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National Highway Traffic Safety Administration

NHTSA

DOT HS 813 735

February 2026

Special Crash Investigations: On-Site Heavy-Truck Underride Crash Investigation; Vehicle: 2017 International ProStar LF687 Truck Tractor; Location: California; Crash Date: December 2022

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15. Supplementary Notes

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

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16. Abstract

This report documents the on-site investigation of a fatal heavy-truck underride crash involving a 2017 International ProStar LF687 truck tractor pulling a 2010 Hyundai trailer and a 2002 Ford Mustang in California in December 2022. The International was driven by a belted 52-year-old male. The Ford was driven by a belted 29-year-old male with an unbelted 28-year-old female in the front passenger seat, a belted 9-year-old male in the second-row left seat, and a 2-year-old female in the second-row right seat. The 2-year-old was using an unknown type of child restraint. The International entered the intersection and began a left turn. The tractor had completed the turn, but the trailer was still in the westbound lanes. The Ford's front plane struck the Hyundai trailer's left plane. The Ford underrode the trailer, became wedged beneath, and came to rest. The Ford driver was fatally injured. The Ford's passengers were transported to a local trauma center with minor to moderate injuries. The International driver was not injured.

17. Key Words	18. Distribution Statement
heavy truck, underride, injury, fatality, trailer	Document is available to the public from the DOT, National Highway Traffic Safety Administration, National Center for Statistics and Analysis, https://crashstats.nhtsa.dot.gov.

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Special Crash Investigations
On-Site Heavy Truck Underride Crash Investigation
Case No. DS23003
Vehicle: 2017 International ProStar LF687 Truck Tractor
2010 Hyundai Trailer
Location: California
Crash Date: December 2022

Background

This report documents the on-site investigation of a fatal heavy truck underride crash selected by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration. The crash was identified by NHTSA in an online news report. The crash involved a 2017 International ProStar LF687 truck tractor pulling a 2010 Hyundai Translead trailer and a 2002 Ford Mustang. SCI notified the team of the crash and requested a face page, which was obtained in January 2023. The team was instructed to establish cooperation to conduct an on-site investigation the same day. The team established cooperation in January 2023. The police crash report (PCR) and on-scene photos were obtained in February and March. The Ford was inspected in January 2023. It had an air bag control module (ACM) with event data recorder (EDR) capabilities supported by the Bosch Crash Data Retrieval system. The module was removed and imaged by a separate police agency. A PDF version of the report was obtained by SCI. The trucking company was contacted several times to locate and inspect the Hyundai trailer, but this effort was unsuccessful. The International had an engine control module (ECM) that was imaged by an International dealership employee and submitted to the investigating police agency. A PDF version of the report was obtained by SCI.

Figure 1. 2002 Ford Mustang's final rest, looking southwest (police image)

The crash occurred in daylight under wet and rainy conditions in December 2022 in California. The crash site was a signal-controlled four-leg intersection. The International was driven southbound by a belted 52-year-old male. The Ford was driven westbound by a belted 29-year-

old male. The Ford also had an unbelted 28-year-old female in the front passenger seat[1], a belted 9-year-old male in the second-row left seat, and a 2-year-old female in the second-row right seat. The 2-year-old was using an unknown type of child restraint. The International was initially stopped for a red light and once the light turned green it entered the intersection and began a left turn to travel east at a PCR/ECM reported speed of 11.9 km/h (7.4 mph). The tractor had completed the turn, but the trailer was still in the westbound travel lanes. The Ford's front plane struck the Hyundai trailer's left plane. The Ford underrode the trailer and became wedged beneath it where it came to rest (Figure 1). The Ford driver was fatally injured. The Ford's passengers were transported to a local trauma center with minor to moderate injuries. The International driver was not injured. The Ford was transported from the scene by tow truck and placed on a police hold. The International was drivable but the status of the trailer is unknown.

[1] Based on the passenger's statement to police.

Summary

Crash Site

The crash site was a signal-controlled four-leg intersection. The intersection's southbound leg had a northbound travel lane, a southbound travel lane, and a right-turn lane (Figure 2). The travel lanes were separated by double yellow painted stripes and the turn lane was separated by a solid white painted stripe. The roadway was straight and level. The southbound lane had a concrete surface. The intersection's westbound leg had two westbound travel lanes separated by a dashed white painted stripe and two eastbound travel lanes separated by a dashed white painted stripe. The asphalt roadway was straight and level. The westbound and eastbound travel lanes were separated by a two-way center turn lane that had solid/dashed painted stripes (Figure 3). The lane tapered to an end as the lane neared the intersection. The westbound leg had a speed limit of 72 km/h (45 mph); the southbound leg had a speed limit of 40 km/h (25 mph). The crash occurred in daylight. It was raining at the time of the crash and the roadways were wet. According to the PCR, traffic was heavy in the area. A crash diagram is included at the end of this report.

Figure 2. Southbound approach, 2017 International ProStar LF687 truck tractor

Figure 3. Westbound approach, 2002 Ford Mustang

Pre-Crash

The International truck tractor was initially traveling southbound. It was stopped in the second lane from the right at the intersection for a red traffic signal. As the traffic signal turned green, the driver began a left turn to go east.[2] According to the ECM report, the International's speed was 11.9 km/h (7.4 mph) at the time of impact. The International was about half-way through the intersection just before impact. The Ford was traveling westbound at a "high speed," according to a witness. The police conducted several tests to determine the Ford's pre-crash speed. The police did not provide the test results. The Ford entered the intersection on a red light according

[2] Police secured surveillance video from a local business that showed the traffic signal was red for westbound travel approximately 7 seconds before the crash.

to security camera footage. The police said they didn't see any pre-impact braking marks due to the rain.

Crash

The Ford struck and underrode the Hyundai trailer's left plane (Event 1). The Ford's EDR reported a cumulative longitudinal delta V of -10.0 km/h (-6.2 mph) at 101 ms. The EDR report said there was a deployment event.

The International driver braked after impact. Given the speed of the International and wet surface, the vehicle probably came to rest 3 to 6 m (10-20 ft) south of the impact area. The Ford came to rest under the trailer.

Post-Crash

Law enforcement and EMS arrived about 9 minutes post-crash. The Ford driver was declared deceased shortly after EMS arrival. The front-right passenger was able to exit the vehicle with help of a bystander. She sustained facial abrasions and contusions and was transported to a local trauma center where she was hospitalized for one day. The rear seat passengers were initially trapped in the vehicle. EMS used several extraction tools to extricate the two child passengers. The second-row left child had facial abrasions, an elbow abrasion, and a scalp laceration. He was transported to a local trauma center for treatment. The duration of his treatment is unknown. The second-row right child had a left orbit fracture and facial contusions and lacerations. She was transported to a local trauma center for treatment. The duration of her treatment is unknown. The International driver was not injured. The Ford was towed from the scene and placed on a police hold. The International was driven from the scene but the status of the trailer is unknown.

