CRASH DATA RESEARCH CENTER
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CALSPAN ON-SITE SIDE IMPACT INFLATABLE OCCUPANT PROTECTION SYSTEM CRASH INVESTIGATION
SCI CASE NO.: CA10024

VEHICLE: 2008 CHEVROLET TAHOE LTZ 4X4

LOCATION: NORTH CAROLINA

CRASH DATE: MAY 2010

Contract No. DTNH22-07-C-00043

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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.

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16. Abstract This on-site investigation focused on the side impact inflatable occupant protection system of a 2008 Chevrolet Tahoe LTZ 4x4 that was involved in a run-off road/side impact crash with a group of trees. The Chevrolet was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system, and combination side impact/rollover sensing Inflatable Curtain (IC) air bags. The manufacturer of the Chevrolet has certified that the vehicle was 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 right front passenger positions, seat track positioning sensors, front seat retractor pretensioners, and a front right occupant presence sensor. The right side of the Chevrolet impacted four trees subsequent to hydroplaning on a wet roadway and departing the right road side in a right side leading counterclockwise yaw. The crash sequence resulted in the deployment of the Chevrolet's left and right IC air bags. The Chevrolet came to rest with its right side against the fourth tree in the impact sequence. The 19-year-old male driver, the 18-year-old female front right passenger and the 19-year-old male rear left passenger sustained minor severity soft tissue injuries. All three occupants of the Chevrolet were transported by ground ambulance to a local hospital where they were treated in the emergency department and released the same day.			
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BACKGROUND

Figure 1: Right rear oblique view of the Chevrolet Tahoe.

This on-site investigation focused on the side impact inflatable occupant protection system of a 2008 Chevrolet Tahoe LTZ 4x4 **(Figure 1)**, that was involved in a run-off road/side impact crash with a group of trees. The Chevrolet was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system, and combination side impact/rollover sensing Inflatable Curtain (IC) air bags. The manufacturer of the Chevrolet has certified that the vehicle was 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 right front passenger positions, seat track positioning sensors, front seat retractor pretensioners, and a front right occupant presence sensor. The right side of the Chevrolet impacted four trees subsequent to hydroplaning on a wet roadway and departing the right road side in a right side leading counterclockwise yaw. The crash sequence resulted in the deployment of the Chevrolet's left and right IC air bags. The Chevrolet came to rest with its right side against the fourth tree in the impact sequence. The 19-year-old male driver, the 18-year-old female front right passenger and the 19-year-old male rear left passenger sustained minor severity soft tissue injuries. All three occupants of the Chevrolet were transported by ground ambulance to a local hospital where they were treated in the emergency department and released the same day.

The vehicle was identified through a visit to a regional vehicle salvage facility on June 24, 2010. Based on the location of the impact and severity of the damage, this case was assigned by the Crash Investigation Division (CID) for an on-site investigation on June 25, 2010. The on-site investigation was initiated on June 28, 2010. The investigation involved the inspection and documentation of the Chevrolet, detailed interviews with the driver and the driver's father (who owned the Chevrolet), the documentation of the crash site, and the imaging of both the Event Data Recorder (EDR) and Rollover Sensor (ROS) of the Chevrolet. The imaged the data files are included as **Attachments A and B** of this report.

SUMMARY

VEHICLE DATA

2008 Chevrolet Tahoe

The 2008 Chevrolet Tahoe was manufactured in August 2007 and was identified by the Vehicle Identification Number (VIN) 1GNFK13028J (production number deleted). The vehicle had been driven 67,992 km (42,257 mi) at the time of the crash. The four-wheel drive Chevrolet was powered by a 5.3-liter, V8 engine linked to a four-speed automatic transmission. The braking system consisted of power-assisted front and rear disc brakes with four-wheel antilock and electronic brakeforce distribution. The Chevrolet was also equipped with a direct Tire Pressure Monitoring System (TPMS) and Electronic Stability Control (ESC). The driver stated in the interview that he had not deactivated the ESC at the time of the crash. All windows were closed at the time of the crash. The Chevrolet was equipped with Bridgestone Dueler H/L tires, size P275/55R20. 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 221 kPa (32 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	214 kPa (31 PSI)	6 mm (8/32 in)	None
Left Rear	207 kPa (30 PSI)	4 mm (5/32 in)	None
Right Front	186 kPa (27 PSI)	6 mm (8/32 in)	None
Right Rear	207 kPa (30 PSI)	2 mm (3/32 in)	None

The interior of the Tahoe was configured with leather-surfaced seven-passenger seating. The front bucket seats were separated by a center console and equipped with height adjustable head restraints. Both front head restraints were found in the full-down position at the time of the SCI inspection. The driver's seat was not damaged in this crash sequence and the seat track was in the full-rear position at the time of the SCI inspection. The driver's seat back was reclined five degrees. The owner of the vehicle stated in his interview that he had moved the seat back up during the post-crash removal of personal items, and did not remember the location of the seat back beyond "a normal position". The front right seat was in the full rearward position and had been deformed by the intrusion of the B-pillar and front right door panel. The seat back angle measured 28 degrees aft of vertical.

The second row consisted of captain's chairs with folding backs and adjustable head restraints. The rear left head restraint was in the full-down position and the rear right head restraint was 3 cm (1.2 in) above the full-down position. The rear left seat back angle measured 20 degrees and the rear right seat back angle measured 30 degrees. The rear right seat was compressed laterally by the intrusion of the rear right door and right C-pillar. The third row consisted of a split bench

with electrically folding backs and height adjustable head restraints for the outboard seating positions. The third row seats were folded prior to the impact to allow for an estimated 136 kg (300 lb) of cargo carried in the rear of the Chevrolet.

The interior occupant safety systems consisted of three-point lap and shoulder belts for all seven designated seating positions, front safety belt retractor pretensioners, dual-stage frontal air bags, and roof side rail-mounted combination side impact/rollover sensing IC air bags that provide protection for the six outboard seating positions. The IC air bags were split; the forward IC's protecting the front and middle rows, and separate IC air bags for the third row outboard seats.

CRASH SITE

Figure 2: Overall westbound view of the crash site.

This crash occurred during daylight hours on a two-lane divided east/west highway. The environmental conditions were heavy rain, with standing water on the roadway at the time of the crash. The westbound roadway consisted of two asphalt-surfaced travel lanes. The roadway was bordered by 70 cm (27.6 in) asphalt shoulders. Grass roadsides extended outboard of the shoulders. The terrain of the roadside sloped away from the road for drainage. To the north, the grade measured negative 3.2 percent for a distance of 3.2 m (10.5 ft), transitioning to negative 6.5 percent. A tree line, parallel to the road, was located 19 m (62 ft) north of the north road edge and extended the length of the area in which the crash sequence occurred. In the pre-crash area, the roadway had a grade of negative 1.0 percent. This transitioned to a level grade in the area in which the Chevrolet hydroplaned, and then to a positive 1.0 percent grade along the vehicle's trajectory. The south roadside included a negative 2.0 percent grade to a cable guardrail 4.6 m (15.1 ft) south of the south road edge. The speed limit on the highway was 113 km/h (70 mph). **Figure 2** is an overall approach view of the crash site. Scene Schematics are included as **Figures 9** and **10** of this report, and depict an overview and a close view of the impact area.

CRASH SEQUENCE

Pre-crash

The restrained 19-year-old male driver of the Chevrolet was operating the vehicle westbound on the two-lane highway. Prior to the loss of control, the Chevrolet was traveling in an area of clear, sunny weather and a dry roadway. The driver had activated the cruise control and was traveling at a driver estimated speed of 121-129 km/h (75-80 mph). As the Chevrolet neared the area in which the crash occurred, it encountered an area of heavy rainfall. Approximately 20 seconds later, the vehicle hydroplaned on standing water in the roadway. The driver reported he

applied the brakes fully and the Chevrolet initiated a Counterclockwise (CCW) yaw. The data imaged from the EDR of the Chevrolet indicated that the Chevrolet was traveling at a speed of 126 km/h (78 mph) 2.5 seconds prior to Algorithm Enable (AE). The cruise control data field indicated the cruise control system was "Off" 1 second prior to AE. The Chevrolet departed the roadway to the right in a right side leading yaw. The driver reported that he released the brakes and attempted to steer the vehicle but was unable to regain control. **Figure 3** depicts the Chevrolet's off-road trajectory. The right front wheel of the Chevrolet furrowed slightly into the ground, depositing a 77.5 m (197 ft) rut in the grass of the north roadside. The right rear wheel furrow measured 54 m (177 ft). The right side of the Chevrolet approached the tree line on the north roadside.

Figure 3: Off-road trajectory of the Chevrolet.

