

Event Data Recorders

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NTSB Directive

NHTSA (H-97-18)

“Develop and implement, in conjunction with the domestic and international manufacturers, a plan to *gather* better *information on crash pulses* and other crash parameters in *actual crashes*, utilizing *current or augmented sensing and recording devices.*”

Safety Benefits of Event Data Recorders (EDRs)

- Provides objective and specific information that can lead to improvements in vehicle and safety system designs

Provide Crash Data for Research

- **18,000** tow-away crashes per day
- Current total production of crash tests conducted for US vehicles is estimated around 5,000/year
- Equivalent to about **\$600 million** worth of crash tests per day
 - (18,000 crashes at \$35,000 / test)



These ARE "Black Boxes"



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These are NOT "Black Boxes"



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What is an EDR?

- It's a function
- It may or may not be a stand alone device
- Typically housed in another vehicle control module (e.g. Air Bag, Powertrain, ...)

The EDR vs. the Flight Data Recorder (FDR)

■ EDR

- Intended to be used to understand vehicle system operations
- Records limited crash data
- Little to no cost to the host module
- No audio record

■ FDR

- Intended to be used to reconstruct the cause of a crash
- Records extensive crash and in-flight data
- Designed to survive a crash
- High cost
- Often records audio

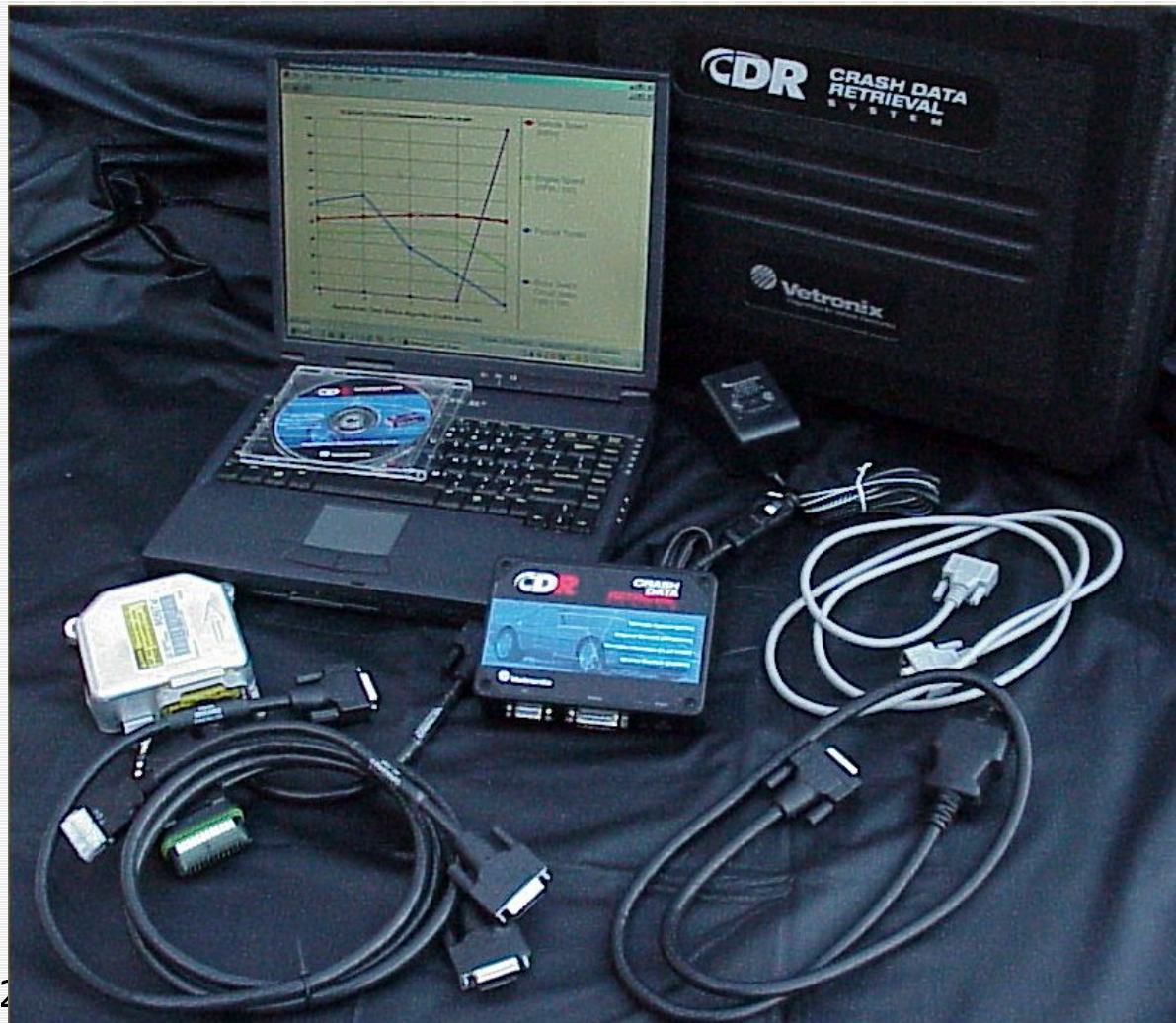
EDR Rollout

- Basic EDRs were first used in production vehicles starting in the 1970s (air bag systems)
- More sophisticated EDRs were introduced in the 1990s with limited data collection capabilities.
- Today's EDR collect more vehicle data (pre and post crash) for longer periods of time

Location of the module (EDR)

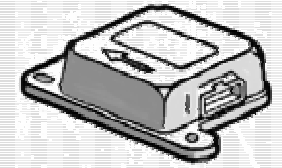
- Varies by manufacturer, year, make and model
 - Can be under the driver or front passenger seats, or
 - Under the center console or under/behind the dash

Vetronix Crash Data Retrieval (CDR) System



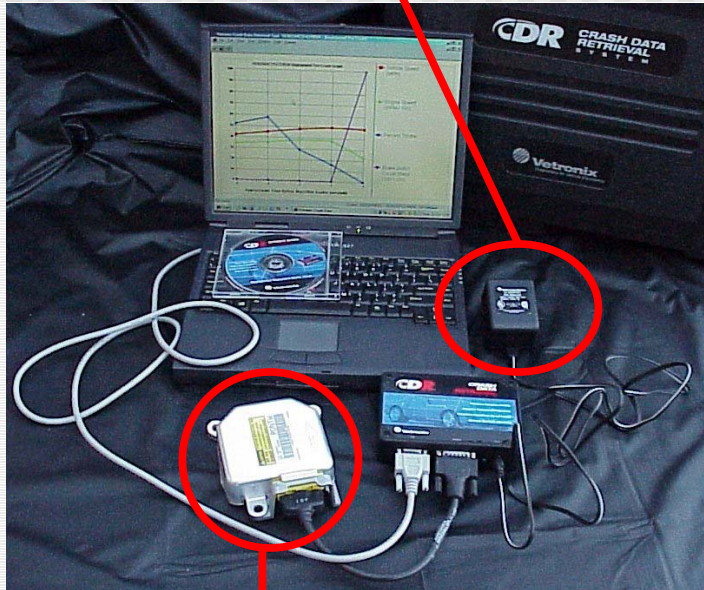
Crash Data Retrieval Methods

- Three possible methods
 - Through the Diagnostic Link connector (DLC)
 - In-car direct to the module
 - "Desktop," module removed from car