2017 International ProStar LF687 Truck Tractor

2010 Hyundai Translead Van-Type Trailer

Vehicle/Trailer Description

The 2017 International ProStar LF687 conventional truck tractor was identified by police with VIN 3HCDJAPR4HLxxxxxx. It had a 6x4 driveline, three axles, a day cab, and a 15.0-liter, 6-cylinder diesel engine coupled to a manual transmission.

The International truck tractor was pulling a 2010 Hyundai Translead composite van-type trailer. The trailer was identified by police with VIN 3H3V532C7ATxxxxxx. The gross vehicle weight rating for the trailer was 30,844 kg (68,000 lb) with a tare weight of 6,146 kg (13,550 lb). According to a bill of lading, the load at the time of the crash was 15,875 kg (35,000 lb). The trailer had dual rear axles. The trailer's length was 16.1 m (52.8 ft) with a width of 259 cm (101.9 in), an overall height of 411 cm (161.8 in), and a track width of 196 cm (77.1 in). The fifth wheel height was 119 cm (46.8 in). The trailer had plastic side skirts forward of the axles. The standard height for a skirt is 81 cm (31.8 in) and the standard length would be 6.7 m (21.9 ft). The trailer was marked with DOT red/white conspicuity tape with a Federal Motor Vehicle Safety Standard compliant rear underride guard.

Exterior Damage

The International truck tractor was not damaged (Figure 4).

Figure 4. 2017 International ProStar truck tractor (police image)

Figure 5. 2010 Hyundai Translead trailer damage, on-scene image looking west (police image)

Figure 6. 2010 Hyundai Translead trailer damage, on-scene image looking west (police image)

The Hyundai trailer sustained moderate left plane and undercarriage damage from the impact with the Ford (Figures 5 and 6). The damage was between the axles and the landing gear at the frame level. The damage extended along the undercarriage to the right plane. The estimated truck deformation classification was 10LTFWA. The trailer sustained damage to the plastic side skirts (Figures 7 and 8).

Figure 7. 2010 Hyundai Translead trailer side skirt damage, left side of trailer (police image)

Figure 8. 2010 Hyundai Translead trailer side skirt damage, right side of trailer (police image)

Engine Control Module

The ECM is a computer attached to the side of a truck engine that receives data from different sources on the truck (input) as well as reporting events or conditions (output). The truck's ECM can store data about a particular event such as a sudden deceleration or a snapshot of a record that occurred. The International's ECM reported a sudden deceleration rate of 11.9 km/h (7.4 mph), which was interpreted by an International dealership as the vehicle's travel speed for this crash.

Interior Damage

The truck tractor did not sustain any interior damage.

Manual Restraint Systems

The police reported that the International driver was using his lap and shoulder belt.

NHTSA Recalls and Investigations

Searches of the NHTSA recall database (www.nhtsa.gov/recalls) using the International's VIN in February 2023 and May 2025 revealed no unrepaired recalls.

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2017 International ProStar LF687 Truck Tractor Occupant

Driver Demographics

Age/sex:	52 years/male
Height:	183 cm (72 in)
Weight:	91 kg (200 lb)
Eyewear:	Unknown
Seat type:	Pedestal
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt available; used
Air bags:	None available
Usage source:	PCR
Alcohol/drug data:	None
Egress from vehicle:	Under own power
Transport from scene:	None
Type of medical treatment:	None

Driver Injuries

The International driver was not injured.

Driver Kinematics

According to the PCR, the driver was using the lap and shoulder seat belt and was actively steering. He saw the Ford approaching from his left but was unable to take any avoidance action. He saw the vehicle strike the trailer's left side. There was no driver movement of any significance.

2002 Ford Mustang

Description

The 2002 Ford Mustang was identified by VIN 1FAFP404X2Fxxxxxx. It was a two-door coupe with two rows of seats for five passengers. It had a 6-cylinder, 3.8-liter gasoline engine coupled to an automatic transmission and rear-wheel-drive. The vehicle manufacturer recommended size P225/55R16 tires. It had Bridgestone and Sumitomo P245/45R17 tires on the front and Goodyear Eagle P275/40R18 tires on the rear. The vehicle had front-row bucket seats with adjustable head restraints and folding backs and a second-row bench seat with folding back.

Exterior Damage

The Ford sustained major damage through the front plane (Figures 9 and 10) from the underride impact with the Hyundai trailer. The direct damage began 70 cm (27.5 in) left of the vehicle centerline and measured 146 cm (57.4 in). The Field L extended from bumper corner to bumper corner and measured 138 cm (54.3 in). Sixteen measurements were taken at the bumper level using the Nikon total station mapping system and the AutoCrush tool calculated six crush measurements as follows: C1=0 cm, C2=0 cm, C3=0 cm, C4=0 cm, C5=0 cm, C6=3 cm (1.1 in). The maximum crush to the bumper was located 70 cm (27.5 in) right of the front centerline and measured 3 cm (1.1 in). There was 119 cm (46.8 in) of direct contact to the right part of the hood and 356 cm (140.1 in) scraping damage along the right plane from the trailer side skirt. There was direct contact to the left and right A-pillars. Both A-pillars were cut during extrication. The A-pillars/roof/windshield header structure was displaced rearward to a position above the rear bumper, partially due to damage and partially due to extrication efforts. The estimated collision deformation classification was 12FDAW9.

Figure 9. 2002 Ford Mustang, front right

Figure 10. 2002 Ford Mustang, right plane

Event Data Recorder

The Ford had an ACM with EDR capabilities supported by the Bosch Crash Data Retrieval system. The module was removed and imaged by a separate police agency. According to the police, one deployment-level event was recovered from the Ford's ACM, a frontal deployment and pretensioner actuation time at 42 ms. There were, however, no air bag deployments and the Ford did not have seat belt pretensioners. The EDR reported a cumulative longitudinal delta V of -10.0 km/h (-6.2 mph) at 101 ms. The EDR did not report precrash data.

Interior Damage

The Ford sustained major interior damage caused by impact forces and occupant contacts. There was integrity loss from the roof, windshield header, side glass, and backlight. The front-right door was jammed shut. There was catastrophic longitudinal intrusion from the windshield, windshield header, roof, and both A-pillars. There was lateral intrusion to the right door at the rear-upper quadrant. The driver's seat back was displaced from its base.

Manual Restraint Systems

The Ford had 3-point manual lap and shoulder belts for all the outboard seating positions. Based on evidence obtained during the vehicle inspection and statements from the front-right passenger to the police, the driver was using the lap and shoulder belt and the front-right passenger was not. According to the PCR, the second-row left passenger was using the lap and shoulder belt and the second-row right passenger was using an unspecified type of child restraint.

Supplemental Restraint Systems

The Ford had a supplemental restraint system that included driver's and passenger's frontal air bags, impact and safing sensors, and a crash sensing and diagnostic module. There were no air bag deployments in this crash. An air bag deployment would not be expected in an underride crash such as the one in this case. The vehicle did not have seat belt pretensioners.

