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Special Crash Investigations: On-Site Alleged Driver's Air Bag Malfunction Crash Investigation; Vehicle: 2016 Honda Civic; Location: California; Crash Date: February 2017

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15. Supplementary Notes
This report documents the investigation of an alleged driver's frontal air bag malfunction and the injuries sustained by the driver of a 2016 Honda Civic that was involved in a crash with a 2005 Dodge Magnum. Each crash represents a unique sequence of events and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) 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
Data obtained from the vehicle inspection and the event data recorder (EDR) indicated the driver's frontal air bag deployed. The crash occurred at 0937 hours during February 2017 on an interstate highway in California. The Honda was being driven southbound in the fourth lane from the right by a belted 41-year-old female at an EDR-reported speed of 124 km/h (77 mph). The Dodge was being driven southbound in the first lane from the right by a belted 22-year-old male at an unspecified high rate of speed. For unknown reasons, the driver of the Dodge departed the roadway on the right edge and struck a wall. Following the impact the Dodge returned to the roadway, crossed over four lanes and struck the Honda. The Honda subsequently struck a concrete divider bordering the left edge of the roadway then returned to the roadway and overturned. It came to rest in an upright orientation. The Dodge struck the barrier and wall again before coming to rest on the roadway. The Honda was equipped with frontal air bags, seat-mounted side impact air bags for the front row and combination side impact/roll-sensing Inflatable Curtain (IC) air bags for both rows. During the crash, the driver's frontal air bag, both seat-mounted side air bags and both IC air bags deployed. The driver of the Honda sustained serious injuries to the head, face and vertebra that required hospitalization. The driver of the Dodge was not injured. Both vehicles were towed due to damage and declared to be total losses.

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BACKGROUND

This report documents the investigation of an alleged driver's frontal air bag malfunction and the injuries sustained by the driver of a 2016 Honda Civic that was involved in a crash with a 2005 Dodge Magnum (**Figure 1**). Data obtained from the vehicle inspection and Event Data Recorder (EDR) indicated the Honda driver's frontal air bag deployed as intended. This case was initiated by the National Highway Traffic Safety Administration's (NHTSA's) Special Crash Investigations (SCI) group in response to a notification submitted by the Honda owner's attorney. SCI assigned the case to Dynamic Science, Inc. in March

Figure 1. 2016 Honda Civic.

2017. The attorney indicated in the notification that the driver's frontal air bag "may have deployed late." The notification also described various serious facial injuries sustained by the Honda driver during the crash. The investigation was intended to determine occupant restraint usage, kinematics, injury sources and air bag deployment times for the Honda. SCI completed the vehicle inspection at an auction facility in March 2017. The Honda was supported by the Bosch Crash Data Retrieval (CDR) system. The EDR was removed from the vehicle imaged using the direct- to-module, bench top method. Air bag data found in the EDR report is discussed later in this report and the complete EDR report is included as **Appendix A** at the end of this report.

The crash occurred at 0937 hours during February 2017 on an interstate highway in the state of California. The Honda was being driven southbound in the fourth lane from the right by a belted 41-year-old female at an EDR-reported speed of 124 km/h (77 mph). The Dodge was being driven southbound in the first lane from the right by a belted 22-year-old male at an unspecified high rate of speed. For unknown reasons, the driver of the Dodge departed the roadway on the right edge and struck a wall. Following the impact the Dodge returned to the roadway, crossed over four lanes and struck the Honda. The Honda subsequently struck a concrete divider bordering the left edge of the roadway then returned to the roadway and overturned. It came to rest in an upright orientation on the roadway. The Dodge struck the barrier and the wall again before coming to rest. The Honda was equipped with frontal air bags, seat-mounted side impact air bags for the front row and combination side impact/roll-sensing Inflatable Curtain (IC) air

bags for both rows. During the crash, the driver's frontal air bag, both seat-mounted side air bags and both IC air bags deployed. The driver of the Honda sustained serious injuries to the head, face and vertebra that required hospitalization. The driver of the Dodge was not injured. Both vehicles were towed due to damage and declared to be total losses.

SUMMARY

Crash Site

The crash occurred in the southbound lanes on a straight and slightly descending section of a divided north/south interstate highway in the state of California (**Figure 2**). Crash site data including roadway measurements were obtained from the police report, SCI images and satellite images. The roadway was asphalt surfaced and was configured with five southbound lanes each measuring 3.6 m (12.0 ft) in width. The fifth lane from the right was a High Occupancy Vehicle (HOV) lane. The lanes were delineated by dashed white painted stripes and raised white pavement markers. The roadway was

Figure 2. Crash site looking south.

bordered by a solid yellow painted stripe on the left and a solid white painted fog line on the right. The roadway was bordered by a paved shoulder measuring 1.2 m (4.0 ft) in width and a jersey-type concrete divider on the left and a paved shoulder measuring 3.0 m (10.0 ft) in width and a concrete sound wall on the right. The posted speed limit was 105 km/h (65 mph).

Conditions at the time of the crash as reported by the nearest weather station were as follows: temperature 10.6 degrees C (51.1 degrees F), 61 percent humidity, southwest winds at 14.8 km/h (9.2 mph), clear visibility and clear skies. A Crash Diagram is included on page 13 of this report.

Pre-Crash

The Honda was traveling southbound in the fourth lane from the right at an EDR-reported speed of 122 km/h (76 mph) with Accelerator Pedal Position 14 percent full, Service Brake "Off", ABS Activity "Off", Stability Control "On Non Engaged", Steering Input 0 degrees, Engine RPM 2,000, Cruise Control "Not Engaged" and "Off" at Time Stamp -5.0 seconds. At Time Stamp -0.5 seconds, vehicle speed was at least 124 km/h (77 mph)[1] with Accelerator Pedal Position 0 percent full, Service Brake "On" and Steering Input 10 degrees (to left). Braking and steering input by the driver of the Honda suggests probable avoidance actions prior to impact with the other vehicle. The tables below summarize the Honda's EDR-reported Pre-Crash Data for the captured events. Time between events was 0.2 seconds.

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[1] The EDR data limitations did not specify an upper limit for the recorded speed for this vehicle's EDR but this value may be the default upper limit value.

Time Stamp (seconds)	Vehicle Speed km/h (mph)	Incremental Distance Traveled m (ft)	Cumulative Distance Traveled m (ft)
-5.0	122 (76)	NA	NA
-4.5	123 (76)	17.1 (55.7)	17.1 (55.7)
-4.0	123 (76)	17.1 (55.7)	34.2 (111.5)
-3.5	124 (77)	17.1 (55.7)	51.3 (168.3)
-3.0	124 (77)	17.2 (56.5)	68.5 (224.7)
-2.5	124 (77)	17.2 (56.5)	85.7 (281.2)
-2.0	124 (77)	17.2 (56.5)	102.9 (337.6)
-1.5	124 (77)	17.2 (56.5)	120.1 (394.0)
-1.0	124 (77)	17.2 (56.5)	137.3 (450.5)
-0.5	124 (77)	17.2 (56.5)	154.5 (506.9)
0	124 (77)	17.2 (56.5)	171.7 (563.3)

Time (sec) 0.0 at Event	Speed Vehicle Indicated (km/h [mph])	Accelerator Pedal (%)	Service Brake Activation
Record 1 (Most Recent)	124 (77)	0	On
Record 2	124 (77)	0	On
Rollover Event Record	Not reported	Not reported	Not reported

The Dodge was traveling southbound at an unknown high rate of speed in the first lane from the right. For unknown reasons, the driver departed the roadway on the right edge.

Crash
The crash included six events. Events 2, 3 and 4 involved the Honda and Events 1, 2, 5 and 6 involved the Dodge. Event 2 was the only vehicle-to-vehicle impact and all other events were vehicle-to-object impacts. Event 4 was a rollover. Initially, an unknown plane of the Dodge struck the sound wall bordering the right shoulder (Event 1). The Dodge was displaced to the left, returned to the roadway, crossed four travel lanes while traveling 51.0 m (167.0 ft) and depositing a tire friction mark measuring 35.6 m (120.0 ft) and struck the right plane of the Honda (Event 2). This impact was a non-deployment event recorded by the Honda's EDR. The Honda was displaced to the left and initiated a clockwise yaw, to which the driver responded by

continued braking and increasing her steering to the left at an EDR-reported steer angle of 25 degrees. The vehicle traveled approximately 7.0 m (23.0 ft) depositing a gouge mark measuring 1.5 m (5.0 ft) in length and a tire friction mark measuring 3.5 m (10.0 ft) in length. The Honda departed the roadway on the left edge striking the jersey-type concrete barrier bordering the left shoulder (Event 3) with its front plane 0.2 seconds after the previous impact. The barrier impact was recorded by the EDR as a deployment event in which the driver's frontal air bag deployed the first stage at 42 milliseconds (ms) and the second stage at 82 ms. The driver's seat belt pretensioner actuated at 28 ms. The vehicle's left seat-mounted side impact air bag and left IC air bag deployed at 41 ms. The Honda returned to the roadway in a counterclockwise rotation until its left side tires tripped on the roadway with sufficient opposing lateral force to initiate a left side leading rollover (Event 4). It rolled four quarter-turns left-side leading along its longitudinal axis and came to rest in an upright orientation facing southeast in the fourth lane from the right. The exact location of the trip point and the rollover distance were unknown. Using police measurements, the Honda's final rest location measured 34.0 m (112.0 ft) from the area of the first barrier impact.

After striking the Honda, the Dodge continued traveling to the left over a distance of 80.0 m (262.0 ft) depositing a tire friction mark measuring 19.2 m (63.0 ft) in length. It then struck the barrier with an unknown plane (Event 5). It was displaced back to the right, crossed over all five lanes while traveling 33.0 m (108.0 ft) and struck the sound wall a second time (Event 6). It traveled an unspecified distance in a southbound trajectory and came to rest facing south on the right shoulder.

For the Honda in Crash Event 2, the Missing Vehicle algorithm of the WinSMASH program calculated a total delta-V of 11 km/h (7 mph), longitudinal delta-V of 10 km/h (6 mph), lateral delta-V of -6 km/h (-4 mph) and a barrier equivalent speed of 12 km/h (8 mph). The WinSMASH results were considered reasonable.

For the Dodge in Event 2, Winsmash calculated a total delta-V of 8 km/h (5 mph), longitudinal delta-V of -8 km/h (-5 mph), lateral delta-V of 1 km/h (1 mph) and a barrier equivalent speed of 7 km/h (4 mph). The reconstruction for the Dodge was considered borderline.

For the Honda in Event 3, the bumper fascia and backing bar were displaced from the vehicle and crush to the front plane was unknown, precluding the use of Winsmash for reconstruction. The EDR captured this impact as a deployment event. The EDR reported a longitudinal delta-V of -17 km/h (-11 mph) and a lateral delta-V of -24 km/h (-15 mph). Those values were used to calculate a total delta-V of 29.4 km/h (18.3 mph) and a 2 o'clock direction of force.

The Honda initiated a rollover for Event 5. This was an EDR-reported left side leading rollover in which the vehicle's left plane struck the ground during the first quarter-turn and the top plane struck the ground during the second quarter-turn. The EDR report included vehicle roll rate in a rollover event record but did not include this as an Event, probably because two locked events occurred (one deployment and one non-deployment) prior to this event. The Honda's left seat-mounted side air bag and left IC air bag likely deployed during this event. The EDR report did not record deployment times or events for those air bag deployments.

Post-Crash

Following the crash, the driver of the Honda was found by responders in her seated position in the vehicle. She was removed due to her perceived serious injuries and transported by ambulance to a local hospital where she was admitted. The driver of the Dodge exited his vehicle unassisted and waited for responders to arrive. He was not injured or transported. Both vehicles were towed due to damage and were later declared to be total losses.

