TECHNICAL RECONSTRUCTION ATTACHMENT

2017 Volkswagen CDR Report

Woodlawn, Maryland

HWY23FH010

(14 pages)

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	3VW2B7AJ9HM[redacted]
User	Cpl J Lantz 5563
Case Number	23MSP010306
EDR Data Imaging Date	03/28/2023
Crash Date	03/22/2023
Filename	3VW2B7AJ9HM[redacted]_ACM.CDRX
Saved on	Tuesday, March 28 2023 at 10:42:38
Imaged with CDR version	Crash Data Retrieval Tool 23.0.2
Imaged with Software Licensed to (Company Name)	Maryland State Police
Reported with CDR version	Crash Data Retrieval Tool 23.0.2
Reported with Software Licensed to (Company Name)	Maryland State Police
EDR Device Type	Airbag Control Module
Event(s) recovered	Record 1

Comments

Search Warrant
DTM
CDR900 / 804
205 55 R16

Data Limitations

AIRBAG CONTROL MODULE (ACM) DATA LIMITATIONS:

General Information:
These limitations are intended to assist you in reading the event data that has been imaged from the vehicle's Airbag Control Module (ACM). They are not intended to provide specific information regarding the interpretation of this data. Event data should be examined in conjunction with other available physical evidence from the vehicle and scene.

> **Note**: The ACM's current DTC status will be altered if the ACM is powered-up without the vehicle periphery connected. This situation might occur when the CDR tool is connected directly to the ACM (e.g. for bench top imaging). It will not affect the stored EDR data, but may result in additional DTCs within the ACM.
>
> **Note**: During bench top imaging, make sure the ACM is not moved, tilted or turned over while connected to and powered by the CDR Interface Module. Also, after a CDR imaging process, wait one minute after power is removed from the ACM before attempting to move the module. Not following these general ACM guidelines for bench top imaging could cause new events to be recorded in the ACM.

Recorded Crash Events:
This ACM is capable of recording up to 6 events of front, side, rear or rollover within its memory. Each record contains 5 seconds of pre-crash data and at least 300ms of post-crash data. Deployment events are locked into memory and cannot be overwritten. Non-deployment events can be overwritten by subsequent deployment or non-deployment events. The oldest non-deployment event will be overwritten first. Some ACMs stop over-writing of older non-deployment events by more recent non-deployment events after a certain number of events (more than 1000). Under these conditions, the storage of deployment events is still available. The event counter is incremented for each event and stored within the data record.

Deployment events are recorded, when a non-reversible restraint system was commanded to deploy. Recording of non-deployment events requires a minimum delta-V of 8km/h within a 150ms period in either longitudinal or lateral direction. Reversible restraint systems (e.g. active headrests) that have been commanded to deploy also trigger recording of a non-deployment event. Time Zero of an event is determined by the ACM's algorithms based on the acceleration and/or pressure sensors or a deployment command. Post-crash data (e.g. deployment time of restraint systems) is reported relative to Time Zero.

The ACM supports recording of multiple events. In case of a rapid sequence of events (e.g. a combined frontal and side event), the ACM will record the data within a common EDR entry (a so-called parallel event). In this case, the post-crash data is reported relative to Time Zero of the initial event. If the initial event has already ended and another event happens within a time period of 5s from Time Zero of the initial event, the ACM will record a multi-event consisting of two or more separate EDR entries.

If power to the ACM was lost during an event, all or part of the event data record may not have been recorded.

Data:
The reported data elements may vary by vehicle model, model year or vehicle configuration. Part of the pre-crash data has been transmitted to the ACM by various vehicle control modules via the vehicle's communication network.

Time-continuous pre-crash data is recorded at two samples per second for 5 seconds before Time Zero. The main data elements are:

- Speed Vehicle Indicated: is reported as displayed by the vehicle's instrument cluster. The vehicle speed is evaluated as an average of wheel speeds and transmitted via the vehicle communication network to the ACM. Its data accuracy may be affected by various factors, such as significant changes in tire size from the factory settings, wheel lock-up or slip.
- Accelerator Pedal: is the ratio of the accelerator pedal's position compared to the fully depressed position (in percent). The pedal position sensor is wired to the Engine Control Module.
- Service Brake Activation: is the status of the brake pedal switch. The switch is wired to the Engine Control Module.
- Engine RPM (Combustion Engine): as reported by the Engine Control Module.
- Steering Input: as reported by the wheel angle sensor.
- ABS Activity: as reported by the Electronic Stability Control Module.
- Stability Control: as reported by the Electronic Stability Control Module.

