

RS3

Math Channels – channels meanings

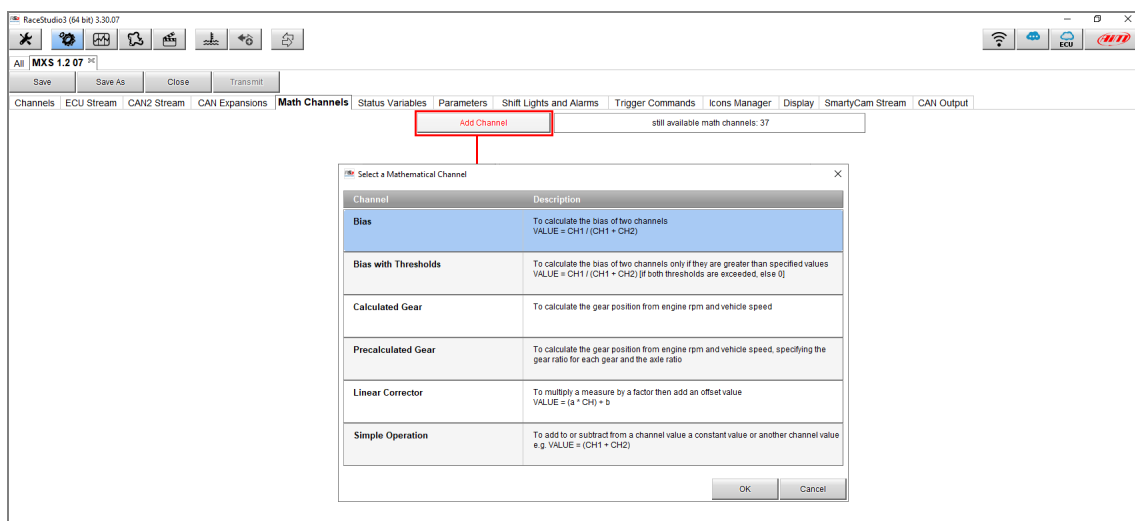
Question:

How can I use mathematical channels and how should I interpret their calculated values?

Answer:

Mathematical channels allow to apply mathematical calculations to one or more device channels: in this way, an additional channel is obtained, that refers the value of those operations, based on instant reference values recorded during the session.

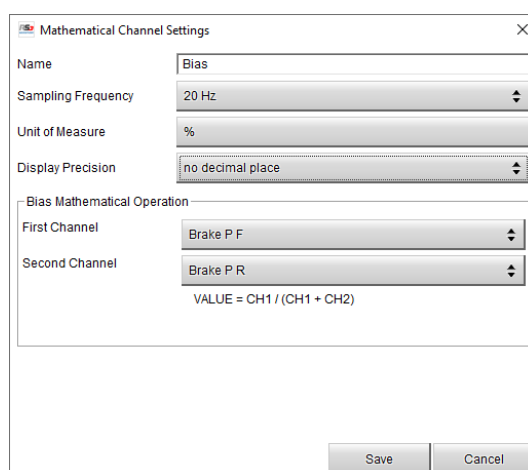
To create mathematical channels, enter the “Math Channels” tab, available into the configuration section of the devices managed through Race Studio 3: clicking the “Add Channel” button (following image), a window appears that describes each available math channel logic.



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Bias: this math channel must be created to express the intervention percentage of the first between the two selected channels (that must be relevant, i.e.: with the same function), calculating it in relation with their addition.

In the following example, the relation between front and rear brake pressure channels is expressed.



Mathematical Channel Settings

Name: Bias

Sampling Frequency: 20 Hz

Unit of Measure: %

Display Precision: no decimal place

Bias Mathematical Operation

First Channel: Brake P F

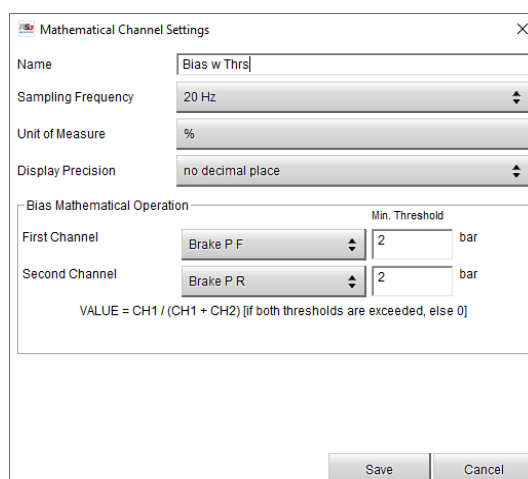
Second Channel: Brake P R

VALUE = CH1 / (CH1 + CH2)