2016 HONDA CIVIC

Description

The 2016 Honda Civic LX was identified by the Vehicle Identification Number (VIN): 19XFC2F58GExxxxxx. The vehicle's mileage was unknown due to the absence of power to the electronic odometer. The Honda was a 4-door sedan configured with a 4-cylinder, 2.0-liter, gasoline engine, automatic transmission, front-wheel drive, disc brakes, antilock braking system, vehicle stability assist (VSA), brake assist, tire pressure monitoring system and advanced compatibility engineering (ACE) body structure. The vehicle manufacturer recommended size P215/55R16 tires for the front and rear with a cold pressure of 220 kPa (32 psi) for the front and rear. The Honda was equipped with Hankook Kinergy GT tires of the recommended size manufactured in June 2016. Specific tire data is included in the table below.

Position	Measured Tread Depth	Restricted	Damage
LR	7 mm (9/32 in)	No	De-beaded
LR	7 mm (9/32 in)	No	None
RR	7 mm (9/32 in)	Yes	None
RF	7 mm (9/32 in)	No	None

The Honda's interior was equipped with two rows of seating to accommodate five occupants. The front row was configured with two bucket seats with adjustable head restraints. The seat track for the driver was set to the middle position, her seat back was upright and the head restraint was adjusted to the lowest position.

Exterior Damage

The Honda sustained direct contact damage to the left, right, front and top planes during the crash. Event 2 was a vehicle-to-vehicle impact with direct damage beginning at the right rear bumper corner and extending 197 cm (77.5 in) forward and ending at the right B-pillar (**Figure 3**). Twenty-two measurements were taken at mid-door level using the Nikon Total Station and the Faro Blitz program computed

Figure 3. Right plane damage (Event 2), 2016 Honda Civic.

crush measurement in six increments as follows: $C_1 = 0$ cm, $C_2 = 0$ cm, $C_3 = 11$ cm, (4.3 in), $C_4 = 1$ cm (0.4 in), $C_5 = 2$ cm (0.8 in), $C_6 = 2$ cm (0.8 in). Maximum crush was located at C_3. The PDOF for this impact was 150 degrees and the Collision Deformation Classification (CDC) for the Honda in Event 2 was 05RZEW2.

Event 3 was a barrier impact involving the vehicle's front plane (**Figure 4**). The Honda's front bumper fascia and backing bar were displaced from the vehicle and could not be repositioned on the vehicle for the purpose of measuring crush. Direct damage began at the left front bumper corner and extended 42 cm (16.5 in) to the right. Induced damage appeared to be distributed across the front plane as well as down the left and right front fenders. EDR reported velocity changes were used to calculate a 50 degree PDOF. The estimated CDC for the Honda in Event 3 was 02FLEW1.

Figure 4. Front plane damage, 2016 Honda Civic.

Event 4 was a rollover event in which the Honda sustained direct damage and induced damage to the top, right, and left planes. Direct damage to the top plane was distributed from roof side rail to roof side rail and measured 120 cm (47.2 in) (**Figure 5**). Maximum lateral crush was located on the right roof just aft of the B-pillar and measured 4 cm (1.6 in). Maximum vertical crush was located on the right roof just aft of the B-pillar and measured 6 cm (2.4 in). The CDC for the rollover event was 00TDDO2.

Figure 5. Top plane damage, 2016 Honda Civic.

Event Data Recorder (EDR)

The Honda's event data recorder (EDR) was removed from the vehicle and imaged by SCI using the direct-to-module, bench-top method. The report was imaged using Bosch CDR Tool version 17.2.1 and was reported using version 17.4.2. The complete EDR report is included in this report as **Appendix A**.

According to the data limitations, the supplemental restraints system (SRS) control unit typically records only one event. Two events can be recorded if the T0 (time 0) value for each event occurs within 5 seconds of each other. A non-deployment event can be recorded and locked if it occurs within 5 seconds of a deployment event. Such was the case in this crash. The EDR captured one non deployment (Event 2, vehicle-to-vehicle) and one deployment event (Event 3, V1 front plane to barrier) which occurred 0.2 seconds apart. Both EDR event records included system status at retrieval, system status at event, deployment command data, pre-crash data (-5 to

0 sec [2 samples/sec]), longitudinal and lateral delta-V, longitudinal and lateral acceleration and normal acceleration.

For EDR Event Record 1, the EDR reported a maximum longitudinal delta-V of -17 km/h (-11 mph) at 117.5 ms and a maximum lateral delta-V of -24 km/h (-15 mph) at 65 ms. A maximum resultant delta-V was recorded at 72.5 ms. The pre-crash data at -1 second for this event was summarized as at Time Stamp -0.1 seconds as follows:

- Safety Belt Status, Driver: On
- Safety Belt Status, Right Front Passenger: Off
- Seat Track Position Switch, Foremost, Status, Driver: No
- Occupant Size Classification, Right Front Passenger Air Bag Suppressed: No
- Frontal Air Bag Warning Lamp: No
- Ignition Cycle, Crash: 517

The EDR event record 1 was a deployment event during which the driver's frontal air bag deployed in two stages at 42 and 82 ms, respectively. The driver's seat belt pretensioner actuated at 28 ms. The EDR report did not reveal any Diagnostic Trouble Codes (DTCs) or other evidence indicating the driver's frontal air bag may have deployed abnormally.

The EDR report indicated that during this event the right seat-mounted side air bag and right IC air bag deployed. The left seat-mounted side air bag and left IC air bag also deployed at some time during the crash but the report did not indicate their deployment status or times during either event.

For Event Record 2, the EDR reported a maximum longitudinal delta-V of -1 km/h (-1 mph) at 75 ms and a maximum lateral delta-V of -8 km/h (-5 mph) at 77.5 ms. A maximum resultant delta-V was recorded at 77.5 ms. The pre-crash data at -1 second for this event was identical to the data in Event Record 1, above.

The EDR included a vehicle roll rate (rollover event record) which contained roll rate data over a period of 3.0 seconds. The data indicated a right side leading rollover. The rollover was not captured as a separate event and did not include any other data.

NHTSA Recalls and Investigations
A search using the vehicle's VIN and last queried in June 2019 revealed no open NHTSA recalls. A search using the vehicle's year/make/model revealed three recalls. Only one of the recalls applied to this vehicle given the model and manufacture date. A vehicle history report indicated no open recalls had been reported in the first four months of ownership. The recalled component was the parking brake and had no effect on this crash or the supplemental restraints system.

Interior Damage
The Honda sustained minor interior damage caused by impact forces, deployed air bags, driver loading and contacts and post-crash activities. The left front, left rear and right front doors remained closed and operational, and the right rear door was jammed shut. Five air bags

deployed and the driver's seat belt pretensioner actuated. The driver deposited contact evidence on the deployed frontal air bag, her seat belt and the roof. The driver's seat belt was cut during post-crash activities.

Vertical intrusion reduced both rows of the occupant compartment as a result of rollover damage as follows. Front row, right roof = 12 cm (4.7 in) and middle roof = 4 cm (1.6 in). Second row, right roof = 10 cm (3.9 in) and middle roof = 6 cm (2.4 in).

Manual Restraint Systems
The Honda was equipped with seating for five occupants and all seats were configured with three-point lap and shoulder seat belts. The front row belts were equipped with retractor pretensioners, sliding latch plates and adjustable D-rings. The driver's belt was configured with an emergency locking retractor (ELR). The driver's D-ring anchorage was adjusted to the full- down position. The driver's seat belt pretensioner actuated at impact with the other vehicle at an EDR reported time of 28 ms. The driver loaded the belt with her chest and deposited a scuff mark located at 26 cm (10.2 in) above the stop button. The belt was cut during post-crash activities at 144 cm (56.7 in) above the lower anchorage.

Supplemental Restraint Systems
The Honda was equipped with six air bags in the following configuration: frontal air bags for the driver and front right occupant, seat-mounted side impact air bags for the driver and front right occupant, and combination side impact/roll-sensing IC air bags for both rows. During the crash, five air bags deployed including all except the front right occupant's frontal air bag, which was suppressed.

According to the EDR report, the driver's frontal air bag, the right seat-mounted side air bag and the right IC air bag deployed during Event Record 1. This was an angled frontal crash in which the Honda's front plane struck a concrete barrier. The frontal air bag deployed in two stages at 42 ms and 82 ms, respectively. SCI examined the deployed air bag during the vehicle inspection and it revealed nothing remarkable or unusual. It appeared to have deployed

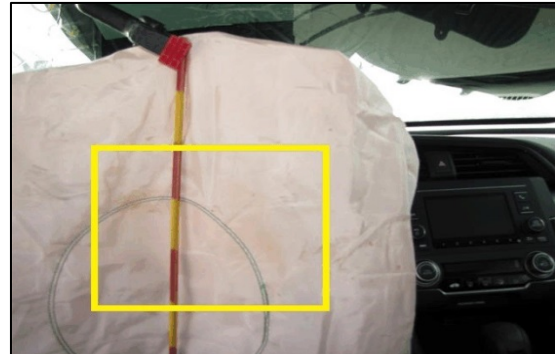**Figure 6**. Driver contact evidence to deployed frontal air bag, 2016 Honda Civic.

Figure 7. Driver blood deposits on deployed frontal air bag, 2016 Honda Civic.

Figure 8. Top cover flap, deployed frontal air bag, 2016 Honda Civic.

normally and as intended. It was configured with two vent ports on the upper aspect and measured 50 cm (20.0 in) in diameter. The driver deposited makeup and skin oil transfers measuring 10 x 15 cm (3.9 x 5.9 in) on the air bag in the circle of stitching just above and to the right of center on the front panel (**Figure 6**). She deposited blood to the lower and left aspects of the air bag (**Figure 7**). The air bag was not damaged and the cover flaps were unremarkable (**Figure 8**).

The contact evidence suggests the driver's face loaded the air bag while it was inflated. No evidence was found to suggest the driver's frontal air bag deployed in any way other than normal. The vehicle sustained a rollover following the deployment event. It is probable the driver's face and head loaded the frontal air bag and steering column a second time, possibly after the air bag had deflated. The left and right seat-mounted side impact air bags deployed from the outboard aspects of their respective seat backs. The EDR indicated the right side air bag deployed at 41 ms during the Event Record 1. The EDR report did not indicate deployment time or event for the deployed left seat-mounted side air bag. The side air bags measured 54 cm (21.3 in) in length and 28 cm (11.0 in) in width. They were configured with two, 7 cm (3.0 in) long vent ports at the forward center aspect. These air bags were unremarkable.

The left and right IC air bags deployed from the roof side rails above the front and second rows, probably during the rollover event. The IC air bags measured 178 cm (70.0 in) in width and 43 cm (17.0 in) in length. In their deflated state, they extended 20 cm (7.9 in) below the bottom of the side glass. The middle and lower aspect of the left IC air bag had been cut away beginning at the left A-pillar and extending to the left B-pillar during post-crash activities. The upper and forward aspect of this air bag remained present and was attached to the left A-pillar. The cut-away section of air bag was not available for inspection. The right IC air bag was unremarkable. It covered the right front and second row side glass entirely. Neither air bag revealed damage or evidence of driver contact.

Rollover Mitigation
The Honda had a NHTSA 5-star (highest possible) rollover rating and a rollover resistance of 9.5 percent. The rollover resistance test measures the risk of rollover in a single-vehicle, loss-of-control scenario. In this crash, the Honda was struck by the other vehicle, displacing it into a barrier, followed by a counterclockwise rotation and finally a trip rollover. Instability and control loss followed the impact with the other vehicle. The driver of the Honda braked and steered left before and after the initial impact but never regained control of the vehicle. The rollover was initiated when its left side tires contacted the roadway with sufficient opposing lateral force causing the vehicle to trip. The Honda rolled a total of four quarter-turns in a counterclockwise direction and came to rest in an upright orientation facing southeast in the fourth lane from the right. The location of the trip point and the rollover distance was unknown. The Honda's final rest location measured 34.0 m (112.0 ft) from the area of the impact with the barrier.

