

**EVO3 PRO for  
Formula Renault 2000  
2007  
Installation manual**



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## 1 – EVO3 Pro

**EVO3 Pro** data logger has the following features:

- 4 speeds digital inputs
- 1 digital RPM input
- 12 fully configurable analog channels
- Integrated longitudinal accelerometer
- Integrated lateral accelerometer
- 2 CAN lines (Max 1Mb/sec)
- 16 Mb non volatile internal memory
- 5Khz total sampling frequency
- Lap digital input

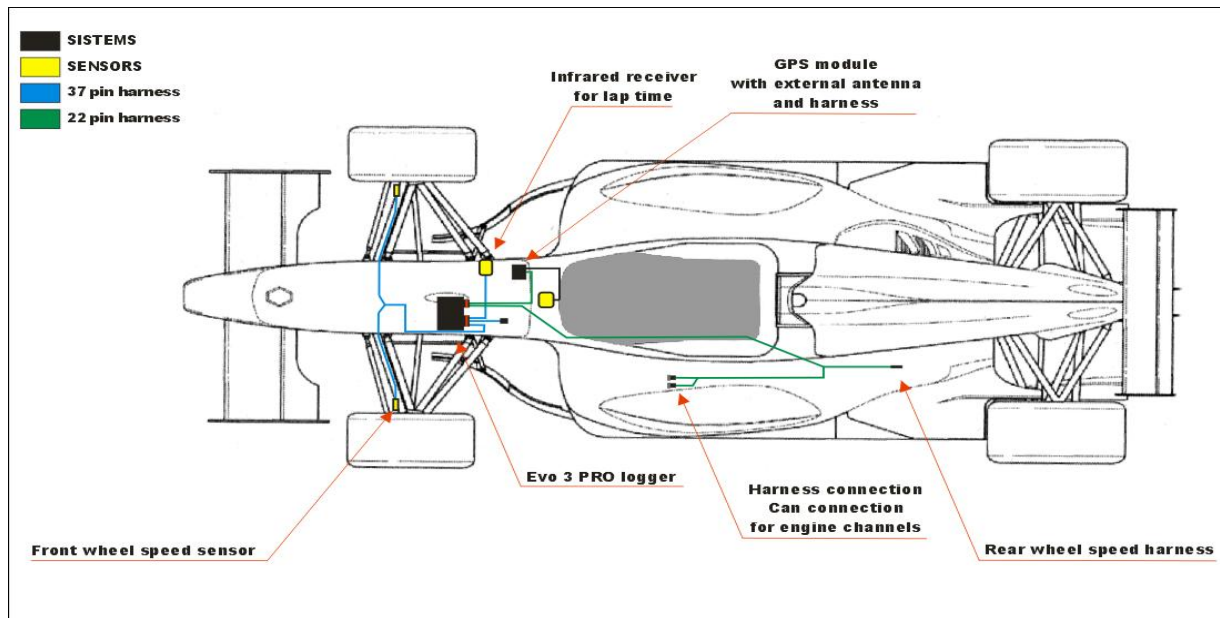
## 2 – EVO3 Pro Formula Renault 2000 (2007) kit

Formula Renault 2000 (2007) data acquisition kit includes:

- **EVO3 Pro**
- Analog inputs wiring
- Digital inputs wiring
- GPS 03 Module
- GPS Antenna
- 2 front wheel speed sensors
- 2 brackets for front wheel speed sensors
- 2 magnetic phonic wheels
- 1 “T” split cable for front wheel speed sensor
- 1 infrared receiver (lap)
- 1 infrared transmitter + 12V power cable
- 1 USB cable
- **Race Studio 2** software CD
- This installation manual

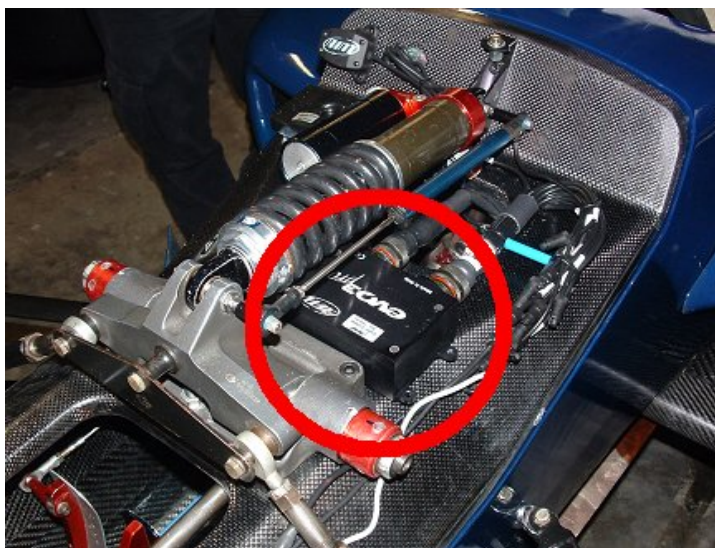
### 3 – Installation

**EVO3 Pro** kit is to be installed as shown in the figure below. The cables length is properly defined for each cable purpose so to make it impossible to install them in a different way.



Refer to the following paragraphs to install the kit components.

