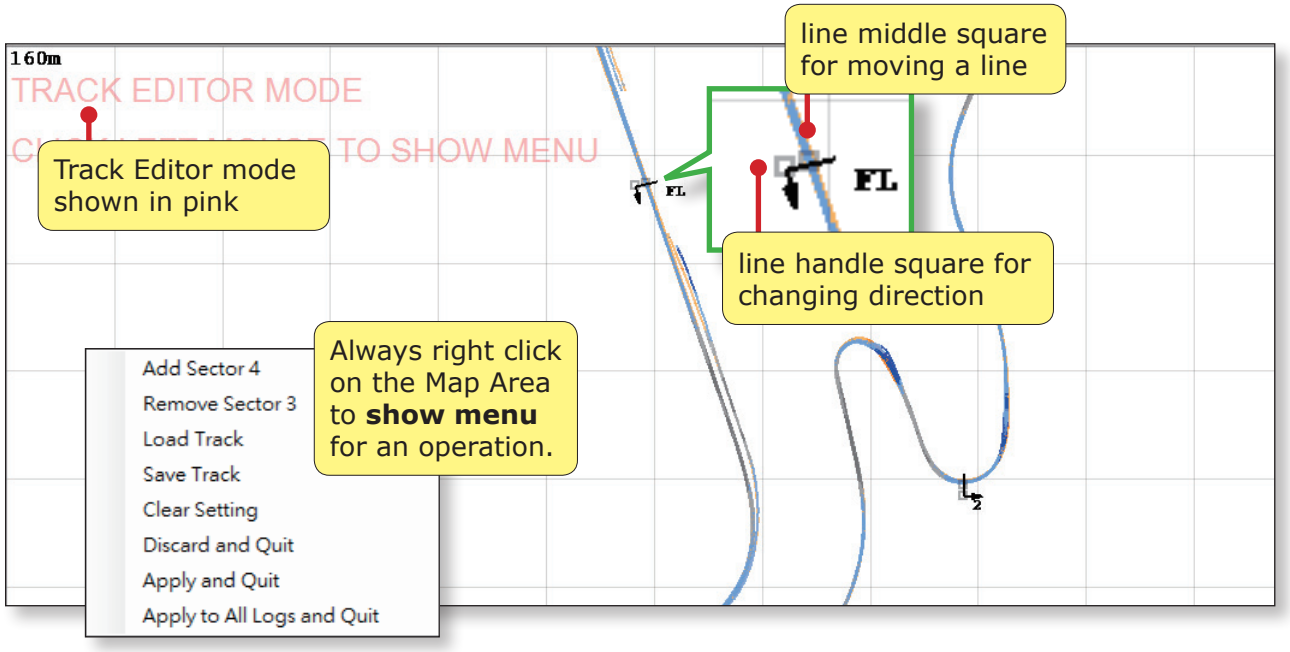


From the dashboard Filename Menu Bar of the Main Trace:



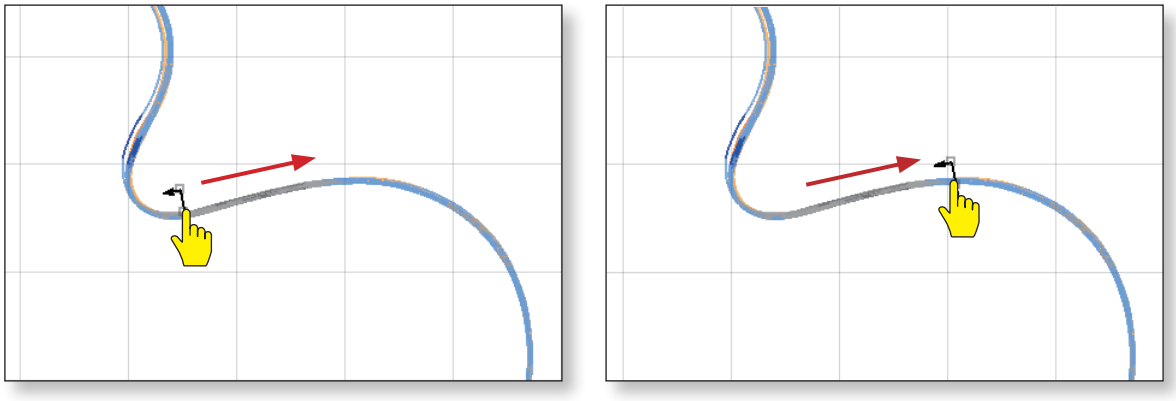
Overview

Once in Track Editor mode, you will see little squares at the center and one side of the Finish Line and each Sectors.

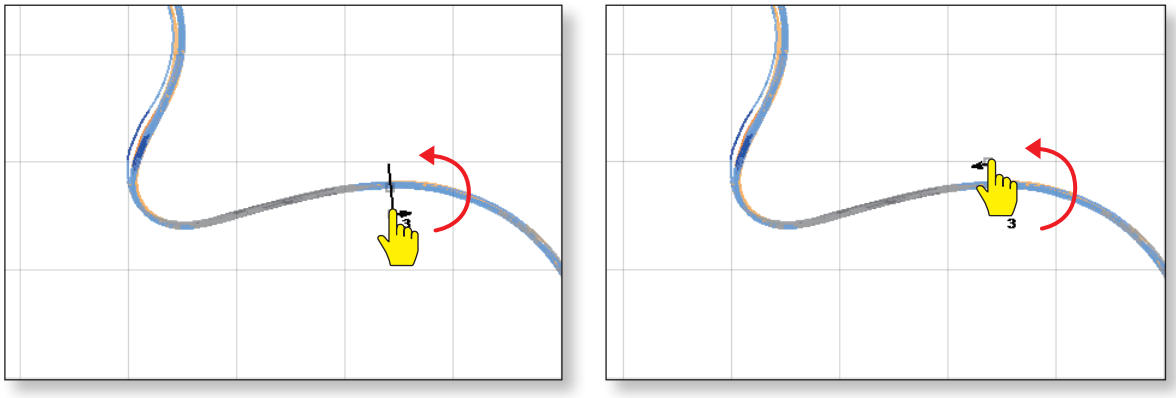


Move a Line/Adjust Traveling direction

If you would like to move a Line, please click and hold the left mouse button on the middle square, and then drag the line to your desired location.

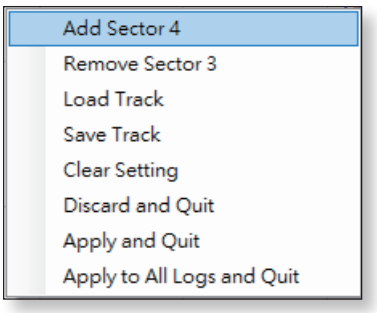


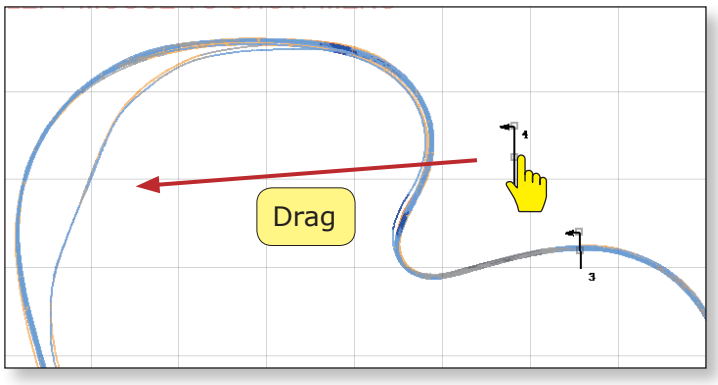
To change the direction of a line, click and hold the left mouse button on the side handle square of the line. Swivel to change it to your desired direction.

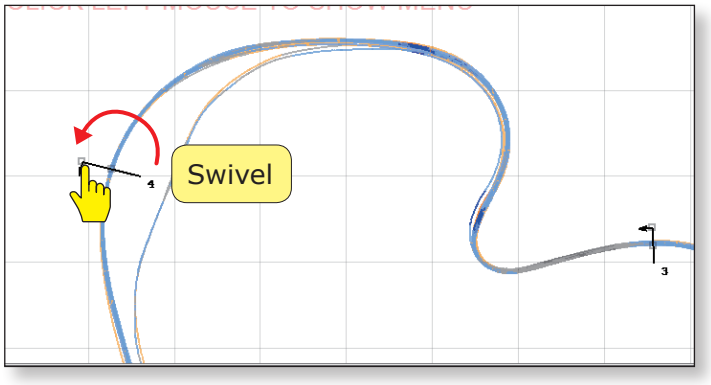


Add a Line

To add a new line to the track setting, simply right click on Map Area to show the menu, and select "ADD XXXX". The system will check what lines have already existed, decide what the next line should be, and show it on Map Area. Drag it to your desired location, and swivel to your desired direction.

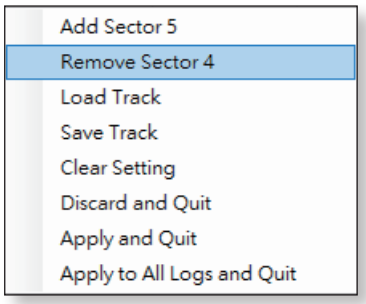


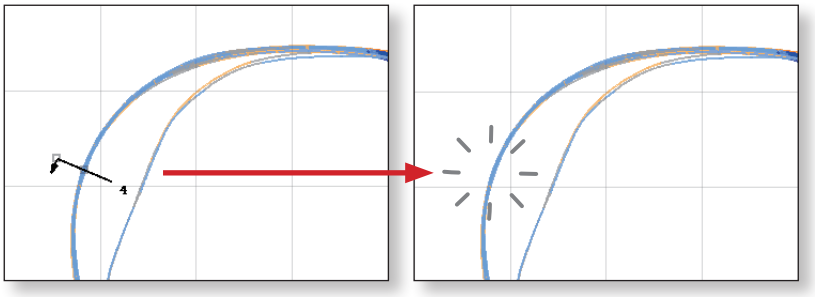




Remove a Line

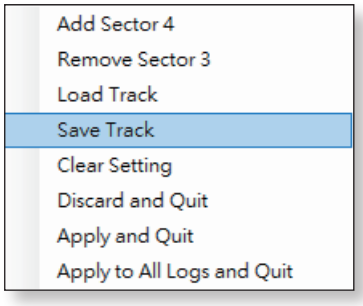
Track Editor allows line removal from the last line up. To remove a line, simply right click on Map Area to show the menu, and select "REMOVE XXXX".

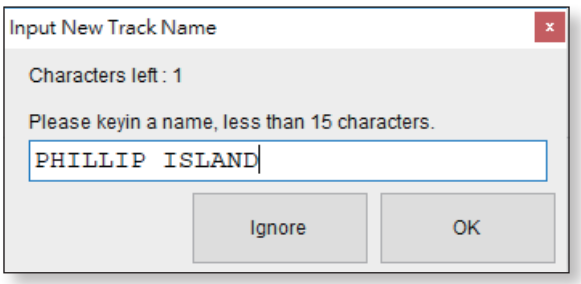




Save as a Track File

When you have finished editing the lines, you can save the settings as a track file in order to apply to another log in the future or to upload to your APEX. To save the settings, please right click on Map Area to show menu, select "SAVE TRACK". Enter a name of 15 characters at most. Only English alphabets and numbers are allowed.

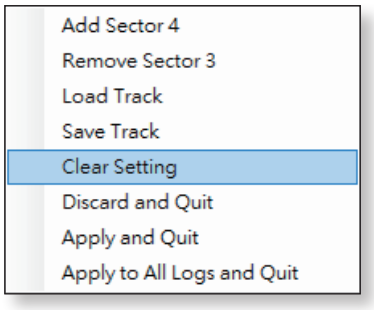


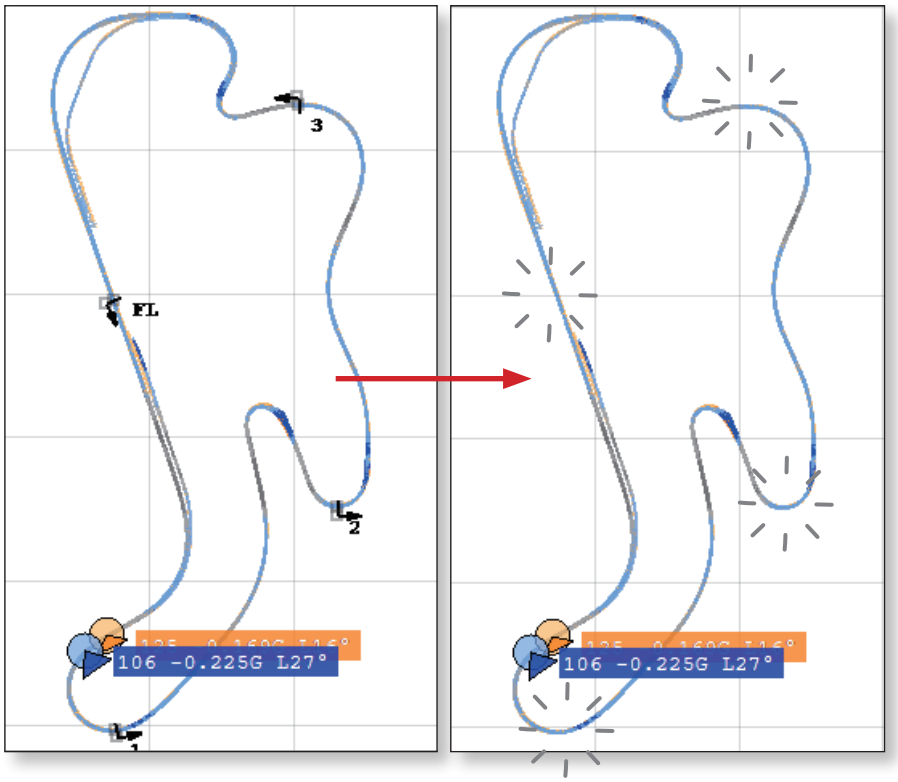


The default track setting filename is "log name.SATrack".

Clear Setting

You can choose to clear all lines and start all over. To clear settings, right click on Map Area to show menu. Select "CLEAR SETTING".

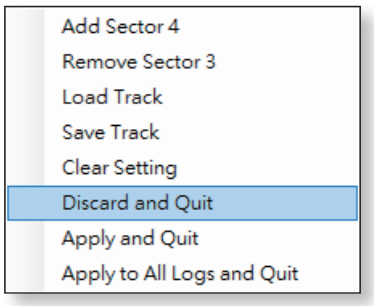




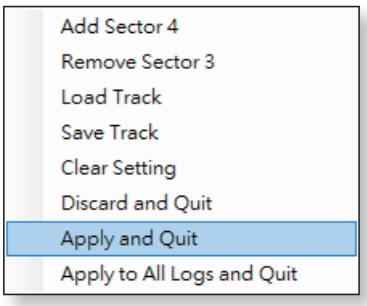
Quit Track Editor

You can choose to let the system apply the modifications in one of the following ways upon quitting:

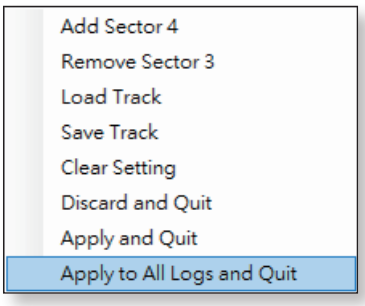
Quit **without applying** any track modifications to the logs.



Apply the track modifications **to Main Trace only** and quit.



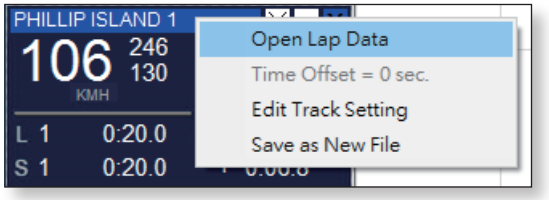
Apply the track modifications **to all logs loaded** and quit.



Check New Lap Report

If you have made modifications to the track settings and have chosen to apply the changes to the log(s), you can open the Lap Report to see how the changes affect the lap times/sector times.

To see Lap Report of a log, please click on the Filename Menu Bar, and select "OPEN LAP DATA".



original Lap Report
(Please open before performing Track Editor.)

LAP REPORT	Lap	Time	Avg Spd	Top Spd	Max			Dec
LAP 1		1:54.860	134	236	5			.938
LAP 2		1:48.050	145	251	60	53	0.900	-0.825
LAP 3		1:49.285	144	252	55	51	0.938	-0.750
LAP 4		1:48.475	144	247	57	60	1.744	-0.825
LAP 5		1:48.918	144	251	57	54	0.900	-0.825
LAP 6		1:48.839	144	251	58	50	1.519	-0.825
LAP 7		1:49.688	143	247	56	52	1.613	-0.825
LAP 8		1:48.728	145	247	59	52	0.900	-0.825
LAP 9		2:33.457	98	249	57	51	0.938	-0.825
AVERAGE		1:48.854	144					

SECTOR	Lap	Time	Avg Spd	Top Spd	Max R	Max L	Max Acc	Max Dec
SECTOR 1	LAP 1	0:28.288	127	178	29	48	0.750	-0.713
	LAP 2	0:24.002	165	251	24	41	0.450	-0.638

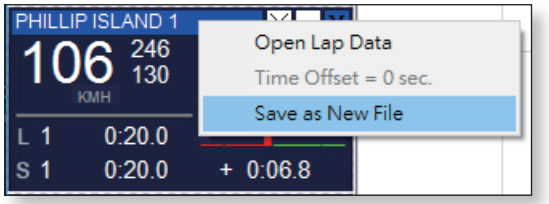
new Lap Report
lap times and sector times changed after track modifications were applied.