2016 HONDA CIVIC OCCUPANT

Driver Demographics

Age/Sex:	41 years/female
Height:	170 cm (67 in)
Weight:	57 kg (126 lb)
Eyewear:	Eyeglasses
Seat type:	Bucket seat with adjustable head restraint
Seat track position:	Middle
Manual restraint usage:	Lap and shoulder seat belt used
Usage source:	Vehicle inspection, EDR report
Air bags:	Frontal air bag, seat-mounted side air bag, IC air bag deployed
Alcohol/drug data:	None
Egress from vehicle:	Removed from vehicle through left side door
Transport from scene:	Ambulance to local hospital
Type of medical treatment:	Hospitalization and follow-up treatment

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Closed unstable burst fracture, L2	650636.3	Seat cushion	Probable
2	Subarachnoid hemorrhage, right/frontal cerebrum, associated with LOC	140694.2	ICS1 Primary - steering wheel rim Alternate - roof/front header	Probable Possible
2	Subarachnoid hemorrhage, right/frontal cerebrum, associated with LOC	140694.2	ICS2 Primary - center IP Alternate - frontal air bag cover flaps	Probable Possible
3	Fracture, right orbital floor	251221.2	ICS1 Primary - steering wheel rim Alternate - roof/front header	Probable Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
3	Fracture, right orbital floor	251221.2	ICS2 Primary - center IP Alternate - frontal air bag cover flaps	Probable Possible
4	Laceration, forehead	210604.2	ICS1 Primary - steering wheel rim Alternate - roof/front header	Probable Possible
4	Laceration, forehead	210604.2	ICS2 Primary - center IP Alternate - frontal air bag cover flaps	Probable Possible
5	Closed fracture, nose	251000.1	Steering wheel hub	Probable
6	Spinal muscle strain, cervical spine	640278.1	Seat belt	Probable

Source: Medical records

Driver Kinematics

The belted 41-year-old female driver of the Honda was seated in a normal upright posture. She was actively steering the vehicle with both hands on the steering wheel and her right foot was on the accelerator pedal. Just prior to impact with the other vehicle, the driver braked and steered slightly left. The vehicle was traveling at a speed of at least 124 km/h (77 mph). At impact with the other vehicle, she was displaced right in response to the direction of force. The driver continued braking and increased her steering angle left. At impact with the barrier, the driver was displaced forward and right in response to the direction of force. Her frontal air bag deployed in two stages and her pretensioner actuated. She was held in her seat by the pretensioned seat belt while her neck hyper-extended causing a spinal muscle strain of the cervical spine. Following the barrier impact, the vehicle rotated counterclockwise and overturned left side leading rolling four quarter-turns in a counterclockwise rotation displacing the driver in multiple directions relative to her seated position. The driver's hips loaded the seat cushion and center console creating a load path to the lumbar spine and causing a burst fracture at L2. Her torso was held in place by the actuated seat belt and her face, head and neck continued to be displaced in multiple directions. It is likely her face and head contacted multiple components including the steering

wheel rim and hub (after deflation of the frontal air bag), air bag cover flaps, front roof header, and right IP, causing a deep laceration to the forehead, fracture to the right orbital floor, fracture to the nose, and subarachnoid hemorrhage to the right/frontal cerebrum with associated loss of consciousness (LOC).

The vehicle came to rest in an upright orientation and the driver remained in her seated position with the seat belt in place until responders arrived and removed her from the vehicle. A passerby who was in first contact with the driver held her forehead and applied pressure to mitigate bleeding from the forehead laceration. She was transported by ambulance to a local hospital and admitted for 7 days. Following her discharge the driver sought follow-up treatment multiple times. Her aftercare included use of a walker for 8 weeks and pain medication lasting several months.

2005 DODGE MAGNUM

Vehicle Data
The 2005 Dodge Magnum was identified in the police report using the VIN 2D4FV48V95Hxxxxxx. The vehicle was a 4-door station wagon configured with a rear hatch. The vehicle interior was configured with seating for five occupants.

Exterior Damage
According to the police report, the Dodge sustained major direct damage to the left, front, and right planes. The vehicle was not available for inspection and no further data was obtained.

Occupant Data
The belted 22-year-old male driver of the Dodge was not injured during the crash. Following the crash, he exited the vehicle unassisted and stood in the center medium until responders arrived.

CRASH DIAGRAM

V2 FINAL REST (ESTIMATED)

EVENT 6: V2 TO WALL

On-Site Alleged Air Bag Malfunction
Investigation
Office of Defects Investigation (ODI)
February 2017
California
V1: 2016 Honda Civic
V2: 2005 Dodge Magnum
Conditions: Daylight, Clear and Dry
Posted Speed Limit: 105 km/h (65 mph)

0   15   30

V1 FINAL REST (POLICE INDICATED)

EVENT 5: V2 TO BARRIER

EVENT 4: V1 ROLLOVER

EVENT 3: V1 TO BARRIER

TIRE FRICTION MARKS (POLICE INDICATED)

0.0 Seconds
124 km/h (77 mph), Accelerator Pedal = 0%
Brake On, Steering Input = 10 degrees

EVENT 2: V2 TO V1

-0.5 Seconds
124 km/h (77 mph), Accelerator Pedal = 0%
Brake On, Steering Input = 10 degrees

-1.0 Seconds
124 km/h (77 mph), Accelerator Pedal = 12%
Brake Off, Steering Input = 0 degrees

SOUND WALL

CONCRETE BARRIER

-1.5 Seconds
124 km/h (77 mph), Accelerator Pedal = 13%
Brake Off, Steering Input = 0 degrees

EVENT 1: V2 TO WALL

-2.0 Seconds
124 km/h (77 mph), Accelerator Pedal = 10%
Brake Off, Steering Input = 0 degrees

V2: 2005 DODGE MAGNUM

V1: 2016 HONDA CIVIC

-2.5 Seconds
124 km/h (77 mph), Accelerator Pedal = 9%
Brake Off, Steering Input = 0 degrees

NHTSA
www.nhtsa.gov

Case Number: DS17004

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APPENDIX A: Event Data Recorder Report (EDR)
2016 Honda Civic[2]

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

CDR File Information

User Entered VIN	19XFC2F58GE******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS17004_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.2.1
Imaged with Software Licensed to (Company Name)	Company Name information was removed when this file was saved without VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 17.4.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	2

Comments

No comments entered.

Data Limitations

General Information:
These limitations are intended to assist you in reading the event data that has been imaged from the vehicle's SRS control unit. They contain general information and are not specific to this particular event. Event data should be considered in conjunction with other available physical evidence from the vehicle and scene.

Honda and Acura passenger vehicles designated as 2013 or later model year production are designed to be compatible with the Bosch CDR tool. Only some 2012 model year vehicles are compatible with the Bosch CDR tool.

Recorded Crash Events:
Data for front, side, rear and rollover events can be recorded as either non-deployment or deployment events. Both types of events can contain pre-crash and crash data.
- A non-deployment event is recorded if the change in longitudinal or lateral velocity equals or exceeds 8km/h over a 150ms timeframe or another type of non-reversible deployable restraint device other than a front, side, or side curtain airbag (e.g. seatbelt pretensioner) is commanded to deploy. Except as indicated below, non-deployment events are not locked into memory and can be over-written by subsequent non-deployment or deployment events.
- A deployment event is recorded if front airbag(s), side airbag(s), or side curtain airbag(s) are commanded to deploy. Deployment events are locked into memory and cannot be over-written.

The SRS control unit typically records only one event. Two events can be recorded if the T0 (time zero) values for each event occur within 5 seconds of each other. Therefore, a non-deployment event can be recorded and locked if it occurs within 5 seconds of a deployment event.

T0 is established by whichever of the following occurs first: (1) the change in longitudinal velocity at the SRS control unit equals or exceeds 0.8km/h over a 20ms timeframe; or (2) the change in lateral velocity at the SRS control unit equals or exceeds 0.8km/h over a 5ms timeframe; or (3) the occupant restraint control algorithm is activated; or (4) a commanded deployment of any type of non-reversible deployable restraint device (e.g. airbag or seatbelt pretensioner). If the time to deploy equals 0, then the command to deploy occurred at T0 or the device was not commanded to deploy during the event.

TEnd (end of event) is established by whichever of the following occurs first: (1) the change in longitudinal and lateral Delta V equals or falls below 0.8km/h over a 20ms timeframe; or (2) the occupant restraint control algorithm resets; or (3) time from T0 exceeds 300ms.

Data:
- Data recorded by the SRS control unit and imaged by the CDR tool is displayed relative to T0, not the time at which the vehicle made contact with another vehicle or object.
- Pre-crash data is recorded at 2 samples per second within the 5 seconds before T0. The sampling point at 0.0 is taken at T0 and is asynchronous with the other sample points. The time between -0.5 and 0.0 is not recorded and is between 1 and 500ms.
- Delta V data is recorded at 100 samples per second from T0 to 250ms or T0 to TEnd plus 30ms.
- Acceleration data is recorded at 100 samples per second from T0 to 250ms.
- Delta V, longitudinal reflects the change in velocity that the SRS control unit experienced in the longitudinal direction during the recorded portion of the event and is not the speed the vehicle was traveling before the event.
- Depending on the severity of the event and the accelerometer characteristics, saturation of the SRS control unit longitudinal or lateral accelerometers may occur, decreasing the recorded Delta V value.

- Time, accelerometer range exceeded is recorded if saturation of the SRS control unit longitudinal, lateral and/or normal (vertical) accelerometer occurs. The recorded data is the time at which the sensor range is first exceeded.
- The maximum recording capability of Deployment Command Data is 254ms or 255ms depending on vehicle model. A recorded value of 254ms or 255ms may indicate that the recording maximum was exceeded. In this case, the deployment command may have occurred between the recorded time and TEnd.
- Speed, vehicle indicated data is the speed indicated to the driver by the speedometer, not actual vehicle ground speed. Data accuracy can be affected by various factors, including but not limited to the following:
    - Significant changes in tire size from the factory setting
    - Wheel lockup or spin
    - Data latency or filtering and hysteresis within the speedometer module
- Accelerator pedal position, percent full is the ratio of accelerator pedal position compared to the fully depressed position.
- PCM (Powertrain Control Module) derived accelerator pedal position, percent full may differ from the accelerator pedal position, percent full under circumstances such as brake override activation or cruise control system engagement. These circumstances are based on vehicle equipment application and vary by model.
- Steering input angle is recorded in 5 degree increments.
- Side air bag suppression system status, right front passenger is recorded when the vehicle is equipped with the Occupant Position Detection System (OPDS).
- Occupant size classification, right front passenger airbag suppressed data is recorded as yes (suppressed) if the front passenger seat weight sensor system determined the passenger seat was empty or occupied by a child-size occupant.
- EV mode data records the vehicle powertrain status, not a driver selected operation mode. EV mode is recorded as On when the vehicle is moving and the internal combustion engine is not operating. EV mode may be recorded as On or Off when the vehicle is stopped.
- If power to the SRS control unit is lost during an event, all or part of the data may not be recorded.

Roll Rate Data:
- Vehicle roll rate data is recorded separately from the non-deployment and deployment events as described above. Therefore, the T0 for the roll rate data may differ from the T0 for the other data in this report.
- Roll rate recording trigger (T0) is established by whichever of the following occurs first: (1) a rollover algorithm ON judgment (SRS control unit decision to command deployment);￭, or (2) a change in relative roll angle at the SRS control unit equal to or exceeding 30 degrees (roll angle is not measured, but is calculated from the roll rate data); or (3) the rollover algorithm is activated.
- Once a recording trigger has been met, roll rate data is recorded for one rollover event at 10 samples per second from 1 second before to 2 seconds after T0. If a roll angle trigger is satisfied without a rollover algorithm ON judgment, the recorded roll rate data is unlocked and can be over-written by a subsequent rollover event. Roll rate data triggered by or recorded during a rollover algorithm ON judgment is locked into memory and cannot be over-written.
- If roll rate is detected at the SRS control unit during a non-deployment or deployment event but the recording trigger has not been satisfied, no roll rate data will be recorded. A graph of roll rate data will only be present in this report if roll rate data is recorded.

