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**Special Crash Investigations:
On-Site Reported Power Steering
Malfunction Crash Investigation;
Vehicle: 2021 Ford F-150 Pickup;
Location: Georgia;
Crash Date: September 2021**

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16. Abstract This on-site investigation documents the road departure crash and the reported power steering malfunction of a 2021 Ford F-150 pickup. The crash was fatal to the belted 68-year-old male driver. The Ford was traveling north on a divided highway approaching an exit ramp. The Ford entered the gore at the exit, struck a road sign, and continued through the gore area for approximately 92 m (300 ft) before striking a large-diameter tree with the front plane, left aspect. The force of the crash caused several safety systems in the Ford to actuate/deploy. The driver was removed from the vehicle by EMS personnel and transported to a medical center where he was pronounced deceased 4 hours later. The investigation was assigned in conjunction with NHTSA Recall 21V-407 for a manufacturing issue that may cause the steering to become hard to turn or lock. The Ford was not listed in the identified recall population; however, its date of manufacture was close to the manufacture dates stated in the recall. A joint inspection of the Ford by SCI, representatives for Ford Motor Company, and legal representatives for the family took place in January 2022. After the investigation and subsequent analysis of the available data, the root cause of the road departure and crash could not be determined.			
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Special Crash Investigations
Reported Power Steering Malfunction Crash Investigation
Office of Defects Investigation
Case Number: CR21025
Vehicle: 2021 Ford F-150 Pickup
Location: Georgia
Crash Date: September 2021

Background

This on-site investigation documents the road departure crash and the reported power steering malfunction of a 2021 Ford F-150 pickup (Figure 1). The crash resulted in fatal injuries to the belted 68-year-old male driver. The Ford was traveling north on a divided highway approaching an exit ramp. The police crash report indicated that the Ford, traveling in the right lane, entered the gore at the exit and struck a road sign. The Ford continued through the gore area and along the roadside for approximately 92 m (300 ft) before striking a large diameter tree with the front plane, left aspect. The force of the crash caused several safety systems in the Ford to actuate/deploy. The driver was removed from the vehicle by EMS personnel and transported to a medical center where he was pronounced deceased 4 hours later.



Figure 1. Left side view of the Ford

The deceased driver's family provided notification of the crash to the National Highway Traffic Safety Administration and the vehicle manufacturer was notified. NHTSA's Crash Investigation Division subsequently assigned an on-site investigation to the Special Crash Investigation (SCI) team at Crash Research and Analysis, Inc., in October 2021. The investigation was assigned in conjunction with NHTSA Recall 21V-407 for a manufacturing issue that may cause the steering to become hard to turn or lock. The Ford was not listed in the identified recall population; however, its date of manufacture was close to the manufacture dates stated in the recall. A joint inspection of the Ford attended by SCI, representatives for Ford Motor Company, and legal representatives for the family took place in January 2022.

On-site investigation activities included an inspection of the Ford to measure exterior deformation and interior damage and intrusion, to document the interior occupant contact evidence, and assess the manual and supplemental restraint systems. Photographs documented the post-crash condition of the power steering rack, and it was removed from the vehicle. At the

conclusion of the joint inspection, the power steering rack remained in the custody of the driver's legal team. A computerized tomography (CT) scan and additional inspection of the power steering assembly was planned for a future date. At the issuance of this final report, no additional information regarding the results of the CT scan or any additional activity was communicated by the driver's legal team to NHTSA or SCI. The Ford was equipped with an event data recorder (EDR), which was removed from the vehicle prior to SCI's investigation. The EDR was imaged by a third party and the imaged CDRX file was shared with NHTSA and SCI. The crash site was also photographed and documented by a total station.

After investigation and subsequent analysis of the available data, the root cause of the road departure and crash could not be determined.

Crash Summary

Crash Site

The crash occurred in the afternoon of September 2021. The police reported the environmental conditions as clear, daylight, and dry. The National Weather Service reported a temperature of 30.5 °C (87 °F), 46 percent relative humidity, 9.6 km/h (6 mph) east southeasterly winds, and mostly cloudy sky conditions. The crash site (Figure 2) was a four-lane State highway with two lanes heading north and two lanes heading south with an exit lane on the right side of the northbound travel lanes.

The speed limit was 113 km/h (70 mph). The exit ramp was posted with a warning sign with a recommended speed of 32 km/h (20 mph).



Figure 2. Viewing north along the Ford's approach



Figure 3. Viewing north at the Ford's road departure

The exit lane had an 18° curve to the right creating a triangular grass gore (Figure 3) that separated the exit ramp from the northbound lanes. Tire marks indicating the trajectory of the Ford were identified during the police investigation at the pavement edge where the surface of the gore changed to grass.

The gore was tapered along its center for drainage. There was a flush-mounted concrete drain structure with a grate approximately 40 meters (131 ft) from the pavement edge. The Ford struck

several fixed objects in the gore as it traveled off-road. In succession, these were an exit sign mounted on two posts with breakaway bases, a raised mound that surrounded a tree stump, a 13 cm (5.0 in) diameter dead tree, and a 52 cm (20.5 in) large diameter tree bordering a wooden area. The road sign measured 182 cm wide by 152 cm tall (72 in x 60 in) and was elevated in the air 223 cm (88.0 in) by two posts. The sign was located 8.0 m (26.2 ft) from the pavement edge of the gore. The raised mound/stump was located 66.8 m (219.2 ft) north of the exit sign along the Ford's trajectory. The dead tree stump was located 8.0 m (26.2 ft) north of the raised mound followed by the large diameter tree 6.4 m (20.9 ft) further to the north. The overall distance from the pavement edge to the large diameter tree was 89.2 m (292.7 ft).

Pre-Crash

The Ford was traveling north on the exit lane with active cruise control at an EDR-reported speed of 124.0 km/h (77 mph) at the 5.0-second pre-crash interval. Approaching the exit, this section of roadway had a large radius right curve and the EDR recorded a consistent right steering input by the driver. Beginning approximately at the 4.0-second pre-crash interval, the right steering input slowly increased as the Ford progressed along the ramp. Reconstruction of the crash determined the Ford crossed the left fog line of the exit ramp at approximately the 3.0-second pre-crash interval entering the paved area of the gore. The EDR recorded a sudden increase in the right steer at this time. The Ford then departed the pavement onto the grass gore at approximately the 2.6-second pre-crash interval evidenced by the tire marks observed during the police investigation and an EDR-recorded brake application.

Crash

The Ford struck the exit sign posts with the front plane and separated the breakaway bases (Event1). The Ford displaced the signposts forward and the sign fell onto the vehicle fracturing the upper aspect of the windshield (Event 2). The driver reacted to the off-road trajectory by an EDR-recorded brake application that disengaged the cruise control and with an increase in the right steering input. The Ford continued towards the center of the wood line in a tracking mode with a slight arc to the right (Figure 4).



Figure 4. Viewing north of the Ford's tire tracking, yellow line represents inside of left tire tracks. (On-scene image from law enforcement)



Figure 5. North view of the tree impact

Approximately 75.0 m (246 ft) from where the Ford left the road, the rear drive train coupling and differential struck the raised mound that measured 121.9 cm (48.0 in) in diameter (Event 3). This impact was the source of algorithm enable (AE). The EDR-recorded speed of the Ford was 88 km/h (54.4 mph) at AE. The Ford then ran over a 12.7 cm (5.0 in) diameter tree stump (Event 4) and struck the large diameter tree (Event 5/Figure 5). Crash diagrams are included at the end of this report.

Post-Crash

Police and EMS and local firefighters responded to the scene. The driver was removed from the Ford by the EMS having suffered incapacitating injuries. The police investigator reported that he was alert and oriented at that time. He was transported by ambulance to a local medical center for treatment and then expired 4 hours after the crash. The Ford was towed from the scene and stored by the driver's legal team until this investigation was conducted.

2021 Ford F-150 Pickup

Description

The Ford F-150 (Figure 6) was a 4-door, SuperCrew pickup equipped with FX4 trim. The vehicle was manufactured in May 2021 and identified by the Vehicle Identification Number 1FTFW1ED3MFxxxxxx. The vehicle's odometer reading was unknown due to crash damage. Constructed on a 369 cm (145.3 in) wheelbase, the Ford was powered by a 3.5-liter, V-6, hybrid engine linked to a 10-speed automatic transmission with 4-wheel drive. The gross vehicle weight rating was 3,334 kg (7,350 lb) with gross axle weight ratings of 1,769 kg (3,900 lb) front and 1,882 (4,150 lb) rear. The Ford had vehicle manufacturer recommended size 275/60R20 tires mounted on OEM alloy wheels. The tread depth of the tires measured 7 mm (9/32 in) or greater. The service brakes were power-assisted, 4-wheel disc brakes with an antilock braking system (ABS). Safety features included electronic stability control, a post-collision safety system, traction control, and a tire pressure monitoring system. Crash avoidance features included adaptive cruise control, crash imminent braking, dynamic brake support, lane departure warning, lane keeping assist, blind spot detection and advanced lighting. It was not equipped with Ford's BlueCruise system. Steering was achieved via an electronic power-assisted rack.

The interior had seating of five occupants with front-row bucket seats and a second-row split-bench seat with folding backs. All seating surfaces were leather. All five positions had adjustable head restraints. The driver's head restraint was removed by EMS during extrication. Safety systems consisted of manual 3-point lap and shoulder seat belts for the five positions. The continuous loop seat belt systems had sliding latch plates. Both front seat belt systems were equipped with retractor and lower anchor pretensioners. Supplemental restraint was provided by certified advanced 208-compliant driver's and passenger's frontal air bags, driver knee air bag, front-seat-mounted side impact air bags, and dual-sensing (side impact and rollover) inflatable curtain (IC) air bags.



Figure 6. Front view of the Ford

Vehicle History

The Ford was purchased by the driver in June 2021, 6 months before the crash date. It was registered in Georgia throughout the ownership without any reported crashes until this investigation in September 2021. There was no recorded mechanical work or alterations done to the steering system.

NHTSA Recalls and Investigations

At the time of the October 2021 case assignment, a query of the NHTSA recall database (see www.nhtsa/recall) using the Ford's VIN indicated that the vehicle had no unrepaired recalls. After the January 2022 vehicle inspection, a second query of the database identified one unrepaired recall. This recall NHTSA Campaign # 21V986 was issued on December 16, 2021, and pertained to underbody, thermal acoustic materials loosening and contacting and damaging the driveshaft. It was issued after the date of the crash and was unrelated to the SCI investigation. An additional query was run in July 2023, and at the time of this report listed two additional recalls. These recalls (NHTSA Campaign # 22V193 and # 22V250) were both issued after the date of the crash and were unrelated to the SCI investigation.

A January 2022 search of the database using Year/Make/Model identifiers indicated a potential seven recalls for the 2021 Ford F-150.

- NHTSA Campaign # 21V090 – Inadequate windshield bonding
- NHTSA Campaign # 21V381 – Two-piece driveshaft may disconnect
- NHTSA Campaign # 21V407 – Damaged steering gear may cause steering loss
- NHTSA Campaign # 21V533 – Electronic brake booster may leak into ECU
- NHTSA Campaign # 21V653 – Front seat belt routed incorrectly
- NHTSA Campaign # 21V805 – Front door side impact sensors damaged
- NHTSA Campaign # 21V986 – Damaged driveshaft may fracture

An additional eight recalls were identified in a July 2023 search of the database—all of which were identified after the date of the crash and were not applicable to the SCI investigation.

In its October 2021 notification to NHTSA regarding the crash, the driver's legal representative reported that the Ford was subject to NHTSA Campaign # 21V407. Ford's voluntary recall identified 223 vehicles built at two plants in the United States from October 29, 2020 to May 29, 2021. These vehicles may have a steering gear that has internal damage, which could result in difficulty steering or the inability to rotate the steering wheel while driving. The Ford under SCI investigation was not listed in the recall population submitted by Ford Motor Company to NHTSA in its defect communications. This specific Ford F-150 was outside the recall population and the recall did not apply.

Exterior Damage

The Ford sustained minor damage from impacts with the exit sign posts (Event 1) and impact from the falling exit sign (Event 2). The front bumper struck the posts with associated damage to the hood face. The posts separated at the ground connections and the sign came down onto the

windshield holing its upper aspect. The Collision Deformation Classification (CDC) assigned to these damage patterns were 12FDMW1 and 00FDGW6 (Figure 7).

The Event 3 contact to the ground caused damage to the rear drive train coupling and differential that consisted of minor scarring to the components and embedded bark (Figure 8). The CDC assigned to this event was 00UBCN1.

The damage associated with the small diameter dead stump (Event 4) was considered minor and was overlapped by the damage from the large diameter tree. The CDC assigned to Event 4 was 12FREN1.

