EVO4

User manual

Racing Data Power

Dear customer

EVO4 belongs to the last generation of AIM data acquisition systems for car/bike installation: a powerful, compact, reliable and expandable logger with **integrated GPS**.

Thanks to ECT[1] it is possible to instantaneously connect it to the vehicle ECU. Supported ECU database is constantly updated. Refer to download area/ documentation section of www.aim-sportline.com for further information.

EVO4 allows to monitor RPM, speed, engaged gear, lap (split) times standard and custom sensors.

The kit includes, beside **EVO4**, beacon equipment, GPS antenna and CAN/RS232 cable.

EVO4 is a modular datalogger and communicates via CAN bus with:

- **Channel expansion**: AIM channels expansion;
- **TC Hub**: AIM thermocouples multiplier;
- **LCU-ONE** Lambda controller – the best way to keep under control the engine Stoichiometric ratio;
- **MemoryKey** – the simple and quick way to save data and transfer to your Pc

Sampled data can also be shown connecting to **EVO4** a high tech AIM display like **MyChron3 Dash,** keeping everything under control in a glance.

Thanks to **Race Studio 2** it is possible to configure the logger, download and analyze data.

Thanks for choosing EVO4!

[1] AIM Easy Connection Technology.

Index

Chapter 1 – EVO4 technical features and kit 3
1.1 – EVO4 kits and spare parts part numbers 4
1.2 – Optional part numbers 4
Chapter 2 – EVO4 front view 5
Chapter 3 – Installation and powering 6
3.1 – How to power EVO4 6
3.1.1 – GND 7
3.2 – The tri-axial accelerometer 8
3.3 – How to install the GPS antenna 10
3.4 – How to connect EVO4 to the ECU 11
3.5 – How to sample RPM 12
3.5.1 – Sampling the RPM via CAN bus/RS232 12
3.5.2 – Sampling RPM from the ECU through a square wave signal 12
3.5.3 – Sampling the RPM from the coil: RPM low voltage input 13
3.6 – Installing and powering the IR transmitter and receiver 16
3.6.1 – The infrared (IR) transmitters 16
3.6.2 – The infrared (IR) receiver 17
3.7 – How to install EVO4 display 18
3.8 – GPS lap timer through the displays 18
3.8.1 – GPS lap timer configuration 18
3.8.2 – How to configure GPS lap timer on MyChron3 Dash. 18
3.8.3 – II software GPS Manager. 20
Chapter 4 – EVO4: software, driver, configuration, transmission, data download, online function 21
Chapter 5 – EVO4 memory 22
Chapter 6 – EVO4 maintenance 23
Appendix – Technical drawings 24

Chapter 1 – EVO4 technical features and kit

Here below are explained **EVO4** technical features, standard kit and optional.

Technical features:

- integrated GPS Module;
- 5 configurable analog channels;
- 2 speed inputs;
- 1 RPM channels;
- 1 internal tri-axial accelerometer;
- Lap time (magnetic/optic/GPS);
- ECU Interface;
- CAN protocol for external expansion modules;
- 8 Mb Memory;
- USB port for data download;
- 5 KHz sampling frequency;
- 8/18 V external power.

The kit includes:

- EVO4;
- GPS antenna;
- Infrared transmitter with power cable;
- Infrared receiver;
- RPM cable;
- ECU interface cable;
- USB data download cable;
- CD **Race Studio 2**.

Optional:

- Display Mycron3 Dash;
- Expansions;
- RPM adapter (only to sample an inductive RPM signal from the spark plug);
- External MemoryKey for data backup;
- Infrared split transmitter.

1.1 – EVO4 kits and spare parts part numbers

EVO4 kits are distinguished by the length of the GPS antenna cable and of the receiver power cable.

- Kit EVO4 with 4 m antenna and 90 cm receiver cable **X60E44090**
- Kit EVO4 with 4 m antenna and and 140 cm receiver cable **X60E44140**
- Kit EVO4 with 4 m antenna and and 300 cm receiver cable **X60E44300**
- Kit EVO4 with 1,3 m antenna and 90 cm receiver cable **X60E41309**
- Kit EVO4 with 1,3 m antenna and 140 cm receiver cable **X60E41314**
- Kit EVO4 with 1,3 m antenna and 300 cm receiver cable **X60E41330**

Spare parts part number:

- RPM cable **V0256302**
- Serial/CAN cable **V0256303**
- USB cable **V0256301**

1.2 – Optional part numbers

MyChron3 Dash: **X30VDAM01**

MemoryKey for data back up: **X50MEPC00**

Data hub (with 150 cm cable): **X08HUB150**

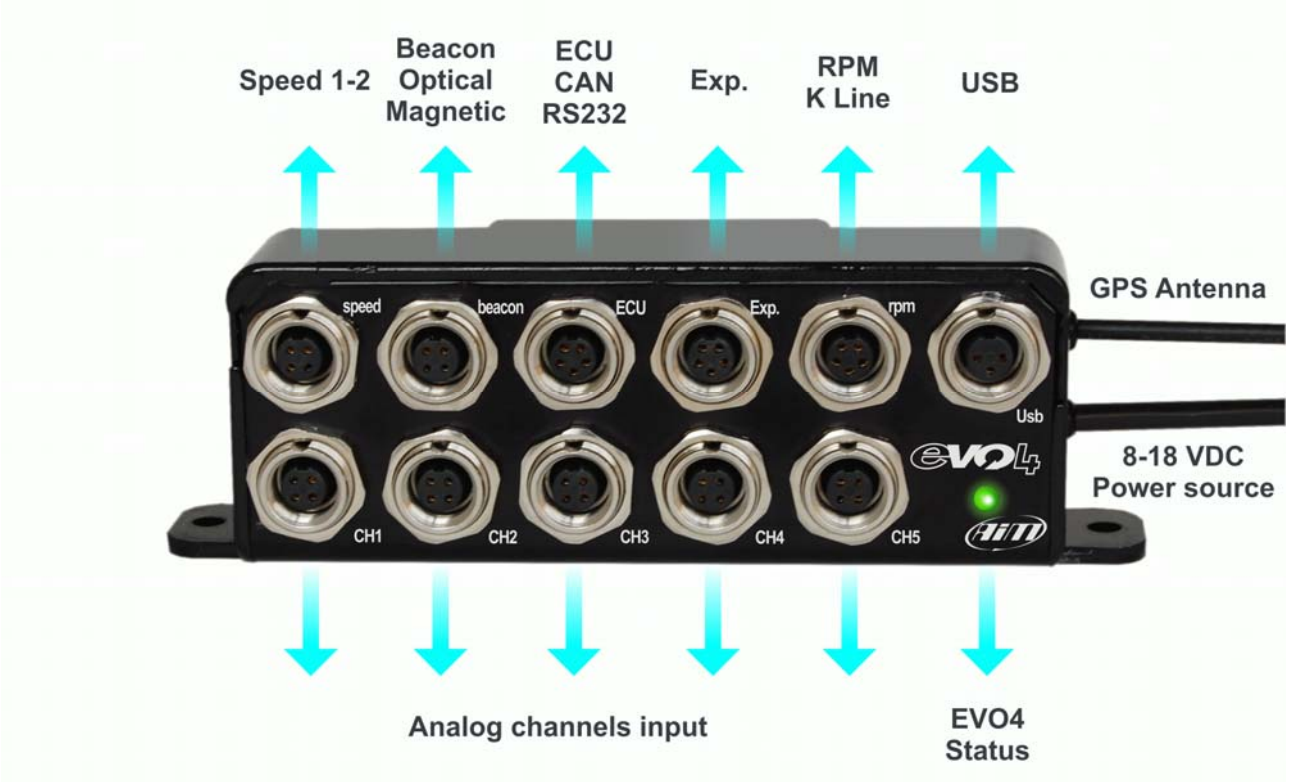
Channel expansion: **X08CHEXUC**

TC Hub: **X08UTCCTC**

LCU-ONE CAN Lambda Controller: **X08LCU03K0**

Infrared split transmitter: **X02TXSPLIT0**

Chapter 2 – EVO4 front view



EVO4 front view shows 11 connectors and a led placed bottom on the right.