NHTSA Recalls and Investigations

Searches of the NHTSA recall database (www.nhtsa.gov/recalls) using the Ford's VIN in February 2023 and May 2025 revealed no unrepaired recalls.

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2002 Ford Mustang Occupants

Driver Demographics

Age/sex:	29 years/male
Height:	175 cm (69 in)
Weight:	95 kg (209 lb)
Eyewear:	Unknown
Seat type:	Bucket with folding back
Seat track position:	Between forward-most and middle position
Manual restraint usage:	Lap and shoulder belt; used
Usage source:	Vehicle inspection, PCR
Air bags:	Frontal air bag available; not deployed
Alcohol/drug data:	Negative for alcohol and drugs
Egress from vehicle:	Fatal, none
Transport from scene:	Unknown
Type of medical treatment:	No treatment

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Blunt head trauma	100999.9	Exterior of other vehicle – side surface Alternative IPC – Windshield frame	Probable Possible
2	Head lacerations	110600.1	Exterior of other vehicle – side surface	Probable
3	Facial lacerations	210600.1	Exterior of other vehicle – side surface	Probable

Source: Autopsy report, toxicology

Driver Kinematics

The 29-year-old male driver was seated in an unknown posture. According to the front-right passenger he was braking and steering to the left just prior to the crash. As the Ford underrode the Hyundai trailer, the driver was struck by intruding frontal components and probably the trailer itself.

Right-Front Passenger Demographics

Age/sex:	28 years/female
Height:	Unknown
Weight:	77 kg (170 lb)
Eyewear:	Unknown
Seat type:	Bucket with folding back
Seat track position:	Between middle and rear-most track position
Manual restraint usage:	Lap and shoulder belt; not used
Usage source:	Front-right passenger statement to police, vehicle inspection
Air bags:	Frontal air bag available; not deployed
Egress from vehicle:	Exited with assistance of bystander
Transport from scene:	Ambulance
Type of medical treatment:	Hospitalized for one day

Right-Front Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Forehead abrasions	210202.1	Windshield	Possible
2	Facial contusions	210402.1	Windshield	Possible

Source: Admission records, ER report, radiology reports

Right-Front Passenger Kinematics

The 28-year-old female right-front passenger was seated in an unknown posture. She was likely displaced forward as the driver braked and the vehicle struck and underrode the trailer. She likely contacted windshield/header components as they were displaced rearward.

Second-Row Left Passenger Demographics

Age/sex:	9 years/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bench with folding back
Manual restraint usage:	Lap and shoulder belt; used
Usage source:	PCR
Air bags:	None available
Egress from vehicle:	Extricated by EMS
Transport from scene:	Ambulance
Type of medical treatment:	Transported to medical facility; unknown if treated

Second-Row Left Passenger Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Forehead abrasions	210202.1	Driver seat back	Probable
2	Abrasion, right elbow	710202.1	Driver seat back	Probable
3	Laceration, back of head	110602.1	Driver seat back	Possible

Source: ER, as reported by police

Second-Row Left Passenger Kinematics

The 9-year-old male second-row left passenger was seated in an unknown posture and was wearing the lap and shoulder belt. At impact, front components of the Ford were displaced rearward and this occupant was displaced forward. The driver's seat back was also displaced rearward and separated from its base, likely contacting this occupant.

Second-Row Right Passenger Demographics

Age/sex:	2 years/female
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bench with folding back
Manual restraint usage:	Unknown, unknown type of child restraint system
Usage source:	PCR
Air bags:	None available
Egress from vehicle:	Extricated by EMS
Transport from scene:	Ambulance
Type of medical treatment:	Transported to medical facility; unknown if treated

Second-Row Right Passenger Injuries

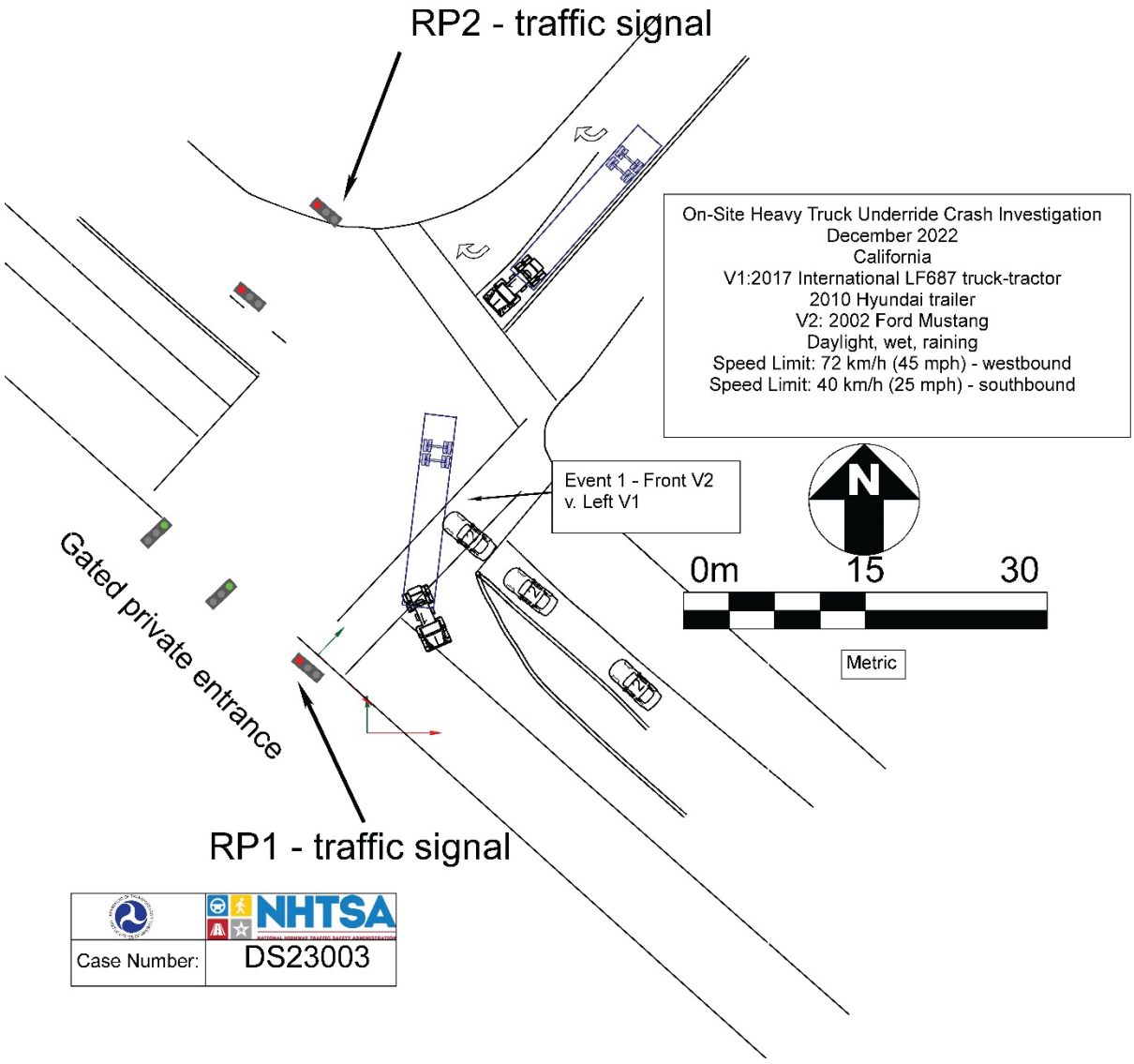
Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Fracture, left eye socket	251200.2	Front passenger seat back	Probable
2	Contusion, left eyelid	210402.1	Front passenger seat back	Probable
3	Laceration, left eyelid	210602.1	Front passenger seat back	Probable
4	Minor abrasion, left cheek	210202.1	Front passenger seat back	Probable

