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Special Crash Investigations

Child Restraint System Crash Investigation
Vehicle: 2016 Chrysler Town & Country
Location: Utah
Crash Date: April 2018

DISCLAIMER

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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 investigation of the child restraint systems (CRSs) used by two occupants of a 2016 Chrysler Town & Country involved in a crash and the injuries sustained by the occupants of the vehicle. A 5-month-old female occupant restrained in a CRS sustained fatal injuries. A 2-year-old female restrained in a CRS, a belted 26-year-old male driver, and a belted 24-year-old female passenger sustained minor to moderate severity injuries. The other involved vehicles were a 1997 GMC Sierra being driven by a 26-year-old male and occupied by a 24-year-old female, and a 2003 Dodge Dakota being driven by a 34-year-old male. The Chrysler was traveling west, the GMC was traveling north and the Dodge was traveling east. The Chrysler and Dodge entered the intersection on green signals and the GMC entered the intersection on a red signal. Witness statements to police indicated the GMC was traveling between 145 to 193 km/h (90 to 120 mph). The crash involved two events. The front plane of the GMC struck the right plane of the Dodge and then the left plane of the GMC struck the left plane of the Chrysler. Drivers and surviving occupants were transported to hospitals by ambulances and three helicopters.

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Table of Contents

Special Crash Investigations
Child Restraint System Crash Investigation
Case Number: DS18011
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Crash Date: April 2018

BACKGROUND

This report documents the investigation of the child restraint systems (CRSs) used by two occupants of a 2016 Chrysler Town & Country (**Figure 1**) involved in a crash and the disparate injuries sustained by the occupants of the vehicle. A 5-month-old female occupant restrained in a CRS sustained fatal injuries. A 2-year-old female restrained in a CRS, a belted 26- year-old male driver, and a belted 24-year-old female passenger sustained minor to moderate severity injuries and were transported by ambulances to a local hospital. The investigation focused on what role the CRS played in the occupants' kinematics and injury mitigation. The investigation was initiated by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration in April 2018 in response to an online news article. The SCI team contacted the investigating police detective, who indicated the Chrysler and CRS used by the 5-month-old decedent were on a police evidence hold. SCI obtained a copy of the police report and permission to conduct inspections. The inspections were completed in May 2018 with the investigating police detective present. The Chrysler was supported by the Bosch Crash Data Retrieval (CDR) system and the vehicle's event data recorder (EDR) was imaged by police who provided SCI with an electronic file of the EDR report. SCI conducted partial inspections of the other two involved vehicles.

Figure 1. The 2016 Chrysler Town & Country.

The crash involved three vehicles and occurred during the early evening in April 2018. The crash site was a four-leg intersection controlled by three-phase traffic signals in a suburban mixed-use area in Utah. The other involved vehicles were a 1997 GMC Sierra driven by a 26-year-old male driver with a 24-year-old female passenger, and a 2003 Dodge Dakota driven by a 34-year-old male. The Chrysler was traveling west, the GMC was traveling north and the Dodge was traveling east. The Chrysler and Dodge entered the intersection on green signals and the GMC entered the intersection on a red signal. Witness statements to police indicated the GMC was traveling from 145 to 193 km/h (90 to 120 mph). The crash involved two events. The front plane of the GMC struck the right plane of the Dodge and then struck the left plane of the Chrysler. The Chrysler and GMC came to rest in the north leg of the intersection and the Dodge departed the roadway coming to rest on the northeast roadside.

The 5-month-old female occupant of the Chrysler was declared deceased on-scene and the other occupants of the vehicle were transported. The driver of the Dodge was transported with incapacitating injuries. The front right passenger of the GMC was fully ejected and transported with incapacitating injuries. The driver of the GMC sustained serious injuries and was transported. All three vehicles were towed due to damage on orders of police and placed into evidence.

SUMMARY

Crash Site

The crash site was a four-leg intersection of a one-way northbound roadway and an east/west roadway (**Figure 2**). The intersection was configured with three-phase overhead traffic signals for all lanes. The northbound approach to the intersection was configured with a right turn lane, bike lane, two through lanes and a left turn lane. This roadway curved slightly right and was level. The eastbound approach was configured with one eastbound through lane, two left turn lanes and two westbound lanes. This was a straight roadway with a slope measuring negative 2.0 percent. The westbound approach was configured with one right turn lane, two westbound through lanes, a painted divider and two eastbound lanes. This was a straight roadway with a slope measuring negative 2.0 percent. The roadway in the intersection where the impacts occurred was level. The asphalt surface and painted stripes for all roadways were in good condition. The intersection was illuminated by overhead lamps. The posted speed limit was 89 km/h (55 mph) for the northbound roadway and 56 km/h (35 mph) for the east/west roadway. Conditions at the time of the crash were daylight, clear and dry. A crash diagram is included at the end of this report.

Figure 2. Crash site looking west.

Pre-Crash

The Chrysler was facing westbound in the third lane from the right and stopped for a red traffic signal at the intersection. When the traffic signal changed to green, the driver accelerated the vehicle westbound into the intersection. Speed and distance calculations are documented in the table on the following page.

Time	Vehicle Speed		Distance Traveled			
			Incremental		Cumulative	
-sec	km/h	mph	m	ft	m	ft
5	0	0	NA	NA	NA	NA
4.5	5	3	0.3	1.1	0.3	1.1
4	6	4	0.8	2.6	1.1	3.7
3.5	11	7	1.2	4	2.3	7.7
3	13	8	1.7	5.5	4	13.2
2.5	16	10	2	6.6	6	19.8
2	19	12	2.5	8.1	8.5	27.9
1.5	21	13	2.8	9.2	11.3	37.1
1	23	14	3	9.9	14.3	47
0.5	24	15	3.2	10.6	17.6	57.6
0	26	16	3.5	11.4	21	69

The Chrysler's EDR-reported pre-crash data at T-0.1 seconds is documented in the table below.

Seconds Before AE	Vehicle Speed (mph [km/h])	Accelerator Pedal % Full	Engine (rpm)	Service Brake	Steering Input (deg)	Stability Control	Cruise Control Status
-0.1	16 [26]	15	2,072	Off	2	On	Off

The GMC was traveling northbound in the second lane from the right at a speed estimated by a witness from 145 to 193 km/h (90 to 120 mph). Calls had been made to police prior to the crash regarding this vehicle's speed. The police report indicated the GMC entered the intersection with the traffic signal in the red phase. There was no physical evidence of braking by the GMC driver prior to impact. The Dodge was traveling eastbound in the first lane from the right and entered the intersection at an unknown speed.

Crash

The crash included two events. The front plane of the GMC struck the right plane of the Dodge in an angled configuration (Event 1). The Dodge rotated counterclockwise, depositing three arcing tire marks measuring 2.0 to 4.0 m (6.6 to 13.1 ft) long north of the point of impact (POI) and was displaced in northeast where it departed the roadway on the northeast corner. One of the vehicle's tires deposited a mark measuring 1.9 m (6.2 ft) long on the sidewalk before the vehicle traveled down a descending embankment and came to rest facing northeast on the roadside. A debris field in the area suggested the vehicle came to rest approximately 43 m (141 ft) from the area of impact.

The GMC rotated clockwise and continued traveling in northbound until its left plane struck the left plane of the Chrysler in an angled configuration (Event 2). The Chrysler rotated

counterclockwise and was displaced in a northwest trajectory. On its path to final rest it deposited an arcing gouge mark measuring 9.5 m (31.1 ft) long followed by a group of shorter gouge marks. After rotating approximately 90 degrees counterclockwise the vehicle came to rest partially off the roadway in the first southbound lane from the right and facing south. The distance from POI to final rest was 39.0 m (128.0 ft).

Following Event 2 the GMC rotated counterclockwise and continued traveling in northbound. It came to rest 30.0 m (98.4 ft) north of the POI for Event 2. At some time during the crash the front right occupant of the GMC was fully ejected and came to rest on the roadway.

For the Chrysler in Event 2, the "missing" algorithm of the WinSMASH program calculated a total delta V of 25 km/h (16 mph), longitudinal delta V of -9 km/h (-5 mph), lateral delta V of 24 (15 mph) and a barrier equivalent speed (BES) of 28 km/h (17 mph). The results appear low when compared to the EDR-reported velocity changes which indicated a maximum longitudinal delta V of -32 km/h (-19.8 mph) and a maximum lateral delta V of 45 km/h (28 mph).

For the GMC in Event 2, WinSMASH calculated a total delta V of 23 km/h (14 mph), longitudinal delta V of -4 km/h (-2 mph), lateral delta V of 22 km/h (14 mph) and a BES of 20 km/h (12 mph). The results for the GMC appear low and the reconstruction is considered borderline.

Post-Crash

Following the crash, the 5-month-old female occupant of the Chrysler was pronounced deceased on-scene. The 2-year-old female occupant was transported by helicopter to a hospital. Her CRS was removed from the vehicle by responders presumably to be used during post-crash activities or transport. The driver and front right occupant were transported by ambulances to a hospital. The driver of the Dodge was transported by helicopter to a hospital. The driver of the GMC was transported by ambulance to a hospital and the passenger was transported by helicopter to a hospital. All three vehicles were towed on orders from police to an impound evidence lot. The CRS used by the 5-month-old female was placed into evidence.

2016 CHRYSLER TOWN & COUNTRY

Description

The 2016 Chrysler Town & Country was a 5-door passenger van identified by the Vehicle Identification Number (VIN): 2C4RC1BG1GRxxxxxx. It was manufactured in March 2016 and the EDR-reported odometer at event reading was 51,427.7 mi (82,765 km). The vehicle was equipped with a 3.6-liter, 6-cylinder, flexible fuel E85/gasoline engine, front-wheel drive and hydraulic brakes. The vehicle manufacturer recommended 225/65R17 tires with a recommended pressure of 250 kPa (36 psi) for the front and rear. The Chrysler was equipped with Kumho Solus KH16 tires of the recommended size on the front and rear manufactured in February 2016. The Chrysler was configured with three rows of seating for seven occupants. The front row was equipped with bucket seats with adjustable active head restraints. The driver's seat cushion was in the middle track position and the seat back was slightly reclined. The seat back was deformed by intrusion of the left B-pillar. The front right passenger's seat cushion was in the forward track position. The seat back was tilted to the left, probably a result of occupant loading at impact with

the other vehicle. The second row was configured with left and right bucket seats with adjustable head restraints. The left seat back was deformed by intrusion of the left C-pillar. The right seat back was tilted to the left, probably a result of occupant loading at impact with the other vehicle. The left and right seat positions were equipped with Lower Anchors and Tethers for Children (LATCH) anchorage systems to be used for installing LATCH-equipped CRSs. The lower anchors were located in the seat bight and the tether anchors were positioned behind the seating position on the lower aspect of the seat back. Both LATCH systems in the second row were used to secured CRSs at the time of the crash. This is discussed further in the Manual Restraint Systems and CRS discussions in this report. The third row was configured with a split bench seat with folding backs and adjustable head restraints. The middle seat position was equipped with LATCH.

Exterior Damage

The Chrysler sustained severe damage to the left plane damage caused by the impact with the GMC (**Figure 3**). Direct damage was distributed longitudinally from bumper corner to bumper corner and vertically from sill to roof side rail. The left front tire was restricted rearward shortening the wheelbase, left rear tire was displaced and the wheel was fractured. Induced damage extended to the front plane where the grille and bumper fascia were displaced, and to the top plane where the roof was buckled and the roof rack was fractured. Forty-four measurements were taken at mid-door level by the Nikon Total Station and the Faro Blitz program computed crush measurements in six increments as follows: C_1 = 0 cm, C_2 = 24 cm (9.4 in), C_3 = 17 cm (6.7 in), C_4 = 2 cm (0.8 in), C_5 = 6 cm (2.4 in), and C_6 = 24 cm (9.4 in). Maximum crush located above the rear axle measured 24 cm (9.4 in). The Collision Deformation Classification (CDC) was 10LDAW3.

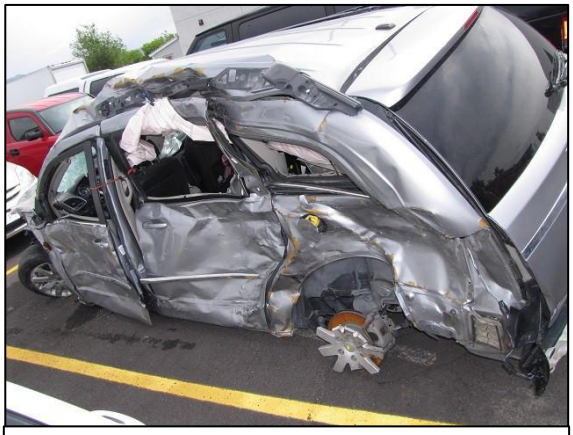


Figure 3. Left plane damage, the 2016 Chrysler Town & Country.

