MXL

USER MANUAL

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.

Warning: MXL Pro is out of production, replaced by MXL Pro05.

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).

1.3 – MXL Pro05 kit, optional and part numbers

MXL Pro05 standard kit: X15MXLP000000

- MXL Pro05 (**1**);
- one 22 pins not cabled Deutsch type connector (**2**);
- one 37 pins not cabled Deutsch type connector (**3**);
- 1 speed sensor with cable (**4**) + 4 pins Binder 712 female connector (**10**) to be chosen among:
    - car speed sensor;
    - bike speed sensor (in the figure here above);
    - Contrinex speed sensor;
- 2 temperature sensors + cable;
- 1 RPM sensor with cable (**5**) to be chosen among:
    - M5 thermo resistor + 4 pins Binder 712 female connector (**10**);
    - M10 thermo resistor + 4 pins Binder 712 female connector (**10**);
    - 1/8 NPT thermo resistor (in the figure here above) + 4 pins Binder 712 female connector;
    - exhaust gas thermocouple + mignon female connector
    - M10 water temperature thermocouple + mignon female connector;
- infrared lap transmitter with external power cable (**6**);
- infrared lap receiver with 90 cm cable (**7**);
- USB cable for PC interface and data download (**8**);
- Race Studio 2 software CD **MXL** user manual and **MXL Pro05** pinout (**9**);

MXL Pro05 Optional:

- Wiring for 22 pins Deutsch type connector: **V02554240**;
- Wiring for 37 pins Deutsch type connector: **V02554200**;
- 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 – MXL installation and power

2.1 – How to install MXL

To install **MXL** follow these instructions:

- choose a place where the display is not in contact with oil or fuel.
- be sure that the logger is not installed close to heat sources.
- to correctly measure lateral acceleration through the internal accelerometer[1] install **MXL** vertically and with the display perpendicular to the vehicle speed;
- avoid rigid connections between the logger display and the vehicle chassis and protect the logger from vibrations using the stock anti-vibration mountings highlighted in the images below.

2.2 – How to power MXL

To power **MXL**:

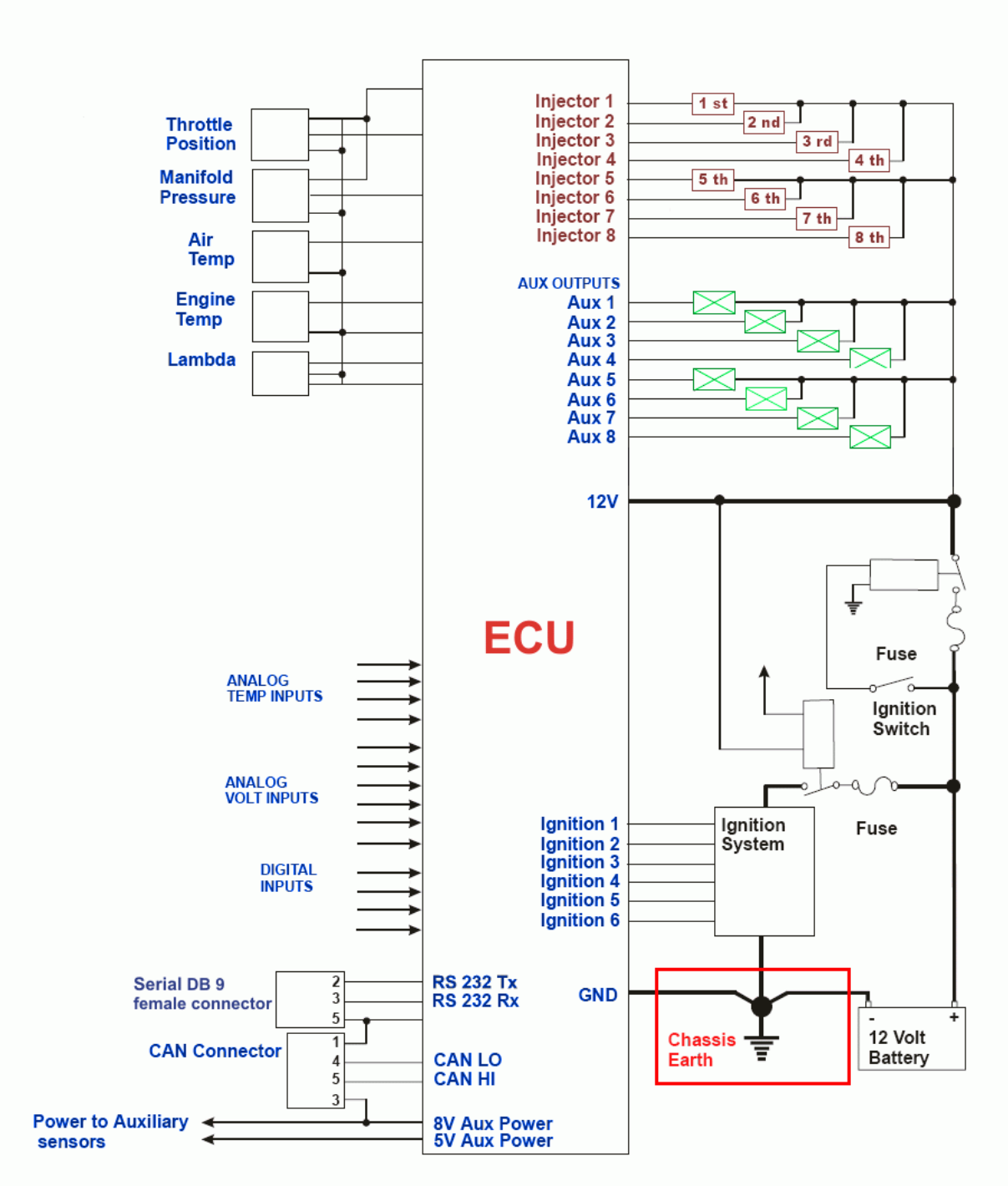
- connect the logger to an external 9-15 VDC power source (the vehicle battery for example). Warning: do not exceed these limits.
- connect the red cable to the battery positive pole (+) and the black cable to the battery negative pole (-).

To save the battery charge it is suggested to power **MXL** through the vehicle master switch.

[1] Included in the standard kit except for **MXL Strada** that does not support it.

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.

2.4 – How to sample the RPM signal

MXL can sample the RPM signal in different ways:

- from the ECU via CAN bus or RS232;
- from the ECU through a square wave signal (from 8 to 50 V);
- from the coil: low voltage input (from 150 o 450 V).

2.4.1 – Sampling the RPM via CAN bus/RS232

To sample RPM via CAN bus/RS232 refer to ECU connection chapter.

2.4.2 – Pre-condition to sample the RPM in another way

To sample RPM signal from the ECU through a square wave signal or through the coil it is necessary:

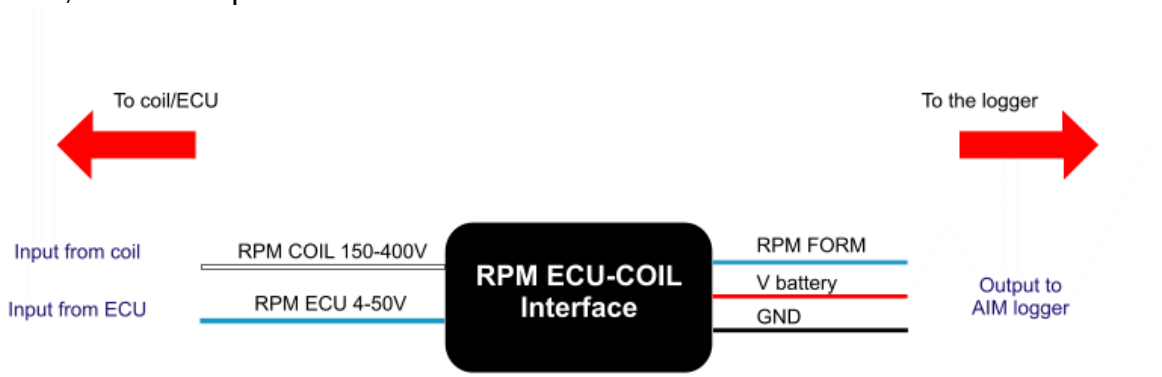
- **MXL Strada** + kit basic sensors (optional – part number **X10MXLKS00000**; draw code 04.554.02);
- **MXL Pista** standard kit;
- **MXL Pro05** + 22 pins Deutsch type connector wiring (optional – part number **V02554540**; draw code 04.554.24) + 37 pins Deutsch type connector wiring (optional – part number V02554240; draw code 04.554.20).

