



CRASH DATA RETRIEVAL FROM AIR BAG MODULES

Dr. Mark Strauss, Ph.D. has recently completed training in the Vextronix Crash Data Retrieval system and is a certified system operator.

Dr. Strauss' areas of consulting include injury causation, biomechanics, and accident reconstruction as well as instrumentation and measurement. His research interests include biomechanics, human factors and truck braking systems.

He received his Ph.D. in biomedical engineering from the University of Texas at Arlington and the Health Sciences Center at Dallas. He also holds an undergraduate degree in mechanical engineering and a master's degree in biomedical engineering. Dr. Strauss serves as an adjunct associate professor in the Department of General Engineering at the University of Illinois at Urbana-Champaign.

In addition, Dr. Strauss is the Chairperson of the ANSI/HFES 300 standards committee, reviews research paper submissions for the Human Factors and Ergonomics Society Journal, and is a member of the Transactions Selections Committee for the Society of Automotive Engineers.

He is also a Diplomat of the American College of Forensic Examiners, holds a commercial driver's license, performs research, publishes and presents his results to national and international forums.



The air bag system in automobiles has been monitoring the dynamics of the vehicle since the 1970's. The system was originally used simply to determine if and when the air bag should deploy in a crash scenario. However, little data was stored.

The Event Data Recorder (EDR) installed in vehicles during the past few years is capable of recording more data than the earlier versions and, for some vehicles, that data can now be downloaded. This downloaded data may provide key information that the reconstructionist can use in combination with scene evidence, vehicle damage, and witness statements to determine the cause of a collision.

Available Data

The following data may be recorded by an EDR, depending upon the vehicle model, year and circumstances surrounding its deployment:

- Delta V (change in velocity due to a collision)
- Time from vehicle impact to time of maximum Delta V
- Maximum Delta V
- Driver's seat belt (latched or unlatched)
- Passenger's air bag (enabled/disabled)

In addition, some EDRs in GM vehicles can record pre-crash information such as vehicle speed, engine rpm, brake application, and throttle position for up to 5 seconds before impact.

GM has been the leader in this area in terms of data availability. For their 1990 model year, GM began using modules that incorporated event data recorders (EDRs) for air bag deployment. However, access to the data was not made available to the public until the 1994 model year. Ford started using their version of the module on a limited basis in their 1997 model year vehicles. Ford made data publicly available starting with their 2001 model year, and then, only on a limited basis.

While all passenger vehicles with air bag systems have air bag control modules, only GM and Ford currently allow public access to the recorded data. It is expected that some additional car companies will allow public access to the data in the near future.

Accessing the Data

The data stored in an EDR can be accessed by either connecting directly to the event data recorder or by connecting to the data link connector (DLC) located underneath the dashboard.

Specialized instrumentation is required to download the data from the event data recorder. Ruhl Forensic, Inc. owns the Vextronix Crash Data Retrieval (CDR) system, the only system licensed by Ford and General Motors to download their data. Research has been conducted by GM, Vextronix, and independent researchers regarding the accuracy of this collision data. It has appeared in peer reviewed publications and has been used in the courts.

Ruhl staff are trained in the procedure for downloading the data and for accurately interpreting it.

Data Recording Events

There are 3 types of events that may trigger data to be stored in an EDR in a GM vehicle:

- deployment,
- non-deployment (near deployment),
- deployment level event.

Deployment Event

When the air bag sensor experiences a deployment level crash pulse, the air bag will be triggered. Once an air bag in an EDR-equipped vehicle is deployed, recorded collision information from that event cannot be erased.

Non-Deployment Event

In a non-deployment event, the sensor may not register a pulse high enough to deploy the air bag, but the pulse may be high enough to record data. In other words, there may be data recorded even if the air bag does not deploy. For example, a vehicle that runs into the rear of the vehicle in front of it may not have an air bag deployment, but data may still be recorded. Data from a non-deployment event may remain in the EDR for as many as 250 ignition cycles.

Deployment Level Event

Additional data may still be recorded after the air bag has been deployed if a deployment-level post-deployment crash pulse is experienced. For example, a collision occurs and the air bag deploys. Less than five seconds later, the vehicle is impacted by



Ruhl Forensic, Inc.'s staff provide expertise in: mechanical and electrical engineering, collision investigation and vehicle dynamics, biomechanics and human factors, heavy vehicle driving and mechanical systems, federal regulations and compliance, fleet safety, traffic engineering, construction zone safety, OSHA, graphic visualization, and other areas.

