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CALSPAN ON-SITE CHILD RESTRAINT SYSTEM CRASH INVESTIGATION
SCI CASE NO.: CA10033

VEHICLE: 2010 DODGE GRAND CARAVAN

LOCATION: NORTH CAROLINA

CRASH DATE: JUNE 2010

Contract No. DTNH22-07-C-00043

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. CA10033	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Calspan On-Site Child Restraint System Crash Investigation Vehicle: 2010 Dodge Grand Caravan Location: North Carolina		5. Report Date: October 2010	
		6. Performing Organization Code	
7. Author(s) Crash Data Research Center		8. Performing Organization Report No.	
9. Performing Organization Name and Address Calspan Corporation Crash Data Research Center P.O. Box 400 Buffalo, New York 14225		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-07-C-00043	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Washington, D.C. 20590		13. Type of Report and Period Covered Technical Report Crash Date: June 2010	
		14. Sponsoring Agency Code	

15. Supplementary Note

An investigation of the chain-reaction crash of a 2010 Dodge Grand Caravan, a 2009 Dodge Grand Caravan and a 2007 Nissan Versa.

16. Abstract

This on-site investigation focused on the Child Restraint Systems (CRS) in use during this on-road multiple impact crash of a 2010 Dodge Grand Caravan. The Dodge was involved in a rear-end impact crash with a 2009 Dodge Grand Caravan. The right aspect of the 2010 Dodge's back plane was impacted by the front of the 2009 Dodge. This resulted in the deployment of the driver's frontal air bag in the 2009 Dodge. The 2010 Dodge was then displaced forward and the front right aspect of the 2010 Dodge impacted the left aspect of a 2007 Nissan Versa's back plane. This secondary impact did not result in the deployment of the frontal air bags in the 2010 Dodge. The 2010 Dodge was occupied by three children restrained in CRS's. Two 4-month-old twins secured in the second row and a 2-year-old was secured in the third row. The 42-year-old male driver of the 2010 Dodge was transported by ambulance to a local hospital for treatment of minor severity soft tissue injuries. The 38-year-old female front right passenger was transported by ambulance to a local hospital for treatment of a moderate severity laceration. The child in the second row left CRS sustained a minor soft tissue injury. The children in the second row right and the third row were reportedly not injured. All three children were transported to a local hospital for evaluation and all occupants were released from the hospital later the same day. All CRS's in the vehicle were secured to the vehicle using the Lower Anchors and Tethers for Children (LATCH) system. The second row infant seats were also secured utilizing the vehicle safety belts.

17. Key Words Front-to-rear crash sequence Child Restraint System LATCH		18. Distribution Statement General Public	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 33	22. Price

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BACKGROUND

This on-site investigation focused on the Child Restraint Systems (CRS) in use during this on-road multiple impact crash of a 2010 Dodge Grand Caravan (**Figure 1**). The Dodge was involved in a rear-end impact crash with a 2009 Dodge Grand Caravan. The 2010 Dodge was then displaced forward and the front of the vehicle impacted the rear of a 2007 Nissan Versa. The 2010 Dodge was equipped with a Certified Advanced 208-Compliant frontal air bag system (CAC), and side impact Inflatable Curtain (IC) air bags. The manufacturer of the Dodge has certified that the vehicle

Figure 1: Right rear oblique view of the 2010 Dodge Grand Caravan.

is compliant to the advanced air bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The CAC system includes dual-stage frontal air bags for the driver and front right passenger positions, seat track positioning sensors, front seat retractor pretensioners, and a front right occupant presence sensor.

The right aspect of the 2010 Dodge's back plane was impacted by the front of the 2009 Dodge. This resulted in the deployment of the driver's frontal air bag in the 2009 Dodge. The 2010 Dodge was then displaced forward and the front right aspect of the 2010 Dodge impacted the left aspect of the Nissan's back plane. This secondary impact did not result in the deployment of the frontal air bags in the 2010 Dodge. The 2010 Dodge was occupied by three children restrained in CRS's. Two 4-month-old twins secured in the second row and a 2-year-old was secured in the third row. The 42-year-old male driver of the 2010 Dodge was transported by ambulance to a local hospital for treatment of minor severity soft tissue injuries. The 38-year-old female front right passenger was transported by ambulance to a local hospital for treatment of a moderate severity laceration. The child in the second row left CRS sustained a minor soft tissue injury. The children in the second row right and the third row were reportedly not injured. All three children were transported to a local hospital for evaluation and all occupants were released from the hospital later the same day. All CRS's in the vehicle were secured to the vehicle using the Lower Anchors and Tethers for Children (LATCH) system. The second row infant seats were also secured utilizing the vehicle safety belts.

This crash was identified through a visit to a regional vehicle salvage facility on August 3, 2010. Based on the location of the impact and severity of the damage and the use of occupied CRS's, this case was assigned by the Crash Investigation Division (CID) for an on-site investigation on August 4, 2010. The on-site investigation was initiated on August 5, 2010. The investigation involved the inspection and documentation of both Dodge minivans and the Nissan, a detailed interview with the front right passenger of the 2010 Dodge (the mother of the children in the rear of the vehicle), a limited interview with the owner of the 2009 Dodge (the father of the driver), the documentation of the crash site, and the documentation of the three CRS's in use at the time of the crash. Additionally, the Event Data Recorder (EDR) was imaged during the inspection of the 2009 Dodge. The imaged EDR data file is included as **Attachment A** of this report. The 2010 Dodge EDR was not supported by the available version of the Crash Data Retrieval tool.

SUMMARY

Crash Site

This crash occurred during daylight hours on a four-lane urban roadway. **Figure 2** depicts the approach by all three vehicles to the area of impact. The roadway extended north/south and was

Figure 2: Pre-crash trajectory of all vehicles.

divided by a painted median that transitioned to a left turn lane for the northerly direction of travel. The environmental conditions were cloudy with rain at the time of the crash. The roadway was straight and consisted of four asphalt-surfaced travel lanes. The outboard lanes measured 4.4 m (14.4 ft) in width and the inboard lanes were 3.6 m (11.8 ft) in width. Dividing the travel lanes was a painted asphalt divider 3.6 m (11.8 ft) in width. This divider began to transition to a left turn lane near the area of impact for this crash. The roadway was bordered on both sides by concrete barrier curbs 16 cm (6.3 in) in height. In the pre-crash area for all three vehicles, the grade was +3 percent. This transitioned to a +1 percent grade near the area of impact. The speed limit in the area in which this crash occurred was 72 km/h (45 mph). A Crash Schematic is included as **Figure 9** of this report.

Vehicle Data

2010 Dodge Grand Caravan

The 2010 Dodge Grand Caravan was manufactured in September 2009 and was identified by the Vehicle Identification Number (VIN) 2D4RN5DXXAR (production sequence deleted). The vehicle had been purchased new by the driver and front right passenger approximately six months prior to the crash and had been driven 4,870 km (3,026 mi) at the time of the crash. The front-wheel drive 2010 Dodge was powered by a 4.0-liter, V-6 engine linked to a four-speed automatic transmission. The braking system consisted of power-assisted front and rear disc brakes with four-wheel antilock, electronic brakeforce distribution and brake assist. The 2010

Dodge was also equipped with a direct Tire Pressure Monitoring System (TPMS) and Electronic Stability Control (ESC). The 2010 Dodge was equipped with four Bridgestone Turanza EL400 tires, size P225/65R17. The tires were mounted on five-spoke OEM alloy wheels. The tire size matched the vehicle manufacturer recommendation. The vehicle manufacturer recommended cold tire pressure was 248 kPa (36 PSI) for the front and rear. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Tire/Wheel Damage
Left Front	234 kPa (34 PSI)	8 mm (10/32 in)	None
Left Rear	241 kPa (35 PSI)	8 mm (10/32 in)	None
Right Front	228 kPa (33 PSI)	8 mm (10/32 in)	None
Right Rear	Tire Flat	8 mm (10/32 in)	14 cm (5.5 in) cut in sidewall

The interior of the Dodge was configured with leather surfaced, seven-passenger seating (2/2/3). The front bucket seats were separated by a removable center console that could be moved to the center of the second row. All seating positions were equipped with height adjustable head restraints. The driver head restraint was 7 cm (2.8 in) above the full-down position, the front right head restraint was 8 cm (3.1 in) above the full-down position, and the third row right head restraint was 6 cm (3.4 in) above the full-down position. Both second row and the third row left and center head restraints were in the full-down position. The driver's seat track was adjusted 5 cm (2 in) forward of full-rear. The driver's seat back angle was 19 degrees aft of vertical. The inboard side of the driver's seat back had deformed slightly rearward as a result of the crash and was at an estimated five degree clockwise rotation from its original location. The front right seat track was 10 cm (3.9 in) forward of full-rear. The front right seat back was at an angle 18 degrees aft of vertical. The second row consisted of two captain's chairs with folding backs. There was a pass-through to the third row between the seats. The second row seat backs were nearly upright, at an 8 degree angle aft of vertical. The third row consisted of a 60/40 spilt bench with folding backs. All second row and third row seats were capable of being folded flat into the floor of the vehicle. Both second row captain's chairs and the center position of the third row bench were equipped with LATCH.

The vehicle's occupant safety systems consisted of 3-point lap and shoulder belts for all seven designated seating positions, front safety belt retractor pretensioners, CAC dual-stage frontal air bags, and roof side rail-mounted side impact IC air bags that provide protection for the six outboard seating positions.

