



# i2 V1.1.4 Updates

## FEATURE GUIDE

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## ► OVERVIEW

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New versions of i2 software have been uploaded to the MoTeC website under [Software > Latest Releases](#). This document provides information about new features and will assist with understanding new functionalities.

## ► SOFTWARE VERSIONS

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This document is based on the following software:

- i2 Standard V1.1.4
- i2 Standard V1.1.4 (64Bit)
- i2 Pro V1.1.4
- i2 Pro V1.1.4 (64Bit)



**Before installing the new software version ensure you have a backup of your current Workspace.  
Once a Workspace has been opened in this version it may not open in previous versions of i2.**

## ▶ i2 PRO

The following features are applicable to i2 Pro only.

**Note:** i2 Pro can be enabled by purchasing the Pro Analysis upgrade for your logging device or by purchasing a Software Feature Licence.

### Multi-Monitor Support

Professional race teams manage large amounts of data, typically for multiple vehicles. It is often helpful to split this vast data across multiple monitors whilst maintaining central management of telemetry, maths, and other related setup.

i2 Pro now allows windows to be opened and dragged across a number of connected monitors.

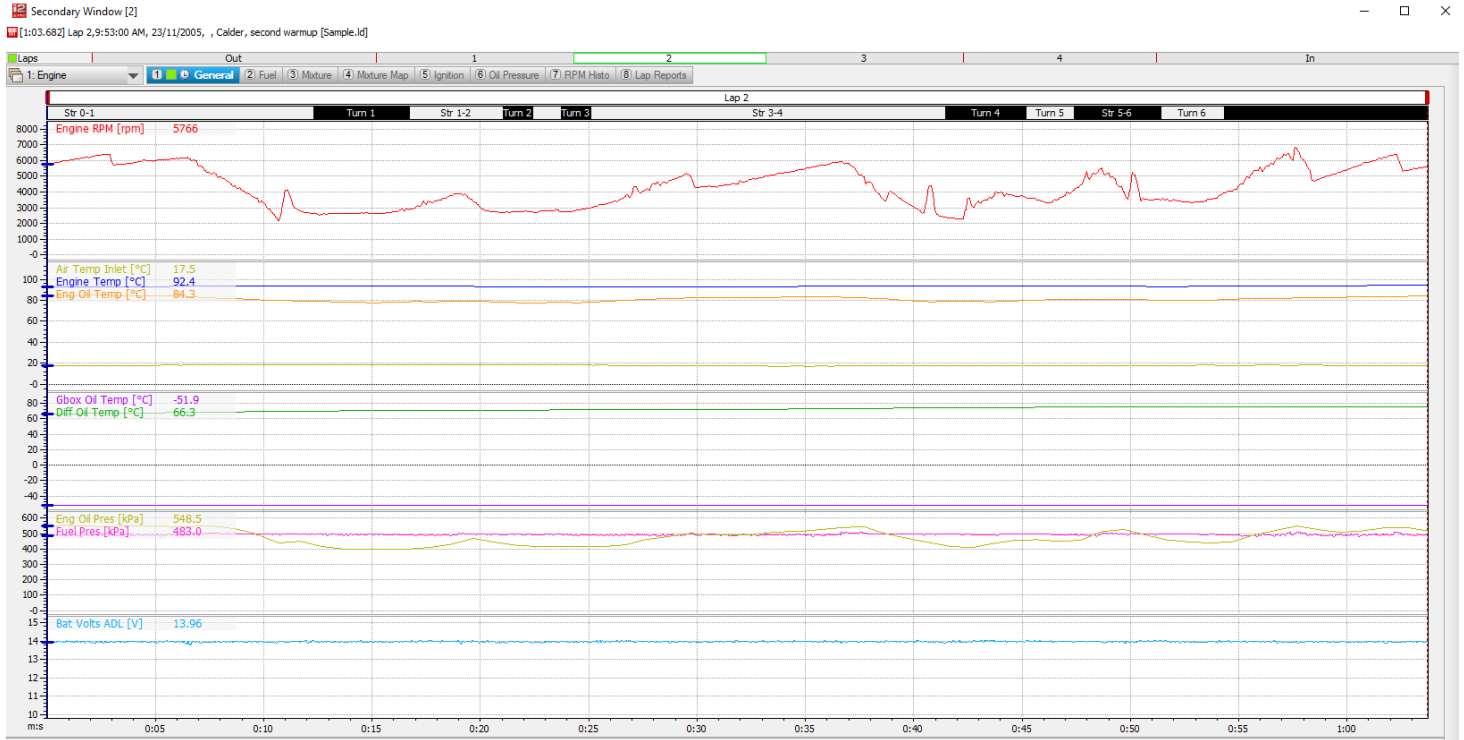
### Terminology

**Primary frame:** The main application window at start up shows a menu bar and the MoTeC logo. Closing this window will close i2 Pro. There is only one primary frame.



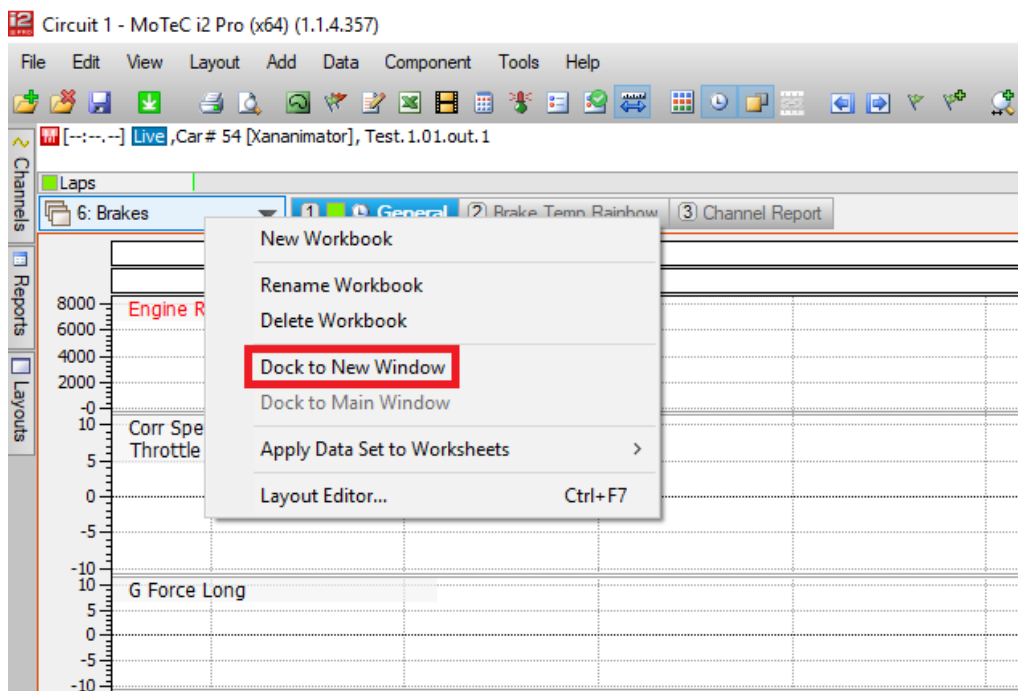
**Secondary frame:** An application window that has been created by the user (see below). Secondary frames do not have a menu bar. Closing them does not close the application.

**Note:** Multiple secondary frames can be created; each will contribute to higher CPU usage.

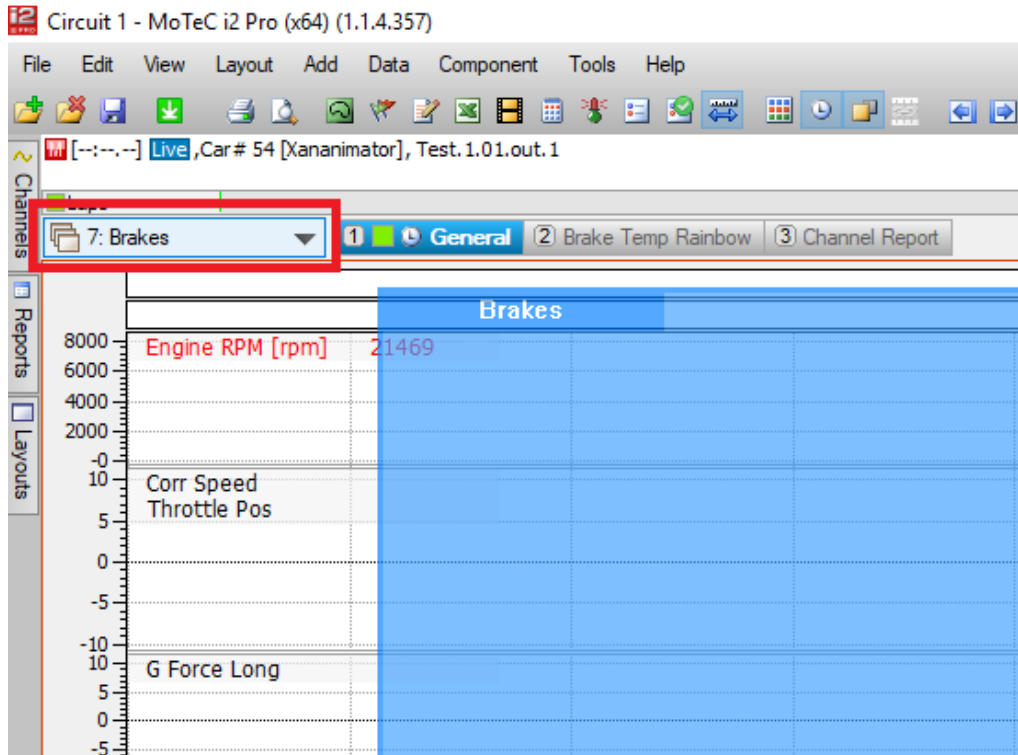


### Usage

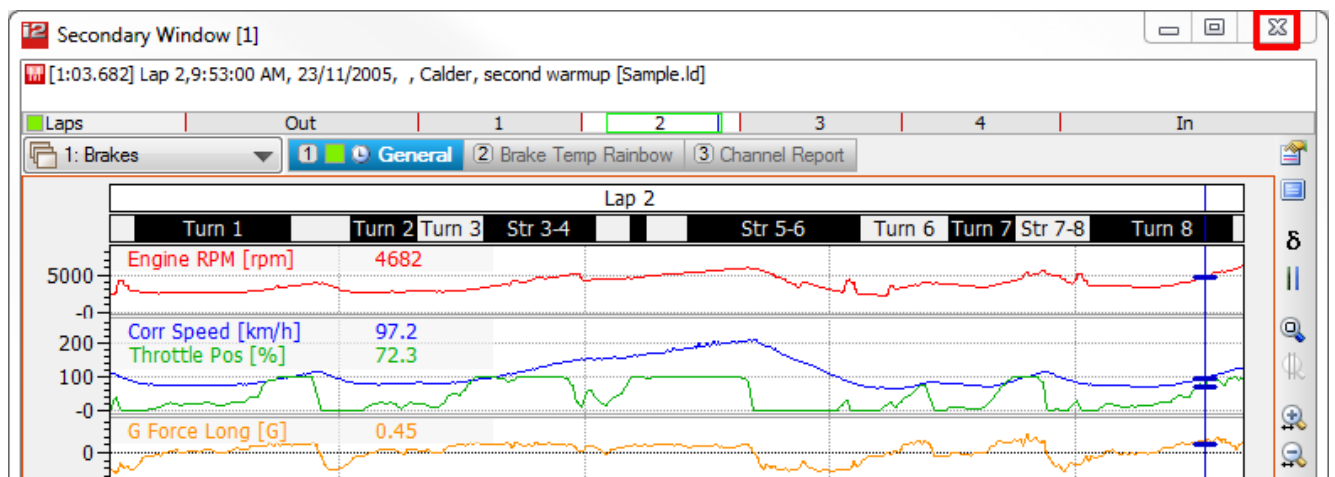
- Right click on the Workbook (combo box) and select **Dock to New Window**.



- Alternatively, Ctrl+drag from the Workbook combo box initiates a drag/drop feature. Valid drop targets are other Workbook combo boxes (in secondary frames) or any area outside the main Workbook area (results in a new secondary frame).



- Clicking the close (X) button on a secondary window will automatically close that window and merge its Workbooks back into the primary frame's Workbooks combo box.