Event Data Recorder

The investigating police department imaged the Chrysler's EDR and released the CDRX file of the report to SCI. The complete report is included in this report as an appendix. The EDR was imaged using software version 17.4.2 and reported using software version 19.3. It included system status, system configuration, deployment command data, longitudinal, lateral and rollover crash pulse and pre-crash data. The EDR captured one deployment event, which was the left plane impact with the GMC. The EDR reported a maximum longitudinal delta V of -32 km/h (-19.8 mph) and a maximum lateral delta V of 45 km/h (28 mph).

Child Restraint Systems

Unknown brand/model CRS

The 2-year-old female was seated in an unknown brand/model CRS anchored to the second row left seat using the LATCH system. The orientation of the CRS was unknown. The CRS lower anchor and tether straps were cut by responders during post-crash activities and the connectors were still attached to the anchors at the time of the SCI inspection. The left, adjustable lower

anchor strap revealed scuffs likely caused by occupant loading (**Figure 4**). The right anchor strap and tether strap were unremarkable. Efforts to identify the CRS were unsuccessful.

Baby Trend Flex-Loc CRS

The 5-month-old female was seated in a Baby Trend Flex-Loc CRS (**Figure 5**) anchored to the second-row right seat. The CRS was identified by the model number TS41948 and the manufacture date of August 31, 2015. This rear-facing-only CRS was configured with an adjustable 5-point-harness system, removable seat pad, canopy, carry handle, fixed (non-adjustable) back, three sets of harness slots, seat angle indicator and LATCH (lower anchors only, no tether). The CRS was designed to be installed using either LATCH or the vehicle's seat belt with the removable stay-in-vehicle base, or using the vehicle's seat belt without the base. According to the investigating police officer, the CRS was installed using the base and LATCH. It was positioned on the second-row right seat cushion and installed rear-facing. The harness shoulder straps were positioned in the lowest set of slots. The LATCH connectors attached to the left and right LATCH anchors, spaced 24 cm (9.4 in) apart.

Labeling on the CRS indicated the seat was intended for use by children meeting the following parameters.

- 5 - 20 lbs (2.2 - 13.6 kg)
- 30 inches (76.2 cm) or less

The 5-month-old female occupant met the weight and height parameters for using this CRS.

The CRS inspection documented evidence of occupant loading to the harness system and shell. A set of scuff marks were present on the right shoulder strap of the harness. The orientation and location of the scuff marks suggested they were caused when the occupant loaded the harness system at impact and the retainer clip pressed into the shoulder strap. With the pad removed, some

Figure 4. LATCH components second-row left seat, the 2016 Chrysler Town & Country.

Figure 5. Baby Trend Flex-Loc CRS, the 2016 Chrysler Town & Country.

Figure 6. Baby Trend Flex-Loc damage to shell, the 2016 Chrysler Town & Country.

discoloration of the shell was documented. This discoloration was located primarily on the right aspect below the headrest (**Figure 6**). This area was likely loaded by the occupant at impact with the other vehicle. In a rear-facing orientation, the occupant was displaced toward the right aspect of the shell and the left side of the vehicle in response to the direction of force. Some scattered discoloration was present in the bottom aspect of the shell. It was likely the result lateral displacement of the occupant and CRS at impact. It is noteworthy that the vehicle bucket seat in which the CRS was installed also exhibited a visible tilt to the left side of the vehicle.

Interior Damage

The Chrysler sustained interior damage resulting from impact forces, air bag deployments and occupant contacts. The windshield was fractured and holed, and all the left side glazing was disintegrated. Both left side doors were jammed shut and the left front door was sprung open during post-crash activities. The driver's seat was deformed by intrusion of the left B-pillar, the front row right seat was deformed by occupant loading, the second row left seat was deformed by intrusion of the left C-pillar and the second-row right seat was deformed by occupant loading.

Both frontal, the driver's knee, driver's seat-mounted and the left IC air bags deployed. The front row seat belt pretensioners actuated at the left and right seat positions. Evidence of driver contacts and loading were documented on the seat belt and frontal air bag. Front right occupant contact was documented on the seat belt, second row left occupant contact was documented on the LATCH system of the CRS used by that occupant and second row right occupant contact was documented on the CRS used by that occupant. The front row was reduced by lateral intrusion as follows: left front door forward upper quadrant 5 cm (2.0 in) and left roof side rail 5 cm (2.0 in). The second row was reduced by lateral intrusion as follows: left B-pillar 10 cm (3.9 in), left C-pillar 30 cm (11.8 in), left roof side rail 15 cm (5.9 in) and left door panel rear upper quadrant 15 cm (5.9 in). The third row was reduced by lateral intrusion as follows: side panel aft of C-pillar 20 cm (7.9 in) and left roof side rail 10 cm (3.9 in).

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, emergency locking retractor (ELR), and an adjustable D-ring in the full-up position. The front row belts were configured with retractor-mounted seat belt pretensioners. The front right occupant's seat belt was configured similar to the driver's with the addition of a switchable automatic locking retractor/ELR retractor and an adjustable D-ring in the full-down position. The EDR report indicated both belts were buckled at impact and both pretensioners actuated. Examination of the belts confirmed both front row occupants were belted at impact. The driver's belt revealed scuff marks spanning the width of the webbing caused by loading where it passed through and engaged the D-ring. The front right occupant's belt revealed similar but more pronounced evidence of loading in the form of stretch marks measuring 50 m (20.0 in).

The second row left and right seat belts were configured with continuous loop belt webbing, a sliding latch plate, ALR/ELR, and an adjustable D-rings in the full-down and middle position. The latch plates revealed slight evidence of historical usage. These belts were not used by the occupants in the second row at the time of the crash. Both CRSs were installed using LATCH.

Supplemental Restraint Systems

The Chrysler's supplemental restraint systems included driver and front passenger advanced frontal, driver's knee, front-seat-mounted side impact and combination side impact/roll-sensing IC air bags. Seven air bags deployed at impact with the GMC. The driver's frontal air bag deployed in two stages from the steering wheel hub at EDR-reported times of 84 ms and 234 ms, respectively. It revealed blood deposits on the lower aspect of the front and back panels. The passenger's frontal air bag deployed in two stages from the top right instrument panel (IP) at the same time sequence as the driver's frontal air bag. This air bag was unremarkable. The driver's knee air bag deployed at an unreported time from the lower left IP and the left seat-mounted side air bag deployed from the driver's seat back. The left IC air bag deployed from the left roof side rail above the front, second and third rows. These air bags were unremarkable.

NHTSA Recalls and Investigations

A query using the vehicle's VIN revealed no open recalls as of January 2020.

2016 CHRYSLER TOWN & COUNTRY OCCUPANTS

Driver Demographics

Age/sex:	26 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Middle
Manual restraint usage:	Lap and shoulder seat belt used
Usage source:	Vehicle inspection
Air bags:	Frontal, knee, seat-back side impact, and IC air bags deployed
Alcohol/drug data:	None
Egress from vehicle:	Exited with assistance due to injury
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Hospitalized for 2 days

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Laceration, 2 cm, with subscapular hematoma, spleen	544222.2	Tandem IPC Left seat-mounted side air bag, left door panel, unknown quadrant	Probable
2	Pneumomediastinum, trace, thorax	442209.2	Tandem IPC Left seat-mounted side air bag, left door panel, unknown quadrant	Probable
3	Fracture, minimally displaced, spinous process, thoracic spine, T-8	650418.1	Left door panel, unknown quadrant	Probable
4	Abrasions, face and forehead	210202.1	Front air bag	Probable
5 6 7	Abrasions, left neck, chest and left shoulder	310202.1 410202.1 710202.1	Shoulder seat belt	Certain

Source: medical records.

Driver Kinematics

The belted 26-year-old male driver was seated in an unknown posture and actively steering and accelerating the vehicle through an intersection. At impact with the other vehicle, the driver's frontal, seat-mounted side and IC air bags deployed and his seat belt pretensioner actuated. He was displaced sharply left in response to the direction of force likely contacting the left door panel and loading the deployed air bags and seat belt causing a laceration to the spleen and fracture to the thoracic spine. His head and face likely loaded the deployed air bags causing abrasions to the face. His forearms loaded the deployed frontal air bag causing a driver-described burning sensation on his arms. Lateral intrusion of the B-pillar deformed his seat back reducing his occupant space. The vehicle initiated a counterclockwise rotation and was displaced to the right displacing the driver to the right. He remained held in his seated position by the pretensioned seat belt until final rest.

According to the EMS report, the driver remained upright in his seated position until responders arrived. The driver sustained moderate severity injuries and was transported by ambulance to a hospital where he was admitted for 2 days.

Front Row Right Occupant Demographics

Age/sex:	24 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Between forward-most and middle
Manual restraint usage:	Lap and shoulder seat belt used
Usage source:	Vehicle inspection
Air bags:	Frontal air bag deployed
Alcohol/drug data:	None
Egress from vehicle:	Unknown
Transport from scene:	Ambulance to hospital
Type of medical treatment:	Treated and released

Front Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1 2 3	Abrasions, right neck, right chest, abdomen	310202.1 410402.1 510202.1	Shoulder seat belt Shoulder seat belt Lap seat belt	Certain
4	Abrasions, right elbow and upper arm	710202.1	Right door panel, unknown quadrant	Probable
5	Hematoma, right lateral thigh	810402.1	Right door panel, unknown quadrant	Probable
6	Abrasion, right knee	810202.1	Right door panel, unknown quadrant	Probable
7	Radiologic findings without neurological impairment, cervical spine (cervical C1 and C2 cerebrovascular injuries)	610299.1	Shoulder portion seat belt	Probable

Source: medical records

Front Row Right Occupant Kinematics

The belted 24-year-old female occupant was seated in an unknown posture. At impact with the other vehicle, the occupant's frontal air bag deployed and her seat belt pretensioner actuated. She was displaced sharply left in response to the direction of force likely contacting the center console and loading the seat belt causing abrasions to the neck, chest and abdomen. Her head and neck were likely hyper-extended causing cerebrovascular injuries to the cervical spine. Impact forces and occupant loading caused her seat to deform to the left. The vehicle initiated a counterclockwise rotation and was displaced to the right displacing the occupant to the right

where she contacted the door panel causing abrasions and contusions to the upper and lower right extremities. She remained held in her seated position by the pretensioned seat belt until final rest.

According to the EMS report, the occupant exited the vehicle unassisted and sat on the ground with her back against the vehicle until responders arrived. She was assisted onto a patient cot and transported by ambulance to a local hospital.

Second Row Left Occupant Demographics

Age/sex:	2 years/female
Height:	Unknown
Weight:	13 kg (28 lb)
Eyewear:	None
Seat type:	Bucket with folding back
Seat track position:	Not adjustable
Manual restraint usage:	LATCH with CRS and 5-point harness
Usage source:	Vehicle inspection
Air bags:	IC air bag deployed
Alcohol/drug data:	None
Egress from vehicle:	Removed from vehicle due to age
Transport from scene:	Helicopter to hospital
Type of medical treatment:	Treated and released

Second Row Left Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Hematoma, forehead	210402.1	CRS shell	Probable
2	Laceration, minor, left finger	710602.1	Flying glass	Possible

Source: medical records.

Second Row Left Occupant Kinematics

The 2-year-old female occupant was restrained in a CRS with a 5-point harness system. At impact with the other vehicle, the left IC air bag deployed and the occupant and CRS were displaced sharply left loading the LATCH components. Lateral intrusion of the C-pillar deformed her seat back reducing her occupant space. The vehicle initiated a counterclockwise rotation and was displaced to the right displacing the occupant to the right likely contacting the CRS shell with her head and face causing a hematoma to the forehead. A laceration to a left finger was possibly caused by flying glass. She remained held in her seated position by the CRS until final rest. The occupant was transported by helicopter to a hospital where she was treated and released.

Second Row Right Occupant Demographics

Age/sex:	5 months/female
Height:	63 cm (25 in)

Weight:	8 kg (18 lb)
Eyewear:	None
Seat type:	Bucket with folding back
Seat track position:	Not adjustable
Manual restraint usage:	LATCH with CRS and 5-point harness
Usage source:	Vehicle inspection
Air bags:	None deployed
Alcohol/drug data	None
Egress from vehicle:	Removed from vehicle due to perceived serious injuries
Transport from scene:	Not transported; declared deceased on-scene
Type of medical treatment:	None

Second Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Dislocation, cervical spine, C1-C2 with laceration and hemorrhage of cord	610234.6	CRS harness	Probable
2	Subdural hemorrhage, cerebrum, right convexity	140651.3	CRS shell	Probable
3	Subarachnoid hemorrhage NFS, cerebrum	140693.2	CRS shell	Probable
4	Intraventricular hemorrhage NFS, cerebrum	140678.2	CRS shell	Probable
5	Fracture, right temporal bone	150402.2	CRS shell	Probable
6	Abrasions, face (forehead, left periorbital	210202.1	CRS shell	Probable
7	Contusion, left neck	310402.1	CRS harness	Probable
8	Contusion, right arm	710402.1	CRS shell	Probable
9	Contusion, left finger	710402.1	CRS shell	Probable
10	Abrasion, right thigh	810202.1	CRS shell	Probable
11	Contusion, posterior left thigh	810402.1	CRS shell	Probable

Source: autopsy.