The pre-crash status is recorded 1 second before Time Zero. The main data elements are:

- Safety Belt Status: as evaluated by the belt-switches that are wired to the ACM.
- Seat Track Position Switch: as evaluated by the seat track position sensors that are wired to the ACM.
- Airbag Warning Lamp, Status: as commanded by the ACM.
- Occupant Size Classification, Front Passenger: as reported by the occupant classification system.
- Frontal Airbag Disable Indicator Status: as commanded by the ACM.

Pre-crash and post-crash data are recorded asynchronously. The data element "Time from Last Speed Data Sample (Precrash) to Time Zero" indicates the time delay between the most recent pre-crash data sample and Time Zero (0 to 500ms).

Post-crash data is recorded after Time Zero up to 300ms. The Vehicle Roll Angle may be recorded for 5 seconds post-crash. The main data elements are:

- Event Type: indicates the event type depending on the algorithm that triggered the recording criteria first (deployment or Delta-V threshold).
- Multi-Event, Number of Events: determines the chronological order of records being part of a multi-event.
- Time from Previous / Initial Event to Current Event: indicates the time difference between records of multi-events.
- Delta-V Longitudinal / Lateral: are recorded every 10ms from Time Zero to 250ms. Delta-V reflects the change in velocity that the ACM experienced during the recorded time period. It does not necessarily correlate with vehicle traveling speed.
- Longitudinal / Lateral / Normal Acceleration: are recorded every 10ms from Time Zero to 250ms (if supported by the ACM). The reported range of acceleration may vary between ACM models.
- Clipping Time, Longitudinal / Lateral Acceleration Sensor: depending on the severity of the event, the measuring range of the longitudinal or lateral accelerometers may be exceeded. The data elements "Clipping Time, Longitudinal / Lateral Acceleration Sensor" indicate the time within an event when the measurement first exceeded the design range of the sensor. As a result, subsequent Delta-V values may be underestimated.
- Vehicle Roll Angle: is recorded every 100ms from 1 second before and up to 5 seconds after Time Zero. Due to mechanical limitations of the roll rate sensor, high accelerations, which can occur during front, side or rear crashes, can disturb the oscillating angular rate sensing element. This results in the roll rate data being temporarily invalid for a short period of time (at or shortly after Time Zero).
- Time to Deployment: indicates the time at which the ACM commanded the deployment of the associated restraint system.
- Disposal: indicates whether the ACM commanded the disposal of the propellant from the associated restraint system. "No Disposal" indicates that the restraint system was commanded to deploy for occupant restraint purposes.
- Date and Time at Event: is reported as the date and time of the vehicle's clock at the time of an event. Since the vehicle clock may be adjusted manually, the reported values may not reflect the actual date and time of a given event. As with the other data elements reported herein, these parameters should be examined in conjunction with other available physical evidence from the vehicle and scene.
- Complete File Recorded: indicates if the event data has been completely recorded to the ACM's memory or if the recording process has been interrupted before completion.

The status "Data not Available" is reported if the ACM was unable to store the data element (e.g. due to missing communication). "Invalid Data" is reported if the ACM was unable to store valid data for the data element (e.g. range exceeded, communication failure, sensor failure).

Data Sign Convention:

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Delta-V, Longitudinal	Forward
Maximum Delta-V, Longitudinal	Forward
Lateral Acceleration	Left to Right
Delta-V, Lateral	Left to Right
Maximum Delta-V, Lateral	Left to Right
Normal Acceleration	Downward
Vehicle Roll Angle	Left to Right Rotation
Steering Input	Left Turn

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.

12001_VWGDefault_r002

System Status at Event (Record 1, Most Recent)

Event Counter at Event (Counts)	1
Multi-Event, Number of Events	1. Event
Time from Initial Event to Current Event (msec)	0.0
Time from Previous Event to Current Event (msec)	0.0
Vehicle Mileage (km)	114,180
Operating Time (min)	219,338
Ignition Cycle at Event (Cycles)	10,157
Ignition Cycle at Download (Cycles)	10,163
Maximum Delta-V, Longitudinal (MPH [km/h])	-3.1 [-5]
Time, Maximum Delta-V, Longitudinal (msec)	192.5
Clipping Time, Longitudinal Acceleration Sensor (msec)	Clipping Not Reached
Maximum Delta-V, Lateral (MPH [km/h])	6.2 [10]
Time, Maximum Delta-V, Lateral (msec)	172.5
Clipping Time, Lateral Acceleration Sensor (msec)	Clipping Not Reached
Time, Maximum Delta-V, Resultant (msec)	172.5
Time from Last Speed Data Sample (Precrash) to Time Zero (msec)	448
Vehicle Identification Number (VIN)	Data Not Available
Supply Voltage (Before Event) (V)	14.2
Complete File Recorded	Completed Successfully

