Protecting EDR Information

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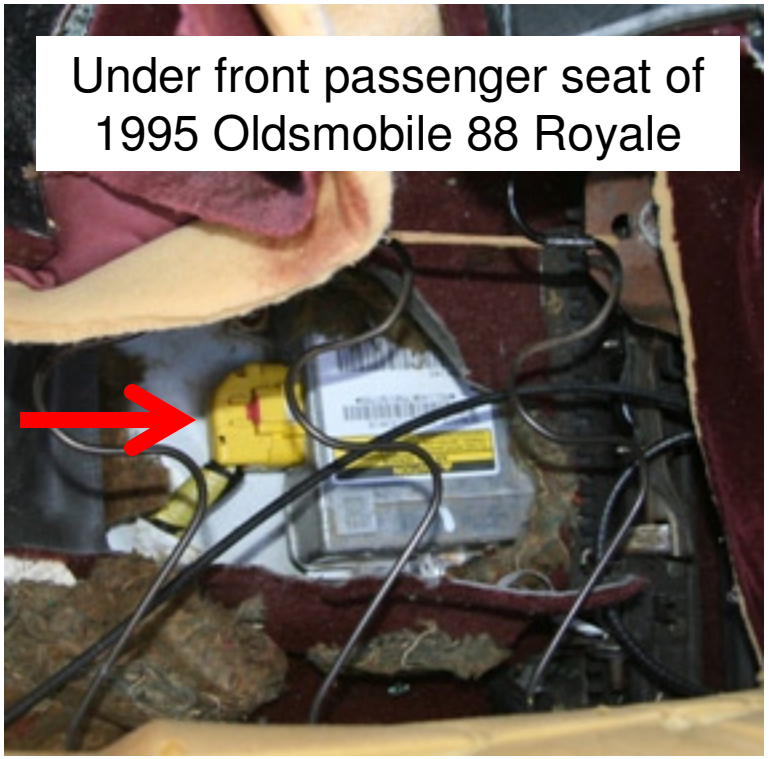
Wednesday, October 9, 2013

ABA Tort Trial & Insurance Practice Section
TIPS Fall Leadership Meeting
Minneapolis, MN

Passenger/Light Vehicle EDR

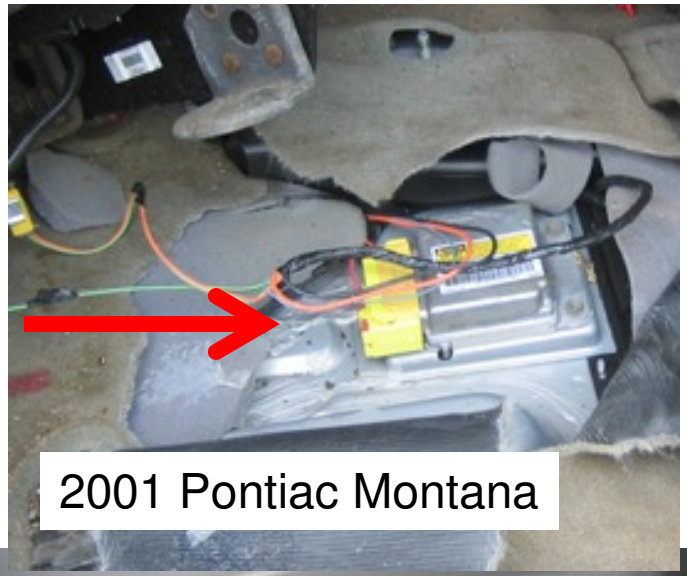
- Most passenger vehicle Event Data Recorders (EDR) are associated with the restraint/airbag system
  - Airbag Control Module (**ACM**)
- Approximate availability:
  - General Motors (1994+)
  - Ford (2001+)
  - Chrysler (2005+)
  - Toyota (2003+)
  - many other manufacturers: Part 563 compliance (2012+)



Under front passenger seat of 1995 Oldsmobile 88 Royale

Passenger/Light Vehicle EDR

- Early ACM modules recorded limited data
  - Delta-V (how much vehicle slowed in first 80 to 300 milliseconds of crash)
  - Seatbelt usage
  - Airbag deployment timing
- ACM typically mounted under front seats (GM) or under instrument panel (Ford)