Connectors are for:

- **Speed**: two speed inputs;
- **Beacon**: optical/magnetic beacon input;
- **ECU**: ECU CAN/RS232;
- **Exp.**: AIM expansions connection (Channel Expansion, TC Hub, LCU-ONE, MemoryKey);
- **RPM**: RPM input and K line connection;
- **CH1, CH2, CH3, CH4, CH5**: analog channels inputs

The **led** placed bottom on the right has a double function. It switches on when **EVO4** is powered and shows logger status according to this scheme.

- Led blinking 1Hz: **EVO4** in stand by
- Led steady: **EVO4** is recording
- Led blinking 3 Hz: configuration not OK
- Led blinking with alternate colors: logger is updating firmware.

The top lateral cable is GPS antenna cable.

The bottom lateral cable is power cable.

Chapter 3 – Installation and powering

Install **EVO4**, its expansions and display in a place where the devices are not in contact with heat sources or electromagnetic interference sources like spark plugs and coil.

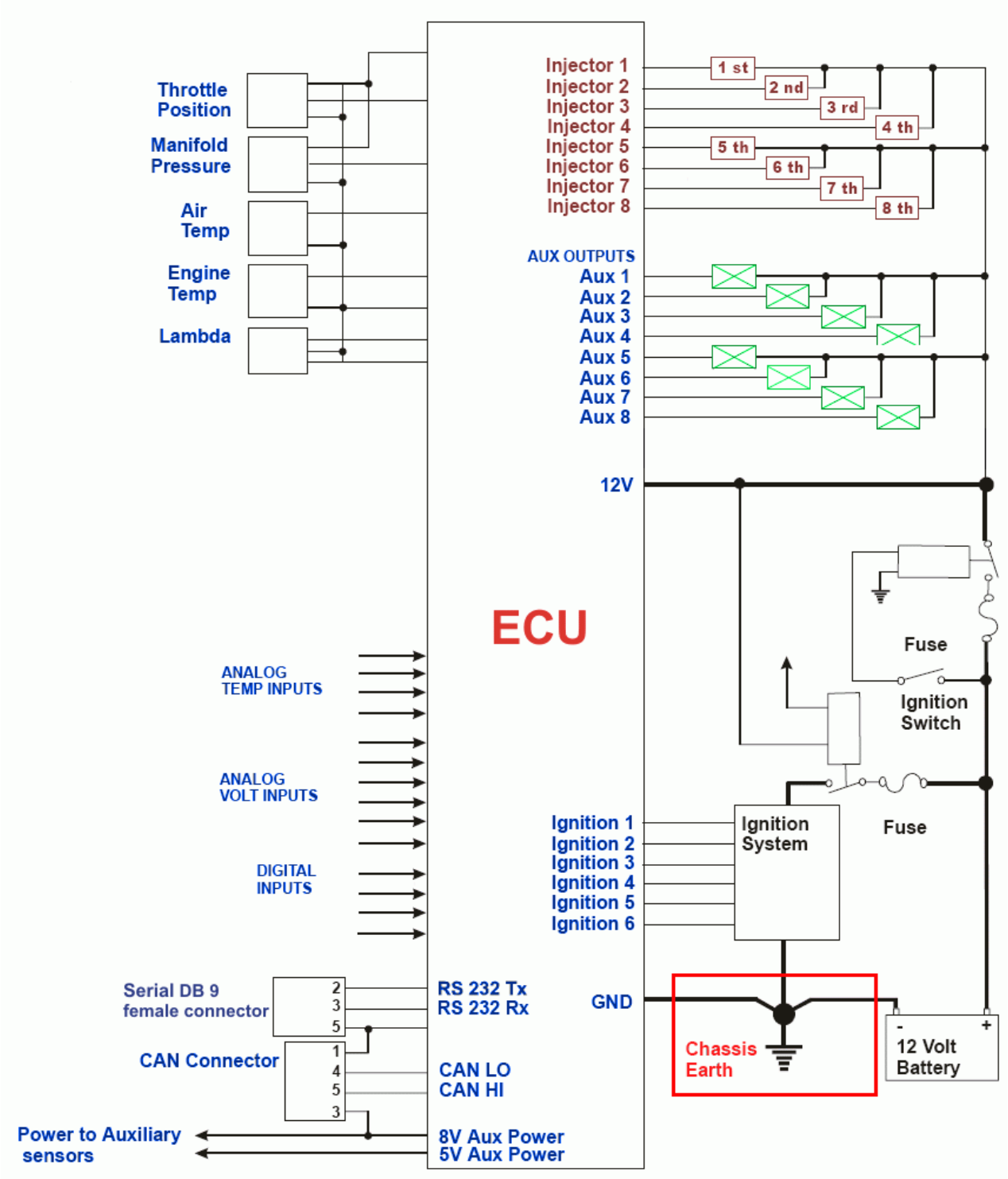
3.1 – How to power EVO4

EVO4 needs a 8-18 VDC non stabilized power source.

It is suggested to power **EVO4** through the vehicle master switch to save vehicle battery charge.

3.1.1 – GND

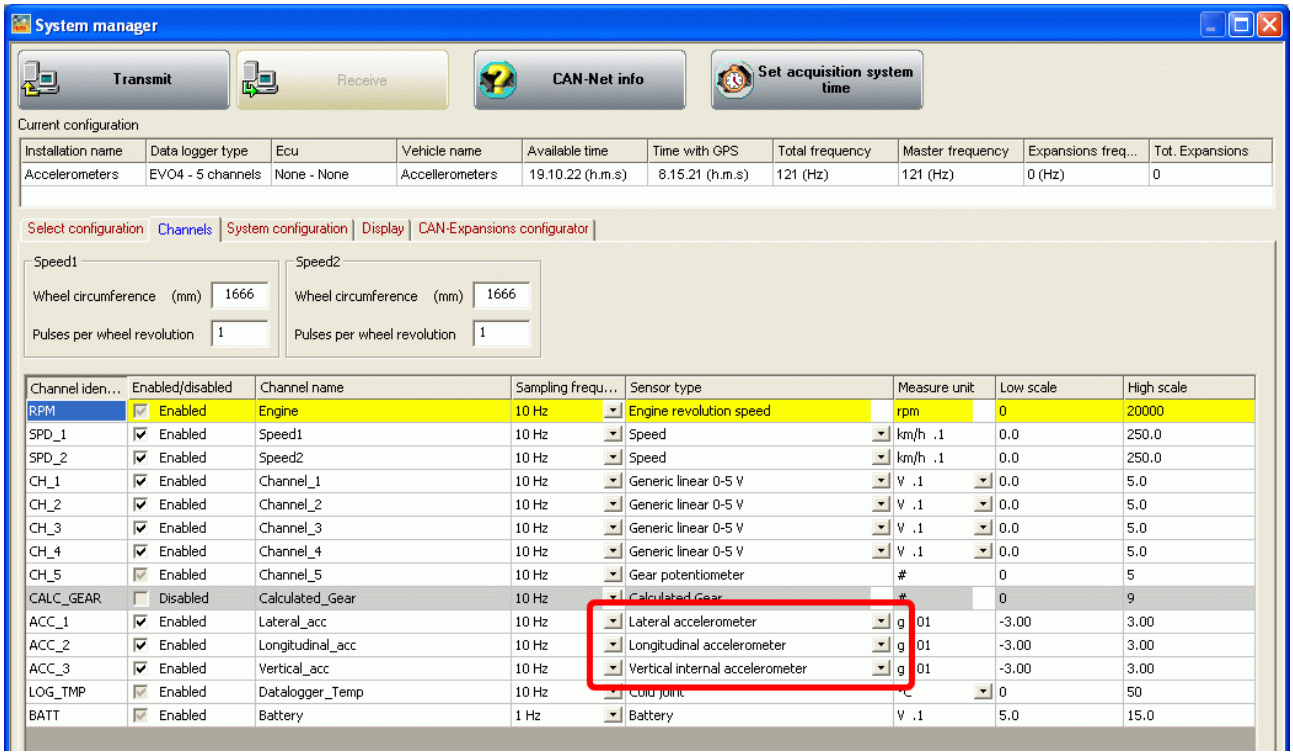
For a correct powering and sensors signal stability it is suggested to connect cable labelled GND of **EVO4** powering wiring to the vehicle chassis earth as highlighted in the figure below.



