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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 published.

16. Abstract

This report documents the non-deployment of the supplemental restraint systems in a 2018 Toyota Corolla. Although none deployed in crash, the Corolla had driver and passenger front air bags, a driver knee air bag, a front-right passenger's seat pan air bag, front-seat-mounted side impact air bags, dual-sensing (side impact and rollover) inflatable curtain (IC) air bags, and front-seat belt retractor pretensioners. It also had crash avoidance features, including forward collision warning and lane departure warning. The Corolla was involved in an intersection crash with a 1997 Toyota Tacoma pickup. The crash occurred when the Corolla initiated a left turn and entered the intersection into the Tacoma's path. At the time of the crash, the Corolla was driven by an 18-year-old belted female driver with a 17-year-old belted male front-row passenger. A 29-year-old male driver and a 20-year-old male passenger were in the Tacoma. No one sustained injuries.

The SCI investigation determined that the crash was insufficiently severe to deploy supplemental restraints. The Corolla's EDR data revealed it had accelerated briefly to speeds less than 15 km/h (9 mph) and slowed prior to the crash. The end-swiping configuration of the impact forces produced a maximum EDR-recorded longitudinal delta V of -8.6 km/h (-5.3 mph) at 138 milliseconds after algorithm enable (AE). The Corolla's CA features, even if turned on during the at-crash ignition cycle, were not applicable to this crash configuration. No anomaly of the Corolla or its supplemental restraint systems was found.

17. Key Words	18. Distribution Statement
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Special Crash Investigations
Air Bag Non-Deployment Crash Investigation
Office of Defects Investigation
Case Number: CR18035
Vehicle: 2018 Toyota Corolla
Location: Delaware
Crash Date: July 2018

Background

This report documents the non-deployment of supplemental restraint systems in a 2018 Toyota Corolla. Although none deployed in crash, the Corolla (Figure 1) had driver and passenger front air bags, a driver knee air bag, a front-right passenger's seat pan air bag, front-seat-mounted side impact air bags, dual-sensing (side impact and rollover) inflatable curtain (IC) air bags, and front-seat belt retractor pretensioners. It also was equipped with multiple crash avoidance features, including forward collision warning (FCW) and lane departure warning (LDW). The Corolla was involved in an intersection crash with a 1997 Toyota Tacoma pickup that occurred when the Corolla initiated a left turn and entered the intersection into the Tacoma's path. At the time of the crash, the Corolla was driven by an 18-year-old belted female with a belted 17-year-old male passenger. A 29-year-old male drove the Tacoma with a 20-year-old male passenger. No one sustained any injuries.

Figure 1. Left front oblique view of the Toyota at the time of the SCI vehicle inspection

The crash was identified by the Office of Defects Investigation (ODI) of the National Highway Traffic Safety Administration through a search of the vehicle inventories at insurance vehicle salvage facilities during November 2018. Information concerning non-deployment of the air bags in this specific Toyota Corolla and potential for relation to ODI Investigation EA19-001 was forwarded to the Special Crash Investigations (SCI) group, with a request for the SCI team to inspect the vehicle and assess the air bag systems. The on-site portion of this investigation took place in November 2018 and consisted of the inspection of the Corolla to examine and document the exterior and interior damage, evaluate the manual and supplemental restraint systems, and

image data from the Corolla's Event Data Recorder (EDR) using the Bosch Crash Data Retrieval software and tool. At the time of the on-site investigation, limited information was available. Only after inspecting the vehicle did the SCI team have enough information to obtain a police crash report from the State records division. Therefore, no on-site inspection of the crash site was conducted.

This SCI investigation determined that the crash was of insufficient severity to deploy the supplemental restraints. The data imaged from the Corolla's EDR revealed that it had accelerated briefly to speeds less than 15 km/h (9 mph) and slowed prior to the crash. The end-swiping configuration of the impact forces produced a maximum EDR-recorded longitudinal delta V of -8.6 km/h (-5.3 mph) at 138 milliseconds after algorithm enable (AE). The Corolla's CA features, even if turned on during the at-crash ignition cycle, were not applicable to this crash configuration. No anomaly of the Corolla or its supplemental restraint systems was found.

Summary

Crash Site

The crash occurred at the intersection of an east/west, two-lane local road with a north/south two-lane, State-maintained roadway. Traffic was controlled for the east/west roadway by stop signs with painted stop bars at the intersection, while the north/south roadway was uncontrolled. Speed was regulated by a posted limit of 80 km/h (50 mph) in all travel directions. According to the police report, environmental conditions were daylight, clear, and dry. No crash site inspection was conducted by SCI, as the location of the crash was unknown at the time of the on-site investigation. Figure 2 shows an east-facing view of the intersection for the Corolla's pre-crash trajectory, while Figure 3 shows a south-facing view of the Tacoma's pre-crash trajectory. A crash diagram is included at the end of this report.

Figure 2. East-facing view of the local roadway for the Corolla's pre-crash travel trajectory (internet geo-mapping software image)

Figure 3. South-facing view of the State-maintained roadway for the Tacoma's pre-crash trajectory (internet geo-mapping software image)

Pre-Crash

The Corolla approached the intersection traveling eastbound on the local roadway. It was driven by the 18-year-old female with a 17-year-old male front-row passenger. According to the data imaged from the Corolla's EDR, both were belted at the time of the crash. The Corolla's driver brought the vehicle to a controlled stop at the intersection, in observance of the traffic control devices (stop sign and stop bar). She intended to turn left at the intersection and travel north.

The Tacoma traveled south on the north/south roadway on approach to the intersection, driven by a 29-year-old male with a 20-year-old male passenger. This vehicle intended to maintain its speed and continue southbound travel through the intersection.

While stopped at the intersection, the Corolla's driver looked but did not see the Tacoma approaching from the north. She accelerated the Corolla from its stopped position and initiated the left turn, encroaching into the intersection. She saw the oncoming Tacoma at the last second, braked and steered right in an attempt to avoid the crash.

Crash

The crash occurred in an end-swipe configuration as the right side of the Tacoma struck the front of the slowly moving Corolla. Directions of force were in the 10 o'clock sector for the Corolla and 1 o'clock sector for the Tacoma. As they engaged, a slight clockwise rotation was induced about the Corolla's vertical axis. The Tacoma was redirected toward the southeast. The Corolla came to rest in the middle of the intersection, while the Tacoma came to rest in the southeast intersection quadrant.

Post-Crash

The emergency response system received notification of the crash and dispatched law enforcement, fire department, and emergency medical personnel. Emergency responders found that all parties had exited the vehicles under their own power. All occupants denied injury and refused medical care. A local recovery service also responded to the crash site and towed the Corolla and Tacoma. The Corolla was subsequently deemed a total loss by its insurer and was transferred to a regional vehicle salvage facility, where it was inspected for this SCI investigation.

2018 Toyota Corolla

Description

The 2018 Toyota Corolla (Figure 4) was manufactured in April 2018 and identified by the VIN 2T1BURHE2JCxxxxxx. At the time of the SCI vehicle inspection, its electronic odometer reading was 4,086 km (2,539 mi). The Corolla was a front-wheel-drive, 4-door sedan powered by a 1.8-liter, inline 4-cylinder, gasoline engine linked to an automatic transmission. It had a 270 cm (106.3 in) wheelbase and a gross vehicle weight rating (GVWR) of 1,733 kg (3,820 lb).

Figure 4. Right-front oblique view of the Corolla

At the time of the SCI vehicle inspection, the Corolla was equipped with four matching tires of the manufacturer's recommended size (P205/55R16). All tires were in like-new condition with minimal tread wear, remained inflated, and were not damaged or restricted. The interior of the Corolla had seating for five occupants, with cloth-surfaced front-row bucket seats and a second-row split bench seat with folding backs. Three-point lap and shoulder seat belts were available for all seat positions, with multiple inflatable supplemental restraint systems to provide protection for the occupants.

Vehicle History

According to a commercially available vehicle history report, the Corolla was purchased new in April 2018. It had been involved in two crashes over its short lifetime, the second of which was the crash under investigation. The first crash occurred in May 2018, prior to this crash. At that time, the Corolla was struck in the rear while stopped in traffic. No supplemental restraint device actuation or deployment was associated with the prior crash.

Exterior Damage

The Corolla's damage was located on the front plane. The front bumper beam was sheared/separated from the frame rail extension ends, and both extensions were bent rightward approximately 45 degrees. The damage profile resembled an end-swipe. The bumper fascia, bumper beam, grille, and both headlight assemblies were missing from the vehicle (Figure 5). On the leading edge of the hood, direct contact spanned 110 cm (43.3 in) from the left-front corner extending right. A residual crush profile was documented using a total station mapping system

across the remnants of the front plane. The deformed frame rail ends defined the width, and the measurements were adjusted to account for free space. Resultant measurements were as follows: C1 = 2 cm (0.8 in), C2 = 5 cm (2.0 in), C3 = 10 cm (3.9 in), C4 = 11 cm (4.3 in), C5 = 15 cm (5.9 in), and C6 = 13 cm (5.1 in). Maximum crush was 13 cm (5.1 in), observed immediately left of the vehicle's right front bumper corner/deformed frame rail extension. Figure 6 shows the damage pattern from an overhead perspective. The collision damage classification (CDC) assigned to the Corolla for the front plane impact with the Tacoma was 10FDEW1.