Crash

The right side of the Chevrolet impacted a small hardwood tree with a diameter of 7 cm (2.8 in) (Event 1). This tree was fractured approximately 2 m (6.6 ft) above the ground and bent over by the contact with the Chevrolet. The rear aspect of the right side of the Chevrolet then impacted a 26 cm (10.2 in) hardwood tree (Event 2). This tree was sheared off 10 cm (3.9 in) above ground level. The second event impact resulted in the maximum crush to the Chevrolet and redirected the vehicle approximately ten degrees clockwise. The Chevrolet continued traveling northwest and the right side impacted a third tree (Event 3) with a diameter of 8 cm (3.1 in). This tree also fractured 1.8 m (5.9 ft) above the ground and the Chevrolet pushed it over as the vehicle traveled over the tree. The right side of the Chevrolet then impacted a 36 cm (14.2 in) pine tree with the right rear door (Event 4). The fourth impact brought the vehicle to a stop. The area of impact is shown in **Figure 4**. The direction of force for this multiple impact sequence was within the 9 o'clock sector. The force of the impact actuated the front seat safety belt pretensioners and deployed the IC air bags. The damage algorithm of the WinSMASH program was used to calculate a total delta-V of 24 km/h (14.9 mph) for the Chevrolet. The longitudinal delta-V for the Chevrolet was 0 km/h, and the lateral delta-V was -24 km/h (-14.9 mph). The Chevrolet came to rest facing southwest against the pine tree.

Figure 4: Area of impact with the four trees.

Post-crash

Police, emergency medical and tow personnel responded to the crash site. The driver, front right and rear left passengers of the Chevrolet were able to exit the vehicle under their own power through the left doors. All three occupants of the Chevrolet were transported by ground ambulance to a local hospital where they were treated in the emergency department for soft tissue injuries and released. The Chevrolet was towed from the scene due to disabling damage. It was transferred from the local tow yard to a regional insurance salvage facility for auction, where it was inspected.

2008 CHEVROLET TAHOE

Exterior Damage

The right side of the Chevrolet sustained moderate damage in this side impact crash sequence **(Figure 5)**. The damage from the four tree impacts was overlapping between the right B-pillar and right rear corner of the Chevrolet. On the right plane, the direct contact damage began 118 cm (46.5 in) forward of the vehicle's right rear axle, and extended rearward 204 cm (80.3 in). The maximum crush was located 54 cm (21.3 in) rearward of the right rear axle, and measured 37 cm (14.6 in). The combined direct and induced damage (Field L) began 212 cm (83.5 in) forward of the right rear axle and extended rearward 314 cm (123.6 in). A residual crush profile was documented along this full width and was as follows: C1 = 11 cm (4.3 in), C2 = 25 cm (9.8 in), C3 = 15 cm (5.9 in), C4 = 34 cm (13.4 in), C5 = 10 cm (3.9 in), C6 = 0 cm. The individual tree impacts from Events 2 and 4 were located 38-74 cm (15-29.1 in) aft of the rear axle and 46-118 cm (18.1-46.5 in) forward of the rear axle, respectively. The maximum crush for the second tree impact was the profile's maximum crush, 37 cm (14.6 in). The maximum crush for the fourth tree impact was 36 cm (14.2 in). The right doors were damaged and were jammed shut post-crash. Both doors intruded into the passenger compartment. The right wheelbase was shortened by 4 cm (1.6 in). The Collision Deformation Classification (CDC) assigned for the overall impact damage was 03RZAW3.

Figure 5: Right side damage to the Chevrolet.

There was minor direct damage to the left rear corner of the Chevrolet that began 58 cm (22.8 in) aft of the left rear axle and extended rearward 43 cm (16.9 in) to the left rear bumper corner. **Figure 6** depicts the damage to the left rear of the Chevrolet. The combined direct and induced damage (Field L) also began 58 cm (22.8 in) aft

Figure 6: Left rear corner damage to the Chevrolet.

of the left rear axle, extending rearward to the bumper corner. The maximum crush was located at C1, the back left bumper corner, and measured 6 cm (2.4 in). A residual crush profile was measured at the lower door level and was as follows: C1 = 6 cm (2.4 in), C2 = 1 cm (0.4 in), C3 = 1 cm (0.4 in), C4 = 1 cm (0.4 in), C5 = 1 cm (0.4 in), C6 = 0 cm. Due to the Chevrolet traveling in a right side leading yaw into the tree line, it is likely that this damage occurred as the vehicle was being towed from final rest.

The windshield was fractured by the impact forces, with more significant damage along the right A-pillar and windshield header. The right rear side windows, backlight, left rear cargo area window and sunroof glazing were disintegrated by the impact sequence. The left side windows for the front and second row were not damaged in this crash.

Interior Damage

The Chevrolet sustained moderate severity damage that was attributed to passenger compartment intrusion, occupant contact and air bag deployment. The restrained driver had loaded the center console with the right side of his abdomen, depositing a scuff mark on the left side of the console that extended 0-13 cm (0-5.1 in) rearward from the front left corner of the console and 0-8 cm (0-3.1 in) below the top edge of the console. The driver's right knee impacted the center instrument panel, depositing a scuff mark 48-56 cm (18.9 – 22 in) above the floor and 11-17 cm (4.3-6.7 in) right of the steering column. The restrained front right passenger's right foot scuffed laterally across the glove compartment door from left to right, depositing a 17 x 6 cm (6.7 x 2.4 in) scuff mark that began 31 cm (12.2 in) left of the right edge of the door and 2 cm (0.8 in) below the top of the door. There was body fluid on the inboard side of the front left seat back located 0-9 cm (0-3.5 in) forward of the rear corner of the seat and 10-19 cm (3.9-7.5 in) below the top of the seat. The unrestrained rear left passenger deformed the inboard arm rest of the rear left seat to the right. He deposited a scuff mark on the right C-pillar in an area unprotected by the right IC. This scuff mark measured 11 cm (4.3 in) vertically and 12 cm (4.7 in) horizontally and was located 17 cm (6.7 in) below the right roof side rail and 9 cm (3.5 in) aft of the forward edge of the right C-pillar. There was smeared body fluid on the rear left seat back located 18-24 cm (7.1-9.4 in) above the bight of the seat and 0-12 cm (0-4.7 in) left of the inboard vertical seat back seam. There was lateral intrusion from the rear half of the front right door to the side panel immediately forward of the D-pillar. The front right seat was compressed laterally 10 cm (3.9 in) and the rear right seat was compressed laterally 20 cm (7.9 in). **Figure 7** depicts the intrusion to the right side of the interior of the Chevrolet.

Figure 7: Lateral intrusion to the passenger compartment of the Chevrolet.

The intrusion to the Chevrolet is listed on the following table:

Position	Component	Direction	Magnitude
Row 1 Right	Right door rear upper quadrant	Lateral	18 cm (7.1 in)
Row 1 Right	B-pillar	Lateral	23 cm (9.1 in)
Row 1 Right	Roof side rail	Lateral	20 cm (7.9 in)
Row 1 Right	Sill	Lateral	12 cm (4.7 in)
Row 2 Right	Right door fwd. upper quadrant	Lateral	34 cm (13.4 in)
Row 2 Right	Roof side rail	Lateral	20 cm (7.9 in)
Row 2 Right	Sill	Lateral	23 cm (9.1 in)
Row 2 Right	C-pillar	Lateral	8 cm (3.1 in)
Row 3 Right	Side panel rear of the C-pillar	Lateral	23 cm (9.1 in)
Row 3 Right	Roof side rail	Lateral	2 cm (0.8 in)

Manual Restraint Systems

The Chevrolet was equipped with 3-point manual lap and shoulder belts for the seven designated seating positions. All belt systems utilized continuous loop webbing and sliding latch plates. The front D-rings were height adjustable, with the front left in the full-up position and the front right 3 cm (1.2 in) below the full-up position. The driver's belt retracted onto an Emergency Locking Retractor (ELR), and the front right passenger's belt retracted onto a switchable ELR/Automatic Locking Retractor (ALR). The front belt systems utilized retractor-mounted pretensioners, which actuated during this crash sequence. The front belts were in use at the time of the crash. The front left belt was gathered in the latch plate 53 cm (20.9 in) above the floor anchor and locked in the used position by the actuated retractor pretensioner. There was 124 cm 48.8 in) of belt webbing spooled out and locked. There was an abrasion on the front right belt webbing from contact with the right D-ring. This abrasion was 7 cm (2.8 in) in length and was located 139 cm (54.7 in) above the floor anchor. There was 149 cm (58.6) of spooled out and locked webbing for the front right seat.

The second and third row belt systems utilized a switchable ELR/ALR retractor. The second row occupant in the rear left seat was not utilizing the safety belt at the time of the crash. The rear left D-ring was not height adjustable and the belt was free from occupant contact evidence and damage. The third row safety belts for all three seating positions were integrated into the seat backs.

Frontal Air Bag System

The Chevrolet Tahoe 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, front seat track positioning sensors, a front right occupant presence sensor, front seat retractor pretensioners, and safety belt buckle switches. The manufacturer of the Chevrolet has certified that this vehicle

meets 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 four-spoke steering wheel and did not deploy in this crash. The front right air bag was mounted within the top aspect of the right instrument panel and did not deploy in this crash.

Side Impact Air Bag System

The Chevrolet was equipped with combination side impact/roll-sensing roof side rail-mounted IC air bags. Each IC consisted of two air bag chambers per side. The forward IC air bags provided protection for the front and second row outboard passengers, and the aft IC air bags provided protection for the third row outboard passengers. The forward IC air bags were labeled with model number E6199600-00, pattern 698, and design 69821342. The aft IC bags were not labeled.