2001 Pontiac Montana


2005 Ford Crown Vic

Passenger/Light Vehicle EDR

- Select 2003-2011 Ford Powertrain Control Modules (PCM) can record data
  - Pre-crash road speed (12.5 to 25 seconds)
  - Engine speed/RPM
  - Throttle position
  - Brake switch
  - Restraint Deployment Signal
- Typically mounted under hood on fender or firewall

2005 Ford Crown Victoria

2006 Ford F-150

Passenger/Light Vehicle EDR

- Newer ACM modules can record much more data
  - Pre-crash road speed (2.5 to 5 seconds)
  - Brake switch & throttle position
  - Delta-V
    - longitudinal and lateral
  - Steering & ABS
- Typically mounted under instrument panel or center console

2011 Toyota 4Runner


2004 Toyota Corolla

Spoliation with Passenger/Light Vehicle EDR

- Deployment of airbag/restraint system generally creates a “locked” or “frozen” file
  - Not subject to subsequent erasing
  - Loss of power during data saving can prevent record or give incomplete record
  - Newer modules indicate if data recording complete

Toyota Terminology: The "ON" setting for the "Freeze Signal" indicates a state in which the non-volatile memory can not be overwritten or deleted by the airbag ECU. After "Freeze Signal" has been turned ON, subsequent events will not be recorded.

System Status At Deployment

Ignition Cycles At Deployment	13616
Ignition Cycles At Investigation	13617
Maximum SDM Recorded Velocity Change (MPH)	-22.31
Event Recording Complete	Yes
Multiple Events	No
Multiple Events Not Recorded	No

Spoliation with Passenger/Light Vehicle EDR

- Non-deployment events can create records that <u>are not locked</u> and can be <u>overwritten</u>
  - About 250 power on/off cycles
  - Another later non-deployment event
  - Improper handling of module during a “bench” download

GM Terminology:
There are two types of recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s).

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	1687
Ignition Cycles At Investigation	1872
Maximum SDM Algorithm Forward Velocity Change (MPH)	-2.36
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	112.5

Download was 185 ignition cycles after event

Spoliation with Passenger/Light Vehicle EDR

- Ford PCMs (powertrain control modules) in select 2003 to 2011 model year vehicles
  - Deployment of airbag/restraint system usually creates a locked record – not subject to subsequent erasing without significant effort
  - Absence of RDS (restraint deployment signal) allows PCM record to be overwritten with battery power and key on

Buffer Address (Hex)	Relative Time (calc.) (Seconds)	Restraint Deployment Signal (Received / Not Received)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal % Full (%)	Engine Throttle % Full (%)	Brake Switch (On / Off)
EA000220	-1.0	Not Received	20 [32.2]	0	8	OFF
EA000230	-0.8	Not Received	14.9 [24]	.5	7.5	ON
EA000240	-0.6	Not Received	11.5 [18.5]	38.5	18	OFF
EA000250	-0.4	Not Received	11.8 [19]	100	93	OFF
EA000260	-0.2	Not Received	12.6 [20.3]	100	100	OFF
EA000270	0.0	Not Received	13.4 [21.6]	100	100	OFF
EA000280	0.2	Received	13.2 [21.2]	6.5	19	OFF
EA000290	0.4	Received	13.4 [21.6]	0	14	ON
EA0002A0	0.6	Received	12.3 [19.8]	0	12	ON
EA0002B0	0.8	Received	9.1 [14.6]	0	10.5	ON
EA0002C0	1.0	Received	9.5 [15.3]	0	9.5	ON

Spoliation with Passenger/Light Vehicle EDR

- Manufacturers add coverage for heritage or older vehicles with new CDR software releases

Version 4.3 (12/12/11) - Added

General Motors
2003 - 2010 Pontiac Vibe

Version 6.0 (8/3/12) - Added
Toyota
o 2006 RAV4 - P/N: 89170-42252
o 2009 Yaris - P/N: 89170-52D70

