

State of EDR in the US

CDR Update

Mar 2022

CDR Software Level **21.4.1**

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Introduction - Main Messages

1. EDR's improve recon **accuracy** & get to **causation** – use with **all other** available scene evidence –EDR is also **PRIMARY EVIDENCE**.
2. EDR strength is speed **PRIOR TO BRAKING OR LOSS OF CONTROL**, & DRIVER BEHAVIOR on gas and brake pedal. Modern ABS brakes **TOOK AWAY** your tire marks, only EDR can “give you back” speed prior to braking. Newer data elements give us **EVEN MORE INSIGHT** into precrash behavior.
3. Event Data Recording capability and data accessibility **varies widely** by **manufacturer, model and model year**. Coverage keeps growing with **MORE AND BETTER DATA** available with each new model released.

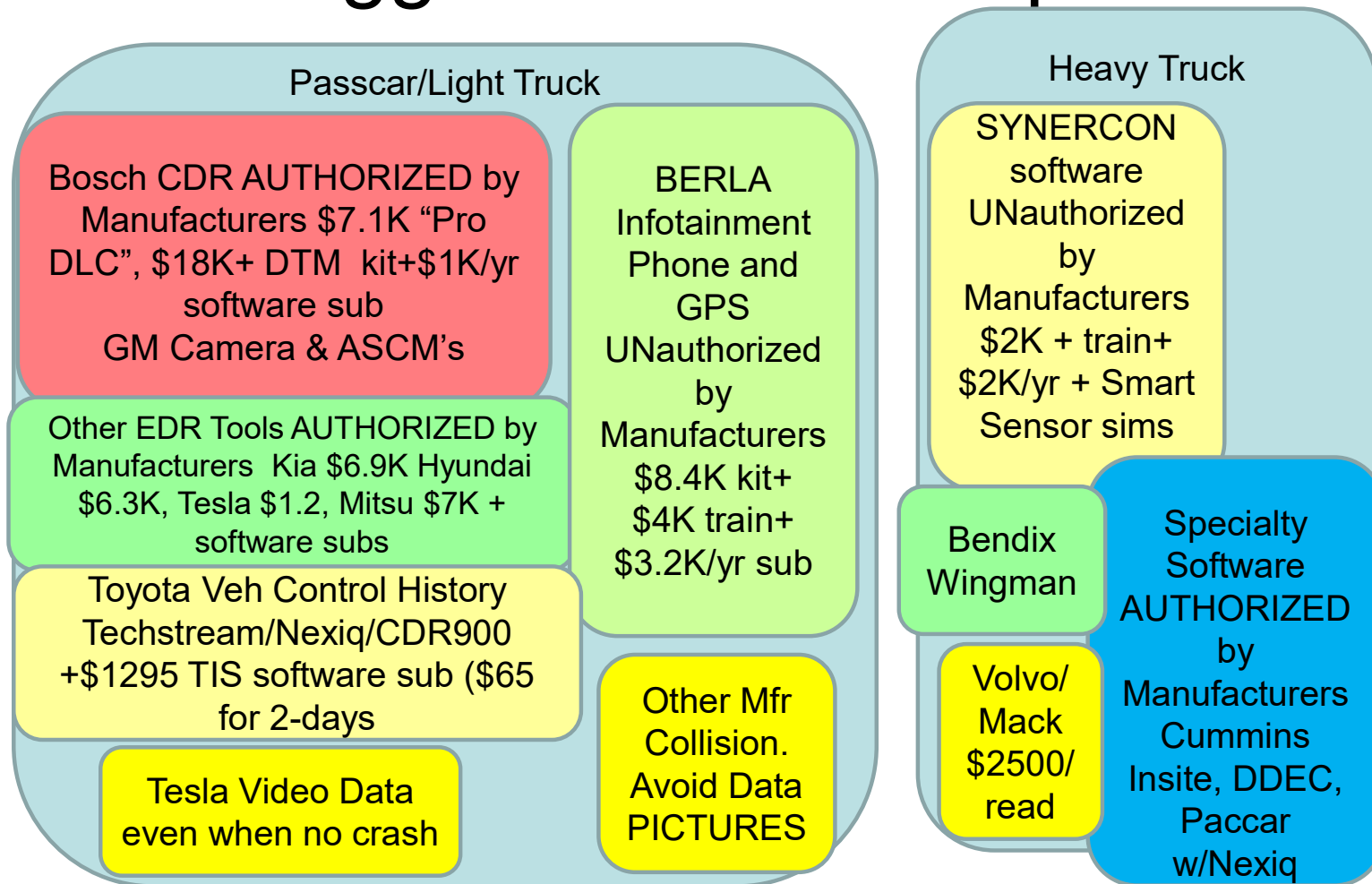
Main Messages

4. NHTSA Part 563 EDR rule Sept 2012 was a game changer – required **Minimum** Data in **US** vehicles equipped with EDR
5. EDR not required but 99% of US 2020 vehicles have one.
6. EDR's will NEVER replace human beings in figuring out what really happened.
7. US Driver Privacy Act Dec 2015 requires owner permission or a warrant to access.
8. AEB (auto braking) + other driver assist tech= fewer crashes + more data
9. If not already bought, budget for CDR 900 interface \$3800 and \$2500 new cables

Keeping EDR's in Perspective

1. There are 305 million vehicles registered in the US. **63+%** have an EDR with data accessible **by the Bosch CDR system**
2. 87+% of 2020's are supported by Bosch.
3. Another 12% have EDR accessible by other tools. **99+%** have EDR.
4. With *advanced* analysis techniques, we can get ***speed at impact*** for both vehicles even if only one has a 563 EDR.

The bigger vehicle data picture



US Lt. Veh EDR & Tool Used

Manufacturer	Annual Sales 4Q 18 to 3Q 19	Percent	EDR First Known Use	Tool?	
GM (Chevy, Buick, GMC, Cadillac)	2,920,580	17.0%	1994	Bosch CDR	
Ford (Ford, Lincoln)	2,404,373	14.0%	1997	Bosch CDR 2001+	
Toyota (includes Lexus, Scion)	2,381,734	13.9%	2001	Bosch CDR	
Fiat Chrysler (includes Dodge, Ram, Jeep, Lancia)	2,216,366	12.9%	2005	Bosch CDR	
Honda (includes Acura)	1,604,240	9.4%	2012	Bosch CDR 2012+	
Nissan (includes Infinity, Renault, EXCLUDES Mitsubishi)	1,413,835	8.3%	2006	Nissan Consult	CDR 2013+
Hyundai (Includes Kia, Genesis)	1,309,862	7.6%	2010	GIT tool co.	
Subaru	702,046	4.1%	2010	Denso +SSM	CDR 2019
BMW (includes Mini, Rolls Royce)	640,003	3.7%	2013	Bosch CDR	
Volkswagen (Includes Audi, Porsche, Bentley)	355,692	2.1%	2014	Bosch CDR	
Daimler Benz (Mercedes, Smart)	348,173	2.0%	2014	Bosch CDR	
Mazda	273,368	1.6%	2011	Bosch CDR 2011+	
Tesla	216,125	1.3%	2012	Tesla Tool	
Tata (Jaguar, Land Rover)	125,388	0.7%		Bosch SPX	
Mitsubishi (Part of Nissan Renault Alliance)	120,000	0.7%	2006	Bosch SPX	CDR 2019
Volvo	102,059	0.6%	early	Bosch CDR 2011+	
Industry Total	17,133,844.00	100.0%			

Porsche 2020 Taycan

2021 Recording Capability

EDR Major Data Elements by Manufacturer (All Mfrs with EDR have the required 15 data elements, all are not listed)

Information is taken from Bosch CDR sample files, Ruth cases, and 2012 MY practice projected into 2019 model year

	Part 563 Table 1			Part 563 Table 2										Beyond 563						
Mfr	Event Complete	Key Cycles	Long. ΔV	Speed/Brake/Throttle or Accel	Multi Event	Lateral ΔV	RPM	Steering Angle	ACM Acceleration	ABS on/off	Roll Angle	ESC Long Accel	ESC Lat Accel	Yaw Rate	Tire Pressure	Panic Brake Assist	Wheel Speeds	Roll Rate	Brake Pressure	OTHER
GM	X	X	X	5@0.5 TA	X	X	X	SDM50	Z 300@2	X		50	50	50	LO	50	1 @ 10ms	50	50 GPS Location	
Ford	X	X	X	5@0.5 A	X	X	X	5@0.1	-	X		5@0.1	5@0.1	5@0.1	LO	-	5@0.1	**	2017 AB12 precrash 0.2 sec	
Chrysler	X	X	X	5@0.1 TA	X	X	X	5@0.1	-	X		-	-	5@0.1	PSI	X	X	-	2018 ACC set speed 2018, Avoidance	
Toyota	X	X	X	5@0.5 TA	X	Side	X	5@0.5	-	Peak&atTRG	5	in roll	5@0.5	-	-	-	In Roll	5@0.5	Ped 2018, Veh history rpt	
Honda	X	X	X	5@0.5 TA	X	X	X	5@0.5	X, Y, Z 250@10	X	-1+5@0.1	-	-	-	-	-	-	-	AEmBrk. Lanekeep	
Nissan	X	X	X	5@0.5 A	X	X	X	5@0.5	X, Y 250@10	-	-	-	-	-	-	-	?	-	-	
Mazda	X	X	X	5@0.5 T	X	X	X	-	X, Y, Z 250@10	-	-	-	-	-	-	-	-	-	-	
Volvo	X	X	X	5@0.5 T	X	2016 XC90	-	2016 XC90	X, Y, Z 250@10	2016 XC90	-1+0.3@0.1	-	-	-	-	-	-	-	-	
BMW	X	X	X	5@0.5 A	X	-	X	5@0.5	X, Y 300@10ms	X	-	-	-	-	-	-	-	-	-	
Mercedes	X	X	X	5@0.5 A	X	2017 E class adds	-	-	-	-	-	-	-	-	-	-	-	-	-	
VW	X	X	X	5@0.5 A	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	Time of Crash
Hyundai/Kia	X	X	X	5@0.5	X	X	X	5@0.5	X, Y, Z 250@10	X	-1+5@0.1	-	-	-	-	-	-	-	19 Forte	
Subaru	X	X	X	5@0.5 A	X	X	X	5@0.5	-	X	-	-	-	-	-	-	-	-1 to+1.5	Eyesight	
Mitsubishi	X	X	X	5@0.5 A	X	X	X	5@0.5	X, Y 250@10	-	-1+5@0.1	-	-	-	-	-	-	-	-	

Bosch CDR Hardware Update

1. *CDR-900 VCI module released July 2018 needed for new vehicles*
2. *Supports w/CAN-HD and Ethernet.*
3. *Derivative of proven diagnostic scan tool.*
4. *New round 19 pins cables vs. flat 15 pin for new releases after 2018.*
5. *CDR 900 must be registered to your laptop (network device) before use.*



CDR 900 Upgrade Kit

\$4000

CDR900

1. Needed for NEW vehicles
2. Intended to eventually read many legacy vehicles, but CAN+ still needed ..

CDR900 Upgrade Kit



Help file identifies interface needed

Mkt	Year/Make	Model	Module	Vehicle Interface	OBD/DLC Connect Adapter/Cable	D2M Connect Adapter/Cable	Module Location
13	2020 Chevrolet	Aveo (note 6)	ACM	Data CANplus	F00K108287	F00K108454	Center tunnel
4	2020 Chevrolet	Blazer (note 6)	ACM	Data CANplus or CDR 900	CANplus - F00K108287 CDR 900 - click here	CANplus - F00K108454 CDR 900 - click here (use listed cable above)	Center tunnel
			ASCM (Note1)	Data CDR 900	CDR 900 - click here	CDR 900 - Cable# 833	In the rear cargo storage area, under the left rear trim panel, at the front of the wheel well

CAN+ only

Either one

CDR900only

CDR 900 details

1. CDR900 integrates power management (no external relays/adapters).
2. CDR900 uses the existing 2.5 amp current limited power supply, but new ACM's may drive bigger supply later.
3. Includes WIRELESS laptop to interface
4. CDR900 does NOT integrate the current CDR500 Flex Ray adapter – still needed!
5. CDR 900 firmware must be flashed initially

CDR900 Tips

1. CDR900 is a network device, VPN's do NOT LIKE other network devices, they are designed to keep them out. CDR900 does not like laptops with firewalls and other virus protection and lots of other programs – suggest using a *dedicated laptop* with few other programs installed.
2. VCI Manager and CDR are *two different programs*, you MUST close VCI manager before CDR program will recognize CDR900!

New users need both CAN+ and CDR900



MSRP: **\$7300**

plus shipping & handling

Add to Cart >

Bosch CDR Pro Tool Kit

DLC ONLY

The CDR Pro Tool Kit is the heart and soul of the Bosch CDR Tool. This package contains all of the hardware required to perform a DLC/OBD retrieval of EDR data in Bosch supported vehicles. It includes both the CDR 900 and CANplus vehicle interface modules. This package also comes with a 1-year CDR software subscription. NOTE: this package does NOT contain any hardware to perform a "direct-to-module (D2M)" retrieval of EDR data. Please see the accessory cable/adaptor packages below for D2M options.

- CDR 900 vehicle interface module
- CDR 900 power cable
- CDR 900/CDR CANplus power supply cable
- CDR 900/CDR CANplus CDR cigarette power adapter
- CDR 900 DLC/OBD cable
- CDR 900 wireless dongles (2)
- CDR 900 extension cable
- CDR 900 legacy cable adapter
- CDR 900 USB cable
- CDR CANplus vehicle interface module
- CDR CANplus DLC/OBD cable
- CDR CANplus GM DLC/OBD cable
- CDR CANplus DLC/OBD adapters (3)
- CDR CANplus PCM adapter
- CDR CANplus USB to Serial port cable
- Deluxe repowering rig
- 1-year CDR software subscription
- Custom carrying case
- Coupon for **FREE online class**: How to Use the Bosch CDR Tool

HARDWARE CHECKLIST 21.4

New 3-digit Part ID

Part Number	Description	Released
1699200778	Cable, ID835, CDR Subaru ACM 1 2019+ Forester/Acsent	19.0
1699200779	Cable, ID836, CDR Subaru ACM 2 2015+ Legacy/Outback	19.0
1699200783	Cable, ID837, CDR Mitsubishi ACM 1 Eclipse Cross	19.0
1699200784	Cable, ID838, CDR Mitsubishi ACM 2 Outlander	19.0
1699200785	Cable, ID839, CDR Mitsubishi ACM 3 Many Older models	19.0
1699200786	Cable, ID840, CDR Mitsubishi ACM 4 Japan Only models	19.0
1699200776	Cable, ID833, CDR GM ASCM 1 Advanced Safety	19.1
1699200777	Cable, ID834, CDR GM ASCM 2 Advanced Safety	19.1
1699200797	Cable, ID842, CDR VW Group ACM 4 2020 Golf, Neo	19.1
1699200800	Cable, ID843, CDR Mazda ACM 2019+ Mazda 3	19.1
1699200838	Cable, ID845, CDR GM ACM SDM-50 2020 Corvette	19.1
1699200837	Cable, ID844, CDR Subaru ACM 3 2020 Legacy/Outback	19.4
1699200839	Cable, ID846, CDR Honda ACM 2021+ Honda Gen 4	19.4
1699200787	Cable, ID841, CDR Daimler ACM (requires CDR 500 2021 S-class	19.6
1699200882	Cable, ID847, CDR PSA ACM 1 2021 Puegot in China	21.1
1699200883	Cable, ID848, CDR PSA ACM 2 2021 Puegot in China	21.1
1699200983	Cable, ID850, CDR VWG ACM 5 2021 Golf + China models	21.1
1699201032	Cable, ID853, CDR Mitsu ACM 5 Outside US/Canada	21.1
1699503814	Cable, ID858, CDR Maserati / Ferrari ACM	21.4
1699503636	Cable, ID859, CDR Lucid ACM	21.4

Coming 2022: 854 & 855 GM ASCM and 856 GM FCM

Bosch CDR and Windows 11

- Windows 11 is not yet supported for use with CDR
- Bosch is working on developing drivers for Win 11
- You may be able to get CDR to run in “Compatibility Mode”. One user reported it did not work in Win10 compatibility but did work in Windows XP compatibility mode.

New Back Powering Gear Needed

1. Manufacturers (GM+) are replacing mini and micro fuses with Micro 2 and Micro 3 fuses to pack more fuses into smaller spaces. The complete back power kit must now have several different yellow clips to fit all the different vehicles on the road. GM started it, Ford followed, more to come. Mini fits into sub mini, don't need sub mini.



2. Buy General Technologies Corp GTC063 set of 6 (including 2 bigger ones you don't really need) at the site below for \$19.95

https://www.amazon.com/General-Technologies-Corp-GTC063-Connector/dp/B0787JKMTH?ref_=bl_dp_s_web_9003703011

EMERGING TRENDS

1. Worry re: **cyber security**, (hackers trying to take over vehicle control systems).
2. Many are installing “gate-way” modules or features to protect ECU’s from hacking.
3. Back power ACM fuse AND cyber security (gateway) module fuse. DTM still an alt.
4. Recently needed on 2017 RAM 3500, 2018 Toyota, all VW, 2020 Ford Explorer
5. Ford “extended power” fuse or “Battery Electronic Control Module” for ACM & “smart data link” gateway— no RCM or SRS

Recent CDR Software Updates

- 19.1 Sept. 20, 2019, 15+ Subaru Outback, GM ASCM reports, more 2020's
- 19.2 Dec. 6 Legacy GM ASCM's, + 2020's
- 19.3 –Dec.23 – CDR900 Toyota support
- 19.4 May 7, 2020 +Subaru, +Porsche, 21GM
- 19.5 Aug 13,2020 + 21's,
- 19.6 Dec 1, 2020 China releases + more
- 21.0 Jan 21, 2021 China releases + more
- 21.1 May 14, 2021 Many Mitsubishi
- 21.2 Aug 3, 2021 GM Fwd Camera Module
- 21.3 Oct. 28, 2021 21 Volvo, 22 Ford, Audi

CDR Budgeting

	Own everything	Middling Approach	A Minimal Approach
Initial Expenses			
Initial Technician Training	\$395	\$395	\$395
Hardware (Cabels Etc...)	\$27,300 (Premium Pro Kit)	\$17,300 (Deluxe Pro Kit)	\$7300 (Pro Kit)
Software	Included	Included	Included
Popular Cables	Included	50 Popular Cables/Adapters Included	~\$6000 (Choose 20 Popular Cables/Adapters - Estimate)
Analyst Training (Travel Extra)	\$995	\$995	\$995
Sub Total	\$28,690	\$18,690	\$14,690
Estimated Annual Recurring Expenses			
Software Updates	\$1,250	\$1,250	\$1,250
New Cables	\$1100 (est 5 @ \$220 each)		
Unexpected Cables		\$440 (2 Cables you need but do not have - Shipped overnight)	\$440 (2 Cables you need but do not have - Shipped overnight)
Analyst Training (Travel Extra, or Online = \$0) \$1000 Every Other Year	\$500	\$500	\$500
Sub Total	\$2,850	\$2,195	\$2,195
* Prices Subject to Change			

New EDR Tool?

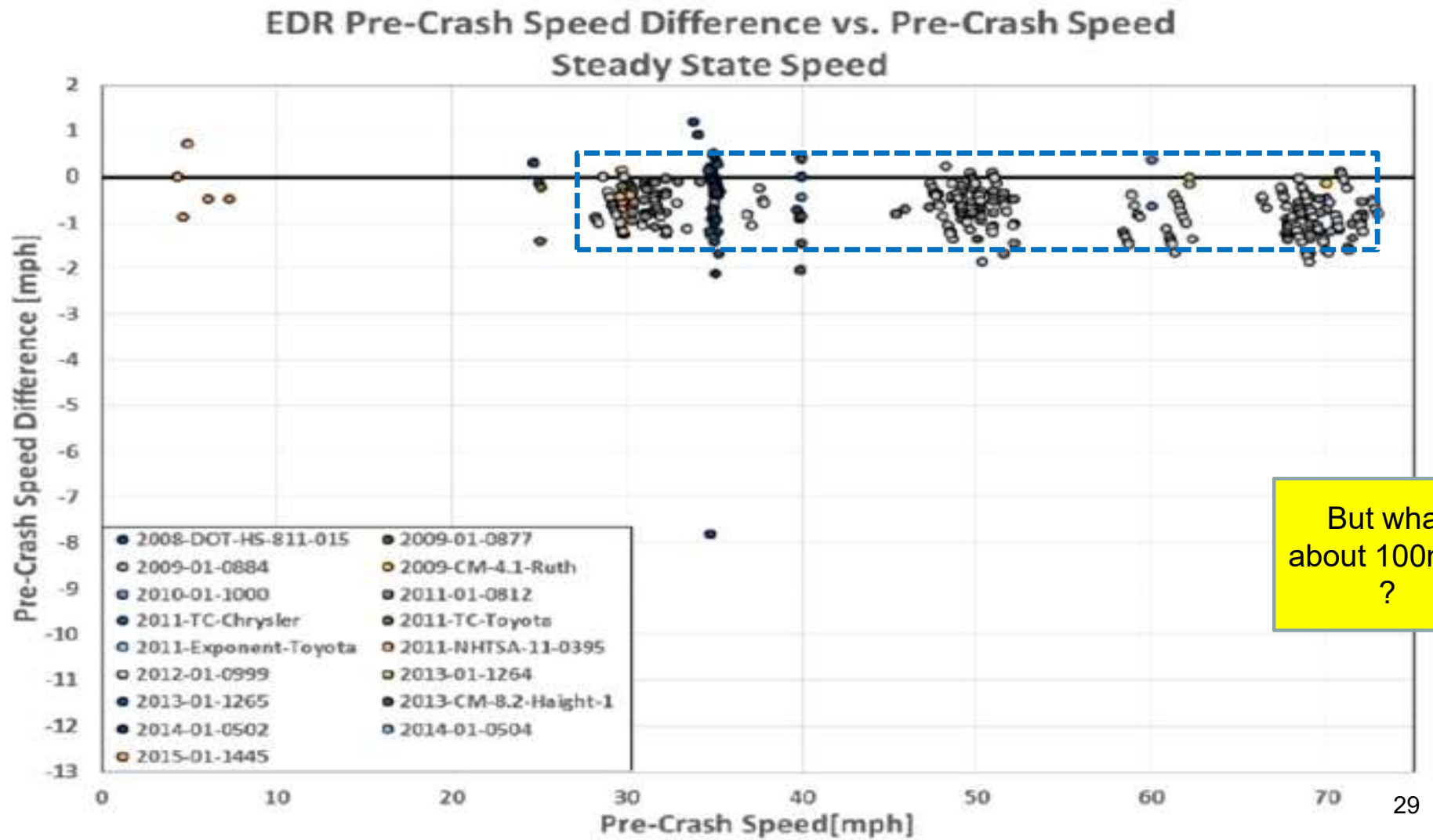
1. Collision Sciences based in Toronto has developed a DLC only tool and Bluetooth software that runs from your phone to read EDR data from vehicles with functioning electrical systems.
2. Business model is still evolving, but entry price for the hardware is very low compared to Bosch
3. Raw data is uploaded to cloud, free teaser preview
4. User pays modest fee to get report which includes value added analysis such as fraud risk assessment or risk of injury (vs. Bosch reports strictly data with no analysis.)
5. Developers are talented engineers - figuring out the decoder – and working on getting decoding data directly from manufacturers.
6. Works on Kia/Hyundai + most CDR supported vehicles

CDR/EDR Training

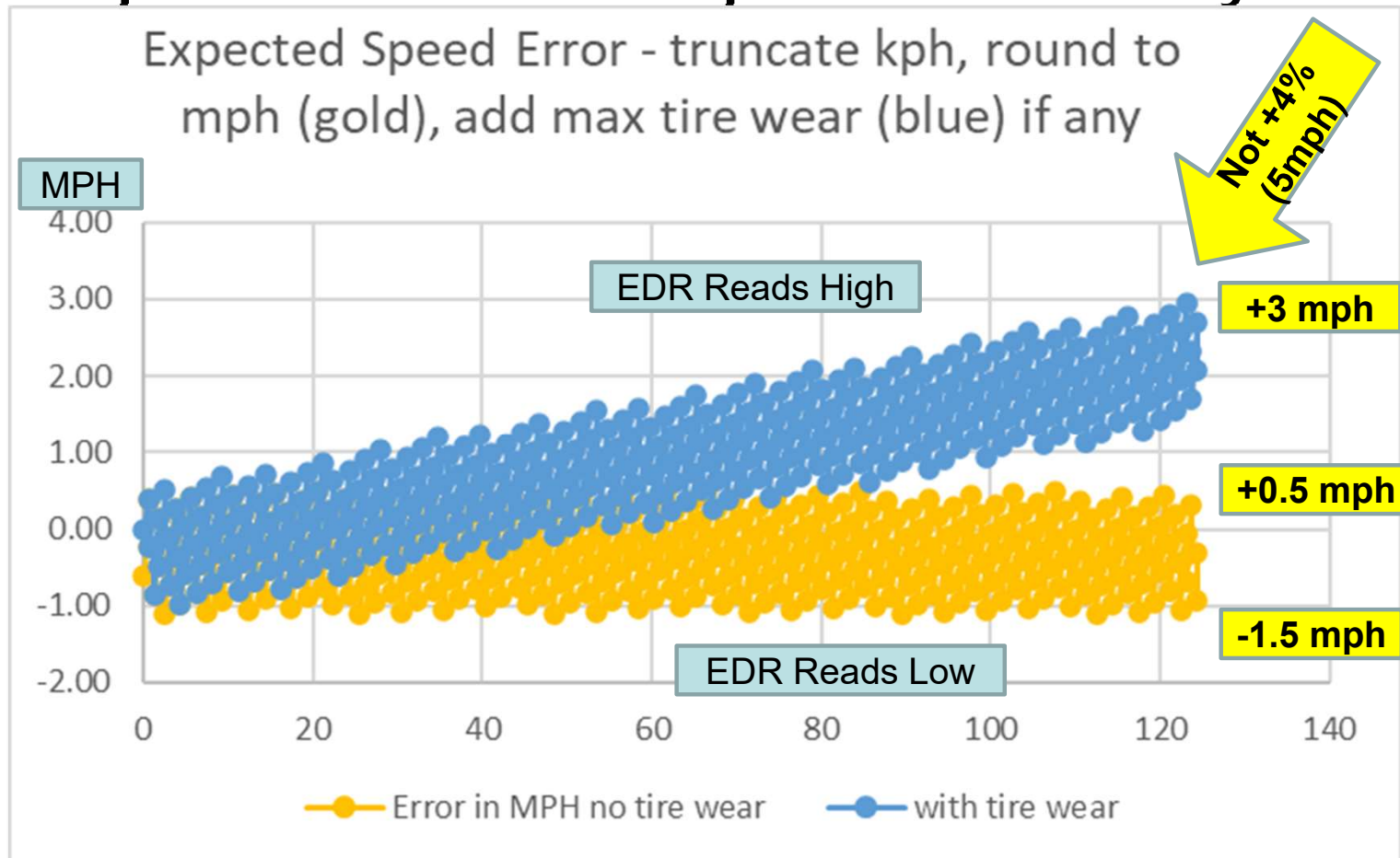
1. Bosch Training Provider Page lists IPTM (Rick Ruth+), Crash Data Specialists (Brad Muir+), CSI (Rusty Haight), Crash Data Group and Northwestern (was CSI, now + Muir/Russel). SAE (Rick R) not listed, teaches analysis only.
2. There is no “certification” – your qualifications depend on your training and experience
3. IPTM **ONLINE technician training \$495** and **ONLINE analyst training \$995**. Live restarting.
4. **SAE Analyst EDR Virtual, will go live again 2022**
5. Online tech basic from Crash Data Group \$200
6. Advanced EDR Technician class by Kent Boots

Additional EDR training available

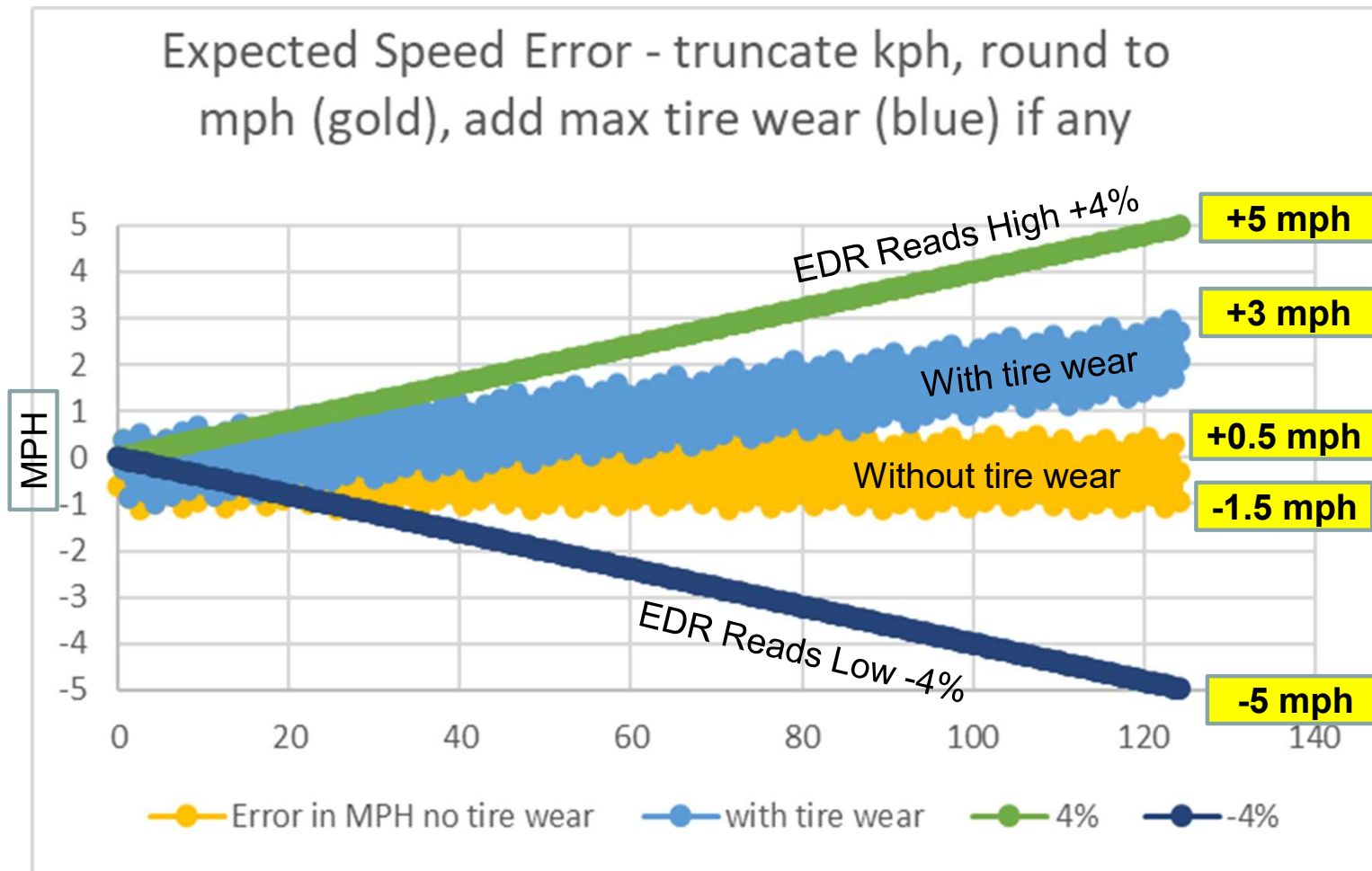
1. IPTM has a “Level 2” analyst class which goes into greater depth on how to use the law of sines and cosines to solve Velocity Vector triangles, offset collisions w/EMR, ground forces & new data elements.
2. EDR for Insurance Analyst now available from Ruth Consulting virtually
3. Other classes being adapted to virtual in response to live class cancellations – contact Rick Ruth for latest



Simulation: -1.5 to +0.5 mph plus tire wear up to 2% if any?



