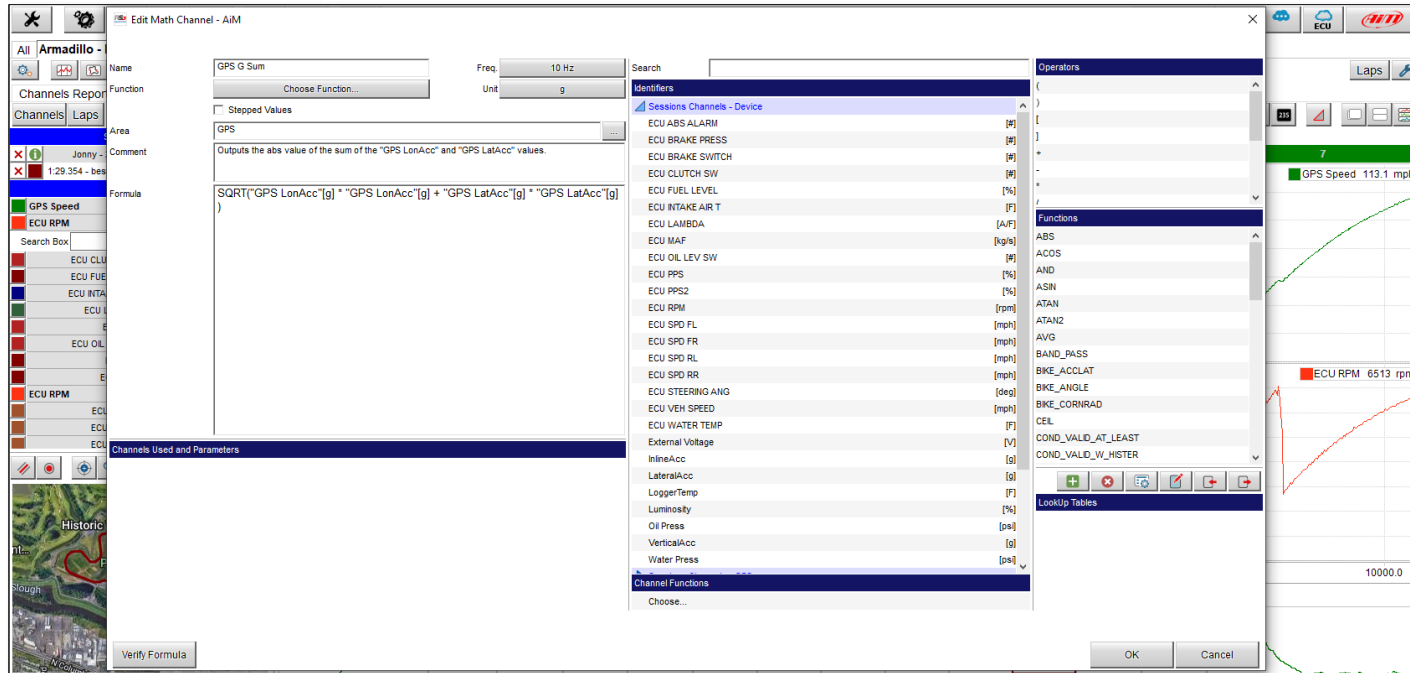


Math Channels

Practical Use of the RS3A Math Channel Function



Co-Host:

Emiliano Bina

AiM-Sportline - Software Lead

Host:

Roger Caddell

AiM Sports - National Training Manager

Co-Host:

Matt Romanowski

TrailBrake.com - Owner



aimsports.com

Tuesday June 7th, 2022

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Emiliano Bina

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RS3
RACESTUDIO

- Graduated in 2000 as Road Vehicles Engineer with a Thesis on a Simulation Model for Toyota Prius Hybrid Powertrain
- Software Developer for AiM Since 2000: RaceStudio2 Analysis, DragAnalyzer, GPSManager, RaceStudio3
- Passion for Sim Racing and Motorsport, Cooperated for Data Analysis in Endurance Races
- Many Time AiM Sports Webinar Co-Host!



