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Race Studio

Software manual

Configuration for Drack EV3

NEW 4 CHANNEL VERSION

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Chapter 1 – Data Acquisition Concepts

1.1 –Analogue and digital signals

The measurement of a physical quantity, such as the car's speed or the exhaust gas temperature is at the same time a very simple and a very complex operation.
The first element necessary to the measurement is the sensor; it is a device that transforms a physical quantity in an electrical signal.
An electrical signal may change between two fixed values or it may assume any value in a fixed range, moreover it can be defined in a continuous time interval or in discrete time.
When a signal is defined in discrete time interval and can assume any value in a fixed range it is named **analogue**.
When a signal is defined for finite time intervals and can assume only fixed values it is named **digital**.
A data logger records and a Personal Computer elaborates only signals in a numerical (or digital) form, for this reason it is necessary to convert all the signals in a digital form.
The data logger makes the conversion.
The sensors used for the measure of the number of engine revolutions and wheel speed provide an output signal assuming only fixed values and it is defined for a continuous time interval. The data logger converts these signals in a digital form counting the impulses generated by the sensors.
All the other sensors, like potentiometers and thermocouples, have analogue outputs. The data logger again performs the analog-to-digital conversion.

1.2 – Calibration

The relationship between the physical quantity and the electrical output of the sensor is a necessary parameter to be known for the data acquisition system. It may be linear, the output increases or decreases in the same way of the input, or non-linear, the output varies in a different way of the input. For example the potentiometers have a linear characteristic on the contrary the thermocouples have a non-linear one.
The Race Studio software performs the transformation from the number obtained from the analog-to-digital conversion to the engineering unit, like bar or °C. For some sensors the program already have all the information for the transformation, for example thermocouples. For some others, which depend on the mounting conditions, it is necessary to give their resting (or zero) position (**Automatic calibration**) for Drack EV3. this operation is always necessary to calibrate the two internal accelerometers. At last few sensors need a full **calibration**, **two** or more positions are necessary this, operation is almost necessary if potentiometers are employed .
For a description of the calibration functions of the Race Studio refer to the chapter 3.5.

1.3 – Sampling rate

The sampling rate is the data acquisition system's recording frequency.
Although the output from the sensors changes continuously and instantaneously, the data acquisition system records data at prefixed time intervals.
The sampling rate is expressed in Hertz (Hz = 1/sec). For example if you have a sampling rate of 10 Hertz, it means that the input is read ten times per second and the time between any two successive readings is 0.1 second.
For a correct representation of a physical phenomenon, like the travel of a suspension, it is very important to read the output of the sensor a number of times sufficient to have no lost of information about the phenomenon itself. So it is very important to select the right sampling rate.
Two factors influence the choice of the sampling rate. They are the frequency of the signal from sensor and the total recording time of the data logger.
These factors are joined: in fact the number of channels recorded and the sampling rate selected for each channel determine the total recording time of the data acquisition system. More channels you record and/or higher sampling rates you select less recording time you have. For Drack EV3. the analog channel's sampling rate has been upgraded to 1000 Hz.

1.4 – Data download

The recorded measures are stored inside the non-volatile data logger memory. In order to see or to modify the recorded data they have to be downloaded on the Personal Computer.
A USB communication is necessary to perform the download operation.
After the download operation has been performed the data are available for any graphical representation, for any modification and calculation you like. In short it is possible to analyze data (for a full description of the analysis functions refer to the “Software manual - Analysis”).

Chapter 2 – Software: general description

2.1 – Introduction

For software management refear to the Race Studio Software analysis manual

2.1.1 - Notational Conventions

This manual uses the following notations:

Example of convention	Description of convention
"Configuration-Load…"	Quotation marks enclose menu item in the program.
[OK]	Brackets enclose buttons you find in the program or keys.
CHANNELS.CFG	Italic capital letters are used for file names.
File menu	Underlined letters are used for menu name.
Track selection	Underlined italic letters are used for operations or windows titles.
Advanced	Blue bold letters are used for the names of the software versions.

2.2 – Getting started

2.2.1 – Before using the Drack EV3 system

Install the data logger (refearing to the installation manual), the sensors and the cables on the vehicle and the software on your Personal Computer well in advance of the departure to the track, in case problems arise they can be solved.
Learn the analysis section of the Race Studio software with the examples given with the program (see also the "Software manual – Analysis").
Make a few trial runs of recording and downloading data in your box.

2.2.5 – Drack EV3 device selection

When you run the program first of all make sure that the selected device is the Drack EV3.
The name of the selected device is written in red colour, the others are black coloured, in the *main window* (for a description of the *main window* refers to chapter 2.3.1).
For the selection of the Drack EV3 device click over the name with the left button of the mouse or move the cursor with the arrow keys and when it is over the Drack EV3 button press the [Enter] key.

2.2.7 – Vehicle selection

When the Race Studio program is running for the first time it is necessary to select the type of the vehicle mounting the data logger.
Run the "Configuration.General" command and then select the vehicle (the selectable values are two wheels and four wheels).
The vehicle selection is a very important operation to do because a wrong selected vehicle disables you from calculating the map of the track.

2.3 - Functionality

Race Studio software includes all the functions for configuration and communication with the data logger. This chapter gives a description of all the main functions provided by the software.
Before describing the program functionality it is necessary to outline the first window shown when the software is run: it is the *main window*.

2.3.1 – Main window

The *main window* is the first window shown when the program is run. In Fig. 2.2 the default *main window* for a video resolution bigger than 800x600 is displayed.