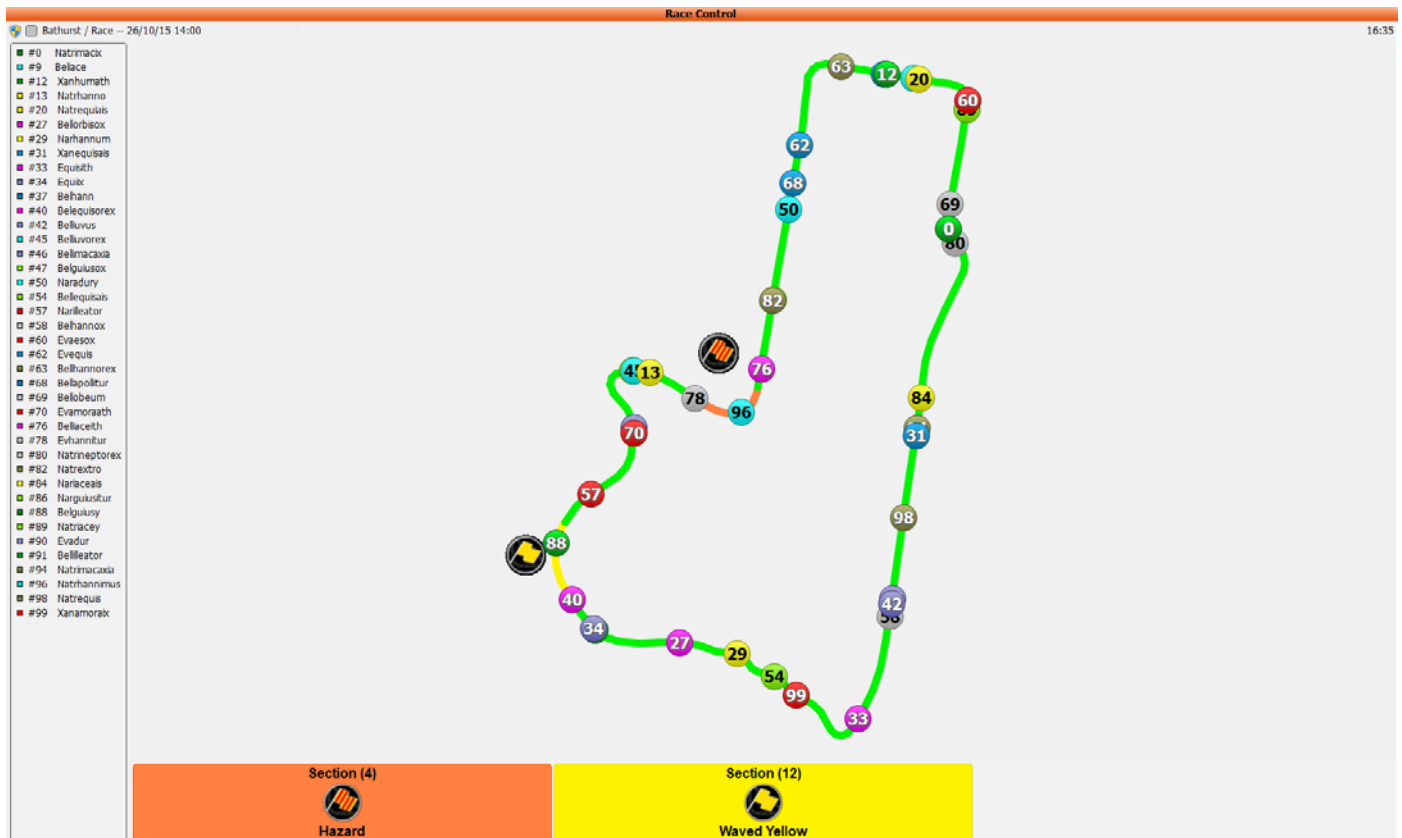


**Note:** Frames that would otherwise appear off-screen (for example, if a second monitor has been disconnected) will be forced onto remaining displays when i2 starts up again.

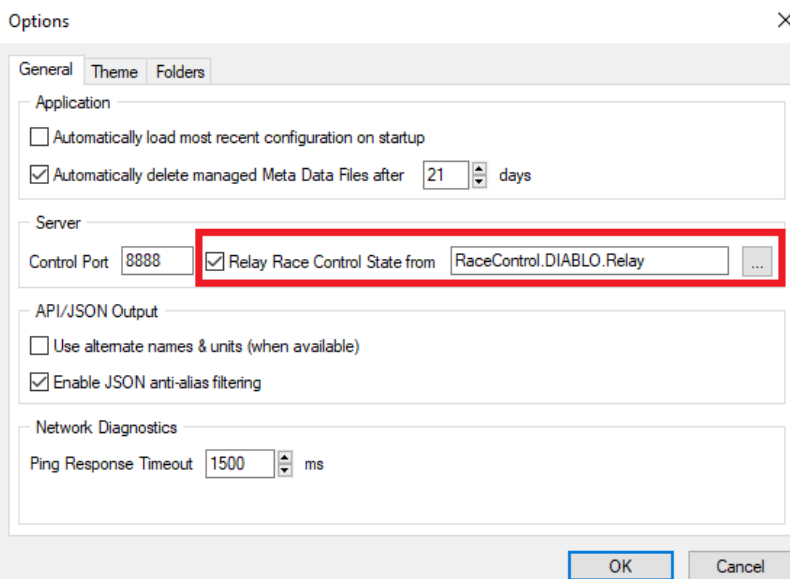
## Race Control Vehicle Position

The Race Control component in i2 is used to convey race control state via the telemetry network to each i2 client. The race control state consists of:

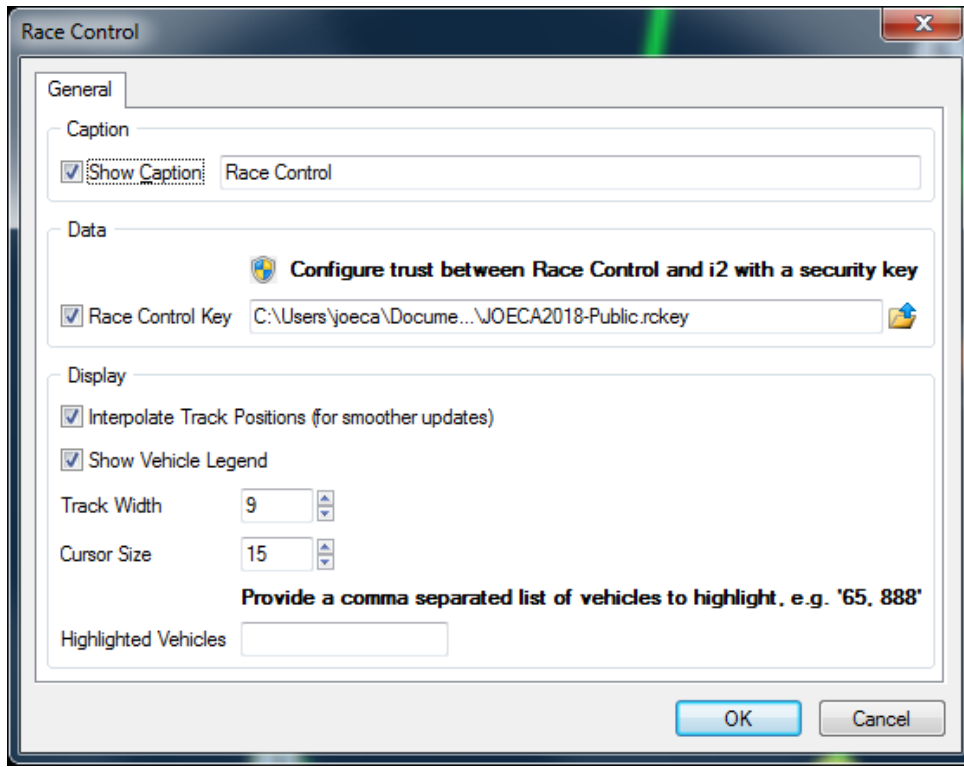
- On track vehicle positions (for all competitors).
- Track status visualisation (green, yellow, red), including section based marshalling states.



In order for this component to function correctly, a Race Control server (or **T2 Server** setup for Race Control relay – see image below) must be visible on the network (via Discovery).



### Configuration Options



**Race Control Key:** Used to establish trust between the Race Control server and i2. This key should be provided from the Race Control Server authority. If not present, data will still be shown, however it may be susceptible to tampering from third parties.

**Interpolate Track Positions:** The track location for each vehicle is updated periodically at a much slower rate than normal telemetry. This has the effect of the vehicles “jumping” along the track. Enabling track position interpolation allows the vehicles to be displayed smoothly between update samples. i2 “learns” the average speed of the track and applies this when interpolating.

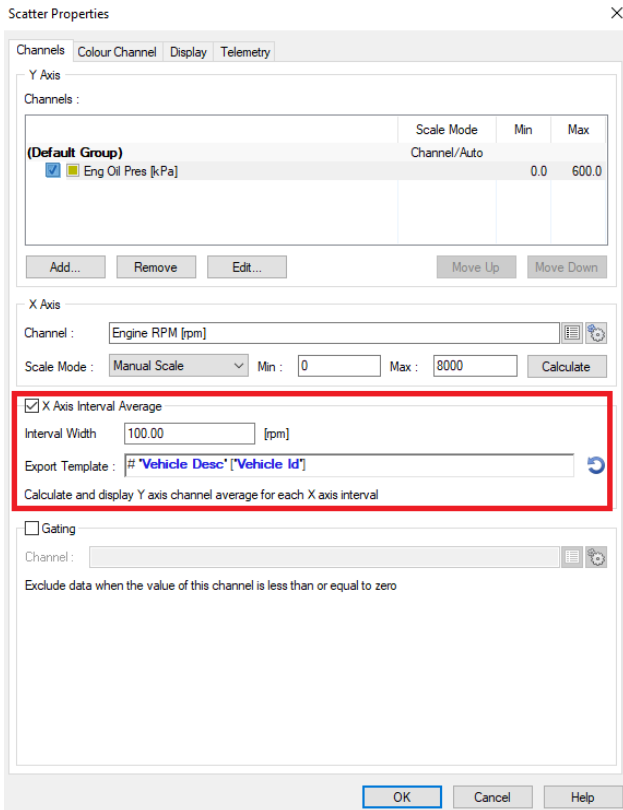
If the error margin between the display and actual location is too large, the vehicles may snap back into position.

**Highlighted Vehicles:** Provides a comma separated list of vehicle numbers (as defined by the Vehicle Number detail) that will highlight on the map. This allows teams to highlight their own vehicles across the field.