The left and right IC air bags all deployed from their respective roof side rails. The forward ICs measured 162 cm (63.8 in) in length. The bags measured 57 cm (22.4 in) in height at the front seating positions and 55 cm (21.7 in) in height at the second row positions. The IC was attached to the A-pillars by a non-inflating triangular sail panel that measured 35 cm (13.8 in) in height and 22 cm (8.7 in) in length. The left sail panel had been cut post-crash. The forward IC air bags provided head protection from 22 cm rear of the A-pillar to the C-pillar and from the roof side rail extending below the window sill for the front and second rows. The left IC was free from occupant contacts and crash-related damage.

The inside aspect of the forward right IC contained a scuff mark attributed to the front right passenger's head. This scuff mark was located 5-15 cm (2-5.9 in) above the lower edge of the air bag and 72-85 cm (28.3-33.5 in) rear of the front edge of the air bag. **Figure 8** depicts the right front IC air bag.

Figure 8: Right IC air bag.

The outboard side of the right IC contained two abraded areas and a 4 cm (1.6 in) cut near the location of the right rear window. The upper left abrasion measured 45 cm (17.7 in) in width and 19 cm (7.5 in) in height. This abrasion began 9 cm (3.5 in) forward of the rear edge of the air bag and 31 cm (12.2 in) above the lower edge of the air bag. The 4 cm (1.6 in) cut was located 9 cm (3.5 in) above the lower edge of the air bag and 58 cm (22.8 in) forward of the rear edge of the air bag. The lower right abrasion measured 8 cm (3.1 in) in width and 7 cm (2.8 in) in height and was located 74 cm (29.1 in) forward of the rear edge of the air bag and 1 cm (0.4 in) above the lower edge of the air bag. The cut and abrasions resulted from contact with the impacted tree trunk.

The aft IC air bags measured 52 cm (20.5 in) in height and 53 cm (20.9 in) in width. They were attached to the C- and D-pillars by non-inflating sail panels. The rear panel to the D-pillar was triangular in shape and was 30 cm (11.8 in) in height and, 13 cm in length. The sail was attached to the D-pillar by an 8 cm (3.1 in) webbing strap. The front panel attached to the C-pillar was rectangular in shape and was 45 cm (17.7 in) in height and 9 cm (3.5 in) in width. There were grommets in the sail panel that allowed it to travel vertically on a metal rod adjacent to the C-pillars. The left aft IC was free from damage or contact evidence. The right aft IC contained an abrasion on its outboard side that measured 32 cm (12.6 in) in width and 8 cm (3.1 in) in height. This abrasion was located 10 cm (3.9 in) above the bottom of the air bag and 8 cm (3.1 in) forward of the rear edge of the air bag and resulted from contact with the impacted tree.

Event Data Recorder

The air bag systems in the Chevrolet were controlled by a Sensing and Diagnostic Module (SDM) that was located under the center console. The SDM controlled the diagnostic, sensing and deployment command functions of the air bag systems. The SDM also had Event Data Recorder (EDR) capabilities. The Rollover Sensor (ROS) also had EDR capabilities. The EDR and ROS were imaged during this SCI investigation utilizing the diagnostic link connector and the Bosch Crash Data Retrieval scan tool and software version 3.3. The imaged data was reread and has been reported with version 3.4.

The EDR recorded one non-deployment event and one deployment event pertaining to this crash. The non-deployment event occurred first. The time between the two events was 0.04 seconds. There were no other unrecorded events associated to the crash sequence. The recorded non-deployment event was associated with the vehicle's off-road trajectory. The recorded deployment event was related to the IC air bag deployment. A field within the imaged data indicated these air bags were commanded to deploy as a result of a side impact event (not as a result of a rollover). The deployment command for the IC air bags occurred 637.5 milliseconds after AE. The maximum longitudinal recorded delta-V was + 38.9 km/h (+24.19 mph) 220 milliseconds after deployment. The maximum recorded lateral delta-V was -31.8 km/h (-19.73 mph). The delta-V data appeared to be suspect based on the sudden change in the magnitude of the reported speed change at T minus 10 milliseconds. The discrepancy in the data may be related to the long duration of the overall crash sequence relative to AE. The imaged EDR is included as Attachment A at the end of this report.

The recorded non-deployment and deployment data were locked and the recording was complete. The imaged data indicated that the driver and front right passenger safety belts were buckled. The ignition cycle-count at deployment was 8,018 and 8,024 at investigation. The EDR recorded 2.5 seconds of pre-crash data for the multiple vehicle parameters, which are listed in the following table:

Parameter	-2.5 Sec	-2 Sec	-1.5 Sec	-1 Sec	-0.5 Sec
Vehicle Speed (MPH)	78	76	72	66	60
Engine Speed (RPM)	2176	2048	1920	1728	1600
Percent Throttle	13	13	12	11	11
Brake Switch Circuit Status	Off	Off	Off	Off	Off
Accelerator Pedal Position (percent)	0	0	0	0	0

The imaged ROS data indicated that a non-rollover event was recorded on ignition cycle 8,018. The crash record was unlocked and the recording was complete. The imaged data is included as Attachment B.

DRIVER DEMOGRAPHICS/DATA

Driver Age/Sex:	19-year-old/Male
Height:	183 cm (72 in)
Weight:	84 kg (185 lb)
Eyewear:	Sunglasses
Seat Track Position:	Full-rear
Manual Safety Belt Use:	3-point lap and shoulder
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Exited under his own power through left front door
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Treated and released from a local hospital

Driver injuries

Injury	Injury Severity (AIS 2005/Update 08)	Injury Source
8 cm (3 in) abrasion on front of left shoulder	Minor (710202.1,2)	Safety belt webbing
10 cm (4 in) abrasion on anterior left forearm	Minor (710202.1,2)	Steering wheel rim
Contusion from elbow to wrist on dorsal side of right arm	Minor (710402.1,1)	Center console

Source = Emergency Room Records

Driver Kinematics

The 19-year-old male driver was seated in a full-rear track position. He was restrained by the manual 3-point lap and shoulder belt system. As the Chevrolet hydroplaned, he applied the brakes hard in a panic maneuver. As the vehicle yawed to the right, he released the brakes and attempted to steer the vehicle but was unable to correct the yaw.

The right side impact actuated the driver's retractor pretensioner and deployed the IC air bags. In response to the lateral direction of the impact force, the driver initiated a right and forward trajectory within the front left seating position. He loaded the safety belt with his abdomen and left shoulder, resulting in the abrasion to the front of his left shoulder. His left arm was displaced from the steering wheel and was abraded by the rim. His right side and right arm loaded the center console, depositing a scuff mark on the center console and resulting in the right lower arm contusion. The driver came to rest in the front left seat. He was able to release the safety belt and open the left front door. He exited the vehicle under his own power and transported by ground ambulance to a local hospital where he was treated in the emergency department and released the same day.

FRONT RIGHT OCCUPANT DEMOGRAPHICS/DATA

Age/Sex:	18-year-old/Female
Height:	168 cm (66 in)
Weight:	54 kg (120 lb)
Eyewear:	Sunglasses
Seat Track Position:	Full rear
Manual Safety Belt Use:	3-point lap and shoulder
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Exited under her own power
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Treated and released from a local hospital

Front Right Occupant Injuries

Injury	Injury Severity (AIS 2005/Update 08)	Injury Source
Right side chest wall contusion	Minor (410402.1,1)	Right B-pillar
Chest contusion, mid-chest	Minor (410402.1,4)	Right B-pillar

Source = Emergency Room Records

Front Right Occupant Kinematics

The 18-year-old female front right passenger was seated in a full-rear track position and was restrained by the manual 3-point lap and shoulder belt system. Her seat back was in a reclined

position prior to the initiation of the crash sequence and her chest was not contacting the shoulder portion of the safety belt. When the Chevrolet impacted the trees, the safety belt retractor pretensioner actuated and the IC air bags deployed. The front right passenger initiated a rightward trajectory within the front right seating position. Her lower body was held in place by the safety belt. The passenger's head and upper body loaded the deployed right IC, depositing a scuff mark on the IC and her chest loaded the B-pillar resulting in the chest contusions. The front right passenger then initiated a rebound trajectory within the front right seating position, and she came to rest against the center console of the Chevrolet.

The front right passenger exited the vehicle under her own power through the front left door. She was transported by ground ambulance to a local hospital where she was treated in the emergency department for chest wall contusions and released the same day.