Emiliano Bina

AiM-Sportline Software Developer



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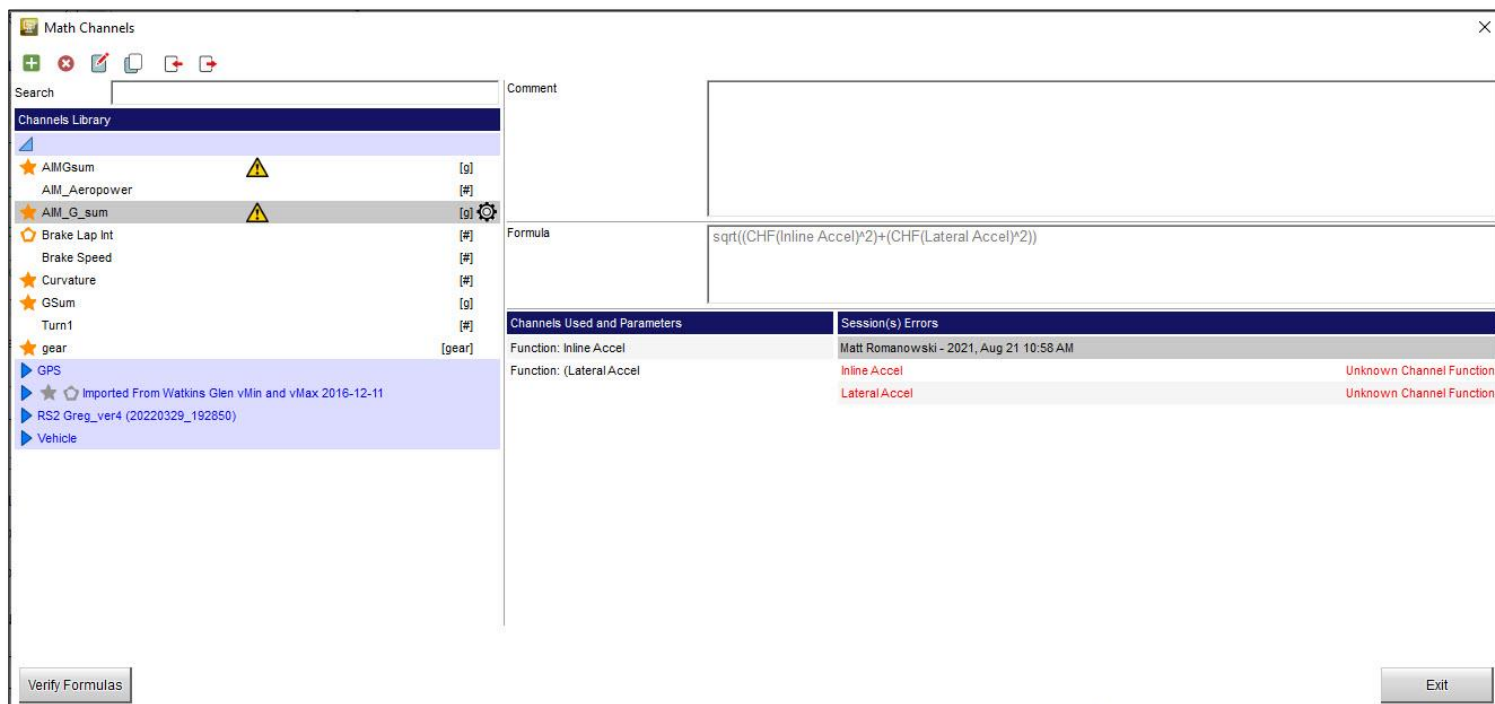


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Math Channels - Notes

When there is a problem, RS3 Analysis will tell you where it is.

Note the exclamation next to the channel names and red channel name and error.



Math Channels

Search:

Channels Library

- ★ AIMGsum [g]
- AIM_Aeropower [#]
- ★ AIM_G_sum [g] ⚠
- ☆ Brake Lap Int [#]
- Brake Speed [#]
- ★ Curvature [g]
- ★ GSum [g]
- Turn1 [#]
- ★ gear [gear]
- ▶ GPS
- ★ Imported From Watkins Glen vMin and vMax 2016-12-11
- ▶ RS2 Greg_ver4 (20220329_192850)
- ▶ Vehicle

Comment

Formula

$$\sqrt{(\text{CHF}(\text{Inline Accel})^2 + (\text{CHF}(\text{Lateral Accel})^2)}$$

Channels Used and Parameters	Session(s) Errors
Function: Inline Accel	Matt Romanowski - 2021, Aug 21 10:58 AM
Function: (Lateral Accel	Inline Accel Unknown Channel Function
	Lateral Accel Unknown Channel Function