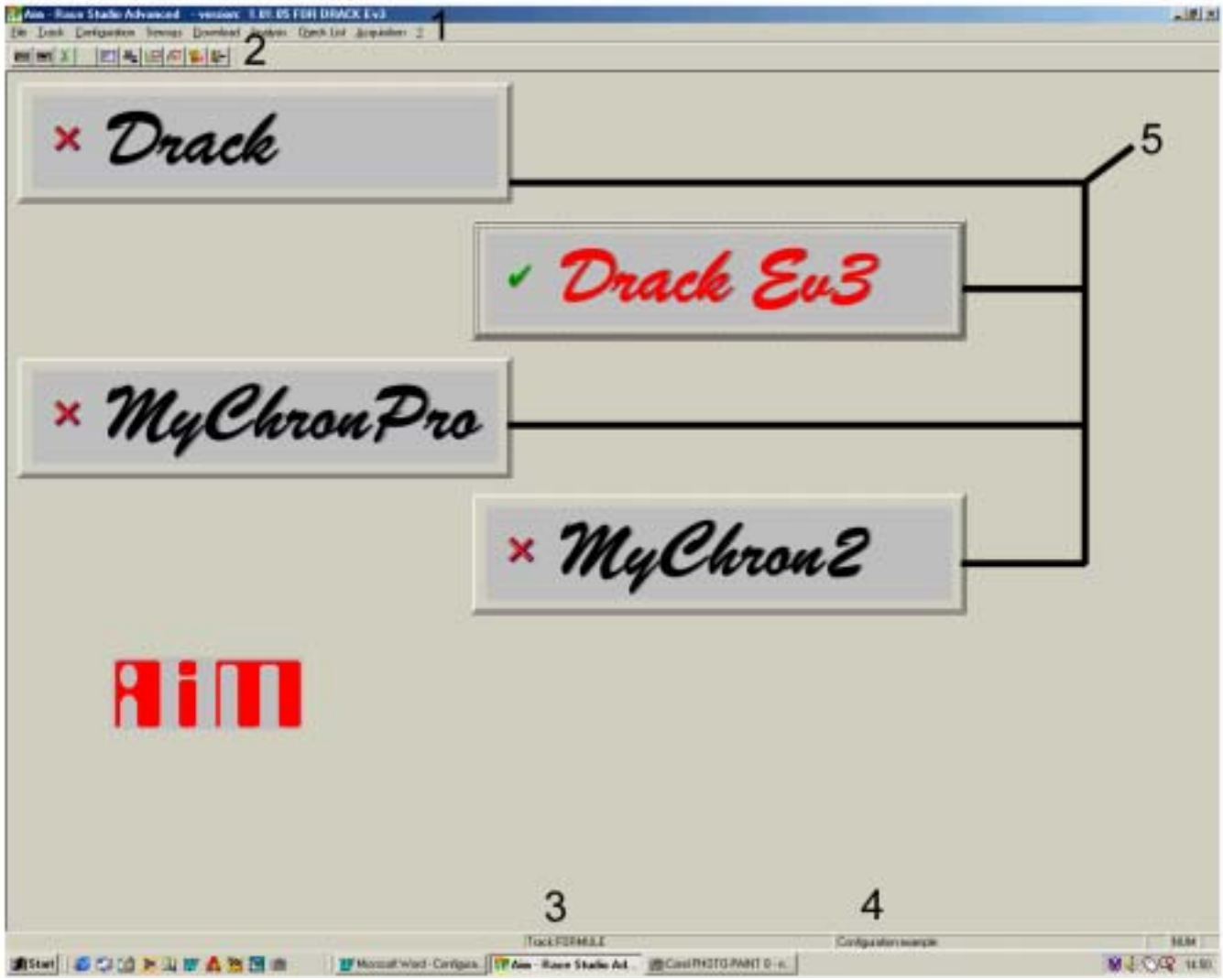


Fig. 2.2 – Main window

The most important areas in the window are:
(1) – The menu includes the main commands of the program.
(2) – The toolbar of the window includes some shortcuts to the most important functions.
(3) – The name of the active Track shown on the status bar.
(4) – The name of the active Configuration shown on the status bar.
(5) – The four "big" buttons for the selection of the connected device, in Fig. 2.2 the Drack EV3 is the selected device and it is displayed red.

The main toolbar includes nine buttons for some of the most used commands of the *main menu*.
Starting from the left they run the following commands:

1) Backup of tests and maps on floppy disk,
2) Restore tests and maps from floppy disk,
3) Delete tests and maps,
4) Configuration of the input channels,
5) Download from the data logger,
6) Run the analysis,
7) Configuration of the math channels,
8) Show this manual,
9) Exit the program.

2.3.2 – Multiple configurations

The program provides the possibility to manage more than one configuration for the data logger. This functionality is useful for teams with more than one vehicle in order to have different configurations for each vehicle.
The configurations may be defined for different types of data loggers.
There are two configurations in the Drack EV3 system: one loaded on the personal computer and another one into the data logger. If on the Personal Computer a single configuration is used the two configurations have to be always the same. If multiple configurations are used it is very important that, when the loaded configuration on the personal computer is sent to the data logger, "Configuration-Transmission to the logger " (F9) command, it is the one you would like to send. Check its name on the status bar of the application (see Fig. 2.2).
Every time the software on the PC recognizes an incompatibility between the PC configuration and the logger one, a warring message appears on the screen.
The commands dealing with the multiple configurations are in the *Configuration menu*: they let you load a configuration, delete a configuration, create a new configuration and to copy the loaded configuration into a new one.

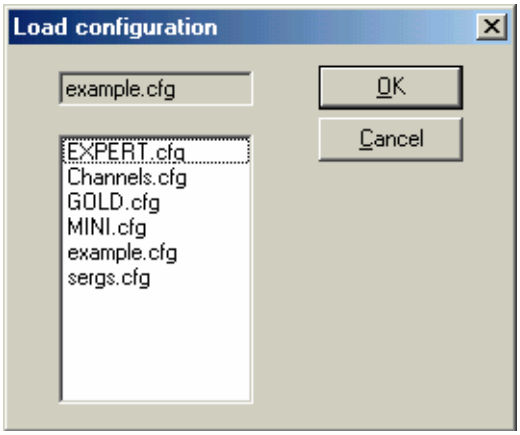


Fig. 2.2 load configuration

2.3.3 – Recording data

The data acquired by the data logger can be recorded on the data logger memory or on the Personal Computer memory.
Record data on the personal computer when the logger is phisically connected to a PC, in order to transmit the data continuosly to it, in this case the trasmission frequency and, of course, the recording frequency, is fixed at 10 Hz per channel. This configuration may be usefull when you have to do tests on a dyno bench.
Record data in the data logger always on the track.
Two recording possibilities are avaible for data recording on the Personal Computer. It can be started both pressing a button in the dialog window shown running the "Acquisition-Memo" command (MANUAL) or when a selected channel reaches a fixed value (THRESHOLD).

When the logger records data on its memory, you may decide to start data recording in two different ways, the data recording configuration is selected running the command " Configuration- General": a description of this command is provided in the next Chapter.

2.4 Sensors and software

In order to calculate the right value of a sensor, the logger has to know the sensor characteristics.
The avaible sensors are described in the following Table.
Warning: It is possible to define a custom sensor, in case the output is linear.

Name	Input type	Calibration	Parameters	Notes
Engine RPM	RPM	NO	Multiply factor. Maximum value (used for the covering function).	For the "maximum value" input a value that is about 10% more than the maximum rpm value reached by the engine
Speed	Speed for Speed #1 or #2	NO	Tyre circumference. Pulses per revolution.	
Rotation speed	Speed	NO	Pulses per revolution.	
Temperature (thermocouple K)	Analogue	NO	NO	
Temperature (infrared TC)	Analogue	NO	NO	
Temperature (NTC Weber)	Analogue	NO	NO	
VDO temp. 40-120 °C (104-248 °F)	Analogue	NO	NO	
VDO temp. 50-150 °C (122-272 °F)	Analogue	NO	NO	
VDO temp. 60-200 °C (140-392 °F)	Analogue	NO	NO	
Potentiometer to autocalibrate	Analogue	Automatic-Calibration	Sensor full scale value	Measurement of travel length (mm or inches). For suspensions or car roll
Potentiometer to calibrate	Analogue	Calibration	NO	Measurement of travel length (mm, inches or percentage) throttle or brake position
Mid-zero potentiometer	Analogue	Calibration	NO	Measurement of travel angle. For steering position
VDO pressure 0-5 bar (0-72.5 PSI)	Analogue	NO	NO	
VDO pressure 0-10 bar (0-145 PSI)	Analogue	NO	NO	
Bosch lambda sensor (1 ST/PC)	Analogue	NO	NO	Stoichiometric value 1
NGK lambda sensor (TL 7111W1)	Analogue	NO	NO	Stoichiometric value 14.57
0-50 milliVolt linear	Analogue	NO	Input in the X0 and X1 fields the output voltage (mV) of two typical points; for instance zero scale and full scale. Input in the Y0 and Y1 fields the corresponding values in engineering units	For custom sensors with linear characteristic and output voltage up to 50 milliVolts. If the sensor is a pressure sensor check the corresponding box.
0-500 milliVolt linear	Analogue	NO	Input in the X0 and X1 fields the output voltage (mV) of two typical points; for instance zero scale and full scale. Input in the Y0 and Y1 fields the corresponding values in engineering units	For custom sensors with linear characteristic and output voltage up to 500 milliVolts. If the sensor is a pressure sensor check the corresponding box.

0-5 Volt linear	Analogue	NO	Input in the X0 and X1 fields the output voltage (V) of two typical points; for instance zero scale and full scale. Input in the Y0 and Y1 fields the corresponding values in engineering units	For custom sensors with linear characteristic and output voltage up to 5 Volts. If the sensor is a pressure sensor check the corresponding box.
Pitot tube speed sensor	Analogue	Automatic-Calibration	Sensor full scale value Multiply factor	The "Multiply factor" depends on the geometry of the tube.
Water temp. installed (RENAULT)	Analogue	NO	NO	Water temperature sensor installed on the Renault engine
Oil temp. installed (RENAULT)	Analogue	NO	NO	Oil temperature sensor installed on the Renault engine
Oil pressure installed (RENAULT)	Analogue	NO	NO	Oil pressure sensor installed on the Renault engine
Lateral accelerometer	Analogue-internal	Automatic-Calibration	NO	
Vertical accelerometer	Analogue-special input	Automatic-Calibration	NO	
Gyro	Analogue-special input	Automatic-Calibration	NO	

Table 1 – Sensors

Some more information may be useful for the usage of the <Potentiometers>.