Source: ER, as reported by police

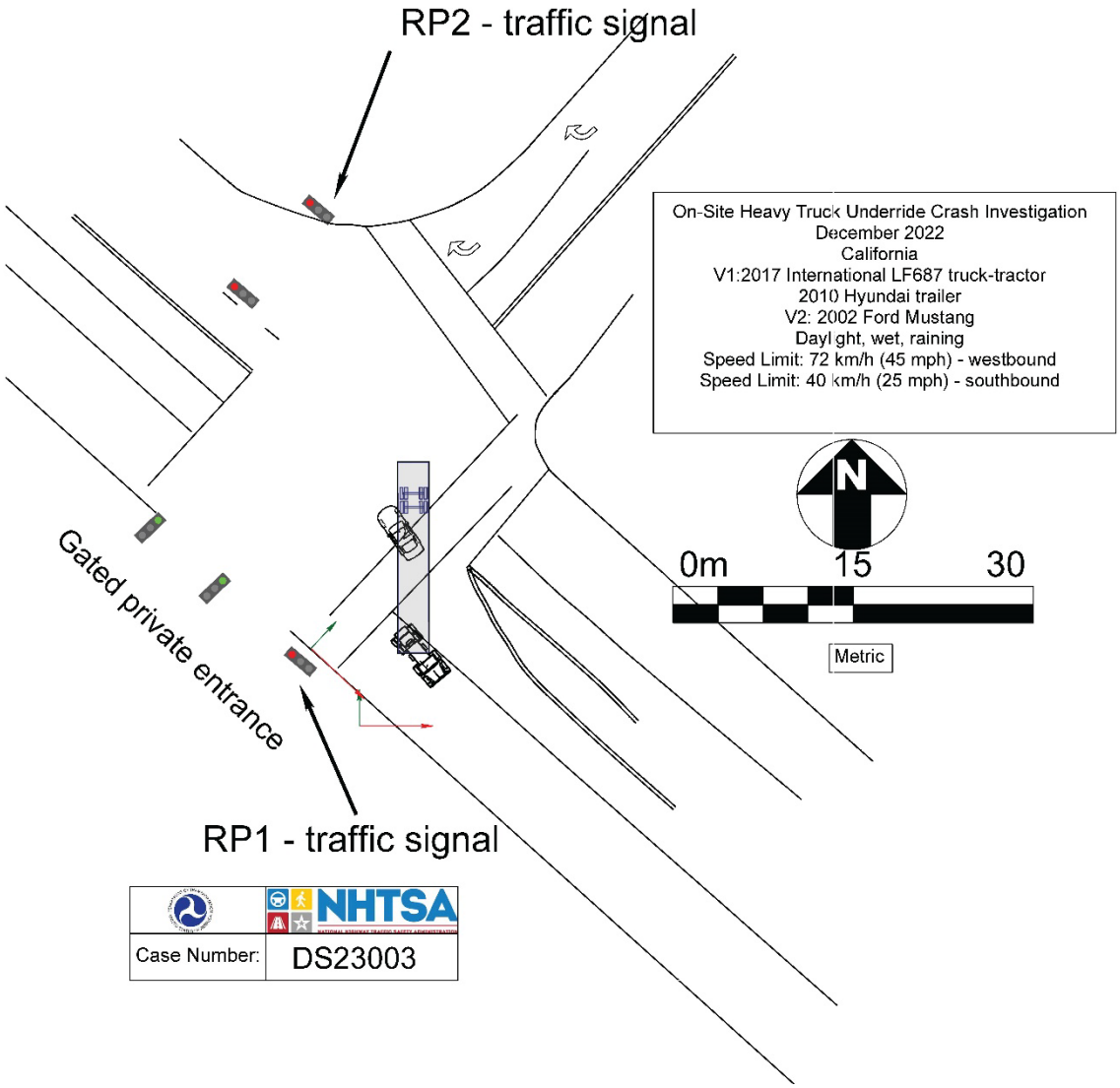
Second-Row Right Passenger Kinematics

The 2-year-old female second-row right passenger was seated in an unknown posture in an unknown type child restraint. At impact, this occupant was likely displaced forward to some degree and engaged the front passenger seat back.

Crash Diagram



Crash Diagram (Final Rest)



Appendix A: Engine Control Module Report – 2017 International ProStar LF687 Truck Tractor[3]

[3] The ECM report in this report was imaged by an International dealership and given to SCI by the investigating police agency as a PDF file.

ECM Template Information

Date	[redacted]
File Location	C:\Intelect\INSITE\WorkOrders\T-202[redacted]
ECM	[redacted]
Status	Good
Customer	[redacted]
Engine Serial Number	[redacted]
Original ECM Image Name	[redacted]
Notes	

Tractor

Features and Parameters

Features and Parameters	ECM Value	Unit
ISX12 CM2350 X102/X103/X108/ISX15 CM2350 X101/X104/X109		
Accelerator Interlock	**Disable**	
Accelerator Options		
Accelerator Type	Dual Analog	
Accelerator Brake Override	**Disable**	
Adjustable Low Idle Speed		
Low Idle Speed	600	RPM
Low Idle Speed Adjustment Switch	**Disable**	
Aftertreatment		
Diesel Particulate Filter		
Active Regeneration in PTO and Remote Modes	**Disable**	
Aftertreatment Diesel Particulate Filter Stationary Regeneratio with Parking Brake	**Disable**	
Aftertreatment Diesel Particulate Filter Temperature Stabilizat	**Disable**	
Automotive Mobile Regeneration		
Minimum Vehicle Speed	0	mph
Diesel Particulate Filter Lamp	**Installed**	
Diesel Particulate Filter Regeneration Permit Switch	**Disable**	
Diesel Particulate Filter Regeneration Start Switch	**Enable**	
High Exhaust System Temperature Lamp Configuration	**Enable**	
Active Due to Regeneration	Disable	
Active Maximum Speed	5	mph
Active Temperature	752	°F
Inactive Temperature	662	°F
SCR Aftertreatment		
Aftertreatment Diesel Exhaust Fluid Level System Configurati		
Aftertreatment Diesel Exhaust Fluid Low Level	10.0	percent
Aftertreatment Diesel Exhaust Fluid Warning Level	2.5	percent
Aftertreatment Diesel Exhaust Fluid Inducement Level	2.5	percent
Diesel Exhaust Fluid Heater		
Diesel Exhaust Fluid Dosing Unit Heater Relay	**Enable**	
Air Shut Off Valve	**Disable**	
Alternator Failure Warning	**Disable**	
Battery Power Required Lamp	**Disable**	
Clutch Pedal Position Switch	**Installed**	
Crankcase Ventilation Heater	**Enable**	
Cruise Control	**Enable**	
Cruise Control Type	Traditional	
Cruise Control Lower Droop	2.0	mph
Cruise Control Upper Droop	3.0	mph
Maximum Cruise Control Speed	62	mph
Adaptive Cruise	**Disable**	

