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

NHTSA

DOT HS 813 635

October 2024

Special Crash Investigations:
On-Site Ambulance Crash Investigation;
Vehicle: 2016 Mercedes-Benz Sprinter
Type II Ambulance;
Location: Texas;
Crash Date: April 2021

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Suggested APA Format Citation:

Crash Research & Analysis, Inc. (2024, October). *Special Crash Investigations: On-site ambulance crash investigation; Vehicle: 2016 Mercedes-Benz Sprinter Type II Ambulance; Location: Texas; Crash Date: April 2021* (Report No. DOT HS 813 635). National Highway Traffic Safety Administration.

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT HS 813 635		

4. Title and Subtitle	5. Report Date
Special Crash Investigations: On-Site Ambulance Crash Investigation; Vehicle: 2016 Mercedes-Benz Sprinter Type II Ambulance; Location: Texas; Crash Date: April 2021	October 2024
	6. Performing Organization Code

7. Author	8. Performing Organization Report No.
Crash Research & Analysis, Inc.	CR21014

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Crash Research & Analysis, Inc. PO Box 302 Elma, NY 14059	**11. Contract or Grant No.** 693JJ919C000004

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
National Highway Traffic Safety Administration 1200 New Jersey Avenue SE Washington, DC 20590	Technical Report
	14. Sponsoring Agency Code

15. Supplementary Notes

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

16. Abstract

This report documents the on-site investigation of a fatal multiple event/intersection crash of a 2016 Mercedes-Benz Sprinter Type II ambulance and a 2013 Toyota Corolla. The ambulance was driven by a belted 31-year-old female with a 50-year-old male EMT in the patient compartment with an 81-year-old female patient who was restrained in the patient cot. The Toyota was driven by a belted 25-year-old male with a belted 28-year-old male front passenger. The crash occurred when the front end of the ambulance struck the left side of the Toyota and then rolled over. The Toyota rotated off the south side of the roadway where it sideswiped a standpipe, and the back end struck a tree. The ambulance driver sustained police-reported B-level (non-incapacitating) injuries and the EMT sustained police-reported A-level (incapacitating) injuries. Both were transported to a hospital. The patient was critically injured and transported by ambulance to a hospital where she was pronounced deceased 90 minutes post-crash. The Toyota driver sustained police-reported A-level injuries and was transported by helicopter to a medical center. The front passenger sustained police-reported B-level injuries and was transported by ambulance to a hospital.

17. Key Words	18. Distribution Statement
type II ambulance, rollover, fatality, cot fastening	Document is available to the public from the DOT, National Highway Traffic Safety Administration, National Center for Statistics and Analysis, https://crashstats.nhtsa.dot.gov.

19 Security Classif. (of this report)	20. Security Classif. (of this page)	21 No. of Pages	22. Price
Unclassified	Unclassified	73	

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

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On-Site Ambulance Crash Investigation
Case Number: CR21014
Vehicle: 2016 Mercedes-Benz Sprinter Type II Ambulance
Location: Texas
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Background

This report documents the on-site investigation of a multiple event/intersection crash of a 2016 Mercedes-Benz Sprinter Type II ambulance (Figure 1) and a 2013 Toyota Corolla that resulted in fatal injuries to an 81-year-old female patient in the ambulance. The National Highway Traffic Safety Administration Office of Emergency Medical Services identified the crash in May 2021 and forwarded the notification to the Crash Investigation Division (CID), which assigned an on-site investigation to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc., in the same month. The SCI team contacted the police department and established cooperation for an on-site investigation that was completed in May 2021.

Figure 1. The 2016 Mercedes Benz Sprinter Type II ambulance

The crash occurred in the four-leg intersection of two, five-lane divided suburban streets. The ambulance was driven by a belted 31-year-old female with a 50-year-old male EMT, and the patient in the patient compartment. Seating and seat belt status of the EMT is unknown. The patient was restrained in the patient cot, but specific use of webbing straps is unknown. The Toyota was driven by a belted 25-year-old male with a belted 28-year-old male front passenger. The ambulance was traveling west, and the Toyota was traveling south, both approaching the intersection. The front of the ambulance struck the left side of the Toyota (Event 1) and both vehicles were redirected southwest. The ambulance rolled over (Event 2) right-side leading, one quarter-turn and the top right rear corner struck the median curb (Event 3). The ambulance continued forward over the median, then rotated approximately 180° clockwise. It returned to its wheels and came to rest in the center lane of the opposing lanes, facing west. The Toyota rotated counterclockwise and redirected off the south side of the roadway. The left side sideswiped a standpipe (Event 4) and the back end struck a tree (Event 5). The Toyota came to rest on the south roadside facing east. The ambulance driver sustained police-reported B-level (non-incapacitating) injuries and the EMT sustained police-reported A-level (incapacitating) injuries.

Both were transported to a hospital. Their specific injury/treatment statuses are unknown. The patient was critically injured and was transported by ambulance to a hospital where she was pronounced deceased 90 minutes post-crash. The Toyota driver sustained police-reported A-level injuries and was transported by helicopter to a medical center. The front passenger sustained police-reported B-level injuries and was transported by ambulance to a hospital. Their specific injury/treatment statuses are unknown.

The SCI on-site investigation took measurements and documentation of the ambulance's exterior damage, interior damage and intrusions, identification of occupant contacts, assessment of the manual and supplemental restraint systems, and inspections of the patient compartment and patient cot. The Mercedes-Benz ambulance was not supported by the Bosch Crash Data Retrieval (CDR) tool. The exterior damage of the Toyota was measured and documented photographically, and the crash site was photographed and mapped using the Nikon Nivo total station. The Toyota's event data recorder (EDR) module was removed prior to SCI inspection and an EDR report was provided in PDF format by the investigating police department in December 2021. All vehicle and scene inspections were completed in May 2021. Requests to interview ambulance personnel were denied by legal counsel; however, a questionnaire was given to the ambulance service. It was completed and returned to the SCI team.

Ambulance Agency, Crew, and Transport Description

This SCI investigation received limited cooperation with the ambulance service, only receiving a partially completed ambulance service questionnaire, and information provided by the service's legal counsel. Interviews of the ambulance crew were denied. Based on these sources, it was determined the private ambulance agency was a multi-tiered medical transport service not associated with any medical treatment center. It provided EMS care at both the basic life support and advanced life support levels. The service performed emergency response, mutual aid, interfacility transfers, private requests, and specialty transports in a multi-state area using a fleet of approximately 630 ground ambulances, helicopters, and a fixed wing aircraft in a multi-state area. It employed an all-career staff of more than 4,300 people, including management, support personnel, drivers, pilots, dispatchers, and EMTs of varying levels of care.

From the partially completed ambulance service questionnaire, it was established that the service primarily scheduled its driver employees on 24-hour shifts. The involved driver was working a 24-hour shift on the date of the crash. The crash occurred approximately 18 hours into her shift. The driver had not worked on the day preceding the crash.

At the time of the crash, the ambulance was transporting the patient who was experiencing abdominal pain. The transport occurred without using emergency warning lights or siren. The time and distance of the trip leading up to the crash is unknown. The number of transports/responses prior to the incident is also unknown.

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Summary

Crash Site

The crash occurred at night at the intersection of two five-lane divided roadways. At the time of the crash, the National Weather Service reported conditions as partly cloudy with a temperature of 22 °C (72 °F), 82 percent humidity and northeasterly winds of 16.8 km/h (10.5 mph). The police crash report (PCR) listed the environment as cloudy, dark with artificial lighting, and dry surface conditions.

The ambulance's roadway traversed in a general east-west direction with two eastbound through lanes and a left turn lane that were separated from the two westbound lanes by a grass median. The intersection was controlled by three-phase overhead traffic signals. The Toyota's roadway traversed in a general north-south direction with two southbound through lanes and a left turn lane that were separated from the two northbound lanes by a grass median. All lanes were approximately 3.6 m (12 ft) wide and all roadways were level concrete with dashed and solid white lane lines. The posted speed limit for both roadways was 56 km/h (35 mph).

Pre-Crash

The ambulance was westbound in the center lane (left through lane) approaching the intersection (Figure 2) with the traffic signal on the green phase. It was traveling in non-emergency mode, without lights or siren activated. The Toyota was southbound in the center lane (left through lane) approaching the same intersection (Figure 3) with the traffic signal on the red phase. The Toyota was traveling at an EDR-reported (most recent event, Trigger 4) speed of 104 km/h (64.6 mph), 4.95 seconds prior to algorithm enable (AE). The Toyota's speed increased and at the time of AE, was traveling at 116 km/h (72.1 mph). The EDR record showed nominal steering input until 0.45 seconds prior to AE when the Toyota driver turned the wheel 24° to the right. At AE, the steering wheel was turned 33° to the right.

Figure 2. West view of the ambulance's approach

Figure 3. South view of the Toyota's approach

Crash

The front of the ambulance struck the left plane of the Toyota (Event 1). The force directions were in the 1 o'clock sector for the ambulance and the 11 o'clock sector for the Toyota. Both of the ambulance's frontal air bags deployed, as did the right outboard seat-mounted side impact and inflatable curtain (IC) air bags. Both Toyota frontal air bags deployed, as did the right IC air bag. The impact redirected both vehicles southwest and both rotated counterclockwise. The ambulance rolled over, right-side leading, one quarter-turn (Event 2). As the right side contacted the pavement, the right rear top of the ambulance struck the west median curb tip (Figure 4, Event 3) interrupting the rollover sequence and induced a clockwise rotation of approximately 180°. The rollover event initiation was classified as a "trip over" though its counterclockwise rotation was caused by the impact with the Toyota. The ambulance slid southwest on its right side, partially on the median/curb and on the roadway. The ambulance righted itself and came to rest in the westbound center lane (Figure 5), facing west, approximately 40 m (131 ft) from the initial impact.

The Toyota, also redirected southwest, rotated counterclockwise approximately 140° and crossed over all eastbound lanes. The vehicle departed the south roadside and the left plane sideswiped a vertical water standpipe (Event 4) as it was sliding rearward. The vehicle continued and the back end struck a tree (Event 5). The Toyota traveled approximately 45 m (148 ft) from the initial impact and came to rest facing northeast (Figure 5) with its back end against the tree.

Figure 4. West median tip, struck by right rear top of the ambulance

Figure 5. Southwest view of vehicles at rest (Police on-scene image, used with permission)

Post-Crash

The police and EMS were notified and arrived 5 minutes later. The ambulance driver sustained B-level injuries and was transported by ambulance to a hospital. The EMT sustained A-level injuries and was transported by ambulance to a hospital. The specific injury and treatment information for both EMS workers is unknown. The patient, who sustained critical injuries, was removed from the ambulance while still on the cot and was transported by ambulance to a hospital. Her treatment in the emergency room was unknown, and she was pronounced deceased 90 minutes after the crash.

The Toyota driver sustained police-reported A-level injuries and was transported by helicopter to a hospital. The front passenger sustained police-reported B-level injuries and was transported by ambulance to a hospital. Specific injury and treatment information for both Toyota occupants is unknown.

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2016 Mercedes-Benz Sprinter Type II Ambulance

Description

The 2016 Mercedes-Benz Sprinter was a rear-wheel-drive, van-based ambulance with Vehicle Identification Number (VIN) WD3PE7CD4GPxxxxxx and manufactured as an incomplete vehicle in June 2016. It had a 2.0 liter, 4-cylinder diesel engine linked to an automatic transmission. The vehicle had frontal air bags, outboard seat-mounted side impact air bags, and side impact IC air bags. The vehicle also had a 4-wheel antilock braking system (ABS), stability and traction control, and emergency brake assist. It is unknown if these warning systems activated prior to the crash. The cab of the ambulance had seating for a driver and front passenger with box-mounted seats, three-point lap and shoulder seat belts, and adjustable head restraints.

Ambulance Patient Compartment

The Mercedes-Benz was completed as a Type II ambulance during secondary manufacturing in October 2016 by Demers Ambulance Manufacturers, Inc. The patient compartment was a mobile emergency medical care unit that seated up to three occupants and could transport one cot patient. It had a sliding right-side door and double rear doors for patient entrance/exit. A rear-facing, high-back pedestal-mounted seat with an integrated lap and shoulder seat belt was mounted toward the front of the compartment. There was a two-passenger bench at the right wall, and each seat had four-point seat belts. Wall-mounted straps were available to secure an additional patient on the bench. A pass-through between the cab and the patient compartment was located adjacent to the captain's chair position.

Medical supplies and roadside safety equipment was kept in interior cabinets. The interior had composite materials and the surfaces were covered with a gel-coat finish and/or vinyl-covered foam padding, and all cabinets were outfitted with clear polymer sliding doors. Aluminum trim covered all the joints of the cabinets. There were several cabinets and a counter area mounted along the left side of the compartment. There were four grab handles available for occupants to maneuver inside the patient compartment while underway and maintain stability. Two were located among the left side cabinets and a third near the right doorway. A fourth was mounted longitudinally to the centerline of the roof.

