MXL

USER MANUAL

AIM

Racing Data Power

MXL, with all its versions (Strada, Pista, Pro, Pro05) belongs to the new generation of AIM data acquisition systems for car/bike races.

Equipped with a beautiful and wide display, easy to use, multi-functional and fully configurable, it fits any need and can record in detail driver's and vehicle performances.

MXL is part of AIM Total Racing Solution, that includes also **Race Studio 2** software to configure the logger and download its data.

MXL allows to monitor and show RPM, speed, engaged gear, lap/split times and data sampled by other custom sensors.

MXL has also a backlight, very useful during night races or in low light conditions.

Moreover, thanks to the lateral g-sensor or to the external gyroscope it is possible to create the track map to relate sampled data to the position on the track.

Always versatile, **MXL** is available with different non volatile internal RAM memory dimensions: 128kb (Strada), 8Mb (Pista/PRO) or 16Mb (PRO 05). The memory is saved also when the logger is switched off.

The logger has a lateral USB port used to connect it to a PC. Thanks to **MemoryKey**, moreover, it is possible to download data with no need of a PC on the track.

MXL is a modular system that, using the CAN bus, can increase every day its potentialities. It is possible to connect it not only to a series of channels multipliers (**Data Hub**, **TC Hub**, etc), but also to a **Lambda Controller**, to the **GPS Module** with lap timer function as well as to a Video system (**DaVid**).

Warning: any documentation mentioned in this user manual can be freely downloaded from AIM corporate website at www.aim-sportline.com.

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1 – MXL kits, optional and part numbers

AIM developed different **MXL** kits to fit any situation. Here below a description of each standard kit with the related optionals.

1.1 – MXL Strada kit, optional and part numbers

MXL Strada standard kit: X10MXLS00000

- MXL Strada (**1**);
- Power and ECU CAN/RS232 interface cable (**2**);
- USB cable for PC interface (**3**);
- AMP 16 pins connector (**4**)
- **Race Studio 2** software CD and **MXL** User manual (**5**).

MXL Strada Optional:

- Kit basic sensors (RPM, speed, water temp.) + wiring: **X10MXLKS00000**;
- Infrared receiver with 90 cable: X41RX12090;
- Infrared lap transmitter: X02TXKMA01;
- Expansions (see related paragraph).

1.2 – MXL Pista kit, optional and part numbers

MXL Pista standard kit: X10MXLC000000

- MXL Pista (**1**);
- Complete wiring with power, RPM signal and ECU CAN/RS232 interface (**2**);
- USB cable for PC interface and data download (**3**);
- 1 speed sensor + cable (**4**);
- 2 temperature sensors + cable (**5**);
- Infrared lap transmitter with external power cable (**6**);
- Infrared receiver with 90 cm cable (**7**);
- **Race Studio 2** Software CD and **MXL** user manual (**8**).

MXL Pista optionals:

- Expansions (see related paragraph).

1.4 – MXL Expansions

- Channel expansion   **X08CHEXUC**
- Data Hub with 40 cm cable: **X08HUB010**
- Data Hub with150 cm cable: **X08HUB150**
- DaVid Slave Expansion: **X01DVMKSE000**
- DaVid Slave Expansion cameras PAL protocol: **X01CAMPAL**
- LCU-ONE CAN: **X08LCU03K0**
- LCU-ONE CAN+Analog   **X08LCUKAOCRS**
- MemoryKey (except for MXL Strada):   **X50MEPC00**
- GPS 05 Module with 130 cm cable: **X40GPS5B130**
- GPS 05 Module with 400 cm cable: **X40GPS5B400**
- TC Hub (CAN):   **X08UTCCTC**

Please visit www.aim-sportline.com for further information concerning expansions and/or to download the documentation.

Warning: connect all expansions do MXL OFF.