Version 11.1 (8/20/13) - Added

General Motors
1996-1998 Pontiac Sunrunner

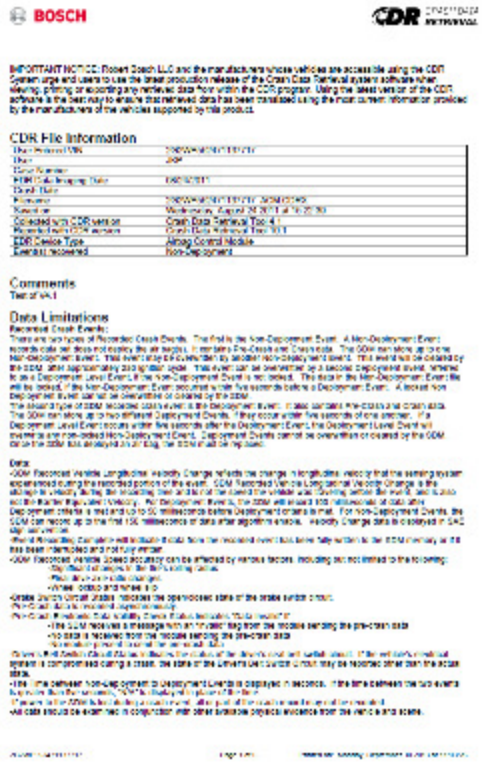
Suzuki
1995-2001 Swift
1996-1998 Sidekick
1999-2004 Vitara

Preserving Information with Passenger/Light Vehicle EDR

- EDR information generally obtained by using the Bosch Crash Data Retrieval system
  - Download procedures well documented
  - Training classes offered regularly for both downloading/imaging and data interpretation

Preserving Information with Passenger/Light Vehicle EDR

- Preserving information with Bosch CDR
  - keep the original machine-readable CDR or CDRx file in addition to the human-readable PDF files
  - older CDR or CDRx files can be re-interpreted with newer versions of the CDR software without requiring an additional download
    - one exception is with Chrysler vehicles using CDR version 3.0 which require a new download to access all available information

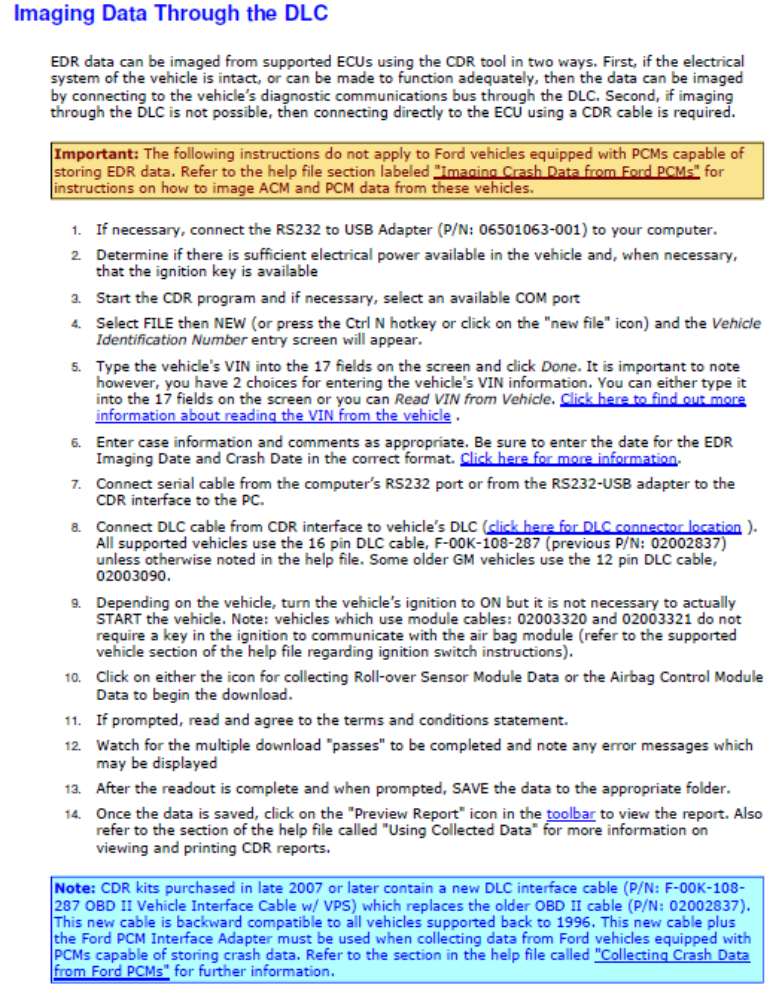


Preserving Information with Passenger/Light Vehicle EDR

- Exceptions to Bosch CDR system
  - 2006 to 2012 Nissan vehicles may have EDR data with access via Nissan proprietary download system
  - several 2002+ Ford models not covered by the Bosch CDR system have data that can be obtained by Ford and/or their ACM suppliers
  - 2012+ Hyundai and Kia have publicly available download systems
  - unknown status for data from Subaru and Mitsubishi vehicles.

