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

NHTSA

DOT HS 812 856

March 2020

Special Crash Investigations
Child Restraint System Crash Investigation
Vehicle: 2010 Dodge Avenger
Location: Missouri
Crash Date: August 2018

DISCLAIMER

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Suggested APA Format Citation:

Dynamic Science, Inc. (2020, March). *Special Crash Investigations: Child Restraint System Crash Investigation; Vehicle: 2010 Dodge Avenger; Location: Missouri; Crash Date: August 2018* (Report No. DOT HS 812 856). National Highway Traffic Safety Administration.

Technical Report Documentation Page

1. Report No. DOT HS 812 856	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Special Crash Investigations: Child Restraint System Crash Investigation Vehicle: 2010 Dodge Avenger Location: Missouri Crash Date: August 2018		5. Report Date March 2020 6. Performing Organization Code	
7. Author Dynamic Science, Inc.		8. Performing Organization Report No. Case No. DS18022	
9. Performing Organization Name and Address Dynamic Science, Inc. 26141 Marguerite Parkway, Suite C Mission Viejo, CA 92692		10. Work Unit No. (TRAIS) 11. Contract or Grant No. DTNH22-12-C00271	
12. Sponsoring Agency Name and Address National Highway Traffic Safety Administration 1200 New Jersey Avenue SE Washington, DC 20590		13. Type of Report and Period Covered Technical Report Crash Date: August 2018 14. Sponsoring Agency Code	

15. Supplementary Notes

Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This report documents the on-site investigation of a child restraint system (CRS) used by the juvenile occupant of a 2010 Dodge Avenger involved in a crash with a 2017 Ford Flex and the injuries sustained by the occupants of the Dodge. This two-vehicle crash occurred in August 2018 in the afternoon on a three-lane State highway in Missouri. The Dodge was traveling southbound and was being driven by a belted 24-year-old male. The front right seat was occupied by an unbelted 23-year-old female. The second-row right seat was occupied by a 3-year-old male seated in a Safety 1st Alpha Omega convertible CRS. The seat was being used in the forward- facing orientation. The Ford was driven by a 78-year-old male and was traveling northbound. The front right seat of the Ford was occupied by a 73-year-old female. It was raining heavily at the time of the crash. The driver of the Dodge lost control of his vehicle and it entered the northbound travel lane. The right plane of the Dodge struck the front plane of the Ford. Both front row occupants of the Dodge were fatally injured. The 3- year-old sustained minor injuries and was transported to a local hospital. The driver of the Ford sustained moderate injuries and was transported by ambulance to a local hospital emergency room. The front right occupant of the Ford sustained serious injuries and was transported by ambulance to a local hospital emergency room.

17. Key Words Child restraint system, injury, air bag deployment, fatality		18. Distribution Statement Document is available to the public from the National Technical Information Service, www.ntis.gov.	
19 Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 37	22. Price

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Table of Contents

BACKGROUND **1**

SUMMARY **2**
Crash Site 2
Pre-Crash 2
Crash 3
Post-Crash 3

2010 DODGE AVENGER SXT **4**
Description 4
Exterior Damage 4
Event Data Recorder 5
Child Restraint Systems 5
Interior Damage 6
Manual Restraint Systems 6
Supplemental Restraint Systems 6
NHTSA Recalls and Investigations 6

2010 DODGE AVENGER OCCUPANTS **7**
Driver Demographics 7
Driver Injuries 7
Driver Kinematics 7
Front Row Right Passenger Demographics 8
Front Row Right Passenger Injuries 8
Front Row Right Passenger Kinematics 8
Second Row Right Passenger Demographics 8
Second Row Right Passenger Injuries 9
Second Row Right Passenger Kinematics 9

2017 FORD FLEX **10**
Description 10
Exterior Damage 10
Event Data Recorder 11
Occupant Data 12

CRASH DIAGRAM **13**

APPENDIX A: Event Data Recorder (EDR) Report 2017 Ford Flex **A-1**

Special Crash Investigations
Child Restraint System Crash Investigation
Case Number: DS18022
Vehicle: 2010 Dodge Avenger
Location: Missouri
Crash Date: August 2018

BACKGROUND

This report documents the on-site investigation of a child restraint system (CRS) used by the juvenile occupant of a 2010 Dodge Avenger involved in a crash with a 2017 Ford Flex and the disparate injuries sustained by the occupants of the Dodge (**Figure 1**). A 3-year-old male occupant was restrained in a CRS and was transported to a local hospital with minor injuries. The front row adult occupants were both fatally injured. The investigation will look at what role manual restraint usage played in the occupants' kinematics and injury mitigation, with a focus on the CRS-restrained occupant. This investigation was identified by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration (NHTSA). The case was assigned to Dynamic Science, Inc. in August 2018. Both vehicles were inspected in August 2018. Both vehicles were supported by the Bosch Crash Data Retrieval (CDR) system. The Event Data Recorder (EDR) modules were removed by police investigators for imaging. They were successful imaging the EDR for the Ford but not the Dodge.

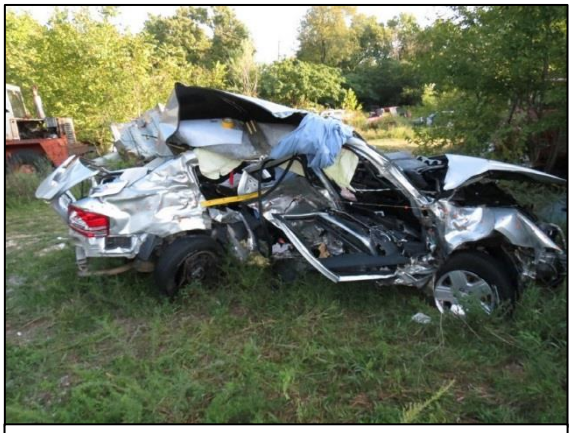


Figure 1. 2010 Dodge Avenger.

This two-vehicle crash occurred in August 2018 in the afternoon hours on a three-lane state highway in Missouri. The Dodge was traveling southbound and was being driven by a belted 24-year-old male. The front right seat was occupied by an unbelted 23-year-old female. The second-row right seat was occupied by a 3-year-old male seated in a Safety 1st Alpha Omega convertible CRS. The seat was being used in the forward-facing orientation. The Ford was being driven by a 78-year-old male and was traveling northbound. The front right seat of the Ford was occupied by a 73-year-old female. It was raining heavily at the time of the crash. The driver of the Dodge lost control of his vehicle and it entered the northbound travel lane. The right plane of the Dodge struck the front plane of the Ford. Both front row occupants of the Dodge were fatally injured. The 3-year-old sustained minor injuries and was transported to a local hospital. The driver of the Ford sustained moderate injuries and the front right occupant sustained serious injuries. Both were transported to a local hospital emergency room. Their treatment status is unknown.

SUMMARY

Crash Site

The crash site was a curved three-lane state highway that was generally oriented in a north/south direction. The asphalt roadway was configured with one southbound lane and two northbound lanes. The radius of curvature was 2,899 ft (883 m). The northbound and southbound lanes were separated by triple solid yellow painted stripes. The northbound lanes were separated by a dashed white painted line and bordered on the right by a solid white painted line and an asphalt shoulder (**Figure 2**). There was a shallow ditch east of the roadway. There was a positive 5 percent grade approaching the area of impact. The southbound lane was bordered on the right by a solid white painted stripe and an asphalt shoulder (**Figure 3**). There were a negative 4 percent grade and a negative 7 percent superelevation approaching the area of impact. The speed limit was 105 km/h (65 mph) in both directions.

Figure 2. Northbound approach.

Figure 3. Southbound approach.

The weather at the nearest reporting station was 23.8 °C (75 °F), 96 percent humidity, cloudy skies, light drizzle and the winds were out of the south southwest at 10 km/h (6 mph). There were reports of occasional heavy rain by persons at the scene. A Crash Diagram is attached at the end of this technical report.

Pre-Crash

The Dodge was traveling southbound in the first lane at an unknown speed while negotiating a left curve. The Ford was traveling northbound in the first lane at an EDR-reported speed of 90 km/h (56 mph) while negotiating a right curve at five seconds prior to impact. An overview of the vehicle 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
5	90	56	NA	NA	NA	NA
4.5	90	56	12.5	41.1	12.5	41.1
4	89	55	12.4	40.7	24.9	81.8
3.5	89	55	12.3	40.3	37.2	122.1
3	89	55	12.3	40.3	49.5	162.4
2.5	89	55	12.3	40.3	61.8	202.7

Time	Vehicle Speed		Distance Traveled Incremental		Cumulative	
2	89	55	12.3	40.3	74.1	243
1.5	89	55	12.3	40.3	86.3	283.3
1	89	55	12.3	40.3	98.6	323.6
0.5	90	56	12.4	40.7	111	364.3
0	89	55	12.4	40.7	123.4	405

Due to weather conditions and speed, the driver of the Dodge lost control of his vehicle and it began a counterclockwise rotation. The vehicle rotated past 90 degrees and entered the northbound travel lanes. The Dodge had slowed to approximately 70 km/h (44 mph)[1]. The Ford's speed continued at 90 km/h (55 mph) till 1 second before impact. The calculated closing speed was 160 km/h (99.8 mph). At 0.8 seconds, the steering wheel angle increased sharply as the Ford driver steered first to the right and then back to the left. At 0.5 seconds, the driver of the Ford began braking.