2009 Dodge Grand Caravan
The 2009 Dodge Grand Caravan was manufactured in December, 2008 and was identified by the Vehicle Identification Number (VIN) 2D8HN44E19R (production sequence deleted). The front-

wheel drive 2009 Dodge was powered by a 3.3-liter, V-6 engine linked to a four-speed automatic transmission. The braking system consisted of power-assisted front and rear disc brakes with four-wheel antilock, electronic brakeforce distribution and brake assist. The 2009 Dodge was also equipped with a direct TPMS and ESC. The vehicle was equipped with Yokohama Avid S33 tires on the front positions and General Altima X HP tires on the rear positions. All tires were size P225/65R16. The tires were mounted on OEM steel wheels with plastic covers. The tire size matched the vehicle manufacturer recommendation. The vehicle manufacturer recommended cold tire pressure was 248 kPa (36 PSI) for the front and rear. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Tire/Wheel Damage
Left Front	Tire Flat	5 mm (6/32 in)	Rim deformed, tire de-beaded
Left Rear	207 kPa (30 PSI)	6 mm (8/32 in)	None
Right Front	186 kPa (27 PSI)	2 mm (3/32 in)	None
Right Rear	228 kPa (33 PSI)	8 mm (10/32 in)	None

2007 Nissan Versa

The 2007 Nissan Versa was manufactured in September, 2006 and was identified by the VIN 3N1BC13E17L (production sequence deleted). The front-wheel drive Nissan was powered by a 1.8-liter, inline four cylinder engine linked to a four-speed automatic transmission. The braking system consisted of front disc and rear drum brakes with four-wheel antilock. The Nissan was also equipped with an indirect TPMS. The Nissan was equipped with four Uniroyal Tiger Paw AWP II tires in size 185/65R15, which matched the manufacturer recommended tire size. The manufacturer recommended cold tire pressure was 228 kPa (33 PSI) for the front and rear. The tires were mounted on OEM steel wheels with plastic covers. The specific tire data at the time of the SCI inspection was as follows:

Position	Measured Tire Pressure	Measured Tread Depth	Tire/Wheel Damage
Left Front	200 kPa (29 PSI)	6 mm (7/32 in)	None
Left Rear	207 kPa (30 PSI)	7 mm (9/32 in)	None
Right Front	221 kPa (32 PSI)	5 mm (6/32 in)	None
Right Rear	214 kPa (31 PSI)	6 mm (8/32 in)	None

Crash Sequence
  Pre-crash
The restrained 42-year-old male driver of the 2010 Dodge was operating the vehicle northbound in lane two of the divided roadway. Traffic had backed up from a traffic control signal ahead and the 2010 Dodge stopped in the traffic lane behind the Nissan. The 2009 Dodge was traveling northbound in the same travel lane driven by a 17-year-old male. As the 2009 Dodge approached the area of the crash, it was traveling at an EDR reported speed of 84 km/h (52 mph) 3 seconds prior to the Algorithm Enable (AE). Based on the EDR data, the driver of the 2009 Dodge applied the brakes 1.2 seconds prior to AE, and slowed the vehicle from 84 km/h (52 mph) to 58 km/h (36 mph). The Brake Assist feature of the 2009 Dodge detected panic braking and the system initiated 0.4 seconds prior to AE. The driver of the 2009 Dodge also initiated a right steering input prior to the impact. As the front of the 2009 Dodge neared the rear of the 2010 Dodge the steering input of the 2009 Dodge changed its trajectory approximately 10 degrees Clockwise (CW). The 17-year-old driver admitted to his parents (post-crash) that he was looking down at a cellular phone text message immediately prior to the crash. The 2009 Dodge driver's parent was interviewed by the SCI investigator.

  Crash
The left aspect of the front of the 2009 Dodge impacted the right aspect of the rear of the 2010 Dodge. The direction of force was within the 12 o'clock sector for the 2009 Dodge and the 6 o'clock sector for the 2010 Dodge. The force of the impact actuated the driver's safety belt pretensioner and deployed both frontal air bags in the 2009 Dodge. The damage algorithm of the WinSMASH program was used to calculate the severity of the crash (delta-V). The total delta-V of the 2010 Dodge was 18 km/h (11.2 mph). The 2010 Dodge's longitudinal and lateral delta-V components were +18 km/h (+11.2 mph) and 0 km/h, respectively. The total delta-V of the 2009 Dodge was 19 km/h (11.8 mph) with a longitudinal and lateral component of -19 km/h (-11.8 mph) and +3 km/h (+1.9 mph), respectively.

The results of the WinSMASH calculated delta-V under-estimated the severity. This borderline reconstruction resulted from the use of a crush profile that was an under-representation of the left front corner deformation of the 2009 Dodge and the use of stiffness values within the program that were not representative of the structure. The crush profile was measured per NASS protocol; however, WinSMASH analyses of corner impacts are a known deficiency due to the program's limitations. An SCI calculation of the 2009 Dodge delta-V using the acceleration pulse reported in the EDR data resulted in a total delta-V of 32 km/h (20 mph) with longitudinal and lateral components of -32 km/h (-20 mph) and +5 km/h (+3 mph). The longitudinal delta-V of the 2010 Dodge estimated by a Conservation of Momentum analysis was 32 km/h (20 mph).

The impact caused the 2010 Dodge to initiate a forward trajectory and rotate 10 degrees counterclockwise (CCW) within the travel lane. The right aspect of the 2010 Dodge's front

plane impacted left aspect of the Nissan's back plane. The direction of force for the secondary impact was within the 12 o'clock sector for the 2010 Dodge and the 6 o'clock sector for the Nissan. No air bags in the 2010 Dodge or the Nissan deployed as a result of this impact. The damage algorithm of the WinSMASH program was used to calculate the severity of the crash (delta-V). The total delta-V of the 2010 Dodge was 12 km/h (7.5 mph). The 2010 Dodge's longitudinal and lateral delta-V components were -12 km/h (-7.5 mph) and 0 km/h, respectively. The total delta-V for the Nissan was 19 km/h (11.8 mph) with a longitudinal and lateral of 19 km/h (11.8 mph) and -3 km/h (-1.9 mph), respectively. The calculated delta-V of the secondary impact appeared reasonable.

There was no physical evidence at the scene that identified the areas of the impacts or the final rest location of any of the vehicles at the time of the SCI scene inspection. The front right passenger of the 2010 Dodge described the vehicle as coming to final rest straddling the lane line between the number two and left turn lane, the Nissan was approximately one-half car length ahead in the number two lane. Her recollection was that the 2009 Dodge came to rest against the east curb.

Post-crash
Police, emergency medical and tow personnel responded to the crash site. The driver and front right passenger of the 2010 Dodge exited the vehicle under their own power. The driver opened the left rear door and removed the three child occupants from their respective CRS. The driver sustained minor muscle strains to his neck, upper and lower back and was transported by ambulance to a local hospital where he was treated in the emergency department and released the same day. The front right passenger sustained moderate soft tissue injuries and was transported by ambulance to a local hospital where she was treated in the emergency department and released the same day. The infant in the rear left seat sustained minor soft tissue injuries. The infant in the rear right seat and the child in the third row seat were not injured in this crash. All three children were transported to a local hospital where they were evaluated in the emergency department and released the same day. All three vehicles were towed from the scene due to disabling damage.

2010 DODGE GRAND CARAVAN
Exterior Damage

The 2010 Dodge's back plane sustained moderate damage in this offset rear-end crash **(Figure 3)**. This impact was Event 1 of the crash sequence. On the back plane, the direct damage began 24 cm (9.4 in) right of the centerline, and extended 56 cm (22 in) right to the bumper corner. The maximum bumper level crush was located at C5, 39 cm (15.4 in) right of the centerline and measured 21 cm (8.3 in). Above the bumper elevation, the maximum crush was at the same location and measured 27 cm (10.6 in). The combined width of the direct and induced damage extended across the entire

Figure 3: Initial impact damage to the rear of the 2010 Dodge.

end-width of the rear plane. A residual crush profile was documented at bumper and above bumper height of the Dodge. The averaged profile was as follows: C1 = 2 cm (0.8 in), C2 = 10 cm (3.9 in), C3 = 15 cm (5.9 in), C4 = 19 cm (7.5 in), C5 = 21 cm (8.3 in), C6 = 17 cm (6.7 in). The front doors and left rear door were fully operational post-crash. The right rear door latch was operational but the door would only open 22 cm (8.7 in) on its track. The rear hatch was jammed shut as a result of the crash damage. The right wheelbase was shortened by 3 cm (1.2 in) as the right rear wheel was displaced forward. The backlight and right rear glazing adjacent to the third row disintegrated as a result of impact forces. All other glazing was undamaged. The Collision Deformation Classification (CDC) assigned for this impact was 06BZEW2.

In Event 2 of this crash sequence, the right aspect of the 2010 Dodge's front plane impacted the left aspect of the Nissan's back plane in an offset impact. The direct damage to the 2010 Dodge began 14 cm (5.5 in) right of the vehicle centerline and extended right 62 cm (24.4 in) to the bumper corner. The maximum crush was located at C6, the front right bumper corner, and measured 7 cm (2.8 in). The Event 2 damage to the 2010 Dodge is depicted in **Figure 4**. The combined direct and induced damage width extended along the entire end-plane. A residual crush profile was documented at the bumper

Figure 4: Event 2 damage to the front plane of the 2010 Dodge.

elevation and was as follows: C1 = 0 cm, C2 = 0 cm, C3 = 0 cm, C4 = 1 cm (0.4 in), C5 = 4 cm (1.6 in), C6 = 7 cm (2.8 in). This damage was measured to the bumper reinforcement bar. The CDC assigned to the secondary impact was 12FZEW1.

