EVO4S Logger

USER GUIDE

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Made in Italy

Thanks.

Dear Customer,

First, we would like to thank you for choosing the EVO4S logger as the tool for improving your racing craft setup and on track performance.

EVO4S is an expandable new generation logger with high sampling capabilities, recording data from a variety of sensors and sources.

Please, before digging into your new data system, keep in mind that we are constantly working on bettering our software and firmware.
So, be sure to check our website periodically for any updates.

www.aim-sportline.com

What is EVO4S?

EVO4S is the evolution of the well known EVO4: same connection logic, one connector per channel, but with a completely redesigned internal electronic board, fully compatible with the last generation of AiM dash/logger and ready for the new RaceStudio 3 software.

Which data does it manage?

Data come from a wide range of sources, including your vehicle ECU, the internal accelerometers and gyro, the GPS module included in the kit, the analog/digital inputs, the external expansions as well as predefined math channels.

Is there a digital output ?

Yes, EVO4S features a digital output you can freely configure.

Are EVO4S data compatible with old MXL/EVO4 data?

Yes, MXL used to produce data in DRK format. EVO4S offers an improved data management and produces XRK format that only Race Studio 3 can read.

Nevertheless, the last releases of Race Studio 2 can detect XRK files and transform them into old DRK format files that are compatible with MXL1 and EVO4 files.

What is the difference between the old DRK format and new XRK?

XRK, taking advantage of GPS technology, associates absolute time and GPS position to each data with the precision of 1 millisecond.

In this way, it is possible to better compare different laps and tests.

How do I download the data from my EVO4S?

EVO4S stores data in its 4GB memory. Download procedure can be easily performed connecting the logger to your PC.

What about RaceStudio3?

RaceStudio3 is the new software for managing configuration, data download and data analysis for all the future AiM systems.

It is going to substitute RaceStudio2, which has accompanied us for almost 15 years.
Based on a totally new and much more flexible architecture, it is a work in progress; some features still have to be developed, so they are actually shared with Race Studio 2.

We are going to upgrade it very often, so, please, don't forget to check our web site at www.aim-sportline.com.

2. What is in the kit

The EVO4S kit includes:

EVO4S logger

Harness

Kit 1
Power, CAN, Dig.Out., USB

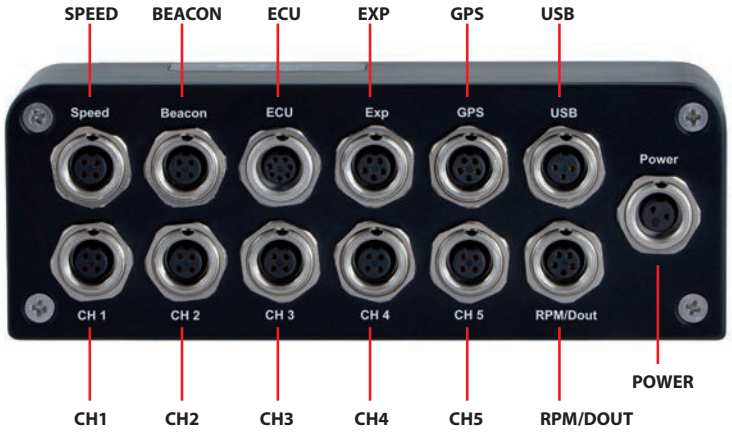
Kit 2
Power, OBD (CAN+K), Dig.Out, USB

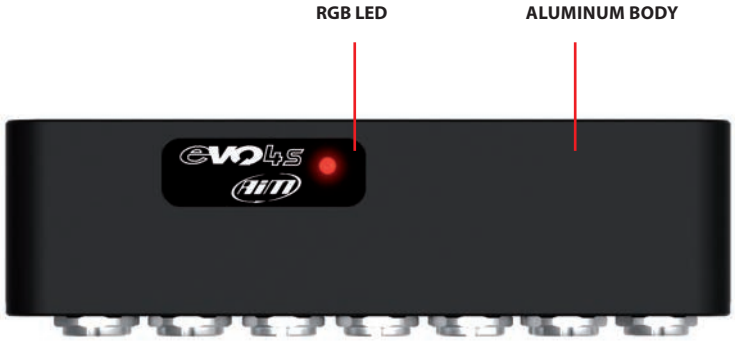
Optional
RS232, RPM+Dig.Out.,CAN+Power

GPS08 module

Software

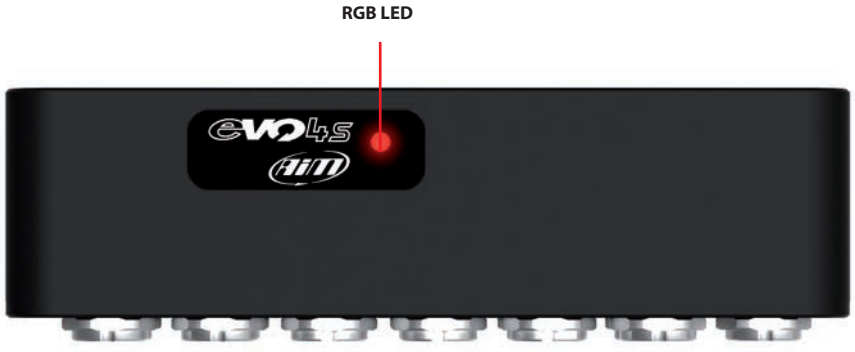
EVO4S Logger





4. RGB Led

The led shows the logger status as for the following table:



LOGGER STATUS	LED COLOUR	BLINKING
Doing firmup	Blue	Quickly
Logger in error	Red	Slowly
Recording	Cyan	Still
Idle status (EVO4S not recording)	Green	Still

5. ECU connection and CAN resistors

EVO5 can acquire data from the ECU of your vehicle. The list of the available ECU protocols is published on our site: www.aim-sportline.com/download area, ecus connections.
This list includes approximately 500 different protocols and is constantly updated with new protocols and upgrades published every week.
When possible, documents explaining how to configure your ECU to ensure compatibility between the data flow transmitted are available, too.
From an hardware point of view, EVO4S is compatible with all currently available connections: CAN, RS232 or K line.

The steps to manage the data coming from the ECU are the following:

1. Determine wich hardware connection is available for your ECU

2. Read the documentation about your ECU at www.aim-sportline.com and identify the name of the software driver to be specified

3. Using RaceStudio3, configure EVO4S setting your ECU driver with the menu shown here below, that appears when you create a new configuration.

The ECU has to be set when configuring your EVO4S with RS3 configuration software.

The steps are explained in section 10.1.2

CAN Resistors
EVO4S features a 120 Ohm ending resistor on CAN Line whose status by default is enabled.

6. RPM

EVO4S can receive the RPM signal from three different sources:

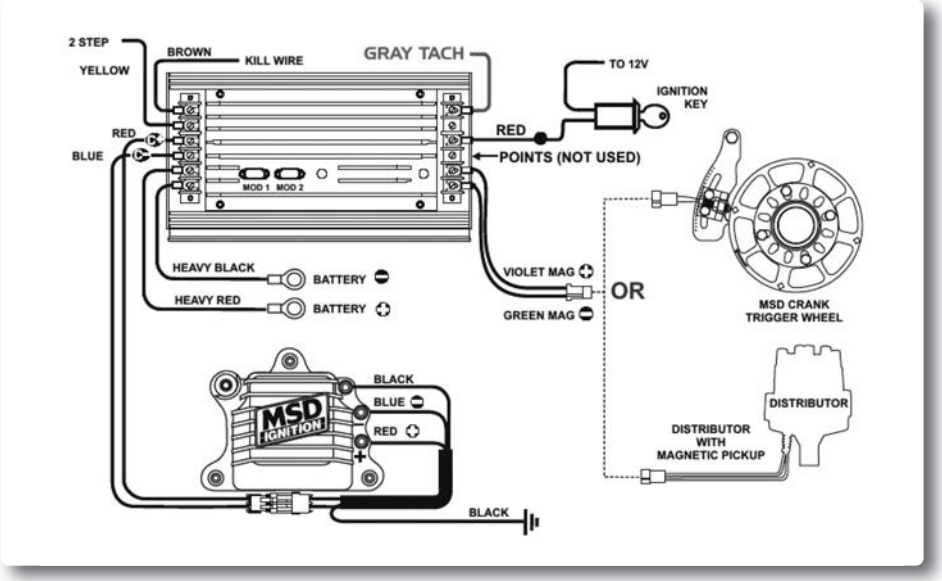
- from ECU
- through a square wave signal (8 to 50 V)
- from the low voltage (from 150 to 400 V) of the coil

6.1 RPM from ECU

To get RPM from the ECU please configure your EVO4S and enable RPM channel as explained in section 10.1. RPM is one of the many data flowing from your ECU to EVO4S.