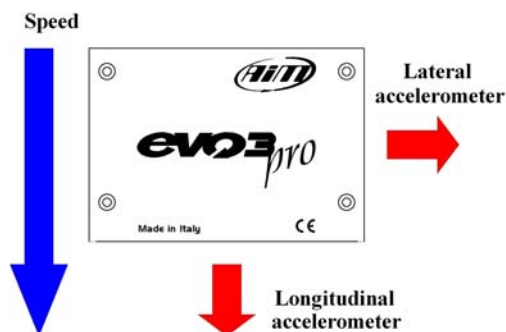
#### 3.1 – Installing EVO3 Pro



**EVO3 Pro** should be installed in the front cockpit left to the front shock spring as shown in the image above.

It is suggested to fix the logger with two Velcro® strips. Logger connectors should face the rear side of the vehicle.

The accelerometers integrated in the logger should be configured as shown below.



### 3.2 – Installing GPS Module

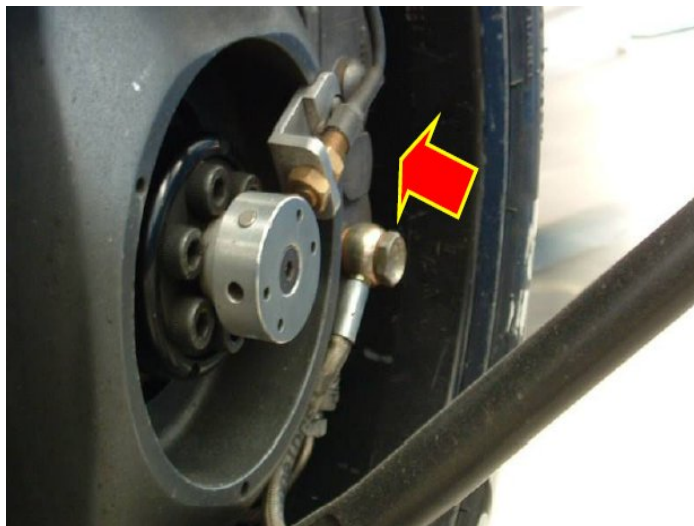


**GPS 03 Module** communicates with **EVO3 Pro** using CAN bus CAN 0.  
 GPS module is to be placed under the front cockpit right to the front shock spring as shown in the figure above.  
 It is suggested to use two Velcro® strips to fasten the GPS Module.



It is strongly recommended to verify that CAN termination connector is correctly plugged in: then connect DTM connector to the **EVO3 Pro** digital harness (22 pins) as shown in the figure above.

### 3.3 – Installing the phonic wheels, the front speed sensor and the related brackets



To install the phonic wheels, the front wheel speed sensor and the related brackets follow these instructions:

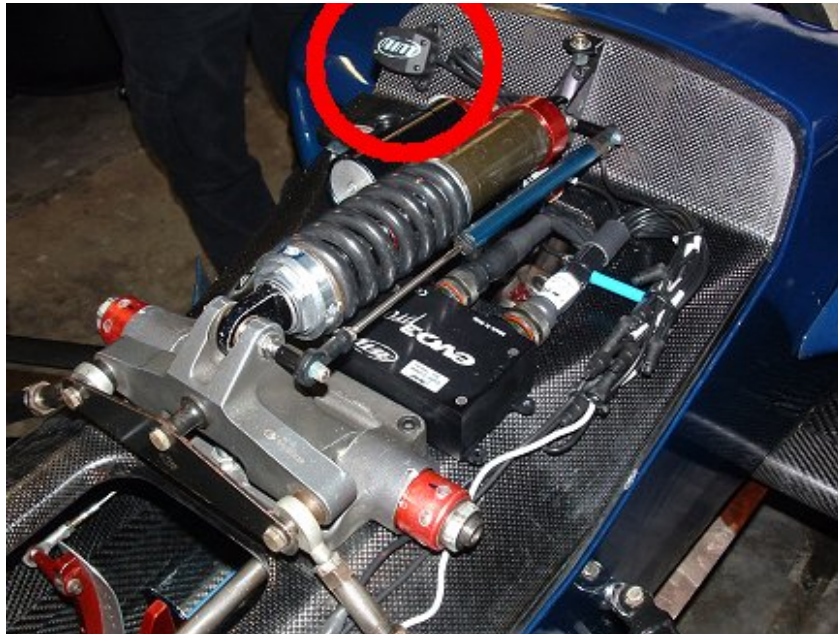
- Install the magnetic “Phonic” wheels coaxially to the front wheels.
- Install the brackets on the wheel hub and then install the speed sensors supplied with the kit.
- Using a locking nut system, adjust the distance between the head of the sensor and the magnets. **Optimum distance** is between 8 and 15 mm (max).
- After sensors installation stretch the speed cables on the anti-vibration mountings. It is suggested to protect the cables with a spiral girdle (not included in the kit).
- Insert the speed sensors connectors in the chassis using the hole located on the right of the oil brake pumps.

### 3.4 – Installing the phonic wheels, the rear speed sensor and the related brackets

The kit allows the user to add two speed sensors (not supplied) on the driving wheels. In the digital harness (22 pins) is a dedicated connector, labelled as “rear speed”, to be placed in the left side of the vehicle body.

The channels dedicated to this measure are labelled as Speed\_3 and Speed\_4.

### 3.5 – Installing the lap receiver (Beacon)



The lap receiver (beacon) is to be installed as shown above. It is recommended to pay particular attention to the following steps:

- Place the receiver “eye” so that it sees the transmitter installed on the border of the track.
- Use Velcro® to fasten the receiver.
- Make a hole on the front fairing in correspondance of the receiver “eye”; hole minimum diameter should be 8 mm (20 mm suggested)
- Connect the receiver to the digital wiring (22 pins) **lap** connector

**Note:** depending on the track direction of travel, the receiver may have to be installed on the other side of the vehicle.