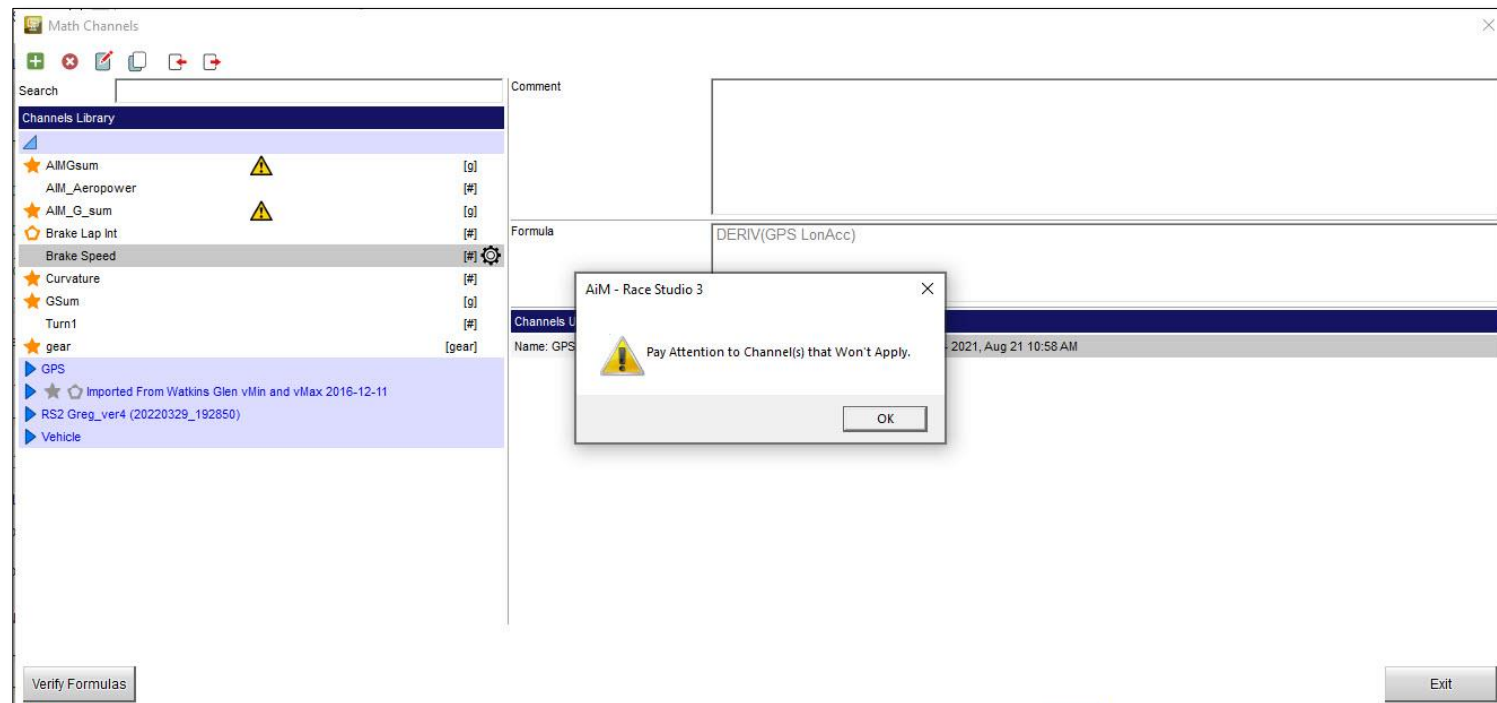
Verify Formulas

Exit

Math Channels - Closing

This popup only tells you that there are some channels in all your sets that won't apply.
This is not saying the channel you just made won't work.

Remember to check the error codes if it's a channel you want to apply.



Math Channels - Errors

Sessions Loaded:

✖ ⓘ Matt Romanowski - 2021, Jul 12 4:25 PM

✖ 1:03.312 - best 4:58:50 PM 0:31.656

Channels:

	RPM	6004	rpm
Search Box			
GPS Gyro	-4.4	deg/s	^
GPS Altitude	451.23	ft	
GPS PosAccuracy	8	in	
GPS Radius	1797.7	ft	
GPS Latitude	41.9251827	deg	
GPS Longitude	-73.3847988	deg	
Distance on GPS Speed	161009.4	ft	
Curvature	0.001	#	
gear	0	gear	
GSum	0.38	n	
Errors detected computing math channel ECU RPM: Can't find a channel with this exact name			
Brake Lap Int	5	#	
AIM G sum	0.00	g	
AIM Gear	0	gear	

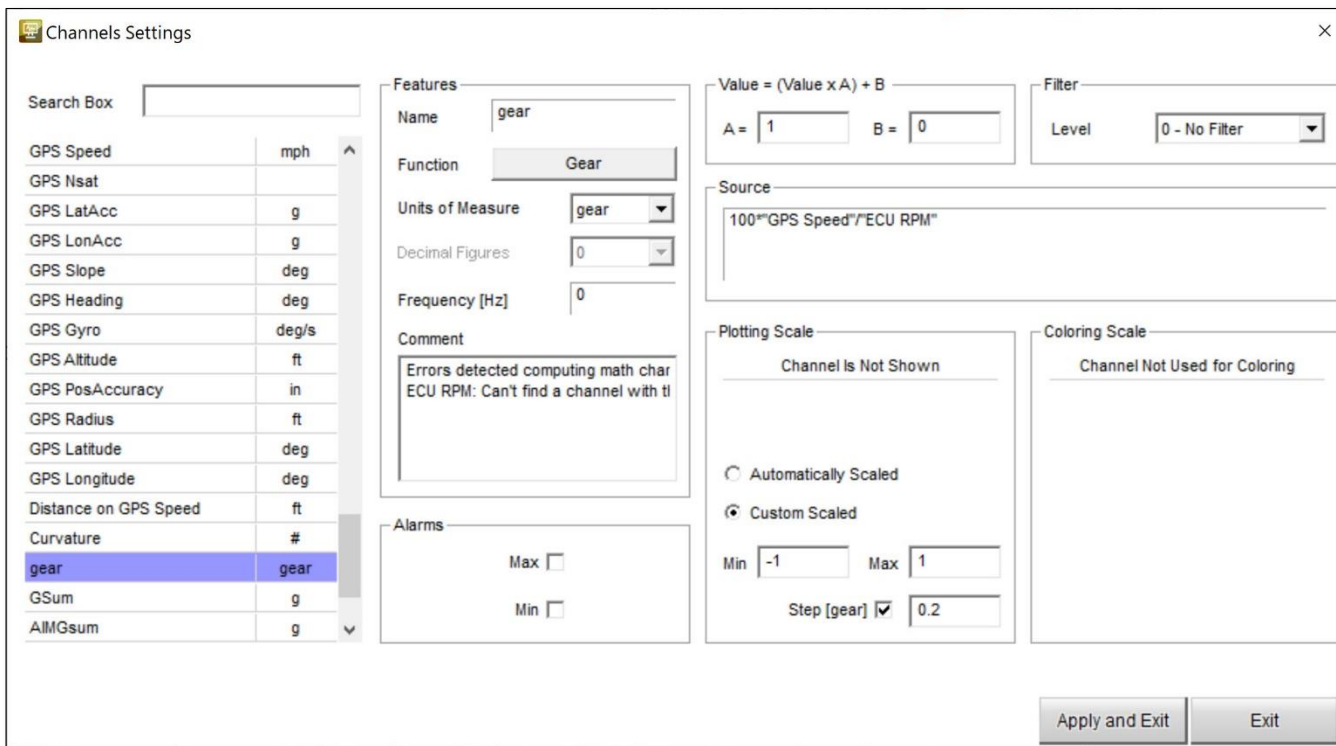
The note in the channels list indicates that something is wrong with that channel.

When you hover over it, you will see a dialogue box that describes the error.