Crash

The right plane of the Dodge was struck by the front plane of the Ford (Event 1). The standard option of the WinSMASH program calculated a total Delta-V of 66 km/h (41 mph) for the Dodge. The longitudinal and lateral components were 33 km/h (21 mph) and -57 km/h (-36 mph), respectively. The right Inflatable Curtain (IC) and right seat-back mounted side air bags deployed. The program calculated a total Delta-V of 51 km/h (31 mph) for the Ford. The longitudinal and lateral components were -51 km/h (-32 mph) and 9 km/h (6 mph), respectively. The EDR-reported maximum longitudinal Delta-V was -73.78 (-45.85 mph) at 154 ms and the maximum lateral Delta-V was 18.78 km/h (11.67 mph) at 58 ms. The frontal air bags in the Ford deployed at impact. Both vehicles were displaced to the north. The Ford rotated counterclockwise and the right rear struck the ditch on the east side of the roadway (Event 2).

Post-Crash

The Ford came to rest partially off the road facing northwest. The Dodge came to rest on the roadway facing east.

The driver of the Dodge was extricated by rescue personnel and transported to a local hospital. Resuscitative efforts were unsuccessful and he was pronounced deceased at 1340 hours, approximately one hour post-crash. The cause of death according to the coroner was blunt force trauma to the chest with right hemothorax. No autopsy was performed. The front right passenger of the Dodge was found compressed in the passenger seat. There were no efforts at resuscitation. She was declared deceased at the scene at 1332 hours. The cause of death according to the coroner was a neck fracture. No autopsy was performed. The second-row right passenger sustained "C" (possible) injuries. He was extricated by rescue personnel and was transported by ambulance to a local hospital for evaluation. He was examined and treated for minor injuries. Due to the severity of the crash, he was held overnight for observation and released the next day to his grandparents.

[1] Calculated using linear closing speed formula with a coefficient of restitution of 0.1 and a calculated total Delta-V of 76.1 km/h (47.3 mph) for the Ford.

The driver of the Ford sustained moderate injuries and the front right occupant sustained serious injuries. Both were transported to a local hospital emergency room. Their treatment status is unknown.

2010 DODGE AVENGER SXT

Description

The Dodge Avenger was a four-door sedan. The vehicle was identified by the Vehicle Identification Number (VIN) 1B3CC4FB8ANxxxxxx. The vehicle was equipped with a 2.4-liter 4-cylinder gasoline engine, 4-speed automatic transmission, front wheel drive, 4-wheel disc brakes, tilt/telescoping steering column, and power rack and pinion steering. Stability control was offered as an option but was not present on this vehicle. The vehicle manufacturer's recommended tire size was P215/65R16 a cold tire pressure of 221 kPa (32 psi). The vehicle was equipped with Lemans Touring tires of the recommended size. The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	220 kPa (32 psi)	5 mm (6/32 in)	No	None
LR	227 kPa (33 psi)	2 mm (2/32 in)	No	None
RR	Tire Flat	3 mm (4/32 in)	No	Sidewall torn
RF	Tire Flast	6 mm (7/32 in)	No	Debeaded

The Dodge was configured with seating for five occupants. The front row was equipped with bucket seats with Active Head Restraints (AHR). If a rear impact requires deployment, both the driver and front passenger seat AHRs will be deployed. When AHRs deploy during a rear impact, the front half of the head restraint extends forward to minimize the gap between the back of the occupant's head and the AHR. This system is designed to help prevent or reduce the extent of injuries to the driver and front passenger in certain types of rear impacts. Both AHRs deployed during this crash. The second row was equipped with a bench seat with 60/40 folding backs.

Figure 4. 2010 Dodge Avenger, right side Damage.

Exterior Damage

The Dodge sustained severe right plane damage from the impact with the front plane of the Ford (**Figure 4**). The direct damage began 79 cm (31.1 in) aft of the rear axle and extended 315 cm (124.0 in) forward. The Field L extended from bumper corner to bumper corner and measured 365 cm (143.7 in). Forty measurements were taken at the mid-door 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 = 34 cm (13.3 in), C_3 = 59 cm (23.2 in), C_4 = 55 cm (21.6 in), C_5 = 16 cm (6.2 in), and C_6 = 14 cm (5.5 in). The crush at the sill level was measured manually as follows: C_1 = 0 cm, C_2 = 30 cm (11.8 in), C_3 = 73 cm (28.7 in), C_4 = 64 cm (25.1 in), C_5 = 31 cm (12.2 in), and C_6 = 0 cm. The average crush profile was as follows: C_1 = 0 cm, C_2 = 34 cm (13.3 in), C_3 = 66 cm (25.9 in), C_4 = 55 cm (21.6 in), C_5 = 24 cm (9.4 in), and C_6 = 7 cm (2.7 in). The maximum crush measured 78 cm (30.7 in) and was located 110 cm (43.3 in) forward of the rear axle. The sill height was 24 cm (9.4 in) and the height of the maximum crush was 45 cm (17.7 in). The door sill differential (DSD) was 28 cm (11.0 in). The Collision Deformation Classification (CDC) was 04RDAW4.

Event Data Recorder

The Dodge was equipped with an Air bag Control Module (ACM) with Event Date Recorder (EDR) capability. The ACM was removed by police personnel prior to the SCI investigation. Their efforts to image the ACM were unsuccessful.

Figure 5. Alpha Omega Elite CRS.

Child Restraint Systems

Safety 1st Alpha Omega Elite 40 Convertible CRS

The 3-year-old male was seated in a Safety 1st Alpha Omega Elite CRS (**Figure 5**) identified by the model number CC159-CRML with a manufacture date of 5/22/2015. The convertible CRS was designed to be used in one of three modes: rear-facing, forward-facing, or a belt positioning booster. This CRS was being used in the forward-facing orientation. The CRS was intended to be used for children weighing between 10.1-18 kg (22-40 lbs) and whose age is greater than 1 year. The child met the age and size requirements. The seat was configured with an adjustable 5-point internal harness, 3-position recline, and LATCH. The CRS was intended to be installed using either LATCH or the vehicle's seat belt. In this case, the seat was installed using the vehicle lap and shoulder seat belt (**Figure 6**). The tether was not used. It is unknown if the seat belt locking mode was engaged. The CRS was held tightly in place at the time of the inspection by intruding vehicle components. The seat belt buckle could not be accessed during the inspection. The CRS was removed from the vehicle by the SCI investigator by cutting the seat belt. The internal harness was adjusted to the top slot. The seat sustained damage due to the impact/intrusion. There were 21 cm (8.2 in) long longitudinal and 10 cm (3.9 in) lateral fractures along the right side (**Figure 7**). There was a series of cuts along the right seat pad measuring 16 cm (6.2 in).

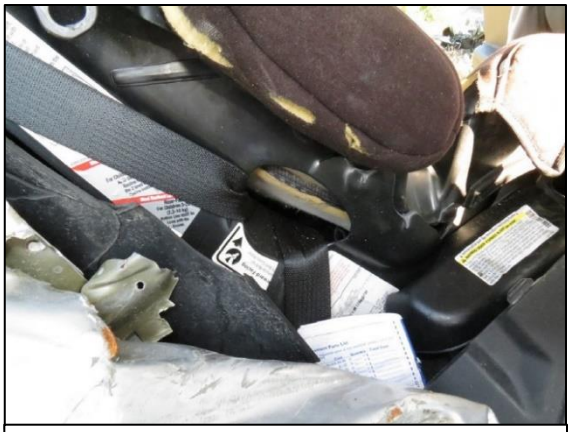


Figure 6. Alpha Omega Elite CRS, installation.

Interior Damage

The Dodge sustained severe interior damage from intrusion. There was lateral intrusion to the right side from the right front door, right sill, right roof side rail, right B-pillar and right rear door. The right front seat was displaced to the left into center and left seat positions (**Figure 8**). There was integrity loss through the side windows, right rear door, backlight, and windshield. The second-row right door latch was separated. There was also post-crash integrity loss due to extrication efforts.

Figure 7. Alpha Omega Elite CRS.