LAP REPORT	Lap	Time	Avg Spd	Top Spd	Max			ec
LAP 1		0:03.404	155	178	1			00
LAP 2		1:55.017	137	251	55	46	1.200	-0.938
LAP 3		1:48.264	145	252	60	53	0.900	-0.825
LAP 4		1:49.026	144	247	55	51	0.938	-0.750
LAP 5		1:48.526	145	251	57	60	1.744	-0.825
LAP 6		1:48.876	144	251	57	54	0.900	-0.825
LAP 7		1:49.008	144	247	58	50	1.519	-0.825
LAP 8		1:49.722	143	247	56	52	1.613	-0.825
LAP 9		1:48.727	145	249	59	52	0.900	-0.825
LAP 10		2:29.630	94	243	57	51	0.938	-0.825
AVERAGE		1:49.645	143					

SECTOR	Lap	Time	Avg Spd	Top Spd	Max R	Max L	Max Acc	Max Dec
SECTOR 1	LAP 1	0:00.000	0	0	0	0	0.000	0.000
	LAP 2	0:24.885	123	178	29	48	0.506	-0.713
	LAP 3	0:20.444	148	239	24	41	0.450	-0.638

Save the Edited Log as a New Log

If you are happy with the track modifications and would like keep them for future use, please remember to save this log as a new log.

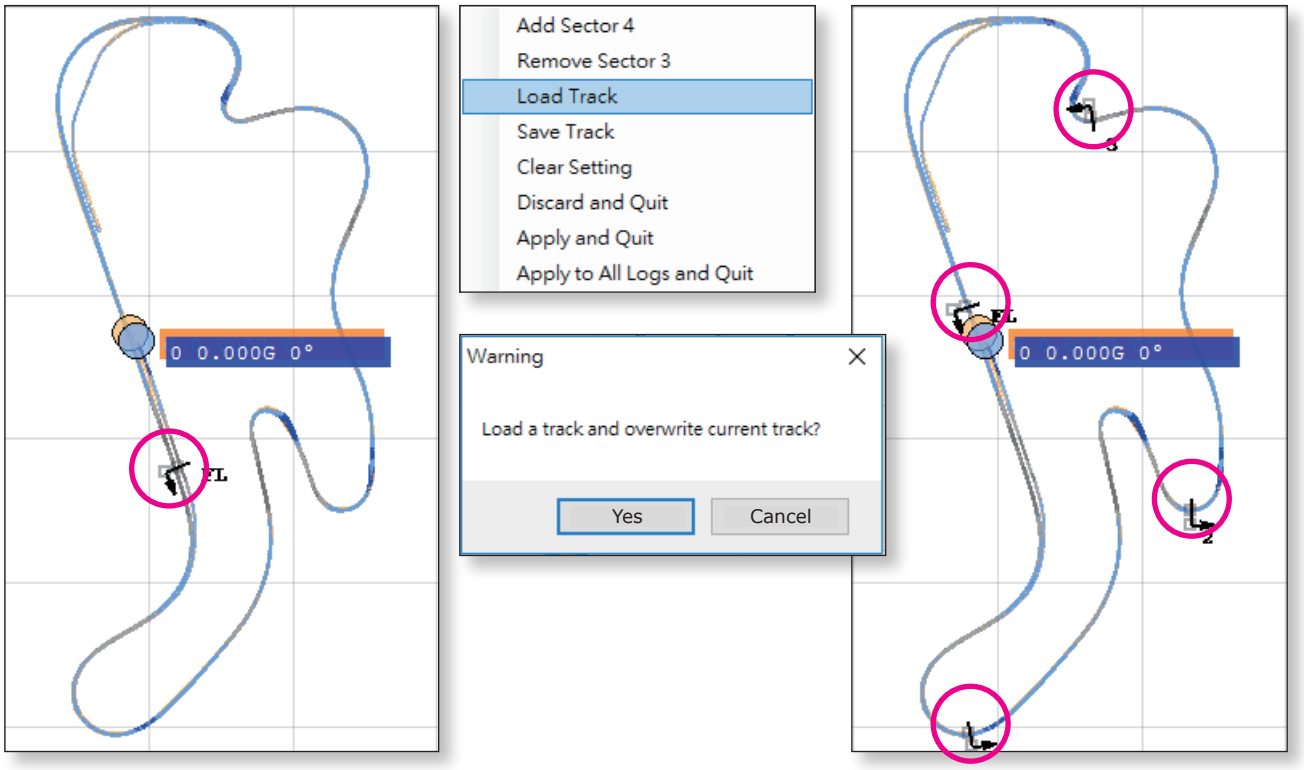


The default new filename is "original filename R.sa".

Load a Track File and Apply It to a Log

If you would like to replace the track settings of or add track settings to a log, and you happen to have a track setting file available, you can load the file and apply it to the log directly.

Please enter Track Editor, right click on Map Area and select "LOAD TRACK". Browse for the Track setting file. (File extension is "SATrack".)



If you are satisfied with the modification, remember to save the modified log as a new file.

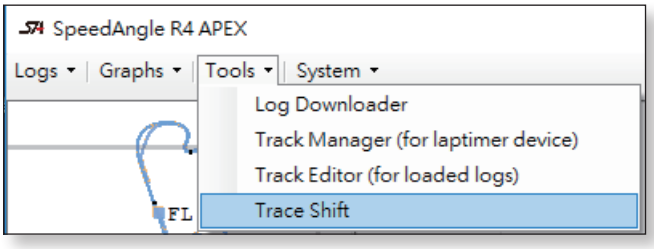
Trace Shift

Sometimes logs of the same location but recorded at different time may exhibit a trace offset because of the different sets of satellites locked on in recording. This may happen especially in parts of the world where the GPS or GLONASS system coverage is not as good as elsewhere. This may cause problems when you want to compare braking points or see Area Report, etc. In such cases, please enter Trace Shift mode and move a certain trace to match the others.

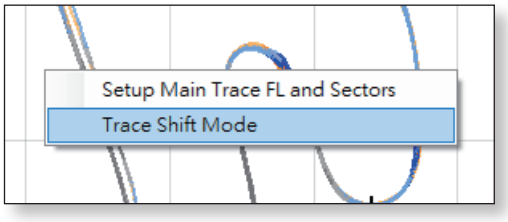
Enter Trace Shift

There are two ways to enter Trace Shift mode.

Go to MENU > TOOLS > TRACE SHIFT.



Right click on Map Area and select "TRACE SHIFT MODE".

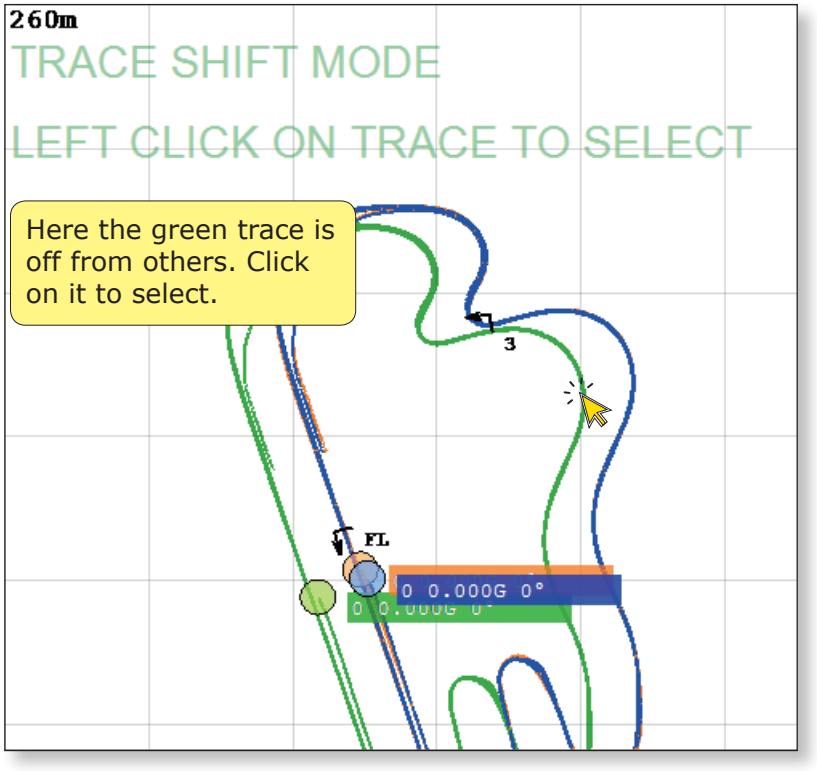


Step 1: Select a Trace

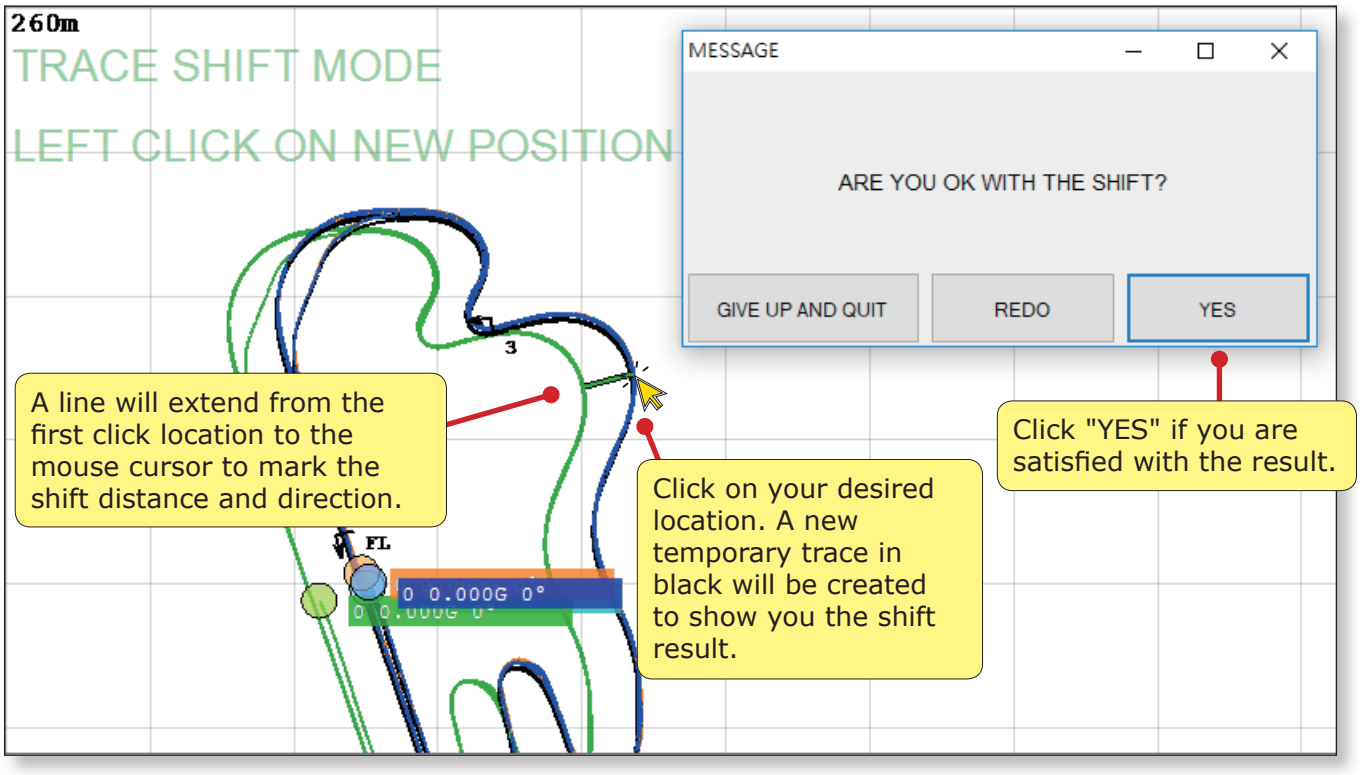
There are only two steps involved in shifting a trace:

- Click on the trace to be shifted.
- Click on the desired location.

There will also be a prompt at the top left corner telling you what to do next.

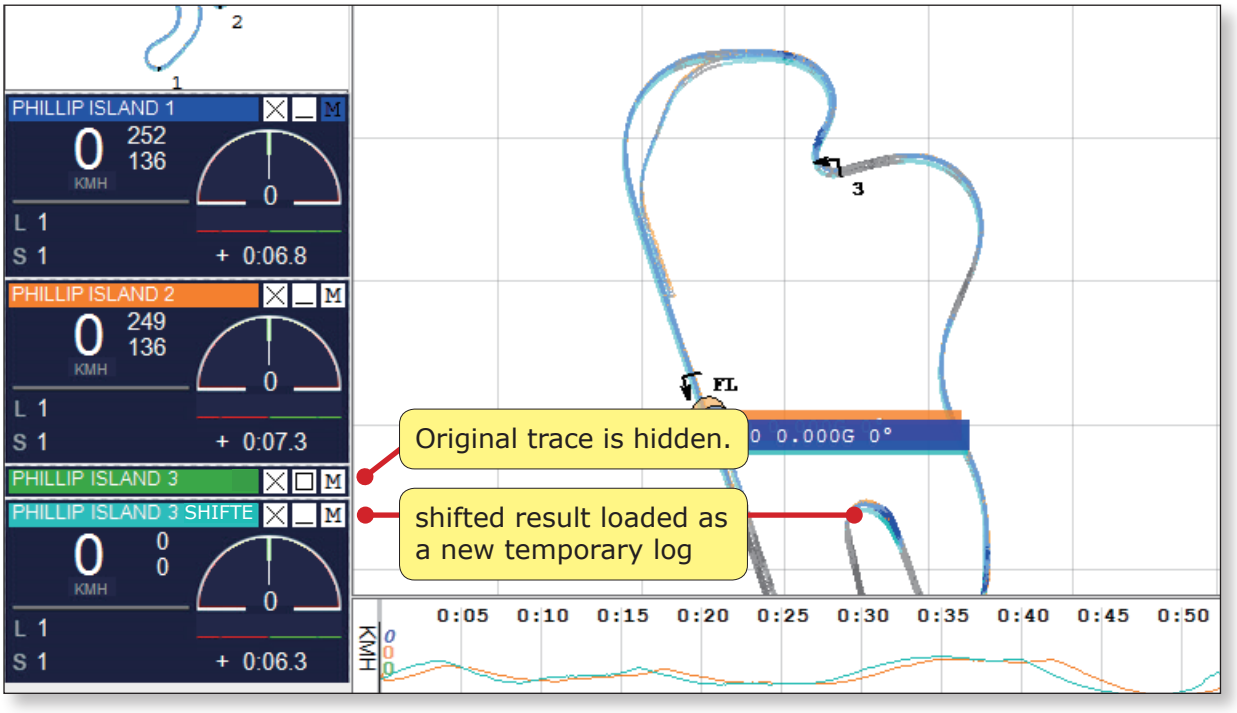


Step 2: Click on the Desired Location:



Shifted Trace Will Be Loaded as a New Log

Once you click YES on the shift result, the system will exit Trace Shift mode, create a new temporary trace at the designated location and hide the original trace. This new temporary trace will be assigned a new trace color and be marked with SHIFTED on the Filename Bar. If you would like to keep it for future use, please save it as a new log. The default filename is "original name SHIFTED.sa"

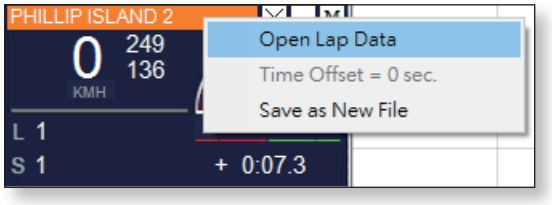


Lap Report and Area Report

There are two reports available with SpeedAngle R4. Lap Report shows the recorded information of a log, while Area Report shows the information of all the lap segments within a rectangle defined by user.

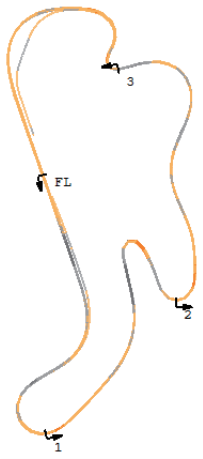
Lap Report

To open the report of a loaded log, please click on its dashboard Filename Menu Bar > OPEN LAP DATA.