Figure 5. View of the Corolla's front plane damage

Figure 6. Overhead view of the Corolla's damage profile

The "missing vehicle" algorithm of the WinSMASH model was used to calculate the severity (delta V) of the crash for analysis purposes. The total calculated delta V of the crash for the front plane impact to the Corolla was 23 km/h (14 mph). Longitudinal and lateral components of the calculated delta V were -15 km/h (-9 mph) and 17 km/h (11 mph), respectively. These results appeared to be overestimated, based on SCI expertise, the observed damage pattern, and the imaged EDR data.

Event Data Recorder

The 2018 Toyota Corolla had an air bag electronic control unit (ECU) located beneath the center stack of the instrument panel that performed the diagnostic, sensing, and deployment command functions for its supplemental restraint systems. The ECU also had EDR capabilities, and its stored data were imaged during the SCI vehicle inspection using the Bosch CDR tool and software version 17.9.1. Data were retrieved via a connection to the vehicle through the diagnostic link connector (DLC) located beneath the left instrument panel in the occupant compartment. The imaged data, reported using software version 21.0.2, are included at the end of this report in **Appendix A**.

Data limitation language in the EDR report indicated that the Corolla's ECU could record two event types. The first kind was the deployment event type, any event in which an inflatable supplemental restraint device (frontal, side, or curtain air bags) was deployed. These events became locked to memory and could not be overwritten. The second type was the non-deployment event, which was any event that met the threshold for recording but did not result in command for deployment of an inflatable supplemental restraint device. Non-deployment events

could include pretensioner actuation only and rear-seat air bag deployment only (if equipped) events. Non-deployment event types were not locked to memory. An unlocked event could be overwritten by any subsequent qualified event.

This EDR recognized longitudinal (front/rear), lateral (side), and rollover event types, and had the capacity to store up to two records for each event type (for a possible total of up to six stored event records). The recording trigger for a front/rear event qualified at 0.8 km/h (0.5 mph) cumulative delta V. Lateral events triggered time zero at algorithm enable. Two memory maps (data buffers/Page 0 and Page 1) were available to record approximately five seconds of pre-crash vehicle performance parameters (vehicle speed, accelerator pedal position, brake status, and engine rpm), and were linked to the recorded event types. The concept of a trigger counter (TRG) was used to order the recorded events.

The imaged data contained three triggers over its lifetime. Trigger 1 was a front/rear type event with a maximum reported positive longitudinal delta V of 18.2 km/h (11.3 mph). Accompanying pre-crash data showed that the Corolla had slowed and come to a complete stop prior to the rear impact. No supplemental restraint actuation or deployment commands were associated with Trigger 1. The event had occurred on a previous ignition cycle (81), and it was therefore determined to be unrelated to the crash under investigation.

Triggers 2 and 3 were side and front/rear types and both occurred on ignition cycle 425. The time separation between them was 24 milliseconds, with a 60-millisecond timeframe between their recorded pre-crash buffers. These triggers were the crash event described by this investigation. There were no actuation/deployment commands. The maximum reported delta V (longitudinal) was -8.6 km/h (-5.3 mph), which occurred at 138 milliseconds relative to TRG 3. An integration of the lateral acceleration pulse calculated a maximum lateral velocity change of 12.8 km/h (7.9 mph) at 110 milliseconds. The seat belt status for both the driver and the front row right occupant was reported ON (buckled) for both triggers (2 and 3). Pre-crash buffer data associated with the maximum delta V trigger (TRG 3) included the following:

Time (sec)	Speed km/h (mph)	Accelerator Pedal (% FULL)	Engine rpm	Service Brake ON/OFF	Yaw Rate (deg/sec)	Steering Input (degrees)
-4.7	0 (0)	0	800	ON	0	0
-4.2	0 (0)	0	800	ON	0	0
-3.7	0 (0)	0	800	ON	0	0
-3.2	0 (0)	0	700	ON	0	0
-2.7	0 (0)	0	800	OFF	0	7.5
-2.2	0 (0)	10.5	1,000	OFF	0	9.0
-1.7	2.5 (4)	34.5	1,800	OFF	0	9.0
-1.2	5.6 (9)	45.5	2,100	OFF	0	3.0
-0.7	8.7 (14)	0	2,100	OFF	0	-1.5
-0.2	5.6 (9)	0	1,200	ON	0	-1.5
0	3.1 (5)	0	1,000	ON	-6.34	0

The imaged data matched the description of the crash reported by the police report. It was apparent that the Corolla had come to a controlled stop at the intersection, then began to accelerate from its stopped position and initiate a left turn. The driver apparently recognized the impending crash event in the final second prior to the crash, as the accelerator pedal was released and the brake pedal depressed in an apparent avoidance attempt.

Interior Damage

The Corolla interior was inspected and found to be in "like-new" condition. There was no discernable evidence of crash-related damage or occupant compartment intrusion. An inspection for occupant contact evidence revealed only one discernable area of contact, located on the polymer surface of the storage compartment door of the right lower instrument panel. This scuff (**Figure 7**) was attributed to probable right knee contact by the front row right occupant.

Figure 7. Probable front-row right occupant knee contact to the right lower instrument panel

Manual Restraint Systems

The Corolla had 3-point lap and shoulder seat belts for both front-row seating positions. They consisted of continuous loop webbing with sliding latch plates and had seat belt buckle switch sensors and retractor pretensioners. The driver's seat belt retracted onto an emergency locking retractor (ELR), while the front right passenger's system was a switchable ELR/ automatic locking retractor (ALR). The shoulder portions of both systems were height-adjustable at their D-ring anchor locations.

At the time of the SCI vehicle inspection, both front-row manual restraint systems were loosely stowed against their respective B-pillar locations and spooled freely from/onto their retractors. There was no discernable loading evidence on either system; however, this was not indicative of their usage status. Rather, the forces of the crash were of insufficient magnitude to elicit occupant displacement; therefore, no loading evidence in relation to the minor severity of this crash would be expected. According to the data imaged from the Corolla's EDR, both front-row seat belt systems were in use by their respective occupants at the time of the crash.

Supplemental Restraint Systems

The Corolla had multiple inflatable supplemental restraints to protect both front-seat occupants. These included a certified advanced 208-compliant (CAC) frontal air bag system, a driver's knee air bag in the left lower instrument panel, seat pan air bag in the front-right passenger's seat cushion, front-seat-mounted side impact air bags, and dual-sensing (side impact and rollover) inflatable curtain (IC) air bags. The CAC frontal air bag system consisted of driver's and passenger's frontal air bags, with seat belt buckle switch sensors, seat track position sensors, and a front-right occupant classification (weight) sensor. None of the Corolla's supplemental restraint devices was commanded to actuate or deploy in relation to the minor severity crash (Figure 8).

Figure 8. Crossing view of the Corolla's front row from the left (driver's side)

NHTSA Recalls and Investigations

A VIN-based query of the NHTSA's recall database (www.nhtsa.gov/recalls) for the 2018 Toyota Corolla as of the date of this report indicated that there were two open recalls and no investigations pertaining to this specific vehicle. Both recalls were issued in 2020, well after the 2018 crash. The first recall, issued on January 13, 2020, was identified by the manufacturer recall number 20TA02 and the NHTSA campaign number 20V012. The recall pertained to a low-pressure fuel pump that had the potential to cease operation, possibly leading to the engine stalling and being unable to restart.

The second recall, issued on January 17, 2020, was identified by the manufacturer recall number 20TA03 and the NHTSA campaign number 20V024. The recall pertained to an ECU that potentially had inadequate protection against certain electrical noise in certain crashes, such as severe underride crashes, that could lead to incomplete or non-deployment of the supplemental restraint devices (pretensioners and air bags). The recall was prompted by ODI Investigation EA19-001, which prompted the interest in this specific crash for investigation. Ultimately, this SCI Investigation confirmed that no defects were found for this crash/vehicle.

Air Bag Non-Deployment Discussion

Through the course of this SCI investigation, it was determined that the crash was of insufficient severity to deploy supplemental restraints. Although there was an active open recall issued after the date of the crash that related to the potential incomplete or non-deployment of the

supplemental restraint systems (NHTSA recall 20V024), it was determined that there were no performance anomalies relative to this crash or this specific vehicle. In this crash, the Corolla's ECU correctly and completely recorded the crash pulse. The Corolla was initially stopped, accelerated briefly to a speed less than 15 km/h (9 mph), and then slowed again prior to the crash. The slow speed of the Corolla and angle of the impact forces only produced a maximum longitudinal delta V recorded by the EDR of -8.6 km/h (-5.3 mph). Based on the low severity of the crash pulse and minor damage sustained by the Corolla, supplemental restraint device actuation/deployment would not be expected.

The Corolla's CA features, even if turned on during the at-crash ignition cycle, were not applicable to this crash configuration. No anomaly of the Corolla, its supplemental restraint systems, or its CA technologies could be detected or otherwise inferred by the SCI investigative team.

2018 Toyota Corolla Occupants

Driver Demographics

Age/sex:	18 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with reclining seatback
Seat track position:	Between middle and rearmost
Manual restraint usage:	3-point lap and shoulder belt
Usage source:	Vehicle inspection, EDR report
Air bags:	Frontal, knee, seat-mounted side impact, and IC air bags available; none deployed
Alcohol/drug data:	None
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	None
Type of medical treatment:	None

Driver Injuries

Injury No.	Injury Description	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	None	N/A	N/A	N/A

Source: police crash report.

