CRASH DATA RETRIEVAL

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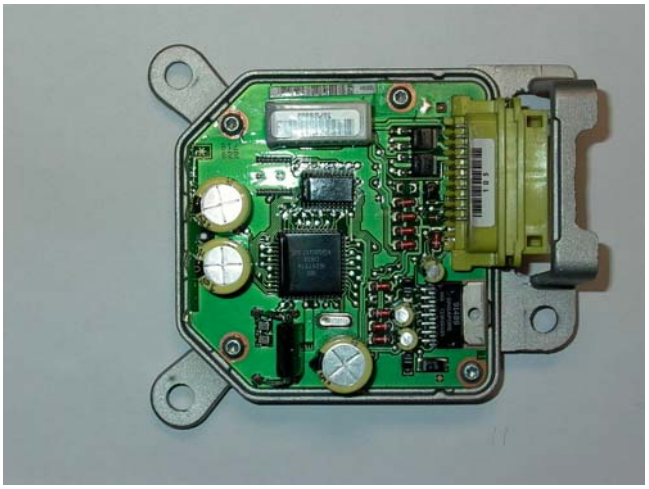
Sensing and Diagnostic Modules (SDMs) have been installed on some vehicles manufactured by General Motors since 1990. Restraint Control Modules (RCMs) have also been installed on other vehicles such as Ford since the mid 1990s. The module, which is the vehicle's front air bag "computer" has evolved and is now installed on almost every if not all GM vehicles. These are mini "black boxes", which were a previously exclusive technology to the aviation industry. The module is actually metallic in colour and is usually located under the carpet below the front seats or along the centre tunnel or console of the vehicles. The primary purpose for the installation of the module is to control air bag deployment. A secondary purpose is to utilize the crash and air bag deployment data as a research tool to improve vehicle crashworthiness and/or supplement (not replace) routine accident reconstruction analysis.

The module, which records crash data in some collisions (primarily containing a frontal component), can also assist qualified professionals in retrieving vital crash information via a crash data retrieval system, which consists of hardware and software to supplement the collision analysis. The data may be downloaded via the vehicle's OBD (on-board diagnostic) connector, without removing the SDM/RCM module. Alternatively, the data may be downloaded from the module directly.

Photograph 1: A view of a late model GM SDM.



There are two main categories of recorded incidents by the SDM/RCM. The "non-deployment" category is an event severe enough to "wake up" the sensing and recording algorithm but not severe enough to deploy the air bags. It may contain pre-crash and crash data. The "deployment" category can also contain pre-crash and crash data.

Photograph 2: A view of the components of a GM SDM.

Depending upon the year and model of vehicle, the module may contain all or some of the following information:

- Brake status and Throttle position up to 5 seconds before impact
- Vehicle forward speed and Engine speed up to 5 seconds before impact
- Air bag warning lamp, driver's seat belt buckle and right front passenger air bag suppression switch status
- Number of ignition cycles at the time of the incident and at the time of the investigation
- Other relevant times and longitudinal speed changes in relation to near deployment or deployment

Photograph 3: A view of a Vetronix Crash Data Retrieval Tool and a notebook computer connected to the OBD link connector of a vehicle.

The above-mentioned information may be used to assess safety restraint systems usage and function and collision severity. This data may also be compared with the reported sequence of events and other evidence in assessing if the collision occurred as reported. For example: to identify if the driver was braking or accelerating to the point of impact or the vehicle speed or if the driver was wearing his/her seat belt.

There are also Electronic Control Modules (ECMs) and other recording devices found on some commercial/heavy trucks. Unlike passenger vehicle's Electronic Data Recorders (EDRs), commercial vehicle modules are deigned to monitor engine parameters, including engine load and speed, fuel usage, oil and coolant conditions, etc. Some of these modules, depending upon the engine manufacturer (such as Detroit Diesel or Cummins) and vintage are capable of recording data such as vehicle speed, throttle, brake, clutch, cruise control, gear position for up to a minute or more before and 14 to 15