The Ford sustained major damage from the impact with the large diameter tree (Event 5). The left aspect of the front plane struck the tree at the left frame rail. The left front upper ball joint, drive axle, and outer tie rod separated resulting in complete separation of the left front wheel assembly. There was significant fracturing of the alloy rim (Figure 9). The CDC assigned to this damage pattern was 12FYEW5 (Figure 10 and Figure 11).



Figure 7. Damage from Event 3 (mound versus coupling)

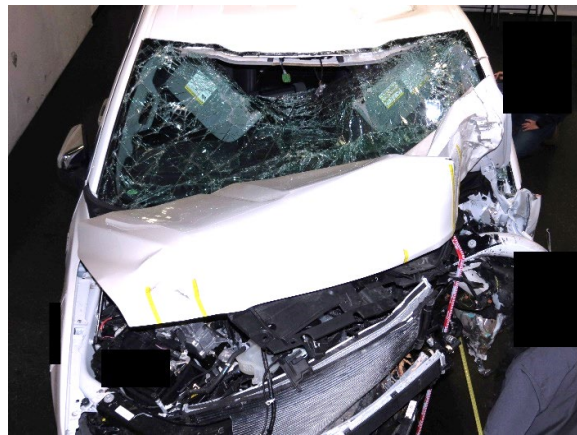


Figure 8. Signpost and sign damage to the Ford



Figure 9. Lateral view of the direct damage from Event 5



Figure 10. Damage from Event 5 to left front tire



Figure 11. Left front oblique view of damage from Event 5

The combined width of the direct and induced damage extended across the 190 cm (75.0 in) end-width. The direct contact damage began 29 cm (11.4 in) left of the centerline and measured 66 cm (26.0 in) wide. The residual crush profile was C1 = 129 cm (51 in), C2 = 135 cm (53 in), C3 = 113 cm (44 in), C4 = 64 cm (25 in), C5 = 29 cm (11 in) C6 = 6 cm (2 in). Maximum crush was

located 20 cm (7.8 in) right of the left front bumper corner. For comparative purposes, the severity of the impact was calculated by the barrier algorithm of the WinSMASH program. The total change in velocity (delta V) was 100 km/h (62 mph). The longitudinal and lateral components were -98 km/h (-61 mph) and 17 km/h (11 mph). The crash configuration fit the parameters of the model and the calculated result was considered high.

Event Data Recorder

The Ford had a restraint control module (RCM) that monitored and controlled the diagnostic, sensing, and deployment commands for the vehicle's supplemental safety systems. The RCM had EDR capabilities. The EDR component was imaged with version 21.2.1 of the Bosch Crash Data Retrieval software via a direct-to-module connection by a third party representing the driver's interests prior to NHTSA's involvement in the crash investigation. The imaged CDRX file was then shared with SCI and is reported with version 23.1.2 and is attached at the end of this report as an appendix.

The EDR was capable of storing up to two crash events, termed either non-deployment or deployment events. Non-deployment events occur when the recording trigger threshold is met or exceeded [minimum of 8 km/h (5 mph)]. Data from non-deployments can be overwritten by subsequent events. Deployment events cannot be overwritten from the RCM. This RCM also categorizes non-air bag deployment events, when there is an event in which non-air bag devices such as pretensioners, have actuated. This type of event can be overwritten given a subsequent air bag deployment event.

Associative to each reported event was a 5.0-second pre-crash buffer. Several data points were recorded on a recurring basis of 0.2 seconds, including: vehicle speed, accelerator pedal (% full), engine throttle (% full), service brake status, engine rpm, and ABS activity. Steering wheel angle and stability control data were recorded in 0.1-second intervals.

First Record

One locked frontal event was recorded by the EDR. It was determined that the imaged data was consistent with the circumstances of the crash under investigation. The ignition cycle count at the time of the recording was 421 and 426 at the time of imaging. There were no diagnostics trouble codes, and the air bag warning lamp was Off. The driver's seat belt was buckled, and the driver seat was adjusted to a rearward position.

Table 1 includes a portion of the 5.0-second pre-crash buffer.

Table 1. Portion of 5.0-second pre-crash buffer

Time (sec)	Indicated Speed km/h (mph)	Accelerator Pedal % Full	Engine rpm	Service Brake	ABS Activity	Steering Wheel Angle (deg.)
-5.0	124 (77.0)	0	1,928	Off	Not engaged	-1.2
-4.0	124 (77.0)	0	1,930	Off	Not engaged	-3.8
-3.0	124 (77.0)	0	1,926	Off	Not engaged	-9.5
-2.8	124 (77.0)	0	1,924	Off	Not engaged	-24.3
-2.6	124 (77.0)	0	1,922	On	Not engaged	-62.6
-2.4	120 (74.9)	0	1,836	On	Engaged	-57.1
-2.2	109 (68.3)	0	1,686	On	Engaged	-78.1
-2.0	110 (63.3)	0	1,692	On	Engaged	-58.7
-1.8	107 (66.5)	0	1,636	On	Engaged	-56.5
-1.6	101 (63.0)	0	1,560	On	Engaged	-80.5
-1.4	104 (64.5)	0	1,636	On	Engaged	-85.2
-1.2	102 (63.3)	0	1,844	On	Engaged	-69.3
-1.0	91 (56.3)	0	1,678	On	Engaged	-58.9
-0.8	93 (57.9)	0	1,424	On	Engaged	-55.5
-0.6	94 (58.5)	0	1,220	On	Engaged	-32.0
-0.4	83 (51.3)	0	982	On	Engaged	-42.9
-0.2	84 (52.5)	0	748	On	Engaged	-51.7
0.0	88 (54.4)	0	544	On	Engaged	-62.5

The recorded data trends indicated that the Ford was operated on cruise control as the vehicle entered the 5.0-second pre-crash recording window. At the -5.0-second interval the speed of the Ford was 124 km/h (77 mph). The cruise control disengaged at the -2.6-second interval by a driver-applied application of the brakes. The brakes remained engaged throughout the remainder of the pre-crash recording with ABS engaged at the -2.4-second interval. The steering trend indicated a right (clockwise) input consistent with the driver's attempt to exit the highway. The magnitude of the steering increased at the -2.8 to -2.2-second interval. Reconstruction of the crash determined that the Ford struck the exit sign (Event 1) during -2.4-second interval. The speed of the Ford decreased by action of the brakes to 88 km/h (54.4 mph) at the time of AE (0.0 seconds). The source of AE was attributed to Event #3, the Ford's undercarriage impact with the raised mound. The maximum longitudinal delta V of this impact was -8.23 km/h (-5.11 mph) at 266 milliseconds.

As the Ford continued northward to the frontal impact with the tree (Event 5), the crash algorithm continued to run. At impact, the advanced safety systems for the driver actuated/deployed at the following times.

- Driver's seat belt retractor pretensioner – 647.5 milliseconds
- Driver's seat belt anchor pretensioner – 652.5 milliseconds
- Driver's frontal air bag stage 1 – 669.0 milliseconds
- Driver's knee air bag – 669.0 milliseconds
- Driver's frontal air bag stage 2 – 689.0 milliseconds
- Driver's seat-mounted side impact air bag – 705.0 milliseconds
- Left and right IC air bags – 705.0 milliseconds

A second longitudinal and lateral crash pulse was recorded in the data and quantified the magnitude of impact necessitating the actuation/deployments. The maximum longitudinal delta V was -84.65 km/h (-52.60 mph). The maximum lateral delta V was 11.26 km/h (7.00 mph). The severity of the delta V was consistent with the Ford's frontal impact to the large diameter tree.

Interior Damage

The interior damage was moderate in the occupant compartment. The forces from the crash caused the driver's door sill and body spot welds to separate by overload (Figure 12). Buckling at the top of the A and B pillars were also observed (Figure 13). The windshield was sagging into the instrument panel. The left instrument panel was intruded 13.9 cm (5.5 in). The left toe pan intruded an estimated 15 cm (6 in) into the foot pedal area. The steering wheel/column was offset to the left from center, the wheel rotated 30° clockwise and jammed (Figure 14). It was deformed 13 cm (5.1 in) at 12 o'clock, 10 cm (4.0 in) at 3 o'clock, 2 cm (0.8 in) at 6 o'clock and 1 cm (0.3 in) at 9 o'clock. The right spoke was fractured due to driver loading (Figure 15).



Figure 12. Buckling of the Ford's A and B pillars



Figure 13. Driver door sill weld separation

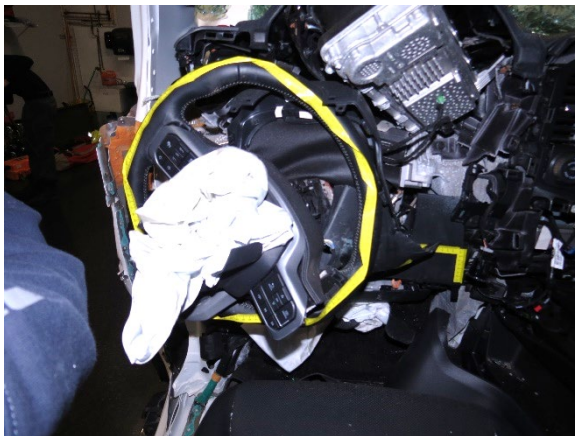


Figure 14. Overview of deformed steering wheel



Figure 15. Steering wheel rim damage at 3 o'clock

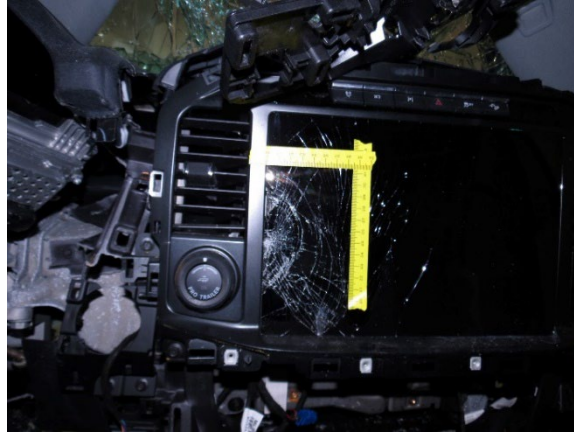


Figure 16. Driver right hand contact



Figure 17. Driver knee contacts to the intruded bolster

The driver's knees contacted the deployed knee air bag and loaded the knee bolster/lower instrument panel (Figure 16). His right hand deflected off the steering wheel and struck the center console screen, fracturing its left aspect (Figure 17).

At the time of the SCI investigation, the center console, passenger seat, and adjoining structures were disassembled due to the removal of the EDR by the driver's legal representatives.

Manual Restraint System

The Ford had 3-point continuous loop lap and shoulder seat belts for each seat position with sliding latch plates and adjustable D-rings. Both front seats were equipped with retractor and anchor pretensioners. The driver was the only person in the vehicle and was belted during the crash.

At the time of the SCI inspection it was observed that the seat belt had been cut by EMS approximately 88.9 cm (35 in) from the anchor pretensioner. There was 30 cm (12.0 in) of webbing extending from the D-ring. The latch plate was not found in the vehicle. However, the SCI investigator did find a rigid belt extender latched in the buckle (Figure 18). There was no webbing connected to the belt extender. The front passenger's seat belt was intact and stowed against the B-pillar.



Figure 18. Driver buckle extender

Supplemental Restraint System

The Ford was equipped with dual stage frontal air bags for the driver and passenger positions, a driver knee air bag, front seat-mounted outboard side impact air bags, and roof side rail-mounted IC air bags. The driver's frontal, knee, side impact and both IC air bags deployed. There were several post-crash blood smears on the driver's frontal and the left IC air bags. These were attributed to post-crash movement of the driver. The right-side impact air bag also deployed.

Electronic Power-Assisted Steering Rack

The Ford was equipped with an electronic power-assisted steering rack (EPAS) that consists of an electronic control unit, a dual-motion motor, a reduction gear, and a torque sensor. The control unit translates the driver steering input to the dual motion motor which engages the reduction gearing and spins the steering pinion left or right steering the wheel assembly.

The part that was in question that was the subject of the NHTSA recall with the steering gear ball nut retainer. The ball nut retainer (Figure 19) consisted of a closed bearing connected to the holed shaft with an interior single-helical channel. This channel housed more than 100 small bearing-like balls. These greased bearing balls contacted the channel of the steering pinion and acted as guides thus reducing the metal-to-metal contact between the pinion and the retainer while translating the rotation from the reduction gear to the steering pinion.