Data Element Sign Convention:
Except as noted below, all data is displayed in SAE J211 sign convention. The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. All directional references to sign notation are from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data element name	Positive sign indicates
Longitudinal Acceleration	Forward direction acceleration
Delta-V, Longitudinal	Forward direction acceleration
Lateral Acceleration	Left to right direction acceleration
Delta-V, Lateral	Left to right direction acceleration
Normal (Vertical) Acceleration	Downward direction acceleration
Vehicle Roll Rate*	See roll rate graph and data (if recorded)
Steering Input Angle*	Left Turn

  *Not SAE J211 sign convention

Data Source:
All recorded data is measured and calculated within the SRS control unit except for the following parameters (if applicable) which are transmitted via the vehicle's communication network to the SRS control unit:
- Speed, vehicle indicated
- Accelerator pedal position, percent full
- Service brake
- ABS activity
- Stability control
- Steering input angle
- Engine RPM
- PCM derived accelerator pedal position, percent full
- EV mode
- Forward Collision Warning
- Collision Mitigation Braking System information
- Lane Keeping Assist System information
- Lane Departure Warning
- Road Departure Mitigation information
- Cruise Control status
- Adaptive Cruise Control status

Depending on vehicle feature content, capability, or conditions described above, the following items may not be recorded. If these items are not recorded, they will not be present in this document.
- EV mode

- Forward Collision Warning
- Collision Mitigation Braking System information
- Lane Keeping Assist System information
- Lane Departure Warning
- Road Departure Mitigation information
- Cruise Control status
- Adaptive Cruise Control status

Hexadecimal Data:
All data that has been specified for imaging is shown in the hexadecimal data section of this report. However, not all of this data is translated by the CDR tool. The SRS control unit may contain additional data that is not retrievable by the CDR tool.

Data Imaging:
If the SRS control unit is imaged outside of the vehicle, ensure that it is not moved, tilted or turned while connected to the CDR tool. Also, after imaging is complete, wait 3 minutes after removing the CDR tool before moving the SRS control unit. Not following this guideline could cause current non-deployment event data to be overwritten and a new event to be recorded. Current fault status could also be altered if the SRS control unit is imaged outside of the vehicle.

04002_HondaSRS_GEN2_r002

System Status at Retrieval

EDR Version	1.3.2.0

System Status at Event (Event Record 1)

Multi-Event, Number of Events (1, 2)	1
Complete File Recorded (Yes/No)	Yes
Ignition Cycle, Download	519
Maximum Delta-V, Longitudinal (MPH [km/h])	-11 [-17]
Time, Maximum Delta-V, Longitudinal (msec)	117.5
Maximum Delta-V, Lateral (MPH [km/h])	-15 [-24]
Time, Maximum Delta-V, Lateral (msec)	65.0
Time, Maximum Delta-V, Resultant (msec)	72.5
Time, Accelerometer Range Exceeded, Longitudinal (msec)	0
Time, Accelerometer Range Exceeded, Lateral (msec)	0
Time, Accelerometer Range Exceeded, Normal (msec)	0

Deployment Command Data (Event Record 1)

Pretensioner Deployment, Time to Fire, Driver (msec)	28
Pretensioner Deployment, Time to Fire, Right Front Passenger (msec)	0
Frontal Air Bag Deployment, Time to Deploy First Stage, Driver (msec)	42
Frontal Air Bag Deployment, Time to Deploy First Stage, Right Front Passenger (msec)	0
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (msec)	82
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (msec)	0
Side Air Bag Deployment, Time to Deploy, Driver (msec)	0
Side Air Bag Deployment, Time to Deploy, Right Front Passenger (msec)	41
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Driver Side (msec)	0
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Right Side (msec)	41
Frontal Air Bag Deployment, 2nd Stage Disposal, Driver (Yes/No)	No
Frontal Air Bag Deployment, 2nd Stage Disposal, Right Front Passenger (Yes/No)	No

Pre-Crash Data -1 sec (Event Record 1)

Safety Belt Status, Driver	On
Safety Belt Status, Right Front Passenger	Off
Seat Track Position Switch, Foremost, Status, Driver	No
Occupant Size Classification, Right Front Passenger Airbag Suppressed (Yes/No)	Yes
Frontal Air Bag Warning Lamp (On, Off)	Off
Ignition Cycle, Crash	517

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

Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal Position, % full	Service Brake (On, Off)	ABS Activity (On, Off)	Stability Control (On, Off, Engaged)	Steering Input (deg)	Engine RPM	PCM Derived Accelerator Pedal Position, % full
-5.0	76 [122]	14	Off	Off	On Non-Engaged	0	2,000	14
-4.5	76 [123]	7	Off	Off	On Non-Engaged	0	2,000	7
-4.0	76 [123]	12	Off	Off	On Non-Engaged	0	2,000	12
-3.5	77 [124]	14	Off	Off	On Non-Engaged	0	2,000	14
-3.0	77 [124]	16	Off	Off	On Non-Engaged	0	2,000	16
-2.5	77 [124]	9	Off	Off	On Non-Engaged	0	2,000	9
-2.0	77 [124]	10	Off	Off	On Non-Engaged	0	2,000	10
-1.5	77 [124]	13	Off	Off	On Non-Engaged	0	2,100	13
-1.0	77 [124]	12	Off	Off	On Non-Engaged	0	2,000	12
-0.5	77 [124]	0	On	Off	On Non-Engaged	10	1,900	0
0.0	77 [124]	0	On	Off	On Non-Engaged	10	1,800	0

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

Time Stamp (sec)	Cruise Control (Not Engaged/ Engaged)	Cruise Control (On/Off)
-5.0	Not Engaged	Off
-4.5	Not Engaged	Off
-4.0	Not Engaged	Off
-3.5	Not Engaged	Off
-3.0	Not Engaged	Off
-2.5	Not Engaged	Off
-2.0	Not Engaged	Off
-1.5	Not Engaged	Off
-1.0	Not Engaged	Off
-0.5	Not Engaged	Off
0.0	Not Engaged	Off

Longitudinal Delta V (Event Record 1)

Longitudinal Delta V (Event Record 1)

Time (msec)	MPH [km/h]
0	0 [0]
10	-1 [-2]
20	-2 [-4]
30	-4 [-6]
40	-6 [-9]
50	-8 [-13]
60	-9 [-14]
70	-10 [-16]
80	-10 [-16]
90	-10 [-16]
100	-11 [-17]
110	-11 [-17]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]

Lateral Delta V (Event Record 1)
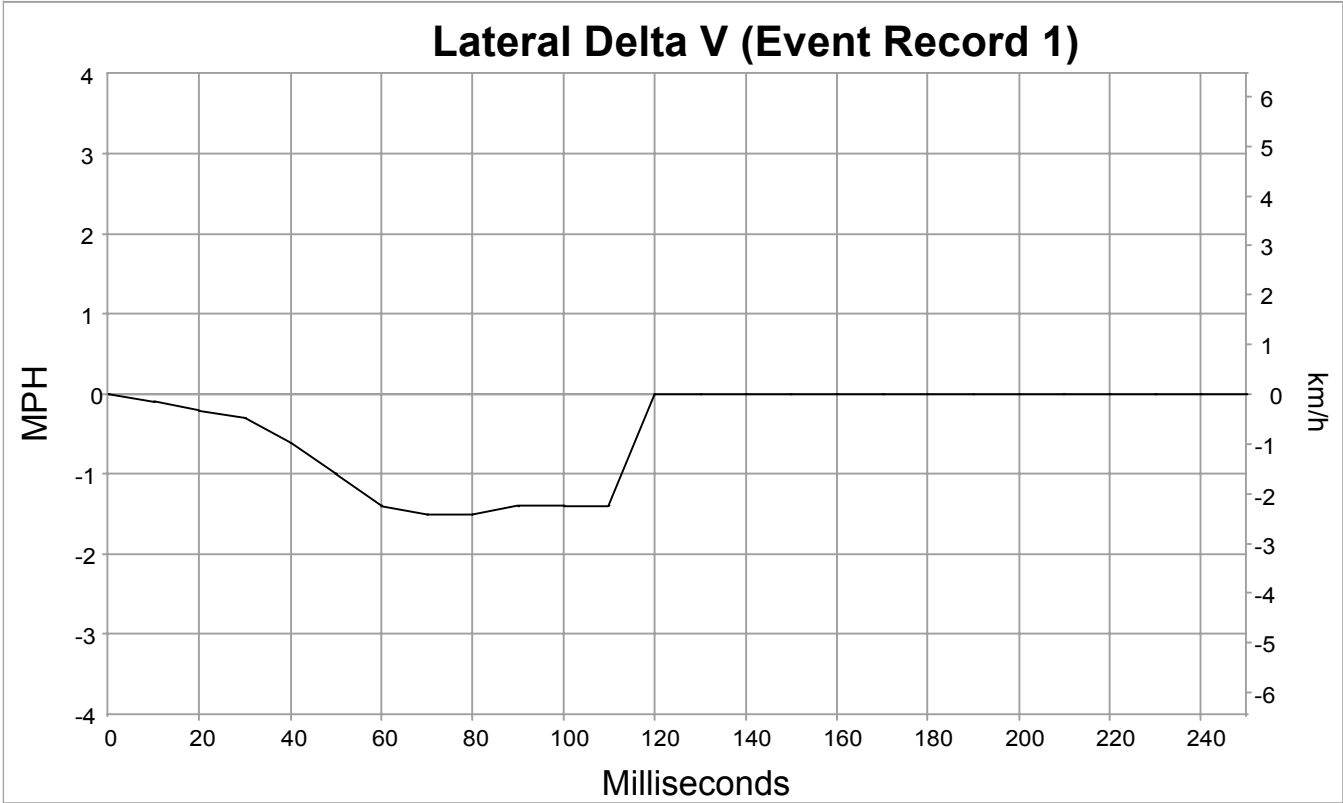
Lateral Delta V (Event Record 1)

Time (msec)	MPH [km/h]
0	0 [0]
10	-1 [-1]
20	-2 [-3]
30	-3 [-5]
40	-6 [-10]
50	-10 [-16]
60	-14 [-23]
70	-15 [-24]
80	-15 [-24]
90	-14 [-23]
100	-14 [-23]
110	-14 [-23]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]

Longitudinal Acceleration (Event Record 1)
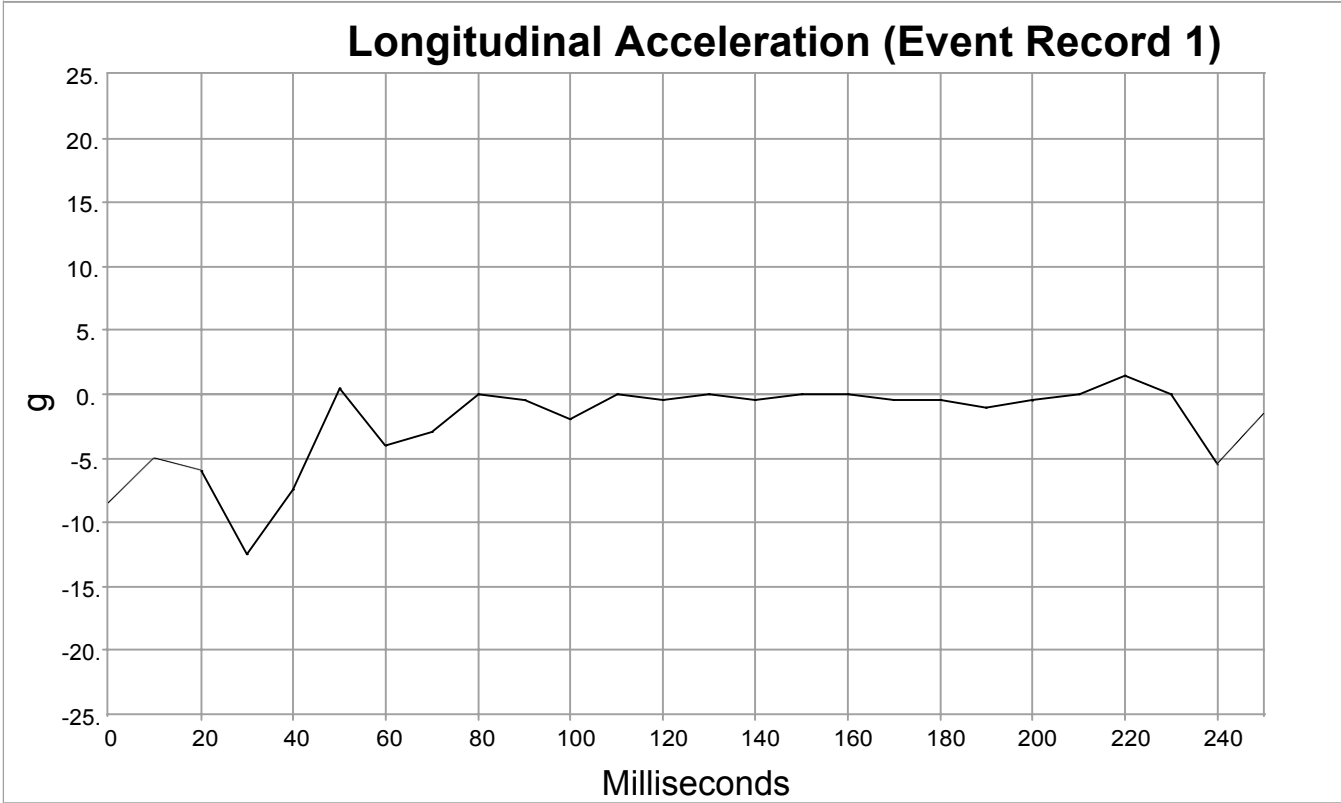
Longitudinal Acceleration (Event Record 1)