Math Channels - Errors

The comments box in the Channels Settings also has the description of what is causing the error.

Also note the logging rate is set to 0 Hz as the math engine can not compute this channel.



The screenshot shows the 'Channels Settings' window for the 'gear' channel. The left sidebar lists various channels, with 'gear' selected. The main area contains the following settings:

- Search Box:** Empty
- Features:**
 - Name: gear
 - Function: Gear
 - Units of Measure: gear
 - Decimal Figures: 0
 - Frequency [Hz]: 0
 - Comment: Errors detected computing math char ECU RPM: Can't find a channel with t
- Alarms:**
 - Max: ☐
 - Min: ☐
- Value = (Value x A) + B:**
 - A: 1
 - B: 0
- Filter:**
 - Level: 0 - No Filter
- Source:**
 - 100*"GPS Speed"/"ECU RPM"
- Plotting Scale:**
 - Channel Is Not Shown
 - ☐ Automatically Scaled
 - ☒ Custom Scaled
 - Min: -1
 - Max: 1
 - Step [gear]: ☒ 0.2
- Coloring Scale:**
 - Channel Not Used for Coloring

Buttons at the bottom right: Apply and Exit, Exit.

Math Channels - Samples

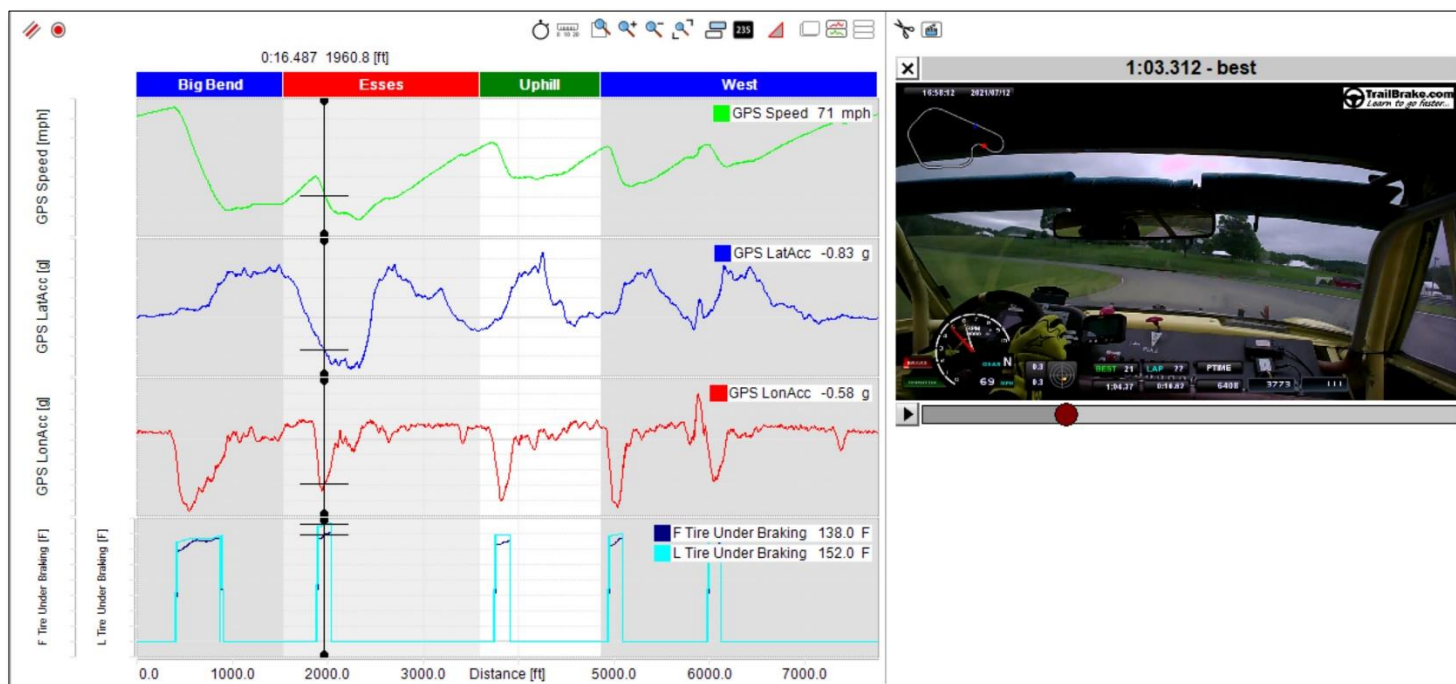
Curvature: $1/\text{GPS Radius}$

Steering Speed: $\text{DERIV}(\text{"STEERINGPOSITION"})$

Brake Speed: $\text{DERIV}(\text{"STEERINGPOSITION"})$

Front Tire Temp when Braking:

$\text{IF}(\text{HIGH_PASS}(\text{"BRAKEPRESSURE"}, 20), \text{AVG}(\text{"FLTIRETEMP"}, \text{"FRTIRETEMP"}), 0)$