Second Row Right Occupant Kinematics

The 5-month-old female occupant was restrained in a rear-facing CRS with a 5-point harness system. At impact with the other vehicle, the occupant and CRS were displaced sharply toward the left side of the vehicle (to occupant's right) loading the CRS shell and LATCH components. Impact forces and occupant loading caused her seat back and cushion to deform toward the left. Her torso was held in place by the 5-point harness and her head and neck were likely hyper-extended contacting the CRS shell and causing a dislocation of the cervical spine at C1-C2 with laceration of the spinal cord. The occupant also sustained multiple serious and moderate severity head injuries including a fracture to the right temporal scull and cerebral hemorrhages. The vehicle rotated counterclockwise and was displaced to the right, displacing the occupant to the right. She remained held in her seated position by the CRS until final rest. The occupant was declared deceased on-scene.

1997 GMC SIERRA

Description

The 1997 GMC Sierra 2500 (**Figure 7**) was a full-size pickup identified in the police report using the VIN 1GTGK29J4VExxxxxx. The vehicle was manufactured in October 1996 and was equipped with an extended cab, 8-cylinder, 7.4-liter gas engine, 4-wheel drive, ABS brakes, and daytime running lights.

Figure 7. The 1997 GMC Sierra 2500.

Exterior Damage

The GMC sustained severe front plane damage caused at impact with the Dodge and moderate left plane damage caused at impact with the Chrysler. Direct damage to the front plane at bumper level was distributed laterally from corner to corner. The CDC for the GMC in Event 1 was 11FDEW2. Direct damage to the left plane began at the left front corner and extended to the left rear corner. The CDC for the GMC in Event 2 09LDEW3.

Occupant Data

Occupants of the GMC included a 26-year-old male driver whose restraint usage was unknown and an unbelted 24-year-old female seated in the front right position. During the crash, the front right occupant was fully ejected and came to rest on the roadway. Following the crash, the driver was transported by ambulance and the front right occupant was transported by helicopter to local hospitals to be treated for police-reported incapacitating injuries. The driver was treated and released and the passenger was hospitalized for an unknown duration.

2003 DODGE DAKOTA

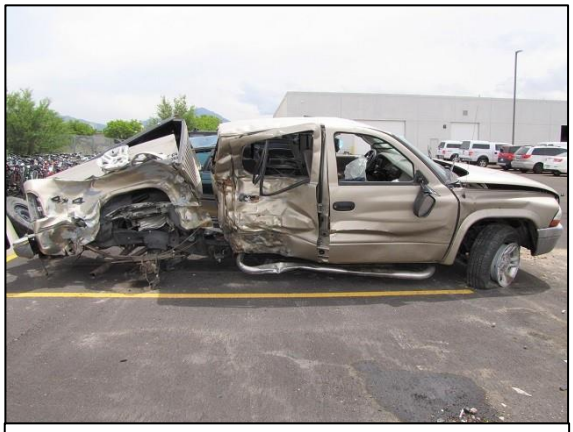


Figure 8. The 2003 Dodge Dakota.

Description

The 2003 Dodge Dakota (**Figure 8**) was a full-size pickup identified in the police report using the VIN 1D7HG48N33Sxxxxxx. The vehicle was manufactured in October 2002 and was equipped with an extended cab, 8-cylinder, 4.7-liter gas engine, 4-wheel drive and ABS brakes.

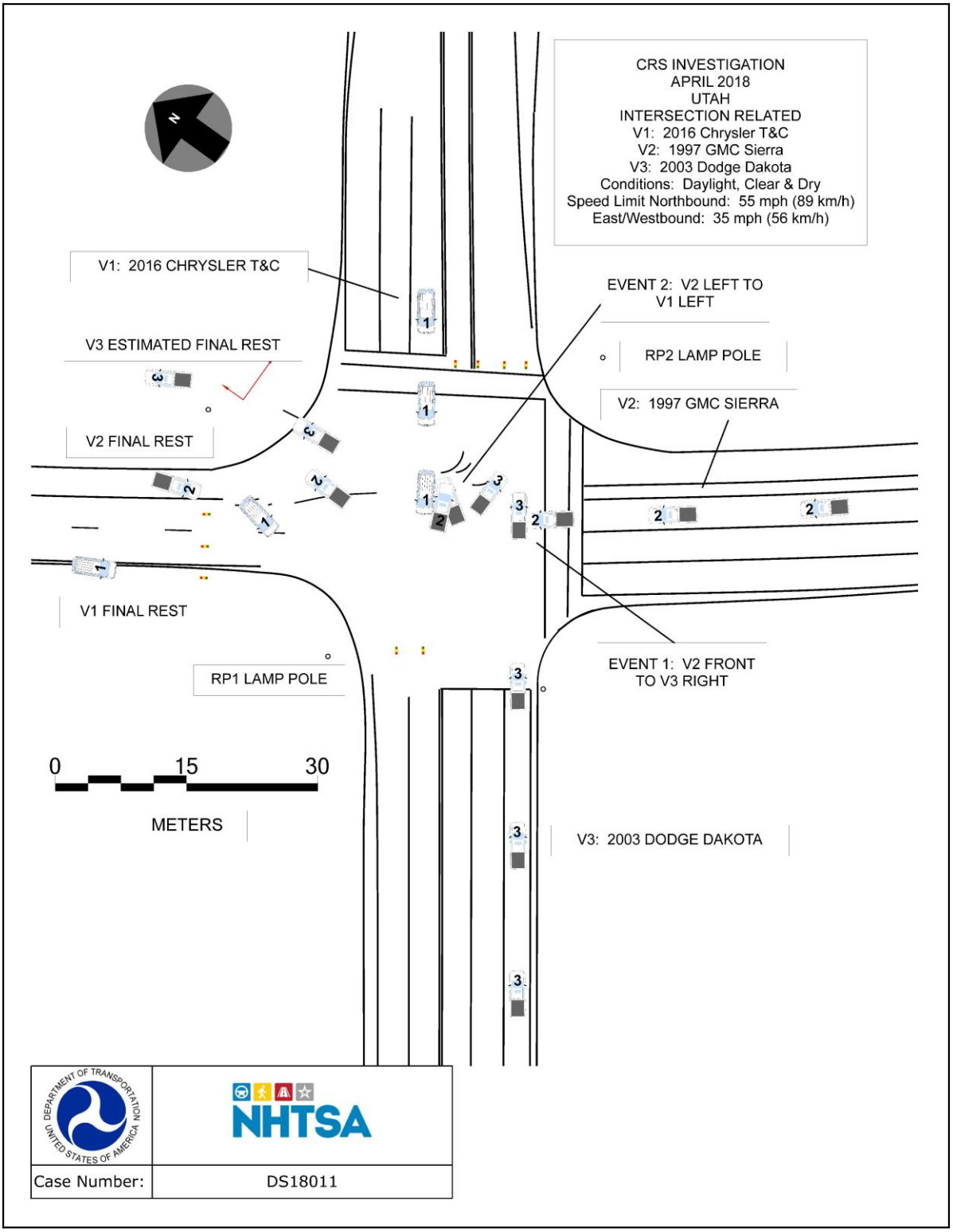
Exterior Damage

The Dodge sustained severe right plane damage caused at impact with the GMC. Direct damage at mid-door level was distributed longitudinally from the right B-pillar to the right rear corner and vertically from sill to above the beltline. The CDC for the Dodge in Event 1 was 02RZAW3.

Occupant Data

The driver of the Dodge was a belted 34-year-old male who sustained police-reported incapacitating injuries and was transported by helicopter to a local hospital for treatment of an unknown duration.

CRASH DIAGRAM



APPENDIX A: 2017 Chrysler Town & Country Event Data Recorder (EDR) Report [1]

[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 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	2C4RC1BG1GR******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS18011 V1 ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.4.2
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 19.3
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Most Recent Event, Deployment Event

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 for direct-to-module imaging may 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.
- If a DLC adapter has to be used with the CDR Tool, the "Read VIN from Vehicle" feature in the CDR Tool will not work. The VIN will have to be manually entered.
- The 2019 MY RAM 1500 may take up to 30 minutes to retrieve the EDR data. The ignition will time out within 20 minutes so the vehicle flashers must be turned on within 20 minutes to keep the ignition and communication bus active.
- Lateral Delta V will not be displayed for the 2013 MY Jeep Compass and Patriot.
- Ignition Cycle, download/crash
    - For RAMs and Dodge Vipers, there are 2 internal ignition counters in the ACM. It is possible for the ignition cycles at download to be different than the ignition cycles at event due to the 2 different counters.
    - Note that the ignition cycle count in an ACM may differ from the ignition cycle count in a Pedestrian Protection Module (PPM) in the same vehicle due to the fact that the ACM has an energy reserve while the PPM does not.

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
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Angular Rate	Clockwise rotation around the longitudinal axis
Peripheral Sensors, X and Y	Outside to Inside
Pressure Sensors	Compression of air

Internal Y Acceleration	Left to Right
Low-g Z Acceleration	Downward
Steering Input	Steering wheel turned counter clockwise
Yaw Rate	Counter clockwise rotation

CDR FILE INFORMATION:

- 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.
- A non-deployment event may be stored with activation of the Active Head Restraints. See AHR explanation under System Configuration at Retrieval/Event section.

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.
- 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.
- For 2013 and 2014 MY Dodge Journey and Fiat Freemont:
  - 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)
- 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: The restraint data is recorded first and then the vehicle data.
  - "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 Pre-Crash Recorder Status.

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/EVENT:

- 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 some 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:

- Number, Total Events - Cumulative number of events that the ACM has recorded, including those non-deployment events that have been overwritten by a subsequent event.
- Occupant Size Classification, Outboard Front Passenger - "Child" status may be used to indicate anything weighing less than a 5 th percentile female adult crash dummy, including an empty seat; "Not Child" indicates anything weighing the same as or more than a 5 th percentile female adult crash dummy.
- 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.
- Safety Belt Status, Outboard Front Passenger - For vehicles sold outside of North America which do not contain a buckle switch for the outboard front passenger, the safety belt status, outboard front passenger will default to "not buckled/unbuckled".
- System Voltage at Event, ACM - 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
- For 2013 MY Minivans and new 2017+ MY Jeep Compass, this time is only cumulative for the past 10 ignition cycles.

- 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.
  - For the 2018+ MY Promaster and 2019+ MY RAM 1500, a value of 0 may be displayed for the first event or for events >5 seconds apart.
  - 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.
    - For the 2019+ MY RAM 1500, the time from event 1 to 2 may utilize a non-stored event as event 1. In this case, the total number of events and multi-event data elements will not include the non-stored event in the number of events. However, the time from event 1 to 2 will be shown as time from that non-stored event.
- 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.
  - For 2019 and later MY RAMs, this time is only cumulative for the current ignition cycle.
- VIN at Event, Last 8 Digits- Last 8 digits of the VIN of the vehicle at the time the ACM records the event.

DEPLOYMENT COMMAND DATA:

- A "Yes" for a particular item indicates that the ACM commanded the deployment /activation of the associated device.
- The phrase "Exceeded Storage Range" for a particular time to deploy indicates that the deployment time is equal to or greater than the 255 milliseconds that can be stored.
- If a device is not deployed, the "time to deploy" for that device will display 0, SNA, N/A or 255.
- In vehicles with Bosch ACMs, once a device has been deployed in an ignition cycle, it is possible that the ACM will not attempt to re-deploy any already deployed device during subsequent events in that same ignition cycle.

DTCs PRESENT AT START OF EVENT:

- 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.
  - DTCs Present at Start of Event are not present in the Alfa Romeo Giulia, Fiat 500X, and the Jeep Renegade.

SENSOR DATA:

- The design range for the angular rate data is:
  - +/- 240 deg/sec for Bosch ACMs
  - +/- 300 deg/sec for TRW ACMs, the 2019 MY RAM 1500, and the 2018+ MY Dodge Journey
  - +/- 290 deg/sec for 2008+ MY minivans and 2009-2017 MY Dodge Journey
  - +/- 340 deg/sec for 2017+ MY Chrysler Pacifica and new 2017+ MY Jeep Compass
- For vehicles that store peripheral sensor data, t0 for the peripheral sensors is the same as the t0 for the delta V.
- Internal y acceleration is stored prior to t0 so the internal y acceleration data will usually be zero unless the rollover sensing algorithm has triggered storage of the EDR event.
- The words "Sensor Design Range Exceeded" and a vertical line will be displayed on the Longitudinal and Lateral Delta-V graphs the first time the applicable sensor range is exceeded.

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.
- In the Pre-Crash Data graph, data transmitted at a rate other than 0.1 seconds will be shown as dots for each available data point. Only data transmitted at a rate of 0.1 seconds will have the dots connected by a line.

