August 22, 2022

Dr. Steven S. Cliff
Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE,
Washington, D.C. 20590-0001

USG 5860
NHTSA-2022-0021

RE: Event Data Recorders, Notice of Proposed Rulemaking, NHTSA Docket 2022-0021, 87 Fed. Reg. 37289 (June 22, 2022)

Dear Dr. Cliff:

General Motors LLC ("**GM**") appreciates the opportunity to provide comments on NHTSA's Notice of Proposed Rulemaking ("**NPRM**") to amend 49 CFR part 563, Event Data Recorders ("**EDRs**") to extend the recording period for pre-crash data from 5 seconds at a frequency of 2 Hz (every 1/2 second) to 20 seconds at a frequency of 10 Hz (every 0.1 sec).

GM was an early adopter and remains an industry leader in the recording of crash data. GM has over thirty years' experience in EDR design, development, validation, implementation, and crash data interpretation. The EDR provides valuable data to help understand crash scenarios and has aided in the company's development of certain active and passive safety systems. GM would support amendments to NHTSA's EDR regulation that would, for example, require additional crash data to aid crash reconstruction or allow for more sophisticated analysis of the performance of safety equipment. However, the proposal in the NPRM to extend the duration and rate of data collection does not aid in either of these endeavors or help to advance vehicle design or develop more effective vehicle safety systems.

GM is not just a developer of EDR, it is a consumer of EDR data. And, after years of EDR implementation and development, GM voluntarily added 3 additional seconds of pre-crash data to its latest generation EDR to the 5 seconds required by Part 563. In our experience, and through our work with accident reconstructionist, police and other investigating authorities, 8 seconds pre-crash is more than sufficient time to have a robust understanding of crash dynamics and vehicle performance. In fact, when discussing EDR data with these groups, it is often additional *categories* of data, both data element and event record types, that they suggest would increase the value of the EDR to their work. As explained below, GM has designed its latest generation EDR to also include more data elements and recorded events. If NHTSA proposes any rule to add requirements to EDR, GM recommends that these additional data signals would be of much greater value to the industry than extending data duration and rate requirements.

GM respectfully submits that the proposed rule does not strategically optimize the quality of the crash data available to NHTSA, manufacturers, crash investigators or accident reconstructionists. The EDR Duration Study upon which NHTSA largely bases its proposal found that the "EDR needs to be able to capture the driver's pre-crash behavior" and that an additional 15 seconds of data would achieve this goal. Yet, the EDR does not record the driver's behavior. Further, many of the GM Advanced Driver Assistance System ("**ADAS**") or crash avoidance features which NHTSA suggests can be evaluated by interrogating EDR have their own publicly retrievable data recording triggered by crash and crash-like events and that data is stored in a separate module, which is not the subject of the NPRM

Accordingly, the purported benefits of NHTSA's proposal cannot be best secured through this rulemaking. And, even if such benefits could be realized, the Agency has underestimated the significant technical and implementation challenges the proposed rule would impose upon an industry vulnerable to supply chain constraints. That is, changes to critical components could negatively impact what are, at the best of times, long lead times for software and hardware development and validation.

I. The "Event Data Recorders (EDRs) Duration Study" Does Not Support Extending the Rate or Duration of EDR Data

In December of 2015, Fixing America's Surface Transportation Act ("**FAST Act**") was signed into law. One of its mandates required NHTSA to conduct a study "to determine the amount of time event data recorders installed in passenger motor vehicles should capture and record for retrieval [of] vehicle-related data in conjunction with an event in order to provide sufficient information to investigate the cause of motor vehicle crashes."

NHTSA contracted with researchers at Virginia Polytechnic Institute and State University ("**Virginia Tech**") and their study, "Event Data Recorders (EDRs) Duration Study", was published in September 2017. The authors focused on just three crash scenarios -- certain rear-end, intersection and road departure crashes – which the authors believed would benefit from more than 5 seconds of pre-crash recording time. They hypothesized that a longer duration EDR record would allow for a better accident reconstruction in these three scenarios because it would capture the driver's pre-crash behavior, such as crash avoidance maneuvers by the driver. No study data proved this hypothesis to be true.

EDR data is only one piece of information used in the complex analysis necessary to determine crash causation. This data, in and of itself, cannot provide the answer. The crash scene, including tire marks; vehicle damage; witness statements; driver and passenger statements; police report, vehicle repair records and other vehicle data, such as ADAS event data, vehicle Diagnostic Trouble Codes ("**DTCs**"), and vehicle telemetry data are all part of the accident reconstruction process. If an Adverse Vehicle ("**AV**") is involved, then the AV EDR data, AV vehicle damage,

AV repair records, AV telemetry data, and AV ADAS event data are also part of the accident reconstruction. Nowhere in the study is it clear that an additional 15 seconds of pre-crash data necessarily increases the ability to analyze a crash beyond the current requirements and, of course, lack of EDR data in a crash event does not prevent accident reconstruction professionals from reconstructing an event.

Based on GM's extensive experience, the braking, steering input and other maneuvers active during the pre-crash window of 5 seconds, along with the wealth of other information listed above, is sufficient to determine crash dynamics in almost all cases. A noteworthy example of the sufficiency of the current recording period is provided by the Society of Automotive Engineers ("**SAE**") in Docket #NHTSA-2022-0021-0005 and Docket #NHTSA-2022-0021-0006[1]. SAE examines an intersection accident scenario which reveals that, at 35 mph, a 5 second window of pre-crash data contains vehicle and functional operation information for a distance of 214.8 feet prior to the crash. This span of operation adequately covers all active safety device actuations and relevant driver operation suggesting an accident maneuver or mitigation action. Nearly all system functions produce such a maneuver at less than 200 feet prior to impact. It is noteworthy that the proposed record duration of 20 seconds would cover a distance span of 984.75 feet, of which all but the data from last 5 seconds is not necessary for accident reconstruction.

In addition, the 2017 study has limited relevance because the majority of the EDR data it analyzed was from GM vehicles predominately from the early 2000's model years. These vehicles did not have the active safety systems that are widely available in vehicles on the road in 2022. Active safety systems such as lane departure warning, lane keep assist, automatic emergency braking, and electronic stability control certainly impact driver – and vehicle – behavior before a crash. In some instances, these technologies may have helped prevent or mitigate many of the accidents included in the study, undermining the value of the data as it relates to vehicle crashes today.

The EDR Duration Study was also limited in that it only assessed three pre-crash parameters: speed, braking and steering. Yet GM's latest generation EDRs record information well beyond these three data points in terms of the number of recorded events, the types of events recorded, and the pre-crash data elements stored. Failing to account for the wide range of additional data in today's EDRs cannot serve as the basis for a critique of the current EDRs value to accident reconstruction or vehicle performance or safety.

More generally, EDRs primary purpose has always been to record crash-related events, with the thresholds for recording events intentionally set to avoid recording of simple braking events. That is, EDR is designed to be a recorder for crash events, not braking or ADAS events. EDR data is intended to capture precrash data to assist in the study of the magnitude of crash forces and the direction of forces. The EDR precrash data is not truly intended for assessment of driver

[1] GM agrees but will not reiterate the concerns documented in both Docket # NHTSA-2022-0021-0005 and Docket #NHTSA-2022-0021-0006 which is the June 3, 2020, SAE letter and SAE July 31, 2020, presentation on NHTSA's report to congress on EDR duration study.

action or recording driver intent. To the extent EDR data does capture crash avoidance maneuvers, 5 seconds is more than sufficient time to determine how those maneuvers may have played a role in the crash per the explanation provided above. To the extent NHTSA suggests that understanding driver's pre-crash behavior will assist in the evaluation of emerging crash avoidance technologies, GM's active safety systems do record event-related data, but it is not primarily stored in the EDR.

GM does believe that ADAS data can be utilized with EDR data to analyze vehicle and driver performance. Such a thorough and detailed review of the total crash data available on today's vehicles should be evaluated in this way prior to the Agency proposing rulemaking to modify 49 CFR Part 563.

There are several other points which counsel against the proposed extension of data recording – or at least indicate the proposed benefit does not outweigh the burden associated with the change to the EDR.

First, NHTSA asserts that additional pre-crash data could also aid first responders in assessing the severity of a crash, estimating the probability of serious injury in vehicles equipped with Advanced Automatic Crash Notification ("**AACN**") systems, and improving defect investigations and crash data collection quality. GM respectfully disagrees. As an industry leader in both Injury Severity Prediction ("**ISP**") algorithms and AACN systems, pre-crash data is not utilized in GM's ISP algorithm. GM has published several publicly available papers on the performance of our ISP algorithm documenting both sensitivity and specificity performance of our algorithm[2] [3]. While GM continues to monitor field performance and look for enhancements to our ISP algorithm, we do not consider vehicle pre-crash data as an enhancement to ISP. Based on GM's review of the publicly available literature, pre-crash data has not been used in any ISP published to date.

Second, the NPRM does not address a key issue: the proposed rule only considers the rate at which data will be recorded. However, if the communication module does not also transmit information at a 10 Hz rate then, in essence, the data will not be available at a 10 Hz rate. Changing the transmittal rate of a message would require extensive changes to both the module communicating the data and vehicle bus architecture. Vehicle buses which transmit data in-vehicle have bandwidth limitations, and thus, modifying data rates will impact the bus throughput.

Finally, recently implemented worldwide EDR regulations, UN R160 series 00, UN R160 series 01 and GB 39732-2020, have maintained the 5 seconds of pre-crash data and sample rates consistent with the current Part 563. The burden of increasing EDR complexity and the inability

[2] Owen, S. H., Joyner, J. W., Zhang, P., and Wang, S. C., 2021. Occupant-Based Injury Severity Prediction. Stapp Car Crash Journal. Vol. 65, pp. 17-28.
[3] Stewart C. Wang, Carla Kohoyda-Inglis, S. Ejima, J. Macwilliams, Peng Zhang, Lisa A. Stacey, Anthony G. Melocchi, D. Gorman, J Král, J.W. Joyner. Published 2017, Second Generation AACN Injury Severity Prediction Algorithm: Development and Real-World Validation

for worldwide regions to come to a more common technical solution concerns automotive manufactures and is exacerbated when you consider the actual and varied cost sources (time, expense, regulatory complexity of different requirements across the globe). This proposal places more burden on resources, including technical development, validation, and certification. GM suggests that closely related worldwide safety regulations sharing the same underlying crash analysis and vehicle safety goals should have harmonized approaches to the extent possible.

II. The NPRM Fails to Account for the Technical Challenges Associated with Extending the Duration and Rate of EDR Pre-Crash Data

There are significant technical challenges associated with extending the recording duration and higher sample rate of pre-crash EDR data. Though presented as a simple modification to the EDR, the proposal impacts numerous components and systems which are not considered in the NPRM but are of considerable significance to GM.

A. The Higher Sample Rate and Memory Capacity Requires Redesign of the Airbag Control Module Hardware and Software

The NPRM states that an increase in pre-crash recording duration from 5 to 20 seconds with an increase in recording frequency from 2 to 10 Hz would require 1.33 Kb of additional memory (a factor of 2.43 increase from the baseline). GM believes this is a distinct oversimplification of memory needs. A vehicle processing a crash event has numerous buffers to write events, and upon event qualification or conclusion, the EDR decides which events shall be saved. Hence, the memory increase required is not only for storage post event.

GM will also have to increase both short-term random-access memory ("**RAM**") buffers and long-term (nonvolatile) memory storage. These types of changes will impact Printed Circuit Board ("**PCB**") design due to microprocessor changes, and potentially power supply component changes, which may impact the module package size. Module size in turn may impact the location in vehicle where it can be placed. We are concerned with module package size and placement because the module containing EDR is also responsible for sensing crashes for post-crash high voltage electrical safety and deploying lifesaving restraint devices. Sensing a crash is our priority, EDR cannot drive module package location.

Looking specifically at event storage memory for GM latest generation EDR which contains 46 pre-crash data elements. The memory would increase from approximately 720 bytes per record .to 8260 bytes or an approximately 11.5-time increase. This needs to be multiplied by 3 for our 3 EDR record buffers. We provide this memory estimate because it is desirable to have a consistent sampling rate across all pre-crash data elements otherwise it increases software complexity.

Memory allocation is an upfront design criterion in new product development that allows us to select the proper microprocessor, memory storage size and type, energy reserve and power supply IC's. All these components drive PCB design and component package size. Examples of changing memory type, including moving to external memory storage, have major design implications. For example, different failure modes exist for external memory storage - it is not a simple drop-in memory replacement for existing EDR designs.

As noted above, this memory increase is substantial and cannot be incorporated into GM's existing designs without modifications. More pointedly, GM does not have a design in production that can simply incorporate the requirements outlined in the NPRM in "spare" memory.

GM does not believe that the proposal of removing pre-crash data elements -- either Part 563 EDR Table II requirements or our optional data -- is directionally correct for understanding crash events. In any event, removal of data elements requires new software development and validation at both a component and vehicle level. This is not a simple solution.

GM does not agree that proposed event recording changes will not burden the speed of the microprocessor. None of the current designs in GM's portfolio can support the event recording proposals without microprocessor changes. The NPRM fails to acknowledge that our latest EDR are not only meeting the regulation but have expanded well beyond the regulatory requirements. Due to this voluntarily data recording which includes expansion in number of events recorded, expansion for type of EDR events recorded and increased number of data elements for both pre-crash data elements and other data elements the microprocessor throughput is impacted.

Considering the current semiconductor supply chain issues, making any change that impacts microprocessors is a major concern and places more risk on vehicle development and customer vehicle supply availability. The NPRM should recognize the unique state of the supply chain that the auto industry has experienced for some time now and which is not expected to be resolved in the near term. Changes to microprocessors and power supply integrated circuits require longer lead development time without which the already strained supply of vehicles for purchase will most certainly become even more restricted, resulting in an overall negative impact for consumers.

B. The NPRM Would Require Additional Efforts to Update Energy Reserve Capability

GM also disagrees that there will be no energy reserve impact. The NPRM would impact the 'write' time duration for a complete record which will require higher energy reserve capacity. Also, if GM must change to a microprocessor that has a higher current draw it will most certainly impact the energy reserve. Changes to energy reserve will impact the PCB and potentially the module package size. The energy reserve is the largest component in the module. Increasing the size of energy reserve will require an energy reserve redesign. This redesign will include

addressing manufacturing enhancements to move to a larger capacitor. Module package size changes may impact the location in vehicle.

To reiterate, GM is very concerned about module package size and placement in vehicle. The module that contains the EDR is also responsible for sensing crashes for post-crash high voltage electrical safety and deploying lifesaving restraint devices. Sensing a crash is GM's priority when determining the location of the module that contains EDR. Simply put, the EDR cannot drive in-vehicle module package location.

C. The NPRM Does Not Comprehend Validation and Recertification of the EDR and SDM

The cost estimate included in the NPRM does not comprehend the required changes, which include component validation, full vehicle validation and vehicle recertification of the EDR and the Sensing and Diagnostic Module ("**SDM**"). The cost impact is not negligible as stated in NPRM. The following component changes and cost must be considered for multiple module designs:

Microprocessor upgrade
Additional memory both RAM and nonvolatile memory
Energy reserve increase
PCB design changes
Module housing changes
Potential mounting changes in vehicle
Software and hardware engineering design and development cost
Component validation cost
Vehicle validation cost for new module designs
Vehicle level recertification

GM also has concerns regarding vehicle level validation of an EDR with 20 seconds of pre-crash data. Would it be required to have a crash of sufficient length to include the entire 20 seconds of pre-crash data, in other words, does this require a crash duration greater than 20 seconds? If this is a requirement, then vehicle barrier facilities/test protocol will be impacted and there will be an associated cost.

III. The Proposed Rollout Phase is Not Realistic

One year of lead time is not reasonable to implement the proposed changes to the regulation. Currently, GM has nine SDMs with multiple suppliers. A change to this module requires adequate development and validation time considering this module is responsible for sensing crashes, for post-crash high voltage electrical safety and for deploying lifesaving restraint devices.

Both hardware and software are impacted, and the associated changes, as outlined in our responses above, are substantial. As noted, with the ongoing current semiconductor supply chain issues, making any change that impacts the microprocessor and integrated circuit components is a major concern. In this context, a phased rollout is more practically feasible and would limit the additional burden on the supply chain. If the regulation is finalized this calendar year (2022) our recommendation for this phased in roll-out is as follows:

Model Year 2027: 25%

Model Year 2028: 50%

Model Year 2029: 75%

Model Year 2030: 100%

Early credits should also be considered as part of this phase in.

This recommended timing would have the advantage of allowing for legacy designs to be phased out without impact. The new data recording requirements can then be incorporated into future designs, where sufficient design and validation time exists. GM is currently working on new designs that are several model years out, which is a typical safety product development lead-time. GM is concerned that if the industry is not provided proper lead-time for product development, a potential adverse consequence would be removal of EDR as defined in Part 563 for some industry vehicle programs, in order to balance the product/vehicle development impact required to meet the NPRM.

In addition, the NPRM did not consider that the publicly available Crash Data Recorder ("**CDR**") download tool will have to be updated for all Original Equipment Manufacturer's ("**OEM**") EDR downloads. Part 563 requires tool availability 90 days after the first sale of a vehicle not for resale purposes. This is a major concern the industry is not given a reasonable phase-in for a change of this magnitude.

IV. Alternative Modifications to the EDR Requirements Would Benefit the Industry

GM agrees with NHTSA that EDR data can be helpful in analyzing vehicle performance in a crash, but we disagree what changes to the EDR regulation would serve that shared goal. GM's position is that, rather than more samples of the parameters outlined in the NPRM, adding additional pre-crash data elements would prove to be substantially more beneficial.

Appendix A includes the pre-crash data stored in GM's latest generation EDR. Notably, the data goes well beyond the requirements in Part 563 EDR requirements and allows for comprehensive crash analysis. To be clear, GM is not advocating that NHTSA require all these data elements, but given appropriate developmental lead time, the addition of a few select high-priority elements and more crash event types recorded would add the most benefit to Part 563 EDR requirements. Another consideration would be to consider the related UN R160 Series 01

regulation, which has included various ADAS data elements that may provide information relating to the state of the ADAS systems at the time of the crash event.

Appendix B is an example of our latest generation EDR data for reference and provides NHTSA with a more complete understanding of the amount and detail of EDR data GM records which, to reiterate, far exceeds Part 563 EDR requirements.

Appendix C shows the accident sequence that can be determined based upon the crash data report from Appendix B. This accident sequence timeline is built with the supplemental EDR data that we have incorporated and reflects the effort GM has made to design our EDR to provide data to build a crash timeline for a complex crash event. As an example, GM has incorporated 30 supplemental data records and 30 supplemental Vulnerable Road User ("**VRU**") events into our EDR design which allows us to build enhanced crash timelines for events. GM's work with accident investigators indicates that this type of information is extremely valuable for crash analysis.

GM has also added pre-crash data samples at time zero which helps eliminate the latency question of the latest precrash data sample (refer to Appendix B for example). When precrash data elements are analyzed together, rather than individually, the asynchronous nature of the data is not a concern, and a higher sample rate is not required for interpretation of the data. By utilizing all the pre-crash data for an event, misinterpretation of EDR data by a qualified person should rarely occur.

Examples listed below are the type of information that GM suggests is most beneficial for analyzing the operation of the vehicle at the time of the event. (These examples were selected because they are the parameters in the Virginia Tech study referenced in the NPRM.)

Rather than 20 seconds of service brake on/off proposed in the NPRM, GM suggests that additional information regarding brake system performance within a shorter time window allows for a comprehensive crash analysis. Namely, GM's latest generation EDR stores 8 seconds @ 2 samples per second of pre-crash data regarding brake system status/performance:

Service Brake On/Off (Brake Pedal Initial Travel Achieved) R563 data element
ABS Activity R563 data element
Brake Pedal Position
Driver Applied Brake Pressure
Driver Applied Brake Pressure Detected
Antilock Brake System Failed
Brake Pedal Override Flag
Automatic Brake Status
Red Brake Telltale On
Brake Boost Status – Eboost
Right Rear Wheel Angular Speed
Left Rear Wheel Angular Speed

Right Front Wheel Angular Speed
Left Front Wheel Angular Speed

Similarly, rather than 20 seconds of vehicle speed data proposed in the NPRM, GM suggests that more information regarding the deceleration of the vehicle allows for a comprehensive crash analysis. Namely, GM's latest generation EDR stores 8 seconds @ 2 samples per second of pre-crash data regarding vehicle speed/vehicle deceleration.

Vehicle speed Indicated R563 data element
Engine RPM R563 data element
Engine Torque
Engine Throttle % Full R563 data element
IMU Yaw Rate
Right Rear Wheel Angular Speed
Left Rear Wheel Angular Speed
Right Front Wheel Angular Speed
Left Front Wheel Angular Speed
Cruise and Speed Limiter Switch Status
Reduced Engine Power Mode Indicator On
Accelerator Pedal % Full R563 data element
Cruise Secondary Switch Status
Conventional Cruise Control Active
Adaptive Cruise Control Selected Mode
Adaptive Cruise Control Active
Transmission Estimated Gear
Transmission Shift Lever Position

Rather than 20 seconds of vehicle steering data proposed in the NPRM, more information regarding the steering/stability control of the vehicle allows for a comprehensive crash analysis. Namely, GM's latest generation EDR stores 8 seconds @ 2 samples per second of pre-crash data regarding vehicle steering/stability control.

Steering Wheel Angle R563 data element
Vehicle speed Indicated R563 data element
IMU Yaw Rate
Right Rear Wheel Angular Speed
Left Rear Wheel Angular Speed
Right Front Wheel Angular Speed
Left Front Wheel Angular Speed
Electronic Stability Control Status R563 data element
Traction Control System Present
Traction Control System Failed
Traction Control System Enabled

Traction Control System Active
Traction Control System Switch Status
IMY Lateral Acceleration
IMU Longitudinal Acceleration

Additionally, recording more types of crash events provides greater benefit for crash analysis. For example, GM's latest generation EDR records up to three records for qualified frontal, side, rear and rollover events, and two VRU events. Whereas Part 563 EDR requires a total of two events, including frontal airbag deployment events and when the criteria are met, record side curtain/tube airbag deployment. This leaves many field-relevant crashes that are not required to record per Part 563 EDR requirements.

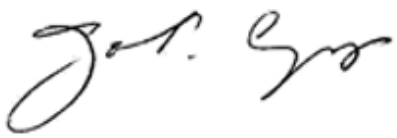
I. Conclusion

GM recommends that the duration and sampling rate of the current Part 563 EDR record requirements remain unchanged. There is no evidence the additional NPRM data would provide any benefit to accident reconstruction analysis or the continued assessment and development of vehicle safety systems. Further, the proposed regulation, with its rapid implementation schedule, could add considerable risk when forced to quickly redesign and validate modules which are also responsible for post-crash high voltage electrical safety and the performance of the airbag module's ability to sense crashes and deploy a potentially lifesaving restraint device. GM does not believe that the technical challenges posed by the NPRM were fully appreciated or that the proposed benefits can or will manifest as a result of the additional data. Any regulation modification should provide a clear societal benefit with supporting data. Those conditions do not exist here and GM urges NHTSA not to adopt the proposed rule.

EDR is a valuable tool to understand accident scenarios and has aided in the development of GM active and passive safety systems. GM supports enhancing Part 563 EDR requirements in a manner that adds value to our shared goal of continuously improving vehicle safety. GM remains committed to continuing to work with NHTSA on this endeavor.

GM appreciates the opportunity to provide comments to the NHTSA. Should you have any questions, please direct inquiries to me or Matthew Jerinsky from our Washington, D.C. office.

Sincerely,



John Capp, Director
Vehicle Safety Technology, Strategy, & Regulations

cc: Ms. Carla Rush
Ms. Sara Bennett

APPENDIX A

General Motors Latest Generation EDR Record Example

8 seconds Pre Crash Data for Numerous Data Elements beyond R563 requirements

Time (sec)	Accelerator Pedal, % Full (%)	ABS Activity	Brake Pedal Position (%)	Driver Applied Brake Pedal Pressure (kPa)	Driver Applied Brake Pedal Pressure Detected	Service Brake, On/Off (Brake Pedal Initial Travel Achieved)	Cruise and Speed Limiter Switch Status
-8.0	0	Off	12	0	True	On (True)	No Activation
-7.5	0	Off	12	0	True	On (True)	No Activation
-7.0	0	Off	12	0	True	On (True)	No Activation
-6.5	0	Off	13	0	True	On (True)	No Activation
-6.0	0	Off	12	0	True	On (True)	No Activation
-5.5	0	Off	12	0	True	On (True)	No Activation
-5.0	44	Off	0	0	False	Off (False)	No Activation
-4.5	99	Off	0	0	False	Off (False)	No Activation
-4.0	57	Off	0	0	False	Off (False)	No Activation
-3.5	0	Off	0	0	False	Off (False)	No Activation
-3.0	0	Off	0	0	False	Off (False)	No Activation
-2.5	0	On	25	810	True	On (True)	No Activation
-2.0	0	On	24	891	True	On (True)	No Activation
-1.5	0	On	41	1,863	True	On (True)	No Activation
-1.0	0	On	20	81	True	On (True)	No Activation
-0.5	0	On	50	5,346	True	On (True)	No Activation
0.0	0	On	49	5,184	True	On (True)	No Activation

Red box represents a R563 requirement
Blue box represents a R563 requirement to have one of the data elements
Yellow box represents R563 if recorded data element
No color is data element not required by R563

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Time (sec)	Engine RPM (Engine Speed)	Engine Torque (Nm [Ft Lbs])	Engine Throttle, % Full (%)	Speed, Vehicle Indicated (MPH [km/h])	IMU Yaw Rate (deg/sec)	Right Front Wheel Angular Speed (RPM)	Left Front Wheel Angular Speed (RPM)
-8.0	1,945	-20.0 [-14.8]	12	28.6 [46]	-0.288	296	296
-7.5	1,866	-20.0 [-14.8]	11	27.3 [44]	-1.392	288	288
-7.0	1,788	-33.5 [-24.7]	11	26.7 [43]	-1.800	278	278
-6.5	1,573	-45.5 [-33.6]	9	25.5 [41]	-2.016	267	270
-6.0	1,432	-30.5 [-22.5]	11	24.2 [39]	-6.264	252	257
-5.5	1,370	-16.5 [-12.2]	10	23.0 [37]	-9.528	239	247
-5.0	1,424	12.5 [9.2]	10	22.4 [36]	-7.440	237	242
-4.5	2,934	608.0 [448.4]	99	24.2 [39]	-11.400	269	263
-4.0	3,389	246.0 [181.4]	45	31.7 [51]	-13.344	353	338
-3.5	2,773	24.5 [18.1]	24	27.3 [44]	-14.496	282	283
-3.0	2,277	-28.0 [-20.7]	11	25.5 [41]	-17.400	264	272
-2.5	1,669	36.5 [26.9]	12	20.5 [33]	-17.136	214	191
-2.0	1,801	55.5 [40.9]	18	23.0 [37]	-12.744	179	207
-1.5	1,454	101.0 [74.5]	21	17.4 [28]	-16.104	149	169
-1.0	1,272	44.5 [32.8]	20	16.2 [26]	-19.272	152	148
-0.5	1,077	44.0 [32.5]	12	13.7 [22]	-16.176	129	144
0.0	956	65.0 [47.9]	19	11.2 [18]	-20.448	54	87

General Motors Latest Generation EDR Record Example

Red box represents a R563 requirement
Blue box represents a R563 requirement to have one of the data elements
Yellow box represents R563 if recorded data element
No color is data element not required by R563

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Time (sec)	Right Rear Wheel Angular Speed (RPM)	Left Rear Wheel Angular Speed (RPM)	Steering Wheel Angle (deg)	Propulsion System Active	System Power Mode	Backup System Power Mode	SDM Power Mode
-8.0	297	297	5	True	Propulsion	Propulsion	Propulsion
-7.5	288	288	-1	True	Propulsion	Propulsion	Propulsion
-7.0	278	279	-2	True	Propulsion	Propulsion	Propulsion
-6.5	268	269	-7	True	Propulsion	Propulsion	Propulsion
-6.0	254	257	-35	True	Propulsion	Propulsion	Propulsion
-5.5	240	246	-47	True	Propulsion	Propulsion	Propulsion
-5.0	238	242	-37	True	Propulsion	Propulsion	Propulsion
-4.5	267	271	-62	True	Propulsion	Propulsion	Propulsion
-4.0	342	337	-69	True	Propulsion	Propulsion	Propulsion
-3.5	282	285	-130	True	Propulsion	Propulsion	Propulsion
-3.0	269	270	-132	True	Propulsion	Propulsion	Propulsion
-2.5	194	196	-115	True	Propulsion	Propulsion	Propulsion
-2.0	238	235	-118	True	Propulsion	Propulsion	Propulsion
-1.5	185	176	-131	True	Propulsion	Propulsion	Propulsion
-1.0	145	149	-133	True	Propulsion	Propulsion	Propulsion
-0.5	131	130	-128	True	Propulsion	Propulsion	Propulsion
0.0	79	106	-66	True	Propulsion	Propulsion	Propulsion

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General Motors Latest Generation EDR Record Example

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-8.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-7.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-7.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-6.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-6.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-5.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-5.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-4.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-4.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Second	Forward Range A	Off
-3.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Second	Forward Range A	Off
-3.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Second	Forward Range A	Off
-2.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Second	Forward Range A	Off
-2.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Second	Forward Range A	Off
-1.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-1.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
-0.5	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off
0.0	No Activation	Inactive	Adaptive Cruise Control	Inactive	Third	Forward Range A	Off

Time (sec)	Ignition Status	Ignition Prolongation Time (sec)	Secondary Collision Prolongation Timer (sec)	Antilock Brake System Failed	Brake Pedal Override Flag	Automatic Brake Status	Electronic Stability Control Status
-8.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-0.5	On	5.0	0.0	False	False	Not Active	Normal Operation
0.0	On	5.0	0.0	False	False	Not Active	Normal Operation

No color is data element not required by R563

Yellow box represents R563 if recorded data element

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General Motors Latest Generation EDR Record Example

None of these data elements are required by R563

Time (sec)	Traction Control System Present	Traction Control System Failed	Traction Control System Enabled	Traction Control System Active	Traction Control System Switch Status	Left Turn Signal Switch Active	Right Turn Signal Switch Active
-8.0	True	False	True	Traction Control Off	Enabled	False	False
-7.5	True	False	True	Traction Control Off	Enabled	False	False
-7.0	True	False	True	Traction Control Off	Enabled	False	False
-6.5	True	False	True	Traction Control Off	Enabled	False	False
-6.0	True	False	True	Traction Control Off	Enabled	False	False
-5.5	True	False	True	Traction Control Off	Enabled	False	False
-5.0	True	False	True	Traction Control Off	Enabled	False	False
-4.5	True	False	True	Traction Control Off	Enabled	False	False
-4.0	True	False	True	Traction Control Active	Enabled	False	False
-3.5	True	False	True	Traction Control Off	Enabled	False	False
-3.0	True	False	True	Traction Control Off	Enabled	False	False
-2.5	True	False	True	Traction Control Off	Enabled	False	False
-2.0	True	False	True	Traction Control Off	Enabled	False	False
-1.5	True	False	True	Traction Control Off	Enabled	False	False
-1.0	True	False	True	Traction Control Off	Enabled	False	False
-0.5	True	False	True	Traction Control Off	Enabled	False	False
0.0	True	False	True	Traction Control Off	Enabled	False	False

Time (sec)	IMU Lateral Acceleration (g)	IMU Longitudinal Acceleration (g)	Red Brake Telltale On	Brake Boost Status - Eboost
-8.0	-0.000122	-0.001586	False	Normal Boost
-7.5	-0.000122	-0.001464	False	Normal Boost
-7.0	-0.000610	-0.001586	False	Normal Boost
-6.5	-0.000610	-0.001708	False	Normal Boost
-6.0	-0.001708	-0.001830	False	Normal Boost
-5.5	-0.001830	-0.002074	False	Normal Boost
-5.0	-0.001830	-0.000610	False	Normal Boost
-4.5	-0.000976	0.002074	False	Normal Boost
-4.0	-0.000854	0.001586	False	Normal Boost
-3.5	-0.002806	-0.000122	False	Normal Boost
-3.0	-0.002318	-0.000366	False	Normal Boost
-2.5	-0.002074	-0.001464	False	Normal Boost
-2.0	-0.002318	-0.000854	False	Normal Boost
-1.5	-0.002440	-0.001220	False	Normal Boost
-1.0	-0.002928	-0.001220	False	Normal Boost
-0.5	-0.003172	-0.000976	False	Normal Boost
0.0	-0.004270	-0.006222	False	Normal Boost

general motors

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APPENDIX B

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	
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	LATEST GEN EDR WOVINSEQ.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 21.4.1
Imaged with Software Licensed to (Company Name)	Company Name information was removed when this file was saved without VIN sequence number
Reported with CDR version	Crash Data Retrieval Tool 21.5
Reported with Software Licensed to (Company Name)	General Motors
EDR Device Type	Airbag Control Module
Event(s) recovered	Non-Deployment Record 1, Non-Deployment Record 2, Non-Deployment Record 3

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events for Front, Side, and Rear (FSR) Events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH [8 km/h]. A Non-Deployment Event may contain Pre-Crash and Crash data. The oldest Non-Deployment event can be overwritten by a Deployment Event, if all three records are full and the Non-Deployment Event is not locked. A Non-Deployment Event can be overwritten by a more recent Non-Deployment Event if all three records are full and the Non-Deployment is older than approximately 250 ignition cycles. Also, a Non-Deployment event can be recorded if the 12 volt or High Voltage Battery Cut-Off Deployment occurs without the Deployment of the restraints such as air bags, pretensioners, or roll bars.
The second type of SDM recorded crash event for FSR Events is the Deployment Event. It also may contain Pre-Crash and Crash data. Deployment Events cannot be overwritten or cleared by the SDM.
Rollover Events contains Pre-Crash and Crash data. Rollover events follow the same rules as FSR Deployment events.
The SDM can store up to three FSR/Rollover Events.
There are two types of PedPro crash events. The first is the Non-Deployment PedPro Event. A Non-Deployment PedPro Event records data but does not deploy anything. A Non-Deployment PedPro Event may contain Pre-Crash and Crash data.
For MY20-22 vehicles, a Non-Deployment PedPro Event will only record data within certain speed range.
The second type of PedPro recorded crash event is the Deployment PedPro Event. It also may contain Pre-Crash and Crash data. Deployment Events cannot be overwritten or cleared by the SDM.
The SDM can store up to two PedPro Events.