2.2.1 – the GND

For a correct powering and signal stability it is suggested to connect the cable labelled GND out coming from **MXL** power wiring to the vehicle chassis earth.
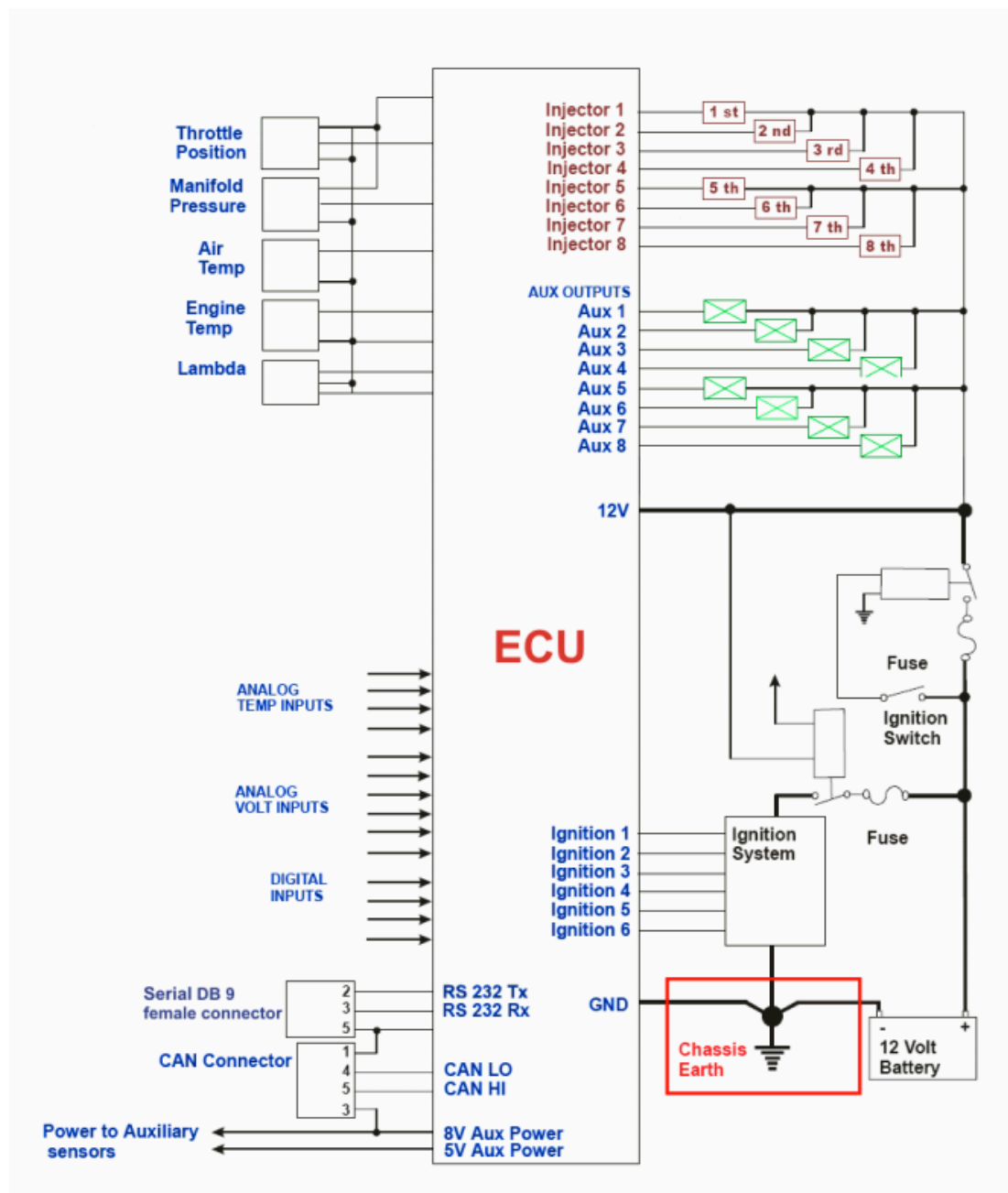
2.3 – How to connect MXL to the ECU

MXL can sample data out coming from the ECU using the proper CAN/RS232 interface cable.

To know if the vehicle ECU is supported by **MXL** – and for further information concerning ECU and AIM loggers connection – refer to the related documentation freely downloadable from AIM corporate website at www.aim-sportline.com download area, ECU section.

In case the conversion of non-standard CAN or RS232 lines is needed, contact our technical support.

It is suggested to always refer to the ECU user manual for any further information concerning pins and cables connection. Moreover – considering that ECU manufacturers constantly improve their products – refer to their websites for more updated information.

To connect **MXL** to the ECU use a serial RS232 or a CAN cable and connect it to the corresponding non cabled wirings of the logger wiring.

In case an AIM wiring is used all cable are labelled, otherwise it is necessary to identify the cables.

2.7 – How to connect MXL to the GPS Module

MXL can be connected via CAN bus with AIM **GPS** lap timer. It allows to record lap and split times with no need of infrared transmitter/receiver. Connection has to be made following these instruction:

- **MXL Strada/MXL Pista**: connect the GPS to 5 pins female 712 Binder connector on the back of the logger (pin 1 = CAN+ ; pin 4 = CAN-)
- **MXL Pro/MXL Pro05**: connect the GPS to 22 pins Deutsch type connector on the back of the logger using the proper cable labelled CAN Exp (pin 1 = CAN+; pin 4 = CAN-).