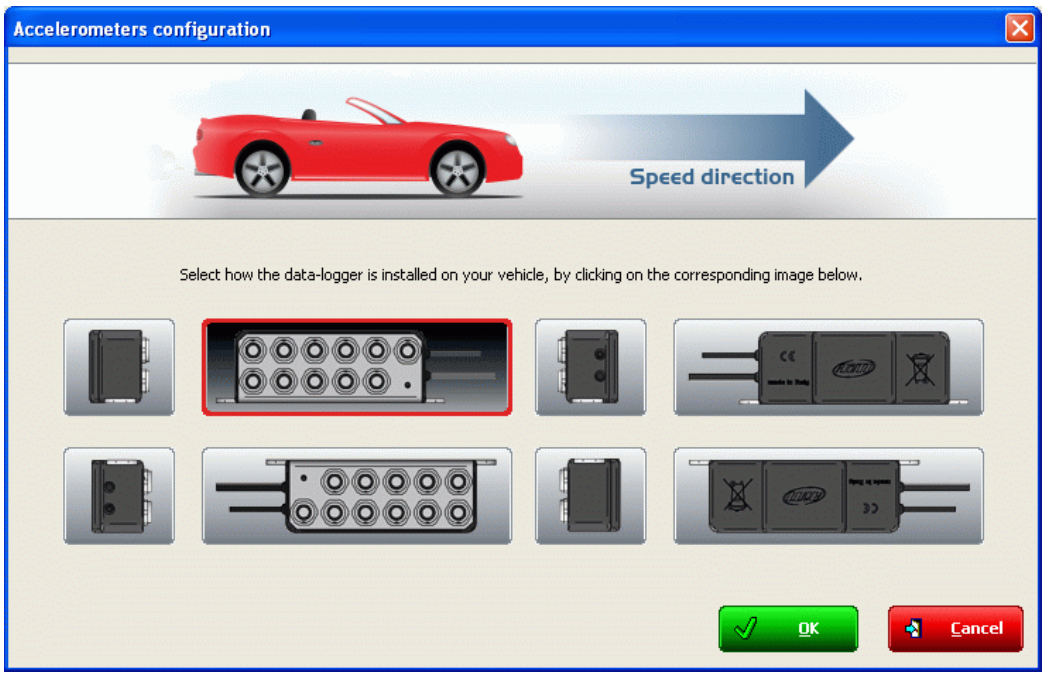
3.2 – The tri-axial accelerometer.

EVO4 is equipped with an internal tri-axial accelerometer that is automatically configured by the software according to the way the logger is installed on the vehicle.
To set the accelerometer follow this procedure:

- activate channels layer (shown here below);

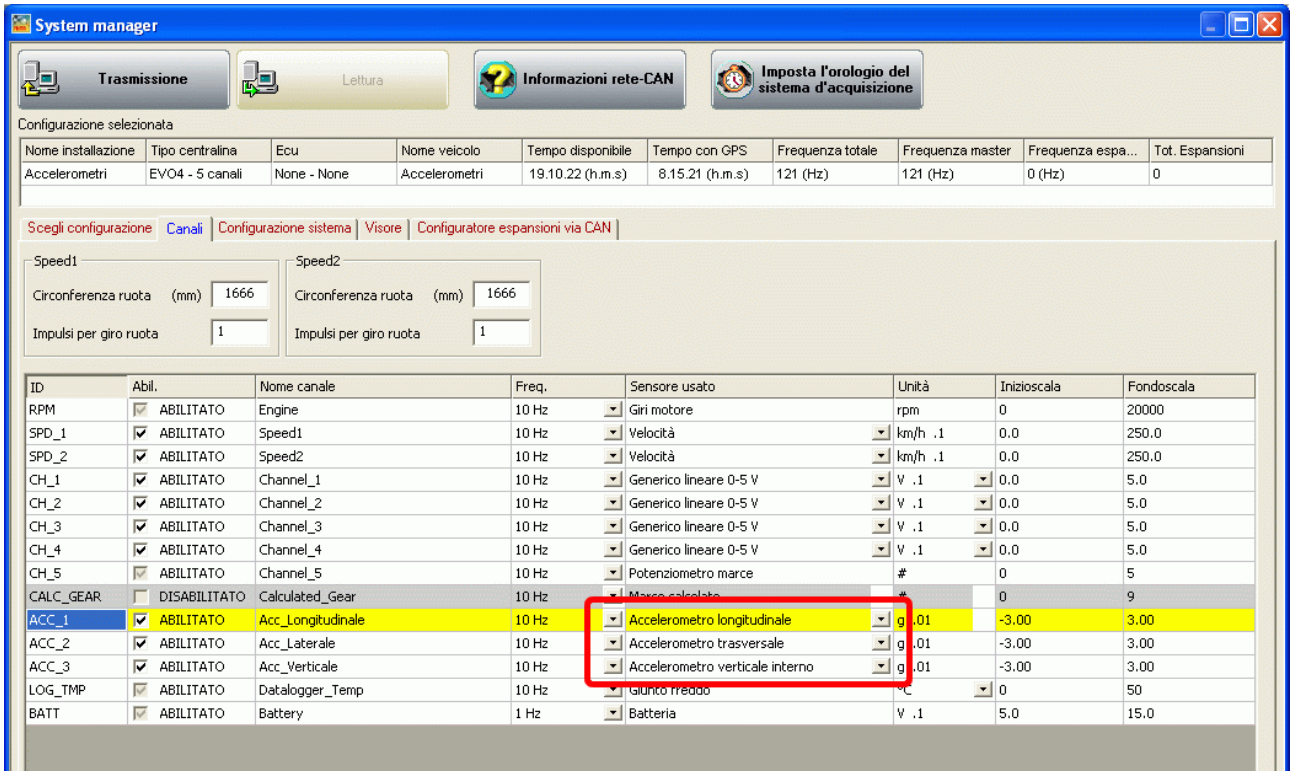


- click twice on the accelerometer to set; the panel here below appears;



- select the position corresponding to **EVO4** installation; the system highlights the selection red circling the selected button;

- the system automatically sets the three accelerometer axles as shown here below.

