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

NHTSA

DOT HS 812 191 October 2021

Special Crash Investigations: Guardrail End Terminal Crash Investigation; Vehicle: 2017 Ford F-250; Location: California; Crash Date: July 2017

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Suggested APA Format Citation:

Dynamic Science, Inc. (2021, October). *Special crash investigations: Guardrail end terminal crash investigation; Vehicle: 2017 Ford F-250; Location: California; Crash date: July 2017* (Report No. DOT HS 813 191). National Highway Traffic Safety Administration.

Technical Report Documentation Page

1. Report No. DOT HS 813 191	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Special Crash Investigations: Guardrail End Terminal Crash Investigation; Vehicle: 2017 Ford F-250; Location: California; Crash Date: July 2017		**5. Report Date** October 2021 **6. Performing Organization Code**
7. Author Dynamic Science, Inc.		**8. Performing Organization Report No.** DS17011
9. Performing Organization Name and Address Dynamic Science, Inc. 26141 Marguerite Parkway, Suite C Mission Viejo, CA 92692		**10. Work Unit No. (TRAIS)** **11. Contract or Grant No.** DTNH22-12-C00271
12. Sponsoring Agency Name and Address National Highway Traffic Safety Administration 1200 New Jersey Ave SE Washington, DC 20590		**13. Type of Report and Period Covered** Technical Report Crash Date: July 2017 **14. Sponsoring Agency Code**

15. Supplementary Notes

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

16. Abstract

This single-vehicle crash occurred during the early morning hours on an on-ramp to a southbound state highway in California in July 2017. The investigation was conducted at the request of the Federal Highway Administration. The Ford F-250 pickup was being driven southbound by a belted 36-year-old male with no other occupants. For unknown reasons, the Ford traveled off the right edge of the roadway and struck the guardrail, including the ET-Plus end terminal, several posts, and the W-beam. The Ford continued traveling on the field side of the guardrail and struck a large concrete pier supporting an overpass. The Ford sustained major severity damage to the front plane and was towed due to damage. The driver sustained police-reported "A" (incapacitating) severity injuries and was transported by ambulance to a local hospital.

17. Key Words guardrail end terminal, air bag, deployment, injury	**18. Distribution Statement** This document is available to the public from the National Technical Information Service, www.ntis.gov/.

19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 54	**22. Price**

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

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Guardrail End Terminal Crash Investigation
Case Number: DS17011
Vehicle: 2017 Ford F-250
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Background

This report documents the guardrail end terminal crash investigation of a 2017 Ford F-250 (Figure 1) that struck an ET-Plus guardrail end terminal (Figure 2) and a concrete pier, resulting in serious injuries to the driver. The investigation is intended to determine what role the guardrail may have played in causing the injuries to the driver. This case was initiated by the California Department of Transportation (Caltrans) that notified the Federal Highway Administration (FHWA) of the crash. The investigation was conducted at the request of the Federal Highway Administration. After reviewing the case and determining that the ET-Plus guardrail end terminal qualified and that the case was of interest, the FHWA forwarded the notification, along with on-scene images to the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration with instructions to deploy the SCI team. SCI assigned the case to Dynamic Science, Inc., in July 2017. That same day, the SCI team conducted an on-scene inspection of the damaged guardrail and end terminal. Caltrans personnel were present during the scene inspection to provide lane closure using two trucks and traffic cones.

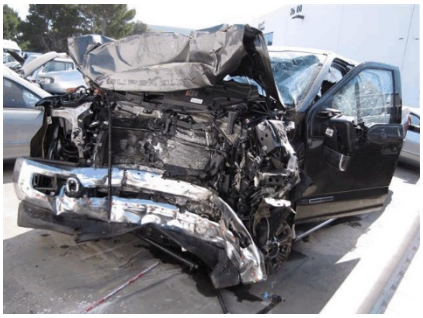


Figure 1. The 2017 Ford F-250

Figure 2. ET-Plus and extruded W-beam (Caltrans photo)

This was a single-vehicle crash in which the Ford pickup departed a State highway on-ramp on the right edge and struck the guardrail end terminal and a concrete overpass pier. The guardrail sustained 6.3 m (20.8 ft) of damage, including extrusion of the W-beam. The Ford was towed due to damage to a lot, where the vehicle inspection was completed in July 2017. The Ford was supported by the Bosch Crash Data Retrieval system, and the Ford's Event Data Recorder (EDR) was imaged during the inspection.

This single-vehicle crash occurred during the dark early morning hours on an on-ramp to a southbound State highway in California in July 2017. The Ford was being driven southbound by a belted 36-year-old male with no other occupants in the vehicle. For unknown reasons, the Ford traveled off the right edge of the roadway and struck the guardrail, including the ET-Plus end terminal, several posts, and the W-beam. The Ford continued traveling on the field side of the

guardrail and struck a large concrete pier supporting an overpass. The pickup sustained major severity damage to the front plane and was towed due to damage. The driver sustained police-reported “A” (incapacitating) severity injuries and was transported by ambulance to a local hospital.

Summary

Crash Site

The crash site was a two-lane on-ramp to a southbound State highway (Figure 3). The roadway curved left in a radius measuring 466.0 m (1,529.0 ft) at the right fog line. The roadway orientation changed from left curve to straight at Post 5, approximately 8.0 m (26.0 ft) south of the guardrail end terminal. The roadway profile was an uphill positive slope measuring 8.2 percent with a positive super-elevation measuring 6.0 percent. The roadway, paved with asphalt in good condition, was dry at the time of the crash. The two travel lanes measuring 3.5 m (11.5 ft) wide were separated by a dashed white painted stripe. The roadway was bordered by a solid white painted fog line on the right and a solid yellow painted fog line on the left. The right edge was bordered by a paved asphalt shoulder measuring 2.2 m (7.2 ft) wide followed by a paved asphalt drainage swale measuring 1.7 m (5.6 ft) wide. The swale descended from the shoulder at a negative slope of 18 percent measured lateral to Post 1 of the guardrail. All the guardrail posts were located on the swale. On the field side of the swale, an unpaved ascending embankment had an uphill slope measuring 58.3 percent.

Figure 3. Crash site looking north to guardrail end terminal

The posted speed limit was 105 km/h (65 mph). Conditions were dark without illumination, overcast, and dry. The weather at the nearest reporting station was 20.0 °C (68.0 °F), 87 percent humidity, clear, and calm winds. Crash diagrams are included at the end of this report.

Pre-Crash

The Ford was traveling southbound in the first lane from the right at an EDR-reported speed of 107.7 km/h (65.1 mph) at time 0.0 second. The EDR report indicated the driver was applying steady pressure to the accelerator pedal, steering slightly left and not actively braking. The Ford's cruise control was not engaged. For unknown reasons, the Ford departed the roadway at a shallow angle trajectory on the right edge and traveled first onto the paved shoulder and then onto the drainage swale. The Ford's pre-crash speed and distances traveled during the EDR-reported time stamps beginning at time -5.0 seconds and ending at Time 0.0 second are stated in the table on the next page.

Time Stamp (seconds)	Vehicle Speed mph (km/h)	Incremental Distance Traveled m (ft)	Cumulative Distance Traveled m (ft)
-5.0	65.7 (106)	NA	NA
-4.5	65.8 (106)	14.7 (48.3)	14.7 (48.3)
-4.0	65.9 (106)	14.7 (48.3)	29.4 (96.6)
-3.5	66.3 (107)	14.7 (48.3)	44.1 (144.9)
-3.0	66.4 (107)	14.9 (48.8)	60.1 (193.7)
-2.5	66.6 (107)	14.9 (48.8)	75.1 (242.5)
-2.0	66.6 (107)	14.9 (48.8)	90.1 (291.3)
-1.5	66.7 (107)	14.9 (48.8)	105.1 (340.1)
-1.0	66.8 (108)	14.9 (48.8)	120.1 (388.9)
-0.5	67.1 (108)	15.0 (49.2)	135.1 (438.1)
0	67.6 (109)	15.0 (49.2)	150.1 (487.3)

The Ford's EDR-reported pre-crash driver input status at time 0.0 second is stated in the table below:

Time (sec) 0.0 at Event	Speed, Vehicle Indicated (km/h [mph])	Accelerator Pedal (%)	Service Brake Activation	Engine rpm
First Record	109 (67.6)	44.0	Off	2,040

Crash

The crash included two events: the guardrail end terminal impact and an overpass pier impact. The EDR report recovered four events, all of which were captured in a single First Record: a locked frontal event, a locked side event, a locked rollover event, and a fuel cutoff level 1. The Ford's front plane struck the ET-Plus guardrail end terminal (Figure 4) in a head-on configuration (Event 1) at an EDR-reported speed of 109.0 km/h (67.6 mph). The end terminal yielded when a section of the metal W-beam measuring 221 cm (87.0 in) long extruded through the head, and the first four guardrail posts fractured. The rail kinked in four places, beginning at Post 2 and ending at Post 5. The driver and front passenger frontal air bags deployed the first stage at impact at an EDR-reported time of 267 ms. The driver's retractor pretensioner actuated at the time. The Ford reached its EDR-reported maximum longitudinal delta V for the guardrail impact at 272 ms, and the driver's anchor pretensioner actuated soon at 273 ms. The Ford was displaced right to the field side of the guardrail and traveled in a southbound trajectory along an unpaved ascending embankment. The embankment sloped upward at a 30.3-degree angle, and

the Ford's EDR report indicated a maximum vehicle roll angle of -30.98 degrees (left-side leading).[1]

The Ford continued traveling southbound until the front plane struck a large concrete pier supporting an overpass (Figure 5) (Event 2). The pier measured 2.4 m (8.0 ft) in diameter and was located 25.4 m (83.3 ft) east of Post 1. The Ford's left and right seat-mounted side air bags and IC air bags deployed at 1,062 ms and triggered in response to the severe frontal impact with the pier. The pier impact was the more severe of the two events, and damage to the Ford's frontal plane caused in the second event overlapped and masked the damage caused by the first event. The Ford's right-side tires deposited a furrow mark in the embankment measuring 20.6 m (67.6 ft) that ended 1.8 m (5.9 ft) south of the point of impact, indicating that the Ford was displaced slightly right after impacting the pier. The Ford came to rest on the embankment and facing south near the pier.

Figure 4. ET-Plus impact head end terminal

Figure 5. Struck overpass pier, looking south on field side of guardrail

Damage to the frontal plane of the Ford caused during the two events could not be separated and the measured crush profile represented overlapping damage. The barrier algorithm of the WinSMASH program calculated a total delta V of 110 km/h (68 mph), a longitudinal delta V of -109 km/h (-68 mph), a lateral delta V of -19 km/h (-12 mph), and a barrier equivalent speed of 110 km/h (68 mph). For Event 1, the Ford's EDR reported a maximum longitudinal delta V of -17.35 km/h (-10.78 mph) and a maximum lateral delta V of 3.60 km/h (2.24 mph). For the purpose of calculating velocity changes for the pier impact, the EDR-reported velocity changes (for Event 1) were subtracted from the WinSMASH velocity changes (for overlapping damage Event 1 and Event 2) and the results were as follows: longitudinal delta V was -92 km/h (-57 mph), and lateral delta V was -15 km/h (-9 mph). The results appear reasonable.