REAR LEFT OCCUPANT DEMOGRAPHICS/DATA

Age/Sex:	19-year-old/Male
Height:	163 cm (64 in)
Weight:	64 kg (140 lb)
Eyewear:	Sunglasses
Seat Track Position:	Not adjustable
Manual Safety Belt Use:	None used
Usage Source:	SCI vehicle inspection
Egress from Vehicle:	Exited under his own power
Mode of Transport from Scene:	Ground ambulance
Type of Medical Treatment:	Treated and released from a local hospital

Rear Left Occupant Injuries

Injury	Injury Severity (AIS 2005/Update 08)	Injury Source
Cervical strain	Minor (640278.1,6)	Right C-pillar, indirect
Upper back (thoracic) strain	Minor (640478.1,7)	Right C-pillar, indirect
Small facial laceration (2 cm over right eye)	Minor (210602.1,1)	Flying glass
Small facial laceration (1 cm under left eye)	Minor (210602.1,2)	Flying glass
Small facial laceration (1 cm on chin)	Minor (210602.1,8)	Flying glass

Source = Emergency Room Records

Rear Left Occupant Kinematics

The 19-year-old male rear passenger was seated in the left rear captain's chair and was not restrained by the manual 3-point lap and shoulder belt system. When the Chevrolet impacted the trees, the rear left passenger initiated a right trajectory across the second row of the Chevrolet. The right side of his abdomen loaded and deformed the inboard armrest of the left seat. He continued on his right trajectory and contacted the right C-pillar with his head in an area unprotected by the right IC air bags. The cervical and thoracic strain (indirectly) resulted from this contact. Glass fragments from disintegrated rear glazing contacted his face, resulting in three small lacerations. His chest, abdomen and right arm loaded the rear right door. The rear left occupant then initiated a rebound trajectory to the left and came to rest with his head on the rear left seat. He deposited body fluid on the lower aspect of the rear left seat and on the inboard aspect of the front left seat back as he exited the vehicle.

The rear left passenger exited the vehicle under his own power through the left door. Due to neck and back pain he was immobilized upon the arrival of EMS. He was transported by ground ambulance to a local hospital where she was treated in the emergency department for the facial lacerations and soft tissue injuries and was released the same day.

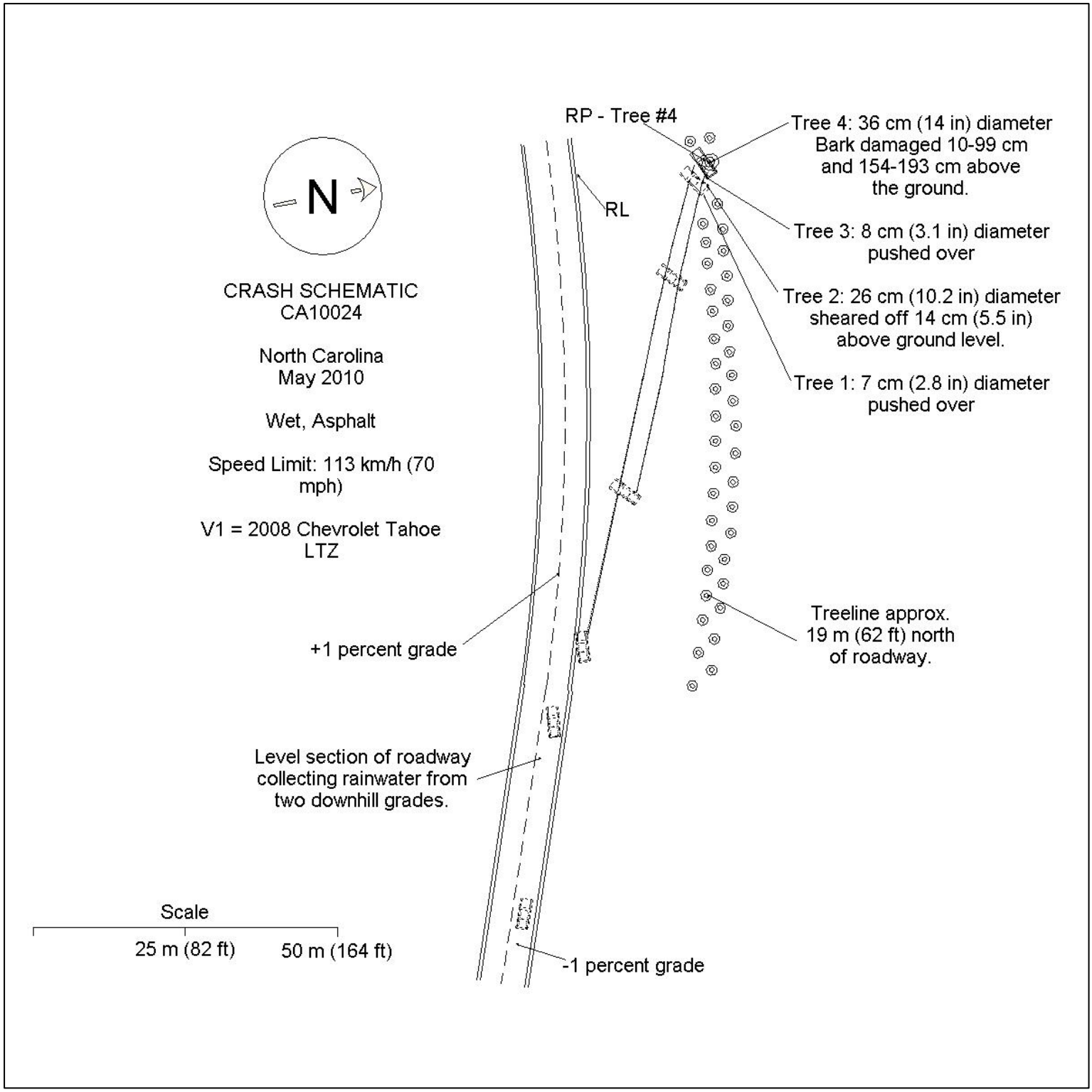


Figure 9: Scene Schematic

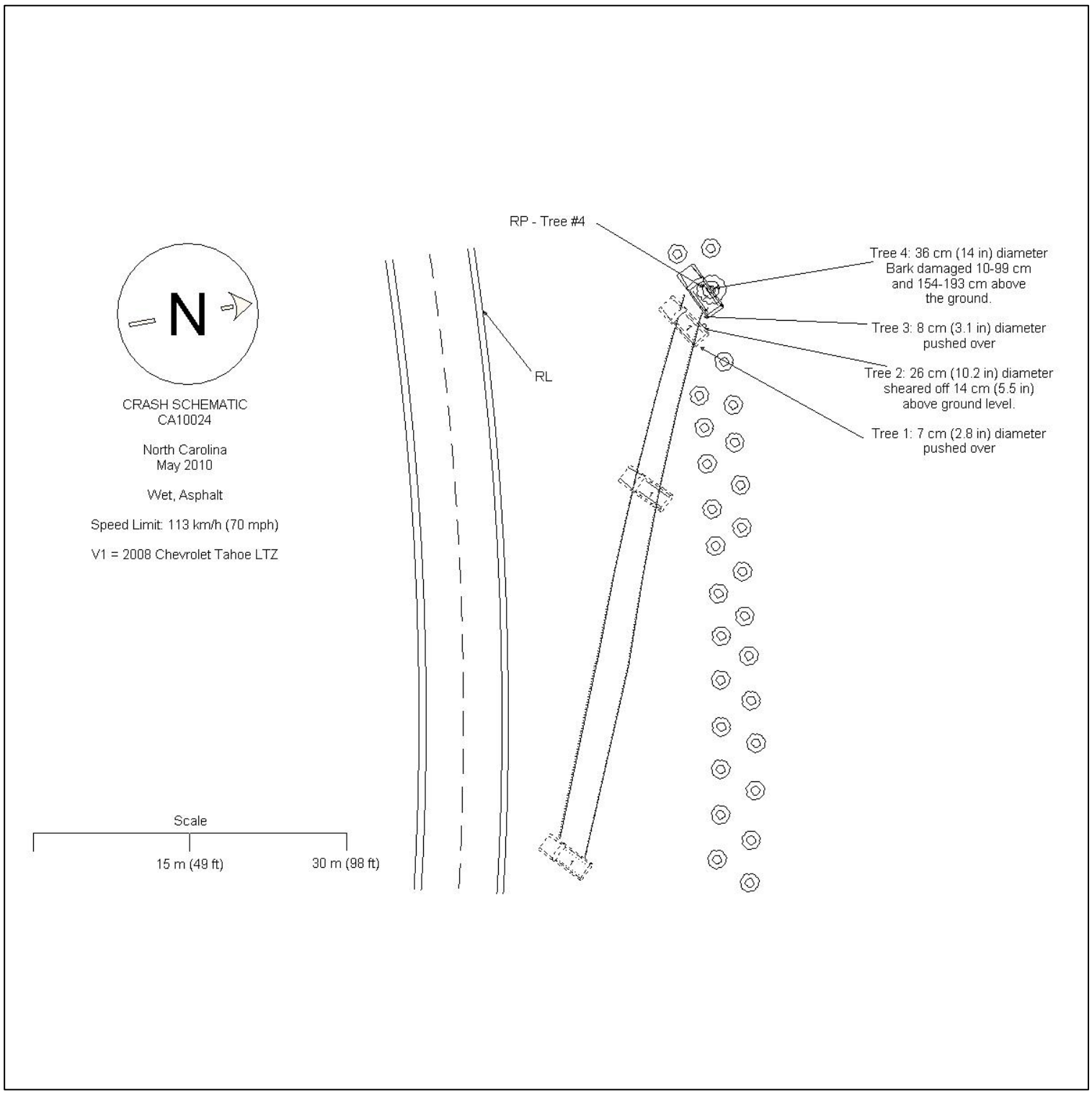


Figure 10: Enlarged area at impact locations.