(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. It will be "SNA" if the vehicle is in the power free mode which limits acceleration.
- Accelerator Pedal (Derived), % Full - This indicates the calculated value of the accelerator pedal for battery electric vehicles only.
- Accelerator Pedal/Engine Throttle, % Full - This indicates the actual position of the accelerator pedal unless the cruise control is engaged. If the cruise control is engaged, this indicates the actual position of the engine throttle blade.
- Braking System, Maximum Braking -- "Yes" indicates that ABS is active on all 4 wheels at the same time.

- Cruise Control:
    - Note that the following two Cruise Control data elements are only valid for vehicles not equipped with Adaptive Cruise Control (ACC). For vehicles equipped with ACC, the ACC data elements are used for both regular Cruise Control and ACC.
    - Cruise Control System/Lamp Status -"On" indicates that the Cruise Control system is turned on.
    - Cruise Control Engaged Status/Active - "Engaged"/"Yes" indicates the Cruise Control system is actively controlling vehicle speed. "Not Engaged"/"No" indicates the system is NOT controlling vehicle speed.
    - Adaptive Cruise Control (ACC) Status (if equip.)- "Off" indicates that all cruise control functionality is disabled; "NCC_On" indicates that the Normal Cruise Control system is turned on; "NCC_Set" indicates the Normal Cruise Control is actively controlling vehicle speed; "ACC_On" indicates that ACC is turned on; "ACC_Set" indicates that the ACC is actively controlling vehicle speed. If the value is SNA for all time stamps, then the vehicle is not equipped with ACC.
    - ACC Speed Set (if equip.)- This indicates the desired speed in mph that was input by the driver for the ACC system. If the value is SNA for all time stamps, then the vehicle is not equipped with ACC.
    - ACC Faulted - "Yes" indicates that the ACC system will not function and the ACC warning lamp is lit; "No" indicates that the ACC system is functional and the ACC warning lamp is off;
    - For new 2017+ MY Jeep Compass, cruise control data elements are only available for vehicles NOT equipped with ACC.
- Drive Mode - This indicates the driver selected mode of operation (e.g. normal, sport, track, …)
- Electronic Brake/Stability Control information:
    - 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. "Partial Off" indicates that engine management has been turned off but brake traction control is still functional.
        - For the Jeep Renegade, if the Stability Control is "Off", the ESC Button Status is "Disabled", and the vehicle speed exceeds 40 mph, the stability control system will operate in a reduced functionality mode with traction control turned off ("partial off" mode) even though the user disabled it. For all other conditions, when the Stability Control is "Off", the stability control system will be off.
        - ESC Button Status - This indicates the driver selected mode for the ESC system. "Disabled" indicates that the driver pressed the ESC Button to disable engine management. "Enabled" is the default state for the ESC system.
            - SRT and some Fiat products have the ability to fully disable the ESC system if the ESC button has been pressed and held for a specific amount of time. Additional system analysis is required.
        - ESP Feature is Completely Disabled - This indicates that the stability control system has turned off engine management, traction control, and stability control.
        - 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.
        - Brake Intervention by ESP - "Yes" indicates that the stability control system has engaged the brakes.
        - 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.
        - Traction Control Active - "Yes" indicates that the traction control system is actively controlling the vehicle's wheels.
- Electronic Park Brake (EPB):
    - Park Brake Engaged - "Yes" indicates that the park brake is applied.
    - EPB MIL - "On" indicates that there is a fault in the Electronic Park Brake System.
- Engine RPM - For the RAM ProMaster City, the minimum resolution for Engine RPM is 32 rpm.
- Engine Throttle, % Full - This indicates the actual position of the Engine Throttle blade. This data element is not supported by vehicles with diesel engines. Thus a value of "SNA" will be displayed if the vehicle has a diesel engine.
- 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.
- Forward Collision Warning (FCW) (if equip.):
    - Object of Interest Distance - This indicates the actual forward distance to the main object being tracked by the FCW system. "FCW present but not tracking" indicates that the FCW system is not currently tracking an object. If the value is SNA for all time stamps, then the vehicle is not equipped with FCW.
    - FCW System Operating State - "Off" indicates that the FCW system is off and the FCW Warning Lamp will be "On"; "On" indicates that the FCW system is fully on with active braking as well as the audible and visual warnings enabled.
    - FCW System Status - "Off" indicates that the FCW system is off and the FCW Warning Lamp will be "On". "On-braking" indicates that the FCW system is on with active braking enabled but there will no FCW audible or visual warnings in an FCW event. "On-warning" indicates that the FCW system is on but active braking is disabled. In an FCW event, the driver will only receive FCW audible and visual warnings. "On-full" indicates that the FCW system is fully on with active braking as well as the audible and visual warnings enabled. SNA indicates that the vehicle is not equipped with FCW.
- Gear Position - For all vehicles except the RAM ProMaster City, this indicates the current transmission gear.
  For the RAM ProMaster City, this indicates the status of the gear shift lever.
- Master Cylinder Pressure - This indicates the brake pressure applied to the brakes through the brake pedal.
- PCM MIL - This indicates the PCM fault indicator lamp status. It will only be "On" when there is a fault in the PCM. "Flashing" indicates misfire detection. The Powertrain Control Module DTC's should be read and recorded for final system interpretation.
- Pre-Crash 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.
    - For the 2014 MY Jeep Grand Cherokee and Dodge Durango, if recording of angular rate data is interrupted, the entire EDR record will display "Interrupted" even though the rest of the data may be complete.
- PRND/PRNDL/PRNDS Status - This indicates the status of the Shifter Position.
- Raw Manifold Pressure - This indicates engine load in kPa.
- Reverse Gear - For manual transmission vehicles only, "Yes" indicates the transmission is in the reverse gear.
- Service Brake - "On" indicates that the brake pedal is physically depressed. Braking from the ABS or FCW systems will not be reported in this data element.
- Speed, Vehicle Indicated - This indicates the average of the wheel speeds of the drive wheels.
    - The reporting resolution for Speed, Vehicle Indicated is 1 km/h.
    - To display this data element in mph, the CDR Tool converts the km/h to mph and reports a rounded value in mph.

- The accuracy of the recorded Speed, Vehicle Indicated may be affected by a significant change of the tire size for the drive wheels or the final drive axle ratio of the transmission from the factory build specifications, wheel lockup, wheel slip, or wheel spin.
- 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 Value, 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.
    - For the following vehicles, the tire location, if displayed, may not be accurate if the tires have been rotated:
      -2013 MY Ram
      -2013-2017 MY Jeep Patriot
      -2013-2014 MY Chrysler 200
      -2013-2017 MY Jeep Compass
      -2013-2016 MY Dodge Dart
    - For the 2013 MY Ram, if the values for tire pressure status and the tire pressure are SNA, the EDR does not store tire pressure monitoring data.
    - Tire pressure is not stored in the EDR for the following vehicles:
      -2014-2018 MY RAM 1500
      -2014+ MY RAM (all but 1500)
      -2013+ MY Jeep Wrangler
      -2013 MY Jeep Grand Cherokee
      -2013 MY Dodge Durango
      -2013-2014 MY Dodge Challenger
      -2013-2016 MY Chrysler Town and Country
      -2013+ MY Dodge Grand Caravan
      -2015+ MY Fiat 500
    - Wheel Speed, XX - This indicates the speed value of a particular tire as denoted by XX.
- Tire Pressure Monitor Indicator Lamp/Faults - "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" or "-0.25s" respectively represents the last set of data captured in the buffer prior to "T0."
- Torque Information:
  - Axle Torque - This indicates the E-Motor Torque multiplied by the gear ratio for battery electric vehicles only.
  - E-Motor Torque - This indicates the calculated torque from the output shaft of the electric motor in battery electric vehicles only.
- Traction Control Intervention Active - "Active" indicates wheel slippage was occurring during vehicle acceleration.

APPLICATION INFORMATION:

- Jeep Renegade and Alfa Romeo Giulia are only CDR supported in the NAFTA market.

03002_Chrysler_ r040

System Status at Retrieval

Original VIN	2C4RC1BG1GR******
Current VIN	2C4RC1BG1GR******
Ignition Cycle, Download	3171
ECU Part Number	68233535AC
ECU Serial Number	T09JF054600207
Supplier Identification	Continental Corporation
ECU Supply Voltage at Time of Retrieval	11.2

System Configuration at Retrieval

Configured for Driver/Passenger Frontal Airbags	Yes
Configured for Rollover Sensing	Yes
Configured for Driver Knee Airbag	Yes
Configured for Driver/Passenger Retractor Pretensioner	Yes
Configured for Driver/Passenger Buckle Pretensioner	Yes
Configured for Driver Seat Track Position Sensor	Yes
Configured for Outboard Front Passenger Seat Track Position Sensor	No
Configured for Passenger Knee Airbag	No
Configured for Left/Right Side Seat Airbag	Yes
Configured for Left/Right Side Curtain Airbag	Yes
Configured for Left/Right Up Front Sensors	Yes
Configured for Left/Right Side Pressure Sensors	Yes
Configured for Left/Right Side B-Pillar Acceleration Sensors	Yes
Configured for Left/Right Side C-Pillar Acceleration Sensors	Yes
Configured for Left/Right Side D-Pillar Acceleration Sensors	Yes
Configured for Driver/Passenger Active Head Restraint	Yes
Configured for Passenger Buckle Switches	Yes

System Configuration at Event (Most Recent Event)

Configured for Driver Frontal Airbag	Yes
Configured for Passenger Frontal Airbag	Yes
Configured for Rollover Sensing	Yes
Configured for Driver Knee Airbag	Yes
Configured for Driver Retractor Pretensioner	Yes
Configured for Driver Seatbelt Buckle Pretensioner	Yes
Configured for Driver Seat Track Position Sensor	Yes
Configured for Outboard Front Passenger Seat Track Position Sensor	No
Configured for Outboard Front Passenger Knee Airbag	No
Configured for Outboard Front Passenger Retractor Pretensioner	Yes
Configured for Outboard Front Passenger Seatbelt Buckle Pretensioner	Yes
Configured for Left Side Seat Airbag	Yes
Configured for Left Side Curtain Airbag	Yes
Configured for Right Side Seat Airbag	Yes
Configured for Right Side Curtain Airbag	Yes
Configured for Left/Right Up Front Sensors	Yes
Configured for Left/Right Side Pressure Sensors	Yes
Configured for Left/Right Side Acceleration Sensors	Yes
Configured for Driver/Passenger Active Head Restraint	Yes
Configured for Passenger Buckle Switches	Yes

System Status at Event (Most Recent Event)

Deployment Data Status	Complete
Complete File Recorded (Yes, No)	Yes
Ignition Cycle, Crash	3170
Safety Belt Status, Driver	Buckled
Safety Belt Status, Outboard Front Passenger	Buckled
Frontal Airbag Warning Lamp, On/Off	Off
Seat Track Position Switch, Foremost, Status, Driver	No
Seat Track Position Switch, Foremost, Status, Outboard Front Passenger	Not Present
Maximum Delta-V Longitudinal (MPH [km/h])	-19.8 [-32]
Time, Maximum Delta-V, Longitudinal (msec)	244
Maximum Delta-V Lateral (MPH [km/h])	28.0 [45]
Time, Maximum Delta-V, Lateral (msec)	146
Time, Operation System Time (sec)	4773000.2
Time, Airbag Warning Lamp On (min)	0
Number, Event	1
Time from Event 1 to 2 (sec)	N/A
Multi-Event, Number of Events (1,2,3)	1
Number, Total Events	1
Operation Via Energy Reserve Only (Yes, No)	No
System Voltage at Event, Bussed (V)	14.2
Supply Voltage at Event, ECU (V)	14.3
Odometer at Event (miles [km])	51427.7 [82765]
VIN at Event (last 8 digits)	GR******