### 3.6 – Installing the USB cable



It is suggested to install the USB female connector (used to configure the system and to download data) in the body cell, under the display, as shown above.

## 4 – Connections to the vehicle

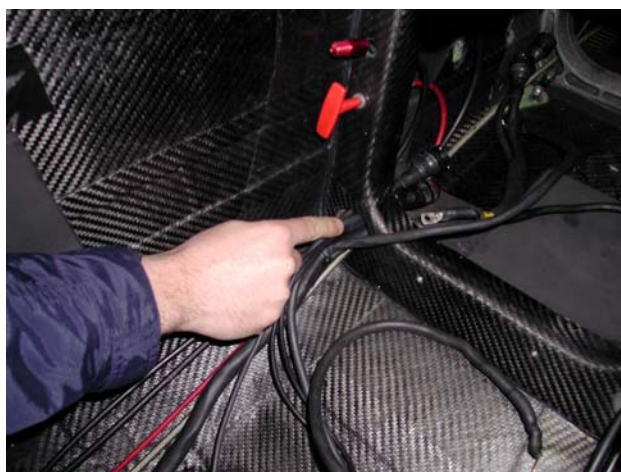


The connection to CAN bus CAN 1, that allows the communication with Magneti Marelli MF4-L ECU, is made through J59 connector of **EVO3 Pro** digital harness, placed in the left side of the vehicle body. J60 connector, on the other side, sends the “end lap” signal to the vehicle dashboard.

To enter the cell on the left side of the vehicle it is suggested to use the passage placed under the left radiator. We would suggest to remove the radiator to clear the passage.



Once reached the vehicle body, it is suggested to use the proper cable passage situated near to the battery on the left side of the vehicle, as shown in the figure below.



Make the wiring exit the cell through the inspection hole placed under the front shock spring as shown aside.



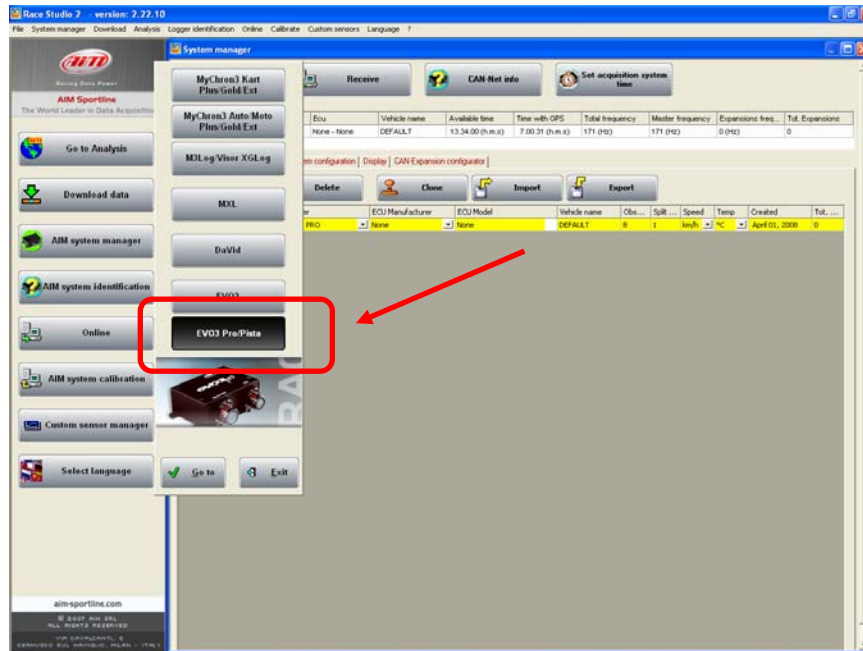
Use plastic wrappers to fix the digital (22 pins) harness to the other cables of the engine plant.



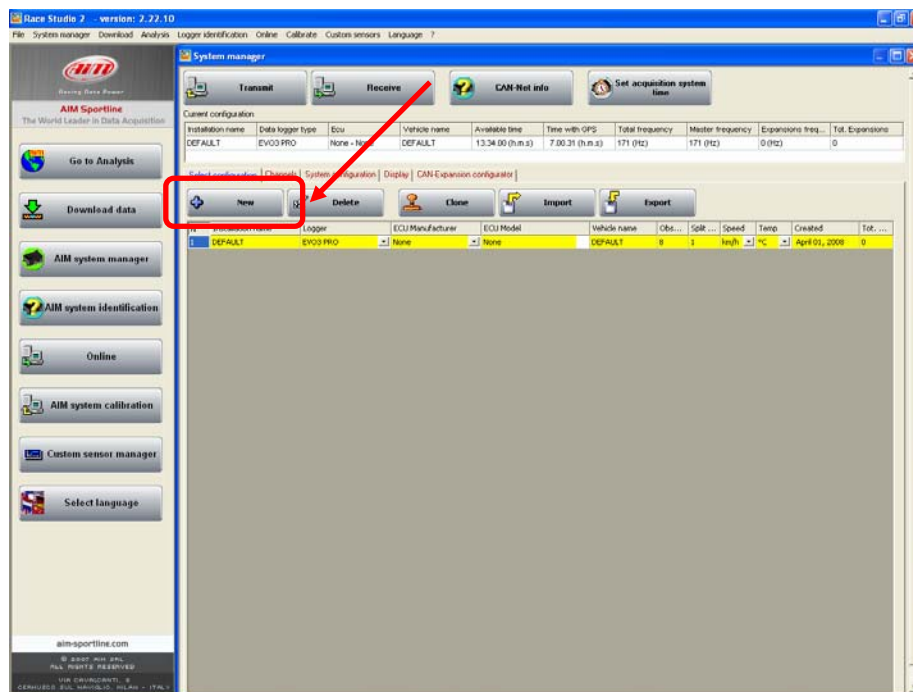
## 5 - Configuring the system

After **Race Studio 2** software installation, run it and follow the instructions here below.