Our experts provide a continuum of service from initial on-site investigations through research, testing and reconstruction to courtroom testimony and presentation graphics and visualization.

We offer quick response to your investigation needs 24 hours a day. Contact us by calling 1-800-355-7800, 1-800-235-2808, or 1-800-278-4095.

Please feel free to call us with any questions that you may have and we will direct you to the appropriate individual within our firm.

another vehicle. Data from the second impact is locked in memory even though the air bag had already been deployed in the first crash.

Ford's EDR only has the ability to record data from deployment and non-deployment events.

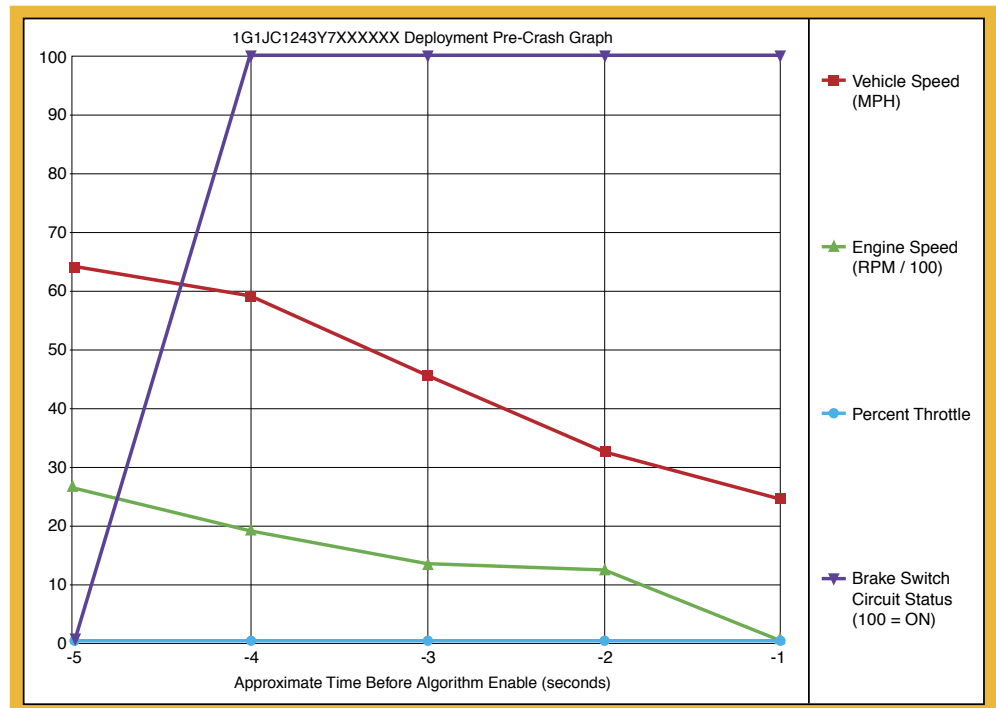
Example of Downloaded Data

A Chevy Cavalier was involved in a collision in which the driver's front air bag had deployed. Ruhl Forensic staff downloaded data from the EDR located underneath the front passenger seat. The figure shown was provided from the Crash Data Retrieval system following the download.

there had been a less severe impact to the vehicle 0.3 seconds before the impact that triggered the air bag. The reported velocity change (Delta V) sustained by the Cavalier 0.15 seconds after impact was 17.74 miles an hour.

Conclusion

Information from EDRs, if available and properly interpreted, provides important additional information to a reconstruction analysis. Our staff can assist you by alerting you to potential data, downloading the data, and analyzing and interpreting the data obtained. An understanding of this data may prove to be a fundamental component of your case.



Pre-crash graph downloaded directly from the Event Data Recorder of the Chevy Cavalier.

The pre-crash data recorded by the EDR showed that the vehicle had slowed from 64 miles an hour five seconds before impact to 32 miles an hour two seconds before impact. The driver's foot was on the brake during part of this time.

For more information on this topic, please contact us at the Champaign, IL office at (800) 355-7800, the Scottsdale, AZ office at (800) 235-2808, or by email at ruhl@ruhl.com.

Please visit us at www.ruhl.com.

Additional information available from the EDR download data showed that the driver's seat belt was unbuckled, and that