Potentiometers

The potentiometers are used for many measurements like suspensions, throttle, brake and steering angle.

The Race Studio software provides three different potentiometers: potentiometer to autocalibrate, potentiometer to calibrate and mid-zero potentiometer.

The <Potentiometer to autocalibrate > is suggested for the suspensions and for car roll. This sensor requires inputting the full-scale value of the sensor for example 100 mm. Moreover the auto-calibration of the sensor is necessary; for this operation the vehicle has to be in the zero position.

The <Potentiometer to calibrate> is suggested for throttle or brake position. It needs calibration and during this operation it is necessary to input a reference value, for example 100, percentage or 150 millimetres.

The <Mid-zero potentiometer> is suggested for steering angle. It needs calibration, during this operation it is necessary to input two reference values, for example – 20° and +20°.

2.5 Channels and sampling rates

The Drack EV3 system provides different sampling rates depending on the channel.
Table2 shows for every kind of channel the available sampling rates.

Channels	Sampling rates (Hz)
Rpm	10, 20.
Speed	10, 20, 50, 100.
Analogue	10, 20, 50, 100, 200.
Analogue-internal	10, 20, 50, 100, 200.
Analogue special inputs	10, 20, 50, 100, 200.
Data logger temperature	10.
Battery	10, 20, 50, 100, 200.
Math	1, 2, 10, 20, 50, 100, 200.

Table 2 – Channels and sampling rates.

The sampling rate of input channels is selected when the "Configuration-Input channels" command is run.
For math channels in the **Advanced** version it is selected running the *Math channels configuration* ("Configuration-Math channels" command).
For math channels in the **Standard** version it is automatically fixed, it is the maximum sampling rate among the acquisition frequencies of the channels necessary to the computation.

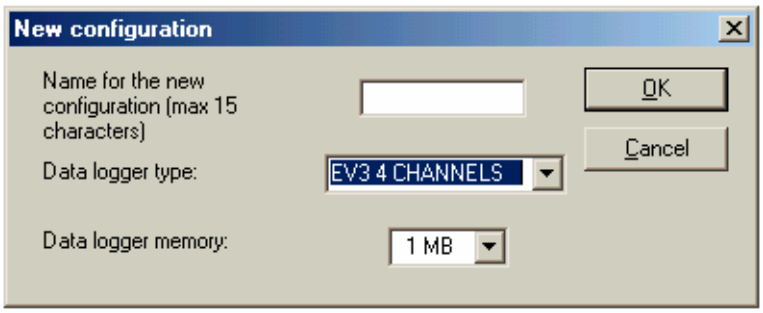
Warning. Summing the sampling rate of all the enabled channels we obtain the total acquisition frequency of the system. The frequency must not exceed **800Hz.**

Chapter 3 – Software main commands

3.1 – Configuration commands

The configuration commands are divided into three groups, the first is dedicated to the multiple configuration management, the second to the configuration of the data logger and of the program and the third is the command for the transmission of the configuration to the data logger.
The multiple configurations management commands are: “New…”, “Load…”, “Copy” and “Delete”.

New.. .
This command creates a new configuration file for the data logger, with the name you input, the data logger type may be also selected. The configuration is created alike the one in the *CHANNELS.INI* file. Use consistent names like the name of the driver or the number of the vehicle.



Load…
Running this command it is possible to select the active configuration. The active configuration is the one edited with the “Configuration-Input channels” command and transmitted to the logger with the “Configuration-Logger transmit” command. The name of the loaded configuration is shown in the status bar of the application, see Fig. 2.2.

Copy
This command copies the active configuration into a new one named by the user. Use consistent names like the name of the driver or the number of the vehicle.

Delete
This command deletes the selected configuration. It is not possible to erase the *CHANNELS.INI* configuration and the active one.

The commands for the configuration of the program and of the data logger are “General”, “Display”, “Beacon”, “Input channels” and “Math channels”.

General
In the dialog window shown selecting the command it is possible to select the recording criterions for the data logger and the Personal Computer, the data logger cleaning memory criterion. Moreover you can choose the vehicle type, the units of measure for speeds and temperatures, the user interface language and the ***Reference speed*** channel.
The Fig. 3.3 shows the dialog window for the general configuration.

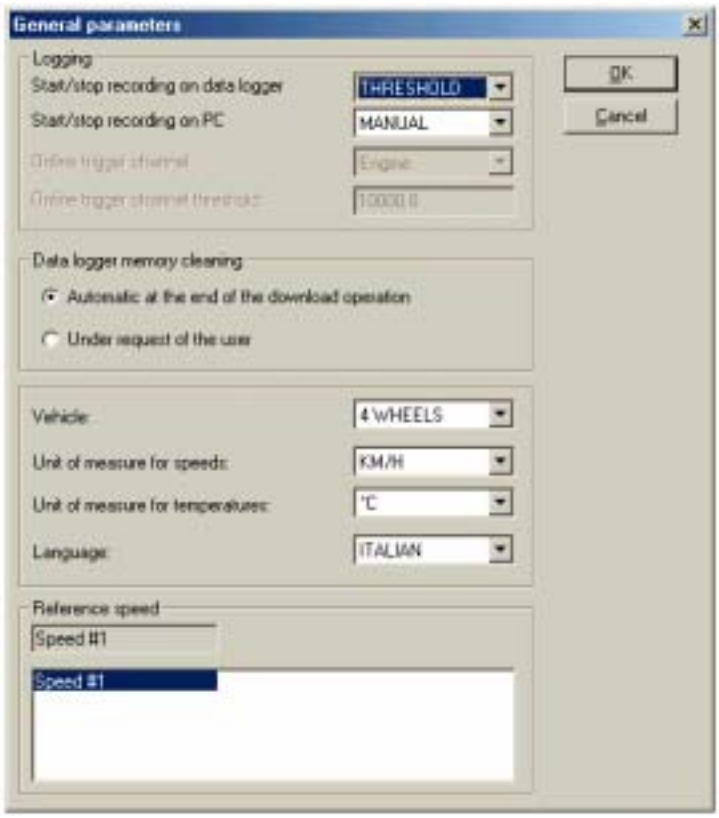


Fig. 3.3 – General configuration

Option/Display	**Use**
Logging	The logging section groups the recording criterions. For the data logger: THRESHOLD for tests on the track or CONTINUOUS for test on the dyno bench. For the Personal Computer MANUAL or THRESHOLD. The <Online trigger channel> and <Online trigger channel threshold> values are necessary if the THRESHOLD choice has been selected.
Data logger memory cleaning	In this section is possible to select the criterion for cleaning the memory of the data logger (for deleting the recorded data). The default is <Automatic at the end of the download> operation. Otherwise it is possible, selecting the <Under request of the user> option, to clean the memory only sending the configuration to the logger. **Warning**: if you choose the second option remember to send the configuration to the logger before run a new test.
Vehicle	In this field it is possible to set the vehicle type (two wheels or four wheels). It is important to select the right item in order to have a correct map creation.
Unit of measure for speeds	In this field it is possible to set the unit of measure (km/h or mph) for speeds and the corresponding units for distance.
Unit of measure for temperatures	In this field it is possible to set the unit of measure (°C or °F) for temperatures.
Language	In this field it is possible to select the language for the user interface, if the language has been changed exit the program, run it again for the activation of the new selection.
Reference speed	In this filed it is possible to set the channel that will be used as the ***Reference speed channel*** in the Analysis functions. For a description of the reference speed role see the 2.2.2 chapter.

Cancel	Choose this command to leave the window and do not save the selections.
Ok	Choose this command to exit the window and to confirm the selections.

Display
The dialog window for the configuration of the display mounted on your vehicle is shown in Fig. 3.5.
If the M2-dash and the Light-dash displays are used here select the Speed channel and the two temperature channels shown on it.