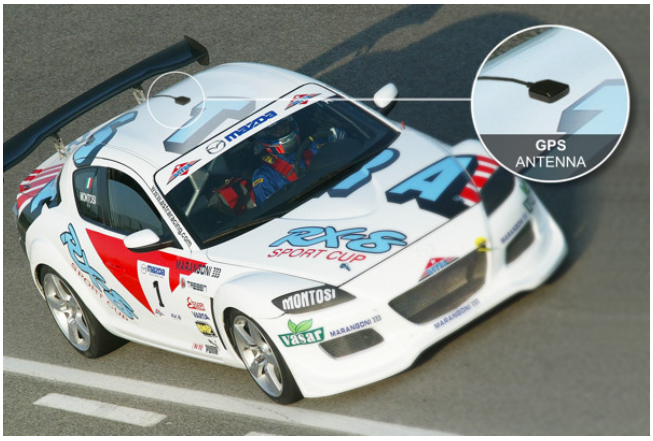


Once the channel is set it is possible to verify if it corresponds to the logger position double clicking on the channel. The panel before appears showing the position corresponding to that setting.

Refer to **Race Studio Configuration** user manual, freely downloadable from the website www.aim-sportline.com for further information concerning channels setting.

3.3 – How to install the GPS antenna

In order to get the **GPS** work properly pay attention when installing the antenna on the vehicle.
Install it far from heat sources and let the antenna cable pass as far as possible from electromagnetic sources (i.e. coil or alternator).
In case of car installation place the antenna on the vehicle roof so that the antenna can fix steady on the metallic surface.
In case the surface where the antenna is to be installed is not ferrous it is suggested to use a piece of 3M Velcro® to correctly fix it to the vehicle chassis.



In case of bike installation place the antenna on the bike tail, where the surface is flat and looking upwards.

3.4 – How to connect EVO4 to the ECU

EVO4 can sample data coming from the vehicle ECU using the proper CAN/RS232 interface cable.

To be sure that the vehicle ECU is supported by **EVO4** and for further updated information concerning ECU – AIM loggers connection refer to the related documentation freely downloadable from AIM corporate website at the following link:

http://www.aim-sportline.com/pages/download/section_documentation_ecu.htm

In case non-standard CAN or RS232 lines need to be converted, it is suggested to contact our technical support.

Always refer to the ECU user manual for any further information concerning pins and cables connection.

To connect **EVO4** to the vehicle ECU use the connector labelled ECU placed on the back of the logger. Refer to the appendix technical drawings for further information.

Using the CAN line the connection is:

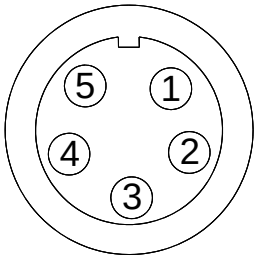
- CAN +: pin 3 white cable labelled CAN +
- CAN –: pin 5 blue cable labelled CAN -

Using the RS232 line the connection is:

- RS232RX pin 4 white cable labelled RS232RX
- RS232TX pin 1 blue cable labelled RS232TX

Using K line the connection is:

- K line pin 4 yellow cable labelled K line.



5 pins Binder 712 male connector pinout – solder termination view.

3.5 – How to sample RPM

EVO4 can sample RPM signal in various different ways:

- from the ECU via CAN bus or RS232;
- from the ECU through a square wave signal (from 8 to 50V);
- from the coil: RPM low voltage (from 150 to 400V) input;
- from the spark plug converting the signal sampled from the spark plug in a square wave signal. In this case it is necessary to use an RPM adapter (optional).

3.5.1 – Sampling the RPM via CAN bus/RS232

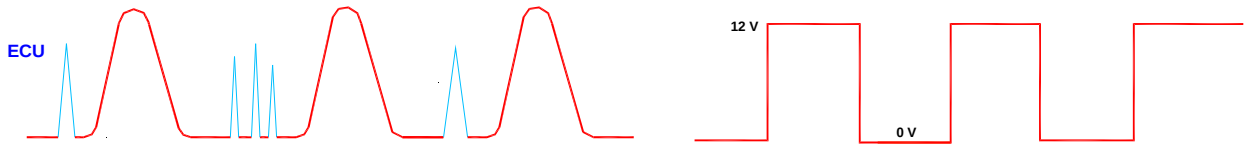
To sample RPM refer to the related chapter for further information.

3.5.2 – Sampling RPM from the ECU through a square wave signal

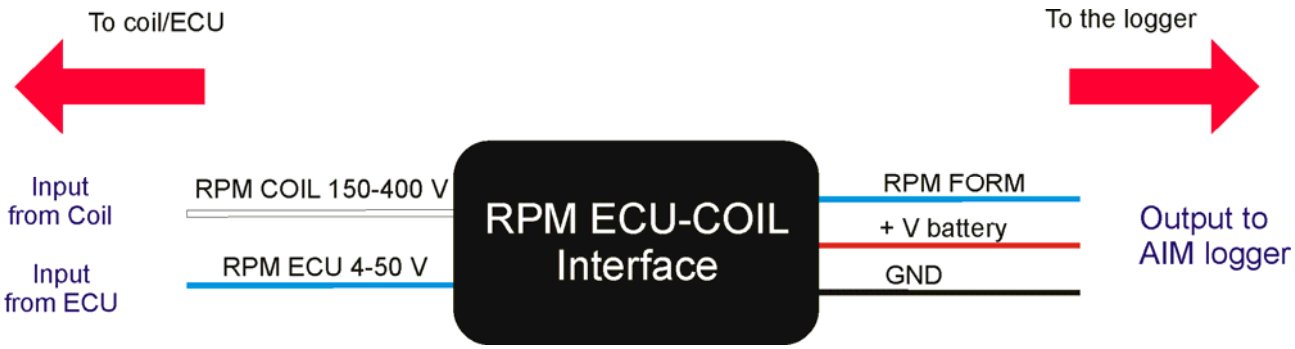
To sample RPM from the ECU through a square wave signal (from 4 to 50V), connect the blue cable labelled “RPM 4-50V” of the 5 pins male Binder connector to RPM output of the ECU (see chapter 2 and appendix technical draw - code 04.563.02).

It can occur that the RPM signal coming out from the ECU is not correctly sampled by **EVO4** because is very unstable.

In case the emitted signal is not a stable square wave one it is necessary to use an (optional) RPM adapter. The images below show - on the left - a not square wave RPM signal coming from the ECU and - on the right - a filtered one.



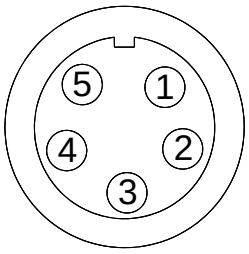
To connect the RPM adapter follow this procedure.



- Connect cable labelled RPM-ECU 4-50 V to ECU RPM output;
- Connect the blue cable of the adapter, “labelled RPM form” to “RPM form 8-50 Volt square wave” input of **EVO4**.
- Connect the red cable of the interface labelled “V battery” to the battery positive pole. It is suggested to connect the red cable downstream the vehicle master switch.
- Connect the interface black cable, labelled GND to the logger GND pin (refer to the appendix technical draw code 04.563.02 for further information).