A report will be opened in a new window, listing the settings used, lap times and lap motion data, sector times and sector motion data, ideal lap and its motion data, and track setting details. You can save it as a file or print it out. Below is an example:

```
APEX Lap Timer Log $Revision: 3.1 $ (c)2014 SpeedAngle.com
FILENAME:PHILLIP ISLAND 2.sa
TRACK:05_13_2014 06-0
ID:
DATE:0513,2014,06:04:54
LAP:9     SECTOR:3
DURATION: 17:10
UNIT:KM/h
```



average speed
max right angle
max acceleration G
lap time
top speed
max left angle
max braking G

LAP REPORT	Lap	Time	Avg Spd	Top Spd	Max R	Max L	Max Acc	Max Dec
LAP	1	1:56.140	133	234	54	56	1.425	-0.750
LAP	2	1:49.520	143	249	47	55	1.088	-0.750
LAP	3	1:48.805	144	249	59	48	0.825	-0.93
LAP	4	1:50.094	143	249	37	54	1.463	-1.463
LAP	5	1:49.665	143	247	54	49	0.825	-0.825
LAP	6	1:50.132	143	247	54	47	0.825	-0.825
LAP	7	1:49.721	143	247	54	51	0.750	-0.825
LAP	8	1:50.665	142	244	54	61	1.275	-0.71
LAP	9	2:25.558	103	244	53	55	0.750	-0.938
AVERAGE		1:49.800	143					

best lap in dark gray

worst lap in light gray

continued below~

Averages are calculated using data from all lthe laps except the first lap and the last lap.

the trace segment from Start to Sector 1

SECTOR	Lap	Time	Avg Spd	Top Spd	Max R	Max L	Max Acc	Max Dec
SECTOR 1	LAP 1	0:29.669	126	164	24	56	0.506	-0.713
	LAP 2	0:24.323	163	249	12	40	0.319	-0.638
	AP 3	0:24.214	164	249	14	47	0.450	-0.638
	AP 4	0:25.093	159	249	29	54	1.463	-1.463
	AP 5	0:24.321	163	247	29	40	0.319	-0.638
	AP 6	0:24.371	163	247	21	45	0.319	-0.638
	AP 7	0:24.213	163	247	18	47	0.319	-0.713
	AP 8	0:24.574	160	244	27	47	0.356	-0.713
	AP 9	0:24.658	160	244	28	55	0.450	-0.938
	VERAGE	0:24.444	162					
SECTOR 2	LAP 1	0:30.379	129	183	52	55	0.825	-0.750
	LAP 2	0:29.580	133	193	38	47	0.750	-0.750
	LAP 3	0:29.863	131	194	52	48	0.825	-0.938
	LAP 4	0:29.245	134	194	37	51	0.750	-0.713
	LAP 5	0:29.363	134	191	54	49	0.825	-0.825
	LAP 6	0:29.598	133	191	54	44	0.825	-0.825
	LAP 7	0:29.713	133	194	53	51	0.750	-0.825
	LAP 8	0:29.697	133	191	51	53	0.750	-0.713
	LAP 9	0:29.700	133	196	53	51	0.750	-0.825
	AVERAGE	0:29.579	133					
SECTOR 3	LAP 1	0:28.557	137	173	44	54	0.563	-0.563
	LAP 2	0:28.401	138	175	25	47	0.563	-0.506
	LAP 3	0:27.485	143	183	34	48	0.563	-0.563
	LAP 4	0:27.897	141	177	22	50	0.563	-0.638
	LAP 5	0:28.440	138	175	34	49	0.563	-0.506
	LAP 6	0:28.196	139	177	23	38	0.563	-0.563
	LAP 7	0:28.253	138	175	38	51	0.563	-0.563
	LAP 8	0:28.184	139	175	31	53	1.275	-0.638
	LAP 9	0:29.400	133	170	33	49	0.563	-0.506
	AVERAGE	0:28.122	139					
FINISH LINE	LAP 1	0:27.535	142	234	54	49	1.425	-0.506
	LAP 2	0:27.216	145	234	47	55	1.088	-0.319
	LAP 3	0:27.243	147	236	59	46	0.563	-0.506
	LAP 4	0:27.859	143	233	35	43	0.638	-0.356
	LAP 5	0:27.541	143	233	54	47	0.750	-0.319
				3	46	47	0.506	-0.356
				1	54	51	0.563	-0.319
				1	54	61	0.638	-0.356
				4	53	42	0.450	-0.638

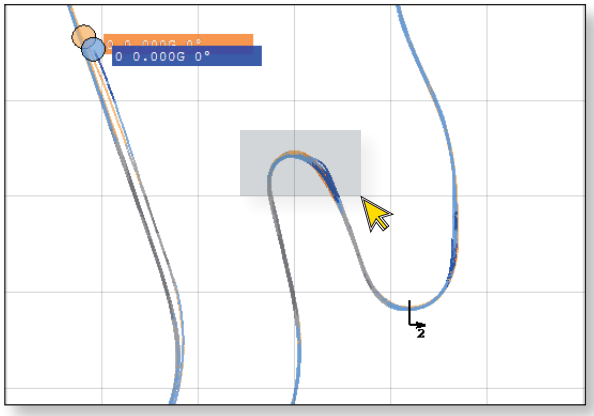
Ideal Lap is calculated by adding up the best sector times selected from all laps.

IDEAL LAP	Lap	Time	Avg Spd	Top Spd	Max R	Max L	Max Acc	Max Dec
SECTOR 1	LAP 7	0:24.213	163	247	18	47	0.319	-0.713
SECTOR 2	LAP 4	0:29.245	134	194	37	51	0.750	-0.713
SECTOR 3	LAP 3	0:27.485	143	183	34	48	0.563	-0.563
FINISH LINE	LAP 2	0:27.216	145	234	47	55	1.088	-0.319
		1:48.159	145	247	47	55	1.088	-0.713

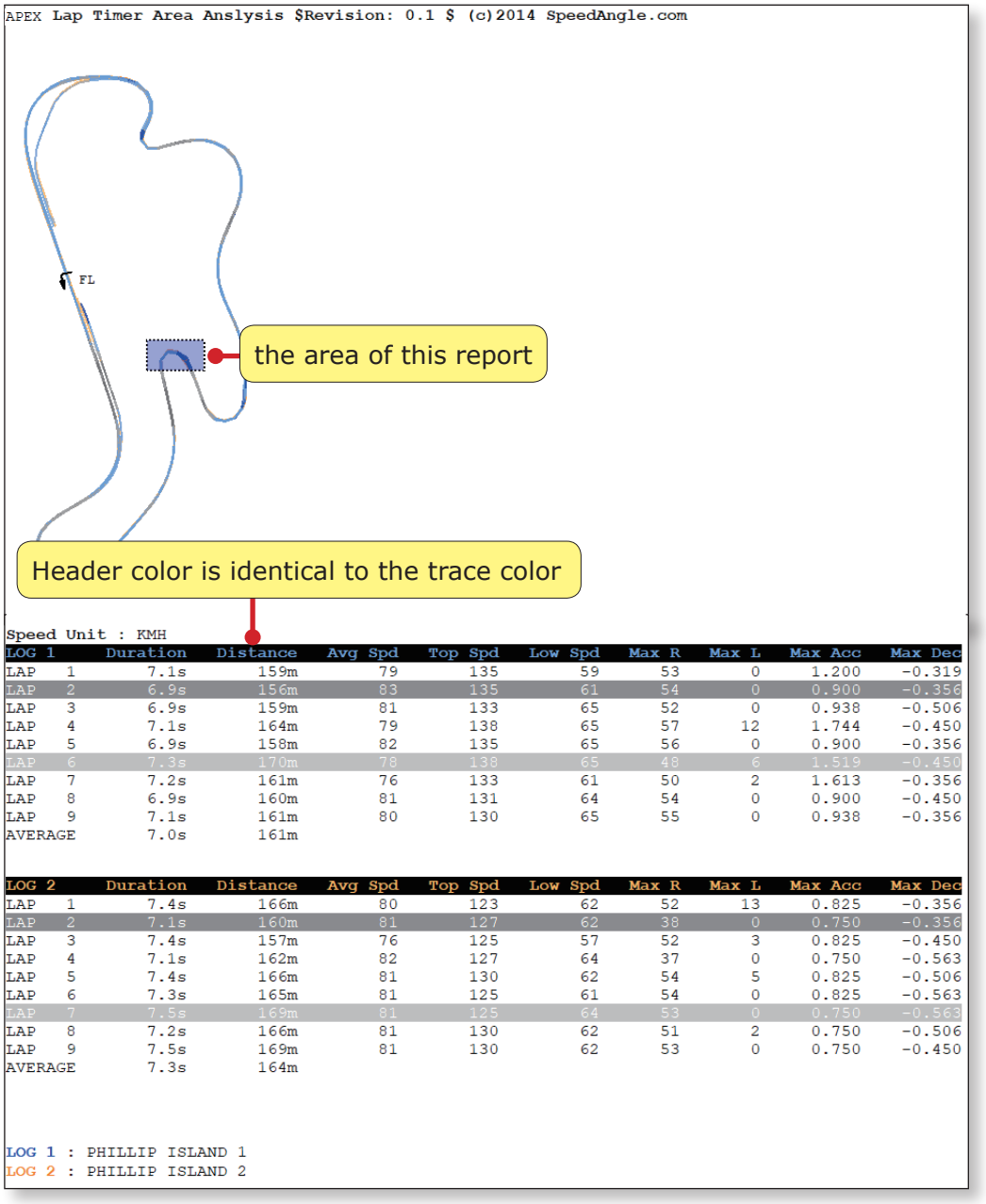
TRACK PLAN	Finish Line and Sectors Coordinates	
SECTOR 1	LAP -38.510901,145.232372	-38.510409,145.232262
SECTOR 2	LAP -38.506744,145.236438	-38.506244,145.236438
SECTOR 3	LAP -38.498895,145.234546	-38.499387,145.234646
FINISH LINE	LAP -38.502563,145.231904	-38.502417,145.232514

Area Report

Area Report is especially useful when you want to know or compare the details of a particualr lap segment. To create an Area Report, hold the right mouse key and drag a rectangle on Map Area:



A report will be opened in a new window, listing the duration, distance, and motion data of each lap segment within the rectangle. Below is an example:



Speed Unit : KMH

LOG 1	Duration	Distance	Avg Spd	Top Spd	Low Spd	Max R	Max L	Max Acc	Max Dec
LAP 1	7.1s	159m	79	135	59	53	0	1.200	-0.319
LAP 2	6.9s	156m	83	135	61	54	0	0.900	-0.356
LAP 3	6.9s	159m	81	133	65	52	0	0.938	-0.506
LAP 4	7.1s	164m	79	138	65	57	12	1.744	-0.450
LAP 5	6.9s	158m	82	135	65	56	0	0.900	-0.356
LAP 6	7.3s	170m	78	138	65	48	6	1.519	-0.450
LAP 7	7.2s	161m	76	133	61	50	2	1.613	-0.356
LAP 8	6.9s	160m	81	131	64	54	0	0.900	-0.450
LAP 9	7.1s	161m	80	130	65	55	0	0.938	-0.356
AVERAGE	7.0s	161m							

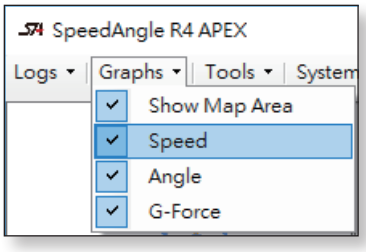
LOG 2	Duration	Distance	Avg Spd	Top Spd	Low Spd	Max R	Max L	Max Acc	Max Dec
LAP 1	7.4s	166m	80	123	62	52	13	0.825	-0.356
LAP 2	7.1s	160m	81	127	62	38	0	0.750	-0.356
LAP 3	7.4s	157m	76	125	57	52	3	0.825	-0.450
LAP 4	7.1s	162m	82	127	64	37	0	0.750	-0.563
LAP 5	7.4s	166m	81	130	62	54	5	0.825	-0.506
LAP 6	7.3s	165m	81	125	61	54	0	0.825	-0.563
LAP 7	7.5s	169m	81	125	64	53	0	0.750	-0.563
LAP 8	7.2s	166m	81	130	62	51	2	0.750	-0.506
LAP 9	7.5s	169m	81	130	62	53	0	0.750	-0.450
AVERAGE	7.3s	164m							

LOG 1 : PHILLIP ISLAND 1
LOG 2 : PHILLIP ISLAND 2

You can save the report as a file or print it out.

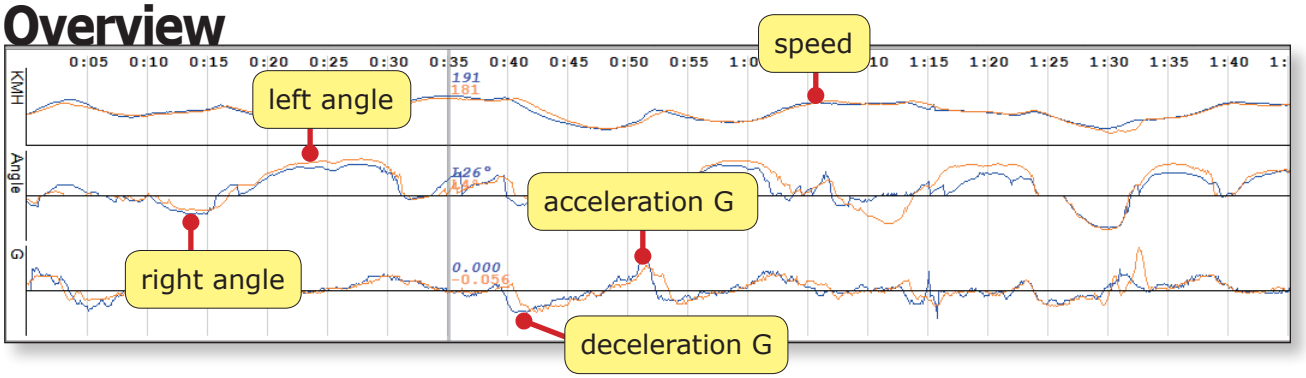
Graphs

In SpeedAngle R4, there are three graphs available: speed, angle, and G. These combined provide unique information of how you ride in a session and can be very helpful in analyzing performance.

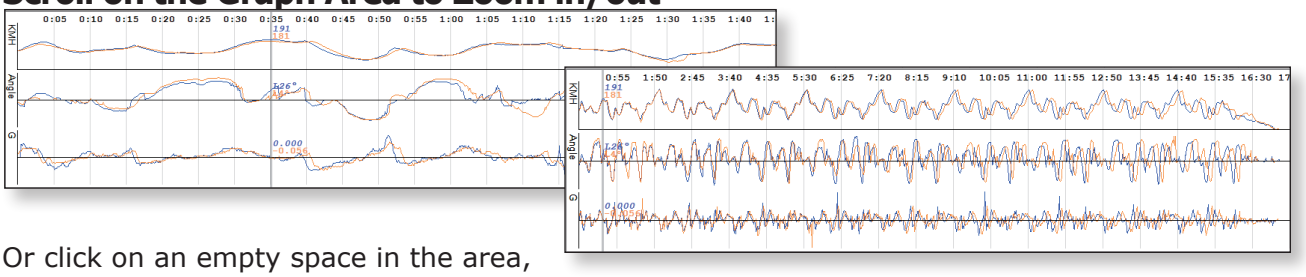


You can go to MENU > GRAPHS and select to show at least one of the graphs, or show/hide Map Area.

Overview

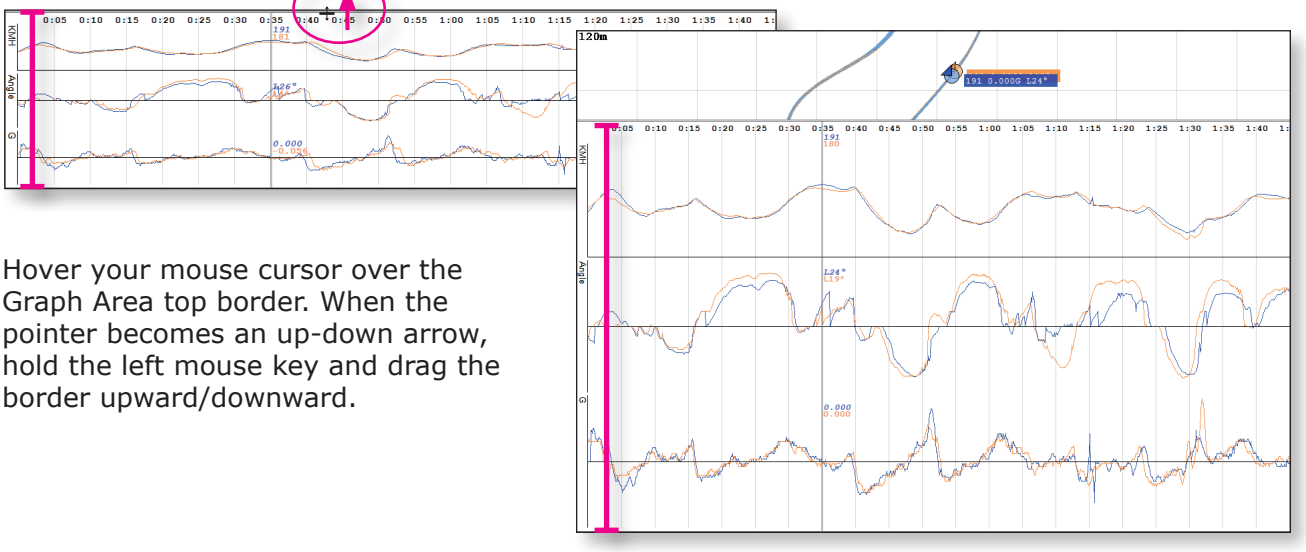


Scroll on the Graph Area to Zoom in/out



Or click on an empty space in the area, And use space/+ or space/- on your keyboard to zoom in or out.

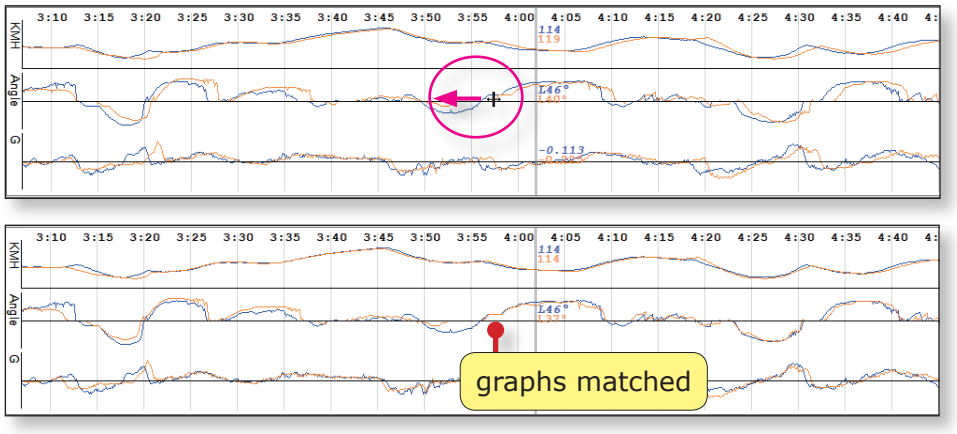
Drag on Top Handle Bar to Adjust Graph Height



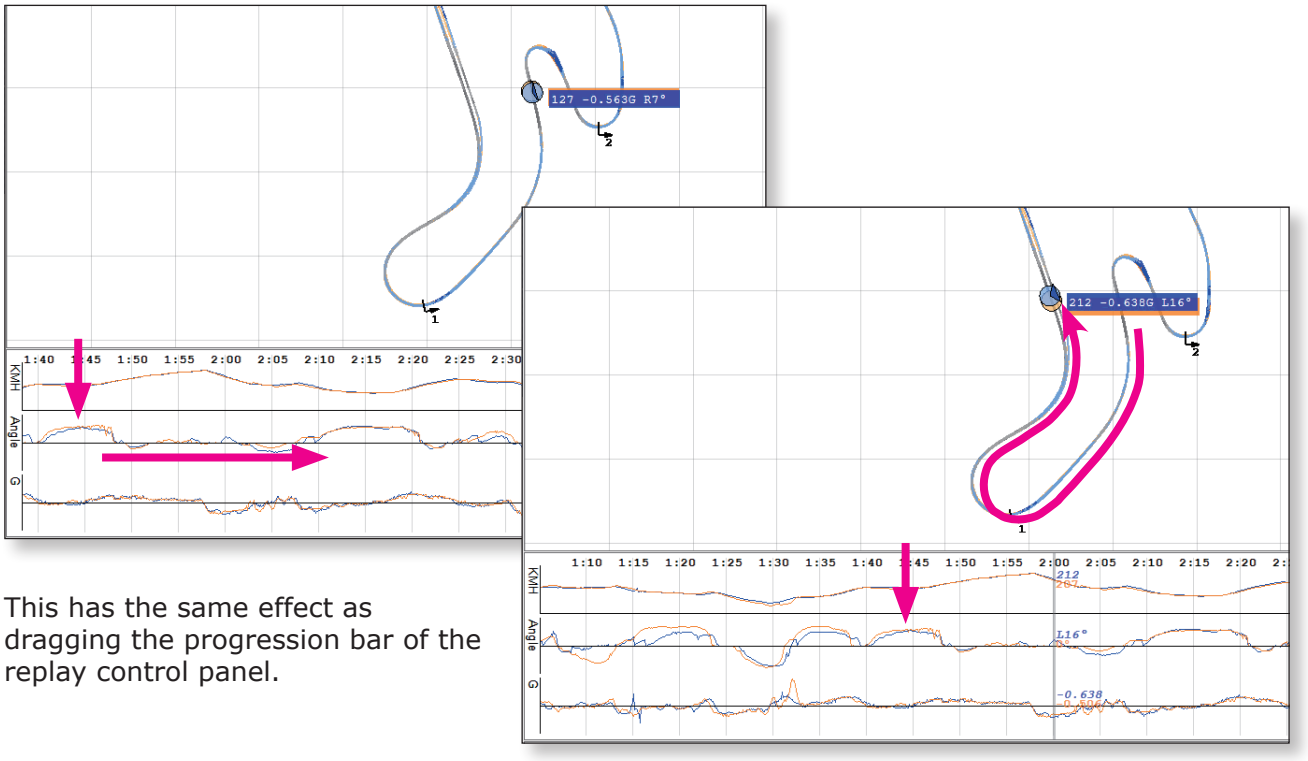
Hover your mouse cursor over the Graph Area top border. When the pointer becomes an up-down arrow, hold the left mouse key and drag the border upward/downward.