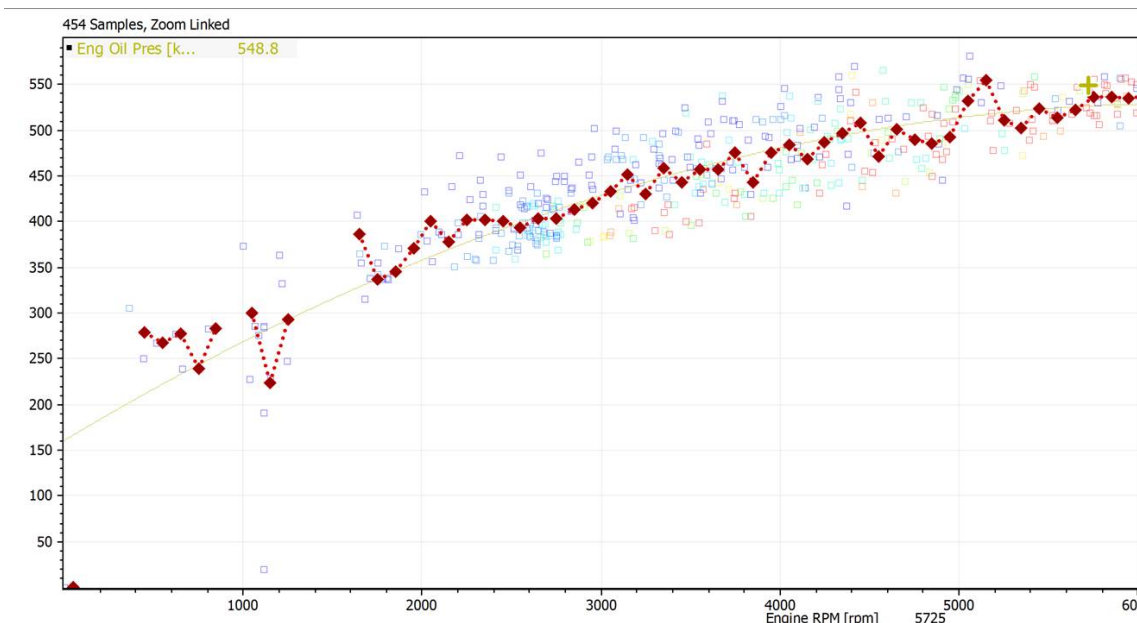


## Scatter Plot Interval Average

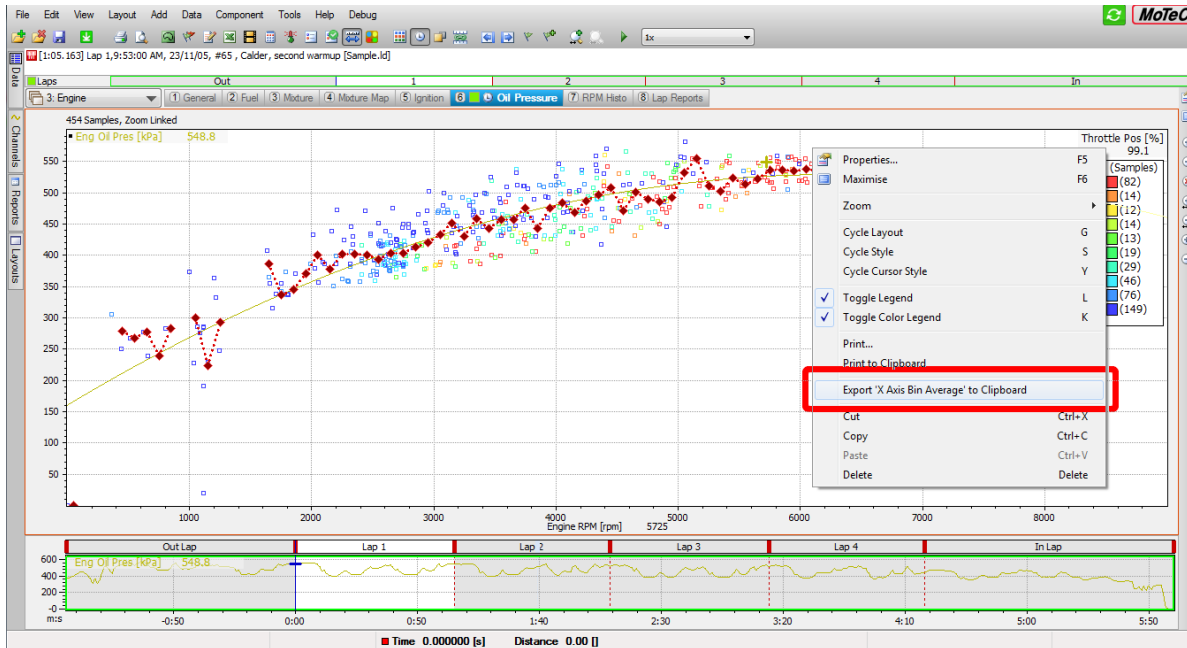
Some categories of racing require analysis of performance characteristics (e.g. average boost at 100 rpm intervals) to determine vehicle compliance. This typically requires the analysis of averages over a band of values and visualising/exporting the data, so this feature has been added to the existing “Scatter Plot” component.



The image below shows an example where the X axis (Engine RPM) has been divided into bins of interval width 100 (rpm). For each bin across the X axis, the Y axis samples (Engine Oil Pres) that fall within the bin are averaged and displayed as a red diamond. A dotted line joins each average to show the trend.



The user can export the averaged data to the clipboard (for example, to paste into Excel).

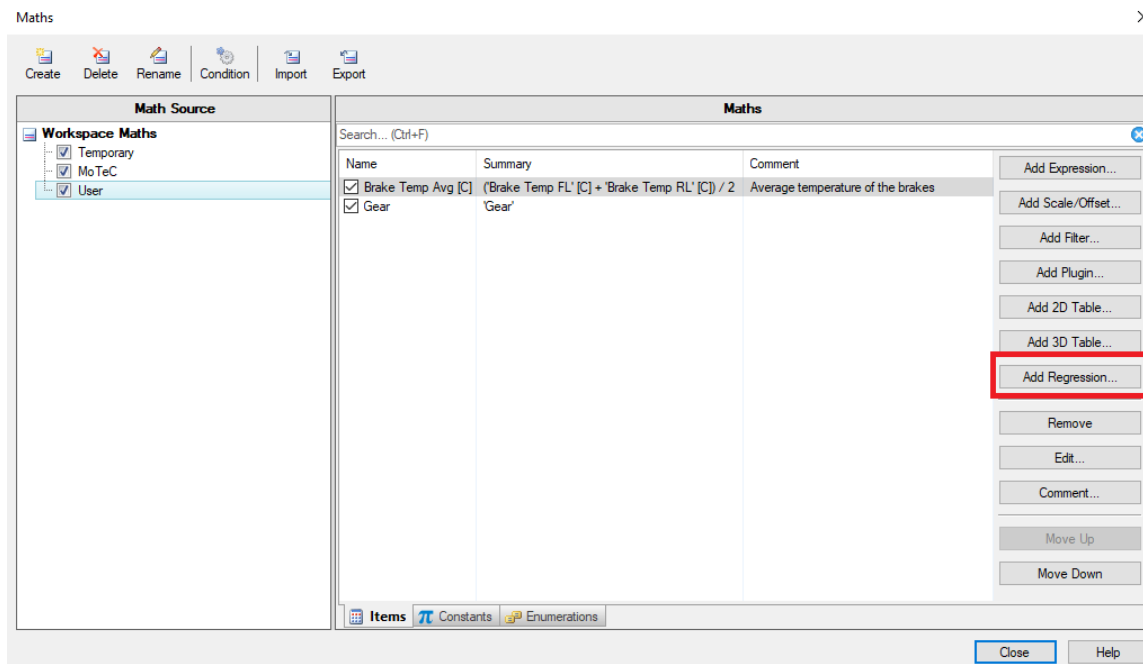


To help identify the exported datasheet, additional details can be included by configuring the **Export Template** setting.

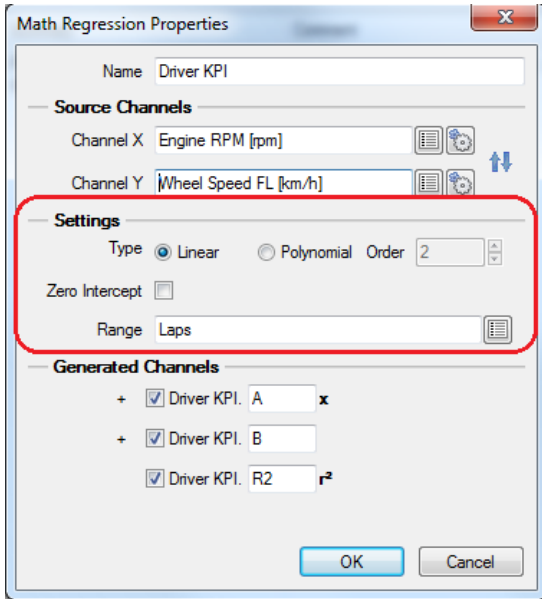
## Math Regression Calculation

For a long time, the Scatter Plot component has been used to analyse and determine correlations between channels. A major reason for that is its ability to perform regression analysis on the supplied data to determine a mathematical relationship between input values. In particular, the regression coefficients (be that Linear or Polynomial) are useful for determining vehicle/driver KPIs and would ideally be available as channels for use in other parts of i2.

The Scatter Plot regression calculations have now been made available via the Maths system. These calculations give a curve of best fit, based on the polynomial order, intercept and range constraints (see Settings).



In the Maths window a new button has been added to configure regression.



The Name given to the Regression Math will auto populate as a prefix under the generated channels. A further name can be added to the various outputs.

Similar to Scatter Plots, the channels for X and Y and the equation type must be defined.

Depending on the type of regression (Linear or Polynomial), a number of channels can be generated that contain the coefficients of the regression.

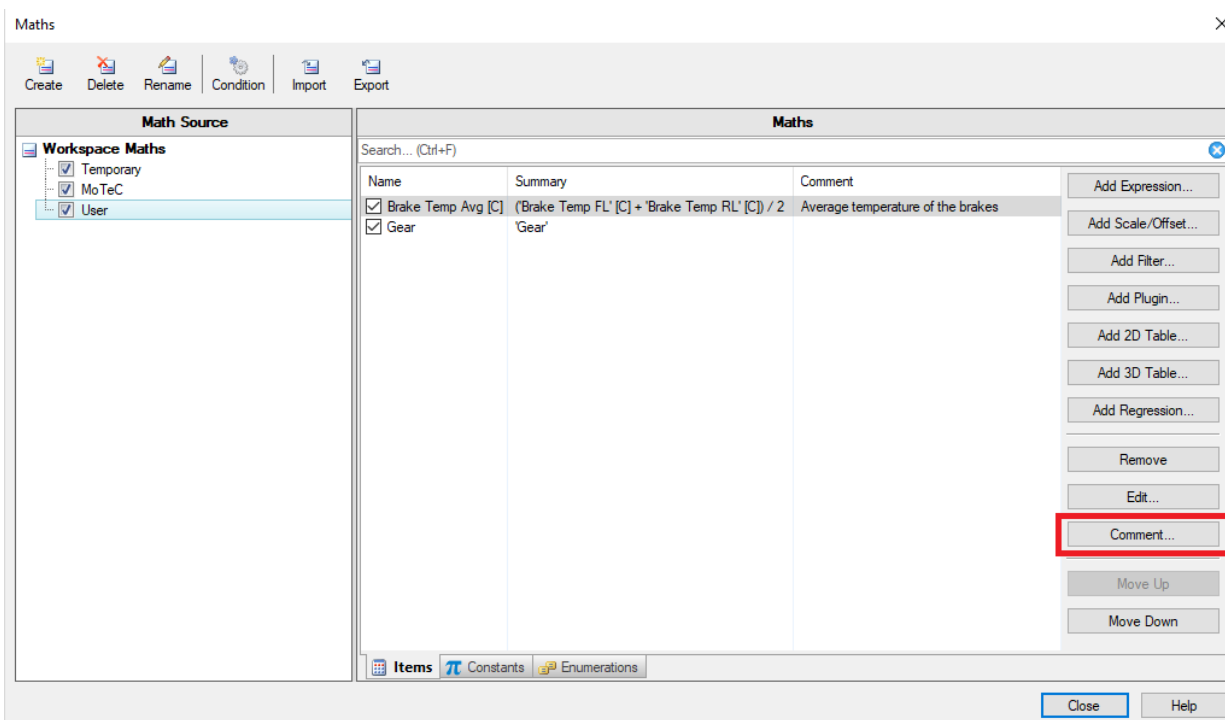
For example, the third order polynomial is described by the general function  $Ax^3 + Bx^2 + Cx + D$ , where the coefficients of A, B, C, D will be generated as a best fit for the data provided.

**Note:** Scatter Plots are able to visualise the regression.

The  $r^2$  coefficient of determination, which provides a statistical measure of how well the regression prediction approximates the data, can also be generated.

## Comments for Maths and Constants

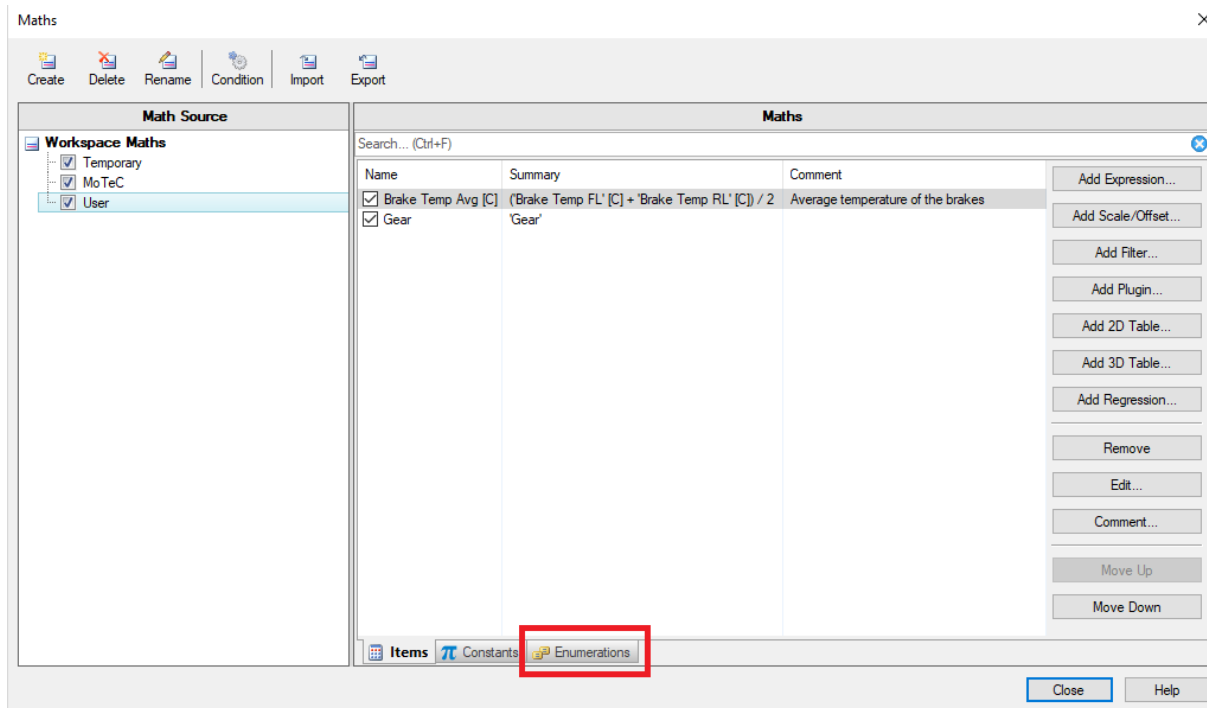
Comments can be added to an individual Maths channel or constant and viewed from the main window.