Data:

For FSR Events, SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event and is also not the Barrier Equivalent Velocity. For Deployment and Non-Deployment Events, the SDM will record up to 300 milliseconds of data after time zero. The SDM will also record up to 300 milliseconds of Vehicle Acceleration data after time zero.
For Rollover Events, the SDM may record Lateral Acceleration, Vertical Acceleration, and Roll Rate data, if the SDM is rollover capable. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Deployment Events, the SDM will record up to 700 milliseconds of data before the Deployment criteria is met and 290 milliseconds after the Deployment criteria is met.
-The Maximum SDM Recorded Vehicle Velocity Change may occur between the recorded 10 millisecond sample points of the SDM Recorded Vehicle Velocity Change.
-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.
-SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
- -Significant changes in the tire's rolling radius
- -Final drive axle ratio changes
- -Wheel lockup and wheel slip

-Pre-Crash data is recorded asynchronously. The 0.5 second Pre-crash data value (most recent recorded data point) is the data point last sampled before Time Zero. That is to say, the last data point may have been captured just before Time Zero but no more than 0.5 second before Time Zero. All subsequent Pre-crash data values are referenced from this data point.
-Pre-Crash Electronic Data Validity Check Status indicates “Data Invalid” if:
-The SDM receives a message with an “invalid” flag from the module sending the pre-crash data
-Pre-Crash Electronic Data Validity Check Status indicates “Data Not Available” if:
-No data is received from the module sending the pre-crash data
-For diesel powered vehicles, the data displayed as Throttle Position (%) is actually the data for the Air Inlet Flap Position. This is not the same as the throttle position for a gasoline powered engine.
-Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
-The ignition cycle counter will increment when the power mode cycles from OFF/Accessory to RUN. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-Ignition Cycles Since DTCs Were Last Cleared can record a maximum value of about 250 cycles and can only be reset by a scan tool.
-For Deployment Events, DTC B1A33 (Deployment commanded) shall be recorded with the remainder of the data for this event even though it occurred after Event Enable.
-Once a firing loop has been commanded to be deployed, it will not be commanded to be deployed again during the same ignition cycle. Firing loop times for subsequent deployment type events, during the same ignition cycle, will record the deployment times as N/A.
-The airbag control module may continue to function for a set period of time after the vehicle's ignition has been changed from Run to Off or Accessory; this is called Prolongation. However, all other vehicle modules may have their functions shut down during Prolongation. For example, if the SIR warning lamp is commanded on by the airbag control module, during Prolongation, and is recorded in the EDR as being commanded on, the actual state of the warning lamp would be off to an observer since the vehicle display cluster would have been in the off state. Vehicle pre-event and system data may be recorded in the EDR as their commanded state, default state, or data invalid state. Additionally, the SDM may activate the Secondary Collision Prolongation Timer when an event is detected while the Ignition Prolongation Timer is Active.
-Propulsion System Active is an indicator of the vehicle’s propulsion capability, either through electric motor, IC engine or both. The Propulsion System Active sets to True when the vehicle is ready to provide propulsion.
-The GM parameter name is displayed in parentheses after the NHTSA Part 563 parameter name.
-All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Data Element Sign Convention:
The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. Directional references to sign notation are all from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Longitudinal Velocity Change	Forward
Lateral Acceleration	Left to Right
Lateral Velocity Change	Left to Right
Vertical Acceleration	Downward
Roll Rate	Clockwise Rotation
Steering Wheel Angle	Counterclockwise Rotation
Yaw Rate	Counterclockwise Rotation

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 tool.

01065_[redacted]

System Status at Time of Retrieval

Ignition Cycle, Download (cycles)	154
Manufacturing Traceability - Line Identification	
Manufacturing Traceability - Shift Identification	
Manufacturing Traceability - Last Two Digits of Year	
Manufacturing Traceability - Julian Date Day of the Year	
Manufacturing Traceability - Serial, Lot or Batch Number	
Part of Assembly Traceability For ESS1 - Line Identification	
Part of Assembly Traceability For ESS1 - Shift Identification	
Part of Assembly Traceability For ESS1 - Last Two Digits of Year	
Part of Assembly Traceability For ESS1 - Julian Date Day of the Year	
Part of Assembly Traceability For ESS1 - Traceability Number	
Part of Assembly Traceability For ESS1 - Data Universal Number System	
Part of Assembly Traceability For ESS1 - CVP and Product Structure	
Part of Assembly Traceability For ESS2 - Line Identification	
Part of Assembly Traceability For ESS2 - Shift Identification	
Part of Assembly Traceability For ESS2 - Last Two Digits of Year	
Part of Assembly Traceability For ESS2 - Julian Date Day of the Year	
Part of Assembly Traceability For ESS2 - Traceability Number	
Part of Assembly Traceability For ESS2 - Data Universal Number System	
Part of Assembly Traceability For ESS2 - CVP and Product Structure	
Part of Assembly Traceability For ESS3 - Line Identification	
Part of Assembly Traceability For ESS3 - Shift Identification	
Part of Assembly Traceability For ESS3 - Last Two Digits of Year	
Part of Assembly Traceability For ESS3 - Julian Date Day of the Year	
Part of Assembly Traceability For ESS3 - Traceability Number	
Part of Assembly Traceability For ESS3 - Data Universal Number System	
Part of Assembly Traceability For ESS3 - CVP and Product Structure	
Part of Assembly Traceability For ESS4 - Line Identification	
Part of Assembly Traceability For ESS4 - Shift Identification	
Part of Assembly Traceability For ESS4 - Last Two Digits of Year	
Part of Assembly Traceability For ESS4 - Julian Date Day of the Year	
Part of Assembly Traceability For ESS4 - Traceability Number	
Part of Assembly Traceability For ESS4 - Data Universal Number System	
Part of Assembly Traceability For ESS4 - CVP and Product Structure	
Part of Assembly Part Number For ESS1	
Part of Assembly Part Number For ESS2	
Part of Assembly Part Number For ESS3	
Part of Assembly Part Number For ESS4	
BSWIDI Module Identifier	Primary Microprocessor Bootloader
BSWIDI Part Number	
BSWIDI Alpha Code	
Module Identifier	Primary Microprocessor Application Software
ASWIDI Part Number	
ASWIDI Alpha Code	
ADIDI Module Identifier 1	
ADIDI Part Number 1	
ADIDI Alpha Code 1	
ADIDI Module Identifier 2	
ADIDI Part Number 2	
ADIDI Alpha Code 2	
Vehicle Identification Number (VIN)	
GM End Model Part Number	
GM Base Model Part Number	
GM End Model Part Number Alpha Code	
GM Base Model Part Number Alpha Code	
Longitudinal Accelerometer Range (g)	120.0
Lateral Accelerometer Range (g)	120.0

Supplemental Event Record #1

Multi-Event, Number of Events (Event Counter)	1
Event Enable Time (msec)	153,116,835
Event End Time (msec)	153,117,159
Ignition Cycle, Crash (Ignition Cycles Counter)	143
Front Pretensioner Severity	False
Front Stage1 Severity	False
Front Stage2 Severity	False
Left Side Severity	False
Right Side Severity	False
Rollover Severity	False
Rear Severity	False
Battery Disconnect Side Severity	False
Event Record Status Event Type	Non-Deployment Event

Supplemental Event Record #2

Multi-Event, Number of Events (Event Counter)	2
Event Enable Time (msec)	153,117,501
Event End Time (msec)	153,117,762
Ignition Cycle, Crash (Ignition Cycles Counter)	143
Front Pretensioner Severity	True
Front Stage1 Severity	True
Front Stage2 Severity	True
Left Side Severity	False
Right Side Severity	True
Rollover Severity	False
Rear Severity	False
Battery Disconnect Side Severity	True
Event Record Status Event Type	Deployment Event
Time From Event 1 to 2 (msec)	666

Supplemental Event Record #3

Multi-Event, Number of Events (Event Counter)	4
Event Enable Time (msec)	153,118,702
Event End Time (msec)	153,119,157
Ignition Cycle, Crash (Ignition Cycles Counter)	143
Front Pretensioner Severity	False
Front Stage1 Severity	False
Front Stage2 Severity	False
Left Side Severity	False
Right Side Severity	False
Rollover Severity	True
Rear Severity	False
Battery Disconnect Side Severity	False
Event Record Status Event Type	Non-Deployment Event
Time From Event 2 to 3 (msec)	1201

Supplemental Event Record #4

Multi-Event, Number of Events (Event Counter)	5
Event Enable Time (msec)	153,119,831
Event End Time (msec)	153,120,109
Ignition Cycle, Crash (Ignition Cycles Counter)	143
Front Pretensioner Severity	False
Front Stage1 Severity	False
Front Stage2 Severity	False
Left Side Severity	False
Right Side Severity	False
Rollover Severity	True
Rear Severity	False
Battery Disconnect Side Severity	False
Event Record Status Event Type	Non-Deployment Event
Time From Event 3 to 4 (msec)	1129

Supplemental Event Record #5

Multi-Event, Number of Events (Event Counter)	3
Event Enable Time (msec)	153,115,621
Event End Time (msec)	153,123,715
Ignition Cycle, Crash (Ignition Cycles Counter)	143
Front Pretensioner Severity	True
Front Stage1 Severity	True
Front Stage2 Severity	True
Left Side Severity	False
Right Side Severity	True
Rollover Severity	True
Rear Severity	False
Battery Disconnect Side Severity	True
Event Record Status Event Type	Deployment Event
Time From Event 4 to 5 (msec)	-4210

System Status at Event (Record 1)

Event Counter	1
Ignition Cycle Counter	143
Microcontroller Safing Timestamp (msec)	0
Frontal Air Bag Warning Indicator (SIR Warning Indicator Status at Enable)	Off
SIR Warning Indicator ON/OFF Time (sec)	68,190
Number of Ignition Cycles SIR Warning Indicator was ON/OFF Continuously	143
Ignition Cycles Since DTCs Were Last Cleared	143
Safety Belt Status, Right Front Passenger (Front Passenger Belt Switch Circuit Status)	Buckled
Safety Belt Status, Driver (Driver Belt Switch Circuit Status)	Buckled
Maximum Resultant Delta-V - Longitudinal Component for FSR Event (MPH [km/h])	-9 [-14]
Maximum Resultant Delta-V - Lateral Component for FSR Event (MPH [km/h])	-6 [-10]
Time From FSR Time Zero to Time of the Maximum Resultant SDM Recorded Vehicle Velocity Change (msec)	288
Maximum Delta-V, Longitudinal (Maximum Longitudinal SDM Recorded Vehicle Velocity Change for FSR Event) (MPH [km/h])	-9 [-14]
Paired SDM Recorded Vehicle Lateral Velocity Change for Maximum Longitudinal Velocity Change (MPH [km/h])	-6 [-10]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change) (msec)	288
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) (MPH [km/h])	-7 [-11]
Paired SDM Recorded Vehicle Longitudinal Velocity Change for Maximum Lateral Velocity Change (MPH [km/h])	-6 [-9]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change) (msec)	170
Tire Pressure Low Indication On at Event	False
Ignition Operating Timer (msec)	153,116,835
UTC Time at Event	03:29:00
UTC Date at Event	2022/02/06
Frontal Algorithm Wakeup Time (msec)	5
Side Algorithm Wakeup Time (msec)	Data Not Available
Rear Algorithm Wakeup Time (msec)	94
Rollover Algorithm Wakeup Time (msec)	0
Frontal Algorithm Reset Time (msec)	49
Side Algorithm Reset Time (msec)	Data Not Available
Rear Algorithm Reset Time (msec)	194
Rollover Algorithm Reset Time (msec)	Data Not Available
Occupant Position Classification, Right Front Passenger (Front Passenger Seat Restraint Control Occupancy Status)	Yes (Occupied Adult)
Commanded State of Suppression ON (PAB Off) Indicator	Off
Commanded State of Suppression OFF (PAB On) Indicator	On
Time to Frontal Impact Pretensioner PCN Request (msec)	Data Not Available
Time to Frontal Impact Stage 1 PCN Request (msec)	Data Not Available
Time to Frontal Impact Stage 2 PCN Request (msec)	Data Not Available
Time to Left Side Impact PCN Request (msec)	Data Not Available
Time to Right Side Impact PCN Request (msec)	Data Not Available
Time to Rear Impact PCN Request (msec)	Data Not Available
Time to Rollover Impact PCN Request (msec)	Data Not Available
Time to Battery Disconnect Switch Side Severity (msec)	Data Not Available
High Voltage Disable Notification Sent	False
Deployment Commanded in Energy Reserve Mode	False
Event Enable Time (T0) (msec)	153,116,835

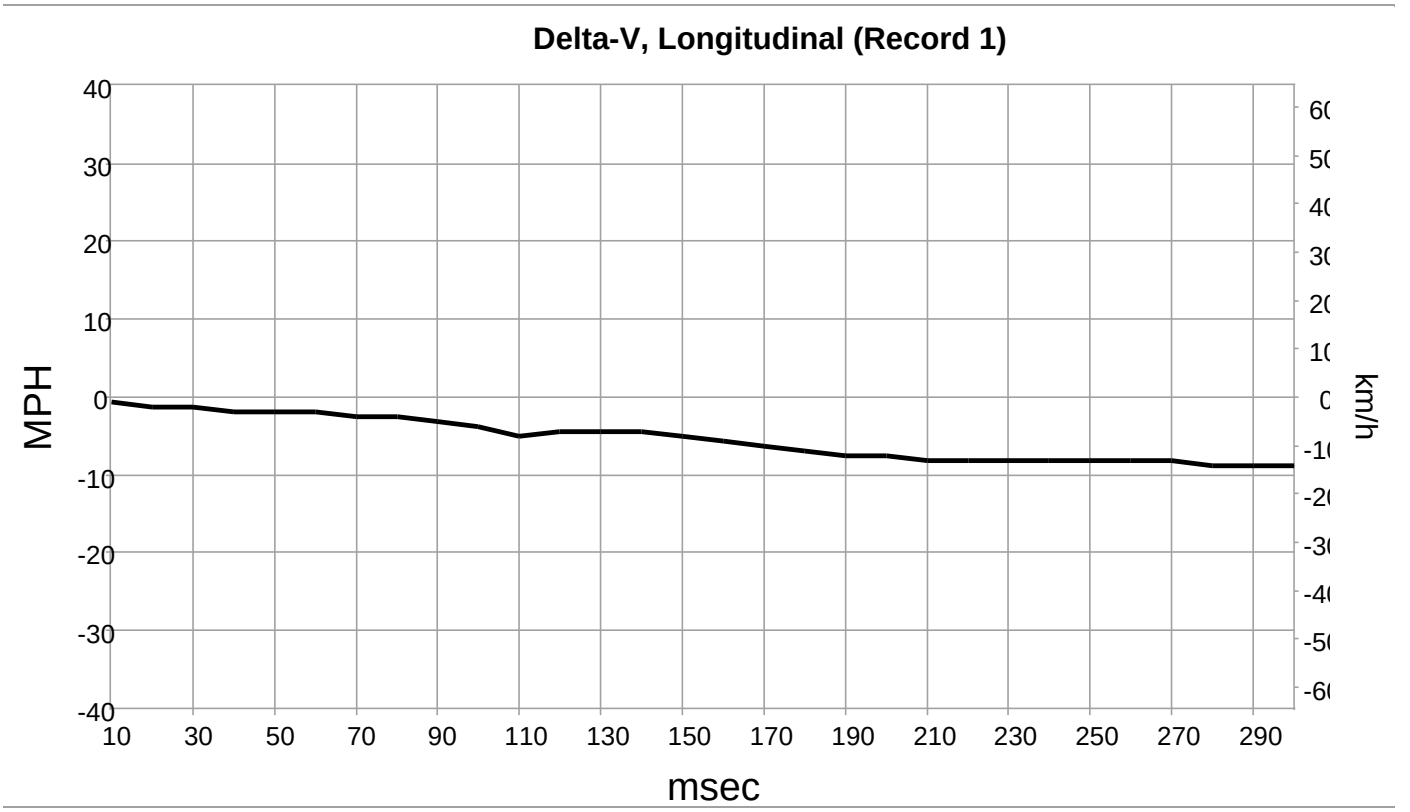
Event End Time (Tend) (msec)	153,117,159
Complete File Recorded (Event Recording Progress and Complete Flag)	Event Recording Complete

Diagnostic Trouble Codes 0.5 Seconds Prior to Time Zero (Record 1)

DTC 1	N/A, N/A
DTC 2	N/A, N/A
DTC 3	N/A, N/A
DTC 4	N/A, N/A
DTC 5	N/A, N/A
DTC 6	N/A, N/A
DTC 7	N/A, N/A
DTC 8	N/A, N/A
DTC 9	N/A, N/A

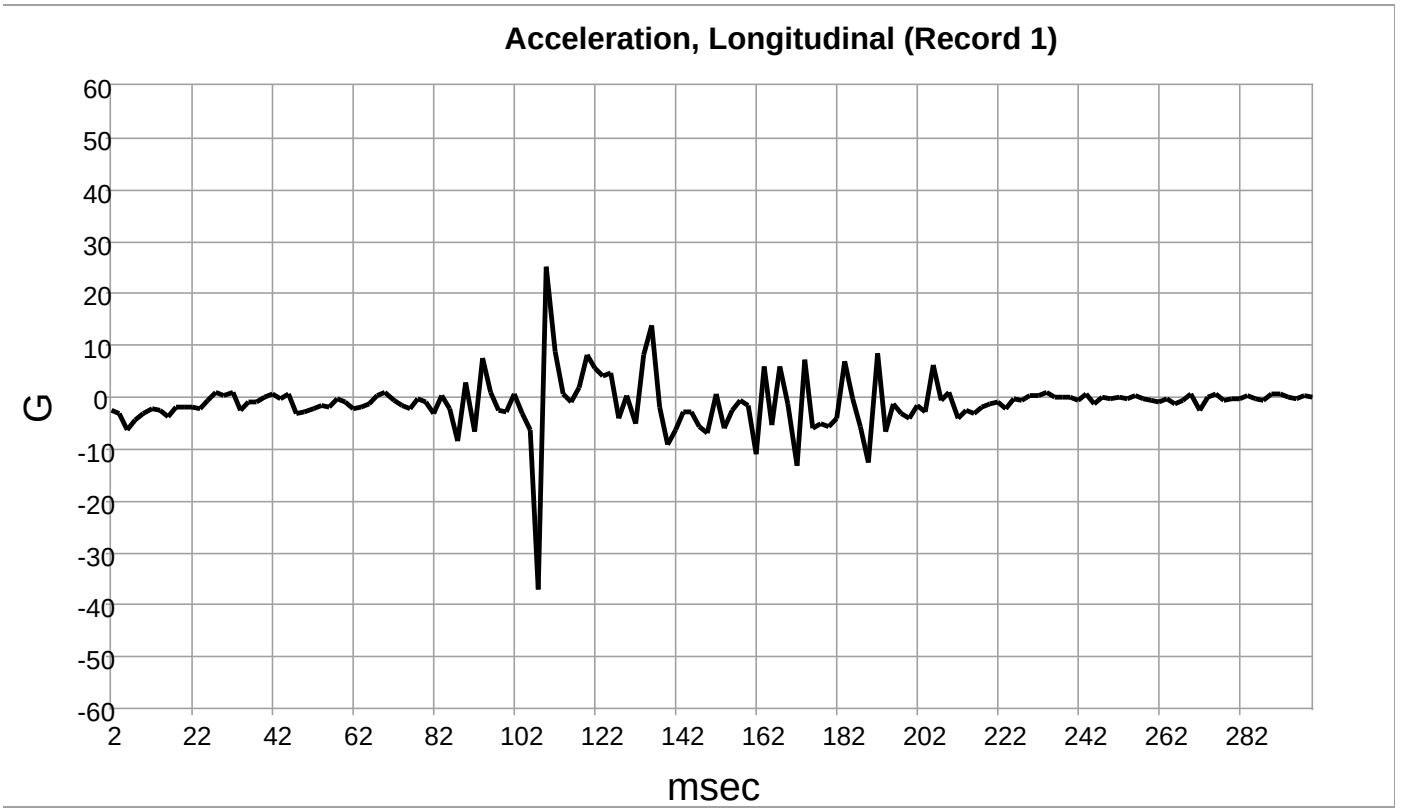
Deployment Command Data (Record 1)

Driver 1st Stage Deployment Loop Commanded (msec)	Data Not Available
Passenger 1st Stage Deployment Loop Commanded (msec)	Data Not Available
Driver 2nd Stage Deployment Loop Commanded (msec)	Data Not Available
Passenger 2nd Stage Deployment Loop Commanded (msec)	Data Not Available
Driver Pretensioner Deployment Loop #1 Commanded (msec)	Data Not Available
Passenger Pretensioner Deployment Loop #1 Commanded (msec)	Data Not Available
Driver Pretensioner Deployment Loop #2 Commanded (msec)	Data Not Available
Passenger Pretensioner Deployment Loop #2 Commanded (msec)	Data Not Available
Driver Thorax Loop Commanded (msec)	Data Not Available
Passenger Thorax Loop Commanded Passenger (msec)	Data Not Available


Delta-V, Longitudinal (Record 1)
MPH
km/h
msec
40
30
20
10
0
-10
-20
-30
-40
10
30
50
70
90
110
130
150
170
190
210
230
250
270
290

Longitudinal Delta-V (Record 1)

Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH [km/h])
10	-1 [-1]
20	-1 [-2]
30	-1 [-2]
40	-2 [-3]
50	-2 [-3]
60	-2 [-3]
70	-2 [-4]
80	-2 [-4]
90	-3 [-5]
100	-4 [-6]
110	-5 [-8]
120	-4 [-7]
130	-4 [-7]
140	-4 [-7]
150	-5 [-8]
160	-6 [-9]
170	-6 [-10]
180	-7 [-11]
190	-7 [-12]
200	-7 [-12]
210	-8 [-13]
220	-8 [-13]
230	-8 [-13]
240	-8 [-13]
250	-8 [-13]
260	-8 [-13]
270	-8 [-13]
280	-9 [-14]
290	-9 [-14]
300	-9 [-14]

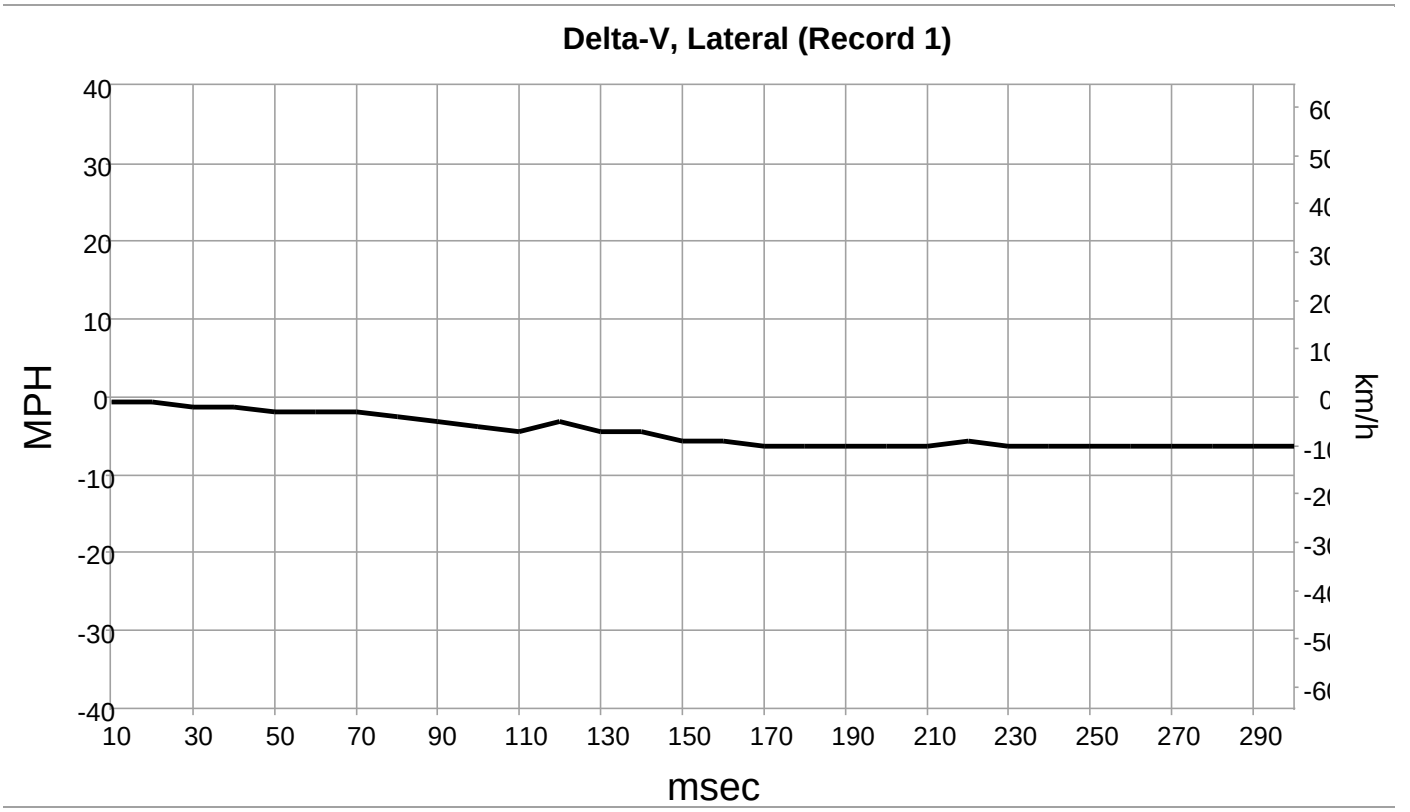

Acceleration, Longitudinal (Record 1)
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
G
2
22
42
62
82
102
122
142
162
182
202
222
242
262
282
msec

Longitudinal Acceleration (Record 1)

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
2	-2.62
4	-3.24
6	-6.31
8	-4.43
10	-3.18
12	-2.24
14	-2.62
16	-3.81
18	-1.99
20	-1.93
22	-1.81
24	-2.12
26	-0.68
28	0.93
30	0.43
32	0.93
34	-2.37
36	-0.87
38	-1.06
40	0.12
42	0.56
44	-0.31
46	0.68
48	-3.06
50	-2.74
52	-2.18
54	-1.68
56	-1.87
58	-0.18
60	-0.99
62	-2.12
64	-1.99
66	-1.12
68	0.43
70	1.06
72	-0.49
74	-1.62
76	-2.06
78	-0.43
80	-0.81
82	-2.99
84	0.18
86	-2.31
88	-8.49
90	2.68
92	-6.56
94	7.43
96	0.99
98	-2.43
100	-2.81
102	0.49
104	-3.12
106	-6.31
108	-36.92
110	25.05
112	8.68