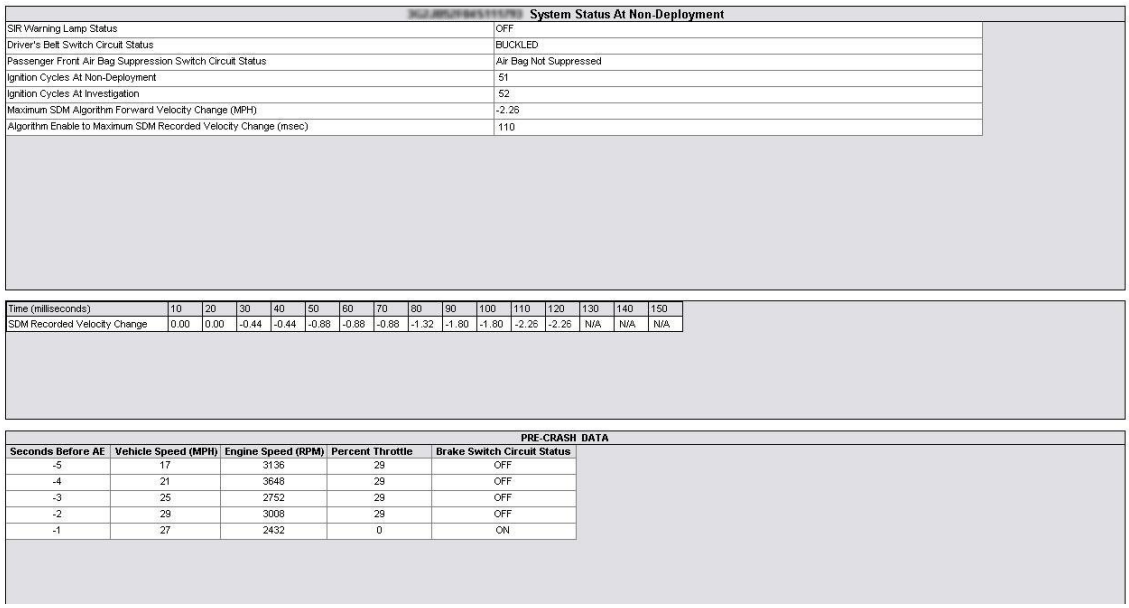
seconds after an event such as a last stop or two hard brake events. The date, time and odometer reading may also be recorded. One or more of these events may be attributed to a collision in question.

Note that some of the recorded data, including “non-deployment” events in passenger vehicles and “Last Stop” or “Hard Brake” events in commercial vehicles is volatile and may be overwritten.

The accuracy and reliability of EDRs have been and continue to be tested by organizations such as Transport Canada, NHTSA, IIHS as well as independent engineering firms and other entities across North America. There are also a number of published materials on the topic. The general observation is that the data downloaded from such modules can be quite reliable during most conditions; however they do have limitations and in few specific occasions, they can report inaccurate data. It is recommended that routine evidence be gathered, accident reconstruction analysis be conducted and this relatively new technology can be utilized to supplement the collision reconstruction.

Even though other manufacturers have modules similar to SDMs or RCMs in their vehicles, they currently do not allow access to the recorded information. It is anticipated that other manufacturers will follow in allowing access to these types of EDR modules in their vehicles soon. Vehicles are becoming and will continue to become more technologically advanced. The modules will evolve themselves to record more data (in terms of variables and range/frequency), possibly including crucial information in the “making or breaking” of a case. It becomes of utmost importance to seize that data or silver box after a collision, even if the air bags did not deploy, before it is altered or damaged.

The following images are excerpts from a CDR report downloaded from a low speed crash test:



System Status At Non-Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger Front Air Bag Suppression Switch Circuit Status	Air Bag Not Suppressed
Ignition Cycles At Non-Deployment	51
Ignition Cycles At Investigation	52
Maximum SDM Algorithm Forward Velocity Change (MPH)	-2.26
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	110

Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Recorded Velocity Change	0.00	0.00	-0.44	-0.44	-0.88	-0.88	-0.88	-1.32	-1.80	-1.80	-2.26	-2.26	N/A	N/A	N/A

PRE-CRASH DATA

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle	Brake Switch Circuit Status
-5	17	3136	29	OFF
-4	21	3648	29	OFF
-3	25	2752	29	OFF
-2	29	3008	29	OFF
-1	27	2432	0	ON

Image 1: A view of a sample CDR Data Summary Information Report.