Features and Parameters	ECM Value	Unit
Cruise Control Auto-Resume	**Disable**	
Cruise Control Pause Switch	**Disable**	
Cruise Control Save Set Speed	**Disable**	
Cruise Control and Engine Brake Interaction	**Disable**	
Cruise Control Switch Setup		
Switch Setup	Set/Coast (Resume/Accelerate)	
Driver Reward	**Disable**	
Electric Fuel Lift Pump	**Enable**	
Engine Brake Control	**Enable**	
Delay Time	1.0	s
Engine Brake Type	Engine Compression Brake	
Minimum Vehicle Speed	2.0	mph
Clutch Pedal Activation	**Enable**	
Engine Brake Lamp	**Disable**	
Service Brake Activation	**Enable**	
Engine Protection		
Engine Coolant Level		
Time Based Shutdown	**Disable**	
Torque Derate	**Disable**	
Limited Restart	**Enable**	
Shutdown	**Enable**	
Shutdown Manual Override	**Disable**	
Enhanced Auxiliary Shutdown Switch	**Disable**	
Ether Injection	**Disable**	
Fan Control	**Enable**	
Fan Control Logic	0 Volt On	
Air Conditioning Pressure Switch Input	**Disable**	
Fan Control Switch	**Disable**	
Fan Minimum Run Time		
Minimum Run Time	00:00:30	HH:MM:SS
Fan on with Engine Braking	**Disable**	
Fan on With Remote Throttle	**Disable**	
Fan Type	**On/Off**	
Fuel Level Sensor 2	**Disable**	
Gear Down Protection	**Enable**	
Gear Down Maximum Vehicle Speed (Heavy Engine Load)	62	mph
Gear Down Maximum Vehicle Speed (Light Engine Load)	62	mph
Governor Type		
Governor Type	Automotive	
Governor Type Switch	**Disable**	
High Soot Load Shutdown	**Enable**	
Idle Shutdown	**Enable**	
Idle Shutdown Coolant Temperature Threshold	30	°F
Percent Engine Load	50	percent
Time Before Shutdown	00:05:00	HH:MM:SS
Ambient Temperature Override	**Disable**	

Features and Parameters	ECM Value	Unit
Greenhouse Gas Idle Shutdown	**Disable**	
Idle Shutdown Service Brake Switch	**Disable**	
Idle Shutdown With Parking Brake Set	**Disable**	
Manual Override	**Disable**	
Shutdown Accessory Relay	**Not Installed**	
Warning Period	**Disable**	
J1939 Controls		
J1939 Service Reset	Enable	
J1939 Stop Broadcast Allowed	Enable	
J1939 Trip Reset	Enable	
Load Based Speed Control	**Enable**	
RPM Breakpoint	1550	RPM
Maintenance Monitor	**Disable**	
Parking Brake Switch	**Enable**	
Powertrain Protection	**Enable**	
Driveshaft / Axle Torque Limit	32744	ft*lb
Limit 1 Gear Ratio 2	2.00	
Limit 1 Torque Limit 1	5000	ft*lb
Limit 2 Gear Ratio 2	10.00	
Limit 2 Torque Limit 2	5000	ft*lb
Limit 3 Gear Ratio 2	16.00	
Limit 3 Torque Limit 3	5000	ft*lb
Maximum Torque at Zero Vehicle Speed	5000	ft*lb
Torque Limit Switch	**Disable**	
Powertrain Protection Engine Speed Limit	**Disable**	
PTO	**Disable**	
Remote Accelerator Pedal or Lever	**Disable**	
Road Speed Governor		
Maximum Accelerator Vehicle Speed	68	mph
Maximum Vehicle Speed	69	mph
Road Speed Governor Lower Droop	0	mph
Road Speed Governor Upper Droop	3	mph
Greenhouse Gas Vehicle Speed Limiter	**Disable**	
Reserve Speed	**Disable**	
Switched Maximum Vehicle Speed	**Disable**	
SAE J1939 Multiplexing		
Accelerator Interlock Switch	**Disable**	
Accelerator Pedal Or Lever Position	**Disable**	
Aftertreatment Diesel Exhaust Fluid Tank Level Sensor	**Enable**	
Source Address	163 - Catalyst Fluid Sensor	
Aftertreatment Diesel Exhaust Fluid Tank Temperature Sensor	**Enable**	
Source Address	163 - Catalyst Fluid Sensor	
Aftertreatment Regeneration Permit Switch	**Disable**	
Aftertreatment Regeneration Start Switch	**Enable**	
Source Address	33 - Body Controller	
Air Conditioning Pressure Switch	**Disable**	

Features and Parameters	ECM Value	Unit
Auxiliary Shutdown Switch	Disable	
⊟ Clutch Pedal Position Switch	Enable	
Source Address	33 - Body Controller	
⊟ Cruise Control On/Off Switch	Enable	
Source Address	33 - Body Controller	
Cruise Control Pause Switch	Disable	
⊟ Cruise Control Set / Resume Switch	Enable	
Source Address	33 - Body Controller	
Diagnostic Test Mode Switch	Disable	
⊟ Engine Brake Switch Level	Enable	
Source Address	33 - Body Controller	
Engine Protection Shutdown Manual Override	Disable	
⊟ Fan Control Switch	Enable	
Source Address	33 - Body Controller	
Fan Control Switch 2	Disable	
⊟ Fuel Level Sensor	Enable	
Source Address	33 - Body Controller	
Fuel Level Sensor 2	Disable	
⊟ Idle Increment/ Idle Decrement Switch	Enable	
Source Address	33 - Body Controller	
Idle Validation Switch	Disable	
⊟ Parking Brake	Enable	
Source Address	33 - Body Controller	
⊟ PTO On/Off Switch	Enable	
Source Address	33 - Body Controller	
⊟ PTO Set / Resume Switch	Enable	
Source Address	33 - Body Controller	
Rear Axle Ratio Switch	Disable	
Remote Accelerator Pedal or Lever	Disable	
Remote Accelerator Pedal or Lever Switch	Disable	
Remote PTO Switch	Disable	
⊟ Service Brake Switch	Enable	
Source Address	33 - Body Controller	
Torque Derate Switch	Disable	
Service Brake Switch	Enable	
SmartAccel	Disable	
Starter Lockout	Disable	
⊟ Sudden Deceleration Event Settings		
Sudden Deceleration Rate Threshold	7.4	mph/s
Switched Maximum Engine Operating Speed	Disable	
Tire Wear Adjustment	Disable	
⊟ Transmission Setup		
Gear Down Transmission Ratio	1.00	
Top Gear Transmission Ratio	0.74	
Transmission Type	Manual	
⊟ Trip Information		