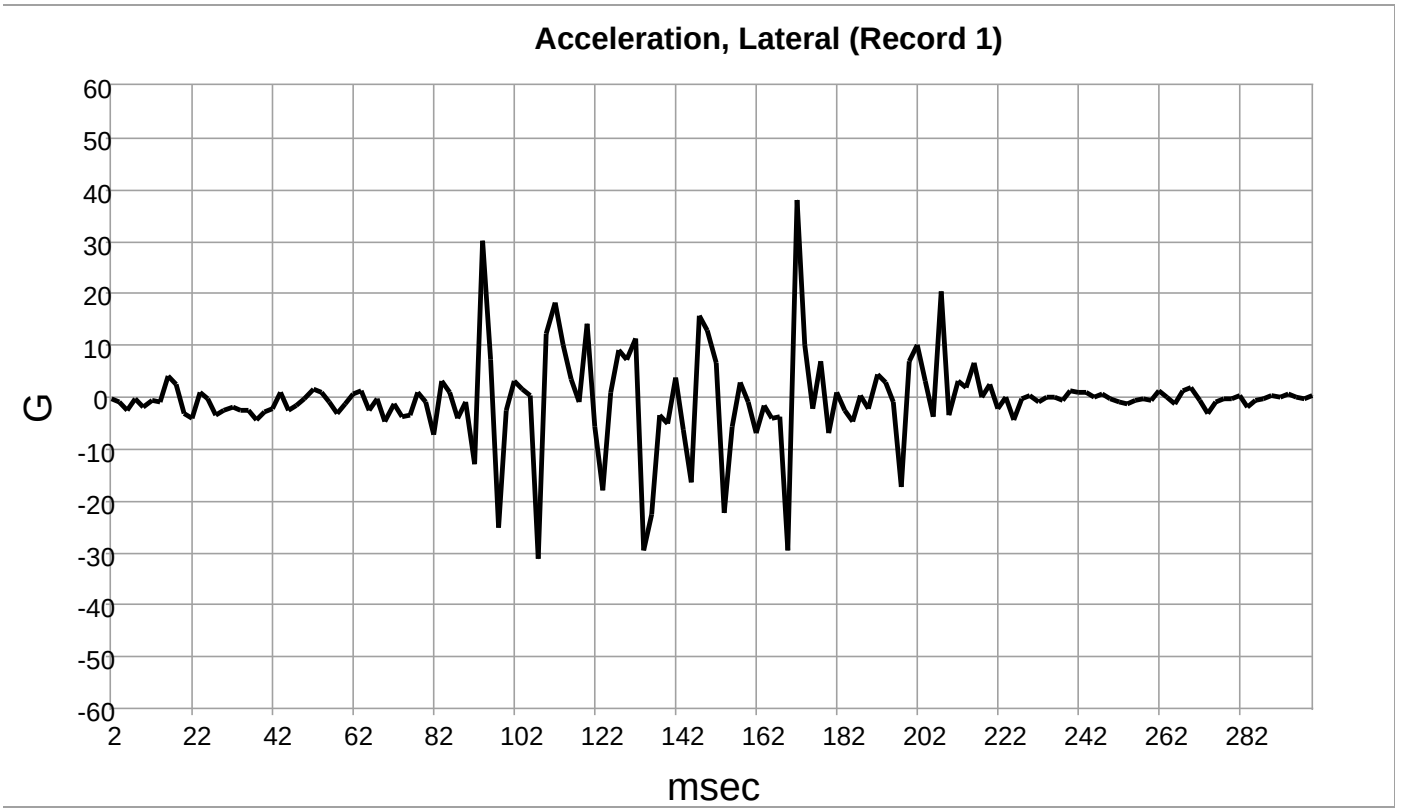
Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
114	0.74
116	-0.99
118	1.93
120	8.24
122	5.81
124	3.99
126	4.81
128	-4.18
130	0.31
132	-4.99
134	8.18
136	13.80
138	-1.74
140	-9.18
142	-6.18
144	-2.68
146	-2.87
148	-5.74
150	-7.06
152	0.68
154	-6.12
156	-2.62
158	-0.68
160	-1.43
162	-10.99
164	6.12
166	-5.24
168	5.87
170	-1.12
172	-13.30
174	7.18
176	-6.12
178	-5.06
180	-5.74
182	-4.18
184	6.87
186	-0.24
188	-5.68
190	-12.68
192	8.37
194	-6.68
196	-1.31
198	-3.06
200	-3.93
202	-1.49
204	-2.81
206	6.31
208	-0.74
210	0.87
212	-4.18
214	-2.56
216	-3.24
218	-1.87
220	-1.31
222	-0.93
224	-2.12
226	-0.37

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
228	-0.74
230	0.31
232	0.31
234	0.81
236	0.00
238	-0.12
240	0.00
242	-0.49
244	0.62
246	-1.37
248	-0.06
250	-0.31
252	0.06
254	-0.31
256	0.18
258	-0.18
260	-0.56
262	-0.93
264	-0.37
266	-1.31
268	-0.49
270	0.56
272	-2.62
274	-0.12
276	0.56
278	-0.74
280	-0.37
282	-0.43
284	0.37
286	-0.43
288	-0.74
290	0.49
292	0.68
294	-0.12
296	-0.18
298	0.31
300	0.06


Delta-V, Lateral (Record 1)
MPH
km/h
msec
40
30
20
10
0
-10
-20
-30
-40
10
30
50
70
90
110
130
150
170
190
210
230
250
270
290

Lateral Delta-V (Record 1)

Time (msec)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (MPH [km/h])
10	-1 [-1]
20	-1 [-1]
30	-1 [-2]
40	-1 [-2]
50	-2 [-3]
60	-2 [-3]
70	-2 [-3]
80	-2 [-4]
90	-3 [-5]
100	-4 [-6]
110	-4 [-7]
120	-3 [-5]
130	-4 [-7]
140	-4 [-7]
150	-6 [-9]
160	-6 [-9]
170	-6 [-10]
180	-6 [-10]
190	-6 [-10]
200	-6 [-10]
210	-6 [-10]
220	-6 [-9]
230	-6 [-10]
240	-6 [-10]
250	-6 [-10]
260	-6 [-10]
270	-6 [-10]
280	-6 [-10]
290	-6 [-10]
300	-6 [-10]

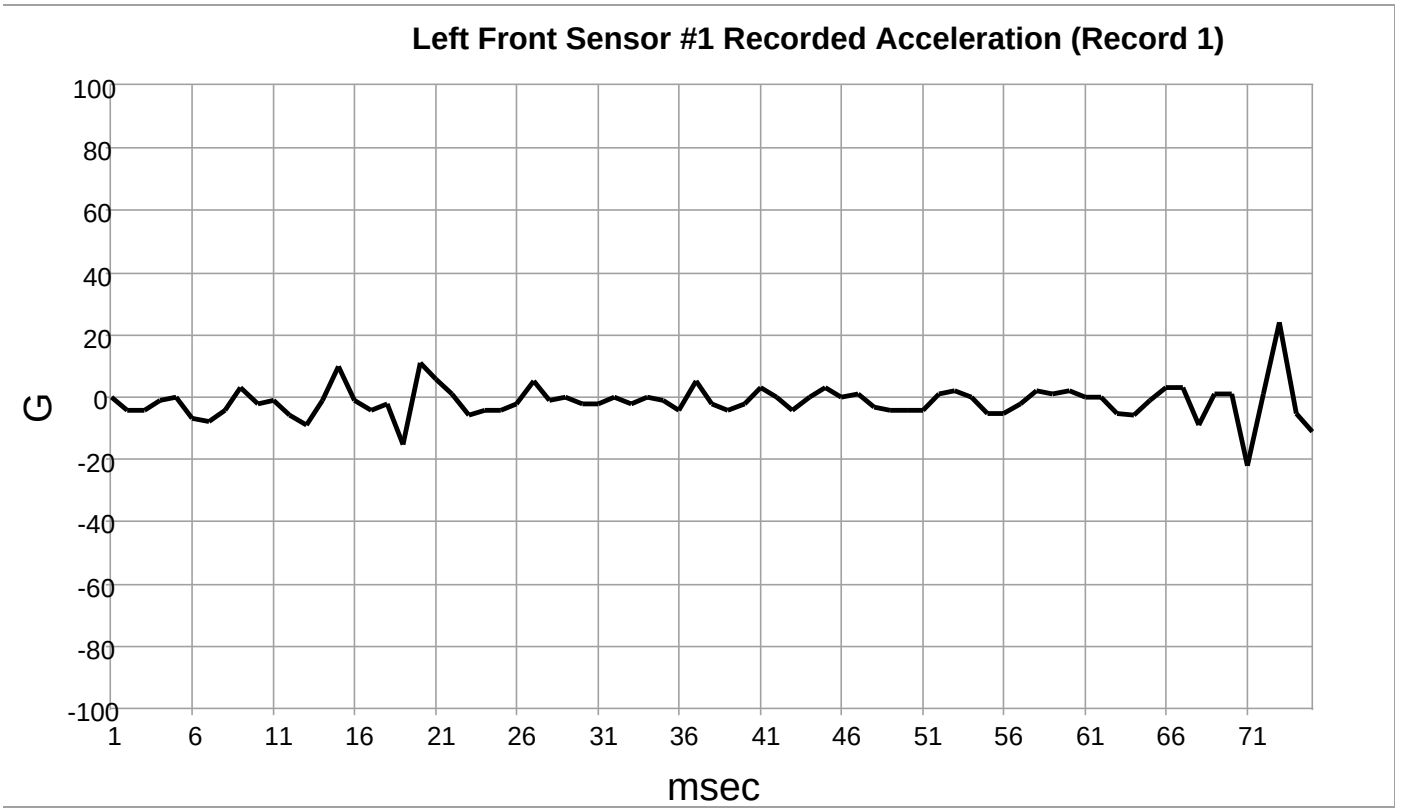

Acceleration, Lateral (Record 1)
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
G
2
22
42
62
82
102
122
142
162
182
202
222
242
262
282
msec

Lateral Acceleration (Record 1)

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
2	-0.43
4	-0.99
6	-2.37
8	-0.43
10	-1.93
12	-0.74
14	-1.06
16	3.93
18	2.56
20	-3.12
22	-4.18
24	0.87
26	-0.37
28	-3.37
30	-2.43
32	-1.81
34	-2.37
36	-2.56
38	-4.37
40	-2.93
42	-2.24
44	1.06
46	-2.56
48	-1.56
50	-0.43
52	1.62
54	0.93
56	-0.99
58	-3.18
60	-1.24
62	0.62
64	1.18
66	-2.56
68	-0.43
70	-4.74
72	-1.31
74	-3.87
76	-3.37
78	0.81
80	-0.87
82	-7.18
84	2.99
86	0.87
88	-4.24
90	-0.87
92	-12.80
94	30.05
96	7.24
98	-24.99
100	-2.43
102	2.99
104	1.56
106	0.31
108	-31.11
110	12.37
112	18.11
114	9.99

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
116	3.43
118	-1.06
120	13.99
122	-5.74
124	-17.99
126	0.81
128	9.24
130	7.37
132	11.43
134	-29.55
136	-22.61
138	-3.49
140	-4.87
142	3.62
144	-6.37
146	-16.24
148	15.74
150	12.93
152	6.56
154	-22.36
156	-5.81
158	2.74
160	-0.93
162	-6.93
164	-1.56
166	-3.93
168	-3.68
170	-29.61
172	37.98
174	10.12
176	-2.18
178	6.81
180	-6.81
182	0.93
184	-2.56
186	-4.81
188	0.37
190	-2.18
192	4.49
194	2.81
196	-1.06
198	-17.36
200	6.99
202	10.18
204	3.12
206	-3.62
208	20.55
210	-3.37
212	3.24
214	1.74
216	6.49
218	0.06
220	2.56
222	-2.12
224	0.06
226	-4.37
228	-0.43
230	0.18

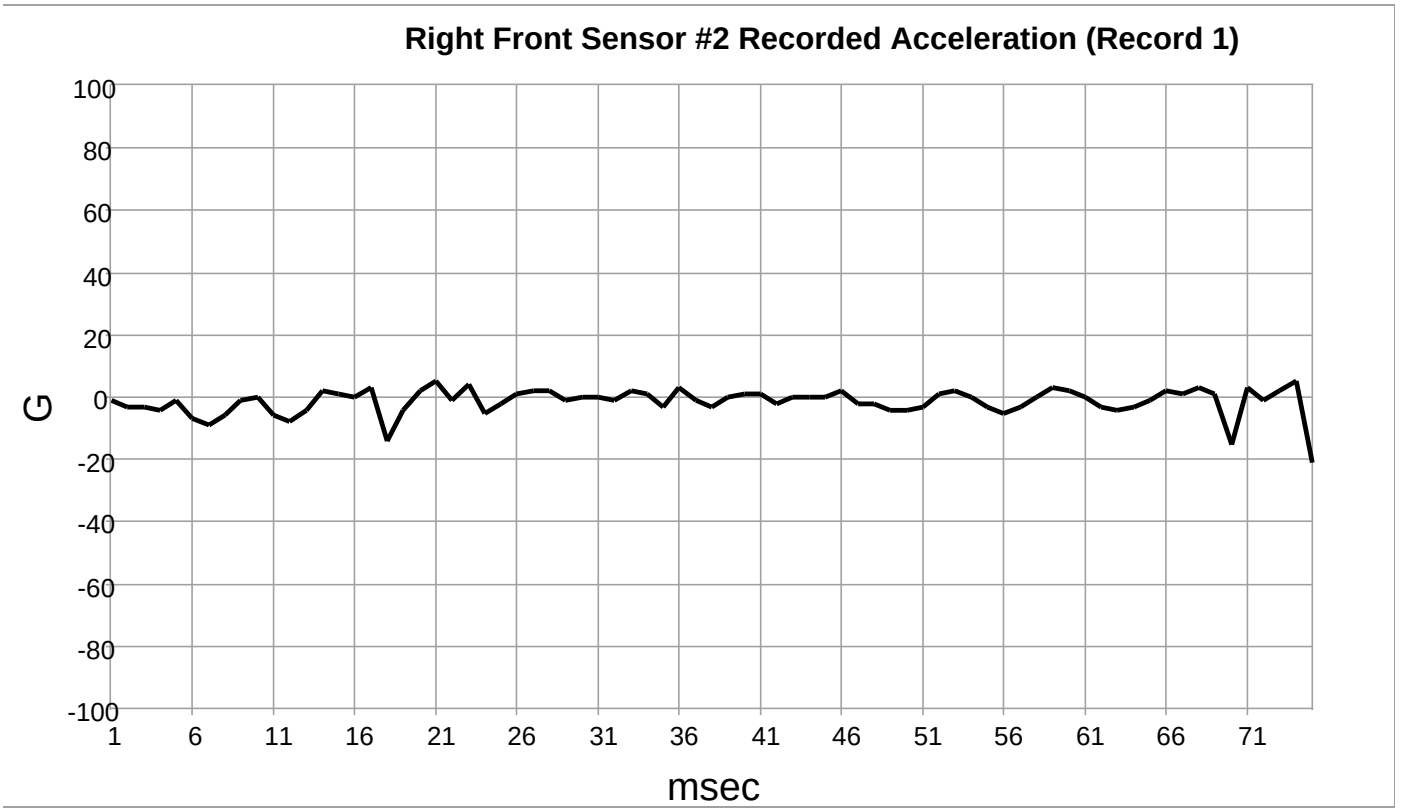
Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
232	-0.99
234	-0.12
236	-0.12
238	-0.68
240	1.12
242	0.93
244	1.06
246	-0.12
248	0.62
250	-0.31
252	-0.87
254	-1.24
256	-0.62
258	-0.18
260	-0.49
262	1.18
264	0.00
266	-1.37
268	1.18
270	1.74
272	-0.62
274	-3.12
276	-0.87
278	-0.31
280	-0.18
282	0.24
284	-1.99
286	-0.56
288	-0.31
290	0.24
292	0.12
294	0.74
296	-0.06
298	-0.18
300	0.31


Left Front Sensor #1 Recorded Acceleration (Record 1)
100
80
60
40
20
0
-20
-40
-60
-80
-100
G
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Left Front Sensor #1 Recorded Acceleration (Record 1)

Time (msec)	Left Front Sensor #1 Recorded Acceleration (g)
1	0.00
2	-4.00
3	-4.00
4	-1.00
5	0.00
6	-7.00
7	-8.00
8	-4.00
9	3.00
10	-2.00
11	-1.00
12	-6.00
13	-9.00
14	-1.00
15	10.00
16	-1.00
17	-4.00
18	-2.00
19	-15.00
20	11.00
21	6.00
22	1.00
23	-6.00
24	-4.00
25	-4.00
26	-2.00
27	5.00
28	-1.00
29	0.00
30	-2.00
31	-2.00
32	0.00
33	-2.00
34	0.00
35	-1.00
36	-4.00
37	5.00
38	-2.00
39	-4.00
40	-2.00
41	3.00
42	0.00
43	-4.00
44	0.00
45	3.00
46	0.00
47	1.00
48	-3.00
49	-4.00
50	-4.00
51	-4.00
52	1.00
53	2.00
54	0.00
55	-5.00
56	-5.00
57	-2.00

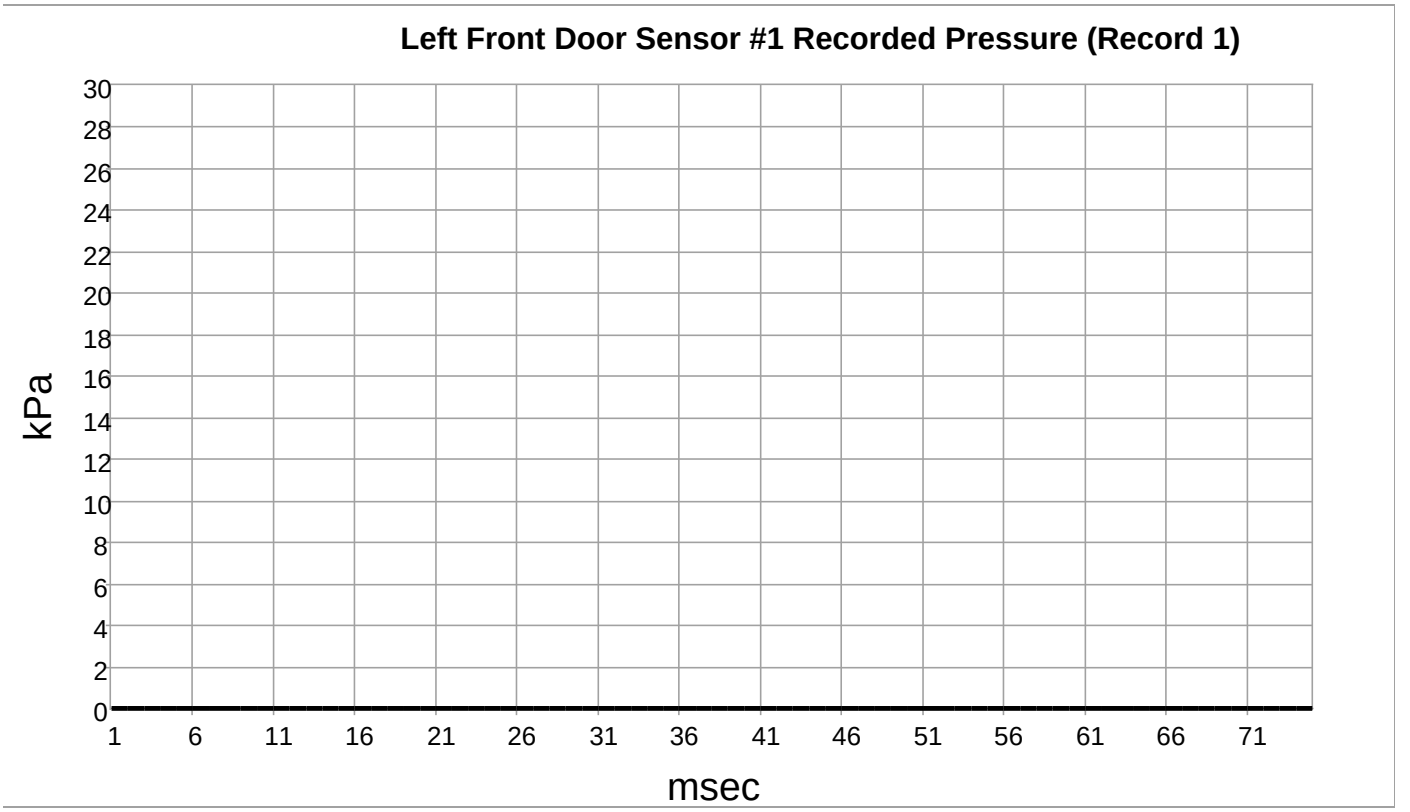
Time (msec)	Left Front Sensor #1 Recorded Acceleration (g)
58	2.00
59	1.00
60	2.00
61	0.00
62	0.00
63	-5.00
64	-6.00
65	-1.00
66	3.00
67	3.00
68	-9.00
69	1.00
70	1.00
71	-22.00
72	1.00
73	24.00
74	-5.00
75	-11.00


Right Front Sensor #2 Recorded Acceleration (Record 1)
100
80
60
40
20
0
-20
-40
-60
-80
-100
G
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Right Front Sensor #2 Recorded Acceleration (Record 1)

Time (msec)	Right Front Sensor #2 Recorded Acceleration (g)
1	-1.00
2	-3.00
3	-3.00
4	-4.00
5	-1.00
6	-7.00
7	-9.00
8	-6.00
9	-1.00
10	0.00
11	-6.00
12	-8.00
13	-4.00
14	2.00
15	1.00
16	0.00
17	3.00
18	-14.00
19	-4.00
20	2.00
21	5.00
22	-1.00
23	4.00
24	-5.00
25	-2.00
26	1.00
27	2.00
28	2.00
29	-1.00
30	0.00
31	0.00
32	-1.00
33	2.00
34	1.00
35	-3.00
36	3.00
37	-1.00
38	-3.00
39	0.00
40	1.00
41	1.00
42	-2.00
43	0.00
44	0.00
45	0.00
46	2.00
47	-2.00
48	-2.00
49	-4.00
50	-4.00
51	-3.00
52	1.00
53	2.00
54	0.00
55	-3.00
56	-5.00
57	-3.00

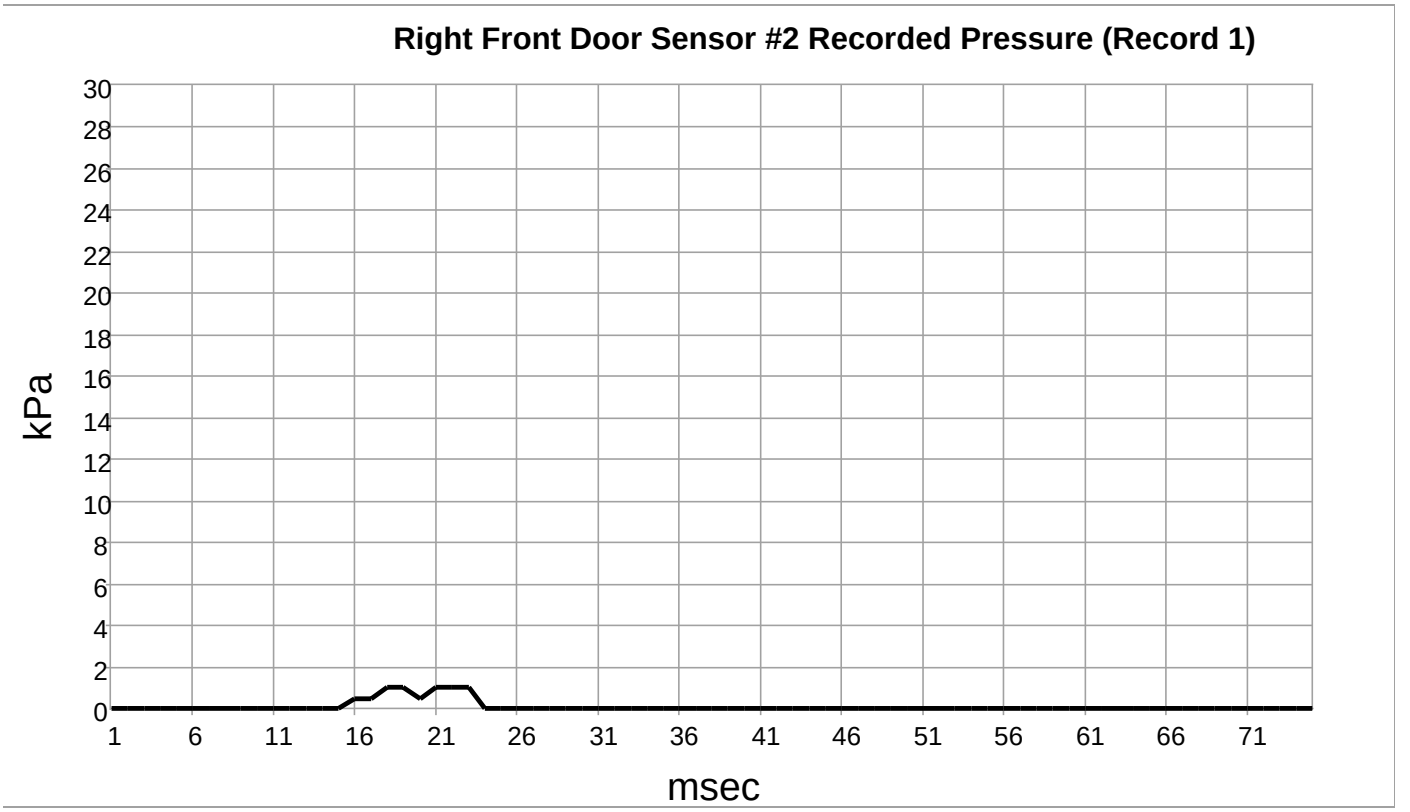
Time (msec)	Right Front Sensor #2 Recorded Acceleration (g)
58	0.00
59	3.00
60	2.00
61	0.00
62	-3.00
63	-4.00
64	-3.00
65	-1.00
66	2.00
67	1.00
68	3.00
69	1.00
70	-15.00
71	3.00
72	-1.00
73	2.00
74	5.00
75	-21.00


Left Front Door Sensor #1 Recorded Pressure (Record 1)
kPa
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Left Front Door Sensor #1 Recorded Pressure (Record 1)

Time (msec)	Left Front Door Sensor #1 Recorded Pressure (kPa)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.0
20	0.0
21	0.0
22	0.0
23	0.0
24	0.0
25	0.0
26	0.0
27	0.0
28	0.0
29	0.0
30	0.0
31	0.0
32	0.0
33	0.0
34	0.0
35	0.0
36	0.0
37	0.0
38	0.0
39	0.0
40	0.0
41	0.0
42	0.0
43	0.0
44	0.0
45	0.0
46	0.0
47	0.0
48	0.0
49	0.0
50	0.0
51	0.0
52	0.0
53	0.0
54	0.0
55	0.0
56	0.0
57	0.0

Time (msec)	Left Front Door Sensor #1 Recorded Pressure (kPa)
58	0.0
59	0.0
60	0.0
61	0.0
62	0.0
63	0.0
64	0.0
65	0.0
66	0.0
67	0.0
68	0.0
69	0.0
70	0.0
71	0.0
72	0.0
73	0.0
74	0.0
75	0.0


Right Front Door Sensor #2 Recorded Pressure (Record 1)
kPa
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Right Front Door Sensor #2 Recorded Pressure (Record 1)

Time (msec)	Right Front Door Sensor #2 Recorded Pressure (kPa)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.5
17	0.5
18	1.0
19	1.0
20	0.5
21	1.0
22	1.0
23	1.0
24	0.0
25	0.0
26	0.0
27	0.0
28	0.0
29	0.0
30	0.0
31	0.0
32	0.0
33	0.0
34	0.0
35	0.0
36	0.0
37	0.0
38	0.0
39	0.0
40	0.0
41	0.0
42	0.0
43	0.0
44	0.0
45	0.0
46	0.0
47	0.0
48	0.0
49	0.0
50	0.0
51	0.0
52	0.0
53	0.0
54	0.0
55	0.0
56	0.0
57	0.0

Time (msec)	Right Front Door Sensor #2 Recorded Pressure (kPa)
58	0.0
59	0.0
60	0.0
61	0.0
62	0.0
63	0.0
64	0.0
65	0.0
66	0.0
67	0.0
68	0.0
69	0.0
70	0.0
71	0.0
72	0.0
73	0.0
74	0.0
75	0.0

Roll Rate (Record 1)

Contains No Recorded Data

Acceleration, Lateral, Rollover (Record 1)

Contains No Recorded Data

Acceleration, Normal, Rollover (Record 1)

Contains No Recorded Data

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 1 of 7

Time (sec)	Accelerator Pedal, % Full (%)	ABS Activity	Brake Pedal Position (%)	Driver Applied Brake Pedal Pressure (kPa)	Driver Applied Brake Pedal Pressure Detected	Service Brake, On/Off (Brake Pedal Initial Travel Achieved)	Cruise and Speed Limiter Switch Status
-8.0	99	Off	0	0	False	Off (False)	No Activation
-7.5	99	Off	0	0	False	Off (False)	No Activation
-7.0	99	Off	0	0	False	Off (False)	No Activation
-6.5	99	Off	0	0	False	Off (False)	No Activation
-6.0	99	Off	0	0	False	Off (False)	No Activation
-5.5	99	Off	0	0	False	Off (False)	No Activation
-5.0	99	Off	0	0	False	Off (False)	No Activation
-4.5	99	Off	0	0	False	Off (False)	No Activation
-4.0	99	Off	0	0	False	Off (False)	No Activation
-3.5	99	Off	0	0	False	Off (False)	No Activation
-3.0	60	Off	0	0	False	Off (False)	No Activation
-2.5	0	Off	0	0	False	Off (False)	No Activation
-2.0	0	Off	0	0	False	Off (False)	No Activation
-1.5	0	Off	0	0	False	Off (False)	No Activation
-1.0	0	Off	0	0	False	Off (False)	No Activation
-0.5	0	Off	0	0	False	Off (False)	No Activation
0.0	0	Off	0	0	False	Off (False)	No Activation

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 2 of 7

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-8.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-7.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-7.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-6.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-6.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-5.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-5.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-4.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-4.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-3.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-3.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-2.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-2.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-1.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-1.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-0.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
0.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 3 of 7

Time (sec)	Engine RPM (Engine Speed)	Engine Torque (Nm [Ft Lbs])	Engine Throttle, % Full (%)	Speed, Vehicle Indicated (MPH [km/h])	IMU Yaw Rate (deg/sec)	Right Front Wheel Angular Speed (RPM)	Left Front Wheel Angular Speed (RPM)
-8.0	4,679	599.0 [441.8]	99	58 [94]	-3.336	767	770
-7.5	5,062	596.5 [440.0]	99	63 [102]	-3.840	830	836
-7.0	5,437	591.5 [436.3]	99	68 [110]	-4.944	893	900
-6.5	5,802	549.0 [404.9]	99	73 [117]	-4.704	951	960
-6.0	6,149	509.5 [375.8]	99	78 [125]	-5.856	1,008	1,018
-5.5	5,021	206.5 [152.3]	99	81 [130]	-4.944	1,056	1,067
-5.0	4,816	604.0 [445.5]	99	85 [136]	-3.576	1,106	1,111
-4.5	4,991	597.5 [440.7]	99	88 [141]	-5.592	1,147	1,157
-4.0	5,233	598.0 [441.1]	99	91 [147]	-4.176	1,184	1,210
-3.5	5,394	595.0 [438.8]	99	95 [153]	-4.920	1,231	1,259
-3.0	5,504	430.5 [317.5]	99	97 [156]	3.816	1,283	1,275
-2.5	5,516	20.5 [15.1]	37	98 [157]	10.152	1,290	1,275
-2.0	5,437	-36.5 [-26.9]	32	96 [154]	11.136	1,274	1,260
-1.5	5,333	-66.0 [-48.7]	29	94 [151]	16.032	1,252	1,231
-1.0	5,089	-90.5 [-66.7]	28	90 [145]	12.336	1,208	1,196
-0.5	4,689	-79.5 [-58.6]	28	84 [135]	29.784	1,005	1,140
0.0	4,472	-72.0 [-53.1]	27	80 [129]	28.296	804	1,038