Speed Error: Simulation vs +/-4%



Which Guidance to Use?

- You must evaluate the circumstances of your case and decide what is most relevant.
- Use AT LEAST ± 0.5 to ± 1.5 mph at low speed
(At 5mph $\pm 4\%$ would be ± 0.2 mph, it is NOT that accurate)
- $\pm 4\%$ at high speed will always cover any error
- Reduce error by considering test data to -1.5 mph min and ± 0.5 to $\pm 2\%$ of speed max w/o tread info
- Further reduce if tread depth can be documented

ACM Not at CG

Thanks to Andy Rich for developing
most of this section, and Bob
Scurlock, Ph.D. for researching it



ACM Not at CG

Two possible conditions

Force applied closer to CG



EDR under-reports delta-V

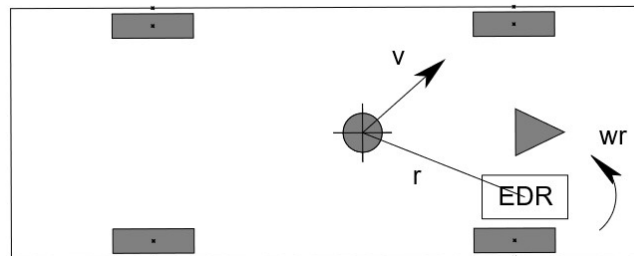
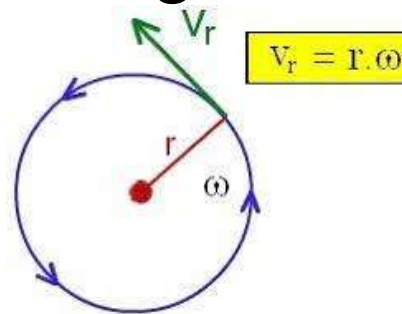
Force applied closer to EDR



EDR over-reports delta-V

ACM Not at CG – Theory

Over/Under reporting is caused by rotation



$$\Delta v^{EDR} = \Delta v^{CG} + \omega r$$

ACM Not at CG

Early Research

Nathan Rose et al. offering the following solution in Collision Magazine V13, I2

$$\Delta v_x^{CG} = \Delta v_x^{EDR} + r_y \Delta \omega_{yaw}$$

$$\Delta v_y^{CG} = \Delta v_y^{EDR} - r_x \Delta \omega_{yaw}$$

- r_x is the longitudinal distance from the EDR to CG
- r_y is the lateral distance from the EDR to the CG
- When EDR is on the centerline (CL) then $r_y = 0$ and $\Delta v_x^{CG} = \Delta v_x^{EDR}$
- But how to get $\Delta \omega$?
- Rose suggests simulation – not typically available to police
- Scurlock, Rich & Poe combine the above equations with conservation of angular momentum to give a mathematical approach.

$$I \Delta \omega = m h \Delta v$$

ACM Not at CG

- The following equation assumes that the EDR is mounted at the centerline (CL) of the car and that the CG is also at the CL.
- If the EDR is not at the CL see

Corrections to Off-Axis Δv Measurements from Event Data Recorders

Bob Scurlock, Ph.D., ACTAR, Andrew Rich, BSME, ACTAR, and Kyle Poe

- June 2021 Collision Magazine
- Available at <https://arxiv.org/abs/2001.03165>
- Heavy math needed to handle all EDR locations and CG's– will strain most brains – but in most typical cases it simplifies to.

$$\Delta v_y^{CG} = \frac{\Delta v_y^{EDR} \cdot k^2 + \Delta v_y^{EDR} \cdot r_y^{cent} \cdot r_x^{EDR}}{k^2 + r_x^{cent} \cdot r_x^{EDR}}$$

ACM Not at CG

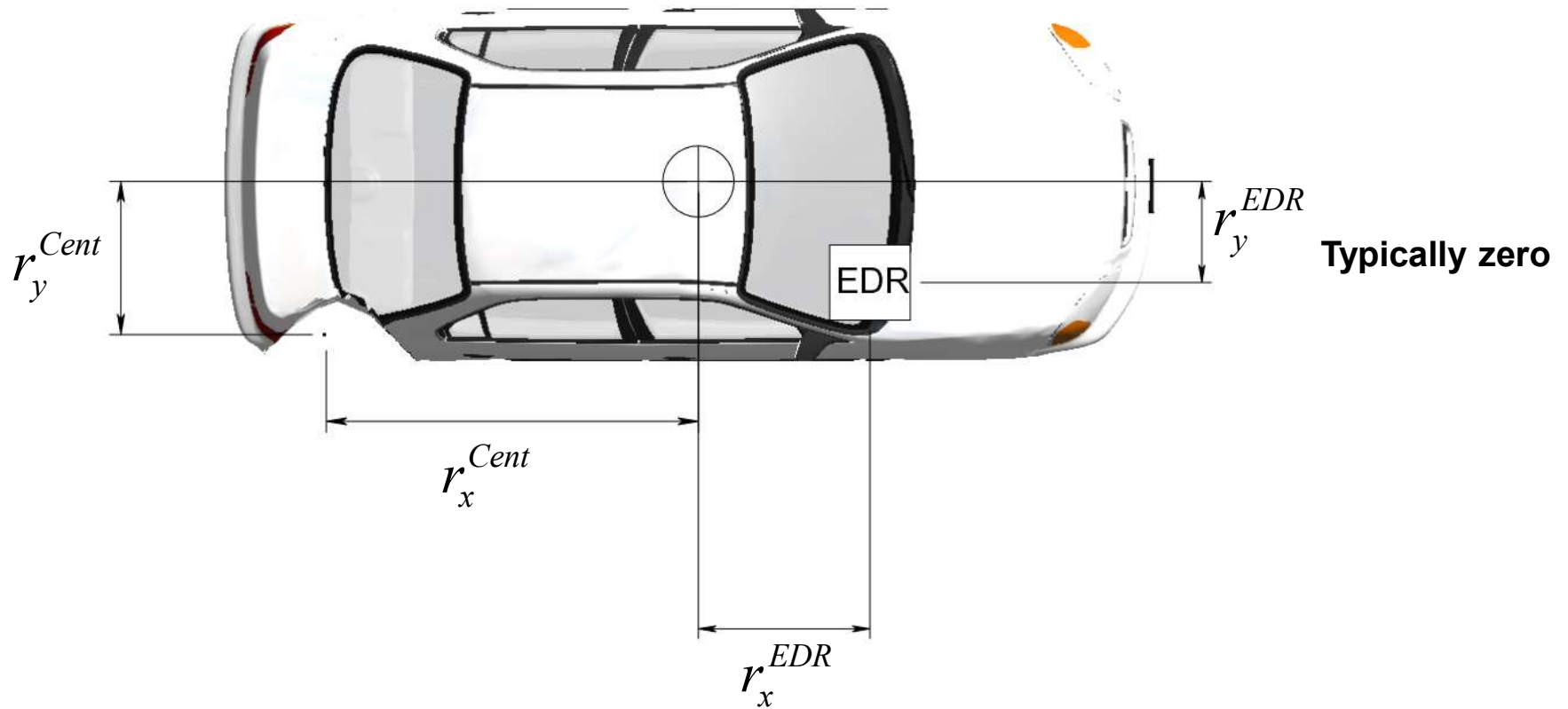
Definitions

$$\Delta v_y^{CG} = \frac{\Delta v_y^{EDR} \cdot k^2 + \Delta v_x^{EDR} \cdot r_y^{cent} \cdot r_x^{EDR}}{k^2 + r_x^{cent} \cdot r_x^{EDR}}$$

- Δv_y^{CG} is the lateral delta-V at the CG
- Δv_y^{EDR} is the lateral delta-V reported by the EDR
- k is the radius of gyration
- Δv_x^{EDR} is the longitudinal delta-V reported by the EDR
- r_y^{cent} is the lateral displacement of the damage centroid from the CG
(Use RHR for sign, positive if on driver side, negative on pass side)
- r_x^{EDR} is the longitudinal displacement of the EDR from the CG (RHR)
(typically 0 to +2 feet)
- r_x^{cent} is the longitudinal displacement of the damage centroid from the CG
(Use RHR for sign, negative if centroid rear of CG, positive if fwd)

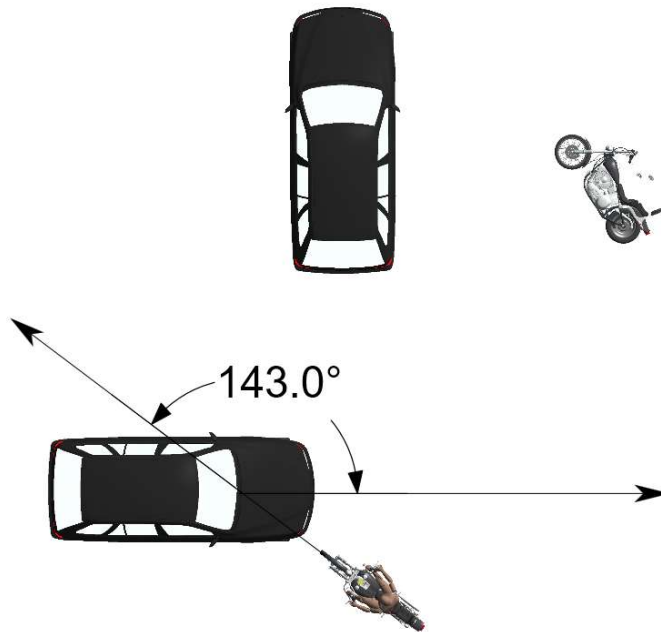
ACM Not at CG

Definitions



ACM not at CG Example

From Collision Magazine V13/Issue2



V_1 is a BMW X2

$W_1 = 4370 \text{ lb}$

$\Delta v_x^{EDR} = -9.90 \text{ mph}$

$\Delta v_y^{EDR} = -6.8 \text{ mph}$

$r_x^{EDR} = 1.08 \text{ ft}$

$r_x^{cent} = 7.50 \text{ ft}$

$r_y^{cent} = 3.00 \text{ ft}$

ACM not at CG

Example From Collision Magazine V13/Issue2
In this example the PDOF line is close to the CG,
rotation is small, the adjustment is small

$$I = 1.03W - 1206 = (1.03)(4370) - 1206 = 3295 \text{ ft-lb-sec}^2$$

$$k^2 = \frac{Ig}{W} = \frac{(3295)(32.2)}{4370} = 24.3 \text{ ft}^2$$

$$\Delta v_y^{CG} = \frac{\Delta v_y^{EDR} \cdot k^2 + \Delta v_x^{EDR} \cdot r_y^{cent} \cdot r_x^{EDR}}{k^2 + r_x^{cent} \cdot r_x^{EDR}}$$

$$\Delta v_y^{CG} = \frac{(-6.8)(24.3) + (-9.9)(3.00)(1.08)}{24.3 + (7.50)(1.08)} = -6.09 \text{ mph}$$

V_1 is a BMW X2

$W_1 = 4370 \text{ lb}$

$$\Delta v_x^{EDR} = -9.90 \text{ mph}$$

$$\Delta v_y^{EDR} = -6.8 \text{ mph}$$

$$r_x^{EDR} = 1.08 \text{ ft}$$

$$r_x^{cent} = 7.50 \text{ ft}$$

$$r_y^{cent} = 3.00 \text{ ft}$$

Recall that $\Delta v_x^{CG} = \Delta v_x^{EDR}$ when the EDR is on the CL

$$|\Delta \vec{v}| = \sqrt{\Delta v_x^2 + \Delta v_y^2} = \sqrt{(-9.9)^2 + (-6.09)^2} = 11.62 \text{ mph}$$

ACM not at CG

Example From Collision Magazine V13/Issue2 continued

$$PDOF = \tan^{-1} \left(\frac{\Delta v_y}{\Delta v_x} \right) = \tan^{-1} \left(\frac{-6.09}{-9.90} \right) = 31.6^\circ$$

$$h = \frac{r_x^{cent} \cdot \Delta v_y^{CG} - r_y^{cent} \cdot \Delta v_x^{CG}}{|\Delta \vec{v}|}$$

$$h = \frac{(7.50)(-6.09) - (3.00)(-9.90)}{11.62} = -1.37 \text{ ft}$$

The minus sign tells us that the car will rotate counterclockwise.

$$\gamma = \frac{k^2}{k^2 + h^2} = \frac{24.3}{24.3 + (1.37)^2} = 0.93$$

V₁ is a BMW

X2

W₁ = 4370 lb

$\Delta v_x^{EDR} = -9.90 \text{ mph}$

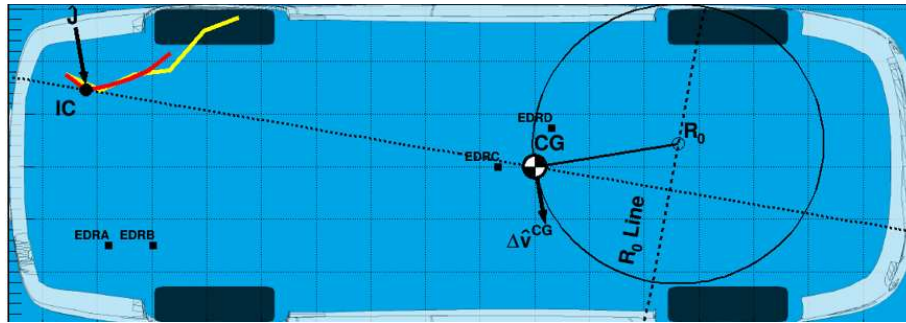
$\Delta v_y^{EDR} = -6.8 \text{ mph}$

$r_x^{EDR} = 1.08 \text{ ft}$

$r_x^{cent} = 7.50 \text{ ft}$

$r_y^{cent} = 3.00 \text{ ft}$

Beware the R_0 Line & the R_0 Point!



The R_0 line is a function of r_x^{EDR}

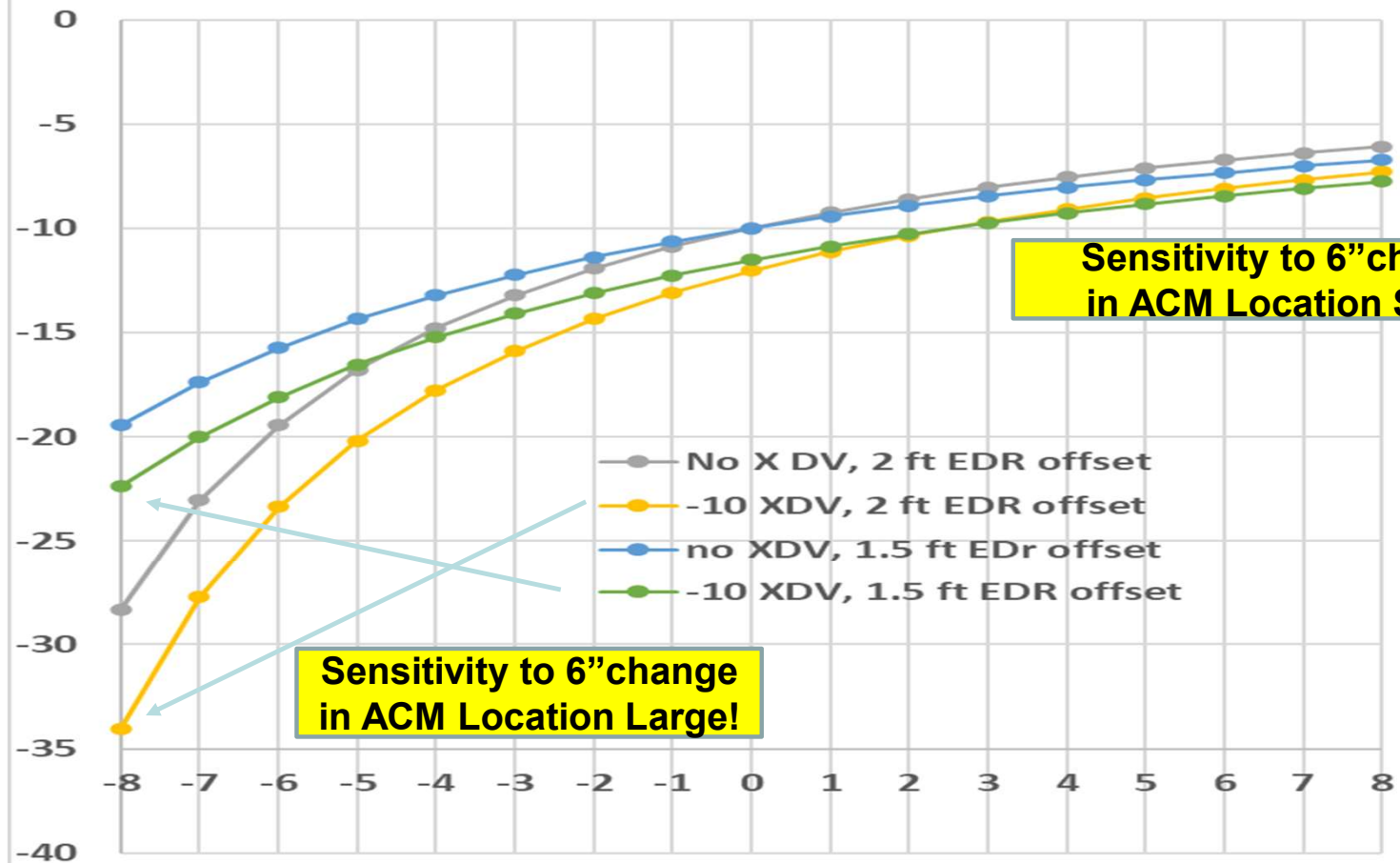
$$r_y^{EDR} = -\frac{k^2}{r_y^{cent}} - \left(\frac{r_x^{cent}}{r_y^{cent}} \right) r_x^{EDR}$$

- There is an imaginary line (the R_0 line) where $\Delta v_y^{EDR} = 0mph$ so we cannot solve for a unique Δv^{CG} .
- When an accelerometer (EDR) is close to the R_0 line, your analysis may be very sensitive to uncertainties in accelerometer location.
- You should do a sensitivity analysis considering actual accelerometer position in EDR may be $\pm 3''$ of the module center you measured. If results diverge excessively, use caution.

Beware the R_0 Line!

- Sensitivity Analysis:
 - **Measure** or look up the location of the EDR with respect to the CG.
 - Note that some BMWs have EDR forward of CG under dash, but the sensors are at CG!
 - Measure or determine the dimensions of the EDR. Include those measurements in your uncertainty analysis (except if you know exactly where the accelerometer is for your ACM).
 - Don't forget delta-V accuracy. See the Scurlock/Rich/Poe paper and other EDR technical papers for detailed discussions.

DVyCG vs offset CG to damage centroid for 10mph EDRyDV



NEW NHTSA CISS DATABASE

1. <https://crashviewer.nhtsa.dot.gov/CISS/SearchIndex>
2. 11,358 cases available from 2016-2020 calendar years – just updated Jan 2022
3. Searchable by manufacturer, model year, model, EDR data available, driver assist technology available, etc
4. Find similar cases, check polarity, see typical EDR report
5. Link to VIN decoder, Canadian Specs, Vin check digit calc'tr [Welcome to VIN Decoding :: provided by vPIC \(dot.gov\)](#)

Details by Manufacturer

NOTE the big picture
OVERVIEW presentation will
end here, but SAE students are
encouraged to review the
remainder of the presentation
for a quick “what’s new in
EDR’s”

Honda 21.3 CDR Coverage

Model	2011- NO time series EDR But may have Delta V single value Honda only assists law enforce-ment voluntarily	##	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
ACURA													
RL			547										
TL			547										
TSX			547										
ZDX			547										
MDX			547		387/789			387/810					846
NSX								387/789					
RDX				547			387/789		387/825				
ILX				547			387/789						
RLX					387/789								
TLX						387/789				387/810		846	846
HONDA		##	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
ACCORD				387/789			387/810		387/825				
CIVIC 2 DR			547				387/810						846
CIVIC 4 DR			547	387/789			387/810						846
CLARITY												387/810	
CROSSTOUR			547										
CR-V			547				387/789	387/810					846
CR-Z			547										
FCX Clarity								387/810					
FIT		EV	547			387/789		387/810					846
HR-V							387/789		387/810				846
INSIGHT			547							387/810			
ODYSSEY			547		387/789			387/810					
PASSPORT										387/810			
PILOT			547				387/789	387/810					
RIDGELINE			547					387/810					

Honda EDR Evolution

1. One set of DL's thru 2015
 - a) Roll rate polarity varies by supplier – polarity added under graph
 - b) Accel data instantaneous
2. 2016-17 Gen 2 adds “Honda sensing” & Cruise. Updated Data Lims.
3. 2018 – 3rd Gen to include “ig switch status”
 - a) Airbag deploys even if ign off until car stops
 - b) Markets outside US/Japan do not get precrash data
4. 2021 – 4th Gen - ??? (please send files!)

Honda Gen 2 EDR

- If equipped may have semi autonomous vehicle data elements

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 2 of 3

Time Stamp (sec)	PCM Derived Accelerator Pedal Position, % full	Forward Collision Warning (Not Warning/ Warning)	Collision Mitigation Braking System (Not Engaged/ Engaged)	Collision Mitigation Braking System, Forward Collision Warning (On/Off)	Lane Departure Warning (Not Warning/ Warning)	Road Departure Mitigation (Not Engaged/ Engaged)	Road Departure Mitigation, Lane Departure Warning (On/Off)
-5.0	16	Not warning	Not engaged	On	Not warning	Not engaged	Off
-4.5	8	Not warning	Not engaged	On	Not warning	Not engaged	Off
-4.0	11	Not warning	Not engaged	On	Not warning	Not engaged	Off
-3.5	13	Not warning	Not engaged	On	Not warning	Not engaged	Off
-3.0	18	Not warning	Not engaged	On	Not warning	Not engaged	Off
-2.5	18	Not warning	Not engaged	On	Not warning	Not engaged	Off
-2.0	17	Not warning	Not engaged	On	Not warning	Not engaged	Off
-1.5	0	Warning	Engaged	On	Not warning	Not engaged	Off
-1.0	0	Warning	Engaged	On	Not warning	Not engaged	Off
-0.5	0	Warning	Engaged	On	Not warning	Not engaged	Off
0.0	0	Warning	Engaged	On	Not warning	Not engaged	Off

Honda Gen 2 Semi Auton cont'd

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 3 of 3

Time Stamp (sec)	Adaptive Cruise Control (Not Engaged/ Engaged)	Adaptive Cruise Control (On/Off)	Lane Keeping Assist (Not Engaged/ Engaged)	Lane Keeping Assist (On/Off)	Cruise Control (Not Engaged/ Engaged)	Cruise Control (On/Off)
-5.0	Not engaged	On	Not engaged	On	Not Engaged	On
-4.5	Not engaged	On	Not engaged	On	Not Engaged	On
-4.0	Not engaged	On	Not engaged	On	Not Engaged	On
-3.5	Not engaged	On	Not engaged	On	Not Engaged	On
-3.0	Not engaged	On	Not engaged	On	Not Engaged	On
-2.5	Not engaged	On	Not engaged	On	Not Engaged	On
-2.0	Not engaged	On	Not engaged	On	Not Engaged	On
-1.5	Not engaged	On	Not engaged	On	Not Engaged	On
-1.0	Not engaged	On	Not engaged	On	Not Engaged	On
-0.5	Not engaged	On	Not engaged	On	Not Engaged	On
0.0	Not engaged	On	Not engaged	On	Not Engaged	On

Reminders: UNIQUE TO HONDA

1. Most manufactures record the speed calculated in the powertrain control module as it is being sent **TO** the speedometer on the CAN bus.
2. Honda records the speed being displayed **ON** the speedometer, after the PCM calculated speed has been dampened or “smoothed”.
3. The last data point labeled 0.0 is sampled at AE. -0.5 is -0.01 to -0.50. While sampled at AE, speedometer processing delays what is being reported, so it lags the true speed at impact during hard braking.

Chevrolet SDM Phase In 87%

	GREEN = 300 ms Longitudinal Delta V										Red = Precrash Data & 150ms Longitudinal Delta V					Blue = Precrash Data & 300ms XY Delta V					3 events			563					SDM50		GM
Model	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021			
Astro			2888	2888	2888	- 2888	2829	2829	2829	2829	2829	2829	2829				454	454	454	454	*										
Avalanche									2829	3003	3003	3003	3003	3320 ROS	3320 ROS	3320 ROS	3320	3320		454	*				454						
Aveo																						454	454								
Beat (India)																										454	454	454			
Blazer					88	- 2888	2829	2829	2829	2829	2829	2829*	*													454	454	454			
Bolt EV																									454	454	454	454			
Camaro			2888	2888	2888	- 2829	2829	2829	2829								454	454	454	454	454	454	454	454	454	454	454	454			
Caprice	3002	3002	3002															452	454	454	police	police	police	police	police	police		454	454		
Captiva																	454	454	454	454	*	Sport	Sport								
City Express																						780	780	780	780	780					
Colorado												3003	3003	3003	3003	3003	3003	3003	3003	3003	3003	454	454	454	454	454	454	454			
Corvette				2888	2888	- 2829	2829	2829	2829	2829	2829	3003	3003	3003	3003	3003	3003	3003	3003	3003	3003	454	454	454	454	454	454	845	845		
Cruze												3003	3003	3003	3003	3003	3003	3003	3003	3003	3003	454	454	454	454	454	454	454			
Equinox												3004	3004	3320 ROS	3320 ROS	3320 ROS	454	454	454	454	454	454	454	454	454	454	454	454			
Express			2888	2888	2888	- 2888	2888	2829	2829	3003	3003	3003	3003	3003	3003	3003	3320 ROS	3320 ROS	3320 ROS	3320 ROS	3320 ROS	3320 ROS	3320 ROS	454	454	454	454	454			
Impala		3002	3002			-	2829	2829	2829	2829	2829	2829	3320	3320	3320	3320	3320	3320	3320	3320	454	454	454	454	454	454	454	454			
Kodiak											2829	2829	2829	2829	2829	2829								2016	2017	2018	2019	2020	2021		
Low Cab Fwd																										454					
Malibu			2888	2888	- 2888	2829	2829	2829	2829		3321***	3321 mix	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321	3321			
Maliz																				454											
Orlando																				454	454	454									
Silverado			2888	2888	- 2888	MIX	2829	2829	3003	3003	3003	3003	3003	3320 ROS*	3320 ROS	3320 ROS	454	454	454	454	454	454	454	454	454	454	454	454			
Sonic																			454	454	454	454	454	454	454	454	454				
Spark																				454	454	454	454	454	454	454	454	454			
SSR										3003	3003	3003	3003									SS	454	454	454						
Suburban			2888	2888	- 2888	MIX	2829	2829	3003	3003	3003	3003	3003	3320 ROS	3320 ROS	3320 ROS	454	454	454	454	454	454	454	454	454	454	454	845			
Tahoe			2888	2888	- 2888	MIX	2829	2829	3003	3003	3003	3003	3003	3320 ROS	3320 ROS	3320 ROS	454	454	454	454	454	454	454	454	454	454	454	845			
Tracker			DLC	DLC	DLC	- DLC	DLC	DLC	DLC	DLC	DLC														454	454	454	454			
TrailBlazer									2829	2829	2829	3293	3293	3293	3293	3293												454			
Traverse																3320 ROS	454	454	454	454	454	454	454	454	454	454	454	454			
Trax																															
Volt																				454	454	454	454	454	454	454	454				

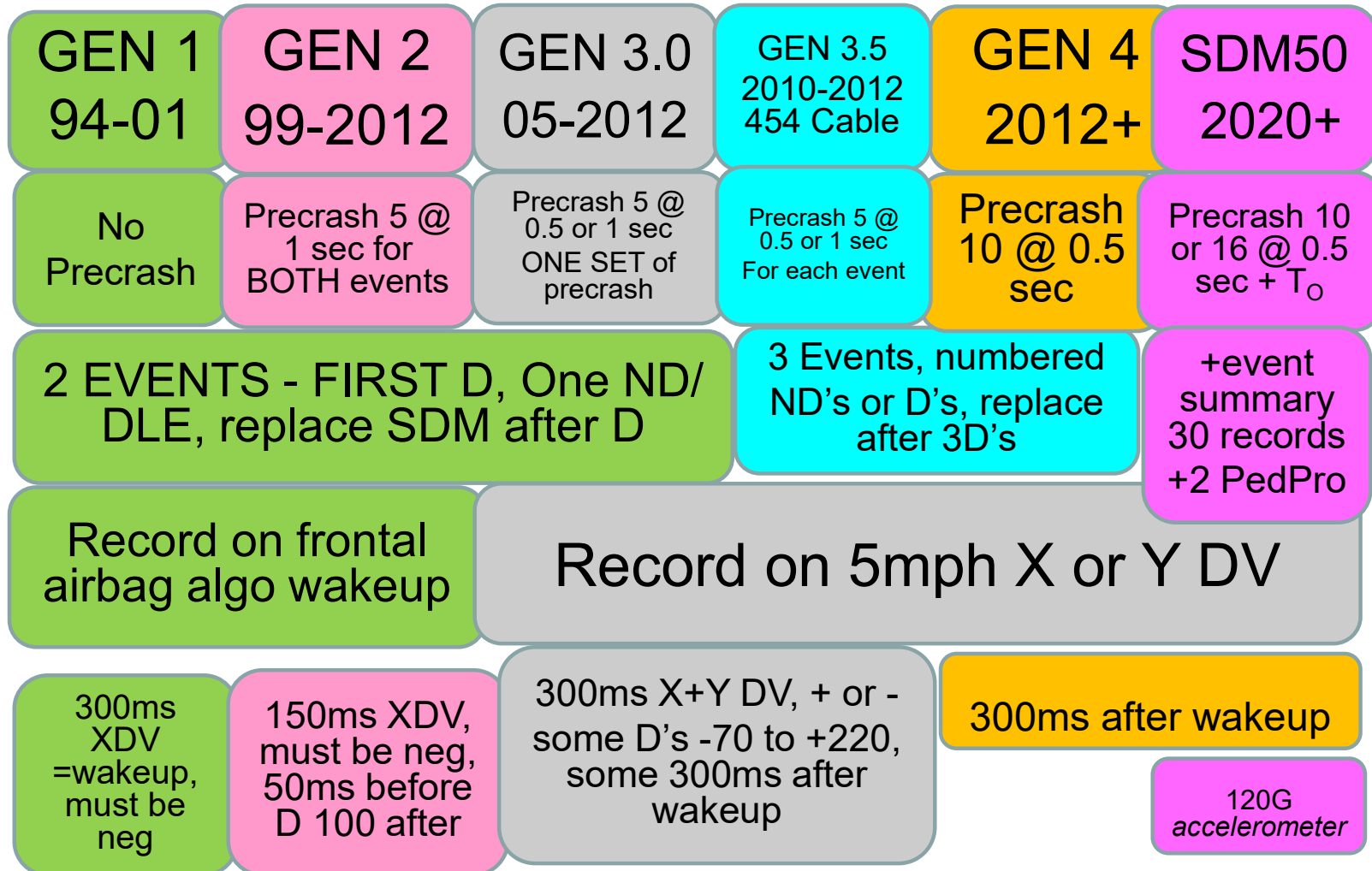
GM full chart printed in color in your book
and is on student reference disk

