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Crash Data Retrieval: The Vetronix Perspective

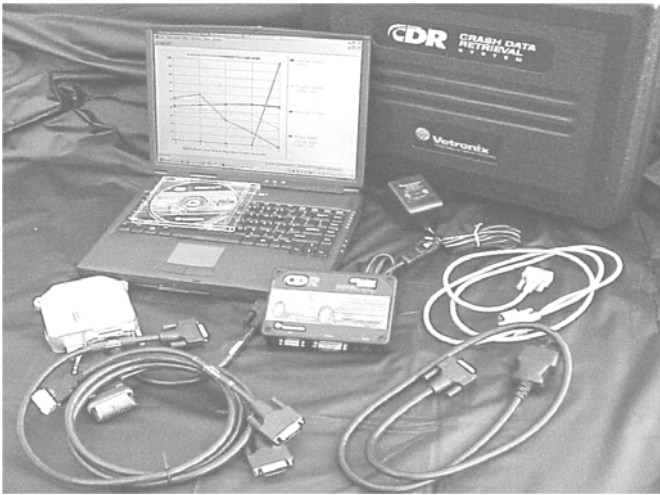
by C. Arthur MacCarley, Ph.D.

Contrary to much-hyped media assumptions, no specific Event Data Recorder (EDR) has ever been incorporated in a major-manufacturer vehicle sold in the US. However, since the mid-1990's, with the advent of air bags controlled by electronics rather than a simple series connection of inertia switches, it has been common practice to incorporate some degree of data retention related to the deployment of the inflatable restraints. The ostensible purpose was to collect diagnostic data solely accessible by the manufacturer. Legal protection in the face of the inevitable lawsuits that follow any new safety-related technology were most surely also a consideration in the development and inclusion of this capability in the supplemental restraint system (SRS) modules.

Since the year 2000, however, Ford and GM in the US have cooperated by providing limited information on the retained data to a single company under license: Vetronix Corporation, now a wholly-owned subsidiary of Robert Bosch GmbH. Some joint-venture vehicle lines, such as Isuzu (GM) or Volvo (Ford) are also accessible. Rumors circulate that Toyota will soon follow suit, but Toyota models are not accessible at this time. It is reasonable to assume that all manufacturers that utilize electronic air bag control modules (ACM) or Restraint Control Modules (RCM) retain some deployment-related data. But at present, the Vetronix "CDR" (Crash Data Retrieval) equipment is only compatible with modules installed in Ford, GM and related vehicles, and only on a limited number of models, not even a majority of their product lines.

Vetronix Essentials

Following an air bag deployment, the Vetronix CDR interface may be used to download crash-related data from a compatible module in one of two basic ways. If the vehicle electrical system is intact, the preferred approach is via the Standard OBD-II Diagnostic Link Connector (DLC) located under the dashboard—the same connector used for retrieving diagnostic trouble codes (DTCs) and optional "Freeze-Frame" data related to each DTC from the Powertrain Control Module (PCM). (OBD-II has been standardized under the auspices of the SAE and ASTM since 1996 for all passenger cars and light trucks sold in the US.)

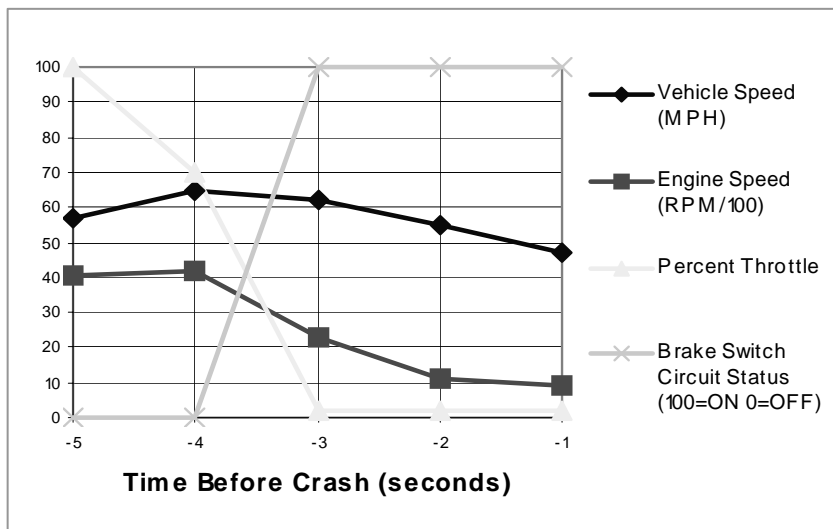


If, however, the vehicle electrical system or diagnostic connector has been compromised or the air bag control module has been removed from the vehicle, it is still possible to download data from the module. This requires one of the more than 15 different (all nonstandard) "umbilical" cables provided with the Vetronix equipment, and probably constituting the majority of its nearly \$3000 cost. Why so many? A total lack of standards, since the data was never intended for accident reconstruction purposes and was only to be downloaded by the vehicle manufacturer.