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

To sample the RPM from the ECU using a square wave, connect:

- the white cable labelled “RPM” (**MXL Strada/Pista**) of the logger wiring to the ECU RPM signal;
- the blue cable labelled “RPM 8-50 V” of the 37 pins Deutsch type connector wiring (**MXL Pro05**) to the ECU RPM signal.

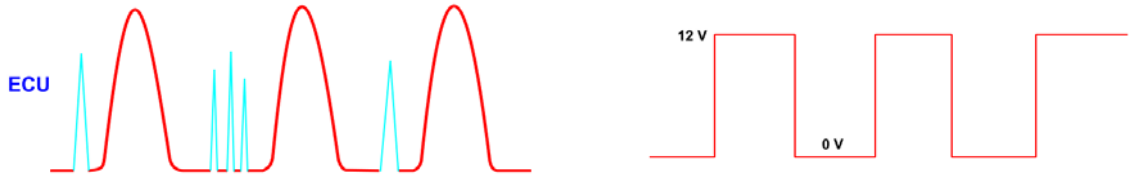
Always refer to the ECU user manual for further information. In case ECU output signal is not a steady square wave, an RPM adaptor (optional) is needed. To connect the filter, follow this procedure.



- Connect the blue cable labelled “RPM form” to the cable labelled “RPM” of **MXL Strada/Pista** wiring.
- Connect the blue adapter cable, labelled “RPM form” to the blue cable labelled “RPM 8-50V” of **MXL Pro05** wiring – pin 12 of 37 pins Deutsch type connector.
- Connect the red interface cable labelled “V battery” to positive pole of the vehicle battery. It is suggested to connect the red cable downstream the vehicle master switch.

- Connect the interface black cable – labelled “GND” – to the vehicle chassis earth (refer to GND paragraph of this user manual for further information).
- Connect the adapter cable labelled “RPM-ECU 4-50 V” to the RPM signal out coming from the ECU.

The images here below show a not square RPM signal on the left and a filtered one on the right.



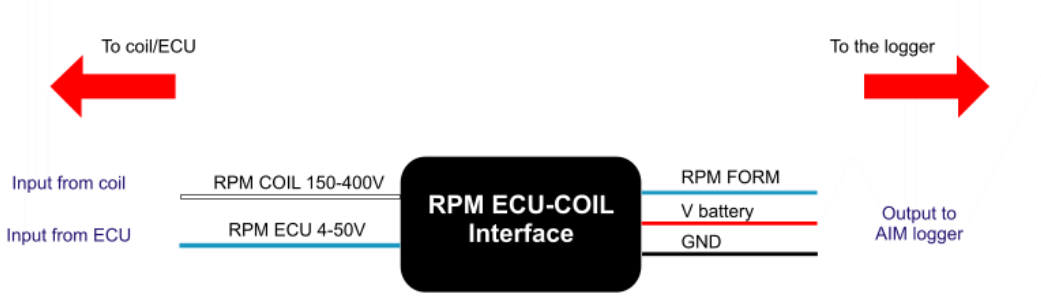
2.4.4 – Sampling the RPM from the coil: low voltage RPM input

To sample the RPM signal from the coil on a low voltage input (from 150 to 400 V), connect:

- cable labelled “RPM” (**MXL Strada/Pista**) to the ECU RPM output that manages the coil;
- cable labelled “RPM 150-450V” (**MXL Pro05**) to the ECU RPM output that manages the coil.

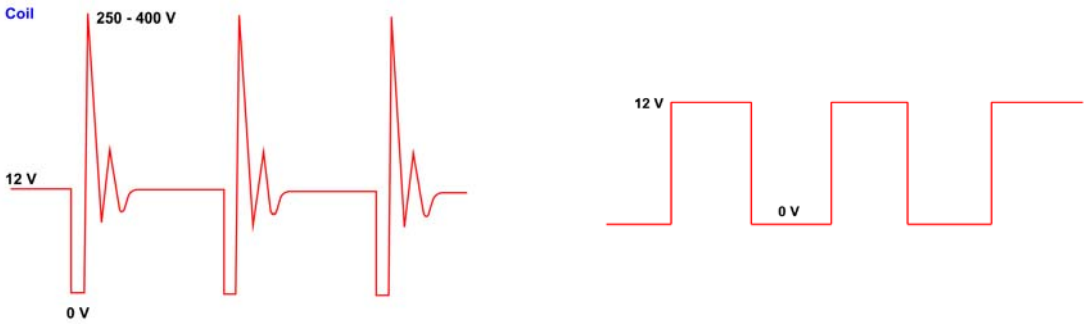
In case the vehicle is not equipped with an ECU take the signal directly from the low tension coil control of the coil.

MXL may not sample correctly the coil signal because this looks unstable. To filter the signal use an “RPM coil-ECU” adapter (optional shown here below). It is a double purpose filter that allows to sample the RPM from the coil and squares the signal wave form.



- connect the blue adaptor cable labelled “RPM form” to the cable labelled “RPM” of **MXL Strada/Pista** wiring.
- connect the blue adapter cable, labelled “RPM form” to the blue cable labelled “RPM 8-50V” of MXL Pro05 wiring – pin 12 of 37 pins Deutsch type connector.
- connect the red interface cable labelled “V battery” to the positive pole of the vehicle battery. It is suggested to connect the red cable downstream the vehicle master switch.
- connect the black interface cable – labelled GND – to the chassis earth of the vehicle wiring (see GND paragraph of this user manual for further information).
- connect the adapter cable labelled “RPM-Coil 150-400 V” to the coil control.

The images below show on the left a non filtered unstable coil signal and on the right a filtered one.



2.5 – How to connect MXL analog channels

MXL is equipped with numerous analog and digital channels and their number changes depending on the model.

MXL Strada/Pista models have 8 analog channels and 3 digital channels:

- RPM
- 1 speed channel
- Lap Time.

MXL Pro model has 8 analog channels and 6 digital channels:

- RPM
- 4 speed channels
- Lap times.

MXL Pro05 has 12 analog channels and 6 digital channels:

- RPM
- 4 speed channels
- Lap time.

To connect the analog channels use the logger wiring. All cables are labelled with the channel number.

Warning: digital channels have to be connected to a sensor and configured.

Refer to each **wiring user manual** to know which sensor can be connected to each channel.

Please note: not all channels have a +Vb.

- **MXL Strada/Pista**: +Vb on channels 4, 5, 6, 7 and 8;
- **MXL Pro05**: +Vb on channels 8, 9, 10 and 11.

Refer to **Race Studio Configuration** user manual to know how to configure each channel and how to manage possible custom sensors not included in the software database.

2.6 – How to install and power transmitter and receiver

AIM provides a range of devices for lap time detection. **MXL** works with infrared transmitter and a receiver only.

2.6.1 – Infrared transmitters

AIM lap transmitter is show here below.

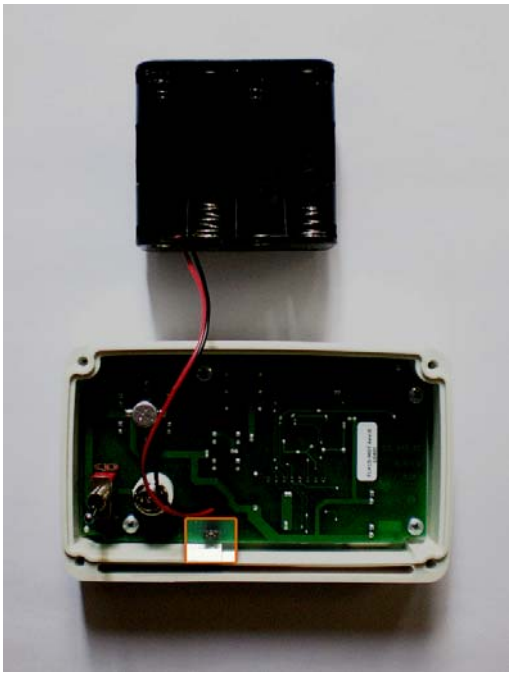
The transmitter can be internally or externally powered:

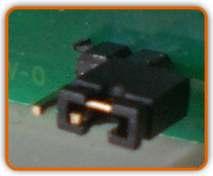
- internally: with 8 AA batteries (placed in the transmitter case); when battery charge status is low, Power led starts blinking each second (1 Hz);
- externally: with an external 12V power cable; when battery charge status is low, Power led starts blinking each second.