Chevrolet Recent Changes **87%** **563**

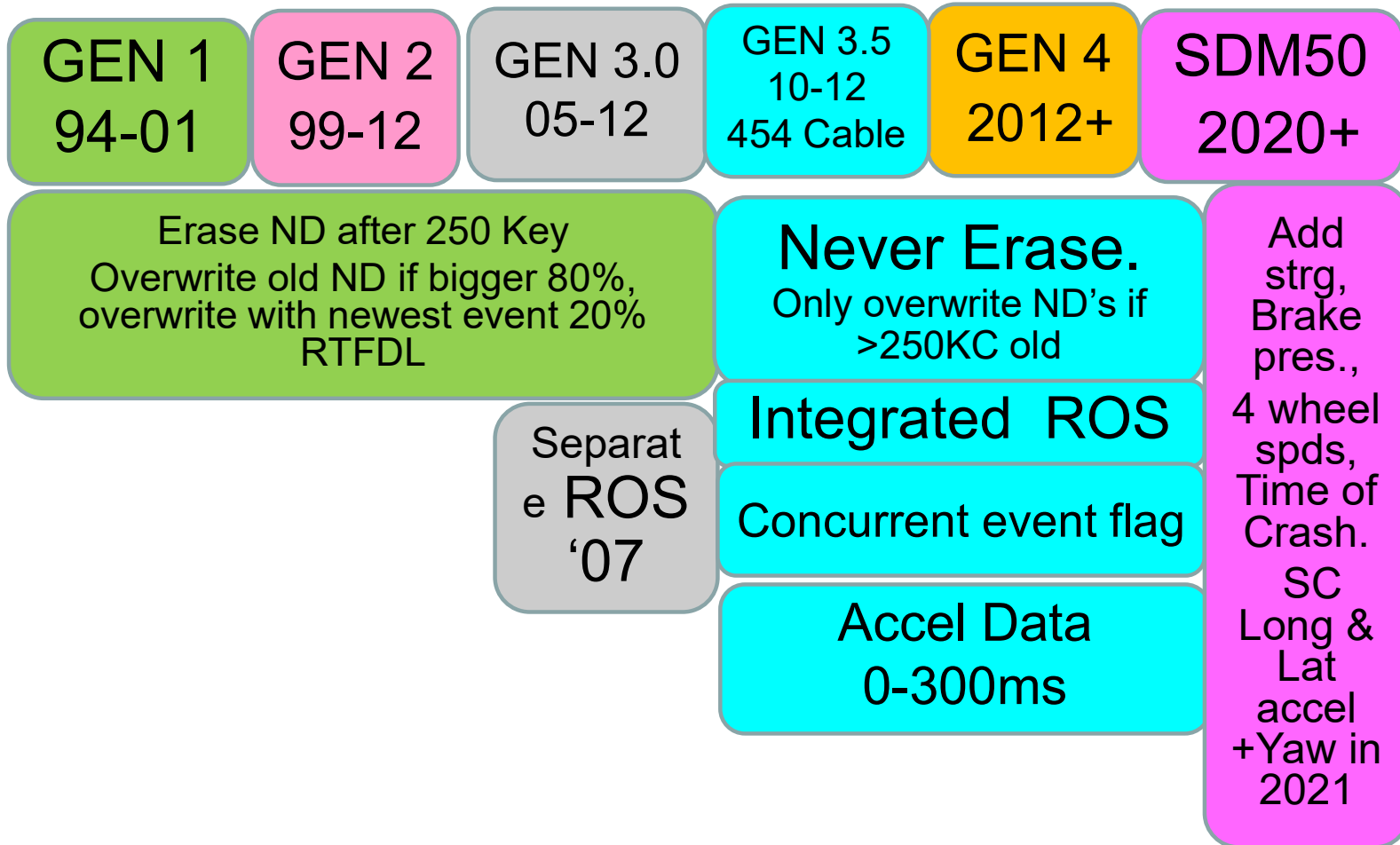
	Part 563 Intent					1 animation				SDM50	GM		
Model	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022		
Avalanche	454	454	*										
Aveo		454	*				454						
Beat (India)			454	454									
Blazer								454	454	454	454		
Bolt EV							454	454	454	454	454		
Camaro	454	454	454	454	454	454	454	454	454	454	454		
Caprice	454	police	police	police	police	police	police						
Captiva	454	454	*	Sport	Sport								
City Express				780	780	780	780	780					
Colorado	3003			454	454	454	454	454	454	454	454		
Corvette	3003	3003	454	454	454	454	454	454	845	845	845		
Cruze	454	454	454	454	454	454	454	454	454				
Equinox	454	454	454	454	454	454	454	454	454	454	454		
Express	3320 ROS	3320 ROS	3320 ROS	3320 ROS	454	454	454	454	454	454	454		
Impala	454	454	454	454	454	454	454	454	454				
Kodiak					2016	2017	2018	2019	2020	2021	2021		
Low Cab Fwd								454					
Malibu	3321	3321 (2012)	454	454	454	454	454	454	454	454	454		
Matiz	454												
Orlando	454	454	454										
Silverado	454	454	454	454	454	454	454	454	454	454	454		
Sonic	454	454	454	454	454	454	454	454	454				
Spark		454	454	454	454	454	454	454	454	454	454		
SSR			SS	454	454	454							
Suburban	454	454	454	454	454	454	454	454	454	845	845		
Tahoe	454	454	454	454	454	454	454	454	454	845	845		
Tracker							454	454	454	454	454		
TrailBlazer										454	454		
Traverse	454	454	454	454	454	454	454	454	454	454	454		
Trax		454	454	454	454	454	454	454	454	454	454		
Volt	454	454	454	454	454	454	454	454					

No Precrash in 2013-5 Express/Savanna

GM EDR Evolution



GM EDR Evolution #2



2020 Corvette SDM50 Data

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 1 of 6

Time (sec)	Accelerator Pedal, % Full (%)	ABS Activity	Brake Pedal Position (%)	Driver Applied Brake Pedal Pressure (kPa)	Driver Applied Brake Pedal Pressure Detected	Brake Pedal Moderate Travel Achieved
-8.0	0	Off	0	0	False	False

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 2 of 6

Time (sec)	Cruise and Speed Limiter Switch Status	Cruise Secondary Switch Status	Cruise Control Active	Adaptive Cruise Control Active Authenticated	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-8.0	No Activation	No Activation	Inactive	Inactive	Ninth	Forward Range A	Off

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 3 of 6

Time (sec)	Engine RPM (RPM)	Engine Torque (foot-pounds)	Engine Throttle, % Full (%)	Speed, Vehicle Indicated (MPH [km/h])	SC accel + Yaw 2021	Right Front Wheel Angular Velocity (RPM)	Left Front Wheel Angular Velocity (RPM)
-8.0	1,301	50.5	16	44.1 [71]		595	598

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 4 of 6

Time (sec)	Right Rear Wheel Angular Velocity (RPM)	Left Rear Wheel Angular Velocity (RPM)	Steering Wheel Angle (deg)	Propulsion System Active	Run/Start Input	Ignition Prolongation Time (sec)	Secondary Collision Prolongation Timer (sec)
-8.0	599	598	0	True	High	5.0	0.0

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 5 of 6

Time (sec)	Antilock Brake System Failed	Brake Pedal Override Flag	Traction Control System Present	Traction Control System Failed	Traction Control System Enabled	Traction Control System Active	Traction Control System Driver Intent
-8.0	False	False	True	False	True	Traction Control Off	Enabled

More 2020 Corvette SDM50

- 3 AACN records in Eng Translation Rpt
- GPS Lat/Long at crash
- Turn Signal Switch Status
- Second and third row seat belt status
- Up to 30 Event Summary records give clear order of events
- Outside Air Temp, Brake Overrides
- Traction Control activate
- Auxilliary Crash Sensor Data

EVERYTHING GM COULD IMAGINE

GM Gen 3.5 & 4 Features

1. 2010 454 cable SDM's do not require replacement after a D (until 3 D's).
2. Events & deployments all numbered vs. labeled D/ND.
3. Events may not be in order algorithms started, they are in order they qualified for recording (see graphic next page)
4. **Align precrash data for all events to see relationship**
5. Black plastic SDM housings
6. Accelerometer max values listed in DL⁷³s

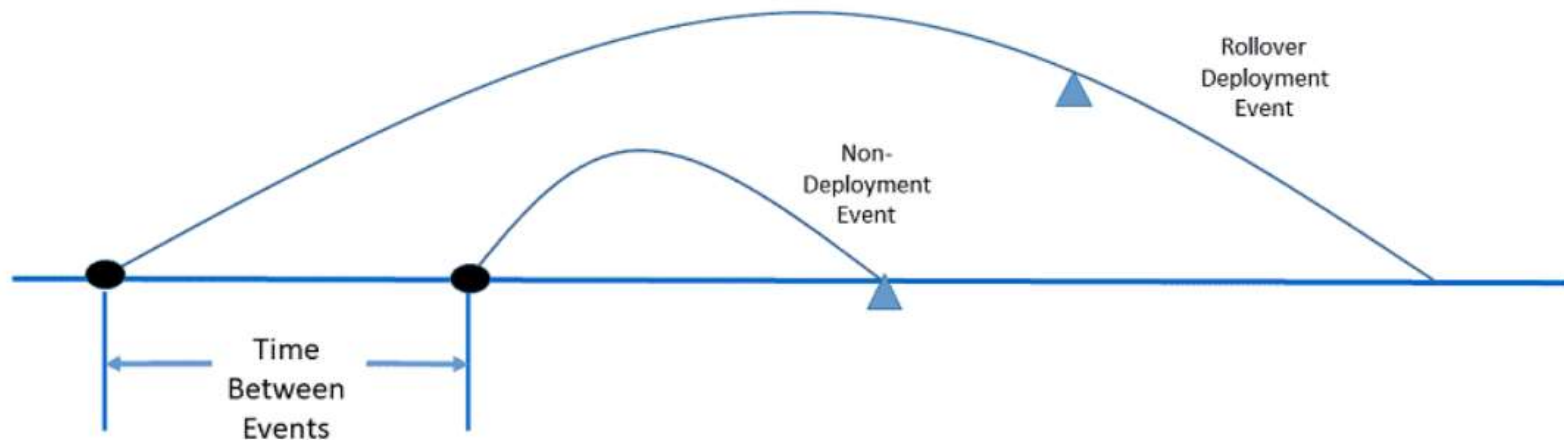
GM Concurrent Event Flag

-A Concurrent Event is when two events are happening nearly simultaneously. The "Concurrent Event Flag Set" parameter will indicate "Yes" if one event begins, but before that event is qualified, another event begins and is qualified.

A Non-Deployment event typically becomes qualified if that event exceeds the 5 MPH (8 km/h) delta V recording threshold and the event has concluded. A deployment event (FSR or Rollover) becomes qualified when a deployment has been commanded for that event.

Example of a Concurrent Event:

A Rollover event begins. Before the Rollover event is qualified, a Non-Deployment event begins and is qualified. Sometime after the Non-Deployment event is qualified, the Rollover event is qualified. The Non-Deployment event will be recorded in the first open record even though the Rollover event enabled before the Non-Deployment event. The Rollover event will be recorded in the next open record. The "Concurrent Event Flag Set" parameter will indicate "Yes" for the Rollover event. The "Time Between Events" parameter will indicate the time from the start of the Rollover event to the start of the Non-Deployment event.



Event Recor #1	Event Record #2
Event Record Type = Non – Deployment	Event Record Type = Rollover
Concurrent Event Flag = No	Concurrent Event Flag = Yes
Time Between Events = NA	Time Between Events = XX seconds

When Concurrent Event Flag is Yes, Overlay Precrash Data from all events

- The event number gives when the event QUALIFIED for recording, not when I started
- Time between events is time between consecutive wake-ups, NOT always time between qualifying events
- Recap Delta V or, if rollover, event type over precrash data to assist understanding

Record 1 -57X, 39Y Event 1 of 5 Time Between Events NA	Record 2 Rollover Event 2 of 5 Time Between Events 0.75	Record 3 +1X, -5Y Event 4 of 5 TBEv 1.01
	47 [75]	Speed, Vehicle Indicated (Vehicle Speed) (MPH [km/h])
45 [73]	45 [73]	
44 [71]	44 [71]	
43 [69]	43 [69]	
41 [66]	41 [66]	41 [66]
38 [61]	38 [61]	38 [61]
31 [50]	31 [50]	31 [50]
30 [49]	30 [49]	30 [49]
30 [49]	30 [49]	30 [49]
23 [37]	23 [37]	23 [37]
11 [17]		11 [17]
		17 [27]
		Data Not Available
		Data Not Available

Noteworthy GM news

1. Conti SDM-30 data incomplete file not accurately interpreted by CDR – not fixable. Must send to Conti for readout and interp. (data lms detail how)
 2. GM note 6 (no key needed) vehicles initially had 2 fuses, SDM bat and SDM ignition. Newer GM vehicles may have only ONE SDM fuse, normally bat, but police packages may only power it with ignition
-
1. Foreign coverage – China since 99 (but only Gov't/NPS can use CDR), Australia/Korea/Thailand since 07

GM Active Safety Control Module

1. First installed in 2013 Cadillac ATS
2. Only with GM option UGN or UKL
3. Initially released in CDR 17.9 to get raw data file only for future interpretation.
4. Interpretation capability added in 19.1
5. REQUIRES CDR 900 interface!
6. Some vehicles have TWO ASCM modules.

GM ASCM CDR 21.4 Coverage

<u>Model</u>	<u>Location</u>	<u>Model Year</u>										
3 digits Bosch CDR cable ID shown												
BUICK		<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	
ENCLAVE	cargo left front of wheel well						833 1B					
ENVISION	rear seat left trim by wheel wl				833 1A	833 1B				854 3-LC		
LACROSSE	trunk left					833 1B						
REGAL	trunk left						833 1B					
CADILLAC		<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	
ATS	trunk left	833 1A					833 1B					
CT4	Trunk upper shelf								854 3-LC	855 3-HC		
CT5	Trunk upper shelf								854 3-LC	855 3-HC		
CT6	Primary right, secondary left				833 1A		833 1B, 834 2					
CTS SEDAN	trunk left		833 1A				833 1B					
CTS	trunk left				833 1A		833 1B					
ESCALADE	under left qtr window trim			833 1A			833 1B			854/855 LC/HC		
SRX	under left rear seat	833 1A										
XT4	cargo left front of wheel well							833 1B				
XT5	cargo left front of wheel well					833 1B						
XT6									833 1B		833 1B/834 2	
XTS	trunk left	833 1A					833 1B					
CHEVROLET		<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	
BOLT	trunk left										834 2	
BLAZER	trunk left							833 1B				
MALIBU	trunk left				833 1A	833 1B						
SUBURBAN											854 3-LC	
TAHOE											854 3-LC	
TRAVERSE	trunk right						833 1B					
VOLT	trunk left					833 1B						
GMC		<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	
ACADIA	cargo left front of wheel well					833 1B						
HUMMER EV											855 3-HC	
YUKON										854 3-LC		

GM Active Safety Control Module

Mkt	Year/Make	Model	Module		Vehicle Interface	OBD/DLC Connect Adapter/Cable	D2M Connect Adapter/Cable	Module Location
4	2018 Cadillac	ATS (note 6)	ACM	Data	CANplus	CANplus - F00K108287	CANplus - F00K108454	Center tunnel
			ASCM (Note1)	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 833	In the luggage compartment, left side, near rear, on outboard side of brace, behind trim
6	2018 Cadillac	ATS-L (note 6)	ACM	Data	CANplus	CANplus - F00K108287	CANplus - F00K108454	Center tunnel
4,6	2018 Cadillac	CT6 (note 6)	ACM	Data	CANplus or CDR 900	CANplus - F00K108287 CDR 900 - click here	CANplus - F00K108454 CDR 900 - click here (use listed cable above)	Center tunnel
			ASCM (Note2) how to image	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 834	In the luggage compartment, right center, mounted to the right side in the battery well. The secondary ASCM is on the left.
			ASCM (Note1)	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 833	In the luggage compartment, right center, mounted to the right side in the battery well

GM Active Safety Module



1. **Must be downloaded separately from ACM**
2. Icon will appear after VIN input for any vehicle that MIGHT have Super Cruise
3. Module /data will only be present if option “UKL” (Super Cruise) or “UGN” (Adv Driver Assist) has been purchased for the subject vehicle (most DO NOT have it).

GM ASCM EDR – New Icon

Effective with V 19.6 of the software, the ASCM “RADAR” Icon has been replaced by new Icon



OLD



NEW

Drop Down Menu
Added for FCM

- Best guess is that there is more upcoming automated sensing data, from other mfrs, that have more than just frontal radar.

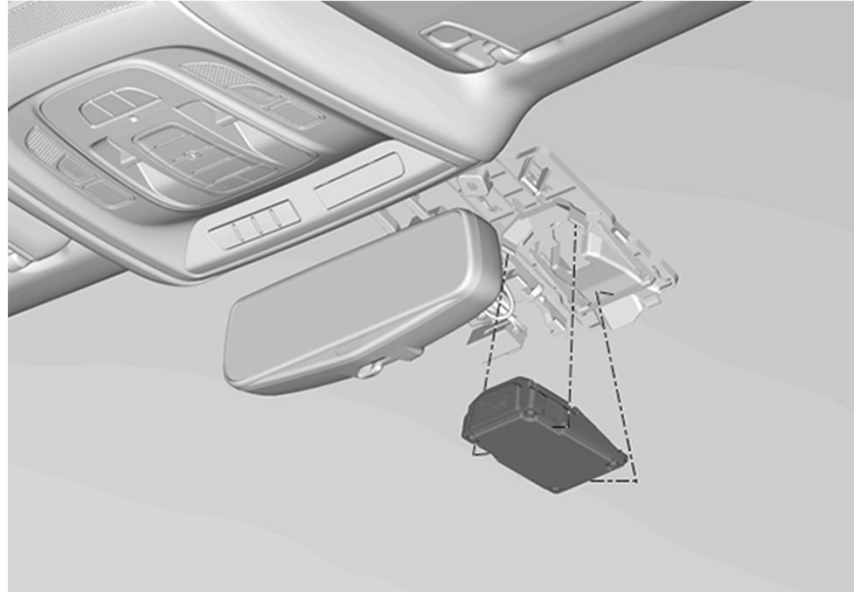
GM Active Safety Module

1. Data can be captured every 80 milliseconds and can record up to 50 records for a total of 4 seconds of data. The data recording window can be either 4 seconds before the end of an auto braking event or 4 seconds before an airbag deployment. ONE EVENT ONLY
2. Data is recorded in non-volatile memory at the next proper power-down of the module. Data may not be stored if the battery power is lost before the power-down.

GM Auto Emergency Braking

1. AEB will prevent many crashes and reduce the severity of crashes still happening
2. If there is still a crash, the AEB system may store up to **3 camera images in FCM***:
 - a) 4 sec before event (*Fwd Camera Module)
 - b) At event
 - c) 4 sec after event
3. **Some accessible with CDR 21.2** – others must be requested with proper legal authority from GM

Front Camera Module (FCM)



FCMs are mounted on the windshield near the rear view mirror.

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GM FCM EDR

- GM released the ability to read data from Front Camera Modules (FCM) with V 21.2 of the CDR Software (Date: 8/2021)
- The data consists of photos taken before, during, and after the crash.
- Not all GM cars are equipped with FCMs
- Some cars have FCMs but are not supported at this time
- We can identify which cars have an FCM by
 - Looking for presence of the camera module near the rear view mirror
 - Verifying the (RPO) UEU and UGN in the vehicles Service Parts Identification sticker, or through the QR code on the FMVSS Sticker (see photos)



FCM access released Aug 2021 in GREEN

Model	Location	Model Year									
3 digits Bosch CDR cable ID shown		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BUICK											
ENCLAVE	cargo left front of wheel well						ASCM				
ENCORE									FCM		
ENVISION	rear seat left trim by wheel w/				ASCM			FCM			
LACROSSE	trunk left					ASCM					
REGAL	trunk left						ASCM				
CADILLAC											
ATS											
CT4								FCM			
CT6 w/o UKL	Trunk right					ASCM	without supercruise				
CT6 w/UKL	Primary right, secondary left				834	Supercruise Option Code UKL					
CTS SEDAN	trunk left		ASCM								
CTS	trunk left				ASCM			FCM			
ESCALADE	under left qtr window trim			ASCM							
SRX	under left rear seat	ASCM									
XT4	cargo left front of wheel well							ASCM			
XT5	cargo left front of wheel well					ASCM					
XT6										ASCM	
XTS								FCM			
CHEVROLET											
BLAZER	trunk left							ASCM			
CRUZE								FCM			
EQUINOX								FCM			
MALIBU	trunk left				ASCM						
SILVERADO								FCM			
SPARK								FCM			
TRAVERSE	trunk right						ASCM				
VOLT	trunk left					ASCM		FCM			
GMC											
ACADIA	cargo left front of wheel well					ASCM					
SIERRA								FCM			
TERRAIN								FCM			

GM FCM EDR

- The Lookup file will identify which GM vehicles may have an

Mkt	Year/Make	Model	Module	Vehicle Interface	OBD/DLC Connect Adapter/Cable	D2M Connect Adapter/Cable	Module Location	
4,6	2019 Cadillac	XTS (note 6)	ACM	Data	CANplus	CANplus - F00K108287	CANplus - F00K108454	Center tunnel, forward
			ASCM (Note1)	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 833	In the luggage compartment, under the left side trim panel
			FCM (Note1)	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 856	Center - top interior of windshield

ACM Data may be present

ASCM Data may be present

FCM Data may be present

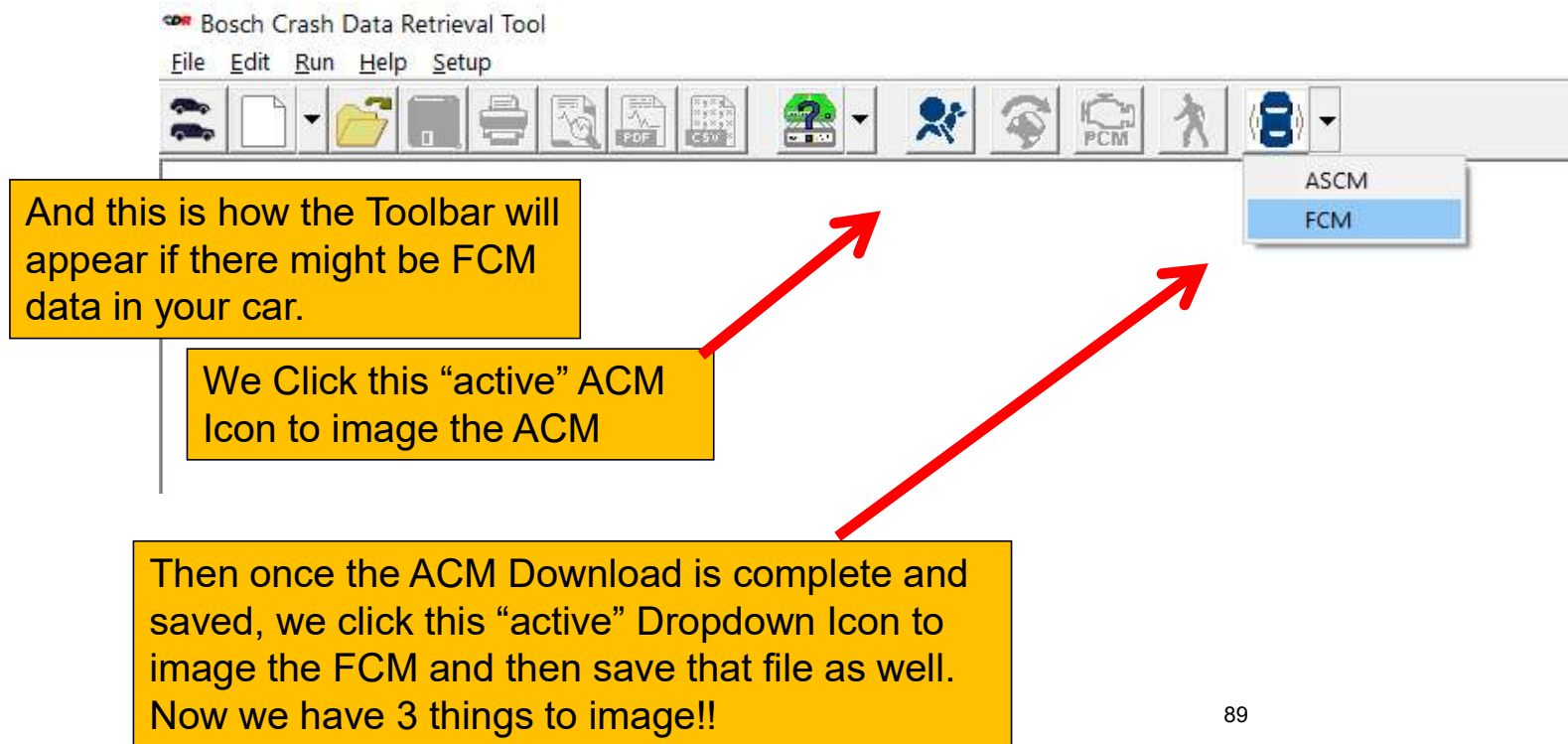
GM FCM EDR

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			ASCM (Note1)	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 833	In the luggage compartment, under the left side trim panel
			FCM (Note1) how to image	Data	CDR 900	CDR 900 - click here	CDR 900 - Cable# 856	Center - top interior of windshield

Note we get hints on how to DL the FCM
– How to image

GM ASCM EDR – Bosch CDR 900



89

GM ASCM EDR – Bosch CDR 900



We repeat the idea that we discussed in the DLC training: If you fail to download and save the data from all available modules you are driving away and leaving unread data in the car.

And, just because you can read the ACM via the DLC does no guarantee that you have communication with the FCM, ASCM, FCM, ROS, etc .

GM FCM EDR

- There are several network pathways in modern vehicles
- Damage may allow DLC communication to one module and prevent comm to another module.
- Do the research to see if your car is equipped with all indicated modules (ACM, ASCM, FCM) and read as necessary (DLC or DTM or maybe one of each)
- At this time FCMs are only readable on 2019MY and later GM's
- If you previously read the SDM and ASCM on an FCM now-supported vehicle, you may have to return to read the data from this new module type
- The FCM raw data was NOT saved in any ASCM files you may have read.

91

GM FCM EDR

- When a CDR file contains image data, the user can export the data using options from the CDR software:

CDR Tool icon



We Click this "Icon" to export FCM images

GM FCM EDR

- The Front Camera Module (FCM) can record two events. Recording is triggered by “events of interest”. The following are possible “events of interest” that trigger data recording listed in the priority order:
 - Airbag Deployment Event,
 - Pretensioner Deployment Event,
 - Non-Deployment Event,
 - Pedestrian Braking,
 - Collision Imminent Braking (CIB)
 - Pedestrian Warning,
 - Front Collision Alert,
 - Lane Departure Warning.

93

93

GM FCM EDR

- The new event is stored only if it is a higher priority than the priority of one of the currently stored events. The new event overwrites the lowest priority event that is already stored.
- If all previously stored events are of equal priority (and are lower priority than the new event), the oldest stored event is the one being overwritten.
- The image data is not rendered directly in the CDR program .
- It must be exported to a file in the images' native format.

94

GM FCM EDR

- Photos are black and white *.pgm files (**P**ortable **G**ray **M**ap)
- You will need a *.pgm file viewer – many free *.pgm apps are available.
(Try www.coolutils.com/online/PGM-to-JPG)
- Users can regenerate the images collected by the FCM as many times as they wish recreating the file as it existed when the data was collected from the vehicle.
- Yet again we see that having the Raw file IS the evidence – As an analyst, *if sharing with another*, you want the raw FCM cdrx file, not someone else's downloaded *.pgm images.
- The data in the FCM CDRx file remains untouched and cannot be changed.
- The images can be downloaded and generated from the Raw file as many times as necessary.

<https://www.coolutils.com/online/PGM-to-JPG>




95

GM FCM EDR

- If the exported image file appears to be changed by another user, you can re-export the image directly from the CDR file it was created; therefore, removing any doubt that the data source was changed after the file was generated.
- One more issue... The FCM image will be upside down.