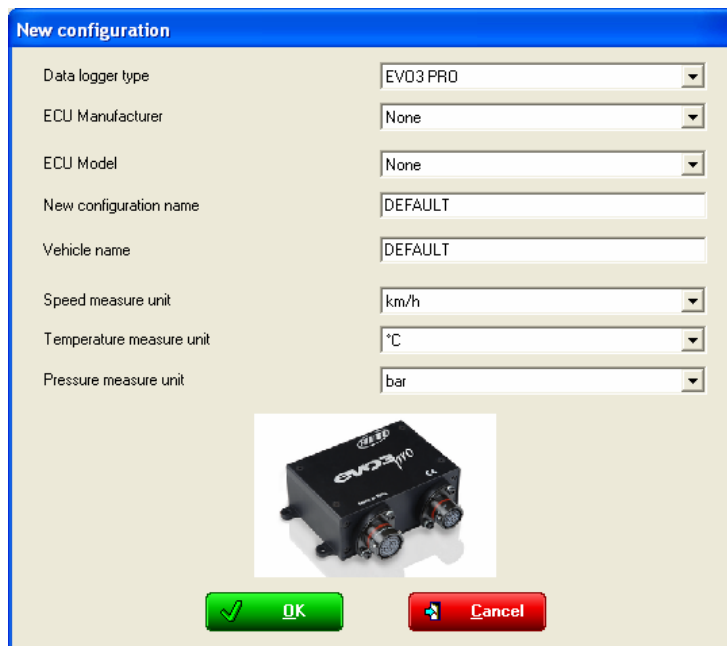
- Press “AIM system manager” button on the left vertical keyboard.
- Select “EVO 3 Pro/Pista”.



- Press “✓ Go to” button
- The window below appears
- Press “New” button on the software central keyboard.

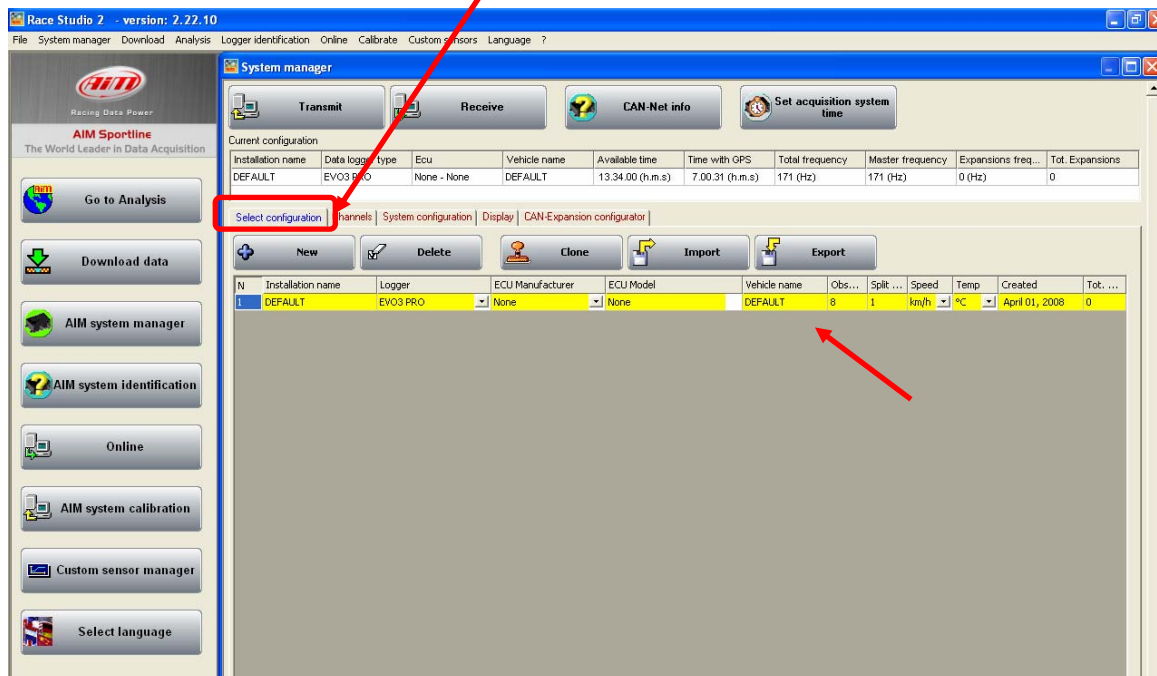


This window appears:



- Select “ECU Manufacturer”: Marelli.
- Verify that “ECU Model” is set on: FR2000; if not, select it manually.
- Press “OK” button to create the configuration.

It appears on “Select Configuration” layer highlighted in yellow.