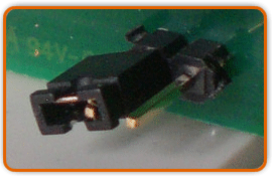
The transmitter has two working mode:

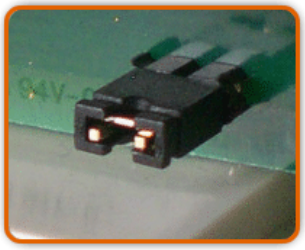
- Low power mode: for tracks less than 10 m (30 ft) wide;
- High power mode: for tracks more than 10 m (30 ft) wide; in this second case 12V external power is required and both led switches on when the transmitter is switched on.

To activate High/Low power mode it is necessary to unscrew the back of the transmitter case as shown here below on the left.









The image here above on the right shows possible working mode. The transmitter comes set in low power mode: see images on top on the right. To set high power mode insert both clips in the jumper: image bottom on the right.

WARNING: verify the number of transmitters installed on the track before installing one's own. It is in effect possible that transmitters – additional to the one placed on the start/finish line – are installed on the track. The simplest way to mark laps and splits is using the same transmitter(s) for all drivers.

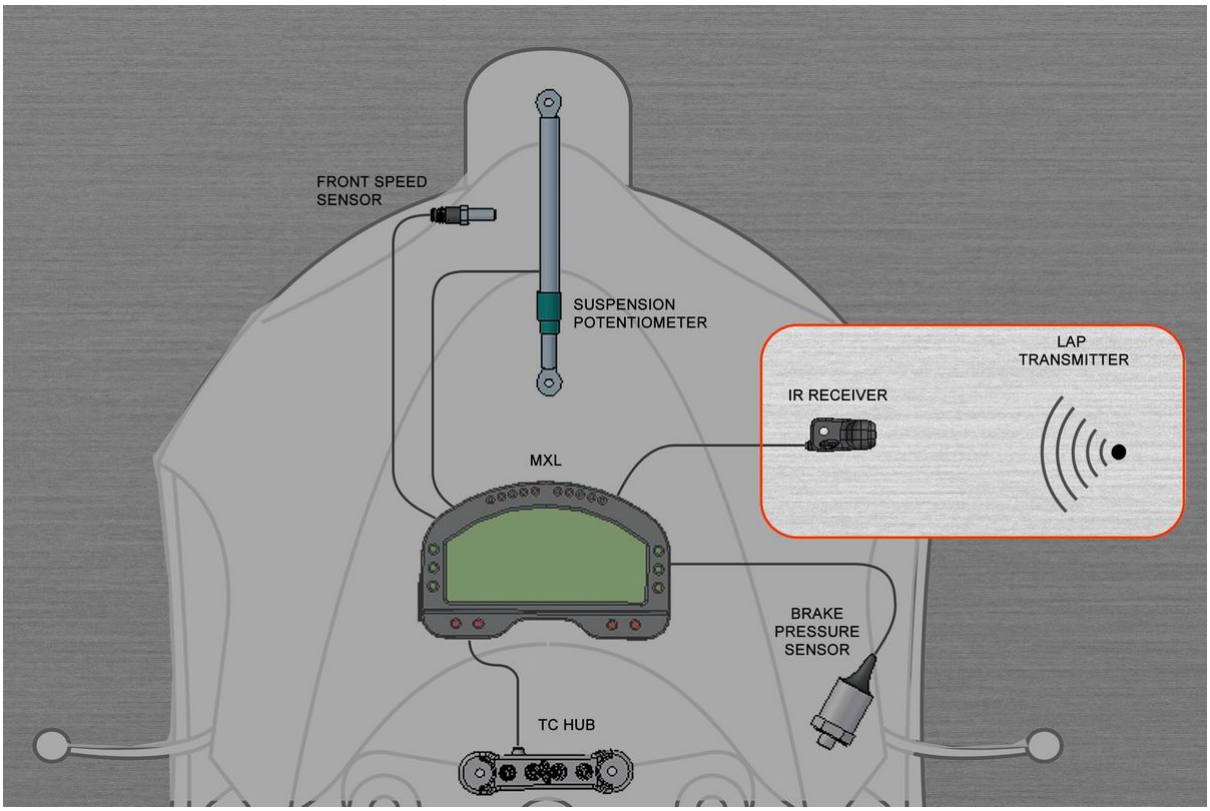
Use obscuring time function (to be set in the software configuration of the logger) to be sure that **MXL** reads only the desired transmitter(s).

Refer to **Race Studio Configuration** user manual for detailed information concerning the system configuration.

2.6.2 – The infrared transmitter

The infrared receiver has to “see” the transmitter installed on the side of the track. Install it with the receiver eye looking at the transmitter. The figure here below shows the receiver eye

Be sure that the receiver has a continuous line with the transmitter on the right side of the vehicle as shown on the image here below.



2.7 – How to connect MXL to the GPS Module

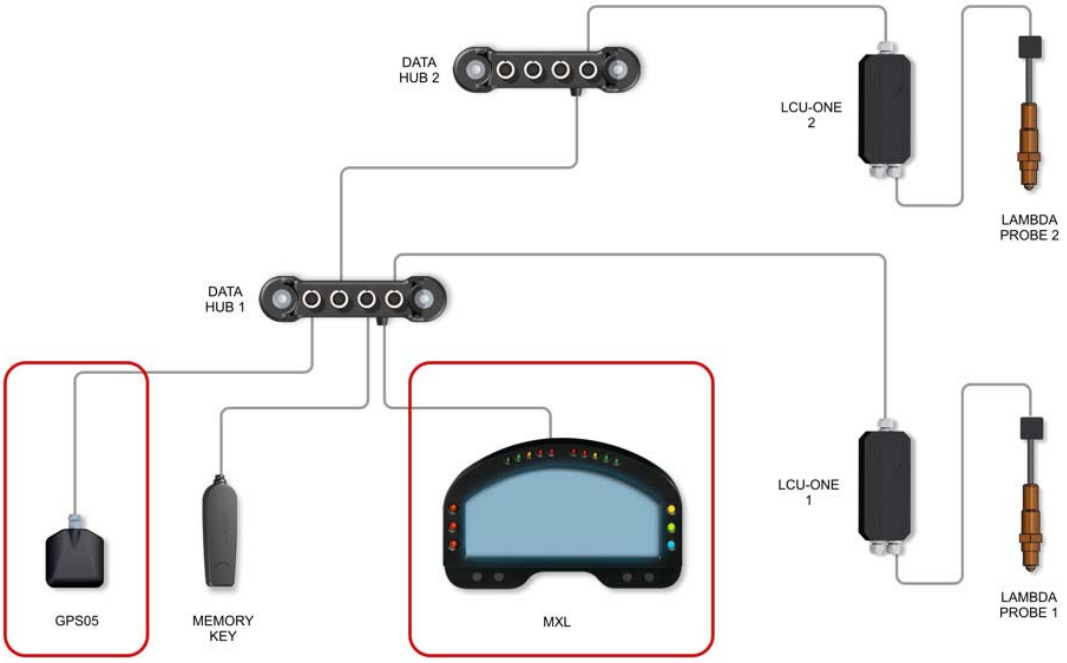
MXL can be connected via CAN bus with AIM **GPS** lap timer. It allows to record lap and split times with no need of infrared transmitter/receiver. Connection has to be made following these instruction:

- **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.