GM FCM EDR

- The solution is to “Invert” or Flip the photo. DO NOT “rotate” it.
- Original FCM “upside down” photo
- A successfully “inverted” or “flipped” photo
(if you convert pgm to jpg, grab the photo at the top and drag the top thru the bottom of the photo to invert it)
- A confusing, inaccurate “rotated” photo. 
(Note car appears to be driving on *wrong side of road*)



GM RPO Sticker Change

1. GM formerly had a sticker with 3 digit RPO (Regular Production Option) codes printed in the glove box or trunk
2. 2018-ish switched to a “QR code”
3. Google search QR code reader and install one on your phone. Some free, some cost

Apps

Windows apps on Microsoft Store

	Scan - QR Code and Barcode Reader Scan is the fastest and most user-friendly QR reader and barcode scanner available. If your computer came with a built-in scanner, ... 3/5 ★★★★★ (188) · \$1.99	Get
	QR Scanner+ // QR Code and Barcode Reader QR Scanner+ is the most comprehensive app when it comes to scanning/reading QR codes! No matter if the QR code contains a ... 4.5/5 ★★★★★ (215) · \$2.49	Get
	QRReader QRReader it's an app to read the two-dimensional code QR code (Quick Response Code). to use it, you've just to capture the QR ... 2/5 ★★★★★ (207) · Free	Get

ETR Access Removed

- CDR 21.0 removes the ability to see and save the Engineering Translation Report as a PDF file.
- Presumably a policy decision
- If ETR is important to you (speed in Gen3 or later SDM says invalid), reinstall an older version of CDR software to access it

Ford CDR 21.3 Coverage 69%

Model Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
500/Montego/Freestyle									GBR/PCM	-	-															
Bronco/Bronco Sport															563										823	
Cmax																	783									
Cougar	NO		CDR	-	-	-																				
Crown Vic/Grand Marquis	NO	CDR	-	-	RCM				PCM/RCM																	
Econoline	CDR	-	-	-	-	-	-	-	GBR/PCM	-	-	CDR/PCM	384 RC6	RC6 2010	RC6 2011										823	
Ecosport																						823 RC8				?
Edge											PCM/RCM				384 RC6 2011					783* AB10P				823		
Escape/Mariner					RCM				CDR	-	-	-	384 RC6			384	783 AB10P		783*					823		
Escort/ZX2	NO	CDR	-	-	RCM																					
Excursion				CDR	RCM																					
Expedition	NO			CDR	RCM		CDR	-	GBR/PCM	-	-	CDR/PCM	-	-	384 RC6 2011				783 RC7			823				?
Explorer Sport (2 dr)				00.5 >	RCM		CDR																			
Explorer/Mountaineer	NO					CDR	-		GBR/PCM	-	PCM/RCM			CDR/PCM	384 RC6 2011		783		783*					823		
F150	NO		CDR	-	RCM				GBR/PCM	-	-	-		384 RC6					783* RC7		?					
Fiesta															384			783 RC7								
Flex													CDR	384												
Focus				CDR	-	-	-	-				RCM/PCM				597 AB10			783 AB10P							
Fusion/Milan														384				783* AB10P				823* AB12				
GT																						783				
Mach E																									823	
Maverick																									823	
Mondeo																									823	
Mustang	NO	NO	CDR	CDR	RCM			RCM	GBR/PCM			CDR/PCM	-	384					783*	RC7P						
Ranger	NO	CDR	CDR	CDR	RCM						CDR			384								823*				?
Sport Trac (pickup bed)				00.5 >	RCM		CDR	-			PCM/RCM		PCM/RCM		CDR											
Super Duty F250-550		CDR	CDR	CDR	RCM				RCM/PCM**		PCM**	CDR/PCM	-	-	384					783*	RC7P					
Super Duty 600+																										
Taurus/Sable	NO	CDR	CDR	CDR	RCM	CDR	-	-	-	-	-		CDR/PCM	-	384			783 RC7								
T-bird	NO	NO			RCM		RCM/PCM																			
Transit																										
Transit Connect															CDR	-	-	778*	783	RC7		783 RC7			823	
Windstar/Freestar/Monterey	NO	NO	CDR	-	RCM			CDR	-	-	-															
Model Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Aviator (Explorer)												GBR/PCM													823	
Continental			CDR	-	RCM																	823*				
LS				CDR	RCM			GBR/PCM																		
Mark LT (F150 platform)										GBR/PCM	CDR/PCM	-														
MKC (Escape Platform)																			783*	AB10P					823*	
MKS (Taurus Platform)														384				783								
MKZ, Zephyr (Fusion platform)										PCM/RCM		CDR/PCM	-	384			783	783*	RC7		823* AB'					
MKT '10 (Flex Platform)													CDR/PCM	384	384											
MKX (Edge Platform)															384						783*	AB10P		823		
Town Car (Cr Vic)	NO	CDR	-	-	RCM				PCM/RCM																	
Navigator (Expedition)		NO		CDR	RCM		CDR	-	GBR/PCM	-		CDR/PCM	-	-	384				783	RC7		823				

X DV

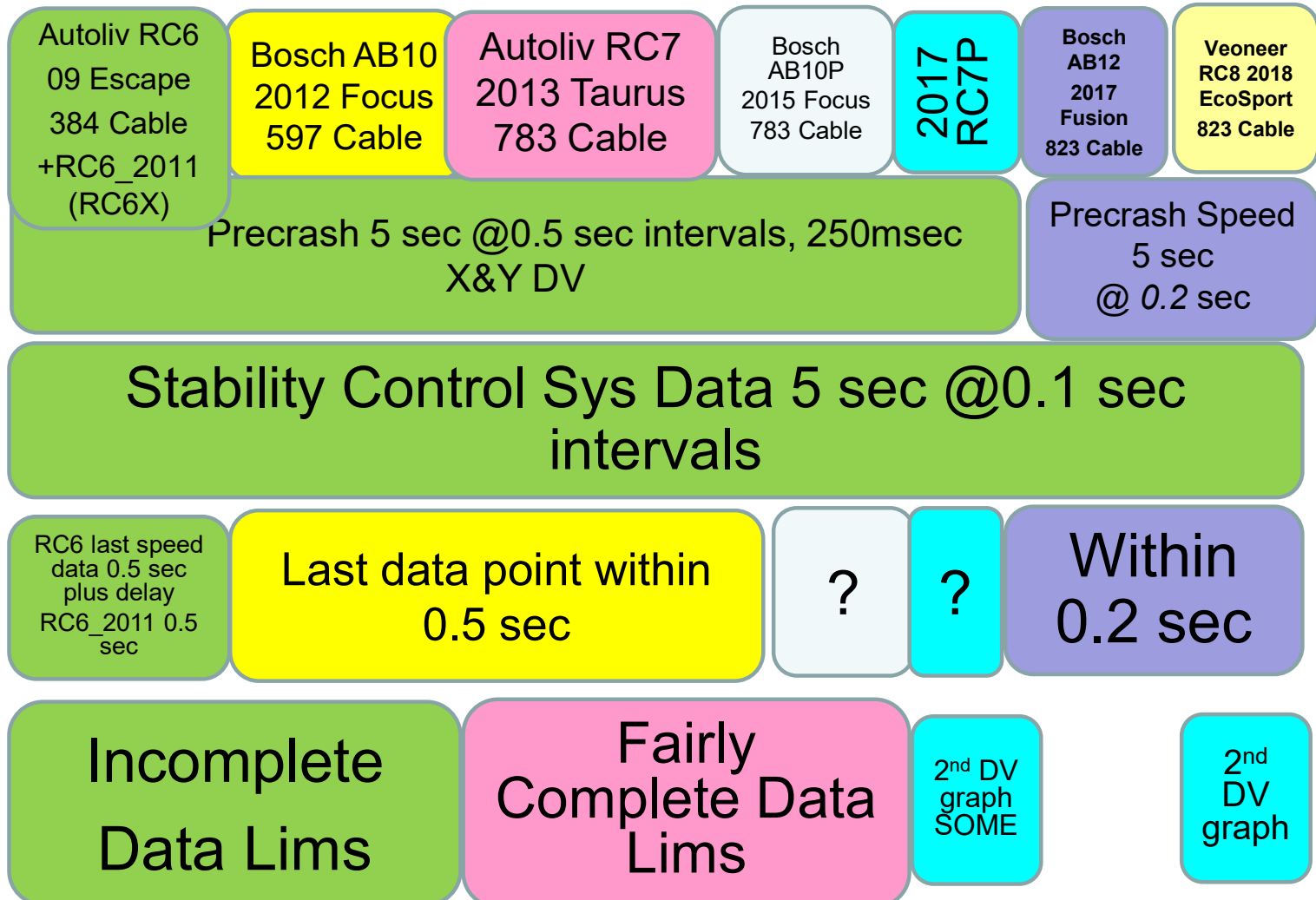
SPEED
In ND's, YDV

+SPEED
In deployments

Ford w/Stability Control Data 21.3

	Model Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
FORD/MERCURY (Merc Discontinued 2011)	500/Montego/Freestyle														
	Bronco/Bronco Sport													823	
	Cmax					783									
	Crown Vic/Grand Marquis														
	Econoline	384												823	
	Ecosport										823 RC8				?
	Edge			384					783* AB10P				823		
	Escape/Mariner	384			384	783 AB10P		783*					823		
	Expedition	-	-	384				783 RC7			823				?
	Explorer/Mountaineer	GDR/PCM	-	384		783			783*				823		
	F150	384						783* RC7		?					
	F250-F550 Super Duty	-	-	384						783*	RC7P				
	F600-750 Medium Duty													783	
	Fiesta			384			783 RC7								
	Flex	CDR	384												
	Focus				597 AB10			783 AB10P							
	Fusion/Milan	-	384			783* AB10P				823* AB12				PHEV	PHEV
	GT										783				
	Mach E													823	
	Maverick													823	
	Mondeo													823	
	Mustang	-	384					783*	RC7P						
	Ranger	-	384									823*			?
	Sport Trac (pickup bed)	PCM/RCM		CDR											
	Taurus/Sable	-	384			783 RC7									
	Transit T150-T350							783 RC7						823	
	Transit Connect		CDR	-	-	778*	783	RC7						823	
	Windstar/Freestar/Monterey														
LINCOLN		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Aviator (Explorer)												823		
	Continental									823*				?	
	MKC/Corsair (Escape Platform)							783*	AB10P				823*		
	MKS (Taurus Platform)		384			783					see aviator				
	MKZ, Zephyr (Fusion platform)	-	384			783	783*	RC7		823* AB					
	MKT '10 (Flex Platform)	CDR/PCM	384	384											
	MKX/Nautilus (Edge Platform)			384					783*	AB10P		823			
	Town Car (Cr Vic)														
	Navigator (Expedition)	-	-	384				783	RC7		823				

Ford Part 563 EDR Subfamilies



Identifying Ford EDR families

1. At the end of the data limitations section, just below the last paragraph, on the left, Bosch puts what version of data limitations is being printed. For Ford, most data limitations by family.
2. No difference between DL
 - a) 2009 RC6 and
 - b) 2011 RC6X.
3. Open cdrx copy in notepad, see RC6_2011

Data Sources:

The Restraints Control Module (RCM) can

1. Internal to the RCM such as internal sensors calculated and stored internally.

2. External to the RCM but with a direct connection measured, calculated and stored internally.

3. External Modules to the RCM such as ABS, ESP, etc. RCM via Vehicle Communication Network

02014_RCM **AB10** PCD4-2_r001

RC8 Precrash Data Look

Pre-Crash Data -5 to 0 sec [5 samples/sec] (First Record)

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Speed, Vehicle Indicated, Quality Factor	Accelerator Pedal, % Full	Accelerator Pedal, % Full, Quality Factor	Service Brake, On/Off	Service brake, on/off Quality Factor	Engine RPM
- 5.0	59.8 [96]	OK	18	OK	OFF(Driver_Not_Braking)	OK	2,174

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record) - Table 1 of 2

Time (sec)	ABS Activity (Engaged, Non-Engaged)	Stability Control Active	Traction Control via Engine	Traction Control via Brakes	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)
- 5.0	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.01	0.02

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record) - Table 2 of 2

Time (sec)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)	Steering Wheel Angle (Pinion) (deg)	Steering Wheel Angle (Pinion) Quality Factor
- 5.0	0.06	-1.53	0.0	OK
- 4.9	-0.13	-1.18	0.0	OK

Other RC8 features

- Acceleration data added
- Second Delta V graph centered around deployment +/- 125ms (in SOME RC7P)
- Unique decoder for occupant size

Pre-Crash Data -5 to 0 sec [1 sample/sec] (First Record)

Time (sec)	Occupant Size Classification, Front Passenger (Child size Yes/No [Hex value])	Extended Power Status
- 5.0	No [\$03]	No Fault
- 4.0	No [\$03]	No Fault

Ford Occupant Size Classification

Pre-Crash Data -1 sec (First Record)

Ignition cycle, crash	359
Frontal air bag warning lamp, on/off	OFF
Occupant size classification, front passenger (Child size Yes/No (Hex value))	No [\$08]
Safety belt status, driver	Driver Buckled

- The Hex Value provides additional information than just child yes/no
- The Decoder is different for each supplier and major module type
- Look at end of data limitations for module type – Autoliv=RC5, RC6, RC7; Bosch=AB9, AB10

<u>RC6/7</u>	<u>AB10</u>	<u>AB12</u>	<u>RC8</u>	<u>Classification</u>
\$01	\$00	\$00	\$00	Empty
\$02	\$01	\$05	\$02	Child or Occupied Disable
\$04	\$05	\$04	\$01	Indeterminate (gray zone between child and adult)
\$08	\$02	\$01	\$03	Occupied Enable Small Adult (typical 110 lb 5 th female)
\$10	\$03	\$02	\$04	Occupied Enable Medium (typical 172 lb 50 th male)
\$20	\$04	\$03	\$05	Occupied Enable Large Adult (typical 223 lb 95 th male)

RC8 Lower Recording Threshold?

- Data Limitations State 5mph DV over 150ms threshold for recording
- But events with less than 5mph are seen

Deployment Data (First Record)

Maximum Delta-V, Longitudinal (MPH [km/h])	-2.02 [-3.25]
Time, Maximum Delta-V Longitudinal (msec)	300.0

- Remember, nothing deployed unless a device is listed with a deploy time
- This is an non-deployment

Unusual Ford Event Names

- Fuel Cutoff Level 1 or 2 (RC7P, RC8, AB12)
- Unlocked Event
- Locked Frontal, Side, or Rollover Event
- Rollover Threshold Exceeded (AB12)
- Side Acceleration Threshold Exceeded (AB12)
- Shutdown Request Threshold Exceeded Level 1,2
- Event Record 1 or 2

Multiple events (front, side, rollover) may be listed in the events recovered but there is only one event in memory – they are “all in one”.

Some events like Fuel Cutoff 1 may NOT store data.

2017 MKZ AB12

Pre-Crash Data -5 to 0 sec [5 samples/sec] (First Record) - Table 1 of 2

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Speed, Vehicle Indicated, Quality Factor	Accelerator Pedal, % Full	Accelerator Pedal, % Full, Quality Factor	Service Brake, On/Off	Service brake, on/off Quality Factor	Engine RPM	Cruise Control Driver Accelerator Pedal Override
- 5.0	99.2 [160]	OK	0	OK	Off	OK	2,816	Cruise_Reg_Not_Overridden
- 4.8	98.7 [159]	OK	0	OK	Off	OK	2,800	Cruise_Reg_Not_Overridden
- 4.6	98.3 [158]	OK	0	OK	Off	OK	2,786	Cruise_Reg_Not_Overridden
- 4.4	98.2 [158]	OK	0	OK	On	OK	2,770	Cruise_Reg_Not_Overridden
- 4.2	98.0 [157]	OK	0	OK	On	OK	2,758	Cruise_Reg_Not_Overridden

Every 0.2 Sec!

Pre-Crash Data -5 to 0 sec [5 samples/sec] (First Record) - Table 2 of 2

Time (sec)	Brake Pre-Charge Request	Brake Assist Sensitivity Level	Brake Deceleration Request (m/s^2)	Large Driver Steering or Accel Pedal Input	Collision Mitigation System Fault	Collision Mitigation System Enabled
- 5.0	N/A	N/A	236	N/A	N/A	N/A
- 4.8	N/A	N/A	236	N/A	N/A	N/A

Collision Avoidance

2017 MKZ AB12 add'l data

Pre-Crash Data -5 to 0 sec [2 samples/sec] (First Record)

Time (sec)	Driver Gear Selection (Auto Trans)	Wheel Torque Requested (Nm)	Total Arbitrated Brake Torque (Nm)	Ignition Status	Speed Control Status
- 5.0	Drive	532	0	Run	Off
- 4.5	Drive	120	0	Run	Off
- 4.0	Drive	-20	0	Run	Off

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record) - Table 1 of 2

Time (sec)	ABS Activity (Engaged, Non-Engaged)	Brake Powertrain Torque Request 1	Brake Powertrain Torque Request 2	Traction Control via Brakes	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)
- 5.0	Non-engaged	No	Inactive	No	-0.02	0.09

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record) - Table 2 of 2

Time (sec)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)	Steering Wheel Angle (deg)	Steering Wheel Angle Quality Factor
- 5.0	0.06	0.24	-0.9	OK
- 4.9	-0.08	0.00	-0.6	OK
- 4.8	0.45	0.86	0.0	OK

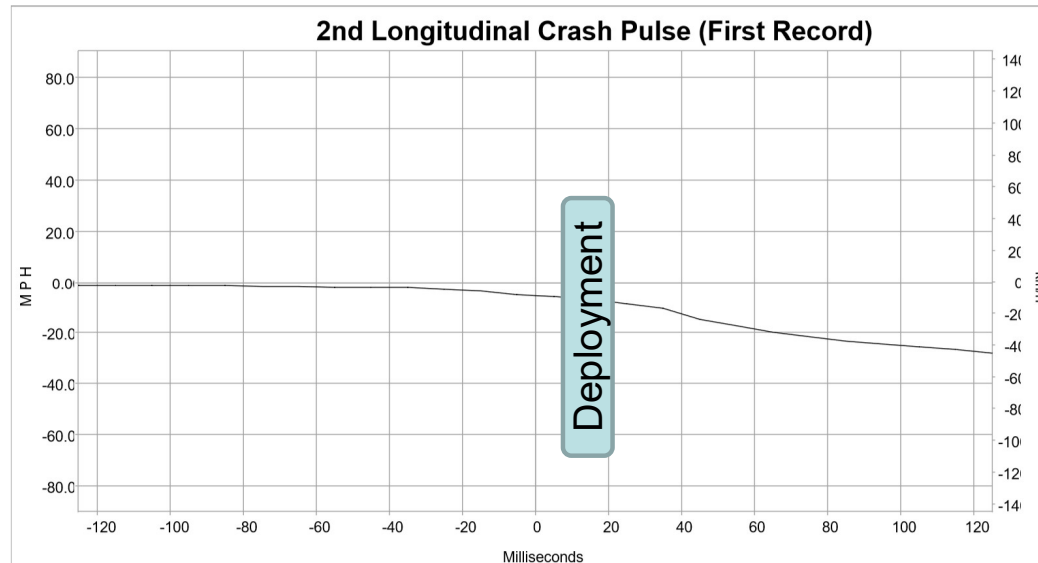
Had this before

Ford AB12 Anomaly

- File found with “Event Record 2” with no “Event Record 1”. Reported to Bosch.
- Check polarities of stability control system data. Ford Steering, Yaw, and Lat Accel 2009+ should all be positive right, negative left, and same sign – ~~but in some Lat Accel is reversed and is not noted in data limitations~~ (CHECKED - FIXED IN 19.5.3)

New RC7P Feature- 2017 F250

- Ford has added a second graph to capture the deployment decision $\pm 125\text{ms}$. This is important in hit-curb-then-hit-tree cases where the deployment was previously off the end of the mandated 250ms after wakeup graph



Ford Global Real Timer

Added for AB12/ RC7P/RC8

Timer starts when car is built, is hooked to battery, runs continuously

Month of build is on door jamb sticker (exact day/time is not)

Can be used to tie your recording to your crash

Great for knowing a more precise time between events when not within 5 seconds

Pre-Crash Data -1 sec (First Record)

Ignition cycle, Crash	1,782
Frontal Air Bag Warning Lamp, On/Off	Off
Safety Belt Status, Driver	Belted
Seat Track Position Switch, Foremost, Status, Driver	Rearward
Seat Track Position Switch, Foremost, Status, Front Passenger	Rearward
Safety Belt Status, Front Passenger	Unbelted
Brake Telltale	Off
ABS Telltale	Off
ESC/TC Telltale	Off
ESC/TC Off Telltale	Default Mode
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL) Telltale	Unchanged Off
Global Real Time (seconds)	47,951,087

Polarity on Stability Control 09+

1. RC6 Data Limitations do not give polarity for stability control data. For lateral it is positive left or CCW. Opposite of right hand rule.
2. New RC7 and AB12 DL's show the stability control lateral polarity as stated above, all 3 backwards of right hand rule

09+ Ford Stability Control Data

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Times (sec)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 1.4	0.086	-0.045	0.12
- 1.3		-0.031	1.5
- 1.2		-0.647	-1.5
- 1.1		-0.75	-2.5
- 1.0		-0.709	-1.5
- 0.9		-0.763	-1.5
- 0.8		-0.826	-1.5
- 0.7		-0.792	-0.75
- 0.6		-0.895	1.25
- 0.5		-0.83	1.87
- 0.4		-0.835	0.75
- 0.3		-0.607	0.37
- 0.2		-0.653	0.75
- 0.1		-0.823	-3.37
0.0	-0.004	-0.811	-3.75

Integrate lat accel - get velocity – integrate again – get displacement

Reaction

Drag Factor!

Integrate yaw – get **approach angle change!!**
Take tangent of cumulative angle, multiply by speed, get **sideways movement** – how far out of lane vehicle went!!

Autoliv RC6 Anomalies (09-10)

1. There are timing delays in reporting the 0.5 sec interval precrash data in the early Ford Autoliv RC6 modules (09 F150-Escape-Econoline and many 2010). Identify by lag between stability control longitudinal (braking) g's and brake on time and speed lost. Use Stability Control System long. accel for timing of accel release and brake on.
2. Fixed by "RC6X", identifiable only by opening COPY of .cdrx in notepad, observe "RC6_2011" in header (and by agreement between stability control and 0.5 sec interval precrash data).

2012-2015 AB10 Anomaly

1. The “Bosch AB10” ACM found in 2012+ Focus and 2015 Escape and other vehicles **produced before Nov. 2015**, which have a **second event**, incorrectly label pre-crash **time** to impact in the second event.
2. Time between events is accurate – use it
3. Second event precrash (both speed and stability control sections) include extra points at irregular intervals labeled as if they occurred at regular intervals.

AB10 Anomaly cont'd

1. If you can see the first event in the second event's data, it will lead you to think the time between events is longer than it really is.
2. The data in the second event did occur, just not at the time it said it did.
3. The second event last precrash speed is still within 0.5 seconds of the second event.
4. There is no software fix for EDR's produced before Nov. 2015. Fix implemented 11/2015.
5. No mention in DL's yet.

Bosch AB10P Unique Info

1. ~~Longitudinal Accel Stability Control Info is~~ **positive for slowing down**, **negative for speeding up** — ~~opposite of what data limitations say.~~ Fixed in latest software
2. ~~Lateral Accel data is~~ **positive right**, **negative left** — ~~different than the other Ford modules.~~ Fixed in latest software
3. Steering and Yaw remain positive left and are identified as such in data limitations.

Ford Red Group Anomalies

- 2006-7 RC5 Lateral Delta V polarity is not stated in the minimal data limitations.
Two recent cases with clear facts showed opposite of right hand rule in 21.0.
- RC5 Lat Delta V graph only 60ms from AE
- 2007+ AB9 Lateral Delta V graph only present if SAB deploys, duration -58ms to deployment.
- AB9 Lifetime operating timer discrepancy between event and readout noted

RC6+ Steering Angle Glitch

1. Ford stores one value for steering relative to original zero position set at factory
2. If vehicle steering is serviced, original zero may be lost and system learns a new one from average of all new driving.
3. EDR may write down ORIGINAL position relative to zero – so a FEW models serviced may appear to have WRONG value for zero.
4. No warning in DL's about this yet

2020/21 F250+ no EDR events

- Ford accidentally turned off the EDR in 20/21 F Super Duty (F250, 350, 450, and 550) ACM's built from 2/18/2019 thru 7/10/2021
- 12/3/2021 Ford issued a Customer Satisfaction Program 21P19 advising of this. Vehicle brought to dealers for other service will reflash the ACM to turn the EDR back on.
- You can ask dealer to run VIN and tell you if 21P19 has been performed before you go to download it so ask not to waste your time.

Backpowering New Fords

1. Airbag system will stay on until car slows to a near stop. Switched battery feed replaces ignition switch feed.
2. Airbag fuse (interior fuse box) Micro 3

19	7.5A ⁷	Extended power module.
----	-------------------	------------------------

3. 2020 Explorer moves to engine compartment

146	15A	Battery electronic control module. ACM Power
-----	-----	--

4. ALSO REQUIRES GATEWAY (INTERIOR FUSE BOX)

13	7.5A	Steering column control module. Smart datalink connector. GATEWAY Instrument cluster.
7	10A	Smart data link connector power. DLC

For Ford EDR **not supported** by Bosch CDR
See “Unsupported Fords” on my website

Many requests can go directly to Ford’s suppliers.
Other requests for assistance to Ford legal:

Email to EDRFORD@FORD.COM

(this is an address for a Bowman and Brooke outside
counsel that handles these requests for Ford)

Contact Rick Ruth for additional information prior to making request

As of this writing, Veoneer (former Autoliv) charges \$2000 to all, Bosch and
Conti are no charge to law enforcement but \$1500 to private parties.

Veoneer now says it cannot download modules >15 years old

Email to rcmdownloads@Veoneer.com is being returned as undeliverable
in last 2 weeks. Use Deborah.Cox@veoneer.com.

**Recent 05 Freestar RCM sent to Takata was returned with Hex Data
only and no guide to interpretation (no charge, no value!)**

ACM suppliers work from home due to COVID, not allowed in lab!

Available on my website

Getting EDR Data from unsupported Fords

Richard R. Ruth, P.E.

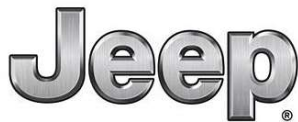
(this copy (this copy has been updated 4-01-2021, after the original)16 CDR
presentation at the Jan 2016 CDR Summit)



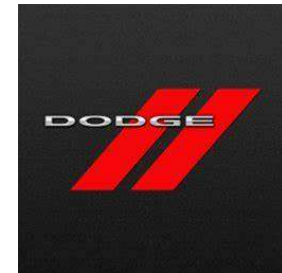
Stellantis (formerly FCA)

Includes Chrysler, Jeep, Dodge, Ram, Fiat,
Lancia, Renault, Citroen and Peugeot

Data Analysis



CHRYSLER

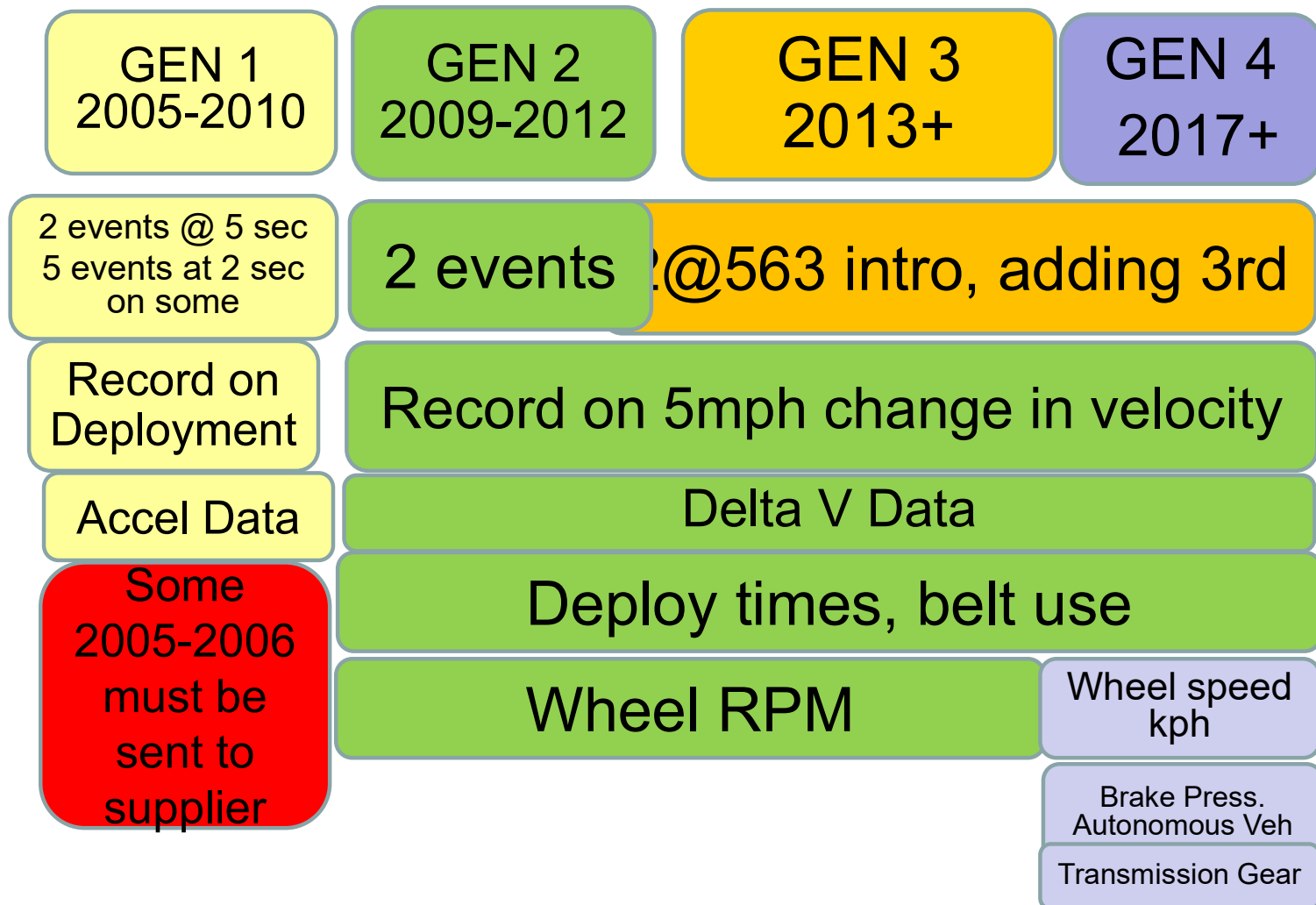


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Stellantis 21.4 CDR Coverage 64%

Last 3 digits of Bosch CDR DTM adapter/cable number s			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Chrysler	200	Console, aft of shifter							790/516		387/516		387/785							
Chrysler	300	Center stack		228 ^{4,5}	228 ⁵				387/598											
Chrysler	Aspen	Console, aft of			226 ⁴	226														
Chrysler	Cirrus (not sold in US)	Console, aft of						387/516 ⁸												
Chrysler	Grand Caravn Voygr	Center stack						387/385 ⁸										387/785		
Chrysler	Pacifica	Center stack			228 ⁵										387/785					
Chrysler	PT Cruiser	Console, fwd of		228 ^{5,7}	228 ⁵															
Chrysler	Sebring	Console, aft of			226 ⁴	226		387/516 ⁸												
Chrysler	Town & Country	Center stack					385 ⁶	387/385 ⁸			387/785									
Dodge	Avenger	Console, aft of					226	387/516 ⁸	387/790/516		387/516									
Dodge	Caliber	Center stack			226 ⁴	226		387/516 ⁸	387/790/516											
Dodge	Caravan	Center stack					385 ⁶	387/385 ⁸			387/785									
Dodge	Challenger	Center stack					228		387/228 ¹⁰	387/228			387/598							
Dodge	Charger	Center stack		228 ^{4,5}	228 ⁵				387/598											
Dodge	Dakota/Raider	Center stack		228 ⁵					228	Mex Only										
Dodge	Dart	Center Stack									387/785									
Dodge	Durango	Console, aft	226 ^{2,4}	226 ^{2,4}	226 ^{2,4}	226 ²	226 ²		387/228 ¹⁰	387/228		387/598								
Dodge	Journey	Console, fwd of shifter					385	387/385 ⁸			387/385	387/385 +516PPT				387/821				
Dodge	Magnum	Center stack		228 ^{4,5}	228 ⁵															
Dodge	Nitro	Console, aft of			227 ⁴	227		387/516 ⁸												
Dodge/Ram	Promaster City	FW of shifter											387/802	+ 709 DLC Adapter						
Dodge/Ram	Promaster (Big Van)	Center stack										387/829 new 17_4	+ 709 DLC Adapter							
Dodge/Ram	Ram Cab Ch	Center console		226 ⁴				387/453 ⁸			387/785									
Dodge/Ram	Ram Pickup (2)	CF Seat/console		226 ⁴			226 ⁵	387/453 ⁸										and classic 1500		
Dodge/Ram	Ram Pickup (1500)	CF Seat/console		226 ⁴		226	453 ⁸	387/453 ⁸	387/453								785 new 1500			
Dodge/Ram	Ram Van	Center Stack									387/785									
Dodge/SRT	Viper	Center Stack									387/785									
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Jeep	Commander	Console, aft		228 ^{4,5}	228 ⁵												Grand commander china only			
Jeep	Compass/Patriot	Center stack			226 ⁴	226		387/516 ⁸	790/516		387/516		387/ 808		808/819	808/819	819			
Jeep	Grand Cherokee	Console, aft of		228 ^{4,5}	228 ⁵				387/228 ¹	387/228+	387/228	387/598								
Jeep	Gladiator	Center Console																821		
Jeep	Liberty/Cherokee	Console, aft				227		387/516 ⁸			?	387/785								
Jeep	Renegade	Center console												387/819*						
Jeep	Wrangler	Console, aft of									387/546						387/821			
Jeep	Wagoneer & G-wag	Center console			227 ⁴	227		387/546 ⁸												785

FCA EDR Evolution (under dev't)



Output New Look –

Removed multiple brake elements, added ABS/SC, moved strg to P1, hi res
Two tables at 0.1 sec interval, others tables @ 0.25 sec intervals

Pre-Crash Data [10 samples/sec] (Most Recent Event table 1 of 2)
(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Pre-Crash Recorder Status	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full	Service Brake	Engine RPM	ABS Activity	Stability Control	Steering Input (deg)
-5.0	Complete	96 [155]	0.00	Off	3,878	No	On	1
-4.9	Complete	96 [154]	0.00	Off	3,835	No	On	-1
-4.8	Complete	96 [154]	0.00	Off	3,726	No	On	-5
-4.7	Complete	96 [154]	0.00	Off	3,621	No	On	-10
-4.6	Complete	96 [154]	0.00	Off	3,489	No	On	-18
-4.5	Complete	95 [154]	0.00	Off	3,344	No	On	-21
-4.4	Complete	95 [153]	0.00	Off	3,210	No	On	-20
-4.3	Complete	95 [153]	0.00	Off	3,109	No	On	-19
-4.2	Complete	95 [153]	0.00	Off	3,068	No	On	-19
-4.1	Complete	95 [152]	0.00	Off	3,108	No	On	-18
-4.0	Complete	95 [152]	0.00	Off	3,079	No	On	-18

Wheel RPM replaced by speed

See driven vs non driven, left vs right, ABS working...