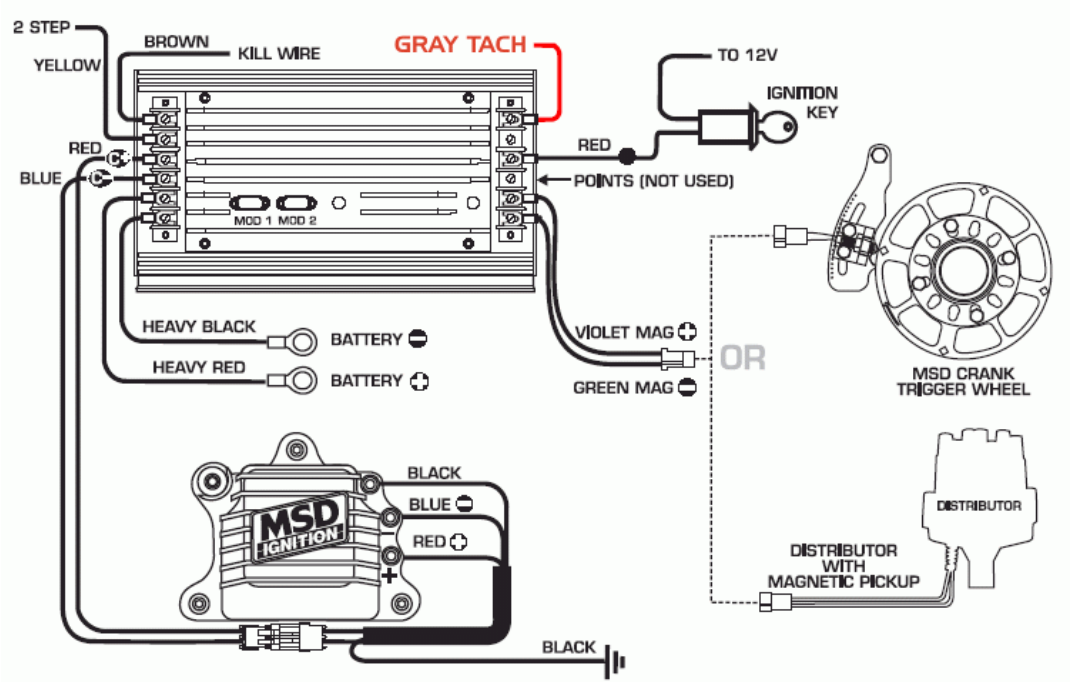
3.5.3 – Sampling the RPM from the coil: RPM low voltage input

To sample RPM signal from the coil on a low voltage RPM input (from 150 to 400V), connect 5 pins Binder 712 male connector pin to ECU RPM output using the white cable labelled RPM 150-450V (see appendix technical draw code 04.563.02).

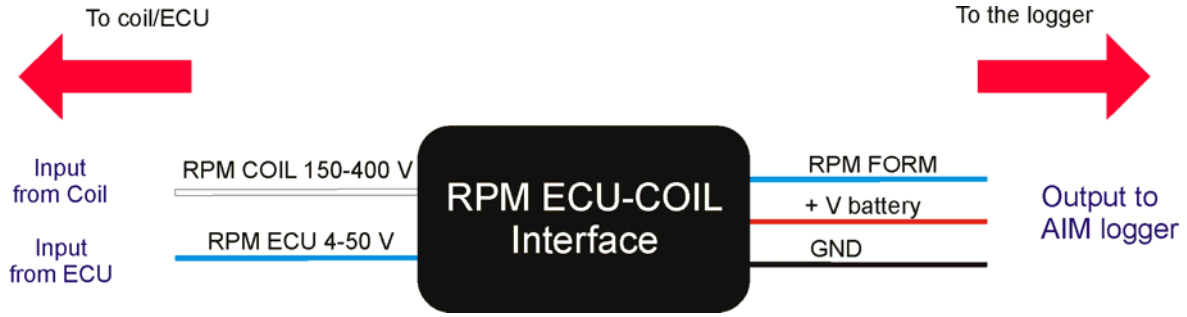


It can occur that RPM signal produced by the coil is not correctly sampled by **EVO4** because the signal is very unstable.

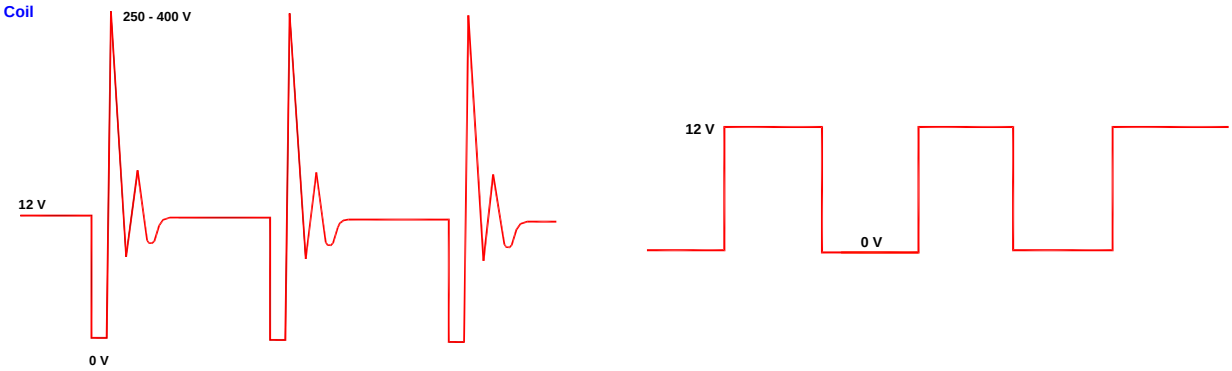
The image below shows a connection scheme example of the ignition key. Here below the out coming cable - labelled gray tach - that can be sampled directly from **EVO4** through the 4-50 Volt (see appendix technical draw code 04.563.02 – pin 3) is highlighted.



In case an ignition output is not available, it is necessary to use a signal coming from the coil after having filtered it.



Here below an RPM signal coming from the coil is shown: not filtered on the left and filtered on the right.

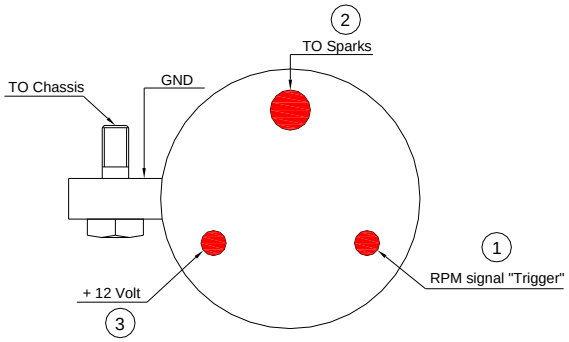


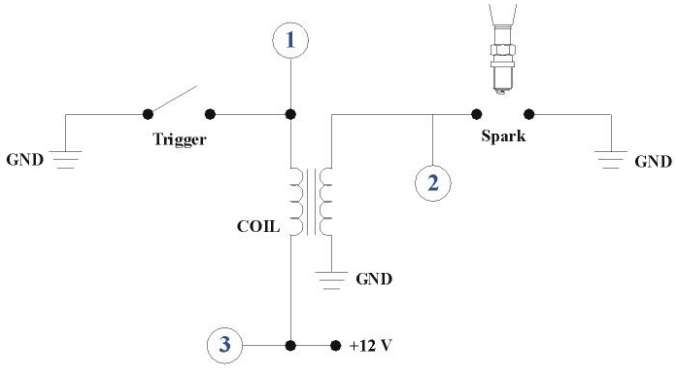
To filter the signal use an “RPM Coil-ECU” adapter (optional). It is a double-purpose filter that allows to sample RPM from the coil and to square the signal wave form.