Post-Crash

All four doors were jammed shut. Damage patterns at the left B-pillar indicated that the driver's door was forced open by emergency responders. The driver sustained major head trauma, and

[1] According to the CDR report data limitations, under roll sensor data, vehicle roll angle, a positive roll angle is counter-clockwise when the Ford is observed from the front.

tow company employees indicated that the driver was unconscious. He was removed from the Ford by emergency responders due to his injury severity and transported by ambulance to a local hospital, where he was admitted for treatment. The police report indicated that the driver was operating the Ford while under the influence of an unspecified drug. The Ford was towed due to damage.

Guardrail End Terminal Discussion

The guardrail end terminal in this crash was an ET -Plus extruder-type end terminal. The rectangular impact face measured 71 x 38 cm (28.0 x 15.0 in) and the guide chute exit measured 50 cm (20.0 in) high. The ET-Plus was configured with a metal ground strut measuring 190 cm (75.0 in) long located between Posts 1 and 2, an anchor cable attached to Post 1 and an anchor bracket attached to the W-beam between Posts 1 and 2. The wooden guardrail Posts 1 to 8 measured 15 x 20 cm (6.0 x in); the I-beam configured steel Posts 8 to 12 measured 15 x 10 cm (6.0 x 4.0 in). All the posts were assembled with wood offset blocks measuring 15 x 20 cm (6.0 x 8.0 in). Post spacing averaged 180 cm (71.0 in), and W-beam height measured top to ground was 69 cm (27.0 in).

Figure 6. Guardrail impact damage looking south, Post 1 in the foreground

At impact with the guardrail end terminal, a section of the W-beam measuring 2.2 m (7.2 ft) long extruded on the traffic side of the guardrail. The W-beam kinked in three areas beginning at Post 2 and ending at Post 5, and the total damaged length of W-beam measured 6.0 m (19.7 ft). The guardrail impact head, anchor cable, and bracket were displaced. Posts 1 to 4 were fractured through, and the remaining posts were undamaged (Figure 6). The Ford was displaced to the field side of the guardrail and continued traveling in an eastbound trajectory until it struck an overpass pier where it came to rest. The complete In-Service End Terminal Evaluation Data Collection Forms are included in this report as Appendix A.

2017 Ford F-250

Description

The 2017 Ford F-250 was a 4-door light truck with a crew cab and long wheelbase. The vehicle, manufactured in December 2016, was identified using the Vehicle Identification Number 1FT7W2BT1HExxxxxx. The odometer was electronic, and the mileage was unknown due to the absence of power. The Ford manufacturer-recommended size for tires was LT275/70R18 with a recommended pressure of 60 psi (420 kPa) for the front and 65 psi (450 kPa) for the rear. The Ford had Goodyear Wrangler tires of size LT275/75R18. The tire identification numbers (TIN) indicated a manufacture date of December 2016.

The Ford had two rows of seating for six occupants. The front row had bucket seats with adjustable head restraints for the outboard occupants and a center seat, which, with the seat back folded forward, served as an armrest and storage compartment. It was in this configuration at the time of the crash. The driver's seat cushion moved left and rearward during the crash, and the seat track setting for the driver was unknown. The seat back and head restraints were not damaged.

Figure 7. Crush profile front plane, the 2017 Ford F-250

Exterior Damage

The Ford sustained major severity front plane damage during the crash. The Ford struck two objects off-road, the ET-Plus guardrail end terminal and a concrete overpass pier. The more severe damage was caused by the impact with the bridge pier. Damage caused by the guardrail impact was overlapped and could not be separated (Figure 7). The Collision Deformation Classification (CDC) for the Ford in Event 1 was 12F9EN99. The Ford had a steel front bumper which was used to obtain crush measurements. Direct damage began 5 cm (2.0 in) right of the front-left bumper corner and extended laterally 174 cm (78.0 in) to the right ending 10 cm (3.9 in) left of the front-right bumper corner. Direct damage began at frame level and extended vertically above the belt-line ending on the hood. The Field L extended from bumper corner to bumper corner and measured 174 cm (68.5 in). Twenty-three measurements in 10 cm (3.9 in) increments were taken at bumper level by the Nikon Total Station, and the Faro Blitz program computed crush measurement in six increments as follows: C_1 = 134 cm (52.8 in), C_2 = 154 cm (60.6 in), C_3 = 150 cm (59.0 in), C_4 = 134 cm (52.8 in), C_5 = 89 cm (35.0 in), and C_6 = 48 cm

(18.9 in). Maximum crush was located 55 cm (21.7 in) right of the front-left bumper corner. The observed principle direction of force (PDOF) was 350 degrees, and the CDC for the Ford in Event 2 was 12FDEW5.

Event Data Recorder

The Ford's EDR was imaged during the inspection by SCI using the direct-to-module method. The report was imaged and reported using Bosch CDR tool version 17.4 and reported using version 19.0. The complete EDR report is included in this report as Appendix B.

According to the data limitations, the restraints control module (RCM) can store up to two crash events, including the following types: non-deployment trigger event, air bag deployment event, and non-air bag deployment event. The EDR report included one event (First Record), which recovered a locked frontal event, a locked side event, a locked rollover event, and a fuel cutoff Level 1.

The EDR report included system status at retrieval, system status at event, faults present at start of event deployment data, pre-crash data -1 sec, pre-crash data tables (2 samples/sec, 4 samples/sec, 5 samples/sec, and 10 samples/sec), longitudinal and lateral crash pulse, and vehicle roll angle.

For the First Record, the deployment data included air bag deployment times for the six deployed air bags (two each for frontal, side, and IC), and two actuated seat belt pretensioners. It reported a maximum longitudinal delta V of -17.35 km/h (-10.78 mph) at 272.0 ms.

Pre-crash data at -1 second for this event were summarized at Time Stamp -0.1 second as follows:

- Seat Belt Status, Driver: Buckled
- Frontal Air Bag Warning Lamp: Off
- Brake Telltale: Off
- ABS Telltale: Off
- ESC/TC Telltale: Off

Additionally, the pre-crash data tables indicated that, at impact with the guardrail end terminal, the driver was actively accelerating at 44.0 percent full and steering left at 16.6 degrees. The service brake and cruise control were "Off."

Data for vehicle roll angle indicated that the Ford attained a maximum left-side leading roll angle of -30.98 degrees as it pitched left while on the embankment prior to the pier impact.

Interior Damage

The Ford's interior sustained major severity damage caused by the impact forces, occupant contacts, and air bag deployments. All four doors were jammed shut. The driver's door was forced open during extrication efforts, and two other doors were forced open during the inspection. The windshield was fractured and in place, and the front-left window and backlight were disintegrated. The left and center aspects of the instrument panel were fractured and

displaced by impact forces. Driver contact caused steering wheel rim deformation in all four quadrants and steering column displacement to the left and upward. The top half of the steering wheel rim was bent 10 cm (3.9 in) forward, and the steering wheel rim was displaced 15 cm (5.9 in) to the left (Figure 8). Driver loading caused scuffing and stretching of the seat belt webbing. Driver loading caused seat cushion movement at the left aspect of 6 cm (2.4 in) and seat back movement at the left aspect 5 cm (2.0 in) outboard and rearward of their original positions. The Ford sustained front-row longitudinal intrusion of the left, center, and right instrument panel, the left and right toe pans, and the accelerator and brake pedals.

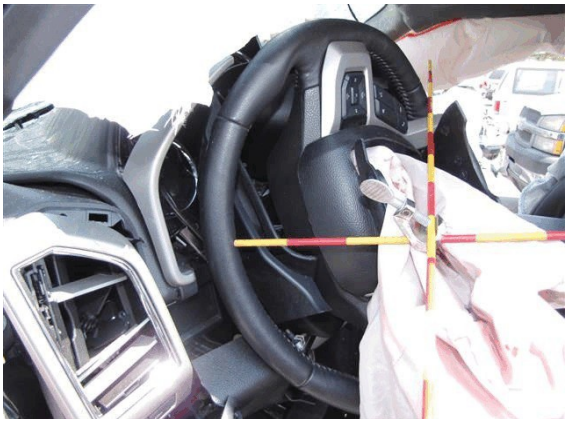


Figure 8. Bent steering wheel rim, driver contact point, the 2017 Ford F-250

Figure 9. Scuffed and stretched seat belt, driver loading point, the 2017 Ford F-250

Manual Restraint Systems

The front row of the Ford was equipped with driver and front 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 upper anchor that was adjusted to the full-down position. The front-row seat belts were equipped with retractor-mounted and anchor-mounted seat belt pretensioners. The Ford inspection, combined with the EDR report, determined that the driver was belted and both pretensioners actuated during the crash. The EDR report indicated that the driver's seat belt pretensioner actuated at the retractor position at 267 ms at impact with the guardrail end terminal and at the anchor position at 274 ms. Driver loading of the seat belt webbing caused scuff marks and stretch marks extending from 110 cm to 165 cm (43.3 in – 65.0 in) above the stop loop (Figure 9).

Supplemental Restraint Systems

The Ford's supplemental restraint systems (SRS) included a restraints control module (RCM), driver's and passenger's frontal air bags, seat-mounted front-row side-impact air bags, and front- and second-row combination roll-sensing/side-impact IC air bags. All the air bags deployed during the crash. The frontal air bags deployed at impact with the guardrail end terminal at an EDR-reported time of 267 ms. The left and right seat-mounted side air bags and the left and right IC air bags deployed at 1,062 ms when the Ford traveled off-road on an uphill slope measuring 58.3 percent. It is probable that the steep angle at which the Ford was leaning caused the system to sense an impending rollover event and trigger deployment of the side air bags and curtains.

The driver's frontal air bag deployed from the steering wheel hub at an EDR-reported time of 267 ms. This air bag likely deployed at impact with the guardrail end terminal. It exhibited blood deposits on the left aspect of the front and back panels. The driver likely loaded this air bag with his face and head. He sustained head trauma, including facial fractures and cerebral bleeding.

The driver's left seat-mounted side air bag deployed from the outboard aspect of the front-row seat back at an EDR-reported time of 1,062 ms. This air bag deployed simultaneously with the IC air bags and was probably triggered by the system sensing a likely rollover when the Ford traveled on the embankment. The seat-mounted side air bag revealed blood deposits on the middle and upper aspects of the inboard panel.

The left IC air bag deployed from the left roof-side rail over the front and second rows at an EDR-reported time of 1,062 ms. In its deflated state, the air bag covered the entire front- and second-row side glass. The forward aspect of the air bag was cut away by responders during the post-crash extrication efforts to remove the driver from the Ford. The bottom edge of the IC air bag revealed blood deposits.