## Enumerations Support

Logged data is fundamentally numeric in nature. However, there are situations where a textual representation of a value better demonstrates the underlying state of a system. Ideally, channel enumerations would be generated at the source of the data (as is done for the M1 logging system), however there are situations where the source is either unknown (third party) or cannot provide the enumeration information required.

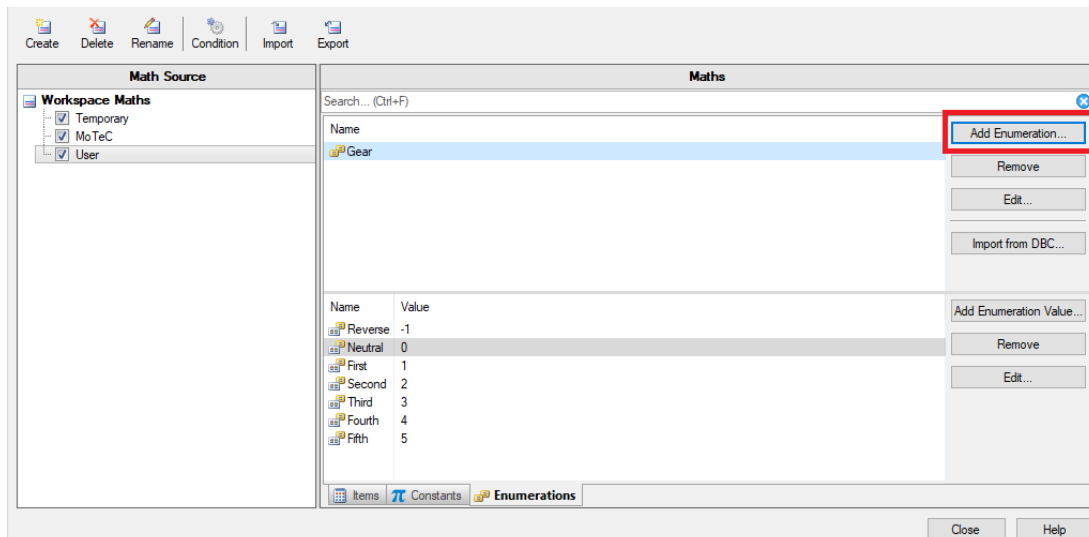
Limited support for user defined enumerations has been added into the i2 Maths system to allow the manual association of values to text.



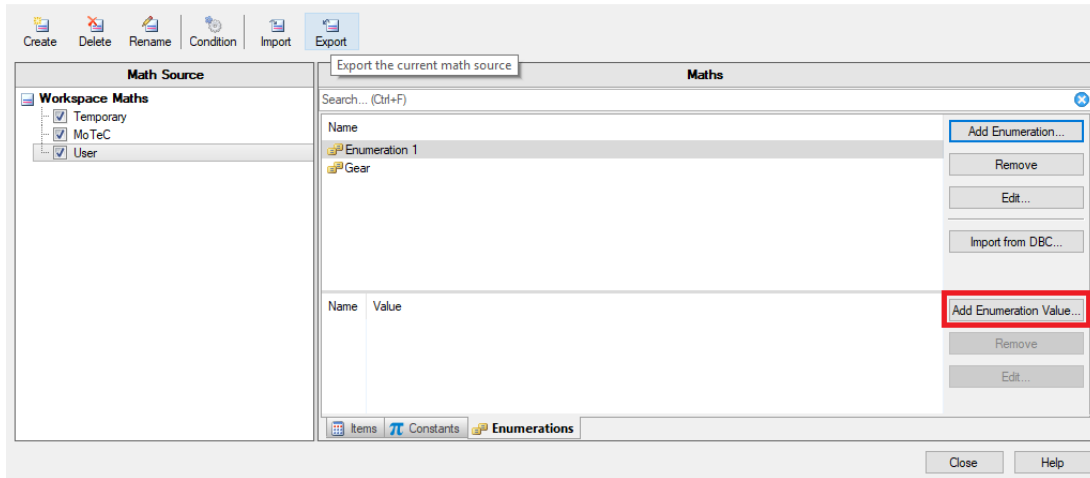
## Usage

Applying an enumeration to a Maths channel requires two steps:

1. Define the enumeration (mapping string/value pairs) by selecting:
  - a) **Add Enumeration**



## b) Add Enumeration Value

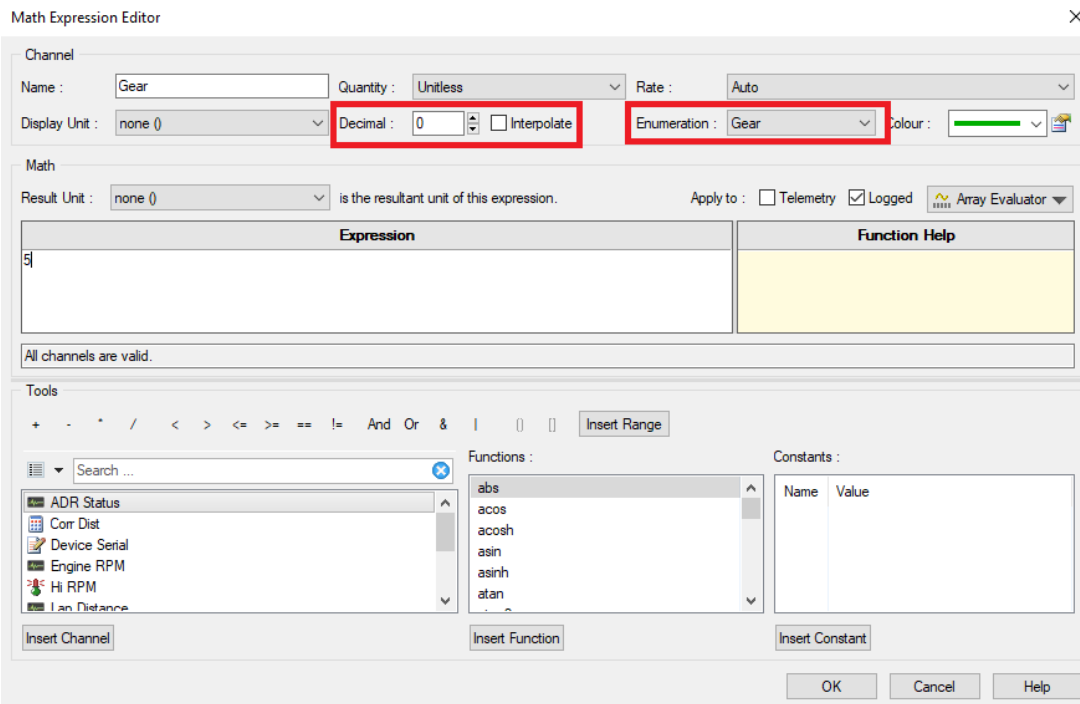


2. Apply the enumeration to the Maths channel.

Enumerations can only be applied to integer channels. To configure an integer channel, you must first:

- Set the **Decimal** to zero (i.e. show no decimal places)
- Uncheck **Interpolate** to turn off Interpolation

Once configured as an integer channel, the **Enumeration** field will allow you to associate the enumeration to the calculation result.



In this case, it will display the Gear channel (which is defined as a constant '5') with the word "Fifth" as defined previously. Enumerations are stored as part of the Maths system and will be transferred whenever a Maths Source is exported or imported.

## Adding Enumerations from DBC Files

DBC is a defacto standard for specifying and distributing information about CAN bus messages and signals (“CAN Database”). If you have a DBC file definition for data that has been logged from a third party, you can import the enumeration definitions into i2.

**Note:** Only DBC “VAL\_TABLE” entries are enumerated and added into i2.

## Telemetry Quality Channel

With the ever increasing reliance on telemetry, a mechanism is required to understand the overall quality/reliability of the data being received. A telemetry “Quality” channel will be automatically generated for each telemetry data source to provide feedback on the quality of its reception.

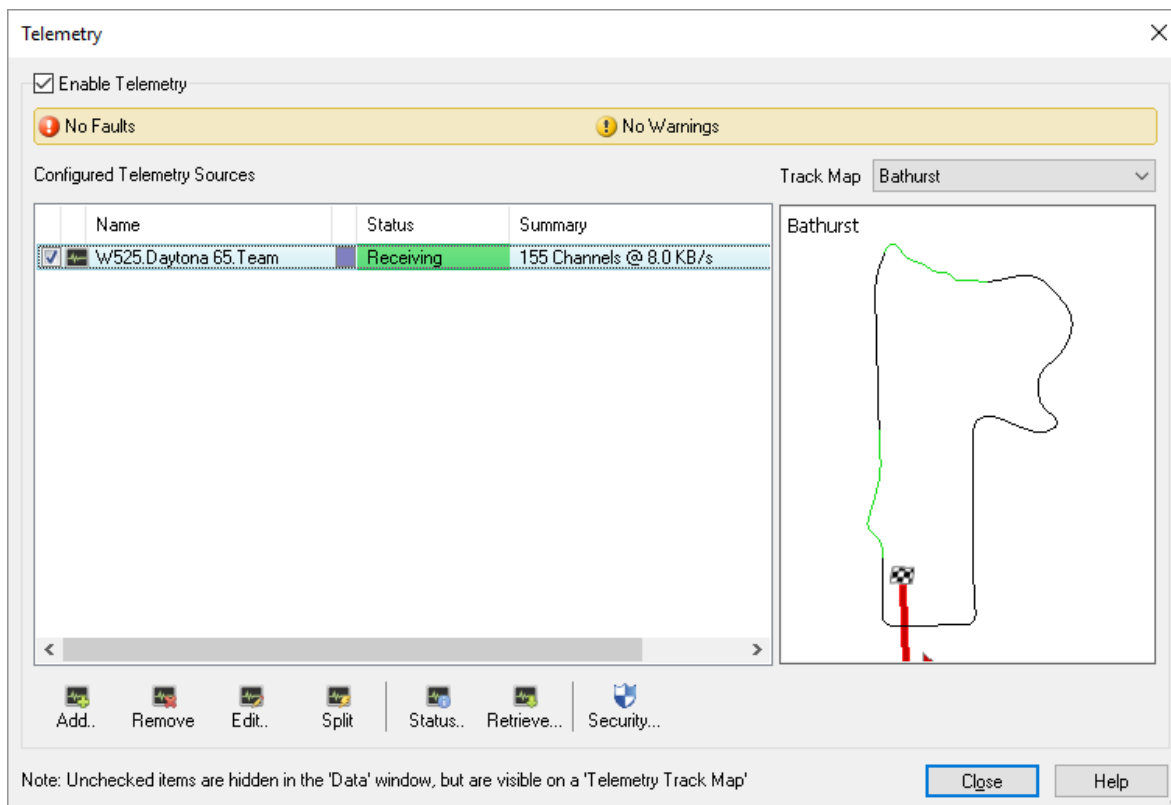
The telemetry quality calculation approximates telemetry coverage by measuring how many packets (for a given channel – usually “Lap Distance”) have been received against how many packets it expects to receive (for that channel). So if that channel is scheduled to arrive at 10Hz (10 packets per second), over the course of 10 seconds we’d expect to see 100 packets. If we have only received 97 packets, that gives us a running coverage of 97%.

At the end of the lap, the coverage metric is reset to 100% and the calculation restarts.

