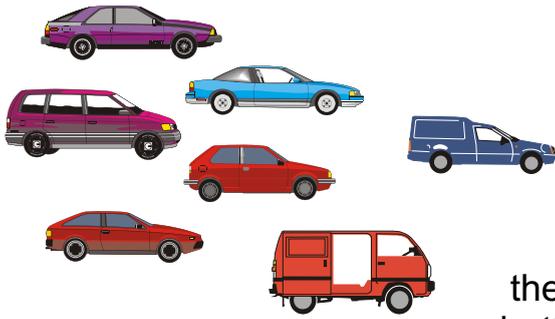


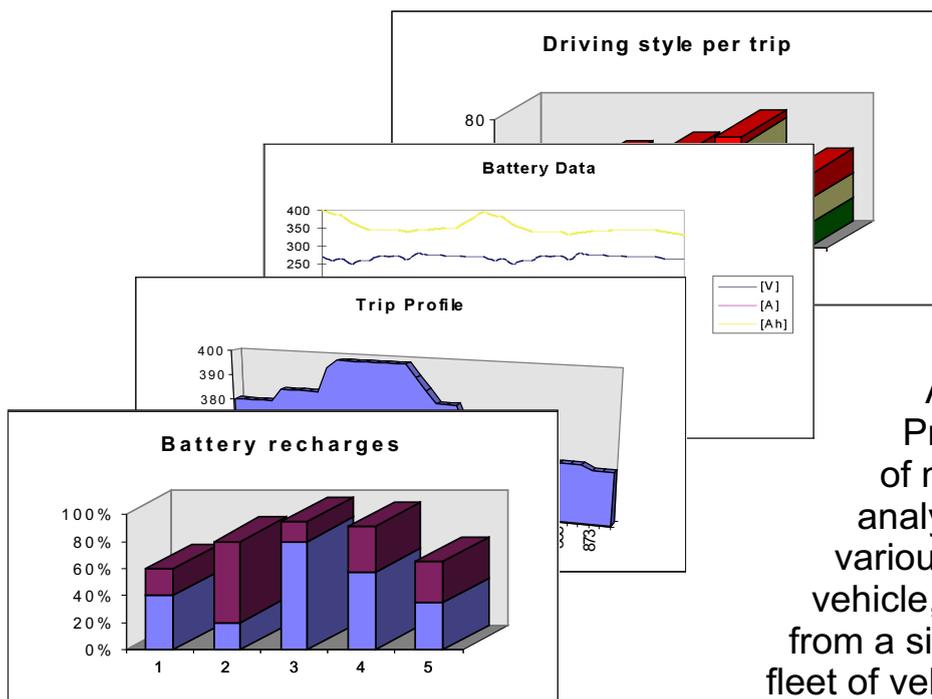
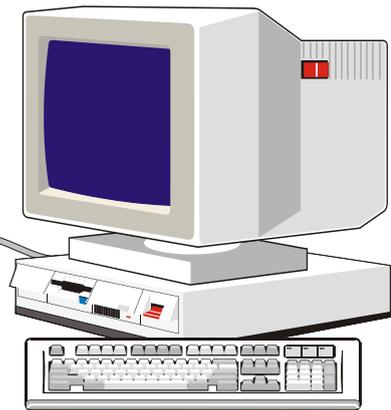
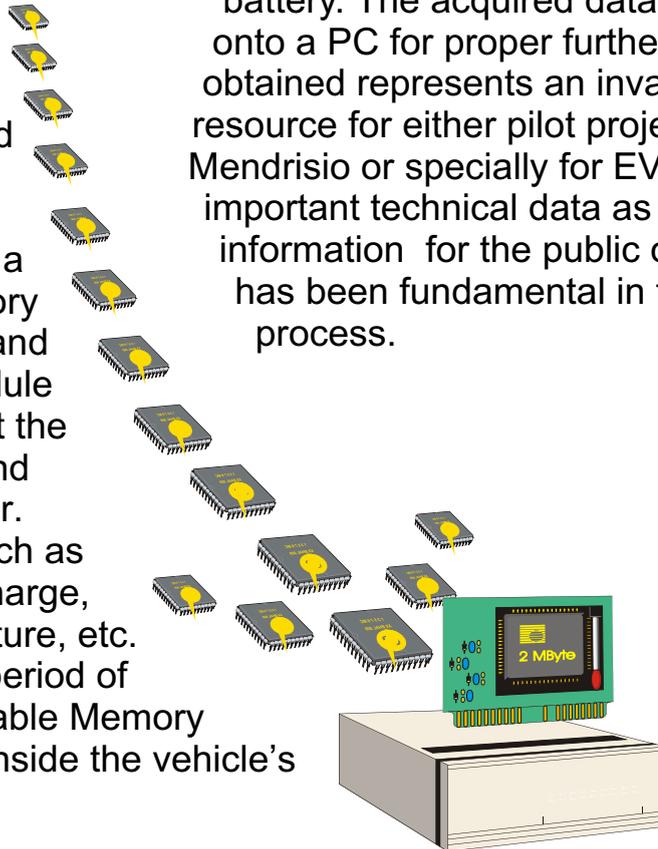
# Data Acquisition System for Electric Vehicles