Protection Against Claims By Opposing Lawyers with Passenger/Light Vehicle EDR

- Follow a documented, written download procedure
  - Bosch CDR software has help files with recommended download procedures
- Keep both the original downloaded *.CDR (or *.CDRx file) as well as any CDR software-produced PDF report files



Imaging Data Through the DLC

EDR data can be imaged from supported ECUs using the CDR tool in two ways. First, if the electrical system of the vehicle is intact, or can be made to function adequately, then the data can be imaged by connecting to the vehicle's diagnostic communications bus through the DLC. Second, if imaging through the DLC is not possible, then connecting directly to the ECU using a CDR cable is required.

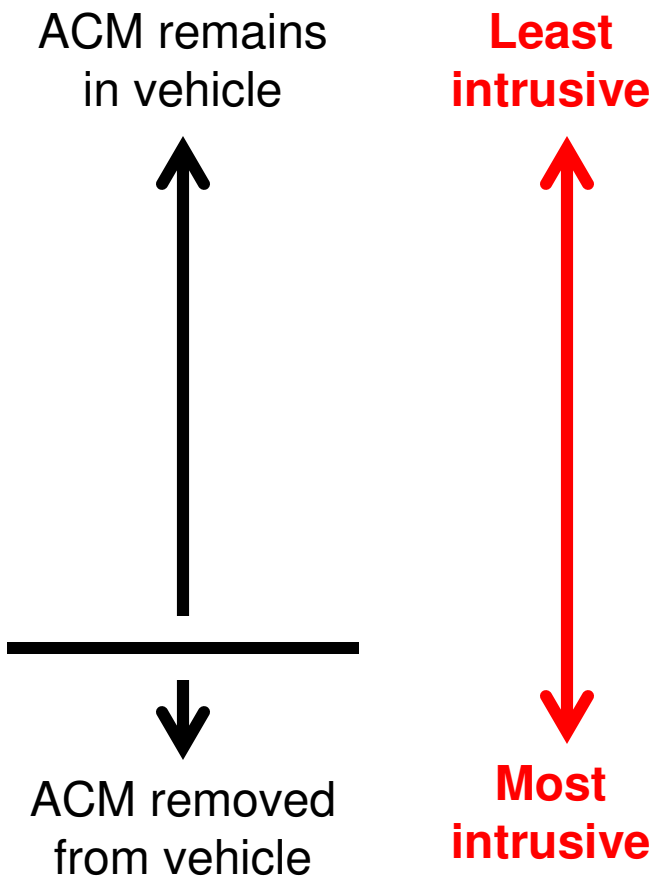
Important: The following instructions do not apply to Ford vehicles equipped with PCMs capable of storing EDR data. Refer to the help file section labeled "Imaging Crash Data from Ford PCMs" for instructions on how to image ACM and PCM data from these vehicles.

1. If necessary, connect the RS232 to USB Adapter (P/N: 06501063-001) to your computer.
2. Determine if there is sufficient electrical power available in the vehicle and, when necessary, that the ignition key is available
3. Start the CDR program and if necessary, select an available COM port
4. Select FILE then NEW (or press the Ctrl N hotkey or click on the "new file" icon) and the *Vehicle Identification Number* entry screen will appear.
5. Type the vehicle's VIN into the 17 fields on the screen and click *Done*. It is important to note however, you have 2 choices for entering the vehicle's VIN information. You can either type it into the 17 fields on the screen or you can *Read VIN from Vehicle*. Click here to find out more information about reading the VIN from the vehicle .
6. Enter case information and comments as appropriate. Be sure to enter the date for the EDR Imaging Date and Crash Date in the correct format. Click here for more information.
7. Connect serial cable from the computer's RS232 port or from the RS232-USB adapter to the CDR interface to the PC.
8. Connect DLC cable from CDR interface to vehicle's DLC (click here for DLC connector location). All supported vehicles use the 16 pin DLC cable, F-00K-108-287 (previous P/N: 02002837) unless otherwise noted in the help file. Some older GM vehicles use the 12 pin DLC cable, 02003090.
9. Depending on the vehicle, turn the vehicle's ignition to ON but it is not necessary to actually START the vehicle. Note: vehicles which use module cables: 02003320 and 02003321 do not require a key in the ignition to communicate with the air bag module (refer to the supported vehicle section of the help file regarding ignition switch instructions).
10. Click on either the icon for collecting Roll-over Sensor Module Data or the Airbag Control Module Data to begin the download.
11. If prompted, read and agree to the terms and conditions statement.
12. Watch for the multiple download "passes" to be completed and note any error messages which may be displayed
13. After the readout is complete and when prompted, SAVE the data to the appropriate folder.
14. Once the data is saved, click on the "Preview Report" icon in the toolbar to view the report. Also refer to the section of the help file called "Using Collected Data" for more information on viewing and printing CDR reports.