Vehicle Weight/Payload

The Mercedes-Benz had a gross vehicle weight rating of 3,878 kg (8,550 lb). This was distributed as gross axle weight ratings of 1,801 kg (3,970 lb) in the front and 2,431 kg (5,360 lb) in the rear. The manufacturer's literature showed that the curb weight of the incomplete vehicle (prior to being fitted for an ambulance) was 2,353 kg (5,187 lb). According to the manufacturer, the maximum payload capacity for the ambulance was 1,021 kg (2,250 lb). The estimated weight of the equipment and supplies was 249 kg (550 lb). Based on the gross vehicle weight rating and other available weight information, the ambulance was operating in its usable payload capacity and weight rating at the time of the crash.

Exterior Damage

The ambulance sustained direct damage to the front and right planes during impact with the Toyota. The front plane damage extended across the entire front plane (Figure 6) width of 173 cm (68.1 in). The field L was 136 cm (53.5 in). Crush measurements were taken on the bumper beam and the maximum residual crush was 46 cm (18.1 in) and was located 23 cm (9.1 in) right of vehicle's centerline. The crush values were: C1 = 11 cm (4.3 in), C2 = 30 cm (11.8 in), C3 = 45 cm (17.7 in), C4 = 46 cm (18.1 in), C5 = 29 cm (11.4 in), C6 = 8 cm (3.1 in). The damage algorithm of the WinSMASH program calculated the total delta V as 31 km/h (19 mph). The longitudinal and lateral velocity changes were calculated as -20 km/h (12 mph) and -24 km/h (15 mph). The analysis of the impact fit the parameters of the program and the results were considered low. The collision deformation classification[1] (CDC) assigned to this damage pattern was 02FDEW3.

Figure 6. Front end and right-side damage

The entire right side of the ambulance was directly damaged during the rollover (Event 2) and rotation on the median and street. Maximum lateral and vertical crush damages overlapped from Event 3. The WinSMASH program could not be used to determine velocity change for this impact because rollovers are out of scope for the program. The CDC assigned to this damage was 00RDAO99.

The ambulance sustained damage to the top right rear corner as it struck the apex of the median curb (Event 3). The roof, D-pillar, and right rear door were directly damaged (Figures 7 and 8), and both doors came open due to the impact. The WinSMASH program could not be used to determine velocity change since non-horizontal impacts are out of scope for the program. Furthermore, damage to the roof and pillar overlapped by the rollover damage (Event 2). The right maximum vertical and lateral crush damage were both located at the right D-pillar and measured 35 cm (13.8 in) and 17 cm (6.7 in), respectively. The CDC assigned for this damage 00TBZW4.

[1] SAE Recommended Practice describing vehicle collision damage in an alphanumeric format.

Figure 7. Right/back rollover damage

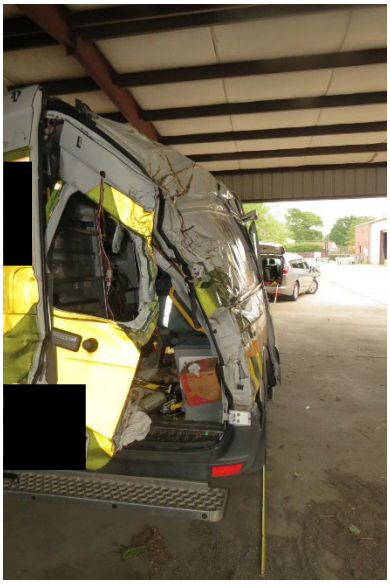

Figure 8. Right/top rollover damage

Event Data Recorder

The Mercedes did not have an EDR. According to the Mercedes' owner's manual, the vehicle had various electronic components with data memories that could store technical information, such as vehicle operating status, events, and malfunctions. This data was used primarily for service, warranty, and quality assurance purposes. The supported vehicles section of the Bosch CDR tool did not include the model under investigation. Compatibility with the Bosch CDR tool did not occur until model year 2019.

Interior Damage

The ambulance cab area sustained minor intrusion damage from impact with the Toyota. The right front door and right A-pillar intruded laterally 9 cm (3.5 in) and 2 cm (0.8 in) respectively, and the right front door was jammed shut. The patient compartment sustained significant intrusion during the rollover and its right rear corner impact with the curb. The right D-pillar intruded 35 cm (13.8 in) vertically and the right-side panel intruded 22 cm (8.7 in) laterally.

Manual Restraint Systems

The cab of the Mercedes-Benz had three-point lap and shoulder seat belt systems for the driver and front passenger positions. Both seat belts had continuous loop webbing with sliding latch plates, adjustable D-rings that were both set to the full-down position. The driver was restrained by her seat belt as evidenced by the load marks present on the polymer surface of the latch plate belt guide.

It is unknown where the EMT was situated in the patient compartment at the time of the crash. His restraint use is also unknown.

Supplemental Restraint Systems

The ambulance had dual-stage frontal, outboard seat-mounted side impact, and IC air bags for both the driver and front passenger positions. Both frontal air bags, as well as the right outboard seat-mounted and right IC air bags deployed during the crash.

The driver's frontal air bag was mounted in the steering wheel hub. The deflated air bag measured 63 cm (24.8 in) in diameter and there was no damage nor discernable evidence of occupant contact. The module cover was a four-flap configuration with intersecting vertical and horizontal tear seams. Each flap measured 8 cm (3.1 in) wide and 7 cm (2.8 in) in height. The cover flaps opened at the designated tear seams and were undamaged.

The passenger's frontal air bag was located in the top instrument panel. The deflated air bag was 57 (22.4) cm in height and 102 cm (40.2) wide and there was no damage nor discernable occupant contact noted. The module cover was a single flap, rectangular design, with tear seams at the top and sides. The flap measured 31 cm (12.2 in) wide and 10 cm (3.9 in) high. The cover flaps opened at the designated tear seams and were undamaged.

The right outboard seat-mounted side impact air bag was located in the outboard side of the seatback and deployed through a vertical tear seam. The deflated air bag was 63 cm (24.8 in) high and 20 cm (7.9 in) wide. The air bag was not damaged.

The right IC air bag was located in the roof side rail inside the headliner. It deployed because of the initial impact. IC air bags may deploy independently in certain crash configurations, and the left IC did not deploy. The deflated right air bag was 134 cm (52.8 in) wide and 88 cm (34.6 in) in height. Excursion below the belt line was 32 cm (12.6 in). There was no damage to the air bag.

Patient Compartment Damage

Inspection of the patient compartment revealed significant intrusion damage to the right plane/top rear corner (Figure 9). The top of the D-pillar intruded 35 cm (13.8 in) vertically and 17 cm (6.7 in) laterally. The right-side panel intruded laterally 22 cm (8.7 in) and the right-side sliding door was jammed shut. On the back plane, the right rear door opened during the rollover due to a hinge separation (Figures 10 and 11). The left door was jammed shut and was mechanically pried opened by rescue personnel (Figure 12). The longitudinal grab handle on the ceiling (see Figure 9) was possibly contacted by the patient and/or cot. Otherwise, there was no other evidence of discernable occupant contact in the patient compartment. Areas of contact and blood evidence were observed on the left cabinets and on the ceiling.

Figure 9. Intrusion damage to the right rear of the patient compartment

Figure 10. Right rear door separation

Figure 11. Right rear door hinge separation

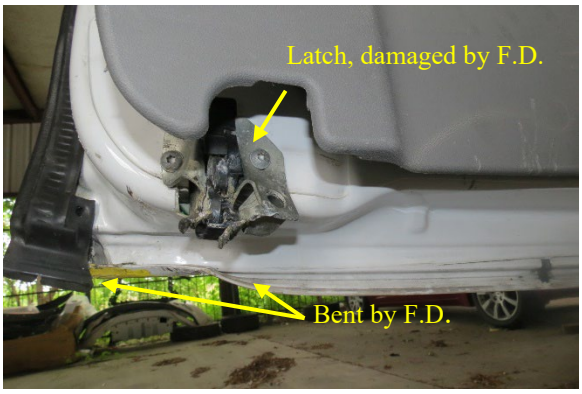

Figure 12. Left rear door latch (note bottom of door bent upward by rescue personnel to access latch)

Stryker Cot Fastening System

Prior to the crash, the patient cot was secured on the floor of the patient compartment via a Stryker Model 6371 cot fastener system. The system had a forward antler bracket and rear locking rail-clamp mechanism (Figures 13 and 14), and both were mounted to the floor of the patient compartment. The antler bracket cradled the forward portion of the cot's frame, while the vertically oriented locking clamp mechanism secured the locking pin, affixed to the lower frame rail of the cot.

Figure 13. Rail clamp cot fastener system with fractured pin

Figure 14. Antler bracket

The antler bracket was secured to the floor of the patient compartment by two hand-tightened bolts that allowed the crew members to adjust and align the bracket to fit different cots if necessary. The rear locking rail-clamp was secured to the left side of the compartment via a bracket and four bolts. Combined, these two components were intended to restrict lateral and longitudinal movement of the cot in the ambulance during transit. The rail clamp and bolts were all intact and in good working order at the time of the SCI investigation in both the unlocked and locked position. The antler bracket was also intact and in good working order.

Patient Cot

The Stryker Power-Pro XT Model 6500 wheeled ambulance cot was manufactured in June 2011 with serial number 11063XXXX. The cot (Figure 15) had a tubular aluminum frame with circumferential weld joints and steel hardware fasteners. The X-frame supporting the mattress platform featured power lift capabilities with variable height positions between a minimum of 36 cm (14.2 in) and a maximum of 105 cm (41.3 in). The mattress platform featured 0 to 73° of positive backrest angular adjustment via a manually controlled gas-pressure cylinder. In a similar fashion, the leg portion featured 15° of positive angular adjustment. Overall dimensions of the cot were 58 cm (22.8 in) wide and 206 cm (81.1 in) long. A placard declared that the loaded capacity limit of the cot 317 kg (700 lb). Electrical power was supplied by a removable 24-v nickel-cadmium direct current battery. The cot had a multi-point harness system for manual restraint of its occupant. This system had a lateral lower extremity strap, lateral lap/thigh strap, and an upper torso harness that incorporated two shoulder straps, each crossing over the patient's chest to the opposite shoulder. All the straps were fixed-length webbing that included locking latch plates and sewn buckles. During the SCI inspection, all straps were intact and historical wear was present. The specific use and placement of the straps could not be definitively determined.

Inspection of the patient cot revealed that all restraint straps were anchored to the mattress platform (Figure 16). The owner's manual stated that proper restraint strap anchor points were on the actual cot frame (Figure 17). Furthermore, the lower leg restraints were anchored closer to the center of the cot than the proper location shown in the owner's manual. Further inspection revealed the left side of the middle section of the platform was pulled from its mounting during the crash sequence (Figure 18).

Figure 15. Stryker Power-Pro XT 6500 patient cot

Figure 16. Cot mattress platform (note restraints anchored to the mattress platform)

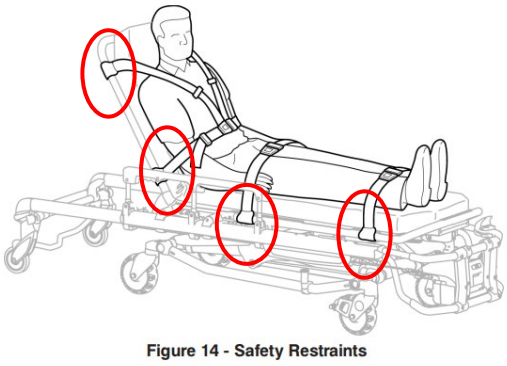

Figure 17. Owner's manual diagram of the proper restraint anchor points (on cot frame)

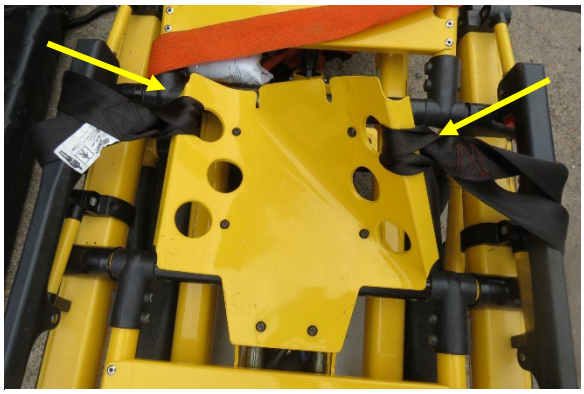

Figure 18. Middle of cot (note restraint anchor points and damage to the mattress platform)

The patient cot locking pin bracket on the tubular frame fractured (Figures 19 and 20) and separated from the cot during the crash sequence. This pin normally secured the cot to the rail clamp in the back of the patient compartment. The separation from the rail clamp allowed the cot to move freely about the compartment during the crash sequence as it hinged vertically while the forward aspect of the cot remained engaged with the antler bracket.

Figure 19. Fractured locking pin from the cot frame (placed back on frame for reference)

Figure 20. Fractured locking pin bracket

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2016 Mercedes-Benz Sprinter Type II Ambulance Occupant Data

Driver Demographics

Age/sex:	31 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with adjustable head restraint
Seat track position:	Between middle and forward-most positions
Manual restraint usage:	Three-point lap and shoulder seat belt
Usage source:	Vehicle inspection; PCR
Air bags:	Frontal, seat-mounted, and IC air bags available; frontal deployed
Alcohol/drug involvement:	None
Egress from vehicle:	Unknown
Transport from scene:	Ambulance to a local hospital
Type of medical treatment:	Unknown

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Unknown	Unknown	Unknown	Unknown

Medical release required but not obtained.