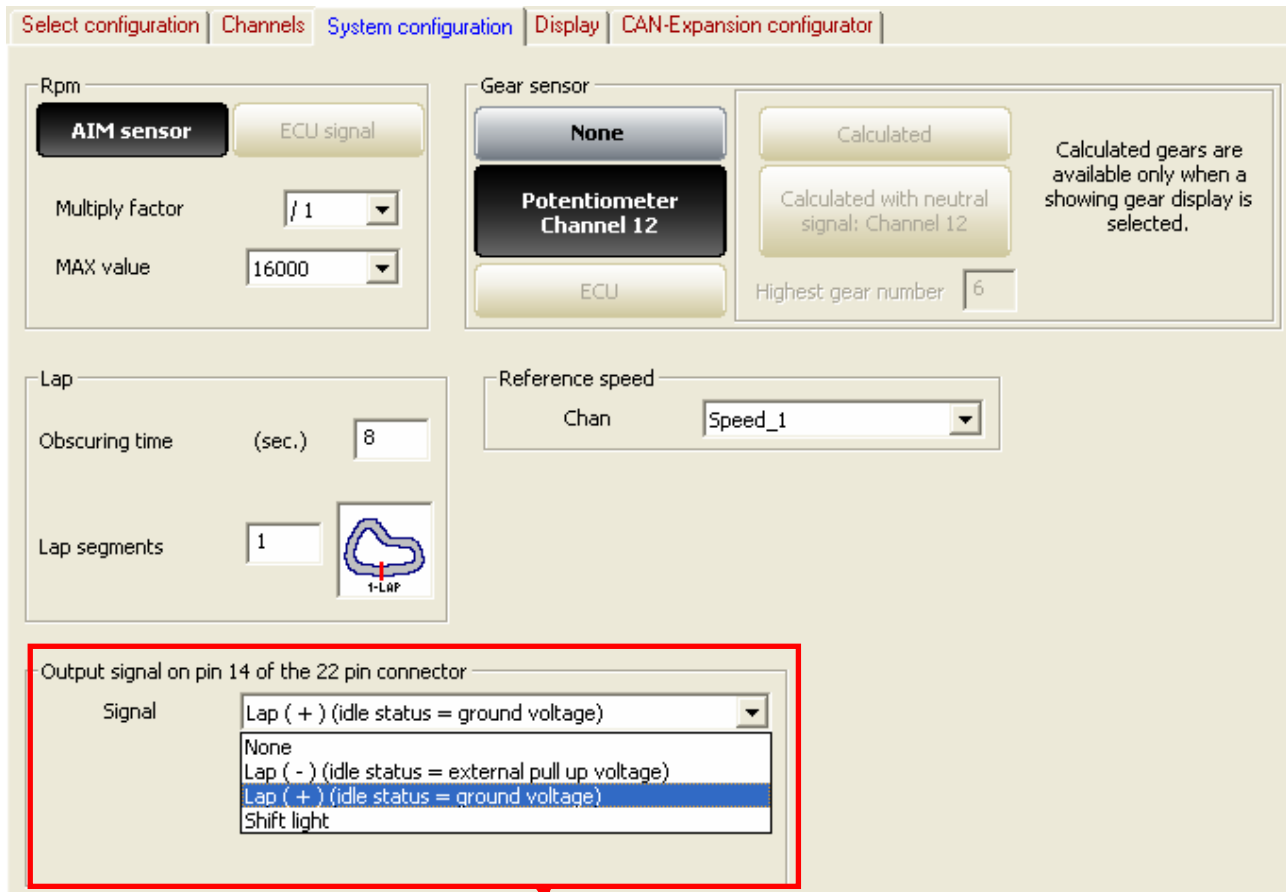
Press “Transmit” button on the software top keyboard to transmit the configuration to **EVO3 Pro**.

**Note:** lack of obligations concerning supported sensors on the 12 analog channels, allows the user to configure the channels depending on the installation. As far as calibration procedure of the sensors that need it is concerned, refer to **Race Studio 2 configuration user manual**.

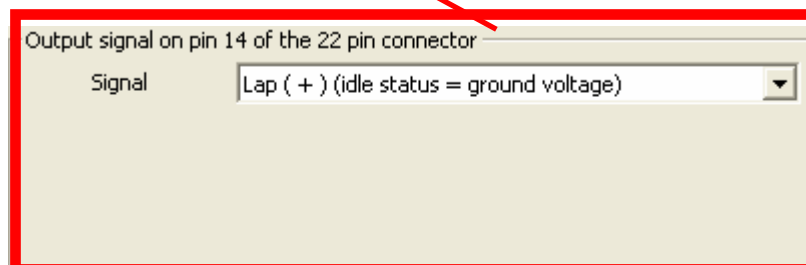
## 5.1 – Configuring output lap signal

To configure output signal:

- Activate “System Configuration” layer
- Enter the pop up menu shown below and select “Lap (+) (idle status = ground voltage)” option;



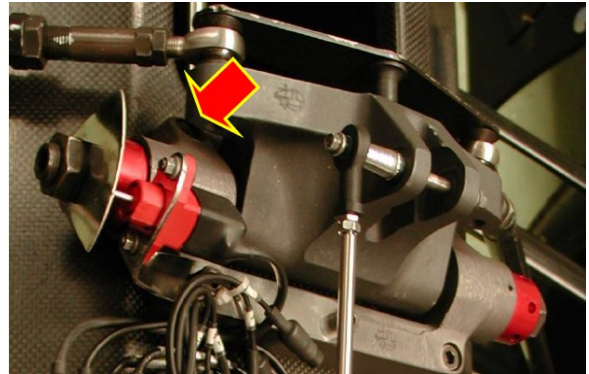
The screenshot shows the 'System configuration' tab of the software interface. The 'Output signal on pin 14 of the 22 pin connector' section is highlighted with a red box. The 'Signal' dropdown menu is open, showing the following options: 'None', 'Lap (-) (idle status = external pull up voltage)', 'Lap (+) (idle status = ground voltage)', and 'Shift light'. The 'Lap (+) (idle status = ground voltage)' option is selected and highlighted in blue. A red arrow points from this selection to a second screenshot below.