Note: CDR kits purchased in late 2007 or later contain a new DLC interface cable (P/N: F-00K-108-287 OBD II Vehicle Interface Cable w/ VPS) which replaces the older OBD II cable (P/N: 02002837). This new cable is backward compatible to all vehicles supported back to 1996. This new cable plus the Ford PCM Interface Adapter must be used when collecting data from Ford vehicles equipped with PCMs capable of storing crash data. Refer to the section in the help file called "Collecting Crash Data from Ford PCMs" for further information.

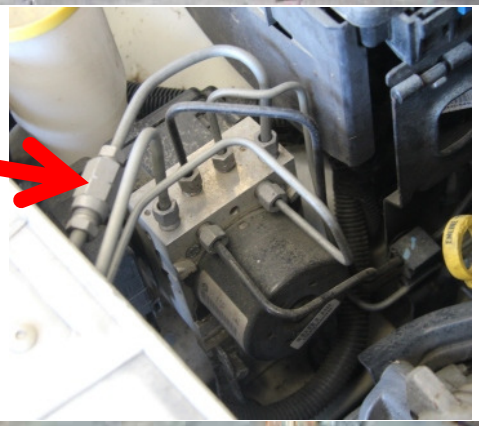
Protection Against Claims By Opposing Lawyers with Passenger/Light Vehicle EDR

- Use of a hierarchy of download procedures is recommended:
  1. direct through the diagnostic link connector (DLC),
  2. “back power” the ACM through the fuse box and download through the DLC
  3. use a cable piercing technique to both power and download module without removing ACM connector
  4. perform a direct-to-module download without removing the ACM from the vehicle, and
  5. remove ACM from the vehicle and perform direct-to-module bench download.



Protection Against Claims By Opposing Lawyers with Passenger/Light Vehicle EDR

- Important pieces of vehicle-specific information should be determined:
  - drive tire size
  - antilock brake system (ABS) presence
  - final/differential drive ratio (if available)
- Each of these can affect the accuracy of data obtained from an EDR

