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Special Crash Investigations

Air Bag Non-Deployment Crash Investigation

Vehicle: 2010 Dodge Charger

Location: California

Crash Date: November 2016

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16. Abstract This three-vehicle crash occurred in November 2016 in the pre-dawn morning in the southbound lanes of a divided interstate highway in California. The roadway was straight and level. The Dodge was being driven southbound by a belted 37-year-old female. The Ford Edge was being driven the wrong way on the highway by a belted 76-year-old male. The Ford was traveling northbound and had entered the southbound lanes at some point. The front plane of the Ford struck the front plane of the Dodge head-on. The air bag in the Ford deployed but the air bags in the Dodge did not. The Dodge came to rest on the roadway and was subsequently struck in the rear by a 2015 International Pro Star semi-truck hauling a 2014 utility box trailer. The driver of the Dodge was fatally injured. All vehicles were towed from the scene due to damage. Based on all available data, the driver's frontal air bag in the Dodge should have deployed but it did not.			
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Case Number: DS17003
Office of Defects Investigation
On-Site Air Bag Non-Deployment Crash Investigation
Vehicle: 2010 Dodge Charger
Location: California
Crash Date: November 2016

BACKGROUND

This report documents the on-site investigation of air bag non-deployments in a 2010 Dodge Charger involved in a head-on crash with a 2010 Ford Edge, followed by rear-end crash with a 2015 International tractor-trailer rig (**Figure 1**).

This investigation was initiated by the Office of Defects Investigation (ODI) in response to a notification from the investigating police agency. The Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration assigned the case to Dynamic Science, Inc., in March 2017. The vehicle inspection was completed in March 2017.



Figure 1. 2010 Dodge Charger

Members of the State Police crash investigation team were present during the inspection. The Dodge and the Ford were supported by the Bosch Crash Data Retrieval (CDR) system and the vehicles' event data recorders (EDRs) were imaged by the police agency. SCI imaged the Dodge's EDR and obtained a PDF version of the report for the Ford. Based on all available data, the driver's frontal air bag in the Dodge should have deployed but it did not.

This three-vehicle crash occurred in November 2016 at 0400 hours in the southbound lanes of a divided interstate highway in California. It was dark at the time of the crash and roadway was straight and level. The Dodge was being driven southbound by a belted 37-year-old female. The Ford Edge was being driven the wrong way on the highway by a belted 76-year-old male. The Ford was traveling northbound and had entered the southbound lanes at some point. The front plane of the Ford struck the front plane of the Dodge head-on. The air bag in the Ford deployed but the air bags in the Dodge did not. The Dodge came to rest on the roadway and was then struck in the rear plane by a 2015 International Pro Star semi-truck hauling a 2014 utility box trailer. The driver of the Dodge was fatally injured. All vehicles were towed from the scene due to damage.

SUMMARY

Crash Site

The crash site was in the southbound lanes of a divided interstate highway (**Figure 2**). The two straight travel lanes were separated from the northbound lanes by a depressed grass-covered median interspersed with bushes. The roadway was bordered on the right by a solid white fog line and an asphalt shoulder and was bordered on the left by a solid yellow line and an asphalt shoulder. It was dark at the time of the crash and there were no streetlights present. The posted speed limit was 112 km/h (70 mph). The weather at the nearest reporting station was 3 degrees C (38 degrees F), 93 percent humidity, clear visibility, clear skies, and calm winds. Crash diagrams are included at the end of this technical report.



Figure 2. Southbound travel lanes

Pre-Crash

The Dodge was traveling southbound in the second lane from the right at an unknown speed. The vehicle was being driven by a belted 37-year-old female. The Ford was being driven the wrong way on the freeway by a belted 76-year-old male. The driver of the Ford had entered an off-ramp for the southbound lanes and was traveling northbound in the same lane as the Dodge at an EDR-reported speed of 68.7 km/h (42.7 mph) at 5 seconds prior to the crash. An overview of the Ford's speed and distance traveled as reported by the EDR is shown in the following table.

Time	Vehicle Speed		Distance Traveled			
			Incremental		Cumulative	
-sec	km/h	mph	m	ft	m	ft
4	69	42.7	NA	NA	NA	NA
3	69	43	19.1	62.8	19.1	62.8
2	70	43.2	19.3	63.2	38.7	126
1	70	43.4	19.4	63.5	57.8	189.5
0	70	43.4	19.4	63.7	77.2	253.2

The Ford had been reported to authorities as traveling the wrong way and police were actively looking for the vehicle prior to the crash. The Ford's speed remained generally constant and was reported as 69.8 km/h (43.4 mph) at time 0. The brake lamp switch depressed status remained as "No" throughout. The impact speed of the Dodge was calculated to be 72.0 km/h (44.7 mph). The delta-V calculations are included as Appendix C.

Crash

The Dodge and Ford struck head-on (Event 1). The standard algorithm of the WinSMASH program calculated a total delta-V of 82 km/h (51 mph) for the Dodge. The longitudinal and lateral components were -82 km/h (-51 mph) and 0 km/h, respectively. The barrier equivalent speed was 103 km/h (64 mph). The collision met the model and the results appear reasonable for

both vehicles. There were no air bag deployments in this vehicle. The program calculated a total delta-V of 76 km/h (47 mph) for the Ford. The longitudinal and lateral components were -76 km/h (-47 mph) and 0 km/h, respectively. The BES was 46 km/h (28 mph). The EDR reported a maximum cumulative longitudinal velocity change of -67.45 km/h (-41.91 mph). The Fords's frontal air bag deployed and the seat belt pretensioner actuated at impact.

According to the police report, the Dodge was displaced rearward approximately 7.9 m (26 ft). Both vehicles came to rest in their original lane of travel. The driver of the Dodge survived this impact and was able to call a friend.

The International semi truck/trailer was traveling southbound in the first lane from the right approximately one minute after the initial crash. The driver reported that he saw a stopped vehicle and brake lights in his lane. As he changed lanes to the left he saw a flash of red and braked. The front of the International struck the rear plane of the Dodge (Event 2) and the Dodge struck the Ford a second time (Event 3). The Dodge was displaced to the south and came to rest in its original lane of travel facing south. The Ford was displaced to the south, began a counterclockwise rotation, and struck the bridge wall with its rear plane (Event 4). It came to rest on the east roadside/median facing south. After striking the rear of the Dodge, the International semi continued southbound for 91 m (298 ft) before coming to rest facing south along the median edge.

Post-Crash

The driver of the Dodge was fatally injured. The driver of the Ford sustained police-reported "A" (severe) injuries that included a sternal fracture, clavicle fractures, and a concussion. He was transported by helicopter to an area trauma center. The driver of the International complained of pain to his neck and back. He was transported by ambulance to an area trauma center.

All vehicles were towed from the scene due to damage.

2010 DODGE CHARGER

Description

The 2010 Dodge Charger SXT was a 4-door, 5-passenger sedan. The Dodge was identified by the Vehicle Identification Number (VIN) 2B3CA3CV3AHxxxxxx and was manufactured in August 2010. The vehicle mileage is unknown. CARFAX reported the last reported odometer reading as 148,722 km (92,412 miles) in 2015. There were three previous owners, the first of which was a fleet/lease company that titled the vehicle in Oklahoma. There were no accidents reported.

The vehicle was equipped with a 3.5-liter, 6-cylinder gasoline engine coupled to an automatic transmission, rear-wheel drive, and 4-wheel ABS. The vehicle manufacturer's recommended front and rear tire size was P215/65R17 with a cold tire pressure of 207 kPa (30 psi). The vehicle was equipped with Goform GH18 tires of the recommended size on the front and Hankook Optima tires of the recommended size on the rear. The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire Flat	5 mm (6/32 in)	Yes	De-beaded
LR	213 kPa (31 psi)	5 mm (6/32 in)	No	None
RR	Tire Flat	6 mm (7/32 in)	No	Sidewall cut
RF	206 kPa (30 psi)	5 mm (6/32 in)	Yes	Sidewall cut

The Dodge was configured with seating for five occupants. The front row was equipped with bucket seats with adjustable head restraints. The seat track positions are unknown. The second row was equipped with a bench seat.