Deployment Command Data (Record 1, Most Recent)

Pretensioner, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Belt-Load Limiter, Time to Deployment, Driver (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Driver (msec)	Not Deployed
Side Airbag, Time to Deployment 1st Stage, Driver (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Driver Side (msec)	Not Deployed
Pretensioner, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Belt-Load Limiter, Time to Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 1st Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, Time to 2nd Stage Deployment, Front Passenger (msec)	Not Deployed
Frontal Airbag, 2nd Stage Disposal, Front Passenger	Not Deployed
Side Airbag, Time to Deployment 1st Stage, Front Passenger (msec)	Not Deployed
Side Curtain/Tube Airbag, Time to Deployment, Passenger Side (msec)	Not Deployed

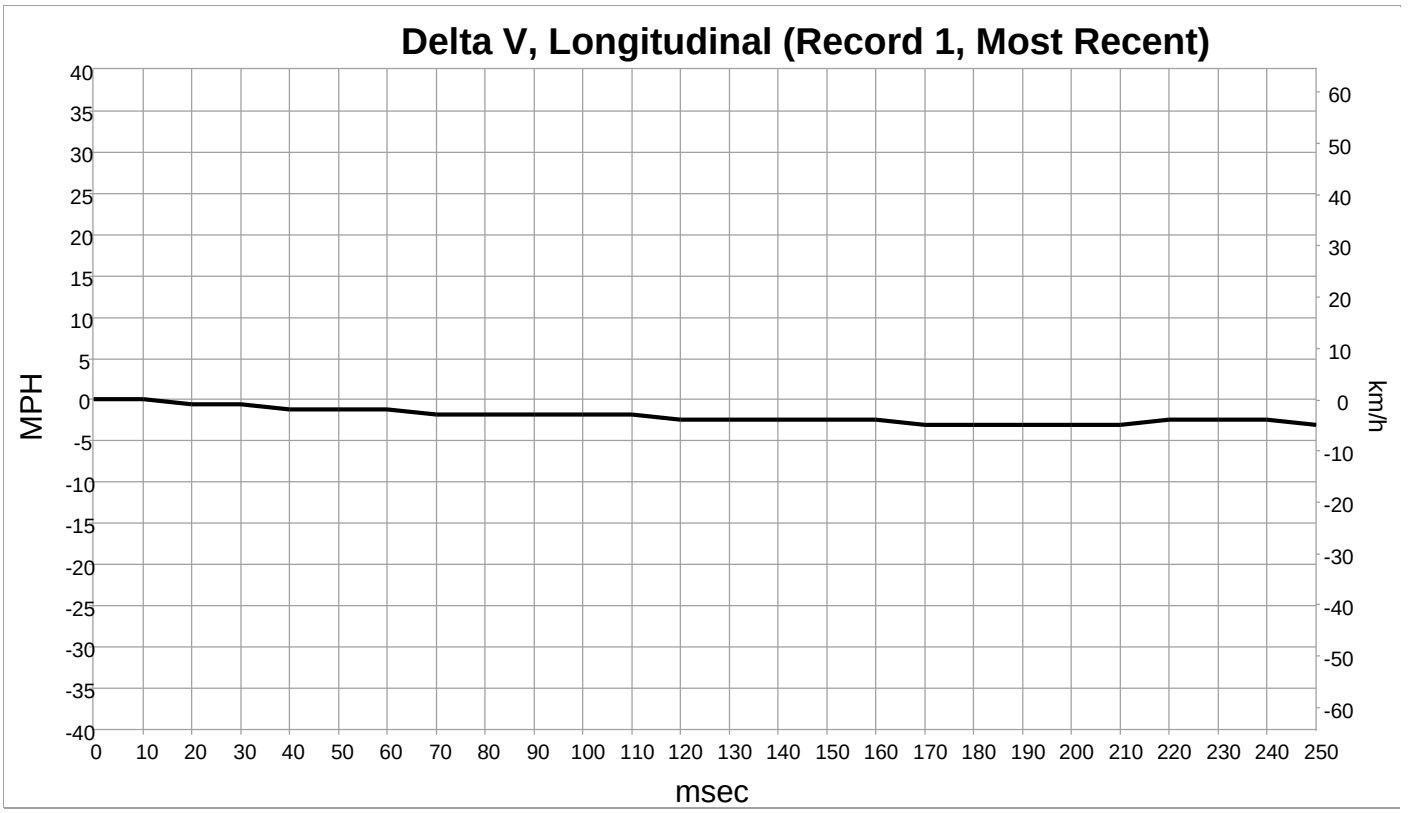
Pre-Crash Data -1 Sec (Record 1, Most Recent)