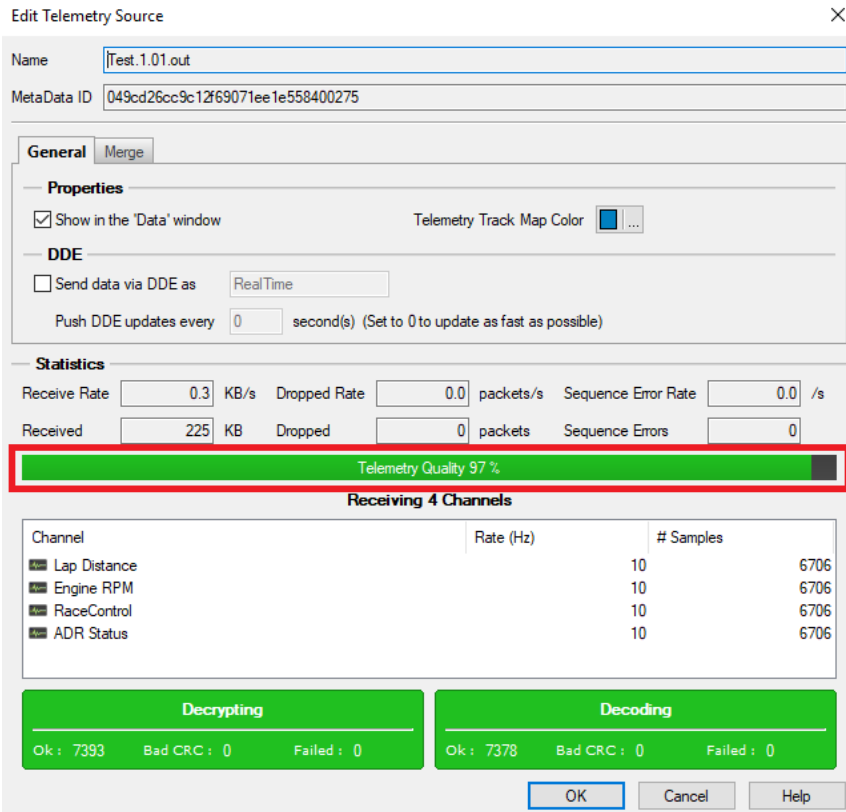
By plotting the channel, it may be possible to locate on track where telemetry blackspots are occurring.

The **Telemetry Quality** channel value is also visible in the Telemetry Data Source Properties dialogue.

When the **Telemetry** window is open with an incoming stream selected, it is shown as follows:



Select the **Edit** button to navigate to the following window.

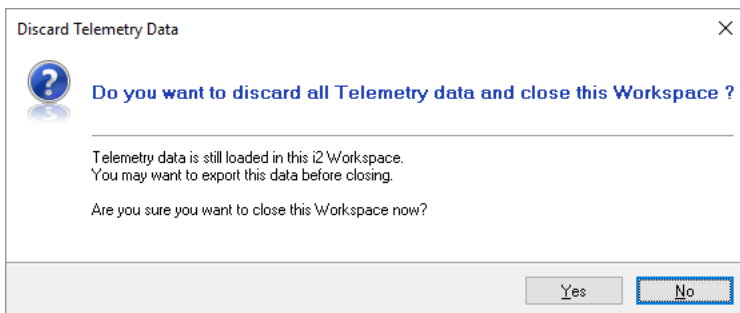


The selected telemetry window will display the live telemetry quality as a percentage.

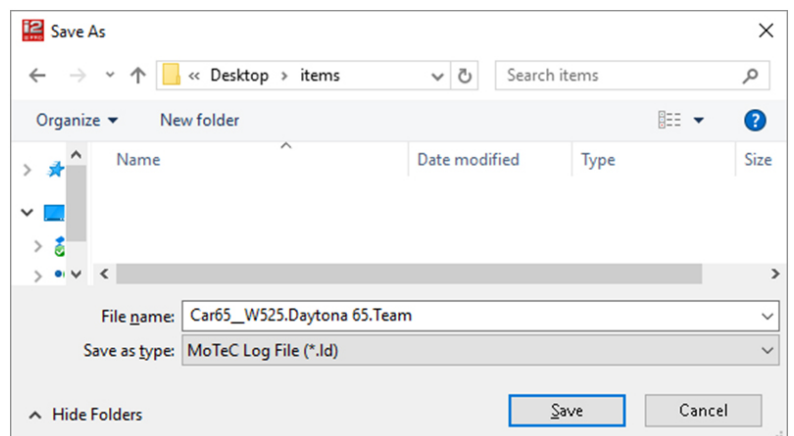
The **Telemetry Quality** channel will also appear in the channels window when running telemetry. This can be used in Channel Reports or displayed on a time/distance graph.

## Save Telemetry Data on i2 Exit

If i2 is being closed when Telemetry is running, it will prompt the message below to ask the user if they wish to export the Telemetry data to an LD file.



If the user exports Telemetry data, the file name will default to the car number followed by the name of the Telemetry Source.



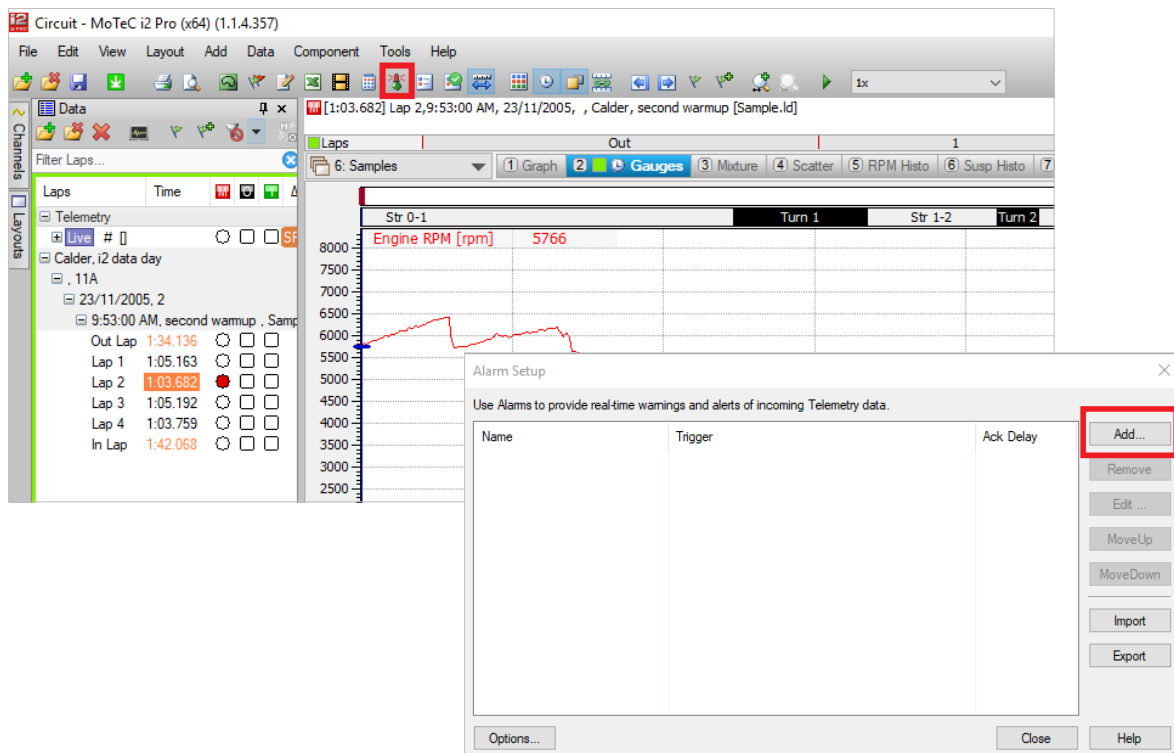
## Gauge Alarms

When monitoring real time telemetry streams for multiple vehicles there is so much to focus on that it can be easy to overlook the centralised alarm view. To augment the alarm system, it's now possible to associate an alarm with any gauge to overlay (and flash) the active alarm state.

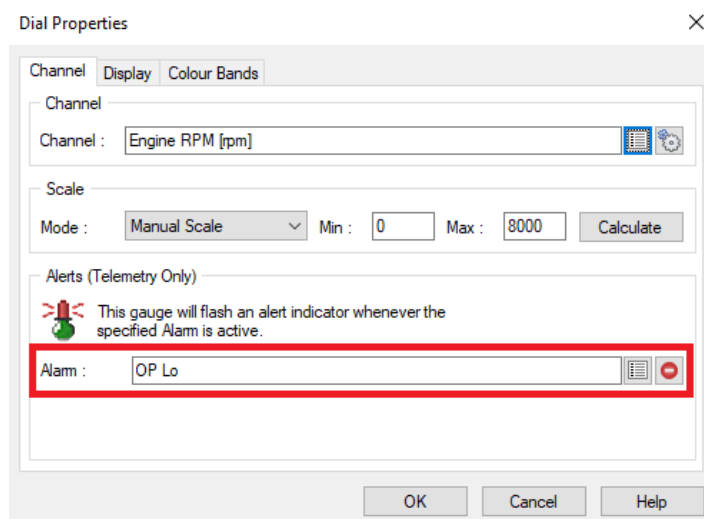
**Note:** This feature only applies when Telemetry Sources are active.

- **Define an alarm**

1. Select the **Alarms** icon in the menu bar, then select **Add**.

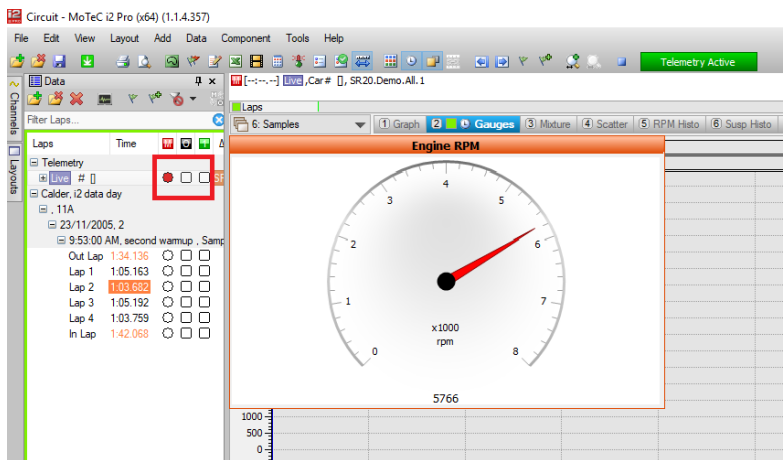


2. Edit the relevant gauge (in this case a dial) and associate the alarm.

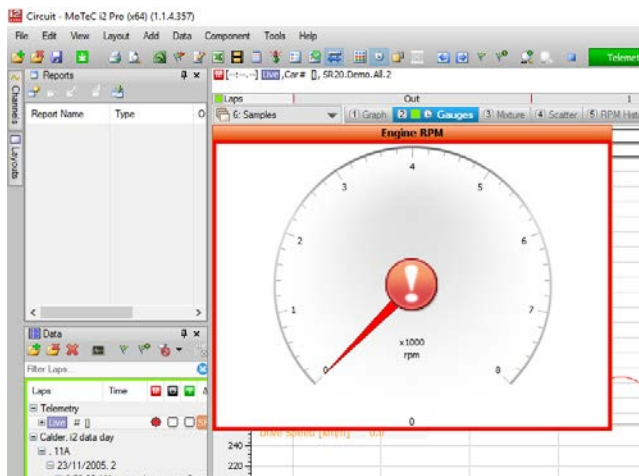




3. Ensure a Telemetry Source is selected as the main data source.



4. If the alarm becomes active, a visual indicator will appear. (The icon that displays is based on the severity of the alarm, as defined in its properties).

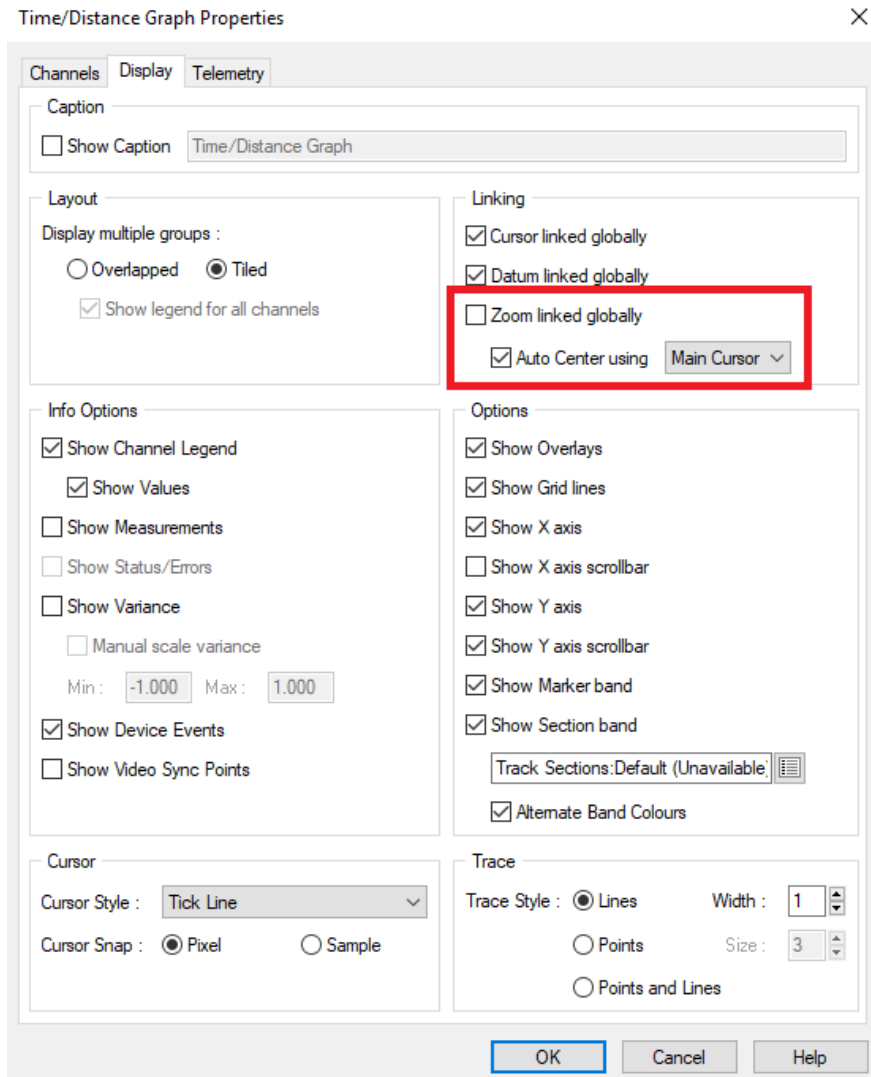


This indicator will flash whilst the alarm is active.