Exterior Damage

The Dodge sustained severe damage to the front plane during the impact with the Ford (Event 1) and possibly sustained some additional damage as the vehicle was displaced forward during the rear plane impact and struck the Ford a second time (Event 3). The direct damage began at the left bumper corner and extended 120.0 cm (47.2 in) to the right bumper corner (**Figure 3**). Fourteen measurements were taken at the bumper backing bar level by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: $C_1 = 95$ cm (37.4 in), $C_2 = 90$ cm (35.4 in), $C_3 = 99$ cm (38.9 in), $C_4 = 102$ cm (40.1 in), $C_5 = 103$ cm (40.5 in), $C_6 = 74$ cm (29.1 in). The Collision Deformation Classification (CDC) was 12FDEW5.



Figure 3. 2010 Dodge Charger, front plane damage

The vehicle sustained severe damage to the rear plane during the impact with the International (Event 2). The direct damage began at the right bumper corner and extended 80 cm (31.4 in) to the left (**Figure 4**). Thirteen measurements were taken at the bumper backing bar level by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: $C_1 = 0$ cm, $C_2 = 14$ cm (5.5 in), $C_3 = 41$ cm (16.1 in), $C_4 = 64$ cm (25.1 in), $C_5 = 80$ cm (31.4 in), $C_6 = 86$ cm (33.8 in). The CDC was 06BZEW5.



Figure 4. 2010 Dodge Charger, rear plane damage

NHTSA Recalls and Investigations

The vehicle was subject to NHTSA Recall Number 15V-313. The recall date was May 26, 2015.

Summary: The driver air bag inflator housing may rupture, due to excessive internal pressure, during normal air bag deployment events. This condition is more likely to occur if the vehicle has been exposed to high levels of absolute humidity for extended periods of time.

Remedy: The driver air bag inflator must be replaced.

Event Data Recorder

The Dodge was equipped with an air bag control module (ACM). The ACM had EDR capability and was configured to store deployment and non-deployment events. The data from the Dodge's EDR was imaged using the Bosch Crash Data Retrieval Tool version 17.2 via the direct-to-module method and reported using the same version. No events were stored in the ACM and thus none were recovered. There were no air bag deployments or seat belt pretensioner actuations.

Interior Damage

The Dodge sustained severe interior damage as a result of intrusion, occupant contacts, and integrity loss. The vehicle sustained longitudinal intrusions to the second row from the seat backs and the backlight header. There was a longitudinal intrusion to the front row from the right passenger seat back. All four doors were jammed shut; the left front door was pried open and the right front door was removed to extricate the driver. There was integrity loss for the backlight glazing and the side windows. The steering wheel rim was deformed forward from occupant contact (**Figure 5**). The driver's seat back was deformed rearward due to driver loading. There was loading evidence documented to the driver's seat belt. The instrument panel was damaged due to occupant contact and removal of the center instrument panel/console to access the ACM.



Figure 5. Steering wheel deformation, 2010 Dodge Charger

Manual Restraint Systems

The front row was equipped with driver and front right passenger lap and shoulder seat belts. The driver's belt was equipped with continuous loop belt webbing, a sliding latch plate, an emergency locking retractor (ELR), and an adjustable upper anchor that was adjusted to the full down position. The front right passenger's seat belt was equipped the same as the driver's, but had a switchable ELR/automatic locking retractor (ALR). Inspection of the driver's seat belt assembly revealed loading evident to the seat belt webbing and the D-ring (**Figure 6**).



Figure 6. Upper anchor D-ring, 2010 Dodge Charger

Supplemental Restraint Systems

The Dodge's supplemental restraint systems included an occupant restraint controller (ORC), driver and front passenger frontal air bags, side impact inflatable curtain air bags, and front row seat belt retractor pretensioners. There were no air bag deployments or seat belt pretensioner actuations.

Air Bag Non-Deployment Discussion

The frontal air bags in this vehicle are a supplement to the seat belt restraint systems. The driver's front air bag was mounted in the center of the steering wheel. The passenger's frontal air bag was mounted in the instrument panel, above the glove compartment. The frontal air bags were multi-stage and are designed to provide output appropriate to the severity and type of collision as determined by the ORC. Both air bags will deploy in a deployment level event. According to the owner's manual the front air bags will not deploy in all frontal collisions, including some that may produce substantial vehicle damage, including some pole collisions, truck underrides, and angle offset collisions. However, the crash configuration in this case should produce a deployment given sufficient deceleration. The level of longitudinal deceleration was significant with a longitudinal delta-V of -82 km/h (-51 mph) Based on all available data, the driver's and front right passenger's frontal air bags in the Dodge should have deployed and they did not.

2010 DODGE CHARGER OCCUPANT

Driver Demographics

Age/Sex:	37 years/female
Height:	163 cm (64 in)
Weight:	87 kg (190 lbs)
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Vehicle inspection
Air bags:	Driver's frontal air bag and IC air bags did not deploy
Alcohol/drug data:	Methamphetamine detected
Egress from vehicle:	Fatal before removed from vehicle
Transport from scene:	None
Type of medical treatment:	None

Driver Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Hemothorax, 100 ml blood loss, right lung	442200.3	Tandem IPC Steering wheel rim Steering wheel hub	Probable Possible
2	Dislocation, atlanto-occipital joint	650208.3	Seat back (extension)	Probable
3	Fractures, right anterior ribs R1-R8	450203.3	Tandem IPC Steering wheel rim Steering wheel hub	Certain Probable
4	Fracture, non-displaced, vault skull (left-right occipital bone)	150402.2	Isolated alternative Driver head restraint Driver Seat back ICS2	Probable Possible
5	Laceration, major (9 in.), right pelvic area to thigh	810604.2	Safety belt webbing	Certain
6	Laceration, major (10 in.), left pelvic area to thigh	810604.2	Safety belt webbing	Certain
7	Multiple fractures, teeth	251404.1	Steering wheel rim	Probable
8	Laceration, minor, right anterior knee	810602.1	Lower instrument panel	Center
9	Laceration, minor, left anterior lower leg	810402.1	Lower instrument panel	Probable

Source: Autopsy Report

Driver Kinematics

The 37-year-old female driver was seated in an unknown posture and was belted. At impact with the Ford, she was displaced forward in relation to the vehicle's direction of force. She immediately loaded the belt with contact to the lap portion of the belt resulting in lateral hip/thigh lacerations. Her knees, particularly the right, contacted the lower instrument panel/knee bolster causing a laceration to the right. She was displaced forward, loading the seat belt at the D-ring, and contacted the steering wheel rim with her torso causing the right rib fractures and hemothorax. The driver survived the initial crash and was able to call a friend post-crash. At impact with the International, she was displaced rearward and loaded the driver's seat back and

sustained a skull fracture. The movement and flexion caused the atlanto-occipital dislocation. She remained belted in her seat and was unresponsive. She was extricated from the vehicle and after finding no signs of life was declared deceased by a fire department responder at 0441 hours.

2010 FORD EDGE

Description

The 2010 Ford Edge Limited was a 5-door SUV. The Ford was identified by the VIN 2FMDK4KC8ABxxxxxx. The vehicle mileage is unknown. The vehicle was equipped with a 3.5-liter, 6-cylinder gasoline engine coupled to 6-speed automatic transmission, all-wheel drive, 4-wheel ABS, and electronic stability control.

Exterior Damage

The Ford sustained major damage to the front plane from the head-on impact with the Dodge (Event 1) and possibly sustained some additional damage as the vehicle was struck by the Ford a second time (Event 3). The direct damage began at the left bumper corner and extended 130 cm (51.1 in) to the right bumper corner (**Figure 7**). Twelve measurements were taken at the backing bar level by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: C1 = 44 cm (17.3 in), C2 = 46 cm (18.1 in), C3 = 46 cm (18.1 in), C4 = 42 cm (16.5 in), C5 = 30 cm (11.8 in), C6 = 17 cm (6.7 in). The CDC was 12FDEW3. The vehicle sustained minor damage to the rear bumper from the impact to the bridge rail (Event 4). The CDC was 09BYLS1.

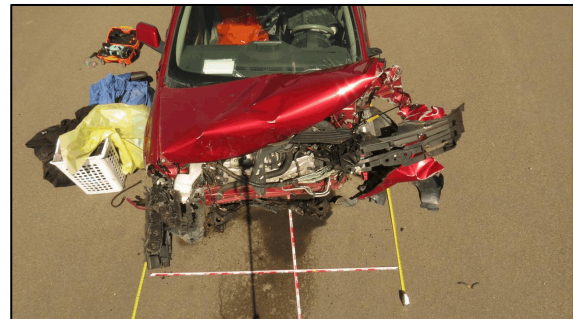


Figure 7. 2010 Ford Edge, frontal damage

Event Data Recorder

The Ford was equipped with a restraint control module (RCM) that had EDR capability to store deployment and non-deployment events. Both types of events can contain pre-crash and crash data. For the pre-crash data there is a 5-second buffer that records accelerator pedal position, vehicle speed, ABS/ESP/TCS events in progress, and brake lamp switch depressed.