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 a non-adjustable upper anchor. The front row seat belts were equipped with retractor pretensioners. It is not known if the pretensioners actuated or not. The driver's seat belt was in use during the crash and was cut by rescue personnel during extrication. The front right passenger seat belt was not used during the crash. It was located in the retracted position and could not be moved, either due to intrusion or pretensioner actuation. The second-row right seat belt was used to secure the CRS.

Supplemental Restraint Systems

The Dodge was equipped with multiple-stage frontal air bags for the driver and front right passenger positions, seat mounted side impact air bags for the front row seats, and side impact IC air bags for the front and second row seats. The right IC air bag deployed from the roof side rail at impact with the Ford. It measured 46 cm (18.1 in) in height and 192 cm (75.5 in) in length. It was configured with a 42 cm (16.5) tether attached to the A-pillar. The front right seat-mounted side air bag deployed at impact with the Ford. It measured 28 cm (11.0 in) in length and 23 cm (9.0 in) in height.

Figure 8. Right intrusion, 2010 Dodge Avenger.

NHTSA Recalls and Investigations

There were no open recalls for this vehicle. The database was last queried in August 2019.

2010 DODGE AVENGER OCCUPANTS

Driver Demographics

Age/sex:	24 years/Male
Height:	Unknown
Weight:	Unknown
Eyewear:	None
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Vehicle inspection
Air bags:	Frontal air bag, seat-mounted side air bag, left IC air bag available, no deployments
Alcohol/drug data:	Tested, negative results
Egress from vehicle:	Removed by rescue personnel
Transport from scene:	Ambulance
Type of medical treatment:	Transported to local hospital, pronounced deceased at 1340 hours

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Blunt force trauma to chest with right hemothorax	442200.3	Right front seat Right front passenger	Probable Possible
2	Contusion, right lateral chest wall	410402.1	Right front seat Right front passenger	Probable Possible
3	Compound fracture, right humerus	751100.2	Right front seat	Probable
4	Abrasion, right upper chest wall	410202.1	Right front seat	Probable
5	Abrasions, right lateral knee	810202.1	Unknown	Unknown

Source: Coroner's report.

Driver Kinematics

The 24-year-old male driver was belted and seated in an unknown posture. As the vehicle negotiated the left curve, the driver lost control of the vehicle. At some point, the vehicle began a counterclockwise rotation and the driver was displaced to the right. At impact with the Ford, the driver was displaced backwards and to the right. He engaged the intruded passenger seat with the right side of his body, causing multiple right-side injuries. There was likely some occupant-to-occupant contact. He was extricated by rescue personnel and transported to a local hospital.

Resuscitative efforts were unsuccessful and he was pronounced deceased at 1340 hours, approximately one hour post-crash.

Front Row Right Passenger Demographics

Age/sex:	23 years/Female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder seat belt not used
Usage source:	Vehicle inspection
Air bags:	Frontal air bag not deployed, seat-mounted side air bag and right IC air bag deployed
Alcohol/drug Data:	Tested, negative results
Egress from vehicle:	Remained with vehicle until it was towed to tow facility where the decedent was removed by fire personnel
Transport from scene:	NA
Type of medical treatment:	None

Front Row Right Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Severe hyper flexed, neck fracture	650216.2	Passenger seat back	Certain
2	Pelvic fracture, right	856100.2	Passenger seat back	Certain
3/4	Multiple fractures, lower extremities	852002.2	Lower instrument panel	Possible
5	Mandible fracture	250600.1	Unknown	Unknown

Source: Coroner's report.

Front Row Right Passenger Kinematics

The 23-year-old female passenger was unbelted and seated in an unknown posture. The vehicle went into a counterclockwise rotation after the driver lost control. She was displaced to the right. At impact with the Ford, she was first displaced to the right and then forced to the left by the right plane intrusion. There was likely some occupant-to-occupant to contact. She was entrapped by the intrusion and died at the scene.

Second Row Right Passenger Demographics

Age/sex:	3 years/Male
Height:	91 cm (36 in)
Weight:	13 kg (29 lbs)

Eyewear:	None
Seat type:	Split bench with folding backs
Seat track position:	NA
Manual restraint usage:	Lap and shoulder belt used to anchor CRS
Usage source:	Vehicle inspection
Air bags:	Right IC air bag, deployed
Alcohol/drug data:	NA
Egress from vehicle:	Removed by rescue personnel
Transport from scene:	Ambulance
Type of medical treatment:	Hospitalized for one day

Second Row Right Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Contusion, right shoulder	710402.1	CRS shell	Certain
2	Neck seatbelt abrasion, right	310202.1	CRS harness	Certain
3	Left thigh contusion	810402.1	Unknown	Unknown
4	Small laceration, left cheek	210602.1	Flying glass	Probable
5 6	Bilateral knee abrasions	810202.1 810202.1	Driver seat back	Probable
7 8	Bilateral hand abrasions	710202.1 710202.1	Flying glass	Possible
9 10	Contusions, right 4th and 5th fingers, right hand	710402.1 710402.1	Driver seat back	Probable
11	Abrasions, entire chest	410202.1	CRS harness	Certain

Source: Emergency room records, radiology reports, discharge summary.

Second Row Right Passenger Kinematics

The 3-year-old male passenger was seated in a forward-facing CRS that was anchored to the second-row seat. Presumably, he was using the 5-point internal harness, but there were no indications of any loading to the harness system. At impact, he was displaced rearward and to the right into CRS seatback. The right-side shell of the CRS was damaged from intrusion on the right plane. He was extricated by rescue personnel and was transported by ambulance to a local hospital for evaluation.

2017 FORD FLEX

Description

The Ford Flex was a five-door sport utility vehicle. The vehicle was identified by the VIN 2FMHK6C8XHBxxxxxx. The vehicle was equipped with a 3.5-liter 6-cylinder gasoline engine, automatic transmission, all-wheel drive, 4-wheel ABS, and stability control. The vehicle manufacturer's recommended tire size was P235/60R18 a cold tire pressure of 241 kPa (35 psi). The vehicle was equipped with Goodyear Assurance tires of the recommended size. The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	Tire flat	3 mm (4/32 in)	Yes	Sidewall holed
LR	241 kPa (35 psi)	3 mm (4/32 in)	No	None
RR	248 kPa (36 psi)	3 mm (4/32 in)	No	None
RF	241 kPa (35 psi)	4 mm (5/32 in)	No	None

The Ford Flex was configured with seating for five occupants. The front row was equipped with buckets seats and the second row was equipped with a bench seat with folding back.

Exterior Damage

The Ford sustained moderate front plane damage from the impact to the right plane of the Dodge (**Figure 9**). The direct damage began 22 cm (8.6 in) right of the left front bumper corner and extended 115 cm (45.2 in) to the right. The Field L extended from bumper corner to bumper corner. Twelve measurements were taken at the bumper level by the Nikon Total Station and the Faro Blitz program computed crush measurement in six increments as follows: C_1 = 35 cm (13.7 in), C_2 = 53 cm (20.8 in), C_3 = 55 cm (21.6 in), C_4 = 41 cm (16.1 in), C_5 = 29 cm (11.4 in), and C_6 =14 cm (5.5 in). The CDC was 12FDEW3.

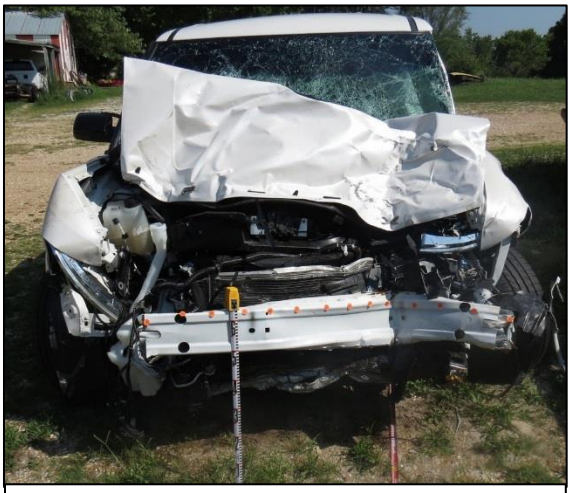


Figure 9. Frontal damage, 2017 Ford Flex.

The Ford sustained minor damage to the right rear bumper back plane from contact to the side of the ditch (**Figure 10**). The direct damage began at the right rear bumper corner and extended 85 cm (33.4 in) to the left. The CDC was 03BZLS1.

Event Data Recorder

The Ford was equipped with an Air bag Control Module (ACM) that had EDR capability to store deployment and non-deployment events. Two events were recovered. One was a locked frontal event and one was a locked side event. The ACM was removed by police personnel prior to the SCI investigation. For the pre-crash data there is a 5 second buffer that records Vehicle Speed, Accelerator pedal percentage, Service Brake Status, Engine RPM, ABS activity, Brake Torque Request, Drive Selection, Traction Control, and Wheel Torque. The Ford EDR data was imaged by the police department using the Bosch Crash Data Retrieval (CDR) scan tool and software version 17.8 via the direct to module method. It is being reported using version 19.0. The Bosch CDR report is included as **Appendix A** at the end of this report. The pre-crash data was as follows:

Figure 10. Rear damage, 2017 Ford Flex.