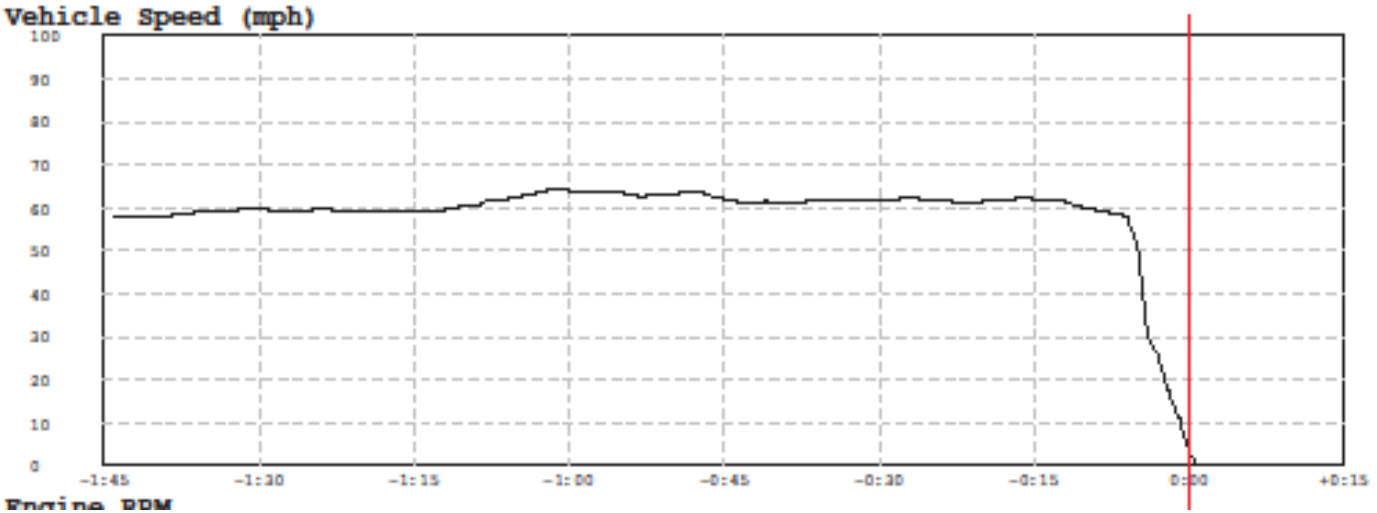


Spoliation Issues with Commercial/Heavy Vehicle EDR

- Most commercial/heavy vehicle event data recorder (HVEDR) information is associated with diesel engine electronic control modules (ECMs).
- Accident related HVEDR data is generally associated with one of three types of events:
  - "hard" braking
  - last stop
  - fault codes

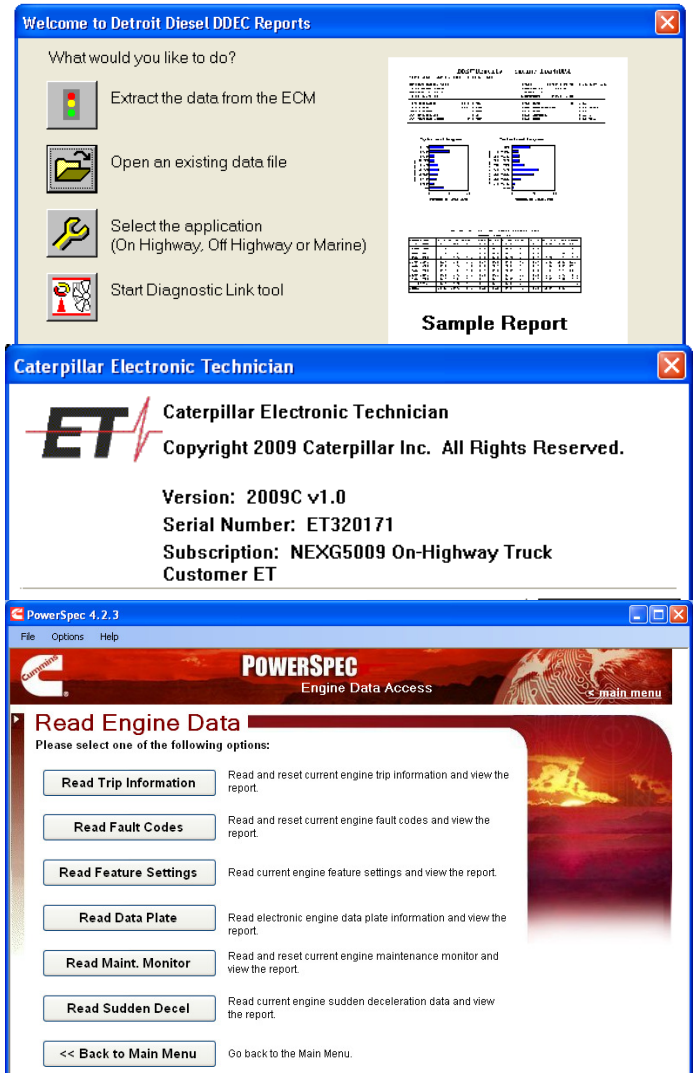
Spoliation Issues with Commercial/Heavy Vehicle EDR

- "Hard" braking or "sudden" deceleration,
  - generally set with vehicle slowing on the order of 7 to 10 mph/sec
    - can be created without an accident,
  - may not be written to "permanent" memory with a power loss or without a key-off event,
  - can be overwritten by a newer hard brake event