Interior Damage

The 2010 Dodge sustained minor severity interior damage that was attributed to passenger compartment intrusion and occupant contact. The D-ring height adjustment control located on the B-pillar for the front right safety belt was fractured at the time of the SCI inspection. The control had been impacted by the front right passenger's forehead causing a laceration. The displaced knob contained body fluid consistent with a forehead laceration. Body fluid was also present on the front right safety belt webbing which was in use at the time of the crash. The rear hatch and right D-pillar structures had intruded forward into the passenger compartment. The right D-pillar was in contact with and had compressed the third row right seat back 4 cm (1.6 in). The intrusion to the vehicle is listed on the following table:

Position	Component	Direction	Magnitude
Row 3 Right	D-pillar	Lateral	16 cm (6.3 in)
Row 3 Right	Rear hatch panel	Longitudinal	24 cm (9.4 in)
Row 3 Right	Side panel aft of the C-pillar	Lateral	10 cm (3.9 in)
Row 3 Right	D-pillar	Longitudinal	10 cm (3.9 in)
Row 3 Center	Rear hatch panel	Longitudinal	21 cm (8.3 in)

Manual Restraint Systems

The 2010 Dodge was equipped with 3-point lap and shoulder belts for the seven designated seating positions. All belt systems utilized continuous loop webbing and sliding latch plates. The upper D-rings for the front and second row seats were height adjustable. The front left height adjustment was in the full-up position, the front right and both second row adjustments were in the full-down position. The driver's belt retracted onto an Emergency Locking Retractor (ELR), all other belts retracted onto switchable ELR/Automatic Locking Retractors (ALR). Both front belts utilized retractor pretensioners which did not actuate during this crash. The front belts were both in use at the time of the crash, restraining the adult driver and front right passenger. The second row belts were in use installing the two infant CRS's. In her interview the front right passenger stated that the second row belts were pulled out fully to change them to the ALR mode to install the CRS's in conjunction with the lower LATCH anchors. The three third row belts were not in use at the time of the crash.

The front right belt webbing exhibited droplets of body fluid from the forehead laceration sustained by the front right passenger. The body fluid began 51 cm (20.1 in) above the floor anchor and extended up the webbing 64 cm (25.2 in).

Frontal Air Bag System

The 2010 Dodge Caravan was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system that consisted of dual stage driver and front right passenger air bags, seat track positioning sensors, front seat retractor pretensioners, and safety belt buckle switches. The

manufacturer of the 2010 Dodge has certified that this vehicle was compliant with the advanced air bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) Number 208.

The driver's air bag was concealed within the center hub of the three-spoke steering wheel. The front right passenger's air bag was concealed within the middle aspect of the right instrument panel under a single cover flap. Neither of the frontal air bags deployed in this crash sequence.

Side Impact Air Bag System

The 2010 Dodge was equipped with roof side rail-mounted side impact IC air bags. The IC air bags did not deploy during this multiple impact crash.

Second Row Child Restraint System

The two child restraints used in the second row of the 2010 Dodge had been replaced by the insurance company prior to SCI involvement and were not available for inspection. The information regarding the child restraints was obtained from the mother of the children who was the front right passenger. The second row was occupied by identical twin 4-month-old female infants secured in Chicco Keyfit infant seats with detachable bases. The CRS's were purchased new in December 2009 by the parents. The bases were restrained by both the lower LATCH anchors in the second row seats and by the vehicle seat belts.

Third Row Child Restraint System

The CRS installed in the third row of the 2010 Dodge was a Britax Marathon, Model number MID80328D1. It was manufactured July 30, 2008 and purchased new. This convertible seat was designed to accommodate a 2.3-15.9 kg (5-35 lb) child in the rear-facing position and a 9.1-29.5 kg (20-65 lb) child in the forward-facing position. The height requirement was for a child 124.5 cm (49 in) or less.

The Britax CRS was installed using the lower LATCH anchors and the top tether strap, and was still installed in the 2010 Dodge at the time of the SCI inspection (**Figure 5**). A Prince Lionheart two-piece seat protector pad was installed on the vehicle seat below the Britax CRS. The Britax seat was installed tightly to the third row bench, with no movement at the belt path in any direction. The length of the LATCH strap between the left lower anchor and the left side of the CRS belt path measured 25 cm (9.8 in). The length of the LATCH strap between the right lower anchor and right side of the CRS Belt path measured 22 cm (8.7 in).

Figure 5: Third row CRS, still installed in the case vehicle.

The Britax CRS was equipped with a 5-point webbing harness with a chest clip. The harness straps were routed through the second slot from the top, of four possible locations. Based on the location of the chest clip at the time of the SCI inspection, it was probably at chest level when in use.

2009 DODGE GRAND CARAVAN
Exterior Damage

The left aspect of the 2009 Dodge's front plane sustained moderate severity damage as a result of the impact with the back right of the 2010 Dodge (Event 1). Refer to **Figure 6.** The direct contact damage began 37 cm (14.6 in) left of the vehicle centerline and extended 40 cm (15.7 in) to the left corner. The combined direct and induced damage extended along the full width of the front bumper. A residual crush profile was documented along the full width of the front bumper reinforcement and was as follows: C1 = 5 cm (2 in), C2

Figure 6: Event 1 damage to the front of the 2009 Dodge.

= 2 cm (0.8 in), C3 = 0 cm, C4 = 0 cm, C5 = 0 cm, C6 = 0 cm. The maximum crush was located at the left end of the reinforcement and measured 5 cm (2 in). As a result of the impact configuration, the direct contact wrapped around the corner and extended rearward along the left side plane 70 cm (27.6 in). The left front suspension was displaced rearward shortening the left wheelbase by 30 cm (11.8 in). The CDC assigned for this initial impact was 12FLEE4.

2008 NISSAN VERSA
Exterior Damage

The back plane of the Nissan sustained moderate severity damage in the secondary impact from the front of the 2010 Dodge (**Figure 7).** The direct contact damage began 14 cm (5.5 in) left of the vehicle centerline and extended left 52 cm (20.5 in). The maximum crush was located at C2, 45 cm (17.7 in) left of the vehicle centerline. The maximum crush measured 31 cm (12.2 in). The combined direct and induced damage extended from the left rear bumper corner to the right rear bumper corner of the Nissan, a distance of 144 cm (56.7 in). A residual crush profile

Figure 7: Secondary event damage to the rear of the Nissan.

was documented along the full width of the Nissan's rear bumper and was as follows: C1 = 18 cm (7.1 in), C2 = 31 cm (12.2 in), C3 = 21 cm (8.3 in), C4 = 8 cm (3.1 in), C5 = 1 cm (0.4 in), C6 = 0 cm. The CDC assigned for the Event 2 impact was 06BYEW2.
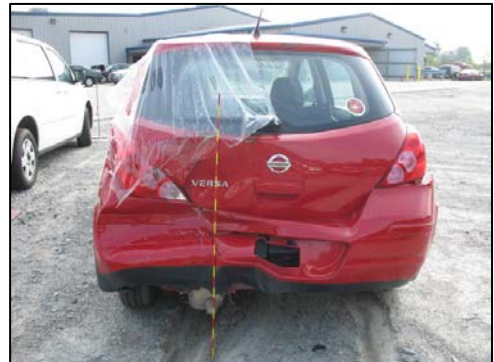
2010 DODGE GRAND CARAVAN
Driver Demographics/Data

Driver Age/Sex:	42-year-old/Male
Height:	188 cm (74 in)
Weight:	100 kg (220 lb)
Eyewear:	None
Seat Track Position:	Mid-to-rear track, 5 cm (2 in) forward of full-rear
Manual Safety Belt Use:	3-point lap and shoulder safety belt
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Exited through LF door under his own power
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Treated in the emergency department of a local hospital and released the same day.

Driver injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Source
Cervical strain	Minor (640278.1,6)	Head restraint
Thoracic strain	Minor (640478.1,7)	Seat back

Source: Medical records

Driver Kinematics

The 42-year-old male driver of the 2010 Dodge was seated in a mid-to-rear track position; the seat was adjusted 5 cm (2 in) forward of full-rear. He was restrained by the manual 3-point lap and shoulder belt system. The vehicle was at a full-stop in a line of traffic stopped for a red traffic signal. He did not see the 2009 Dodge prior to the initial impact and did not initiate any avoidance maneuvers.

At impact, the driver initiated a rear trajectory within the front left seating position. The emergency-locking feature of the safety belt retractor locked but the pretensioner did not actuate. He loaded the front left seat back with his back and the head restraint with the back of his head. This loading deformed the front left seat back, causing it to torque CW approximately five degrees. The impact forces and contact with the head restraint/seat back resulted in the muscle strain to the neck, upper and lower back to the driver of the 2010 Dodge. As the crash sequence progressed, the driver initiated a rebound trajectory within the front left seating position in response to the secondary frontal crash. The driver loaded the safety belt with his abdomen and chest and was restrained in the driver's seat at the time of the secondary impact. The driver rebounded off the safety belt and came to rest restrained in the front left seat.

The driver was immediately concerned with the safety of the children in the rear of the vehicle. He exited the vehicle under his own power through the left front door, and opened the left rear door to access the children in the rear of the vehicle. He removed the three children from their CRS seats and from the vehicle. At that time, several bystanders who witnessed the crash had stopped to help. These bystanders held the children until EMS arrived. Due to experiencing neck and back pain, the driver was placed on a backboard for transport by EMS to a local hospital. At the hospital he was treated in the emergency department and released the same day.

Front Right Occupant Demographics/Data

Occupant Age/Sex:	38-year-old/Female
Height:	170 cm (67 in)
Weight:	66 kg (145 lb)
Eyewear:	None
Seat Track Position:	Mid-track, 10 cm (3.9 in) forward of full-rear
Manual Safety Belt Use:	Lap and shoulder
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Exited through RF door under her own power
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Treated in the emergency department of a local hospital and released the same day.