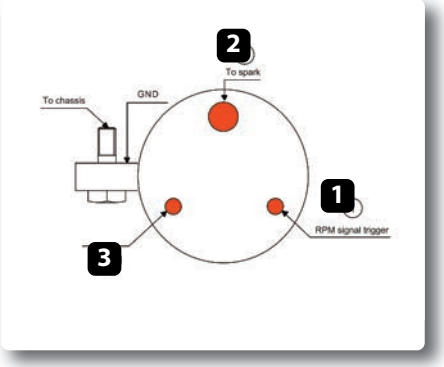
6.2 RPM via a 5-50 V Square Wave Signal or coil (150-400 V)

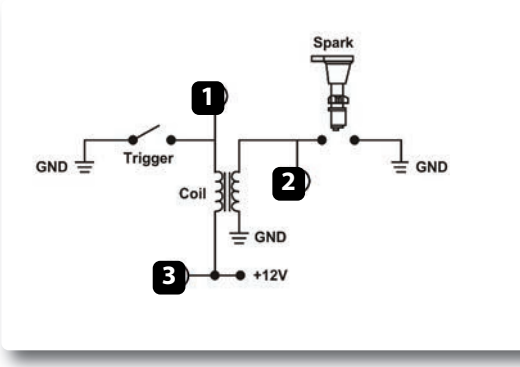
In case your engine is not managed by any ECU, EVO4S can read the signal from the low voltage of the coil (whose peak can be from 150 to 400 V) or from a possible square wave (the peak can be from 5 to 50V). The pin labelled **"RPM"** reported in appendix **"Pinout"** receives the signal.



The image shows an example of wiring for the ignition system.

The output, labelled **"GRAY TACH"** gives a 5-50V output that can be directly acquired from EVO4S. If the output is not available from the ignition system, the system has to be connected to the low voltage of the coil, as shown in the following schematic.





Point 1: Low voltage of the coil
Point 2: Connected to the spark plug
Point 3: Connected to the +12V of the battery

After connecting the RPM signal, please use the software RaceStudio3 for enabling the RPM channel, as explained in section 10.1.1

7. Speed

EVO4S can receive the speed signal from three different sources:

- from the ECU
- from the GPS receiver included in the kit
- from the wheel sensors (digital channels)

It is therefore possible for EVO4S to receive and store different values of speed at the same time; the more powerful ECUs transmit up to four wheel speed values.

7.1 Speed read from the ECU

If your ECU sends the value of speed in its data stream, it is obviously possible to read, record and show that value.
Simply enable it using RaceStudio3 software, as explained in section 10.1.1

7.2 Speed read from the GPS receiver

The GPS receiver you find in EVO4S kit is configured in order to obtain the best performance in terms of reactivity and accuracy.
For getting GPS speed, you don't need any configuration.
Simply connect the GPS Module to your EVO4S and after a setup period of some seconds, the data will be received and automatically recorded.

7.3 Speed read from wheel sensors

EVO4S has two wheel speed inputs: to connect two speed sensors use the proper split cable with part numberV02549030.

The digital sensor X02SNVM00 detects the presence of a metallic tooth placed at a distance between 0.5 and 2 mm.

Spd1	☐	Speed1	Vehicle Spd
Spd2	☐	Speed2	Vehicle Spd

Please use the software RaceStudio3 for configuring the system.

Just enter the program configuration panel and, after enabling the desired speed channels, set the wheel circumference and the number of pulses per revolution.

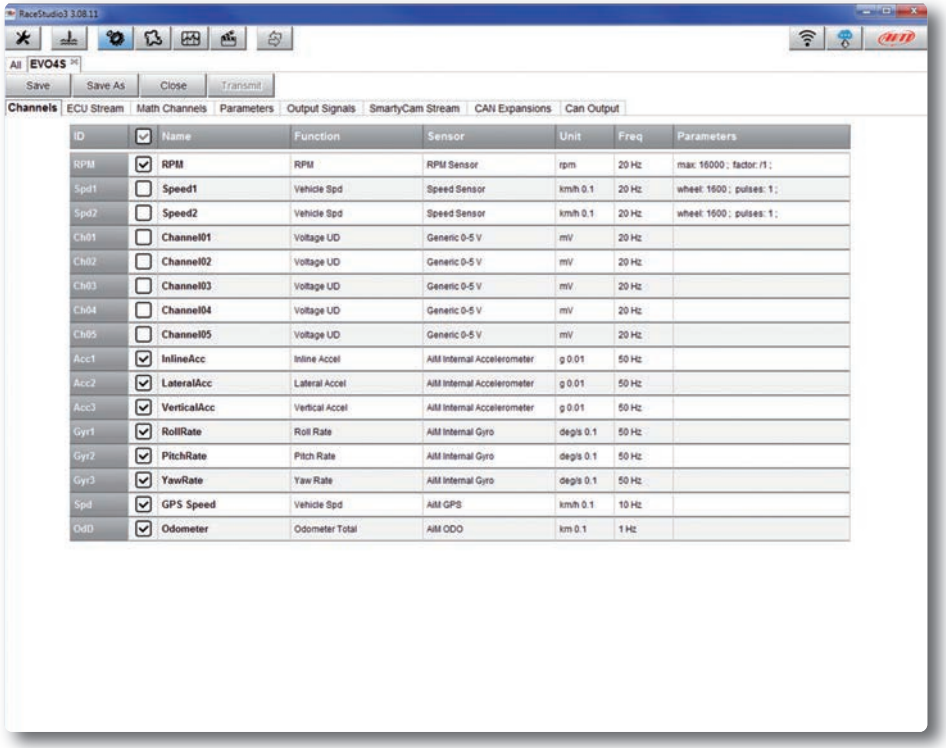
8. Analog Inputs

EVO4S has 5 analog inputs, recorded up to 1000 times per second each.
You can connect:

- 0-5 Volt signals
- ratiometric potentiometers
- pressure sensors
- thermo-resistances
- K-type thermocouples

Please use the following steps, using the software RaceStudio3 as explained in section 10.1:

- connect the sensor to the desired input
- enable the channel in the Channels table
- select the proper sensor type; sensors of many different types are properly handled
- set the sampling frequency
- set the unit of measure.