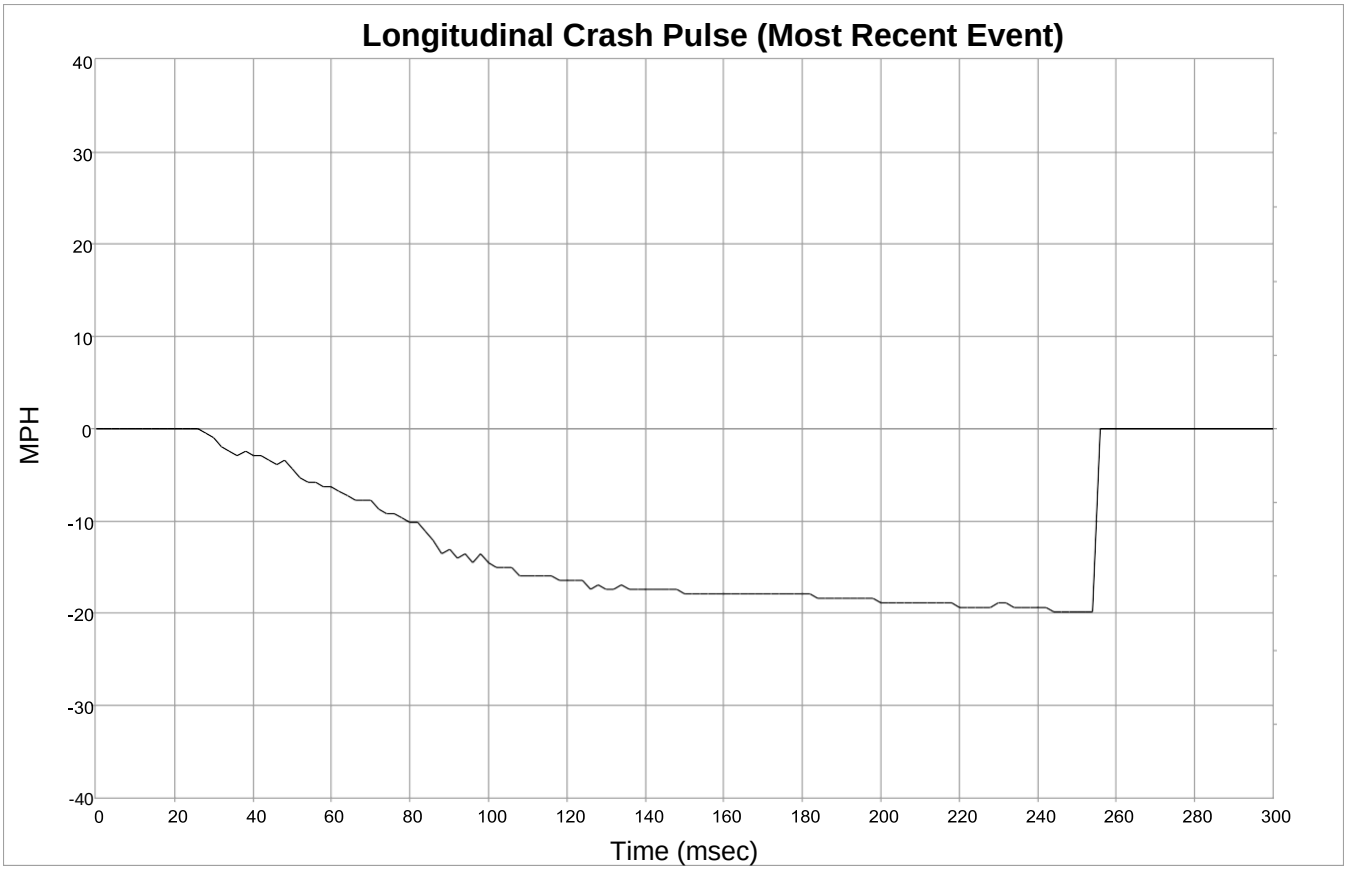
Deployment Command Data (Most Recent Event)

Frontal Airbag Deployment, 1st Stage, Driver	Yes
Frontal Airbag Deployment, 2nd Stage, Driver	Yes
Frontal Airbag Deployment, Time to First Stage Deployment, Driver (msec)	84
Frontal Airbag Deployment, Time to 2nd Stage Deployment, Driver (msec)	234
Knee Airbag Deployment, Driver	Yes
Retractor Pretensioner, Driver	Yes
Seatbelt Buckle Pretensioner, Driver	Yes
Frontal Airbag Deployment, 1st Stage, Passenger	Yes
Frontal Airbag Deployment, 2nd Stage, Passenger	Yes
Frontal Airbag Deployment, Time to First Stage Deployment, Passenger (msec)	84
Frontal Airbag Deployment, Time to 2nd Stage Deployment, Passenger (msec)	234
Retractor Pretensioner, Outboard Front Passenger	Yes
Seatbelt Buckle Pretensioner, Outboard Front Passenger	Yes
Side Seat Airbag Deployment, Left	Yes
Side Seat Airbag Deployment, Right	No
Side Curtain Airbag Deployment, Left	Yes
Side Curtain Airbag Deployment, Right	No
Active Headrest Deployment, Driver	No
Active Headrest Deployment, Passenger	No

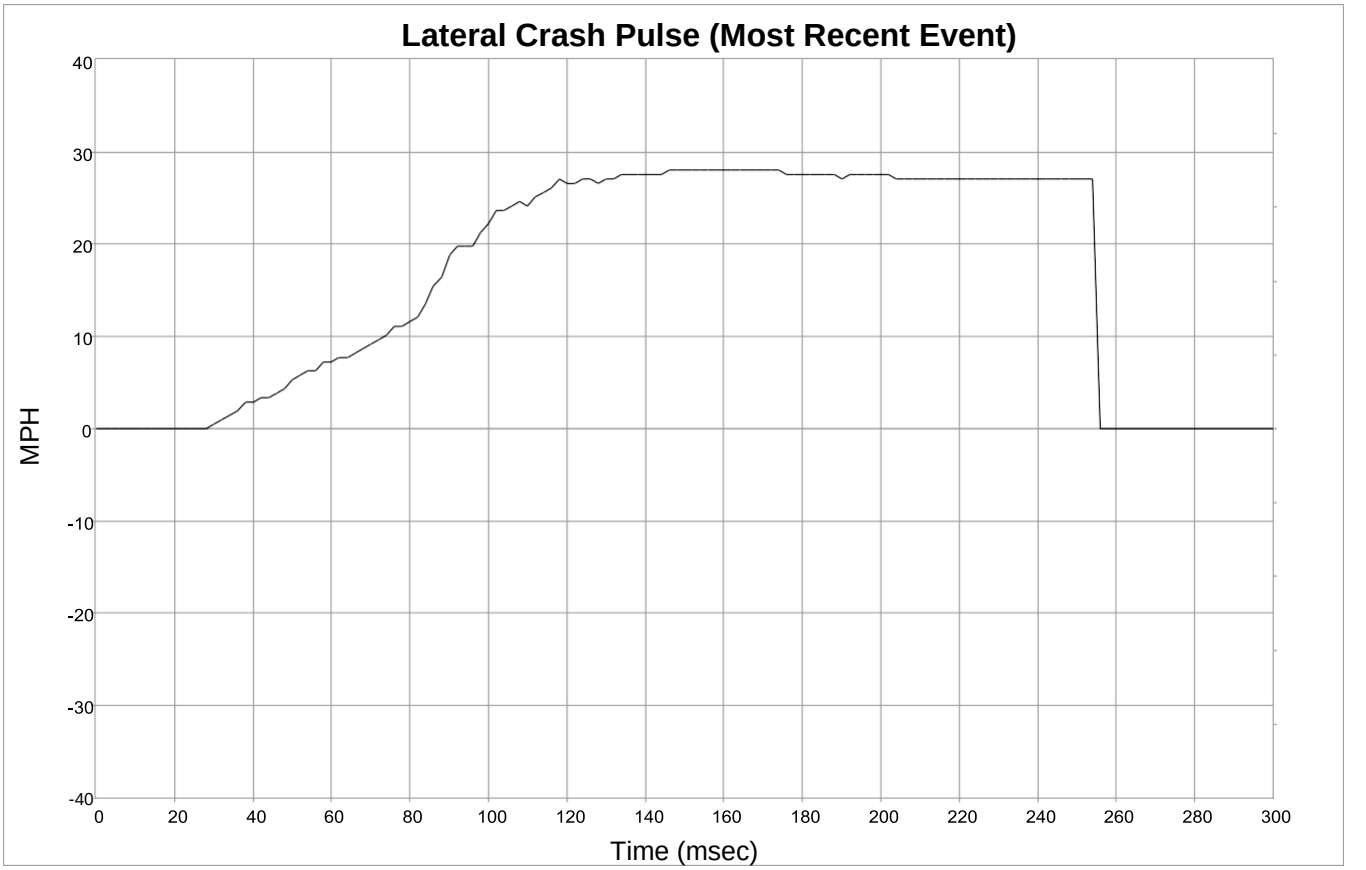
DTCs Present at Start of Event (Most Recent Event)

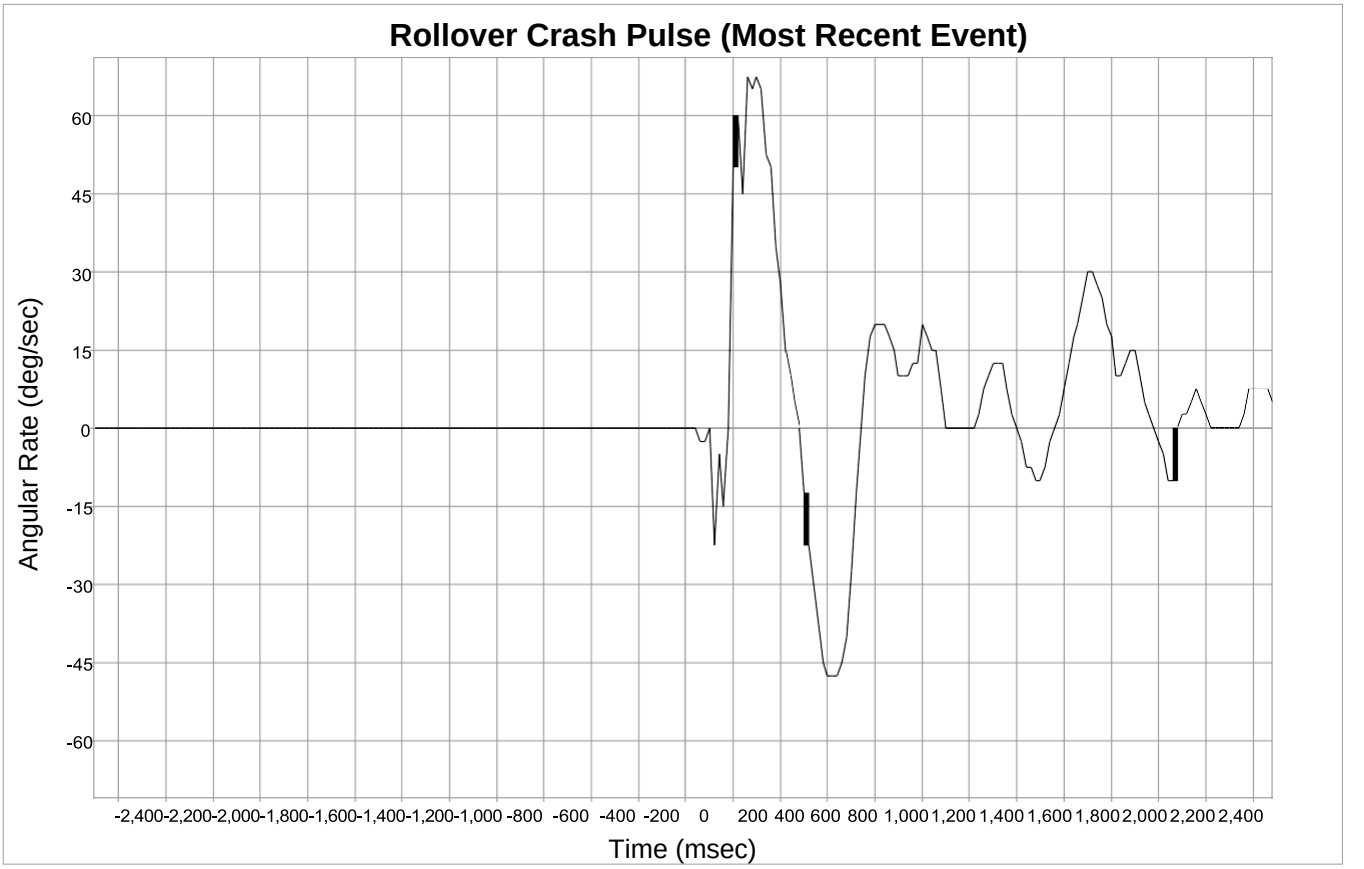
No DTCs Present

Longitudinal Crash Pulse (Most Recent Event)



Lateral Crash Pulse (Most Recent Event)




Rollover Crash Pulse (Most Recent Event)
Angular Rate (deg/sec)
60
45
30
15
0
-15
-30
-45
-60
-2,400 -2,200 -2,000 -1,800 -1,600 -1,400 -1,200 -1,000 -800 -600 -400 -200 0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000 2,200 2,400
Time (msec)