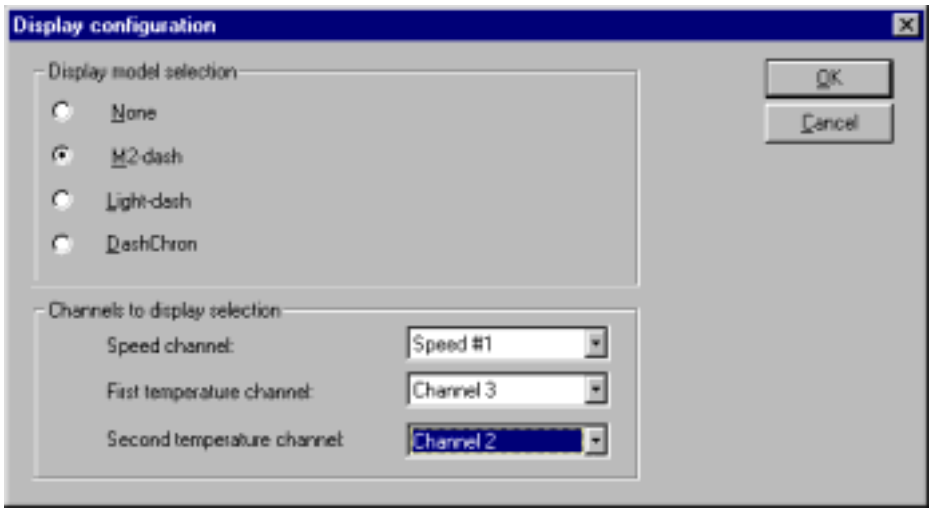


Fig. 3.5 – Display configuration

If the DashChron is selected the dialog window shown in Fig. 3.6 is displayed.

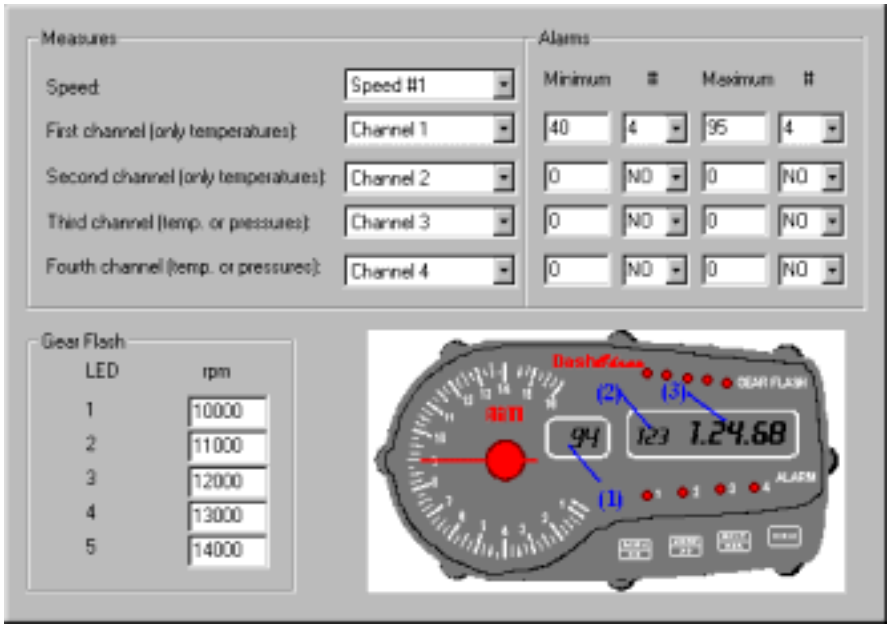


Fig. 3.6 – DashChron configuration

Option/Display	**Use**
Measures	In these fields select the channel you would like to see also in the dashboard. They are one speed channel and four analogue channels. The first two analogue channels can be only temperatures the second two can be temperatures or pressures. The first analogue channel will be displayed in the **(1)** display, the other channels can be shown in the display number **(2)**. The display **(3)** shows always the lap time.
Alarms	In these fields it is possible to input, for each channels, the minimum and the maximum alarm. For each alarm can be selected the threshold value and the LED which will show the alarm.

Gear Flash	In these fields input the value for the five Gear Flash LED's. For each LED it is possible to input the rpm threshold value. Different values or the same value for all the LED's can be input. The fifth value is also the threshold for the external Gear Flash.

If DashChron has been chosen the internal battery's life will be strongly reduced, in this case you're promped to connect to the logger an external power source.

Beacon
The "Beacon" command allows configuring the obscuring time for the beacon. How many seconds the infrared receiver has to be obscured after a lap marker has been detected.

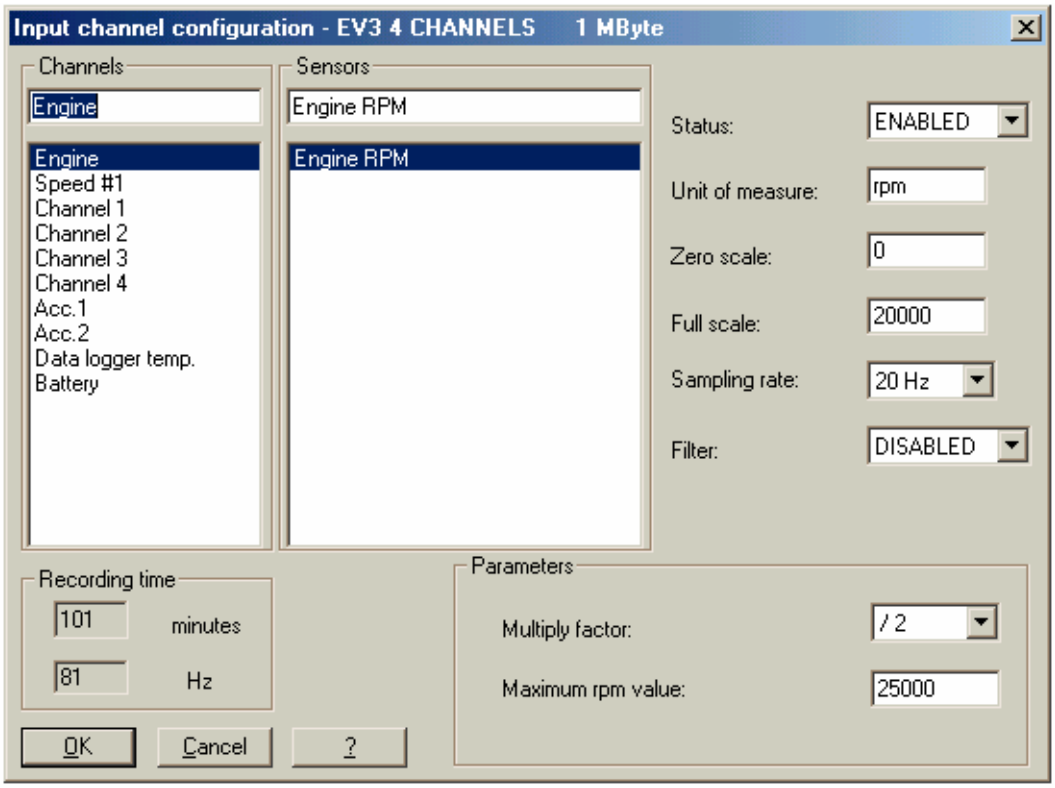


Fig. 3.7 – Input channels configuration

Input channels
The "Input  channels" command allows configuring all the data logger channels. Fig. 3.7 shows the dialog window displayed for the configuration; it refers to a EV3 4Channels data logger.

Select a channel from the list, all the information about it is shown. A description of all the fields in the dialog window is given below.