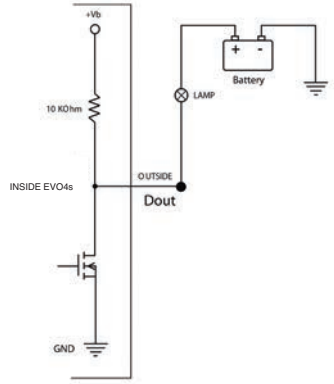


ID	☑	Name	Function	Sensor	Unit	Freq	Parameters
RPM	☑	RPM	RPM	RPM Sensor	rpm	20 Hz	max: 16000 ; factor: /1 ;
Spd1	☐	Speed1	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd2	☐	Speed2	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Ch01	☐	Channel01	Voltage UD	Generic 0-5 V	mV	20 Hz	
Ch02	☐	Channel02	Voltage UD	Generic 0-5 V	mV	20 Hz	
Ch03	☐	Channel03	Voltage UD	Generic 0-5 V	mV	20 Hz	
Ch04	☐	Channel04	Voltage UD	Generic 0-5 V	mV	20 Hz	
Ch05	☐	Channel05	Voltage UD	Generic 0-5 V	mV	20 Hz	
Acc1	☑	InlineAcc	Inline Accel	AIM Internal Accelerometer	g 0.01	50 Hz	
Acc2	☑	LateralAcc	Lateral Accel	AIM Internal Accelerometer	g 0.01	50 Hz	
Acc3	☑	VerticalAcc	Vertical Accel	AIM Internal Accelerometer	g 0.01	50 Hz	
Gyr1	☑	RollRate	Roll Rate	AIM Internal Gyro	deg/s 0.1	50 Hz	
Gyr2	☑	PitchRate	Pitch Rate	AIM Internal Gyro	deg/s 0.1	50 Hz	
Gyr3	☑	YawRate	Yaw Rate	AIM Internal Gyro	deg/s 0.1	50 Hz	
Spd	☑	GPS Speed	Vehicle Spd	AIM GPS	km/h 0.1	10 Hz	
OdD	☑	Odometer	Odometer Total	AIM ODO	km 0.1	1 Hz	

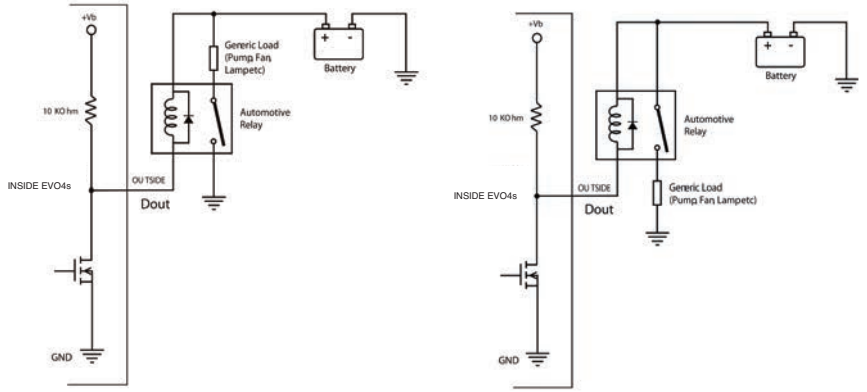
9. Digital Output

EVO4S features one digital output giving an output of 1 Amp at 12 volts.
The digital output (Dout) is a LOW-SIDE type with internal 10 Kohm pull up resistor. Here below are some connecting examples. You can configure it in order to turn it on or off depending on the value of the analog or digital inputs, ECU values, expansion values, GPS information or math channels. Please refer to section 10.1.6 to see how to use RaceStudio3 to manage the digital output.

Connecting examples



Load up to 1 Amp Directly managed by EVO4S digital output



Load higher than 1 Amp requires an automotive relay

10. Race Studio 3 Software

RaceStudio3 is the powerful software that you are going to use for all the activities regarding your EVO4S.

It is provided on a CD included in EVO4S kit or can be downloaded from Download area of www.aim-sportline.com.
It offers the following features:

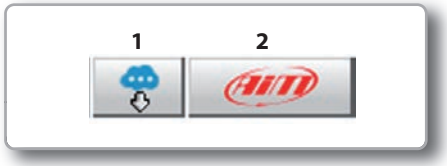
EVO4S configuration:
Creates, modifies, deletes, exports and imports configurations with all Channels, ECU drivers, Math channels, Digital outputs and all the expansions.
When you start Race Studio 3 with your EVO4S connected and switched on, you can see a row of seven pushbuttons top left of the screen that give you different options:

- Preferences
- Custom sensors
- Configurations
- Tracks
- Analysis
- Movies
- Devices

Preferences
For setting software language, measure units (pressures, speed, temperature, brake and oil pressure) and fixing download settings.

Configurations
Creates, imports, exports and modifies existing configurations.
Tracks
Creates, imports, exports and modifies the map of your racing tracks.
Analysis
For looking at and comparing your data.
Movies
For watching and comparing up to two track laps movies.
Devices
To establish the connection with the loggers and to receive data.

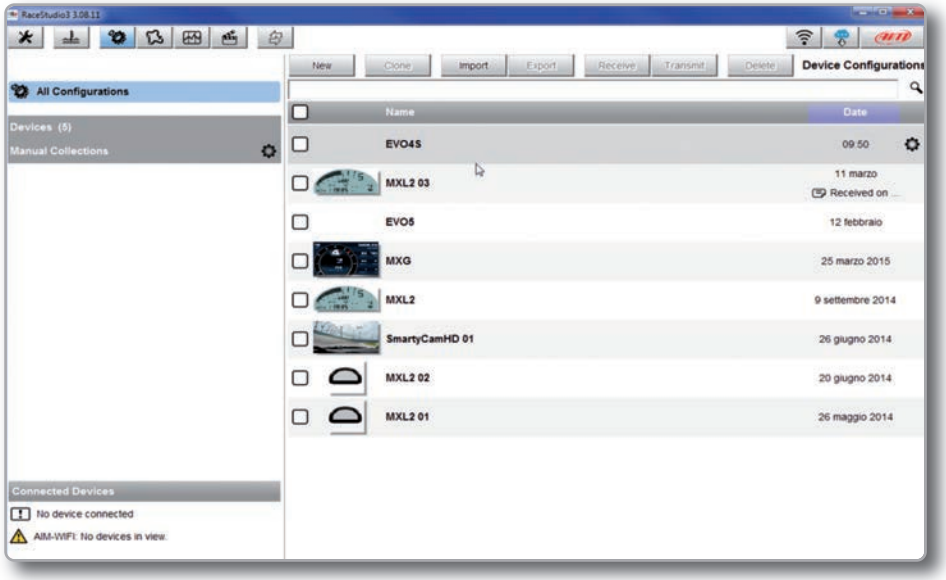
Top right of the screen you see two pushbuttons:



1 Download web updates.
It automatically detects which new firmware and software releases are available and let you download them from our site www.aim-sportline.com.

2 Connect to AiM website

10.1 Configuration



The configuration page is divided into two sections.
The left side is dedicated to the folders that you can create and manage in order to better organize your configurations.

Simply push the setting icon in order to create a new one. 

When you connect an AiM logger, like your EVO4S, its serial number appears in the left side of your screen. In the right side of the screen you can see all the configurations of the selected folder.
Please click on the desired one for editing it or push the **"NEW"** pushbutton for creating a new one.

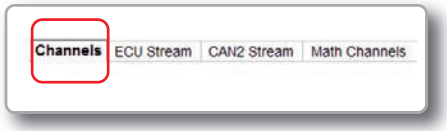
After having entered the EVO4S configuration page you can see different tabs, which are useful for selecting one of the following configuration features:

- Channels
- ECU Stream
- Math channels
- Parameters
- Output Signal
- SmartyCam Stream
- CAN Expansions
- CAN Output

10.1.1Channels Configuration

Push the tab Channels:

The channel configuration page will appear.