Driver Kinematics

The ambulance driver was seated in an unknown posture with the seat track adjusted between the middle and forward-most positions and the seatback was slightly reclined. The adjustable head restraint was in the full-down position, and she was restrained by her seat belt.

The driver responded to the frontal impact with the Toyota by initiating a forward and rightward trajectory and she loaded the seat belt and the deployed driver's air bag. The ambulance driver was redirected to the right during the rollover as the vehicle struck the pavement. She was redirected in several directions as the ambulance rotated on its right side and to her left as the ambulance rolled back onto its wheels. The seat belt system restrained the driver in her seated position.

The driver sustained police-reported B-level injuries and was transported to a hospital. Specific injury and treatment information is unknown. An SCI request for her medical records was refused by the hospital.

EMT Occupant Demographics

Age/sex:	50 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown

Seat type:	Unknown
Seat track position:	None adjustable
Manual restraint usage:	Unknown
Usage source:	Vehicle inspection
Air bags:	None available
Alcohol/drug involvement:	None
Egress from vehicle:	Unknown
Transport from scene:	Ambulance to a local hospital
Type of medical treatment:	Unknown

EMT Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Unknown	Unknown	Unknown	Unknown

Date of birth unknown, therefore medical records would not be released.

EMT Occupant Kinematics

The EMT was in the patient compartment at the time of the crash and the ambulance was in non-emergency mode, making an inter-facility transfer. The PCR stated that no seat belt was used but this could not be confirmed. No discernable contacts were noted during inspection. These factors show that it was probable that the EMT was seated in the rear-facing seat at the forward portion of the patient compartment, though there was no discernable evidence he was restrained by his seat belt. The impact with the Toyota displaced the EMT toward the front of the vehicle and to his left. His back loaded the seatback and may have contacted the right supply cabinet and right-side door as the vehicle rolled onto its right side. The EMT was redirected to the left side of the patient compartment as the ambulance returned to its wheels. His final rest position and egress from the vehicle is unknown. He sustained police-reported A-injuries and was transported by ambulance to a hospital. Request for medical records were refused.

Patient Demographics

Age/sex:	81 years/female
Height:	168 cm (66 in)
Weight:	82 kg (181 lb)
Eyewear:	Unknown
Seat type:	Patient cot
Seat track position:	Not adjustable
Manual restraint usage:	Several harness straps on cot, specific placement unknown
Usage source:	Cot inspection
Air bags:	None available
Alcohol/drug involvement:	None
Egress from vehicle:	Removed by rescue personnel
Transport from scene:	Ambulance to level 1 trauma center
Medical treatment:	Treatment unknown, pronounced dead prior to admission

Patient Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Full-thickness 1 1/2 inch laceration of anterior left ventricular wall; 1 1/2 inch full-thickness laceration of apical left ventricular wall	441016.6	Isolated IPC Caused by other injury (#2)	Probable
2	Rib cage fractures with flail, unilateral: left posterior 2-11, left lateral 2-10	450213.4	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
3	Rib cage fractures without flail, bilateral: left anterior 3-6, right anteriorlateral 2-7, right posterior 1, 8, 9	450203.3	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
4	Left hemothorax, 200 mL	442200.3	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
5	Complete displaced fracture of spine at T12 vertebral body with exposure of spinal cord and underlying cord contusion	610400.3	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
6	Multiple spleen lacerations ranging from 1/2 to 2 1/2 inches	544224.3	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
7	Fracture of distal right femur, NFS	853331.3	Isolated IPC Left Side – Other left side object (specify): Left side cabinetry	Possible
8	1 1/2 inch laceration of pericardium and intercostal muscles	441602.2	Isolated IPC Caused by other injury (#2)	Probable
9	Multiple left lung contusions ranging from 1/4 to 1 inch	441407.2	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
10	Transverse sternum fracture	450804.2	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
11	Non-displaced fracture of anterior superior C7 osteophyte with prevertebral muscular hemorrhage	650230.2	Isolated IPC Interior – Other restraint system component (specify): Cot upper torso harness	Probable
12	Fracture of mid left radius	752211.2	Isolated IPC Injured, unknown source	Unknown
13	Fracture of distal left ulna	752313.2	Isolated IPC Injured, unknown source	Unknown
14	Full-thickness 1 3/4 inch right superior frontal scalp laceration with contused borders	110604.2	Isolated IPC Interior – Interior loose objects (specify): Unknown	Possible
15	Right superior frontal scalp contusion	110402.1	Isolated Interior – Interior loose objects (specify): Unknown	Possible
16	An area of contusion measuring 4 inches vertically by 1 1/2 inch horizontally involving the lateral right forehead, right zygomatic region, and upper right cheek region; 1 1/4 inch contusion to upper left forehead	210402.1	Isolated Interior – Interior loose objects (specify): Unknown	Possible
17	Abrasion to upper left forehead 1 1/4 inch	210202.1	Isolated Interior – Interior loose objects (specify): Unknown	Possible
18	Abrasion to left eyelid 1/2 inch	210202.1	Isolated Interior – Interior loose objects (specify): Unknown	Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
19	Abrasions to upper right chest 1/2, 1/8, and 1/16 inch; multiple linear abrasions ranging from 1/2 to 1 inch beneath both breasts; 1 1/4 inch horizontal abrasions on lower lateral chest; 1/4 inch abrasion below left clavicle	410202.1	Isolated Interior – Other restraint system component (specify): Cot upper torso harness	Probable
20	3-inch contusion to right superior shoulder	710402.1	Isolated Interior – Other restraint system component (specify): Cot upper torso harness	Probable
21	Multiple contusions to right upper arm	710402.1	Isolated Interior – Other restraint system component (specify): Cot upper torso harness	Possible
22	Multiple contusions to right forearm	710402.1	Isolated Interior – Other restraint system component (specify): Cot upper torso harness	Possible
23	Multiple contusions to right hand	710402.1	Isolated Left side – Other left side object (specify): Left side cabinetry	Possible
24	3-inch oval contusion to dorsal upper left arm	710402.1	Isolated Interior – Interior loose objects (specify): Unknown	Possible
25	1 1/2 inch contusion to dorsal left wrist	710402.1	Isolated Injured, unknown source	Unknown
26	Multiple abrasions to right upper arm	710202.1	Isolated Left side – Other left side object (specify): Left side cabinetry	Possible
27	Multiple abrasions to right forearm	710202.1	Isolated Left side – Other left side object (specify): Left side cabinetry	Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
28	Multiple abrasions to right hand	710202.1	Isolated Left side – Other left side object (specify): Left side cabinetry	Possible
29	1 1/2 inch irregular abrasion to dorsal left forearm	710202.1	Isolated Injured, unknown source	Unknown
30	1 inch contusion to medial right ankle	810402.1	Isolated Left side – Other left side object (specify): Left side cabinetry	Possible
31	Medial right ankle abrasion 1/2 inch	810202.1	Isolated Left side – Other left side object (specify): Left side cabinetry	Possible

Source: Medical examiner's report (internal).

Patient Kinematics

The patient was assumed to be in a supine position on the ambulance cot, restrained by several harness straps affixed to the cot. The specific configuration and tightness of the harness straps around the patient is unknown. In response to the frontal impact with the Toyota, the patient initiated a trajectory toward the front of the vehicle and to her left, with respect to her supine position. As the cot's locking pin fractured and separated from the rail clamp bracket, the cot pitched upward as the ambulance rolled over on its right side. The aft aspect of the cot struck the longitudinal grab handle on the ceiling, deforming the handrail and separating the aft mounting brackets from the roof. The forward aspect of the cot's frame remained engaged against the antler bracket and the cot probably oscillated left and right during the rollover, rotation, and subsequent return to its wheels. The patient did not separate from the cot. Her loading of the harness straps produced multiple injuries of the chest and abdomen to include multiple unilateral rib fractures with flail, a full thickness laceration of the ventricular wall, left hemothorax, and a splenic laceration. She also sustained abrasions to the chest, multiple left pulmonary contusions with hemothorax, a sternal fracture, fractures of thoracic and cervical vertebrae, and a contusion on the right superior shoulder.

She contacted the left side cabinets at some point in the crash sequence and sustained multiple contusions and abrasions to her right arm and lower right leg and a fracture of the distal right femur.

The patient was probably contacted by internal loose objects in the patient compartment that produced facial and head lacerations, abrasions, and contusions. She also sustained left forearm fractures, abrasions, and contusions, from an unknown source.

SCI inspection revealed that all cot restraints were anchored to the mattress support platforms of the cot, not to the cot's frame as shown by the owner's manual. The lower and upper body platforms were not damaged, but the left top aspect of the mid-body platform was deformed

(bent) upward by the patient's harness strap loading during the rollover and impact with the curb (see Figure 19). This deformed component may have contributed to the patient's injuries but given the magnitude of the crash and severity of injuries that potential contribution is unknown.

Post-crash, the cot was resting on the floor of the patient compartment with the patient still restrained by the harness straps. The patient was transferred to another ambulance and was transported to a level 1 trauma center where she expired 90 minutes post-crash due to blunt force trauma to the chest.

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2013 Toyota Corolla

Description

The 2013 Toyota Corolla was a front-wheel drive, 4-door sedan, identified with VIN: 2T1BU4EEXDCxxxxxx, with a 1.8 liter, I-4 gasoline engine linked to an automatic transmission. The Toyota had a gross vehicle weight rating of 1,742 KG (3,840 lbs.). This was distributed as gross axle weight ratings of 948 kg (2,089 lbs.) in the front and 839 kg (1,849 lbs.) rear.

Exterior Damage

The Toyota sustained direct damage to the left side during impact with the ambulance (Figure 21, Event 1). The direct damage began 102 cm (40.2 in) forward of the left rear axle and extended 212 cm (83.5 in) forward. The field L was 213 cm (83.9 in). Crush measurements were taken at the mid-door level and maximum residual crush was 47 cm (18.5 in), occurring 212 cm (83.5 in) forward of the left rear axle. The crush measurements values were: C1 = 37 cm (14.6 in), C2 = 47 cm (18.5 in), C3 = 37 cm (14.6 in), C4 = 42 cm (16.5 in), C5 = 33 cm (13.0 in), C6 = 26 cm (10.2 in). The damage algorithm of the WinSMASH program calculated the Toyota's total delta V as 71 km/h (44 mph). The longitudinal and lateral velocity changes were -54 km/h (-34 mph) and 46 km/h (29 mph). The analysis of the impact fit the parameters of the program and the results were reasonable. The CDC for this damage pattern was 11LYAW4.

Figure 21. Event 1 involving the Toyota's left plane damage

The Toyota sustained direct damage on its left plane during the sideswipe impact with the vertical standpipe (Event 4). The direct damage began 50 cm (19.7 in) rear of the left rear axle and extended 131 cm (51.6 in) forward. The WinSMASH program could not be used on this impact because sideswipes are out of scope for the program. Furthermore, due to overlapping damage from the initial impact, no damage was measured. The CDC for this damage pattern was 06LZEW1.

The Toyota sustained direct damage to its back end during the impact with the tree (Figure 22, Event 5). The direct damage began 37 cm (14.6 in) right of the left rear bumper beam end and extended 32 cm (12.6 in) to the right. The field L was 89 cm (35.0 in). Crush measurements were taken on the bumper beam and maximum residual crush was 35 cm (13.8 in) occurring 52 cm

(20.5 in) right of the left end of the bumper beam. The crush measurements were C1 = 7 cm (2.8 in), C2 = 20 cm (7.9 in), C3 = 35 cm (13.8 in), C4 = 32 cm (12.6 in), C5 = 17 cm (6.7 in), C6 = 3 cm (1.2 in). The CDC for this damage pattern was 06BCEN02. The damage algorithm of the WinSMASH program calculated the total delta V as 32 km/h (20 mph). The longitudinal and lateral velocity changes were 32 km/h (20 mph) and 0 km/h, respectively. The analysis of the impact fit the parameters of the program and the results were reasonable.

Figure 22. Events 4 and 5 involving the Toyota's left and rear plane damage

Event Data Recorder

The Toyota had an air bag electronic control unit (ECU) that performed the diagnostic, sensing, and deployment command functions of the vehicle's supplemental restraint systems. This ECU had EDR capabilities. The EDR component was imaged by the investigating police with software version 21.0.2 of the Bosh CDR tool. The same version was used to report the data. A PDF of the report was provided to the SCI team in December 2021. The EDR report is included at the end of this report as Appendix A.

The data limitations reported that data from deployment events could not be overwritten or deleted following the event. Data from non-deployments could be overwritten if by a following deployment event. This air bag ECU had two recording pages (memory maps) to store pre-crash data. For post-crash data, the ECU had two recording pages for each crash type: frontal and rear crash, side crash, and rollover event. In front/rear collision events the first point where a longitudinal cumulative delta V over 0.8 km/h (0.5 mph) is reached is regarded as time zero for recorded data. In side impacts and rollovers, the point in time the recording trigger is established is regarded as time zero.