The coil to sample the signal from, shown here below, is a black cylinder with three cables (1,2 and 3 labelled).

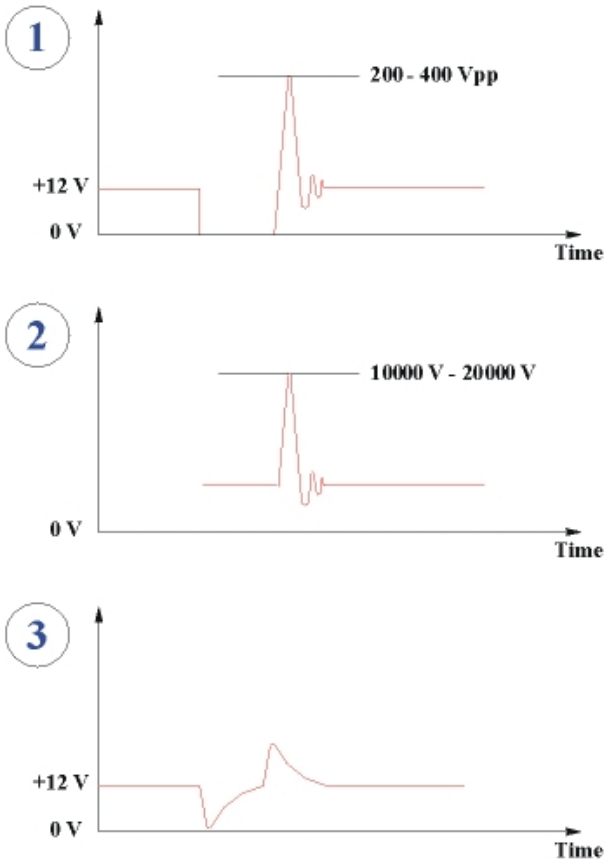
Cable labelled 1 is the coil low tension input.
Cable labelled 2 is connected to the coil.
Cable labelled 3 is connected to the battery positive pole (+12V).

Moreover the coil is generally grounded with the chassis as shown by the scheme below on the right.





The scheme below shows the voltage in the points labelled 1,2 and 3 in the images here above.



It is reminded that the adapter white cable, labelled "RPM-Coil 150-400 V" is to be connected to the RPM trigger wiring indicated by digit 1 in the above schemes.

3.6 – Installing and powering the IR transmitter and receiver

AIM provides a range of beacon equipments:

3.6.1 – The infrared (IR) transmitters

AIM provides two kinds of transmitter:

- the lap transmitter;
- the split transmitter; this last one emits a different signal and **EVO4** can distinguish the two signals.

The transmitter can be internally or externally powered:

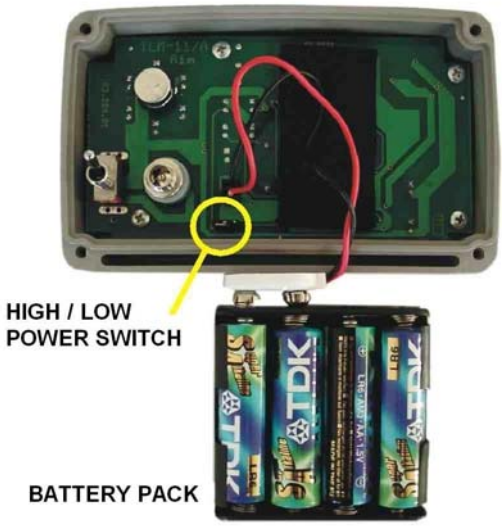
- internally: with 8 AA batteries (placed in the transmitter case); when battery charge status is low power led starts blinking each second (1Hz);
- externally: with an external 12 V power cable; when battery charge status is low the led starts blinking each second.

The transmitter has 2 working modes:

- Low power mode: for tracks whose width is less than 10 m (30 ft);
- High power mode: for tracks whose width is more than 10 m (30 ft); in this second case external 12V power is necessary and both led switch on when the transmitter is switched on.

To activate High/Low power mode:

- unscrew the back of the transmitter case;
- place the clip - yellow circled in the figure below - behind one of the connectors for “Low power” mode and behind both of them for “High power” mode.



Warning: it is recommended to verify the number of transmitters already installed on the circuit before installing your own. It is in fact possible that there are transmitters additional to the one placed on the start/finish line. The simplest way to record correct times is using the same transmitter(s) for all racers.

3.6.2 – The infrared (IR) receiver

The infrared receiver has to be installed on the vehicle so that it can see the transmitter placed on the side of the track. The red circle in the figure below indicates the receiver eye.

3.7 – How to install EVO4 display

EVO4 can be connected to an AIM display to see channels and alarms during the race. At present, available display is MyChron3 Dash.

Information shown in the different display pages can be configured by the user through Race Studio 2 software.

For further information concerning the display configuration refer to Race Studio Configuration user manual downloadable from www.aim-sportline.com and to the display user manual.

3.8 – GPS lap timer through the displays

EVO4 can use the connected display to show lap/split times using GPS lap timer without using any external lap/split transmitter.

3.8.1 – GPS lap timer configuration

For **EVO4** to compute lap times using GPS lap timer it is necessary to set this option in its configuration and then transmit it to the logger. Refer to Race Studio Configuration user manual – chapter "**EVO4** and transmitting the configuration" – for further information.

3.8.2 – How to configure GPS lap timer on MyChron3 Dash.

To set lap and splits on **MyChron3 Dash** via keyboard follow this procedure.

- Use "VIEW/quit" button to scroll **default fields** pages until this screen is shown ("OK SET GPS MARKER").

- Press "**MEM/OK**" button to start lap/split setting procedure. In case **EVO4** configuration has a split setting the screen here below appears ("OK TO SET SPLIT 1"). Split number is set via software.

- Run a track lap to select the physical points where to set lap and split markers.
- Press "MEM/OK" button on **MyChron3 Dash** keyboard in the point where to set the split.
- Repeat this operation as many times as all splits are set.
- Once set the splits, the screen asking for lap marker setting - shown here below - appears ("OK TO SET LAP"). In case no split is set in the logger configuration this screen appears immediately after "lap timer starting setup" one ("OK SET GPS MARKER). Press "**MEM/OK**" button in the point where lap marker is to be set.

- Once lap marker is set, GPS lap timer setting procedure is over and the display shows a confirmation screen ("GPS MARKER END"). This screen appears only if the procedure has been successfully completed.

Starting from this moment **MyChron3 Dash** automatically samples lap/split times using the GPS signal only.

In case the procedure has not been correctly completed the screen here below appears.

In case GPS memory is full, the screen here below appears.

To empty GPS memory (that stores tracks memorization) it is necessary to use **GPS Manager** software, freely downloadable form download/software section of AIM website www.aim-sportline.com.
Refer to GPS Module user manual for further information concerning the use of **GPS Manager** and the management of GPS through this software.

To disable this function it is necessary to re-configure **EVO4** disabling use GPS lap timer option.

3.8.3 – Il software GPS Manager.

EVO4 integrated GPS can store tracks and the related settings; these information are managed through GPS Manager, the software properly developed by AIM. For further information on the subject refer to GPS Module user manual.