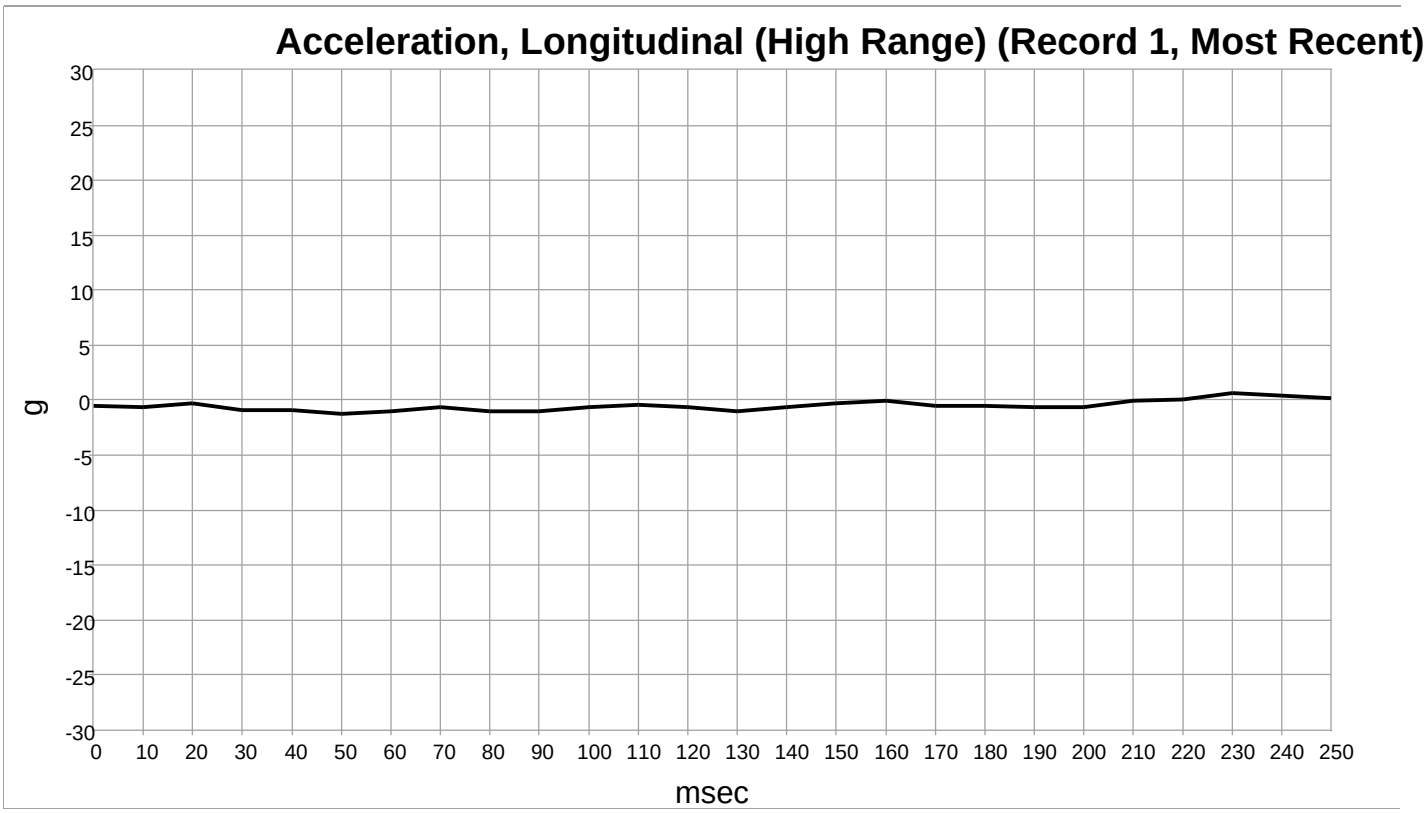
Safety Belt Status, Driver	Belted
Seat Track Position Switch Status, Driver	Rear
Safety Belt Status, Front Passenger	Not Belted
Seat Track Position Switch Status, Front Passenger	Rear
Occupant Size Classification, Front Passenger	Empty
Frontal Airbag Disable Indicator Status, Passenger	On
Airbag Warning Lamp, Status	On

Pre-Crash Data -5 to 0 sec (Record 1, Most Recent)