Refer to:

- Appendix "A.1" for further information concerning the loggers pinout;
- logger wiring user manuals for further information concerning **MXL** wiring;
- GPS Module user manual for further information concerning its installation on the vehicle.

The figure below shows a CAN network where **MXL** is connected also to **GPS Module**. In case Data Hub is not available, plug the Module directly into **MXL** as explained before.
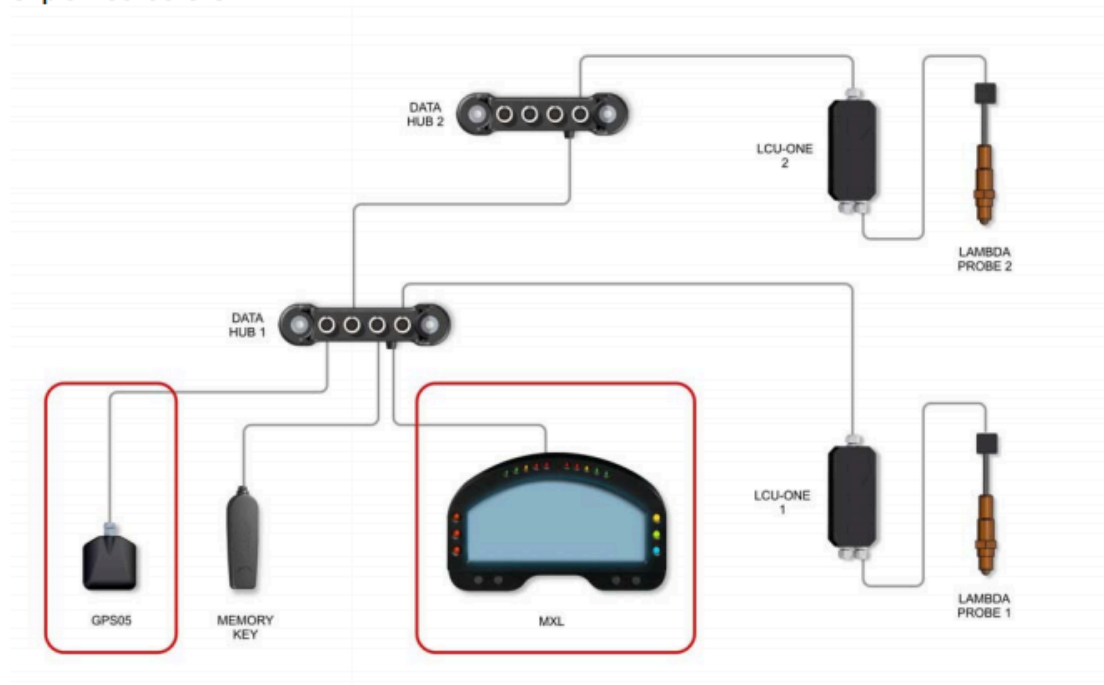
2.7.1 – GPS Module and the Lap timer function

This new **MXL** expansion allows to show and record lap and split times without infrared receivers and transmitters. A **GPS Module** (with **firmware version 35.13 or later**) connected to an **MXL** (with **firmware version 14.86.22 or later**) is all you need.

The first thing to do is fixing lap and split points giving the **GPS Module** instructions that are correct and coherent with the configuration set. This allows it to record lap times.
Note: this operation has to be performed before going on the track and has to be done once for each track.

The **GPS Module** can record up to 50 tracks configurations. Once saved, the circuit will be automatically recognised when entering that track with that **GPS Module** connected to **MXL**.

Warning: MXL with GPS lap timer function manages also signals out coming from infrared receiver. It is suggested to unplug the infrared receiver to avoid risks of lap times duplication.

GPS Module, like any other AIM expansion, has its own user manual, downloadable from www.aim-sportline.com download area documentation section. Refer to that document for any further information.

2.7.2 – GPS Manager Software

GPS Manager is the software properly developed to manage **GPS Module** memory and the configurations there stored. It permits to move configurations from the Module to the PC and vice versa as well as moving them from one module to another or delete them both from the PC or physically from the **GPS Module** memory. It can be freely downloaded from www.aim-sportline.com download area software section.

Refer to **GPS Module** user manual for any further information concerning **GPS Manager** software.