Time (msec)	g
0	-8.5
10	-5.0
20	-6.0
30	-12.5
40	-7.5
50	0.5
60	-4.0
70	-3.0
80	0.0
90	-0.5
100	-2.0
110	0.0
120	-0.5
130	0.0
140	-0.5
150	0.0
160	0.0
170	-0.5
180	-0.5
190	-1.0
200	-0.5
210	0.0
220	1.5
230	0.0
240	-5.5
250	-1.5

Lateral Acceleration (Event Record 1)
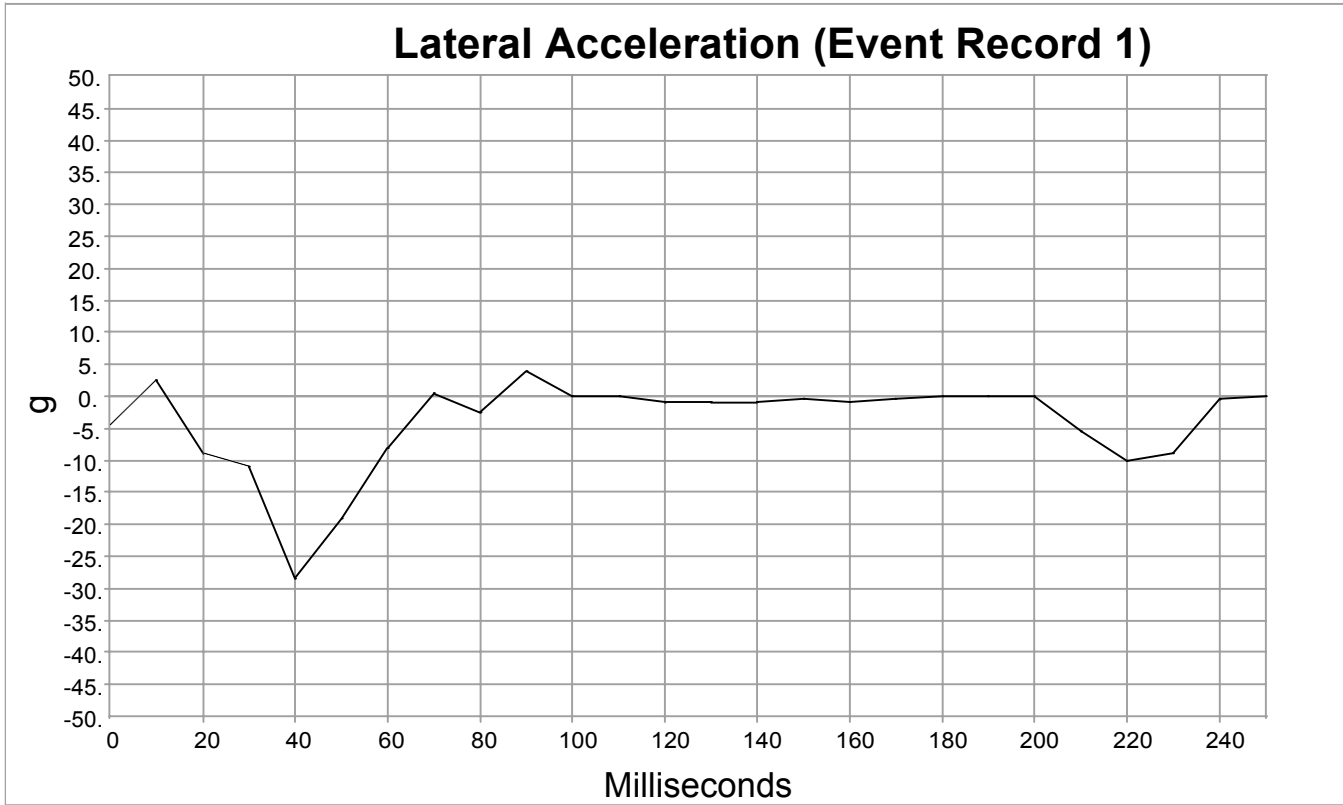
Lateral Acceleration (Event Record 1)

Time (msec)	g
0	-4.5
10	2.5
20	-9.0
30	-11.0
40	-28.5
50	-19.0
60	-8.0
70	0.5
80	-2.5
90	4.0
100	0.0
110	0.0
120	-1.0
130	-1.0
140	-1.0
150	-0.5
160	-1.0
170	-0.5
180	0.0
190	0.0
200	0.0
210	-5.5
220	-10.0
230	-9.0
240	-0.5
250	0.0

Normal Acceleration (Event Record 1)
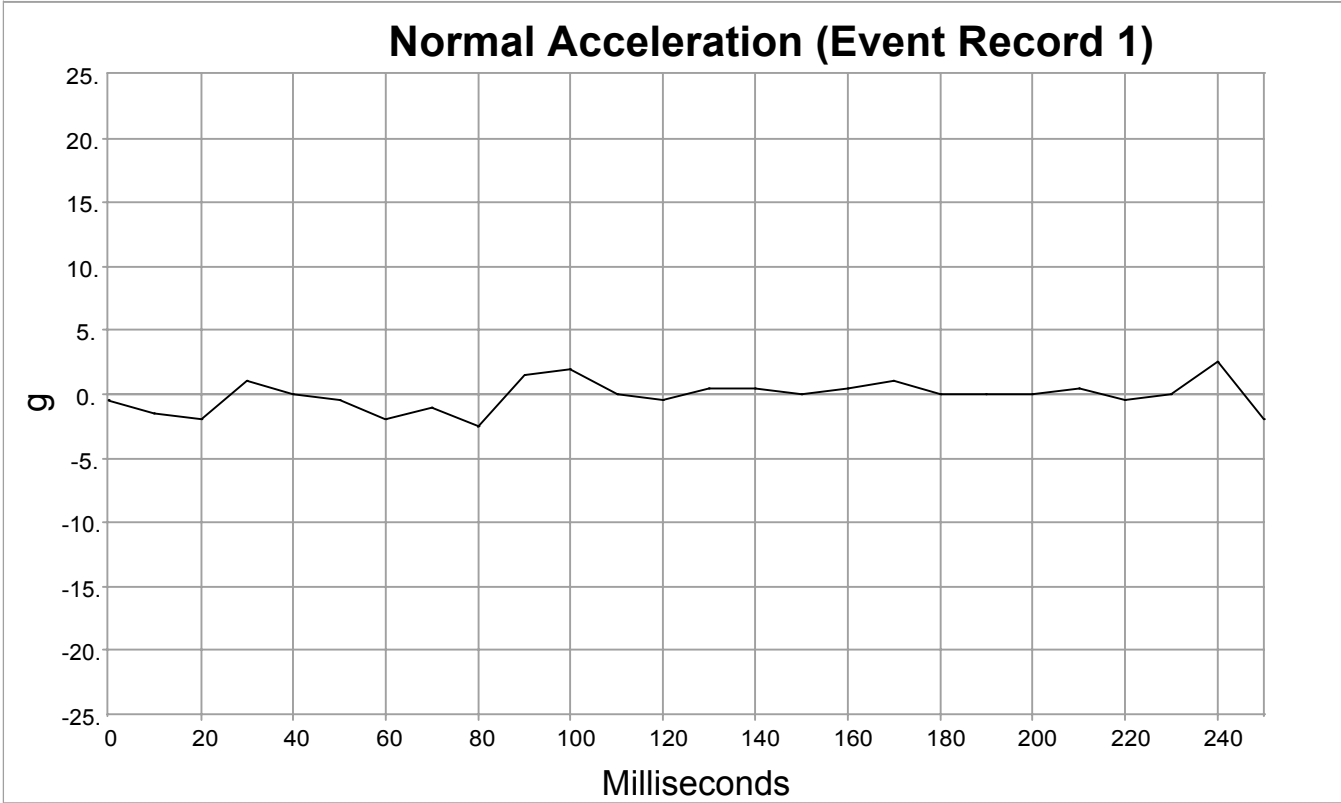
Normal Acceleration (Event Record 1)

Time (msec)	g
0	-0.5
10	-1.5
20	-2.0
30	1.0
40	0.0
50	-0.5
60	-2.0
70	-1.0
80	-2.5
90	1.5
100	2.0
110	0.0
120	-0.5
130	0.5
140	0.5
150	0.0
160	0.5
170	1.0
180	0.0
190	0.0
200	0.0
210	0.5
220	-0.5
230	0.0
240	2.5
250	-2.0

System Status at Event (Event Record 2)

Multi-Event, Number of Events (1, 2)	2
Complete File Recorded (Yes/No)	Yes
Ignition Cycle, Download	519
Time from Event 1 to 2 (sec)	0.2
Maximum Delta-V, Longitudinal (MPH [km/h])	-1 [-1]
Time, Maximum Delta-V, Longitudinal (msec)	75.0
Maximum Delta-V, Lateral (MPH [km/h])	-5 [-8]
Time, Maximum Delta-V, Lateral (msec)	77.5
Time, Maximum Delta-V, Resultant (msec)	77.5
Time, Accelerometer Range Exceeded, Longitudinal (msec)	0
Time, Accelerometer Range Exceeded, Lateral (msec)	0
Time, Accelerometer Range Exceeded, Normal (msec)	0

Deployment Command Data (Event Record 2)