Drag on a Graph and Move It for Comparison

Hover your mouse cursor over the log graph that you would like to move. When the cursor becomes a left-right arrow, hold the left mouse key and drag it to your desired location.



Drag on Blank Area to Move All Graphs Fast Forward/Backward



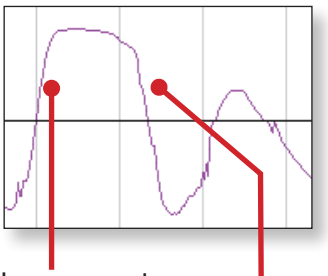
This has the same effect as dragging the progression bar of the replay control panel.

Graph Reading

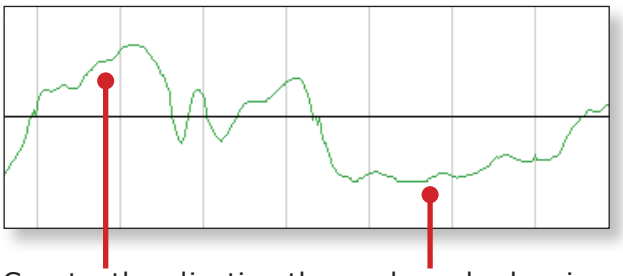
Besides racing lines and speeds, SpeedAngle R4 also shows you unique information acquired with our lean angle measurement. G's and angles combined allow you to analyze what your riding style is and how your riding plan was executed. You can also compare your performance across you own laps or or with those of your friends. We suggest using practice session logs or qualifying session logs for the best result.

Angles

In a corner, though often higher cornering speed are accompanied by larger angles, please note that this is not universal to all cases. Body position also plays a very important role in lean angles. When reading lean angle data alone, we suggest putting emphasis on if the bike was leant over and picked up fast, and if the lean angle curve is smooth. These show how familiar you are with the corner and how well you are able to maneuver your bike so that you can lean efficiently without wasting time adjusting the bike angles, which also means adjusting brakes and throttle.



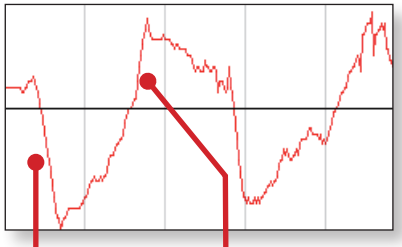
Lean over to a proper angle fast, stay steady, and pick up fast.



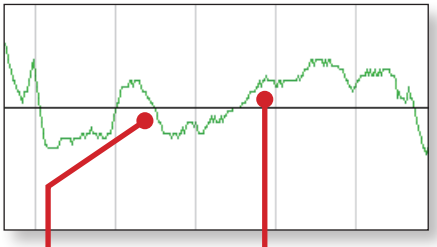
Constantly adjusting the angle under leaning.

G's

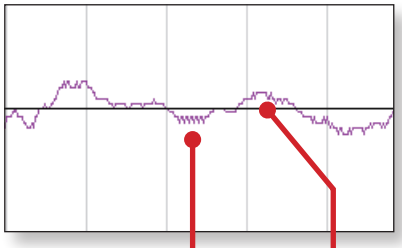
When reading the G graph alone, we suggest always taking note of the max acceleration/deceleration G values and the gradient of the acceleration/deceleration G graph. The steepness of the G graph slope shows how hard or how soft your acceleration/deceleration is. Please compare the max G's and the gradients of G graph across laps, and with those of a faster rider if possible.



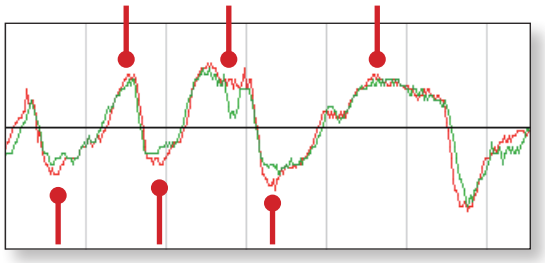
Braking G starts deep and steep. So is Acceleration G.



gentle brake and acceleration



Little deceleration (maybe just engine brake) and acceleration



Compare with a faster rider if possible. You can see how the red line brakes deeper and steeper than the green line, and how the former accererates a bit faster and higher than the latter.

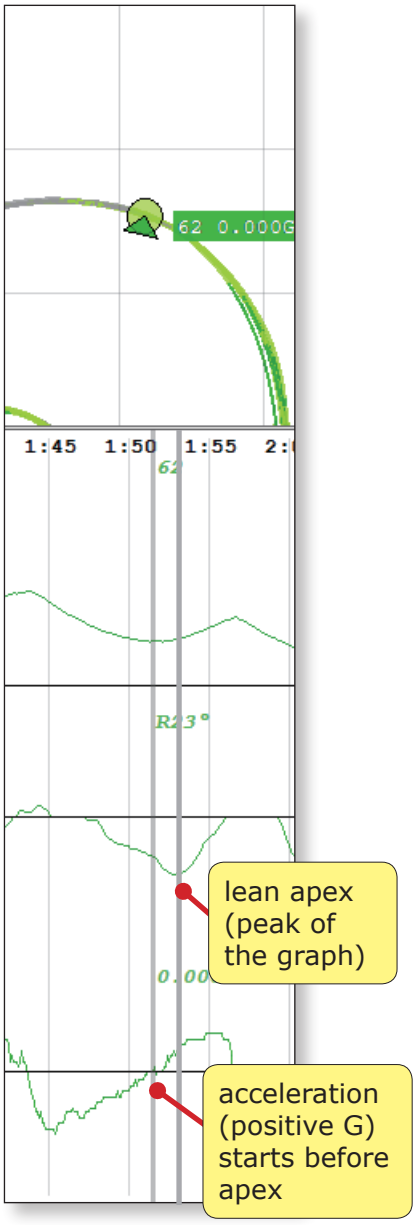
If necessary, drag one graph to match the other location wise for ease of comparison.

Angles and G's Combined

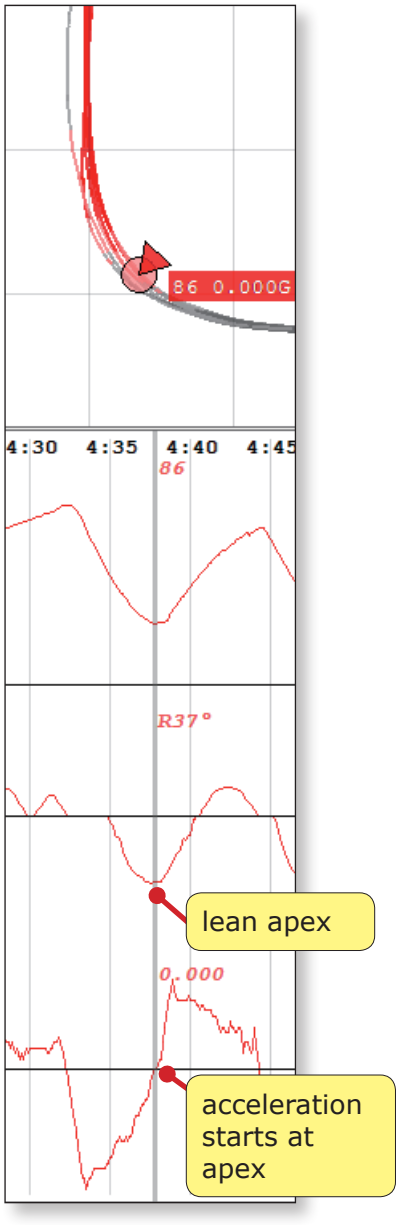
A unique and crucial information provided by SpeedAngle graphs is the relationship between the lean angles and G's. This is the truly important thing that can show how your curving technique is, such as how you brake before corner entry, how you brake into the turn, and how fast you exit it.

Here are some examples of angle and G at lean apex*:

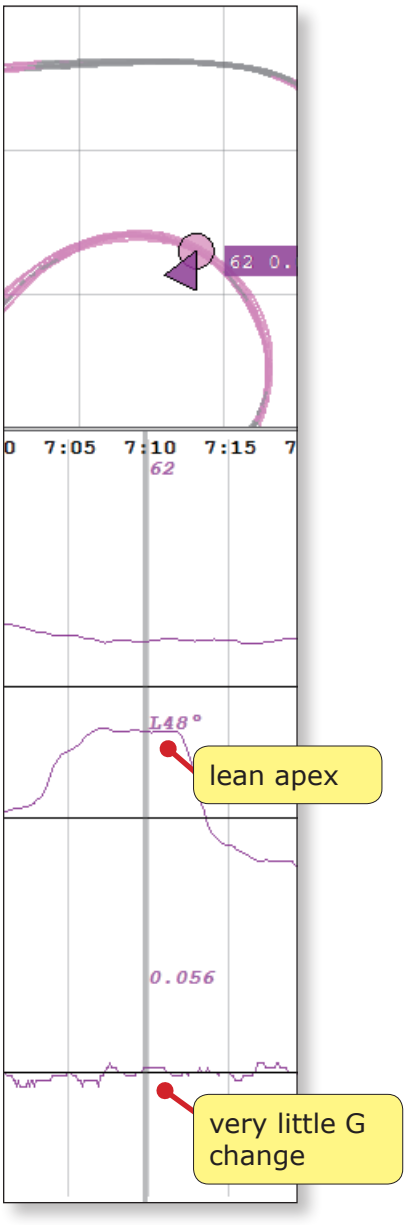
acceleration starts before lean apex



acceleration starts at lean apex



coastering at a constant speed through the corner

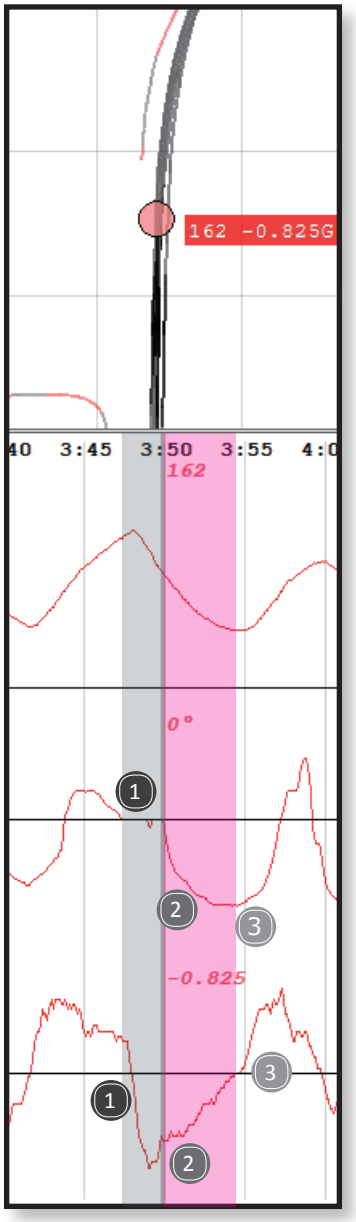


*
Here "lean apex" indicates the peak of your lean. This may or may not coincide with the apex of the corner location wise.

Below are some examples of angles and G's from corner entry to lean apex.

Though riders may carry some angles when they enter a long straight, many of them will pick the bike up before they brake into the corner ahead. Below shows four examples of them.

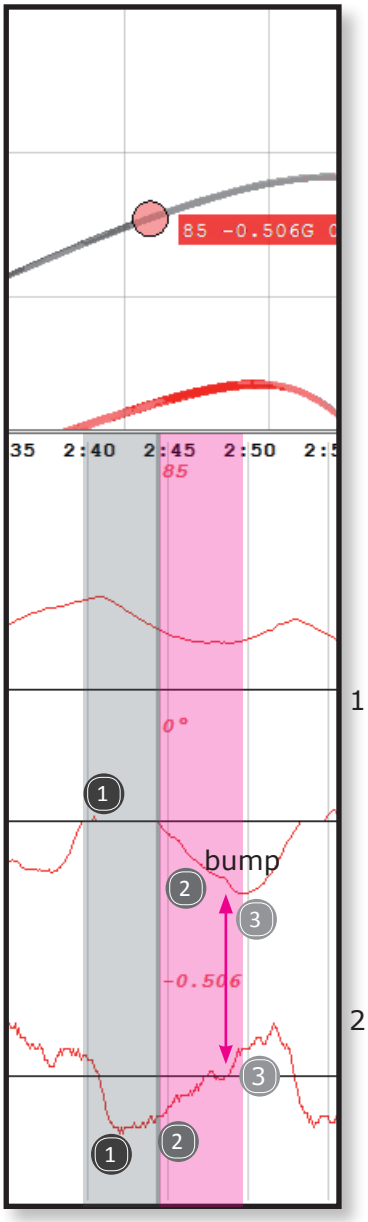
The gray blocks below mark the section of 0 angle degree (meaning the bike is upright). The pink block marks the beginning till the apex of the lean.



1 Shortly after the bike was upright, brake started very hard.

2 The deceleration G decreased sharply before lean started. It then climbed up fast to zero till lean apex and transited to acceleration smoothly.

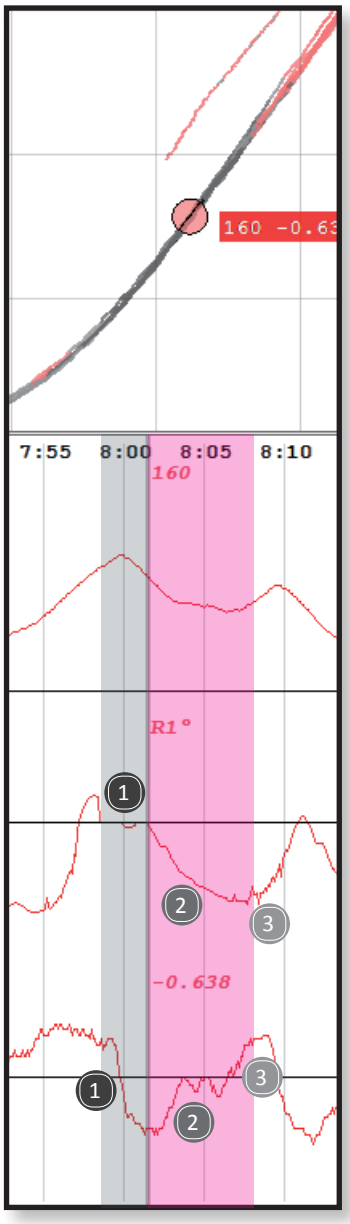
3 Acceleration G shot up on lean apex.



1 After the bike was upright, brake startd gentle, and then went harder, followed by an extended brake. (This may mean that there was room for a harder and later brake.)

2 The deceleration G was trailed off to zero in the corner. A light brake (or just a release of throttle) was applied before acceleration. (Maybe the rider found that more angles were needed for the curve, as can be shown by the little bump of the angle graph.)

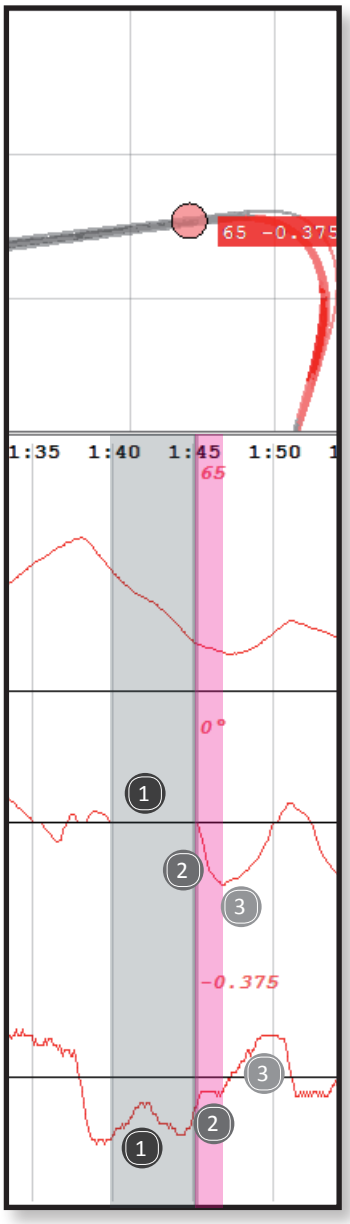
3 Acceleration started before lean apex.