Driver Kinematics

The driver of the Corolla driver was seated in a normal driving posture with the manual seat track adjusted to a position between middle and rearmost, with the seatback slightly reclined and the adjustable head restraint 1 cm (0.4 in) upward. She used the 3-point lap and shoulder seat belt for manual restraint, confirmed by the data imaged from the Corolla's EDR. The driver told to the investigating law enforcement agency that she had stopped at the stop sign and looked but did not see the oncoming Tacoma. She initiated a left turn at the intersection and encroached into the Tacoma's travel path. Data imaged from the Corolla's EDR indicated that the driver released the accelerator pedal, depressed the brake pedal, and steered the Corolla back to the right in an attempt to avoid the impending crash.

At impact with the Tacoma, the driver initiated a forward and left trajectory. The ELR mode of the seat belt retractor engaged, and the driver's body was restrained by the seat belt system. The driver remained restrained as the Corolla rotated slightly clockwise and came to rest in the intersection. The driver did not interact with surrounding interior components or sustain injury. She refused medical evaluation/treatment at the crash scene, and she was not medically transported post-crash.

Front-Row Right Occupant Demographics

Age/sex:	17 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Forward-facing bucket seat with reclining seatback
Seat track position:	Rearmost
Manual restraint usage:	3-point lap and shoulder belt
Usage source:	Vehicle inspection, EDR report
Air bags:	Frontal, seat-mounted side impact, and IC air bags available; none deployed
Alcohol/drug data:	None
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	None
Type of medical treatment:	None

Front-Row Right Occupant Injuries

Injury No.	Injury Description	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
N/A	None	N/A	N/A	N/A

Source: police crash report.

Front-Row Right Occupant Kinematics

The front-right occupant was seated in the forward-facing bucket seat with the track adjusted to its rearmost position and the adjustable head restraint fully downward. He was restrained by the manual seat belt system, as confirmed by the data imaged from the Corolla's EDR.

At impact with the Tacoma, the Corolla passenger initiated a forward and left trajectory. The ELR mode of the seat belt system's retractor engaged, locking the belt webbing in position. Movement of the occupant's body was restricted by his use of the manual restraint system. His legs extended forward, and his right knee contacted and loaded the right instrument panel. This contact was evidenced by a scuff on the polymer surface of the storage compartment door.

Following the crash, the occupant exited the vehicle without assistance. He denied injury, refused medical evaluation/treatment, and was not medically transported from the crash scene.

1997 Toyota Tacoma

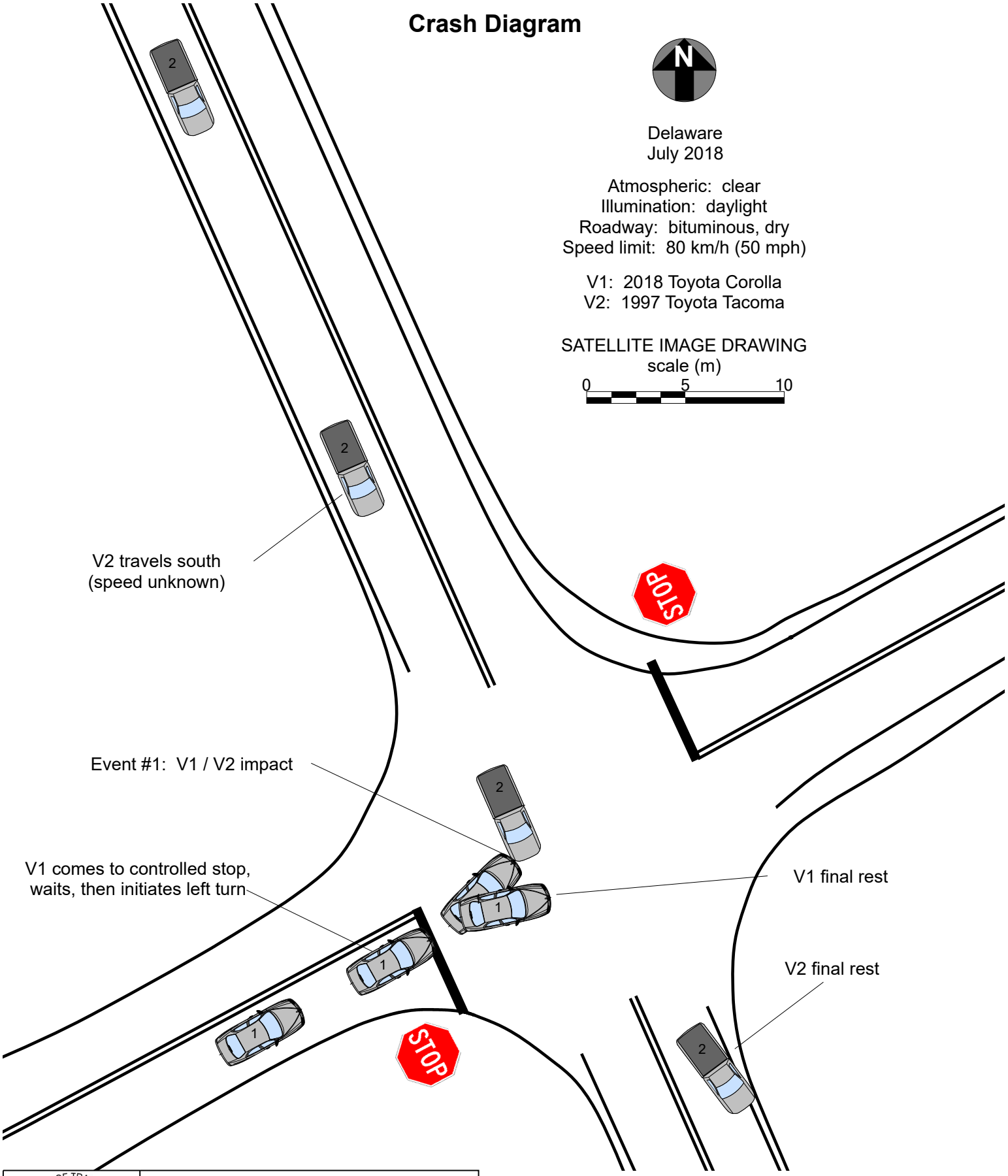
Description

The 1997 Tacoma involved in this crash was a small pickup identified by the VIN 4TAVL52N3VZxxxxxx and had a 2.4-liter, inline, 4-cylinder engine. According to a commercially available vehicle history report, the 1997 Toyota Tacoma was sold in 2018 at salvage auction with a reported odometer reading of 399,703 km (248,364 mi). It was not available for SCI inspection, and there were no images of it available.

Occupant Data

At the time of the crash, the Tacoma was driven by a 29-year-old male with a 20-year-old male front-row passenger. Their seat belt usage status was not documented by the police report. According to the police report, neither occupant sustained injury in the crash.

Crash Diagram



Case Number:	CR18035

Appendix A: Event Data Recorder Report for 2018 Toyota Corolla[1]

[1] The EDR report contained in this technical report was imaged using the version of the Bosch CDR software current at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this report.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN/Frame Number	2T1BURHE2JC******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR18035_V1_ACM.CDRX
Saved on	Monday, November 12 2018 at 15:22:32
Imaged with CDR version	Crash Data Retrieval Tool 17.9.1
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 21.0.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Front/Rear (2), Side (1)

Comments

No comments entered.

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
Lateral Acceleration for Frontal/Rear Crash, Floor Sensor	Left to Right
Lateral Acceleration, Side Satellite Sensor 1	Left to Right
Lateral Acceleration, Side Satellite Sensor 2	Left to Right
Lateral Acceleration, Side Satellite Sensor 3	Left to Right
Lateral Acceleration, Side Satellite Sensor 4	Left to Right
Lateral Acceleration for Side Crash, Floor Sensor	Left to Right
Roll Angle Peak	Clockwise Rotation
Roll Angle at the Time of TRG	Clockwise Rotation
Roll Rate	Clockwise Rotation
Lateral Acceleration for Rollover, Floor Sensor	Left to Right
Longitudinal Acceleration , VSC Sensor	Forward
Yaw Rate	Left Turn
Steering Input	Left Turn

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 indicated 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 1.5 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.
- "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.