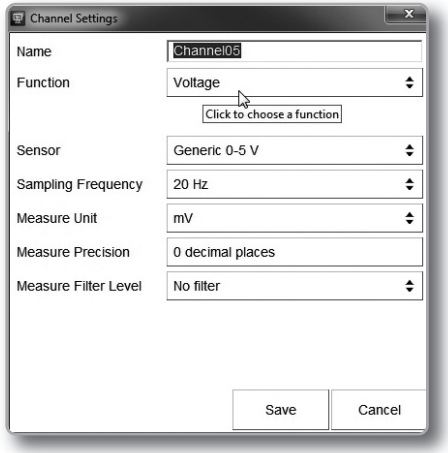


With this page you can define all the parameters for your analog inputs, speed inputs and digital RPM input.

Id		Name	Function	Freq	Parameters
RPM	☑	RPM	RPM	20 Hz	
Spd001	☑	Speed001	Vehicle Spd	20 Hz	
Spd002	☑	Speed002	Vehicle Spd	20 Hz	
Spd003	☑	Speed003	Vehicle Spd	20 Hz	
Spd004	☑	Speed004	Vehicle Spd	20 Hz	
Ch001	☑	Channel001	Pct	20 Hz	
Ch002	☑	Channel002	Pct	20 Hz	
Ch003	☑	Channel003	Pct	20 Hz	
Ch004	☑	Channel004	Pct	20 Hz	
Ch005	☑	Channel005	Pct	20 Hz	
Ch006	☑	Channel006	Pct	20 Hz	
Ch007	☑	Channel007	Pct	20 Hz	

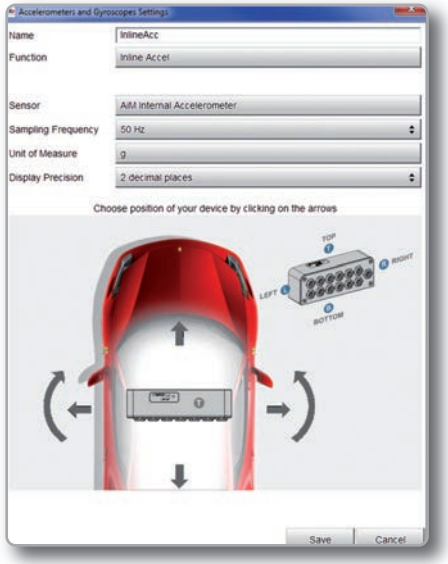
By clicking on each line, a menu appears: You can define:

- the name of the channel
- the function
- the sensor connected
- the sampling frequency
- the measure unit



To set EVO4S three-axial accelerometers:

- Click on the cell "Accelerometer" in sensor column
- The panel on the right appears, allowing you to set the accelerometers



10.1.2 ECU Stream configuration

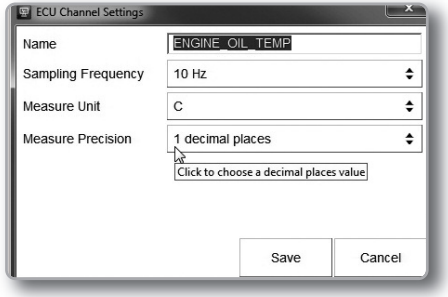
Push the tab **"ECU Stream"**.

Here you set the ECU driver as well as enable or disable the data coming from your ECU and enable/disable the ending 120 Ohm CAN 1 resistor.

To set the ECU driver of your vehicle click **"Change ECU"** and select ECU Manufacturer and ECU Model.

Each ECU channel can be enabled/ disabled and you can define:

- Name
- Sampling frequency
- Measure unit
- Measure precision

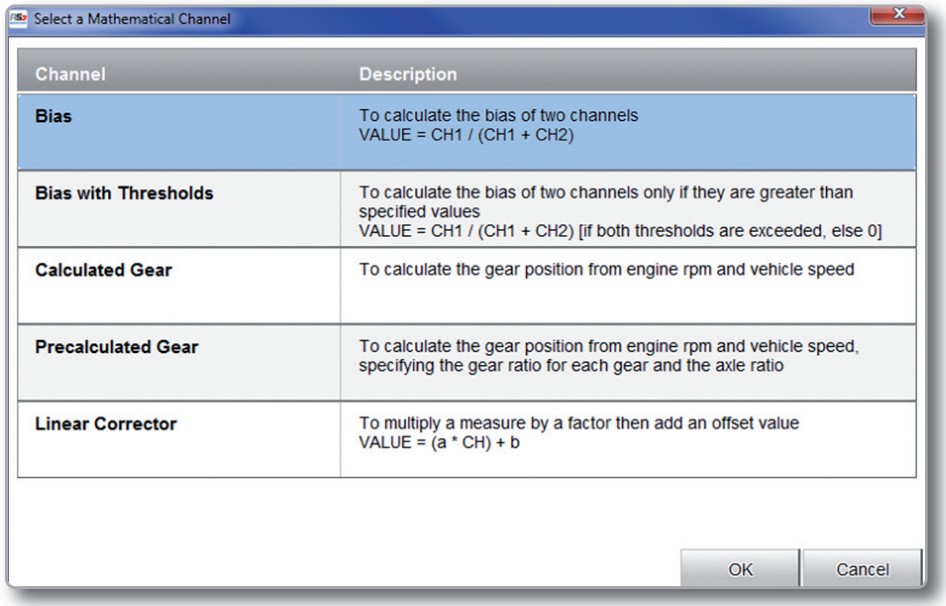


10.1.3 CAN resistor configuration

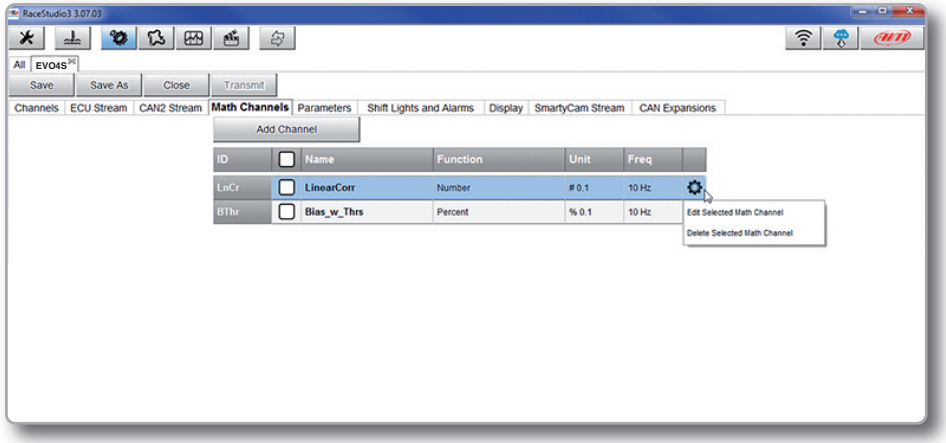
A CAN line ending 120 Ohm resistor can be enabled/disabled through this checkbox.

10.1.4 Math Channels

Press "Math channels" tab. Using the button **"Add Channel"** you can calculate the engaged gear both with a learning lap (calculated gear) and filling in the RPM values (precalculated gear). You can as well configure Bias channels and add linear corrector channels.



To modify/delete a math channel click the corrisponding icon and select the desired option.