ATTACHMENT A

2008 Chevrolet Tahoe EDR DATA

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	1GNFK13028J******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CA10024_ACM.CDR
Saved on	Friday, June 25 2010 at 03:09:42 PM
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	Deployment Non-Deployment

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH. A Non-Deployment Event may contain Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle velocity change. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds of a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM.

The second type of SDM recorded crash event is the Deployment Event. It also may contain Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. If a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

Data:

-SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment Events, the SDM will record 220 milliseconds of data after deployment criteria is met and up to 70 milliseconds before deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.

-The CDR tool displays time from Algorithm Enable (AE) to time of deployment command in a deployment event and AE to time of maximum SDM recorded vehicle velocity change in a non-deployment event. Time from AE begins when the first air bag system enable threshold is met and ends when deployment command criteria is met or at maximum SDM recorded vehicle velocity change. Air bag systems such as frontal, side, or rollover, may be a source of an enable. The time represented in a CDR report can be that of the enable of one air bag system to the deployment time of another air bag system.

-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity.

-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.

-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
- -significant changes in the tire's rolling radius
- -final drive axle ratio changes
- -wheel lockup and wheel slip

-Brake Switch Circuit Status indicates the open/closed state of the brake switch circuit.

-Pre-Crash data is recorded asynchronously.

-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:
- -the SDM receives a message with an "invalid" flag from the module sending the pre-crash data
- -no data is received from the module sending the pre-crash data

-no module is present to send the pre-crash data
-Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, "N/A" is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-The ignition cycle counter relies upon the transitions through OFF->RUN->CRANK power-moding messages, on the GMLAN communication bus, to increment the counter. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene

Data Source:
All SDM recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Status Data (Pre-Crash) is transmitted to the SDM, by various vehicle control modules, via the vehicle's communication network.
-The Belt Switch Circuit is wired directly to the SDM.

01005_SDMC-delphi_r001

Multiple Event Data

Associated Events Not Recorded	0
An Event(s) Preceded the Recorded Event(s)	No
An Event(s) was in Between the Recorded Event(s)	No
An Event(s) Followed the Recorded Event(s)	No
The Event(s) Not Recorded was a Deployment Event(s)	No
The Event(s) Not Recorded was a Non-Deployment Event(s)	No

System Status At AE

Low Tire Pressure Warning Lamp (If Equipped)	OFF
Vehicle Power Mode Status	Run
Remote Start Status (If Equipped)	Inactive
Run/Crank Ignition Switch Logic Level	Active

Pre-crash data

Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	1.11	5.16

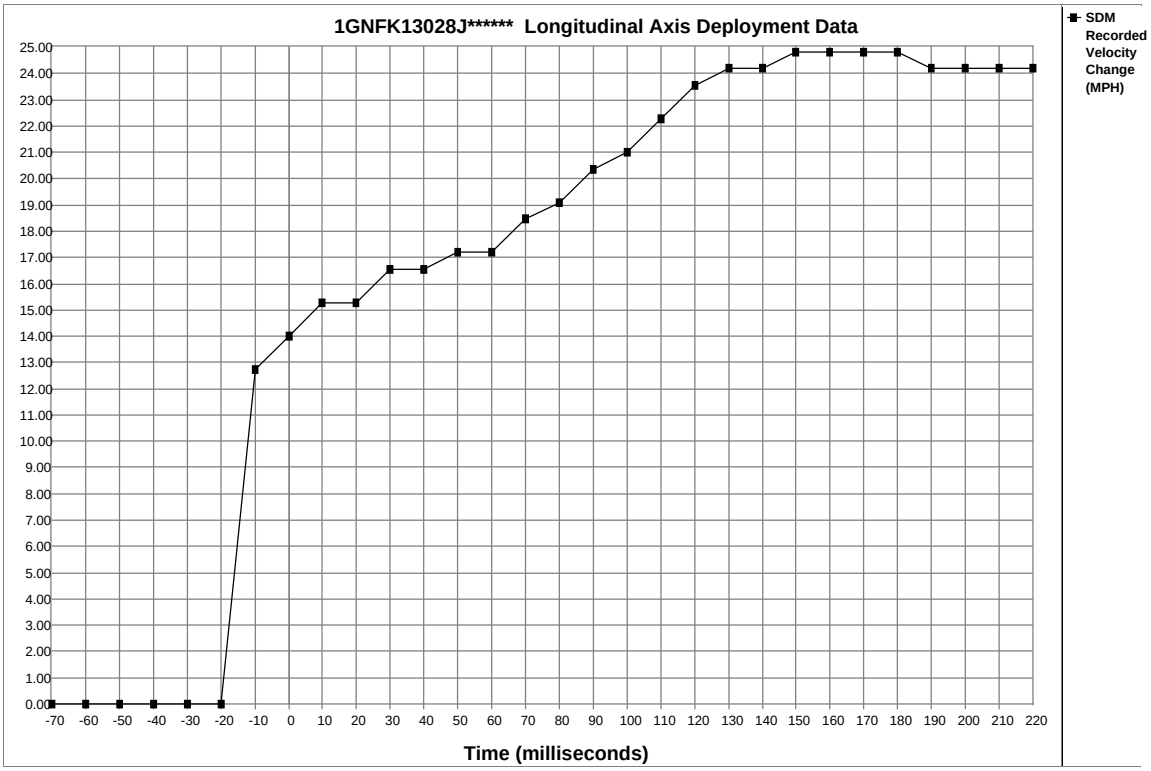
Pre-Crash Data

Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Accelerator Pedal Position (percent)	0	0	0	0	0
Vehicle Speed (MPH)	78	76	72	66	60
Engine Speed (RPM)	2176	2048	1920	1728	1600
Percent Throttle	13	13	12	11	11
Brake Switch Circuit Status	OFF	OFF	OFF	OFF	OFF