Figure 19. Exemplar ball retainer nut

As described in NHTSA Recall No. 21V-407, “A broken steering gear ball nut retainer can allow balls in the ball nut assembly to displace and wedge. Continued steering wheel movement can further wedge the balls and displace the retainer, resulting in increased steering effort. Should this continue and the balls do not transition back into the return guides, the ball nut may not be able to rotate. As a consequence, the driver may not be able to rotate the steering wheel while driving, increasing the risk of a crash.”¹

Over the duration of the inspection, the entire steering rack was removed as a complete unit. The steering rack (Figure 20 denoted by the yellow arrows) was located behind and bolted to the lower front cross-member. It was jammed in the deformation. Front components were removed from the vehicle in a step-wise manner and the front cross-member was cut away for access (Figure 21). Hydraulic spreaders were used to release the tension of the impact deformation at the left side of the steering rack and the rack was removed after a 3-hour process (Figure 22 and Figure 23).

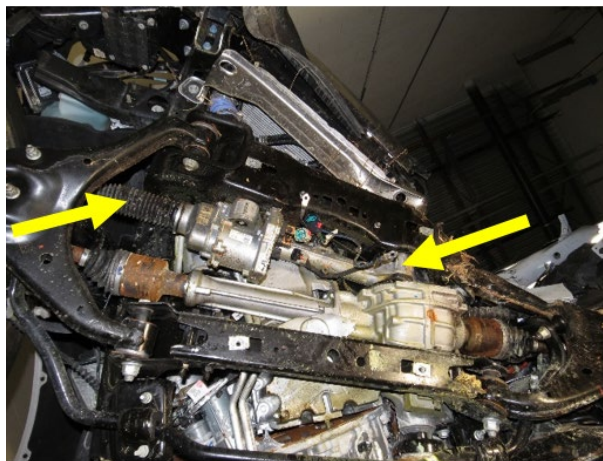


Figure 20. Undercarriage view of the Ford and the steering rack

¹ National Highway Traffic Safety Administration. (2021, May 29). Part 573 Safety Recall Report 21V-407. <https://static.nhtsa.gov/odi/rcr/2021/RCLRPT-21V407-6008.PDF>



Figure 21. View of the Ford's steering rack with the front cross-member removed



Figure 22. Hydraulic spreaders used to release tension and allow the steering rack removal



Figure 23. Steering rack after removal from the Ford

Due to the nature of the retaining ball nut and the fact that if rotated to remove it from the steering pinion, the current ball positions and conditions would be at risk, it was decided to send the steering rack to a third party to have a CT scan completed. The steering rack remained in the custody of the driver's legal team. Neither NHTSA nor SCI were party to the CT scan or any

follow-up inspection. As of the date of this report, no further information regarding the CT scan of the steering rack was received from the driver's legal representatives. The root cause of the road departure and crash could not be identified.

2021 Ford F-150 Pickup Occupant

Driver Demographics

Age/Sex: 68 years/male
 Height: 180 cm (71 in)
 Weight: 109 kg (240 lb)
 Eyewear: None
 Seat type: Forward-facing bucket seat with adjustable head restraint
 Seat track position: Mid-to-rear track
 Manual restraint usage: Lap and shoulder belt
 Usage source: Vehicle inspection, EDR
 Air bags: Driver's frontal, knee, seat-mounted, and IC air bags available; all deployed
 Alcohol/drug involvement: No test performed
 Egress from vehicle: Removed from vehicle due to perceived serious injuries
 Transport from scene: Transport to level 1 trauma center
 Type of medical treatment: Deceased 4 hours post-crash

Driver Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Rib cage fractures with flail – unilateral: Left lateral 6, 7, 8, 9 and left anterior 6, 7, 8, 9; left lateral rib 5 also fractured	450212.3	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub Tertiary: Front – Steering wheel (combination of rim and hub/spoke)	Possible Possible Certain
2	Rib fractures without flail: Right anterior 6, 7, 8	450203.3	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub	Probable Possible Possible

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
			Tertiary: Front – Steering wheel (combination of rim and hub/spoke)	
3	Bilateral pulmonary contusions, right and left upper lobes	441410.3	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub Tertiary: Front – Steering wheel (combination of rim and hub/spoke)	Possible Possible Certain
4	Small left pneumothorax	442202.2	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub Tertiary: Front – Steering wheel (combination of rim and hub/spoke)	Possible Possible Certain
5	Sternum fracture	450804.2	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub Tertiary: Front – Steering wheel	Possible Possible Certain

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
			(combination of rim and hub/spoke)	
6	Open book pelvic fracture with diastasis of pubic symphysis as well as bilateral anterior sacroiliac joints	856161.3	Tandem IPC Primary: Left Air Bag – Left bottom instrument panel Secondary: Front – Left lower instrument panel (includes knee bolster)	Possible Certain
7	Right femur fracture, comminuted, in mid diaphyseal region	853271.3	Tandem IPC Primary: Left Air Bag – Left bottom instrument panel Secondary: Front – Left lower instrument panel (includes knee bolster)	Possible Certain
8	Right femur neck fracture	853161.3	Tandem IPC Primary: Left Air Bag – Left bottom instrument panel Secondary: Front – Left lower instrument panel (includes knee bolster)	Possible Certain
9	Right acetabulum fracture, superior, extends to medial wall	856251.2	Tandem IPC Primary: Left Air Bag – Left bottom instrument panel Secondary: Front – Left lower instrument panel (includes knee bolster)	Possible Certain
10	Right proximal tibia fracture, severely comminuted	854111.2	Tandem IPC Primary: Left Air Bag – Left bottom instrument panel	Possible Certain

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
			Secondary: Front – Left lower instrument panel (includes knee bolster)	
11	T1 vertebral body fracture, anterior inferior aspect	650430.2	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub Tertiary: Front – Steering wheel (combination of rim and hub/spoke)	Possible Possible Certain
12	T3 vertebral body fracture, anterior inferior aspect	650430.2	Tandem IPC Primary: Interior – Shoulder portion of belt restraint Secondary: Left Air Bag – Steering wheel hub Tertiary: Front – Steering wheel (combination of rim and hub/spoke)	Possible Possible Certain
13	L1 right transverse process fracture	650620.1	Isolated Front - Steering wheel (combination of rim and hub/spoke)	Probable
14	L2 right transverse process fracture	650620.1	Isolated Front - Steering wheel (combination of rim and hub/spoke)	Probable
15	Chin laceration, 7 cm	210602.1	Isolated	Probable

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
			Front - Steering wheel rim	
16	3 cm left forehead laceration	210602.1	Isolated Front - Steering wheel rim	Probable
17	Left forehead contusion	210402.1	Isolated Front - Steering wheel rim	Probable
18	Left chest wall hemorrhage	410402.1	Caused by rib fxs	Certain
19	Abdominal bruising	510402.1	Isolated Interior – Lap portion of belt restraint	Certain
20	3 cm left elbow laceration	710602.1	Isolated Left Door Panel – Left forward upper quadrant	Probable
21	Right hand abrasions	710202.1	Isolated Front - Center instrument panel	Certain
22	Left hand abrasions	710202.1	Isolated Front – Left instrument panel	Possible

Source: Hospital record

Driver Kinematics

The 68-year-old male driver was seated with the power-adjustable seat set to a mid-to-rear track position. The seat back was repositioned by the EMS during the removal of the driver from the vehicle. He was belted at impact, using the manual 3-point lap and shoulder seat belt system with a secondary rigid buckle belt extender that added 4.8 cm (1.9 in) to buckle height of the OEM latch plate.

Prior to the road departure crash, the driver was probably seated in an upright driving posture as he actively steered and operated the Ford. As the vehicle departed the paved surface and entered the grass gore, the front of the Ford struck the road sign and sheared the break-away bases of the signposts. This Event 1 impact did not result in a significant velocity change to displace the driver from his pre-crash position. The recorded-EDR data indicated he reacted to this impact by

braking and steering right. As the vehicle continued to travel across the irregular grass surface, the driver may have moved forward due to the terrain-induced oscillations and deceleration of the vehicle. The ELR seat belt retractor possibly locked and unlocked during this trajectory.

The impacts with the raised mound and the small diameter tree (Events 3 and 4) possibly displaced the driver forward. When the Ford struck the large-diameter tree, the seat belt retractor and lower anchor pretensioners actuated and the driver's frontal air bag (stage 1 and 2), knee, seat-mounted, and IC air bags deployed. The offset left impact resulted in severe frontal structural crush and intrusion of the left instrument panel and toe pan into the driver's compartment.


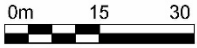
The driver initiated a forward trajectory and loaded the manual seat belt webbing and the deployed air bag. Due to his probable forward position and severity of the impact, the driver loaded through the deployed driver's frontal air bag and engaged the steering wheel rim. The rim's right spoke fractured and the wheel deformed 10 cm (4.0 in). The driver's knees and lower extremities loaded the deployed knee air bag and the intruding lower instrument panel and the base of the steering column. Scuff marks and fractures of the polymer components evidence the contacts. The loading force was transmitted through the knees and lower extremities into the femurs and pelvis. He sustained a severely comminuted fracture of the proximal right tibia, a comminuted right femur fracture, and fractures of the right femoral neck and acetabulum. The loading and butterfly deflection of the lower extremities resulted in an "open-book" pelvic fracture.

Chest loading severely deformed the wheel rim, fractured the right spoke and fully compressed the energy absorbing steering column. As a result of this loading, the driver sustained an abdominal contusion, bilateral rib fractures with left flail chest, a sternal fracture, bilateral upper lobe pulmonary contusions, and a small left pneumothorax. His forward motion and severe loading of the steering assembly produced fractures of the vertebral bodies at T1 and T3 and fractures of the spinous process at L1 and L2. The driver's face contacted the upper aspect of the deployed air bag and steering wheel rim, resulting in a left forehead laceration and contusion and a laceration of the chin.

During his forward trajectory, the driver's right hand probably deflected off the steering wheel rim and struck the center instrument panel monitor, fracturing the screen and causing abrasions to the hand. He also sustained a left elbow laceration from possible contact with the left door panel and left hand abrasions from left instrument panel contact.

The driver came to final rest in his seat and was subsequently removed from the vehicle by the EMS and responding firefighters. He was transported by ambulance to a local hospital where he arrived alert and responsive. During evaluation and treatment his condition began to deteriorate, and he expired 4 hours following the crash. He was transferred to a funeral home without autopsy.

Crash Diagram: Overview


 Environmental Conditions:
 Cloudy, dry daylight
 Speed Limit: 113 km/h (70 mph)
 V1: 2021 Ford F-150 Supercrew