05013_ToyotaS00std_r028

System Status at Time of Retrieval

ECU Part Number	89170-02K90
EDR Generation	13EDR
Complete File Recorded	Yes
Freeze Signal	OFF
Freeze Signal Factor	None
Diagnostic Trouble Codes Exist	No
Ignition Cycle ,Download (times)	426
Multi-event, number of events (times)	2 or greater
Time from event 1 to 2 (s)	-0.024
Time from Previous Pre Crash TRG (msec)	16381 or greater
Latest Pre-Crash Page	1
Contains Unlinked Pre-Crash Data	No

Event Record Summary at Retrieval

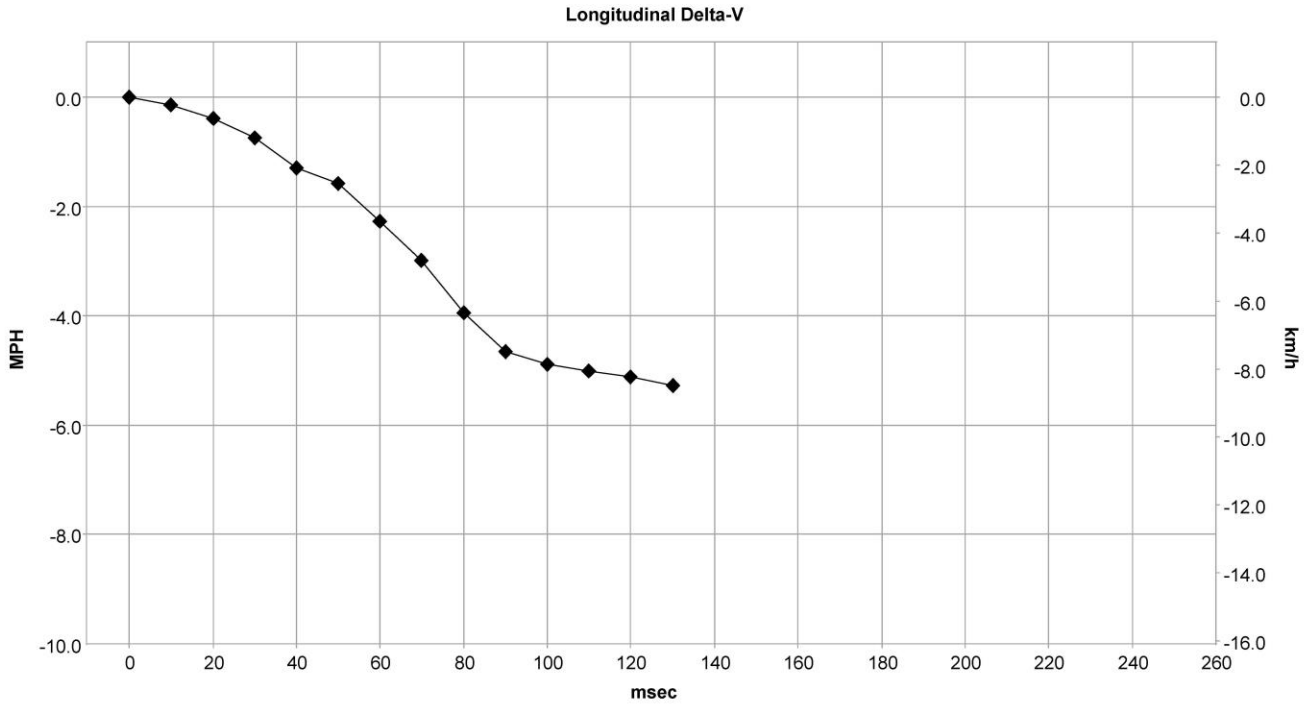
Events Recorded	TRG Count	Crash Type	Time (msec)	Pre-Crash & DTC Data Recording Status	Event & Crash Pulse Data Recording Status
Most Recent Event	3	Front/Rear Crash	0	Complete (Page 1)	Complete (Front/Rear Page 1)
1st Prior Event	2	Side Crash	24	Complete (Page 1)	Complete (Side Page 0)
2nd Prior Event	1	Front/Rear Crash	-16381 or greater	Complete (Page 0)	Complete (Front/Rear Page 0)

System Status at Event (Most Recent 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)	60
Linked Pre-Crash Page	1
Frontal Airbag Deployment, Time to 1st Stage Deployment, Driver (msec)	No
Frontal Airbag Deployment, Time to 1st Stage Deployment, Front Passenger (msec)	No
Pretensioner Deployment, Time to Fire, Driver (msec)	No
Pretensioner Deployment, Time to Fire, Front Passenger (msec)	No
Frontal Airbag Deployment, Time to 2nd Stage, Driver (msec)	N/A
Frontal Airbag Deployment, Time to 2nd Stage, Front Passenger (msec)	N/A
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)	No
Side Curtain Airbag Deployment, Time to Deploy, Passenger (msec)	No
Side Airbag Deployment, Time to Deploy, Driver (msec)	No
Side Airbag Deployment, Time to Deploy, Passenger (msec)	No
Rear Window Airbag Deployment, Time to Deploy (msec)	SNA

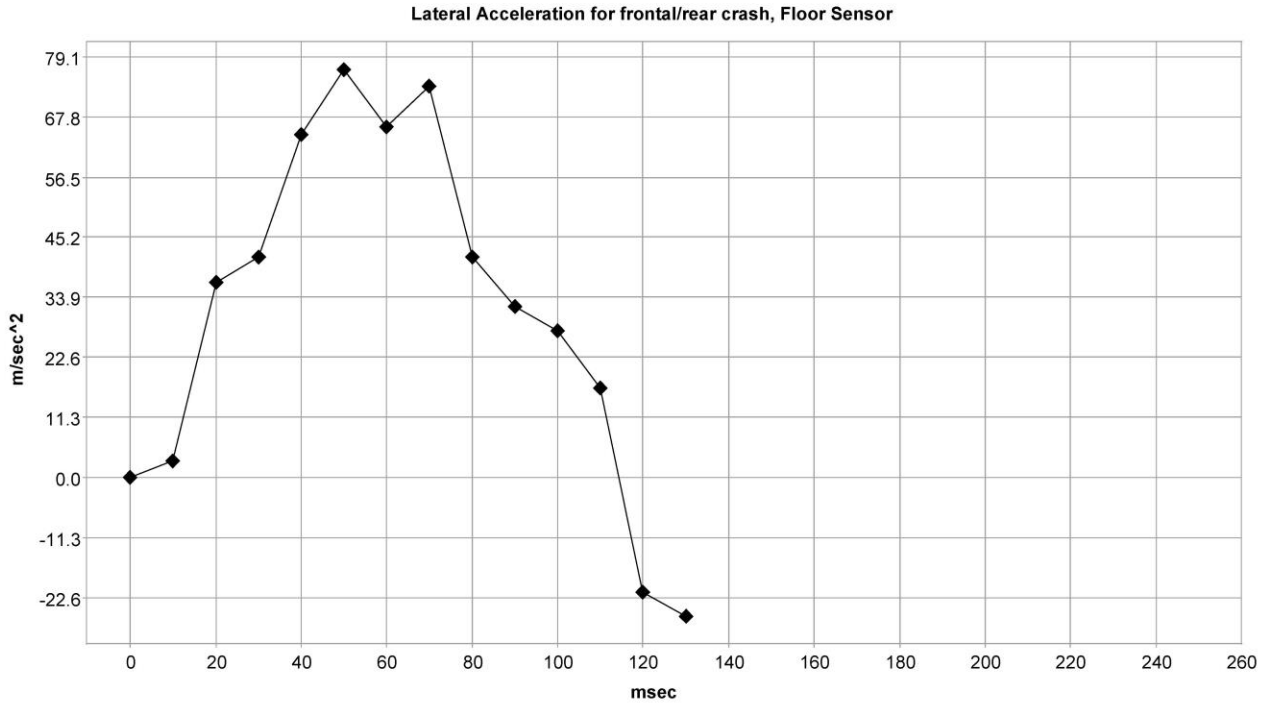
Longitudinal/Lateral Crash Pulse (Most Recent Event, TRG 3 - table 1 of 2)

Recording Status, Time Series Data	Complete
Time from Time Zero to TRG (msec)	84.0
Length of Delta-V (msec)	130
Max. Longitudinal Delta-V (MPH [km/h])	-5.3 [-8.6]
Time, Maximum Delta-V, Longitudinal (msec)	138.0
Power Supply Status at Max. Delta-V	OFF
Clipping Time of Longitudinal Delta-V (msec)	No
Clipping Time of Lateral Acceleration, Floor Sensor (msec)	47.0



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 CSA
8	Passenger CSA
9	Rear Window Airbag Deployment Time
10	Driver SAB
11	Passenger SAB



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 CSA
8	Passenger CSA
9	Rear Window Airbag Deployment Time
10	Driver SAB
11	Passenger SAB

Longitudinal/Lateral Crash Pulse (Most Recent Event, TRG 3 - table 2 of 2)

Time (msec)	Longitudinal Delta-V (MPH [km/h])	Lateral Acceleration for Frontal/Rear Crash, Floor Sensor (m/sec^2)	Power Supply Status
0	0.0 [0.0]	0.0	ON
10	-0.1 [-0.2]	3.1	ON
20	-0.4 [-0.6]	36.8	ON
30	-0.7 [-1.2]	41.4	ON
40	-1.3 [-2.1]	64.4	ON
50	-1.6 [-2.6]	76.6	ON
60	-2.3 [-3.7]	65.9	ON
70	-3.0 [-4.8]	73.5	ON
80	-3.9 [-6.3]	41.4	ON
90	-4.6 [-7.5]	32.2	ON
100	-4.9 [-7.9]	27.6	OFF
110	-5.0 [-8.1]	16.9	OFF
120	-5.1 [-8.2]	-21.5	OFF
130	-5.3 [-8.5]	-26.0	OFF
140	0.0 [0.0]	0.0	ON
150	0.0 [0.0]	0.0	ON
160	0.0 [0.0]	0.0	ON
170	0.0 [0.0]	0.0	ON
180	0.0 [0.0]	0.0	ON
190	0.0 [0.0]	0.0	ON
200	0.0 [0.0]	0.0	ON
210	0.0 [0.0]	0.0	ON
220	0.0 [0.0]	0.0	ON
230	0.0 [0.0]	0.0	ON
240	0.0 [0.0]	0.0	ON
250	0.0 [0.0]	0.0	ON