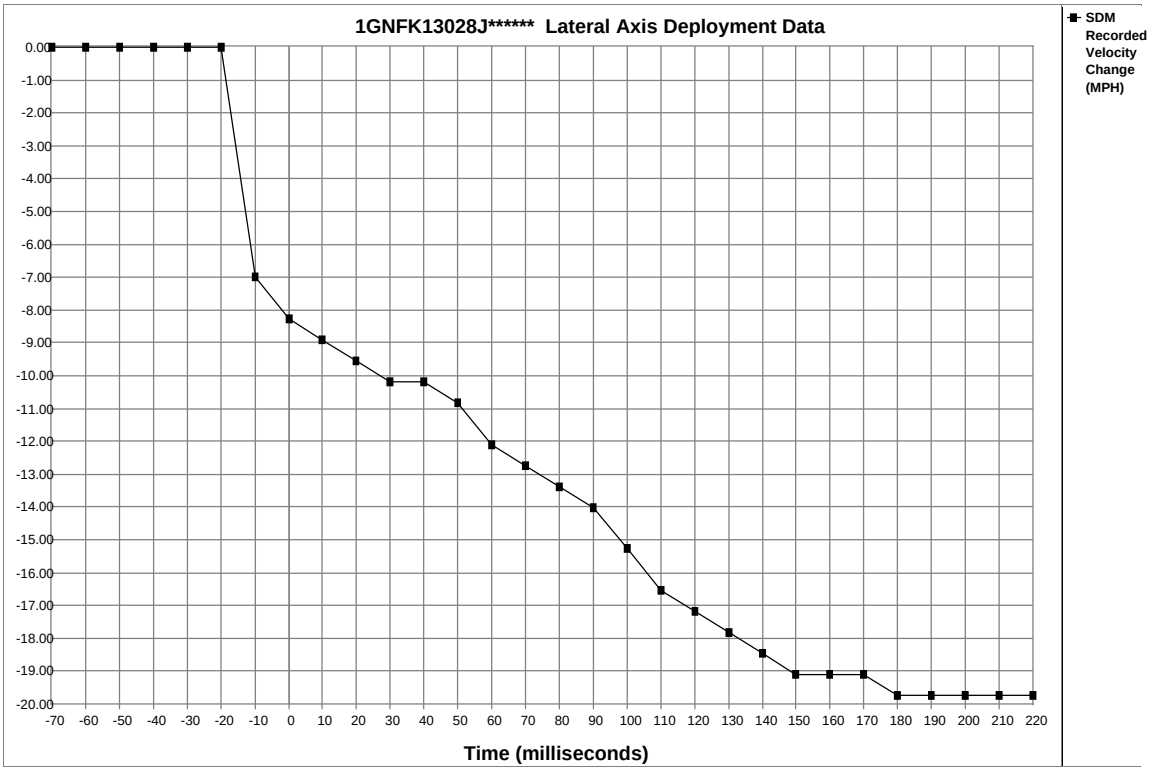
System Status At Deployment

Ignition Cycles At Investigation	8024
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON/OFF Time Continuously (seconds)	655350
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	6005
Ignition Cycles At Event	8018
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	BUCKLED
Driver Seat Position Switch Circuit Status	Rearward
Passenger Classification Status at Event Enable	Large Occupant Classification Type #1
Current Passenger Position Status at Event Enable	Unknown
Previous Passenger Position Status at Event Enable	Unknown
Passenger Air Bag Indicator Status at Event Enable	ON
Diagnostic Trouble Codes at Event, fault number: 1	N/A
Diagnostic Trouble Codes at Event, fault number: 2	N/A
Diagnostic Trouble Codes at Event, fault number: 3	N/A
Diagnostic Trouble Codes at Event, fault number: 4	N/A
Diagnostic Trouble Codes at Event, fault number: 5	N/A
Diagnostic Trouble Codes at Event, fault number: 6	N/A
Diagnostic Trouble Codes at Event, fault number: 7	N/A
Diagnostic Trouble Codes at Event, fault number: 8	N/A
Diagnostic Trouble Codes at Event, fault number: 9	N/A
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Driver Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	637.5
Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	637.5
Rollover Occupant Containment Enable Status	Enabled
Side Air Bag Deployment Status	Side Air Bag(s) Were First Commanded to Deploy Due to Side Impact Event
Rollover Sensor Status	No Rollover
Time From Rollover Event Enable to Deployment (ms)	0
Crash Record Locked	Yes
Vehicle Event Data (Pre-Crash) Associated With This Event	No
SDM Synchronization Counter	8018
Time Between Events (sec)	.04
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	No
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded for Disposal	No
Passenger Second Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded for Disposal	No
Driver Pretensioner Deployment Loop Commanded	Yes
Passenger Pretensioner Deployment Loop Commanded	Yes
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	Yes
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	Yes
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	Yes
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	Yes
Driver Knee Deployment Loop Commanded	No

Passenger Knee Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	No



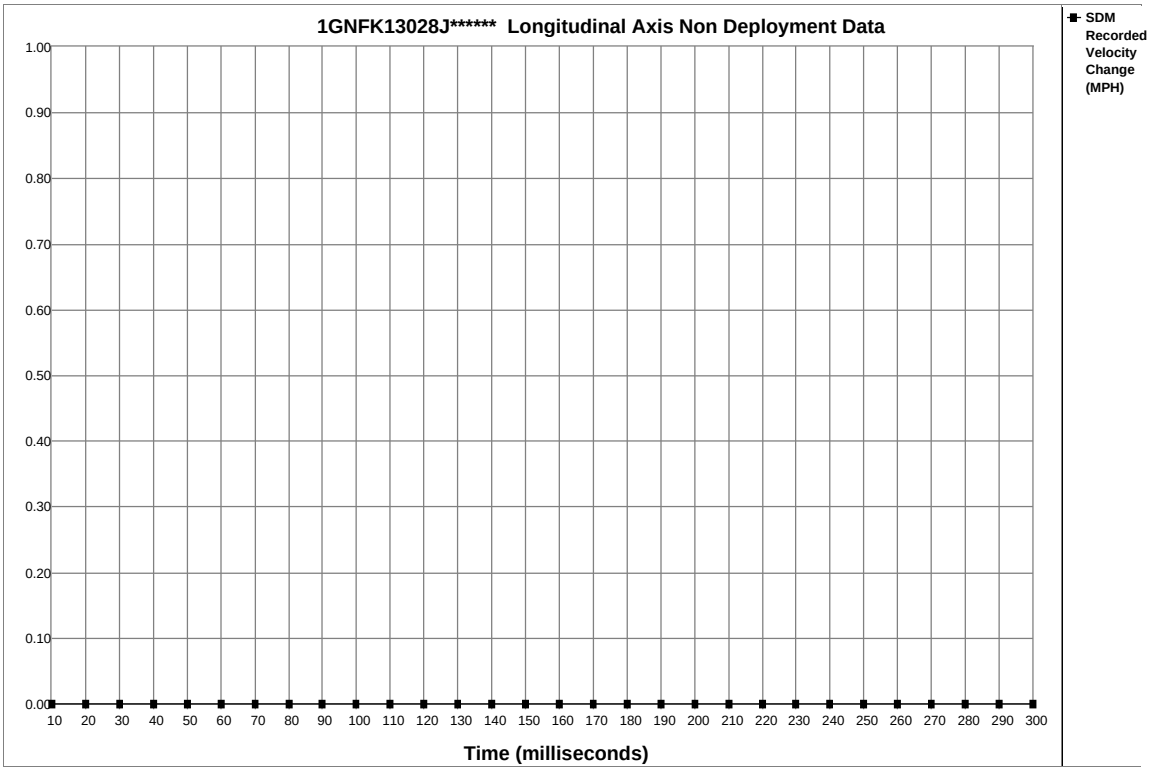
Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	12.73	14.01	15.28	15.28	16.55	16.55	17.19	17.19	18.46
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	19.10	20.37	21.01	22.28	23.55	24.19	24.19	24.83	24.83	24.83	24.83	24.19	24.19	24.19	24.19



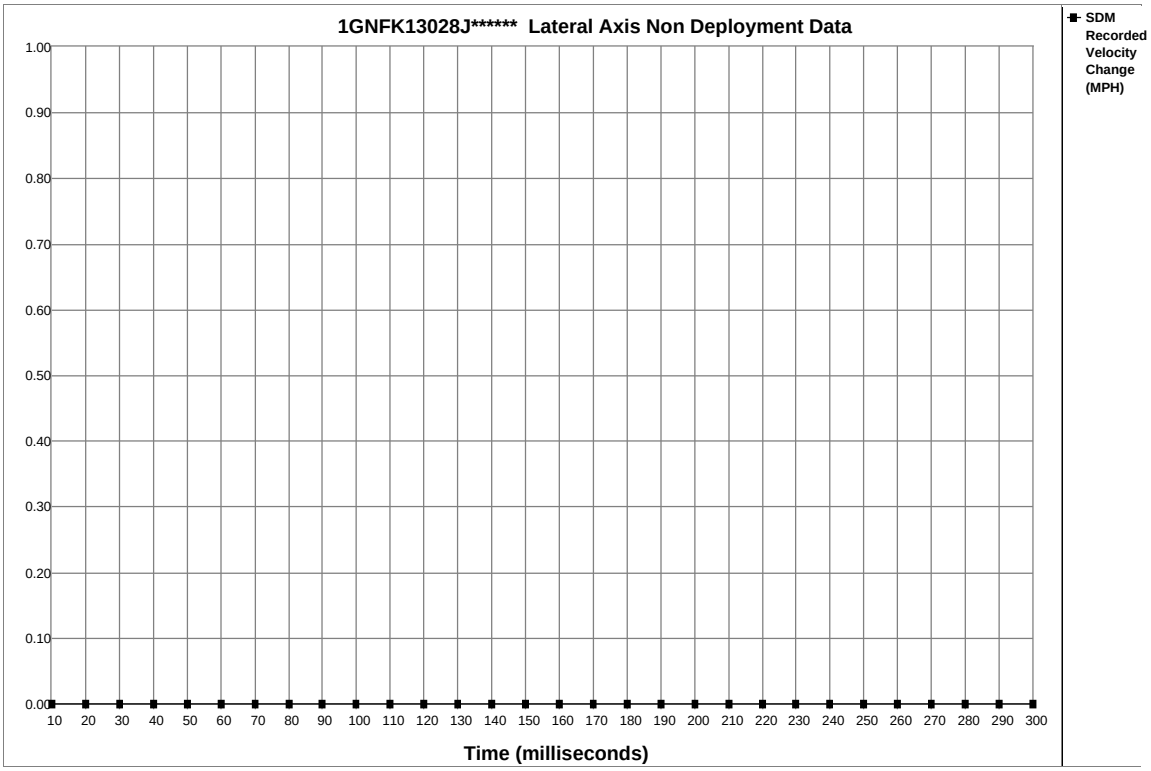
Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	-7.00	-8.28	-8.91	-9.55	-10.19	-10.19	-10.82	-12.10	-12.73
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	-13.37	-14.01	-15.28	-16.55	-17.19	-17.82	-18.46	-19.10	-19.10	-19.10	-19.73	-19.73	-19.73	-19.73	-19.73

System Status At Non-Deployment

Ignition Cycles At Investigation	8024
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON/OFF Time Continuously (seconds)	655350
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	6005
Ignition Cycles At Event	8018
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	BUCKLED
Driver Seat Position Switch Circuit Status	Rearward
Diagnostic Trouble Codes at Event, fault number: 1	N/A
Diagnostic Trouble Codes at Event, fault number: 2	N/A
Diagnostic Trouble Codes at Event, fault number: 3	N/A
Diagnostic Trouble Codes at Event, fault number: 4	N/A
Diagnostic Trouble Codes at Event, fault number: 5	N/A
Diagnostic Trouble Codes at Event, fault number: 6	N/A
Diagnostic Trouble Codes at Event, fault number: 7	N/A
Diagnostic Trouble Codes at Event, fault number: 8	N/A
Diagnostic Trouble Codes at Event, fault number: 9	N/A
Maximum SDM Recorded Velocity Change (MPH)	0.00
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	0
Crash Record Locked	Yes
Deployment Event Recorded in the Non-Deployment Record	No
Vehicle Event Data (Pre-Crash) Associated With This Event	Yes
SDM Synchronization Counter	8018
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	No
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded for Disposal	No
Passenger Second Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded for Disposal	No
Driver Pretensioner Deployment Loop Commanded	No
Passenger Pretensioner Deployment Loop Commanded	No
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Driver Knee Deployment Loop Commanded	No
Passenger Knee Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	No



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ATTACHMENT B

2008 Chevrolet Tahoe ROS DATA

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	1GNFK13028J******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CA10024_ROS.CDR
Saved on	Friday, June 25 2010 at 03:11:02 PM
Collected with CDR version	Crash Data Retrieval Tool 3.3
Reported with CDR version	Crash Data Retrieval Tool 3.4
EDR Device Type	Roll-over Sensor
Event(s) recovered	Event Record "A"

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Rollover Event. A Non-Deployment Event records data but does not deploy the air bag(s). The ROS can store one Non-Rollover Event. This event will be overwritten by the next Non-Rollover Event or by a second Rollover Event. A locked Non-Rollover Event cannot be overwritten or cleared by the ROS.
The second type of ROS recorded crash event is the Rollover Event. The ROS can store up to two different Rollover Events. Rollover Events cannot be overwritten or cleared from the ROS. Once the ROS records two Rollover Events, the ROS must be replaced.