Option/Display	**Use**
Channels	In these fields the name of the selected channel and the list of the available channels are shown. The name of the selected channel can be edited.
Sensors	In these fields the name of the selected sensor and the list of the sensors are shown. A double click over a sensor name in the list and it becomes the selected one. **Warning** with a single click the sensor does not become the selected one!
Status	In this field choice if the selected channel have to be acquired (select ENABLED) or not (select DISABLED).
Unit of measure	In this field input the unit of measure of the channel. For instance °C for a temperature

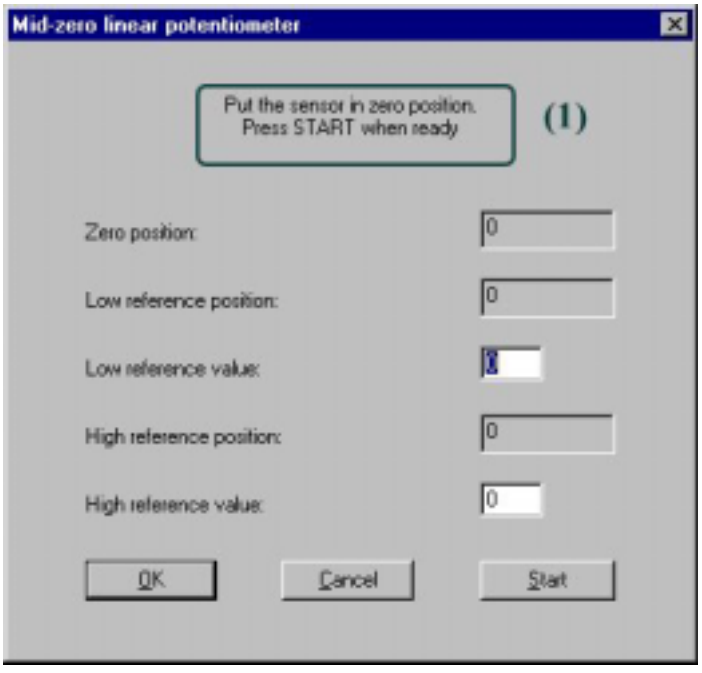
	or km/h for speed.
Zero scale	In this field input the beginning of the scale for the visualisation of the plot in the Analysis section.
Full scale	In this field input the end of the scale for the visualisation of the plot in the Analysis section.
Sampling rate	Select the number of readings per second of the channel. The provided values are 1, 2, 10, 20, 50, 100 and 200 Hertz. For every channel different frequencies are available
Filter	In this field select if a filter function has to be applied to the data of the selected channel after the download operation. Data is filtered in the same way used in the Analysis section
Recording time	In this field the maximum recording time for the data logger is shown. This parameter depends on the number of enabled channels and on their sampling rate. Appendix A shown some typical recording time.
Parameters	The parameters' fields are displayed only when the selected sensor needs them. For example speed sensor needs two parameters: tyre circumference and pulses per revolution. A full description of these parameters is given in the Table 4.
?	Choose this command to show a help dialog window.
Cancel	Choose this command to leave the window and do not save the selections.
Ok	Choose this command to exit the window and to confirm the selections.

3.2 – Sensors commands

The sensors' menu includes the "Calibration" and the "Automatic calibration" items.

Calibration

The <Potentiometer to calibrate> and the <Mid-zero potentiometer> are the sensors needing calibration.
The calibration has to be performed with the sensors directly mounted on the vehicle.
When the "Calibration" command is run the data logger has to be connected to the personal computer and powered on.



Selecting the “Calibration” command a dialog window with the channels to calibrate is shown; select a channel and press [Start].
For a < Mid-zero potentiometer > the dialog window shown in Fig. 3.9 is displayed.

Fig. 3.9 - < Mid-zero potentiometer > calibration

Here the steps necessary to do the calibration are described, we suppose we are calibrating the Steering wheel sensor.

1. The area **(1)** shows the “Put the sensor in zero position. Press START when ready” message.
2. Leave the Steering wheel in the rest position and press [Start].
3. The area **(1)** shows the “Operation in progress...” message and a number appears in the “Zero position” field.
4. When the operation finished the area **(1)** shows the “Put the sensor in low reference position. Press START when ready” message. Turn the Steering wheel all on the right and press [Start].
5. The area **(1)** shows the “Operation in progress...” message and a number appears in the “Low reference position” field. Keep the Steering wheel in the same position during the operation.
6. When the operation finished the area **(1)** shows the “Put the sensor in high reference position. Press START when ready” message. Turn the Steering wheel all on the left and press [Start].
7. The area **(1)** shows the “Operation in progress...” message and a number appears in the “High reference position” field. Keep the Steering wheel in the same position during the operation.
8. When the operation finished the area **(1)** shows the “Enter the low and high reference values.” message. Input the asked values into the “Low reference value” and “High reference value” field respectively. For example –20 and 20 degrees can be good values.
9. When finished press [Ok]. The calibration is done.

The same procedure is done for the calibration of the <Potentiometer to calibrate> and a dialog window very similar to the one shown in Fig. 3.8 is displayed.
For this sensor a single reference value is required, it can be the full-scale value of the measure.
For instance when the potentiometer is used to measure the throttle position the zero position is when the throttle is closed and the reference position is when the throttle is full.

Automatic calibration
The automatic calibration is necessary for the sensors that change their value depending on a zero (or rest) position.
See Table 1 for knowing the sensor needing automatic calibration.
Before starting the “Automatic calibration” command make sure the data logger is connected to the personal computer and it is powered on.
If multiple configurations are used check the loaded configuration, it has to be the right one for the data logger connected to the personal computer.
Then in order to perform a correct calibration put the vehicle in the rest position, for example places the car on the ground with the driver inside, and run the command. After a few seconds the operation can be finished pressing [Ok].

3.3 – Download command

The “Download” command allows downloading data from the Drack EV3 data loggers to the Personal Computer memory.

When the “Download” command is selected for the first time the track selection dialog window is shown, see it in Fig. 3.2.

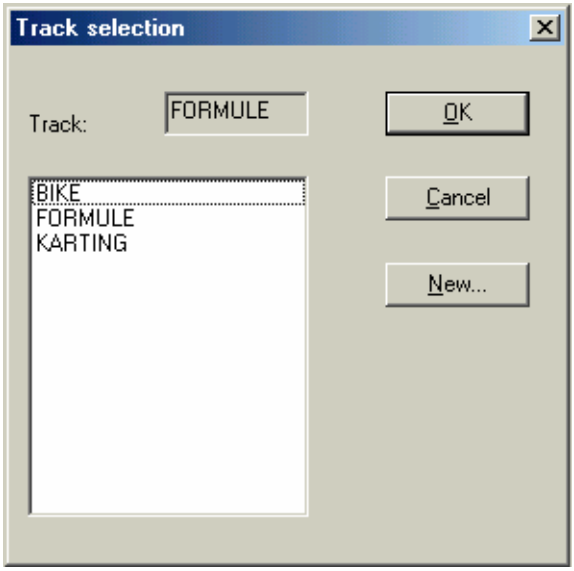


Fig 3.2.- Track selection

After the selection of the track or the creation of a new one press [Ok] and a dialog window named *Test information setting* is shown, see Fig. 3.10. In this dialog window it is possible to input some information describing the test.

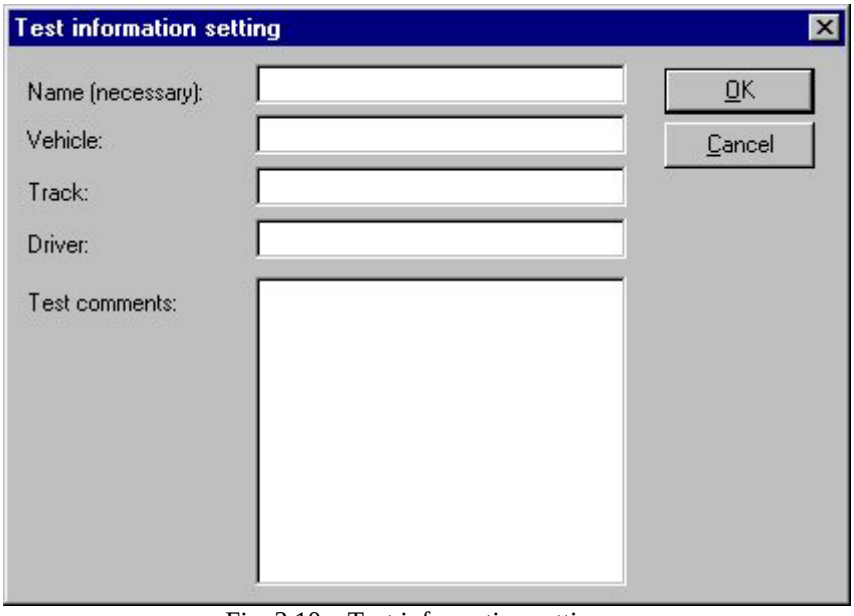


Fig. 3.10 – Test information setting

Option/Display	**Use**
Name (necessary)	Input here the name of the test, maximum twenty characters. This is the name of the file that includes the data of the test and it is also the name you will find when you would like to analyse the data. **Warning**, the name is necessary.
Vehicle	Input the kind of the vehicle, maximum twenty characters (optional).