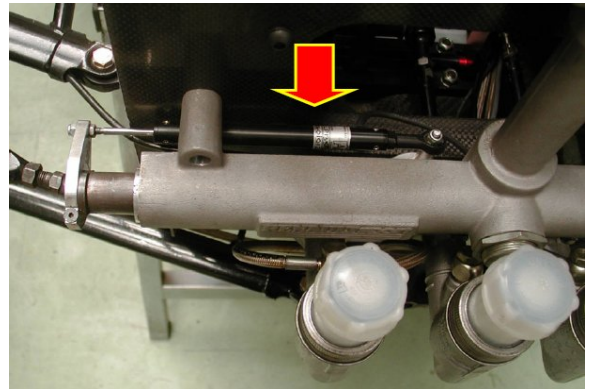
This is a close-up screenshot of the 'Output signal on pin 14 of the 22 pin connector' section. The 'Signal' dropdown menu is set to 'Lap (+) (idle status = ground voltage)'. The entire section is enclosed in a red box.

## Appendix “A” – Additional sensors

The rolling potentiometer is to be installed as shown aside.

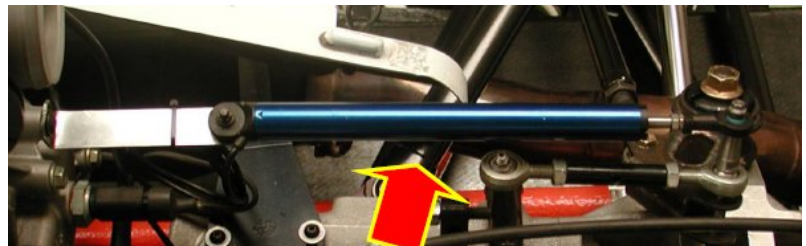


The steering potentiometer is to be installed as shown in the figure on the right.



It is recommended to use linear 100 mm potentiometers for both rear and front suspensions. Once installed the sensors, as shown in the figures below, connect the potentiometers to the desired analog inputs.

Rear suspension potentiometer.



Front suspension potentiometer.



## Appendix “B” – GPS Module

### B.1 – Data analysis

**Warning:**

**EVO3 Pro data download is available only from Race Studio 2.21.20 onwards.**

When a test made using GPS Module is loaded, some new channels are automatically added to “Measures and laps” toolbar of **Race Studio Analysis** software, to say:

- GPS Speed;
- GPS Nsat;
- GPS LatAcc;
- GPS LonAcc;
- GPS Slope;
- GPS Heading;
- GPS Gyro;

#### **GPS Speed**

Indicates the speed measured through GPS signals.

#### **GPS Nsat**

Indicates the number of satellites received during the test. Max number of satellites used to compute GPS solutions is 9.

#### **GPS Lat Acc**

This channel shows lateral acceleration compared to the trajectory computed from GPS speed on the three axis.

#### **GPS LonAcc**

This channel shows the longitudinal acceleration compared to the trajectory calculated through GPS speed on three axis. It shows accelerations and braking G-forces.

#### **GPS Slope**

This channel measures positive and negative slopes of the track.

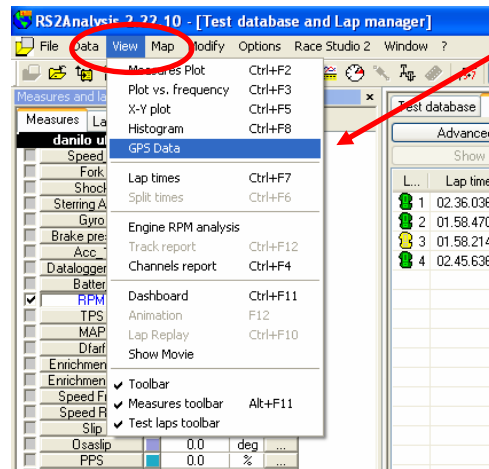
#### **GPS Heading**

This channel measures the heading of the vehicle compared to the North direction.

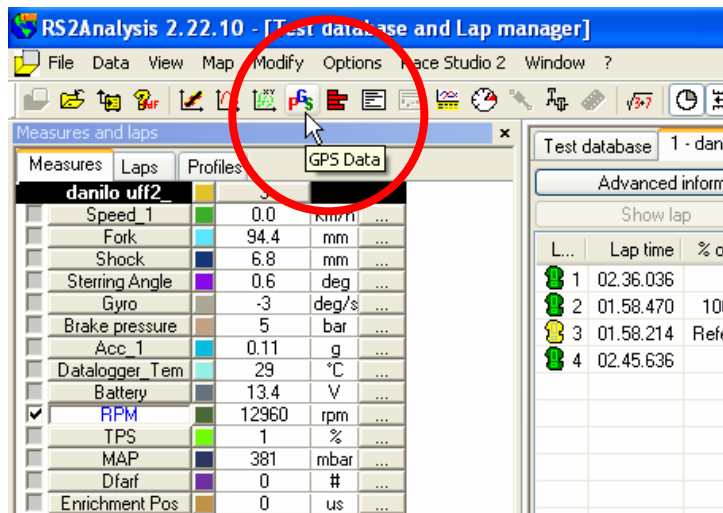
#### **GPS Gyro**

This channel measures the cornering speed of the trajectory in degrees/second.