Data:

-The ROS Records Lateral Acceleration, Vertical Acceleration, and Roll Rate data. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Events, the ROS will record 750 milliseconds of data before the deployment criteria is met. For Non-Rollover Events, the ROS will record 750 milliseconds of data before Event Conclusion. Acceleration and Roll Rate data are displayed in SAE sign convention.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the ROS memory or if it has been interrupted and not fully written.
-ROS Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
- -significant changes in the tire's rolling radius
- -final drive axle ratio changes
- -wheel lockup and wheel slip

-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:
- -the ROS receives a message with an "invalid" flag from the module sending the pre-crash data
- -no data is received from the module sending the pre-crash data
- -no module present to send the pre-crash data

-If power to the ROS is lost during a crash event, all or part of the crash record may not be recorded.
-Event Recorded Last in the Ignition Cycle is used to determine the order of recorded ROS events, if they occur in the same ignition cycle.
-Ignition Cycles Since DTCs Were Last Cleared can record a maximum value of 255 cycles and can only be reset by a scan tool.
-Rollover Occupant Containment Enable Status
- Enabled: Indicates that the ROS system enabled after the ROS internal system check
- Disabled: Indicates that the ROS system disabled after the ROS internal system check

-Rollover Occupant Containment Enable Override Status
- Normal: Indicates that the ROS system enabled after recite of expected messages from the SDM
- Override: Indicates that the ROS system enabled without recite of expected messages from the SDM (This does not inhibit ROS performance)

-When reviewing ROS crash data, associated SDM crash data should also be reviewed.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Data Source:

All ROS recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Status Data (Pre-Crash) is transmitted to the ROS, by various vehicle control modules, via the vehicle's communication network.

01036_ROSB_r002.rft

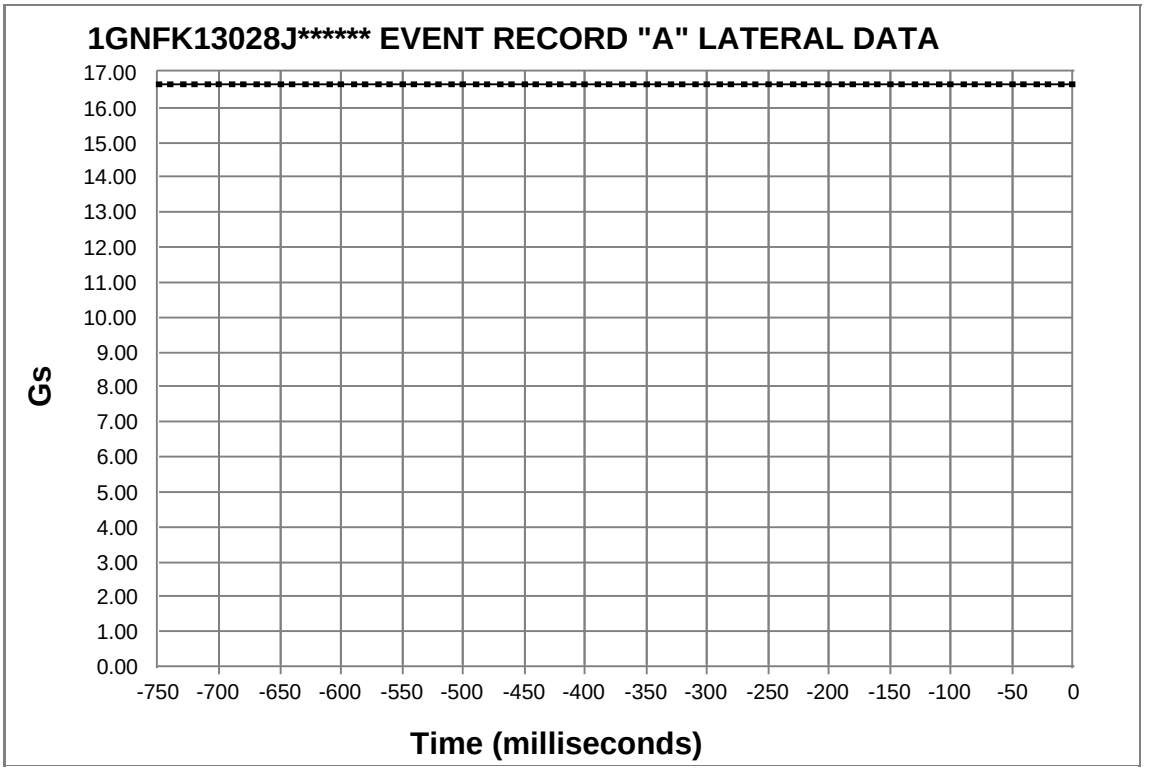
Event Record "A" Data

Crash Record Locked	No
Event Recording Complete	Yes
Event Record Type	Non-Rollover
Event Recorded Last in the Ignition Cycle	Yes
SDM Event Synchronization Counter at Event Enable	8018
Ignition Cycles Since DTCs Were Last Cleared	255
Non-Rollover Data Overwritten	No
Vehicle Speed at Event Enable (MPH)	4
Vehicle Power Mode Status at Event Enable	Run
Remote Start Status at Event Enable (If Equipped)	Inactive
Run/Crank Ignition Switch Logic Level at Event Enable	Inactive
Diagnostic Trouble Code at Event Enable, fault number: 1	N/A
Diagnostic Trouble Code at Event Enable, fault number: 2	N/A
Diagnostic Trouble Code at Event Enable, fault number: 3	N/A
Diagnostic Trouble Code at Event Enable, fault number: 4	N/A
Diagnostic Trouble Code at Event Enable, fault number: 5	N/A
Diagnostic Trouble Code at Event Enable, fault number: 6	N/A
Time from Event Enable to Deployment Command Criteria Met (msec)	5100
Rollover Occupant Containment Enable Status	Enabled
Rollover Occupant Containment Enable Override Status	Normal
Energy Source Rollover System Used	No Information
Number of Non-Rollover Events During this Ignition Cycle	1
Deployment Mode	N/A

Event Record "A" ROS Recorded Vehicle Lateral Acceleration

Time (ms)	Acceleration (G)
-750	16.68
-740	16.68
-730	16.68
-720	16.68
-710	16.68
-700	16.68
-690	16.68
-680	16.68
-670	16.68
-660	16.68
-650	16.68
-640	16.68
-630	16.68
-620	16.68
-610	16.68
-600	16.68
-590	16.68
-580	16.68
-570	16.68
-560	16.68
-550	16.68
-540	16.68
-530	16.68
-520	16.68
-510	16.68
-500	16.68
-490	16.68
-480	16.68
-470	16.68
-460	16.68
-450	16.68
-440	16.68
-430	16.68
-420	16.68
-410	16.68
-400	16.68
-390	16.68
-380	16.68