The data from the Fords's EDR was imaged using the Bosch Crash Data Retrieval Tool version via direct-to-module method by the investigating police agency through the diagnostic link connector (DLC) using vehicle power and reported using version 18.0.2. A single deployment event was recovered.

The deployment events resulted from the impact with the front plane of the Dodge. The event was complete and locked. The maximum longitudinal delta-V was -67.45 km/h (-41.91) at 100 ms. The first stage driver's frontal air bag deployed at 8.0 ms, the second stage deployed at 18.0 ms. The seat belt pretensioner actuated at 8.0 ms.

The Bosch CDR report is included at the end of this report. The pre-crash data at -1 seconds from algorithm enable (AE) was as follows:

Accelerator Pedal Position (%):	21
Vehicle Speed:	69.8 km/h (43.4 mph)
ABS Event in Progress:	No
ESP Event in Progress:	No
TCS Event in Progress:	No
Brake Lamp Switch Depressed:	No

Occupant Data

The driver of the Ford was a 76-year-old male. He reportedly sustained moderate injuries that included a sternal fracture, a clavicle fractures, and a concussion. He was transported to a local trauma center for treatment.

2015 INTERNATIONAL PRO STAR TRUCK TRACTOR

Description

The International Pro Star was a conventional cab truck tractor that was pulling a 2014 utility box trailer. The vehicle was identified by the VIN 3HSDJAPR2FNxxxxxx. The vehicle was equipped with 3-axles in a 6x4 configuration and a gross vehicle weight greater than 13,608 kg (30,000 lbs).

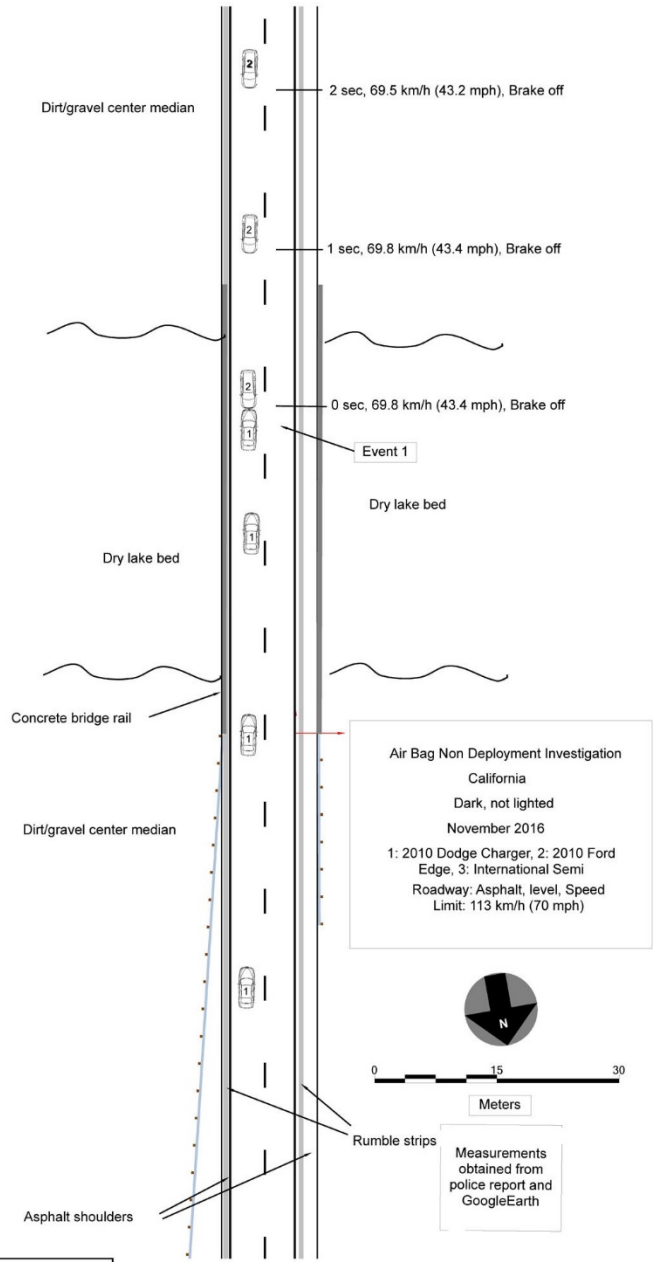
Exterior Damage

The police reported minor frontal plane damage. The vehicle was towed from the scene.

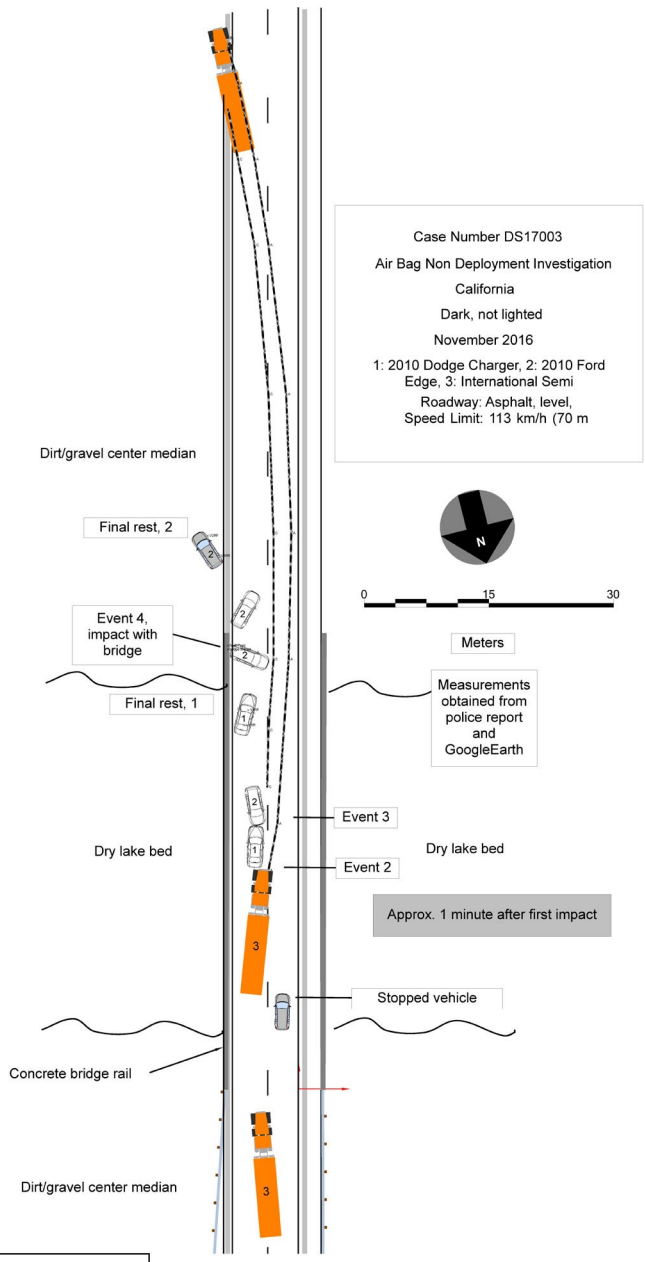
Occupant Data

The driver of the International was a belted 60-year-old male. He complained of pain to his neck and back. He was transported by ambulance to a local trauma center.

CRASH DIAGRAM



	 <p>www.nhtsa.gov</p>
<p>Case Number:</p>	<p>DS17003</p>



	 www.nhtsa.gov
Case Number:	DS17003

APPENDIX A: Event Data Recorder Report 2010 Dodge Charger¹

¹ The EDR Report contained in this technical report was imaged using the current version of the Bosch CDR software at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this report.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	2B3CA3CV3AH*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	201750S3DS17003_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.2
Imaged with Software Licensed to (Company Name)	Company Name information was removed when this file was saved without VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 18.0.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	None

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

GENERAL INFORMATION:

CAUTION: During direct-to-module imaging where the Airbag Control Module (ACM) is disconnected and removed from a vehicle, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module (with appropriate adaptors in place, where required). Also, after a CDR imaging process, wait 2 minutes after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines direct-to-module imaging could cause new events to be recorded in the ACM.