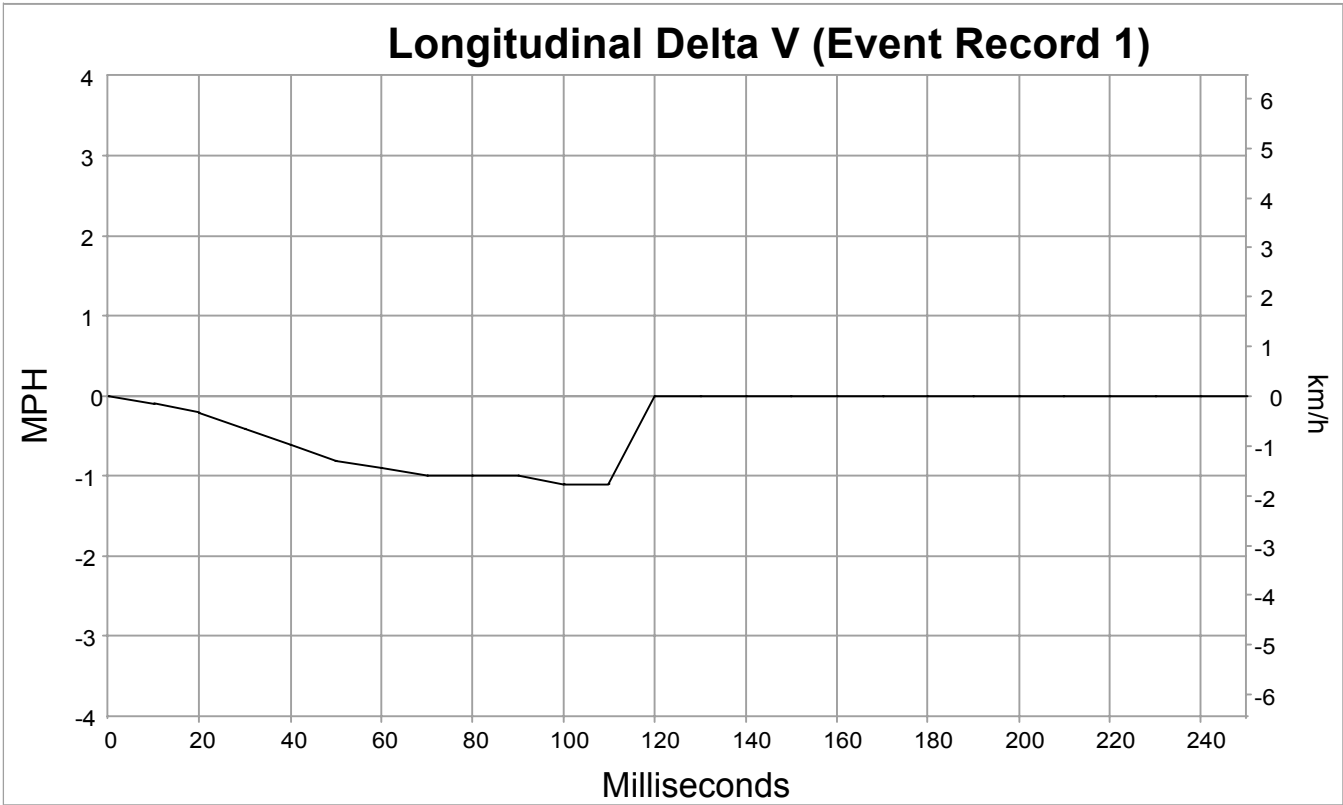|	
Pretensioner Deployment, Time to Fire, Driver (msec)	0
Pretensioner Deployment, Time to Fire, Right Front Passenger (msec)	0
Frontal Air Bag Deployment, Time to Deploy First Stage, Driver (msec)	0
Frontal Air Bag Deployment, Time to Deploy First Stage, Right Front Passenger (msec)	0
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (msec)	0
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (msec)	0
Side Air Bag Deployment, Time to Deploy, Driver (msec)	0
Side Air Bag Deployment, Time to Deploy, Right Front Passenger (msec)	0
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Driver Side (msec)	0
Side Curtain/Tube Air Bag Deployment, Time to Deploy, Right Side (msec)	0
Frontal Air Bag Deployment, 2nd Stage Disposal, Driver (Yes/No)	No
Frontal Air Bag Deployment, 2nd Stage Disposal, Right Front Passenger (Yes/No)	No

Pre-Crash Data -1 sec (Event Record 2)

Safety Belt Status, Driver	On
Safety Belt Status, Right Front Passenger	Off
Seat Track Position Switch, Foremost, Status, Driver	No
Occupant Size Classification, Right Front Passenger Airbag Suppressed (Yes/No)	Yes
Frontal Air Bag Warning Lamp (On, Off)	Off
Ignition Cycle, Crash	517

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

| Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal Position, % full	Service Brake (On, Off)	ABS Activity (On, Off)	Stability Control (On, Off, Engaged)	Steering Input (deg)	Engine RPM	PCM Derived Accelerator Pedal Position, % full
-5.0	76 [122]	14	Off	Off	On Non-Engaged	0	2,000	14
-4.5	76 [123]	7	Off	Off	On Non-Engaged	0	2,000	7
-4.0	76 [123]	12	Off	Off	On Non-Engaged	0	2,000	12
-3.5	77 [124]	14	Off	Off	On Non-Engaged	0	2,000	14
-3.0	77 [124]	16	Off	Off	On Non-Engaged	0	2,000	16
-2.5	77 [124]	9	Off	Off	On Non-Engaged	0	2,000	9
-2.0	77 [124]	10	Off	Off	On Non-Engaged	0	2,000	10
-1.5	77 [124]	13	Off	Off	On Non-Engaged	0	2,100	13
-1.0	77 [124]	12	Off	Off	On Non-Engaged	0	2,000	12
-0.5	77 [124]	0	On	Off	On Non-Engaged	10	1,900	0
0.0	77 [124]	0	On	On	On Engaged	25	800	0

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

Time Stamp (sec)	Cruise Control (Not Engaged/ Engaged)	Cruise Control (On/Off)
-5.0	Not Engaged	Off
-4.5	Not Engaged	Off
-4.0	Not Engaged	Off
-3.5	Not Engaged	Off
-3.0	Not Engaged	Off
-2.5	Not Engaged	Off
-2.0	Not Engaged	Off
-1.5	Not Engaged	Off
-1.0	Not Engaged	Off
-0.5	Not Engaged	Off
0.0	Not Engaged	Off

Longitudinal Delta V (Event Record 2)

Longitudinal Delta V (Event Record 2)

Time (msec)	MPH [km/h]
0	0 [0]
10	0 [0]
20	0 [0]
30	0 [0]
40	0 [0]
50	0 [0]
60	-1 [-1]
70	-1 [-1]
80	0 [0]
90	0 [0]
100	0 [0]
110	0 [0]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]

Lateral Delta V (Event Record 2)
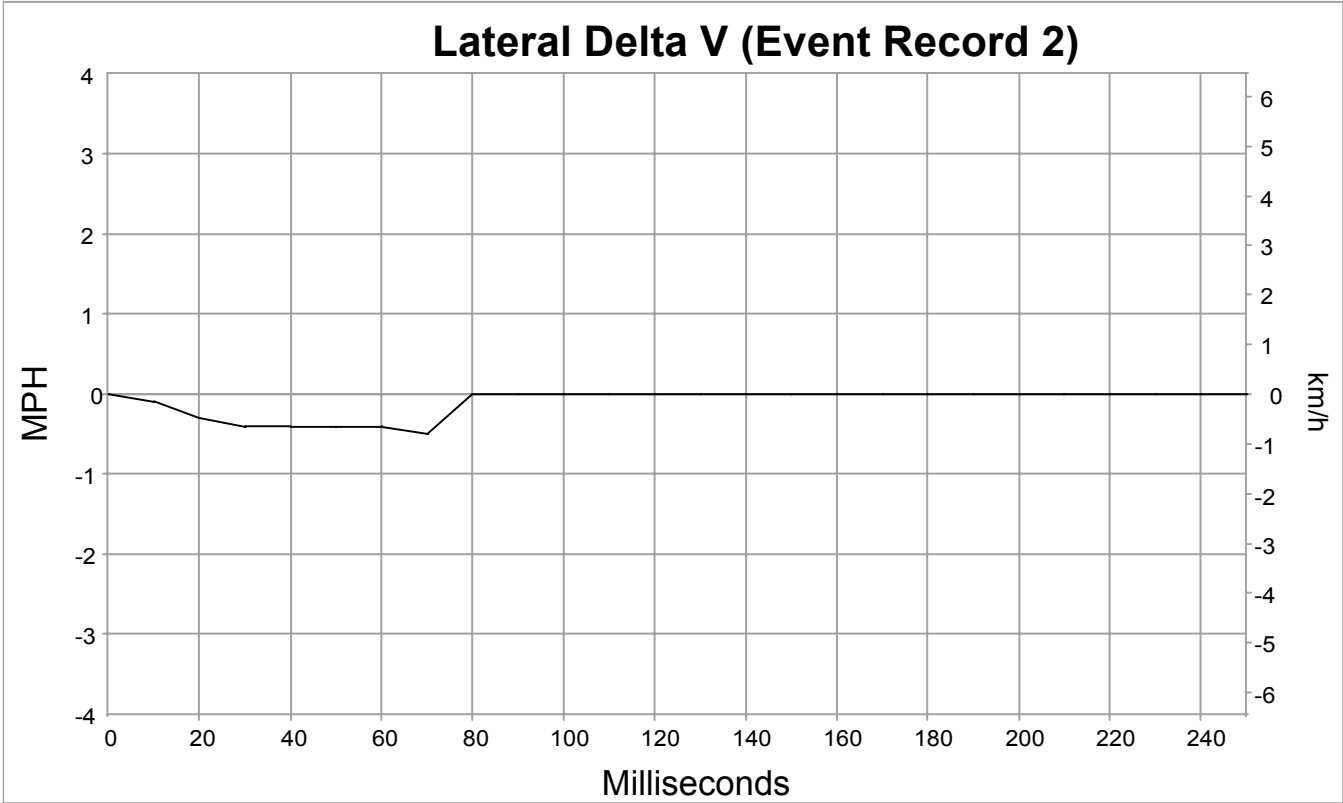
Lateral Delta V (Event Record 2)

Time (msec)	MPH [km/h]
0	0 [0]
10	-1 [-2]
20	-3 [-5]
30	-4 [-7]
40	-4 [-7]
50	-4 [-7]
60	-4 [-7]
70	-5 [-8]
80	0 [0]
90	0 [0]
100	0 [0]
110	0 [0]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]

Longitudinal Acceleration (Event Record 2)
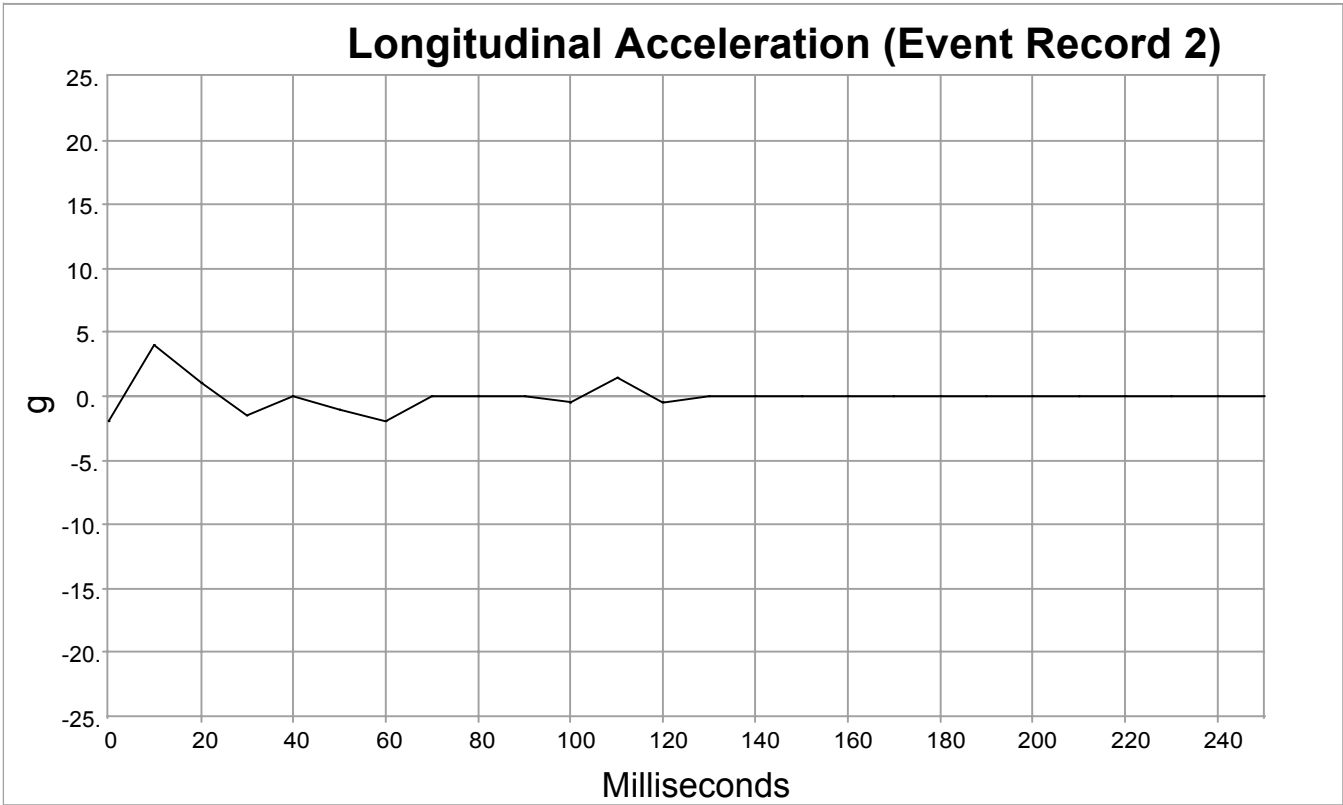
Longitudinal Acceleration (Event Record 2)