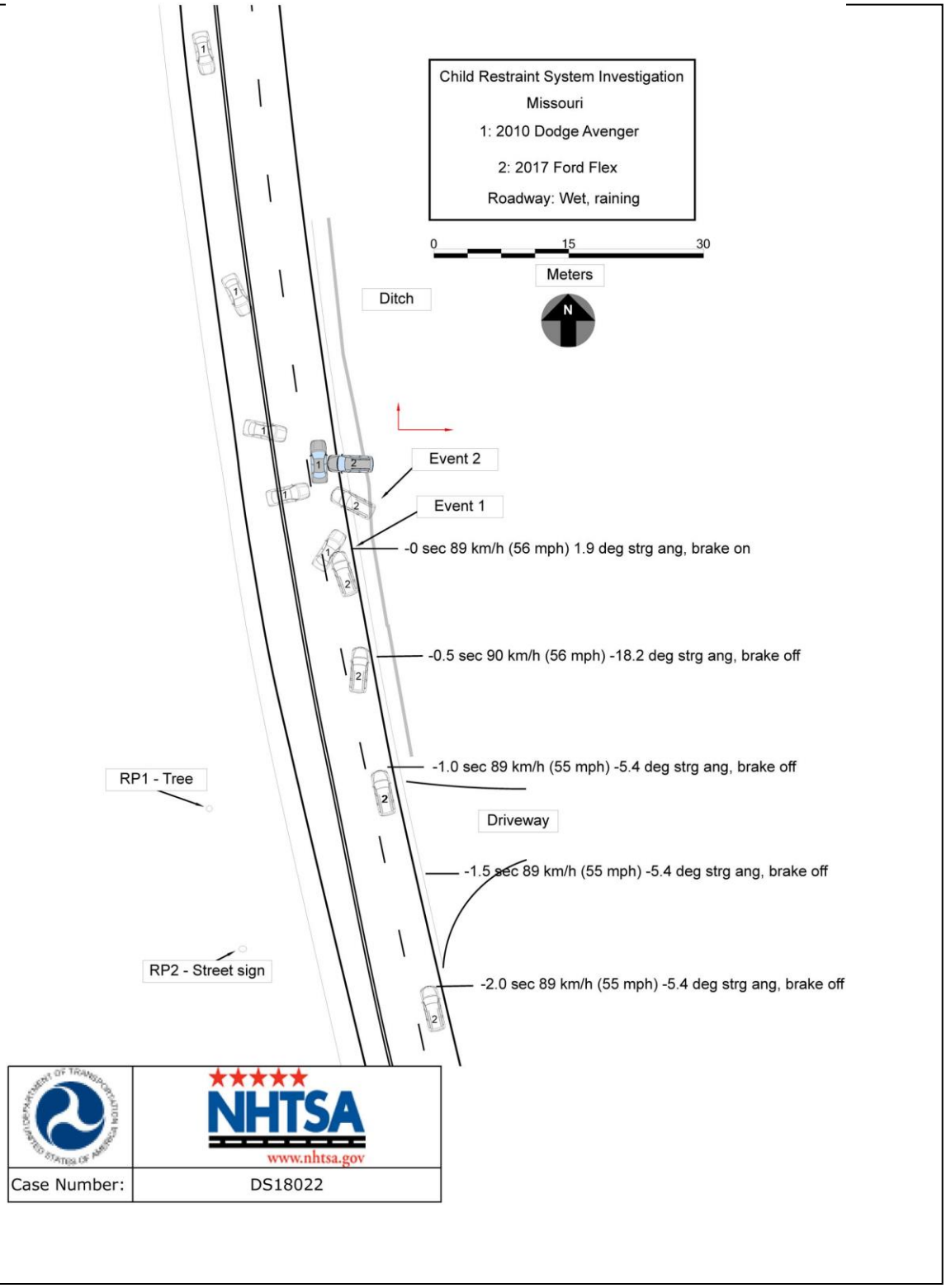
Time (sec)	Vehicle Speed MPH [km/h]	Acc. Pedal, %	Service Brake, On/Off	RPM	ABS Activity	Brake Powertrain Torque Request	Driver Gear Sel.	Traction Control	Wheel Torque
-5.0	56 [90]	24.6	Off	2,474	non-engaged	No	Drive	non-engaged	604
-4.5	[56 [90]	26.4	Off	2,484	non-engaged	No	Drive	non-engaged	708
-4.0	55 [89]	26.6	Off	2,460	non-engaged	No	Drive	non-engaged	740
-3.5	55 [89]	27.0	Off	2,456	non-engaged	No	Drive	non-engaged	752
-3.0	55 [89]	28.4	Off	2,478	non-engaged	No	Drive	non-engaged	792
-2.5	55 [89]	30.3	Off	2,458	non-engaged	No	Drive	non-engaged	876
-2.0	55 [89]	30.6	Off	2,458	non-engaged	No	Drive	non-engaged	892
-1.5	55 [89]	30.6	Off	2,472	non-engaged	No	Drive	non-engaged	892

Time (sec)	Vehicle Speed MPH [km/h]	Acc. Pedal, %	Service Brake, On/Off	RPM	ABS Activity	Brake Powertrain Torque Request	Driver Gear Sel.	Traction Control	Wheel Torque
-1.0	55 [89]	30.6	Off	2,458	non-engaged	No	Drive	non-engaged	896
-0.5	56 [90]	0.0	Off	2,464	non-engaged	No	Drive	non-engaged	844
0.0	55 [88]	0.0	On	2,384	non-engaged	No	Drive	non-engaged	-32

Occupant Data

The Ford was being driven by a belted 78-year-old male. The front right seat was occupied by a belted 73-year-old female. The driver of the Ford sustained moderate injuries and the front right occupant sustained serious injuries. Both were transported to a local hospital emergency room. Their treatment status is unknown.

CRASH DIAGRAM



APPENDIX A:
Event Data Recorder (EDR) Report 2017 Ford Flex[2]

[2] The EDR report contained in this technical report was imaged by law enforcement using version 17.8 of the Bosch CDR software at the time of the vehicle inspection. Law enforcement provided a copy of the CDRx file to the SCI investigator and it was re-read and is being reported by version 19.0. The CDR report contained in the associated Crash View 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	2FMHK6C8XHB******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS18022_V2_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.8
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 19.0
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	No
Event(s) recovered	locked frontal event locked side event

Comments

No comments entered.

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a court order or search warrant, as indicated by the CDR tool user on .

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.
- For 2011 Ford Mustangs, the Steering Wheel Angle parameter indicates the change in steering wheel angle from the previously recorded sample value and does not represent the actual steering wheel position.

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, etc.

02007_RCM-RC6_r002

System Status at Time of Retrieval

VIN as programmed into RCM at factory	2FMHK6C8XHB******
Current VIN from PCM	2FMHK6C8XHB******
Ignition cycle, download (first record)	1,792
Ignition cycle, download (second record)	N/A
Restraints Control Module Part Number	DA83-14B321-AF
Restraints Control Module Serial Number	9009688300000000
Restraints Control Module Software Part Number (Version)	CT43-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	1D5BC1CD
Left Side Restraint Sensor 1 Serial Number	CD762B50
Left Side Restraint Sensor 2 Serial Number	1D6195C1
Right Frontal Restraints Sensor Serial Number	1D51F890
Right Side Restraint Sensor 1 Serial Number	99B52B50
Right Side Restraints Sensor 2 Serial Number	1D616D85

System Status at Event (First Record)

Recording Status	Locked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	1
Time from event 1 to 2 (msec)	N/A
Lifetime Operating Timer at event time zero (seconds)	1,312,340
Key-on Timer at event time zero (seconds)	640
Vehicle voltage at time zero (Volts)	13.851
Energy Reserve Mode entered during event (Y/N)	Yes
Time Driver Front Satellite Sensor Lost Relative to Time Zero (msec)	6.5
Time Passenger Front Satellite Sensor Lost Relative to Time Zero (msec)	20.0
Time Driver First Row Satellite Sensor Lost Relative to Time Zero (msec)	201.0
Time Passenger Second Row Satellite Sensor Lost Relative to Time Zero (msec)	201.0