Front Right Occupant Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Source
Closed Head Injury	Minor (110009.1,0)	D-ring attachment
Upper mid forehead laceration (3.5 cm semi-lunar, vertical)	Minor (210602.1,7)	D-ring attachment
Mid forehead contusion (surrounding laceration)	Minor (210402.1,7)	D-ring attachment

Source: Medical records

Front Right Occupant Kinematics

The 38-year-old female front right occupant was seated in a mid track position with the seat track adjusted 10 cm (3.9 in) forward of the full-rear position. She was restrained by the 3-point lap and shoulder belt system and had leaned forward slightly prior to the initial impact. She did not see the 2009 Dodge prior to the impact and did not brace her body prior to the initial impact.

At the initial impact, the front right occupant initiated a rearward trajectory within the front right seating position. The emergency-locking feature of the safety belt retractor locked but the retractor pretensioner did not actuate. The front right passenger loaded the seat back with her back and the head restraint with the back of her head. The seat did not deform as a result of the

loading. The rear impact displaced the Dodge forward and rotated the vehicle approximately 10 degrees CCW as a result of the offset impact.

The front of the 2010 Dodge then impacted the Nissan. The front right passenger initiated a rebound trajectory within the front right seating position in response to the frontal impact. The combination of the CCW rotation of the vehicle and the rebound trajectory resulted in contact between the front right passenger's forehead and the right B-pillar/D-ring attachment (**Figure 8**). The contact was evidenced by the damage to the D-ring height adjustment control knob and resulted in the forehead laceration, a contusion and a closed head injury. The front right occupant then loaded the safety

Figure 8: Damage to the front right safety belt height adjustment.

belt system with her chest and abdomen during the secondary impact. She came to rest restrained in the front right seating position.

The front right occupant was able to open the right front door but was told by the driver that the children in the rear of the vehicle were safe and out of the vehicle, so she remained in the front right seat until the arrival of EMS. She was transported by ground ambulance to a local hospital where she was treated in the emergency department and released the same day.

Second Row Left Occupant Demographics/Data

Occupant Age/Sex:	4-month-old/Female
Height:	64 cm (25 in)
Weight:	6 kg (14 lb)
Eyewear:	None
Seat Track Position:	Full-rear
Manual Safety Belt Use:	5-point harness of the CRS
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Removed through left rear door by driver
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Evaluated in the emergency department of a local hospital and released the same day.

  Second Row Left Occupant Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Source
Left side neck abrasion	Minor (310202.1,2)	CRS harness strap

Source: Medical records

13

Second Row Left Occupant Kinematics

The 4-month-old female second row left occupant was restrained in a Chicco Keyfit rear-facing infant seat at the time of the crash. The CRS was secured to the rear left captain's chair by the lower LATCH anchors and by the vehicle's lap and shoulder belt. The mother of the occupant stated in the interview that the leveling gauge on the shell of the CRS showed that the seat was installed at the correct angle prior to the crash. The mother of the occupant believes that the infant was not sleeping prior to the crash.

At impact, the child occupant initiated a rearward trajectory within the CRS. She was restrained by the 5-point webbing harness of the CRS. Loading the harness webbing resulted in the left neck abrasion. She then initiated a rebound trajectory into the shell of the CRS, and further loaded the shell with her back and head in the secondary impact. The CRS remained attached to its base post-crash, and the base remained attached to the vehicle.

The occupant was unbuckled from the CRS and removed from the vehicle by the driver post-crash. After arrival and evaluation by EMS, the infant was returned to the CRS, without the base, for transport to the local hospital. She was evaluated in the hospital emergency department and released the same day.

Second Row Right Occupant Demographics/Data

Occupant Age/Sex:	4-month-old/Female
Height:	64 cm (25 in)
Weight:	6 kg (14 lb)
Eyewear:	None
Seat Track Position:	Full-rear
Manual Safety Belt Use:	5-point harness of the CRS
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Removed through left rear door by driver
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Evaluated in the emergency department of a local hospital and released the same day.

Second Row Right Occupant Injuries

Injury	Injury Severity (AIS 2005/08)	Injury Source
None	N/A	N/A

Source: Interview. No record of treatment at the reported hospital.

14

Second Row Right Occupant Kinematics

The 4-month-old female second row right occupant was restrained in a Chicco Keyfit rear-facing infant seat at the time of the crash. The CRS was secured to the rear right captain's chair by the lower LATCH anchors and by the vehicle's lap and shoulder belt. The mother of the occupant stated in the interview that the leveling gauge on the shell of the CRS showed that the seat was installed at the correct angle prior to the crash. The mother of the occupant believes that the infant was not sleeping prior to the crash.

At impact, the child occupant initiated a rearward trajectory within the CRS. She was restrained by the 5-point webbing harness of the CRS. The mother of the rear right occupant stated in the interview that she was possibly more tightly restrained prior to the crash than the second row left occupant, sparing her from the abrasions experienced by the other child. The second row right occupant then initiated a rebound trajectory into the shell of the CRS, and further loaded the shell with her back and head in the secondary impact. The CRS remained attached to its base post-crash, and the base remained attached to the vehicle.

The rear left occupant was unbuckled from the CRS and removed from the vehicle by the driver post-crash. After arrival and evaluation by EMS, the infant was returned to the CRS for transport to the local hospital. She was evaluated in the hospital emergency department and released the same day. The child was not injured.

Third Row Center Occupant Demographics/Data

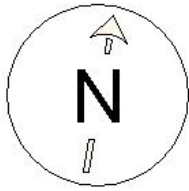|	
Occupant Age/Sex:	2 1/2-year-old/Female
Height:	91 cm (36 in)
Weight:	16 kg (35 lb)
Eyewear:	None
Seat Track Position:	Full-rear
Manual Safety Belt Use:	5-point harness of a CRS
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Removed through left rear door by driver
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Evaluated in the emergency department of a local hospital and released the same day.

Third Row Center Occupant Injuries

Injury	Injury Severity (AIS 2005/08)	Injury Source
None	N/A	N/A

Source: Medical records

Third Row Center Occupant Kinematics

The 2 ½-year-old female third row center occupant was restrained by the 5-point harness system in a Britax Marathon convertible CRS. The CRS had been installed forward-facing in the third row center seat using the LATCH lower anchors and top tether. The vehicle's lap and shoulder belt was not used in the third row CRS installation. The recline feature of the Britax CRS seat back was in the top position of four available adjustment points.

At the initial impact, the third row center occupant initiated a rearward trajectory, loading the shell of the CRS with her back, the back of her head and the back of her legs. She then initiated a rebound trajectory forward within the CRS. The occupant was restrained by the 5-point harness through the rebound movement and the secondary impact. She came to rest still restrained within the CRS in the third row of the 2010 Dodge. The lower LATCH anchors and top tether remained attached to the vehicle throughout the crash sequence. The third row occupant was unbuckled from the CRS and removed from the vehicle by the driver post-crash. She was held by a bystander until the arrival of EMS, and transported by ground ambulance without her CRS to a local hospital. She was evaluated in the emergency department and released the same day. She was not injured.
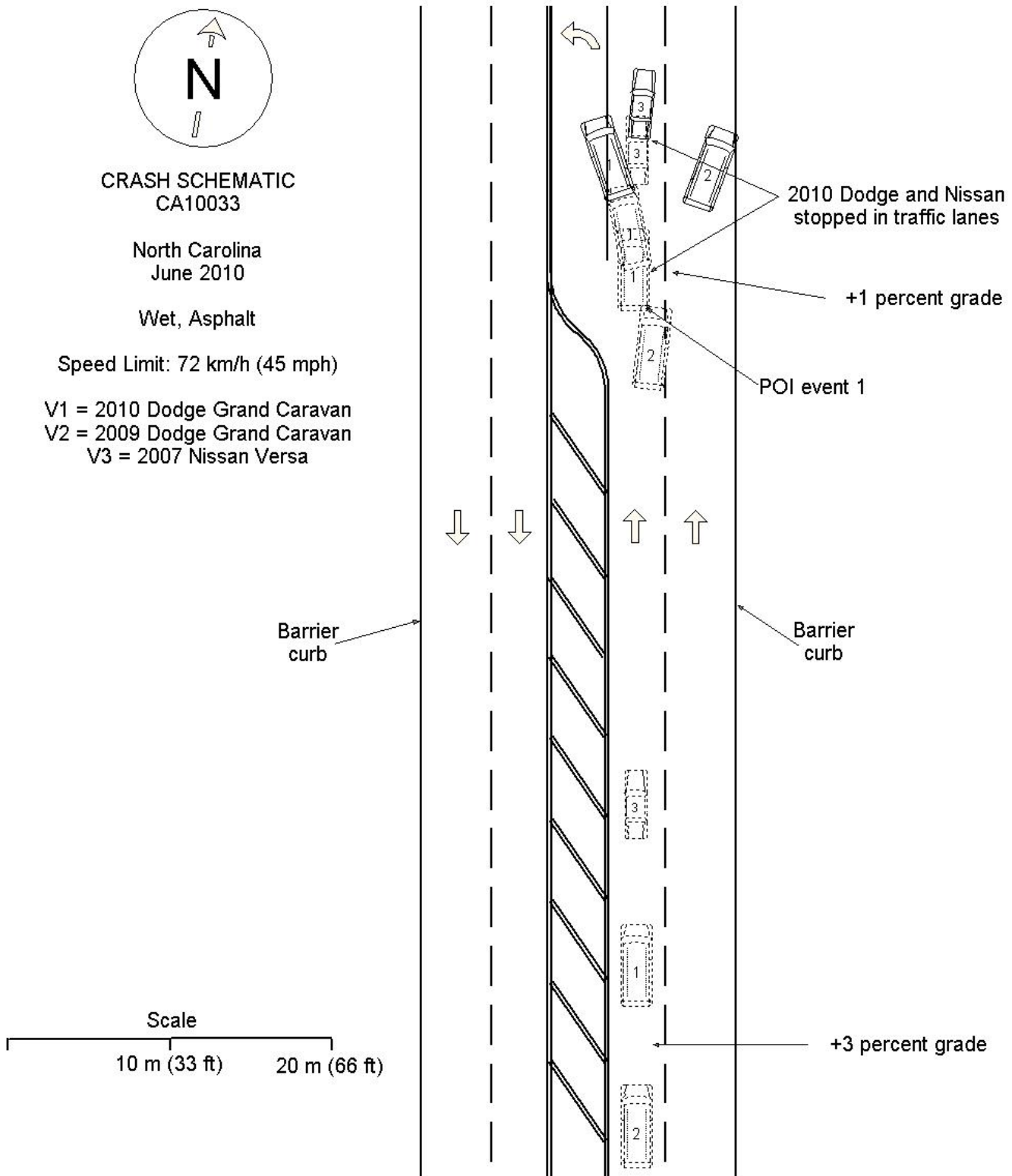
Figure 9: Crash Schematic