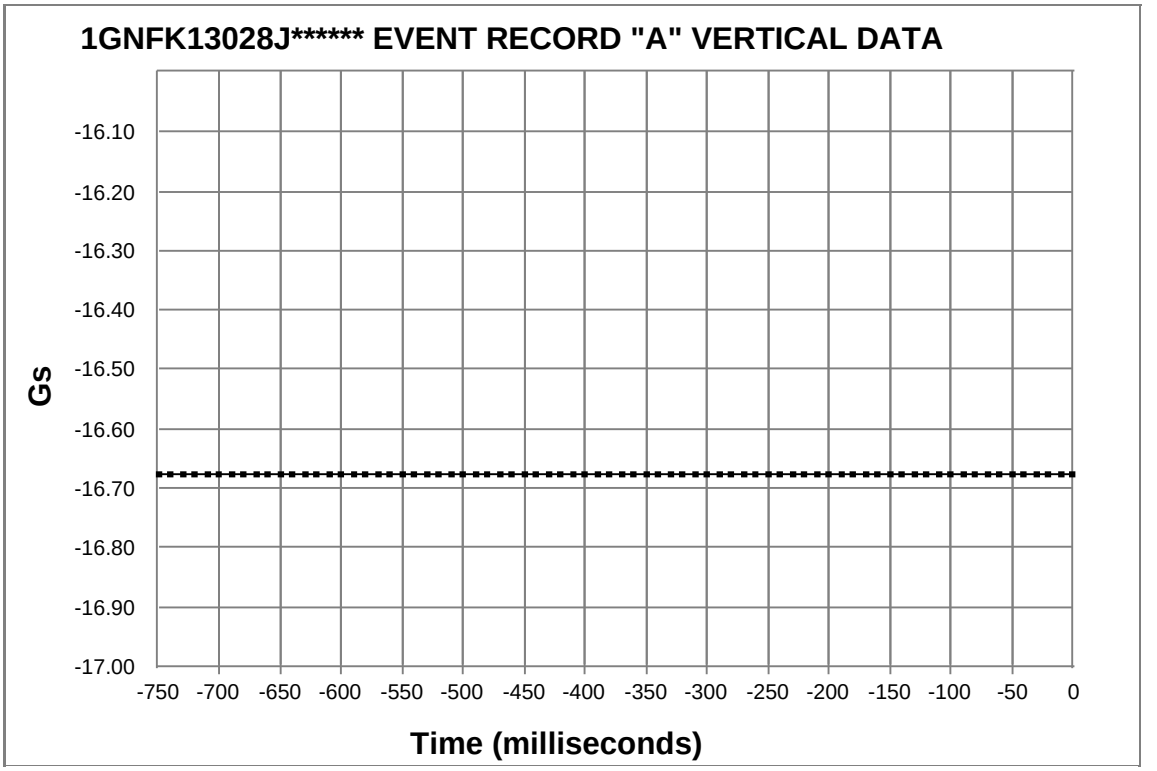
Time (ms)	Acceleration (G)
-370	16.68
-360	16.68
-350	16.68
-340	16.68
-330	16.68
-320	16.68
-310	16.68
-300	16.68
-290	16.68
-280	16.68
-270	16.68
-260	16.68
-250	16.68
-240	16.68
-230	16.68
-220	16.68
-210	16.68
-200	16.68
-190	16.68
-180	16.68
-170	16.68
-160	16.68
-150	16.68
-140	16.68
-130	16.68
-120	16.68
-110	16.68
-100	16.68
-90	16.68
-80	16.68
-70	16.68
-60	16.68
-50	16.68
-40	16.68
-30	16.68
-20	16.68
-10	16.68
0	16.68


1GNFK13028J****** EVENT RECORD "A" LATERAL DATA
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Gs
-750 -700 -650 -600 -550 -500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0
Time (milliseconds)

Event Record "A" ROS Recorded Vehicle Vertical Acceleration

Time (ms)	Acceleration (G)
-750	-16.68
-740	-16.68
-730	-16.68
-720	-16.68
-710	-16.68
-700	-16.68
-690	-16.68
-680	-16.68
-670	-16.68
-660	-16.68
-650	-16.68
-640	-16.68
-630	-16.68
-620	-16.68
-610	-16.68
-600	-16.68
-590	-16.68
-580	-16.68
-570	-16.68
-560	-16.68
-550	-16.68
-540	-16.68
-530	-16.68
-520	-16.68
-510	-16.68
-500	-16.68
-490	-16.68
-480	-16.68
-470	-16.68
-460	-16.68
-450	-16.68
-440	-16.68
-430	-16.68
-420	-16.68
-410	-16.68
-400	-16.68
-390	-16.68
-380	-16.68

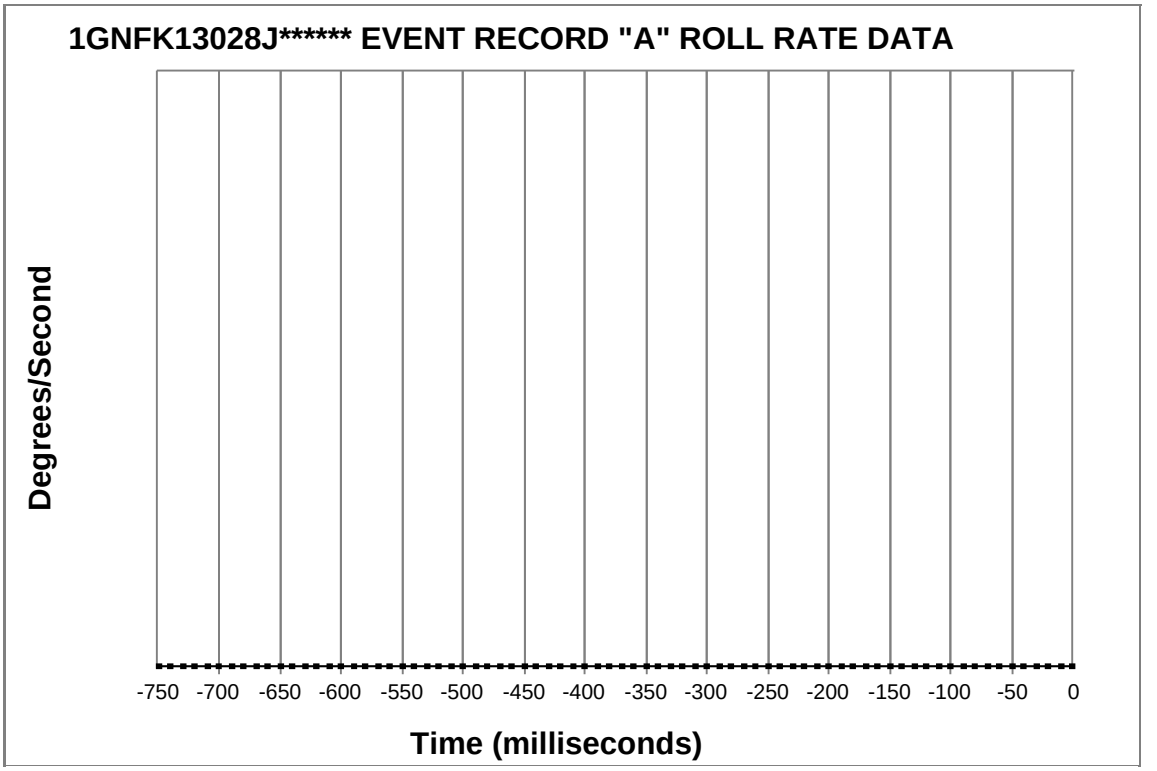
Time (ms)	Acceleration (G)
-370	-16.68
-360	-16.68
-350	-16.68
-340	-16.68
-330	-16.68
-320	-16.68
-310	-16.68
-300	-16.68
-290	-16.68
-280	-16.68
-270	-16.68
-260	-16.68
-250	-16.68
-240	-16.68
-230	-16.68
-220	-16.68
-210	-16.68
-200	-16.68
-190	-16.68
-180	-16.68
-170	-16.68
-160	-16.68
-150	-16.68
-140	-16.68
-130	-16.68
-120	-16.68
-110	-16.68
-100	-16.68
-90	-16.68
-80	-16.68
-70	-16.68
-60	-16.68
-50	-16.68
-40	-16.68
-30	-16.68
-20	-16.68
-10	-16.68
0	-16.68


1GNFK13028J****** EVENT RECORD "A" VERTICAL DATA
-16.10
-16.20
-16.30
-16.40
-16.50
-16.60
-16.70
-16.80
-16.90
-17.00
Gs
-750 -700 -650 -600 -550 -500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0
Time (milliseconds)

Event Record "A" ROS Recorded Vehicle Roll Rate Data

Time (ms)	Roll Rate (degrees/second)
-750	0.00
-740	0.00
-730	0.00
-720	0.00
-710	0.00
-700	0.00
-690	0.00
-680	0.00
-670	0.00
-660	0.00
-650	0.00
-640	0.00
-630	0.00
-620	0.00
-610	0.00
-600	0.00
-590	0.00
-580	0.00
-570	0.00
-560	0.00
-550	0.00
-540	0.00
-530	0.00
-520	0.00
-510	0.00
-500	0.00
-490	0.00
-480	0.00
-470	0.00
-460	0.00
-450	0.00
-440	0.00
-430	0.00
-420	0.00
-410	0.00
-400	0.00
-390	0.00
-380	0.00

Time (ms)	Roll Rate (degrees/second)
-370	0.00
-360	0.00
-350	0.00
-340	0.00
-330	0.00
-320	0.00
-310	0.00
-300	0.00
-290	0.00
-280	0.00
-270	0.00
-260	0.00
-250	0.00
-240	0.00
-230	0.00
-220	0.00
-210	0.00
-200	0.00
-190	0.00
-180	0.00
-170	0.00
-160	0.00
-150	0.00
-140	0.00
-130	0.00
-120	0.00
-110	0.00
-100	0.00
-90	0.00
-80	0.00
-70	0.00
-60	0.00
-50	0.00
-40	0.00
-30	0.00
-20	0.00
-10	0.00
0	0.00


1GNFK13028J****** EVENT RECORD "A" ROLL RATE DATA
Degrees/Second
-750 -700 -650 -600 -550 -500 -450 -400 -350 -300 -250 -200 -150 -100 -50 0
Time (milliseconds)