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Frontal airbag deployment, time to first stage deployment, driver (msec)	6.5
Frontal airbag deployment, time to 2nd stage, driver (msec)	26.5
Side curtain airbag deployment, time to deploy, driver side (msec)	37.0
Side (thorax) air bag deployment, time to deploy, driver (msec)	37.0
Pretensioner (buckle) deployment, time to fire, driver (msec)	10.5
Pretensioner (retractor) deployment, time to fire, driver (msec)	5.5
Frontal airbag deployment, time to first stage deployment, front passenger (msec)	6.5
Frontal airbag deployment, time to 2nd stage, front passenger (msec)	16.5
Side curtain airbag deployment, time to deploy, right side (msec)	37.0
Pretensioner (buckle) deployment, time to fire, right front passenger (msec)	5.5
Adaptive Load Limiter deployment, time to fire, passenger (msec)	51.5
Adaptive Steering Column deployment, time to deploy, driver (msec)	6.5
Maximum delta-V, longitudinal (MPH [km/h])	-45.85 [-73.78]
Time, maximum delta-V longitudinal (msec)	154
Maximum delta-V, lateral (MPH [km/h])	11.67 [18.78]
Time, maximum delta-V lateral (msec)	58
Left, forward, side satellite sensor discriminating deployment	Yes
Left, forward, side satellite sensor safing	Yes
Left, rear, side satellite sensor safing	Yes
Right, forward, side satellite sensor safing	Yes
Right, rear, side satellite sensor safing	Yes
RCM, side left sensor safing	Yes
RCM, side right sensor safing	Yes
Left or center front, satellite Sensor discriminating deployment	Yes
Left or center, front satellite Sensor safing	Yes
Right, front satellite sensor safing	Yes
RCM, front sensor discriminating deployment	Yes
RCM, front sensor safing	Yes
Longitudinal Delta-V Time Zero Offset	6.0 ms
Lateral Delta-V Time Zero Offset	6.0 ms
Roll Angle Time Zero Offset	86.0 ms

Pre-Crash Data -1 sec (First Record)

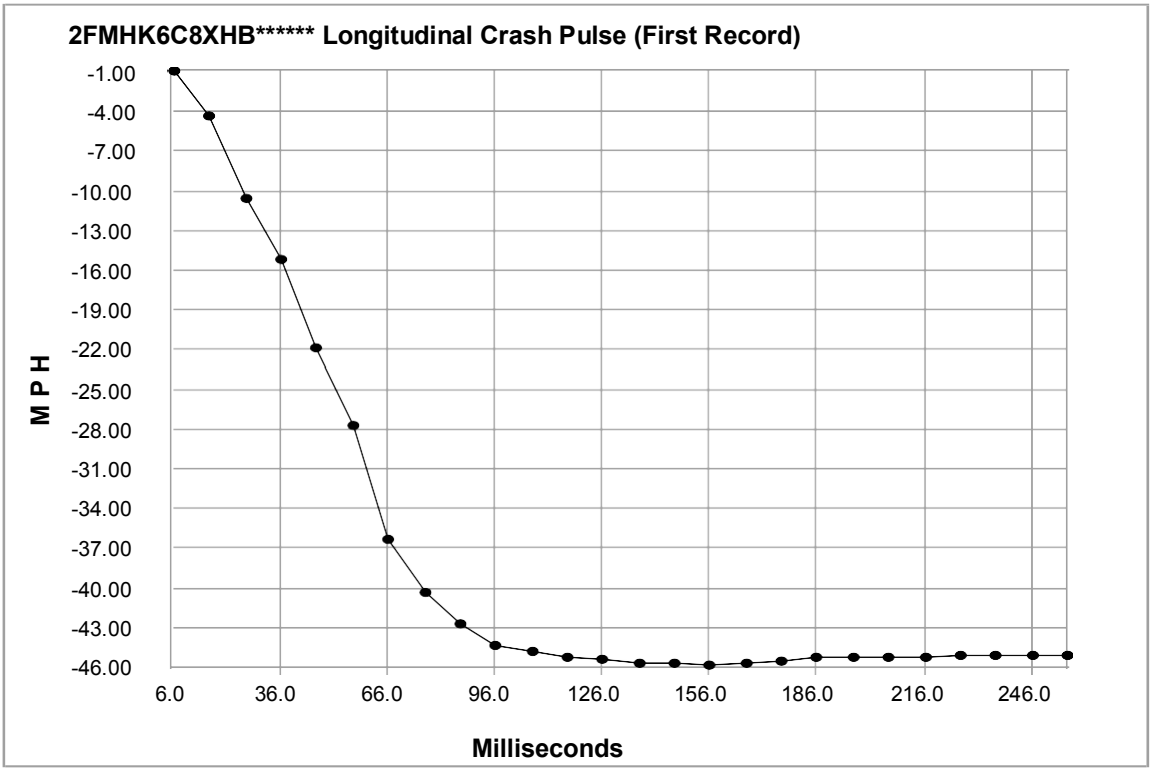
Ignition cycle, crash	1,790
Frontal air bag warning lamp, on/off	Off
Occupant size classification, front passenger (Child size Yes/No [Hex value])	No [$20]
Safety belt status, driver	Driver Buckled
Seat track position switch, foremost, status, driver	Not Forward
Safety belt status, front passenger	Passenger Buckled
Brake Telltale	Off
ABS Telltale	Off
ESC/TC Telltale	Off
ESC/TC Off Telltale	Default
Powertrain Wrench Telltale	Off
Speed Control Telltale	Off
MIL Telltale	Off

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

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine RPM	ABS activity (engaged, non-engaged)	Brake Powertrain Torque Request	Driver Gear Selection	Traction Control via Brakes	Wheel Torque
- 5.0	56 [90]	24.6	Off	2,474	non-engaged	No	Drive	non-engaged	604
- 4.5	56 [90]	26.4	Off	2,484	non-engaged	No	Drive	non-engaged	708
- 4.0	55 [89]	26.6	Off	2,460	non-engaged	No	Drive	non-engaged	740
- 3.5	55 [89]	27.0	Off	2,456	non-engaged	No	Drive	non-engaged	752
- 3.0	55 [89]	28.4	Off	2,478	non-engaged	No	Drive	non-engaged	792
- 2.5	55 [89]	30.3	Off	2,458	non-engaged	No	Drive	non-engaged	876
- 2.0	55 [89]	30.6	Off	2,458	non-engaged	No	Drive	non-engaged	892
- 1.5	55 [89]	30.6	Off	2,472	non-engaged	No	Drive	non-engaged	892
- 1.0	55 [89]	30.6	Off	2,458	non-engaged	No	Drive	non-engaged	896
- 0.5	56 [90]	0.0	Off	2,464	non-engaged	No	Drive	non-engaged	844
0.0	55 [88]	0.0	On	2,384	non-engaged	No	Drive	non-engaged	-32