Chapter 4 – EVO4: software, driver, configuration, transmission, data download, online function

EVO4 connects easily to a PC through the USB cable and can be configured only through **Race Studio 2**, the powerful software properly developed by **AIM** to configure its loggers and analyze data.

EVO4 standard kit includes the USB cable and **Race Studio 2** and USB driver installation CD.

Warning: the logger can be configured only after software and driver installation. Periodically check on www.aim-sportline.com new releases of Race Studio 2 software and/or EVO4 firmware.

Race Studio Configuration user manual, downloadable from download area of AIM corporate website www.aim-sportline.com, includes all information concerning:

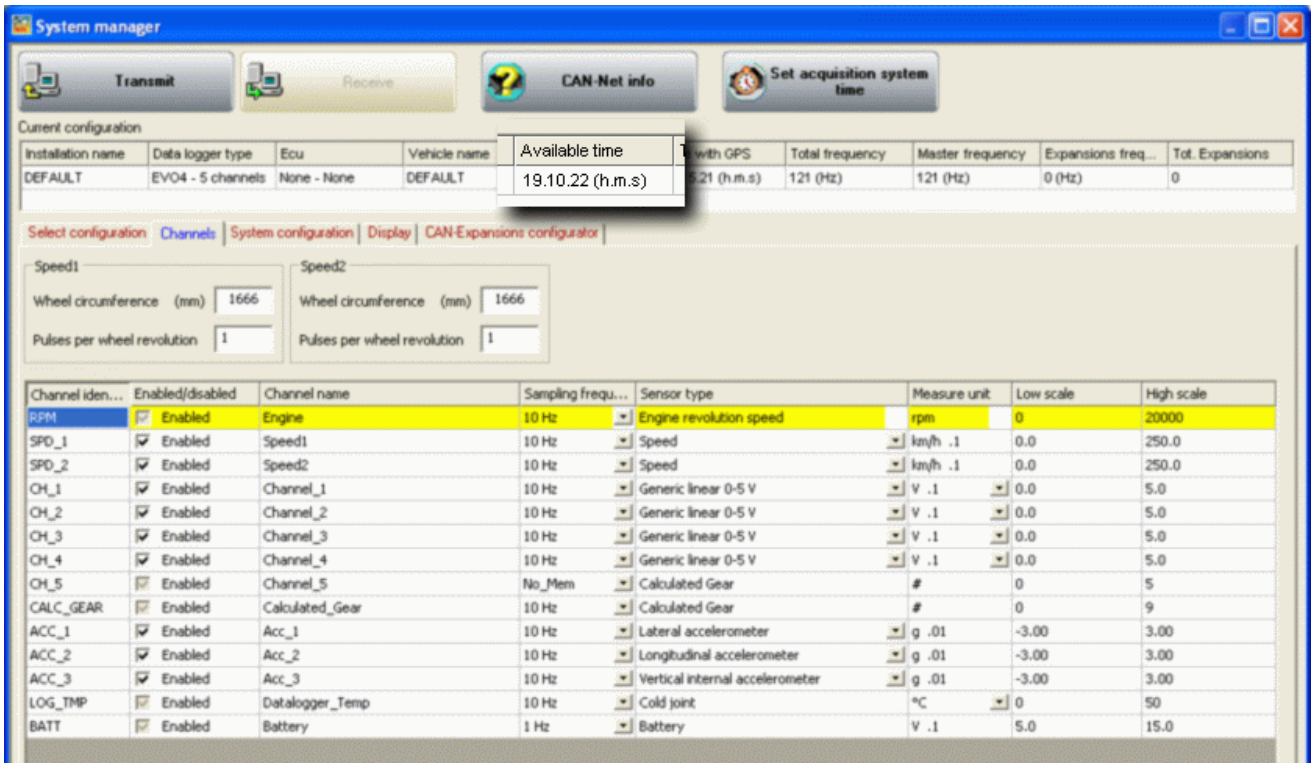
- how to install **Race Studio 2** under Microsoft Windows XP®, Microsoft Windows Vista® (32 bit only);
- how to configure **EVO4** and set its channels;
- how to configure **EVO4** CAN expansions and set their channels;
- how to configure **EVO4** display and set its channels;
- setting and managing standard and custom sensors;
- calibrating and auto-calibrating sensors;
- transmitting the configuration to **EVO4** once set;
- gear calculation;
- data download;
- online function.

Chapter 5 – EVO4 memory

EVO4 is equipped with an internal flash memory whose characteristics are:

- **8 Mb**;
- **non volatile** (data are stored also when the logger is off);
- **round** (when it is full, new data automatically overwrite the old ones).

Memory roundness implies an automatic over-writing of old data. To avoid loosing data it is suggested to set each channel sampling frequency on a value that guarantees a sufficient amount of time.
Channels sampling frequency is set using **Race Studio 2** software. In the image here below - showing channel layer - the case 'Available time' is highlighted. It shows the time available with the sampling frequency currently set on each channel.



Modifying each channel sampling frequency available time can increase or decrease.
Refer to **Race Studio Configuration** user manual for further information concerning channels setting and their sampling frequency.

Chapter 6 – EVO4 maintenance

EVO4 needs no special maintenance. Just take care of the logger and its components; the only suggested maintenance is a periodic software/firmware updating:

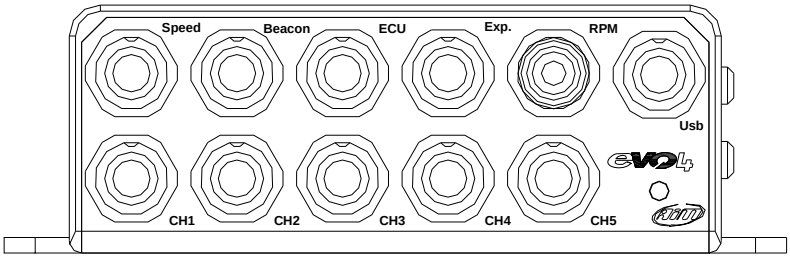
Updates are constantly released by AIM and issued on www.aim-sportline.com download firmware / software area.
To update firmware/software it is necessary to:

- Connect to www.aim-sportline.com.
- Click on “Download area”.
- Click on the corresponding section depending on what is to be updated: software or firmware.
- Select the software/firmware to be updated.
- Check if any update has been released.
- Download and run them double clicking on them.
- Follow the instructions that appear on the PC monitor.

Appendix – Technical drawings

N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

PINOUT EVO4



4 Pins Female Binder connector labelled **SPEED**		4 Pins Female Binder connector labelled **BEACON**		5 Pins Female Binder connector labelled **ECU**		5 Pins Female Binder connector labelled **EXP**		5 Pins Female Binder connector labelled **RPM**	
1	SPEED1	1	Magnetic Lap	1	RS232RX	1	CAN 0+	1	RPM Input
2	GND	2	GND	2	GND	2	GND	2	GND
3	+VB	3	+VB	3	CAN 1+	3	+VB	3	RPM 4-8 V
4	SPEED2	4	Optical Lap	4	RS232TX	4	CAN 0-	4	K Line
				5	CAN 1-	5	VB Ext.	5	Digital Output

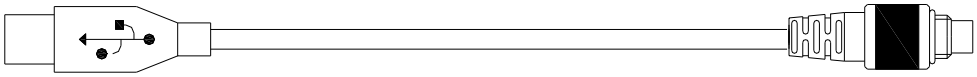
3 Pins Female Binder connector labelled **USB**	
1	USB D+
2	USB D-
3	GND