- For additional definitions, please refer to the CDR Help File Glossary.
- As the VIN may be used to determine the configuration of the restraint system, it is imperative that the correct VIN be entered into the CDR Tool during the imaging process.
- For Fiat vehicles, the "Read VIN from Vehicle" feature in the CDR Tool will not work. The VIN will have to be manually entered.
- Delta-V is first available starting with some 2010 MY vehicles.
 - On vehicles not equipped with side impact sensing, Lateral acceleration and Delta-V will not be available.
 - Lateral acceleration is also not available for the 2008-2009 MY Chrysler Town and Country/ Dodge Grand Caravan/Lancia Voyager and 2010 MY Dodge Journey and Fiat Freemont even when equipped with side impact sensing.
 - Longitudinal and Lateral Delta-V are not available for the 2010-2012 MY Chrysler Town and Country/ Dodge Grand Caravan/Lancia Voyager.
- The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. All directional references to sign notation are from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Lateral Acceleration	Left to Right
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Steering Input*	Steering wheel turned counter clockwise
Angular Rate	Left to Right Rotation Clockwise rotation around the longitudinal axis
Yaw Rate**	Counter clockwise rotation

- * The Steering Input for the following vehicles has a positive sign notation for the steering wheel turned clockwise:
 - o 2006 - 2007 Grand Cherokee

- o 2006 - 2007 Commander
- o 2005 - 2010 300, Magnum, and Charger
- o 2008 - 2010 Challenger

**The Yaw Rate for the 2011-2012 MY RAM has a positive sign notation for clockwise rotation.

CDR FILE INFORMATION:

- For ACMs that store non-deployment events, an event will be stored when the delta V is approximately 5 mph (8 km/h) or greater within a 150 ms interval.
- For non-NAFTA ACMs that control pedestrian protection devices, a non-deployment event will be stored when the pedestrian protection devices are activated.

Event(s) Recovered definitions:

- None - There are no stored events in the ACM
- Not Retrievable - Event Data may be stored in the ACM but is not retrievable by the CDR tool.
- For Continental ACMs:
 - Event Record 1 - Data from an event is stored in the ACM (not necessarily in chronological order)
 - Event Record 2 - Data from another event is stored in the ACM (not necessarily in chronological order)
 - Event Record 3 - Data from another event is stored in the ACM (not necessarily in chronological order) (for modules with 3 stored events)
- For all other ACMs:
 - Most Recent Event - Data of the most recent event is displayed in the report
 - 1st Prior Event - Two events are stored in the ACM, Data displayed is of the first prior event.
 - 2nd Prior Event - Three events are stored in the ACM, Data displayed is of the second prior event.
 - Etc., (for modules with 3 to 5 stored events)
- For TRW modules:
 - If there is a side impact, two EDR events may be stored for the one side impact event. The second event may be recorded due to the Lateral Delta V exceeding 5 mph (8 km/h) within a 150 ms interval after the side deployment occurred.
- For some Fiat vehicles:
 - Two EDR events may be stored for one impact event. The second event may be recorded due to the deployment of the frontal airbag, 3rd stage passenger.
- During an event, if power to the ACM is lost, all or part of the event data record may not be recorded. An indication may be observed in the recorded data under this condition:
 - "None" may be displayed in the "Event(s) Recovered" section of the report indicating no pre-crash vehicle data.
 - An event may be displayed in the "Event(s) Recovered" section of the report and "Interrupted" will be displayed for Vehicle Event /Pre-Crash Recorder Status.
- For 2010-2012 MY Dodge Journey and 2010-2012 MY Chrysler Town and Country/Dodge Grand Caravan/Lancia Voyager, a non-deployment event will also display "Interrupted" for the Vehicle Event/Pre-Crash Recorder Status. This non-deployment event can be distinguished from a power loss by:
 - In the System Status at Event and Deployment Command Data section, Event/Deployment Recorder Status will display "Interrupted".
 - In the Deployment Command Data section, a value of "No" will be displayed for each deployment data element.

SYSTEM STATUS AT RETRIEVAL:

- Original VIN - The VIN is captured by the ACM and then recorded as the Original VIN after 10 consecutive ignition cycles of capturing the same number. Once it has been recorded, this number cannot be changed.

SYSTEM CONFIGURATION AT RETRIEVAL:

- The System Configuration data tables indicate the components that the ACM for a particular vehicle monitors and/or controls.
- Active Head Restraint (AHR) - This refers to the active head restraint systems that are electronically controlled by the ACM. AHRs may activate but not store an EDR Record if the delta V does not exceed the minimum delta V threshold. It is possible that the AHRs may activate after the EDR record has been stored and written, based on achieving the minimum delta V. This condition will result in an EDR but no record of the AHR activation in the CDR report. Activation of only the AHRs, if stored, will be a non-deployment event.

SYSTEM STATUS AT EVENT (if applicable):

- Event Number -
 - Indicates the event number per vehicle ignition cycle for 2010-2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
 - Indicates the overall order of the events for all other applicable vehicles.
- Event Signal Transmission, Complete - "Yes" indicates that the ACM has sent the automatic collision notification (ACN) message.
- Odometer at Event - Vehicle odometer at the time of the event
- Operation via Energy Reserve Only - "Yes" indicates that the ACM had lost power at or before T0 and was only operating on energy reserve

- at T0.
- Side Fuel Cutoff, Activated - Applicable to the Fiat 500, "Yes" indicates that the ACM has sent the automatic collision notification (ACN) message.
- System Voltage at Event, ECU - Voltage at the ACM as measured by the ACM.
- System Voltage at Event, Bussed - Voltage of the vehicle system, communicated on the communication bus to other electronic modules in the vehicle.
- Temperature, Outside - Ambient Air Temperature.
- Time, Airbag Warning Lamp On - This is a cumulative time. It indicates the total amount of time that the ACM has requested the Airbag Warning Lamp be turned on.
- This time does not include the warning lamp bulb check time, which occurs at every ignition cycle
- Time from event 1 to 2 -
 - If only one event is stored, either a value of 0 or >5 may be displayed for this data element.
 - If multiple events exist in the EDR, the time from event 1 to event 2 is defined as:
 - For Bosch and TRW modules, the time from the prior recorded event (even if it has been overwritten) to the current recorded event.
 - For Continental modules, the time from the prior existing recorded event (as long as it is still displayed in the CDR report) to the current recorded event. If the prior event in a multi-event condition is overwritten by a subsequent event, the multi-event status will no longer be displayed.
- Time, Operation System Time - This is a cumulative lifetime timer for the ACM. It indicates the total amount of time the ACM has been powered up.
- Total Number of Events -
 - Stops incrementing when each event record is recorded by the ACM for 2010 - 2012 Sebring, Avenger, Caliber, Nitro, Compass, Liberty, Patriot, Wrangler, and Ram
 - Indicates the total number of events that the ACM has recorded, including those non-deployment events that have been overwritten by a subsequent event, for all other applicable vehicles.
- VIN at Event, Last 8 Digits- Last 8 digits of the VIN of the vehicle at the time the ACM records the event.

STATUS OF THE DATA IN THE MOST RECENT EVENT (if applicable):

Definitions for Data Blocks 1 - 7 and Overall Data Record Complete:

1. Crash Record (system status and DTCs)
2. NHTSA Table #1 Vehicle System data
3. NHTSA Table #1 Longitudinal delta-V
4. NHTSA Table #2 Vehicle System Data
5. NHTSA Table #2 Lateral delta-V - will be a NO if vehicle is not equipped with side sensing
6. ACM angular rate data - will be a NO if vehicle is not equipped with roll-over sensing
7. Other Vehicle System Data - Chrysler Specific Data

Overall Data Record Complete - Yes, No is defined based on the specific vehicle configuration. For example, a NO may be present for a non-applicable data block but a YES may be present for overall data record complete as all of the applicable data is complete.

DEPLOYMENT COMMAND DATA (if applicable):

- A "Yes" for a particular item in the Deployment Command Data section of the report indicates that the ACM commanded the deployment /activation of the associated device.
- Deployment of Seatbelt Pretensioners is not stored in the EDR for the 2010 MY vehicles that utilize a TRW ACM. Assessment of the seatbelt pretensioners' deployment status in these vehicles must be made by physical inspection in the vehicle.

DTCs PRESENT AT START OF EVENT (if applicable):

- If any DTCs (diagnostic trouble codes) are present in the ACM at the start of the event, these will be listed in this section. A dealership service manual can be used to decode the DTCs.