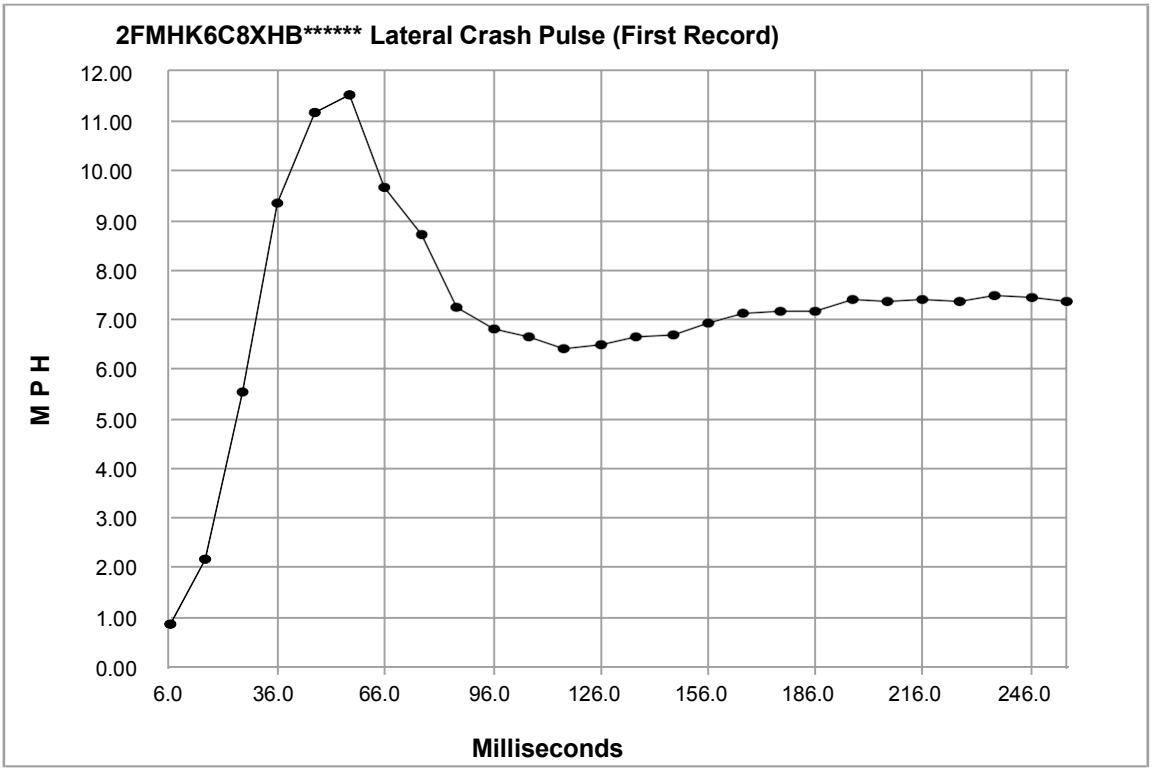
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Times (sec)	Steering Wheel Angle (degrees)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)
- 5.0	-5.8	-0.017	0.067	-1.25	-0.75
- 4.9	-5.8	-0.03	0.052	-1.75	-1.37
- 4.8	-5.8	-0.025	0.042	-1.25	-1.87
- 4.7	-5.8	-0.033	0.033	-1.12	-1.5
- 4.6	-5.8	-0.04	0.04	-1.5	-0.37
- 4.5	-5.8	-0.041	0.038	-1.62	1.12
- 4.4	-5.9	-0.032	0.044	-1.25	1.5
- 4.3	-5.9	-0.015	0.057	-1.87	1.25
- 4.2	-5.9	-0.021	0.069	-1.37	1.5
- 4.1	-5.9	-0.017	0.059	-1.75	0.87
- 4.0	-5.9	-0.023	0.057	-1.75	0.62
- 3.9	-5.9	-0.04	0.042	-1.62	1.0
- 3.8	-5.9	-0.037	0.038	-1.87	0.87
- 3.7	-5.9	-0.039	0.04	-1.75	0.37
- 3.6	-5.9	-0.025	0.047	-1.75	0.37
- 3.5	-5.9	-0.023	0.049	-2.0	0.62
- 3.4	-5.8	-0.012	0.054	-2.0	0.37
- 3.3	-5.8	-0.013	0.072	-1.75	0.37
- 3.2	-5.8	-0.018	0.08	-1.5	0.62
- 3.1	-5.8	-0.033	0.059	-1.25	1.25
- 3.0	-5.7	-0.04	0.054	-1.5	1.12
- 2.9	-5.7	-0.044	0.054	-1.87	0.12
- 2.8	-5.7	-0.023	0.057	-1.75	0.0
- 2.7	-5.4	-0.013	0.062	-2.12	-1.0
- 2.6	-5.3	-0.006	0.067	-2.12	-0.87
- 2.5	-4.8	-0.017	0.08	-1.87	0.0
- 2.4	-4.1	0.001	0.099	-1.25	0.37
- 2.3	-3.9	-0.005	0.077	-1.0	0.5
- 2.2	-4.3	-0.017	0.069	-0.62	1.12
- 2.1	-4.9	-0.011	0.047	-0.75	0.5
- 2.0	-5.4	-0.016	0.049	-1.0	-0.25
- 1.9	-5.4	-0.036	0.042	-1.25	-0.5
- 1.8	-5.4	-0.011	0.08	-1.62	-0.87
- 1.7	-5.4	-0.012	0.075	-1.37	-0.12
- 1.6	-5.4	-0.007	0.08	-1.62	1.12
- 1.5	-5.4	-0.005	0.082	-1.5	0.87
- 1.4	-5.4	-0.017	0.08	-1.37	1.75
- 1.3	-5.4	-0.032	0.064	-1.62	2.12
- 1.2	-5.4	-0.032	0.059	-1.37	1.37
- 1.1	-5.3	-0.027	0.052	-1.62	0.5
- 1.0	-5.4	-0.017	0.054	-1.62	-0.12
- 0.9	-5.8	-0.009	0.072	-1.62	-0.62
- 0.8	-9.9	-0.045	0.033	-1.75	-0.87
- 0.7	-33.7	-0.206	-0.009	-4.87	-4.75
- 0.6	-37.3	-0.227	-0.009	-10.5	-3.62
- 0.5	-18.2	-0.242	-0.012	-10.37	1.62
- 0.4	7.5	-0.146	-0.019	-5.0	3.62
- 0.3	10.8	-0.076	-0.034	2.12	3.12
- 0.2	5.6	0.014	-0.078	4.0	3.87
- 0.1	3.4	0.114	-0.508	3.62	4.12
0.0	1.9	0.163	-0.637	3.37	0.75



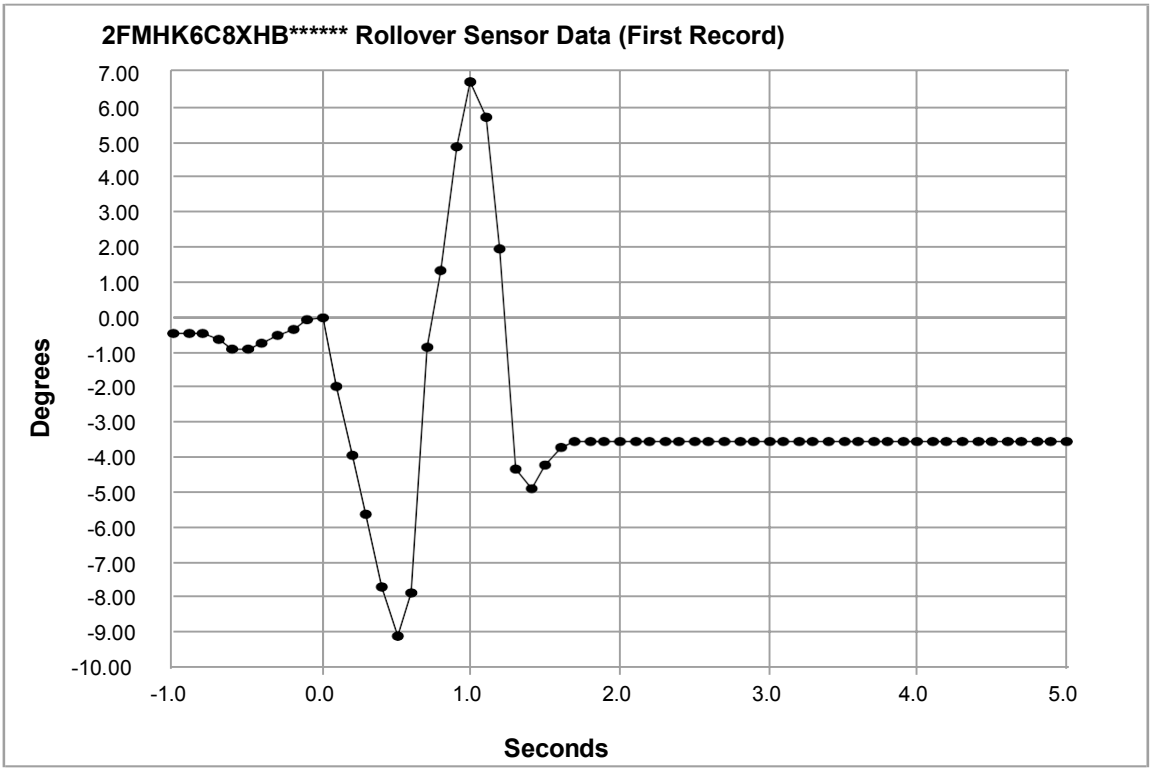
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
6.0	-1.04	-1.67
16.0	-4.46	-7.18
26.0	-10.62	-17.10
36.0	-15.19	-24.45
46.0	-21.91	-35.26
56.0	-27.73	-44.63
66.0	-36.36	-58.52
76.0	-40.34	-64.92
86.0	-42.72	-68.75
96.0	-44.42	-71.48
106.0	-44.76	-72.04
116.0	-45.32	-72.93
126.0	-45.45	-73.15
136.0	-45.63	-73.44
146.0	-45.74	-73.60
156.0	-45.79	-73.69
166.0	-45.67	-73.50
176.0	-45.50	-73.23
186.0	-45.26	-72.84
196.0	-45.27	-72.86
206.0	-45.19	-72.72
216.0	-45.21	-72.75
226.0	-45.14	-72.65
236.0	-45.16	-72.67
246.0	-45.10	-72.58
256.0	-45.13	-72.63



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
6.0	0.85	1.37
16.0	2.18	3.51
26.0	5.56	8.95
36.0	9.35	15.04
46.0	11.19	18.01
56.0	11.54	18.58
66.0	9.66	15.55
76.0	8.73	14.04
86.0	7.24	11.65
96.0	6.80	10.95
106.0	6.66	10.71
116.0	6.40	10.31
126.0	6.50	10.46
136.0	6.66	10.72
146.0	6.68	10.75
156.0	6.95	11.18
166.0	7.13	11.48
176.0	7.18	11.56
186.0	7.18	11.56
196.0	7.41	11.92
206.0	7.38	11.88
216.0	7.41	11.92
226.0	7.37	11.86
236.0	7.49	12.06
246.0	7.44	11.98
256.0	7.38	11.87