3.1 – Forecast Lap time

Forecast Lap Time is an algorithm predicting, in real time, current lap time before the lap is completed. **MXL** compares each 0.1 km (0.16 miles) the current lap with a reference one and – using this information – foresees the final lap time. Forecast Lap Time is updated on the display as soon as a new value is computed and has these characteristics:

- uses best lap time as reference lap;
- needs a speed channel and a lap or GPS sensor;
- appears in the field dedicated to lap time;
- is visible on the display during the race pressing "VIEW" button;
- produces two values shown in two display pages:
  - "FORE" o Forecast Lap Time (figure below on the left) that – using best lap time as reference – shows the foreseen lap time;
  - "RTSPL" o Real Time Split (figure below on the right) that – using best lap time as reference – shows the gap between current lap and best lap time.
- is always enabled and it is only required to choose which page to see.

3.2 – Alarm led and shift light
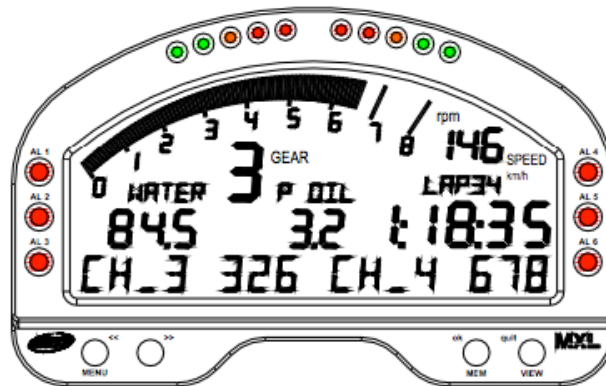
The ten top led (shift light) of the display are connected to engine RPM; values corresponding to each led are set via software or via keyboard. See the paragraph concerning keyboard function or **Race Studio Configuration** user manual for further information on the subject.

The 6 alarm led on the left and on the right of the display can be connected to 6 different channels and - setting the related threshold values - they can work as max or min alarm.

3.3 – Other useful information

MXL divides data of a session in runs: each run includes the laps between two pit stops / 2 switch off / 2 sampling.

If configured to sample split times, the system shows "Split nr.x" (Sx) up to the number of splits inserted; the final split is shown as complete lap.

When **MXL** records the best lap time, the bottom field of the display shows "BEST LAP TIME". This happens also if the static string is enabled.

The logger has from eight (**MXL Strada**, **Pista** e **PRO**) to twelve (**MXL Pro05**) analog channels and shows six of them as follows:

- on the left of the display, channels set on fields 1 and 2 of system configuration window of **Race Studio Configuration** software; in the image above they are labelled "water" and "P oil" and the related values are 84.5 and 3.2;

- on the static string (if not enabled) two by two other four channels; in the image above they are labelled CH_3 and CH_4 and their values are respectively 326 and 678.

Channels settings are stored by the logger and restored at each switch on.

4 – MXL: software, driver, configuration, transmission, download, online, maintenance

MXL easily connects to a PC thanks to the USB cable and can be configured only using **Race Studio 2**, the powerful software – supplied free of charge – developed by AIM to configure its loggers and analyze data.

MXL 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. Check regularly on www.aim-sportline.com if new Race Studio 2 software and/or MXL firmware versions have been released.

Race Studio Configuration user manual, downloadable from AIM corporate website www.aim-sportline.com, download area, software section contains all information on how to:

- install **Race Studio 2** under Microsoft Windows Xp®, Microsoft Windows Vista® and Microsoft Windows 7®;
- configure **MXL** and set its channels;
- configure **MXL** CAN expansions and set its channels;
- set and manage standard and custom sensors;
- calibrate and auto-calibrate sensors;
- transmit configuration to **MXL**, once set;
- calculate engaged gears;
- download stored data (**MXL Pista**, **Pro** and **Pro05** only; **MXL Strada** shows data but does not sample them);
- see the logger in online mode.

MXL does not need any special maintenance.

The only suggested maintenance is a periodic software/firmware update: periodically check www.aim-sportline.com download area, software/firmware section, and select in succession firmware and software options. Check if new releases have been released, download, run them and follow the instructions that appears on the PC monitor.

5 – MXL keyboard function

MXL keyboard has got a number of functions: data recall and deletion, back-light, date and time, **GPS Module**, calculated gears, shift lights, demo mode.

5.1 – Data recall

When a test session is over it is possible to recall data stored in **MXL** memory. To enter data recall mode press **MEM** button, highlighted here below.