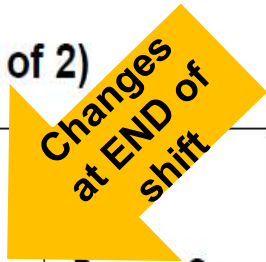
Pre-Crash Data [10 samples/sec] (Most Recent Event - table 2 of 2)
(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	ABS MIL	Yaw Rate (deg/sec)	Wheel Speed LF (km/h)	Wheel Speed RF (km/h)	Wheel Speed LR (km/h)	Wheel Speed RR (km/h)
-5.0	Off	0.40	154.37	154.52	154.55	154.52
-4.9	Off	-0.48	154.28	154.16	154.25	154.25
-4.8	Off	-1.76	154.40	154.09	153.88	153.77
-4.7	Off	-2.80	154.28	153.95	153.88	153.67
-4.6	Off	-4.24	154.01	153.64	153.85	153.55
-4.5	Off	-6.80	153.98	153.16	153.80	153.19
-4.4	Off	-7.12	153.80	152.88	153.70	152.80
-4.3	Off	-5.84	153.49	152.67	153.37	152.62
-4.2	Off	-5.12	153.13	152.19	153.25	152.38
-4.1	Off	-4.64	152.80	152.04	152.91	151.91
-4.0	Off	-4.64	152.49	151.73	152.46	151.65
-3.9	Off	-4.00	152.13	151.55	152.13	151.31
-3.8	Off	-3.68	151.83	151.25	151.95	151.13

Current Gear & More @ 0.25 sec

Pre-Crash Data [4 samples/sec] (Most Recent Event - table 1 of 2)

(the most recent sampled values are recorded prior to the event)





Time Stamp (sec)	Pre-Crash Recorder Status	Raw Manifold Pressure (kPa)	PCM MIL	ETC Lamp	Current Gear	Reverse Gear Status
-5.00	Complete	20.00	Off	Off	D5	Not Reverse
-4.75	Complete	20.00	Off	Off	D5	Not Reverse
-4.50	Complete	21.60	Off	Off	D5	Not Reverse
-4.25	Complete	23.20	Off	Off	D5	Not Reverse
-4.00	Complete	23.20	Off	Off	D6	Not Reverse
-3.75	Complete	23.20	Off	Off	D6	Not Reverse
-3.50	Complete	23.20	Off	Off	D6	Not Reverse
-3.25	Complete	23.20	Off	Off	D6	Not Reverse
-3.00	Complete	22.40	Off	Off	D6	Not Reverse
-2.75	Complete	21.60	Off	Off	D6	Not Reverse
-2.50	Complete	21.60	Off	Off	D7	Not Reverse
-2.25	Complete	21.60	Off	Off	D7	Not Reverse
-2.00	Complete	21.60	Off	Off	D7	Not Reverse
-1.75	Complete	21.60	Off	Off	D7	Not Reverse

Tire pressure @ 0.25 sec intervals

Pre-Crash Data [4 samples/sec] (Most Recent Event - table 2 of 2)

(the most recent sampled values are recorded prior to the event)



Time Stamp (sec)	Tire Pressure Position	Tire Pressure Status	Tire Pressure Value (PSI)	Cruise Control Lamp Status	Cruise Control Engaged Status	ACC On/Off	ACC Set Speed (MPH [km/h])
-5.00	LHF	Normal	34	Off	Not_Engaged	Off	0 [0.0]
-4.75	RHR	Normal	32	Off	Not_Engaged	Off	0 [0.0]
-4.50	RHR	Normal	32	Off	Not_Engaged	Off	0 [0.0]
-4.25	RHR	Normal	32	Off	Not_Engaged	Off	0 [0.0]
-4.00	RHR	Normal	32	Off	Not_Engaged	Off	0 [0.0]
-3.75	LHR	Normal	33	Off	Not_Engaged	Off	0 [0.0]
-3.50	LHR	Normal	33	Off	Not_Engaged	Off	0 [0.0]
-3.25	LHR	Normal	33	Off	Not_Engaged	Off	0 [0.0]
-3.00	LHR	Normal	33	Off	Not_Engaged	Off	0 [0.0]
-2.75	RHF	Normal	33	Off	Not_Engaged	Off	0 [0.0]
-2.50	RHF	Normal	33	Off	Not_Engaged	Off	0 [0.0]

Integrating FCA Yaw Rate

From 08 charger case

- 3 deg/sec * 0.1 sec =	-0.3 degrees
-11 deg/sec * 0.1 sec =	-1.1 degrees
-18 deg/sec * 0.1 sec =	-1.8 degrees
-15 deg/sec * 0.1 sec =	-1.5 degrees
- 9 deg/sec * 0.1 sec =	-0.9 degrees
- 4 deg/sec * 0.1 sec =	-0.4 degrees
- 1 deg/sec * 0.1 sec =	<u>-0.1 degrees</u>
<u>Total Swerve Right</u>	<u>6.1 degrees</u>

Note 1: this is how far nose of car is pointing right – CG motion may lag

Note 2: Polarity opposite RH rule this model

New Chrysler Info

1. Frontal sensors are 100G at 45 degrees ($100 \cdot \cos 45^\circ = 71\text{g}$ straight ahead).
2. “Sensor Design Range Exceeded” line on graph means clipping above that level
3. Buckle switch NOT normally used to determine if pre-tensioner fires (Exceptions on some non US built vehicles)
4. Fiat Spider = Mazda Miata, threshold <5mph
5. Master Cylinder Pressure on 2018 Charger!
6. Driver assistance data elements coming in
7. 2019+ not reading in 21.4, revert to 19.5 to read

Toyota US CDR 21.4 Coverage 84%

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
LEXUS	CT200h																		discontinued				
	ES																			GEN 4			
	GS																					discontinued	
	GX																						
	IS																				GEN 4		
	LC																		GEN 4				
	LFA													out of production									
	LS																		GEN 4				
	LX																						
	NX																					GEN 4	
	RC350	GEN 1 w/PRECRASH																					
	RC-F																						
TOYOTA	RX									Type 1											GEN 4		
	SC																						
	UX																			GEN 4			
	4Runner																						
	86																						844 Suba
	Avalon																		GEN 4				
	Camry																		GEN 4				
	C-HR																				GEN 4		
	Corolla																						
	Echo																			GEN 4			
	FJ																						
	GR Supra (BMW)																		not in production			BMW	
TOYOTA	Highlander																				GEN 4		
	Land Cruiser																					GEN 4	
	Matrix																						
	Mirai																						
	Prius																					GEN 4	
	RAV4																						
	Sequoia																			GEN 4			
	Sienna																					GEN 4	
	Solara																						
	Tacoma																						
	Tundra																						
	Venza																						
TOYOTA	Yaris																						
	FR-S																						
	iA																						
	iM																						
	iQ																						
	tC																						
	xA																						
	xB																						
	xD																						

Chart is only intended to cover US models - No Crown, HiAce, Leven,

No EDR

Post Crash (DV, seatbelt) - 00/02 Type

DV + 5 sec Pre Crash, 00/02 Type

DV + Precrash 04/06 Type

DV, no precrash, 04/06 Type

Not in production

563 Intent, 12/13/15 EDR

GEN 4 17 or 19 EDR

GEN 3

GEN 4

Bosch CDR information is based on the 21.4 help file and available industry information of US (not worldwide) application, but is not guaranteed

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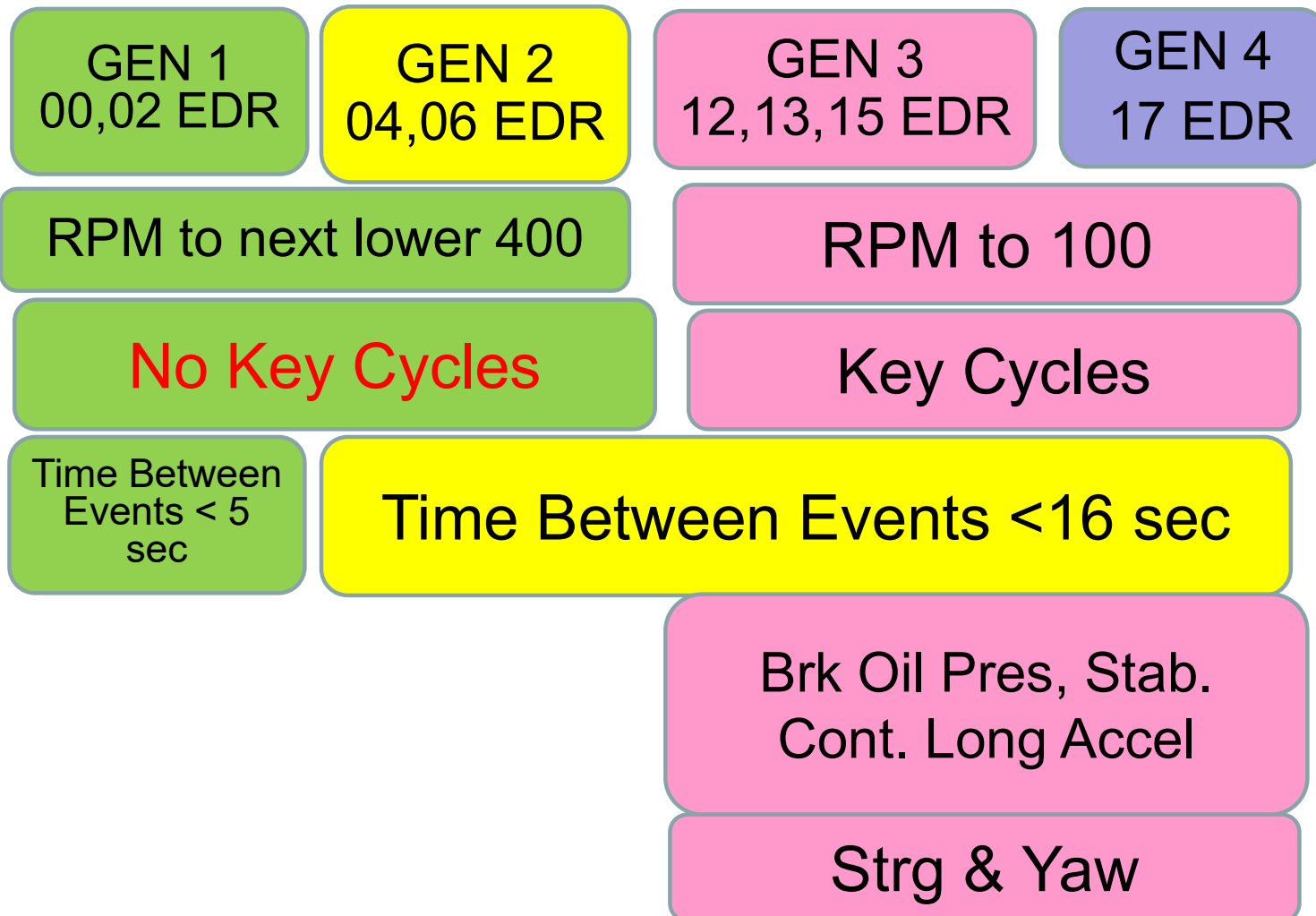
Toyota EDR Evolution

GEN 1 00,02 EDR	GEN 2 04,06 EDR	GEN 3 12,13,15 EDR	GEN 4 17 EDR
3 front 1 side 1 roll	2 front 2 side 2 roll		4 front 4 side 6 precrash
Record on 2g wakeup		Record on 5mph XDV, side 3.5g wake	Record on 5 X or Y DV
150ms XDV 5PC@1 + TRG	200ms XDV 5PC@1+TRG	250ms XDV 10PC@0.5 + TRG	250ms XY 10PC@0.5+TRG

Toyota EDR Evolution cont'd

GEN 1 00,02 EDR	GEN 2 04,06 EDR	GEN 3 12,13,15 EDR	GEN 4 17 EDR
70ms YDV@ACM+sats	12 YDV 70ms sats only 13 250ms ACM	250ms YDV	
REFRESH 500 MS SPEED	REFRESH 24 MS SPEED		
78 MPH TOP, 2kph res	75 MPH TOP. 2kph res	124 MPH TOP 1 kph res	
Accel Pedal Volts	Accel Pedal % & Throttle %		

Toyota EDR Evolution cont'd



New “17 EDR”

- “Front/Rear” events also triggered by 5mph Y DV or side deployment
- Y Delta V from ACM added to frontal events for recon
- More precrash registers (6 vs 2 prior)
- More front/rear & side registers (4 vs 2)
- Separate side events still reported, but do NOT have precrash associated with them. Side events have detail of side satellite sensors (generally ***not used*** by Recons).
- Odometer data element added

17 EDR Event Record Summary

more events, detail on recording status

Event Record Summary at Retrieval

Events Recorded	TRG Count	Crash Type	Time (msec)	Pre-Crash Recording Status	Diagnostic Data Recording Status	Occupant Data Recording Status	Crash Info Recording Status	Time Series Recording Status
Most Recent Event	10	Side Crash	0	N/A	Complete	N/A	N/A	Complete
1st Prior Event	9	Frontal/Rear/Side Crash	-898	Complete	Complete	Complete	Complete	Complete
2nd Prior Event	8	Side Crash	-925	N/A	Complete	N/A	N/A	Complete
3rd Prior Event	6	Side Crash	N/A	Complete	Complete	N/A	N/A	Complete
4th Prior Event	5	Rollover	N/A	Complete	Complete	Complete	Incomplete	Incomplete
5th Prior Event	4	Frontal/Rear/Side Crash	N/A	Complete	Complete	Complete	Complete	Complete
6th Prior Event	3	Side Crash	N/A	N/A	Complete	N/A	N/A	Complete
7th Prior Event	2	Rollover	N/A	Complete	Complete	Complete	Complete	Complete

#7 missing

Pages NOT numbered like Gen3

Lost count due to 7 missing

No precrash for sides

Same Data, New Look to Precrash

Pre-Crash Data -5 to 0 Seconds (1st Prior Event, TRG 2) - Table 1 of 4

Time (sec)	Vehicle Speed (MPH [km/h])	Accelerator Pedal, % Full (%)	Percentage of Engine Throttle (%)	Fuel Injection Quantity (mm ³ /st)	Engine RPM (RPM)	Motor RPM (RPM)	Service Brake, ON/OFF
-5.00	29.8 [48]	49.5	24.5	Invalid	2,400	Invalid	OFF
-4.50	32.3 [52]	47.0	24.5	Invalid	2,500	Invalid	OFF
-4.00	34.2 [55]	38.0	20.0	Invalid	2,700	Invalid	OFF
-3.50	35.4 [57]	32.5	16.0	Invalid	2,800	Invalid	OFF
-3.00	36.7 [59]	26.5	13.5	Invalid	2,400	Invalid	OFF
-2.50	37.3 [60]	22.5	11.0	Invalid	2,400	Invalid	OFF
-2.00	37.3 [60]	19.0	8.5	Invalid	2,200	Invalid	OFF
-1.50	38.5 [62]	19.0	6.0	Invalid	1,900	Invalid	OFF
-1.00	37.9 [61]	18.0	5.5	Invalid	1,900	Invalid	OFF
-0.50	37.9 [61]	18.0	5.0	Invalid	1,800	Invalid	OFF
TRG(0)	36.0 [58]	100.0	26.0	Invalid	1,700	Invalid	OFF

Pre-Crash Data -5 to 0 Seconds (1st Prior Event, TRG 2) - Table 2 of 4

Time (sec)	ABS Control Status	BOS Control Status	Brake Oil Pressure (Mpa)	Longitudinal Acceleration , VSC Sensor (m/s ²)	Yaw Rate (deg/s)	Steering Input (degrees)	Shift Position
-5.00	OFF	OFF	0.00	1.579	-0.98	-4.5	D
-4.50	OFF	OFF	0.00	1.795	0.00	-1.5	D
-4.00	OFF	OFF	0.00	1.292	0.49	0.0	D
-3.50	OFF	OFF	0.00	0.861	0.00	-1.5	D
-3.00	OFF	OFF	0.00	0.718	0.00	-1.5	D
-2.50	OFF	OFF	0.00	-0.072	0.00	-1.5	D
-2.00	OFF	OFF	0.00	0.000	0.00	-1.5	D
-1.50	OFF	OFF	0.00	0.000	-0.49	-1.5	D
-1.00	OFF	OFF	0.00	0.287	0.00	-1.5	D
-0.50	OFF	OFF	0.00	-0.144	0.00	-1.5	D
TRG(0)	OFF	OFF	0.48	-1.507	61.00	-19.5	D

Pre-Crash Data -5 to 0 Seconds (1st Prior Event, TRG 2) - Table 3 of 4

Time (sec)	Sequential Shift Range	Cruise Control Status	VSC Control Status	READY Signal	Drive Mode, Power Train	Drive Mode, Snow	Drive Mode, EV
-5.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-4.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-4.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-3.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-3.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-2.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-2.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-1.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-1.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-0.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
TRG(0)	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid

Pedestrian Protection Module

System Status at Pedestrian Event (1st Prior Event, TRG 1)

TRG Count (times)	1
TRG Count not for Pedestrian (times)	SNA
Ignition Cycle, Crash (times)	353
Odometer signal (miles [km])	1,195 [1,923]
Trip count (times)	392
Time count (msec)	1,283,900
Time count input system	Normal
Airbag Warning Lamp, On/Off	OFF
Pedestrian Warning Lamp, On/Off	OFF
Time from Previous TRG (msec)	32767 or greater
Time from Pre-Crash to TRG (msec)	300
Time between TRG not for Pedestrian and TRG for Pedestrian (msec)	SNA
TRG Establishment not for Pedestrian, within 5 sec.	ON
Freeze Signal	ON
Recording Status, Pre-Crash	Complete
Recording Status, Crash Info.	Complete
Recording Status, EDR Correlation Info.	Complete

Deployment Command Data (1st Prior Event, TRG 1)

Front Pop-Up Hood, Time to Deploy (msec)	3.0
Rear Pop-Up Hood, Time to Deploy (msec)	3.0
Airbag for Pedestrian Deployment, Time to Deploy (msec)	SNA

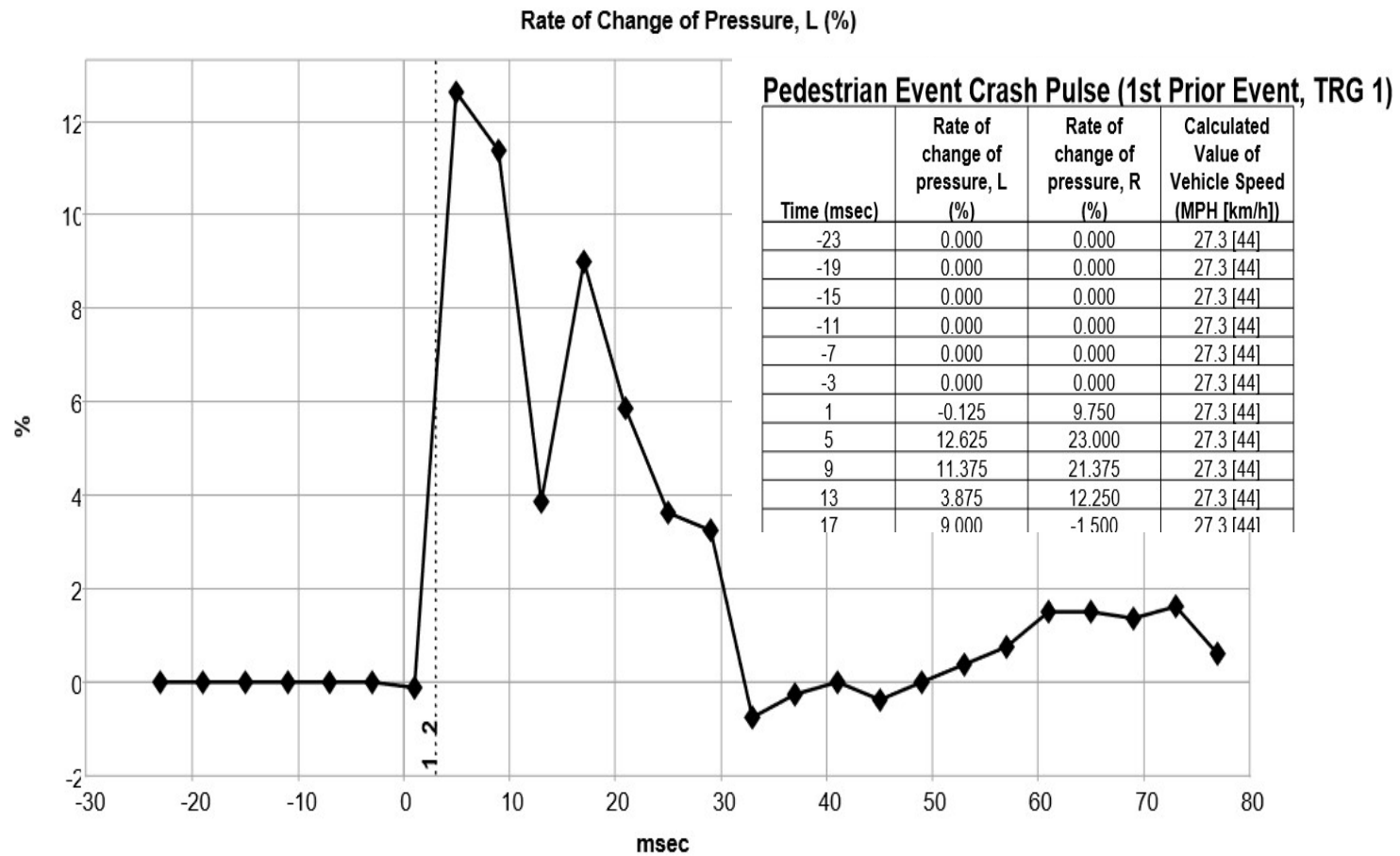
DTCs Present at Time of Event (1st Prior Event, TRG 1)

Recording Status, Diagnostic	Complete
Ignition Cycle Since DTC was Set (times)	0
Warning ON Time Since DTC was Set, for Pedestrian (min)	0
Diagnostic Trouble Codes	None

Pedestrian Event Crash Pulse (1st Prior Event, TRG 1)

Recording Status, Time Series Data	Complete
Time from TRG to Next Sample (msec)	1

Data from L/R bumper pressure sensors on 15 & 17 EDR



Toyota Help File Organization

Supported Toyota Vehicles

Use this section of the help file to determine if a vehicle is supported by the CDR tool and to look up the correct cable (and in some cases, adapter) to use for EDR data directly from the ACM. It is important to note that even if the vehicle is listed in this section, CDR must also support the part number on the ACM. Click on the list of supported ACM part numbers.

[Click here for tips on how to use this Supported Vehicles help topic](#)

This Started in Nov 2015

IMPORTANT: To prevent damage to Toyota ECUs when imaging EDR data directly from the ECU, you must always use the appropriate cable called out in this the help file.

General Toyota Application Notes:

The CDR Tool software will accept most Toyota VINs entered by the user and the *Collect Airbag Control Module Data* icon will no longer be grayed out. **This is not an indicator that the vehicle is supported.** Only the vehicles listed in the help file below are supported as indicated by the list and any associated coverage notes. All supported vehicles listed can be imaged through the vehicle's DLC connector using the CDR OBDII DLC Cable (F00K108287) unless otherwise stated. All supported vehicles require the vehicle's ignition key to be switched on prior to and during EDR record imaging through the vehicle's DLC connector.