Time (sec)	Engine RPM (Combustion Engine) (RPM)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal (%)	Service Brake Activation
-5.0	4,608	122 [196]	100	Off
-4.5	4,608	122 [197]	100	Off
-4.0	4,608	123 [198]	100	Off
-3.5	4,608	123 [198]	100	Off
-3.0	4,608	123 [198]	100	Off
-2.5	4,608	123 [198]	100	Off
-2.0	4,608	124 [199]	100	Off
-1.5	4,608	124 [199]	100	Off
-1.0	4,608	123 [198]	0	Off
-0.5	4,544	122 [196]	0	On
0.0	4,416	111 [178]	54	On

Longitudinal Crash Pulse (Record 1, Most Recent)

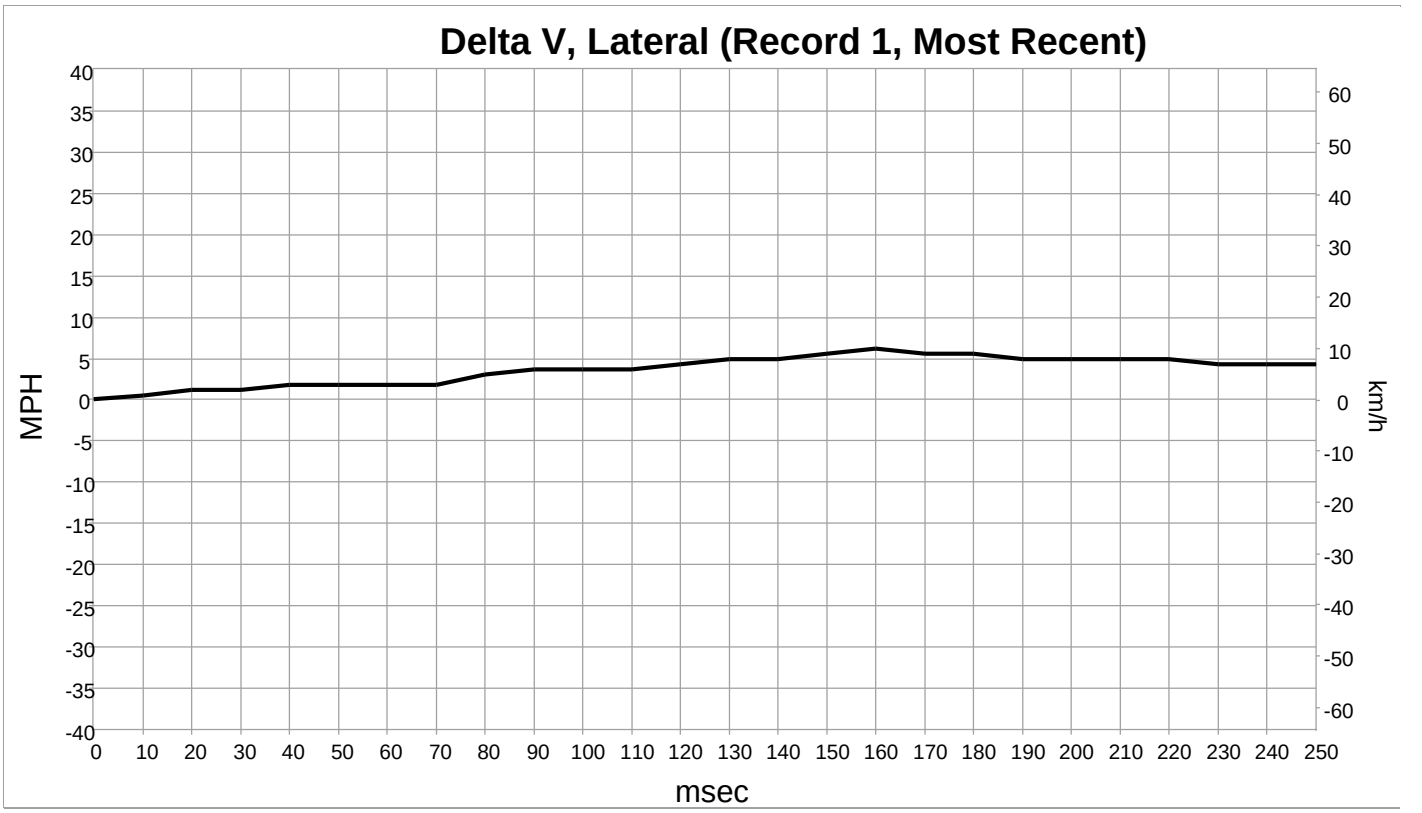


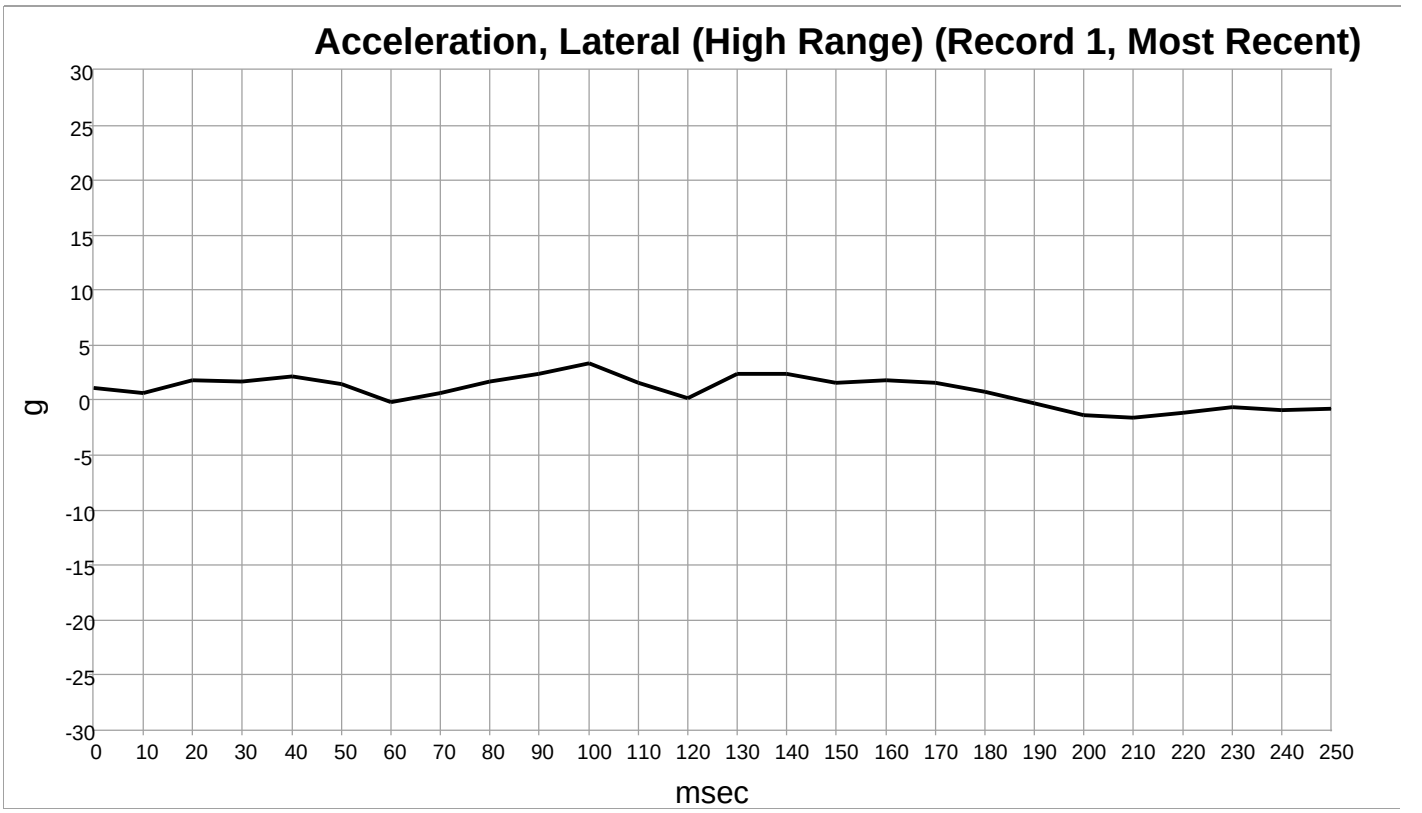


Longitudinal Crash Pulse (Record 1, Most Recent)

Time (msec)	Delta-V, Longitudinal (MPH [km/h])	Longitudinal Acceleration High Range (g)
0	0.0 [0]	-0.57
10	0.0 [0]	-0.64
20	-0.6 [-1]	-0.29
30	-0.6 [-1]	-0.88
40	-1.2 [-2]	-0.90
50	-1.2 [-2]	-1.25
60	-1.2 [-2]	-0.98
70	-1.9 [-3]	-0.63
80	-1.9 [-3]	-1.05
90	-1.9 [-3]	-0.99
100	-1.9 [-3]	-0.67
110	-1.9 [-3]	-0.39
120	-2.5 [-4]	-0.60
130	-2.5 [-4]	-1.03
140	-2.5 [-4]	-0.64
150	-2.5 [-4]	-0.25
160	-2.5 [-4]	-0.10
170	-3.1 [-5]	-0.52
180	-3.1 [-5]	-0.53
190	-3.1 [-5]	-0.62
200	-3.1 [-5]	-0.64
210	-3.1 [-5]	-0.04
220	-2.5 [-4]	0.11
230	-2.5 [-4]	0.60
240	-2.5 [-4]	0.42
250	-3.1 [-5]	0.18