PRE-CRASH DATA:

- The recorded Event may contain Pre-Crash data. Pre-Crash data from the various electronic control modules in the vehicle is transmitted to the Airbag Control Module via the vehicle's communication bus.
- If a recorded event has Engine RPM equal to SNA and Speed, Vehicle Indicated equals SNA for each time stamp, then the data is default data and the event stored in the ACM is not valid.
- (if equip.) - If a parameter name is followed by the words (if equip.), then the parameter is only valid for vehicles equipped with the associated parameter/vehicle system.
- The MIL (Malfunction Indicator Lamp) Status for the various recorded systems indicates the requested state of the applicable malfunction indicator lamp at the time that the data was captured. Note: Some fault codes could be stored due to component/system damage from the accident. The appropriate diagnostic tool should be used to read any stored Diagnostic Trouble Codes (DTC's) in the various electronic modules (ACM, PCM, ABS, TCM, etc., where applicable) for use in interpretation of some vehicle specific recorded data.

- ABS Activity - "Yes" indicates an active ABS event in which the ABS is actively controlling the brakes.
- ABS MIL- This indicates the ABS fault indicator lamp status. It will only be "On" when there is a fault in the ABS system. The Electronic brake module DTC's should be read and recorded for final system interpretation.
- Accelerator Pedal, % Full - This indicates the actual position of the accelerator pedal.
- Brakes:
 - Brake Lamps On - "On" indicates that the brake lamps/CHMSL are illuminated.
 - Brake Switch #2 Status - "On" indicates that the brake pedal is depressed.
 - Braking System, Intervention by ESP - "Yes" indicates that the stability control system has engaged the brakes.
 - Braking System, Intervention Enabled "Yes" indicates that the ESC system is functional.
 - Braking System, Emergency Braking - "Yes" indicates that panic brake assist is active.
 - Braking System, Maximum Braking -- "Yes" indicates that ABS is active on all 4 wheels.
 - Panic Brake Assist Active - "Yes" indicates that all four of the brake circuits are undergoing ABS control.
 - Service Brake - "On" indicates that the brake pedal is depressed.
- Cruise Control:
 - Cruise Control System/Status - "On" indicates that the Cruise Control system is turned on.
 - Cruise Control Engaged/Active - "Engaged"/"Yes" indicates the Cruise Control system is actively controlling vehicle speed. "Not Engaged"/"No" indicates the system is NOT controlling vehicle speed.
- Electronic Brake/Stability Control information:
 - ESC/ESP MIL - This indicates the ESC/ESP fault indication lamp status. It will only be "On" when there is a fault or thermal mode shutdown in the ESC/ESP system. The ESC/ESP module DTC's should be read and recorded for final system interpretation.
 - ESP Lamp - This is the status of the ESP symbol - "car with squiggly lines" indicator lamp. "On" indicates ESP has been turned off by the driver or has reduced performance and is not an indication of a fault in the system.
 - ESP Lamp Flashing Requested - If "Yes", then an ESP, Traction Control or Trailer Sway Control (if equipped) event was active at the time of data capture.
 - ESP Disabled - "Yes" indicates that ABS & ESP have been disabled by the driver or due to system performance.
 - ESP/ESC Functional/Active - "YES" indicates that the ESP system is functional and has no faults.
 - ESC System Status - "OK" indicates no faults in the ABS or ESC system that affect the system functionality; "ABS Fault" indicates a fault in the ABS system and "ESC Fault" indicates a fault in the ESC system.
 - Engine Torque Applied - "No" indicates no engine torque output was applied (as in Park/Neutral for Automatic transmissions or clutch depressed on manual or during an ESP/Traction Control event). If "Yes", then engine torque output was applied.
 - Stability Control - This is the status of the ESC symbol - "car with squiggly lines" indicator lamp. "On" indicates that the ESC system is functional. "Off" indicates that the ESC system was turned off either by the driver or due to a fault or thermal mode shutdown. "Engaged" indicates an active ESC/TCS event.
 - Traction Control Intervention Active - "Yes" indicates that the traction control system is actively controlling the vehicle's wheels.
- Engine RPM - On 2006-2009 Ram 2500/3500, the Engine RPM recorded is limited to a maximum of 4080 RPM. On the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey, the engine RPM resolution is 256 rpm. On all other vehicles, the resolution is 32 rpm.
- Engine Throttle, % Full - This indicates the actual position of the Engine Throttle blade.
- ETC -
 - On vehicles equipped with ETC, "Accelerator Pedal, % Full" and "Engine Throttle, % Full" are relative values - relative pedal position and relative engine throttle. These parameters may record values of less than 100% when the pedal/throttle is actually at its maximum. (Max. ~ 77%)
 - ETC Lamp - Lamp "ON" indicates there is an active Electronic Throttle DTC.
 - ETC Lamp Flashing - "Yes" indicates that the ETC is in the limp-in mode.
- PCM MIL - This indicates the PCM fault indicator lamp status. It will only be "On" when there is a fault in the PCM. The Powertrain Control Module DTC's should be read and recorded for final system interpretation.
- Raw Manifold Pressure - This indicates engine load in kPa.
- Speed, Vehicle Indicated - This indicates the average of the drive wheels. The accuracy of the recorded Speed, Vehicle Indicated will be affected if the vehicle had the tire size or the final drive axle ratio changed from the factory build specifications. On the 2008 - 2009 Dodge Grand Caravan, 2008-2009 Chrysler Town and Country and 2009 Dodge Journey, the speed resolution is 2 kph. On all other vehicles, the resolution is 1 kph. On some vehicles capable of speeds in excess of 255km/h (about 158mph), the actual vehicle speed may have exceeded the reporting range. It is always prudent to check the reported wheel speeds and other parameters to confirm the Speed, Vehicle indicated value(s).
- Tire Information:
 - XX where LF = Left Front Tire, RF = Right Front Tire, LR = Left Rear Tire, and RR = Right Rear Tire.
 - Tire X Location - This indicates the location of the tire pressure sensor data being displayed for that time stamp. Default is used to indicate that the location of the tire pressure sensor is unknown or there is no tire pressure sensor in that wheel. Vehicles with Base Tire Pressure Monitoring systems will display SNA for both Tire Locations as these vehicles do not send actual pressure values across the communication bus.
 - Tire X Pressure/Tire Pressure Status, XX -This indicates the actual pressure status of the Tire Location defined in the previous column (Tire X Location) or by the values for XX. Possible values are LOW, NORMAL, HIGH, or SNA for this parameter. Vehicles with Base Tire Pressure Monitoring systems may display NORMAL even though these vehicles do not send actual pressure values across the communication bus.
 - Tire X Pressure/Tire Pressure, XX (psi) - This indicates the actual tire pressure value of the Tire Location defined in the previous column (Tire X Location) or by the values for XX. Vehicles with Base Tire Pressure Monitoring systems will display N/A for this parameter as these vehicles do not send actual pressure values across the communication bus.
 - Wheel Speed, XX - This indicates the speed value (in revolutions per minute) of a particular tire as denoted by XX.
 - For the following vehicles, the tire location, if displayed, may not be accurate if the tires have been rotated:
 - 2011-2012 MY Jeep Wrangler

- 2010-2012 MY Jeep Patriot
- 2010-2012 MY Chrysler 200
- 2010-2012 MY Jeep Compass
- Tire pressure is not stored in the EDR for the following vehicles. If a value is displayed, it may not be accurate:
 - 2011-2012 MY Jeep Grand Cherokee
 - 2011-2012 MY Dodge Durango
 - 2010-2012 MY Dodge Challenger
 - 2011-2012 MY Chrysler Town and Country
 - 2011-2012 MY Dodge Grand Caravan
 - 2010-2012 MY Ram
- Tire Pressure Monitor Indicator Lamp - "On" indicates a fault in the tire pressure monitoring system. The TPM module DTC's should be read and recorded for final system interpretation.
- "T0" ("Time zero" where '0' is seen as subscript) is defined as "beginning of the crash event". T0 is the time at which the ACM algorithm is activated, a specific Delta-V is exceeded, or a non-reversible restraint device is deployed. T0 may be defined differently for front, side, rear and roll-over events.
 - If multiple algorithm decisions (i.e.: frontal, side, rear and/or rollover) are made before the first recorded event ends, all of those events are part of the same event record and "T0" is defined as the "T0" from the first recorded event.
 - In the Pre-Crash data tables, the relative time marker "-0.1s" represents the last set of data captured in the buffer prior to "T0."
- Transmission/Shifter Position -
 - Gear Status - This indicates the current transmission gear.
 - PRND/PRNDL Status - This indicates the status of the Shifter Position.
 - Reverse Gear - For manual transmission vehicles only, "Yes" indicates the transmission is in the reverse gear.
 - Shift Gear Position - This indicates the current transmission gear/Shifter Position.
- Vehicle Data Recorder Complete - Due to the interruption of data recording in one section, this data element may display "Interrupted" for all sections when some data sections are actually complete.