ATTACHMENT A

2009 Dodge Grand Caravan EDR Data

CDR File Information

User Entered VIN	2D8HN44E19R******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CA10033_V2_CDR.CDR
Saved on	Friday, August 6 2010 at 09:58:21 AM
Collected with CDR version	Crash Data Retrieval Tool 3.3
Reported with CDR version	Crash Data Retrieval Tool 3.4
EDR Device Type	airbag control module
Event(s) recovered	Event Record 1

Comments

No comments entered.

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

GENERAL INFORMATION:

CAUTION: During Bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. 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 bench top imaging could cause new events to be recorded in the ACM.

The ACM current fault status will be altered if the ACM is powered-up without having all of the other vehicle inputs connected (e.g., bench top imaging). This situation will occur when the CDR tool is connected directly to the ACM. This will not affect any of the stored fault data information in any of the Event Records. Always make a note in the CDR case comments page when an ACM bench top imaging process is performed.

The recorded Deployment Event will contain Pre-Crash data.
- T0 (where '0' is subscript) (-.01 sec.) is defined as the last sample point in the vehicle data buffer when the ACM commanded a deployment for all vehicles except the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey. In these vehicles, T0 (where '0' is subscript) is defined as the algorithm wakeup. Please note that the algorithm wakeup may be different for front, side, and roll-over events and their associated parameters.
- 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 can not be modified.

CDR FILE INFORMATION:

Event(s) Recovered definitions:
- None - There are no stored events in the Airbag Control Module (ACM)
- Not Retrievable - Event Data is stored in the ACM but is not retrievable by the CDR tool.
- For Continental ACMs:
  - Event Record 1 - Data from an event is stored in the ACM (not necessarily in chronological order)
  - Event Record 2 - Data from another event is stored in the ACM (not necessarily in chronological order)
  - Event Record 3 - Data from another event is stored in the ACM (not necessarily in chronological order)
- For all other ACMs:
  - Most Recent Event - Data of the most recent event is displayed in the report
  - 1st Prior Event - Two events are stored in the ACM, Data displayed is of the first prior event.
  - 2nd Prior Event - Three events are stored in the ACM, Data displayed is of the second prior event.
  - Etc., (for modules with 3 to 5 stored events)

CDR RECORD INFORMATION:

- If power to the ACM is lost during a deployment event, all or part of the event data record may not be recorded. "Interrupted" will be displayed for Vehicle Event Recorder Status.
- The Airbag Control Module Configuration indicates the inputs and outputs that the ACM for a particular vehicle monitors and/or controls.

- For applicable vehicles, the "Event Number" in the System Status at Event section of the report indicates the order of the events.
- For applicable vehicles, the "Total Number of Events Recorded" in the System Status at Event section of the report indicates the total number of events that the ACM has recorded.
- For applicable vehicles, a "Yes" for a particular item in the Deployment Command Data section of the report indicates that the ACM commanded the deployment of the associated device.
- Vehicle Data (Pre-Crash) is transmitted to the Airbag Control Module, by various vehicle control modules, via the vehicle's communication network.
- On 2006-2009 Dodge Ram 2500/3500, the Engine RPM recorded is limited to a maximum of 4080 RPM. On the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey, the engine RPM resolution is 256 rpm. On all other vehicles, the resolution is 32 rpm.
- If a recorded event has Engine RPM equal to SNA and Speed, Vehicle Indicated equals SNA for each time stamp, then the data is default data and the event stored in the ACM is not valid.
  - The accuracy of the recorded Speed, Vehicle Indicated will be affected if the vehicle had the tire size or the final drive axle ratio changed from the factory build specifications.
  - Speed, Vehicle Indicated is reported as an average of the drive wheels.
- On the 2008 - 2010 Dodge Grand Caravan, 2008-2010 Chrysler Town and Country and 2009-2010 Dodge Journey, the vehicle speed resolution is 2 kph. On all other vehicles, the resolution is 1 kph.
- The MIL (Malfunction Indicator Lamp) Status for the various recorded systems indicates the 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.

NOTE: A StarScan 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.

VEHICLE DATA DEFINITIONS:

Vehicle Event Recorder Status definitions:
- For additional definitions, please refer to the CDR Help File Glossary
- ABS MIL status - This indicates the ABS fault indicator lamp status. It will only be illuminated when there is a fault in the ABS system. The Electronic brake module DTC's should be read and recorded for final system interpretation.
- ESP MIL status - This indicates the ESP/BAS fault indicator lamp status. It will only be illuminated when there is a fault or thermal model shutdown in the ESP system. The ESP module DTC's should be read and recorded for final system interpretation. This is only valid for vehicles equipped with ESP.
- ESP Lamp Steady State Requested - This is the status of the ESP symbol - "car with squiggly lines" indicator lamp. "Yes" indicates ESP has been turned off by the driver or has reduced performance and is not an indication of a fault in the system. This is only valid for vehicles equipped with ESP.
- ESP Lamp Flashing Requested - If "Yes", then an ESP, Traction Control or Trailer Sway Control (if equipped) event was active at the time of data capture. This is only valid for vehicles equipped with ESP.
- ESP Disabled - "Yes" indicates that ABS & ESP have been disabled by the driver or due to system performance. This is only valid for vehicles equipped with ESP.
- Traction Control Button - When the button is "ON", (driver has pushed the button), the Traction Control system is "Disabled". When the button is "OFF", the Traction Control system is "Enabled".
- ESP Active - "YES" indicates that the ESP system is intervening with wheel specific braking/engine control. This is only valid for vehicles equipped with ESP.
- Panic Brake Assist Active - "Yes" indicates that all four of the brake circuits are under going ABS control. This is only valid for vehicles equipped with ESP.
- Steering Input (deg) if equipped:
  - Steering Input polarity is positive for right turns on:
    - 2005 - 2007 Grand Cherokee
    - 2006 - 2007 Commander
    - 2005 - 2010 300, Magnum, and Charger
    - 2008 - 2010 Challenger
  - Steering Input polarity is negative for right turns on:
    - All other vehicles and model years not specified above
- Yaw Rate (Degrees) if equipped: All vehicles have negative yaw rate when making a right turn.
- ETC Lamp Status - Lamp "ON " indicates there is an active Electronic Throttle DTC. This is only valid for vehicles equipped with ETC.
- ETC Lamp Flashing - If "Yes", then the ETC is in the limp-in mode. This is only valid for vehicles equipped with ETC.
- Engine Torque Applied - If "No", then 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.
- Tire 1 (2) Location - This indicates the location of the tire pressure sensor data. Default is used to indicate that the location of the tire pressure sensor is unknown or there is no tire pressure sensor in the 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 1 (2) Pressure Status - This indicates the actual pressure status of the Tire Location defined in the previous column. Possible values are LOW, NORMAL, HIGH, or SNA for this parameter. Vehicles with Base Tire Pressure Monitoring systems will display NORMAL even though these vehicles do not send actual pressure values across the communication bus.
- Tire 1 (2) Pressure (psi) - This indicates the actual tire pressure value of the Tire Location defined. 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.
- Cruise Control System - "Yes" indicates that the Cruise Control system is turned on.
- Cruise Control Active - "Yes" indicates the Cruise Control system is actively controlling vehicle speed. "No" indicates the system is NOT controlling vehicle speed.