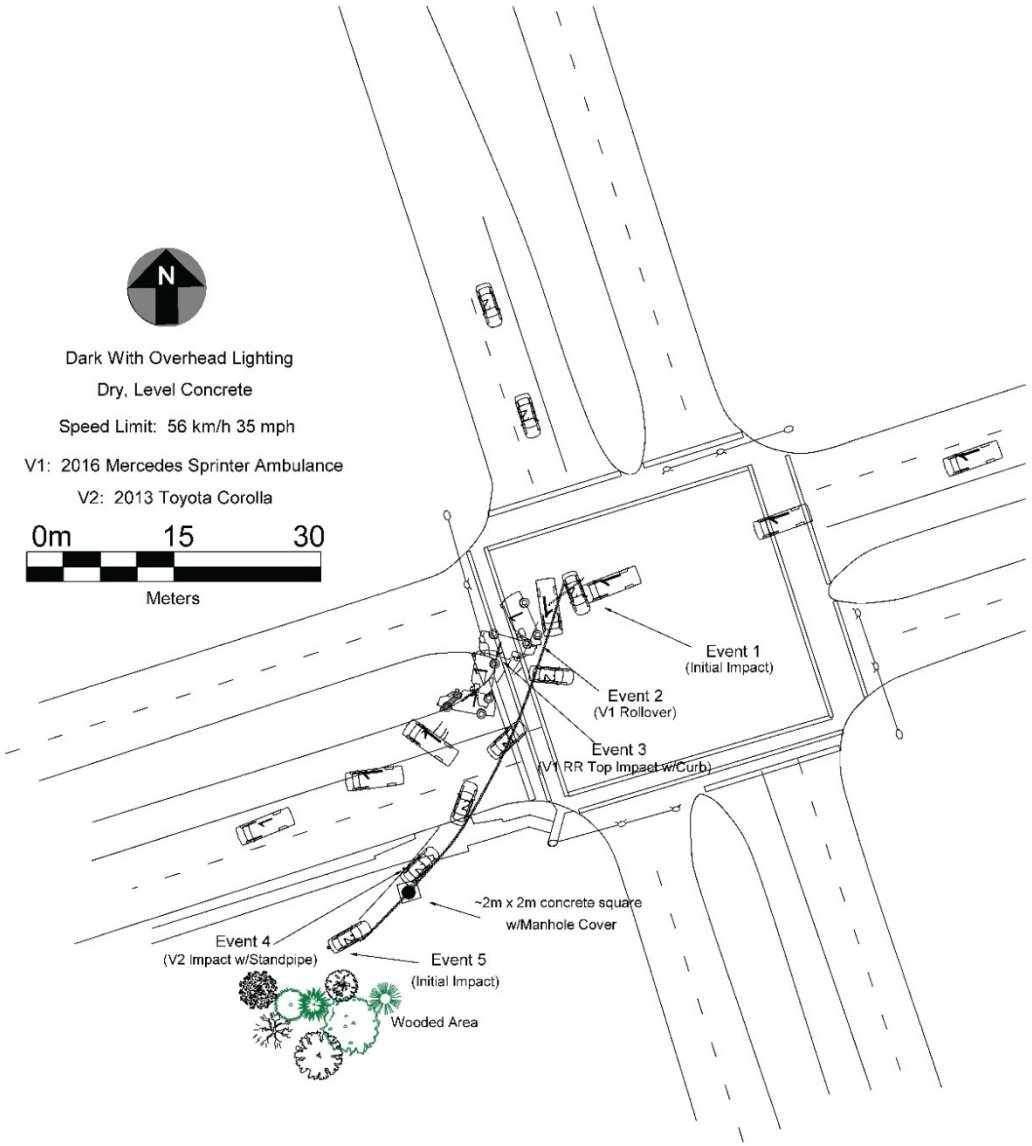
The vehicle's EDR triggered four events over its lifetime of operation. Trigger 1 was an unlinked event and disregarded. Triggers 2, 3, and 4 were stored in the EDR as a side crash, front/rear crash, and side crash, respectively, all corresponding to the left side impact with the front of the Toyota. This all occurred in 98 msec and at ignition cycle 14,882, and all pre-crash records were identical. For each trigger, the airbag warning lamp was reported as "OFF," the driver and front passenger seat belt status was reported as "ON," the recording status was complete, and there were no diagnostic trouble codes.

The EDR reported a maximum longitudinal delta V of -54.3 km/h (-33.7 mph) during the first prior event (Trigger 3) and the maximum lateral delta V was reported as 47.6 km/h (29.6 mph) during the second prior event (Trigger 2).

Occupant Data

The Toyota was driven by a belted 25-year-old male with a belted 28-year-old male front passenger. The driver and passenger sustained police-reported A-level and B-level injuries, respectively. The driver was transported by helicopter to a hospital. The passenger was transported by ambulance to a hospital. Specific injury and treatment status of the occupants is unknown.

Crash Diagram



Case Number:	CR21014

Appendix A: 2013 Toyota Corolla Event Data Recorder Report[2]

[2] The EDR was imaged by the police during their investigation with the Bosch Crash Data Retrieval tool. The police shared the imaged data with SCI in a PDF file. The PDF file has been sanitized to remove potential personal identifiable information.

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/Frame Number	2T1BU4EEXDCxxxxxx
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR21014_V2_ACM.CDRX
Saved on	Wednesday, March 14th 2022
Imaged with CDR version	Crash Data Retrieval Tool 21.0.2
Imaged with Software Licensed to (Company Name)	
Reported with CDR version	Crash Data Retrieval Tool 21.0.2
Reported with Software Licensed to (Company Name)	
EDR Device Type	Airbag Control Module
Event(s) recovered	Front/Rear (1), Side (2)

Comments

Data Limitations

CDR Record Information:

- Due to limitations of the data recorded by the airbag ECU, such as the resolution, data range, sampling interval, time period of the recording, and the items recorded, the information provided by this data may not be sufficient to capture the entire crash.
- Pre-Crash data is recorded in discrete intervals. Due to different refresh rates within the vehicle's electronics, the data recorded may not be synchronous to each other.
- Airbag ECU data should be used in conjunction with other physical evidence obtained from the vehicle and the surrounding circumstances.
- If any of the front passenger seat airbags, side airbags, or Curtain Shield Airbags have deployed, data will not be overwritten or deleted by the airbag ECU following that event. If none of the airbags have deployed, the data of that event may be overwritten by a following event even if other airbags (pretensioner, rear seat airbag, etc.) have deployed.
- If power supply to the airbag ECU is lost during an event, all or part of the data may not be recorded.
- "Diagnostic Trouble Codes" are information about faults when a recording trigger is established. Various diagnostic trouble codes could be set and recorded due to component or system damage during an accident.
- The airbag ECU records only diagnostic information related to the airbag system. It does not record diagnostic information related to other vehicle systems.
- The TaSCAN, Global Tech Stream, or Intelligent Tester II devices (or any other Toyota genuine diagnostic tool) can be used to obtain detailed information on the diagnostic trouble codes from the airbag system, as well as diagnostic information from other systems. However, in some cases, the diagnostic trouble codes of the airbag system recorded by the airbag ECU when the event occurred may not match the diagnostic trouble codes read out when the diagnostic tool is used.

General Information:

- The data recording specifications of Toyota's airbag ECUs are divided into the following categories. The specifications for 12EDR or later are designed to be compatible with NHTSA's 49CFR Part 563 rule.
  - 00EDR / 02EDR / 04EDR / 06EDR / 10EDR / 12EDR / 13EDR / 15EDR / 17EDR / 19EDR
- The airbag ECU records data for all or some of the following accident types: frontal crash, rear crash , side crash, and rollover events.

Depending on the installed airbag ECU, data for side crash and/or rollover events may not be recorded.

- This airbag ECU records record pre-crash data and post-crash data.
  - If a single event occurs independently, the data for that event is recorded on a one-to-one basis.
  - If multiple events occur successively (within a period of approximately 500ms), the establishment of the recording trigger for the first event is defined as the "pre-crash recording trigger". Pre-crash data for the first event and post-crash data for each successive event is then recorded.
- The airbag ECU has two recording pages (memory maps) to store pre-crash data. Additionally, to store post-crash data, the airbag ECU has two recording pages for each accident type: two pages for frontal and rear crash, two pages for a side crash, and two pages for rollover event.
- The data recorded by the airbag ECU includes correlating information between each previously occurring event (i.e., information that clarifies the collision event sequence. This correlation information consists of the following items.
  - Time from Previous Pre-Crash TRG
  - Linked Pre-Crash Page
  - Time from Pre-Crash TRG
  - TRG Count
  - Previous Crash Type
- In frontal and rear collision events, the first point where a longitudinal cumulative delta-V of over 0.8 km/h (0.5 mph) is reached is regarded as time zero for the recorded data. In side impact collision and rollover events, the point in time at which the recording trigger is established is regarded as time zero for the recorded data.
- The recording trigger judgment threshold value differs depending on the collision type (i.e., frontal crash, rear crash, side crash, or rollover event).
- Some of the data recorded by the airbag ECU is transmitted to the airbag ECU from various vehicle control modules by the vehicle's Controller Area Network (CAN).
- In some cases, the airbag ECU part number printed on the ECU label may not match the airbag ECU part number that the CDR tool reports. The part number retrieved by the CDR tool should be considered as the official ECU part number.
- In frontal and rear collision events, the record time varies depending on the period during which a longitudinal cumulative delta-V of over 0.8 km/h (0.5 mph) is reached, and time series data is recorded for up to 250 ms. The record time described above is indicated as "Length of Delta-V". "Delta-V, Longitudinal" outside the record time is indicated by area shaded in the table, and not indicated in the graph.

Data Element Sign Convention:
The following table provides an explanation of the sign notation for data elements that may be included in this CDR report.

Data Element Name	Positive Sign Notation Indicates
Maximum Delta-V, Longitudinal	Forward
Delta-V, Longitudinal	Forward
Maximum Delta-V Lateral, Side Satellite Sensor 1	Left to Right
Maximum Delta-V Lateral, Side Satellite Sensor 2	Left to Right
Maximum Delta-V Lateral, Side Satellite Sensor 3	Left to Right
Maximum Delta-V Lateral, Side Satellite Sensor 4	Left to Right
Delta-V Lateral, Side Satellite Sensor 1	Left to Right
Delta-V Lateral, Side Satellite Sensor 2	Left to Right
Delta-V Lateral, Side Satellite Sensor 3	Left to Right
Delta-V Lateral, Side Satellite Sensor 4	Left to Right
Roll Angle Peak	Clockwise Rotation
Roll Angle at the Time of TRG	Clockwise Rotation
Roll Rate	Clockwise Rotation
Lateral Acceleration , Airbag ECU Sensor *	Left to Right
Longitudinal Acceleration , VSC Sensor	Forward
Yaw Rate	Left Turn
Steering Input	Left Turn

* For sensing a rollover

Data Definitions:

- The "ON" setting for the "Freeze Signal" indicates a state in which the non-volatile memory can not be overwritten or deleted by the airbag ECU. After "Freeze Signal" has been turned ON, subsequent events will not be recorded.
- "Recording Status" indicates a state in which all recorded event data has been written into the non-volatile memory, or a state in which this process was interrupted and not fully written into the non-volatile memory. If "Recording Status" is "Incomplete", recorded event data may not be valid.
- If the "Occupant Size Classification, Front Passenger" displays "Child" or "Not Occupied", "Side Air Bag Deployment, Time to Deploy" and "Pretensioner Deployment, Time to Fire" may indicate a time even if deployment did not occur on the for following part no's:
  - 89170-07280, 35400, 35410, 35470, 42660, 0R120, 0R080, 0R081, 0R150
- "Engine RPM" indicates the number of engine revolutions, not the number of motor revolutions. The recorded value has an upper limit of 12,800 rpm. Resolution is 100 rpm and the value is rounded down and recorded. For example, if the actual engine speed is 799 rpm, the recorded value will be 700 rpm.
- If the electric vehicle is using a calculated/virtual engine RPM for drivetrain control, "Engine RPM" may be recorded, but should not be used during data analysis.
- The upper limit for the recorded "Vehicle Speed" value is 200 km/h (125mph). Resolution is 1km/h (0.6mph) and the value is rounded

down and recorded. The accuracy of the "Vehicle Speed" value can be affected by various factors. These include, but not limited, to the following.
- Significant changes in the tire's rolling radius
- Wheel lock and wheel slip