DTCs Present at Time of Event (Most Recent 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 (Most Recent Event, TRG 3)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	200
TRG Count when Pre-crash TRG was Established (times)	2
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	SNA
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	425

Pre-Crash Data, -5 to 0 seconds (Most Recent Event, TRG 3)

Time (sec)	-4.7	-4.2	-3.7	-3.2	-2.7	-2.2	-1.7	-1.2	-0.7	-0.2	0 (TRG)
Vehicle Speed (MPH [km/h])	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	2.5 [4]	5.6 [9]	8.7 [14]	5.6 [9]	3.1 [5]
Accelerator Pedal, % Full (%)	0.0	0.0	0.0	0.0	0.0	10.5	34.5	45.5	0.0	0.0	0.0
Percentage of Engine Throttle (%)	0.0	0.0	0.0	0.0	0.0	3.5	16.0	25.0	1.0	0.0	0.0
Engine RPM (RPM)	800	800	800	700	800	1,000	1,800	2,100	2,100	1,200	1,000
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
Brake Oil Pressure (Mpa)	0.53	0.62	0.62	0.67	0.00	0.00	0.00	0.00	0.00	4.70	5.28
Longitudinal Acceleration , VSC Sensor (m/sec^2)	-0.359	-0.431	-0.072	-0.215	0.215	0.718	2.512	2.656	2.225	-6.747	Invalid
Yaw Rate (deg/sec)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-6.34
Steering Input (degrees)	0.0	0.0	0.0	0.0	7.5	9.0	9.0	3.0	-1.5	-1.5	0.0
Shift Position	D	D	D	D	D	D	D	D	D	D	D
Sequential Shift Range	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, ECO	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, Sport	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, Snow	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

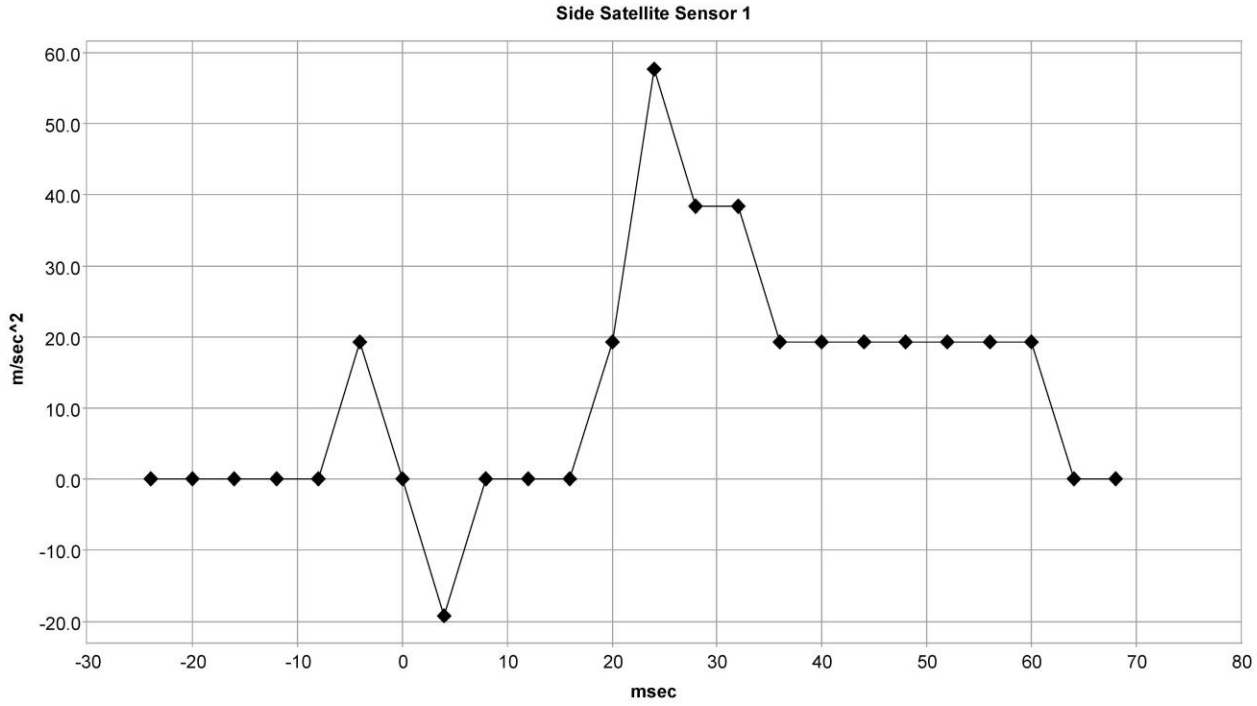
Drive Mode, EV	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Fuel Injection Quantity (mm3/st)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

System Status at Event (1st 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

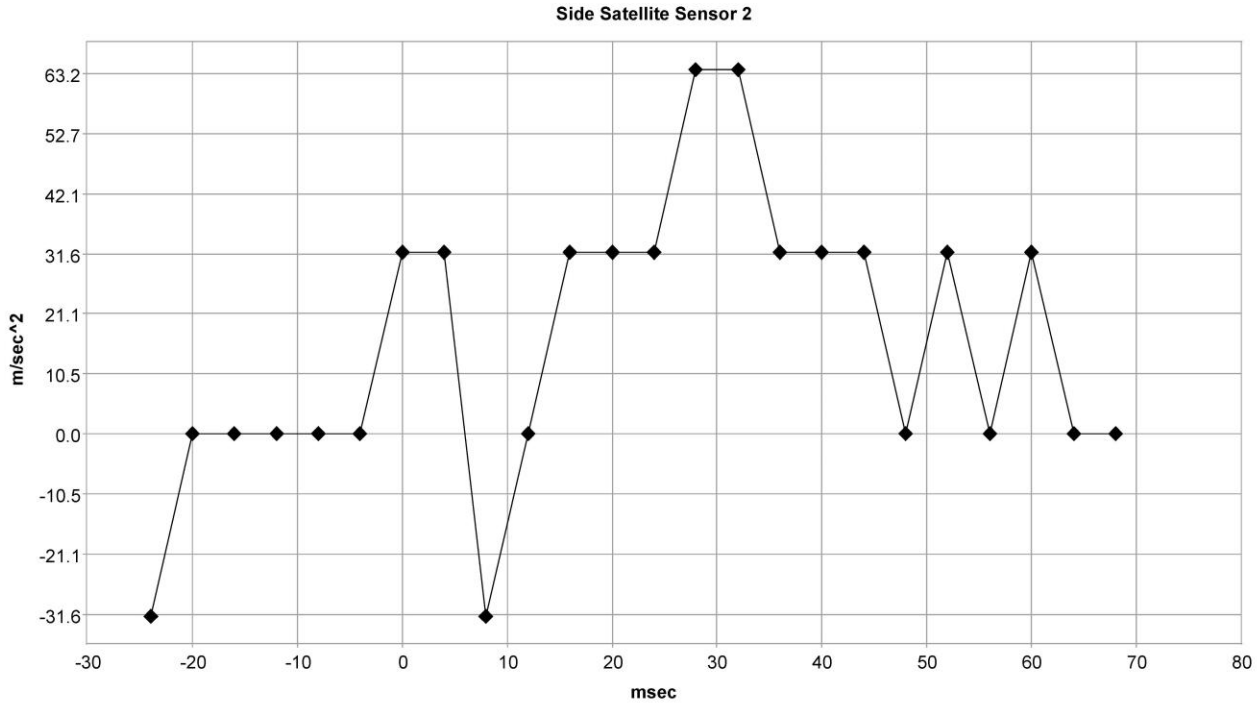
Lateral Crash Pulse (1st Prior Event, TRG 2 - table 1 of 2)

Recording Status, Time Series Data	Complete
Recorded Side	Left Side
Time from TRG to Next Sample (msec)	0
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
Location of Floor Sensor	Airbag ECU
Clipping Time of Lateral Acceleration, Side Satellite Sensor 1 (msec)	No
Clipping Time of Lateral Acceleration, Side Satellite Sensor 2 (msec)	No
Clipping Time of Lateral Acceleration, Side Satellite Sensor 3 (msec)	No
Clipping Time of Lateral Acceleration, Side Satellite Sensor 4 (msec)	SNA
Clipping Time of Lateral Acceleration, Floor Sensor (msec)	23.0