2.8 – How to connect MXL to the MemoryKey

MXL can be connected via CAN bus to **MemoryKey**. It allows to download data without connecting the logger to a PC. The connection has to be done as follows:

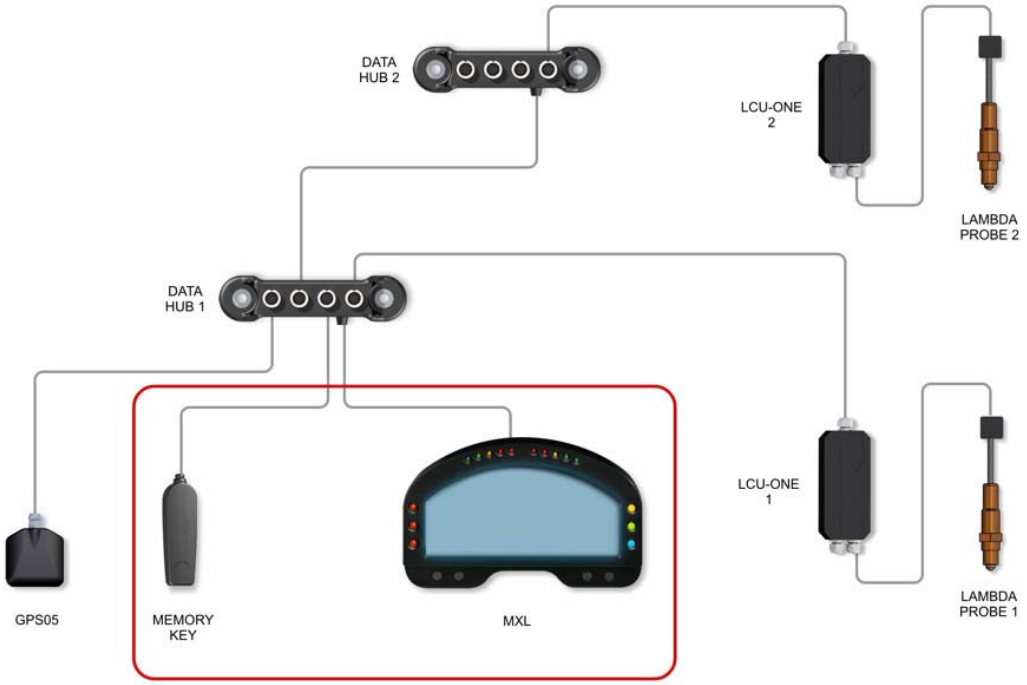
- **MXL Pista**: connect the **MemoryKey** to 5 pins Binder 712 female connector on the back of the logger (pin 1 = CAN+ ; pin 4 = CAN-)
- **MXL Pro/MXL Pro05**: connect **MemoryKey** to 22 pins Deutsch type connector using the proper cable labelled CAN Exp (pin 1 = CAN+; pin 4 = CAN-).

Note: it is not possible to connect MemoryKey to MXL Strada.

See:

- Appendix “A.1” for further information concerning the loggers pinout;
- loggers wiring user manuals for further information concerning MXL wiring;
- **MemoryKey** user manual for information concerning its connexion with **MXL**.

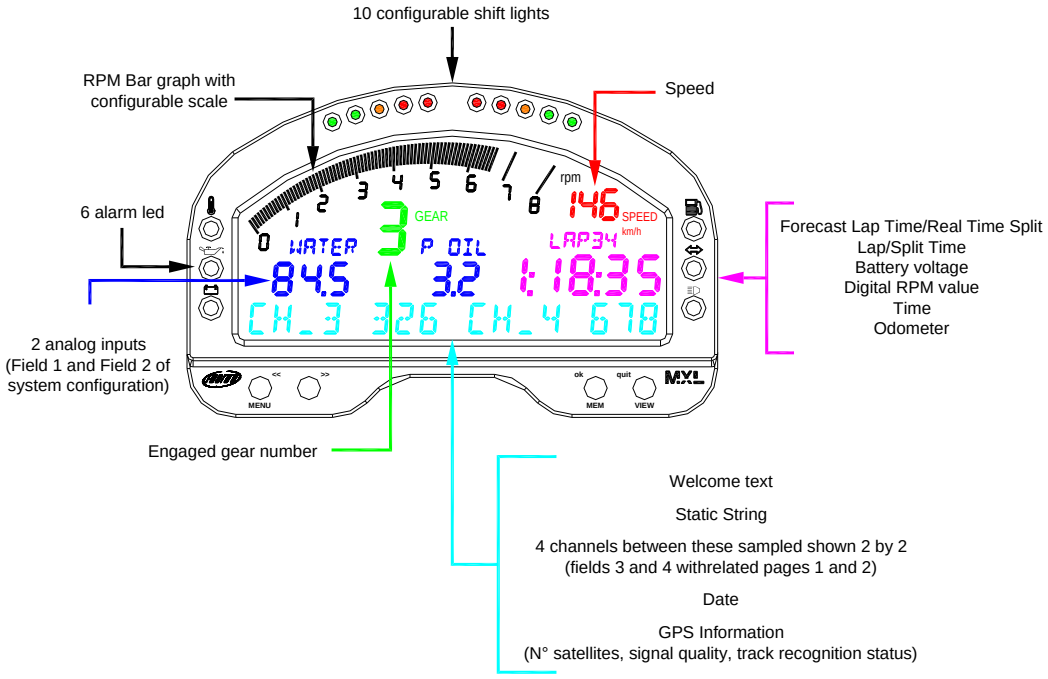
The figure below shows a CAN network where **MXL** is connected to a **MemoryKey** too. In case **Data Hub** is not available plug **MemoryKey** directly into **MXL** as explained before.



3 – MXL display

Here below explanation of the which information are provided by **MXL** display, and where.

Please refer to Race Studio Configuration user manual, that can be downloaded from www.aim-sportline.com download area, software section for any further information about MXL configuration.



Most of the information shown by the display are set only via software and more information are shown in the same field of the display.

Press **VIEW** to scroll the information shown in the same field of the display.

Use "**>>**" button to see – two by two – the four channels shown on the bottom of the display.

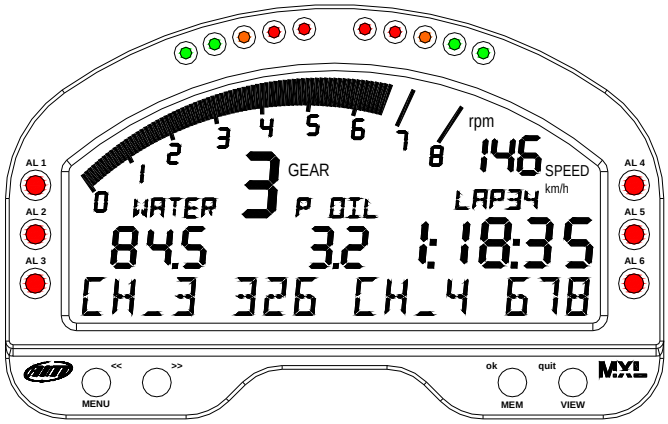
In case welcome message or static text have been enabled, they appear in this order at logger switch up and the static string remains steady. When the logger records the best lap time, display shows "best lap time" for some seconds on the static string and after the static string comes back steady.

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.

Using buttons "**<<** / **>>**" it is possible to scroll all laps and runs.

"<</>>" buttons scroll times and values starting from best lap.

In case the system is set to capture split times, they are always shown on the static string and it is possible to distinguish them from lap times because time value is anticipated by an "S". The above image shows the static string with – from left to right:

- run number: 2;
- lap number: 5;
- split number (S): 1;
- split time: 0.04.07.

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:

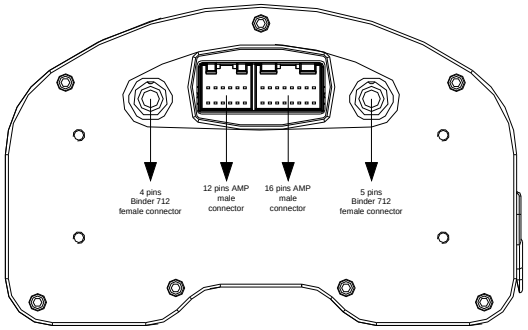
- **MXL Strada/MXL Pista/MXL Pro**: 3 hours sampling time at 380Hz total sampling frequency; 30’ at 2kHz total sampling frequency;
- **MXL Pro05**: 6 hours sampling time at 380Hz total sampling frequency; 60’ at 2kHz sampling frequency.