1 A little after the bike was upright, brake started hard, then more brake followed. (This may mean that there was room for a harder and later brake.)

2 Deceleration G stayed at max into the lean, then climbed up sharply to zero. Two more brakes were applied before acceleration.

3 Acceleration started before lean apex.



1 Brake started very early, even before the bike was upright. So early that the rider had two long brakes.

2 Deceleration G climbed up before lean started. However, the climb stopped till the lean apex.

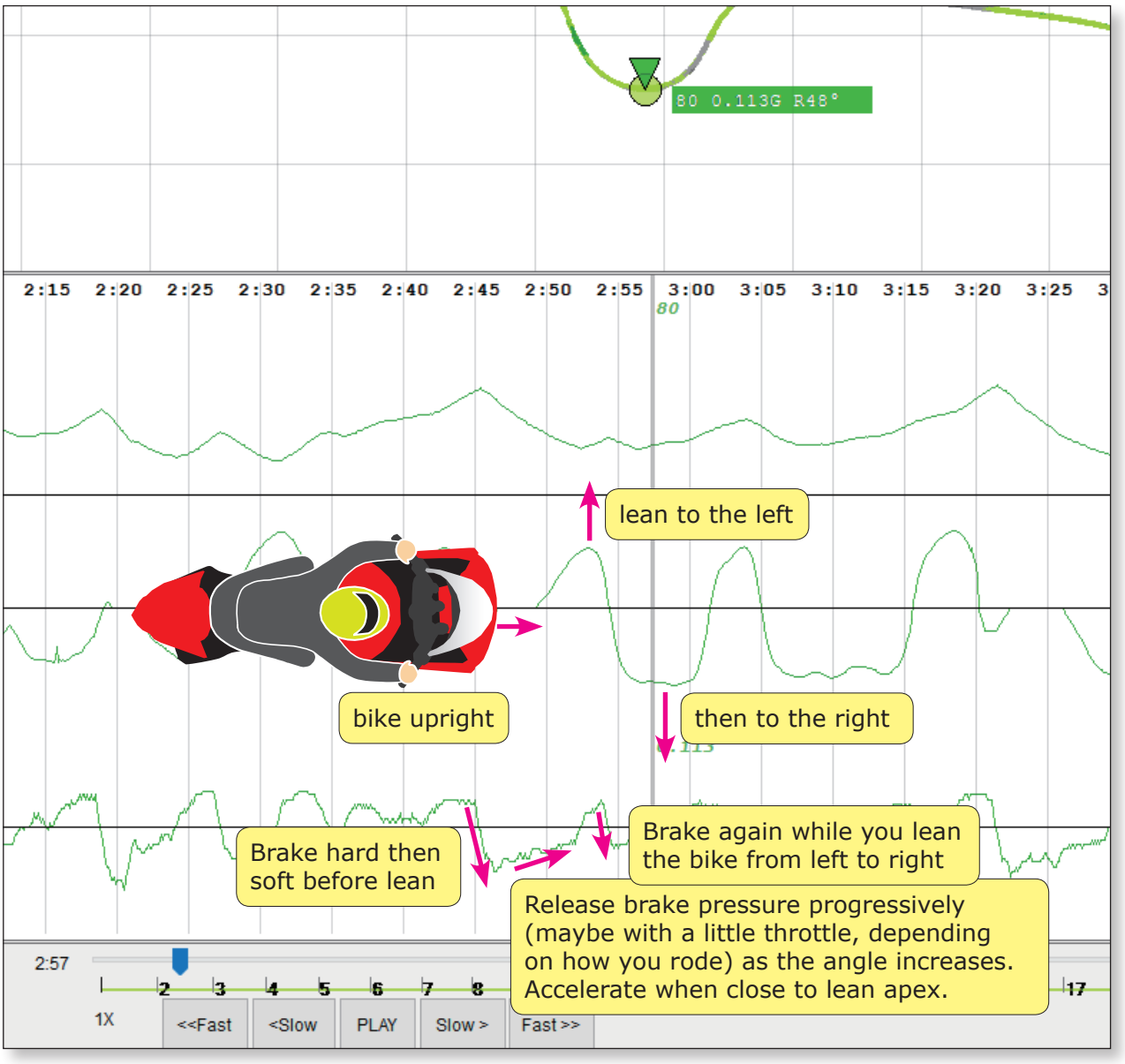
3 Acceleration started after lean apex.

Using Graphs to See Your Skill

G and Angle graphs are very useful for analyzing riding style. They show your acceleration and deceleration along with your leans so that you can check how your braking plan and cornering plan were executed before/in/after corner. Please use the trace color in the Map Area as an aid. It would be best if you can also load your SA log to Google Earth to have the trace color projected on the satellite image of the track. SA to KMZ converter and its user manual can be found at www.SpeedAngle.com/download, KMZ converter section.

Visualizing Angle and G Graphs

While reading the graphs, it would be very helpful if you can turn the angles and Gs to images of you riding on the track in your head. A good way to do this is to imagine yourself as a bike moving along the lean angle graph horizontal axis. Lean to the left or right with the angle graph, and accelerate (positive G) or brake (negative G) with the G graph at the same time.



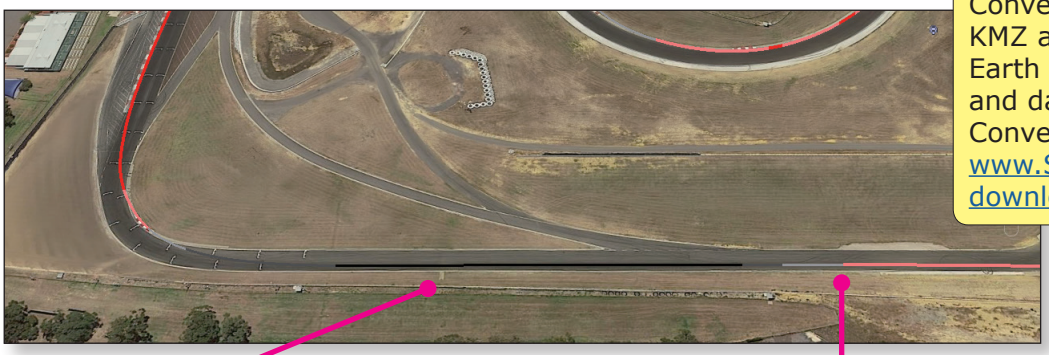
Braking before Corner Entry after a Straight

Skilled riders often plan ahead about how they are to brake before a certain corner, how they are to balance brake and throttle mid corner, or how they are to exit it. Below are some of the points many riders take note of when making their plans, and how they are represented in SpeedAngle R4 graphs and trace. Even if you don't have a plan before going on the track, these can help you check afterwards how you performed. It would be best if you can compare across laps or with other riders.

Please note that, besides riding skills, bike setting also plays an important role in how fast you can ride. Do not overlook your bike capability and sacrifice safety over performance when making your braking and cornering plans.

Things to note	How it is represented in graph or trace
braking point: Is the location as planned, too early, or too late?	where the gray trace color begins on R4 trace
	where the gray trace color begins on Google Earth image
how the braking before entry was executed: soft-hard-soft? hard-soft? or?	Trace color before angle goes from zero: **soft-hard-soft:** some light gray, long dark gray/black, then some light gray. Also check if the proportion fits your plan, such as whether the dark gray is long enough. **hard-soft:** very short light gray, long dark gray/black, then some light gray. **or?**
	G graph before angle goes from zero: **soft-hard-soft:** gentle drop followed by a steep drop then a gentle climb **hard-soft:** sharp G drop followed by a gentle climb **or?**
Was the maximum of the brake done before the lean started or after?	Check whether the lowest point of G graph is before or after the angle graph goes from zero.
braking distance and duration:	can be measured and shown in *Area Report* by drawing a rectangle covering the braking section
	or use the step button of the *Replay* Panel to count the number of clicks in the brake section.
entry speed:	check the speed reading where the angle graph goes from zero.

Below we will demonstrate how to check these points in SpeedAngle R4 graphs, traces, and Google Earth image.



Convert your SA log to KMZ and load it to Google Earth to have the trace and data projected on it. Converter download link: www.SpeedAngle.com/download, KMZ section.

Check the location of your braking point. Is it as planned, too early or too late?

To find the time and distance of the brake, create an area report of the section. Just right-click and hold the mouse key, and drag across the gray trace to define the area. You can also use the STEP buttons on the Replay Panel to calculate the time between two points. Please see below.

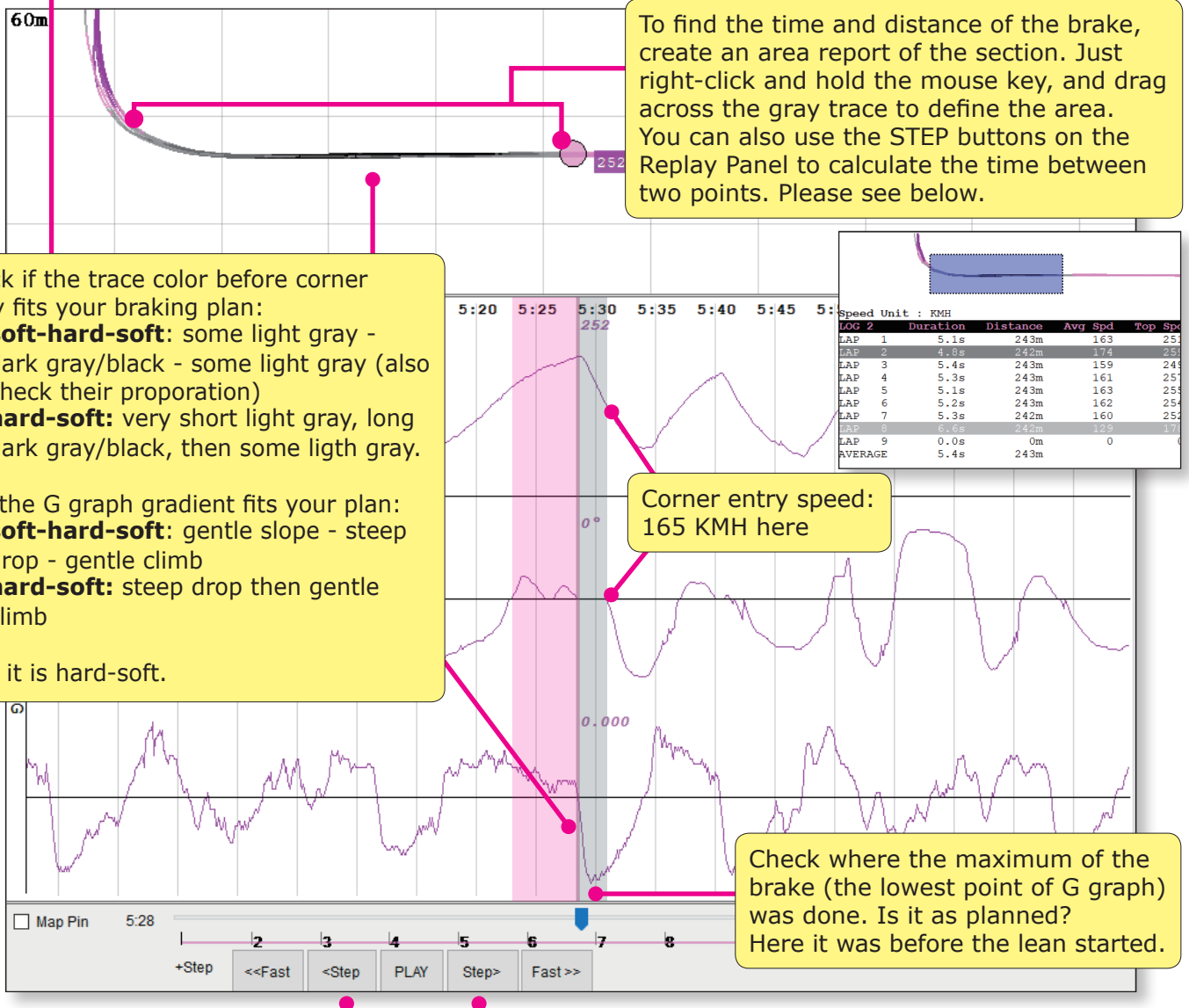
Check if the trace color before corner entry fits your braking plan:

- **soft-hard-soft**: some light gray - dark gray/black - some light gray (also check their proporation)
- **hard-soft:** very short light gray, long dark gray/black, then some ligth gray.

or if the G graph gradient fits your plan:

- **soft-hard-soft**: gentle slope - steep drop - gentle climb
- **hard-soft:** steep drop then gentle climb

Here it is hard-soft.



Speed Unit : KMH

LOG 2	Duration	Distance	Avg Spd	Top Spd
LAP 1	5.1s	243m	163	251
LAP 2	4.8s	242m	174	258
LAP 3	5.4s	243m	159	249
LAP 4	5.3s	243m	161	257
LAP 5	5.1s	243m	163	259
LAP 6	5.2s	243m	162	254
LAP 7	5.3s	242m	160	252
LAP 8	0.0s	242m	129	171
LAP 9	0.0s	0m	0	0
AVERAGE	5.4s	243m		

Corner entry speed: 165 KMH here

Check where the maximum of the brake (the lowest point of G graph) was done. Is it as planned? Here it was before the lean started.

Click on SLOW till it becomes STEP. Then click to move the marker forward or backward by 0.1 second at a time. Count the number of clicks between the two points and you can find the time between them.

The pink block marks the first half of the straight where the bike is on a lot of throttle.

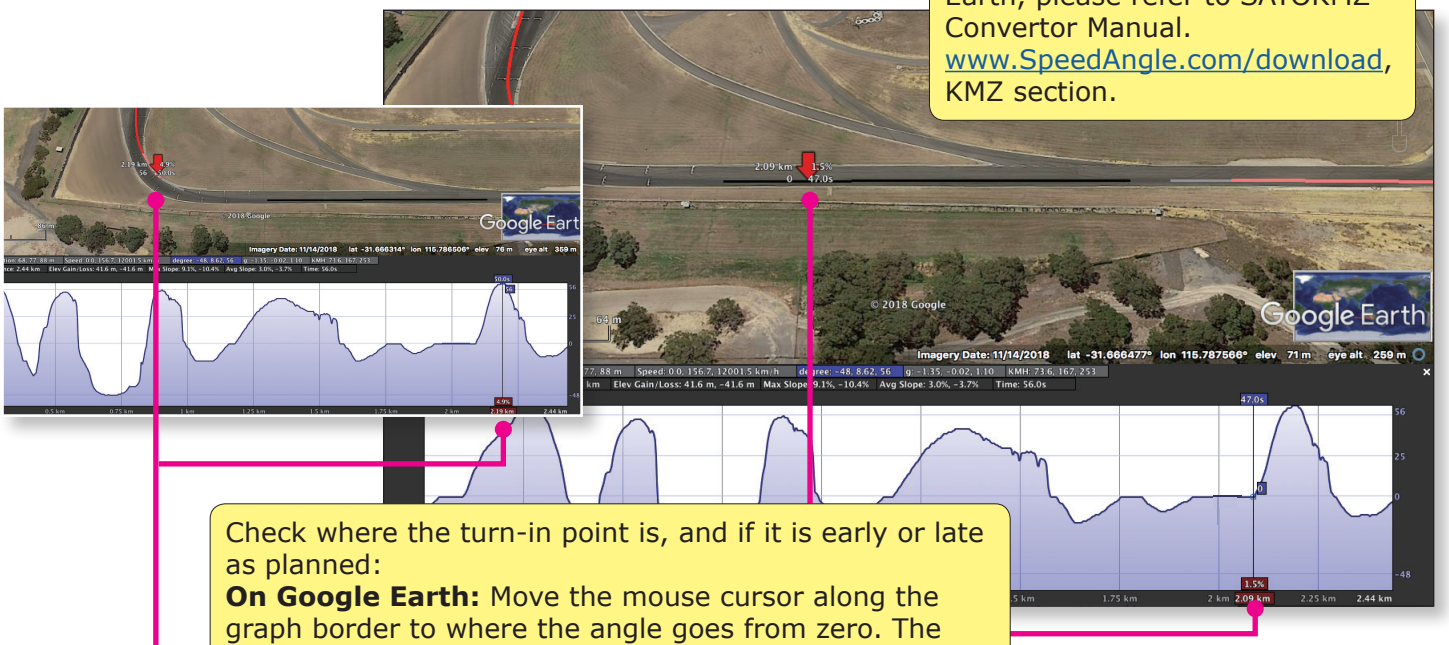
The gray block marks the second half of the straight where braking started.