## Time/Distance Component Auto Centre Mode

This feature allows you to set up two (or more) time/distance components where one is an overview with a larger zoom area; the other is zoomed around the cursor showing more detail.

To enable this feature, you must uncheck **Zoom linked globally**, then check **Auto Center using** and select a cursor type.



### Example:

You want to analyse a corner. Use the lap based view to move the cursor to the corner in question.

The second (auto centering) view automatically tracks the cursor and shows data zoomed in at a shorter distance, highlighting details of the corner.



The top graph is the “lap graph” (a regular time/distance component).

The bottom graph is “Auto Centered using Main Cursor” and is zoomed in either side of the cursor, which is positioned in the middle of Turn 4.

As the cursor on the top graph is moved, the data in the bottom graph will pan to follow.

## ▶ i2 PRO AND i2 STANDARD

The following features are applicable to i2 Pro and i2 Standard.

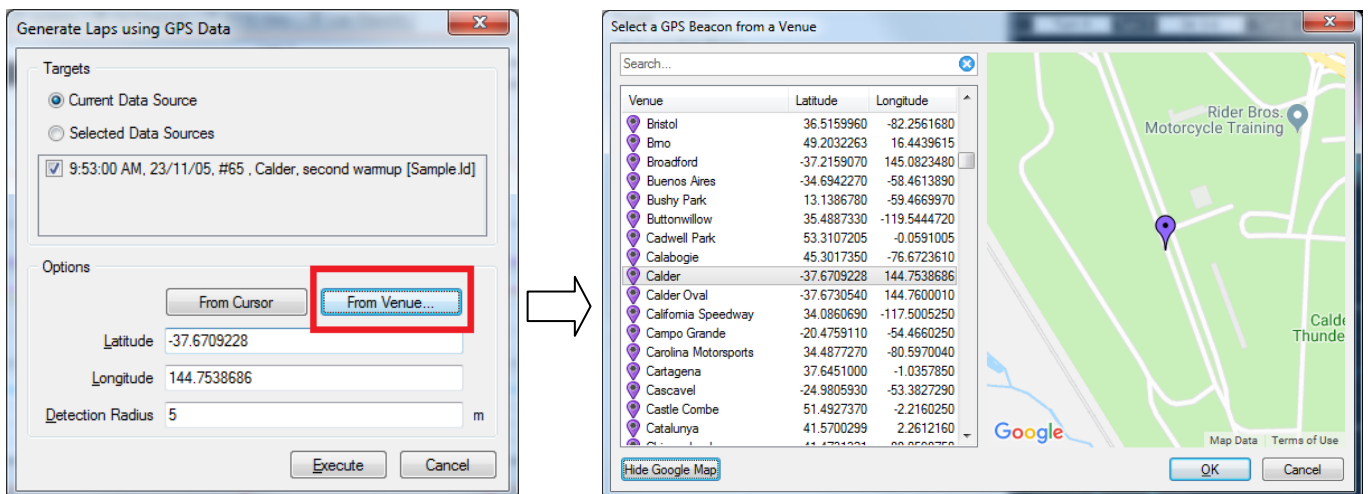
### Lap Editor GPS Beacon Selection

Typically, laps are generated via physical beacons or pre-configured GPS coordinates. Occasionally, these methods require post-processing to further improve or clarify the logged data, for example, when there are missed beacons (missed laps) or a GPS beacon in the wrong spot (i.e. the start/finish line has changed physical location).

#### Usage

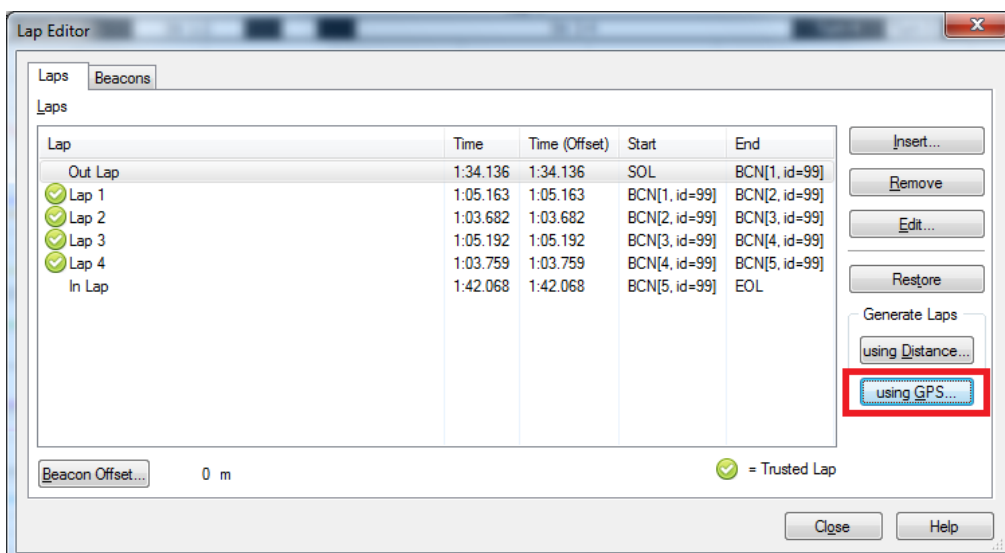
There are two ways of using this function:

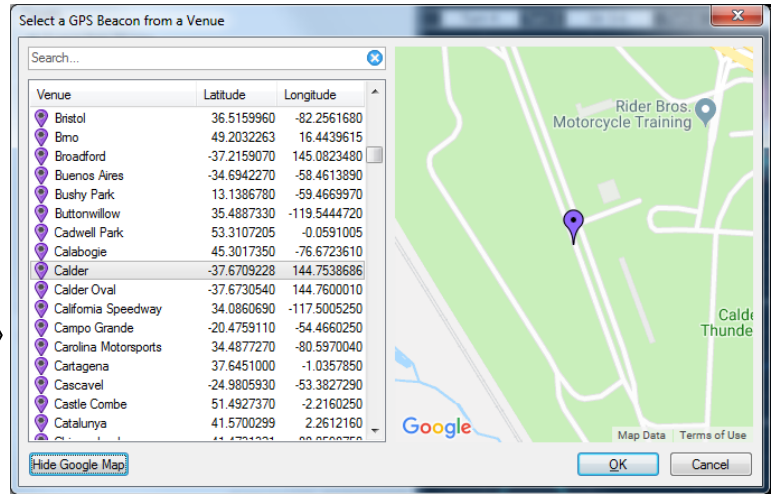
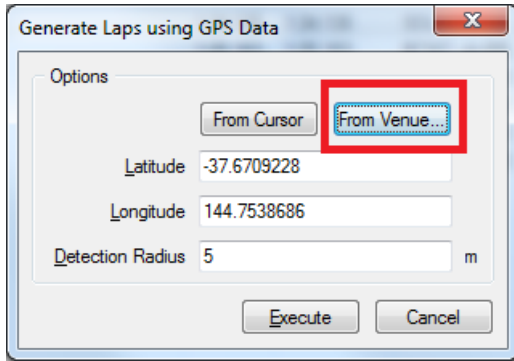
1. From the main application window, select **Tools > Lap Generator > From Venue**



Selecting the venue will automatically populate the GPS coordinates (Latitude/Longitude) from the previous dialogue.

2. Alternatively, from the main application window, select **Tools > Lap Editor > using GPS > From Venue**





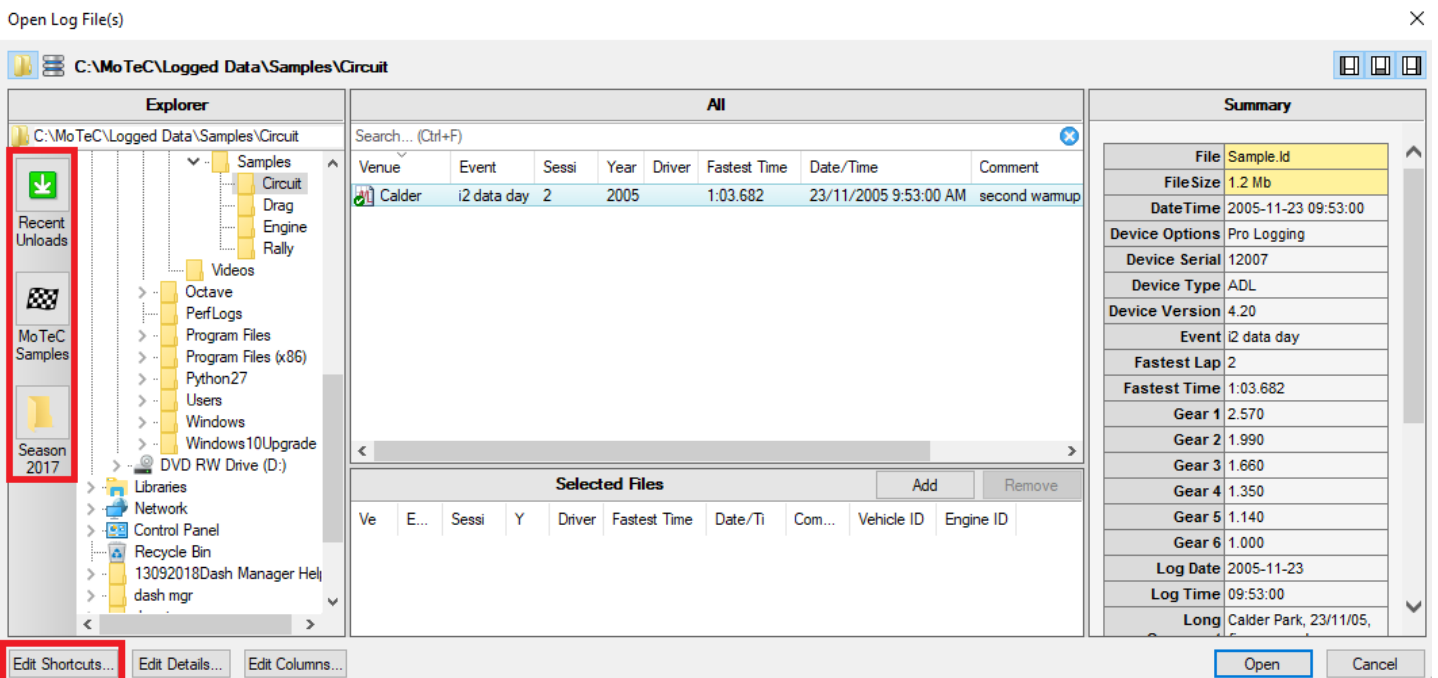
### Notes:

- The purple marker indicates the GPS location of the lap marker.
- The marker can be dragged and adjusted by the user. The updated location is returned from this dialogue, but will not be saved, hence the next time you enter this dialogue the original venue definition of the GPS location will be displayed.
- Clicking on different venues causes the map to change.

### Log File Open Dialogue Shortcuts

Logged data is typically archived into an organised folder structure, many levels deep.