4 Pins Female Binder connector labelled **CH1**		4 Pins Female Binder connector labelled **CH2**		4 Pins Female Binder connector labelled **CH3**		4 Pins Female Binder connector labelled **CH4**		4 Pins Female Binder connector labelled **CH5**	
1	Analog Input 1	1	Analog Input 2	1	Analog Input 3	1	Analog Input 4	1	Analog Input 5
2	GND	2	GND	2	GND	2	GND	2	GND
3	+ VB	3	+ VB	3	+ VB	3	+ VB	3	+ VB
4	V Ref	4	V Ref	4	V Ref	4	V Ref	4	V Ref

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
L.I.					**10/09/08**	
Racing Data Power		Titolo / Title	**Pinout EVO4**			
		N. disegno / Drawing N.			Rev. / Rev.	Foglio / Sheet
						1 of 1

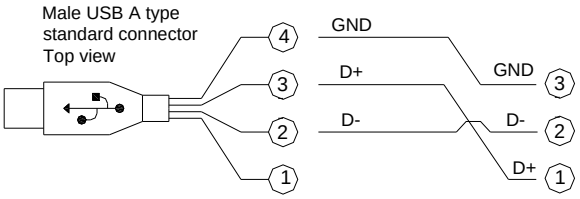
N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

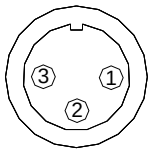
USB cable for EVO4



Male USB A type
standard connector
Top view

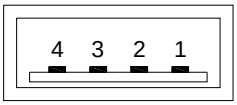
3 pins Binder 712
male connector





3 pins Binder 712
male connector pinout
Solder termination view

USB male connector pinout
Frontal view

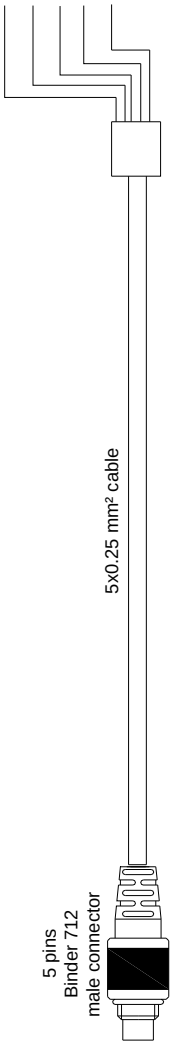


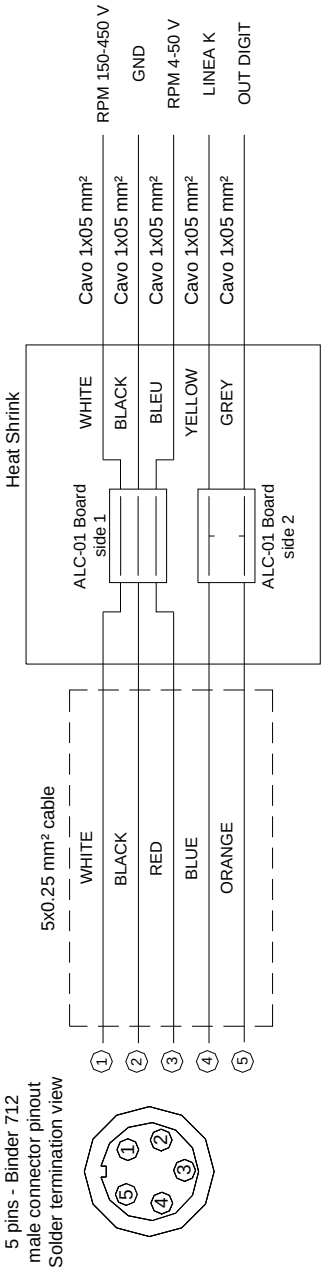
Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
D.B.					08-07-08	

	Titolo / Title		
Racing Data Power	USB cable for EVO4		
	N. disegno / Drawing N.	Rev. / Rev.	Foglio / Sheet
	04.563.03		1 of 1

N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

RPM, gear flash and K line cable for EVO4

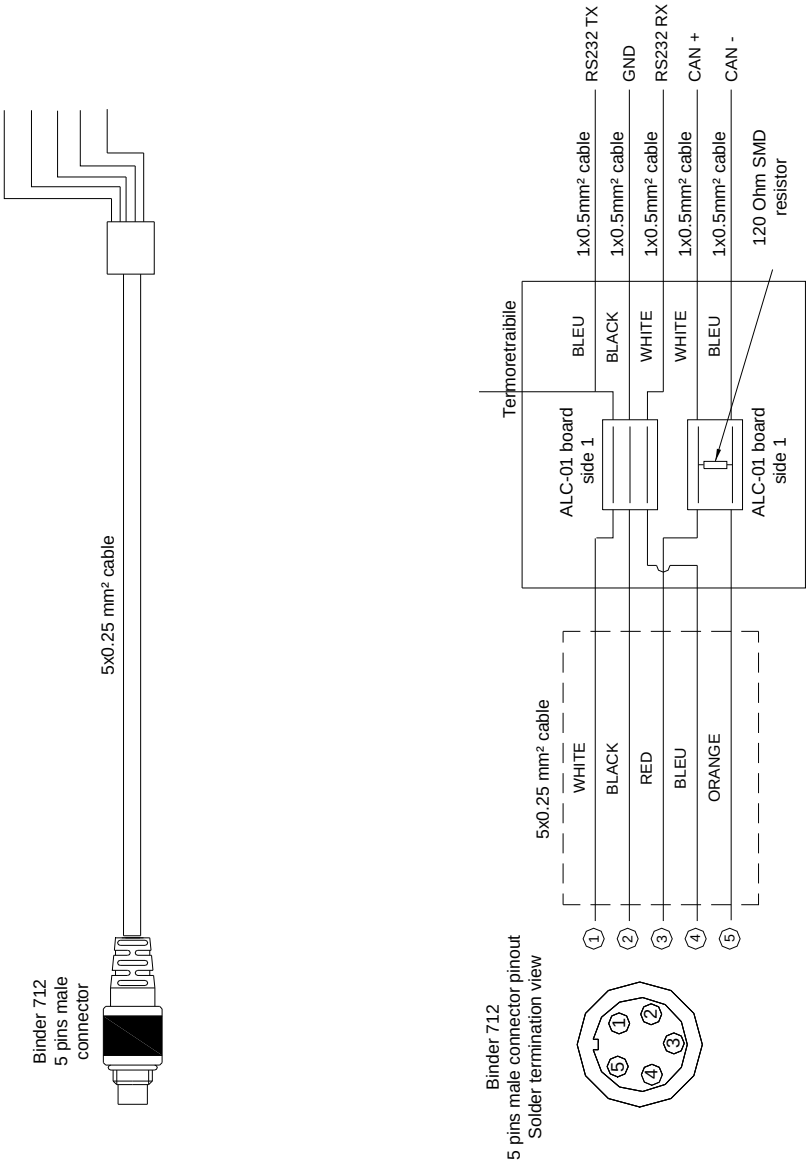




Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by: D.B.		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Cavo RPM, gear flash e linea K per EVO4				
		N. disegno / Drawing N.: 04.563.02			Rev. / Rev.: 1	Foglio / Sheet: 1 of 1

N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

EVO4 ECU CAN and serial cable



Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by: D.B.		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Cavo ECU seriale e CAN per EVO4				
		N. disegno / Drawing N.: 04.563.01			Rev. / Rev.: 1	Foglio / Sheet: 1 of 1