Longitudinal Crash Pulse (Most Recent Event)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])
0	0.0 [0]
2	0.0 [0]
4	0.0 [0]
6	0.0 [0]
8	0.0 [0]
10	0.0 [0]
12	0.0 [0]
14	0.0 [0]
16	0.0 [0]
18	0.0 [0]
20	0.0 [0]
22	0.0 [0]
24	0.0 [0]
26	0.0 [0]
28	-0.5 [-1]
30	-1.0 [-2]
32	-1.9 [-3]
34	-2.4 [-4]
36	-2.9 [-5]
38	-2.4 [-4]
40	-2.9 [-5]
42	-2.9 [-5]
44	-3.4 [-5]
46	-3.9 [-6]
48	-3.4 [-5]
50	-4.3 [-7]
52	-5.3 [-9]
54	-5.8 [-9]
56	-5.8 [-9]
58	-6.3 [-10]
60	-6.3 [-10]
62	-6.8 [-11]
64	-7.2 [-12]
66	-7.7 [-12]
68	-7.7 [-12]
70	-7.7 [-12]
72	-8.7 [-14]
74	-9.2 [-15]
76	-9.2 [-15]
78	-9.7 [-16]
80	-10.1 [-16]
82	-10.1 [-16]
84	-11.1 [-18]
86	-12.1 [-19]
88	-13.5 [-22]
90	-13.0 [-21]
92	-14.0 [-23]
94	-13.5 [-22]
96	-14.5 [-23]
98	-13.5 [-22]
100	-14.5 [-23]
102	-15.0 [-24]
104	-15.0 [-24]
106	-15.0 [-24]
108	-15.9 [-26]
110	-15.9 [-26]
112	-15.9 [-26]
114	-15.9 [-26]
116	-15.9 [-26]
118	-16.4 [-26]
120	-16.4 [-26]
122	-16.4 [-26]
124	-16.4 [-26]
126	-17.4 [-28]
128	-16.9 [-27]
130	-17.4 [-28]
132	-17.4 [-28]
134	-16.9 [-27]
136	-17.4 [-28]
138	-17.4 [-28]
140	-17.4 [-28]
142	-17.4 [-28]
144	-17.4 [-28]
146	-17.4 [-28]
148	-17.4 [-28]
150	-17.9 [-29]
152	-17.9 [-29]
154	-17.9 [-29]
156	-17.9 [-29]
158	-17.9 [-29]
160	-17.9 [-29]
162	-17.9 [-29]
164	-17.9 [-29]
166	-17.9 [-29]
168	-17.9 [-29]
170	-17.9 [-29]
172	-17.9 [-29]
174	-17.9 [-29]
176	-17.9 [-29]
178	-17.9 [-29]
180	-17.9 [-29]
182	-17.9 [-29]
184	-18.3 [-30]
186	-18.3 [-30]
188	-18.3 [-30]
190	-18.3 [-30]
192	-18.3 [-30]
194	-18.3 [-30]
196	-18.3 [-30]
198	-18.3 [-30]
200	-18.8 [-30]
202	-18.8 [-30]
204	-18.8 [-30]
206	-18.8 [-30]
208	-18.8 [-30]
210	-18.8 [-30]
212	-18.8 [-30]
214	-18.8 [-30]
216	-18.8 [-30]
218	-18.8 [-30]
220	-19.3 [-31]
222	-19.3 [-31]
224	-19.3 [-31]
226	-19.3 [-31]
228	-19.3 [-31]
230	-18.8 [-30]
232	-18.8 [-30]
234	-19.3 [-31]
236	-19.3 [-31]
238	-19.3 [-31]
240	-19.3 [-31]
242	-19.3 [-31]
244	-19.8 [-32]
246	-19.8 [-32]
248	-19.8 [-32]
250	-19.8 [-32]
252	-19.8 [-32]
254	-19.8 [-32]
256	0.0 [0]
258	0.0 [0]
260	0.0 [0]
262	0.0 [0]
264	0.0 [0]
266	0.0 [0]
268	0.0 [0]
270	0.0 [0]
272	0.0 [0]
274	0.0 [0]
276	0.0 [0]
278	0.0 [0]
280	0.0 [0]
282	0.0 [0]
284	0.0 [0]
286	0.0 [0]
288	0.0 [0]
290	0.0 [0]
292	0.0 [0]
294	0.0 [0]
296	0.0 [0]
298	0.0 [0]
300	0.0 [0]

Lateral Crash Pulse (Most Recent Event)

Time (msec)	Delta-V, Lateral (MPH [km/h])
0	0.0 [0]
2	0.0 [0]
4	0.0 [0]
6	0.0 [0]
8	0.0 [0]
10	0.0 [0]
12	0.0 [0]
14	0.0 [0]
16	0.0 [0]
18	0.0 [0]
20	0.0 [0]
22	0.0 [0]
24	0.0 [0]
26	0.0 [0]
28	0.0 [0]
30	0.5 [1]
32	1.0 [2]
34	1.4 [2]
36	1.9 [3]
38	2.9 [5]
40	2.9 [5]
42	3.4 [5]
44	3.4 [5]
46	3.9 [6]
48	4.3 [7]
50	5.3 [9]
52	5.8 [9]
54	6.3 [10]
56	6.3 [10]
58	7.2 [12]
60	7.2 [12]
62	7.7 [12]
64	7.7 [12]
66	8.2 [13]
68	8.7 [14]
70	9.2 [15]
72	9.7 [16]
74	10.1 [16]
76	11.1 [18]
78	11.1 [18]
80	11.6 [19]
82	12.1 [19]
84	13.5 [22]
86	15.4 [25]
88	16.4 [26]
90	18.8 [30]
92	19.8 [32]
94	19.8 [32]
96	19.8 [32]
98	21.2 [34]
100	22.2 [36]
102	23.7 [38]
104	23.7 [38]
106	24.1 [39]
108	24.6 [40]
110	24.1 [39]
112	25.1 [40]
114	25.6 [41]
116	26.1 [42]
118	27.0 [44]
120	26.6 [43]
122	26.6 [43]
124	27.0 [44]
126	27.0 [44]
128	26.6 [43]
130	27.0 [44]
132	27.0 [44]
134	27.5 [44]
136	27.5 [44]
138	27.5 [44]
140	27.5 [44]
142	27.5 [44]
144	27.5 [44]
146	28.0 [45]
148	28.0 [45]
150	28.0 [45]
152	28.0 [45]
154	28.0 [45]
156	28.0 [45]
158	28.0 [45]
160	28.0 [45]
162	28.0 [45]
164	28.0 [45]
166	28.0 [45]
168	28.0 [45]
170	28.0 [45]
172	28.0 [45]
174	28.0 [45]
176	27.5 [44]
178	27.5 [44]
180	27.5 [44]
182	27.5 [44]
184	27.5 [44]
186	27.5 [44]
188	27.5 [44]
190	27.0 [44]
192	27.5 [44]
194	27.5 [44]
196	27.5 [44]
198	27.5 [44]
200	27.5 [44]
202	27.5 [44]
204	27.0 [44]
206	27.0 [44]
208	27.0 [44]
210	27.0 [44]
212	27.0 [44]
214	27.0 [44]
216	27.0 [44]
218	27.0 [44]
220	27.0 [44]
222	27.0 [44]
224	27.0 [44]
226	27.0 [44]
228	27.0 [44]
230	27.0 [44]
232	27.0 [44]
234	27.0 [44]
236	27.0 [44]
238	27.0 [44]
240	27.0 [44]
242	27.0 [44]
244	27.0 [44]
246	27.0 [44]
248	27.0 [44]
250	27.0 [44]
252	27.0 [44]
254	27.0 [44]
256	0.0 [0]
258	0.0 [0]
260	0.0 [0]
262	0.0 [0]
264	0.0 [0]
266	0.0 [0]
268	0.0 [0]
270	0.0 [0]
272	0.0 [0]
274	0.0 [0]
276	0.0 [0]
278	0.0 [0]
280	0.0 [0]
282	0.0 [0]
284	0.0 [0]
286	0.0 [0]
288	0.0 [0]
290	0.0 [0]
292	0.0 [0]
294	0.0 [0]
296	0.0 [0]
298	0.0 [0]
300	0.0 [0]

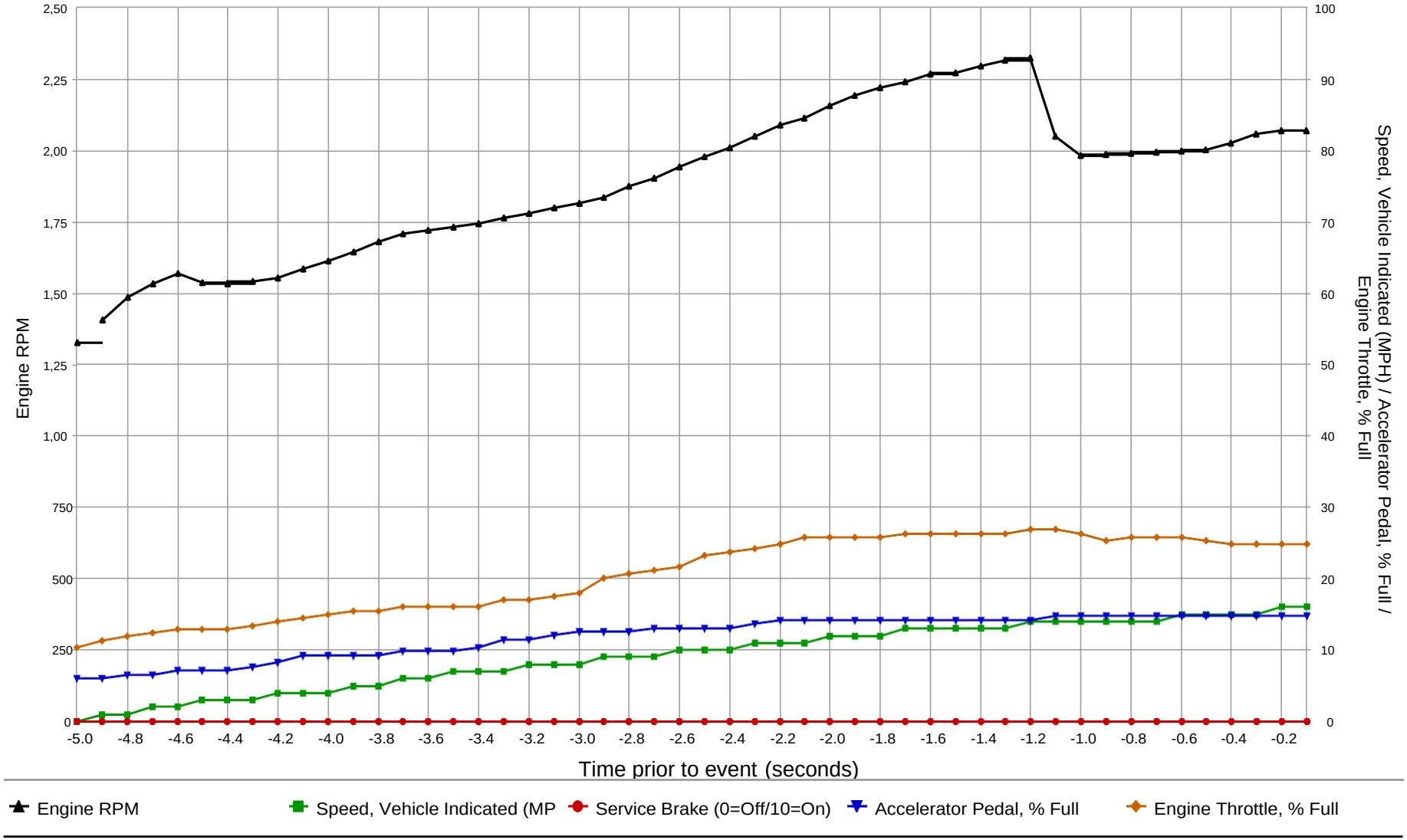
Rollover Crash Pulse (Most Recent Event) (if equipped)

Time (msec)	Angular Rate (deg/sec)	Time (msec)	Angular Rate (deg/sec)	Time (msec)	Angular Rate (deg/sec)
-2500	0.00	-1500	0.00	-500	0.00
-2480	0.00	-1480	0.00	-480	0.00
-2460	0.00	-1460	0.00	-460	0.00
-2440	0.00	-1440	0.00	-440	0.00
-2420	0.00	-1420	0.00	-420	0.00
-2400	0.00	-1400	0.00	-400	0.00
-2380	0.00	-1380	0.00	-380	0.00
-2360	0.00	-1360	0.00	-360	0.00
-2340	0.00	-1340	0.00	-340	0.00
-2320	0.00	-1320	0.00	-320	0.00
-2300	0.00	-1300	0.00	-300	0.00
-2280	0.00	-1280	0.00	-280	0.00
-2260	0.00	-1260	0.00	-260	0.00
-2240	0.00	-1240	0.00	-240	0.00
-2220	0.00	-1220	0.00	-220	0.00
-2200	0.00	-1200	0.00	-200	0.00
-2180	0.00	-1180	0.00	-180	0.00
-2160	0.00	-1160	0.00	-160	0.00
-2140	0.00	-1140	0.00	-140	0.00
-2120	0.00	-1120	0.00	-120	0.00
-2100	0.00	-1100	0.00	-100	0.00
-2080	0.00	-1080	0.00	-80	0.00
-2060	0.00	-1060	0.00	-60	0.00
-2040	0.00	-1040	0.00	-40	0.00
-2020	0.00	-1020	0.00	-20	0.00
-2000	0.00	-1000	0.00	0	0.00
-1980	0.00	-980	0.00	20	0.00
-1960	0.00	-960	0.00	40	0.00
-1940	0.00	-940	0.00	60	-2.50
-1920	0.00	-920	0.00	80	-2.50
-1900	0.00	-900	0.00	100	0.00
-1880	0.00	-880	0.00	120	-22.50
-1860	0.00	-860	0.00	140	-5.00
-1840	0.00	-840	0.00	160	-15.00
-1820	0.00	-820	0.00	180	0.00
-1800	0.00	-800	0.00	200	50.00
-1780	0.00	-780	0.00	220	60.00
-1760	0.00	-760	0.00	240	45.00
-1740	0.00	-740	0.00	260	67.50
-1720	0.00	-720	0.00	280	65.00
-1700	0.00	-700	0.00	300	67.50
-1680	0.00	-680	0.00	320	65.00
-1660	0.00	-660	0.00	340	52.50
-1640	0.00	-640	0.00	360	50.00
-1620	0.00	-620	0.00	380	35.00
-1600	0.00	-600	0.00	400	27.50
-1580	0.00	-580	0.00	420	15.00
-1560	0.00	-560	0.00	440	10.00
-1540	0.00	-540	0.00	460	5.00
-1520	0.00	-520	0.00	480	0.00