APPLICATION INFORMATION:

- 2005 - 2009 Durango's equipped with side airbags have EDR data that can be imaged by the CDR tool. Durango's not equipped with side airbags have EDR Data that might be imaged by the CDR tool and may be imaged by the supplier.
- For 2005 & 2006 MY, some Chrysler 300, Dodge Magnum, Dodge Charger, Jeep Grand Cherokee, and Jeep Commander models may contain EDR data that cannot be imaged by the CDR tool, but may be imaged by the supplier.
- For 2006 & 2007 MY, some PT Cruiser models may contain EDR data that cannot be imaged by the CDR tool, but may be imaged by the supplier
- EDR Data is only recorded for frontal deployments in the following vehicles:
 - 2005-2007 Durango
 - 2006-2007 Ram 1500
 - 2006-2009 Ram 2500/3500 Heavy Duty
 - 2007 Aspen, Caliber, Compass, Patriot, Nitro, Sebring, Wrangler

03001_Chrysler_r025

System Status at Retrieval

Original VIN	2B3CA3CV3AH*****
Airbag Control Module Part Number	56054087AC
Airbag Control Module Serial Number	T52MD176001263a
Airbag Control Module Supplier	Bosch

System Configuration at Retrieval

Configured for Driver Seatbelt Switch	No
Configured for Front Center Seatbelt Switch	No
Configured for Front Passenger Seatbelt Switch	No
Configured for 2nd Row Left Seatbelt Switch	No
Configured for 2nd Row Center Seatbelt Switch	No
Configured for 2nd Row Right Seatbelt Switch	No
Configured for 3rd Row Left Seatbelt Switch	No
Configured for 3rd Row Center Seatbelt Switch	No
Configured for 3rd Row Right Seatbelt Switch	No
Configured for Driver Knee Airbag	No
Configured for Left Curtain #1	Yes
Configured for Right Curtain #1	Yes
Configured for Left Curtain #2	No
Configured for Right Curtain #2	No
Configured for Front Driver Seatbelt Pretensioner	Yes
Configured for Front Center Seatbelt Pretensioner	No
Configured for Front Passenger Seatbelt Pretensioner	Yes
Configured for 2nd Row Left Seatbelt Pretensioner	No
Configured for 2nd Row Center Seatbelt Pretensioner	No
Configured for 2nd Row Right Seatbelt Pretensioner	No
Configured for 3rd Row Left Seatbelt Pretensioner	No
Configured for 3rd Row Center Seatbelt Pretensioner	No
Configured for 3rd Row Right Seatbelt Pretensioner	No
Configured for Left Side Sensor #1	Yes
Configured for Left Side Sensor #2	Yes
Configured for Left Side Sensor #3	No
Configured for Right Side Sensor #1	Yes
Configured for Right Side Sensor #2	Yes
Configured for Right Side Sensor #3	No
Configured for Left Up Front Sensor	Yes
Configured for Right Up Front Sensor	Yes
Configured for Front Driver Digressive Load Limiter	No
Configured for Front Passenger Digressive Load Limiter	No
Configured for Driver Seat Track Position Sensor	Yes
Configured for Front Passenger Seat Track Position Sensor	No
Configured for Driver Airbag Disable Switch	No
Configured for Passenger Airbag Disable Switch	No
Configured for Front Passenger Occupant Classification System	No
Configured for Right Side Thorax	No
Configured for Left Side Thorax	No
Configured for Passenger Knee Airbag	No
Configured for Passenger Belt Tension Sensor	No
Configured for Driver Belt Tension Sensor	No
Configured for Occupant Detection Sensor	No
Configured for DOC Disable Switch	No

Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

5A 87 02 03 03 03 80 12 02 0E 12 02 35 36 30 35 34 30 38 37 41 43

5A 88 32 42 33 43 41 33 43 56 33 41 48 2A 2A 2A 2A 2A 2A

5A 90 32 42 33 43 41 33 43 56 33 41 48 2A 2A 2A 2A 2A 2A

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61 E1 54 35 32 4D 44 31 37 36 30 30 31 32 36 33

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71 EF 01 A1 2D 20 00 21 A4

71 EF 02 A1 0D 20 00 21 A4

71 EF 03 9B 8E E0 00 00 00

71 EF 04 9B 8F 20 00 00 00

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Disclaimer of Liability

The users of the CDR product and reviewers of the CDR reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Robert Bosch LLC and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Robert Bosch LLC expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the CDR

data, CDR software or use thereof.

APPENDIX B: Event Data Recorder Report 2010 Ford Edge²

² TThe Bosch CDR Report contained in this technical report was imaged by the investigating police department using the current version of the Bosch CDR software at the time of imaging the EDR. Only a .pdf copy of the Bosch CDR report was provided by police and the EDR hexadecimal data has been deleted from the report due to potential personal identifiable information contained (i.e. vehicle identification number, etc) within the report.



✓



IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	2FMDK4KCBABxxxxxx
User	
Case Number	
EDR Data Imaging Date	03/06/2017
Crash Date	
Filename	2FMDK4KCBABxxxxxx_ACM.CDRX
Saved on	Monday, March 6 2017 at 15:01:12
Imaged with CDR version	Crash Data Retrieval Tool 17.2
Imaged with Software Licensed to (Company Name)	
Reported with CDR version	Crash Data Retrieval Tool 17.2
Reported with Software Licensed to (Company Name)	
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) Recovered	1
First Event Recorded	Frontal Deployment

Comments

No comments entered.

x

Data Limitations

Restraints Control Module Recorded Crash Events:

Deployment Events cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device, the RCM must be replaced. The data from events which did not qualify as deployable events can be overwritten by subsequent events. The RCM can store up to two deployment events.

Airbag Module Data Limitations:

- Restraints Control Module Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced from the point of algorithm wake up. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately five seconds prior to algorithm wake up. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change.
- Event Recording Complete will indicate if data from the recorded event has been fully written to the RCM memory or if it has been interrupted and not fully written.
- If power to the Airbag Module is lost during a crash event, all or part of the crash record may not be recorded.

Airbag Module Data Sources:

- Event recorded data are collected either INTERNALLY or EXTERNALLY to the RCM.
 - INTERNAL DATA is measured, calculated, and stored internally, sensors external to the RCM include the following:
 - > The Driver and Passenger Belt Switch Circuits are wired directly to the RCM.
 - > The Driver's Seat Track Position Switch Circuit is wired directly to the RCM.
 - > The Side Impact Sensors (if equipped) are located on the side of vehicle and are wired directly to the RCM.
 - > The Occupant Classification Sensor is located in the front passenger seat and transmits data directly to the RCM on high-speed CAN bus.
 - > Front Impact Sensors (right and left) are located at the front of vehicle and are wire directly to the RCM.
 - EXTERNAL DATA recorded by the RCM are data collected from the vehicle communication network from various sources such as Powertrain Control Module, Brake Module.



02006_RCM-AB9_r001

System Status at Time of Data Retrieval

VIN as programmed into RCM at factory	2FMDK4KC8ABxxxxxx
Current Lifetime Operating Timer (sec)	11,267,486
Deployment Command Counter	1
First Record Recording Status	Completed & Locked
Second Record Recording Status	No Data
Restraints Control Module Part Number	9T43-14B321-BB
Restraints Control Module (Serial Number)	30153223
Occupant Classification System ECU (Serial Number)	024008492080000
Driver Front Crash Sensor (Serial Number)	04D823EA
Passenger Front Crash Sensor (Serial Number)	04D82A43
Driver 1st Row Side Crash Sensor (Serial Number)	04EFFB41
Passenger 1st Row Side Crash Sensor (Serial Number)	04F3D151
Driver 2nd Row Side Crash Sensor (Serial Number)	04EFFB20
Passenger 2nd Row Side Crash Sensor (Serial Number)	04F3D13F

Deployment Data (First Record)

Driver First Stage Airbag Deployment Time (msec)	8.0
Driver Second Stage Airbag Deployment Time (msec)	18.0
Passenger First Stage Airbag Deployment Time (msec)	N/A
Passenger Second Stage Airbag Deployment Time (msec)	N/A
Driver Pretensioner Deployment Time (msec)	8.0
Passenger Pretensioner Deployment Time (msec)	N/A
Driver SIDE Airbag Deployment Time (msec)	N/A
Passenger SIDE Airbag Deployment Time (msec)	N/A
Driver CURTAIN Airbag Deployment Time (msec)	N/A
Passenger CURTAIN Deployment Time (msec)	N/A