Save Cancel

Bias with Threshold: this math channel function is the same as “Bias”, with an additional threshold value that filters those values not exceeding it. This additional setting is useful, for example, when the two selected channels show a not stable behaviour, for example brake pressures not equal to zero.

This math channel value is different from zero when both the channels values assume higher instant values than the threshold ones.



Mathematical Channel Settings

Name: Bias w Thrs

Sampling Frequency: 20 Hz

Unit of Measure: %

Display Precision: no decimal place

Bias Mathematical Operation

First Channel: Brake P F

Second Channel: Brake P R

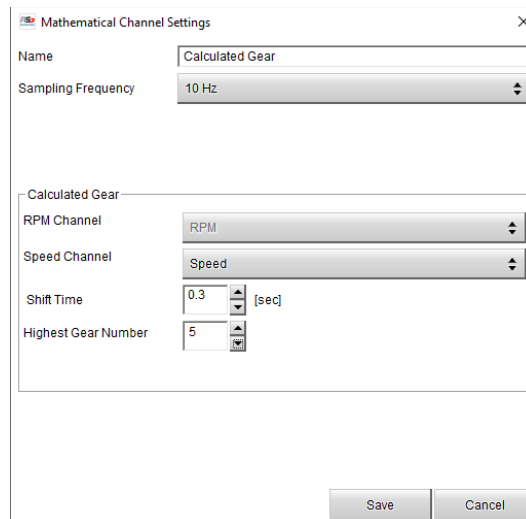
Min. Threshold: 2 bar

VALUE = CH1 / (CH1 + CH2) [if both thresholds are exceeded, else 0]

Save Cancel

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Calculated Gear: this math channel can calculate gear, selecting the reference RPM and speed channels, shifting time and the highest gear number. Once the setup has been transmitted, it is necessary to perform a gear calibration lap, so that the system can calculate each gear ratio.

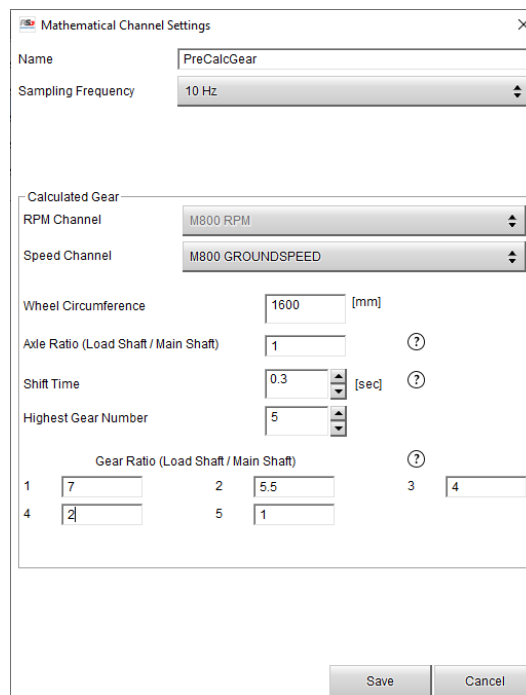


The image shows a 'Mathematical Channel Settings' dialog box. It has a title bar with a close button (X). Inside, there are two main sections. The first section has a 'Name' field with the text 'Calculated Gear' and a 'Sampling Frequency' dropdown menu set to '10 Hz'. The second section is titled 'Calculated Gear' and contains four settings: 'RPM Channel' with a dropdown set to 'RPM', 'Speed Channel' with a dropdown set to 'Speed', 'Shift Time' with a numeric input of '0.3' and a unit selector set to '[sec]', and 'Highest Gear Number' with a numeric input of '5'. At the bottom right of the dialog are 'Save' and 'Cancel' buttons.