Race Studio 3 – Math Channels

Math Channels - Samples

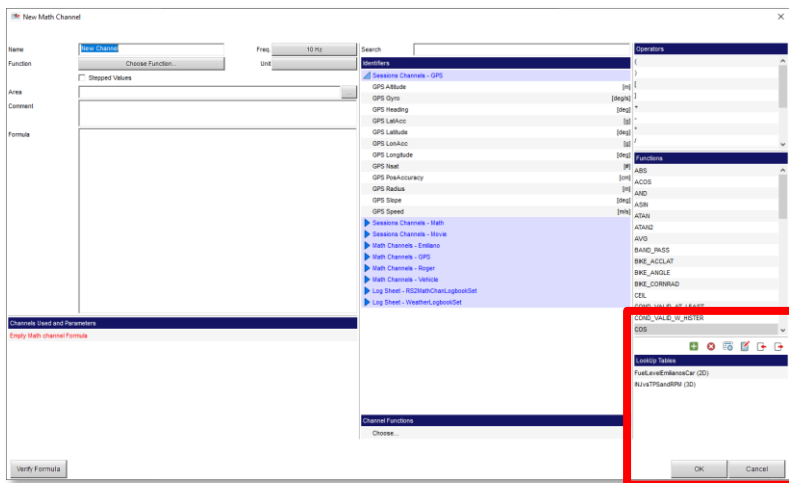
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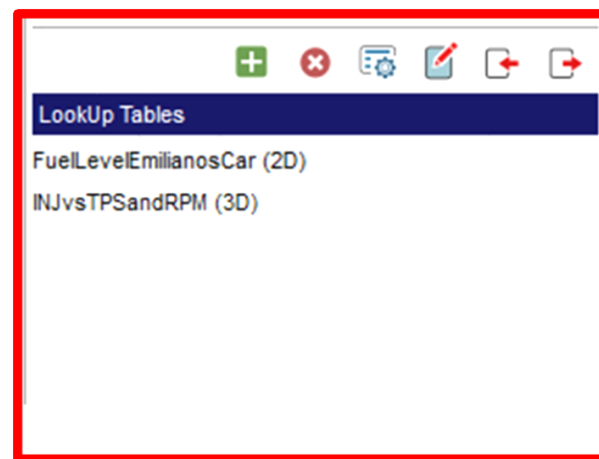
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Math Channels – Creation (LookUp Tables)

You're now allowed to define your own curves.



- New
- Delete
- Properties
- Edit File
- Import
- Export

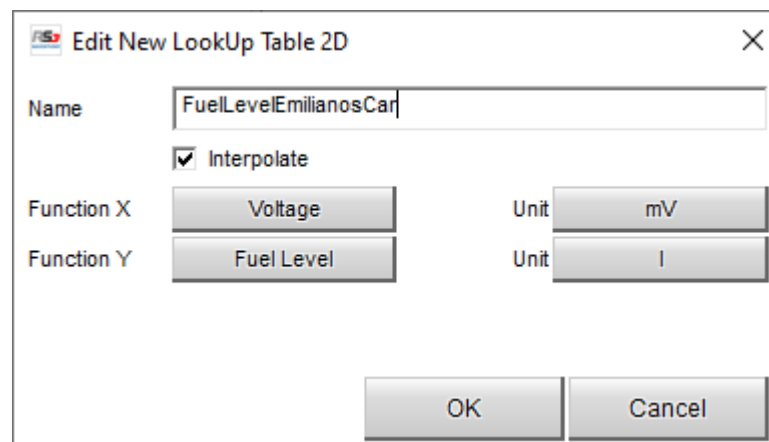


Math Channels – Creation (LookUp Tables)

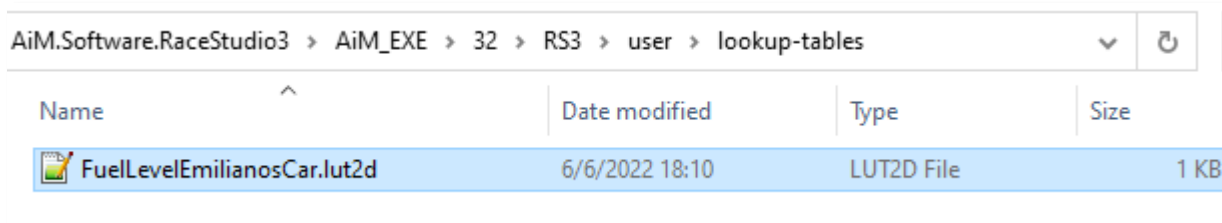


While creating a lookup table or modifying its properties:

- Set table name (will be the file name)
- Choose if to interpolate it
- Choose function and units for X axis
- Choose function and units for Y axis



When you choose to edit the lookup table file, you're prompted a Windows Explorer window, through which you can access the file and edit it with any text editor, i.e. Windows Notepad.

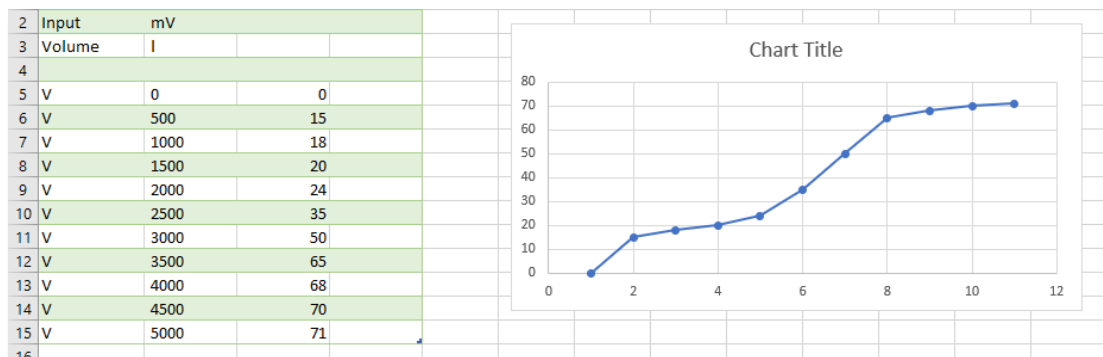


Math Channels – Creation (LookUp Tables)



Take any 2D curve...