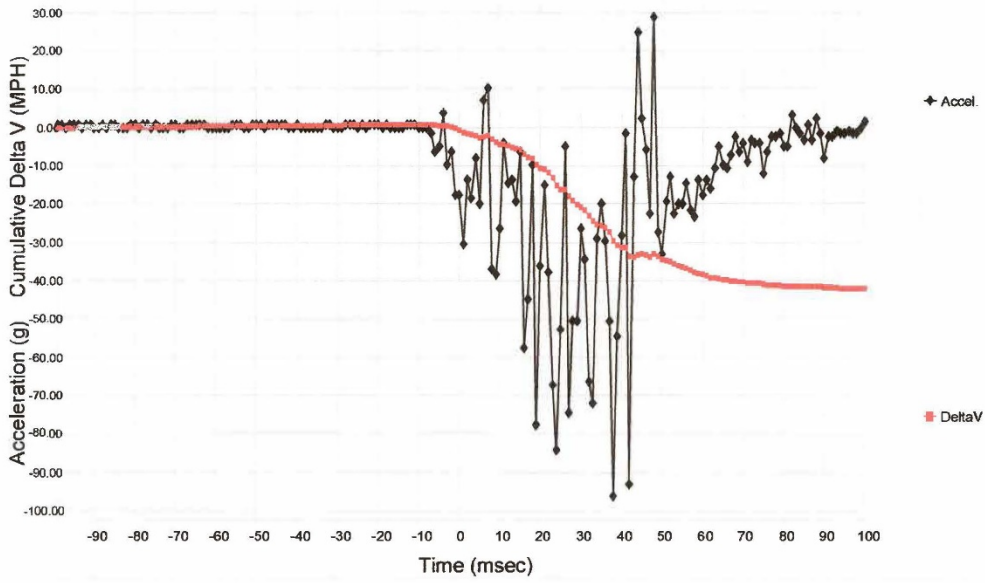
System Status at Event (First Record)

Lifetime Operating Timer at Algorithm Wake-up (sec)	11,266,078
Key On Timer at Algorithm Wake-up (sec)	20,995
Battery voltage at Algorithm Wake-up (volts)	13.82
RCM Energy Reserve voltage at Algorithm Wake-up (volts)	24.72
Driver Seat Belt Switch Circuit Status at Algorithm Wake-up	Buckled
Driver Seat Belt Switch Fault at Algorithm Wake-up	No
Driver Seat Track Forward of Switch Point at Algorithm Wake-up	Not Forward
Driver Seat Track Position Switch Fault at Algorithm Wake-up	No
Passenger Seat Belt Switch Circuit Status at Algorithm Wake-up	Unbuckled
Passenger Seat Belt Switch Fault at Algorithm Wake-up	No
Passenger Classification Status at Algorithm Wake-up	Empty
OCS Passenger State at Algorithm Wake-up	Empty
Driver Front Crash Sensor Fault at Algorithm Wake-up	No
Driver SIDE Crash Sensor Row 1 Fault at Algorithm Wake-up	No
Driver SIDE Crash Sensor Row 2 Fault at Algorithm Wake-up	No
Passenger Front Crash Sensor Fault at Algorithm Wake-up	No
Passenger SIDE Crash Sensor Row 1 Fault at Algorithm Wake-up	No
Passenger SIDE Crash Sensor Row 2 Fault at Algorithm Wake-up	No

Pre-Crash Data (First Record)

Time (sec)	-4	-3	-2	-1	0
Accelerator Pedal Position (%)	17	17	17	10	21
Vehicle Speed (MPH [km/h])	42.7 [68.7]	43.0 [69.2]	43.2 [69.5]	43.4 [69.8]	43.4 [69.8]
ABS Event in Progress	No	No	No	No	No
ESP Event in Progress	No	No	No	No	No
TCS Event in Progress	No	No	No	No	No
Brake Lamp Switch Depressed (from PCM)	No	No	No	No	No
RCM Serial Number Received by OCS	No	No	No	No	No
OCS Sensor Status	Empty	Empty	Empty	Empty	Empty
OCS System Level 1 Fault	No	No	No	No	No
OCS System Level 2 Fault	No	No	No	No	No
Vehicle Calibration ID	56	56	56	56	56
Vehicle Model Year Calibration ID	07	07	07	07	07

2FMDK4KC8ABxxxxxx Longitudinal Crash Pulse (First Record)



Longitudinal Crash Pulse (First Record)

Time (msec)	Recorded Vehicle Longitudinal Acceleration (g)	Cumulative Longitudinal Velocity Change (MPH [km/h])	Time (msec)	Recorded Vehicle Longitudinal Acceleration (g)	Cumulative Longitudinal Velocity Change (MPH [km/h])
-99	0.80	0.02 [0.03]	-49	0.80	0.49 [0.79]
-98	0.80	0.04 [0.06]	-48	0.00	0.49 [0.79]
-97	0.00	0.04 [0.06]	-47	0.80	0.51 [0.82]
-96	0.80	0.05 [0.08]	-46	0.80	0.53 [0.85]
-95	0.80	0.07 [0.11]	-45	0.80	0.54 [0.87]
-94	0.80	0.09 [0.14]	-44	0.80	0.56 [0.90]
-93	0.00	0.09 [0.14]	-43	0.80	0.58 [0.93]
-92	0.80	0.11 [0.18]	-42	0.00	0.58 [0.93]
-91	0.80	0.12 [0.19]	-41	0.00	0.58 [0.93]
-90	0.00	0.12 [0.19]	-40	0.80	0.60 [0.97]
-89	0.00	0.12 [0.19]	-39	0.00	0.60 [0.97]
-88	0.80	0.14 [0.23]	-38	0.00	0.60 [0.97]
-87	0.00	0.14 [0.23]	-37	0.00	0.60 [0.97]
-86	0.80	0.16 [0.26]	-36	0.00	0.60 [0.97]
-85	0.80	0.18 [0.29]	-35	0.00	0.60 [0.97]
-84	0.00	0.18 [0.29]	-34	0.00	0.60 [0.97]
-83	0.00	0.18 [0.29]	-33	0.80	0.61 [0.98]
-82	0.00	0.18 [0.29]	-32	0.80	0.63 [1.01]
-81	0.80	0.19 [0.31]	-31	0.00	0.63 [1.01]
-80	0.80	0.21 [0.34]	-30	0.00	0.63 [1.01]
-79	0.00	0.21 [0.34]	-29	0.00	0.63 [1.01]
-78	0.80	0.23 [0.37]	-28	0.80	0.65 [1.05]
-77	0.80	0.25 [0.40]	-27	0.80	0.67 [1.08]
-76	0.00	0.25 [0.40]	-26	0.80	0.68 [1.09]
-75	0.80	0.26 [0.42]	-25	0.00	0.68 [1.09]
-74	0.00	0.26 [0.42]	-24	0.80	0.70 [1.13]
-73	0.00	0.26 [0.42]	-23	0.00	0.70 [1.13]
-72	0.00	0.26 [0.42]	-22	0.80	0.72 [1.16]
-71	0.80	0.28 [0.45]	-21	0.80	0.74 [1.19]
-70	0.80	0.30 [0.48]	-20	0.80	0.76 [1.22]
-69	0.00	0.30 [0.48]	-19	0.00	0.76 [1.22]
-68	0.00	0.30 [0.48]	-18	0.80	0.77 [1.24]
-67	0.80	0.32 [0.51]	-17	0.00	0.77 [1.24]
-66	0.80	0.33 [0.53]	-16	0.00	0.77 [1.24]
-65	0.80	0.35 [0.56]	-15	0.00	0.77 [1.24]
-64	0.80	0.37 [0.60]	-14	0.00	0.77 [1.24]
-63	0.80	0.39 [0.63]	-13	0.80	0.79 [1.27]
-62	0.00	0.39 [0.63]	-12	0.80	0.81 [1.30]
-61	0.00	0.39 [0.63]	-11	0.80	0.83 [1.34]
-60	0.00	0.39 [0.63]	-10	0.00	0.83 [1.34]
-59	0.00	0.39 [0.63]	-9	0.00	0.83 [1.34]
-58	0.00	0.39 [0.63]	-8	0.00	0.83 [1.34]
-57	0.00	0.39 [0.63]	-7	-1.60	0.79 [1.27]
-56	0.80	0.40 [0.64]	-6	-6.40	0.65 [1.05]
-55	0.80	0.42 [0.68]	-5	-4.80	0.54 [0.87]
-54	0.80	0.44 [0.71]	-4	4.00	0.63 [1.01]
-53	0.00	0.44 [0.71]	-3	-9.60	0.42 [0.68]
-52	0.00	0.44 [0.71]	-2	-6.40	0.28 [0.45]
-51	0.80	0.46 [0.74]	-1	-17.60	-0.11 [-0.18]
-50	0.80	0.47 [0.76]	0	-17.60	-0.49 [-0.79]