10.1.5 Parameters

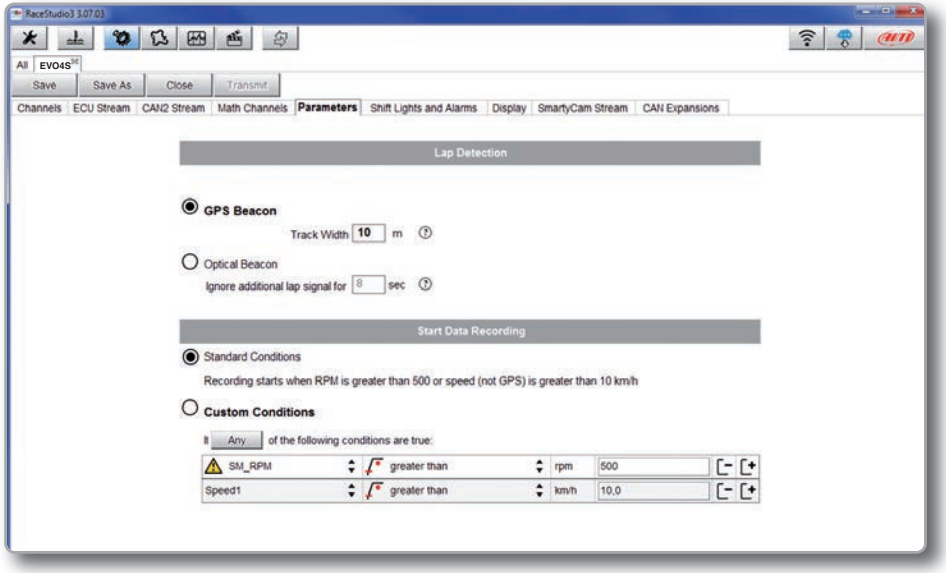
Press **"Parameters"** tab. Here you can set the lap detection (GPS or Optical beacon) as well as decide when start recording.

1) Lap Detection

You can choose whether detecting a lap signal from GPS or using optical transmitter/receiver.
GPS Beacon requires the track width while Optical beacon requires you to insert a time during which the system does not record additional lap signals.

2) Start Data Recording

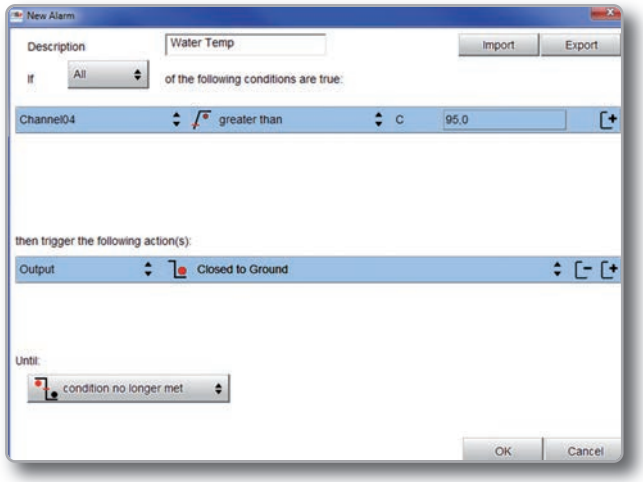
By default EVO4S starts recording when RPM value is greater than 500 or GPS speed is greater than 10 km/h.
Using Custom condition option you can define one or more custom conditions and decide that your EVO4S start recording when one or all set conditions occurs.



10.1.6 Output Signals

Push the tab "Output Signals" for managing EVO4S digital output.

Here you can define the condition to meet and the action to perform. In the example below Channel4 is a Temperature channel: when Water Temperature is higher than 95°C the digital output will close the circuit to ground until when the condition is no longer met.



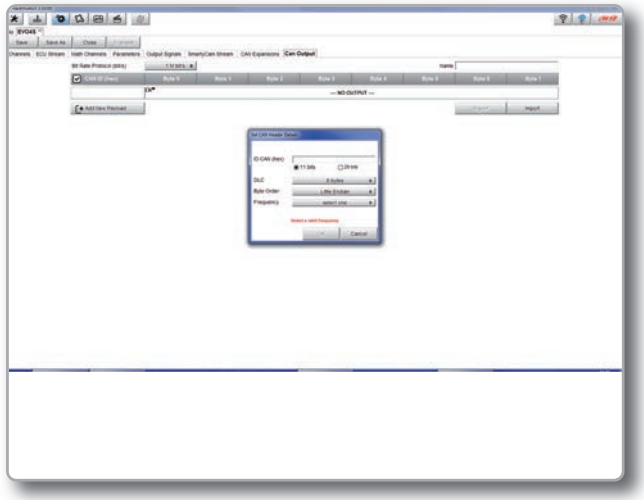
10.1.7 CAN Output

Push the tab "CAN Output" to define a CAN Stream Output.

For each payload you can define:

- ID CAN (Hex)
- Byte number (DLC): up to 8 bytes
- Byte Order: little endian or big endian
- Frequency: up to 20 Hz

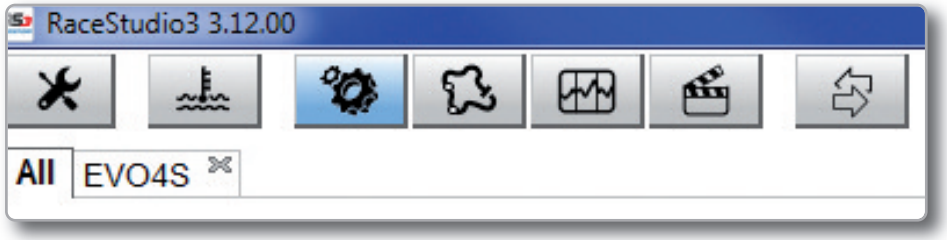
Moreover you can transmit each field coming from Analog, digital, internal channel, expansions, ECU or GPS Module.



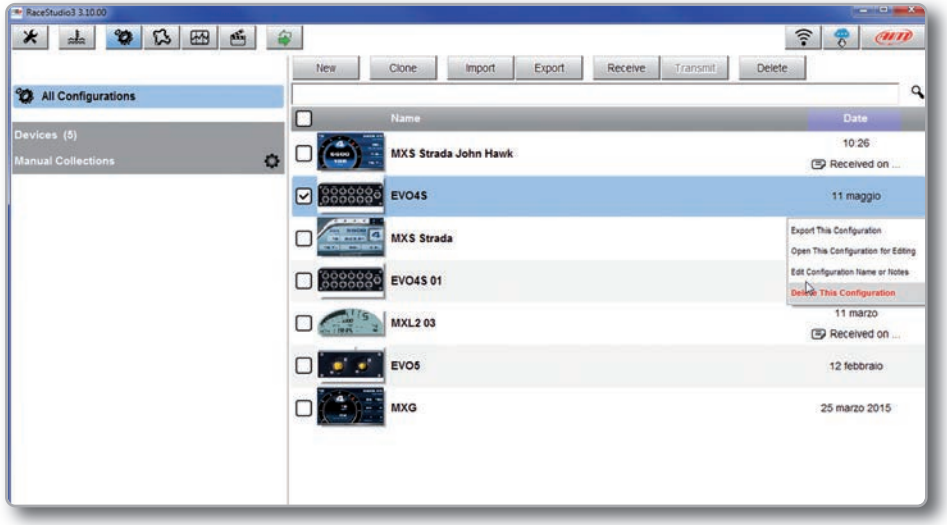
WARNING: Please be advised that this function allows you to send messages directly to your vehicle CAN network. Sending messages that can potentially conflict with the CAN-bus frame may cause malfunction of your vehicle's safety systems, resulting in personal injury or death. It is your responsibility to fully understand your vehicles CAN-bus. AiM cannot be held responsible for any damage or injury caused by misuse of this function.

10.2 Modify or Delete an Existing configuration

Push "All" tab top left of RaceStudio3 page; just under the seven pushbuttons.

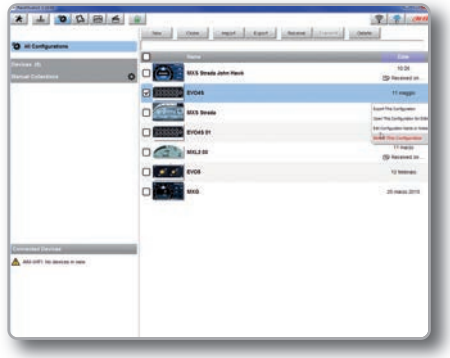


All configurations are shown on the right part of the page. For modifying an existing configuration, right click on it and select the desired option.
To delete an existing configuration, right click on it and select delete.