... and make a lookup table
out of it



```

1 X, mV, 21, 11
2 Y, 1, 1430
3 I, INTERP
4 BEGIN_TABLE
5 V, 0, 0
6 V, 500, 15
7 V, 1000, 18
8 V, 1500, 20
9 V, 2000, 24
10 V, 2500, 35
11 V, 3000, 50
12 V, 3500, 65
13 V, 4000, 68
14 V, 4500, 70
15 V, 5000, 71
16 END_TABLE
    
```

The exact number of rows.

The curve points, using the
units specified in the first
two lines.

Math Channels – Creation (LookUp Tables)



While creating a lookup table or modifying its properties:

- Set table name (will be the file name)
- Choose if to interpolate it
- Choose function and units for X axis
- Choose function and units for Y axis
- Choose function and units for Z axis

Edit New LookUp Table 3D

Name: INJvsTPSandRPM

☒ Interpolate

Function X	Percent Throttle Load	Unit	%
Function Y	Engine RPM	Unit	rpm
Function Z	Injection Advance Ti...	Unit	ms

OK Cancel

... and make a lookup table
out of it

[illegible]

```

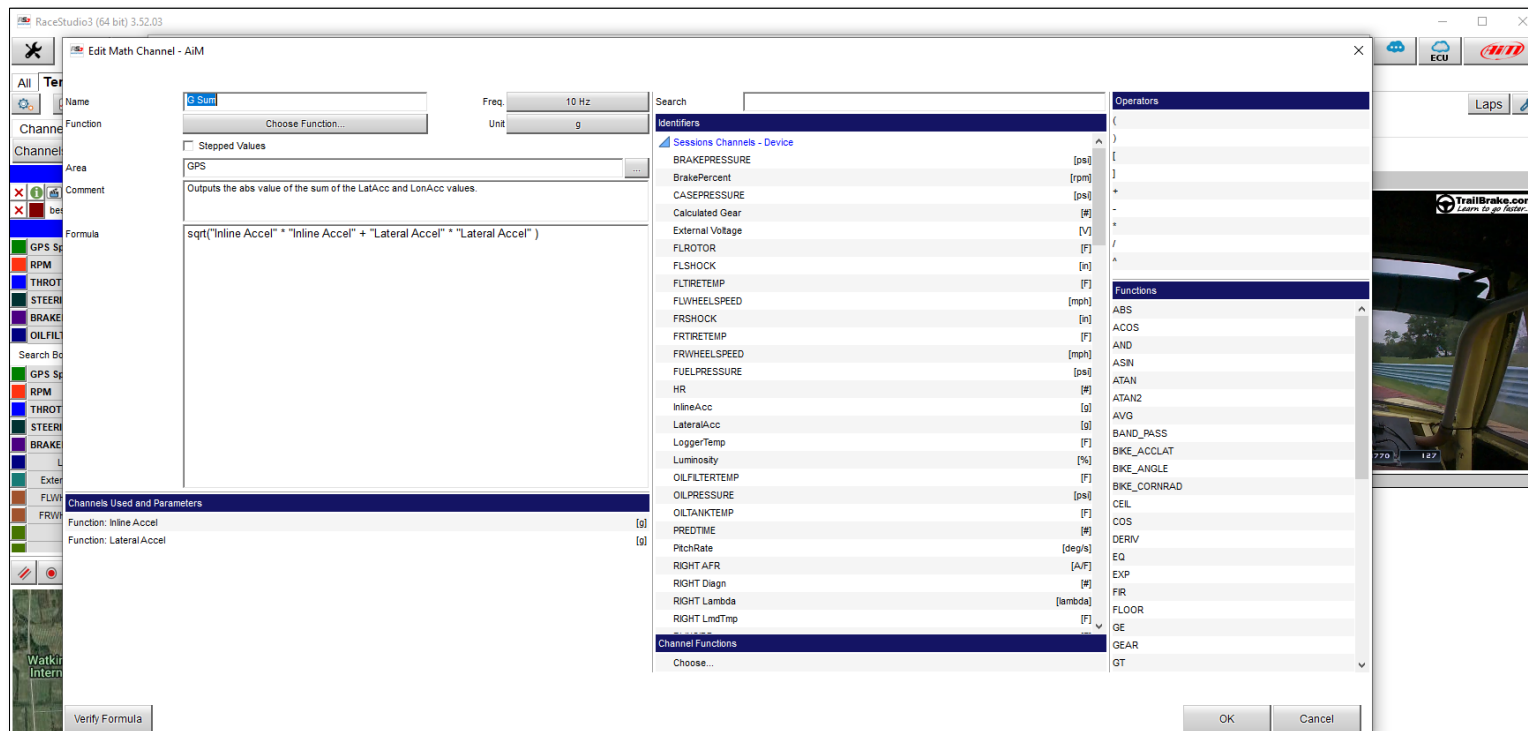
1 X, %, 3713, 10
2 Y, rpm, 15, 64
3 Z, ms, 2218
4 I, INTERP
5 BEGIN_TABLE
6 V, *, 250, 500, 750, 1000, 1250, 1500, 1750, 2000, 2250
7 V, 0, 1, 1, 1, 1, 1, 0.932, 0.932, 0.932, 0.932, 0.932,
8 V, 2.5, 1.237, 1.237, 1.237, 1.237, 1.237, 1.237, 1.237,
9 V, 5, 1.538, 1.538, 1.538, 1.538, 1.538, 1.538, 1.538, 1.54,
10 V, 10, 1.938, 1.938, 1.938, 1.938, 1.938, 1.938, 1.941,
11 V, 25, 3.32, 3.32, 3.32, 3.32, 3.32, 3.32, 3.312, 3.32,
12 V, 33, 3.46, 3.46, 3.46, 3.46, 3.46, 3.46, 3.456, 3.46,
13 V, 50, 3.65, 3.65, 3.65, 3.65, 3.65, 3.65, 3.636, 3.64,
14 V, 66, 3.71, 3.71, 3.71, 3.71, 3.71, 3.71, 3.708, 3.70,
15 V, 75, 3.75, 3.75, 3.75, 3.75, 3.75, 3.76, 3.762, 3.76,
16 V, 100, 3.88, 3.88, 3.88, 3.88, 3.88, 3.88, 3.888, 3.88,
17 END_TABLE
18
19