- "Accelerator Pedal" has two recording specifications. Both the recorded value increases as the driver depresses the accelerator.
  - Percentage of accelerator pedal depressed (recorded as 0-100(%)).
  - Output voltage of accelerator pedal module (recorded as 0-5(V)).
- If M/T transmission vehicle of some limited model, "Shift Position" may display "Drive" regardless of the actual shift position.
- Depending on the type of occupant sensor installed in the vehicle, one of the following three recording formats for "Occupant Size Classification, Front Passenger" will be utilized.
  - Occupied / Not Occupied
  - AM50 / AF05 / Child / Not Occupied
  - AM50 / AF05 / Child or Not Occupied
- "Cruise Control Status" indicates whether the cruise control system is actuated or not. OFF indicates that the cruise control system is not actuated, but can also indicates that the vehicle is not equipped with the system.
- "Air Bag Warning Lamp, On/Off", "Ignition Cycle, Crash", "Seat Track Position Switch, Foremost, Status, Driver", "Occupant Size Classification, Front Passenger", "Safety Belt Status, Driver", "Safety Belt Status, Front Passenger", "Frontal Air Bag Suppression Switch Status, Front Passenger", and "RSCA Disable Switch" indicate the state approximately 1 second before time zero. They may not always indicate the state at the moment of collision.
- The upper and lower limits for the recorded value of "Motor RPM" is 17,500 rpm and -7,500 rpm respectively. Resolution is 100 rpm and the value is rounded down and recorded.
- "Brake Oil Pressure" has an upper limit of 12.14 Mpa. In the case of the vehicle that has not VSC system, "0 Mpa" or "Invalid" may be displayed.
- "Longitudinal Acceleration , VSC Sensor" has upper and lower limits for the recorded value of 8.973 m/s^2 and -8.973 m/s^2 respectively. This acceleration sensor does not sense collisions.
- "Sequential Shift Range" displaying "Undetermined" indicates the shift range is undetermined or was not being used.
- Some vehicles will not be equipped with all "Drive Mode" types indcated in the "Drive Mode" table. If some or all drive modes are not applicable to vehicle, "OFF" or "Invalid" may be displayed. The item in the "Drive Mode" table may not match the name of switch or indicator that equipped the vehicle.
- The upper and lower limits for the recorded value of "Steering Input" is 375 deg and -375 deg respectively. Resolution is 3 deg and the value is rounded down and recorded.
- Resolution of the "Air Bag Warning Lamp ON Time Since DTC was Set" is 15 minutes, and the value is rounded down and recorded.
- "Delta-V, Longitudinal" indicates the change in forward speed after time zero. This does not refer to vehicle speed, and it does not include the change in speed during the period from the start of the actual collision to establishment of the time zero.
- "Location of Side Satellite Sensor" shows the outline of a typical sensor position. Sensory location can be confirmed using the repair manual.
- For "Lateral Delta-V", the acceleration sensor installed in the airbag ECU is not used but the satellite sensor is used for the "Lateral Delta-V" calculation.
- "Time from Previous Pre-Crash TRG" indicates the time between the establishment of an event's pre-crash recording trigger to the establishment of a more recent event's pre-crash recording trigger. The upper limit for the recorded value is 16,381 milliseconds. In the event of establishment of the first pre-crash recording trigger after the ignition is switched ON, the upper limit value(max value) is recorded.
- "TRG Count" indicates a calculated value of the number of times recording triggers have been established for all crash types. The sequence in which each event occurred can be verified from the "TRG Count". The smaller the "TRG Count" value, the older the data. The upper limit for the recorded value is 65,533 times. When more than one event reaches the upper limit, the actual "TRG Count" may be greater than what is displayed for that event.
- "Linked Pre-Crash Page" is used to link 'paged" pre-crash data with 'paged" post-crash data. When old pre-crash data is overwritten by new pre-crash data, the "Linked Pre-Crash Page" value may record a page number that is not actually linked.
- Resolution of the "Time from Pre-Crash to TRG" is 50 [ms], and the value is rounded up and recorded
- "Roll Angle at the Time of TRG" and "Roll Angle Peak" do not represent the actual roll angle of the vehicle. These values are used internally by the airbag ECU for sensing a rollover.

05012_ToyotaS02std_r028

System Status at Time of Retrieval

ECU Part Number	89170-02D53
EDR Generation	12EDR
Complete File Recorded	Yes
Freeze Signal	ON
Freeze Signal Factor	Front Airbag Deployment
Diagnostic Trouble Codes Exist	No
Ignition Cycle ,Download (times)	14883
Multi-event, number of events (times)	2 or greater
Time from event 1 to 2 (s)	0.098
Time from Previous Pre Crash TRG (msec)	16381 or greater
Latest Pre-Crash Page	1
Contains Unlinked Pre-Crash Data	Yes

Event Record Summary at Retrieval

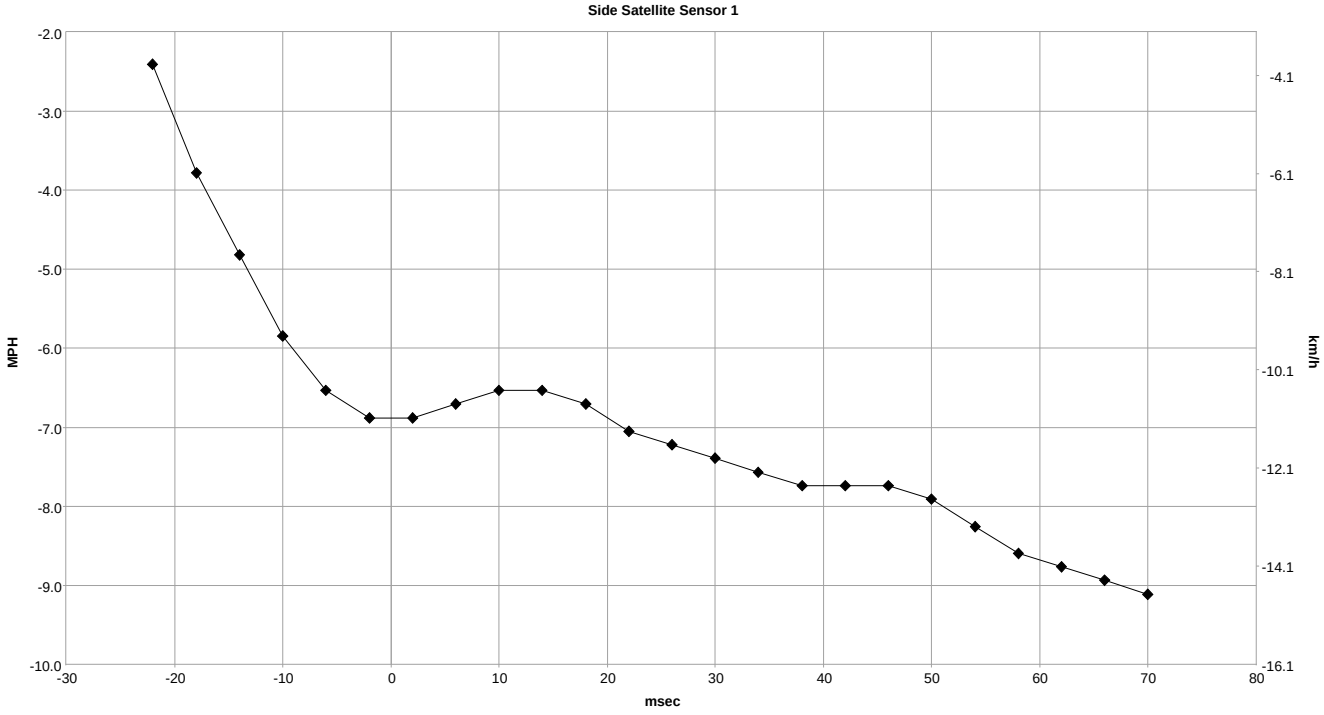
Events Recorded	TRG Count	Crash Type	Time (msec)	Pre-Crash & DTC Data Recording Status	Event & Crash Pulse Data Recording Status
Most Recent Event	4	Side Crash	0	Complete (Page 1)	Complete (Side Page 0)
1st Prior Event	3	Front/Rear Crash	-98	Complete (Page 1)	Complete (Front/Rear Page 0)
2nd Prior Event	2	Side Crash	-97	Complete (Page 1)	Complete (Side Page 1)

System Status at Event (Most Recent Event, TRG 4)

Recording Status, Side Crash Info.	Complete
Crash Type	Side Crash
TRG Count (times)	4
Previous Crash Type	Front/Rear Crash
Time from Pre-Crash TRG (msec)	97
Linked Pre-Crash Page	1
Side Airbag Deployment, Time to Deploy (If Equipped) (msec)	No
Side Curtain Airbag Deployment, Time to Deploy (If Equipped) (msec)	No
Pretensioner Deployment, Time to Fire (msec)	No
Rear Window Airbag Deployment, Time to Deploy (msec)	SNA

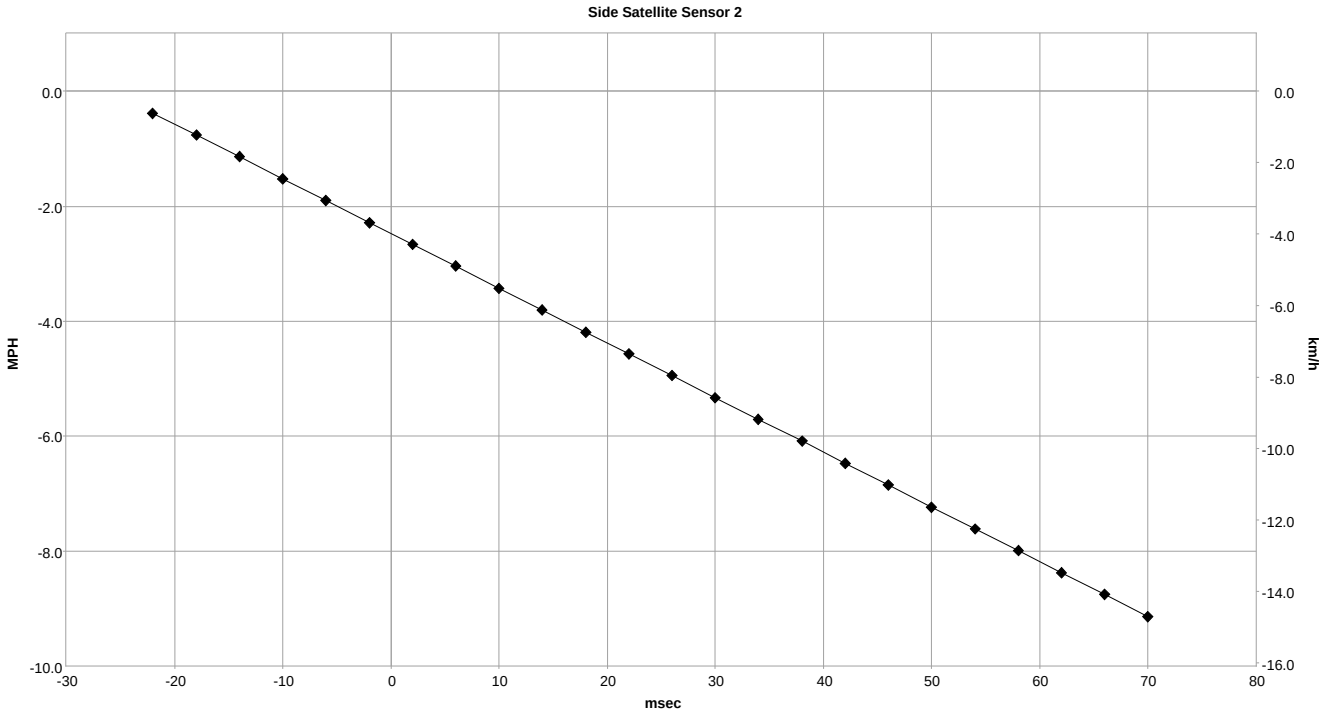
Lateral Crash Pulse (Most Recent Event, TRG 4 - table 1 of 2)

Recording Status, Time Series Data	Complete
Recorded Side	Left Side
Time from TRG to Next Sample (msec)	2
Location of Side Satellite Sensor 1	B-Pillar
Location of Side Satellite Sensor 2	Front Door
Location of Side Satellite Sensor 3	C-Pillar
Location of Side Satellite Sensor 4	Not Equipped
Maximum Delta-V Lateral, Side Satellite Sensor 1 (MPH [km/h])	-9.1 [-14.7]
Maximum Delta-V Lateral, Side Satellite Sensor 2 (MPH [km/h])	-9.1 [-14.7]
Maximum Delta-V Lateral, Side Satellite Sensor 3 (MPH [km/h])	13.5 [21.7]
Maximum Delta-V Lateral, Side Satellite Sensor 4 (MPH [km/h])	N/A