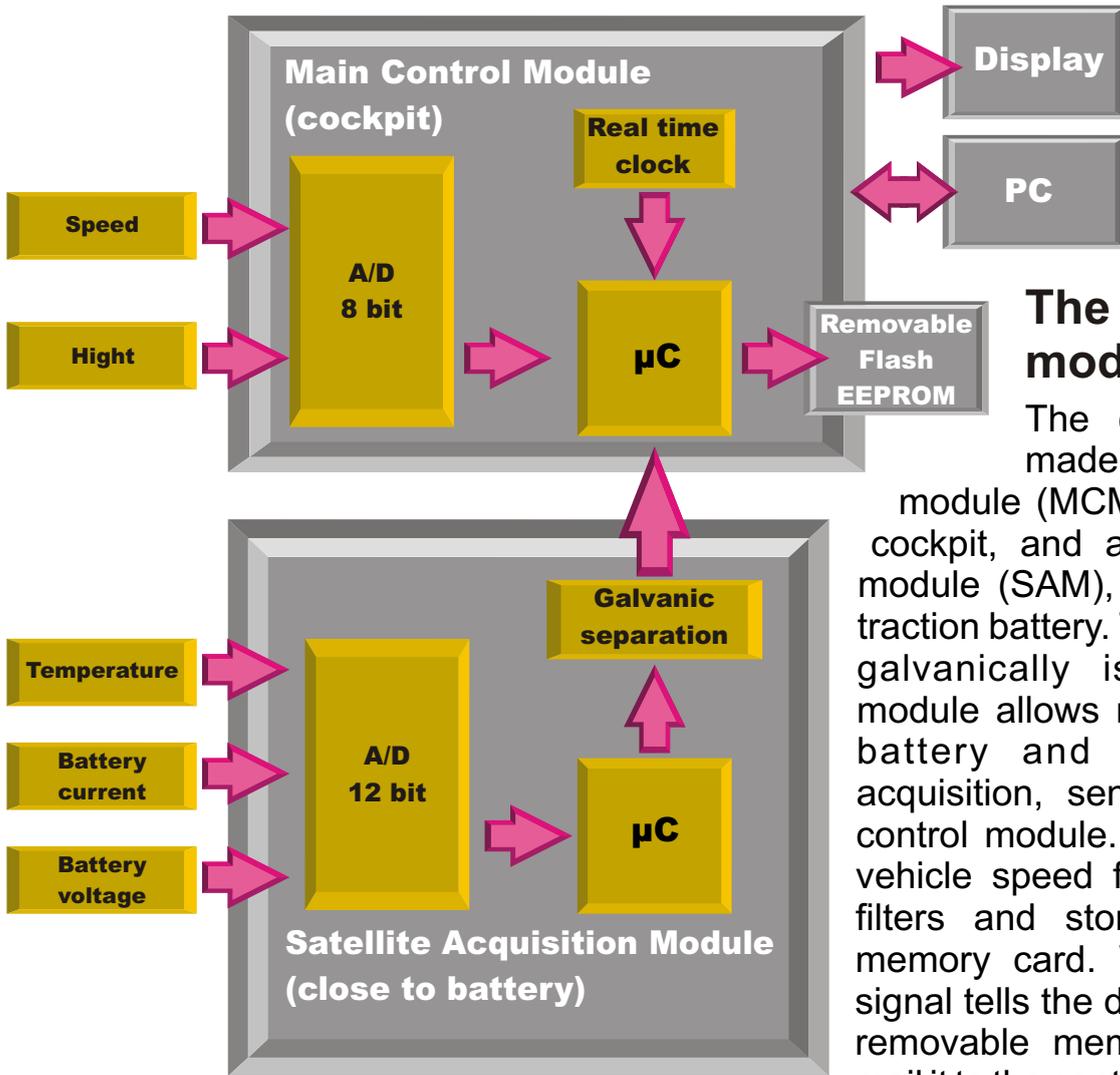


The DAS system is made up of an on-board module (OBM), mounted inside the vehicles with a removable memory module (RMM), and an off-board module (FBM), located at the data collection and processing center. Primitive data such as speed, battery charge, current, temperature, etc. are stored for a period of time in a Removable Memory Module located inside the vehicle's cockpit.

The DAS system has been developed in cooperation with the VEL project in Mendrisio, Switzerland. It allows the acquisition (through an on-board module), storage (on the Removable Memory Module) and visualization of data, characterising the energetic behaviour and the typical operation of an electric vehicle and its battery. The acquired data is stored and transferred onto a PC for proper further analysis. All information obtained represents an invaluable and indispensable resource for either pilot projects, like the one in Mendrisio or specially for EV manufacturers rendering important technical data as well as significant information for the public opinion. User friendliness has been fundamental in the product's design process.



Once full, the memory module can be easily removed and sent to the processing center, where all data is automatically transferred onto a data base. An efficient Data Analysis Program allows the generation of many statistics and advanced analysis. It is possible to make various analysis from battery to vehicle, including driving style, and from a single EV-type up to a complete fleet of vehicles.