Event 5 V1 vs large tree & V1 final rest

Event 4 V1 vs 13cm diameter stump

Event 3 V1 vs mound/stump

V1 Position at 0.0 seconds prior to crash algorithm enabled

V1 position at 1.0 second prior to crash algorithm enabled

Drain grate

V1 position at 2.0 seconds prior to crash algorithm enabled

Event 2 V1 vs sign



Event 1 V1 vs signposts

V1 position at 2.6 seconds prior to crash algorithm enabled



V1 position at 3.0 seconds prior to crash algorithm enabled

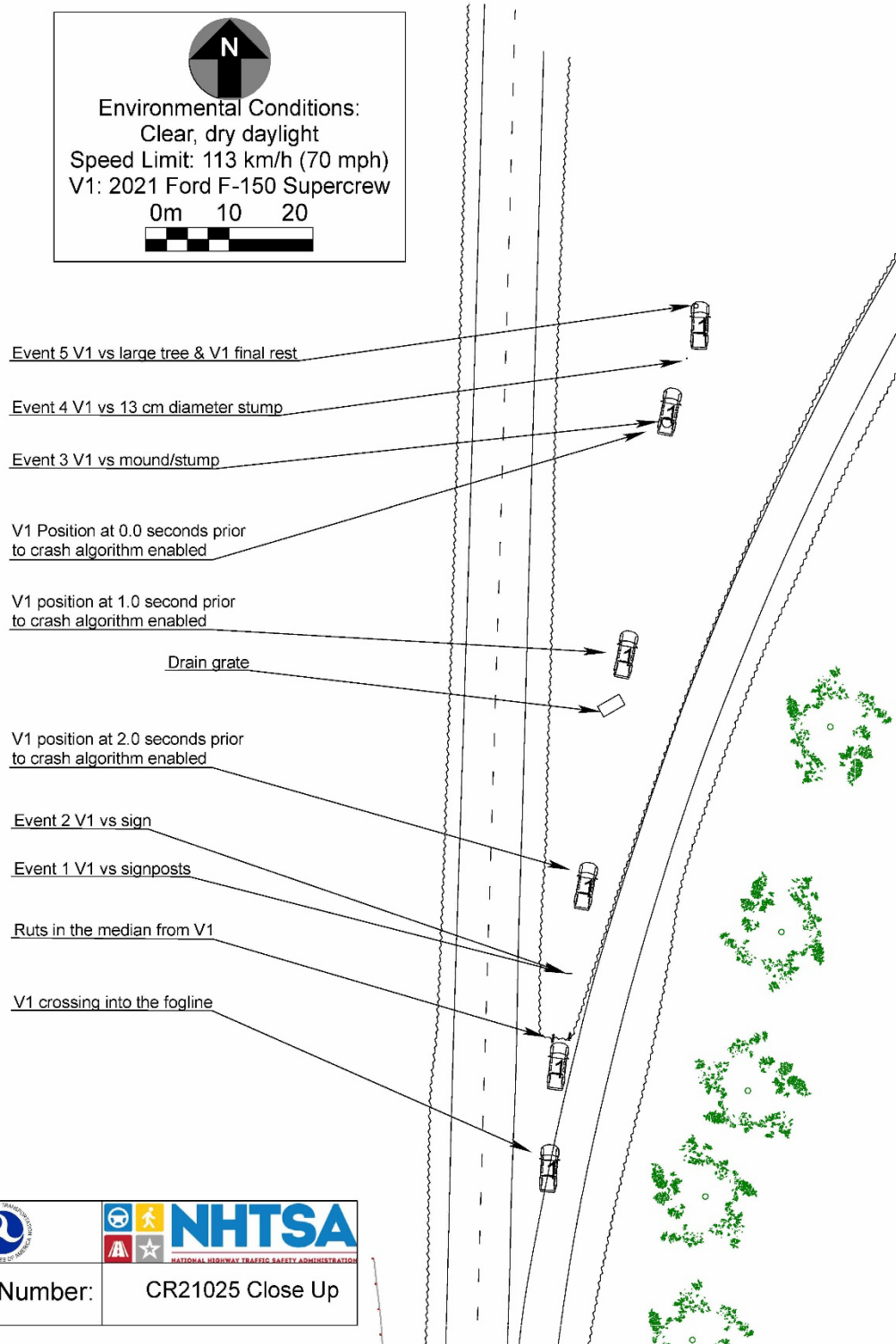
V1 position at 4.0 seconds prior to crash algorithm enabled



V1 position at 5.0 seconds prior to crash algorithm enabled

	
Case Number:	CR21025 Overview

Crash Diagram: Close Up


Environmental Conditions:
 Clear, dry daylight
 Speed Limit: 113 km/h (70 mph)
 V1: 2021 Ford F-150 Supercrew
 0m 10 20




 TEXAS DEPARTMENT OF TRANSPORTATION STATE OF TEXAS	 NHTSA NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Case Number:	CR21025 Close Up

Appendix: 2021 Ford F-150 Pickup Event Data Recorder Report²

² The EDR was imaged by the plaintiffs' lawyer prior to the joint vehicle inspection with the BOSCH scan tool. The EDR was not available to image in person. The imaged data was shared with SCI in a CDRX file and 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	1FTFW1ED3MF*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR21025_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 21.2.1
Imaged with Software Licensed to (Company Name)	Company Name information was removed when this file was saved without VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 23.1.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	locked frontal event Fuel cutoff level 1

Comments

No comments entered.

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

Data Limitations

Data Imaging:

CAUTION: When imaging data directly from the RCM on a bench top, make sure the RCM is placed on a flat surface without any movement (static) while connected to and powered by the CDR interface. Not following the above guideline for bench top imaging could risk inducing new events to be recorded in the RCM and possibly overwriting a Non airbag deployment.

Note that the RCM Adapter Detected during Download parameter equal to " Yes" indicates that the EDR data was collected directly from the RCM. When equal to "No", it indicates that the EDR data was collected through the OBD II from the vehicle.

Restraints Control Module (RCM) Recorded Crash Event(s):

The RCM can store up to two crash events. Event types are categorized as follow:

1. Non deployment trigger event is an event in which EDR recording trigger threshold is met or exceeded (minimum of 5 mph (8kph) Accumulated Delta Velocity within 150ms interval), but no device(s) have deployed. The data from such event can be overwritten by subsequent events.
2. Airbag deployment event is an event in which frontal, side or curtain airbags have deployed. Note that such event cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device(s), the RCM must be replaced.
3. Some RCM may also categorize Non airbag deployment event. This type is an event in which non airbag devices such as pretensioners, knee bolster etc... have deployed. Note that such event can be overwritten given a subsequent "deployment" event.

"Time zero" or Event Beginning of any event (First Record or Second Record) is defined as the first Algorithm wake up during that event. So all the Pre-Crash, At Event, Delta V Data, deployment times etc... are relative to "Time zero".

It is possible that conditions in a crash may result in an incomplete event data record.

EDR Data Elements Overview/Interpretation in CDR Report:

Under CDR File Information Section

- Event(s) recovered indicates if an event was detected and recorded by RCM. If no event is detected, it will indicate "none". If a trigger or non airbag deployment event is detected, it will indicate "unlocked event". If an airbag deployment is detected, it will indicate "locked frontal event", or "locked side event", or "locked rollover event".

Under System Status at Event Section

- Complete file recorded indicates if data from the recorded event has been fully written to the RCM memory.

- If the RCM detected a peripheral crash sensor was lost during an event, the crash sensor would be identified as well as the time it was lost during that event relative to Time zero. If no loss of a peripheral crash sensor, nothing would be displayed. Note in some vehicles, loss of a peripheral crash sensor may lead to the loss of another peripheral crash sensor due to shared communication.

Under Deployment Data Section

- If the RCM commanded a deployment during an event, the deployment device(s) would be identified as well as the time the RCM commanded its deployment relative to Time zero. If no device was commanded to deploy by the RCM, nothing (no deployment device(s)) would be displayed.

Under Pre-Crash Data -5 to 0 sec

- Steering Wheel Angle if Applicable: positive value indicates left turn, and negative value would indicate right turn.

- Stability Control Lateral Acceleration if Applicable: Lateral Acceleration (Y-direction) is the acceleration along the lateral axis of the vehicle, reported as positive when accelerating to the left.

- Stability Control Longitudinal Acceleration if Applicable: Longitudinal Acceleration (X-direction) is the acceleration along the longitudinal axis of the vehicle, reported as positive when accelerating in a forward direction.

- Stability Control Yaw Rate if Applicable: The Yaw Axis is the vertical axis of the vehicle, generally perpendicular to the plane of the road. A positive Yaw Rate is counter-clockwise when observing the vehicle from above.

- Stability Control Roll Rate if Applicable: The Roll Axis is the longitudinal axis of the vehicle, generally aligned with the primary axis of motion of the vehicle. A positive Roll Rate is counter-clockwise when observing the vehicle from the front.

Under Longitudinal Crash Pulse

- Delta-V, longitudinal: SAE J211 sign convention, negative value generally indicates a front crash and positive value generally indicates a rear crash. Longitudinal delta-V reflects the change in forward velocity that the sensing system experienced from Time zero. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle longitudinal delta-V.

Under Lateral Crash Pulse

- Delta-V, lateral: SAE J211 sign convention, Positive value generally indicates a driver side crash and negative value generally indicates a passenger side crash.

Under Rollover Sensor Data (if Applicable)

- Vehicle roll angle if applicable: The Roll Axis is the longitudinal axis of the vehicle, generally aligned with the primary axis of motion of the vehicle. A positive Roll Angle is counter-clockwise when observing the vehicle from the front.

Data Sources:

The Restraints Control Module (RCM) contains all recorded data on any event. Data collected from the RCM comes from multiple sources:

1. Internal to the RCM such as internal sensors for delta Velocity data, rollover angle data if applicable, etc... which are measured, calculated and stored internally.
2. External to the RCM but with a direct connection such as buckle switches, peripheral crash sensors, seat track switch(s) etc... which are measured, calculated and stored internally.
3. External Modules to the RCM such as Powertrain Control Module, Brake Control Module, etc... These modules communicate to the RCM via Vehicle Communication Network. The RCM stores the received data internally.

02018_RCM-RC8_r001

System Status at Time of Retrieval

VIN As Programmed into RCM at Factory	1FTFW1ED3MF*****
Current VIN (From PCM)	1FTFW1ED3MF*****
Ignition Cycle, Download (First Record)	426
Ignition Cycle, Download (Second Record)	N/A
Restraints Control Module Part Number	ML3T-14B321-YD
Restraints Control Module Serial Number	3021413634470000
Restraints Control Module Software Part Number (Version)	ML3T-14C028-CA
Restraints Control Module Calibration Part Number (Version)	ML3T-14C635-HH
Driver/Center Frontal Restraints Sensor Serial Number	N/A
Driver Side Restraint Sensor 1 Serial Number	N/A
Driver Side Restraint Sensor 2 Serial Number	N/A
Passenger Frontal Restraints Sensor Serial Number	N/A
Passenger Side Restraint Sensor 1 Serial Number	N/A
Passenger Side Restraints Sensor 2 Serial Number	N/A
Internal Sensor Serial Number	C8C421F31F21
Driver Side Restraints Sensor 3 Serial Number	N/A
Passenger Side Restraints Sensor 3 Serial Number	N/A
Driver Side Restraints Sensor 4 Serial Number	N/A
Passenger Side Restraints Sensor 4 Serial Number	N/A
Steering Wheel Location	Left Hand Drive

System Status at Event (First Record)

Complete File Recorded (Yes,No)	Yes
Multi-Event, Number of Events	1
Time From Event 1 to 2 (seconds)	N/A
Lifetime Operating Timer at Event Time Zero (sec)	639,470
Key-On Timer at Event Time Zero (sec)	2,045
Vehicle Voltage at Time Zero (V)	13.8
Energy Reserve Mode Entered During Event (Yes, No)	Yes
Time Driver Side/Center Frontal Restraints Sensor Lost Relative to Time Zero (msec)	668
Time Row 1 Driver Side Restraint Sensor Lost Relative to Time zero (msec)	744
Longitudinal Delta-V Time Zero Offset (msec)	10.0
Lateral Delta-V Time Zero Offset (msec)	10.0
Roll Angle Time Zero Offset (msec)	100.0
Time RCM longitudinal acceleration reached maximum sensor range (msec)	maximum not reached
Time RCM lateral acceleration reached maximum sensor range (msec)	maximum not reached
Time from Time zero to Frontal Algorithm Wake Up (msec)	643
Time from Time zero to Side Algorithm Wake Up (msec)	Wake up threshold not reached
Time from Time zero to Rear Algorithm Wake Up (msec)	Wake up threshold not reached
Time from Time Zero to Rollover Algorithm Wake Up (msec)	Wake up threshold not reached
Time from Time zero to Frontal Algorithm Reset (msec)	857
Time from Time zero to Side Algorithm Reset (msec)	Reset threshold not reached
Time from Time zero to Rear Algorithm Reset (msec)	Reset threshold not reached
Time from Time zero to Rollover Algorithm Reset (msec)	Reset threshold not reached
RCM number	C8C421F31F21
RCM internal flag	01000000
Fuel Cutoff Algorithm Decision Time (msec)	685

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Frontal Airbag Deployment, Time to First Stage Deployment, Driver (msec)	669.0
Frontal Airbag Deployment, Time to 2nd Stage, Driver (msec)	689.0
Side (Thorax) Airbag Deployment, Time to Deploy, Driver (msec)	705.0
Side (Thorax) Airbag Deployment, Time to Deploy, Right Front Passenger (msec)	705.0
Side Curtain Airbag Deployment, Time to Deploy, Driver Side (msec)	705.0
Side Curtain Airbag Deployment, Time to Deploy, Passenger Right Side (msec)	705.0
Pretensioner (Retractor) Deployment, Time to Fire, Driver (msec)	647.5
Inflatable Knee Bolster Deployment, Time to Fire, Driver (msec)	669.0
Adaptive Steering Column Deployment, Time to Deploy, Driver (msec)	669.0
Adaptive Load Limiter Deployment, Time to Fire, Driver (msec)	695.5
Pretensioner (Anchor) Deployment, Time to Fire, Driver (msec)	652.5
Maximum Delta-V, Longitudinal (MPH [km/h])	-5.11 [-8.23]
Time, Maximum Delta-V Longitudinal (msec)	266.0
RCM High-G (Longitudinal), Discriminating Deployment	Yes
RCM High-G (Longitudinal), Safing	Yes
RCM High-G (Lateral), Discriminating Deployment	Yes
RCM High-G (Lateral), Safing	Yes
Driver, front satellite sensor, Discriminating Deployment	Yes
Driver, front satellite sensor, Safing Deployment	Yes
Passenger, front satellite sensor, Discriminating Deployment	Yes
Passenger, front satellite sensor, Safing Deployment	Yes

Pre-Crash Data -1 sec (First Record)