Vetronix CDR Data Sets

What data is available? At a minimum, all Vetronix-compatible modules retain some or all of the "crash" pulse, or the rapid deceleration associated with the impact that was responsible for the air bag or other

restraint system deployment. Acceleration in G's (gravity) along the longitudinal axis and the time-integrated velocity change referred to as "Delta V" is generally recorded at a rate of one sample every 0.8 to 2.0 milliseconds (ms) for a period ranging from 60 to 300 ms, depending on the vehicle model. Some vehicles also retain up to five seconds of "pre-crash" data, generally sampled at once per second. This data usually includes, but is not limited to, the vehicle's absolute speed, the status of the brake switch and the throttle position. Since 2003, much more detailed information has been retained, especially with the use of "smart" two-stage air bags in newer cars. The module generally stores the results of only one deployment incident, although some modules retain at least one additional non-deployment event—a situation in which conditions approached, but did not reach, those necessary for air bag deployment.



Graph of Pre-Crash Data

The downloaded results are then displayed in various graphical or list renderings via the proprietary Vetronix software. As new modules show up in new vehicles, software updates (and often new umbilical cables) are needed approximately every six months in order to stay current with all compatible vehicles—a limited but captive market for Vetronix.

Vetronix Timeline

The Vetronix CDR system accesses select GM models from 1994-2006 and select Ford models from 2001-2005.

1984	2000	2003	2004	2005	2006
Vetronix & GM begin Relationship.	CDR system released. GM-only coverage.	First Ford update 2.3. Bosch purchases Vetronix.	Second Ford release 2.7.	2.8 release.	2007 GM update. 2004-2006 update.

Vetronix CDR Realities

There is almost no commonality between Ford and GM, or even between different vehicle models from the same manufacturer, regarding the data collected, the sample rate, recording period, the communications protocols or the module connectors. This has led to a cottage industry of sorts for "experts" who own and know how to use the Vetronix equipment.

In addition to the subtle differences in each module's data and appropriate interpretation, the firmware embedded in many modules includes a number of outright bugs. Failure to be sensitive to the proper interpretation and limitations of the data in each module, as well as these bugs, can easily lead to an incorrect but convincing conclusion—a situation already chronicled in a number of court cases in which justice was not served. This underscores the need for a high level of familiarity with the technology, as well as good common sense when incorporating the revelations of the EDR with the traditional results of collision dynamics analysis and the physical evidence from the vehicle or crash site.

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Vetronix CDR Compatible 2006 Models for General Motors Automobiles

Access the list of Vetronix-compatible vehicles through <http://sbcommerce.vetronix.com/CDR/CDRVehicleList.pdf>. The sixteen-page list inventories the Ford and GM models by year/automaker/model. The 2006 list includes 60 GM models compatible with the Vetronix Version 2.8 Software Release. Check the website frequently for updates.

Buick:	Allure, Lacrosse, Lucerne, Rainier, Rendezvous, Terraza
Cadillac:	Commercial, CTS, DTS, Escalade, SRX, STS, XLR Roadster
Chevrolet:	Avalanche, Blazer, Cobalt, Colorado, Corvette, Equinox, Express, HHR, Impala, Malibu, Monte Carlo, Silverado, SSR, Suburban, Tahoe, Trailblazer, Uplander, AW9, Venture
GMC:	Canyon, Envoy, Savana, Sierra, Sonoma, Top Kick, Yukon
Hummer:	H2 and H3
Isuzu:	Ascender
Pontiac:	G6, Grand Am, Grand Prix, Montana, AW9, Pursuit, Solstice, Torrent
Saab:	9-7X
Saturn:	Ion, Relay, VUE

Other EDR/CDR Publications by Peter R. Thom & Associates Inc.

Access www.prtassoc.com for EDR and CDR-related articles or contact Peter R. Thom & Associates Inc. for reprints.

Black Box I traced EDR origins to the development of the automotive air bag. Along with the development of the air bag triggering mechanisms, automobile manufacturers amplified the data-gathering resources connected to the air bags in order to gather real-world data for optimizing air bag system performance. OBD tracks emission-related components and systems for malfunctions that could trigger increased emissions. Both gather data, but OBD records specific component problems while EDR documents a finite data stream collected only in air bag deployment or near-deployment events.

Black Box II took a closer look at EDR technology and the types of data collected. Many new cars contain EDR modules, but not all car manufacturers have made their systems compatible with commercially available crash data retrieval products. EDR cycles through 5-8 second data streams, updating and deleting data at the end of a cycle. Upon air bag deployment (or near-deployment) the data stream can store about 5 seconds of pre-crash and crash data: vehicle speed, engine speed, brake status, throttle position, seat belt status, passenger air bag status, time from impact to air bag deployment, ignition cycles, the delta "V's" and time between deployment and non-deployment events.

EDR Revisited explored the implications of the broader use of automotive EDR by regulatory agencies, law enforcement, insurance companies and attorneys. Although developed as a data-gathering resource for improving automotive air bag performance, EDR is developing a role that transcends the automaker's vision and challenges the ad hoc formatting, reporting and retrieval standards employed to date for the technology. With more actors using EDR data, NHTSA published an EDR rule in 2006 outlining disclosure and formatting standards for automakers who install EDR modules.

Peter R. Thom & Associates Inc. offers crash data retrieval services.

Visit www.prtassoc.com for information about the company, associate roster and areas of expertise.