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 4 of 7

Time (sec)	Right Rear Wheel Angular Speed (RPM)	Left Rear Wheel Angular Speed (RPM)	Steering Wheel Angle (deg)	Propulsion System Active	System Power Mode	Backup System Power Mode	SDM Power Mode
-8.0	737	737	-9	True	Propulsion	Propulsion	Propulsion
-7.5	799	799	-10	True	Propulsion	Propulsion	Propulsion
-7.0	858	860	-12	True	Propulsion	Propulsion	Propulsion
-6.5	918	916	-12	True	Propulsion	Propulsion	Propulsion
-6.0	973	972	-13	True	Propulsion	Propulsion	Propulsion
-5.5	1,014	1,014	-11	True	Propulsion	Propulsion	Propulsion
-5.0	1,059	1,057	-9	True	Propulsion	Propulsion	Propulsion
-4.5	1,101	1,100	-13	True	Propulsion	Propulsion	Propulsion
-4.0	1,144	1,150	-13	True	Propulsion	Propulsion	Propulsion
-3.5	1,181	1,195	-9	True	Propulsion	Propulsion	Propulsion
-3.0	1,218	1,213	8	True	Propulsion	Propulsion	Propulsion
-2.5	1,221	1,216	24	True	Propulsion	Propulsion	Propulsion
-2.0	1,202	1,193	24	True	Propulsion	Propulsion	Propulsion
-1.5	1,180	1,173	31	True	Propulsion	Propulsion	Propulsion
-1.0	1,129	1,122	46	True	Propulsion	Propulsion	Propulsion
-0.5	1,057	1,040	56	True	Propulsion	Propulsion	Propulsion
0.0	614	870	44	True	Propulsion	Propulsion	Propulsion

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 5 of 7

Time (sec)	Ignition Status	Ignition Prolongation Time (sec)	Secondary Collision Prolongation Timer (sec)	Antilock Brake System Failed	Brake Pedal Override Flag	Automatic Brake Status	Electronic Stability Control Status
-8.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-0.5	On	5.0	0.0	False	False	Not Active	Normal Operation
0.0	On	5.0	0.0	False	False	Not Active	Normal Operation

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 6 of 7

Time (sec)	Traction Control System Present	Traction Control System Failed	Traction Control System Enabled	Traction Control System Active	Traction Control System Switch Status	Left Turn Signal Switch Active	Right Turn Signal Switch Active
-8.0	True	False	True	Traction Control Off	Enabled	False	False
-7.5	True	False	True	Traction Control Off	Enabled	False	False
-7.0	True	False	True	Traction Control Off	Enabled	False	False
-6.5	True	False	True	Traction Control Off	Enabled	False	False
-6.0	True	False	True	Traction Control Off	Enabled	False	False
-5.5	True	False	True	Traction Control Off	Enabled	False	False
-5.0	True	False	True	Traction Control Off	Enabled	False	False
-4.5	True	False	True	Traction Control Off	Enabled	False	False
-4.0	True	False	True	Traction Control Off	Enabled	False	False
-3.5	True	False	True	Traction Control Off	Enabled	False	False
-3.0	True	False	True	Traction Control Off	Enabled	False	False
-2.5	True	False	True	Traction Control Off	Enabled	False	False
-2.0	True	False	True	Traction Control Off	Enabled	False	False
-1.5	True	False	True	Traction Control Off	Enabled	False	False
-1.0	True	False	True	Traction Control Off	Enabled	False	False
-0.5	True	False	True	Traction Control Off	Enabled	False	False
0.0	True	False	True	Traction Control Active	Enabled	False	False

Pre-Crash Data -8.0 to 0.0 sec (Record 1) - Table 7 of 7

Time (sec)	IMU Lateral Acceleration (g)	IMU Longitudinal Acceleration (g)	Red Brake Telltale On	Brake Boost Status - Eboost
-8.0	-0.001220	0.005612	False	Normal Boost
-7.5	-0.001952	0.005490	False	Normal Boost
-7.0	-0.002684	0.005246	False	Normal Boost
-6.5	-0.003172	0.005124	False	Normal Boost
-6.0	-0.004148	0.004758	False	Normal Boost
-5.5	-0.004392	0.002806	False	Normal Boost
-5.0	-0.003416	0.003416	False	Normal Boost
-4.5	-0.004636	0.003538	False	Normal Boost
-4.0	-0.004392	0.002928	False	Normal Boost
-3.5	-0.002928	0.003416	False	Normal Boost
-3.0	0.003782	0.001830	False	Normal Boost
-2.5	0.009028	-0.000976	False	Normal Boost
-2.0	0.011102	-0.001830	False	Normal Boost
-1.5	0.013542	-0.002318	False	Normal Boost
-1.0	0.008540	-0.002562	False	Normal Boost
-0.5	0.007808	-0.002318	False	Normal Boost
0.0	0.009760	0.001098	False	Normal Boost

System Status at Event (Record 2)

Event Counter	2
Ignition Cycle Counter	143
Microcontroller Safing Timestamp (msec)	0
Frontal Air Bag Warning Indicator (SIR Warning Indicator Status at Enable)	Off
SIR Warning Indicator ON/OFF Time (sec)	68,190
Number of Ignition Cycles SIR Warning Indicator was ON/OFF Continuously	143
Ignition Cycles Since DTCs Were Last Cleared	143
Safety Belt Status, Right Front Passenger (Front Passenger Belt Switch Circuit Status)	Buckled
Safety Belt Status, Driver (Driver Belt Switch Circuit Status)	Buckled
Maximum Resultant Delta-V - Longitudinal Component for FSR Event (MPH [km/h])	-14 [-22]
Maximum Resultant Delta-V - Lateral Component for FSR Event (MPH [km/h])	-12 [-20]
Time From FSR Time Zero to Time of the Maximum Resultant SDM Recorded Vehicle Velocity Change (msec)	260
Maximum Delta-V, Longitudinal (Maximum Longitudinal SDM Recorded Vehicle Velocity Change for FSR Event) (MPH [km/h])	-14 [-22]
Paired SDM Recorded Vehicle Lateral Velocity Change for Maximum Longitudinal Velocity Change (MPH [km/h])	-12 [-20]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change) (msec)	260
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) (MPH [km/h])	-12 [-20]
Paired SDM Recorded Vehicle Longitudinal Velocity Change for Maximum Lateral Velocity Change (MPH [km/h])	-14 [-22]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change) (msec)	228
Tire Pressure Low Indication On at Event	False
Ignition Operating Timer (msec)	153,117,501
UTC Time at Event	03:29:01
UTC Date at Event	2022/02/06
Frontal Algorithm Wakeup Time (msec)	0
Side Algorithm Wakeup Time (msec)	118
Rear Algorithm Wakeup Time (msec)	Data Not Available
Rollover Algorithm Wakeup Time (msec)	0
Frontal Algorithm Reset Time (msec)	39
Side Algorithm Reset Time (msec)	150
Rear Algorithm Reset Time (msec)	Data Not Available
Rollover Algorithm Reset Time (msec)	Data Not Available
Occupant Position Classification, Right Front Passenger (Front Passenger Seat Restraint Control Occupancy Status)	Yes (Occupied Adult)
Commanded State of Suppression ON (PAB Off) Indicator	Off
Commanded State of Suppression OFF (PAB On) Indicator	On
Time to Frontal Impact Pretensioner PCN Request (msec)	140
Time to Frontal Impact Stage 1 PCN Request (msec)	140
Time to Frontal Impact Stage 2 PCN Request (msec)	140
Time to Left Side Impact PCN Request (msec)	Data Not Available
Time to Right Side Impact PCN Request (msec)	155
Time to Rear Impact PCN Request (msec)	Data Not Available
Time to Rollover Impact PCN Request (msec)	Data Not Available
Time to Battery Disconnect Switch Side Severity (msec)	155
High Voltage Disable Notification Sent	True
Deployment Commanded in Energy Reserve Mode	False
Event Enable Time (T0) (msec)	153,117,501

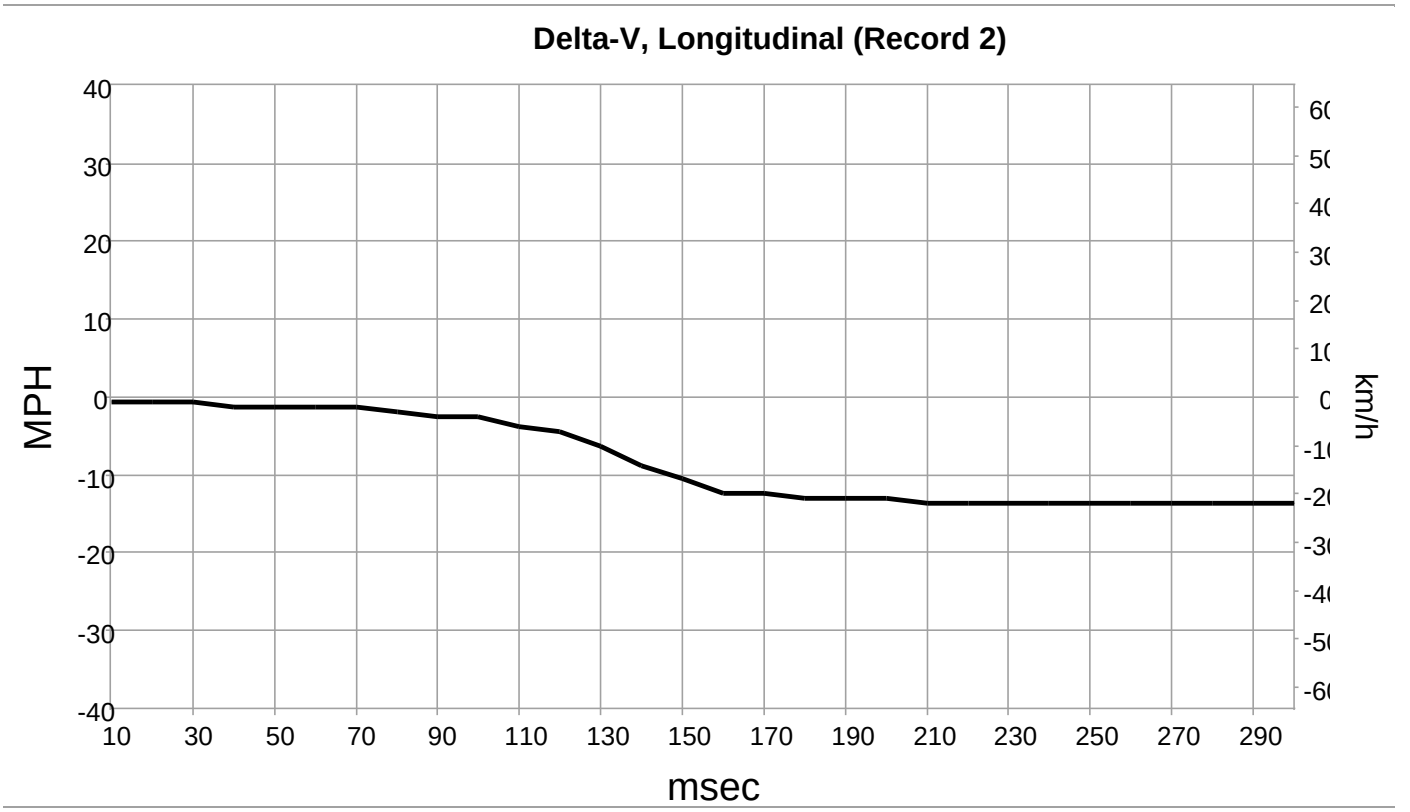
Event End Time (Tend) (msec)	153,117,762
Complete File Recorded (Event Recording Progress and Complete Flag)	Event Recording Complete

Diagnostic Trouble Codes 0.5 Seconds Prior to Time Zero (Record 2)

DTC 1	U0101-00
DTC 2	U1611-00
DTC 3	N/A, N/A
DTC 4	N/A, N/A
DTC 5	N/A, N/A
DTC 6	N/A, N/A
DTC 7	N/A, N/A
DTC 8	N/A, N/A
DTC 9	N/A, N/A

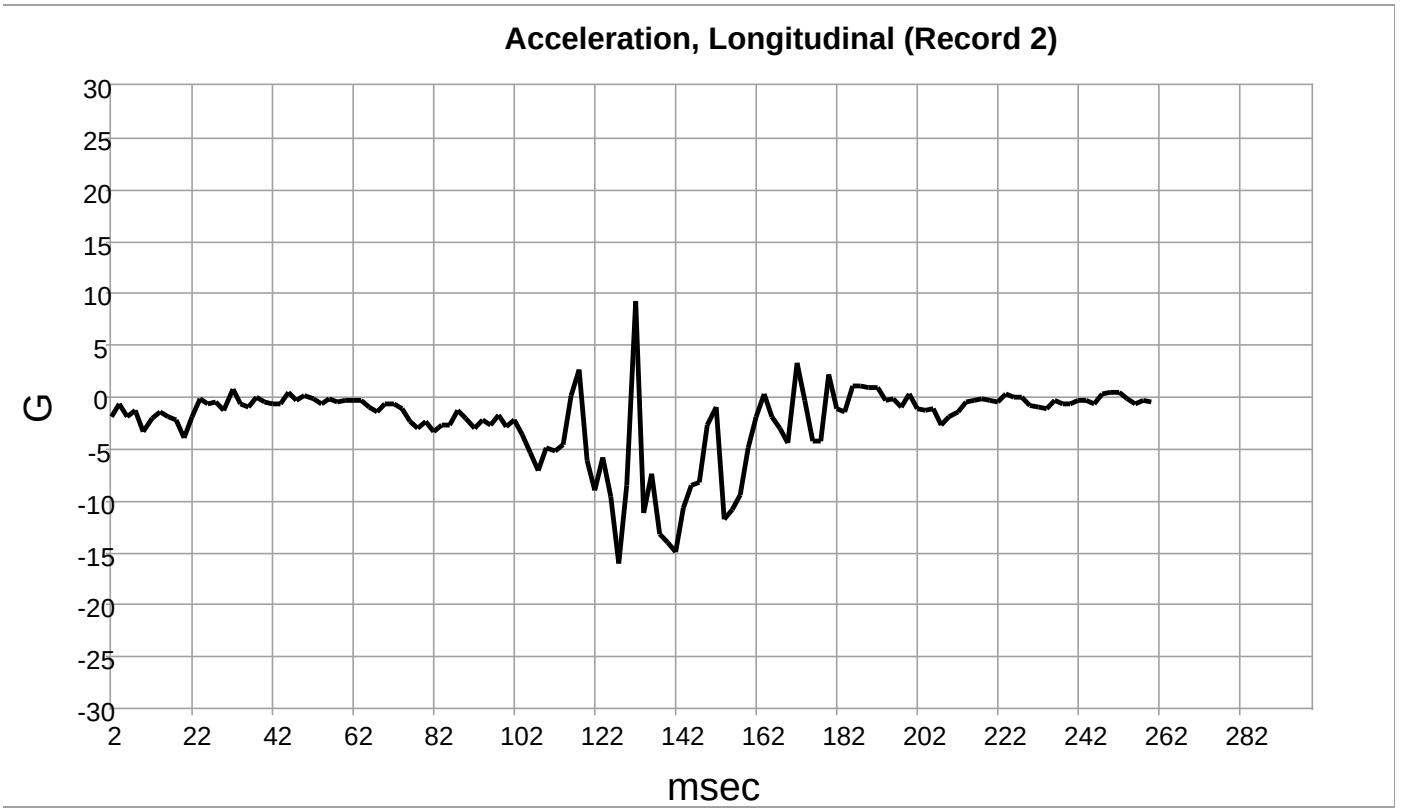
Deployment Command Data (Record 2)

Driver 1st Stage Deployment Loop Commanded (msec)	140
Passenger 1st Stage Deployment Loop Commanded (msec)	140
Driver 2nd Stage Deployment Loop Commanded (msec)	142
Passenger 2nd Stage Deployment Loop Commanded (msec)	260
Driver Pretensioner Deployment Loop #1 Commanded (msec)	140
Passenger Pretensioner Deployment Loop #1 Commanded (msec)	140
Driver Pretensioner Deployment Loop #2 Commanded (msec)	146
Passenger Pretensioner Deployment Loop #2 Commanded (msec)	146
Driver Thorax Loop Commanded (msec)	Data Not Available
Passenger Thorax Loop Commanded Passenger (msec)	155


Delta-V, Longitudinal (Record 2)
MPH
km/h
msec
40
30
20
10
0
-10
-20
-30
-40
10
30
50
70
90
110
130
150
170
190
210
230
250
270
290

Longitudinal Delta-V (Record 2)

Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH [km/h])
10	-1 [-1]
20	-1 [-1]
30	-1 [-1]
40	-1 [-2]
50	-1 [-2]
60	-1 [-2]
70	-1 [-2]
80	-2 [-3]
90	-2 [-4]
100	-2 [-4]
110	-4 [-6]
120	-4 [-7]
130	-6 [-10]
140	-9 [-14]
150	-11 [-17]
160	-12 [-20]
170	-12 [-20]
180	-13 [-21]
190	-13 [-21]
200	-13 [-21]
210	-14 [-22]
220	-14 [-22]
230	-14 [-22]
240	-14 [-22]
250	-14 [-22]
260	-14 [-22]
270	-14 [-22]
280	-14 [-22]
290	-14 [-22]
300	-14 [-22]

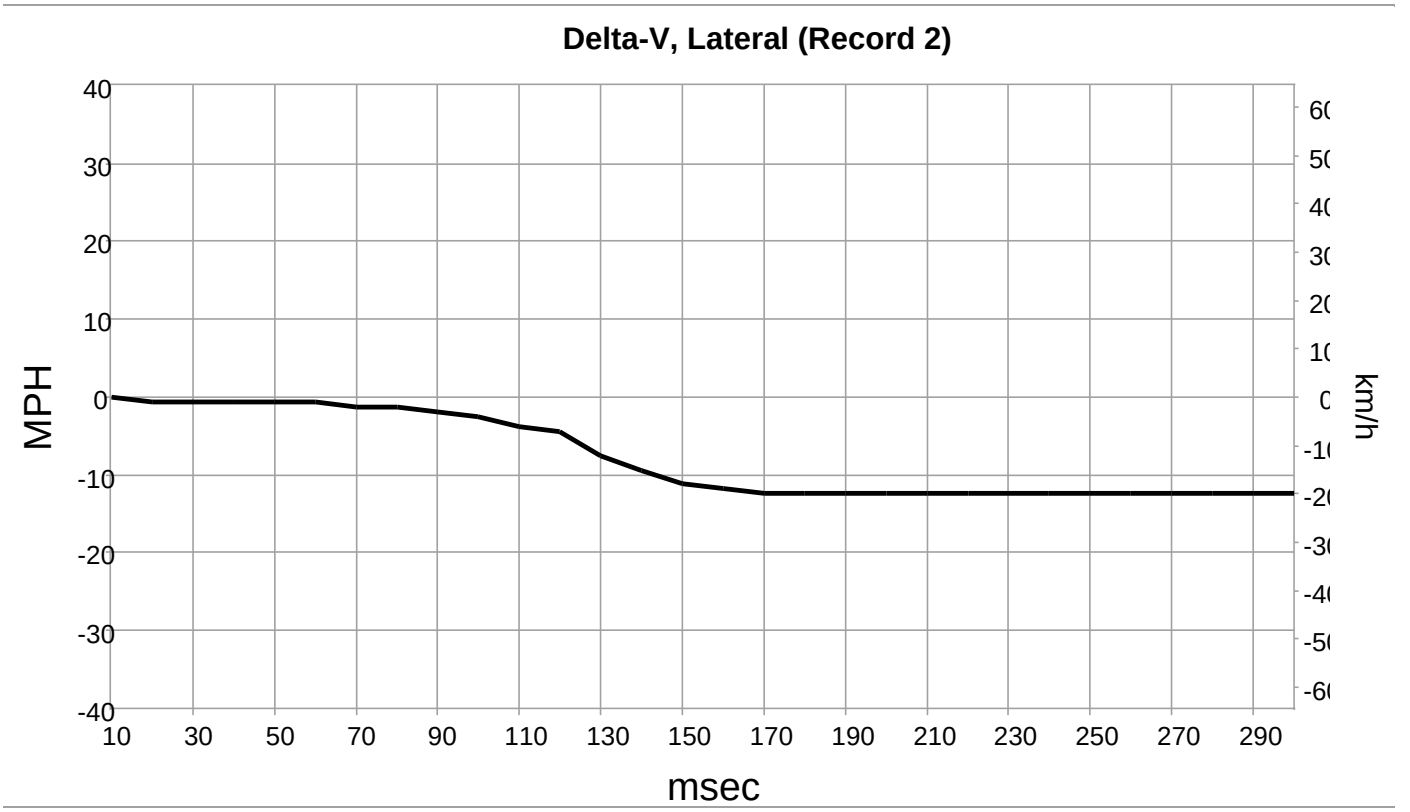

Acceleration, Longitudinal (Record 2)
G
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
2
22
42
62
82
102
122
142
162
182
202
222
242
262
282
msec

Longitudinal Acceleration (Record 2)

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
2	-1.93
4	-0.62
6	-1.87
8	-1.24
10	-3.37
12	-1.99
14	-1.43
16	-1.81
18	-2.24
20	-3.87
22	-1.87
24	-0.12
26	-0.56
28	-0.49
30	-1.24
32	0.74
34	-0.56
36	-0.99
38	-0.06
40	-0.43
42	-0.62
44	-0.62
46	0.43
48	-0.24
50	0.18
52	-0.18
54	-0.68
56	-0.18
58	-0.43
60	-0.31
62	-0.31
64	-0.37
66	-0.99
68	-1.37
70	-0.62
72	-0.56
74	-1.12
76	-2.43
78	-2.99
80	-2.37
82	-3.24
84	-2.74
86	-2.62
88	-1.24
90	-2.12
92	-2.93
94	-2.18
96	-2.62
98	-1.74
100	-2.87
102	-2.18
104	-3.68
106	-5.37
108	-6.99
110	-4.93
112	-5.24

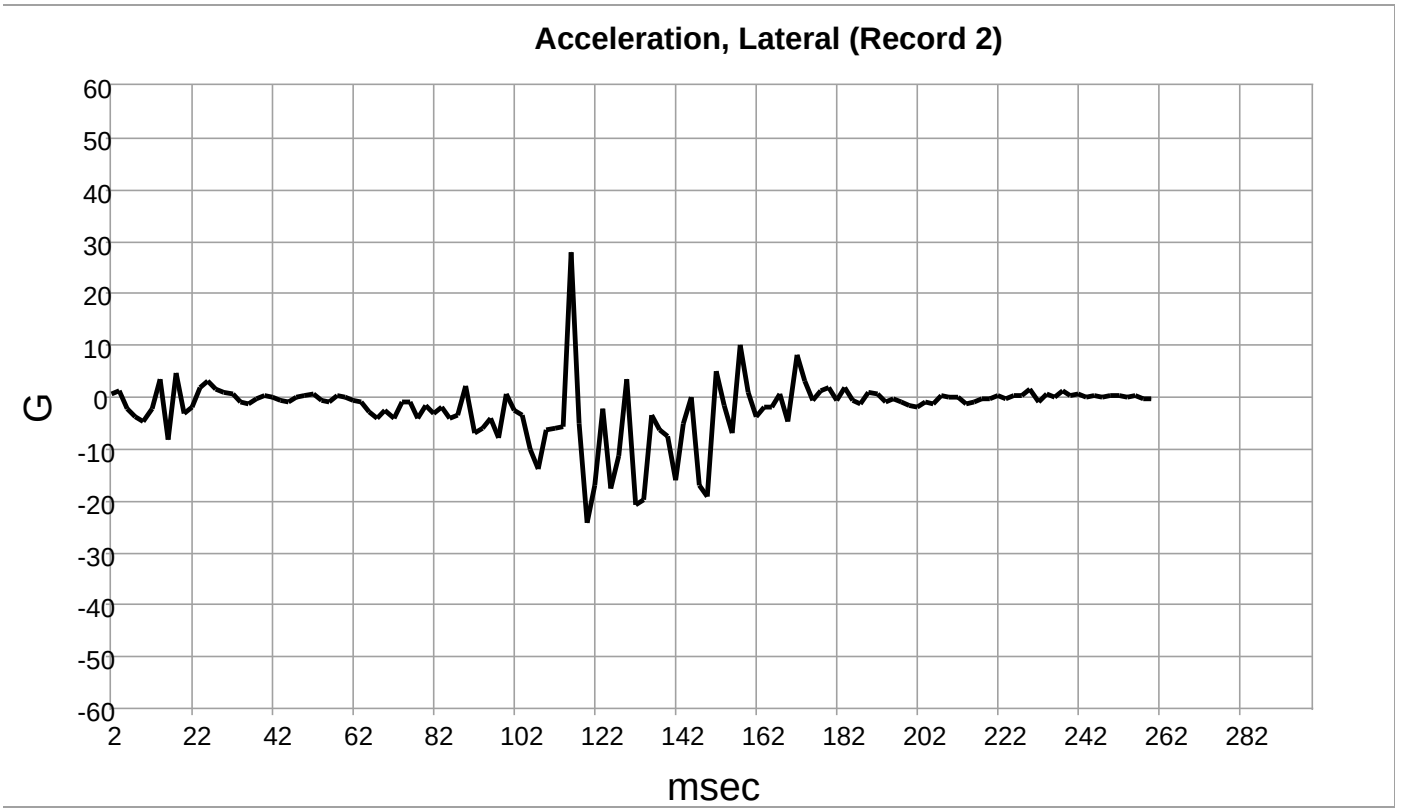
Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
114	-4.49
116	0.18
118	2.62
120	-6.18
122	-8.99
124	-5.74
126	-9.62
128	-15.99
130	-8.55
132	9.24
134	-11.12
136	-7.31
138	-13.12
140	-13.99
142	-14.99
144	-10.68
146	-8.55
148	-8.18
150	-2.68
152	-0.87
154	-11.74
156	-10.80
158	-9.43
160	-4.93
162	-1.81
164	0.31
166	-1.81
168	-2.99
170	-4.43
172	3.24
174	-0.31
176	-4.24
178	-4.31
180	2.24
182	-1.12
184	-1.37
186	1.12
188	1.06
190	0.99
192	0.87
194	-0.37
196	-0.18
198	-0.99
200	0.24
202	-1.06
204	-1.24
206	-1.12
208	-2.68
210	-1.87
212	-1.37
214	-0.49
216	-0.24
218	-0.18
220	-0.24
222	-0.49
224	0.37
226	0.06

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
228	0.06
230	-0.81
232	-0.87
234	-1.06
236	-0.37
238	-0.62
240	-0.68
242	-0.31
244	-0.24
246	-0.62
248	0.31
250	0.43
252	0.43
254	-0.12
256	-0.56
258	-0.31
260	-0.43
262	Data Not Available
264	Data Not Available
266	Data Not Available
268	Data Not Available
270	Data Not Available
272	Data Not Available
274	Data Not Available
276	Data Not Available
278	Data Not Available
280	Data Not Available
282	Data Not Available
284	Data Not Available
286	Data Not Available
288	Data Not Available
290	Data Not Available
292	Data Not Available
294	Data Not Available
296	Data Not Available
298	Data Not Available
300	Data Not Available


Delta-V, Lateral (Record 2)
MPH
km/h
msec
40
30
20
10
0
-10
-20
-30
-40
10
30
50
70
90
110
130
150
170
190
210
230
250
270
290

Lateral Delta-V (Record 2)

Time (msec)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (MPH [km/h])
10	0 [0]
20	-1 [-1]
30	-1 [-1]
40	-1 [-1]
50	-1 [-1]
60	-1 [-1]
70	-1 [-2]
80	-1 [-2]
90	-2 [-3]
100	-2 [-4]
110	-4 [-6]
120	-4 [-7]
130	-7 [-12]
140	-9 [-15]
150	-11 [-18]
160	-12 [-19]
170	-12 [-20]
180	-12 [-20]
190	-12 [-20]
200	-12 [-20]
210	-12 [-20]
220	-12 [-20]
230	-12 [-20]
240	-12 [-20]
250	-12 [-20]
260	-12 [-20]
270	-12 [-20]
280	-12 [-20]
290	-12 [-20]
300	-12 [-20]

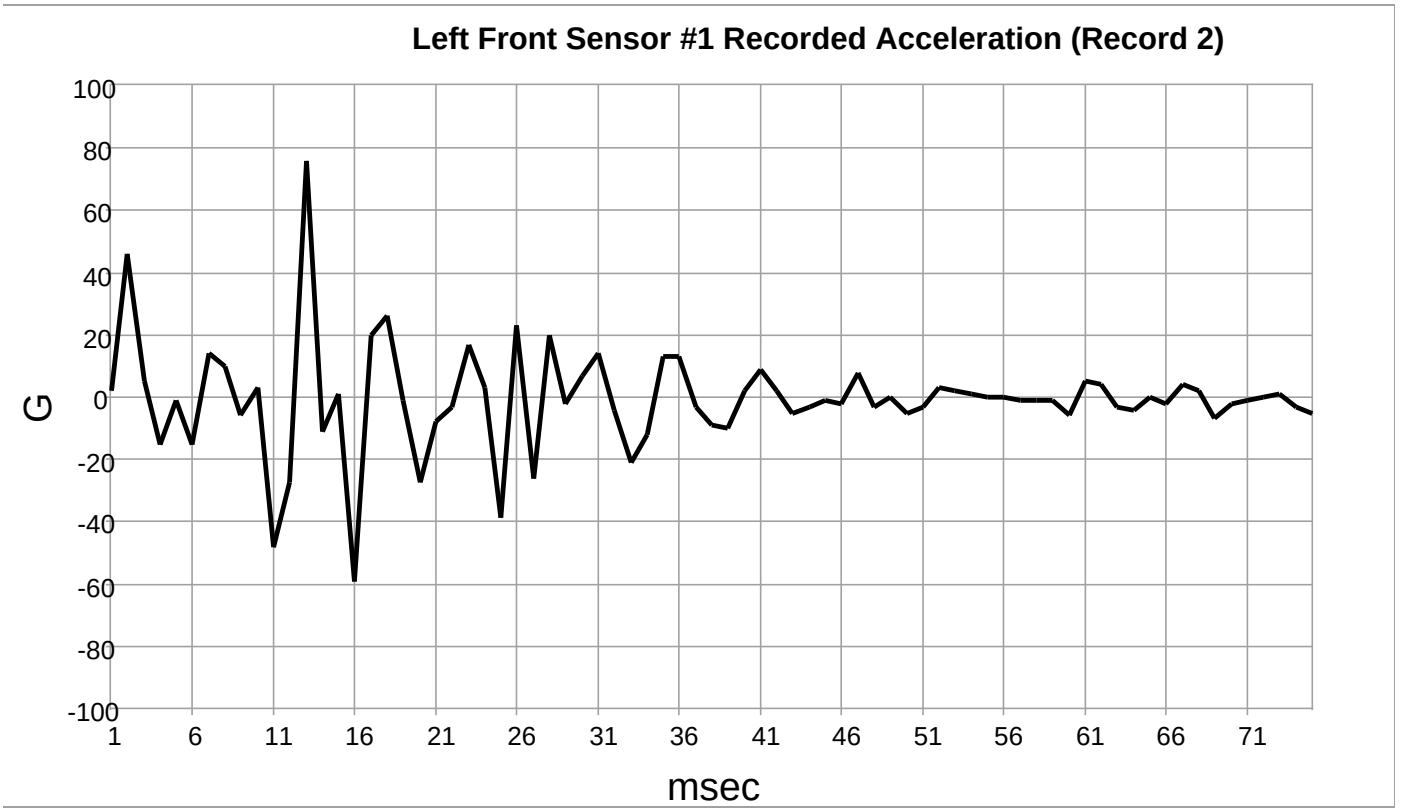

Acceleration, Lateral (Record 2)
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
G
2
22
42
62
82
102
122
142
162
182
202
222
242
262
282
msec