Longitudinal Crash Pulse (First Record) - Continued

Time (msec)	Recorded Vehicle Longitudinal Acceleration (g)	Cumulative Longitudinal Velocity Change (MPH [km/h])	Time (msec)	Recorded Vehicle Longitudinal Acceleration (g)	Cumulative Longitudinal Velocity Change (MPH [km/h])
1	-30.40	-1.16 [-1.87]	51	-19.20	-34.72 [-55.88]
2	-13.60	-1.46 [-2.35]	52	-12.80	-35.00 [-56.33]
3	-18.40	-1.86 [-2.99]	53	-22.40	-35.50 [-57.13]
4	-8.00	-2.04 [-3.28]	54	-20.00	-35.94 [-57.84]
5	-20.00	-2.48 [-3.99]	55	-20.00	-36.37 [-58.53]
6	7.20	-2.32 [-3.73]	56	-14.40	-36.69 [-59.05]
7	10.40	-2.09 [-3.36]	57	-21.60	-37.16 [-59.80]
8	-36.80	-2.90 [-4.67]	58	-23.20	-37.67 [-60.62]
9	-38.40	-3.74 [-6.02]	59	-13.60	-37.97 [-61.11]
10	-26.40	-4.32 [-6.95]	60	-17.60	-38.36 [-61.73]
11	-4.00	-4.41 [-7.10]	61	-13.60	-38.66 [-62.22]
12	-14.40	-4.72 [-7.60]	62	-16.00	-39.01 [-62.78]
13	-13.60	-5.02 [-8.08]	63	-10.40	-39.24 [-63.15]
14	-19.20	-5.44 [-8.75]	64	-4.80	-39.34 [-63.31]
15	-6.40	-5.59 [-9.00]	65	-9.60	-39.55 [-63.65]
16	-57.60	-6.85 [-11.02]	66	-10.40	-39.78 [-64.02]
17	-44.80	-7.83 [-12.60]	67	-7.20	-39.94 [-64.28]
18	-9.60	-8.04 [-12.94]	68	-2.40	-39.99 [-64.36]
19	-77.60	-9.75 [-15.69]	69	-6.40	-40.13 [-64.58]
20	-36.00	-10.54 [-16.96]	70	-4.00	-40.22 [-64.73]
21	-15.20	-10.87 [-17.49]	71	-8.80	-40.41 [-65.03]
22	-37.60	-11.70 [-18.83]	72	-3.20	-40.48 [-65.15]
23	-67.20	-13.17 [-21.20]	73	-4.00	-40.57 [-65.29]
24	-84.00	-15.02 [-24.17]	74	-4.00	-40.66 [-65.44]
25	-52.80	-16.18 [-26.04]	75	-12.00	-40.92 [-65.85]
26	-4.80	-16.28 [-26.20]	76	-6.40	-41.06 [-66.08]
27	-74.40	-17.91 [-28.82]	77	-2.40	-41.12 [-66.18]
28	-50.40	-19.02 [-30.61]	78	-2.40	-41.17 [-66.26]
29	-50.40	-20.13 [-32.40]	79	-1.60	-41.20 [-66.30]
30	-26.40	-20.71 [-33.33]	80	-4.80	-41.31 [-66.48]
31	-34.40	-21.46 [-34.54]	81	-4.80	-41.42 [-66.66]
32	-66.40	-22.92 [-36.89]	82	3.20	-41.34 [-66.53]
33	-72.00	-24.50 [-39.43]	83	0.00	-41.34 [-66.53]
34	-28.80	-25.13 [-40.44]	84	-1.60	-41.38 [-66.59]
35	-20.00	-25.57 [-41.15]	85	-3.20	-41.45 [-66.71]
36	-29.60	-26.22 [-42.20]	86	0.80	-41.43 [-66.68]
37	-50.40	-27.33 [-43.98]	87	-3.20	-41.50 [-66.79]
38	-96.00	-29.44 [-47.38]	88	2.40	-41.45 [-66.71]
39	-54.40	-30.63 [-49.29]	89	-1.60	-41.49 [-66.77]
40	-28.00	-31.25 [-50.29]	90	-8.00	-41.66 [-67.05]
41	-1.60	-31.28 [-50.34]	91	-2.40	-41.71 [-67.13]
42	-92.80	-33.32 [-53.62]	92	-2.40	-41.77 [-67.22]
43	-12.80	-33.60 [-54.07]	93	-0.80	-41.78 [-67.24]
44	24.80	-33.05 [-53.19]	94	-1.60	-41.82 [-67.30]
45	2.40	-33.00 [-53.11]	95	-1.60	-41.85 [-67.35]
46	-5.60	-33.13 [-53.32]	96	-0.80	-41.87 [-67.38]
47	-22.40	-33.62 [-54.11]	97	-1.60	-41.91 [-67.45]
48	28.80	-32.98 [-53.08]	98	-1.60	-41.94 [-67.50]
49	-27.20	-33.58 [-54.04]	99	0.00	-41.94 [-67.50]
50	-32.80	-34.30 [-55.20]	100	1.60	-41.91 [-67.45]



Lateral Crash Pulse (First Record)

Contains No Recorded Data

Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

```
          PIDs
30 34 44 38
32 41 34 33
39 53 34 33 2D 31 34 43 30 32 38 2D 41 41 00 00 00 00 00 00
00 00 00
39 54 34 33
14 0B 03 21
02 01
02 40 08 49
20 8F 00 00
30 34 44 38
32 33 45 41
30 34 45 46
46 42 34 31
30 34 46 33
44 31 35 31
30 34 45 46
46 42 32 30
30 34 46 33
44 31 33 46
33 30 31 35
33 32 32 33
00 00 00 32
46 4D 44 4B
34 4B 43 38
41 42 41 31
36 39 33 37
02 0F 6C
```

```
          EDR Data          9 | A
30 15 32 23 30 30 30 20 09 06110 06 30 01 4B 4B
48 49 40 17 00 AB ED 9E 37 831FF FF 00 01 14 0B
03 21 02 01 39 54 34 33 55 56107 01 80 80 00 00
01 02 55 55 00 00 00 00 00 00100 00 00 00 00
FF 01 00 00 00 00 00 AB E8 1E189 8F 07 07 00 52
03 00 00 00 56 07 00 00 00 56107 00 00 00 56 07
00 00 00 56 07 00 00 00 56 0712A 14 22 22 22 FF
42 55 42 53 42 37 42 16 41 E5100 00 00 00 00 FF
51 50 00 28 00 04 00 00 00 18100 00 00 04 00 00
00 00 00 00 00 00 00 00 00 00100 00 0A 0C 09 00
00 00 22 04 00 81 07 07 1F 001F5 7D 45 62 00 03
00 27 FF FF 00 04 02 8D 00 04102 8D FF FF FF FF
00 04 00 04 FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF 0C 00 27 9B 9B1FF FF FF FF 40 CB
98 FF FF FF 02 80 B9 45 FF FF1FF 00 55 FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF1FF FF FF FF FF
```

APPENDIX C: Speed at Impact From Delta-V Calculations

$$aV_1 = -aV_2 * W_2/W_1$$

$$aV_1 = -41.9 * 4274/3790$$

$$aV_1 = -47.25 \text{ mph}$$

$$\text{Inline closing speed} = (|aV_1| + |aV_2|) * (1/(1+e)) \text{ [using 0.01 for restitution]}$$

$$\text{Inline closing speed} = 89 * .99$$

$$\text{Inline closing speed} = 88.12 \text{ mph}$$

$$V_2 \text{ impact speed} = \text{Inline closing speed} - V_1 \text{ impact speed}$$

$$V_2 \text{ impact speed} = 88.12 - 43.4$$

$$V_2 \text{ impact speed} = 44.7 \text{ mph}$$

DOT HS 812 770
September 2019



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