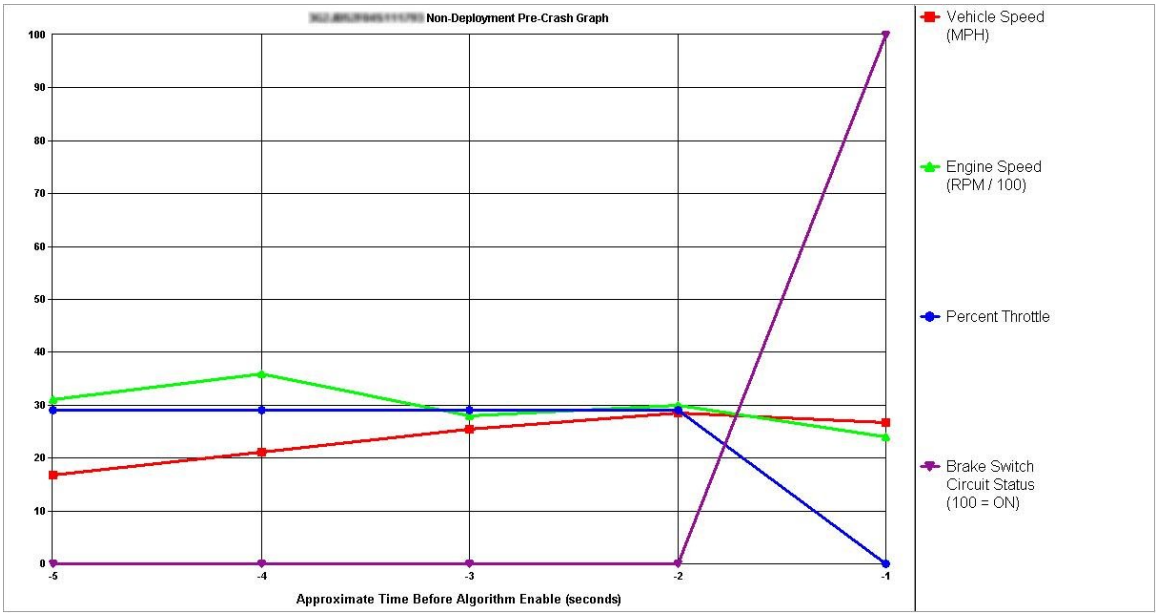


Image 2: A view of a sample CDR Pre-Crash Report.

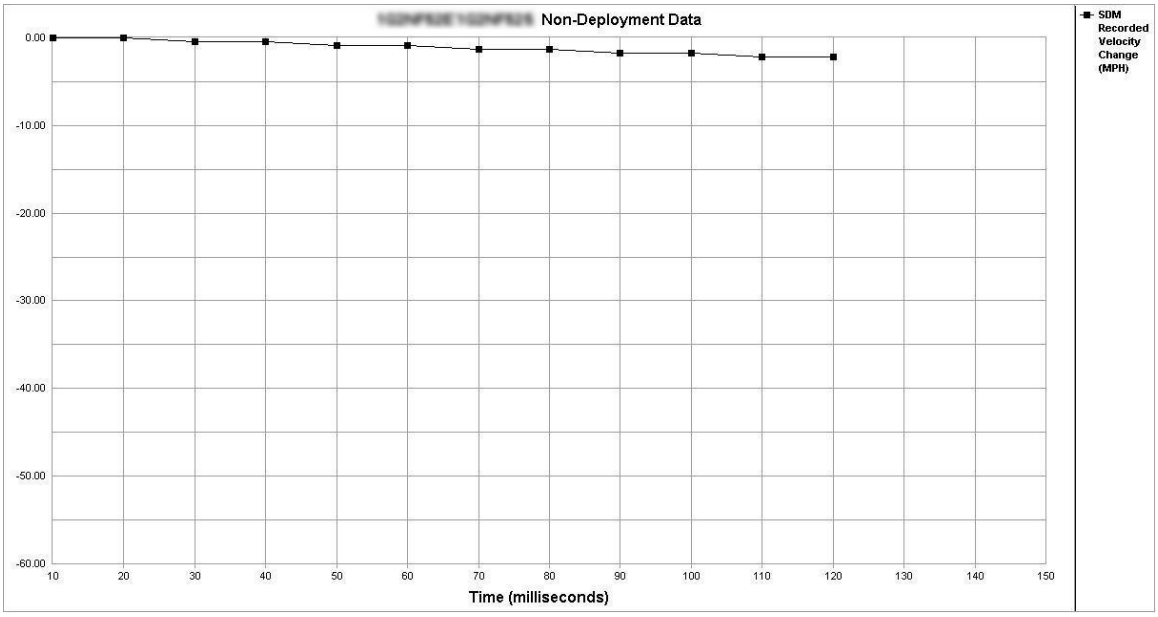


Image 3: A view of a sample CDR Crash Pulse (Speed Change vs. Time) Graph.