Vehicle Specific Application Notes:

[Click here to view all vehicle specific Toyota coverage notes](#)

Vehicles Are Listed Alphabetically
Not by Model Year

Toyota Models begin with: [4](#) [8](#) [9](#) [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [H](#) [I](#) [K](#) [L](#) [M](#) [N](#) [P](#) [R](#) [S](#) [T](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

4Runner (Toyota)	2003 and later	Market: Z		
Year	EDR Generation	CDR Cable & Adapter	Module	Module Location
2002 - 2008	Gen 1 (02EDR)	F00K108617 (no adapter)	ACM	Under Center Stack
2009 - 2011	Gen 2 (06EDR)	F00K108616 & F00K108387	ACM	Under Center Stack
2012 and later	Gen 3 (12EDR/13EDR)	F00K108616 & F00K108387	ACM	Under Center Stack

Help file may be CALENDAR year not model year,
EDR may not yet be present in Model Year of first year listed

Toyota Vehicle Lookup

Camry (Toyota)	2001 and later	Market: Z	All Markets the Vehicle is Sold
Year	EDR Generation	CDR Cable & Adapter	M
2001 - 2004 2005 (US/Canada)	Gen 1 (00EDR/02EDR)	F00K108615 (no adapter) F00K108617 (no adapter) Click here [?] to match the ACM part number to the correct cable	Al
Note CAMRY got EDR in 02 Model Year in US			
2005 - 2011	Gen 2 (04EDR/06EDR)	F00K108613 (no adapter) F00K108614 & F00K108387 F00K108615 (no adapter) F00K108616 & F00K108387 Click here [?] to match the ACM part number to the correct cable	Al
Note CAMRY got 04 EDR in 07 Model Year in US			
2012 and later	Gen 3 (12EDR/13EDR)	F00K108616 & F00K108387	Al
< Models			
Note CAMRY got 12 EDR as running change in 12 model year, early models have 04/06 EDR in US			

Toyota 12 EDR Drawback

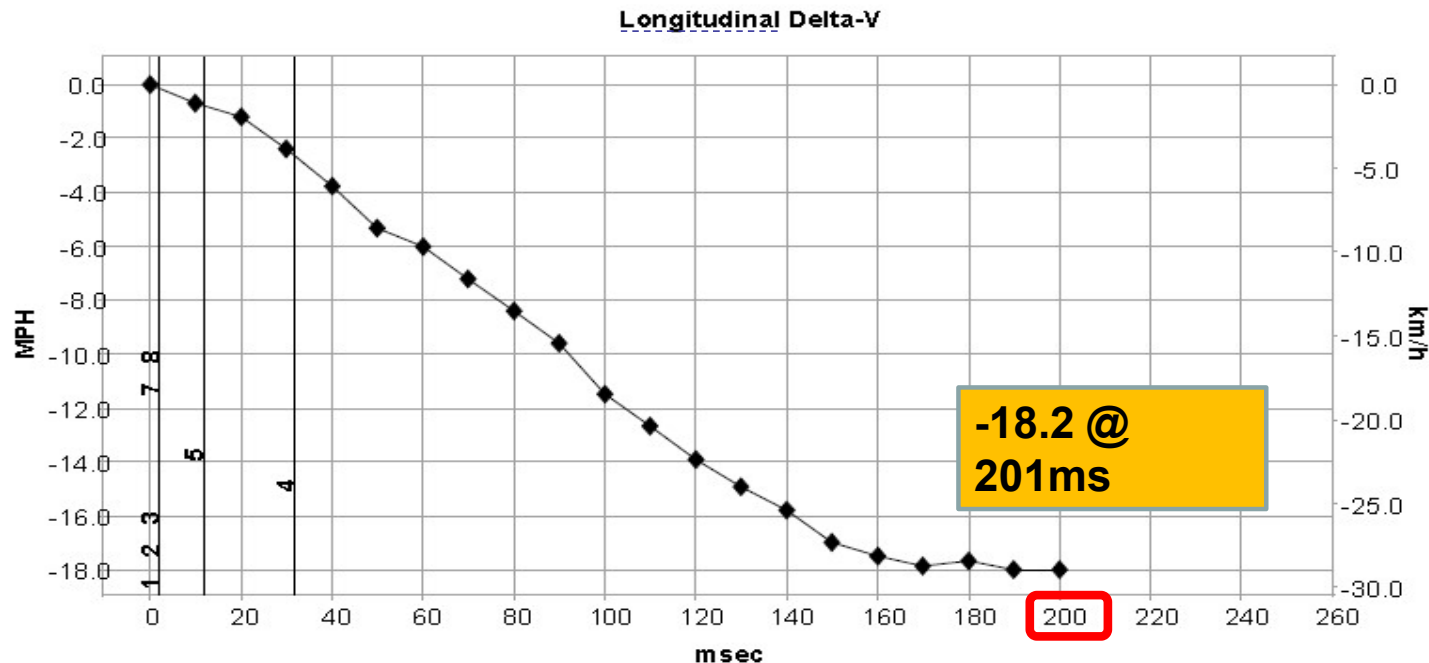
1. Lateral acceleration is only recorded in a side algorithm wakeup.
2. When it is recorded, it is only for 68ms
3. It is only recorded for the side satellites, not for the central control module
4. If trying to calculate a PDOF you must be very aware of the different recording timing and sensor location
5. Fixed in “13EDR” – get 250ms of Y accel

Delta V analysis – What's the PDOF? The Total?? 12 EDR

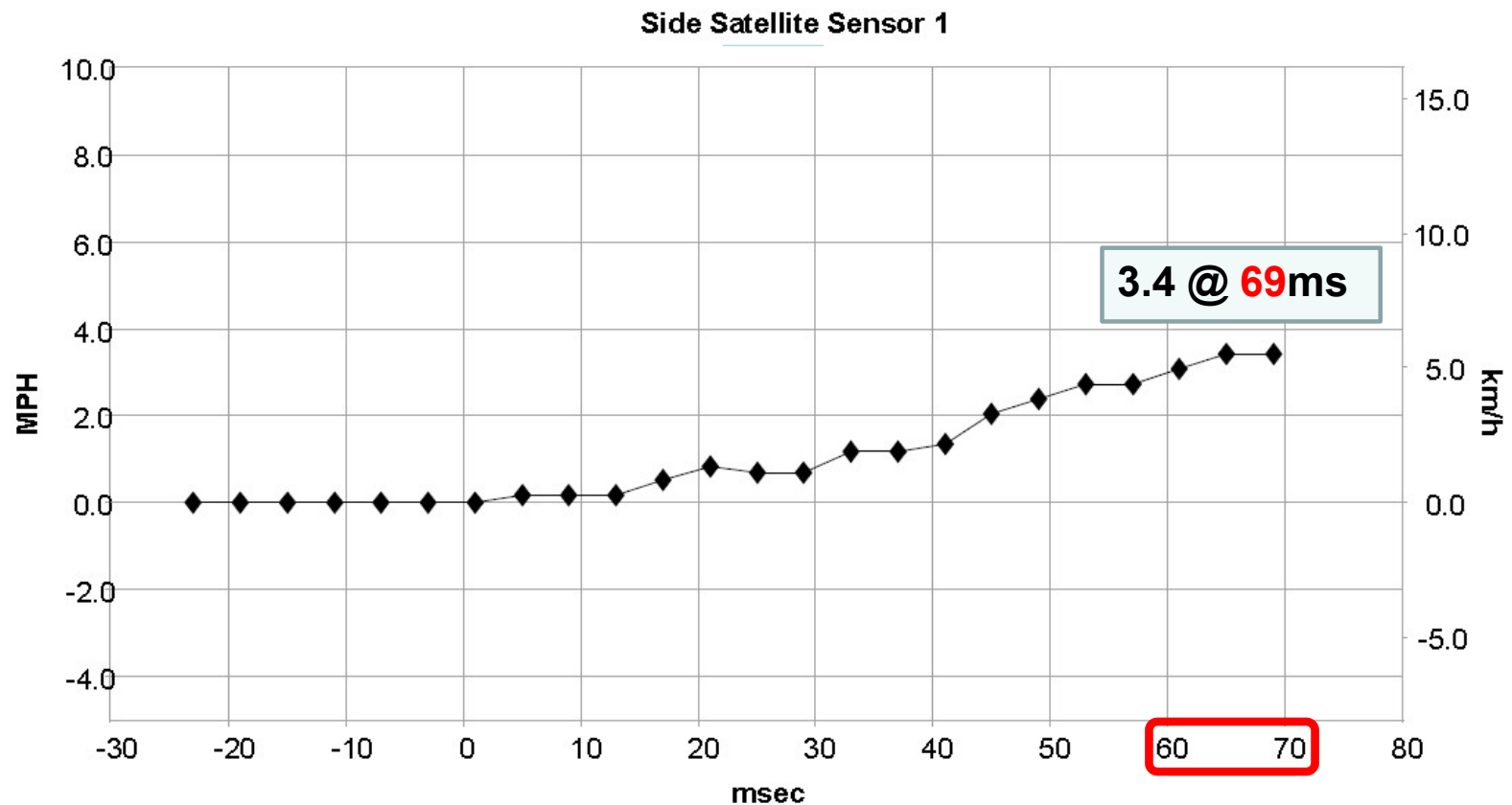
- PDC

Longitudinal Crash Pulse (1st Prior Event, TRG 2 - table 1 of 2)

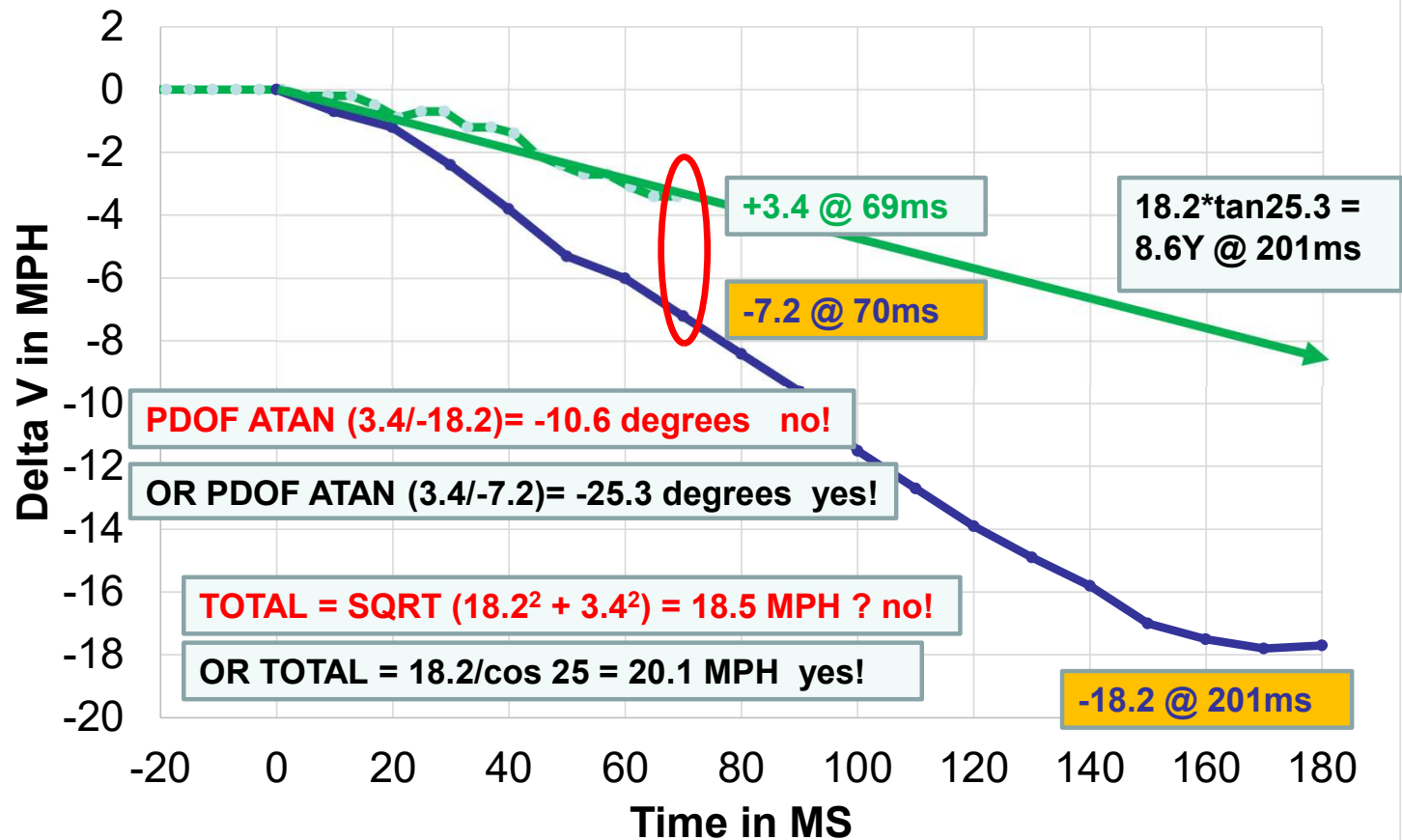
Recording Status, Time Series Data	Complete
Time from Time Zero to TRG (msec)	2.0
Length of Delta-V (msec)	200
Max. Longitudinal Delta-V (MPH [km/h])	-18.2 [-29.2]
Time, Maximum Delta-V, Longitudinal (msec)	201.0
Power Supply Status at Max. Delta-V	ON



12 EDR Lateral Delta V -



Lateral Delta V and Longitudinal Overlaid Sign of Lateral Reversed for Graphing Ease



VCH Freeze Frame Data 2013+

- New feature in 2013+ Rav 4 and 2014+ Highlander & Lexus IS, 2015+ Lexus NX & RC, “Vehicle Control History”
- Triggers EDR-style recording if accel pedal is rapidly depressed or other conditions that might occur during an alleged sudden or unintended acceleration or lane excursion. 26 triggers including crash avoidance, ESC.
- Accessible only with Toyota Techstream service tool – not part of Bosch CDR system. Annual s/w subscription or 2 day subs available.
- CDR900 or Nexiq works as pass thru device same as Toyota Mongoose hardware
- Data exports as CSV to Microsoft excel
- Space in memory for MANY events – can show a history of erratic driver behavior
- **Details in SAE 2016-01-1495 Appendix D. New 2019-01-0632 “Reconstructing Vehicle Dynamics from On-Board Event Data” discovered VCS has data 6.6 times per second in ABS events vs 2 times in hard accel events).**
- **Photos stored by pre-collision braking system may be accessed with Techstream system!**

TOYOTA/LEXUS Vehicles with Vehicle Control History Data									
		2013	2014	2015	2016	2017	2018	2019	2020
LEXUS	CT200h								
	ES								
	GS								
	GX								
	IS		250 and 350						
	LS								
	LX								
	NX								
	RC								
	RX								
TOYOTA	Avalon								
	Camry								
	Corolla								
	Prius			C and V	and Prius	and Prime			
	Highlander								
	Land Cruiser								
	4Runner								
	Tacoma								
	Tundra								
	Sequoia								
	RAV4								
	Sienna								
	Yaris								
SCION	iM								

Toyota/Lexus with Photos stored

			Gen 1 TSS/LSS pictures only with auto braking, Gen 2 pictures in more circumstances								
			2015	2016	2017	2018	2019	2020	2021	2022	2023
LEXUS	CT200h					discontinued					
	ES			LSS	LSS	LSS	?	?	?	2.5	
	GS			LSS	LSS	LSS	?	?	discontinued		
	GX							LSS	LSS	LSS	
	IS				LSS	LSS	?	?	?	2.5	
	LC					LSS	LSS	LSS	LSS	LSS	
	LS					LSS+	2.0	2.0	2.0	2.5	
	LX			LSS	LSS	LSS	?	?	?	2.5	
	NX					LSS	?	?	?	3.0	
	RC-F					LSS	?	?	?	LSS	
	RX			LSS	LSS	LSS	?	?	?	2.0	
	UX									2.0	
TOYOTA	4Runner							P	P	P	
	86									Subaru	
	Avalon			P	P	P	P	P	P	2.5+	
	Camry					P	P	P	2.5+	2.5+	
	C-HR					P	P	P	2.5	2.5	
	Corolla			P/C	P		2.0	2.0	2.0	2.0	
	Echo										
	FJ										
	Highlander			P	P	P	P	2.0	2.5+	2.5+	
	Land Cruiser			P	P	P	P	P	P		
	Mirai						2.0	2.0	2.5+	2.5+	
	Prius			P/C	P/C	P	P/C	P	2.0	2.0	
	RAV4			P/C	P/C	P	2.0	2.0	2.0	2.0	
	Sequoia					P	P/C	P	P	P	
	Sienna					P	P/C	P	2.0	2.0	
	Supra (BMW)							(made by BMW)			
	Tacoma					P	P	P	P	P	
	Tundra					P	P	P	P	2.5	
	Venza		out of production						2.0	2.0	
	Yaris				C	C					

Chart is only intended to cover US models. Content MAY depend on trim level or model.

Toyota TechStream / PCS & VCH Data

For IATAI 2021 Conference

Copy in SAE EDR student reference materials

This presentation developed by

Brad Muir

of



Edited for time and Presented by

Rick Ruth

of



TSS 1.0

- For Images to be recorded and linked the
VEHICLE must brake
- A PCS warning buzzer is not sufficient for images to be linked with VCH and recorded
- If vehicle begins to brake and driver responds, then related images should be stored
- CHECK: perform CDR download FIRST. Look for deceleration with no driver input: i.e. no brake switch = on, no brake oil pressure, but_speed drops more than idling down

TSS 2.0

- Adds new Image capture categories:
 - Vehicle behavior related image data: 1 Set of images
 - PCS related image data: 3 Sets of images (Pre-Crash, AEB)
 - LKA related image data: 1 Set of images (Lane Keep)
 - ICS related image data : 3 Sets of images
(Intelligent Clearance Sonar – short range)
 - Collision related image data : 2 Sets of images

TSS 2.5 / 2.5+

- 2021 Camry and Highlander and Lexus IS to start
- Camera / Millimetre Wave Radar optimized improve response range and enhanced low light pedestrian and daytime bicycle recognition.
- Pre-Collision System adds new Features

TSS-C

TSS-C features Pre-Collision System, Lane Departure Alert, and Automatic High Beam.

TSS-P

TSS-P enhances TSS-C, and adds Dynamic Radar Cruise Control to its suite of systems.

TSS 2.0

Builds on TSS-P, and consists of up to six active safety and driver assistance systems.

TSS 2.5+

TSS 2.5+ adds new capabilities to the Pre-Collision and Dynamic Radar Cruise Control Systems, and enhances Lane Tracing Assist.

20 Images from the Toyota FCM @ 0.6 sec



Sample VCH Summary

Vehicle Diagnostic Report

2020 Rav4 [REDACTED]
004320 mile

Printed By: Default User(1)

Vehicle Control History Report (1 of 2)

Current Key Cycle : 00372
Current Key Cycle Elapsed Time : 00000:17:23
Maximum Number of Overwrite of the Recording Area : 30000
Key Cycle : All

Key Cycle	Elapsed Time	Clock Type	Time and Date	Trigger	Image	ODO (mile)	Number of Overwrite of the Recording Area
00030	00000:53:56.4	-	2/1/2020 4:24:56 PM	Steering angle speed over certain number was detected (related to LDA/LKA/LTA)	Icon	51	1
00044	00000:19:06.4	-	2/4/2020 11:00:03 AM	PCS operation history		264	1
00051	00000:01:15.3	-	2/6/2020 9:30:21 AM	Steering angle speed over certain number was detected (related to LDA/LKA/LTA)	Icon	315	1
00055	00000:24:15.8	-	2/7/2020 8:50:59 AM	Steering angle speed over certain number was detected (related to LDA/LKA/LTA)	Icon	340	1

A way to get ped hits??

Vehicle Control History				Current Key Cycle
Key Cycle	All			00372
Key Cycle	Elapsed Time	Clock Type	Time and Date	Trigger
00143	00000:47:31.8	-	2/24/2020 11:24:28 AM	Steering angle speed over certain number was dete
00144	00000:19:09.1	-	2/24/2020 7:22:43 PM	PCS operation history
00145	00000:07:55.7	-	2/24/2020 7:53:02 PM	Sudden braking history
00162	00000:43:37.7	-	2/28/2020 6:26:13 PM	PCS operation history
00178	00000:03:40.9	-	3/4/2020 5:09:47 PM	Steering angle speed over certain number was dete
00182	00000:24:30.4	-	3/6/2020 5:50:27 PM	Sudden braking history
00182	00000:24:30.4	-	3/6/2020 5:50:27 PM	PCS operation history
00182	00000:24:30.5	-	3/6/2020 5:50:27 PM	Steering angle speed over certain number was dete
00182	00000:24:30.8	-	3/6/2020 5:50:27 PM	Accelerator signal and brake signal input simultane
00226	00000:00:04.3	-	3/27/2020 6:58:48 AM	Accelerator signal and brake signal input simultane

Toyota “13 EDR” & “15 EDR”

1. **13 EDR** Adds Lateral Accel data from ACM in frontal events for 200ms
(Fixes biggest drawback of **12 EDR**)

Longitudinal/Lateral Crash Pulse (Most Recent Event,

Time (msec)	Longitudinal Delta-V (MPH [km/h])	Lateral Acceleration for Frontal/Rear Crash, Floor Sensor (m/sec^2) --	F
0	0.0 [0.0]	0.0	
10	0.3 [0.6]	-1.9	
20	0.5 [0.8]	0.0	

2. **Calculate** Lat **Delta V** for each 10ms interval
3. $DV_{10ms} = \text{Accel} / 9.8 * (32.2 / 1.466) * 0.01s$
4. Add up intervals to get total Delta V
5. **Template available to calculate it**

2018+ Toyota “17EDR”

1. “Front/rear” 5mph X events replaced by “Front/Rear/Side”, events triggered by 5mph X **or Y** DV or side deploys. Y DV graph added.
2. 6 precrash memory spaces, 4 DV spaces for each crash type (vs 2 each prior)
3. Separate side events still reported with 70ms side accel in m/sec², but do NOT have precrash associated with them.

17EDR Precrash (new look, same data)

Pre-Crash Data -5 to 0 Seconds (1st Prior Event, TRG 2) - Table 1 of 4

Time (sec)	Vehicle Speed (MPH [km/h])	Accelerator Pedal, % Full (%)	Percentage of Engine Throttle (%)	Fuel Injection Quantity (mm ³ /st)	Engine RPM (RPM)	Motor RPM (RPM)	Service Brake, ON/OFF
-5.00	29.8 [48]	49.5	24.5	Invalid	2,400	Invalid	OFF
-4.50	32.3 [52]	47.0	24.5	Invalid	2,500	Invalid	OFF
-4.00	34.2 [55]	38.0	20.0	Invalid	2,700	Invalid	OFF
-3.50	35.4 [57]	32.5	16.0	Invalid	2,800	Invalid	OFF
-3.00	36.7 [59]	26.5	13.5	Invalid	2,400	Invalid	OFF
-2.50	37.3 [60]	22.5	11.0	Invalid	2,400	Invalid	OFF
-2.00	37.3 [60]	19.0	8.5	Invalid	2,200	Invalid	OFF
-1.50	38.5 [62]	19.0	6.0	Invalid	1,900	Invalid	OFF
-1.00	37.9 [61]	18.0	5.5	Invalid	1,900	Invalid	OFF
-0.50	37.9 [61]	18.0	5.0	Invalid	1,800	Invalid	OFF
TRG(0)	36.0 [58]	100.0	26.0	Invalid	1,700	Invalid	OFF

Pre-Crash Data -5 to 0 Seconds (1st Prior Event, TRG 2) - Table 2 of 4

Time (sec)	ABS Control Status	BOS Control Status	Brake Oil Pressure (Mpa)	Longitudinal Acceleration , VSC Sensor (m/s ²)	Yaw Rate (deg/s)	Steering Input (degrees)	Shift Position
-5.00	OFF	OFF	0.00	1.579	-0.98	-4.5	D
-4.50	OFF	OFF	0.00	1.795	0.00	-1.5	D
-4.00	OFF	OFF	0.00	1.292	0.49	0.0	D
-3.50	OFF	OFF	0.00	0.861	0.00	-1.5	D
-3.00	OFF	OFF	0.00	0.718	0.00	-1.5	D
-2.50	OFF	OFF	0.00	-0.072	0.00	-1.5	D
-2.00	OFF	OFF	0.00	0.000	0.00	-1.5	D
-1.50	OFF	OFF	0.00	0.000	-0.49	-1.5	D
-1.00	OFF	OFF	0.00	0.287	0.00	-1.5	D
-0.50	OFF	OFF	0.00	-0.144	0.00	-1.5	D
TRG(0)	OFF	OFF	0.48	-1.507	61.00	-19.5	D

Pre-Crash Data -5 to 0 Seconds (1st Prior Event, TRG 2) - Table 3 of 4

Time (sec)	Sequential Shift Range	Cruise Control Status	VSC Control Status	READY Signal	Drive Mode, Power Train	Drive Mode, Snow	Drive Mode, EV
-5.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-4.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-4.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-3.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-3.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-2.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-2.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-1.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-1.00	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
-0.50	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid
TRG(0)	Undetermined	OFF	ON (enable)	Invalid	Normal	OFF	Invalid

17 EDR time data & ped events

System Status at Pedestrian Event (1st Prior Event, TRG 1)

TRG Count (times)	1
TRG Count not for Pedestrian (times)	SNA
Ignition Cycle, Crash (times)	353
Odometer signal (miles [km])	1,195 [1,923]
Trip count (times)	392
Time count (msec)	1,283,900
Time count input system	Normal
Airbag Warning Lamp, On/Off	OFF
Pedestrian Warning Lamp, On/Off	OFF
Time from Previous TRG (msec)	32767 or greater

1. Odometer added
2. “Trip count” similar to key cycles but slightly higher,
3. Time Count (like Ford “Key on time”), Odometer
4. Pedestrian events if pedpro option bought

NISSAN EDR's 21.4.1 (CDR 51%)

Model	Location	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Last 3 digits of Bosch CDR cable number		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
INFINITI																	No info
G CONVERTIBLE	TUNNEL BETWEEN SEATS			*			Jul-12		780								
G COUPE	TUNNEL BETWEEN SEATS		*	Yellow = Proprietary Consult Tool Only					780								
G SEDAN	TUNNEL BETWEEN SEATS		*	No direct to module cables				Jul-12	780								
M	TUNNEL BETWEEN SEATS								780								
Q30													780				
Q40	TUNNEL BETWEEN SEATS	Yellow area not covered by CDR									780						
Q50	TUNNEL BETWEEN SEATS								780								
Q60	TUNNEL BETWEEN SEATS								780				780				
Q70	TUNNEL BETWEEN SEATS								780								
EX	TUNNEL BETWEEN SEATS		Dealers do NOT have special software required to read EDR						780								
FX	TUNNEL BETWEEN SEATS								780								
JX35	TUNNEL BETWEEN SEATS								780								
QX50													780		828		
QX60													780				
QX80	TUNNEL BETWEEN SEATS								780							828	
QX30	TUNNEL BETWEEN SEATS												598				
NISSAN		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
370Z	TUNNEL BETWEEN SEATS		*				Aug-12		780								
ALTIMA COUPE	TUNNEL BETWEEN SEATS			*					780	INCLUDED IN SEDAN BELOW							
ALTIMA SEDAN	TUNNEL BETWEEN SEATS		*	Yellow = Proprietary Consult Tool Only					780						828		
ARMADA	TUNNEL BETWEEN SEATS	*		No direct to module cables					780			?	780				
CUBE	TUNNEL BETWEEN SEATS			*					780								
FRONTIER	TUNNEL BETWEEN SEATS	*					Oct-12		780								780
GT-R	TUNNEL BETWEEN SEATS			*						780							
JUKE	TUNNEL BETWEEN SEATS								780								
KICKS														780		828	
LEAF	TUNNEL BETWEEN SEATS								780							828	
MAXIMA SEDAN	TUNNEL BETWEEN SEATS		*						780							828	
MICRA	Check Manual										780						
MURANO	TUNNEL BETWEEN SEATS		*		*				780							828	
MURANO CROSS C	TUNNEL BETWEEN SEATS								included in above								
NV200	TUNNEL BETWEEN SEATS								780								
PATHFINDER	TUNNEL BETWEEN SEATS	*							780								
QUEST	CTR CONSOLE NEAR FRONT		*						780								
ROGUE	Check Manual			*					780								828
ROGUE SPORT/QUASHAI														780		828	
ROOX (Japan)																828	
SENTRA	TUNNEL BETWEEN SEATS		*						780							828	
TITAN	TUNNEL BETWEEN SEATS	*							780								
VERSA SEDAN	TUNNEL BETWEEN SEATS		*						780							828	
VERSA NOTE HB	TUNNEL BETWEEN SEATS						Sep-12		780								100
XTERRA	TUNNEL BETWEEN SEATS	*					Oct-12		780								

Nissan Pre-Crash Data

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % full	Engine RPM	Motor RPM	Service Brake (On, Off)	Steering Input (deg)
-5.0	24 [39]	16	2650	0	Off (Brake Not Activated)	-32
-4.5	23 [37]	11.5	1750	0	Off (Brake Not Activated)	-2
-4.0	21 [34]	9	1200	0	On (Brake Activated)	28
-3.5	15 [24]	9	1150	0	On (Brake Activated)	14
-3.0	13 [21]	4	950	0	On (Brake Activated)	4
-2.5	11 [17]	4	950	0	On (Brake Activated)	4
-2.0	5 [8]	4	900	0	On (Brake Activated)	-48
-1.5	3 [5]	4	850	0	On (Brake Activated)	-98
-1.0	1 [2]	4	850	0	On (Brake Activated)	-160
-0.5	3 [5]	10.5	1100	0	Off (Brake Not Activated)	-194
0.0	6 [9]	16	1150	0	Off (Brake Not Activated)	-218

At AE

Hybrid/Electric or Trans Input
Trans input tells you convert to slip

Table 2 - not req'd

Nissan Long ΔV Polarity Fixed?

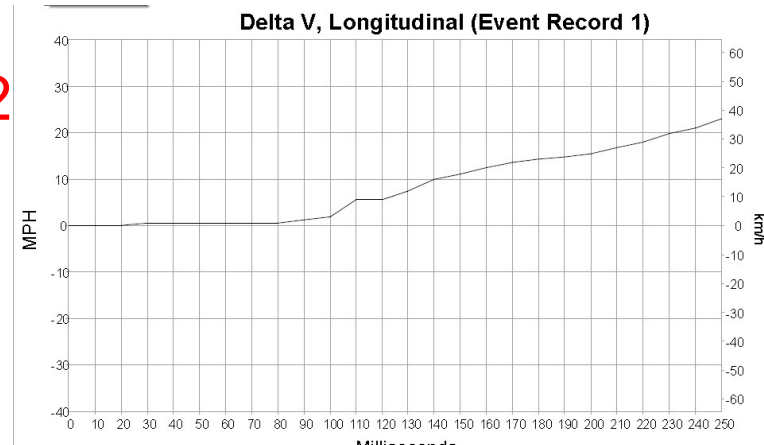
Front hit was positive - *Some exceptions still in 19.3!*

2013 Altima in CDR 12.2

System Status at Event (Event Record 1)

Front Air Bag Suppression Switch Status	3 airbag inhibited
Maximum Delta-V, Longitudinal (MPH [km/h])	29 [47]
Time, Maximum Delta-V, Longitudinal (msec)	300
Maximum Delta-V, Lateral (MPH [km/h])	5 [8]
Time, Maximum Delta-V, Lateral (msec)	210
Maximum Acceleration, Longitudinal (g)	32.5
Time, Maximum Acceleration, Longitudinal (msec)	102.5
Maximum Acceleration, Lateral (g)	36
Time, Maximum Acceleration, Lateral (msec)	112.5

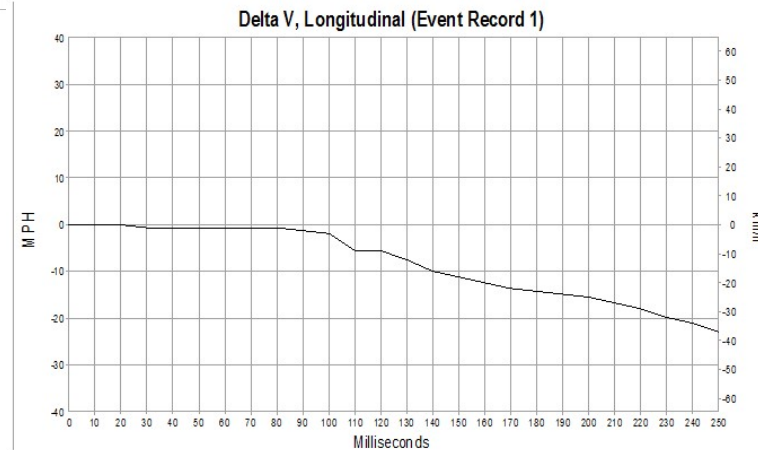
+29 at 300ms



2013 Altima in CDR 16.5

Maximum Delta-V, Longitudinal (MPH [km/h])	-29 [-47]
Time, Maximum Delta-V, Longitudinal (msec)	300
Maximum Delta-V, Lateral (MPH [km/h])	5 [8]
Time, Maximum Delta-V, Lateral (msec)	210
Maximum Acceleration, Longitudinal (g)	-32.5
Time, Maximum Acceleration, Longitudinal (msec)	102.5
Maximum Acceleration, Lateral (g)	36
Time, Maximum Acceleration, Lateral (msec)	112.5

-29 at 300ms



Nissan Recording Threshold

1. Several files have been read with events under 5mph Delta V over 150ms.
2. From 2013-2019 we believed all Nissans had a wakeup threshold of AE
3. At 2020 EDR User Summit, it was reported that tests were done on a 2014 Pathfinder at low speeds. No events were created below 5mph Delta V, events were created over 5mph.
4. Threshold could be model dependent!