APPLICATION INFORMATION:

- 2005 - 2010 Durango's equipped with side airbags have EDR data that can be imaged by the CDR tool. Durango's not equipped with side airbags have EDR Data that might be imaged by the CDR tool and can always be imaged by the supplier.
- For 2006 MY, some Chrysler 300, Dodge Magnum, Dodge Charger, Jeep Grand Cherokee, and Jeep Commander models may contain EDR data that can not be imaged by the CDR tool.
- For 2007 MY, some PT Cruiser models may contain EDR data that can not be imaged by the CDR tool.
- EDR Data is only recorded for frontal deployments in the following vehicles:
  - 2005-2007   Durango
  - 2007   Aspen
  - 2006-2007   Ram 1500
  - 2006-2009   Ram 2500/3500 Heavy Duty
  - 2007   Caliber, Compass, Patriot
  - 2007   Sebring
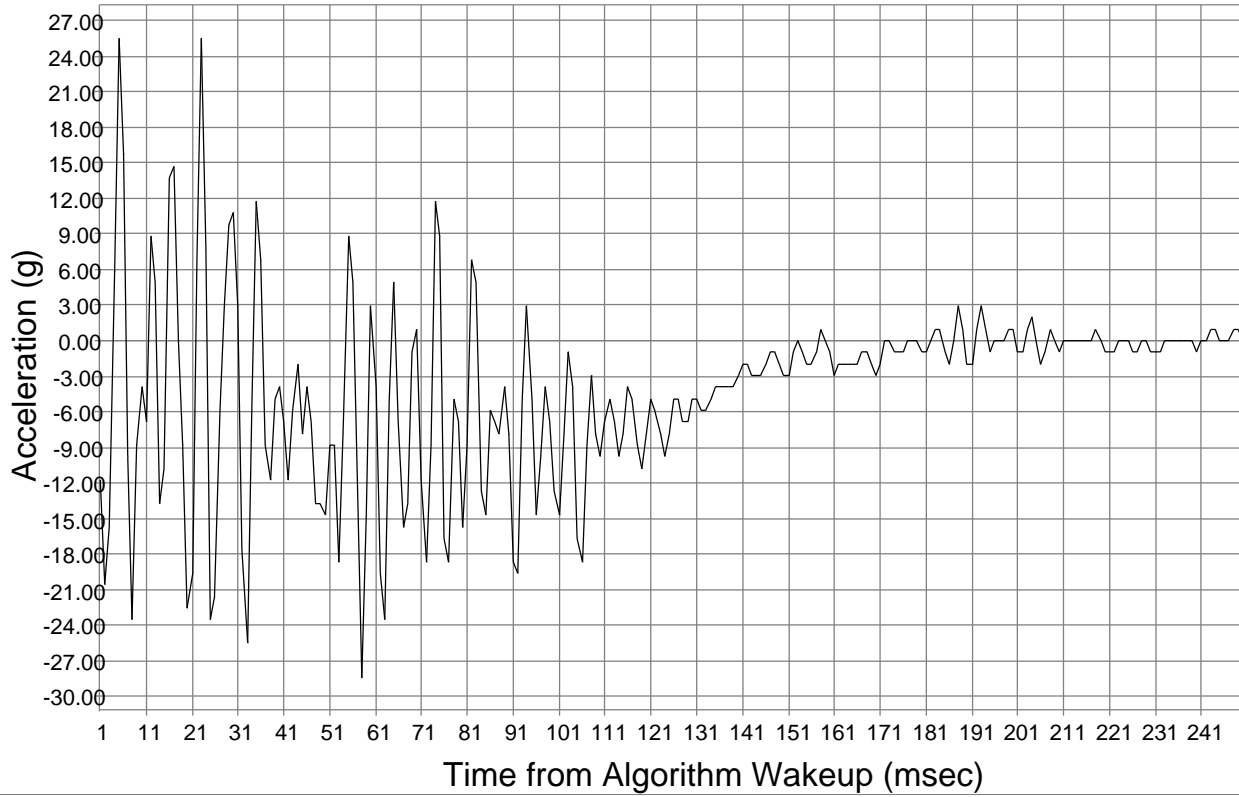 - 2007   Nitro
  - 2007   Wrangler

03001_Chrysler_r003

System Status at Retrieval

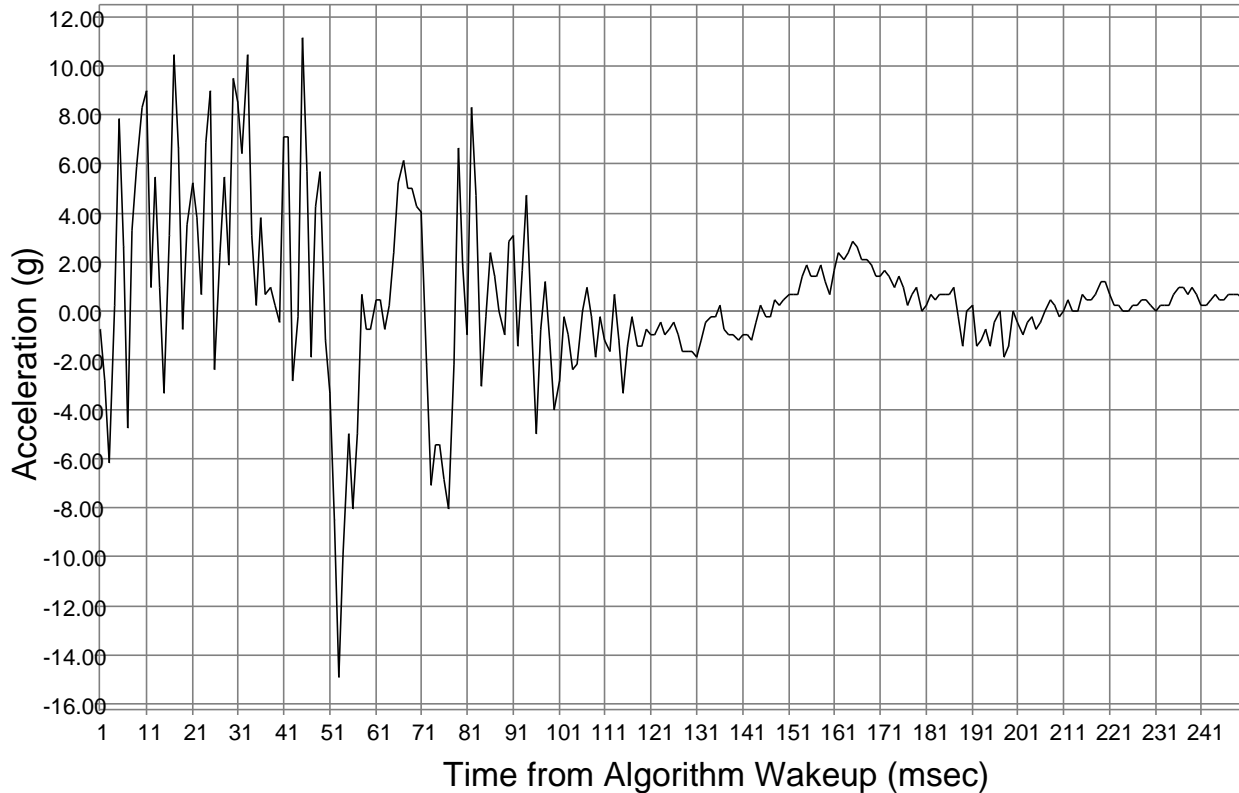|	
Original VIN	2D8HN44E19R******
Airbag Control Module Part Number	05094018AN
Airbag Control Module Serial Number	T19JF31380928F
Airbag Control Module Supplier	Continental Corporation

System Configuration at Retrieval

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

Longitudinal Crash Pulse (Event Record 1)

Acceleration (g) vs Time from Algorithm Wakeup (msec)

Lateral Crash Pulse (Event Record 1)

Acceleration (g) vs Time from Algorithm Wakeup (msec)

Longitudinal Crash Pulse (Event Record 1)

Time from Algorithm Wakeup (msec)	Longitudinal Acceleration (g)	Time from Algorithm Wakeup (msec)	Longitudinal Acceleration (g)	Time from Algorithm Wakeup (msec)	Longitudinal Acceleration (g)
1	-11.76	51	-8.82	101	-14.71
2	-20.59	52	-8.82	102	-7.84
3	-15.69	53	-18.63	103	-0.98
4	5.88	54	-7.84	104	-3.92
5	25.49	55	8.82	105	-16.67
6	15.69	56	4.90	106	-18.63
7	-9.80	57	-11.76	107	-8.82
8	-23.53	58	-28.43	108	-2.94
9	-8.82	59	-14.71	109	-7.84
10	-3.92	60	2.94	110	-9.80
11	-6.86	61	-3.92	111	-6.86
12	8.82	62	-19.61	112	-4.90
13	4.90	63	-23.53	113	-6.86
14	-13.73	64	-4.90	114	-9.80
15	-10.78	65	4.90	115	-7.84
16	13.73	66	-6.86	116	-3.92
17	14.71	67	-15.69	117	-4.90
18	0.00	68	-13.73	118	-8.82
19	-8.82	69	-0.98	119	-10.78
20	-22.55	70	0.98	120	-7.84
21	-19.61	71	-11.76	121	-4.90
22	6.86	72	-18.63	122	-5.88
23	25.49	73	-8.82	123	-7.84
24	7.84	74	11.76	124	-9.80
25	-23.53	75	8.82	125	-7.84
26	-21.57	76	-16.67	126	-4.90
27	-5.88	77	-18.63	127	-4.90
28	2.94	78	-4.90	128	-6.86
29	9.80	79	-6.86	129	-6.86
30	10.78	80	-15.69	130	-4.90
31	2.94	81	-8.82	131	-4.90
32	-17.65	82	6.86	132	-5.88
33	-25.49	83	4.90	133	-5.88
34	-5.88	84	-12.75	134	-4.90
35	11.76	85	-14.71	135	-3.92
36	6.86	86	-5.88	136	-3.92
37	-8.82	87	-6.86	137	-3.92
38	-11.76	88	-7.84	138	-3.92
39	-4.90	89	-3.92	139	-3.92
40	-3.92	90	-7.84	140	-2.94
41	-6.86	91	-18.63	141	-1.96
42	-11.76	92	-19.61	142	-1.96
43	-5.88	93	-4.90	143	-2.94
44	-1.96	94	2.94	144	-2.94
45	-7.84	95	-4.90	145	-2.94
46	-3.92	96	-14.71	146	-1.96
47	-6.86	97	-9.80	147	-0.98
48	-13.73	98	-3.92	148	-0.98
49	-13.73	99	-6.86	149	-1.96
50	-14.71	100	-12.75	150	-2.94

Longitudinal Crash Pulse (Event Record 1)