Corner Entry

Below are some of the things many riders check for the corner entry period:

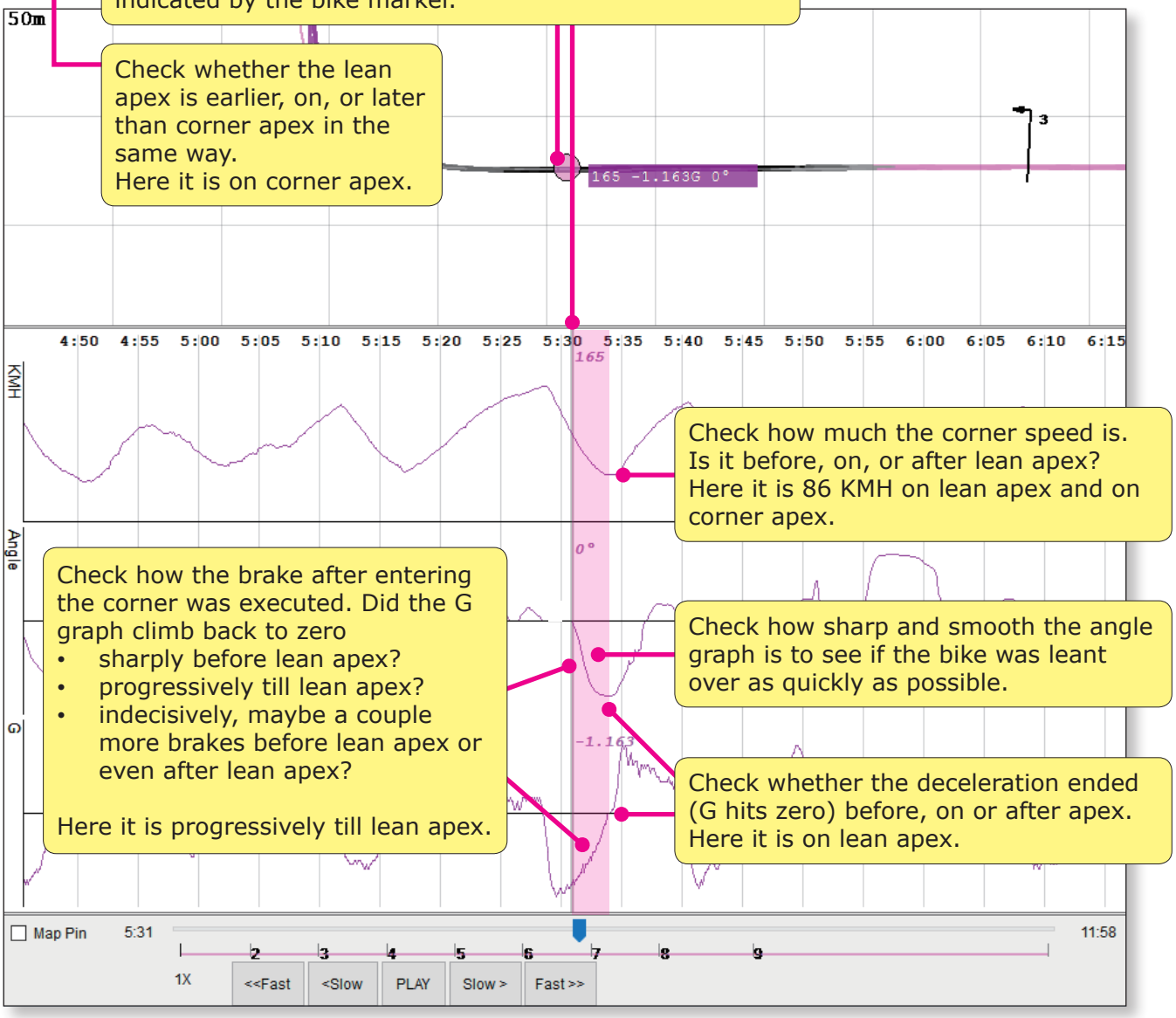
Things to note	How it is represented in graph or trace
turn-in point: as planned, too early? or too late?	Check both where on Google Earth or on the trace the lean angle graph goes from zero
lean in efficiency: Is the bike leant over quickly and smoothly?	Check if the angle graph climbs or drops from zero sharp and smooth.
How deceleration was executed before lean apex: Did it end sharply before lean apex? progressively on lean apex? or indecisively, maybe even after lean apex?	Check the G graph slope and where it hits zero in relation to lean apex.
lean apex and corner apex: Is lean apex before, on or after corner apex? Is it as planned?	Find the lean apex location on Google Earth trace using Google Earth graph chart. Compare it with corner apex.
Corner speed: How much and whether it happened before, on or after lean apex and corner apex	Find the lowest speed in the corner on the speed graph. Check the location in relation to the lean angle graph apex and the corner apex on Google Earth trace.

For displaying charts on Google Earth, please refer to SATOKMZ Convertor Manual. www.SpeedAngle.com/download, KMZ section.



Check where the turn-in point is, and if it is early or late as planned:
On Google Earth: Move the mouse cursor along the graph border to where the angle goes from zero. The location is indicated by an arrow.
On R4 trace: Move the graph till the vertical marker is on where the angle graph goes from zero. The location is indicated by the bike marker.

Check whether the lean apex is earlier, on, or later than corner apex in the same way.
Here it is on corner apex.



Check how much the corner speed is. Is it before, on, or after lean apex?
Here it is 86 KMH on lean apex and on corner apex.

Check how the brake after entering the corner was executed. Did the G graph climb back to zero
- sharply before lean apex?
- progressively till lean apex?
- indecisively, maybe a couple more brakes before lean apex or even after lean apex?

Here it is progressively till lean apex.

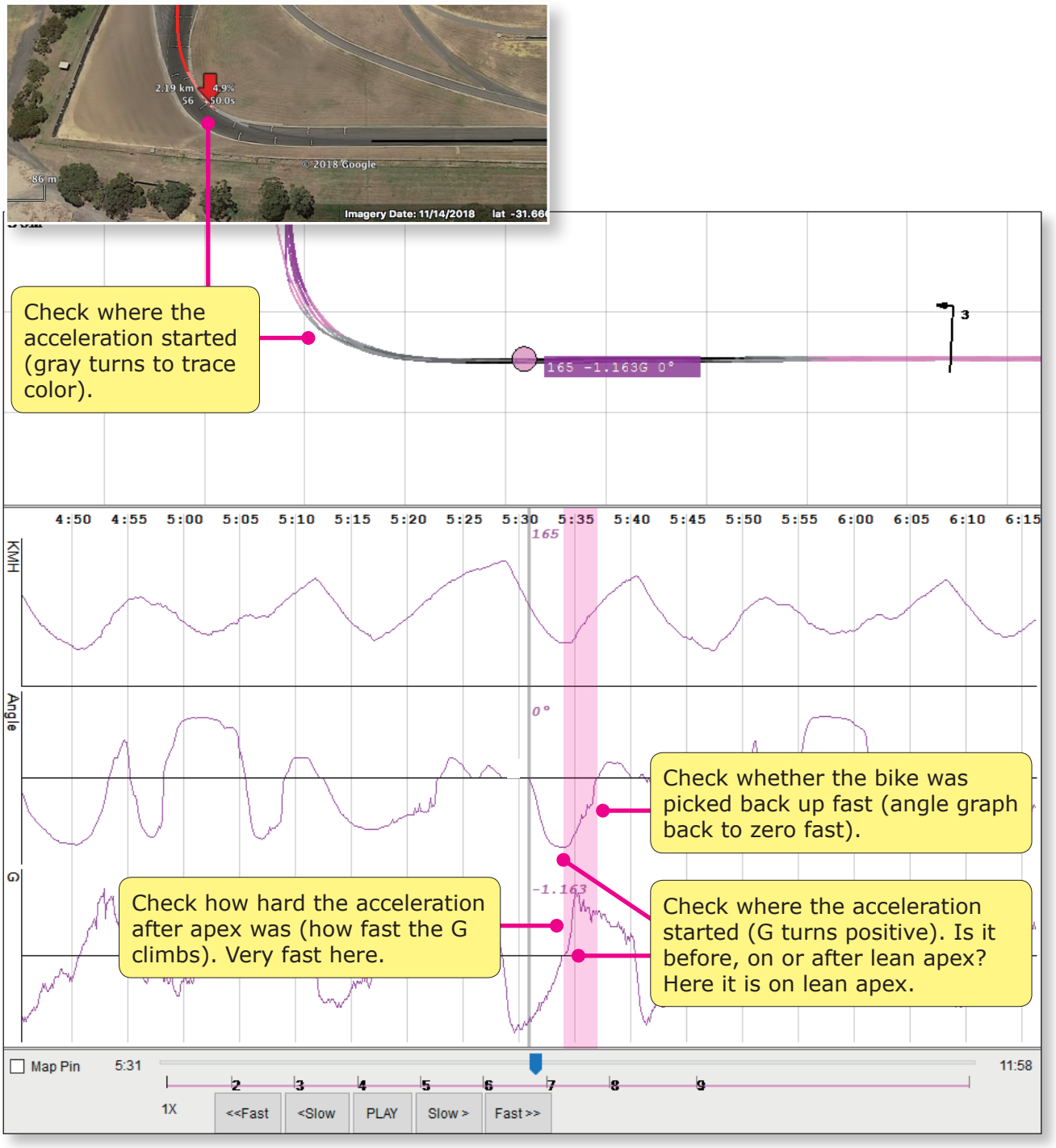
Check how sharp and smooth the angle graph is to see if the bike was leant over as quickly as possible.

Check whether the deceleration ended (G hits zero) before, on or after apex.
Here it is on lean apex.

Exiting a Corner

Below are some of the things many riders take note of for corner exit.

Things to note	How it is represented in graph or trace
if the bike was picked back up fast	if the angle graph comes back to zero sharply
where the acceleration started	if the G graph turns positive before, at or after apex
how hard the acceleration was	how fast the G graph climbs



Passing through a Series of Corners

Use R4 graphs to check if your braking skill and cornering skill have been applied as desired when you pass through a series of corners.

Below are a series of three corners of a rider. The gray blocks mark the parts from corner entry till lean apex, while the pink blocks mark the exit parts.

For this rider, the entry of the each corner consists of two parts:

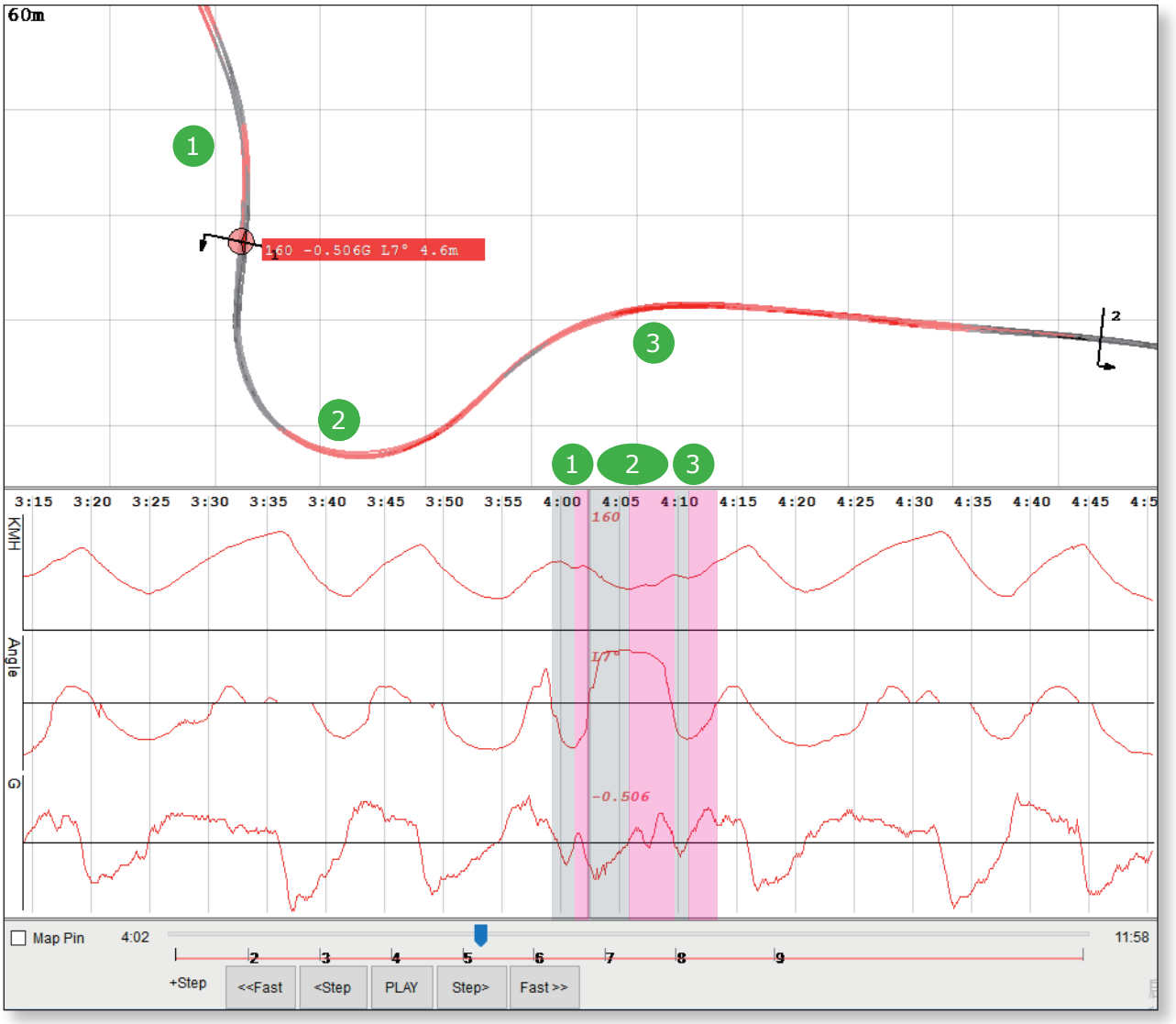
- braking carried from the previous corner, and
- deceleration decreasing progressively as the angle increased till apex

The exit of each corner also consists of two parts:

- start of acceleration, and
- braking (or just throttle release) for the next turn, except for the third corner, which is followed by a straignt.

How much brake or angle was appropriate differ from corner to corner. Here the brakes, leans, and acceleration were smooth without much adjustment or hesitation.

You can use the methods mentioned in the previous sections to check whether your speeds, brakes, leans and acceleration in a series of corners were executed as your plan. Compare them across laps or with a faster rider to find the differences and improve your skill.

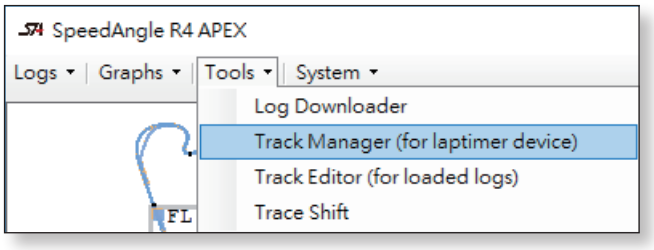


Track Manager

With Track Manager, you can create/edit a track setting file, upload/download track setting files to/from your APEX, and delete track setting files from APEX. Pleaes note that Track Manager is for customer upload tracks only. Factory preloaded tracks (those come loaded in your APEX) can not be accessed for the time being.

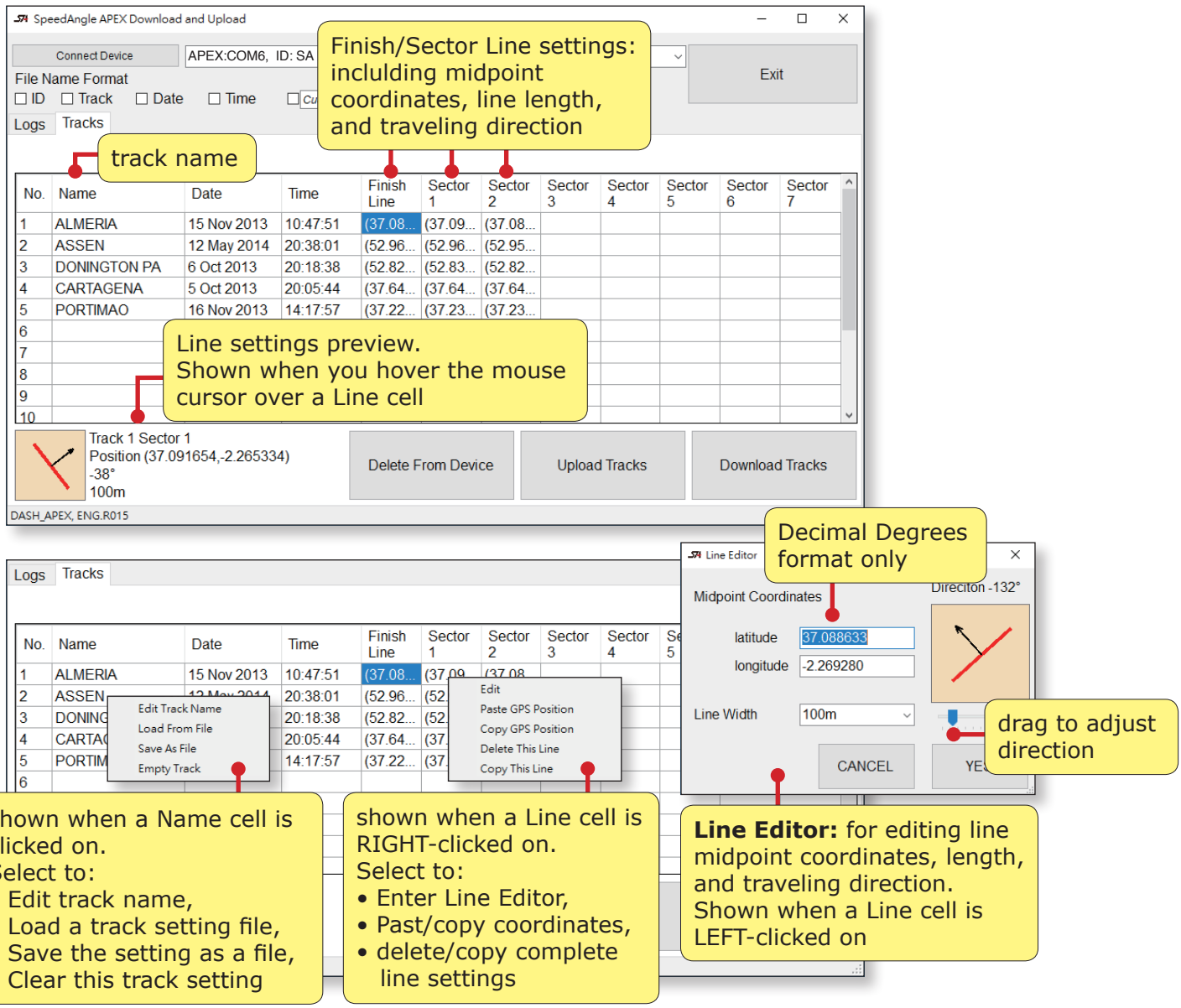
Enter Track Manager

Please go to MENU > TOOLS > TRACK MANAGER (FOR LAPTIMER DEVICE).