Rollover Sensor Data (First Record)

Time (sec)	Vehicle roll angle (degrees)
-1.0	-0.48
-0.9	-0.48
-0.8	-0.48
-0.7	-0.64
-0.6	-0.9
-0.5	-0.89
-0.4	-0.72
-0.3	-0.52
-0.2	-0.33
-0.1	-0.08
0.0	-0.01
0.1	-2.0
0.2	-3.95
0.3	-5.65
0.4	-7.73
0.5	-9.12
0.6	-7.87
0.7	-0.87
0.8	1.32
0.9	4.87
1.0	6.73

Time (sec)	Vehicle roll angle (degrees)
1.1	5.73
1.2	1.92
1.3	-4.35
1.4	-4.9
1.5	-4.23
1.6	-3.7
1.7	-3.58
1.8	-3.57
1.9	-3.57
2.0	-3.57
2.1	-3.57
2.2	-3.57
2.3	-3.57
2.4	-3.57
2.5	-3.57
2.6	-3.57
2.7	-3.57
2.8	-3.57
2.9	-3.57
3.0	-3.57
3.1	-3.57

Time (sec)	Vehicle roll angle (degrees)
3.2	-3.57
3.3	-3.57
3.4	-3.57
3.5	-3.57
3.6	-3.57
3.7	-3.57
3.8	-3.57
3.9	-3.57
4.0	-3.57
4.1	-3.57
4.2	-3.57
4.3	-3.57
4.4	-3.57
4.5	-3.57
4.6	-3.57
4.7	-3.57
4.8	-3.57
4.9	-3.57
5.0	-3.57

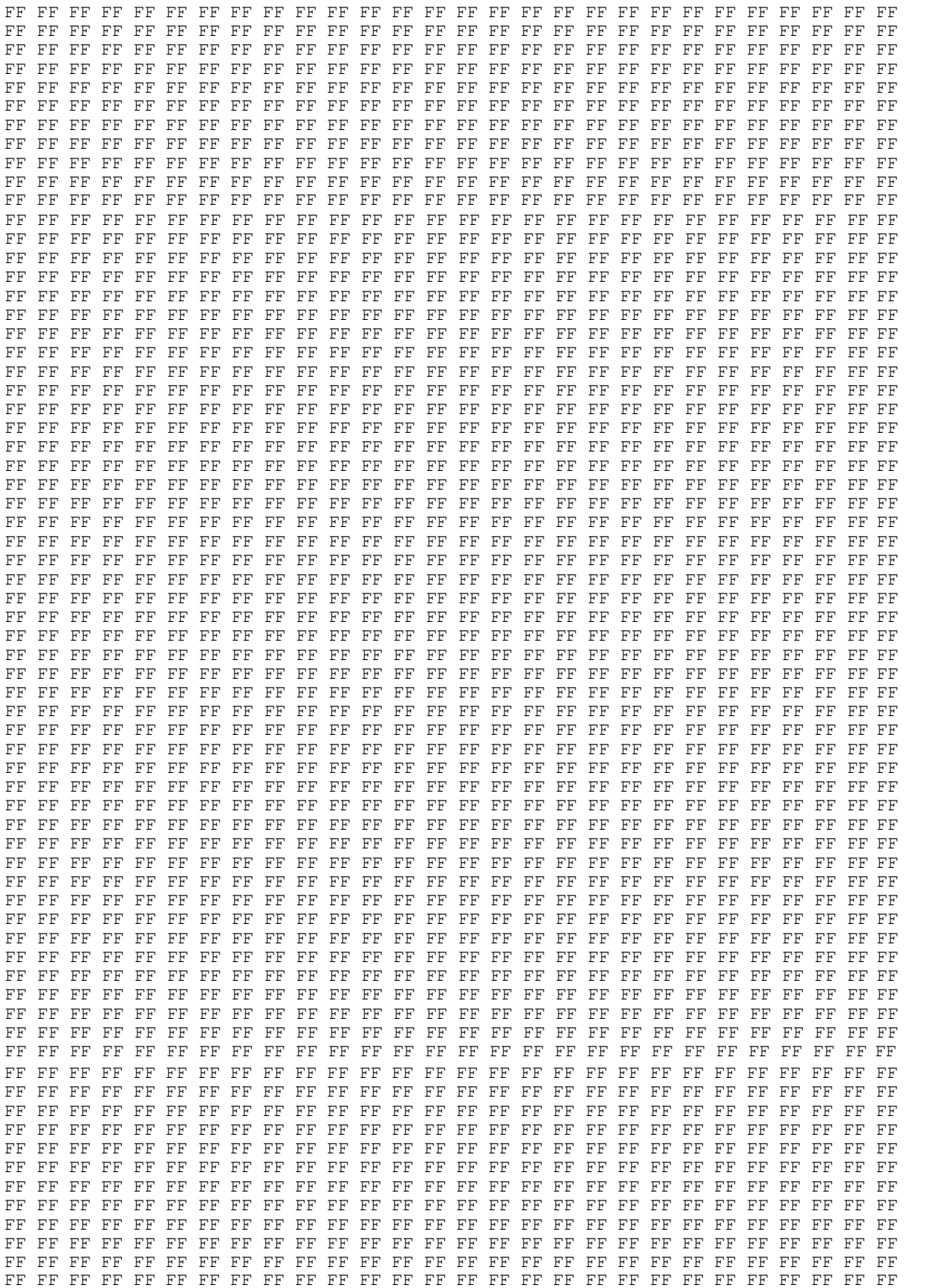
Hexadecimal Data

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.

```
06 00 00 00

44 41 38 33 2D 31 34 42 33 32 31 2D 41 46 00 00 00 00 00 00 00 00 00 00

39 30 30 39 36 38 38 33 30 30 30 30 30 30 30 30

43 54 34 33 2D 31 34 43 30 32 38 2D 41 42 00 00 00 00 00 00 00 00 00 00

1D 5B C1 CD 00 00 00 00 00 00 00 00 00 00 00 00

CD 76 2B 50 00 00 00 00 00 00 00 00 00 00 00 00

1D 61 95 C1 00 00 00 00 00 00 00 00 00 00 00 00

1D 51 F8 90 00 00 00 00 00 00 00 00 00 00 00 00

99 B5 2B 50 00 00 00 00 00 00 00 00 00 00 00 00

1D 61 6D 85 00 00 00 00 00 00 00 00 00 00 00 00

32 46 4D 48 4B 36 43 38 58 48 42 2A 2A 2A 2A 2A 2A

32 46 4D 48 4B 36 43 38 58 48 42 2A 2A 2A 2A 2A 2A 00 00 00 00 00 00 00
```