```

The exact number of rows.
The exact number of columns.

The curve points, using the units specified in the first three lines.

Live RS3A Demonstration



Race Studio 3 – Math Channels

Live RS3A Demonstration

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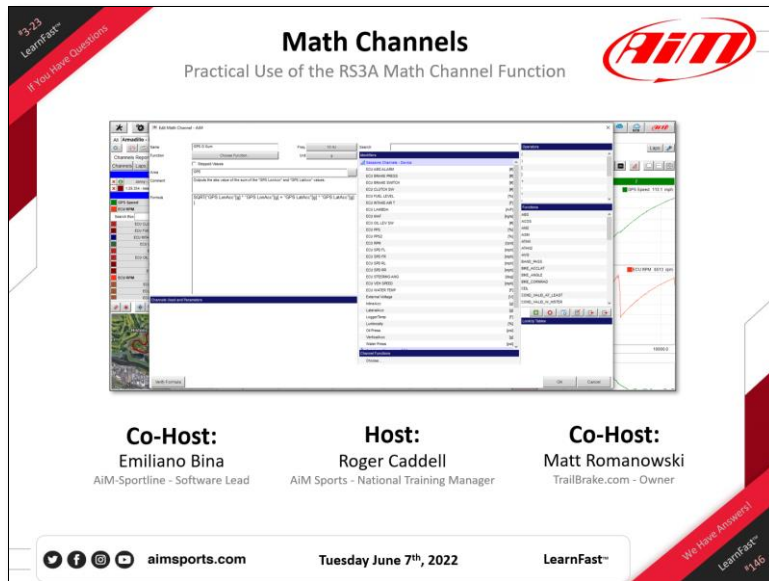


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 - Customizing AiM Device Logos
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 - **I Have Downloaded my Data, Now What - Part 2*
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 - Sort Channels
 - Test Properties
 - Per Lap Color
 - Export Tests
 - Channel Reports
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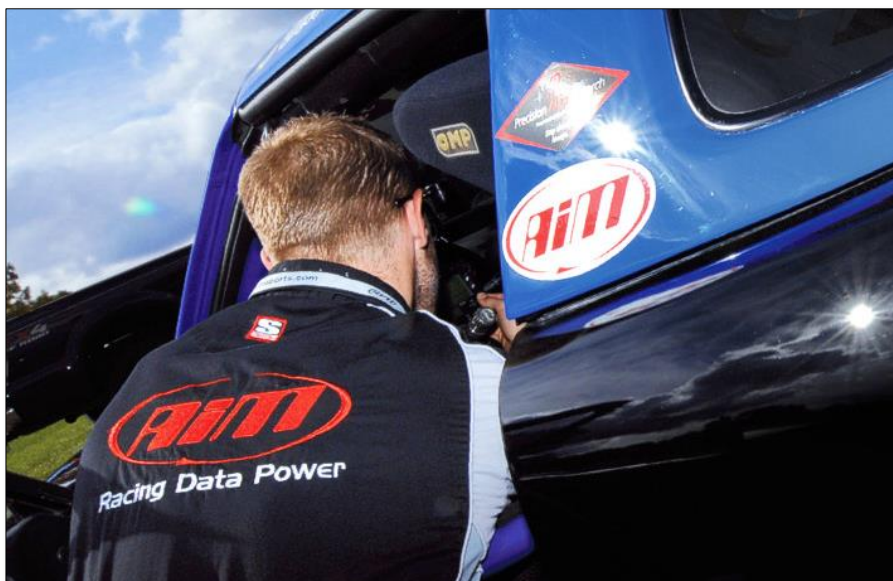
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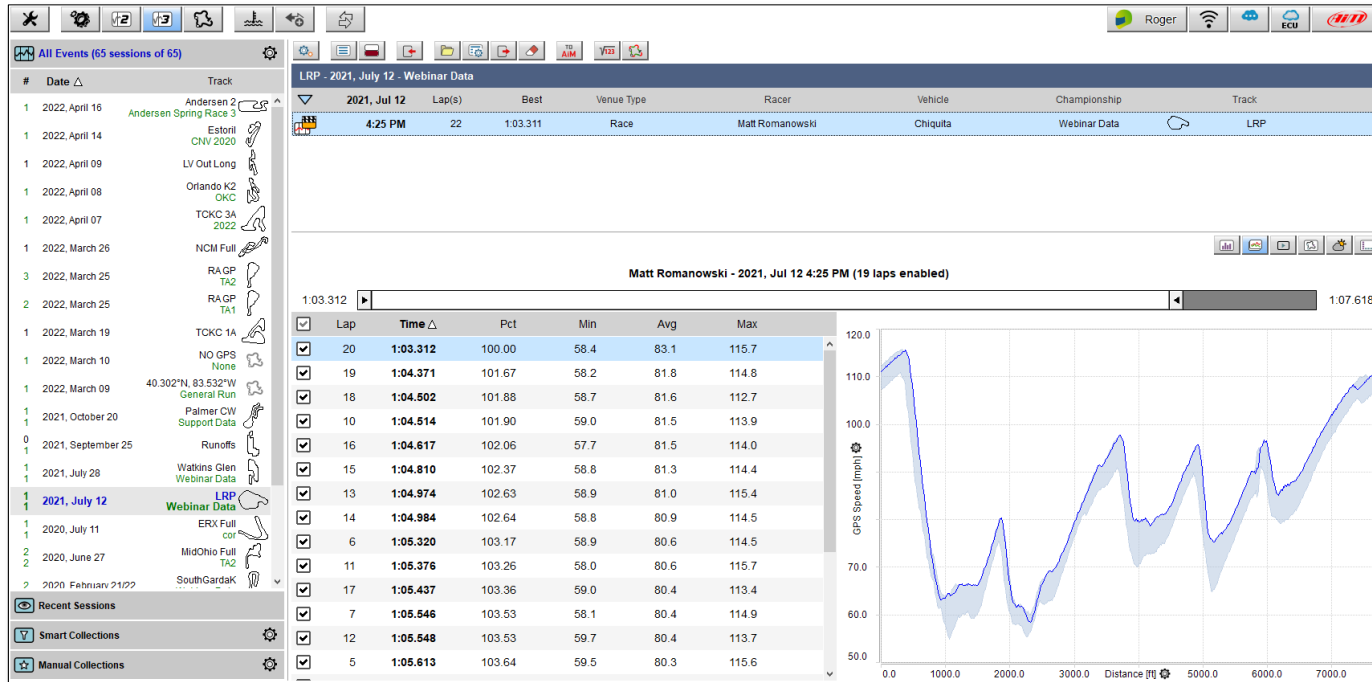
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TBD
TBD