CDR Interface Overview

Source of 12v



Direct connect
to module
\$11/2004
in/out of car

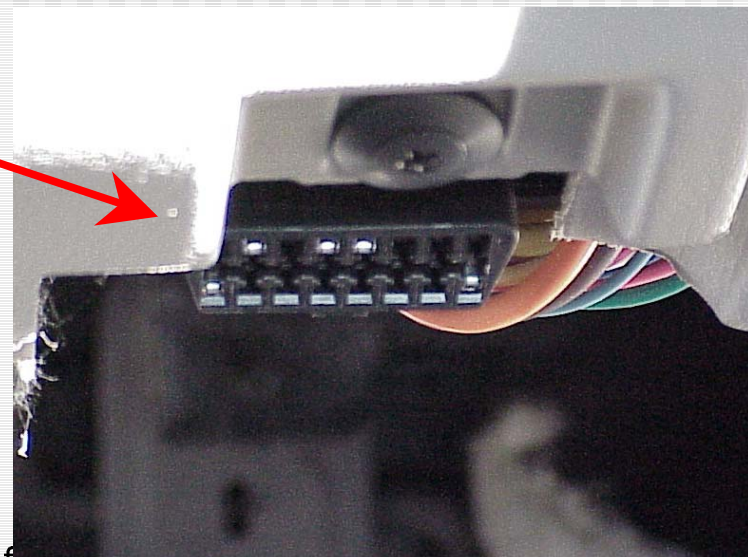
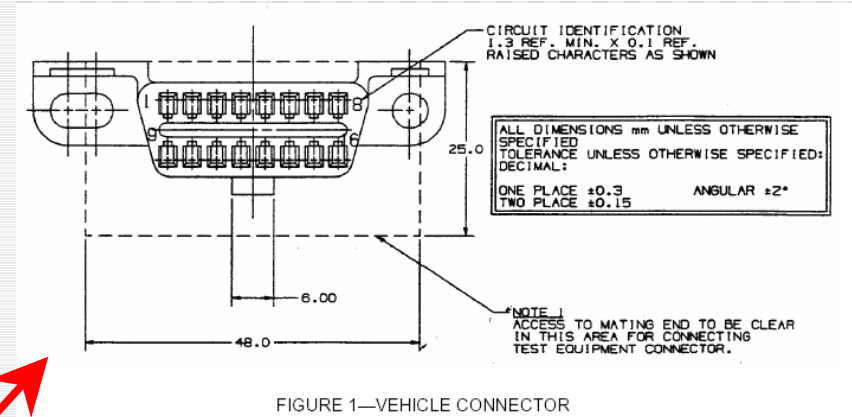
DLC connect
in car

CDR tool
interface
unit



Crash Data Retrieval - DLC

- In-car at the Diagnostic Link Connector (DLC)
- Connection is via the DLC (SAE) J1962 connector
- Typically located under the dashboard



Typical DLC location



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DLC to CDR connection



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CDR in-car download



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Direct connect to module (EDR)



What may get recorded?

- Possible data
 - Vehicle speed
 - Percent throttle
 - Engine RPM
 - Brake switch status
 - Seat belt buckle status
 - Seat position
 - Order of events (continued)

What may get recorded?

- Possible data (continued)
 - System status parameters
 - Time to deployment
 - Air bag stage deployed
 - System diagnostic data
 - Suppression status
 - Vehicle Crash Severity
 - Delta V or Acceleration

- Possible EDR data recording time frame
 - Up to 7 seconds before an event and up to 300 milliseconds after an event

SAE VEDI Committee

- J-1698 Vehicle Event Data Interface (VEDI) was approved as a suggested practice containing Vehicle Output Data Definitions (VODD)
 - Light-duty vehicles
 - Data elements currently in use or coming out in the near future.
- The committee decided to address the communications protocol issue by developing an SAE informational report
 - Catalogs the various systems used by different manufacturers
 - Leaves it to the downloading tool makers to design for the systems

SAE VEDI – Future Direction

- The committee is now considering future EDR activity
- Defining data elements and parameters for
 - Side impact
 - Rear impact
 - Rollover events
 - Multiple events

Potential Uses of EDR Data

| <i>Category</i> | <i>Examples</i> |
|---|---|
| <i>Safety agencies:</i> Improve vehicle design & highway infrastructure | <ul style="list-style-type: none">- evaluate airbag sensing & system deployment criteria- evaluate roadside safety feature design standards and implementation |
| <i>Government:</i> Provide a basis for regulatory & consumer information initiatives | <ul style="list-style-type: none">- justify offset frontal impact severity- examine "real world" average/extreme vehicle crash pulses |
| <i>Crash Reconstructionists:</i> Provide objective data for analytical evaluation and technique validation | <ul style="list-style-type: none">- compare data with computer programs and other methods of analysis- better understand crash pulse relative to injury |
| <i>Multidisciplinary:</i> Develop an objective driver behavior database | <ul style="list-style-type: none">- pre-crash driver braking (steering)- belt use- vehicle speed |

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Using EDR Data

- Accuracy, Reliability, & Repeatability
 - Barrier Testing
 - Data shows correlation between known values and instrumentation equipment with the vehicle EDR
- Acceptance in the Scientific Community
 - NHTSA Sponsored Tests (NCAP)
 - Generated articles supporting data integrity
- Must always account for and correlate data with physical information