The display shows:

Best lap time of the last run in the static string field, as follows: run number (2), lap number (4) and lap time (0.07.94).

RPM max value on the graphic bar and in lap time field (4392).

Speed max value (186), Channel 1 and Channel 2 in the related fields. In the figure above channels 1 and 2 are set on water temperature (water) and oil pressure (P OIL) and the related values are 84.5 and 3.2.

5.2 – Other keyboard functions

MXL keyboard manages all these functions not managed by the software and allows also to set the shift lights.

The following paragraph explains how to manage the single controls: they are listed in the same order they appear pressing "MENU".

5.2.1 – Backlight

Press "MENU".

The display shows: Night Vision on/off.

Press "OK/MEM" to enable/disable the backlight and then "Quit/VIEW" to confirm.

To enable/disable the backlight during race press "MENU".

Backlight settings are stored by the logger and restored at each switch on.

5.2.2 – Setting GPS lap timer laps and splits

This menu appears only if a **GPS Module** is connected to the logger.

Press twice "MENU".

Refer to **GPS Module** user manual for further information.

5.2.3 – Total running

Press two/three times (depending on whether there is a GPS Module connected or not) "MENU".

The display shows: Total running in km on the left (and in hours on the right).

Press "OK" to clear and again to confirm.

The display shows "Total are cleared".

5.2.3 – Odometer (not resettable)

Press three/four times (depending on whether there is a GPS Module connected or not) "MENU".

Display will show odometer in Km on the right.

5.2.4 – Date and time

Press four/five times (depending on whether there is a GPS Module connected or not) "MENU".

The display will show: set date and time.

- Press "OK";
- "Set Hour" appears on the display;
- use "<< / >>" buttons to set time
- press "OK" button;
- "Set Minute" appears on the display;
- use "<< / >>" buttons to set minute;
- press "OK" button;
- "Set Year" appears on the display;
- use "<< / >>" buttons to set year;
- press "OK" button;
- "Set Month" appears on the display;
- use "<< / >>" buttons to set month;
- press "OK" button;
- "Set Day" appears on the display;
- use "<< / >>" buttons to set day;
- press "OK" button;
- "Set weekday" appears on the display;
- use "<< / >>" to set weekday;
- press "OK" button;
- press "Quit / view" button.

5.2.5 – Shift lights

Press six/seven times (depending on whether there is or not a GPS Module connected) "MENU".

The display shows "Shift Light":

- press "OK";
- first led top on the left and on the right of **MXL** display start blinking and the display shows "Insert RPM value";
- use "<</>>" buttons to set RPM value (accepted values from "0" to "22.000");
- press "OK";
- the second led top on the left and on the right of **MXL** display start blinking and the display shows "Insert RPM value";
- this way until all led have been set;
- press "OK";
- "save new config" appears on the display;
- press "OK";
- press "Quit/VIEW".

5.2.6 – System Information

Press seven/eight times (depending on whether there is a GPS Module connected or not) "MENU".

The display shows Firmware version on the left and logger serial number on the right.

5.2.7 – Demo mode

It is possible to see **MXL** working mode also without any sensor connected. It is just enough it is powered.

Switch the logger on and press "MENU/<<" and ">>". Demo mode starts.

To stop it switch the logger off.

6 – MXL memory

Each **MXL** is equipped with a non-volatile RAM memory, whose dimensions change depending on the logger model:

- **MXL Strada** 128 kb
- **MXL Pista/Pro** 8 Mb
- **MXL Pro05** 16 Mb

The round memory records up to 500 laps in two blocks made of 250 laps; so, when lap 501 is recorded laps from 1 to 250 are deleted. This means that the last 250 laps are always in the memory of the logger and that lap memory does never fill up.

6.1 – Memory architecture:

MXL memory is divided in two parts:

- the first part records sampled channels and when it fills up **MXL** display shows "MEMORY FULL";
- the second part, round, records times, RPM, speed and max values of channels 1 and 2 for at least the last 250 laps and never fills up.

6.2 – Memory working way

MXL has a fixed sampling time at 380Hz total sampling frequency. Increasing each channel sampling frequency, total available time diminishes. The characteristics of **MXL** models are:

- **MXL Strada/MXL Pista/MXL Pro**: 3 hours sampling time at 380Hz total sampling frequency; 30' at 2kHz total sampling frequency;
- **MXL Pro05**: 6 hours sampling time at 380Hz total sampling frequency; 60' at 2kHz sampling frequency.

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