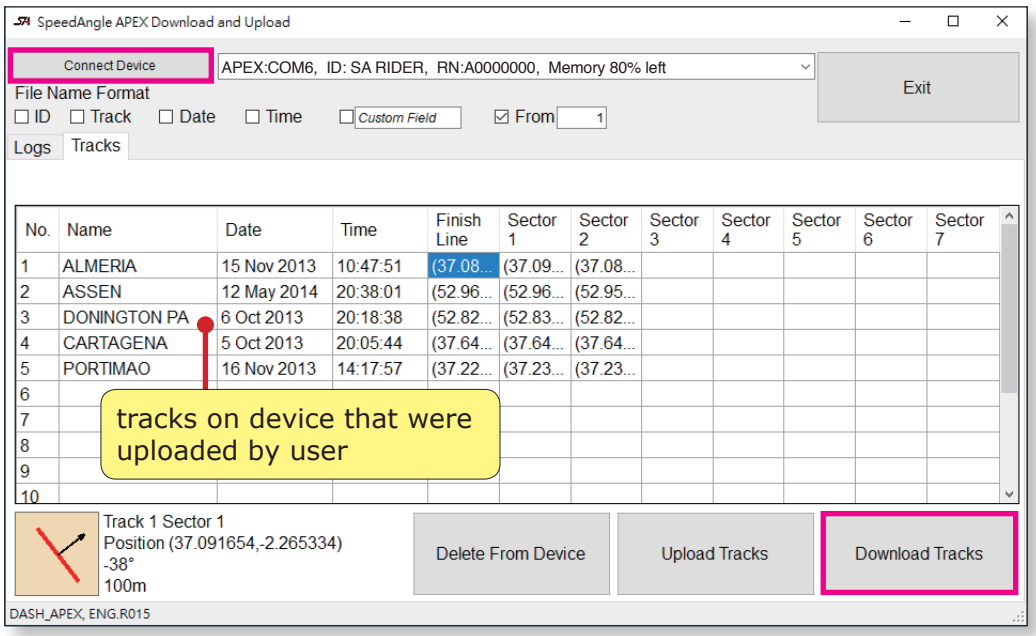
Overview

Track manager is in the same dialog as Downloader, just in a different tab.



Connect APEX to R4 and Download Tracks

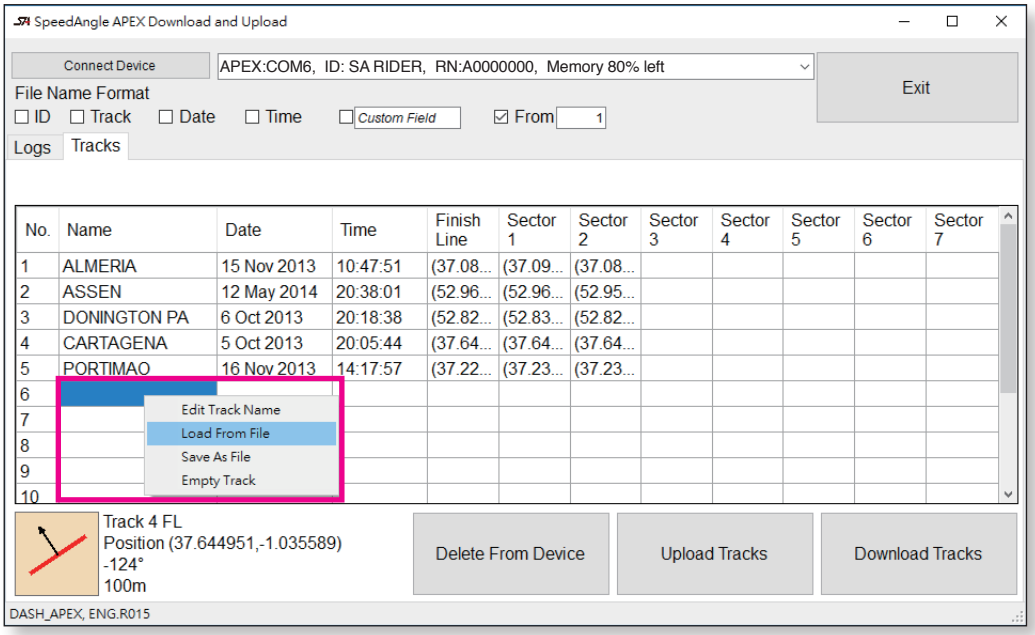
Click on "CONNECT DEVICE" to connect your APEX. When connected, click on "DOWNLOAD TRACKS" at the bottom to download customer upload tracks (if any) on APEX to Track Manager. Please note that factory preload tracks can not be accessed for the time being.



Load a Track File and Upload it to APEX

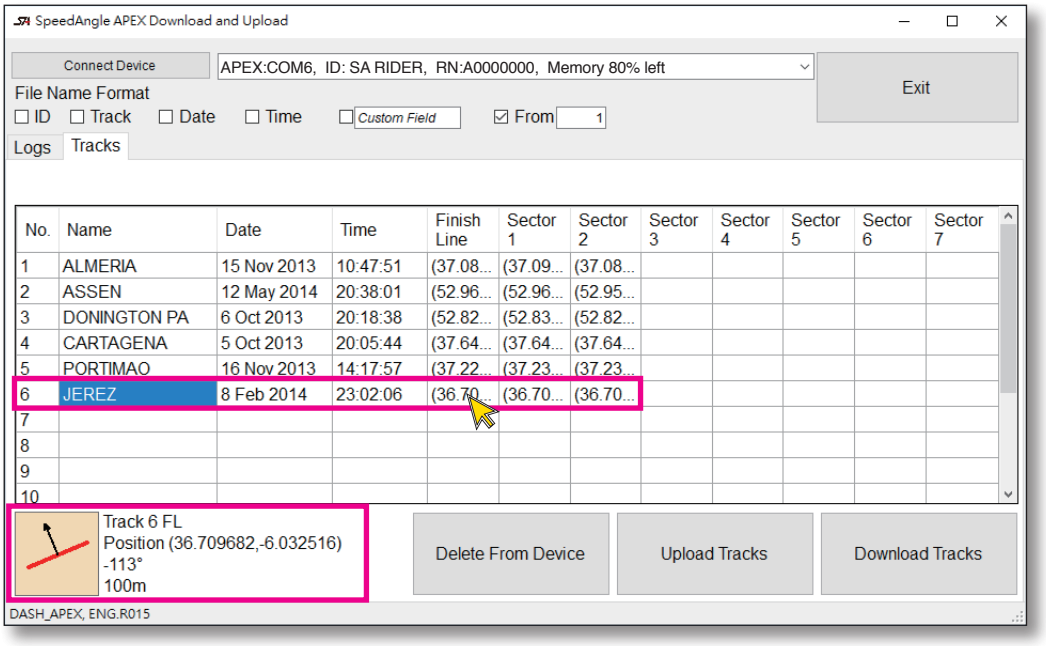
Load the Track File to Track Manager

If you have a track setting file (filename.SATrack) and you would like to upload it to your APEX, please click on an empty track name cell and select "LOAD FROM FILE". Navigate to find the file.



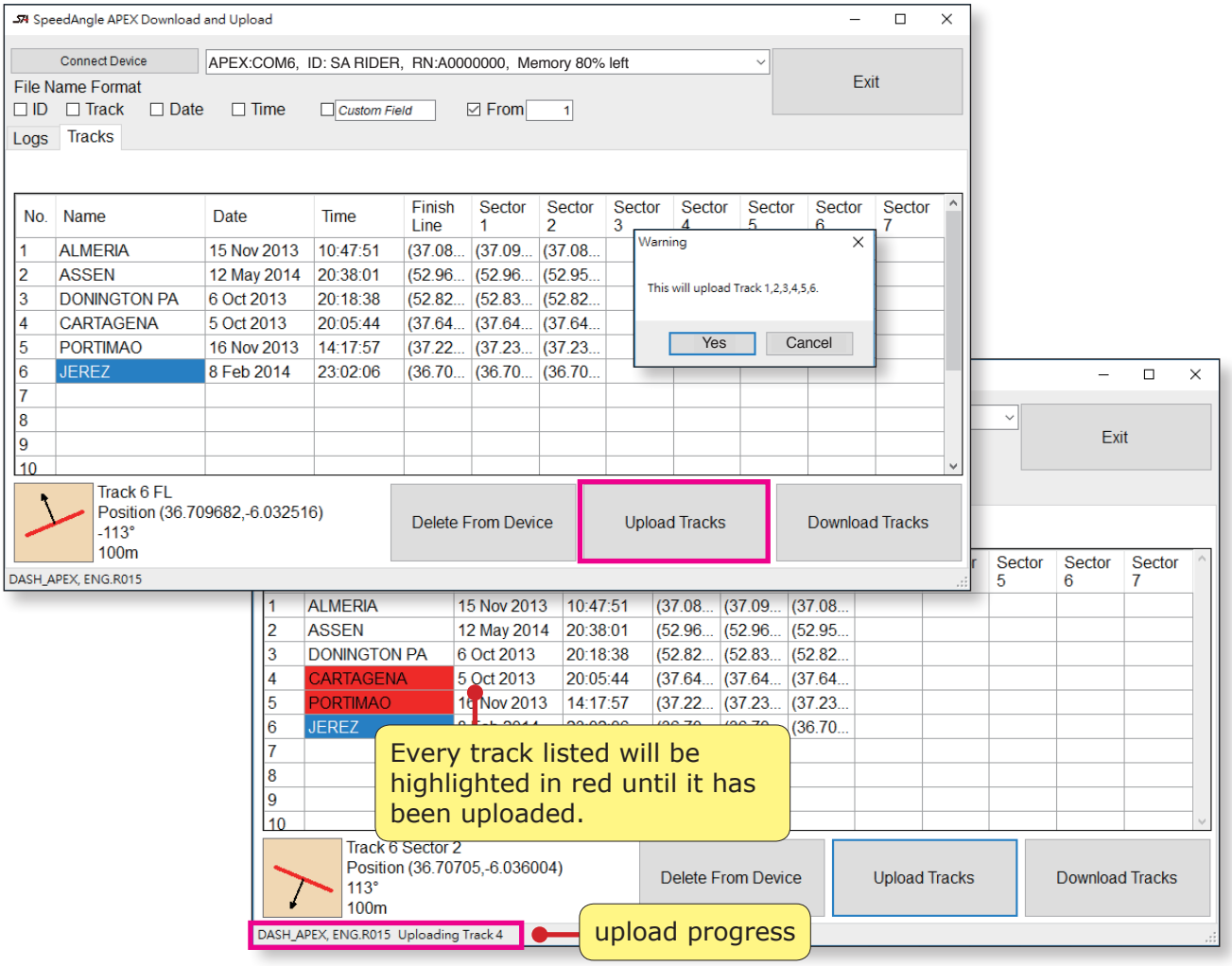
Preview Line Contents

Hover the mouse cursor over each Line cell of this track and check the setting from the preview below. If you would like to edit the settings, left click on the cell to enter Line Editor.



Upload Tracks to APEX

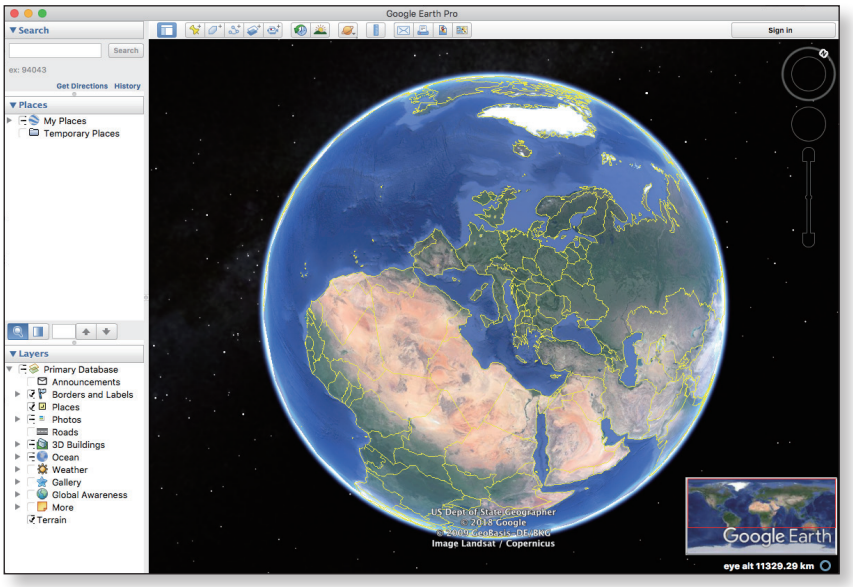
Connect your APEX if you have not. Click the "UPLOAD TRACKS" button below. This will upload all the track settings listed to your APEX.



Create a Track Setting (Finish Line / Sector)

When creating a track setting, you need a Geographic Information System software such as Google Earth to help you find the coordinates of Line midpoints and traveling directions. Here we use Google Earth as an example.

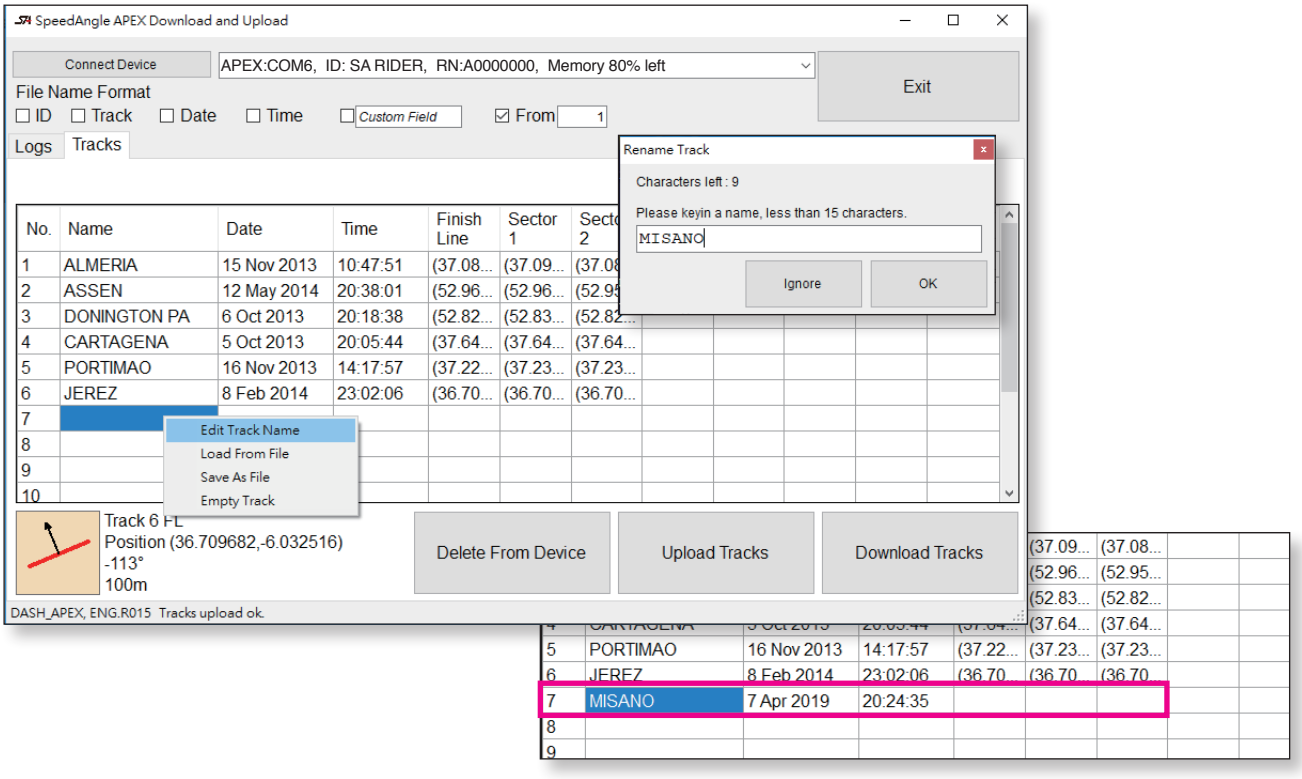
Launch Google Earth



Set Track Name

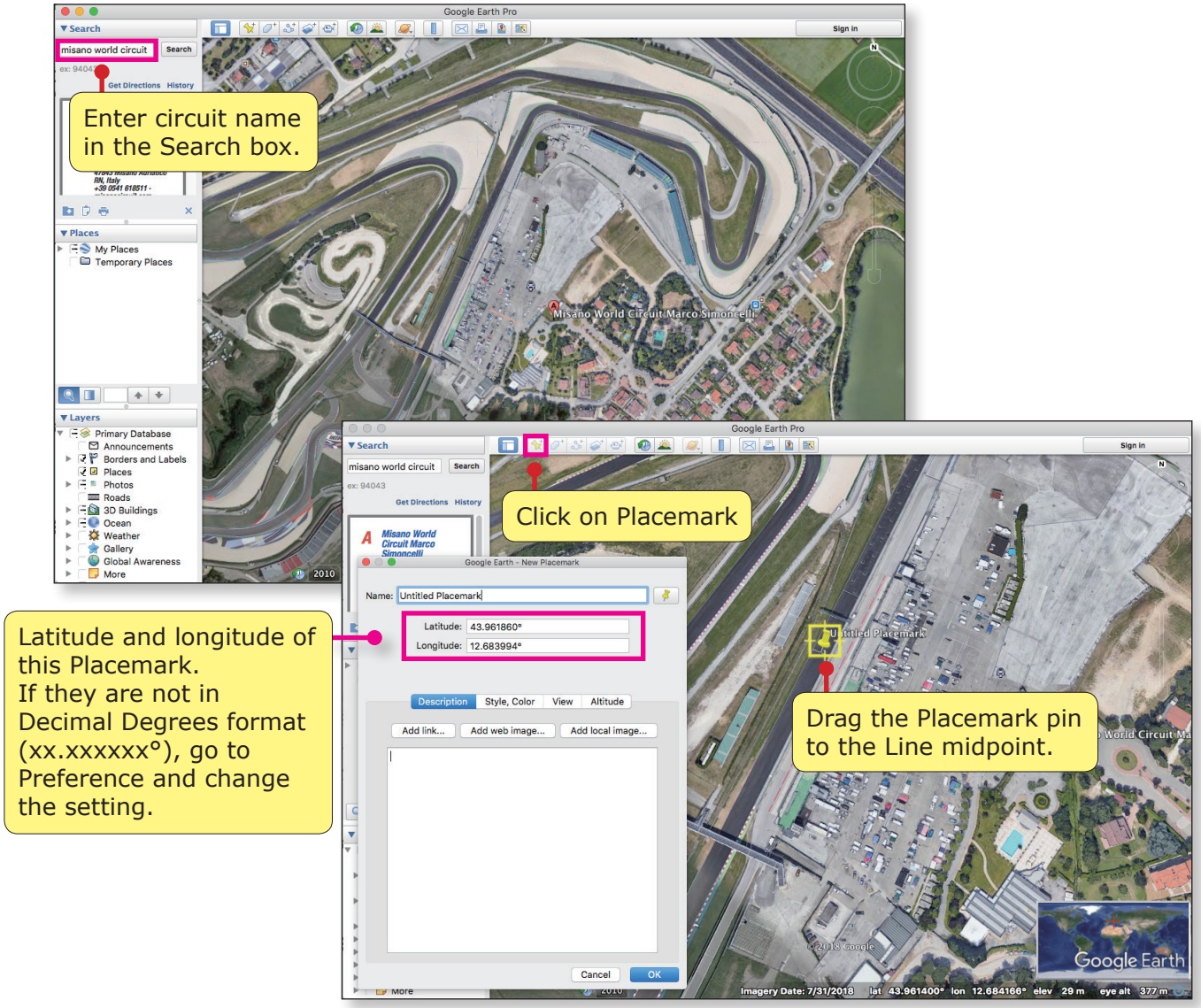
Suppose we are setting a track setting for Misano in Italy.