NHTSA Recalls and Investigations

A search last queried in July 2019 using the Ford's VIN revealed no open recalls.

2017 Ford F-250 Occupant

Driver Demographics

Age/sex:	36 years/male
Height:	183 cm (72 in)
Weight:	77 kg (170 lb)
Eyewear:	Unknown
Seat type:	Bucket with adjustable head restraint
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder seat belt
Usage source:	Vehicle inspection, EDR report
Air bags:	Driver's frontal air bag, seat-mounted side air bag, and IC air bag, deployed
Alcohol/drug data:	Positive for unspecified drug
Egress from vehicle:	Entrapped, extrication required, removed by emergency responders due to serious injuries
Transport from scene:	Ambulance to a local hospital
Type of medical treatment:	Admitted for an unknown length of time

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Hemorrhage, cerebrum	140629.3	Steering wheel rim	Probable
2	LOC 20 minutes	161004.2	Steering wheel rim	Probable
3	Fracture NFS, right wrist	751900.2	Left IP	Probable
4	Fracture NFS, left wrist	751900.2	Left IP	Probable
5	Fracture NFS, right ankle	852002.2	Left toe pan	Probable
6	Fractures NFS, face	250400.1	Steering wheel rim	Probable
7	Abrasions NFS	910200.1	Unknown	Unknown

Source: EMS report, police report.

Driver Kinematics

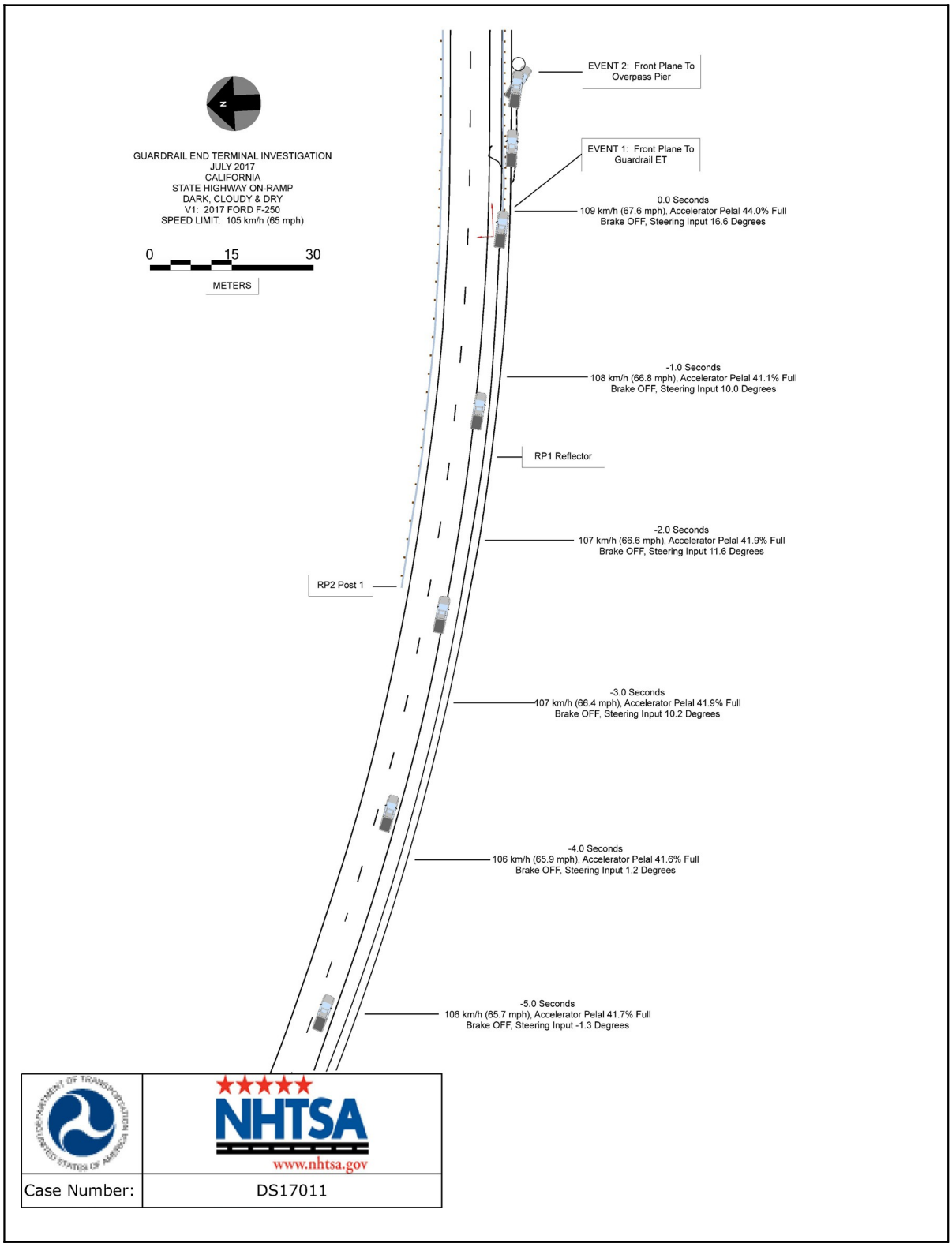
The belted 36-year-old male driver was seated in an unknown posture. He was reported by the police to be driving under the influence of an unspecified drug. For unknown reasons, the Ford departed the roadway on the right edge. At impact with guardrail end terminal, the driver was displaced forward in response to the direction of force. His frontal air bag deployed, and his seat belt pretensioners actuated. He continued to be displaced forward, which loaded the actuated seat belt and deployed frontal air bag. The Ford was displaced right to the field side of the guardrail and laterally traversed an ascending unpaved embankment in a left-side leading tilt of

approximately -30 degrees. The driver was displaced by gravitational forces to the left in response to the orientation of the Ford. At impact with the pier, the Ford's left seat-mounted side air bag and left IC air bag deployed. The driver was displaced sharply forward in response to the direction of force, which loaded the seat belt and contacted the steering wheel through the deflated frontal air bag. The driver's face, head, chest, and pelvis and extremities continued to be displaced forward, loading the steering wheel, steering column, left instrument panel, and floor. This dynamic was intensified by the longitudinal intrusion of those components, reducing the front row of the occupant compartment.

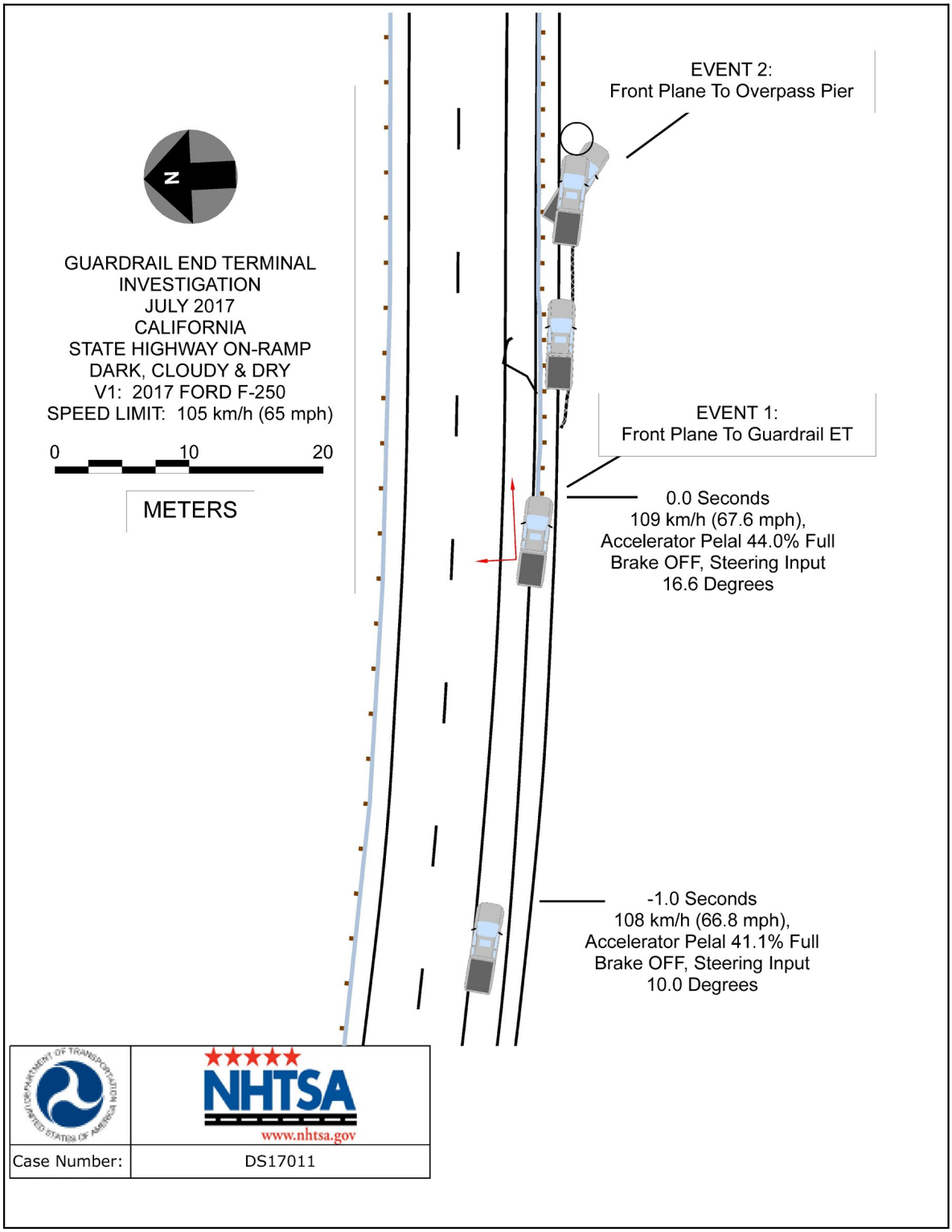
His face and head contacted the steering wheel, deforming the spokes and rim, and displacing the column to the right that caused unspecified fractures to the face and cerebral bleeding. His hands and forearms were displaced forward, contacting the left instrument panel and causing injuries described only as "wrist fractures." His right foot contacted the toe pan, causing an injury described only as "ankle fracture." He also sustained numerous unspecified abrasions. The driver slumped to the left, contacting the frontal and seat-mounted side air bags and depositing blood on both.

The Ford came to rest near the bridge pier. The driver was unconscious following the crash and remained so for at least 20 minutes, according to the EMS report. He remained in his seated position until the driver's side door was forced open by responders, and he was removed from the Ford. He was transported by ambulance to a local hospital and admitted for treatment for an unknown length of time.