Time (msec)	g
0	-2.0
10	4.0
20	1.0
30	-1.5
40	0.0
50	-1.0
60	-2.0
70	0.0
80	0.0
90	0.0
100	-0.5
110	1.5
120	-0.5
130	0.0
140	0.0
150	0.0
160	0.0
170	0.0
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Lateral Acceleration (Event Record 2)
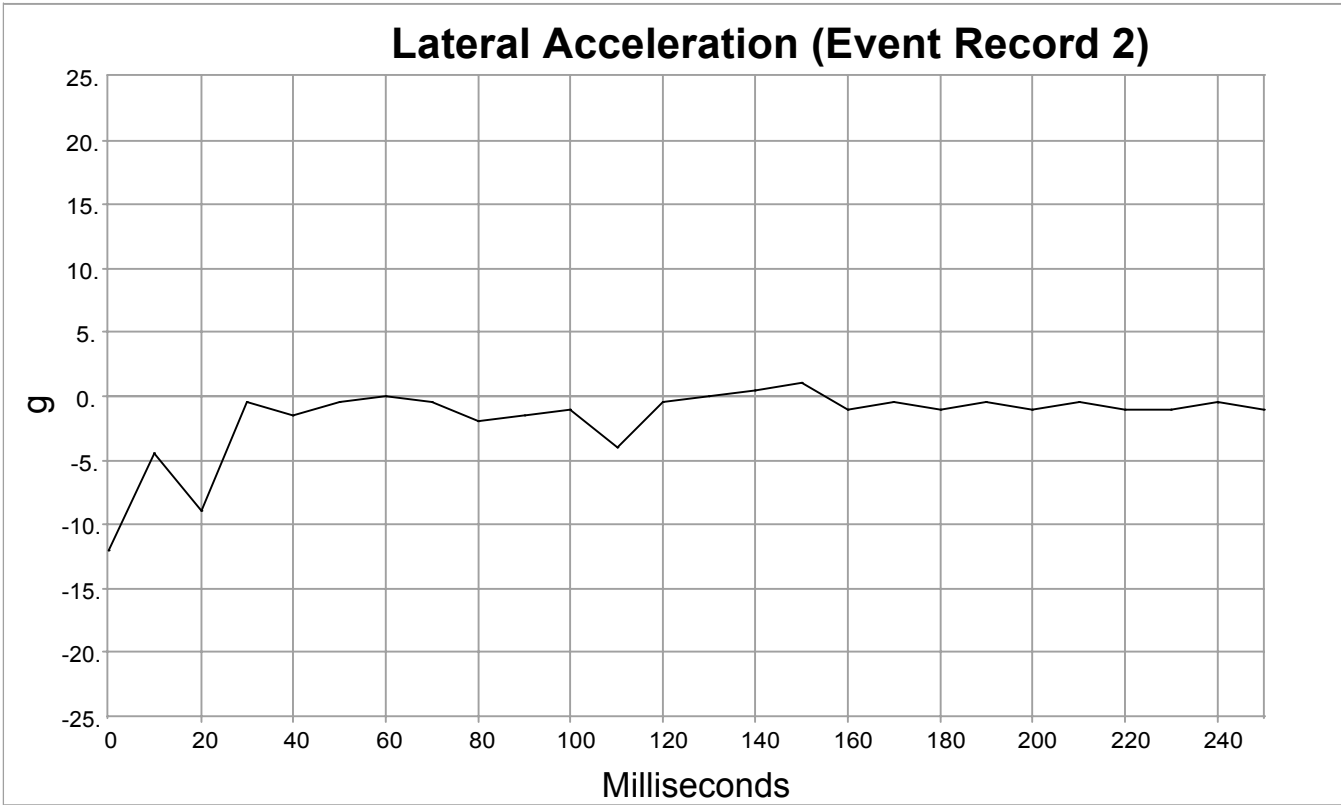
Lateral Acceleration (Event Record 2)

Time (msec)	g
0	-12.0
10	-4.5
20	-9.0
30	-0.5
40	-1.5
50	-0.5
60	0.0
70	-0.5
80	-2.0
90	-1.5
100	-1.0
110	-4.0
120	-0.5
130	0.0
140	0.5
150	1.0
160	-1.0
170	-0.5
180	-1.0
190	-0.5
200	-1.0
210	-0.5
220	-1.0
230	-1.0
240	-0.5
250	-1.0

Normal Acceleration (Event Record 2)
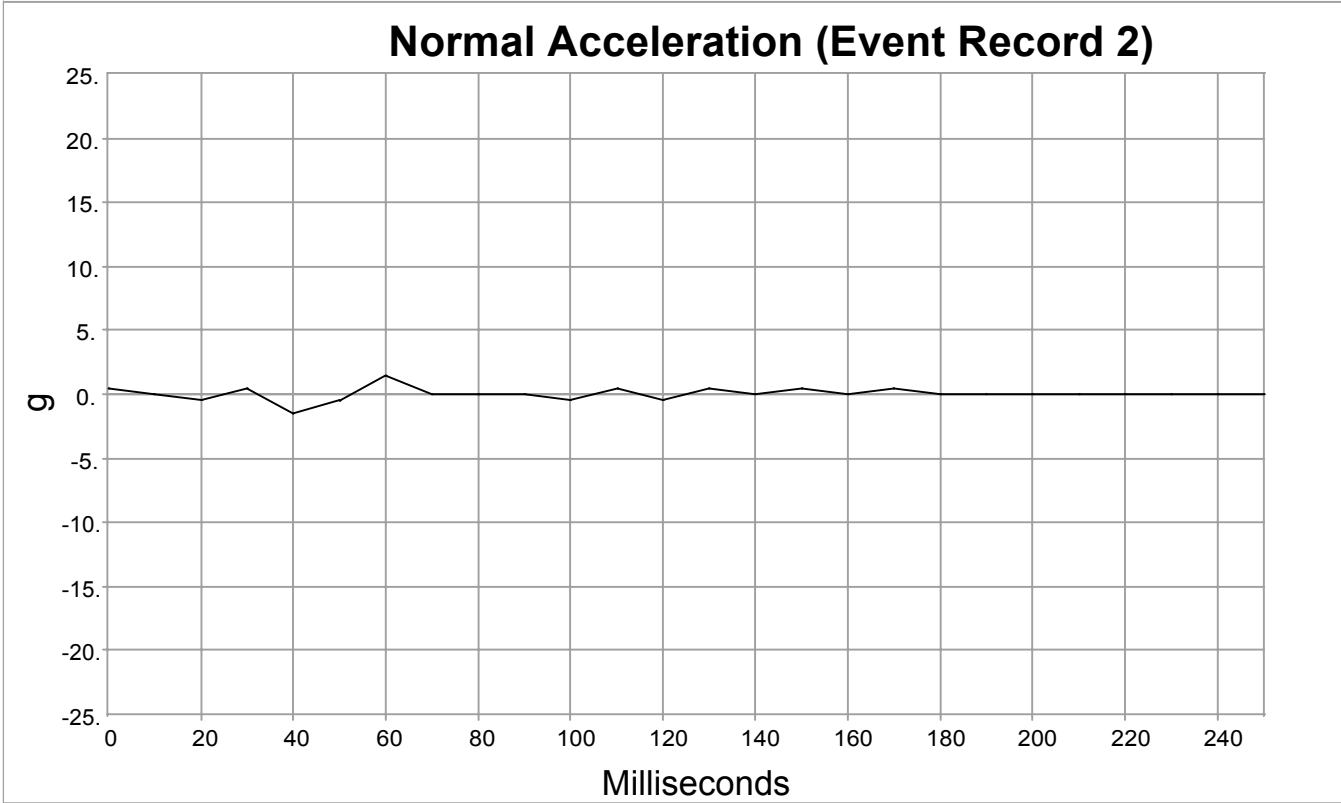
Normal Acceleration (Event Record 2)

Time (msec)	g
0	0.5
10	0.0
20	-0.5
30	0.5
40	-1.5
50	-0.5
60	1.5
70	0.0
80	0.0
90	0.0
100	-0.5
110	0.5
120	-0.5
130	0.5
140	0.0
150	0.5
160	0.0
170	0.5
180	0.0
190	0.0
200	0.0
210	0.0
220	0.0
230	0.0
240	0.0
250	0.0

Vehicle Roll Rate (Rollover Event Record)
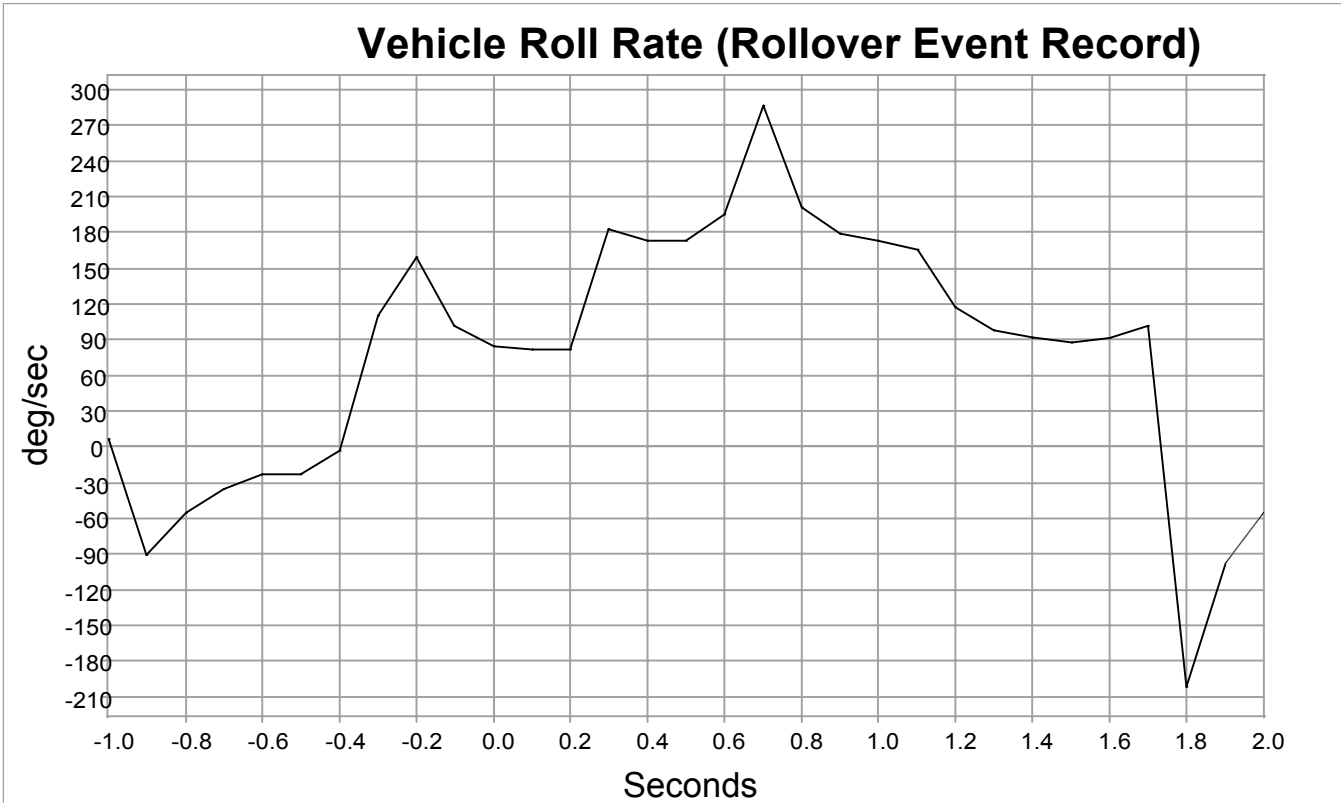
Positive roll rate indicates right-to-left (counterclockwise) rotation