10.3 Connect Your EVO4S to a PC

When you connect your EVO4S to the PC, it is automatically recognized, and on the left side of the PC display the name of your device appears, as shown in the picture.



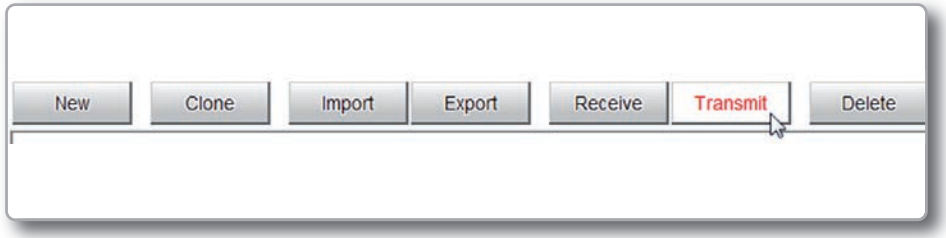
At this point, you can execute the following functions:

- Transmit the configuration
- On Line view
- Calibration
- Data download

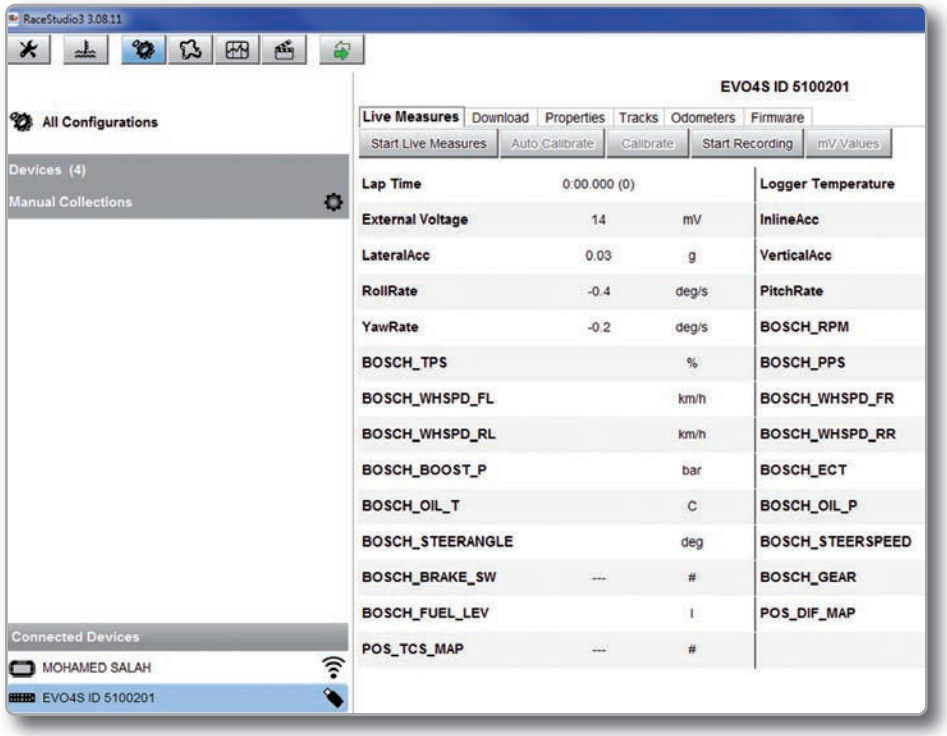
This is explained in the next paragraphs.

10.3.1 Configuration Transmission

When you connect an EVO4S to your PC, the "TRANSMIT" pushbutton appears at the top of the configuration page. Push it and the configuration will be transmitted.



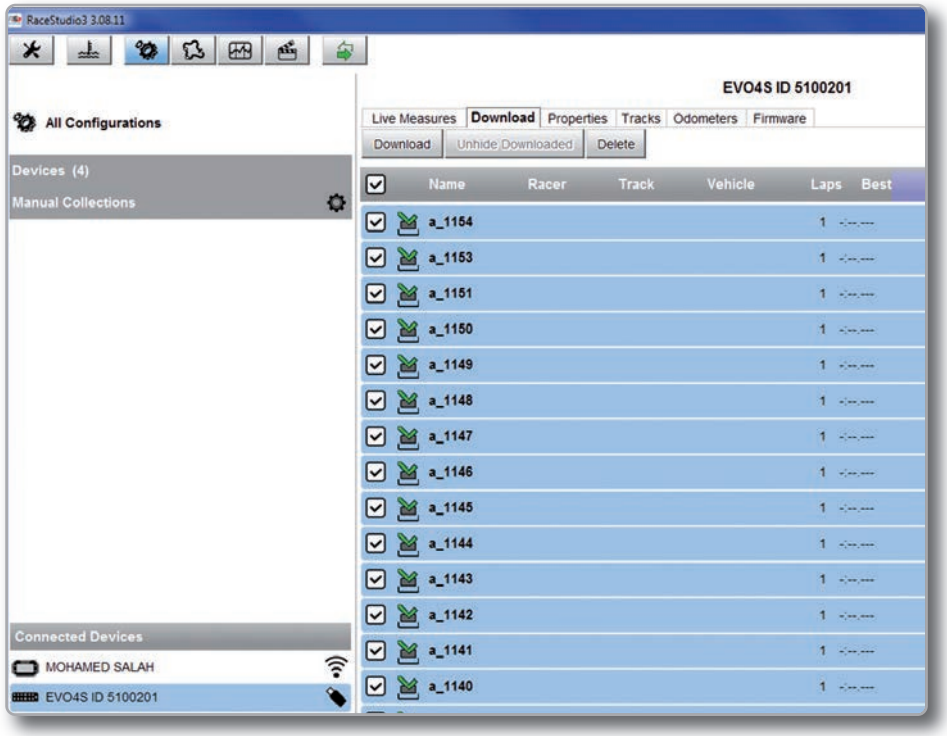
10.3.2 On Line View and Calibration



Once EVO4S connected, click on it to enter On Line view.
Select "LIVE MEASURE" tab to see the data coming from your EVO4S.
You can change the measure unit double-clicking on the measure.
From "Live measures" tab, you can calibrate or auto-calibrate the channels using the related pushbuttons on the layer top keyboard.

Sensors to be auto-calibrated are typically those sensors that output data using primary units of measures like for example length or pressure.
Sensors to be calibrated are those sensors that output data using secondary units of measures like percentage, degrees or radians.
Auto-explicative panels will help you performing this operation.

10.3.3. Data Download



To download data click on your EVO4S name in "Connected devices" panel bottom left of the software main page.

The device window appears on the right.

Push "DOWNLOAD" tab for downloading the data recorded in your EVO4S.

You will see the information about the files recorded in the system: dimension and date/time of the file creation.

Please select a file and push "DOWNLOAD" for transferring it to your PC.