Crash Diagram



Crash Diagram: A Detailed View



Appendix A: FHWA In-Service End Terminal Evaluation Forms

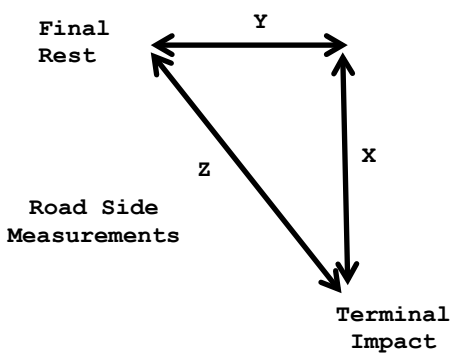
Case No.: DS17011

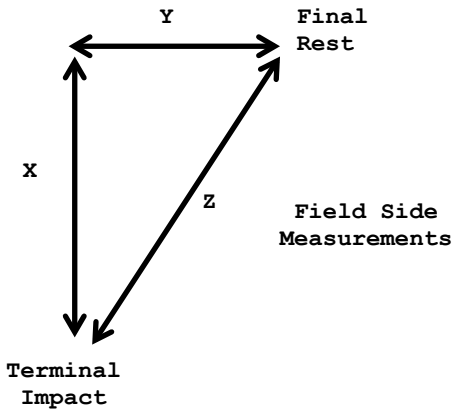
PREPOPULATED DATA (BY OTHERS)			
Date of Crash	July 2017	**TIME OF CRASH (MILITARY)**	Early Morning Hours
Case Number	DS17011	**State**	California
Traffic Route	State highway	**Direction (Southbound = SB)**	SB
Ambient Conditions (at time of crash)			
Temperature (°F)	68.0	**Lighting**	Dark
Atmospheric	Cloudy		

SCENE INFORMATION	
Type of area where crash occurred	☐ Urban ☐ Rural ☒ Suburban
Terminal on a horizontal curve?	☐ No ☒ Curve/LT ☐ Curve/RT
Estimated or Reconstructed Speed at Impact (MPH)	67.6
Est. distance (straight line) from terminal impact to COM final rest position (ft.)	Z = 88.0 ft
Est. distance (longitudinal) along guardrail from terminal impact to COM final resting location (ft.)	X = 88.0 ft
Est. distance (normal) from either 1. the white paint line; or 2. roadway/shoulder/pavement edge to COM rest position (ft.)	Y = 10.0 ft
Super elevation	☒ +2% ☐ -2% ☐ NONE or FLAT
Curve Radius (ft.)	1,529.0

KEY:

- COM – Center of Mass of Vehicle
- Distance Measurements





Case No.: DS17011

ON-SCENE INFORMATION		
End Treatment Type	☐ Extruder	☐ ET2000 ☐ ET-Plus 4in ☒ ET-Plus 5in ☐ SKT ☐ FLEAT ☐ SOFT STOP
	☐ Telescope	☐ X-LITE ☐ X-TENSION
Curb?	☒ No ☐ Yes	☐ AASHTO Type A ☐ AASHTO Type B ☐ AASHTO Type C ☐ AASHTOType D ☐ AASHTO Type E ☐ AASHTO Type F ☐ AASHTO Type G ☐ AASHTO Type H
Curb Height: NA		

GUARDRAIL INSTALLATION

Post No.	Post		Offset Block		Pre-Existing Damage		Offset to Post or Post Hole (ft.)		Spacing to Next Post (ft. -in.)
	Type	Dim.	Type	Dim.	Yes No Unknown	Describe	Travel Way	Curb	
	Steel Wood Other	D x W (in.) or Dia. (in.)	Steel Wood Composite	D x W (in.)					
0	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	Wood	6 x 8	Unknown	Unk.	Unk.	–	8-11	NA	5-9
2	Wood	6 x 8	Unknown	Unk.	Unk.	–	8-9	NA	5-8

Case No.: DS17011

Post No.	Post		Offset Block		Pre-Existing Damage		Offset to Post or Post Hole (ft.)		Spacing to Next Post (ft. -in.)
	Type	Dim.	Type	Dim.	Yes No Unknown	Describe	Travel Way	Curb	
	Steel Wood Other	D x W (in.) or Dia. (in.)	Steel Wood Composite	D x W (in.)					
3	Wood	6 x 8	Unknown	Unk.	Unk.	–	9-3	NA	5-9
4	Wood	6 x 8	Unknown	Unk.	Unk.	–	9-2	NA	5-9
5	Wood	6 x 8	Wood	6 x 8	No	–	9-0	NA	5-8
6	Wood	6 x 8	Wood	6 x 8	No	–	9-1	NA	5-8
7	Wood	6 x 8	Wood	6 x 8	No	–	8-11	NA	5-8
8	Wood	6 x 8	Wood	6 x 8	No	–	8-11	NA	6-2

Case No.: DS17011

Post No.	Post		Offset Block		Pre-Existing Damage		Offset to Post or Post Hole (ft.)		Spacing to Next Post (ft. -in.)
	Type	Dim.	Type	Dim.	Yes No Unknown	Describe	Travel Way	Curb	
	Steel Wood Other	D x W (in.) or Dia. (in.)	Steel Wood Composite	D x W (in.)					
9	Steel	6 x 4	Wood	6 x 8	No	–	8-6	NA	6-5
10	Steel	6 x 4	Wood	6 x 8	No	–	8-6	NA	6-2
11	Steel	6 x 4	Wood	6 x 8	No	–	8-7	NA	6-5
12	Steel	6 x 4	Wood	6 x 8	No	–	8-6	NA	6-2

Additional Comments:

Case No.: DS17011

EXTRUDER			
Feeder Channel Width at impact head	☐4inches ☒5 inches ☐Other _____		
Guide Chute Exit Height (in.)	20.0		
Connection of feeder channels to head damaged?	☒No ☐Yes	Are Welds Broken?	☒No ☐Yes
Anchor Cable Present?	☐No ☒Yes	Connected?	☒No ☐Yes
Rail Extrusion?	☐No ☒Yes	Length (ft. in.)	7-3
Rail Extrusion Direction	☒Traffic Side ☐Field Side		
Total Length of Rail Damaged (ft.) [total length would include extruded rail plus damaged rail downstream from head.]	19-8		

TELESCOPE				
Rail Displacement	☐No	☐Yes; Length: NA	No of Panels Displaced	☐1 ☐2 ☐3 ☐4 ☐5 ☐6

ALL-SYSTEM PERFORMANCE		
Railkinks Downstream of Head?	☐No	☒Yes No. of Kinks in Rail: 4 ;
Was there intrusion into the Occupant Compartment by foreign object (guardrail)?		☒No ☐Yes
Did vehicle impact other objects after impact with terminal?		☐No ☒Yes
Object Contacted	Concrete overpass pier	

ALL-SYSTEM PERFORMANCE ENVIRONMENT			
SIDESLOPE	**50 ft in advance of Post 1**	**At Post 1**	**50 ft Past Post 1**
Percent - %	-13.0	-18.0	-8.1
Adjacent Lane Width (ft)	11.6		
Lane Type (NAS EDS Variable: Sur. Type)	Asphalt		
Shoulder Type	Asphalt		

Case No.: DS17011

ALL-SYSTEM PERFORMANCE ENVIRONMENT			
SIDESLOPE	**50 ft in advance of Post 1**	**At Post 1**	**50 ft Past Post 1**
Shoulder Width (ft)	7.4		
Guardrail Height (in)	27.0		

VEHICLE INFORMATION		
Vehicle Type (NHTSA Input)	Standard pickup	
Vehicle Identification Number (VIN)	1FT7W2BT1HExxxxxx	
Vehicle Mass (NASS var.: veh.wgt)	6,693 lbs.	
Vehicle orientation upon impact	☒Case Type 1 ☐ Case Type 2 ☐Case Type 3 ☐ Case Type 4 ☐ Case Type 5 ☐Case Type 6 ☐ Case Type 7 ☐ Case Type 8 ☐Other	
If 'Other', describe		
Collision Deformation Classification	12F9EN99	
delta V	-10.78	
Occupant Compartment Penetration of rail	☒No	☐Yes; Describe:
Quarter Turns (NASS EDS variable: Rollover)	☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 ☐11 ☐12 ☐13 ☐14 ☐15 ☐16 ☐17+	
Object Precipitating Rollover, (NASS EDS variable: Rollobj)	NA	
Rollover Type, Terhune Scale, (NASS EDS variable: rolintyp)	NA	

Appendix B: Event Data Recorder Report for 2017 Ford F-250[2]

[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.

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	1FT7W2BT1HE******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS17011_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.4
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 19.0
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
ACM Adapter Detected During Download	Yes
Event(s) recovered	locked frontal event locked side event locked rollover event Fuel cutoff level 1

Comments

No comments entered.

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

Data Limitations

Data Imaging:

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

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

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

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

1. Non deployment trigger event is an event in which EDR recording trigger threshold is met or exceeded (minimum of 5 mph (8kph) Accumulated Delta Velocity within 150ms interval), but no device(s) have deployed. The data from such event can be overwritten by subsequent events.

2. Airbag deployment event is an event in which frontal, side or curtain airbags have deployed. Note that such event cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device(s), the RCM must be replaced.

3. Some RCM may also categorize Non airbag deployment event. This type is an event in which non airbag devices such as pretentioners, knee bolster etc… have deployed. Note that such event can be overwritten given a subsequent "deployment" event.

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

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

EDR Data Elements Overview/Interpretation in CDR Report:

Under CDR File Information Section

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

Under System Status at Event Section

- Complete file recorded indicates if data from the recorded event has been fully written to the RCM memory.
- If the RCM detected a peripheral crash sensor was lost during an event, the crash sensor would be identified as well as the time it was lost during that event relative to Time zero. If no loss of a peripheral crash sensor, nothing would be displayed. Note in some vehicles, loss of a peripheral crash sensor may lead to the loss of another peripheral crash sensor due to shared communication.

Under Deployment Data Section

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

Under Pre-Crash Data -5 to 0 sec

- Steering Wheel Angle if Applicable: positive value indicates left turn, and negative value would indicate right turn.
- Stability Control Lateral Acceleration if Applicable: Lateral Acceleration (Y-direction) is the acceleration along the lateral axis of the vehicle, reported as positive when accelerating to the left.
- Stability Control Longitudinal Acceleration if Applicable**:** Longitudinal Acceleration (X-direction) is the acceleration along the longitudinal axis of the vehicle, reported as positive when accelerating in a forward direction.
- Stability Control Yaw Rate if Applicable: The Yaw Axis is the vertical axis of the vehicle, generally perpendicular to the plane of the road. A positive Yaw Rate is counter-clockwise when observing the vehicle from above.
- Stability Control Roll Rate if Applicable: The Roll Axis is the longitudinal axis of the vehicle, generally aligned with the primary axis of motion of the vehicle. A positive Roll Rate is counter-clockwise when observing the vehicle from the front.

Under Longitudinal Crash Pulse

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

Under Lateral Crash Pulse

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

Under Rollover Sensor Data (if Applicable)

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

Data Sources:

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

1. Internal to the RCM such as internal sensors for delta Velocity data, rollover angle data if applicable, etc… which are measured, calculated and stored internally.