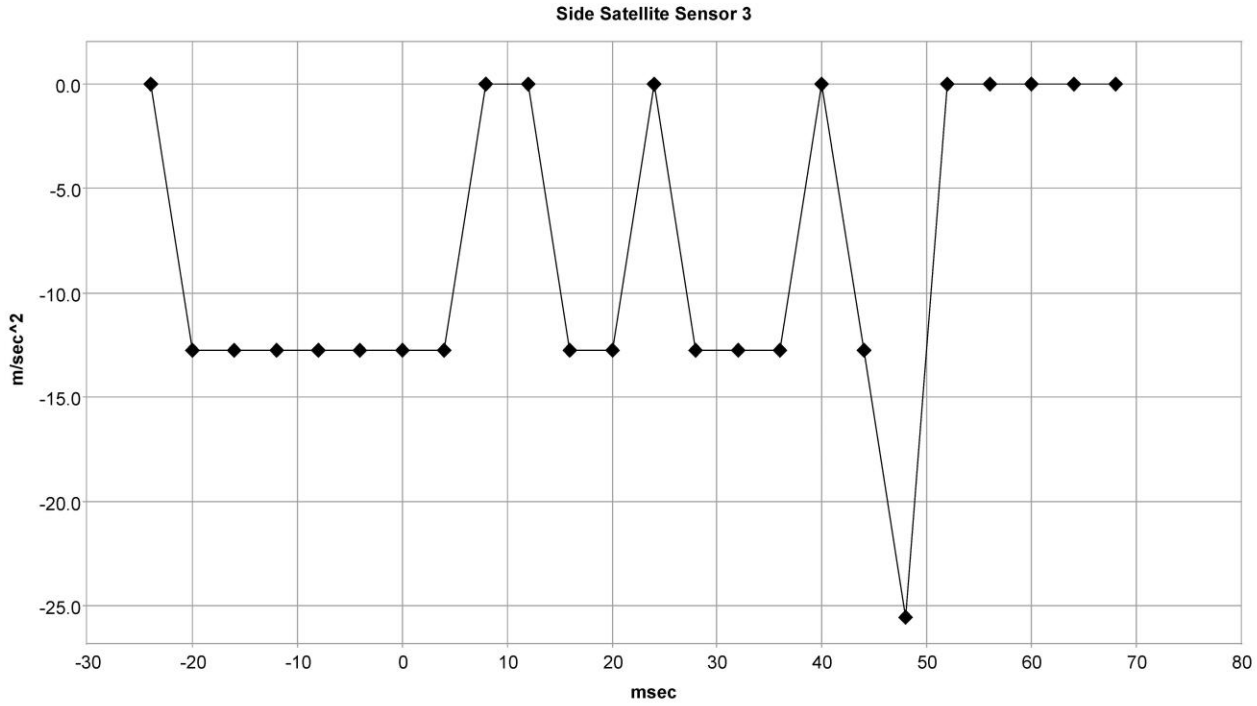
Deployment Time Marker Key

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



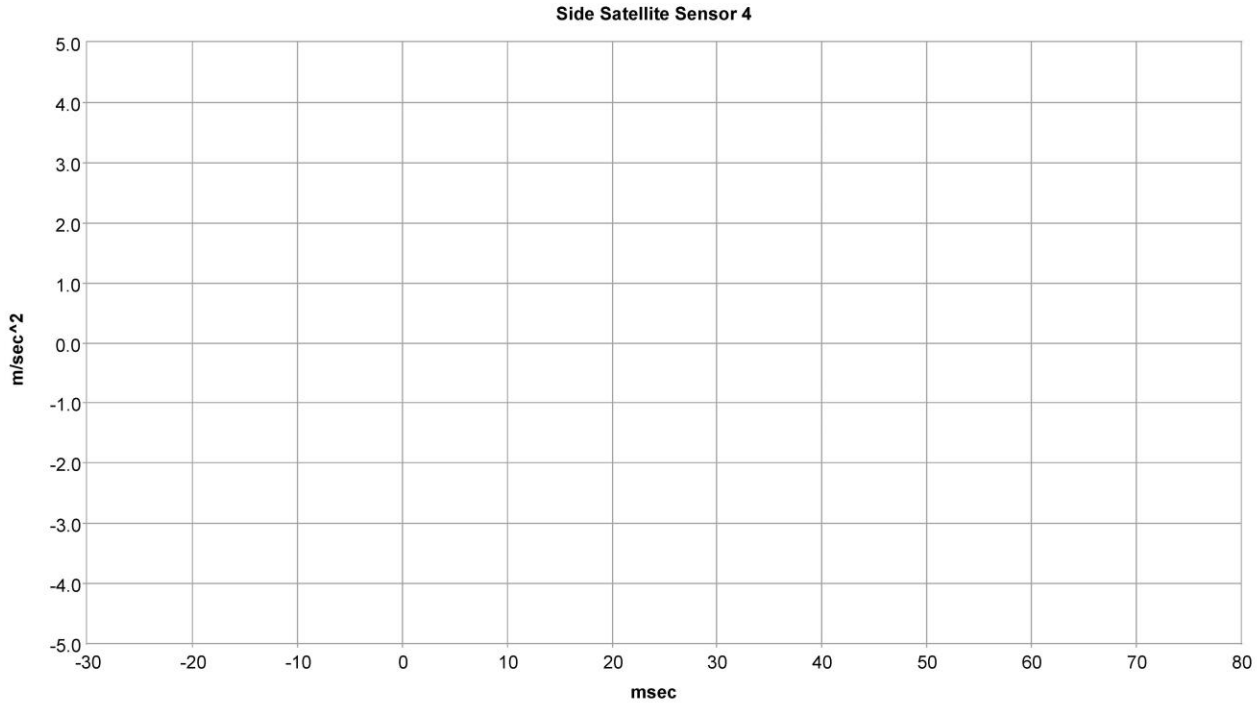
Deployment Time Marker Key

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



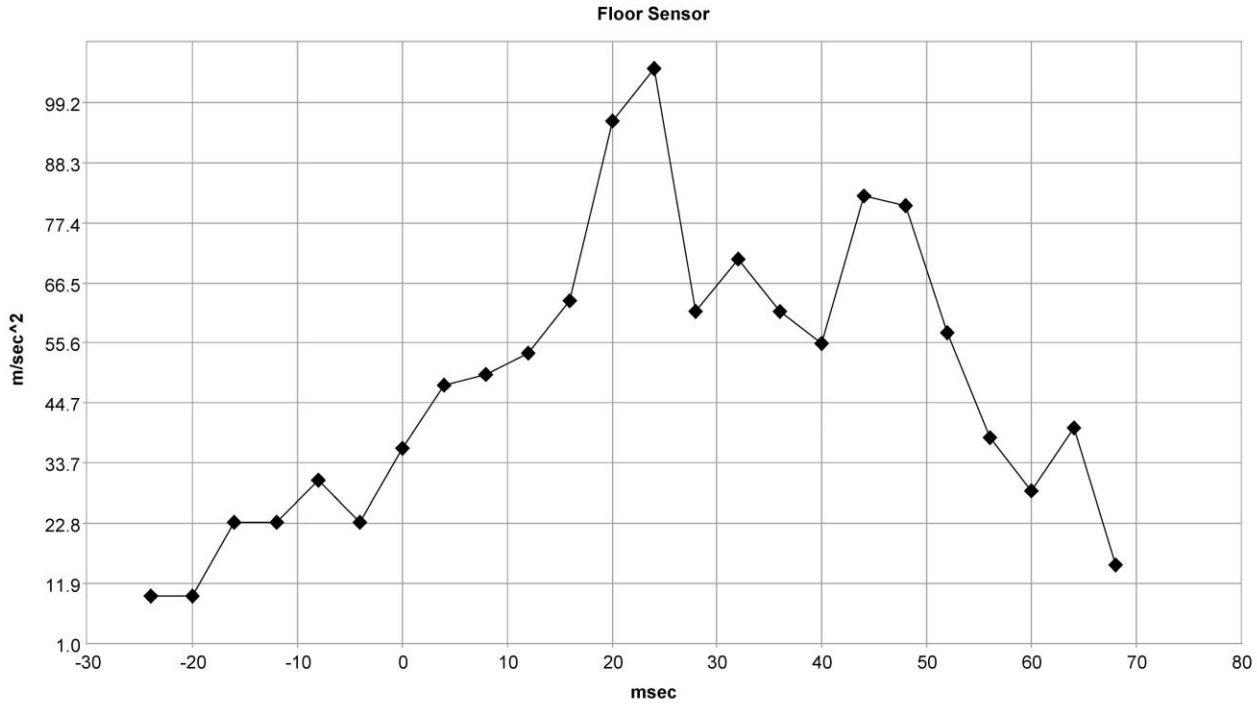
Deployment Time Marker Key

1	Side Curtain Airbag



Deployment Time Marker Key

1	Side Curtain Airbag



Deployment Time Marker Key

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

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

Time (msec)	Lateral Acceleration, Side Satellite Sensor 1 (m/sec^2)	Lateral Acceleration, Side Satellite Sensor 2 (m/sec^2)	Lateral Acceleration, Side Satellite Sensor 3 (m/sec^2)	Lateral Acceleration, Side Satellite Sensor 4 (m/sec^2)	Lateral Acceleration for Side Crash, Floor Sensor (m/sec^2)
-24	0.0	-31.9	0.0	SNA	9.6
-20	0.0	0.0	-12.8	SNA	9.6
-16	0.0	0.0	-12.8	SNA	23.0
-12	0.0	0.0	-12.8	SNA	23.0
-8	0.0	0.0	-12.8	SNA	30.6
-4	19.2	0.0	-12.8	SNA	23.0
0	0.0	31.9	-12.8	SNA	36.4
4	-19.2	31.9	-12.8	SNA	47.9
8	0.0	-31.9	0.0	SNA	49.8
12	0.0	0.0	0.0	SNA	53.6
16	0.0	31.9	-12.8	SNA	63.2
20	19.2	31.9	-12.8	SNA	95.8
24	57.6	31.9	0.0	SNA	105.3
28	38.4	63.8	-12.8	SNA	61.3
32	38.4	63.8	-12.8	SNA	70.9
36	19.2	31.9	-12.8	SNA	61.3
40	19.2	31.9	0.0	SNA	55.5
44	19.2	31.9	-12.8	SNA	82.4
48	19.2	0.0	-25.5	SNA	80.4
52	19.2	31.9	0.0	SNA	57.5
56	19.2	0.0	0.0	SNA	38.3
60	19.2	31.9	0.0	SNA	28.7
64	0.0	0.0	0.0	SNA	40.2
68	0.0	0.0	0.0	SNA	15.3