Ignition cycle, Crash	421
Frontal Air Bag Warning Lamp, On/Off	Off
Safety Belt Status, Driver	Belted
Safety Belt Status, Front Passenger	Unbelted
Seat Track Position Switch, Foremost, Status, Driver	Rearward
Rear Safety Belt Status, 2nd Row Driver Side	Unbelted
Rear Safety Belt Status, 2nd Row Middle	Unbelted
Rear Safety Belt Status, 2nd Row Passenger Side	Unbelted
Brake Telltale	Off(No)
ABS Telltale	Off
ESC/TC Telltale	Fast flash
ESC/TC Off Telltale	Default Mode
Powertrain Wrench Telltale	Off
MIL Telltale (Powertrain Malfunction Indicator)	Fresh Off
Global Real Time (seconds)	10,491,360.4

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

Time (sec)	Driver Gear Selection (Auto Trans)	Wheel Torque Requested (Nm)	Total Arbitrated Brake Torque (Nm)	Ignition Status	Speed Control Status
- 5.0	Drive	668	0	Run	Active
- 4.5	Drive	640	0	Run	Active
- 4.0	Drive	640	0	Run	Active
- 3.5	Drive	624	0	Run	Active
- 3.0	Drive	632	0	Run	Active
- 2.5	Drive	632	0	Run	Active
- 2.0	Drive	-28	3,024	Run	Standby
- 1.5	Drive	-4	2,712	Run	Standby
- 1.0	Drive	0	1,864	Run	Standby
- 0.5	Drive	-4	5,080	Run	Standby
0.0	Drive	0	2,672	Run	Standby_Denied

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record) - Table 1 of 2

Time (sec)	ABS Activity (Engaged, Non-Engaged)	Stability Control Active	Traction Control Via Engine	Traction Control via Brakes	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 5.0	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.03	0.02	-0.28
- 4.9	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.01	-0.02	-0.55
- 4.8	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.01	0.00	-0.86
- 4.7	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.03	0.00	-0.95
- 4.6	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.04	-0.01	-0.90
- 4.5	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.04	0.00	-0.90
- 4.4	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.05	-0.01	-0.98
- 4.3	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.04	0.00	-1.00
- 4.2	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.04	0.01	-0.99
- 4.1	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.05	-0.03	-1.11
- 4.0	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.05	-0.01	-1.18
- 3.9	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.03	0.01	-1.18
- 3.8	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.02	-0.01	-1.26
- 3.7	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.05	-0.01	-1.49
- 3.6	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.05	0.01	-1.69
- 3.5	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.09	-0.01	-1.77
- 3.4	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.06	0.00	-1.63
- 3.3	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.07	-0.01	-1.96
- 3.2	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.06	-0.01	-2.12

Time (sec)	ABS Activity (Engaged, Non-Engaged)	Stability Control Active	Traction Control Via Engine	Traction Control via Brakes	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 3.1	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.05	0.00	-2.53
- 3.0	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.06	-0.01	-2.66
- 2.9	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.10	-0.01	-2.58
- 2.8	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.18	0.00	-3.29
- 2.7	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.30	-0.05	-5.98
- 2.6	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.51	-0.06	-10.82
- 2.5	Off/non-engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.56	-0.47	-13.03
- 2.4	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.08	-0.01	-7.79
- 2.3	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.17	-0.37	-7.86
- 2.2	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.72	0.58	-5.73
- 2.1	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.01	0.05	-4.92
- 2.0	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.07	-0.11	-4.63
- 1.9	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.08	-0.17	-0.64
- 1.8	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.37	-0.53	0.92
- 1.7	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.44	-0.07	-2.02
- 1.6	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.05	-0.45	-6.75
- 1.5	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.37	-0.55	-7.32
- 1.4	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.29	-0.69	-4.08
- 1.3	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.36	-0.59	0.08

Time (sec)	ABS Activity (Engaged, Non-Engaged)	Stability Control Active	Traction Control Via Engine	Traction Control via Brakes	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 1.2	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.49	-0.62	0.22
- 1.1	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.37	0.20	5.27
- 1.0	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.25	-0.90	-0.22
- 0.9	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.11	-0.81	-7.03
- 0.8	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.18	1.82	-7.20
- 0.7	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.54	-0.35	1.21
- 0.6	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.18	-0.29	4.93
- 0.5	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	0.00	-0.92	3.18
- 0.4	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.19	-0.46	1.48
- 0.3	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.06	-0.58	3.15
- 0.2	On/engaged	Off/non-engaged (No)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.13	0.01	2.28
- 0.1	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-0.81	-0.56	1.79
0.0	On/engaged	On/engaged (Yes)	Off/non-engaged (Inactive)	Off/non-engaged (Inactive)	-1.24	-0.90	1.28

Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record) - Table 2 of 2

Time (sec)	Stability Control Roll Rate (deg/sec)	Steering Wheel Angle (deg)	Steering Wheel Angle Quality Factor
- 5.0	1.39	-1.2	OK
- 4.9	0.66	-2.1	OK
- 4.8	0.65	-1.9	OK
- 4.7	1.37	-2.1	OK
- 4.6	1.91	-2.5	OK
- 4.5	1.53	-2.8	OK
- 4.4	1.47	-3.7	OK
- 4.3	2.45	-3.8	OK
- 4.2	3.22	-3.7	OK
- 4.1	2.69	-3.8	OK
- 4.0	1.35	-3.8	OK
- 3.9	-0.86	-4.1	OK
- 3.8	-1.96	-5.4	OK
- 3.7	0.12	-5.5	OK
- 3.6	2.61	-5.9	OK
- 3.5	4.95	-6.7	OK
- 3.4	3.93	-7.3	OK
- 3.3	2.24	-8.8	OK
- 3.2	-2.63	-9.9	OK
- 3.1	-6.41	-9.7	OK
- 3.0	-5.99	-9.5	OK
- 2.9	-6.32	-14.3	OK
- 2.8	-4.10	-24.3	OK
- 2.7	-6.45	-46.8	OK
- 2.6	-8.84	-62.6	OK
- 2.5	-4.73	-64.3	OK
- 2.4	-3.54	-57.1	OK
- 2.3	25.17	-71.9	OK
- 2.2	36.66	-78.1	OK
- 2.1	-16.61	-64.7	OK
- 2.0	-34.96	-58.7	OK
- 1.9	-23.31	-54.8	OK
- 1.8	-3.29	-56.5	OK
- 1.7	2.55	-68.1	OK
- 1.6	-21.34	-80.5	OK
- 1.5	-10.97	-79.3	OK
- 1.4	4.52	-85.2	OK
- 1.3	18.46	-62.5	OK
- 1.2	53.31	-69.3	OK
- 1.1	27.83	-78.0	OK
- 1.0	43.47	-58.9	OK
- 0.9	-56.38	-55.8	OK
- 0.8	-87.24	-55.5	OK
- 0.7	16.09	-36.6	OK
- 0.6	36.28	-32.0	OK
- 0.5	0.33	-33.4	OK
- 0.4	-12.19	-42.9	OK
- 0.3	-2.72	-41.2	OK
- 0.2	22.52	-51.7	OK
- 0.1	13.39	-84.0	OK
0.0	0.27	-62.5	OK

Pre-Crash Data -5 to 0 sec [5 samples/sec] (First Record) - Table 1 of 2

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Speed, Vehicle Indicated, Quality Factor	Accelerator Pedal, % Full	Accelerator Pedal, % Full, Quality Factor	Service Brake, On/Off	Service brake, on/off Quality Factor	Engine RPM	Brake Pre-Charge Request
- 5.0	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,928	No PreCharge Request
- 4.8	77.1 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,930	No PreCharge Request
- 4.6	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,930	No PreCharge Request
- 4.4	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,928	No PreCharge Request
- 4.2	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,926	No PreCharge Request
- 4.0	77.1 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,930	No PreCharge Request
- 3.8	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,926	No PreCharge Request
- 3.6	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,930	No PreCharge Request
- 3.4	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,926	No PreCharge Request
- 3.2	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,930	No PreCharge Request
- 3.0	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,926	No PreCharge Request
- 2.8	77.0 [124]	OK	0	OK	OFF(Driver_Not_Braking)	OK	1,924	No PreCharge Request
- 2.6	77.0 [124]	OK	0	OK	ON(Driver_Braking)	OK	1,922	No PreCharge Request
- 2.4	74.9 [120]	OK	0	OK	ON(Driver_Braking)	OK	1,836	No PreCharge Request
- 2.2	67.5 [109]	OK	0	OK	ON(Driver_Braking)	OK	1,686	No PreCharge Request
- 2.0	68.3 [110]	OK	0	OK	ON(Driver_Braking)	OK	1,692	No PreCharge Request
- 1.8	66.5 [107]	OK	0	OK	ON(Driver_Braking)	OK	1,636	No PreCharge Request
- 1.6	63.0 [101]	OK	0	OK	ON(Driver_Braking)	OK	1,560	No PreCharge Request
- 1.4	64.5 [104]	OK	0	OK	ON(Driver_Braking)	OK	1,636	No PreCharge Request

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Speed, Vehicle Indicated, Quality Factor	Accelerator Pedal, % Full	Accelerator Pedal, % Full, Quality Factor	Service Brake, On/Off	Service brake, on/off Quality Factor	Engine RPM	Brake Pre-Charge Request
- 1.2	63.3 [102]	OK	0	OK	ON(Driver_Braking)	OK	1,844	No PreCharge Request
- 1.0	56.3 [91]	OK	0	OK	ON(Driver_Braking)	OK	1,678	No PreCharge Request
- 0.8	57.9 [93]	OK	0	OK	ON(Driver_Braking)	OK	1,424	No PreCharge Request
- 0.6	58.5 [94]	OK	0	OK	ON(Driver_Braking)	OK	1,220	No PreCharge Request
- 0.4	51.3 [83]	OK	0	OK	ON(Driver_Braking)	OK	982	No PreCharge Request
- 0.2	52.5 [84]	OK	0	OK	ON(Driver_Braking)	OK	748	No PreCharge Request
0.0	54.4 [88]	OK	0	OK	ON(Driver_Braking)	OK	544	No PreCharge Request

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

Time (sec)	Brake Assist Sensitivity Level	Brake Deceleration Request (m/s^2)	Brake Override Status Flag	Brake Deceleration Request Enable	Large Driver Steering or Accel Pedal Input	Collision Mitigation System Fault	Collision Mitigation System Enabled	Cruise Control Driver Accelerator Pedal Override
- 5.0	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 4.8	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 4.6	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 4.4	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 4.2	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 4.0	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 3.8	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 3.6	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 3.4	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 3.2	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 3.0	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	No	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 2.8	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 2.6	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 2.4	Normal	0	Fresh_data_0ff	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)

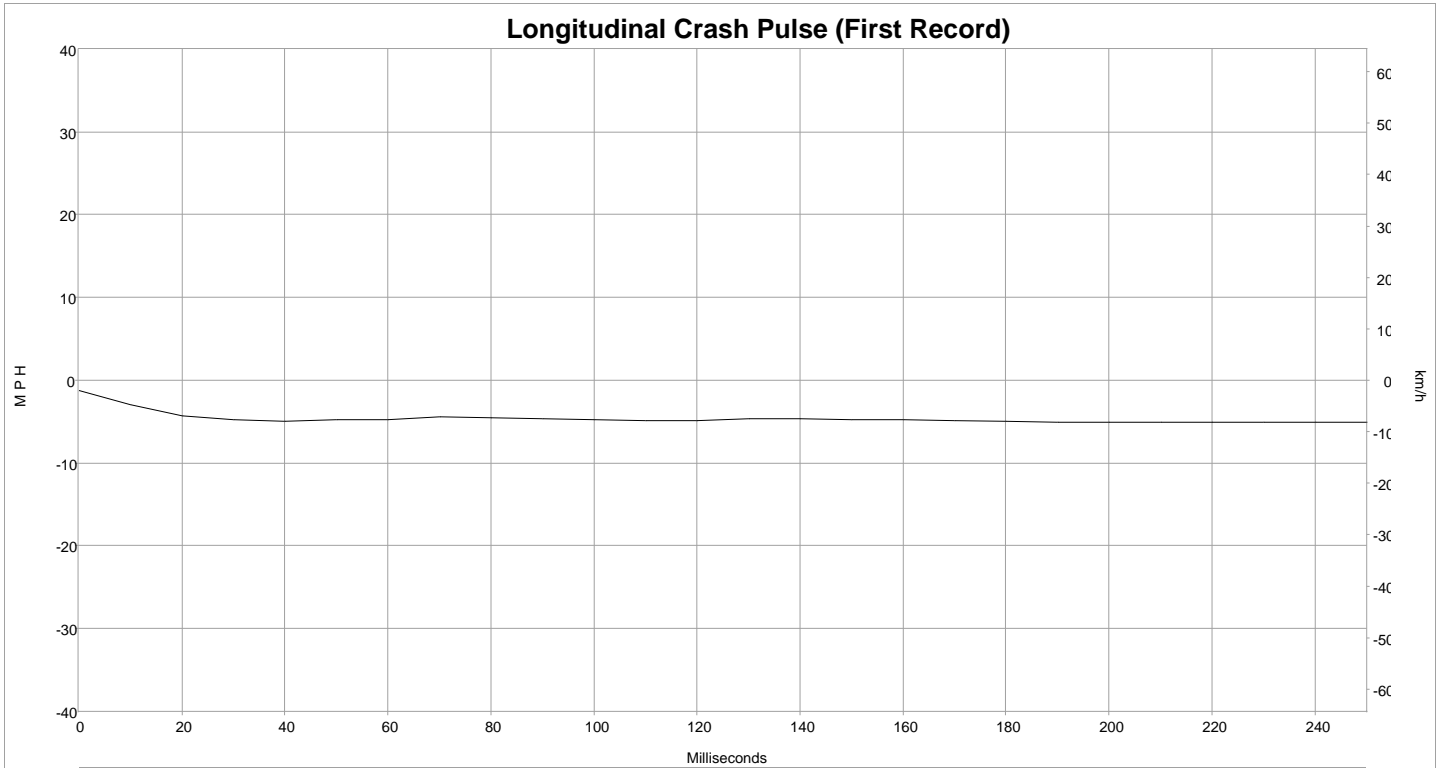
Time (sec)	Brake Assist Sensitivity Level	Brake Deceleration Request (m/s^2)	Brake Override Status Flag	Brake Deceleration Request Enable	Large Driver Steering or Accel Pedal Input	Collision Mitigation System Fault	Collision Mitigation System Enabled	Cruise Control Driver Accelerator Pedal Override
- 2.2	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 2.0	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 1.8	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 1.6	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 1.4	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 1.2	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 1.0	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 0.8	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	No (not denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 0.6	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	Yes (denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 0.4	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	Yes (denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
- 0.2	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	Yes (denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)
0.0	Normal	0	Fresh_data_Off	No (no CMbB deceleration request)	Yes	Yes (denied)	Yes	Cruise_Reg_Not_Overridden(Inactive)