Features and Parameters	ECM Value	Unit
Vehicle Overspeed 1	75.0	mph
Vehicle Overspeed 2	77.1	mph
Variable Rate Vehicle Acceleration Management	**Disable**	
Vehicle Speed Sensor Anti-Tampering		
Vehicle Speed Sensor Anti-Tampering Sensitivity		
Tampering Sensitivity Level	High	
Vehicle Speed Source		
Maximum Engine Speed without Vehicle Speed Source	1419	RPM
Number of Transmission Tailshaft Gear Teeth	16	
Rear Axle Ratio	3.36	
Tire Size	511	revs/mi
Vehicle Speed Sensor Type	Magnetic	
Two Speed Rear Axle	**Disable**	

Appendix B: Event Data Recorder Report – 2002 Ford Mustang[4]

[4] The ACM report in this report was imaged and given to SCI by the investigating police agency as a PDF file.

BOSCH

CDR CRASH DATA RETRIEVAL

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	[redacted]
User	[redacted]
Case Number	[redacted]
EDR Data Imaging Date	[redacted]
Crash Date	[redacted]
Filename	[redacted]
Saved on	Wednesday, [redacted] 10:24:14
Imaged with CDR version	Crash Data Retrieval Tool 23.0.2
Imaged with Software Licensed to (Company Name)	[redacted]
Reported with CDR version	Crash Data Retrieval Tool 23.0.2
Reported with Software Licensed to (Company Name)	[redacted]
EDR Device Type	Airbag Control Module
Event(s) recovered	Deployment

Comments

Inspection location:[redacted]
Vehicle description:[redacted]
Individuals present:[redacted]
Observed visible restraint deployment(s):none seen/pretensioners unable to determine.
Imaging conducted pursuant to search warrant (warrant details)[redacted]
Ignition key or fob available and its position at the start of the inspection:Ignition key.
Odometer reading/units: N/A
Recommended tire size (sticker): N/A
Tire size(s) (actual): F:245/45 17, R:275/40 18
R/F Sumitomo HTR AS P02 245/45 R17
R/R Goodyer Eagle F1 P275/40 ZR18 94Y
L/F Bridgestone Potenza RE97 AS P245/45
L/R Goodyer Eagle F1 P275/40 ZR18 94Y
Imaging completed by direct-to-module access:D2M
"Re-powering" required (Y/N):N
Additional power-up used:Y, 110V
Other notes:RCM removed[redacted]

Mustang

Disclaimer

I have accessed and retrieved data from CDR Tool accessible system(s) from or in the vehicle identified by the applied VIN in which potential Event Data Recorder (EDR) may be found. The retrieved data may be related to a crash or other physical event. The successful retrieval of the data and production of this report is an indication that the procedure(s) necessary to properly access and retrieve the data have been followed and the data was properly imaged/downloaded.

I have or will provide the appropriate party(s) a copy of the original, raw data file - the underlying CDR System file - for discovery and/or later re-printing as necessary. This file will be named using the vehicle's Vehicle Identification Number (VIN) and identified by the *.CDRx file extension. This file should only be opened and viewed with the latest version of the Bosch Crash Data Retrieval System Software; improper use of a "text viewer" may corrupt the CDRx file which would prevent it from being opened again in the CDR Tool software and generating a data translation report.

The raw data as found in the CDRx file might be compared to a photographic negative and it is a direct image or copy of the data stored on/in the module(s) accessed using the CDR Tool. The CDRx file should be preserved in its native format, unedited, and should be shared in that format where it may be viewed at a later date using a licensed copy of the CDR Tool software or using the "free reader" version of the CDR Tool software in the latest production release of that software. Prior to any analytical use of this data or legal proceeding, the original *.CDRx file should be reopened and the raw data translated in the latest production version of the CDR software to ensure the most recent, complete

translation of the data is used as described in the "Important Notice" above.

I have indicated to the individual(s) receiving the CDRx file that the report includes a Data Limitations section which follows this disclaimer and that portion of this translation report may describe or suggest conditions or characteristics of the data which may be, on the surface, confusing or require a more complete analysis by other means. I have also informed the individual(s) that the data may be affected by conditions or vehicle characteristics described in the Data Limitations section of the report or in other related reference material including, but not limited to, the CDR Tool software Help File. For these reasons and others, a situationally complete analysis of the crash or event under study should be undertaken to fully evaluate the meaning, usefulness and applicability of the recovered data found in this report.

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 Wednesday, January 4 2023 at 10:24:14.

Data Limitations

Important Limitations on Bosch Crash Data Retrieval (CDR) Tool Capabilities.

Disclaimer: This Restraint Control Module (RCM) records longitudinal deceleration data for the purpose of understanding the input data the Restraint Control Module used to determine whether or not to deploy restraint devices. This module does not record vehicle speed, throttle position, brake on-off, and other data, which may be recorded in some 1999 model year and later General Motors modules. The deceleration data recorded by Ford's module during a crash can subsequently be mathematically integrated into a longitudinal Delta-V. Delta-V is the change in velocity during the recording time and is NOT the speed the vehicle was traveling before the accident, and is also not the Barrier Equivalent Velocity. The Bosch CDR Tool will read and interpret both acceleration in G's and Delta-V in mph. RCM's in Ford vehicles that can be read by the Bosch CDR tool are listed in the Bosch Help Files.

Important

If there is any question that the restraint system did not perform as it was designed to perform, please read the system only through the diagnostic link connector. The Bosch CDR kit provides an RCM interface cable to plug directly into the restraint control module. The Bosch CDR RCM Interface Cable connects only power, ground, and memory read pins to the relevant vehicle restraint control module. The other RCM pins normally connect to inputs, such as sensors, and outputs, such as airbags, are not connected when you use the RCM Interface Cable to plug directly into the module. Since the vehicle restraint control module is constantly monitoring airbag system readiness (when powered), it will detect that the sensors and airbags are not connected. The restraint control module may record a new diagnostic trouble code into memory for each device that is not connected. These new diagnostic trouble codes may record over previously written diagnostic trouble codes present prior to the accident and spoil evidence necessary to determine if the restraint system performed in the accident as it was designed to perform. Not only could this prevent Ford from being able to determine if the system performed as it was designed to perform, but, regardless of innocent inadvertence, you could raise issues of evidence spoliation in any litigation that may arise out of the accident. If you cannot read the module via the diagnostic link connector, and if you suspect improper system performance, contact Ford Motor Company and request their assistance to read the module with a proper vehicle simulator attached.