DTCs Present at Time of Event (1st 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 (1st Prior Event, TRG 2)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	200
TRG Count when Pre-crash TRG was Established (times)	2
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	SNA
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	425

Pre-Crash Data, -5 to 0 seconds (1st Prior Event, TRG 2)

Time (sec)	-4.7	-4.2	-3.7	-3.2	-2.7	-2.2	-1.7	-1.2	-0.7	-0.2	0 (TRG)
Vehicle Speed (MPH [km/h])	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	2.5 [4]	5.6 [9]	8.7 [14]	5.6 [9]	3.1 [5]
Accelerator Pedal, % Full (%)	0.0	0.0	0.0	0.0	0.0	10.5	34.5	45.5	0.0	0.0	0.0
Percentage of Engine Throttle (%)	0.0	0.0	0.0	0.0	0.0	3.5	16.0	25.0	1.0	0.0	0.0
Engine RPM (RPM)	800	800	800	700	800	1,000	1,800	2,100	2,100	1,200	1,000
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
Brake Oil Pressure (Mpa)	0.53	0.62	0.62	0.67	0.00	0.00	0.00	0.00	0.00	4.70	5.28
Longitudinal Acceleration , VSC Sensor (m/sec^2)	-0.359	-0.431	-0.072	-0.215	0.215	0.718	2.512	2.656	2.225	-6.747	Invalid
Yaw Rate (deg/sec)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-6.34
Steering Input (degrees)	0.0	0.0	0.0	0.0	7.5	9.0	9.0	3.0	-1.5	-1.5	0.0
Shift Position	D	D	D	D	D	D	D	D	D	D	D
Sequential Shift Range	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, ECO	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, Sport	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, Snow	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

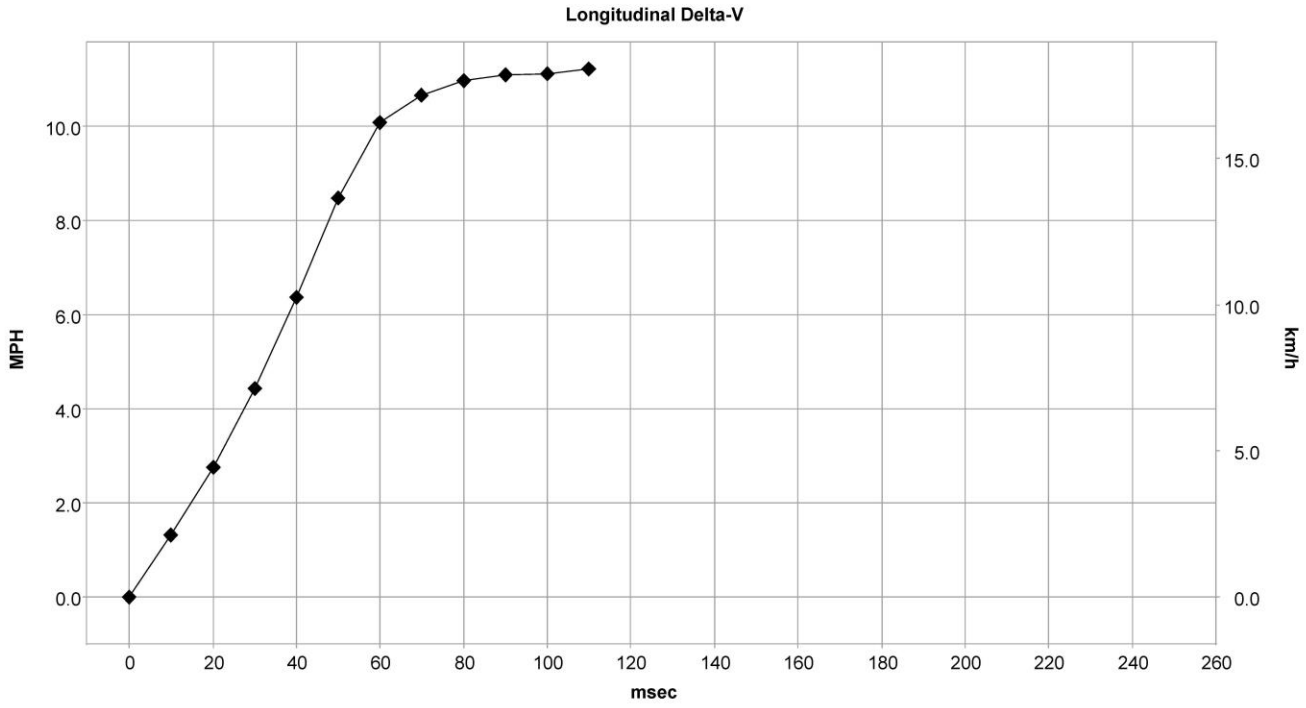
Drive Mode, EV	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Fuel Injection Quantity (mm3/st)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

System Status at Event (2nd Prior Event, TRG 1)

Recording Status, Front/Rear Crash Info.	Complete
Crash Type	Front/Rear Crash
TRG Count (times)	1
Previous Crash Type	No Event
Time from Pre-Crash TRG (msec)	0
Linked Pre-Crash Page	0
Frontal Airbag Deployment, Time to 1st Stage Deployment, Driver (msec)	No
Frontal Airbag Deployment, Time to 1st Stage Deployment, Front Passenger (msec)	No
Pretensioner Deployment, Time to Fire, Driver (msec)	No
Pretensioner Deployment, Time to Fire, Front Passenger (msec)	No
Frontal Airbag Deployment, Time to 2nd Stage, Driver (msec)	N/A
Frontal Airbag Deployment, Time to 2nd Stage, Front Passenger (msec)	N/A
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)	No
Side Curtain Airbag Deployment, Time to Deploy, Passenger (msec)	No
Side Airbag Deployment, Time to Deploy, Driver (msec)	No
Side Airbag Deployment, Time to Deploy, Passenger (msec)	No
Rear Window Airbag Deployment, Time to Deploy (msec)	SNA

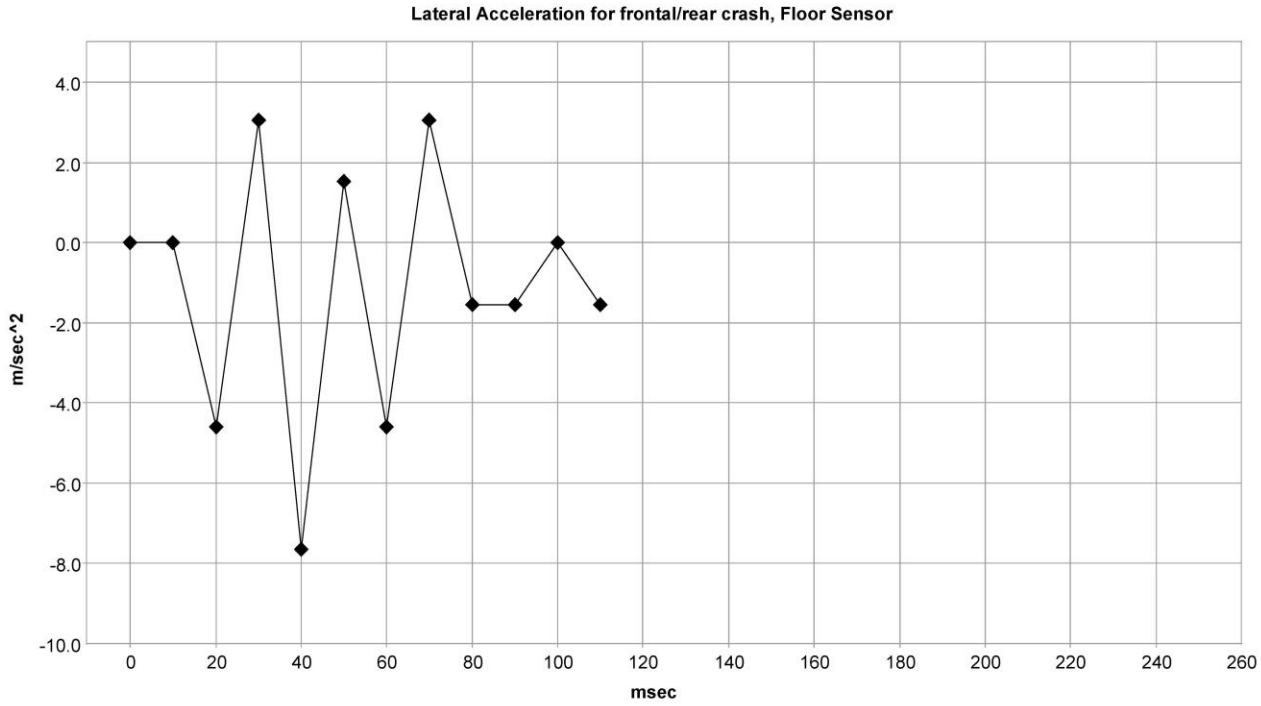
Longitudinal/Lateral Crash Pulse (2nd Prior Event, TRG 1 - table 1 of 2)

Recording Status, Time Series Data	Complete
Time from Time Zero to TRG (msec)	37.0
Length of Delta-V (msec)	110
Max. Longitudinal Delta-V (MPH [km/h])	11.3 [18.2]
Time, Maximum Delta-V, Longitudinal (msec)	118.0
Power Supply Status at Max. Delta-V	ON
Clipping Time of Longitudinal Delta-V (msec)	No
Clipping Time of Lateral Acceleration, Floor Sensor (msec)	No



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 CSA
8	Passenger CSA
9	Rear Window Airbag Deployment Time
10	Driver SAB
11	Passenger SAB



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 CSA
8	Passenger CSA
9	Rear Window Airbag Deployment Time
10	Driver SAB
11	Passenger SAB

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

Time (msec)	Longitudinal Delta-V (MPH [km/h])	Lateral Acceleration for Frontal/Rear Crash, Floor Sensor (m/sec^2)	Power Supply Status
0	0.0 [0.0]	0.0	ON
10	1.3 [2.1]	0.0	ON
20	2.8 [4.4]	-4.6	ON
30	4.4 [7.1]	3.1	ON
40	6.4 [10.3]	-7.7	ON
50	8.5 [13.7]	1.5	ON
60	10.1 [16.2]	-4.6	ON
70	10.7 [17.2]	3.1	ON
80	11.0 [17.7]	-1.5	ON
90	11.1 [17.9]	-1.5	ON
100	11.1 [17.9]	0.0	ON
110	11.2 [18.1]	-1.5	ON
120	0.0 [0.0]	0.0	ON
130	0.0 [0.0]	0.0	ON
140	0.0 [0.0]	0.0	ON
150	0.0 [0.0]	0.0	ON
160	0.0 [0.0]	0.0	ON
170	0.0 [0.0]	0.0	ON
180	0.0 [0.0]	0.0	ON
190	0.0 [0.0]	0.0	ON
200	0.0 [0.0]	0.0	ON
210	0.0 [0.0]	0.0	ON
220	0.0 [0.0]	0.0	ON
230	0.0 [0.0]	0.0	ON
240	0.0 [0.0]	0.0	ON
250	0.0 [0.0]	0.0	ON

DTCs Present at Time of Event (2nd Prior Event, TRG 1)

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 1)

Recording Status, Pre-Crash/Occupant	Complete
Time from Pre-Crash to TRG (msec)	500
TRG Count when Pre-crash TRG was Established (times)	1
Safety Belt Status, Driver	ON
Safety Belt Status, Front Passenger	OFF
Occupant Size Classification, Front Passenger	Child or Not Occupied
Frontal Airbag Suppression Switch Status, Front Passenger	SNA
RSCA Disable Switch	SNA
Seat Track Position Switch, Foremost, Status, Driver	SNA
Airbag Warning Lamp, On/Off	OFF
Ignition Cycle ,Crash (times)	81

Pre-Crash Data, -5 to 0 seconds (2nd Prior Event, TRG 1)

Time (sec)	-5	-4.5	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0 (TRG)
Vehicle Speed (MPH [km/h])	19.3 [31]	18.6 [30]	18.6 [30]	19.3 [31]	19.3 [31]	19.3 [31]	13 [21]	3.7 [6]	0 [0]	0 [0]	0 [0]
Accelerator Pedal, % Full (%)	9.5	12.0	12.5	14.0	14.0	0.0	0.0	0.0	0.0	20.0	66.0
Percentage of Engine Throttle (%)	1.0	3.0	4.0	5.0	5.5	0.0	0.5	0.0	0.5	0.0	11.5
Engine RPM (RPM)	1,200	1,200	1,100	1,100	1,200	1,300	1,100	900	1,000	1,000	1,100
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
Brake Oil Pressure (Mpa)	0.00	0.00	0.00	0.00	0.00	0.00	3.89	4.08	0.00	0.00	0.00
Longitudinal Acceleration , VSC Sensor (m/sec^2)	-0.646	0.000	0.000	0.000	0.000	-1.723	-8.973	-8.973	1.723	-0.215	Invalid
Yaw Rate (deg/sec)	0.49	0.49	0.00	0.00	0.00	-0.98	-0.49	0.00	0.49	0.00	1.95
Steering Input (degrees)	4.5	1.5	-3.0	-3.0	-3.0	-7.5	-6.0	-6.0	-6.0	-6.0	-6.0
Shift Position	D	D	D	D	D	D	D	D	D	D	D
Sequential Shift Range	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, ECO	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, Sport	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, Snow	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Drive Mode, EV	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Fuel Injection Quantity (mm3/st)	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.

PIDs	PID	Data
	00	BC 64 00 01
	01	00
	03	30 32 4B 39 30 30 30 30 34 30 30 30 30 34 30 30 30 30 33 38 30 30 30 33 38 30 30 30 35 30 30 30 30 35 30 30 30 30 35 31 30 30 30 35 31
	04	03 01 01
	05	01
	06	00
	0A	03
	0B	00
	20	80 00 00 01
	21	04 A0
	40	C0 00 E0 01
	41	54 57
	42	45 53 16 18 02
	51	FF
	52	99
	53	00
	60	FF FF F0 01
	61	04 05 C8 00 B2 60 28 00 02 7E 02 7E 01 80 01 80 03 C0 03 C0 00 00 00 00 1F 40 29 B1 85 5F C8 00 19 00 19 00
	62	00 00 7F FD 01 AA 00 00 00 00
	63	55 24 00 51 F1 10 FF 00 11 11 11 11 11 10 1F 1E 1E 1F 1F 1F 15 06 00 00 00 13 18 19 1C 1C 00 00 00 00 28 84 00 05 00 0C 0C 0B 0B 0C 0D 0B 09 0A 0A 0B 00 00 00 00 00 00 00 01
	64	55 0C 01 A9 F3 11 FF 00 11 11 11 11 11 10 00 00 00 00 00 00 04 09 0E 09 05 00 00 00 00 00 00 15 45 5B 00 00 00 55 00 14 08 08 08 07 08 0A 12 15 15 0C 0A 00 00 00 00 00 00 00 02
	65	55 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	66	55 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	67	55 E0 00 00 01 FE FE FE FE FE 55 FD FD FF FE FF FE FF FE FF FE 03 FE
	68	55 14 3C 00 03 FE FE FE FE FE 55 FD FD FF FE FF FE FF FE FF FE 03 FE
	69	00 4A 0C 00 00 3F C3 3F 7F 3F 31 3E D6 3E 74 3E 29 3E 0E 3D FF 3D FA 3D F9 3D F4 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 3D EF 00 EC
	6A	00 A8 CE 00 00 00 06 00 12 00 23 00 3C 00 4A 00 6A 00 8B 00 B8 00 D9 C0 E4 C0 EA C0 EF C0 F6 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 C0 F8 0D 14
	6B	55 E4 00 00 02 FE FE FE FE 55 00 00 00 00 00 00 01 00 FF 00 00 00 01 03 02 02 01 01 01 01 01 01 01 00 00 00 FF FF FF FF FF FF FF 00 00 FF FF 00 FF FF FF 00 FF FE 00 00 00 00 00
	6C	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	6D	FF 00 00 00 00 00 01 01 FF 00 01 01 01 02 02 01 01 01 00 01 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 FE 01 FE 01 FE 01 FE
	6E	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	6F	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	70	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

71	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
72	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
73	00 00 00 00 00 00 51 55 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	01 01 00 00 00 FE FF 00 01 00 04 F7 00 00 00 00 E8 83 83 18 FD 7E
	02 06 08 0A 0B 00 01 00 01 00 17 00 00 00
74	0B 0D 0D 0E 00 00 00 00 00 62 6E 00 00 00 00 00 00 00 00 00 00 00
	00 00 00 00 00 00 00 00 00 00 F3 FB FA FF FD 03 0A 23 25 1F A2 7E
	00 00 00 00 00 07 20 32 02 00 00 00 00 00
80	00 00 00 01
A0	0C 00 DF 81
A5	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE
	FE FE FE FE FE FE FE FE FE FE FE
A6	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE FE
	FE FE FE FE FE FE FE FE FE FE FE
B4	FB FB F4 F4 F0 F4 ED E7 E6 E4 DF CE C9 E0 DB E0 E3 D5 D6 E2 EC F1
	EB F8 00 2E
B5	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
	00 00 00 00
B6	00 00 03 FE 05 FF 03 FE 01 01 00 01 00 00 00 00 00 00 00 00 00 00
	00 00 00 00 03 FE
B7	00 FE E8 E5 D6 CE D5 D0 E5 EB EE F5 0E 11 00 00 00 00 00 00 00 00
	00 00 00 00 00 5E
B8	00 03 00 01 03 FE 03 FE 03 FE 03 FB 03 FC 03 FC 03 FC 03 FC 03 FC
B9	00 00 00 00 00 00 00 00 00 05 00 06 00 06 00 02 03 FF 03 FF 00 00

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**National Highway
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