| | |
|---------------------|-----------------|
| Name | Calculated Gear |
| Sampling Frequency | 10 Hz |
| Calculated Gear | |
| RPM Channel | RPM |
| Speed Channel | Speed |
| Shift Time | 0.3 [sec] |
| Highest Gear Number | 5 |

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Pre-Calculated Gear: thanks to this math channel it is possible to pre-calculate gear, selecting the reference RPM and speed channels and completing the other settings, defining all gear ratios, wheel circumference and axle ratio. In case there is also a final transmission (i.e. motorbikes), multiply the primary and final transmission ratio together and type the result in the “Axle Ratio” box. In this case, calibration lap is not necessary.



Mathematical Channel Settings

Name: PreCalcGear

Sampling Frequency: 10 Hz

Calculated Gear

RPM Channel: M800 RPM

Speed Channel: M800 GROUNDSPED

Wheel Circumference: 1600 [mm]

Axle Ratio (Load Shaft / Main Shaft): 1 ?

Shift Time: 0.3 [sec] ?

Highest Gear Number: 5

Gear Ratio (Load Shaft / Main Shaft) ?

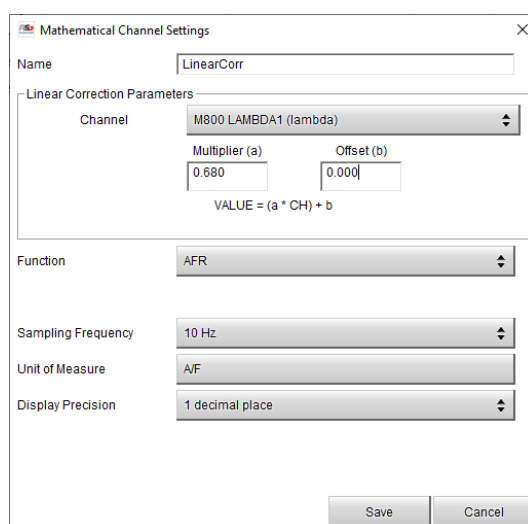
| | | | | | |
|---|---|---|-----|---|---|
| 1 | 7 | 2 | 5.5 | 3 | 4 |
| 4 | 2 | 5 | 1 | | |

Save Cancel

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Linear Corrector: it is possible to set a multiplier and a positive/negative offset to the channel instant value, so to correct its final measure.

In the following image, Lambda channel is included into this operation (multiplied), to obtain its related AFR value.



Mathematical Channel Settings

Name: LinearCorr

Linear Correction Parameters

Channel: M800 LAMBDA1 (lambda)

Multiplier (a): 0.680

Offset (b): 0.000

VALUE = (a * CH) + b

Function: AFR

Sampling Frequency: 10 Hz

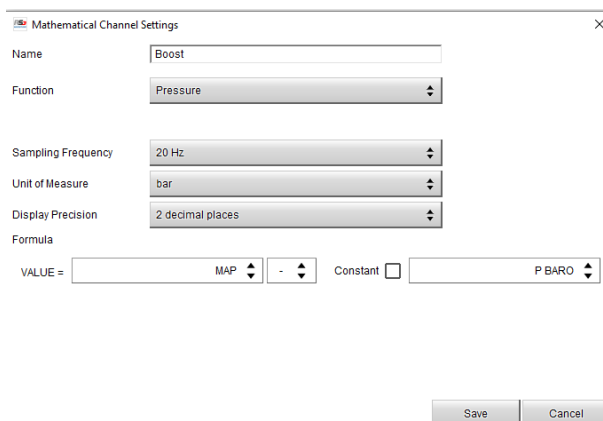
Unit of Measure: A/F

Display Precision: 1 decimal place

Save Cancel

Simple Operation: starting from an existing channel, a new math channel can be obtained, adding or subtracting a constant value or another configuration channel instant value.

In the following example, instant barometric pressure value is subtracted to the manifold air pressure one, to obtain the resulting boost pressure value, given by the difference between these two channels values during the session.



Mathematical Channel Settings

Name: Boost

Function: Pressure

Sampling Frequency: 20 Hz

Unit of Measure: bar

Display Precision: 2 decimal places

Formula

VALUE = MAP - Constant P BARO

Save Cancel