Time from Algorithm Wakeup (msec)	Longitudinal Acceleration (g)	Time from Algorithm Wakeup (msec)	Longitudinal Acceleration (g)
151	-2.94	201	-0.98
152	-0.98	202	-0.98
153	0.00	203	0.98
154	-0.98	204	1.96
155	-1.96	205	0.00
156	-1.96	206	-1.96
157	-0.98	207	-0.98
158	0.98	208	0.98
159	0.00	209	0.00
160	-0.98	210	-0.98
161	-2.94	211	0.00
162	-1.96	212	0.00
163	-1.96	213	0.00
164	-1.96	214	0.00
165	-1.96	215	0.00
166	-1.96	216	0.00
167	-0.98	217	0.00
168	-0.98	218	0.98
169	-1.96	219	0.00
170	-2.94	220	-0.98
171	-1.96	221	-0.98
172	0.00	222	-0.98
173	0.00	223	0.00
174	-0.98	224	0.00
175	-0.98	225	0.00
176	-0.98	226	-0.98
177	0.00	227	-0.98
178	0.00	228	0.00
179	0.00	229	0.00
180	-0.98	230	-0.98
181	-0.98	231	-0.98
182	0.00	232	-0.98
183	0.98	233	0.00
184	0.98	234	0.00
185	-0.98	235	0.00
186	-1.96	236	0.00
187	0.00	237	0.00
188	2.94	238	0.00
189	0.98	239	0.00
190	-1.96	240	-0.98
191	-1.96	241	0.00
192	0.98	242	0.00
193	2.94	243	0.98
194	0.98	244	0.98
195	-0.98	245	0.00
196	0.00	246	0.00
197	0.00	247	0.00
198	0.00	248	0.98
199	0.98	249	0.98
200	0.98	250	0.00

Lateral Crash Pulse (Event Record 1)

Time from Algorithm Wakeup (msec)	Lateral Acceleration (g)	Time from Algorithm Wakeup (msec)	Lateral Acceleration (g)	Time from Algorithm Wakeup (msec)	Lateral Acceleration (g)
1	-0.71	51	-3.31	101	-2.84
2	-2.84	52	-8.52	102	-0.24
3	-6.16	53	-14.91	103	-0.95
4	0.24	54	-9.94	104	-2.37
5	7.81	55	-4.97	105	-2.13
6	2.60	56	-8.05	106	0.00
7	-4.73	57	-4.97	107	0.95
8	3.31	58	0.71	108	-0.24
9	5.92	59	-0.71	109	-1.89
10	8.29	60	-0.71	110	-0.24
11	9.00	61	0.47	111	-1.18
12	0.95	62	0.47	112	-1.66
13	5.45	63	-0.71	113	0.71
14	0.95	64	0.24	114	-1.18
15	-3.31	65	2.37	115	-3.31
16	3.08	66	5.21	116	-1.42
17	10.42	67	6.16	117	-0.24
18	6.63	68	4.97	118	-1.42
19	-0.71	69	4.97	119	-1.42
20	3.55	70	4.26	120	-0.71
21	5.21	71	4.02	121	-0.95
22	3.79	72	-2.13	122	-0.95
23	0.71	73	-7.10	123	-0.47
24	6.87	74	-5.45	124	-0.95
25	9.00	75	-5.45	125	-0.71
26	-2.37	76	-6.87	126	-0.47
27	2.37	77	-8.05	127	-0.95
28	5.45	78	-2.13	128	-1.66
29	1.89	79	6.63	129	-1.66
30	9.47	80	1.89	130	-1.66
31	8.52	81	-0.95	131	-1.89
32	6.39	82	8.29	132	-1.18
33	10.42	83	4.73	133	-0.47
34	3.08	84	-3.08	134	-0.24
35	0.24	85	-0.24	135	-0.24
36	3.79	86	2.37	136	0.24
37	0.71	87	1.42	137	-0.71
38	0.95	88	0.00	138	-0.95
39	0.24	89	-0.95	139	-0.95
40	-0.47	90	2.84	140	-1.18
41	7.10	91	3.08	141	-0.95
42	7.10	92	-1.42	142	-0.95
43	-2.84	93	1.66	143	-1.18
44	-0.24	94	4.73	144	-0.47
45	11.13	95	-0.95	145	0.24
46	5.68	96	-4.97	146	-0.24
47	-1.89	97	-0.71	147	-0.24
48	4.26	98	1.18	148	0.47
49	5.68	99	-1.18	149	0.24
50	-1.18	100	-4.02	150	0.47

Lateral Crash Pulse (Event Record 1)

Time from Algorithm Wakeup (msec)	Lateral Acceleration (g)	Time from Algorithm Wakeup (msec)	Lateral Acceleration (g)
151	0.71	201	-0.47
152	0.71	202	-0.95
153	0.71	203	-0.47
154	1.42	204	-0.24
155	1.89	205	-0.71
156	1.42	206	-0.47
157	1.42	207	0.00
158	1.89	208	0.47
159	1.18	209	0.24
160	0.71	210	-0.24
161	1.66	211	0.00
162	2.37	212	0.47
163	2.13	213	0.00
164	2.37	214	0.00
165	2.84	215	0.71
166	2.60	216	0.47
167	2.13	217	0.47
168	2.13	218	0.71
169	1.89	219	1.18
170	1.42	220	1.18
171	1.42	221	0.71
172	1.66	222	0.24
173	1.42	223	0.24
174	0.95	224	0.00
175	1.42	225	0.00
176	0.95	226	0.24
177	0.24	227	0.24
178	0.71	228	0.47
179	0.95	229	0.47
180	0.00	230	0.24
181	0.24	231	0.00
182	0.71	232	0.24
183	0.47	233	0.24
184	0.71	234	0.24
185	0.71	235	0.71
186	0.71	236	0.95
187	0.95	237	0.95
188	-0.24	238	0.71
189	-1.42	239	0.95
190	0.00	240	0.71
191	0.24	241	0.24
192	-1.42	242	0.24
193	-1.18	243	0.47
194	-0.71	244	0.71
195	-1.42	245	0.47
196	-0.47	246	0.47
197	0.00	247	0.71
198	-1.89	248	0.71
199	-1.42	249	0.71
200	0.00	250	0.47

Pre-Crash Data (Event Record 1)

Legend:
- ▲ Engine RPM
- ▼ Accelerator Pedal, % Full
- ■ Speed, Vehicle Indicated (MPH)
- ◆ Enginge Throttle, % Full
- ● Service Brake (0=Off/10=On)
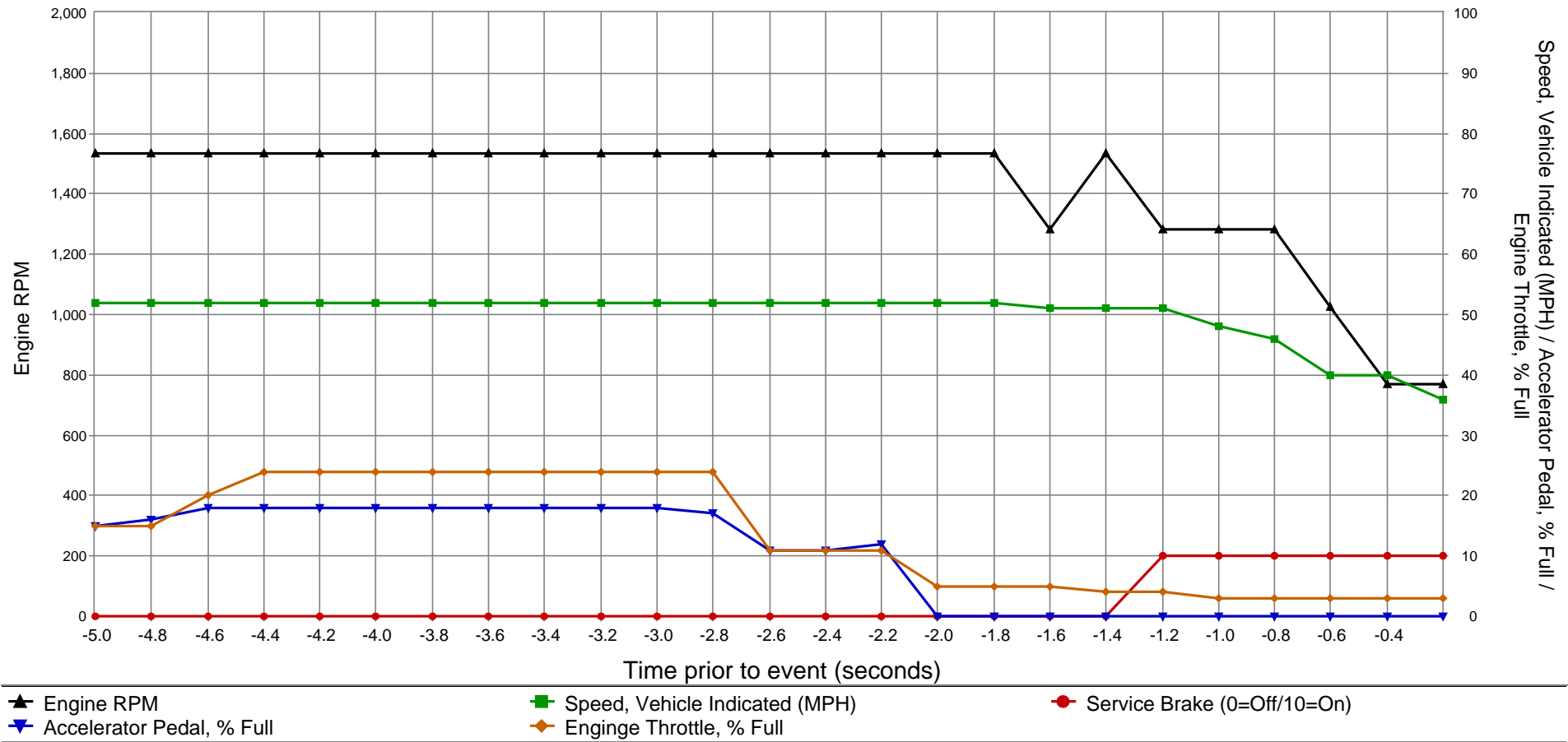
Pre-Crash Data (Event Record 1 - table 1 of 5)