11. GPS and Track Management

The GPS Module included in the EVO4S kit, provides the following information, updated ten times per second

- position (latitude, longitude, altitude)
- speed
- longitudinal acceleration
- lateral acceleration

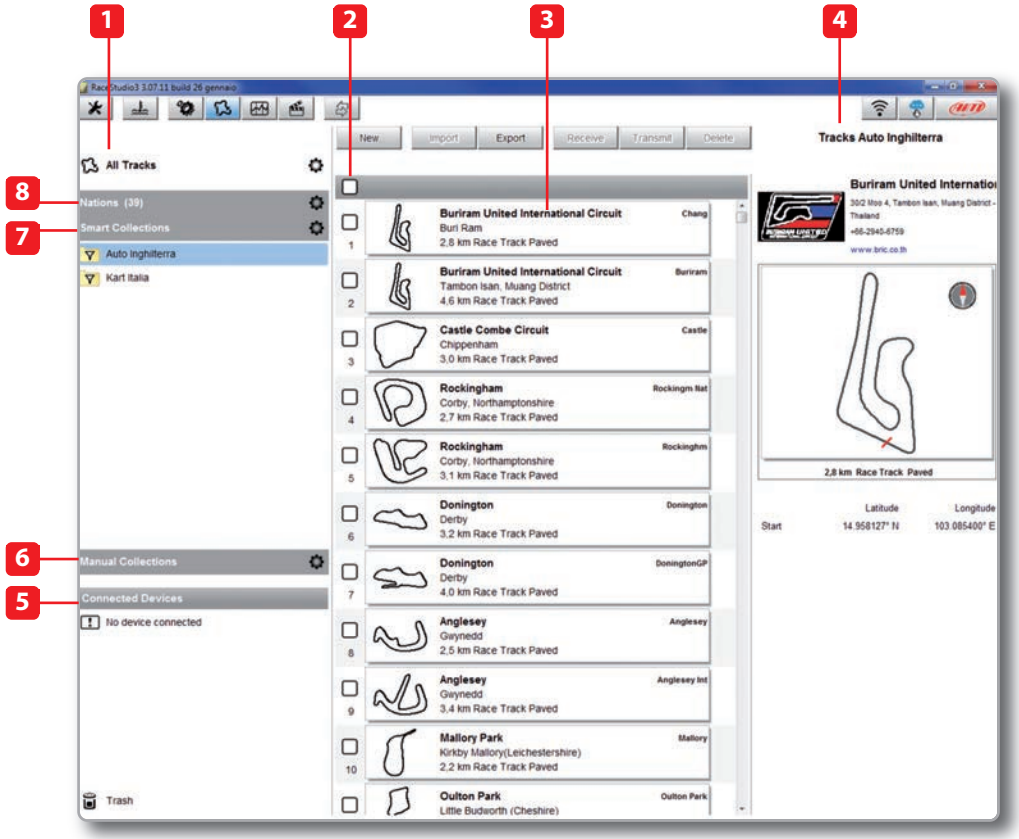
If EVO4S knows the finish line of the track and the split coordinates, it can calculate and show:

- Lap Times
- Split times

To transmit/receive track information to EVO4S, use "Tracks" feature, as explained in the following section

11.1 Tracks Feature

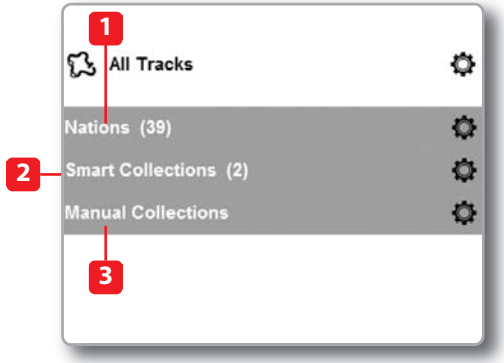
With "Tracks" you can update, modify, transmit and receive to and from EVO4S the coordinates of the start/finish line and split points of all the tracks you are going to run on.
Opening the software, with no logger connected to your PC, you will see the screen shown here on the right. As you can see, the screen is divided in three parts.
On the left are track collections and connected devices
Central is the track list. If available, each track label shows you the track layout, its address and the type of vehicle that usually races on that track.
On the right side of the screen, if available, you will find the track page with its logo, address, contact information, website and coordinates.



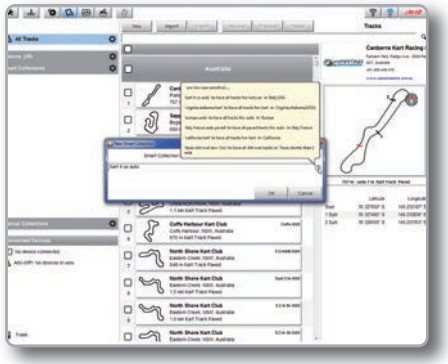
1. Shows all available tracks
2. Select all track of the list
3. Track info
4. Track page
5. Shows all connected devices
6. Shows Manual collections
7. Shows smart collections
8. Shows all nations whose track are included in the database

11.2 Tracks Collections

You can see collections of tracks selecting the Nation they belong to (1), setting some filtering criteria and creating Smart collections (2) or selecting some tracks and creating Manual collections (3).

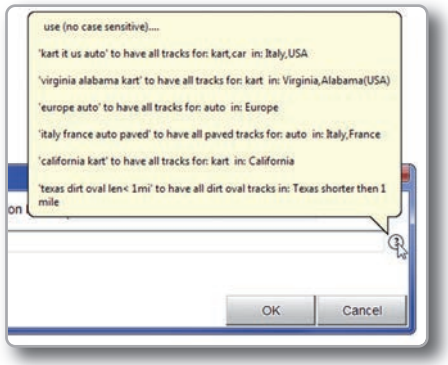


1) Nations
Select a Nation and you will see only the tracks belonging to that Country.



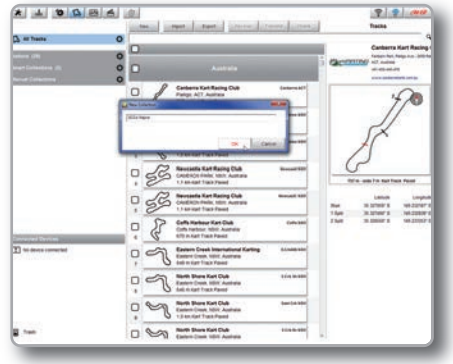
2) Smart collections
To create a Smart Collection of tracks click the setting icon highlighted top left on the software page.

"Selection criteria" panel appears.

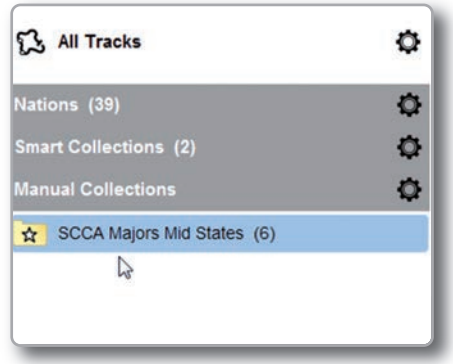


To know how to perform a search click the question mark on the right and some examples show up in a yellow pop up panel as shown here on the right.

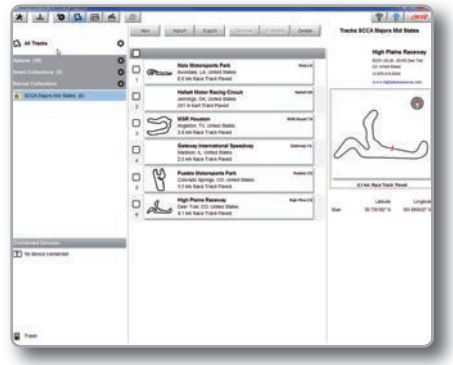
3) Manual collections
To create a Manual Collection of tracks click on the setting Icon, fill in the Collection name and click OK.



The new collection appears in the Manual Colections list.
Drag and drop the tracks you want to insert in the collection from the central panel.

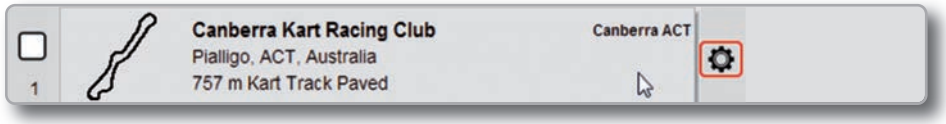


Click on the Manual list name and the tracks you included appear in the central panel.