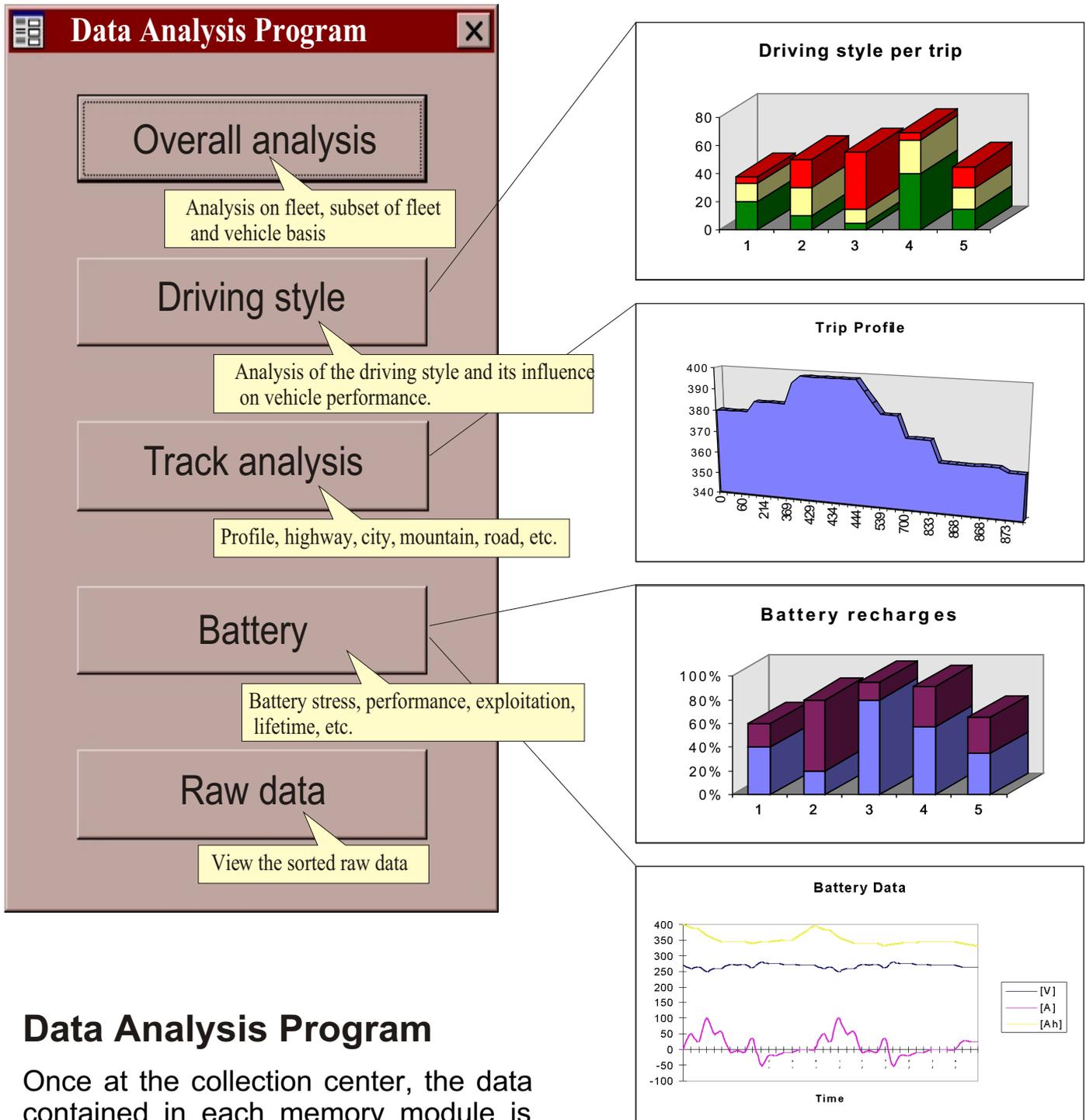
## The OBM on-board module

The on-board module is made up of a main control module (MCM), located inside the cockpit, and a satellite acquisition module (SAM), located close to the traction battery. The two modules are galvanically isolated. The SAM module allows reliable and accurate battery and environment data acquisition, sending it to the main control module. The latter reads the vehicle speed from the tachometer, filters and stores all data in the memory card. When almost full, a signal tells the driver to substitute the removable memory module and to mail it to the center for processing. An optional display can be mounted on the MCM to show important information to the driver, such as: battery endurance, instantaneous energy consumption, battery charge level, etc.

## Technical data

- Sampling frequency: 20 times per second
- Data storage frequency: once per second
- Memory card capacity: 0.5 or 2 Mbyte
- Operational temperature: -25°C to +70°C
- Serial interface RS-232 for diagnostics and PC installation
- Mechanical dimensions (mm.): main module: 168x112x30 satellite: 115x64x30  
memory card: 30x27x3
- Norms: Conforms to IEC 950, CISPR 25, VDE 0879-T3

Data	Range	Error	Resolution
Traction battery voltage	0-400 V	±0.2%	0.1V (12 bit)
Traction battery current	-400A to +400A	±0.2%	0.1A (13 bit)
Ambient temperature	-25°C to +70° C	±1%	1°C (8 bit)
Altitude variation	0-5000 m		10 m (9 bit)
Speed	0-255 Km/h	depends on tacho	1 Km/h (8 bit)
Battery capacity	0-2000 Ah	±0.2%	0.1 Ah (12bit)



## Data Analysis Program

Once at the collection center, the data contained in each memory module is downloaded onto a central MS-ACCESS® PC database. The memory card is then emptied and sent back to the EV driver.

Several predefined statistics and deep analysis can be performed using the Data Analysis Program. Since this software is based on an open system, further customized analysis can be easily projected and performed importing data and results in any Microsoft application, (MS-EXCEL®, MS-Word®, etc.). Further assistance can be easily obtained from Pitagora S.A.