Track	Input the name of the track, maximum twenty characters (optional).
Driver	Input the name of the driver, maximum twenty characters (optional).
Test comments	Input any comments you would like, maximum two hundreds characters (optional).
Ok	Choose this command to exit the window and to confirm the input data.
Cancel	Choose this command to leave the window and do not save any modification you made.

All the information input in this window can be modified during the analysis selecting the “Modify-Test-Name” command (see “Software manual – Analysis).
If the <Under request of the user> option has been selected in the “Configuration – General” the program asks if you want to clean the memory of the data logger, otherwise it automatically cleans it.

3.4 – Check list command

The “Check list” command shows a dialog window with some useful information for the operation on the track.
These suggestions can appear obvious for a skilled user but follow them can prevent you from recording unreadable data or from recording no data at all.

3.5 – Acquisition commands

The “Acquisition” commands allow connecting to the data logger for the “on line” operations.
The acquisition menu includes the “View” and the “Memo” items.

View
The “Acquisition-View” command allows seeing all the input channels.
Before running the command connect the data logger to the PC and power it on.
In Fig. 3.12 the visualisation for a EV3 4Channels data logger is shown.

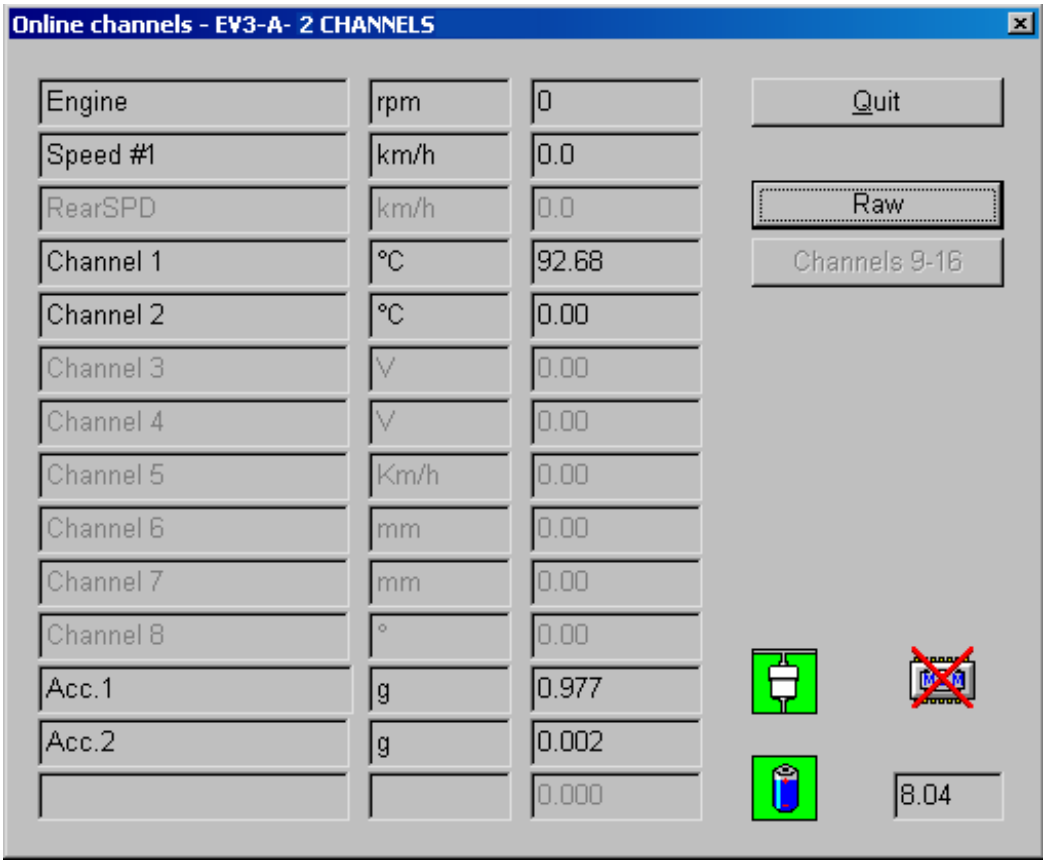


Fig. 3.12 – “Acquisition-View”: channels on line view

The dialog window shows a table having in the first column (the one on the left) the name of the channels (the disabled channels are greyed), in the second column the unit of measure of the channels and in the third column the value of the channels (in engineering units).
Two icons representing the status of the serial communication and of the battery are also displayed. Green icons mean that the status of the USB line and of the battery is correct red icons mean status not correct.
Moreover the status of the memorisation is shown (in the Fig. 3.12 the data logger is not recording). 
The  icon is shown (like in Fig. 3.12) when a lap marker is received.

At the bottom of the window the voltage of the battery is also shown.

Option/Display	**Use**
Quit	Choose this command to exit the visualisation.
Raw/Calculated	Choose this command to see the input values in engineering units (default) or in raw counts.
Channels 9-16/ Channels 1-8	This command is available only for EXPERT data loggers, for other data loggers version this button is greyed. Pressing this button the first eight analogue channels or the second eight are shown.

Memo

The "Acquisition-Memo" command allows seeing data from the data logger and recording them in the Personal Computer.

Before running the command connect the data logger to the PC and power it on.

The functionality of this command depends on the logging criterion selected in the general configuration, see chapter 3.4.

If the MANUAL start/stop recording has been selected pressing the [Start/Stop acquisition] button the acquisition begins or ends. At the end of the acquisition press [Save] to record data on the PC hard disk, the dialog window shown in Fig. 3.10 is displayed.

If the THRESHOLD start/stop recording has been selected the acquisition begins when one of the speed channels reach the 10 km/h (6.2 mph) and ends when all the speed channels values are below the 10 km/h (6.2 mph). At the end of the acquisition press [Save] to record data on the PC hard disk, the dialog window shown in Fig. 3.7 is displayed.

When the command is selected a dialog window is shown, in Fig. 3.13 an example for a EV3 4Channels data logger is displayed.