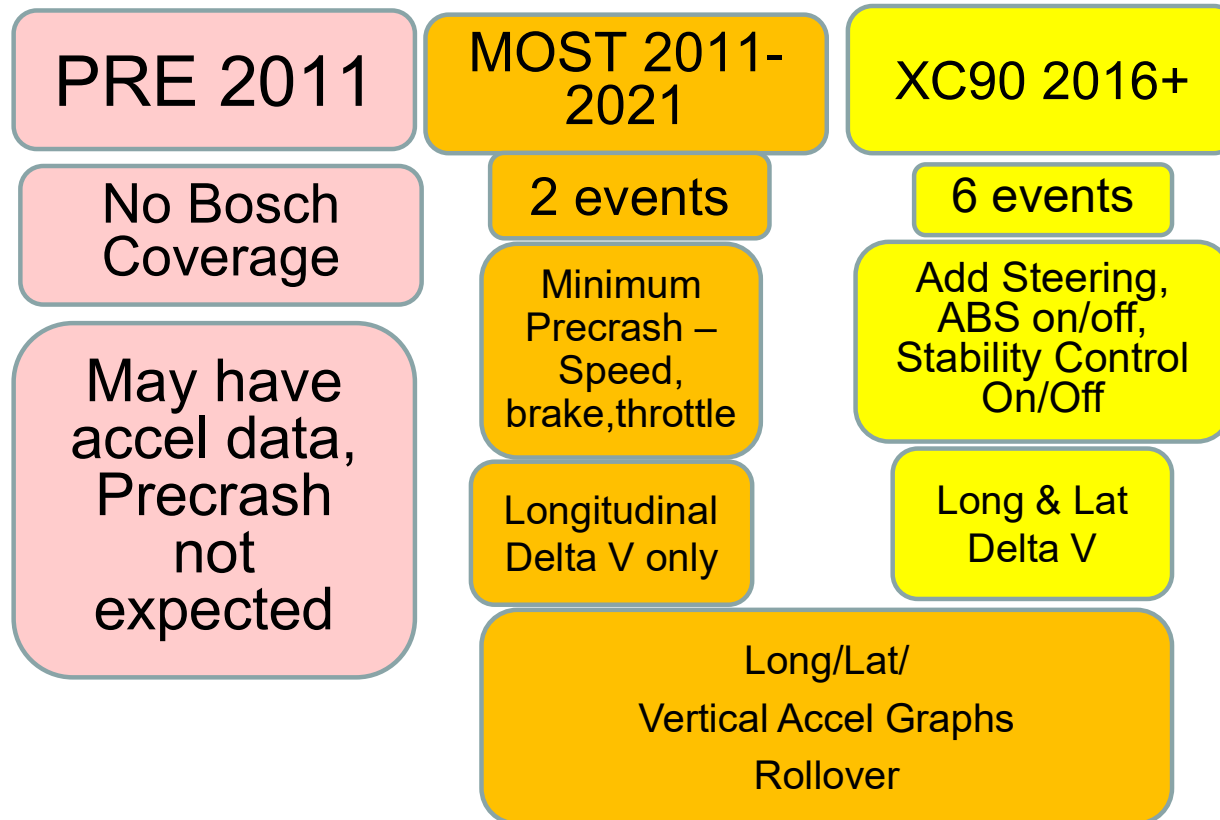
Mazda CDR 21.2 Coverage 44%

Model	Location															
Last 3 digits of Bosch CDR cable number shown			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
MAZDA			All Mazda use 387 adapter for direct to module													
CX-3	TUNNEL BELOW IP	Law Enforcement Contact Your Instructors - Data available from pre-CDR ACM's from Mazda or Mazda suppliers.								812						
Tribute/CX-5	TUNNEL AFT SHIFTER		Read as Escape		779					811	812					
CX-9	TUNNEL BELOW IP			778						811						
CX-30														843		
Mazda 2	TUNNEL AFT SHIFTER			792					not listed	812	not listed					
Mazda 3	TUNNEL AFT SHIFTER				779					811			843			
Mazda 5	TUNNEL BELOW IP				778						not listed					
Mazda 6	TUNNEL BELOW IP			792				779		811		831				
MX-5 Miatta	TUNNEL BELOW IP						no coverage			812						
MX-30																843
Memo: The Mazda Tribute was sister to the Ford Escape thru 2011. A 2011 Tribute was read using a 2011 Escape VIN.																
The source data for this chart is the Bosch CDR help file for Version 21.2																
Always consult the latest help file for the most accurate coverage																

Volvo CDR 21.3 Coverage 32%

<u>Model</u>	<u>Location</u>													
Last 3 digits of Bosch CDR cable number show		<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	
VOLVO		All Volvo use 387 Adapter for DTM images												
S40														
S60	CTR TUNNEL UNDER CONSOLE		799							500/830				
S80, S80L	CTR TUNNEL UNDER CONSOLE													
S90	CTR TUNNEL UNDER CONSOLE								816					
V40	CTR TUNNEL UNDER CONSOLE								816 Euro					
V60	CTR TUNNEL UNDER CONSOLE		799							500/830				
V70	CTR TUNNEL UNDER CONSOLE				799									
V90	CTR TUNNEL UNDER								816					
XC40	CTR TUNNEL UNDER									500/830				
XC60	CTR TUNNEL UNDER CONSOLE				799						816			
XC70	CTR TUNNEL UNDER CONSOLE				799									
XC90	CTR TUNNEL UNDER CONSOLE								816					
The source data for this chart is the Bosch CDR help file for Version 21.3														
Always consult the latest help file for the most accurate coverage														
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SAE, IATAI, PSP, & MATAI														

Volvo EDR Evolution



2016+ XC90 Sample Volvo File

(vs. 2013 Volvo with minimum data)

Pre-Crash Data -1 Sec (Event Record 1)

Ignition Cycle, Crash	2,764
Safety Belt Status, Driver	On, Belted
Safety Belt Status, Passenger	On, Belted
Frontal Airbag Warning Lamp	Off
Frontal Airbag Suppression Switch Status, Front Passenger	On
Seat Track Position Switch, Foremost, Status, Driver	Not Equipped
Seat Track Position Switch, Foremost, Status, Front Passenger	Not Equipped
Occupant Size Right Front Passenger Child	Not Equipped

2020 still not added to other models

Pre-Crash -5 to 0 sec (Event Record 1)

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full (%)	Service Brake (On, Off)	Steering input (%)	ABS Activity	Stability control status
-5.0	43.5 [70.0]	100.0	Off	0.0	Off	On
-4.5	47.8 [77.0]	100.0	Off	0.0	Off	On
-4.0	52.2 [84.0]	100.0	Off	2.0	Off	On
-3.5	55.9 [90.0]	100.0	Off	3.0	Off	On
-3.0	58.4 [94.0]	100.0	Off	3.0	Off	On
-2.5	61.5 [99.0]	100.0	Off	11.0	Off	Engaged
-2.0	62.8 [101.0]	100.0	Off	6.0	Off	Engaged
-1.5	65.2 [105.0]	100.0	Off	-9.0	Off	Engaged
-1.0	67.1 [108.0]	100.0	Off	-8.0	Off	Engaged
-0.5	69.6 [112.0]	100.0	Off	-9.0	Off	Engaged
0.0	70.2 [113.0]	100.0	Off	-13.0	Off	Engaged

Added Data for XC90

2016+ XC90 Sample Volvo File

2021 still not added to other models

System Status at Retrieval

Vehicle Identification Number	YV1LF
Application Diagnostic Database Part Number	31387255 AL
Ignition Cycle, Download	2,765
Lifetime Operating Timer (sec)	2,154,311

System Status at Event (Event Record 1)

Data Area Status, Event Record 1	Locked, Data Stored
Data Area Read Status, Event Record 1	Data Not Read
Complete File Recorded (Yes/No)	Yes
Multi-Event, Number of Events (1,2)	Event Number 1
Time from Preceding Event (sec)	Written but No Data Available
Maximum Delta-V, Longitudinal (MPH [km/h])	< -62 [-100]
Time, Maximum Delta-V, Longitudinal (msec)	100
Maximum Delta-V, Lateral (MPH [km/h])	-19.9 [-32.0]
Time, Maximum Delta-V, Lateral (msec)	>300

Clipped Value (at Max)

Not present in 2013, Added for XC90

See help file for Rolls Royce

The source data for this chart is the Bosch CDR help file for Version 19.5		
Always consult the latest help file for the most accurate coverage		
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BMW EDR Evolution

1. Basic EDR 2013
2. “Extension” 2014
3. Some driver assist mid-2015 - timing
4. Auto Steering (autonomous vehicle) Cameras all views 4 fps
 Not intended for CDR,
 only BMW can access
5. Clock and odometer in 2019 Mini Cooper

Hardware/Software Glitch?

- Recently a 2020 BMW X5 was read DTM using CAN+/387/CDR500 and obtained a file with no events. The hex data shows memory section headings which all said “No Data Received”.
- Module was read using CDR900/CDR500 and retrieved a valid event.
- This is under investigation by Bosch, until resolved use CDR900 whenever possible.

More data elements in 2020 X5 “ACSM5”

- Recent files show day/date/time of crash and second/third row seat belt use. more

Multi-Event, Number of Events	1. Event
Time From Previous Event to Current Event (msec)	Data Not Available
Time From Last Speed Data Sample (Precrash) to Time Zero (msec)	57
Time From Initial Event to Current Event (msec)	Data Not Available
Complete File Recorded, Public, Prio 1 Data	Completed Successfully
Ignition Cycle, Crash (Cycle)	1,315
Ignition Cycle, Download (Cycle)	1,316
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM:SS)	2020-12-18, 09:03:54
Vehicle Mileage (km)	13,285
Operating Time (min)	20,794
Safety Belt Status, 2nd Row, Left Side	Not Belted
Safety Belt Status, 2nd Row, Center	Not Belted
Safety Belt Status, 2nd Row, Right Side	Not Belted
Safety Belt Status, 3rd Row, Left Side	Data Not Available
Safety Belt Status, 3rd Row, Center	Data Not Available
Safety Belt Status, 3rd Row, Right Side	Data Not Available

Mercedes CDR Coverage 21.2 36%

Model	Start of Sales	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Last 3 digits of Bosch CDR DTM cable number											
Mercedes	EDR Start	All Mercedes use 387 adapter for direct to module downloads									
A-Class Limo								832			
AMG-GT					800						
B-Class EV	after 4/1/2014		598								
B-Class	after 6/2/2014			598					832 Limo		
C Class Sedan	after 9/1/2014			801							
C Class Coupe	tart of 2015 M.Y.			800	801						
CLA Class	after 6/2/2014			598					832		
CLS-Class				800					801		
E Class (includes coupe)	after 4/1/2013		800			801 w steering data					
EQA/B/C									801 w strg		
G Class	after 11/1/201			598				801			
GL Class	after 7/11/201			598	?	?					
GLA Class	after 6/2/201			598						832	
GLC Class					598		801			832	
GLE Class					598				832		
GLK	after 12/2013		800		?	?					
GLS Class					598				832		
GT								801			
G wagon									801		
Maybach S600					801						
ML-Class	after 7/11/2014			598	?						
S-class Sedan	after 9/2013		801							500/841	
S-Class Coupe	after 9/1/2014			801							
SL	after 12/2013		800								
SLC							800				
SLK	after 12/2013		800								
Sprinter								832			
Vito					598					832	
Smart & 2016 with "E"	after 9/1/2014			809							
Smart with VIN 4th "F"					820						
Smart for two, coupe, cabrio							820				
Metris							598				

No "back
model"
coverage

Mercedes Details

1. Mercedes phased in EDR in anticipation of the NPRM requiring EDR's for Sept. 2014
2. Precrash speed, brake, throttle (563 Table 1) & lat/longitudinal ΔV .
3. Can hold 5 events, D's lock, ND's FIFO
4. Recording threshold is 5 mph over 150ms
5. Speed is avg. of 4 wheel speed sensors
6. The new 2017 E Class has Steering, ABS, Stab Cont'l. This marks a departure from their philosophy to record only the minimum required by law.

Mercedes Key Cycles

- Some Mercedes have unusually high key cycle counts for their age, and since event.
- Other brands have 2500 key cycles per yr or 20,000km.
- Working theory is that counter increments whenever key fob leaves range and comes back into range.

Ignition Cycle, Crash (cycle)	11,639
Ignition Cycle, Download (cycle)	12,113
Vehicle Mileage (km)	20,950
Operating Time (min)	29,712
Vehicle Identification Number	4JGDA5JB2HA*****
Event Counter (counts)	1

VW/Audi Brands EDR

1. EDR in 2014 EOS, most 2015+ VW/Audi.
2. EDR was installed in anticipation of the US NPRM requiring EDR's by 9/1/2014, which was never implemented.
3. **Bentley** has EDR 2016+.
4. **Lamborghini** has EDR in Adventadore/Huracan
5. **Porsche no EDR *until 2020 Taycan*.**
6. US only 2015-17, Worldwide 2018+ in transverse engine platforms

VW/Audi 21.3 Oct 2021 34+%

See help file for Rolls Royce

Model	Location	2009-13	2014	2015	2016	2017	2018	2019	2020	2021	2022
Last 3 digits of Bosch CDR adapter/cable number		2009-13	2014	2015	2016	2017	2018	2019	2020	2021	2022
All VW/Audi Require the 387 Adapter to read DTM			Gold = US only (Canada not covered)				Yellow=Worldwide				
VW											
Arteon	UNDER CENTER STACK						805				
Atlas	UNDER CENTER STACK						805				
Beetle	UNDER CENTER STACK			804			Canada added				
CC	UNDER CENTER STACK			804							
Crafter	UNDER CENTER STACK						805				
EOS	UNDER CENTER STACK		806								
Golf, eGolf	UNDER CENTER STACK			805			Worldwide				
Jetta	UNDER CENTER STACK			804			805				
Neo											
Passat	UNDER CENTER STACK			804			805				
Polo	UNDER CENTER STACK						805				
Routan	UNDER CENTER STACK	785									
Sportwagen + Alltrack				Golf platform, not called out separately in help file							
T-Roc	UNDER CENTER STACK						805	805			
T-Cross	UNDER CENTER STACK										
Tiguan	UNDER CENTER STACK			804		805					
Touareg	UNDER GEAR SELECTOR			804				500/826			
Touran	UNDER CENTER STACK						805				
AUDI				2015	2016	2017	2018	2019	2020	2021	2022
A1	Under Center Stack							805			
A3,S3, RS3	Under Center Stack			805					842		
A4, S4, A4 allroa	Tunnel between 1st/2nd row seats			804		500/813					
A5, R5, S5, RS5	Tunnel between 1st/2nd row seats			804			500/813				
A6, A6L, S6, Ava	Tunnel between 1st/2nd row seats			804			500/826				
A7, S7, RS7	Tunnel between 1st/2nd row seats			804			500/826				
A8, A8L, S8	Tunnel between 1st/2nd row seats			804			500/826				
Q2	Under Center Stack						805				
Q3	Under Center Stack				804			805			
Q4											842
Q5, SQ5	Tunnel between 1st/2nd row seats				804		500/813				
Q7	Under Center Stack					500/813			500/826		
Q8	Under Center Stack						500/826				
R8	Under Center Stack					804					
TT, TTS					not covered at this time						
eTron	Under Center Stack							500/826			

The source data for this chart is the Bosch CDR help file for Version 9.6.

Always consult the latest help file for the most accurate coverage

VW/Audi Events

- Recorder holds up to 6 events in Chron order.
- Event types are Front, Rear, Side, Rollover, Pedestrian (if equipped), External Trigger, and HV (undefined). External triggers are Automatic Driver Assistance System (ADAS) events and are not crashes. If the driver is not braking hard enough, ADAS will override and brake harder.
- DL's say crash event threshold is 8 kph (5mph) lat or long Delta V over 150ms for ND's, D's will record at any magnitude. External Triggers may record with 0 ΔV .
- A small # of ND events have <5mph, this is the exception not the rule.

VW/Audi Details

1. Same data set for all event types
2. Time from last precrash to AE noted
3. Some 2017+ modules use Flex Ray/500
4. Date/Time of Crash from clock (GPS if clock not set) in 2015+ Audi models, phased into VW models
5. Newer models require hood to be open to read through DLC, have gateway
6. Speed from speedometer

Threshold & Time between events (Five Overlaid)

System Status at Event (Record 5)

Event Counter at Event	1	2	3	4	5
Event Type	Frontal	Frontal	Frontal	Data Not Available	Data Not Available
Multi-Event, Number of Events	1. Event	2. Event	3. Event	4. Event	5. Event
Time from Initial Event to Current Event (msec)	0.0	306.0	608.0	1,275.0	1,327.0
Vehicle Clock, Date and Time at Event (YYYY-MM-DD, HH:MM)	2019-11-01, 19:50:40	2019-11-01, 19:50:41	2019-11-01, 19:50:41	2019-11-01, 19:50:41	2019-11-01, 19:50:43
Vehicle Mileage (km)	55,370	55,370	55,370	55,370	55,370
Operating Time (min)	80,639	80,639	80,639	80,639	80,639
Ignition Cycle at Event (Cycles)	5,265	5,265	5,265	5,265	5,265
Ignition Cycle at Download (Cycles)	5,271	5,271	5,271	5,271	5,271
Maximum Delta-V, Longitudinal (MPH [km/h])	-24.9 [-40]	-2.5 [-4]	0.0 [0]	1.9 [3]	1.9 [3]
Time, Maximum Delta-V, Longitudinal (msec)	300.0	290.0	75.0	300.0	300.0
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached	Clipping Not Reached	Clipping Not Reached	Clipping Not Reached	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	-7.5 [-12]	0.0 [0]	-0.6 [-1]	2.5 [4]	1.9 [3]
Time, Maximum Delta-V, Lateral (msec)	300.0	252.5	230.0	285.0	300.0
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached	Clipping Not Reached	Clipping Not Reached	Clipping Not Reached	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	300.0	300.0	230.0	297.5	300.0
Time from Last Speed Data Sample (Precrash) to Time Zero	110	304	2	335	283
Time from Time Zero to Algorithm Start (Front) (msec)	Algorithm Started at Time Zero	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Front) (msec)	285	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Side) (msec)	7	196	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Side) (msec)	Algorithm Not Reset	206	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset
Time from Time Zero to Algorithm Start (Rear) (msec)	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rear) (msec)	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset
Time from Time Zero to Deployment (Rollover) (msec)	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started	Algorithm Not Started
Time from Time Zero to Algorithm Reset (Rollover) (msec)	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset	Algorithm Not Reset
Vehicle Identification Number (VIN)	VWZZZAUZJW162808	2AUZJW162808	2AUZJW162808	2AUZJW162808	VWZZZAUZJW162808
Part Number, ACM	5Q0959655BH	5Q0959655BH	5Q0959655BH	5Q0959655BH	5Q0959655BH
Supplier ID, ACM	TSR	TSR	TSR	TSR	TSR
Production Date, ACM	171117	171117	171117	171117	171117
Supply Voltage (Before Event) (V)	14.7	12.6	12.6	12.6	12.6
Complete File Recorded	Completed Successfully	Completed Successfully	Completed Successfully	Completed Successfully	Completed Successfully

Less than 5mph

110+500-(306-0)=304

304-(608-306)=2

335-(1327-1275)=283

Subaru CDR EDR Availability

Model	Bosch CDR900 Interface Required for true Subaru models												
	Cables 614 and 616 were originally released for Toyota models but also service some Subaru's												
	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	
SUBARU US Models													
Ascent	Not in production								835			?	
BRZ	n/a	n/a	Read as Toyota brand 86 model with Cable 614 (CAN+ or CDR900 interface)										844
Crosstrek	n/a	n/a	616										
Forester	No	No	616						835				
Impreza	No	614	614/616								Japan		
Legacy	No	No	614		836					844			
Outback	No	No	614		836					844			
WRX (inlcudes STI)	No	No	No	No	614		616	614/616				844	
Tribeca	No	No	No	No	Discontinued								
NON-US Models													
Exiga (Australia, Japan)			614										
XV (Europe)		614					614/616		616				
Levorg (Japan)					614	614/616					844	844	

Subaru EDR Tools

1. Bosch CDR 900 interface and 21.3+ software reads all model and model years except for 2013-2020 BRZ, which you read as a Toyota brand Model 86. The 21.4 software is rejecting the BRZ, reload 19.6 software to read it until Bosch fixes that.
2. The Subaru Dealer tool previously used for EDR is no longer needed thanks to Bosch CDR coverage. It may still be useful for fault codes or freeze frame data.
\$5.8K initial cost, \$2700/yr subscription .

CDR 2015+ Outback Precrash Data

Pre-Crash Data -5 to 0 Sec (Record 1)

Time (sec)	-5.0	-4.5	-4.0	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0
Speed, Vehicle Indicated (MPH [km/h])	21.1 [34]	22.4 [36]	23.6 [38]	24.9 [40]	24.9 [40]	23.0 [37]	19.3 [31]	16.2 [26]	10.6 [17]	7.5 [12]	6.8 [11]
Accelerator Pedal, % Full (%)	23	28	24	0	0	0	0	0	0	0	0
Service Brake, On/Off	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON
Engine RPM (RPM)	1,900	2,100	2,300	1,800	1,300	1,100	1,200	1,100	1,000	1,000	1,000
ABS Activity	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Stability Control (On, Off, Engaged)	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Steering Input (deg)	0.0	0.0	0.0	0.0	0.0	-2.5	-2.5	-5.0	-5.0	-2.5	-2.5



1. Bosch CDR software 21.1 includes significantly expanded Mitsubishi coverage.
2. The only models not officially covered are pre-2013 and may be spoofable as Dodge Calibers.
3. The original Mitsubishi proprietary tool (\$7,000) is not needed for any vehicles
4. Early Mitsubishi readouts had some incomplete files retrieved (no useful data retrieved). CDR coverage is not expected to affect that issue, it will still exist.

Mitsubishi EDR's May 2021

Most now supported by CDR, as of Dec '21 some not

Model	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Delica D5 (Japan)	839 Bosch CDR												839/837	837		
Eclipse (PS Platform)		Part MU141170														
Eclipse Spyder Conv.		4/2005 to 8/2011														
Eclipse Cross (SUV)			?													
EK Wagon/EK Space (Japan)																
Endeavor SUV (PS Platform)																
Expander (Philippines)																
Galant Fortis																
iMiEV																
Lancer																
Lancer Evolution & Evo X																
Lancer Sportback																
Mirage, Attrage (subcompact)																
Outlander SUV & PHEV																
Outlander Sport, RVR, ASX																
Pajero/Montero (SE Asia only)																
Raider pickup (Dodge Dakota sister)																
Triton pickup (non-US)																
The source of this data is the Mitsubishi EDR tool flyer from Bosch Diagnostics and CDR help file version 21.1 & other available industry data - best info available, not guaranteed																
Acknowledgement to Brad Muir of Crash Data Specialists for providing many details on models and data available																
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Help file cable links suggest some Mitsubishi listed in help file as supported are not (yet) – possibly in 21.4?

MITSUBISHI ACM CABLE - P/N: 1699200783 / CABLE ID# 837

This CDR **cable** is required for direct-to-module imaging of 2018 and newer Eclipse Cross vehicles sold into the various markets. This **cable** will be available end of June 2019.

MITSUBISHI ACM CABLE - P/N: 1699200784 / CABLE ID# 838

This CDR **cable** is required for direct-to-module imaging of 2011 and newer Mitsubishi vehicles (see below) sold into the various markets. This **cable** will be available end of June 2019.

2011 - 2019 ASX, Outlander Sport & RVR

2014 - 2019 Outlander

2018 - 2019 Outlander PHEV

*2014 and newer Mirage

*2017 and newer Attrage

*2012 and newer iMiEV

* not currently supported in CDR software, support planned for a future release

MITSUBISHI ACM CABLE - P/N: 1699200785 / CABLE ID# 839

This CDR **cable** is required for direct-to-module imaging of 2007 and newer Mitsubishi vehicles (see below) sold into the various markets. This **cable** will be available end of June 2019.

*2008 and newer Galant Fortis

*2007 and newer Delica-D5

*2009 and newer Lancer Evolution

*2007 - 2013 Outlander

* not currently supported in CDR software, support planned for a future release

Typical Mitsubishi CDR Data

Pre-Crash Data -5 to 0 Sec (Record 1)

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full (%)	Service Brake, On/Off	Engine RPM (RPM)	Steering Input (deg)
-5.0	3.1 [5]	0	On	797	4.5
-4.5	2.5 [4]	0	On	751	4.5
-4.0	1.9 [3]	0	On	648	4.0
-3.5	1.2 [2]	0	On	593	4.0
-3.0	0.6 [1]	0	On	641	4.0
-2.5	0.6 [1]	60	Off	719	4.5
-2.0	1.2 [2]	71	Off	1,297	14.0
-1.5	4.3 [7]	75	Off	1,840	46.5
-1.0	7.5 [12]	77	Off	2,010	90.0
-0.5	9.9 [16]	76	Off	2,180	124.5
0.0	11.2 [18]	72	Off	2,206	146.0

- +Long & Lat Delta V and Acceleration
- +Roll Angle -1 to +5 sec @ 0.1 sec interval

Typical Mitsubishi CDR Data

System Status at Event (Record 1)

Ignition Cycle, Crash	1,828
Multi-event, Number of Events (1,2)	1
Time From Event 1 to 2 (ms)	0.0
Complete File Recorded (Yes, No)	Yes
Safety Belt Status, Driver	Belted
Safety Belt Status, Front Right Passenger	Unbelted
Frontal Air Bag Warning Lamp, On/Off	Off
Frontal Air Bag Suppression Switch Status	None
Seat Track Position Switch Status, Driver	Not Forward
Occupant Size Classification, Passenger, Child Size	OC 5TH UP
Maximum Delta-V, Longitudinal (MPH [km/h])	-25.5 [-41]
Time, Maximum Delta-V Longitudinal (ms)	290
Maximum Delta-V, Lateral (MPH [km/h])	29.2 [47]
Time, Maximum Delta-V Lateral (ms)	110
Time, Maximum Delta-V, Resultant (ms)	290

TESLA



1. Remember the definition of an EDR is something that records a time series of data **as a result of a crash.**
2. Tesla may record information as a result of turning the key on, but that is not an event data recorder. More on this later.
3. Tesla did not have any EDR in the ACM of its original 2008 Roadster models.
4. Tesla has installed EDR in The 2012+ Model S, the 2015+ Model X, and the 2017 Model 3.
5. Effective March 2018, Tesla announced they will sell a publicly available tool to download the Tesla EDR

Tesla EDR

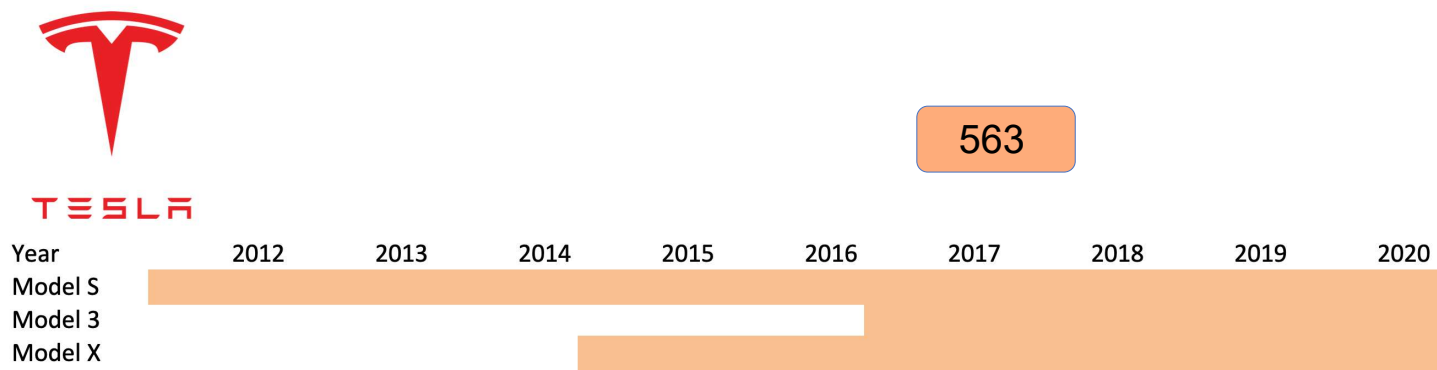
- Kit includes:
 - TIV-144: In vehicle cable for Tesla Model S and X
 - TIV-145: In vehicle cable for Tesla legacy Model S
 - TIV-996: In vehicle cable for Tesla Model 3
 - TD2M-601: Direct to Module cable for Tesla Model X and 3
 - TD2M-602: Direct to Module cable for Tesla Model S
 - TD2M-139: Direct to Module cable for Tesla Model S (NEW CABLE)
 - AC Power Adapter
 - PCAN-USB adapter
 - Hard Shell Case



COST: \$1200.00

Tesla EDR

Coverage



TESLA

- More information is available on their website <https://edr.tesla.com>
- See “Other sources” later

Order Cables

Order the cables needed to retrieve EDR data. Note that a USB-to-CAN adapter is also required in order to retrieve EDR data. See the [help](#) page for more information.

ORDER CABLES

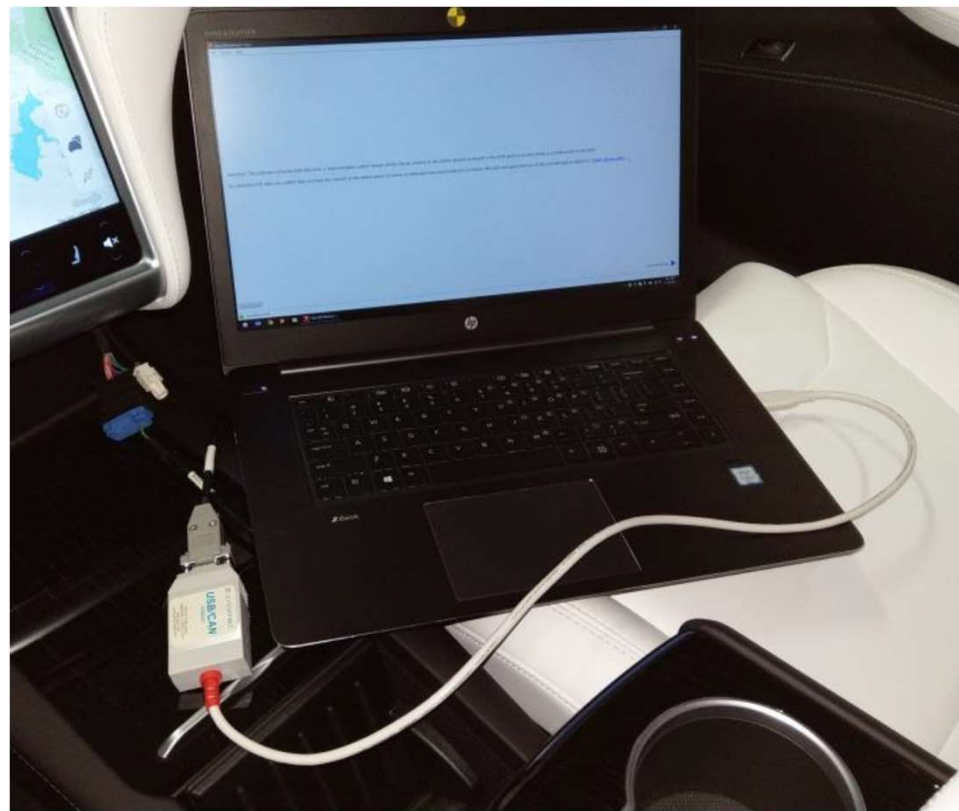
Download the Tesla EDR Retrieval Program

This free software program is used to retrieve EDR data.