Rollover Crash Pulse (Most Recent Event) (if equipped)

Time (msec)	Angular Rate (deg/sec)	Time (msec)	Angular Rate (deg/sec)
500	-12.50	1500	-10.00
520	-22.50	1520	-7.50
540	-30.00	1540	-2.50
560	-37.50	1560	0.00
580	-45.00	1580	2.50
600	-47.50	1600	7.50
620	-47.50	1620	12.50
640	-47.50	1640	17.50
660	-45.00	1660	20.00
680	-40.00	1680	25.00
700	-27.50	1700	30.00
720	-12.50	1720	30.00
740	0.00	1740	27.50
760	10.00	1760	25.00
780	17.50	1780	20.00
800	20.00	1800	17.50
820	20.00	1820	10.00
840	20.00	1840	10.00
860	17.50	1860	12.50
880	15.00	1880	15.00
900	10.00	1900	15.00
920	10.00	1920	10.00
940	10.00	1940	5.00
960	12.50	1960	2.50
980	12.50	1980	0.00
1000	20.00	2000	-2.50
1020	17.50	2020	-5.00
1040	15.00	2040	-10.00
1060	15.00	2060	-10.00
1080	7.50	2080	0.00
1100	0.00	2100	2.50
1120	0.00	2120	2.50
1140	0.00	2140	5.00
1160	0.00	2160	7.50
1180	0.00	2180	5.00
1200	0.00	2200	2.50
1220	0.00	2220	0.00
1240	2.50	2240	0.00
1260	7.50	2260	0.00
1280	10.00	2280	0.00
1300	12.50	2300	0.00
1320	12.50	2320	0.00
1340	12.50	2340	0.00
1360	7.50	2360	2.50
1380	2.50	2380	7.50
1400	0.00	2400	7.50
1420	-2.50	2420	7.50
1440	-7.50	2440	7.50
1460	-7.50	2460	7.50
1480	-10.00	2480	5.00

Pre-Crash Data (Most Recent Event)



SNA values will not be plotted on the graph

Pre-Crash Data (Most Recent Event - table 1 of 4)

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

Time Stamp (sec)	Pre-Crash Recorder Status	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full	Engine RPM	Engine Throttle, % Full	Raw Manifold Pressure (kPa)	Service Brake	Brake Lamp On
-5.0	Complete	0 [1]	6	1,329	10	58	Off	Brake Off
-4.9	Complete	1 [1]	6	1,408	11	59	Off	Brake Off
-4.8	Complete	1 [2]	7	1,485	12	61	Off	Brake Off
-4.7	Complete	2 [3]	7	1,535	12	61	Off	Brake Off
-4.6	Complete	2 [3]	7	1,571	13	62	Off	Brake Off
-4.5	Complete	3 [4]	7	1,540	13	62	Off	Brake Off
-4.4	Complete	3 [5]	7	1,535	13	63	Off	Brake Off
-4.3	Complete	3 [5]	8	1,542	13	64	Off	Brake Off
-4.2	Complete	4 [6]	8	1,554	14	65	Off	Brake Off
-4.1	Complete	4 [7]	9	1,586	14	66	Off	Brake Off
-4.0	Complete	4 [7]	9	1,614	15	67	Off	Brake Off
-3.9	Complete	5 [8]	9	1,645	15	68	Off	Brake Off
-3.8	Complete	5 [8]	9	1,682	15	68	Off	Brake Off
-3.7	Complete	6 [9]	10	1,710	16	68	Off	Brake Off
-3.6	Complete	6 [10]	10	1,721	16	68	Off	Brake Off
-3.5	Complete	7 [10]	10	1,731	16	68	Off	Brake Off
-3.4	Complete	7 [11]	10	1,744	16	68	Off	Brake Off
-3.3	Complete	7 [12]	11	1,763	17	69	Off	Brake Off
-3.2	Complete	8 [12]	11	1,781	17	71	Off	Brake Off
-3.1	Complete	8 [13]	12	1,799	18	73	Off	Brake Off
-3.0	Complete	8 [13]	13	1,816	18	75	Off	Brake Off
-2.9	Complete	9 [14]	13	1,837	20	77	Off	Brake Off
-2.8	Complete	9 [14]	13	1,875	21	78	Off	Brake Off
-2.7	Complete	9 [15]	13	1,903	21	78	Off	Brake Off
-2.6	Complete	10 [15]	13	1,942	22	79	Off	Brake Off
-2.5	Complete	10 [16]	13	1,981	23	79	Off	Brake Off
-2.4	Complete	10 [16]	13	2,013	24	79	Off	Brake Off
-2.3	Complete	11 [17]	14	2,049	24	80	Off	Brake Off
-2.2	Complete	11 [17]	14	2,089	25	80	Off	Brake Off
-2.1	Complete	11 [18]	14	2,116	26	80	Off	Brake Off
-2.0	Complete	12 [19]	14	2,159	26	80	Off	Brake Off
-1.9	Complete	12 [19]	14	2,194	26	79	Off	Brake Off
-1.8	Complete	12 [20]	14	2,220	26	79	Off	Brake Off
-1.7	Complete	13 [20]	14	2,243	26	79	Off	Brake Off
-1.6	Complete	13 [21]	14	2,268	26	79	Off	Brake Off
-1.5	Complete	13 [21]	14	2,273	26	79	Off	Brake Off
-1.4	Complete	13 [21]	14	2,298	26	79	Off	Brake Off
-1.3	Complete	13 [21]	14	2,316	26	79	Off	Brake Off
-1.2	Complete	14 [22]	14	2,327	27	79	Off	Brake Off
-1.1	Complete	14 [22]	15	2,050	27	79	Off	Brake Off
-1.0	Complete	14 [22]	15	1,982	26	80	Off	Brake Off
-0.9	Complete	14 [23]	15	1,987	25	80	Off	Brake Off
-0.8	Complete	14 [23]	15	1,992	26	80	Off	Brake Off
-0.7	Complete	14 [23]	15	1,995	26	80	Off	Brake Off
-0.6	Complete	15 [24]	15	2,000	26	80	Off	Brake Off
-0.5	Complete	15 [24]	15	2,002	25	80	Off	Brake Off
-0.4	Complete	15 [24]	15	2,026	25	79	Off	Brake Off
-0.3	Complete	15 [25]	15	2,058	25	79	Off	Brake Off
-0.2	Complete	16 [25]	15	2,070	25	79	Off	Brake Off
-0.1	Complete	16 [26]	15	2,072	25	79	Off	Brake Off

Pre-Crash Data (Most Recent Event - table 2 of 4)

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

Time Stamp (sec)	Panic Brake Assist Active (if equip.)	PCM MIL	ABS MIL	ESP MIL	Stability Control	Steering Input (deg)	Yaw Rate (deg/sec) (if equip.)
-5.0	False	Off	Off	Off	On	7	0.12
-4.9	False	Off	Off	Off	On	7	0.24
-4.8	False	Off	Off	Off	On	5	0.12
-4.7	False	Off	Off	Off	On	4	0.00
-4.6	False	Off	Off	Off	On	3	0.12
-4.5	False	Off	Off	Off	On	2	0.12
-4.4	False	Off	Off	Off	On	2	0.12
-4.3	False	Off	Off	Off	On	2	0.00
-4.2	False	Off	Off	Off	On	2	0.00
-4.1	False	Off	Off	Off	On	2	0.00
-4.0	False	Off	Off	Off	On	2	0.00
-3.9	False	Off	Off	Off	On	2	0.00
-3.8	False	Off	Off	Off	On	2	0.00
-3.7	False	Off	Off	Off	On	2	0.00
-3.6	False	Off	Off	Off	On	2	-0.12
-3.5	False	Off	Off	Off	On	2	0.00
-3.4	False	Off	Off	Off	On	3	0.12
-3.3	False	Off	Off	Off	On	3	0.00
-3.2	False	Off	Off	Off	On	3	0.00
-3.1	False	Off	Off	Off	On	3	0.37
-3.0	False	Off	Off	Off	On	4	0.24
-2.9	False	Off	Off	Off	On	5	0.12
-2.8	False	Off	Off	Off	On	7	0.12
-2.7	False	Off	Off	Off	On	7	0.37
-2.6	False	Off	Off	Off	On	7	0.24
-2.5	False	Off	Off	Off	On	7	0.24
-2.4	False	Off	Off	Off	On	5	0.00
-2.3	False	Off	Off	Off	On	5	0.12
-2.2	False	Off	Off	Off	On	5	0.24
-2.1	False	Off	Off	Off	On	5	0.24
-2.0	False	Off	Off	Off	On	5	0.37
-1.9	False	Off	Off	Off	On	5	0.24
-1.8	False	Off	Off	Off	On	4	0.12
-1.7	False	Off	Off	Off	On	4	0.37
-1.6	False	Off	Off	Off	On	4	0.37
-1.5	False	Off	Off	Off	On	4	0.00
-1.4	False	Off	Off	Off	On	3	0.12
-1.3	False	Off	Off	Off	On	3	0.49
-1.2	False	Off	Off	Off	On	3	0.24
-1.1	False	Off	Off	Off	On	3	0.12
-1.0	False	Off	Off	Off	On	3	0.12
-0.9	False	Off	Off	Off	On	3	0.12
-0.8	False	Off	Off	Off	On	3	-0.12
-0.7	False	Off	Off	Off	On	3	-0.12
-0.6	False	Off	Off	Off	On	3	0.24
-0.5	False	Off	Off	Off	On	3	0.12
-0.4	False	Off	Off	Off	On	3	-0.12
-0.3	False	Off	Off	Off	On	3	0.00
-0.2	False	Off	Off	Off	On	4	0.12
-0.1	False	Off	Off	Off	On	2	0.12

Pre-Crash Data (Most Recent Event - table 3 of 4)

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

Time Stamp (sec)	Wheel Speed LF (RPM)	Wheel Speed RF (RPM)	Wheel Speed LR (RPM)	Wheel Speed RR (RPM)	ETC Lamp	ETC Lamp Flashing	Engine Torque Applied	Gear Position Display (Auto Trans. Only)
-5.0	7	6	7	7	Off	No	Yes	Drive
-4.9	11	12	9	9	Off	No	Yes	Drive
-4.8	16	16	15	15	Off	No	Yes	Drive
-4.7	21	21	21	20	Off	No	Yes	Drive
-4.6	27	26	26	25	Off	No	Yes	Drive
-4.5	31	31	31	31	Off	No	Yes	Drive
-4.4	36	36	36	36	Off	No	Yes	Drive
-4.3	41	41	41	40	Off	No	Yes	Drive
-4.2	45	45	45	45	Off	No	Yes	Drive
-4.1	50	50	49	49	Off	No	Yes	Drive
-4.0	54	54	54	53	Off	No	Yes	Drive
-3.9	59	59	58	58	Off	No	Yes	Drive
-3.8	64	64	63	63	Off	No	Yes	Drive
-3.7	69	68	68	68	Off	No	Yes	Drive
-3.6	74	74	73	73	Off	No	Yes	Drive
-3.5	79	78	79	78	Off	No	Yes	Drive
-3.4	84	84	83	83	Off	No	Yes	Drive
-3.3	88	88	87	87	Off	No	Yes	Drive
-3.2	92	92	92	92	Off	No	Yes	Drive
-3.1	96	96	96	96	Off	No	Yes	Drive
-3.0	100	100	100	100	Off	No	Yes	Drive
-2.9	105	104	104	104	Off	No	Yes	Drive
-2.8	108	108	108	107	Off	No	Yes	Drive
-2.7	112	112	111	111	Off	No	Yes	Drive
-2.6	116	116	114	114	Off	No	Yes	Drive
-2.5	120	119	119	118	Off	No	Yes	Drive
-2.4	124	124	122	122	Off	No	Yes	Drive
-2.3	127	127	127	126	Off	No	Yes	Drive
-2.2	131	131	131	131	Off	No	Yes	Drive
-2.1	135	135	134	134	Off	No	Yes	Drive
-2.0	139	140	138	139	Off	No	Yes	Drive
-1.9	144	143	142	142	Off	No	Yes	Drive
-1.8	147	147	146	146	Off	No	Yes	Drive
-1.7	151	151	149	151	Off	No	Yes	Drive
-1.6	155	155	155	156	Off	No	Yes	Drive
-1.5	158	157	158	157	Off	No	Yes	Drive
-1.4	159	159	159	159	Off	No	Yes	Drive
-1.3	161	161	160	161	Off	No	Yes	Drive
-1.2	165	164	161	161	Off	No	Yes	Drive
-1.1	165	165	164	163	Off	No	Yes	Drive
-1.0	166	166	166	165	Off	No	Yes	Drive
-0.9	170	169	168	168	Off	No	Yes	Drive
-0.8	172	171	170	170	Off	No	Yes	Drive
-0.7	174	174	174	173	Off	No	Yes	Drive
-0.6	176	176	175	176	Off	No	Yes	Drive
-0.5	180	180	179	179	Off	No	Yes	Drive
-0.4	183	182	182	181	Off	No	Yes	Drive
-0.3	185	185	184	185	Off	No	Yes	Drive
-0.2	189	188	188	188	Off	No	Yes	Drive
-0.1	192	192	191	190	Off	No	Yes	Drive