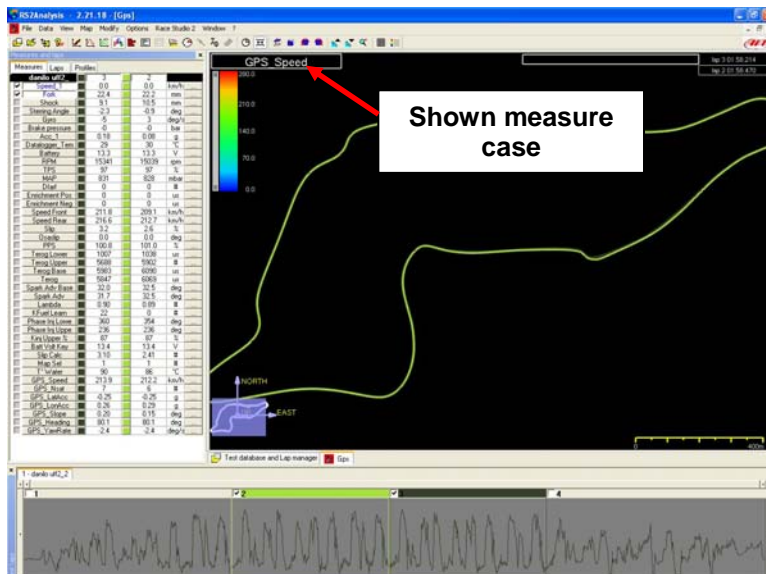
Pressing “View” button on the menu bar of **Race Studio Analysis** and selecting “GPS Data” option, the window concerning the trajectory run by the vehicle during the test, lap by lap, is shown:



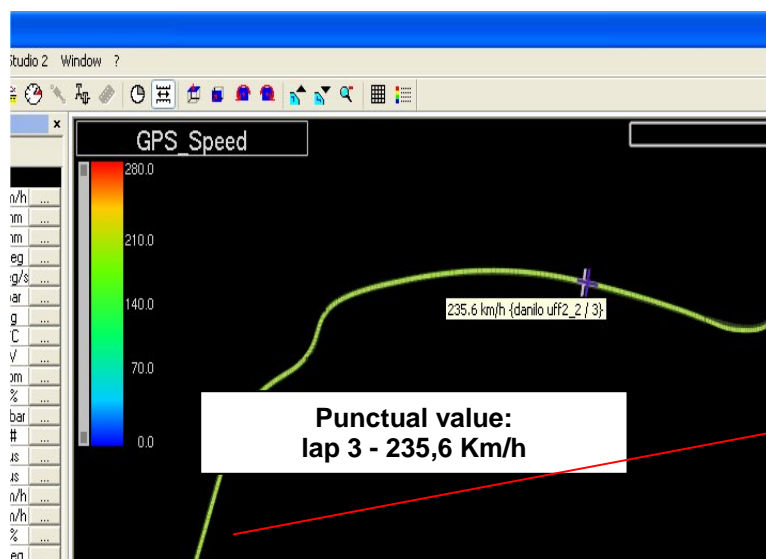
The same function can be activated through the icons bar.



It is possible to scroll the sampled channels values positioning the mouse pointer on the case that indicates the shown measure and using the mouse roller.

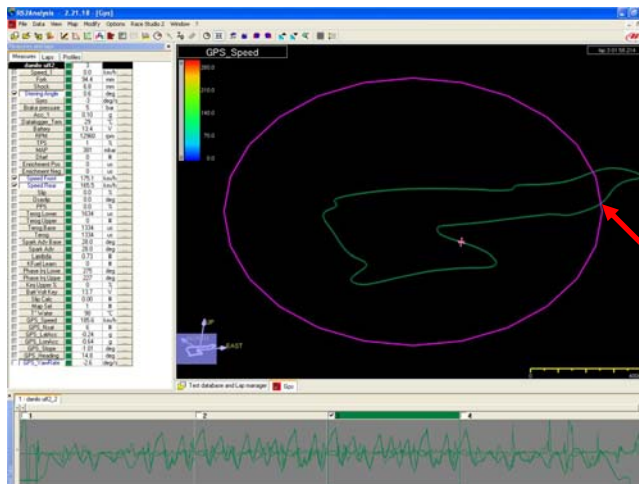


On the other side, positioning the mouse pointer on the trajectory, the punctual value of the shown measure (in this case GPS speed) appears:



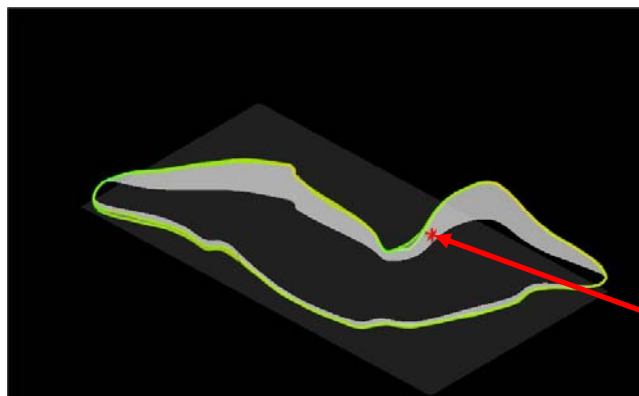
Zoom (IN and OUT) function, available on measures graph analysis is also available on GPS trajectory analysis. It is possible to zoom in and out the trajectory in any point of the track.