Host:

Roger Caddell

AIM Sports - National Training Manager

Co-Host:

TBD

TBD

Next Webinar: Tuesday June 14th, 2022 - 10:00am Pac/1:00pm East

Next Webinar

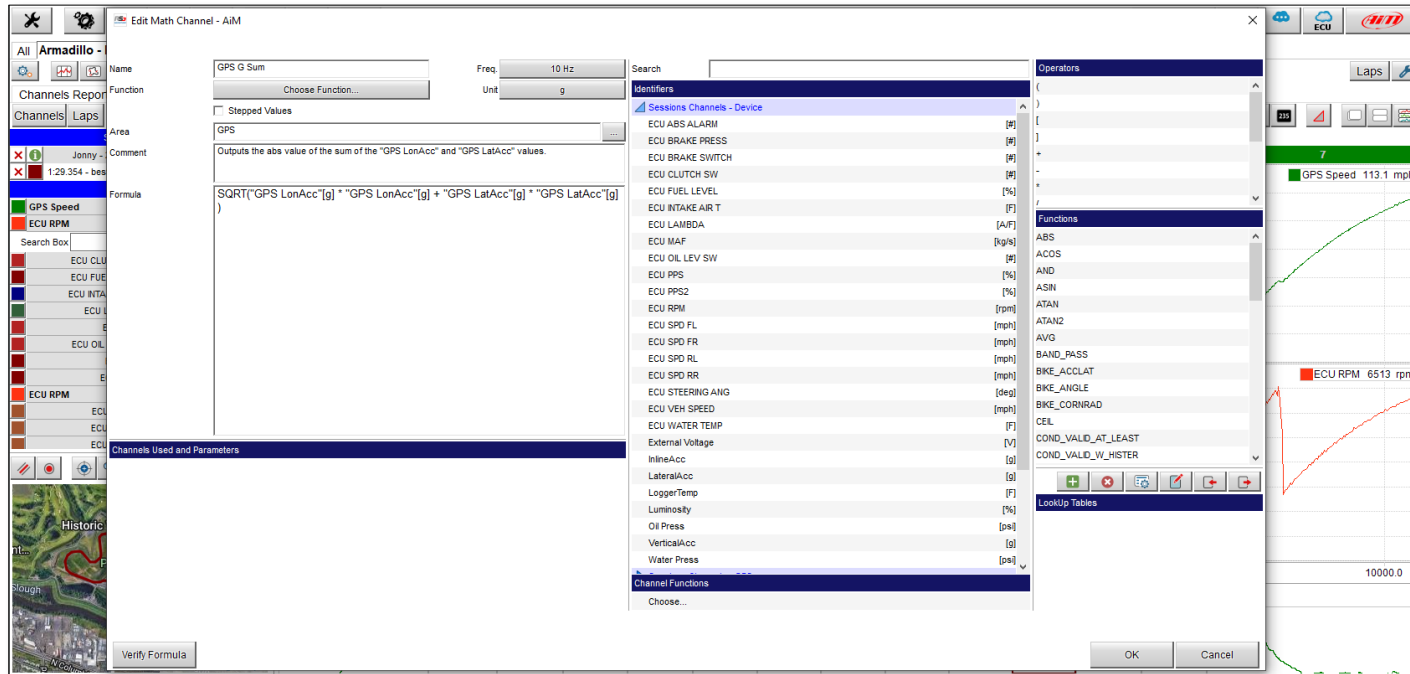
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Tuesday June 7th, 2022

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