Lateral Acceleration (Record 2)

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
2	0.49
4	1.12
6	-2.18
8	-3.81
10	-4.62
12	-2.24
14	3.31
16	-8.05
18	4.74
20	-3.18
22	-1.87
24	1.87
26	3.06
28	1.56
30	0.99
32	0.62
34	-0.93
36	-1.31
38	-0.31
40	0.24
42	0.12
44	-0.68
46	-0.93
48	0.12
50	0.31
52	0.74
54	-0.68
56	-0.99
58	0.24
60	-0.12
62	-0.49
64	-0.99
66	-2.81
68	-4.12
70	-2.56
72	-4.24
74	-0.81
76	-0.99
78	-4.24
80	-1.43
82	-3.12
84	-1.93
86	-3.93
88	-3.37
90	2.12
92	-6.93
94	-5.87
96	-4.24
98	-7.74
100	0.62
102	-2.56
104	-3.49
106	-10.05
108	-13.68
110	-6.18
112	-5.99
114	-5.56

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
116	27.99
118	-5.12
120	-24.30
122	-16.99
124	-2.18
126	-17.68
128	-11.37
130	3.49
132	-20.74
134	-19.93
136	-3.31
138	-6.43
140	-7.43
142	-16.05
144	-4.87
146	0.06
148	-17.05
150	-19.30
152	4.93
154	-1.43
156	-6.81
158	10.12
160	0.93
162	-3.68
164	-1.81
166	-1.93
168	0.62
170	-4.56
172	8.05
174	2.99
176	-0.62
178	1.37
180	1.81
182	-0.68
184	1.74
186	-0.49
188	-1.37
190	0.99
192	0.49
194	-1.06
196	-0.43
198	-0.99
200	-1.56
202	-1.99
204	-1.06
206	-1.31
208	0.24
210	-0.12
212	-0.12
214	-1.18
216	-1.06
218	-0.43
220	-0.24
222	0.18
224	-0.31
226	0.31
228	0.24
230	1.49

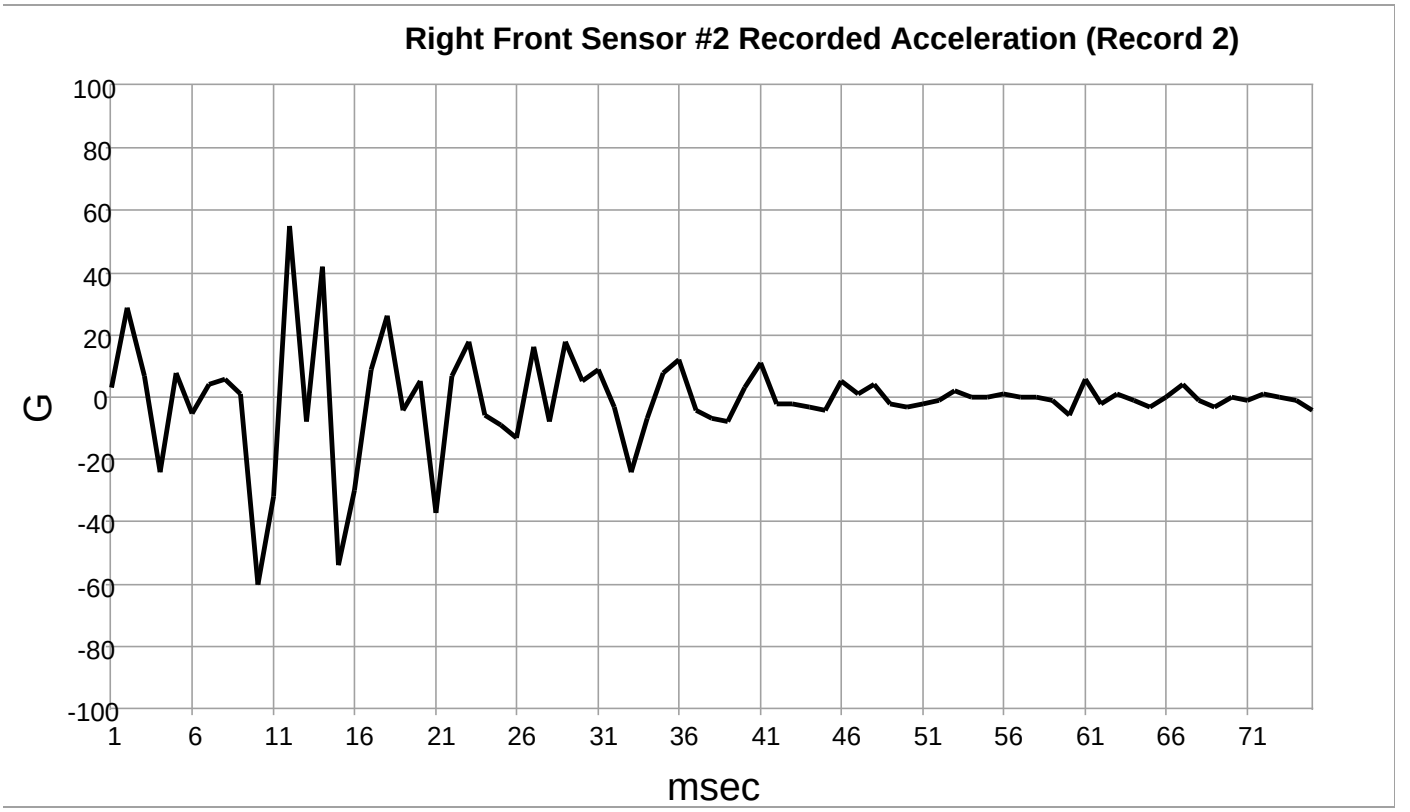
Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
232	-0.99
234	0.56
236	-0.06
238	1.24
240	0.18
242	0.62
244	0.12
246	0.24
248	0.12
250	0.37
252	0.18
254	0.06
256	0.31
258	-0.43
260	-0.43
262	Data Not Available
264	Data Not Available
266	Data Not Available
268	Data Not Available
270	Data Not Available
272	Data Not Available
274	Data Not Available
276	Data Not Available
278	Data Not Available
280	Data Not Available
282	Data Not Available
284	Data Not Available
286	Data Not Available
288	Data Not Available
290	Data Not Available
292	Data Not Available
294	Data Not Available
296	Data Not Available
298	Data Not Available
300	Data Not Available


Left Front Sensor #1 Recorded Acceleration (Record 2)
100
80
60
40
20
0
-20
-40
-60
-80
-100
G
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Left Front Sensor #1 Recorded Acceleration (Record 2)

Time (msec)	Left Front Sensor #1 Recorded Acceleration (g)
1	2.00
2	46.00
3	5.00
4	-15.00
5	-1.00
6	-15.00
7	14.00
8	10.00
9	-6.00
10	3.00
11	-48.00
12	-27.00
13	76.00
14	-11.00
15	1.00
16	-59.00
17	20.00
18	26.00
19	-1.00
20	-27.00
21	-8.00
22	-3.00
23	17.00
24	3.00
25	-39.00
26	23.00
27	-26.00
28	20.00
29	-2.00
30	7.00
31	14.00
32	-4.00
33	-21.00
34	-12.00
35	13.00
36	13.00
37	-3.00
38	-9.00
39	-10.00
40	2.00
41	9.00
42	2.00
43	-5.00
44	-3.00
45	-1.00
46	-2.00
47	8.00
48	-3.00
49	0.00
50	-5.00
51	-3.00
52	3.00
53	2.00
54	1.00
55	0.00
56	0.00
57	-1.00

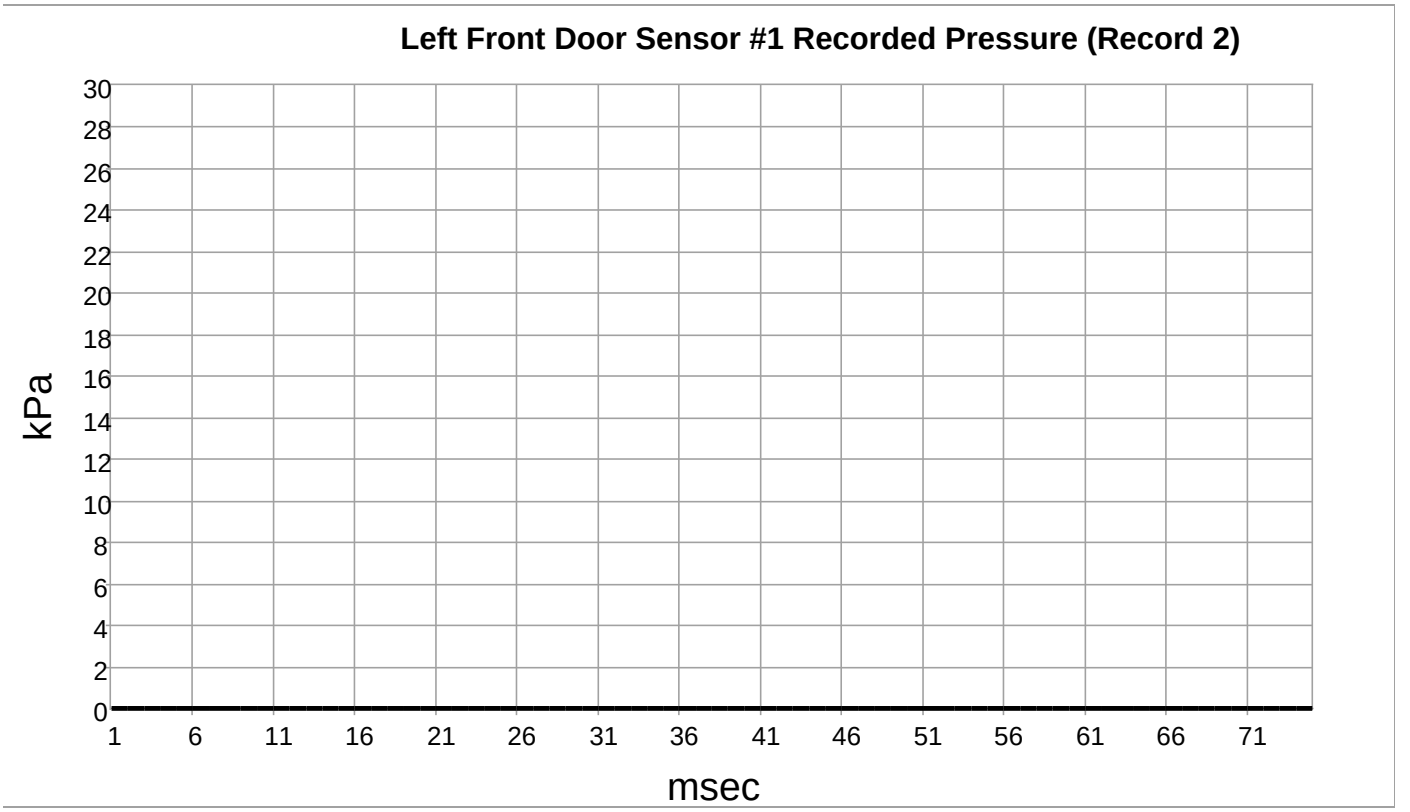
Time (msec)	Left Front Sensor #1 Recorded Acceleration (g)
58	-1.00
59	-1.00
60	-6.00
61	5.00
62	4.00
63	-3.00
64	-4.00
65	0.00
66	-2.00
67	4.00
68	2.00
69	-7.00
70	-2.00
71	-1.00
72	0.00
73	1.00
74	-3.00
75	-5.00


Right Front Sensor #2 Recorded Acceleration (Record 2)
100
80
60
40
20
0
-20
-40
-60
-80
-100
G
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Right Front Sensor #2 Recorded Acceleration (Record 2)

Time (msec)	Right Front Sensor #2 Recorded Acceleration (g)
1	3.00
2	29.00
3	7.00
4	-24.00
5	8.00
6	-5.00
7	4.00
8	6.00
9	1.00
10	-60.00
11	-32.00
12	55.00
13	-8.00
14	42.00
15	-54.00
16	-30.00
17	9.00
18	26.00
19	-4.00
20	5.00
21	-37.00
22	7.00
23	18.00
24	-6.00
25	-9.00
26	-13.00
27	16.00
28	-8.00
29	18.00
30	5.00
31	9.00
32	-3.00
33	-24.00
34	-7.00
35	8.00
36	12.00
37	-4.00
38	-7.00
39	-8.00
40	3.00
41	11.00
42	-2.00
43	-2.00
44	-3.00
45	-4.00
46	5.00
47	1.00
48	4.00
49	-2.00
50	-3.00
51	-2.00
52	-1.00
53	2.00
54	0.00
55	0.00
56	1.00
57	0.00

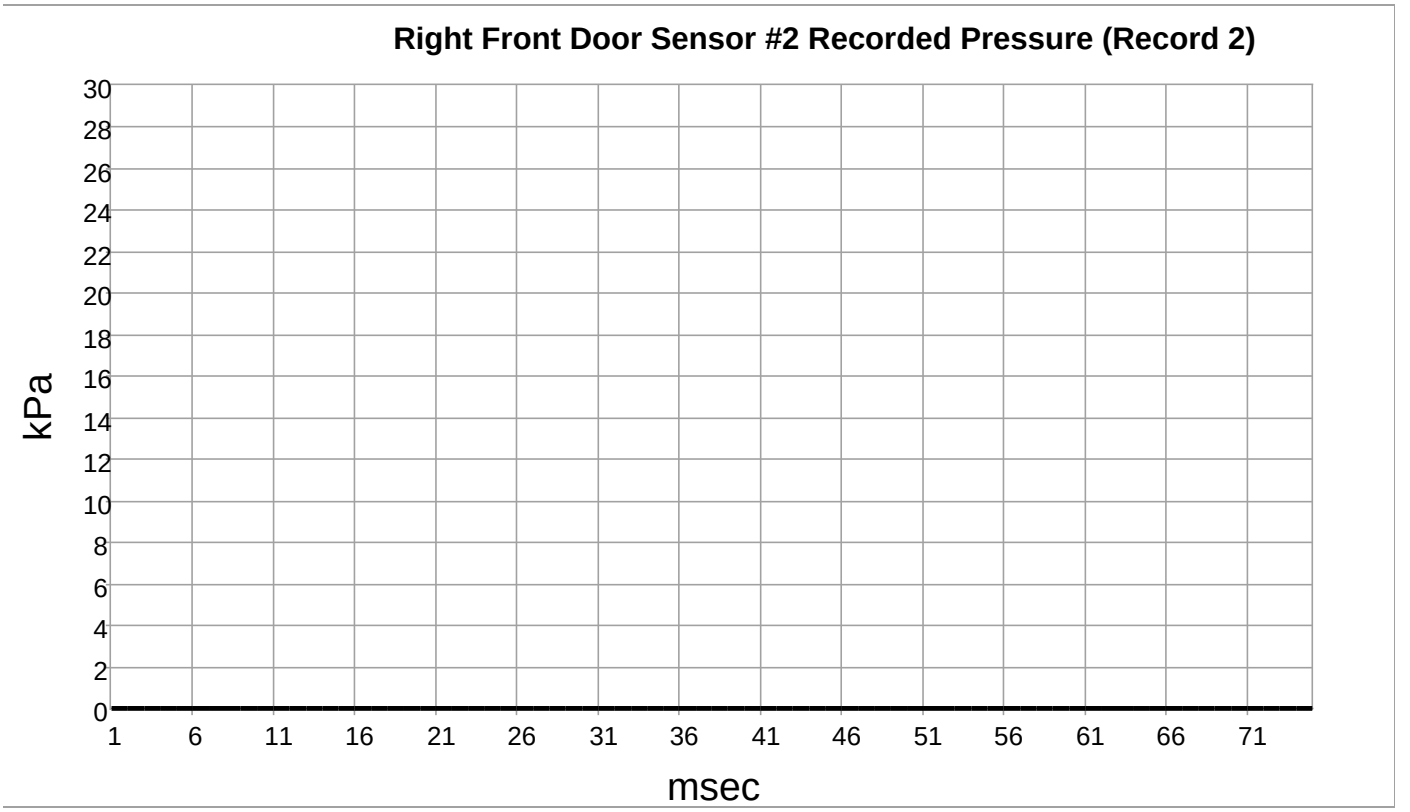
Time (msec)	Right Front Sensor #2 Recorded Acceleration (g)
58	0.00
59	-1.00
60	-6.00
61	6.00
62	-2.00
63	1.00
64	-1.00
65	-3.00
66	0.00
67	4.00
68	-1.00
69	-3.00
70	0.00
71	-1.00
72	1.00
73	0.00
74	-1.00
75	-4.00


Left Front Door Sensor #1 Recorded Pressure (Record 2)
kPa
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Left Front Door Sensor #1 Recorded Pressure (Record 2)

Time (msec)	Left Front Door Sensor #1 Recorded Pressure (kPa)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.0
20	0.0
21	0.0
22	0.0
23	0.0
24	0.0
25	0.0
26	0.0
27	0.0
28	0.0
29	0.0
30	0.0
31	0.0
32	0.0
33	0.0
34	0.0
35	0.0
36	0.0
37	0.0
38	0.0
39	0.0
40	0.0
41	0.0
42	0.0
43	0.0
44	0.0
45	0.0
46	0.0
47	0.0
48	0.0
49	0.0
50	0.0
51	0.0
52	0.0
53	0.0
54	0.0
55	0.0
56	0.0
57	0.0

Time (msec)	Left Front Door Sensor #1 Recorded Pressure (kPa)
58	0.0
59	0.0
60	0.0
61	0.0
62	0.0
63	0.0
64	0.0
65	0.0
66	0.0
67	0.0
68	0.0
69	0.0
70	0.0
71	0.0
72	0.0
73	0.0
74	0.0
75	0.0


Right Front Door Sensor #2 Recorded Pressure (Record 2)
kPa
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
msec

Right Front Door Sensor #2 Recorded Pressure (Record 2)

Time (msec)	Right Front Door Sensor #2 Recorded Pressure (kPa)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0
12	0.0
13	0.0
14	0.0
15	0.0
16	0.0
17	0.0
18	0.0
19	0.0
20	0.0
21	0.0
22	0.0
23	0.0
24	0.0
25	0.0
26	0.0
27	0.0
28	0.0
29	0.0
30	0.0
31	0.0
32	0.0
33	0.0
34	0.0
35	0.0
36	0.0
37	0.0
38	0.0
39	0.0
40	0.0
41	0.0
42	0.0
43	0.0
44	0.0
45	0.0
46	0.0
47	0.0
48	0.0
49	0.0
50	0.0
51	0.0
52	0.0
53	0.0
54	0.0
55	0.0
56	0.0
57	0.0

Time (msec)	Right Front Door Sensor #2 Recorded Pressure (kPa)
58	0.0
59	0.0
60	0.0
61	0.0
62	0.0
63	0.0
64	0.0
65	0.0
66	0.0
67	0.0
68	0.0
69	0.0
70	0.0
71	0.0
72	0.0
73	0.0
74	0.0
75	0.0

Roll Rate (Record 2)

Contains No Recorded Data

Acceleration, Lateral, Rollover (Record 2)

Contains No Recorded Data

Acceleration, Normal, Rollover (Record 2)

Contains No Recorded Data

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 1 of 7

Time (sec)	Accelerator Pedal, % Full (%)	ABS Activity	Brake Pedal Position (%)	Driver Applied Brake Pedal Pressure (kPa)	Driver Applied Brake Pedal Pressure Detected	Service Brake, On/Off (Brake Pedal Initial Travel Achieved)	Cruise and Speed Limiter Switch Status
-8.0	99	Off	0	0	False	Off (False)	No Activation
-7.5	99	Off	0	0	False	Off (False)	No Activation
-7.0	99	Off	0	0	False	Off (False)	No Activation
-6.5	99	Off	0	0	False	Off (False)	No Activation
-6.0	99	Off	0	0	False	Off (False)	No Activation
-5.5	99	Off	0	0	False	Off (False)	No Activation
-5.0	99	Off	0	0	False	Off (False)	No Activation
-4.5	99	Off	0	0	False	Off (False)	No Activation
-4.0	60	Off	0	0	False	Off (False)	No Activation
-3.5	0	Off	0	0	False	Off (False)	No Activation
-3.0	0	Off	0	0	False	Off (False)	No Activation
-2.5	0	Off	0	0	False	Off (False)	No Activation
-2.0	0	Off	0	0	False	Off (False)	No Activation
-1.5	0	Off	0	0	False	Off (False)	No Activation
-1.0	0	Off	0	0	False	Off (False)	No Activation
-0.5	0	Off	2	0	False	Off (False)	No Activation
0.0	0	Off	0	0	False	Off (False)	No Activation

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 2 of 7

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-8.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-7.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-7.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-6.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-6.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-5.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-5.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-4.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-4.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-3.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-3.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-2.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-2.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-1.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-1.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Unknown	Lever Position Unknown	Data Not Available
-0.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Unknown	Lever Position Unknown	Data Not Available
0.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Unknown	Lever Position Unknown	Data Not Available

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 3 of 7

Time (sec)	Engine RPM (Engine Speed)	Engine Torque (Nm [Ft Lbs])	Engine Throttle, % Full (%)	Speed, Vehicle Indicated (MPH [km/h])	IMU Yaw Rate (deg/sec)	Right Front Wheel Angular Speed (RPM)	Left Front Wheel Angular Speed (RPM)
-8.0	5,437	591.5 [436.3]	99	68 [110]	-4.944	893	900
-7.5	5,802	549.0 [404.9]	99	73 [117]	-4.704	951	960
-7.0	6,149	509.5 [375.8]	99	78 [125]	-5.856	1,008	1,018
-6.5	5,021	206.5 [152.3]	99	81 [130]	-4.944	1,056	1,067
-6.0	4,816	604.0 [445.5]	99	85 [136]	-3.576	1,106	1,111
-5.5	4,991	597.5 [440.7]	99	88 [141]	-5.592	1,147	1,157
-5.0	5,233	598.0 [441.1]	99	91 [147]	-4.176	1,184	1,210
-4.5	5,394	595.0 [438.8]	99	95 [153]	-4.920	1,231	1,259
-4.0	5,504	430.5 [317.5]	99	97 [156]	3.816	1,283	1,275
-3.5	5,516	20.5 [15.1]	37	98 [157]	10.152	1,290	1,275
-3.0	5,437	-36.5 [-26.9]	32	96 [154]	11.136	1,274	1,260
-2.5	5,333	-66.0 [-48.7]	29	94 [151]	16.032	1,252	1,231
-2.0	5,089	-90.5 [-66.7]	28	90 [145]	12.336	1,208	1,196
-1.5	4,689	-79.5 [-58.6]	28	84 [135]	29.784	1,005	1,140
-1.0	Data Not Available	-2.5 [-1.8]	27	Data Not Available	22.344	967	1,000
-0.5	Data Not Available	-2.5 [-1.8]	27	Data Not Available	31.272	926	797
0.0	Data Not Available	-3.5 [-2.6]	27	Data Not Available	48.096	916	787

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 4 of 7

Time (sec)	Right Rear Wheel Angular Speed (RPM)	Left Rear Wheel Angular Speed (RPM)	Steering Wheel Angle (deg)	Propulsion System Active	System Power Mode	Backup System Power Mode	SDM Power Mode
-8.0	858	860	-12	True	Propulsion	Propulsion	Propulsion
-7.5	918	916	-12	True	Propulsion	Propulsion	Propulsion
-7.0	973	972	-13	True	Propulsion	Propulsion	Propulsion
-6.5	1,014	1,014	-11	True	Propulsion	Propulsion	Propulsion
-6.0	1,059	1,057	-9	True	Propulsion	Propulsion	Propulsion
-5.5	1,101	1,100	-13	True	Propulsion	Propulsion	Propulsion
-5.0	1,144	1,150	-13	True	Propulsion	Propulsion	Propulsion
-4.5	1,181	1,195	-9	True	Propulsion	Propulsion	Propulsion
-4.0	1,218	1,213	8	True	Propulsion	Propulsion	Propulsion
-3.5	1,221	1,216	24	True	Propulsion	Propulsion	Propulsion
-3.0	1,202	1,193	24	True	Propulsion	Propulsion	Propulsion
-2.5	1,180	1,173	31	True	Propulsion	Propulsion	Propulsion
-2.0	1,129	1,122	46	True	Propulsion	Propulsion	Propulsion
-1.5	1,057	1,040	56	True	Propulsion	Propulsion	Propulsion
-1.0	590	902	42	True	Propulsion	Propulsion	Propulsion
-0.5	353	746	87	Data Not Available	Propulsion	Propulsion	Propulsion
0.0	48	734	84	Data Not Available	Propulsion	Propulsion	Propulsion

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 5 of 7

Time (sec)	Ignition Status	Ignition Prolongation Time (sec)	Secondary Collision Prolongation Timer (sec)	Antilock Brake System Failed	Brake Pedal Override Flag	Automatic Brake Status	Electronic Stability Control Status
-8.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.0	On	5.0	0.0	False	False	Not Active	Failed
-0.5	On	5.0	0.0	False	False	Not Active	Failed
0.0	On	5.0	0.0	False	False	Not Active	Failed

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 6 of 7

Time (sec)	Traction Control System Present	Traction Control System Failed	Traction Control System Enabled	Traction Control System Active	Traction Control System Switch Status	Left Turn Signal Switch Active	Right Turn Signal Switch Active
-8.0	True	False	True	Traction Control Off	Enabled	False	False
-7.5	True	False	True	Traction Control Off	Enabled	False	False
-7.0	True	False	True	Traction Control Off	Enabled	False	False
-6.5	True	False	True	Traction Control Off	Enabled	False	False
-6.0	True	False	True	Traction Control Off	Enabled	False	False
-5.5	True	False	True	Traction Control Off	Enabled	False	False
-5.0	True	False	True	Traction Control Off	Enabled	False	False
-4.5	True	False	True	Traction Control Off	Enabled	False	False
-4.0	True	False	True	Traction Control Off	Enabled	False	False
-3.5	True	False	True	Traction Control Off	Enabled	False	False
-3.0	True	False	True	Traction Control Off	Enabled	False	False
-2.5	True	False	True	Traction Control Off	Enabled	False	False
-2.0	True	False	True	Traction Control Off	Enabled	False	False
-1.5	True	False	True	Traction Control Off	Enabled	False	False
-1.0	True	True	True	Traction Control Active	Enabled	False	False
-0.5	True	True	False	Traction Control Off	Enabled	False	False
0.0	True	True	False	Traction Control Off	Enabled	False	False

Pre-Crash Data -8.0 to 0.0 sec (Record 2) - Table 7 of 7

Time (sec)	IMU Lateral Acceleration (g)	IMU Longitudinal Acceleration (g)	Red Brake Telltale On	Brake Boost Status - Eboost
-8.0	-0.002684	0.005246	False	Normal Boost
-7.5	-0.003172	0.005124	False	Normal Boost
-7.0	-0.004148	0.004758	False	Normal Boost
-6.5	-0.004392	0.002806	False	Normal Boost
-6.0	-0.003416	0.003416	False	Normal Boost
-5.5	-0.004636	0.003538	False	Normal Boost
-5.0	-0.004392	0.002928	False	Normal Boost
-4.5	-0.002928	0.003416	False	Normal Boost
-4.0	0.003782	0.001830	False	Normal Boost
-3.5	0.009028	-0.000976	False	Normal Boost
-3.0	0.011102	-0.001830	False	Normal Boost
-2.5	0.013542	-0.002318	False	Normal Boost
-2.0	0.008540	-0.002562	False	Normal Boost
-1.5	0.007808	-0.002318	False	Normal Boost
-1.0	0.015982	-0.017690	False	Normal Boost
-0.5	0.006344	-0.010858	False	Normal Boost
0.0	0.002440	-0.005368	False	Normal Boost

System Status at Event (Record 3)

Event Counter	3
Ignition Cycle Counter	143
Microcontroller Safing Timestamp (msec)	3
Frontal Air Bag Warning Indicator (SIR Warning Indicator Status at Enable)	Off
SIR Warning Indicator ON/OFF Time (sec)	68,190
Number of Ignition Cycles SIR Warning Indicator was ON/OFF Continuously	143
Ignition Cycles Since DTCs Were Last Cleared	143
Safety Belt Status, Right Front Passenger (Front Passenger Belt Switch Circuit Status)	Buckled
Safety Belt Status, Driver (Driver Belt Switch Circuit Status)	Buckled
Maximum Resultant Delta-V - Longitudinal Component for FSR Event (MPH [km/h])	Data Not Available
Maximum Resultant Delta-V - Lateral Component for FSR Event (MPH [km/h])	Data Not Available
Time From FSR Time Zero to Time of the Maximum Resultant SDM Recorded Vehicle Velocity Change (msec)	Data Not Available
Maximum Delta-V, Longitudinal (Maximum Longitudinal SDM Recorded Vehicle Velocity Change for FSR Event) (MPH [km/h])	0 [0]
Paired SDM Recorded Vehicle Lateral Velocity Change for Maximum Longitudinal Velocity Change (MPH [km/h])	0 [0]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change) (msec)	Data Not Available
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) (MPH [km/h])	0 [0]
Paired SDM Recorded Vehicle Longitudinal Velocity Change for Maximum Lateral Velocity Change (MPH [km/h])	0 [0]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change) (msec)	Data Not Available
Tire Pressure Low Indication On at Event	False
Ignition Operating Timer (msec)	153,115,621
UTC Time at Event	03:28:59
UTC Date at Event	2022/02/06
Frontal Algorithm Wakeup Time (msec)	1,050
Side Algorithm Wakeup Time (msec)	1,998
Rear Algorithm Wakeup Time (msec)	1,308
Rollover Algorithm Wakeup Time (msec)	0
Frontal Algorithm Reset Time (msec)	1,125
Side Algorithm Reset Time (msec)	2,030
Rear Algorithm Reset Time (msec)	1,408
Rollover Algorithm Reset Time (msec)	8,094
Occupant Position Classification, Right Front Passenger (Front Passenger Seat Restraint Control Occupancy Status)	Yes (Occupied Adult)
Commanded State of Suppression ON (PAB Off) Indicator	Off
Commanded State of Suppression OFF (PAB On) Indicator	On
Time to Frontal Impact Pretensioner PCN Request (msec)	2,020
Time to Frontal Impact Stage 1 PCN Request (msec)	2,020
Time to Frontal Impact Stage 2 PCN Request (msec)	2,020
Time to Left Side Impact PCN Request (msec)	Data Not Available
Time to Right Side Impact PCN Request (msec)	2,035
Time to Rear Impact PCN Request (msec)	Data Not Available
Time to Rollover Impact PCN Request (msec)	2,440
Time to Battery Disconnect Switch Side Severity (msec)	2,035
High Voltage Disable Notification Sent	True
Deployment Commanded in Energy Reserve Mode	False
Event Enable Time (T0) (msec)	153,115,621