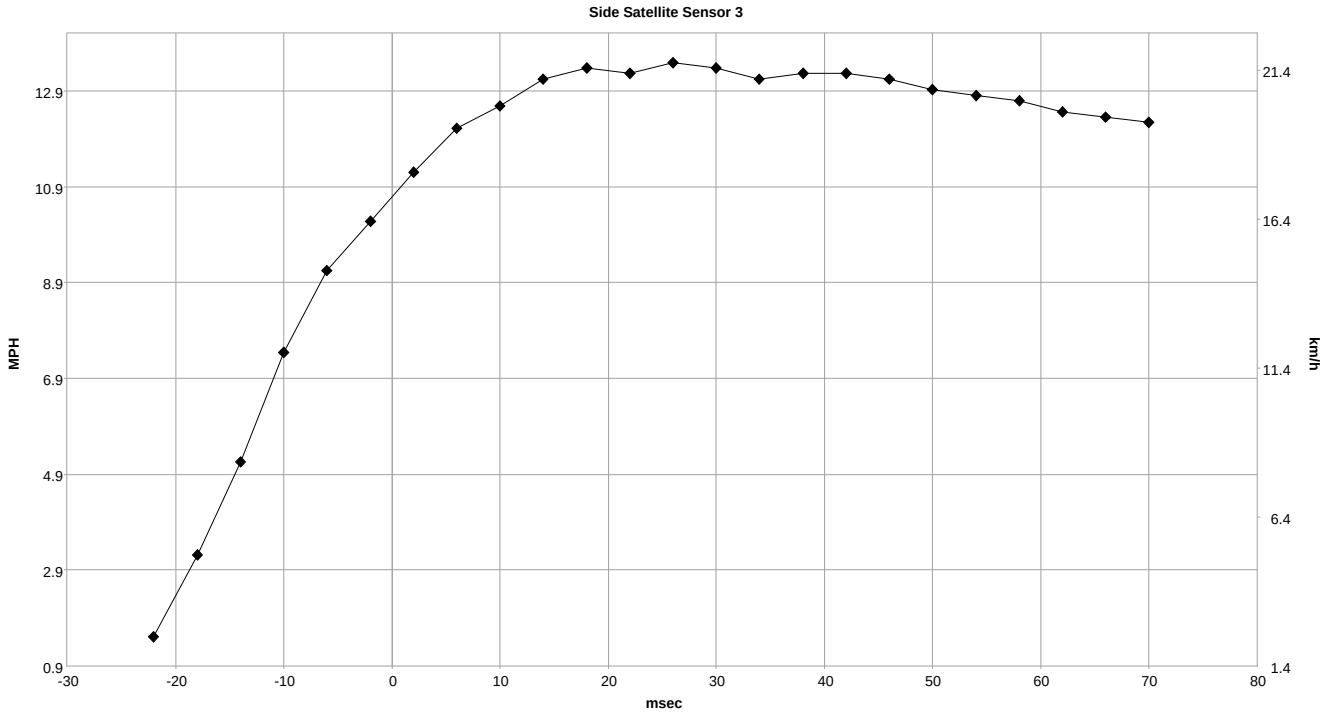
Deployment Time Marker Key

1	Driver/Passenger Pretensioner
2	Side Airbag
3	Rear Window Airbag Deployment Time



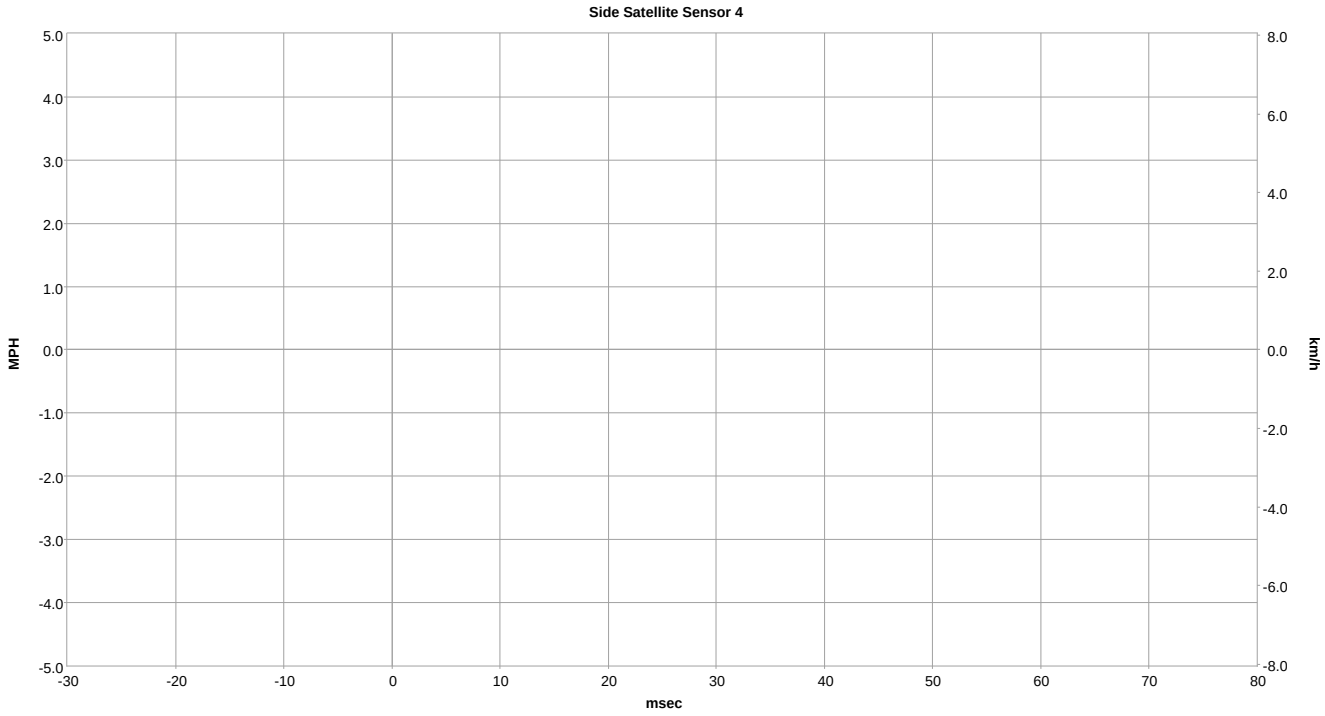
Deployment Time Marker Key

1	Driver/Passenger Pretensioner
2	Side Airbag
3	Rear Window Airbag Deployment Time



Deployment Time Marker Key

1	Side Curtain Airbag



Deployment Time Marker Key

1	Side Curtain Airbag

Lateral Crash Pulse (Most Recent Event, TRG 4 - table 2 of 2)

Time (msec)	Delta-V Lateral, Side Satellite Sensor 1 (MPH [km/h])	Delta-V Lateral, Side Satellite Sensor 2 (MPH [km/h])	Delta-V Lateral, Side Satellite Sensor 3 (MPH [km/h])	Delta-V Lateral, Side Satellite Sensor 4 (MPH [km/h])
-22	-2.4 [-3.9]	-0.4 [-0.6]	1.5 [2.4]	SNA [SNA]
-18	-3.8 [-6.1]	-0.8 [-1.2]	3.2 [5.1]	SNA [SNA]
-14	-4.8 [-7.7]	-1.1 [-1.8]	5.1 [8.3]	SNA [SNA]
-10	-5.8 [-9.4]	-1.5 [-2.5]	7.4 [12.0]	SNA [SNA]
-6	-6.5 [-10.5]	-1.9 [-3.1]	9.1 [14.7]	SNA [SNA]
-2	-6.9 [-11.1]	-2.3 [-3.7]	10.2 [16.4]	SNA [SNA]
2	-6.9 [-11.1]	-2.7 [-4.3]	11.2 [18.0]	SNA [SNA]
6	-6.7 [-10.8]	-3.0 [-4.9]	12.1 [19.5]	SNA [SNA]
10	-6.5 [-10.5]	-3.4 [-5.5]	12.6 [20.2]	SNA [SNA]
14	-6.5 [-10.5]	-3.8 [-6.1]	13.1 [21.1]	SNA [SNA]
18	-6.7 [-10.8]	-4.2 [-6.7]	13.4 [21.5]	SNA [SNA]
22	-7.0 [-11.3]	-4.6 [-7.4]	13.3 [21.3]	SNA [SNA]
26	-7.2 [-11.6]	-5.0 [-8.0]	13.5 [21.7]	SNA [SNA]
30	-7.4 [-11.9]	-5.3 [-8.6]	13.4 [21.5]	SNA [SNA]
34	-7.6 [-12.2]	-5.7 [-9.2]	13.1 [21.1]	SNA [SNA]
38	-7.7 [-12.5]	-6.1 [-9.8]	13.3 [21.3]	SNA [SNA]
42	-7.7 [-12.5]	-6.5 [-10.4]	13.3 [21.3]	SNA [SNA]
46	-7.7 [-12.5]	-6.9 [-11.0]	13.1 [21.1]	SNA [SNA]
50	-7.9 [-12.7]	-7.2 [-11.6]	12.9 [20.8]	SNA [SNA]
54	-8.3 [-13.3]	-7.6 [-12.3]	12.8 [20.6]	SNA [SNA]
58	-8.6 [-13.8]	-8.0 [-12.9]	12.7 [20.4]	SNA [SNA]
62	-8.8 [-14.1]	-8.4 [-13.5]	12.5 [20.0]	SNA [SNA]
66	-8.9 [-14.4]	-8.8 [-14.1]	12.3 [19.9]	SNA [SNA]
70	-9.1 [-14.7]	-9.1 [-14.7]	12.2 [19.7]	SNA [SNA]

DTCs Present at Time of Event (Most Recent Event, TRG 4)

Recording Status, Diagnostic	Complete
Ignition Cycle Since DTC was Set (times)	0
Airbag Warning Lamp ON Time Since DTC was Set (min)	0
Diagnostic Trouble Codes	None

Pre-Crash Data, 1 Sample (Most Recent Event, TRG 4)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	450
Safety Belt Status, Driver	ON
Safety Belt Status, Front Passenger	ON
Occupant Size Classification, Front Passenger	AM50 (Not Child)
Frontal Airbag Suppression Switch Status, Front Passenger	SNA
RSCA Disable Switch	SNA
Seat Track Position Switch, Foremost, Status, Driver	No
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	14882

Pre-Crash Data, -5 to 0 seconds (Most Recent Event, TRG 4)

Time (sec)	-4.95	-4.45	-3.95	-3.45	-2.95	-2.45	-1.95	-1.45	-0.95	-0.45	0 (TRG)
Vehicle Speed (MPH [km/h])	64.6 [104]	66.5 [107]	68.4 [110]	69.6 [112]	69.6 [112]	70.8 [114]	71.5 [115]	71.5 [115]	72.1 [116]	71.5 [115]	72.1 [116]
Accelerator Pedal, % Full (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of Engine Throttle (%)	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0	100.0
Engine RPM (RPM)	6,100	6,200	6,400	6,500	6,400	6,400	6,500	6,600	6,700	6,500	6,400
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Brake Oil Pressure (Mpa)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Longitudinal Acceleration , VSC Sensor (m/sec^2)	1.579	0.502	1.938	0.431	0.072	0.861	1.364	0.646	1.579	-0.790	-6.819
Yaw Rate (deg/sec)	-0.98	0.49	0.49	-0.49	-1.46	0.00	-0.49	-0.49	-0.49	-5.37	-7.32
Steering Input (degrees)	-3	0	0	0	-3	0	-3	-3	-3	-24	-33
Shift Position	2	2	2	2	2	2	2	2	2	2	2
Sequential Shift Range	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, ECO	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, Sport	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

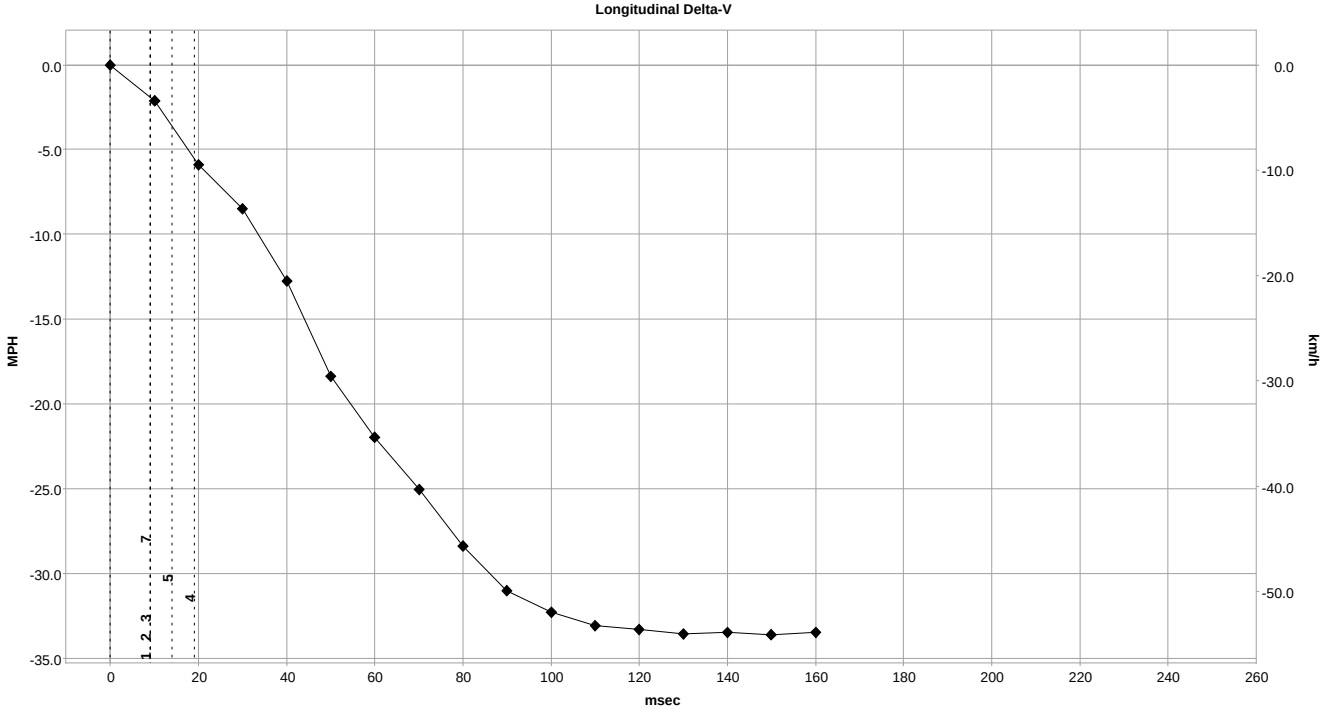
Drive Mode, Snow	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, EV	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