Pre-Crash Data -5 to 0 sec [1 sample/sec] (First Record)

Time (sec)	Occupant Size Classification, Front Passenger (Child size Yes/No [Hex value])	Extended Power Status
- 5.0	No [\$00]	No Fault
- 4.0	No [\$00]	No Fault
- 3.0	No [\$00]	No Fault
- 2.0	No [\$00]	No Fault
- 1.0	No [\$00]	No Fault
0.0	No [\$00]	No Fault

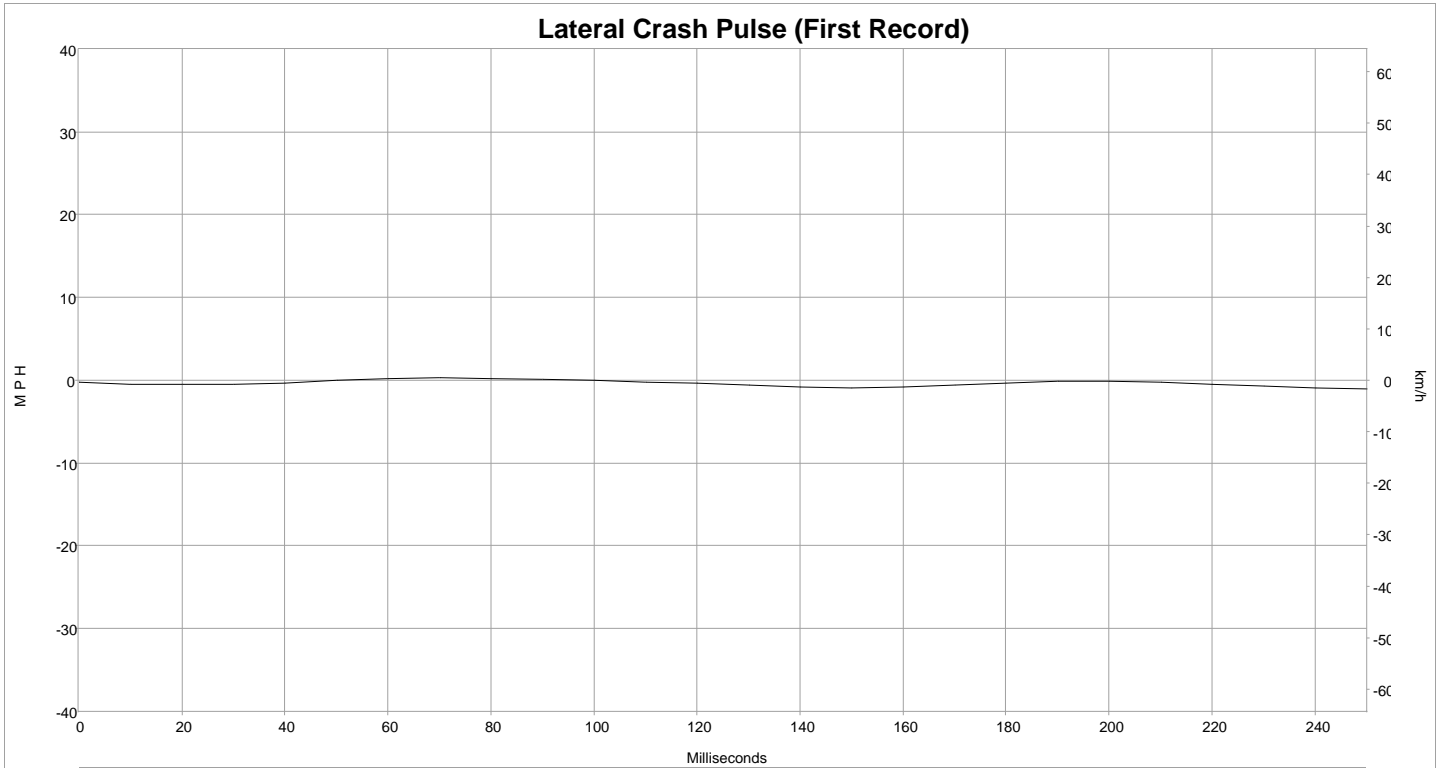
Post-Crash Data 0 to 5 sec [4 samples/sec] (First Record)

Time (sec)	Impact Event Feedback Status
0.00	Normal
0.25	Normal
0.50	Normal
0.75	Normal
1.00	Normal
1.25	Normal
1.50	Normal
1.75	Normal
2.00	Normal
2.25	Normal
2.50	Normal
2.75	Normal
3.00	Normal
3.25	Normal
3.50	Normal
3.75	Normal
4.00	Normal
4.25	Normal
4.50	Normal
4.75	Normal
5.00	Normal



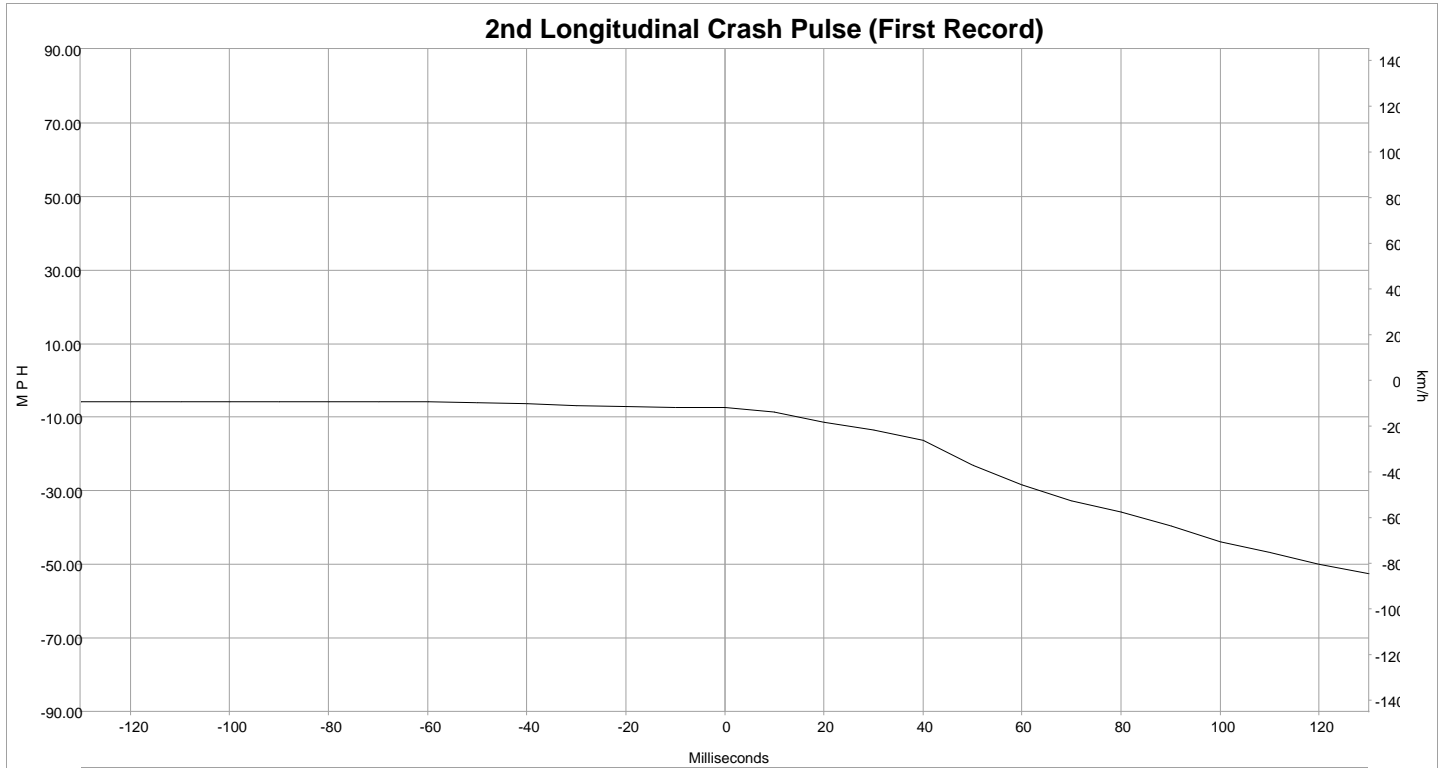
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	-1.21	-1.95
10	-2.88	-4.63
20	-4.31	-6.94
30	-4.74	-7.63
40	-4.90	-7.89
50	-4.78	-7.70
60	-4.69	-7.55
70	-4.40	-7.08
80	-4.53	-7.29
90	-4.62	-7.43
100	-4.70	-7.56
110	-4.84	-7.79
120	-4.83	-7.77
130	-4.60	-7.40
140	-4.61	-7.42
150	-4.72	-7.59
160	-4.74	-7.63
170	-4.88	-7.86
180	-5.00	-8.05
190	-5.07	-8.16
200	-5.11	-8.22
210	-5.06	-8.14
220	-5.05	-8.13
230	-5.01	-8.07
240	-5.02	-8.08
250	-5.10	-8.21