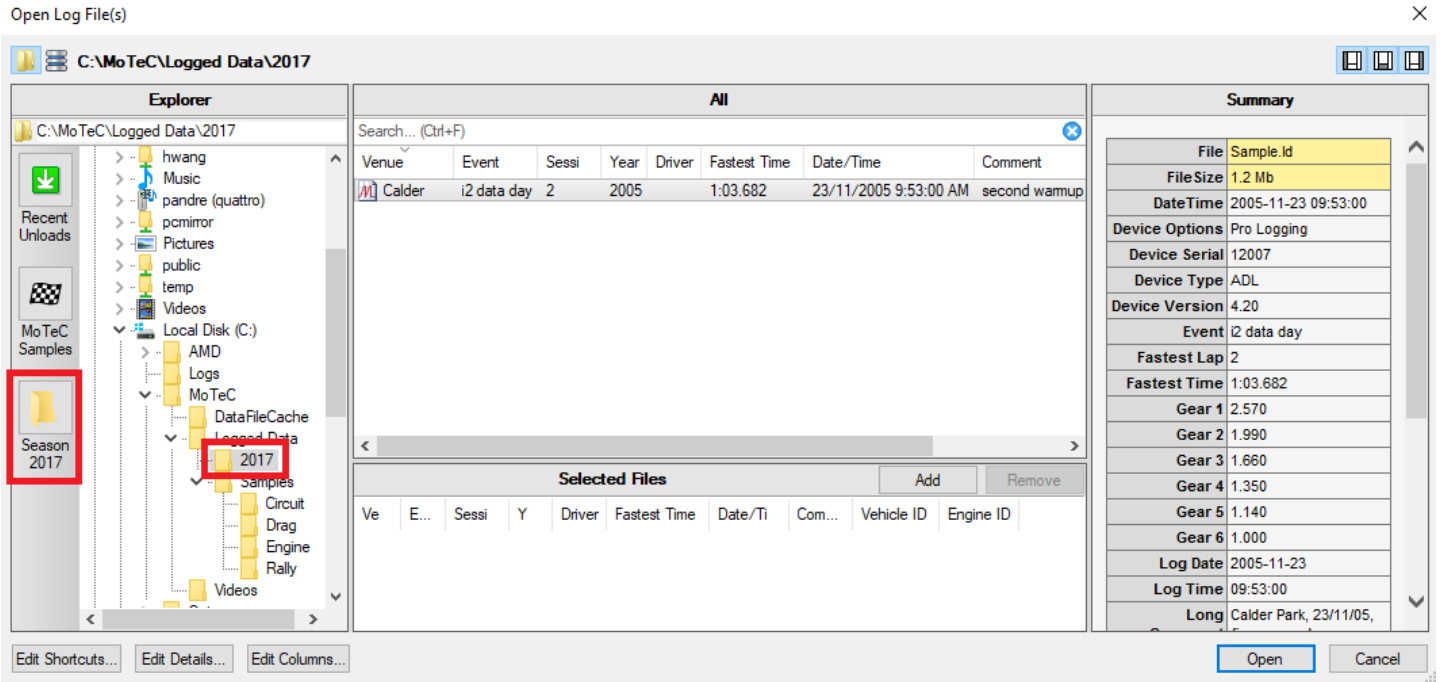
Accessing these folders manually requires navigating a folder hierarchy that can become cumbersome when repeated often. It's now possible to save common folder locations as shortcuts and quickly navigate to them from within the i2 LD File Open dialogue.



### Usage

Clicking on any of the buttons on the left hand side will cause the Folder Tree beside it to focus that location.

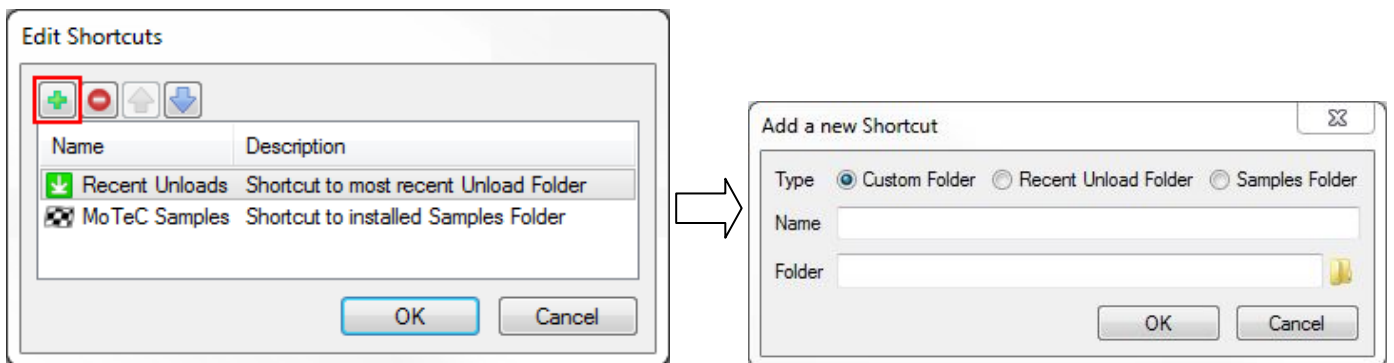
For example:



### Configuration

There are two ways to create a shortcut:

1. Select **Edit Shortcuts...**
  - a) Click the + symbol to add a new shortcut



2. Alternatively, drag a folder you want as a shortcut from the Folder Tree onto an empty area of the shortcuts button panel.

These shortcut preferences are stored on the local machine as a user preference (not part of the Workspace).

### Reports

Channel and Time reports have historically been displayed as textual table representations. This provides the most detailed view of the data, but it can be difficult to easily identify trends. i2 can now optionally show “Channel Report” and “Time Report” results as a line charts.

### Usage

G key cycles through the chart view setting:

- Text view
- Chart view
- Split view (text and chart)

Shift+G toggles the split view orientation (horizontal/vertical).

**Note:** Selecting a cell in the text area will also highlight the chart (and vice-versa).

Summary		, 11A Calder, i2 data day 23/11/2005, 2 9:53:00 AM, second warmup											
		Str 0-1 (End)	Turn 1	Str 1-2	Turn 2	Str 2-3	Turn 3	Str 3-4	Turn 4	Turn 5	Str 5-6	Turn 6	Str 0-1 (Start)
		Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]	Lap 3 [1:05.192]
Corr Speed [km/h]	Min	78.4	70.6	81.3	74.6	76.2	77.2	78.2	71.0	72.0	64.4	64.8	86.9
	Max	239.4	83.2	112.4	82.9	79.2	87.2	201.8	80.4	86.3	96.1	87.4	206.6
Engine RPM [rpm]	Min	2730	2562	2784	2620	2616	2703	2346	2490	2547	2977	3114	4096
	Max	6270	2847	3834	2784	2772	3014	5898	2736	2977	4932	4096	6648
	Avg	4927	2660	3285	2688	2668	2814	4128	2623	2682	3449	3435	5420

Text view

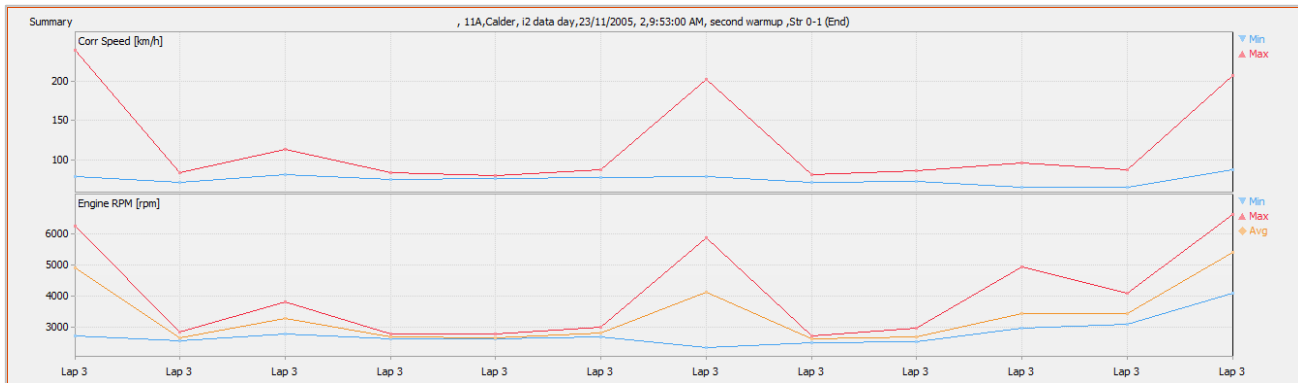
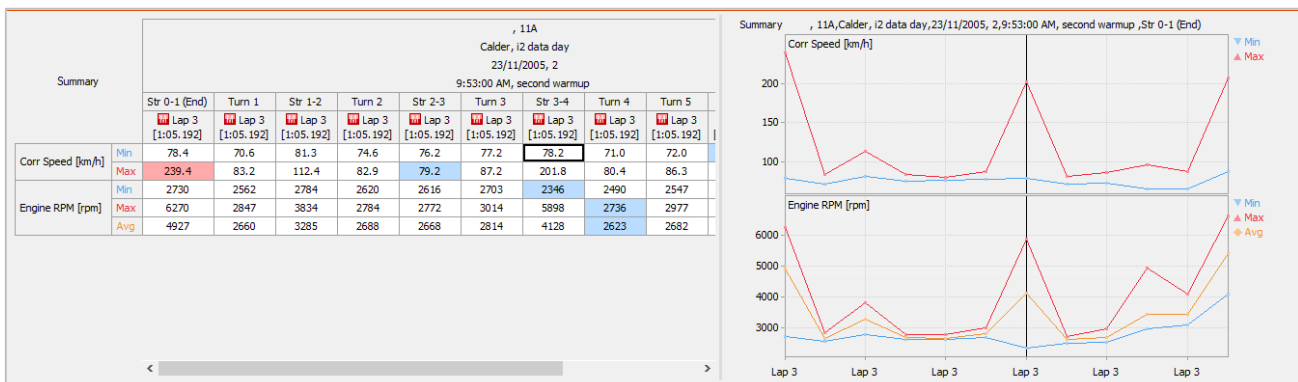


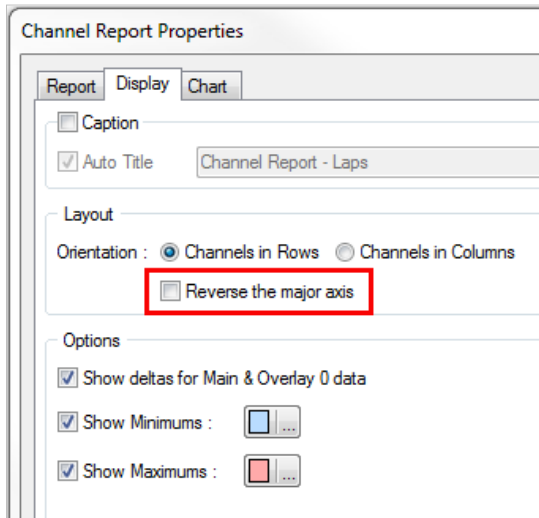
Chart view



Split view

### Channel Report Reverse Display

On the **Display** Tab of the Channel Report there is an option to “Reverse the main axis”, allowing the live lap to display on the left or the right.

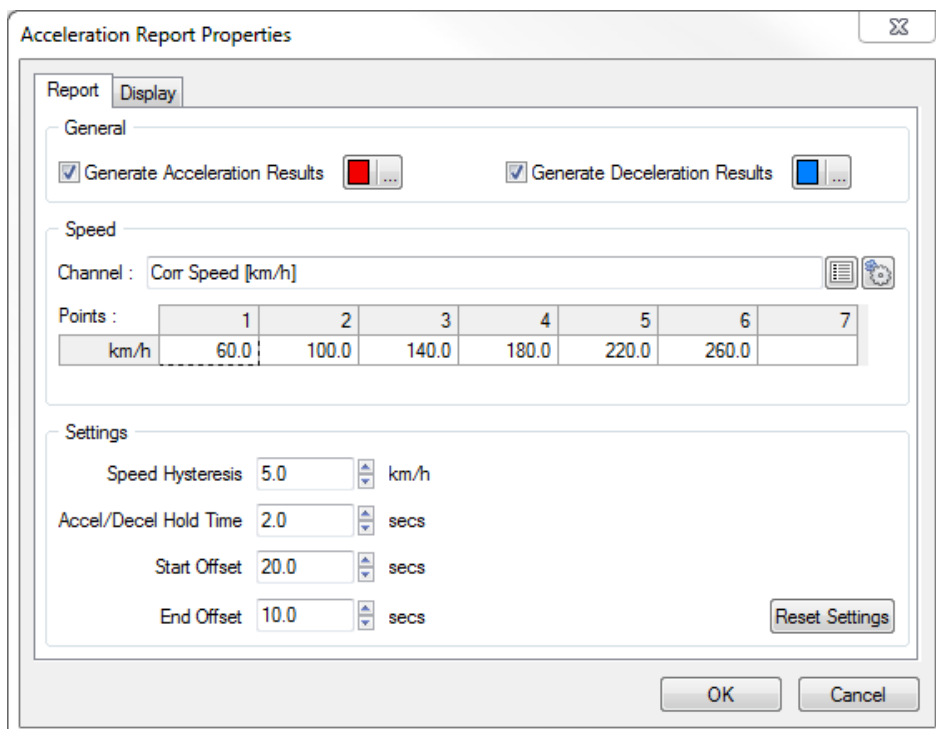


### Acceleration Report Component

A new Acceleration Report has been added in order to analyse acceleration and deceleration characteristics of a vehicle, for example, for category compliance.