Vehicle Roll Rate

Time (sec)	deg/sec	Time (sec)	deg/sec
-1.0	6.5	0.6	195.3
-0.9	-91.1	0.7	286.4
-0.8	-55.3	0.8	201.8
-0.7	-35.8	0.9	179.0
-0.6	-22.8	1.0	172.5
-0.5	-22.8	1.1	166.0
-0.4	-3.3	1.2	117.2
-0.3	110.7	1.3	97.7
-0.2	159.5	1.4	91.1
-0.1	100.9	1.5	87.9
0.0	84.6	1.6	91.1
0.1	81.4	1.7	100.9
0.2	81.4	1.8	-201.8
0.3	182.3	1.9	-97.7
0.4	172.5	2.0	-55.3
0.5	172.5		

Hexadecimal Data

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	20 0F 00 E9 02 06 22 00 00 00 00 00 00 00 00 00
	11 11 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 27
$8020	01 03 00 00 00 00 00 00 00 00 00 00 00 00 00 FC
$8021	AA 00 01 02 00 02 00 00 00 00 51 02 07 AA AA
$8022	AA 00 C0 78 66 00 00 00 1C 00 00 00 00 00 00 00
	00 2A 00 52 00 00 00 00 00 00 29 00 00 00 29 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
	11 00 00 00 00 00 00 00 00 00 00 00 00 00 00 BD
$8023	AA 00 C0 78 66 00 00 00 00 00 00 00 00 00 00 00
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	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
	11 00 00 00 00 00 00 00 00 00 00 00 00 00 00 A7
$8024	AA 00 FF 00 00 40 43 02 12 12 11 00 02 05 00 00
	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 96
$8025	AA 00 FF 00 00 40 43 02 12 12 11 00 02 05 00 00
	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 96
$8026	AA 01 FC 10 35 00 00 00 00 00 30 00 00 00 00 00
	7A 0E 00 14 0E 00 00 00 00 11 00 10 00 00 00 00
	7B 07 00 14 07 00 00 00 00 11 00 10 00 00 00 00
	7B 0C 00 14 0C 00 00 00 00 11 00 10 00 00 00 00
	7C 0E 00 14 0E 00 00 00 00 11 00 10 00 00 00 00
	7C 10 00 14 10 00 00 00 00 11 00 10 00 00 00 00
	7C 09 00 14 09 00 00 00 00 11 00 10 00 00 00 00
	7C 0A 00 14 0A 00 00 00 00 11 00 10 00 00 00 00
	7C 0D 00 15 0D 00 00 00 00 11 00 10 00 00 00 00
	7C 0C 00 14 0C 00 00 00 00 11 00 10 00 00 00 00
	7C 00 02 13 00 01 00 00 00 11 00 10 00 00 00 00
	7C 00 02 12 00 01 00 00 00 11 00 10 00 00 00 73
$8027	AA 01 FC 10 35 00 00 00 00 00 30 00 00 00 00 00
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	7B 07 00 14 07 00 00 00 00 11 00 10 00 00 00 00
	7B 0C 00 14 0C 00 00 00 00 11 00 10 00 00 00 00
	7C 0E 00 14 0E 00 00 00 00 11 00 10 00 00 00 00
	7C 10 00 14 10 00 00 00 00 11 00 10 00 00 00 00
	7C 09 00 14 09 00 00 00 00 11 00 10 00 00 00 00
	7C 0A 00 14 0A 00 00 00 00 11 00 10 00 00 00 00
	7C 0D 00 15 0D 00 00 00 00 11 00 10 00 00 00 00
	7C 0C 00 14 0C 00 00 00 00 11 00 10 00 00 00 00
	7C 00 02 13 00 01 00 00 00 11 00 10 00 00 00 00
	7C 00 05 08 00 25 00 00 00 11 00 10 00 00 00 56
$8028	AA 00 00 FE FC FA F7 F3 F2 F0 F0 F0 EF EF 00 00
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	00 00 00 00 00 00 00 00 EF 2F 00 00 00 00 00 BA
$8029	AA 00 00 00 00 00 00 FF FF 00 00 00 00 00 00 00
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	00 00 00 00 00 00 00 00 FF 1E 00 00 00 00 00 3B
$802A	AA 00 00 FF FD FB F6 F0 E9 E8 E8 E9 E9 E9 00 00
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              00 00 00 00 00 00 00 00 E8 1A 00 1D 00 00 00 E6

$802B         AA 00 00 FE FB F9 F9 F9 F9 F8 00 00 00 00 00 00
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              00 00 00 00 00 00 00 00 F8 1F 00 1F 00 00 00 4B

$802C         AA 01 EF F6 F4 E7 F1 01 F8 FA 00 FF FC 00 FF 00
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$802D         AA 01 FC 08 02 FD 00 FE FC 00 00 00 FF 03 FF 00
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              00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 57

$802E         AA 01 F7 05 EE EA C7 DA F0 01 FB 08 00 00 FE FE
              FE FF FE FF 00 00 00 F5 EC EE FF 00 00 00 00 00
              00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 28

$802F         AA 01 E8 F7 EE FF FD FF 00 FF FC FD FE F8 FF 00
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              00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 AD

$8030         AA 01 FF FD FC 02 00 FF FC FE FB 03 04 00 FF 01
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$8031         AA 01 01 00 FF 01 FD FF 03 00 00 00 FF 01 FF 01
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$8007         AA 00 00 00 00 00 00 00 0E 00 00 00 00 00 00 00
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$803F         AA 01 00 30 80 80 00 00 00 00 00 00 00 00 00 00
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$8011         AA 01 C4 2F E0 00 00 00 00 01 27 16 00 00 00 10
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$8012         AA 00 5D 04 8B 07 1D 06 6C 0C 87 80 20 50 A7 00
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              02 00 0F 00 00 3F 12 00 00 00 00 00 00 00 00 00
              00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 9E

$8013         AA 01 C4 2F E0 00 00 00 00 01 27 16 00 00 00 10
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              00 00 00 00 00 00 00 00 00 AC

$8014         AA 00 58 13 E1 00 00 1E EA 00 00 80 20 50 44 00
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              00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 88
              22 0F 0F 23 12 E7 13 00 00 00 00 00 00 00 00 00
              00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 91

$8015         AA 01 C4 2F E0 00 00 00 00 01 27 16 00 00 00 10
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$8016         AA 00 01 42 06 43 12 BB 00 00 00 71 FA 3D 00 00
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$8017        AA 01 C4 2F E0 00 00 00 00 01 27 16 00 00 00 10
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$8018        AA 00 01 43 02 9D 10 37 00 00 00 5F 04 75 00 00
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$8019        AA 01 C4 2F E3 10 BF 80 00 01 27 16 00 00 00 10
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$801A        AA 00 42 80 00 08 00 00 1B 12 00 00 1B 12 00 00
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             00 00 F6 02 00 00 00 00 00 00 00 00 00 00 00 00
             01 A6 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
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$801B        AA 00 02 E4 EF F5 F9 F9 FF 22 31 1F 1A 19 19 38
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             EF 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
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             FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

$8001        AA 00 C4 18 00 00 00 00 36 36 00 00 00 30 00 00
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$8002        AA 01 E0 FE F8 FF 00 00 02 80 3F 00 00 00 00 00
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             00 2C 00 04 0C FC 20 00 00 00 00 00 00 00 00 A8
             05 C5 00 01 9E 04 26 00 00 00 00 00 00 00 00 6D
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$8008        Not Used

$8009        AA 01 B7 F8 AA AA AA AA 00 00 01 00 08 FF FD 07
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$800A        AA 00 00 31 00 00 41 CC 93 11 9D 41 B0 9A A0 07
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$8010        AA 00 F8 F8 F8 F8 E0 E0 E0 E3 00 00 00 00 00 00
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$8043      AA 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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$8044      AA 00 FF 00 80 82 7F 7F 80 7F 80 7E 00 00 00 00
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$8045      AA 00 B4 00 75 00 78 5B 00 00 00 00 00 00 00 00
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$8046      AA 00 C0 00 00 00 00 00 00 00 00 00 00 00 00 00
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$8051      12 81 02 00 98 71 03 00 98 72 03 00 B3 21 01 00
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$8052      03 33 15 15 01 15 15 01 65 00 00 00 00 00 00 00

$8053      94 54 24 00 00 00 00 00 00 00 00 00 00 00 00 00

$8054      AA 00 E2 5F 28 E9 E2 5F 28 E9 00 00 00 00 00 00
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$8062      AA 01 FF F0 3F 00 00 00 00 00 00 00 00 00 00 00
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$8063   AA 00 FF FF 00 00 00 00 00 00 00 00 00 00 00 00
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$8064   AA 00 F0 32 00 00 00 00 00 00 00 00 00 00 00 00
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$8065   AA 00 FF F0 F0 CC 00 00 00 00 00 00 00 00 00 00
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$8070          AA 00 00 00 00 00 00 00 00 00 00 00 00 18 00 00
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$8071          AA 00 F3 FF F0 0F 00 00 00 00 00 00 00 00 00 00
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               02 05 83 83 00 00 00 00 00 00 00 00 00 40 02 0C
               7B 7B 5C 5C 00 00 02 00 01 FF 02 03 02 01 02 06
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               02 04 83 83 00 00 00 00 00 00 00 00 00 40 02 0C
               05 05 5C 5B 00 00 02 00 02 00 02 03 02 01 02 06
               02 04 83 83 00 00 00 00 00 00 00 00 00 40 00 0C
               05 05 5C 5C 00 00 02 00 02 00 02 03 02 02 02 06
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               05 05 5C 5C 00 00 02 00 01 FF 02 03 02 02 02 06
               02 05 83 83 00 00 00 00 00 00 00 00 00 40 00 0C
               05 05 5C 5B 00 00 02 00 01 FF 02 03 02 02 02 06
               02 05 83 83 00 00 00 00 00 00 00 00 00 40 00 0C
               05 05 5C 5C 00 00 02 00 02 00 02 03 02 02 02 06
               02 05 83 83 00 00 00 00 00 00 00 00 00 40 00 0C
               05 05 5C 5C 00 00 02 00 02 00 02 03 02 01 02 06
               02 05 83 83 00 00 00 00 00 00 00 00 00 40 00 0C
               7C 05 5C 4D 00 00 02 00 02 00 02 03 02 01 02 06
               02 05 83 83 00 00 00 00 00 00 00 00 00 40 00 0C
               7A 77 5C 5B 00 00 02 00 01 FF 02 03 02 02 02 06
               02 05 83 83 00 00 00 00 00 00 00 00 00 40 00 0C

$8072          AA 00 FF F9 00 00 00 00 00 00 00 00 00 00 00 00
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$E600          2D CB

$E604          01 00 00 00

$F100          00 00 00 00

$F110          0E 37 37 39 36 30 54 42 41 41 30 33 30 4D 32 00
               00

$F112          0B 43 31 48 42 30 48 39 30 51 33 41 00 00 00 00
               00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

$F181          37 37 39 35 39 2D 54 42 41 2D 41 30 33 30 00 00
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DOT HS 812 792
June 2020

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**