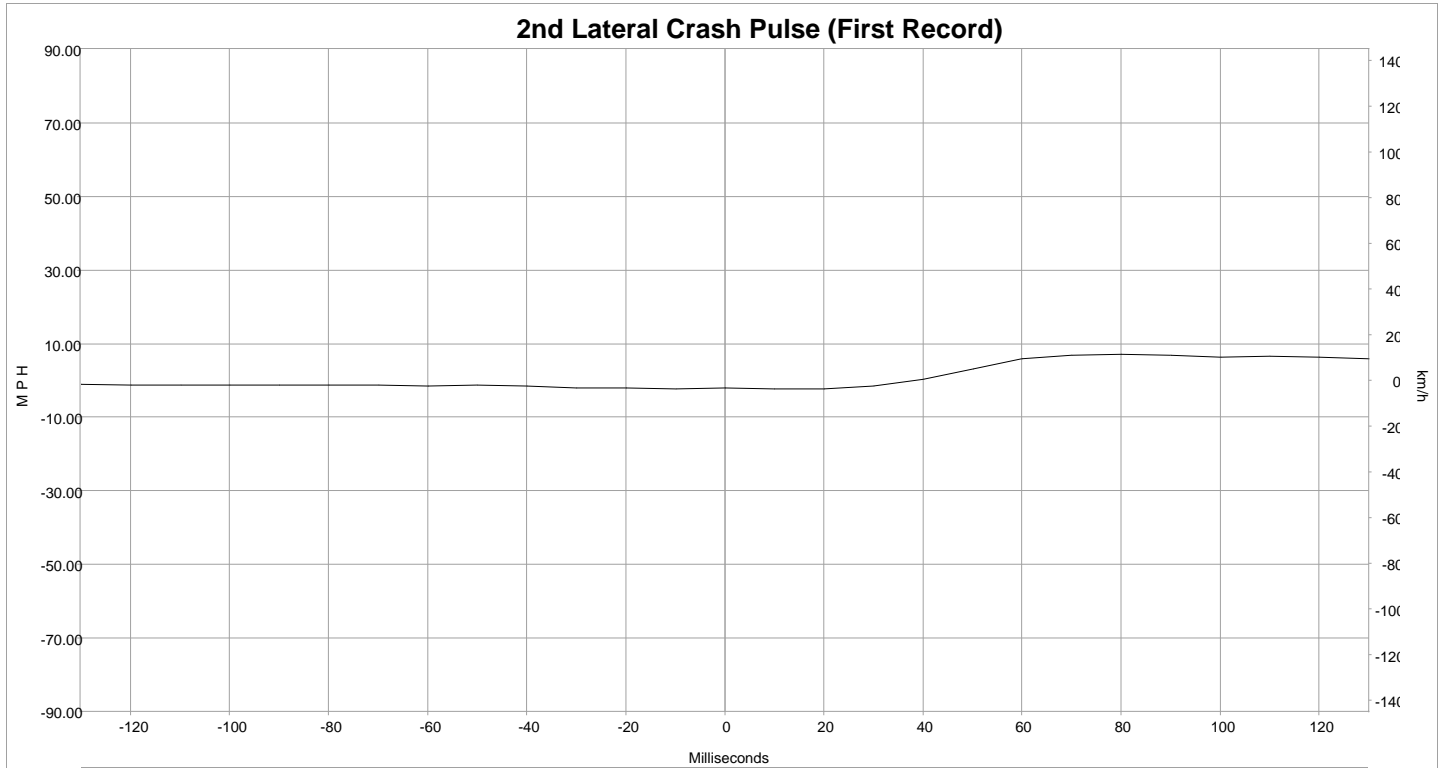
Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, Lateral (MPH)	Delta-V, Lateral (km/h)
0	-0.24	-0.38
10	-0.42	-0.67
20	-0.45	-0.73
30	-0.49	-0.79
40	-0.30	-0.48
50	-0.02	-0.04
60	0.20	0.32
70	0.30	0.49
80	0.23	0.37
90	0.11	0.18
100	-0.06	-0.09
110	-0.28	-0.45
120	-0.39	-0.62
130	-0.58	-0.94
140	-0.78	-1.26
150	-0.91	-1.47
160	-0.81	-1.30
170	-0.57	-0.91
180	-0.32	-0.52
190	-0.14	-0.23
200	-0.09	-0.14
210	-0.25	-0.41
220	-0.44	-0.71
230	-0.65	-1.04
240	-0.87	-1.40
250	-0.99	-1.60



2nd Longitudinal Crash Pulse (First Record)

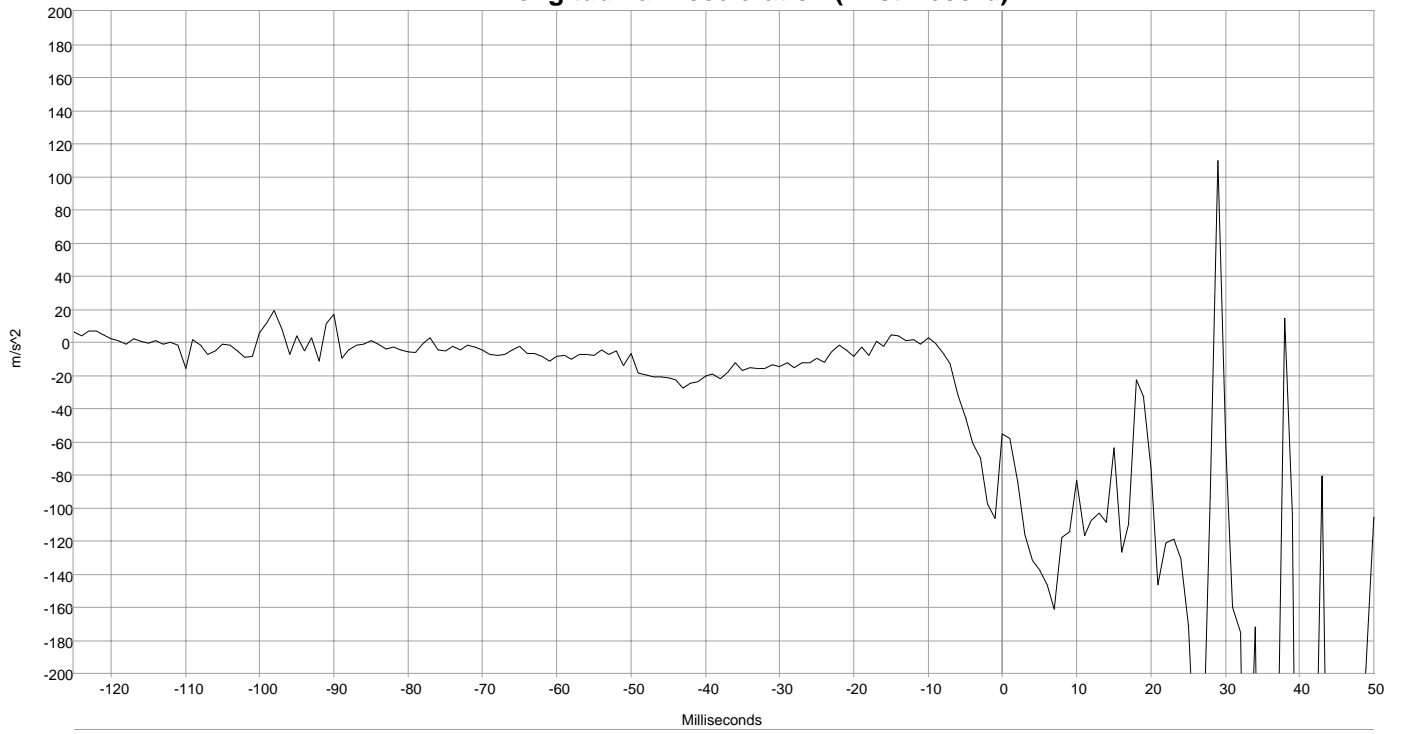
Time (msec)	2nd Delta-V, longitudinal (MPH)	2nd Delta-V, longitudinal (km/h)
-130	-5.91	-9.51
-120	-5.82	-9.36
-110	-5.72	-9.21
-100	-5.77	-9.28
-90	-5.79	-9.32
-80	-5.76	-9.27
-70	-5.82	-9.36
-60	-5.90	-9.50
-50	-6.06	-9.75
-40	-6.28	-10.10
-30	-6.78	-10.91
-20	-7.13	-11.47
-10	-7.30	-11.75
0	-7.29	-11.73
10	-8.61	-13.85
20	-11.35	-18.26
30	-13.33	-21.46
40	-16.22	-26.10
50	-22.96	-36.95
60	-28.43	-45.75
70	-32.63	-52.51
80	-35.74	-57.52
90	-39.58	-63.70
100	-43.89	-70.64
110	-46.73	-75.20
120	-50.00	-80.46
130	-52.60	-84.65



2nd Lateral Crash Pulse (First Record)

Time (msec)	2nd Delta-V, Lateral (MPH)	2nd Delta-V, Lateral (km/h)
-130	-1.11	-1.79
-120	-1.24	-1.99
-110	-1.29	-2.08
-100	-1.30	-2.10
-90	-1.31	-2.11
-80	-1.33	-2.14
-70	-1.37	-2.21
-60	-1.42	-2.28
-50	-1.37	-2.21
-40	-1.60	-2.58
-30	-1.91	-3.07
-20	-2.03	-3.27
-10	-2.16	-3.47
0	-2.09	-3.36
10	-2.26	-3.64
20	-2.17	-3.50
30	-1.57	-2.52
40	0.20	0.32
50	3.11	5.00
60	5.84	9.40
70	6.80	10.94
80	7.00	11.26
90	6.81	10.96
100	6.26	10.08
110	6.63	10.67
120	6.35	10.22
130	5.79	9.32

Longitudinal Acceleration (First Record)



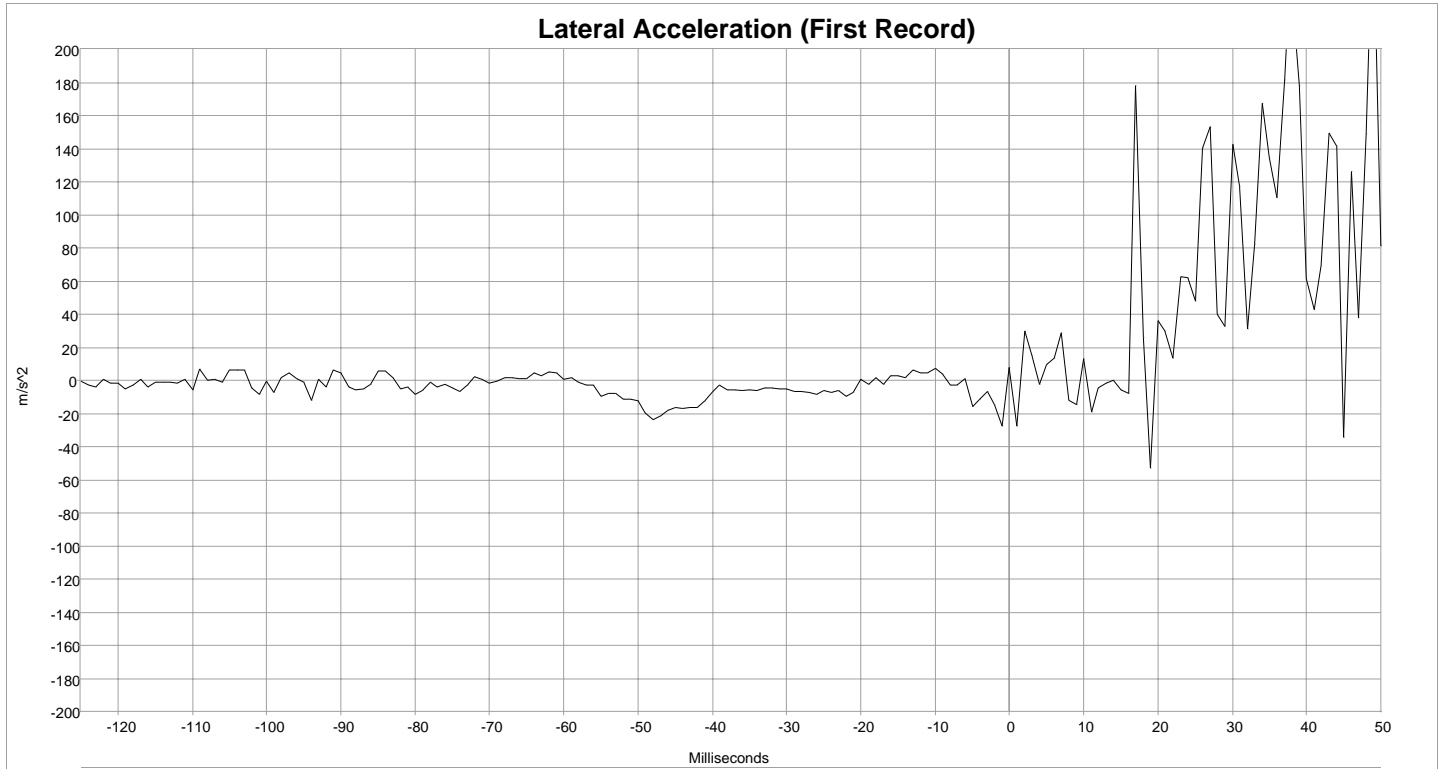
Longitudinal Acceleration (First Record)

Time (msec)	Longitudinal Acceleration (RCM internal high-G accel) (m/s^2)
-125	6.13
-124	3.68
-123	6.74
-122	6.74
-121	4.29
-120	2.45
-119	1.23
-118	-1.23
-117	2.45
-116	0.61
-115	-0.61
-114	1.23
-113	-1.23
-112	0.00
-111	-1.84
-110	-15.94
-109	1.84
-108	-1.84
-107	-7.36
-106	-4.90
-105	-1.23
-104	-1.84
-103	-4.90
-102	-9.19
-101	-8.58
-100	5.52
-99	11.65
-98	19.00
-97	7.97
-96	-7.36
-95	3.68
-94	-4.90
-93	3.06
-92	-11.03
-91	11.03
-90	17.16
-89	-9.81
-88	-4.29
-87	-1.84
-86	-1.23
-85	1.23
-84	-1.23
-83	-3.68
-82	-3.06