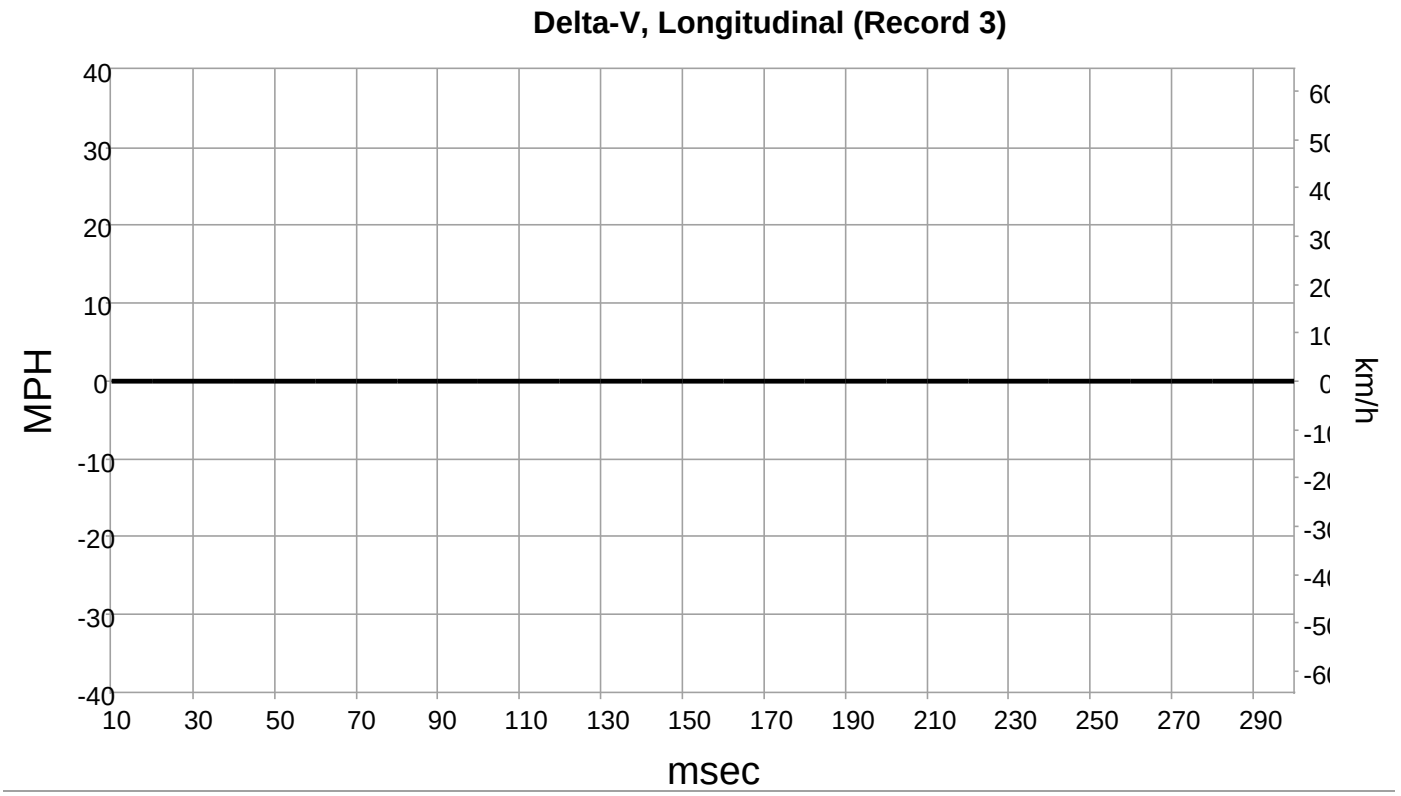
Event End Time (Tend) (msec)	153,123,715
Complete File Recorded (Event Recording Progress and Complete Flag)	Event Recording Complete

Diagnostic Trouble Codes 0.5 Seconds Prior to Time Zero (Record 3)

DTC 1	N/A, N/A
DTC 2	N/A, N/A
DTC 3	N/A, N/A
DTC 4	N/A, N/A
DTC 5	N/A, N/A
DTC 6	N/A, N/A
DTC 7	N/A, N/A
DTC 8	N/A, N/A
DTC 9	N/A, N/A

Deployment Command Data (Record 3)

Driver 1st Stage Deployment Loop Commanded (msec)	Data Not Available
Passenger 1st Stage Deployment Loop Commanded (msec)	Data Not Available
Driver 2nd Stage Deployment Loop Commanded (msec)	Data Not Available
Passenger 2nd Stage Deployment Loop Commanded (msec)	Data Not Available
Driver Pretensioner Deployment Loop #1 Commanded (msec)	Data Not Available
Passenger Pretensioner Deployment Loop #1 Commanded (msec)	Data Not Available
Driver Pretensioner Deployment Loop #2 Commanded (msec)	Data Not Available
Passenger Pretensioner Deployment Loop #2 Commanded (msec)	Data Not Available
Driver Thorax Loop Commanded (msec)	Data Not Available
Passenger Thorax Loop Commanded Passenger (msec)	Data Not Available

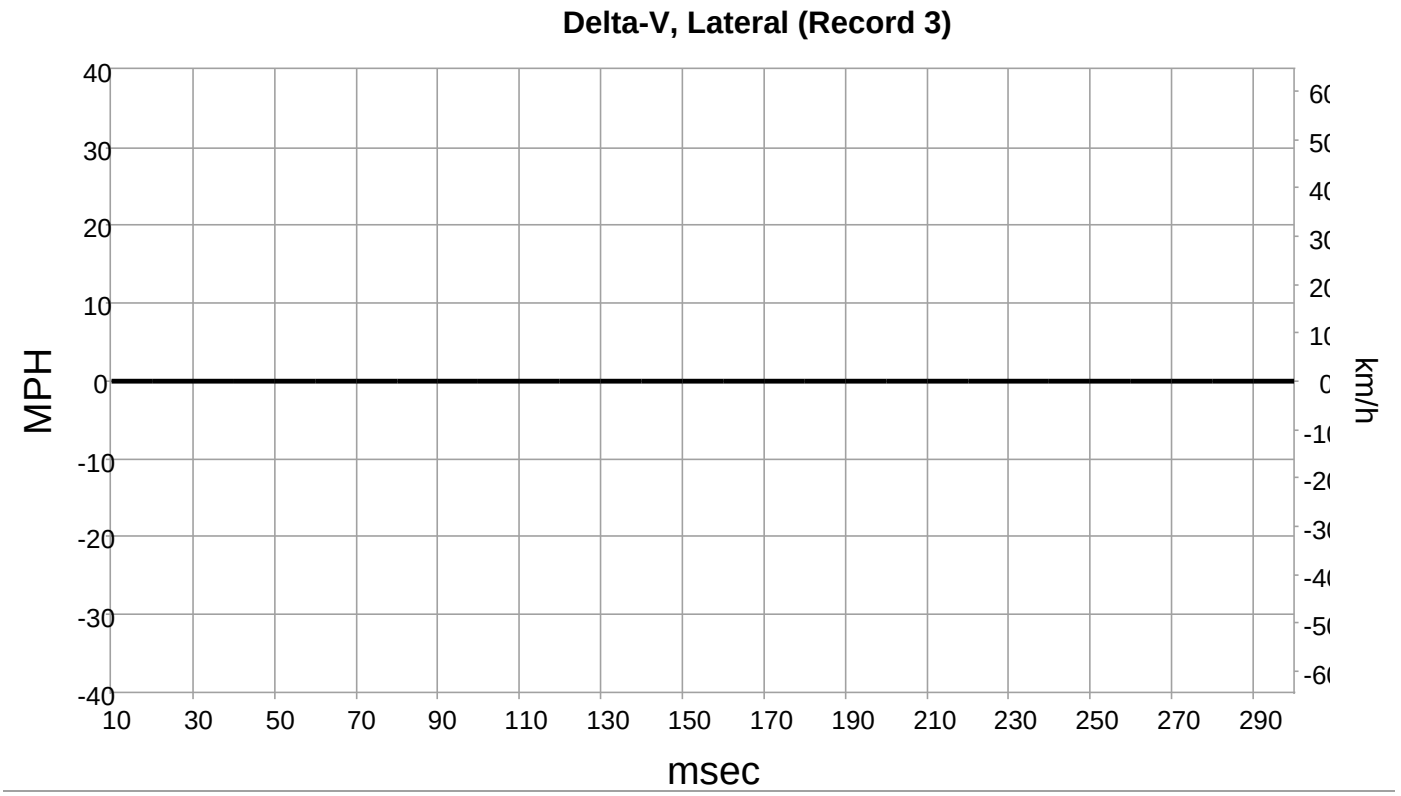

Delta-V, Longitudinal (Record 3)
MPH
km/h
msec
40
30
20
10
0
-10
-20
-30
-40
10
30
50
70
90
110
130
150
170
190
210
230
250
270
290

Longitudinal Delta-V (Record 3)

Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH [km/h])
10	0 [0]
20	0 [0]
30	0 [0]
40	0 [0]
50	0 [0]
60	0 [0]
70	0 [0]
80	0 [0]
90	0 [0]
100	0 [0]
110	0 [0]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]
260	0 [0]
270	0 [0]
280	0 [0]
290	0 [0]
300	0 [0]

Acceleration, Longitudinal (Record 3)

Contains No Recorded Data


Delta-V, Lateral (Record 3)
MPH
km/h
msec
40
30
20
10
0
-10
-20
-30
-40
10
30
50
70
90
110
130
150
170
190
210
230
250
270
290

Lateral Delta-V (Record 3)

Time (msec)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (MPH [km/h])
10	0 [0]
20	0 [0]
30	0 [0]
40	0 [0]
50	0 [0]
60	0 [0]
70	0 [0]
80	0 [0]
90	0 [0]
100	0 [0]
110	0 [0]
120	0 [0]
130	0 [0]
140	0 [0]
150	0 [0]
160	0 [0]
170	0 [0]
180	0 [0]
190	0 [0]
200	0 [0]
210	0 [0]
220	0 [0]
230	0 [0]
240	0 [0]
250	0 [0]
260	0 [0]
270	0 [0]
280	0 [0]
290	0 [0]
300	0 [0]

Acceleration, Lateral (Record 3)

Contains No Recorded Data

Left Front Sensor #1 Recorded Acceleration (Record 3)

Contains No Recorded Data

Right Front Sensor #2 Recorded Acceleration (Record 3)

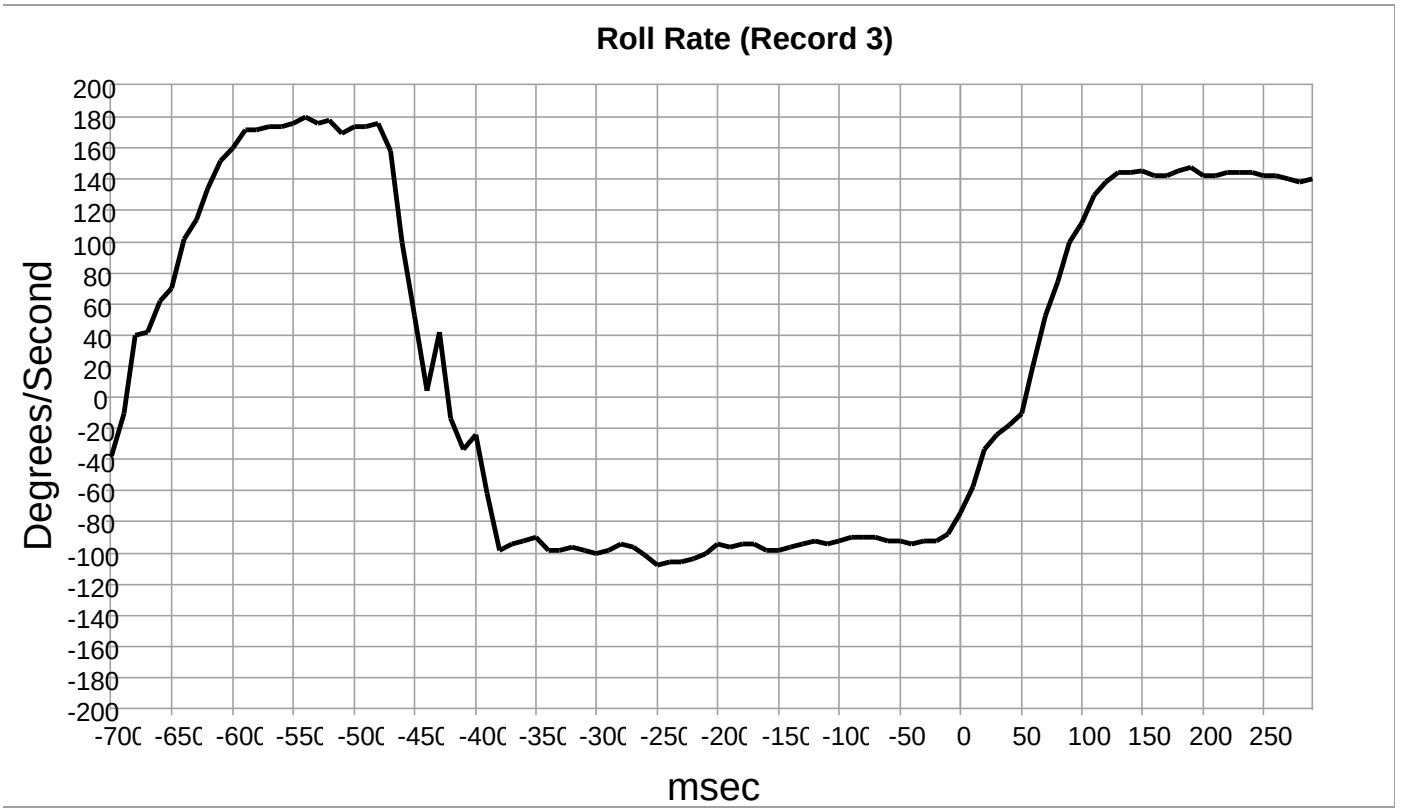
Contains No Recorded Data

Left Front Door Sensor #1 Recorded Pressure (Record 3)

Contains No Recorded Data

Right Front Door Sensor #2 Recorded Pressure (Record 3)

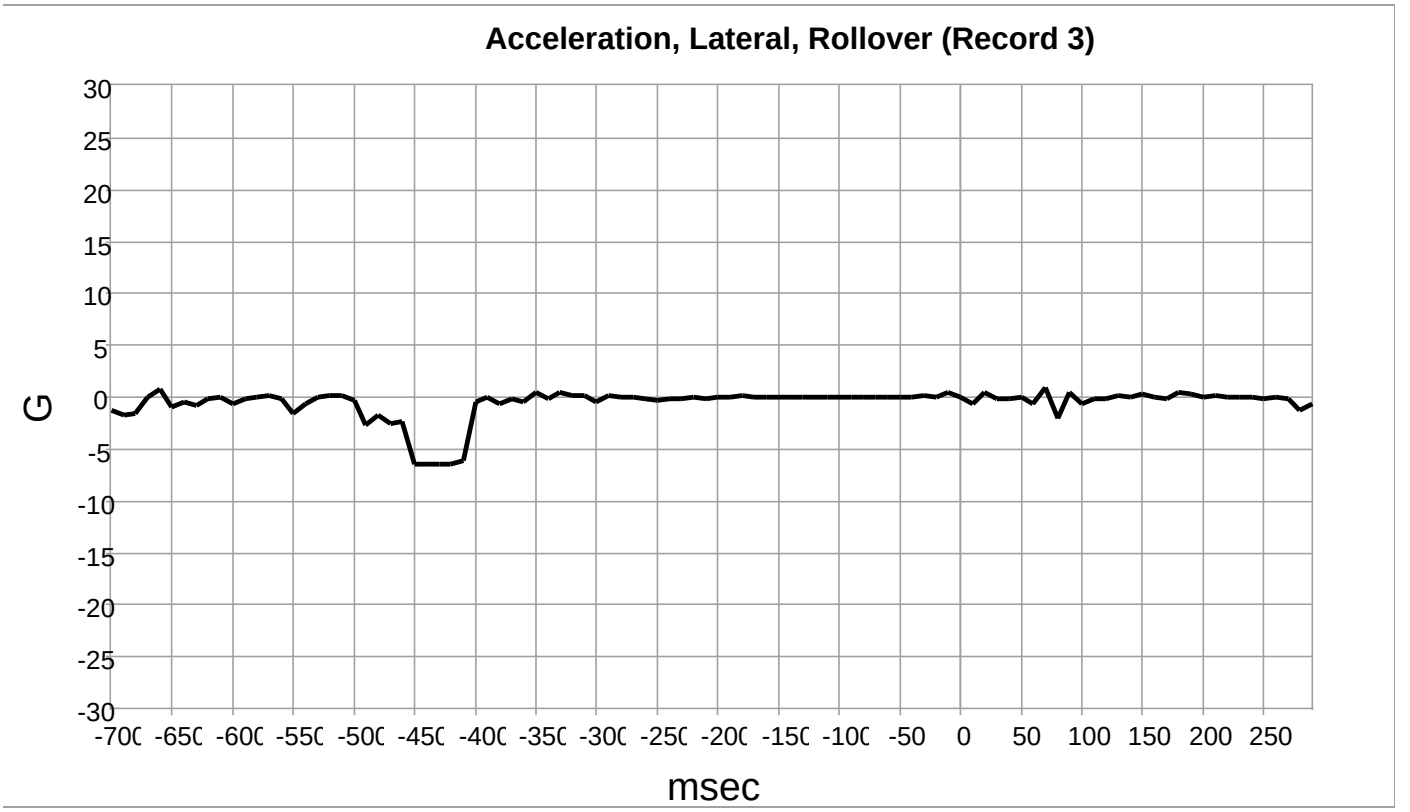
Contains No Recorded Data


Roll Rate (Record 3)
Degrees/Second
200
180
160
140
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-70C -65C -60C -55C -50C -45C -40C -35C -30C -25C -20C -15C -10C -50 0 50 100 150 200 250
msec

Rollover Crash Pulse (Record 3)

Time (msec)	SDM Recorded Vehicle Roll Rate (deg/sec)
-700	-38
-690	-10
-680	40
-670	42
-660	62
-650	70
-640	102
-630	114
-620	134
-610	152
-600	160
-590	172
-580	172
-570	174
-560	174
-550	176
-540	180
-530	176
-520	178
-510	170
-500	174
-490	174
-480	176
-470	158
-460	100
-450	52
-440	4
-430	42
-420	-14
-410	-34
-400	-24
-390	-62
-380	-98
-370	-94
-360	-92
-350	-90
-340	-98
-330	-98
-320	-96
-310	-98
-300	-100
-290	-98
-280	-94
-270	-96
-260	-102
-250	-108
-240	-106
-230	-106
-220	-104
-210	-100
-200	-94
-190	-96
-180	-94
-170	-94
-160	-98
-150	-98
-140	-96

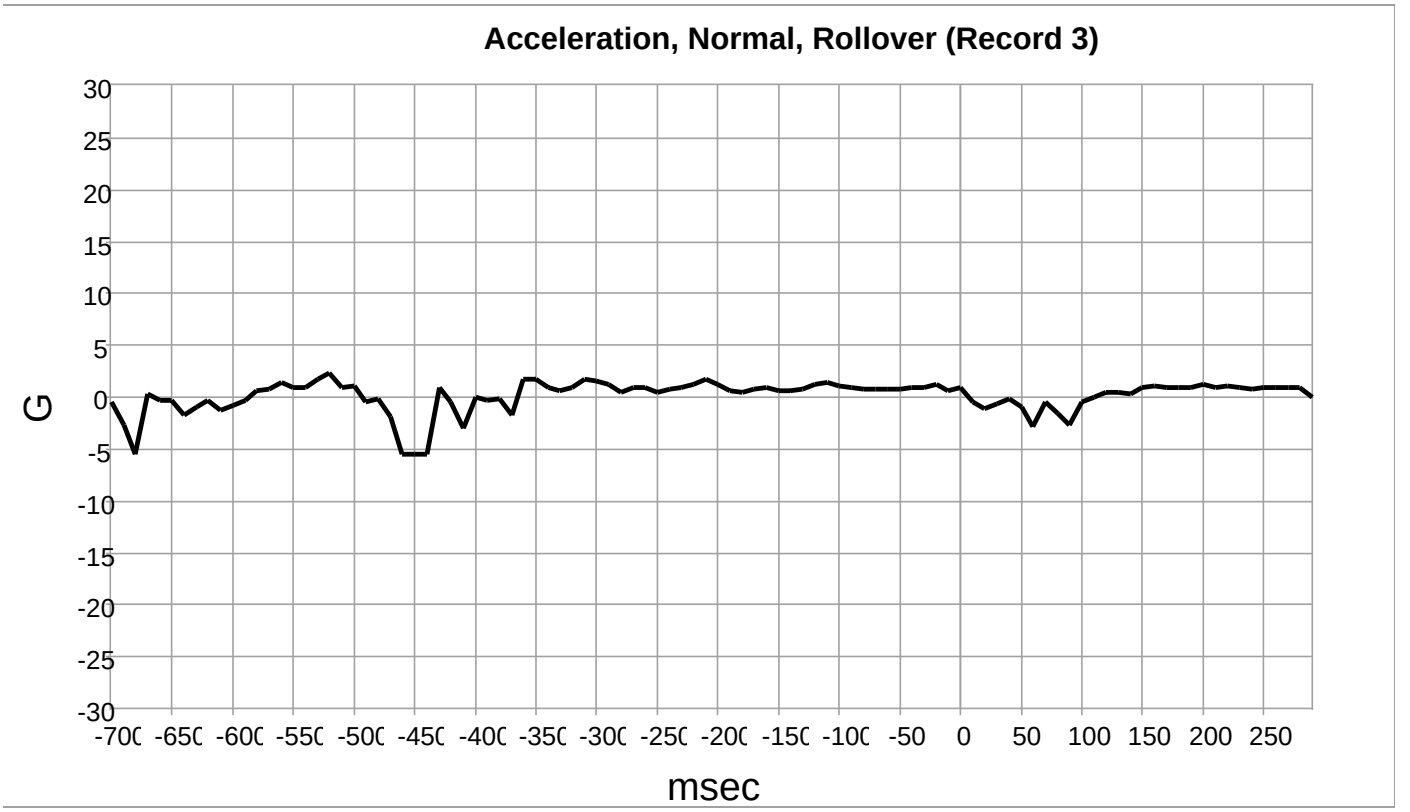
Time (msec)	SDM Recorded Vehicle Roll Rate (deg/sec)
-130	-94
-120	-92
-110	-94
-100	-92
-90	-90
-80	-90
-70	-90
-60	-92
-50	-92
-40	-94
-30	-92
-20	-92
-10	-88
0	-74
10	-58
20	-34
30	-24
40	-18
50	-10
60	20
70	52
80	74
90	100
100	112
110	130
120	138
130	144
140	144
150	146
160	142
170	142
180	146
190	148
200	142
210	142
220	144
230	144
240	144
250	142
260	142
270	140
280	138
290	140


Acceleration, Lateral, Rollover (Record 3)
G
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-70C -65C -60C -55C -50C -45C -40C -35C -30C -25C -20C -15C -10C -50 0 50 100 150 200 250
msec

Acceleration, Lateral, Rollover (Record 3)

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for Rollover Event) (g)
-700	-1.30
-690	-1.80
-680	-1.60
-670	0.00
-660	0.80
-650	-1.00
-640	-0.40
-630	-0.80
-620	-0.10
-610	0.00
-600	-0.60
-590	-0.20
-580	0.00
-570	0.20
-560	-0.20
-550	-1.60
-540	-0.70
-530	0.00
-520	0.10
-510	0.10
-500	-0.30
-490	-2.70
-480	-1.80
-470	-2.50
-460	-2.30
-450	-6.50
-440	-6.50
-430	-6.50
-420	-6.50
-410	-6.10
-400	-0.50
-390	0.00
-380	-0.60
-370	-0.20
-360	-0.40
-350	0.50
-340	-0.20
-330	0.40
-320	0.10
-310	0.10
-300	-0.40
-290	0.10
-280	0.00
-270	0.00
-260	-0.20
-250	-0.30
-240	-0.10
-230	-0.20
-220	0.00
-210	-0.10
-200	0.00
-190	0.00
-180	0.10
-170	0.00
-160	0.00
-150	0.00
-140	0.00

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for Rollover Event) (g)
-130	0.00
-120	0.00
-110	0.00
-100	0.00
-90	0.00
-80	0.00
-70	0.00
-60	0.00
-50	0.00
-40	0.00
-30	0.10
-20	0.00
-10	0.40
0	0.00
10	-0.60
20	0.50
30	-0.20
40	-0.20
50	0.00
60	-0.70
70	0.90
80	-2.00
90	0.50
100	-0.60
110	-0.10
120	-0.20
130	0.20
140	0.00
150	0.30
160	0.00
170	-0.20
180	0.50
190	0.30
200	0.00
210	0.10
220	0.00
230	0.00
240	0.00
250	-0.10
260	0.00
270	-0.10
280	-1.20
290	-0.60


Acceleration, Normal, Rollover (Record 3)
G
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-70C -65C -60C -55C -50C -45C -40C -35C -30C -25C -20C -15C -10C -50 0 50 100 150 200 250
msec

Acceleration, Normal, Rollover (Record 3)

Time (msec)	Normal Acceleration (SDM Recorded Vehicle Vertical Acceleration for Rollover Event (g)
-700	-0.50
-690	-2.60
-680	-5.50
-670	0.30
-660	-0.30
-650	-0.30
-640	-1.80
-630	-1.00
-620	-0.30
-610	-1.20
-600	-0.80
-590	-0.30
-580	0.60
-570	0.80
-560	1.40
-550	1.00
-540	1.00
-530	1.80
-520	2.30
-510	0.90
-500	1.10
-490	-0.40
-480	-0.20
-470	-1.90
-460	-5.50
-450	-5.50
-440	-5.50
-430	1.00
-420	-0.40
-410	-3.00
-400	0.00
-390	-0.30
-380	-0.20
-370	-1.80
-360	1.70
-350	1.80
-340	1.00
-330	0.70
-320	1.00
-310	1.70
-300	1.60
-290	1.30
-280	0.50
-270	0.90
-260	0.90
-250	0.50
-240	0.80
-230	1.00
-220	1.30
-210	1.70
-200	1.30
-190	0.70
-180	0.50
-170	0.80
-160	0.90
-150	0.70
-140	0.60

Time (msec)	Normal Acceleration (SDM Recorded Vehicle Vertical Acceleration for Rollover Event (g)
-130	0.80
-120	1.20
-110	1.40
-100	1.10
-90	0.90
-80	0.80
-70	0.80
-60	0.80
-50	0.80
-40	0.90
-30	1.00
-20	1.20
-10	0.70
0	1.00
10	-0.40
20	-1.10
30	-0.70
40	-0.20
50	-1.00
60	-2.80
70	-0.40
80	-1.60
90	-2.60
100	-0.50
110	0.00
120	0.40
130	0.50
140	0.30
150	0.90
160	1.10
170	0.90
180	0.90
190	0.90
200	1.20
210	1.00
220	1.10
230	1.00
240	0.80
250	0.90
260	0.90
270	1.00
280	0.90
290	0.00

Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 1 of 7

Time (sec)	Accelerator Pedal, % Full (%)	ABS Activity	Brake Pedal Position (%)	Driver Applied Brake Pedal Pressure (kPa)	Driver Applied Brake Pedal Pressure Detected	Service Brake, On/Off (Brake Pedal Initial Travel Achieved)	Cruise and Speed Limiter Switch Status
-8.0	99	Off	0	0	False	Off (False)	No Activation
-7.5	99	Off	0	0	False	Off (False)	No Activation
-7.0	99	Off	0	0	False	Off (False)	No Activation
-6.5	99	Off	0	0	False	Off (False)	No Activation
-6.0	99	Off	0	0	False	Off (False)	No Activation
-5.5	99	Off	0	0	False	Off (False)	No Activation
-5.0	99	Off	0	0	False	Off (False)	No Activation
-4.5	99	Off	0	0	False	Off (False)	No Activation
-4.0	99	Off	0	0	False	Off (False)	No Activation
-3.5	99	Off	0	0	False	Off (False)	No Activation
-3.0	99	Off	0	0	False	Off (False)	No Activation
-2.5	99	Off	0	0	False	Off (False)	No Activation
-2.0	60	Off	0	0	False	Off (False)	No Activation
-1.5	0	Off	0	0	False	Off (False)	No Activation
-1.0	0	Off	0	0	False	Off (False)	No Activation
-0.5	0	Off	0	0	False	Off (False)	No Activation
0.0	0	Off	0	0	False	Off (False)	No Activation

Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 2 of 7

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-8.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-7.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-7.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-6.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-6.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-5.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-5.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-4.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Third	Forward Range A	Off
-4.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-3.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-3.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-2.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-2.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-1.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off

Time (sec)	Cruise Secondary Switch Status	Conventional Cruise Control Active	Adaptive Cruise Control Selected Mode	Adaptive Cruise Control Active	Transmission Estimated Gear	Transmission Shift Lever Position	Reduced Engine Power Mode Indicator On
-1.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
-0.5	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off
0.0	No Activation	Inactive	Cruise Control Mode Switching Not Supported	Inactive	Fourth	Forward Range A	Off

Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 3 of 7

Time (sec)	Engine RPM (Engine Speed)	Engine Torque (Nm [Ft Lbs])	Engine Throttle, % Full (%)	Speed, Vehicle Indicated (MPH [km/h])	IMU Yaw Rate (deg/sec)	Right Front Wheel Angular Speed (RPM)	Left Front Wheel Angular Speed (RPM)
-8.0	3,938	579.0 [427.0]	73	48 [78]	-2.880	636	641
-7.5	4,320	600.0 [442.5]	99	53 [86]	-4.944	701	707
-7.0	4,679	599.0 [441.8]	99	58 [94]	-3.336	767	770
-6.5	5,062	596.5 [440.0]	99	63 [102]	-3.840	830	836
-6.0	5,437	591.5 [436.3]	99	68 [110]	-4.944	893	900
-5.5	5,802	549.0 [404.9]	99	73 [117]	-4.704	951	960
-5.0	6,149	509.5 [375.8]	99	78 [125]	-5.856	1,008	1,018
-4.5	5,021	206.5 [152.3]	99	81 [130]	-4.944	1,056	1,067
-4.0	4,816	604.0 [445.5]	99	85 [136]	-3.576	1,106	1,111
-3.5	4,991	597.5 [440.7]	99	88 [141]	-5.592	1,147	1,157
-3.0	5,233	598.0 [441.1]	99	91 [147]	-4.176	1,184	1,210
-2.5	5,394	595.0 [438.8]	99	95 [153]	-4.920	1,231	1,259
-2.0	5,504	430.5 [317.5]	99	97 [156]	3.816	1,283	1,275
-1.5	5,516	20.5 [15.1]	37	98 [157]	10.152	1,290	1,275
-1.0	5,437	-36.5 [-26.9]	32	96 [154]	11.136	1,274	1,260
-0.5	5,333	-66.0 [-48.7]	29	94 [151]	16.032	1,252	1,231
0.0	5,282	-77.0 [-56.8]	29	94 [151]	16.200	1,264	1,222

Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 4 of 7

Time (sec)	Right Rear Wheel Angular Speed (RPM)	Left Rear Wheel Angular Speed (RPM)	Steering Wheel Angle (deg)	Propulsion System Active	System Power Mode	Backup System Power Mode	SDM Power Mode
-8.0	613	612	-8	True	Propulsion	Propulsion	Propulsion
-7.5	674	676	-16	True	Propulsion	Propulsion	Propulsion
-7.0	737	737	-9	True	Propulsion	Propulsion	Propulsion
-6.5	799	799	-10	True	Propulsion	Propulsion	Propulsion
-6.0	858	860	-12	True	Propulsion	Propulsion	Propulsion
-5.5	918	916	-12	True	Propulsion	Propulsion	Propulsion
-5.0	973	972	-13	True	Propulsion	Propulsion	Propulsion
-4.5	1,014	1,014	-11	True	Propulsion	Propulsion	Propulsion
-4.0	1,059	1,057	-9	True	Propulsion	Propulsion	Propulsion
-3.5	1,101	1,100	-13	True	Propulsion	Propulsion	Propulsion
-3.0	1,144	1,150	-13	True	Propulsion	Propulsion	Propulsion
-2.5	1,181	1,195	-9	True	Propulsion	Propulsion	Propulsion
-2.0	1,218	1,213	8	True	Propulsion	Propulsion	Propulsion
-1.5	1,221	1,216	24	True	Propulsion	Propulsion	Propulsion
-1.0	1,202	1,193	24	True	Propulsion	Propulsion	Propulsion
-0.5	1,180	1,173	31	True	Propulsion	Propulsion	Propulsion
0.0	1,171	1,160	30	True	Propulsion	Propulsion	Propulsion

Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 5 of 7

Time (sec)	Ignition Status	Ignition Prolongation Time (sec)	Secondary Collision Prolongation Timer (sec)	Antilock Brake System Failed	Brake Pedal Override Flag	Automatic Brake Status	Electronic Stability Control Status
-8.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-7.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-6.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-5.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-4.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-3.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-2.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.5	On	5.0	0.0	False	False	Not Active	Normal Operation
-1.0	On	5.0	0.0	False	False	Not Active	Normal Operation
-0.5	On	5.0	0.0	False	False	Not Active	Normal Operation
0.0	On	5.0	0.0	False	False	Not Active	Normal Operation

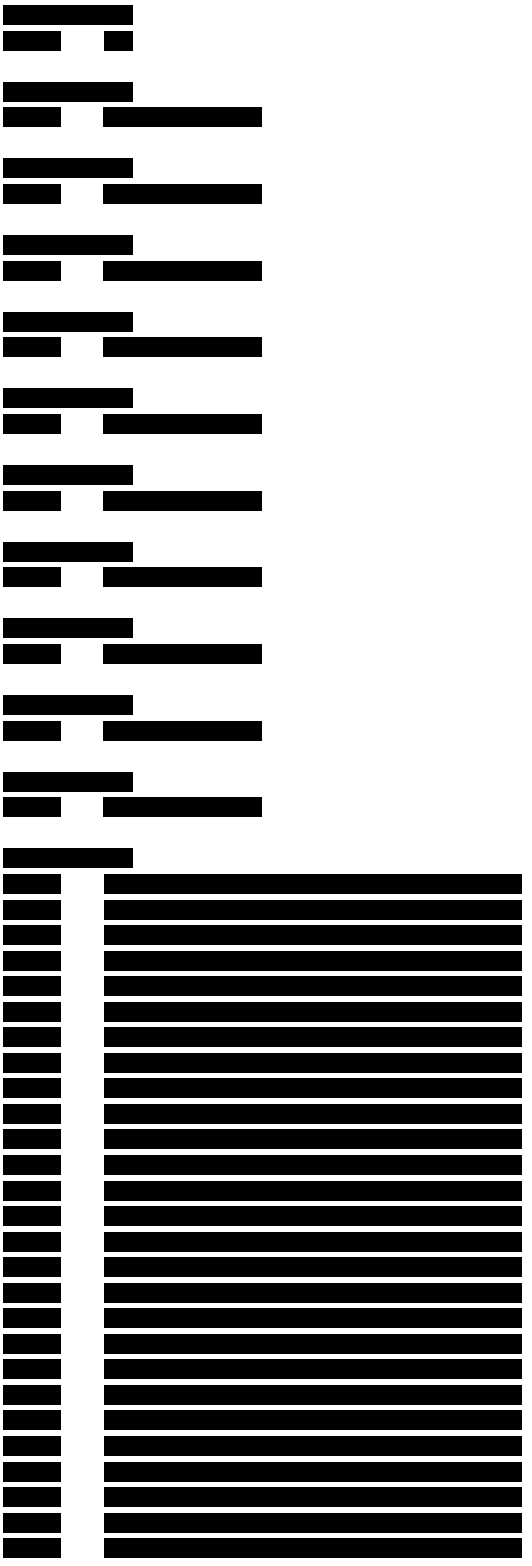
Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 6 of 7

Time (sec)	Traction Control System Present	Traction Control System Failed	Traction Control System Enabled	Traction Control System Active	Traction Control System Switch Status	Left Turn Signal Switch Active	Right Turn Signal Switch Active
-8.0	True	False	True	Traction Control Off	Enabled	False	False
-7.5	True	False	True	Traction Control Off	Enabled	False	False
-7.0	True	False	True	Traction Control Off	Enabled	False	False
-6.5	True	False	True	Traction Control Off	Enabled	False	False
-6.0	True	False	True	Traction Control Off	Enabled	False	False
-5.5	True	False	True	Traction Control Off	Enabled	False	False
-5.0	True	False	True	Traction Control Off	Enabled	False	False
-4.5	True	False	True	Traction Control Off	Enabled	False	False
-4.0	True	False	True	Traction Control Off	Enabled	False	False
-3.5	True	False	True	Traction Control Off	Enabled	False	False
-3.0	True	False	True	Traction Control Off	Enabled	False	False
-2.5	True	False	True	Traction Control Off	Enabled	False	False
-2.0	True	False	True	Traction Control Off	Enabled	False	False
-1.5	True	False	True	Traction Control Off	Enabled	False	False
-1.0	True	False	True	Traction Control Off	Enabled	False	False
-0.5	True	False	True	Traction Control Off	Enabled	False	False
0.0	True	False	True	Traction Control Off	Enabled	False	False

Pre-Crash Data -8.0 to 0.0 sec (Record 3) - Table 7 of 7

Time (sec)	IMU Lateral Acceleration (g)	IMU Longitudinal Acceleration (g)	Red Brake Telltale On	Brake Boost Status - Eboost
-8.0	-0.000976	0.005490	False	Normal Boost
-7.5	-0.002318	0.005734	False	Normal Boost
-7.0	-0.001220	0.005612	False	Normal Boost
-6.5	-0.001952	0.005490	False	Normal Boost
-6.0	-0.002684	0.005246	False	Normal Boost
-5.5	-0.003172	0.005124	False	Normal Boost
-5.0	-0.004148	0.004758	False	Normal Boost
-4.5	-0.004392	0.002806	False	Normal Boost
-4.0	-0.003416	0.003416	False	Normal Boost
-3.5	-0.004636	0.003538	False	Normal Boost
-3.0	-0.004392	0.002928	False	Normal Boost
-2.5	-0.002928	0.003416	False	Normal Boost
-2.0	0.003782	0.001830	False	Normal Boost
-1.5	0.009028	-0.000976	False	Normal Boost
-1.0	0.011102	-0.001830	False	Normal Boost
-0.5	0.013542	-0.002318	False	Normal Boost
0.0	0.014640	-0.003782	False	Normal Boost

Hexadecimal Data



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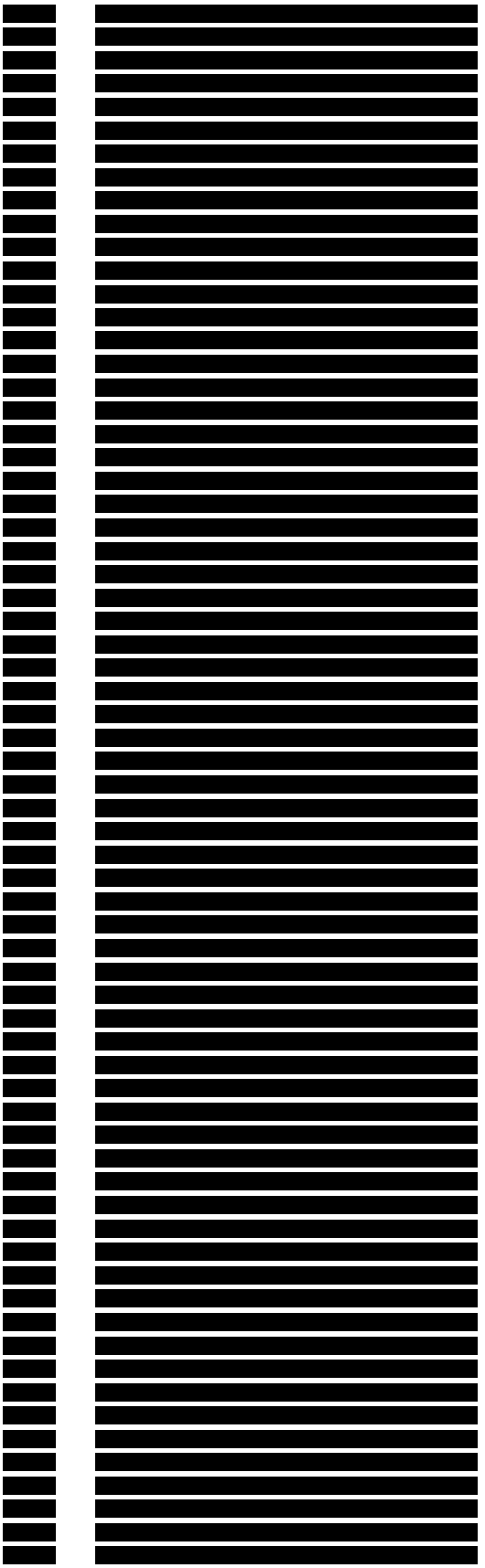

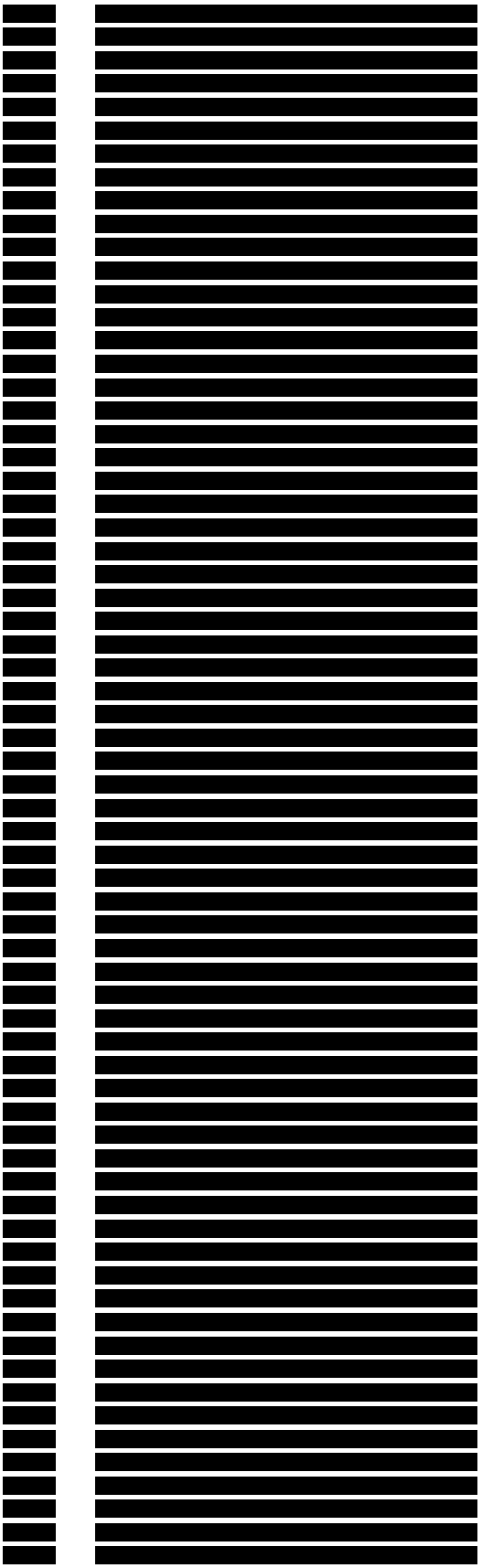

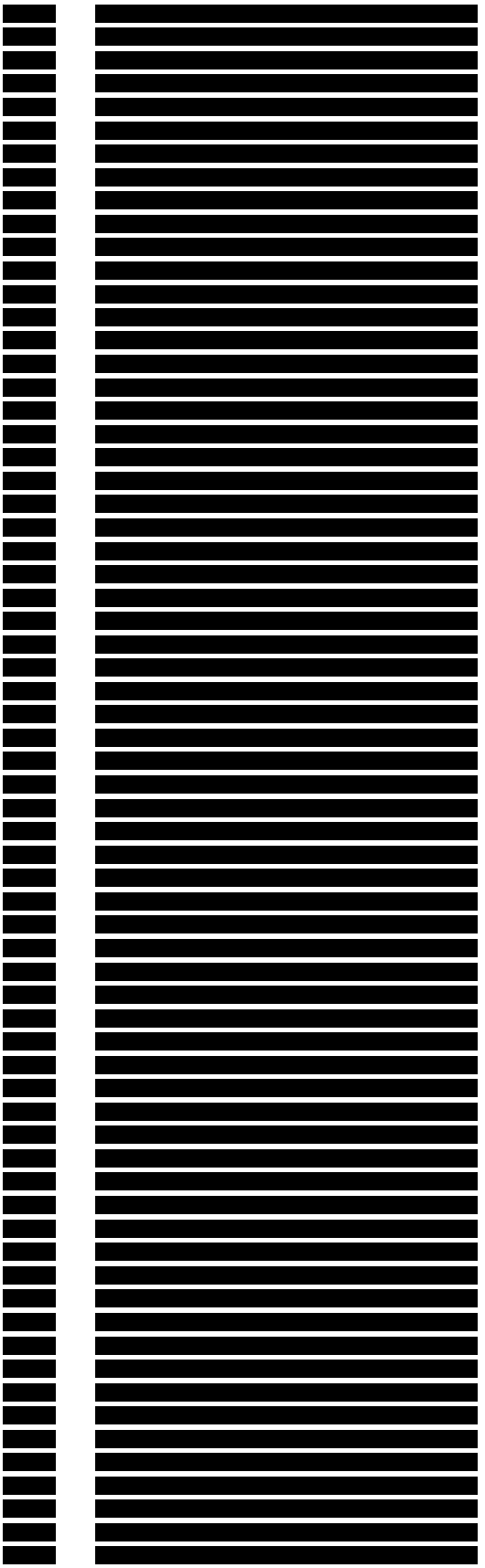

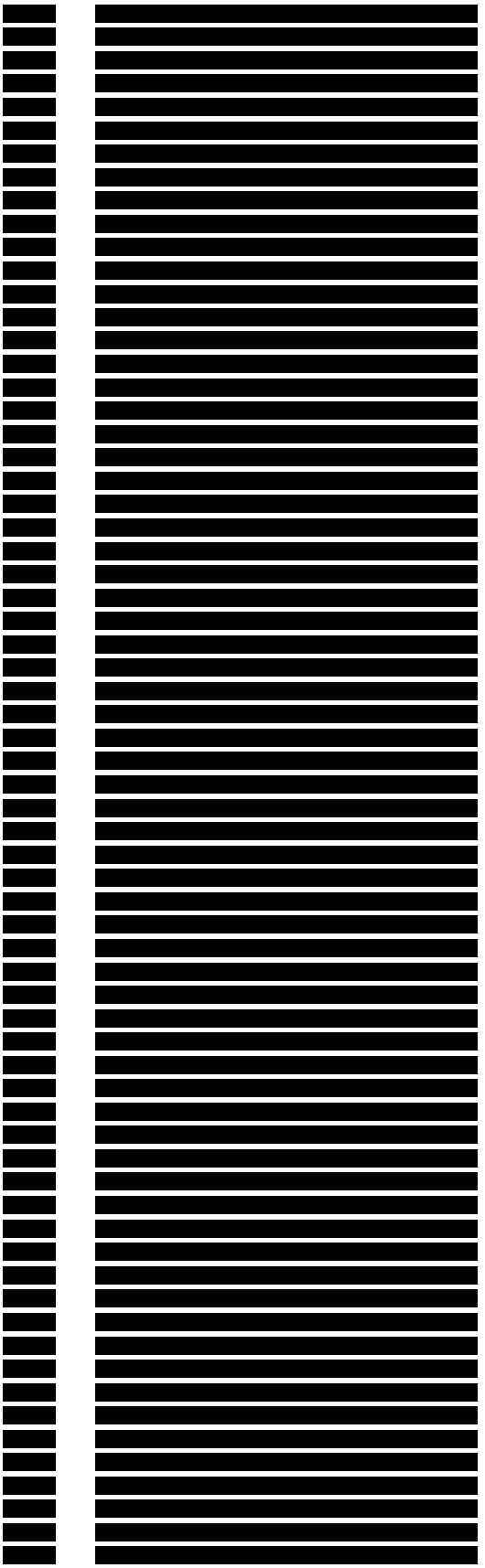

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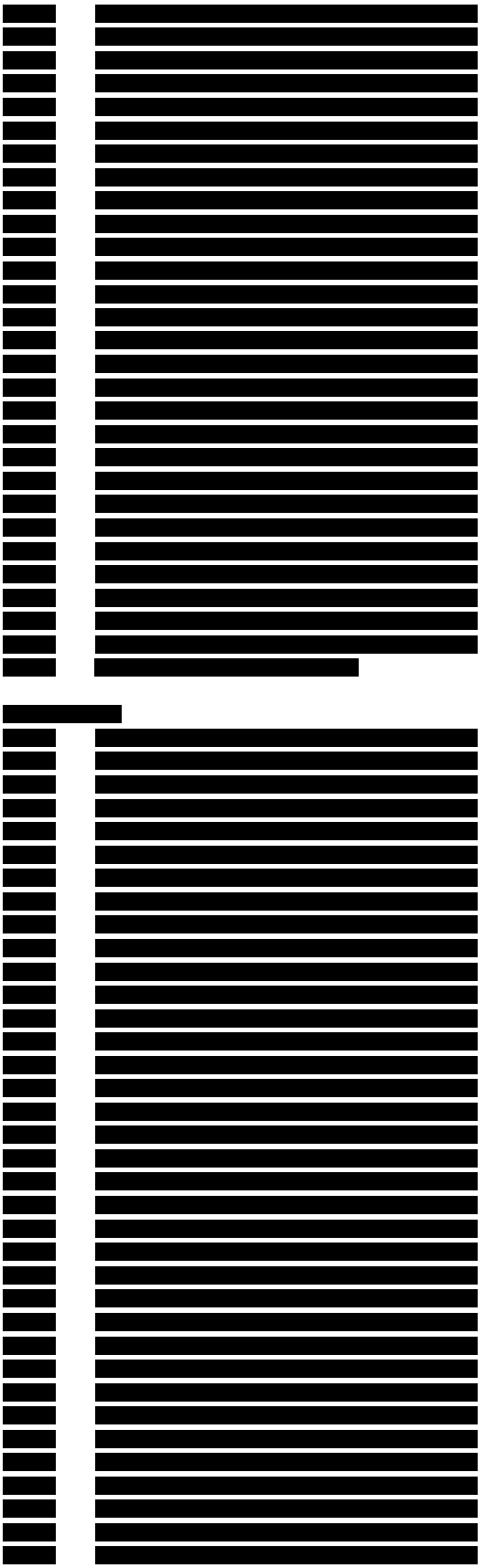

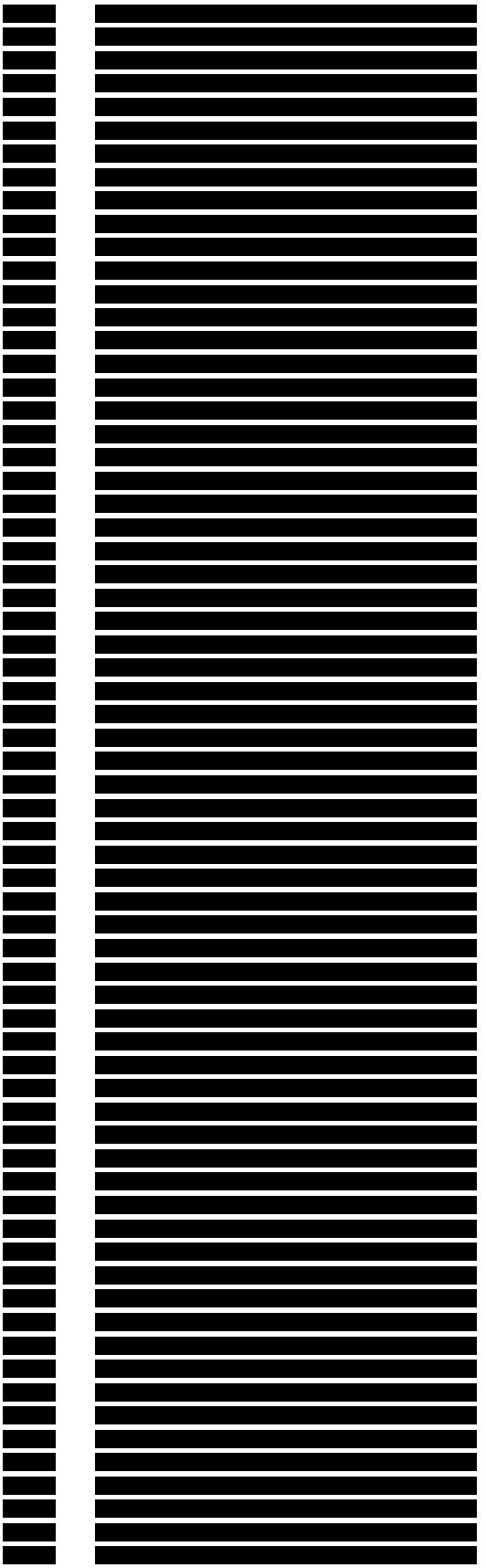

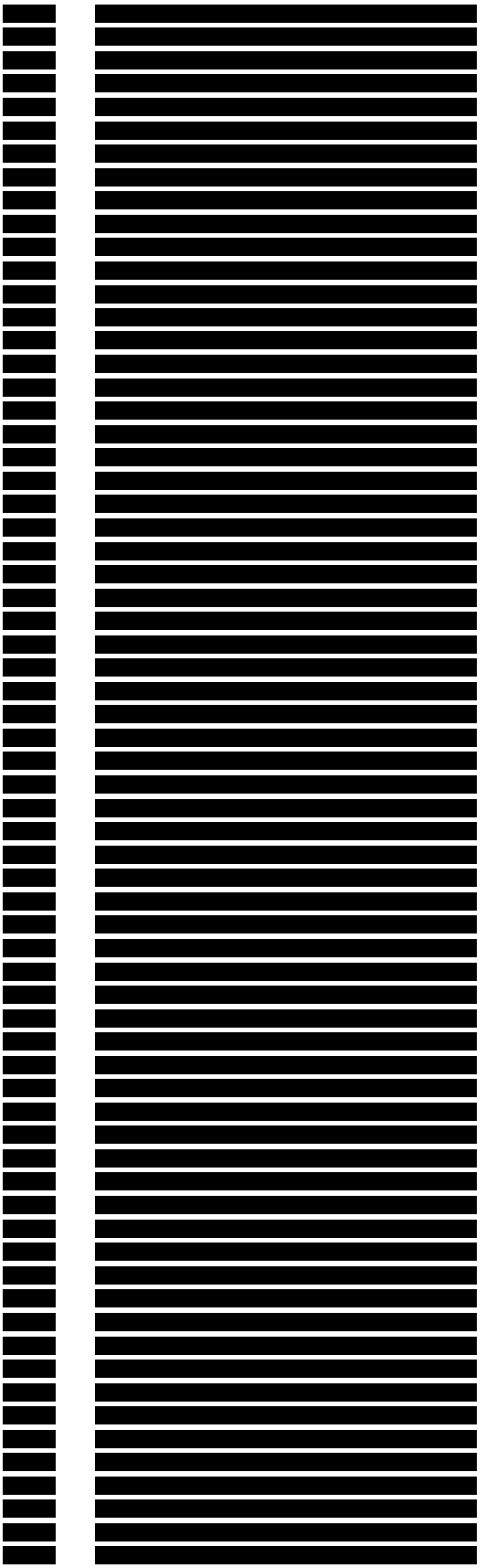

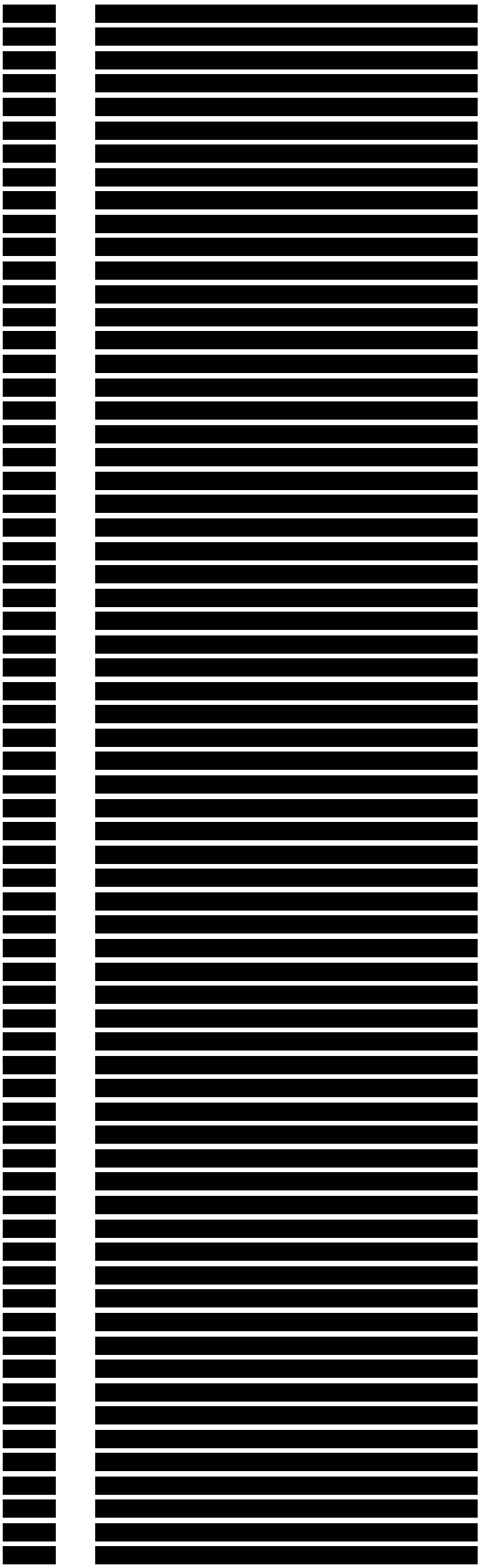

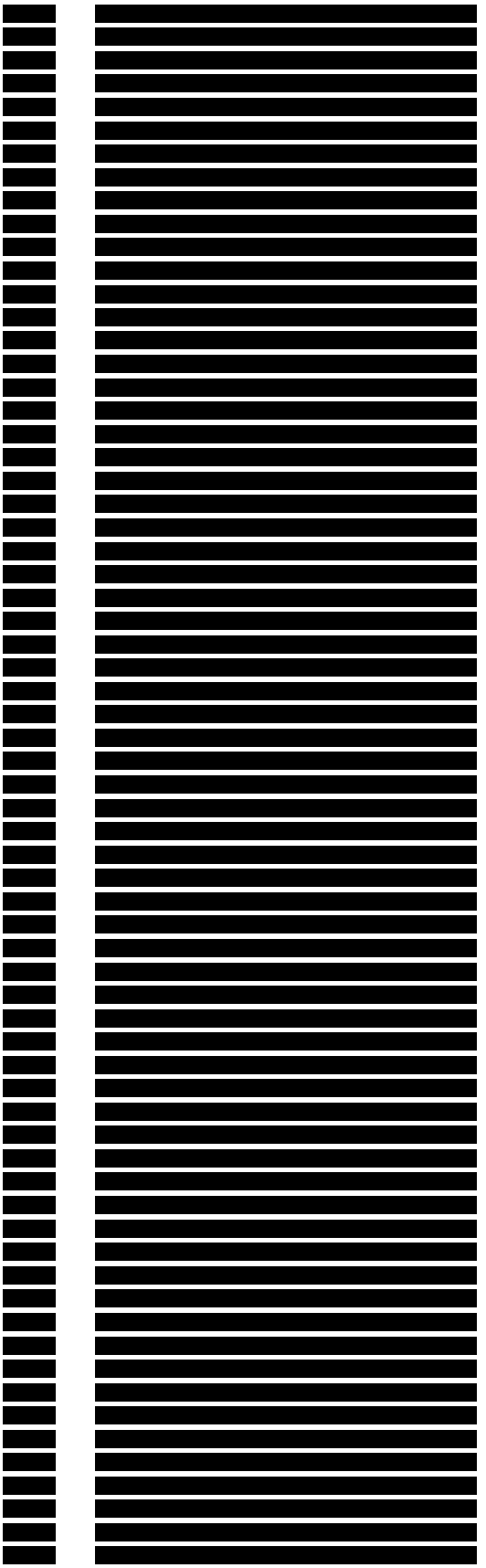

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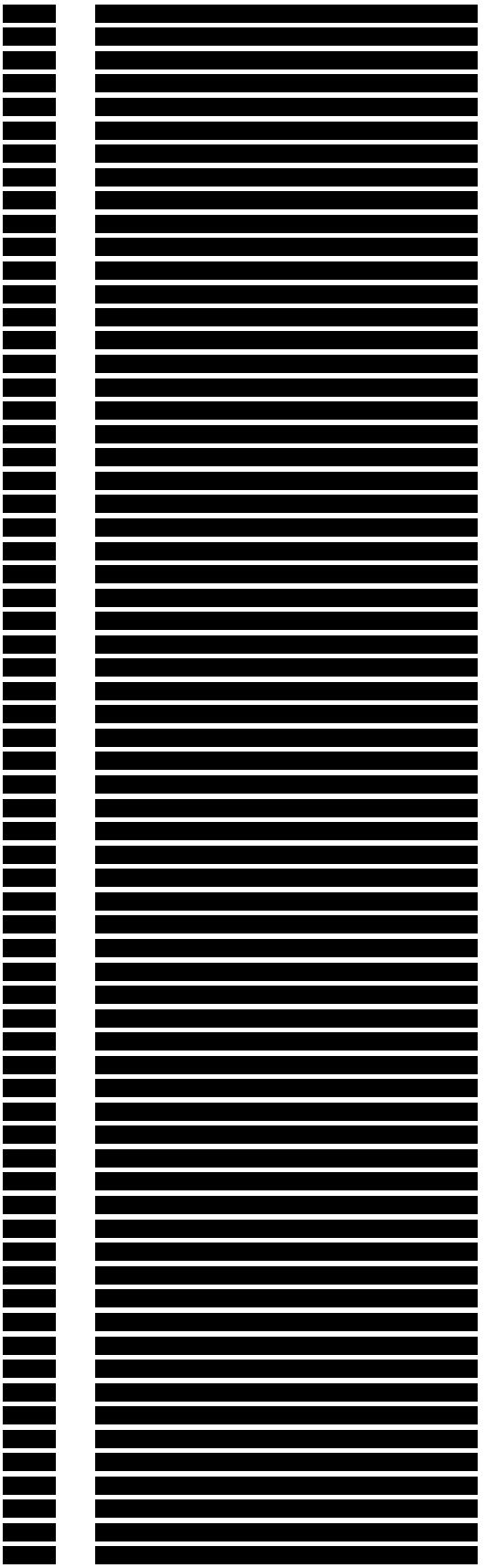