Event Record 1

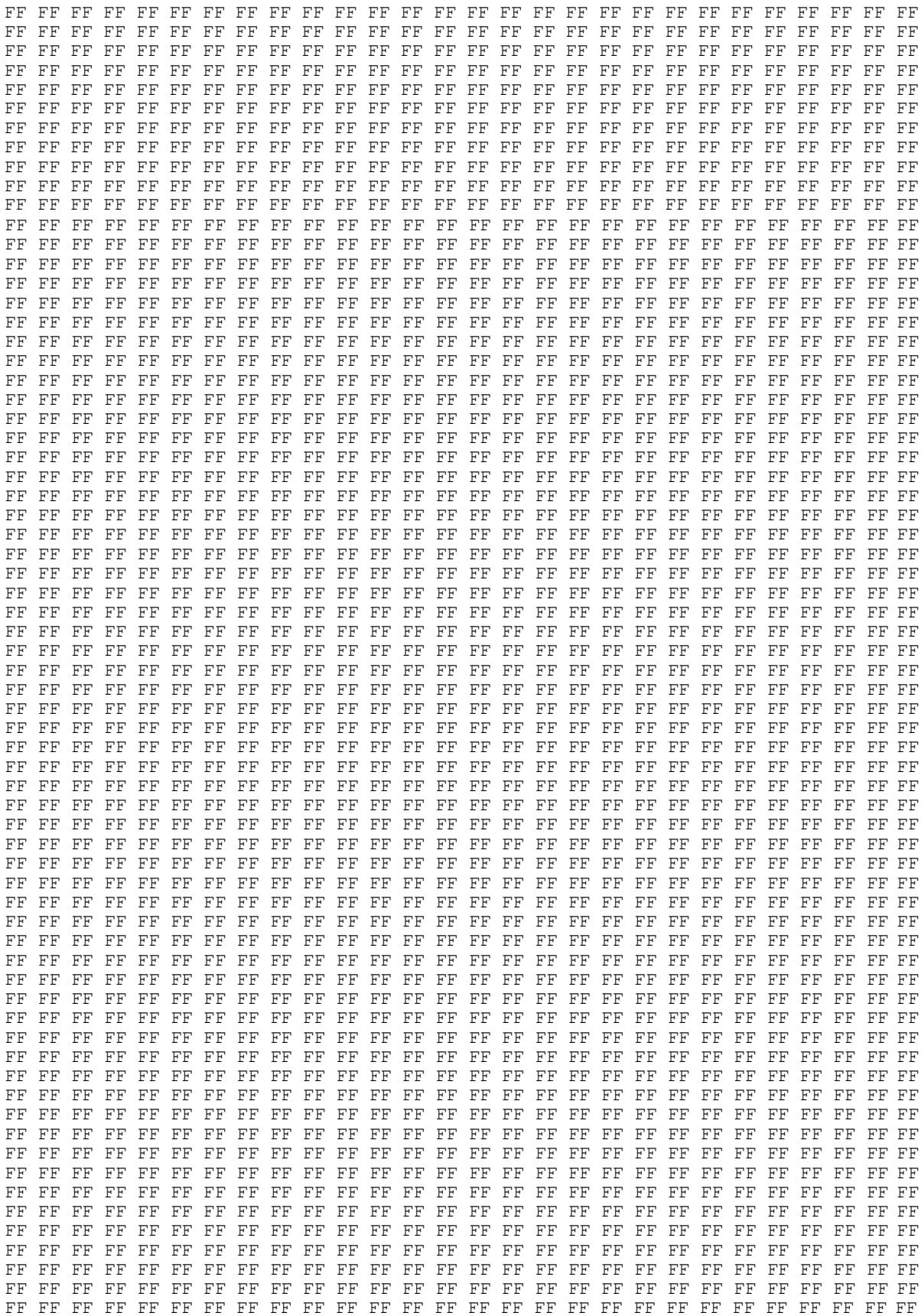

```
FE 06 00 00 00 07 00 00 44 01 04 00 80 00 00 00 71 9F 00 00 94 28 00 00 26 22 F6 FF
E4 48 F6 FF 54 FE FF FF 77 E1 09 00 5F ED 09 00 CD 02 0A 00 B1 12 0A 00 0C 2A 0A 00
4E 3E 0A 00 4F 5C 0A 00 24 6A 0A 00 6D 72 0A 00 54 78 0A 00 86 79 0A 00 74 7B 0A 00
ED 7B 0A 00 8F 7C 0A 00 E9 7C 0A 00 19 7D 0A 00 B1 7C 0A 00 1C 7C 0A 00 41 7B 0A 00
4E 7B 0A 00 00 7B 0A 00 11 7B 0A 00 D7 7A 0A 00 E7 7A 0A 00 B5 7A 0A 00 CF 7A 0A 00
13 BA 09 00 B0 BE 09 00 73 CA 09 00 9E D7 09 00 05 DE 09 00 41 DF 09 00 B4 D8 09 00
75 D5 09 00 4A D0 09 00 C6 CE 09 00 43 CE 09 00 62 CD 09 00 B5 CD 09 00 44 CE 09 00
58 CE 09 00 45 CF 09 00 E9 CF 09 00 15 D0 09 00 18 D0 09 00 DF D0 09 00 CA D0 09 00
DD D0 09 00 BB D0 09 00 2A D1 09 00 FF D0 09 00 C5 D0 09 00 AD F7 AD F7 AD F7 AD F7
53 00 53 00 53 00 DE FF 26 FF 2D FF A7 FF 34 00 C3 00 73 01 A8 01 10 FC 9D F6 D9 F1
0A EC 23 E8 A0 EB 39 FF 61 05 4E 0F 81 14 B7 11 0F 07 7D F5 F4 F3 D2 F5 53 F7 A9 F7
AB F7 AC F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7
AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7 AD F7
AD F7 46 3E 46 3E 46 3E 46 3E 47 3E 47 3E 47 3E 4A 3E 4B 3E 50 3E 57 3E 59 3E 55 3E
4F 3E 4A 3E 4A 3E 4A 3E 4A 3E 4A 3E 4A 3E 4A 3E 4A 3E 4A 3E 4B 3E 4A 3E 46 3E 1D 3E
2F 3D 0B 3D CA 3D CB 3E EC 3E B8 3E A2 3E 93 3E 46 3E 46 3E 46 3E 46 3E 46 3E 46 3E
45 3E 45 3E 45 3E 45 3E 45 3E 45 3E 45 3E 45 3E 45 3E 45 3E 06 08 18 08 20 08 0B 08
06 08 06 08 09 08 0E 08 13 08 20 08 33 08 1D 08 15 08 FF 07 01 08 FA 07 20 08 1B 08
20 08 22 08 20 08 10 08 0B 08 04 08 06 08 18 08 F1 07 C7 07 C7 07 C4 07 BD 07 AE 07
82 07 D4 05 53 05 13 08 04 08 FA 07 F1 07 F8 07 F6 07 FC 07 09 08 15 08 0B 08 09 08
FA 07 F6 07 F8 07 FF 07 01 08 C4 07 C3 07 BE 07 AF 07 A8 07 A4 07 B9 07 C3 07 CA 07
BF 07 D1 07 CB 07 BF 07 C5 07 C0 07 AC 07 C5 07 C4 07 C9 07 CB 07 BF 07 B0 07 B0 07
B5 07 BF 07 C7 07 A3 07 02 07 ED 06 DE 06 3E 07 84 07 DE 07 42 08 73 08 BF 07 B2 07
B7 07 AF 07 A8 07 A7 07 B0 07 C1 07 BB 07 BF 07 B9 07 A8 07 AB 07 A9 07 B7 07 B9 07
88 45 A1 45 BA 45 D3 45 BA 45 95 45 A1 45 7C 45 7C 45 95 45 D3 45 EC 45 12 46 05 46
EC 45 D3 45 AE 45 C7 45 AE 45 BA 45 C7 45 AE 45 C7 45 AE 45 AE 45 AE 45 A1 45 69 44
36 42 43 42 5C 44 24 47 E0 47 BA 47 A1 47 D3 45 A1 45 D3 45 E0 45 BA 45 AE 45 D3 45
95 45 C7 45 A1 45 A1 45 AE 45 95 45 A1 45 A1 45 88 45 55 75 55 75 6E 75 AD 75 A0 75
3C 75 30 75 CC 74 D9 74 30 75 55 75 62 75 A0 75 62 75 17 75 FE 74 D9 74 24 75 A0 75
87 75 DF 75 04 76 B9 75 62 75 24 75 F2 74 D9 74 55 73 C6 73 D2 75 9A 76 68 76 B3 76
CC 76 7B 75 E5 74 A7 74 75 74 9A 74 0B 75 A0 75 C6 75 AD 75 C6 75 87 75 6E 75 94 75
87 75 55 75 55 75 6E 75 0D 00 0D 00 15 00 0B 00 0B 00 67 00 35 00 21 00 4A 00 00 00
4A 00 4A 00 00 00 00 00 0D 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF FF FF FF FF FF FF FF FF FF FF FF
0D 00 FF FF 28 00 92 01 92 01 FF FF FF FF 92 01 92 01 FF FF 00 00 FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 33 01 73 00
02 0A DA 0F 0C 00 0C 00 AC 00 18 7C A8 8E 23 1E 01 2F 04 CD 00 00 80 DB 00 00 00 03
00 18 7C A8 8E 23 17 01 32 04 CD 00 00 80 DF 00 00 00 03 00 18 7C A8 9A 23 23 01 32
04 D4 00 00 80 DF 00 00 00 03 00 18 7C A8 9A 23 27 01 32 04 CD 00 00 80 E0 00 00 00
03 00 18 7C A8 A6 23 33 00 00 04 D0 00 00 80 D3 00 00 00 03 00 18 7C A8 A6 22 C2 00
00 04 A8 00 00 7F F8 00 01 00 03 00 18 7C A8 76 23 32 00 F6 04 D5 00 00 80 97 00 00
00 03 00 18 7C A8 76 23 2E 01 08 04 DA 00 00 80 B1 00 00 00 03 00 18 7C A8 82 23 23
01 0A 04 CE 00 00 80 B9 00 00 00 03 00 18 7C A8 82 23 21 01 0E 04 CC 00 00 80 BC 00
00 00 03 00 18 7C A8 8E 23 16 01 1C 04 D7 00 00 80 C6 00 00 00 03 00 00 00 00 00 00
00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00
00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00
00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00
00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00
00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00
00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00
00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00 00 00 00 00 00 14 09 00
00 00 00 00 00 14 09 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 03 00 01 00 01 02 00 20 00 01 AB 00 00 00 06 23 04
07 0B 33 3D 1A 1A 0B 02 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```



FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF

Event Record 2

```
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```


FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF

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 usethereof.

DOT HS 812 856
March 2020

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

14501-031020-v5