Lateral Crash Pulse (Record 1, Most Recent)

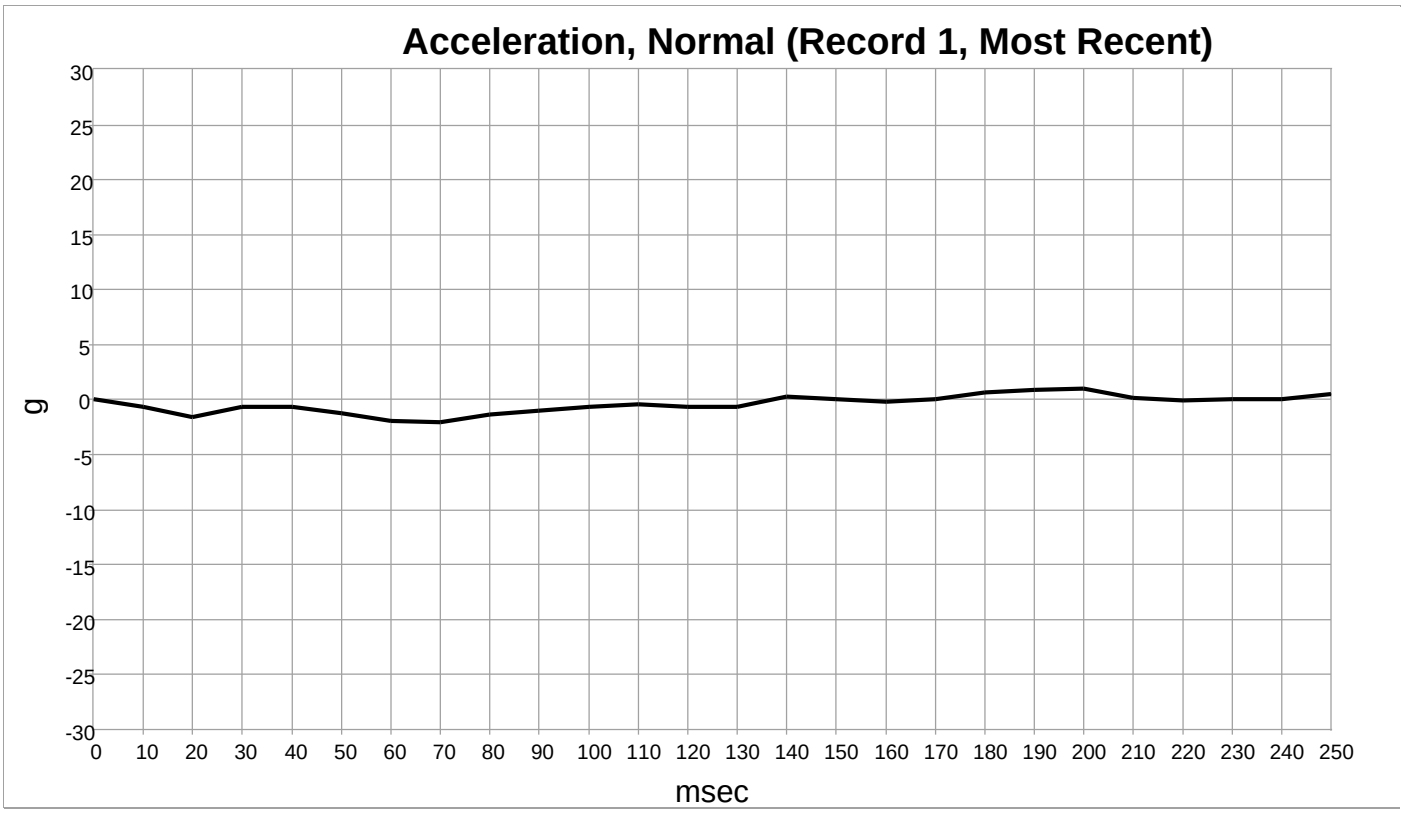




Lateral Crash Pulse (Record 1, Most Recent)