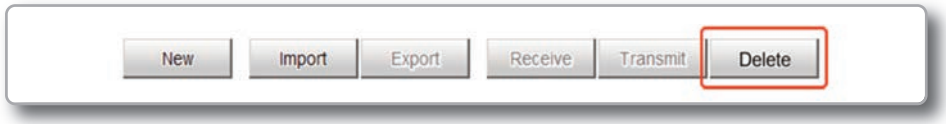
11.3 How to Modify Track Data in the PC Database

Click the setting icon that appears right of the track label mousing over it.
Select "Edit" to modify all track information.



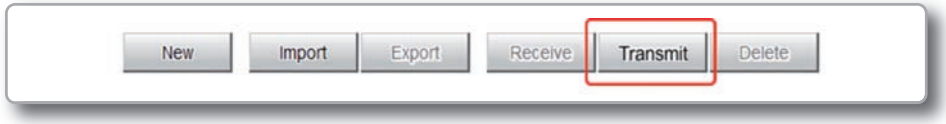
11.4 How to delete a track from the PC Database

The tracks you find in the software by default and provided by AiM cannot be deleted.
To delete a track you imported just select it and press "Delete" on the software top central keyboard.



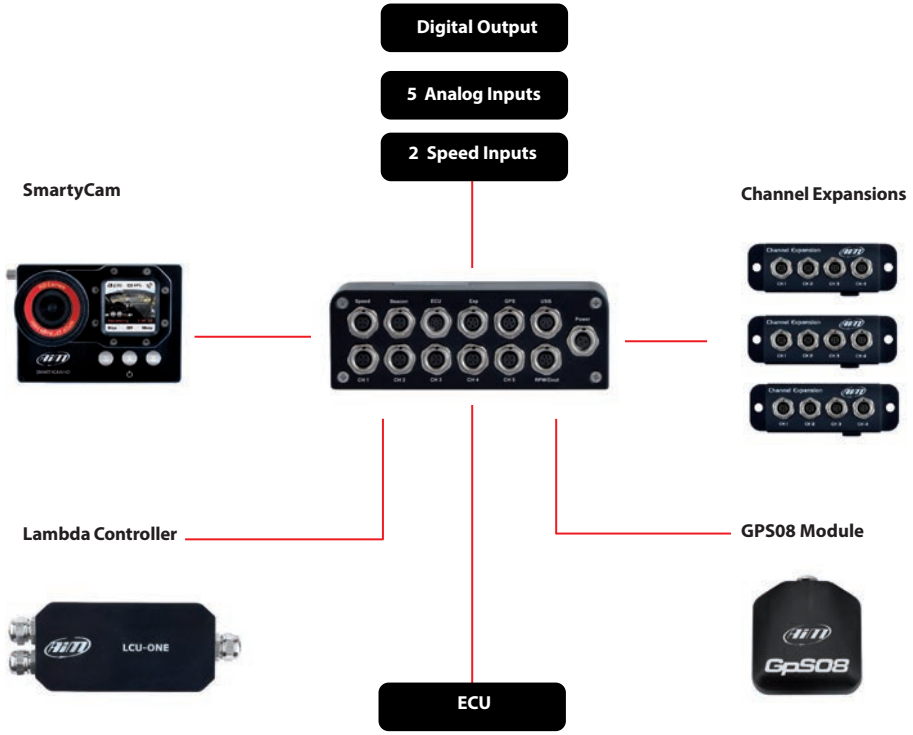
11.5 How to transmit track information to EVO4S

To transmit track information to your EVO4S select the tracks you want to load in your EVO4S and click "Transmit" on the software top central keyboard.



12. Expansions

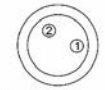
Using our built in CAN bus, add expansion modules like GPS, channel expansions, lambda controllers. These are only some of the items that can be added to our EVO4S range for incrementing the performance and the data acquired.



13. EVO4S Pinout

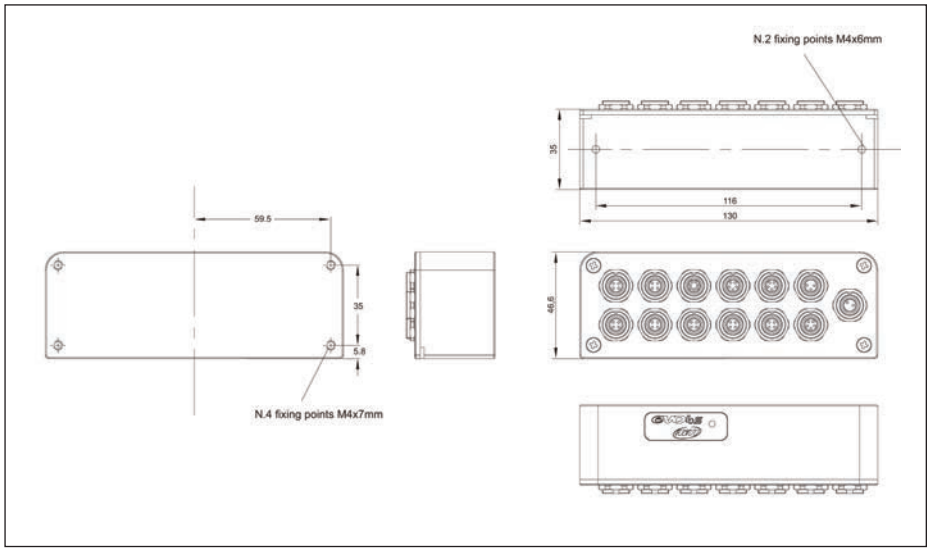
Speed (external view)  1 - Speed1 2 - GND 3 - +Vb out 4 - Speed2	**Beacon** (external view)  1 - Magnetic Lap 2 - GND 3 - +Vb out 4 - Optical Lap	**ECU** (external view)  1 - CAN1+ 2 - CAN1- 3 - 9-15V Power in 4 - RS232TX 5 - RS232RX 6 - K Line 7 - Battery GND	**Exp** (external view)  1 - CAN+ exp 2 - GND 3 - +Vb out CAN 4 - CAN- exp 5 - +Vbext CAN	**GPS** (external view)  1 - CAN+ exp 2 - GND 3 - +Vb out CAN 4 - CAN- exp 5 - +Vbext CAN	**USB** (external view)  1 - USB D+ 2 - USB D- 3 - GND
CH1 (external view)  1 - Analog Input 1 2 - Analog GND 3 - +Vb out 4 - Vreference	**CH2** (external view)  1 - Analog Input 2 2 - Analog GND 3 - +Vb out 4 - Vreference	**CH3** (external view)  1 - Analog Input 3 2 - Analog GND 3 - +Vb out 4 - Vreference	**CH4** (external view)  1 - Analog Input 4 2 - Analog GND 3 - +Vb out 4 - Vreference	**CH5** (external view)  1 - Analog Input 5 2 - Analog GND 3 - +Vb out 4 - Vreference	**RPM/Dout** (external view)  1 - RPM 2 - GND 3 - nc 4 - nc 5 - Digital output

Power
(external view)



1 - 9-15V Power in
2 - Battery GND

14. Technical Drawings



- ECU connection	CAN, RS232, K-Line
- External modules connection	YES: GPS module, Channel expansion, Lambda controller, SmartyCam HD
- Analog inputs	5 fully configurable: 0-5V, 0-12V, K thermocouples. Max freq 1 KHz each
- Digital inputs	Coil RPM and 2 speed inputs
- Inertial platform	Internal 3 axis +-5G accelerometer + 3 axis gyro
- Internal memory	4 gigabytes
- Digital outputs	1, up to 1 Amp
- Body	Anodized aluminum
- Dimension	130X46,6X35mm
- Weight	330g
- Waterproof	IP65

Our web site **aim-sportline.com** is constantly updated.

Please, check it frequently and download the latest versions of the firmware of your products.