2. External to the RCM but with a direct connection such as buckle switches, peripheral crash sensors, seat track switch(s) etc… which are measured, calculated and stored internally.

3. External Modules to the RCM such as Powertrain Control Module, Brake Control Module, etc… Theses modules communicate to the RCM via Vehicle Communication Network. The RCM stores the received data internally.

02013_RCM-RC7P_r001

System Status at Time of Retrieval

VIN As Programmed into RCM at Factory	1FT7W2BT1HE******
Current VIN from PCM	1FT7W2BT1HE******
Ignition Cycle, Download (First Record)	1,894
Ignition Cycle, Download (Second Record)	N/A
Restraints Control Module Part Number	HC3T-14B321-BE
Restraints Control Module Serial Number	3032577337270000
Restraints Control Module Software Part Number (Version)	GR3T-14C028-AA
Driver Side/Center Frontal Restraints Sensor Serial Number	001229E1
Driver, Row 1, Side Restraint Sensor 1 Serial Number	0000000A
Driver, Row 2, Side Restraint Sensor 2 Serial Number	000629E1
Passenger Frontal Restraints Sensor Serial Number	00000000
Passenger, Row 1, Side Restraint Sensor 1 Serial Number	000000D6
Passenger, Row 2, Side Restraint Sensor 2 Serial Number	000C29E1

System Status at Event (First Record)

Complete File Recorded (Yes,No)	Complete
Multi-Event, Number of Events	1
Time From Event 1 to 2 (msec)	0
Lifetime Operating Timer at Event Time Zero (sec)	2,716,325
Key-On Timer at Event Time Zero (sec)	2,790
Vehicle Voltage at Time Zero (V)	14.1
Energy Reserve Mode Entered During Event (Yes, No)	Yes
Time Yaw Rate Lost (msec)	1,173.0
Time Front Passenger Restraint Sensor Lost Relative to Time Zero (msec)	1,227.5
Longitudinal Delta-V Time Zero Offset	0.5
Lateral Delta-V Time Zero Offset	0.5
Roll Angle Time Zero Offset	80.5
Fuel Cutoff Algorithm Decision Time (msec)	267

Faults Present at Start of Event (First Record)

No Faults Recorded

Deployment Data (First Record)

Frontal Airbag Deployment, Time to First Stage Deployment, Driver (msec)	266.5
Frontal Airbag Deployment, Time to First Stage Deployment, Front Passenger (msec)	266.5
Pretensioner (Retractor) Deployment, Time to Fire, Driver (msec)	266.5
Side (Thorax) Airbag Deployment, Time to Deploy, Driver (msec)	1,061.5
Side (Thorax) Airbag Deployment, Time to Deploy, Right Front Passenger (msec)	1,061.5
Side Curtain Airbag Deployment, Time to Deploy, Driver Side (msec)	1,061.5
Side Curtain Airbag Deployment, Time to Deploy, Passenger Right Side (msec)	1,061.5
Pretensioner (Anchor) Deployment, Time to Fire, Driver (msec)	273.5
Maximum Delta-V, Longitudinal (MPH [km/h])	-10.78 [-17.35]
Time, Maximum Delta-V Longitudinal (msec)	272.0
Driver, side sensor 1 (1st row), Discriminating Deployment	Yes
Driver, side sensor 1 (1st row), Safing Deployment	Yes
Driver, side sensor 2 (2nd row), Safing Deployment	Yes
Passenger, side sensor 1 (1st row), Safing Deployment	Yes
Passenger, side sensor 2 (2nd row), Safing Deployment	Yes
RCM, side Driver (lateral), Safing Deployment	Yes
RCM, side Passenger (lateral), Safing Deployment	Yes
Driver or center, front satellite sensor, Discriminating Deployment	Yes
Driver or center, front satellite sensor, Safing Deployment	Yes
Passenger, front satellite sensor, Discriminating Deployment	Yes
RCM front(longitudinal), Discriminating Deployment	Yes
RCM front(longitudinal), Safing Deployment	Yes
RCM, rollover, Discriminating Deployment	Yes
RCM, vertical, Safing Deployment	Yes

Pre-Crash Data -1 sec (First Record)

Ignition cycle, Crash	1,891
Frontal Air Bag Warning Lamp, On/Off	Off
Safety Belt Status, Driver	Buckled
Safety Belt Status, Front Passenger	Unbuckled
Brake Telltale	Off
ABS Telltale	Off
ESC/TC Telltale	Off
ESC/TC Off Telltale	Default Mode
Powertrain Wrench Telltale	Off
MIL Telltale (Powertrain Malfunction Indicator)	Unchanged Off
Global Real Time (seconds)	17,275,185.0
Frontal Air Bag Suppression Switch Status, Front Passenger	Off

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

Time (sec)	Speed, Vehicle Indicated (MPH [km/h])	Speed, Vehicle Indicated, Quality Factor	Accelerator Pedal, % Full	Accelerator Pedal, % Full, Quality Factor	Service Brake, On/Off	Service brake, on/off Quality Factor	Engine RPM	ABS Activity (Engaged, Non-Engaged)
- 5.0	65.7 [106]	OK	41.7	OK	Off	OK	1,954	Non-engaged
- 4.5	65.8 [106]	OK	41.4	OK	Off	OK	1,962	Non-engaged
- 4.0	65.9 [106]	OK	41.6	OK	Off	OK	1,978	Non-engaged
- 3.5	66.3 [107]	OK	41.9	OK	Off	OK	1,974	Non-engaged
- 3.0	66.4 [107]	OK	41.9	OK	Off	OK	1,978	Non-engaged
- 2.5	66.6 [107]	OK	42.0	OK	Off	OK	1,982	Non-engaged
- 2.0	66.6 [107]	OK	41.9	OK	Off	OK	1,986	Non-engaged
- 1.5	66.7 [107]	OK	41.3	OK	Off	OK	1,988	Non-engaged
- 1.0	66.8 [108]	OK	41.1	OK	Off	OK	1,994	Non-engaged
- 0.5	67.1 [108]	OK	40.8	OK	Off	OK	2,000	Non-engaged
0.0	67.6 [109]	OK	44.0	OK	Off	OK	2,040	Non-engaged

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

Time (sec)	Brake Powertrain Torque Request 1	Brake Powertrain Torque Request 2	Traction Control via Brakes	Wheel Torque Requested	Speed Control Status	Driver Gear Selection (Auto Trans)	Cruise Control Driver Accelerator Pedal Override
- 5.0	No	No	No	2,128	Standby	Drive	Inactive (not overridden)
- 4.5	No	No	No	2,092	Standby	Drive	Inactive (not overridden)
- 4.0	No	No	No	2,132	Standby	Drive	Inactive (not overridden)
- 3.5	No	No	No	2,128	Standby	Drive	Inactive (not overridden)
- 3.0	No	No	No	2,120	Standby	Drive	Inactive (not overridden)
- 2.5	No	No	No	2,112	Standby	Drive	Inactive (not overridden)
- 2.0	No	No	No	2,112	Standby	Drive	Inactive (not overridden)
- 1.5	No	No	No	2,068	Standby	Drive	Inactive (not overridden)
- 1.0	No	No	No	2,028	Standby	Drive	Inactive (not overridden)
- 0.5	No	No	No	2,016	Standby	Drive	Inactive (not overridden)
0.0	No	No	No	2,080	Standby	Drive	Inactive (not overridden)

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

Time (sec)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)	Stability Control Roll Rate (deg/sec)	Steering Wheel Angle (deg)
- 5.0	-0.06	0.10	2.06	-1.51	-1.3
- 4.9	-0.10	0.04	2.06	1.88	-0.7
- 4.8	-0.08	0.07	2.64	3.04	-0.7
- 4.7	-0.02	0.09	2.64	2.64	-0.3
- 4.6	-0.01	0.10	2.22	0.23	0.2
- 4.5	0.00	0.09	2.04	-3.44	1.2
- 4.4	-0.01	0.07	1.90	-3.55	1.2
- 4.3	-0.03	0.07	1.83	-0.15	1.0
- 4.2	-0.06	0.07	2.61	2.39	0.0
- 4.1	-0.01	0.10	2.52	1.03	0.0
- 4.0	-0.03	0.10	2.11	-0.60	1.2
- 3.9	0.00	0.09	2.18	-2.20	4.5
- 3.8	-0.02	0.09	2.43	-1.11	7.6
- 3.7	-0.01	0.09	2.59	0.47	8.0
- 3.6	-0.02	0.09	3.47	0.95	8.2
- 3.5	-0.01	0.09	3.29	0.19	9.0
- 3.4	0.02	0.08	3.04	-0.03	9.6
- 3.3	0.00	0.09	2.85	0.28	10.0
- 3.2	0.04	0.11	3.33	0.36	10.0
- 3.1	0.04	0.06	2.97	0.39	10.2
- 3.0	0.01	0.06	3.31	-0.84	10.2
- 2.9	0.01	0.07	3.08	-2.39	10.6
- 2.8	0.05	0.08	2.97	-1.32	11.3
- 2.7	0.01	0.08	3.27	0.47	11.3
- 2.6	0.03	0.09	3.70	0.52	11.3
- 2.5	0.05	0.10	3.36	0.52	11.3
- 2.4	0.03	0.09	3.22	-0.39	11.3
- 2.3	0.02	0.07	3.22	-0.36	11.6
- 2.2	0.03	0.08	3.27	-0.52	11.6
- 2.1	0.04	0.09	3.15	-0.07	11.6
- 2.0	0.03	0.09	3.27	-0.76	11.6
- 1.9	0.05	0.10	3.11	0.15	11.6
- 1.8	0.00	0.09	3.24	1.88	11.3
- 1.7	0.03	0.07	3.59	2.39	11.3
- 1.6	0.02	0.07	3.43	0.52	11.3
- 1.5	0.04	0.08	3.01	-0.36	11.3
- 1.4	0.03	0.09	2.94	0.03	11.3
- 1.3	0.03	0.08	3.20	1.24	11.0
- 1.2	0.00	0.08	2.88	1.59	10.0
- 1.1	0.04	0.08	3.15	-0.15	10.0
- 1.0	0.02	0.07	2.83	-1.27	10.0
- 0.9	0.04	0.08	2.66	-1.43	9.6
- 0.8	0.03	0.09	2.76	-0.55	9.2
- 0.7	0.00	0.10	2.97	1.88	8.6
- 0.6	0.01	0.10	2.88	2.83	8.2
- 0.5	0.01	0.05	2.75	3.68	8.2
- 0.4	0.02	0.06	2.81	1.72	8.0
- 0.3	0.03	0.07	2.31	-0.39	8.0
- 0.2	0.00	0.09	1.99	-0.36	9.0
- 0.1	0.01	0.08	1.60	8.64	11.6
0.0	-0.07	0.08	2.85	23.16	16.6