Moreover it is possible to rotate the map, using 3D view, right clicking with the mouse and keeping the mouse pointer on the track view.



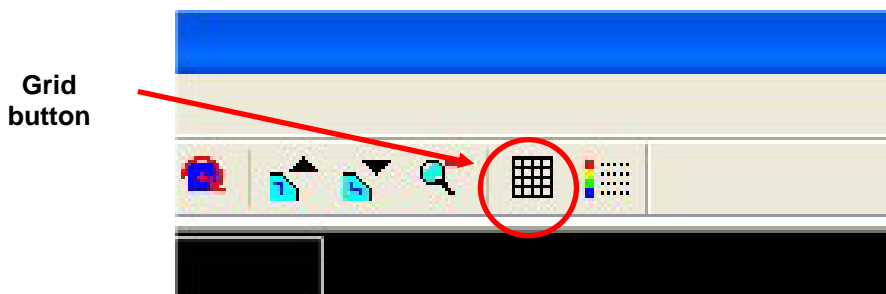
Right clicking with the mouse and keeping its right button pressed, it is possible to rotate the map

The map is 3D (three-dimensional) view and looking at it laterally it is thereby possible to detect altimetric variations, that are shown right clicking twice and keeping the mouse pointer on GPS map.



3D view

To analyse more in detail the track it is possible to show a grid pressing the proper button on the toolbar.



Grid button

Grid dimension is customizable from the menu bar pressing “Options ► GPS Tools ► Grid settings”;

## Appendix “C” – Troubleshooting

### C.1 - Speed

Problem	Probable cause	Suggested solution
Lack of wheel speed signal	<ol style="list-style-type: none"> <li>1. Verify that the distance between sensor and magnets is the one specified</li> <li>2. Verify that the sensor is connected to the proper input</li> <li>3. The cable is damaged or broken</li> <li>4. The sensor is damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the distance</li> <li>2. Connect the speed sensor cable to the logger speed input</li> <li>3. Replace the cable</li> <li>4. Replace the sensor</li> </ol>
Wheel speed value is incorrect	<ol style="list-style-type: none"> <li>1. Verify that the wheel circumference value is correct (default value is 1666 mm)</li> <li>2. Verify that the number of magnet is correct and consistent with the configuration</li> </ol>	<ol style="list-style-type: none"> <li>1. Set the right value in “Channels” layer of Race Studio 2.</li> <li>2. Set the right value in “Channels layer” of Race Studio 2</li> </ol>
High-Low peaks	<ol style="list-style-type: none"> <li>1. Verify that the distance between sensors and magnets is between 6 and 15 mm</li> <li>2. The sensor is damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust the distance between sensor and phonic wheel and check sensor / magnet alignment</li> <li>2. Replace the sensor</li> </ol>

## C.2 – Data

Problem	Probable cause	Suggested solution
The logger has no stored data	1. The logger switched off during the test.	1. Check that the logger is correctly powered and that there are no short circuits on the harnesses (n.b. carbon chassis potential is negative)
	2. A configuration has been transmitted to the logger before data download	2. Transmitting a configuration or making a calibration, the logger memory is deleted
Sampled data are incorrect	1. The sensor is damaged	1. Replace the sensor
	2. The wiring is damaged	2. Replace the wiring
	3. Channels have not been calibrated / auto-calibrated	3. Repeat the calibration

## C.3 – Lap times

**Warning: XAP display could not show lap times page. It is suggested to address to the display manufacturer for firmware update.**

Problem	Probable cause	Suggested solution
Some laps are grouped	1. Incorrect receiver installation	1. Reinstall the receiver
All laps are grouped	1. Verify that the receiver is installed on the right side of the vehicle	1. Reposition the receiver
	2. Verify that the receiver or the cable are not damaged	2. Replace the cable or the receiver
	3. Verify the position of the transmitter	3. Reposition the transmitter.
	4. The hole on the front fairing is too small	4. Enlarge the hole (suggested 20mm)
	5. Transmitter battery is exhausted	5. Replace the battery
Lap times are too short.	1. Verify that laps labelled as “Stop vehicle” are not considered good	1. Disable laps labelled as “Stop vehicle” in Race Studio 2 Analysis
	2. Verify that there are no additional transmitters on the border of the track	2. Remove additional transmitters or increase obscuring time value

## C.4 – Logger – PC communication

<b>Problem</b>	<b>Probable cause</b>	<b>Suggested solution</b>
Race Studio 2 and the logger do not communicate	<ol style="list-style-type: none"><li>1. The logger is switched off</li><li>2. USB driver is not correctly installed</li><li>3. PC USB port does not work correctly</li><li>4. USB cable is damaged</li></ol>	<ol style="list-style-type: none"><li>1. Switch the logger on</li><li>2. Re-install USB driver</li><li>3. Try another USB port if available</li><li>4. Replace the USB cable</li></ol>