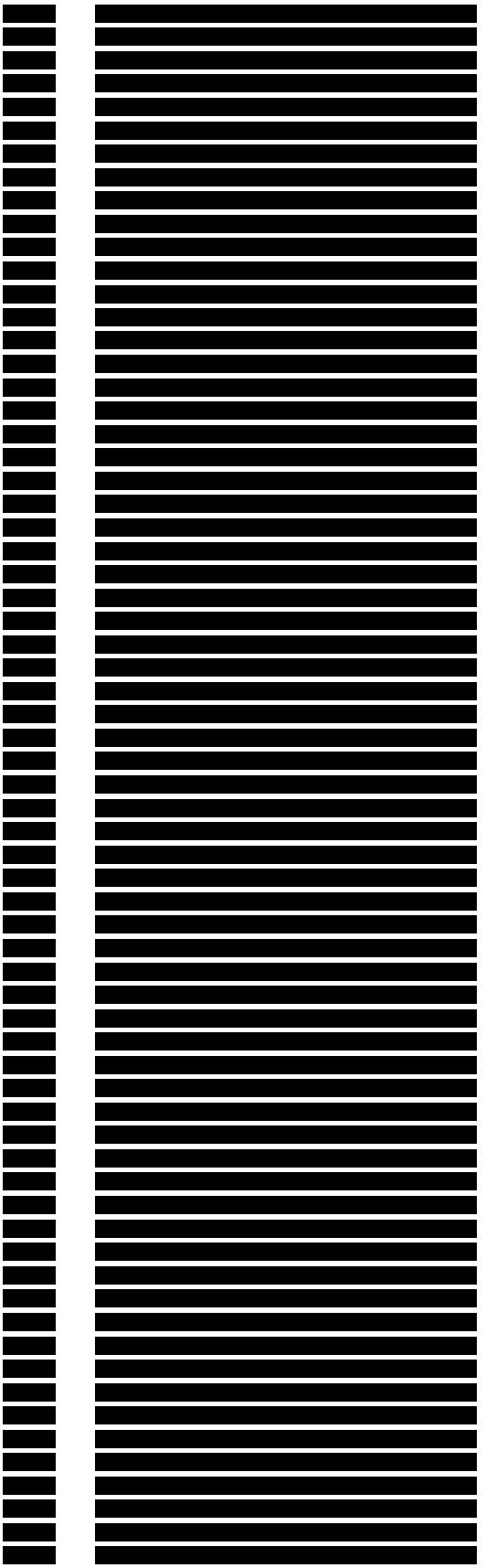

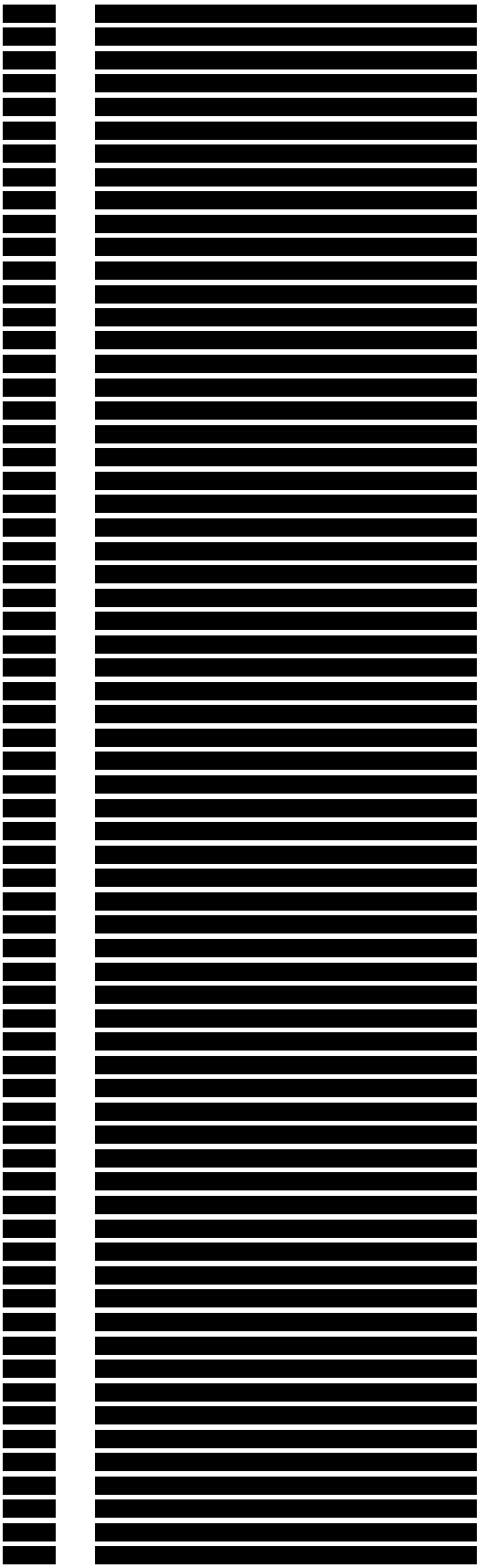

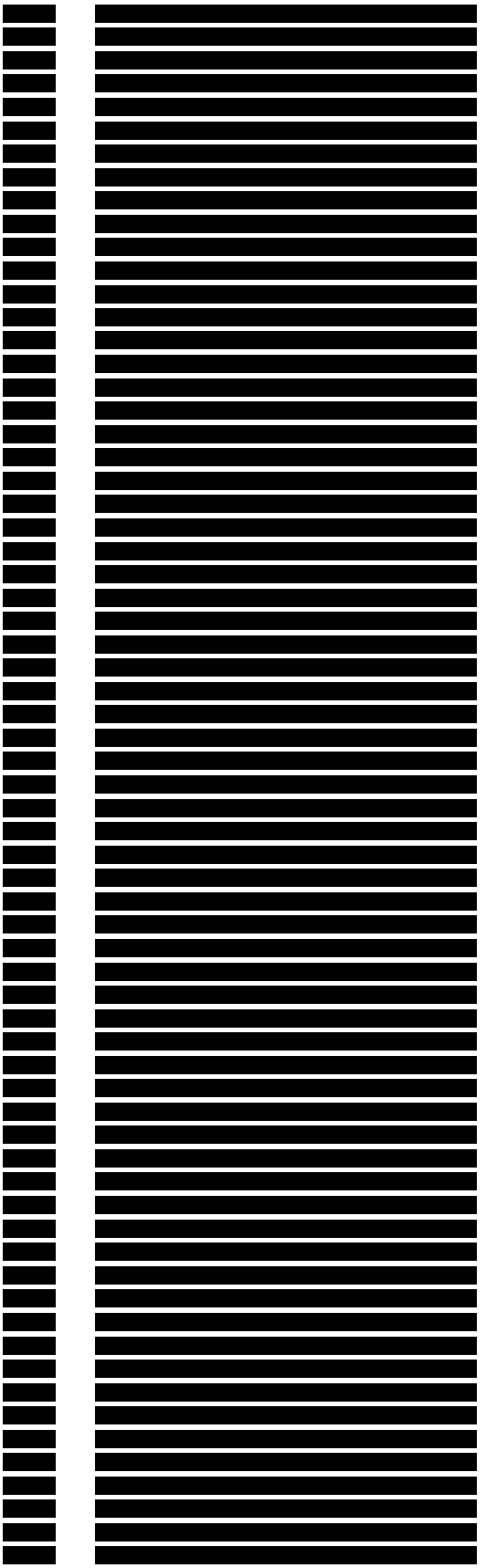

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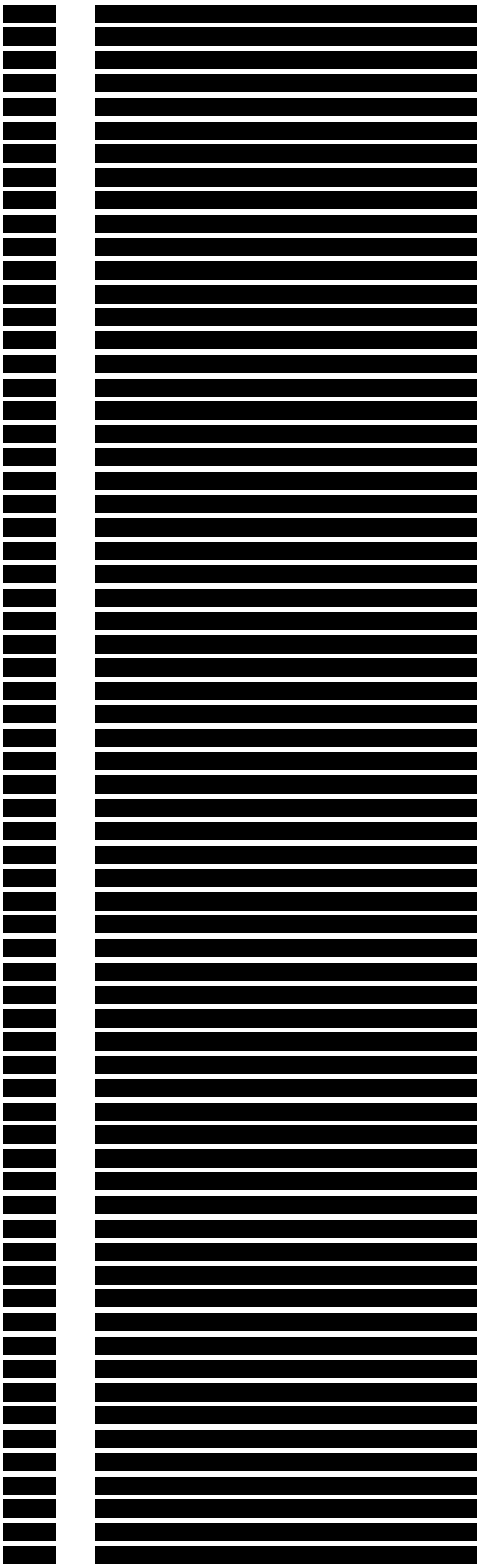

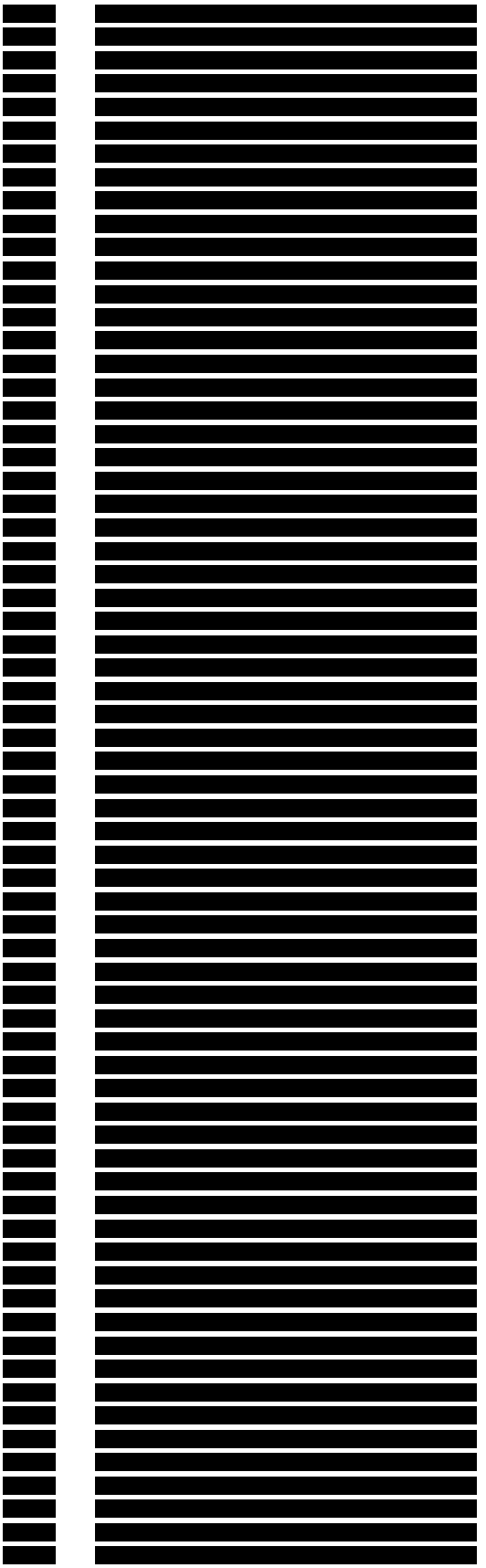

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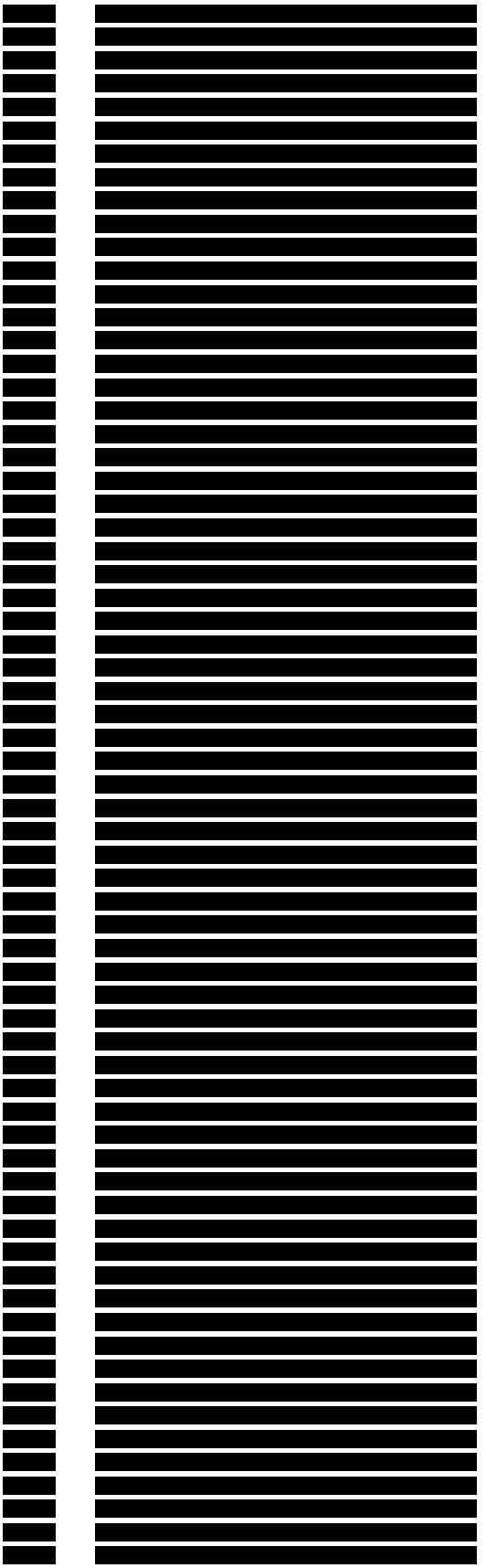

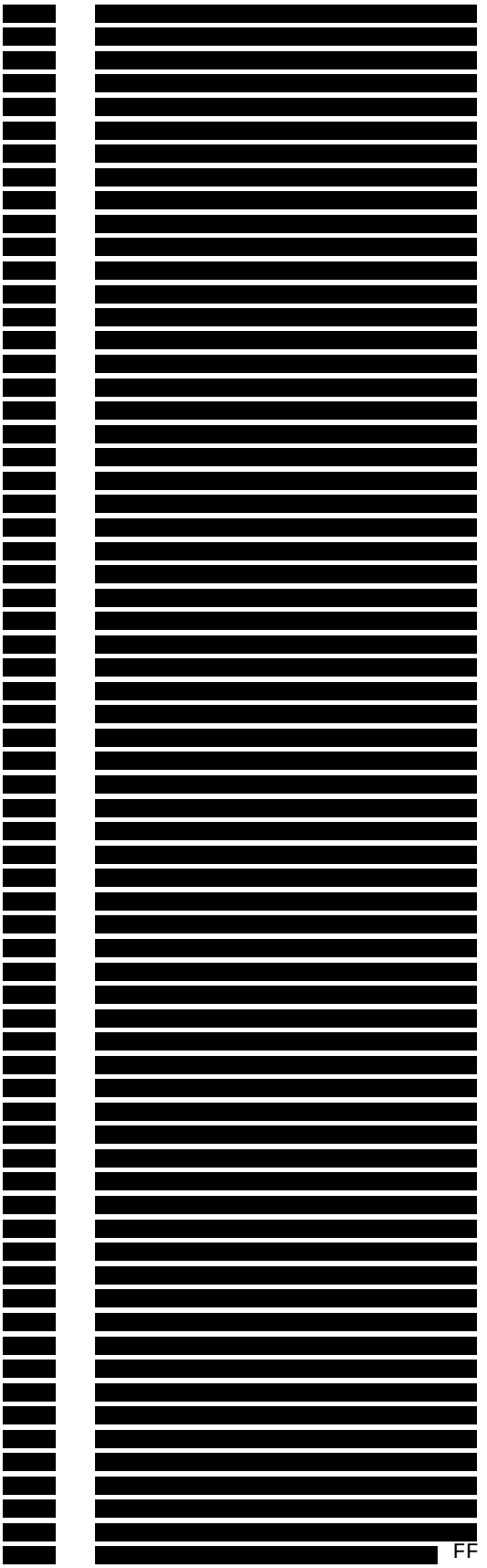
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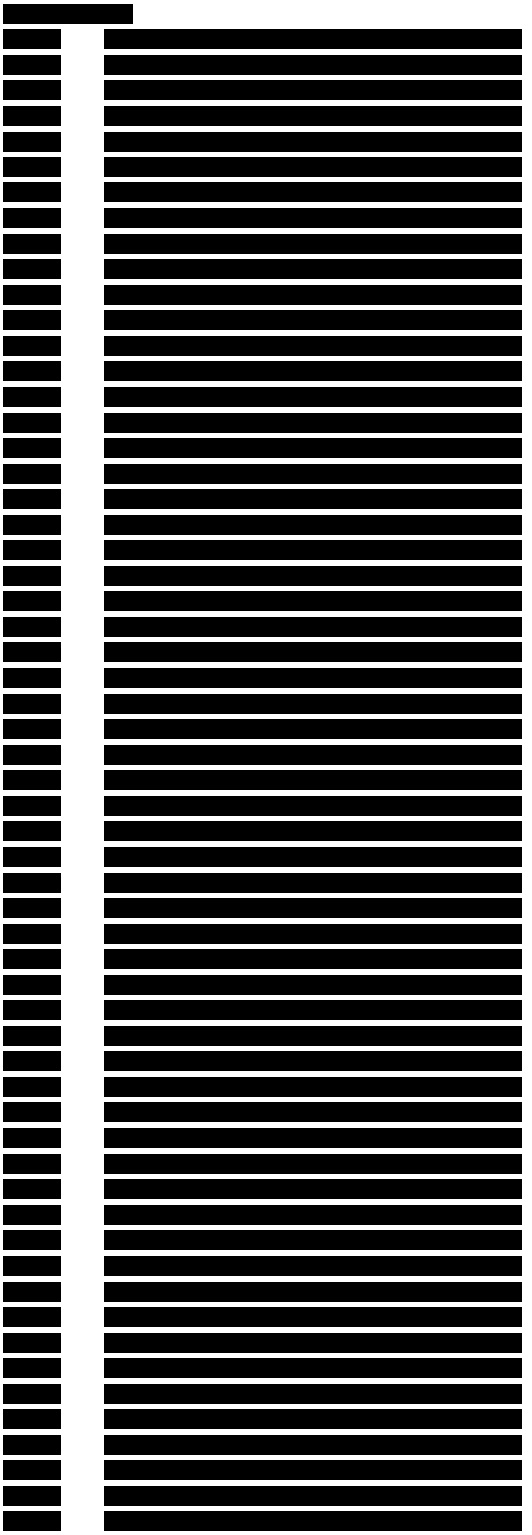

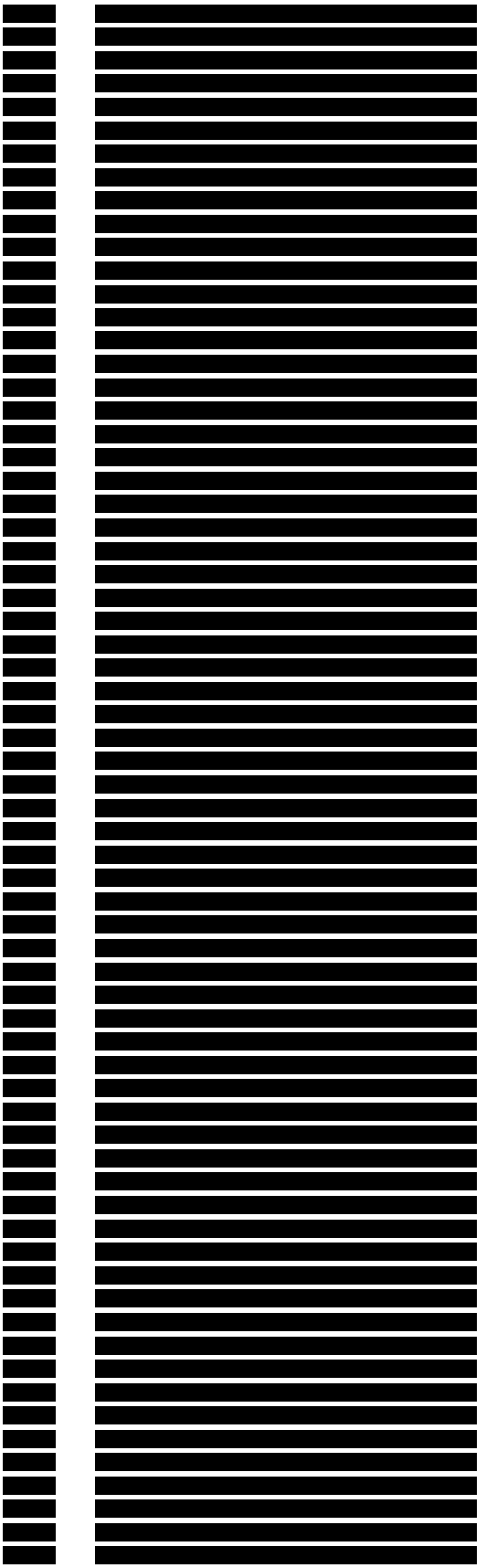

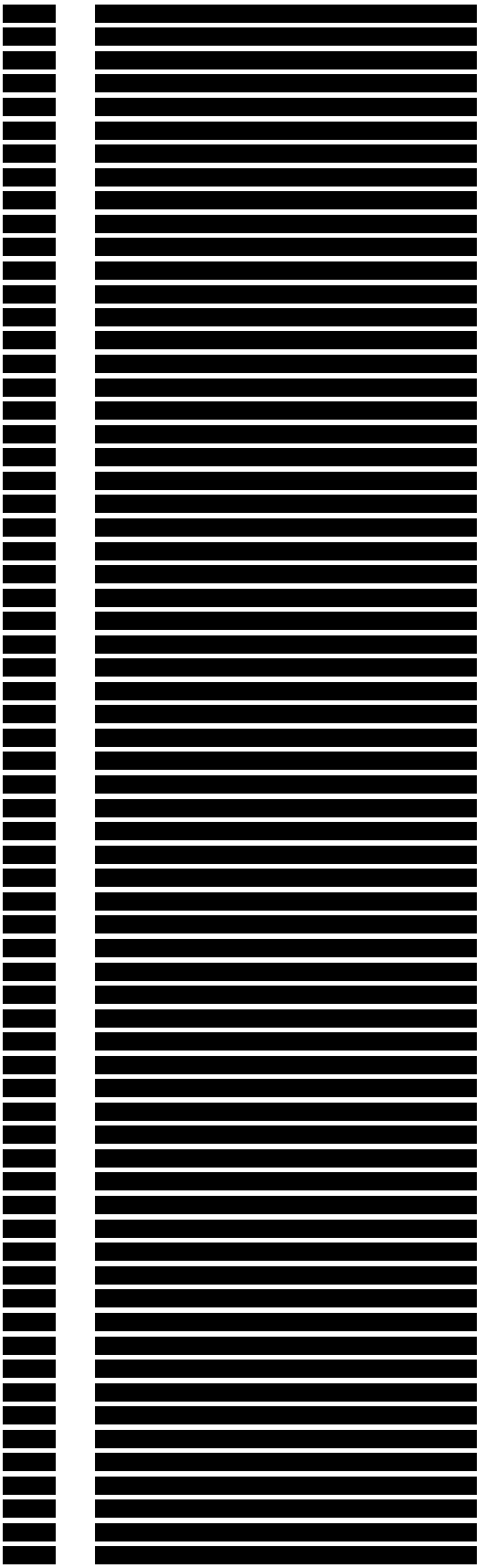

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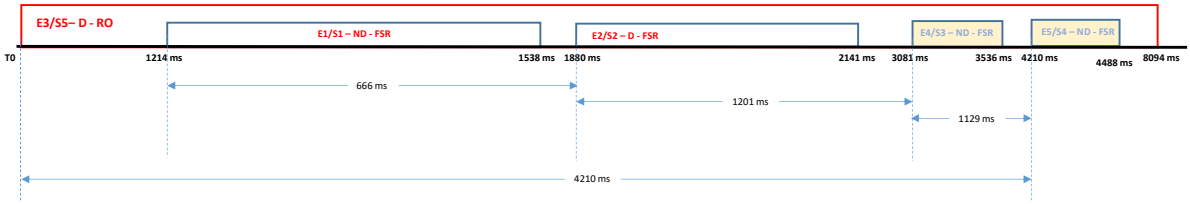
APPENDIX C

Latest Generation GM EDR
Event Timing Sequence using Supplemental Event Record Information



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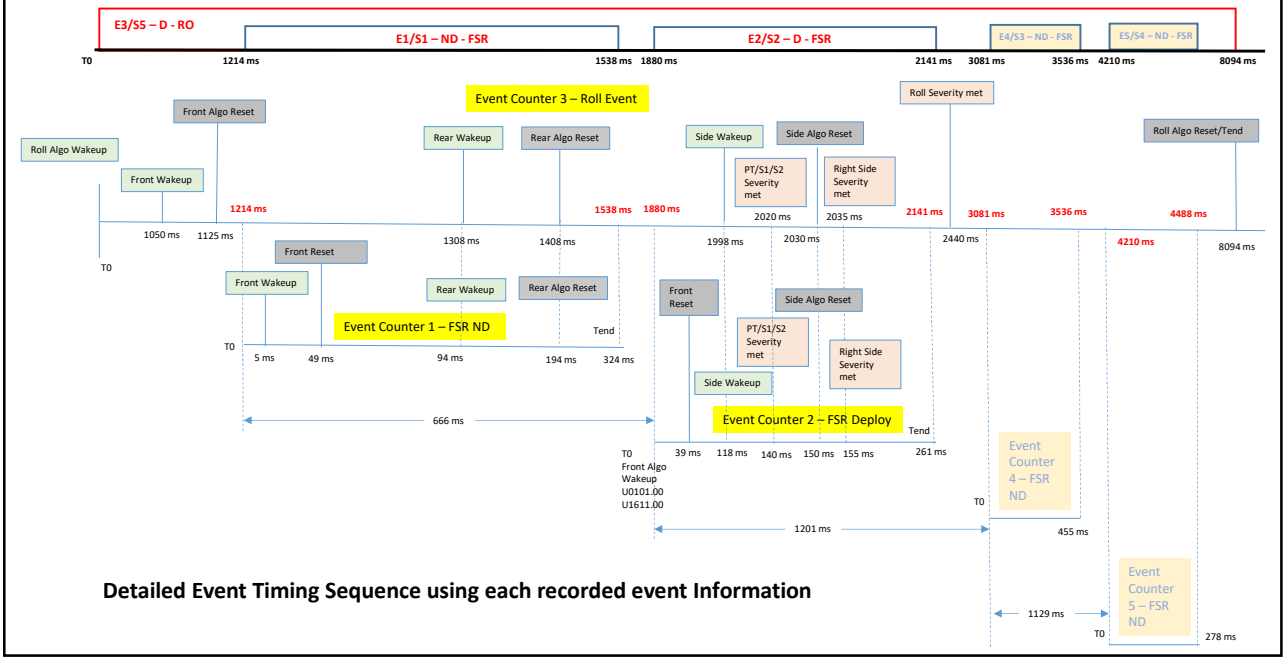
Latest Generation GM EDR



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