Click on an empty Track name cell and select "EDIT TRACK NAME". Enter a name of up to 15 characters. Only English alphabets and numbers are allowed. Here we enter MISANO. The date and time when this track was created will be shown automatically.



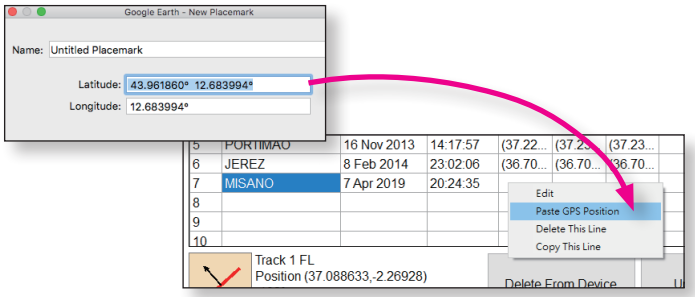
Find and Copy Line Midpoint Coordinates with Google Earth

Enter the name of the Misano course in the search box of Google Earth. On the map, find the Finish Line location. Click on the PLACEMARK icon and drag the pin to the midpoint of the Line. Copy the coordinates from the Placemark dialog.

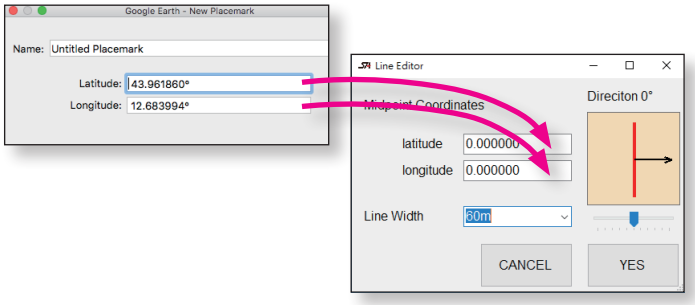


There are two ways to copy the Google Earth placemark coordinates:

- Copy the longitude and paste it behind the latitude, with a space separating them. Then copy them together, go to Track Manager, right click on the Misano Finish Line cell and select "PASTE GPS POSITION".



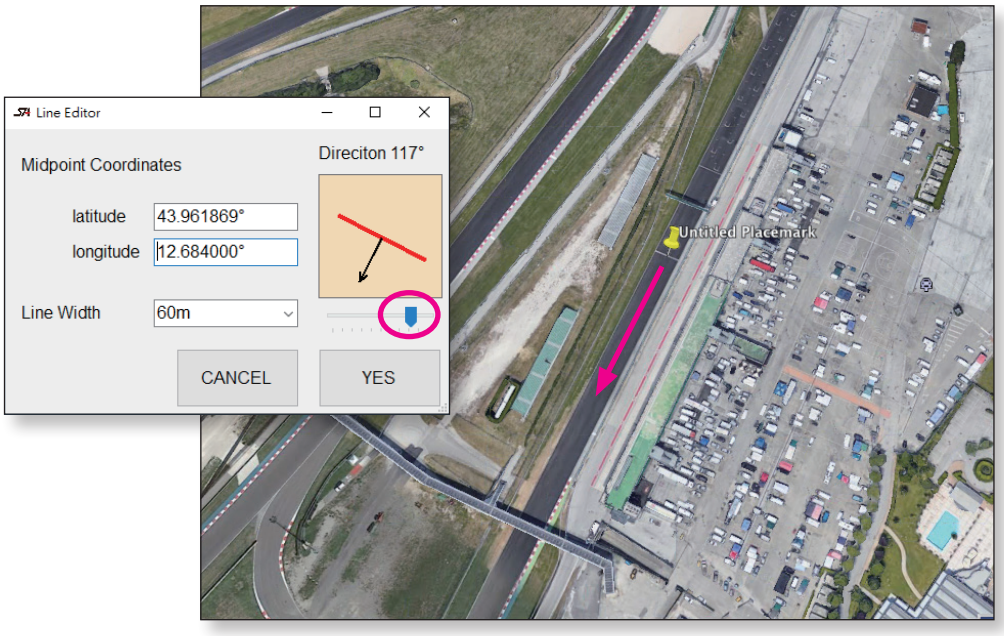
- Copy the latitude coordinate, left-click on Misano Finish Line cell to open Line Editor, and paste it in the latitude box. Repeat this process with the longitude coordinate.



Set Traveling Direction

Left click on Misano Finish Line cell to open Line Editor if you have not.

Drag the Line Direction handle bar (or click on the handle and use the arrow keys on your keyboard), swivel the arrow till it points to the same traveling direction of the straight where the Finish Line is located at.



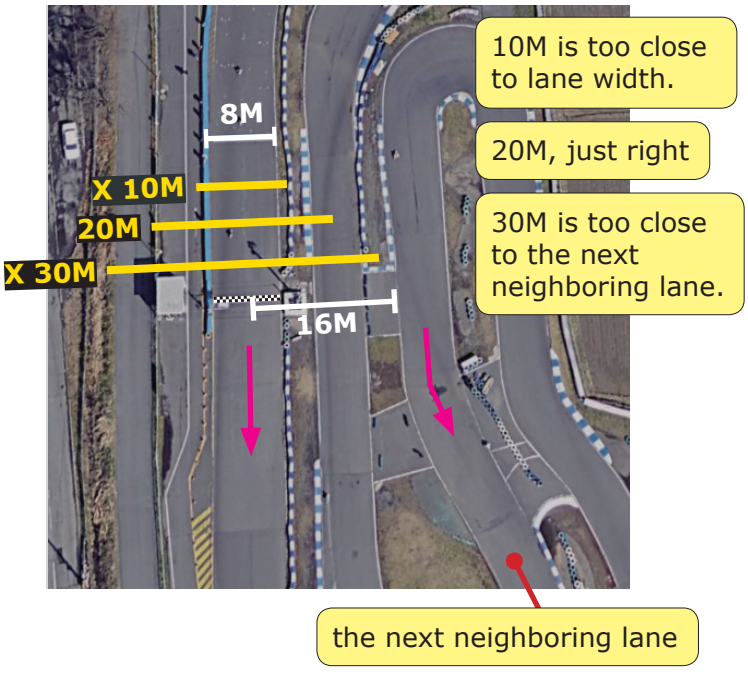
Set Line Length

There are six Line Lengths available: 10M, 20M, 30M, 40M, 60M, and 100M. When choosing a Line Length for your track, please

- choose one that is at least 10M larger than the lane width to allow GPS drift and Google Earth error , and
- make sure that the Line will not extend to the next neighboring lane to avoid unwanted line crossing.

Example 1: the majority of tracks:

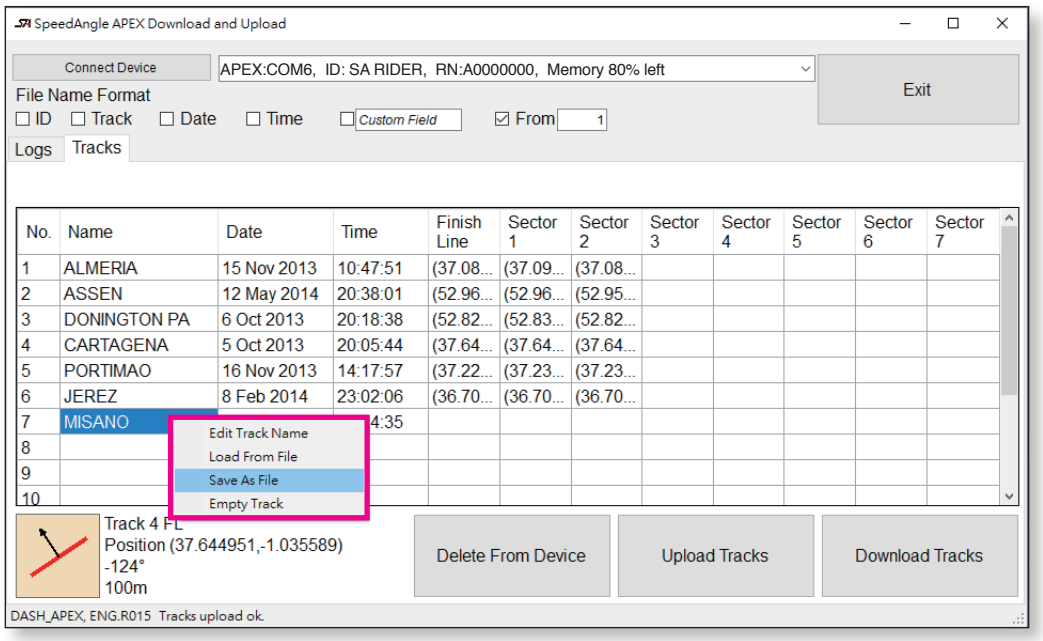
Example 2: small kart tracks:



Save as a File

After the midpoint coordinates, traveling direction and line length are set, you have finished setting up the Misano Finish Line. Repeat this procedure if you would like to set up Sectors.

After all Lines have been set, click on the Misano name cell and selct "SAVE AS FILE" to save this track setting. The saved file extention is SATrack.



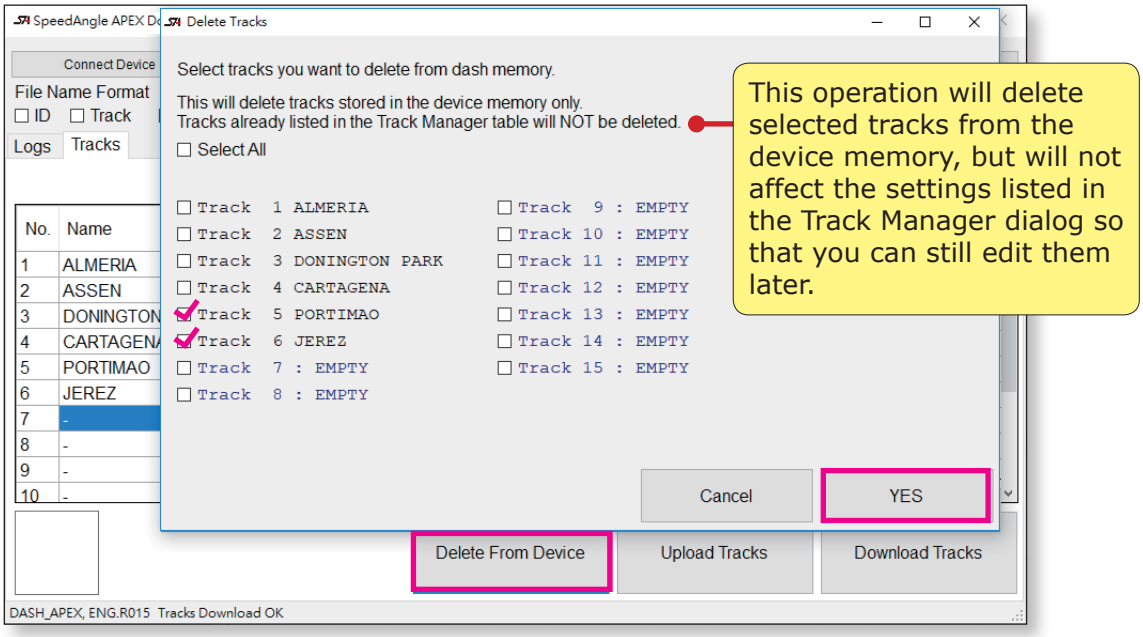
To upload this track to your APEX, connect it if you have not. Then click on the "UPLOAD TRACKS" button.

Delete Track Settings from APEX

To delete user upload track settings from your APEX, please

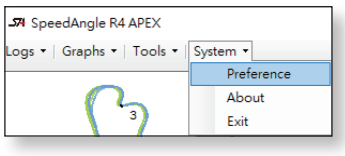
- Click on “CONNECT DEVICE” if you have not. Click on "DOWNLOAD TRACKS".
- Click on "DELETE FROM DEVICE".
- Check those tracks you would like to delete, and click "YES".

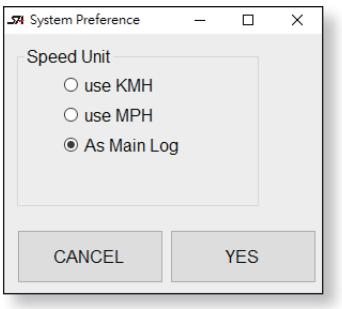
To check the result, reconnect your APEX and download the tracks again.



Set Speed Unit

You can set the system speed unit to be KMH only, MPH only, or changing automatically according to the main log speed unit. To set speed unit, please go to MENU > STSTEM > PREFERENCE.





SA Log Format

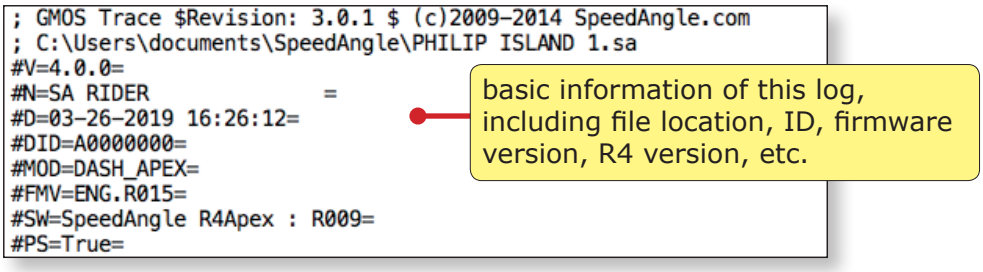
SA logs are actually txt files. You can see the contents by opening it with a text editor software, such as Notepad. The main body of SA logs is in CSV format. This means that you can easily load it to softwares like Excel to do your own analysis.

An SA log is composed of three sections:

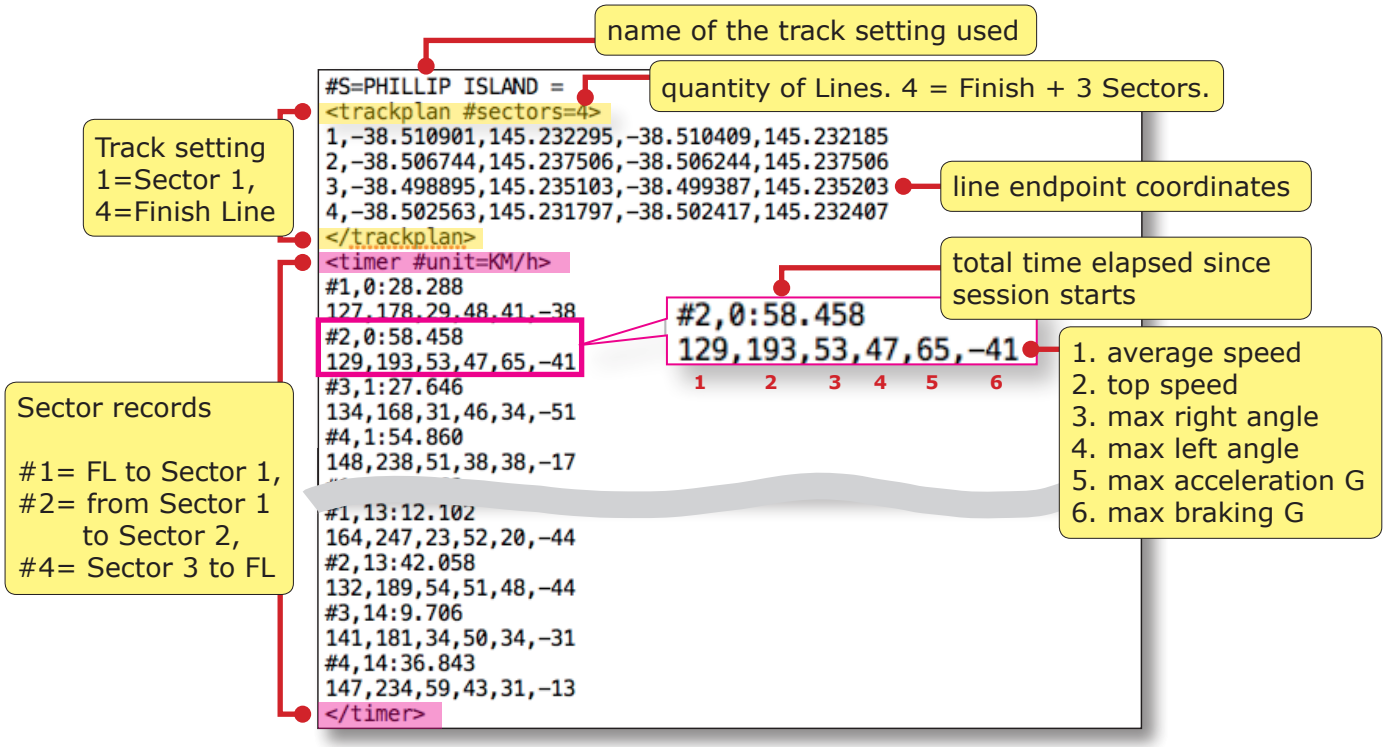
- header,
- track setting and record,
- trace and motion data.

Below explains what the SA log fields represent:

Header:



Track Setting and Record:



Trace and Motion Data: