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# Special Crash Investigations On-Site Child Restraint System Investigation Vehicle: 2007 Toyota Camry Location: California Crash Date: September 2016

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male while traveling in a 2007 Toyota Camry involved in a rear-end crash with a 2008 Toyota Sequoia. The crash occurred at approximately 1830 hours on the shoulder of a four-lane divided interstate highway in northern California. The Camry was traveling northbound and was occupied by a 30-year-old female driver, an 11-year-old male in the front row right position, a 9-month-old female seated in a CRS in the second row right position, and a 3-year-old male seated in a CRS in the second row left position. The Camry ran out of gas and stopped on the shoulder while waiting for gas. The Sequoia was being driven by a 38-year-old female and was traveling northbound at an EDR-reported speed of 82 km/h (51 mph). The Sequoia entered the shoulder and the front plane of the Sequoia struck the rear plane of the Camry. The Camry was displaced forward and to the right and struck a sound wall with its right side before coming to rest. The driver of the Camry sustained serious back injuries. She was transported from the scene and hospital for transment. The 3			The ver, ow of ed ced e - - -
year-old was fatally injured. The drive local hospital. She was later arrested f	er of the Sequoia sustained unknown in or driving while under the influence.	juries and was transported to	a
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Special Crash Investigations On-Site Child Restraint System Investigation Case Number DS16021 Vehicle: 2007 Toyota Camry Location: California Crash Date: September 2016

### BACKGROUND

This report documents the on-site investigation of the child restraint system (CRS) used by a 3-yearold male while traveling in a 2007 Toyota Camry involved in a rear-end crash with a 2008 Toyota Sequoia (**Figure 1**). This crash was identified by a Dynamic Science, Inc., investigator from an online news article. The article was forwarded to the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration in September 2016 and permission was given to pursue the investigation.



Figure 1. 2007 Toyota Camry

SCI obtained permission to inspect the Camry, Sequoia, and the CRSs. The case was assigned in October 2016. The vehicle and CRS inspections were completed in October 2016. Both vehicles were supported by the Bosch Crash Data Retrieval (CDR) system and the vehicles' event data recorders (EDRs) were imaged by the police. PDF copies of the EDR reports were obtained by SCI.

The crash occurred at approximately 1830 hours on the shoulder of a four-lane divided interstate highway in northern California. The Camry was traveling northbound and was occupied by a 30-year-old female driver, an 11-year-old male in the front row right position, a 9-month- old female seated in a CRS in the second row right position, and a 3-year-old male seated in a CRS in the second row right position, and a 3-year-old male seated in a CRS in the second row left position. The Camry ran out of gas and stopped on the shoulder while waiting for gas. The Sequoia was being driven by a 38-year-old female and was traveling northbound at an EDR-reported speed of 82 km/h (51 mph). The Sequoia entered the shoulder and the front plane of the Sequoia struck the rear plane of the Camry. The Camry was displaced forward and to the right and struck a sound wall with its right side before coming to rest.

The driver of the Camry sustained serious back injuries. She was transported from the scene and hospitalized. The 11-year-old and 9-month-old sustained minor injuries and were transported to a local hospital for treatment. The 3-year-old was fatally injured. The driver of the Sequoia sustained unknown injuries and was transported to a local hospital. She was later arrested for driving while under the influence.

### SUMMARY

#### Crash Site

The crash occurred on the shoulder of a four- lane divided interstate highway in northern California (**Figure 2**). The roadway was straight, level, and oriented north/south. The northbound roadway was comprised of three concrete through lanes and an asphalt high occupancy vehicle (HOV) lane. The roadway was bordered on the left by an asphalt shoulder and concrete median barrier. It was bordered on the right by an asphalt shoulder and a concrete barrier with a sound wall. The



Figure 2. Northbound approach

posted speed limit was 105 km/h (65 mph). The weather at the nearest reporting station was 24 °C (76 °F), 32 percent humidity, 16 km (10 miles) visibility, clear, and the winds were out of the west northwest at 18.5 km/h (11.5 mph). A crash diagram is attached at the end of this technical report.

#### Pre-Crash

While traveling northbound, the Camry ran out of gas and the driver moved the vehicle to the right shoulder and brought it to a stop. The vehicle gear shift lever was placed in Park. The driver and the three children remained belted in their original seat positions. The vehicle was stopped on the roadside for approximately two minutes. The Sequoia was traveling northbound in the right travel lane at an EDR-reported speed of 82 km/h (51 mph) at -5.0 seconds prior to algorithm enable (AE). From -5.0 to 0 seconds prior to AE, the vehicle slowed to 76 km/h (47 mph). The driver of the Sequoia allowed her vehicle to move to the right onto the shoulder. The driver did not apply the brakes in an attempt to avoid the crash as indicated by the pre-crash data, which reported the service brake as "Off" during the 5.0 seconds of pre-crash recording. The Sequoia's EDR-reported pre-crash data is presented in the following table.

Time (sec)	Speed km/h (mph)	Brake Switch	Accelerator Rate (V)	Engine RPM
-5	82 (51)	Off	0.78	1,200
-4	80 (49)	Off	0.78	1,200
-3	80 (49)	Off	0.78	1,200
-2	78 (48)	Off	0.78	1,200
-1	78 (48)	Off	0.78	1,200
0	76 (47)	Off	0.78	1,200

#### Sequoia's Pre-Crash Data

#### Crash

After traveling onto the shoulder, the front plane of the Sequoia struck the rear plane of the Camry (Event 1). At impact, the EDR-reported speed was 76 km/h (47.2 mph) and the brake switch status was "Off." The standard algorithm of the WinSMASH program calculated a total delta-V of 40 km/h (25 mph) for the Camry. The longitudinal and lateral components were 40 km/h (25 mph) and 0 km/h (0 mph), respectively. The results were considered borderline due to the overriding damage pattern. The EDR reported a longitudinal crash pulse of 48.5 km/h (30.2 mph). The WinSMASH program calculated a total delta-V of 24 km/h (15 mph) for the Sequoia. The longitudinal and lateral components were -24 km/h (-15 mph) and km/h (0mph), respectively. The driver's frontal and both IC air bags deployed at this time. The EDR reported a longitudinal crash pulse of -26.9 km/h (-16.7 mph).

The Camry was displaced forward and struck the concrete barrier with its front right plane (Event 2). The EDR reported a maximum lateral delta-V of - 9.7 km/h (-6.0 mph) at the C-pillar sensor and deployed the left inflatable curtain (IC) air bag.

#### Post-Crash

Both vehicles came to rest on the shoulder (Figure 3) with the Camry still in contact with the barrier. The driver of the Camry sustained "A" (serious) back injuries and required extrication. She was transported from the scene and hospitalized. The 11-year-old sustained "C" (complaint of pain) injuries. He was transported to a children's trauma center where he was treated and released. The 3year-old required extrication. He was transported by helicopter to a local trauma center and passed away while in surgery. The 9-month-old sustained minor injuries of an unknown nature. The driver of the Sequoia sustained unknown injuries and was transported to a local hospital. She was later arrested for driving while under the influence. Both vehicles were towed from the scene due to damage and placed on a police hold.



**Figure 3.** Final rest, looking south (news photo)

#### **2007 TOYOTA CAMRY**

#### Description

The 2007 Toyota Camry was a 4-door, 5-passenger sedan. The vehicle was identified by the Vehicle Identification Number (VIN): 4T1BE46K27Uxxxxx and manufactured in February 2006. The vehicle was configured with a 2.4-liter, 4-cylinder, gasoline engine, an automatic transmission, front-wheel drive, and standard ABS. The vehicle manufacturer's recommended tire size was P215/60R16 with a cold pressure 210 kPa (30 psi) and it was equipped with Yokohama YK580 tires of the recommended size. The specific tire information was as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	207 kPa (30 psi)	2 mm (3/32 in)	Yes	None
LR	Tire Flat	7 mm (9/32 in)	No	Debeaded
RR	220 kPa (32 psi)	6 mm (8/32 in)	No	None
RF	199 Ka (29 psi)	1 mm (1/32 in)	Yes	None

The Camry was configured with seating for five occupants. The front row was equipped with bucket seats adjustable head restraints. Both seats were adjusted to the mid track position. The driver's seat back was deformed rearward. The second row was equipped with a split bench seat with folding backs with adjustable head restraints. The second row was deformed longitudinally due to intrusion.

#### **Exterior Damage**

The Camry sustained major rear plane damage with significant underride from the impact with the Sequoia in Event 1 (**Figure 4**). The direct damage began at the left bumper corner and extended 36.0 cm (14.1 in) to the right. The Field L extended from bumper corner to bumper corner. The bumper was rotated downward. Thirteen measurements were taken at bumper backing bar level by the Nikon Total Station and the Faro Blitz program computed crush measurements in six increments as follows:  $C_1=52.0$  cm (20.4 in),  $C_2=52.0$  cm (20.4 in),  $C_3=43.0$  cm (16.9 in),  $C_4$ = 30.0 cm (11.8 in),  $C_5=13.0$  cm (5.1 in),  $C_6=0$ cm. Crush was adjusted to compensate for the bumper rotation.



**Figure 4.** Rear plane damage, 2007 Toyota Camry

Additional measurements were taken at the trunk level. The program computed crush measurements in six increments as follows:  $C_1=131 \text{ cm} (51.5 \text{ in})$ ,  $C_2=89 \text{ cm} (35 \text{ in})$ ,  $C_3=92 \text{ cm} (36.2 \text{ in})$ ,  $C_4=87 \text{ cm} (34.2 \text{ in})$ ,  $C_5=72 \text{ cm} (28.3 \text{ in})$ ,  $C_6=56 \text{ cm} (22.0 \text{ in})$ .

The crush profile was averaged as follows:  $C_1 = 92 \text{ cm} (36.2 \text{ in})$ ,  $C_2 = 71 \text{ cm} (27.9 \text{ in})$ ,  $C_3 = 68 \text{ cm} (26.7 \text{ in})$ ,  $C_4 = 59 \text{ cm} (23.3 \text{ in})$ ,  $C_5 = 43 \text{ cm} (16.9 \text{ in})$ ,  $C_6 = 28 \text{ cm} (11.0 \text{ in})$ . The Collision Deformation Classification (CDC) was 06BYEW6.

The Camry sustained minor front plane damage from the impact with the sound wall barrier in Event 2 (**Figure 5**). The direct damage was located at the right front bumper corner and was 4 cm (1.6 in) wide. It extended 75 cm (29.5 in) longitudinally along the right side of the vehicle. The CDC was 12FRES3.

#### Event Data Recorder

The Camry was equipped with an air bag electronic control unit that had EDR capability and was configured to store deployment and non-



**Figure 5.** Front plane damage, 2007 Toyota Camry

deployment events. Both types of events can contain pre-crash and crash data. For the pre-crash data there is a 4.1-second buffer that records vehicle speed, brake switch status, accelerator rate, and engine rpm.

The data from the Camry's EDR was imaged using the Bosch Crash Data Retrieval Tool version 17.0 through the DLC by the investigating police agency and is being reported using the same version. SCI was provided with pdf copy of the EDR report. Three events were recovered, two of which were related to this crash. The Bosch CDR report is included at the end of this report.

The "Most Recent Event" resulted from the impact with the sound wall and occurred 52 milliseconds (ms) after the impact with the Sequoia. The crash type was described as a side crash. The maximum lateral delta-V at the C-pillar sensor was -9.7 km/h (-6.0 mph). The driver's IC air bag deployed during this event. There were no vehicle speeds reported and the vehicle was in Park. The EDR reported both front seats as being "Buckled."

The "1st Prior Event" resulted from the rear-end impact with the Sequoia. The crash type was described as a front/rear crash. The longitudinal delta-V was 48.5 km/h (30.2 mph). There were no air bag deployments. There were no vehicle speeds reported and the vehicle was in Park.

The 2nd Prior event was not related to this crash.

#### Interior Damage

The Camry sustained moderate interior damage due to intrusion and extrication. Both left side doors were jammed shut. The driver's door was removed by rescue personnel. The right doors remained closed and operational. The backlight and second row left glazing was disintegrated. The right front glazing may have been damaged during extrication. The second row sustained forward longitudinal intrusion of the seat back that



**Figure 6.** Second row intrusion, 2007 Toyota Camry

measured 84.0 cm (33.0 in) at the second row left position (**Figure 6**). The backlight header intruded 42.0 cm (16.5 in). The driver's seat back was deformed 12.0 cm (4.7 in) rearward into the second row left position.

#### Manual Restraint Systems

The front row was equipped with driver and front right passenger lap and shoulder seat belts. The driver's belt was equipped with continuous loop belt webbing, a sliding latch plate, an emergency locking retractor (ELR), and an adjustable anchorage. The front right passenger's seat belt was equipped the same as the driver's, but had a switchable ELR/automatic locking retractor (ALR). The front seat positions were equipped with retractor-mounted seat belt pretensioners that did not actuate. The second row was equipped with lap and shoulder belts for all three positions. The outboard seat belts were used in conjunction with CRSs. The Camry was configured with Lower Anchors and Tethers for CHildren (LATCH) in the second row. The outboard seat positions were equipped with lower anchors and upper tether anchors. LATCH was not used in this crash.

#### Supplemental Restraint Systems

The Camry's supplemental restraint systems included an air bag electronic control unit, driver and front passenger frontal air bags, front row seat-mounted side impact air bags, and front and second row side impact inflatable curtain (IC) air bags. The left IC air bag deployed during the crash. The air bag measured 135.0 cm (53.1 in) in length and 37.0 cm (14.5 in) in height. It was attached to the A-pillar by a 6.0 cm (2.3 in) tether and provided coverage for both the front and second row.

#### Child Restraint System (CRS)

#### Graco Argos 70 CRS

The Graco Argos 70 CRS was a 3-in-1 forwardfacing combination safety seat that was being used without back as a belt-positioning booster (BPB) in the second row left position (**Figure 7**). The model number was 1801003 and the date of manufacture was April 6, 2013. The Graco was designed to be used with the built-in harness, without the built-in harness, or without the back. The CRS was being used without the back. The occupant parameters for using the seat without the back are as follows.

- Weight: 18-54.4 kg (40-120 lbs)
- Height: 101-145 cm (40-57 in)
- Approximately 4-10 years in age



Figure 7. Graco Argos 70 CRS

- The shoulder belt MUST lie across child's shoulder and the lap portion of the belt is positioned low on the child's hips
- When sitting on the booster seat, the child's ears should be below the top of the vehicle seat cushion/ head support

The child in this seat position was underage (3 years old) and did not meet the weight requirements (17 kg/37.5 lbs). He did meet the height requirement (109 cm/43 in). It is not known if the child met the seat cushion height positioning requirement.

The CRS was being used in conjunction with the vehicle's lap and shoulder seat belt located in the left side of the second row. The seat sustained moderate damage during the crash. The left arm was displaced and the left seat base was fractured (**Figure 8**). Blood deposits were located on the right side of the seat, right arm rest, and in the cup holder.

#### Britax Roundabout CRS

The Britax Roundabout was a convertible CRS that was being used in the forward-facing orientation (**Figure 9**).

The model number was E900230 and the date of manufacture was November 9, 2000. The occupant parameters for using the seat are as follows:

- Weight: 9-18 kg (20-40 lbs)
- Height: 69-102 cm (27-40 in)

It is not known if the child met the demographic requirements.

The CRS was being used with the internal 5- point harness and in conjunction with the vehicle's lap and shoulder seat belt in the right side of the second row. The seat belt was routed through the forward facing belt path. It is not known if the belt was in ALR or ELR mode at the time of the crash. There was no damage to the seat.



Figure 8. Graco Argos 70 CRS



Figure 9. Britax Roundabout CRS

## 2007 TOYOTA CAMRY OCCUPANTS

#### **Driver Demographics**

30 years/female
Unknown
Unknown
Unknown
Bucket
Mid
Lap and shoulder belt used
Vehicle inspection, police, EDR report
Frontal air bag, seat-mounted side air bag, IC air bag.
IC air bag deployed.
Unknown
Removed from vehicle due to injuries
Ambulance
Hospitalized, unknown number of days

#### **Driver** Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Spinal fracture	650416.2	Driver seat back	Certain
2	Multiple rib fractures (6)	450203.3	Driver seat back	Certain
3	Head laceration	110600.1	Head restraint	Probable

Source: News/Police

#### **Driver Kinematics**

The 30-year-old female driver of the Camry was seated an unknown posture and was belted. At impact, she was displaced rearward into the driver's seat back while sustaining spinal and rib fractures. At impact with the sound wall, she was displaced slightly forward and to the right. She was removed from the vehicle due to her injuries and transported to a local trauma center for treatment.

#### Front Row Right Occupant Demographics

11 years/male
Unknown
44 kg (97 lbs)
None
Bucket
Mid
Lap and shoulder belt used
Vehicle inspection, EDR report, police
Frontal air bag, seat-mounted side air bag, IC air bag.
No deployments.

Egress from vehicle:	Exited with assistance
Transport from scene:	Ambulance
Type of medical treatment:	Transported and released

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Abrasion, right shoulder	710202.1	Seat back	Probable
2	Abrasion, right, lateral neck	310202.1	Seat belt webbing	Probable
3	Laceration, left lower leg	810600.1	Flying glass	Probable
4	Contusion, thoracic wall (unspecified area)	410402.1	Seat back	Possible

#### Front Row Right Occupant Injuries

Source: Emergency Department notes

#### Front Row Right Occupant Kinematics

The 11-year-old male was seated in an unknown posture and was belted at the time of the crash. At impact, he was displaced rearward into the seat back, causing the right shoulder abrasion. The seat back was not deformed. At impact with the sound wall, he was displaced slightly forward and to the right.

#### Second Row Left Occupant Demographics

<i>y</i> 1	01
Age/Sex:	3 years/male
Height:	109 cm (43 in)
Weight:	17 kg (37.5 lbs)
Eyewear:	None
Seat type:	Bench with folding back
Manual restraint usage:	Lap and shoulder belt used with CRS
Usage source:	Police, vehicle inspection
Air bags:	IC air bag, deployed
Egress from vehicle:	Entrapped, required extrication
Transport from scene:	Helicopter
Type of medical treatment:	Treated at trauma center, died during treatment

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Bilateral subdural subarachnoid and	140602.3	Second row seat back	Probable
2	cortical hemorrhages, both cortices	140688.3		
3 4	show contusions and lacerations with hemorrhages	140693.2		
5	with hemorrhages	140688.3		
6		140693.2		
7	Bilateral lung contusions with intrapulmonary hemorrhages	441410.3	Driver's seat back, combined with second row seat back	Probable
8	Fracture, left femur	853000.3	Driver seat back	Probable
9	Laceration, renar hilar vessels on right	521404.3	Seat belt webbing	Possible
10	Contusion, liver, right lobe, 7.6 cm (3.0 in)	541812.2	Seat belt webbing	Possible
11 12	Contusions, small and large bowel	540810.2 541410.2	Seat belt webbing	Possible
13	Stomach contusions	544410.2	Seat belt webbing	Possible
14	Contusion, adventitia of aorta, epicardium contusion	441002.1	Driver seat back	Probable
15	Chest contusion, left	410402.1	Driver seat back	Probable
16	Abrasion, left temple (2 x 2 x 1 in)	210202.1	Driver seat back	Probable
17	Abrasion, left cheek (1.5 in)	210202.1	Driver seat back	Probable
18	Laceration, right cheek	210600.1	Driver seat back	Probable
19	Contusions, cheek to chin Contusion, behind left ear	210402.1	Driver seat back	Probable
20	Torso, multiple abrasions	410202.1	Unknown	Unknown
21	Torso, multiple contusions	410402.1	Unknown	Unknown
22	Upper frenulum laceration, lower lip laceration	210600.1	Driver seat back	Probable
23	Diffuse subgaleal hemorrhages	110402.1	Second row seat back	Possible

Second Row Left Occupant Injuries

Source: Coroner's Report

#### Second Row Left Occupant Kinematics

The 3-year-old male second row left occupant was seated on a BPB CRS and was belted with the vehicle lap and shoulder seat belt. At impact, he was displaced rearward into the seat back as the second row seat back was forced forward by vehicle intrusion. The driver's seat back was forced rearward by the driver and contacted this occupant also.

#### Second Row Right Occupant Demographics

9 months/female
Unknown
Unknown
Unknown
Bench with folding back
Lap and shoulder belt used with CRS
Police
IC air bag, did not deploy
Exited with assistance
Ambulance
Treated, unknown if admitted

#### Second Row Right Occupant Injuries

The second row right occupant sustained unknown minor injuries and was transported by ambulance to an area hospital.

#### Second Row Right Occupant Kinematics

The 9-month-old female second row right occupant was belted in a forward facing CRS. The CRS was belted to the vehicle. At impact, she was displaced rearward into the CRS seat back. There was no damage to the CRS. At impact with the sound wall, she was displaced slightly forward and to the right.

### 2008 TOYOTA SEQUOIA

#### Description

The 2008 Toyota Sequoia was an sport utility vehicle (SUV) identified by the VIN 5TDBY68A28Sxxxxx and was manufactured in November 2007. The vehicle was configured with a 5.7-liter, 8-cylinder engine, an automatic transmission, and all-wheel drive.

#### Exterior Damage

The Sequoia sustained moderate front plane damage from the impact with the Camry in Event 1 (**Figure 10**). The direct damage began at the right bumper corner and extended 85.0 cm (33.4 in) to the left. The Field L extended from bumper corner to bumper corner. Eighteen measurements were taken at bumper backing bar level by the Nikon Total Station and the Faro Blitz program computed



Figure 10. 2008 Toyota Sequoia

crush measurement in six increments as follows:  $C_1 = 0$  cm,  $C_2 = 0$  cm,  $C_3 = 0$  cm,  $C_4 = 0$  cm,  $C_5 = 0$  cm,  $C_6 = 1$  cm (0.4 in). The CDC was 12FZEW1.

#### **Event Data Recorder**

The Sequoia was equipped with an air bag electronic control unit that had EDR capability and was configured to store deployment and non-deployment events. Both types of events can contain pre-crash and crash data. For the pre-crash data there is a 6.0-second buffer that records vehicle speed, brake switch status, accelerator rate, engine rpm, and pre-crash data status.

The data from the Sequoia's EDR was imaged using the Bosch Crash Data Retrieval Tool version 17.0 through the DLC by the investigating police agency. Two events were recovered, one of which was related to this crash.

The Bosch CDR report is included at the end of this report.

The Most Recent Event resulted from the impact with Camry. The crash type was described as front/rear. The longitudinal crash pulse for this event was -26.9 km/h (-16.7 mph).

The 1st Prior Event was not related to this crash.

The data record reported the buckle switch status as "Buckled" for the driver and "Unbuckled" for the passenger seat. It indicated that the passenger position was unoccupied and the driver seat position was rearward.

The pre-crash data recorded at 0 (TRG) is as follows:

Vehicle Speed (mph[km/h]):	47.2 [76]
Brake Switch:	OFF
Accelerator Rate (V):	0.78
Engine rpm:	1,200
Pre-Crash Data Status:	Valid

#### **Occupants**

The belted 39-year-old female driver of the Sequoia sustained minor injuries of an unknown nature. She was transported by ambulance to a local trauma center. Her treatment status is not known. She was arrested for driving under the influence of drugs.

## **CRASH DIAGRAM**





## APPENDIX A: EVENT DATA RECORDER REPORT 2007 TOYOTA CAMRY<sup>1</sup>

<sup>&</sup>lt;sup>1</sup> The EDR report contained in this technical report was imaged by the investigating police department. Only a PDF copy of the EDR report was provided by the police and the hexadecimal data contained in the report has been deleted due to potential personal identifiable information contained in the EDR report (i.e. vehicle identification number, etc).





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	4T1BE46K27U*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	2007 TOYOTA CAMRY.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.0
Imaged with Software Licensed to (Company	Company Name information was removed when this file was saved without
Name)	VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 17.0
Reported with Software Licensed to (Company	California Highway Patrol
Name)	
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 the airbags did not deploy or the pretensioners did not operate during an event that meets a specified recording threshold, it is called a Non-Deployment Event. Data from a Non-Deployment Event can be overwritten by a succeeding event that meets the specified recording threshold. If the airbag(s) deploy or the pretensioners are operated, it is called a Deployment Event. Deployment Event data cannot be overwritten or deleted by the airbag ECU following that event.
- 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 TechStream, 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 airb ag 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 eight 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
- 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 post-crash data, and depending on the airbag ECU, may record pre-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
- 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).
- Time series data for side crash may have 24 or 25 sampling points.
- 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.

#### **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
Max. Longitudinal Delta-V	Forward
Longitudinal Delta-V	Forward
Max. Lateral Delta-V, B-Pillar Sensor	Outside to Inside
Max. Lateral Delta-V , C-Pillar Sensor	Outside to Inside
Max. Lateral Delta-V , Slide Door Sensor	Outside to Inside
Lateral Delta-V, B-Pillar Sensor	Outside to Inside
Lateral Delta-V, C-Pillar Sensor	Outside to Inside
Lateral Delta-V, Slide Door Sensor	Outside to Inside
Lateral Delta-V, Airbag ECU Sensor	Left to Right
Roll Angle Peak	Clockwise Rotation
Roll Angle	Clockwise Rotation
Lateral Acceleration, Airbag ECU Sensor *	Right to Left

\* For sensing a rollover

#### **Data Definitions:**

1)

- 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.
- "Time to Deployment Command" indicates the time between recording trigger establishment and the determination of airbag deployment. This value may differ from the actual time it takes for the airbag to fully deploy.
- Even if an airbag/pretensioner did not deploy due to the "front passenger airbag disable switch and/or "RSCA Disable Switch" in the ON position or other disabling criteria are met, the "Time to deployment command" data element for that airbag/pretensioner may stil I be recorded.
- "Engine RPM" indicates the number of engine revolutions, not the number of motor revolutions. The recorded value has an upper limit
  of 5,200 rpm. Resolution is 400 rpm and the value is rounded down and recorded. For example, if the actual engine speed is 799
  rpm, the recorded value will be 400 rpm.
- The upper limit for the recorded "Vehicle Speed" value is 122 km/h (75.8mph). Resolution is 2km/h (1.2mph) 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 Rate" value is recorded as a voltage. The voltage increases as the driver depresses the accelerator.
- The "Drive" setting for the "Shift Position" value indicates the shift position state is other than "R,"(Reverse), "N" (Neutral), or "P" (Park). If sequential shift had been used, "Invalid" may be displayed.
- Depending on the type of occupant sensor installed in the vehicle, one of the following three recording formats for "Occupancy Status, Passenger" will be utilized.
  - Occupied / Not Occupied
  - Adult / Child / Not Occupied
  - AM50 / AF05 / Child / Not Occupied
- Resolution of the "Air Bag Warning Lamp ON Time Since DTC was Set" is 15 minutes, and the value is rounded down and recorded.
- "Longitudinal Delta-V" indicates the change in forward speed after establishment of the recording trigger. 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 recording trigger.
- Depending on the specifications, "Roll Angle peak" can be recorded as absolute value.
- "Roll Angle peak" may not always match the peak value within the "Roll Angle" sampling points due to differences in data calculation method.





- For "Lateral Delta-V", the sensor location (B-pillar, front door, C-pillar, and slide door) 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 even t'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 re cording 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 100 [ms], and the value is rounded down and recorded.

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#### System Status at Time of Retrieval

ECU Part Number	89170-33490
ECU Generation	04EDR
Recording Status, All Pages	Complete
Freeze Signal	ON
Freeze Signal Factor	Side, Driver Curtain Shield Airbag Deployment
Diagnostic Trouble Codes Exist	No
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	Crash Type	Time (msec)	Pre-Crash & DTC Data Recording Status	Event & Crash Pulse Data
Most Recent Event	3	Side Crash		Complete (Page 1)	Complete (Side Page 1)
1st Prior Event	2	Front/Rear Crash	-52	Complete (Page 1)	Complete (Front/Rear Page 1)
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, Side Crash Info.	Complete
Crash Type	Side Crash
TRG Count (times)	3
Recorded Side	Driver's Side
Previous Crash Type	Frontal/Rear
Time from Pre-Crash TRG (msec)	52
Linked Pre-Crash Page	1
Time to Deployment Command, B-Pillar Sensor (msec)	Not Commanded
Time to Deployment Command, C-Pillar Sensor (msec)	9





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



msec











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

	Lateral Delta-V, Airbag	Lateral Delta-V, B-Pillar	Lateral Delta-V, C-Pillar
Time (mass)	ECU Sensor	Sensor	Sensor
Time (msec)			
-22	0.2 [0.3]	0.4 [0.6]	0.3 [0.4]
-18	0.4 [0.6]	0.8 [1.2]	0.3 [0.4]
-14	0.5 [0.8]	0.6 [1.0]	0.2 [0.3]
-10	0.6 [1.0]	0.3 [0.4]	-0.7 [-1.1]
-6	0.8 [1.3]	0.0 [0.0]	0.1 [0.1]
-2	1.0 [1.7]	0.3 [0.4]	-1.7 [-2.8]
2	1.3 [2.1]	0.4 [0.6]	-1.3 [-2.1]
6	1.5 [2.4]	-0.4 [-0.6]	-3.3 [-5.2]
10	1.7 [2.8]	-0.4 [-0.6]	-1.3 [-2.1]
14	2.0 [3.2]	-0.1 [-0.2]	0.0 [0.0]
18	2.4 [3.9]	0.6 [1.0]	-0.7 [-1.1]
22	2.8 [4.4]	1.3 [2.1]	-1.8 [-2.9]
26	2.9 [4.7]	0.6 [1.0]	-4.1 [-6.6]
30	3.0 [4.8]	-0.6 [-1.0]	-5.5 [-8.8]
34	3.0 [4.9]	-1.7 [-2.7]	-6.0 [-9.7]
38	3.2 [5.1]	-1.7 [-2.7]	-5.1 [-8.1]
42	3.2 [5.2]	-1.8 [-2.9]	-4.0 [-6.5]
46	3.4 [5.4]	-1.7 [-2.7]	-3.5 [-5.7]
50	3.6 [5.8]	-1.7 [-2.7]	-3.7 [-5.9]
54	3.7 [6.0]	-1.9 [-3.1]	-3.9 [-6.2]
58	3.8 [6.2]	-1.7 [-2.7]	-4.2 [-6.8]
62	4.0 [6.5]	-1.3 [-2.1]	-4.4 [-7.0]
66	4.3 [6.9]	-0.9 [-1.4]	-4.3 [-6.9]
70	4.5 [7.3]	-0.8 [-1.2]	-4.2 [-6.8]
74	4.8 [7.8]	-0.8 [-1.2]	-3.9 [-6.3]





#### 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)	100
Buckle Switch, Driver	Buckled
Buckle Switch, Passenger	Buckled
Occupancy Status, Passenger	AF05
Seat Position, Driver	Rearward
Shift Position	Р

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

Time (sec)	-4.1	-3.1	-2.1	-1.1	-0.1	0 (TRG)
Vehicle Speed (MPH [km/h])	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
Brake Switch	ON	ON	ON	ON	ON	ON
Accelerator Rate (V)	0.78	0.78	0.78	0.78	0.78	0.78
Engine RPM (RPM)	0	0	0	0	0	0





#### System Status at Event (1st Prior Event, TRG 2)

Recording Status, Front/Rear Crash Info.	Complete
Crash Type	Front/Rear Crash
TRG Count (times)	2
Previous Crash Type	No Event
Time from Pre-Crash TRG (msec)	0
Linked Pre-Crash Page	1
Time to Deployment Command, Front Airbag, Driver (msec)	Not Commanded
Time to Deployment Command, Front Airbag, Passenger (msec)	Not Commanded
Event Severity Status, Driver	N/A
Event Severity Status, Passenger	N/A
Time to Deployment Command, Pretensioner (msec)	Not Commanded











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

Time (msec)	Longitudinal Delta-V (MPH [km/h])
10	1.2 [1.9]
20	2.2 [3.6]
30	2.9 [4.7]
40	4.4 [7.0]
50	7.1 [11.4]
60	9.9 [16.0]
70	13.2 [21.2]
80	15.4 [24.8]
90	17.4 [28.0]
100	18.8 [30.2]
110	20.7 [33.4]
120	22.3 [35.9]
130	23.3 [37.5]
140	24.4 [39.3]
150	26.0 [41.8]
160	27.3 [43.9]
170	28.3 [45.5]
180	29.1 [46.8]
190	29.7 [47.9]
200	30.2 [48.5]





#### 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)	100
Buckle Switch, Driver	Buckled
Buckle Switch, Passenger	Buckled
Occupancy Status, Passenger	AF05
Seat Position, Driver	Rearward
Shift Position	Р

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

Time (sec)	-4.1	-3.1	-2.1	-1.1	-0.1	0 (TRG)
Vehicle Speed (MPH [km/h])	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
Brake Switch	ON	ON	ON	ON	ON	ON
Accelerator Rate (V)	0.78	0.78	0.78	0.78	0.78	0.78
Engine RPM (RPM)	0	0	0	0	0	0





#### 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
Time to Deployment Command, Front Airbag, Driver (msec)	Not Commanded
Time to Deployment Command, Front Airbag, Passenger (msec)	Not Commanded
Event Severity Status, Driver	N/A
Event Severity Status, Passenger	N/A
Time to Deployment Command, Pretensioner (msec)	Not Commanded











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

Time (msec)	Longitudinal Delta-V (MPH [km/h])
10	0.5 [0.8]
20	1.4 [2.2]
30	2.9 [4.7]
40	3.9 [6.3]
50	5.1 [8.3]
60	6.5 [10.5]
70	7.6 [12.3]
80	8.1 [13.1]
90	8.3 [13.4]
100	8.4 [13.5]
110	8.6 [13.8]
120	8.7 [14.1]
130	8.8 [14.2]
140	8.8 [14.2]
150	8.8 [14.2]
160	8.8 [14.2]
170	8.9 [14.3]
180	9.0 [14.5]
190	9.0 [14.5]
200	9.0 [14.5]





#### 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)	200
Buckle Switch, Driver	Unbuckled
Buckle Switch, Passenger	Buckled
Occupancy Status, Passenger	Child
Seat Position, Driver	Rearward
Shift Position	Drive

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

Time (sec)	-4.2	-3.2	-2.2	-1.2	-0.2	0 (TRG)
Vehicle Speed (MPH [km/h])	3.7 [6]	7.5 [12]	5 [8]	1.2 [2]	0 [0]	0 [0]
Brake Switch	OFF	ON	ON	ON	ON	ON
Accelerator Rate (V)	1.17	0.78	0.78	0.78	0.78	0.78
Engine RPM (RPM)	1,600	1,200	800	400	400	400





#### **Disclaimer of Liability**

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

#### APPENDIX B: EVENT DATA RECORDER REPORT 2008 TOYOTA SEQUOIA<sup>2</sup>

<sup>&</sup>lt;sup>2</sup>The EDR report contained in this technical report was imaged by the investigating police department. Only a PDF copy of the EDR report was provided by the police and the hexadecimal data contained in the report has been deleted due to potential personal identifiable information contained in the EDR report (i.e. vehicle identification number, etc).





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	5TDBY68A28S*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	2008 TOYOTA SEQUOIA.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.0
Imaged with Software Licensed to (Company	Company Name information was removed when this file was saved without
Name)	VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 17.0
Reported with Software Licensed to (Company	California Highway Patrol
Name)	California Flighway Fattor
EDR Device Type	Airbag Control Module
Event(s) recovered	Front/Rear (2)

#### 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 the airbags did not deploy or the pretensioners did not operate during an event that meets a specified recording threshold, it is called a Non-Deployment Event. Data from a Non-Deployment Event can be overwritten by a succeeding event that meets the specified recording threshold. If the airbag(s) deploy or the pretensioners are operated, it is called a Deployment Event. Deployment Event data cannot be overwritten or deleted by the airbag ECU following that event.
- 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 TechStream, 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 airb ag 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 eight 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
- 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.
- The airbag ECU records post-crash data and may record pre-crash data in the event of a frontal/rear crash. In addition, it may record post-crash data in the event of a side crash or rollover.
- The airbag ECU has the following recording pages (memory maps) for each accident type to store event data: three pages for frontal or rear crash, one page for a side crash (if airbag ECU is applicable), and one page for rollover events. (if airbag ECU is applicable)
- The data recorded by the airbag ECU in the event of a frontal/rear crash includes information that indicates the sequence and interval
  of each previously-occurring frontal/rear crash event.

- Time from Previous TRG

- TRG Count





- The point in time at which the recording trigger is established is regarded as time zero for the recorded data. For the time indicated in "Lateral Delta-V", "Roll Angle" or "Lateral Acceleration", the first sampling point after the recording trigger establishment is regarded as time zero. The time zero of the data and the recording trigger establishment do not always occur simultaneously.
- 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.
- The sampling interval of "Roll Angle" and "Lateral Acceleration" is 8 [ms] or 128 [ms]. A field indicating the sampling interval is not provided. The graph scaling can assist with derterming the sample rate. The time zero is indicated by count (0).
- The data sampling interval and data recording period may be 1.024 times depending on the ECU specifications.
- "Prior Event" is the event that occurred before the "1st Prior Event" that reached the greatest MAX Delta-V. Therefore, "Prior Event" is not always the prior event of "1st Prior Event".

#### **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
Max. Longitudinal Delta-V	Forward
Longitudinal Delta-V	Forward
Max. Lateral Delta-V, B-Pillar Sensor	Outside to Inside
Max. Lateral Delta-V, C-Pillar Sensor	Outside to Inside
Lateral Delta-V, B-Pillar Sensor	Outside to Inside
Lateral Delta-V, C-Pillar Sensor	Outside to Inside
Lateral Delta-V, Airbag ECU Sensor	Left to Right
Roll Angle Peak	Clockwise Rotation
Roll Angle	Clockwise Rotation
Lateral Acceleration, Airbag ECU Sensor *	Right to Left

\* For sensing a rollover

#### Data Definitions:

- 1)
- 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.
- "Recording Status, All Pages" does not consider the recording state of the side crash. Even if the side crash page writing process is
  interrupted, "Recording Status, All Pages" may display "Complete". If the writing of the frontal/rear crash page or rollover page is
  interrupted, "Recording Status, All Pages" may be displayed as "In complete".
- "Time to Deployment Command" indicates the time between recording trigger establishment and the determination of airbag
  deployment. This value may differ from the actual time it takes f or the airbag to fully deploy. In the case of multiple crash, this item
  records the information of the first airbag which had been determined to deploy from Frontal/Rear impact TRG. It is necessary to
  confirm this record with an actual vehicle state.
- Even if an airbag/pretensioner did not deploy due to the "front passenger airbag disable switch and/or "RSCA Disable Switch" in the ON position or other disabling criteria are met, the "Time to deployment command" data element for that airbag/pretensioner may still be recorded.
- "Engine RPM" indicates the number of engine revolutions, not the number of motor revolutions. The recorded value has an upper limit
  of 6,000 rpm. Resolution is 400 rpm and the value is rounded down and recorded. For example, if the actual engine speed is 799
  rpm, the recorded value will be 400 rpm.
- The upper limit for the recorded "Vehicle Speed" value is 126 km/h (78.3mph). Resolution is 2km/h (1.2mph) 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, t o the following.
  - Significant changes in the tire's rolling radius
  - Wheel lock and wheel slip
- The "Accelerator Rate" value is recorded as a voltage or level. In the case of voltage, the voltage increases as the driver depress es the accelerator. In case of the level, the following three levels are recorded.
- FULL / MIDDLE / OFF
- "Accelerator Rate" may be recorded as "OFF" even if the accelerator pedal is depressed lightly. In addition, "FULL" may be recorded when the accelerator pedal is depressed strongly but not fully.
- The "Drive" setting for the "Shift Position" value indicates the s hift position state is other than "R,"(Reverse), "N" (Neutral), or "P" (Park). It also includes communication disruption. Regardless of a n actual shift position, "Drive" is always set for M/T vehicles be cause the shift position signal is not available.
- Depending on the type of occupant sensor installed in the vehicle, one of the following three recording formats for "Occupancy Status, Passenger" will be utilized.
  - Occupied / Not Occupied
  - Adult / Child / Not Occupied
  - AM50 / AF05 / Child / Not Occupied





- Resolution of the "Air Bag Warning Lamp ON Time Since DTC was Set" is 15 [min] or 15.36[min] for ECUs with 1.024 data sampling intervals, and the value is rounded down and recorded.
- "Longitudinal Delta-V" indicates the change in forward speed after establishment of the recording trigger. 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 recording trigger.
- "Roll Angle peak" may not always match the peak value within the "Roll Angle" sampling points due to differences in data calculation method.
- For "Lateral Delta-V", the sensor location (B-pillar, front door, C-pillar, and slide door) shows the outline of a typical sensor position. Sensory location can be confirmed using the repair manual.
- "TRG Count" indicates the number of frontal/rear recording triggers that have been established. The calculated value does not include the number of times side or rollover recording triggers have been established. The sequence in which each frontal/rear event occurred can be verified from the "TRG Count". The lesser the "TRG Count" value, the older the data. The upper limit for the recorded value is 254 times. When more than one event reaches the upper limit, the a ctual "TRG Count" may be greater than what is displayed for that event.
- Resolution of the "Time from Pre-Crash to TRG" is 100[ms] or 102.4[ms] for ECUs with 1.024 data sam pling intervals, and the value is
  rounded down and recorded.
- For "Time from Previous TRG", the recording trigger of side crash and rollover is not considered. The upper limit for the recorded value is 5000 [ms] or 5120 [ms] for ECUs with 1.024 data sampling intervals. Resolution is 20 [ms] or 20.48 [ms] and the value is rounded down and recorded.
- If 2 or more frontal/rear events occur successively within a period of 5000ms (or 5120ms for ECUs with 1.024 data sampling intervals), the actual sample time before the trigger is not displayed for sub sequent events. The sample time before trigger will only be displayed for the first event of the successive events. For subsequent events (i.e second event or later events), the pre-crash "Time (sec)" data is replaced by integers -5 through -1 and the heading "Time (sec)" is replaced with "Sample Count". The time between "Sample Count" integers (-5 through -1) cannot be determined. The time between the last integer and TR G cannot be determined.
- "Pre-Crash Data Status" indicates data communication status of the vehi cle. If communication disruption or other failure is occur, "Invalid" is set. Moreover, "Invalid" is set for some M/T vehicles because the shift position signal is not transmitted for them even if the other data is valid.

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#### System Status at Time of Retrieval

ECU Part Number	89170-0C410
ECU Generation	02EDR
Recording Status, All Pages	Complete
Diagnostic Trouble Codes Exist	No
Total Number of Front/Rear Crash Events	2
Freeze Signal	ON

## Front/Rear Event Record Summary at Retrieval

Events Recorded	TRG Count	Crash Type	Time (msec)	Event & Crash Pulse Data Recording Status
Most Recent Frontal/Rear Event	2	Front/Rear Crash	0	Complete (Front/Rear Page 1)
1st Prior Frontal/Rear Event	1	Front/Rear Crash	-5000 or greater	Complete (Front/Rear Page 0)

## System Status at Front Airbag Deployment

Time to Deployment Command, Front Airbag, Driver (msec)	24
Time to Deployment Command, Front Airbag, Passenger (msec)	24
Event Severity Status, Driver	Level 3
Event Severity Status, Passenger	N/A





#### System Status at Event (Most Recent Frontal/Rear Event, TRG 2)

Recording Status, Front/Rear Crash Info.	Complete
TRG Count	2
Time From Previous TRG (msec)	5000 or greater
Time from Pre-Crash to TRG (msec)	1,000
Buckle Switch, Driver	Buckled
Buckle Switch, Passenger	Unbuckled
Occupancy Status, Passenger	Not Occupied
Seat Position, Driver	Rearward
Shift Position	Drive











#### Longitudinal Crash Pulse (Most Recent Frontal/Rear Event, TRG 2 - table 2 of 2)

Time (mess)	Longitudinal Delta-V
Time (msec)	
10	-0.5 [-0.8]
20	-1.2 [-1.9]
30	-1.9 [-3.0]
40	-2.4 [-3.9]
50	-4.3 [-6.9]
60	-6.0 [-9.7]
70	-7.9 [-12.7]
80	-9.5 [-15.2]
90	-10.3 [-16.6]
100	-11.4 [-18.3]
110	-12.9 [-20.8]
120	-13.9 [-22.4]
130	-15.0 [-24.1]
140	-16.0 [-25.7]
150	-16.7 [-26.9]

#### DTCs Present at Start of Event (Most Recent Frontal/Rear Event, TRG 2)

Ignition Cycle Since DTC was Set (times)	ſ <b>´</b>	2047
Airbag Warning Lamp ON Time Since DTC was Set (min)		75
Diagnostic Trouble Codes		None

#### Pre-Crash Data, -5 to 0 seconds (Most Recent Frontal/Rear Event, TRG 2)

Time (sec)	-5	-4	-3	-2	-1	0 (TRG)
Vehicle Speed (MPH [km/h])	51 [82]	49.7 [80]	49.7 [80]	48.5 [78]	48.5 [78]	47.2 [76]
Brake Switch	OFF	OFF	OFF	OFF	OFF	OFF
Accelerator Rate (V)	0.78	0.78	0.78	0.78	0.78	0.78
Engine RPM (RPM)	1,200	1,200	1,200	1,200	1,200	1,200
Pre-Crash Data Status *	Valid	Valid	Valid	Valid	Valid	Valid

\* "Invalid" may be set for M/T vehicle





## System Status at Event (1st Prior Frontal/Rear Event, TRG 1)

Recording Status, Front/Rear Crash Info.	Complete
TRG Count	1
Time From Previous TRG (msec)	5000 or greater
Time from Pre-Crash to TRG (msec)	500
Buckle Switch, Driver	Unbuckled
Buckle Switch, Passenger	Unbuckled
Occupancy Status, Passenger	Not Occupied
Seat Position, Driver	Rearward
Shift Position	R











## Longitudinal Crash Pulse (1st Prior Frontal/Rear Event, TRG 1 - table 2 of 2)

Time (msec)	Longitudinal Delta-V (MPH [km/h])
10	0.5 [0.8]
20	1.2 [1.9]
30	1.9 [3.0]
40	2.6 [4.2]
50	3.3 [5.3]
60	3.8 [6.1]
70	4.1 [6.6]
80	4.3 [6.9]
90	4.3 [6.9]
100	4.3 [6.9]
110	4.1 [6.6]
120	4.1 [6.6]
130	4.1 [6.6]
140	4.1 [6.6]
150	4.1 [6.6]

#### DTCs Present at Start of Event (1st Prior Frontal/Rear Event, TRG 1)

Ignition Cycle Since DTC was Set (times)	2047
Airbag Warning Lamp ON Time Since DTC was Set (min)	75
Diagnostic Trouble Codes	None

#### Pre-Crash Data, -5 to 0 seconds (1st Prior Frontal/Rear Event, TRG 1)

Time (sec)	-4.5	-3.5	-2.5	-1.5	-0.5	0 (TRG)
Vehicle Speed (MPH [km/h])	1.2 [2]	2.5 [4]	2.5 [4]	2.5 [4]	2.5 [4]	2.5 [4]
Brake Switch	OFF	OFF	ON	ON	ON	ON
Accelerator Rate (V)	0.78	0.78	0.78	0.78	0.78	0.78
Engine RPM (RPM)	400	400	400	400	400	400
Pre-Crash Data Status *	Valid	Valid	Valid	Valid	Valid	Valid

\* "Invalid" may be set for M/T vehicle





#### **Disclaimer of Liability**

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