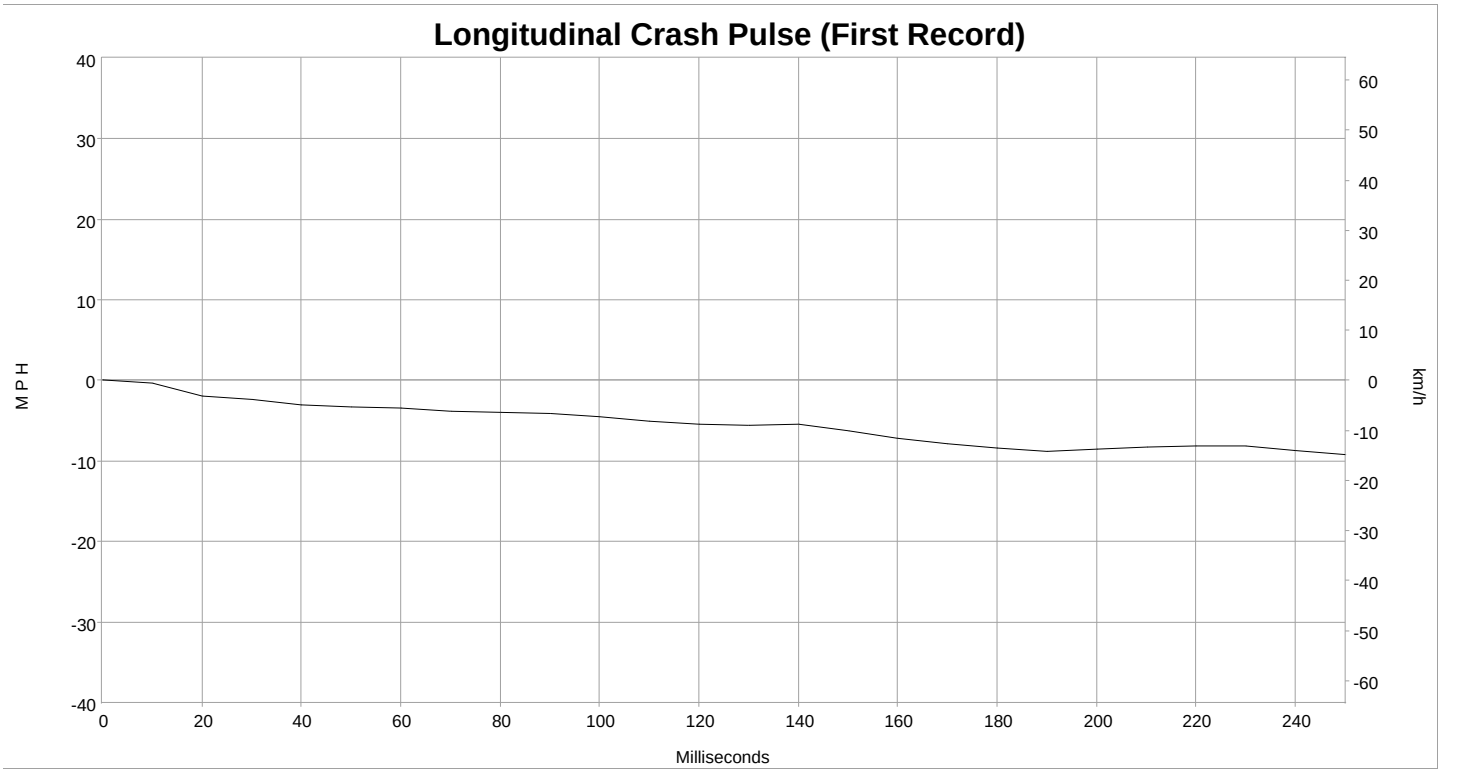
Pre-Crash Data -5 to 0 sec [5 samples/sec] (First Record)

Time (sec)	Brake Pre-Charge Request	Brake Assist Sensitivity Level	Brake Deceleration Request (m/s^2)	Brake Deceleration Request Enable	Large Driver Steering or Accel Pedal Input	Collision Mitigation System Fault	Collision Mitigation System Enabled
- 5.0	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 4.8	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 4.6	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 4.4	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 4.2	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 4.0	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 3.8	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 3.6	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 3.4	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 3.2	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 3.0	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 2.8	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 2.6	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 2.4	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 2.2	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No

Time (sec)	Brake Pre-Charge Request	Brake Assist Sensitivity Level	Brake Deceleration Request (m/s^2)	Brake Deceleration Request Enable	Large Driver Steering or Accel Pedal Input	Collision Mitigation System Fault	Collision Mitigation System Enabled
- 2.0	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 1.8	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 1.6	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 1.4	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 1.2	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 1.0	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 0.8	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 0.6	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 0.4	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
- 0.2	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No
0.0	No PreCharge Request	Normal	0	No (no CMbB deceleration request)	No	No (not denied)	No

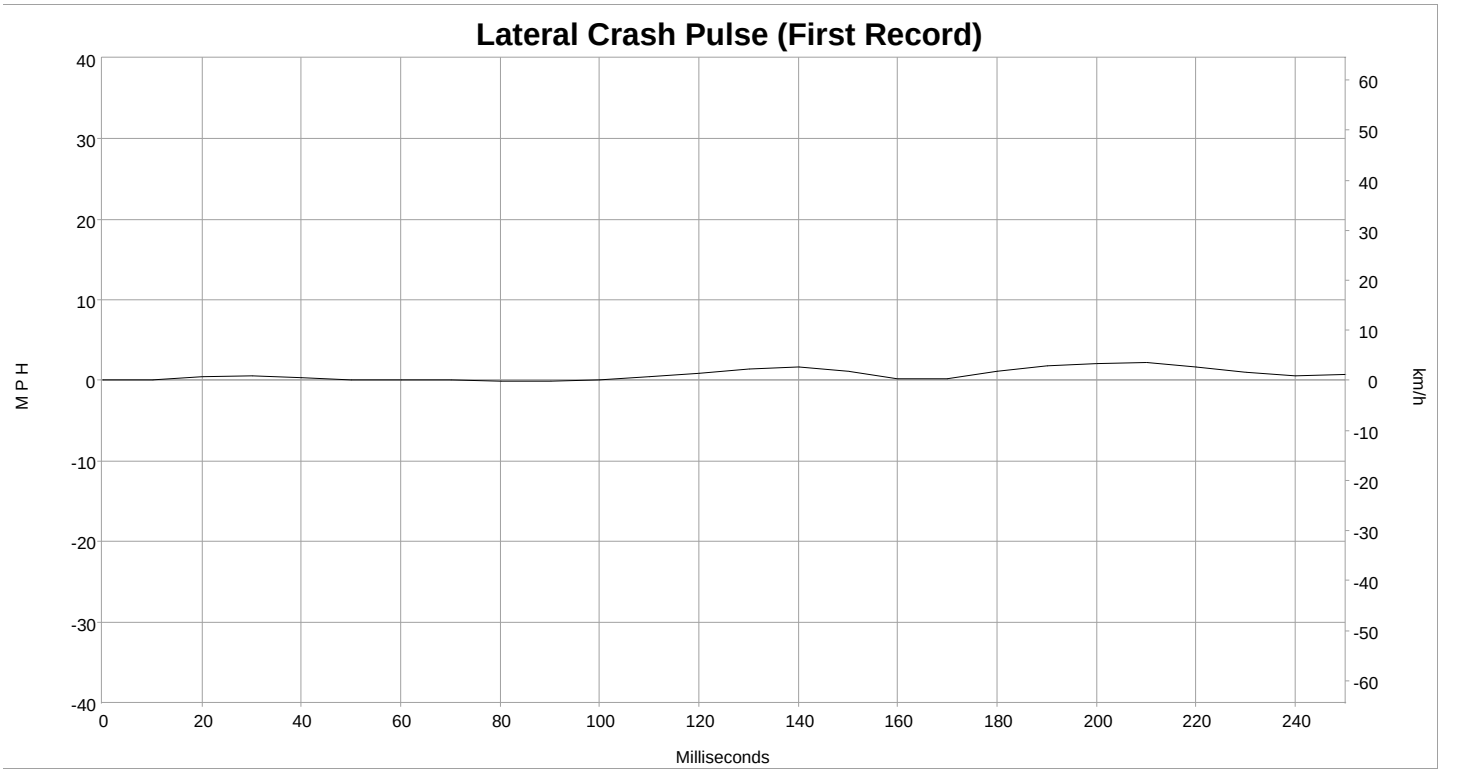
Post-Crash Data 0 to 5 sec [4 samples/sec] (First Record)

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



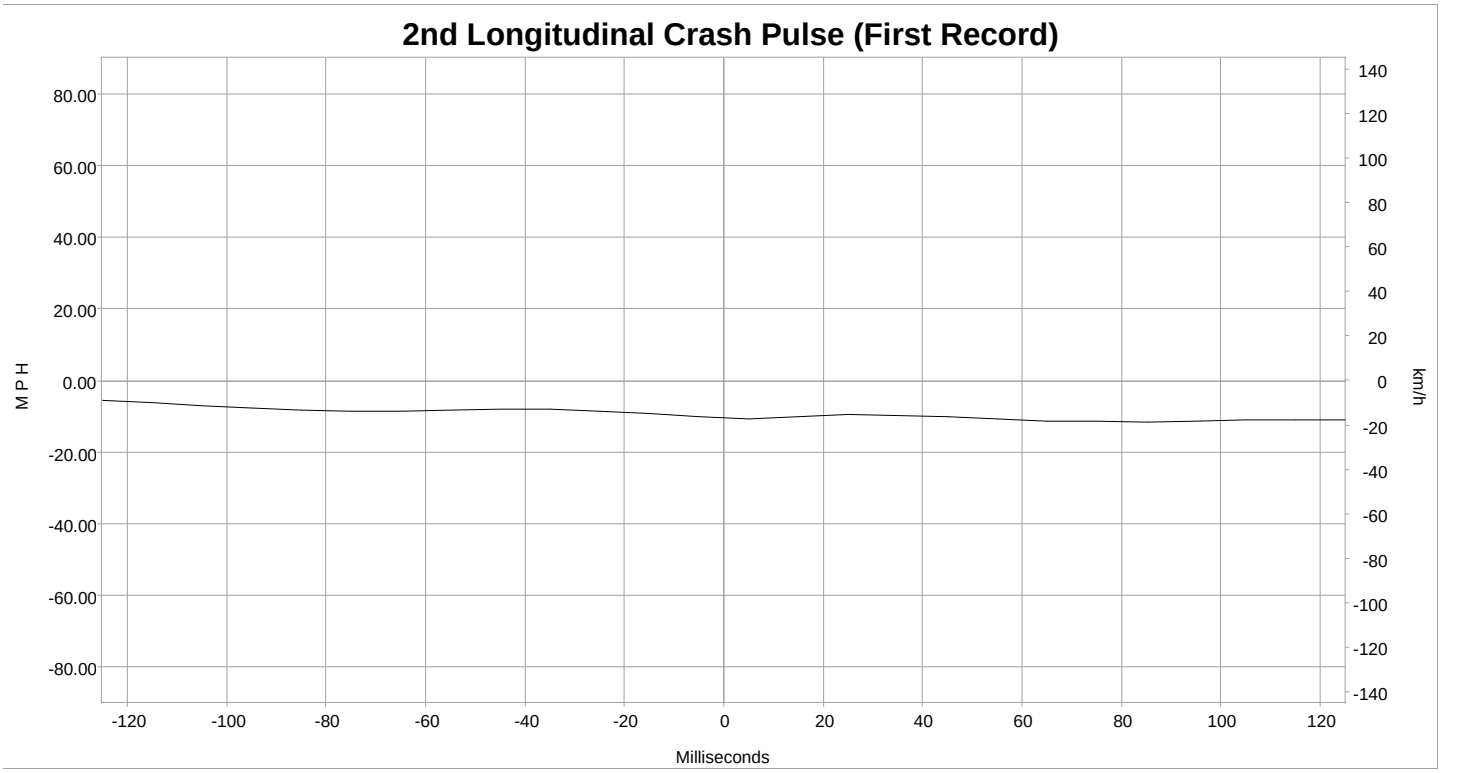
Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	0.00	0.00
10	-0.35	-0.57
20	-1.89	-3.04
30	-2.37	-3.81
40	-3.09	-4.97
50	-3.36	-5.40
60	-3.47	-5.58
70	-3.79	-6.10
80	-3.98	-6.41
90	-4.11	-6.61
100	-4.49	-7.22
110	-5.08	-8.17
120	-5.51	-8.86
130	-5.63	-9.06
140	-5.48	-8.82
150	-6.21	-10.00
160	-7.23	-11.64
170	-7.85	-12.64
180	-8.44	-13.59
190	-8.76	-14.09
200	-8.48	-13.64
210	-8.25	-13.28
220	-8.08	-13.01
230	-8.15	-13.12
240	-8.69	-13.99
250	-9.24	-14.87