While data stored in RCM's is accurate, accident reconstructionists must be aware of the limitations of the data recorded in Ford's control modules and should compare the recorded data with the physical evidence at the accident scene using professional accident reconstruction techniques (i.e. vehicle crush characteristics, skid marks, etc) before making any assumptions about the import and validity of the data recorded in the module with respect to the crash event being analyzed. The following describes specific limitations that must be considered when analyzing recorded data. Investigators should obtain permission of the vehicle owner or have sufficient legal authority prior to reading any data.

1. There may be no deceleration data recorded in the module.
Loss of power (cut wires, damaged battery, crushed fuse box) to the module during or immediately after the crash may prevent the crash data from being recorded. A backup power supply within the module has sufficient power to continue to analyze the deceleration data and deploy restraint devices if needed, but there is no backup power for recording.

If the deceleration input does not create a vehicle longitudinal Delta-V above 4 mph within 100 milliseconds, there may not be any data recorded.

2. In unusual circumstances, deceleration data stored in the module may be from a crash other than the one you are currently analyzing.
The module will record data from some non-deploy events. If, after the module has recorded data from a non-deploy event, and there is a subsequent event in which there is a loss of power and no new recording is made for that subsequent event, the deceleration data in the module's memory may be from the prior event. If the new, subsequent event is a deploy event and recording has occurred, the deployment times should be recorded. If there are no deployment times recorded, but airbags or other restraint devices are observed to have deployed, the recorded data that you read are most likely from a prior event.

Once an airbag or other restraint device has been commanded to deploy, the data recorded in connection with that deployment are "locked", and subsequent crashes cannot be recorded.

If a vehicle is being repaired, the RCM should be replaced after any crash in which restraint devices deploy. Early printed shop manuals refer to re-using modules by clearing the "crash data memory full" code, but this is no longer true and the latest on-line electronic shop manual directs that modules be replaced.

Crashes that involve multiple impacts will record only one of the impacts. If there is a deployment, the deployment event will be recorded and locked. If no restraint device is commanded to deploy, the recorded data are not "locked", and subsequent impacts may record over any previous recorded data. Further analysis will be required to determine which of the events was actually recorded.

3. The computed longitudinal Delta-V may understate the total Delta-V

Many real-world crashes can last longer than the memory has the capacity to record. Therefore, the actual Delta-V of the event may be higher than the Delta-V calculated and displayed by the Bosch CDR System output. Review the end of the longitudinal acceleration/deceleration pulse - if it has not settled to zero G's by the end of the recording, the vehicle longitudinal Delta-V is most likely understated. If there is a clear decaying trend line you may choose, at your own risk, to estimate the total Delta-V by extrapolating the decay trend to zero and to calculate the additional Delta-V not captured.

Under some circumstances where power is interrupted, during the recording of data, or the module re-sets during the recording of data, a partial recording may occur. This will be shown as "no data" in the data table and will not be plotted on the graph of acceleration. When some portion of the acceleration data is not recorded, the Delta-V during that time cannot be calculated. A Delta-V will be calculated for the points that are valid, but the user must be aware that the partial Delta-V calculated will further underestimate the actual event total Delta-V.

4. This module records only longitudinal acceleration/deceleration of the vehicle. You must compute lateral or resultant total acceleration based on your estimated Principal Direction of Force (PDOF).

5. Vertical acceleration/decelerations are not recorded. Vehicle spin about a point not centered on the Restraints Control Module sensor may add or subtract from bulk vehicle motion.

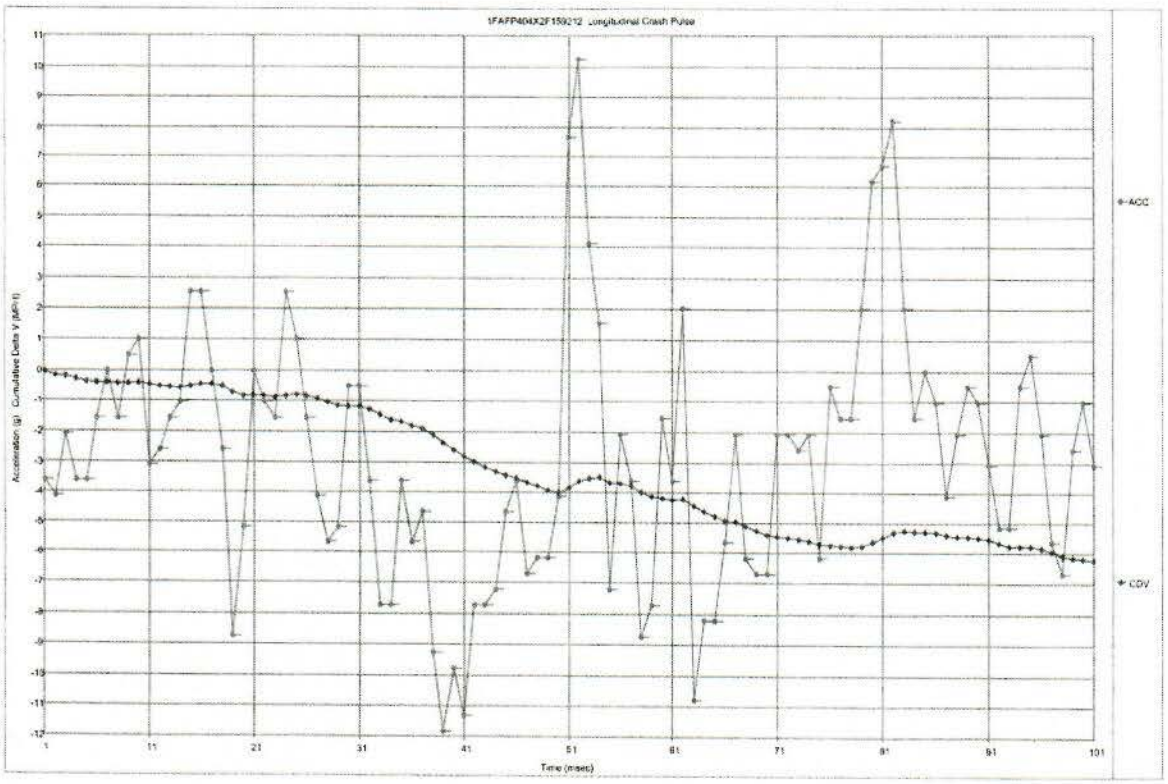
6. This module is not intended to record acceleration/deceleration in a side-impact event. If the side impact generates a longitudinal deceleration component sufficient to wake up the frontal deployment algorithm, there may be a recording of longitudinal deceleration in a side impact event.