Time (msec)	Longitudinal Acceleration (RCM internal high-G accel) (m/s^2)
-81	-4.29
-80	-5.52
-79	-6.13
-78	-0.61
-77	3.06
-76	-4.29
-75	-4.90
-74	-2.45
-73	-4.29
-72	-1.84
-71	-3.06
-70	-4.29
-69	-7.36
-68	-7.97
-67	-7.36
-66	-4.29
-65	-2.45
-64	-6.74
-63	-6.74
-62	-8.58
-61	-11.03
-60	-8.58
-59	-7.97
-58	-10.42
-57	-7.36
-56	-7.36
-55	-7.97
-54	-4.29
-53	-7.36
-52	-4.90
-51	-14.10
-50	-6.74
-49	-18.39
-48	-19.61
-47	-20.84
-46	-20.84
-45	-21.45
-44	-22.68
-43	-27.58
-42	-24.52
-41	-23.90
-40	-20.23
-39	-19.00
-38	-22.07

Time (msec)	Longitudinal Acceleration (RCM internal high-G accel) (m/s^2)
-37	-17.77
-36	-12.26
-35	-17.16
-34	-15.32
-33	-15.94
-32	-15.94
-31	-13.48
-30	-14.71
-29	-12.26
-28	-15.32
-27	-12.26
-26	-12.26
-25	-9.81
-24	-11.65
-23	-5.52
-22	-1.84
-21	-4.29
-20	-8.58
-19	-3.06
-18	-7.97
-17	0.61
-16	-2.45
-15	4.29
-14	3.68
-13	1.23
-12	1.84
-11	-1.23
-10	3.06
-9	-0.61
-8	-6.74
-7	-12.87
-6	-31.87
-5	-45.36
-4	-60.68
-3	-69.87
-2	-97.45
-1	-106.65
0	-55.16
1	-58.23
2	-84.58
3	-115.84
4	-131.78
5	-137.29
6	-146.49

Time (msec)	Longitudinal Acceleration (RCM internal high-G accel) (m/s^2)
7	-161.20
8	-117.68
9	-114.62
10	-83.36
11	-116.45
12	-107.87
13	-102.97
14	-108.49
15	-63.74
16	-126.87
17	-109.71
18	-22.68
19	-32.48
20	-76.62
21	-146.49
22	-121.36
23	-118.91
24	-130.55
25	-171.00
26	-237.20
27	-282.56
28	-93.78
29	109.71
30	-63.13
31	-159.97
32	-175.30
33	-341.40
34	-171.62
35	-386.14
36	-498.92
37	-304.01
38	14.71
39	-102.97
40	-431.50
41	-458.46
42	-353.65
43	-80.29
44	-349.98
45	-338.33
46	-377.56
47	-393.49
48	-302.78
49	-196.75
50	-105.42



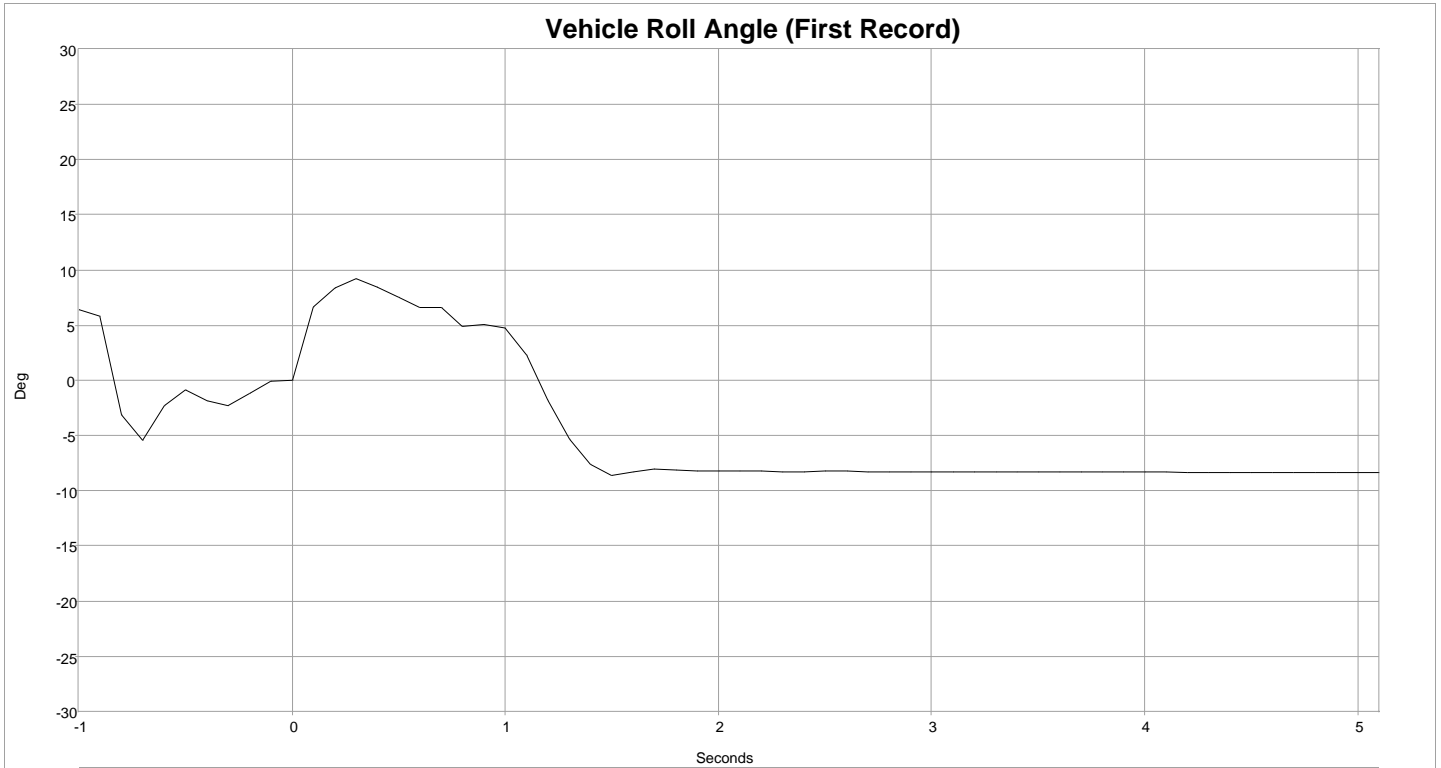
Lateral Acceleration (First Record)

Time (msec)	Lateral Acceleration (RCM internal high-G accel) (m/s^2)
-125	-0.61
-124	-3.06
-123	-3.68
-122	0.61
-121	-1.84
-120	-1.84
-119	-4.90
-118	-3.06
-117	0.61
-116	-3.68
-115	-1.23
-114	-1.23
-113	-1.23
-112	-1.84
-111	0.61
-110	-5.52
-109	6.74
-108	0.00
-107	0.61
-106	-1.23
-105	6.13
-104	6.13
-103	6.13
-102	-4.29
-101	-8.58
-100	-0.61
-99	-7.36
-98	1.84
-97	4.29
-96	1.23
-95	-1.23
-94	-11.65
-93	0.61
-92	-3.68
-91	6.13
-90	4.29
-89	-3.68
-88	-5.52
-87	-4.90
-86	-2.45
-85	5.52
-84	5.52
-83	1.84
-82	-4.90

Time (msec)	Lateral Acceleration (RCM internal high-G accel) (m/s^2)
-81	-3.68
-80	-8.58
-79	-6.13
-78	-1.23
-77	-3.68
-76	-2.45
-75	-4.29
-74	-6.74
-73	-3.06
-72	2.45
-71	0.61
-70	-1.84
-69	-0.61
-68	1.84
-67	1.84
-66	1.23
-65	1.23
-64	4.29
-63	3.06
-62	4.90
-61	4.29
-60	0.61
-59	1.84
-58	-1.23
-57	-3.06
-56	-3.06
-55	-9.81
-54	-7.97
-53	-7.97
-52	-11.03
-51	-11.03
-50	-12.26
-49	-19.61
-48	-23.90
-47	-21.45
-46	-17.77
-45	-16.55
-44	-17.16
-43	-16.55
-42	-16.55
-41	-12.26
-40	-6.74
-39	-3.06
-38	-5.52

Time (msec)	Lateral Acceleration (RCM internal high-G accel) (m/s^2)
-37	-5.52
-36	-6.13
-35	-5.52
-34	-6.13
-33	-4.29
-32	-4.29
-31	-4.90
-30	-4.90
-29	-6.74
-28	-6.74
-27	-7.36
-26	-8.58
-25	-6.13
-24	-7.36
-23	-6.13
-22	-9.81
-21	-7.36
-20	0.61
-19	-2.45
-18	1.84
-17	-2.45
-16	3.06
-15	3.06
-14	1.84
-13	6.13
-12	4.29
-11	4.29
-10	7.36
-9	3.68
-8	-3.06
-7	-3.06
-6	1.23
-5	-15.94
-4	-11.03
-3	-6.74
-2	-14.71
-1	-27.58
0	7.97
1	-27.58
2	30.03
3	15.32
4	-2.45
5	9.81
6	13.48

Time (msec)	Lateral Acceleration (RCM internal high-G accel) (m/s^2)
7	28.81
8	-11.65
9	-14.71
10	12.87
11	-19.00
12	-4.29
13	-1.84
14	0.00
15	-5.52
16	-7.97
17	177.75
18	25.74
19	-52.71
20	36.16
21	30.03
22	13.48
23	62.52
24	61.90
25	47.81
26	140.36
27	153.23
28	39.84
29	32.48
30	142.81
31	117.07
32	31.26
33	82.13
34	167.33
35	134.84
36	110.33
37	181.42
38	248.23
39	177.75
40	61.29
41	42.90
42	69.26
43	149.55
44	141.58
45	-34.32
46	126.26
47	38.00
48	148.94
49	280.10
50	80.91



Vehicle Roll Angle (First Record)

Time (sec)	Vehicle Roll Angle (deg)
-1.0	6.43
-0.9	5.86
-0.8	-3.12
-0.7	-5.39
-0.6	-2.30
-0.5	-0.86
-0.4	-1.86
-0.3	-2.29
-0.2	-1.17
-0.1	-0.12
0.0	0.00
0.1	6.64
0.2	8.33
0.3	9.24
0.4	8.41
0.5	7.55
0.6	6.56
0.7	6.55
0.8	4.91
0.9	5.09
1.0	4.71

Time (sec)	Vehicle Roll Angle (deg)
1.1	2.28
1.2	-1.78
1.3	-5.30
1.4	-7.60
1.5	-8.59
1.6	-8.32
1.7	-7.99
1.8	-8.08
1.9	-8.21
2.0	-8.16
2.1	-8.17
2.2	-8.23
2.3	-8.24
2.4	-8.24
2.5	-8.22
2.6	-8.21
2.7	-8.26
2.8	-8.26
2.9	-8.27
3.0	-8.27
3.1	-8.28

Time (sec)	Vehicle Roll Angle (deg)
3.2	-8.28
3.3	-8.28
3.4	-8.29
3.5	-8.30
3.6	-8.30
3.7	-8.30
3.8	-8.31
3.9	-8.31
4.0	-8.32
4.1	-8.32
4.2	-8.33
4.3	-8.33
4.4	-8.33
4.5	-8.33
4.6	-8.34
4.7	-8.34
4.8	-8.34
4.9	-8.34
5.0	-8.35
5.1	-8.35

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.

\$5B17 - Event Type
12 00 00 00

\$F113 - RCM Part Number
4D 4C 33 54 2D 31 34 42 33 32 31 2D 59 44 00 00 00 00 00 00 00 00 00 00

\$F18C - RCM Serial Number
33 30 32 31 34 31 33 36 33 34 34 37 30 30 30 30

\$F188 - RCM Software Part Number
4D 4C 33 54 2D 31 34 43 30 32 38 2D 43 41 00 00 00 00 00 00 00 00 00 00

\$F143 - Driver/Center Frontal Restraints Sensor Serial Number
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

\$F141 - Driver Side Restraint Sensor 1 Serial Number
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

\$F145 - Driver Side Restraint Sensor 2 Serial Number
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

\$F144 - Passenger Frontal Restraints Sensor Serial Number
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

\$F142 - Passenger Side Restraint Sensor 1 Serial Number
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

\$F146 - Passenger Side Restraints Sensor 2 Serial Number
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

\$DE00 - Original VIN
31 46 54 46 57 31 45 44 33 4D 46 2A 2A 2A 2A 2A 2A

\$F190 - Current VIN
31 46 54 46 57 31 45 44 33 4D 46 2A 2A 2A 2A 2A 2A 00 00 00 00 00 00 00

\$DE01 - RCM Option Content
C7 EA E7 3F 70 0C E6 99 00 00 00 00

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Disclaimer of Liability

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DOT HS 813 510
September 2023



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