Appendix “A” – Technical drawings

A.1 – Loggers pinout

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

MXL Strada pinout



4 pins Binder 712 female connector pinout - Beacon	
Pin	Function
1	Magnetic Lap
2	GND
3	+VB
4	Optical Lap

12 pins AMP male connector pinout	
Pin	Function
1	GND
2	External power 9-15 V
3	CAN 1- ECU interface
4	CAN 1+ ECU interface
5	RS232TX
6	RS232RX
7	USB D-
8	RPM 150-400V coil and RPM square wave (>8V)
9	+VB
10	GND
11	+VB
12	Speed

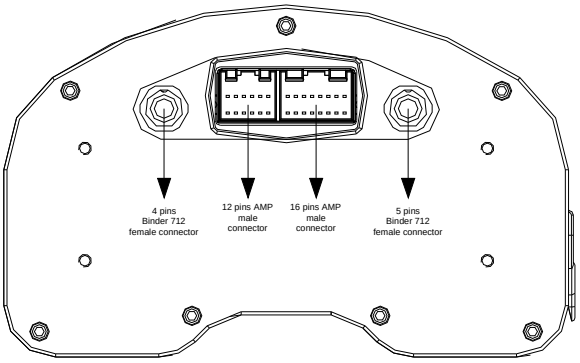
16 pins AMP male connector pinout	
Pin	Function
1	Analog channel 4
2	V Reference
3	Analog GND
4	Analog channel 3
5	Analog channel 2
6	V Reference
7	Analog GND
8	Analog channel 1
9	Analog channel 8
10	USB D+
11	Analog GND
12	Analog channel 7
13	Analog channel 6
14	V Reference
15	Analog GND
16	Analog channel 5

5 pins Binder 712 female connector pinout - Exp	
Pin	Function
1	Can 0+
2	GND
3	+VB
4	Can 0-
5	Vbext (9-15 VDC)

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by: L.I.		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power			Titolo / Title: Pinout MXL Strada			
			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

MXL Pista pinout



4 pins Binder 712 female connector pinout - Beacon	
Pin	Function
1	Magnetic Lap
2	GND
3	+VB
4	Optical Lap

12 pins AMP male connector pinout	
Pin	Function
1	GND
2	External power 9-15 V
3	CAN 1- ECU interface
4	CAN 1+ ECU interface
5	RS232TX
6	RS232RX
7	USB D-
8	RPM 150-400V coil and RPM square wave (>8V)
9	+VB
10	GND
11	+VB
12	Speed

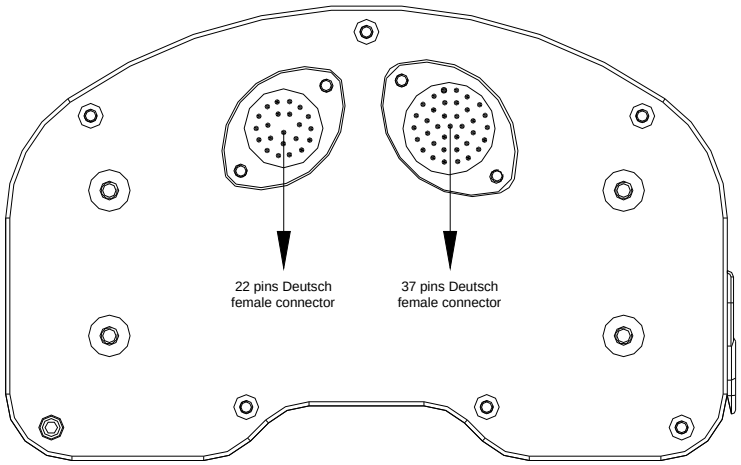
16 pins AMP male connector pinout	
Pin	Function
1	Analog channel 4
2	V Reference
3	Analog GND
4	Analog channel 3
5	Analog channel 2
6	V Reference
7	Analog GND
8	Analog channel 1
9	Analog channel 8
10	USB D+
11	Analog GND
12	Analog channel 7
13	Analog channel 6
14	V Reference
15	Analog GND
16	Analog channel 5

5 pins Binder 712 female connector pinout - Exp	
Pin	Function
1	Can 0+
2	GND
3	+VB
4	Can 0-
5	Vb ext (9-15 VDC)

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by: L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Pinout MXL Pista			
		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

MXL Pro pinout



22 pins Deutsch female connector pinout

Pin	Function
1	+VB
2	GND
3	CAN 0+ for external expansion modules
4	CAN 0- for external expansion modules
5	Speed 3
6	Speed 4
7	USB D-
8	USB D+
9	GND
10	+ VB
11	GND
12	GND
13	+ VB
14	MEM
15	VIEW
16	GND
17	RS232RX for ECU interface
18	RS232TX for ECU interface
19	GND
20	CAN 1+ for ECU interface
21	CAN1- for ECU interface
22	n.c.

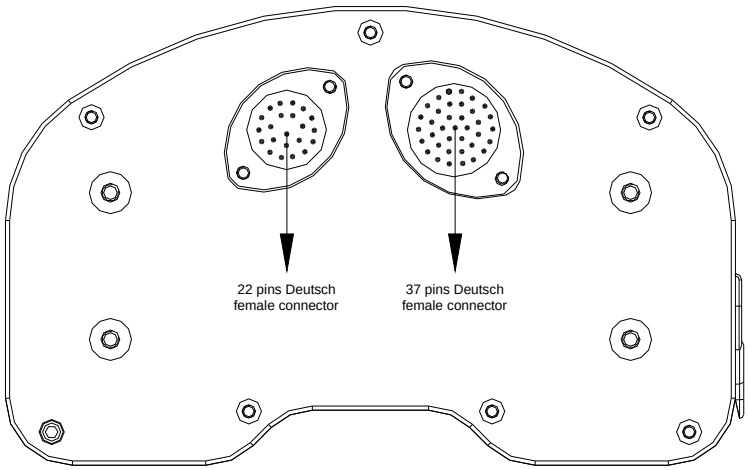
37 pins Deutsch female connector pinout

Pin	Function
1	External power 9-15 V
2	Analog input 1
3	Analog input 2
4	Analog GND
5	Analog GND
6	V Reference
7	V Reference
8	Analog input 3
9	Analog input 4
10	Analog input 6
11	Analog GND
12	RPM aquare wave (4-8 V)
13	RPM 150-400 V coil and RPM square wave (>8V)
14	+VB
15	GND
16	+VB
17	+VB
18	GND
19	Analog GND
20	Analog GND
21	V Reference
22	V Reference
23	Analog GND
24	V Reference
25	Analog GND
26	Analog input 8
27	GND
28	Optical Lap
29	Magnetic Lap
30	Speed 2
31	Analog GND
32	Analog input 5
33	Analog input 7
34	V Reference
35	GND
36	Velocità 1
37	GND

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by: L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Pinout MXL Pro			
		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

MXL Pro05 pinout



22 pins Deutsch female connector pinout

Pin	Function
1	+VB
2	GND
3	CAN 0+ for expansion modules
4	CAN 0- for expansion modules
5	Speed 3
6	Speed 4
7	USB D+
8	USB D-
9	GND
10	+ VB
11	GND
12	GND
13	+ VB
14	MEM
15	VIEW
16	Gear Flash
17	RS232RX for ECU interface
18	RS232TX for ECU interface
19	GND
20	CAN 1+ for ECU interface
21	CAN1- for ECU interface
22	9-15 V external power

37 pins Deutsch female connector pinout

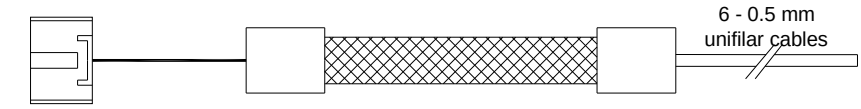
Pin	Function
1	9-15 V external power
2	Analog input 1
3	Analog input 2
4	Analog GND
5	Analog GND
6	V Reference
7	V Reference
8	Analog input 3
9	Analog input 4
10	Analog input 6
11	Analog GND
12	RPM square wave (>5V)
13	RPM coil input
14	+VB
15	GND
16	+VB
17	+VB
18	GND
19	Analog input 11
20	Analog input 12
21	V Reference
22	V Reference
23	Analog input 10
24	V Reference
25	Analog input 9
26	Analog input 8
27	Analog GND
28	GND
29	+VB
30	Speed 2
31	Analog GND
32	Analog input 5
33	Analog input 7
34	V Reference
35	Analog GND
36	Speed 1
37	Optical lap

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by: L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Pinout MXL Pro05			
		N. disegno / Drawing N.		Rev. / Rev.	Foglio / Sheet: 1 of 1