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

Time Stamp (sec)	Vehicle Event Recorder Status	Engine RPM	Speed, Vehicle Indicated (MPH [km/h])	Engine Throttle, % Full	Accelerator Pedal, % Full	Raw Manifold Pressure (kPa)	Service Brake	Brake Switch #2 Status	Brake Lamps On
-5.0	Complete	1,536	52 [84]	15.0	15.0	85	Off	Open	No
-4.8	Complete	1,536	52 [84]	15.4	15.7	85	Off	Open	No
-4.6	Complete	1,536	52 [84]	20.1	17.7	91	Off	Open	No
-4.4	Complete	1,536	52 [84]	24.0	17.7	95	Off	Open	No
-4.2	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-4.0	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-3.8	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-3.6	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-3.4	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-3.2	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-3.0	Complete	1,536	52 [84]	24.0	18.1	95	Off	Open	No
-2.8	Complete	1,536	52 [84]	23.6	17.3	95	Off	Open	No
-2.6	Complete	1,536	52 [84]	11.4	11.4	78	Off	Open	No
-2.4	Complete	1,536	52 [84]	11.4	11.4	75	Off	Open	No
-2.2	Complete	1,536	52 [84]	11.4	11.8	74	Off	Open	No
-2.0	Complete	1,536	52 [84]	4.7	0.0	59	Off	Open	No
-1.8	Complete	1,536	52 [84]	4.7	0.0	38	Off	Open	No
-1.6	Complete	1,280	51 [82]	4.7	0.0	33	Off	Open	No
-1.4	Complete	1,536	51 [82]	3.9	0.0	30	Off	Open	No
-1.2	Complete	1,280	51 [82]	3.5	0.0	26	On	Closed	Yes
-1.0	Complete	1,280	48 [78]	3.1	0.0	26	On	Closed	Yes
-0.8	Complete	1,280	46 [74]	3.1	0.0	25	On	Closed	Yes
-0.6	Complete	1,024	40 [64]	3.1	0.0	26	On	Closed	Yes
-0.4	Complete	768	40 [64]	3.1	0.0	29	On	Closed	Yes
-0.2	Complete	768	36 [58]	3.1	0.0	30	On	Closed	Yes

Pre-Crash Data (Event Record 1 - table 2 of 5)
(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Panic Brake Assist Active (if equip.)	ABS MIL (if equip.)	ESP MIL (if equip.)	ESP Lamp (if equip.)	ESP Lamp Flashing Requested (if equip.)	ESP Disabled (if equip.)	Traction Control Button (if equip.)	ESP Active (if equip.)
-5.0	No	Off	Off	No	No	No	Off	Yes
-4.8	No	Off	Off	No	No	No	Off	Yes
-4.6	No	Off	Off	No	No	No	Off	Yes
-4.4	No	Off	Off	No	No	No	Off	Yes
-4.2	No	Off	Off	No	No	No	Off	Yes
-4.0	No	Off	Off	No	No	No	Off	Yes
-3.8	No	Off	Off	No	No	No	Off	Yes
-3.6	No	Off	Off	No	No	No	Off	Yes
-3.4	No	Off	Off	No	No	No	Off	Yes
-3.2	No	Off	Off	No	No	No	Off	Yes
-3.0	No	Off	Off	No	No	No	Off	Yes
-2.8	No	Off	Off	No	No	No	Off	Yes
-2.6	No	Off	Off	No	No	No	Off	Yes
-2.4	No	Off	Off	No	No	No	Off	Yes
-2.2	No	Off	Off	No	No	No	Off	Yes
-2.0	No	Off	Off	No	No	No	Off	Yes
-1.8	No	Off	Off	No	No	No	Off	Yes
-1.6	No	Off	Off	No	No	No	Off	Yes
-1.4	No	Off	Off	No	No	No	Off	Yes
-1.2	No	Off	Off	No	No	No	Off	Yes
-1.0	No	Off	Off	No	No	No	Off	Yes
-0.8	No	Off	Off	No	No	No	Off	Yes
-0.6	No	Off	Off	No	No	No	Off	Yes
-0.4	Yes	Off	Off	No	No	No	Off	Yes
-0.2	Yes	Off	Off	No	No	No	Off	Yes

Pre-Crash Data (Event Record 1 - table 3 of 5)
(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Steering Input (deg) (if equip.)	Yaw Rate (deg/sec) (if equip.)	Wheel Speed LF (RPM) (if equip.)	Wheel Speed RF (RPM) (if equip.)	Wheel Speed LR (RPM) (if equip.)	Wheel Speed RR (RPM) (if equip.)
-5.0	-8	-2	661	660	660	660
-4.8	-9	-1	662	663	660	661
-4.6	-8	-1	663	664	661	660
-4.4	-10	-1	663	663	660	659
-4.2	-8	-1	662	661	661	662
-4.0	-8	-1	661	662	661	663
-3.8	-7	-1	663	664	661	660
-3.6	-4	-1	662	662	661	659
-3.4	-5	0	663	661	661	663
-3.2	-5	0	663	662	661	662
-3.0	-5	0	664	664	662	663
-2.8	-6	0	667	665	660	660
-2.6	-5	-1	664	663	662	661
-2.4	-4	-1	661	662	662	663
-2.2	-5	0	661	662	661	662
-2.0	-5	-1	660	661	659	661
-1.8	-4	-1	660	659	656	657
-1.6	-2	0	656	656	655	654
-1.4	0	0	652	651	653	654
-1.2	0	0	638	639	641	646
-1.0	1	0	613	615	610	615
-0.8	-1	-1	553	575	560	564
-0.6	2	-2	475	347	533	522
-0.4	-4	-2	504	506	515	413
-0.2	-1	0	393	461	450	461

Pre-Crash Data (Event Record 1 - table 4 of 5)

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

Time Stamp (sec)	ETC Lamp	ETC Lamp Flashing	Engine Torque Applied	Shift Gear Position (if equip.)	Cruise Control System	Cruise Control Active
-5.0	Off	No	Yes	Drive	Off	No
-4.8	Off	No	Yes	Drive	Off	No
-4.6	Off	No	Yes	Drive	Off	No
-4.4	Off	No	Yes	Drive	Off	No
-4.2	Off	No	Yes	Drive	Off	No
-4.0	Off	No	Yes	Drive	Off	No
-3.8	Off	No	Yes	Drive	Off	No
-3.6	Off	No	Yes	Drive	Off	No
-3.4	Off	No	Yes	Drive	Off	No
-3.2	Off	No	Yes	Drive	Off	No
-3.0	Off	No	Yes	Drive	Off	No
-2.8	Off	No	Yes	Drive	Off	No
-2.6	Off	No	Yes	Drive	Off	No
-2.4	Off	No	Yes	Drive	Off	No
-2.2	Off	No	Yes	Drive	Off	No
-2.0	Off	No	Yes	Drive	Off	No
-1.8	Off	No	Yes	Drive	Off	No
-1.6	Off	No	Yes	Drive	Off	No
-1.4	Off	No	Yes	Drive	Off	No
-1.2	Off	No	Yes	Drive	Off	No
-1.0	Off	No	Yes	Drive	Off	No
-0.8	Off	No	Yes	Drive	Off	No
-0.6	Off	No	Yes	Drive	Off	No
-0.4	Off	No	Yes	Drive	Off	No
-0.2	Off	No	Yes	Drive	Off	No

Pre-Crash Data (Event Record 1 - table 5 of 5)
(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Tire Pressure Monitor Faults (if equip.)	Tire 1 Location (if equip.)	Tire 1 Pressure Status (if equip.)	Tire 1 Pressure (psi) (if equip.)	Tire 2 Location (if equip.)	Tire 2 Pressure Status (if equip.)	Tire 2 Pressure (psi) (if equip.)
-5.0	No	LR	Normal	38	RR	Normal	34
-4.8	No	LR	Normal	38	RR	Normal	34
-4.6	No	LR	Normal	38	RR	Normal	34
-4.4	No	LR	Normal	38	RR	Normal	34
-4.2	No	LF	Normal	39	RF	Normal	33
-4.0	No	LF	Normal	39	RF	Normal	33
-3.8	No	LF	Normal	39	RF	Normal	33
-3.6	No	LF	Normal	39	RF	Normal	33
-3.4	No	LF	Normal	39	RF	Normal	33
-3.2	No	LR	Normal	38	RR	Normal	34
-3.0	No	LR	Normal	38	RR	Normal	34
-2.8	No	LR	Normal	38	RR	Normal	34
-2.6	No	LR	Normal	38	RR	Normal	34
-2.4	No	LR	Normal	38	RR	Normal	34
-2.2	No	LF	Normal	39	RF	Normal	33
-2.0	No	LF	Normal	39	RF	Normal	33
-1.8	No	LF	Normal	39	RF	Normal	33
-1.6	No	LF	Normal	39	RF	Normal	33
-1.4	No	LF	Normal	39	RF	Normal	33
-1.2	No	LR	Normal	38	RR	Normal	34
-1.0	No	LR	Normal	38	RR	Normal	34
-0.8	No	LR	Normal	38	RR	Normal	34
-0.6	No	LR	Normal	38	RR	Normal	34
-0.4	No	LR	Normal	38	RR	Normal	34
-0.2	No	LF	Normal	39	RF	Normal	33