Time (msec)	Delta-V, Lateral (MPH [km/h])	Lateral Acceleration High Range (g)
0	0.0 [0]	1.14
10	0.6 [1]	0.69
20	1.2 [2]	1.85
30	1.2 [2]	1.65
40	1.9 [3]	2.13
50	1.9 [3]	1.46
60	1.9 [3]	-0.21
70	1.9 [3]	0.67
80	3.1 [5]	1.65
90	3.7 [6]	2.35
100	3.7 [6]	3.30
110	3.7 [6]	1.63
120	4.3 [7]	0.17
130	5.0 [8]	2.42
140	5.0 [8]	2.40
150	5.6 [9]	1.61
160	6.2 [10]	1.86
170	5.6 [9]	1.53
180	5.6 [9]	0.75
190	5.0 [8]	-0.25
200	5.0 [8]	-1.30
210	5.0 [8]	-1.56
220	5.0 [8]	-1.07
230	4.3 [7]	-0.61
240	4.3 [7]	-0.89
250	4.3 [7]	-0.71

Normal Acceleration (Record 1, Most Recent)



Time (msec)	Normal Acceleration (g)
0	0.0
10	-0.7
20	-1.6
30	-0.7
40	-0.7
50	-1.2
60	-1.9
70	-2.0
80	-1.4
90	-1.0
100	-0.7
110	-0.4
120	-0.6
130	-0.6
140	0.3
150	0.1
160	-0.2
170	0.1
180	0.6
190	0.9
200	1.0
210	0.2
220	-0.1
230	0.0
240	0.1
250	0.5

Hexadecimal Data

```
FA10   01

FA12   01 00 00 07 F1 00 00 07 F9

FA11   02 00 04

FA13   00 01 00 04 00 00 00 05 00 19 00 06 00 D8 00 07
       FF FF 00 0C 00 0F 00 0D 00 28 00 0E 00 E2 00 0F
       FF FF 00 16 64 5C 09 10 80 71 80 44 80 B8 80 A4
       80 D4 80 91 7F EA 80 42 80 A4 80 EA 81 49 80 A2
       80 10 80 F1 80 EF 80 A0 80 B9 80 98 80 4A 7F E6
       7F 7D 7F 63 7F 94 7F C2 7F A6 7F B8 00 17 64 5C
       09 10 7F C6 7F BF 7F E2 7F A7 7F A5 7F 82 7F 9D
       7F C0 7F 96 7F 9C 7F BC 7F D8 7F C3 7F 98 7F BF
       7F E6 7F F5 7F CB 7F CA 7F C1 7F BF 7F FB 80 0A
       80 3B 80 29 80 11 00 19 64 5C 09 10 7F 78 6F 78
       78 73 6C 6B 71 75 78 7B 79 79 82 80 7D 80 85 88
       89 81 7E 7F 80 84 00 1F 64 5C 09 10 7F 7F 7E 7E
       7D 7D 7D 7C 7C 7C 7C 7C 7B 7B 7B 7B 7B 7A 7A 7A
       7A 7A 7B 7B 7B 7A 00 20 64 5C 09 10 7F 80 81 81
       82 82 82 82 84 85 85 85 86 87 87 88 89 88 88 87
       87 87 87 86 86 86 00 21 7A 00 22 89 00 23 4D 00
       24 45 00 25 45 00 28 FF 00 29 FF 00 2D 01 00 2E
       00 00 00 2F 01 C0 00 30 00 00 00 33 FF FF 00 38
       FF FF 00 39 FF FF 00 3B FF 00 3D FF FF 00 3E FF
       FF 00 3F FF FF 00 41 FF FF 00 42 FF FF 00 43 FF
       FF 00 47 01 00 48 02 00 4B 01 00 4D 00 00 4E 02
       00 4F 00 00 51 01 00 5B C4 C5 C6 C6 C6 C6 C7 C7
       C6 C4 B2 00 5C 64 64 64 64 64 64 64 64 00 00 36
       00 5D 48 48 48 48 48 48 48 48 48 47 45 00 5F 00
       00 00 00 00 00 00 00 00 01 01 00 73 FF FF 00 74
       FF FF 03 CF 00 8E 03 DD 59 4E 46 03 DE 17 03 16
       03 E8 A5 03 E9 27 AD 03 EA 27 B3 03 EB A7 03 EC
       0E 03 ED 14 03 EE 0C 03 EF 22 03 F0 33 03 F1 2C
       9A 03 F2 03 58 CA 03 F3 FF FF FF FF FF FF FF FF
       FF FF FF FF FF FF FF FF FF 03 FB 04 03 FD 00 01
       03 FE 69 8E AB 66

FA14   00 00

FA15   00 00

FA16   00 00

FA17   00 00

FA18   00 00
```

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.