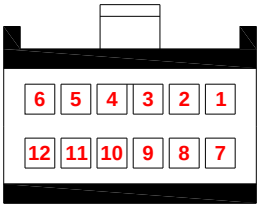
A.2 – MXL Strada/Pista wirings

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

MXL Strada standard cable



AMP 12 pins
female
connector



AMP 12 pins
female connector pinout
Contact insertion view

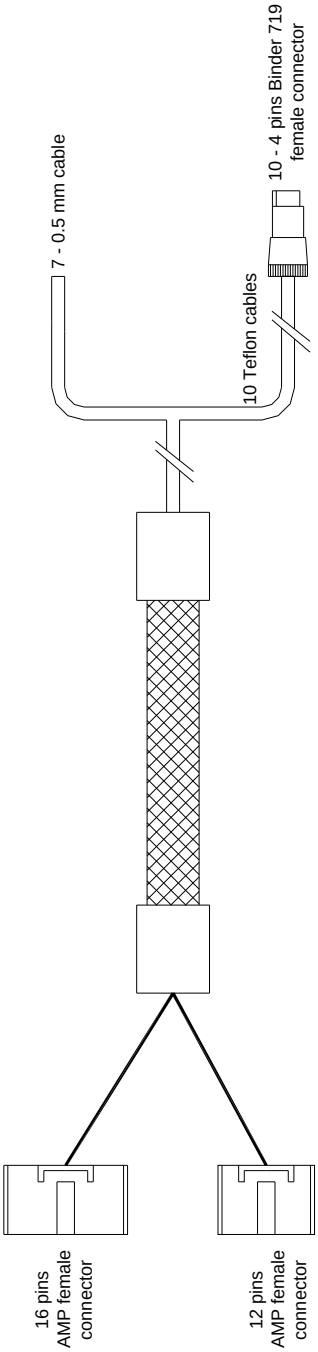
Non cabled channels table

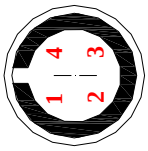
Channels	Cable Colour	AMP 12 pin	Connection	Length
Power	red black	2 1	VB ext (9 -15 VDC) GND	500 mm
CAN	white blue	4 3	CAN + CAN -	500 mm
RS 232	white blue	6 5	RS 232 RX RS 232 TX	500 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by L.I.		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo Standard MXL Strada				
		N. disegno / Drawing N. 04.554.09			Rev. / Rev.	Foglio / Sheet 1 of 1

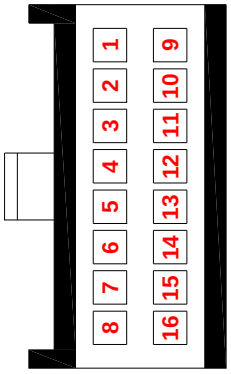
N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

Cable standard for MXL Pista and optional for MXL Strada

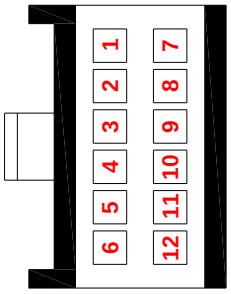




4 pins Binder 719
female connector
Solder termination view



16 pins AMP
female connector
Contact insertion view



12 pins AMP
female connector
Contact insertion view

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by: L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Cavo standard per MXL Pista ed optional per MXL Strada			
		N. disegno / Drawing N.: 04.554.02		Rev. / Rev.	Foglio / Sheet: **1 of 3**

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

Binder 719 connector Table

Channel	Binder pin	Cable Colour	AMP 12 pin	AMP 16 pin	Connection	Length
Ch. 1	1 2 3 4	White Black Red Blue		8 7 6	Analog input 1 Analog GND V reference	350 mm
Ch. 2	1 2 3 4	White Black Red Blue		5 7 6	Analog input 2 Analog GND V reference	350 mm
Ch. 3	1 2 3 4	White Black Red Blue		4 3 6	Analog input 3 Analog GND V reference	350 mm
Ch. 4	1 2 3 4	White Black Red Blue	9	1 3 2	Analog input 4 Analog GND + VB V reference	400 mm
Ch. 5	1 2 3 4	White Black Red Blue	9	16 15 2	Analog input 5 Analog GND + VB V reference	400 mm
Ch. 6	1 2 3 4	White Black Red Blue	9	13 15 2	Analog input 6 Analog GND + VB V reference	400 mm
Ch. 7	1 2 3 4	White Black Red Bleu	11	12 11 14	Analog input 7 Analog GND + VB V reference	450 mm
Ch. 8	1 2 3 4	White Black Red Blue	11	9 11 14	Analog input 8 Analog GND + VB V reference	450 mm
Speed	1 2 3 4	White Black Red Blue	12 10 11		Speed GND + VB	450 mm
USB	1 2 3 4	White Black Red n.c.	10 7	10	USB D+ GND USB D-	1000 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name		Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo standard per MXL Pista ed optional per MXL Strada				
		N. disegno / Drawing N. 04.554.02		Rev. / Rev.	Foglio / Sheet **2 of 3**	

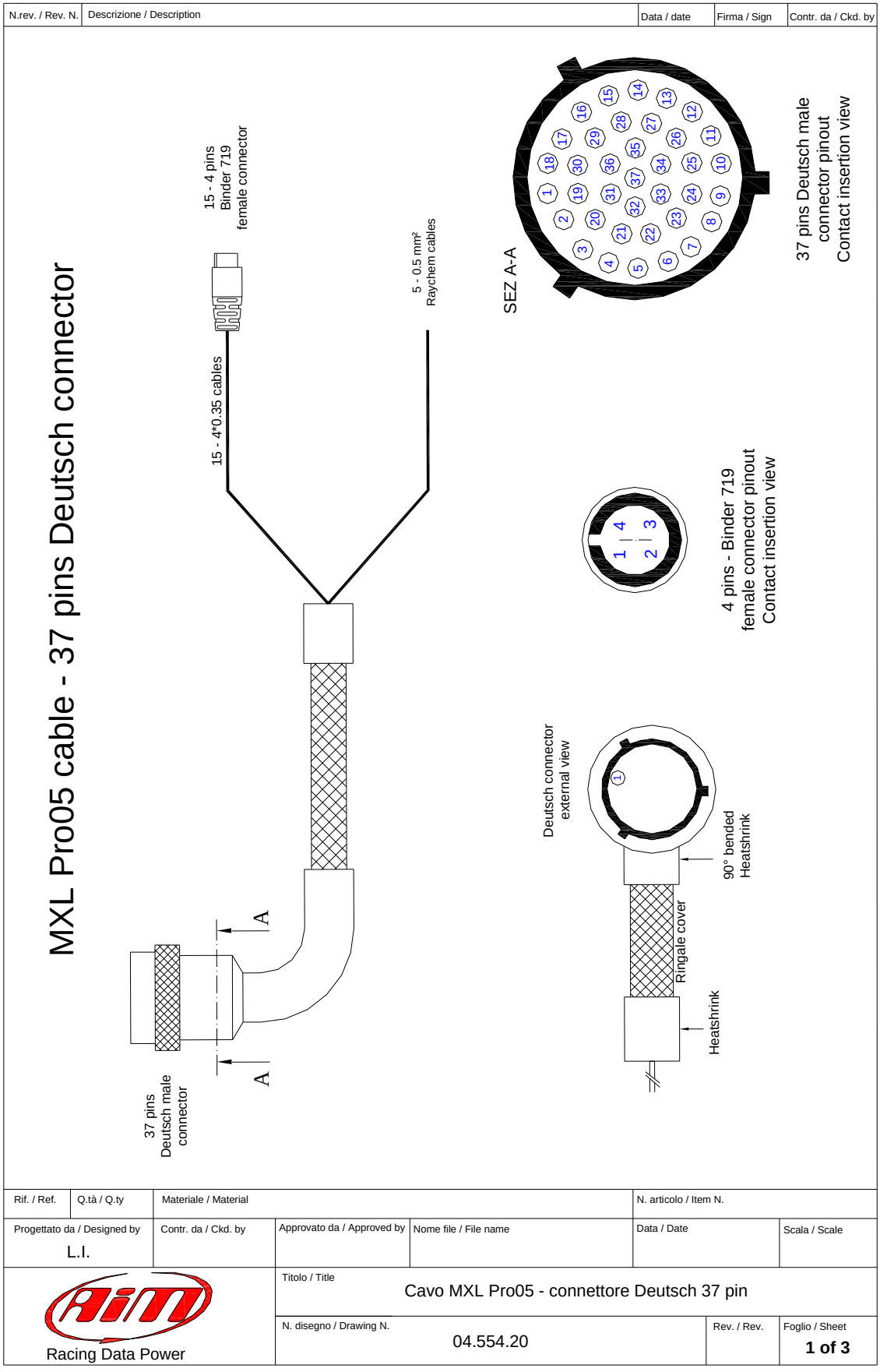
N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

Not cabled channels table

Channel	Cable colour	AMP 12 pin	Connection	Length
Power	Red Black	2 1	Vb ext (9-15 VDC) GND	500 mm
RPM	White	8	RPM Coil - Square Wave	500 mm
CAN	White Blue	4 3	CAN+ CAN-	500 mm
RS232	White Blue	6 5	RS232RX RS232TX	500 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo standard per MXL Pista ed optional per MXL Strada			
		N. disegno / Drawing N. 04.554.02		Rev. / Rev.	Foglio / Sheet **3 of 3**