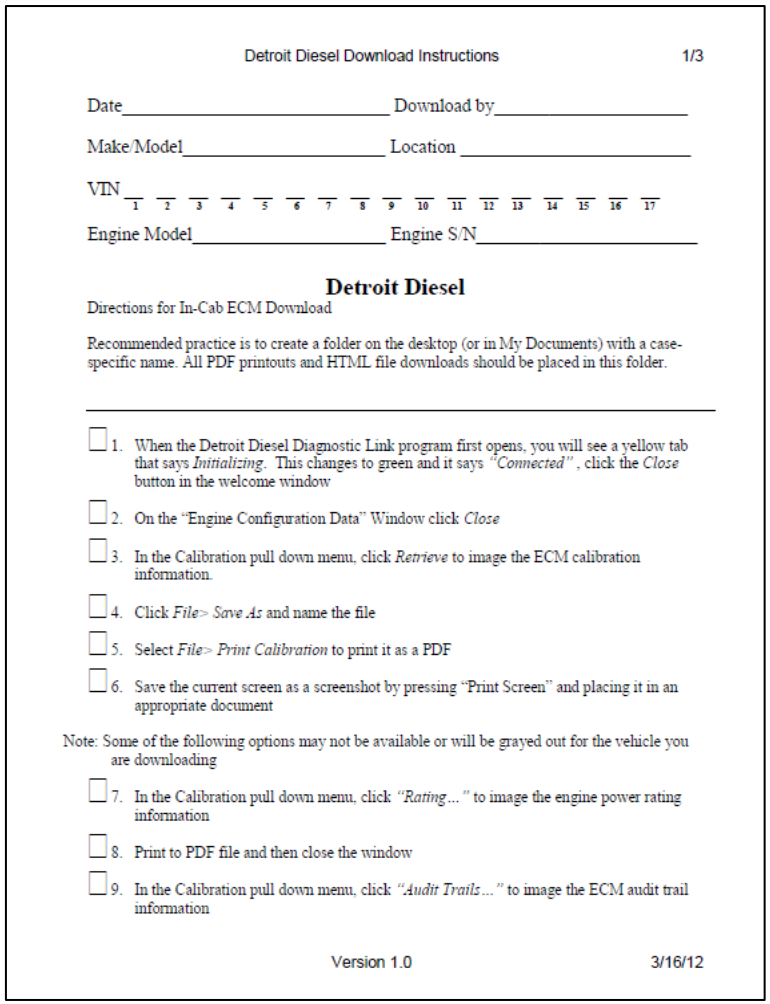
Preserving Information with Commercial/Heavy Vehicle EDR

- Manufacturer-specific software required to access ECMs
- Some data saved in proprietary file formats
  - not generally subject to data manipulation
- Other data available only in HTML, XML, or PDF formats



Preserving Information with Commercial/Heavy Vehicle EDR

- Best practice is to agree on protocols for sharing downloaded information in advance.
- Provide other side(s) with downloaded information as soon as it is generated
  - no opportunity for data manipulation with multiple original versions.



Detroit Diesel Download Instructions 1/3

Date_____ Download by_____

Make/Model_____ Location _____

VIN __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Engine Model_____ Engine S/N_____

Detroit Diesel

Directions for In-Cab ECM Download

Recommended practice is to create a folder on the desktop (or in My Documents) with a case-specific name. All PDF printouts and HTML file downloads should be placed in this folder.

☐ 1. When the Detroit Diesel Diagnostic Link program first opens, you will see a yellow tab that says *Initializing*. This changes to green and it says *"Connected"*, click the *Close* button in the welcome window

☐ 2. On the "Engine Configuration Data" Window click *Close*

☐ 3. In the Calibration pull down menu, click *Retrieve* to image the ECM calibration information.

☐ 4. Click *File> Save As* and name the file

☐ 5. Select *File> Print Calibration* to print it as a PDF

☐ 6. Save the current screen as a screenshot by pressing "Print Screen" and placing it in an appropriate document

Note: Some of the following options may not be available or will be grayed out for the vehicle you are downloading

☐ 7. In the Calibration pull down menu, click *"Rating…"* to image the engine power rating information

☐ 8. Print to PDF file and then close the window

☐ 9. In the Calibration pull down menu, click *"Audit Trails…"* to image the ECM audit trail information

Version 1.0 3/16/12

Questions?

Full presentation available at:

www.3axisllc.com/resources/