Any Longitudinal Delta-V determined by using data read from the air bag module should be verified with physical evidence from the crash (such as vehicle crush, skid marks) and assumed accident sequence. Multiple impacts, angular collisions, side impacts, vehicle spin, etc should be considered in addition to the data read from the air bag module.

02001_RCM-1_r002

System Status At Deployment

Diagnostic codes active when event occurred	0
Passenger Airbag Switch Position During Event	Activated
Time From Side Safing Decision to Left (Driver) Side Bag Deployment (msec)	Not Deployed
Frontal and Pretensioner Fire time (ms)	42


1FAFP404X2F159212 Longitudinal Crash Pulse
Acceleration (g) Cumulative Delta V (MPH)
Time (msec)
ACC
CDV

Crash Pulse Data

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
1	-3.60	-0.08
2	-4.11	-0.17
3	-2.06	-0.21
4	-3.60	-0.29
5	-3.60	-0.37
6	-1.54	-0.41
7	0.00	-0.41
8	-1.54	-0.44
9	0.51	-0.43
10	1.03	-0.41
11	-3.08	-0.47
12	-2.57	-0.53
13	-1.54	-0.56
14	-1.03	-0.59
15	2.57	-0.53
16	2.57	-0.47
17	0.00	-0.47
18	-2.57	-0.53
19	-8.74	-0.72
20	-5.14	-0.84
21	0.00	-0.84
22	-1.03	-0.86
23	-1.54	-0.89
24	2.57	-0.84
25	1.03	-0.81
26	-1.54	-0.85
27	-4.11	-0.94
28	-5.65	-1.06
29	-5.14	-1.17
30	-0.51	-1.18
31	-0.51	-1.20
32	-3.60	-1.28
33	-7.71	-1.44
34	-7.71	-1.61
35	-3.60	-1.69
36	-5.65	-1.82
37	-4.63	-1.92
38	-9.25	-2.12
39	-11.82	-2.38
40	-9.77	-2.60
41	-11.31	-2.84
42	-7.71	-3.01
43	-7.71	-3.18
44	-7.20	-3.34
45	-4.63	-3.44
46	-3.60	-3.52
47	-6.68	-3.67
48	-6.17	-3.80
49	-6.17	-3.94
50	-4.11	-4.03

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
51	7.71	-3.86
52	10.28	-3.63
53	4.11	-3.54
54	1.54	-3.51
55	-7.20	-3.67
56	-2.06	-3.71
57	-3.60	-3.79
58	-8.74	-3.98
59	-7.71	-4.15
60	-1.54	-4.19
61	-3.60	-4.27
62	2.06	-4.22
63	-10.79	-4.46
64	-8.22	-4.64
65	-8.22	-4.82
66	-5.65	-4.94
67	-2.06	-4.99
68	-6.17	-5.12
69	-6.68	-5.27
70	-6.68	-5.42
71	-2.06	-5.46
72	-2.06	-5.51
73	-2.57	-5.56
74	-2.06	-5.61
75	-6.17	-5.74
76	-0.51	-5.76
77	-1.54	-5.79
78	-1.54	-5.82
79	2.06	-5.78
80	6.17	-5.64
81	6.68	-5.50
82	8.22	-5.32
83	2.06	-5.27
84	-1.54	-5.30
85	0.00	-5.30
86	-1.03	-5.33
87	-4.11	-5.42
88	-2.06	-5.46
89	-0.51	-5.47
90	-1.03	-5.50
91	-3.08	-5.56
92	-5.14	-5.68
93	-5.14	-5.79
94	-0.51	-5.80
95	0.51	-5.79
96	-2.06	-5.83
97	-5.65	-5.96
98	-6.68	-6.11
99	-2.57	-6.16
100	-1.03	-6.18
101	-3.08	-6.25

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.

```
0800:  AA 42 40 5F 14 A2 58 2D 0D 23 0F 2D 38 57 C8 FF
0810:  10 FF 22 17 3C 78 F1 9E 08 A2 F9 EF 19 99 52 49
0820:  2D 03 B3 43 1E 0A F5 0A A1 5E 03 0E 1D 1E 00 25
0830:  3C 3C 80 28 05 28 FC 0A 04 0F 0E 0F 03 84 B7 05
0840:  50 07 0E 07 9F 3B 60 00 C8 00 3C 00 C0 00 14 2C
0850:  EC 2E E0 00 14 15 7C 17 70 01 90 00 3C 00 60 07
0860:  BC 13 EC 02 FB 00 09 00 C8 00 00 00 96 04 7E 7D
0870:  00 00 33 03 E8 00 B4 13 EC 02 58 00 64 04 28 01
0880:  DC 00 0A 00 56 00 5F 00 C8 44 38 00 7F 00 E6 01
0890:  14 50 5A 64 41 64 14 64 27 69 02 18 40 01 FF C9
08A0:  14 FF 50 01 47 CD 4F FF FF FF FF FF FF FF FF BF
08B0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF 00 FF
08C0:  03 FF FF FF FF FF 72 04 64 58 52 33 41 00 04 1C
08D0:  00 F7 00 0A 00 80 32 FE 00 00 FE 1A 32 FE 80 FF
08E0:  03 FF 80 04 FF 80 2F FF 80 02 FF 80 09 00 80 FF
08F0:  1D 1F 00 00 00 80 04 FF FF FF FF FF FF FF 00 00
0900:  02 FF 83 08 01 2A 11 FF FF FF FF FF 28 01 24 60
0910:  FF 12 01 24 64 13 01 24 64 12 32 11 18 44 FF FD
0920:  9C 9B 9F 9C 9C A0 A3 A0 A4 A5 9D 9E A0 A1 A8 A8
0930:  A3 9E 92 99 A3 A1 A0 A8 A5 A0 9B 98 99 A2 A2 9C
0940:  94 94 9C 98 9A 91 8C 90 8D 94 94 95 9A 9C 96 97
0950:  97 9B B2 B7 AB A6 95 9F 9C 92 94 A0 9C A7 8E 93
0960:  93 98 9F 97 96 96 9F 9F 9E 9F 97 A2 A0 A0 A7 AF
0970:  B0 B3 A7 A0 A3 A1 9B 9F A2 A1 9D 99 99 A2 A4 9F
0980:  98 96 9E A1 9D 00 00 00 00 00 00 00 00 00 00 00
0990:  00 00 00 00 A3 04 FF 00 FC 9E 00 25 00 00 00 00
09A0:  00 D9 00 00 00 A1 00 25 00 A8 00 B0 00 00 00 05
09B0:  00 00 01 21 00 A8 00 64 01 94 00 00 00 00 00 00
09C0:  00 00 A8 FF 00 FF FF 07 29 00 FF FF FF FF FF FF
09D0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
09E0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
09F0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
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Disclaimer of Liability

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

DOT HS 813 735
February 2026

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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