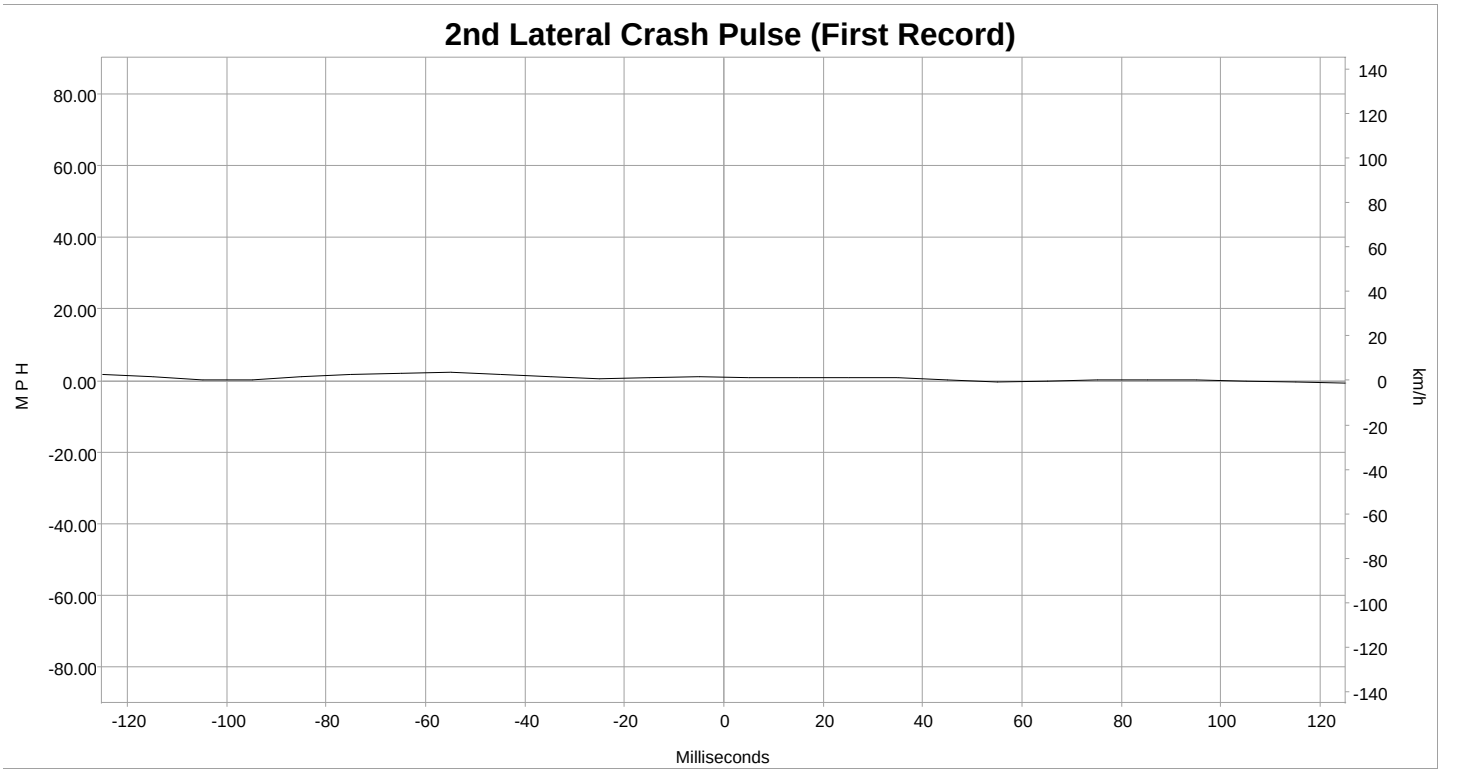
Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, Lateral (MPH)	Delta-V, Lateral (km/h)
0	0.00	0.00
10	0.02	0.03
20	0.44	0.71
30	0.56	0.90
40	0.29	0.47
50	0.00	0.00
60	0.06	0.10
70	0.04	0.07
80	-0.01	-0.01
90	-0.12	-0.20
100	0.11	0.17
110	0.45	0.72
120	0.86	1.39
130	1.46	2.35
140	1.69	2.72
150	1.20	1.93
160	0.16	0.25
170	0.14	0.22
180	1.09	1.75
190	1.76	2.83
200	2.09	3.37
210	2.24	3.60
220	1.68	2.70
230	1.00	1.61
240	0.55	0.88
250	0.76	1.23



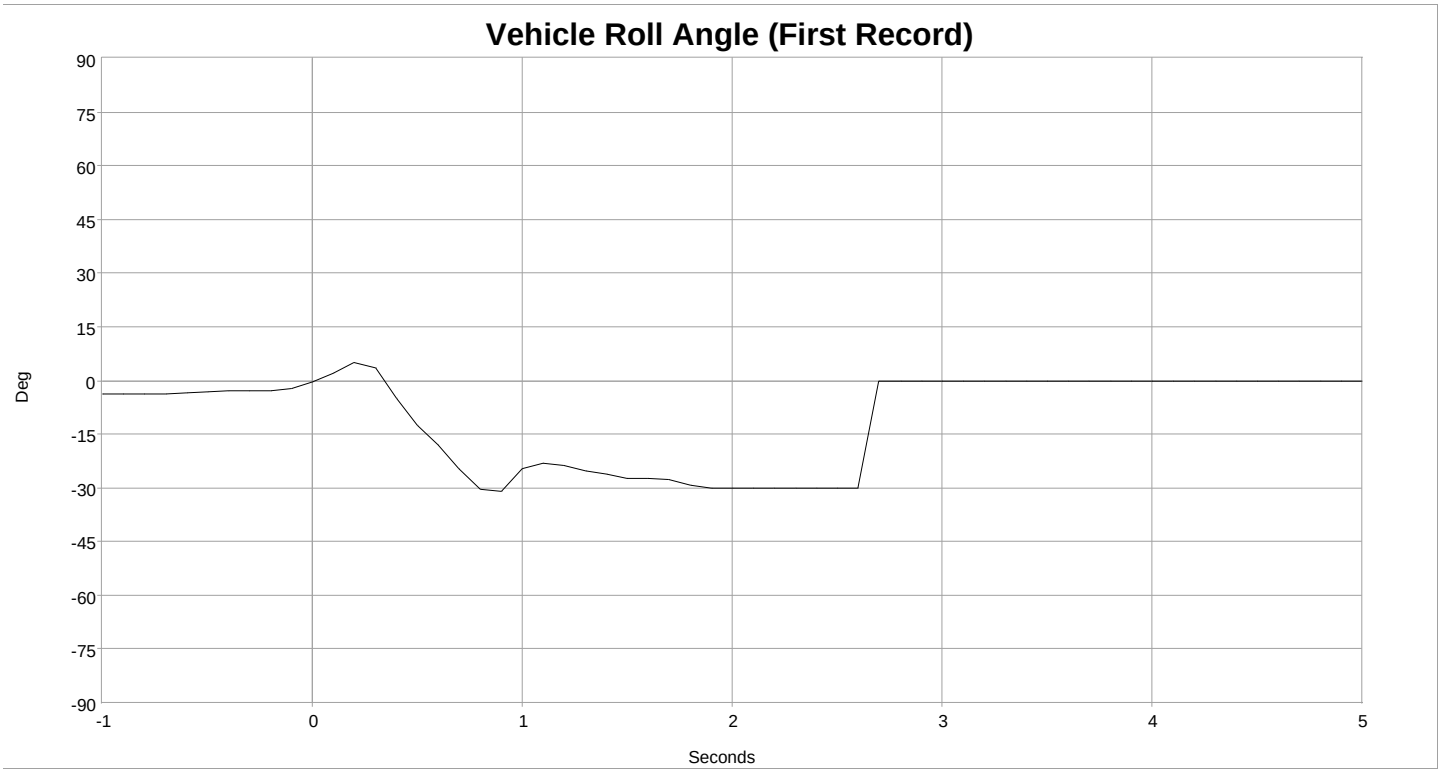
2nd Longitudinal Crash Pulse (First Record)

Time (msec)	2nd Delta-V, longitudinal (MPH)	2nd Delta-V, longitudinal (km/h)
-125	-5.48	-8.82
-115	-6.21	-10.00
-105	-7.23	-11.64
-95	-7.85	-12.64
-85	-8.44	-13.59
-75	-8.76	-14.09
-65	-8.48	-13.64
-55	-8.25	-13.28
-45	-8.08	-13.01
-35	-8.15	-13.12
-25	-8.69	-13.99
-15	-9.24	-14.87
-5	-10.12	-16.29
5	-10.69	-17.21
15	-10.22	-16.45
25	-9.67	-15.57
35	-9.69	-15.60
45	-10.08	-16.23
55	-10.71	-17.24
65	-11.27	-18.13
75	-11.42	-18.38
85	-11.50	-18.51
95	-11.45	-18.42
105	-11.13	-17.92
115	-11.02	-17.73
125	-11.04	-17.76