A.3 – MXL Pro05 wirings



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

Table of channels cabled with Binder 719

Channel	Binder pin	Cable colour	Deutsch pin	Connection	Length
Ch. 1	1 2 3 4	White Black Red Blue	2 4 21	+ Analog input 1 Analog GND + V reference	340 mm
Ch. 2	1 2 3 4	White Black Red Blue	3 4 21	+ Analog input 2 Analog GND + V reference	340 mm
Ch. 3	1 2 3 4	White Black Red Blue	8 5 6	+ Analog input 3 Analog GND + V reference	360 mm
Ch. 4	1 2 3 4	White Black Red Blue	9 5 6	+ Analog input 4 Analog GND + V reference	360 mm
Ch. 5	1 2 3 4	White Black Red Blue	32 31 7	+ Analog input 5 Analog GND + V reference	380 mm
Ch. 6	1 2 3 4	White Black Red Blue	10 31 7	+ Analog input 6 Analog GND + V reference	380 mm
Ch. 7	1 2 3 4	White Black Red Blue	33 35 34	+ Analog input 7 Analog GND + V reference	400 mm
Ch. 8	1 2 3 4	White Black Red Blue	36 35 16 34	+ Analog input 8 Analog GND +VB + V reference	400 mm
Ch. 9	1 2 3 4	White Black Red Blue	25 11 16 24	+ Analog input 9 Analog GND +VB + V reference	420 mm
Ch. 10	1 2 3 4	White Black Red Blue	23 11 29 24	+ Analog input 10 Analog GND +VB + V reference	420 mm
Ch. 11	1 2 3 4	White Black Red Blue	19 27 29 22	+ Analog input 11 Analog GND +VB + V reference	440 mm
Ch. 12/ Gear	1 2 3 4	White Black Red Blue	20 27 22	+ Analog input 12 Analog GND + V reference	440 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name		Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo MXL Pro05 - Connettore Deutsch 37 pin				
		N. disegno / Drawing N. 04.554.20			Rev. / Rev.	Foglio / Sheet **2 of 3**

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

Channels cabled with Binder 719
Continuation table of sheet 2

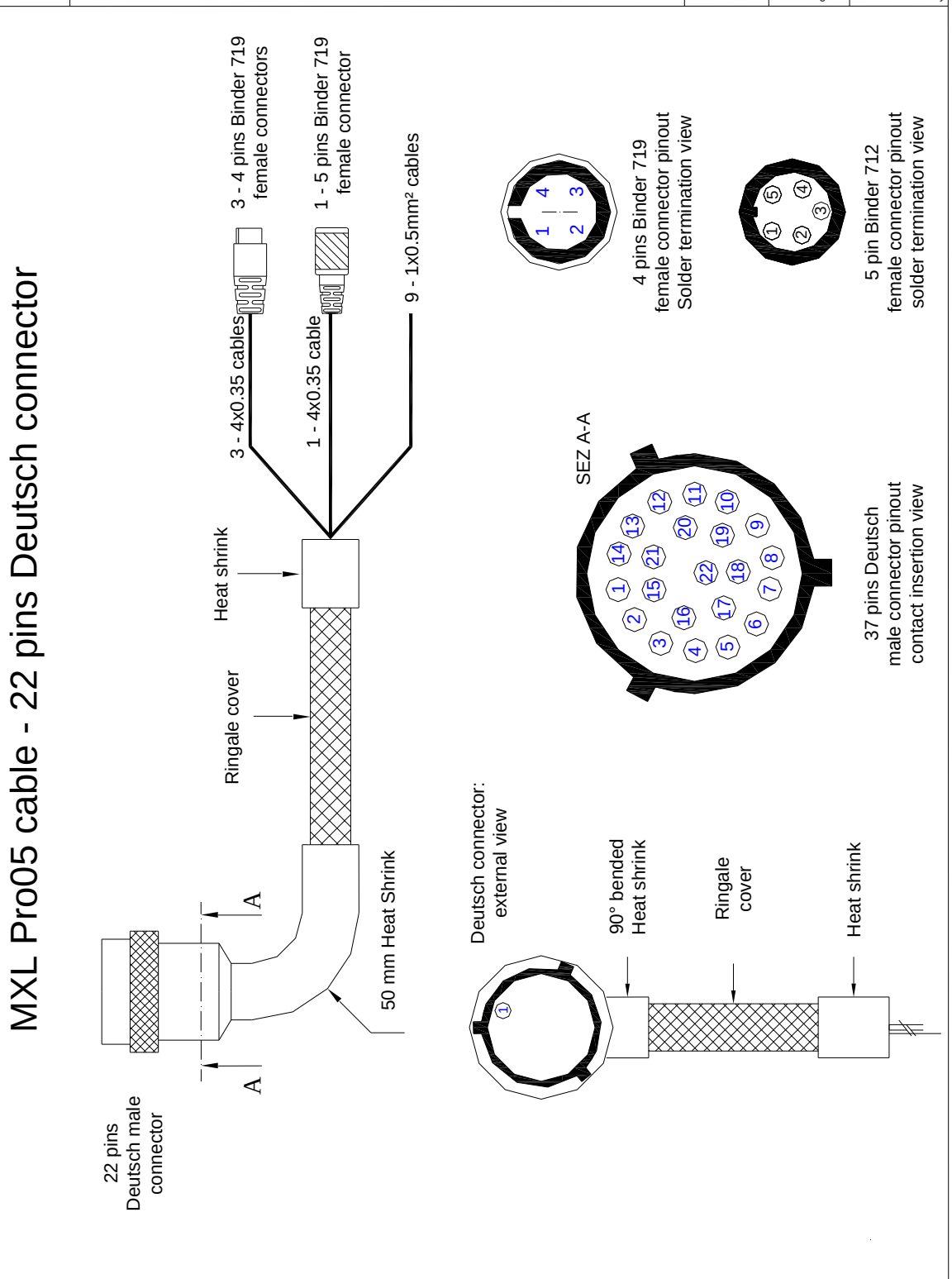
Channel	Binder pin	Cable colour	Deutsch pin	Connection	Length
Lap	1 2 3 4	white black red blue	37 28 14 37	Lap in GND + VB Lap in	320 mm
Speed 1	1 2 3 4	white black red n.c.	36 28 14	Speed 1 GND + VB	320 mm
Speed 2	1 2 3 4	white black red n.c.	30 28 14	Speed 2 GND + VB	320 mm

Table of not cabled channels

Not cabled channels	Cable colour	Deutsch pin	Connection	Length
RPM	white black blue	13 18 12	RPM Coil GND Square wave >5 V	520 mm
Power	black red	15 1	GND 9-15 V Power IN	520 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo MXL Pro05 - Connettore Deutsch 37 pin			
		N. disegno / Drawing N. 04.554.20		Rev. / Rev.	Foglio / Sheet **3 of 3**

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



Rif. / Ref.	Q.tà / Q.ty	Materiale / Material		N. articolo / Item N.	
Progettato da / Designed by: L.I.	Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title: Cavo MXL Pro05 - Connettore Deutsch 22 pin			
		N. disegno / Drawing N.: 04.554.24		Rev. / Rev.	Foglio / Sheet: 1 of 2

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

Channels ending with Binder 719

Channel	Binder Pin	Cable colour	Deutsch pin	Connection	Length
USB	1 2 3 4	white black red n.c.	7 9 8	USB D+ GND USB D-	1100 mm
Speed 3	1 2 3 4	white black red n.c.	5 11 10	Speed 3 GND + VB	300 mm
Speed 4	1 2 3 4	white black red n.c.	6 11 10	Speed 4 GND + VB	300 mm