DOWNLOAD

The Tesla EDR Tool

1. Tesla provides the software free of charge on their website that installs on your laptop. No special computer is needed.
2. The hardware kit sells for a list price of \$1200.00.
3. The equivalent of the Bosch CDR interface manual is the "PCAN-USB" adapter. It is very small, and reminds you more of a USB to serial adapter, just a slight bit larger.

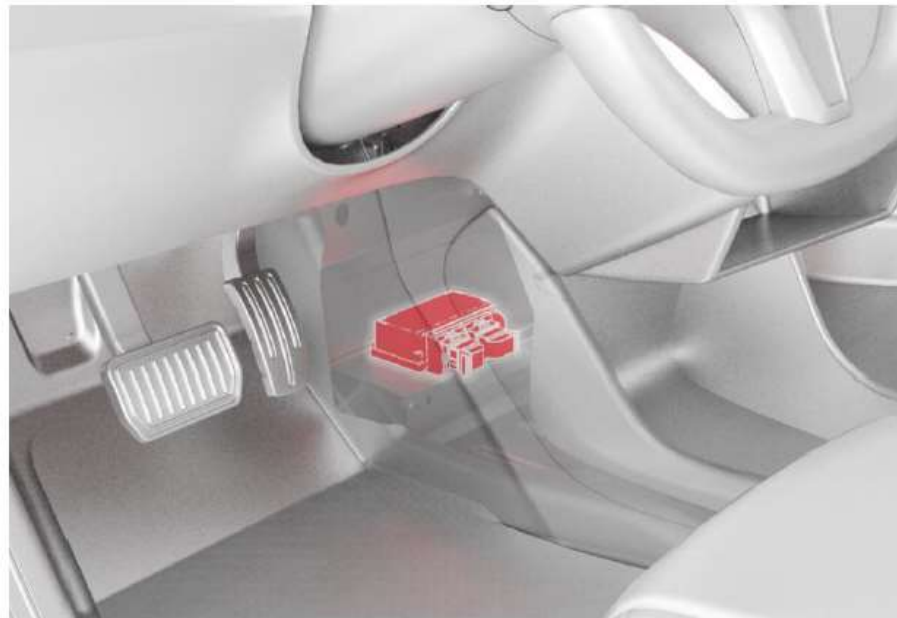


Plug in the PCAN adapter to the Body Harness. Model X and Model 3 are in other places & use a different connector described in Tesla's 27-page EDR guide at **edr.tesla.com/help**.



TESLA also has 3 direct to module connectors

If the In-Vehicle Connection procedure is unsuccessful, you might be able to connect to the RCM directly, and establish a direct-to-module connection. The RCM is located forward of the center console, below the instrument panel and center screen.



Some 2018 Model 3 Cables must be replaced

External Power must be used for DTM readouts

- h. Connect 12V power to the Tesla Model S Direct-To-Module EDR Retrieval Harness.

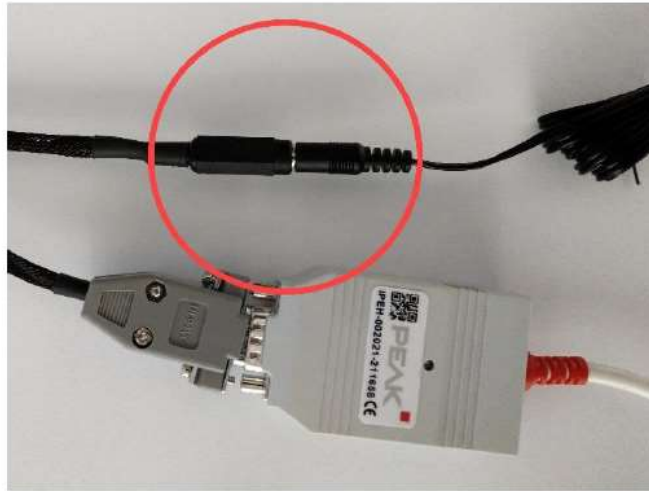


Figure 20. Connecting 12V power to the EDR retrieval harness

- i. Proceed to “Retrieve Data” on page 26 to complete the data retrieval procedure.

The Tesla 27-page Guide

- The Guide is VERY thorough and helpful
- It gives step by step instructions for the hardware assembly and to navigate the EDR program
- There are photographs of connector and module locations
- There are instructions for disassembly to get to the connectors and modules

Tesla EDR

- Data varies by model

Model	S	Model 3	X
Event Data			
Max X Δv	X	X	X
Time to X Max ΔV	X	X	X
Max Y Δv	X	X	X
Time to Y Max ΔV	X	X	X
Time to Max Resultant Δv	X	X	X
Ignition cycle Event	X	X	X
Ignition cycle runtime	X	X	X
Odometer at event	X	X	X
Driver Seat Track Position	X	X	X
Driver belt	X	X	X
Passenger Belt/Occupant	X	X	X
2nd row Belt/Occupant	X		X
3rd row Belt/Occupant			X
File Complete	X	X	X

Tesla EDR

- Data varies by model

	Model		
	S	3	X
PreCrash Data			
Vehicle Speed	2Hz	5Hz	2Hz
Accelerator Pedal	2Hz	5Hz	2Hz
Rear Motor Speed	2Hz	5Hz	2Hz
Service Brake	2Hz	2Hz	2Hz
Stability Control	2Hz	2Hz	2Hz
ABS	2Hz	2Hz	2Hz
Steering Wheel Angle	2Hz	10 Hz	10 Hz
Lateral Acceleration	Not Reported	10 Hz	10 Hz
Longitudinal Acceleration	Not Reported	10 Hz	10 Hz
Roll Rate	Not Reported	10 Hz	10 Hz
Yaw Rate	Not Reported	10 Hz	10 Hz

Tesla EDR

- Data varies by model

	Model		
	S	3	X
Crash Data			
Longitudinal Δv	300ms	300ms	250ms
Lateral Δv	300ms	300ms	250ms
Longitudinal Acceleration	500Hz (300ms)	2000Hz (60ms)	2000Hz (60ms)
Lateral Acceleration	500Hz (300ms)	2000Hz (60ms)	2000Hz (60ms)
Normal Acceleration	Not Reported	Not Reported	50Hz (1.4s)
Roll Angle	100Hz (6s)	Not Reported	Not Reported

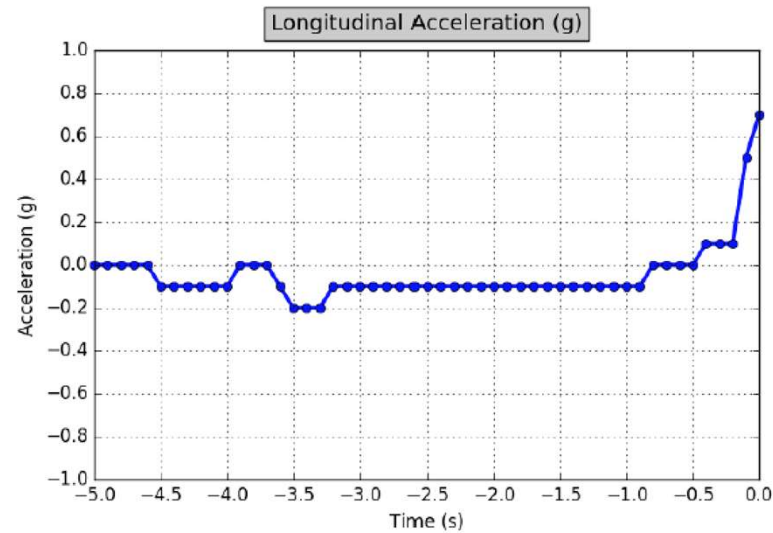
Tesla EDR Sample File

- Model 3 Data

Time (sec)	Service Brake	Stability Control	ABS Activity
-5.0	Off	Off	Off
-4.5	Off	Off	Off
-4.0	Off	Off	Off
-3.5	Off	Off	Off
-3.0	Off	Off	Off
-2.5	Off	Off	Off
-2.0	Off	Off	Off
-1.5	Off	Off	Off
-1.0	Off	Off	Off
-0.5	Off	Off	Off
0.0	On	Off	Off
-2.6	6.0	10.8	714
-2.4	6.0	13.2	746
-2.2	6.0	14.8	784
-2.0	7.0	12.4	807
-1.8	7.0	12.4	845
-1.6	7.0	12.4	883
-1.4	7.0	11.2	905
-1.2	8.0	12.0	922
-1.0	8.0	10.4	941
-0.8	8.0	4.8	932
-0.6	8.0	0.0	916
-0.4	8.0	0.0	888
-0.2	8.0	0.0	843
0.0	7.0	0.0	749

Tesla EDR Sample File

- Model 3 Data



Time (s)	Acceleration (g)	Time (s)	Acceleration (g)	Time (s)	Acceleration (g)
-5.0	0.0	-3.2	-0.1	-1.4	-0.1
-4.9	0.0	-3.1	-0.1	-1.3	-0.1
-4.8	0.0	-3.0	-0.1	-1.2	-0.1
-4.7	0.0	-2.9	-0.1	-1.1	-0.1
-4.6	0.0	-2.8	-0.1	-1.0	-0.1
-4.5	-0.1	-2.7	-0.1	-0.9	-0.1
-4.4	-0.1	-2.6	-0.1	-0.8	0.0
-4.3	-0.1	-2.5	-0.1	-0.7	0.0
-4.2	-0.1	-2.4	-0.1	-0.6	0.0
-4.1	-0.1	-2.3	-0.1	-0.5	0.0
-4.0	-0.1	-2.2	-0.1	-0.4	0.1
-3.9	0.0	-2.1	-0.1	-0.3	0.1
-3.8	0.0	-2.0	-0.1	-0.2	0.1
-3.7	0.0	-1.9	-0.1	-0.1	0.5
-3.6	-0.1	-1.8	-0.1	0.0	0.7
-3.5	-0.2	-1.7	-0.1		
-3.4	-0.2	-1.6	-0.1		
-3.3	-0.2	-1.5	-0.1		

Troubleshooting

1. Some users report a “time out” error when trying to read data. The vehicle is going back to sleep.
Putting your foot on the brake pedal and keeping it there for the whole readout keeps the vehicle alive.
2. Low battery power accentuates the time out problem.
Tesla NEMA 5-15 adapter?



3. Or see the Help Guide for information how to backpower through the First-Responder loop.

Converting Raw Data to a Report

The Tesla software extracts a raw data file. To convert the raw data to a report, you must upload the raw data to the Tesla Server. A report is immediately returned in the latest version of software.

Generate a Report

Create a MyTesla account in order to upload an EDR data file and generate a report in PDF format.

LOG IN

Create a MyTesla account

Worried about report conversion being biased by Tesla?

1. Data is Encrypted.
2. The report is returned IMMEDIATELY. There is no time for Tesla to alter any data to Tesla's benefit.
3. However, some clients insist that no one has a copy of the data except them.
4. There is a "Save without VIN sequence" option to de-identify data
5. There is no alternative.

What about OTHER data Tesla Data Records?

1. Most of the time you will NOT NEED to access the other data Tesla records, the EDR should be sufficient. But if you need a longer time history, Tesla records MANY data parameters every one second plus, when anything electronically monitored happens. It gets uploaded to the cloud.
2. It is NOT an “event” data recorder, it is a continuous recorder (does **NOT** meet Part 563 definition of a data recorder) (so **NO** PUBLICLY AVAILABLE tool to read it)
3. Law Enforcement contact Tesla and demonstrate proper legal authority
4. Tell them what you are interested in (they have so much you have to narrow it down)

What about OTHER data Tesla Data Records?

1. Modern Tesla have recorded video that can be uploaded to Tesla
2. This data can be retrieved from Tesla
3. Contact legal@tesla.com



Other sources for Tesla equipment

1. www.edrfinder.com has developed their own independent Tesla hardware kit. (They are affiliated with one of the Bosch CDR distributors for Europe, and are located in Germany)
2. It utilizes the same interface PCAN-USB adapter
3. They have made an adapter from the PCAN adapter to a Bosch CDR DLC cable and the Bosch 783 direct-to-module cable
4. They still have to make a special cable for the Delphi DTM cable
5. Assuming you have a CDR system, this system is lower cost because it has fewer parts
6. Introductory pricing is \$695

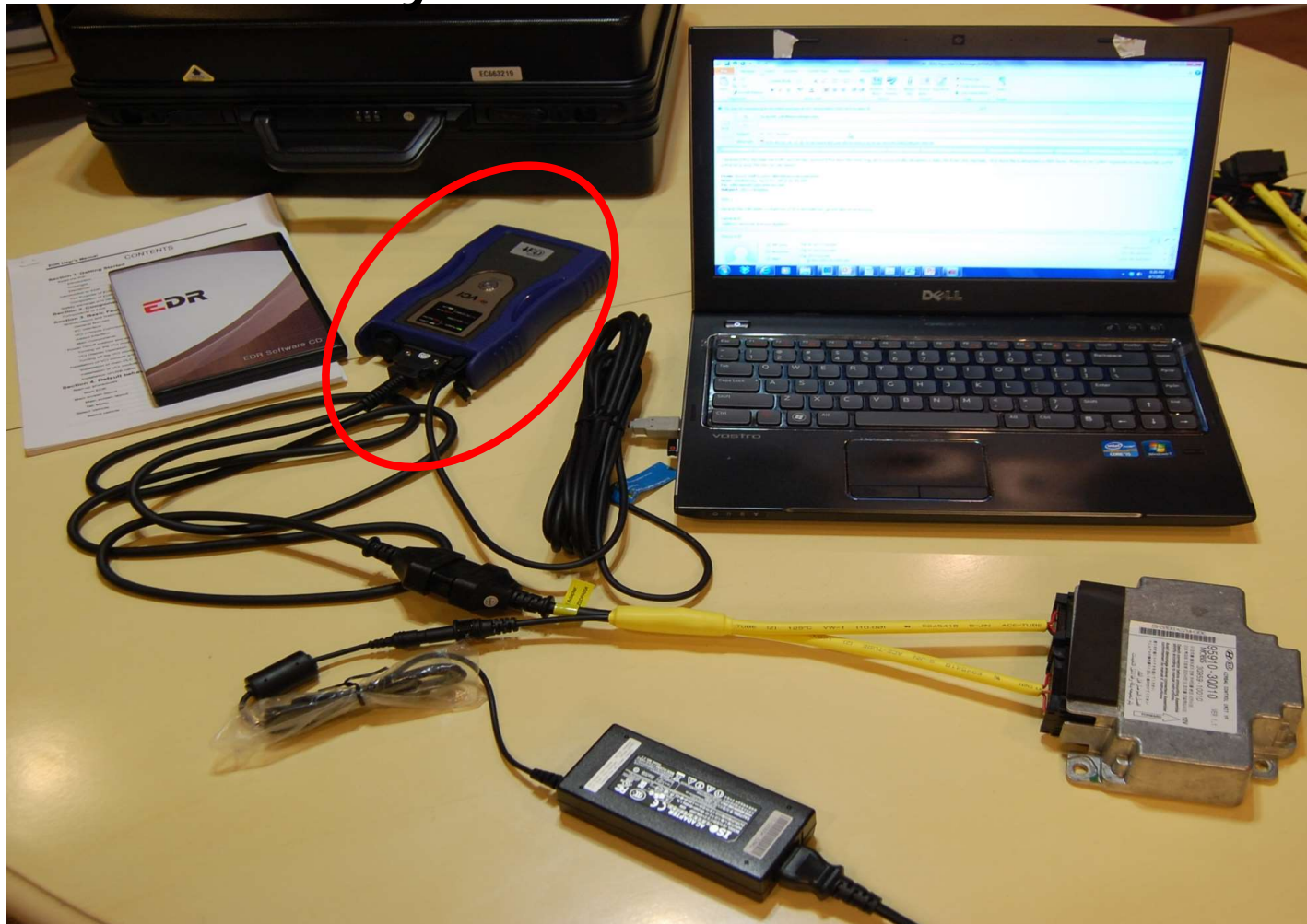
Hyundai/Kia EDR Tools

- Starting Jan 2022, you may purchase U.S. DLC only kits from Crash Data Group \$4950 per brand.
- Full Hyundai kit comes with 13 DTM cables thru #24, Kia with 15 DTM cables thru #23. 10 Cables are in both. New cables now cost \$300 each . #25-30 for 2019/2020/2021/2022's not yet included in full kits.
- Hyundai full kit: Part G0Z**H**DMN001 **\$6450**, Kia full kit: Part GIT0Z**K**DMN001 **\$6950 + tax+ship, +software \$695/brand**
- Software updates **\$695/yr/** brand from GIT Tool Company or Crash Data Group. Current V46 Hyundai/Genesis, V44 Kia.
- CAN-FD (Flexible Data Rate) DTM adapter needed for 2020 HV80 & other new models cost approx. \$1,080
- Contacts: Patrick Dadson pdadson@gitamerica.com (888)549-4977
- Scott Baker crash@crashdatagroup.com (800) 280-7940

Additional Info

1. K/H Interface modules are identical, but you must buy both to get software for both. Software updates won't download unless the correct interface module is attached to your laptop.
2. I read K/H modules for others for \$500. More people are buying Hyundai kits now that we have 8+ model years on the road.

The Hyundai EDR Reader



Officially Supported 2013+ Models V48H/45K

Model	Model Years																
KIA	2010	2011	2012	2013*	2014	2015	2016	2017	2018	2019	2020	2021	2022				
CADENZA (Azera sister)					19(VG)	19	19	13(YG)	13	13							
FORTE	10	10	10	10 (TD)	6 (YD)	6	6	12(YD,YDM)	12	21(BDm)	21	21					
K5													26(D3LA)				
K900						11 (KH)	11	11	11	21(RJ)	21						
NIRO (DE EV, DE HEV, DE PHEV)								21(DE)	21	21	21	21					
OPTIMA	No	4	4	4 (TF/QF)	4	4	14 (JF,JFA)*	14	14	14(JFA)	14	?					
OPTIMA HYBRID	No	4	4	4 (TF HEV)	4	4	4	23(JF HEV)	23	23	23	?					
RIO	No	No	8	8(UB)	8	8	8	8	21 (SC)	21	21	21					
RONDO (Canada only 2011 MY+)	No	No	9	(not officially supported since non-US, read as a Kia Rio)													
SEDONA /CARNIVAL and EV6	No	No	No	No	10(VQ)	12(YP)	12	12	12	12	12	12	29+CFCI	KA4			
SELTOS													28(SP2)				
SORENTO	No	3	3	3(XM)	3,7(XM)	3,7	13 (UMA)	13	13	13	13	29+CFCI	(MQ4)				
SOUL	1 see note 1	1 see note 1	1	1(AM)	12(PS)	12(PSEV)	12	12	12	12,26(SK3 EV)	26 (SK3)	26					
SPORTAGE (SL)	No	Yes	2	2(SL)	2	2	2	13(QL)	13	13	13	13					
STINGER (CK)									21 (CK)	21	21	21	30+CFCI	NQS			
TELLURIDE (ON)											25(ON)	25					
HYUNDAI	2010	2011	2012	2013*	2014	2015	2016	2017	2018	2019	2020	2021					
ACCENT (RB)	No 10	No?	5 see note 2	5(RB)	5	5	5	5	21(HC)	21	21	21					
AZERA (HG)		likely	Yes	7(HG)	7	7	7	7									
ELANTRA Coupe(JK), Sedan(UD/MD)	No	Yes	8	8(JK/UD/MD)	8	8	8	21(AD, ADA)	21	21	21	Hyb 28 (CN7)					
ELANTRA GT (GD) (aka "I30")	old model		new model	6/12(GD)	6,12	6,12	6,12	6,12	21(PD)	21	21	21					
EQUUS (VI)(stretch genesis)	?	yes?	yes?	9,11(VI)	9,11(VI)	9,11(VI)	9,11(VI)										
GENESIS (Coupe BK, Sedan BH/DH)	9 shave keyway	9 shave keyway	?	9(BK, BH)	9	13(DH)	13										
GENESIS G70										21,25(IK)	21,25	29+CFCI	(JK1)				
GENESIS G80								13(DH)	13	13	13	29+CFCI					
GENESIS GV80											29+CFCI	29+CFCI					
GENESIS G90								13(HI)	13	13	13	13					
IONIQ EV and HEV								21(AE)	21	21	21	21					
KONA (i20, Rio sister)small SUV									24 (OS)	24	24	24					
KONA EV										27 (OS EV)	27	27					
NEXO										26 (FE)	26	26					
PALISADE											25(LX2)	25					
SANTA CRUZ													30+CFCI	(NX4)			
SANTE FE	9 shave keyway note 3	9 shave keyway	9 shave keyway	7(NC,DMA)	7	7	7	7	7	25 (TMA)	25	25					
SONATA		4	?	(YFA, YF HEV)	4	4 (LF)	14 (LF HEV)	14	14	14	25(DN8A)	25					
TUCSON	Yes	Yes	2	2(LM)	2	2	13(TL)	13	13	13	13	30+CFCI	(NX4)				
VELOSTER coupe	out of production		?	5(FS)	5	5	5	5	5	14 (JS)	14	14					
VELOSTER N										28(JSN)	28	28					
VENUE											30(QX)	30					

Smart Cruise Control info 21 Palisades

Pre-Crash Information 2 (-5 ~ 0 sec)

Time (sec)	Gear shift selector display	SCC information (Main switch status)	SCC information (Set Speed)	SCC information (SPEED UNIT)	SCC information (Mode status)	SCC information (Fail info)
-5.0	D	ON	85	MPH	Engaged	System without Error
-4.5	D	ON	85	MPH	Engaged	System without Error

Auto Braking info 21 Palisades

Pre-Crash Information 3 (-5 ~ 0 sec)

Forward Collision Alert			
Time (sec)	FCA (Function status)	FCA (Warning Level)	FCA (Fail info)
-1.0	ON	No Warning / Invalid or Not supported	Normal
-0.9	ON	No Warning / Invalid or Not supported	Normal
-0.8	ON	Level 1 Audible	Normal
-0.7	ON	Level 2 0.2g Autobrake	Normal
-0.6	ON	Level 2	Normal
Level 3 =Max autobrake			

Pre-2013 Kia Hyundai may have data

Model	Vehicle Size, Description	Model Years			
		2010	2011	2012	2013*
KIA		Cable #	Cable #	Cable #	Cable #
CADENZA (VG, 2014) (Azera sister)	112.0" WB	YG requires cable 13 per software			
FORTE (TD 2013, YD 2014))	104.3"WB, compact	10	10	10	10 (TD)
K900 (KH 2015)	119.9"WB				
NIRO					
OPTIMA (2013 TF QF, 2016 JF, JFA)	110.0" WB sedan	No	4	4	4 (TF/QF)
OPTIMA HYBRID	110.0" WB sedan	No	4	4	(TF HEV)
RIO (UB)	94.5"WB, compact	No	No	8	8(UB)
RONDO (Canada only 2011 MY+)		No	out of production		
SEDONA (VQ '14, YP '15)	113.8/118.9" WB miniv	No	No	No	No
SORENTO (XM to 2015)(UMA 2016)	106.3" WB, crossover	No	3	3	3(XM)
SOUL (AM 2013, PS 2014+)	100.4" WB	¹ see note 1	¹ see note 1	1	1(AM)
SPORTAGE (SL)	103.9" WB, crossover	No	Yes	2	2(SL)
HYUNDAI					
ACCENT (RB)	94.5"WB, compact	No 10	No?	⁵ see note 2	5(RB)
AZERA (HG)	109.4"WB, sedan		likely	Yes	7(HG)
ELANTRA Coupe(JK), Sedan(UD/MD)	104.3"WB, compact	No	Yes	8	8(JK/UD/MD)
ELANTRA GT (GD) (aka "i30")	former Elantra Touring	old model		new model	6(GD)
EQUUS (VI)(stretch genesis)	119.9" WB, luxury seds	?	yes?	yes?	9(VI)
GENESIS (Coupe BK, Sedan BH/DH))	115.6" WB, luxury seds	9 chav keyway	9 chav keyway	?	9(BK, BH)
GENESIS G90					
SANTE FE (Sport DMA, NC)	106.3" WB, crossover	9 chav keyway note 3	9 chav keyway	9 chav keyway	7(NC,DMA)
SONATA (YF sedan, YF HEV)	110.0" WB sedan		4	?	4(YF)
TUCSON (LM to 2015)(TL-in 2016)	103.9" WB, crossover	Yes	Yes	2	2(LM)
VELOSTER coupe (FS)	104.3"WB, compact	out of productior		?	5(FS)

2010-2012 EDR Access

1. The tool requires VIN input and only allows read of 2013+ VINS.
2. Input surrogate 2013 VIN to communicate with 2010-2012 models. Report will list surrogate VIN used.
3. Decoder changed slightly for 2013. Not all data decodes properly.
4. 2010-12 file admissibility must be presented skillfully (get help).
- 5. Data successfully admitted in Virginia, Florida, and California.**

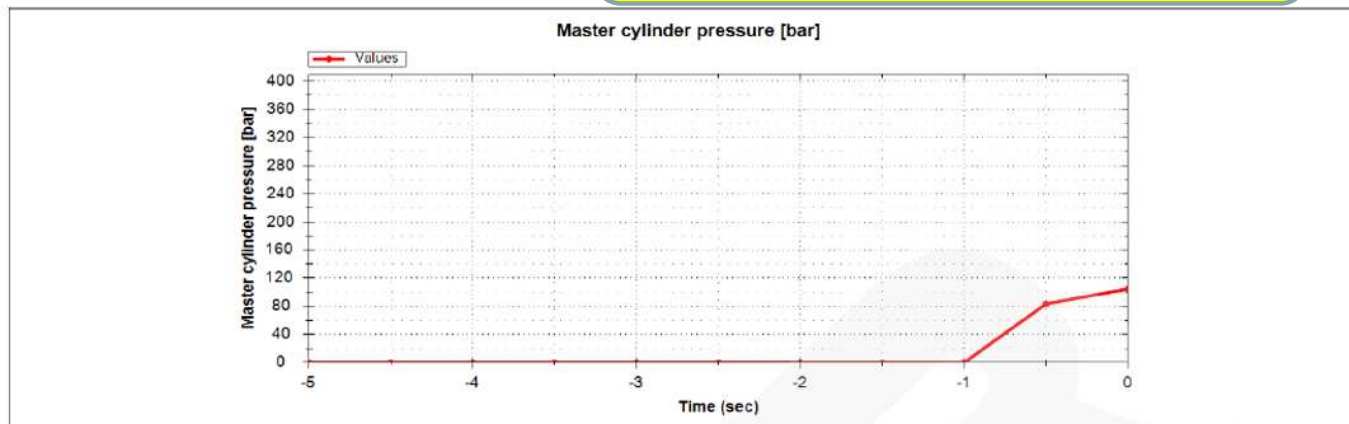
K/H 2010-2012 data reliability?

1. In 50+ NHTSA crashes, speed, delta V and belt use appear OK (one exception)
2. Steering angle, and accel data appear implausible on some
3. Key cycles at download not in all models
4. SAE 2014-01-0502 has details.
5. Additional testing on 2012 Soul reported in SAE 2015-01-1445.
6. Admitted to court in VA, CA, one other

Brake Pres. added to 2019 Forte

page movement
Snow
ZOOM
< Event 1 >
Master cylinder pressure

Units in Bars. 1 Mpa=10 bars
Toyota max scale is 12 Mpa=120 bar



Num	Time (sec)	Master cylinder pressure [bar]
1	-5.0	0.2
2	-4.5	0.2
3	-4.0	0.2
4	-3.5	0.2
5	-3.0	0.2
6	-2.5	0.2
7	-2.0	0.2
8	-1.5	0.2
9	-1.0	0.2
10	-0.5	83.7
11	0.0	104.6

Newly published research

1. Every year at the SAE World Congress in April new research is presented.
2. A very brief summary follows, I encourage you to read these papers.
3. Other good sources of EDR info include Collision Magazine

<https://www.collisionmagazine.com/article-index/>
& Accident Reconstruction Journal.

EDR SAE Papers 2020

2020-01-1327 Performance of Event Data

Accuracy of Speed Change Measured by Event Data Recorders during Oblique Offset Frontal Impacts by by Curtat, Wilkinson, Siegmund (MEA Forensic)

2020-01-1328 Evaluation of General Motors Event Data Recorder Performance in Semi-Trailer Rear Underride Collisions by Famiglietti, Fatzinger et al (Momentum Engineering)

2020-01-TBD Analysis of Honda Accord EDR Data for Low- to High Speed Impact Severities by Crosby/Skiera/Bare (Exponent)

2020-01-1329 Further Non-deployment and Deployment Laboratory Experiments Using a Toyota Auris 2007 Event Data Recorder by Tabone (Univ. of Malta)

EDR @ SAE 2021

- 1. Accuracy of Gen 2 Toyota EDR in Low Speed Side Impacts**
- 2. Analysis of Crash Data from a 2012 Hyundai Genesis Coupe Event Data Recorder**
- 3. Validation of EEPROM Chip Removal and Reinstallation for Retrieval of Electronic Crash Data**

Regulatory Update

1. NHTSA issued NPRM in Dec 2012 to **require** 563-EDR's by Sept 2014 (past!)
2. NPRM proposed EDR as FMVSS 405, OEM's would have to self certify EDR's. Strong OEM objections were filed.
3. **Officially withdrawn Feb 2019**
<https://www.federalregister.gov/documents/2019/02/08/2019-01651/federal-motor-vehicle-safety-standards-event-data-recorders>
4. Mfrs were NOT expected to remove EDR's – But one Land Rover model may have – now has Bosch freeze frame recorder.

Regulatory Update

1. NHTSA/IIHS got 10 auto mfrs to agree on 9/11/2015 to making **Auto Emergency Braking (AEB)** standard (timeline 2022). Voluntary commitment is a relatively new strategy by NHTSA. Now 20 have agreed.
2. Next big issue is Autonomous Vehicles (self driving cars).
3. States are drafting conflicting regulations on type of certification required – could hinder development.

Appeal for Files

- Manufacturers keep coming out with new generations of EDR's
- The way I keep up is asking my network of former students send me files from new vehicles
- PLEASE SEND ME FILES FROM 2019/2020/2021 MY VEHICLES
- If you don't de-identify them, I will
- Helpful if I know which way they turned to check polarity of steering, yaw, lat accel