2nd Lateral Crash Pulse (First Record)

Time (msec)	2nd Delta-V, Lateral (MPH)	2nd Delta-V, Lateral (km/h)
-125	1.69	2.72
-115	1.20	1.93
-105	0.16	0.25
-95	0.14	0.22
-85	1.09	1.75
-75	1.76	2.83
-65	2.09	3.37
-55	2.24	3.60
-45	1.68	2.70
-35	1.00	1.61
-25	0.55	0.88
-15	0.76	1.23
-5	1.19	1.92
5	0.85	1.37
15	0.89	1.44
25	0.87	1.40
35	0.72	1.16
45	0.07	0.12
55	-0.34	-0.55
65	-0.09	-0.15
75	0.14	0.23
85	0.16	0.26
95	0.12	0.19
105	-0.16	-0.25
115	-0.60	-0.96
125	-0.76	-1.22



Vehicle Roll Angle (First Record)

Time (sec)	Vehicle Roll Angle (deg)
-1.0	-3.90
-0.9	-3.90
-0.8	-3.90
-0.7	-3.80
-0.6	-3.54
-0.5	-3.15
-0.4	-2.91
-0.3	-2.88
-0.2	-2.88
-0.1	-2.35
0.0	-0.51
0.1	1.99
0.2	4.85
0.3	3.53
0.4	-4.99
0.5	-12.51
0.6	-17.86
0.7	-24.77
0.8	-30.31
0.9	-30.98
1.0	-24.54

Time (sec)	Vehicle Roll Angle (deg)
1.1	-23.17
1.2	-23.80
1.3	-25.11
1.4	-26.22
1.5	-27.32
1.6	-27.52
1.7	-27.67
1.8	-29.20
1.9	-30.15
2.0	-30.13
2.1	-30.14
2.2	-30.14
2.3	-30.14
2.4	-30.14
2.5	-30.14
2.6	-30.14
2.7	0.00
2.8	0.00
2.9	0.00
3.0	0.00
3.1	0.00

Time (sec)	Vehicle Roll Angle (deg)
3.2	0.00
3.3	0.00
3.4	0.00
3.5	0.00
3.6	0.00
3.7	0.00
3.8	0.00
3.9	0.00
4.0	0.00
4.1	0.00
4.2	0.00
4.3	0.00
4.4	0.00
4.5	0.00
4.6	0.00
4.7	0.00
4.8	0.00
4.9	0.00
5.0	0.00

Hexadecimal Data

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

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$F113 - RCM Part Number
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$F18C - RCM Serial Number
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$F188 - RCM Software Part Number
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$5800 - Left/Center Frontal Restraints Sensor Serial Number
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$5801 - Left Side Restraints Sensor One Serial Number
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$5802 - Left Side Restraints Sensor Two Serial Number
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$5804 - Right Frontal Restraints Sensor Serial Number
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$5805 - Right Side Restraints Sensor One Serial Number
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$5806 - Right Side Restraints Sensor Two Serial Number
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$F190 - Current VIN
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$DE01 - RCM Option Content
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$5817 - Event Record 1

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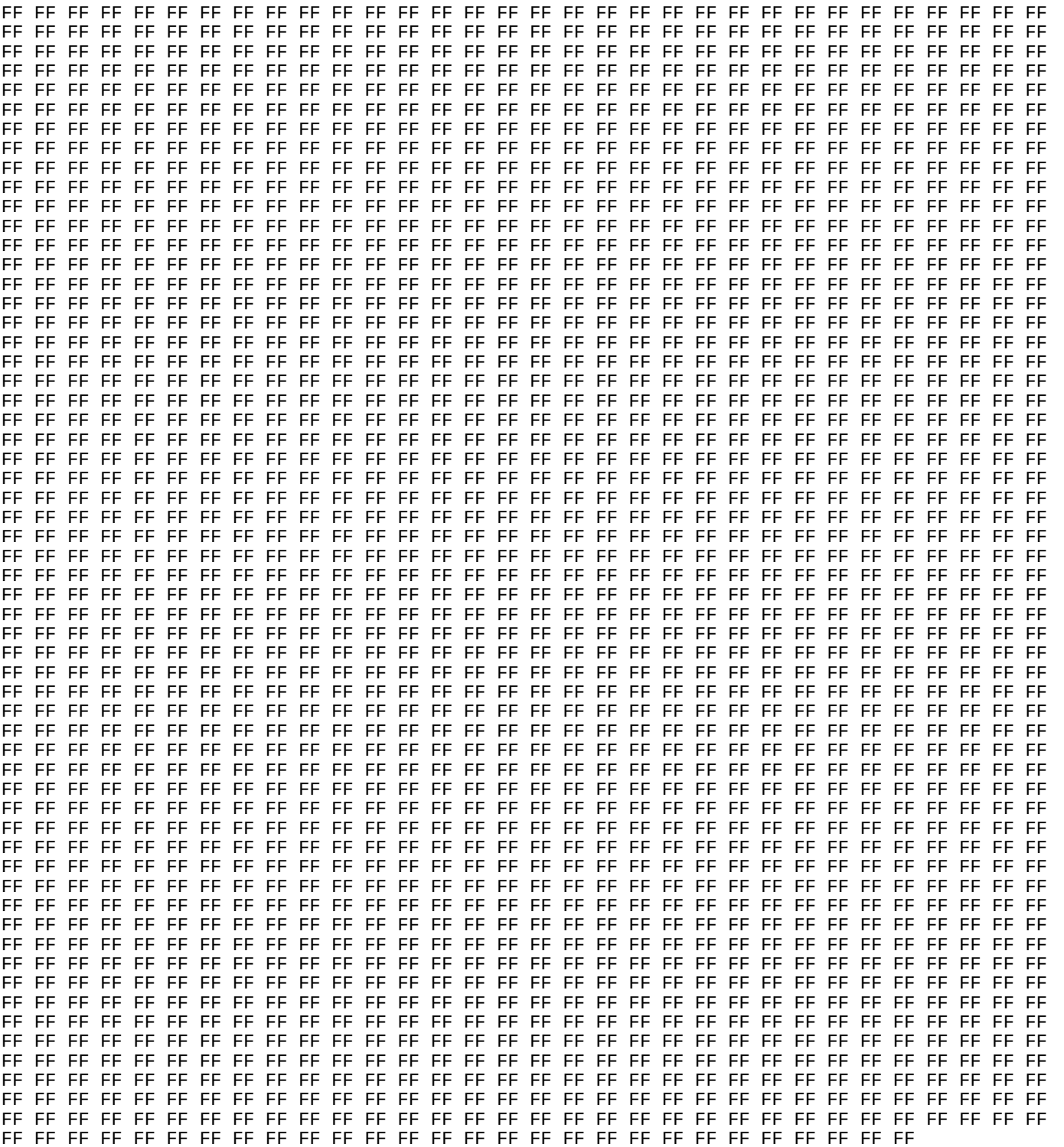

$5818 - Event Record 2

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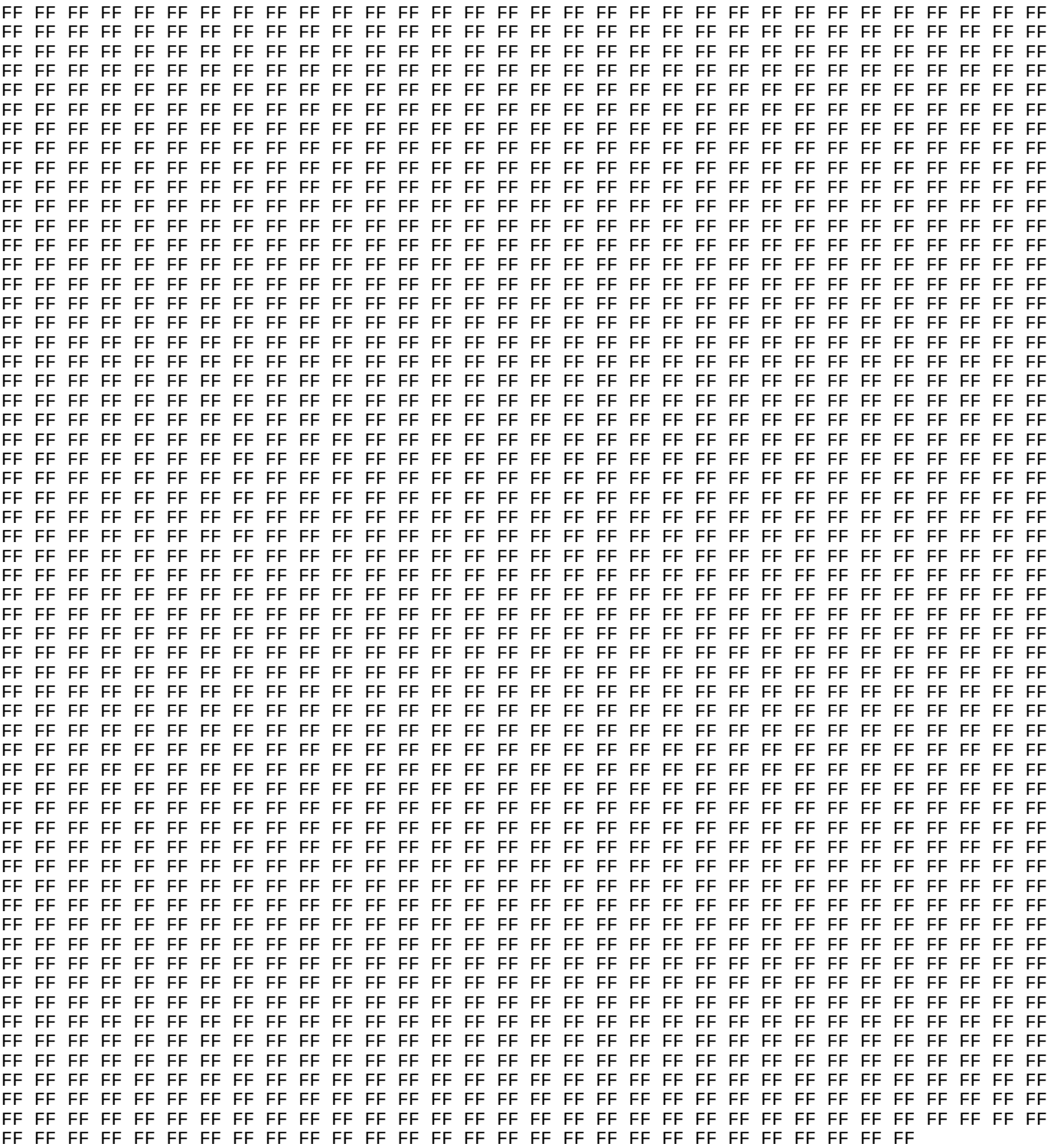

$EE00 - Decoder DID

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DOT HS 812 191
October 2021

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**National Highway
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15364-100721-v4