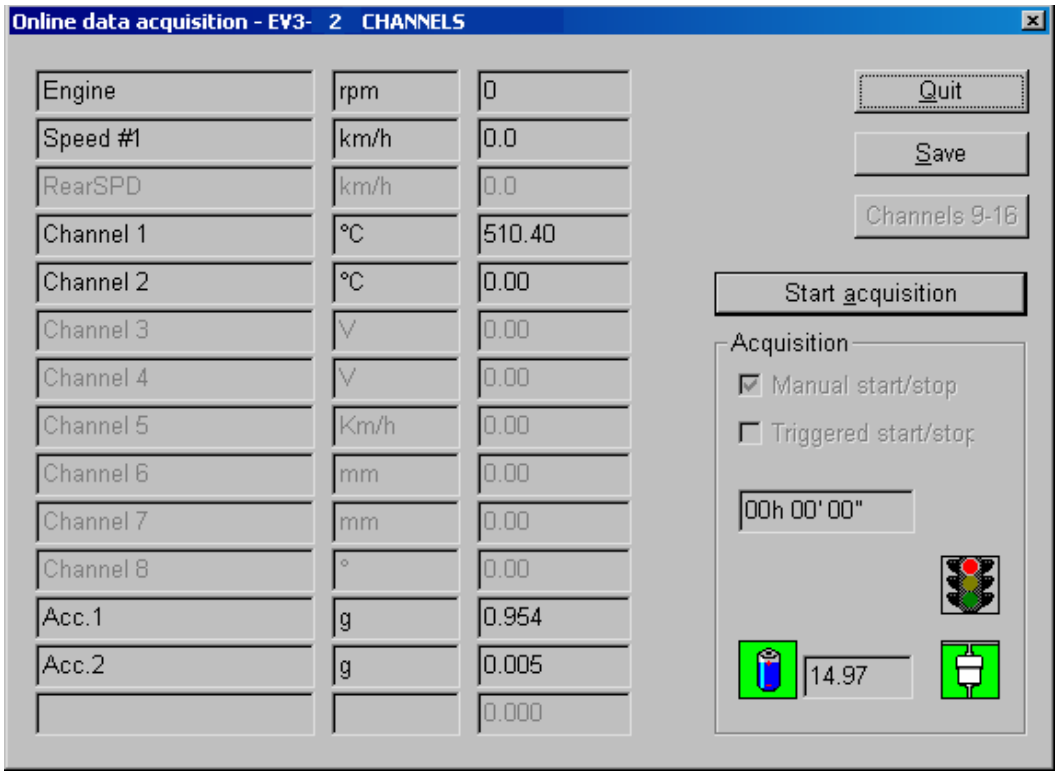


Fig. 3.13 – "Acquisition -Memo": on line data acquisition

The dialog window shows a table having in the first column (the one on the left) the name of the channels (the disabled channels are greyed), in the second column the unit of measure of the channels and in the third column the value of the channels (in engineering units).

Two icons representing the status of the serial communication and of the battery are also displayed. Green icons mean status of the battery and of the serial line ok red icons mean status not correct.

Another icon shows a traffic light, the red light on means the acquisition is stopped the green light on means the acquisition is running. Beside the traffic light icon the acquisition time is shown.

The icon  is shown (like in Fig. 3.13) when a lap marker is received.

At the bottom of the window the voltage of the battery is also shown (14.97 Volt in Fig. 3.13).

Option/Display	**Use**
Quit	Choose this command to exit the visualisation.
Save	Choose this command to save on the PC hard disk the recorded data.
Channels 9-16/ Channels 1-8	This command is available only for EXPERT data logger, for other data logger version this button is greyed. Pressing this button the first eight analogue channels or the second eight

	are shown.
Start acquisition/ Stop acquisition	Choose this command to start the acquisition when the MANUAL recording has been selected, otherwise the button is greyed.
Acquisition	The start/stop recording criterion is shown, the MANUAL start/stop is shown in Fig. 3.11.

3.6 – Help commands

Manual
Running this command this manual in PDF format is displayed.

About Race Studio…
The command shows the version of the Race Studio software running on your Personal Computer and the available resources of the PC.

Chapter 4 – Troubleshooting

4.1 - Data logger does not reply during serial communication

On line operations

1. Check the connections of the cable for the USB communication to the data logger and to the Personal Computer. If the cable has one or more extensions check every connection. The maximum length of the cable has to be 10 metres (32.8 feet).
2. Check the state of charge of the battery powering the data logger (during this operation the data logger must be powered).

Download operation

This trouble happens when the Race Studio program shows an error message during the download, for example the operation does not start or stops. It does not concern the problem "no data has been recorded" (for this problem see below).

1. Check the connections of the cable for the USB communication to the data logger and to the Personal Computer. If the cable has one or more extensions check every connection. The maximum length of the cable has to be 10 metres (32.8 feet).
2. Check the state of charge of the battery powering the data logger (during this operation the data logger must be powered).
3. Remove all the power saving features of the Personal Computer. Performing the operation use the Control Panel of the Windows® operating system. For more details refer to the manual of the operating system installed on your Personal Computer.

4.2 - The data logger did not record data

This information may appear at the beginning of the download operation.

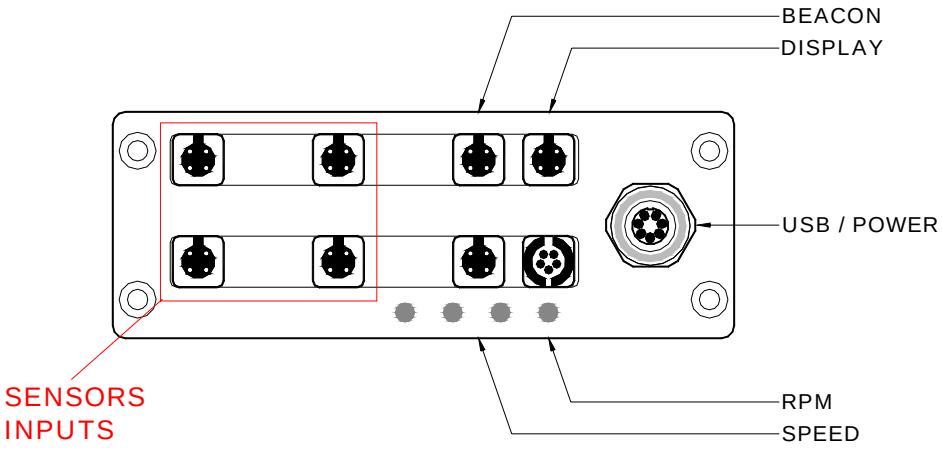
1. Check the voltage of the battery powering the data logger (during this operation the data logger must be connected to the battery).
2. If the recording criterion for the data logger is THRESHOLD, check the position of the speed sensor.

Appendix A

1 Technical characteristics

Analog channels	4 : 0-5V / 0-500mV / 0-50mV / thermocouple inputs / PGA programmable gain amplifier, 12 bit resolution
Digital channels	RPM : 1 input : spark wire / Low Voltage from coil / square wave 0 – 5V(Max 60000 RPM) Speed : 1 input. (Max frequency 4000 Hz)
Lap Time input	From optical or magnetic receiver
Other internal channels	Biaxial G sensor -10g +10g Battery level Logger temperature
Sampling/recording rate	From 10 to 200 samples per second. Totally configurable
Voltage output	V. reference and V. battery
Digital output	1: display or configurable gear flash
Non volatile Data Memory	1 megabyte flash eprom
Program memory	Flash Eprom. Firmware upgrade possible from PC
Power	External 8-15V
Internal battery	NiMh 650 mAh - Recharged when connected to an external power >= 12Vdc
Internal battery charger	Fast charge in 90 minutes
Power consumption	90 mA (sensors excluded)
PC interface	Fast USB 300 kbyte/second
Dimensions	Mm 100 x 71 x 38
Weight	400 g (battery included)
Working temperature	-20 +65 Celsius
Water resistence	IP65