System Status at Event (1st Prior Event, TRG 3)

Recording Status, Front/Rear Crash Info.	Complete
Crash Type	Front/Rear Crash
TRG Count (times)	3
Previous Crash Type	Side Crash
Time from Pre-Crash TRG (msec)	8
Linked Pre-Crash Page	1
Frontal Airbag Deployment, Time to 1st Stage Deployment, Driver (msec)	9
Frontal Airbag Deployment, Time to 1st Stage Deployment, Front Passenger (msec)	9
Pretensioner Deployment, Time to Fire, Driver (msec)	9
Pretensioner Deployment, Time to Fire, Front Passenger (msec)	9
Frontal Airbag Deployment, Time to 2nd Stage, Driver (msec)	19
Frontal Airbag Deployment, Time to 2nd Stage, Front Passenger (msec)	14
Active Head Restraint, Time to Deploy, Driver (msec)	SNA
Active Head Restraint, Time to Deploy, Front Passenger (msec)	SNA
Side Curtain Airbag Deployment, Time to Deploy, Driver (msec)	9
Side Curtain Airbag Deployment, Time to Deploy, Passenger (msec)	9
Rear Window Airbag Deployment, Time to Deploy (msec)	SNA

Longitudinal Crash Pulse (1st Prior Event, TRG 3 - table 1 of 2)

Recording Status, Time Series Data	Complete
Time from Time Zero to TRG (msec)	9
Length of Delta-V (msec)	160
Max. Longitudinal Delta-V (MPH [km/h])	-33.7 [-54.3]
Time, Maximum Delta-V, Longitudinal (msec)	154
Power Supply Status at Max. Delta-V	ON



Deployment Time Marker Key

1	Driver Airbag Deployment Time
2	Passenger Airbag Deployment Time
3	Driver/Passenger Pretensioner
4	Driver 2nd Stage Airbag Deployment Time
5	Passenger 2nd Stage Airbag Deployment
6	Driver/Passenger AHR
7	Driver/Passenger CSA
8	Rear Window Airbag Deployment Time

Longitudinal Crash Pulse (1st Prior Event, TRG 3 - table 2 of 2)

Time (msec)	Longitudinal Delta-V (MPH [km/h])	Power Supply Status
0	0.0 [0.0]	ON
10	-2.1 [-3.4]	ON
20	-5.9 [-9.5]	ON
30	-8.5 [-13.7]	ON
40	-12.7 [-20.5]	OFF
50	-18.4 [-29.6]	ON
60	-22.0 [-35.3]	OFF
70	-25.0 [-40.3]	OFF
80	-28.4 [-45.6]	OFF
90	-31.0 [-49.9]	OFF
100	-32.3 [-52.0]	ON
110	-33.1 [-53.2]	ON
120	-33.3 [-53.6]	ON
130	-33.6 [-54.0]	ON
140	-33.5 [-53.9]	ON
150	-33.6 [-54.1]	ON
160	-33.5 [-53.9]	ON
170	0.0 [0.0]	ON
180	0.0 [0.0]	ON
190	0.0 [0.0]	ON
200	0.0 [0.0]	ON
210	0.0 [0.0]	ON
220	0.0 [0.0]	ON
230	0.0 [0.0]	ON
240	0.0 [0.0]	ON
250	0.0 [0.0]	ON

DTCs Present at Time of Event (1st Prior Event, TRG 3)

Recording Status, Diagnostic	Complete
Ignition Cycle Since DTC was Set (times)	0
Airbag Warning Lamp ON Time Since DTC was Set (min)	0
Diagnostic Trouble Codes	None

Pre-Crash Data, 1 Sample (1st Prior Event, TRG 3)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	450
Safety Belt Status, Driver	ON
Safety Belt Status, Front Passenger	ON
Occupant Size Classification, Front Passenger	AM50 (Not Child)
Frontal Airbag Suppression Switch Status, Front Passenger	SNA
RSCA Disable Switch	SNA
Seat Track Position Switch, Foremost, Status, Driver	No
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	14882

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Pre-Crash Data, -5 to 0 seconds (1st Prior Event, TRG 3)

Time (sec)	-4.95	-4.45	-3.95	-3.45	-2.95	-2.45	-1.95	-1.45	-0.95	-0.45	0 (TRG)
Vehicle Speed (MPH [km/h])	64.6 [104]	66.5 [107]	68.4 [110]	69.6 [112]	69.6 [112]	70.8 [114]	71.5 [115]	71.5 [115]	72.1 [116]	71.5 [115]	72.1 [116]
Accelerator Pedal, % Full (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of Engine Throttle (%)	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0	100.0
Engine RPM (RPM)	6,100	6,200	6,400	6,500	6,400	6,400	6,500	6,600	6,700	6,500	6,400
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Brake Oil Pressure (Mpa)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Longitudinal Acceleration , VSC Sensor (m/sec^2)	1.579	0.502	1.938	0.431	0.072	0.861	1.364	0.646	1.579	-0.790	-6.819
Yaw Rate (deg/sec)	-0.98	0.49	0.49	-0.49	-1.46	0.00	-0.49	-0.49	-0.49	-5.37	-7.32
Steering Input (degrees)	-3	0	0	0	-3	0	-3	-3	-3	-24	-33
Shift Position	2	2	2	2	2	2	2	2	2	2	2
Sequential Shift Range	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, ECO	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, Sport	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

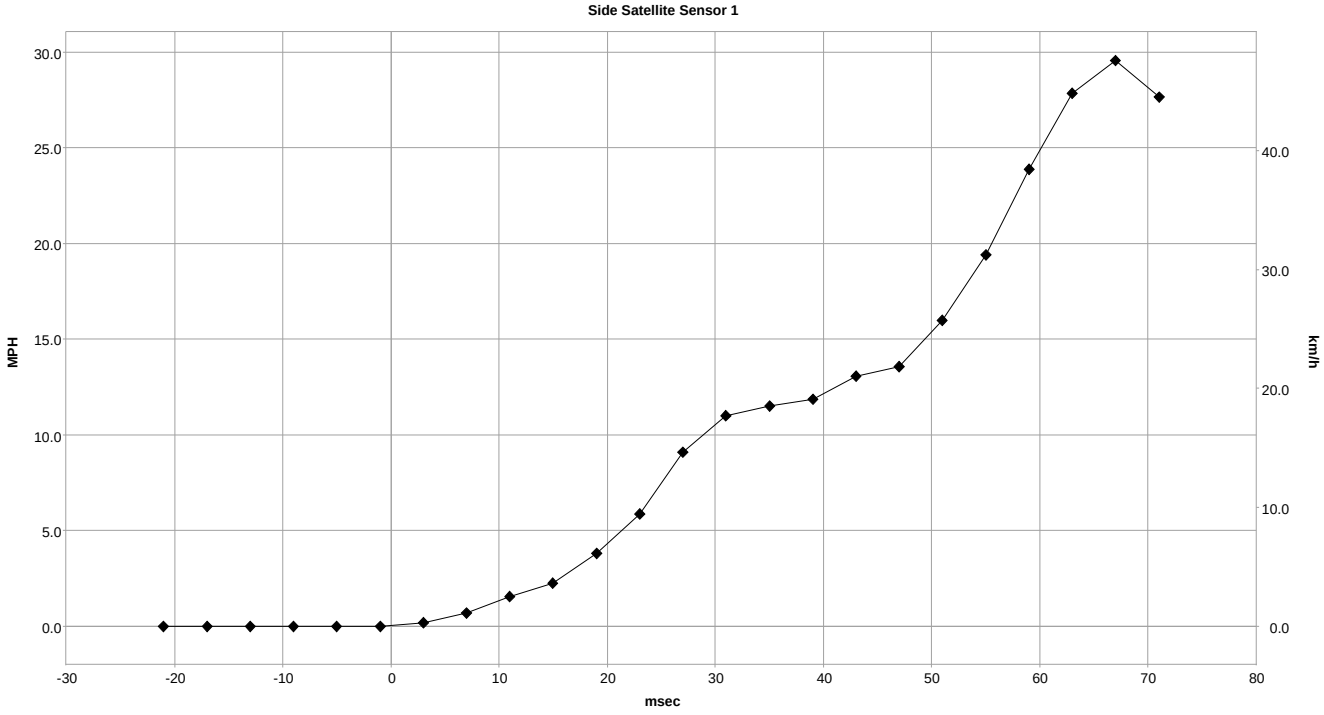
Drive Mode, Snow	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, EV	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

System Status at Event (2nd Prior Event, TRG 2)

Recording Status, Side Crash Info.	Complete
Crash Type	Side Crash
TRG Count (times)	2
Previous Crash Type	No Event
Time from Pre-Crash TRG (msec)	0
Linked Pre-Crash Page	1
Side Airbag Deployment, Time to Deploy (If Equipped) (msec)	No
Side Curtain Airbag Deployment, Time to Deploy (If Equipped) (msec)	No
Pretensioner Deployment, Time to Fire (msec)	No
Rear Window Airbag Deployment, Time to Deploy (msec)	SNA

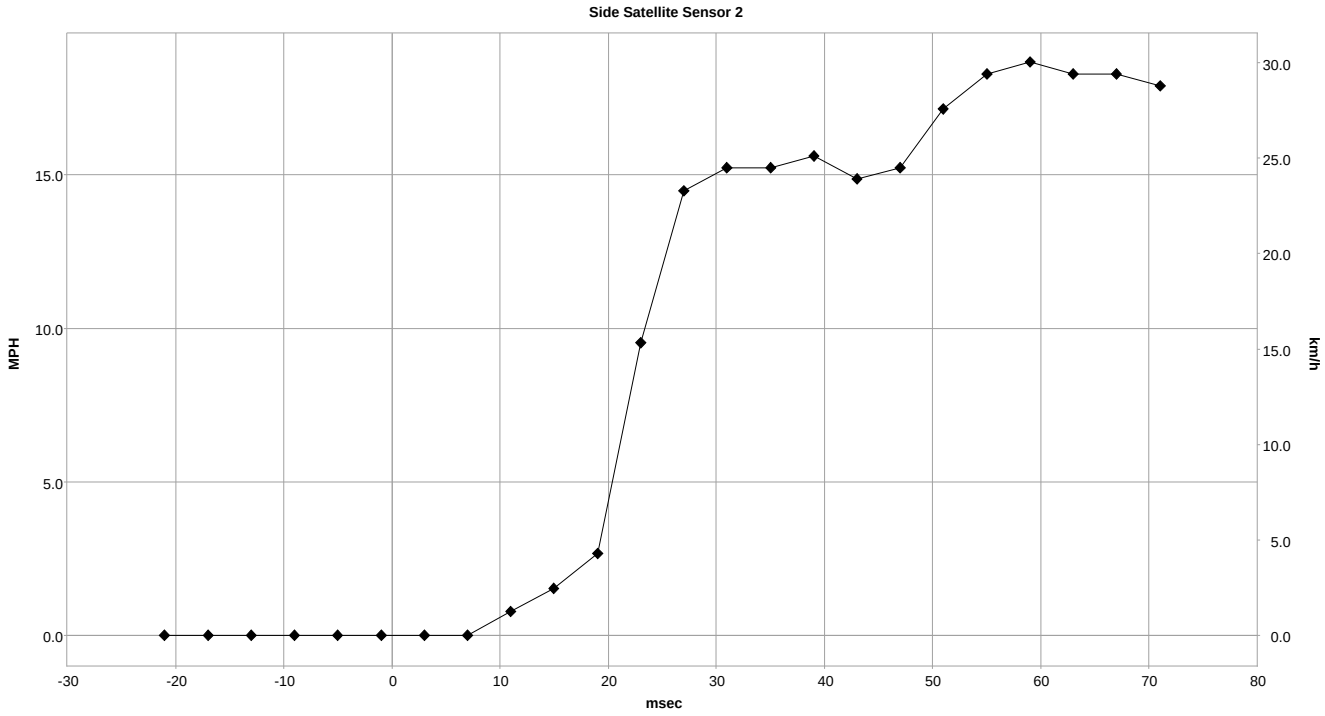
Lateral Crash Pulse (2nd Prior Event, TRG 2 - table 1 of 2)

Recording Status, Time Series Data	Complete
Recorded Side	Left Side
Time from TRG to Next Sample (msec)	3
Location of Side Satellite Sensor 1	B-Pillar
Location of Side Satellite Sensor 2	Front Door
Location of Side Satellite Sensor 3	C-Pillar
Location of Side Satellite Sensor 4	Not Equipped
Maximum Delta-V Lateral, Side Satellite Sensor 1 (MPH [km/h])	29.6 [47.6]
Maximum Delta-V Lateral, Side Satellite Sensor 2 (MPH [km/h])	18.7 [30.0]
Maximum Delta-V Lateral, Side Satellite Sensor 3 (MPH [km/h])	19.7 [31.6]
Maximum Delta-V Lateral, Side Satellite Sensor 4 (MPH [km/h])	N/A