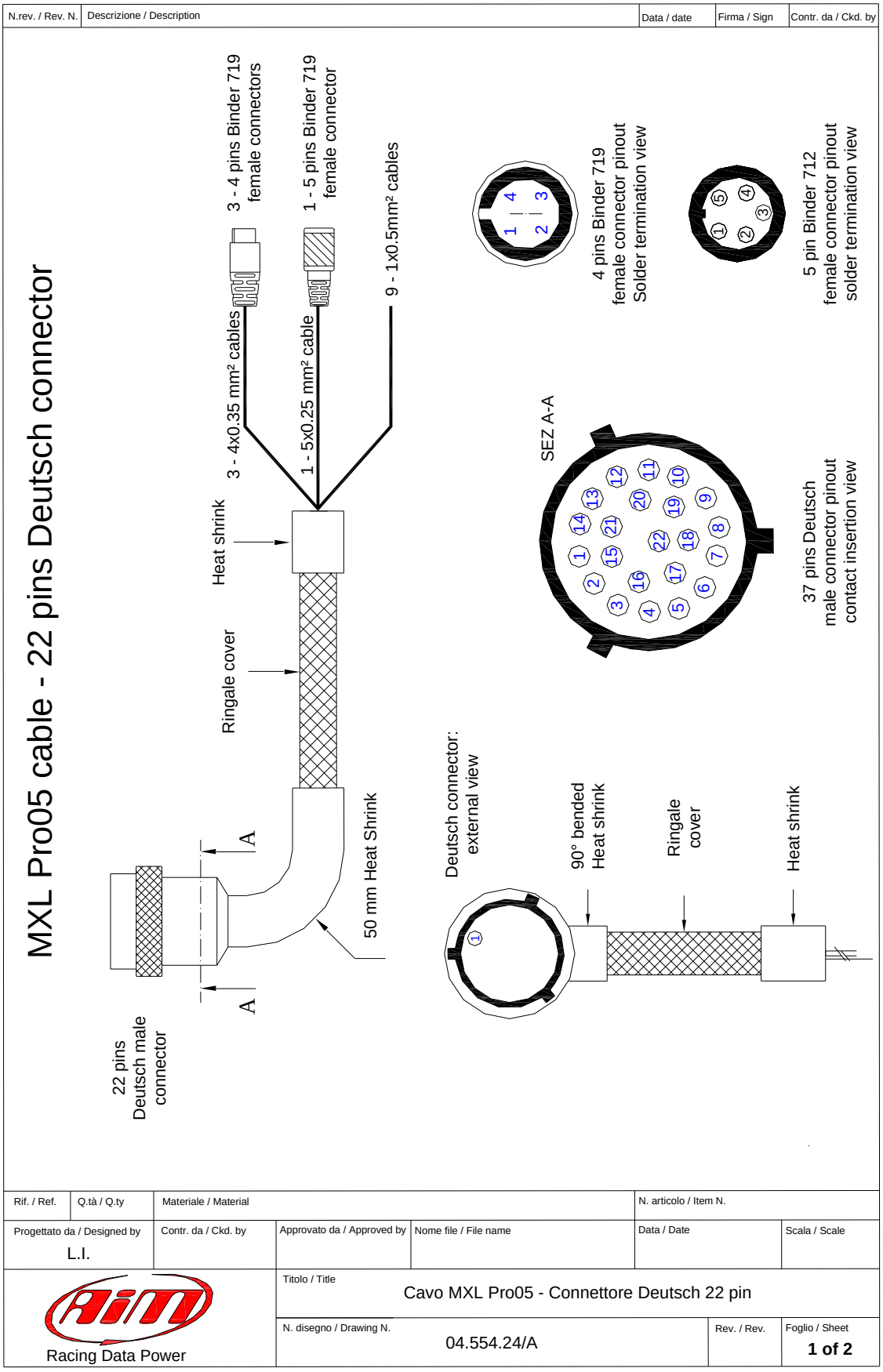
Channel ending with Binder 712

Channel	Binder pin	Cable colour	Deutsch pin	Connection	Length
Expansion	1 2 3 4 5	white black red blue	3 2 13 4	CAN 0+ GND + VB CAN 0- NC	350 mm

Not cabled channels table

Not cabled Channels	Cable colour	Deutsch pin	Connection	Length
Keyboard	white black blue	14 12 15	MEM GND VIEW	550 mm
CAN	white black blue	20 19 21	CAN + GND CAN -	550 mm
RS 232	white black blue	17 19 18	RS 232 RX GND RS 232 TX	550 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by **L.I**		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo MXL Pro05 - Connettore Deutsch 22 pin				
		N. disegno / Drawing N. 04.554.24			Rev. / Rev.	Foglio / Sheet **2 of 2**


N.rev. / Rev. N.
Descrizione / Description
Data / date
Firma / Sign
Contr. da / Ckd. by
MXL Pro05 cable - 22 pins Deutsch connector
3 - 4 pins Binder 719 female connectors
1 - 5 pins Binder 719 female connector
9 - 1x0.5mm² cables
3 - 4x0.35 mm² cables
1 - 5x0.25 mm² cable
Heat shrink
Ringale cover
50 mm Heat Shrink
A
A
22 pins Deutsch male connector
4 pins Binder 719 female connector pinout Solder termination view
5 pin Binder 712 female connector pinout solder termination view
SEZ A-A
37 pins Deutsch male connector pinout contact insertion view
Deutsch connector: external view
90° bended Heat shrink
Ringale cover
Heat shrink
Rif. / Ref.
Q.tà / Q.ty
Materiale / Material
N. articolo / Item N.
Progettato da / Designed by
L.I.
Contr. da / Ckd. by
Approvato da / Approved by
Nome file / File name
Data / Date
Scala / Scale
Racing Data Power
Titolo / Title
Cavo MXL Pro05 - Connettore Deutsch 22 pin
N. disegno / Drawing N.
04.554.24/A
Rev. / Rev.
Foglio / Sheet
1 of 2

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

Channels ending with Binder 719

Channel	Binder Pin	Cable colour	Deutsch pin	Connection	Length
USB	1 2 3 4	white black red n.c.	7 9 8	USB D+ GND USB D-	1100 mm
Speed 3	1 2 3 4	white black red n.c.	5 11 10	Speed 3 GND + VB	300 mm
Speed 4	1 2 3 4	white black red n.c.	6 11 10	Speed 4 GND + VB	300 mm

Channel ending with Binder 712

Channel	Binder pin	Cable colour	Deutsch pin	Connection	Length
Expansion	1 2 3 4 5	white black red blue orange	3 2 13 4 22	CAN 0+ GND + VB CAN 0- +Vb ext.	350 mm

Not cabled channels table

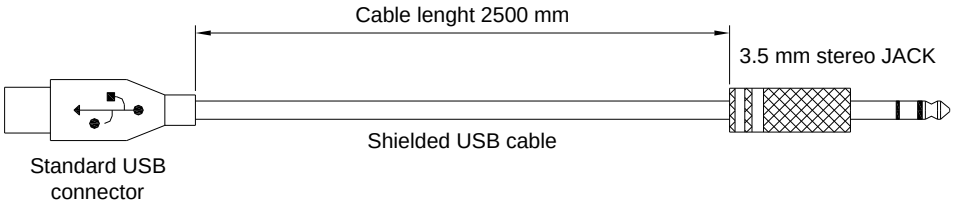
Not cabled Channels	Cable colour	Deutsch pin	Connection	Length
Keyboard	white black blue	14 12 15	MEM GND VIEW	550 mm
CAN	white black blue	20 19 21	CAN + GND CAN -	550 mm
RS 232	white black blue	17 19 18	RS 232 RX GND RS 232 TX	550 mm

Rif. / Ref.	Q.tà / Q.ty	Materiale / Material			N. articolo / Item N.	
Progettato da / Designed by **L.I**		Contr. da / Ckd. by	Approvato da / Approved by	Nome file / File name	Data / Date	Scala / Scale
Racing Data Power		Titolo / Title Cavo MXL Pro05 - Connettore Deutsch 22 pin				
		N. disegno / Drawing N. 04.554.24/A			Rev. / Rev.	Foglio / Sheet **2 of 2**

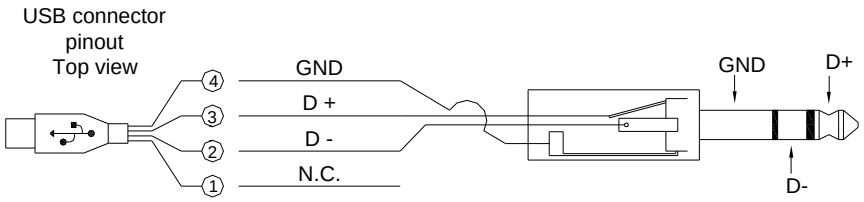
A.4 – USB Cable

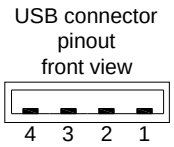
N.rev. / Rev. N.	Descrizione / Description	Data / date	Firma / Sign	Contr. da / Ckd. by

USB cable for data download - 3.5 mm stereo Jack



Pin connection





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
Racing Data Power		Titolo / Title: Cavo USB per scarico dati - Jack da 3.5 mm stereo			
		N. disegno / Drawing N.: 04.554.30		Rev. / Rev.	Foglio / Sheet: 1 of 1