FRONT PANEL PIN-OUT



SENSORS INPUTS

1	Signal
2	Ground
3	V battery
4	V reference

SPEED

1	Speed 1
2	Ground
3	V battery
4	Speed 2

RPM

1	Spark wire RPM
2	Ground
3	V battery
4	High voltage RPM (coil) (from 150 to 400 V)
5	Low voltage RPM (from 0 to 20 V)

BEACON

1	Magnetic marker
2	Ground
3	V battery
4	Infra Red Marker

DISPLAY

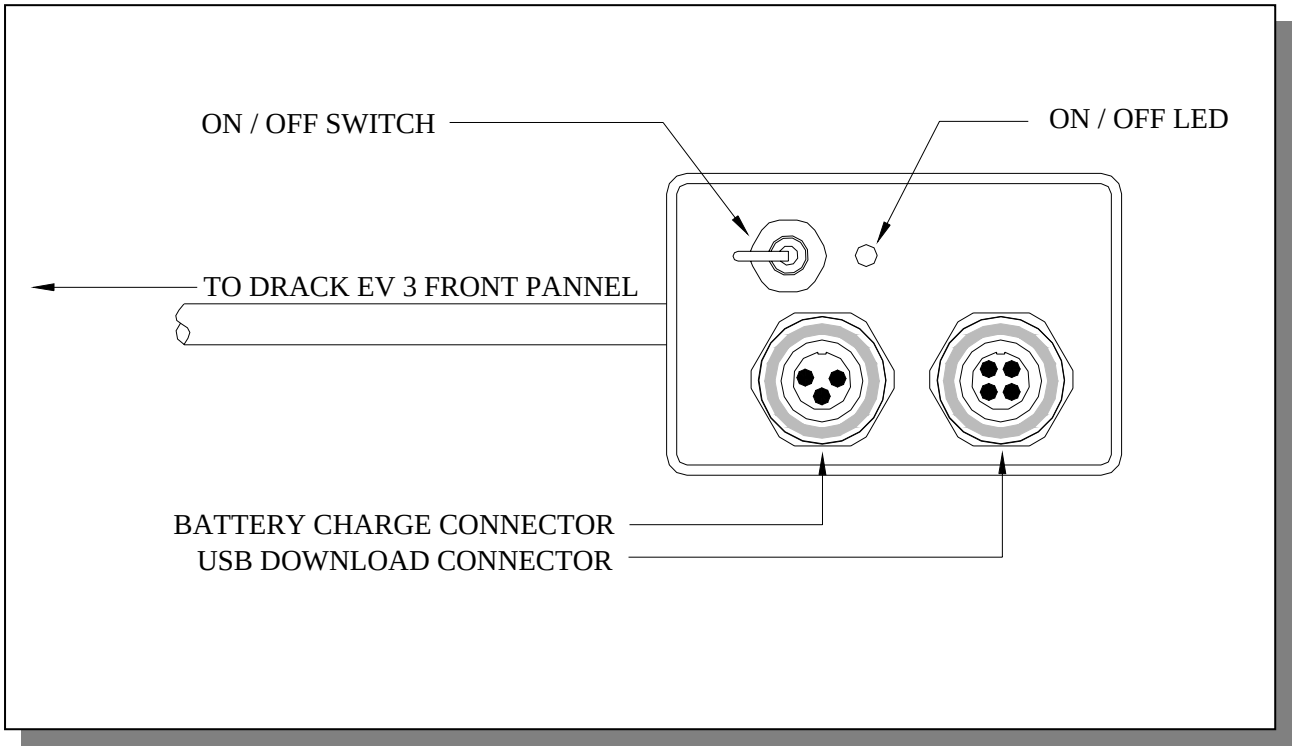
1	SCL/CAN +/GF1
2	Ground
3	V battery
4	SDA/CAN -/GF2

USB / POWER

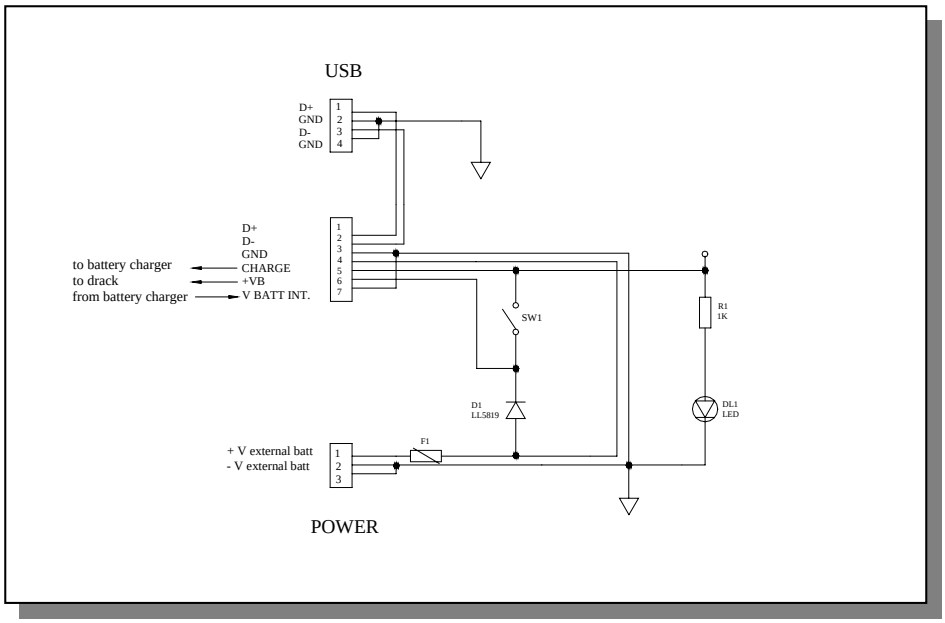
1	+ D
2	- D
3	V battery
4	Ground
5	Charge
6	V battery
7	ON/OFF switch

3 USB and Battery Charge device box

DRACK EV 3 has an external device box made to make easier data's downloading and battery charging. This external device has to be plugged to the USB/POWER connector on the DRACK EV3 front pannel.



Electrical scheme of this device circuit



LED’s functions in Drack EV 3

Drack EV3 has four status LEDs, the table below is usefull to understand the logger’ status and to make a first aid troubleshotting

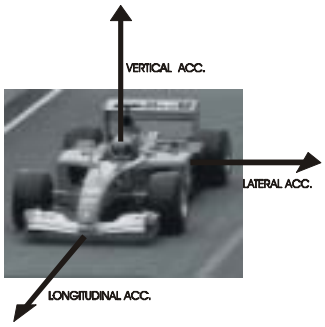
LED's sequency

Refear also to the front panel PIN-OUT scheme

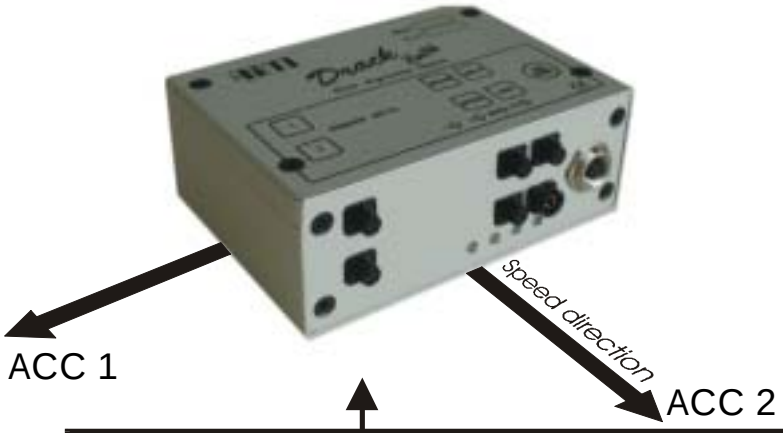
LED ‘ S FUNCTION					
STATUS	**1**	**2**	**BS**	**FC**	**NOTES**
Fast charge				Red / blinking	/
Battery charge				Red	/
Battery short cut			Red		/
Battery low	OFF	OFF	OFF	OFF	Charge battery
Not valid configuration	Green / fast blinking	Green / fast blinking			Transmitt configuration
Aquisition OFF / empty memory	OFF	Green / slow blinking			/
Aquisition OFF / not empty memory	Green / slow blinking	Green / slow blinking			/
Aquisition OFF / memory over 3/4	Yellow / slow blinking	Yellow / slow blinking			/
Aquisition OFF / memory full	Red / slow blinking	Red / slow blinking			/
Aquisition ON	OFF	Green			/
Aquisition ON / memory over 3/4	OFF	Yellow			/
Memory writing error	Yellow / fast blinking	Red / fast blinking			Contact technical support
Memory writing error 2	Red / fast blinking	Red / fast blinking			Contact technical support
Digital/analog channels error	Yellow / fast blinking	Yellow / fast blinking			Contact technical support
Analog channels overflow error	Red / fast blinking	Yellow / fast blinking			Contact technical support

ACCELEROMETER CONFIGURATION

Drack EV 3 has two internal configurable accellerometers, each accellerometer has to be set according to the logger installation. Please configure accellerometers as shown below.
AIM suggests not to install the logger in a different way.



Set ACC 1 as longitudinal accellellerometer
Set ACC 2 as lateral accellerometer



Set ACC 2 as longitudinal accellellerometer
Set ACC 1 as lateral accellerometer

Set ACC 1 as vertical accellellerometer
Set ACC 2 as longitudinal accellerometer

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