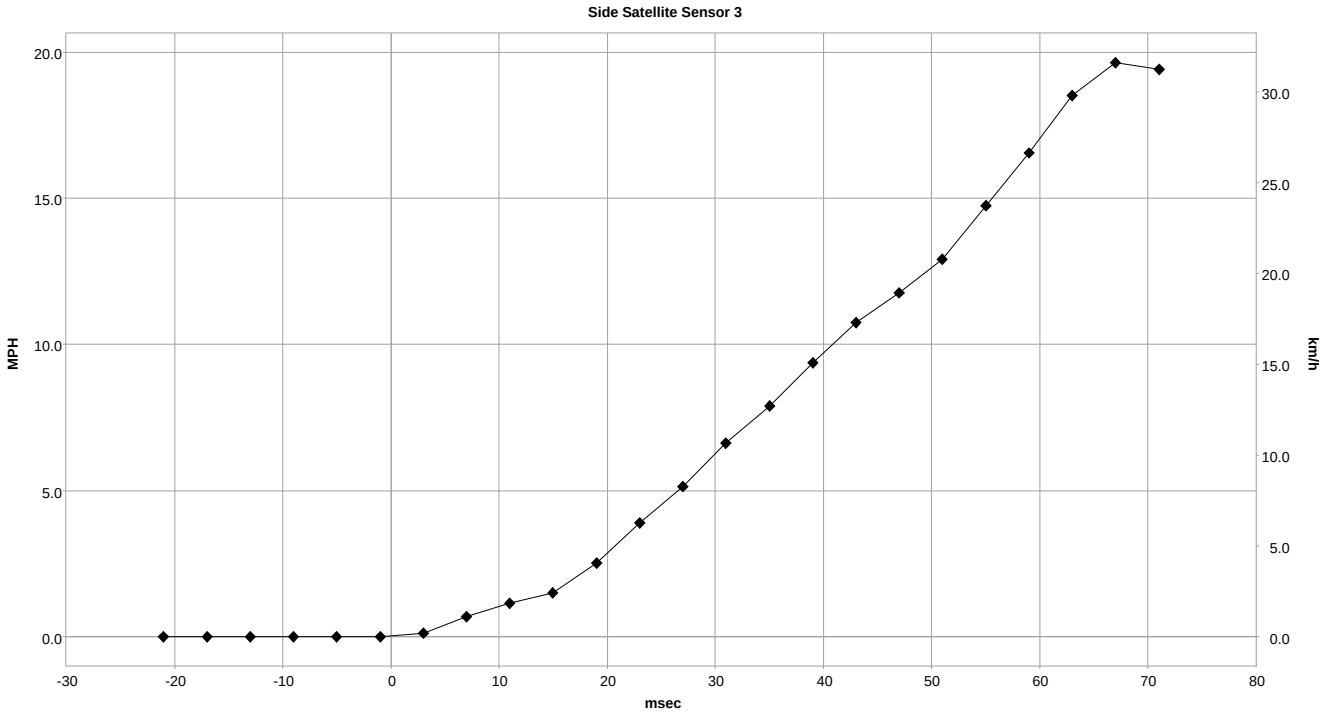
Deployment Time Marker Key

1	Driver/Passenger Pretensioner
2	Side Airbag
3	Rear Window Airbag Deployment Time



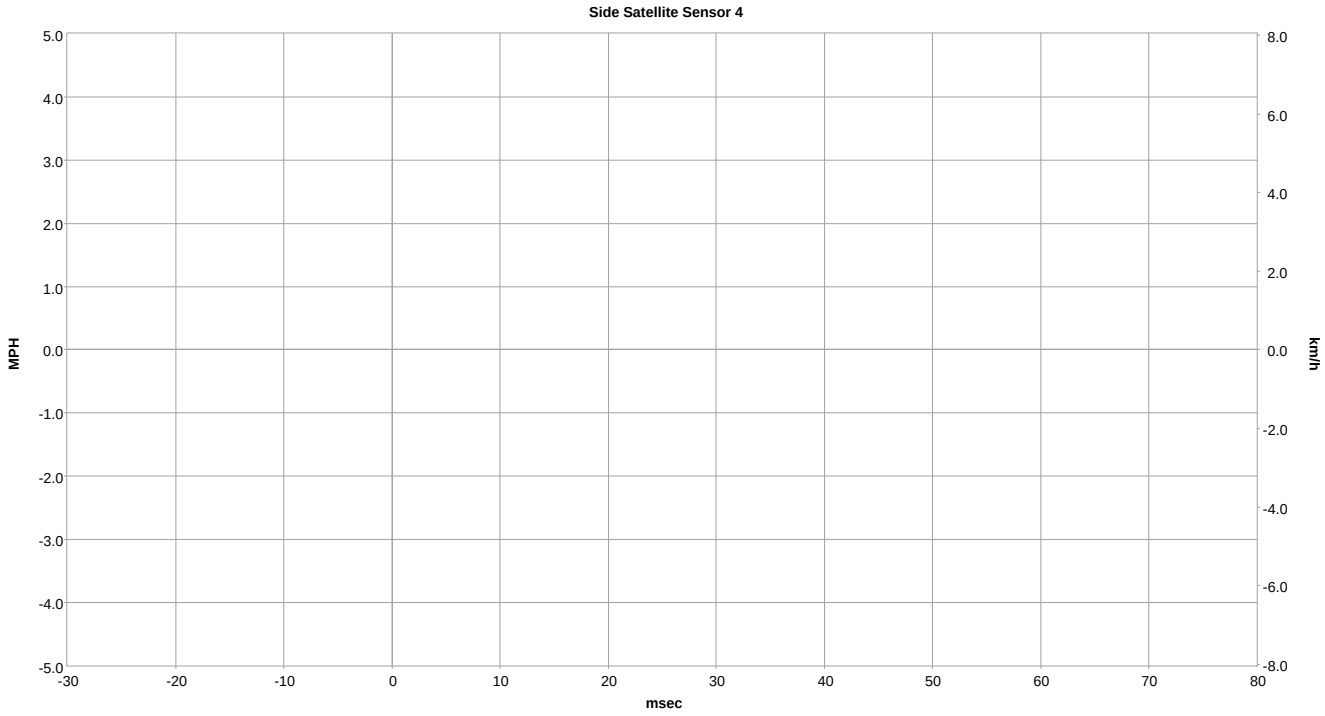
Deployment Time Marker Key

1	Driver/Passenger Pretensioner
2	Side Airbag
3	Rear Window Airbag Deployment Time



Deployment Time Marker Key

1	Side Curtain Airbag



Deployment Time Marker Key

1	Side Curtain Airbag

Lateral Crash Pulse (2nd Prior Event, TRG 2 - table 2 of 2)

Time (msec)	Delta-V Lateral, Side Satellite Sensor 1 (MPH [km/h])	Delta-V Lateral, Side Satellite Sensor 2 (MPH [km/h])	Delta-V Lateral, Side Satellite Sensor 3 (MPH [km/h])	Delta-V Lateral, Side Satellite Sensor 4 (MPH [km/h])
-21	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]	SNA [SNA]
-17	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]	SNA [SNA]
-13	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]	SNA [SNA]
-9	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]	SNA [SNA]
-5	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]	SNA [SNA]
-1	0.0 [0.0]	0.0 [0.0]	0.0 [0.0]	SNA [SNA]
3	0.2 [0.3]	0.0 [0.0]	0.1 [0.2]	SNA [SNA]
7	0.7 [1.1]	0.0 [0.0]	0.7 [1.1]	SNA [SNA]
11	1.5 [2.5]	0.8 [1.2]	1.1 [1.8]	SNA [SNA]
15	2.2 [3.6]	1.5 [2.5]	1.5 [2.4]	SNA [SNA]
19	3.8 [6.1]	2.7 [4.3]	2.5 [4.0]	SNA [SNA]
23	5.8 [9.4]	9.5 [15.3]	3.9 [6.3]	SNA [SNA]
27	9.1 [14.7]	14.5 [23.3]	5.1 [8.3]	SNA [SNA]
31	11.0 [17.7]	15.2 [24.5]	6.6 [10.7]	SNA [SNA]
35	11.5 [18.5]	15.2 [24.5]	7.9 [12.7]	SNA [SNA]
39	11.9 [19.1]	15.6 [25.1]	9.4 [15.1]	SNA [SNA]
43	13.1 [21.0]	14.9 [23.9]	10.7 [17.3]	SNA [SNA]
47	13.6 [21.9]	15.2 [24.5]	11.8 [18.9]	SNA [SNA]
51	16.0 [25.7]	17.1 [27.6]	12.9 [20.8]	SNA [SNA]
55	19.4 [31.3]	18.3 [29.4]	14.7 [23.7]	SNA [SNA]
59	23.9 [38.5]	18.7 [30.0]	16.6 [26.7]	SNA [SNA]
63	27.9 [44.8]	18.3 [29.4]	18.5 [29.8]	SNA [SNA]
67	29.6 [47.6]	18.3 [29.4]	19.7 [31.6]	SNA [SNA]
71	27.7 [44.5]	17.9 [28.8]	19.4 [31.3]	SNA [SNA]

DTCs Present at Time of Event (2nd Prior Event, TRG 2)

Recording Status, Diagnostic	Complete
Ignition Cycle Since DTC was Set (times)	0
Airbag Warning Lamp ON Time Since DTC was Set (min)	0
Diagnostic Trouble Codes	None

Pre-Crash Data, 1 Sample (2nd Prior Event, TRG 2)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	450
Safety Belt Status, Driver	ON
Safety Belt Status, Front Passenger	ON
Occupant Size Classification, Front Passenger	AM50 (Not Child)
Frontal Airbag Suppression Switch Status, Front Passenger	SNA
RSCA Disable Switch	SNA
Seat Track Position Switch, Foremost, Status, Driver	No
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	14882

Pre-Crash Data, -5 to 0 seconds (2nd Prior Event, TRG 2)

Time (sec)	-4.95	-4.45	-3.95	-3.45	-2.95	-2.45	-1.95	-1.45	-0.95	-0.45	0 (TRG)
Vehicle Speed (MPH [km/h])	64.6 [104]	66.5 [107]	68.4 [110]	69.6 [112]	69.6 [112]	70.8 [114]	71.5 [115]	71.5 [115]	72.1 [116]	71.5 [115]	72.1 [116]
Accelerator Pedal, % Full (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of Engine Throttle (%)	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	100.0	100.0
Engine RPM (RPM)	6,100	6,200	6,400	6,500	6,400	6,400	6,500	6,600	6,700	6,500	6,400
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Brake Oil Pressure (Mpa)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Longitudinal Acceleration , VSC Sensor (m/sec^2)	1.579	0.502	1.938	0.431	0.072	0.861	1.364	0.646	1.579	-0.790	-6.819
Yaw Rate (deg/sec)	-0.98	0.49	0.49	-0.49	-1.46	0.00	-0.49	-0.49	-0.49	-5.37	-7.32
Steering Input (degrees)	-3	0	0	0	-3	0	-3	-3	-3	-24	-33
Shift Position	2	2	2	2	2	2	2	2	2	2	2
Sequential Shift Range	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, ECO	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, Sport	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

Drive Mode, Snow	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, EV	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

DTCs Present at Time of Event (Unlinked, Page 0)

Recording Status, Diagnostic	Complete
Ignition Cycle Since DTC was Set (times)	0
Airbag Warning Lamp ON Time Since DTC was Set (min)	0
Diagnostic Trouble Codes	None

Pre-Crash Data, 1 Sample (Unlinked, Page 0)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	400
Safety Belt Status, Driver	ON
Safety Belt Status, Front Passenger	OFF
Occupant Size Classification, Front Passenger	Not Occupied
Frontal Airbag Suppression Switch Status, Front Passenger	SNA
RSCA Disable Switch	SNA
Seat Track Position Switch, Foremost, Status, Driver	No
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	14608

BOSCH

Pre-Crash Data, -5 to 0 seconds (Unlinked, Page 0)

Time (sec)	-4.9	-4.4	-3.9	-3.4	-2.9	-2.4	-1.9	-1.4	-0.9	-0.4	0 (TRG)
Vehicle Speed (MPH [km/h])	24.2 [39]	24.9 [40]	24.9 [40]	24.9 [40]	24.9 [40]	24.9 [40]	24.2 [39]	24.2 [39]	23.6 [38]	23 [37]	22.4 [36]
Accelerator Pedal, % Full (%)	14.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentage of Engine Throttle (%)	9.0	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Engine RPM (RPM)	1,700	1,700	1,300	1,000	1,000	1,000	1,000	900	900	900	900
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Brake Oil Pressure (Mpa)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Longitudinal Acceleration , VSC Sensor (m/sec^2)	0.287	0.359	-0.144	-0.072	-0.287	-0.359	-0.646	-0.574	-0.502	-1.651	-0.718
Yaw Rate (deg/sec)	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.00	-2.44	-3.90
Steering Input (degrees)	3	3	3	3	3	3	3	3	3	-9	-24
Shift Position	D	D	D	D	D	D	D	D	D	D	D
Sequential Shift Range	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, ECO	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, Sport	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

Drive Mode, Snow	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, EV	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

Hexadecimal Data

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

Hexadecimal data has been removed in order to prevent the retrieval of personally identifiable information

Disclaimer of Liability

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

DOT HS 813 635
October 2024

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

16402-092624-v2