Based on the “Corrected Speed” channel (this can be configured), a report is generated based on user defined (speed) intervals that shows minimum and maximum acceleration and deceleration (i.e. the time it takes to get from one speed to another, e.g. 60km/h -> 100km/h).

Results can be displayed in time, distance or (average) G Force and can be toggled with the U key.





**Channel:** The speed channel on which to perform the acceleration/deceleration analysis.

**Points:** An ordered sequence of speeds, with each speed providing a point of reference for the difference calculation.

For example:

60 -> 100, 60 -> 140, 60 -> 180

100 -> 140, 100 -> 180, 100 -> 220

...and so on.

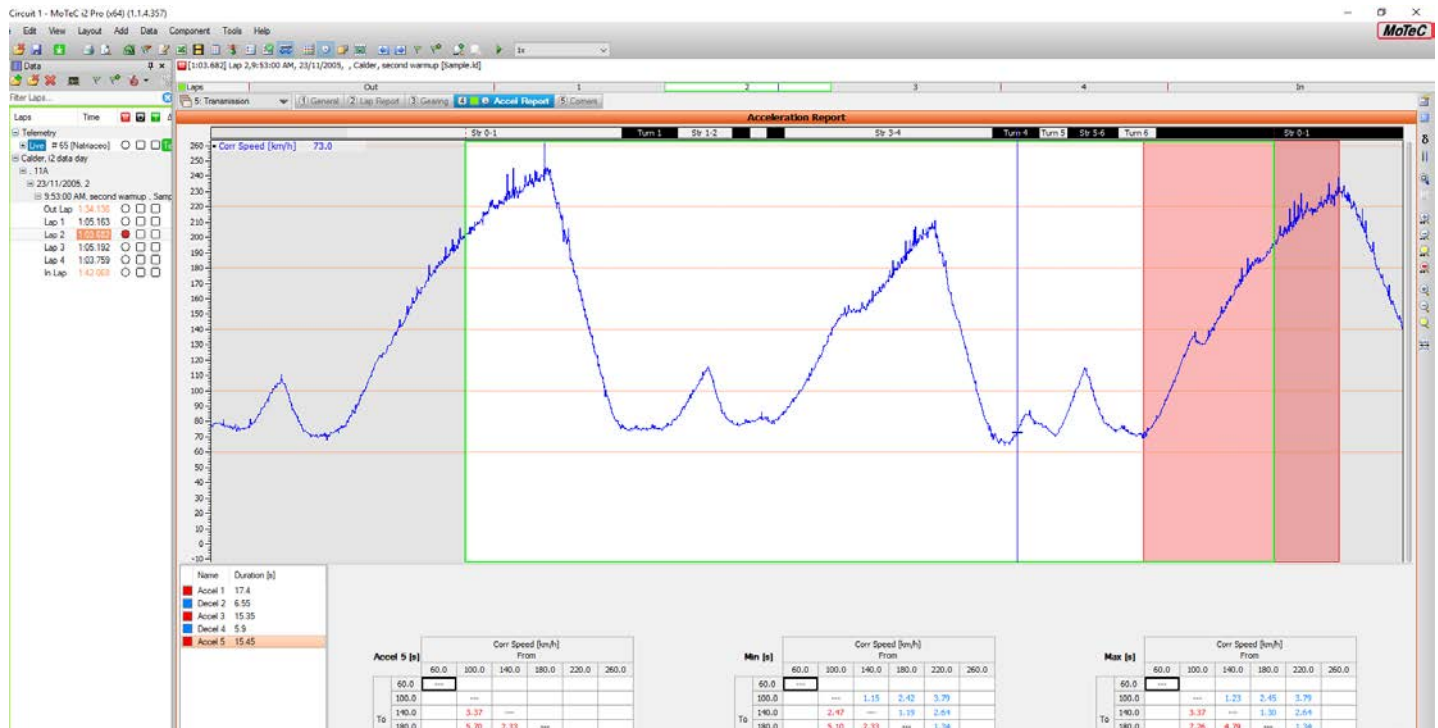
**Speed Hysteresis:** How much speed difference must be seen before entering/exiting an acceleration/deceleration region.

**Accel/Decel Hold Time:** Only include acceleration/deceleration events that hold for at least this amount of time.

**Start Offset:** Display an additional amount of time before the lap (since acceleration/deceleration events may cross a lap boundary).

**End Offset:** Display an additional amount of time after the lap (since acceleration/deceleration events may cross a lap boundary).

Result is shown as follows:



The green outline identifies the lap being analysed (as determined by the Main selection). Extra data is displayed (Start Offset, End Offset) to show acceleration/deceleration events across lap boundaries.

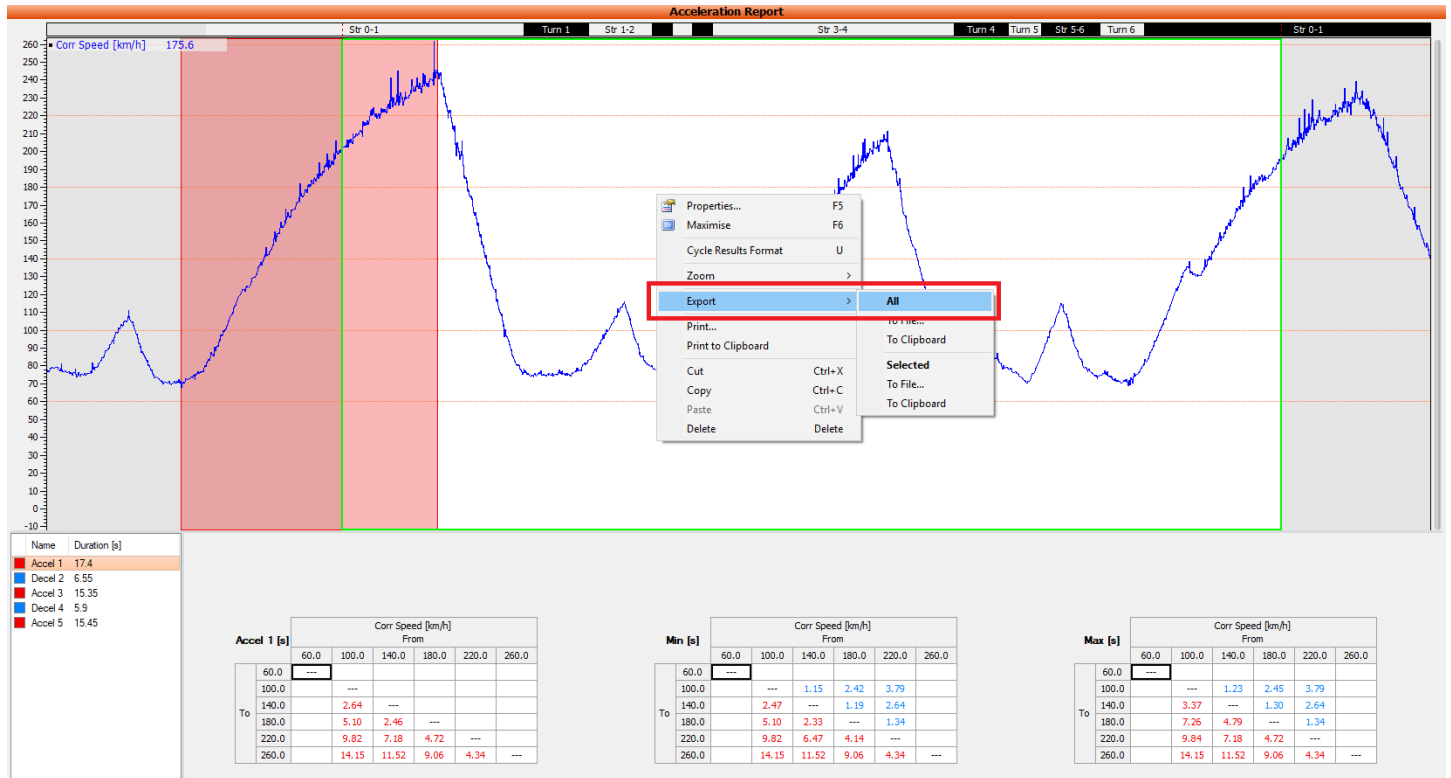
Based on the defined Speed Points, i2 will determine:

1. How long it takes to accelerate (or decelerate) from one speed to another, or
2. How far (distance) it took to achieve a given speed, or
3. Average acceleration (in G) within the region

This provides an indication of the overall acceleration or deceleration characteristics of the vehicle (engine/tyres etc.).

## Export Data Option on Acceleration Reports

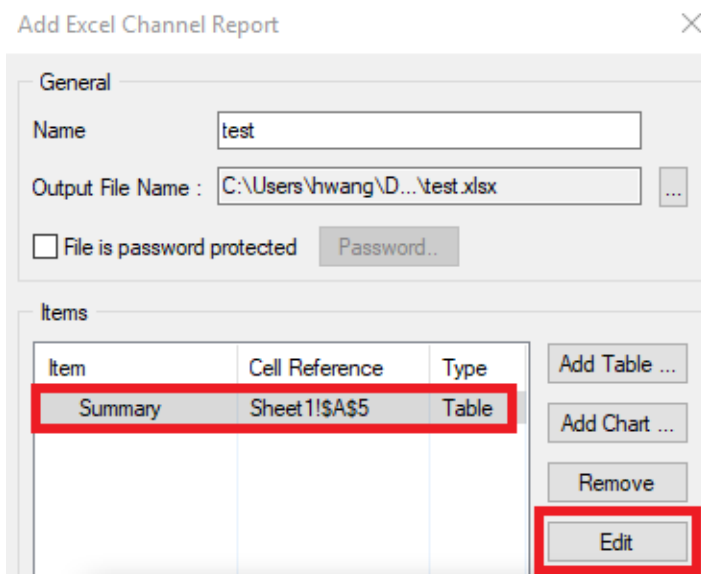
This new feature has been added to export all the Acceleration zones at once by right-clicking on the Acceleration Report, then select **Export > All**.



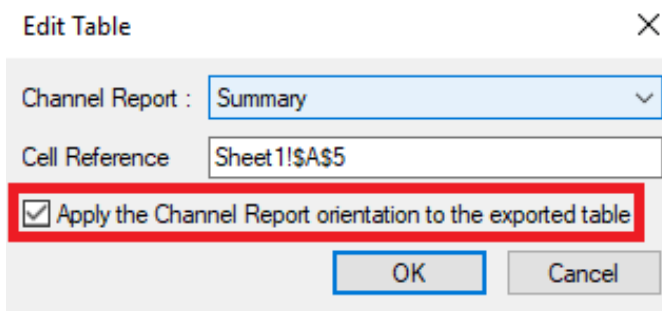
## Excel Report

Excel reports can now be exported in the same orientation as the Channel Report in i2.

1. Select an Excel report in the **Add Excel Channel Report** window, then select **Edit**.



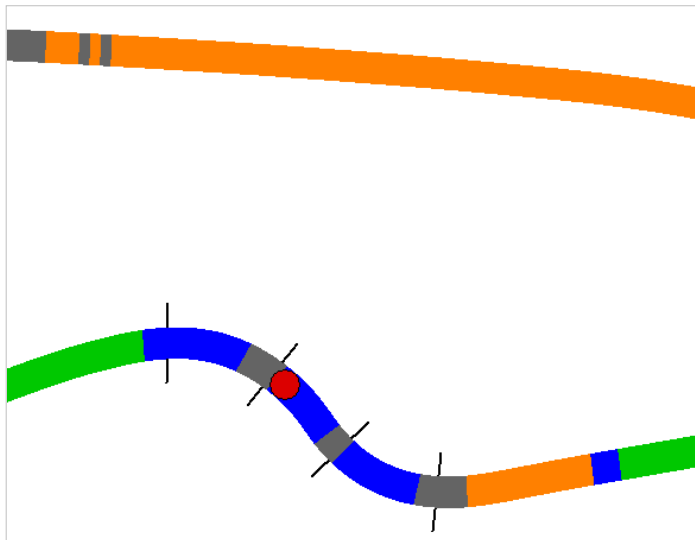
2. In the **Edit Table** window, check **Apply the Channel Report orientation to the exported table**.



### Track Report Zoom

Track Reports can be zoomed.

- Use the mouse wheel to zoom the report.



- Click and drag the zoom box to pan the view.
- Double click the zoom box to reset zoom.