Pre-Crash Data (Most Recent Event - table 4 of 4)

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

Time Stamp (sec)	Cruise Control Status	Cruise Control Engaged
-5.0	Off	Not Engaged
-4.9	Off	Not Engaged
-4.8	Off	Not Engaged
-4.7	Off	Not Engaged
-4.6	Off	Not Engaged
-4.5	Off	Not Engaged
-4.4	Off	Not Engaged
-4.3	Off	Not Engaged
-4.2	Off	Not Engaged
-4.1	Off	Not Engaged
-4.0	Off	Not Engaged
-3.9	Off	Not Engaged
-3.8	Off	Not Engaged
-3.7	Off	Not Engaged
-3.6	Off	Not Engaged
-3.5	Off	Not Engaged
-3.4	Off	Not Engaged
-3.3	Off	Not Engaged
-3.2	Off	Not Engaged
-3.1	Off	Not Engaged
-3.0	Off	Not Engaged
-2.9	Off	Not Engaged
-2.8	Off	Not Engaged
-2.7	Off	Not Engaged
-2.6	Off	Not Engaged
-2.5	Off	Not Engaged
-2.4	Off	Not Engaged
-2.3	Off	Not Engaged
-2.2	Off	Not Engaged
-2.1	Off	Not Engaged
-2.0	Off	Not Engaged
-1.9	Off	Not Engaged
-1.8	Off	Not Engaged
-1.7	Off	Not Engaged
-1.6	Off	Not Engaged
-1.5	Off	Not Engaged
-1.4	Off	Not Engaged
-1.3	Off	Not Engaged
-1.2	Off	Not Engaged
-1.1	Off	Not Engaged
-1.0	Off	Not Engaged
-0.9	Off	Not Engaged
-0.8	Off	Not Engaged
-0.7	Off	Not Engaged
-0.6	Off	Not Engaged
-0.5	Off	Not Engaged
-0.4	Off	Not Engaged
-0.3	Off	Not Engaged
-0.2	Off	Not Engaged
-0.1	Off	Not Engaged

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.

62 F1 00 00 05 01 03

62 F1 32 36 38 32 33 33 35 33 35 41 43

62 F1 50 13 08 00

62 F1 51 12 31 00 14 31 00 14 31 00

62 F1 8C 54 30 39 4A 46 30 35 34 36 30 30 32 30 37

62 F1 54 00 C6

62 F1 90 32 43 34 52 43 31 42 47 31 47 52 2A 2A 2A 2A 2A 2A

62 F1 A0 32 43 34 52 43 31 42 47 31 47 52 2A 2A 2A 2A 2A 2A

62 02 50 0C 63 00 48 D5 AE 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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62 FA 01 01 CC 01 01 05 54 54 25 F9 05 B0 9A A4 00 00 05 00 0C 62 0C A1 00 D7 7A 3A 49 04 00 FC
EF 40 44 E0 8F D0 00 96 96 00 00 00 FE FF FE FF FF 8E 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 47 52 2A 2A 2A 2A 2A 2A FF FF
12 31 00 F8 B1 EF C1 14 58 FF 14 02 48 4C 44 02 48 4C 44 03 48 4C 44 00 48 4C 44 00 FF FF FF FF
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62 FA 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
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62 FA 03 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
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62 FA 04 01 7F 00 00 00 00

62 F1 0B 00 14 01 02 AB A9 F0 0F DC 89 58 22 48 4C 44 02 48 4C 44 03 48 4C 44 00 48 4C 44 00 00
00 00 00 00 07 01 02 15 10 4D FD 56 47 00 00 08 00 00 07 00 90 01 80 E7 19 0E 00 00 0C 03 00 01
D8 FE 04 00 00 0B 1E 00 00 01 00 00 00 AD 01 03 00 00 00

62 A0 0E 11 34 01 80 01 7F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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62 A0 0F FF FF FF FF FF FF 00 3A 00 00 00 FF FF 00 00 00 FF 3A 00 00 00 00 00 00 00 00 00 00 00
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71 01 03 01 01 00 CC FF 08 18 81 01 7C 01 7D 01 7F 01 7F 80 0C F8 FF FE FC FF 4A B5 46 23 63 30
27 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 04 FF 0C CC F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF

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71 01 03 01 01 01 CC FF 08 16 81 01 78 01 77 01 79 01 78 80 0C F8 FF FE FC FF 4A B4 46 23 63 30
27 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 07 FF 0C 99 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 02 CC FF 08 0A 81 01 71 01 6F 01 71 01 71 80 00 F8 FF FE FC FF 4A B5 46 23 63 30
27 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 05 FF 0C 51 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 03 CC FF 07 EA 81 01 6A 01 6B 01 6E 01 6C 7F F4 F8 FF FE FC FF 49 B5 46 23 63 30
27 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 05 FF 0C 2D F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 04 CC FF 07 D2 81 01 66 01 65 01 68 01 68 80 0C F8 FF FE FC FF 4A B4 46 23 64 31
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71 01 03 01 01 05 CC FF 07 D0 81 01 60 01 5E 01 60 01 60 80 18 F8 FF FE FC FF 4B B3 46 23 64 32
27 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 05 FF 0B C8 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 06 CC FF 07 CB 81 01 5A 01 5B 01 5B 01 5B 7F F4 F8 FF FE FC FF 4B B3 46 23 64 32
27 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 05 FF 0B 9D F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 07 CC FF 07 C8 81 01 53 01 54 01 57 01 56 7F F4 F8 FF FE FC FF 4B B3 46 23 64 32
27 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 05 FF 0B 72 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 08 CC FF 07 C3 81 01 50 01 50 01 53 01 52 80 0C F8 FF FE FC FF 4A B4 46 23 64 31
27 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 05 FF 0B 4E F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 09 CC FF 07 BE 81 01 4A 01 4B 01 4B 01 4C 80 0C F8 FF FE FC FF 49 B5 46 23 64 33
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27 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 06 FF 0A FF F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 0B CC FF 09 17 81 01 42 01 41 01 49 01 48 80 18 F8 FF FE FC FF 4D B1 45 23 63 34
26 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 06 FF 0A F0 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 0C CC FF 09 0C 81 01 41 01 3F 01 41 01 42 80 31 F8 FF FE FC FF 4C B2 45 23 63 33
26 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 06 FF 0A B7 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 0D CC FF 08 FA 81 01 3D 01 3E 01 3E 01 3E 80 0C F8 FF FE FC FF 4C B2 45 22 63 33
26 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 06 FF 0A A1 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 0E CC FF 08 E1 81 01 39 01 3B 01 3B 01 3A 80 00 F8 FF FE FC FF 4C B2 45 22 63 33
26 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 07 FF 0A 7D F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 0F CC FF 08 DC 81 01 37 01 35 01 36 01 36 80 25 F8 FF FE FC FF 4C B2 45 22 63 33
26 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 08 FF 0A 60 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 10 CC FF 08 C3 81 01 2D 01 2A 01 2D 01 2E 80 25 F8 FF FE FC FF 4C B2 45 22 63 33
26 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 08 FF 0A 11 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 11 CC FF 08 AC 81 01 24 01 24 01 26 01 26 80 0C F8 FF FE FC FF 4C B2 45 22 63 32
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26 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 08 FF 09 D0 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 12 CC FF 08 92 81 01 1B 01 1B 01 1F 01 1E 80 18 F8 FF FE FC FF 4B B3 45 22 63 32
26 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 09 FF 09 90 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 13 CC FF 08 6F 81 01 15 01 14 01 16 01 17 80 25 F8 FF FE FC FF 4B B3 45 22 64 32
26 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 09 FF 09 48 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 14 CC FF 08 44 81 01 0C 01 0C 01 0D 01 0E 80 18 F8 FF FE FC FF 4B B3 45 22 64 32
26 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 09 FF 09 00 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 15 CC FF 08 29 81 01 05 01 05 01 05 01 05 80 18 F8 FF FE FC FF 4A B4 45 22 64 30
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71 01 03 01 01 16 CC FF 08 01 81 00 FC 00 FD 00 FE 00 FE 80 0C F8 FF FE FC FF 48 B6 44 22 64 2F
25 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 0A FF 08 77 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 17 CC FF 07 DD 81 00 F4 00 F4 00 F7 00 F7 80 00 F8 FF FE FC FF 48 B7 43 22 63 2E
24 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 0A FF 08 36 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 18 CC FF 07 BD 81 00 EC 00 ED 00 EF 00 EE 80 18 F8 FF FE FC FF 46 B8 43 22 63 2D
24 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 0D FF 07 EE F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 19 CC FF 07 96 81 00 E4 00 E4 00 E7 00 E8 80 18 F8 FF FE FC FF 45 BA 43 22 63 2A
24 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 0D FF 07 B4 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 1A CC FF 07 6F 81 00 DE 00 DD 00 DF 00 E0 80 25 F8 FF FE FC FF 43 BC 43 21 62 29
24 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 0D FF 07 74 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 1B CC FF 07 53 81 00 D6 00 D7 00 D7 00 D7 80 0C F8 FF FE FC FF 41 BD 42 21 61 28
23 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 0D FF 07 2C F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 1C CC FF 07 2D 81 00 CF 00 CF 00 D1 00 D0 80 0C F8 FF FE FC FF 40 BE 42 21 60 27
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71 01 03 01 01 1D CC FF 07 18 81 00 C8 00 C7 00 C7 00 C7 80 18 F8 FF FE FC FF 3E C0 42 21 5E 23
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71 01 03 01 01 1E CC FF 07 07 81 00 C0 00 BF 00 C0 00 C0 80 25 F8 FF FE FC FF 3C C2 41 20 5B 22
22 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 05 FF 06 62 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF

71 01 03 01 01 1F CC FF 06 F5 81 00 B7 00 B7 00 B7 00 B7 80 00 F8 FF FE FC FF 3B C4 40 20 59 21
21 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 05 FF 06 1A F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 20 CC FF 06 E3 81 00 AE 00 AE 00 AF 00 B0 80 00 F8 FF FE FC FF 3A C5 40 20 56 21
21 C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 05 FF 05 D2 F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 21 CC FF 06 D0 81 00 A5 00 A5 00 A7 00 A7 80 0C F8 FF FE FC FF 39 C6 3E 1F 55 1F
1F C0 FE 44 FD C3 26 C4 26 C0 00 FF 10 05 FF 05 8A F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 22 CC FF 06 C3 81 00 9C 00 9D 00 9D 00 9C 80 00 F8 FF FE FC FF 38 C6 3D 1F 55 1F
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71 01 03 01 01 23 CC FF 06 B9 81 00 91 00 91 00 94 00 94 7F F4 F8 FF FE FC FF 38 C7 3D 1E 55 1F
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71 01 03 01 01 24 CC FF 06 AE 81 00 88 00 87 00 89 00 88 80 00 F8 FF FE FC FF 38 C7 3D 1E 55 1F
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71 01 03 01 01 25 CC FF 06 92 81 00 7D 00 7E 00 7F 00 7F 80 00 F8 FF FE FC FF 38 C7 3D 1E 55 1E
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71 01 03 01 01 28 CC FF 06 32 81 00 62 00 62 00 63 00 63 80 00 F8 FF FE FC FF 36 C9 3C 1E 52 1C
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71 01 03 01 01 2A CC FF 06 06 81 00 4F 00 51 00 51 00 51 80 00 F8 FF FE FC FF 33 CB 39 1D 50 1A
1A C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 03 FF 02 AC F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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71 01 03 01 01 2B CC FF 05 FF 81 00 47 00 47 00 47 00 48 80 0C F8 FF FE FC FF 33 CB 39 1C 4F 19
19 C0 FE 44 FD C1 22 C2 25 C0 00 FF 10 03 FF 02 5C F8 FE 7C FF FF FF FF FF FF FF FF FF FF FF FF
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DOT HS 812 910
March 2020

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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